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Studies of the response of the ATLAS Tile Calorimeter to beams of particles at the CERN test beams facility

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The Large Hadron Collider (LHC) Phase II upgrade aims to increase the accelerator instantaneous luminosity by a factor of 10. Due to the expected higher radiation levels, aging of the current electronics and to provide the capability of coping with longer latencies of up to 35 μ s needed by the trigger system at such high pileup levels, a new readout system of the ATLAS Tile Calorimeter (TileCal) is needed.

A prototype of the upgrade TileCal electronics has been tested using the beam from the Super Proton Synchrotron (SPS) accelerator at CERN. Data were collected in 2016-2018 with beams of muons, electrons and hadrons at various incident energies and impact angles. The muons data allow to study the dependence of the response on the incident point and angle in the cell. The electron data are used to determine the linearity of the electromagnetic energy measurement. The hadron data allows to tune the modelling of the calorimeter response to pions and kaons with the purpose of improving the reconstruction of the energy of jets. The results of the ongoing data analysis are discussed in the presentation.

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