

# SAND Physics/Software WG

M. Tenti - Bologna

# The Contributors

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**Valentina Cicero** Bologna  
**M. Tenti** Bologna  
**Matteo Sorbara** Roma2  
**Antonio Giosiosa** Roma2  
**Lea Di Noto** Genova

ECAL clustering + PID w/ ECAL	Kalman Filter	Kalman Filter w/ GENFIT	H sample w/ fast reco	Straw -VS drift- based tracker	Event reconstruction	CAF	Integration
D. Casazza R. D'amico P. Gauzzi	V. Pia G. Lupi	A. Chukanov G. Vorobyev	G. Ingratta	M. Sorbara A. Gioiosa	P. Bernardini A. Surdo F. Alemanno	L. Di Noto	M. Tenti

# Meetings

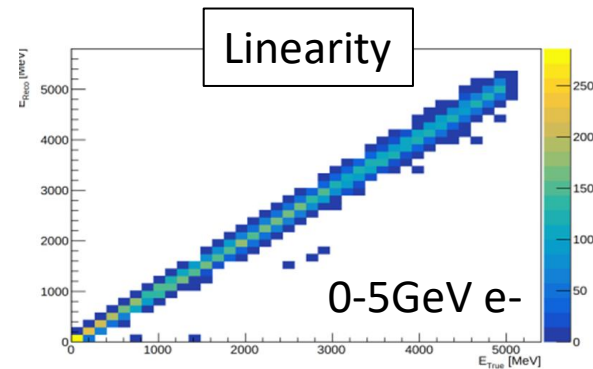
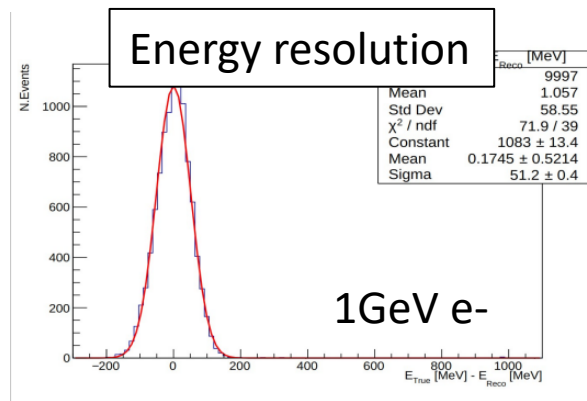
- Starting from 21/02 we have regular weekly meetings
- A shared google docs is used to take notes [[here the folder](#)]
- Meetings are recorded [[here the folder](#)]
- A list of action items is produced and checked during the meeting
- Notes, video and action items can be found in the corresponding indico agenda

# SAND in DUNE

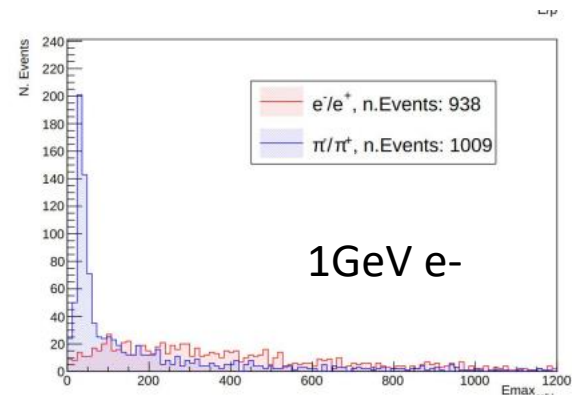
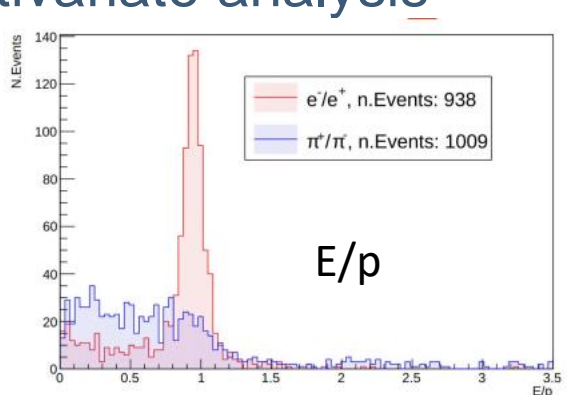
- SAND needs to be much more integrated in the DUNE Collaboration
- We need liaison people
  - **NIUWG** : **missing**
    - Neutrino interaction uncertainties
  - **LBL** : L. Di Noto [Genova]
    - Long baseline oscillations
  - **ND sim/reco** : M. Tenti [Bologna]
    - ND simulation and reco
  - **BSM** : D. Montanino [Lecce]
    - Beyond Standard Model
  - **BIWG** : **missing**
    - Beam Interface

# ECAL clustering and PID

- Validation of the clustering algo... before being intergrated into *sandreco*



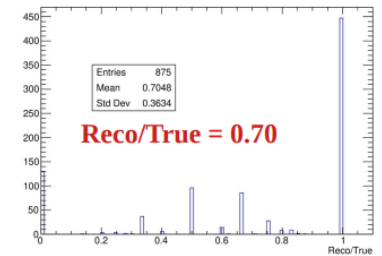
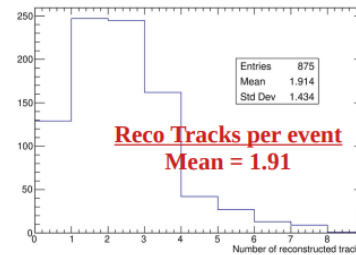
- Searching for powerfull e/pi discriminating variables as input for multivariate analysis



