

## High-density backplanes – problems and solutions

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The challenges of producing high-performance and low-latency realtime systems for LHC have led many groups to design systems with higher channel density and greater interconnectivity between modules. Custom backplanes with 2mm Hard Metric connectors provide the high pin counts necessary for these systems, but also present new problems, including increased insertion and extraction forces, vulnerable and easily damaged pins, and other long-term maintenance issues.

The ATLAS Level-1 calorimeter trigger processor presents a near “worst-case” example of such a system. The Jet/Et and em/hadron subsystems use a full-custom 21-slot 9U backplane fully populated with 2mm HM connectors with a total of 1148 signal and ground pins per module. In this paper we present our solutions for reducing insertion/extraction force, providing strain relief for hundreds of connected cables while maintaining accessibility, and maintaining and repairing the backplane over the lifetime of LHC.

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