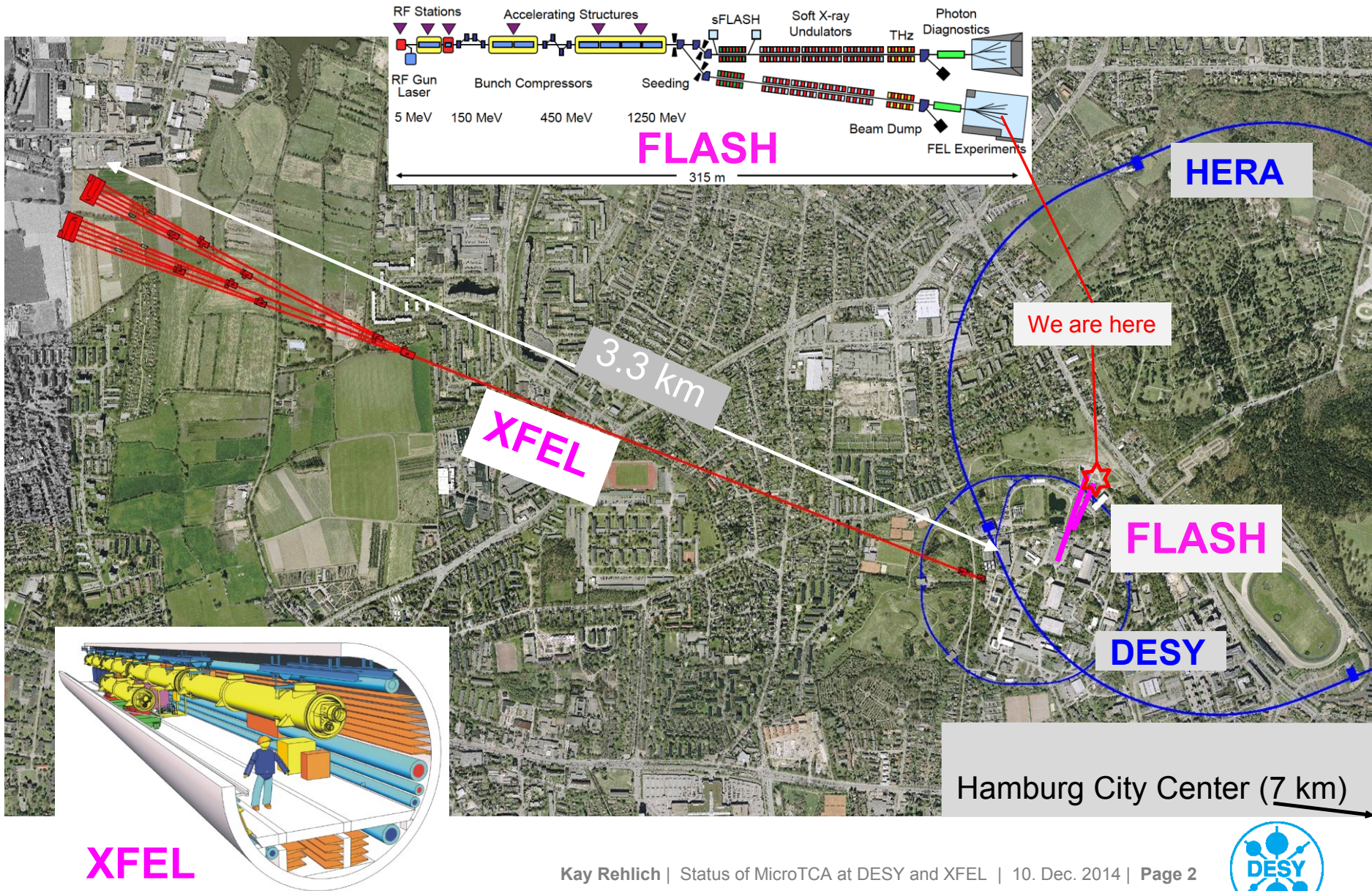


Status of MicroTCA at DESY and XFEL

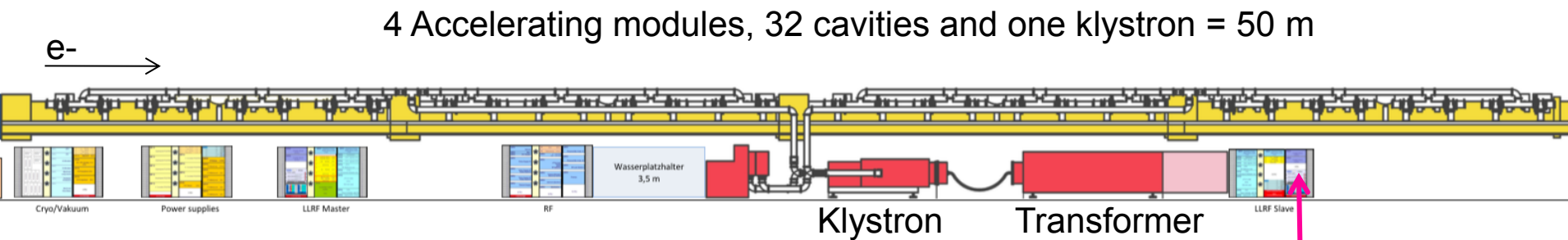
Kay Rehlich

MicroTCA Workshop @ DESY, 10. Dec. 2014

The Projects: FLASH and XFEL (and REGAE, AMTF)



XFEL Tunnel: One out of 25 Klystron Sections



Electronics for:

