Progress Report of SESAME Project

A. NADJI

On Behalf of SESAME Team

What is SESAME?

SESAME (**S**ynchrotron-light for **E**xperimental **S**cience and **A**pplications in the **M**iddle **E**ast)

is the first international 3rd generation synchrotron light source

in the Middle East region,

under construction near Amman (Jordan)

Members:
Bahrain, Cyprus, Egypt, Israel, Iran, Jordan, Pakistan, Palestinian Authority, Turkey.
Pending (?): Iraq

Observers: **France, Greece, Germany, Italy, Japan, Kuwait, Portugal, Russian Federation, Sweden, UK and USA**

Purpose: **Foster excellent science and technology in the Middle East (and prevent or reverse the brain drain).**

+ Build bridges between diverse societies, and contribute to a culture of peace through international collaboration in science.

Very Brief History of SESAME

- **1997: proposal by Prof Herman Winick (SLAC) and Prof G.-A. Voss (DESY):**

➔ *rebuild old 0.8 GeV BESSY I in the Middle East, as basis for a new international organization, modeled on CERN, under umbrella of* ***UNESCO.***

- **2002: Shipment of BESSY I to Jordan**

- **2002: decision to build a new 2.5 GeV ring** (BESSY I as injector)

➔ *world* ***competitive*** *device*

- **2003: Ground breaking Ceremony**

➔ *foundation of* ***SESAME***

- **2008: Completion of the building**

SESAME GROUND BREAKING CEREMONY - 6 JANUARY 2003

SESAME building, financed by Jordan

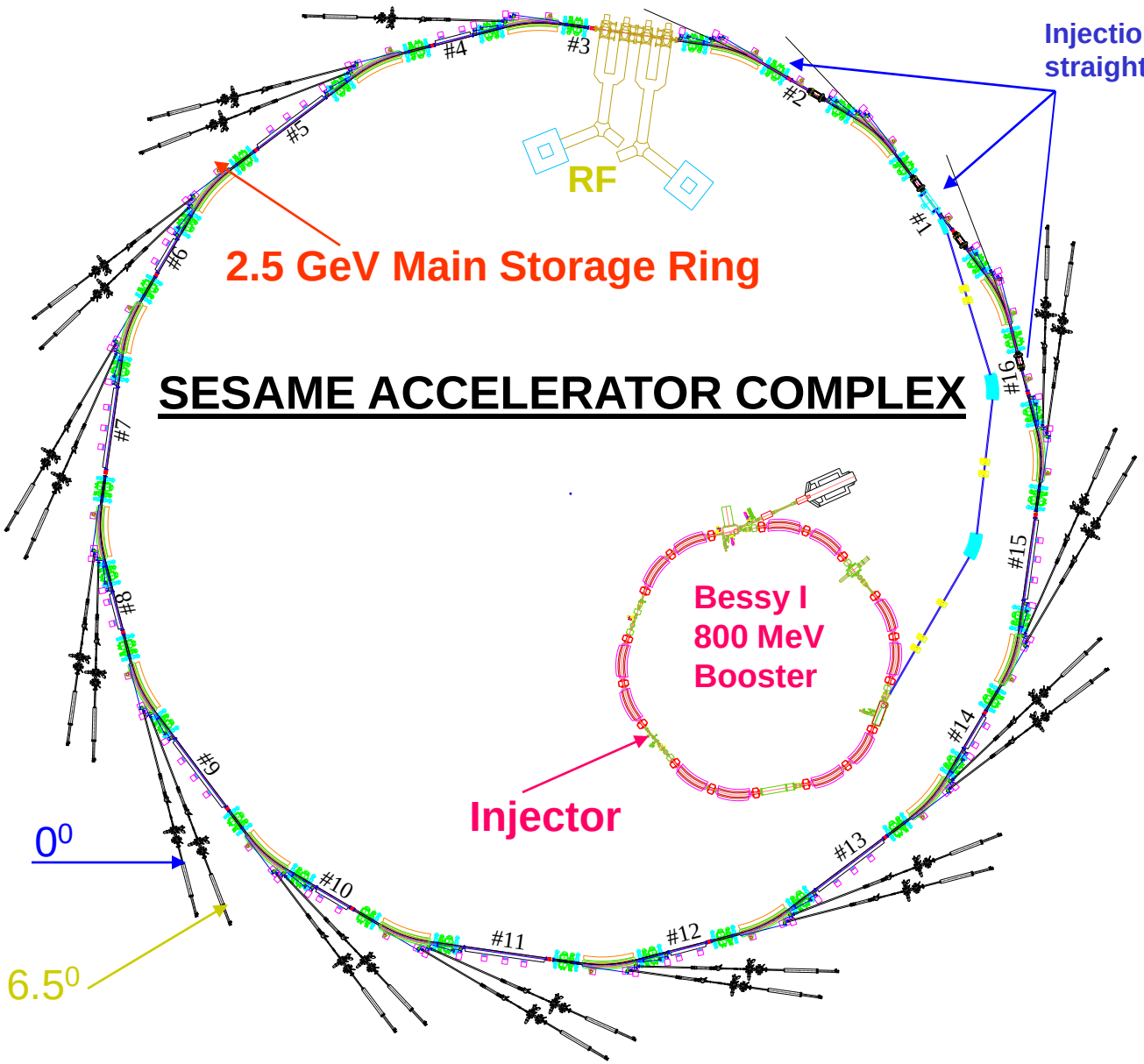
Opening of the SESAME building
3 November 2008

SESAME FACILITY

Main Ring Parameters:

Energy = 2.5 GeV
Circumference = 133.2 m
Emitt. = 26.0 nm.rad
16 Straights sections
{8 x 4.44 m + 8 x 2.38 m}
Up to 28 Beamlines:
12 Insertion Devices
16 Dipole ports with

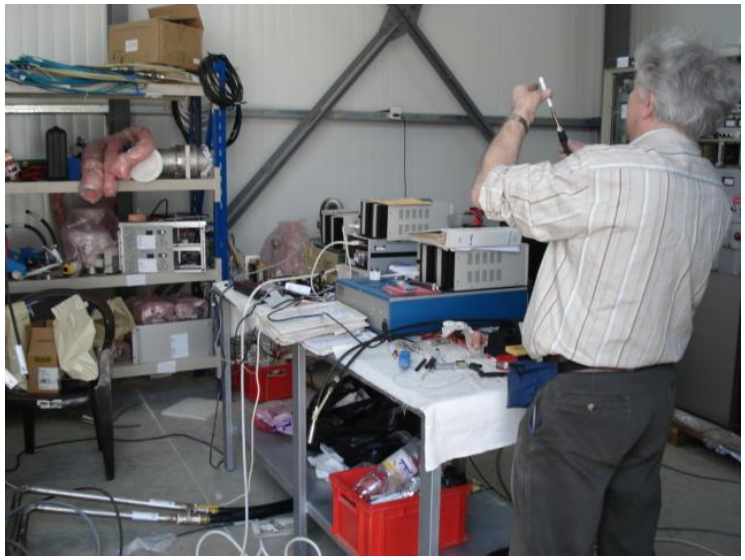
Beamlines length range from 21 m – 36.7 m



Status of the MICROTRON

MICROTRON Subsystems Tests in the Hanger

(April – June 2008)



MICROTRON Installation in the SESAME Experimental Hall

25/08/2008

The *MICROTRON* System installed and tested

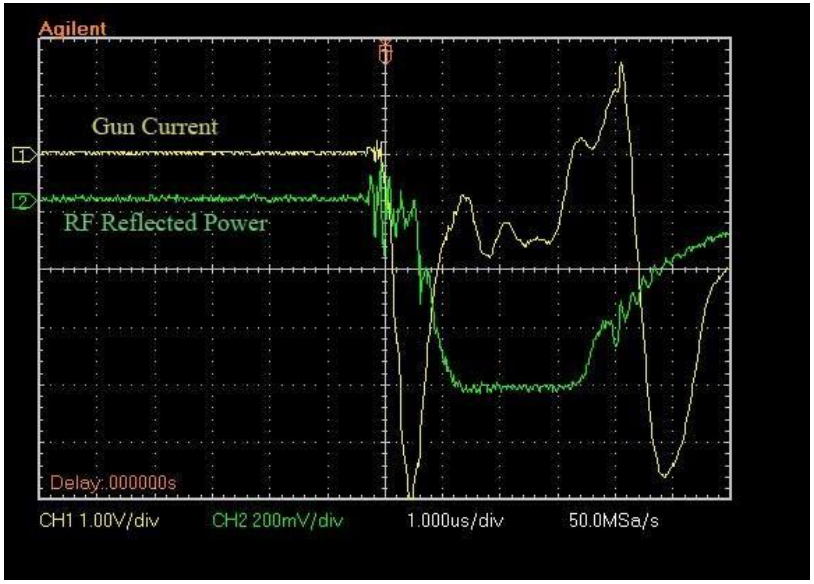
at BESSY (1998)

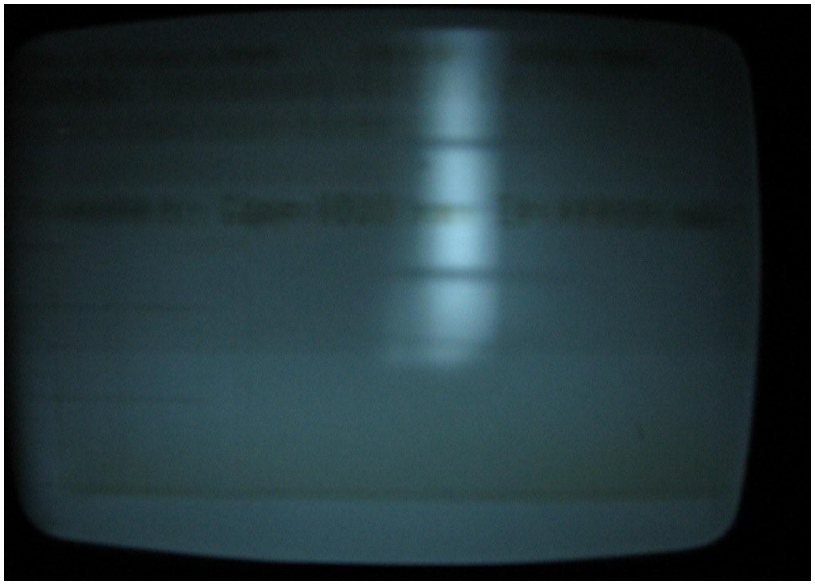
at SESAME (end 2008)

