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

and workshop organization

Dr. Holger Schlarb
MSK, DESY
DESY, 10.12.2014
Co-chair of this event...

- 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!
History of MicroTCA@DESY

- 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
  - “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€
Work packages and program “MTCA.4 for Industry”

**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**
- AP 2.1.1 Industrial production of timing module
- AP 2.1.2 2 GSps, 4 channel, 12bit ADCs on RTM & AMC
- AP 2.1.3 32 ch., 40MSPs, AMC-RTM with analog shaping capability
- AP 2.1.4 Management low noise power supplies

**AP2.2 EMI optimization and classification of MTCA.4 components**
- AP 2.2.1 EMI test board development
- AP 2.2.2 EMI current distribution in MTCA.4 crate
- AP 2.2.3 Optimization of crate-contact transitions
- AP 2.2.4 Shields for AMC/RTM boards
- AP 2.2.5 EMI Bypass-concept
- AP 2.2.6 Vibration studies and vibration reduction
- AP 2.2.7 EMI classification of AMC and RTM boards commercially available
- AP 2.2.8 AMC Backplane/connector/board development towards 10Gbit/sec

**AP2.3 Application of MTCA.4 in industry**
- AP 2.3.1 Integrated klystron life-time and LLRF system

**AP2.4 Evaluation of MTCA.4 market**
- AP 2.4.1 Market evaluation for industry
- AP 2.4.2 Market evaluation for institutes
- AP 2.4.3 Optional industry order after evaluation

**AP2.5 Integral test of MTCA.4 in large facility, availability, failure analysis**
- AP 2.5.1 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**

**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**
HVF Consortium was steadily growing ...

> Status December 2014

- **Industry cooperation partners:**
  - *Original HVF Consortium (7):*
    - ELMA
    - PENTAIR
    - struk Innovative Systeme
    - AMPEGON
    - TEWS Technologies
    - AD-TEC

- *New Partners (6):*
    - IC INTERFACE CONCEPT
    - eicsys GmbH
    - COSYLAB
    - powerBridge Computer
    - CAENels
    - SINTEC

- *Not able to include due to budget & personnel & time constrains (6):*
    - vdata
    - HARTING
    - kontron
    - iXPON
    - Wiener
Status work package AP1: RF control systems

AP1.1 Revision of existing RF modules

- Struck GmbH: DRTM-DWC10
- Vadatech: DAMC-TCK7
- Dynamique Sarl: DeRTM-LOG1300
- Ready for licence

AP1.2 Cost opt. for Single Cavities Applications

- Struck GmbH: DRTM-DWC8VM1
- SIS8325
- Available Q1/15

250 MSPS/16bit
Follow up of SIS8300L2

AP1.3 Extending Portfolio in Frequency

- Struck GmbH: DRTM-DS8VM1
- DeRTM-CLK
- Design ready
- On demand
- 0.35-0.7GHz
- 3-6GHz
- Ready for licence

- DeRTM-LOGLF/HF
- Ready for licence

- DRTM-VM2HF
- Available Q1/15

- DRTM-DWC8VM1HF

- ~ MHz
- 6 GHz

Ready for licence
Status work package AP1: RF control systems

AP1.4 Supplementary systems for RF control

- DAMC-FMC20
- DFMC-MD22
- DRTM-PZT4
- DAMC-DS800

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

AP1.5.3 AMC - RF Source

- Radiall Coaxipack 2 upgrade
- Ready for licence
- Talk T. Lesniak, ISE/WUT

- Multi-purpose feed through RTM (Q1/15)
- High order mode RTM (Q1/15)
- Femtosecond Synchr. RTM (Q3/15)

Available Q2/15

SAMC-DDS1400

- Vibration studies

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

AP2.1 Extension of product portfolio for MTCA.4

- ps-timing distribution
- High end FMC-carrier / 4ch 1.6GSPS
- RTM Shaper - AMC 32 ch ADC 12/14bit

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

- Market entry starter kit (1HE)
- High voltage AMC
- Generic linux driver for MicroTCA

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

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 << mΩ
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

DAMC-EMI
Decoupling of digital/analog grounds by local isolation

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

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

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

- Zone 3 Recommendation
  - MMC Altium designer templates
  - MMC Starter Kit (AMC/RTM) available
  - MMC code development
  - Interlock integration…

- MMC Altium designer templates
  - Zone 3 Connector Pin Assignment Recommendation 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:

- MMC Starter Kit (AMC/RTM) available
  - MMC code development
  - Interlock integration…

- MMC code development
  - Interlock integration…

- Talk F. Ludwig
  - Talk M. Killenberg
  - Talk M. Fenner
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

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:**

- **2013 FLASH I ~ 10 crates**
- **2014 FLASH II ~ 20 crates**
- **2015/16 European XFEL ~ 200 crates**

- RF controls
  - RF-Gun
  - 5 MeV, 150 MeV, 450 MeV, 1250 MeV
  - FLASH Accelerator
  - sFLASH
  - Fixed Gap Undulators
  - HHG Seed Laser
  - Variable Gap Undulators

- 3.5 km
- with ~4500 MicroTCA Components

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We are here!

... 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 10\textsuperscript{th} at 12:00

Next Workshop:

9/10 of Dec. 2015!
Wish you an informative and pleasant 3\textsuperscript{nd} MTCA Workshop

Thanks for attention
Personal.../ faces ... / HVF team...

Management

Thomas Walter

Contracts

Ilka Mahns

Since spring/summer 2013

Software

Martin Killenberg

Tech. Marketing

Annika Rosner

Old faces...

Developers

Developers...