

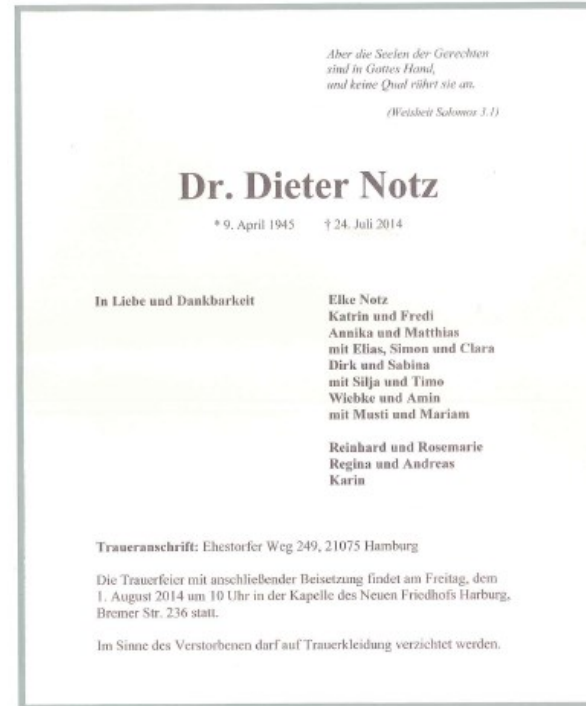
Helmholtz Validation Fund Results and Perspectives "MTCA.4 for Industry"

and workshop organization



Dr. Holger Schlarb
MSK, DESY
DESY, 10.12.2014

- Dieter Notz, 69, passed away unexpectedly....



He provided us the main guidance and shaped this event ...
and we sadly missed him in the course of the preparations for this year workshop.

Email from Elke Notz:

Best wish to you and your team for successful MTCA-workshop.
My husband would have deeply enjoyed to be present ...

What is the HGF validation fund?

- Finance instrument to support the spin-off and technology transfer from scientific, technical inventions or developments from HGF centers to the industry and society
- Validation: increase of value (material/immaterial) with direct application to society / industry
- Ideally: generate commercial product

Boundaries:

- Duration max. 2 years
- Funding max. 2 M€/a (50% by HGF)
- Not extendable!

Helmholtz-Validierungsfonds
auf einen Blick



(1) Mit Inanspruchnahme der Schutzrechte
(2) Projektschritte sind in der Regel: 1. Validierung, 2. Kommerzialisierung, 3. Realisierung

Weitere Informationen finden Sie im Leitfaden zur Antragstellung, der wie die Ausschreibung und die Antragsformulare zum Download zur Verfügung steht: www.helmholtz.de/ausschreibungen

Ansprechpartner

Kontakt:
Für weitere Fragen stehen Ihnen die Technologietransferstellen der Helmholtz-Zentren zur Verfügung.

Ihr Ansprechpartner in der Geschäftsstelle der Helmholtz-Gemeinschaft ist:
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Anna-Luise-Karsch-Strasse 2
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joern.krupa@helmholtz.de

Foto credit: Helmholtz-Bericht



HELMHOLTZ-GEMEINSCHAFT
DEUTSCHER FORSCHUNGSZENTREN
HELMHOLTZ-VALIDIERUNGSFONDS

HELMHOLTZ
GEMEINSCHAFT

- Nov. 2005: Reliability Workshop in Grömitz, Germany
 - **Joint meeting with ILC** (intern. linear collider, 33km, 500GeV)
- Dec. 2007: XFEL Crate-Standard Workshop
 - **MicroTCA and ATCA was defined to be used**
- Mar. 2009: First PICMG Meeting “xTCA for Physics”
 - **Hardware group: rear I/O and timing**
 - **Software group: standardization of interfaces for FPGAs...OPsys**
- Oct. 2011: Official announcement of PICMG Specification
 - **“MTCA.4 Enhancements for Rear I/O and Precision Timing”**
- Jul. 2012: Start of Helmholtz Validation Fund
 - **„MicroTCA.4 for Industry“**
- Jan. 2014: Significant activities with HW/SW PICMG working groups

➔ **Talk from Ray Larsen, SLAC**

Main objectives of project:

Establish MTCA.4 electron crate system

- In accelerator community
- Industrial branches
- Scientific community

by reducing the market entry barriers and foster MTCA.4 to industry

Business model:

