

Baseline All-Si layout for EIC YR

Proposed:

- 1) Material changes
- 2) Vertexing-layer changes
- 3) Disk changes

Rey Cruz-Torres
LBNL EIC Meeting
09/15/2020

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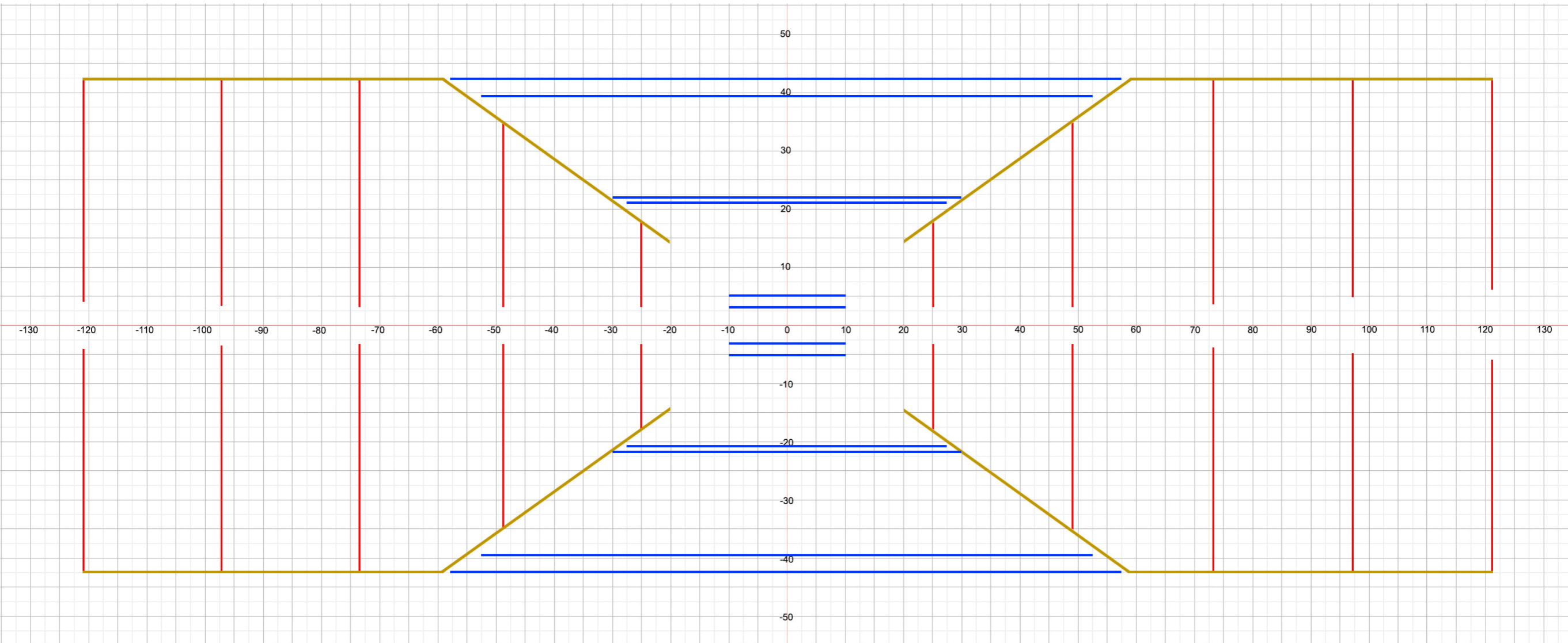
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Current detector configuration

• Disks

• Barrel

• Support

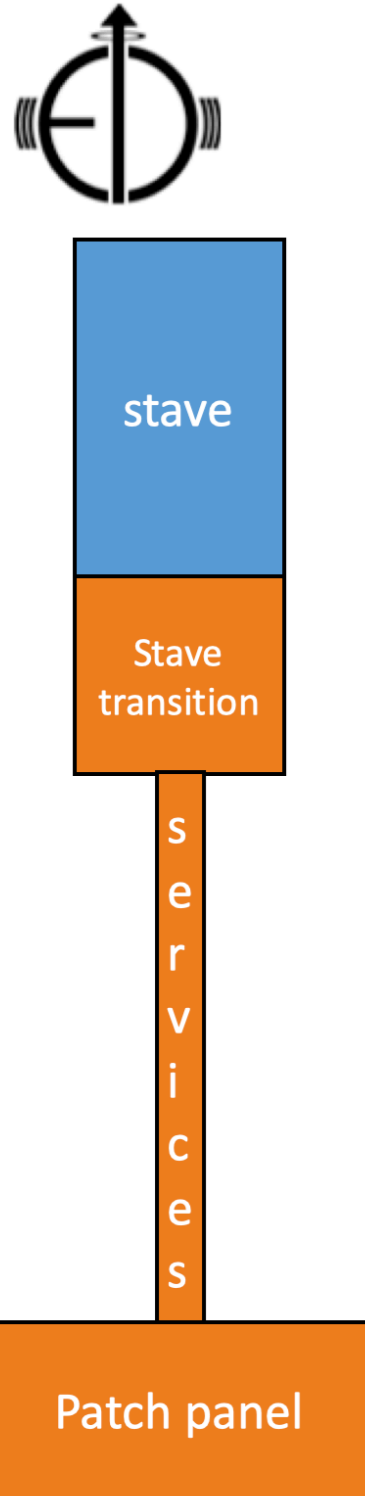


- 2 short vertexing layers
- 4 additional barrel layers
- 5 disks (each direction)

- stave material budget:
 - 0.3% X/X_0 everywhere

Material Budget Updates

Services – what can we expect for EIC tracking Si?



