ATF2 as a test bench for CLIC BDS tuning, also

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Thanks to P. Bambade and G. White

ATF2 project meeting 2007

Contents

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  - Beam based alignment in the CLIC BDS
  - FFS?
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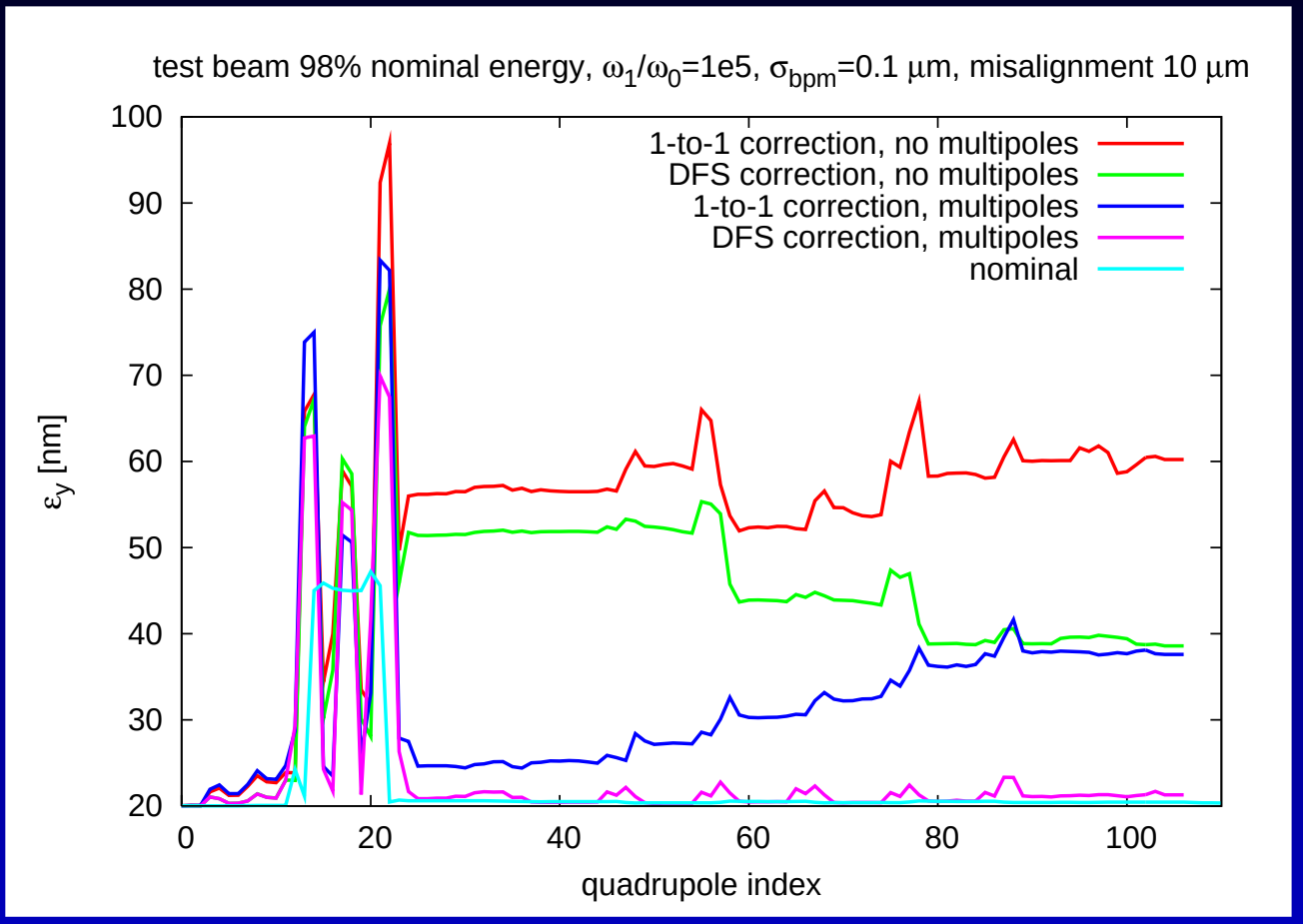
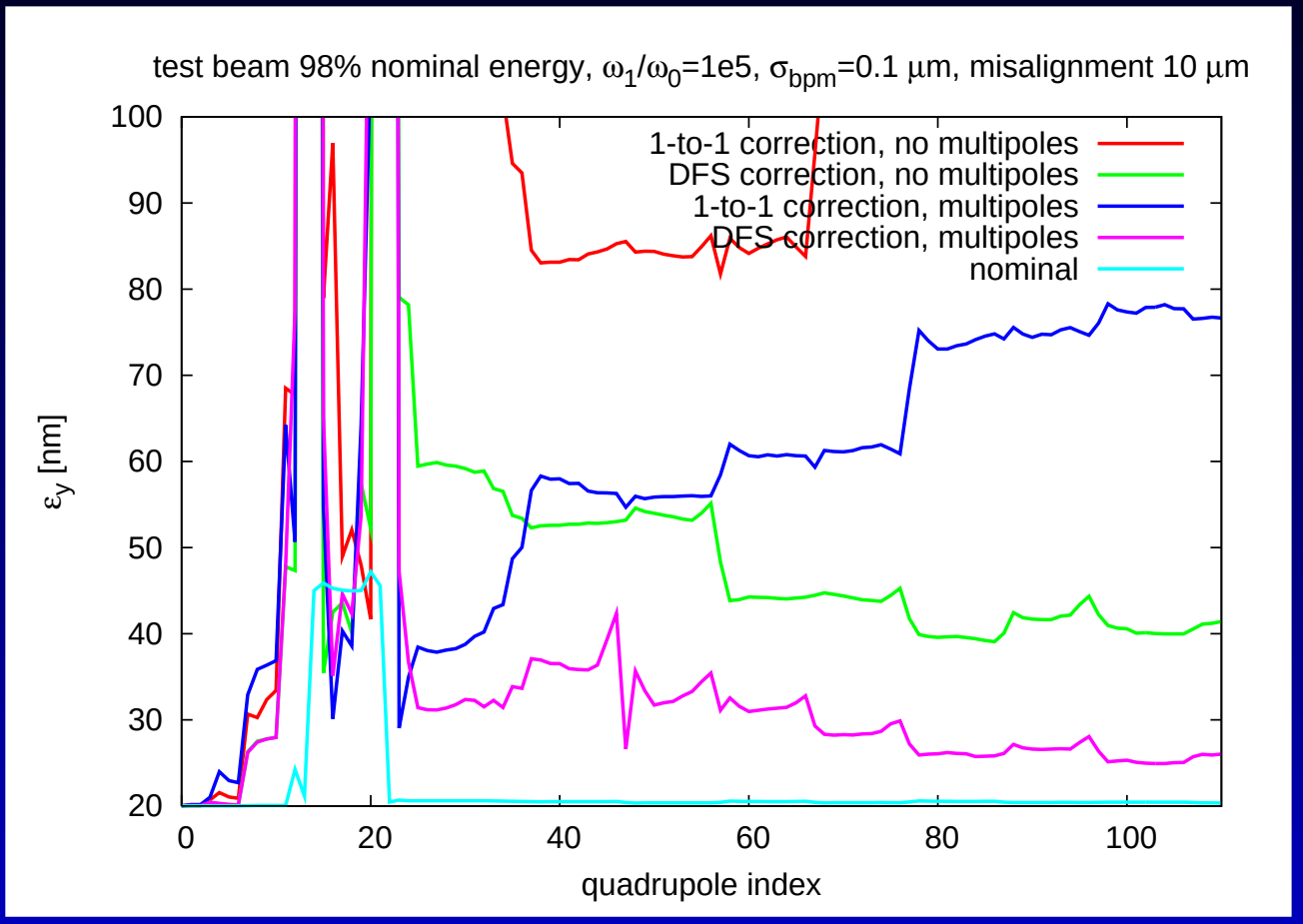
Aligning the CLIC collimation section



