Geometry models

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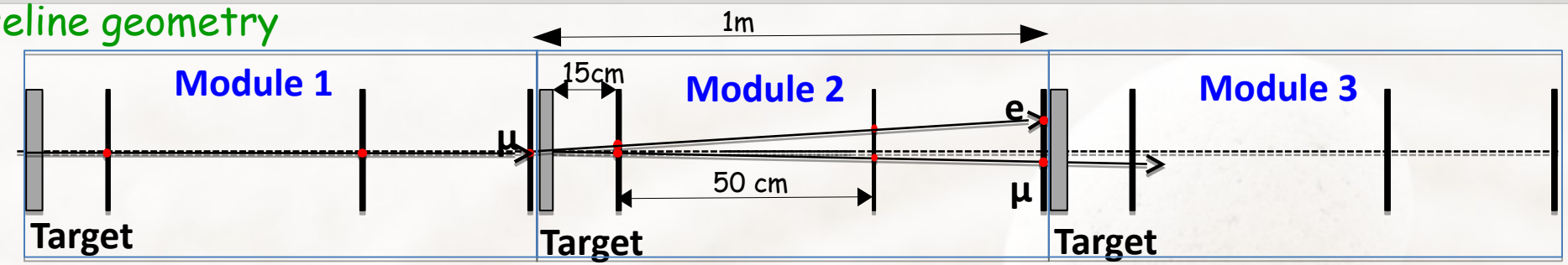
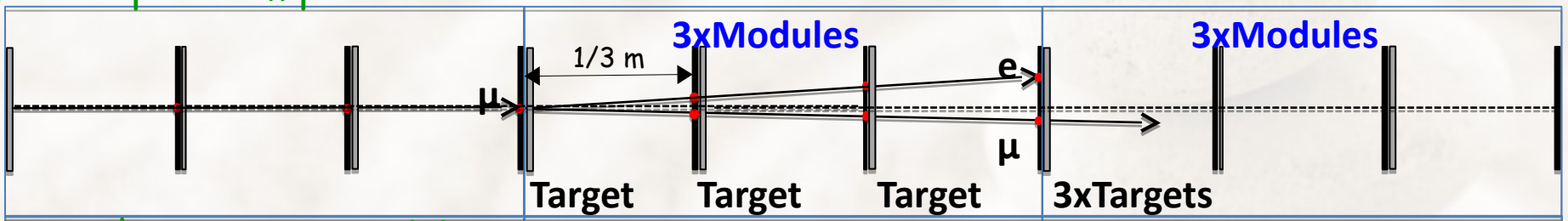
models

