

Summary of the 13th *MicroTCA* *Workshop for Industry &* *Research (2024)*

2025 MicroTCA/ATCA International Workshop for Large Scientific Facility Control

Chongqing University 15-17.09.2025

Holger Schlarb, MSK/DESY

DESY, 15.09.2025



DESY. Summary of the 13th MicroTCA Workshop at DESY | H. Schlarb | Chongqing, China, 15.09.2025

13th MicroTCA Workshop for Industry & Research

Statistics

55 new participants!

	2024	2023	2022	2021	2020	2019	2018	2017	2016	2015	2014	2013	2012
Participants	184	207	190	189	200	198	188	183	159	177	188	191	180
Institutes	26	30	26	29	37	34	22	27	25	31	30	30	25
Companies	25	27	23	21	23	25	31	24	28	36	39	39	29
Exhibitors	11	14	13	9	9	12	14	13	14	14	16	16	12
Talks	36	42	44	40	44	43	43	38	38	45	44	53	42

- Well prepared & clear talks
- Lively discussions ...
- Enthusiastic and very informative
- Networking in focus

Newcomers ~ 30 % (1st time)
High recurrent ~ 40 % (≥ 4)

Workshop program Tu / We / Th

Indico page:

Morning:

Keynotes:

<https://indico.desy.de/event/46036/timetable/#all.detailed>

three tutorial tracks ~ 7 presentations, Tu 9:00 – 12:30

1 Science (E. Weckert) & 1 Technology (Analog Devices)

MicroTCA Tutorials

Firmware & Software Frameworks

Tue 10/12			
09:00	Introduction 09:30 - 09:05 MicroTCA Basics 09:35 - 09:35 MicroTCA Management 09:35 - 10:05	Kay Reiblich Ralf Wacker Heiko Kone Kay Reiblich	MTCA Tutorial: Hardware Design and Test Environment 09:00 - 10:30
10:00	Communication links, clocks and triggers 10:35 - 10:30	Kay Reiblich	Bulding 03, Seminar Room 304 09:00 - 10:30
Coffee break 10:30 - 11:00			
11:00	Unlocking MicroTCA.4 for FPGA Developers 11:00 - 11:45	Cagil Goktas	11:00 - 11:45
12:00	Control Application Interfacing with ChimeraTK and Python 11:45 - 12:30	Dietrich Raabe	11:45 - 12:30

MicroTCA Hardware



14.00 →

Tuesday

14:00	Introduction	Dr Holger Schardt
	Welcome	Beate Reihmann
	Status of upgrades in MicroTCA at the Spallation Neutron Source	Thomas Jostes
	Current Status of MicroTCA at ESS	Uwe Döcker
15:00	ITER Fast Instrumentation and Control: Current Status and Plans for MTCA	Sergio Esquivel
	Discussion	
16:00	Coffee break	
	Keynote: 60 Years of Synchrotron Radiation	Edgar Weichert
	MTCA-based Accelerator Control Systems at DESY	Tim Wilken
	Status of MTCA at J-PARC in 2024	Fumihiko Tatsuura
17:00	MTCA 6 based high speed digitizer system for J-PARC MR	Yasuyuki Sappia
	Modernizing Fermilab's Accelerator Control Hardware	Andrew Kishel
	Update on a MicroTCA-based control system for quantum computers	Jan Magazovic
	Discussion	

36 talks
2 Keynote

Wednesday

09:00	Summary on the MicroTCA workshop in China	Zhen Zhang
		09:00 - 09:15
	MicroTCA use at HEPs	Jiang
		09:15 - 09:30
	Update of CERN Proton Synchrotron (CPS) Beam Controller based on MicroTCA architecture	Francisco Javier Diaz Fernandez
		09:30 - 09:45
	KeyNote: Technology advances in AD and DA converters, an outlook	Martin Winkler
		09:45 - 10:00
10:00	Discussion	
		10:15 - 10:30
	Coffee break	
		10:30 - 11:00
11:00	Introducing nVent SCHROFF's Cutting Edge MTCA.4 Crate with Superior Bandwidth and Cooling	Christian Gernyng
		11:00 - 11:15
	NAT-MCH GenII	HEARD KODAK
		11:15 - 11:30
	Introduce our MicroTCA 4.0 R.3 and other new products	Karl Juchacz
	Dr. Heiko Scholz	
	14:00 - 14:15	
	Count Analog IO to MTCA 4	Mr. Peter M...

Thursday

Thu 12/12		Thursday
9:00	MTCA applications at IZDR Image Acquisition and Processing with MicroTCA-6 The DAMC-D5504DR: A High-Speed and High-Performance RFSoc-Based Platform for Diverse Scientific Applications Update of controls for the MINERVA project	Michael Kurtz Danijel Malenica Krzysztof Mroczka
10:00	LISA phasemeter project update Discussion Coffee break	prof. Oliver Griebner
11:00	Main Oscillator with sub-fs Resolution and High Performance Local Oscillator Generation in MicroTCA-6 Remote setup of LLRF control systems through the example of TARLA Jump-Start Control Application Development with ChimeraTIC and Python Update: MicroTCA Next Generation specification	Jean-Yves Beaupre Simon Noll Dimitri Popovich Kay Pelkovic
12:00	Discussion Closure	

← 14.00

Participating entities...

Institutes:



Universities:



Exhibitors:



Industry:

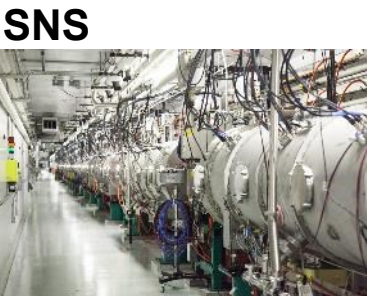


Further dissemination of MicroTCA...

Large-scale accelerators:

→ Very international

America



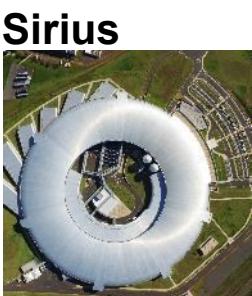
Thomas Justice (ORNL)



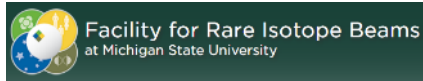
APS-U



Fermilab *new*



Sirius



Europe



Tim Wilksen (DESY)



Faye Chicken (ESS)



F. Ferreira (CERN)



FAIR - GSI



Diamond



Alba



MYRRHA *new*

K. Meeus(SCK-CEN)



Soleil



Bessy



PETRA IV

Asia



PAL-FEL



Spring 8



J-PARC

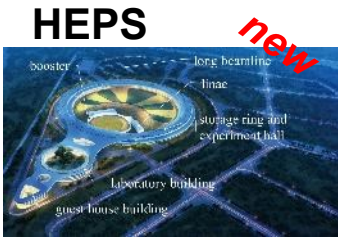
Fumihiko Tamura (J-Parc)
Yasuyuki Sugiyama (KEK)



CSNS



SXFEL



HEPS *new*



BEPC *new*



HALF/HLS-II



UTEF *new*



S3FEL... *new*



Ansto

Community is steadily growing...

