

A Brief Introduction to the New Framework for UK ITk Pixel Test Beam Reconstruction and Analysis

Adam Rennie

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What happens at test-beam ?

- All recent test-beams have been at DESY
- Use the synchrotron there to produce an electron beam
- Aim to characterise new devices with this beam and DESY's *telescope*
- The telescope is a system comprising six planes of Mimosa pixel detectors
- With the device under test (DUT) in the centre of the telescope, fire the beam through
- Collect data from all planes including DUTs in runs ; compare DUT to telescope information

EUTelescope basics

EUTelescope is the software which is used to reconstruct the data taken from the telescope at DESY. There are five steps to the reconstruction :

- 1 Converter ; conversion of raw data format
- 2 Clustering ; creating clusters and masking noisy pixels
- 3 Hitmaker ; local-to-global positioning for hit-definitions
- 4 Align (multiple iterations possible) ; align planes generating track candidates
- 5 Fit ; output best track candidates as per fitting procedure

EUTelescope basics

The output files from EUTelescope are :

- 1 histograms ; containing information such as, e.g., cluster-size
- 2 Icio ; used internally by EUTelescope
- 3 database ; as for Icio, also can be used to debug
- 4 logs ; provides record of the reconstruction process
- 5 tbtrack ; output then used for analysis of reconstructed data

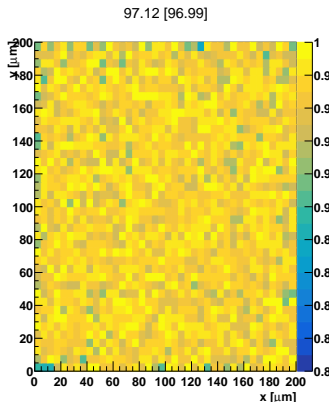
TBMon2 basics

TBMon2 is the software used to then analyse the reconstructed data. Amongst other things, it will calculate the most important metric for the module, the efficiency. This is defined as :

$$\epsilon = \frac{\text{Number of tracks with a hit in the DUT}}{\text{Number of tracks in the telescope}} \quad (1)$$

TBMon2 basics

- TBMon2 can also produce many other useful pieces of insight, dependent on how it has been configured
- For example, in-pixel efficiency. Shown opposite is one of the 25x100 MS modules



The aim

- Have a central git repository on which to host scripts, configs, gear files etc. for UK test beam efforts
- To be structured à la the markey survey repository which a few of us have been using

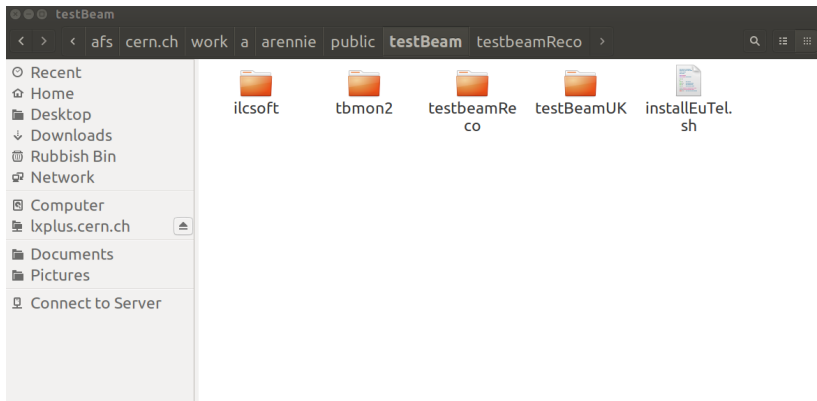
Why ?

