

FCC-ee IR magnetic element design – an update

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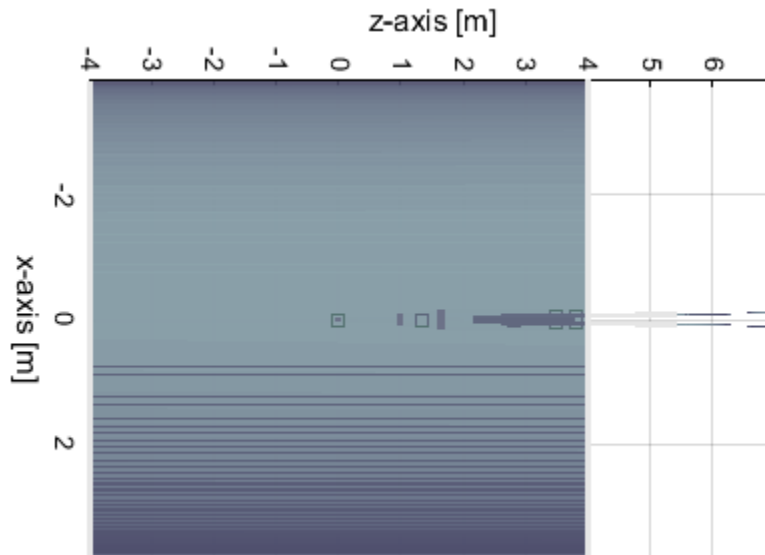
18/1/2017

State of play up to now

- Up to now baseline solution was the one where the first magnetic element (the compensating solenoid) was at an L^* of 1.0m.
- This was deemed not sufficient as the space left for the luminometer was inadequate.
- That design however satisfied our emittance blow-up requirement (and all other requirements for the IR regarding field integral and value of solenoid field at the position of the quadrupole)
- Emittance blow-up for 2IPS was 0.1pm

Realistic detector solenoid

- I have now included a realistic detector solenoid according to the latest design. (up to now I had a constant and universal field of 2T)
 - solenoid dimensions 3.76m(inner radius) (outer radius 3.818m) × 4m (half-length)



