

A stack of four white, smooth stones on a sandy beach. The stones are stacked in a slightly offset manner, with the top stone being the most prominent. The background is a soft, out-of-focus view of the ocean and sky.

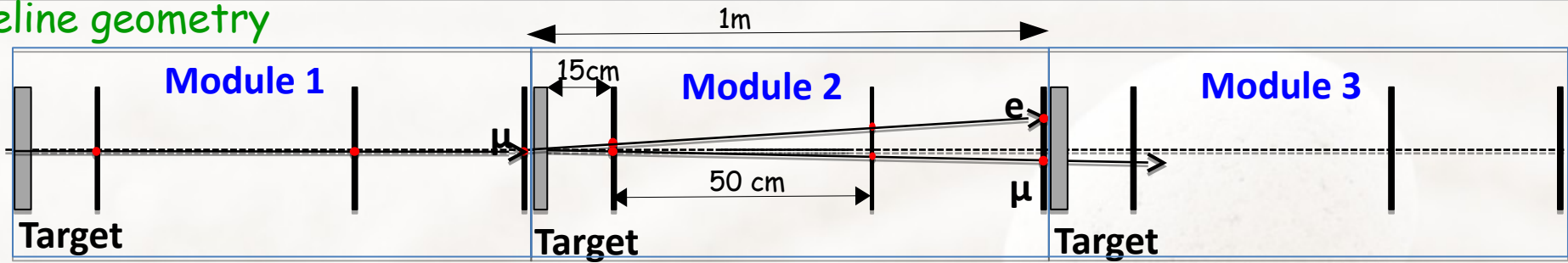
Geometry models

Fedor Ignatov

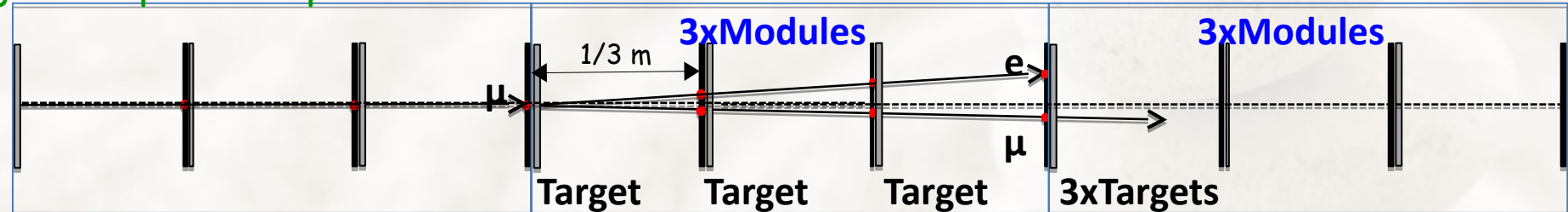
23 October 2019
MUonE weekly meeting

models

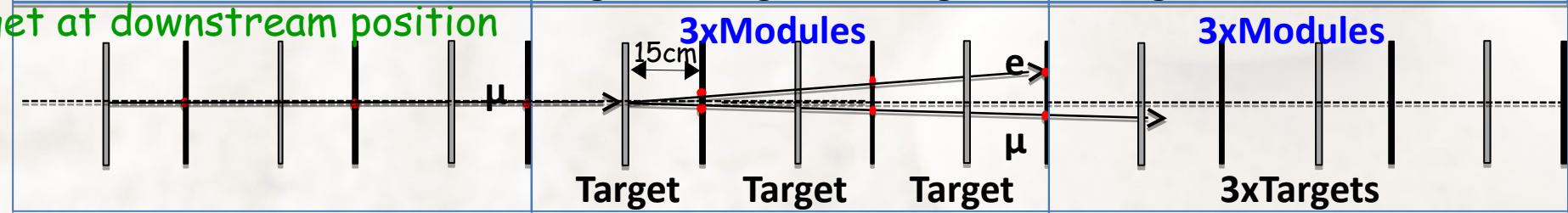
Baseline geometry



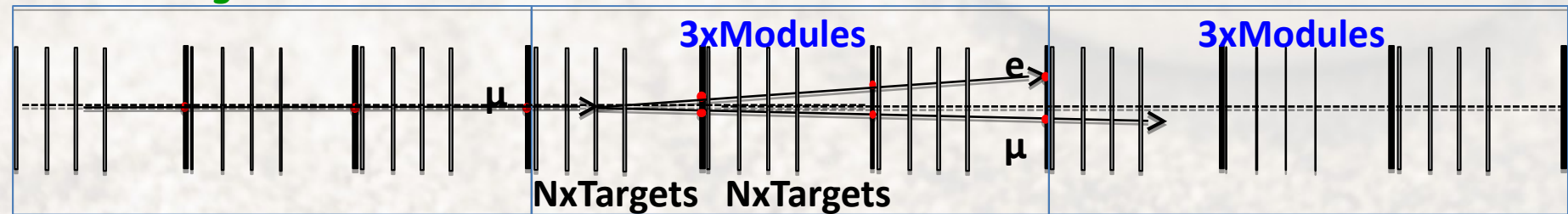
Target at upstream position



Target at downstream position



Distributed targets



Toy MC

baseline module:

- x 3xsensor planes: 3x1.28 mm Si 3x0.0137 X/X0
