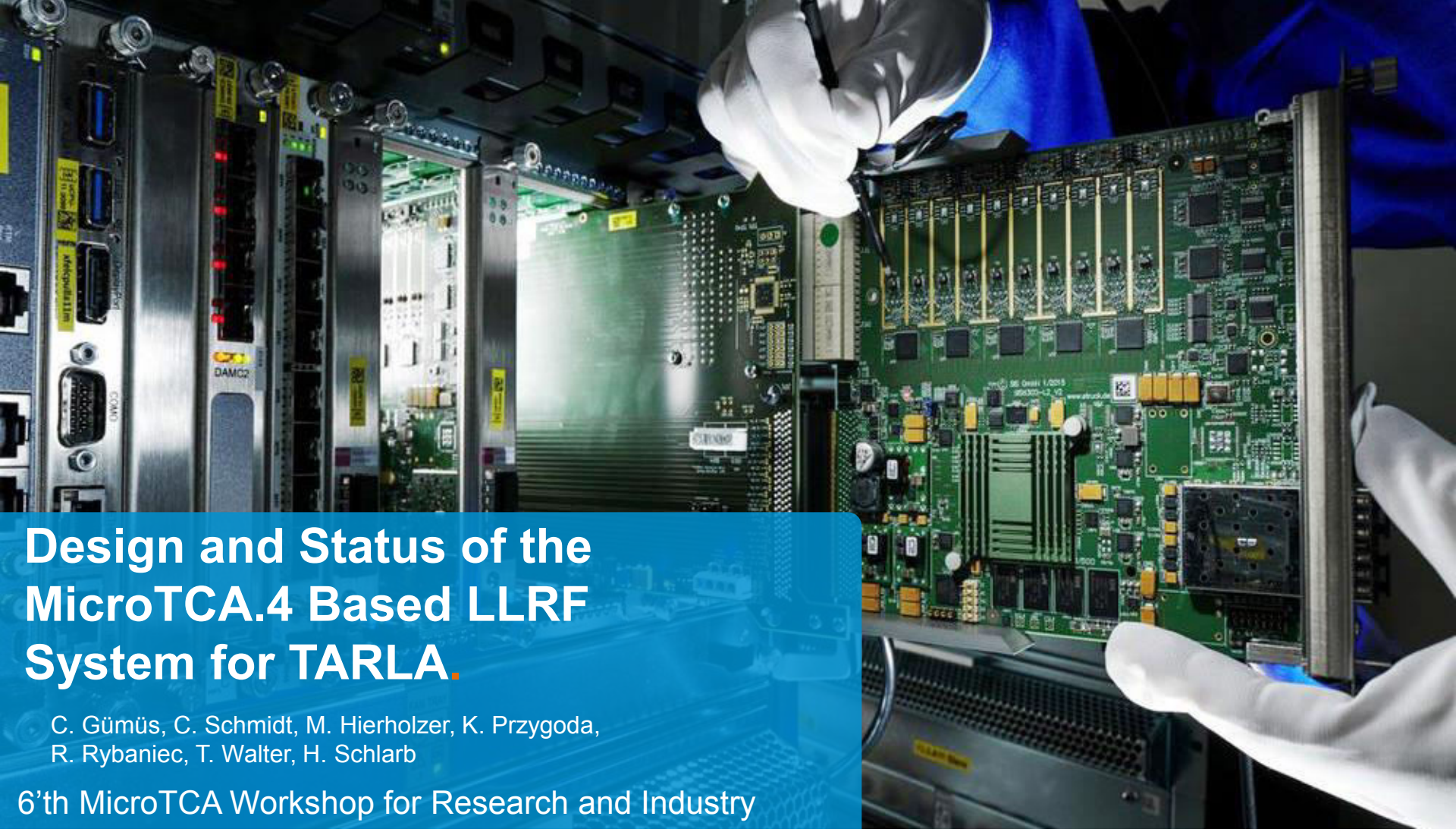


Design and Status of the MicroTCA.4 Based LLRF System for TARLA.

