Nuclear Physics Working Group Report

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Summary

- Six ongoing analysis reviews (no new reviews since March 2017 meeting)
- New working group webpage: https://wiki.jlab.org/cnpwgwiki/
- Requiring a checklist of standard content for CLAS6 analysis notes based on https://www.jlab.org/Hall-B/secure/claschair/docs/AnalysisNoteOutline.docx

PAC45
Proposals by the ALERT Group:

- Tagged EMC Measurements of Light Nuclei
- Tagged Deeply Virtual Compton Scattering Off Light Nuclei
- Partonic Structure of Light Nuclei
- Summary of additional channels

Proposal by new run group:
Electrons for Neutrinos - Addressing Critical Neutrino-Nucleus Issues

LOIs
Study of J/Ψ Photoproduction off Deuteron
Search for a ϕ-N Bound State at Hall B

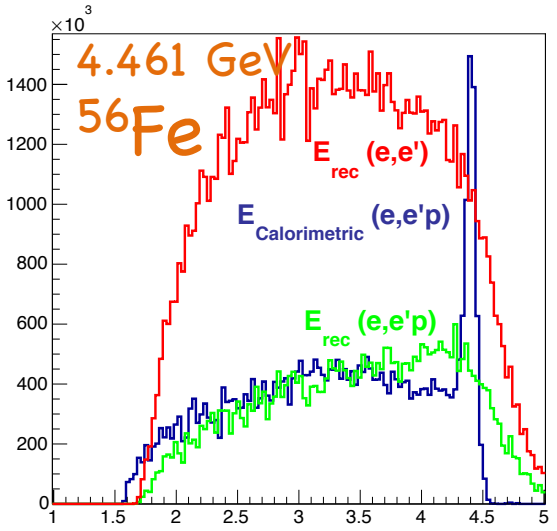
Summary on Validation of neutrino energy estimation using electron scattering data

1.First use of electron data to test neutrino energy reconstruction algorithms

- use zero-pion cuts to enhance quasi-elastic event selection
- just scattered lepton (E_{rec})
  - ✧ used in Cherenkov-type neutrino detectors
- total energy of electron plus proton ($E_{\text{Calorimetric}}$)
  - ✧ used in calorimetric neutrino detectors
- improved by a transverse momentum cut to better select QE events

2.Only 12-55% of events reconstruct to within 5% of the beam energy

- better for lighter nuclei and lower energies



3.Serious implications for neutrino oscillation measurements

4.Tremendous interest in the neutrino community

5.Analysis note in preparation, aiming for PRL

6.Future work:

- extend analysis to more targets and energies
- compare to neutrino event generators
- proposal to PAC 45

Status update on the analysis note

https://www.jlab.org/Hall-B/secure/eg2/taya/review.html

Neutral pion electroproduction ratios off C, Fe, and Pb to D

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Review page of CLAS analysis note
The target journal is PRC or PRL

CLAS Analysis Note

Review committee: Yordanka Ilieva, Larry Weinstein and Michael Wood

The original analysis note submitted to the committee can be found here
The review was requested on March 25, 2014 and received on July 3, 2014

Questions

- The committee response to original note is here
- Larry W. supplementary comments are here

Answers

- Current form of corrected analysis note is here
- Response to committe's questions is here

Meeting discussions

- Multiplicities presentation
- Acceptance correction presentation
- Systematics due to DC fiducial cuts presentation
- Systematics due to fit to the invariant mass presentation
- Systematics due to model dependence of acceptance presentation
- 1D multiplicity, acceptance and RC corrected: presentation

