Status of S091 experiment

Probing nucleon-nucleon correlations in atomic nuclei via (p,pd) QFS reactions

Fragment acceptance simulation

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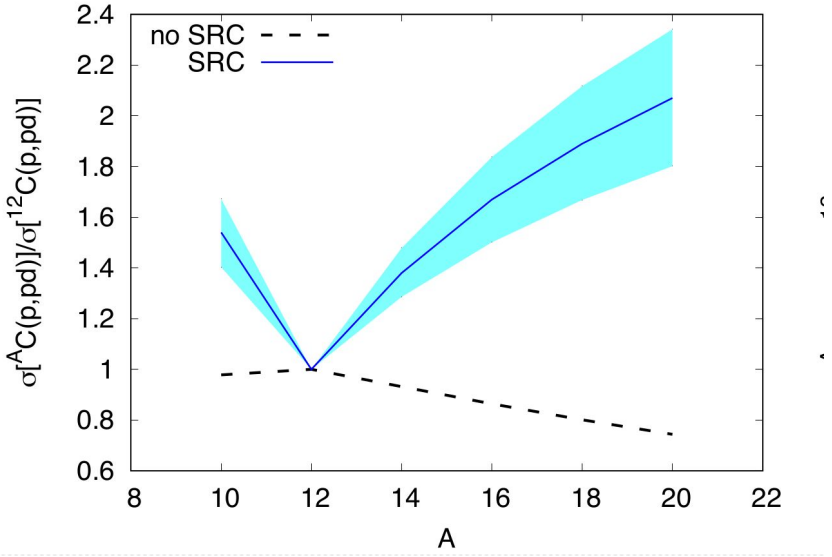
Motivation

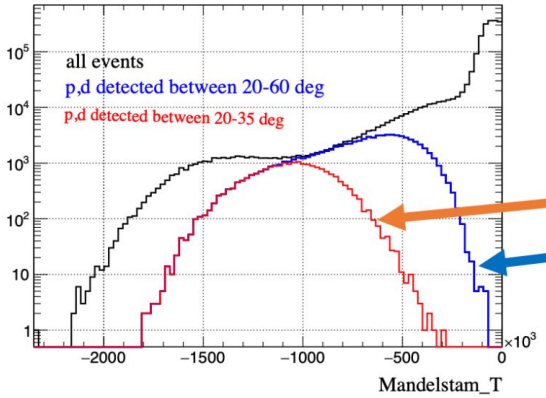
In the presence of the SRC components of the NN interaction,

$$|qp\rangle \sim 80\%\,|p\rangle + 20\%\,|h\rangle \otimes |qd\rangle$$

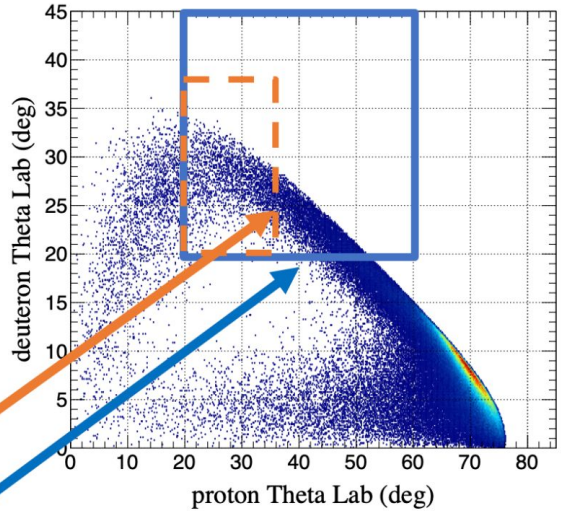
SRCs are expected to contribute with a dependence on the isospin asymmetry, and hence an A dependence of the (p,pd) cross section is expected.



