



Contribution ID: 44

Type: Poster

## Dependability Study of the Large Hadron Collider Beam Loss Monitor Optical Link and Comparison to the Next Generation Link under Development

*Wednesday 18 October 2017 16:00 (1h 30m)*

The primary function of the Large Hadron Collider beam loss monitoring system is to protect the accelerator components from damage due to unacceptable beam losses. It acquires data from 4000 ionisation detectors distributed along the accelerator tunnel using radiation tolerant front-end electronics linked to surface electronics that perform continuous real-time processing. To connect these two parts approximately 1400 optical links transmit more than  $3 \times 10^7$  packets per second. Combining an extensive dependability study and many years of operational experience, this large and distributed system serves as the basis for developing a new link for future upgrades. This next generation link will employ the best performing parts of the existing system, but also introduce new, redesigned parts such as the surface transceiver module. The design differences with related advantages and disadvantages are compared, and two failure rate predicting models are presented including a sensitivity analysis for the observed failure mechanisms based on operational data.

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**Session Classification:** 11- Poster Session

**Track Classification:** Accelerator Systems