MEDSI PARIS 2018

MECHANICAL ENGINEERING DESIGN OF SYNCHROTRON RADIATION EQUIPMENT AND INSTRUMENTATION

SOLEIL SYNCHROTRON

10TH INTERNATIONAL CONFERENCE

MEDSI 2018

MECHANICAL ENGINEERING DESIGN OF SYNCHROTRON RADIATION EQUIPMENT AND INSTRUMENTATION

25-29 JUNE

CITÉ INTERNATIONALE UNIVERSITAIRE PARIS

CONFERENCE GUIDE

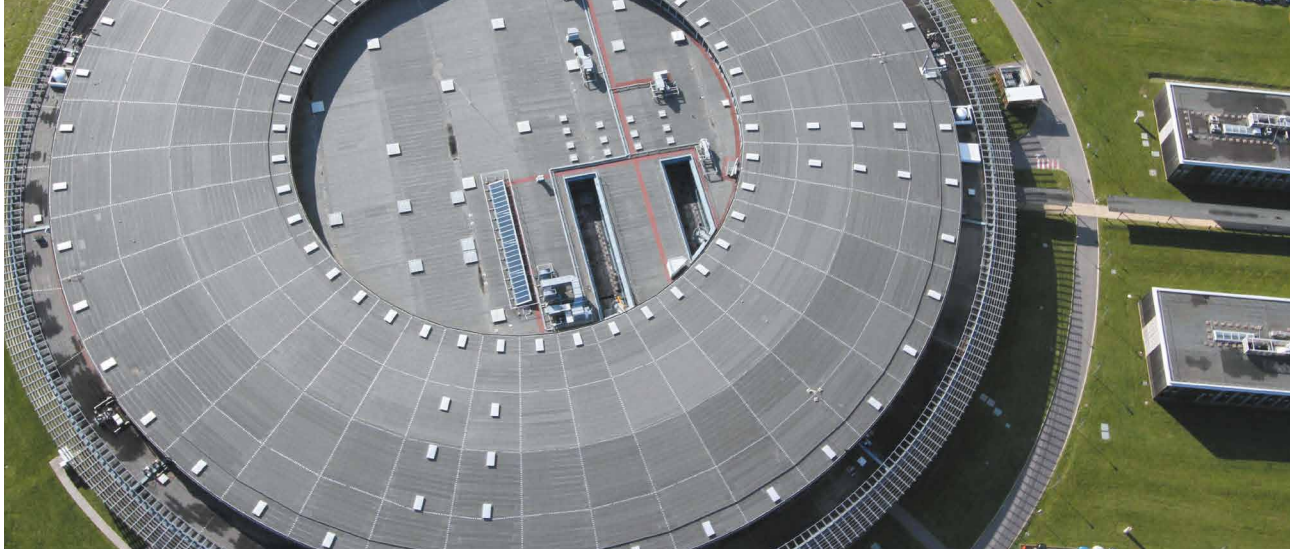
Conference Chair: K. Tavakoli (Synchrotron SOLEIL)
MEDSI IOC Chair: J. Kay (Diamond Light Source)
Scientific Committee Chairs: J-L. Giorgetta – N. Jobert (Synchrotron SOLEIL)

medsi2018@synchrotron-soleil.fr

WWW.MEDSI2018.ORG

Société Française de Physique
DIVISION ACCÉLÉRATEURS

HOP SCOTCH CONGRÈS



SOLEIL, an acronym (in French) for "Optimized Light Source of Intermediate Energy to LURE[1]," is a research center located on the Plateau de Saclay in Saint Aubin, Essonne. More concretely, it is a particle (electron) accelerator that produces the synchrotron radiation, an extremely powerful light that permits exploration of inert or living matter.

The **synchrotron radiation** is today essential in Research and Industrial applications.

Financed by two principal shareholders, the CEA and the CNRS, and four key partners, the "Ile de France" Region, the "Essonne" Department, the "Centre" Region, and the state (Ministry of Research), SOLEIL holds a private statute as a "Civil Company."

As a high-technology facility, SOLEIL is both an electromagnetic radiation source covering a wide range of energies (from the infrared to the X-rays) and a research laboratory at the cutting edge of experimental techniques dedicated to matter analysis down to the atomic scale, as well as a service platform open to all scientific and industrial communities

SOLEIL was commissioned in 2006, with the first expert users in January 2007. The facility is operating 24/7 in top-up injection mode and delivers a 500 mA electron beam of 2.75 GeV for a ring circumference of 354 meters and an emittance of 4 nm.rad. Today 29 beam lines exploit simultaneously the intense stable photon beams produced all around the storage ring with photon energies ranging in 10 orders of magnitudes from THz to Hard X-ray radiation.

www.synchrotron-soleil.fr

The French Physical Society (SFP) founded in 1873 by Charles Joseph d'Almeida

The French Physical Society is a non-profit state-approved membership organization working to advance and diffuse the knowledge of physics through its publications, scientific meetings, and education, outreach, advocacy, and international activities. It brings physicists living in France together by encouraging their interactions regardless of their cultures and backgrounds.

The SFP is the leading voice for physics and an authoritative source of physics information for the advancement of physics and the benefit of all; The SFP aims to increase awareness, access, and understanding of the value that physics holds for the greatest number. The SFP organizes a large number of events and edits the Bulletin Newsletters and the review "Reflets de la Physique". Each year, several prizes are awarded to physicists in honor of specific works or actions towards the promotion of physics outside the community. More recently the society paid special attention to questions related to young physicists, the place of women in physics and building bridges with the industries.

The SFP is a member of The European Physical Society (EPS) and of the International Union of Pure and Applied Physics (IUPAP).

www.sfpnet.fr

1 *LURE: "Laboratoire d'Utilisation du Rayonnement Électromagnétique", the Laboratory for the Use of Electromagnetic Radiation was a pioneering laboratory in the field of synchrotron radiation, located in the premises of the Université d'Orsay, where research and development of the use of the synchrotron radiation were cultivated on several machines (ACO: Orsay Collision Ring; DCI: Igloo Collision Machine, and SUPER ACO). SOLEIL has taken up the torch passed by LURE, which closed in 2003*

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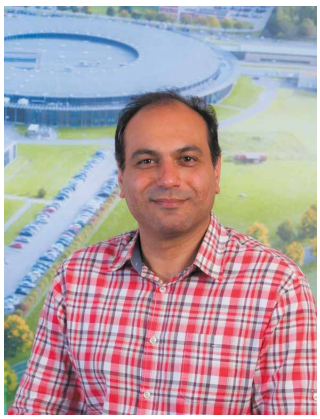
WELCOME FROM THE LOC CHAIR



I am delighted to welcome you to Paris and to the 2018 Edition of MEDSI on behalf of the Local Organization Committee. We have been preparing this event with the goal of making your experience as effective and pleasant as possible. The LOC has been working hard in connection with the IOC to make this edition a success.

This 10th Mechanical Engineering Design of Synchrotron Radiation Equipment and Instrumentation takes place in Paris, France, from June 25 to June 29, 2018 and is hosted by Synchrotron SOLEIL. This important biannual conference gathers worldwide experts of the accelerator community and related technologies. MEDSI provides a forum for engineers of those fields from facilities around the world to meet and share their experience. The conference fulfills the need to improve information exchange on technical issues and equipment design. It also facilitates the opportunity for individuals to share their problems and solutions with their peers.

The sessions have been redefined in cooperation with the International Organizing Committee in order to give more coherence to the scientific-technical content. The Scientific committee has reviewed all the abstracts to select the contributions and distribute them between oral and posters presentations.

I will take the opportunity to deeply thank all the LOC Member for their dedication in making this event possible. And I have to say that working closely with the IOC Members has been inspiring.

I wish you a very productive conference, hoping that all the conditions will be met for brainstorming, sharing experience and solutions in an open and friendly environment.

Enjoy these conference days in Paris.

Keihan TAVAKOLI, Synchrotron SOLEIL
Conference Chair

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Brookhaven National Laboratory

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Nicolas Jobert (Chair)

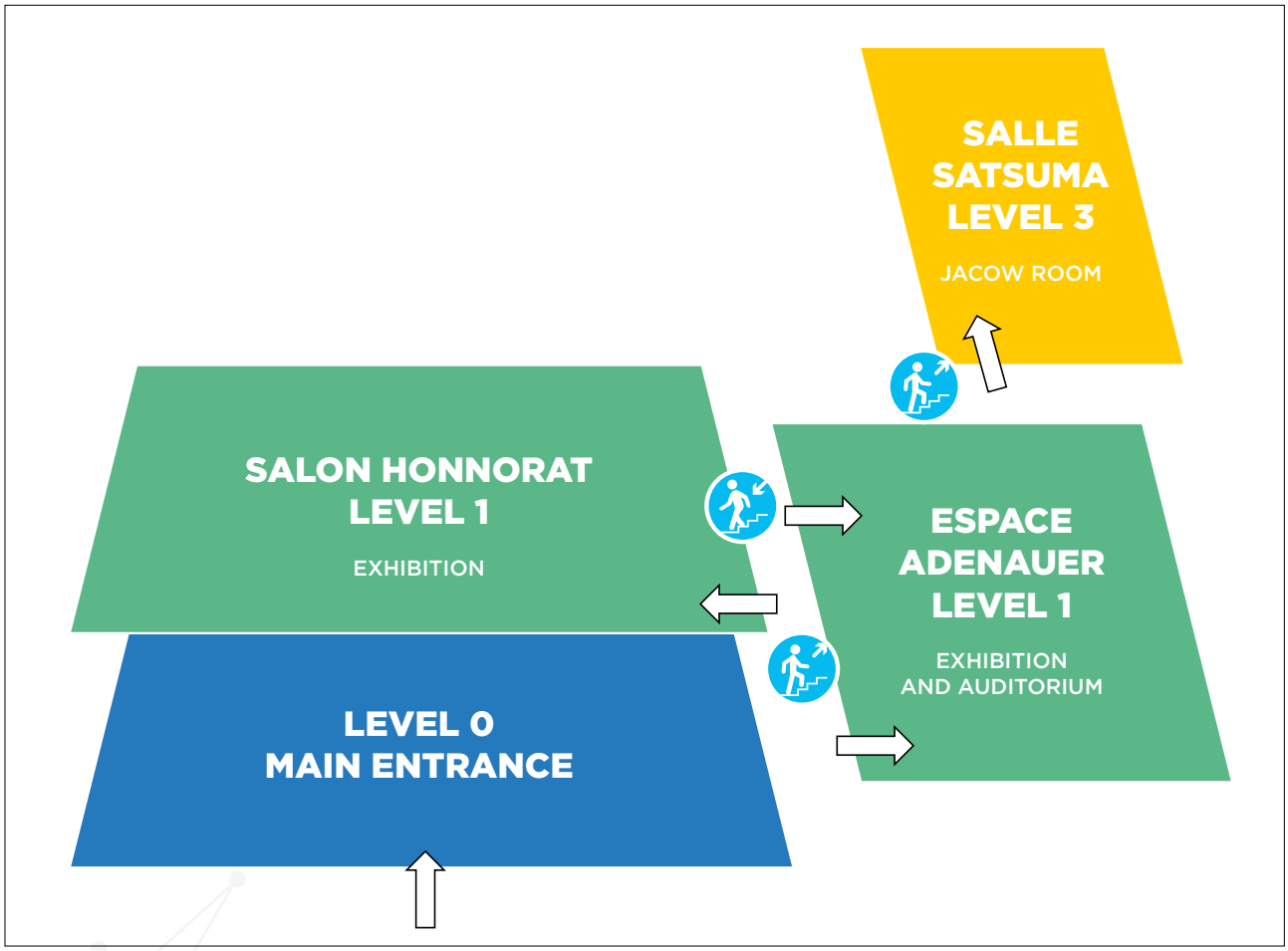
Keihan TAVAKOLI

Manuel Tilmont

Cité Internationale Universitaire – Maison Internationale
17, Boulevard Jourdan 75014 Paris

VENUE

The Cité Internationale Universitaire is a multicultural space built in the 1930's. It was conceived as a place where students of all nationalities could meet. Its style, inspired by the Château de Fontainebleau, gives it a monumental air. Inside, some of the lounges are in Art Deco style.



The congress will take place on the +1 level:
- Conference in ADENAUER / +1 level
- Exhibition in HONNORAT and ADENAUER / +1 level
- JACoW room: SATSUMA room / +3 level

PRACTICAL INFORMATION

ACCESS

The Cité Internationale Universitaire is accessible by:

- Tramway T3
  Cité Universitaire
- Métro line 4
  Porte d'Orléans
- RER B – Cité Universitaire
- Bus 21,88 and 67

WIFI

Wifi is available in all conference venue.
Login to the network: **WIFI-COLLOQUES**
Choose « accès invité » and enter « **adenauer** »

WELCOME DESK OPENING HOURS

Monday, June 25th: 09:00-11:00 and 16:00-18:00
Tuesday, June 26th: 08:30-18:00
Wednesday, June 27th: 08:30-18:00
Thursday, June 28th: 08:30-18:00
Friday, June 29th: 08:30-13:00

LOCAL TOURIST INFORMATION

The Convention and Visitor bureau of Paris will help you organise sightseeing of Paris and France. More information on their website:
https://www.parisinfo.com/

EMERGENCY CONTACT

112: European general emergency number (40 languages spoken including English)
122: National centre for emergency calls for deaf and people with hearing problems
18: Fire brigade
15: SAMU/medical emergency
17: Police or Gendarmerie (automatically redirected to the nearest station)

VISIT OF SYNCHROTRON SOLEIL

Monday 25 June, 11:00 – 16:00
Meeting point: 09:00 at the venue (pick up your badge at the welcome desk first)

High-technology facility, SOLEIL is both an electromagnetic radiation source covering a wide range of energies (from the infrared to the X-rays) and a research laboratory at the cutting edge of experimental techniques dedicated to matter analysis down to the atomic scale, as well as a service platform open to all scientific and industrial communities.

SOLEIL accelerator complex is composed of a 100 MeV LINAC, a 2.75 GeV BOOSTER and a 3.9 nmrad storage ring. A total of 29 beam lines take their photon beam either from a dipole or an undulator source.

IMPORTANT: Not allowed to people with pacemakers or defibrillator implants (High intensity magnetic field)

PROGRAM AT A GLANCE

MONDAY, JUNE 25TH	TUESDAY, JUNE 26TH	WEDNESDAY, JUNE 27TH	THURSDAY, JUNE 28TH	FRIDAY, JUNE 29TH
Registration 09:00-11:00	Registration and welcome coffee 09:00-10:00	KEYNOTE TALK 2: Selection of materials and processes for vacuum, cryogenic and non-magnetic applications in particle accelerators 09:00-10:20	KEYNOTE TALK 3: Toward high precision position control using laser interferometry: main sources of errors 09:00-10:20	BEAMLINES 09:00-10:20
	Conference welcome 10:00-10:30			
	JACoW presentation 10:30-10:50	Coffee Break 10:20-10:50	Coffee Break 10:20-10:50	Coffee Break 10:20-10:50
Visit of Synchrotron SOLEIL 11:00-15:20	KEYNOTE TALK 1: Shining a light on synchrotron light 10:50-12:10	PRECISION MECHANICS 10:50-12:10	SIMULATION 10:50-12:10	BEAMLINES 10:50-12:10
	Lunch 12:10-13:30	Lunch 12:10-13:30	Lunch 12:10-13:30	Farewell Lunch 12:10-13:00
	ACCELERATORS 13:30-14:50	PRECISION MECHANICS 13:30-13:45	SIMULATION 13:30-14:10	
		CORE TECHNOLOGY DEVELOPMENTS 13:45-14:50	BEAMLINES 14:10-14:50	
	Tea Break 14:50-15:20	Tea Break 14:50-15:20	Tea Break 14:50-15:20	
Social Event Welcome Reception 16:00-18:00	ACCELERATORS 15:20-16:40	CORE TECHNOLOGY DEVELOPMENTS 15:20-16:40	BEAMLINES 15:20-16:40	
	Poster session 1 16:40-18:00	Poster session 2 16:40-18:00	Poster session 3 16:40-18:00	
			Social Event Conference Dinner 20:00-23:00	

GOLD SPONSORS

ILON

BESTEC

CECOM

FMB Oxford

GAMMA VACUUM

idt instrument design technology Beamline Engineering Excellence

IRELEC ALCEN

JJ X-RAY Danish Science Design

JPE EXPERTS IN POSITIONING JANSSEN PRECISION ENGINEERING

JPHE

Kashiyama Vacuum Solutions

MEWASA SWISS MADE

MI PARTNERS PARTNERS IN MECHATRONIC INNOVATION

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saes group

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SILENTFLEX vibration control

TRIOPTICS See the Difference.

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PHOTON LINES Solutions optiques

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Cryotherm

CryoVac low temperature technologies

EDWARDS

HEIDENHAIN The Measure of Excellence

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Kurt J. Lesker Company

MICROCERTEC Advanced Ceramics for High-Tech Industries

phytron Extreme. Precision. Positioning.

PI

PiNK Vakuumtechnik

上海碩頌電子科技有限公司 Shanghai Shuosong electronic technology Company limited

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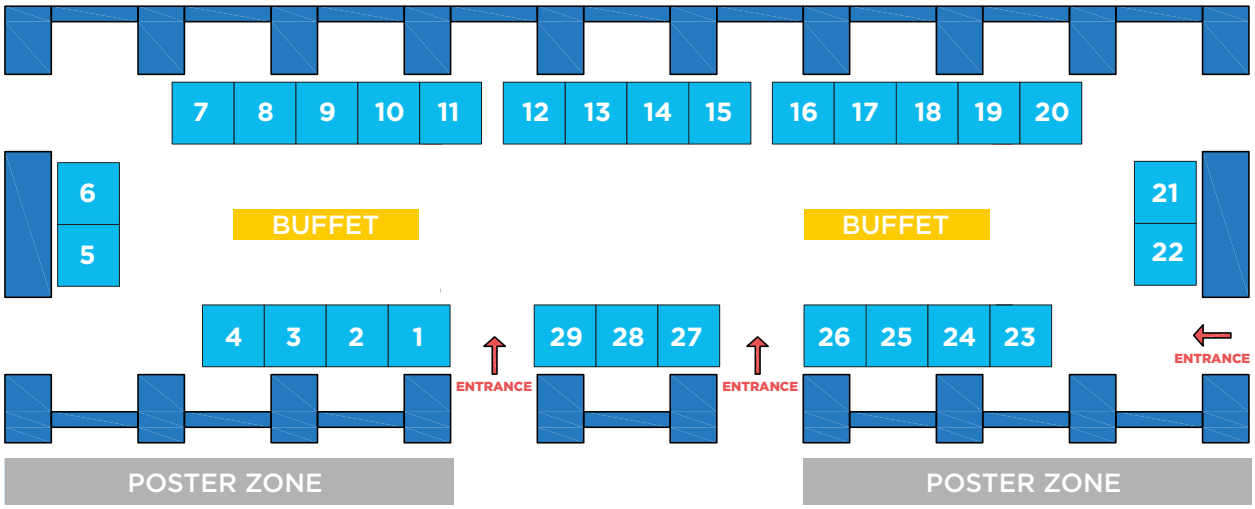
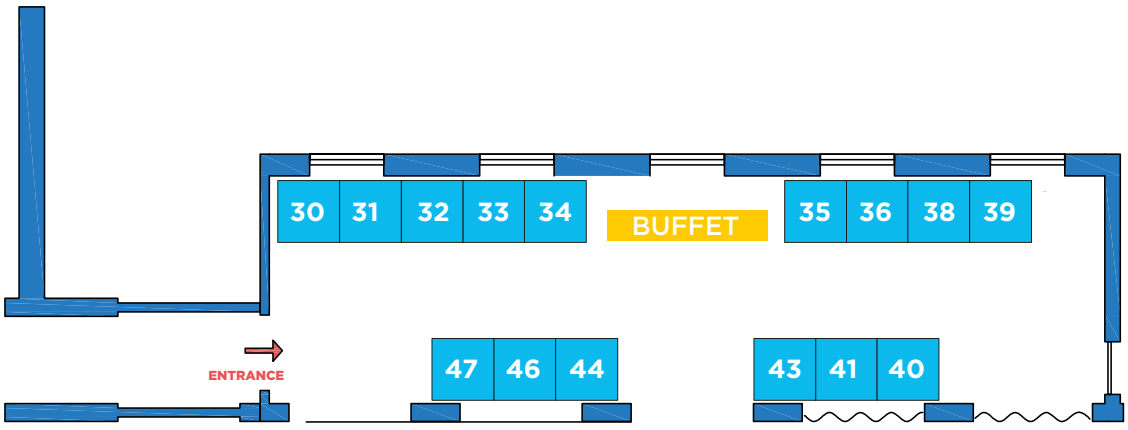
EXHIBITION PLAN

SALON HONNORAT



GALERIE ADENAUER



EXHIBITION OPENING HOURS

Monday 25th: 16:00-18:00
Tuesday 26th: 09:00-18:00
Wednesday 27th: 09:00-18:00
Thursday 28th: 09:00-18:00
Friday 29th: 09:00-13:00

1	SILENFLEX	**23**	SHANGAY SHUOSONG ELECTRONIC TECHNOLOGY COMPAGNY LIMITED
2	HEIDENHAIN FRANCE	**24**	ALLECTRA
3	LEYBOLD	**25**	TOYAMA
4	MICROCERTEC	**26**	FLEX - EQUIPEMENT MEWASA
5	VACOM	**27**	CRYOVAC
6	HUBER DIFFRAKTIONSTECHNIK GMBH & CO. KG	**28**	SAES-GROUP
7	VACUUM FAB	**29**	SMARACT GMBH
8	PHYTRON	**30**	PI FRANCE
9	COSMOTEC	**31**	EDWARDS
10	SAINT GOBAIN	**32**	CEDRAT TECH
11	NORTEMECANICA	**33**	PHOTON LINES
12	FMB OXFORD LIMITED	**34**	TRIOPTICS
13	JANSSEN PRECISION ENGINEERING	**35**	AXILON AG
14	UMICORE FRANCE	**36**	JPHE CALDEIRARIA E MAQUINAS
15	JJ X - RAY	**38**	CRYOTHERM
16	BESTEC	**39**	AVS ADDED VALUE SOLUTIONS
17	INSTRUMENT DESIGN TECHNOLOGY LTD	**40**	PINK GMBH VACUUMTECHNIK
18	SYMÉTRIE	**41**	APPLIED DIAMOND, INC.
19	SYDORTECHNOLOGIES	**43**	GAMMA VACUUM
20	KURT J.LESKER COMPAGNY	**44**	KASHIYAMA
21	MI-PARTNERS	**46**	CECOM
22	IRELEC	**47**	UHVDESIGN

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ALLECTRA

Description: Allectra is a leading manufacturer and supplier of High
Vacuum and UHV components including custom items
Address: Meridian House, Bluebell Business Estate, Sheffield Park, East Sussex, TN22 3HQ
Phone: +44 1825 721900
Contact email: sales@allectra.com
Website: www.allectra.com

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APPLIED DIAMOND, Inc

Description: Applied Diamond manufactures optical components from diamond for synchrotron beam lines and other technical applications. Our growth capabilities and supplier networks enable us to select the proper material for your windows, beam monitors, lenses, monochromators and other optics.
Address: 3825 Lancaster Pike Wilmington, DE 19805 USA
Phone: 1-302-999-1132
Contact email: services@usapplieddiamond.com
Website: www.usapplieddiamond.com

35

AXILON AG

Description: AXILON provides excellent and efficient solutions for complete beamlines, beamline components, monochromators, mirror systems, experimental stations, X-ray microscopes, insertion devices and other special engineering and manufacturing solutions.
Address: Johann-Pullem-Str. 29b; 50996 Koeln
Phone: +49 221 165 324 00
Contact email: beamlines@axilon.de
Website: www.axilon.de

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BESTEC

Description: Provider of synchrotron instrumentation and deposition systems
Address: Am Studio 2b, D-12489 Berlin
Phone: +49 151 4673 1251
Contact email: tanja.giessel@bestec.de
Website: www.bestec.de

45

CECOM

Description: CECOM is specialized in Design manufacturing and testing UHV vacuum chambers and components.
New solution to joint copper and stainless steel have been developed (a cold method not altering the mechanical characteristics). Aluminum vacuum chambers with bimetallic fitting have been done for ESRF – EBS.
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Phone: +39774355777
Mail: a.ceracchi@cecomweb.com
Website: www.cecomweb.com

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CEDRAT TECHNOLOGIES (CTEC)

Description: CEDRAT TECHNOLOGIES (CTEC) is a high technology French SME offering mechatonic solutions for demanding applications. CTEC has more than 18 years of experience in designing and developing Piezo based mechanisms. It is the only company to manufacture, test and establish successfully the Fast Piezo Shutter for X - Ray beamlines application.
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Phone: 456580400
Contact email: actuator@cedrat-tec.com
Website: www.cedrat-technologies.com

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Phone: 1 408 428 9741
Contact email: ask@cosmotec.us
Website: www.cosmotec.us

38

CRYOTHERM

Description: Cryotherm are the specialists for the construction and manufacturing of vacuum super insulated vessels and transfer lines for cryogenic liquid gases that are used in many different industries such as chemical industries, medicine, foodstuffs, research or biotechnology.
Address: Euteneuen 4, 57548 Kirchen / Sieg
Phone: 0049 274195850
Contact email: info@cryotherm.de
Website: www.cryotherm.de

27

CRYOVAC

Description: CryoVac is a leading supplier for customized cryogenic solutions, offering a broad range of cryogenic equipment, open/closed-cycle systems, from table top to room size cryostat (mK-range up to 800K).

Address: Heuserweg 14, 53842 Troisdorf, Germany

Phone: 0049 (0)2241-846730

Contact email: info@cryovac.de

Website: www.cryovac.de

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AVS ADDED VALUE SOLUTION

Description: In AVS we are experts in design, manufacturing, assembly, tests and supply under ISO 9001 and EN 9100, providing our customers from the conceptual design to the turnkey. From the machine to the beamlines, AVS contributes with its knowledge in precision mechanics, UHV procedures, fabrication techniques and integration to give response to specific problematics. AVS carries out development projects for X-Rays synchrotrons where standard solutions are not an option. With a large experience in beam collimation and diagnostics, AVS is very solvent both at the elemental conception and during production of advanced accelerator components like slits, scrapers and diagnostic chambers. AVS has also developed alignable structures where stability and accuracy are a must.

Address: Polígono Industrial Sigma, Zizilion kalea 2 Bajo, Pabellón 10, 20870 Elgoibar, Gipuzkoa

Phone: 0034 943 821 841

Contact email: avs@a-v-s.es

Website: www.a-v-s.es

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EDWARDS

Description:

Edwards is a leading developer and manufacturer of sophisticated vacuum products, abatement solutions and related value-added services. Our products are used within an increasingly diverse range of industrial processes ; and for both scientific instruments and a wide range of R&D applications

Address: 23 Rue du Gros Murger 95220 Herblay

Phone: 01 41 21 12 56

Contact email: celine.agnus@edwardsvacuum.com

Website: www.edwardsvaccum.com

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JANSSEN PRECISION ENGINEERING (JPE)

Description: Positioners for UHV and cryogenic environment

Address: Aziëlaan 12, 6199 AG Maastricht-Airport

Phone: 00 31 43 3 58 57 77

Contact email: Huub.Janssen@jpe.nl

Website: www.JPE.nl

26

FLEX-EQUIPEMENTS MEWASA

Description: Fabrication de soufflets métalliques à membranes.

Address: 5 rue des Cerisiers 91090 LISSES

Phone: 01 60 88 24 81

Contact email: jl.diat@flex-equipements.fr

Website: www.mewasa.ch

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FMB OXFORD LIMITED

Description: FMB Oxford is a world leading, multi-disciplinary company at the forefront of engineering design and manufacturing for synchrotron and FEL facilities. With over 20 years' experience working with high precision optics, our team has the expertise to provide the best solution for your specific needs. Our ultra-stable designs, measuring capabilities and published papers are testament to our expertise in the field and collaborative approach we take with our customers. Most recent experiences include deliveries and installations of ultra-stable mirror systems to the European XFEL, complete beamlines to MAX IV Lab and beamline components to Sirius.

Address: Unit 1 Ferry Mills, Osney Mead, Oxford, OX2 0ES

Phone: +44 1865 320300

Contact email: Sales@FMB-Oxford.com

Website: www.fmb-oxford.com

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GAMMA VACUUM

Description: Gamma Vacuum designs and manufactures ion pumps, titanium sublimation pumps, non-evaporable getters and their controls. Our staff and facility are dedicated to one thing: Creating the purest vacuum environments on earth.

Address: 2915 133rd Street W. Shakopee, MN 55379

Phone: 01 952 445 4841

Contact email: sean.duffin@gammavacuum.com ou lori.mccloud@gammavacuum.com

Website: www.gammavacuum.com

2

HEIDENHAIN France

Description: Conception et fabrication de capteurs intelligents et d'électroniques de traitement et d'analyse des données, afin de fiabiliser et d'optimiser la productivité et la connectivité des machines.

Address: 2 avenue de la Cristallerie 92310 Sèvres

Phone: 01 41 14 30 00

Contact email: cavarec@heidenhain.fr

Website: www.heidenhain.fr

6

HUBER DIFFRAKTIONSTECHNIK GMBH & CO. KG

Description: Supplier of Diffractometers and Positioning Equipment

Address: Sommerstrasse 4, 83253 Rimsting

Phone: +49805168780

Contact email: info@xhuber.com

Website: www.xhuber.com

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INSTRUMENT DESIGN TECHNOLOGY Ltd

Description: Supplier of SR instrumentation from complete Beamlines to leading edge range of monochromators, focsuing optics CRL, Large,medium & small mirror systems

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Contact email: enquiries@idtnet.co.uk

Website: www.idtnet.co.uk

22

IRELEC

Description: Since 1985, IRELEC is a provider of "Design and Build" solutions for applied research (components, sub-systems and services), continuously outstripping the state-of-the-art in the fields of x-ray optical system, biomedical robotics and precision instrumentation.

Address: 20 Rue du tour de l'eau, 38400 Saint Martin d'Hères

Phone: 04 76 44 12 96

Contact email: irelec@irelec-alcen.com

Website: www.irelec-alcen.com

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JJ X - RAY

Description: JJ X-ray can design, produce and install on component basis, e.g. white beam power slits and CRL transfocator systems, scaling all the way to full beamlines.

Address: Dr Neergaards Vej 5D, 2970 Hoersholm

Phone: 0045 47763000

Contact email: info@jjxray.dk

Website: www.jjxray.dk

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JPHE CALDEIRARIA E MAQUINAS

Description: Boilermaking, Welding and Engineering Company

Address: Rua João Covolan Filho, 385 - Distrito Industrial I, Santa Bárbara d'Oeste - São Paulo

Phone: 55 19 3454 2594

Contact email: biscola.wh@jphe.com.br

alcantara.ep@jphe.com.br

Website: www.jphe.com.br

44

KASHIYAMA

Description: Dry Vacuum Pump,Turbo Vacuum Unit

Address: Stefan-George-Ring 2, 81929 München Germany

Phone: +49 (0)152 0441 4768

Contact email: m-toyama@kashiyama.com

Website: http://de.kashiyama.com/

20

KURT J. LESKER COMPANY

Description: KJLC® is a global leader in the design and manufacturing of intricate vacuum chambers. Our manufacturing experts work with you to devise bespoke, quality solutions for all your application needs.

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Contact email: EMEIAsales@lesker.com

Website: www.lesker.com

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Description: With a long history in collaboration with major research institutes, laboratories, universities and scientific instrument manufacturers, Leybold is the right partner to provide the necessary vacuum expertise, experience and equipment.

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Contact email: sales.or@leybold.com

Phone: 01.69.82.48.00

Website: www.leybold.com

4

MI- PARTNERS

Description: Mechatronic Innovation Partner: High-end Engineering company specialized in the design and realization of accurate and highly dynamic systems such as sample manipulators, Nano-end stations and monochromators. Core competences: System architecture, Dynamics, thermal (cryo) design and calculations, predictive modeling, metrology.

Address: Dillenburgstraat 9N, 5652AM Eindhoven

Phone: + 31 6 1475 1371

Contact email: R.schneider@MI-Partners.nl

Website: www.MI-Partners.nl

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MICROCERTEC

Description: Microcertec is specialized in the development and manufacturing of advanced ceramic components using high precision machining technologies, and offers complementary skills such as 3D thin film metallization and ceramic to metal brazed assemblies.