C. Gümüs, C. Schmidt, M. Hierholzer, K. Przygoda,
R. Rybaniec, T. Walter, H. Schlarb

6’th MicroTCA Workshop for Research and Industry

TARLA Turkish Accelerator and Radiation Laboratory in Ankara

MicroTCA TECHNOLOGY LAB
A HELMHOLTZ INNOVATION LAB

DESY

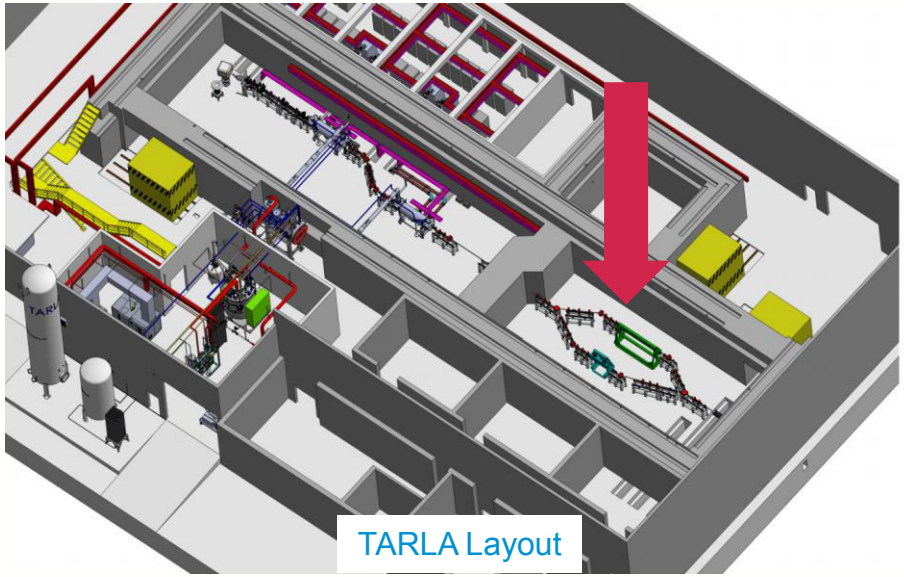
Facility Information


Building Entrance

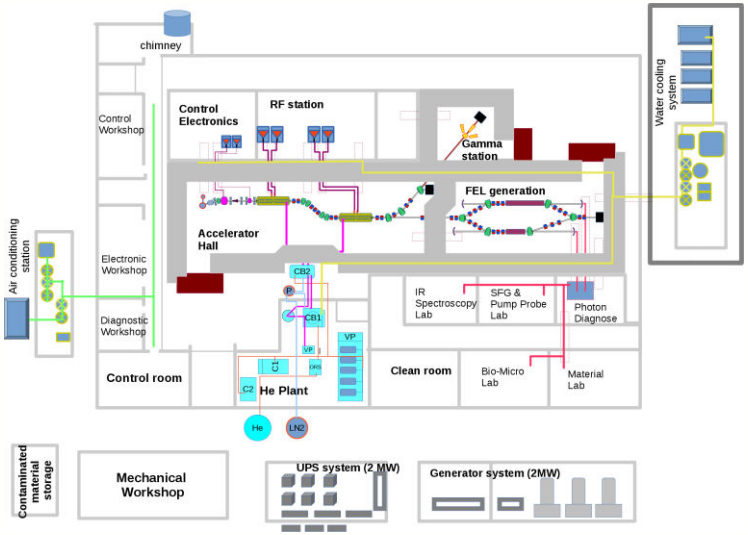
- The Turkish Accelerator and Radiation Laboratory in Ankara (TARLA) is an Infrared Free Electron Laser (IR-FEL) and Bremsstrahlung facility located at Ankara – Turkey.
- 3-250μm FEL, usage of Bremsstrahlung radiation and fixed target experiments
- Collaboration with DESY:
- Installation and commissioning of the Low-Level Radio Frequency (LLRF) Control system.


TARLA Facility

Facility Information



TARLA Layout



- Similar design with ELBE Accelerator in HZDR (Dresden/Germany)
- Continuous-Wave RF Operation
- Expected Beam Energy ~40MeV
- Bunch repetition rate of 52 MHz (max) 13 MHz nominal

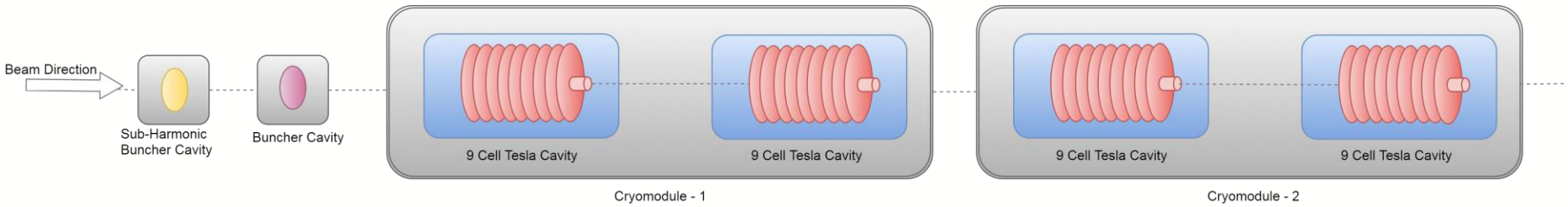
Parameter	Unit	Base Value	Upgrade Value
Beam Energy	MeV	0 - 40	0 - 40
Max Bunch Charge (@13 MHz)	pC	77	115
Max Average Beam Current	mA	1	1.5
Horizontal Emittance	mm mrad	$<$15	$<$15
Vertical Emittance	mm mrad	$<$12	$<$12
Longitudinal Emittance	keV ps	$<$85	$<$85
Bunch Length	ps	0.4 - 6	0.3 - 6
Bunch Repetition	MHz	13	0.001-104
Macro pulse Duration	μs	10 - CW	10 - CW
Macro pulse Repetition	Hz	1 - CW	1 - CW

Latest Update from Site[1]

