

Injector Upgrade Optics

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AIPINJ Weekly Status Meeting

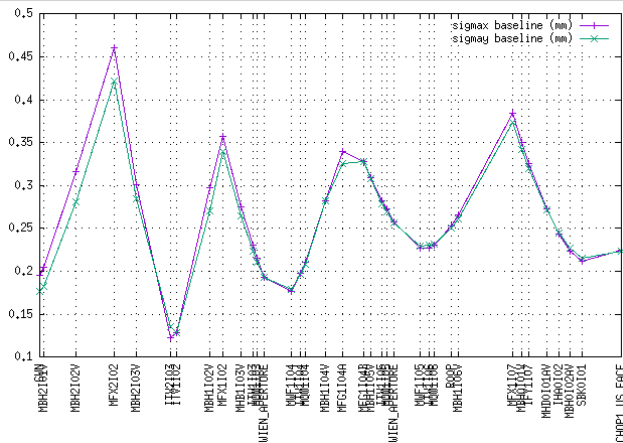
These optics are based on the 2020-02-26 layout and include the beamline from 0.19m downstream of the cathode to the upstream face of Chopper 1.

Knobs and constraints:

- ▶ Beam size should be less than 1.6mm and round
- ▶ 2I01 solenoid → waist at entrance of 15° dipole
- ▶ 1I02 solenoid → waist at entrance of VWIEN
- ▶ Waist at HWIEN and Prebuncher
- ▶ 0I01 solenoid → waist at A1/A2
- ▶ 0I03 solenoid → waist at CHOPPER1 upstream

Baseline

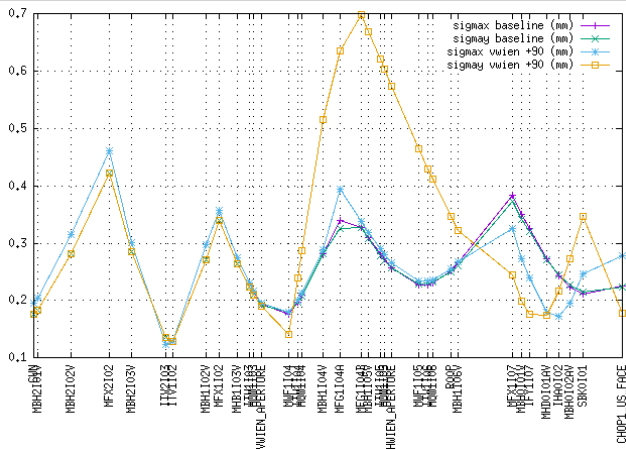
Wien Filters OFF, Quads \approx OFF



S1	S2	Q1	Q2	FGA	FGB	Q3	Q4	S3	S4
219.9	252.3	1.9	4.94	86.8	-86.8	2.38	0.24	-122.5	-148.9

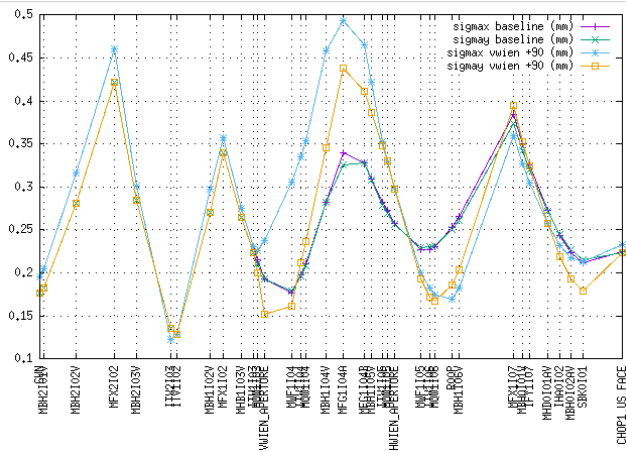
Units are field B in Gauss, with $T=200\text{keV}$

VWIEN +90, Quads OFF



S1	S2	Q1	Q2	FGA	FGB	Q3	Q4	S3	S4
219.9	252.3	0.0	0.0	86.8	-86.8	0.0	0.0	-144.5	-348.9

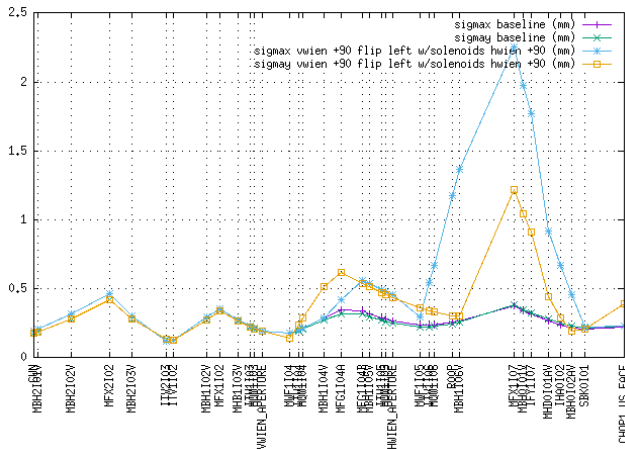
VWIEN +90, Quads ON



S1	S2	Q1	Q2	FGA	FGB	Q3	Q4	S3	S
219.9	252.3	-50.9	-12.3	86.8	-86.8	-10.1	14.1	-141.0	-15

VWIEN +90, flip left w/FGs, HWIEN +90, Quads OFF

Worst Case



S1	S2	Q1	Q2	FGA	FGB	Q3	Q4	S3	S4
219.9	252.3	0	0	-86.8	-86.8	0	0	-142.5	-350

Solenoid 4 railed at -350G!

Conclusion

- ▶ Optically, the layout works.
- ▶ We need all four QWs to keep the optics under control for various Wien configurations.
- ▶ We don't need to spend money on Darsmstadt triplets or doublets.