Address: PAE de Lamirault: 22 Rue de Lamirault, 77090 Collégien

Phone: 01 60 06 66 73

Contact email: mariem.filali@microcertec.com

Website: www.microcetec.com

11

NORTEMECANICA

Description: Nortemecánica is a reference in manufacturing, assembly and commissioning of capital goods, machinery and spare parts for the industry, with over 25 years' experience.

Address: Area Industrial de Tabaza I, parcela E5, 33469 Carreño, Asturias

Phone: 34985579857

Contact email: comercial@nortemecanica.es

Website: www.nortemecanica.es

8

PHYTRON

Description: Manufacturer of high precision and smooth running stepper motor technology

Address: Industriestr. 12, 82194 Gröbenzell

Phone: 4981425030

Contact email: sales@phytron.de

Website: www.phytron.eu

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PI FRANCE SAS

Description: Physik Instrumente (PI) is a leading player in the global market for precision positioning technology. PI develops and manufactures standard and customized solutions with various piezo and drive technologies. With four locations in Germany, PI is represented internationally by fifteen subsidiaries

Address: ZAC de la Duranne, 380, avenue Archimède Bâtiment D, 13100 Aix en Provence, France

Phone: 04 42 97 52 30

Contact email: info.france@pi.ws

Website: www.physikinstrumente.com

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PHOTON LINES

PROGRAM AND ABSTRACTS

Keynote talk 1 Tuesday, 26-JUN-18 10:50-12:10 **Location:** Auditorium

TUKA01 Shining a Light on Synchrotron Light

Authors Sylvain Ravy (Laboratory for Solid State Physics LPS, Orsay)

Abstract Synchrotron radiation light is now available in many centers throughout the world and it is used by chemists, physicists, biologists, geologists and other scientists to study samples as diverse as crystals, single molecules, viruses, old manuscripts, nanoparticles, cement, thin films or glasses. In this keynote, we will present in a didactic way the essential properties of synchrotron light, and the basic physical phenomena underlying the interaction between synchrotron light and matter: scattering and absorption. The main classes of techniques that beamlines offer to the users community, namely diffusion-diffraction, spectroscopy and imaging, will then be presented. A special emphasis will be given to the huge increase of brilliance, and thus of coherence, that the new generation of synchrotrons have pledged to provide.

Oral Session: Accelerators Tuesday, 26-JUN-18 13:30-14:50 **Location:** Auditorium

TUOPMA01 Status of the European XFEL Photon Beam Systems

Authors Martin Dommach (XFEL.EU, Schenefeld)

Abstract The European XFEL, a fourth generation Free-Electron-Laser facility in Hamburg area (Germany), start-ed user operation in September 2017. In full operation the novel facility will produce at MHz repetition rate coherent femtosecond pulses with unprecedented brilliance in the energy range from 250 eV to 25 keV. The facility comprises of a linear accelerator and three photon beamlines: SASE1, that operates in the hard X-ray regime, is already in user operation mode, SASE2 saw first light in May and will be commissioned during this year and SASE3, that covers the soft X-ray range up to 3 keV, is under com-missioning right now and will start user operation late in 2018. The presentation will cover the current status, timeline and engineering challenges of the three photon beamlines and the six scientific instruments of the facility as well as possible future upgrades.

TUOPMA02 Mechanical Engineering for SCLF Accelerator

Authors Lixin Yin, Rongbing Deng, Han Wen Du, Xiao Hu, Zhiqiang Jiang, Yiyong Liu, Sen Sun, Wei Zhang (SINAP, Shanghai)

Abstract The Shanghai Coherent Light Facility (SCLF) is a hard X-ray free electron laser facility under construction. It is designed to deliver photons from 400eV to 25keV at a repetition rate as high as 1MHz based on an 8GeV superconducting LINAC. The radiator section consists of two variable gap undulator lines and one superconducting undulator line. The main accelerator locates in the 3km tunnel, with 30m underground depths. The mechanical engineering, including the vibration on site ground and in the underground tunnel, the consideration of the tunnel sedimentation monitoring and compensation, as well as the structure design of the main components and it's support are described in this paper.

TUOPMA03 Development of new UE38 Undulator for Athos Beamline in SwissFEL

Authors Haimo Joehri, Marco Calvi, Marco Hindermann, lars huber, Andreas Keller, Marcel Locher, Thomas Schmidt, Xinyu Wang (PSI, Villigen PSI)

Abstract For the next beamline, we will profit from the experience of the U15 undulator development, but there are new requirements, because it will be a polarized undulator with a period of 38mm. We are developing a new arrangement of the drives, a further development of the magnet keepers and a vacuum pipe with only 0.2mm of wall thickness. A rough overview was given at Medsi 2016, together with the talk of the U15 Undulator. Meantime, the UE38 is in production and the talk will present the actual status and the lessons we learned during development and the fabrication: - Realization of vacuum chamber with 0.2mm wall thickness - Support structure for the vacuum chamber - Precision of manufacturing - Precision of assembling - Design of Magnet keeper: Differential screw, forces, stiffness

TUOPMA04 Mechanical System of Apple II Insertion Devices at MAXIV

Authors Andreas Thiel, Mohammed Ebbeni, Hamed Tarawneh (MAX IV Laboratory, Lund)

Abstract At present five Apple II insertion devices were made and installed at MAX IV, three of them in the 1.5GeV-ring, and two in the 3GeV-ring. The assembly of the last one of a total number of six Apple II undulators made at MAX IV is currently going on. The undulators have period lengths of 48mm (two devices), 53mm, 58mm, 84mm and 95.2mm. The operational gap range of the 3GeV devices is between 11mm and 150mm, the range of the 1.5GeV devices is 14mm to 150mm. Structural analysis was applied to assure a minimum deflection of the main frame and the magnet array girders. The main frame is made of nodular cast iron, while the girders are made of aluminium alloy. In order to optimize the magnetic tuning the position of the magnet keepers can be adjusted by wedges. The undulators were fiducialized before the installation in the ring tunnel and were aligned in the straight section using their magnetic center as reference. All MAX IV made undulators have three feet with vertical adjustment and separate horizontal adjusters. This paper describes the design, assembly, shimming and installation of the MAX IV Apple II devices in more detail.

Oral Session: Accelerators | Tuesday, 26-JUN-18 15:20-16:40 | **Location:** Auditorium

TUOPMA05 Updates on the Storage Ring Vacuum System for Spring-8-II

Authors Sunao Takahashi, Teruhiko Bizen (JASRI/SPring-8, Hyogo), Masazumi Shoji (JASRI, Sayo-gun), Masaya Oishi, Kazuhiro Tamura, Yukiko Taniuchi (JASRI/SPring-8, Hyogo-ken)

Abstract At SPring-8, aiming at the realization of upgrade project (SPring-8-II), development of hardware in each sub-system has been energetically advanced. Furthermore, a test half-cell construction is underway and scheduled for completion in this summer, so that interference between sub-systems and consistency in the alignment strategy could be confirmed. As for the vacuum system, development of a 12-m-long integrated vacuum chamber (12m-LIC) made of stainless steel and discrete photon absorbers with compact design are important keys to the success. The straight chamber was fabricated from several parts, mainly formed by roll-forming, and unitized by means of LBW according to proper longitudinal sections. Then, they will be integrated into the 12m-LIC with the bending chamber, photon absorbers and other vacuum components including transport gate valves at both ends. There are two kinds of photon absorbers, horizontal and vertical insertion types, both of which are equipped with scattering blocking structure. The configuration of the absorbing body was designed so as not to generate the plastic deformation with the heat transfer coefficient distribution calculated by CFD analysis.

TUOPMA06 Status of the ESRF EBS Storage Ring Engineering and Construction

Authors Philippe Marion, Jean-Claude Biasci, Thierry Brochard, Laurent Eybert, Loys Goirand (ESRF, Grenoble)

Abstract In the frame of its Extremely Brilliant Source (EBS) upgrade, the ESRF is preparing the replacement of its existing storage ring by a new ring based on a 7-bend achromat lattice enabling to reduce the electron beam horizontal emittance by a factor 30. The project involves challenging engineering requirements due to the large number of magnets, space constraints and specified geometrical precision. In order to validate the feasibility of this very compact assembly with real parts, a Mock-up of a complete EBS cell was assembled in 2017. The preparation of fully equipped girders with all components assembled, aligned and tested was started in October 2017 and is progressing as a rate of 3 per week. The main technical achievements and issues encountered during manufacturing of magnets, girders, chambers and absorbers will be presented, together with an outline of the planned dismantling and installation phases, scheduled from December 2018. This presentation is given on behalf of the ESRF EBS engineering team: J-C Biasci, J Borrel, T Brochard, F Cianciosi, D Coulon, Y Dabin, L Eybert, L Goirand, M Lesourd, N Louis, T Mairs, B Ogier, J Pasquaud, P Van Vaerenbergh, F Villar.

TUOPMA07 RF Fingers for the New ESRF-EBS Storage Ring

Authors Thierry Brochard, Philipp Marian Brumund, Loys Goirand, J. Pasquaud, Simon Mathieu White (ESRF, Grenoble)

Abstract In the new ESRF-EBS (Extremely Brilliant Source) storage ring vacuum chambers assembly, with a reduced aperture and the new omega shape, RF fingers are a key component to ensure good vacuum conditions and reach the best possible machine performance. As a result, dedicated efforts were put into producing a more compact more robust more reliable and easier to assemble RF finger design for the new machine. The work was done in parallel on the beam coupling impedance reduction, which have a direct impact on the electron beam lifetime, and on the mechanical aspect with FEA validation and geometry optimization. Many test have been made, in a mechanical laboratory, including high resolution 3D computed tomography images in order to measure the electrical contact, and also in the existing ESRF storage ring with the electron beam, to validate the final design before launching the series production

TUOPMA08 Deformable RF Fingers with Axial Extension

Authors Sushil Sharma, Frank DePaola, Frank Charles Lincoln, John Tuozzolo (BNL, Upton, Long Island, New York)

Abstract RF fingers in a bellows assembly provide electrical continuity for the image current between adjacent vacuum chambers. They are required to absorb all misalignments between the two chambers while minimizing abrupt changes in the beam aperture. In addition, during bake-outs of the chambers the fingers are required to absorb their large thermal expansions. The latter is achieved either by having a sliding-contact finger design or a deformable finger design. In this paper we describe a version of the deformable finger design which permits large compression and significant misalignments including axial extension. A novel method of fingers' fabrication, FE analysis and experimental results are presented.

Poster Session: Accelerators / Core Technology | Tuesday, 26-JUN-18 16:40-18:00 | **Location:** Honnorat Access Gallery

TUPH01 Installation and Alignment of SESAME Storage Ring

Authors Thaer Hatem Abu-Hanieh, Maher Mustafa Shehab (SESAME, Allan)

Abstract SESAME (Synchrotron-light for Experimental Science and Applications in the Middle East) is the first international 3rd generation synchrotron light source in the Middle East region. This paper presents the method used for installing the Storage ring girders, magnets, vacuum chambers, straight sections, and how the alignment was done. The Installation have been done in a short time with few staff. It was hard and difficult, but went great. A substantial progress has been made in the design, construction and installation of the SESAME Mechanical Systems. All Storage Ring accelerator systems are ready and commissioned.

TUPH02 Collimator Design for Synchrotron

Authors Jacques BORREL (ESRF, Grenoble)

Abstract The function of the collimator is to localize the majority of the electron losses in the ESRF-EBS storage ring (SR). In addition, the collimator of the ESRF-EBS should absorb about 1200w of synchrotron radiation. For ESRF-EBS, the electron losses due to intra bunch scattering (Touschek scattering) will be higher than in the current ESRF SR. To control the level of radiation outside the storage ring tunnel and the activation level of the vacuum chambers, it is more efficient to localize the electron losses and block the radiations at one place rather than reinforce all of the SR tunnel shielding. The poster will show how the design has taken into account all the diverse requirements from a safety, accelerator physics, thermo-mechanical and mechanical point of view.

TUPH03 U15 Cryogenic Undulator: Design and Construction Progress

Authors Fabien Briquez, Philippe Berteaud, Frederic Blache, Marie-Emmanuelle Couprie, José Da Silva Castro, Jean-Michel Dubuisson, Francois Lepage, Fabrice Marteau, Arnaud Mary, Keihan Tavakoli, Manuel Tilmont, Mathieu Valléau, José Vétéran (SOLEIL, Gif-sur-Yvette)

Abstract A 15 mm period PrFeB Cryogenic Permanent Magnet Undulator (CPMU) is under construction at SOLEIL in the frame of collaboration with MAXIV, relying on the experience gained from the two PrFeB CPMU already installed at SOLEIL. The improved design includes a magnetic length of 3 m and a minimum gap of 3 mm, leading to a polyvalent device of interest for both synchrotron radiation sources and free electron lasers. A dedicated magnetic measurement bench is also under development to perform measurements at cryogenic temperature, based on the SAFALI system. The designs of both undulator and measurement bench will be explained, the construction progress will be detailed and first results will be given.

TUPH04 Progress on the Final Design of the APS-Upgrade Storage Ring Vacuum System

Authors Jason Carter, Brian Billett, Bran Brajuskovic, Mark Lale, Austin McElderry, John Noonan, Maria O'Neill, Kevin Wakefield, Dean Walters, Greg Edward Wiemerslage, John Zientek (ANL, Argonne, Illinois)

Abstract The final design phase is underway for the APS-Upgrade project's storage ring vacuum system. Many aspects of the design are being worked on to address challenging interfaces and to optimize vacuum system performance. Examples of recent work include updates to ray tracing, new thermal/structural analyses of photon absorbers and vacuum chambers, detailing flange connections and water flow routing within narrow interfaces, and further refinement of vacuum pumping plans to achieve the best possible pressure distributions. Recent R&D work and results from a vacuum system sector mockup have also informed designs and installation plans. An overview of progress in these areas and remaining challenges is presented.

TUPH05 Design and Implementation of a Thin, 40mm Diameter, Radiation Tolerant, YAG Profile Monitor for the Energy- and Time-Dispersed LCLS Electron Beam

Authors Antonio Cedillos, R. Clive Field (SLAC, Menlo Park, California)

Abstract The Linac Coherent Light Source (LCLS) electron beam can have damaging effects on YAG:Ce scintillation screens over time. Approximately after a year of using the existing profile monitor to image the beam after passing through a transverse accelerating R/F cavity this damage has diminished the fluorescence of the scintillator. This considerable decrease in performance has resulted in distorted beam images which can compromise the acquired data. Since it can be multiple weeks until there is an opportunity to change out the single YAG screen, the accuracy of the gathered data is diminished. We have developed a unique profile monitor that incorporates multiple YAG screens (Ø40mm, 50um thick) and various methods to reduce the downtime of the device and thus the beam line. Like the current version, this device uses unique geometry to direct optical transition radiation (OTR) away from the optical path thus preserving the beam image. In addition to the operations requirements and constraints, we present the design of the device and its various components. Finally, we briefly present sample beam data and results of the installed device.

TUPH06 Construction of a Twin-Helix Undulator Prototype

Authors Cheng-Hsiang Chang, Cheng-Hsing Chang, Ting-Yi Chung, Cheng Ying Kuo (NSRRC, Hsinchu), Ching-Shiang Hwang (NCTU, Hsinchu; NSRRC, Hsinchu)

Abstract A Twin-Helix Undulator (THU) with a period length of 24 mm was designed to produce strong and homogeneous helical fields within a 5 mm diameter aperture. A 10-period prototype was constructed to test mechanical and magnetic performance characteristics. The prototype is composed of four helically shaped magnet arrays, which are designed to produce helical and linear fields by shifting its diagonal magnet arrays. A quadrant and half of the magnetic arrays are evaluated to verify the magnetic field performance. Helical array girders were assembled in a rectangular box-like frame with a cross-roller guideway. Mechanical considerations and field analysis of the THU are discussed in this note.

Footnotes [1] C.Y. Kuo et al., IEEE Transactions on Applied Superconductivity, 28, 4100805 (2018).
[2] T.Y. Chung et al., Synchrotron Radiat. News Vol.31, No. 3 (2018).

TUPH07 The Thermo-Mechanical Stability at TPS

Authors June-Rong Chen, Mei Ling Chen, Wei-Yang Lai, Zong-Da Tsai, Yi-Chen Yang (NSRRC, Hsinchu)

Abstract The thermo-mechanical stability is crucial to the performance of an advanced light source. The effects of the temperature fluctuations, such as outdoor temperature, air temperature in the tunnel, surface temperature of the major components and the ground temperature in the accelerator building, to the position of the mechanical structure of the 3 GeV Taiwan Photon Source (TPS) were depicted. The correlations and routes of the thermo-mechanical effects were studied.

TUPH08 Aluminum and Bimetallic Vacuum Chambers for the New ESRF Storage Ring

Authors Filippo Cianciosi, Philipp Marian Brumund, Loys Goirand (ESRF, Grenoble)

Abstract The ESRF is proceeding with the design and procurement of its new low emittance storage ring EBS (Extremely Brilliant Source project). This completely new storage ring requires a new vacuum system including UHV chambers with complex shape and strict geometrical and dimensional tolerances. In order to meet these requirements we decided to build about half of the chambers in aluminum alloy machined from the bulk, the only technology permitting to respect the requirements. The result are 128 chambers, 2.5m long, built in alloy 2219 with Conflat flanges custom made from the chamber supplier by explosion bonding. The production phase is nearly finished, the produced chambers satisfy completely the expectations. A second generation of experimental aluminum chambers was designed as a substitution of some steel ones in order to solve same geometrical difficulties. These chambers are very complex as they have steel-aluminum junctions in the body in order to accommodate bellows and beam position monitor buttons. The delivery of the first prototype of this type of chamber is previewed for June 2018.

TUPH09 Friction Stir Welding and Copper-Chromium Zirconium: a New Concept for the Design of the Sirius' High-Power Absorbers

Authors Gabriel Claudiano, Lucas Monteiro Volpe (LNLS, Campinas)

Abstract Sirius, the new Brazilian fourth-generation synchrotron light source, is currently under construction. Due to the high brilliance and low emittance of its source, the photon beam on each undulator beamline can have power densities as high as 55 W/mrad². To protect the components downstream, the Front-End power absorbers need to manage this power in a limited space, but also having precision in alignment and being reliable all over its lifetime. To achieve this behavior, the selected alloy was the copper-chromium-zirconium (CuCrZr, commercially known as C18150) because of its improved thermal and mechanical properties. In order to seal the water chamber (i.e. path on which the cooling water flows), friction stir welding was the selected joining method. During the welding process, the material passes through a grain refinement process which results in a high-resistance joint. The manufacturing process could also result on a reduction of costs and lead times. Finally, it will be presented the optimizations done on the component, on its support and the characterizations done to validate the welded joint under water pressure and vacuum requirements.

TUPH10 APS Upgrade Project Removal and Installation: Interfaces with Operational Systems

Authors Robert Connatser (ANL, Argonne, Illinois)

Abstract A critical time for the APS Upgrade Project is the twelve month dark period in which the current accelerator, front ends, and insertion devices will be removed and the new MBA will be installed. In addition to the technical interfaces, there are a significant number of operational support systems and utilities that will be affected. For the dark period to be a success, these additional interfaces need to be described and their interaction with the removal and installation processes defined. This poster describes many of these additional systems and their interfaces.

TUPH11 Retractable Absorber and White Beam Imager Diagnostic for Canted Straight Section

Authors José Da Silva Castro, Nicolas Hubert, Marie Labat, Francois Lepage, Keihan Tavakoli (SOLEIL, Gif-sur-Yvette)

Abstract At the SOLEIL synchrotron, as in other accelerators, two canted sources can coexist on the same straight section for space and economic reasons. For its two long beamlines (ANATOMIX source upstream and NANOSCOPIUM source downstream) SOLEIL has made the choice to equip one of his long straight section with two canted insertion devices capable to operate simultaneously. That implies to take into account the degradation risk management of equipment, due to radiation. As the beam power deposition from the upstream undulator can seriously degrade the downstream one, or even other equipment. To handle these risks, Soleil first designed and installed in 2016 a retractable vertical absorber between both insertions to protect the downstream source from the upstream one. In 2017, Soleil then designed and installed a white beam imager, redundant an existing photon beam monitor (XBPM), to verify the correct positioning / alignment of equipment and beams relative to each other. For the vertical absorber as for the white beam imager Soleil had to meet some interesting technological and manufacturing aspects that we propose to present in a poster.

TUPH12 Multipole Injection Kicker, a Cooperative Project Soleil and MAX IV

Authors José Da Silva Castro, Patrick Alexandre, Rachid Ben El Fekih, Serge Thoraud (SOLEIL, Gif-sur-Yvette)

Abstract The cooperative MIK project SOLEIL / MAX IV started in 2012 and is part of the Franco-Swedish scientific collaboration agreement, signed in 2009 and followed by framework agreements signed in 2011. The MIK is a particular electromagnet using theoretical principles of the 1950s and recently used by the new generation of synchrotrons to significantly improve the Top-Up injection of electrons into the storage rings. Indeed, this type of magnet can drastically reduce disturbances on stored beams and also offers substantial space savings. The MIK is a real opportunity for synchrotrons wishing to upgrade their facilities. One of the first MIK developed by BESSY II in 2010 gave significant results. These results motivated SOLEIL and MAX IV to develop together their own MIK. Many technical challenges have been overcome in the area of mechanical design and manufacture as well as in magnetic and high voltage design of the MIK. Currently the first series is in operation at MAX IV and displays already outstanding performances. Optimization work is in progress.

TUPH13 Mechanical Design Challenges Building a Prototype 8-Pole Correctore Magnet

Authors Frank DePaola, Sushil Sharma, Charles Spataro (BNL, Upton, Long Island, New York), Animesh Kumar Jain, Mark Jaski (ANL, Argonne, Illinois), Richard Faussete (BNL, Upton, New York)

Abstract An innovative design was developed for an 8-pole corrector magnet for the APS upgrade program. This is a combined function magnet consisting of horizontal and vertical correctors as well as a skew quadrupole. This paper describes technical challenges presented by both the magnetic design and the interface constraints for the magnet. A prototype magnet was built, and extensive testing on the magnet confirmed that all magnetic and mechanical requirements were achieved. Improvements were identified during the manufacturing and testing of the prototype magnet. The final design of the magnet which has incorporated these improvements is discussed in the paper.

TUPH14 Status of the Conceptual Design of ALS-U

Presenter Robert M. Duarte (LBNL, Berkeley, California)

Authors Christoph Steier, Ken Chow, Robert M. Duarte, Matthaeus Leitner, Olusola Omolayo, Fernando Sannibale, Charles Allen Swenson (LBNL, Berkeley, California)

Abstract The ALS-U conceptual design promises to deliver diffraction limited performance throughout the soft x-ray range by lowering the horizontal emittance to about 70 pm rad resulting in 2-3 orders of brightness increase for soft x-rays compared to the current ALS. The design utilizes a nine bend achromat lattice, with reverse bending magnets and on-axis swap-out injection utilizing an accumulator ring. This paper shows some aspects of the completed conceptual design of the accelerator, as well as some results of the R&D program that has been ongoing for the last years.

Footnotes [1] H. Tarawneh et al., J. Phys.: Conf. Ser. 493 012020, 2014.
[2] C. Steier et al., in Proceedings of IPAC2015, 1840, 2015.

TUPH15 Friction Stir Welding Attemtps for UHV Applications: Stainless Steel/Aluminum

Authors Alexey Ermakov, Cornelius Martens, Uwe Naujoks (DESY, Hamburg)

Abstract At DESY in Hamburg an investigation was started to join aluminum chambers with stainless steel flanges by friction stir welding. First results will be presented. It will be shown that there is only a small effect of hardening in the contact zone at the stainless-steel side, a small amount of particles are given and the diffusion zone is about 3 microns, but with a very irregular effect on the structured junction. Because of that, the influence of the surface and the welding parameters on the process will be investigated in the future.

TUPH16 Hammerhead Support Design and Application at SSRF

Authors Fei Gao, Rongbing Deng, Zhiqiang Jiang, Lixin Yin (SINAP, Shanghai), Sushil Sharma (BNL, Upton, Long Island, New York)

Abstract Electron beam stability is very important for Shanghai Synchrotron Radiation Facility(SSRF). One of the major players on beam stability is the vibration stability of magnet support systems. This paper describes several kinds of hammerhead magnet support prototypes with different structures, materials and ground fixation. Modal and response analyses of these prototypes are contrasted by finite-element analysis(FEA) and tests. The design can be applied to guide and improve the mechanical structures and the stability of magnet support systems at SSRF and other light source facilities.

TUPH17 Design Considerations Associated With the Replacement of a Sextupole Magnet with a Short Wiggler in a Cell of the Diamond Storage Ring Lattice

Authors Nigel Hammond, Ian Martin (DLS, Oxfordshire)

Abstract Now that all of the original straight sections in the Diamond storage ring are occupied, novel ways of converting bending magnet beamline locations into insertion device beamlines have been considered. Recently one cell of the 24 cells was reconfigured in to a Double-Double Bend Achromat (DDBA) to provide a new location for an Undulator and enable a formerly designated bending magnet beamline to become an Insertion Device Beamline*. Extending this concept for the new Dual Imaging and Diffraction (DIAD) Beamline proved to have a strong impact on lifetime and injection efficiency, so instead it was decided to remove a Sextupole magnet in one cell and substitute it with a short fixed gap Wiggler. The accelerator physics, mechanical and electrical design aspects associated with the change are described.

Footnotes * Mechanical Engineering solutions for the Diamond DDBA Project, J Kay, MEDSI 2014

TUPH18 Vacuum Performance Test of CuCrZr Photon Absorbers with and without NEG Coating

Presenter Ping He (IHEP, Beijing)

Authors Qi Li, Ping He (IHEP, Beijing), Dizhou Guo (IHEP,)

Abstract To test the pumping performance of CuCrZr photon absorbers, we performed a comparative experiment on the two absorbers. One with NGE coating and one without. First, we tested the background pressure curve with time of the measurement chamber, and then two absorbers are mounted inside the chamber for the pressure vs. time profiles testing. The measurement results also compare with MOLFLOW simulation. The experimental set-up and pressure profiles will be presented here.

TUPH19 A Mechanical Undulator Frame to Minimize Intrinsic Phase Errors

Authors Jui-Che Huang (NSRRC, Hsinchu)

Abstract A PrFeB-based cryogenic permanent magnet undulator (CPMU) is under construction at the Taiwan Photon Source (TPS) to generate brilliant X-rays. When magnets are cooled to 77 K, a CPMU with a period length of 15 mm can generate an effective magnetic field of 1.32 T in a gap of 4 mm. A main feature of the TPS CPMU is its low-intrinsic-phase errors by the installation of force-compensation modules on the out-of-vacuum girders in a four-support-points configuration. Moreover, adjusting the spring settings one can obtain very low undulator phase errors. In this paper, a mechanical frame design for the TPS-CPMU with force-compensating spring modules will be discussed. Observations of deformation effects of the out-of-vacuum girders on the CPMU will be presented.

TUPH20 R&Ds of the Beamline and the Related Facilities at the Photon Factory.

Authors Noriyuki Igarashi, Takeharu Mori, Yasuo Takeichi, Hirokazu Tanaka, Yusuke Yamada (KEK, Tsukuba), Haruno Ishii, Takashi Kosuge, Hiroaki Nitani (KEK, Ibaraki)

Abstract The Photon Factory in the KEK has been operating two SR sources, the PF-ring and the PF-AR for over thirty years. Although even now the 2 rings are used extensively in the wide science fields, the aging problems are quite critical so that we started considering the upgrades of the rings and a new SR facility. Assuming an extremely low-emittance storage ring, we are studying in 5 items, beamline optics design, vibration reduction, heat-load management, beam control and beamline vacuum. In particular, the vibration reduction and heat-load management are quite important issues and we are antecedently conducting necessary R&Ds of the beamline and the related facilities, first mirror heat-load management with test chamber, vibration evaluation with fine encoder, development of the phase separator for stable nitrogen supply and the development of the GRIDCOP direct-cooling mirror system. Here, we will introduce our R&Ds.

TUPH21 Design of Vertical and Horizontal Linear Flexure Stages for Beam Size Monitor System

Authors Wei-Yang Lai, Chien-Kuang Kuan, Shen-Yaw Perng, Huai-San Wang (NSRRC, Hsinchu)

Abstract Taiwan photon source is a third generation accelerator with low emittance. The electric Beam size is the one of accelerator parameters to indicate the stability and energy density of light source. The aperture size of beam slitter is a crucial part to calculate the value of beam size in the X-ray pine-hole system. In order to obtain the more precise result of beam size, the flexure mechanism is applied for the adjustment of the aperture of the beam slitter.

TUPH22 Study on Cooling Technology of the Superconducting Undulator at SSRF

Authors Yiyong Liu, Sen Sun, Jian Wang, Li Wang, ShuHua Wang (SINAP, Shanghai), XingLong Guo (JiangShu University, Jiangsu Province)

Abstract A superconducting undulator (SCU) prototpye with the period of 16 mm and the magnetic gap of 9.5 mm has been designed and fabricated at the Shanghai Institute of Applied Physics (SINAP) since late 2013. A set of cooling system is designed to cool down cold masses. This paper presents the details of their design, calculation and test: 4 small cryogenic refrigerators are used as cold sources, and the superconducting coil and beam pipe are independently cooled down; The 4.2 K superconducting coil is mainly cooled by the liquid helium tube of the thermosiphon loop with evaporation and re-condensation; The 10~20 K ultra-high vacuum beam tube is cooled by heat conduction. The main sources and mechanism of thermal loads for SCU were analyzed. And experimental test of cooling technology for SCU prototype had been performed, the feasibility of cooling scheme and the rationality of the cooling structure for the SINAP SCU prototype were verified. The cryogenic test and operation of the SCU doesn't require the input of liquid helium from the outside, and is not limited by the liquid helium source. This is the characteristic of SINAP's SCU cooling technology.

TUPH23 Field Quality From Tolerance Analyses in Two-Half Sextuple Magnet*

Authors Jie Liu, Roger J. Dejus, Aric Thomas Donnelly, Charles Logan Doose, Animesh Kumar Jain, Mark Jaski (ANL, Argonne, Illinois)

Abstract Sextuple magnets are used extensively in particle accelerators, synchrotrons, and storage rings. Good magnetic field quality is needed in these magnets, which requires machining the magnet parts to high precision and is the primary driver of high fabrication cost. To minimize the fabrication cost, a magnetic field quality study from tolerance analyses was conducted. In this paper, finite element analysis (FEA) using OPERA was performed to identify key geometric factors that affect the magnetic field quality and identify the allowable range for these factors. Next, geometric and dimensional tolerance stack-up analyses are carried out using Teamcenter Variation Analysis to optimize the allocation of the geometric tolerances to parts and assemblies. Finally, the analysis results are compared to magnetic measurement in a R&D sextuple magnet.

Footnotes * Work supported by the U.S. Department of Energy, Office of Science, under Contract No. DE-AC02-06CH11357

TUPH24 Front End of Dual Imaging and Diffraction Beamline at Diamond Light Source

Authors Xia Liu (DLS, Oxfordshire)

Abstract The Dual Imaging and Diffraction (DIAD) beamline X-ray source is a ten pole mini wiggler. By locating the mini wiggler in place of an existing sextupole magnet, the DIAD beamline is built at a bending magnet beamline position in Diamond. To accommodate the unusual beam trajectory, a new front end was designed for the DIAD beamline. The particular designs and specifications including an improved front end slits design, as well as the synchrotron and bremsstrahlung ray tracing of the front end are presented in this paper. The development process of delivering the front end - the project challenges, approach and activities are also described along with the technical challenges.

TUPH25 Morphologies of Oxygen-Free Ti and Pd/Ti Thin Films, New Non-Evaporable Getter (NEG) Coatings

Authors Tetsuya Miyazawa (Sokendai, The Graduate University for Advanced Studies, Tsukuba), Takashi Kikuchi, Kazuhiko Mase (KEK, Tsukuba), Ayako Hashimoto (NIMS, Tsukuba, Ibaraki)

Abstract Non-evaporable getter (NEG) is a metal such as Ti, Zr, and V which can evacuate active residual gases (especially hydrogen) after activation through baking under ultrahigh vacuum (UHV). NEG coating is a technique that inner walls of a vacuum chamber are coated with NEG thin films. NEG coating is ideal for an accelerator because it realizes UHV on the order of 10^-8 Pa with small ion pumps, and because it requires no additional space. However, NEG coating has been scarcely applied for beamlines and end stations in synchrotron radiation facilities so for. To expand the scope of application of NEG coating, we developed oxygen-free Ti and Pd/Ti coating using sublimation under UHV [*]. In the present paper, we report morphologies of the oxygen-free Ti and Pd/Ti film observed by a scanning transmission electron microscope (STEM), scanning electron microscope (SEM), and transmission electron microscope (TEM).

