BDS Tuning Results

Glen White

SLAC

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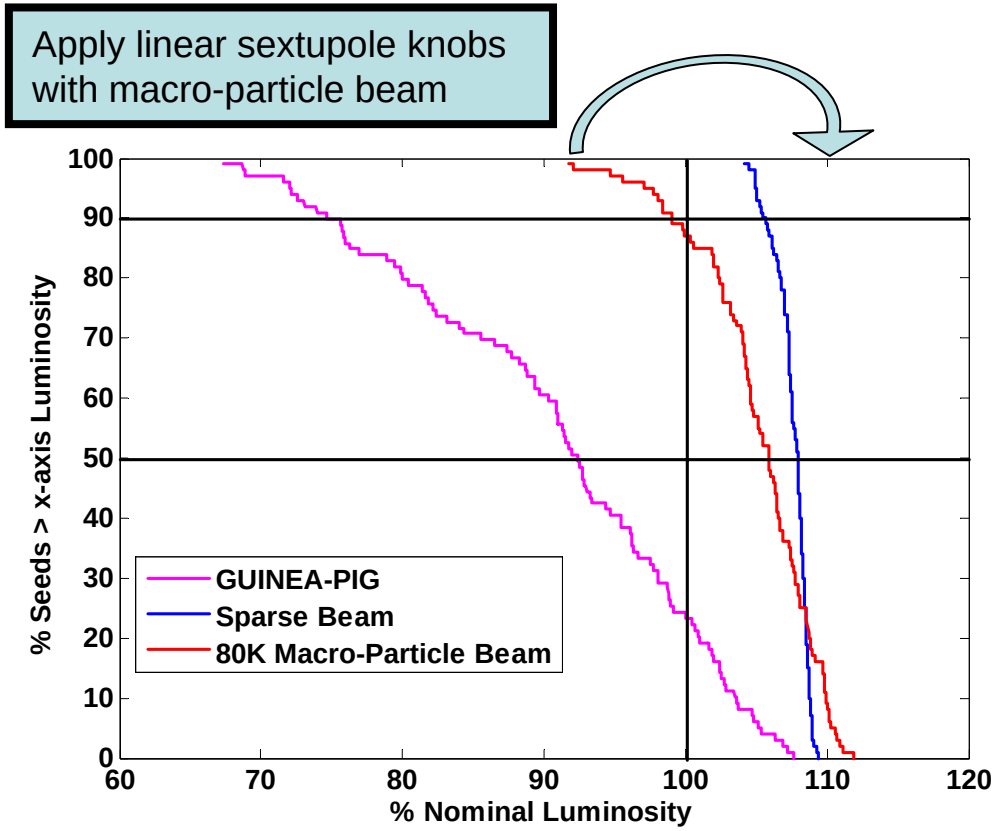
BDS Alignment and Tuning

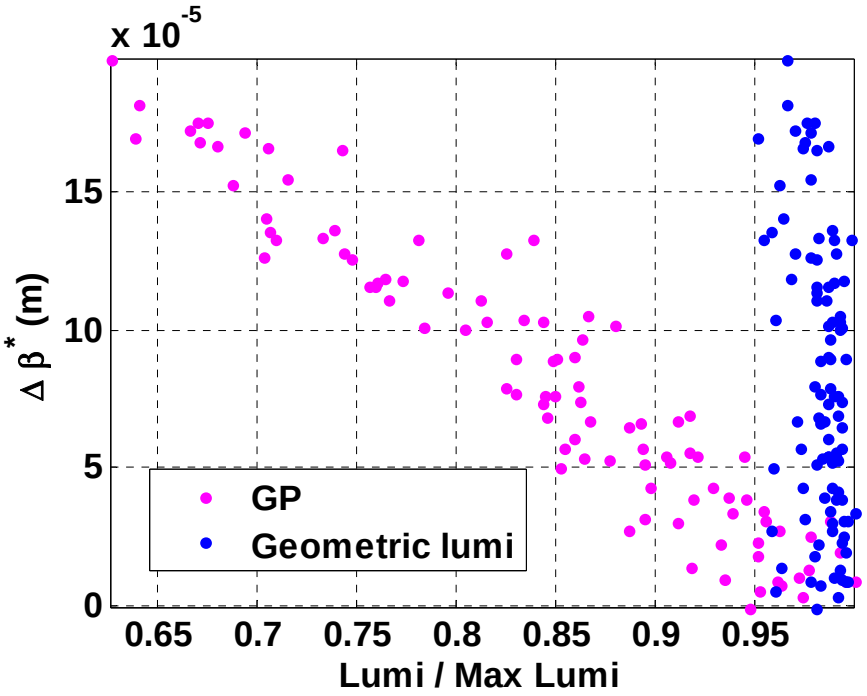
- BDS aligned and tuned with sparse beam representation (31 slices * 11 particles).
- After alignment, results checked by tracking 80K macro-particle bunch.
- 80K bunch also run through GUINEA-Pig simulation to compare with geometric lumi used for tuning.
- 100 random seeds modeled.

