CLIC Beam Delivery System

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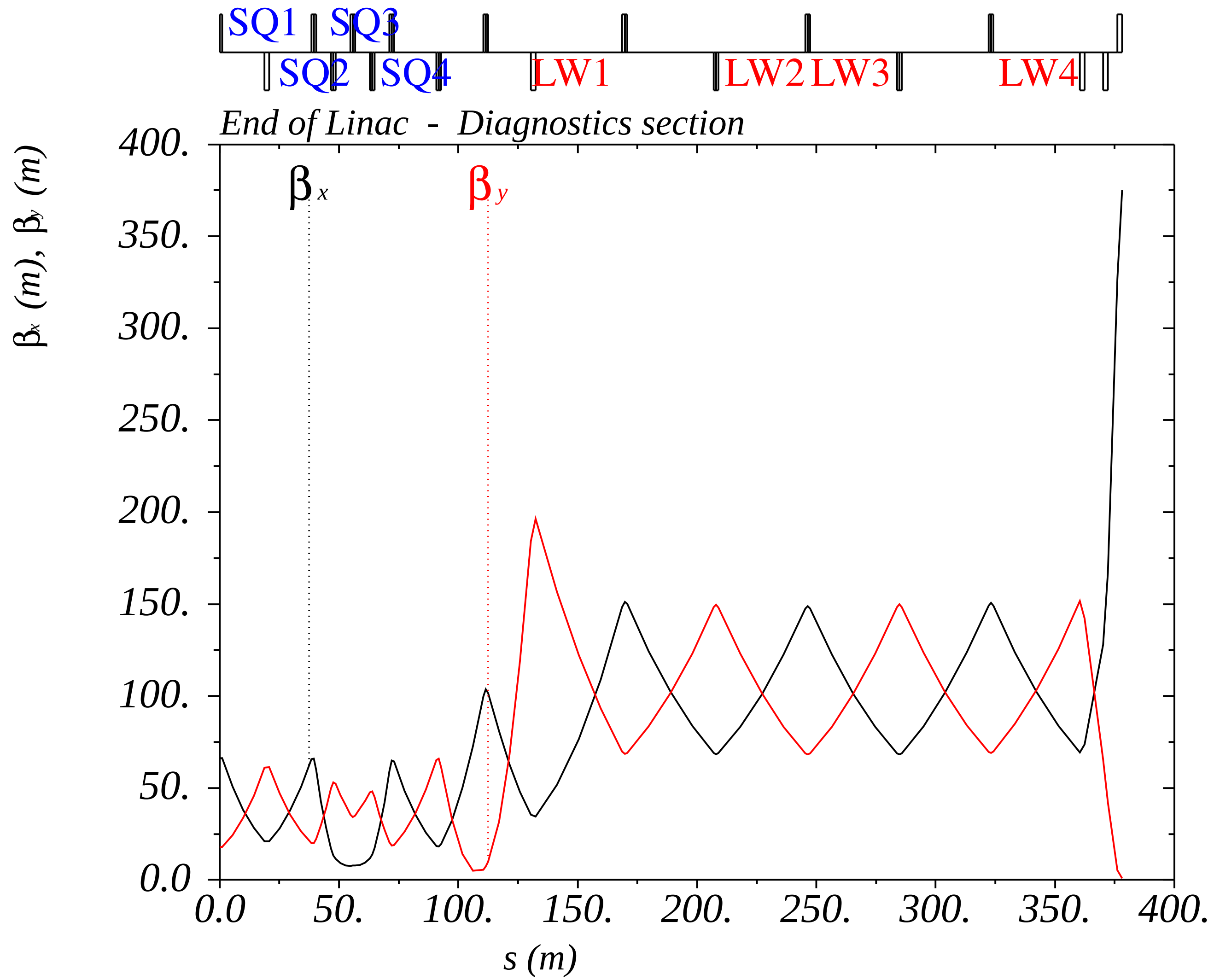
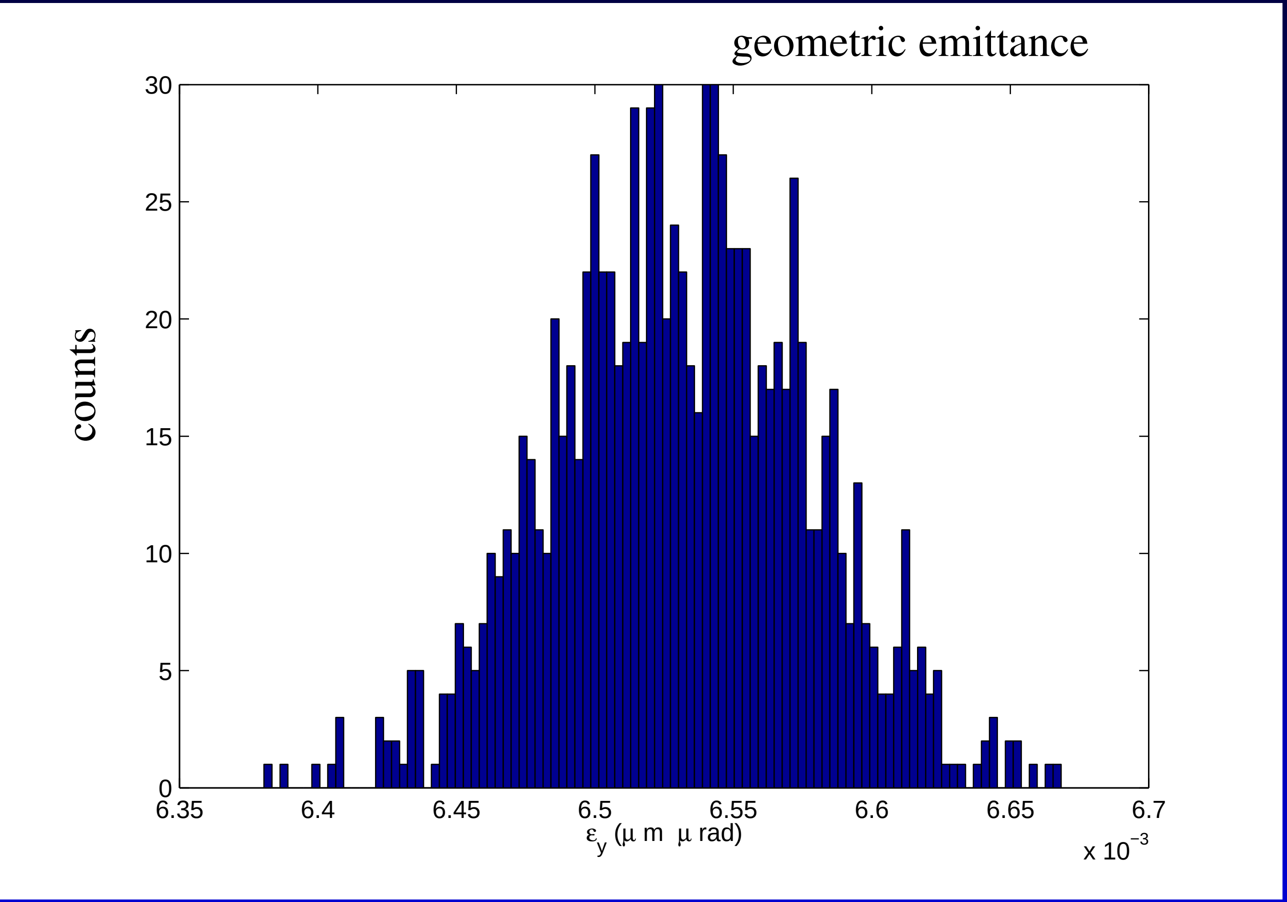
Diagnostics: emittance measurement



$\sigma_y = 1\mu m$ @ Laser wires (for ϵ_y=20nm)