Kinematics for (p,pd) at 480 MeV/nucleon

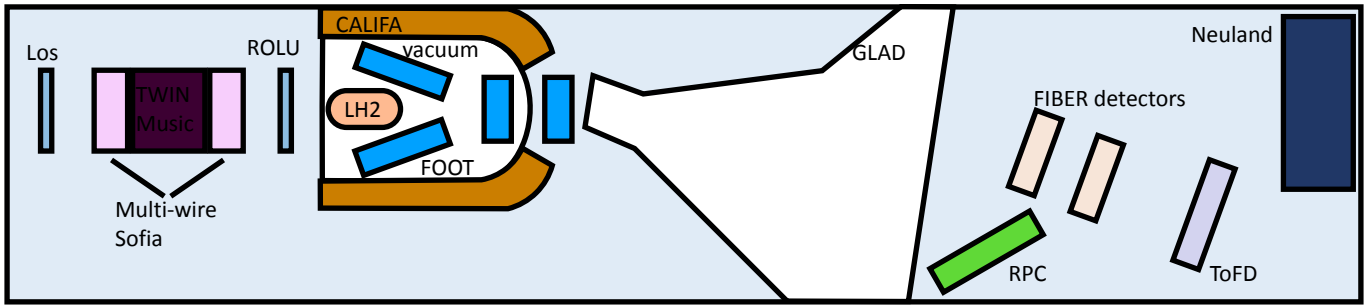


$(MeV/c^2)^2$



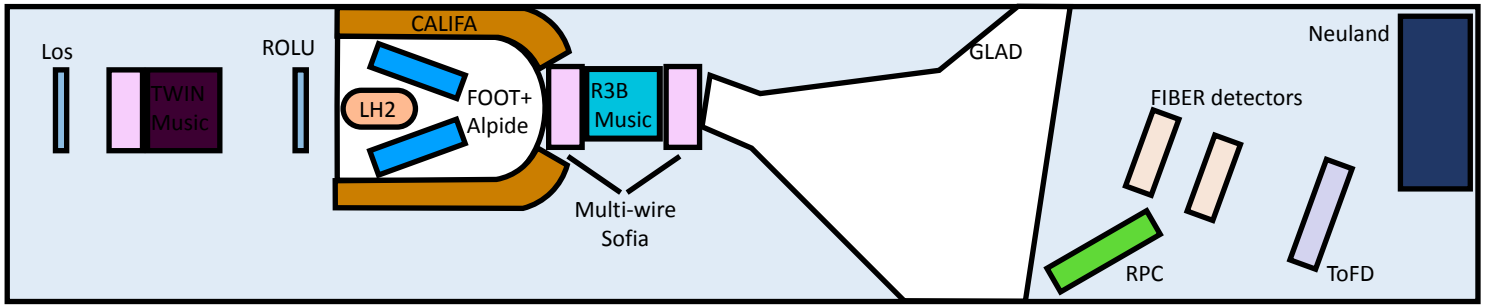
High momentum transfer

S522/S509



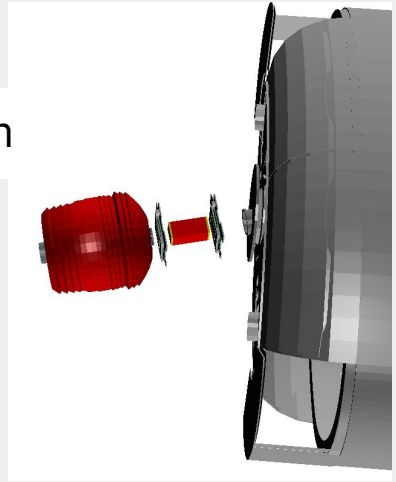
Fragment Arm
@14 deg

S091

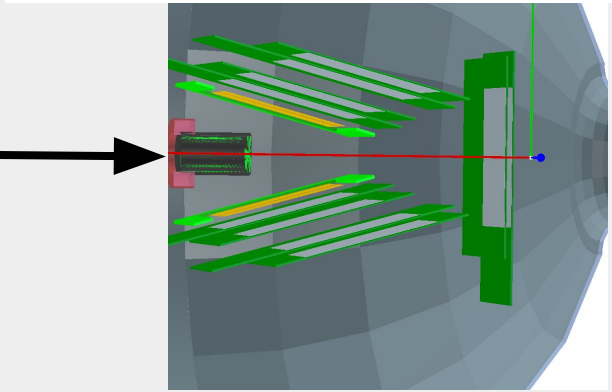


