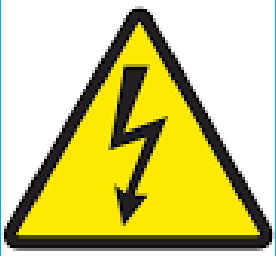
High Voltage Power Module



pluggable to
NAT RTM Power Supply Carrier

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Michael Fenner,
DESY

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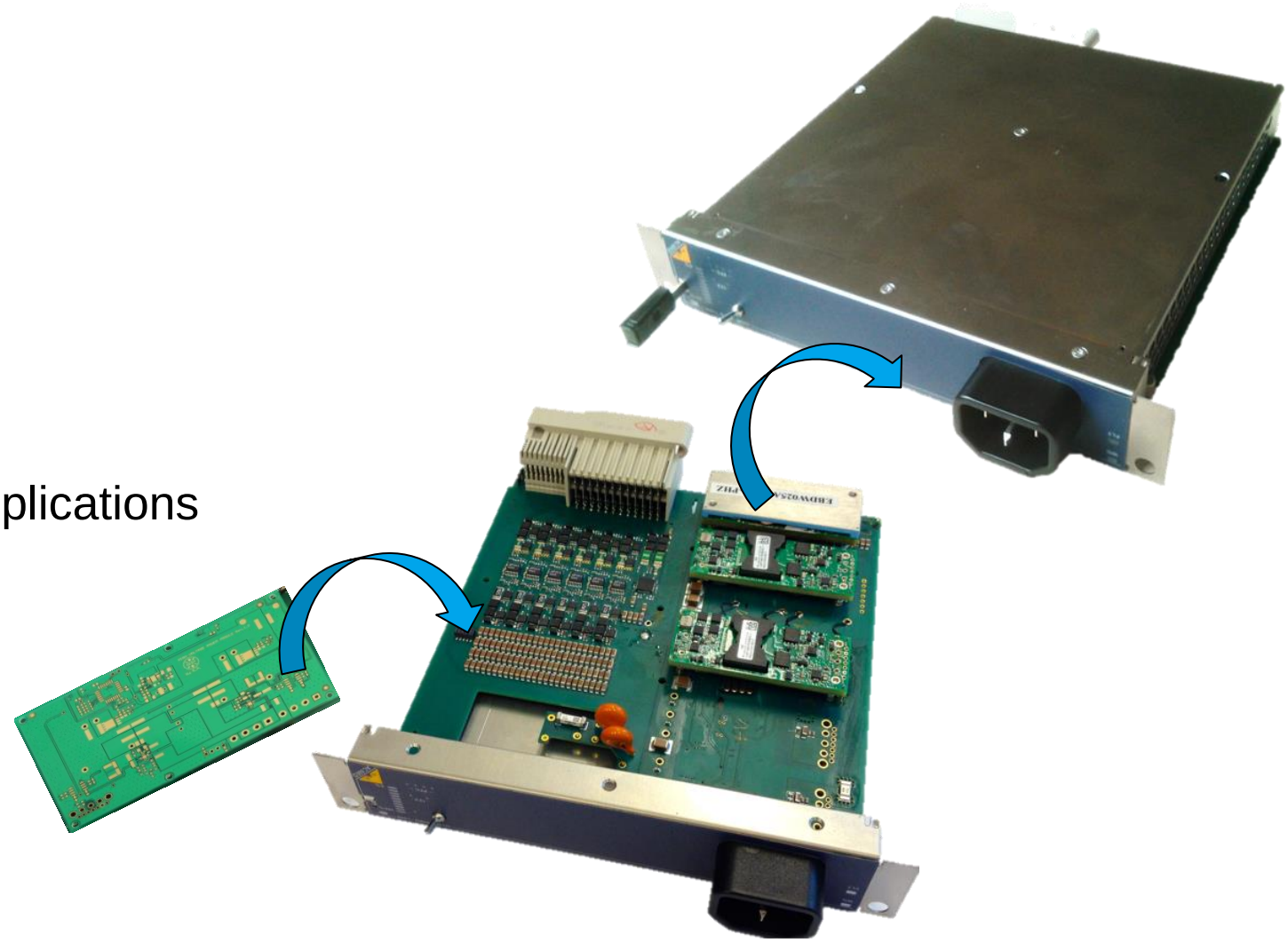
NAT