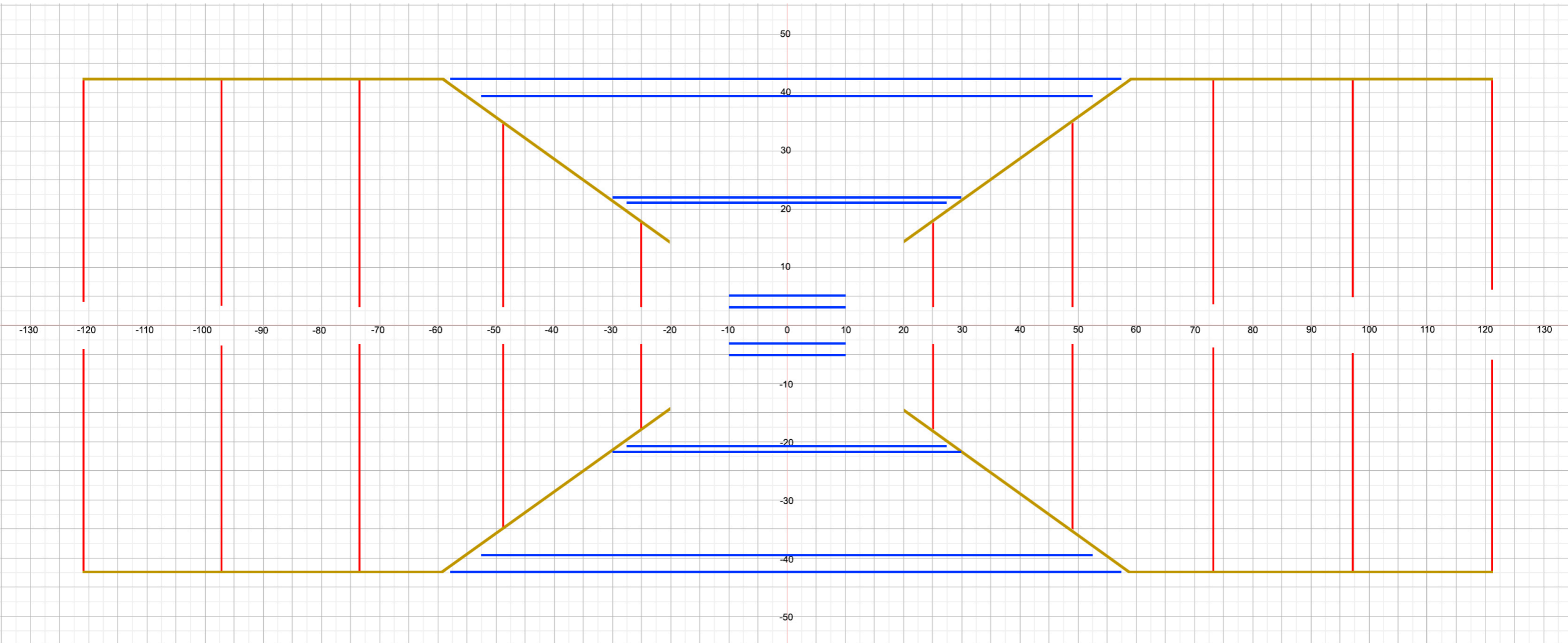
Volume and radiation length estimates for ITS3 like sensor based EIC tracking detector

| | Stave X/X0 | Stave transition (per 100 cm ² of Si surface) | Services (per 100 cm ² of Si surface) | Patch panel (per 100 cm ² of Si surface) |
|--|------------|---|--|---|
| ITS3 like vertexing | ~0.1% | 6.66 cm ³ of material with X/X0 of 0.031 per traversed cm | 2.96 cm ² cross section with X/X0 of 0.002 per traversed cm | 4.32 cm x 1cm x 1 cm with 0.03423 X/X0 per traversed cm |
| ITS3 like barrel (up to 1.5m length) | 0.55 % | 4.286 cm ³ of material with X/X0 of 0.0306 per traversed cm | 1.905 cm ² cross section with X/X0 of 0.002 per traversed cm | 2.778cm x 1cm x 1 cm with 0.03423 X/X0 per traversed cm |
| ITS3 like disc (up to 60 cm diameter) | 0.24% | 6.66 cm ³ of material with X/X0 of 0.031 per traversed cm | 2.96 cm ² cross section with X/X0 of 0.002 per traversed cm | 4.321 cm x 1cm x 1 cm with 0.03423 X/X0 per traversed cm |

https://indico.bnl.gov/event/7449/contributions/36038/attachments/27241/41529/2020_03_20_EIC_Si_services_parametrization_for_sim.pptx

https://indico.bnl.gov/event/8231/contributions/37955/attachments/28329/43586/2020_05_15_EIC_Si_material_projections.pptx

Proposed Material Budget Changes



- stave material budget:
 - 0.3% X/X_0 everywhere



- vertexing layers: 0.05% X/X_0
- remaining barrel layers: 0.55% X/X_0
- disks: 0.24% X/X_0