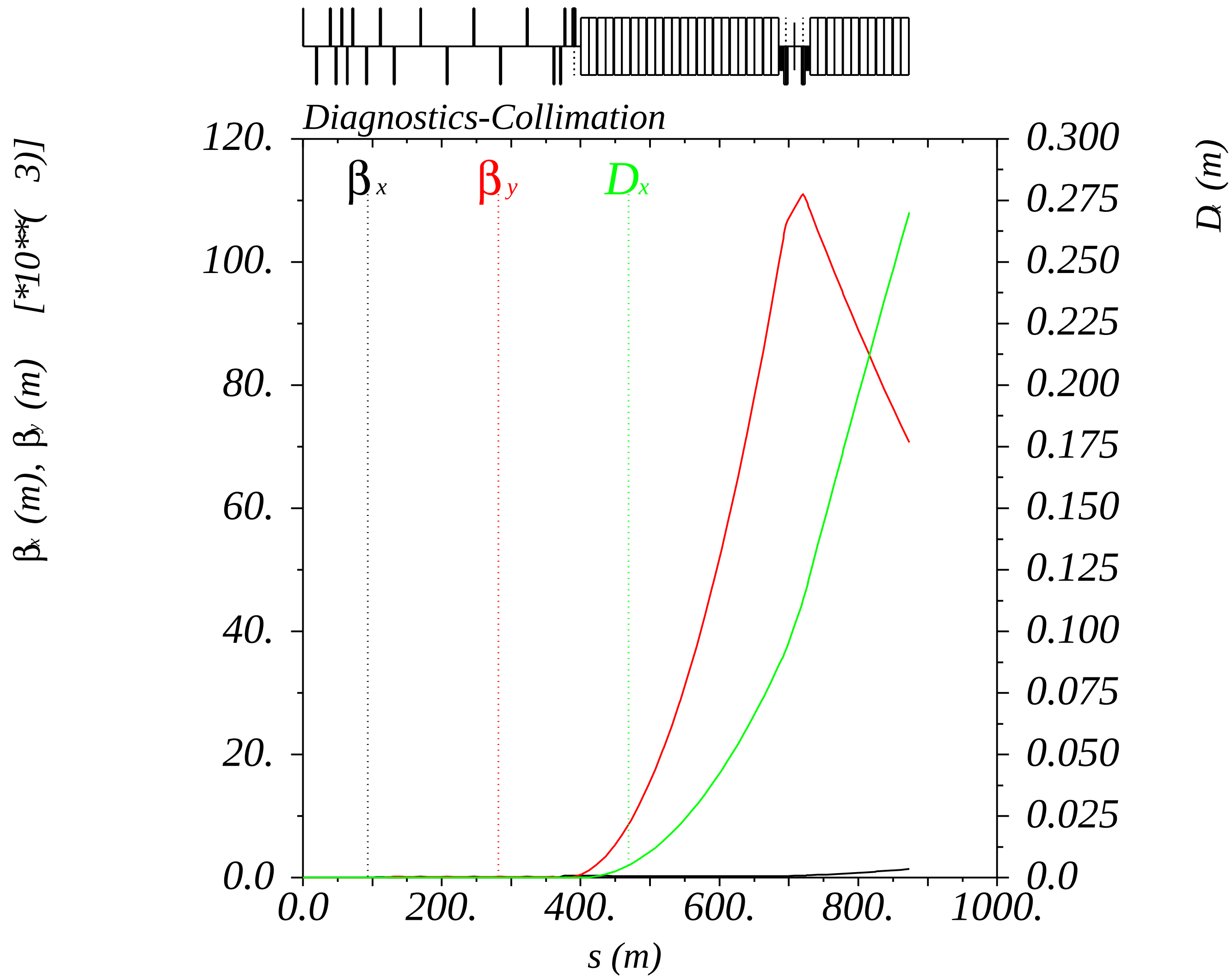
Emittance measurement

Simulations by I. Agapov: 3 trains, 3 wires and 10% error on beam size assumed.