Footnotes * T. Miyazawa, K. Tobishima, H. Kato, M. Kurihara, S. Ohno, T. Kikuchi, and K. Mase, Vac. Surf. Sci. 61, 227 (2018).

TUPH26 A Quasi-Periodic Elliptically Polarized Undulator at the National Synchrotron Light Source II

Authors Marco Musardo, Peter Louis Cappadoro, David Harder (BNL, Upton, New York), Oleg Chubar, Todd Corwin, Yoshiteru Hidaka, Jim Rank, Toshiya Tanabe (BNL, Upton, Long Island, New York), Charles Agbehonou Kitegi (SOLEIL, Gif-sur-Yvette)

Abstract A 2.8 m long quasi-periodic APPLE II type undulator has been commissioned at the National Synchrotron Light Source II (NSLS-II) for the Electron Spectro-Microscopy (ESM) beamline in the framework of the NEXT (NSLS-II Experimental Tools) project. It provides high brilliance photon beams in circularly and linearly polarized radiation from VUV to soft X-Rays. The mechanical structure implemented to achieve the quasi-periodicity in the magnetic field profile is described together with the optimization techniques utilized to correct the undesirable phase-dependent errors. The final magnetic results are presented as well as the spectral performance and commissioning results of the device.

TUPH27 Structure Design of a Multi-Wire Target

Authors Xiaojun Nie, Huayan He, Lei Liu, Taoguang Xu, Donghui Zhu (IHEP, Beijing), Jia-Xin Chen, Jilei Sun, Anxin Wang, Jiebing Yu (CSNS, Guangdong Province)

Abstract Introduce a structure design of a Multi-Wire Target. The plan of wire alignment was decided by analysis. The wire tightening device with interlaced alignment was used to solve the wire alignment in narrow space. The vacuum chamber was designed by optimization. The displacement pickup was used to make the movement control of translation stages.

TUPH28 Calculation of Orbit Distortions for the APS Upgrade Due to Girder Resonances

Authors Jeremy Nudell, Zunping Liu, Curt Preissner, Vadim Sajaev (ANL, Argonne, Illinois)

Abstract Maintaining sub-micron-scale beam stability for the APS-U Multibend Achromat Lattice places strict requirements on the magnet support system. Historically, magnet vibration requirements have been based on physics simulations which make broad generalizations and assumptions regarding the magnet motion. Magnet support systems have been notoriously difficult to analyze with FEA techniques and as a consequence, these analyses have been underutilized in predicting accelerator performance. The APS has developed a procedure for accurate modeling of magnet support systems. The girder mode shapes are extracted from these analyses and exported to accelerator simulation code elegant to calculate the static beam amplification factor for each mode shape. These amplification factors, along with knowledge of damping coefficients and the character of the tunnel floor motion, may then be used to predict the effect of girder resonances on beam stability and validate the magnet support designs.

TUPH29 Next Generation X-ray Beam Position Monitor System for the Advance Photon Source MBA Upgrade

Authors Samuel Oprondek, Yifei Jaski, Edmund Kirkus, Soonhong Lee, James Mulvey, Mohan Ramanathan, Denise Skiadopoulos, Frank Westferro, Bingxin Yang (ANL, Argonne, Illinois)

Abstract The Advanced Photon Source (APS) upgrade from double-bend achromats (DBA) to multi-bend achromats (MBA) lattice has increased the need for reliable diagnostic systems. This upgrade will decrease the size of the photon beam drastically and beam current will be increased from 100 mA to 200 mA. The small beam and intense heat loads provided by the upgraded APS requires unique and innovative approaches to beam position monitoring. To meet the need for a reliable diagnostic system for the APS upgrade, the next generation X-ray Beam Position Monitoring System (XBPM) is required which includes 1st XBPM (XBPM1), an Intensity Monitor (IM1) and a 2nd XBPM (XBPM2). This paper presents progress and status of the current configuration of the XBPM system especially the development work involving the IM1 and XBPM2. The R&D work to develop an alternative XBPM1 using the Compton scattering principle is also presented.

TUPH30 ALBA Synchrotron Light Source Liquefaction Helium Plant

Authors Montserrat Prieto, Joan Josep Casas, Carles Colldelram, Yury Nikitin (ALBA-CELLS Synchrotron, Cerdanyola del Vallès)

Abstract ALBA is a 3rd generation Synchrotron Light facility with: 8 operational Beam Lines (BLs), a 2nd BL of Phase II under construction and 3 first Phase III BLs in design phase. Some user experiments require Liquid Helium (LHe) as a coolant. The resulting LHe consumption at ALBA is about 650 l/week. Thus far the vaporized helium, which results from the refrigeration of experiments and equipment, has been released into the atmosphere without being reused. Due to the increasing price of LHe, ALBA agreed with ICN2 (Catalan Institute of Nanoscience and Nanotechnology) to invest in a Liquefaction Helium Plant. Internal staff has carried out the project, installation and pressure equipment legalization of the plant, which is located in a new 80 m2 construction. Under operation the plant allows recycling up to 24960 liters of LHe per year, which is an 80% of the helium consumed at ALBA, by making the gaseous helium undergo through 3 main stages: recovery, purification and liquefaction. The plant, unique in Catalonia, will entail cost savings about 77% and will reduce vulnerability to supply disruptions. ICN2 will benefit from a part of the production due to their initial investment.

TUPH31 Development of a Revolver Type Undulator

Authors Torsten Ramm, Markus Tischer (DESY, Hamburg)

Abstract A revolver type undulator is developed for the SASE section of the FLASH Free-Electron Laser (FEL) at DESY. Currently, a 1,2GeV linear accelerator injects electrons into two undulator lines to provide fully coherent VUV light to different experimental stations in two experimental halls. The more recently built FLASH2 branch consists of 12 planar undulators with a fixed magnet structure of ~32mm period length. Within plans for refurbishment of the original FLASH1 undulator section and also to open up new operation schemes with an extended photon energy range, an undulator development was started that allows for a change of different magnet structures. Once installed, it will be possible to change the wavelength range or the FEL operation scheme within a short period of time. Magnet structures can then be switched at any time without any observable effect on the electron beam orbit or the photon beam position. The single design steps are described in the following article: profile of requirements, choice of an applicable changing mechanism, development of a new magnet structure, the position of the bearing points, a new floor assembly and improvement of the cantilever arm.

TUPH32 Water Cooling System Design & Operation

Authors Maher Mustafa Shehab (SESAME, Allan)

Abstract SESAME started operation in January 2017. In order to receive heat deposited in various synchrotron devices during operation, a low-conductivity water cooling system was installed. Within this paper the design, construction and operation of the water cooling system will be discussed, Both Hydraulic and Thermal Behavior of the system will be analyzed and discussed with numerical simulation means as well as real operation pressure and temperature data for the purpose of a better understanding of the cooling system

TUPH33 Vibration Measurement & Simulation of Magnet Girder in SESAME

Authors Maher Mustafa Shehab (SESAME, Amman), Marc Lesourd (ESRF, Grenoble)

Abstract In This Paper , vibration measurements and Simulation of magnet girder in SESAME ,Jordan are presented . the motivation was to provide information on the girder stability and its design.

TUPH34 The Use of AM Technologies for HV and UHV Components and Vessels.

Authors Andrew Stallwood (DLS, Oxfordshire)

Abstract AM technology (3D Printing) in plastics and metals has now been in commercial use for over 30 years. However, the application of this technology in vacuum environments has been limited, due to the material porosity and additives used in the manufacturing techniques. This paper reports on the testing and use of FDM (Fused Deposition Modelling) PEEK and DMLS (Direct Metal Laser Sintering) metal components inside a UHV environment. Specifically covering the use of DMLS to successfully produce a complex vacuum vessel operating at 10-6 mbar, as used on the new VMXm beamline at Diamond Light Source. Vacuum testing the vessel has demonstrated that this manufacturing technique has the potential to produce vessels that are capable of holding 10-10mbar.

TUPH35 Stainless Steel Vacuum Chambers for the EBS Storage Ring

Authors Pierre Van Vaerenbergh, Jean-Claude Biasci, Dieter Einfeld, Loys Goirand, Joachim Leonardon, Hugo Pedroso Marques, Joel Pasquaud, Kees Bertus Scheidt (ESRF, Grenoble)

Abstract The upgrade of the ESRF (ESRF-EBS) is a very challenging project in many respects. One of its challenges is the manufacturing of vacuum chambers within extremely tight tolerances. The chambers envelope is constrained by the very limited available space between the beam stay clear and the magnets pole tips, requiring profile tolerances of just 500 µm over 50 mm width and over the full length of the chamber (up to 3 m). An additional challenge is guaranteeing the perpendicularity (up to 0.75 mrad) between the CF flanges and the chamber body. While a design using discrete removable absorbers was chosen, one family of chambers contains a distributed absorber required to protect the insertion devices from 600 W of upstream dipoles X-rays. Two companies have been selected to produce a total of 296 stainless steel chambers. Given the unusual tolerance requirements the manufacturers have been forced to adapt and develop their production techniques to overcome the challenges. During manufacture, vacuum leaks were discovered on some of the BPM buttons. This paper will also present the two techniques that ESRF has developed in order to prevent the integration of potentially leaking buttons.

TUPH36 Metal 3D Additive Machining for in-Vacuum Beam Instrumentation

Authors Raymond Veness, William Andreazza, Dmitry Gudkov, Ana Miarnau Marin, Sebastian Samuelsson (CERN, Geneva)

Abstract 3D additive machining by selective laser melting (SLM) has great potential for widespread use in the field of accelerator instrumentation. However, as with any new process or material, it must be adapted and qualified for use in the specific in-vacuum accelerator environment. This paper outlines recent developments of this technology for beam instrumentation in CERN accelerators. It covers topological optimisation, design and production methods for SLM, validation and test of samples and components to qualify the production process. It also reports on experience of operation in multiple machines with beam.

TUPH37 A New Sealing Technology for High Precision Wide Open Uhv Vacuum Flange or Waveguide Connections With Metal Gaskets

Authors Silke Vilcins (DESY, Hamburg), Daniel Bandke (DESY Zeuthen, Zeuthen)

Abstract The European-XFEL, the X-Ray laser facility is located in Hamburg. Since September 2017, this large X-ray laser open up new research opportunities for industrial users and scientists. For the diagnostics ultra-high vacuum components with high mechanical precision and additional strict requirements on particle cleanliness had to be produced. A bunch compressor (BC) has been installed with a cross section of 400*40.5 mm made by stainless steel blocks 1.4429 (316 LN). These chambers have integrated flange-connections for large VATSEAL® gaskets. The tolerances are extremely tight. This contribution will report of a new technology of final surface finishing large rectangular or other big flange surfaces. It will also describe the influences of material properties of the sealing area. The dependence of tightening forces and surfaces structure is reported. Further this contribution will compare the present procedure with this new technology. This technology can be used for other vacuum flange metals like aluminium or titanium. Using of this technology for applications under special conditions, like particle free applications due to the non-lubricated conditions are conceivable

TUPH38 Preliminary Design of the Magnets of HALS

Authors Bo Zhang, Zhiliang Ren, Xiangqi Wang, Yong Wang, Hong-liang Xu (USTC/NSRL, Hefei, Anhui)

Abstract The Hefei Advanced Light Source (HALS) is a future soft X-ray diffraction-limited storage ring at National Synchrotron Radiation Laboratory (NSRL) of China. This project aims to improve the brilliance and coherence of the X-ray beams and to decrease the horizontal emittance. The lattice of the HALS ring relies on magnets with demanding specifications, including combined function dipole-quadrupoles (DQs) with high gradients, dipoles with longitudinal gradients (DLs), high gradient quadrupoles and sextupoles. All these magnets have been designed using POSSION and Radia. Preliminary design of them is presented in this paper.

TUPH39 The Development of LCLS2 Photon Beam Containment System

Authors Hengzi Wang (SLAC, Menlo Park, California)

Abstract LCLS2 will produce very powerful photon beams. Unlike conventional synchrotron, the LCLS2 beam containment components withstand not only the high average beam power and power density, but also the instantaneous thermal shocks from pulsed FEL beam, which can reach ~9mJ/pulse. With beam repetition rate up to 1MHz, regular metal based beam collimators and absorbers can no longer work, because of the likelihood of fatigue failure. And because of the poor thermal conductivity, the old LCLS B4C based absorber would need very shallow glancing angle and take valuable beamline space. Hence, a low-Z and high thermal conductivity CVD diamond based photon beam collimator and absorber systems have been developed in LCSL2. The initial damage tests using LCLS FEL beam provided positive results that graphite coated CVD diamond can endure per pulse dose level to 0.5eV/atom. For the beamline and personnel safety, in addition to the passive CVD diamond collimators and absorbers, newly developed photon diode beam mis-steer detection systems and conventional SLAC pressurized burnt-through monitors have been also introduced in the photon beamline system design.

TUPH40 Advanced Photon Source Water Systems History and Maintenance

Authors Robert David Wright, Eugene Swetin (ANL, Argonne, Illinois)

Abstract Abstract Particle Accelerators require significant amounts of water to cool components and devices. Care are and planning are required to maintain these large systems. The purpose here is to provide insight into the operation and maintenance of water systems at the Advanced Photon Source (APS), Argonne National Laboratory. Low Conductivity Water (LCW) systems are integral in the design of particle accelerators. Initial design requirements often change over time to accommodate new requirements. Some of the issues seen over the 23-year operation of the APS are erosion, clogging, and the need for more precise temperature control. Water chemistry, flow velocity, type of control systems and sensors, along with maintenance practices all contribute to successful operation. We will discuss our successes and failures in regards to water quality, temperature stability, reliability and longevity of the system, as well as equipment maintenance and repair. These aspects of water system design and maintenance are all critical to reliable operations of the APS. This document will provide useful information for institutions that intend to design, build, and/or maintain a particle accelerator.

Footnotes Advanced Photon Source, a U.S. Department of Energy (DOE) Office of Science User Facility operated for the DOE Office of Science by Argonne National Laboratory under Contract No. DE-AC02-06CH11357.

TUPH41 Investigation of Regulation Plan for the Vibration Utility Equipments of HEPS

Authors Fang Yan, Gang Xu (IHEP, Beijing), Zhizhuo Wang (IHEP,)

Abstract For the third or fourth generation synchrotron light sources, the brilliance of the x-ray beam is 2 to 3 order higher than other generations, and in the meanwhile the beam emittance is at least one order smaller. To ensure the stability of the beam, the vibration caused beam motion is usually controlled to be within 10% of the RMS beam size. Thus the smaller beam emittance is, more restrict of the regulation plan to the vibration sources should be. Inside of the light source site, one major vibration source is the utility equipment such as water pump, compressors and so on. There are two controlling approaches for the vibration amplitude of those sources, one is damping, another way is decay. However reasonable specification is the key of the controlling method. This work will present the detailed establish process of the regulation plan for HEPS in China.

TUPH42 Design a Vertical Polarized Undulator Based on Magnetic Force Compensation Technology

Authors Wei Zhang, Yongzhou He, Zhiqiang Jiang, Dong Wang, Shengwang Xiang, Ya zhu (SINAP, Shanghai)

Abstract A vertical polarized undulator is in design at SSRF in order to reach 1.5T magnetic peak field with a period length 68mm. The undulator has a magnet length 4 m with maximum magnetic force more than 60kN. In order to reduce the undulator beam volume, this undulator designed uses a magnetic force compensation system based on repulsive magnet arrays.

TUPH43 The LNLS Metrology Building - Environmental Control Results

Authors Henrique Geraissate Paranhos de Oliveira, Cassiano Sergio Noventa Corrêa Bueno, Murilo Bazan da Silva, Bernd Christian Meyer, Lucas Sanfelici (LNLS, Campinas)

Abstract Modern synchrotron light sources require high mechanical stability throughout its facilities, frequently demanding characterization processes in the micro and nanometer scales. In this context, the Brazilian Synchrotron Light Laboratory (LNLS) built a new laboratory with several controlled environment rooms to minimize disturbances during optical and mechanical metrology procedures and to support advanced instrumentation development for the new Sirius beamlines. The building design imposed very strict requirements regarding temperature, humidity and cleanliness. This work presents the environmental control validation results and the floor vibration assessment enlightening the influence of the building machinery. Temperature variations below ± 0,1 °C were successfully achieved for all rooms, relative humidity is also better than 50 ± 5 % and the floor RMS displacement did not exceed 50 nm. The building is fully operational since 2017 and currently hosting several tests on Monochromators, mirrors, front-ends and many other systems for the Sirius beamlines.

Footnotes Metrology, environment control, vibration assessment

TUPH44 Capacitive Beam Position Monitor Design and Study of the Project SARAF-LINAC

Authors lu zhao (CEA/DRF/IRFU, Gif-sur-Yvette), Franck Senee, Claire Simon (CEA/DSM/IRFU,)

Abstract A capacitive beam position monitor has been designed and developed for the future SARAF-LINAC (phase 2), which yields 5 mA proton and deuteron beams at energies up to 40 MeV. This paper addresses all aspects to the design, study and test of the BPM, while emphasizing the mechanical design to the determination of the capacitance of the BPM. The numerical simulation for different mechanical designs is performed with CST STUDIO SUITE using the wake-field solver. The simulation results give a good agreement with the measured capacitance using impedance analyzer. A calibration test stand is under development.

Keynote talk 2 Wednesday, 27-JUN-18 09:00-10:20 **Location:** Auditorium

WEKA01 Selection of Materials and Processes for Vacuum, Cryogenic and Non-Magnetic Applications in Particle Accelerators

Authors Stefano Sgobba (CERN, Geneva)

Abstract Stringent requirements are placed on materials of modern accelerators. Their physical and mechanical properties, machinability, weldability or brazeability are key parameters. Adequate strength, ductility, magnetic properties at room as well as low temperatures are important factors for materials of accelerators working at cryogenic temperatures. In addition, components undergoing baking, NEG activation or submitted to the impact of the beam impose specific choices of material grades. Magnetic properties are of paramount importance. In order to minimize the magnetic permeability of the final components, precise specifications in terms of composition and microstructure have to be applied. Today, stainless steels are the dominant materials for accelerator construction. Their metallurgy is extensively treated. It will be shown that a stainless steel does not only consist of a chemical composition or a designation, but is the result of a whole metallurgy and metalworking process, in view of obtaining adequate purity, weldability, inclusion cleanliness and fineness of the microstructure. Innovative manufacturing and non-destructive examination technologies will also be covered.

Oral Session: Precision Mechanics Wednesday, 27-JUN-18 10:50-12:10 **Location:** Auditorium

WEOAMA01 Offline Results of the New High-Dynamic DCM for Sirius

Authors Renan Ramalho Geraldes, Ricardo Malagodi Caliari, Gabriel Barros Zanoni Lopes Moreno, Lucas Sanfelici, Marlon Saveri Silva, Harry Westfahl Jr. (LNLS, Campinas)

Abstract The monochromator is known to be one of the most critical optical elements of a synchrotron beamline, since it directly affects the beam quality with respect to energy and position. Naturally, the new 4th generation machines, with their small emittances, start to bring about higher stability performance requirements, in spite of factors as high power loads, power load variations, high radiation levels, ultra-high vacuum compatibility and vibration sources. In response to that, an innovative concept of a high-dynamic vertical DCM (Double Crystal Monochromator) with angular range between 3 and 60 degrees (equivalent to 2.3 to 38 keV with Si(111)) has been developed at the Brazilian Synchrotron Light Laboratory. A highly repeatable dynamic system, with servocontrol bandwidth of 250 Hz, has been achieved and will be installed at Sirius macromolecular crystallography beamline (MANACA) still in 2018. The complete offline results of the in-vacuum cryocooled high-dynamic DCM, showing stability between crystals of a few tens of nrad, even during the Bragg angle motion for flyscans, will be presented.

WEOAMA02 Sample Stabilization for Tomography Experiments in Presence of Large Plant Uncertainty

Authors Thomas Dehaeze, Muriel Magnin-Mattenet (ESRF, Grenoble), Christophe Collette (ULB - FSA - SMN, Bruxelles)

Abstract A new low emittance lattice storage ring is under construction at ESRF. In this new instrument, the upgraded end stations must allow to position the samples along complex trajectories, with a nanometer precision. In order to reach these requirements, samples have to be mounted on high precision stages, combining a capability of large stroke, spin motion, and active rejection of disturbances. As the mass of the samples may vary by up to two orders of magnitudes, robust control strategies are required to address such plant uncertainty. After a brief description of the requirements, the proposed control strategy will be presented and applied on a mechanical model, accounting for structural flexibilities and system uncertainties. Then, the control strategy will be transposed to a more elaborated model, including a realistic representation of the underneath support, updated with experimental data. Time domain simulations are conducted to simulate a tomography experiment in presence of instrumentation noise and system uncertainty. The performance of the control strategy are presented and converted into requirements for the mechanical design of the nano-positioning stage.

WEOAMA03 High-Accuracy Small Roll Angle Measurement Method Based on Dual-Grating Diffraction Heterodyne Interferometer

Authors Shanzhi Tang, Ming Li, Weifan Sheng (IHEP, Beijing)

Abstract Small roll angle (ROLL) is an crucial parameter for the motion performances of ultra-precision guide way often applied in fine mechanics and instruments of synchrotron radiation, such as long trace profiler (LTP). However, it is difficult to be measured by conventional methods including interferometer and autocollimator owing to their low sensitivities in axial direction. There is an orthogonal dilemma between measured direction and angular displacement plane for ROLL measurement. Therefore, a novel method based on dual-grating diffraction heterodyne interferometer is presented, which uses the combining scheme of diffraction grating and heterodyne interferometer to overcome the orthogonal problem. Moreover, the design of differential structure with dual-grating and grating interferometer instead of pure interferometer, is adopted to improve the practicability against the environment, e. g. air fluctuation, inconstant rotation center. It has inherited advantages of high-resolution up to 2nrad, high sampling rate up to 50kHz, and contactless by mathematical modeling and analysis. So, theoretical and experimental verifications are both implemented to its validation.

WEOAMA04 The Design of Exactly-constrained X-ray Mirror Systems for Sirius

Authors Renan Ramalho Geraldes, Gabriel Claudiano, Victor Zoratti Ferreira, Lucas Sanfelici, Alexis Sikorski, Mailson da Silva Souza, Helio Tolentino, Lucas Monteiro Volpe, Harry Westfahl Jr. (LNLS, Campinas)

Abstract The first set of Sirius beamlines is expected to start operating in early 2019. Regarding X-ray mirror systems, a single design concept could be proposed once side-bounce fixed-shape mirrors were standardized to achieve the strict optical quality requirements. To preserve the extreme quality of both the mirror figures and the source, the main design targets were keeping thermo-mechanical distortions in the mirrors typically bellow 150 nrad RMS, while maximizing mechanical and thermal stabilities. The result combines deterministic design for clamping and thermal management with an innovative exactly-constrained flexure-based mirror support concept, which is expected to be applied in forthcoming dynamic mirrors. The main features include cryocooling, first resonances above 150 Hz, and fine pitch tuning with sub-100-nrad resolution, mrad range and actuation forces below 10 N. Indirect cryocooling strategy via cryostats is allowed by power loads generally below 10 W, thus drastically minimizing thermal gradients and distortions in the mirrors, decoupling vibration sources and significantly simplifying cooling circuits. The specifications, design and partial results are presented.

Oral Session: Precision Mechanics Wednesday, 27-JUN-18 13:30-14:10 **Location:** Auditorium

WEOAMA05 FE Model of a Nanopositioning Flexure Stage for Diagnosis of Trajectory Errors

Authors Steven Patrick Kearney, Deming Shu (ANL, Argonne, Illinois)

Abstract The Advanced Photon Source Upgrade project includes upgrading several beamlines, which desire nanopositioning and fly-scan capabilities. A step towards achieving this is through the use of flexure stages with minimal trajectory errors. Typically, parasitic motion is on the order of micrometer-level displacements and tens of microradian-level rotations [1]. The cause of such errors is difficult to diagnosis due to the scale and complexity of the overall mechanism. Therefore, an FE model of a flexure pivot nanopositioning stage with centimeter-level travel range [1, 2] has been developed to aid in trajectory error diagnosis. Previous work used an FE model and relative error analysis to quantify the effects of assembly error on trajectory errors [3]. Relative error analysis was used due to the difficulty in validating a complex FE model. This study develops an experimentally validated FE model of a single joint to quantify the expected error in the full FE model. The full model is then compared experimentally to the flexure stage to assess the model accuracy and diagnosis trajectory errors.

Footnotes
* D. Shu, et al. In Proc. SPIE, vol. 10371, 2017.
** U.S. Patent granted No. 8,957,567, D. Shu, S. Kearney, and C. Preissner, 2015.
*** S. Kearney and D. Shu. In Proc. SPIE, vol. 10371, 2017.

WEOAMA06 Concepts and Instrumentation for Scanning Free X-ray Emmission Spectroscopy

Authors Daniel Grötzsch, Richard Gnewkow, Birgit Kanngießer, Wolfgang Malzer, Christopher Schlesiger (Technische Universität Berlin, Berlin), Lars-Christian Anklamm (Helmut Fischer GmbH, Sindelfingen), Serena DeBeer, Sergey Peredkov (MPI CEC, Mülheim an der Ruhr)

Abstract X-ray Emission spectroscopy is a common tool for the study of the electronic structure of chemical compounds*,** and a widely used technic at synchrotron facilities. There are two different principles. Johansson spectrometers with scanning excitation energy rely on highly precise motorized axes, whereas polychromatic Von Hamos spectrometers don't need the scanning modus. We present different von Hamos Spectrometer concepts and instruments dedicated for synchrotron and laboratory use. The presentation includes everything from the idea, planning, development, design and mounting to the commissioning, alignment and first operation. Furthermore we found a common solution for both different excitations, synchrotron and laboratory sources with respect to reliable energy alignment. The requirements to the mechanics, especially positioning devices which are both commercial and self-developed will also be explained.

Footnotes *C.J. Pollock, S. DeBeer, Accounts of Chemical Research, 48, 2967, (2015)
**C.J. Pollock, M.U. Delgado-Jaime, M. Atanasov, F. Neese, S. DeBeer, J. of the American Chemical Society 136, 9453 (2014)

Oral Session: Core Technology Wednesday, 27-JUN-18 14:10-14:50 **Location:** Auditorium

WEOPMA07 Development of a New Sub-4k ARPES Endstation at PSI

Authors Daniel Trutmann, Leonard Nue, Andreas Pfister, Nicholas Clark Plumb, André Schwarb, Ming Shi (PSI, Villigen PSI), Christoph Paul Maag (DESY, Hamburg)

Abstract In spring 2016 a project was started to renew the high-resolution ARPES endstation of the Surface/Interface Spectroscopy (SIS) beamline at PSI. The focus lay on achieving sample temperatures below 4K while maintaining 6 degrees of freedom. This made it necessary to redesign all thermally active parts, such as the connection to the cryostat, the flexible braid that enables the tilt and azimuth movement, the sample clamping as well as the thermal isolators that hold the clamping device in place. A newly introduced shield in the main analyser chamber, cooled by separate cryopumps, is used to remove nearly all radiation heat load. A major milestone has recently been taken, by running cryogenic tests on a test stand. The simplified setup reached sample temperatures of 3.35K. The temperature loss from the cryostat to the sample was as low as 0.6K. Encouraged by these results, it is believed that the final endstation will be able to reach temperatures even below 3K. With the new cryo concept, the thermal performance seems to be mainly limited by the radiative heat load emitted by the analyser lens. The new endstation is planned to be in operation by spring 2019.

WEOPMA02 Non-Contact Luminescence Lifetime Cryothermometry for Application in Vacuum Environment

Authors Vitaliy Mykhaylyk, Armin Wagner (DLS, Oxfordshire), Hans Kraus (Oxford University, Oxford, Oxon)

Abstract Measurement of the temperature of cryogenically cooled samples in a vacuum environment is a challenging task that requires specialist technical solutions. A new technique enabling non-contact monitoring of temperature has been developed for the I23 beamline. The temperature is determined by measuring the luminescence decay constant of a Bi4Ge3O12 scintillation sensor. One of the main advantages of the non-contact thermometry system is elimination of any connections between the sensor and the readout system that makes it fully compatible with the vacuum environment and necessity of swift replacement and manipulation of the samples. The technique was applied to quantify the thermal performance of different sample mounts that has been used for MX experiment at I23 beamline. It has been shown that the magnitude of the temperature rise across the sample mounts varies in wide range from 60 to 110 K while the temperature of goniometer was 40 K. The obtained results not only explain previous empirical finding but also demonstrated how this technique can aid studies of the complex relationships between various parameters influencing the heat conductance and temperature of the samples.

Oral Session: Core Technology Wednesday, 27-JUN-18 15:20-16:40 **Location:** Auditorium

WEOPMA03 Application of Additive Manufacturing in the Development of a Sample Holder for a Fixed Target Vector Scanning Diffractometer at SwissFEL

Authors Xinyu Wang, Patrick Hirschi, Jan Hora, Haimo Joehri, Bill Pedrini, Claude Pradervand (PSI, Villigen PSI)

Abstract Whilst the benefit of additive manufacturing (AM) in rapid prototyping becomes more and more established, the direct application of 3D printed part is still demanding. Exploitation of AM opens the door for complex and optimized parts which are otherwise impossible to fabricate. In the meanwhile, specific knowledge and aspects in analysis and design process are still to be explored. For a fixed target vector scanning diffractometer [1] at SwissFEL we developed, manufactured and tested a 3D-printed sample holder with carbon fiber reinforced plastics material. The diffractometer for serial crystallography is dedicated to collect diffraction patterns at up to 100 Hz on many small crystals (< 5 µm) by scanning the sample support in a continuous, arbitrary motion. The high dynamics arising from curved trajectories in the xy-plane requires a light and stiff sample holder which attaches the sample to the stage. In addition to 3D printed parts, an aluminum counterpart produced by CNC machining has also been tested and carefully evaluated. Our work in the course of development process on topology optimization, design, manufacturing and dynamic verification tests will be presented.

Footnotes [1] C. Pradervand et al., SwissMX: Fixed Target vector scanning diffractometer for Serial Crystallography at SwissFEL, SRI 2018

WEOPMA04 Mechanical Design of a New Precision Alignment Apparatus for Compact X-ray Compound Refractive Lens Manipulator

Authors Deming Shu, Lahsen Assoufid, Walan Cesar Grizolli, Zahirul Islam, Steven Patrick Kearney, Peter Kenesei, Sarvjit D. Shastri, Xianbo Shi (ANL, Argonne, Illinois), Jayson William John Anton (ANL, Argonne, Illinois; University of Illinois at Chicago, Chicago)

Abstract A prototype of compact x-ray compound refractive lens (CRL) manipulator system has been developed at the Argonne National Laboratory for dark-field imaging of multi-scale structures. This novel full-field imaging modality uses Bragg peaks to reconstruct 3D distribution of mesoscopic and microscopic structures that govern the behavior of functional materials, in particular, thermodynamic phase transitions in magnetic systems. At the heart of this microscopy technique is a CRL-based x-ray objective lens* with an easily adjustable focal length to isolate any region of interest, typically in the energy range of 5-100 keV or higher, with high precision positional and angular reproducibility. Since the x-ray CRL manipulator system for this technique will be implemented on a high-resolution diffractometer detector arm that rotates during diffraction studies, compactness and system stability, along with the ability to change focal length (zooming), became key design requirements for this new CRL manipulator system. The mechanical design of the compact x-ray CRL manipulator system, as well as finite element analyses for its precision alignment apparatus are described in this paper.