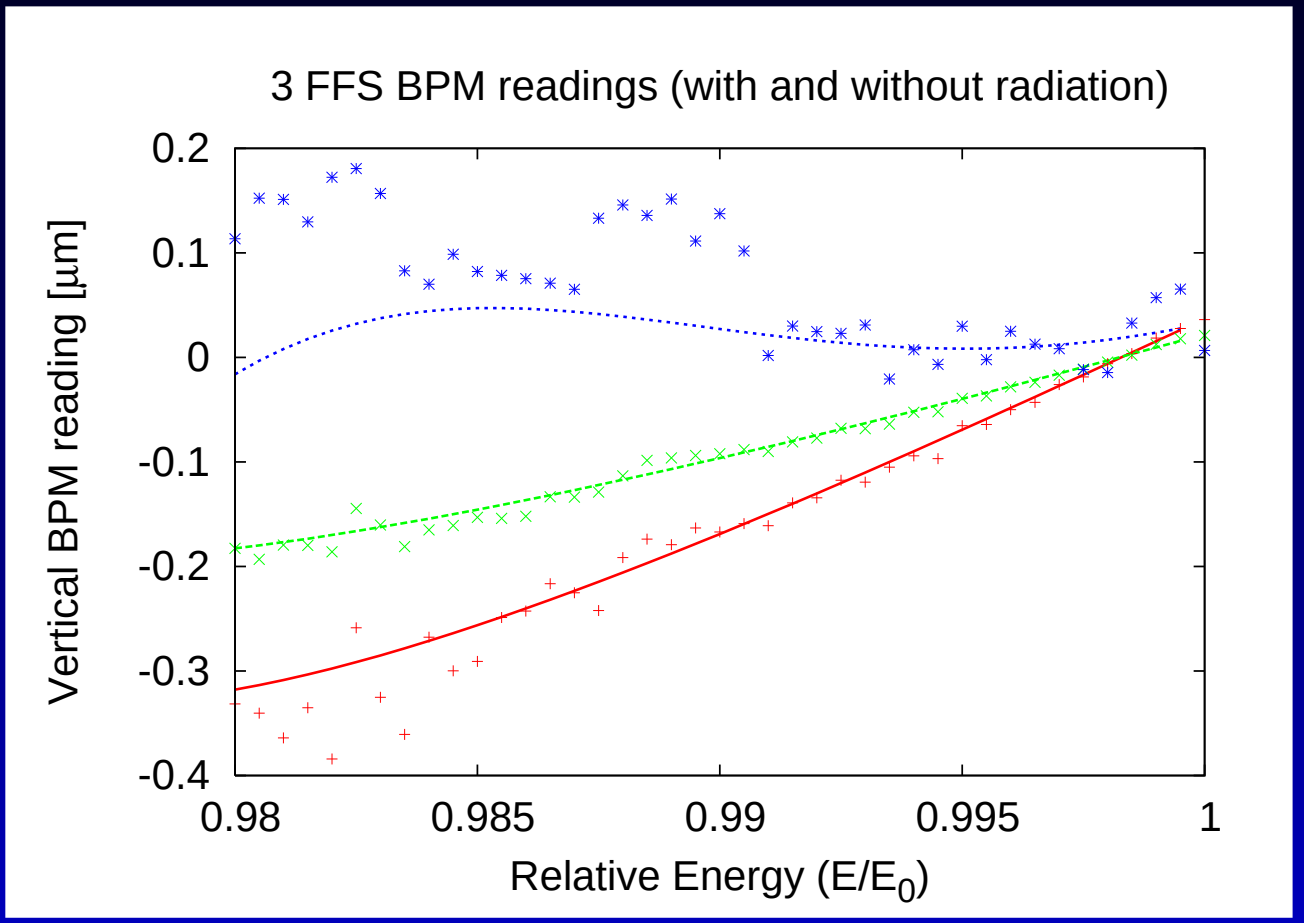
5% emittance growth after aligning only the collimation section.