Temporary Shielding for MICROTRON Operation

FIRST SESAME MICROTRON BEAM

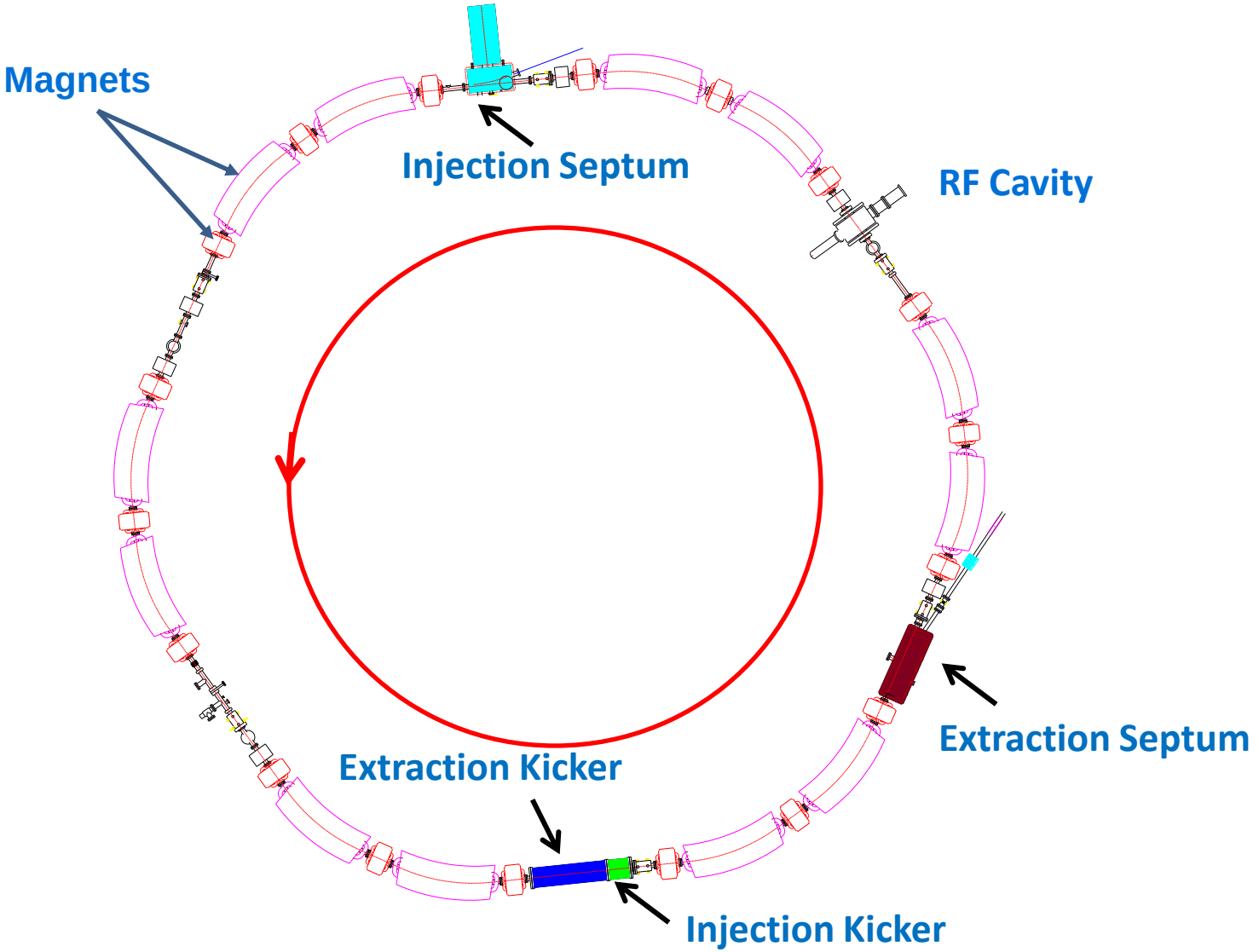
JULY, 14th, 2009 (00:35)





Status of the BOOSTER

Tests of Booster Equipment



Booster's Magnets Hydraulic tests

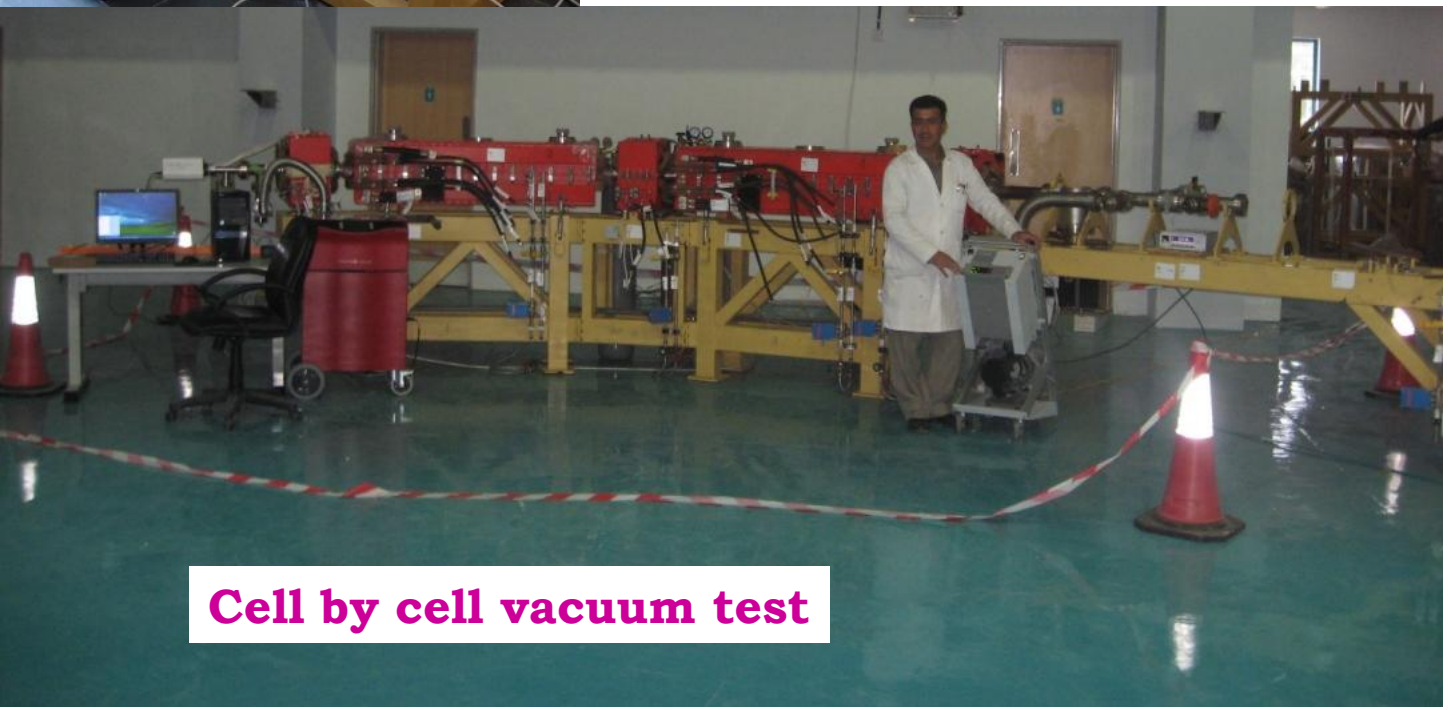
Hydraulic Cell Assembly

Water Magnet Cleaning

Flow Switch Test

Booster Vacuum Tests

In-vacuum injection Septum is being tested inside the lab



Cell by cell vacuum test

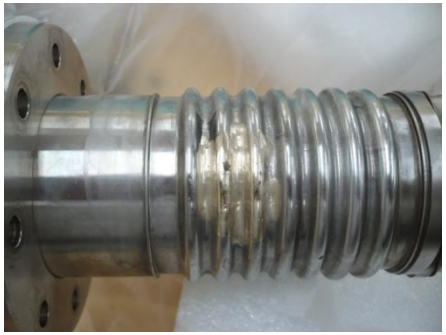
The whole Booster's Vacuum Tests

A worry!

❖ Holes of 1 to 3 cm in length were discovered in **two dipole chambers**. Up to now, the reason is unknown.

❖ Welding using silver, under Argon shield, gave a good result.

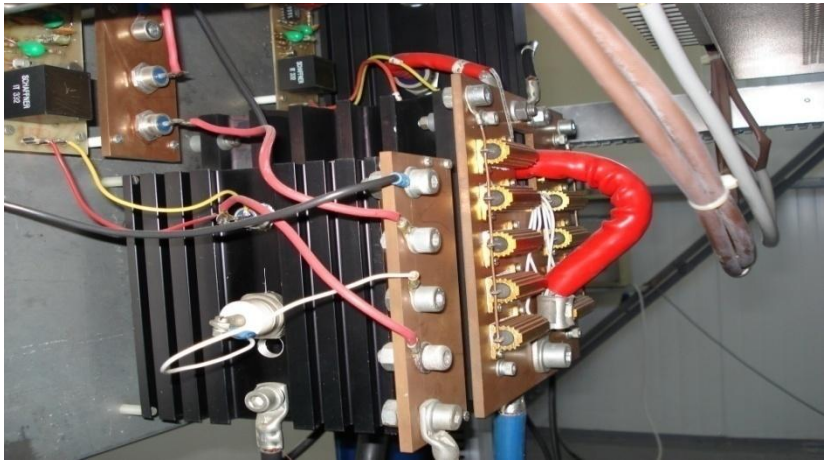
❖ No visible hole in all the other chambers (helium leak detector). Nevertheless, it is essential to understand the reason of the presence of these holes before the installation of the Booster. Inspection is underway.

