# IP knobs and luminosity

Leon van Riesen-Haupt, Peter Kisciny

FCC-ee optics tuning WG meeting

Study

- Use IR waist knobs created for one IP
  - Using response matrix and SVD method to obtain knobs
  - Quadrupole circuits redefined as deferred expressions to set tuning knob strength

- Vertical and horizontal tuning knob scanned computing Luminosity using Xsuite beam-beam module by Peter Kisciny
  - Set knobs for single IR in MADX before conversion to X-Suite
  - Install single beam-beam element in modified IR
  - Compute luminosity over 300 turns with 100,000 macro particles

Results

- Statistical noise
  - More particles might help
  - Only take Luminosity from the last few turns
- Clear trend visible
  - Much more sensitive in y than in x

Log(Luminosity)

Future Plans
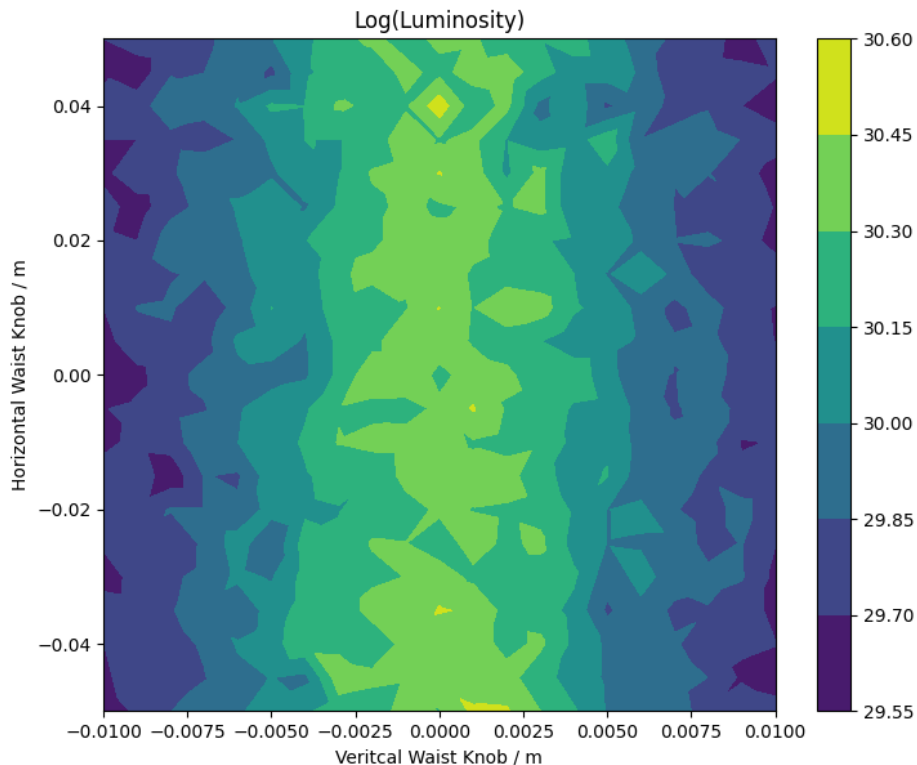
- Observe impact on luminosity in other IPs
  - Requires modification of beam-beam module

- Scan further parameters using knobs – e.g. beta function at waist

- Scan knobs with errors
  - With small field errors in (dispersion free section of) IR
    - To recover luminosity
    - Measure waist position from maximum luminosity
  - As IR tuning in globally corrected lattices
    - Requires sufficient dynamic aperture with beam-beam
    - Improved corrections needed