Footnotes * http://www.rxoptics.de/intro.html

WEOPMA05 Application of Industry Recognised Development Tools and Methodologies, such as Design for Six Sigma to Facilitate the Efficient Delivery of Innovative and Robust Engineering Solutions in Synchrotron

Authors Sarah Ann Macdonell (DLS, Oxfordshire)

Abstract Synchrotron facilities play a key part in the delivery of world leading science to facilitate research and development across multiple fields. The enabling technology designed by engineers at these facilities is crucial to their success. The highly academic nature of Synchrotron facilities does not always lead to working in the same way as a commercial engineering company. However, are the engineering requirements at Synchrotrons different to commercial companies? Exploring the parallels between research and commercial companies, can we show that the tools and methodologies employed could benefit engineering development at Synchrotrons? This paper provides a theoretical discussion on the commonality between engineering developments at Synchrotron facilities compared to commercial companies. How methodologies such as Design for Six Sigma and in particular tools such as stakeholder analysis, functional tree analysis, FMEA and DoE could be utilised in the design process at Synchrotrons. It also seeks to demonstrate how implementation could aid the development of innovative, robust and efficient design of engineering solutions to meet the ever-increasing demands of our facilities.

WEOPMA06 A Compact and Calibratable Von Hamos X-Ray Spectrometer Based on Two Full-Cylinder HAPG Mosaic Crystals for High-Resolution XES

Authors Ina Holfelder, Burkhard Beckhoff, Rolf Fliegauf, Yves Kayser, Matthias Mueller, Malte Wansleben, Jan Weser (PTB, Berlin)

Abstract In high-resolution X-ray Emission Spectroscopy (XES) crystal-based Wavelength-Dispersive Spectrometers (WDS) are being applied for characterization of nano- and microscaled materials. Thereby the so called von Hamos geometry provides high detection efficiency due to sagittal focusing using cylindrically bent crystals. To maximize the detection efficiency a full-cylinder optic can be applied. A novel calibratable von Hamos X-ray spectrometer based on up to two full-cylinder optics was developed at the PTB. To realize the full-cylinder geometry Highly Annealed Pyrolytic Graphite (HAPG) [1] was used. Besides its good bending properties this mosaic crystal shows highly integrated reflectivity while offering low mosaicity ensuring high resolving power [2]. The spectrometer enables chemical speciation of elements in an energy range from 2.4 keV up to 18 keV. The design and commissioning of the spectrometer will be presented together with first results using synchrotron radiation as excitation source. The spectrometer combines high efficiency with high spectral resolution (ten times better than in commercial WDS systems) in a compact arrangement also suitable for laboratory arrangements.

Footnotes [1] H. Legall et al. (2006). Proc. FEL, BESSY FRAAU04, 798-801
[2] M. Gerlach et al. (2015). J. Appl. Cryst. 48, 2015, 1381-1390

Poster Session: Simulation / Precision Mechanics / Beamlines Wednesday, 27-JUN-18 16:40-18:00 **Location:** Honnorat Access Gallery

WEPH01 Evaluation of Anisotropic Simulations & Redesign of the BXDS High Energy Monochromator Bent Laue Diffraction Crystal Holders

Authors Madison Adam, Narayan Appathurai (CLS, Saskatoon, Saskatchewan)

Abstract The Brockouse X-ray and Diffraction Scattering Sector (BXDS) high-energy (HE) beamline includes a bent Laue diffraction monochromator. The BXDS HE monochromator achieves energy ranges of 35keV to 90 keV through the bent Laue diffraction of two silicon crystal wafers. Each wafer (750um & 1000um thick) is bent to achieve specific sagittal radius (Rs); subsequent anticlastic meridional radius (Rm) results from the anisotropic nature of silicon, creating the desired x-ray focusing parameters. During the initial conditioning of the BXDS HE monochromator spurious diffraction patterns were observed indicating that the crystal holder and crystal integrity failed. Alternative holder designs were evaluated using FEA (ANSYS) simulations to ensure that appropriate Rs and Rm values were achieved, verification of the crystal holder Rs was completed using contact 3D measurement (FaroArm), and the crystal surface was assessed using 3D optical profiling (Zygo). A superior holder was chosen based on the results, and replaced. The performance of the BXDS HE monochromator has been characterized, indicating the new holder design has achieved x-ray focusing parameters.

WEPH02 Thermomechanical Analysis of SESAME High-Heat-Load Front Ends Components

Authors Mohammad Ali Al-Najdawi (SESAME, Allan)

Abstract New front end beamline components at SESAME* are designed to handle the high heat load produced by the insertion devices. A mini gap wiggler will be installed for the Material science Beamline and the front end will receive 5.0 kW of total power and 7.74 kW/mrad2 of peak power density. The power produced by the insertion device was simulated using SynRad+, this software is using Monte Carlo simulation to simulate the synchrotron radiation from either an insertion device or any magnet source, the surface power density distribution generated by this software mapped directly to an FEA software to conduct a coupled thermo-mechanical analysis. The design, modeling, power source simulation and FEA analysis of the fixed mask, shutter and filter for the material science Beamline front end will be presented in this paper

Footnotes Synchrotron-light for Experimental Science and Applications in the Middle East

WEPH03 Design of New Beam Instrumentation for the ISOLDE Isotope Separator at CERN

Authors William Andreazza, Michel Duraffourg, Gerrit Jan Focker, Ana Miarnau Marin, Dorota smakulska, Jean Tassan-Viol, Raymond Veness (CERN, Geneva)

Abstract The ISOLDE radioactive ion beam separator facility at CERN produces beams of short-lived isotopes for experiments in physics, material and medical science. New requirements for more precise measurement of profile, position and intensity has pushed the CERN beam instrumentation group to start the study of a new generation of ISOLDE beam instrumentation dedicated to the specific needs of this facility. This paper will describe the design and the development of a number of new ISOLDE instruments with the aim of achieving better performance, increased reliability and to facilitate maintenance in the radioactive environment. It will explain how modern technologies (i.e. magnetically coupled push pull, 3D additive machining) have been used to make a modern, precise and reliable beam instrumentation design.

WEPH04 Finite Element Analysis of a Combined White Beam Filter and Visual Screen Utilizing CVD Diamond for the BXDS Beamline

Presenter Gordon Barkway (CLS, Saskatoon, Saskatchewan)

Authors David Maitland Smith, Madison Adam, Adam Janis (CLS, Saskatoon, Saskatchewan)

Abstract A white beam filter and visual screen are required for the undulator beamline at the Brockhouse X-Ray Diffraction and Scattering Sector. Reusing a water-cooled copper paddle with a 0.1 mm thick chemical vapor deposition (CVD) diamond foil, a combined filter and screen design is presented. The Canadian Light Source previously experienced failure of CVD diamond filters when exposed to high flux density white beam. Finite element analysis (FEA) was done to determine if the CVD diamond will fracture under the undulator heat load. Conservative failure criteria are selected for CVD diamond based on available literature for the following failure mechanisms: high temperature, thermal fatigue, and temperature induced stress. Four designs are analyzed using FEA models simulating effects of clamping pressure and heat load on the CVD diamond. The simulations are verified by optimizing the model mesh, comparing results against hand calculations, and comparing theoretical absorbed heat load to simulated values. Details of the modeling method are reviewed and results for the different designs evaluated. Suggestions for future testing of CVD diamond in a synchrotron setting will be discussed.

WEPH05 Compact Extraction System for the B70 Cyclotron

Authors Teodor Boiesan, Mark Carlson (BCSI, Vancouver)

Abstract Best Cyclotron Systems Inc (BCSI) has designed and manufactured a 70 MeV compact cyclotron for radioisotope production and research applications. The cyclotron extractor design allows negative ion stripping to extract protons between 35 and 70 MeV. The extractor is consistent with the requirement for high current operation with a minimum of intervention. Twenty-two extractor foils are available in any selection sequence on each side of the cyclotron. The foil exchange is performed in vacuum so that an exchange takes about 2 minutes while obeying safety protocols. The 22 foils are contained in a cartridge that can be quickly exchanged through a vacuum load lock minimizing operator exposure. An added benefit is that the extractor modular design reduces the operational space requirement outside of the cyclotron thus reducing the vault footprint and shielding requirement.

WEPH06 Upgrade of Magnetic Measurements Laboratory Using Step Motors at ALBA Synchrotron

Authors Josep Campmany, Fulvio Becheri, Jordi Marcos, Valentí Massana, Roberto Arturo Petrocelli, Llibert Ribo (ALBA-CELLS Synchrotron, Cerdanyola del Vallès)

Abstract Along 2017 and 2018, a complete upgrade of ALBA magnetic measurements lab has been done. Upgrade has affected both hardware and software. Regarding hardware, a relevant innovation has been the replacement of DC motors by step motors in new Hall probe bench and in flipping and rotating coil benches. Up to now, these kind of continuous measurements usually were done using DC motors because step motors were considered unable to fulfil the required smoothness of the movement. However, current step motors state of the art made them compatible with DC. In our case, we have tested the performance of upgraded benches and they reach the same accuracy, or even better. Regarding software, we have unified all motion drivers to ICEPAP and all control system to Tango package, taking advantage of the last ICEPAP firmware. That includes the feature of triggering data acquisition system by signals generated from different axis that can be selected by software.

WEPH07 Photon Beam Applied as Heat Flux on Irregular Surfaces in FEA

Authors Daniela Capatina (ANL, Argonne, Illinois)

Abstract The light source front ends and beamlines contain several devices designed to limit the size of, or completely stop, the photon beam. Most of these devices are meant to protect personnel and/or equipment, thus their failure would have serious implications for the facility operation. The photon beam carries extremely high energy, thus the system will experience very large thermal loads. Accurate temperature and stress distribution of these components, based on well-reasoned assumptions, is needed to accurately review the performance of these devices during the design process. Applying nonuniform heat flux as a thermal load in simulation presents a challenge. This work describes the steps of the thermomechanical numerical simulation for a typical component at the Advanced Photon Source (APS), subject to photon beam interception. The numerical algorithm used to apply the nonuniform heat flux distribution on an irregular type of surface is presented in detail. The algorithm was developed using the commercial Finite Element Analysis (FEA) software ANSYS of ANSYS, Inc.

WEPH08 Application of Remote Installation and Measurement Walking Platform in Accelerator

Authors Jia-Xin Chen, Yongji Yu (CSNS, Guangdong Province), Ling Kang, Xiaojun Nie, Guangyuan Wang, Jiebing Yu (IHEP, Beijing)

Abstract The installation, alignment measurement and vibration monitoring of the accelerator equipment are cumbersome. In order to reduce the work intensity and exposure time of personnel, this paper has developed a walking equipment that can automatically walk and automatically adjust the horizontal in the accelerator or beam line area. The equipment can move forwards, sideways, oblique lines, rotations and combinations, and can automatically adjust the level according to different terrains. The auto-leveling accuracy is better than 0.001 degrees. By installing vibration measuring equipment or collimating equipment on the platform, vibration testing and collimation measurement of the equipment in the accelerator or beamline device can be performed.

WEPH09 Vibrational Stability of a Crycooled Double Crystal Monochromator at SSRF

Authors YICHEN FAN (SSRF, Shanghai)

Abstract There is an increasingly critical demand on the angular stability of double crystal Monochromator (DCM). This work focuses on a method to measure angular vibration directly at the DCM crystals using a dual-frequency interferometer. This method was applied to the off-line test of a newly developed cryocooled DCM at Shanghai Synchrotron Radiation Facility (SSRF), which can obtain a resolution of 8 nrad. The DCM was then tested on the X-ray Test Line. Both off-line and on-line results matched well, and were referenced for DCM structure improvements. In this paper, the DCM angular stability measuring method is presented, and detailed information of the results are shown.

WEPH10 Thermal-Distortion Predictions of a Silicon Monochromator Using the Finite Element Under Extreme Heat Load

Authors Lidan Gao (IHEP, Beijing)

Abstract X-ray crystal monochromators of high thermal load exposed to white-beam in third generation synchrotron light sources are subject to thermal deformations that must be minimized using an optimized cooling structure. Finite-element analysis is used to calculate the crystal thermal deformations and optimize the cooling structure by changing crystal size and cooling structure. Optimization results are displayed. The heat absorbers consist of two copper cooling clamped to the crystal side faces via an indium foil in order to ensure a good thermal contact and to relax the thermal deformation. Those absorbers are each composed of 16 cooling fins regularly spaced and carved from the cooper block. The cooling fluid of high fin position is higher than the silicon crystal surface. The cooling structure can dissipate a heat load up to 800W& power density 10W/mm2.

WEPH11 High-Efficiency and Compact Von Hamos Spectrometer for the Soft X-Ray Range

Authors Tatjana Gießel, Filip Fuchs (Bestec GmbH, Berlin), Franz Schäfers (HZB, Berlin)

Abstract Samples illuminated by pulsed soft X-rays with a large number of photons per pulse (XFEL, Laser-plasma sources) often restrict analytical methods to photon-in-photon-out techniques, since photon-in-electron-out techniques can suffer severely from space charge. We introduce a compact and large angle acceptance soft X-ray spectrometer for an energy range of 1-3 keV suitable for experiments under the above conditions. The spectrometer uses a von Hamos optical design covering a simultaneous energy window of >300 eV at a resolving power of 1200-2800 and a total length of the spectrometer of <600 mm. We will present design details and first performance test results.

WEPH12 Development of the Mechanics of MOBIPIX, a Small Volume High Heat Density X-ray Detector

Authors Allan Gilmour, William Roberto de Araujo, Jean Marie Marie Polli (LNLS, Campinas)

Abstract Nowadays fast and reliable detectors are required for experimental research at new light sources, Mobipix project is one compact X-ray imaging camera based on the Medipix3RX* chips for Sirius** the control and acquisition uses System On a Chip technology with embedded GPUs (Graphics Processing Units) where data processing algorithms will be executed in real time. The aim is to transform the Mobipix X-ray camera in a system like video camera, that will allow conduct either imaging experiments or beam diagnose without necessity of external computers at kHz frame rate. This paper presents the development of the Mobipix detector mechanics, the authors describes the path taken to design the structural aspects, ensuring robustness and versatility in the attachment of the device to the beamlines, and the thermal aspects, given the chosen refrigerating option, high heat density, and small volume through which the flow will occur. The latter aspects were developed by exploiting CFD modelling. It is expected that the first prototype results will be presented in this paper as well. The Mobipix has 28 x 28 mm² active area, 260k of 55 x 55 m² pixels, continuous readout up to 2000 Frm/s.

Footnotes * LNLS is a member of CERN Medipix3 Collaboration. https://medipix.web.cern.ch/collaboration/medipix3-collaboration
** Sirius is the new Brazilian Synchrotron Light Source under construction

WEPH13 Vibration Monitoring at TPS Storage Ring

Authors Keng-Hao Hsu (NSRRC, Hsinchu)

Abstract TPS, a third-generation synchrotron accelerator in Taiwan, is located in Hsinchu Science Park. Therefore, the vibration sources surrounding TPS are supposed to be traffic, utility machinery and so on. In order to monitor the vibration of TPS storage ring, the accelerometers and the velocity sensors are placed on the magnet girders and the ground respectively. In this paper, the results of girder and ground vibration of TPS storage ring are shown.

WEPH14 Shape Optomechanical Optimization for a Sagittaly Bent Double Crystal Monochromator, Using Combined Finite Elements and Ray Tracing Tools: Application to the SAMBA Beamline

Authors Nicolas Jobert, Emiliano Fonda, Thierry Moreno, Marc Ribbens (SOLEIL, Gif-sur-Yvette)

Abstract Designing a second crystal for a sagittally bent Double Crystal Monochromator (DCM) requires dealing with a number of conflicting requirements. Especially when working with high-energy photons, the angular aperture (Darwin width) becomes very narrow (below 10µrad for Si) while simultaneously the bending radius is increasing small (down to 1m for typical beamline dimensions at 40keV). In this situation, the cross-talk between tangential and sagittal curvature becomes a key parameter, and two strategies are generally used to overcome the issue: either using a flat crystal with a specific length/ with ratio, or usage of a rib-stiffened crystal. In the frame of the upgrade of the SAMBA beamline DCM, both solutions have been explored, using a suite of scripts connecting a general purpose FEM code (ANSYS) and a ray-tracing code (SpotX). This has allowed a systematic evaluation of a wide number of configurations, giving insight in the interaction between geometric parameters, and ultimately resulting in a twofold increase in the photon throughput at 30keV without comprising neither spectral resolution nor spot size at sample location.

WEPH15 Experimental Modal Analysis Vibration Measurement to Inform Engineering Design

Authors Jonathan Kelly (DLS, Oxfordshire)

Abstract Experimental Modal Analysis was performed on an existing 5 degree of freedom mirror system on beamline I08 at The Diamond Light Source, by impacting the structure and measuring the response at locations of interest. Commercial software was used to generate the frequency response functions and mode shape animations. This experimental information was used to inform and optimise a design iteration for a new mirror system. The new mechanism was designed, installed and tested on the J08 branch line at The Diamond Light Source to validate the expected improvements in stability, stiffness and resonant frequency. The mirror system fundamental resonant frequency was significantly increased from 20 Hz to 49 Hz.

WEPH16 Thermal Analysis of High Heat Load Mirrors for the in-Situ Nanoprobe Beamline of the APS Upgrade

Authors Jonathan Knopp, Michael V Fisher, Jörg Maser, Ruben Reininger, Xianbo Shi (ANL, Argonne, Illinois)

Abstract The Advanced Photon Source (APS) is currently in the process of upgrading to a multi-bend achromat (MBA) storage ring, which will increase brightness and coherent flux by several orders of magnitude. The planned In-Situ Nanoprobe (ISN) beamline, one of the feature beamlines of the APS Upgrade (APS-U) project, is a 220 m long beamline that aims to focus the x-ray beam to a spot size of 20 nm or below. In this beamline, a double-mirror system containing a high heat load mirror and a pink beam mirror is designed to provide high harmonic rejection and focus the beam to a beam-defining aperture (BDA). One of the key issues is to manage the high power and power density absorbed by these mirrors due to the new source. To attain the best focus at the BDA, the pink beam mirror needs to be mechanically bent to correct for thermal deformations on both mirrors. In this paper we report on the thermal responses to different cooling schemes (e.g., side and internally water cooled) for these mirrors as calculated with Finite Element Analysis (FEA) and optical ray tracing. We provide an in-depth discussion on how the thermal deformations affect the flux and the quality of the focus seen downstream.

WEPH17 Adjusting Mechanism of Inter-Undulator Section for PAL XFEL

Authors Hong-Gi Lee, Jang Hui Han, Seong-Hun Jeong, YoungGyu Jung, Heung-Sik Kang, Dong Eon Kim, Heung-Soo Lee, Sangbong Lee, Bonggi Oh, Ki-Hyeon Park, Hyung Suck Suh (PAL, Pohang, Kyungbuk)

Abstract Pohang Accelerator Laboratory (PAL) has developed a SASE X-ray Free Electron Laser based on a 10 GeV linear accelerator. The inter-Undulator (IU) support section was developed to be used in the intersections of the Undulator Systems. The IU supports consist of phase shifter, quadrupole magnet with mover, beam loss monitor, cavity BPM with mover, two corrector magnets and vacuum components. The adjusting mechanism of IU Support has manual alignment system to be easily adjusting the component. The mover of quadruple magnet and cavity BPM with submicron repeatability has auto-adjusting systems with stepping motor. The mover main specifications include compact dimensions and a ±1.5 mm stroke in the vertical and horizontal direction. Linear motion guide based on 5-phase stepping motors have been chosen. This paper describes the design of the stages used for precise movement and results of mechanical measurements including reproducibility will be reported.

WEPH18 Operation Status of HLS System Installed to Measure Ground Change of Large Scientific Equipment in Real Time.

Authors Hyojin Choi, Jang Hui Han, Heung-Sik Kang, Seung Hwan Kim, Seung Nam Kim, Hong-Gi Lee, Sangbong Lee (PAL, Pohang, Kyungbuk)

Abstract Several parts that comprise the large scientific equipment should be installed and operated at precise three-dimensional location coordinates X, Y, and Z through survey and alignment to ensure their optimal performance. As time goes by, however, the ground goes through uplift and subsidence, which consequently changes the coordinates of installed components and leads to alignment errors. As a result, the system parameters change, and the performance of the large scientific equipment deteriorates accordingly. Measuring the change in locations of systems comprising the large scientific equipment in real time would make it possible to predict alignment errors, locate any region with greater changes, realign components in the region fast, and shorten the time of survey and alignment. For this purpose, a WPS's (wire position sensor) are installed in undulator section and a HLS's (hydrostatic leveling sensor) are installed in PAL-XFEL building. This paper is designed to introduce performance enhancements to reduce observed phenomena and measurement errors in the HLS system operation process.

WEPH19 Positioning Behavior of a Lead-Screw Type In-Vacuum Actuator

Authors Lance Lee, Daniel Schiller Morton, May Ling Ng, Lin Zhang (SLAC, Menlo Park, California)

Abstract In-vacuum actuators are under consideration for operating the bending flexures of the new Kirkpatrick-Baez focusing mirrors as part of the upgrade to LCLS-II. To achieve an mechanical accuracy of better than 1e4, the characteristics of the actuators need to be explored. We designed a testing procedure in terms of both setup and actuator excursion program to understand various behaviors of the actuator in a simulated typical operating condition. Multiple independent sensors were used, including optical linear encoder, laser interferometer and capacitive sensors. In this presentation, I will show the testing procedure and results obtained for a commercially available high-precision leadscrew type in-vacuum linear actuator with a stroke of 10 mm and a resolution of 2.5 nm. It was found that under typical static operation conditions, an accuracy of 1e4 can be achieved without external encoder feedback. Detailed behaviors regarding repeatability and backlash are also discussed.

WEPH20 Upgrade of Double Crystal Monochromators for EMBL Beamlines at PETRAIII

Authors Fang Liu (ShanghaiTech University, Shanghai), Clement Blanchet, Gleb Bourenkov, Stefan Fiedler, Thomas Gehrmann, Doris Jahn, George Marshall, Jochen Meyer, Guillaume Pompidor, Uwe Ristau (EMBL, Hamburg)

Abstract Double crystal monochromators (DCM) are very important instruments in hard X-ray beamlines. Publications have indicated that the mechanical stability of the DCM would affect the whole beam quality very much. To upgrade the performance of the DCMs of the EMBL beamlines, the vibrational stability, thermal stability and mechanical repeatability were improved. To improve the vibrational stability, an off-line vibration measurement for the pitch and roll, as well as the perp, were designed with a set of in-vacuum interferometers was developed for measuring the vibrations without X-ray beam. Then several attempts were tried to reduce the vibration caused by the cooling system, in the end, the pitch vibration was improved from 390nrad to 50nrad. To improve the thermal stability, the cooling blocks and thermal braids were optimized with the FEA methods, the steady time of the 2nd crystal were improved from 2.5 hours to less than 45 minutes after each energy change. To improve the repeatability of the orientation, the wedge jacks were replaced by worm gear boxes, repeatability was reached to less than 3 um.

WEPH21 A Family of Redundant Positioning Devices for Synchrotron Applications

Authors Gheorghe Olea, Norman Huber (HUBER Diffraktiontechnik GmbH&Co.KG, Rimsting)

Abstract A family of reconfigurable devices able to work in synchrotron applications, especially in diffractometer environments has been developed. It can provide six (6) or less than six (<6) degrees of freedom (dof) motion capabilities (F<=6) being able to pose a heavy load sample (instruments) with high precision towards an X-ray coming beam. It is based on the Parallel Kinematics (PK) Quatropod concept with redundant actuation (Rd=2) and were built around the fully (F=6dof) basic topology 6-4(213) where 2-actuated and 1, 3-passive joints, respectively. By altering the passive joints dof, structures with less than six dof (F<6) can be obtained, e.g. 5-4[213(2)]/F=5, 4-4[213(1)]/F=4, 3-4[213(0)]/F=3 (3(2) and 3(1)and 3(0) stand for 3dof joint with constrained(less) dof - f=2, 1 or 0/blocked). For a perfect symmetric arrangement and using only P and S (P-prismatic, S-spherical) joints, several useful positioning mechanisms are presented. And, in the design phase, 2dof linear actuators (2P), e.g. XY stages have been proved to be a suitable choice, too.

Footnotes
* J.P. Merlet, Parallel Robots Springer (2ed), 2006
** G. Olea, D 202014 011 139 U1, DPMA, 2018
*** HUBER GmbH, Diff. & Positioning Products, www.xhuber.com, 2018

WEPH22 Le Guide for Support: A Cookbook for Modeling of Accelerator Structures*

Authors Curt Preissner, Scott Jon Izzo, Zunping Liu, Jeremy Nudell (ANL, Argonne, Illinois)

Abstract The Advanced Photon Source-Upgrade (APS-U) project has stringent specifications and a 12 month installation schedule. Some form of these constraints appear to be common at all multi-bend achromat upgrade projects. At the APS-U, no full tests will be made of the final accelerator support design. The evaluation of the final design against the specifications will be based primarily on computer simulations using virtual inputs. Insuring that the final designs meet specifications solely based on simulations is much like cooking a complex, multi-course meal without a trial run. Producing a successful meal on the first try requires a prior understanding of the ingredients, techniques, and interactions between the constituents. A good cookbook can be essential in providing this under-standing. Likewise, producing an accelerator support final design that meets the requirements requires a prior under-standing of the materials, components, techniques, and interactions between them. This poster describes a cookbook-style approach that any design team can use to confidently predict important characteristics such as natural frequency and ambient vibration response with an error of around 10%.

WEPH23 FEA Simulations of the Aluminium Vacuum Chamber for LOREA Insertion Device at ALBA Synchrotron Light Source

Authors Marcos Quispe, Artur Gevorgyan (ALBA-CELLS Synchrotron, Cerdanyola del Vallès)

Abstract For LOREA, the new beamline at ALBA, the Insertion Device Apple-II helical out-vacuum undulator requires the installation of a suitable narrow-gap aluminium chamber. The chamber design is based on the standard ALBA aluminium chamber which has an internal elliptical cross section, where NEG coating is deposited and bending magnet (BM) radiation from the upstream dipole is dissipated on the chamber walls. For the standard chamber the upstream distributed absorber cannot protect the entire chamber from direct BM radiation because there is a limitation for its design: the beam impedance of the machine. Based on new studies of collective effects it has been concluded that it's possible to implement modifications on the upstream distributed absorber and protect the chamber from lateral collision of BM radiation keeping the beam impedance of the machine inside of a safe range. In spite of that still there is a contribution of the tails of BM radiation. In this paper we describe the behavior of the new aluminium vacuum chamber for different thermal load conditions using water and air for refrigeration. Also we present the design of the modified OFHC upstream distributed absorber.

WEPH24 Design of an Integrated Crotch Absorber for ALBA Synchrotron Light Source

Authors Marcos Quispe, Josep Campmany, Artur Gevorgyan, Jordi Marcos (ALBA-CELLS Synchrotron, Cerdanyola del Vallès)

Abstract This paper presents the design of an Integrated Crotch Absorber for the new beamline LOREA (Low-Energy Ultra-High-Resolution Angular Photoemission for Complex Materials at ALBA). The LOREA Insertion Device (ID) consists of an Apple II undulator with a period of 125 mm. For the current ALBA dipole chamber the ID vertical polarized light hits the upper and lower walls because of the very narrow vertical aperture between the cooling channels. To solve this problem some modifications must be implemented both in the dipole chamber and in the crotch absorber located inside of the dipole. The new crotch absorber, named Integrated Crotch Absorber, must absorb a significant part of the ID vertical polarized light in order to avoid radiation impinging at the post dipole chamber. The geometry of the Integrated Crotch Absorber is a combination of the conventional crotch and the distributed absorber done at PSI for ANKA. The design has been optimized taking into account the standard thermo-mechanical design criteria as well as the reflective effects of the ID radiation from the opening towards the walls of the dipole chamber.

WEPH26 High Rigidity Girder System for the Sirius Machine

Authors Flávio Rodrigues, Thiago Jasso, Rodrigo Junqueira Leao, André Luis Mesa, Regis Neuenschwander, Milton Cesar Rocha, Antonio Ricardo Droher Rodrigues (LNLS, Campinas)

Abstract Sirius is a 4th generation synchrotron light source under construction in Brazil, with a bare emittance of 250 picometer rad, scheduled to have the first beam late this year. One of the most important aspects for this ultra-low emittance machine is the stability of the components, especially the magnets. This paper describes the main characteristics of the girder system, including the concrete pedestal, the leveling units, the girder itself, the clamping mechanism for the magnets and the measurements procedures. Each detail was considered in the design phase and the result is a high rigidity setup with a first horizontal mode close to 160 Hz.

WEPH27 High Heat Load Optics

Authors Joern Seltmann (DESY, Hamburg)

Abstract Beamline P04 at the 6GeV storage ring PETRA-III is a XUV to soft x-ray facility in the range of 250-3000eV. High K (up to K=6.5) operation of the 5m long APPLE-2 undulator result in high on-axis heat load. The absorbed power on the first mirror will be up to 1.6 kW (100 mA ring current, linearly polarized light). This mirror is located 46 m upstream of the focal spot, therefor has optical requirements of a tangential slope error of less than 1 µrad and has to be operated under UHV-conditions. Previous FEM studies * pointed towards an internal cooling concept based on liquid nitrogen, to cope with the high heat load and the optical needs. This initial concept has been improved with further FEM simulations and the technical feasibility of a cryo-stable metal to silicon connection for the coolant was proven under vacuum conditions.

Footnotes * Hans-B. Peters, Finite Elemente Berechnung, Silizium-Planspiegel M1 für XUV-Strahl in Petra-III, Beamline P04, DESY / Abtlg. ZM1, Hamburg, den 23.01.2008

WEPH28 A Note of Thermal Analysis in Synchrotron Radiation Accelerator Engineering

Authors I-Ching Sheng (NSRRC, Hsinchu)

Abstract Thermal and thermomechanical analysis is one of the key process while designing accelerator components that may subject to synchrotron radiation heating. Even some closed-form solutions are available, and yet as to complex geometry numerical analysis such as finite element method (FEM) is commonly used to obtain the result. However due to its complexity of density distribution of the heat load, implementing such boundary conditions in the FEM model is relatively tedious. In this report we provide a simplified, practical and more conservative method to apply heat load both for bending magnet and insertion device. In addition, a general purpose synchrotron radiation heating numerical modeling is also introduced.

WEPH29 NSLS-II Vibration Studies to Characterize Beamline Stability

Authors Charles Spataro, Frank Charles Lincoln, Sushil Sharma (BNL, Upton, Long Island, New York)

Abstract High performance goals of NSLS-II require stringent mechanical stability of its instruments such as BPMs, slits, mirrors, monochromators, and detectors. Mechanical stability of these components can be compromised by site-wide as well as local vibration sources (pumps, compressors, etc.). Several vibration studies have been performed at NSLS-II at the request of beamline users. This paper presents the results of these studies highlighting sources of vibration and mitigation strategies.

WEPH30 The Design of Energy Saving for an Air-Conditioning System

Authors Zong-Da Tsai, Wen Shuo Chan, Chih-Sheng Chen, Yuan Yuan Cheng, Yen-Ching Chung, Ching-Yuarn Liu (NSRRC, Hsinchu)

Abstract In the Taiwan Light Source (TLS) and Taiwan Photon Source (TPS), several studies related to energy saving of an air-conditioning system continue to progress. The systems for heat recovery have been considered in laboratory applications. The performance of a run-around coil has demonstrated that heat recovery plays an important role in energy conservation. Base on this design of air handle unit (AHU), we upgrade this model and combine with enthalpy control for season change. Here we construct a new AHU to verify the practical influences of energy usage. The improvements prove that both mechanisms can be achieved concurrently.

WEPH31 Thermal and Mechanical Simulations for Sirius High-Stability Mirrors

Authors Lucas Monteiro Volpe, Gabriel Claudiano, Renan Ramalho Geraldes, Sérgio Augusto Lordano Luiz, Bernd Christian Meyer, Artur Clarindo Pinto, Lucas Sanfelici, Helio Tolentino, Harry Westfahl Jr. (LNLS, Campinas)

Abstract The mirrors for Sirius, the new 4th-generation synchrotron at the Brazilian Synchrotron Light Laboratory (LNLS), have strict requirements regarding thermo-mechanical stability and deformations, with figure height errors limited to a few nanometers, and figure slope errors and angular stability of tens of nanoradians. Therefore, fixed-shape mirrors have been defined with horizontally-reflecting orientation, except for vertically-reflecting mirrors of KB systems, whereas their cooling schemes, namely, air, water or liquid nitrogen cooling, depend on to the particular power load. A thermal and mechanical simulation method was developed to guide the design of mirrors through the evaluation of deformations, caused by power load, cooling, gravity, tightening of the fastening screws and manufacturing errors, and modal analyses. Up to now, this method was already used to define the mirrors of CATERETÊ, IPÊ, EMA and CARNAÚBA beamlines, which include plane, cylindrical, elliptical and ellipsoidal mirrors, as well as KB systems for microprobe and nanoprobe stations.

