Study of Tracks originated in the LAr volume of GRAIN

17/6/22

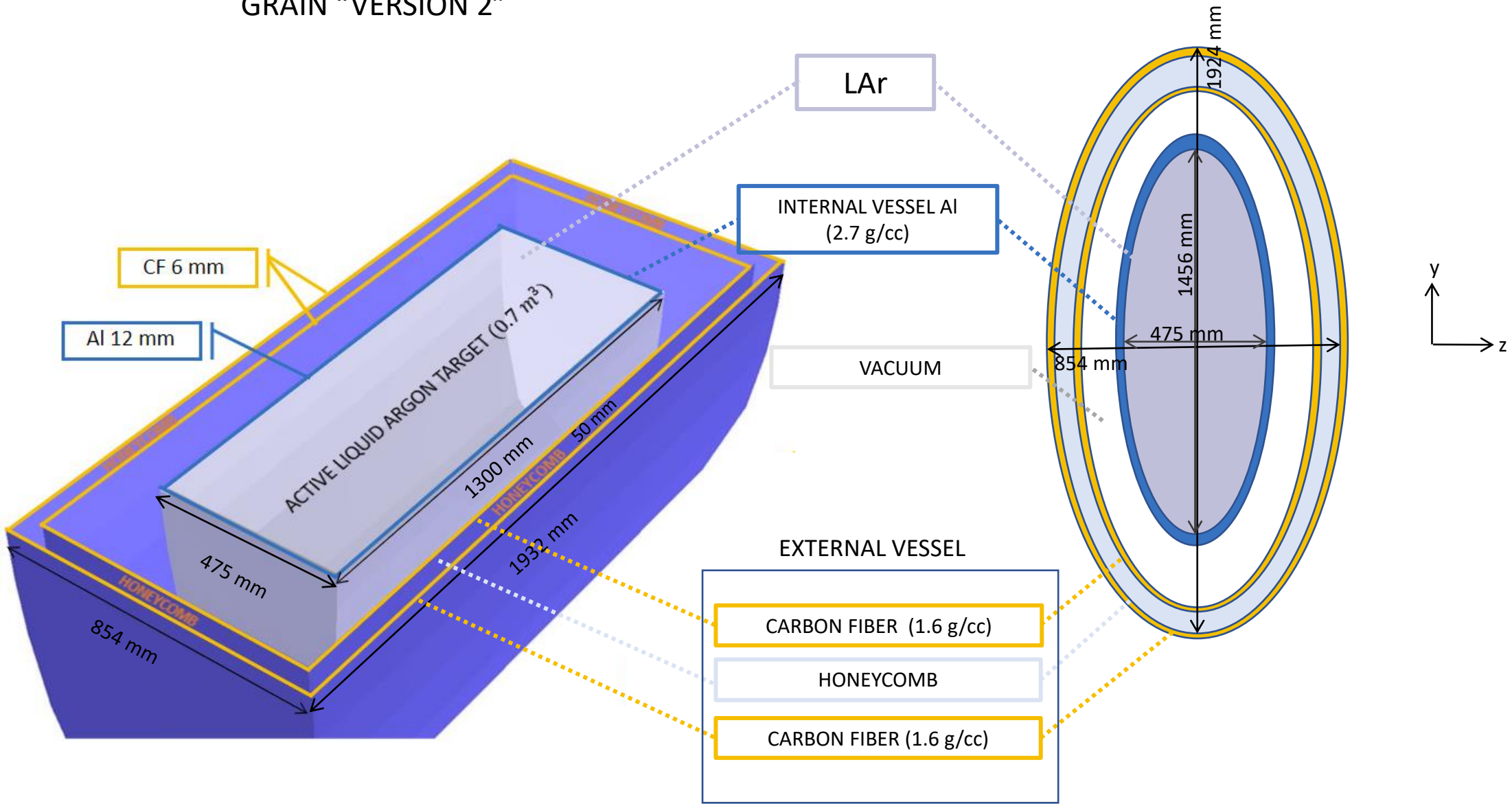
AIM OF THE ANALYSIS

- Composition and materials of GRAIN are still under discussion.
- The purpose of this analysis is the study of the stopping power for the GRAIN cryostat vessels

SIMULATIONS

- Neutrinos energy spectrum from FHC LBNF beam
- 90k $\nu_\mu(\nu_e) - Ar$ interactions generated with GENIE (v.2) in the LAr volume of GRAIN
- Final state particles propagated through SAND with EDepSim

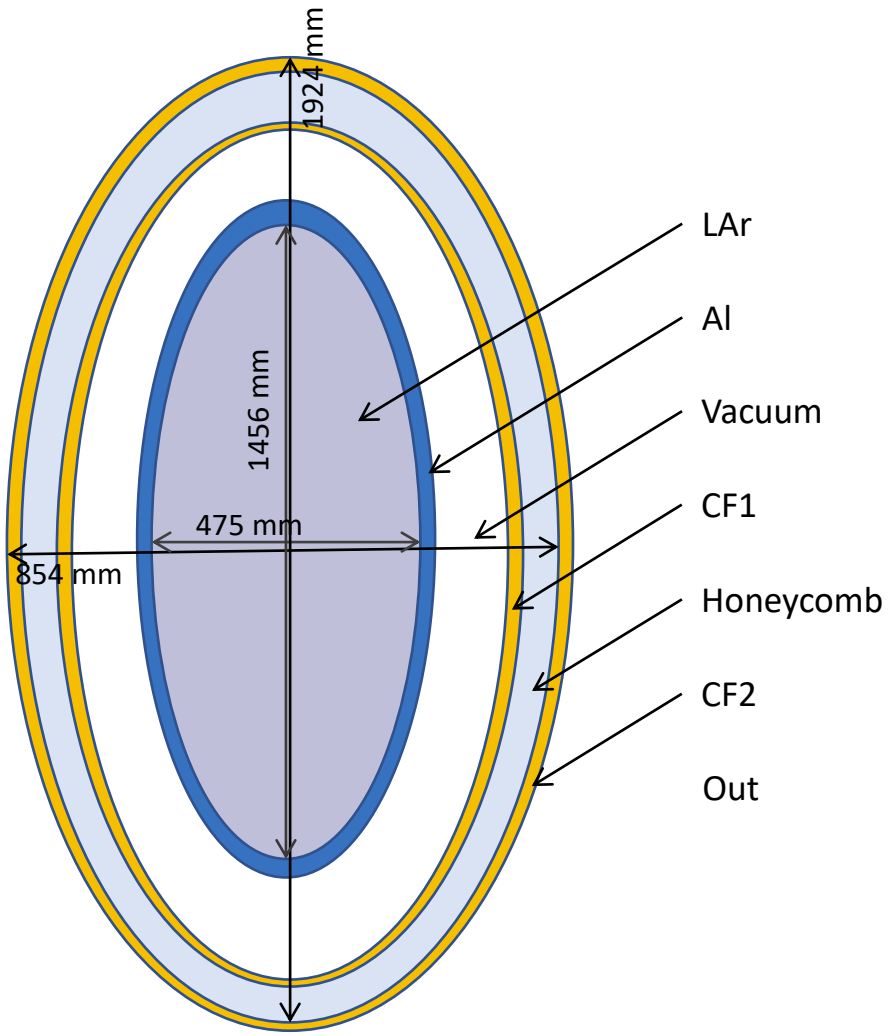
GRAIN “VERSION 2”



