

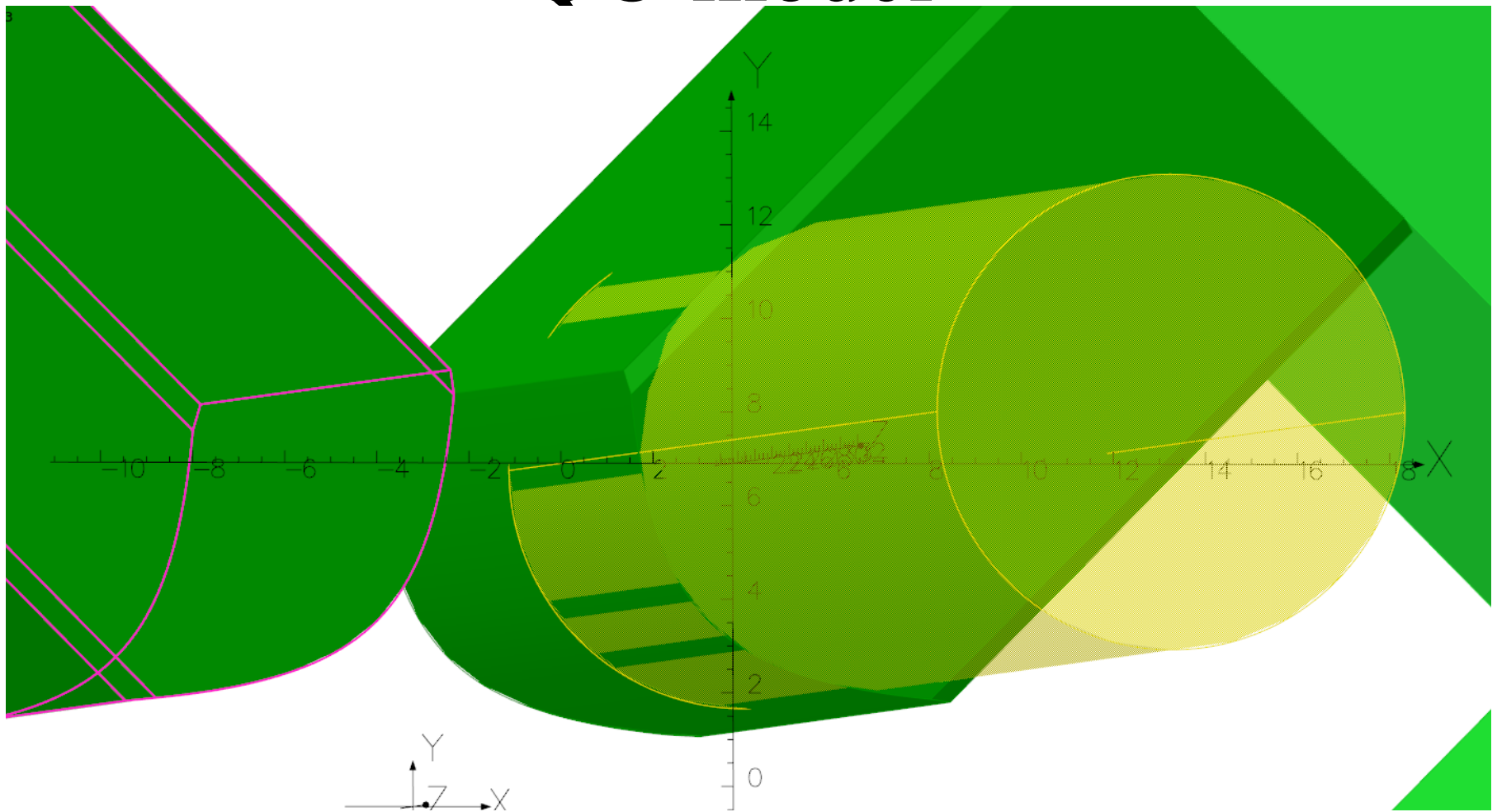
Hall A Moller Polarimeter Quads

Jay Benesch
31 January 2019

Background

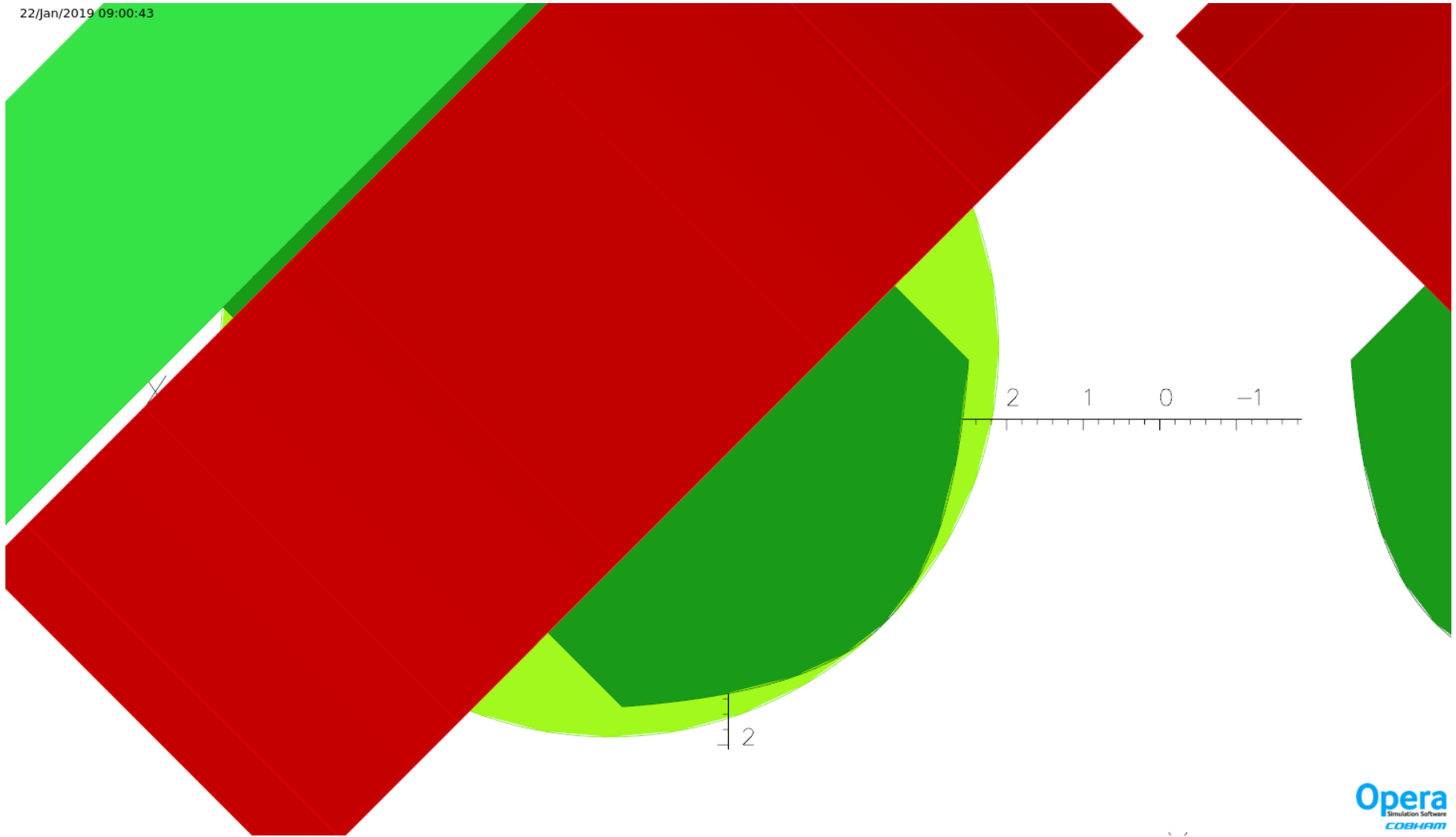
- Sasha Glamazdin prepared initial models. QO (Q1, Q3, Q4) from Wines STP file. QM from rough measurements and I hope it's incorrect.
- He sent me models because allowed Fourier components were high
- I remeshed and ran many cases with three BH curves
- See TN-19-001 for more information
- Spreadsheets of Fourier components and field maps were provided to those working on polarimeter modeling.

