

Revised Q2pF Lead End for updated turn-to-turn spacing

Ramesh Gupta
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@BrookhavenLab

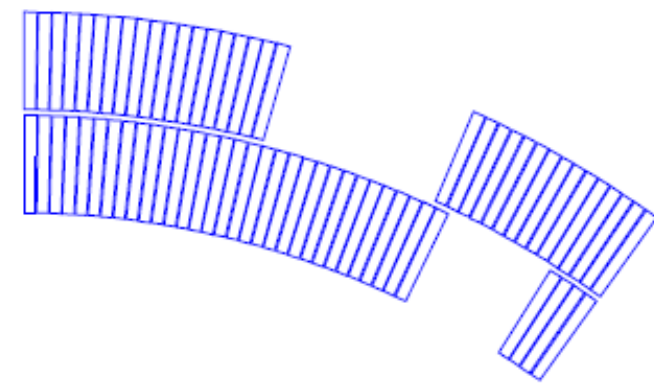
Updated Lead End

- **Cross-section was updated to accommodate a significant change in turn-to-turn spacing (from 0.12 mm to 0.0965 mm).**
- **Therefore, the end design needs to be updated. “Return End” was presented last time. This one is for “Lead End”.**
- **Need to assure a good field quality (end harmonics) and low peak fields with desired layout of end turns (Min. tilt angle 70 degrees).**

Final optimization after the feedback from the single turn winding trials

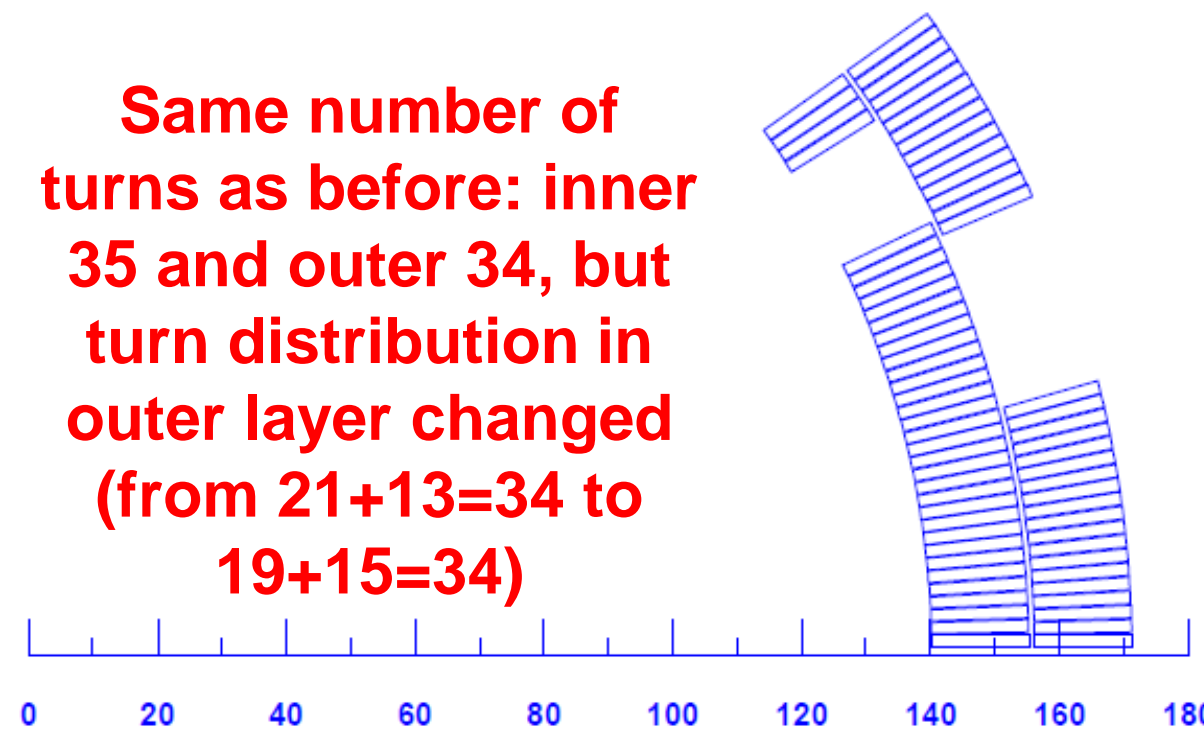
Revised X-section with Symmetric Wedges

- Uses EIC Quad Cable
- Field Quality Optimized
- Peak field Optimized
- Poles of Outer and Inner aligned
- Wedges made exactly symmetric
- Collaring process should provide a good pre-stress (note: wedge shape at poles)