- x base target: 15mm Be 0.0436 X/X0
- x $L_{\text{module}} = 1\text{m}$

With such sensors
X/X0 of target and Si
are near same....

x For all geometries:

3 sensors planes/1m

at least 15 cm spacing between target and next first Si plane

total target thickness as 15 mm/1m

x $\sigma_{\text{hit}} = 18\mu\text{m}$

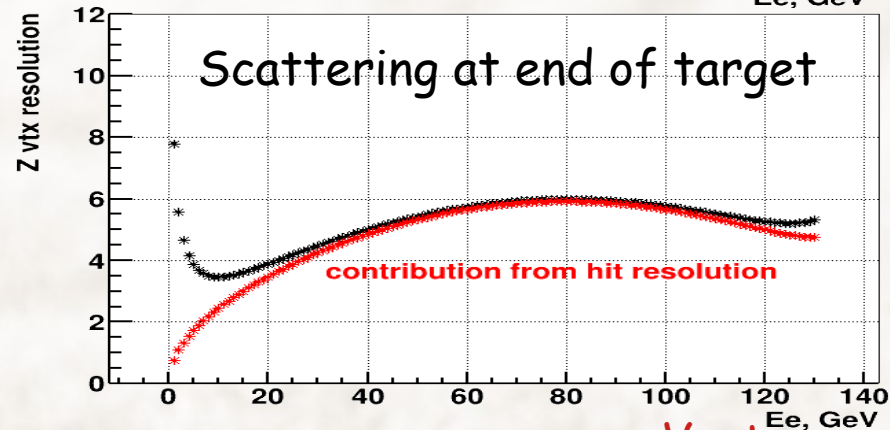
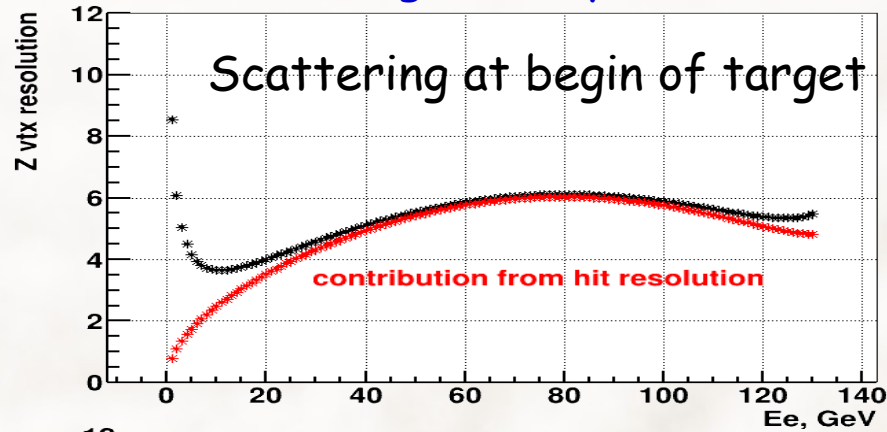
x Multiple scattering as angle sampling with single gauss by the PDG formula
+ correlated sampling of lateral displacement after passing thick target

x Simple line fit with 3 hits for in,out tracks (no sigma MS addition)