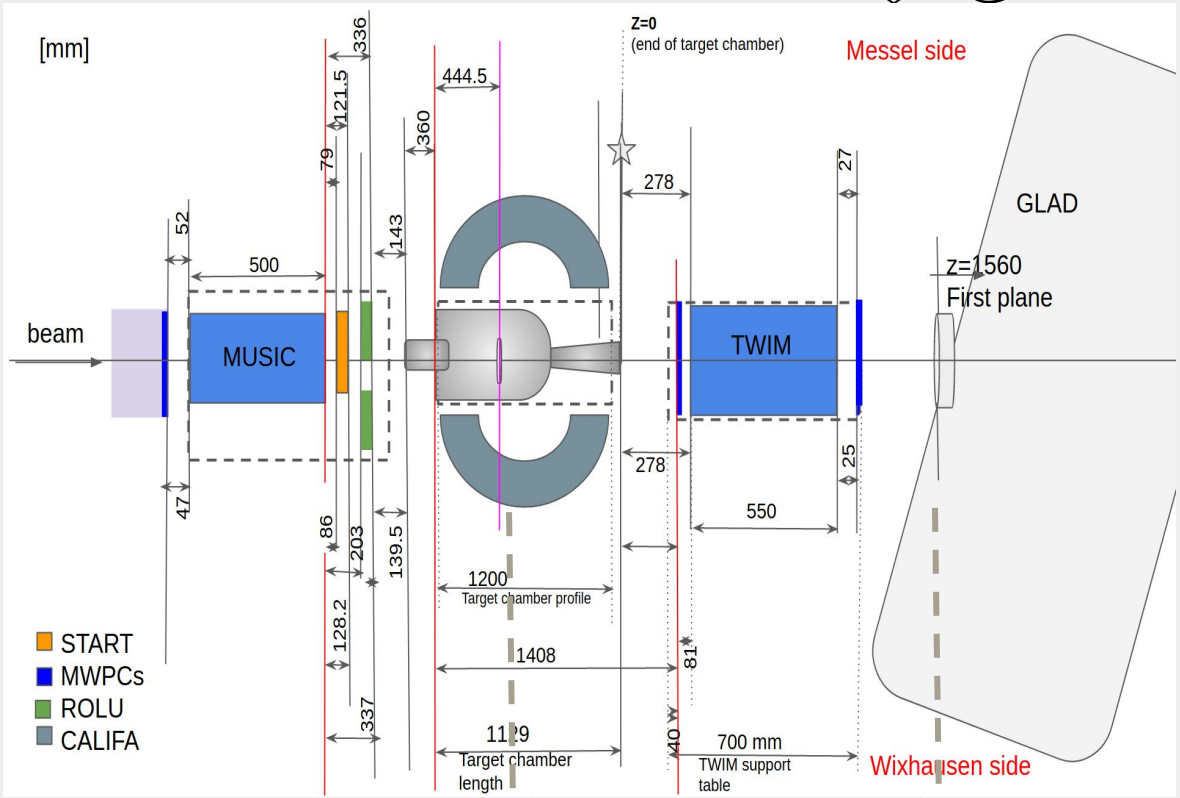
S467

Move -70 cm



FOOT +ALPIDE
Presentation by ***Matt Whitehead***





We plan to have this at ~1.8m for S091 → ~ 2.2 m

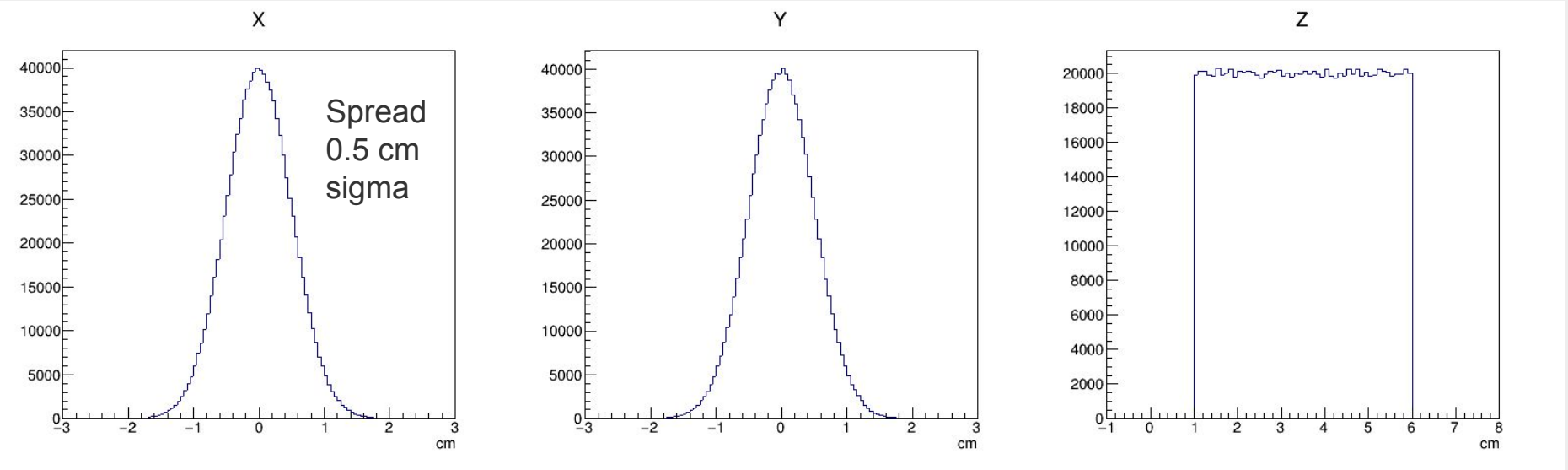
12C(p,pd) 10B reaction – Distributions at the Target