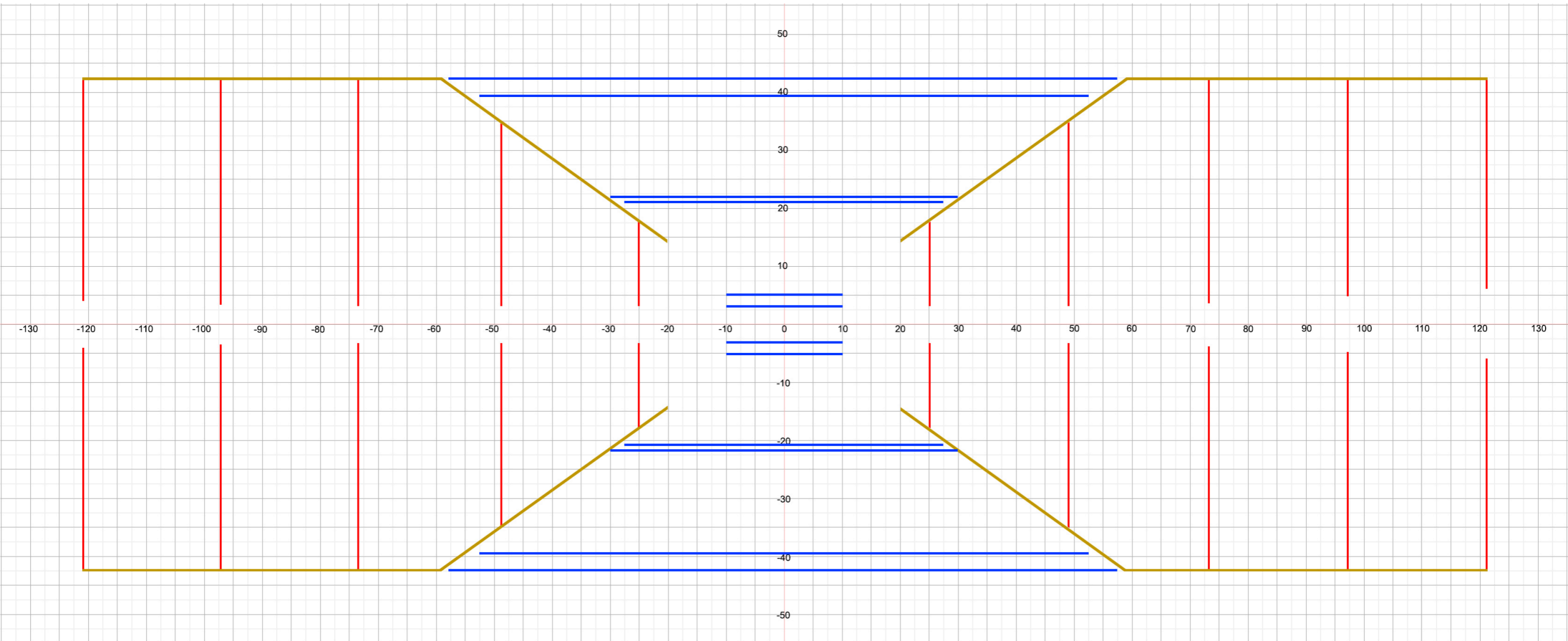
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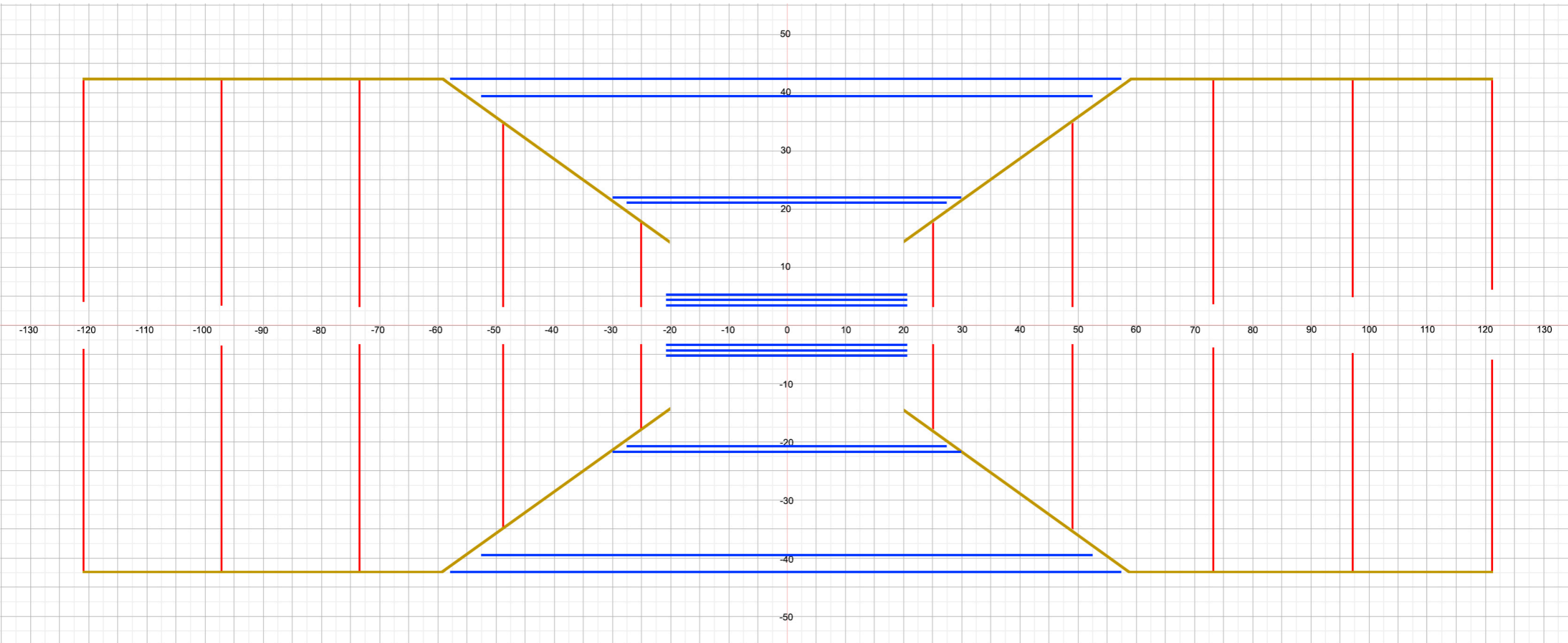
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Proposed Vertexing Changes



