Proposal from NCNR
and status of current works

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We are interested in continuation of topics we were touching in the proposal preparation.

Our work is focused on the reconstruction and PID in LArTPC: there are obvious overlaps with 35t, WA105, WA104, SBN, … that we would like to use: share our solutions, compare and very likely mix with other approaches.

The aim of the CERN test beam measurements is
- asses systematics / calibrate response of the detector response
- minimize systematics of reconstruction tools
- deploy the reconstruction tools in the real FD-like conditions

We would like to participate to the tools preparation and related analyses, as in the next slide.

Main interests in work on the CERN Prototype

<u>Specific topics that we are interested in:</u>

- electron / gamma separation studies:
  - developments that are possible with the π^0 and electron samples:
    - algorithms for low energy cascade reconstruction
    - reconstruction of the cascades's initial part: dE/dx, 3D direction
    - calorimetric calibration
  - calibration of *Collection / Induction* signal reconstruction, angular corrections
  - deployment of algorithms to real data conditions

- hadron track/shower related measurements:
  - reconstruction developments and validation for hadronic showers, required to calibrate hadron momentum measurement
  - recombination angular effects: measurement methodology, tools for various models simulation, reconstruction tools, and finally analysis
  - PID: extrapolation of prototype results to FD (more than just training patterns)

- studies of the FD detector parameters impact on the reconstruction efficiencies

  Realization coordinated with Systematics / FastMC group to focus on the most critical parameters.

Tools in LArSoft framework:

- PMA reconstruction algorithm, used also for the proposal preparation – implemented, further development is continued in LArSoft

- work on algorithms for EM cascades reconstruction ongoing (i.e. initial part reconstruction)

- muon momentum measurements (calorimetric vs range-based) requested by FastMC should be available soon

- *studies done for the proposal can be continued in the prototype geometry towards the preparation of tools/methods to be applied on the test beam data*

Overlaps with WA105 (and other LAr TPC's):

- tools work also for 2-view configurations, any "wire" orientation, and can be tested / compared!

- we hope to continue development of LArSoft based algorithms at CERN

MC: 5 muons
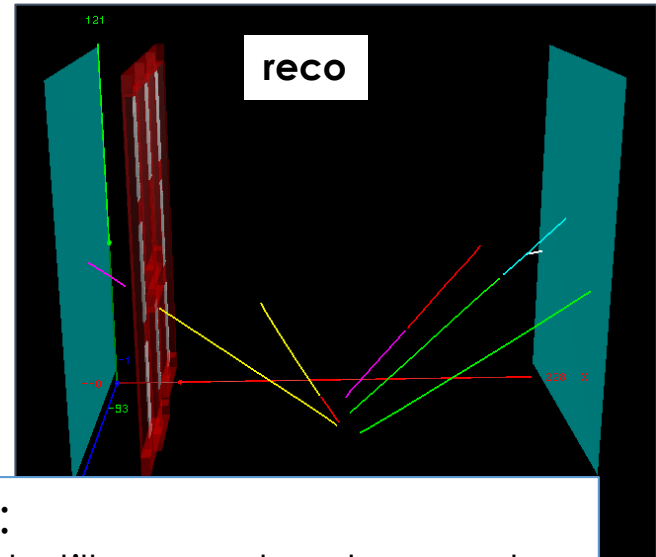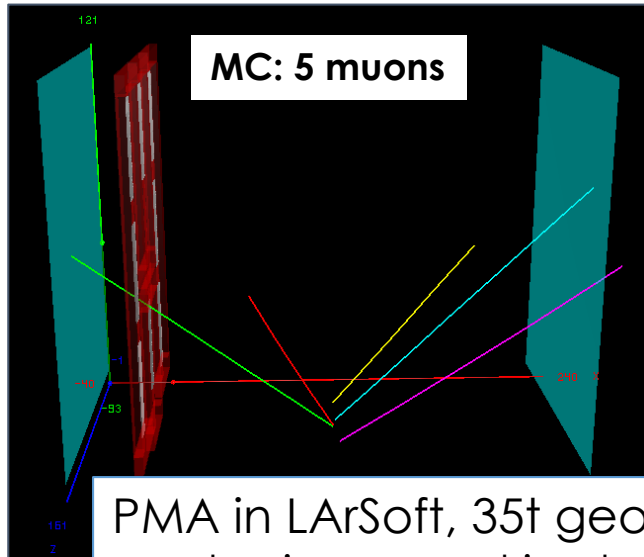
reco

PMA in LArSoft, 35t geometry:
basic concept implemented, still many developments
required, note: real data is much more difficult than MC

MC: kaon decay

reco

Work needed
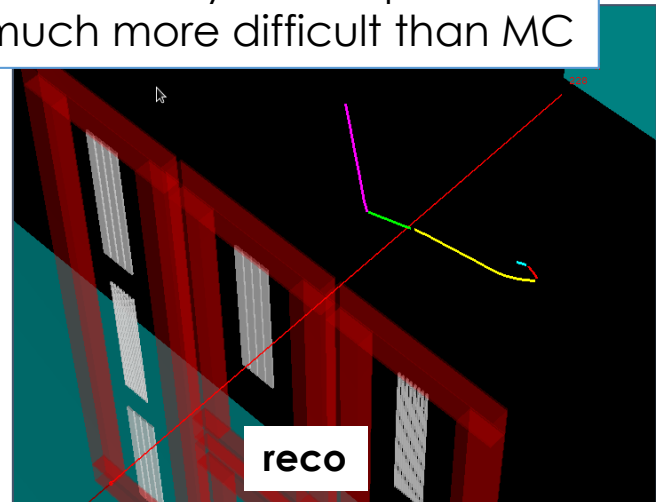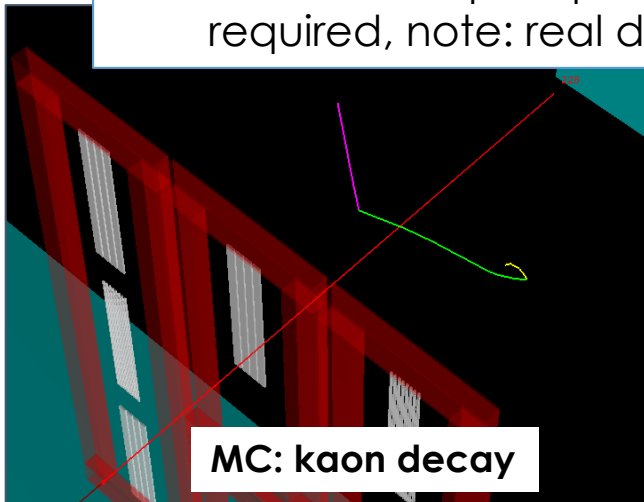
<u>Common testing tools to measure efficiencies:</u> spatial / calorimetric reconstruction, PID, …

- technical, quick check/comparison of algorithms
- identify problematic classes

This work is started and being done by several groups. It seems very important to us to have such contributions collected in a common, standard tool.

Next: connection of such pure technical efficiency tests to the systematics in physics analysis:
- how much syst. is affected by specific inefficiency
- what are priorities of improvements

Such work will be very useful for the Measurement Group.
But maybe it should be responability of the whole DUNE reconstruction.

Thank you!