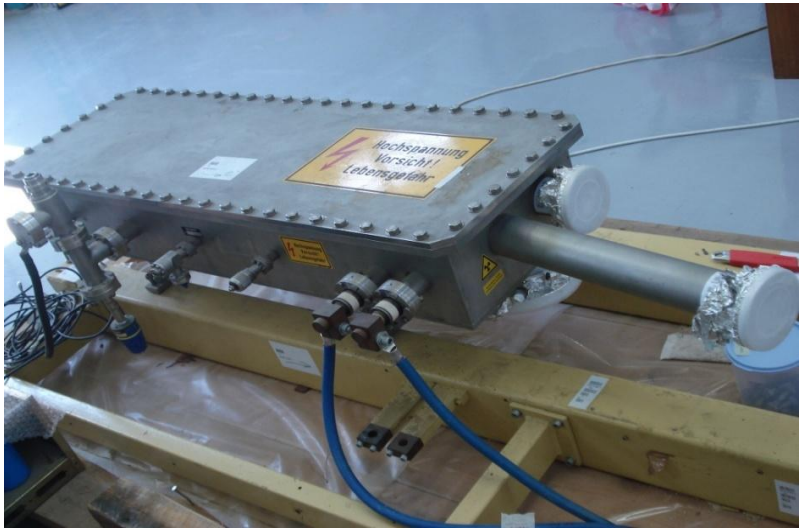


Brazing by DIN 8513 LAG40 CD

Booster's pulsed Injection and Extraction system tests

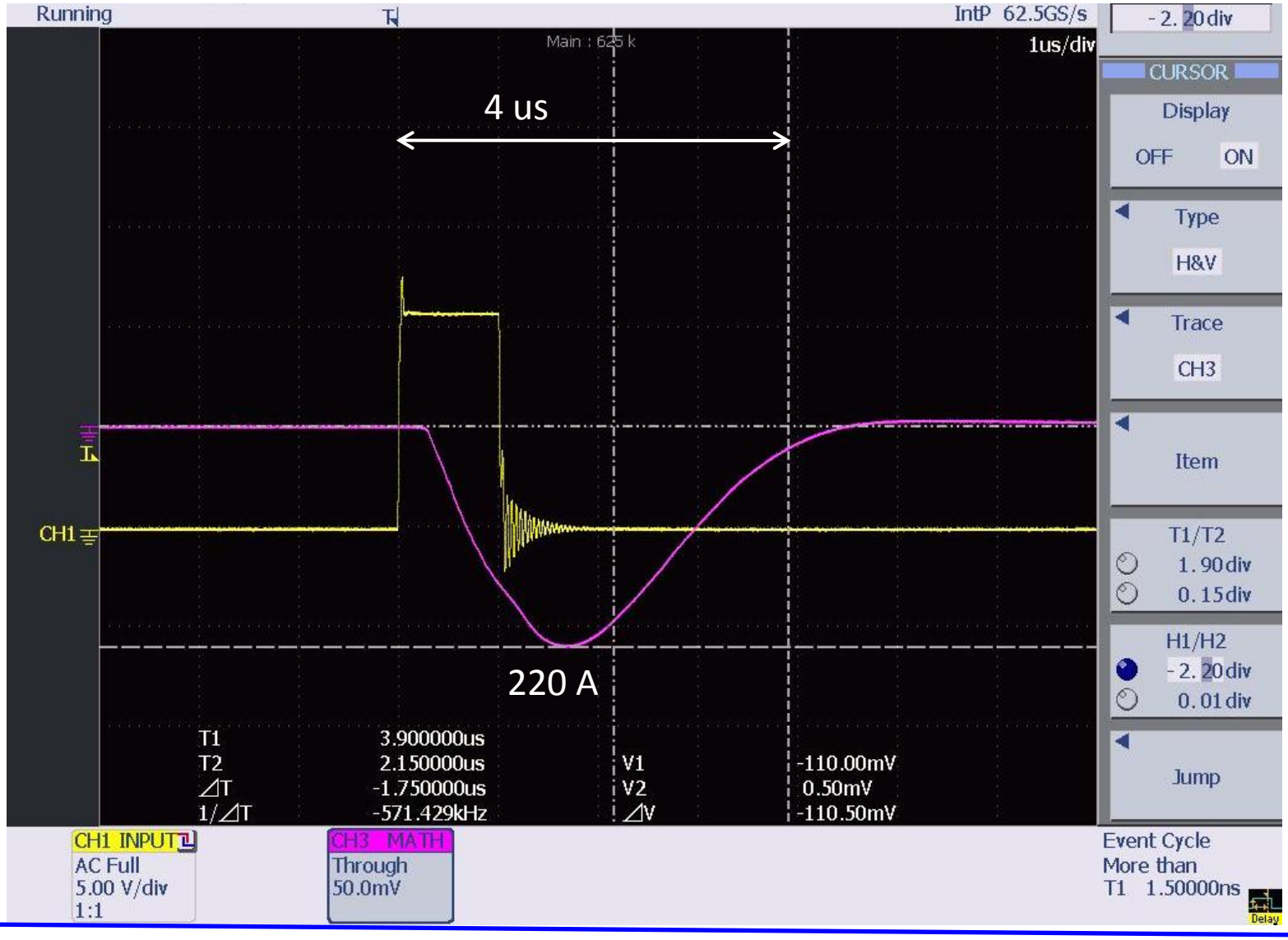
Successfully tested





Booster's pulsed Injection and Extraction system tests

Injection kicker tests results



Booster RF System

- The Booster RF system **is complete** and ready to be installed in the Booster tunnel.

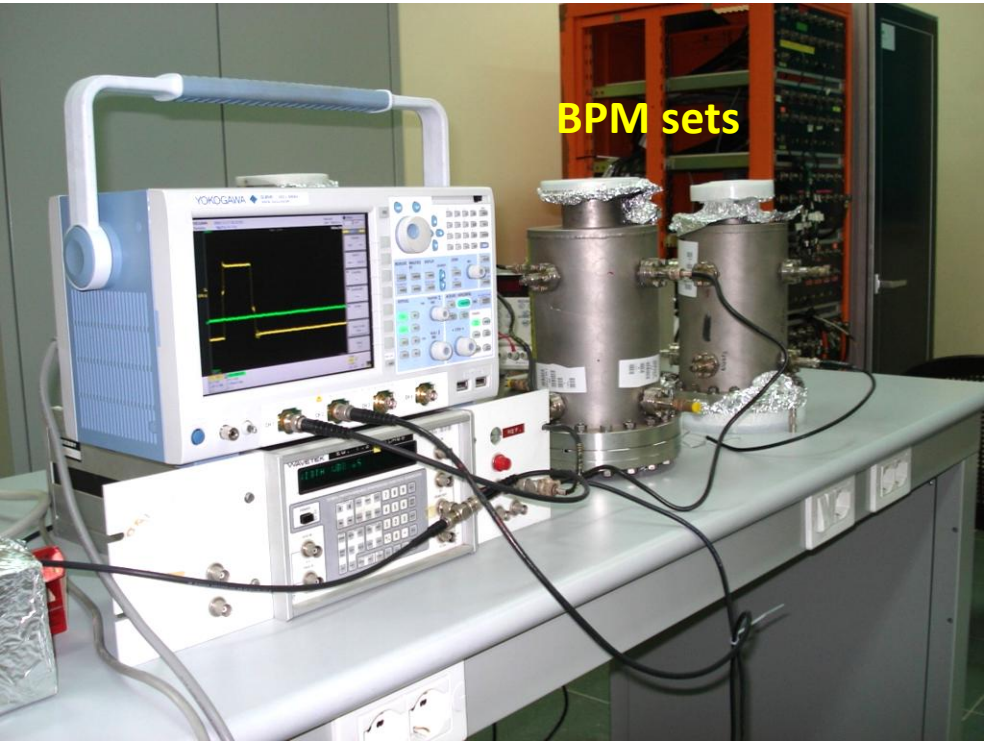
- All the subsystems have been tested and connected, including Cavity, LLRF, solid-state transmitter, interlocks and RF control system.

Booster RF system

Booster RF Cavity during commissioning

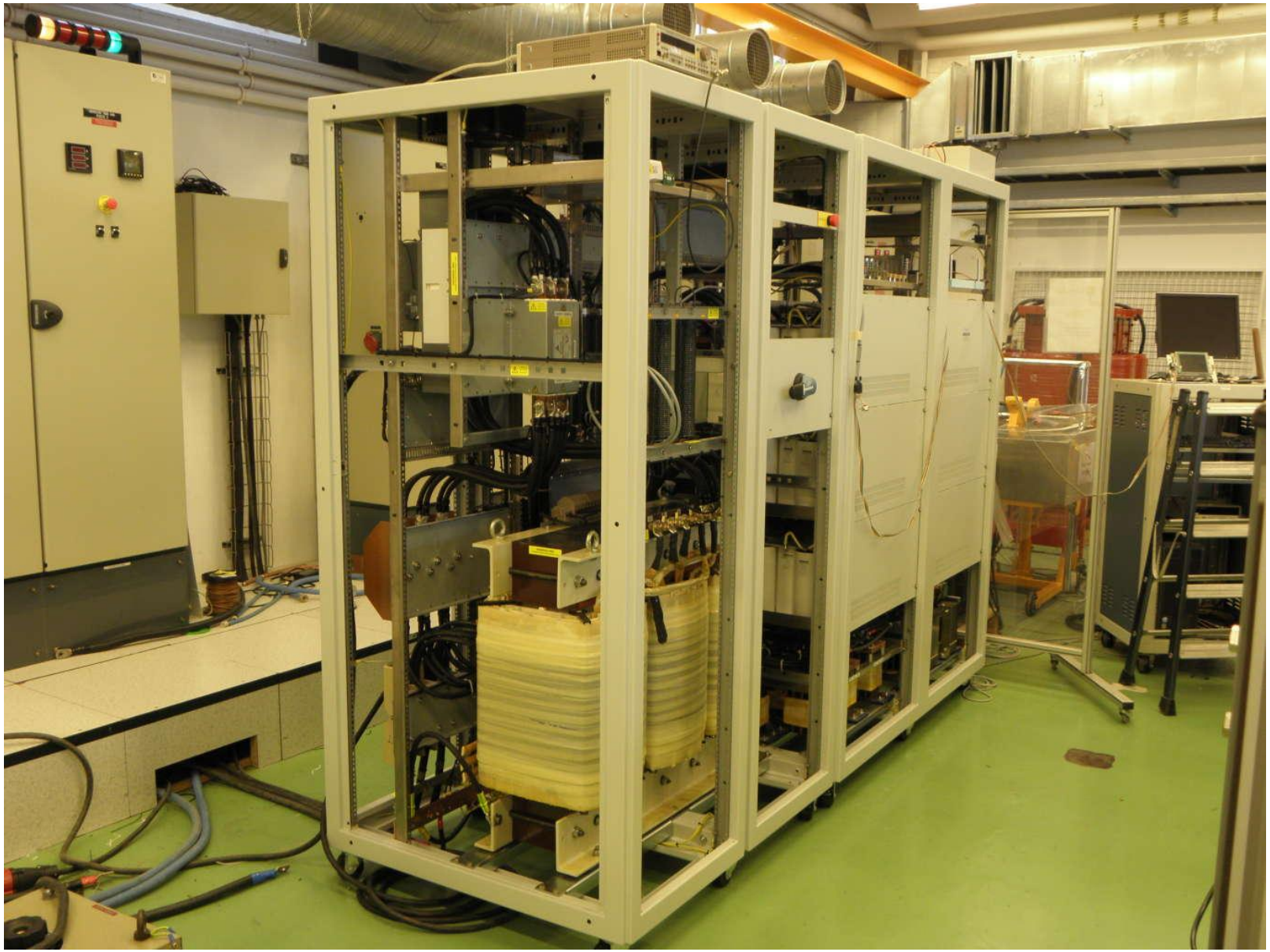
Booster Beam Diagnostics Tests Preparation

BPM sets Response initial tests assembly (Down left), and High frequency termination/50Ω preparation (Down right) at the electric Lab.



