Summary of data analysis activities

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CYGNO general meeting 17/02/2022

Winter22 RECO production

- Finished a "central" production of reconstructed ROOT trees with RECO quantities of the majority of data taken with LIME in the last year
- Winter-22 tag (based on "autumn-21" branch) for production aiming the needs of the vast majority of the analyses using images
  - saving RECO cluster quantities
  - saving non-zero suppressed pixels of clusters with *lenght < 5 cm, integral > 10^3 counts* (to suppress cosmics and fakes) to keep size under control
  - ensure reproducibility and bookkeeping of the produced quantities
- DOCUMENTATION:
  - Variables meaning in this wiki page
  - event size for LIME@LNF for typical runs with source + natural BKG is **~250 kb / event**
    - dominated by "reduced" pixels collection: 86%
- Sharing:
  - temporarily in this location, will be moved to INFN cloud shortly

RECO status

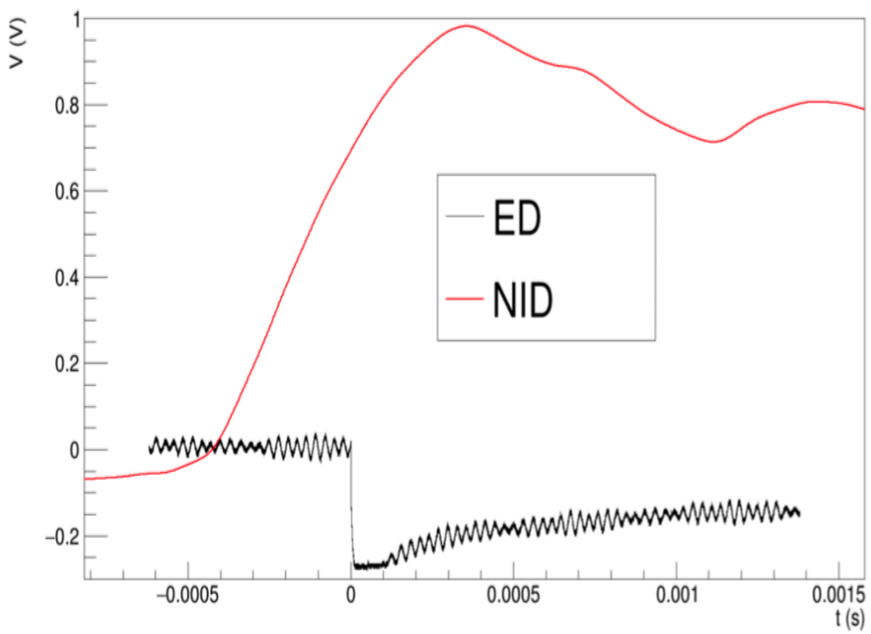
- From Davide's table and plan

Runs	Description	PMT	People interested	RECO status
3631-3700	55Fe :Zscan at different Edrift - Pedestal and Cosmics	No		
3737-3805	Neutrons - Pedestal and Cosmics	No	Emanuele and Flaminia	100%
4119-4190	55Fe: Zscan and VGEM1 scan (Donatella's Thesis)	No	Donatella and Giulia	NO NEED
4416-4469	55Fe: Zscan and VGEM1 scan + BKG	Yes	David and Luca	100%
4490-4504	Multi-source Cu: Zscan and VGEM1 scan + BKG	Yes	Samuele and Emanuele	100%
5790-5860	Multi-source High Statistics	No	Samuele and Emanuele	100%
5861-5911	55Fe: VGEM1 scan / BKG + High Statistics + Water Cooling	No	Rita Joanna and Emanuele	100%
6121-6141	Titanium + BKG High Statistics	Yes	Atul and Davide	100%
6143-6290	Calcium + Pedestal Very High Statistics	Yes	Atul and Davide	100%
6291-6313	55Fe: VGEM1 scan + BKG + ORCA BT	No	Brazilian Team	NO NEED
6314-6339	55Fe: VGEM1 scan + BKG + ORCA QUEST	No	Brazilian Team	NO NEED
6340-6362	55Fe: VGEM1 scan + BKG + Sensor Board	No	Brazilian Team	NO NEED
Several	Long Term Stability	Yes	Rita and Giovanni	100%