HELMHOLTZ GEMEINSCHAFT

DESY

Outline

- Motivation
- Hardware
- Firmware
- Software
- Results
- Possible applications



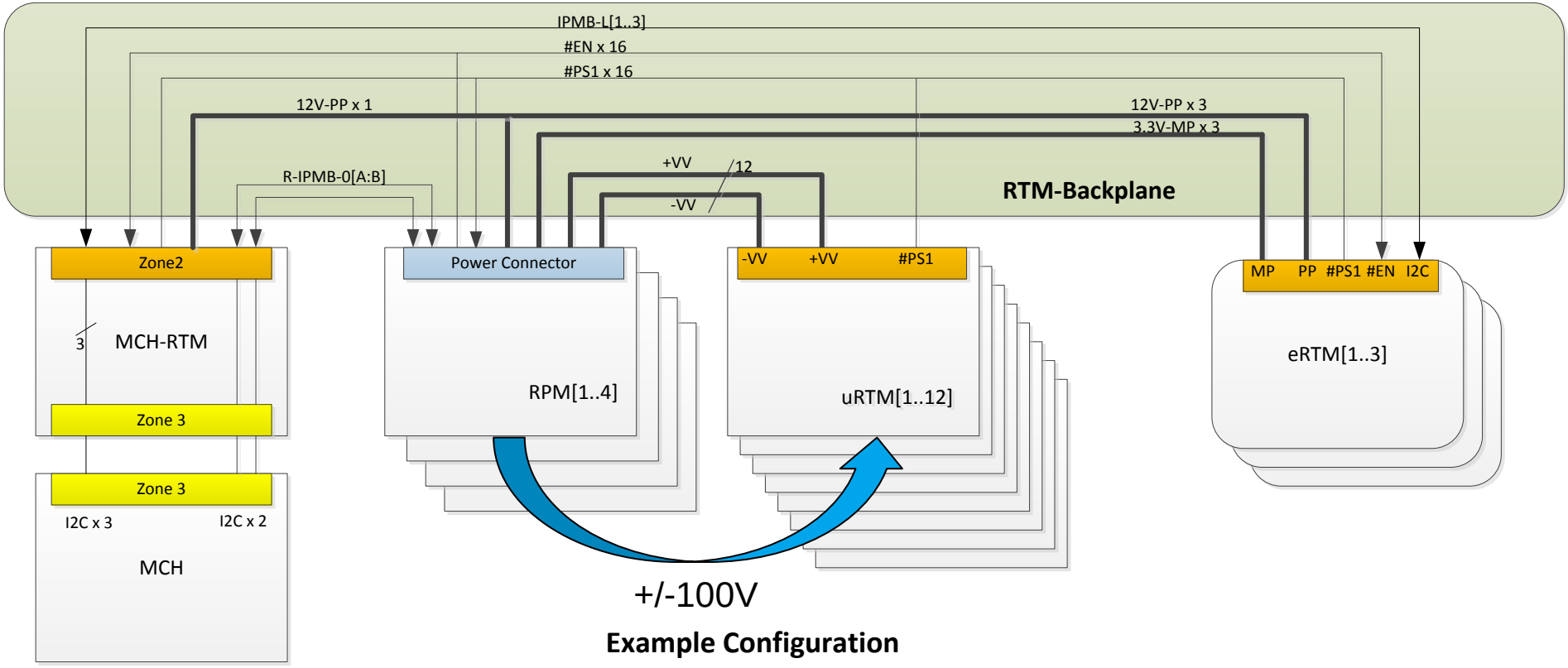
Motivation

- DESY introduced an RF-Backplane for MicroTCA.4 Crates
  - The RF-Backplane is located behind the AMC backplane of the MicroTCA.4 Crate.
  - Three types of RTMs used: µRTMs with only a Zone-3 connection to the front AMCs, µRTMs with a connector to the RF-Backplane and optionally a Zone-3 connection to the front AMCs and extended RTMs
- eRTMs are not covered by MicroTCA.4 Specification, a standard Power Modules does not provide power to them
- µRTMs used together with the RF-Backplane might be powered from the RF-Backplane instead of corresponding to a given AMC board
- In many cased sensitive analog signal conditioning elements are installed on RTMs and there is a need to provide clean power supply to these RTMs
- For specific applications there is a need to deliver high voltage, high current power supply which is not covered by MicroTCA.4 Specification

Hardware (RF-Backplane)

