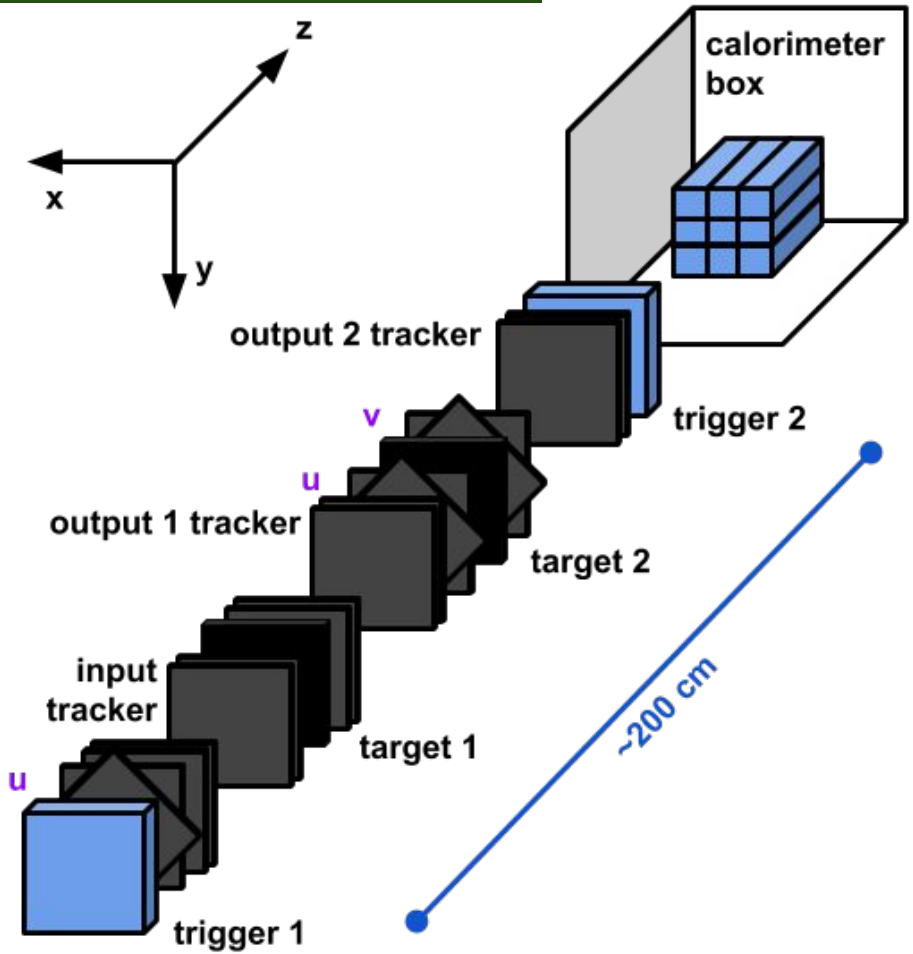
MUonE

2018

feasibility test @ COMPASS

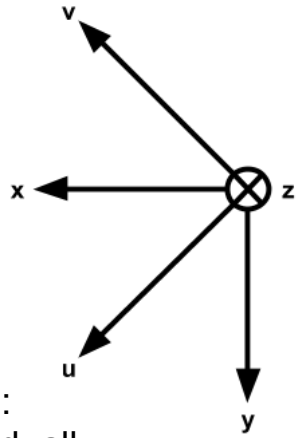
Mattia Soldani
Università degli Studi dell'Insubria
INFN Sezione di Milano Bicocca

detector layout



tracking system: 16 (when fully operational) Si microstrip layers

- ~10cm*10cm wide
- readout pitch is 242um
- vistas: 7 *x*, 6 *y*, 2 *u*, 1 *v*



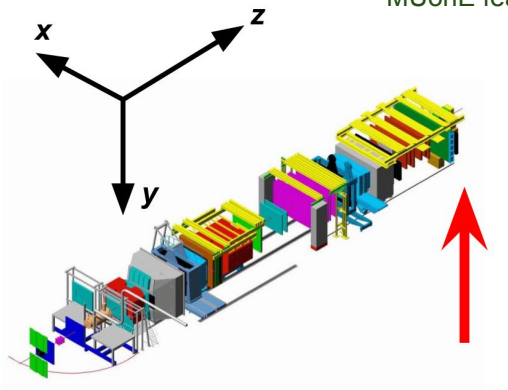
2 8mm deep graphite targets

electromagnetic calorimetry setup: many different solutions were used, all with scintillators & PMTs

