The Large Hadron Collider forward (LHCf) experiment has successfully finished the first phase of data taking at $\sqrt{s} = 0.9$ and 7 TeV proton-proton collisions in 2010. In this poster, the performance of LHCf detector for hadronic shower and the current status of neutron analysis are presented. The energy resolution, energy linearity, and position resolution were estimated by using test beam experiment at SPS and MC simulation. The energy spectra of the arm1 detector calculated from interaction models are compared.

**Detector performance for neutron by MC study**

- Detection efficiency: more than 70% for $> 500$ GeV neutron
- Energy scale non-linearity: < 2.5%
- Energy resolution: 30-37% irrespective to neutron energy
- Lateral hit position resolution: 0.5 - 2.0 mm for small tower, 1.0 - 4.0 mm for large tower

**Data and reconstruction algorithm**

- Data: Fill 1104 (same as published photon paper[2])
- Integrated luminosity: 0.68ab = $4.8 \times 10^{10}$ collisions
- MC statistics: QGSJET2, 0.99$^9_{10}$ collisions
- EPOS, 0.99$^9_{10}$ collisions
- PHOJET, 0.99$^9_{10}$ collisions
- DPMJET3, 0.99$^9_{10}$ collisions
- SYBILL, 0.99$^9_{10}$ collisions
- Event Selection: trigger, coincidence of any successive three layers
- Energy reconstruction: linear fit to energy deposit, $E_{\text{det}} = \sum E_{X}(x, y, x = 0) / \sum E_{X}(x, y, x = 0)$
- Lateral hit position
- Scintillator X and Y hit position reconstruction
- Particle identification (PID) from difference in longitudinal shower development

**Preliminary result**

Here we show very preliminary results for various MC generations. Full detector MC and analysis procedure same as experimental data are applied. The vertical axes are normalized to a number of event per 10$^7$ inelastic collisions.

**Summary and prospects**

LHCf has successfully completed the data taking for $\sqrt{s} = 7$ TeV p-p collisions in 2010. Currently, we are intensively working for neutron analysis. The performance of the LHCf detectors for neutron measurement was confirmed by the MC calculation and the SPS beam test. The LHCf calorimeters have a detection efficiency of more than 70% for $> 500$ GeV neutrons, with 3.3% non-linearity of energy scale and 30-37% of energy resolution. The calorimeters have the position resolution of 0.5 to 4.0mm for lateral direction. We are analyzing the neutron events at $\sqrt{s} = 7$ TeV p-p collisions and the results are presented in this poster.

**Future plans**

We will compare the data with the spectra simulated with interaction models, and more detailed study to understand detector simulation is needed. Finally we will compare with arm2 results.

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**Reference**