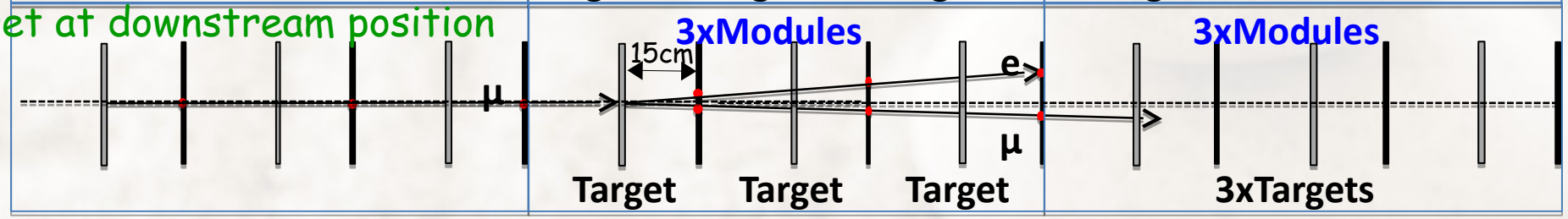
Baseline geometry



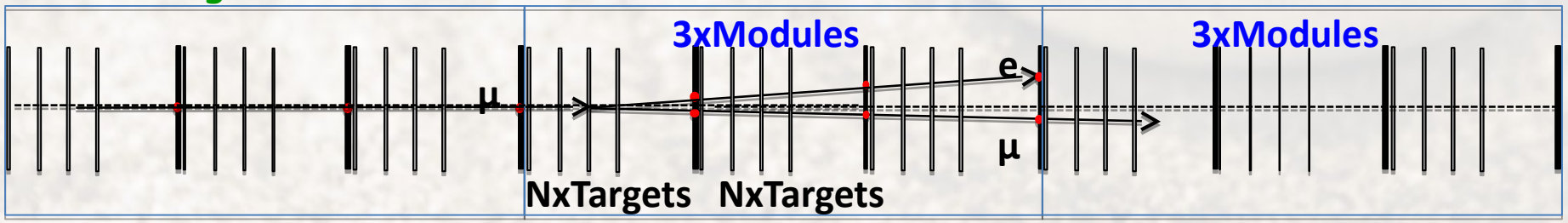
Target at upstream position



Target at downstream position



Distributed targets



Toy MC

baseline module:

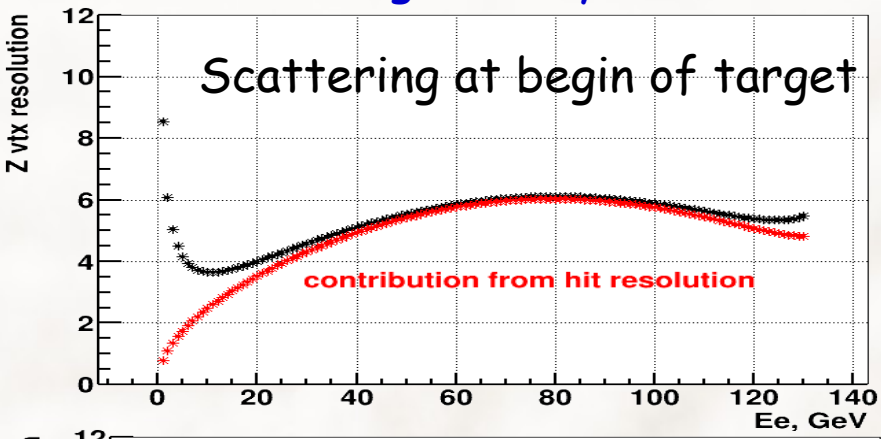
- 3xsensor planes: 3x1.28 mm Si 3x0.0137 X/X0
- base target: 15mm Be 0.0436 X/X0
- L_{module} = 1m

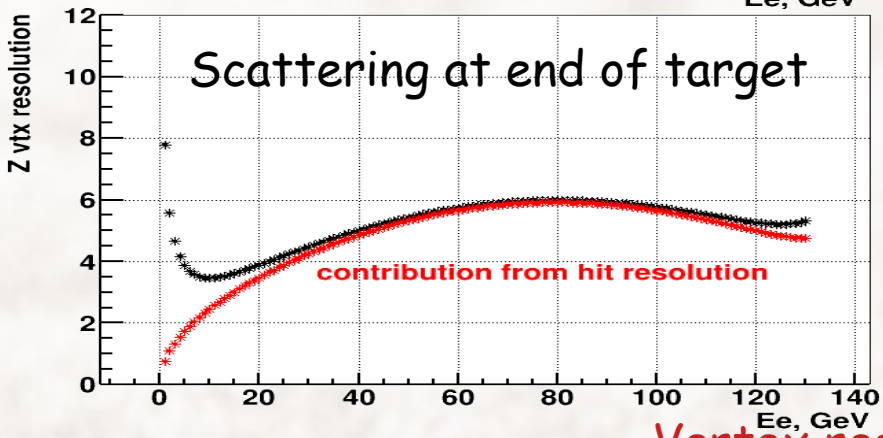
With such sensors X/X0 of target and Si are near same….