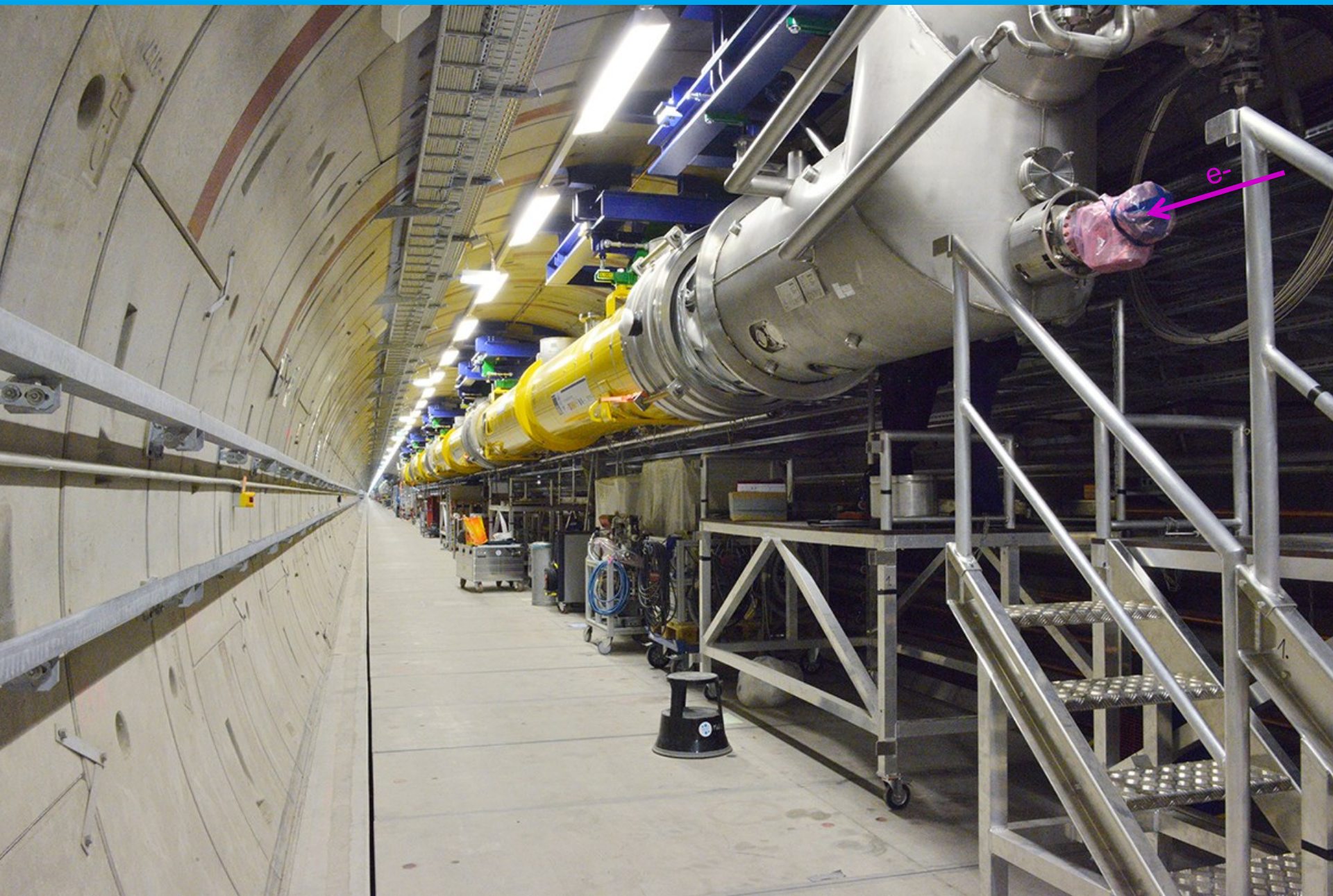
- Cryogenics
- Vacuum
- Magnets
- LLRF
- Interlocks
- Diagnostics
- Klystron

MicroTCA crates:

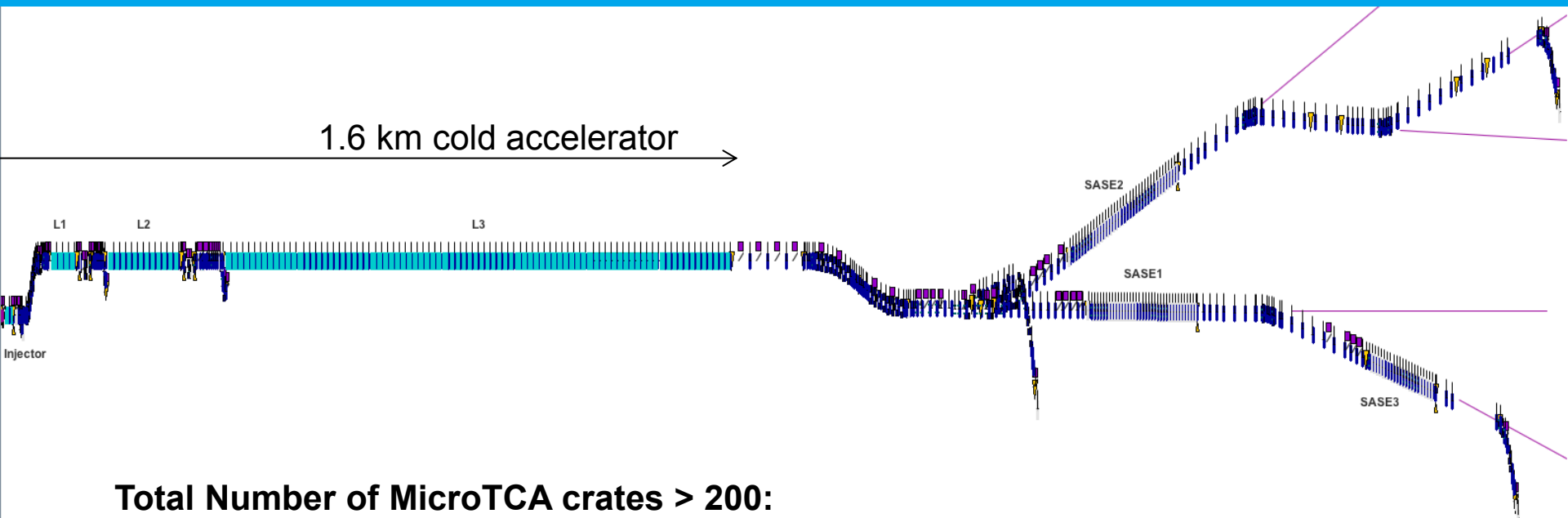
- 2 * LLRF
- 2 * Interlocks
- Diagnostics, Vacuum, Magnets