Courtesy by H. Lauftkoetter

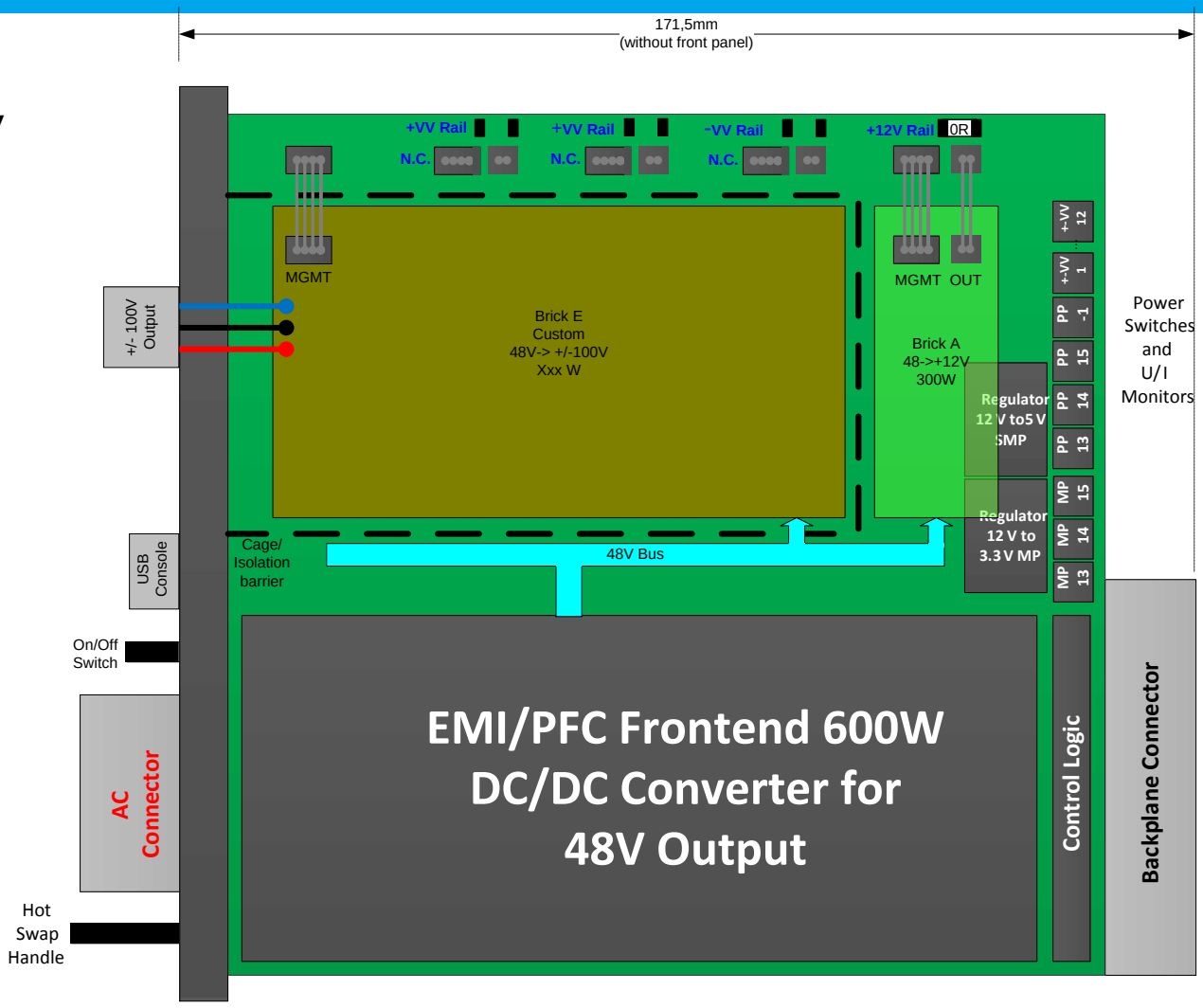
Hardware (Example Setup)



Courtesy by H. Lauftkoetter

Hardware (NAT RTM Power Supply Carrier)

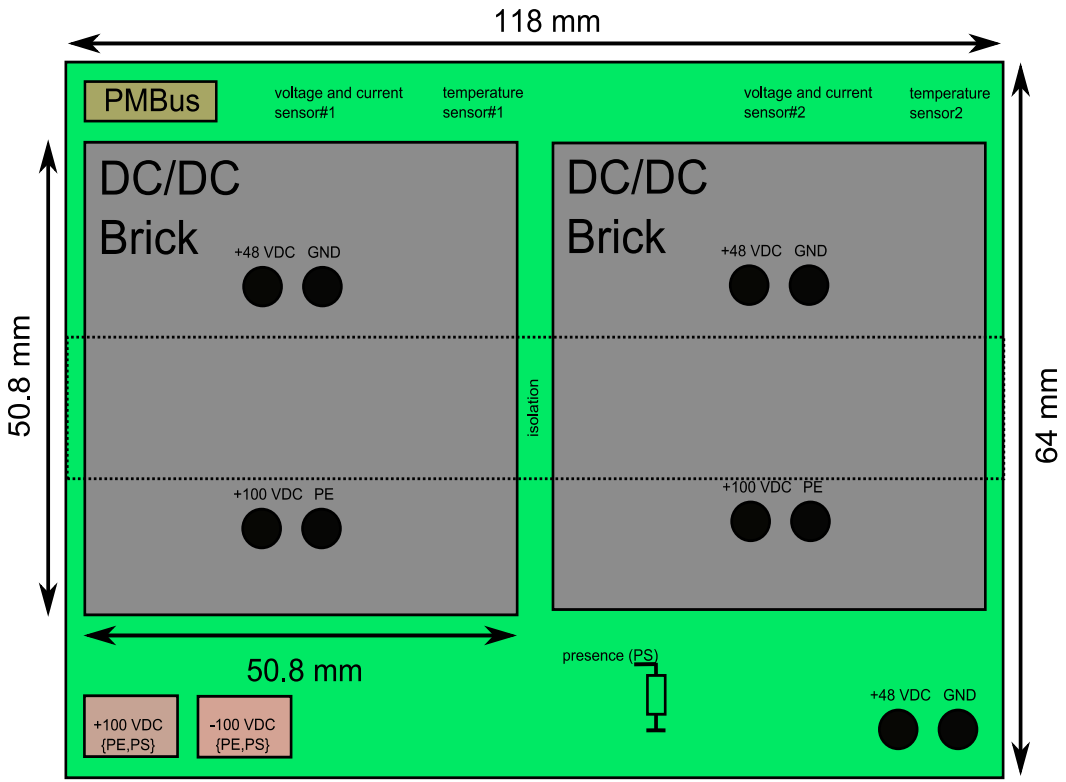
- High quality ±VV for µRTMs, adjustable 5-12V
- +12V PP, +3.3V MP for eRTMs
- Contention protection against standard PMs
- Modular design
- Optional ±100V output at front panel
- AC frontend



Courtesy by H. Lauftkoetter

Hardware (High Voltage Power Module)

