CLIC Beam Delivery System

R. Tomás, H. Braun, A. Latina, D. Schulte

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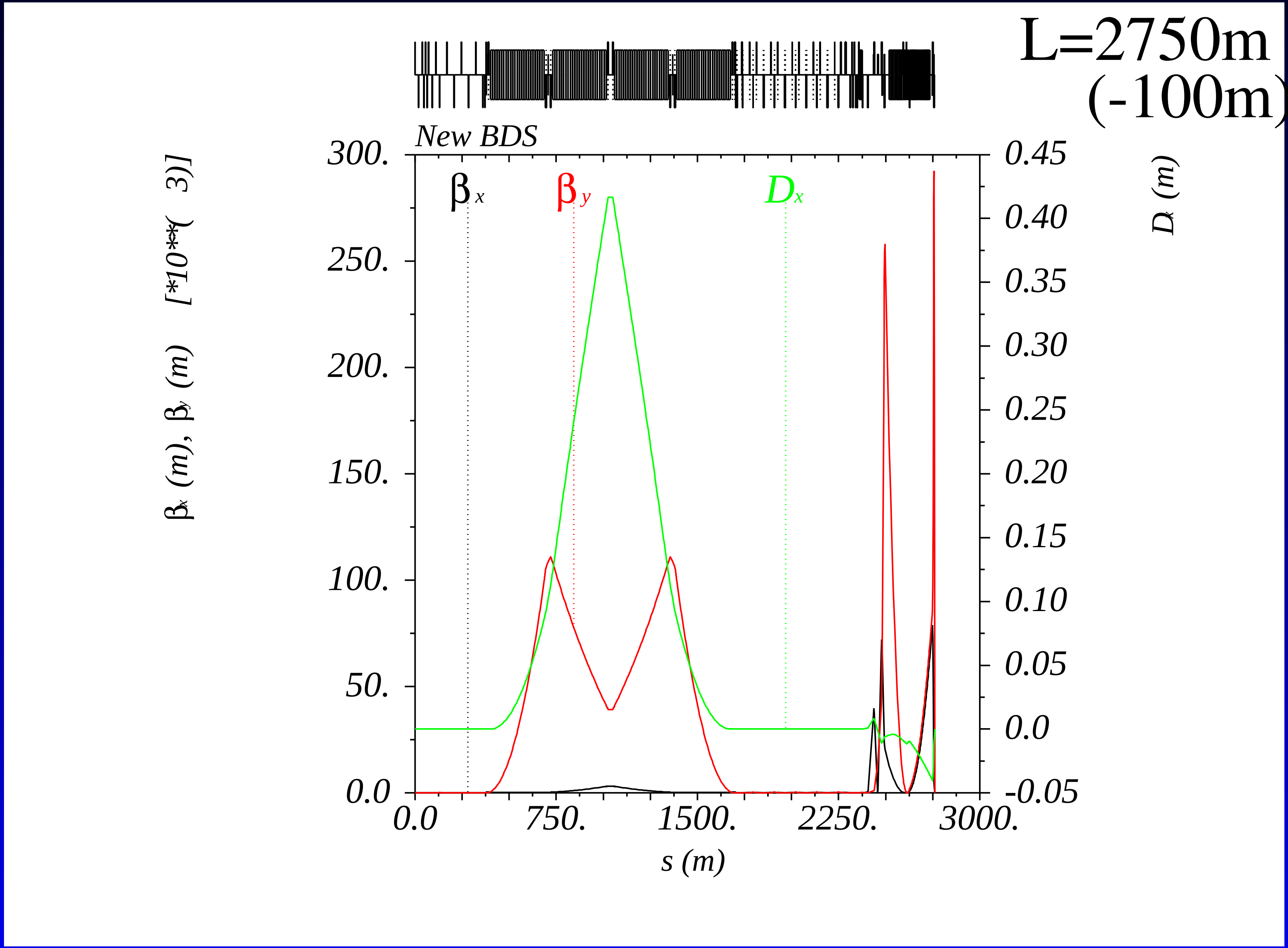
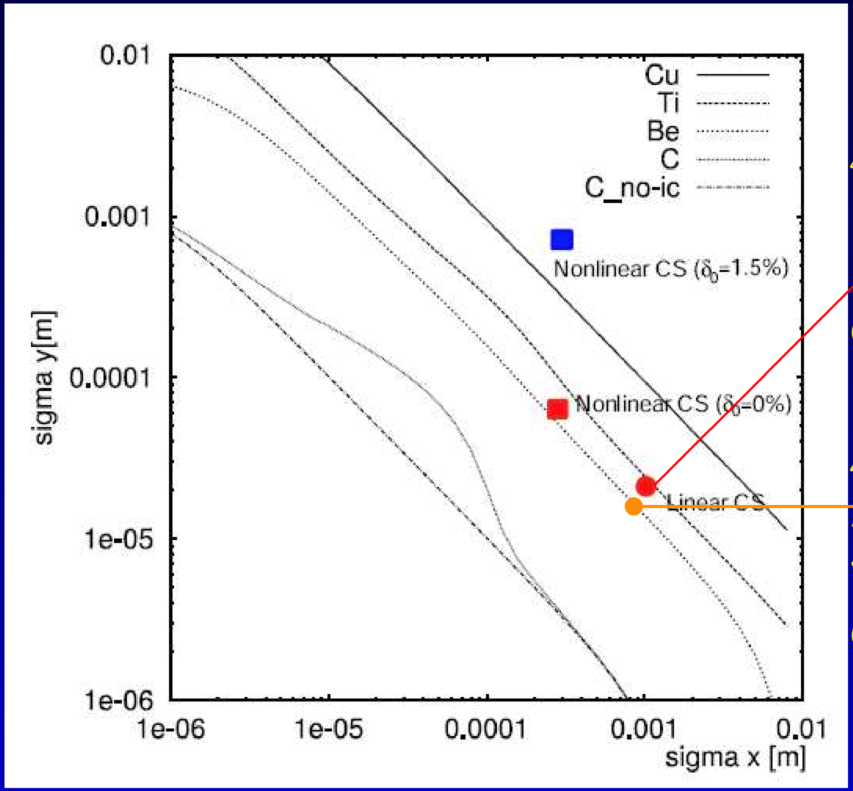
New BDS optics



