Global Tracking Status



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FOOT coll meeting

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Outline

• Stability of global reco VS magnetic field knowledge.

• Momentum resolution and geometry (V14, V15).

• Summary Table of momentum resolution performance.



Global Reconstruction parameters:

- VT xy Reso: 0.0006cm z Reso: 0.005cm
- IT xy Reso: 0.0006cm z Reso : 0.02cm
- MSD xy Reso: 0.003cm z Reso : 0.01cm



- General running condition:
 - 9 hits for each track
 - Hit: Pixel center for VT, IT and "MSD"



Efficiency is ~1, not realistic, an efficient way to deal with multytracking and assignment of "true" hit list for each fragment track has to be developed.

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Magnetic Field tests

Aim of the tests: Understand possibile degradation of momentum resolution due to "wrong" knowledge of magnetic field.

Rotation of the magnatic field cases:

- 1) Both magnet maps tilted \rightarrow total field rotation of 1 deg.
- 2) Second magnet map rotation of 1 deg wrt the first one.
- 3) Gaussian smearing of the magnetic field components.
- Magnetic maps shifted in reconstruction (SHOE) wrt the one used in simulation (FLUKA).
- The magnetic field maps are used both in generation (FLUKA) and reconstruction (SHOE) to evaluate momentum resolution.



ROTATION CHECK: NO ROTATION



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ROTATION CHECK: ROTATION 90 deg



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Rotation of the magnetic field and p resolution



super-small difference



Gaussian smearing of the B and p resolution

- Test the impact of the uncertainties in the B <u>measurement</u> by smearing the magnetic field.
- Gaussian smearing in Bx, By, Bz components of the magnetic field map independently (map granularity every 5mm);



super-small difference



Global Reconstruction vs Magnetic map shift:



Not a dramatic degradation observed due to total map shift wrt nominal position...

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Resolution and energy

- At 200MeV/n, all elements are in the "decreasing" part, dominated by *MS contribution*;
 - light elements have *lower p*: MS contribution fall earlier;
 - beavy-elements have *higher p*: approaching minimum, MS not so high anymore;
- At 700MeV/n, all in region dominated by <u>spatial resolution</u>;
 - light elements (steeper growth, lower-p minimum) have low p; still close to the minimum
 - beavy elements (grows slower, higher-p minimum) have higher p but still close to the minimum

0.04

0.035

0.03

0.025 0.02

0.015

0.01

0.005





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Momentum Resolution and FOOT Geometry

 Resolution for the V14 FOOT long setup geometry with 7 cm magnets

• $\sigma(p)/p = 3.3\%$ is the fit value



Momentum Resolution and FOOT Geometry

- Resolution for the V14 FOOT long setup geometry with 10 cm magnets
- $\sigma(p)/p = 2.6\%$ is the fit value



A resolution and isotopes identification



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Momentum Resolution increasing B



Δ

FOOT Geometry V15

From Serena





New magnets configuration:11 cm long

5 cm distance

Mag1: Rin=2,5 cm, Rout=15,5 cm, Bmax=13 kG

Mag2: Rin=5,3 cm, Rout=25,5 cm, Bmax=8,7 kG

Distances btw the detectors of the magnetic systemMagnetic area extended to the beam monitor and the start counter

New magnetic field map (calculated by Sanelli)

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Momentum Resolution in FOOT Geometry V15

 Best momentum resolution for the new V15 FOOT geometry with asymmetric magnets

• $\sigma(p)/p = 3.2$ % is the fit value



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A Resolution and FOOT Geometry

V14 with 10 cm magnets

Magnet 7 cm

70 (C) - 140 (H)

1.5

Magnet 10 cm

70 (C) - 140 (H)

1.5

V15 with asymmetric magnets



 A resolution for the new V15 FOOT geometry with asymmetric magnets goes below 3%

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Tof (ps)

E_{kin} (%)

A Resolution and FOOT Geometry



Moving isotopes in the zone where A resolution values are good enough

to have a better identification.

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Summary table Resolution VS FOOT Geometry

GEO Version	Setup configuration	Magnet configuration	Beam Energy	Momentum Resolution
V13	1.0 m	7 cm	200 Mev/n	5 - 6 %
V14	1.0 m	10 cm	200 MeV/n	4 %
V14	1.0 m	10 cm	700 MeV/n	3 %
V14	2.9 m	7 cm	700 MeV/n	3.5 %
V14	2.9 m	10 cm	700 MeV/n	2.5 %
V15	1.0 m	Asymm.	200 MeV/n	3.2 %



Conclusions

- Global reco in his first stage seems to be stable wrt to magnets possible misalignment.
- Global reco and momentum resolution guided FOOT geometry development. (mostly Magnets design)



Next steps

 Global reco to be updated in a new framework configuration in order to use local reco.

More in Matteo's talk



Backup slides



Change of the IT z resolution ONLY

VT xy Reso: 0.0006cm

IT xy Reso: 0.0006cm

z Reso : ????cm

z Reso: 0.005cm

Focusing on the IT z-resolution only since have a non-negligible impact;

Important to set acceptable threshold for hardware constrains;

Similar effect for **VT** z-resolution;

