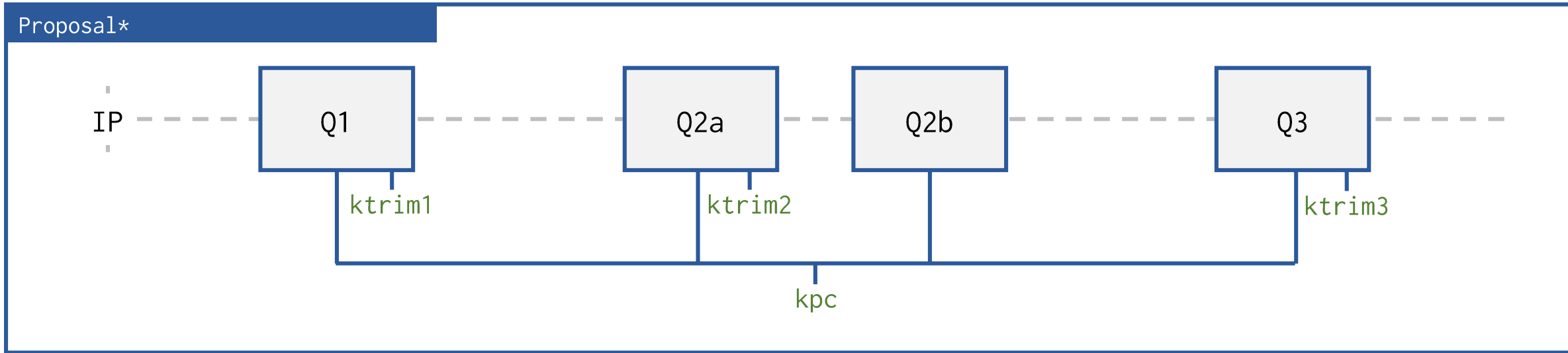
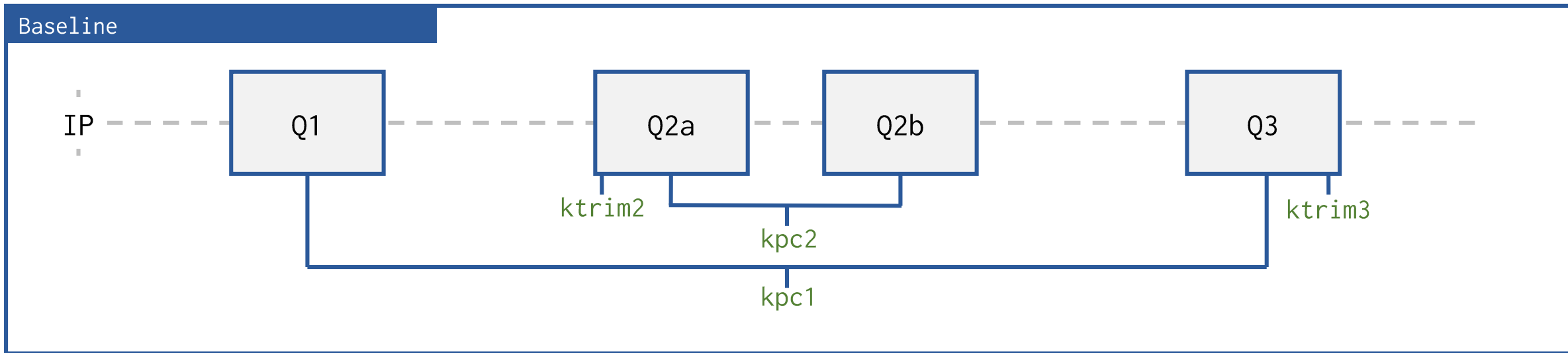


Analysis of tune and β -beating jitter from IT power converters



Powering schemes used



* 4th HL-LHC TCC: *State of discussion in preparation of circuit review*, F.Rodriguez (<https://indico.cern.ch/event/476960/>)