New parameters and Collimation I

Survival plot from CLIC note 477 and J. Resta's thesis for different materials:



$4 \times 10^9\ e^-$
154 bunches/train
$\epsilon_y = 10nm$

$4 \times 10^9\ e^-$
312 bunches/train
$\epsilon_y = 20nm$

Be collimators on the edge! and now what?

New parameters and Collimation II

Studies to pursue:

- Simulation of energy deposition
- Failure modes analysis

Possible solutions:

- replaceable collimators
- larger betas $\longrightarrow$ longer system
- non-linear collimation system $\longrightarrow$ slightly lower luminosity
- Carbon collimator $\longrightarrow$ Large wakefields

FFS shortening and optimization I

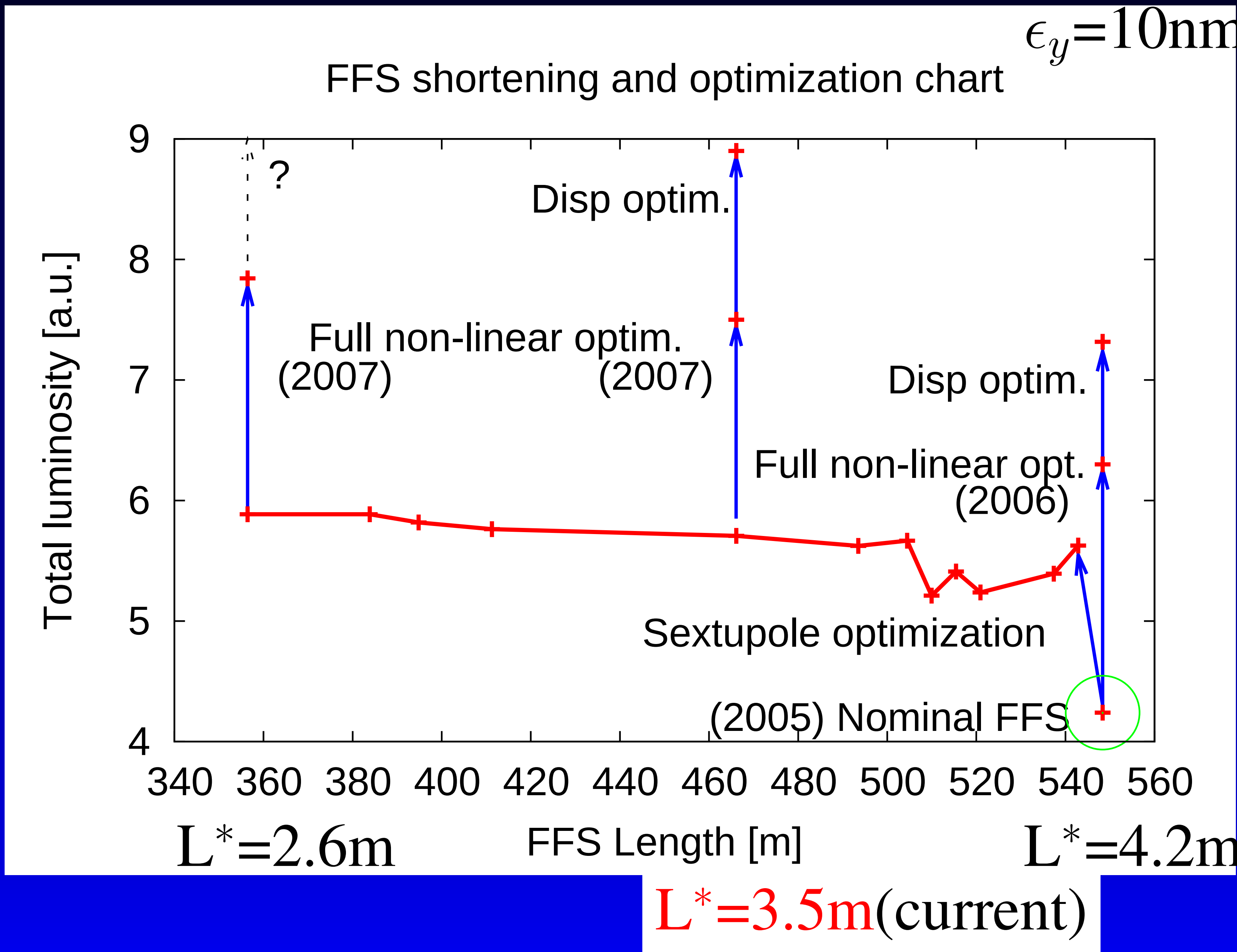
Advantages of a shorter FFS:

- Shorter tunnel
- Lower beta peak (better stability)
- Lower chromaticity (smaller aberrations)
- Shorter L^*