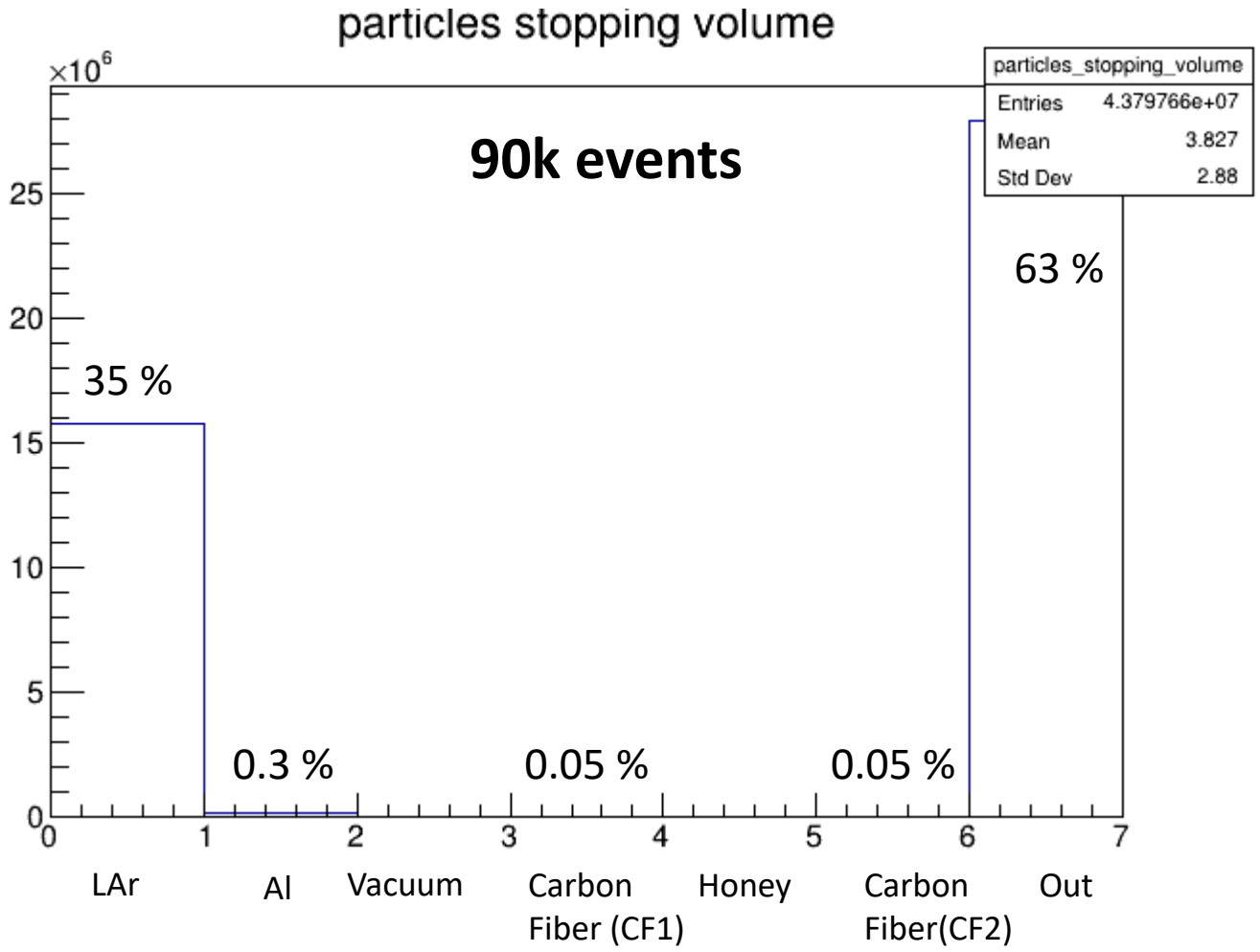
* INTERNAL VESSEL ENDCAPS 16 mm

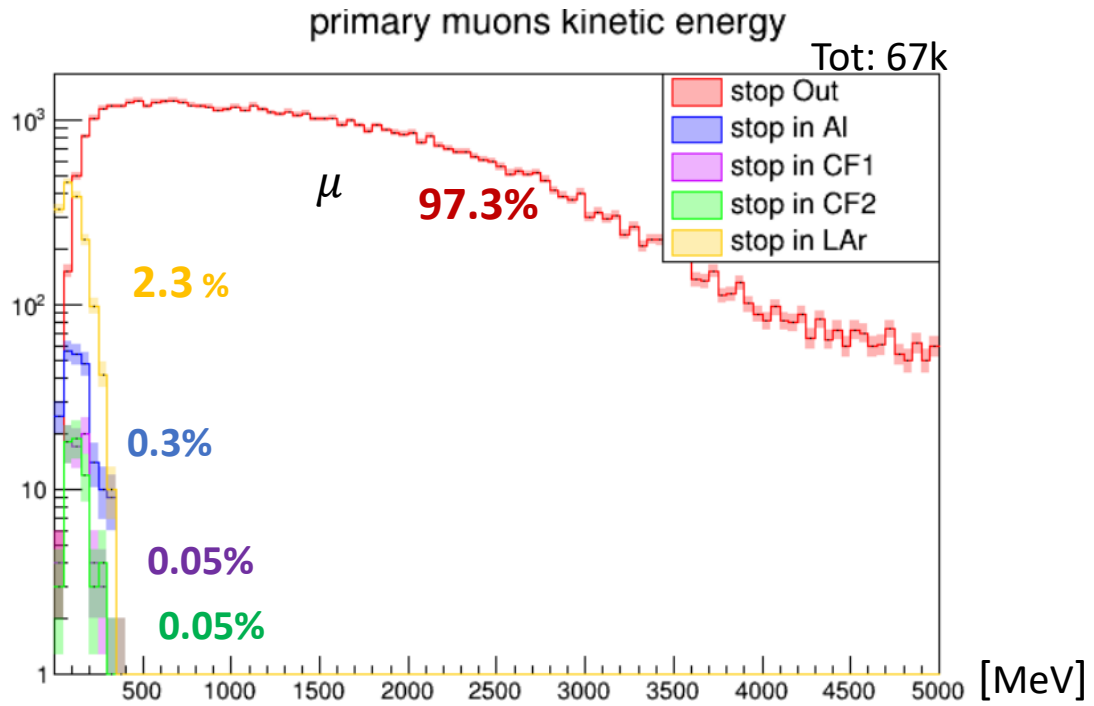
* 90k interactions generated in the LAr volume