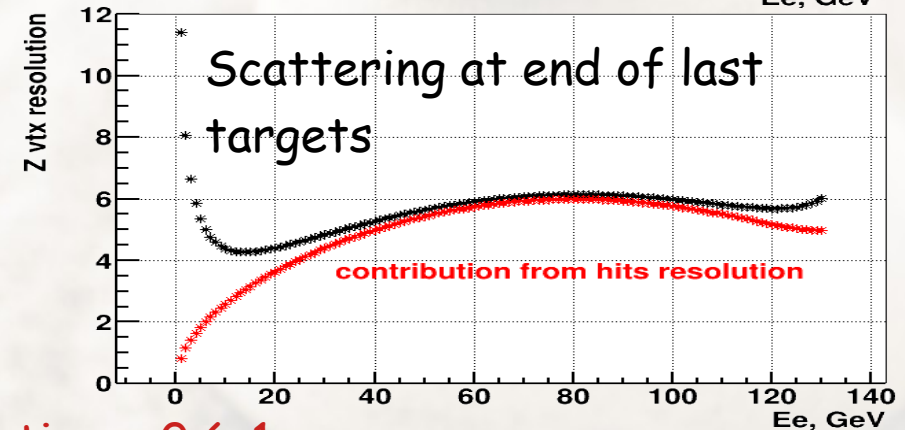
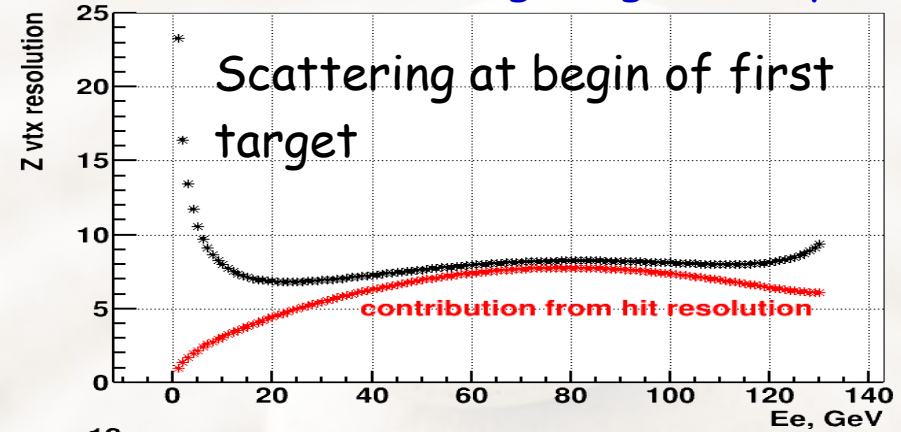
x Vertex fit by χ^2 minimization of input+outputs tracks

Vertex position resolution (based on in+outs tracks)