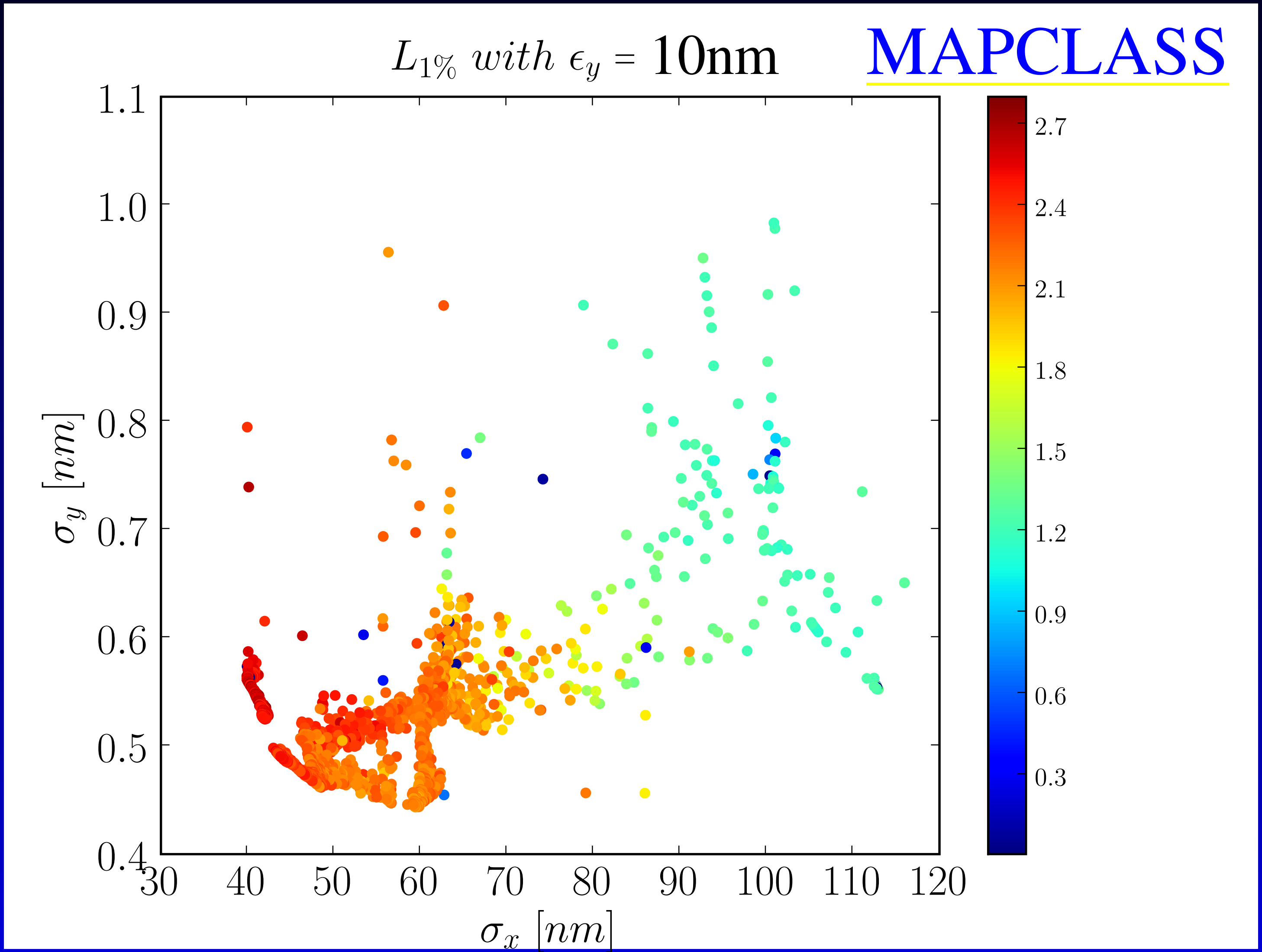
Disadvantages:

- Shorter L^* (detector and solenoid constrains)
- Stronger focusing (quad field)
- Oide effect? (radiation in the quads)