QO model



4" cylinder superimposed on pole to show that its cross-section is a conical section other than a circle. Quadrupoles generally have hyperbolic poles with modifications to reduce 12-pole and 20-pole components, "allowed multipoles"

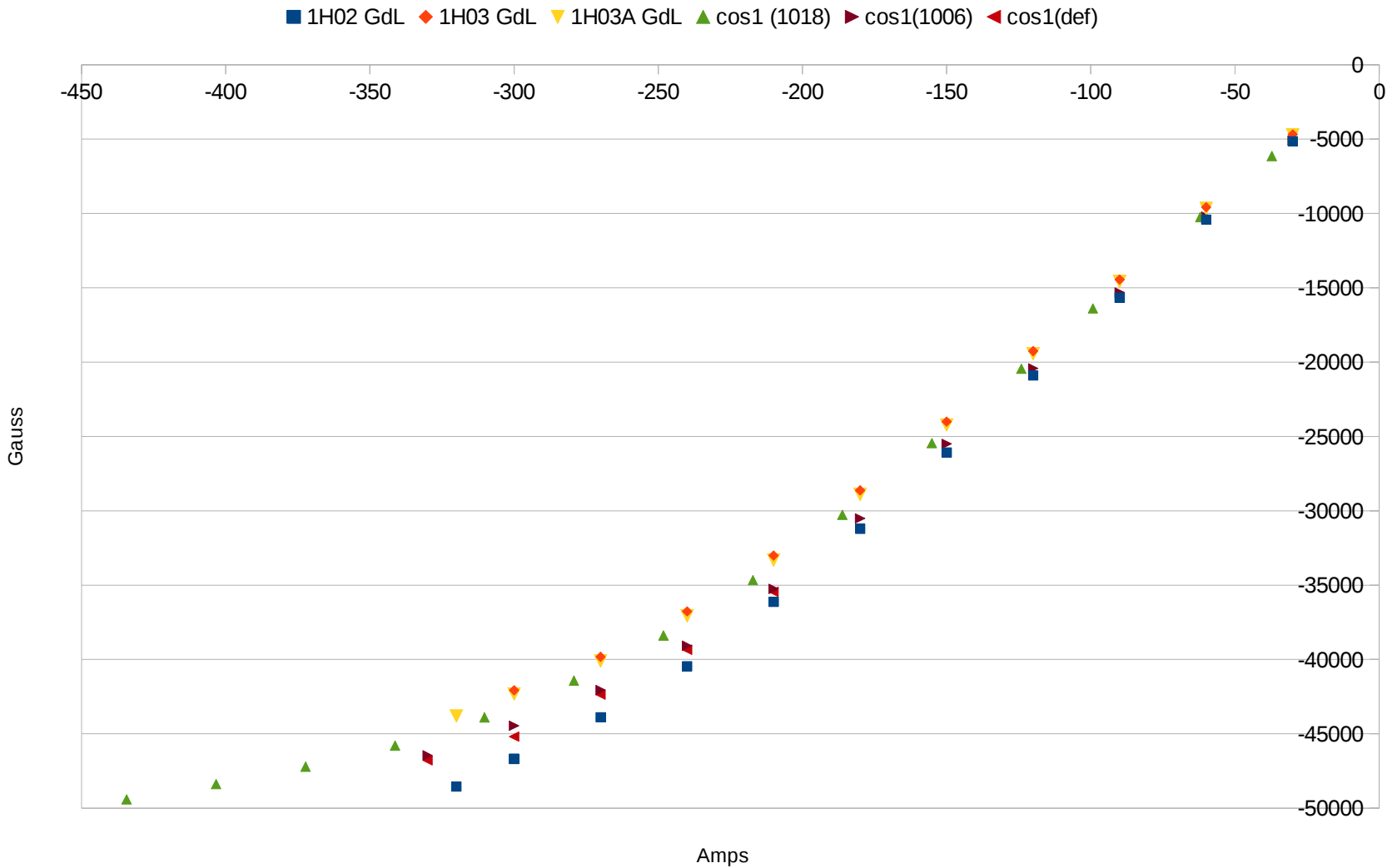
QM model



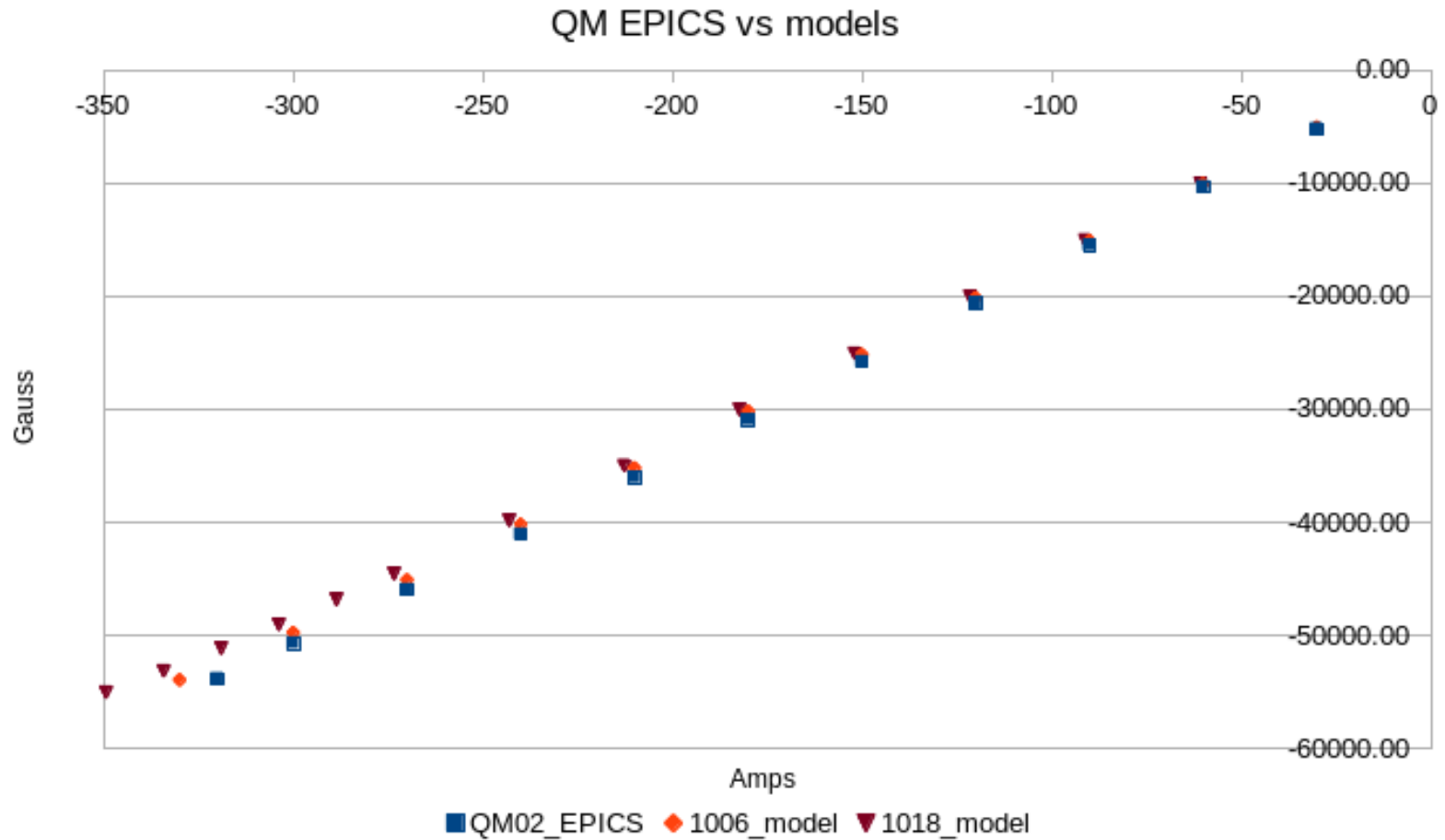
QM model with 4" cylinder behind it. Unlike the QO the pole has steeper slope than cylinder.