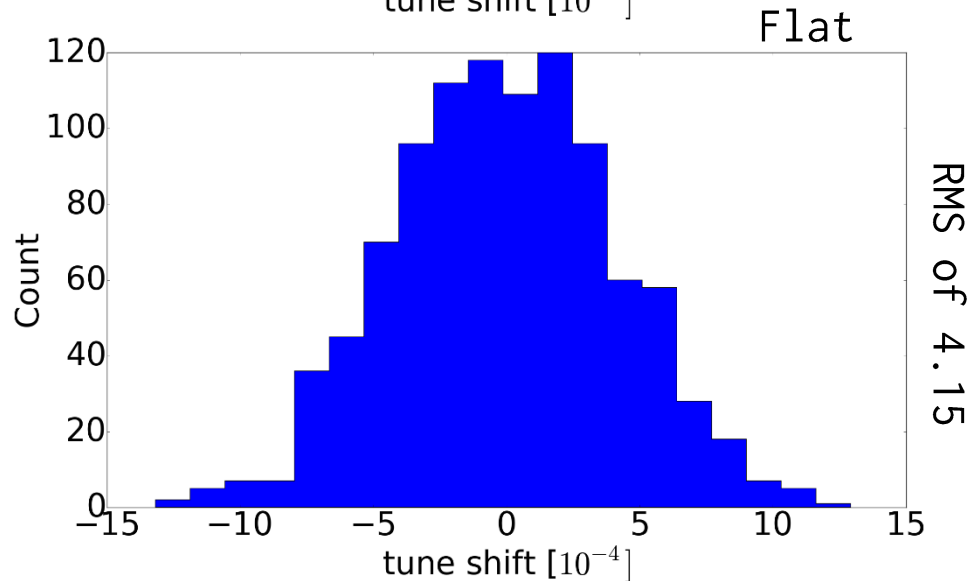
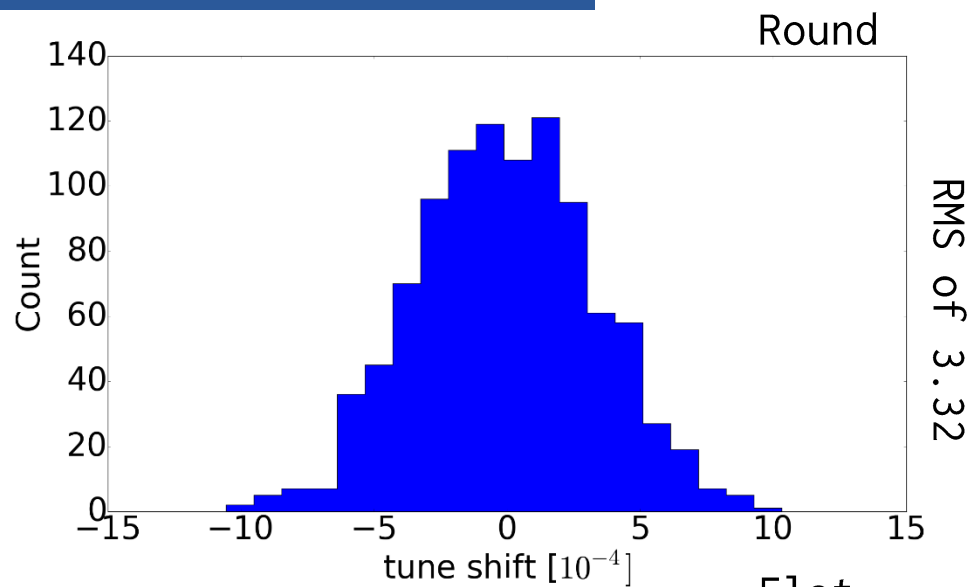
- HL-LHC V1.2 Layout (Beam 1).
- Round (15cm) and flat (7.5cm, 30cm) optics. Same seeds used for flat and round optics of the same layout.
- 1000 seeds, errors only in the triplet -> Both sides of IP1 and IP5.
- Magnets k error -> Gaussian of 1 ppm of the nominal k (comparison with LHC DR*).