- two short (0.3% X/X_0) vertexing layers

Proposed Vertexing Changes



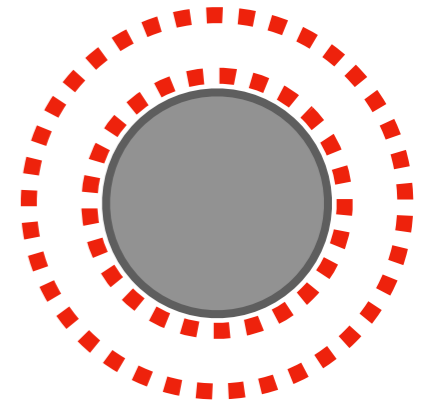
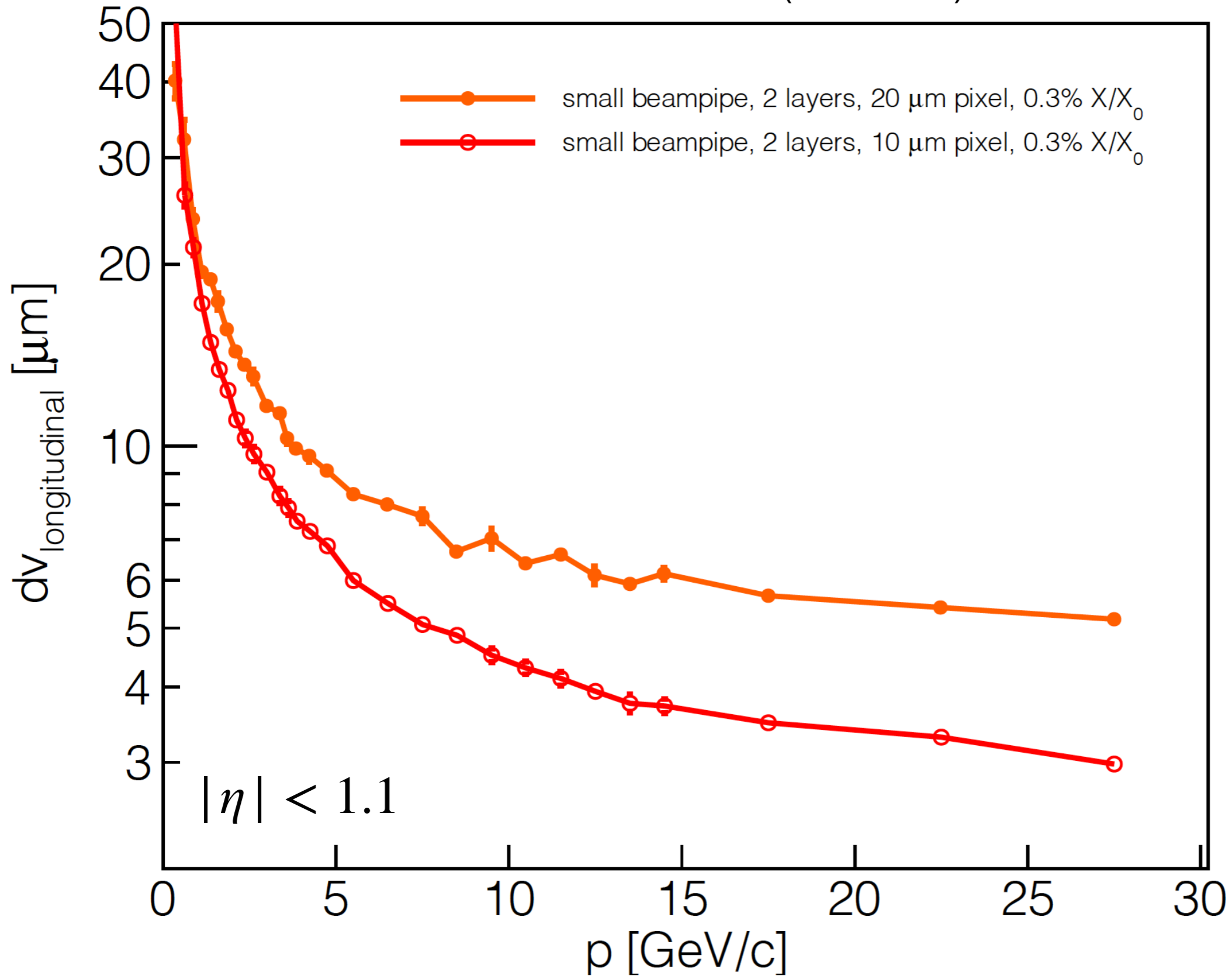
- two short ($0.3\% X/X_0$) vertexing layers