- Marketing for the RF controls modules via Company using DESY License

Funding distribution: **4 Mio€**



AP1: Industrialize modules of the RF control system

AP1.1 Revision of existing modules

- AP 1.1.1 Field Detection (uDWC)
- AP 1.1.2 Controller (uTC)
- AP 1.1.3 RF driver unit (uVM)
- AP 1.1.4 Local RF-Generation (uLOG)

AP1.2 Cost opt. for Single Cavities Applications

- AP 1.2.1 Field detector with RF driver (uDWC-VM)
- AP 1.2.2 High-end Digitizer (DAQ-LNC)

AP1.3 Extending Portfolio in Frequency

- AP 1.3.1 Field detector with RF driver (uVM, 0.35-6GHz)
- AP 1.3.2 Local RF-Generation (uLOG, 0.35-6GHz)
- AP 1.3.3 RTM with local clock circuit (uCLK-RTM, 10–350MHz)
- AP 1.3.4 Global clock generation (uCLK-eRTM, 10-350MHz)

AP1.4 Supplementary systems for RF control

- AP 1.4.1 Multi-channel Direct RF-sampling (uDS800)
- AP 1.4.2 AMC carrier with motor/RTM with Piezo driver (uFMC20)

AP1.5 Introduction of RTM-RF Backplane

- AP 1.5.1 Development of RTM-RF Backplane concept
- AP 1.5.2 Crate integrated RF source (uOSC_eRTM)

AP2: Completion of MTCA.4 for industry and institutions

AP2.1 Extension of product portfolio for MTCA.4

- AP2.1.1 Industrial production of timing module
- AP2.1.2 2 GSPS, 4 channel, 12bit ADCs on RTM & AMC
- AP2.1.3 32 ch., 40MSPS, AMC-RTM with analog shaping capability
- AP2.1.4 Management low noise power supplies

AP2.2 EMI optimization and classification of MTCA.4 components

- AP2.2.1 EMI test board development
- AP2.2.2 EMI current distribution in MTCA.4 crate
- AP2.2.3 Optimization of crate-contact transitions
- AP2.2.4 Shields for AMC/RTM boards
- AP2.2.5 EMI Bypass-concept
- AP2.2.6 Vibration studies and vibration reduction
- AP2.2.7 EMI classification of AMC and RTM boards commercially available
- AP2.2.8 AMC Backplane/connector/board development towards 10Gbit/sec

AP2.3 Application of MTCA.4 in industry

- AP2.3.1 Integrated klystron life-time and LLRF system

AP2.4 Evaluation of MTCA.4 market

- AP2.4.1 Market evaluation for industry
- AP2.4.2 Market evaluation for institutes
- AP2.4.3 Optional industry order after evaluation

AP2.5 Integral test of MTCA.4 in large facility, availability, failure analysis

- AP2.5.1 Inter-compatibility of boards/sub-systems, radiation, remote controllability

- Almost 50 sub-projects to be carried out and completed

- > 40 hardware developments

- > 30 new products on market

→ Demanding & challenging program
...also for DESY...

→ Industrial consortium essential

→ Collaborations:



AP3: Marketing & Support

AP3.1 Support and consultancy

- AP 3.1.1 Continues guidance and consultancy
- AP 3.1.2 Tutorials

AP3.2 MicroTCA user guide

AP3.3 Marketing and exhibitions

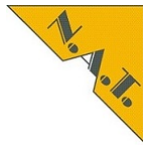
AP3.4 MTCA.4 annual workshop



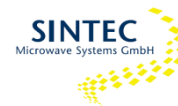
> Status December 2014

■ Industry cooperation partners:

• Original HVF Consortium (7):



• New Partners (6):



• Not able to include due to budget & personnel & time constraints (6):



