MICE Collaboration

Energy loss in MICE absorbers

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Outline

- MC simulation details

- Energy loss in LH2 target using MC truth

- Energy loss with empty LH2 target and LiH using MC truth

- Outlook

MICE MC simulation

Simulation using datacard: datacard_200MeV_mu_plus.py
- reconstruction included

LH2 target MC sample produced :
- **96k** single muons
- keep_only_muon_tracks = True
- **geometry id 51**
- simulation_reference_particle = {
"position":{"x":0.0, "y":-0.0, "z":2770.0},
"momentum":{"x":0.0, "y":0.0, "z":1.0},
"particle_id":-13, "energy":226.2 }
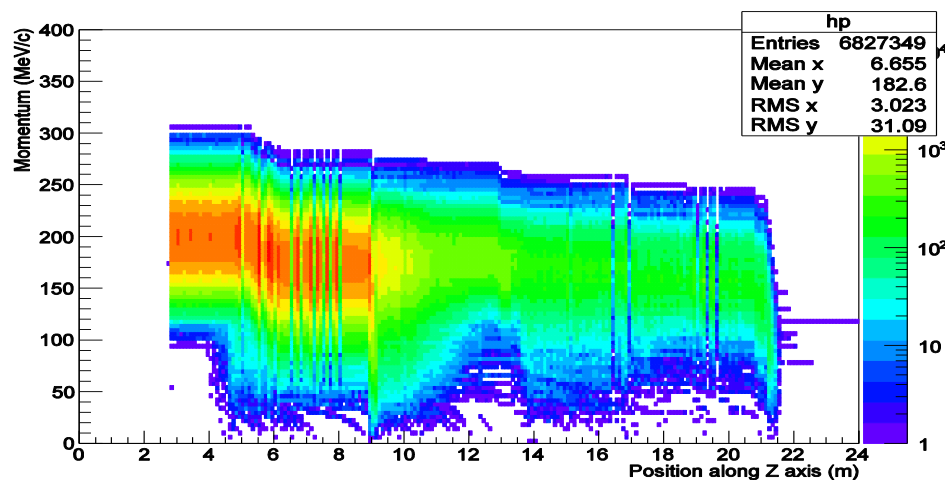
Empty LH2 target (LH2->Galactic) MC sample produced:
- **50k** single muon spill events
- modified **geometry id 51**
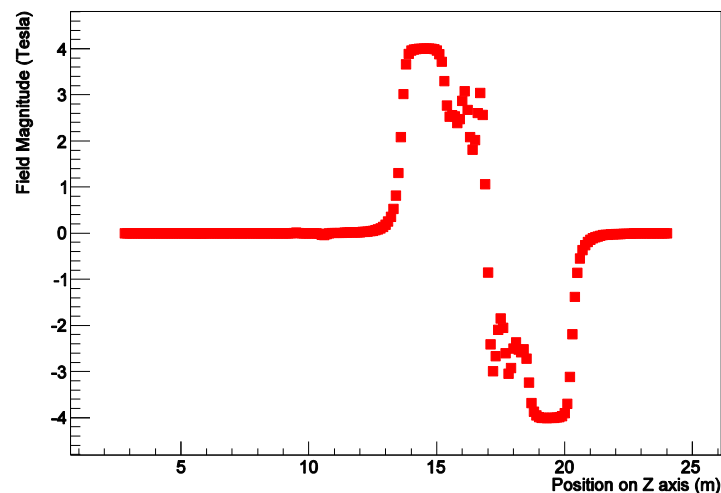
LiH target MC sample produced :
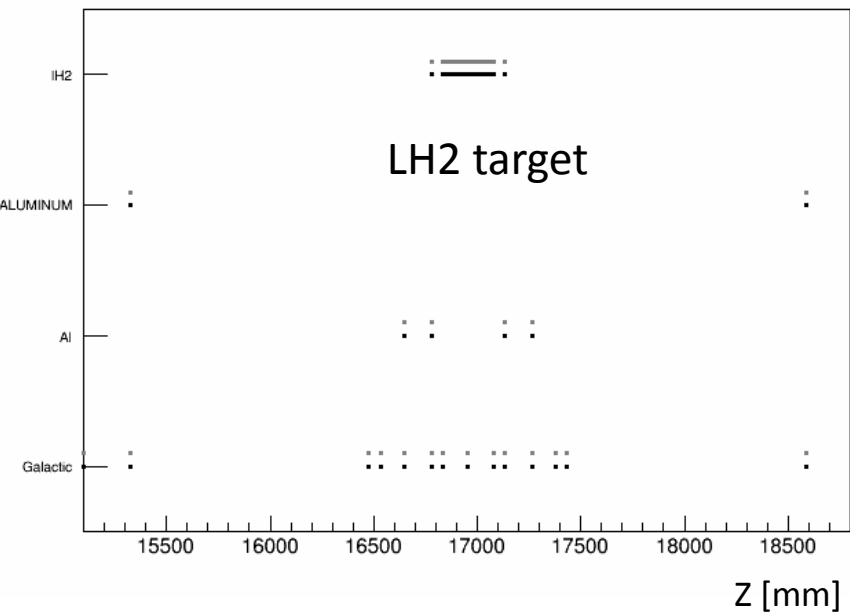- **30k** single muons
- **geometry id 52**

