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Readout and trigger for AFP detector at ATLAS experiment

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AFP, the ATLAS Forward Proton detector upgrade project consists of two forward detectors at 205 m and 217 m on each side of the ATLAS experiment at the LHC. The new detectors aim to measure momenta and angles of diffractively scattered protons. In 2016 two detector stations on one side of the ATLAS interaction point have been installed and are being commissioned.
The front-end electronics consists currently of eight tracking modules based on the ATLAS 3D pixel sensors with the FEI4 readout chip. The chips are read via serial lines at 160 Mbps. The transmission line consists of 8 m of electrical twisted pair cable to an optical converter and 200 m of optical fiber. The DAQ system uses a FPGA board based on a Xilinx Artix chip, HSIO-2, and a mezzanine card that plugs into this board. The mezzanine card contains a RCE data processing module based on a Xilinx Zynq chip.
The software for calibration and monitoring of the AFP detectors runs on the ARM processor of the Zynq under Linux. The RCE communicates with the ATLAS Run Control software via the standard ATLAS TDAQ software. The AFP trigger signal is generated from the OR of all pixels of each frontend chip where the signals from individual planes can be logically combined. The resulting trigger signal in the form a NIM pulse is transmitted over a 260 m long air core coaxial cable where it is fed into the ATLAS LVL1 trigger system.
In this contribution we give an technical overview of the AFP detector together and the commissioning steps that have been taken. Furthermore first performance results are presented.

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