AP1.1 Revision of existing RF modules



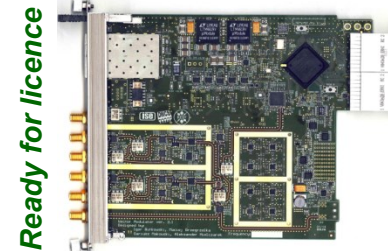
DRTM-DWC10



DAMC-TCK7



DeRTM-LOG1300

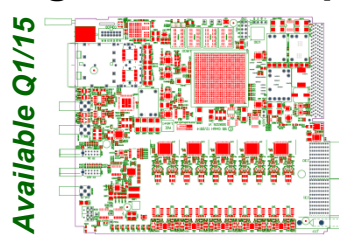


DRTM-VM2LF

AP1.2 Cost opt. for Single Cavities Applications → poster



DRTM-DWC8VM1



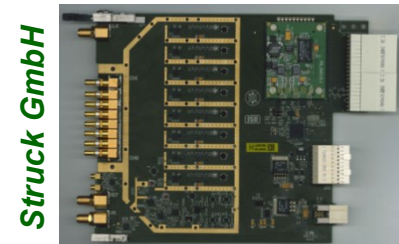
SIS8325

250 MSPS/ 16bit
Follow up of
SIS8300L2

AP1.3 Extending Portfolio in Frequency

~ MHz ●

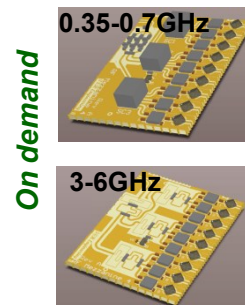
→ 6 GHz



DRTM-DS8VM1



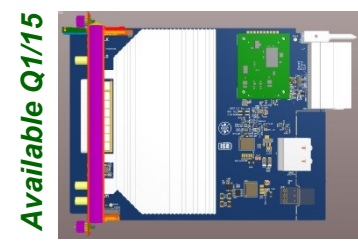
DeRTM-CLK



DeRTM-LOGLF/HF



DRTM-VM2HF

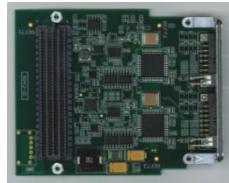


DRTM-DWC8VM1HF

AP1.4 Supplementary systems for RF control



DAMC-FMC20



DFMC-MD22



DRTM-PZT4



DAMC-DS800

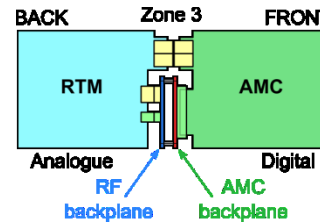
Multi-purpose feed through RTM (Q1/15)

High order mode RTM (Q1/15)

Femtosecond Synchr. RTM (Q3/15)

AP1.5 Introduction of RTM-RF Backplane

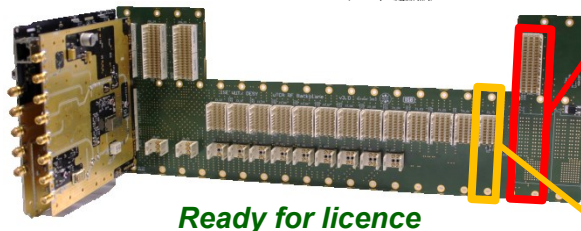
- Performance improvement and extended to 6 GHz
- Adaption of crate mechanics (two vendors)
- Upgrade Radiall coaxpack2 connector
- Specification will be part of PICMG MicroTCA.4 standard
- Patent (DESY/ISE) released free of charge to PICMG
- Management concept developed
- Power supply carrier



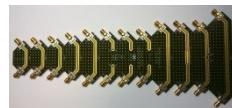
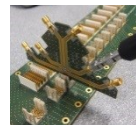
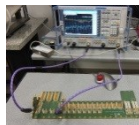
Radiall Coaxipack 2 upgrade



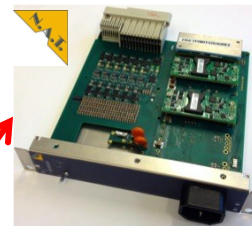
HELMHOLTZ
GEMEINSCHAFT



Ready for licence



→ Talk T. Lesniak, ISE/WUT

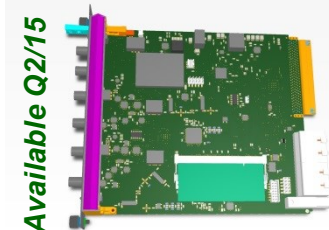


NAT-RPM-PSC



NAT-MCH-RTM-RF

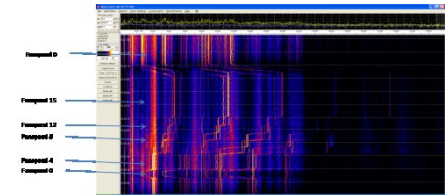
AP1.5.3 AMC - RF Source



SAMC-DDS1400

→ poster

→ Vibration studies

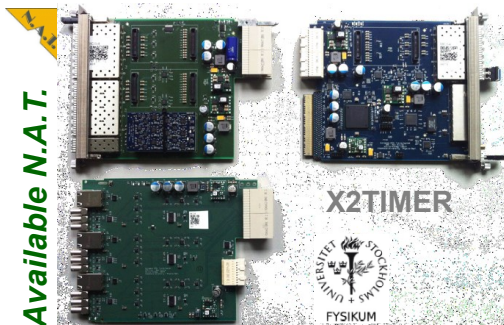


Status work package AP2: Completion of the MTCA.4 for industry and institutes

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AP2.1 Extension of product portfolio for MTCA.4

ps-timing distribution



RTM_TRIG1

Available N.A.T.