- 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
- σ_{hit} = 18μm
- Multiple scattering as angle sampling with single gauss by the PDG formula
  + correlated sampling of lateral displacement after passing thick target
- Simple line fit with 3 hits for in,out tracks (no sigma MS addition)
- Vertex fit by χ2 minimization of input+outputs tracks

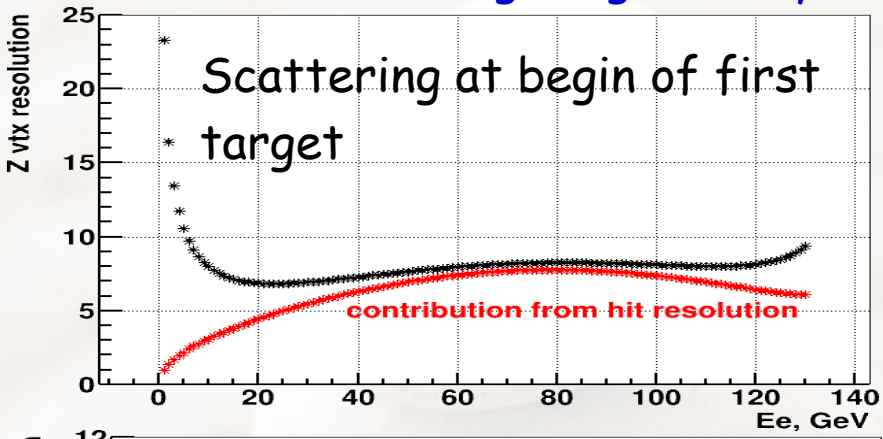
Vertex position resolution (based on in+outs tracks)

