

FOOT CDR

Present status (Aug. 29)

Version 3

- 94 pages, 90 Figures, 19 Tables
- It contains the result of work of many people in many months
- Recheck of physics. Improvements in many parts and in Performances Evaluation in particular (
 next presentation by R. Spighi).
- A lot relies upon simulation studies and past experience. Further substantial improvement will be possible only after the integration of all laboratory/beam tests.
- Some typos corrected. Some improvements of language
- Available from FOOT web site: <u>https://web.infn.it/f00t/index.php/it/public-links</u>

Behind the CDR: FOOT simulation

For electronic apparatus: Version: 12.4



U:V

For Emulsion Set-up parallel version exists

40

30

20

10

0

-10

-20

-30

FOOT simulation: available data

¹⁶O and ¹²C projectiles

Targets: C and C₂H₄

🛹 1.2e-2 – 2.0e-2 s/event

Energy: 200 MeV/u: 2.0e+7 primaries for each comb. of proj.+target 350 MeV/u: 2.0e+7 " 700 MeV/u: 4.0e+6 " -----> 3.8e-2 - 7.2e-2 s/event

> Typical CPU consumption on Intel(R) Xeon(R) CPU E5-2640 v4 @ 2.40GHz

Compare with amount of exp. data needed (Tab. 19 in CDR):

Measurement	beam	target	E_{kin} MeV/u	N _{prim}	N ^{tot} prim	T(s)
Target Frag.	C, O, He	$C, C_2H_4, PMMA$	200, 150	8×10 ⁷	9.6×10^{8}	4.8×10^{5}
Project. Frag.	C, O, He	C, C_2H_4 , PMMA	350, 400	3.2×10^{7}	3.8×10^{8}	2.0×10^{5}
Space	C, O, He	C_2H_4	600, 800	1.0×10^{7}	4×10^{7}	2.0×10^{4}

FOOT simulation: data storage

Energy: 200 MeV/u: 10 – 20 Gbytes/10⁷ prim (including intermediate files)

700 MeV/u: 50 – 160 Gbytes/10⁷ prim "

Notice:

- simulation has to be repeated many times differentiating various parameters
- a next sub-version (V12.5) is already in preparation

Reconstruction Software

Documentation update

http://arpg-serv.ing2.uniroma1.it/twiki/bin/view/Main/FOOTReconstruction

Currently 3 branch projects:

Shoe_geoDeveloping_v12.4 5 -> 14db04c6 · add genfit · 6 days ago 5 digitizer_v1.0 -> 92da890b · Change method name accordingly to TAVTparGeo class (not used for the moment) · 5 days ago 6 master default protected -> 92da890b · Change method name accordingly to TAVTparGeo class (not used for the moment) · 5 days ago -> 92da890b · Change method name accordingly to TAVTparGeo class (not used for the moment) · 5 days ago

proposal

oftware for

adrontherapy

Optimisation

-of a6eb9396 · add magnetic field testing function · 6 days ago

Main and official version with the most stable and tested code.

Why we arrived to the choice of MSD instead of Drift Chamber

10 tracks of protons superimposed



δ-rays

10 tracks of ⁴He superimposed



10 tracks of ⁶Li superimposed



10 tracks of ¹²C superimposed



10 tracks of ¹⁶O superimposed



Of course one should weight by energy loss in the cells...

Gas: Ar-CO2 80/20; E = 200 MeV/u

e⁻ 60 keV →~ 0.5 cm in gas

after analytical integration:

Z	Wmax	N _δ (E _δ >5 keV)/cm	< E _δ >	N _δ (E _δ >60 keV)/cm	<e<sub>δ></e<sub>
1	486 keV	~0.1	21.8 keV	0.005	137 keV
2	u	0.3	u	0.019	и
3	u	0.6	u	0.045	и
4	u	1.1	u	0.078	и
5	u	1.8	u	0.121	и
6	u	2.6	u	0.175	и
7	u	3.5	u	0.238	и
8	и	4.6	u	0.310	и

Understanding better the exercise on Inverse Kinematics Difference between MC and GANIL data



Fluka simulation in the FOOT experimen



FOOT simulation/reconstruction: a partial to do list

- More and more realistic geometry
- Optimization of some parameters: distances, thicknessess, magnetic field, etc.
- Specific Detector Response (laboratory, test beams, past experience)

- example: Light collection in scintillators, clustering in pixel det.,

etc.

- Reconstruction Software is in continuous improvement
 - next: matching of geometry in simulation and tracking (GENFIT)
 - exploiting the dE/dx meas. on different detectors
- Development of analysis strategies/tools
- •

Spares

V12.5: More realistic Magnet size

Uť



-30

-40

Energy loss in 3 mm scint. ¹²C @200 MeV/u



Energy Loss in MSD for 12C @200 MeV/u