Looking forward on updates & news from:

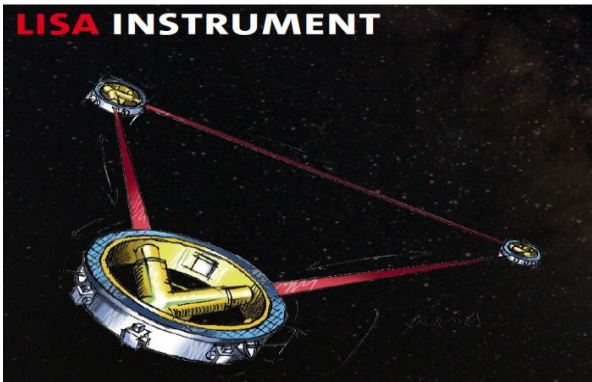
➔ Cross discipline synergies

Astrophysics Observatories



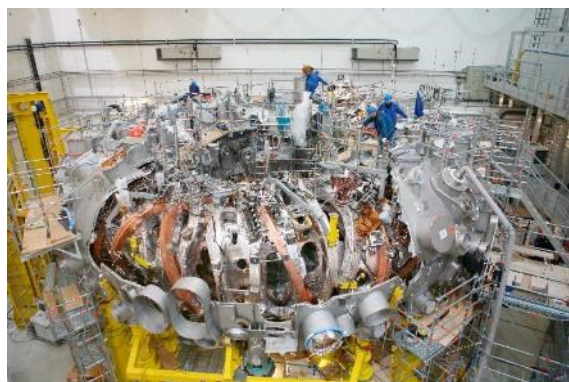
M. Richerzhagen (ESO)

Gravitational Wave Detection



Oliver Gerberding (UniHH)

Fusion: W7-X Stellerator



Fusion: ITER

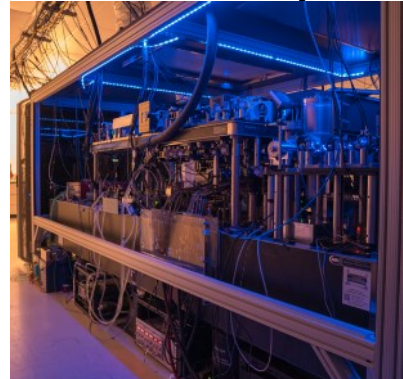


Sergio Esquembri (ITER)

Fusion: ASDEX

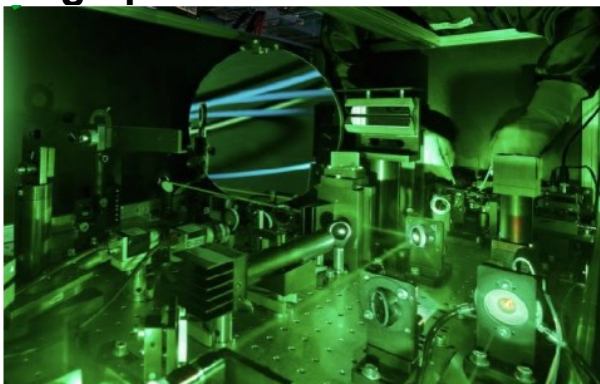


Quantum Comp.



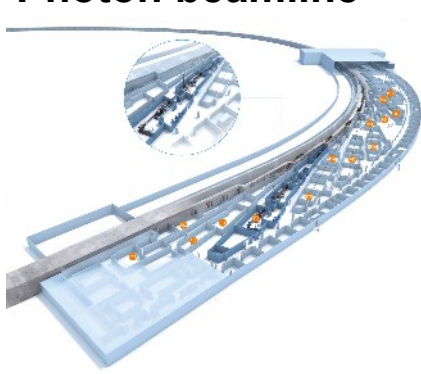
J. Marjanovic (Atom Comp.)

High power lasers



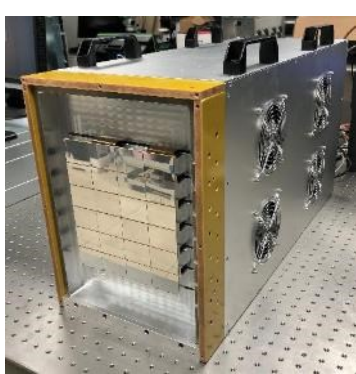
C. Duelsen (DESY)

Photon beamline



M. Tolkiehn (DESY)
M. Randall (DESY)

Detectors



Regional workshops...

Gains momentum...

2024

EPICS Collaboration Meeting
Sep 16 – 20, 2024
Spallation Neutron Source
US/Eastern timezone

OAK RIDGE National Laboratory

Fermilab

Argonne NATIONAL LABORATORY

EUROPEAN SPALLATION SOURCE

Workgroups and Training
Monday and Friday, Sept. 16 & 20, 2024, 10:00-12:00
Recordings for several of the sessions are:
Monday Morning, Track 1
EPICS 7 Overview
Demo of using PVAccess with IOC and C++
• Top level repository for all the main as4dpc
• Links to VM images will be provided
training/training-vm/blob/main/docs

OPC UA Device Support

2025

EPICS Collaboration Meeting
Apr 7 – 11, 2025
ISIS Neutron and Muon Source
Europe/London timezone

Rutherford Appleton Laboratory

2025

UTEF

Chongqing Prof. Jungiang Zhang

2025

MTCAWS in Japan 2025
KEK, Tsukuba
August 27-29, 2025

Organizers:
Fumihiko Tamura (JAEA/J-PARC)
Tetsuya Kobayashi (KEK)
Hirokazu Maesaka (SPring-8/SACLA)

2024

2024 MicroTCA/ATCA for Large Scientific Facility Control International Workshop
Organizer: University of Science and Technology of China (USTC)
Sep. 18 - Sep. 20, 2024 - Hefei, China

18. Sep – 20. Sep 2024 Hefei
<https://indico.pnp.ustc.edu.cn/event/1979/overview>
2024 MicroTCA/ATCA for Large Scientific Facility Control Workshop
Hosted by USTC
➔ Summary by Zeran Zhou

➔ Organized by Alan Justice

Pre-Workshop: MicroTCA Hardware Design and Test Environment

Presented by Michael Fenner

1. Designing Boards for MicroTCA in a Nutshell *(Based on Advanced MTCA Training Material)*

- MicroTCA backplane links (and how to connect to them)
- Tools: AMC and RTM templates and DMMC-STAMP
- Special aspects: JTAG arbitration, in-system FLASH updates and power inrush considerations
- General Design Guidelines: High-speed routing, termination, decoupling and board handling
- Board Implementation Details: Board stack-up, materials and length matching

Lecture tricks
and
potential pitfalls

2. Measurement Challenges and Our Solutions

- AMC, RTM and FMC bring-up solutions and adapters
- Testing serial and optical links – how to probe? IBERT, eye scans
- How to test PCI Express? (and our tricks)
- How to test parallel LVDS interfaces?