LH2 target MC simulation details
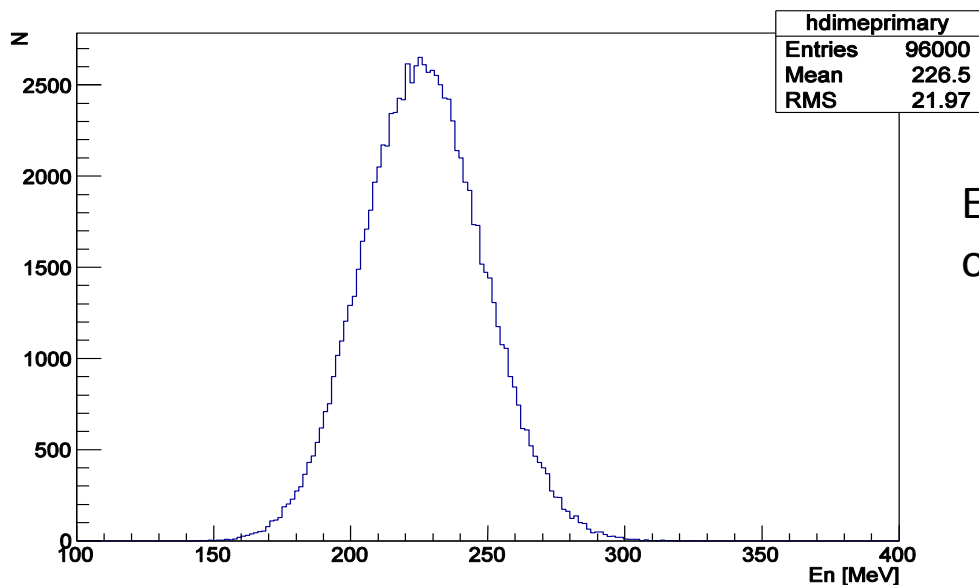
Energy distribution
of primaries.