WEPH32 Design of a Layered High Precision Magnet Girder

Authors Guangyuan Wang (IHEP, Beijing)

Abstract In order to adjust the collimation of the light source magnet, a layered magnet girder is developed, which can adjust the six degrees of freedom accurately and reduce the mutual influence of the adjustment process between the various layers of the girder. The precision of the collimation is up to 5 microns.

WEPH33 Challenges for Nanopositioning

Authors Patrik Wiljes (DESY, Hamburg)

Abstract In nanopositioning systems there are plenty of disturbance sources corrupting the stability of the positioners and optics. Vibrations are induced by machines like pumps and coolers, as well as by car traffic hundreds of meters far from the facility. Furthermore the small and lightweight mechanical components are strongly influenced by sound waves. The positioners themselves may also produce vibrations or at least amplify them by the eigenfrequencies of their flexure joints, which are used for nanometer positioning accuracy without backlash. To identify the sources, amplification and damping of vibrations inside the setup, different kinds of measurements, including broadband frequency stimulation, have been performed on a setup at a nano experimental hutch of a PETRA III Beamline. Therefore some mechanical components and positioning stages were changed against stiffer materials to have comparable measurements to get statements about the quality of the mechanical properties. The poster shows the experimental setup, the measuring methods and some comparing vibration plots, which give information about the identified mechanical behavior.

WEPH34 Research on Active Vibration Isolator

Authors Jiebing Yu, Ling Kang (IHEP, Beijing), Jia-Xin Chen, Xiaojun Nie, Anxin Wang, Guangyuan Wang, Jun Song Zhang (CSNS, Guangdong Province)

Abstract The development tendency of accelerator technology: the energy of beam becomes higher and higher, the size becomes smaller and smaller, and the requirements to support system become more and more strict. In order to reduce the influence of vibration at low frequency, active vibration control method is proposed. This paper mainly shows the experimental system, and some work has been done at present. We hope the active vibration control system will be steadily used in some precision equipment and instruments support system.

WEPH35 System Design of Hard Xray Split and Delay

Authors Hongliang Shi, andrew barada (SLAC, Menlo Park, California)

Abstract A new hard X-Ray Split and Delay system has been recently commissioned on the SLAC XCS instrument beam-line. This presentation will explain the engineering decisions that drove the unique design of the precision mechanics and positioning systems in order to meet nanoradian positioning requirements. Recent performance data will be presented along with proposed enhancements as part of a continuing improvement development phase.

Footnotes *Development of a hard x-ray split-delay system at the Linac Coherent Light Source, June 2017
DOI10.1117/12.2265171
Conference: SPIE Optics + Optoelectronics

WEPH36 From Plate Screening to Artificial Intelligence: Innovative developments on PROXIMA 2A at Synchrotron SOLEIL

Authors Damien jeangerard, Lidia CICCONE, Kewin Desjardins, Antoine LE JOLLEC, Martin SAVKO, William SHEPARD (SOLEIL, Gif-sur-Yvette)

Abstract PROXIMA 2A is a high performance 3rd generation synchrotron beamline dedicated to X-ray micro-crystallography on biological macromolecules. Since opening in March 2013, the experimental station has hosted a large number of users who have collected vast amounts of X-ray diffraction images from literally thousands of crystals. In order to streamline the throughput, enhance performance and add functionality, a number of innovative developments have been launched on PROXIMA 2A. These cover all aspects of the beamline, from the practical to the visionary: such as the design, fabrication and implementation of a dedicated high-precision motorized stage to screen crystallization plates for in situ X-ray data collections, and the employment artificial intelligence and computer vision technologies for the detection of samples under liquid nitrogen. Other notable beamline projects include the addition of a vertical translation table for the EIGER X 9M detector to permit the acquisition of ultrahigh (0.6 Å) resolution X-ray data, the incorporation of a miniaturized YAG-coupled photodiode within a beamstop and the determination of the SOC of a recently added kappa arm to the goniometer.

WEPH37 Modified Twyman-Green Interferometer for the Sagittal-Focusing Monochromator

Authors Fugui Yang (IHEP, Beijing)

Abstract The sagittally bent monochromator is a desirable optics for hard X-ray beamlines and an important part of the advanced research for High Energy Photon Source (HEPS). The information of the surface figure of the crystal is very important for the optimization of bender. However, it is difficult to measure the shape directly by interferometer or long trace profiler due to very big principal curvature (1/Rs), which distorts the deflectometric probe light therefore affects the accuracy of the measurement. We have developed ex-situ metrology instrument - a low-cost modified Twyman-Green interferometer by using commercial element in our laboratory. The misalignment among the detector, cylindrical sample light and the crystal mirror was adjusted by rotating the interferometer according to the theoretical calculation, which can separate the effect of the misalignment and the distortion of the mirror. The accuracy of the curvature radius (about few mm) is assured by precisely moving the mirror under test.

WEPH38 Mechanical Design and Construction of the Coherent X-ray Scattering Beamline at Taiwan Photon Source

Authors Hong-Yi Yan, Chao-Yu Chang, Chien-Hung Chang, Shih-Hung Chang, Chun-Yu Chen, Chao-Chih Chiu, Liang-Jen Huang, Yu-Shan Huang, Longlife Lee, Jhih-Min Lin, Din-Goa Liu (NSRRC, Hsinchu)

Abstract The Coherent X-ray Scattering (CXS) beamline at Taiwan Photon Source has been completely constructed in the end of 2015 and opened for users in the next half year of 2016 successfully. Two In-vacuum Undulators (IU22) with lengths of 3 m and 2 m were used as the Insertion Device (ID) to provide intense synchrotron radiation for the CXS beamline. To achieve the coherent performance, the setup of components in the beamline needs to be considered and designed carefully. As no white-beam diamond window was installed in the upstream beamline for the maintenance of coherent beam, a differential pumping mechanism was evaluated to prevent the worse vacuum condition influencing the front end and the storage ring. A single-crystal diamond filter was also adopted to maintain the coherence of x-ray. The protection of bremsstrahlung radiation for this beamline was designed specifically based on the optical layout. This paper will introduce the detailed mechanical design and current status for the CXS beamline.

WEPH39 Tests in Sirius Front End Prototype

Authors Lucas Monteiro Volpe, Lucas Cordeiro Arruda, Cassiano Sergio Noventa Corrêa Bueno, Henrique Ferreira Canova, Gabriel Claudiano, Henrique Geraissate Paranhos de Oliveira, Paulo de Tarso Fonseca, Gustavo Lorencini Martins Pereira Rodrigues, Lucas Sanfelici (LNLS, Campinas)

Abstract A Front End (FE) prototype for an APU19 insertion device beamline of the new 4th-generation synchrotron, Sirius, was assembled in the LNLS metrology building in January 2017. Tests were made in this prototype to validate concepts adopted on the FE design. In matters of stability, a flow-induced vibration (FIV) test was carried out on the water-cooled components. The shutters' movement vibration transmitted to the floor was also measured to evaluate possible perturbations to the Storage Ring. A modal analysis and characterization was made on the X-Ray Beam Position Monitor (XBPM) support, since it is the component that requires the best stability. Regarding the vacuum system, it was verified the final pressure achieved and a vacuum breach was purposely caused to check the equipment protection system. A cycling test concerning the Photon and Gamma shutters movement was also conducted to verify the FE reliability. At last, the three-layer protection system developed to limit the maximum aperture for the High-Power Slits was tested to verify its functionality. All the collected results were used to improve the FE to its final design, which components is currently under manufacturing.

WEPH40 A High Power Laser Facility for the ESRF ID24-ED Beamline

Authors Francois Villar, Gilles Berruyer, Carole Clavel, Olivier Mathon, Sakura Pascarelli, Sebastien Pasternak, Florian Perrin, Perrine Ponthenier, Nicolas Sévelin-Radiguet, Raffaella Torchio (ESRF, Grenoble)

Abstract The ESRF is designing a laser facility for dynamic compression coupled to the ID24-ED beamline in order to study the properties and dynamic behavior of matter under extreme pressure and temperature. To achieve this, a pulsed laser will be focused on samples together with the Xray beam used to perform absorption spectroscopy. The laser setup is placed in a dedicated clean room from which an 85mm diameter beam is transported in the experimental hutch to the laser/sample interaction chamber thanks to a 15m long optical system. The laser beam is then focused down to 250 micrometers on the sample. Operating ID24-ED at different energies requires the samples to be rotated by about 40 degrees around the last Xray optical element of the beamline, a polychromator placed 1m upstream of the sample. The movement of the sample and the need for the laser to follow it put strong constraints on the mechanical design of the whole setup. We will present the layout of laser facility, the opto-mechanical system of mirrors and lenses used to transport the laser onto the sample, the kinematics of the mechanical system used to follow the rotation of the sample and the mechanical design of the interaction chamber.

WEPH41 The Detector Adjustment System of TPS 24A

Authors Bo-Yi Chen, Ming-Ying Hsu, Lee-Jene Lai, Chien-Yu Lee, Duan Jen Wang, Gung-Chian Yin (NSRRC, Hsinchu)

Abstract The soft X-ray tomography endstation of TPS has the ability to provide 3D biological cell images by fluorescence structured-illumination microscopy (SIM) and soft x-ray tomography (SXT). The detector system equipped with an Andor® iKon-L Series imaging CCD, X-Z-roll adjustment stage, and long stroke bellows system. The detector system can adjust the CCD about 10 mm in both X and Z direction, and +-5 degree of roll. Moreover, the long stroke bellows system gives the CCD an extra degree of freedom in Y direction and its range is up to 2500 mm. That can locate the CCD close to the sample to get larger field of view, and far from the sample to get higher image resolution. In this study, the design and commission status of the detector system is studied and the mechanical structure is also presented.

Footnotes soft X-ray tomography, Detector system

WEPH42 Sub-20-nrad Stability of an LN2-Cooled Vertical-Offset Double-Crystal Monochromator

Authors Andreas Schacht, Urs Wiesemann, Ina Schweizer, Timm Waterstradt, Wolfgang Diete (Axilon AG), Mario Scheel, Christer Engblom, and Timm Weitkamp (Synchrotron SOLEIL)

Abstract We have developed a compact and rigid mechanical design for a liquid-nitrogen-cooled vertically-deflecting double-crystal monochromator (DCM) for the ANATOMIX beamline at Synchrotron SOLEIL. An in-situ differential interferometer setup directly measures the pitch and roll parallelism between the first and the second crystal under operating conditions with liquid-nitrogen flow and at pressures below 10E-8 mbar. Factory measurements at moderate LN2 flow rates show a stability of the relative pitch of 25 nrad RMS (0.1 to 10 kHz) and a first relevant resonant frequency of 175 Hz. At lower flow rates, still sufficient to dissipate several hundred watts of heat load, an angular stability of 15 nrad RMS is achieved.

Keynote talk 3 Thursday, 28-JUN-18 09:00-10:20 **Location:** Auditorium

THKA01 Toward High Precision Position Control Using Laser Interferometry: Main Sources of Errors

Authors Sebastien Ducourtieux (LNE, Trappes Cedex)

Abstract When designing or sizing a high precision positioning system using homodyne laser interferometry or when evaluating a measurement uncertainty of an already designed system, many error sources which can degrade the measurement precision have to be taken into account. Some errors originate from: -the mechanical and electronical integration of the interferometer (mechanical drift, dead path error, resolution limit, noise level, interpolation, cosine error, ...) -the environment in which the instrument is installed (mechanical vibration, drift of environmental parameters like pressure, temperature, hygrometry, Edlen correction, air turbulence), -the optical components (mirror shape and roughness, orthogonality error), -intrinsic errors linked to the principles of interferometry (vacuum wavelength calibration of the laser source used, wavelength stability, calibration of environment sensor used for Edlen correction, beam profile quality,...) -... The given presentation will review the main errors sources, quantify and classify them by order of importance and establish the principle rules to achieve nanometer range precision when measuring displacements by interferometry.

Oral Session: Simulation Thursday, 28-JUN-18 10:50-12:10 **Location:** Auditorium

THOAMA01 Optimizing the PETRA IV Girder by Using Bio-Inspired Structures

Authors Simone Andresen (Alfred-Wegener-Institut, Bremerhaven)

Abstract The PETRA IV project at DESY (Deutsches Elektronen Synchrotron) aims at building a unique synchrotron light source to provide beams of hard X-rays with unprecedented coherence properties that can be focused to dimensions in the nanometer-regime. An optimization of the girder structure is necessary to reduce the impact of ambient vibrations on the particle beam. For this purpose, several numerical approaches have been made to simultaneously reach natural frequencies above 50 Hz, a high stiffness and a low mass. In order to define an optimal girder support, a parametrical study was conducted varying both the number and location of support points. Based on the resulting arrangement of support points, topology optimizations were performed with the aim of high stiffness and high first natural frequency. The following transformation of the results into parametrical constructions allowed further parametrical studies to find optimal geometry parameters leading to the aimed girder properties. In addition to that, bio-inspired structures based on marine organisms were applied to the girder which likewise resulted into improved girder properties.

THOAMA02 LCLS NEH Floor Thermal Deformation and Mitigation Plan

Authors Lin Zhang, Jean-Charles Castagna, Michael Holmes (SLAC, Menlo Park, California)

Abstract The key features of LCLS-II upgrade are the high repetition rate up to 1 MHz, and two variable-gap undulators (SXR and HXR). To take the advantages of this major upgrade, LCLS, SLAC is designing and building new soft and tender X-ray beamlines (TMO, TXI, RIXS, XPP). The laser pump FEL probe, or SXR FEL pump HXR probe experiments need sub-micron stability in a time range from 5 ms to a few hours. Dynamically bendable KB mirror can focus X-ray beam down to 300 nm. The overlap of the pump laser (or FEL), probe FEL beam and sample is challenging. Some measurements on vibration and long term stability have been carried out on the floor in the Near Experimental Hall (NEH) to host the new beamlines. The vibration displacement in the frequency range of 1 to 200 Hz is at the level of 25 nm. The floor deformation over hours and days measured by HLS and interferometer, however, show tens micro-meters displacement variation. This huge floor deformation is incompatible with the stability requirement. In this paper, we will present the simulation of the whole NEH building, comparison with measurement results, describe mitigation plan and predict the performance.

THOAMA03 Mechanical Design And Simulation For SPIRAL2 Project at GANIL

Authors Cécile Barthe-Dejean, Patrice Gangnant, Franck Lutton, Matthieu Michel (GANIL, Caen)

Abstract The SPIRAL2 project at GANIL is based on a superconducting ion continuous wave LINAC with two associated experimental areas named S3 (Super Separator Spectrometer) and NFS (Neutron For Science). This paper will report the main contributions of Mechanical Design Group at GANIL to the project. Mechanical engineers have been highly involved since 2005 from the pre-design of the accelerator and its development until present to finalize the installation. During the development phase, design and numerical simulation were used throughout the complete process: from the ion sources, to the LINAC accelerator, then through beam transport lines to experimental halls equipped with detectors. The entire installation (process, buildings and systems) is integrated in 3D CAD models. The paper focuses on three equipments designed in collaboration with electronics engineers and physicists: the Rebuncher in Mean Energy Beam Transport line; the Instrumentation Profiler SEM and the Target Chamber in S3. SPIRAL2 also has to meet safety requirements, such as seismic hazard, therefore the dynamic simulations performed to demonstrate the mechanical strength in case of earthquake will also be detailed.

THOAMA04 Design and FEA of an Innovative Rotating Sic Filter for High-Energy X-Ray Beam

Authors Walter Tizzano, Thomas Connolley, Steve Davies, Michael Drakopoulos, George Edward Howell (DLS, Oxfordshire)

Abstract I12 is a high-energy imaging, diffraction and scattering beamline at Diamond. Its source is a superconducting wiggler with a power of approximately 9kW at 500 mA after the fixed front-end aperture; two permanent filters aim at reducing the power in photons below the operating range of the beamline of 50-150 keV, which accounts for about two-thirds of the total*. This paper focuses on the design and simulation process of the secondary permanent filter, a 4mm thick SiC disk. The first version of the filter was vulnerable to cracking due to thermally induced stress, so a new filter based on an innovative concept was proposed: a water-cooled shaft rotates, via a ceramic interface, the SiC disk; the disk operates up to 900 degrees C, and a copper absorber surrounding the filter dissipates the heat through radiation. We utilised analysis data following failure of an initial prototype to successfully model the heat flow using FEA. Such model informed different iterations of the re-design of the assembly, addressing the issues identified. The operational temperature of the final product matches within few degrees C the one predicted by the simulation.

Footnotes *M. Drakopoulos et al., “I12: the Joint Engineering, Environment and Processing (JEEP) beamline at Diamond Light Source”.

Oral Session: Simulation Thursday, 28-JUN-18 13:30-14:10 **Location:** Auditorium

THOAMA05 3D Numerical Ray Tracing for the APS-Upgrade Storage Ring Vacuum System Design

Authors Jason Carter (ANL, Argonne, Illinois)

Abstract The APS-Upgrade project will build a diffraction limited storage ring requiring a vacuum system design with small aperture vacuum chambers passing through narrow magnet poles. The small apertures dictate that the walls of the vacuum chambers act as distributed photon absorbers. The vacuum chambers must be designed robustly so a thorough understanding of the synchrotron ray tracing with beam missteering is required. A MatLab program has been developed to investigate 3D ray tracing with beam missteering. The program discretizes local phase spaces of deviation possibilities along the beam path in both the horizontal and vertical planes of motion and then projects rays within a 3D model of the vacuum system. The 3D model contains elements in sequence along the beam path which represent both chamber segments and photon absorbers. Ray strikes are evaluated for multiple worst-case criteria such as local power intensity or strike offset from cooling channels. The worst case results are plotted and used as boundary conditions for vacuum chamber thermal/structural analyses. The results have also helped inform decisions about practical beam position limits.

THOAMA06 A New X-Ray Beam for the ESRF Beamlines, Opto-Mechanical Global Survey

Authors Yves Dabin, Raymond Barrett, Sylvie Jarjayes, Manuel Sanchez del Rio (ESRF, Grenoble)

Abstract The new ESRF photon source EBS, introduces important changes for the beamlines. Half of them are concerned with the concept of low beta (small source size/ high divergence). This survey is an opto-mechanical review with all of the thermal/high heat-load issues on optics. This plan uses new package, OASYS aimed at making X-ray beam simulations for most optical parameters. White beam aspects are introduced, using ANSYS and COMSOL modules, leading to beam propagation FEA analysis with deformed optics. This presentation describes the optical aspects of the ESRF beamlines (high/low beta optics), and their transition towards this new source. Some key issues like IDs beam illumination; power filtering and optimization of the best part of the spectrum are detailed. Mirrors and monochromator crystals deformation will be presented, first for the day-one best conditions. As a second issue, OASYS enables to simulate the full beamline, from the IDs to the experiment, allowing simulating virtual experiments, with samples. This work is developed through many ESRF contributors; first the OASYS designers, Optics group, and then opto-mechanical experts, in association with mechanical engineering.

Footnotes OASYS (OrAnge SYnchrotron Suite) is a simulation tool suite (2013)- This open source platform supports SHADOW, XOP, SRW (source)-Maintained and distributed by the ESRF-M. Sanchez Del Rio-L. Rebuffi

Oral Session: Beamlines | Thursday, 28-JUN-18 14:10-14:50 | **Location:** Auditorium

THOPMA01 Piezo Technology in Synchrotrons

Authors BORIS LALUC (CTEC, MEYLAN)

Abstract Synchrotrons need robust products, that's why the association of the piezo actuator technology and the CEDRAT TECHNOLOGIES (CTEC) know-how has been successful for synchrotron mechanisms projects. The technological brick Amplified Piezo Actuator (APA®) tested and widely used in space applications is implemented in all CTEC piezo mechanisms and induces a high robustness. Modifying the layout and the number of APA® allows to address several needs in beamlines. Three applications developed in collaboration with EMBL and SOLEIL will be developed in the paper. The first application consists in cutting a beam with a piezo shutter. The maximum beam diameter is 3mm. The second mechanism allows to modify the energy of a beam by using a series of piezo actuated filters. And the last mechanism aims at modifying the beam section shape with an active piezo micro-slits mechanism.

Footnotes "Synchrotron SOLEIL"
"EMBL ESRF Grenoble"
www.cedrat-technologies.com

THOPMA02 APS Upgrade - Beamline Engineering Overview

Authors Oliver Schmidt, Erika Benda, Daniela Capatina, Jeffrey Todd Collins, Mark Erdmann, Jonathan Knopp (ANL, Argonne, Illinois)

Abstract The Advanced Photon Source (APS) is currently in the midst of a major upgrade to a 4th generation high-energy light source. A new multi-bend achromat storage ring will provide increased brightness and an orders-of-magnitude improvement in coherent flux over the current facility. To take advantage of these new capabilities, we will be building nine new feature beamlines and implementing numerous additional beamline enhancements, all while ensuring the compatibility of existing programs. As clear challenges exist in advancing state-of-the-art optics and developing nano-resolution instrumentation, we also need to recognize and address project scheduling, labor resources, existing infrastructure, bending magnet parameters, and possible modifications to radiation shielding requirements in order to achieve project success.

Footnotes Sub Classification should be something like General Beamline Design but option not available.

Oral Session: Beamlines | Thursday, 28-JUN-18 15:20-16:40 | **Location:** Auditorium

THOPMA03 PtyNAMi: Ptychographic Nano-Analytical Microscope at PETRA III -How to Achieve Sub-nanometer Sample Stability

Authors Ralph Doehrmann, Stephan Joachim Botta, Gerald Falkenberg, Jan Garrevoet, Maik Kahnt, Mikhail Lyubomirskiy, Maria Scholz, Christian G. Schroer, Andreas Schropp, Martin Seyrich, Patrik Wiljes (DESY, Hamburg)

Abstract In recent years, ptychography has been established as a method in X-ray microscopy to achieve a spatial resolution even below the diffraction limit of x-ray optics, down to a few nm. This requires, among other things, an extremely high degree of mechanical stability, a low background signal from the x-ray microscope and highest demands on the beam guiding and focusing optics. PtyNAMi is the new generation hard x-ray scanning microscope at beamline P06 of PETRA III at DESY combining a sample scanner designed for maximal stability, a new detector system designed to reduce background signals, and an interferometric position control of sample and X-ray optics. The interferometer system enables tracking the sample position relative to the optics in scanning microscopy and tomography on all relevant time scales. This is crucial for high-resolution scanning x-ray microscopy to track vibrations and long-term drifts in the noisy environment of a synchrotron radiation source in user operation. We present the design concept in detail with a special focus on real-time metrology of the sample position during 3D x-ray scanning microscopy using a ball-lens retroreflector.

THOPMA04 A New Procurement Strategy to Challenge the Supplier Constraints Created When Using a Fully Developed Reference Design

Authors George Edward Howell (DLS, Oxfordshire)

Abstract A common procurement strategy is to produce a fully optimised reference design that makes assumptions about the manufacturing process and supplier capability. This approach can restrict the opportunities for some companies to include their own specialist manufacturing capability to provide a more effective and cost efficient solution. A new approach is suggested following the recent experience at Diamond Light Source. The manufacture of high stiffness welded fabrications up to 13m in length for the I21 RIXS Spectrometer is used as an example. The I21 RIXS Spectrometer design was optimised for stiffness and control of vibration. The use of Finite Element Analysis enabled different design options and compromises to be explored utilising the supplier's capabilities. The final design was tested during manufacture to verify the FEA model. With the I21 RIXS Spectrometer commissioned the data collected shows the final stability performance of the system including detector stability over full experiment durations has met the scientific goals of the design.

THOPMA05 Using Resistive Element Adjustable Length (REAL) Cooling to Increase Optical Design Flexibility in High Power XFELS

Authors Corey Lee Hardin, Daniele Cocco, Lance Lee, Daniel Schiller Morton, May Ling Ng, Lin Zhang (SLAC, Menlo Park, California)

Abstract With the onset of high power XFELs and diffraction limited storage rings, there is a growing demand to maintain sub nanometer mirror figures even under high heat load. This is a difficult issue as the optimum cooling design for an optic is highly dependent on the power footprint on the mirror, which can be highly dynamic. Resistive Element Adjustable Length cooling can be utilized to change the cooling parameters during an experiment to adapt for changing beam parameters. A case study of the new soft x-ray monochromator for the LCLS L2SI program is presented that utilizes this new capability to allow the beam to translate across the mirror for different operation modes, greatly simplifying the monochromator mechanics.

THOPMA06 Development of Low Vibration Cooling Systems for Beamline Optics Using Heat Pipe Technology

Authors James R. Nasiatka, Stefan Soezeri (LBNL, Berkeley, California)

Abstract Cooling of in-vacuum beamline components has always been problematic. Water cooling lines can transfer vibrations to critical components, and often require complex air guarding systems to ensure that the vacuum envelope is not breached in the event of a leak. These constraints increase design complexity, limit options, and provide challenges for assembly and maintenance. Commercial heat pipes are inexpensive and readily available. Custom assemblies can be fabricated into vacuum flanges and may use non-water based cooling mediums if required. A mockup of an optical assembly has been used to explore vibration reduction and cooling capacity. Other example beamline components such as a heat generating electromagnetic shutter demonstrate the cooling capability of these heat pipes.

Poster Session: Beamlines Thursday, 28-JUN-18 16:40-18:00 **Location:** Honnorat Access Gallery

THPH01 SAXS/WAXS Complete in Vacuum Endstation Upgrade- Installation Expected Dec2018

Authors Luke Adamson (ASCo, Clayton, Victoria)

Abstract The SAXS/WAXS beamline at the Australian Synchrotron is carrying out a complete in house design endstation upgrade to incorporate 2 new in vacuum detectors, a Pilatus3-2M (SAXS) and a Pilatus-100K (WAXS). The new design will encase the new detector, detector stages and multiple beam stops (all in house design) in an 8m x 1.1m x 1.25m long rectangular, modular, aluminium vacuum chamber capable of achieving pressures of 1e-4 - 1e-5mbar. The 2M and beamstops can be driven the entire length of the chamber for fast change of focal length. The upstream end of the chamber has a 250mm gate valve onto which an in vacuum sample chamber (housing an IV hexapod and positioning stages) can be quickly connected and pumped down in minutes. This chamber can be automatically driven up and out the way and replaced with a flange to take nose cones with kapton windows for in air samples. The entire chamber is mounted on a jacking and air pad system giving the chamber 6 degrees of freedom. The system will dramatically improve signal to noise during data collection, maximise use of the detector area and increase beamline efficiency by reducing time to change focal length from 4hrs to seconds.

THPH02 LCLS Pulse Selector

Authors Ernesto ALberto PAISER, Rebecca Armenta (SLAC, Menlo Park, California)

Abstract The LCLS Pulse Selector was designed to pick specific pulses and reduce the repetition rate of the 120Hz LCLS pulse train in support of widely diverse, user defined experiments. It utilizes two rotating parallel plates to alternately transmit and block pulses in a single sweeping motion. A conventional stepper motor connected to the plates provides the rotation. The key to the system is its sophisticated timing scheme. Each sweep of the shutter is synchronized (with a precise delay) with the event codes normally generated with each pulse for data acquisition use. This shutter system has the capability of reducing the repetition rate of the LCLS x-ray to any frequency less than or equal to 60Hz in order to select a single pulse of LCLS x-ray beam at 120Hz. Since its installation, the pulse selector has been used in multiple experiments with great success providing independent pulse selection to individual beamlines at the same time.

THPH03 The XBPM Project at MAX IV Frontends, Overview and First Results

Authors Antonio Bartalesi (MAX IV Laboratory, Lund)

Abstract All the frontends installed on the 3GeV storage ring at MAX IV are equipped with two X-Ray Beam Position Monitors. Having recently finished the installation of the acquisition system, it was possible to record and analyse data. This presentation describes the setup and shows the first results.

THPH04 Constant Photon Flux on the Sample: Fast X-Ray Beam Intensity Stabilization

Authors Mario Birri, Daniel Grolimund, Beat Meyer, Vallerie Ann Samson (PSI, Villigen PSI)

Abstract The characteristics of synchrotron sources and beamline optics commonly result in systematic and random variations of the delivered photon flux. In X-ray absorption based measurements, for example, monochromator glitches [1] or the energy dependent gap size of small gap in-vacuum undulators [2] are intrinsic sources for changes in the intensity of the incoming photon flux (I0), however many types of x-ray experiments would benefit from a constant I0. Monochromator Stabilization (MOSTAB) is a common solution for most synchrotron beamlines with double crystal monochromators. This approach is based on the relative alignment of the two monochromator crystals (dynamic detuning) to stabilize beam intensity or position. Obviously, any change in angular alignment of the monochromator crystals will also induce deviations in the beam trajectory and photon energy distribution. At the microXAS undulator beamline of the SLS, we have implemented a system to achieve a constant I0. Two wedge-shaped absorbers produce a spatially uniform attenuation preserving the beam shape without introducing changes in its trajectory. Hardware, control loop and system performance will be presented.

Footnotes [1] F.Bridges,Nuclear Instruments and Methods in Physics Research A257 (1987) 447-450.
[2] H.Kitamura, J.Synchrotron Rad. 7 (2000), 121-130.

THPH05 An Improved Polarisation Analyser for the I16 Beamline at Diamond

Authors Martin Burt (DLS, Oxfordshire)

Abstract The project to upgrade the I16 polarisation analyser was necessary to increase its functionality and to introduce a more robust construction. The requirement that the analyser was to be mounted on a diffractometer meant the construction needed to be as lightweight and as compact as possible. This provided opportunities to explore new collaborative ways of working with both in-house and external suppliers. The paper describes the approach taken to develop lightweight aluminium vacuum chambers working with a company specialising in additive layer manufacturing. In addition, the design of lightweight and compact slit assemblies are detailed; these were developed in collaboration with a supplier of driven linear stages. A novel requirement for the analyser is to have a detector mounted on a rotation axis in vacuum. The results of working with the in-house detector group to develop a design to with all the necessary thermal and electrical connections are described. The paper also describes further use of additive layer manufacturing to produce prototypes that allows the design of a cable management system to be optimised where previously using 3d CAD models had proved unsatisfactory.

THPH06 TMO - a New Soft X-Ray Beamline at LCLS II

Authors Jean-Charles Castagna, Lope Mongcopa Amores, Michael Holmes, Justin Hawk James, Timur Osipov, Peter Walter (SLAC, Menlo Park, California)

Abstract LCLS is building 4 new soft X-ray beamlines with the LCLS-II upgrade. The TMO (Time resolved Molecular Optical science) beamline aka NEH 1.1 will support many ex-perimental techniques not currently available at LCLS. The beamline hinges around 2 main end stations, LAMP a multi configurable end station and DREAM, dedicated to COLTRIM type of experimentation. Both the existing LAMP as well as the newly built DREAM end-station will be configured to take full advantage of both the high per pulse energy from the copper accelerator (120 Hz) as well as high average intensity and high repetition rate (up to 100 kHz) from the superconducting accelera-tor. Each end station will have its own focusing optic systems (KB Mirrors) which can focus the beam down to 300 nm, and have laser pump probe experiments capability. Very demanding requirements for IR and X-ray overlap as well as beam stability, make the TMO beamline a major engineering challenge. The main components of the beamline (KB optics, DREAM end stations and diagnostics components) are built on granite stands. The building struc-ture is being reviewed for thermal stability. First light on TMO is expected in February 2020

THPH07 Nanosurveyor 2: A Compact Instrument for Nano-Ptychography at the Advanced Light Source

Authors Richard Celestre, Howard A. Padmore, David Alexander Shapiro (LBNL, Berkeley, California), Kasra Nowrouzi (LBNL, Berkeley, California; UCB, Berkeley, California)

Abstract The Advanced Light Source has developed a compact tomographic microscope based on soft x-ray ptychography for the study of meso and nanoscale materials [1,2]. The microscope utilizes the sample manipulator mechanism from a commercial TEM coupled with laser interferometric feedback for zone plate positioning and a fast frame rate charge-coupled device detector for soft x-ray diffraction measurements. The microscope has achieved scan rates of greater than 50 Hz, including motor move, data readout and x-ray exposure, with a positioning accuracy of better than 2 nm RMS and has achieved spatial resolution of better than 5 nm. The instrument enables the use of commercially available sample holders compatible with FEI TEMs. This allows in-situ measurement of samples using both soft x-rays and electrons. This instrument is a refinement of a currently commissioned instrument called The Nanosurveyor, which has demonstrated resolution of better than 20nm in both two and three dimensions using 750 eV x-rays. [3] The instrument has been installed on the new COSMIC beamline at the ALS. It will enable spectromicroscopy and tomography of materials with wavelength limited spatial resolution.

