Introduction

More than 150 million events were recorded during the week of test beam data. The details of the runs are recorded in the google spreadsheet and an overview of the data is also given in the presentations here. The raw data files can be found in /eos/project/f/faser-commissioning/TestBeamData/ and while reconstructed data can be found in /eos/project/f/faser-commissioning/Reconstruction/ and simulations in /eos/project/f/faser-commissioning/Simulation/TestBeam/. The spreadsheet detailing the simulation samples can be found in this google doc.

Paper draft

Overleaf link.

Organization

Meetings will be held bi-weekly starting on August 25 with agenda’s in Indico. Announcements will take place on the “faser-test-beam@cern.ch” mailing list while discussions should mostly be held in the mattermost channel.

Analysis codes and scripts should be organized in the gitlab area. Please contact Brian if you cannot create your own repository in that group. Ntuples and other data files can be shared in suitable subdirectories in /eos/project/f/faser-commissioning/TestBeamAnalysis/

Analysis topics

General topics

PMT Reconstruction (People: Eric, Deion)

• Waveform fit optimization and charge extraction

Track Reconstruction (People: Dave, Andrea)

• Efficient track reconstruction
• Optimization for multi-track events

Good events selection (People: )

• Single good track definition
• Cosmic suppression

Calorimetry

Calorimeter response and energy scale (People: Deion, Lottie, Carl, Monica)

• Absolute energy scale and linearity based on electron beam
• Corrections for preshower response
• Sharing/leakage between modules
• Energy resolution
• Comparison to simulation
Cross calibration from muons to electrons (People: Deion, Lottie, Carl, Monica)

- Precisely fit muon (MIP) and electron signal under same conditions to obtain EM equivalent scale
- To be used for setting absolute energy scale in TI12

Gain dependence on HV (People: Friedemann)

- Comparison between particle and LED response vs HV
- Comparison to lab measurements of the calorimeter PMTs
- Investigate if there are non-linearity visible at the highest energy/lowest gain

Preshower response (People: Savannah, Noshin, Deion, Lottie, Carl, Monica)

- Demonstrate PID capabilities using muon, electron and pion beam data
- Comparison to simulation

Scintillators

Scintillator efficiencies (People: Eric, Brian)

- Measure MIP efficiency in both preshower and trigger scintillators

Timing resolution (People: Eric, Brian)

- Measure relative timing resolution of both preshower and trigger scintillators
- If possible study calorimeter signals as well

Tracker studies

Tracker efficiency (People: Tobias, Savannah, Andrea)

- Use large sample of muon to make detailed hit efficiency map of tracker modules
- Measure middle layer hit efficiency as function of bias voltage and threshold setting

Backsplash from calorimeter (People: Tobias)

- Measure tracker hit occupancy in electron beam events as a function of preshower material

Tracker alignment (People: Markus, Tomohiro, Xin, Hao, Ke)

- Use muon beam data (and probably cosmic data) to make first alignment for the IFT
- Compare to metrology results
- Extend to other stations using cosmic data

Tracker clustering (People: Ke and Shih-Chieh)

- Measure average cluster size and compare to simulation

Other Information

- At high energy the actual beam energy is lower than nominal due to synchrotron radiation. The mapping is:
Descriptions of the reconstruction tags used to reconstruct the data are described at FaserReleases.

-- BrianPetersen - 2021-08-09

<table>
<thead>
<tr>
<th>Nominal E</th>
<th>Actual E</th>
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<tbody>
<tr>
<td>100 GeV</td>
<td>99.83 GeV</td>
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<tr>
<td>150 GeV</td>
<td>149.14 GeV</td>
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<td>197.32 GeV</td>
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<tr>
<td>250 GeV</td>
<td>243.61 GeV</td>
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<tr>
<td>300 GeV</td>
<td>287.18 GeV</td>
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