In short: What I always wanted to tell other HW designers

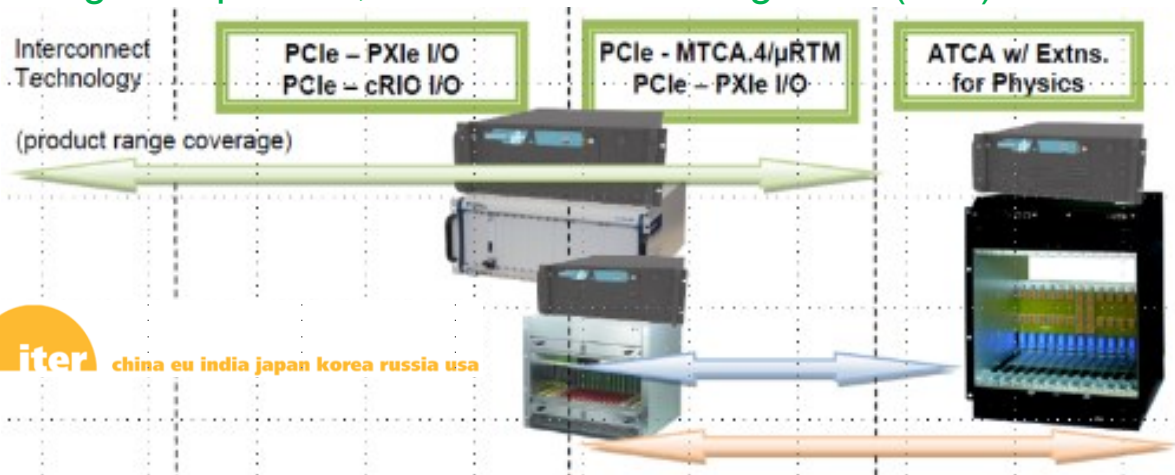
- ➔ Very well received
- ➔ Considerable interest in own HW develop.



> 25 participants

Some snap-shots ... facility reports

Sergio Esquembri, Central Control Integration (CCI)



- All Fast Controllers delivered until now were based on CompactRIO/PXIe
- But this is changing...



- Several diagnostics are now evaluating MTCA
 - Density, Toroidal and Poloidal Interferometer Polarimeter
 - Divertor Neutron Flux Monitoring
 - Upper/Equatorial Wide Angle Viewing Systems
- Why
 - Wider market, easier to obtain customized solution
 - Better performance
 - NI not predictable with obsolescence/maintenance
 - No strategic agreement in place

Accelerators and Projects at DESY

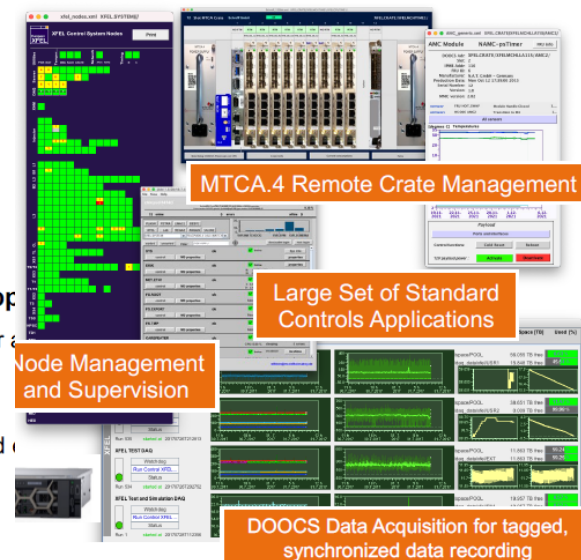
User Facilities FELs and Synchrotron + Test Facilities and ARD Projects



T. Wilksen, MCS



Control System Applications



EuXFEL Status 2024

Statistics on MTCA components @ EuXFEL

- More than 30 different kinds of MTCA-based software applications
- Essential to have a portfolio of standard solutions for modular systems
- About 300 MTCA systems @ EuXFEL as of 2024:
 - About 4800 MTCA modules (AMC, RTM, P/S, MCH,...) installed

Some snap-shots ... facility reports

MicroTCA future at SNS

- VME to MicroTCA upgrades are part of the Integrated Controls Section modernization strategy at SNS
- 7 years of production at SNS for MicroTCA
- Extensive in-house hardware & firmware expertise
- Improving the reliability through extensive component health monitoring (IPMI)
 - EPICS interface is deployed for production



This Photo by Unknown Author is licensed under CC BY-SA-NC



Vadatech VT814

Alan Justice

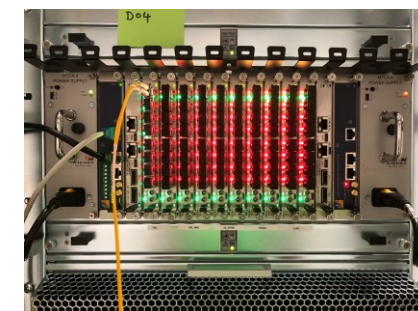


Faye Chicken

Have around 230 systems now online and in use throughout the facility

Mostly in RF, Beam Instrumentation and Timing

Small number of systems for Fast Beam Interlock



MicroTCA Applications at SNS

- Currently 69 MicroTCA Systems in Production
- Low Level RF
- Machine Protection System(MPS)
- Magnet Power Supplies(PS) - Injection Kickers
- Personnel Protection System(PPS)