Footnotes [1] P. Thibault, et al, Science, 321, 379 (2008)
[2] P. Denes, et al, Rev. Sci. Inst., 80, 083302 (2009)
[3] D. Shapiro, et al, Nature Photonics volume 8, pages 765-769 (2014)

THPH08 Develop Standard Components for TPS Beamline

Authors Chao-Yu Chang, Chia-Feng Chang, Chien-Hung Chang, Shih-Hung Chang, Hsin Wei Chen, Chao-Chih Chiu, Liang-Jen Huang, Longlife Lee, Ming Han Lee, Chinyen Liu, Hong-Yi Yan (NSRRC, Hsinchu)

Abstract The beamline group is actively doing two new projects. One project is developing of standardization and modularization beamline components for the Taiwan Photon Source (TPS) and Taiwan Light Source (TLS) beamlines. The components including the high heat load masks, white/mono beam slits, phosphor screens type beam monitor system, beam shutters, common chambers, and support tables/stands, are selected as the standards so far. Many advanced concepts and materials are applied for the developing components to improve their stability and reliability. The other project is planning to design a monitor and control system for the beamline components. Some EPICS compatible instruments are being partially tested and will be applied to the new beamlines at TPS.[1-3] The log of beamline status for all beamlines will be recorded and stored in an archive. The purpose of these projects will save not only the cost but also the manpower on construction for several beamlines in time.

THPH09 Design of Indirect X-Ray Detectors for Tomography on the Anatomix Beamline at Soleil

Authors Kewin Desjardins, Alexandre Carcy, Jean-Luc Giorgetta, Claude Menneglier, Mario Scheel, Timm Weitkamp (SOLEIL, Gif-sur-Yvette)

Abstract ANATOMIX* is a long beamline for full-field tomography techniques at the French synchrotron SOLEIL [1]. It will operate in the energy range from 5 to 30 keV, and feature several operation modes via versatile optics configurations, including direct white beam propagation. Two methodologically different experimental stations will be used: parallel-beam X-ray shadowgraphy, for spatial resolution down to the sub-micron range, and full-field transmission X-ray microscopy down to a spatial resolution of less than 100 nm. To cover this large panel of experimental possibilities, the Detector Group, the Mechanical Engineering Group and beamline team have designed four dedicated indirect X-ray detector. For pixels in the sub-micron size range: a micro-tomography revolver camera for versatility, a high-efficiency camera for flux-limited experiments, and a high-resolution camera for the largest optical magnifications will be available. For experiments with a large X-ray beam and pixel sizes from several microns upward, a “large-field” camera completes the set. We describe these different assemblies with the detailed components and expected specification of each solution.

Footnotes * Beamline largely funded by the French National Research Agency through the EQUIPEX investment program, NanoimagesX. [1] T Weitkamp et al 2017 J. Phys.: Conf. Ser. 849 012037

THPH10 High Resolution Monochromator for the IXS Experiment at Petra III Beamline P01

Authors Frank-Uwe Dill (DESY, Hamburg)

Abstract Since April 2017, beamline P01 at Petra III DESY is providing monochromatic X-Rays at energies down to 2.5keV. An in-house developed High Resolution Monochromator (HRM) for High Vacuum (5x10-7mbar) was assembled and installed in early summer 2017. As a core component a high precision goniometer was designed. A piezo actuator provides the required angular range of 40°. The angular resolution is specified with 0.5microrad and is controlled by an encoder. Three goniometers can be moved independently along the three linear directions. The linear movements are assembled by low cost linear guide components and driven by toothed wheels and toothed bars or by spindles directly attached to the motor shaft. First beamtimes in 2017 with channel cut Si (111) crystals showed promising results - HRM providing x-rays with a bandwidth of 100meV (at 2.840keV). The resolution of the goniometers is better than 0,1microrad with a stability of ±50nanorad. In spring 2018 a four-bounce setup with additional standard piezo manipulators was designed to reach a bandwidth between of 50meV. After installation and first measurements in May 2018 a total energy resolution of 100meV was achieved.

THPH11 LCLS-II FEL Photon Collimators Design

Authors Sílvia Forcat Oller (SLAC, Menlo Park, California)

Abstract The unique capabilities of LCLS, the world's first hard X-ray FEL, have had significant impact on advancing our understanding across a broad range of science. LCLS-II, a major upgrade of LCLS, is being developed as a high-repetition rate X-ray laser with two simultaneously operating FELs. It features a 4 GeV continuous wave superconducting Linac capable of producing ultrafast X-ray laser pulses at a repetition rate up to 1 MHz and energy range from 0.25 to 5 keV. The LCLS-II upgrade is an enormous engineering challenge not only on the accelerator side but also for safety, machine protection devices and diagnostic units. A major part of the beam containment is covered by the FEL beam collimators. The current collimator design is no longer suitable for the high power densities of the upcoming LCLS-II beam. Therefore, a complete new design has been conceived to satisfy this new constrains. Moreover, a special FEL miss-steering detection system based on a photo diodes array has been designed as an integral part of the photon collimator as additional safety feature. This poster describes the new LCLS-II FEL Collimators, their mechanical design and challenges encountered.

THPH12 Granite Benches for Sirius X-ray Optical Systems

Authors Renan Ramalho Geraldes, Cassiano Sergio Noventa Corrêa Bueno, Gabriel Claudiano, Victor Zoratti Ferreira, Lucas Sanfelici, Alexis Sikorski, Mailson da Silva Souza, Lucas Monteiro Volpe, Harry Westfahl Jr. (LNLS, Campinas)

Abstract The first set of Sirius beamlines is expected to start operating in early 2019 and over the last few years some of the main optical systems for the X-ray beamlines have been developed in house at the Brazilian Synchrotron Light Laboratory (LNLS). Starting with the High-Dynamic Double Crystal Monochromator (HD-DCM), passing by the Double Channel-Cut Monochromator (4CM) and continuing with new standard mirror systems, a series of granite benches, based on high-resolution levelers, and a combination of embedded and commercial air-bearings, has been designed for high mechanical and thermal stability. Specifications, designs, simulations and partial results are presented, showing the progressive increase in complexity according to a deterministic design approach.

THPH13 Development of Instrumentation for X-ray Spectroscopy at the PETRAIII-Beamline P64 at DESY, Hamburg

Authors Marcel Goerlitz (DESY, Hamburg)

Abstract The beamline P64 is located in the north of the PETRA III storage ring. It is dedicated to X-ray absorption spectroscopy experiments with high flux and high photon energy. Regular user operation started on May 5, 2017. Experiments cover wide ranges of research like: solid state physics, catalysis, bio-chemistry, environmental sciences etc. The poster-presentation will concentrate on the two main projects in 2017:
- von-Hamos Spectrometer for X-Ray Fluorescence Spectroscopy
- Liquid Sample Cell
In 2017, a new von-Hamos-type X-ray emission spectrometer was constructed and installed at the beamline P64. It is dedicated to work in a 90° geometry for pure fluorescence mode. It comprises, inter alia, a fine-tunable array of cylindrical Bragg crystals, a rail-positioning system for fast detector-alignment and two CMOS-based X-Ray area detectors (LAMBDA-detector). Another development is the construction of a liquid flow cell, which can be used for fluorescence and for absorption spectroscopy. It is used for experiments (as an alternative to the liquid jet), where only small amounts of liquid samples are available or where liquids should be protected from oxygen atmosphere.

THPH14 Beam Conditioning Optics at the ALBA NCD-SWEET Beamline

Authors Nahikari Gonzalez, Carles Colldelram, Salvador Ferrer, Abel Fontsere Recuenco, Joaquín Benchomo González Fernández, Gabriel Jover-Mañas, Christina Kamma-Lorger, Jon Ladrera Fernández, Marta Llonch, Marc Malfois, Juan Carlos Martinez Guil, Igors Sics (ALBA-CELLS Synchrotron, Cerdanyola del Vallès)

Abstract The non-crystalline diffraction beamline (NCD-SWEET) at Alba Synchrotron has undergone a major upgrade in the optics and the end station to perform state-of-the-art SAXS/WAXS experiments. In order to reduce X ray scattering with air and maximize the photon flux at the sample, an optimized beam conditioning optics has been designed and built in the end station, integrating previously used and new components in vacuum. The beam conditioning optics includes a fast shutter, a set of commercial guard slits and a diagnostic unit comprising three filters and a four-quadrant transmissive photodiode. In addition, a set of refractive beryllium lenses system allows micro focusing of the beam. The lenses can be removed from the beam path remotely. Finally, an on axis sample viewing system, with a novel design based on an in-vacuum camera mirror and a mica window minimizes the beam path in air up to the sample. To facilitate the alignment of the elements with respect to the beam, all the subsystems are supported by a high-stability granite table with 4 degrees of freedom and sub-micron resolution.

THPH15 A New High Precision, Fully Motorized 6-DoF Sample Stage for the ALBA PEEM Endstation

Authors Nahikari Gonzalez, Lucia Aballe, Antonio Carballedo, Carles Colldelram, Michael Foerster (ALBA-CELLS Synchrotron, Cerdanyola del Vallès)

Abstract A new 6-DOF sample manipulator has been designed for the ALBA Synchrotron PhotoEmission Electron Microscopy (PEEM) experimental station, based on a commercial Elmitec LEEM 3. The new design includes full motorization of all 6 axes with position feedback, no backlash, and maximized stability, crucial to achieve the best spatial resolution of down to 8 nm (in so-called LEEM mode). The in-plane longitudinal and transversal motions with sub-micron resolution are based on high precision linear guides, while the pitch and roll stages (sample tilt), guided by angular guides, are actuated by a double-flexure system, which enhances the overall rigidity of the system. The vertical stage is composed by a high rigidity recirculating roller screw and cross roller guides. Finally, 360° yaw rotation is supplied by a differentially pumped commercial rotary stage. On top of the stage, the sample support is mounted on a customized DN63CF flange. This support keeps the original functionalities of the sample manipulator and holders, with 6 independent electrical contacts, and the possibility to heat the sample up to 2000 K and cool it to 100 K with an improved liquid nitrogen cooling system.

THPH16 Compact Mirror Bender With Sub-Nanometer Adaptive Correction Control

Authors Nahikari Gonzalez, Carles Colldelram, Joaquín Benchomo González Fernández, Judith Juanhuix, Josep Nicolas, C. Ruget (ALBA-CELLS Synchrotron, Cerdanyola del Vallès)

Abstract We present a compact mirror bender with dynamic surface correction. The system is the evolution of an in-house development and will be the default focusing system for the new ALBA beamlines. The bender is now more compact and can introduce stronger curvatures, as required for microfocus applications. It allows for in-situ correction of the mirror surface, with resolution and stability below one nanometer. The bender can compensate parasitic deformations caused by thermal bumps, changes of focus, or stresses appeared during installation or bakeout. The system includes two torque actuators at the ends of the mirror as well as a number of correctors along the mirror length, capable of introducing high order surface corrections. The bending curvature is actively stabilized, by a feedback loop that controls the applied force, to the equivalent of 0.25 nm rms in a 500 mm long mirror. The figure correctors provide up to 20N push-pull force with resolution below .001 N. They combine elastic and magnetic forces to improve their stability.

THPH17 NCD-SWEET Beamline Upgrade

Authors Joaquín Benchomo González Fernández, Carles Colldelram, Salvador Ferrer, Abel Fontsere Recuenco, Artur Gevorgyan, Nahikari Gonzalez, Gabriel Jover-Mañas, Christina Kamma-Lorger, Marta Llonch, Marc Malfois, Juan Carlos Martinez Guil, Yury Nikitin, Gabriel Peña, Llibert Ribo, Igors Sics, Jorge Villanueva (ALBA-CELLS Synchrotron, Cerdanyola del Vallès)

Abstract The non-crystalline diffraction beamline (NCD-SWEET) at ALBA Synchrotron has undergone major improvements in three main areas, beam performance, SAXS detector data quality and beamline operability, in order to perform state-of-the-art SAXS/WAXS experiments. A new channel-cut monochromator system has improved the beam quality and stability, with currently vibration amplitudes under 1% of the beam size. Two sets of beryllium lenses have been installed for focusing the beam. One of the set allows microfocus beam size. Be-sides, the former CCD detector has been replaced by a single-photon counting pixel detector, a Piltatus3 S 1M. In the end station, a full re-design of the mechanical elements with sub-micron resolution movements together with the installation of new equipment has been done, resulting in an improved beamline configuration, and in a faster and safer rearrangement of the flight tube length. This configuration also allows GISAXS experiments. Finally, other transversal developments have been done in areas like radiation protection, air conditioning, health and safety, cable management, electronics and control.

THPH18 A Multi Sample Holder for the MSPD Beamline at Alba

Authors Joaquín Benchomo González Fernández, Francesc Farré París, François Fauth, Pablo Pedreira, Daniel Roldan, Xavier Serra Gallifa (ALBA-CELLS Synchrotron, Cerdanyola del Vallès)

Abstract At the high resolution powder diffraction end station of The Materials Science and Powder Diffraction Beamline (MSPD) at ALBA Synchrotron, several samples are measured in daily basis. Thus, an automatic sample ex-changer is a great asset to the beamline, permitting a more efficient use of beam time. Even if an arm robot is the more suitable option for a sample exchanger device, in terms of cost, compactness and versatility MSPD needs other approach. ALBA engineering division has developed a multi sample holder that allows loading up to eight samples and exchanging between them with a resolution of less a micron. This new design consists in a customized and motorized linear stage that has been designed to fit in the present three circles diffractometer, on top of the positioning stages, avoiding any possible collision with the eulerian cradle. In addition, this new holder permits using different types of samples like capillaries in fast spinners, coin cell batteries and electrochemical cells. Finally, the system is compatible with the usual sample conditioning equipment on the end station like hot blower, cryostream, beamstop, chiller, etc.

THPH19 Engineering Design of the XPD & PDF Beamline Sample Environment for Safe Experimental Use of Hazardous Gases

Authors Edwin G Haas (BNL, Upton, Long Island, New York)

Abstract The X-ray Powder Diffraction (XPD) and Pair Distribution Function (PDF) beamlines located at the 28-ID beam port at NSLS-II require a means for safely supplying, containing, and exhausting hazardous gases to and from experimental samples. These beamlines plan to use a wide range of flammable, toxic, and reactive gases for in-situ studies of catalytic and chemical reactions. Since many of the gases are hazardous, a low-cost, robust means is needed to safely supply gases to samples, position the samples quickly, accurately, and remotely, collect scattered X-rays over a wide-angle without distortion, and exhaust the gases safely. Ideally, the sample environment should also allow rapid sample set-up and change-out. The PDF/XPD system includes a sample holder, internal beam stop, sample chamber, and stages that provide eight degrees of freedom. A specially-designed window is also included for maximum X-ray transmission at minimum cost. Sensors, flow metering devices, and circuitry are included to provide proper purging, control hazardous and dilution gas flows, and integrate all of the safeguards needed to assure safe operation.

THPH20 Polarization Measurements at the THz Beamline of the MLS

Authors Arne Hoehl, Bernd Kaestner (PTB, Berlin)

Abstract The low-energy electron storage ring Metrology Light Source (MLS) is in user operation since April 2008 at operating energies ranging from 105 MeV up to 630 MeV. In addition to the broadband incoherent synchrotron radiation (SR) emission it provides coherent synchrotron radiation (CSR) when it is operated in a low alpha mode with shortened electron bunches. At the MLS a special bending magnet beamline optimized for the FIR/ THz spectral range is operational. We report about the integration of a custom made wiregrid based polarizer into the THz beamline and basic measurements of the polarization characteristics at the main experimental stations with respect to the SR, CSR and thermal background contributions.

THPH21 DREAM - A New Soft X-ray (Dynamic REAction Microscopy) COLTRIMS Endstation at LCLS-II

Authors Michael Holmes, Lope Mongcopa Amores, Jean-Charles Castagna, Justin Hawk James, Timur Osipov, Peter Walter (SLAC, Menlo Park, California)

Abstract SLAC is building new soft X-ray beamlines to take advantage of the LCLS-II upgrade to 1 MHz. One of the new beamlines is called TMO (Time resolved Molecular Optical science) also known as NEH 1.1. It will be a soft X-ray beamline featuring a sub-micron X-ray focus at its second, most downstream interaction region where the DREAM COLTRIMS (COld Target Recoil Ion Momentum Spectroscopy) endstation will be situated. DREAM will feature; large magnetic coils to provide a strong uniform magnetic field through the spectrometer, rigid in-vacuum laser in- & out-coupling optics decoupled from the chamber support stand for pump-probe experiments, a multi-stage differentially pumped gas jet with catcher, insertable diagnostics, a long-distance microscope, scatter slits, a steerable gas jet, jet slits, and an adjustable stand to bias the spectrometer off-center from the interaction region. In order to achieve a spot overlap spec of 0.5 um; the KB mirrors, laser optics, & beam position diagnostics all sit on a common granite support structure to minimize mechanical vibrations and thermal drifts. An in-vacuum UHV hexapod will be utilized for fine positioning of the laser in-coupling optic.

THPH23 Interlock System for a Magnetic Bearing Pulse Selector

Authors Haruno Ishii, Jun-ichi Adachi, Takashi Kosuge (KEK, Ibaraki), Hirokazu Tanaka (KEK, Tsukuba)

Abstract A hybrid operation mode that enables beam time sharing between single-bunch users and multi-bunch users has been introduced in the PF 2.5GeV ring of KEK (High Energy Accelerator Research Organization). A pulse selector, a kind of optical chopper, is used to permit the passage only of an X-ray pulse that comes from a single bunch part of the hybrid filling pattern. We have developed a new pulse selector with a magnetic bearing. It comprises a rotating dish-shaped disk, a phase-lock-loop (PLL) controlled motor system, and other parts. The speed and phase of the rotating disk is controlled by TTL signals obtained by dividing the RF signal of the PF 2.5 GeV ring. A commercially available motor driver was designed for lower loading. The rotating disk for the pulse selector is heavier than those disks used previously in which air bearings are used. A rapid deceleration of the rotation causes problems through a large current flow back to the motor driver. In this study, we describe the prototype of a programmable logic controller based on an interlock system to avoid the current flow back problem in the pulse selector.

THPH24 Front Ends Design for the Advance Photon Source MBA Upgrade

Authors Yifei Jaski, Melike Abliz, Joshua Steven Downey, Soonhong Lee, James Mulvey, Samuel Oprondek, Mohan Ramanathan, Frank Westferro, Bingxin Yang (ANL, Argonne, Illinois)

Abstract The Advanced Photon Source (APS) upgrade from double-bend achromats (DBA) to multi-bend achromats (MBA) lattice is underway. This upgrade will change the storage ring energy from 7 GeV to 6 GeV and beam current from 100 mA to 200 mA. All front ends must be upgraded to fulfill the following requirements: 1) Include a clearing magnet in all front ends to deflect and dump any electrons in case the electrons escape from the storage ring during swap-out injection with the safety shutters open, 2) Incorporate the next generation x-ray beam position monitors (XBPMs) into the front ends to meet the new stringent beam stability requirements, 3) For insertion device (ID) front ends, handle the high heat load from two undulators in either inline or canted configuration. The upgraded APS ID front ends will only have two types: High Heat Load Front End (HHLFE) for single beam and Canted Undulator Front End (CUFE) for canted beam. The preliminary design of all front ends has been completed and the HHLFE has reached final design stage. This paper presents the final design of the HHLFE and preliminary design of the CUFE. The upgrade of the Bending Magnet Front End (BMFE) will be briefly discussed.

THPH25 The Metrology Light Source - Insertion Device Beamline (MLS-IDB): A Versatile Beamline for UV to Soft X-Ray Surface Analytics

Authors Hendrik Kaser, Alexander Gottwald, Michael Kolbe (PTB, Berlin)

Abstract The PTB operates its own electron storage ring MLS [1] in Berlin. Utilizing the radiation from a U125 undulator, an IDB delivers high flux with high spectral purity from 4.4 nm to 800 nm. The undulator radiation is monochromatized by a normal incidence-grazing incidence (NI-GI) hybrid plane grating monochromator. Different coatings are used to cover the whole wavelength range. The beamline is optimized to suppress false light contributions and to allow a high reliability of the monitoring of the radiation intensity. Thus, it can provide quantitative photon numbers for traceable measurements. Currently, MLS-IDB is mainly used for investigations of interfaces and nanostructures by various experimental techniques, such as photoelectron spectroscopy [2,3,4] as well as spectroscopic ellipsometry [5]. The investigations of the relation between the optical properties and the inner structure of selected samples provide further information about promising materials in the semiconductor as well as photovoltaic research and manufacturing. Furthermore, a sample preparation chamber with modular design has been recently put into operation.

Footnotes
[1] DOI:10.1088/0026-1394/49/2/S146
[2] DOI:10.1016/j.elspec.2017.05.008
[3] DOI:10.1038/ncomms9287
[4] DOI:10.1088/0957-4484/27/32/324005
[5] DOI:10.1063/1.4878919

THPH26 Mechanical Conversion of a Vertically Reflecting Artificial Channel-cut Monochromator to Horizontally Reflecting

Authors Steven Patrick Kearney, Eric M. Dufresne, Suresh Narayanan, Alec Sandy, Deming Shu (ANL, Argonne, Illinois)

Abstract The mechanical conversion of a high-resolution artificial channel-cut monochromator (ACCM) from a vertically reflecting orientation to a horizontally reflecting orientation is presented. The ACCM was originally commissioned for the 8-ID-I beamline at the Advanced Photon Source (APS), Argonne National Laboratory [1, 2]. The ACCM was intentionally designed at commission to have the potential to be reoriented to the horizontal direction. After nearly a decade of operation in the vertical orientation the ACCM was rotated to the horizontal orientation. The details of the design which allowed this conversion and the preparation steps needed to assure the continued performance of the ACCM will be discussed.

Footnotes
* Narayanan, S., et al., J. Synchrotron Radiat. 15(1), 12-18 (2008).
** U.S. Patent granted No. 6,607,840, D. Shu, T. S. Toellner, and E. E. Alp, 2003.

THPH27 Mechanical Design of a Compact Non-invasive Wavefront Sensor for Hard X-rays

Authors Steven Patrick Kearney, Lahsen Assoufid, Walan Grizolli, Tomasz Kolodziej, Keenan Lang, Albert Macrander, Xianbo Shi, Deming Shu, Yuri Shvyd'ko, Michael Wojcik (ANL, Argonne, Illinois)

Abstract Abstract This work describes mechanical design of a prototype compact wavefront sensor for in situ measurement and monitoring of beam wavefront of hard x-ray beamlines [1]. The system is based on a single-shot grating interferometer [2, 3] and a thin diamond single-crystal beam splitter. The beam splitter is designed to be inserted in the incident and oriented to diffract a fraction of the incident beam bandwidth into the interferometer, for wavefront measurement and reconstruction. The concept is intended to study the feasibility of a non-invasive wavefront sensor for real time wavefront monitoring and diagnostics, with possible application in adaptive mirrors for wavefront preservation and control [1, 4]. The design focus was on compactness to enable easy portability and implementation in a beamline.

Footnotes
* L. Assoufid et al., Rev. Sci. Instrum., 87(5), 052004, 2016
** W. Grizolli et al., SPIE Proc., 1038502, 2017
*** S. Marathe et al., Adaptive X-Ray Optics III, SPIE Proc., 92080D, 2014

THPH28 The Development of PAL-XFEL Beamline

Authors Seonghan Kim, Sunmin Hwang, HyoJung Hyun, Bongsoo Kim, Myong-jin Kim, Sangsoo Kim, Sunam Kim, GiSu Park, Jaehyun Park, Jaeku Park, Ho Cheol Shin (PAL, Pohang), Intae Eom, JiHwa Kim, Kwang-Woo Kim, Kyung Sook Kim, Seung Nam Kim, Chae-Soon Lee, Eun Hee Lee, Seungyu Rah (PAL, Pohang, Kyungbuk)

Abstract Pohang Accelerator Laboratory X-ray Free Electron Laser (PAL-XFEL) is a research facility, which is designed to generate extremely intense (assuming 1x1012 photon/pulse at 12.4 keV) and ultra-short (10-200 femtosecond) pulsed X-rays. Now two beamlines were constructed, the one is hard X-ray and the other is soft X-ray. The beamline is consist of UH (Undulator hall) and OH (Optical hall), EH (Experimental hall). The UH is usually the same as the front end of a beamline, and OH has the same function as PTL (Photon Transfer Line). We have two hutches including HXPP and HCXI in hard X-ray beamline. The two hutches are connected each other, and sharing main optics (Mirrors and DCM, etc.). PAL-XFEL is a very precise facility and has very large heat power, so thermal and structural analysis as well as vibration analysis is essential. Now many vacuum components of beamline were installed and completed the test of performance.

THPH29 X-Ray Beam Position Monitor in TPS 24A Beamline

Authors Ming Han Lee, Chao-Yu Chang, Chien-Hung Chang, Shih-Hung Chang, Chao-Chih Chiu, Liang-Jen Huang, Lee-Jene Lai, Longlife Lee, Din-Goa Liu, Yi-Jr Su, Hong-Yi Yan (NSRRC, Hsinchu)

Abstract By contributions of the generic beamline components project in recent years, modular mechanisms such as mask, X-ray beam position monitor (XBPM), photon absorber (PAB), and screens were used in every beamline of the Taiwan Photon Source (TPS). However, these beamline components were designed for ID beamlines, so they should be redesigned for bending magnet (BM) beamlines. The TPS 24A, Soft X-ray Tomography (SXT) beamline, is one of the bending magnet (BM) beamlines in the second construction phase at the TPS. This BM beamline has high flux in the range between 260 eV and 2600 eV. It is designed for transmission full-field imaging of frozen-hydrated biological samples. At the exit slit, the beam flux optimized in 520 eV is 2.82e11 photons/second with resolving power 2000, the beam size is 50 um × 60 um (V × H, FWHM) and the beam divergence is 1.73 mrad × 1.57 mrad (V × H, FWHM). Since the TPS 24A is commissioning during these months, this paper generally makes a discussion about the XBPM in TPS 24A to help further improvement in the future.

THPH30 Instrumentation for Source-based Calibration of Space Instruments using Synchrotron Radiation at the Metrology Light Source (MLS)

Authors Janin Lubeck, Rolf Fliegauf, Roman Markus Klein, Simone Kroth, Wolfgang Paustian, Mathias Richter, Reiner Thornagel (PTB, Berlin)

Abstract PTB has been involved in the calibration of many space-based instruments which often require a calibration for the absolute measurement of radiometric quantities. Based on SR, PTB can perform these absolute measurements traceable to the primary national standards. Over the past decades, PTB has performed calibrations for numerous space missions within scientific co-operations and has become an important partner [1]. Dedicated instrumentation in the PTB laboratory at the MLS has been set up for that purpose: A facility for the calibration of radiation transfer sources in the 7 nm to 400 nm spectral range [2], traceable to the MLS as primary SR source standard, is in operation. Also an existing VUV transfer calibration source [3] was upgraded to cover the extended spectral range from 16 nm to 350 nm. Moreover, a large vacuum vessel is available at the MLS, which allows the handling of complete space instruments, opening up the way for calibration of space instruments directly to the primary source standard MLS. By choosing an appropriate electron beam current or electron beam energy, the spectral radiant intensity and spectral shape can be adjusted to best suit the calibration task.

Footnotes
[1] R. Klein et al., J. Astron. Telesc. Instrum. Syst. 2(4), 044002 (2016).
[2] R. Thornagel et al., Rev. Sci. Instrum. 86, 013106, (2015).
[3] J. Hollandt et al., Metrologia 30, 381 (1993).

THPH31 Design of a flexible RIXS Setup

Authors Daniel Meissner, Susanne Adler, Martin Beye, Axel Bühner, Hilmar Krueger, Roland Platzer, Torben Reuss, Maike Roehling, Ernst-Otto Saemann, Ekanan Saithong (DESY, Hamburg)

Abstract We present a new mechanical design for a RIXS experiment setup consisting of a sample environment vacuum chamber and corresponding spectrometer. It allows variable beam incidence angles to the sample as well as observation angles of the spectrometer. The dispersive element of the spectrometer can be aligned in five DOF by motors inside the UHV chamber. The alignment of the CCD detector can be adjusted independently in the lateral and longitudinal position as well as incidence angle. In combination with a tiltable detector chamber this design allows for multiple observation methods, not limited to variable energies but also for use of different optics or direct observations of the sample.

THPH32 Dual Beam Visualizer - Intensity Monitor for Lucia Beamline at SOLEIL Synchrotron

Authors Claude Menneglier, Kewin Desjardins, Victor Pinty, Damien Roy, Delphine Vantelon (SOLEIL, Gif-sur-Yvette)

Abstract LUCIA is a micro-focused beamline (0.8 - 8 keV) dedicated to X-ray fluorescence and X-ray absorption spectroscopy at SOLEIL Synchrotron.* With its recent optical upgrade and photons flux increase, the three pink-beam diagnostics of the beamline have been upgraded to support a beam reaching 10^13ph/s and 20 W/mm². This paper presents the thermomechanical study and the realization of new devices adapted to the current constraints of use, making possible to both visualize the shape of the pink beam and to measure its intensity simultaneously in the same compact device. The beam is visualized by a piece of Al2O3 - Cr ceramic, soldered to a copper heat sink, whose fluorescence image is visible in visible light with a suitable camera and optical system. The measurement of the photonic intensity is made by a polarized CVD diamond used as a photosensitive element, the current reading is made by a suitable low current amplifier. The design of this dual beam visualizer and intensity monitor, made by the SOLEIL detectors group with thermomechanical studies done by the Mechanical Design Office, will be presented in details. In-lab measurements will be also presented.

Footnotes * D. Vantelon et al., The LUCIA beamline at SOLEIL, Journal of Synchrotron Radiation, vol 23 (part 2), pp 635-640, March 2016. doi:10.1107/S1600577516000746

THPH33 Direct LN2 Cooled Double Crystal Monochromator

Authors Tetsuro Mochizuki, Kazuteru Akiyama, Katsumi Endo, Hirotsugu Hara, Takumi Ohsawa, Junki Sonoyama, Tetsuya Tachibana, Hisataka Takenaga, Koji Tsubota (TOYAMA Co., Ltd., Kanazawa), Klaus Attenkofer, Eli Stavitski (BNL, Upton, Long Island, New York)

Abstract A liquid-nitrogen-cooled (LN) X-ray double crystal Monochromator has been designed and built for the high power load dumping wiggler beamline of the NSLS2. It was designed as the direct LN first crystal to dissipate the max heat load of 2 kW and the second is in-direct-braid LN. It is designed to operate for beam energy 5 to 36 keV with fixed exit beam mode, and for QEXAFS compatible with channel cut mode. It is designed to rotate the Bragg axis with using AC servo motor and achieve up to 10 Hz scan.

THPH34 Design & Validation of Adaptive Bendable Mirrors for the LCLS-II Soft X-Ray Beam Lines

Authors Daniel Schiller Morton, Daniele Cocco, Corey Lee Hardin, Lin Zhang (SLAC, Menlo Park, California)

Abstract One of the key components of the photon beam transport system, in the LCLS-II SXR beamlines is the bendable focusing mirror system. For the first time in the Synchrotron or FEL beamlines, the large bending needed to focus the beam will be coupled with a direct cooling system, since almost the entire FEL power is de-livered through the optics to the sample. While cooling and bending the mirror, height errors shall be preserved below one nanometer RMS, to not distort the wavefront of the coherent FEL beam. This has required an extensive study of the mechanical properties of the thermal interface material, Gallium Indium (GaIn). Aside from the challenges introduced by the cooling, the mechanical requirements of the bender have resulted in an extensive design effort. This effort has yielded a prototype system that has been tested to validate our design decisions, and the FEA models of the system. In this paper, the key design elements of the bendable mirror system will be reviewed. We then discuss FEA models of the system and the expected performance. This is followed by results from laboratory tests and comparison to simulations. We finalize with the design changes and future work.