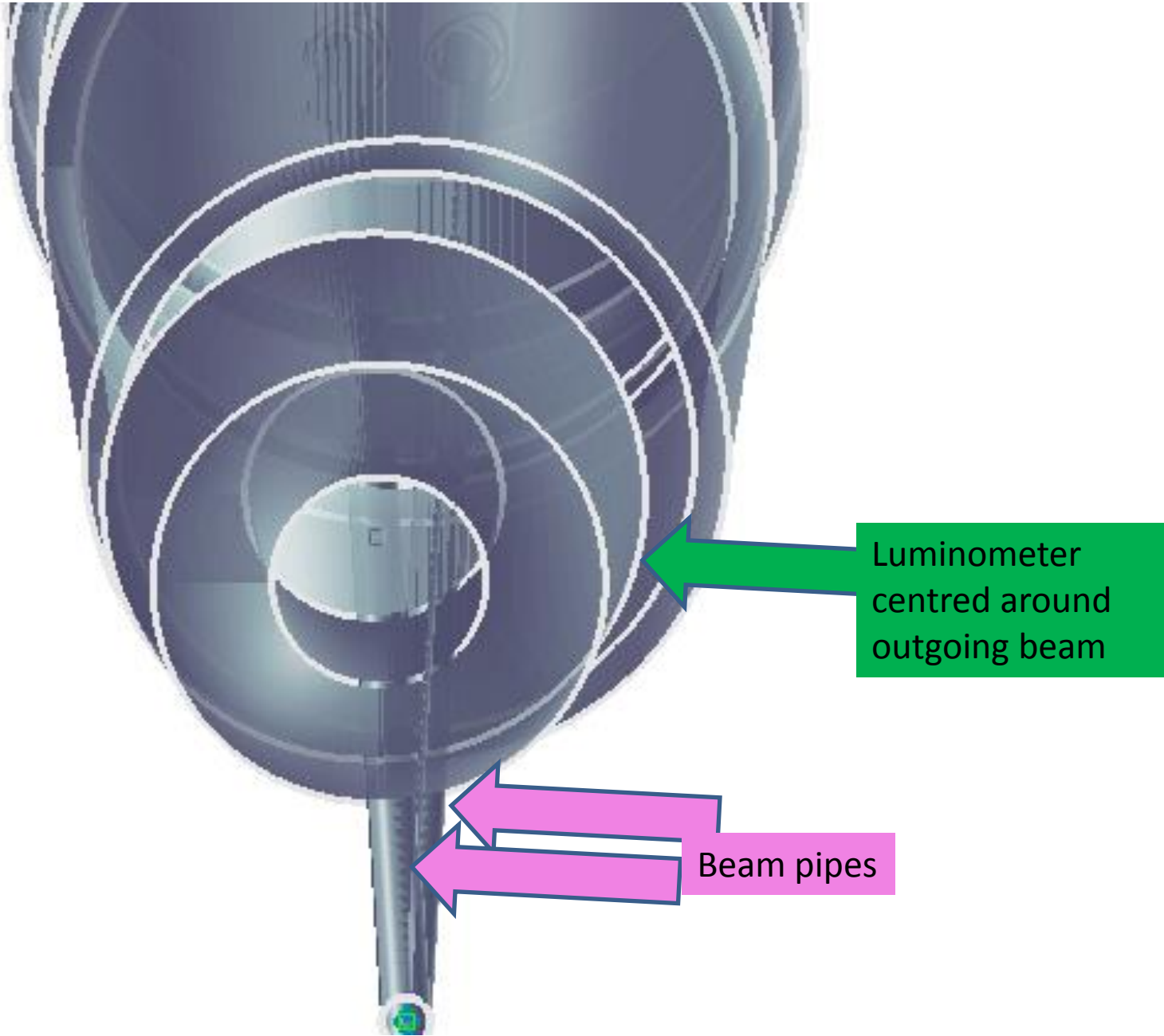
Positioning the luminometer

- I have positioned the luminometer between 100cm and 120cm in Z, tilted it by 15mrad and centered it around outgoing beam pipe.