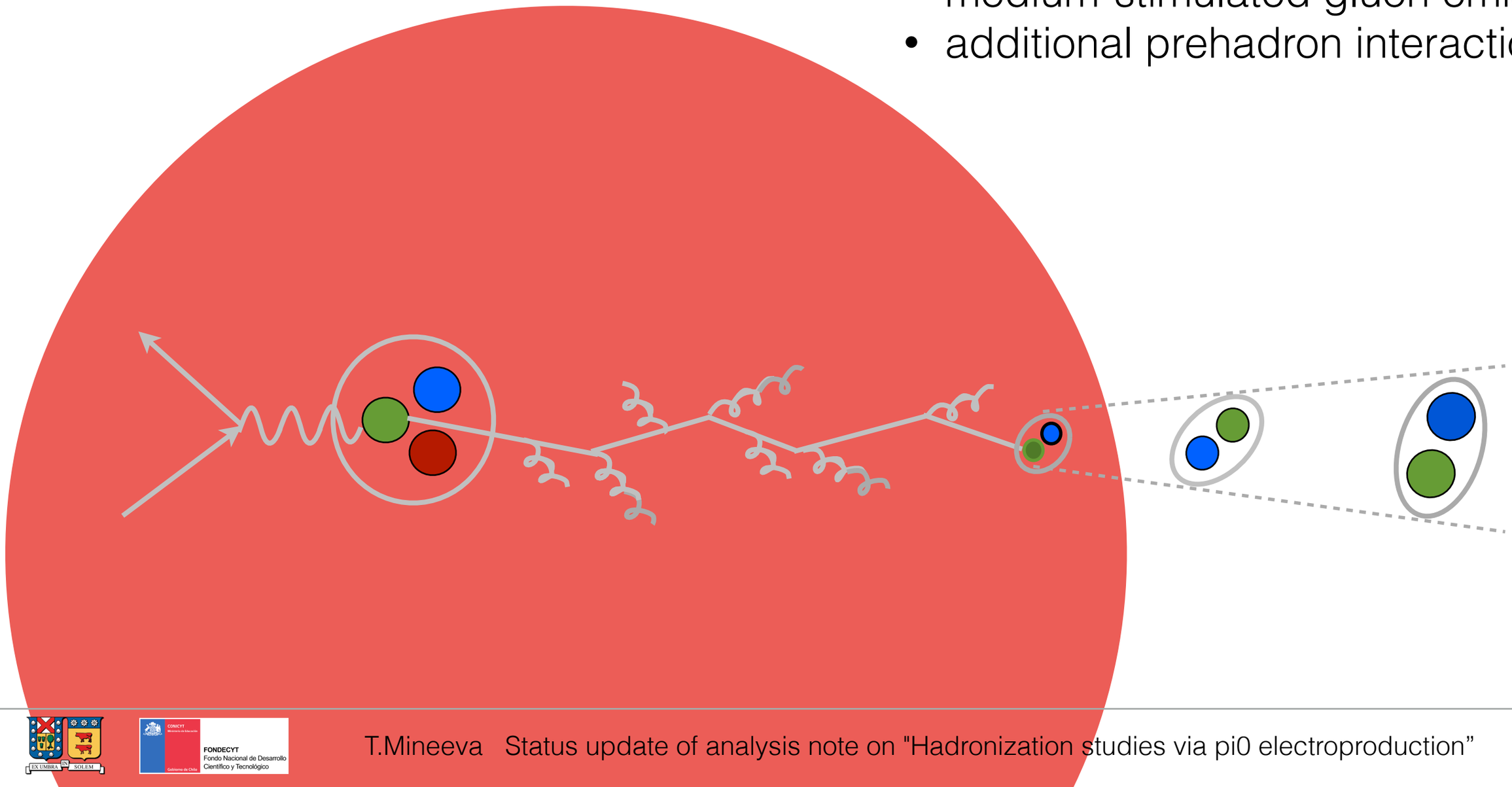
My wiki page

Last update June13 2017

Hadronization: in-medium

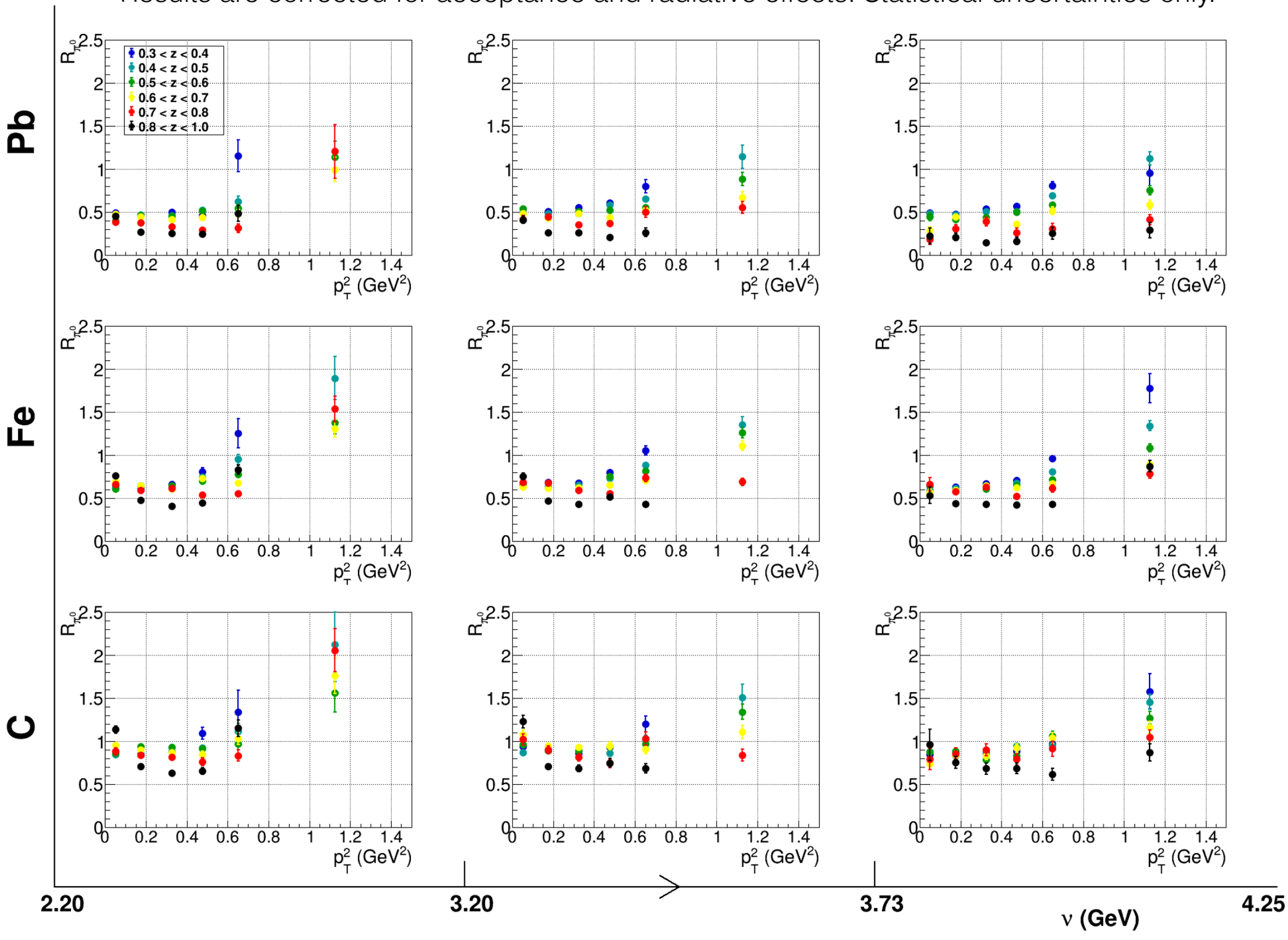
Nuclear medium of variable size acts as a ruler that provides space-time information on hadronization process

- partonic multiple scattering
- medium-stimulated gluon emission
