Contribution ID: **195** Type: **Oral**

Versatile Link+ Transceiver Production

Thursday 22 September 2022 14:40 (20 minutes)

The Versatile Link+ project targeting the Phase 2 HL-LHC detector upgrades has entered the production phase. After several years of prototyping and a successful pre-series production, the industrialisation of the Versatile Link+ Transceiver (VTRx+) was completed in 2021 and the VTRx+ modules are now being manufactured by an industrial partner. We describe the extensive qualification effort that preceded the launch of the series production and the quality assurance procedures put in place to monitor the manufacturing quality. We summarise the experience of the first few production months and we present the plans for the rest of the production.

Summary (500 words)

High-speed optical links are among the key enabling technologies adopted by HL-LHC detector sub-systems for their Phase 2 detector upgrades. Piggybacked on its predecessor, the Versatile Link+ project proposes a common link architecture that addresses the needs of the upgraded readout systems. To fulfil the most challenging requirements present at the front-end side of the link, a low-mass, low-profile, radiation-tolerant front-end interface, the Versatile Link+ Transceiver (VTRx+), has been developed by CERN. Following an iterative prototyping phase, the design was finalised in 2020. The pre-series production carried out in 2021 completed the industrialisation process and its success was crowned by the manufacturing contract signature at the end of 2021. After a short preparation phase, the production is now in full swing and the first deliveries are expected during the first half of 2022.

Based on the experience gained from the Versatile Link project, a comprehensive quality assurance (QA) programme has been defined. The test procedures defined in the QA programme were carried out on VTRx+ modules from the pre-series production as part of the industrialization effort. Functional tests at room temperature, as well as over the operating temperature range, have been performed and the salient module parameters have been extracted. The large amount of data collected during these tests was used to calculate the expected manufacturing yield and allowed the industrial partner to improve the assembly process before the launch of the series production. In addition, to assess the reliability of the assembled VTRx+ modules, long-term environmental tests (temperature, humidity, radiation) were conducted in accordance with some well-established industry standards or specific user requirements. This testing effort lead to the definition and implementation of a production test system which is going to be used by the contract manufacturer to qualify all VTRx+ modules at the last stage of the assembly process, as well as by CERN to perform the lot acceptance on a certain fraction of the delivered VTRx+ modules.

We describe the test procedures and the various test systems that have been developed in the framework of the VTRx+ QA programme. We present the functional test results acquired since the launch of the production and summarise the experience of the first few production months.

Primary author: SOOS, Csaba (CERN)

Co-authors: SCARCELLA, Carmelo (CERN); SIGAUD, Christophe (CERN); BERGIN, Daisy Elizabeth (University of Bath (GB)); TROSKA, Jan (CERN); OLANTERA, Lauri (CERN); MARCON, Leonardo (CERN); LALOVIC,

Milana (University of Belgrade (RS)); DETRAZ, Stephane (CERN); PROUSALIDI, Thenia (National Technical Univ. of Athens (GR)); SANDVEN, Ulrik (CERN)

Presenter: SOOS, Csaba (CERN)

Session Classification: Optoelectronics and Links

Track Classification: Optoelectronics and Links