- The edge of the luminometer is at 140mrad (the other side at 110mrad)

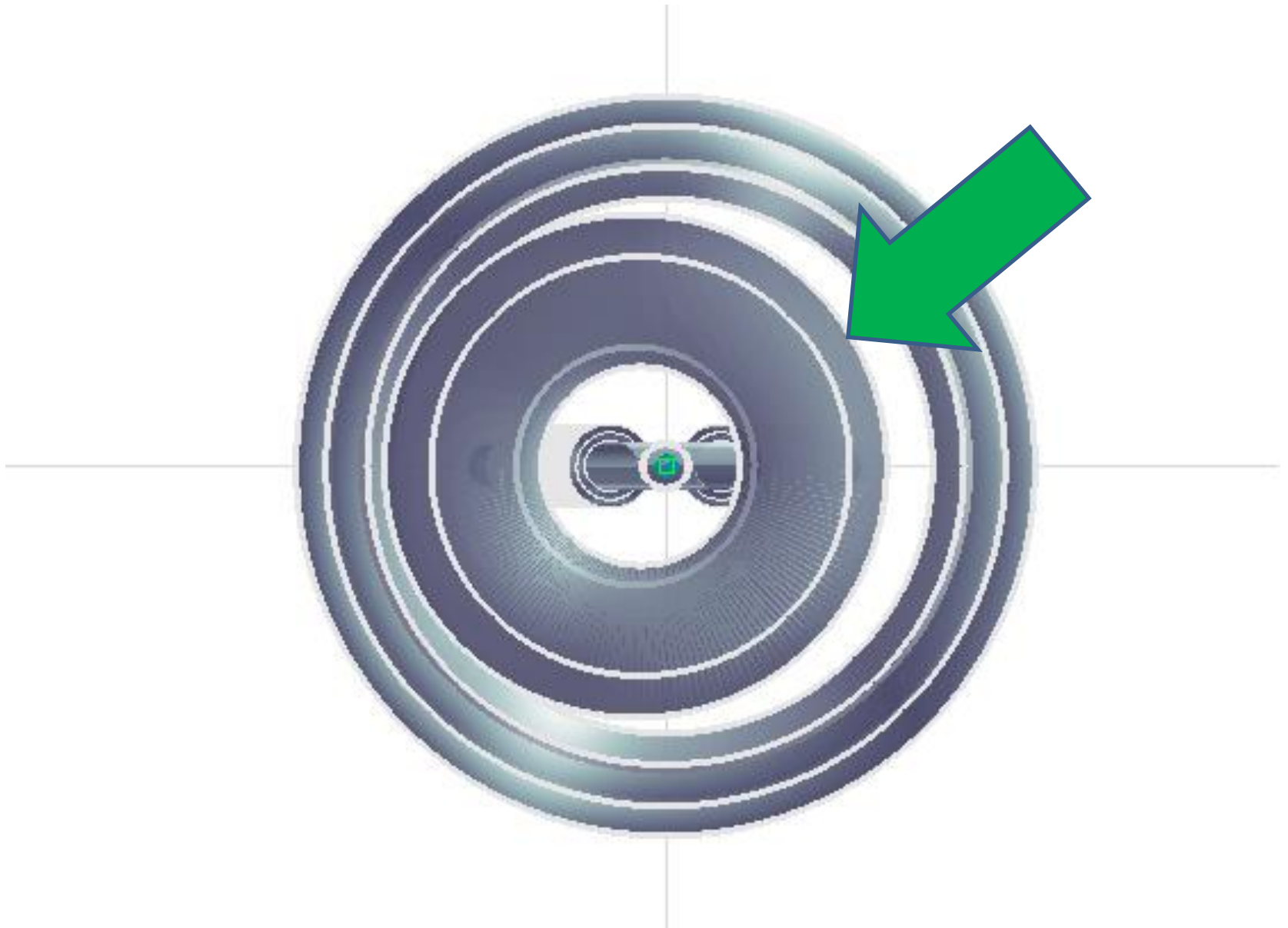
Lumi counter wrt the rest of the magnetic systems