THPH35 The Bright Beamlines - Beamline Build Program of the Australian Synchrotron

Authors Brad Mountford (ASCo, Clayton, Victoria)

Abstract The Australian Synchrotron is entering its first major beamline build program since the completion of its original beamline construction phase which accompanied the construction of the facility. The Bright Program aims to construct 8 Beamlines by 2024 with 2 beamlines having accompanying branchlines and supporting endstations. Conceptual designs of the first two beamlines are underway and are aimed at providing medium energy XAFS (MCT) and micro-computed tomographic imaging capability (MCT), both off bend magnet sources. Planning is well advanced for the following two beamlines with the start of conceptual engineering work expected to start in the second half of 2018. This poster will describe the scope of the Bright Beamline Program and the anticipated beamline engineering challenges that are already identified. The impact on existing technical systems and infrastructure will also be described.

THPH36 Engineering Challenges for the NEH2.2 Beamline at LCLS-II

Authors Francis Pierce O'Dowd, Daniele Cocco, Georgi Dakovski, Jim Defever, Serge Guillet, Corey Lee Hardin, Daniel Schiller Morton, Ted Osier, Maceo Owens, David Rich, Lin Zhang (SLAC, Menlo Park, California)

Abstract SLAC National Accelerator Laboratory is developing LCLS-II, a superconducting linear accelerator based FEL capable of repetition rates up to 1MHz. The NEH2.2 Instrument at LCLS-II will use this combination of exceptionally high flux of monochromatic photons to achieve multidimensional and coherent X-ray techniques that are possible only with X-ray lasers. The challenges, which emanate from delivering the beam from the sub-basement level to the basement of the Near Experimental Hall (NEH) along with the stringent requirements for providing a stable beam at the interaction points, necessitate unique engineering solutions. With this paper we present the conceptual design for the NEH2.2 Instrument along with an overview of the R&D program required to validate design performance. Furthermore, it will additionally show the design of the proposed Liquid Jet Endstation (LJE) and Resonant Inelastic X-Ray Scattering Endstation (RIXS) that will be installed on the beamline. After introducing the context and layout of the beamline, this paper will focus on the technical challenges and present the mechanical design solutions adopted for beam delivery and other strategic components.

THPH37 MAGSTAT V3: An in-Vac Variable-Gap Quadrupole With Rotary Permanent Magnets

Authors Victor Pinty (SOLEIL, Gif-sur-Yvette)

Abstract MAGSTAT is a quadrupole designed to magnetize samples of various sizes using a variable magnetic flow density. Four rotary permanent magnets allow the user to specify a direction for the field and changing in situ the gap between the poles drives the field intensity. The first prototype was realized in 2016 on the SEXTANTS beamline in the framework of SOLEIL-MAXIV collaboration; a second version has been manufactured for MAXIV SoftImax beamline. This third version shows a significant evolution of the mechanical design, guaranteeing a much better stiffness in high field configurations. Samples up to Ø74mm can be placed in this quadrupole, and the tiny ones which may fit in a Ø10mm circle or smaller, can ben magnetized with a 1T local field. Angles of each magnet are driven by dedicated stepper motors with a great reduction ratio. The total gap is ensured by a single motor which motion is symmetrically transferred to the magnets through an Archimedean spiral. The device will be installed permanently at COMET endstation dedicated to the coherent scattering of soft x-rays in transmission for imaging magnetic materials via the Fourier Transform Holography or the ptychography technique.

THPH38 Design & Development of an Innovative 6 Axis Sample Manipulator.

Authors Martin Frederick Purling (DLS, Oxfordshire)

Abstract The accurate positioning & alignment of sample specimens within the experimental test chamber on a beam line is always a challenge. The ability to move in any direction and angle to very precise increments with repeatable positioning is crucial for being able to focus on the exact part of the sample required in the correct orientation. It can be made even more difficult when the sample is required to work within the UHV vacuum environment and be cooled to cryogenic temperatures. Initially in conjunction with St Andrews University, Diamond Light Source Ltd. have been developing their own manipulator for this purpose, it has six degrees of freedom for alignment of the sample and easy remote sample plate loading via a transfer arm system. This paper describes the developments made from the initial design to working manipulators with increased functionality for bespoke requirements on four different beamline within Diamond.

THPH39 Novel Comprehensive UHV Lens Changer at the Petra III Extension Beamlines P22, P23 and P24

Authors Jana Raabe, Wolfgang Drube, Katrin Ederer, Dmitri Novikov, Christoph Schlüter (DESY, Hamburg)

Abstract Three new beamlines went into operation at the high brilliance PETRA III storage ring at DESY (Hamburg, Germany) in 2017. At the beamlines P22, P23 and P24 compound refractive lenses are employed for X-ray beam focusing and conditioning. We show two novel designs for UHV compatible lens changers for 1D and 2D lenses. Refractive optics are of key importance for beamlines aiming for micrometer and sub-micrometer beam sizes. Both designs are used for moderate beam focusing, collimation and aperture matching at the beamlines P22, P23 and P24 at PETRA III. The poster presents the new lens changer designs for the reliable use under ultra-high vacuum conditions, focused in the 2D mechanics. Aim of the project was the development of a user-friendly, low-maintenance optical component. In the poster, we will show the detailed design of the devices and discuss the results of the performance tests.

THPH40 Training the Next Generation of Engineers for Photon Based Light Sources

Authors Stewart Scott (DLS, Oxfordshire)

Abstract The continued increase in the number of Light Sources, their beamlines and the need for upgrades of both machine and beamlines requires an ever larger supply of suitably qualified and experienced engineers. If there is a worldwide shortage of Engineers where will facilities find these engineers and how can they be trained to the required level? This paper discusses these issues by looking at the growth of demand for engineers within light sources, the evidence of shortages of engineers, the changes in attitudes to work by younger people, the skills necessary, training opportunities and the issues in attracting people into the light sources industry. The paper will also outline the training week for early career engineers delivered at Diamond.

THPH41 Front End Slits for Closely-Spaced Wiggler Beams

Authors Sushil Sharma, Christopher Amundsen, Frank DePaola, John Tuozzolo (BNL, Upton, Long Island, New York)

Abstract A high energy X-ray (HEX) beamline facility will be constructed at NSLS-II for R&D in energy storage technologies using hard X-ray diffraction, scattering and imaging. A 4.3 Tesla superconducting wiggler will be used to produced X-rays of total power of approximately 56 kW in 20-200 Kev range. The nominal horizontal fan of ~ 10 mrad will be split into three closely spaced beams of 0.2 mrad, 1.0 mrad and 0.2 mrad horizontal fans. Each beam is required to have a front end slit with four distinct apertures. The conventional L-shape design of the slit is not feasible for these closely spaced beams because of constraints on side cooling and horizontal travel of the slits. In this paper we propose two solutions for these slits using a beam pass-through design and optimized cooling configurations.

THPH42 The Design of HEPS Front Ends

Authors Hong Shi (IHEP, Beijing)

Abstract High Energy Photon Source (HEPS) is a 6GeV synchrotron radiation facility to be built in Huairou, Beijing, with a perimeter of 1390.6m and 48 linear sections. In the first phase, 15 front ends will be installed, including 14 ID front ends and 1 BM front end. These front ends are divided into three categories: the standard undulator front end, the wiggler front end, and the BM front end. The peak power density that the front end bears is about 850W/mrad^2, the total power is about 35KW. This paper describes the general layout design of the three different types of front end, the functions of the main components, and the finite element analysis of key devices in the HEPS front end.

THPH43 New Holder for Dual-Axis Cryo Soft X-Ray Tomography of Cells at the Mistral Beamline

Authors Ricardo Valcárcel, Carles Colldelram, Nahikari Gonzalez, Eva Pereiro, Ana Joaquina Perez-Berna, Andrea Sorrentino (ALBA-CELLS Synchrotron, Cerdanyola del Vallès)

Abstract A new dual-axis sample holder has been designed and built for the Transmission soft X-ray Microscope (TXM) at the MISTRAL beamline (ALBA Synchrotron) to perform cryo-soft X-ray tomography of cells with dual tilt configuration to reduce the missing wedge. The design, with restricted dimensions Ø7x30mm, enables using commercial Auto-Grid support rings that give rigidity to the sample grid handling. It consists of a guided miniature handle with a spring system that allows sample rotation by 90º around the beam axis inside vacuum and in cryogenic conditions by using the TXM sample loading robot keeping a rotation of ±65° at the sample stage. Two magnets fix the positions at 0° and 90°.The two tilt series can be collected consecutively and the use of Au fiducials permits combining both improving the final quality of the 3D reconstructions. In particular, cellular features hidden due to their orientation with respect to the axis of rotation become visible. The main frame is made in aluminium bronze to enhance the thermal conductivity and in addition, all the pieces have undergone an ion implantation treatment in order to reduce friction and improve the anti-seizure property of the parts.

Oral Session: Beamlines Friday, 29-JUN-18 09:00-10:20 **Location:** Auditorium

FROAMA01 Mechanical Engineering Instrument Design and Development for LCLS-II

Authors Lin Zhang (SLAC, Menlo Park, California)

Abstract The high-repetition-rate FELs will enable a broad range of high-resolution, coherent pump probe experiments over a large photon energy range. On top of the extreme high peak power of the FEL, the average power of this high-repetition-rate FEL reaches several hundred watts. This combination of extreme high peak power and high average power becomes very challenging for the X-ray optics to preserve the FEL beam quality. As an example for X-ray optics - water cooled and dynamically bendable KB mirror, minimizing thermal deformation, bending the mirror to perfect ellipse shape. Managing the beam power of soft X-ray FEL with high energy per pulse and high average power needs windowless gas attenuator with differential pumping system. FEL beam from two different sources (SXR and HXR) or to split femtosecond FEL pulses and recombine them with a precisely adjustable delay opens numerous scientific applications such X-ray pump X-ray probe. The complexity of a delay system for LCLS-II includes multiple bounce crystals requiring femtosecond time delay accuracy and with the possibility of photon energy scan. In this paper, we will highlight design and development of these systems at LCLS.

FROAMA02 A High Heat Load Double Crystal Monochromator and Its Cryo Cooling System for HEPS

Authors Hao Liang, Lidan Gao, Yongcheng JIANG, Weifan Sheng, Shanzhi Tang, Aiyu Zhou (IHEP, Beijing)

Abstract A high heat load double crystal monochromator and its cryo cooling system were designed and fabricated for the future HEPS. The mechanical and cooling structure of the monochromator is introduced. The FEA results show the monochromator is capable of cooling 800 watts of heat load. The structure and cooling scheme of the cryo cooling system are also introduced. Test results show the pressure stability of the cryo cooling system is less than 2 mbar RMS. Offline heat load test of the monochromator were carried out by a ceramic heater attached to the center of the incident surface of the first crystal, and 834 watts heat load were applied by the heater, the temperature rise was about 11K at the button end face of the first crystal. Offline absolute vibration measurement of the second crystal assembly was carried out by a laser interferometer under different cryo pump speed, pressure and heat load conditions, to find out the stability performance accordingly. An absolute vibration of 41 nrad RMS was measured, with the pump running at 45Hz, which has a cooling capability of 400 watts.

FROAMA03 R&D of Mirror Bending Techniques in BSRF

Authors Ming Li, Lidan Gao, Haijiao Han, Qingfu Han, Xu Liu, Shanzhi Tang (IHEP, Beijing)

Abstract High precision bending technology is development at Beijing Synchrotron Radiation Facility. We adopted two independent bending moment and variable width mirror geometry design, and no gravity compensation system, and use four rollers structure in long mirror bender and a special flexible hinge structure in short mirror bender. We test the benders' performance by our Flag-type LTP and get sub-200nrad RMS elliptical bending surface shape accuracy in full range, with 72h stability: 66nrad RMS for long mirror and 6nrad RMS for short mirror.

FROAMA04 European XFEL SASE3 Photon Beam Commissioning and Lesson Learned

Authors Daniele La Civita (XFEL.EU, Schenefeld), Harald Sinn (XFEL.EU, Hamburg)

Abstract European XFEL, the Free-Electron-Laser facility in Hamburg (Germany), started user operation in September 2017. The novel facility produces at MHz repetition rate, coherent, 1mJ energy, femto-second pulses in a wide photon energy range. The facility comprises of a linear accelerator and three beamlines: SASE1 works in the hard X-ray regime and it is presently in user operation; SASE3 is the soft X-ray beamline and it is in advanced commissioning with beam and ready to receive users at the end of 2018; SASE2 is the second hard X-ray beamline that saw FEL light in early May 2018 and it is now in beam commissioning phase. The length of the beamlines together with the high energy and high repetition rate pulses place interesting and new engineering design challenges. The experience gained during the commissioning allows confirmations, revisions and upgrade of the present design of devices. This contribution reports about the commissioning of the SASE3 beamline and reviews part of the beamline device performance. Focus is given on the grating monochromator commissioning with beam and also on the mechanical performance verified during the device technical commissioning.

Oral Session: Beamlines Friday, 29-JUN-18 10:50-12:10 **Location:** Auditorium

FROAMA05 Design and Commissioning Performance of the Two Soft X-ray Beamlines in NEXT, ESM and SIX

Authors Yi Zhu, Steven Hulbert, Ignace Jarrige, Elio Vescovo (BNL, Upton, Long Island, New York)

Abstract Two of the five NSLS-II Experimental Tools (NEXT) project insertion-device beamlines developed for the NSLS-II facility at Brookhaven National Laboratory are state-of-the-art soft X-ray beamlines covering the 15 eV- 1500 eV photon energy range. The engineering challenges of these two beamlines included: accurate and realistic optical simulations, nearly perfect optic figure and mechanical/thermal implementation, and advanced diagnostics systems developed in-house. The measured performance (flux, spot size, resolution) of these two beamlines closely matches the calculated values. Here, the engineering design and performance measurements of these two beamlines are presented.

FROAMA06 High Resolution Monochromator for IXS Experiments at Petra III Beamline P01

Authors Frank-Uwe Dill (DESY, Hamburg)

Abstract Since April 2017, beamline P01 at Petra III DESY is providing monochromatic X-Rays at energies down to 2.5keV. An in-house developed High Resolution Monochromator (HRM) for High Vacuum (5x10-7mbar) was assembled and installed in early summer 2017. As a core component a high precision goniometer was designed. A piezo actuator provides the required angular range of 40°. The angular resolution is specified with 0.5microrad and is controlled by an encoder. Three goniometers can be moved independently along the three linear directions. The linear movements are assembled by low cost linear guide components and driven by toothed wheels and toothed bars or by spindles directly attached to the motor shaft. First beamtimes in 2017 with channel cut Si (111) crystals showed promising results - HRM providing x-rays with a bandwidth of 100meV (at 2.840keV). The resolution of the goniometers is better than 0,1microrad with a stability of ±50nanorad. In spring 2018 a four-bounce setup with additional standard piezo manipulators was designed to reach a bandwidth between of 50meV. After installation and first measurements in May 2018 a total energy resolution of 100meV was achieved.

FROAMA07 ESRF Double Crystal Monochromator Prototype Project

Authors Robert Baker, Raymond Barrett, Pascal Bernard, Julien Bonnefoy, Maxim Brendike, Philipp Marian Brumund, Yves Dabin, Ludovic Ducotte, Hervé Gonzalez (ESRF, Grenoble)

Abstract Spectroscopy beamlines at the ESRF are equipped with a generic model of double crystal monochromator, originally acquired in the 1990's. After over 15 years of continuous service, their conception, although pioneering 20 years ago, can no longer meet the challenge of present and future scientific goals in terms of position and angular stability, thermal stability, cooling system, vibration, control and feedback, particularly in view of the ESRF - EBS upgrade. Considering the above issues, a feasibility phase was launched to develop a prototype DCM dedicated to future spectroscopy applications at the ESRF. Specifications: derived from expected performance of the EBS upgrade and scientific objectives - are extremely challenging, especially in terms of mechanical and thermal stability and impose the adoption of several innovative design strategies. The prototype is currently in the assembly phase and tests of the complete system are planned before the end of 2018. An overview of the DCM prototype project will be given, including specifications, major design options implemented and various validated concepts. Current project status and first test results will also be presented.

FROAMA08 Refinements of SPring-8 Standard Monochromators with Cryogenically Cooled Silicon Crystals toward 50 nrad-Stability

Authors Hiroshi Yamazaki, Yuki Ikeya, Hikaru Kishimoto, Yasuhisa Matsuzaki, Takanori Miura, Haruhiko Ohashi, Yasunori Senba, Yasuhiro Shimizu, Tomoyuki Takeuchi, Masayuki Tanaka, Ichiro Tsuboki (JASRI/SPring-8, Hyogo)

Abstract In SPring-8, 21 of the 28 X-ray undulator beamlines have the same sets of a double-crystal monochromator (DCM) and a cryogenically cooling system. A remaining problem is vibration for the forthcoming upgraded SPring-8. For certain experiments, vibration seems to fluctuate the source position. The virtual fluctuation, which increases the effective source size, degrades high-density nanobeam made by direct projection of the source. When a DCM is placed at 40 m downstream from a source with 6-um size, the vibration should be 50 nrad to suppress 20%-increase of the source size. The vibration was over 800 nrad in 2011. We have continued improving low-vibration flexible tubes for transport tube of liquid nitrogen, high-rigidity tilt stages, and temperature controllers of the coolant. The latest-version refinements were carried out to 5 DCMs in 2017FY. The vibrations were reduced to about 110 nrad in 4 DCMs and 55 nrad for one.

Farewell talk and Lunch box

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Collette	C.G.R.L.	WEOAMA02
Collins	J.T.	THOPMA02
Connatser	R.W.	TUPH10

Connolley	T.	THOAMA04
Corwin	T.M.	TUPH26
Couprie	M.-E.	TUPH03
da Silva	M.B.	TUPH43
Da Silva Castro	J.	TUPH03, TUPH11, TUPH12
Dabin	Y.	THOAMA06, FROAMA07
Dakovski	G.L.	THPH36
Davies	S.	THOAMA04
de Oliveira	H.G.P.	TUPH43, WEPH39
DeBeer	S.D.	WEOAMA06
Defever	J.	THPH36
Dehaeze	T.	WEOAMA02
Dejus	R.J.	TUPH23
Deng	R.B.	TUPH16, TUOPMA02
DePaola	F.A.	TUOPMA08, THPH41, TUPH13
Desjardins	D.K.	THPH32, THPH09, WEPH36
Diete	W.	WEPH42
Dill	F.U.	THPH10, FROAMA06
Doehrmann	R.	THOPMA03
Dommach	M.	TUOPMA01
Donnelly	A.T.	TUPH23
Doose	C.L.	TUPH23
Downey	J.S.	THPH24
Drakopoulos	M.	THOAMA04
Drube	W.	THPH39
Du	H.W.	TUOPMA02
Duarte	R.M.	TUPH14
Dubuisson	J.M.	TUPH03
Ducotte	L.	FROAMA07
Ducourtieux	S.	THKA01
Dufresne	E.M.	THPH26
Duraffourg	M.	WEPH03
Ebbeni	M.	TUOPMA04
Ederer	K.	THPH39
Einfeld	D.	TUPH35
Endo	K.	THPH33
Engblom	Ch.	WEPH42
Eom	I.	THPH28
Erdmann	M.	THOPMA02
Ermakov	A.	TUPH15
Eybert	L.	TUOPMA06
Falkenberg	G.	THOPMA03
FAN	Y.	WEPH09
Farré París	F.	THPH18
Faussete	R.	TUPH13
Fauth	F.	THPH18
Ferreira	V.Z.	THPH12, WEOAMA04
Ferrer	S.	THPH17, THPH14
Fiedler	S.	WEPH20
Field	R.C.	TUPH05
Fisher	M.V.	WEPH16
Fliegauf	R.	THPH30, WEOPMA06

Focker	G.J.	WEPH03
Foerster	M.	THPH15
Fonda	E.	WEPH14
Fonseca	P.T.	WEPH39
Fonseca	E.B.	TUPH09
Fontsere Recuenco	A.	THPH17, THPH14
Forcat Oller	S.	THPH11
Fuchs	F.	WEPH11
Gangnant	P.	THOAMA03
Gao	F.	TUPH16
Gao	L.	WEPH10, FROAMA02, FROAMA03
Garrevoet	J.	THOPMA03
Gehrmann	T.	WEPH20
Geraldes	R.R.	WEPH31, THPH12, WEOAMA04, WEOAMA01
Gevorgyan	A.A.	WEPH24, THPH17, WEPH23
Gießel	T.	WEPH11
Gilmour	A.	WEPH12
Giorgetta	J.L.	THPH09
Gnewkow	R.G.	WEOAMA06
Goerlitz	M.	THPH13
Goirand	L.	TUOPMA07, TUPH35, TUPH08, TUOPMA06
Gonzalez	N.	THPH16, THPH17, THPH43, THPH14, THPH15
Gonzalez	H.	FROAMA07
González Fernández	J.B.	THPH18, THPH16, THPH17, THPH14
Gottwald	A.	THPH25
Grizolli	C.	WEOPMA04
Grizolli	W.	THPH27
Grolimund	D.	THPH04
Grötzsch	D.	WEOAMA06
Gudkov	D.	TUPH36
Guillet	S.	THPH36
Guo	D.Z.	TUPH18
Guo	X.L.	TUPH22
Haas	E. G.	THPH19
Hammond	N.P.	TUPH17
Han	.	FROAMA03
Han	J.H.	WEPH17, WEPH18
Han	Q.	FROAMA03
Hara	H.	THPH33
Harder	D.A.	TUPH26
Hardin	C.L.	THOPMA05, THPH36, THPH34
Hashimoto	A.H.	TUPH25
He	Y.Z.	TUPH42
He	P.	TUPH18
He	H.Y.	TUPH27
Hidaka	Y.	TUPH26
Hindermann	M.	TUOPMA03
Hirschi	P.	WEOPMA03
Hoehl	A.	THPH20
Holfelder	I.	WEOPMA06
Holmes	M. R.	THOAMA02, THPH21, THPH06
Hora	J.	WEOPMA03

Howell	G.E.	THOPMA04, THOAMA04
Hsu	K.H.	WEPH13
Hsu	Hsu, M.Y.	WEPH41
Hu	X.	TUOPMA02
Huang	J.C.	TUPH19
Huang	Y.-S.	WEPH38
Huang	L.	THPH29, THPH08, WEPH38
huber	L.	TUOPMA03
Huber	N.	WEPH21
Hubert	N.	TUPH11
Hulbert	S.L.	FROAMA05
Hwang	S-M.	THPH28
Hwang	C.-S.	TUPH06
Hyun	H.J.	THPH28
Igarashi	N.	TUPH20
Ikeya	Y.	FROAMA08
Ishii	H.	THPH23, TUPH20
Islam	Z.	WEOPMA04
Izzo	S.J.	WEPH22
Jahn	D.	WEPH20
Jain	A.K.	TUPH13, TUPH23
James	J.H.	THPH21, THPH06
Janis	A.J.	WEPH04
Jarjayes	SJ.	THOAMA06
Jarrige	I.	FROAMA05
Jaski	M.S.	TUPH13, TUPH23
Jaski	Y.R.	THPH24, TUPH29
Jasso	T.	WEPH26
jeangerard	d.j.	WEPH36
Jeong	S.-H.	WEPH17
JIANG	Y.C.	FROAMA02
Jiang	Z.	TUPH16, TUPH42, TUOPMA02
Jobert	N.	WEPH14
Joehri	H.	WEOPMA03, TUOPMA03
Jover-Mañas	G.	THPH17, THPH14
Juanhuix	J.	THPH16
Jung	Y.G.	WEPH17
Junqueira Leao	Leao, R.J.	WEPH26
Kaestner	B.	THPH20
Kahnt	M.	THOPMA03
Kamma-Lorger	C.S.	THPH17, THPH14
Kang	H.-S.	WEPH17, WEPH18
Kang	L.	WEPH08, WEPH34
Kanngießer	B.	WEOAMA06
Kaser	H.K.	THPH25
Kayser	Y.	WEOPMA06
Kearney	S.P.	WEOAMA05, WEOPMA04, THPH26, THPH27
Keller	A.	TUOPMA03
Kelly	J.H.	WEPH15
Kenesei	P.	WEOPMA04
Kikuchi	T.	TUPH25
Kim	S.H.	THPH28

Kim	S.	THPH28
Kim	B.	THPH28
Kim	K.W.	THPH28
Kim	S.N.	THPH28, WEPH18
Kim	D.E.	WEPH17
Kim	M-J.	THPH28
Kim	K.S.	THPH28
Kim	S.H.	WEPH18
Kim	J.H.	THPH28
Kim	S.	THPH28
Kirkus	E.S.	TUPH29
Kishimoto	H.	FROAMA08
Kitegi	C.A.	TUPH26
Klein	R.	THPH30
Knopp	J.J.	THOPMA02, WEPH16
Kolbe	M.	THPH25
Kolodziej	T.	THPH27
Kosuge	T.	THPH23, TUPH20
Kraus	H.	WEOPMA02
Kroth	S.	THPH30
Krueger	H.	THPH31
Kuan	C.K.	TUPH21
Kuo	C.Y.	TUPH06
La Civita	D.	FROAMA04
Labat	M.	TUPH11
Ladrera Fernández	J.	THPH14
Lai	W.Y.	TUPH07, TUPH21
Lai	L.	THPH29, WEPH41
Lale	M.A.	TUPH04
LALUC	B.	THOPMA01
Lang	K.	THPH27
LE JOLLEC	A.	WEPH36
Lee	L.	THPH29, THPH08, WEPH38
Lee	S.B.	WEPH17, WEPH18
Lee	H.-G.	WEPH17, WEPH18
Lee	E.H.	THPH28
Lee	M.H.	THPH29, THPH08
Lee	L.	THOPMA05, WEPH19
Lee	C.	THPH28
Lee	H.-S.	WEPH17
Lee	C.Y.	WEPH41
Lee	S.H.	THPH24, TUPH29
Leitner	M.	TUPH14
Leonardon	J.	TUPH35
Lepage	F.	TUPH03, TUPH11
Lesourd	M.	TUPH33
Li	Q.	TUPH18
Li	M.	WEOAMA03, FROAMA03
Liang	H.	FROAMA02
Lin	J.M.	WEPH38
Lincoln	F.C.	TUOPMA08, WEPH29
Liu	C.Y.L.	THPH08

Liu	Y.	TUPH22, TUOPMA02
Liu	C.Y.	WEPH30
Liu	Z.	WEPH22, TUPH28
Liu	D.G.	THPH29, WEPH38
Liu	J.	TUPH23
Liu	Liu, F.	WEPH20
Liu	X.	TUPH24
Liu	L.	TUPH27
Liu	.	FROAMA03
Llonch	M.L.	THPH17, THPH14
Locher	M.	TUOPMA03
Lubeck	J.	THPH30
Luiz	S.A.L.	WEPH31
Lutton	F.	THOAMA03
Lyubomirskiy	M.	THOPMA03
Maag	St.	WEOPMA07
Macdonell	S. A.	WEOPMA05
Macrander	A.	THPH27
Magnin-Mattenet	M.	WEOAMA02
Malfois	M.	THPH17, THPH14
Malzer	W.	WEOAMA06
Marcos	J.	WEPH24, WEPH06
Marion	P.	TUOPMA06
Marques	H.P.	TUPH35
Marshall	G.M.	WEPH20
Marteau	F.	TUPH03
Martens	C.	TUPH15
Martin	I.P.S.	TUPH17
Martinez Guil	J.C.	THPH17, THPH14
Mary	A.M.	TUPH03
Mase	K.	TUPH25
Maser	J.	WEPH16
Massana	V.	WEPH06
Mathon	O.	WEPH40
Matsuzaki	Y.	FROAMA08
McElderry	A.	TUPH04
Meissner	D.	THPH31
Menneglier	C.M,	THPH32, THPH09
Mesa	A.L.	WEPH26
Meyer	B.C.	WEPH31, TUPH43
Meyer	J.M.	WEPH20
Meyer	B.	THPH04
Miarnau Marin	A.	TUPH36
Miarnau Marin	A.	WEPH03
Michel	M.	THOAMA03
Miura	T.	FROAMA08
Miyazawa	T.	TUPH25
Mochizuki	T.	THPH33
Moreno	G.B.Z.L.	WEOAMA01
Moreno	T.	WEPH14
Mori	T.	TUPH20
Morton	D.S.	THOPMA05, THPH36, WEPH19, THPH34

Mountford	B.	THPH35
Mueller	M.	WEOPMA06
Mulvey	J.	THPH24, TUPH29
Musardo	M.	TUPH26
Mykhaylyk	V.B.	WEOPMA02
Narayanan	S.	THPH26
Nasiatka	J.R.	THOPMA06
Naujoks	U.	TUPH15
Neuenschwander	R.T.	WEPH26
Ng	M.L.	THOPMA05, WEPH19
Nicolas	J.	THPH16
Nie	X.J.	WEPH08, TUPH27, WEPH34
Nikitin	Y.	TUPH30, THPH17
Nitani	H.	TUPH20
Noonan	J. R.	TUPH04
Novikov	D.	THPH39
Nowrouzi	K.	THPH07
Nudell	J.	WEPH22, TUPH28
Nue	L.	WEOPMA07
O'Dowd	F.P.	THPH36
Oh	B.G.	WEPH17
Ohashi	H.	FROAMA08
Ohsawa	T.	THPH33
Oishi	M.	TUOPMA05
Olea	G.	WEPH21
Omolayo	O.	TUPH14
O'Neill	M.M.	TUPH04
Oprondek	S.M.	THPH24, TUPH29
Osier	T.O.	THPH36
Osipov	T.O.	THPH06
Osipov	T.	THPH21
Owens	M.A.	THPH36
Padmore	H.A.	THPH07
PAISER	E.P.	THPH02
Park	J.K.	THPH28
Park	G.S.	THPH28
Park	K.-H.	WEPH17
Park	J.	THPH28
Pascarelli	S.	WEPH40
Pasquaud	J.	TUOPMA07
Pasquaud	J.	TUPH35
Pasternak	S.	WEPH40
Paustian	P.	THPH30
Pedreira	P.	THPH18
Pedrini	B.	WEOPMA03
Peña	G.	THPH17
Peredkov	S.P.	WEOAMA06
Pereiro	E.	THPH43
Perez-Berna	A.J.	THPH43
Perng	S.Y.	TUPH21
Perrin	F.	WEPH40
Petrocelli	R.	WEPH06

Pfister	A.	WEOPMA07
Pinto	A.C.	WEPH31
Pinty	V.	THPH32, THPH37
Platzer	R.	THPH31
Plumb	P.N.	WEOPMA07
Polli	J.M.	WEPH12
Pompidor	G.P.	WEPH20
Ponthenier	P.	WEPH40
Pradervand	C.	WEOPMA03
Preissner	C.A.	WEPH22, TUPH28
Prieto	M.	TUPH30
Purling	M.F.	THPH38
Quispe	M.	WEPH24, WEPH23
Raabe	J.	THPH39
Rah	S.Y.	THPH28
Ramanathan	M.	THPH24, TUPH29
Ramm	T.	TUPH31
Rank	J.	TUPH26
Ravy	S.	TUKA01
Reininger	R.	WEPH16
Ren	Z.L.	TUPH38
Reuss	T.	THPH31
Ribbens	M.	WEPH14
Ribo	L.	WEPH06, THPH17
Rich	D.W.	THPH36
Richter	M.	THPH30
Ristau	U.	WEPH20
Rocha	M.C.	WEPH26
Rodrigues	A.R.D.	WEPH26
Rodrigues	G.L.M.P.	WEPH39
Rodrigues	F.	WEPH26
Roehling	M.	THPH31
Roldan	D.	THPH18
Roy	D.	THPH32
Ruget	C.	THPH16
Saemann	E.	THPH31
Saithong	E.	THPH31
Sajaev	V.	TUPH28
Samson	V.A.	THPH04
Samuelsson	S.	TUPH36
Sanchez del Rio	M.	THOAMA06
Sandy	A.	THPH26
Sanfelici	L.	WEPH31, THPH12, WEOAMA04, TUPH43, WEOAMA01, WEPH39
Sannibale	F.	TUPH14
Saveri Silva	M.	WEOAMA01
Savko	M.	WEPH36
Schäfers	F.	WEPH11
Schacht	A.	WEPH42
Scheel	M.	THPH09, WEPH42
Scheidt	K.B.	TUPH35
Schlesiger	C.S.	WEOAMA06
Schlüter	C.	THPH39