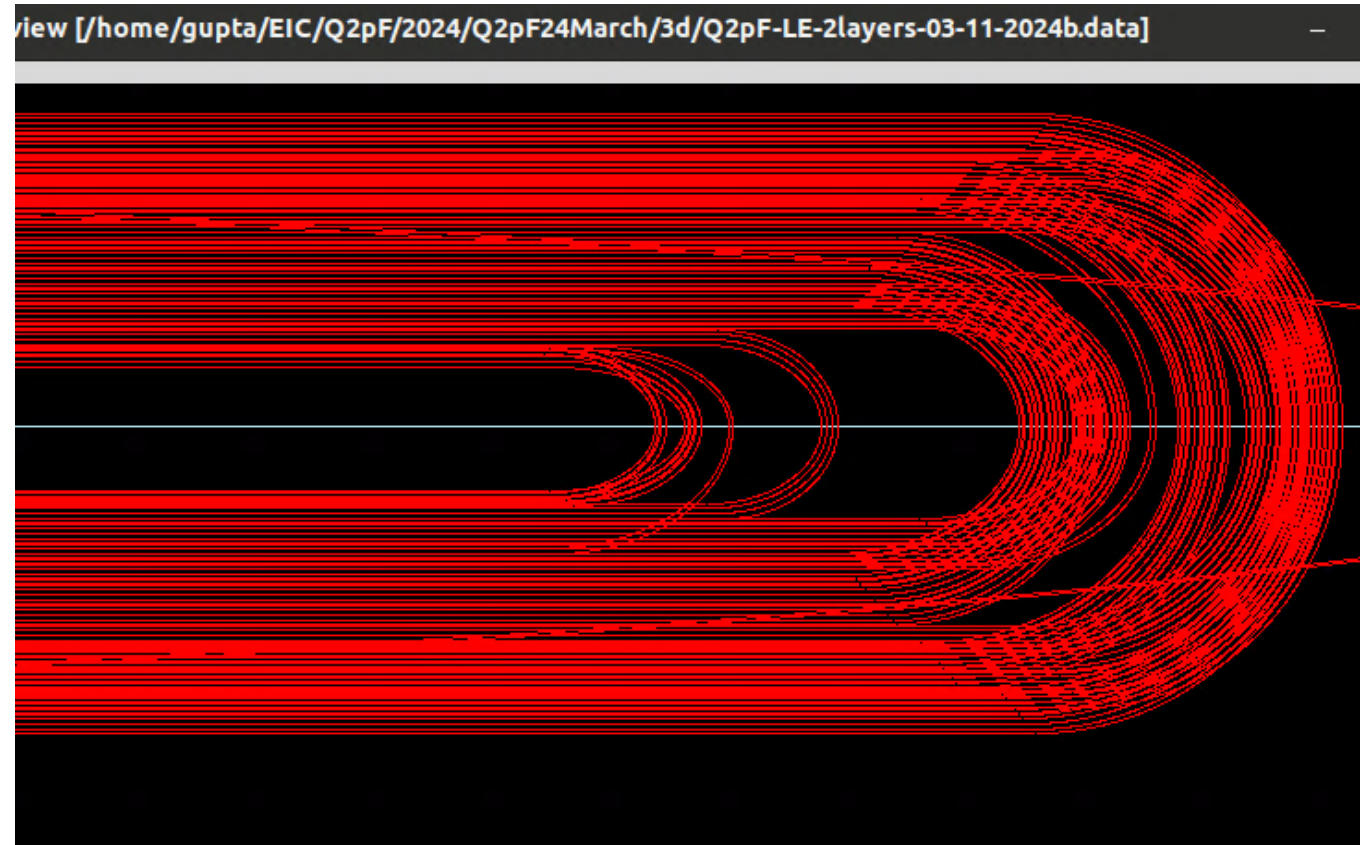
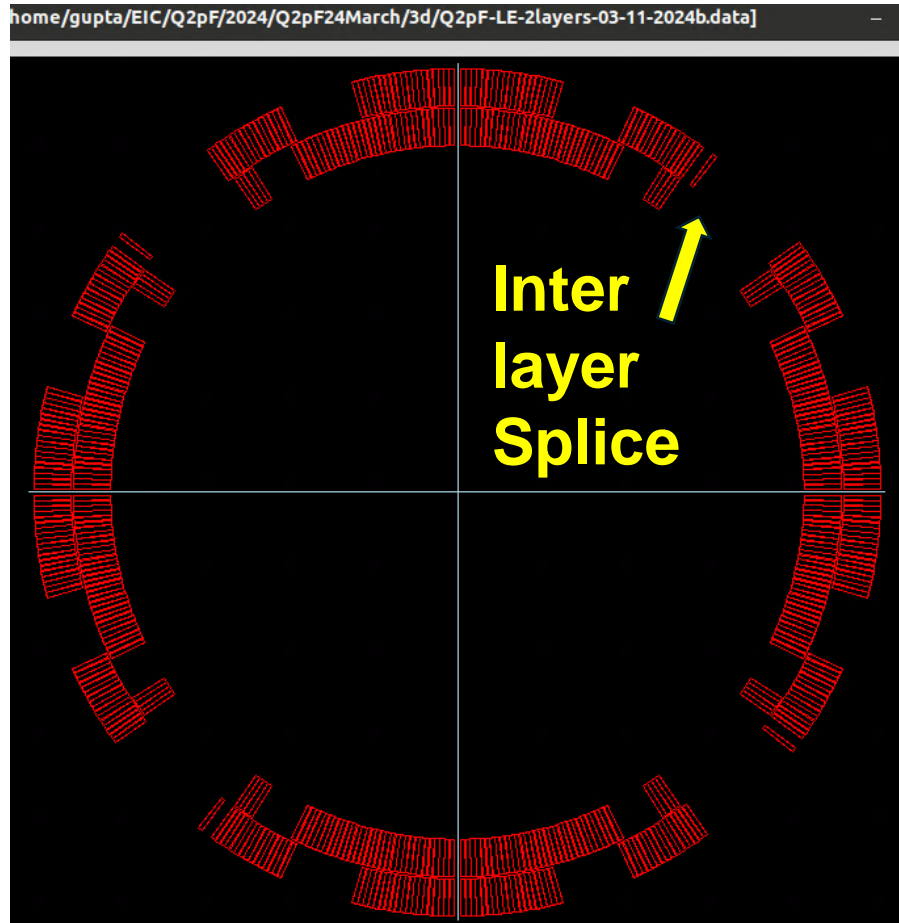
Looks good mechanically

Same number of turns as before: inner 35 and outer 34, but turn distribution in outer layer changed (from $21+13=34$ to $19+15=34$)