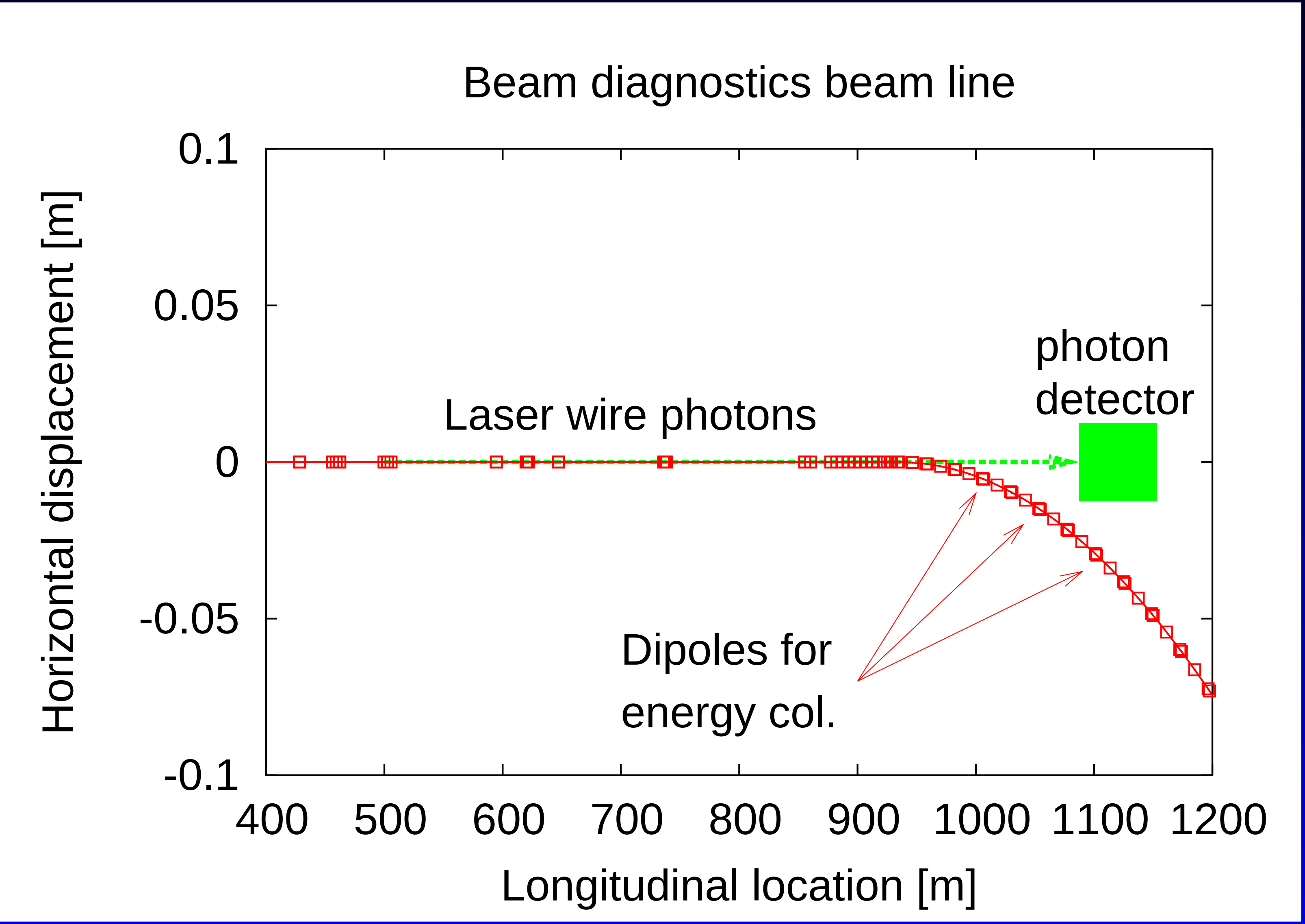


$$\Delta\epsilon_{x,y}/\epsilon_{x,y} \approx 7\%$$

Diagnostics inside collimation

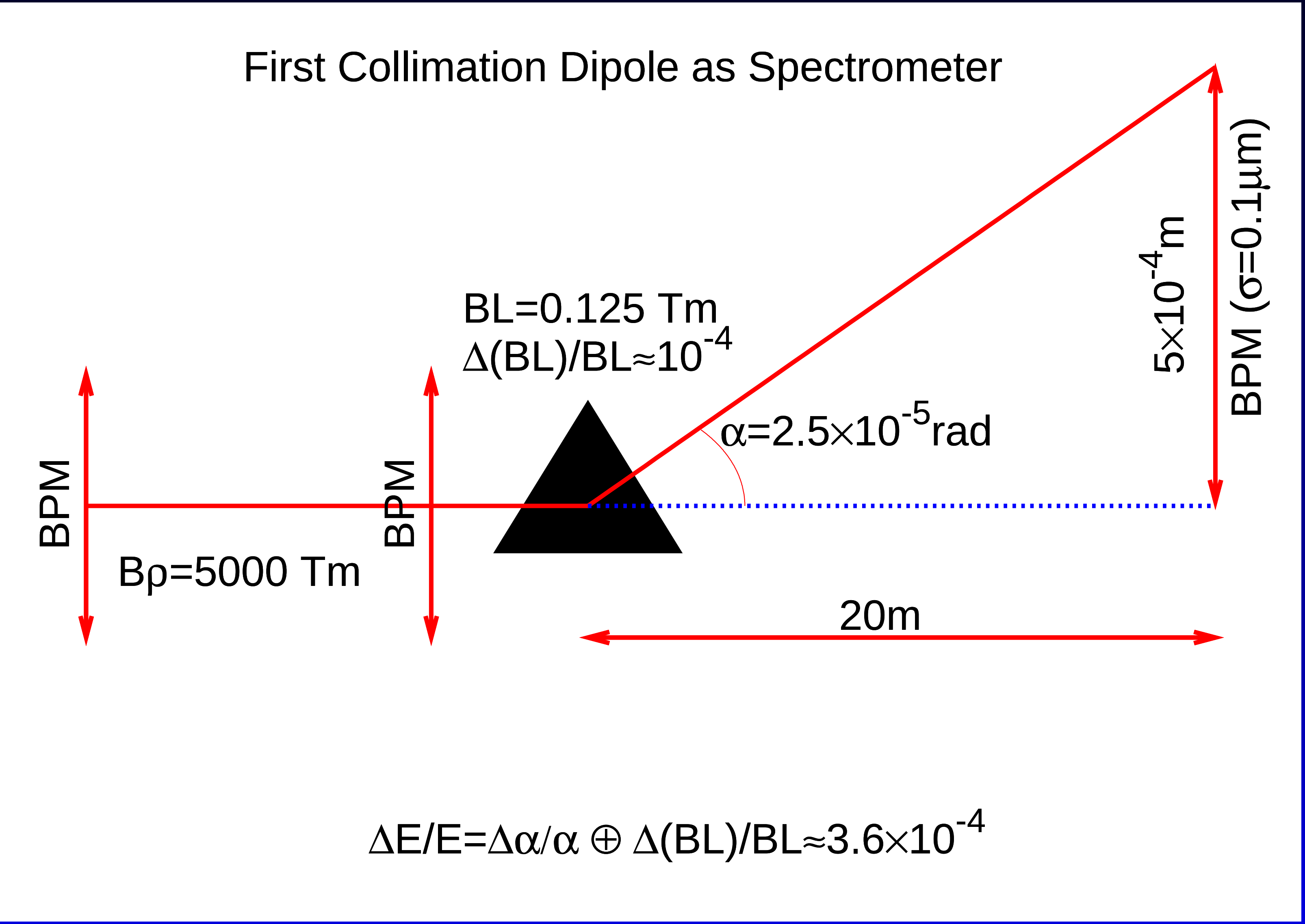


Layout & photon collection

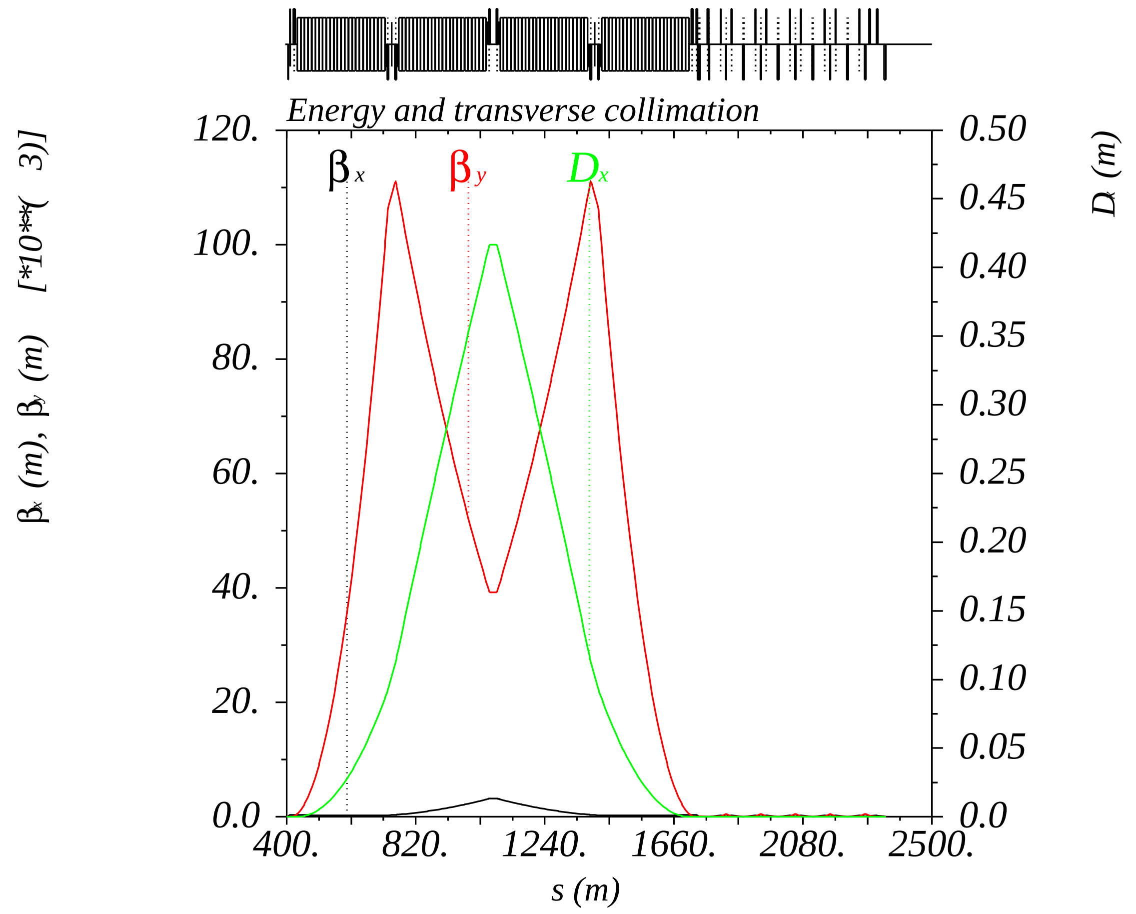


Photon collector based on ILC

CLIC compact energy measurement