Lumi counter wrt the rest of the magnetic systems

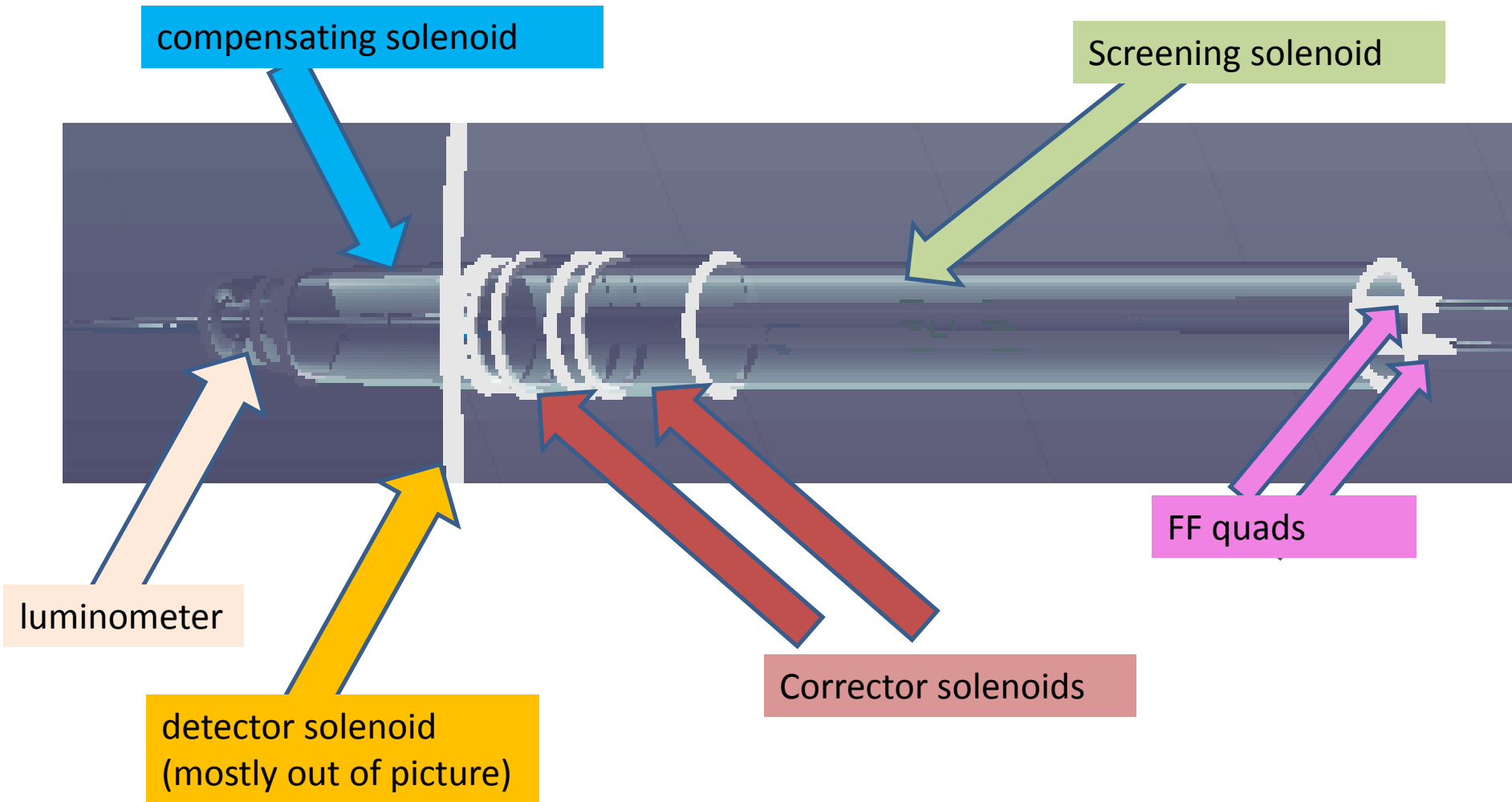


From the centre of the detector



More modifications

- Two extra solenoid corrector coils, to give more flexibility



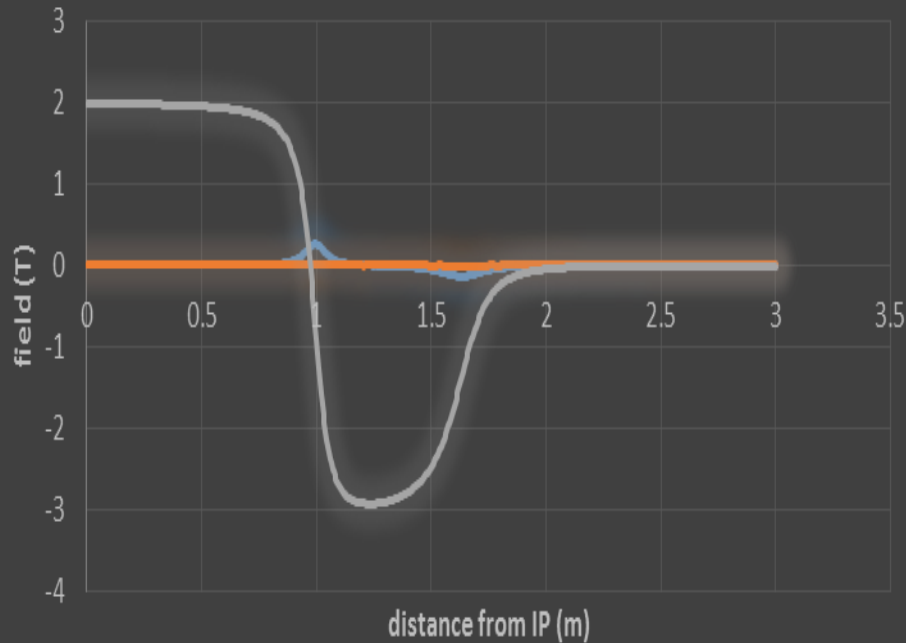
B_x, B_y, B_z along electron path

Before (baseline)