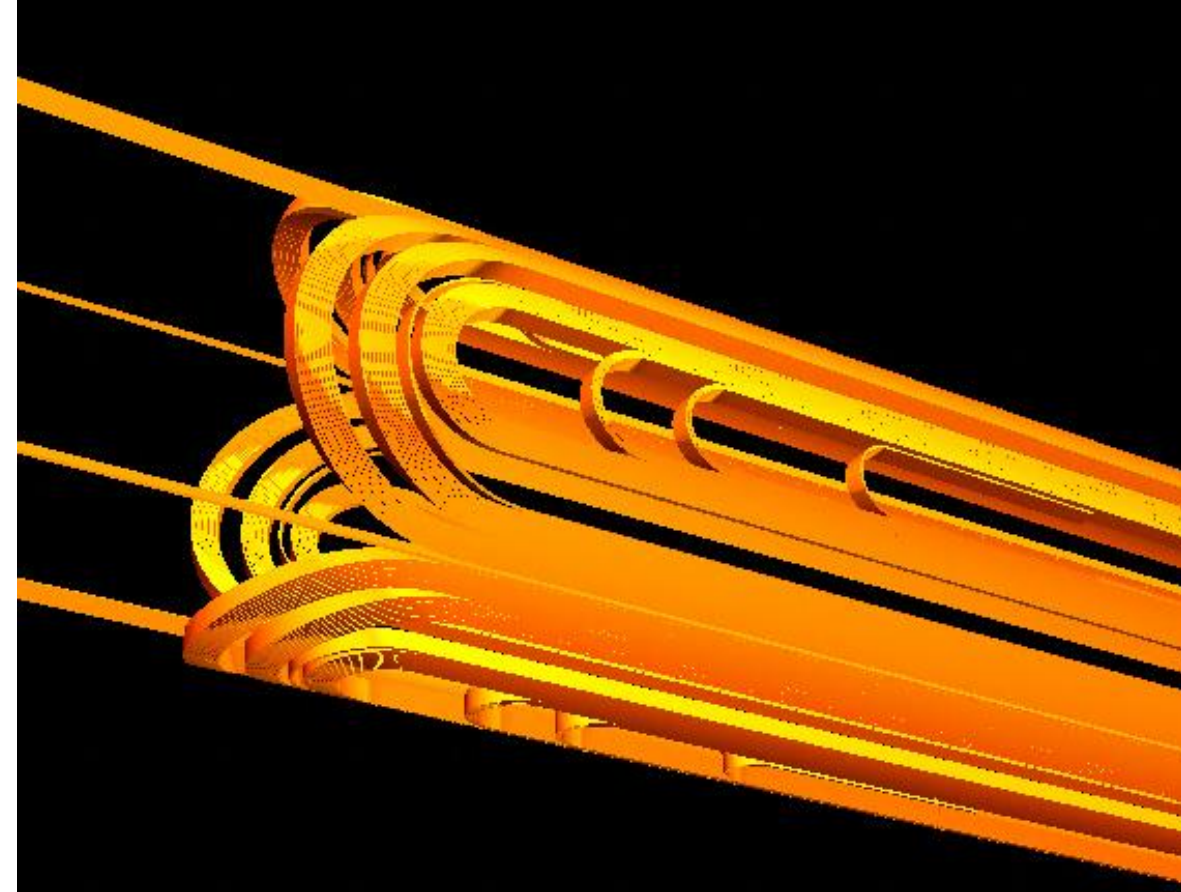
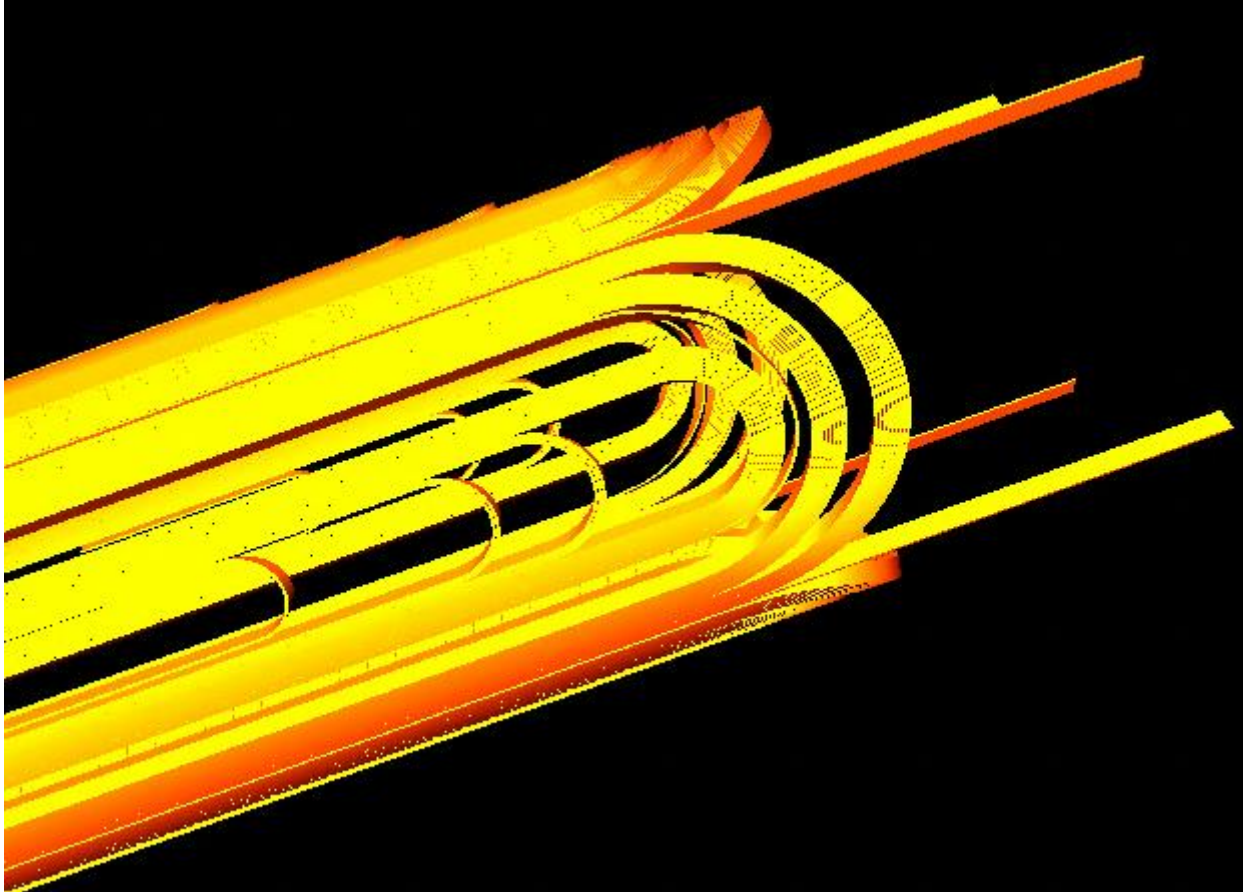


Lead End for updated turn-to-turn spacing (min tilt angle 70°)