Aligning the full BDS?



Does not work. The FFS corrupts the correction in the collimation section.

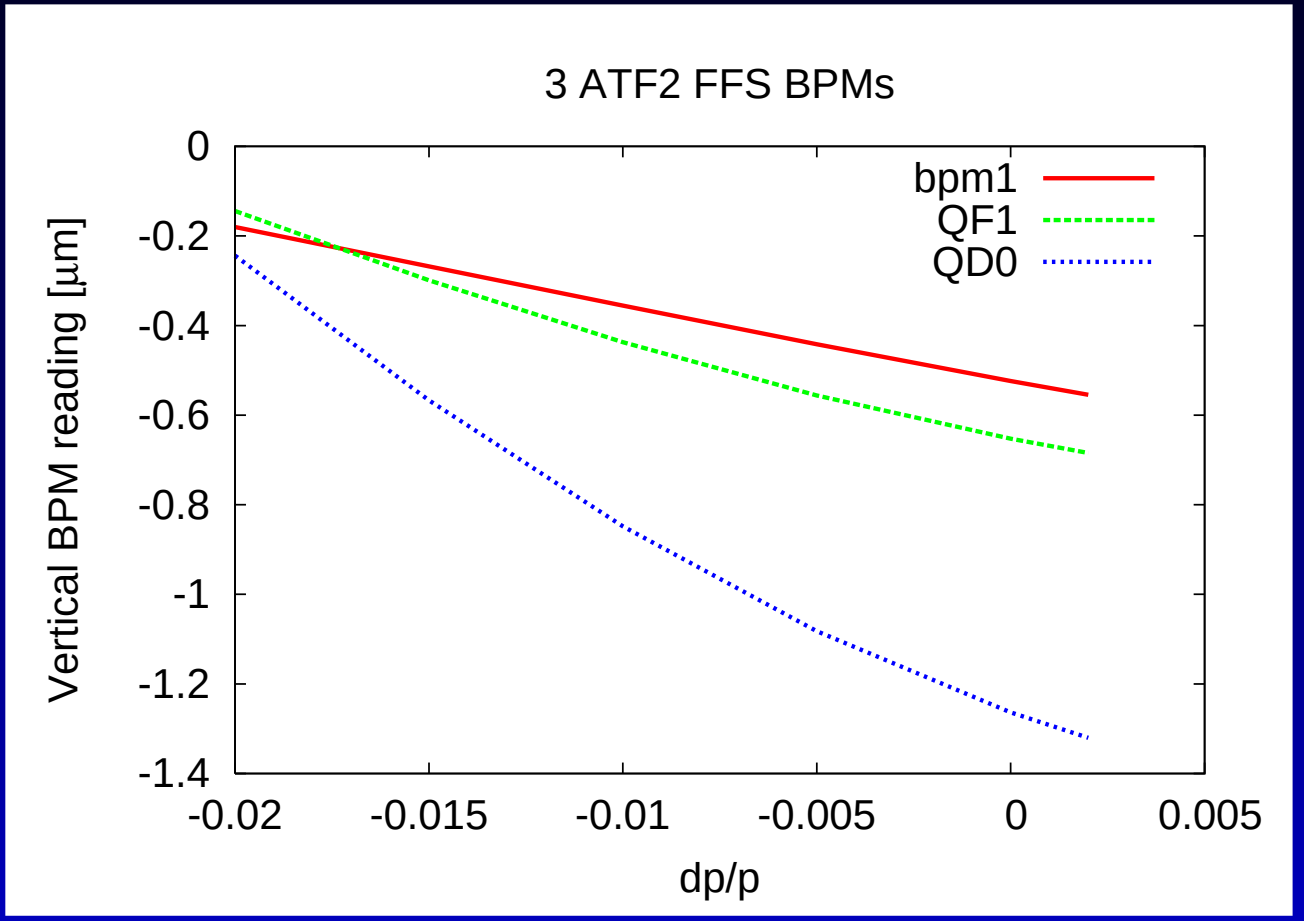
Looking into the CLIC FFS



Large error due to radiation

Apparent linear and non-linear vertical dispersion

The ATF2 FFS



Apparent linear and non-linear vertical dispersion due to the transverse particle distribution.

Tuning approach

A 0-th order tuning algorithm based on the Simplex:

- Observables: σ_x and σ_y at IP.
- Variables: Magnet strengths, x, y and tilt displacements.

