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Prototype of FASERCal detector at LHC Run 4

One of the major physics goals of the FASER experiment at CERN LHC is to study the highest-energy human-made neutrinos. These neutrinos enable investigations of neutrino interactions at the TeV energy scale as well as rare processes such as charm production. In the upcoming LHC Run 4, the increased luminosity will lead to significantly higher collision rates, providing substantially larger neutrino statistics and enhancing the experiment's physics potential. However, it will also result in a much higher muon background rate, making detector operation increasingly challenging. To address this challenge while maintaining the physics reach, a new neutrino detector, FASERCal, has been proposed. Its main component consists of modules made of finely segmented plastic scintillator cubes, inspired by the T2K Super-FGD detector design, which provide both tracking and calorimetric capabilities. A novel technology has been developed to glue the cubes together, drastically reducing the complexity of detector construction. A prototype detector consisting of one scintillator module has been successfully built and installed at the FASER site, where it has successfully recorded LHC beam data in a high-rate environment. This talk will present the production, assembly, operation, and data-analysis performance of the prototype, demonstrating the feasibility of the proposed full-scale FASERCal detector for Run 4.

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