→ check in the following…

telescopic trigger system based on AND of 2 ~10cm*10cm scintillators

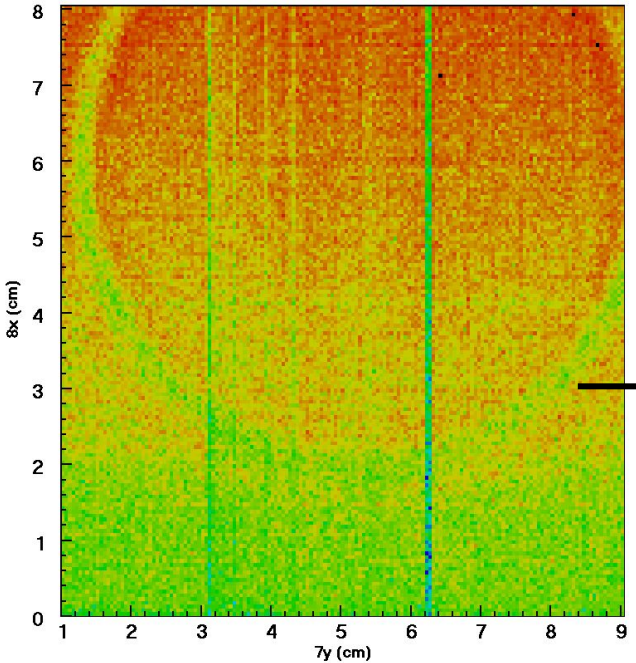
installation started on April 4th
and lasted few days…



14 Si layers only during the 1st month

checks and improvements

⇒ 1st check with physics data already at beam run start…



beam

target 1

target 2

single strip signal

strip number

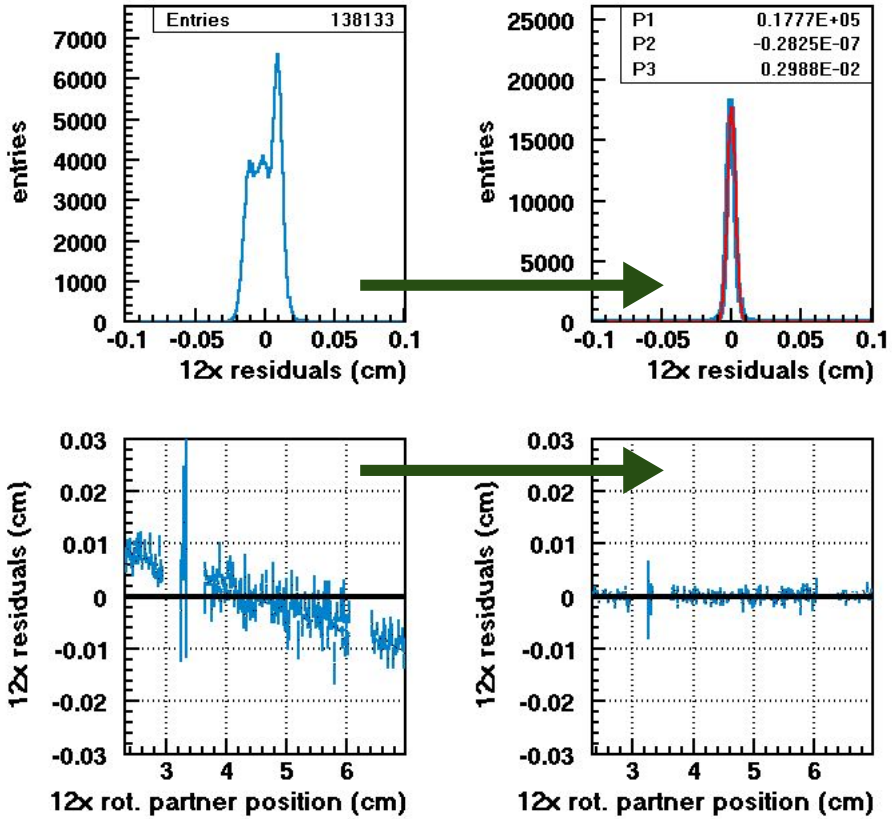
u

v

interaction with target 2?

upstream pipe or TPC?

