# Update on Benchmarking

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June 5th, 2006

Working on converging BMAD/ILCv, MatLIAR and SLEPT DFS results

- Much progress on careful comparisons between MatLIAR DFS and ILCv DFS

  - MatLIAR now has "Jeff" mode that mimics my DFS algorithm (versus PT's original) modes called "jeff"-like and "PT"-like

  - Found bug in BMAD wakefield calculation with offset cavities

  - Results between ILCv and MatLIAR are very close for the same misalignment sets (see next slide)

  - Large spikes at beginning of linac in MatLIAR plots appears to be due to launch region resteering (i.e. definitely piculiar to PT's specific implementation -- my method doesn't produce them)

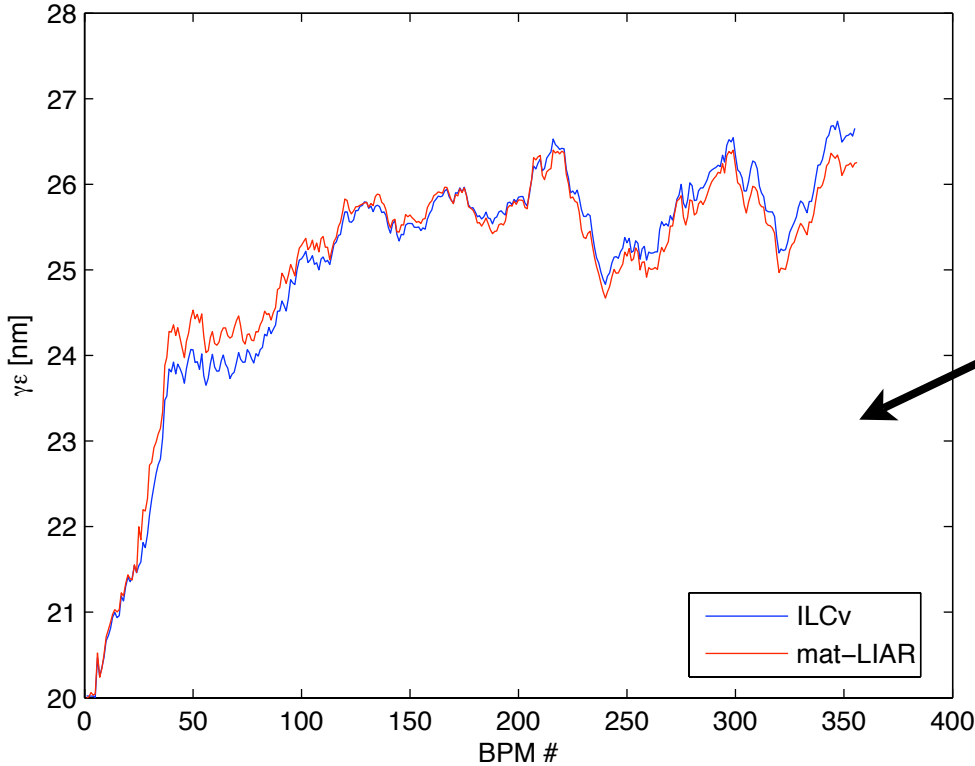# Results with Single Seed, MatLIAR vs. ILCv