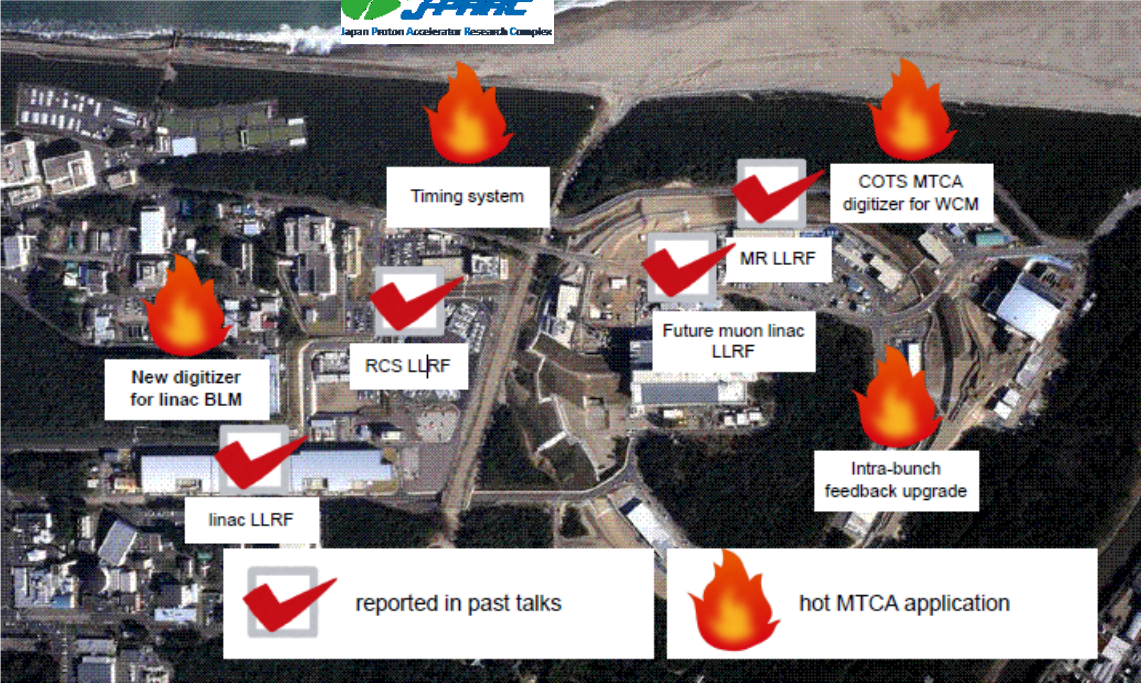
Active or upcoming systems for production:

- 200 9U Chassis and 70 3U Chassis (nVent SCHROFF)
- 500 PSU (W-IE-NE-R and N.A.T)
- 280 N.A.T MCH-PYHS
- 280 Concurrent Technologies CPU (AM900 and G6 models)
- 590 AMCs (IOxOS IFC_1410 & Struck SIS8300)
- 400 RTMs (IOxOS and Struck)
- 300 Custom AMC and RTM from IK collaboration with PEG
- 135 Event Master Timing Cards
- 125 Event Receiver Cards + 2 RTMs (all timing hardware from MRF)

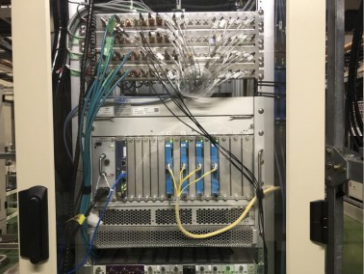
➔ > 2700 MicroTCA Modules

Some snap-shots ... facility reports

Fumihiko Tamura  大連電子加速器施設
Japan Proton Accelerator Research Complex



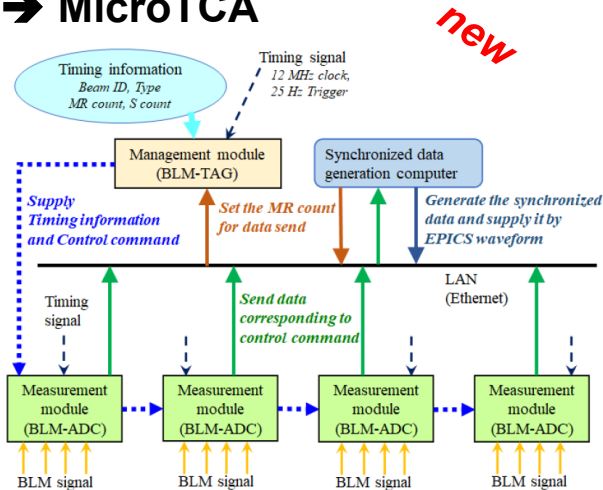
LLRF: Linac



LLRF: Synchr.



Beam Loss Monitor System → MicroTCA



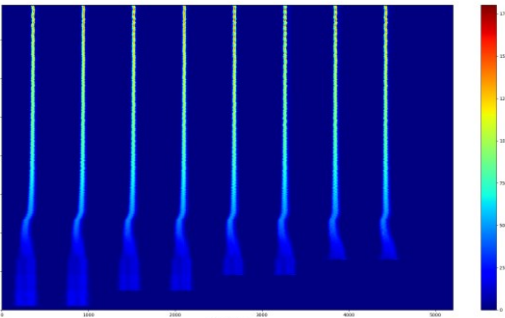
- 1U MTCA chassis with high-speed digitizer AMC module.
- Digitizer: Teledyne SP Device ADQ14
- 14bit, 1GSa/s, 700MHzBW, 4ch input, 2GB memory.
- Vadatech MTCA chassis VT816 (Ubuntu Linux)
- MCH with CPU
- Fast readout via PCIe express bus in the MTCA backplane.



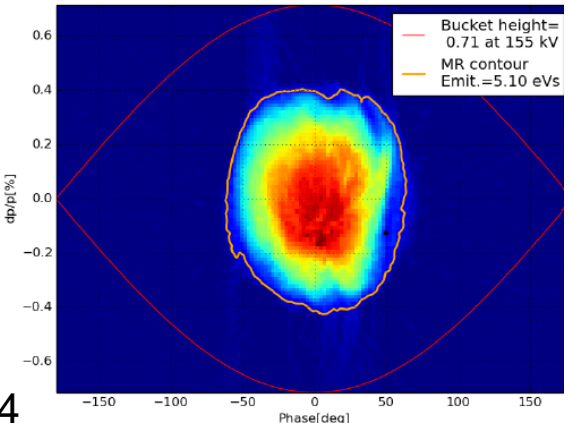
In operation since Nov 2024

Yasuyuki Sugiyama

High-speed digitizer for waveform monitoring longitudinal beam property & analysis