XFEL December 2014: First Klystron Section Installation



Planned MicroTCA Crates for XFEL



Total Number of MicroTCA crates > 200:

- 58 LLRF
- 53 Coupler Interlocks
- 50 Diagnostics
- 21 Special Diagnostics
- 20 Vacuum, Magnets
- ? Experiments

XFEL MicroTCA Crates

Common modules

Application modules . . .

ADC
Digi. IO
Controller
....

- LLRF
- Diagnostics
- Cpl. Interlocks
- Laser
- ...

MCH

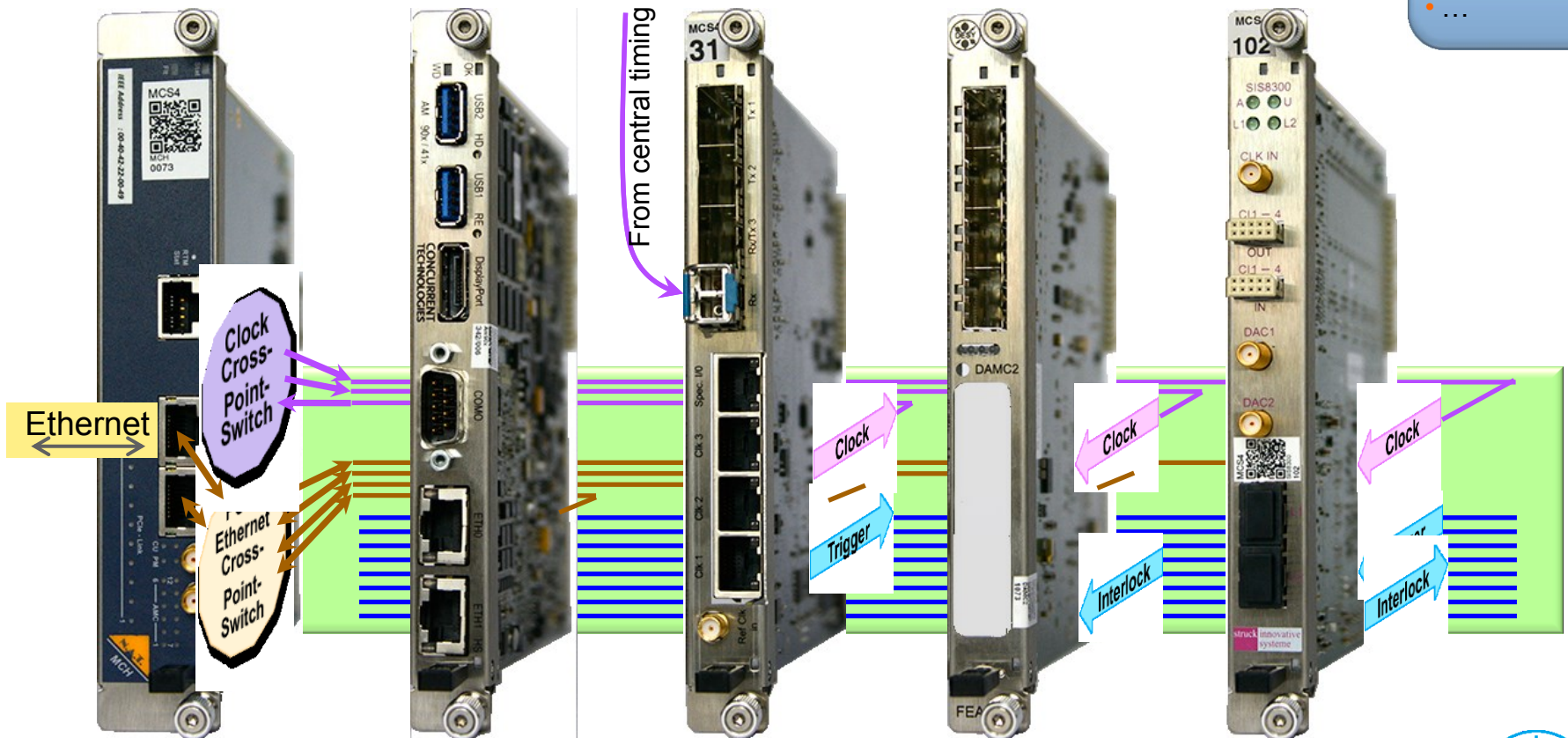
CPU

Timing

Machine
Protection
System

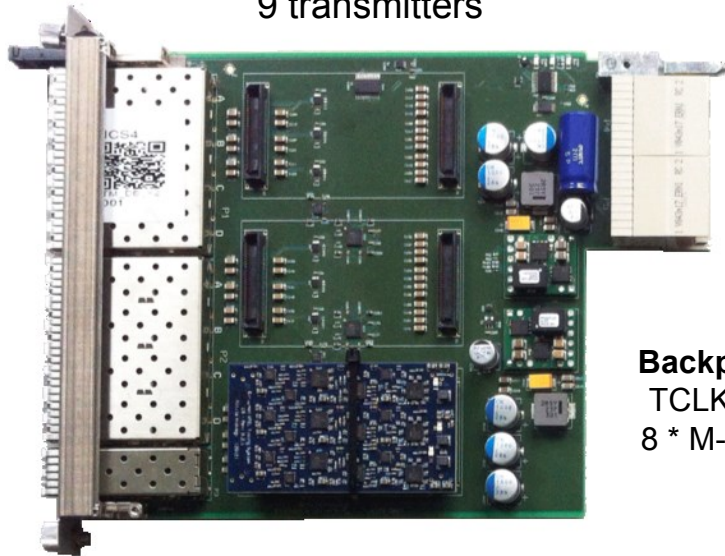
ADC
Digi. IO
Controller
....