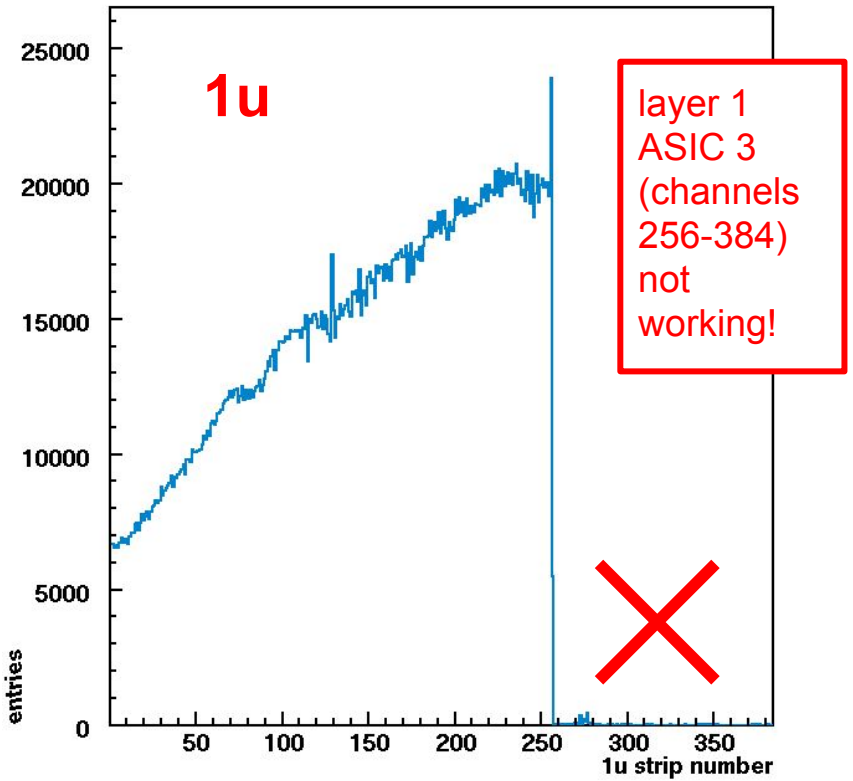
...then some work was performed for Si layers relative alignment using global single tracks (i.e. non interacting muons)

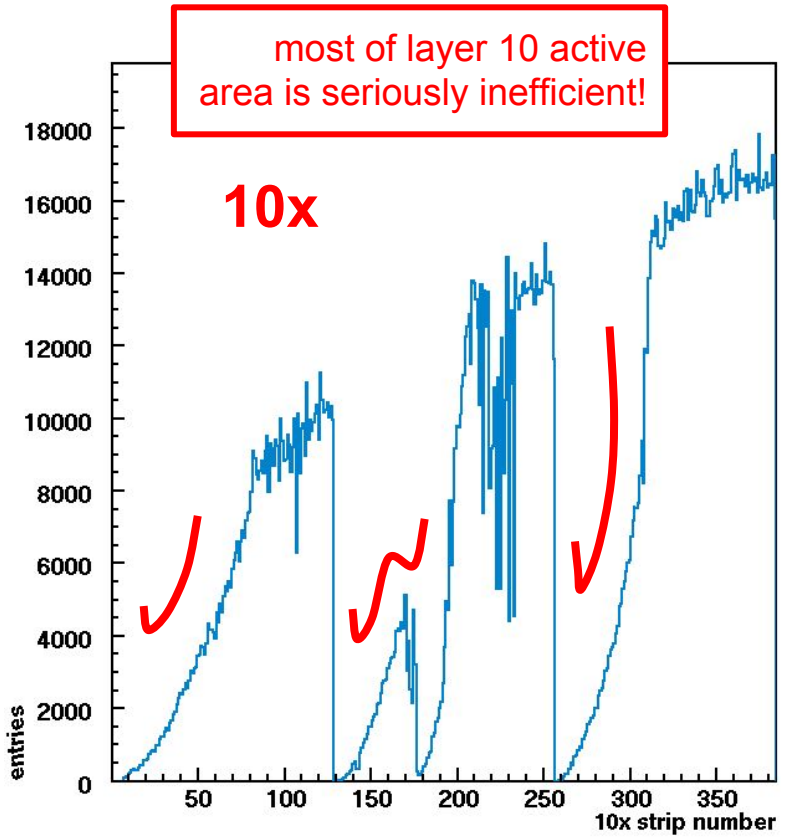


- ➔ alignment with respect to reference layers
- ➔ iterative algorithm
- ➔ automatic correction of transverse shifts and tilts about *z* axis
- ➔ other individual effects are corrected a priori, such as
  - tilts about *x* & *y* axes
  - single ASICs malfunctioning
  - local inefficiencies
  - …