High end FMC-carrier / 4ch 1.6GSPS

IC-FEP-TCAa

Virtex-7 FPGA Modul für MTCA.4 Rear-I/O und 2 FMC-Steckplätzen



IC-ADC-FMCc
4-Kanal ADC, 1.6 GSPS

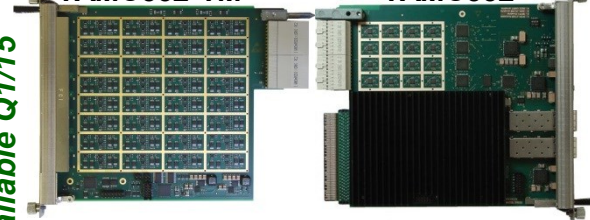


Available

RTM Shaper - AMC 32 ch ADC 12/14bit

TAMC532-TM

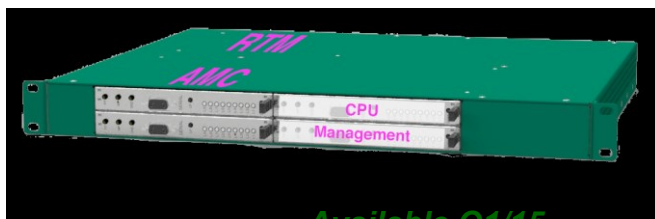
TAMC532



Available Q1/15

AP2.4 Evaluation of MTCA.4 market → Optional industry order after evaluation

Market entry starter kit (1HE)



Available Q1/15

High voltage AMC

HV-Panda



Available Q1/15



Generic linux driver for MicroTCA

Open source !

Topics:



- Linux kernel driver & libraries
- Efficient DMA transfer
- Hotplug capability
- Set of test cases
- Test suite for automated driver test
- Redesign of API implementation

➡ Several talks scheduled
Petrosyan/Killenberg/Mehle

Status work package AP2: Completion of the MTCA.4 for industry and institutes

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AP2.2 EMI optimization and classification of MTCA.4 components

- ✓ 1. EMI test board development
- ✓ 2. EMI current distribution in MTCA.4 crate
- ✗ 3. Optimization of crate-contact transitions → complicated $\ll m\Omega$
- ✓ 4. Shields for AMC/RTM boards
- ✗ 5. EMI Bypass-concept → less benefit ⇒ local Isolation ✓
- ✓ 6. Vibration studies and vibration reduction
- ✗ 7. EMI classification of AMC and RTM boards commercially available
- ✓ 8. AMC Backplane/connector/board development towards 10Gbit/sec

