
Contribution ID: **239** Type: **Oral presentation**

# RTM RF Backplane Extensions for MicroTCA.4 Crates – Concept and Performance Measurements

*Monday, June 6, 2016 5:40 PM (20 minutes)*

The idea of the Rear Transition Module (RTM) Backplane was originally created to simplify cable management of an MicroTCA.4 based LLRF control system for the European XFEL project. The first RTM backplane (called an RF Backplane) was designed to distribute about dozen of precise RF and clock signals to uRTM cards. It was quickly found out, that this backplane offers very powerful extension possibilities for the MTCA.4 standard and can be used also more widely than for the RF applications only. Nowadays, the RTM Backplane is compliant with the PICMG standard and an optional crate extensions. The RTM Backplane provides multiple links for high-precision clock and RF signals (DC to 6GHz) to analog µRTM cards it ) together with distribution of a low noise managed power supply and data transmission to RTM cards.
In addition, the RTM backplane offers a possibility to add so called extended RTMs (eRTM) and RTM Power Modules (RTM-PM) to a 12 slot MicroTCA crate. Up to three 6 HE wide eRTMs and two RTM-PMs can be installed behind the front PM and MCH modules. An eRTM attached to the MCH via Zone 3 connector is used for analog signal management on the RTM backplane. This eRTM allows also installing a powerful CPU to extend the processing capacity of the MTCA.4 crate. Three additional eRTMs provide significant space extensions of the MTCA.4 crate that can be used e.g. for analog electronics designed to supply RF signals to the uRTMs.
The RTM-PMs deliver a managed low-noise (separated from front crate PMs) analog bipolar power supply (+VV, -VV) for the µRTMs and an unipolar power supply for the eRTMs. This extends functionality of the MicroTCA.4 crate and offers unique performance improvement for analog front-end electronics.
This paper covers a new concept of the RTM Backplane, a new implementation for the real-time LLRF control system and performance evaluation of designed prototype, including precise measurements of RF loss, impedance matching and crosstalk.

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**Session Classification:** Fast data Transfer links and networks

**Track Classification:** Upgrades