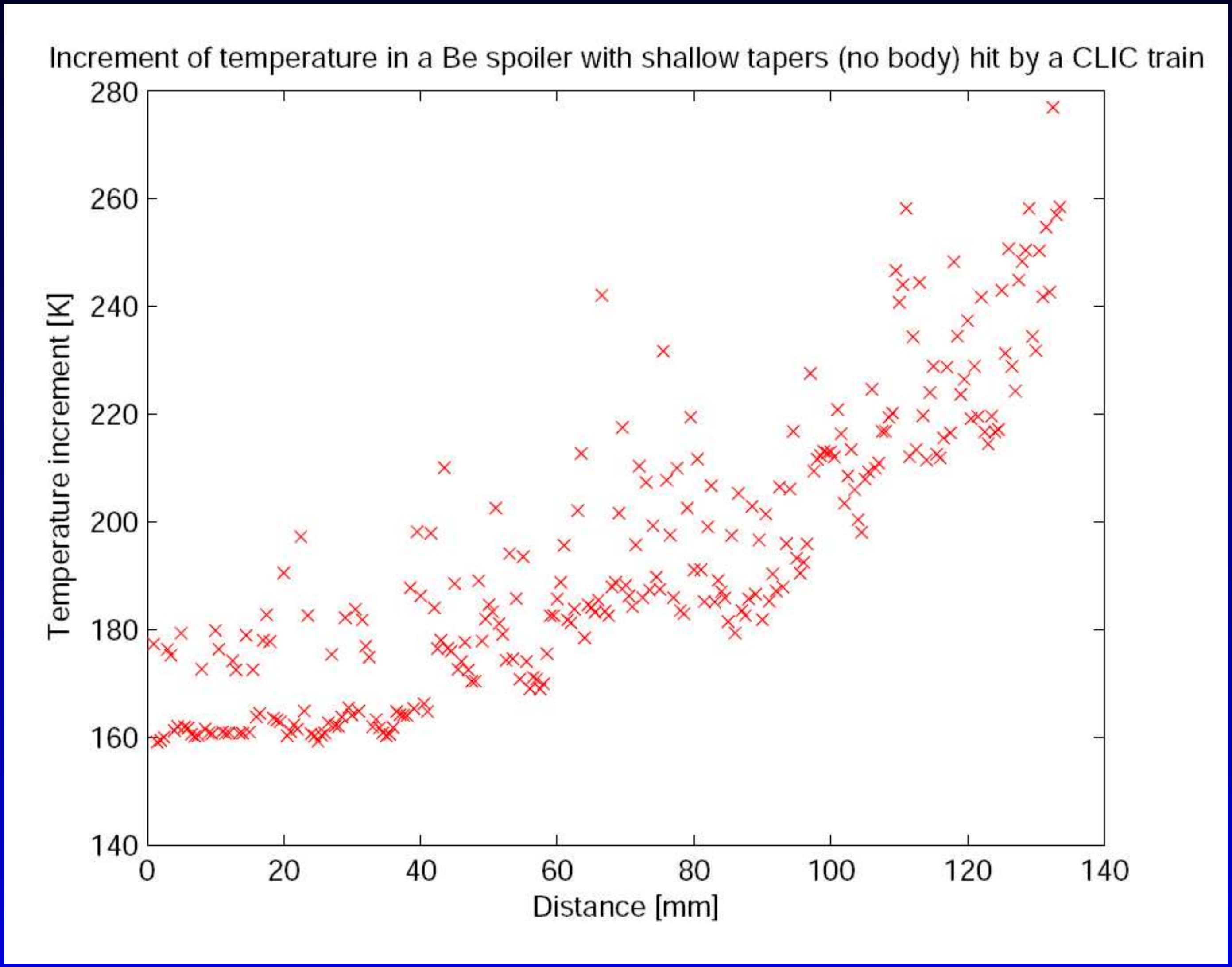


Collimation section



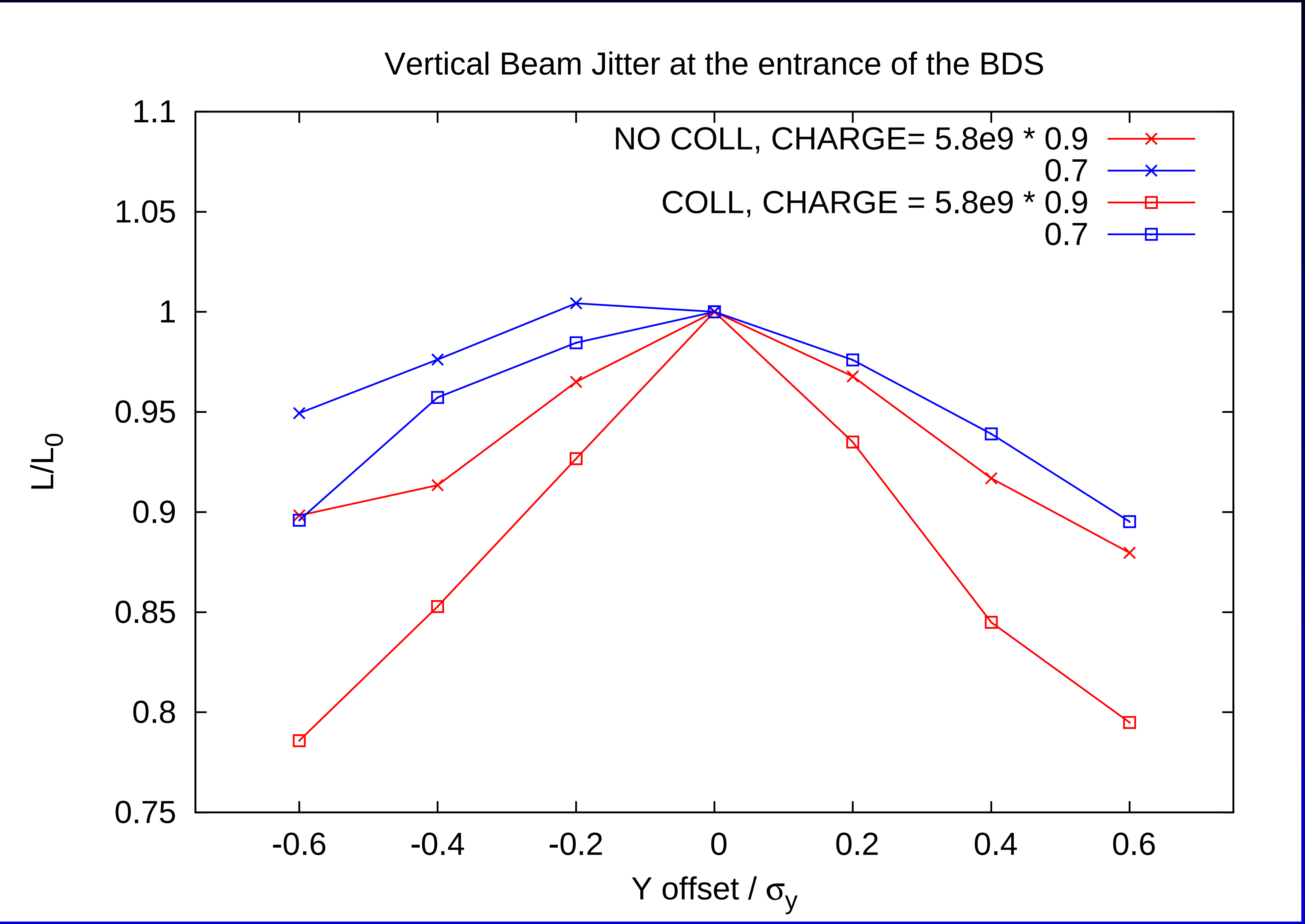
Cleaning inefficiency for new parameters under investigation by J. Resta.

Collimator survival (J. Resta, L. Fernandez)



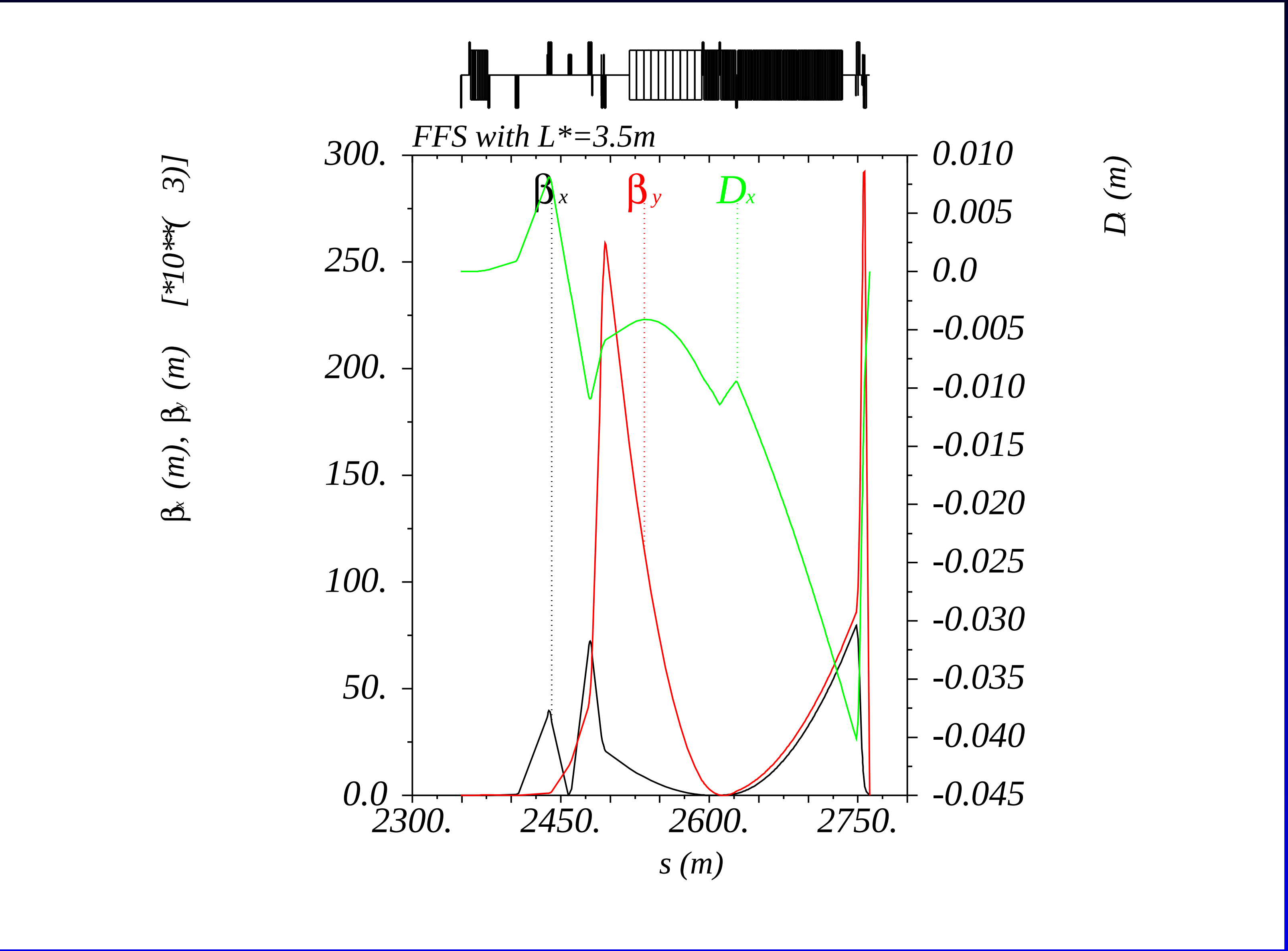
Be thermal fracture limit = 370K → Good!