MTCA.4 Backplane



ps Timing System for XFEL and FLASH

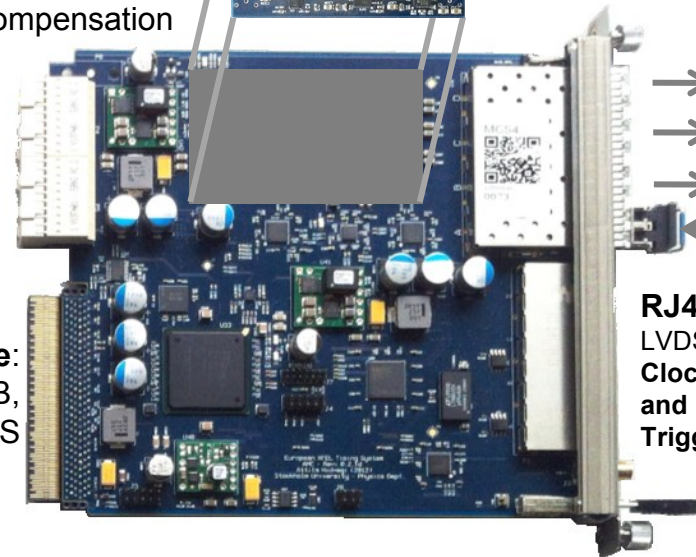
RTM:
9 transmitters



Transmitter
Piggyback
with link delay
compensation



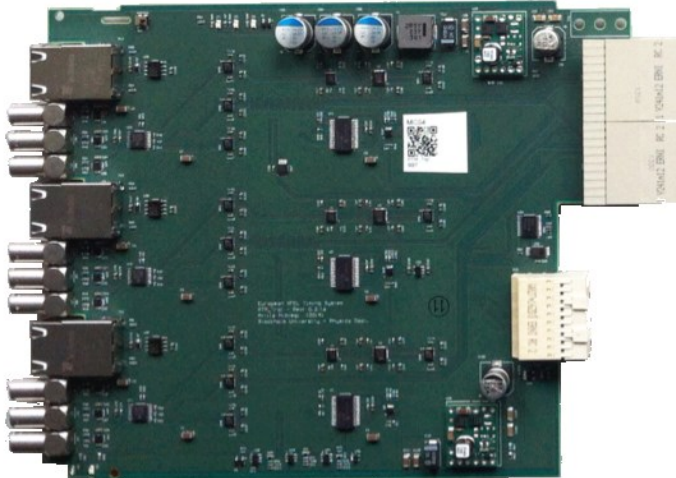
Backplane:
TCLKA / B,
8 * M-LVDS



→
→
→
←
Fiber optics

RJ45
LVDS
Clocks
and
Triggers

RJ45
LVDS
or **LEMO**
50 Ohm TTL
Clocks
and
Triggers



> 100 x2timer AMCs available,
24/7 operations of FLASH

More by
Christoph Stechmann



The XFEL Working Horses, DESY Designs

> RTM to adapt applications

- **Machine protection system**
- **Coupler interlocks**

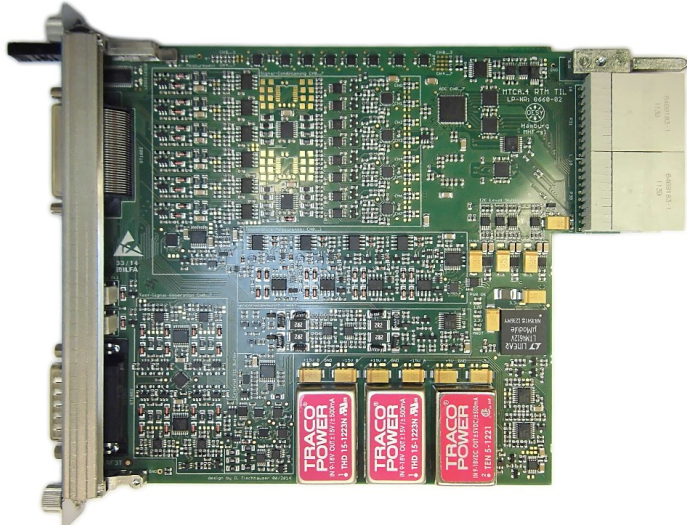
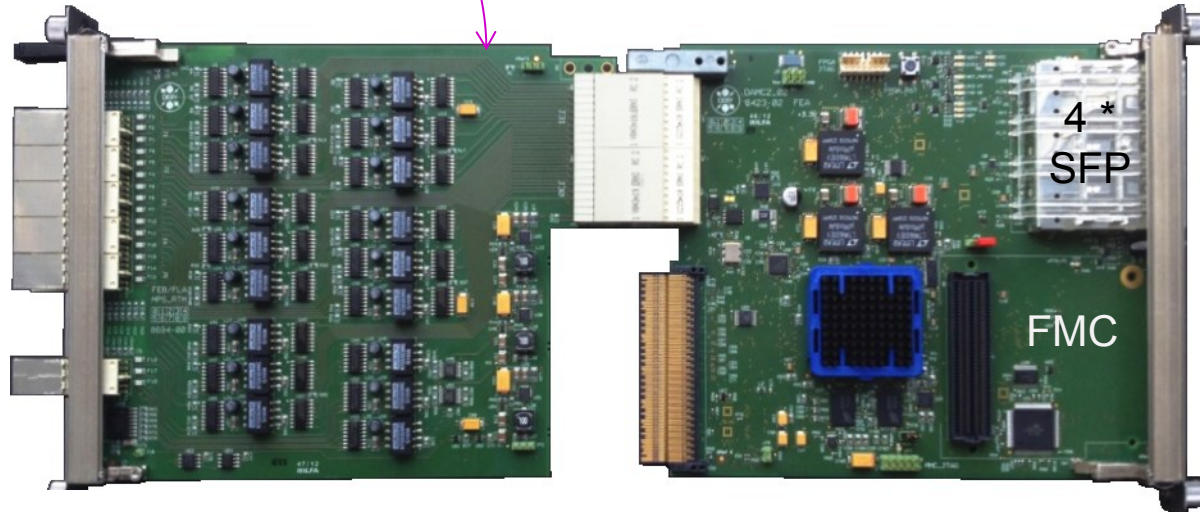
