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A combined MIMOSA26 and ATLAS FE-I4 test beam telescope with parallel triggerless readout

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Beam telescopes, such as the EUDET/AIDA telescope, are a commonly used tool for testing and characterization of pixel detector prototypes. Based on the MIMOSA26 telescope planes and an ATLAS FE-I4 reference plane, a fast, high resolution test beam telescope with continuous triggerless readout was derived.
For the integration of this telescope into the Python-based data acquisition framework pyBAR, a new readout system was developed. It features a continuous, triggerless readout of the MIMOSA26 planes and precise event time-stamping from the FE-I4 as well as real-time data quality assessment. This new readout system was successfully tested and operated at the Bonn Electron Stretcher and Accelerator facility (ELSA) using a custom-made readout board. As the analysis of the test run suggests, the readout can cope with particle rates up to 20 kHz, which allows track reconstruction with efficiencies of more than 99%.

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