- additional prehadron interaction



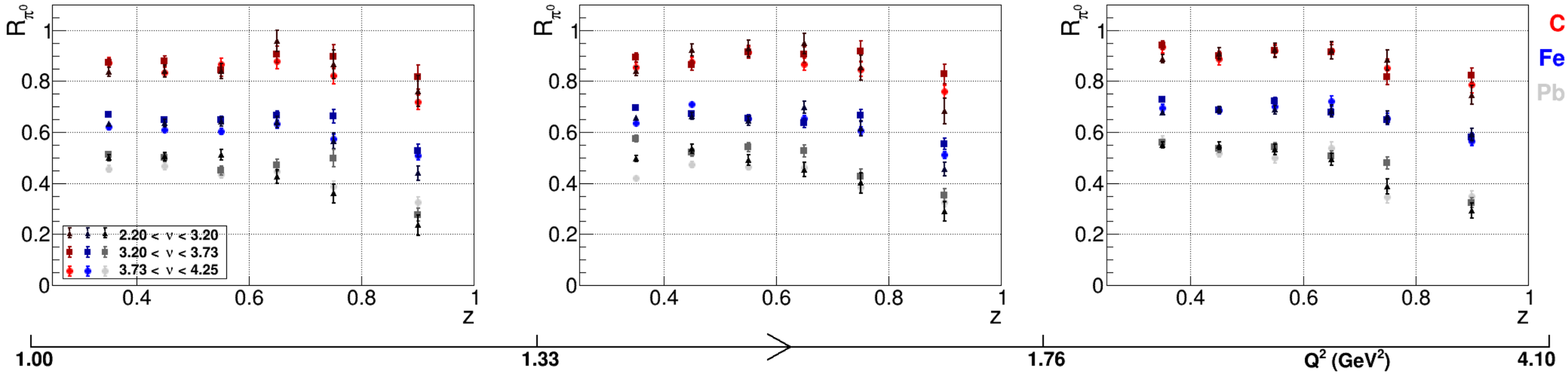
Multiplicity ratios in (ν, z, pT²)

Results are corrected for acceptance and radiative effects. Statistical uncertainties only.



Multiplicity ratios in (Q^2,ν, z)

Results are corrected for acceptance and radiative effects. Statistical uncertainties only.



