ILC BDS 5-Hz Feedback

Glen White

Simulation Aims

- Use seed near median result from 100-seed simulation of BDS tuning with 1e-4 magnet errors.
- Initial tracking gives 1.26 x nominal geometric luminosity.
- Add in ground motion, technical noise, energy error and imprecise energy measurement and incoming beam jitter.
- Simulate BDS lumi performance over time with 5-Hz feedback stabilization.

Assumed Error Parameters

- Incoming beam jitter (100um,100urad)- assuming operation of FFB at Linac-exit.
- Ground Motion Models A,B,C and K.
- Technical noise = random magnet jitter of 10nm or 25nm (RMS all magnets).
- Shot-shot energy jitter 1e-3, error on measurement 1e-4 RMS.

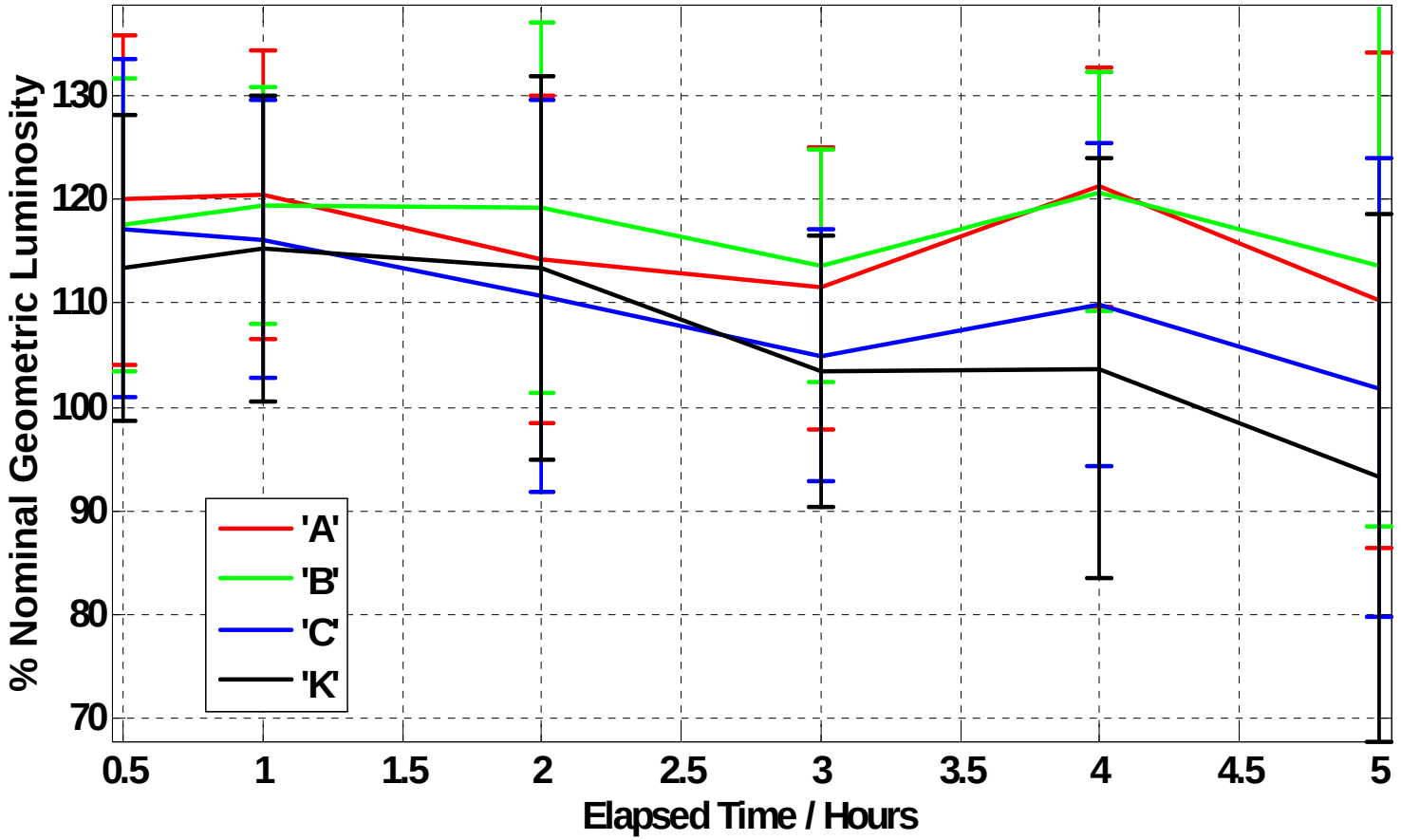
5-Hz Orbit Feedback

- 5 100nm-resolution BPMs (FF Sextupole BPMs) for x- and y-feedback.
- + additional 8 1um-resolution BPMs (Quad bpms) throughout BDS (vertical plane only required).
- Equal number of dipole correctors used as BPMs (dipole windings in magnets).
- Dispersion measured in BPMs (1^{st} and 2^{nd} order) to subtract E error effects.