Incoming beam ^{12}C: 480 MeV/nucleon

Proposed beam rate: $5x10^4$ pps

The LiH target cell radius is 15 mm, its length is 5 cm

In this simulation, the incoming beam or outgoing fragments were assumed to have Gaussian distributions at X and Y directions with Gaus(0, 0.5 cm) and have a Uniform distribution at Z direction with Uniform(0, 5.0 cm).

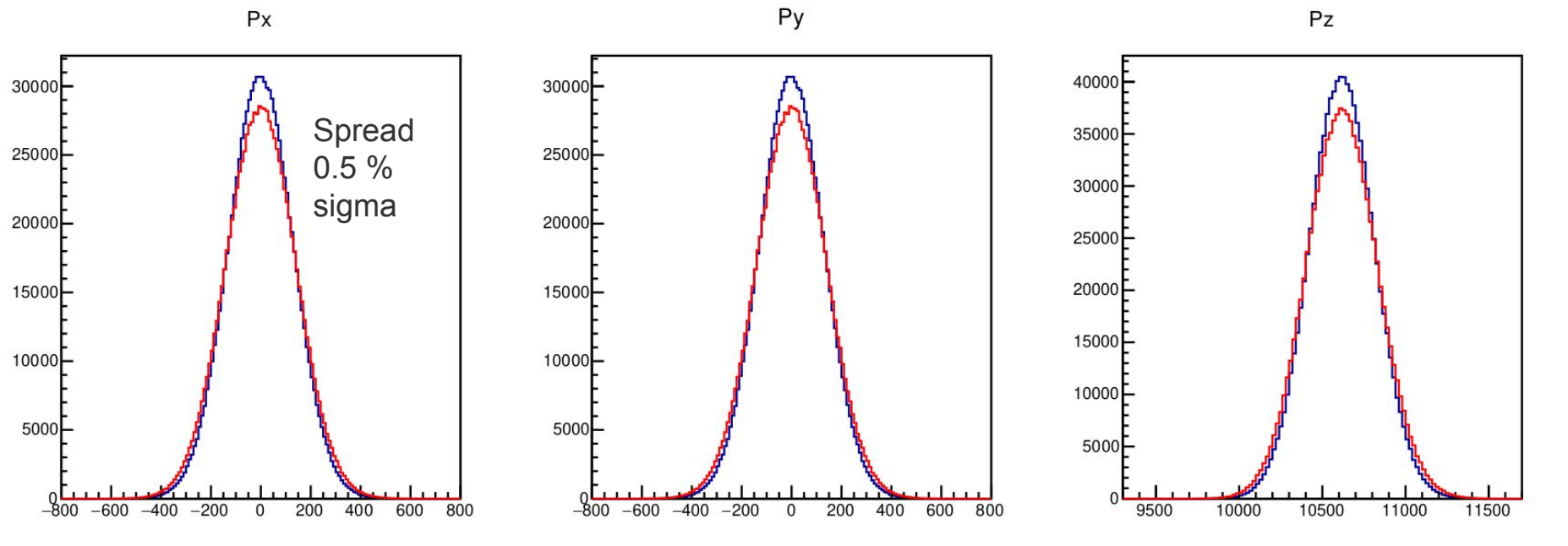


Fragment ^{10}B Momentum distribution