- End turns of the outer layer and the inner layers aligned

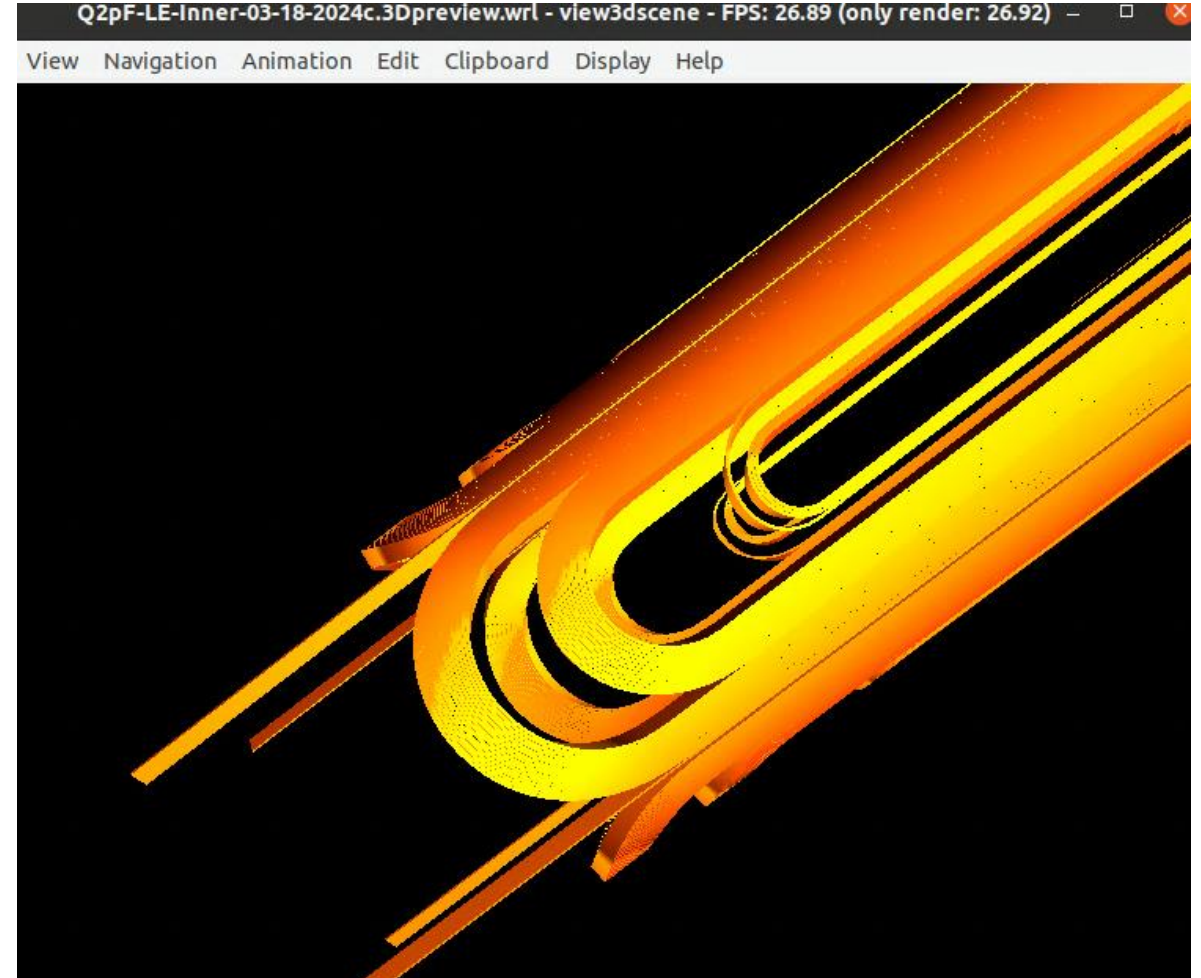
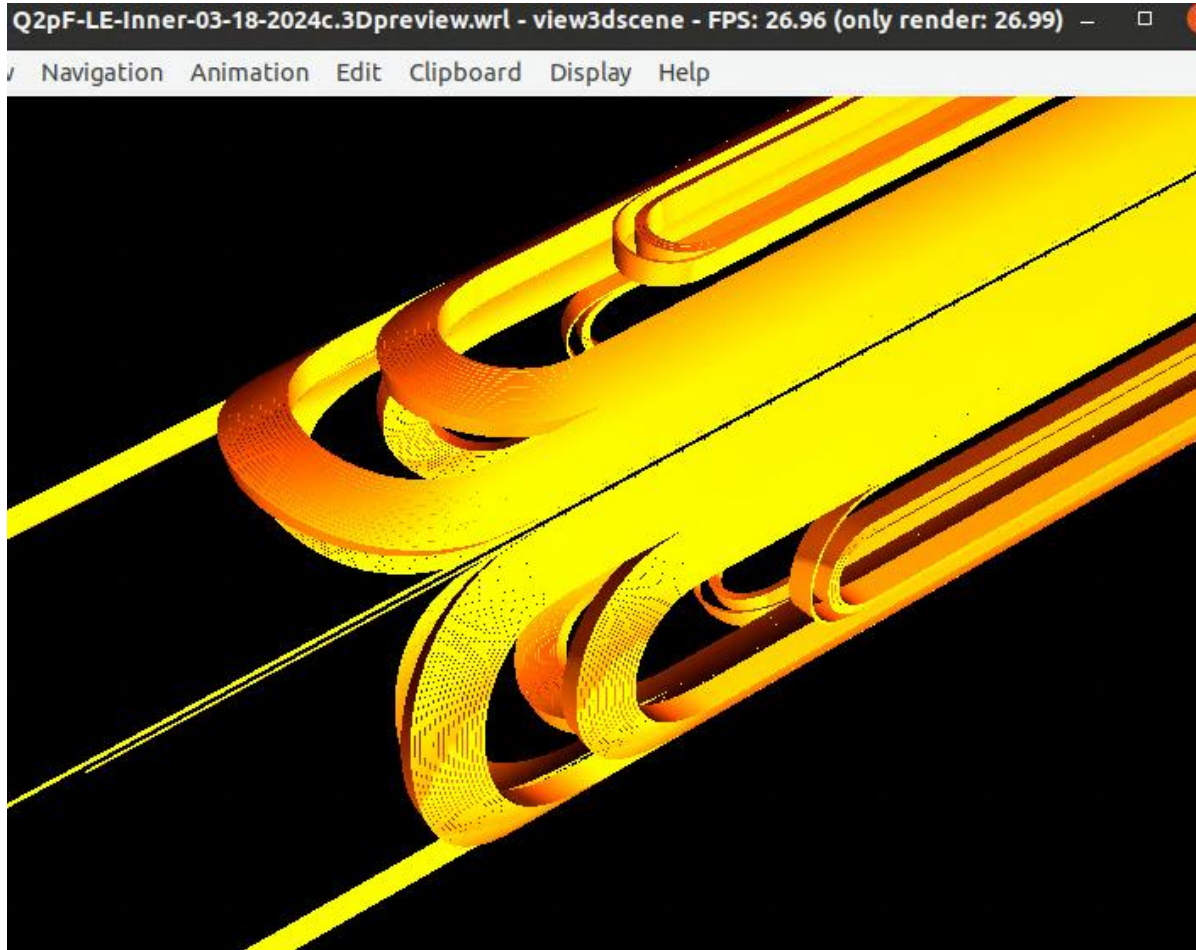