- three long ($0.05\% X/X_0$) vertexing layers

Vertexing layers

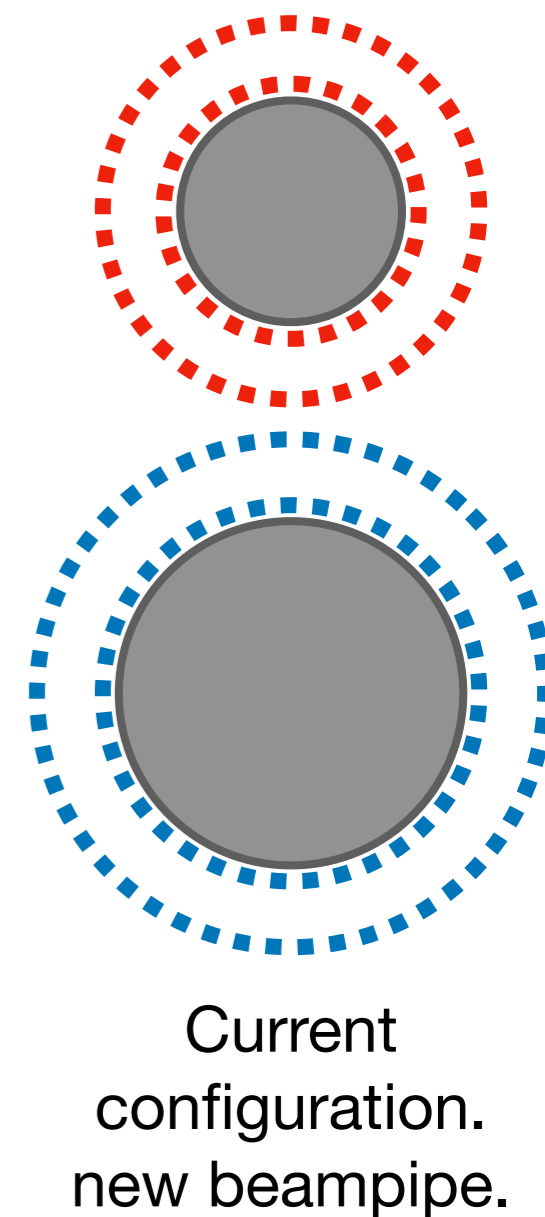
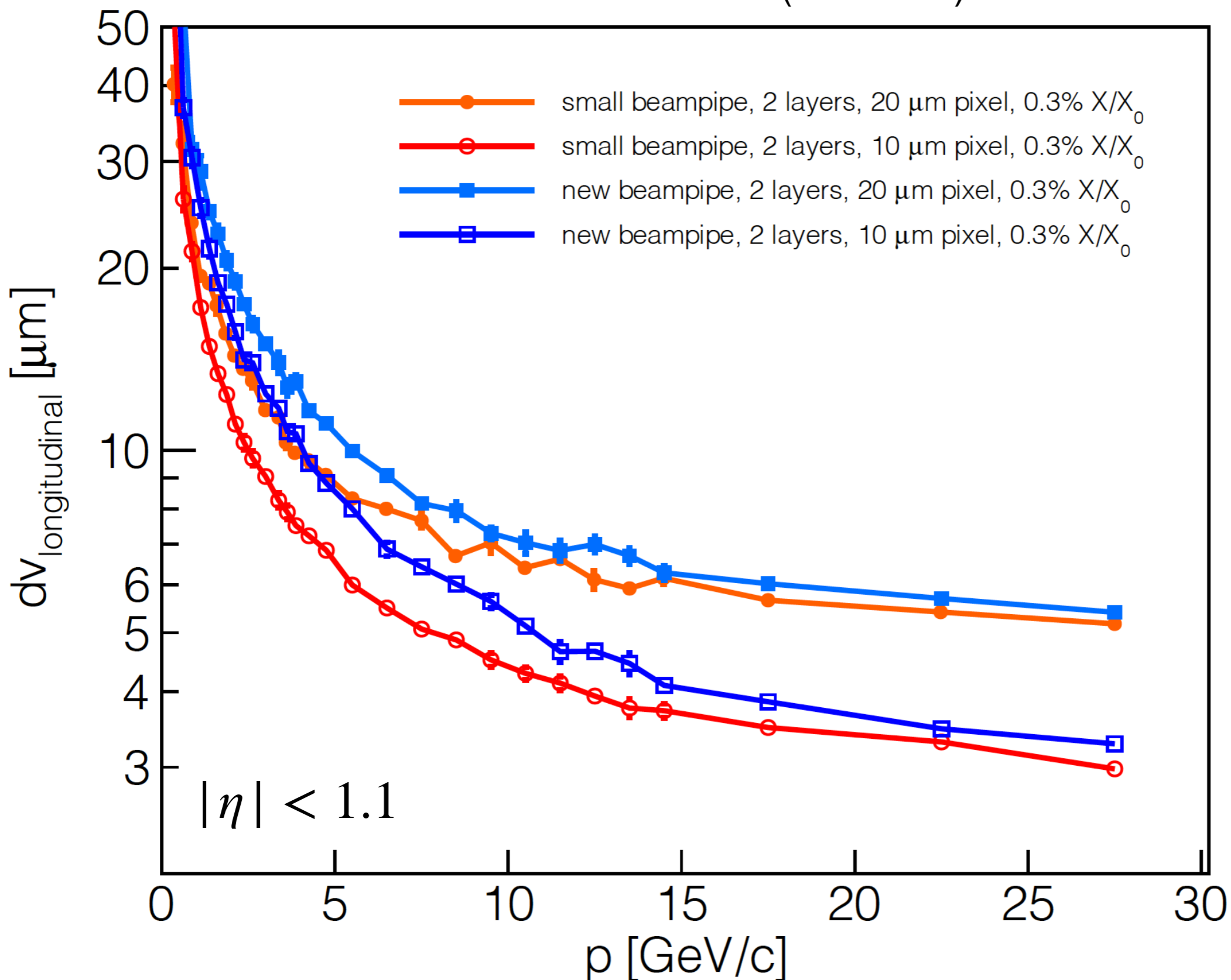
Full Simulation Results (3.0 T field)



Original configuration by Ernst and Yue Shi. Small-radius beampipe.