DFS spikes with PT data 20060510

10 Seeds

Jeff DFS in mat–LIAR and ILCv –– 10 seeds provied by ILCv
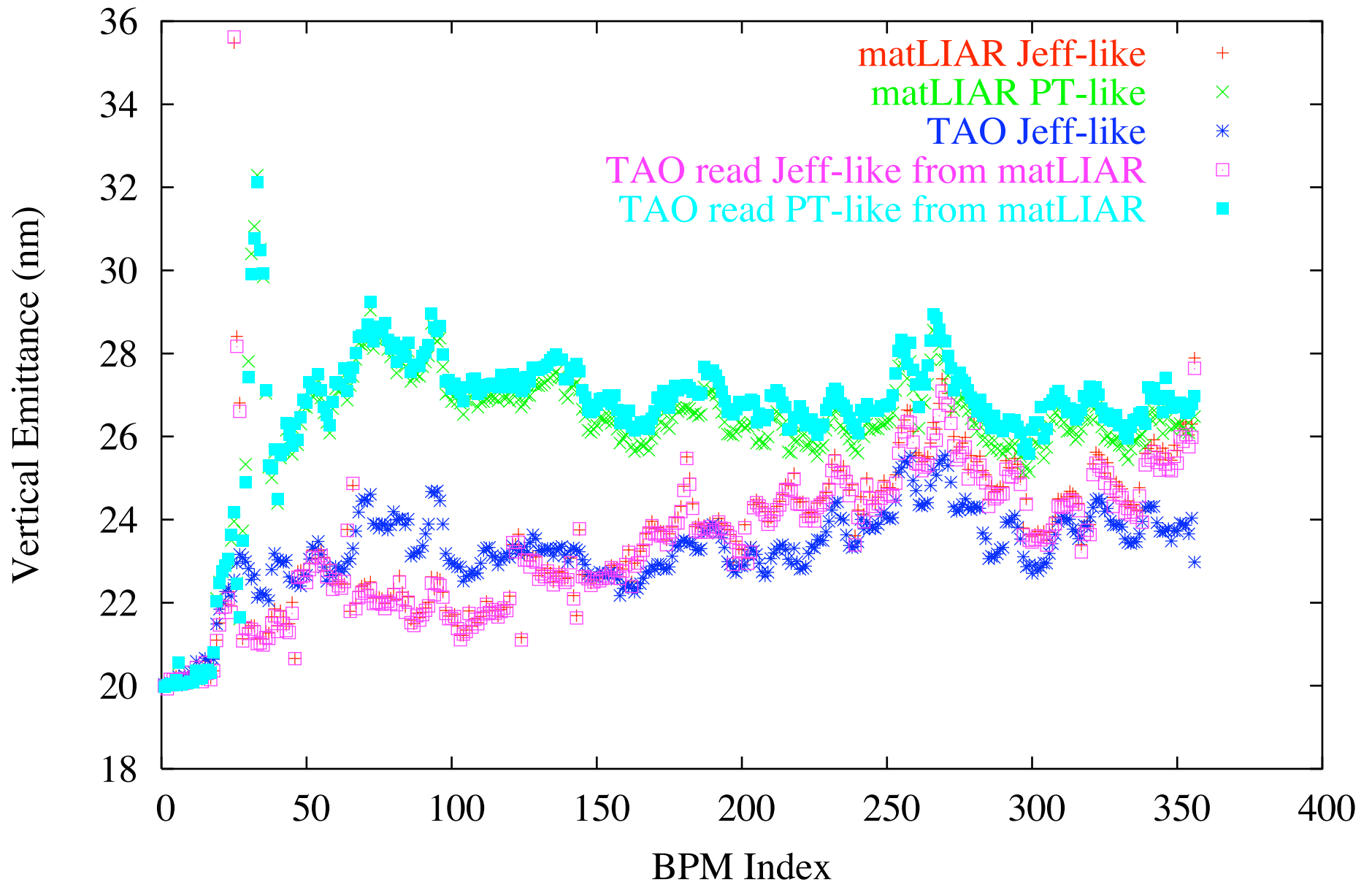
This is a ILCv and MatLIAR both running "Jeff"-like the same 10 seeds from ILCV. Agreement to 10 percent level

This is ILCv running "Jeff"-like with 10 different seeds from ILCv and MatLIAR. Differences more on the 30%-50% level.