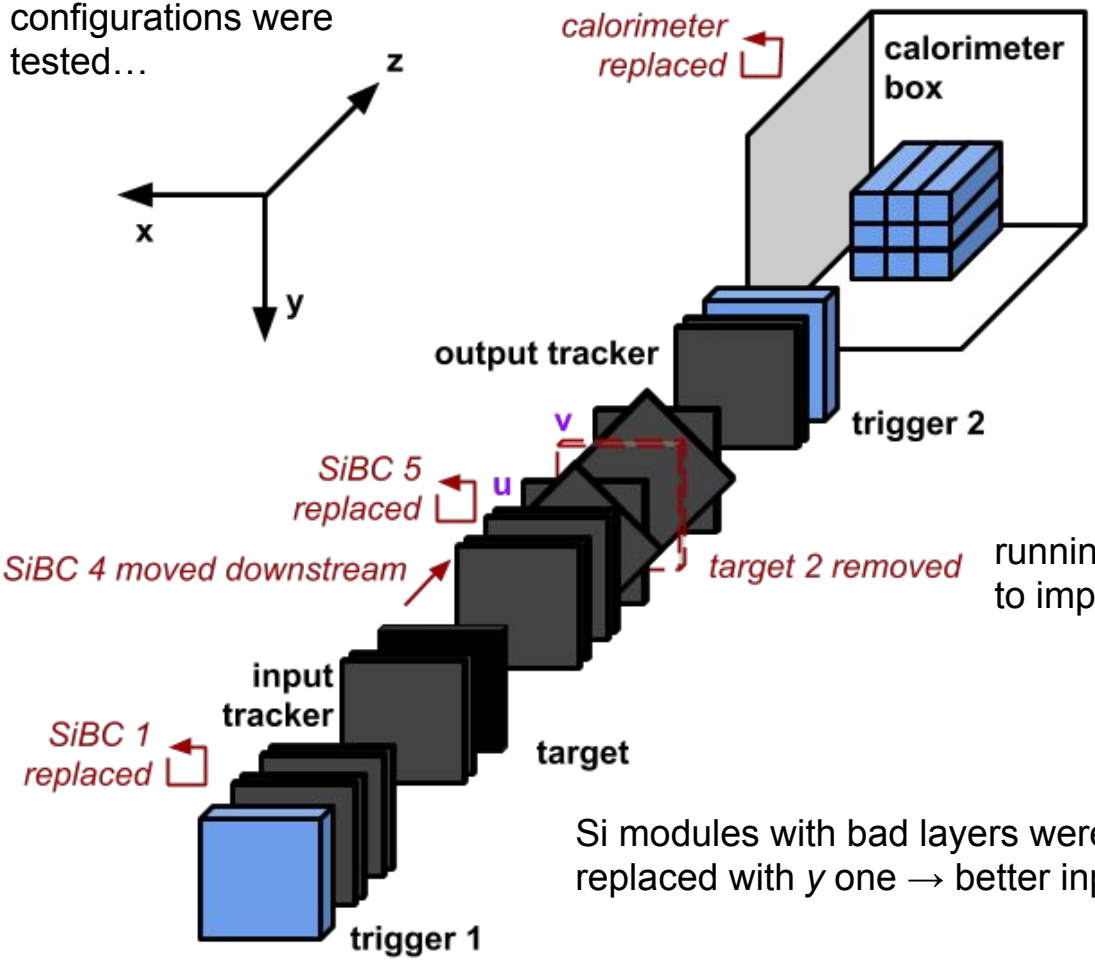
⇒ $\sigma \in (28,56)$um for all the layers

⇒ some layers malfunctioning soon emerged from beam profiles or residual spectra studies… → for example:





many different configurations were tested…



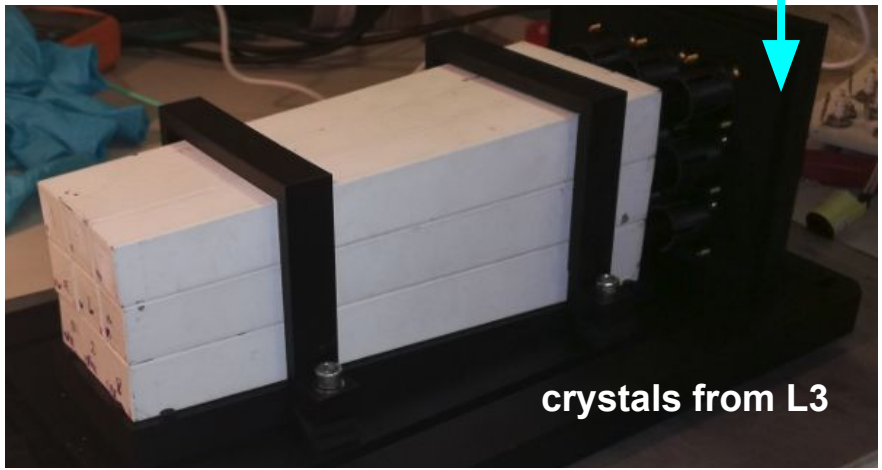
3 calorimeters were used:

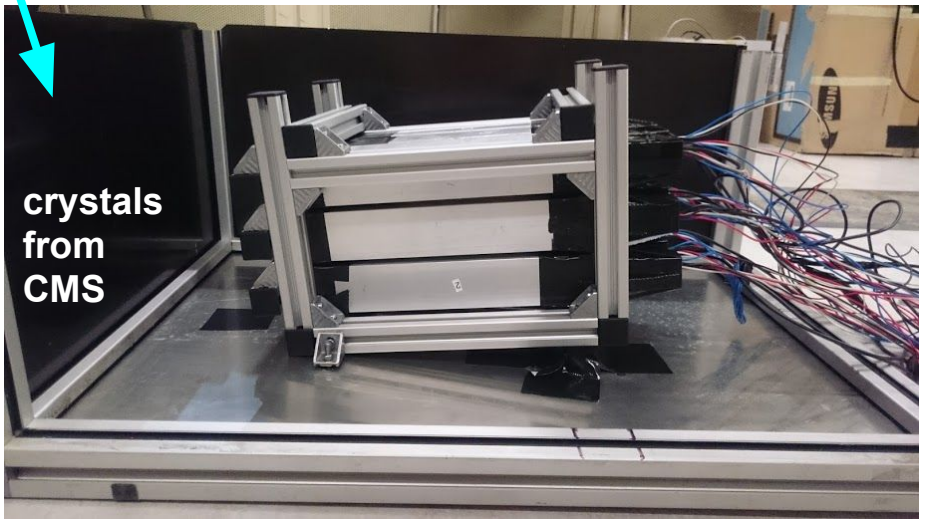
1. **DEVA**: sampling (Pb & plastic), longitudinally segmented
2. **STEFI**: 3x3 matrix of PbWO4 crystals → transverse segmentation
3. **GENNI**: 3x3 matrix of BGO crystals → transverse segmentation

running with 1st target only from June 27th, in order to improve output tracking capability

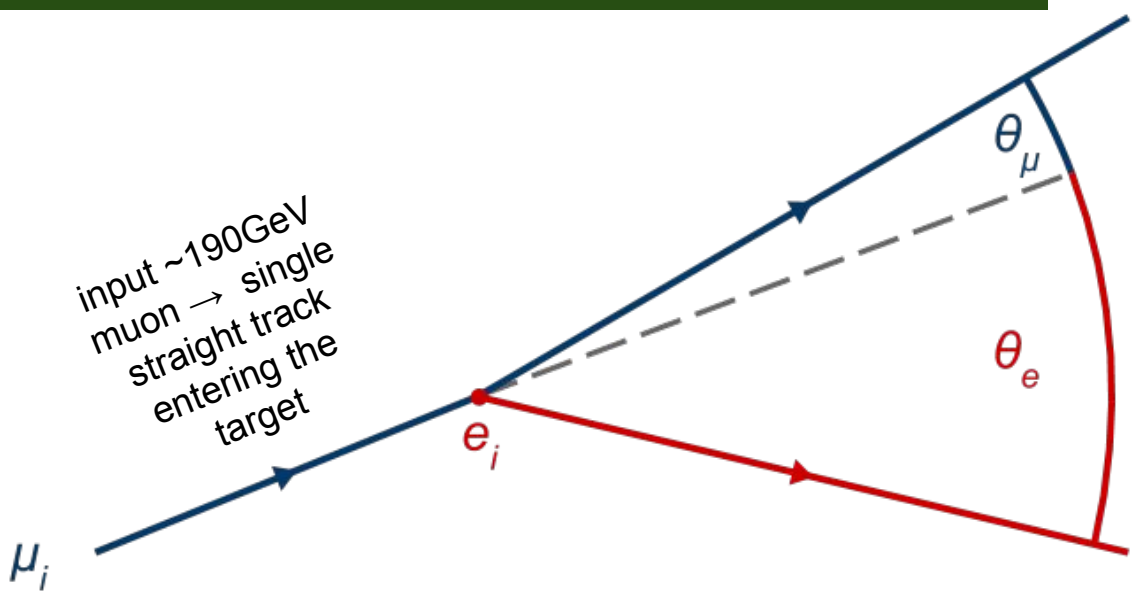
Si modules with bad layers were replaced on August 22nd; input stereo layer replaced with *y* one → better input acceptance

from	to	calorimeter
04/04 *(the beginning)*	01/05	**DEVA**
02/05	22/05	**STEFI**
23/05	07/06	none *(tb @ T9)*
08/06	...	**GENNI**