RS422
Inputs

outputs

Inputs for:
e-
Light detectors
Temperatures

> AMC

- Virtex-5 FPGA
- > 700 Boards for XFEL



Further Subsystems:

- Beam Loss Monitors
- Beam Position Monitor Interface
- Clock & Trigger Contr. For Exp.
- Toroid Protection & Readout
- Wire Scanner

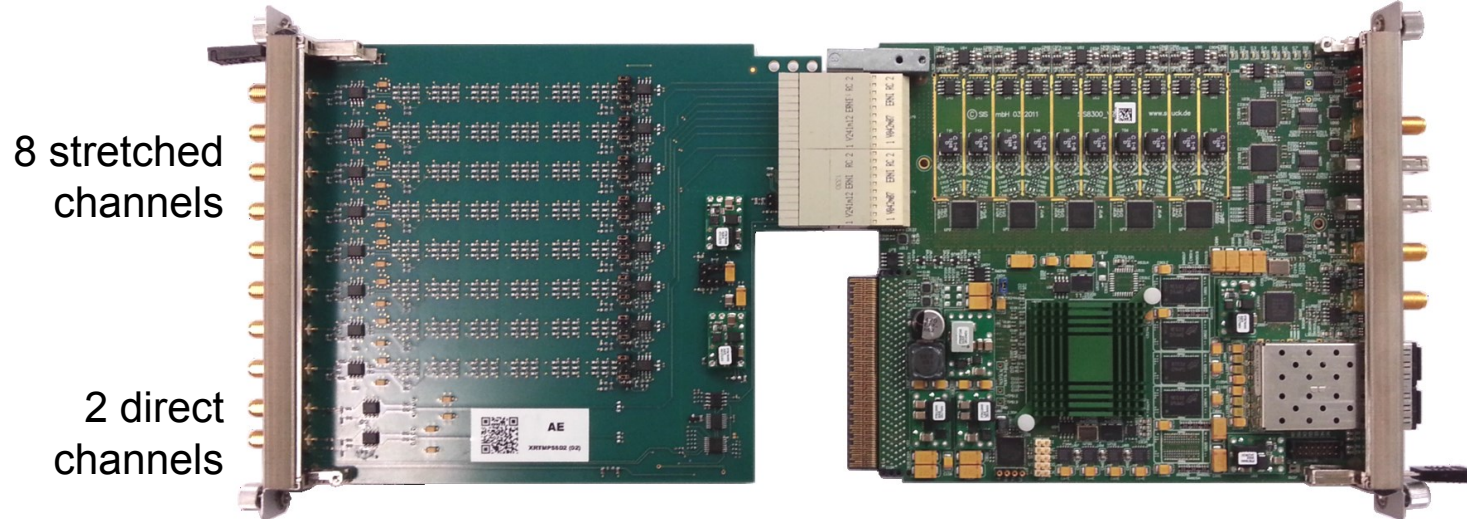
The Analog IO: Mixed Industrial, DESY, XFEL

> RTM to adapt applications

- Fast Photo diodes pulse stretcher

> AMC

- SIS8300
- 10ch, 125MSPS, 16 bit ADC



Further Subsystems:

- Down converter for LLRF
- Dark current Monitor
- Faraday cup
- Multi Channel Plate (Photon Diag.)
- Beam Position Monitor
- ...