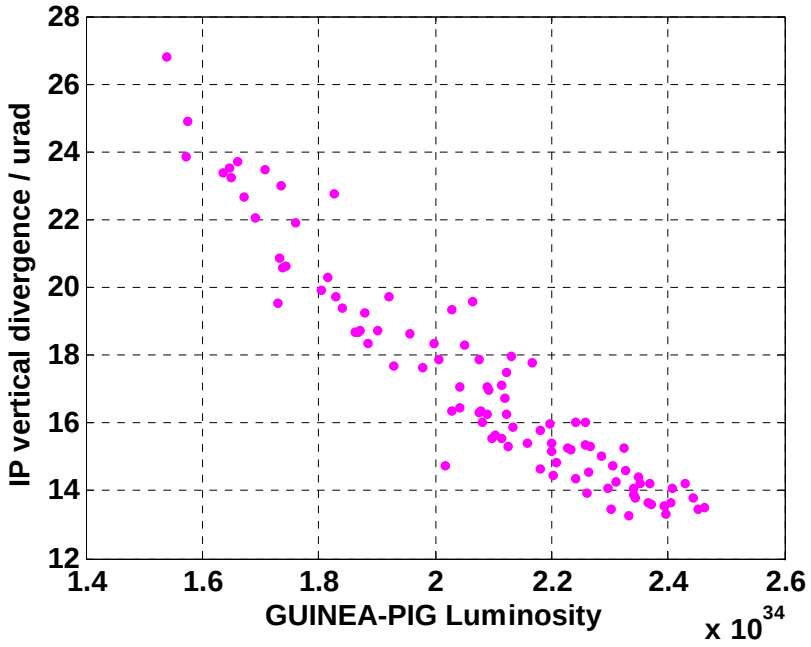
Post-tuning luminosity results



- Geometric lumi calculated from final beam distribution after tuning with sparse beam representation for sparse and macro-particle beam and calculated with GP using macro-particle beam.
- Applying linear knobs to worst 80K-beam seed takes lumi to ~110%.

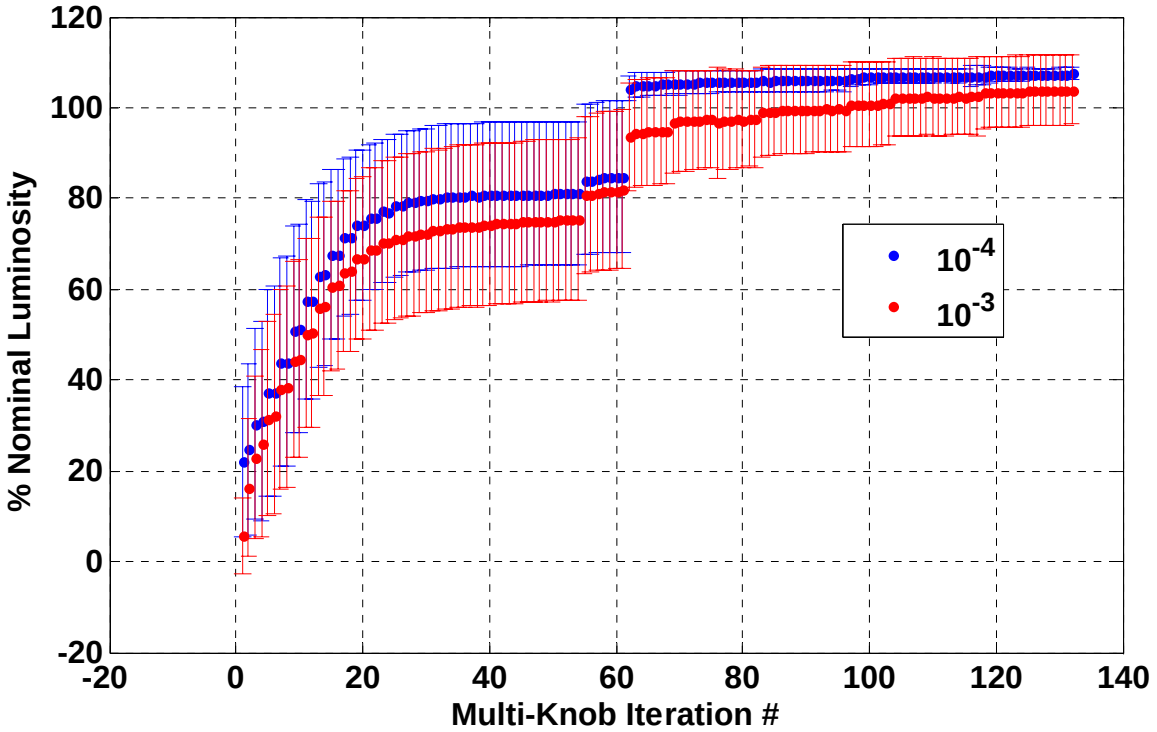
Lumi vs. Vertical IP Beta / Divergence Angle





- Beta (y) calculated from sigma(y)^2 / emittance (y)
- Calculated lumi from tuning sim (blue)
- Guinea-Pig calculated lumi (80K macro-particles) (magenta)

Comparison of 10^{-3} / 10^{-4} Magnet Strength Errors



- Larger spread of initial errors and slower convergence rate for case of 1e-3 magnet strength errors.
- Only 75% of 1e-3 seeds exceed nominal lumi after tuning.
- For one seed, lumi increased beyond 100% nominal by extending # of linear tuning iterations.
- Larger spread of IP divergences in 1e-3 case suggests difference even more severe when GUINEA-PIG used for lumi calculation.