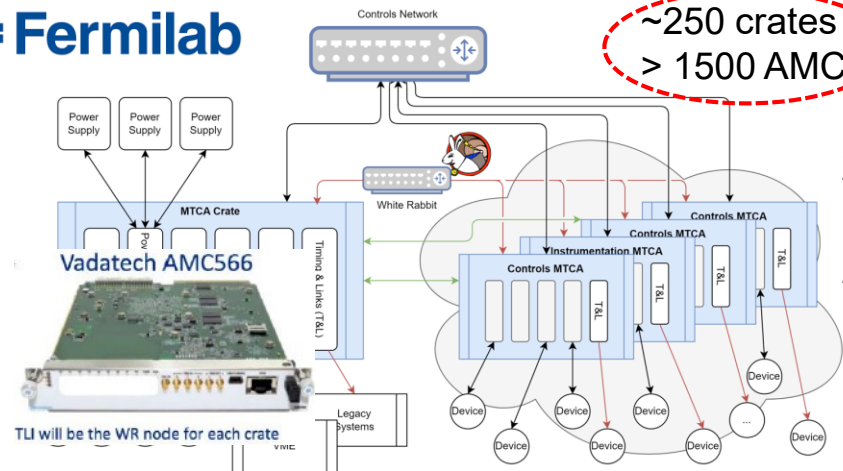


Reconstructed distribution by Tomography



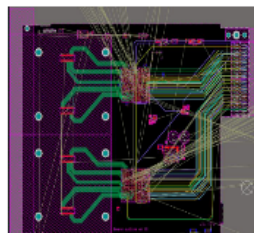
Some snap-shots ... facility reports

ACORN Data Acquisition & Control Hardware *A. Whitbeck*

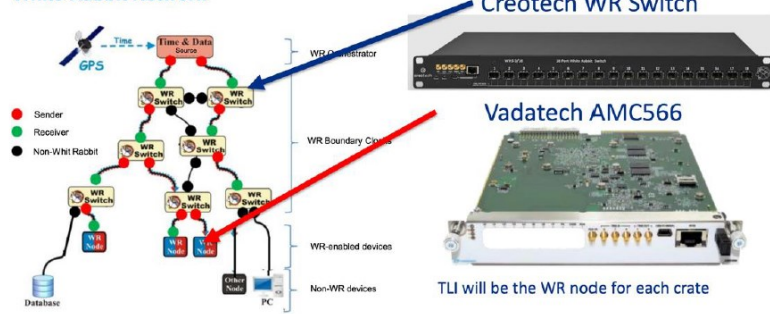


Prototype RTM

- Prototyping one solution in which legacy cables connect directly with RTMs
 - Starting with a digital IO cards
 - Building off the DESY RTM template

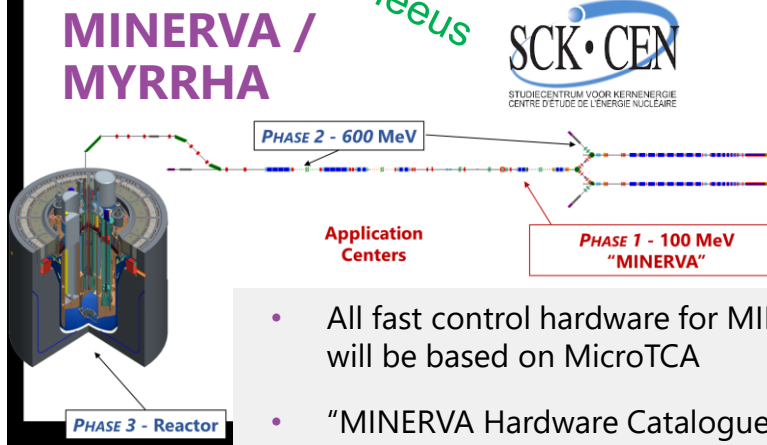


White Rabbit Network



Credit: White Rabbit Cookbook

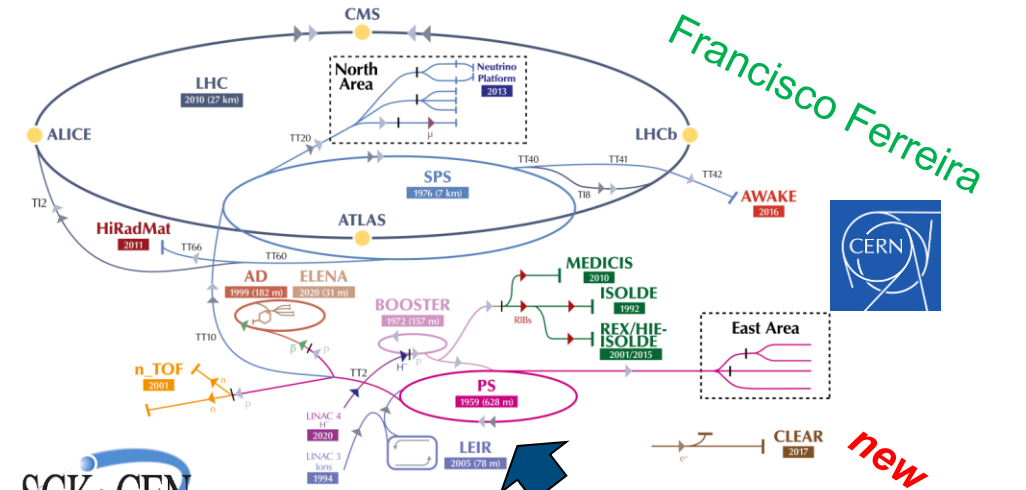
Roughly 2 dozen switches required



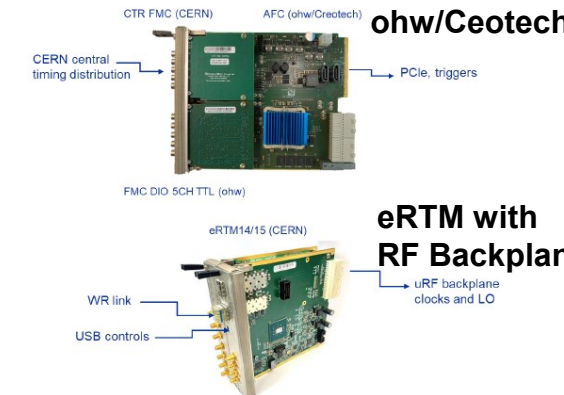
- All fast control hardware for MINERVA will be based on MicroTCA
- "MINERVA Hardware Catalogue", for primary system integration → COTS
- MicroTCA: Diag./LLRF/MPS/Timing
- Custom development (next to RF-SoC) limited to RTM / FMC boards ⇒ development team



STUDIECENTRUM VOOR KERNENERGIE
CENTRE D'ETUDE DE L'ENERGIE NUCLEAIRE



MicroTCA beam cntr. for PS



Some snap-shots ... project status reports

D. Makowski

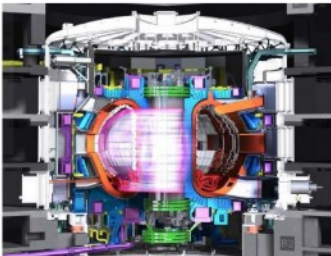


Lodz University of Technology

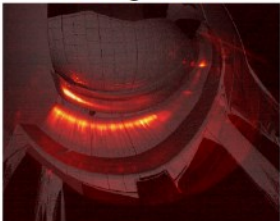
Imaging diagnostics:

