Follow up on the Helmholtz Validation Fund "MicroTCA.4 for Industry"

and workshop organization

Dr. Holger Schlarb
MSK, DESY
DESY, 09.12.2015

HELMHOLTZ GEMEINSCHAFT

DESY

History of MicroTCA@DESY

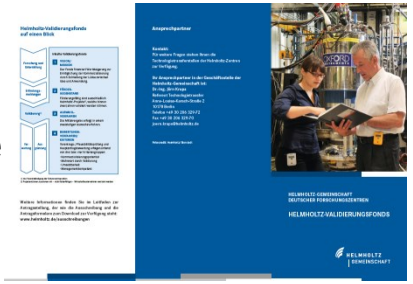
- Nov. 2005: Reliability Workshop in Grömitz, Germany
  - **Joint meeting with ILC (intern. linear collider, 33km, 500GeV)**
- Dec. 2007: European XFEL Crate-Standard Workshop
  - **MicroTCA and ATCA was defined to be used**
- Mar. 2009: First PICMG Meeting "xTCA for Physics"
  - **Hardware group: rear 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 till Dec. 2014
  - **„MicroTCA.4 for Industry"**
- Jan. 2014: Reestablish HW/SW PICMG working groups ➔ R. Larsen, SLAC
- 2015-16: Production / Installation of MicroTCA controls for European XFEL

➔ Talk K. Rehlich / Ch. Schmidt

Helmholtz Validation Fund "MicroTCA for Industry"

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



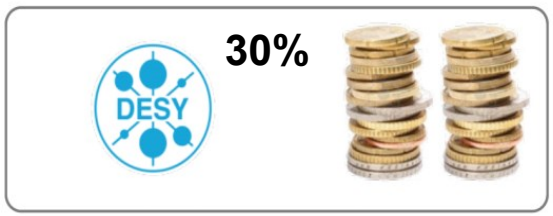
Main objectives of "MicroTCA for Industry" project:

Establish MicroTCA.4 electron crate system

- In accelerator community
- Industrial branches
- Scientific community

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

Boundaries: 4 Mio (50% HGF) max 2 years, HVF0016: 07/2012 – 12/2014 successfully



7 partners

+ 6 new partners

INTERFACE CONCEPT · eicSys GmbH · COSYLAB · powerBridge Computer · CAENels Gear For Science · SINTEC Microwave Systems GmbH

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

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

- **> 50 sub-projects were carried out and completed**
- **> 40 hardware developments**
- **33 new products were developed suitable for the market:**
  - 24 are available by industry
  - 6 still pending
  - 3 on demand

AP3: Marketing & Support

AP3.1 Support and consultancy

AP 3.1.1 Continues guidance and consultance
AP 3.1.2 Tutorials

AP3.2 MicroTCA user guide

AP3.3 Marketing and exhibitions

AP3.4 MTCA.4 annual workshop

AP1: RF controls boards

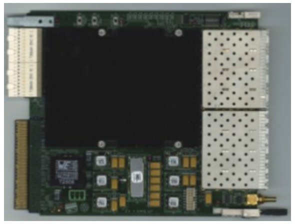
LLRF controls: rapid portfolio extension was possible through modularity…

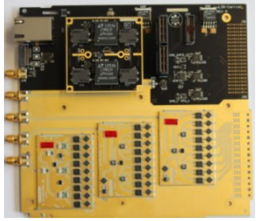
➔Talk K.Czuba/V. Dirksen

Standard RF Modules (used by FLASH & XFEL)