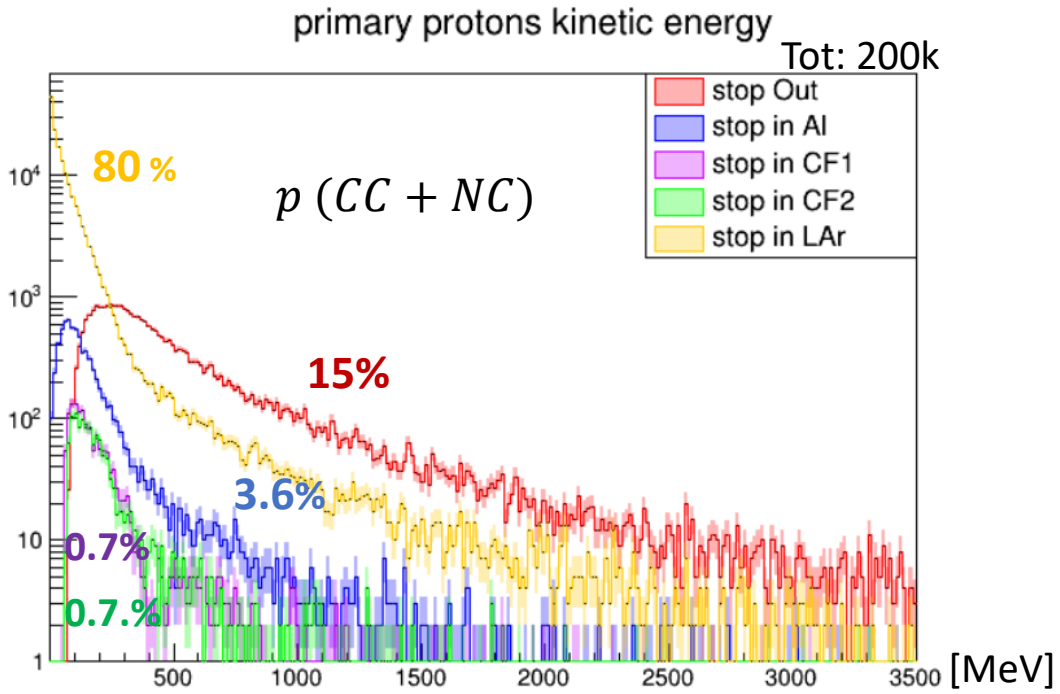
ALL TRACKS (primary, secondary, charged and neutral)

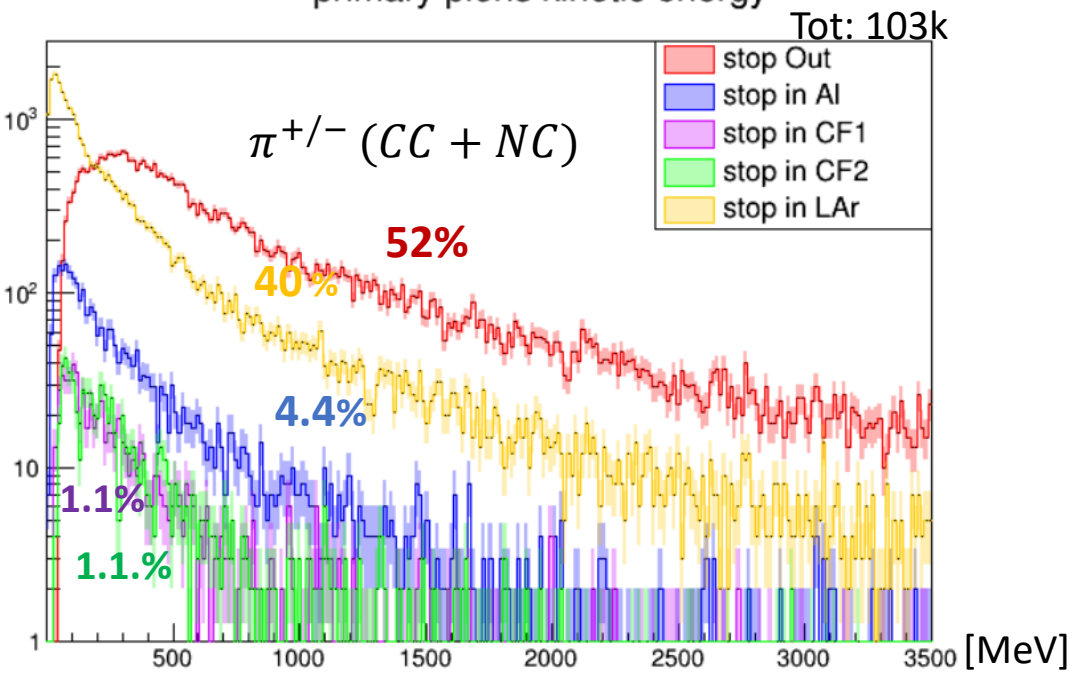


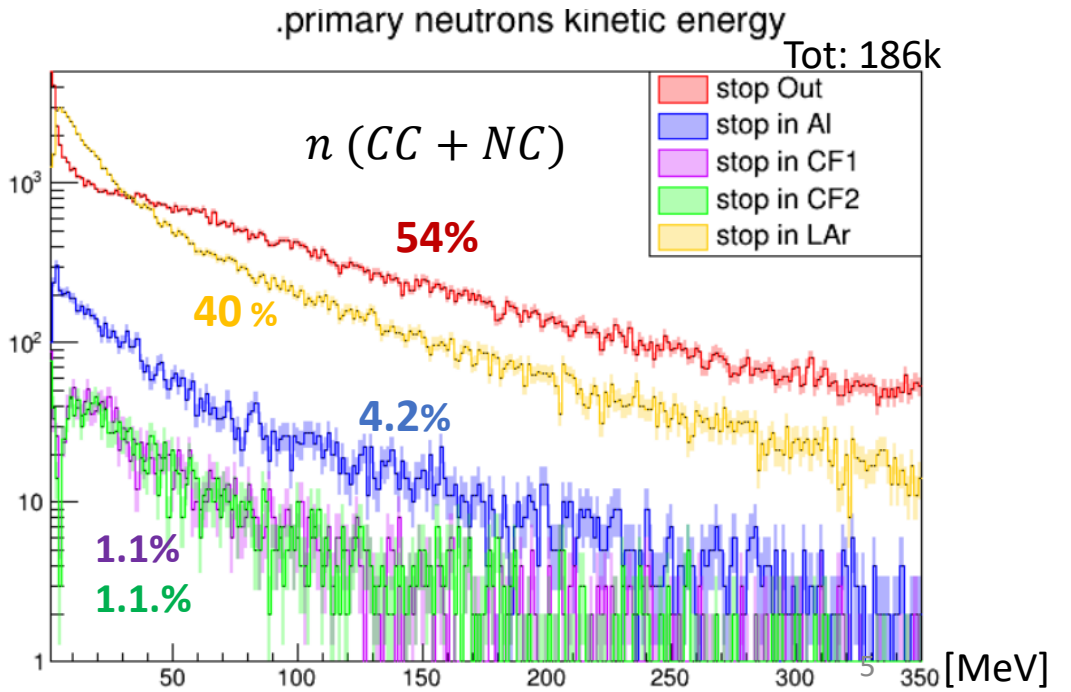
$\nu_\mu - Ar$ interactions




primary muons kinetic energy
Tot: 67k
stop Out
stop in Al
stop in CF1
stop in CF2
stop in LAr
μ
97.3%
2.3 %
0.3%
0.05%
0.05%
[MeV]