- Ensure homogeneity in setups across our efforts
- New fixes, updates, new scripts, features etc. can be easily integrated and pushed out to everyone
- For each new test beam, simply create a few new files and you're good to go

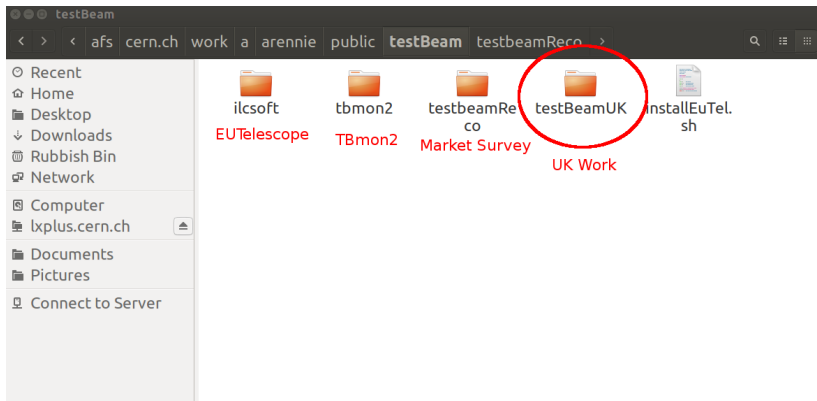
How ?

- A new UK PIXEL TEST BEAM group has been created on the CERN GitLab. This will be the namespace on which the new repository is hosted \Rightarrow not tied to one individual. . . eternal
- The central repository is called TESTBEAMUK
- RECOTRICKS can also be hosted on this namespace and included in TESTBEAMUK as a submodule
- People have been added to UK PIXEL TEST BEAM and have hopefully cloned TESTBEAMUK and created their own branch to work on

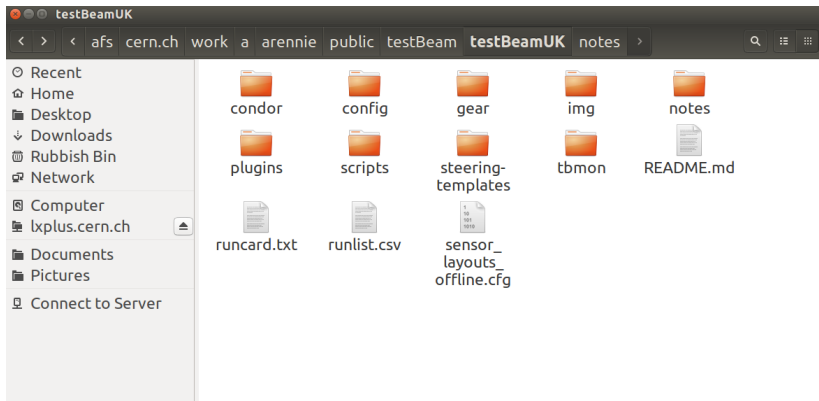
What does it look like ?



What does it look like ?



What does it look like ?



Reconstruction

- Runs are organised into *batches*
- Batches are groups of runs for which the configuration of the telescope and DUTs is constant
- The file “runlist.csv” groups runs into batches and associates each batch with a “gear” file
- Each batch has a corresponding config file, named “config_(YEAR)(MONTH)(BATCH)” which points to input and output locations and allows for cuts and parameters to be altered
- Each batch also has its own gear file, named “gear_(YEAR)(MONTH)(BATCH)” which defines the geometry of that batch.

Reconstruction

- The EU Telescope environment should be set by running :
`scripts/setupEuTelescope.sh`
- With these files defined, EU Telescope can be run by doing :
`. scripts/runEuTelescope.sh RUN BATCH MONTH YEAR`
- It is also now possible to send a whole batch to HTCondor for reconstruction by doing
`. scripts/batchRunCondor.sh BATCH MONTH YEAR`
- The output can then be investigated using the rest of the “scripts” directory and the “tbtrack” files passed on for use in TBMon2

Analysis

- TBMon2 is configured via the “tbmon/config/mainConfig.cfg” file
- This in turn points to the “tbmon/config/analysisConfig.cfg” file

Analysis

- With these files defined, TBMon2 can be run by doing :
`.scripts/runTbmon.sh`
- Similarly to Eutelescope, TBMon2 can also be run over sub-batches (i.e. voltage steps, THL changes), by doing :
`.scripts/runAllTbmon.sh`

Analysis

Happy Reconstruction !