Collimation wakefields

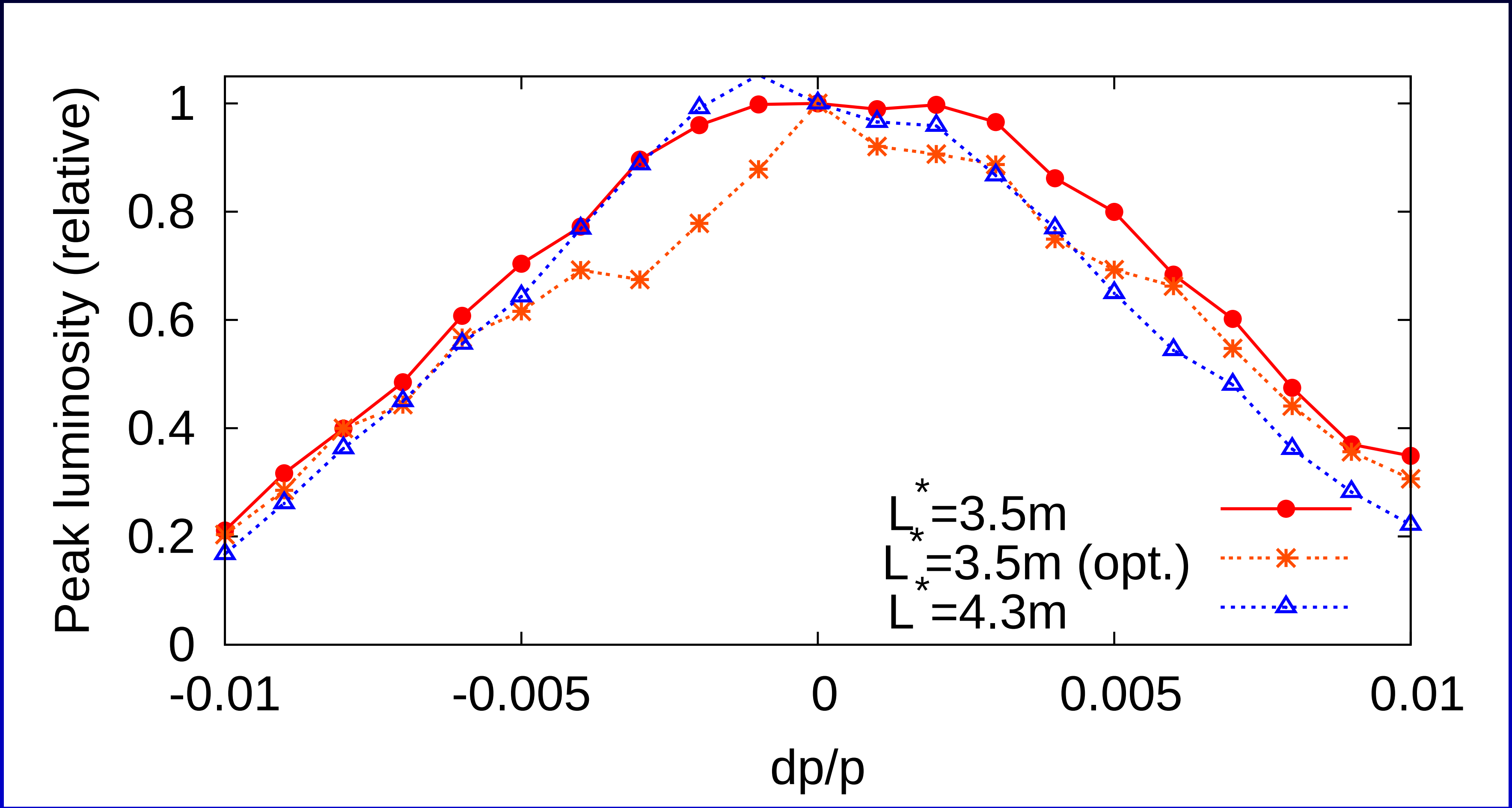


Tolerance in the level of the $0.1\sigma_y$

Final Focus System with L*=3.5m

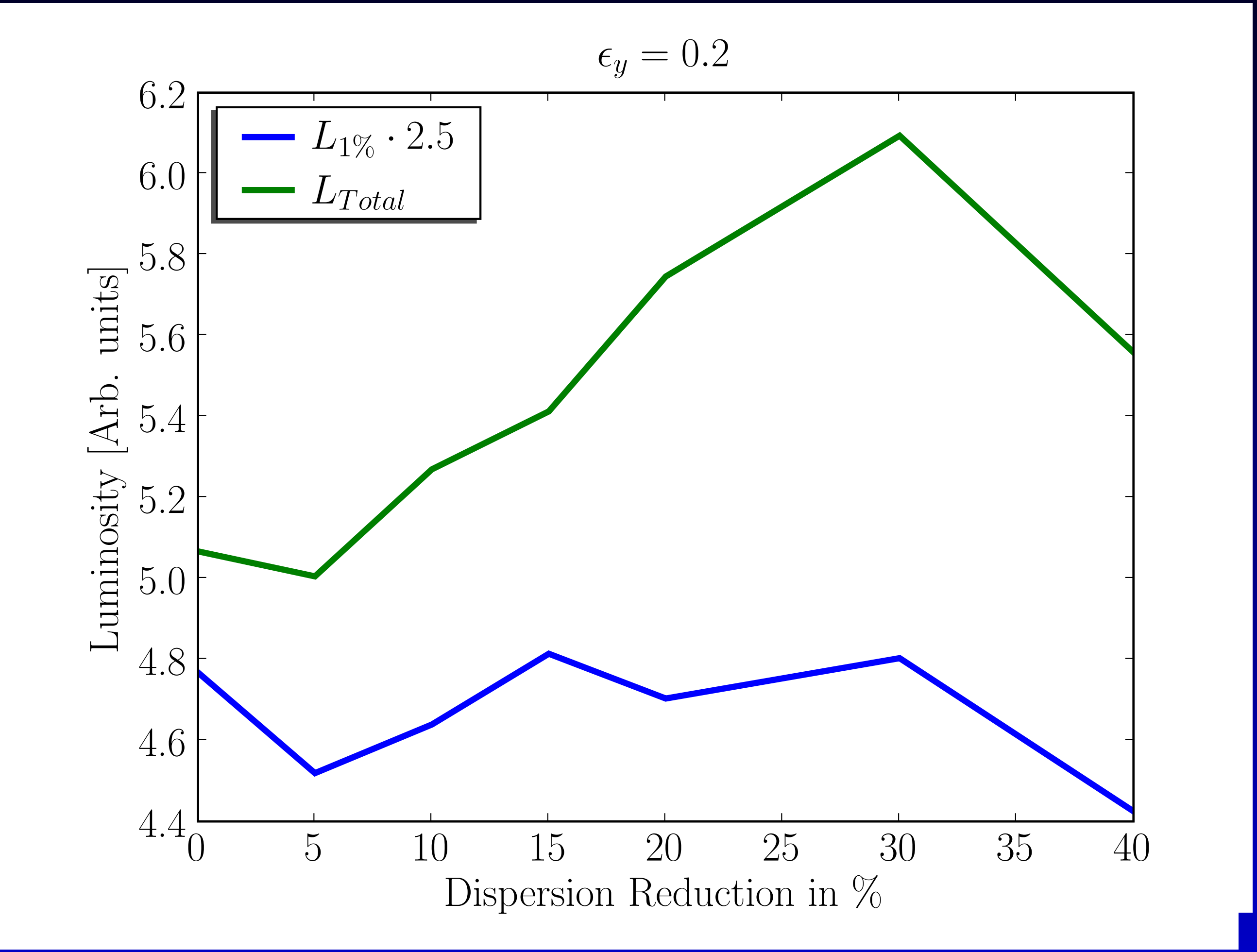


Final Focus Systems, 3.5m versus 4.3m L*



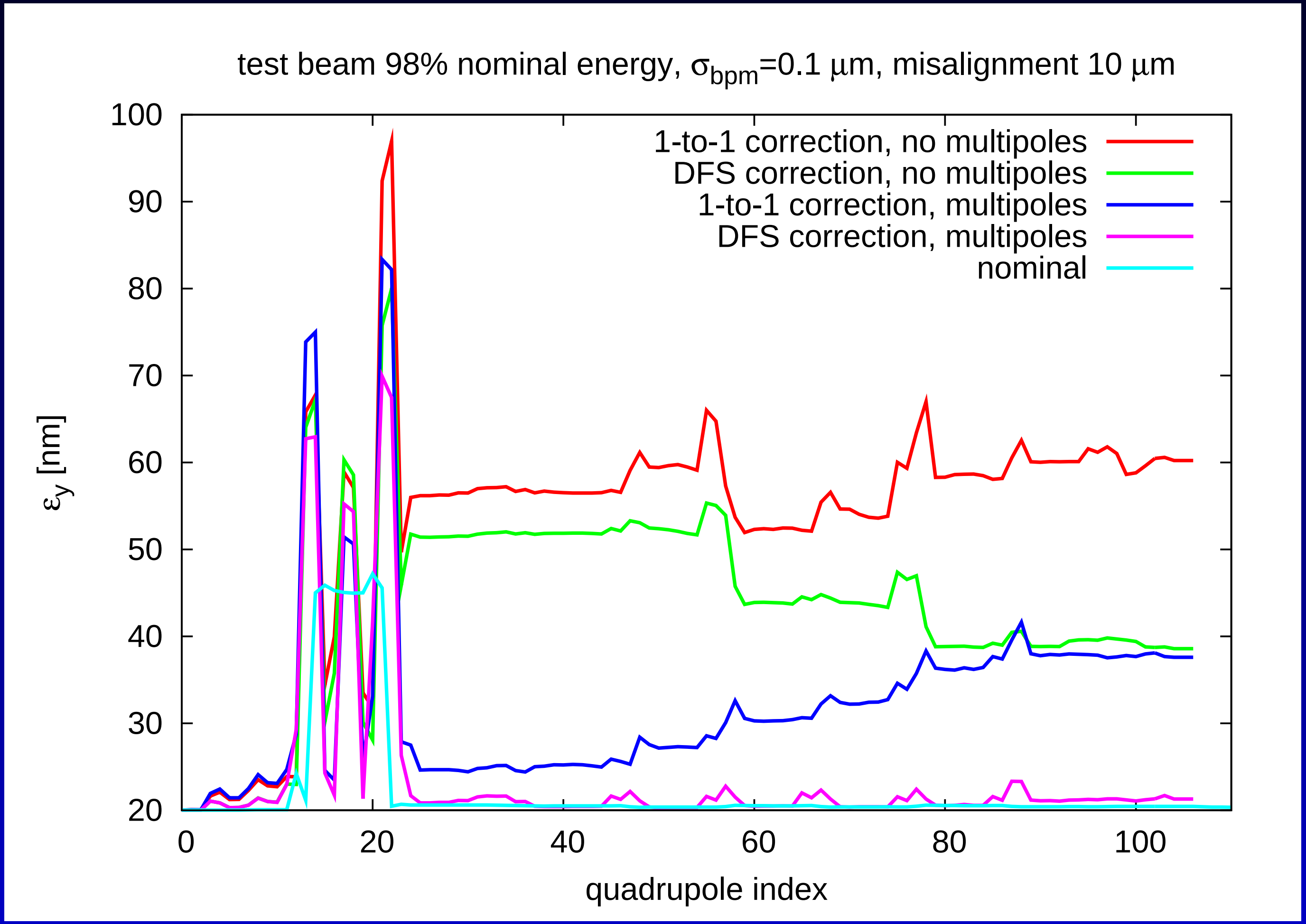
