High Voltage Power Module

pluggable to
NAT RTM Power Supply Carrier

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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 cases 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)

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<tbody>
<tr>
<td>PM</td>
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<td>MCH</td>
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<td>AMC</td>
<td>MCH</td>
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### Courtesy by H. Lauftkoetter

Rear PM
Rear PM
Hardware (Example Setup)

Example Configuration

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

EMI/PFC Frontend 600W DC/DC Converter for 48V Output

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)
- ...

Konrad Przygoda | Seite 8
Software

NAT RTM PSC menu

HVPM submenu
## Results

<table>
<thead>
<tr>
<th>Load</th>
<th>Ripples [Vrms]</th>
<th>Waveform</th>
</tr>
</thead>
<tbody>
<tr>
<td>0V@none</td>
<td>0.051</td>
<td><img src="image1.png" alt="Waveform" /></td>
</tr>
<tr>
<td>100V@200 Ohm</td>
<td>0.036</td>
<td><img src="image2.png" alt="Waveform" /></td>
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<tr>
<td>-100V@200 Ohm</td>
<td>0.043</td>
<td><img src="image3.png" alt="Waveform" /></td>
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</table>
Possible Applications (XFEL RF Station – 32 cavities)

8x RF in (probe)
1x KLY
2x
FPGA
DRTM-VM2
DAMC-TCK7

8x RF in (forward)
2x
FPGA
RTM-DWC10
AMC-SIS8300

8x RF in (reflected)
2x
FPGA
RTM-DWC10
AMC-SIS8300

4x V_{piezo}

1x12 Slot Crate

32x cavities = 64x piezos

Cavity tuner control – pulse or cw modes
Possible Applications (XFEL link stabilization)

1x12 Slot Crate

4x OXC

Link Stabilization

24x links = 24x piezo fiber stretchers

Courtesy by C. Sydlo
Possible Applications (XFEL Master Laser Oscillator Sync)

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?

Possible Applications (many more)

- bERLinPro at HZB
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Courtesy by P. Echeverria