This analysis

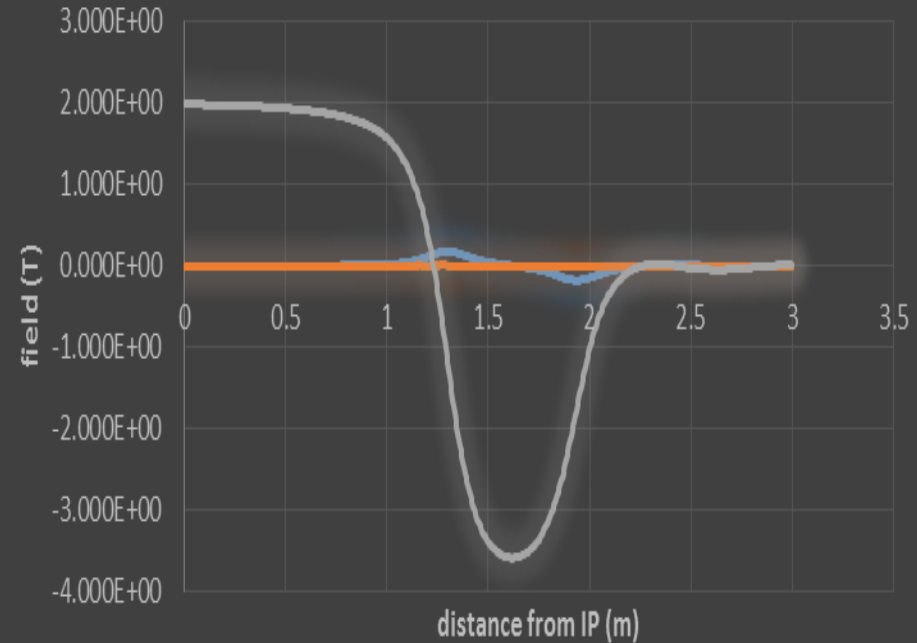
along electron path

Bx By Bz



along electron path

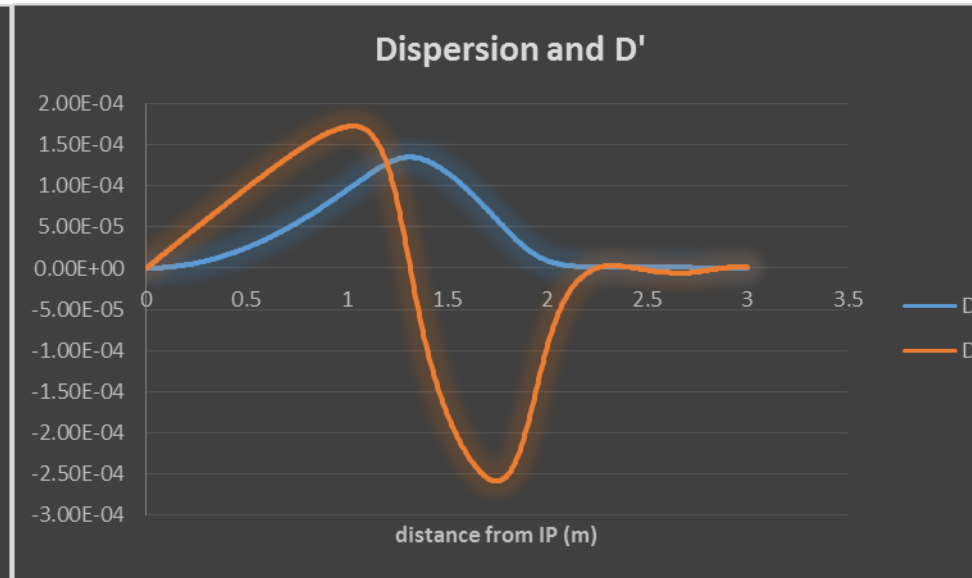
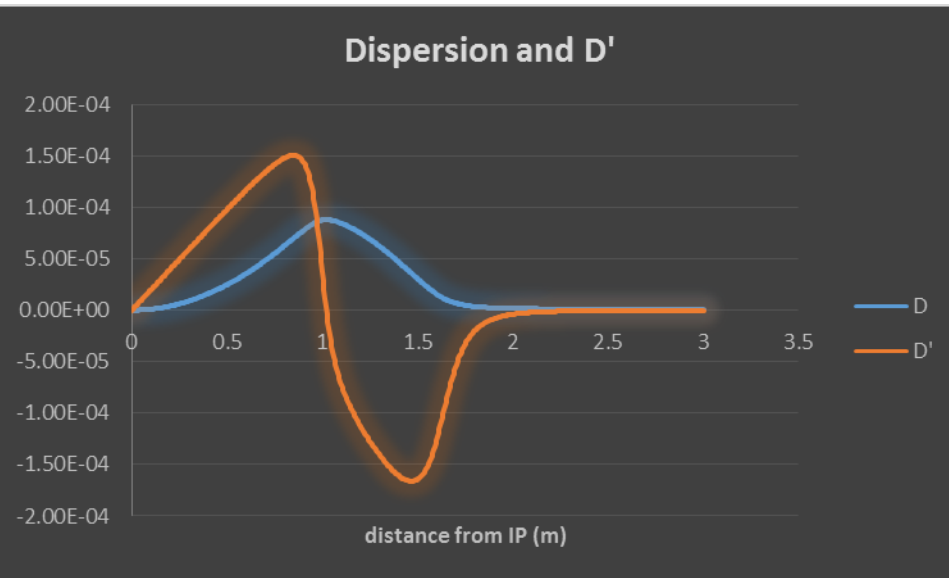
Bx By Bz