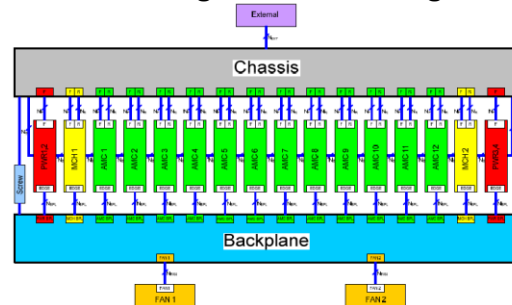
→ Talk T. Owczarek, ISE/WUT 



DAMC-EMI



MicroTCA.4 ground modelling



Decoupling of digital/analog grounds by local isolation ✓

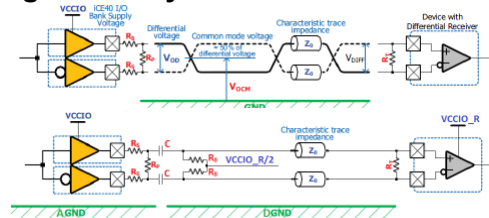
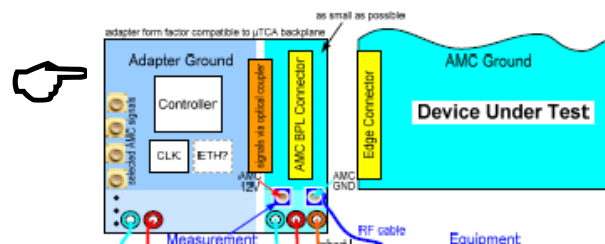
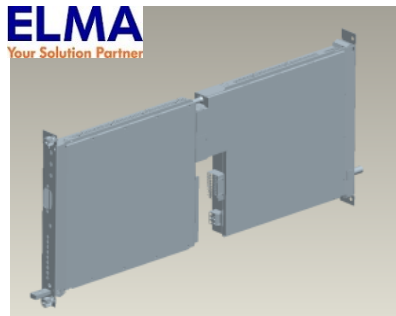


Figure 2 Isolated LVDS link with capacitive coupling



 **ENGINEERING SOLUTIONS**
Technology Group

Requires for quantitative measurements & classification specialized setup!
Project launched: Q2/15


→ Talk H-H. Ibowski

Status work package AP2: Completion of the MTCA.4 for industry and institutes

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AP2: missing standards / critical items / open issues / misc. barriers...

➤ Zone 3 Recommendation



Deutsches Elektronen-Synchrotron
Ein Forschungszentrum der Helmholtz-Gemeinschaft

<http://mtca.desy.de>



Class D1.0, D1.1, D1.2, D1.3, D1.4

Zone 3 Connector Pin Assignment Recommendation for Digital Applications for AMC/μRTM Boards in the MTCA.4 standard

FEATURES

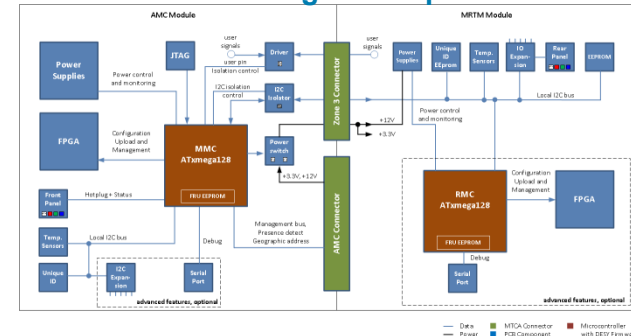
- MTCA.4 management zone:
- Power, I2C, optional JTAG support
- Digital signals in the user zone:

APPLICATIONS

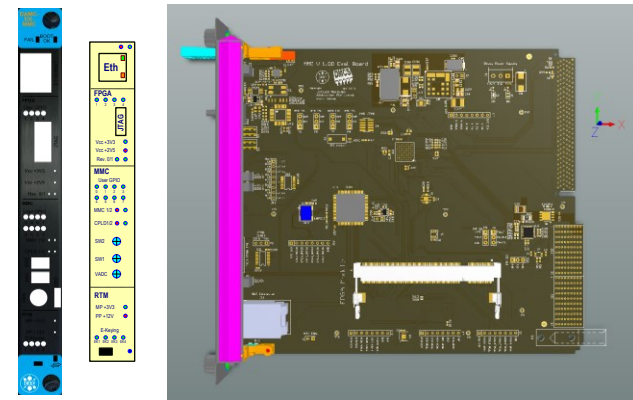
- AMC / μRTM board design in MTCA.4 standard
- High-speed data processing
- Multi-channel data-converters, sensor readout and output
- Digital signal conditioning boards

➡ Talk F. Ludwig

➤ MMC Altium designer templates

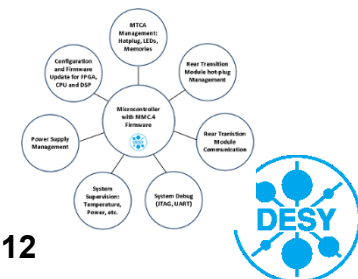


➤ MMC Starter Kit (AMC/RTM) available

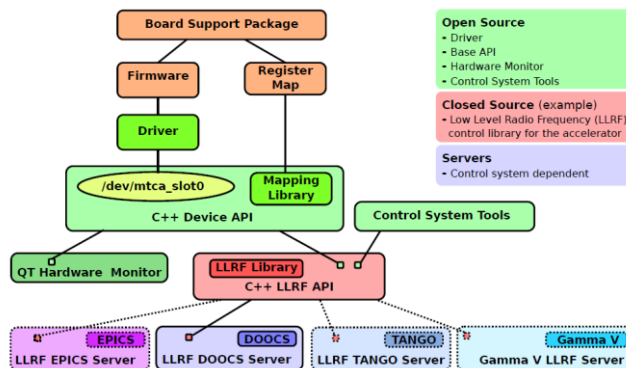


➤ MMC code development

➡ Talk M.Fenner



➤ MTCA.4, open software framework



➡ Talk M.Killenberg

➤ Interlock integration....