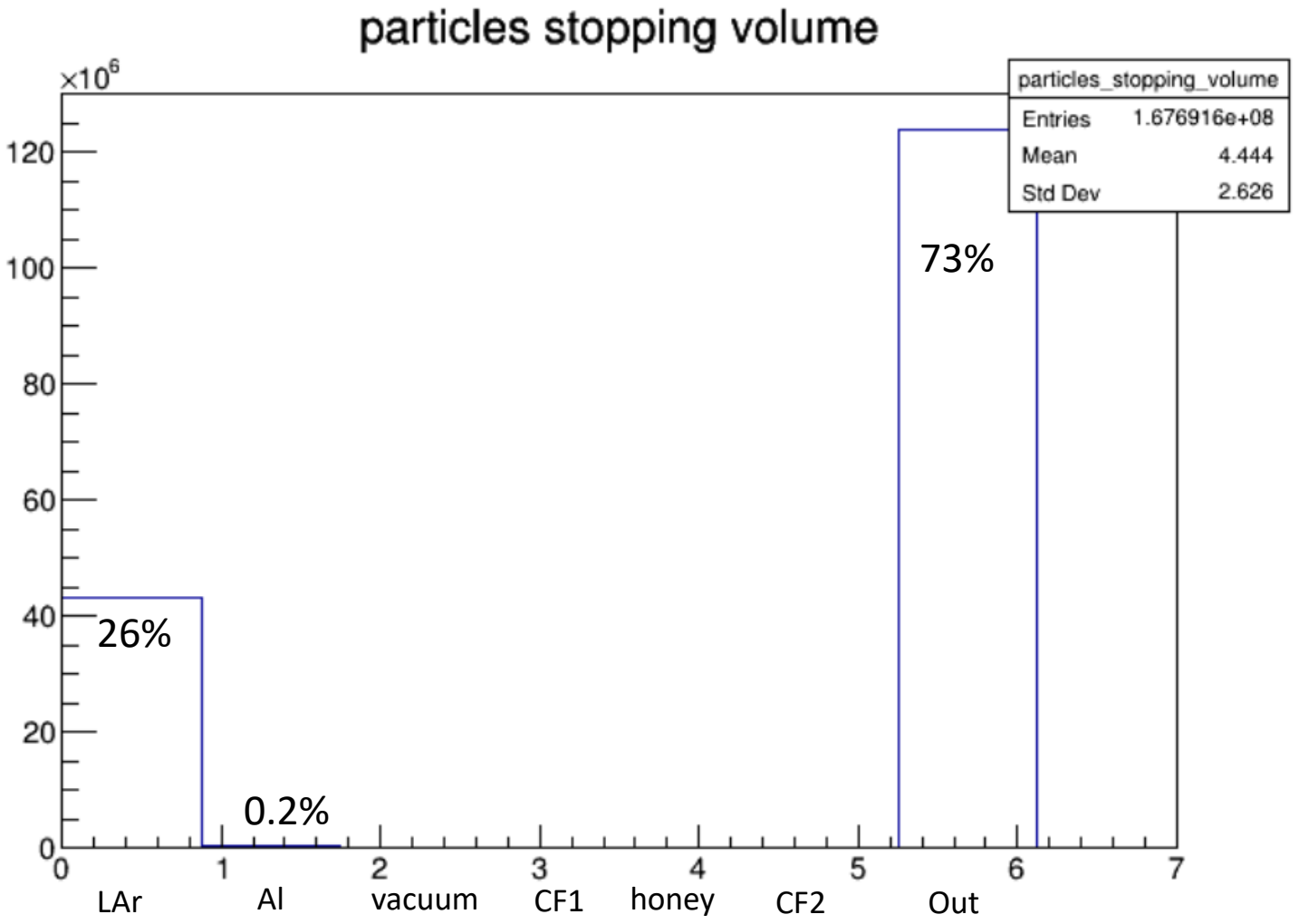

primary protons kinetic energy
Tot: 200k
stop Out
stop in Al
stop in CF1
stop in CF2
stop in LAr
80 %
$p\ (CC + NC)$
15%
3.6%
0.7%
0.7%
[MeV]

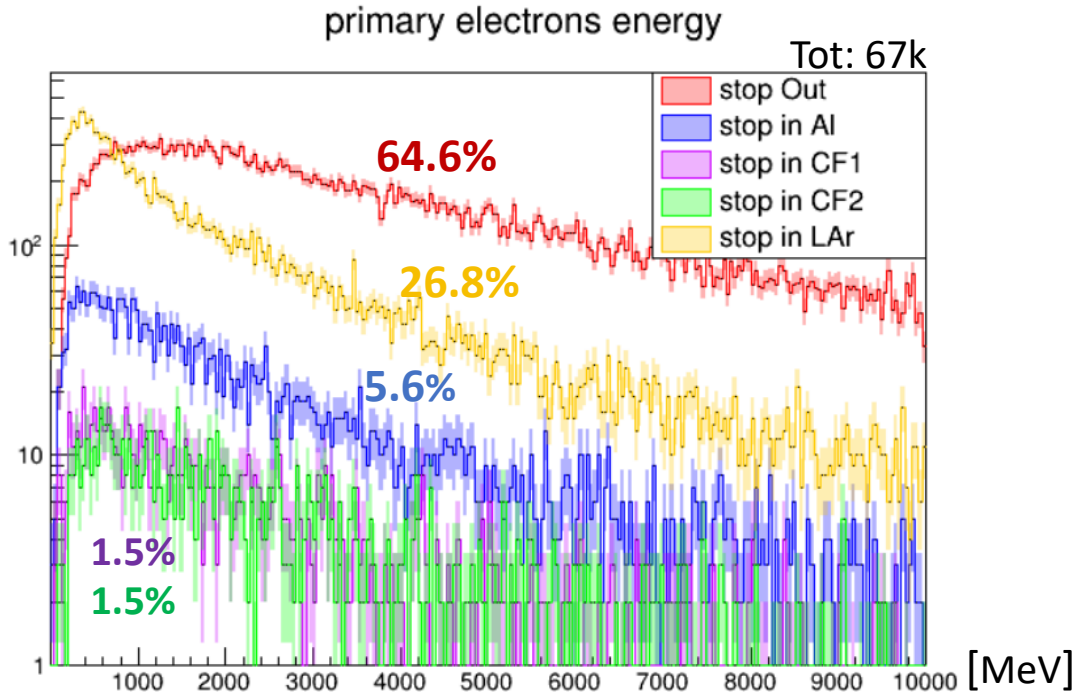

primary pions kinetic energy
Tot: 103k
stop Out
stop in Al
stop in CF1
stop in CF2
stop in LAr
$\pi^{+/-}\ (CC + NC)$
52%
40 %
4.4%
1.1%
1.1%
[MeV]