Renderings of the Outer Layer of the Lead End



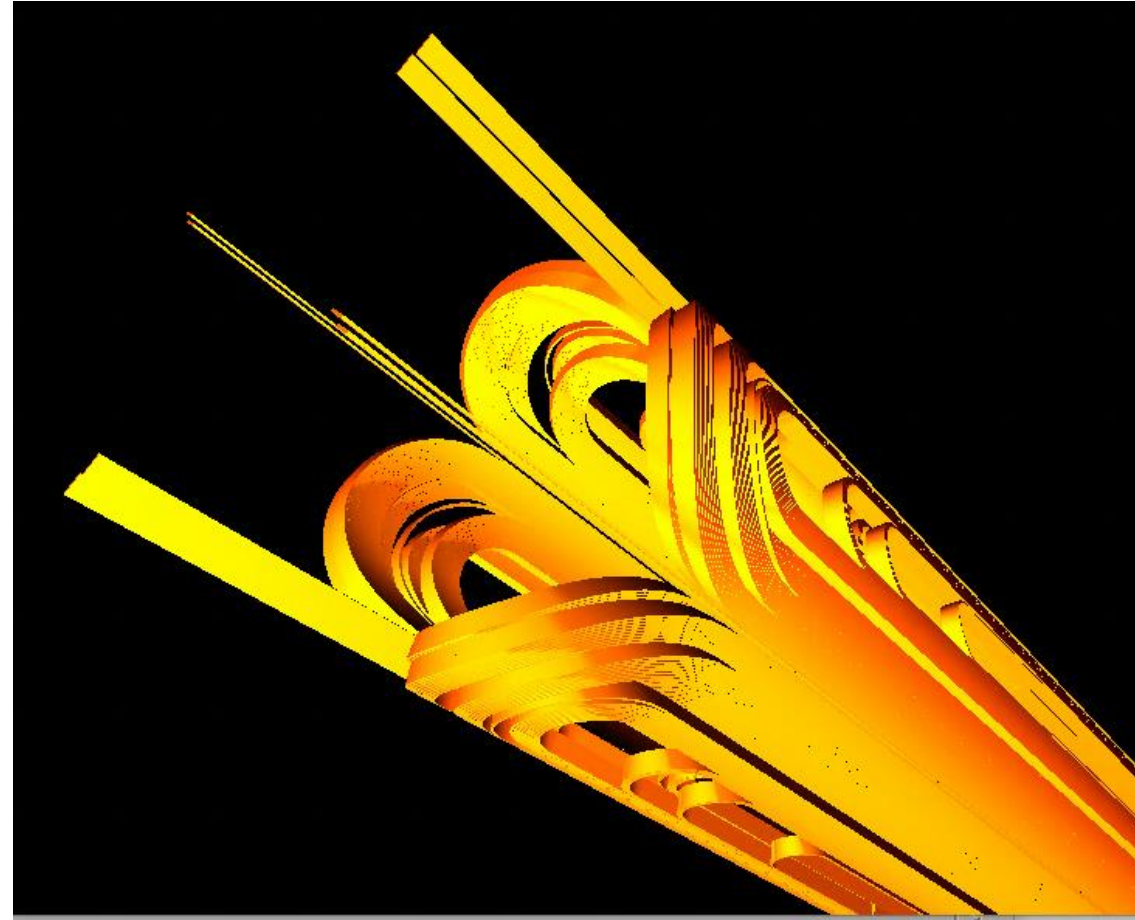
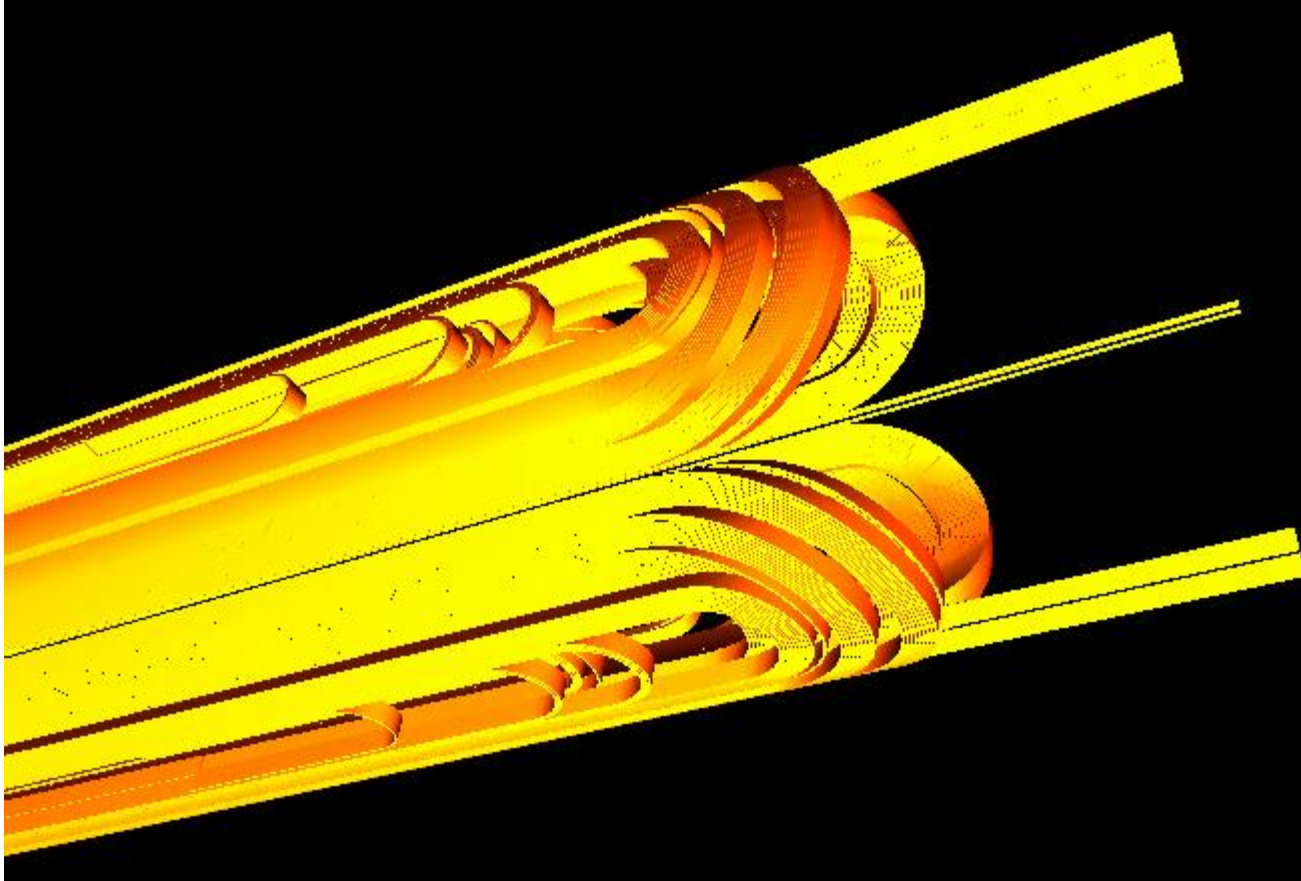
Looks reasonably ok; to be examined more carefully

Renderings of the Inner Layer of the Lead End



Looks reasonably ok; to be examined more carefully

Renderings of Both Layers of the Lead End



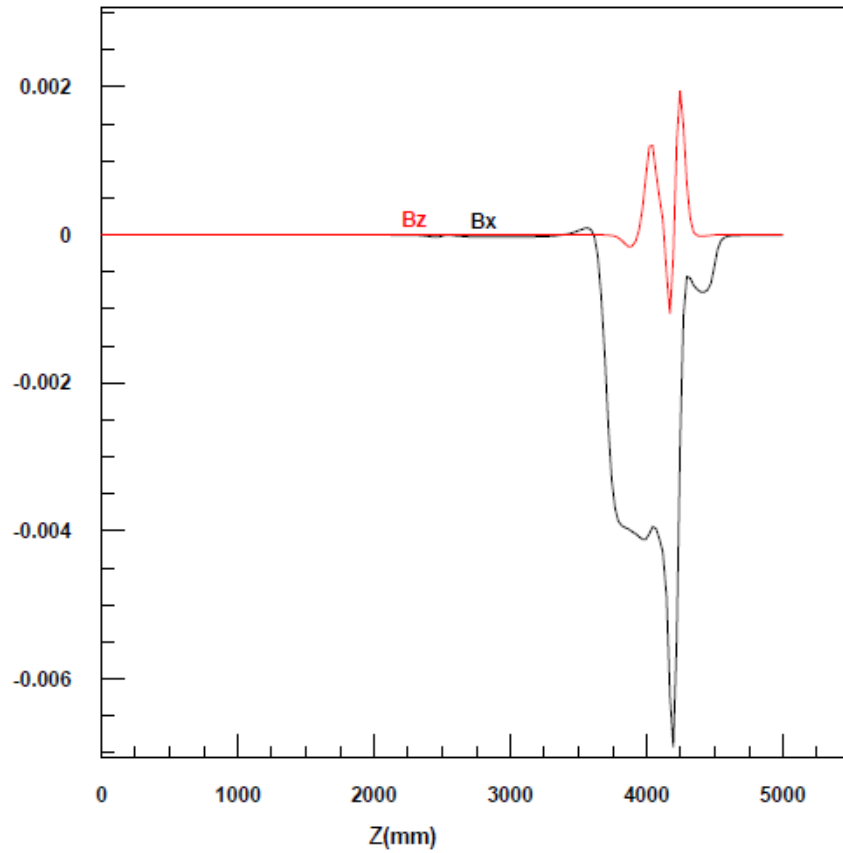
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Field along the z-axis at a radius of 100 mm on the horizontal axis and vertical axis