* Power converter tolerances for the current LHC in ppm of Inominal (LHC design report):

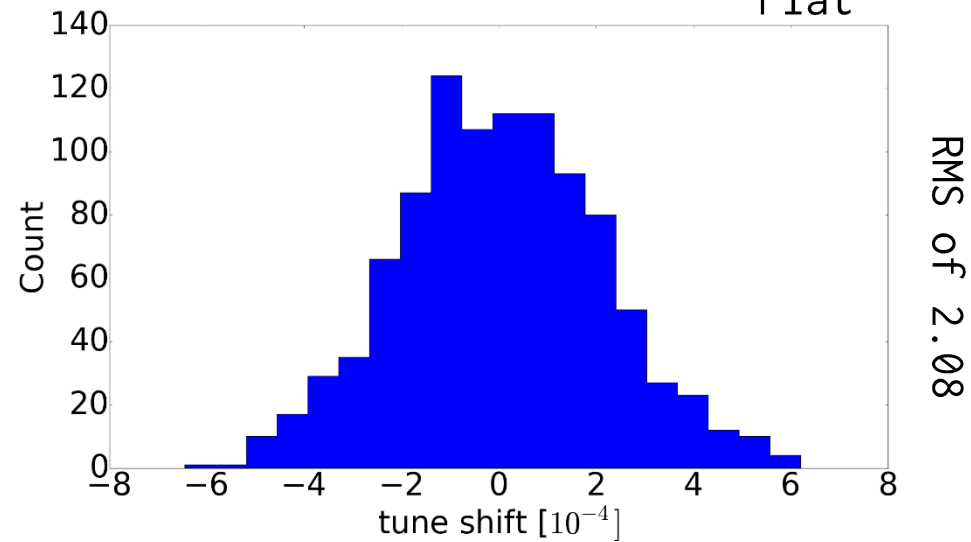
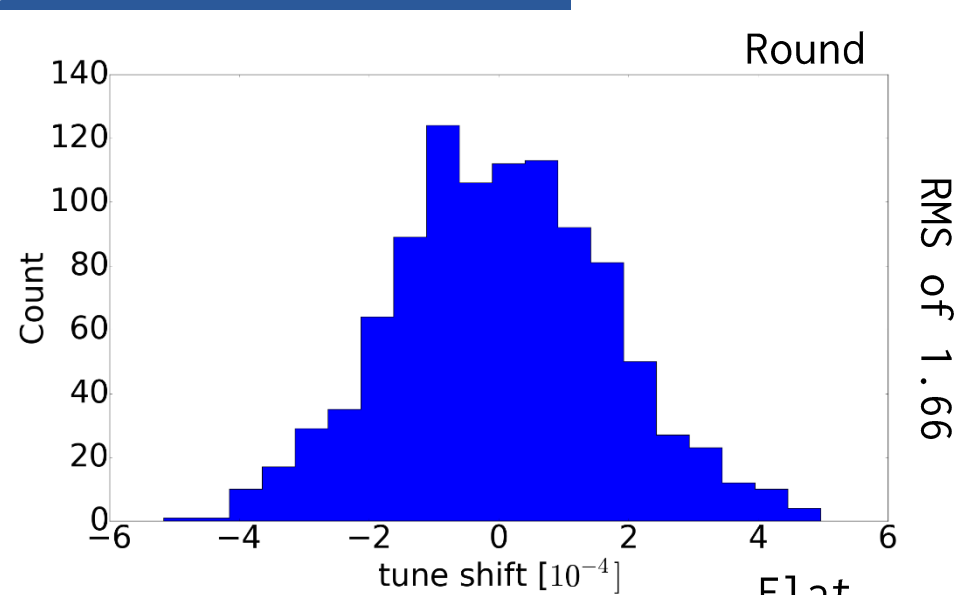
One year accuracy	One day reproducibility	½ hour stability	Resolution
±100 (±20 with calibration)	±20	±10	15

Tune shift (Horizontal)