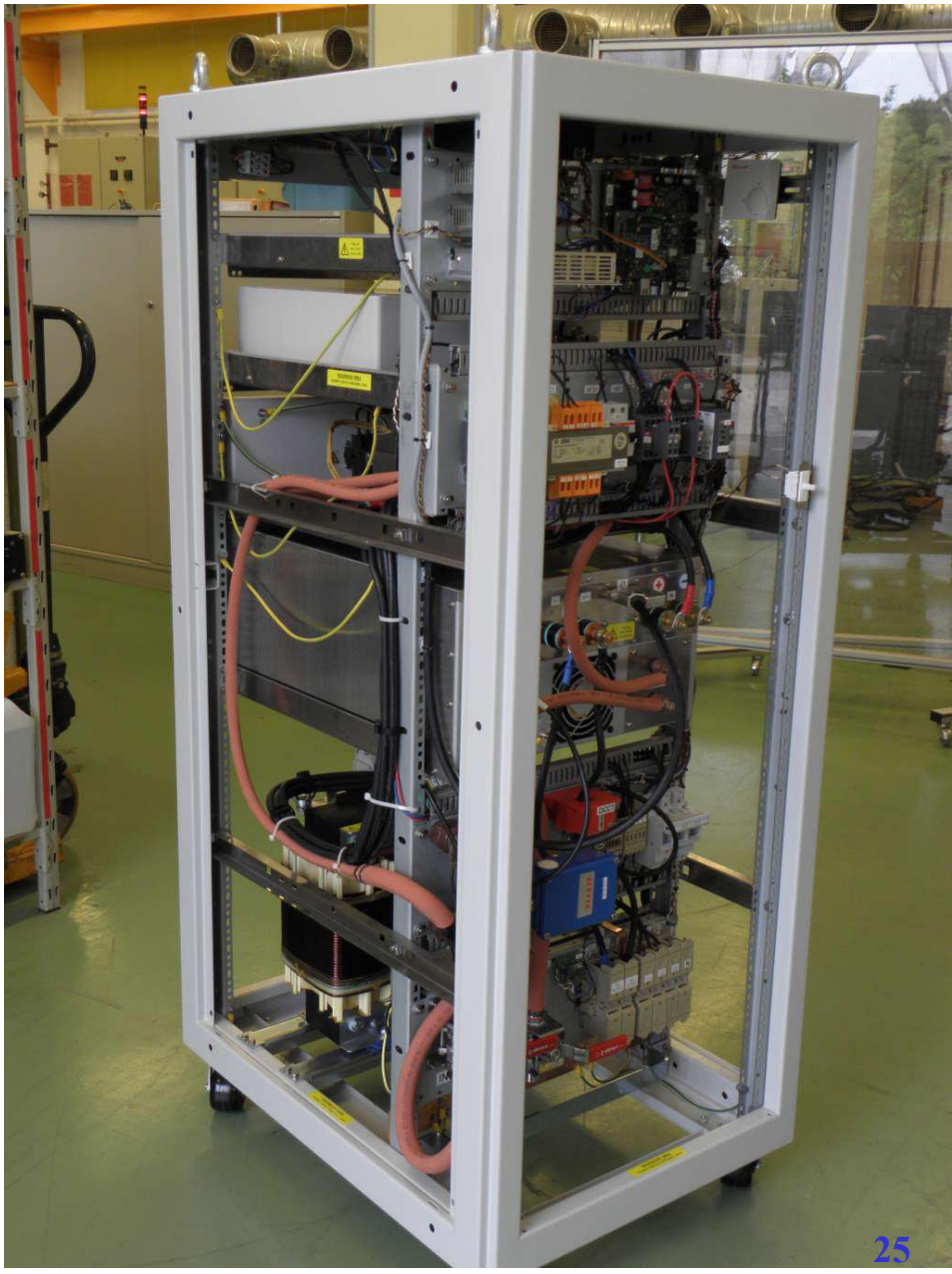
Booster Dipole Magnet Power Supply

Under manufacture at Bruker (France)



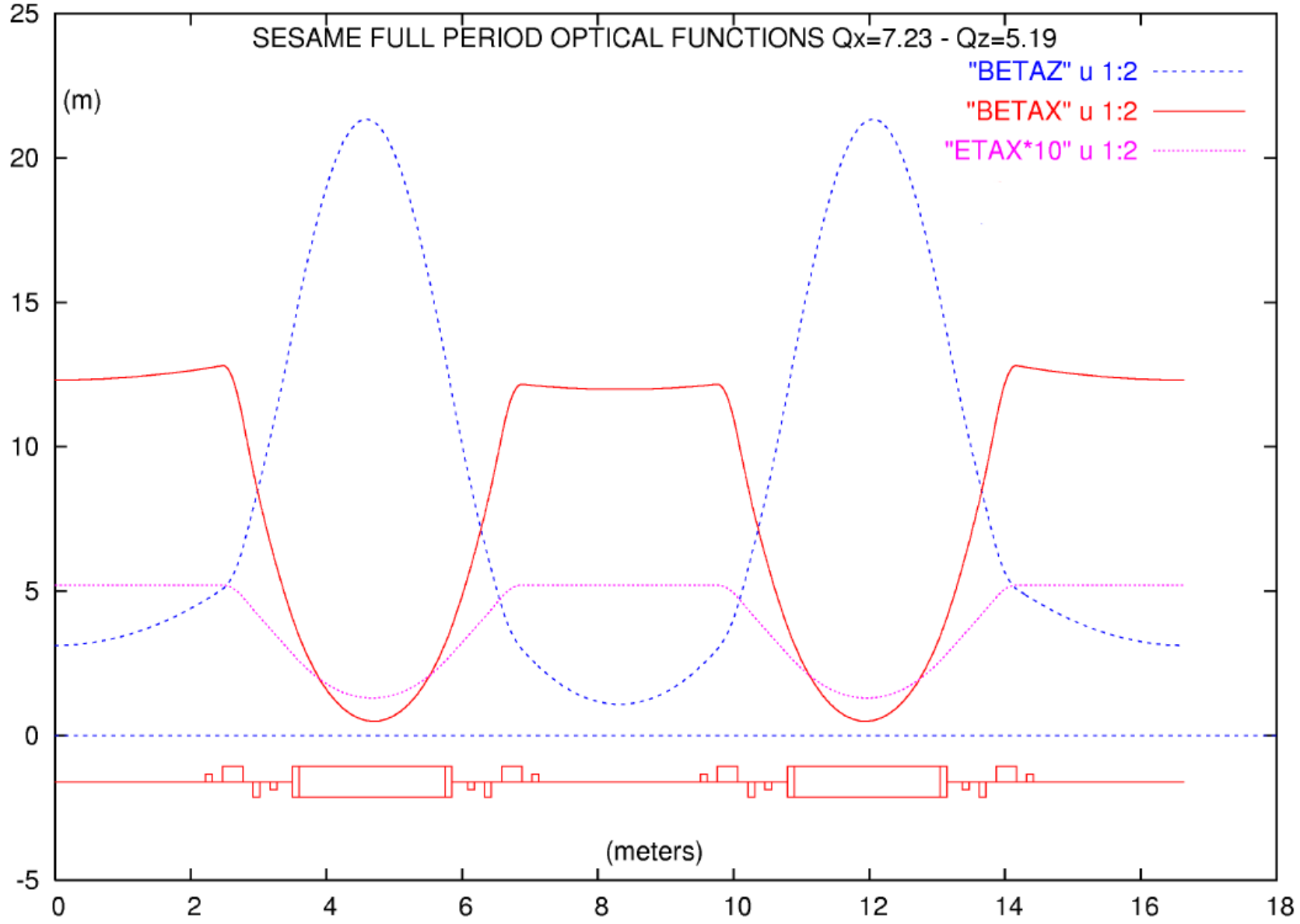
Booster Quadrupoles Power Supplies

Under manufacture at Bruker (France)