FFS shortening and optimization II

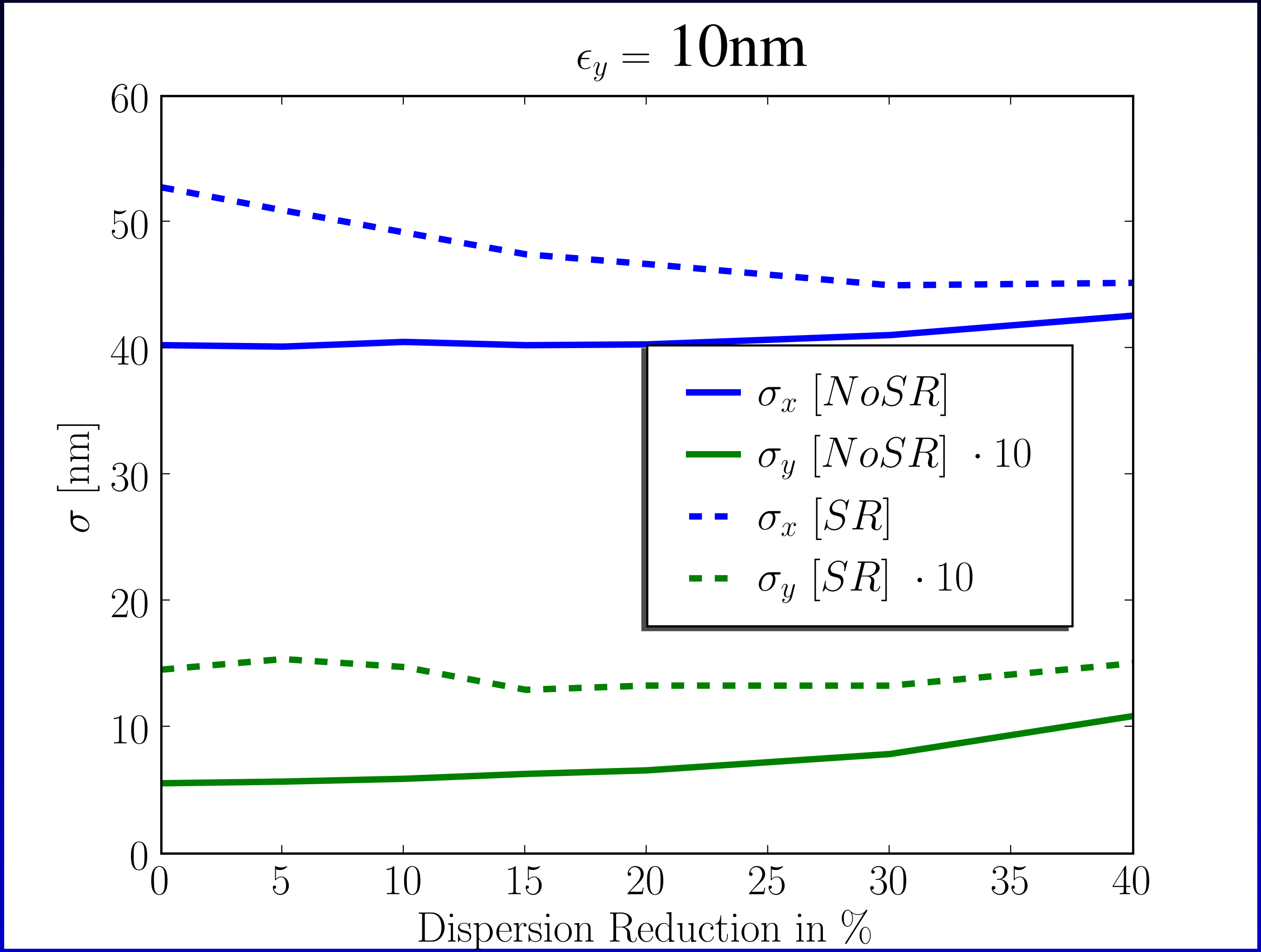


Non-linear optimization for L^*=3.5m