Further XFEL Subsystems Based on MicroTCA, COTS

> Diagnostics

- Photon energy and position, GPS

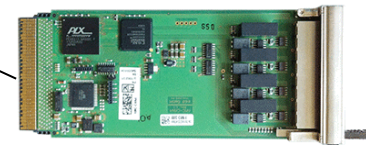
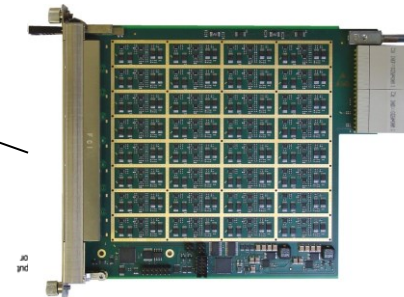
> Special Diagnostics

- Cameras
- Kicker
- Spectrometer

> Magnets & Vacuum

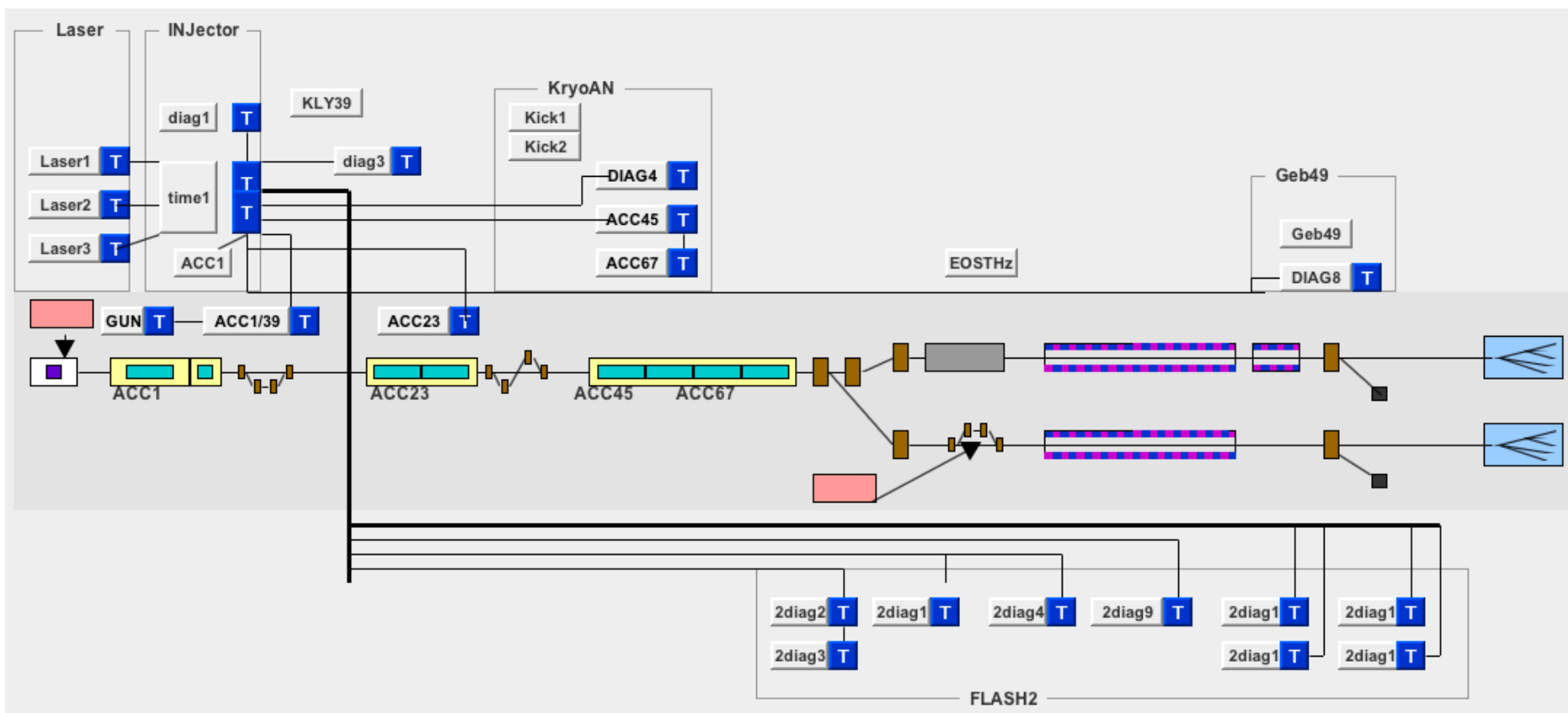
> LLRF

- See other talks....



MicroTCA Crates at FLASH / FLASH2

- > 20 MicroTCA Crates are used in standard FLASH operation 24/7
- Used for LLRF, Timing, MPS, Laser, Kicker, Diagnostics



MicroTCA Remote Management Software

Graphical presentations:

- Is-inserted, fault, ...
- Temperatures, voltages
- Reset, power on/off
- Act. Power consumption

SystemStatus.xml

DOOCS System Status

Applications Server Status Network Status FLASH Timing FLASH VME FLASH uTCA MicroTCA FLASH.L

XFEL MicroTCA Crates

Module	Manufacturer	Status
XFELMCHXM1:	Schroff GmbH	12
XFELMCHTIME1:	Schroff GmbH	12
XFELMCHLLGUN1:	Schroff GmbH	6
XFELMCHTIL1:	ELMA Electronic GmbH	12
XFELMCHLASER1:	Schroff GmbH	12
XFELMCHDI3011:	Schroff GmbH	12
XFELMCHVAC1:	Schroff GmbH	6
XFELMCHMAG1:	Schroff GmbH	12
XFELMCHLA2M:	off	
XFELMCHLA2S:	Schroff GmbH	0