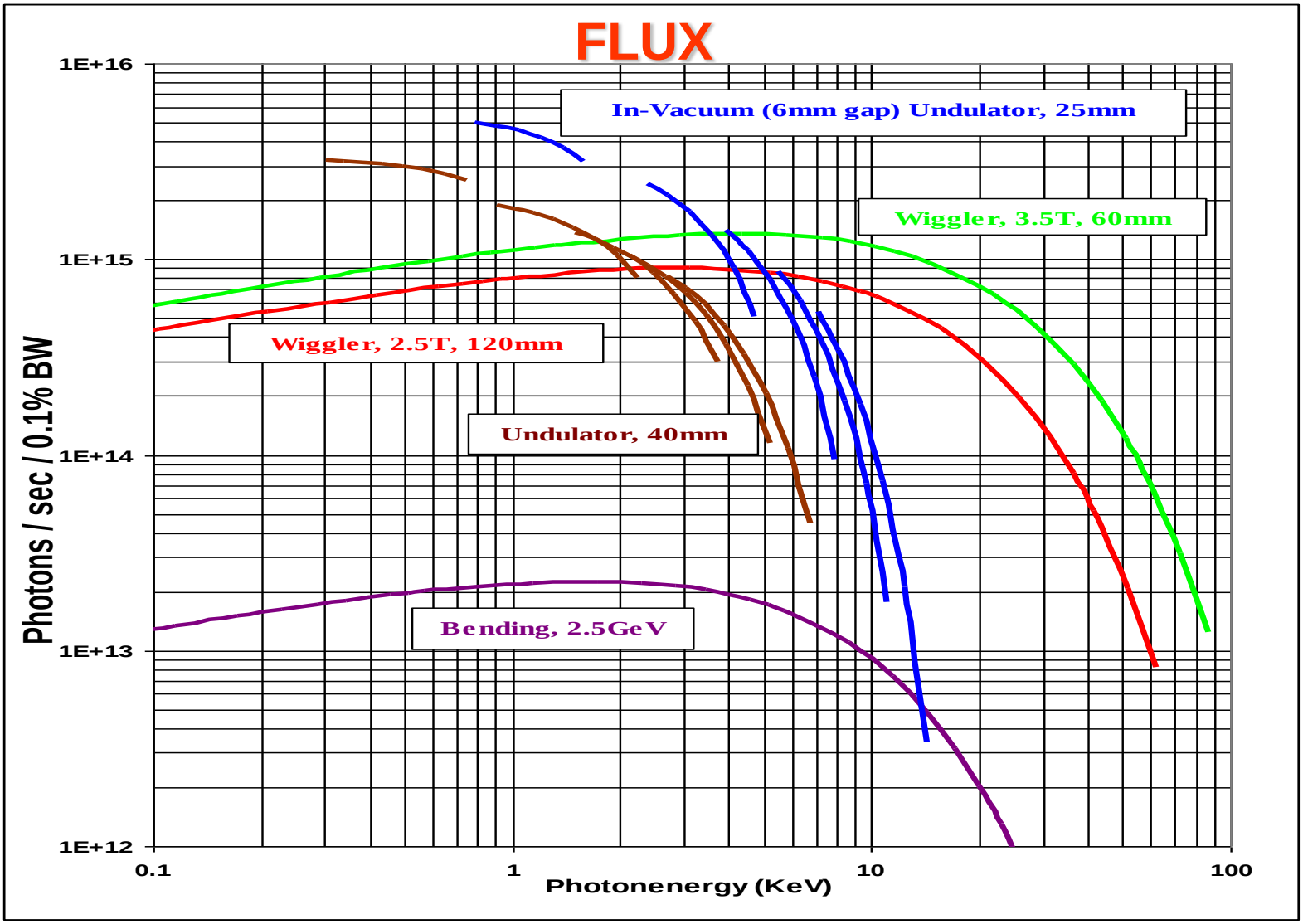


Status of the STORAGE RING

STORAGE RING OPTICS



Radiation from Bending Magnets, Wigglers and Undulators



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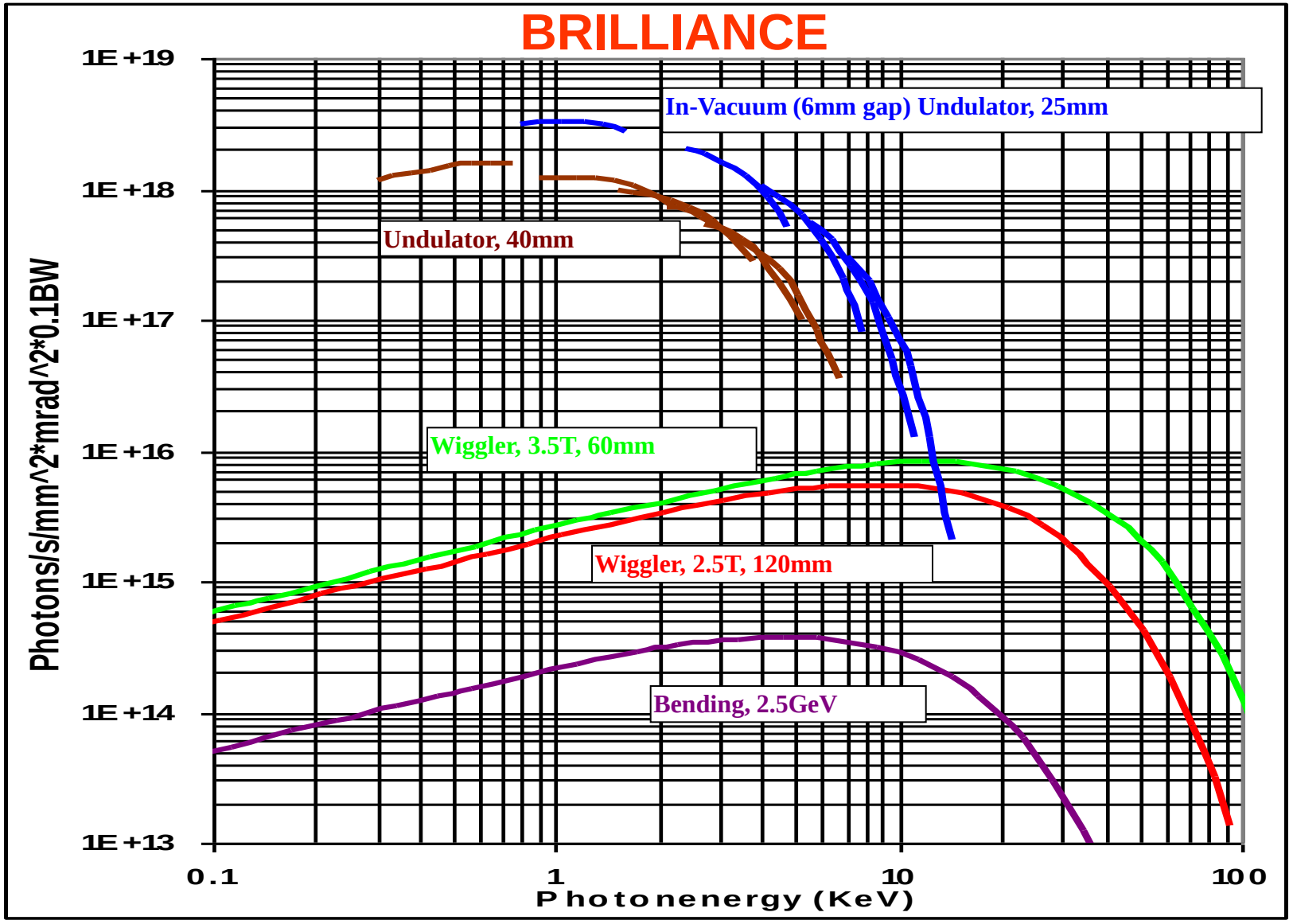
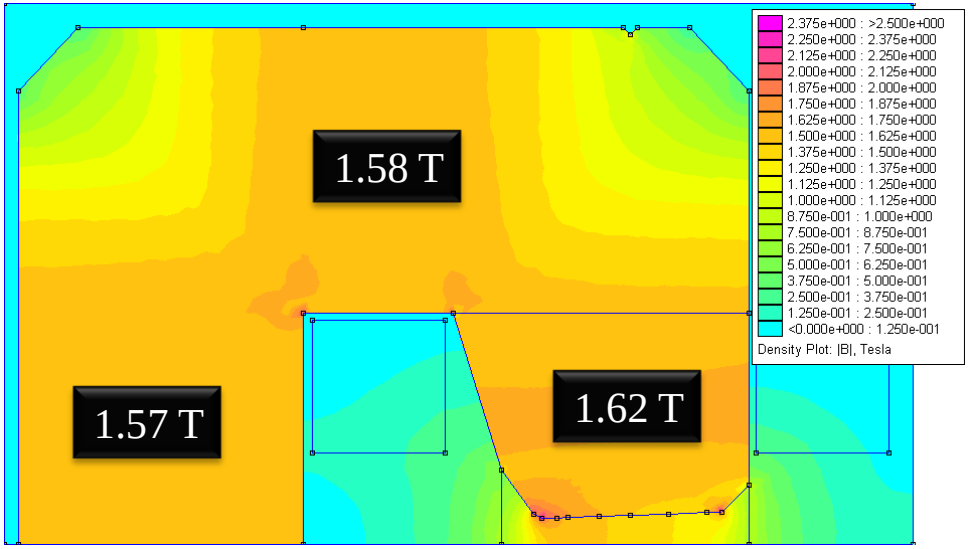
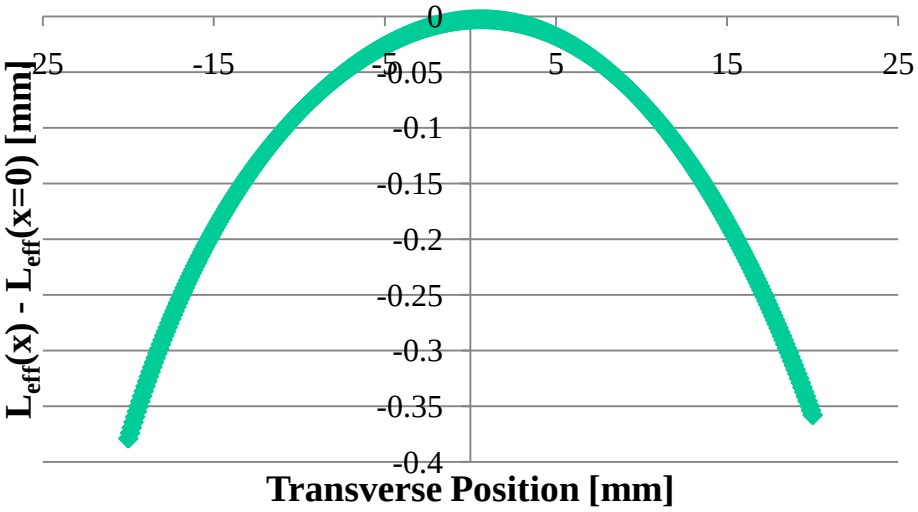
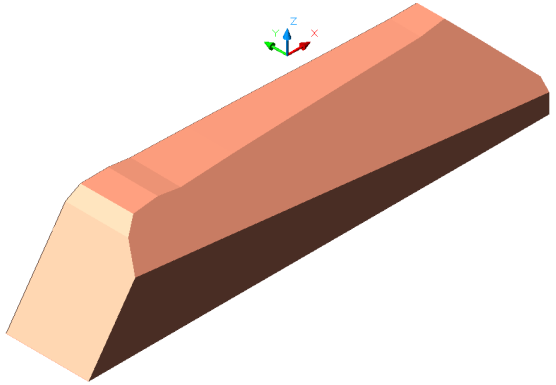