Baseline

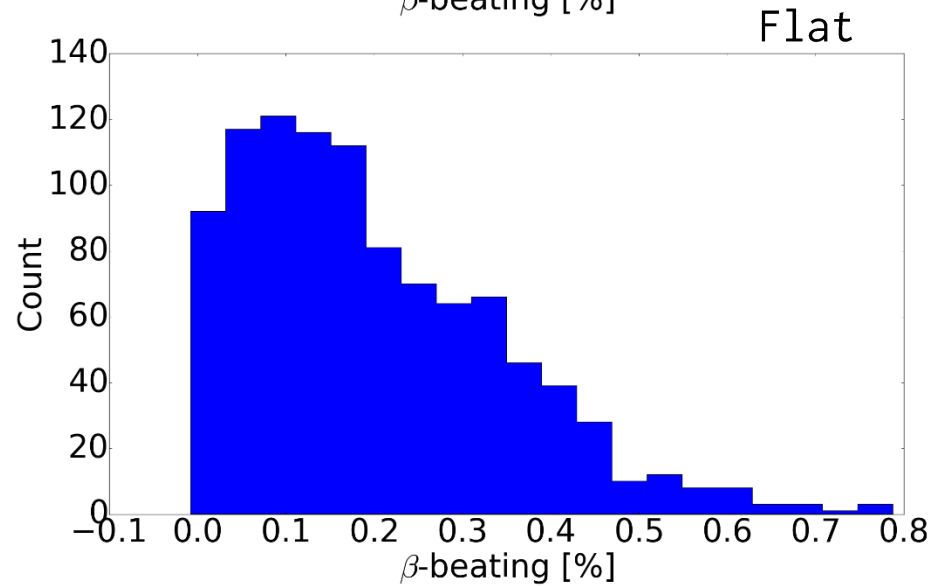
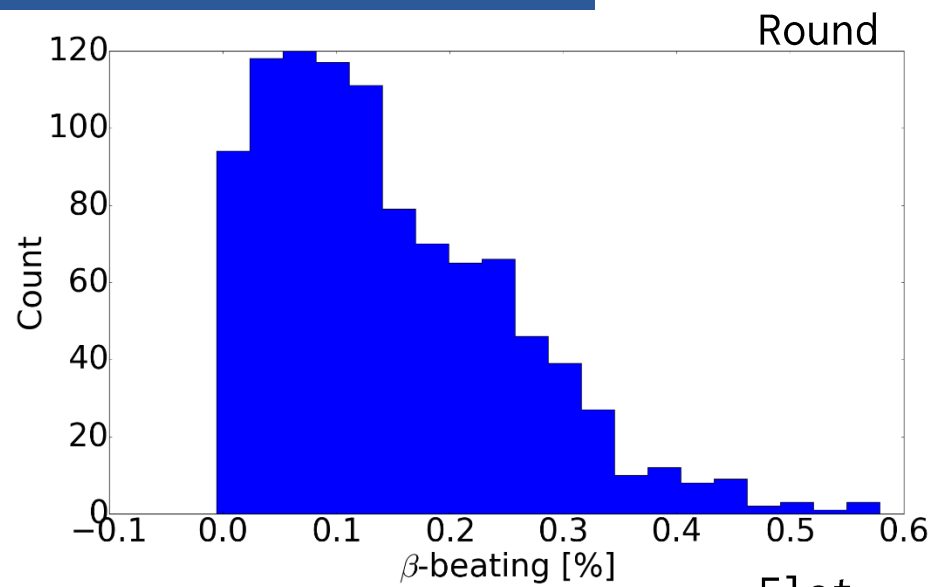