Struck GmbH

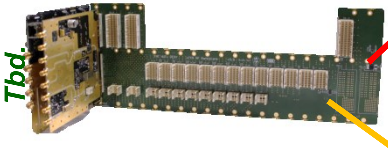
DRTM-DWC10

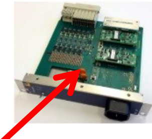
Vadatech

DAMC-TCK7

Dynamique

DeRTM-LOG1300

Ready for licence

DRTM-VM2LF

Tbd

RF Backplane


NAT-RPM-PSC


NAT-MCH-RTM-RF

Single cav. extension

Struck GmbH

DRTM-DWC8VM1

Stuck GmbH

SIS8325

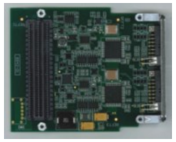
Supplementary module extension

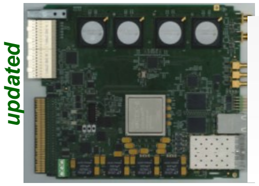
EicSys

DAMC-FMC20

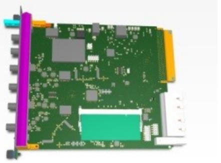
Ready for licence

DRTM-PZT4

CAEN-els

DFMC-MD22

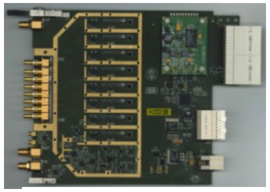
updated

DAMC-DS800

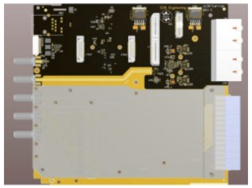
RF source

Sintec

SAMC-DDS1400

Frequency extension

~ MHz → 6 GHz

Struck GmbH

DRTM-DS8VM1

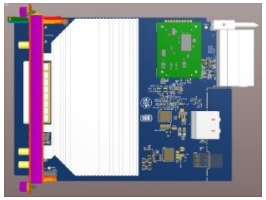
evaluation

DeRTM-CLK

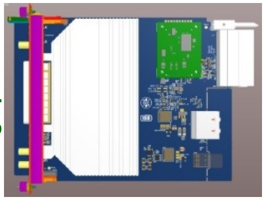
On demand


DeRTM-LOGLF/HF

Ready for licence

DRTM-VM2HF

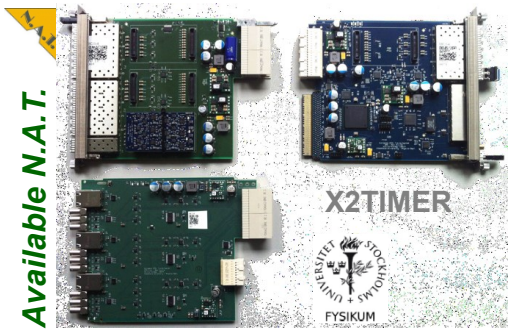
Stuck GmbH

DRTM-DWC8VM1HF

Design phase

DRTM-DWC10HF

2013-2015 through Validation Fund: almost all modules are now available by industry
2014/15 many improvements w.r.t. performance, features and additional functionalities

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

ps-timing distribution

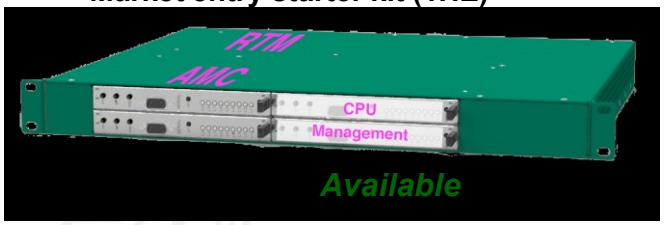


RTM_TRIG1

High end FMC-carrier / 4ch 1.6GSPS

RTM Shaper - AMC 32 ch ADC 12/14bit

Market entry starter kit (1HE)



High voltage AMC

HV-Panda

Generic linux driver for MicroTCA

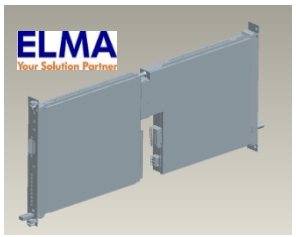
Open source !