→ Slightly larger peak-lumi-bandwidth for the 3.5m L* FFS

Saturation of the peak luminosity



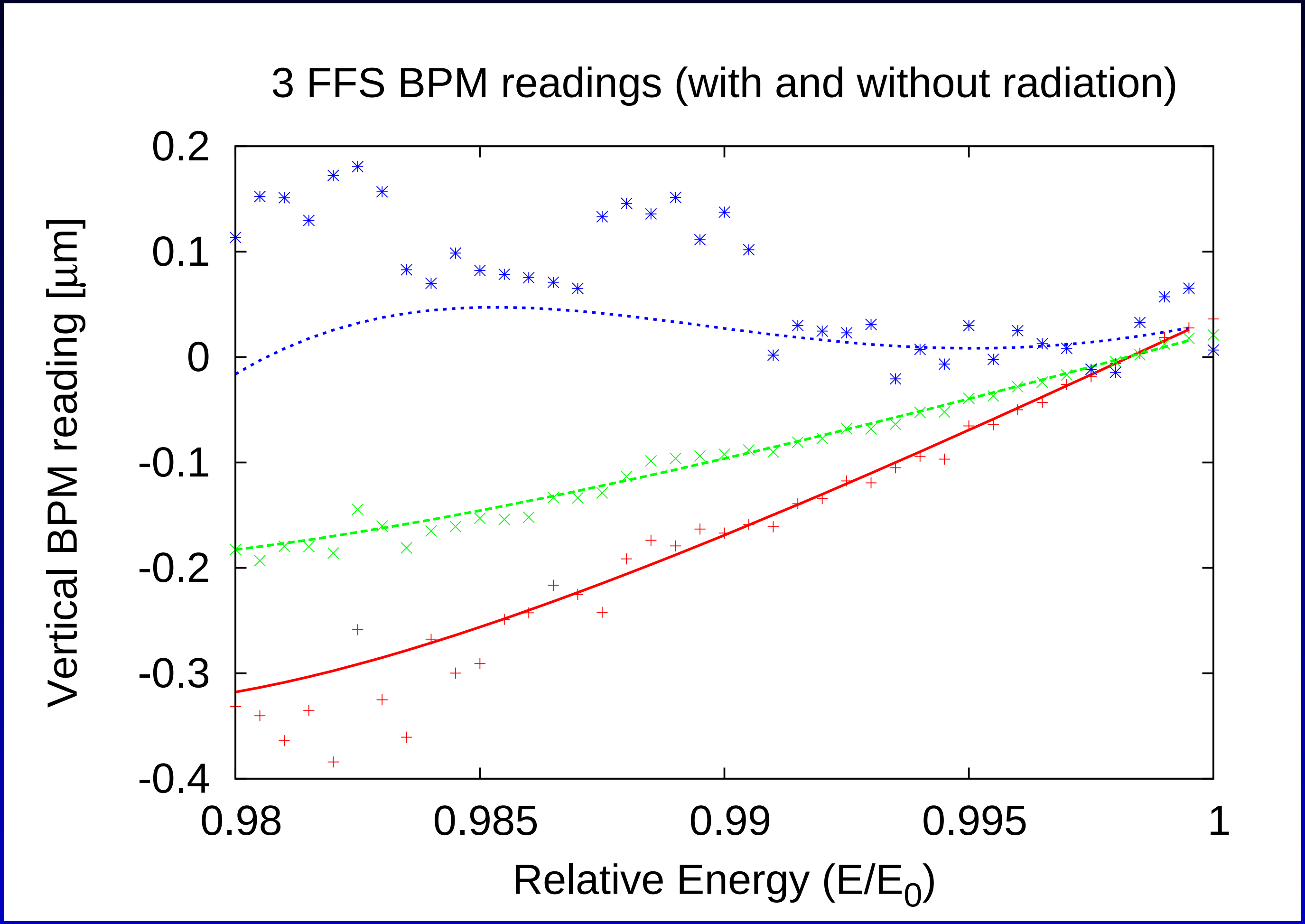
→ With the current beam parameters further reductions of IP beam size do not increase peak lulminosity