Incoming beam ^{12}C: 480 MeV/nucleon

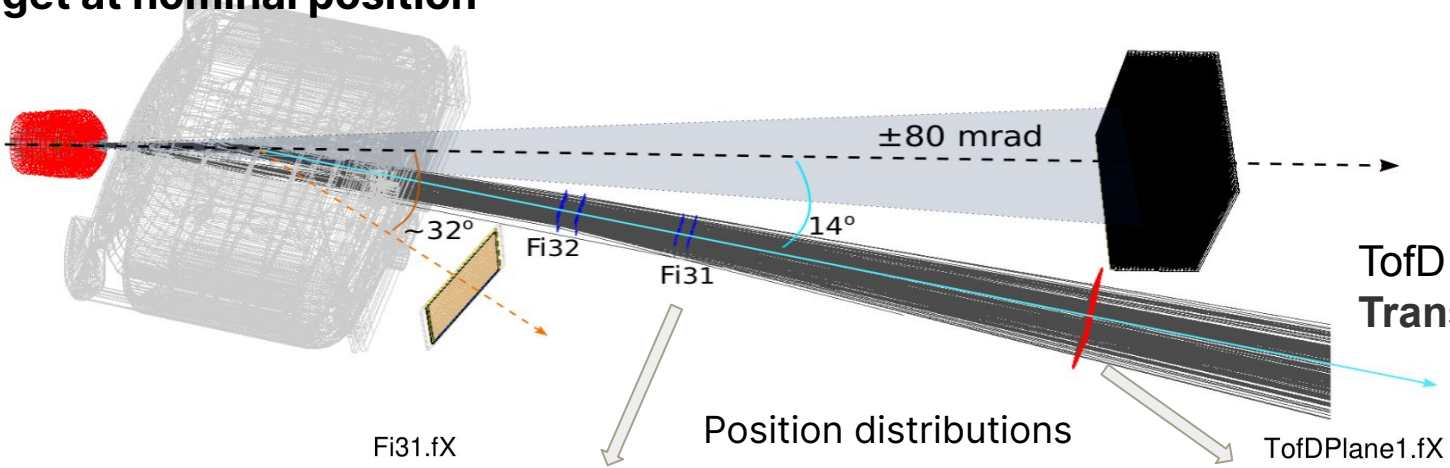
Internal momentum spread (Gauss) MOM_SIGMA= **130 MeV/c**

Considering a Gaussian distribution with (sigma = 0.5%) for incoming beams in three directions



1 momentum sigma corresponds to an angle < 13 mrad.

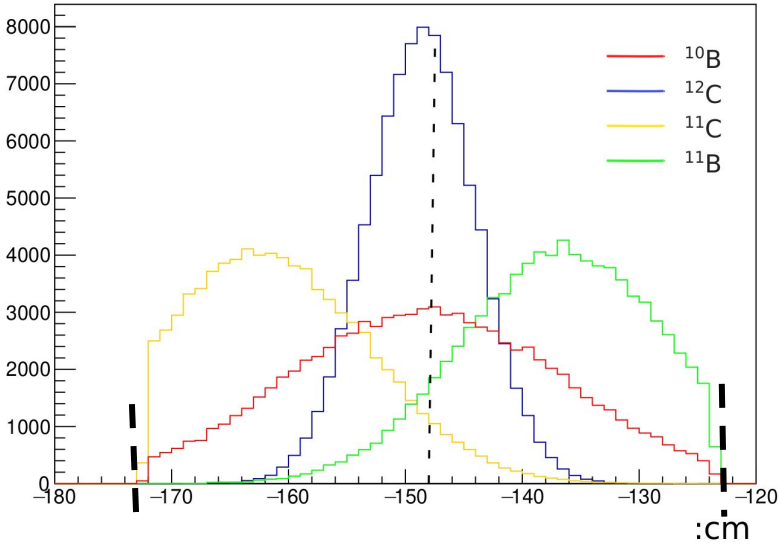
Target at nominal position



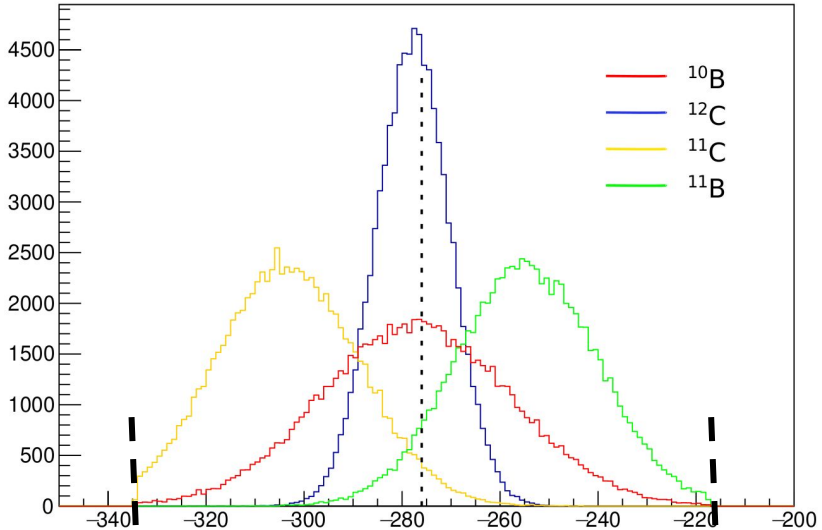
TofD at Z = 1376cm
Transported in the air