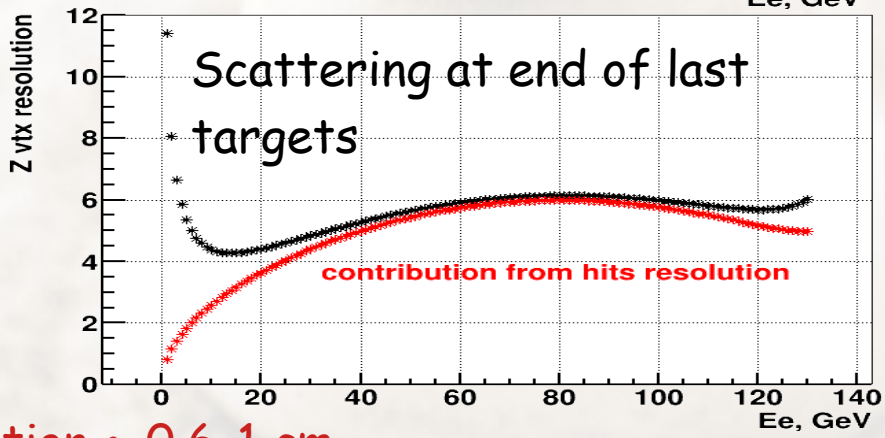
Baseline geometry





Distributed targets geometry

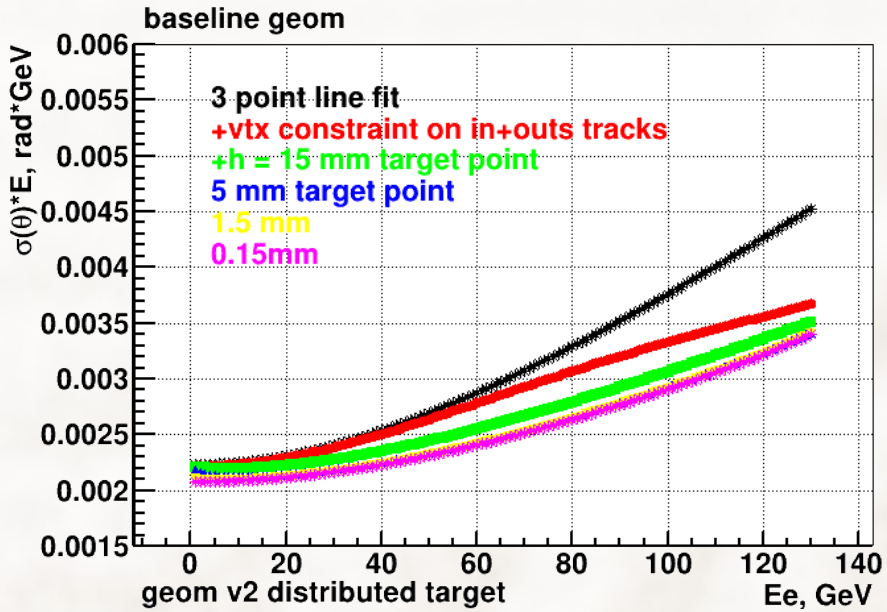


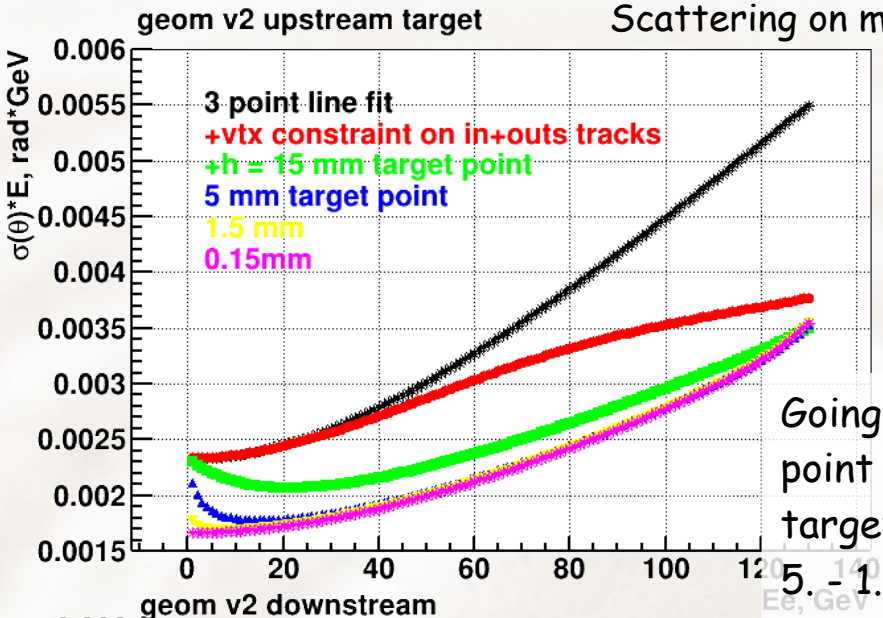


Vertex resolution ~ 0.6-1 cm

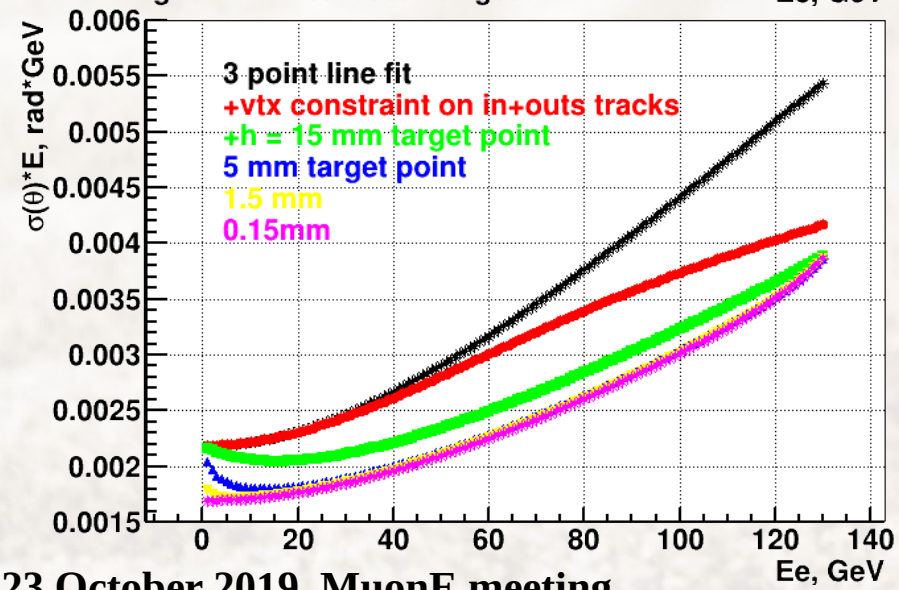
- ✗ Should be >~ 5 cm between targets: to say at which target was scattering
- ✗ Should be ~ 15 cm between target and next Si sensor: to keep hits separation between nearest tracks (5mrad*15cm → 750μm/90μm ~ 8 strips)
- ✗ Also about ~5 cm between target and previous sensor(if we want to distinguish scattering from target and Si)