- W7-X: 17 VIS and 13 IR cameras (OP2.1-OP2.4)
- ITER: more than 200 cameras

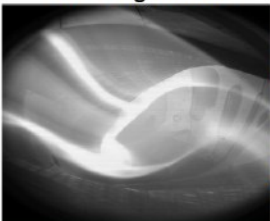
ITER Tokamak



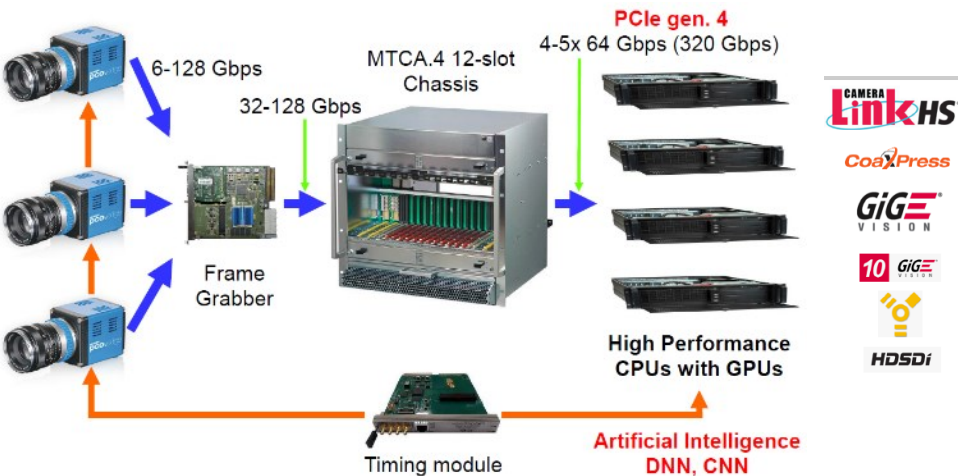
IR Diagnostics



VIS Diagnostics

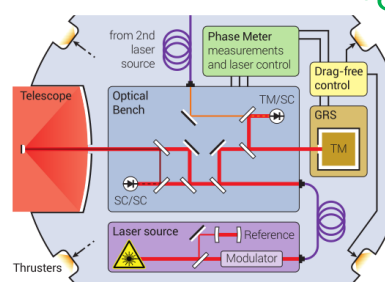
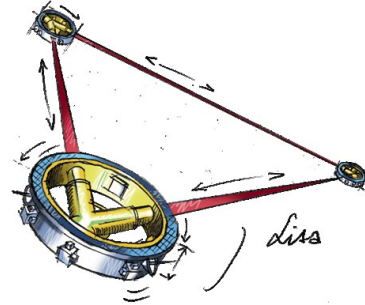
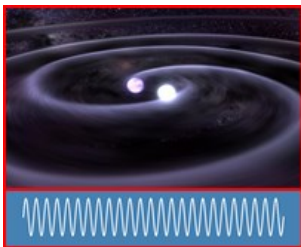


Wendelstein 7-X Stellarator

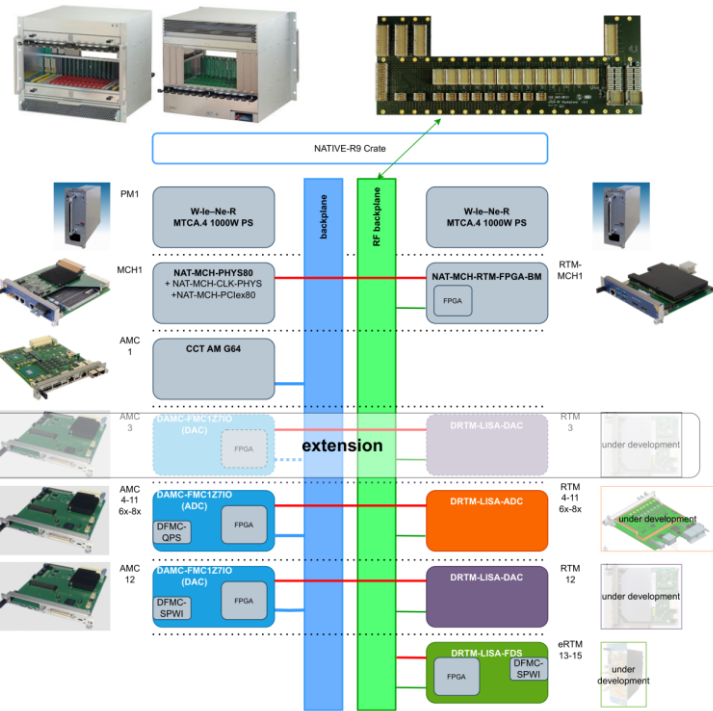


Laser interferometer space antenna

O. Gerberding



Ground-support equipment (GSE) phasemeter for assembly, integration, verification and testing of the instrument

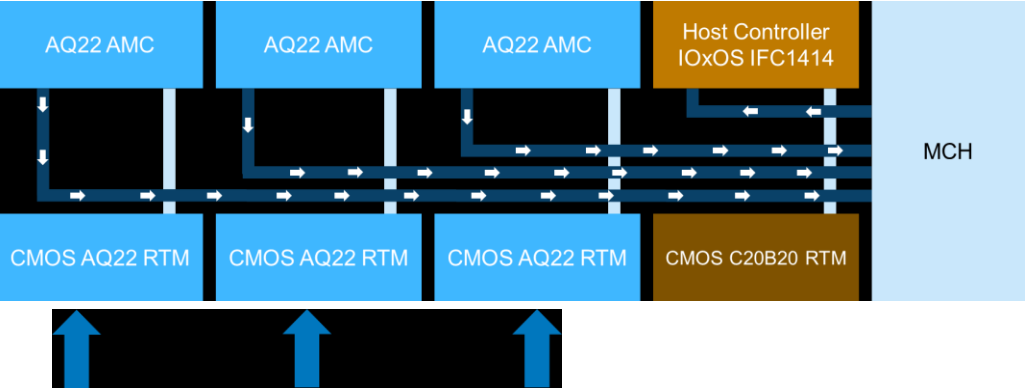
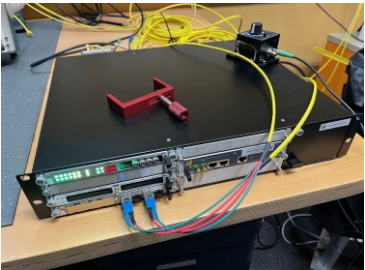
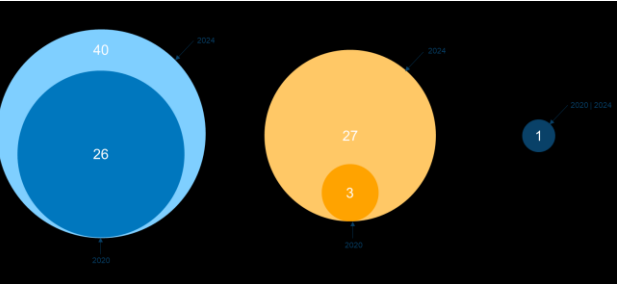


