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Versatile Link PLUS Transceiver Development

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The Versatile Link PLUS project (VL+) targets the phase II upgrades of the ATLAS and CMS experiments. It will develop a radiation resistant optical link, operating at up to 10Gbps in the upstream and 5Gbps in the downstream directions with a smaller footprint and higher channel count than its predecessor. A low-profile package is being developed that allows volume production at reduced costs, but which nevertheless can be configured at assembly time to suit the individual needs of different detectors. This paper describes the development strategies and summarizes the status of the feasibility demonstration phase of the project.

Summary

During the phase II upgrades of the ATLAS and CMS experiments at the Large Hadron Collider (LHC) several detectors will be replaced to improve their physics performance. To cope with the increasing data volume and the higher trigger rate, high-speed optical links will be deployed in large quantities as part of the upgrade programme. The tight space constraints and the high channel count of the detector electronics will require to develop a low-profile (20mm x 10mm x 2mm target), multi-channel front-end component. During their expected lifetime these components have to withstand the on-detector radiation levels (1 MGy total dose, 2e15 n/cm2 and 1e15 hadrons/cm2 total fluence) and they have to operate over a wide temperature range (-35 to +60 degC). The Versatile Link PLUS (VL+) project is developing custom front-end modules that fulfil these requirements. To suit the specific needs of different detectors, such as the number of transmit and receive channels, the modules will be configurable at assembly time.

To achieve the aforementioned goals with the lowest possible risk the VL+ project is pursuing two development paths with several industrial partners. In the first case, a full custom front-end module is being designed by CERN based on in-house developed radiation hard ASICs and qualified optical components, which will be assembled by an industrial partner. In the second case, CERN will work with commercial module manufacturers that are willing to customize their proprietary package to include the above mentioned components.

To demonstrate the feasibility of the full custom VL+ transceiver development, a prototype has been designed, manufactured and tested. Two additional prototypes that more closely resemble the desired front-end module are being designed. The paper will summarize the experience gained during this iterative process, and it will show measurement results obtained during functional and environmental tests.
To launch the discussion about the second development path with various module vendors a procurement strategy has been defined. The paper will describe the proposed customization steps and it will show the results of the tests carried out on two candidate components provided by different manufacturers.

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