Magnetic Design Complete

Example of the Bending Magnet

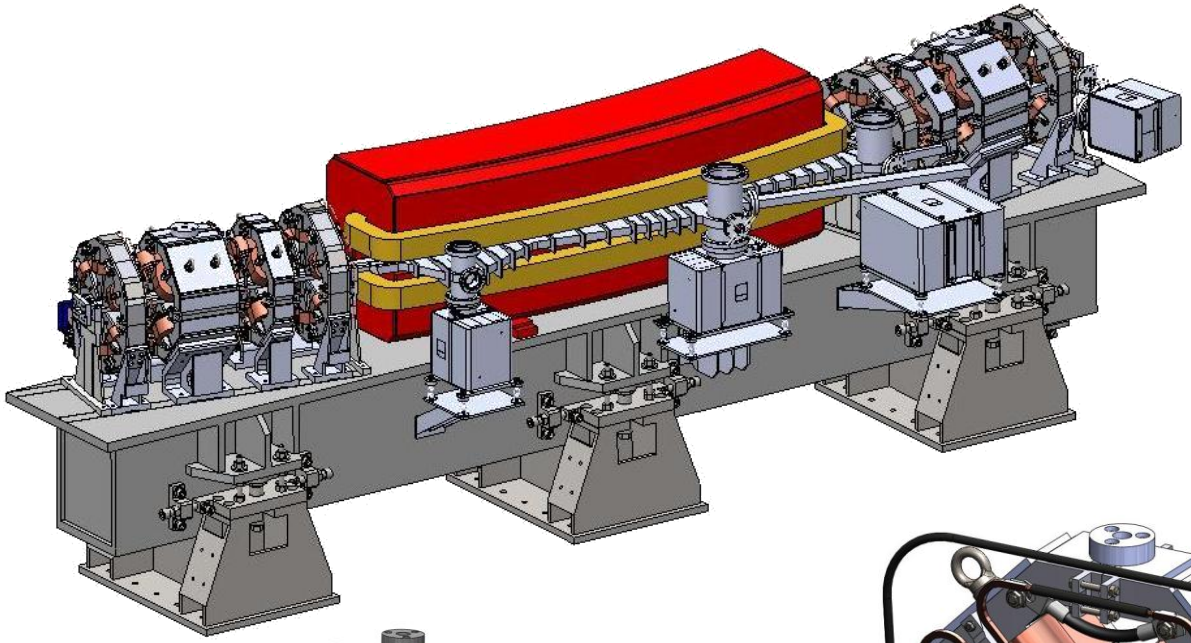


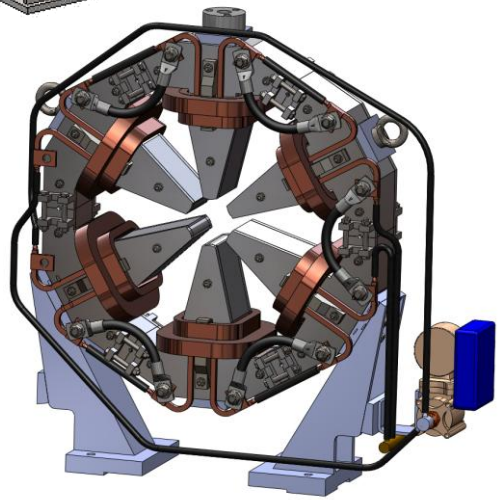


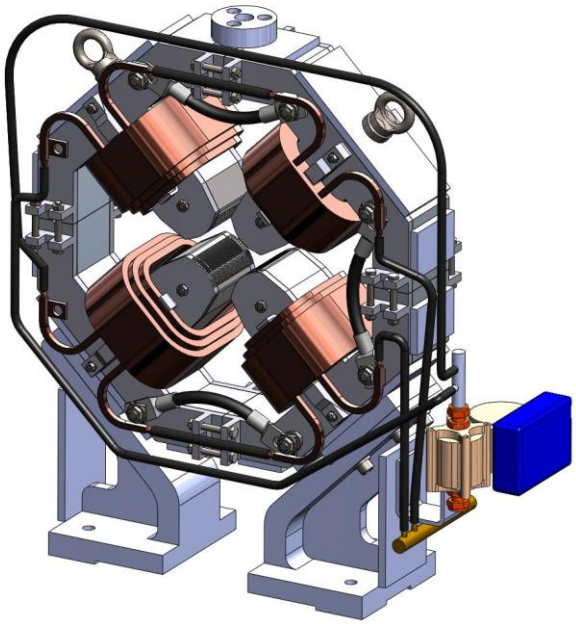


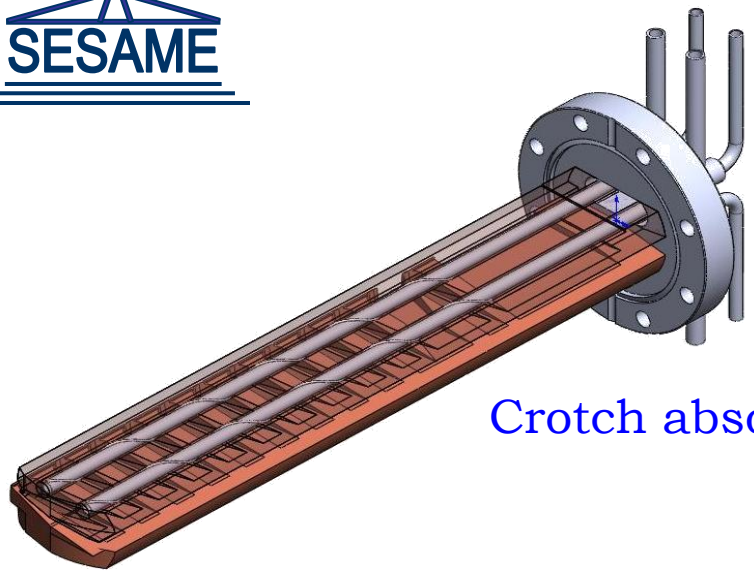
End-chamfer to achieve the same effective magnetic length along the transversal position.