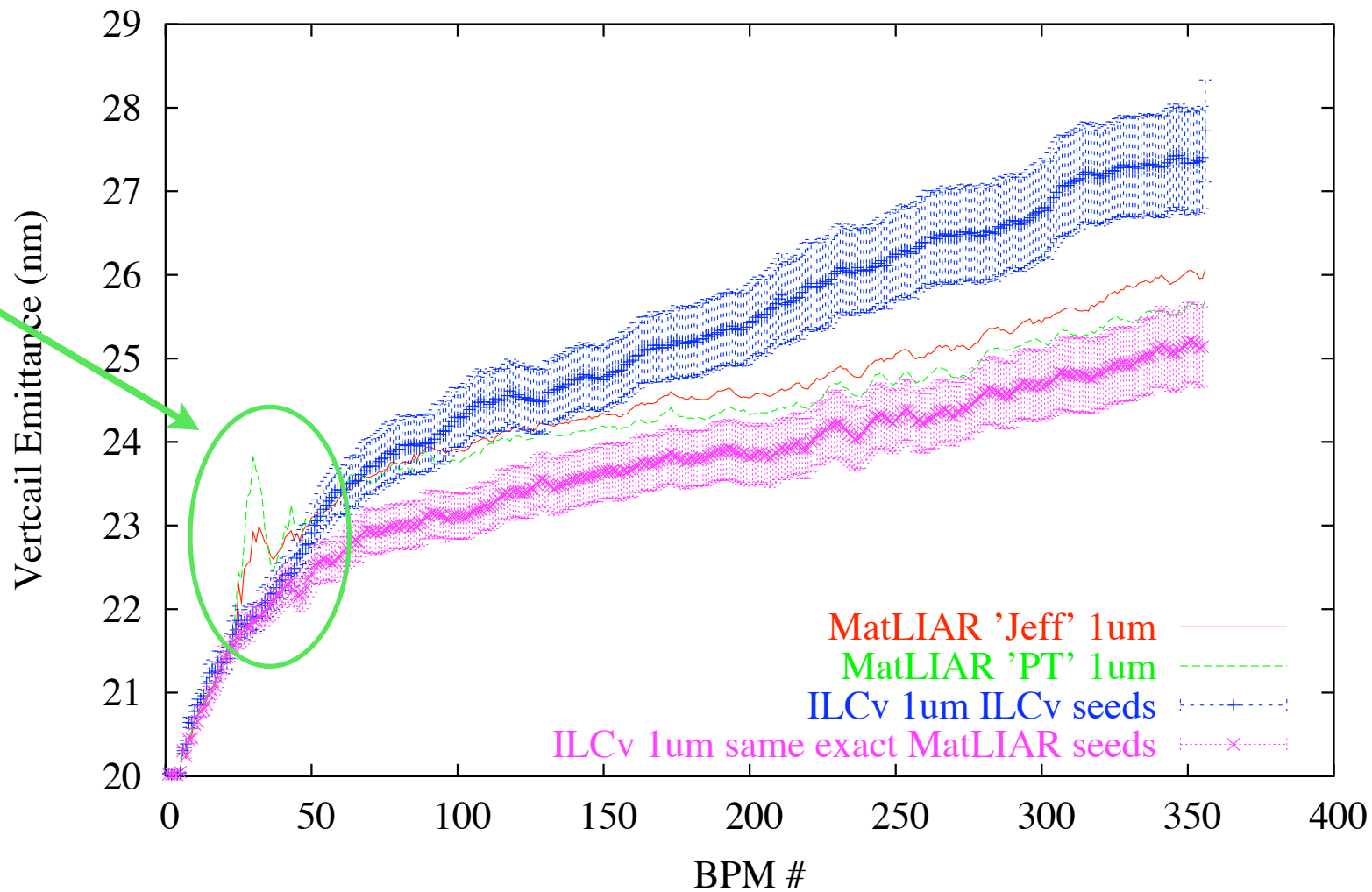Conclusion: Algorithm Agreement to 10% level

Jeff DFS in mat–LIAR –– 10 seeds from ILCv, 10 from mat–LIAR
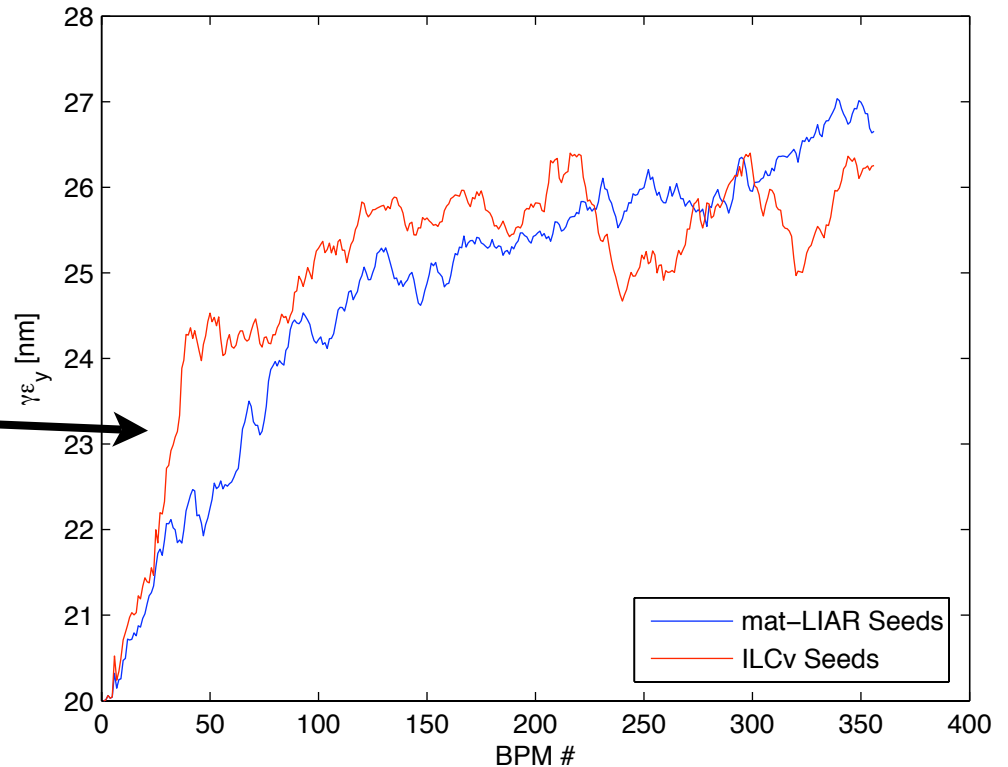
100 seeds