Alignment of the collimation section



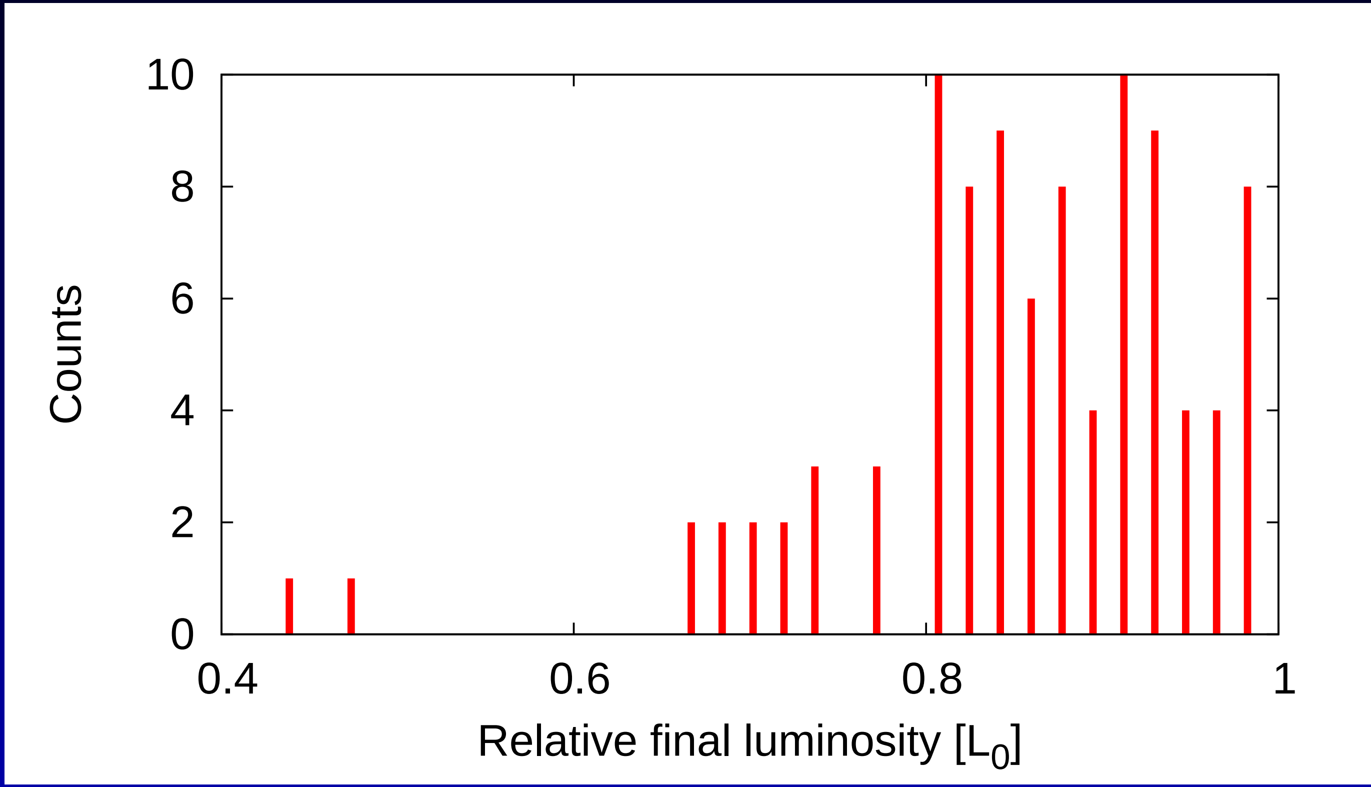
→ Dispersion Free Steering works in the collimation section.

The more complex FFS



The FFS is the most complex section. Rather than align the FFS more general tuning algoritms must be used.

Luminosity after tuning



80% of the seeds give more than 80% of the design luminosity $\rightarrow$ 20% fail.

ATF2 ultra low betas: Tuning difficulty

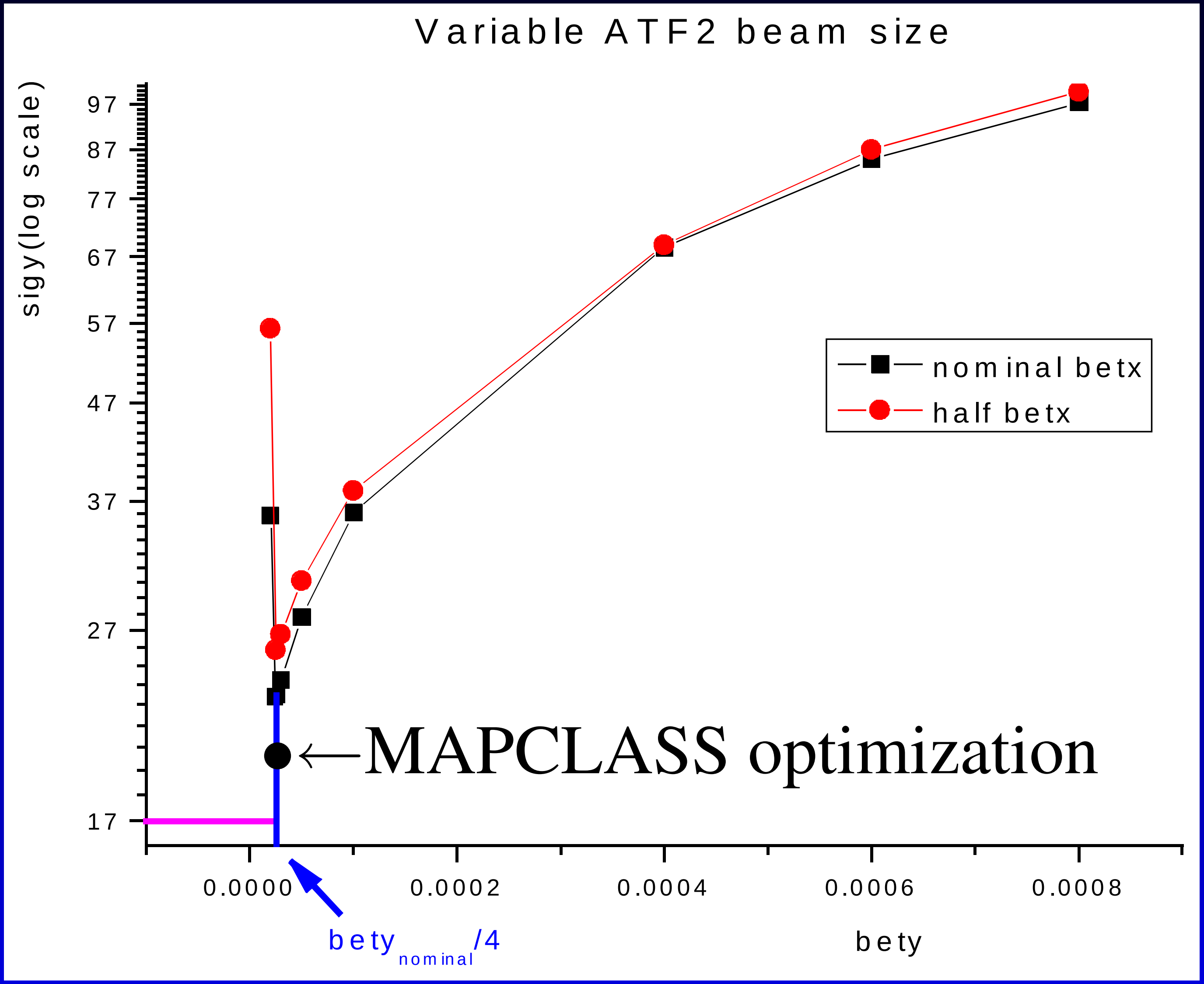
Project	Status	σ_y^* [nm]
FFTB	Measured	70
ATF2	Design	37
ATF2 pushed	Proposed	<26
ILC	Design	6
CLIC 500GeV	Design	3

Does tuning difficulty scale as ${\sigma_y^*}^{-1}$?

Both ILC and CLIC need as low ATF2 σ_y^* as possible.

What is the minimum achievable σ_y^* in ATF2?