physics analysis is ongoing…



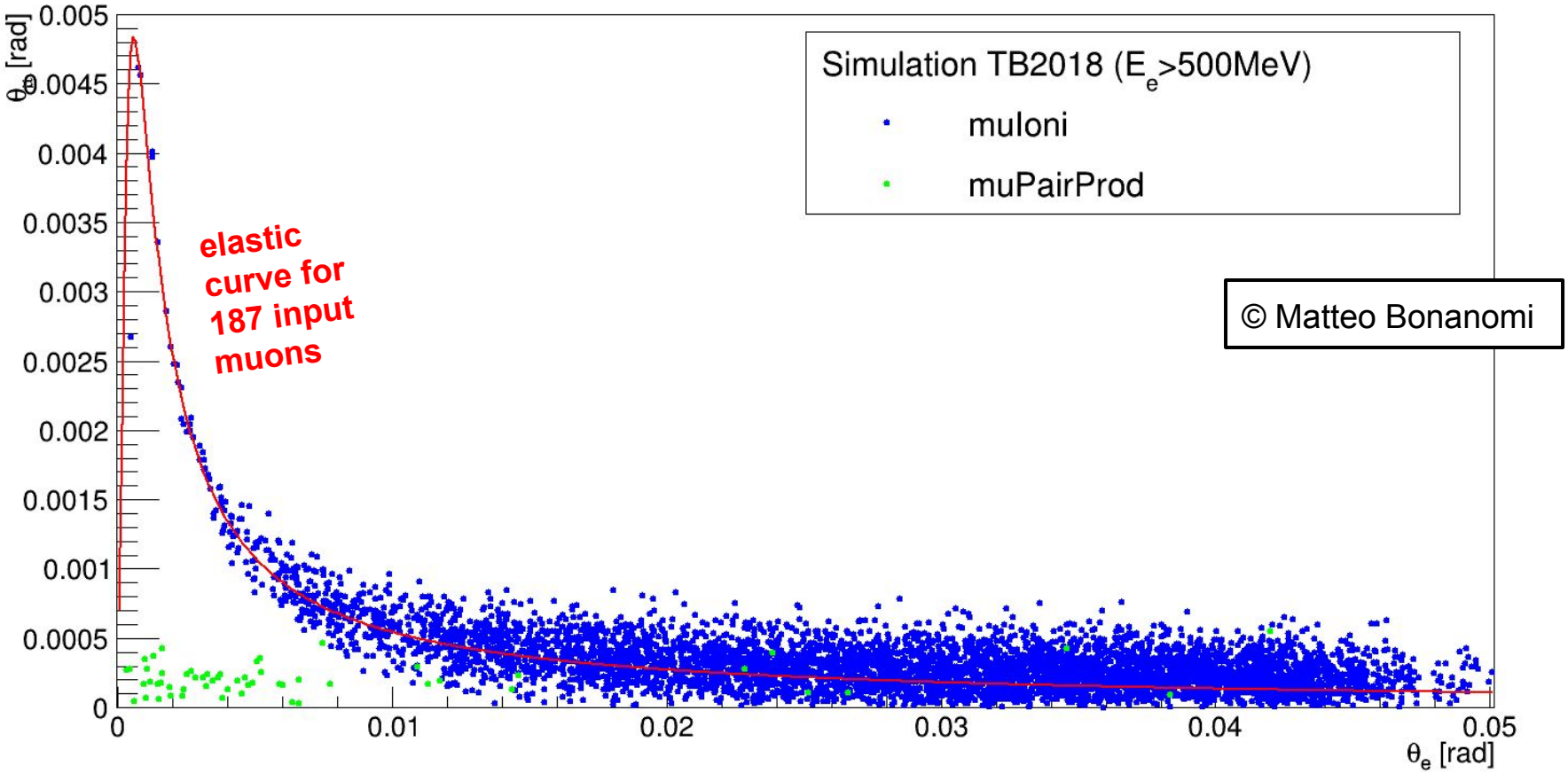
search for two particles in output

- **muon** which has a straight track with little deviation (mrad) with respect to the input one
- many-GeV **electron** which exits the target with larger angle (tens of mrad) and suffers MCS in the 410um deep Si layers