Position distributions

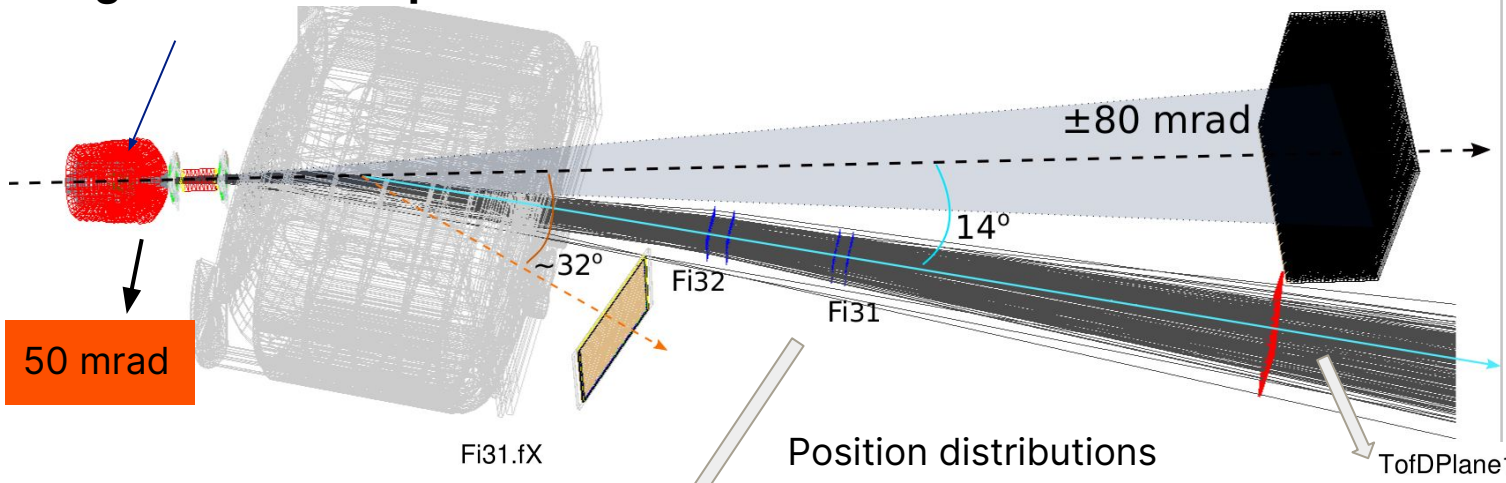
Fi31.fX



TofDPlane1.fX



Target at shifted upstream 70 cm



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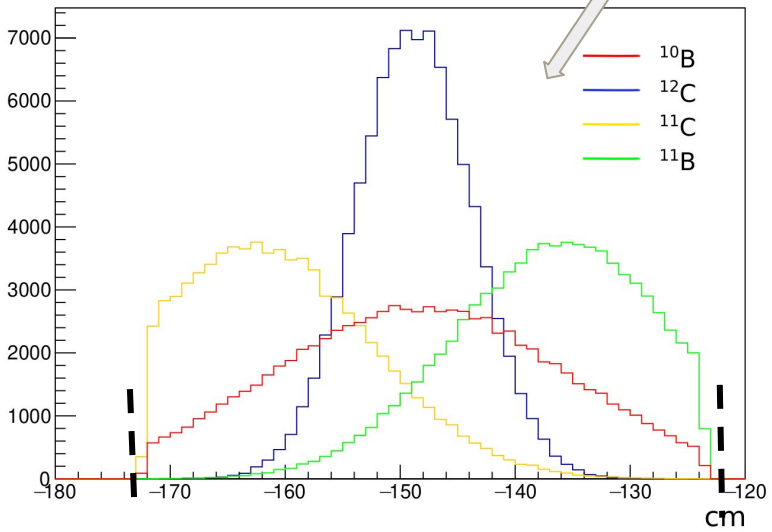
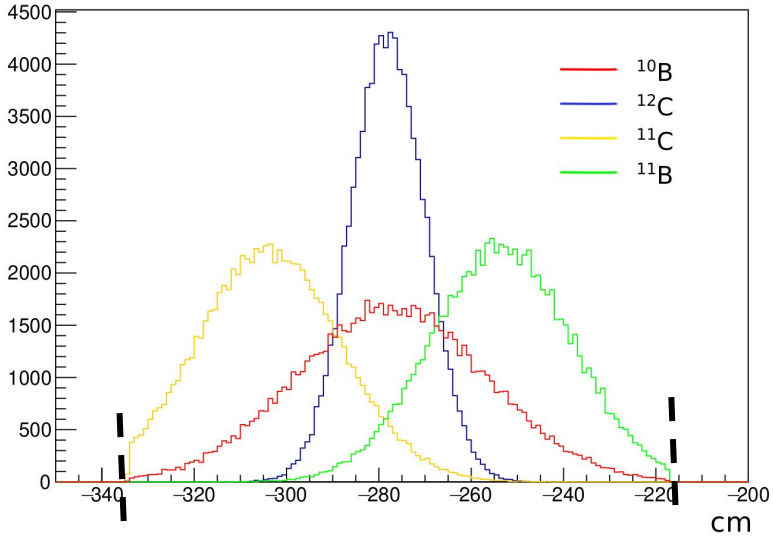
Position distributions