5-Hz Tuning Knob Corrections

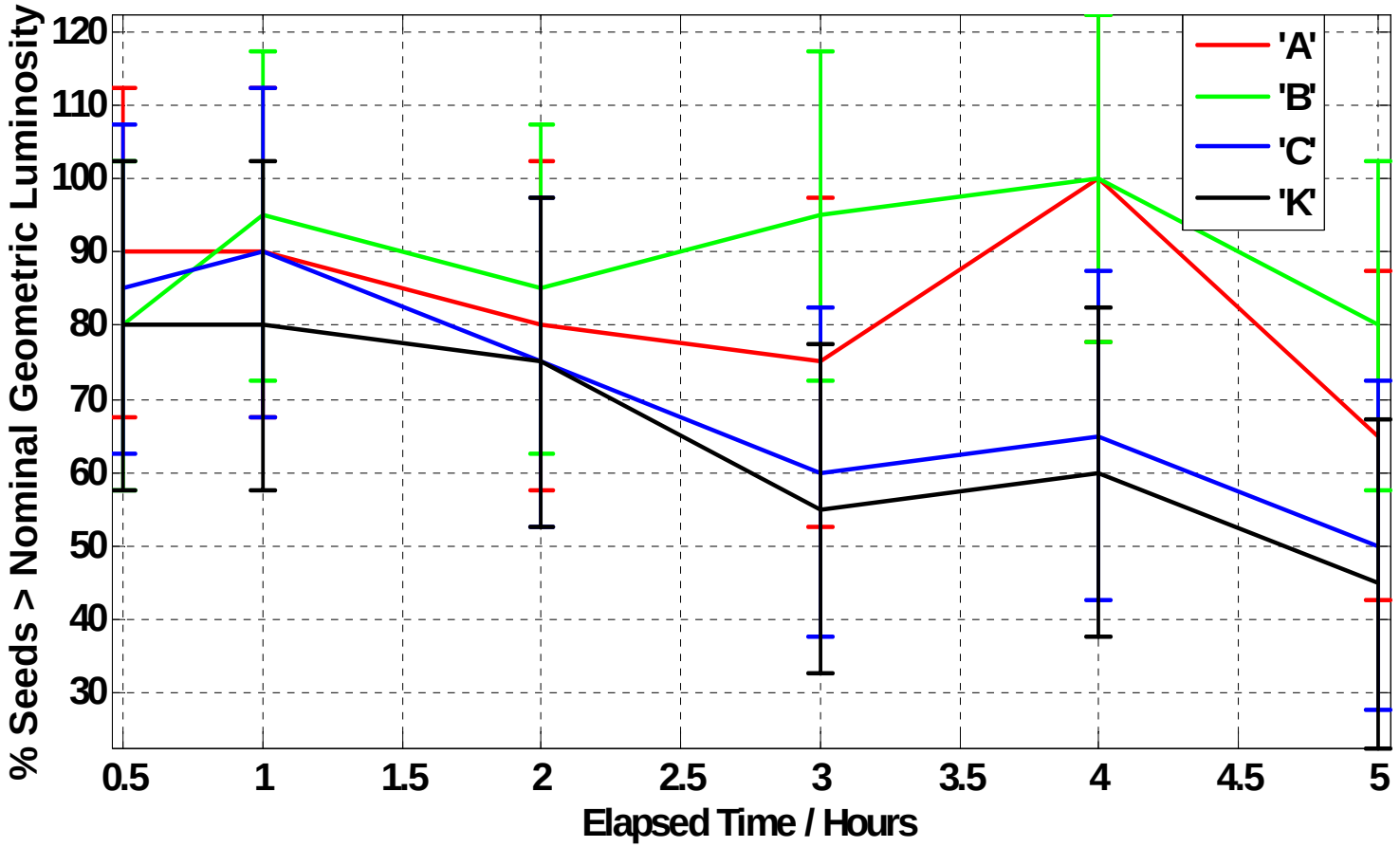
- Horizontal and Vertical IP-dispersion and x'-y coupling knobs (orthogonalized Sextupole moves) applied at regular intervals.

Results



- Simulation run for 0.5-5 hours with 20 seeds.
- Figure shows mean and RMS spread of luminosity for the 4 GM cases and 25nm RMS technical noise.

Results



- As before, showing % of seeds at each time point that have greater than the design nominal luminosity.
- Error bars assume Poisson distribution of errors.

Results Summary

	‘A’	‘B’	‘C’	‘K’
30 Mins.	90%	80%	85%	80%
	90%	95%	95%	85%
	100%	95%	95%	95%
5 Hours	65%	80%	50%	45%
	100%	100%	95%	45%
	100%	100%	90%	50%

•Percentage of seeds > nominal luminosity after stated time for the 4 GM models.

•Black numbers for 25nm RMS tech. noise, blue for final doublet reduced to 10nm, red for all 10nm.