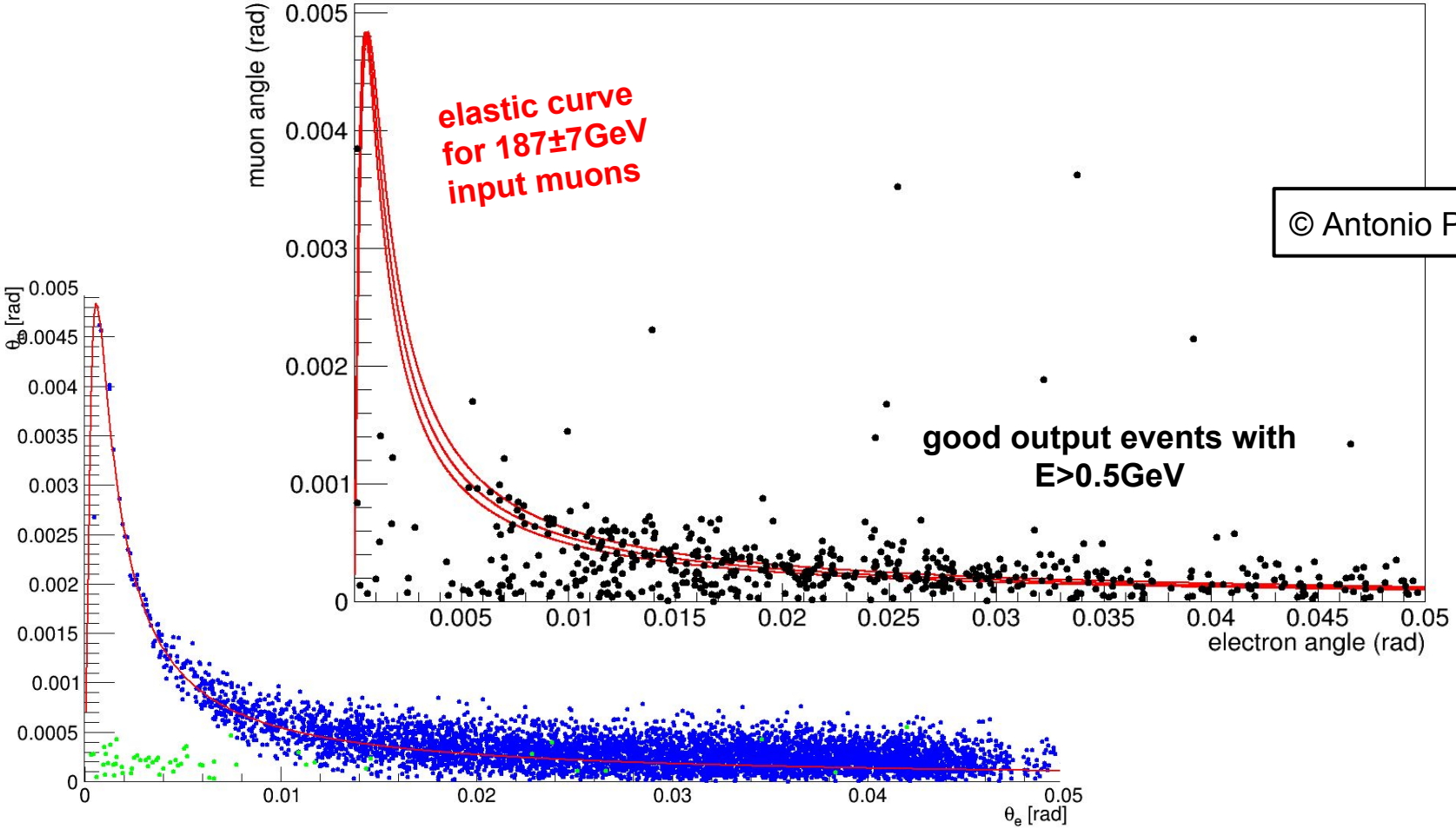
⇒ good events identification requires careful tuning of the selection criteria

- output multiplicity topology
- goodness of track fits
- vertex location
- output tracks coplanarity
- energy measurement when in calorimeter acceptance
- …

how do local inefficiencies, misalignment and limited spatial resolutions affect real data? → constant study of the comparison between **MC**...



