Report of RFTech presentation during Mixdes conference

(Warsaw, 24-26 May 2012, Poland)

Title of presentation:

FMC-based Neutron and Gamma Radiation Monitoring Module For xTCA Applications

Presenter:

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Tomasz Kozak presented a radiation monitoring module dedicated to monitor gamma and neutron radiation doses absorbed by electronics. The module has been developed as a FMC size format board and can be used with every kind of carrier board equipped with FMC VITA57 standard compliant connector. The LLRF system for E-XFEL will follow the MTCA.4 standard and since, the system will be installed in the accelerator tunnel, monitoring of gamma and neutron radiation is recommended. Presented solution allows to measure radiation inside uTCA shelf in the nearest proximity of the LLRF hardware and calculated absorbed radiation dose with high precision. It can help to estimate remaining lifetime of the system and schedule needed equipment exchange.

Abstract: The machines used in High Energy Physics (HEP) experiments, such as accelerators or tokamaks, are sources of gamma and neutron radiation fields. The radiation has a negative influence on electronics and can lead to the incorrect functioning of complex control and diagnostic system designed for HEP machines. Therefore, in most cases the electronic equipment is installed in radiation-safe areas, but in some cases this rule is omitted to decrease costs of the project. The European X-ray Free Electron Laser (E-XFEL), being under construction at DESY research center, is a good example. The E-XFEL uses single tunnel and part of the electronic system will be installed next to main beam pipe and exposed to radiation. The modern Advanced/Micro Telecommunications Computing Architecture (ATCA/µTCA) standards are foreseen as a base for control and diagnostic system for this new project. These flexible standards provide high reliability, availability and usability for the system which can be decreased by negative influence of parasitic radiation field. The additional shielding will be introduced to protect racks with electronics, but during commissioning and, in case of control systems errors, the assumed radiation levels can be exceeded. Therefore, it is highly recommended to monitor doses absorbed by electronics. Moreover, it could be helpful for estimating system lifetime, scheduling maintenance periods and protecting machine from unexpended failures. The paper describes a Radiation Monitoring Module (RMM) based on FPGA mezzanine card standard capable of monitoring gamma radiation and neutron fluence in real-time.

Index Term: Micro Telecommunications Computing Architecture, FPGA Mezzanine Card, RF Control System, gamma radiation dosimetry, neutron radiation dosimetry, linear accelerator, X-ray Free Electron Laser

Remarks:

The attendance in the conference allowed me to present my work and discuss about possible future research directions. Conferences' attenders provided me several interesting remarks and idea.

We acknowledge funding from the European Commission under the FP7 Research Infrastructures project EuCARD, grant agreement no. 227579.