DRTM-LISA-ADC

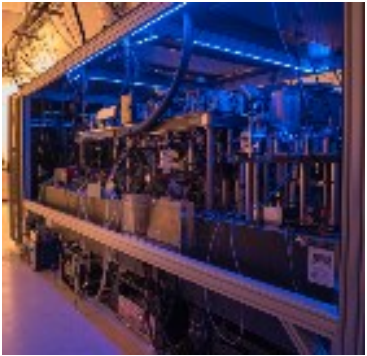


Some snap-shots ... project status reports

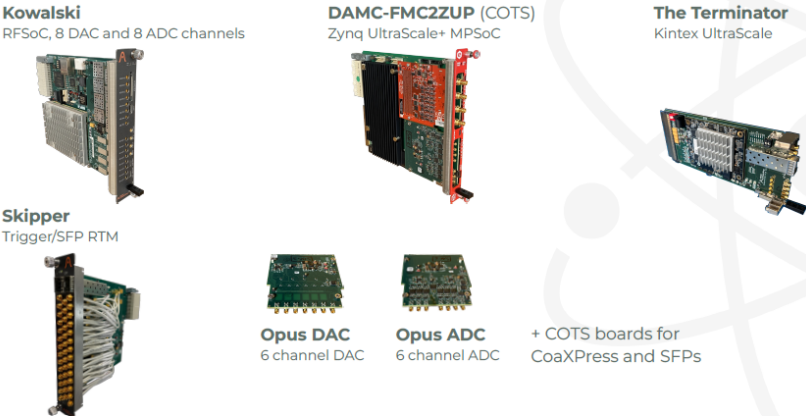
M. Richerzhagen



J. Marjanovic



Board portfolio (mostly COTS)



MMC Stamp

Implementation of the MMC on the boards

- All our boards use DESY MMC Stamp to implement the MMC
- We have licensed the SDK to customize it for our boards
- Robust and reliable implementation



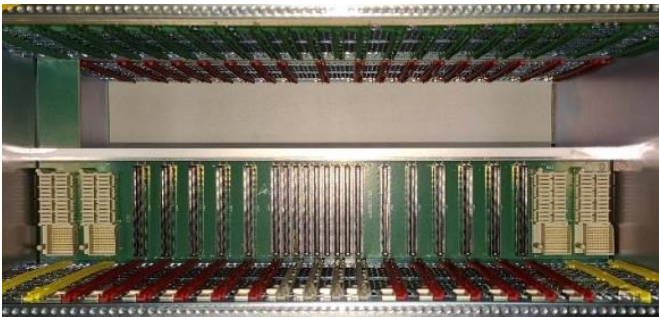
Some snap-shots ... Hardware from industry

Next Generation MicroTCA

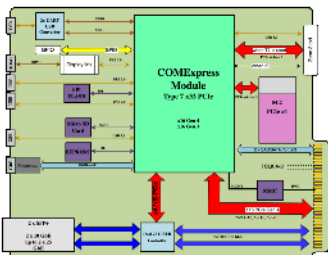
- Supports PCI Express Gen 4 & 5
- Supports 100 Gb Ethernet
- Power Module with 110 W channels for MCH and CU