Work continuing on systematic uncertainties on the radiative corrections.

Bose Einstein Correlations

Bose-Einstein Correlations (BEC) arise from the interference between the symmetrized wave functions of identical bosons, in this case pions.
The correlation function used in the analysis is defined:

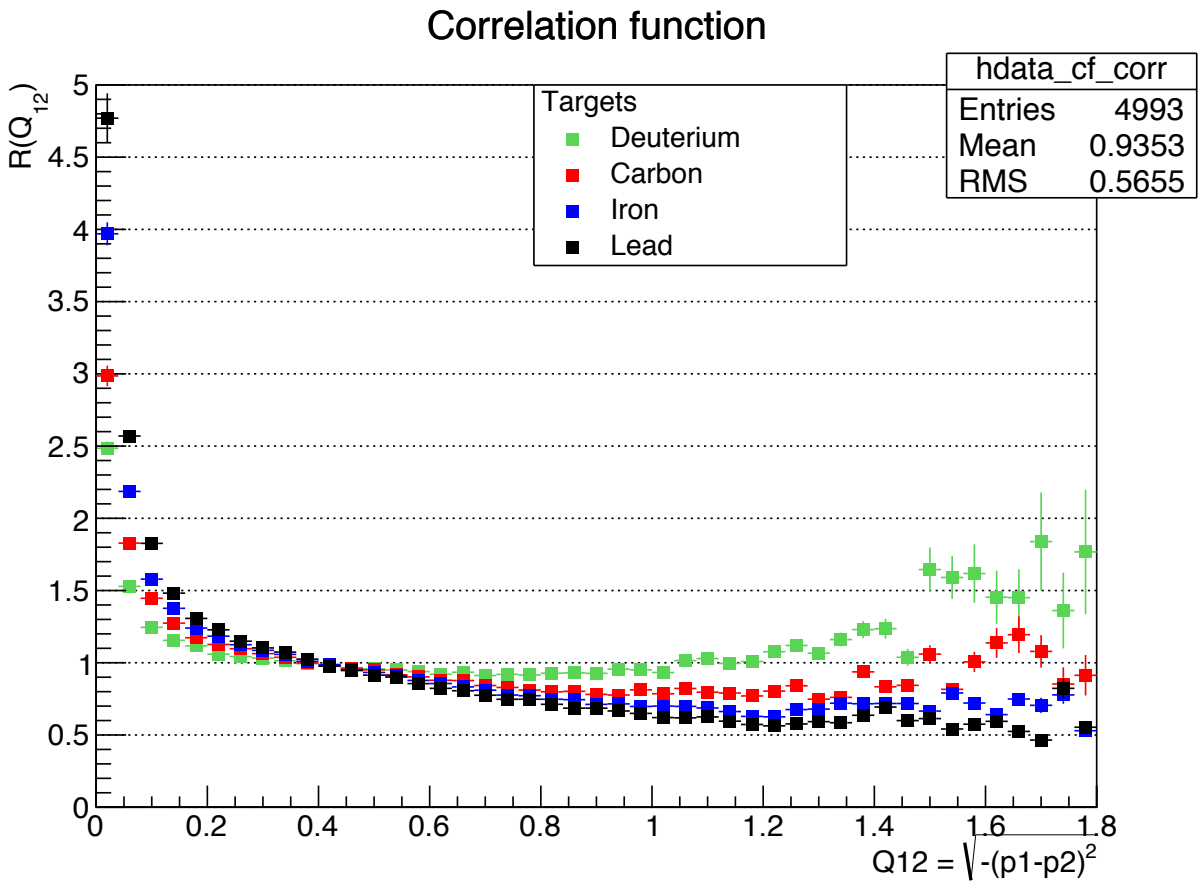
$$R(p_1, p_2) = \frac{D(p_1, p_2)}{D_b(p_1, p_2)} \tag{1}$$

Two different corrections are made:

- Mixing Correction.
- Efficiency Correction.