Magnetic Field is on

Momentum vs z histogram

Materials on r=0 for different targets

LH2 target Energy loss
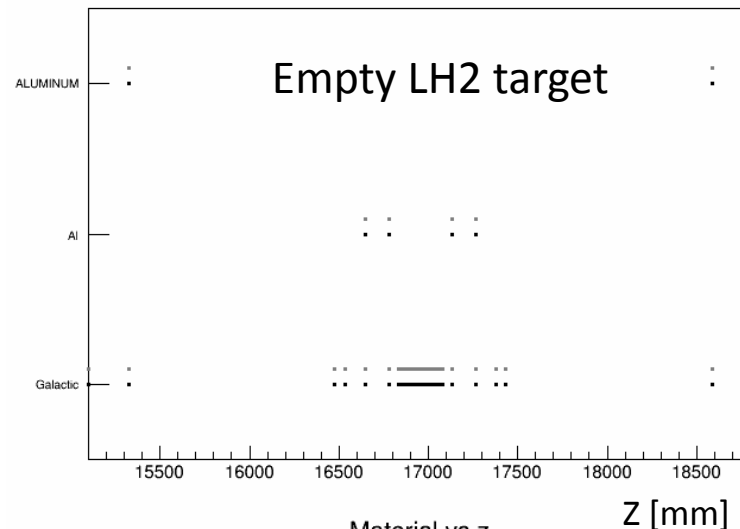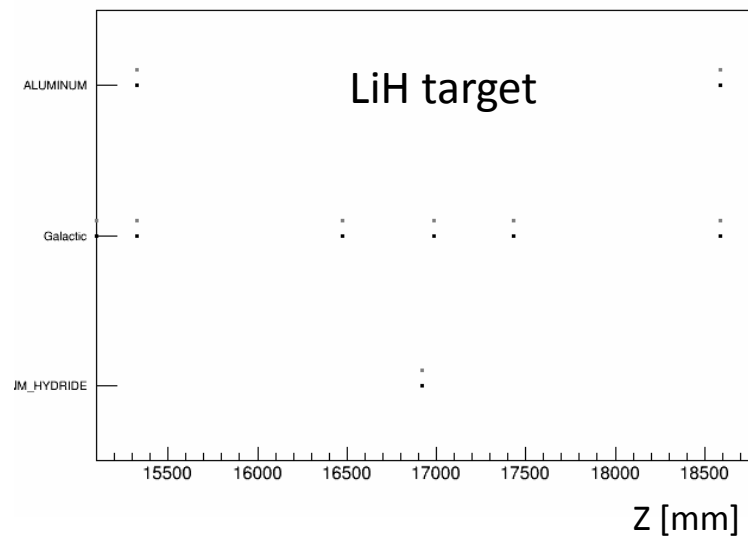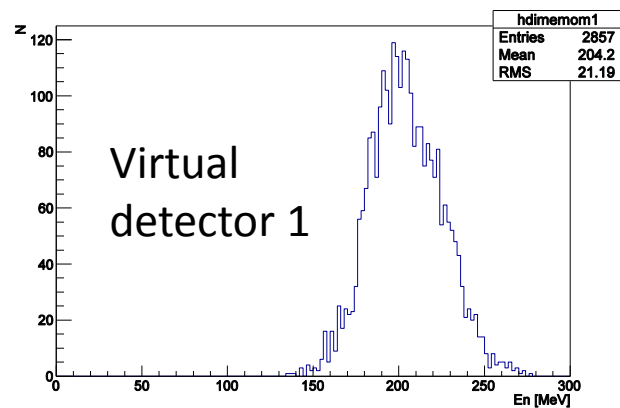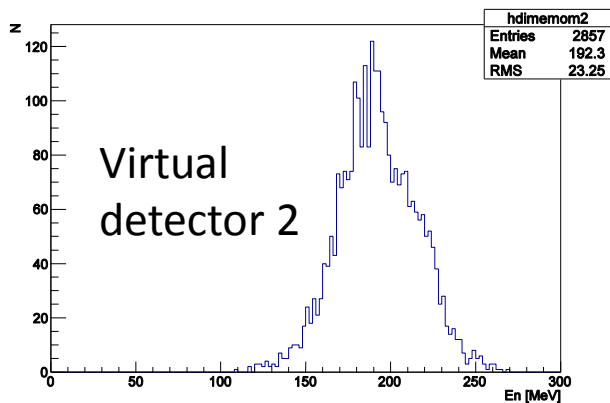
Measurements of energy loss between virtual detector stations 154 and 191, which are placed inside the Trackers' z positions.