100 Seed MatLIAR vs. ILCv 1 um Res.

Still some spike remnants in MatLIAR

MatLIAR 'Jeff' 1um
MatLIAR 'PT' 1um
ILCv 1um ILCv seeds
ILCv 1um same exact MatLIAR seeds

Vertcail Emittance (nm)

BPM #

Conclusion: For 100 seeds still limited by random number distribution, so, should use same seeds to get 10% level agreement.

SLEPT vs. ILCv

- Kiyoshi Kubo has three "modes" of DFS.

- He changes the energy by scaling all cavities by a constant value versus turning off an appropriate set of cavities (like MatLIAR and ILCv)

- Resteering method is different

- Implemented his three modes in ILCv
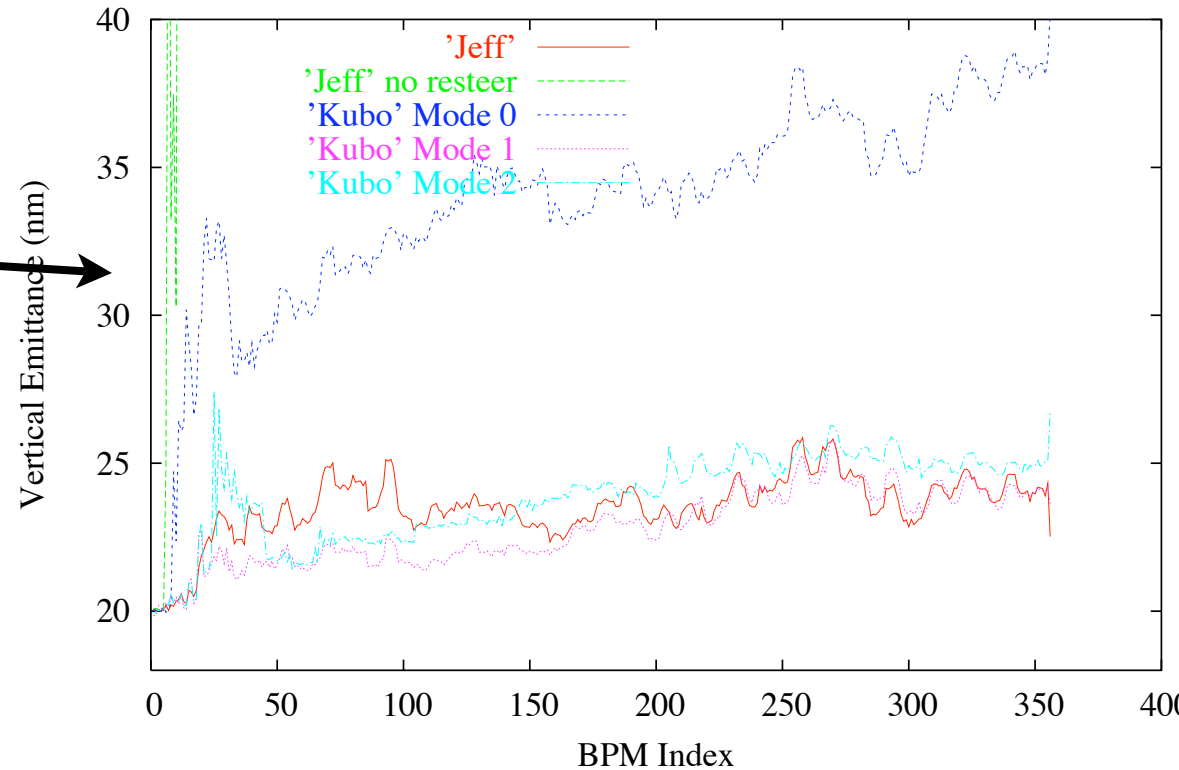
Kubo modes in SLEPT and ILCv