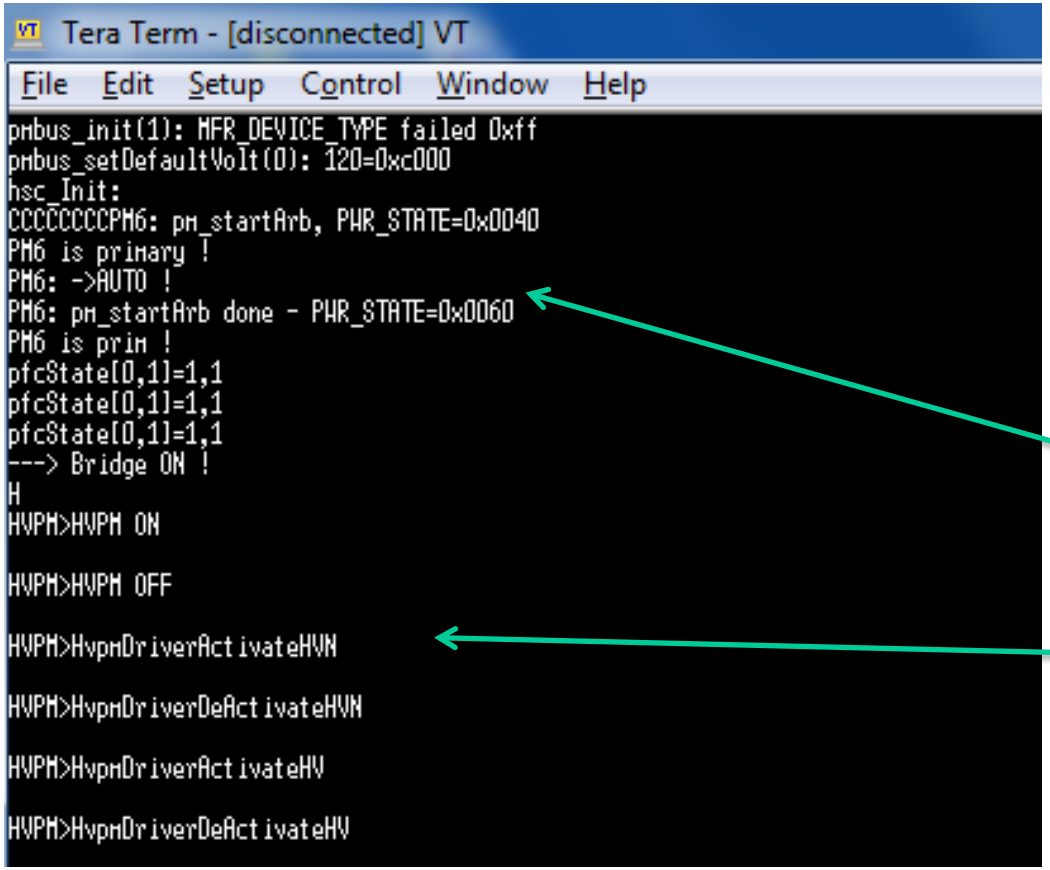
- Accept low voltage input (up to +48 VDC) and deliver stable, high voltage (up to ±100 VDC – bipolar or unipolar) and high current (up to 500 mA) outputs
- PMBus standard communication bus
- Temperature, output voltage, current and power sensors
- Allow supplying up to 4x RTM cards
- High voltage output indicated by front panel LEDs
- Built in: short circuit protection, input filter
- Inputs/outputs isolated with possible line, load regulation
- Closed inside housing (Nickel Plated Copper),
- Cooled using free air convection (no additional heat sink needed)

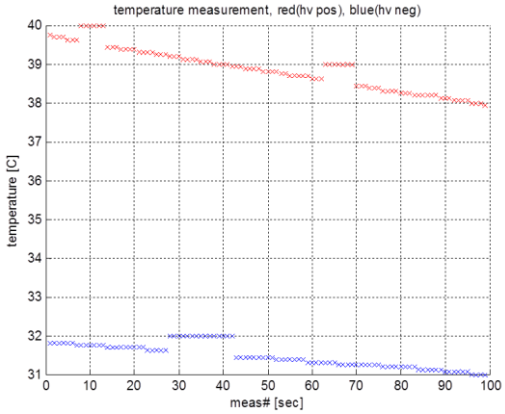


Firmware (ATXMEGA128A1U)

- hvpm.c
  - void HVPM_DriverInit(); void HVPM_ActivateHVPos(); void HVPM_DeactivateHVPos();
  - void HVPM_ActivateHVNeg(); void HVPM_DeActivateHVNeg();
  - void HVPM_ActivateHVPosNeg(); void HVPM_DeActivateHVPosNeg();
  - void HVPM_TemperatureSenseHVPos(); void HVPM_TemperatureSenseHVNeg();
  - void HVPM_VoltageSenseHVPos(); void HVPM_CurrentSenseHVPos();
  - void HVPM_PowerSenseHVPos(); void HVPM_VoltageSenseHVNeg();
  - void HVPM_CurrentSenseHVNeg(); void HVPM_PowerSenseHVNeg();
- hvpm.h
  - #define MAX6626A_ADDR (0x48)
  - #define MAX6626B_ADDR (0x49)
  - #define LTC2945A_ADDR (0xD8>>1)
  - #define LTC2945B_ADDR (0xDE>>1)
  - …