Baseline geometry



Distributed targets geometry

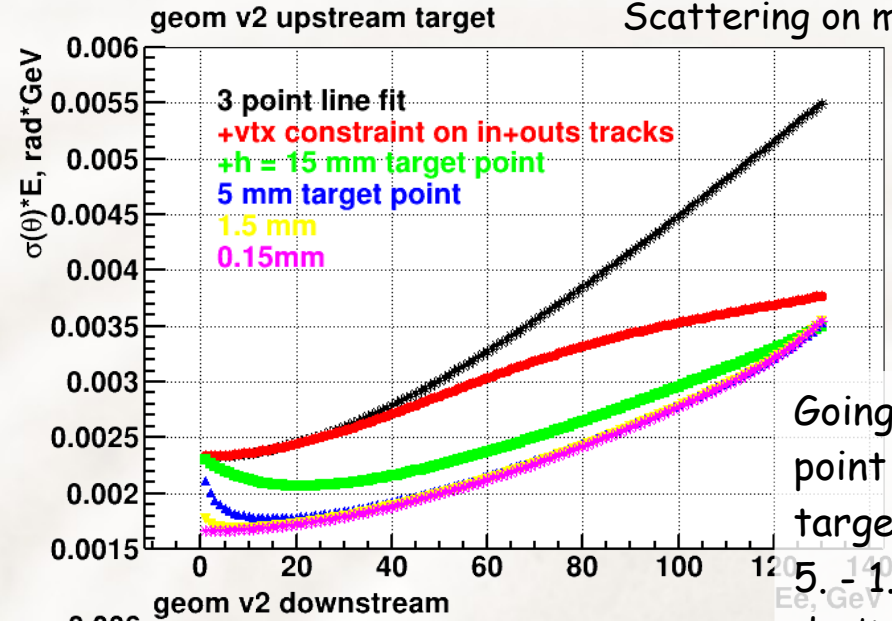
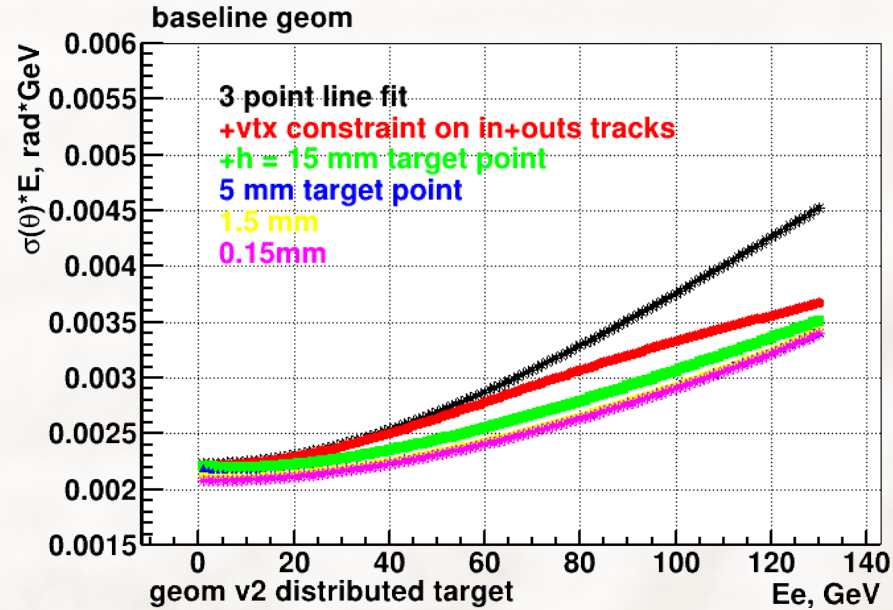


Vertex resolution $\sim 0.6-1$ cm

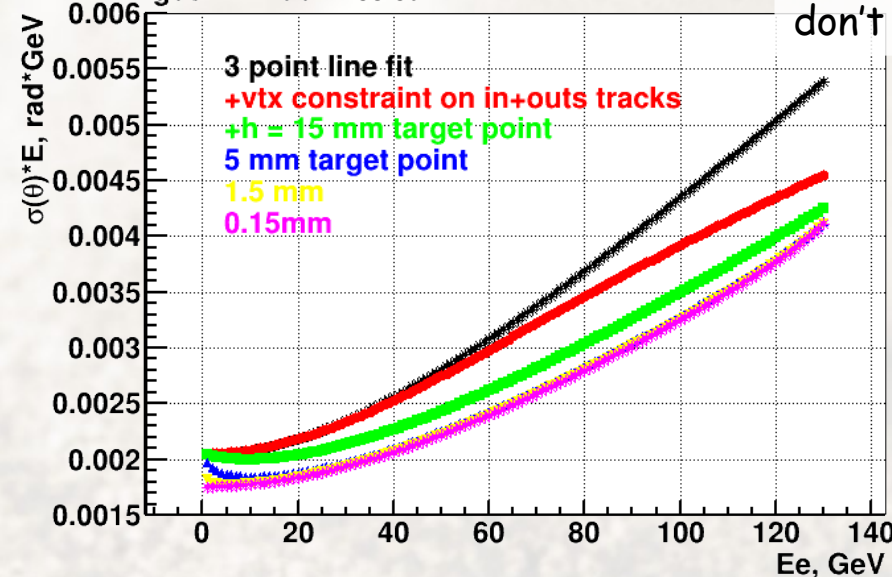
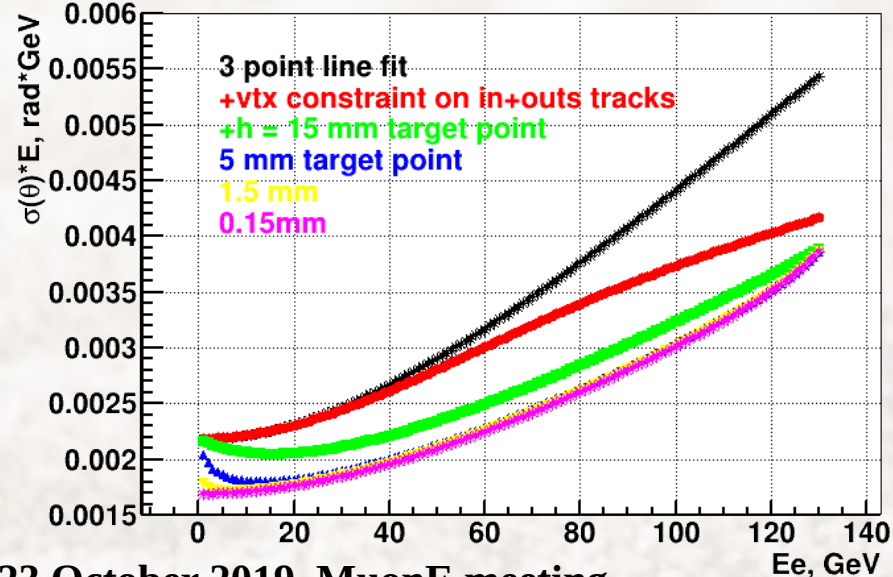
- × Should be $\gg 5$ cm between targets: to say at which target was scattering
 - × Should be ~ 15 cm between target and next Si sensor: to keep hits separation between nearest tracks
($5\text{mrad} \cdot 15\text{cm} \rightarrow 750\mu\text{m}/90\mu\text{m} \sim 8$ strips)
 - × Also about ~ 5 cm between target and previous sensor (if we want to distinguish scattering from target and Si)
- 23 October 2019, MuonE meeting