Schmidt	T.	TUOPMA03
Schmidt	O.A.	THOPMA02
Scholz	M.	THOPMA03
Schroer	C.G.	THOPMA03
Schropp	A.	THOPMA03
Schwarb	A.	WEOPMA07
Schweizer	I.	WEPH42
Scott	S.M.	THPH40
Seltmann	J.	WEPH27
Senba	Y.	FROAMA08
Senee	F.	TUPH44
Serra Gallifa	X.	THPH18
Sévelin-Radiguet	N.	WEPH40
Seyrich	M.	THOPMA03
Sgobba	S.	WEKA01
Shapiro	D.A.	THPH07
Sharma	S.K.	TUOPMA08, THPH41, TUPH16, TUPH13, WEPH29
Shastri	S.D.	WEOPMA04
Shehab	M.M.	TUPH01, TUPH33, TUPH32
Sheng	I.C.	WEPH28
Sheng	W.F.	WEOAMA03, FROAMA02
SHEPARD	W. E.	WEPH36
Shi	H.	THPH42
Shi	S.	WEOPMA07
Shi	X.	WEOPMA04, THPH27, WEPH16
Shi	H.	WEPH35
Shimizu	Y.	FROAMA08
Shin	H.C.	THPH28
Shoji	M.	TUOPMA05
Shu	D.	WEOAMA05, WEOPMA04, THPH26, THPH27
Shvyd'ko	Yu.	THPH27
Sics	I.	THPH17, THPH14
Sikorski	A.	THPH12, WEOAMA04
Silva	M. H. S.	TUPH09
Simon	C.	TUPH44
Sinn	H.	FROAMA04
Skiadopoulos	D.	TUPH29
smakulska	D.	WEPH03
Smith	D.M.	WEPH04
Soezeri	S.S.	THOPMA06
Sonoyama	J.	THPH33
Sorrentino	A.	THPH43
Souza	M.S.	THPH12, WEOAMA04
Spataro	C.J.	TUPH13, WEPH29
Stallwood	A.	TUPH34
Stavitski	E.	THPH33
Steier	C.	TUPH14
Su	Y.	THPH29
Suh	H.S.	WEPH17
Sun	S.	TUPH22, TUOPMA02
Sun	J.L.	TUPH27
Swenson	C.A.	TUPH14

Swetin	E.	TUPH40
Tachibana	T.	THPH33
Takahashi	S.	TUOPMA05
Takeichi	Y.	TUPH20
Takenaga	H.	THPH33
Takeuchi	T.	FROAMA08
Tamura	K.	TUOPMA05
Tanabe	T.	TUPH26
Tanaka	M.	FROAMA08
Tanaka	H.	THPH23, TUPH20
Tang	S.	WEOAMA03, FROAMA02, FROAMA03
Taniuchi	Y.	TUOPMA05
Tarawneh	H.	TUOPMA04
Tassan-Viol	J.	WEPH03
Tavakoli	K.T.	TUPH03, TUPH11
Thiel	A.	TUOPMA04
Thoraud	T. S.	TUPH12
Thornagel	R.	THPH30
Tilmont	M.	TUPH03
Tischer	M.	TUPH31
Tizzano	W.	THOAMA04
Tolentino	H.C.N.	WEPH31, WEOAMA04
Torchio	R.	WEPH40
Trutmann	D.	WEOPMA07
Tsai	Z.-D.	TUPH07, WEPH30
Tsuboki	I.	FROAMA08
Tsubota	K.	THPH33
Tuozzolo	J.L.	TUOPMA08, THPH41
Valcárcel	R.	THPH43
Valléau	M.	TUPH03
Van Vaerenbergh	P.	TUPH35
Vantelon	D.	THPH32
Veness	R.	WEPH03, TUPH36
Vescovo	E.	FROAMA05
Vétéran	J.	TUPH03
Vilcins	S.	TUPH37
Villanueva	J.	THPH17
Villar	F.	WEPH40
Volpe	L.M.	WEPH31, TUPH09, THPH12, WEOAMA04, WEPH39
Wagner	A.	WEOPMA02
Wakefield	K.	TUPH04
Walter	P.	THPH21, THPH06
Walters	D.R.	TUPH04
Wang	H.S.	TUPH21
Wang	G.Y.	WEPH08, WEPH32
Wang	A.X.	TUPH27, WEPH34
Wang	S.H.	TUPH22
Wang	G.Y.	WEPH34
Wang	Z.Z.	TUPH41
Wang	D.-J.	WEPH41
Wang	X.Q.	TUPH38
Wang	D.	TUPH42

Wang	Y.	TUPH38
Wang	L.	TUPH22
Wang	J.	TUPH22
Wang	H.	TUPH39
Wang	X.	WEOPMA03, TUOPMA03
Wansleben	M.	WEOPMA06
Weitkamp	T.	THPH09, WEPH42
Weser	J.	WEOPMA06
Westfahl Jr.	H.	WEPH31, THPH12, WEOAMA04, WEOAMA01
Westferro	F.	THPH24, TUPH29
White	S.M.	TUOPMA07
Wiemerslage	G.E.	TUPH04
Wiesemann	U.	WEPH42
Wiljes	P.	WEPH33, THOPMA03
Wojcik	W.	THPH27
Wright	R.D.	TUPH40
Xiang	S.	TUPH42
Xu	H.	TUPH38
Xu	G.	TUPH41
Xu	T.G.	TUPH27
Yamada	Y.	TUPH20
Yamazaki	H.	FROAMA08
Yan	H.Y.	THPH29, THPH08, WEPH38
Yan	F.	TUPH41
Yang	Y.C.	TUPH07
Yang	B.X.	THPH24, TUPH29
Yang	Yang,F.G.	WEPH37
Yin	G.C.	WEPH41
Yin	L.	TUPH16, TUOPMA02
Yu	Y.J.	WEPH08
Yu	J.B.	WEPH08, TUPH27, WEPH34
Zhang	W.	TUOPMA02
Zhang	W.	TUPH42
Zhang	B.	TUPH38
Zhang	L.	THOAMA02, THOPMA05, THPH36, WEPH19, THPH34, FROAMA01
Zhang	J.S.	WEPH34
zhao	L.	TUPH44
Zhou	A.Y.	FROAMA02
zhu	Y.	TUPH42
Zhu	D.H.	TUPH27
Zhu	Y.	FROAMA05
Zientek	J.	TUPH04

DETAILED PROGRAM

MONDAY JUNE 25TH

REGISTRATION AND BUS DEPARTURE FROM VENUE TO SOLEIL
09:00 - 11:00

SOLEIL VISIT
11:00 - 15:20

LUNCH AT SOLEL
12:30 - 13:45

BUS DEPARTURE FROM SOLEIL TO VENUE
14:45 - 15:45

SOCIAL EVENT - WELCOME RECEPTION AT THE VENUE
16:00-18 :00

TUESDAY JUNE 26TH

WELCOME COFFEE
09:30 - 10:00
EXHIBITION HALLS

Amor Nadji et al.
CONFERENCE WELCOME
10:00 - 10:30

Manuel TILMONT
JACOW COOPERATION AND SCIENTIFIC EDITION FOR MEDSI
10:30 - 10:50

Dr Sylvain RAVY
TUKA01: SHINING A LIGHT ON SYNCHROTRON LIGHT
10:50 - 12:10

LUNCH
12:10 - 13:30
EXHIBITION HALLS

Dommach Martin
TUOPMA01: STATUS OF THE EUROPEAN XFEL PHOTON BEAM SYSTEMS
13:30 - 13:50

Lixin Yin
TUOPMA02: MECHANICAL ENGINEERING FOR SCLF ACCELERATOR
13:50 - 14:10

Haimo Joehri
TUOPMA03: DEVELOPMENT OF NEW UE38 UNDULATOR FOR ATHOS BEAMLINE IN SWISSFEL
14:10 - 14:30

Andreas Thiel
TUOPMA04: MECHANICAL SYSTEM OF APPLE II INSERTION DEVICES AT MAXIV
14:30 - 14:50

TEA BREAK
14:50 - 15:20
EXHIBITION HALLS

Sunao Takahashi
TUOPMA05: UPDATES ON THE STORAGE RING VACUUM SYSTEM FOR SPRING-8-II
15:20 - 15:40

Philippe Marion
TUOPMA06: STATUS OF THE ESRF EBS STORAGE RING ENGINEERING AND CONSTRUCTION
15:40 - 16:00

Thierry Brochard
TUOPMA07: RF FINGERS FOR THE NEW ESRF-EBS STORAGE RING
16:00 - 16:20

Sushil Sharma
TUOPMA08: DEFORMABLE RF FINGERS WITH AXIAL EXTENSION
16:20 - 16:40

POSTER SESSION: ACCELERATORS / CORE TECHNOLOGY
16:40 - 18:00

WEDNESDAY JUNE 27TH

Dr Stefano SGOBBA
WEKA01: SELECTION OF MATERIALS AND PROCESSES FOR VACUUM, CRYOGENIC AND NON-MAGNETIC APPLICATIONS IN PARTICLE ACCELERATORS
09:00 - 10:20

COFFEE BREAK
10:20 - 10:50
EXHIBITION HALLS

Renan Ramalho Geraldes
WEOAMA01: OFFLINE RESULTS OF THE NEW HIGH-DYNAMIC DCM FOR SIRIUS
10:50 - 11:10

Thomas Dehaeze
WEOAMA02: SAMPLE STABILIZATION FOR TOMOGRAPHY EXPERIMENTS IN PRESENCE OF LARGE PLANT UNCERTAINTY
11:10 - 11:30

Shanzhi Tang
WEOAMA03: HIGH-ACCURACY SMALL ROLL ANGLE MEASUREMENT METHOD BASED ON DUAL-GRATING DIFFRACTION HETERODYNE INTERFEROMETER
11:30 - 11:50

Gabriel Claudiano
WEOAMA04: THE DESIGN OF EXACTLY-CONSTRAINED X-RAY MIRROR SYSTEMS FOR SIRIUS
11:50 - 12:10

LUNCH
12:10 - 13:30
EXHIBITION HALLS

Steven Patrick Kearney
WEOAMA05: FE MODEL OF A NANOPOSITIONING FLEXURE STAGE FOR DIAGNOSIS OF TRAJECTORY ERRORS
13:30 - 13:50

Daniel Grötzsch
WEOAMA06: CONCEPTS AND INSTRUMENTATION FOR SCANNING FREE X-RAY EMMISSION SPECTROSCOPY
13:50 - 14:10

Daniel Trutmann
WEOPMA07: DEVELOPMENT OF A NEW SUB-4K ARPES ENDSTATION AT PSI
14:10 - 14:30

Vitaliy Mykhaylyk
WEOPMA02: NON-CONTACT LUMINESCENCE LIFETIME CRYOTHERMOMETRY FOR APPLICATION IN VACUUM ENVIRONMENT
14:30-14:50

TEA BREAK
14:50 - 15:20
EXHIBITION HALLS

Xinyu Wang
WEOPMA03: APPLICATION OF ADDITIVE MANUFACTURING IN THE DEVELOPMENT OF A SAMPLE HOLDER FOR A FIXED TARGET VECTOR SCANNING DIFFRACTOMETER AT SWISSFEL
15:20-15:40

Deming Shu
WEOPMA04: MECHANICAL DESIGN OF A NEW PRECISION ALIGNMENT APPARATUS FOR COMPACT X-RAY COMPOUND REFRACTIVE LENS MANIPULATOR
15:40 - 16:00

Sarah Ann Macdonell
WEOPMA05: APPLICATION OF INDUSTRY RECOGNISED DEVELOPMENT TOOLS AND METHODOLOGIES, SUCH AS DESIGN FOR SIX SIGMA TO FACILITATE THE EFFICIENT DELIVERY OF INNOVATIVE AND ROBUST ENGINEERIN...
16:00 - 16:20

Ina Holfelder
WEOPMA06: A COMPACT AND CALIBRATABLE VON HAMOS X-RAY SPECTROMETER BASED ON TWO FULL-CYLINDER HAPG MOSAIC CRYSTALS FOR HIGH-RESOLUTION XES
16:20 - 16:40

POSTER SESSION: SIMULATION, PRECISION MECHANICS, BEAMLINES
16:40 - 18:00

THURSDAY JUNE 28TH

Dr Sébastien Ducourtieux
THKA01: TOWARD HIGH PRECISION POSITION CONTROL USING LASER INTERFEROMETRY: MAIN SOURCES OF ERRORS
09:00 - 10:20

COFFEE BREAK
10:20 - 10:50
EXHIBITION HALLS

Simone Andresen
THOAMA01: OPTIMIZING THE PETRA IV GIRDER BY USING BIO-INSPIRED STRUCTURES
10:50 - 11:10

Lin Zhang
THOAMA02: LCLS NEH FLOOR THERMAL DEFORMATION AND MITIGATION PLAN
11:10 - 11:30

Cécile Barthe-Dejean
THOAMA03: MECHANICAL DESIGN AND SIMULATION FOR SPIRAL2 PROJECT AT GANIL
11:30 - 11:50

Walter Tizzano
THOAMA04: DESIGN AND FEA OF AN INNOVATIVE ROTATING SIC FILTER FOR HIGH-ENERGY X-RAY BEAM
11:50 - 12:10

LUNCH
12:10 - 13:30
EXHIBITION HALLS

FRIDAY JUNE 29TH

Jason Carter
THOAMA05: 3D NUMERICAL RAY TRACING FOR THE APS-UPGRADE STORAGE RING VACUUM SYSTEM DESIGN
13:30 - 13:50

Yves Dabin
THOAMA06: A NEW X-RAY BEAM FOR THE ESRF BEAMLINES, OPTO-MECHANICAL GLOBAL SURVE
13:50 - 14:10

Boris Laluc
THOPMA01: PIEZO TECHNOLOGY IN SYNCHROTRONS
14:10 - 14:30

Oliver Schmidt
THOPMA02: APS UPGRADE - BEAMLINE ENGINEERING OVERVIEW
14:30 - 14:50

TEA BREAK
14:50 - 15:20
EXHIBITION HALLS

Ralph Doehrmann
THOPMA03: PTYNAMI: PTYCHOGRAPHIC NANO-ANALYTICAL MICROSCOPE AT PETRA III -HOW TO ACHIEVE SUB-NANOMETER SAMPLE STABILITY
15:20 - 15:40

George Edward Howell
THOPMA04: A NEW PROCUREMENT STRATEGY TO CHALLENGE THE SUPPLIER CONSTRAINTS CREATED WHEN USING A FULLY DEVELOPED REFERENCE DESIGN
15:40-16:00

Corey Lee Hardin
THOPMA05: USING RESISTIVE ELEMENT ADJUSTABLE LENGTH (REAL) COOLING TO INCREASE OPTICAL DESIGN FLEXIBILITY IN HIGH POWER XFELS
16:00 - 16:20

James R. Nasiatka
THOPMA06: DEVELOPMENT OF LOW VIBRATION COOLING SYSTEMS FOR BEAMLINE OPTICS USING HEAT PIPE TECHNOLOGY
16:20 - 16:40

POSTER SESSION: BEAMLINES
16:40 - 18:00

CONGRESS DINER
19:45-23:00
BATEAUX MOUCHES, PARIS

Lin Zhang
FROAMA01: MECHANICAL ENGINEERING INSTRUMENT DESIGN AND DEVELOPMENT FOR LCLS-II
09:00 - 09:20

Hao Liang
FROAMA02: A HIGH HEAT LOAD DOUBLE CRYSTAL MONOCHROMATOR AND ITS CRYO COOLING SYSTEM FOR HEPS
09:20 - 09:40

Ming Li
FROAMA03: R&D OF MIRROR BENDING TECHNIQUES IN BSRF
09:40 - 10:00

Daniele La Civita
FROAMA04: EUROPEAN XFEL SASE3 PHOTON BEAM COMMISSIONING AND LESSON LEARNED
10:00 - 10:20

COFFEE BREAK
10:20 - 10:50
EXHIBITION HALLS

Yi Zhu
FROAMA05: DESIGN AND COMMISSIONING PERFORMANCE OF THE TWO SOFT X-RAY BEAMLINES IN NEXT, ESM AND SIX
10:50 - 11:10

Frank-Uwe Dill
FROAMA06: HIGH RESOLUTION MONOCHROMATOR FOR IXS EXPERIMENTS AT PETRA III BEAMLINE P01
11:10 - 11:30

Robert Baker
FROAMA07: ESRF DOUBLE CRYSTAL MONOCHROMATOR PROTOTYPE PROJECT
11:30 - 11:50

Hiroshi Yamazaki
FROAMA08: REFINEMENTS OF SPRING-8 STANDARD MONOCHROMATORS WITH CRYOGENICALLY COOLED SILICON CRYSTALS TOWARD 50 NRAD-STABILITY
11:50 - 12:10

FAREWELL AND LUNCH BOX
12:10 - 13:00
EXHIBITION HALLS

AUTHOR PRACTICAL INFORMATION

Authors are reminded that all conference contributions must be accompanied by a paper. Templates for papers are available at JACoW Website.

During the conference papers as well as the oral presentations must be submitted and they are being reviewed by JACoW editors during all conference days. The editors' office is at the 3d floor on the top of the auditorium. A screen is showing the status of the paper edition at the registration/information desk.

- Paper needs revision by the Author
- Paper needs minor revision by the Author
- Paper is ready for publication

Authors must check the status of their papers and in case of a revision is needed ask to the editors for clarifications.

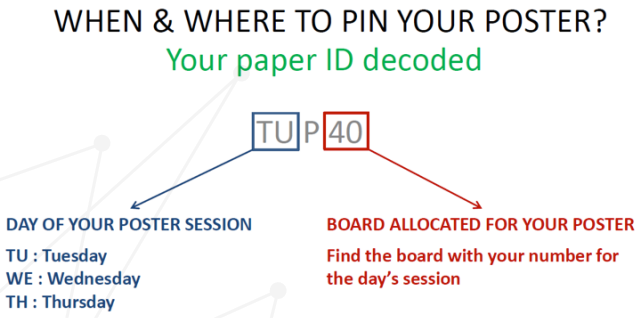
POSTER SESSION

There are three poster sessions from Tuesday 26th to Thursday 28th June 2018 from 16:40 to 18:00:

- Tuesday 26/06: Accelerators / Core Technology
- Wednesday 27/06: Simulation / Precision Mechanics / Beamlines
- Thursday 28/06: Beamlines

The conference organizers will provide necessary materials for poster mounting and Local Committee's members will support delegates for mounting.

The **poster must be placed at the assigned location early morning before the starting of the first coffee break**. Poster Session Managers will be available with the necessary material for display. The poster **shall be removed after 18:00** of the corresponding session.



ORAL CONTRIBUTION GUIDELINES

Presentations are viewed using a computer managed by MEDSI conference. **No personal computer can be used. Macintosh computers are not available**. Authors using Macintosh must ensure that their presentation operates correctly using Microsoft Office 2016 or Adobe Acrobat in the Windows environment.

Please arrive at least 10 minutes before the session start and introduce yourself to the session chair before the start of the session.

Slides must be sized for an on-screen show of 16:9

Speakers are invited to the **Preview Room** to check the presentation. In the case that the presentation is not uploaded on SPMS, it has to be copied manually on the preview computer preferably the **day before** and **at least 2 hours before** the start of the session. Only USB Flash memories are accepted.

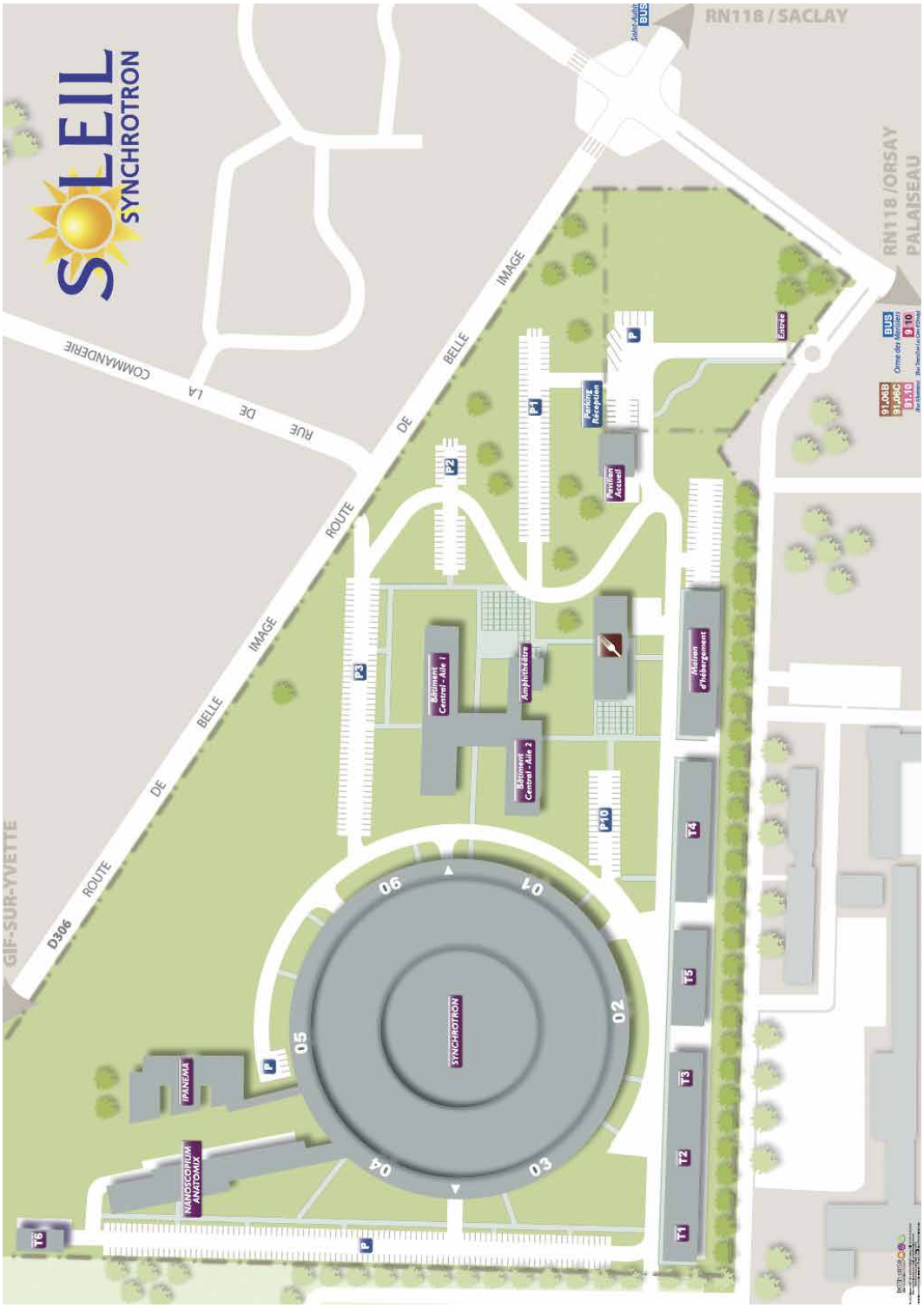
Speakers of the morning sessions should upload their presentation the day before.

The Preview room is located on the first floor, at the back of the auditorium Adenauer. **The entrance of the preview room is on the right side of the welcome desk.**

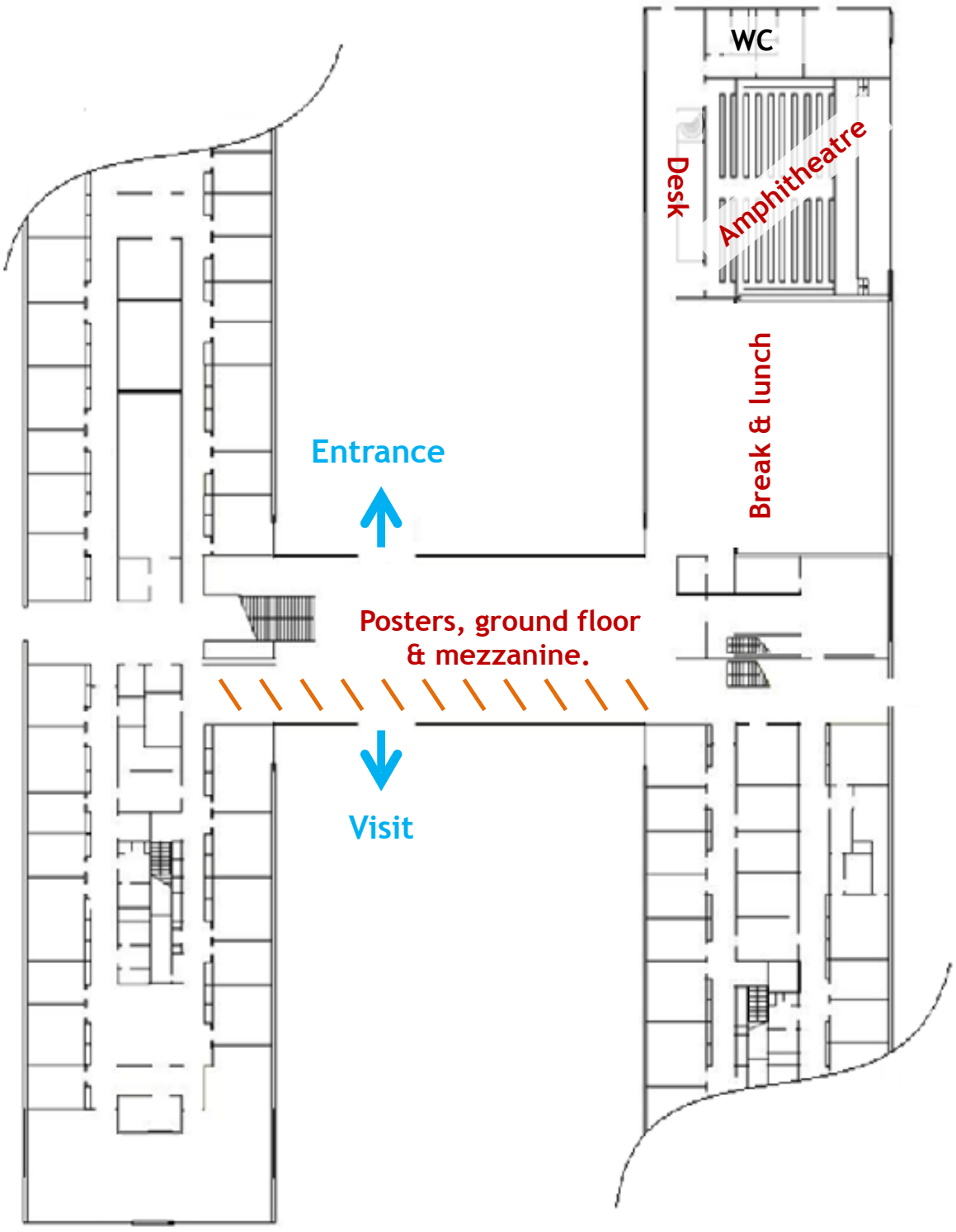
Opening time of preview room:
Tuesday, June 26th: 8:00 am – 6:00 pm
Wednesday, June 27th: 8:30 am – 6:00 pm
Thursday, June 28th: 8:30 am – 6:00 pm
Friday, June 29th: 8:30 am – 12:00 pm

The software version used in the conference room is **Microsoft PowerPoint 2016**. Pdf format is allowed only if the "full screen mode" is used during the presentation. Authors using Macintosh must ensure that their presentation operates correctly in the Windows environment.

SYNCHROTRON SOLEIL SITE PLAN



SYNCHROTRON SOLEIL - MAIN BUILDING PLAN



SOCIAL EVENTS

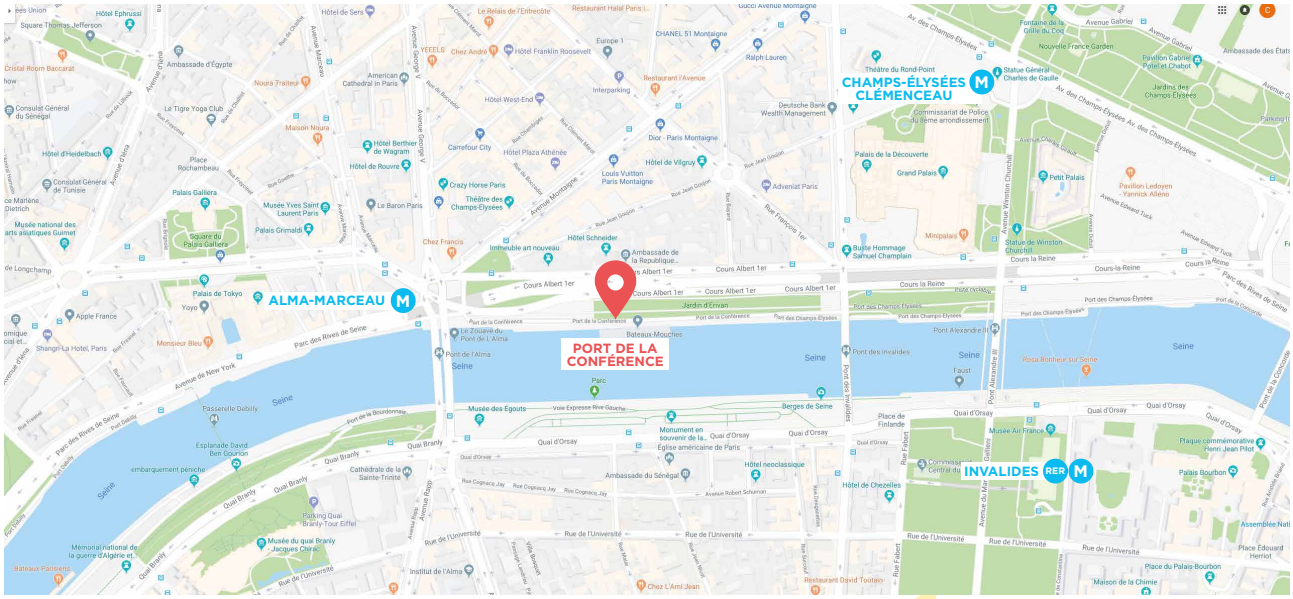
CHEESE & WINE WELCOME RECEPTION
Monday 25 June

Join us for a warm welcome to MEDSI 2018 at the Venue from 16:00 to 18:00. Come along and taste some lovely typical French wines and enjoy all the different cheeses on display. Other beverages will also be available.

CONFERENCE DINNER – CRUISE ON SEINE WITH THE BATEAUX MOUCHES
Thursday 28 June

The Eiffel Tower, the Louvre, Notre Dame, the Conciergerie, the Musée d'Orsay ... These monuments, forming the true richness of Paris' heritage, are absolute must-sees. Seeing Paris by boat gives you a different perspective, enabling you to take in the historic heart of Paris in a new way, from a different angle. MEDSI invites you to hop on board for a fantastic dinner and trip down the Seine.

Meeting point: 19:45 - Bateaux «La Patache» Bateaux-Mouches - Port de la Conférence, 75008 Paris
The boat will leave at 20:30 (no entrance on the boat after 20:20)
The boat will be back at 23:00.



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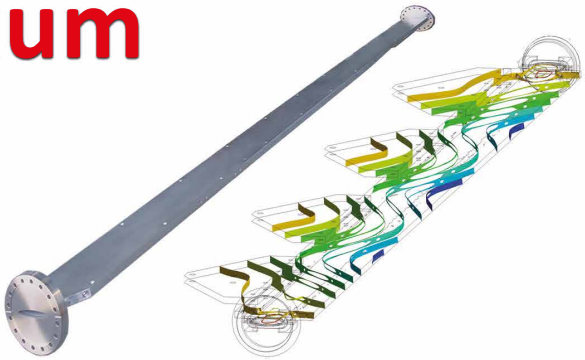

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Ultimate pressure (Without gas ballast)	3.8×10⁻²Torr (0.05 mbar)	7.5×10⁻³Torr (0.01mbar)				2×10⁻³Torr (0.003 mbar)
Supply voltage (50/60Hz) *1	Single Phase, AC100～120V Single Phase, AC200～240V	Single Phase, AC100～120V Single Phase, AC200～240V 3Phase, AC200～240V			Single Phase, AC200～240V 3Phase, AC200～240V	
Gas ballast mechanism	Standard accessory					
Power Connector *2	IEC 60320-C14					Contact us
Weight [kg]	19	23	25	54	56	125
Dimensions [mm] L×W×H *4	360×196×219	385×210×250	410×210×250	475×298×275	530×315×275	574×304×575
Safety standard	CE Marking, NRTL(UL 61010-1, CAN/CSA C22.2 No.61010-1)					

*1) Contact us for other voltage options. *2) Please contact us for other connectors.
*3) This is based on JIS standard, please contact us about some date based on ISO. *4) Package size.
* Spec. & name of products are subject to change without prior notice.

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Vacuum Solutions

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