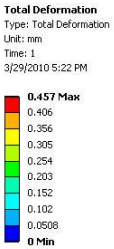
3D Mechanical Engineering Design

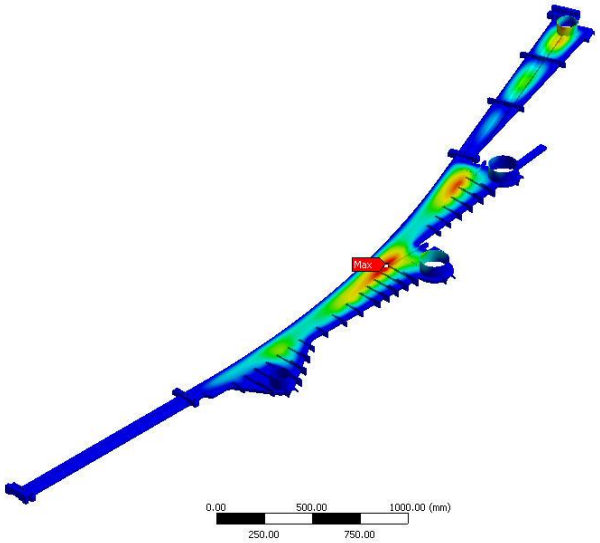




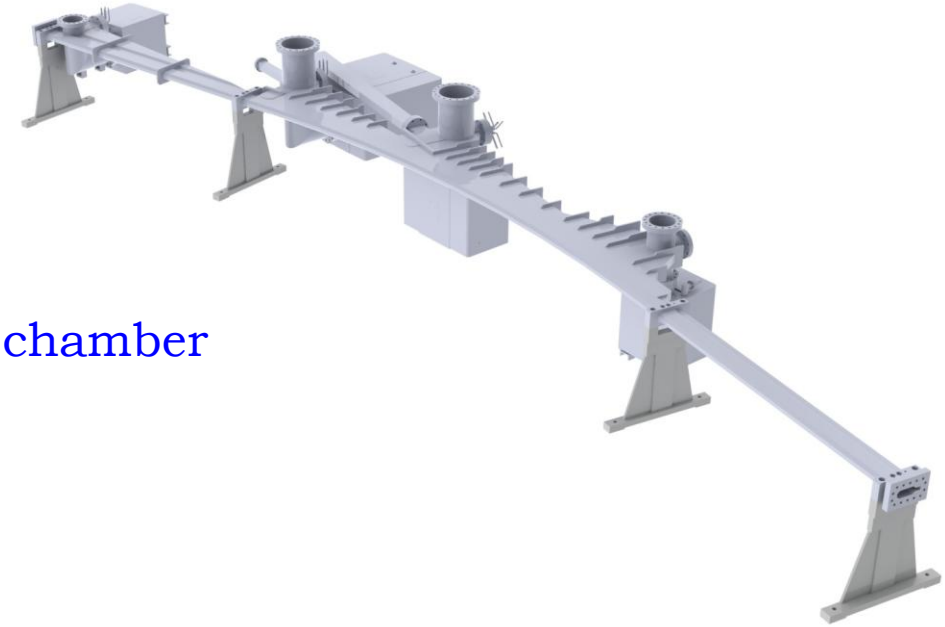








Crotch absorber



Arc vacuum chamber

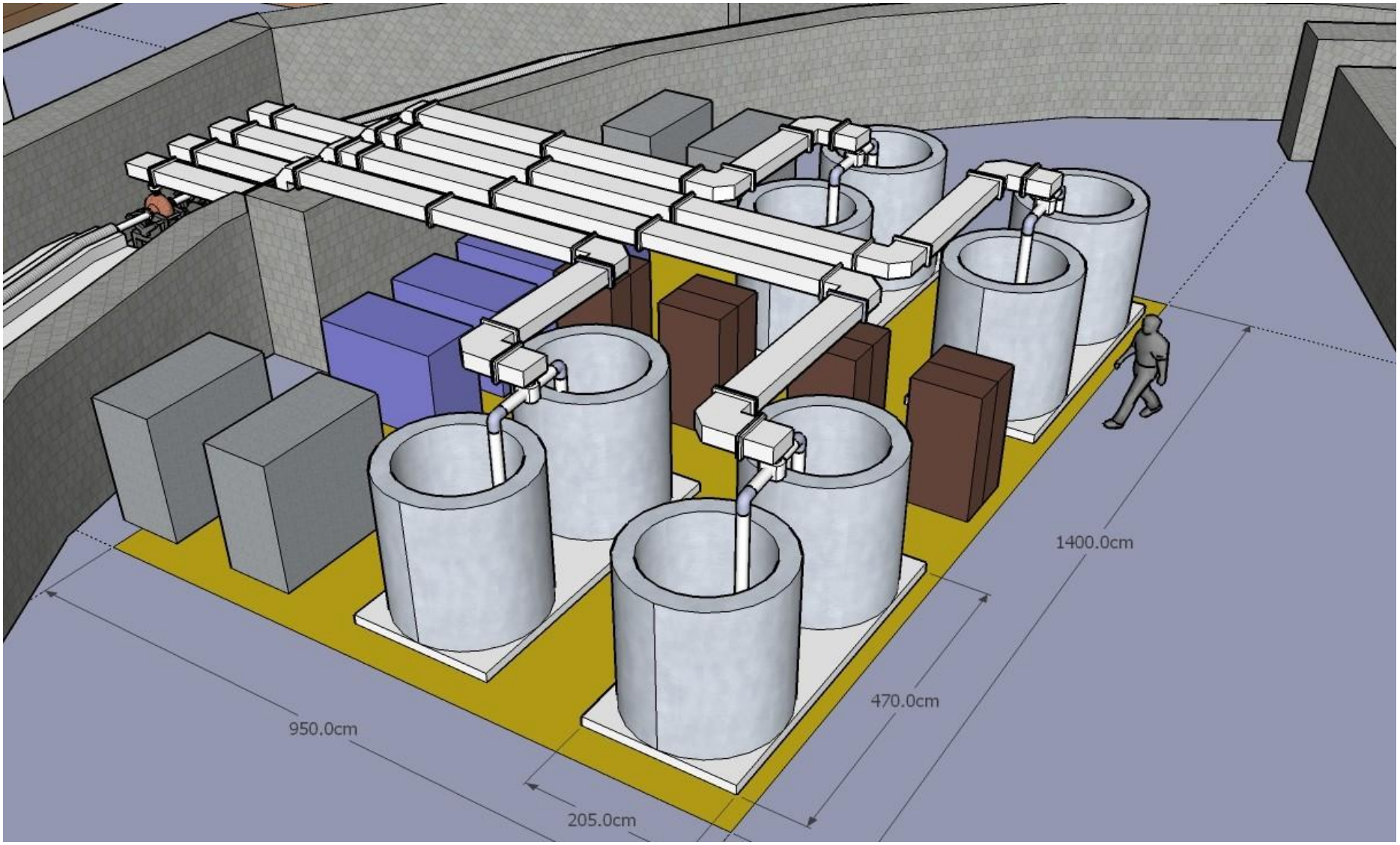
RADIATION SCHIELDING WALL CONSTRUCTION


SESAME

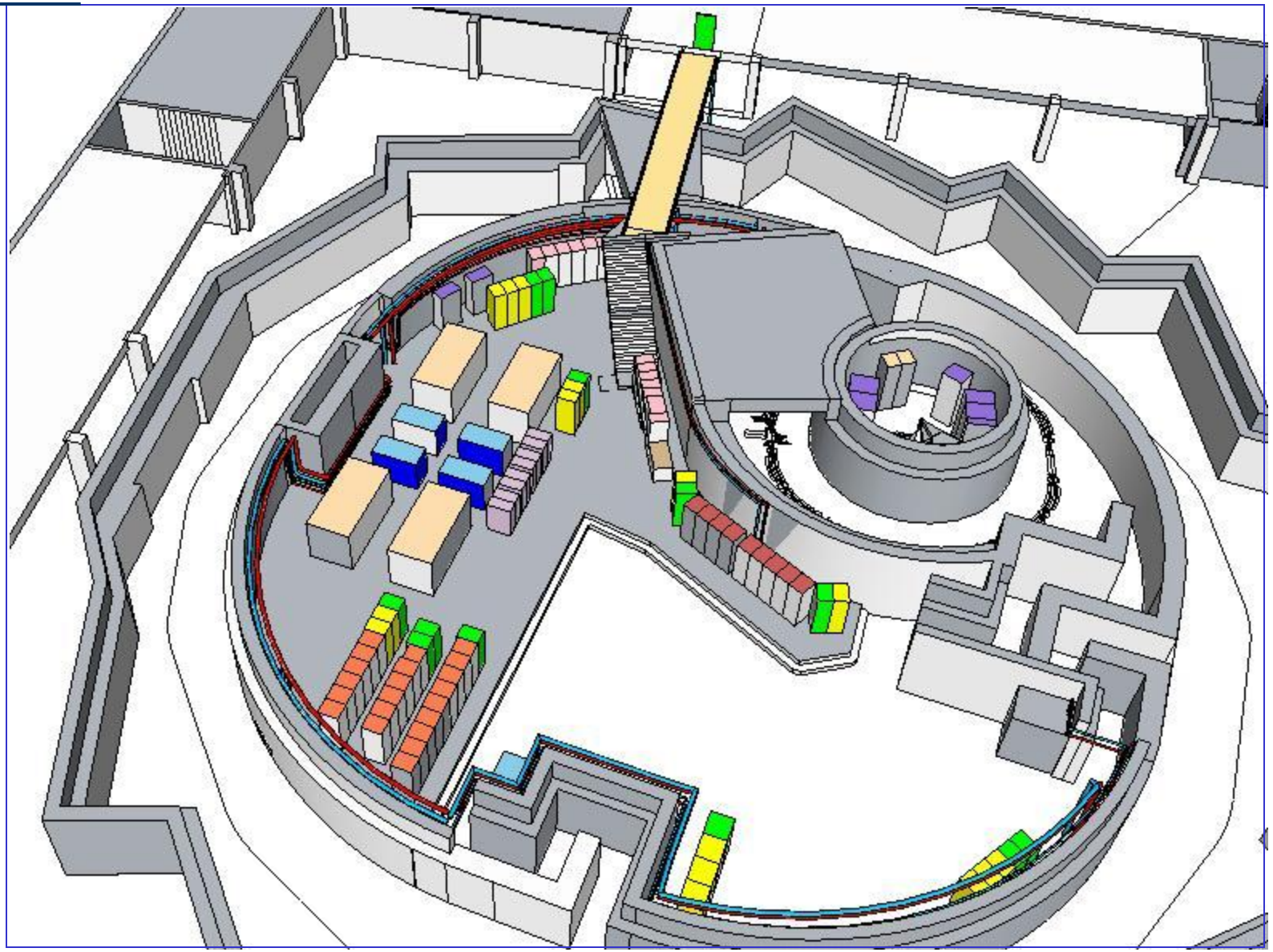

SESAME


SESAME

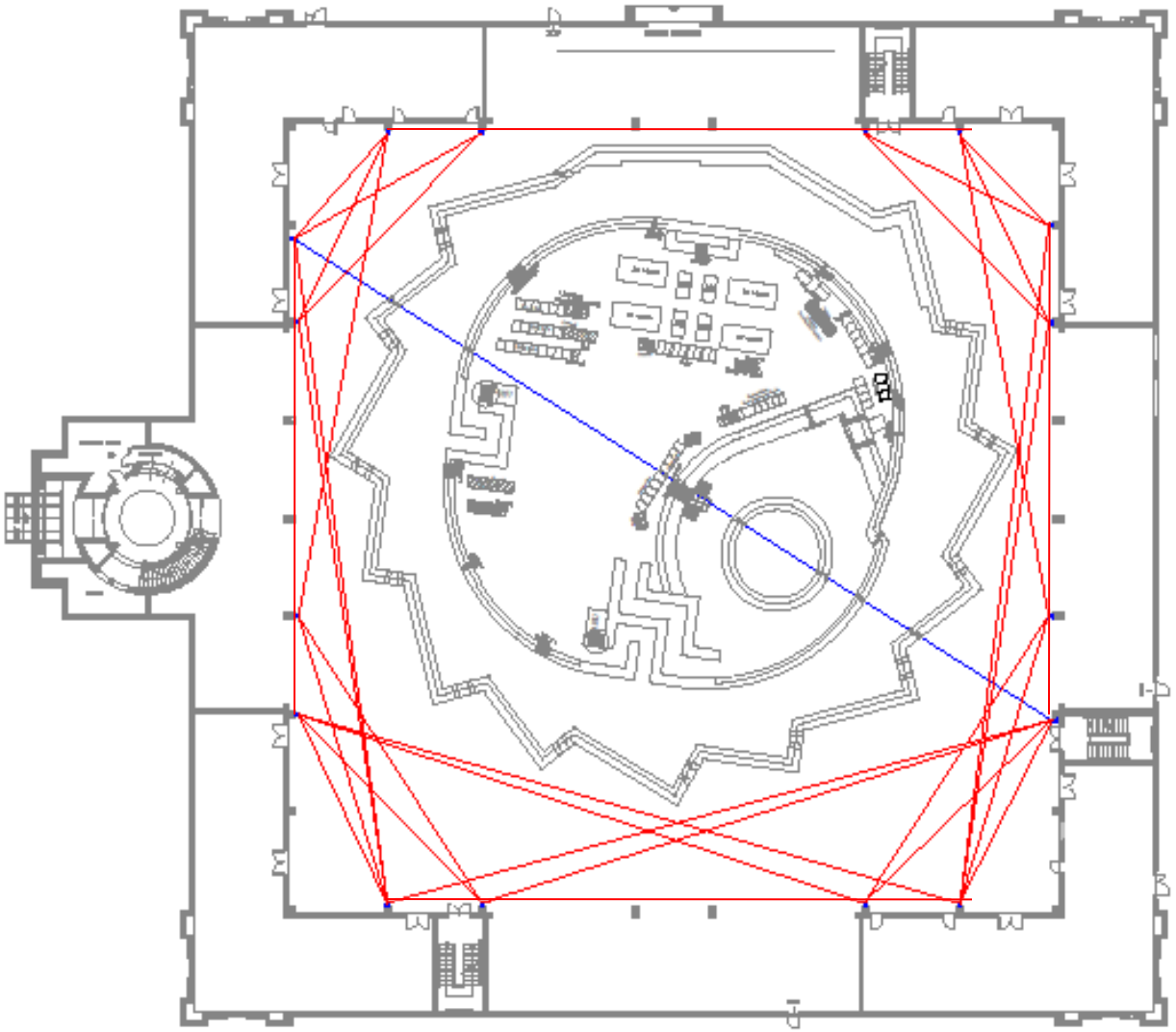
A Proposal for the Installation of the Solid State Amplifiers of the Storage Ring RF System

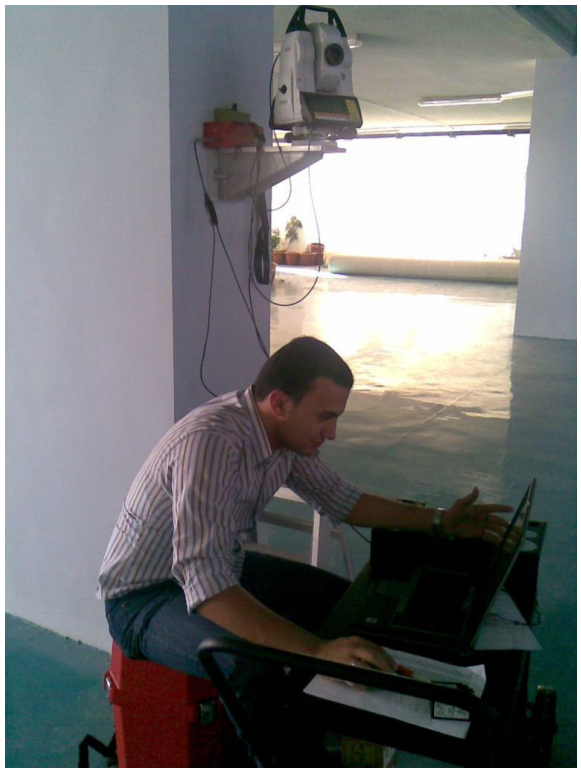


Fitting out of the **Service Area** (to scale)