Results

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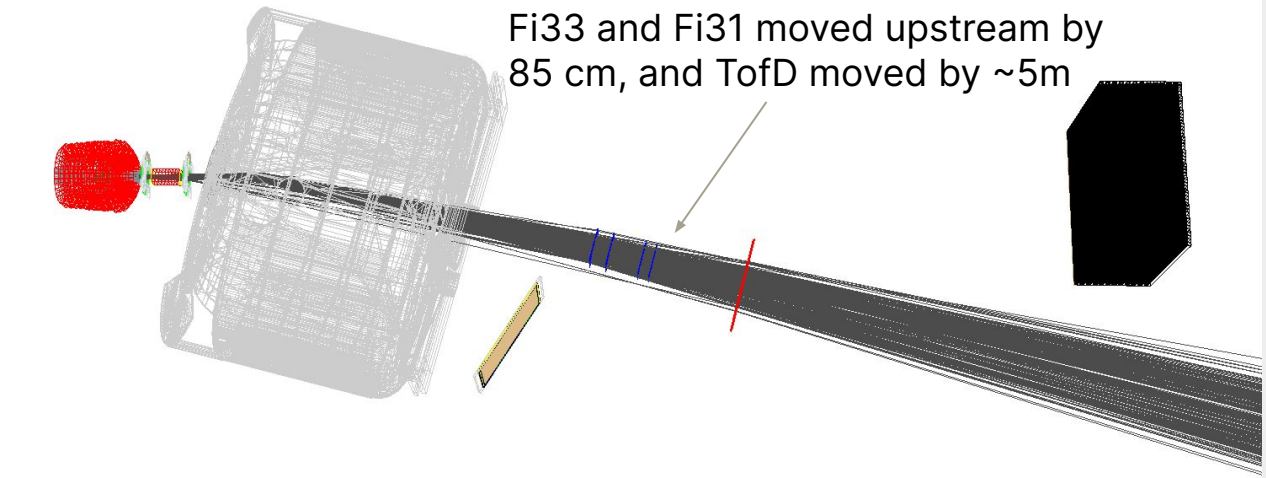
S522

Transmission (%)	^{12}C	^{11}C	^{11}B	^{10}B
Fi32	93.7	92.0	92.4	92.9
Fi31	91.8	79.3	83.5	86.7
TofD Plane1	86.7	85.8	86.0	86.6
TofD Plane1 && Fibers	86.7	75.1	78.4	81.8

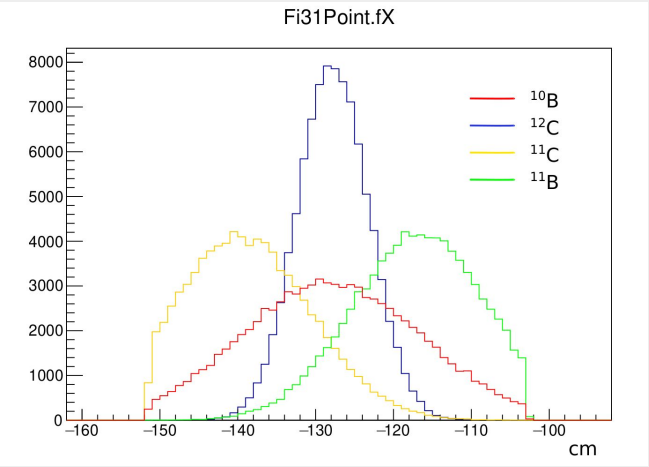
-70 cm

Transmission (%)	^{12}C	^{11}C	^{11}B	^{10}B
Fi32	93.4	90.3	91.1	91.3
Fi31	91.5	76.3	81.6	83.8
TofD Plane1	86.2	84.5	85.4	86.1
TofD Plane1 && Fibers	86.2	72.2	76.5	78.9