AMTF MicroTCA

Module	Manufacturer	Status
MSKMCHAMTF1:	Schroff GmbH	12
MSKMCHAMTF2:	Schroff GmbH	12
MSKMCHAMTF3:	Schroff GmbH	12
AMTFMTS1MCH:	Schroff GmbH	12
AMTFMTS2MCH:	Schroff GmbH	12
AMTFMTS1MCH:	Schroff GmbH	12

Elma_12slot.xml FLASH.CRATE/MSKMCHACC67/*LAB.CRAT

xTCA-12 spezial 12 Slot MicroTCA Crate

FLASH.CRATE/MSKMCHACC67/ device online

Display by standard controls tool jdd

Modules in selected crate: **XFEL.CRAT/XFELMCHDI3011/**

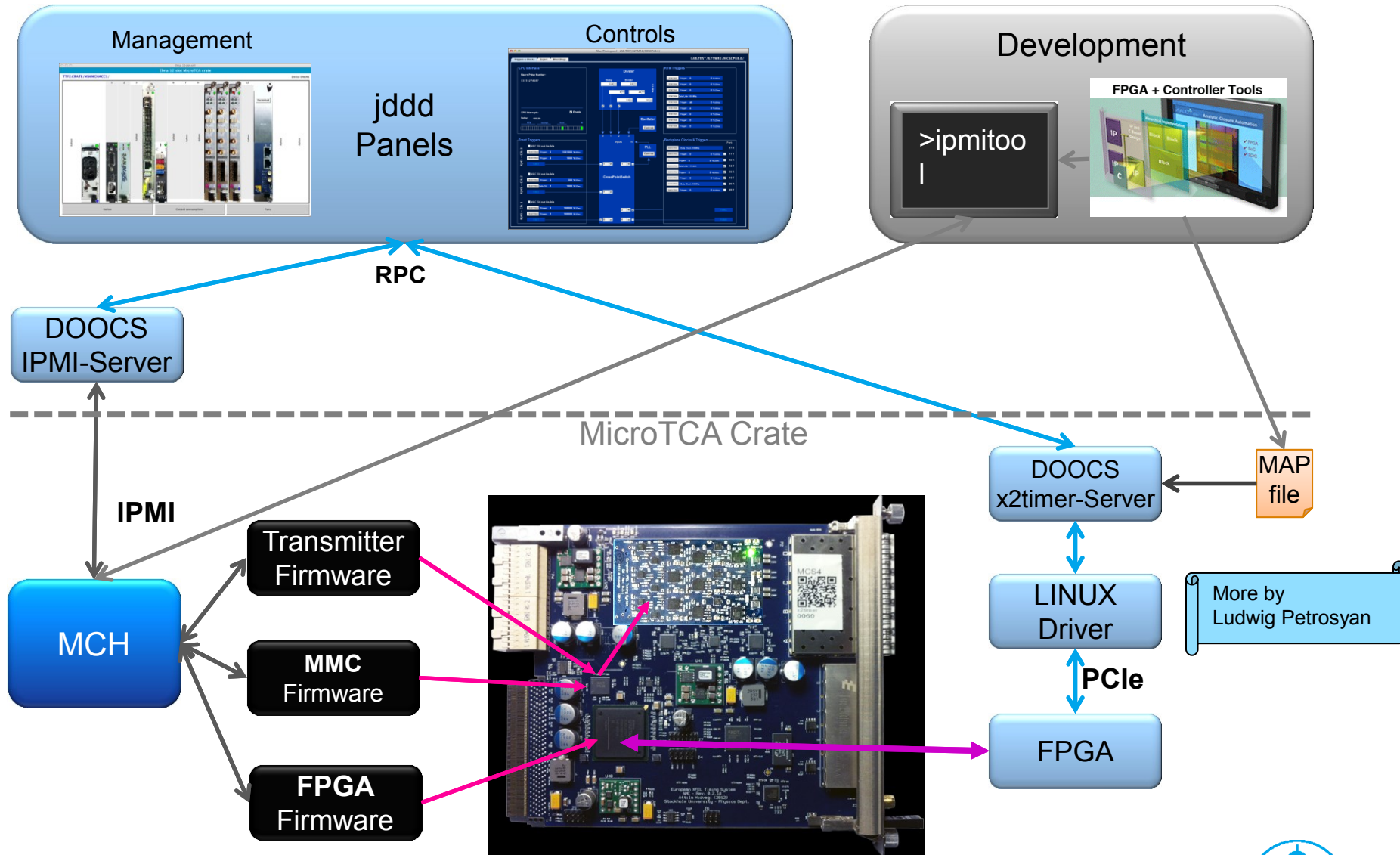
CRATE: Schroff GmbH

Module	Manufacturer	U	Temp	Status	Serial	MMC version
RTM3:	MPS-RTM1 ATP			info	0000000000000001	1.0
RTM8:	SIS8900 Struck Innovative Systeme GmbH			info	01-012	0.00
RTM4:	XFEL-BLM Deutsches Elektronen-Synchrotron			info	069901010	0.00
AMC3:	DAMC2 Deutsches Elektronen-Synchrotron	U= 3.3	Temp= 30.0	info	1075	1.02
COOL_UNIT2:	Fan speed= 2580 2640 3000 3060 Temp= 27.0 24.0			info	1051405710AB	1.18
COOL_UNIT1:	Fan speed= 2580 2520 2940 2940 Temp= 26.0 24.0			info	1051405711AB	1.18
AMC1:	AM 900/412 Concurrent Technologies	U= 0.9	Temp= 35.0	info	M23485D016	3.09
AMC4:	DAMC2 Deutsches Elektronen-Synchrotron	U= 3.5	Temp= 29.0	info	1020	2.00