Dispersion calculation

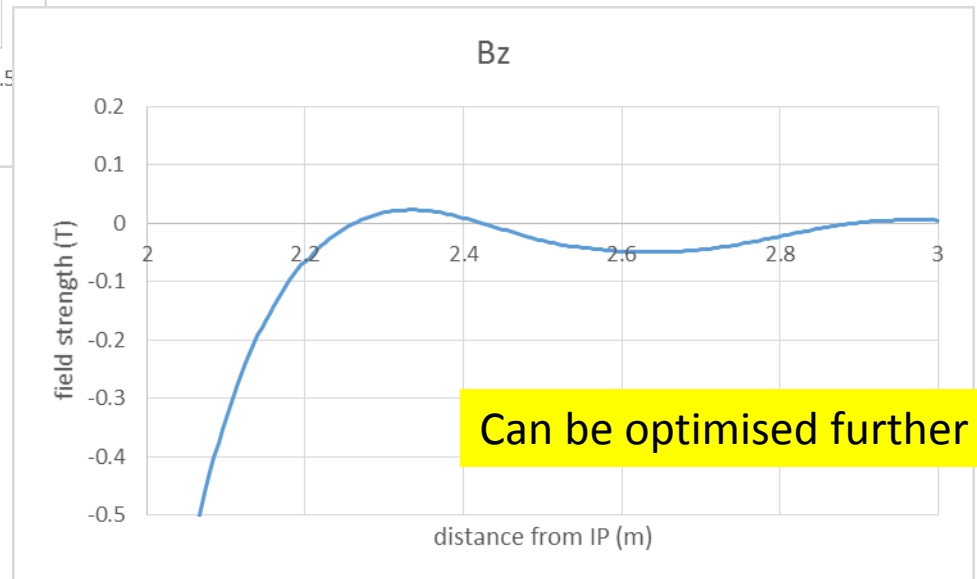
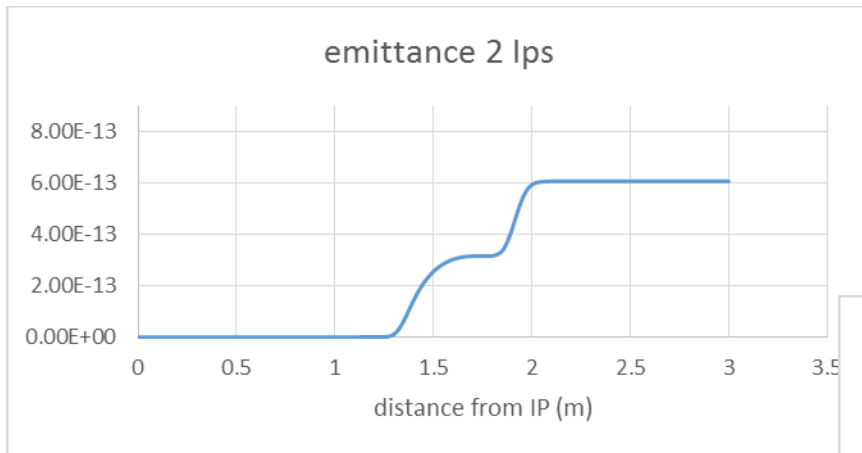
Before (baseline)