On-going optimization with MAPCLASS

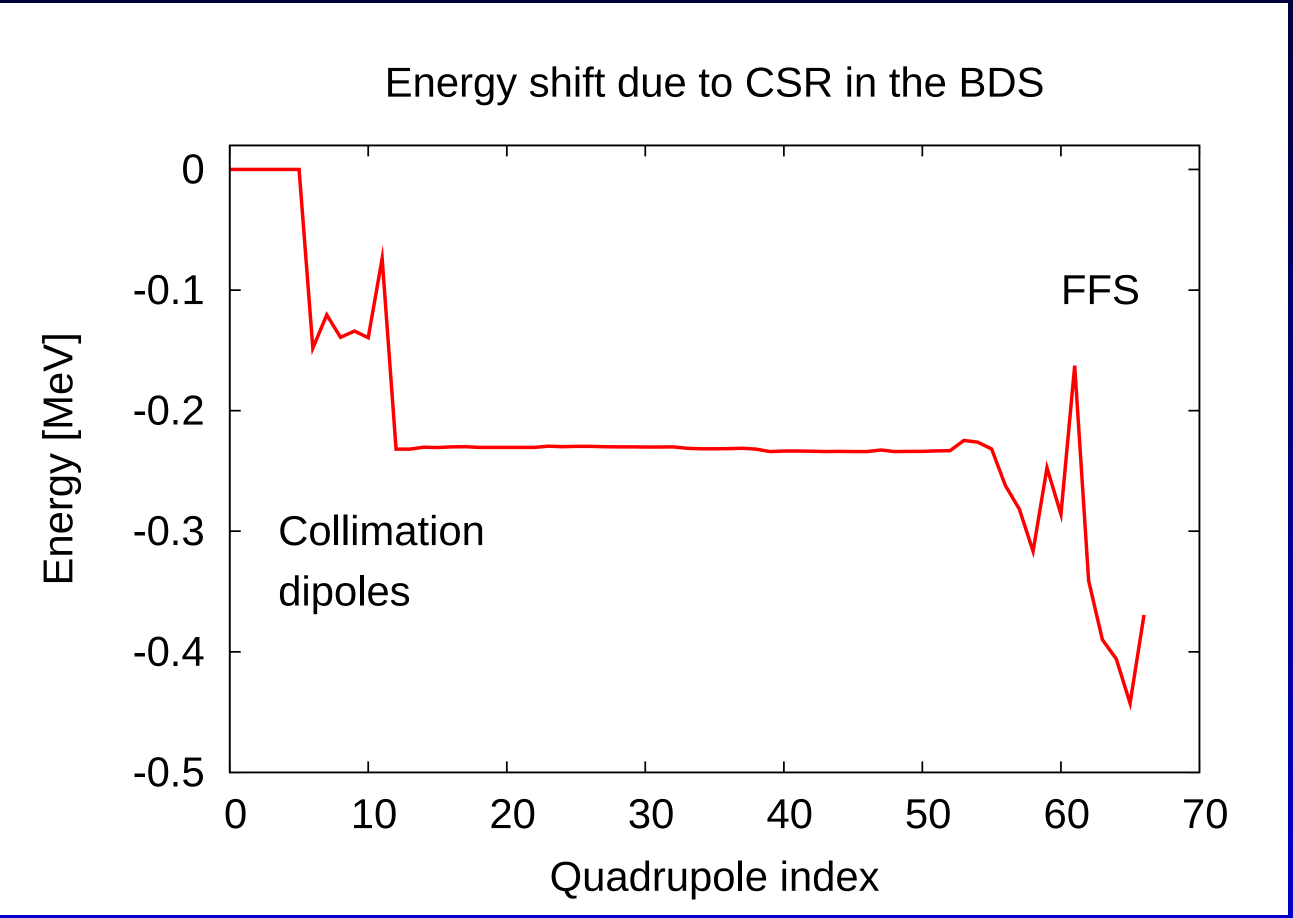


Resistive wall in the BDS

- It amplifies the incoming jitter of the beam
- and it decreases for larger beam pipes $\left(\propto \frac{1}{r^3}\right)$
- Conservative estimates by D. Shulte and G. Rumolo suggest r=8mm

CSR in the BDS?

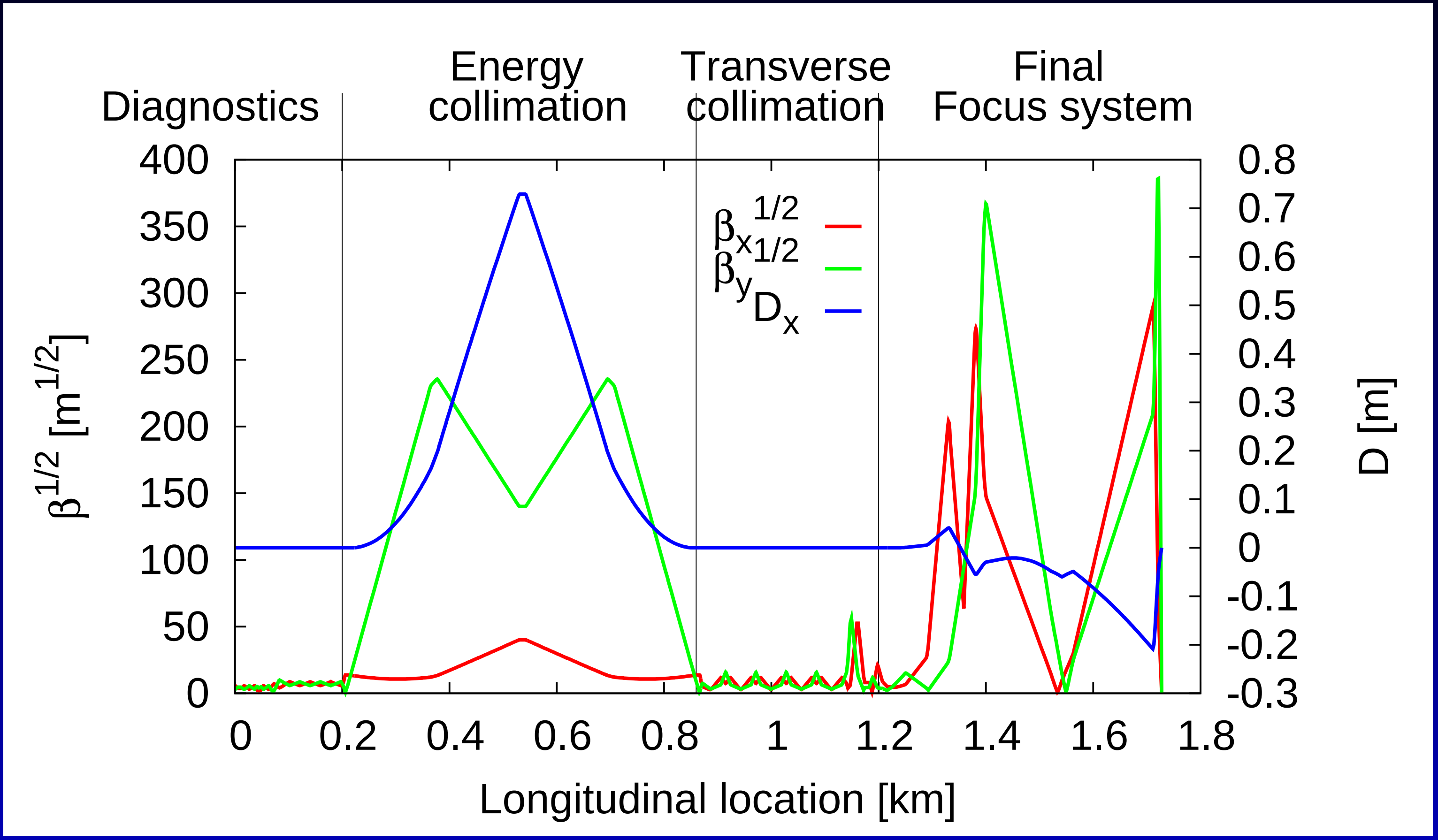
CSR module in PLACET by E. Adli.



Negligible effect, also from formula:

$$< \delta E > \propto \frac{r_e q L E_0}{e\gamma(R^2\sigma_s^4)^{1/3}} \approx 1\ MeV$$

CLIC 500GeV BDS: a proposal



Collimation section can be scaled by a factor 2.

Dispersion and efficiency still to be optimized.

Summary

- Convergence to an optimized BDS design
- The challenge remains to verify tuning in realistic simulations with dynamic effects
- Lots to learn from ATF2 experience
- and many details to address...

Workplan towards 2010 & collaborators

- FFS tuning and dynamic effects simulations: lots of work and need of new ideas (2010)
- ATF2 regular experience (2010) and ultra-low βs (2011)
- Collimation efficiency validation for new parameters at 3TeV (end 2008) and for 500GeV (2009)
- Final quadrupole design validation (2009)

Workplan towards 2010 & collaborators

- Polarization measurement design (2009)
- Post-collision line and dump design (2010)
- Collective effects review (2009)