➤ MTCA.4 support and consulting

FAQ/Hotline

Direct support

Tutorial, every 2 month “hands on”

6 in 2013

8 in 2014 (4 advanced)

➤ MicroTCA.4 Introductory guide

Booklet published by DESY/NAT : Q1/15

➤ Products marketing & information

3 MTCA.4 workshops (2012/2013/2014)

Marketing on industrial exhibitions/ Face-to-face meetings

28 (+11) in 2013

16 (+16) in 2014

Webpage

➤ Interoperability / Integration



- AIW24 Pentair, Straubenheim @ Nov 2013
- **AIW25 DESY, Hamburg** @ Apr 2014
- AIW26 Vadatech, Henderson @ Oct 2014
- **Integration WS, DESY** @ Dec 2014

MTCA Tutorials at DESY (05/2013)
& Shanghai (09/2014)



Embeddedworld 2013
Nürnberg



IPAC 2013 Shanghai



TWEPP 2013 Perugia



European Microwave
Week 2013

Webpage URL <http://mtca.desy.de/>



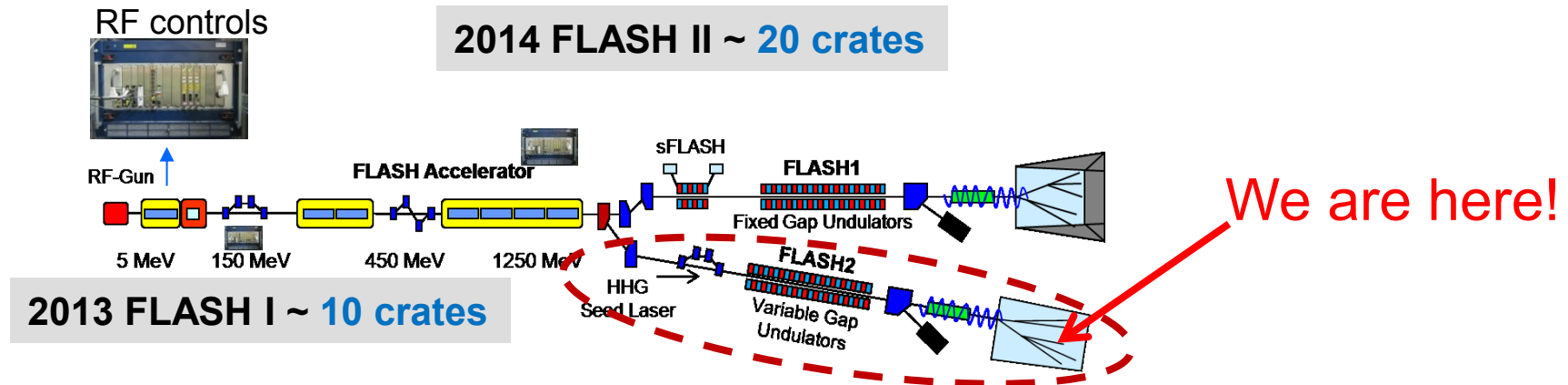
DESY Directorate recently approved founding of

