MicroTCA Technology Lab at DESY

Start-Up Phase Summary

Thomas Walter
(on behalf of the MSK/ITT teams)
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The European X-ray Free Electron Laser

- 17.5 GeV light source user facility
- TESLA superconducting 1.3 GHz RF cavities
- 1.4 msec RF pulses at 10 Hz
- e-beam 1.35 mA nom. - 4.5 mA max
- Dec. 18th 2015: first beam in injector
- 2015-2016: main tunnel installation
- Q1 of 2017: main linac commissioning
- May 4th 2017: first lasing
- End of 2017: first user operation
European XFEL
MicroTCA

- open (no vendor lock-in)
- modular
- broadly supported (PICMG)
- high performance
- compact
- versatile
- reliable (through redundancy and “hot plug & play”)
- remote diagnostics/remote management
- economical

Transfer potential:
- accelerator community
- other research facilities
- industry!

Figure 1. The MicroTCA family of specifications maximizes reuse from its ATCA and AMC parent specifications.
Rear Transfer Module (RTM)
- rearside cable access
- mostly analog
- signal sampling & conditioning

Advanced Mezzanine Card (AMC)
- mostly digital
- latest FPGAs
- data processing
MicroTCA Technology Transfer

Source: https://www.helmholtz.de/en/transfer/technology_transfer/transfer_instruments/

since 10/2016
HIL-02 „MicroTCA Technology Lab“

07/2012-12/2014
HVF-0016 „MicroTCA.4 for Industry“
HVF: Hardware development, community support

> analog/ digital signal processing boards

- DAMO-2
- DAMO-TC07
- DAMO-D037
- DAMO-C050
- DAMO-FMC25
- DAMO-FIV-6
- DAMO-VM-2
- DAMO-VM-5.5
- DAMO-EC84
- DAMO-EC28
- DAMO-EC26

Support activities

- Annual MicroTCA Workshop (~150-200)
- MicroTCA Helpline
- Website: [http://mtca.desy.de/](http://mtca.desy.de/)
- MicroTCA Starter Kits
- MicroTCA Trainings (Basic, Advanced)
MicroTCA Technology Lab / MSK interaction

“MSK/TechLab Mixed Zone“:
306 – Advanced Measurements/ Special Equipment
305 – Kitchen/ Hospitality
304 – Meeting Room

“TechLab Core Zone“:
307 – Programmers 1 and 2
308 – TechLab Guests/ Storage
Hallway – Showcases and Posters
309a – Production Workshop
309 – Demo/ Test Lab
310 – Showroom/ Meeting room
MSK – Maschine Strahlkontrollen

Responsibilities:

- Beam stabilization systems (transversal/longitudinal) in storage rings & linacs
- Timing for pre-accelerator systems
- Precision magnet controls for DESY II
- Precision synchronization systems on femtosecond level Special Diagnostic devices
- RF Control Systems for the accelerator structures (LLRF)
MicroTCA Technology Lab – basic facts and figures

- MicroTCA.4 → „MicroTCA“
- 5 year project, official start in October 2016
- 2,5m EUR grant, 5m EUR total budget
- team: 5-7, close collaboration with DESY MSK
- mid-term evaluation after 2,5 years
- mission: facilitate industrial applications based on MicroTCA, build „enabling space“ for collaborations with industrial partners
- break even after year 5
- continue HVF technology transfer: support, training, workshops, (
- )
- expand services beyond HVF, build regular business operations:
  - design services & product development (HW, FW, SW)
  - high-end test and measurement services
  - consulting (configuration, integration)
VHDL

- Board support packages
- MGTs >10Gbps
- High performance PCIe drivers

Hardware

- board development/ upgrades
- latest FPGAs: Virtex 6, Kintex 7, Zynq
- board portfolio
- signal integrity >10Gbps
- advanced board material
- next generation backplanes
- test adapters and calibration kits

System Integration

- vendor-independent, modular configurations
- Custom designs for specific applications

https://www.xilinx.com/
MicroTCA Technology Lab – high-end test/measurement

- 20 GHz / 80GS Scope
- Compliance testing
  - PCIe Gen3
  - 10GB Ethernet
  - DDR3/4 RAM
  - USB 3.0

*PCIe Gen3 testing in a medical technology device*
MicroTCA Technology Lab – Team status

Legend

- position filled
- position advertised 06/17
- position to be advertised later

JOB OFFERS.

