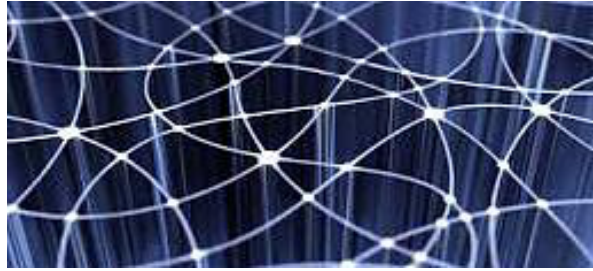


High-performance Signal and Data Processing: Challenges in Astro- and Particle Physics and Radio Astronomy Instrumentation



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The sROD Module for the ATLAS Tile Calorimeter Phase-2 Upgrade Demonstrator

TileCal is the central hadronic calorimeter of the ATLAS experiment at the Large Hadron Collider at CERN. The main upgrade of the LHC to increase the instantaneous luminosity is scheduled for 2022. The High Luminosity LHC, also called upgrade phase-2, will imply a complete redesign of the read-out electronics in TileCal. In the new read-out architecture, the front-end electronics aims to transmit full digitized information to the back-end system in the counting room. Thus, the back-end system will provide digital calibrated information with enhanced precision and granularity to the first level trigger to improve the trigger efficiencies. The demonstrator project has been envisaged to qualify this new proposed architecture. A reduced part of the detector, 1/256 of the total, will be upgraded with the new electronics during 2014 to evaluate the proposed architecture in real conditions. The sROD module is designed on a double mid-size AMC format and will operate under an AdvancedTCA framework. The module includes one Xilinx Kintex 7 and one Xilinx Virtex 7 for data receiving and processing, as well as the implementation of embedded systems. Related to optics, the sROD uses 4 Avago MiniPODs to receive data from the front-end electronics and 2 Avago MiniPODs to send control commands to the front-end and for communication with the first level trigger. A QSFP optical module is also included for expansion functionalities and a SFP module to maintain compatibility with the existing hardware. A complete description of the sROD module for the demonstrator including the main functionalities, circuit design and the control software and firmware will be presented.

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