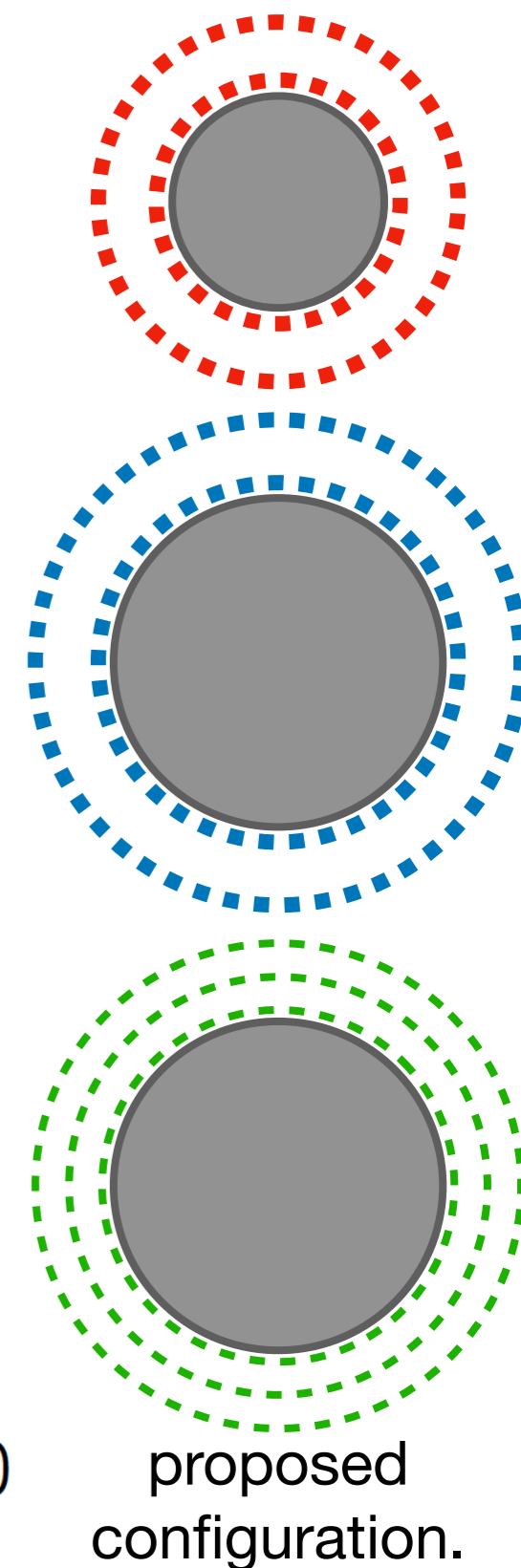
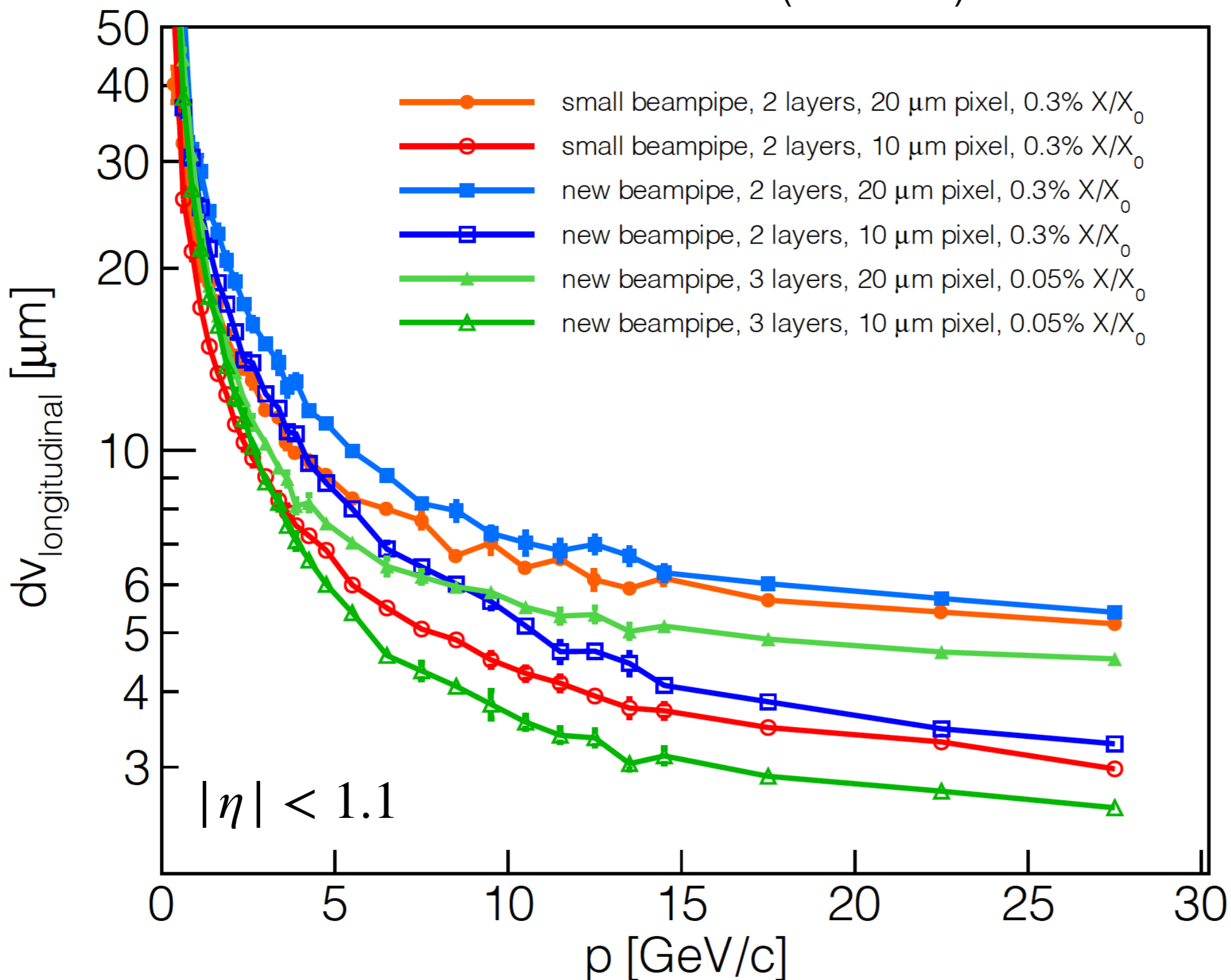
Vertexing layers

Full Simulation Results (3.0 T field)



Vertexing layers

Full Simulation Results (3.0 T field)