Topics:

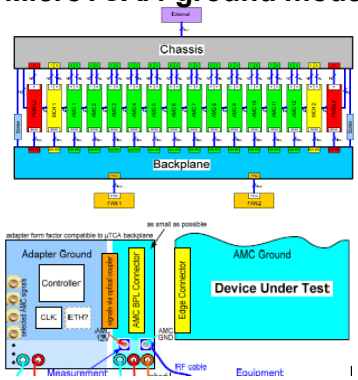
COSYLAB

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

EMI/EMC



MicroTCA.4 ground modelling



ENGINEERING SOLUTIONS
BLAUPUNKT Technology Group

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

➡ **Talk H-H. Ibowski**

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

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

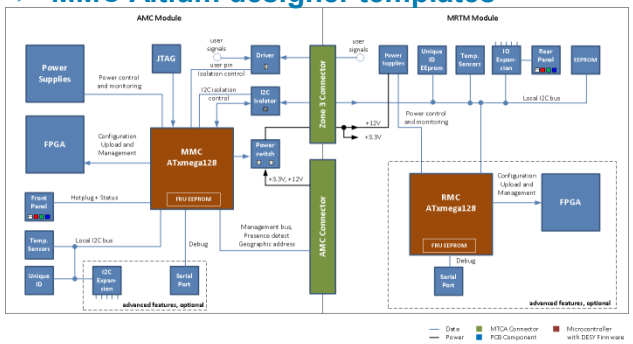
MTCA.4 management zone:
- Power, I²C, optional JTAG support

Digital signals in the user zone:

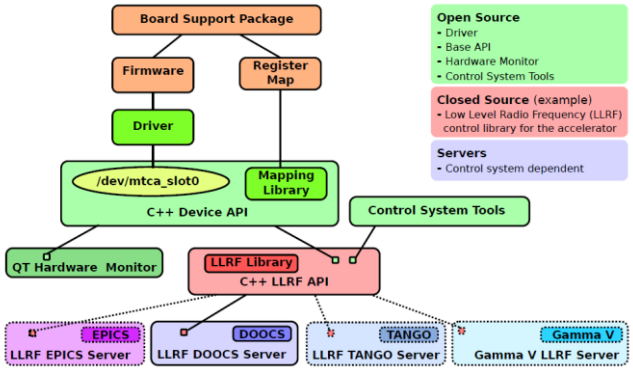
APPLICATIONS

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

➢ MMC Altium designer templates



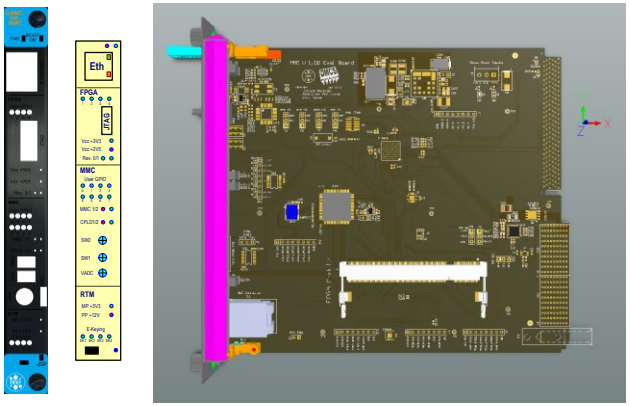
➢ MTCA.4, open software framework



➡ **Talk N. Shezhad**

➢ Interlock integration….

➢ MMC Starter Kit (AMC/RTM) available



➢ MMC code development

Meanwhile widely adopted…

AP3: Support / Consulting / Marketing

- **MTCA.4 support and consulting**
  - FAQ/Hotline
  - Direct support
  - Tutorial, every 2 month “hands on”
    - **6 in 2013**
    - **8 in 2014 (4 advanced)**
    - **7 in 2015 (4 advanced)**

- **MicroTCA.4 Introductory guide**
  - Booklet published by DESY/NAT: work in progress

- **Products marketing & information**
  - 4th MicroTCA.4 workshops (2012-2015)
  - Marketing on industrial exhibitions/ Face-to-face meetings
    - **28 (+11) in 2013**
    - **16 (+16) in 2014**
    - **2 (+4) in 2015**