This analysis



Preliminary results

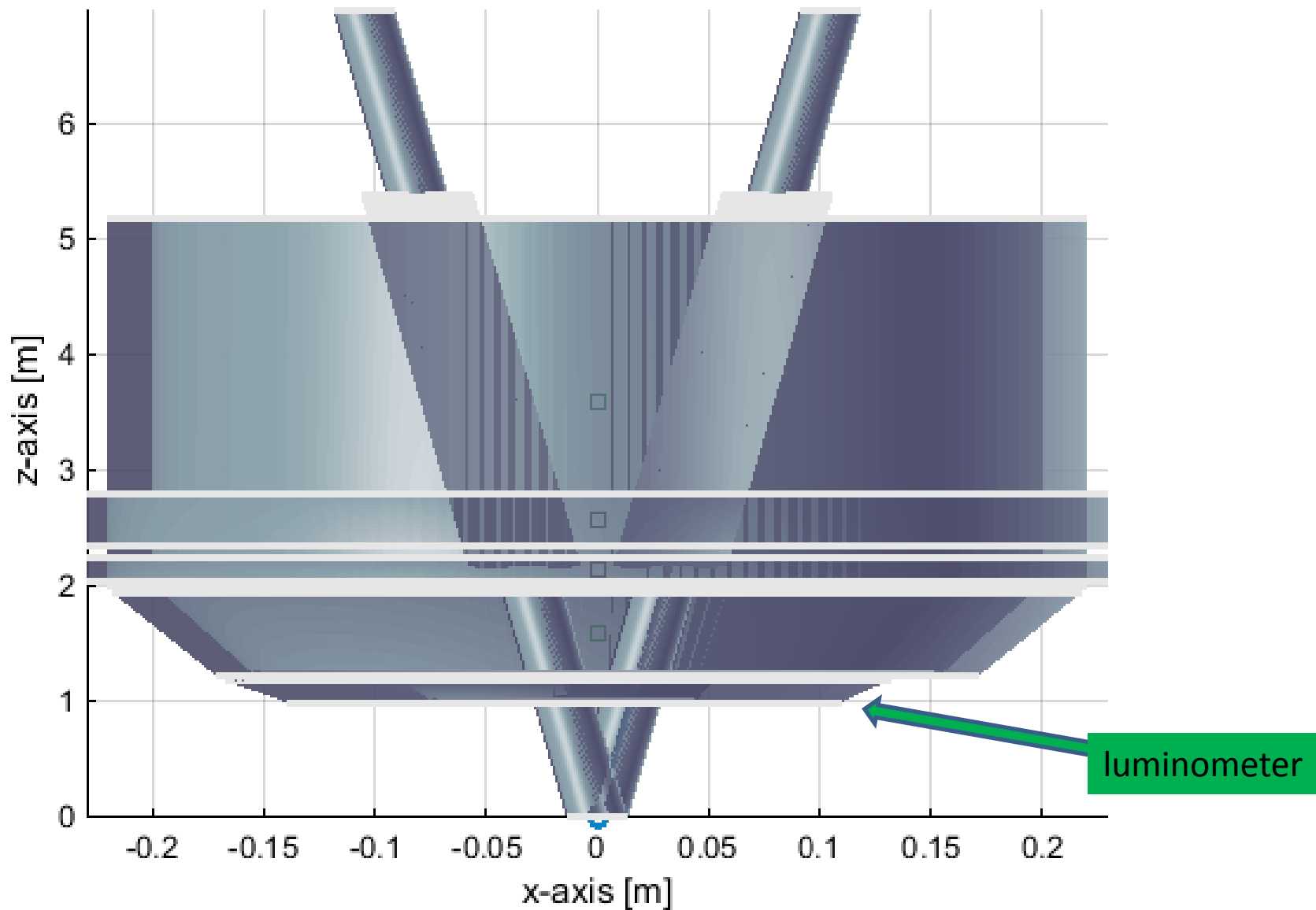
- Emittance blow up: 0.6pm for 2IPs (60% of budget)
- Longitudinal field at the position of the FF quads: <0.05T