“MicroTCA Innovation Laboratory” @ DESY

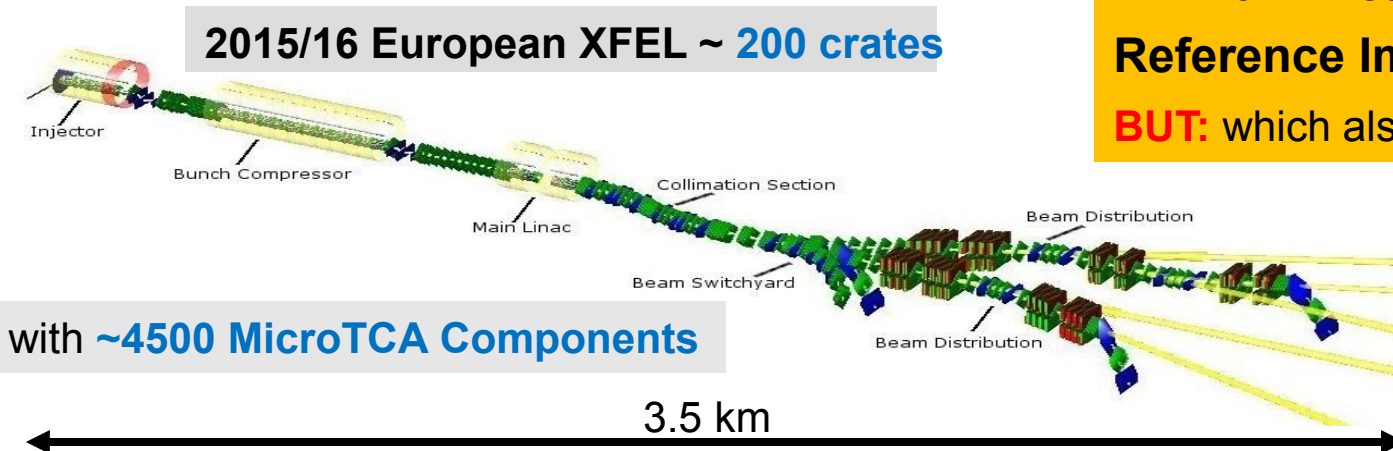
Activities:

- Future enlarge MicroTCA product portfolio through licensing
- Continuation PICMG efforts (HW/SW)
- Marketing / support / consultancy (somewhat reduced)
 - Annual MTCA.4 Workshop
 - Trainings & Tutorials ~ 4-6/a
 - Marketing on industrial exhibitions/ science conferences
 - Interoperability / Integration Workshop
- Further & forward developments (EMI/Analog/Digital)
- Contact point: Internally and external, e.g. MicroTCA cooperation Network!

Clearly the most relevant contributions ...



European X-Ray Free Electron Laser:



... which will serve the community as
Reference Implementation
BUT: which also will draw resources