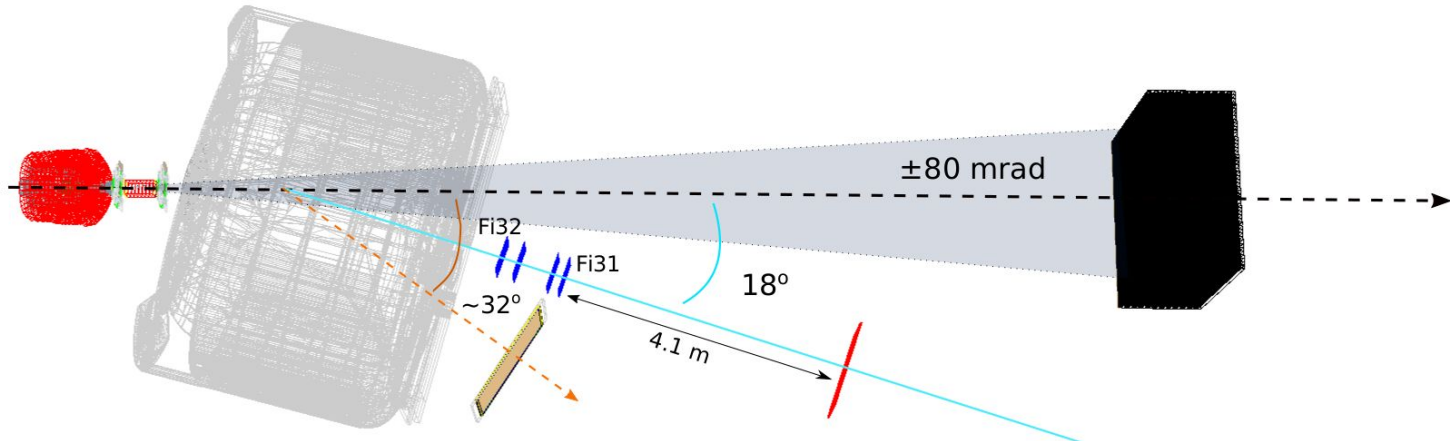
Distance between Fi30 and Fi33 is now 50 cm.

TofD at Z = 916cm



Transmission (%)	^{12}C	^{11}C	^{11}B	^{10}B
Fi32	93.4	90.3	91.1	91.3
Fi31	91.6	83.5	86.3	87.4
TofD Plane1	88.6	88.5	88.0	88.7
TofD Plane1 && Fibers	88.6	80.2	82.4	83.7

Investigate fragment arm at 18 deg (instead of 14 deg)



Distance between Fi30 and Fi33 is 50 cm.

TofD at Z = 1032cm;
X = -247 cm

Transmission (%)	^{12}C	^{11}C	^{11}B	^{10}B
Fi32	94.2	93.4	93.6	93.8
Fi31	92.4	88.3	89.5	91.2
TofD Plane1	87.9	87.6	87.6	87.8
TofD Plane1 && Fibers	87.6	84.0	84.5	86.2

Fibre detectors can be moved closer:
→ Increases Transmission

Any constraints to do this?

ToDo:

Investigate Proton distribution on RPCs

Consider support structures/frames

Investigate the situations for 10C and 16C and finalize the positions for these detectors

...

Are the suggested distances from magnet to detectors and between them realistic?

Any other constraints?

...


THANK YOU
FOR YOUR
ATTENTION

Fragment ^{11}B Momentum distribution

Incoming beam ^{12}C: 480 MeV/nucleon

Proposed beam rate: 5x10^4 pps

Internal momentum spread (Gauss) MOM_SIGMA= 100 MeV/c

After considering a momentum distribution for incoming beam particles with a Gaussian distribution (sigma = 0.5%) in three directions, the momentum distribution for fragment 11B are shown in red line.