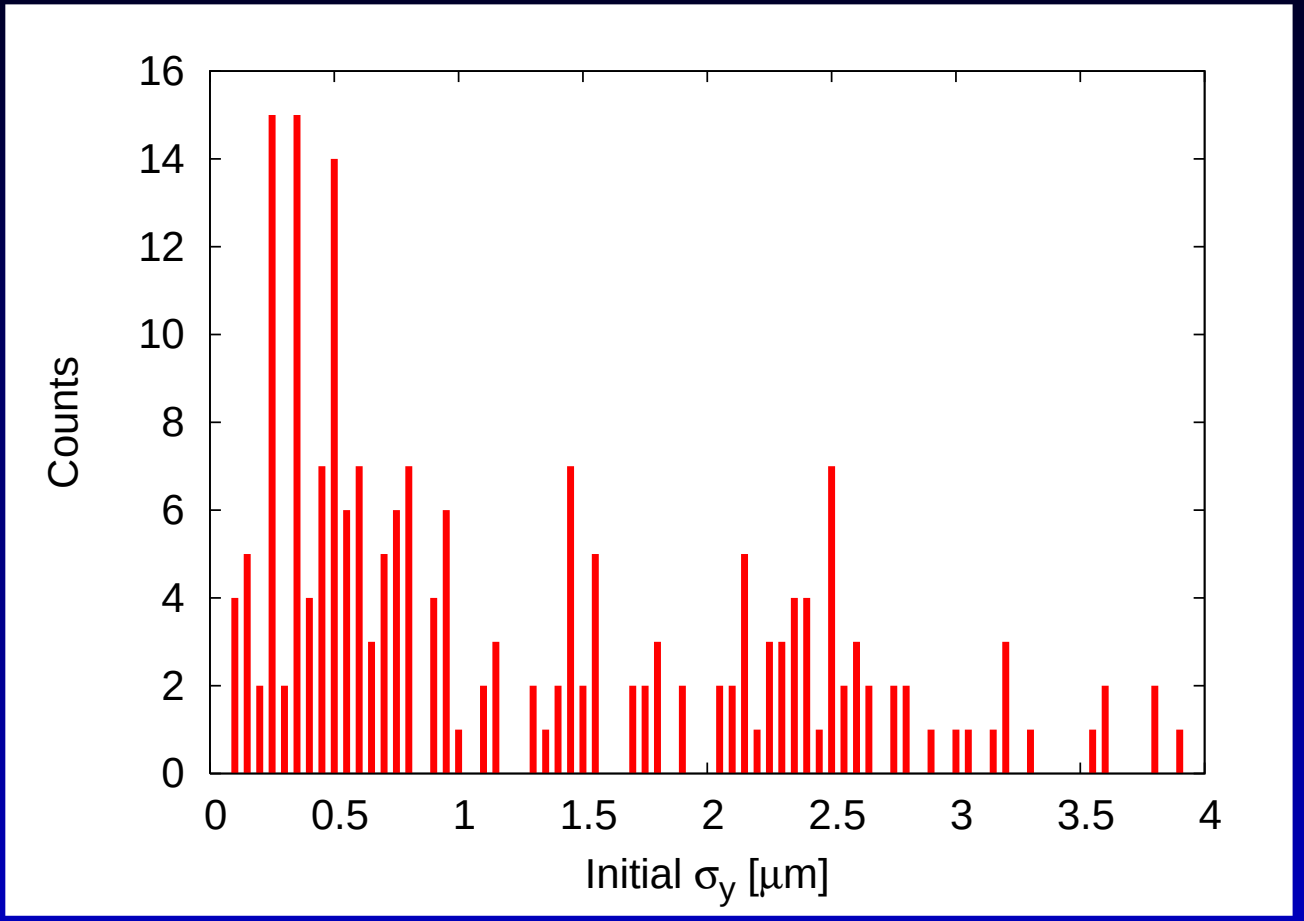
First test via ATF2 simulations:

- Code: PLACET-Octave
- Ingredients: realistic errors but no ground motion (yet)