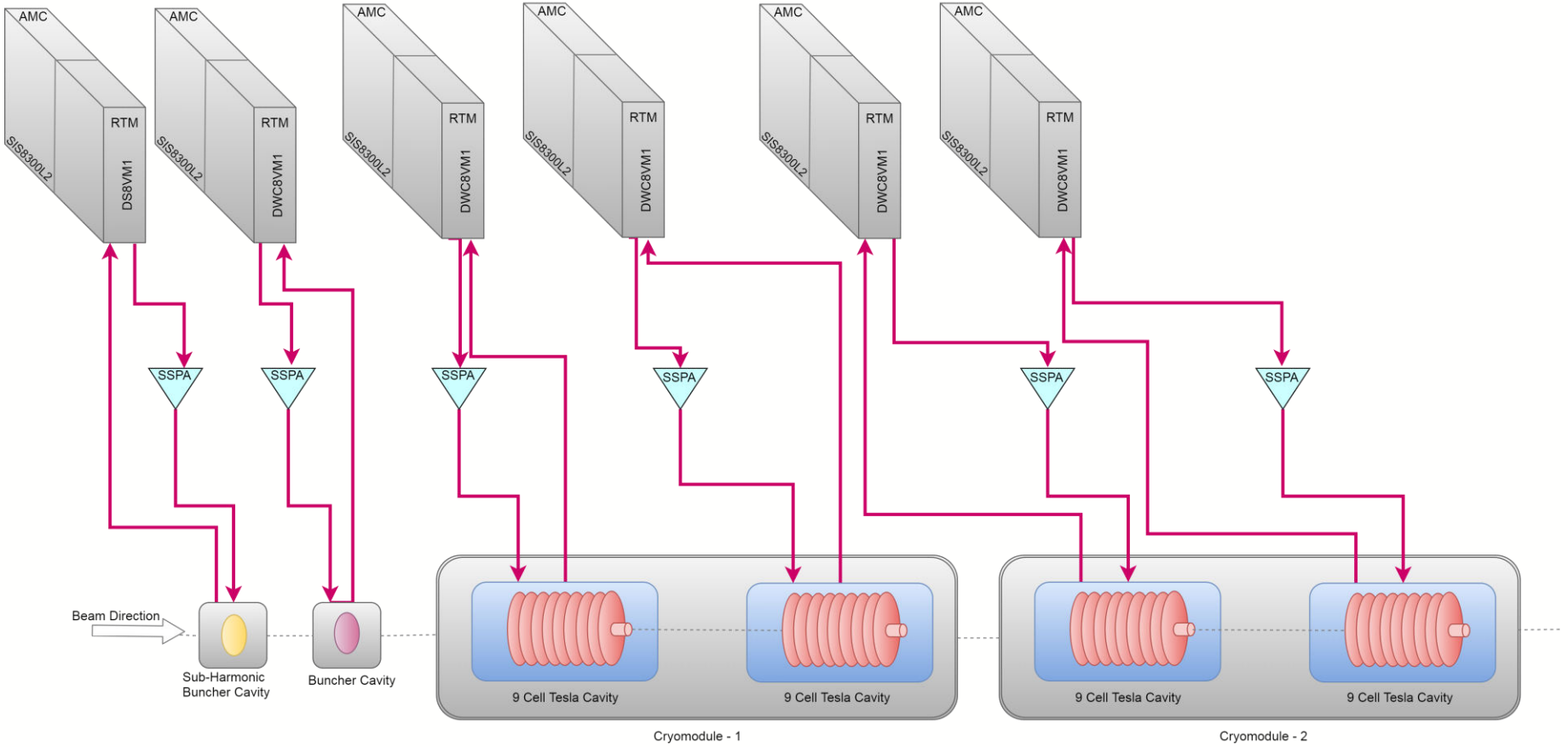
- Commissioning of gun is almost complete
- Injector commissioning on going, will be ready by Q1 of 2018.
- Helium plant commissioning is almost done and will be ready by Q1 of 2018
- First cryomodule tests without beam after finishing He plant tests
- Expected LLRF System shipment is around Q4 of 2018
- First beam is expected by Q1 of 2019

[1] A. Aksoy, “TARLA Project” 13th Nanoscience and Nanotechnology Conference, 22-25/Oct/2017