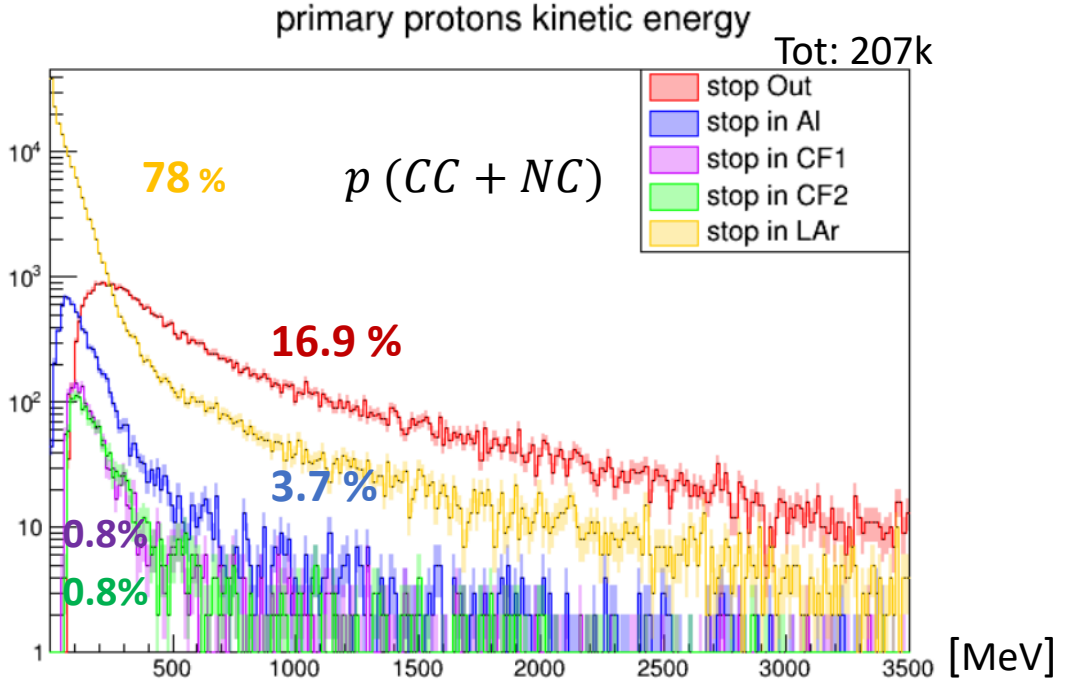

.primary neutrons kinetic energy
Tot: 186k
stop Out
stop in Al
stop in CF1
stop in CF2
stop in LAr
$n\ (CC + NC)$
54%
40 %
4.2%
1.1%
1.1%
[MeV]

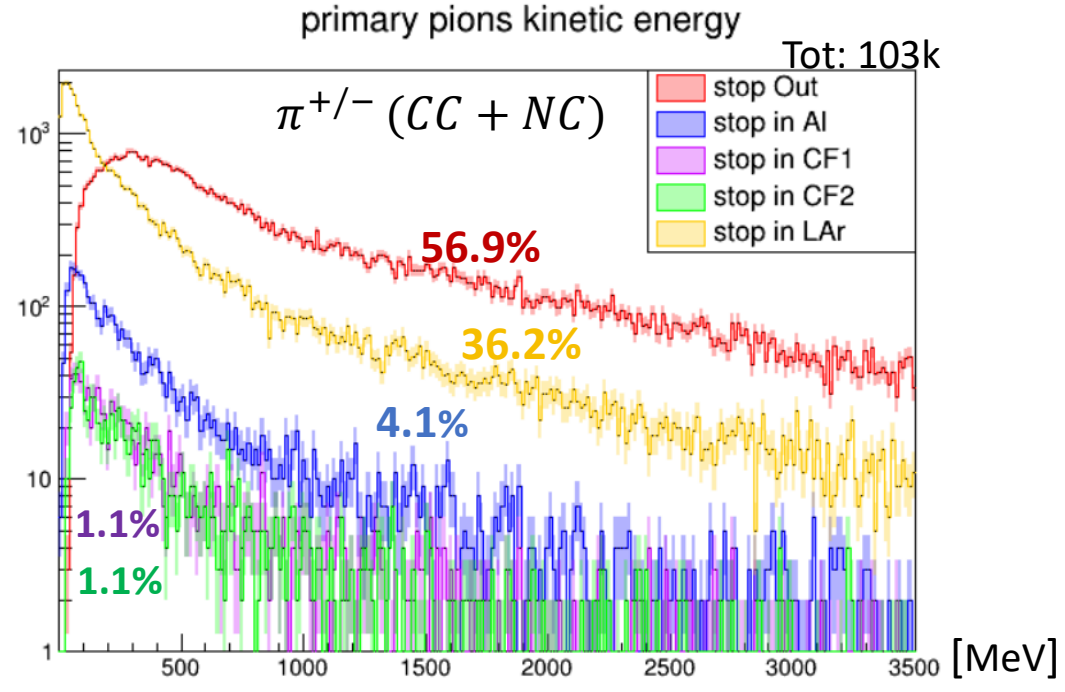
ALL TRACKS (primary, secondary, charged and neutral)

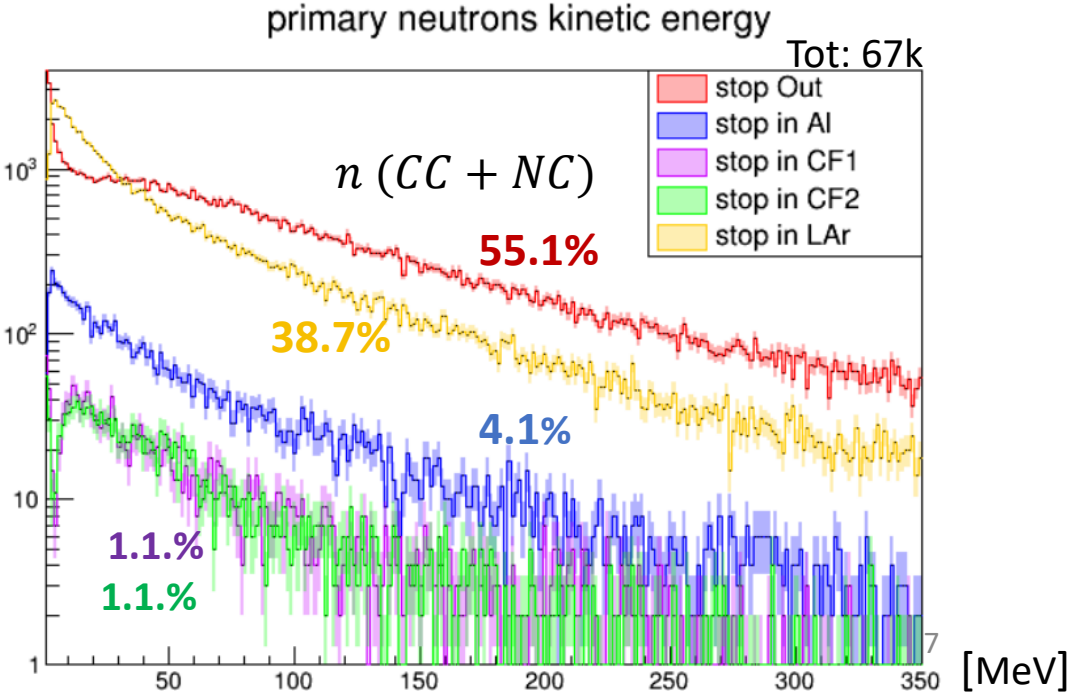
$\nu_e - Ar$ interactions




primary electrons energy
Tot: 67k
stop Out
stop in Al
stop in CF1
stop in CF2
stop in LAr
64.6%
26.8%
5.6%
1.5%
1.5%
[MeV]


primary protons kinetic energy
Tot: 207k
stop Out
stop in Al
stop in CF1
stop in CF2
stop in LAr
78 %
$p\ (CC + NC)$
16.9 %
3.7 %
0.8%
0.8%
[MeV]


primary pions kinetic energy
Tot: 103k
$\pi^{+/-}\ (CC + NC)$
stop Out
stop in Al
stop in CF1
stop in CF2
stop in LAr
56.9%
36.2%
4.1%
1.1%
1.1%
[MeV]


primary neutrons kinetic energy
Tot: 67k
$n\ (CC + NC)$
stop Out
stop in Al
stop in CF1
stop in CF2
stop in LAr
55.1%
38.7%
4.1%
1.1%
1.1%
[MeV]