Simulation ingredients: errors

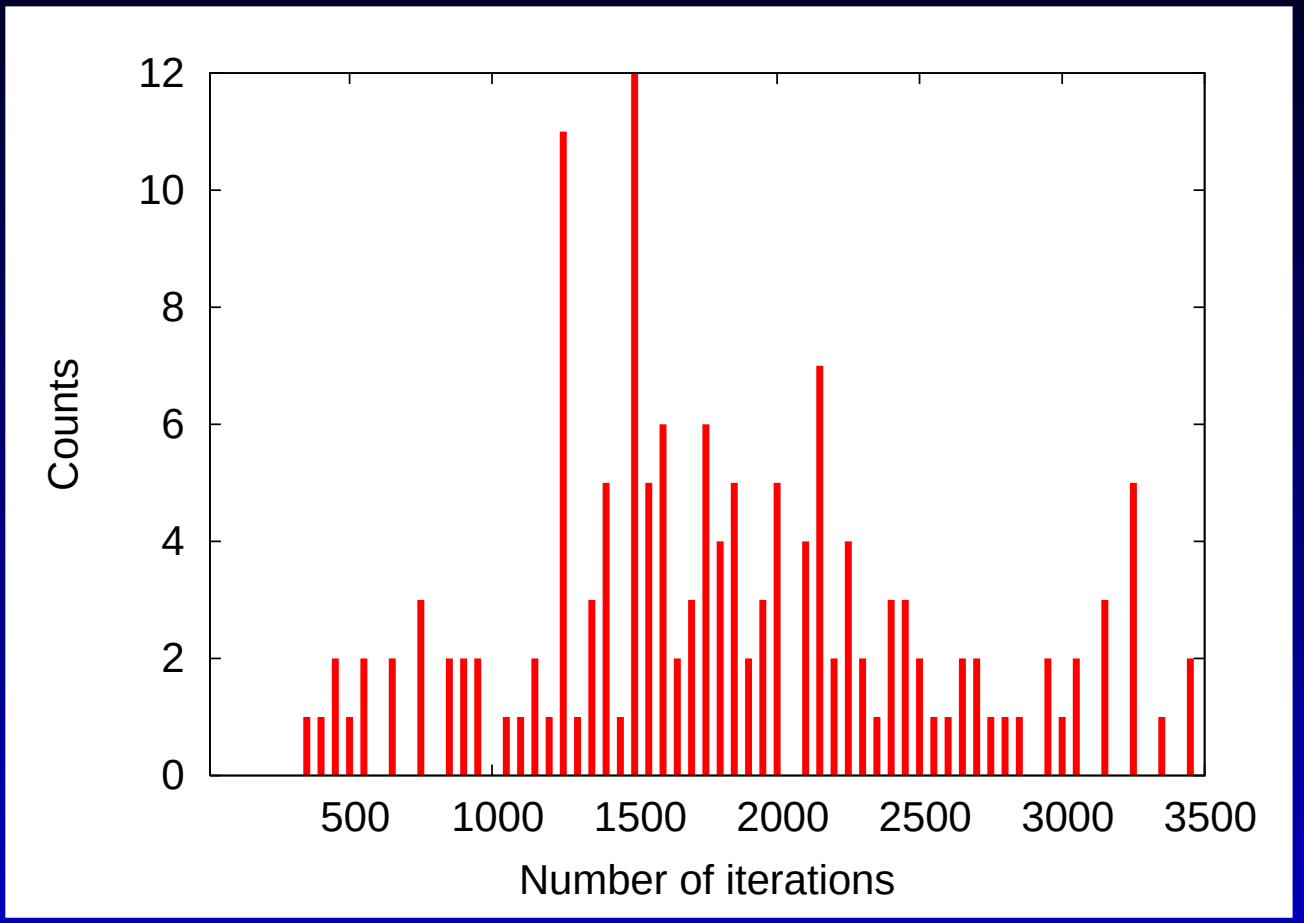
- H & V misalignments with $\sigma = 30\mu$m.
- Transverse roll with $\sigma = 30\mu$rad.
- Relative strength error with $\sigma = 10^{-4}$.
- Measurement error of σ_y, σ=1nm.