DFS spikes with PT data 20060510
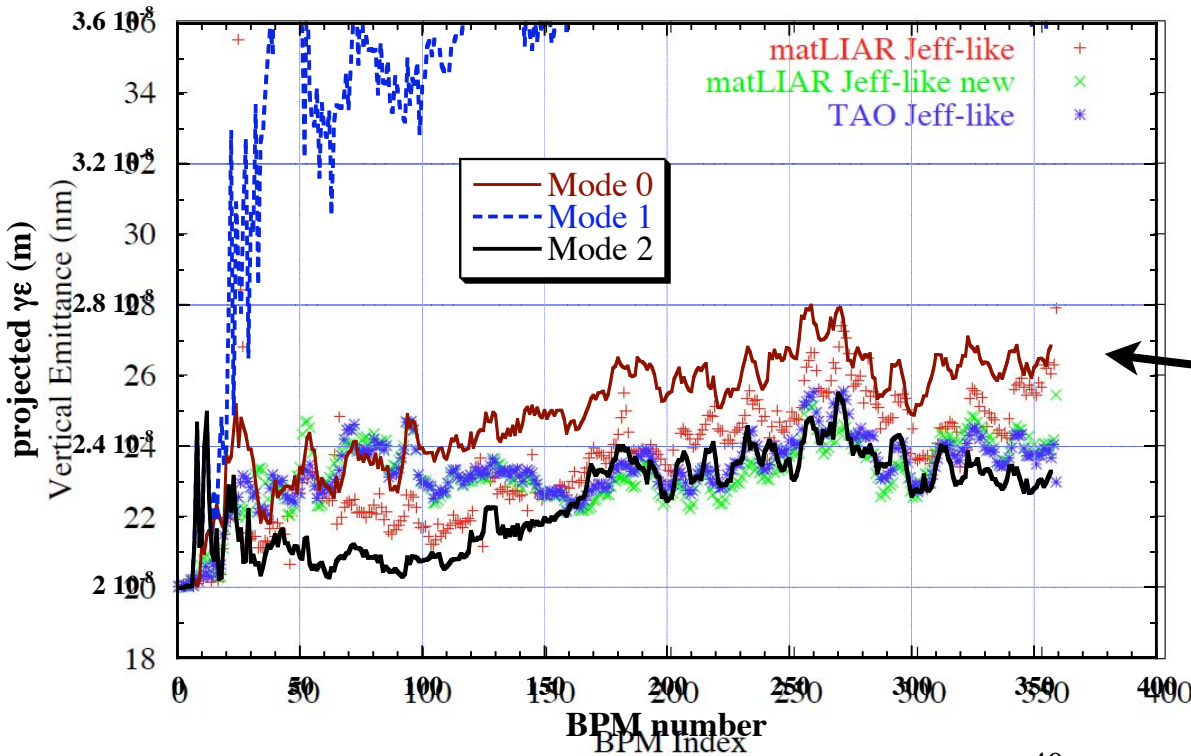
Kubo Modes via SLEPT (compared with ILCv data)

Kubo Modes via ILCV (compared with two "Jeff" modes)

Conclusion: Some differences but Mode 2 behaves similarly between codes and with "Jeff" mode

Kubo DFS modes and Jeff method

100 seeds

Again, mode 2 agrees very
well with "Jeff" mode.