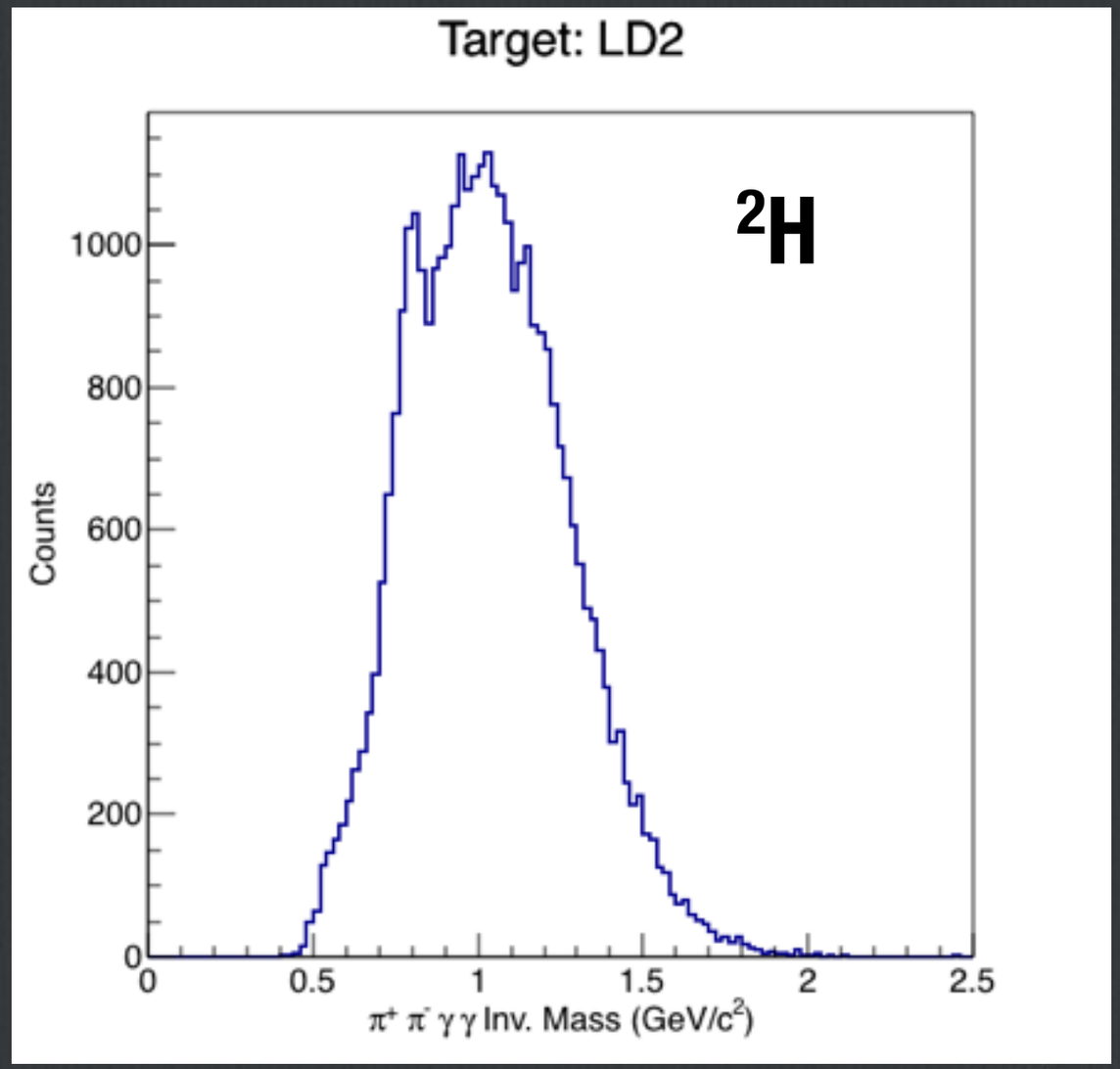
C vs Fe vs Pb vs D2 with both correction