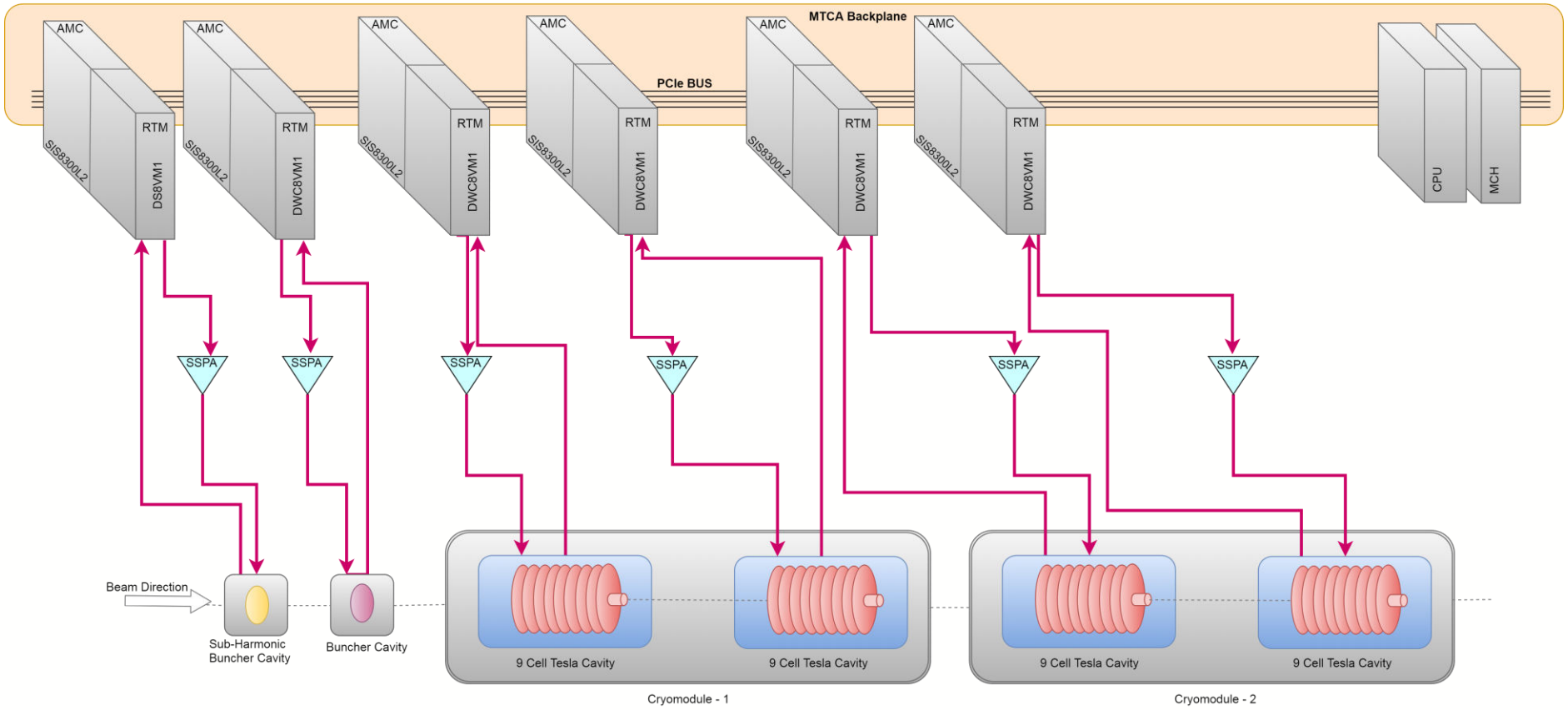
LLRF Control System Overview



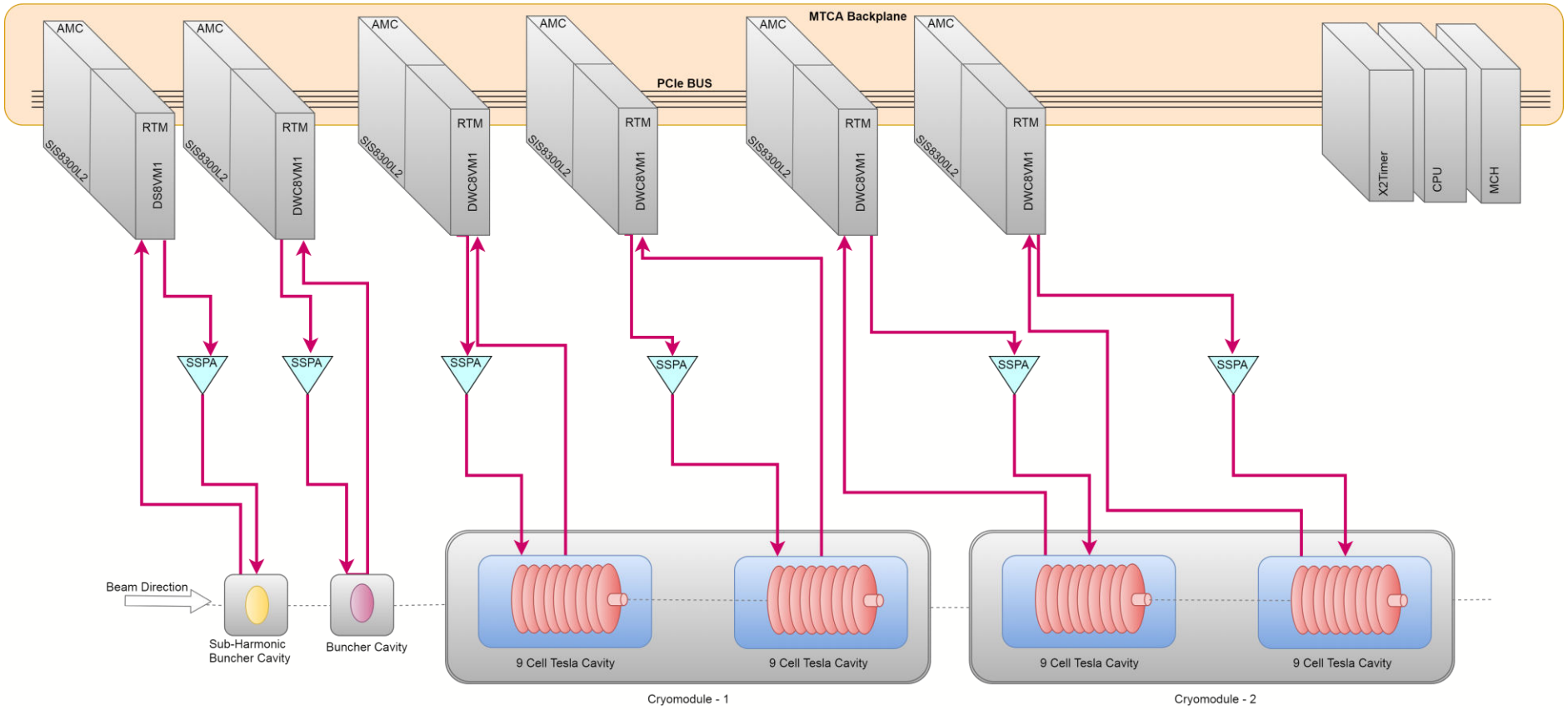
LLRF Control System Overview