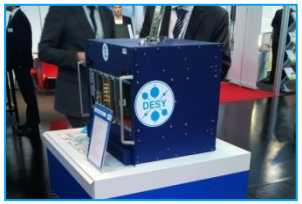
- **Interoperability / Integration**
  - AIW24 Pentair, Straubenhardt @ Nov 2013
  - ***AIW25 DESY, Hamburg*** @ Apr 2014
  - AIW26 Vadatech, Henderson @ Oct 2014
  - ***Integration WS, DESY*** @ Dec 2014
  - ***Integration WS, DESY*** @ Dec 2015

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

IPAC 2013 Shanghai

TWEPP 2013 Perugia

Embeddedworld 2013 Nürnberg



European Microwave Week2013

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

Perspectives MicroTCA@DESY 2015+

2015 DESY Directorate approved funding to continue ***"MicroTCA" @ DESY***

Activities (strongly reduced compared to HVF):

- Future enlarge MicroTCA product portfolio through licensing
- Continuation PICMG efforts (HW/SW)
- Marketing / support / consultancy
- **Investigate future funding options**

Most promising: Applied to „Helmholtz Innovation Labs" initiative

- Interface between industrial and research centers
- Close interaction between Scientists and Industry & users/customer

Funding: 5 Mio total (50%/50%)/ 5 years!

Target of submit application:

- Service & Support
- Creation of set of turn key system

Decision taking: Q1-Q2/2016

- Follow to HVF Consortium was discussed
- Tuned out to be challenging due to personal constrains at DESY
- ***But:***

  Initiated discussion to apply for "ZIM-Cooperation Network"

  ZIM = Zentrales Innovationsprogramm Mittelstand

  Targeted toward small and medium companies in Germany, but not limited to Germany / KMU's when sufficient KMU partners joined already

- *Found very competent partner for funding consultancy and managing of a "MicroTCA Cooperation Network"*

- *See booth industrial exhibition → EurA Constance AG*

Workshop organization

Katharina Kull

Workshop program:

Monday 07 December 2015

14:00 - 17:00 Integration Workshop
Building 3, BAH1/BAH2

Tuesday 08 December 2015

10:00 - 13:00 Integration Workshop
Building 3, BAH1/BAH2

Michael Fenner

Goal:
Opportunity to test **your application** with vendors on different platform configurations

Well received,

> 20 participants

➔ Will be continued next year

Workshop program:

Tuesday 08 December 2015

14:30 - 17:30 Tutorials about MicroTCA.4 given by experts

Building 3, BAH1/BAH2

14:30-15:15 MicroTCA.4 Tutorial Basics
Dietmar Mann, PENTAIR

15:15 – 16:00 MicroTCA Management
Christoph Stechmann, DESY

16:00-16:45 Tutorial about MicroTCA.4
Vollrath Dirksen, N.A.T. GmbH

16:45 – 17:30 MicroTCA and PCI Express and PCI Express Hot Swap under Linux
Ludwig Petrosyan, DESY