Q2pF15mm: TWO Layers Lead March 2024

24/03/20 14:24

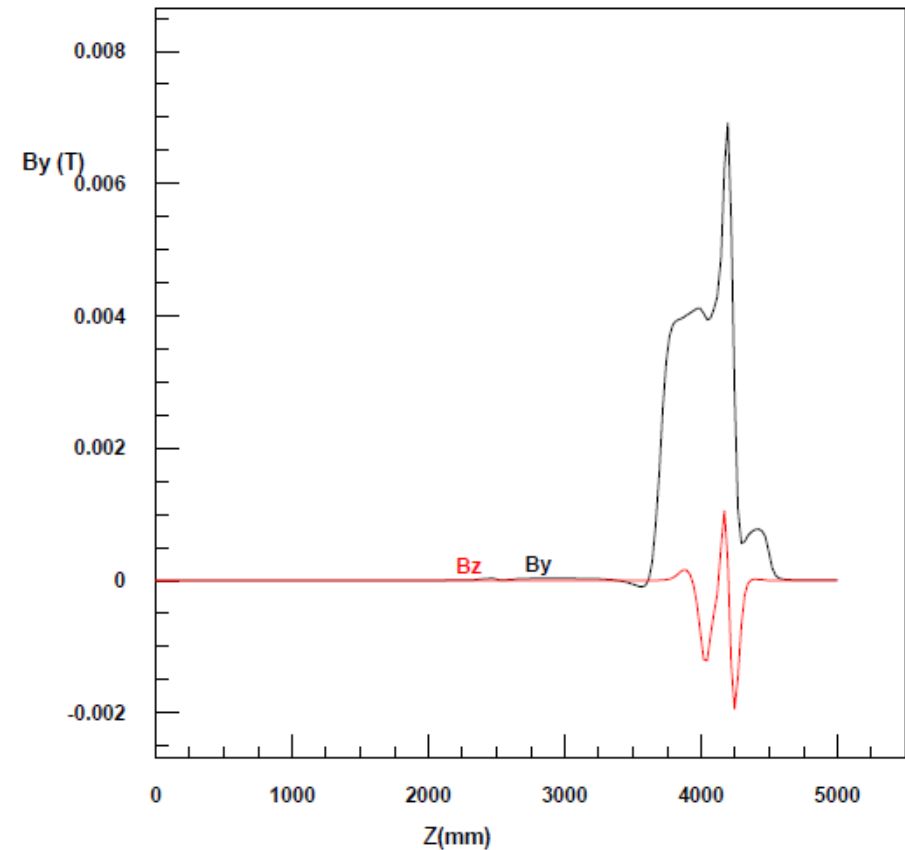
Q2pF Outer Layer, x=100, y=0



Q2pF15mm: TWO Layers Lead March 2024

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Q2pF Outer Layer, x=0, y=100