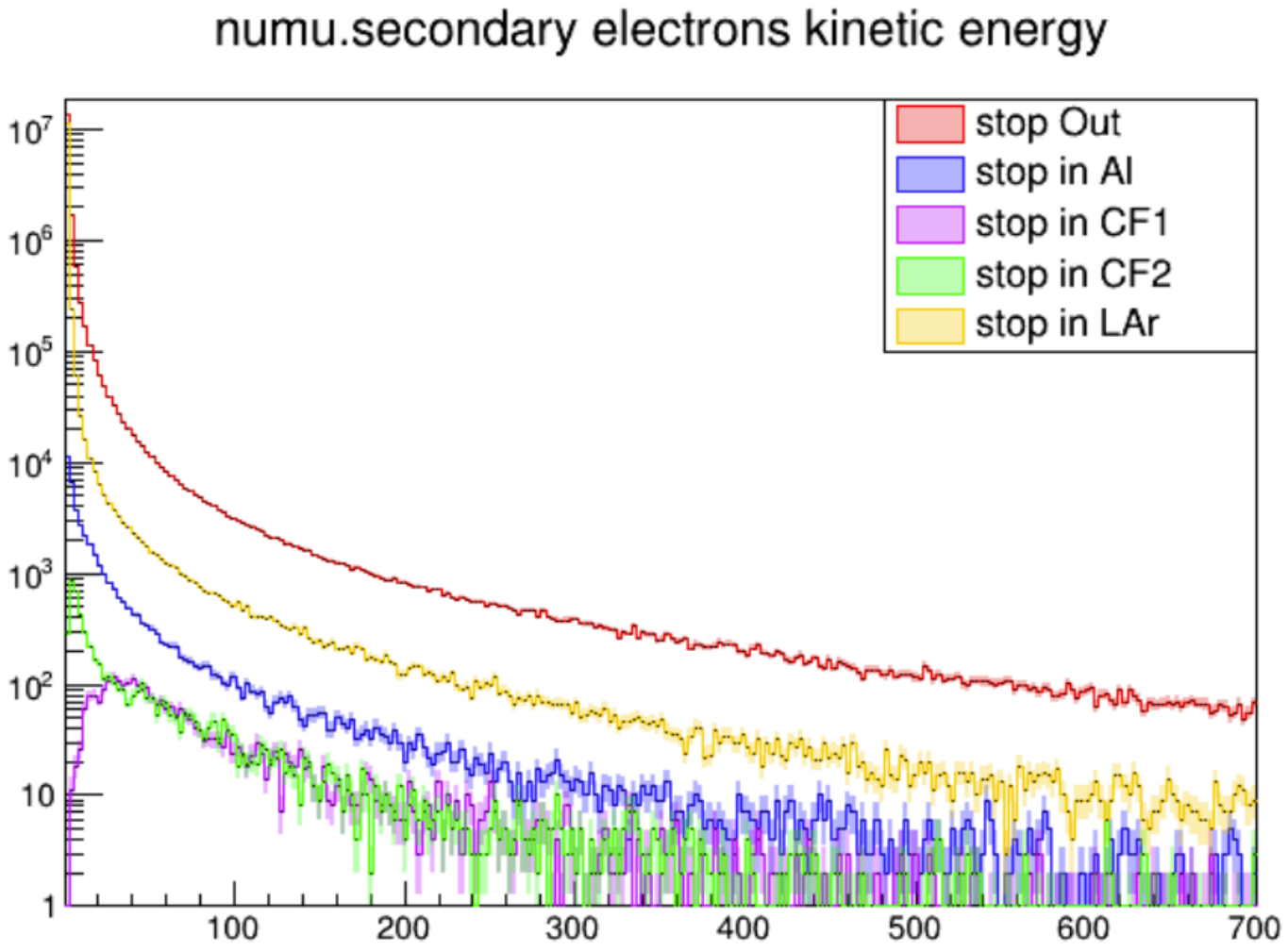
Outlook

$\nu_\mu - Ar$ int.	LAr	Al vessel	CF vessels	Out of GRAIN
μ	2.3 %	0.3 %	0.1 %	97.3%
Primary p	80 %	3.6 %	1.4 %	15 %
Primary n	40 %	4.4 %	2.2 %	52 %
Primary $\pi^{+/-}$	40 %	4.2 %	2.2 %	54 %

$\nu_e - Ar$ int	LAr	Al vessel	CF vessels	Out of GRAIN
e	26.8 %	5.6 %	3 %	64.6 %
Primary p	78 %	3.7 %	1.6 %	16.9 %
Primary n	38.7 %	4.1 %	2.2 %	56.9 %
Primary $\pi^{+/-}$	36.2 %	4.1 %	2.2 %	55.1 %