Software

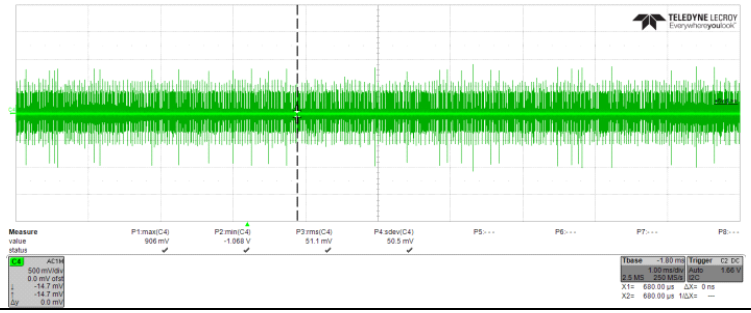
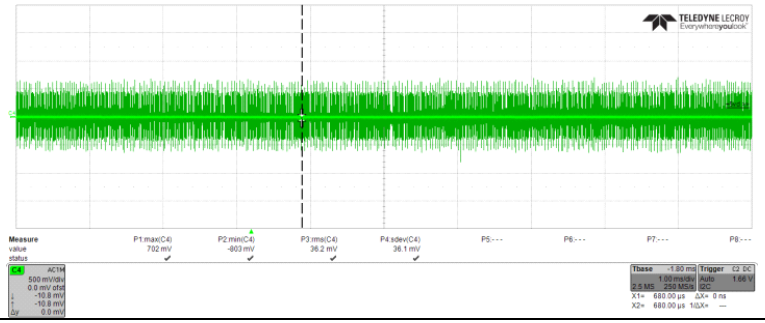
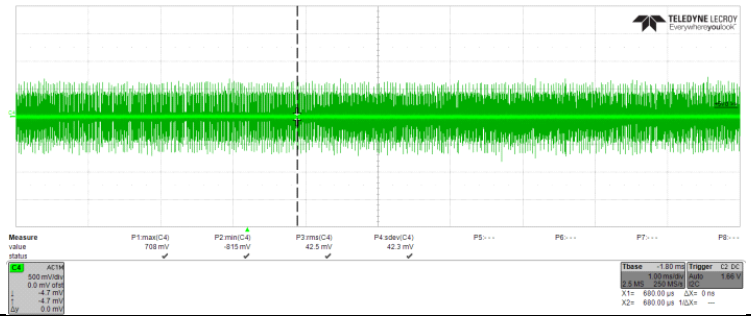