QO GdL vs Current, varying BH

QO CED field maps vs three Opera BH models



QM GdL vs current, varying BH



Allowed Fourier Components

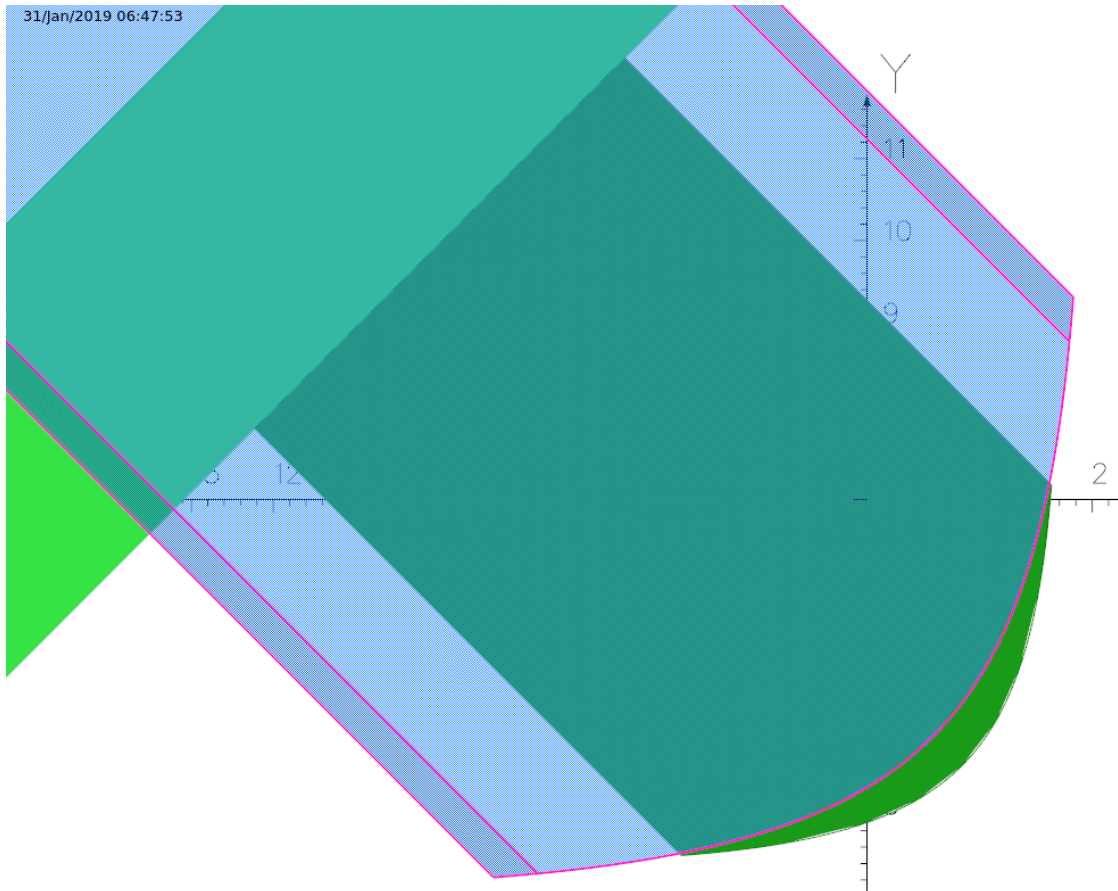
	12-pole	20-pole
QM at 4 cm R	5.5% of quadrupole	0.5% of quad
QM at 4.8 cm R	13.6% of quad	1.3% of quad
QO at 4 cm R	2.1% of quad	0.14% of quad
QO at 4.8 cm R	5.3% of quad	0.36% of quad

IR of 4" tube ~4.8 cm

Summary

- At radii of interest to Accelerator these quads are fine.
- At radii of interest to precise polarimetry detailed simulations are needed (Syracuse and Temple) for each beam momentum
- BTW: Effect on beam envelope of unscattered electrons of polarimeter settings ought to be examined for open detectors, e.g. SBS and MOLLER. CASA can do this after settings are known and transmitted. I worried about this during 6 GeV era in defining files every 100 MeV/c. AFAIK this has not been investigated in 12 GeV era.

Recommendation



QO pole superimposed on QM pole, recessed 0.5 cm.

Someone should model machining this change in QM pole, making up the length at the joint with the return steel with lowest carbon sheet stock available. If Fourier components improve substantially, 2020.