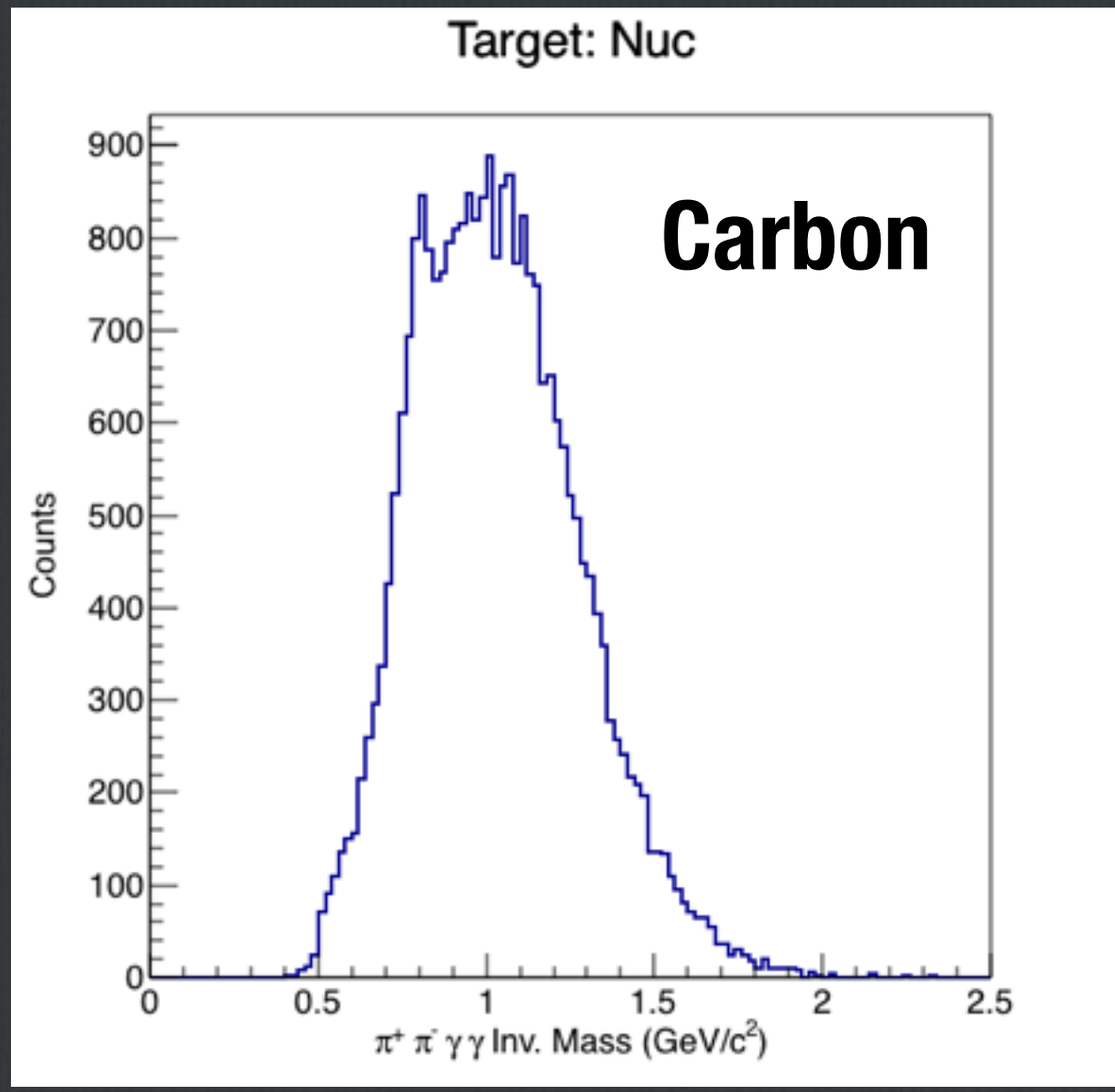
Correlation function comparison with Efficiency and Mixing Corrections



Hadronization of the ω Meson

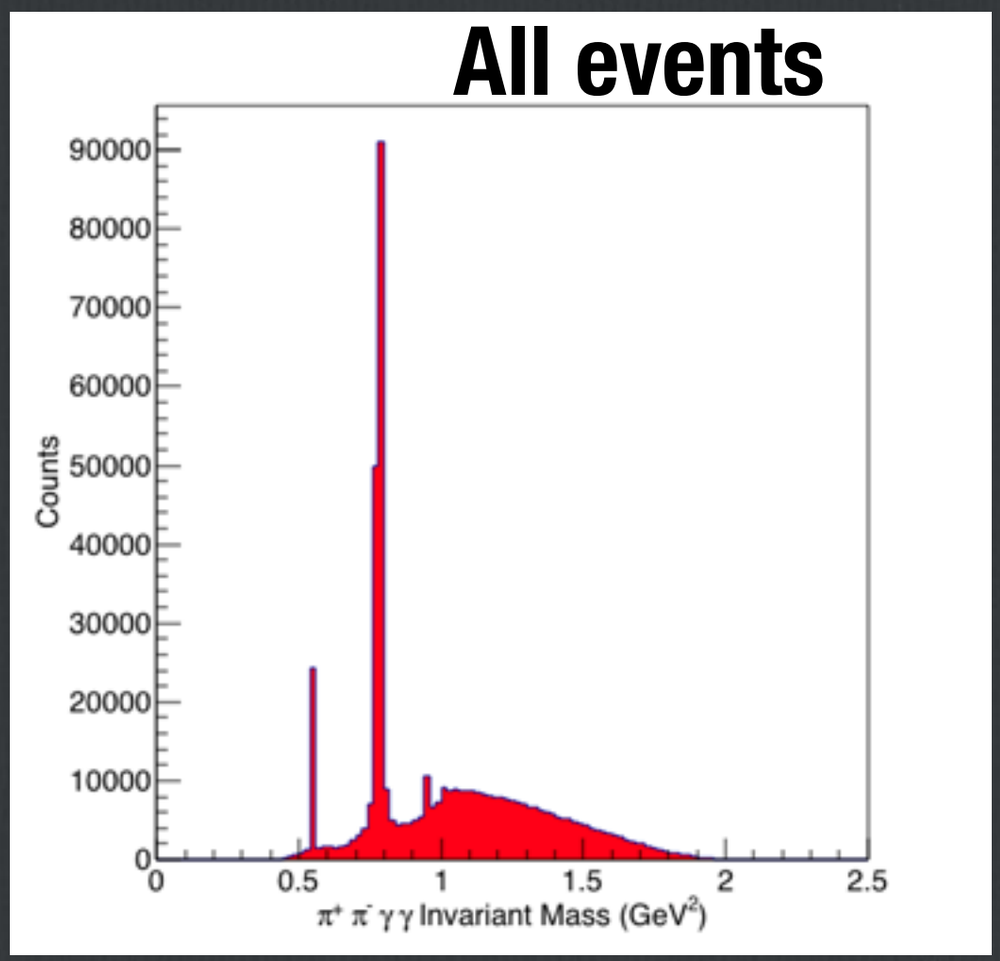
eg2 data mining: $\omega \rightarrow \pi^+ + \pi^- + 2\gamma$