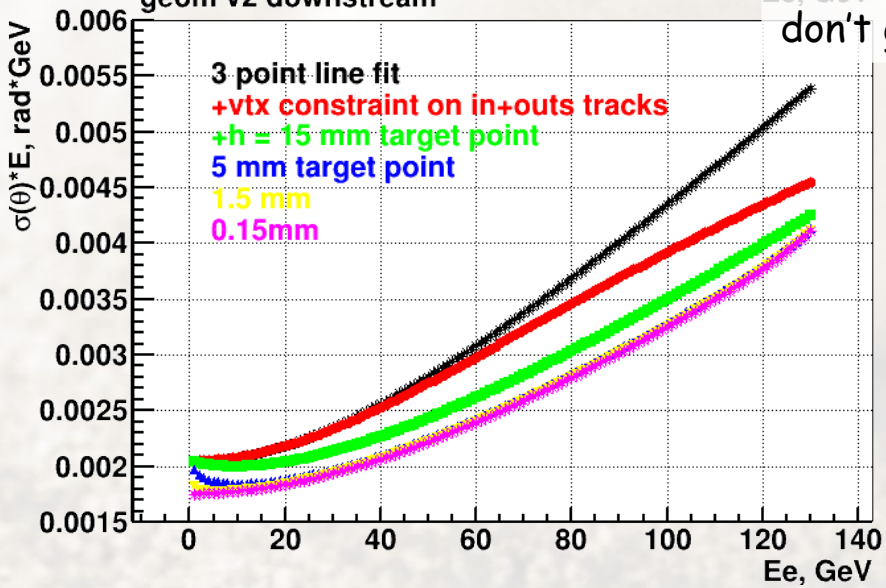
Angle resolution





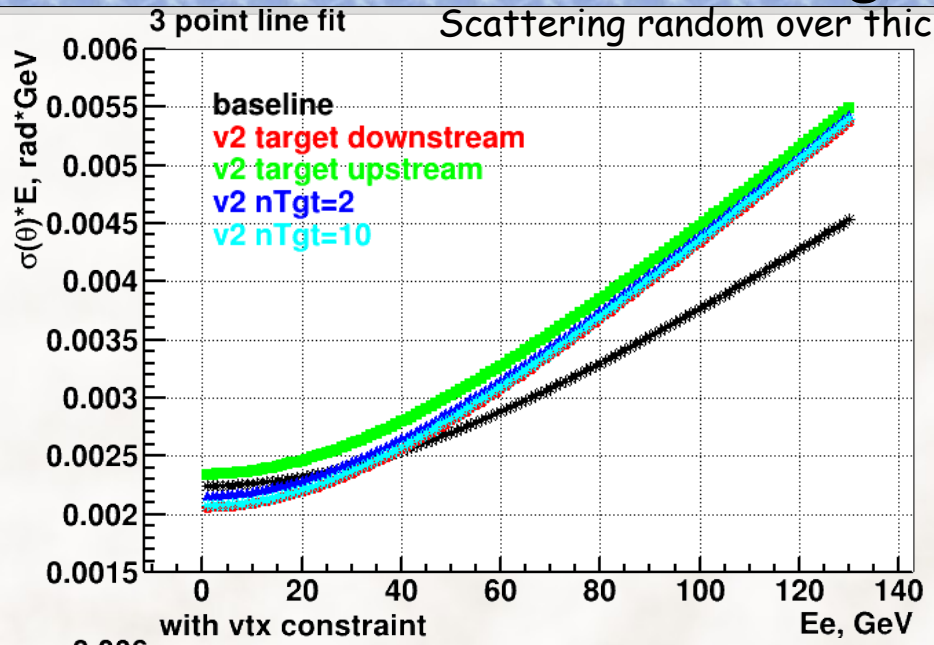
Scattering on middle of target





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

Angle resolution

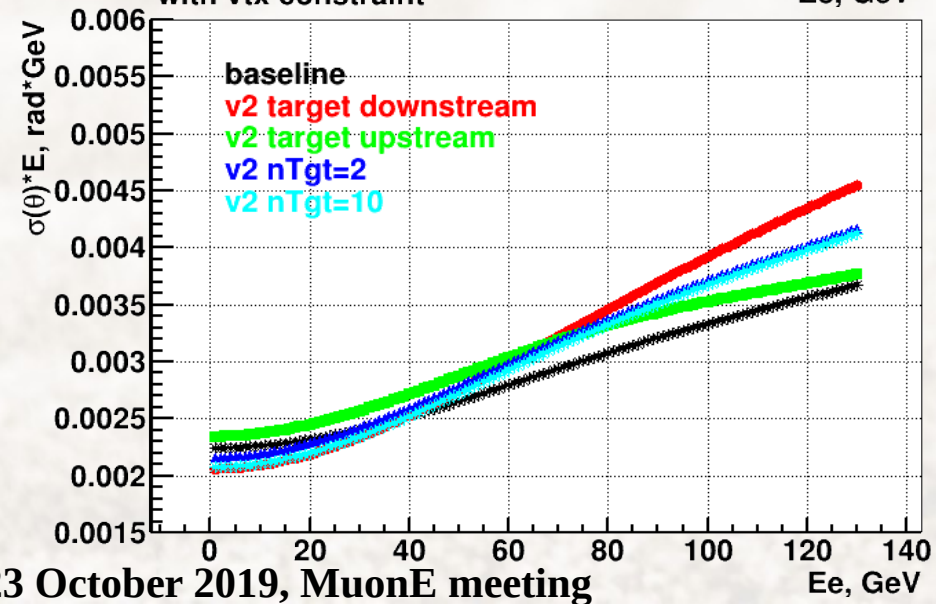


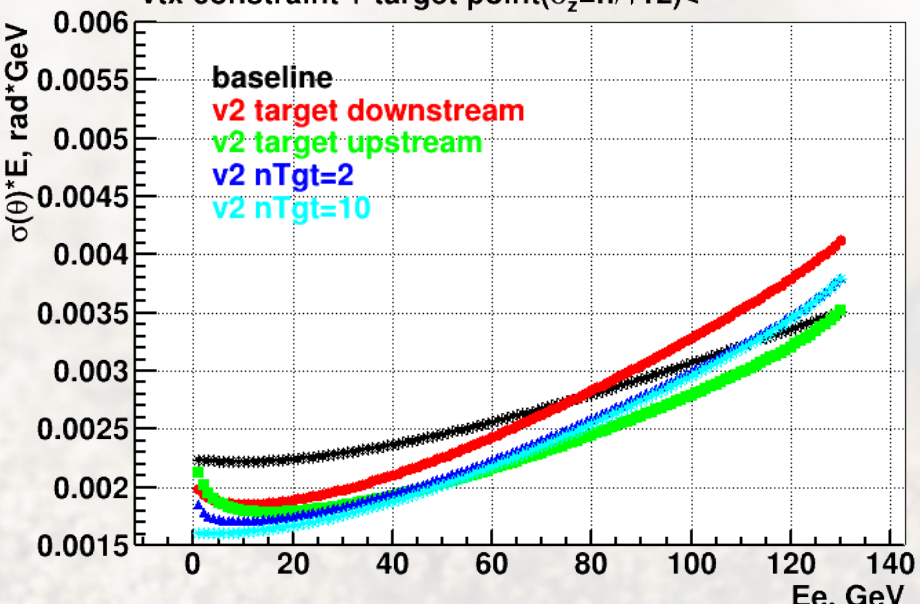
Longer arm gives better resolution

E_e > 30 GeV with unconstrained fit

Splitted modules can give 10-20 %

Better angle resolution with constrained fit





conclusion

2 different cases for angle resolution:

- at E_e > 10 GeV : precision required for E_{beam} determination,
  also it is signal region
  longer arm between Si planes will help
- at E_e < 10 GeV: low value better for control MS,
  such tracks gives background to signal region via MS
  splitted targets is better

- Answer to referee: we should to keep Si at 5(after)-15(before) cm from targets,
  vertex resolution limits spacing between targets > 5 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 < 5GeV with constrained fit of target position

- But than each targets should be controlled on same 10μm precision, and more complicated fitting

backups