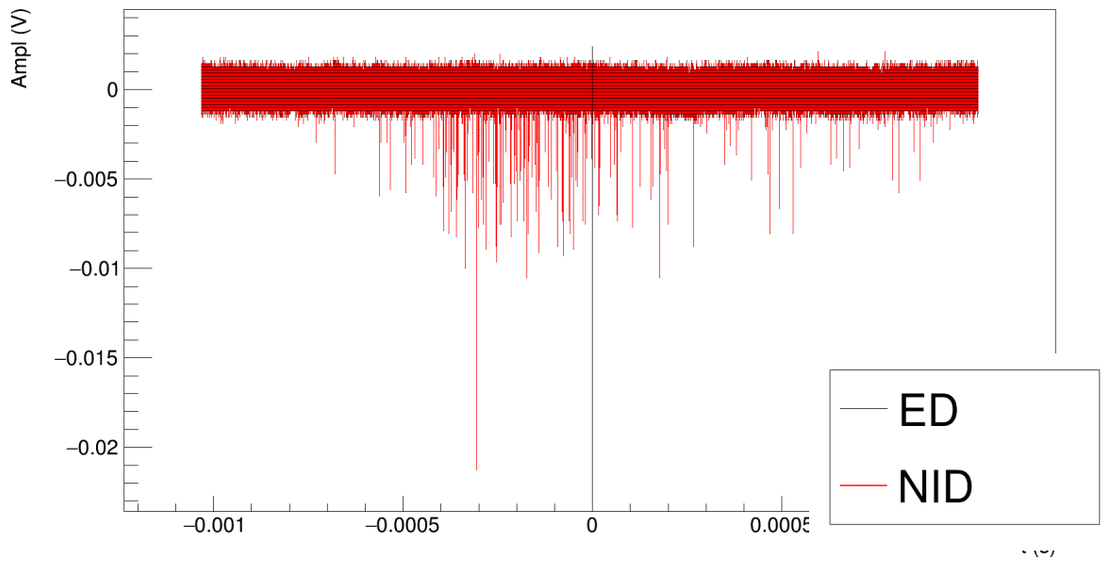
Update on NID operation

- Established the NID operation from the GEM3 signal waveform, and clear difference also in the duration of the PMT signal wrt ED