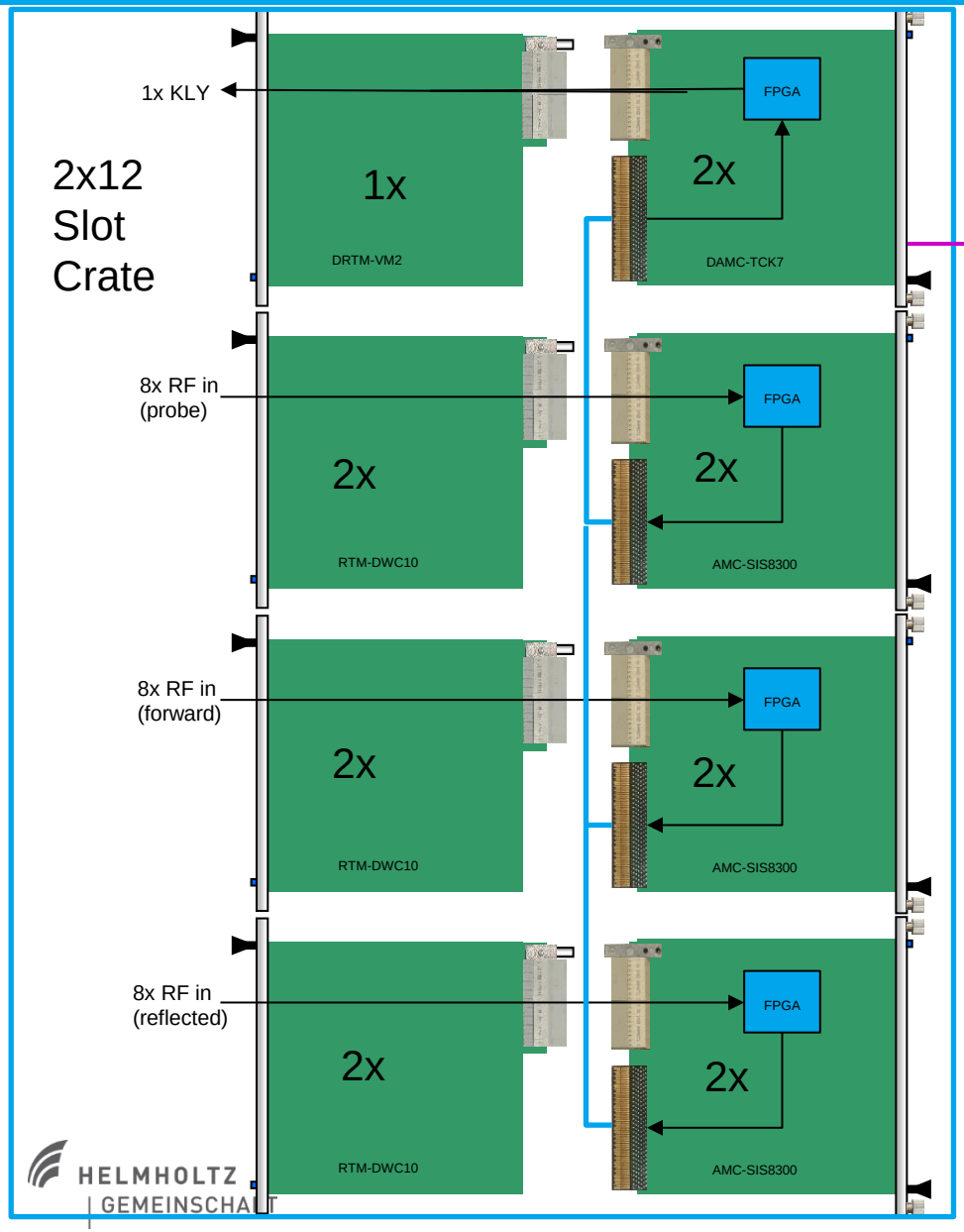
NAT RTM PSC menu

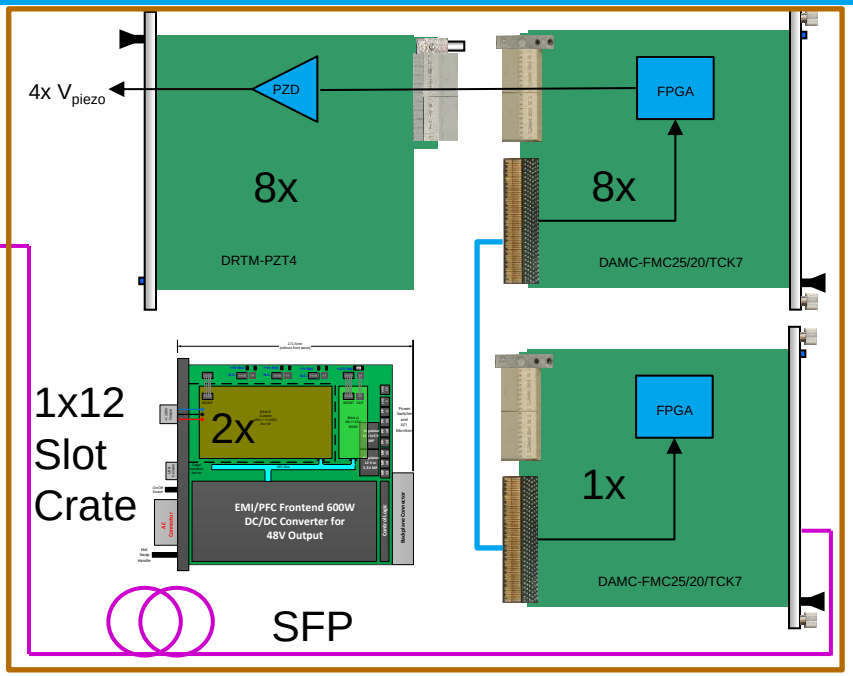
HVPM submenu

Results

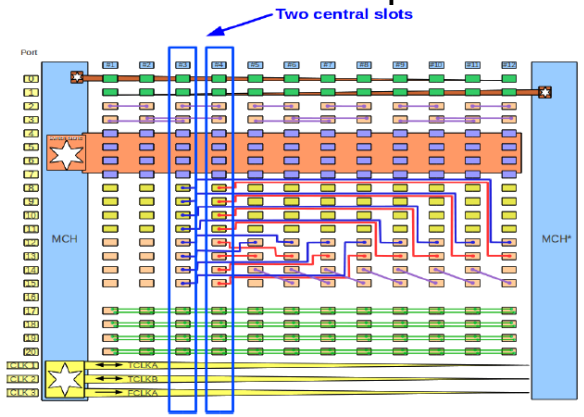
Load	Ripples [Vrms]	Waveform
0V@none	0.051	
100V@200 Ohm	0.036	
-100V@200 Ohm	0.043	

Possible Applications (XFEL RF Station – 32 cavities)