…& **physical data** analysis



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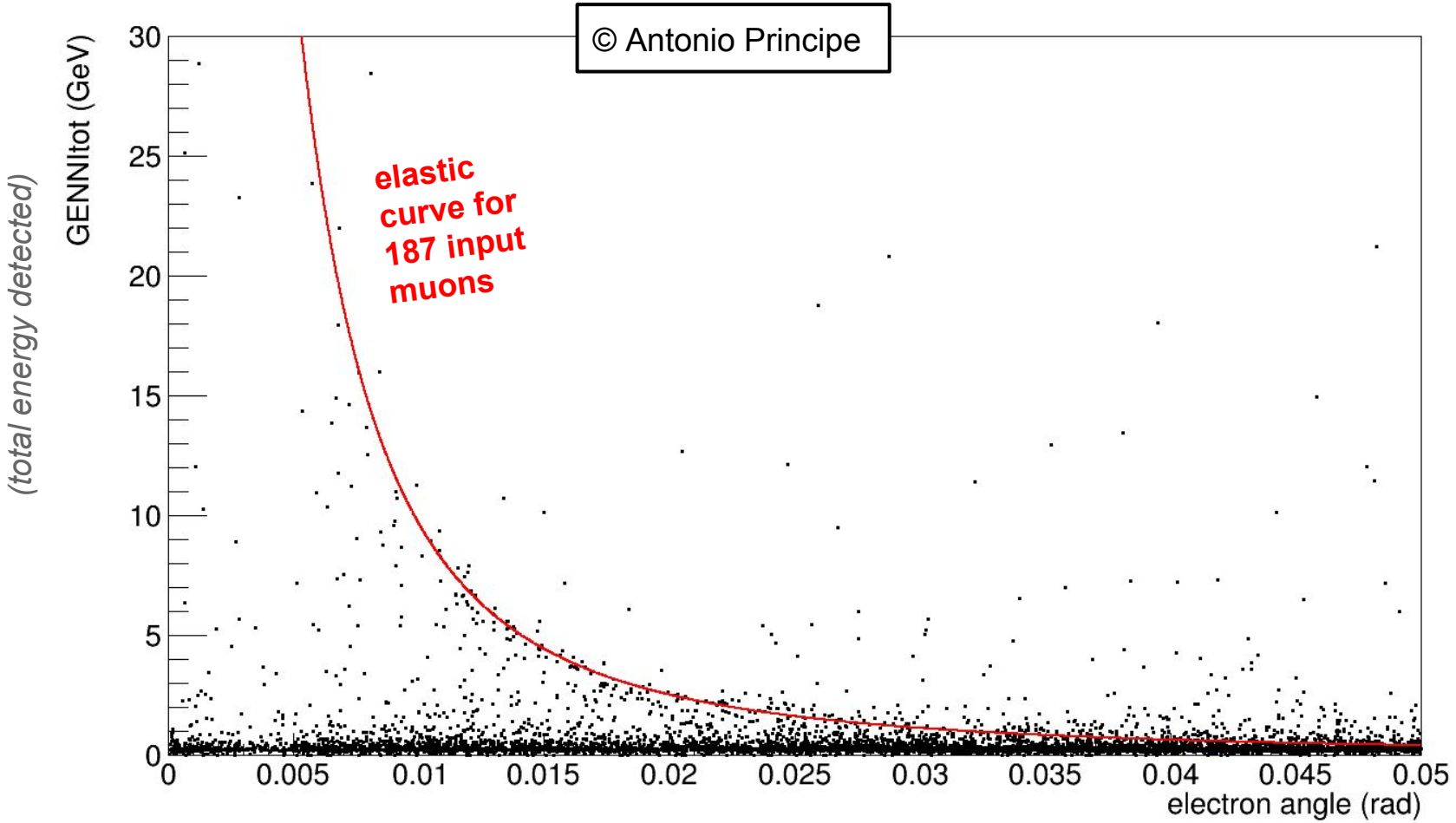
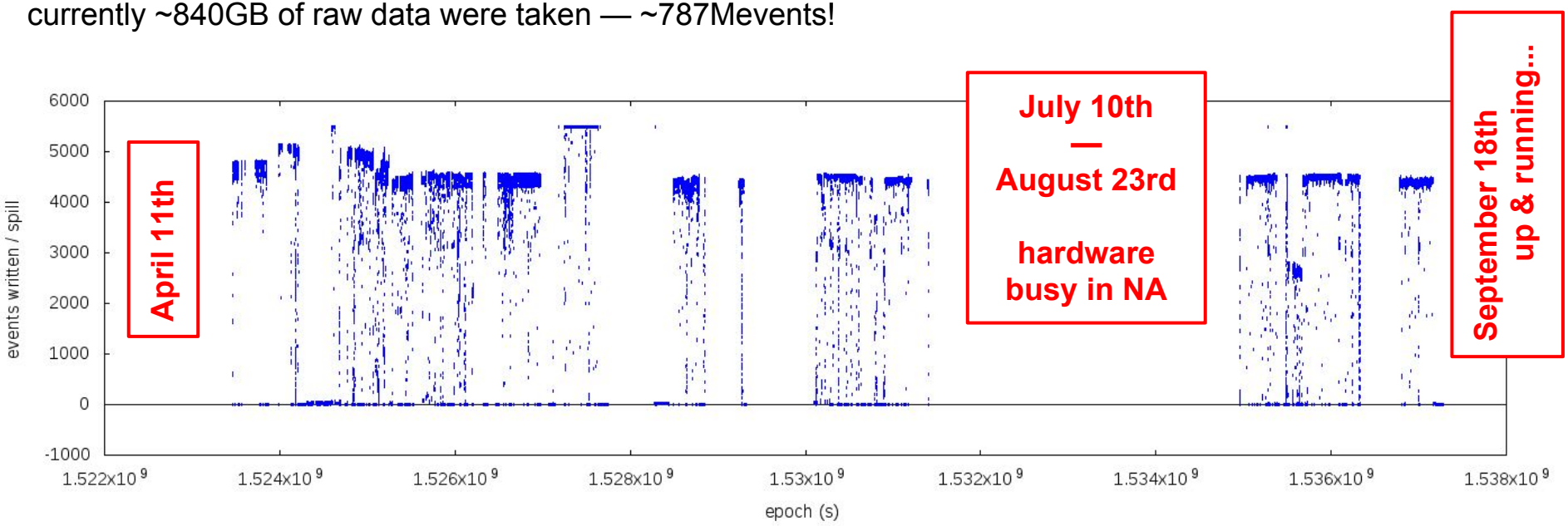


some DAQ statistics & outlook

currently ~840GB of raw data were taken — ~787Mevents!



planning to keep on with minor modifications in the readout electronics until the middle of November…

Thank you!