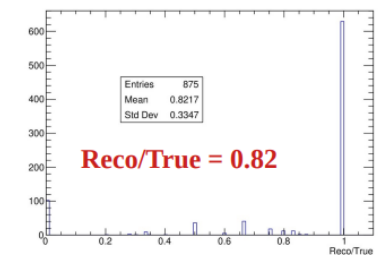
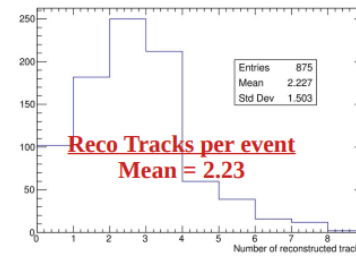
# Event Reconstruction

- Characterization of the sandreco performances and comparison with past FLUKA based results
- Reconstructed neutrino energy and vertex multiplicity were investigated
- Investigation on pathological null reconstructed neutrino energy events leads to find bug found and solved  
..... Solution waiting to be implemented in *sandreco*

OLD track reconstruction

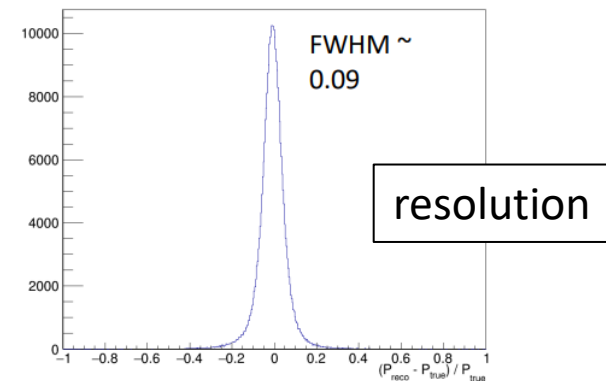
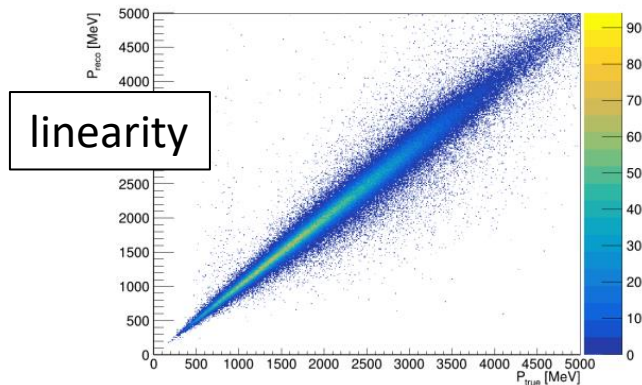


NEW track reconstruction



# Kalman Filter

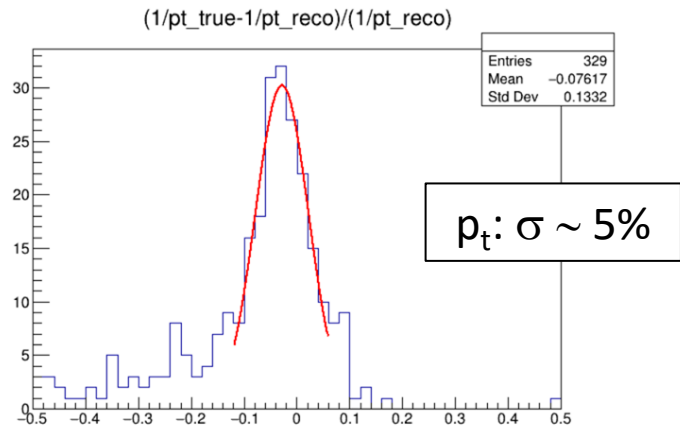
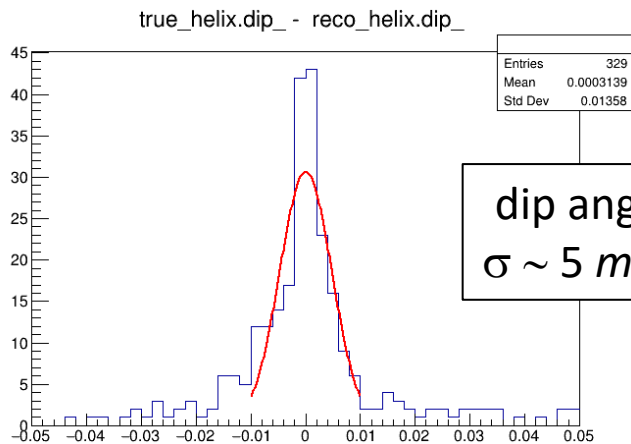
- Found and fixed an issue on the application of the smoothing step
- Preliminary reconstructed momentum:



- Valerio presented the status of the kalman filter development to ND sim/reco meeting on 20/03

# H sample w/ fastreco

- GI is developing a fast reconstruction based on likelihood exploiting expected and reconstructed distances from wires (radii)
- GI presented preliminary results



- The next step is to redo H analysis ( $\bar{\nu}_\mu + p \rightarrow \mu^+ + n$  channel)



# In addition (I)

- **Rome2:** Matteo Sorbara and Antonio Gioiosa are working on the straw- vs drift- based trackers comparison
- **CAF:** Lea Di Noto works on SandRecoBranchFiller to correctly fill the variables in SANDStdRecordObject.  
Two steps strategy: first integration with duneanaobj and, secondly SAND-wide discussion on the content
- **TDR:** Antonio presented a preliminary draft for *Event Reconstruction* and *Analyses* sections and assignments.  
*Software and Computing* will follow

# In addition (II)

- **Dubna:** Artem Chukanov and Grigory Vorobyev are willing to develop an alternative Kalman Filter based on [GENFit](#)
- **GRAIN:** Valentina will work on the GRAIN physics case
- Porting sandreco in **AL9** and **SPACK** is on going
- **Integration** in ND sim/reco machinery is on going

# Thank you