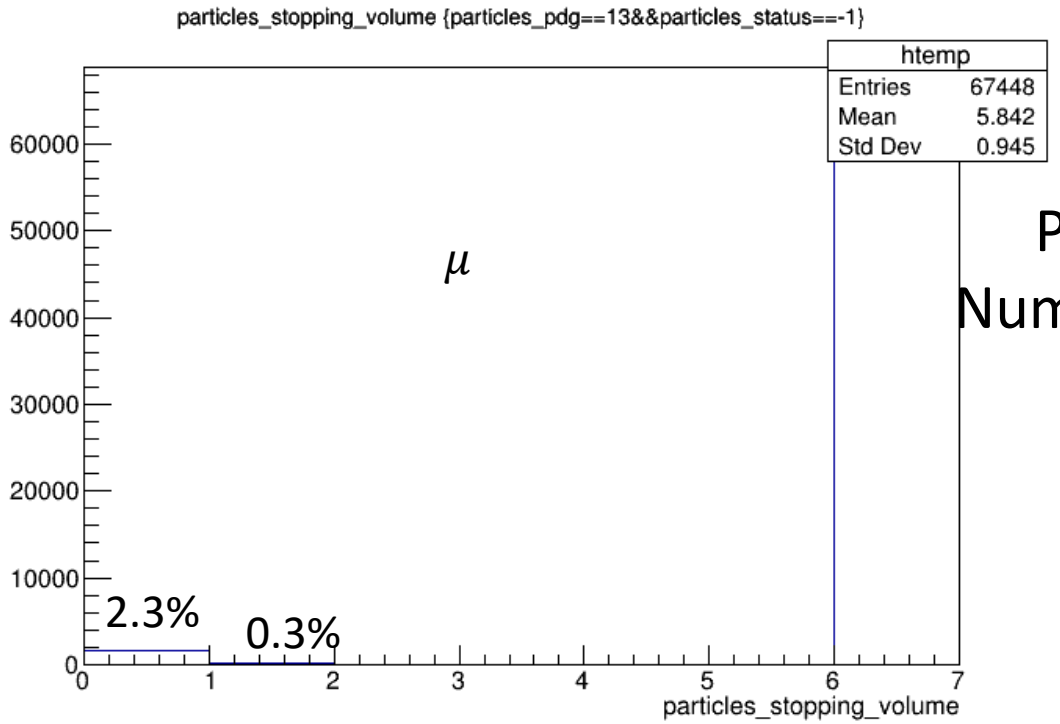
BACKUP SLIDES

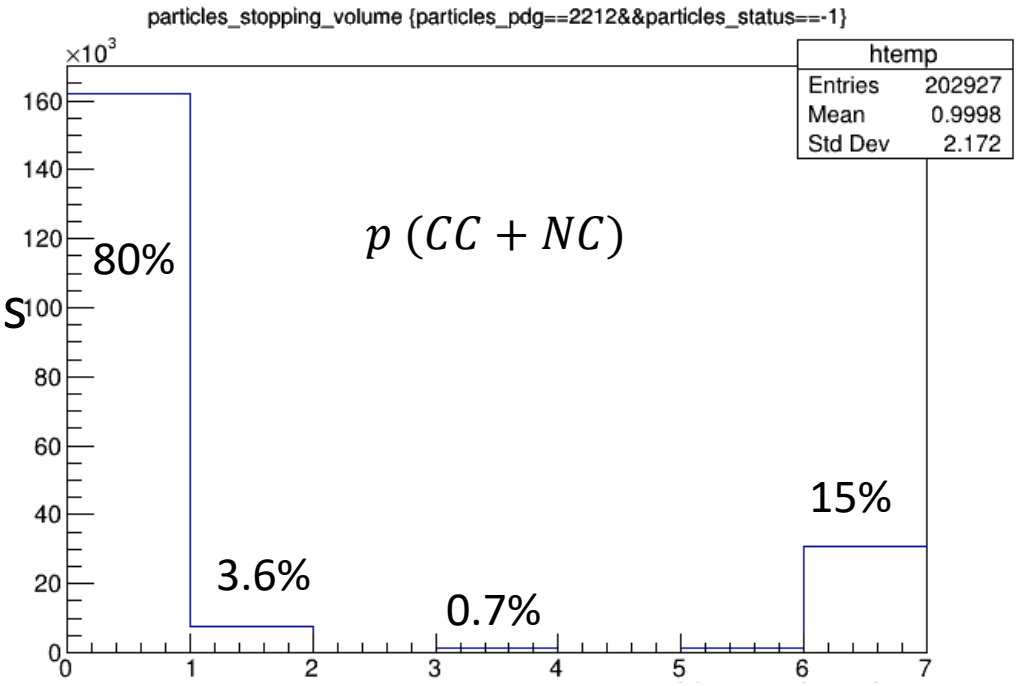
Secondary electrons (ν_μ BEAM)