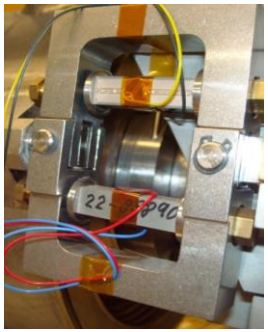




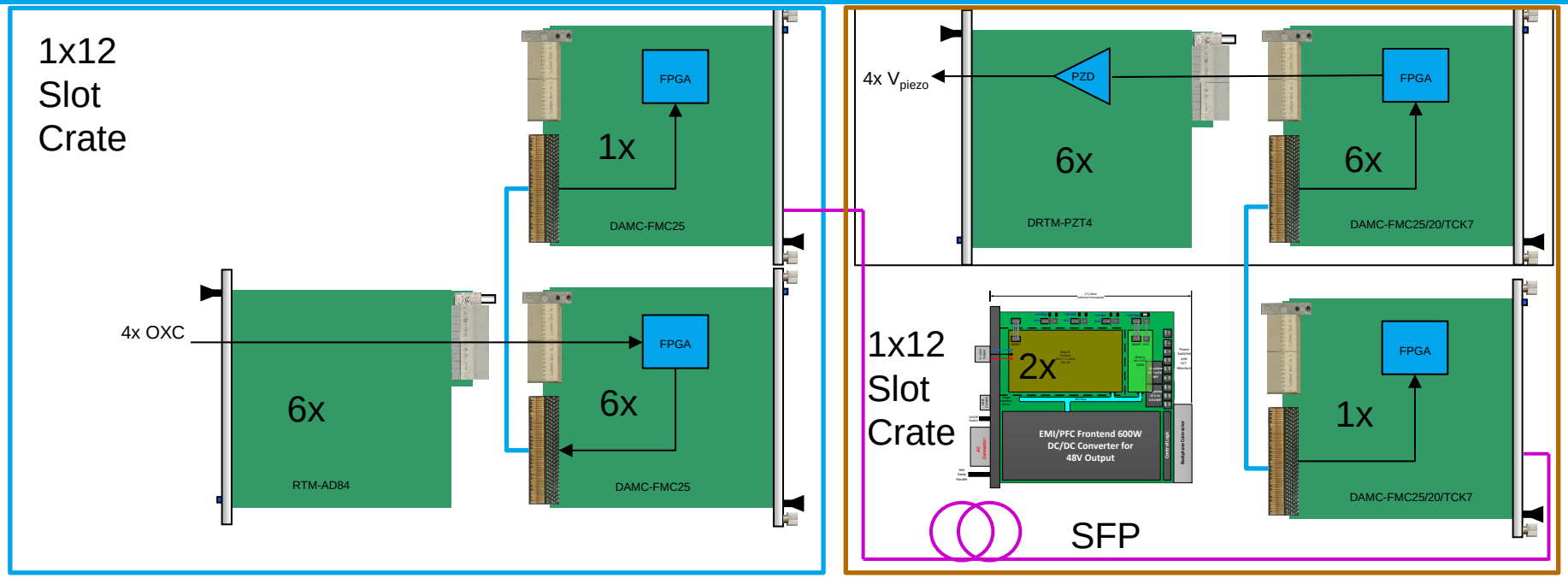
32x cavities = 64x piezos



Cavity tuner control – pulse or cw modes

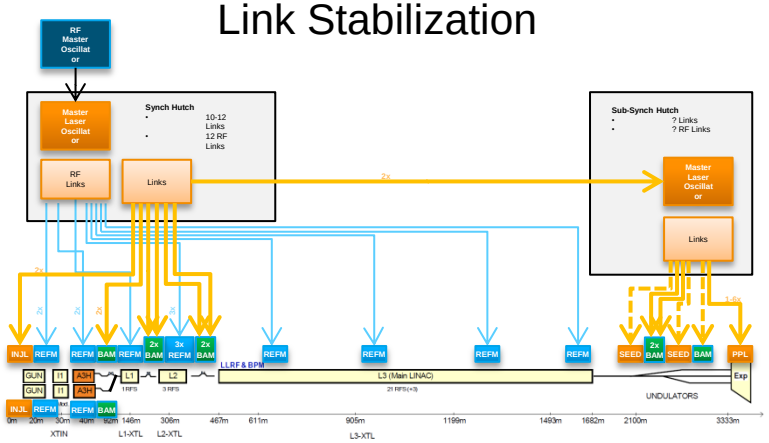


Possible Applications (XFEL link stabilization)