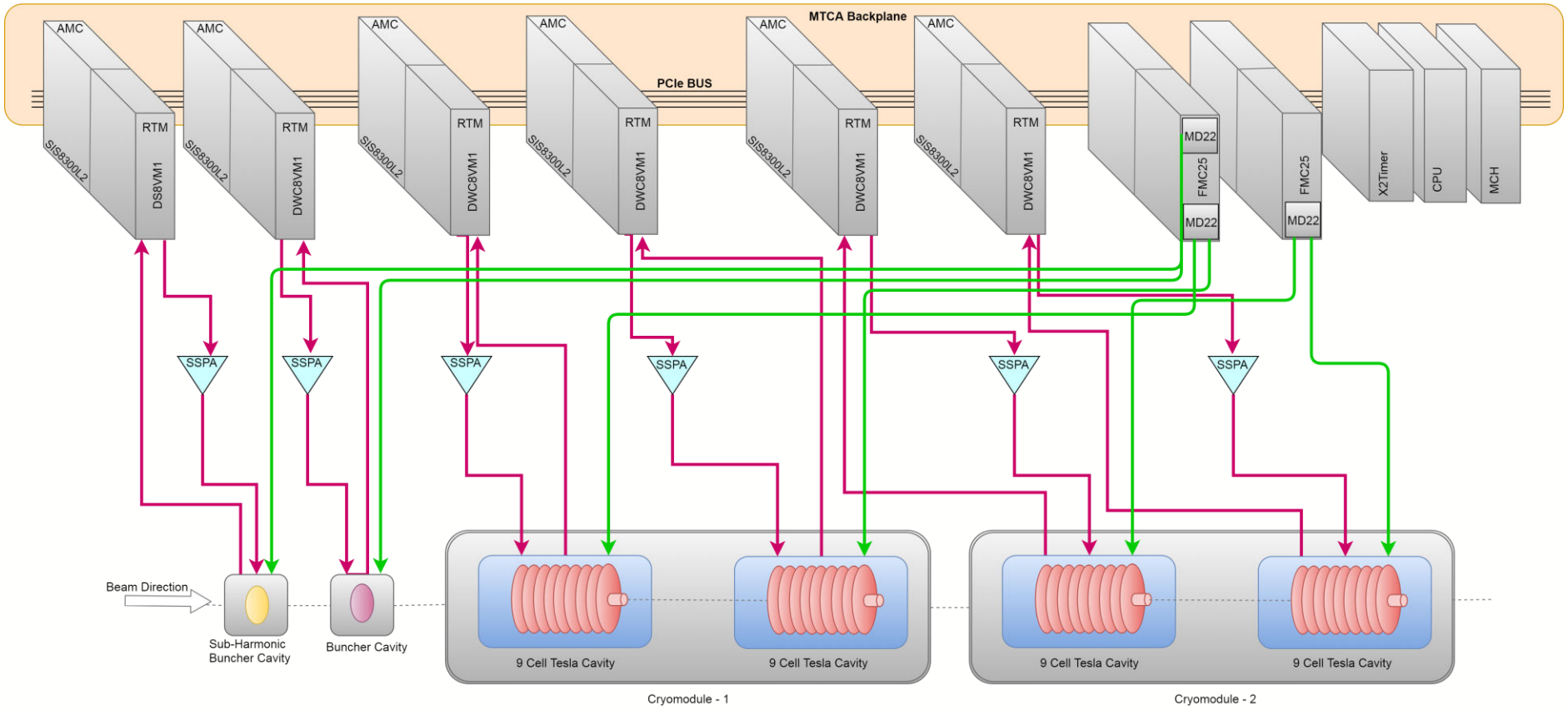
LLRF Control System Overview



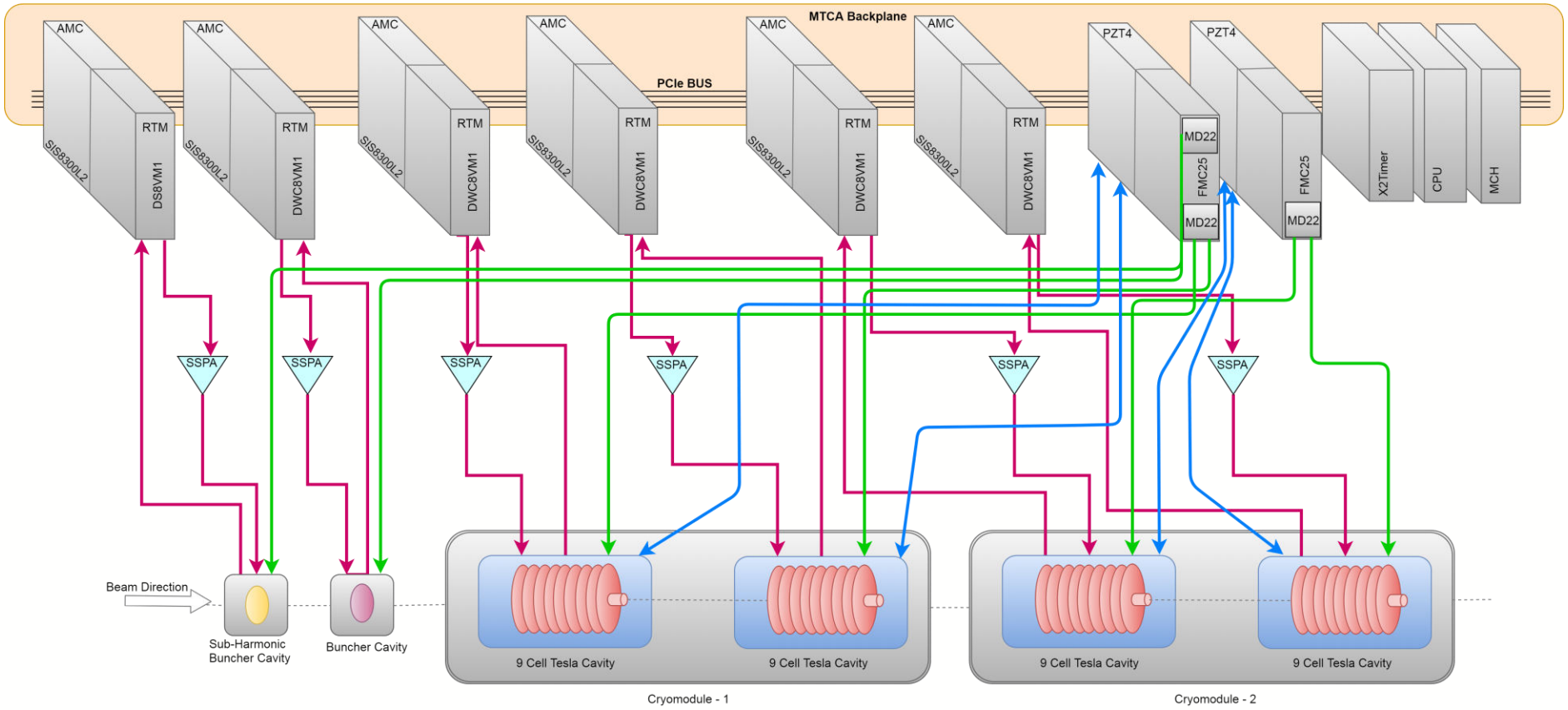
LLRF Control System Overview