Further improvements

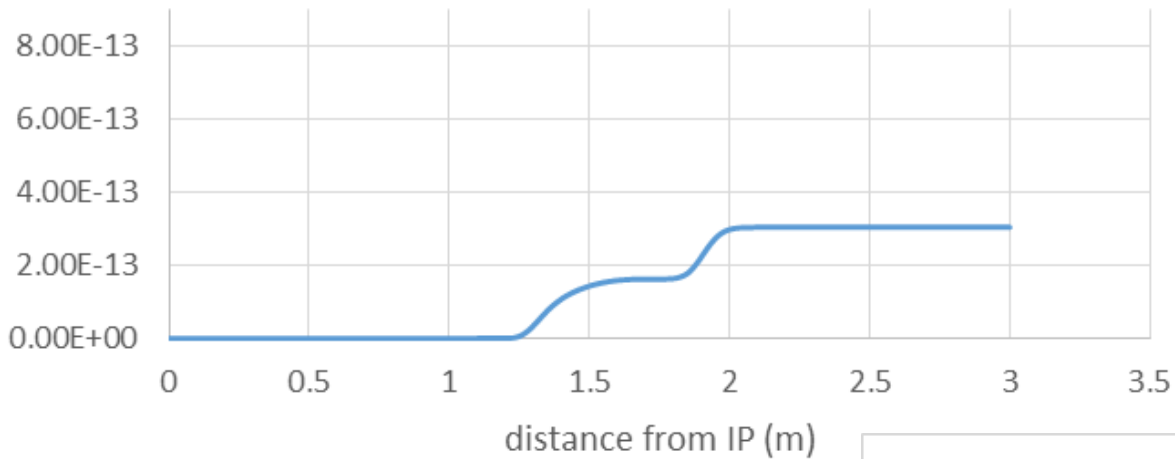
- I have moved things around to get better results
- Now the first element starts at 125cm and not 130cm from the IP – there are still 5cm between the luminometer and the compensating solenoid (just the length of a thin cryostat...)
- The screening solenoid has increased in diameter from 40cm to 44cm (i.e. does not fit in the envelope of the 100 mrad cone, but is fully in the shadow of the luminometer)
- End result is good: emittance blow-up down to **0.3pm** for 2IPs

Latest layout



Results

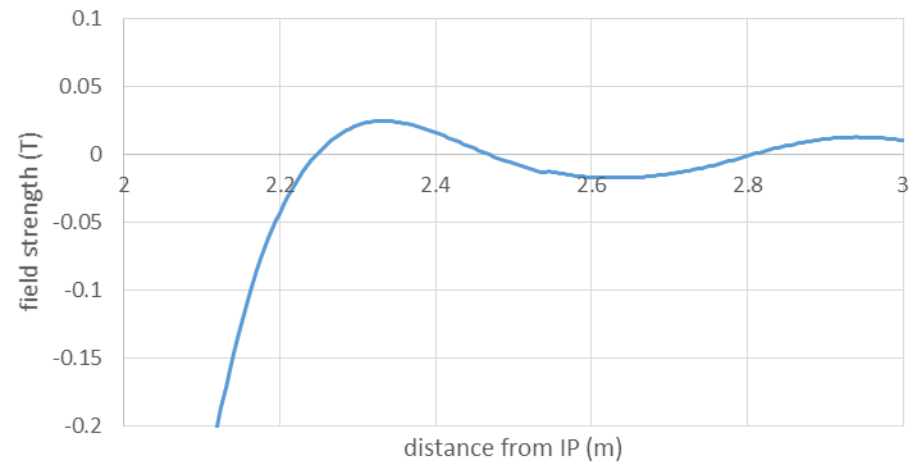
emittance 2 Ips



Total emittance
blow-up = 0.3pm

Remnant field at
quads: <0.05T

Bz



THANK YOU