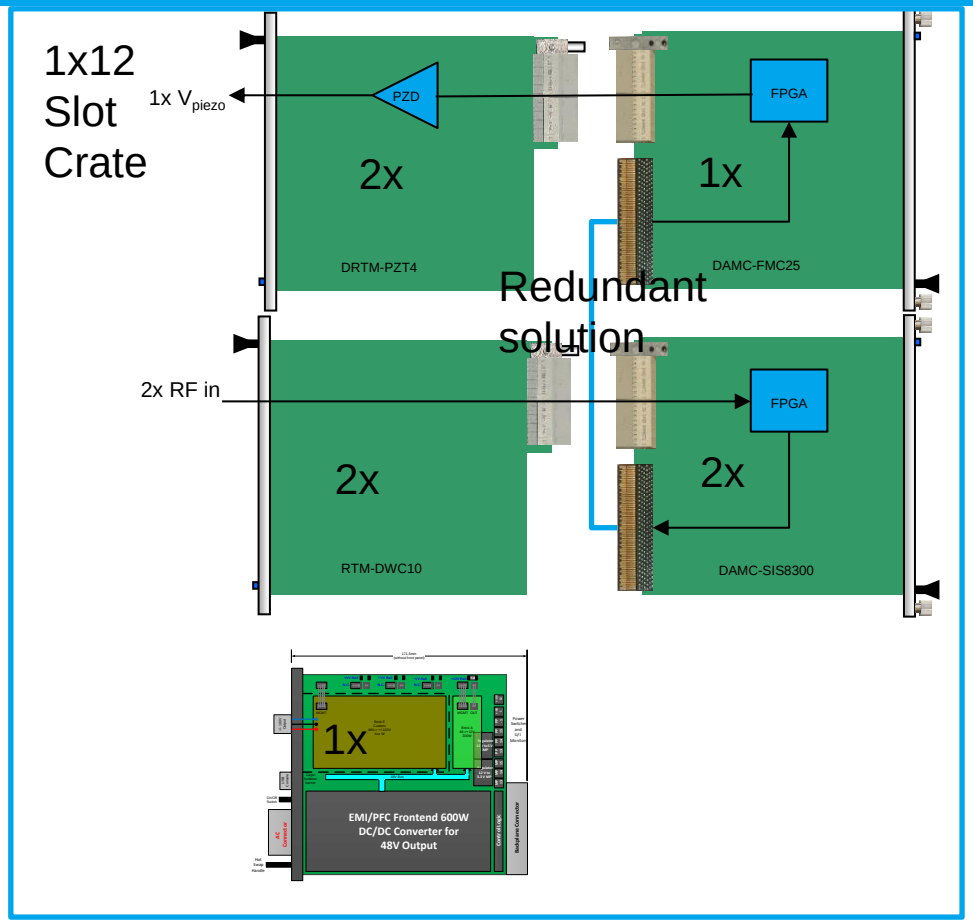
24x links = 24x piezo fiber stretchers

Link Stabilization

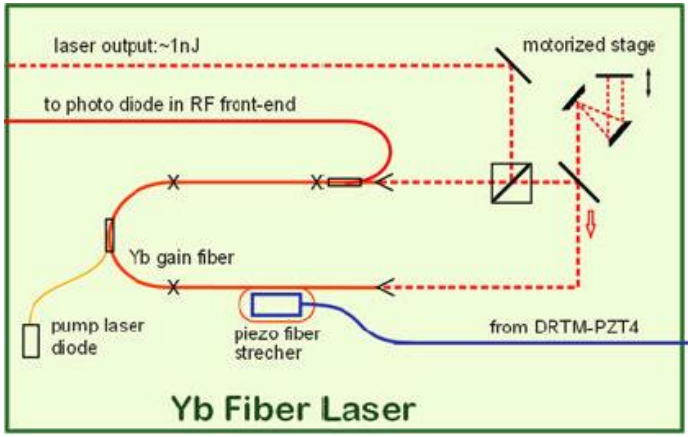


Courtesy by C. Sydlo

Possible Applications (XFEL Master Laser Oscillator Sync)



Laser Synchronization

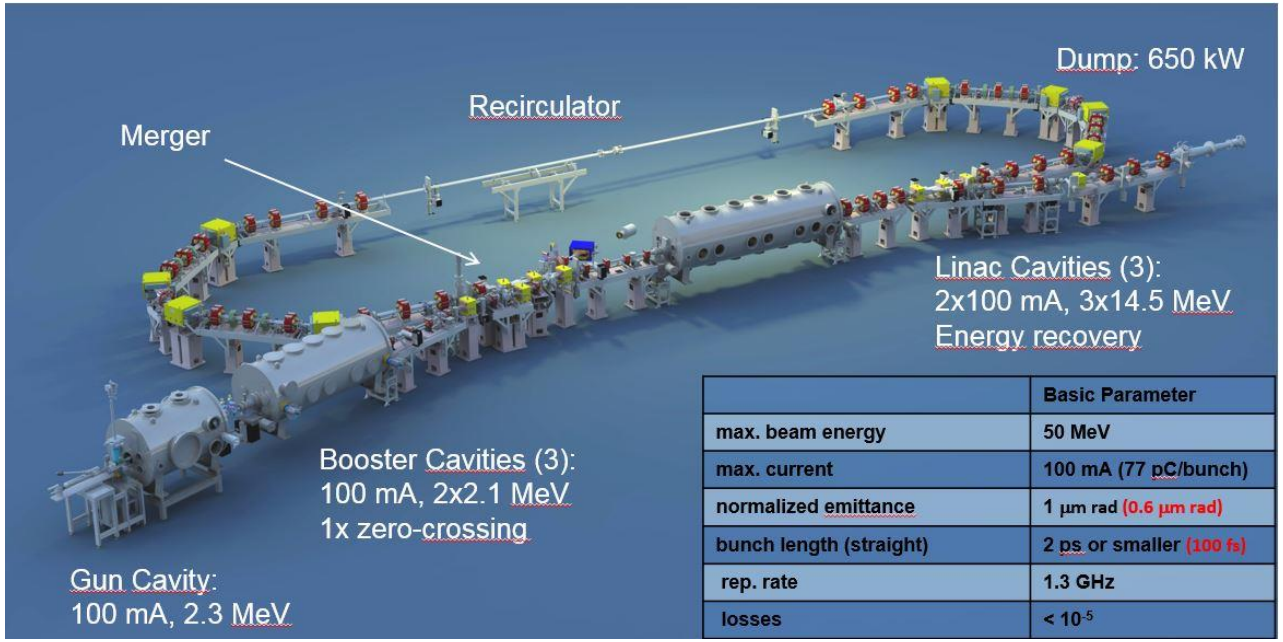


Courtesy by U. Mavric

Before connecting your AMCs with serial links over the AMC backplane study its show_fruinfo 253

Possible Applications (many more)

- bERLinPro at HZB
- TARLA in Ankara
- ESS?



	Basic Parameter
max. beam energy	50 MeV
max. current	100 mA (77 pC/bunch)
normalized emittance	1 μm rad (0.6 μm rad)
bunch length (straight)	2 ps or smaller (100 fs)
rep. rate	1.3 GHz
losses	< 10^{-5}

Courtesy by P. Echeverria

Thank You for Attention