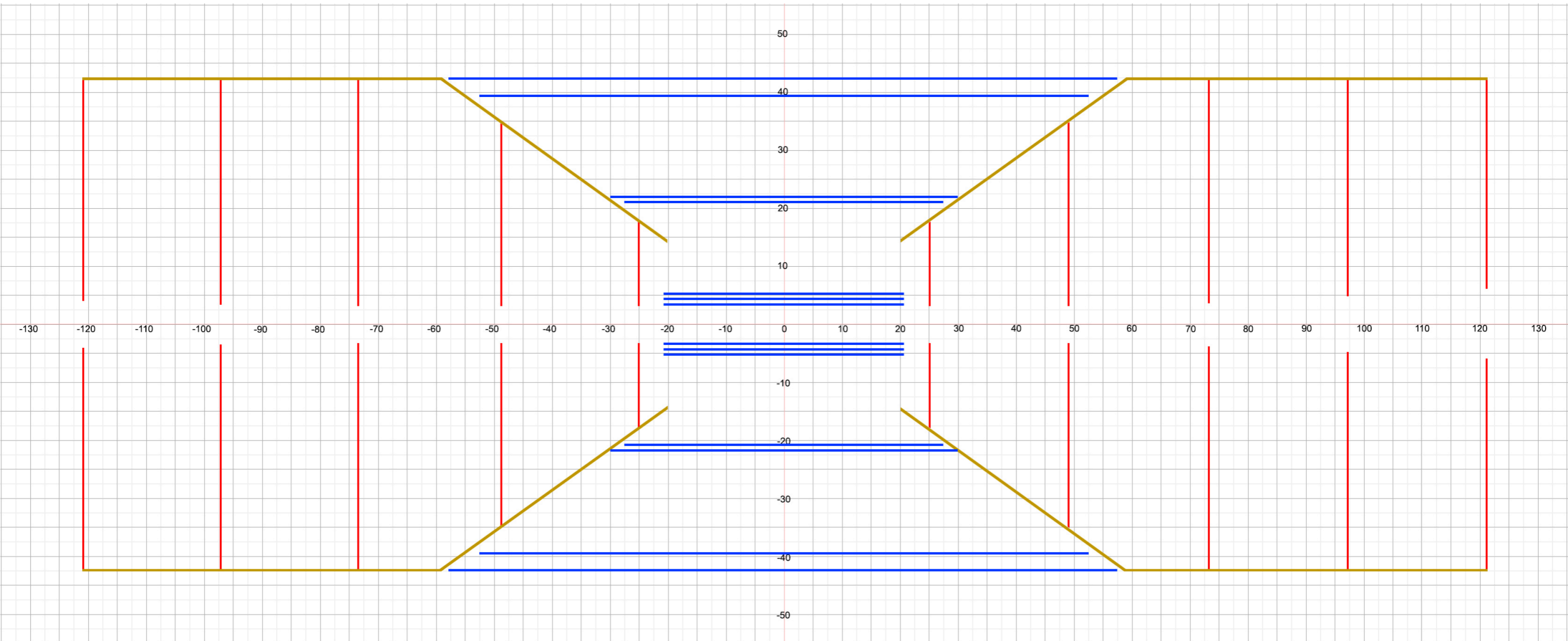
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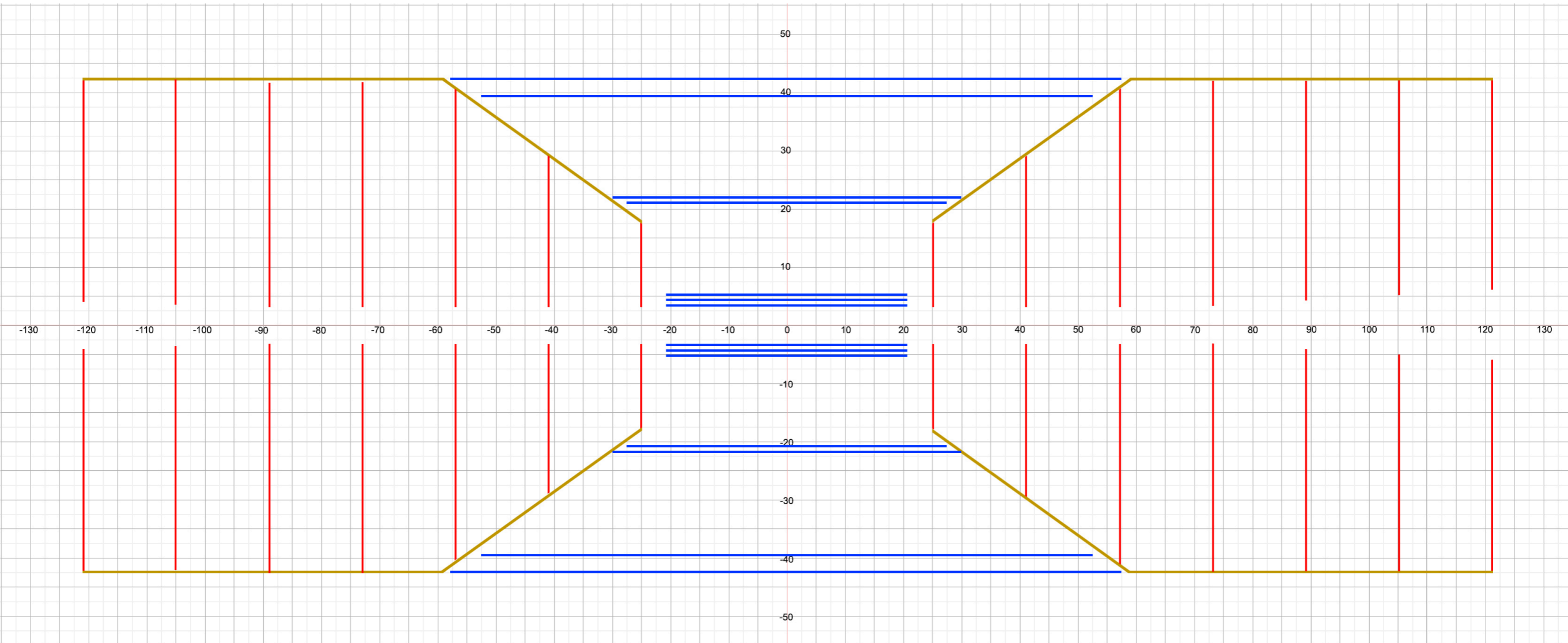
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Proposed Disk Changes



- five (0.3% X/X_0) disks (each direction)