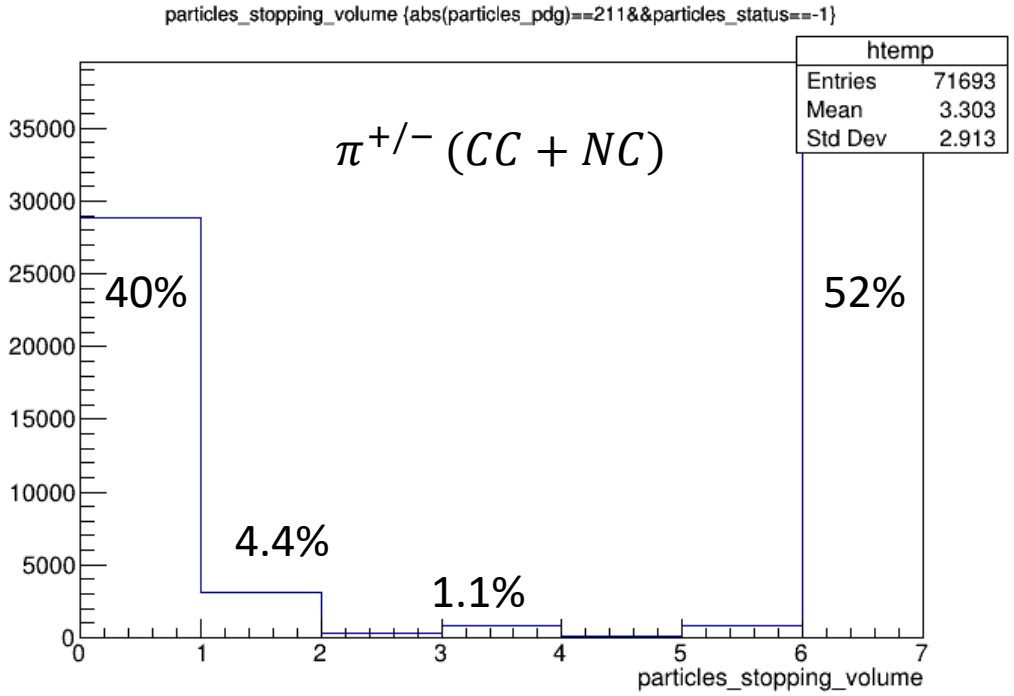


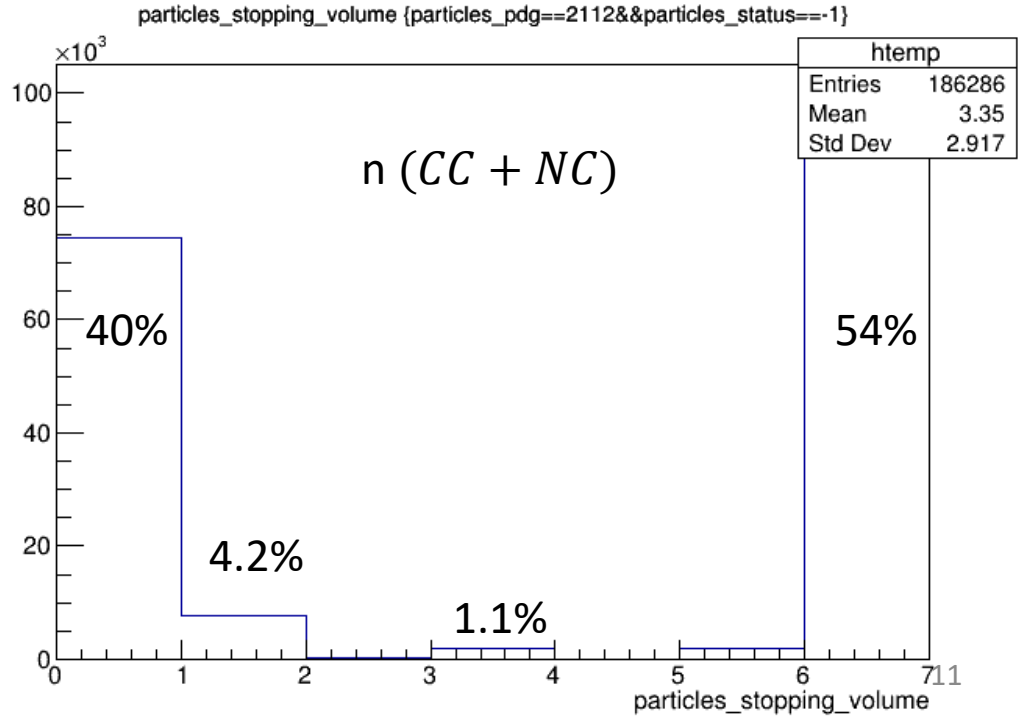
PRIMARIES

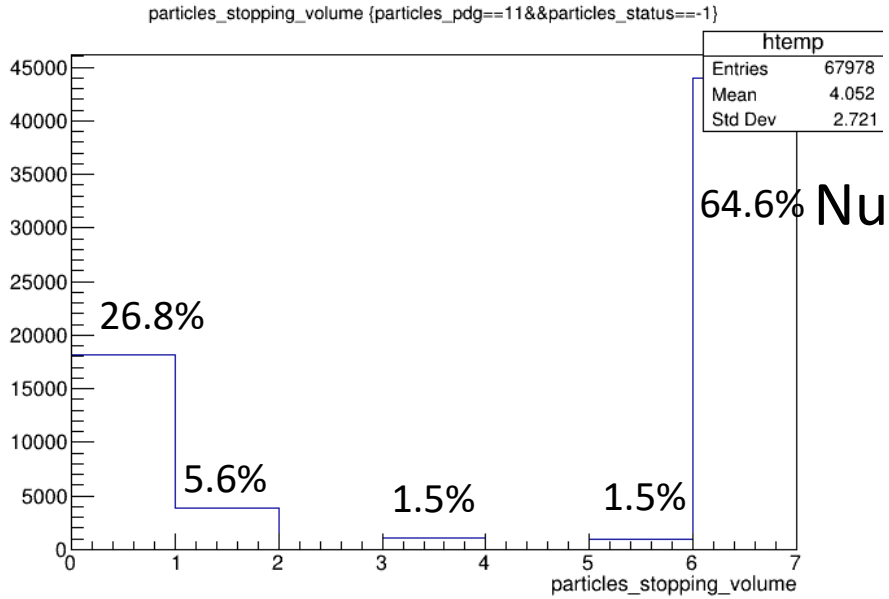
Numu interactins

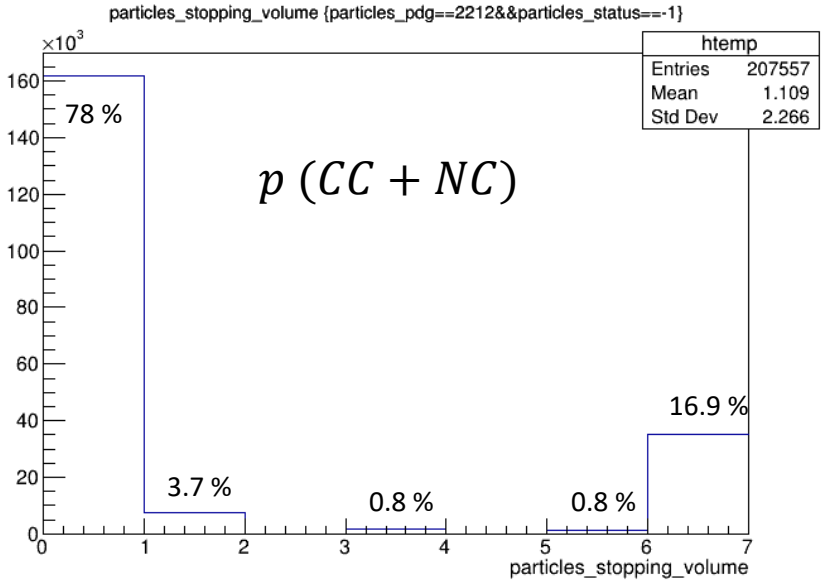
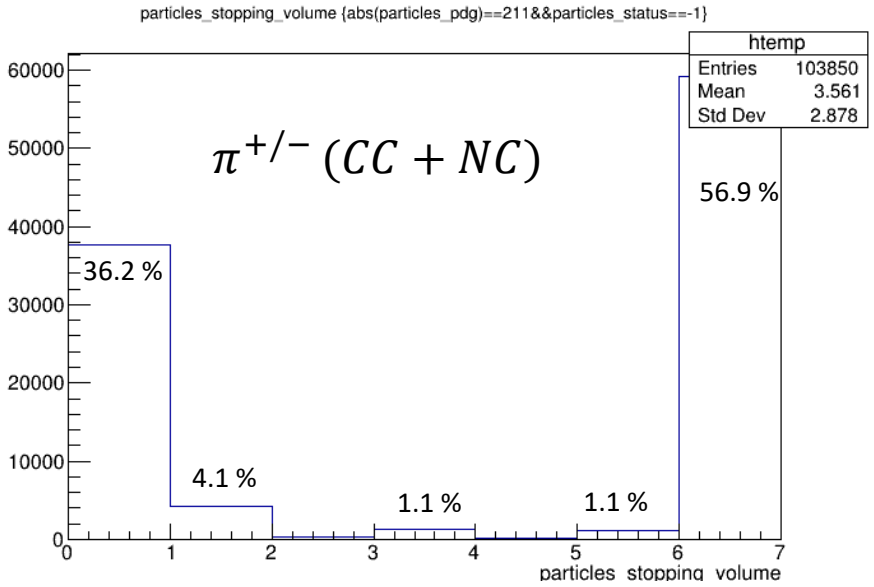
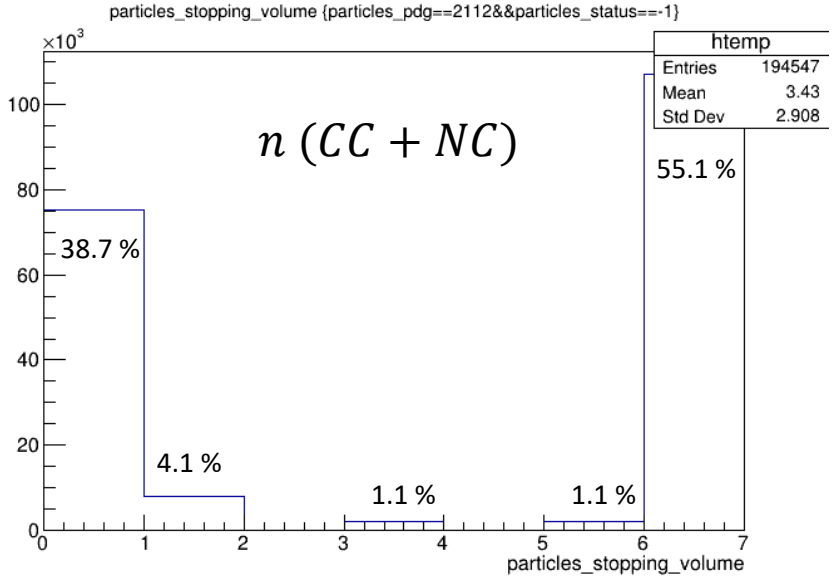










PRIMARIES

Nue interactions