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Fault detection methods for the LHC BLM system at CERN

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The LHC Beam Loss Monitoring (BLM) system is one of the most complex instrumentation systems deployed in the LHC. In addition to protecting the collider, the system also needs to provide a means of diagnosing machine faults and deliver a feedback of losses to the control room as well as to several systems for their setup and analysis. It has to transmit and process signals from almost 4’000 monitors, and has nearly 4.5 million configurable parameters. In a system of such complexity, system fault detection, quick resolution of issues, and fault tracking become critical issues. The integrity of the signal chain of the LHC BLM system and its ability to correctly detect unwanted scenarios and thus provide the required protection level must be ensured. To cover the maximum error detection area, an advanced verification environment has been developed that operates in parallel to evaluate the performance and response of the system. This paper will report on the numerous checks that are been performed and on how the results are used to identify the cause or schedule the maintenance of the system.

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