Kubo vs. Jeff DFS 100 seeds 1 um BPM resolution 20060602
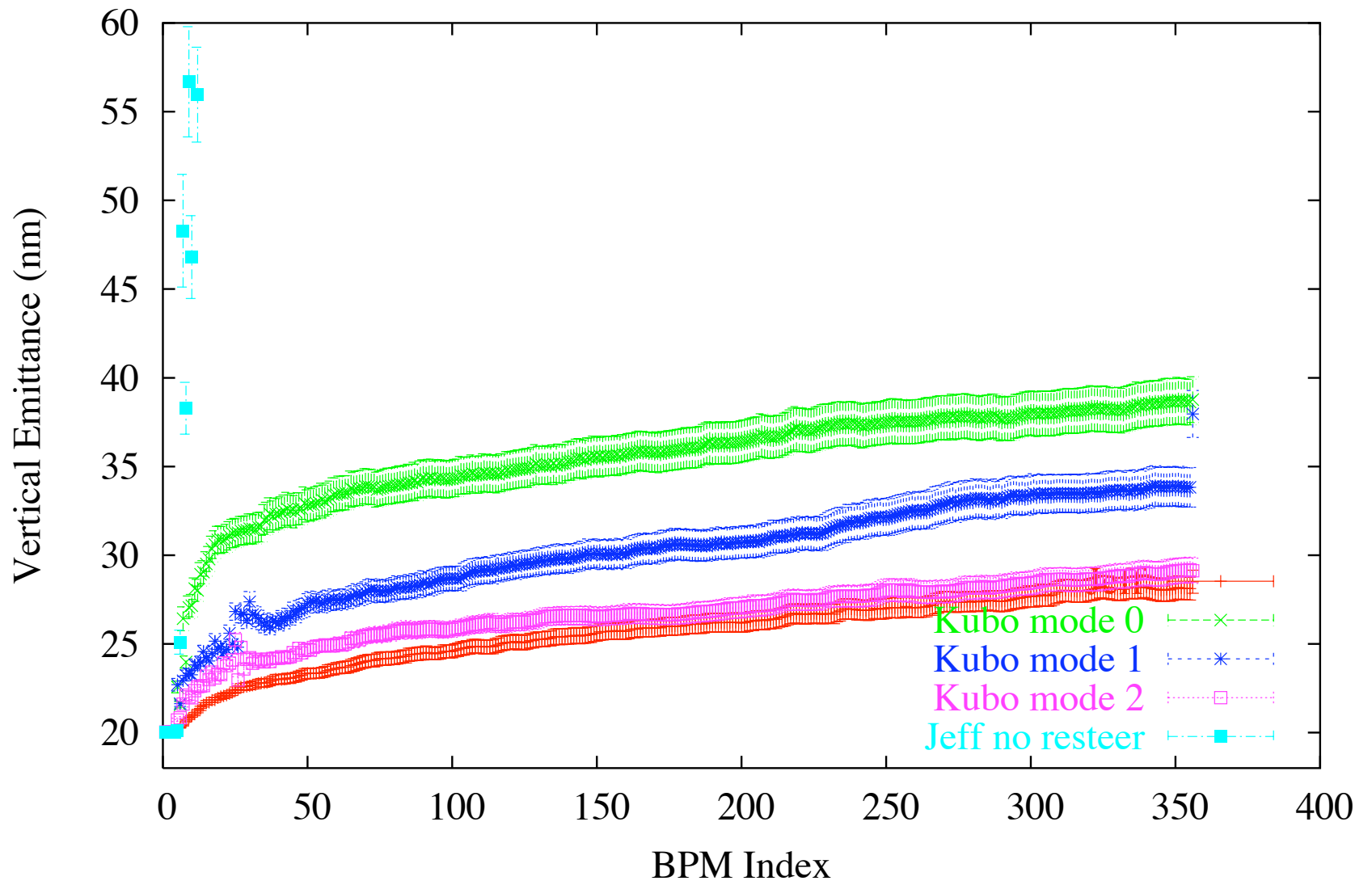
Conclusions

- Three of the four LET codes (MatLIAR, SLEPT and ILCv) were able to converge on DFS performance.

- Still little bumps (not spikes anymore) in MatLIAR DFS (will investigate).

- Kiyoshi Kubo's mode 2 works just as well as "Jeff"like DFS and yet is simpler because it uses fewer steps.

  - However, found to be much more sensitive to BPM resolution so it may not be as robust (will investigate)

- Still one more code: Daniel Schulte's PLACET

  - need to get his group involved