Field harmonics B_6 and B_{10} along the z-axis

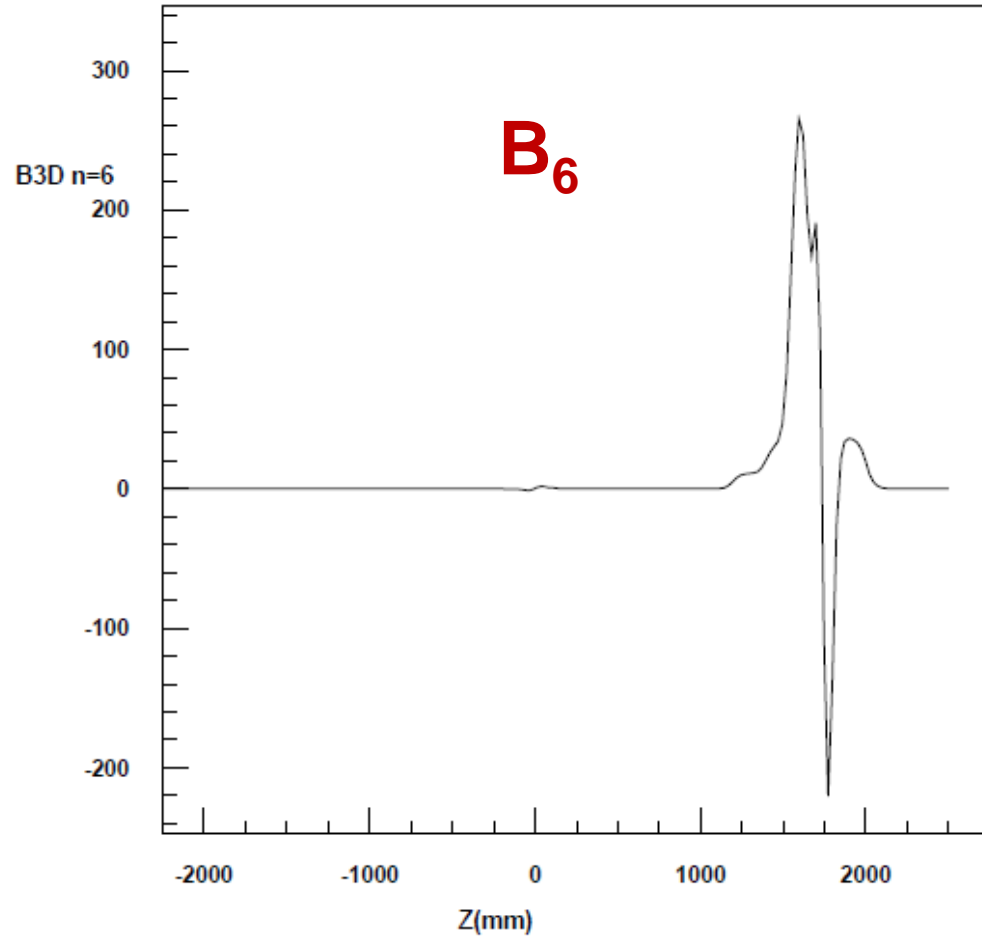
Q2pF15mm: TWO Layers Lead March 2024

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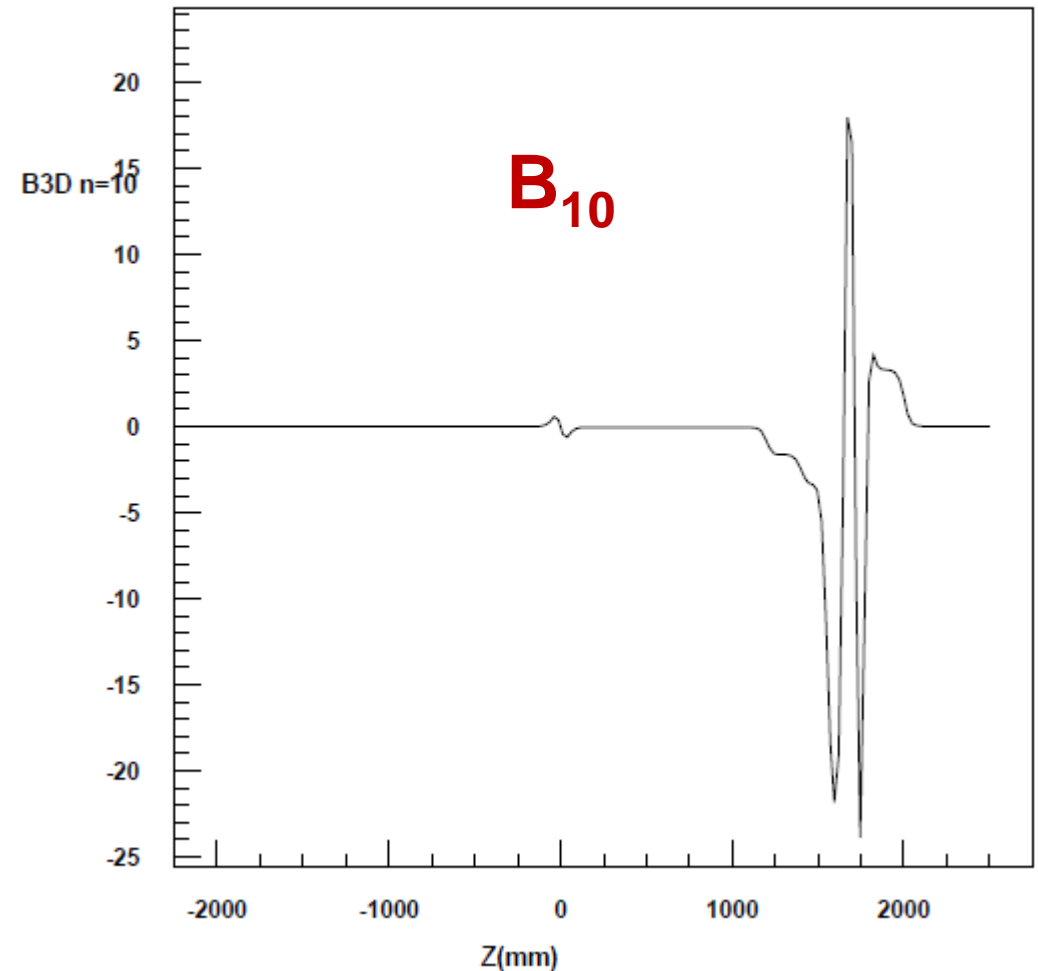
Q2pF15mm: TWO Layers Lead March 2024