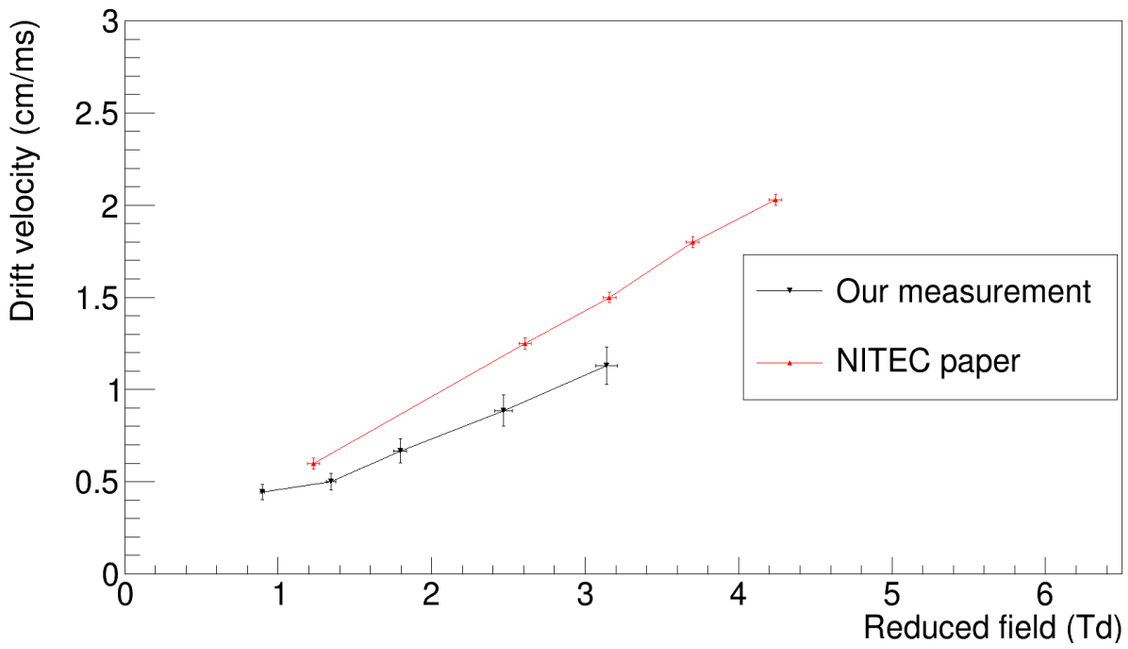
GEM 3



PMT



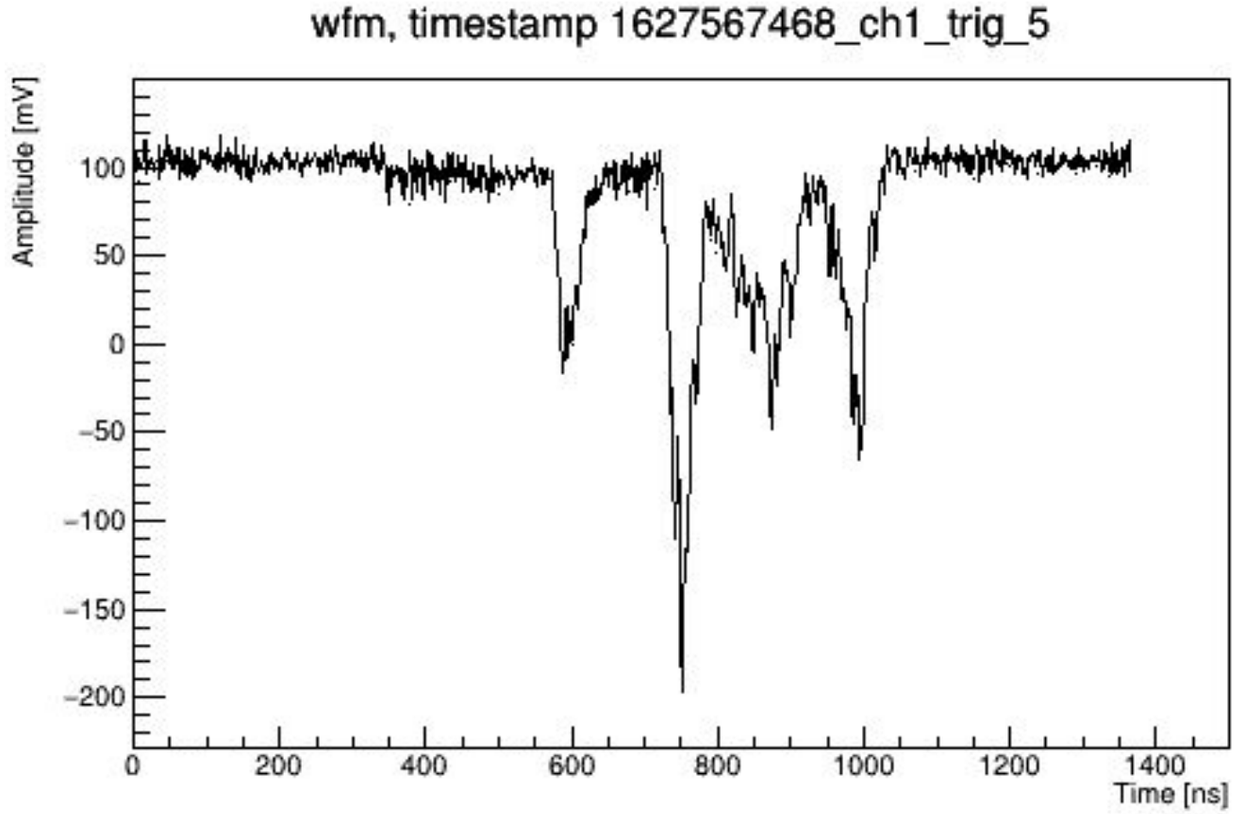
- estimated **drift velocity** consistent with NID with smaller prototype NITEC



Giorgio, Elisabetta

First look at LIME PMTs

- Started tackling the PMT waveforms in LIME data with data with different sources and different configurations
- After understanding how to assemble the PMTs waveforms, goals are:
  - Correlate PMT signal in a single event
  - Correlate PMT signals with camera picture (**3D tracking**)