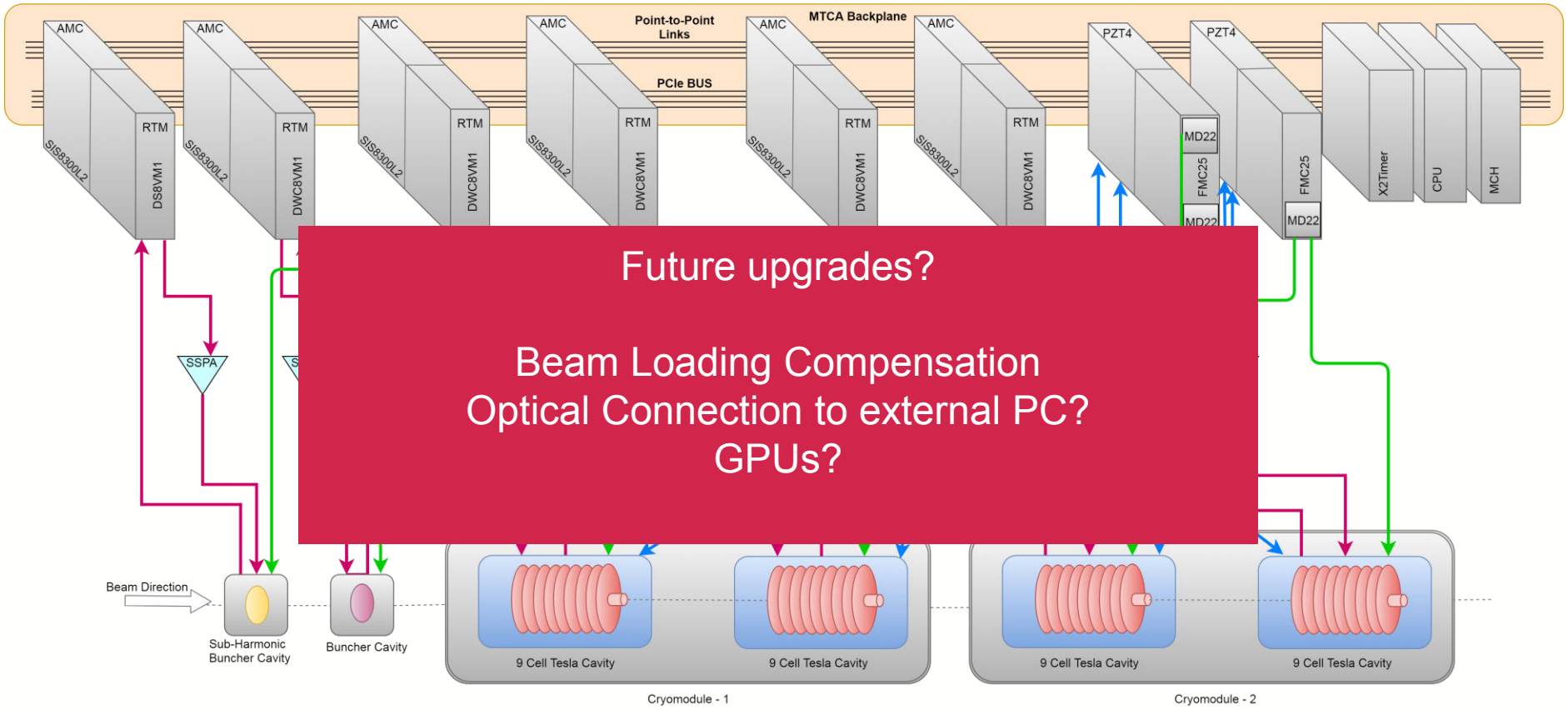
LLRF Control System Overview



LLRF Control System Overview



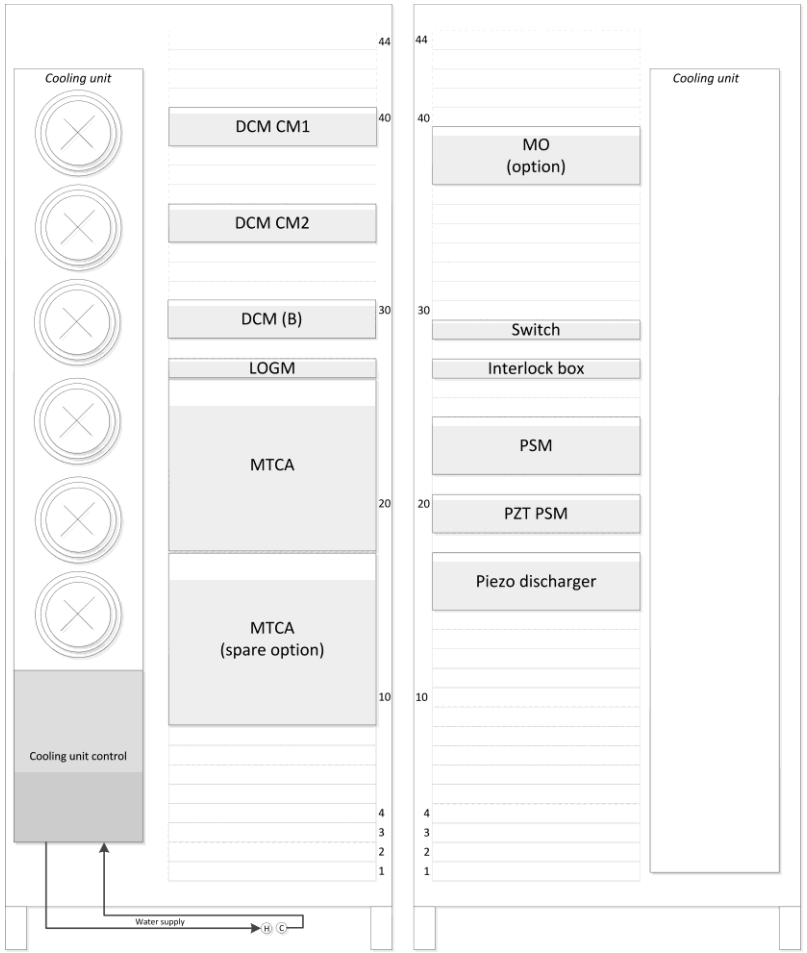
LLRF Control System Overview



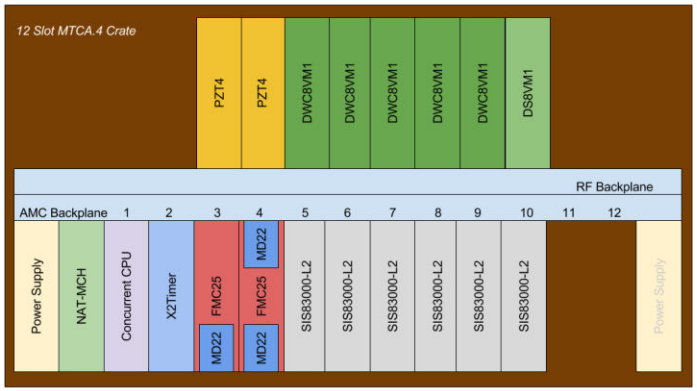
Future upgrades?

Beam Loading Compensation
Optical Connection to external PC?
GPUs?