Virtual detector 1

Energy of muons on windows

Virtual detector 2

Convoluted Landau and Gauss functions fit:

En_Loss_2_windows_c	
Entries	142
Mean	11.23
RMS	4.352
χ^2 / ndf	178.2 / 111
Width	0.5 ± 0.0
MP	9.29 ± 0.04
Area	456.3 ± 8.9
GSigma	0.9918 ± 0.0335
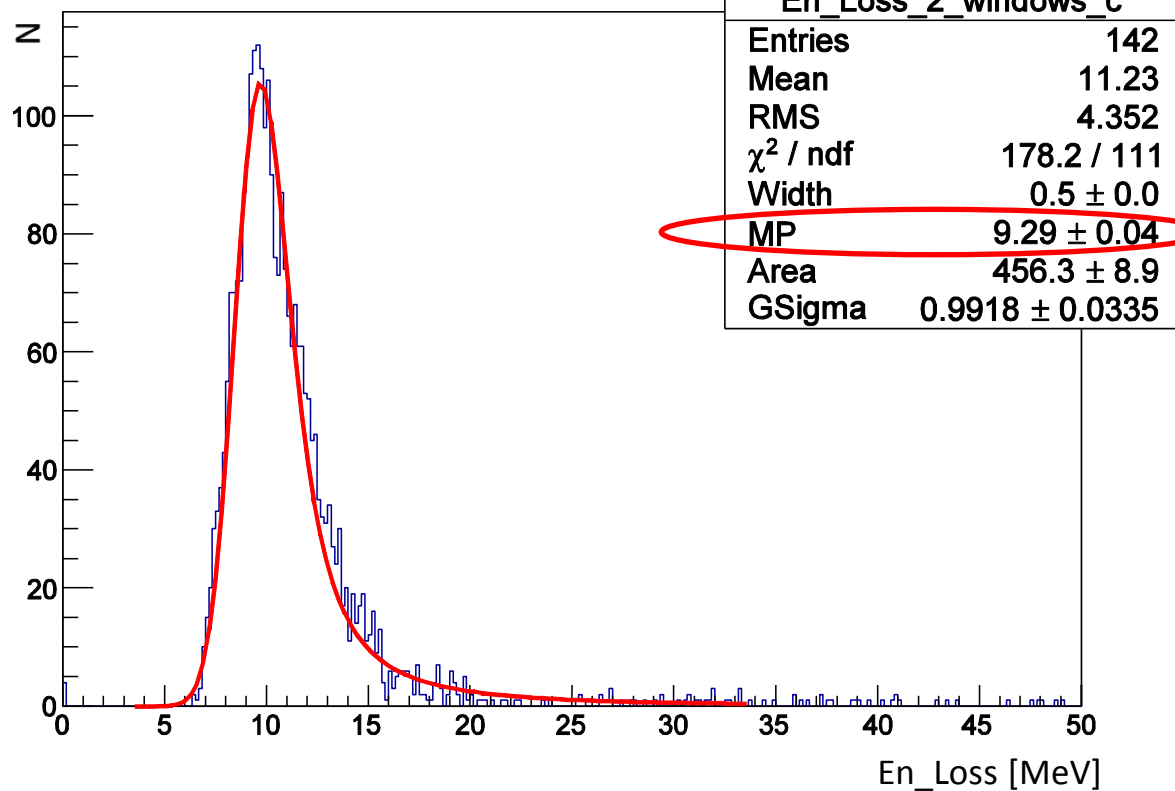
Bethe:

(LH2) 4.2 MeV cm^2/g * 25 cm * 0,07085 g/cm^3 = 7.44 MeV

(Al) 0.7 MeV cm^2/g * 0.4 cm * 2.7 g/cm^3 = 0.756 MeV

(Air) 1.7 MeV cm^2/g * 345 cm * 0.00129 g/cm^3 = 0.757 MeV

9.0 MeV

Empty LH2 and LiH targets

En_Loss_2_windows_b	
Entries	1473
Mean	2.434
RMS	2.753
χ^2 / ndf	117.9 / 93
Constant	417.1 ± 16.0
MPV	1.231 ± 0.027
Sigma	0.4209 ± 0.0122