Proposed Disk Changes

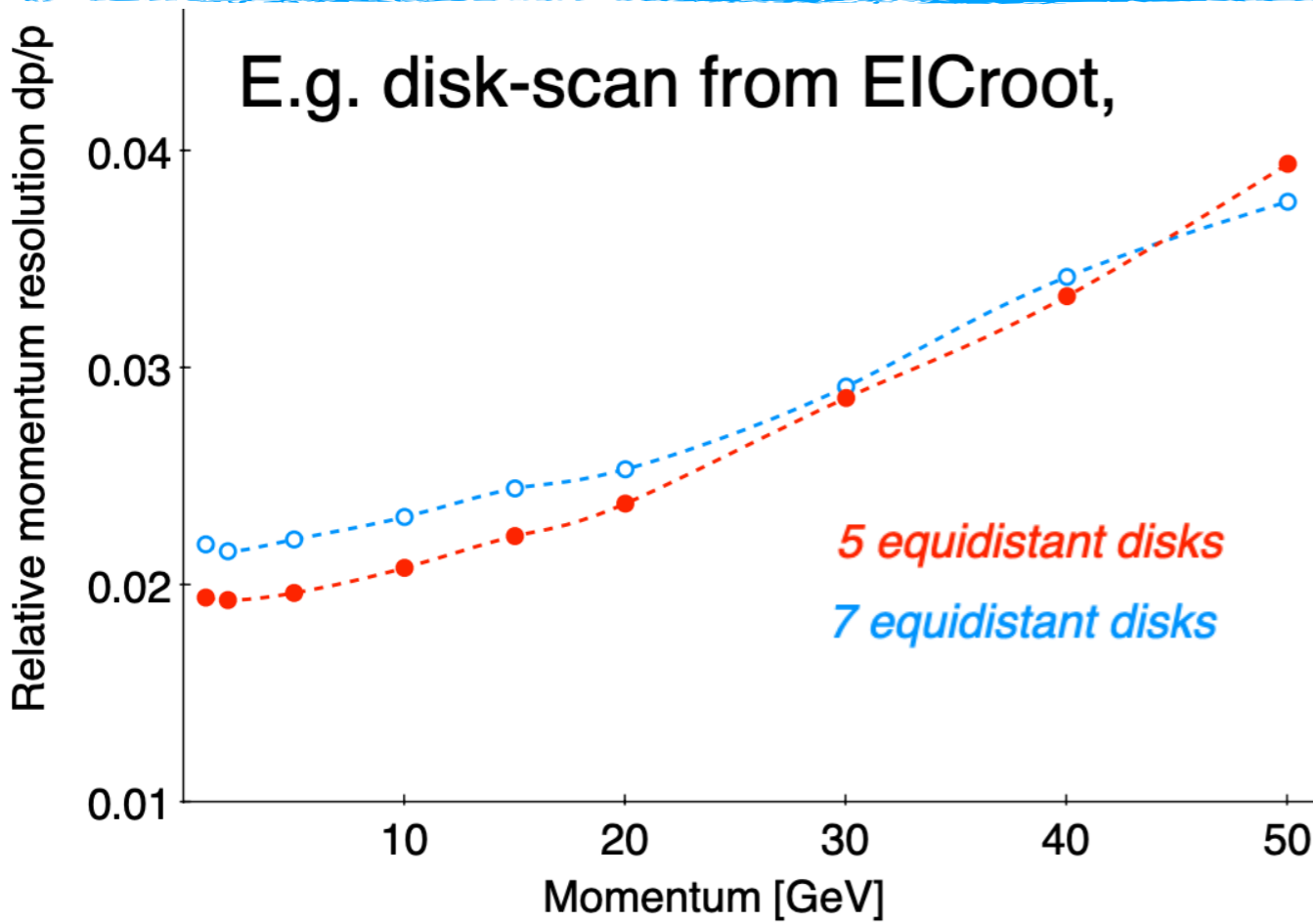


- five ($0.3\% X/X_0$) disks (each direction)



- seven ($0.24\% X/X_0$) disks (each direction)

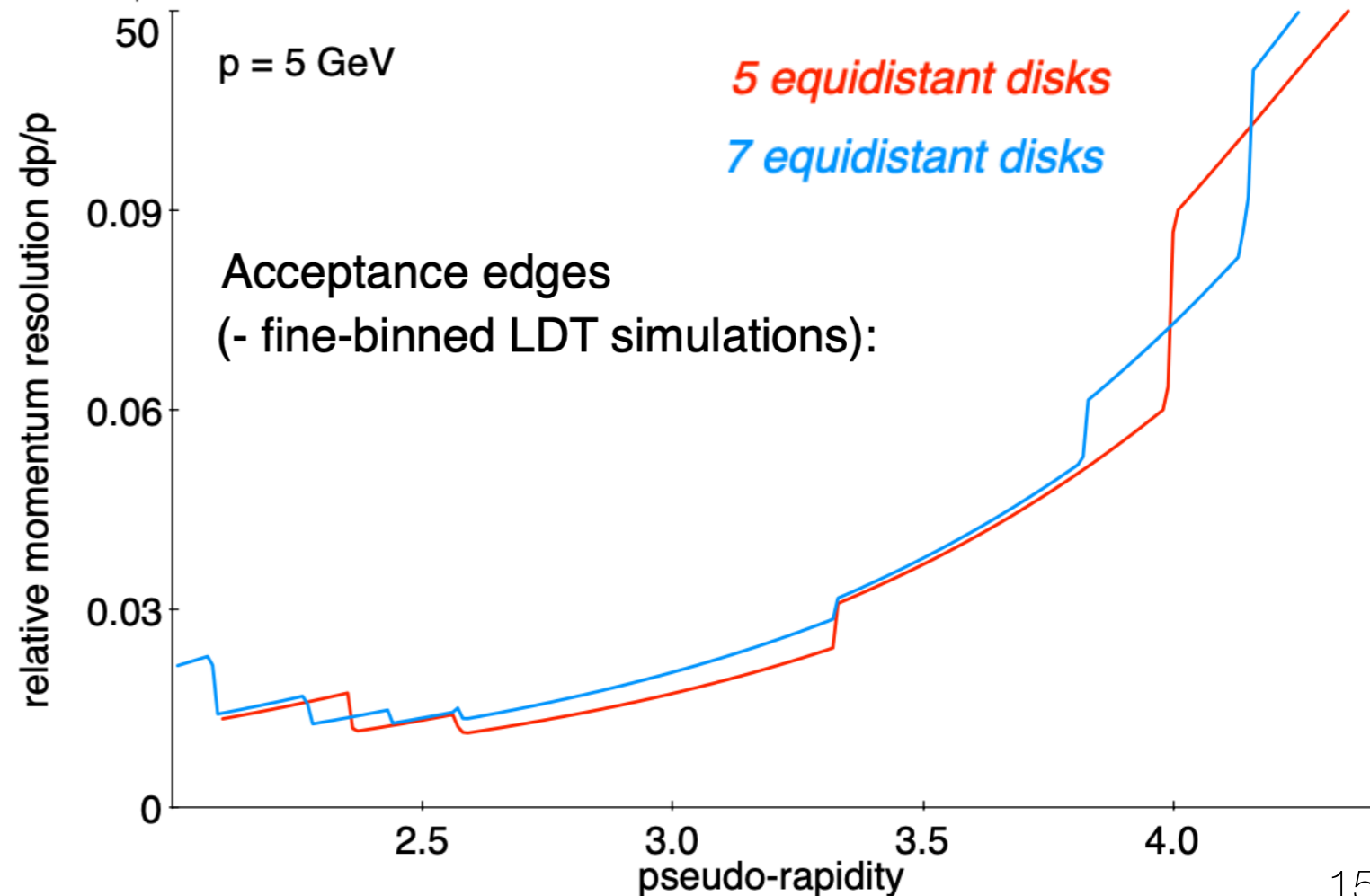
Fast-Simulation Results



eRD16+ - simulations

E. Sichtermann

Equidistant disks with $20\mu\text{m}^2$ pixels, $0.25 < z < 1.21\text{m}$,
3T field ("open field"), $\eta = 3$



Affected by
dip-angle and curvature measurement ($20\mu\text{m}$ pixels),
acceptance (18mm inner radii and 185mm out radii),
positions (disks are equidistant in z ; nominal collision vertex),
traversed material (0.3% beam-pipe, 0.3% for each disk).

Fast-Simulation Results