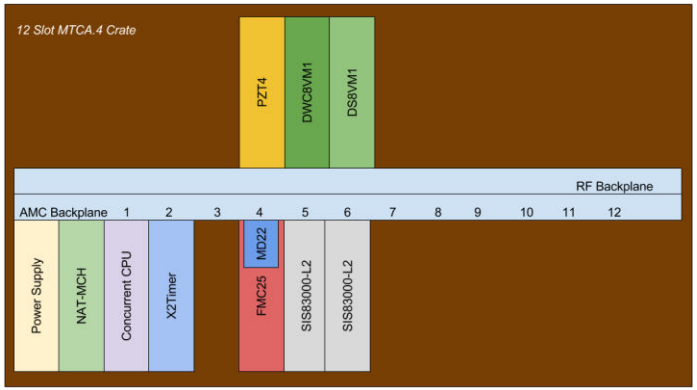
Rack and Crate Layout



Main Crate



Spare Crate



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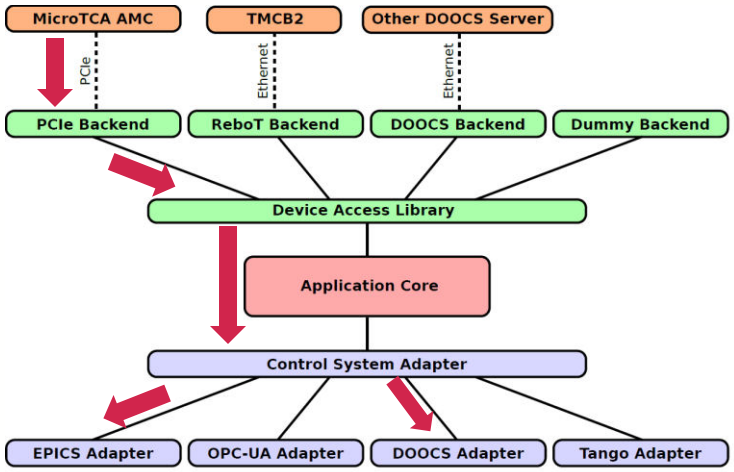
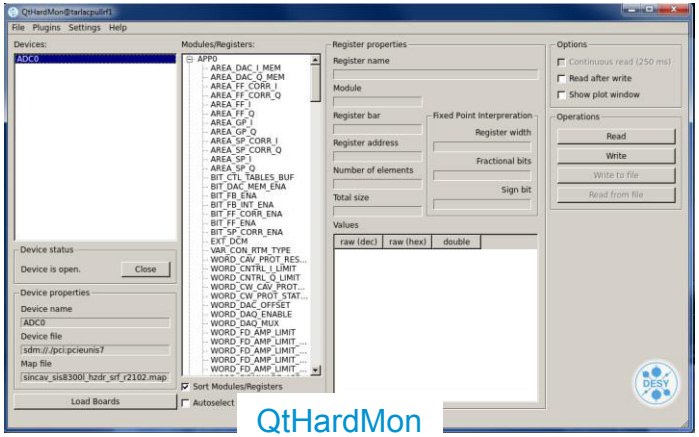
Software

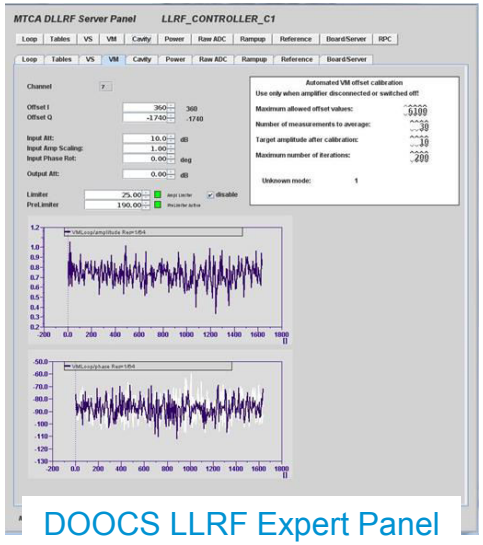


ChimeraTK Structure

- Initial tests with DOOCS using ChimeraTK
  - Tutorial from Martin Killenberg (DESY)
- Switching to EPICS(3+4) Interface
- Successful integration to OPC-UA Adapter at HZDR
  - Talk from Reinhard Steinbrück (HZDR)

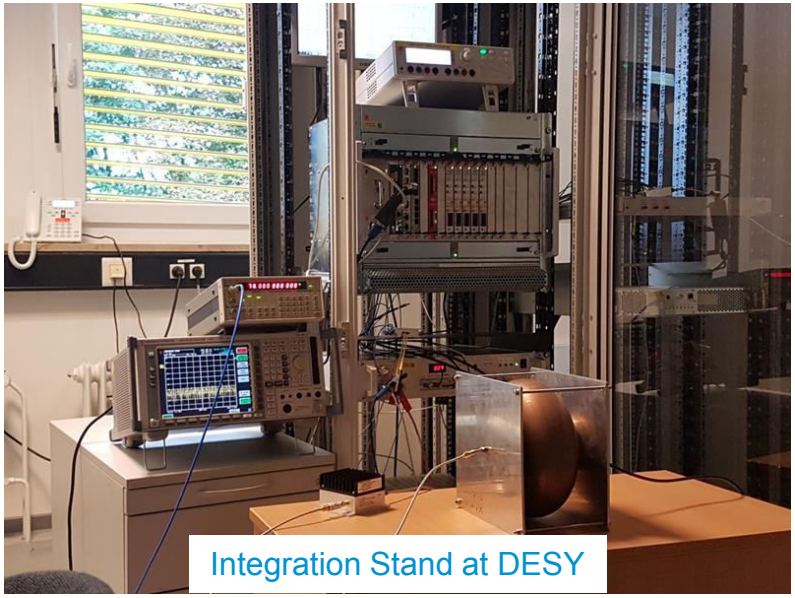


QtHardMon



DOOCS LLRF Expert Panel

Putting things together at DESY



Integration Stand at DESY

- Individual component tests using ADC & RTM Test Stand (Performance + Functionality)
- Firmware & Software Development (Parallel with HZDR)
- Complete System Integration + Inner Rack Cabling + Documentation
- ➔ Shipment
- Training of TARLA staff
  - MicroTCA Training
  - Server Structure
  - Hardware Experience

[2]

Thank you for your attention!

[2] A. Aksoy, “TARLA Project” 13th Nanoscience and Nanotechnology Conference, 22-25/Oct/2017