Angle resolution

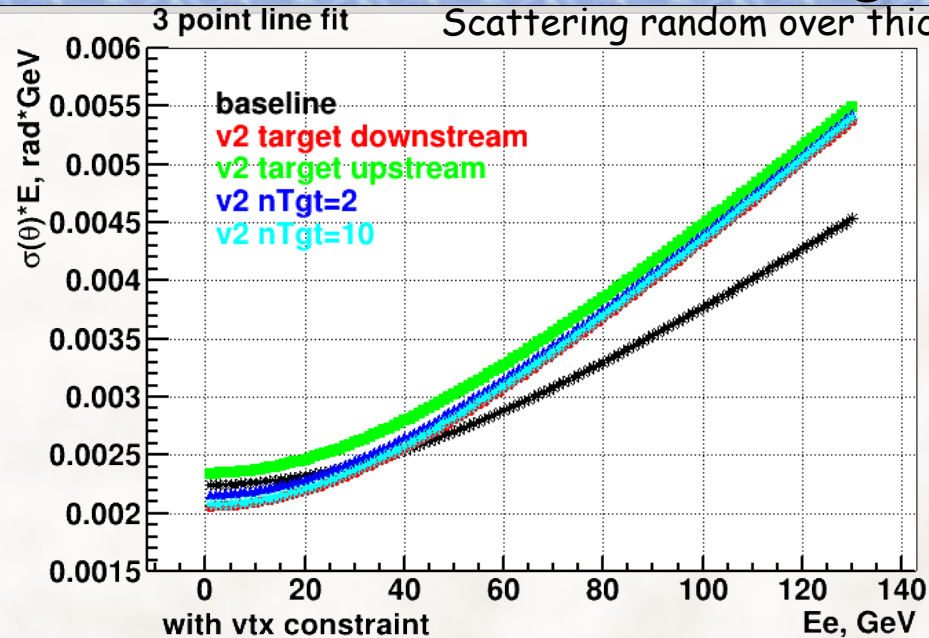
Scattering on middle of target



Going from point with target thickness 5. - 1.5 mm to below don't give much

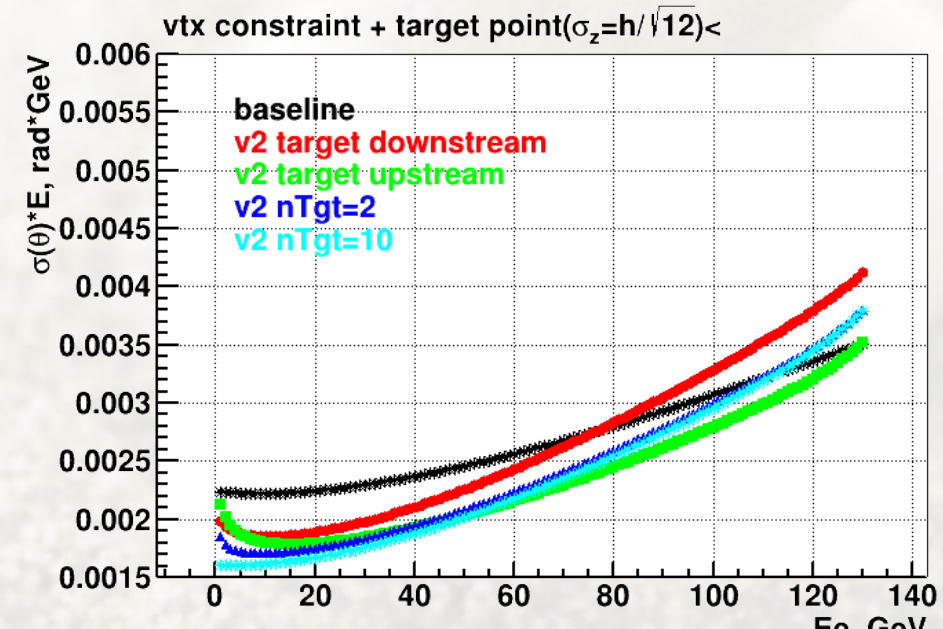
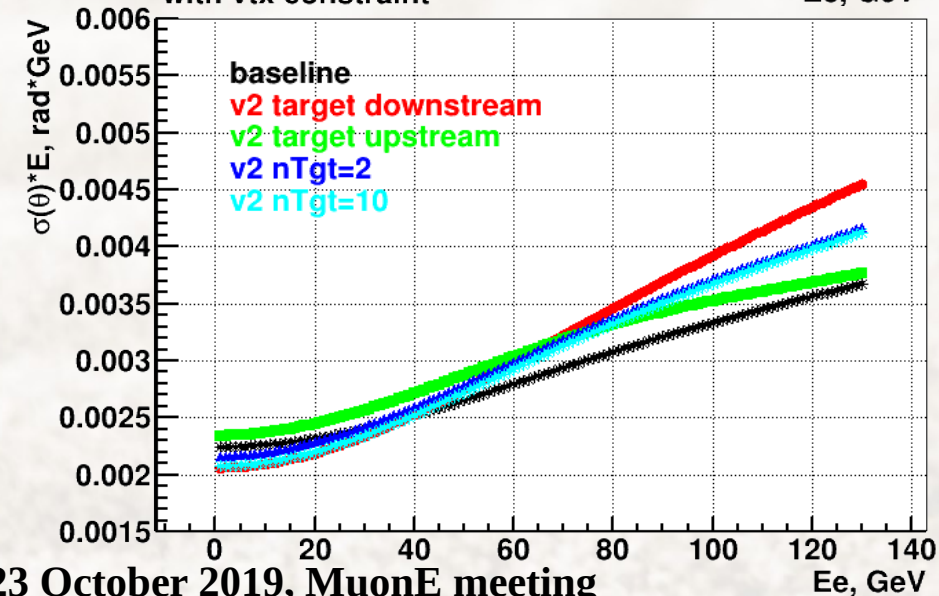


Angle resolution



Longer arm gives better resolution
 $E_e > 30 \text{ GeV}$ with unconstrained fit

Splitting modules can give 10-20 %
Better angle resolution with constrained fit



conclusion

2 different cases for angle resolution:

x at $E_e > 10 \text{ GeV}$: precision required for E_{beam} determination,
also it is signal region

longer arm between Si planes will help

x at $E_e < 10 \text{ GeV}$: low value better for control MS,
such tracks gives background to signal region via MS
splitted targets is better

x Answer to referee: we should to keep Si at 5(after)-15(before) cm from targets,
vertex resolution limits spacing between targets $> 5 \text{ cm}$
we can't put more than 2-3 targets on 33cm module spacing
going from point with 5mm thick target to below can improve 10-15% for electron
energies $< 5 \text{ GeV}$ with constrained fit of target position

x But than each targets should be controlled on same $10 \mu\text{m}$ precision, and more
complicated fitting

A stack of three smooth, light-colored stones is positioned on the right side of the image. The stones are stacked vertically, with the top stone being the smallest and the bottom stone being the largest. The background is a soft, out-of-focus sandy surface. The word "backups" is written in a simple, black, sans-serif font across the middle of the image, partially overlapping the stones.

backups