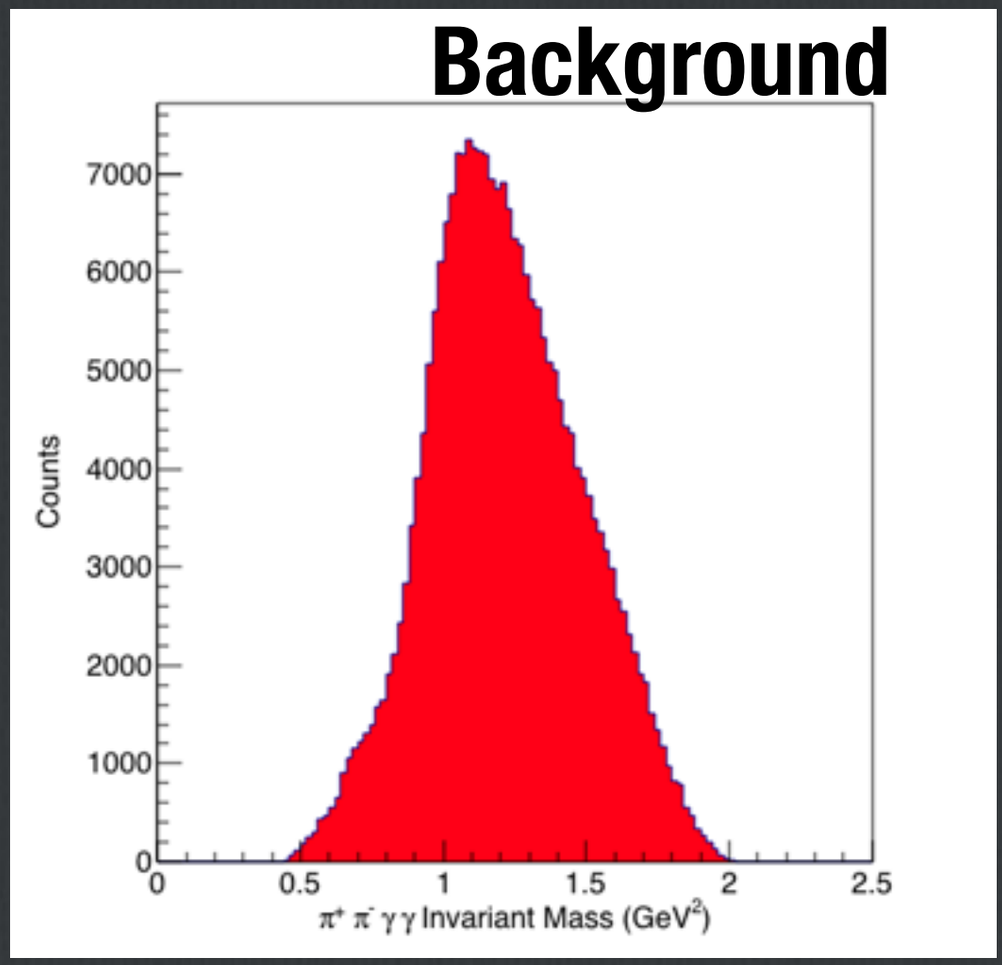




Simulated Background

Event generator: PYTHIA electroproduction off of the proton.