Workshop organization



Katharina Fein

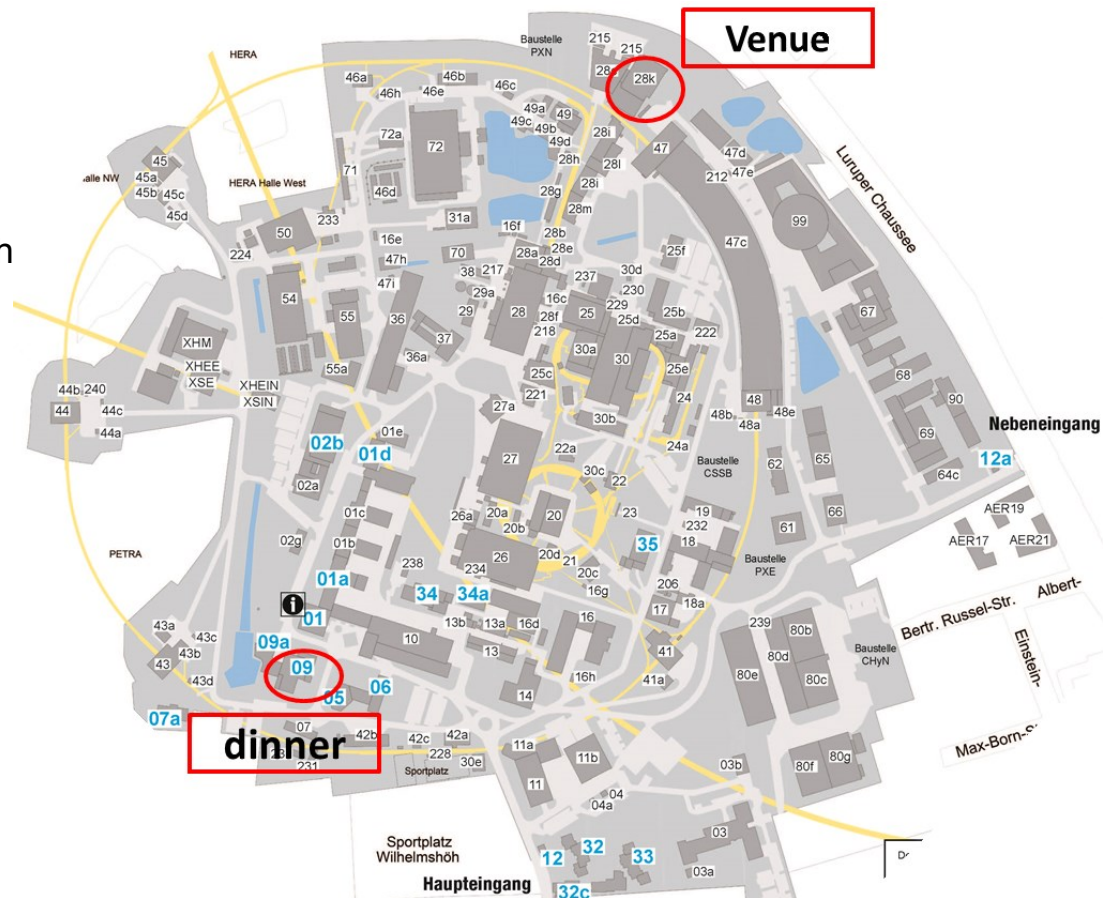
General information

Lunch

- Lunch will be served in FLASH II hall

Workshop Dinner

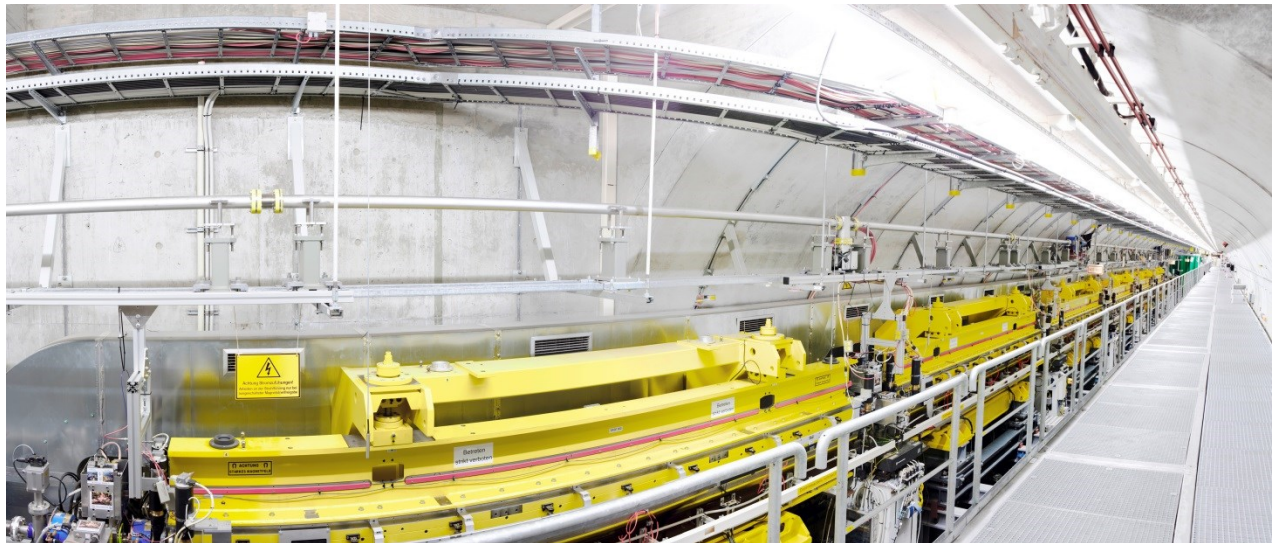
- Wednesday, November 10th at 19:30
- in building 9



General information

DESY tour

- Meeting point → in front of the registration desk
- Takes about an hour
- Guides you to FLASH facilities and AMTF hall



General information

WLAN

- name **"MTCA-Workshop"**
- Password **rkMwdT7n**

Group photo

- Wednesday, November 10th
at 12:00

Next Workshop:

9/10 of Dec. 2015!



**Wish you an informative
and pleasant
3rd MTCA Workshop**

Thanks for attention

Management



Thomas Walter

Contracts

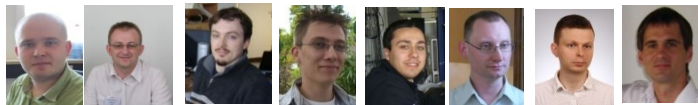


Ilka Mahns

Old faces...



Developers



**HELMHOLTZ
GEMEINSCHAFT**

Since spring/summer 2013

Software



Martin Killenberg

Tech. Marketing



Annika Rosner

Event/Markt.



Katharina Fein

Development



Michael Fenner