C. Ganninger



NAT-AMC-COMex V2



+ NAT-AMC-COMex-mini

H. Erd



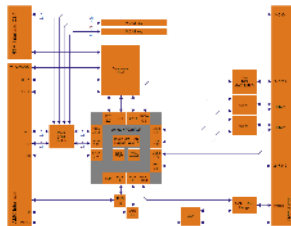
NATserver-R1



IFC_1416 – MTCA.4
Processor AMC & FMC
Carrier



MHC_1418 –
Processor AMC



T. Holzampfel



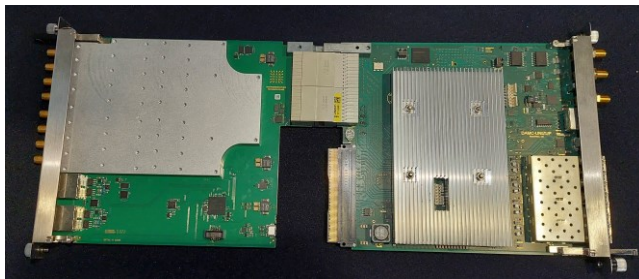
Intel® Core™
i3-1320PRE



INSTRUMENTATION
TECHNOLOGIES

A. Bardorfer

Libera 2BPMRTM & DAMC-UNIZUP



5th Generation MCH

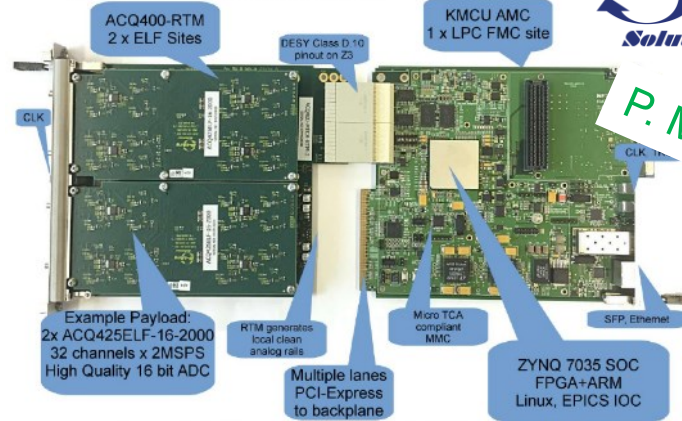


- 100G Ethernet
- PCIe Gen.4

AMC577 - RFSoc



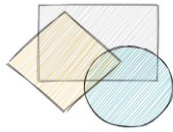
KMCU: MicroTCA.4 AMC with ACQ400 RTM



P. Milne

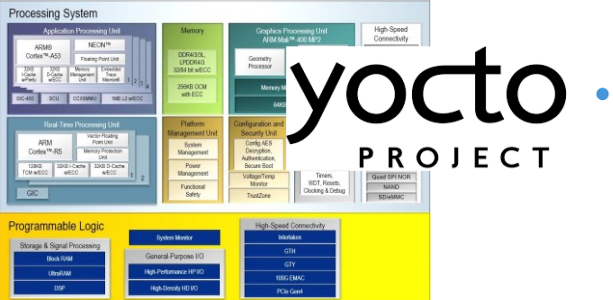
Some snap-shots ... HW/FW/SW

Firmware Frameworks

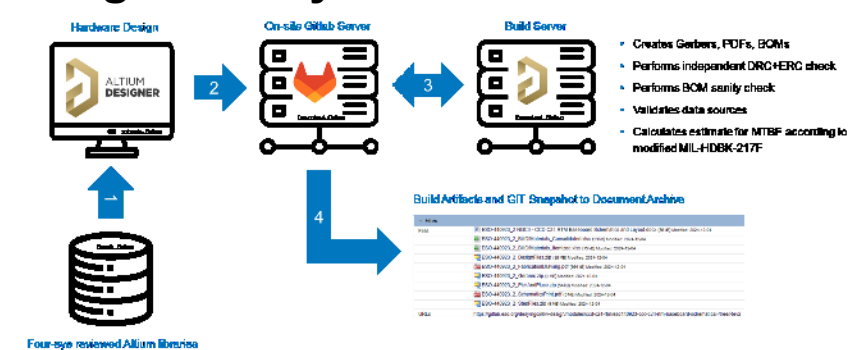


FWK
FPGA Firmware Framework

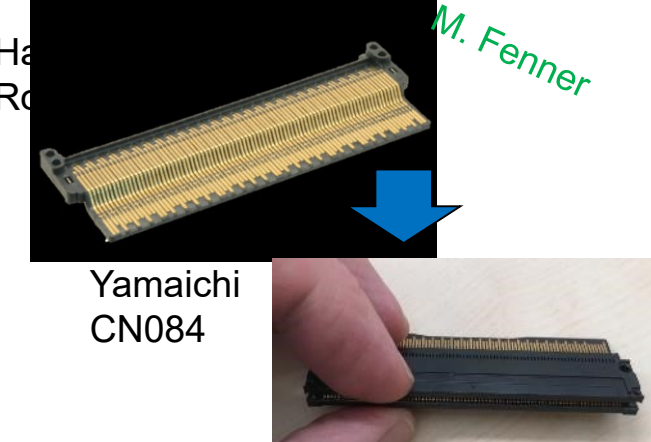
C. Guemes



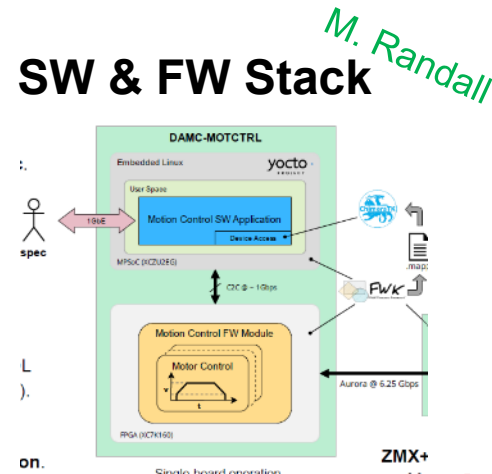
Design Quality Measures in Workflow



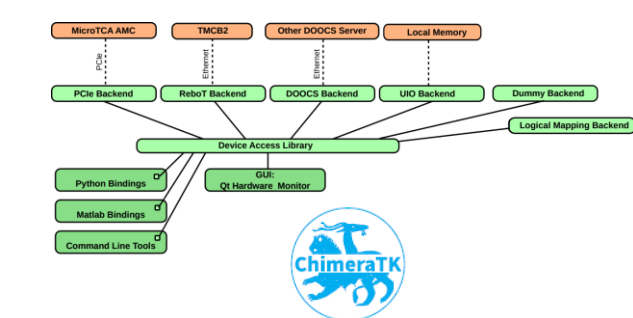
Connector



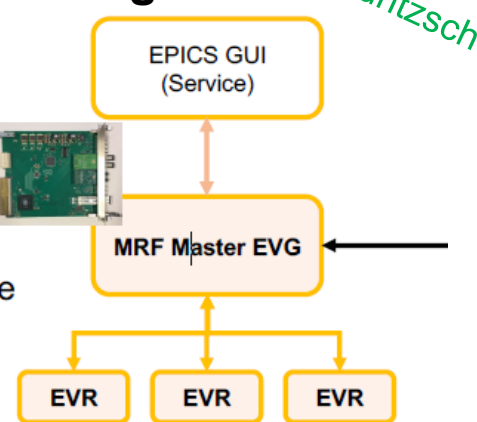
SW & FW Stack



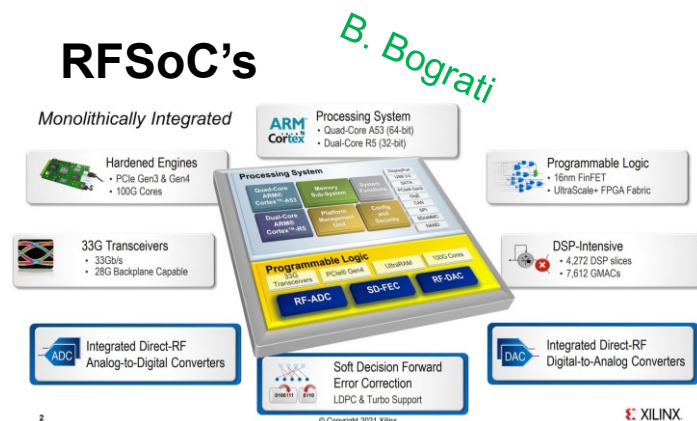
Software Frameworks



Timing...



RFSoc's



... and many more contributions e.g. IHEP/MTCA2024/KVG/Beamlines/...

Takeaway from 13th MicroTCA Workshop

➤ **Face-to-face** (~165) + virtual participation (~19)

➤ **Essential for MicroTCA Ecosystem & Network:**

- Get known to each other... who is who
- Exchange solutions and ideas ...
- Innovation space ...
- Community support ...

➔ *Almost familiar atmosphere*

➔ *Truly cross-discipline*

➤ **Education** of young engineers & scientists & newcomers

➔ *Tutorial tracks*

➤ **Largest event** of its kind & close **liaison to the industry**

➔ *Unique*

➤ **FW & SW & Mgmt** of large complex systems

➔ *Became new bond*

➤ **Future topics:**

- Embedded system of SoC / NoC e.g. using Yocto (tech. evolution)
- Asset management, deployment tools, system integration..
- Machine learning on edge computing system
- Next generation of components / MicroTCA



Chair: Kai Rehlich



Save the date 14th MicroTCA WS:

02-04.12.2025
(Tu-Th)

New: Pre-workshop on Mon. 01.12. Versal & NoC