Summer 2017

Two projects

1. Background simulation (Trent Schrader)- put generated PYTHIA events through full CLAS6 simulation (GSIM, GPP, USER_ANA, etc.). Use PYTHIA cross sections to normalize to data luminosity. Extract yields by subtracting simulated background.
2. Detector acceptance (Giuseppe Campanella) - analyze the simulations by Ahmed El Alaoui (UTFSM). Uses the GENIE event generator. Determine detector acceptance for ω meson observables.

Double Target for CLAS12

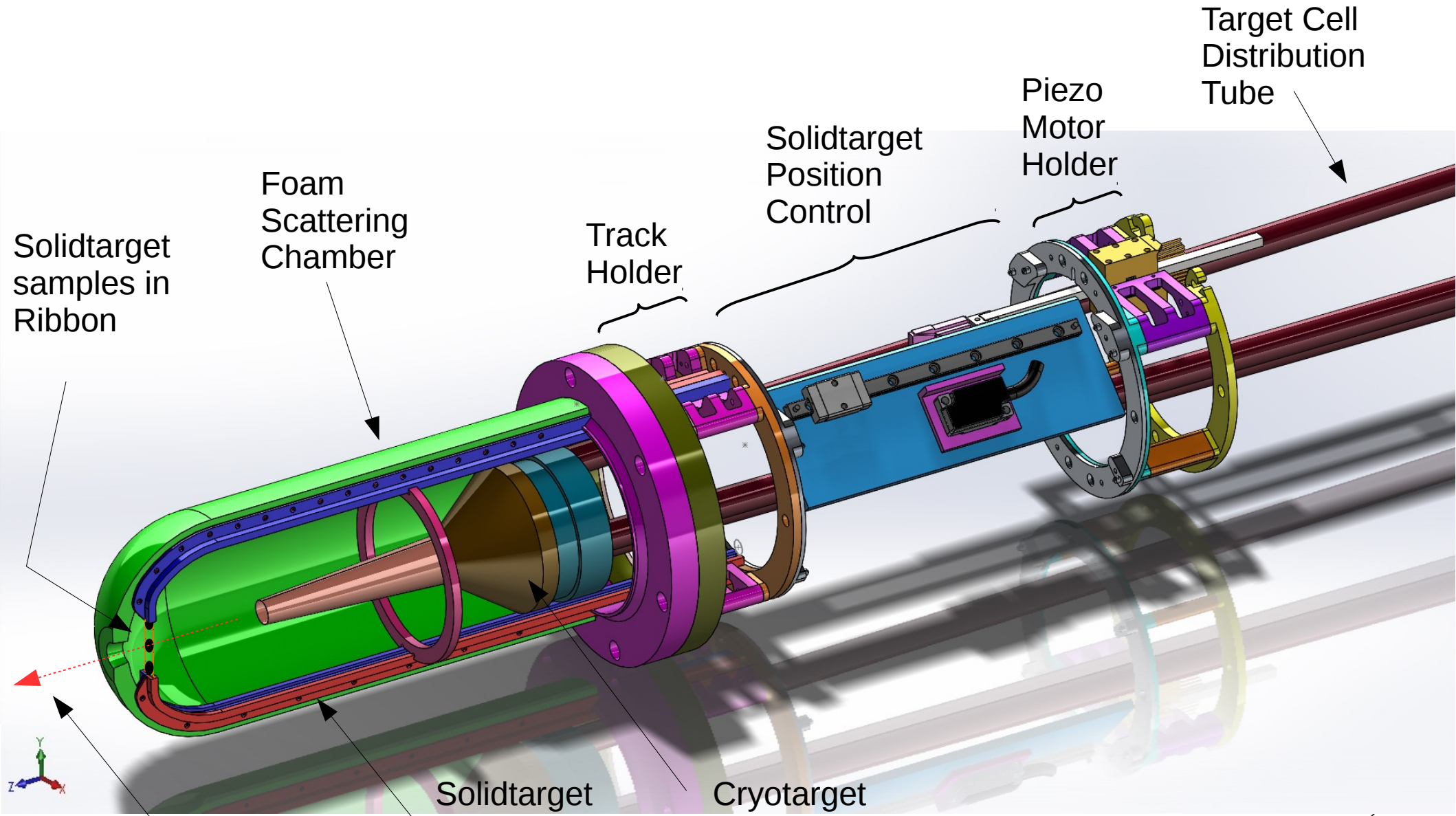
William Brooks, Hayk Hakobyan, Alejandro Peralta, Milan Ungerer, Juan (Iñaki) Vega

Universidad Técnica Federico Santa Maria (UTFSM)

CLAS collaboration meeting

June, 2017

Full Assembly



Solid Target
1:1 working model