Survey & Alignment Network

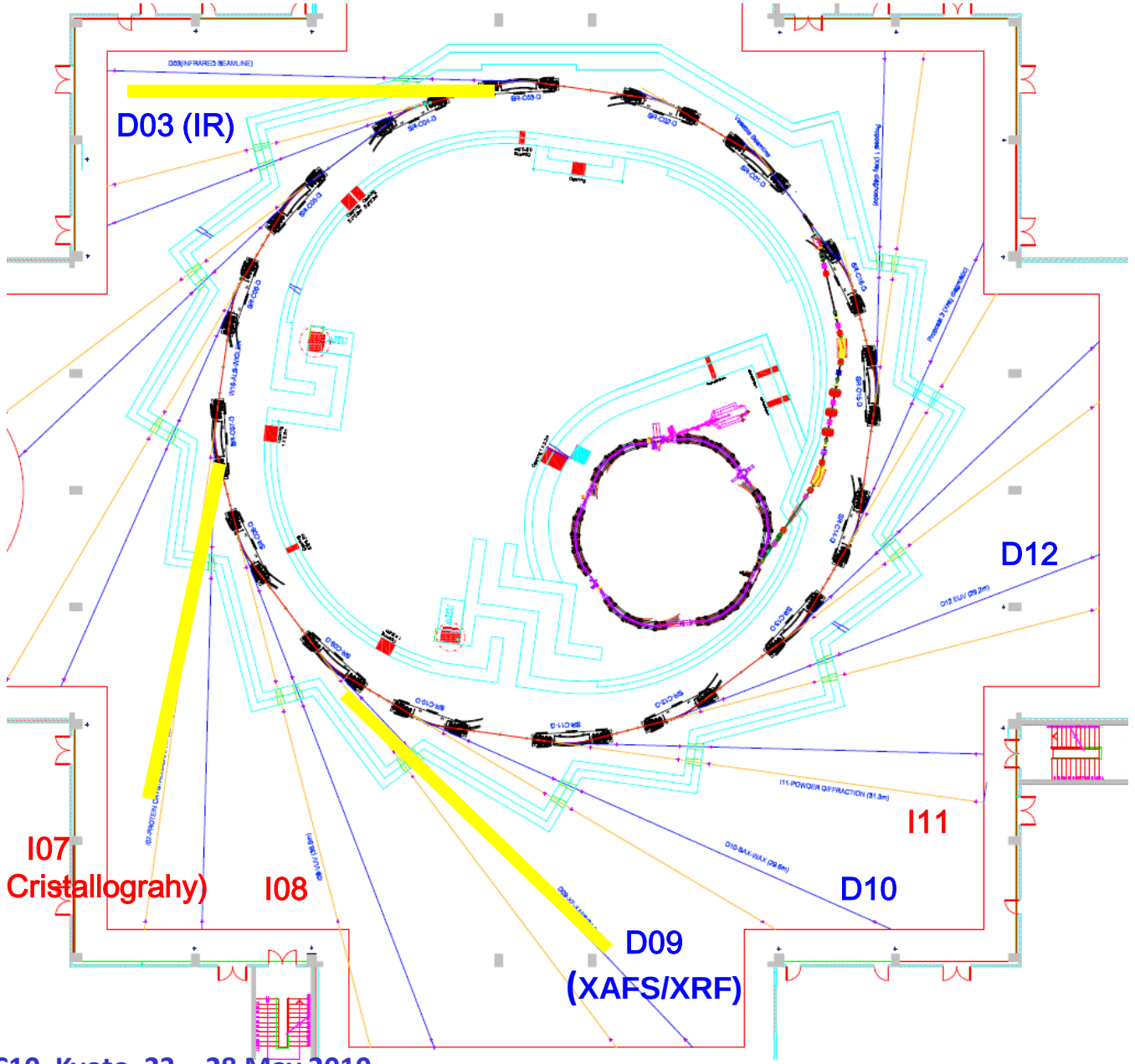




PHASE 1 BEAMLINES

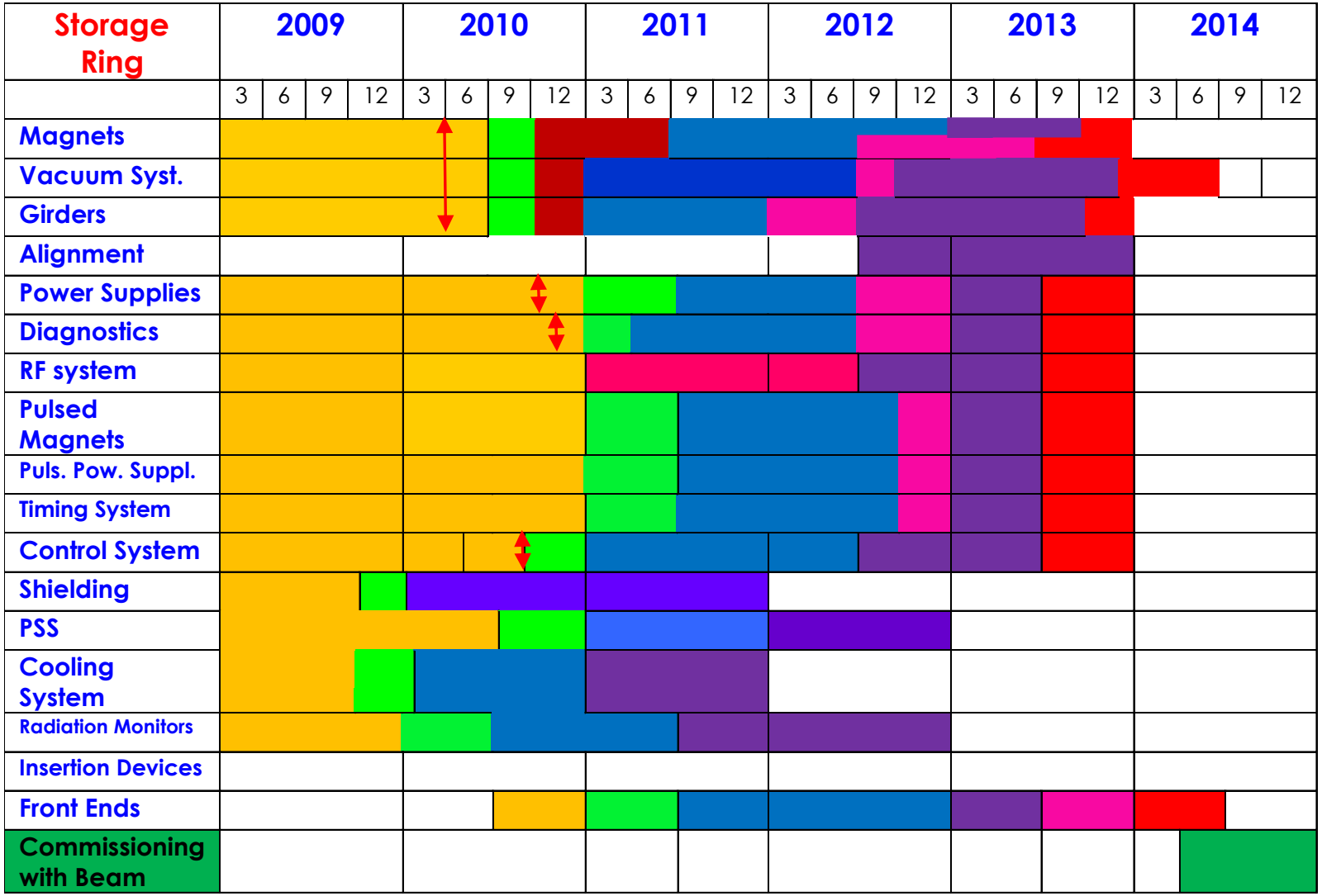
No.	Beamline	Energy Range	Source Type	Donation
1.	Protein Crystallography	4 – 14 keV	Wiggler (ALS)	**Daresbury DL – 14.1 & 14.2**
2.	XAFS/XRF	3 – 30 keV	Bending Magnet	**Daresbury DL – 4.1 & 4.2**
3.	Infra-red Spectro-microscopy	0.01 – 1 eV	Bending Magnet	-
4.	Soft X-ray, Vacuum Ultra Violet (VUV)	0.05 – 2 keV	Elliptically Polarizing Undulator	-
5.	Small and Wide Angle X-ray Scattering (SAXS/WAXS)	8 – 12 keV	Bending Magnet	**Daresbury DL – 16.1**
6.	Powder Diffraction	3 – 25 keV	Multi-pole Wiggler	**SLS**
7.	Extreme Ultraviolet (EUV)	10 – 200 eV	Bending Magnet	**LURE**

Location of PHASE 1 Beamlines



SESAME

Major tasks for the ***Storage Ring*** until the start of the commissioning



Cost of Completing Construction

Item	Budget Without options	Budget With options
Microtron + Booster + Storage Ring (M€)	15.340	17.940
Infrastructure (M€)	3.160	3.160
Contingency (10%) (M€)	1.850	2.110
Total in M€	20.350	23.210
Total in MUS$	30.525	34.815

SESAME Technical Staff

	Name	Field of Activity	Nat.	Hir. Date
1	Maher Attal	Acc. Physics.	Palestine	Jan 2004
2	Firas Makahleh	Cooling and Vacuum	Jordan	Jun 2004
3	Seadat Varnasseri	Diagnostics & Puls. Magnets & Power Supplies	Iran	Jul 2004
4	Adel Amro	Vacuum & Service Area	Jordan	Jul 2004
5	Maher Shehab	Mech. Engineering	Jordan	Feb 2005
6	Darweesh Foudeh	RF & Electronics	Jordan	June 2007
7	Arash Kaftoosian	RF	Iran	Oct 2005
8	Hamed Tarawneh	Acc. Physics/ Magnet	Jordan	Mar. 2006
9	Moh'd. Alnajdawi	Mechanical Engineering	Jordan	June 2007
10	Salman Matalgah	Computing and Network	Jordan	Sept. 2007
11	Ahed Aladwan	Control System	Jordan	March 2007
12	Adli Hamad	Radiation Safety	Jordan	June 2007
13	Thaer Abu Haniah	Alignment & Survey	Jordan	Nov. 2007
14	Tasadaq Ali Khan	RF & Control	Pakistan	Nov. 2007
15	Saed Budair	Vacuum	Jordan	July 2008
16	Muayed Sbahi	Electrical & Cabling	Jordan	August 2008

There are challenges…

- **Construction budget not secure**
- **Need of stable financial support**
- **Increasing the number of member countries in the Gulf as well as in the Maghreb**
- **Compensating the differences in the human and financial resources of the member countries**
- **Solutions to some practical problems involving travel restrictions in the region**

Construction Funds (spent)

- **1.2 M€ from EU – Jordan**

  Electronic, RF, Control and Vacuum **labs**
  Mechanical workshop
  Refurbishment of the Microtron

- **500 kJD from Ministry Of Higher Education- Jordan**

  Network infrastructure

- **3.1M US$ from Jordan Royal Court**

  Alignment tools and network
  Radiation shielding wall construction
  Complement for the network
  Bridge and cable trays

Training Programme

One of the essential objectives of SESAME

- **Funded by IAEA, other organisations around the world, and numerous synchrotron laboratories which provide training opportunities : ALBA, ESRF, PF, SLS, SOLEIL,…**

- **Many workshops, users' meetings: + schools supported by JSPS**

- **Travel support from APS-EPS-IoP-DPG, ICTP and Canon Foundation (UK)**

Strong and Continuous help and advice from SOLEIL.

Signature of the Collaboration between SESAME and SOLEIL (France) (October 23, 2007)

CONCLUSION

- The Microtron has been successfully commissioned with beam at low energy.
- All the existing Booster subsystems have been tested and new Booster magnets power supplies are being manufactured. More investigation are made for the vacuum chambers.
- The shielding wall is under construction.
- The design of the Storage Ring equipment is finalised and technical specifications are ready for call for tender.

We have come this far, we have to believe we will get there

We will keep the faith but we need your help.