Proposal

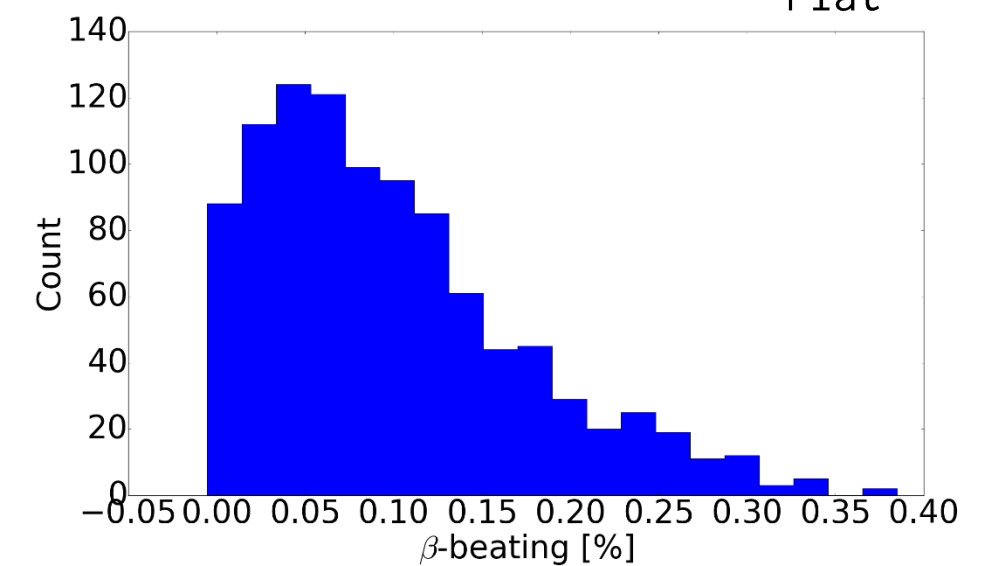
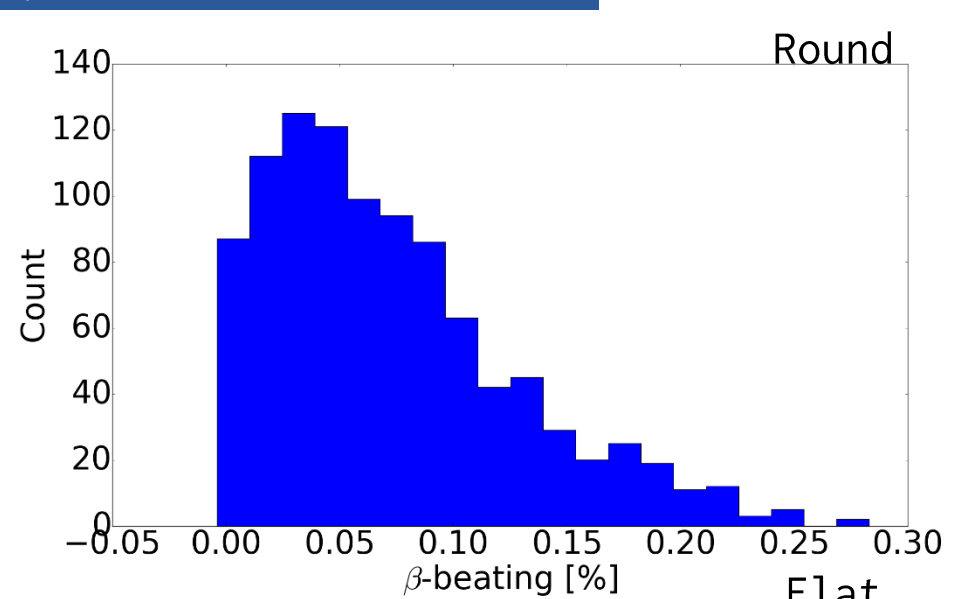


Maximum β -beating (Horizontal)

Baseline



Proposal



- Tune shift worrying, almost factor 2.5 over previous studies.*:

	$\text{rms}((Q_z - Q_{z0}) \times 10^4)$
nom. LHC	0.25
HL-LHC 1.0 (M.Fitterer)	1.35
HL-LHC 1.2	3.32

- The new layout proposal behaves factor 2 better in tune shift and β -beating.
- Round optics generally gives better results than flat.
- The impact on β -beating is always tolerable.

* 32nd HiLumi WP2 Task Leader Meeting:

Powering requirements (topology, noise levels, reproducibility, accuracy) for HL-LHC triplet, M.Fitterer (<https://indico.cern.ch/event/323862/>)