Initial σ_y for 150 seeds



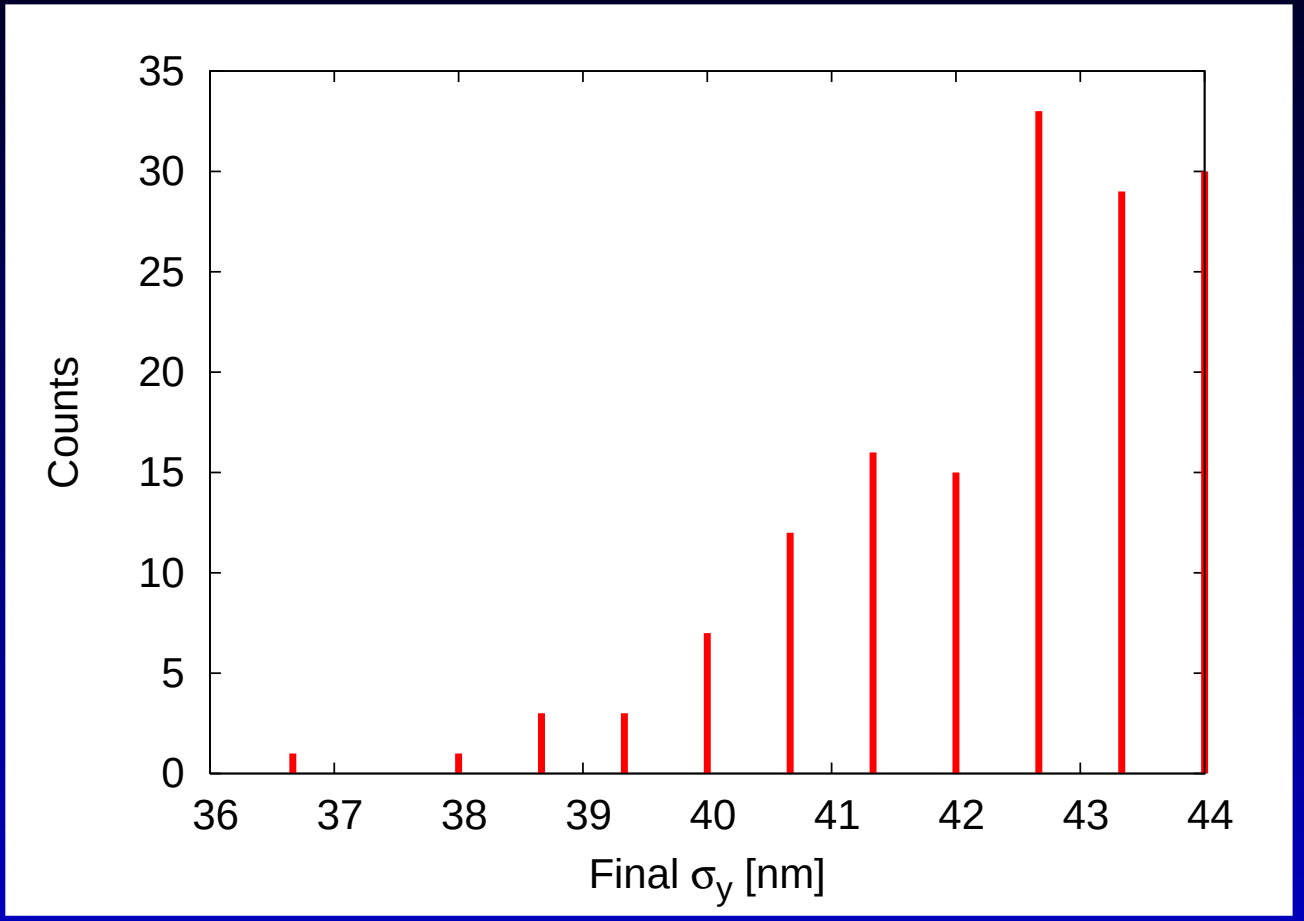
Up to 4μm of initial σ_y.

Number of Simplex iterations



Below 4000 iterations required (without ground motion).

Final σ_y



Final σ_y between 37 and 44nm.

Summary and such

- ATF2 tuning experience is extremely valuable for CLIC.
- A 0-th order tuning algorithm has been simulated with ATF2 based on the Simplex.
- Initial $\sigma_y < 4\mu$m gets below 44nm in less than 4000 iterations
- Consistent with Glenn's previous results
- Ground motion to be included in future studies
- "Realism" studies from SLAC colleagues to be observed (even more dramatic for CLIC!).