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The ATLAS Pixel nSQP readout chain

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The ATLAS Pixel new Service Quarter Panel (nSQP) project aims to deliver replacements for all on-detector services of the ATLAS Pixel Detector. The nSQPs will have LVDS transceivers at the place of the present electro-optical converters. The transceivers, realized in 130 nm technology, communicate with the existing ATLAS Pixel MCC chips, and over a 6.6m long electrical transmission line with VCSEL driver chips that are driving new electro-optical converters located in an accessible region.

The talk will describe the development, performance and limitations of the electrical transmission lines, as well as quality assurance testing.

Summary

The ATLAS Pixel nSQP project aims to deliver a set of replacement parts for all on-detector service components of the ATLAS Pixel Detector, built within a set of 8 service panels. These these new service panels will be modified. Opposed to the version in use, they will incorporate no electro-optical converters within the panels. Instead, an electrical buffer circuit will be inserted, allowing to transmit outgoing data through a 6.6m long readout harness into an optical converter that rests outside the detector volume. This outside location allows for easier access during shutdowns, thus making the electro-optical converter system maintainable.
In the frame of setting up this new electrical link, an LVDS transceiver has been designed, based on the LVDS receivers and transmitters of the Frontend I4. The LVDS transceiver is primarily used to drive data out of the detector volume through a 6.6m long custom built readout harness. At the far end of the transmission line, a converter then translates electrical into optical transmission, allowing further communication up into the counting rooms.
Four Integrated circuits, each holding 8 transceiver channels form an Eboard, replacing a former Optoboard (electro-optical converter) in its location within the service panels. Due to less functionality and other powering requirements, the implementation causes subtle modifications of the Pixel Detector services, but otherwise the board plugs into the exact same location as before.
The 6.6m long electrical readout (ER) harness extends out of the pixel Faraday cage and thus comes with external shielding. It also transports the Pixel Detectors internal ground reference out to the new location of a re-designed Optoboard.
Both, Eboard and ER-harness, undergo different stages of quality control, starting with optical inspection of the components and culminating in a transmission test in-situ.

Authors: DOBOS, Daniel (CERN); DOPKE, Jens (CERN)

Presenter: WELCH, Steven (Oklahoma State University (US))

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