DESY offers challenging tasks in an international setting

http://www.desy.de/about_desy/career/job_offers/index_eng.html

MSK - Maschine Strahlkontrolle
ITT - Innovations- und Technologietransfer
TechLab/MSK – Software development framework and tools

- MicroTCA AMC
- TMCB2
- Other DOOCS Server

- PCIe Backend
- ReboT Backend
- DOOCS Backend
- Dummy Backend

Device Access Library

Application Core

Control System Adapter

- EPICS Adapter
- OPC-UA Adapter
- DOOCS Adapter
- Tango Adapter

* Control system and Hardware Interface with Mapped and Extensible Register-based device Abstraction Tool Kit

* https://github.com/ChimeraTK/
TechLab – Context: Entrepreneurship in PROs


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**TechLab – Context: Entrepreneurship in PROs**

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<td>Steinmo, M. and Rasmussen, E.</td>
<td>(2016)</td>
<td>➔ <em>proximity parameters</em> of firm-PRO interactions: social, geographical, organisational, cognitive; science-based vs. engineering firms</td>
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<td>Coccia, M. and Rolfo, S.</td>
<td>(2010)</td>
<td>➔ <em>matrix organisation</em> for Italian PROs (to make them more entrepreneurial)</td>
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<td>Klein, P. et al</td>
<td>(2010)</td>
<td>➔ <em>research framework</em> and summary of open research questions/ research opportunities</td>
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<tr>
<td>Tether, B.S. and Tajar, A</td>
<td>(2008)</td>
<td>➔ <em>patterns of PRO use</em> in the UK: R&amp;D, financial commitment to innovation, human capital, degree of innovation</td>
</tr>
<tr>
<td>Rothaermel, F. T. et al</td>
<td>(2007)</td>
<td>➔ <em>how to make universities more entrepreneurial</em></td>
</tr>
<tr>
<td>Lockett, A. et al</td>
<td>(2005)</td>
<td>➔ <em>role of tacit knowledge</em> transfers, location issues</td>
</tr>
<tr>
<td>Hindle, K. and Yencken, J</td>
<td>(2004)</td>
<td>➔ <em>structure of innovation process</em> and spin-off creation</td>
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TechLab – Focus area: Infrastructure

- removals
- asbestos clean-up
- carpets
- ceiling tiles
- electrics/ lighting
- LAN/ WLAN
- safety/ security/ access control
- audio visual equipment
- painter/ decorators
- graphics design
- carpentry/ furniture
- lab installations
- locksmithery/ doors
- airconditioning
- plumbers
- ...
TechLab – Focus area: Personnel

> Timeline:
  - October 2016: official project start
  - January 2017: job advertisement placed
  - April 2017: job interviews, candidate selected
  - May 2017: negotiations successful, paperwork completed
  - September 2017: candidate starts
  - ~ end of 2017: onboarding/qualification completed
  - March 2019: mid-term evaluation of the project

> Time-limited contracts

> Public pay scale
TechLab – Focus area: Processes

- Price indication / official quotation
- Contractual paperwork for collaboration agreements
- Procurement of non-standard IT
- Outbound logistics (insurance!)
- Project-specific cost controlling and budget transfers
- Website set-up (sub domain DESY)
- DESY CI-compliant marketing material
- ...

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TechLab – Focus area: Strategy

- objective: sustainable innovation strategy
- questionnaire + two-stage workshop:
  - Resources, leadership, culture, organisation, clients, location, context, technological environment, …

Technology X from DESY (Helmholtz Association)

- student team from TU Berlin/Potsdam, 2 month project
- market research/ market strategy (update)
- fresh ideas?

Federal Ministry of Education and Research

ENABLING INNOVATION
Your best estimate? (... x2)

- Team diversity
- Celebrate victories (also the little ones)
  - Enlist top-level support
  - Working relationships
    - 80/20
  - Go explore…
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