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Q2pF Outer Layer, Bn



Q2pF Outer Layer, Bn



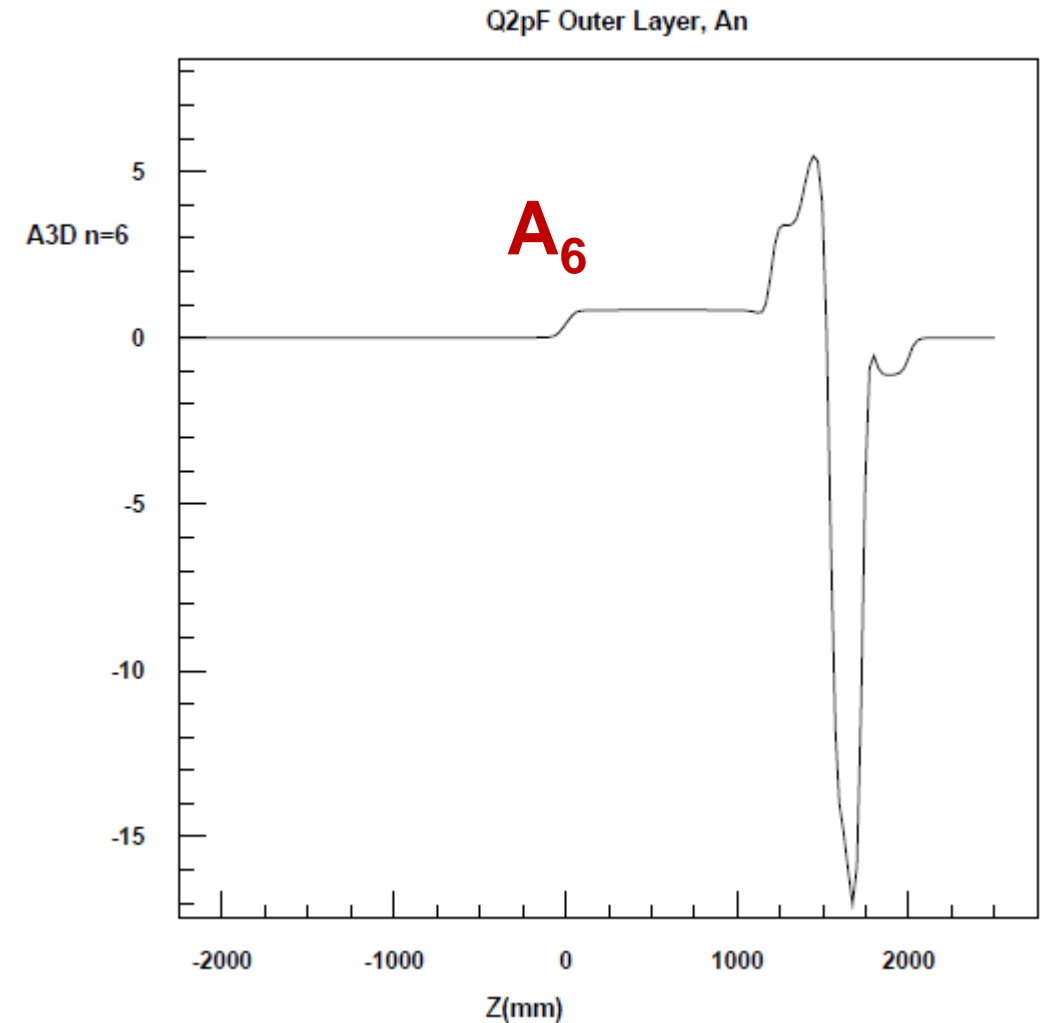
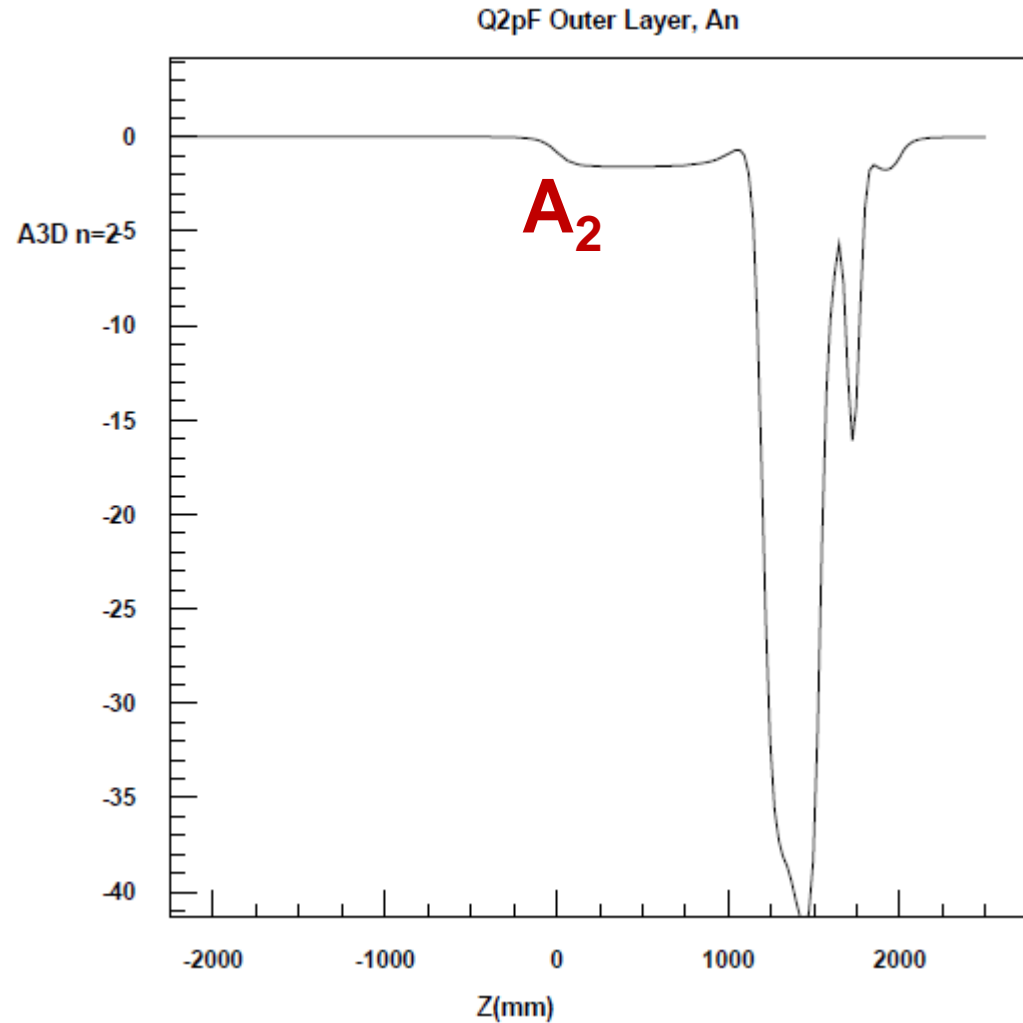
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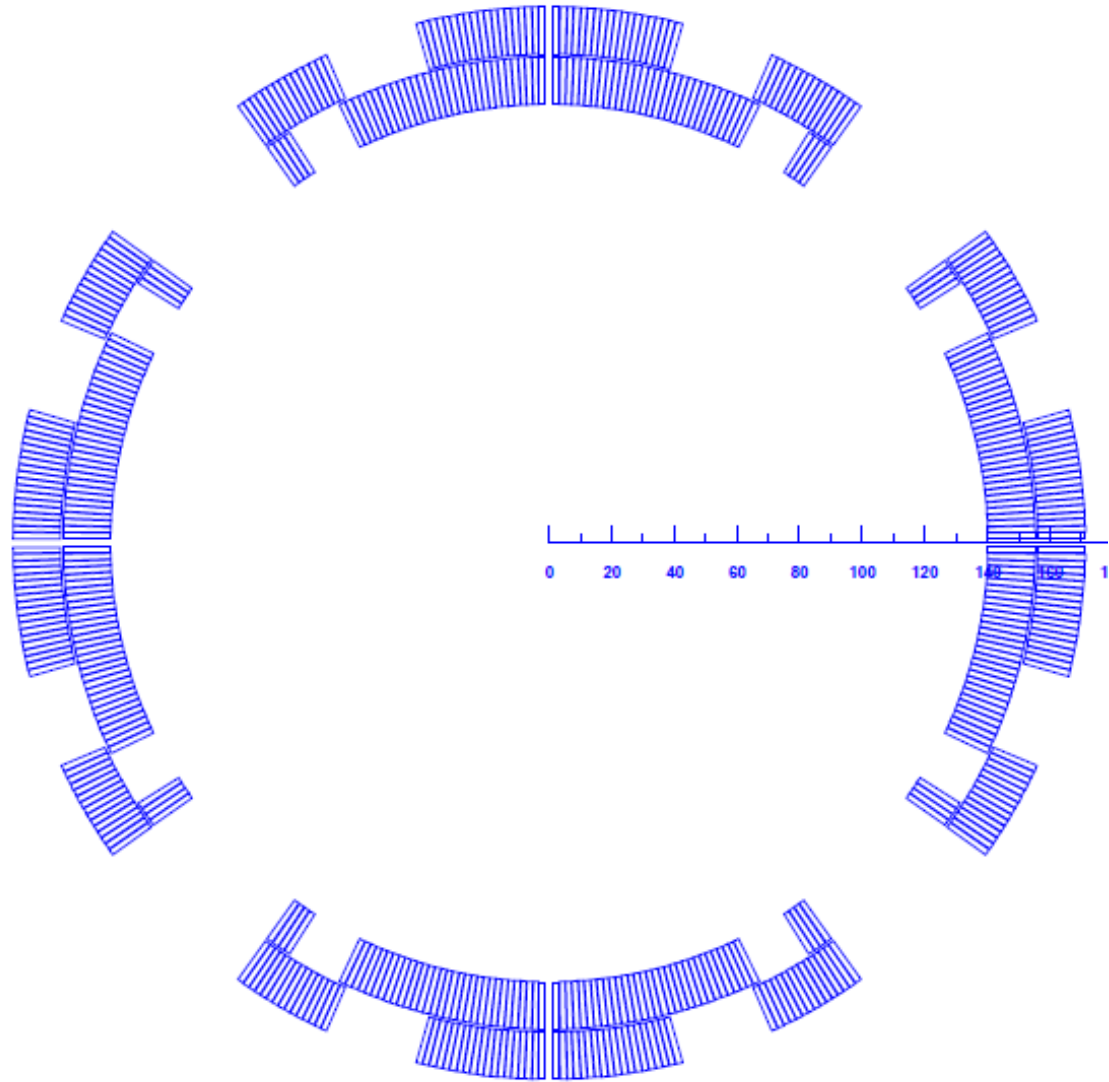


Summary

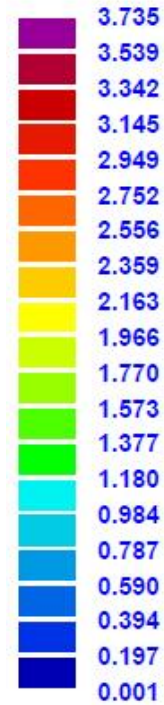
- **Initial lead end design completed for the updated turn-to-turn spacing**
- **Next : Update with the lead end and return end combined**
- **Final finer optimization of both lead end and return end to be performed after the winding trials (just in case the parameters have to be adjusted)**

Extra Slides

Cross-section (ROXIE)



|Btot| (T)



ROXIE_{10.2}

