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## FASER Tracking and Emulsion Station Alignment

*Thursday, 14 March 2024 16:50 (20 minutes)*

FASER, the ForwArd Search ExpeRiment, is an LHC experiment located 480 m downstream of the ATLAS interaction point along the beam collision axis. FASER has been taking collision data since the start of LHC Run3 in July 2022. The first physics results were presented in March 2023 [1,2], including the first direct observation of collider neutrinos. FASER includes four identical tracker stations constructed from silicon microstrip detectors, which play a key role in the physics analysis. Specifically the tracker stations are designed to precisely reconstruct the charged particles arising from a new particle decay, as well as high-energy muons from neutrino interactions. For the current analyses the three upstream tracking stations, the tracking spectrometer, have been used. To take full advantage of the detector in neutrino analyses we need to include the neutrino detector, an emulsion detector, and the InterFace Tracker (IFT). The unique geometry of FASER requires a 2-prong alignment procedure for the tracking stations. The tracking spectrometer, which is supported by a precision aluminium beam, is aligned first then the more challenging alignment of the IFT is performed to correct for its relatively large misalignments. After the alignment of the tracking stations we perform the emulsion-IFT alignment. This talk will present updated results for the spectrometer and first result on the IFT and emulsion-IFT alignment using the 2022 collision data.

### Significance

In addition to the tacking station alignment of the FASER detector we will also present the alignment between the emulsion and IFT detectors, this is a unique combination of detectors that need to be aligned, and is not often done in the LHC. The combination of the non-electronic and high density tracks of the emulsion tracks and the much lower density tracks of the IFT provides a challenging alignment effort.

### References

- [1] FASER Collaboration, "First direct observation of collider neutrinos with FASER at the LHC." *Physics Review Letters*, 2023, 031801.
- [2] FASER Collaboration, "Search for dark photons with the FASER detector at the LHC", *Physics Letters B*, 848, 2024, 138378.

### Experiment context, if any

FASER

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