Kay Rehlich

Target audience:
Part 1:
- New comers to MicroTCA.4 standard

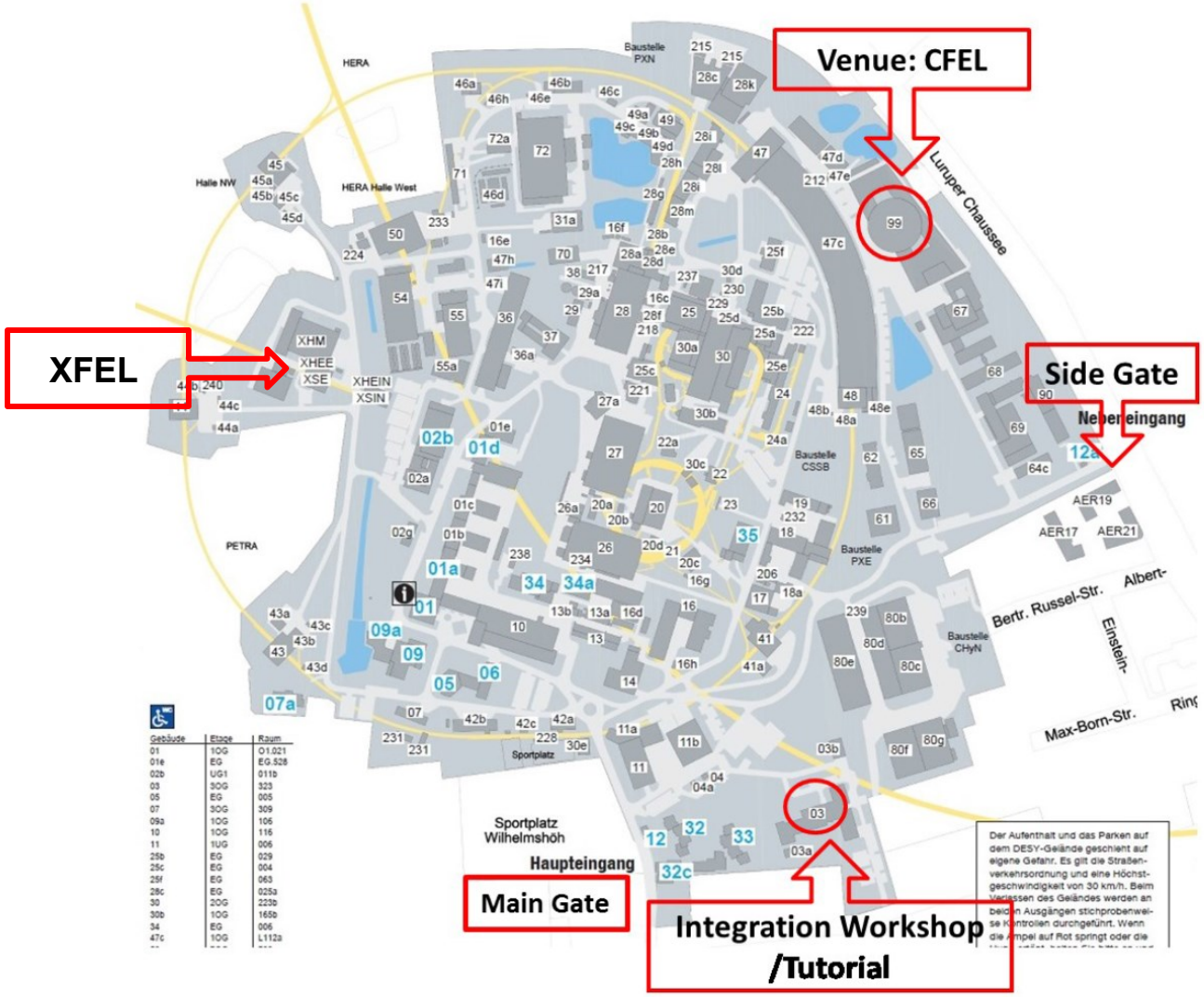
Part 2:
- Advanced users

Well received,

> 50 participants

➔ Will be continued next year

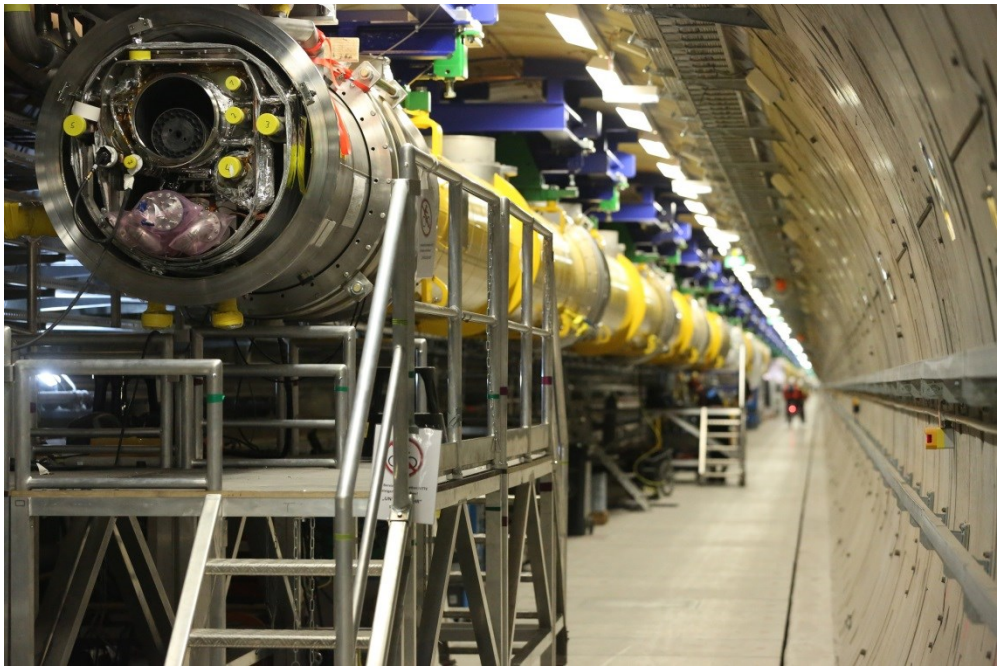
Workshop locations



General Information

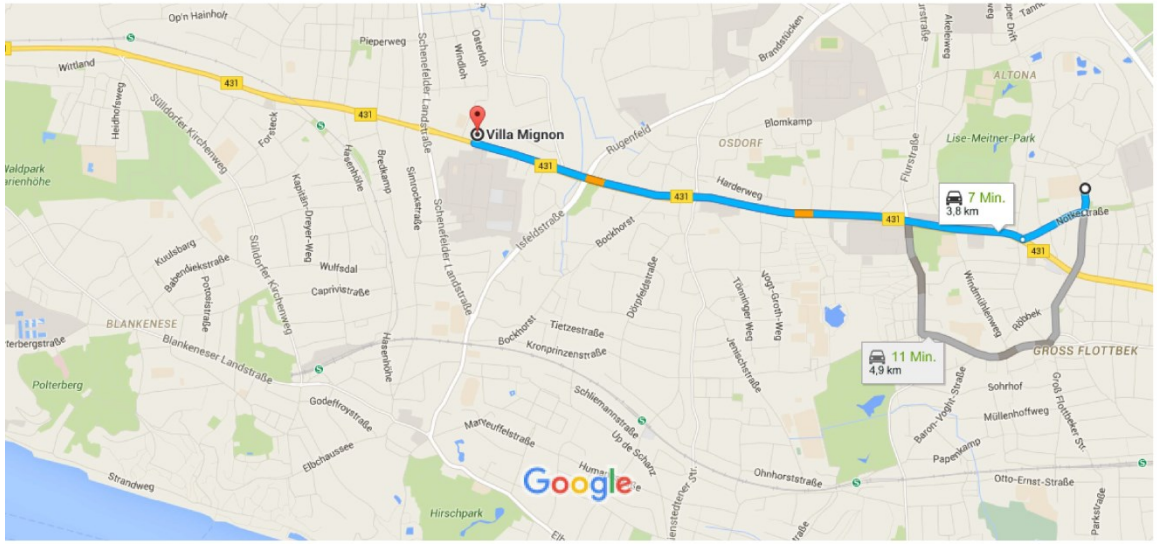
DESY/XFEL tour

- Meeting point ➔ in front of the registration desk
- Takes about an hour
- Guides you to European XFEL facilities



Workshop Dinner

- Wednesday, December 9th in Villa Mignon
- blue dot on your name badge = dinner registration
- Shuttle busses starting from 18:45 in front of CFEL and 18:50 at DESY main gate
- Bring a jacket the reception is outside!
- More information in abstract booklet



General Information

WLAN

- Name: **MTCA-Workshop**
- Password: **MTCA-Workshop-2015**

Next Workshop:

7th/8th of Dec. 2016!

Wish you an informative and pleasant 4th MTCA Workshop

Thanks for attention