Empty LH2 target Energy loss

LiH target energy loss

En_Loss_2_windows	
Entries	1489
Mean	13.62
RMS	3.457
χ^2 / ndf	59.57 / 34
Width	0.5 ± 0.0
MP	12.01 ± 0.06
Area	742 ± 19.7
GSigma	1.145 ± 0.055
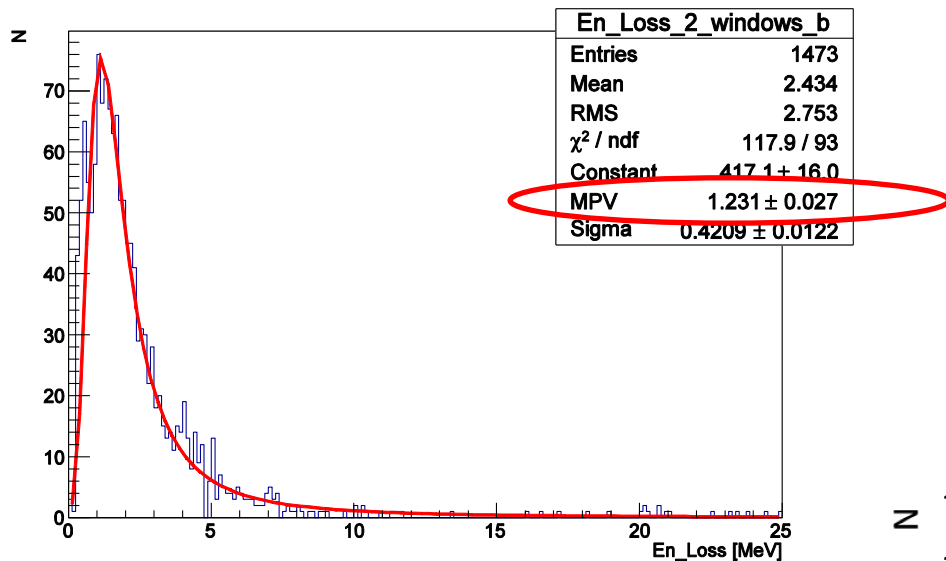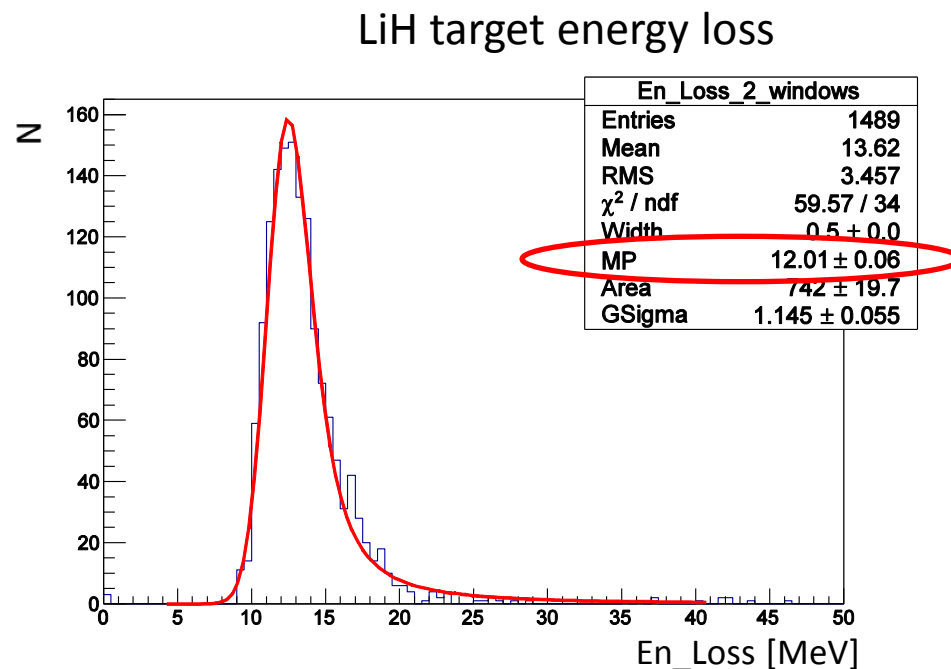
Outlook

- We've just started with the analysis of Energy loss

- Lots of things to check and understand

- Need to look into reconstructed MC Tracker data

- To look into real data