

mTower analysis meeting summary

18.03.2020

DESY test beam is closed until further notice. The organisation will try to reallocate all approved beam time once the facility is reopened. Universities are closed, so lab work can only be done remotely. At Utrecht the mTower setup is taking cosmic data continuously. At Bergen work is ongoing to automatise the test setup for remote operations. That means that we must focus on analysis of the February and November test beams.

Fabian/Rene/Hiroki: Discussed the feature in the hitmap. All studies now point to the scintillator+SiPM trigger modules as the source. Mainly the data taken at 20 degree angle wrt the beam show that the feature is not fixed on a position of the chip, but progresses along with the centre of the beam, so with (roughly) the position of the SiPMs. The response of the trigger modules is different very close to the SiPMs, so it could be an efficiency issue.

Fabian will continue the comparison of different data, with the focus on the November data.

Check the November data.

Check for different event types.

Can it be related to the trigger (SiPM position)? Check the runs at an angle.

Check front / back incidence (shape difference because 1 or 2 SiPMs).

Naomi: Check the SPS data from 2018.

Qasim: Presented results on the number of clusters and cluster size in the February and November data.

Check with the same pixel mask, are there still large differences?

Check why the number of clusters is smaller for 5 GeV than for 4 GeV. Can it be related to multi-electron events?

Check if the size of the shift in the shower max position for mTower at an angle is as expected from the path length increase (cosine).

Check in the reversed mTower data at an angle.

Aart: Presented the total number of hits at 5 GeV for different numbers of clusters in the first layer. The distributions still need to be better understood. Find a good event selection. Apply pixel mask. Check hits in the second layer that correspond to the cluster in the first.

What kind of events fall into each category?

Robbie: The CED viewer is well underway. Some last steps are still needed. The Multi-gauss fit on the total number of hits is working better for some energies than for others.

Use the selection of single, double, trippel electron events that Aart is working

on.

Check linearity based on the fit results.

Hiroki: Presented further studies on pixel masking. Masking 75 pixels gives better results, but still some hot pixels seem to remain.

Dividing the chip into sectors (for beam data) and taking out the outliers wrt the sector mean gives a much better result. It does require a high statistics run. How much real signal do we sacrifice by cutting? Check some extreme cases. Make the pixel masks for all energies available for others to use.

Stephen/Nigel: Stephen set up a Allpix2 simulation of mTower and looked at energy resolution vs shower leakage. This can be a real issue for this small prototype, as not to underestimate its potential performance.

Now the simulation uses one 1024x1024 chip per layer. For future comparison of ideal vs realistic detector geometry, a setup with two sensors per layer would be better.

Emilie/Viljar: Emilie will look at the highest occupancy data at 3 GeV with the long strobe, to check the performance under such conditions.