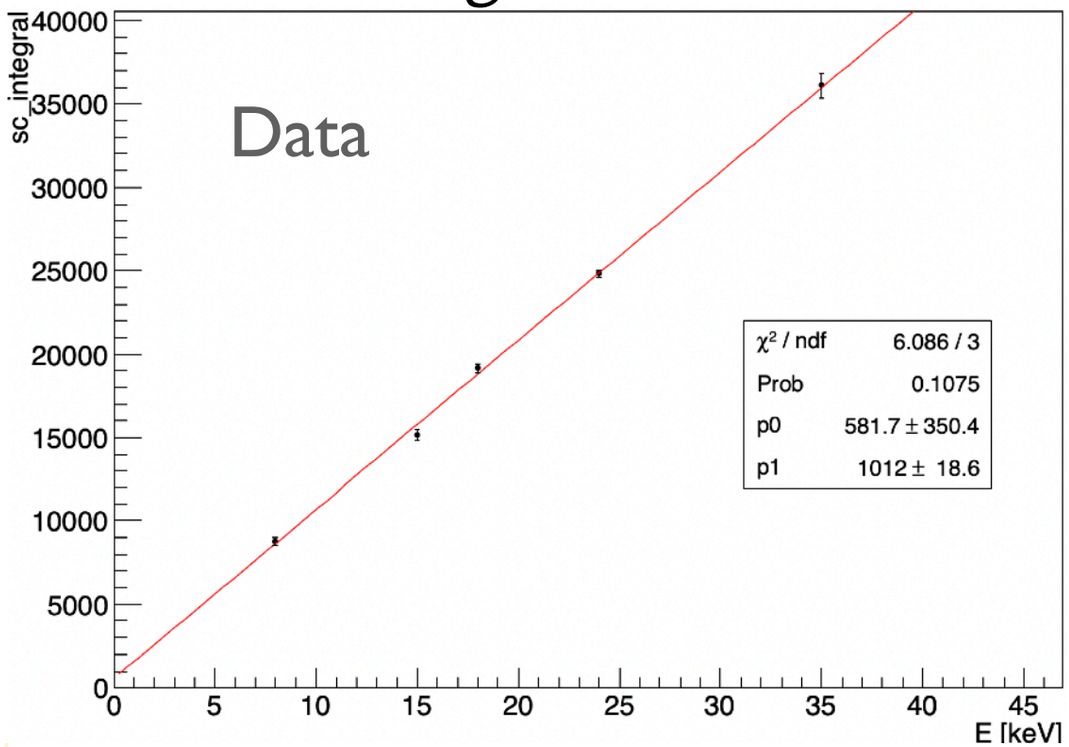


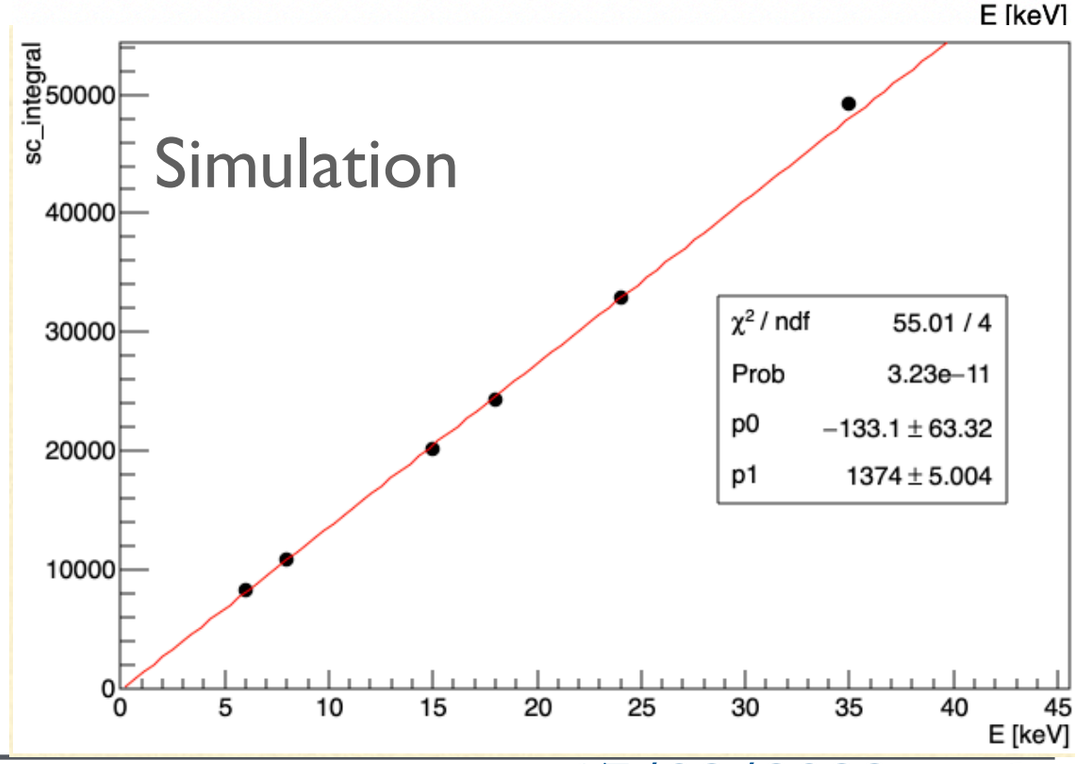
David, Gianluca

Simulation validation

- Started a systematic validation of simulation with X-rays at different energies
  - cluster shapes
  - energy linearity
  - inputs to the directionality algorithm
- Pro: use of the large statistics of LIME data
- Refinement of the energy estimate
  - application of the energy MVA regression
  - more robust estimate of the natural background

From partially-corrupted data being redone





Elisabetta, Samuele, Emanuele

The End