AMC6:	DAMC2 Deutsches Elektronen-Synchrotron	U= 3.3	Temp= 30.0	info	1025	1.01
AMC8:	SIS8300 Struck Innovative Systeme GmbH	U= 1.8	Temp= 41.0	info	029	1.00
AMC7:	DAMC2 Deutsches Elektronen-Synchrotron	U= 3.3	Temp= 30.0	info	3010	2.00
AMC2:	XZTIMER Stockholm University	U= 3.3	Temp= 31.0	info	0067	2.00
MCH:	NAT-MCH V1.3, R130927 Current= 2.0 Temp= 27.0 32.0 30.0 29.0			info	128	2.15
POWER_UNIT2:	MTCA Power S...			info	01786007	1.10

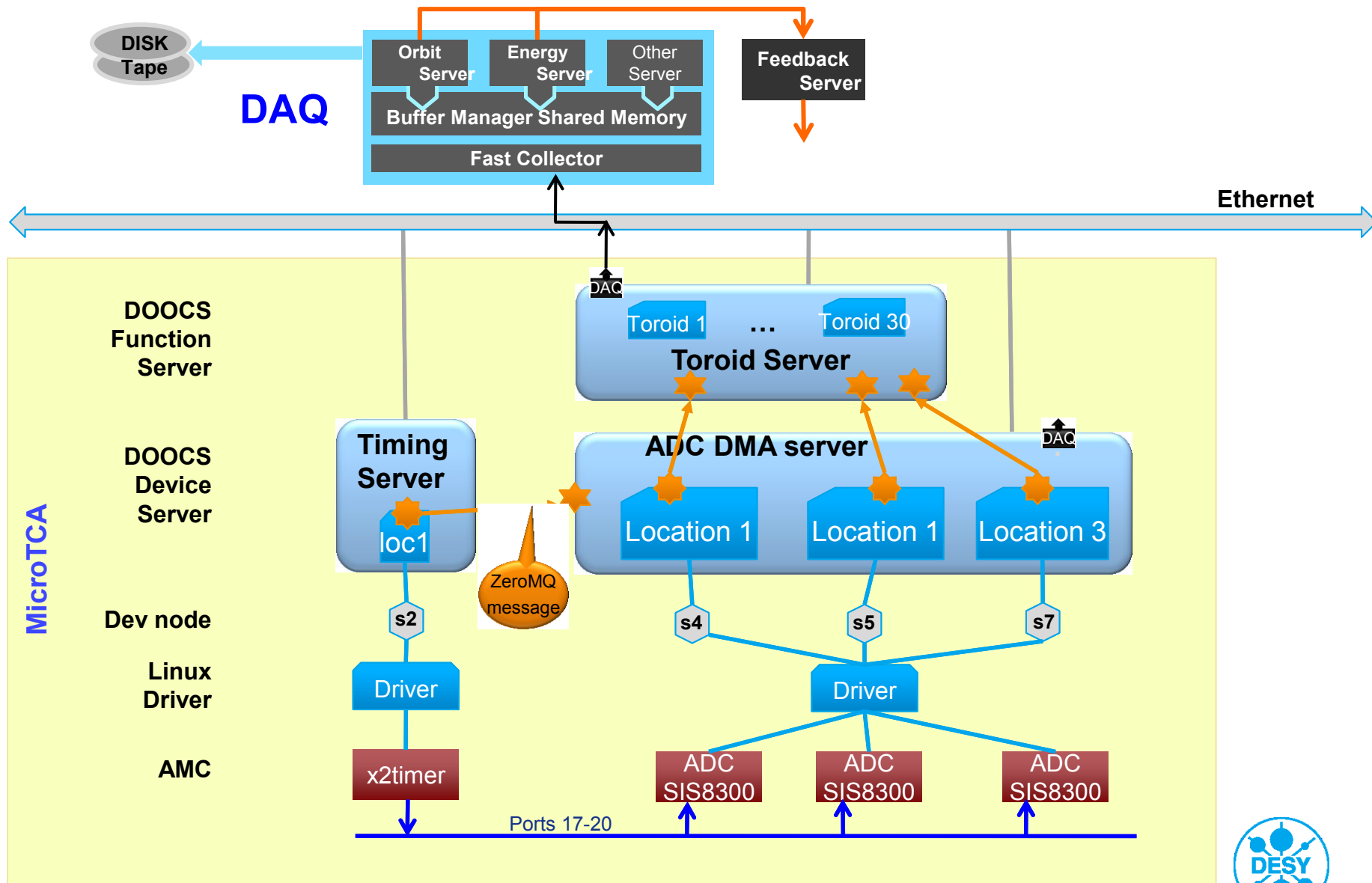
Remote upgrade of Firmware
Remove/insert of modules
in a running system



Management, Controls and Development Interfaces



Fast Data Processing from MicroTCA to Server



Conclusions

- Major parts of the MicroTCA hardware are in operation
 - **FLASH**: 20 crates installed, 4 RF stations are controlled 24/7 by MicroTCA
 - Excellent performance:
 - analog, throughput, reliability, maintainability
 - All critical components are operating at FLASH
 - LLRF, Timing, MPS, BPM, ADC - including software

- Next steps
 - 2015: installation in XFEL
 - Operation of the Gun and XFEL Injector
 - 2016: operation of XFEL