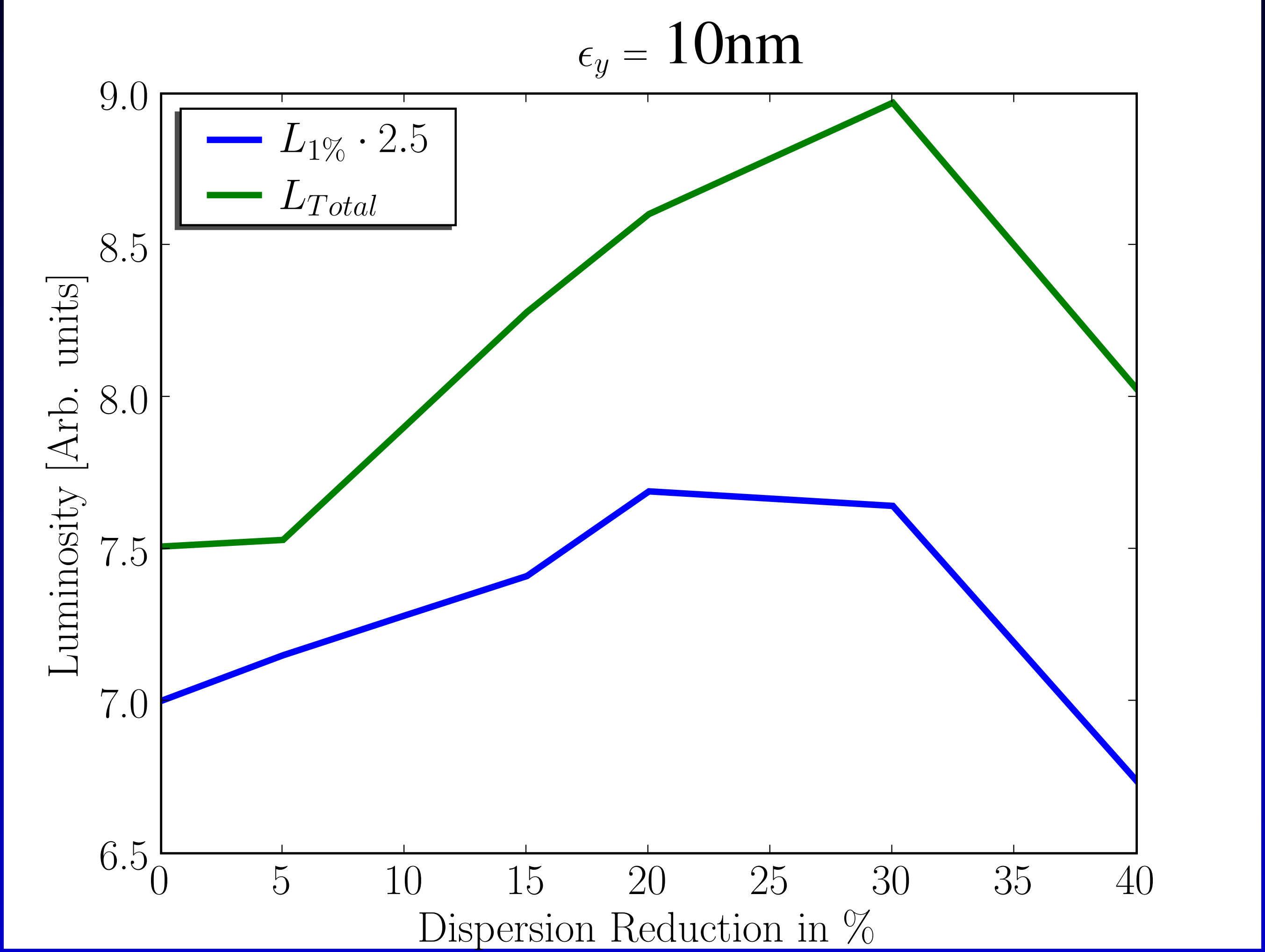
Strongest dependence is on σ_x. Clear minimum limit.

Dispersion optimization: Beam sizes



$\sigma_z = 35\mu$m

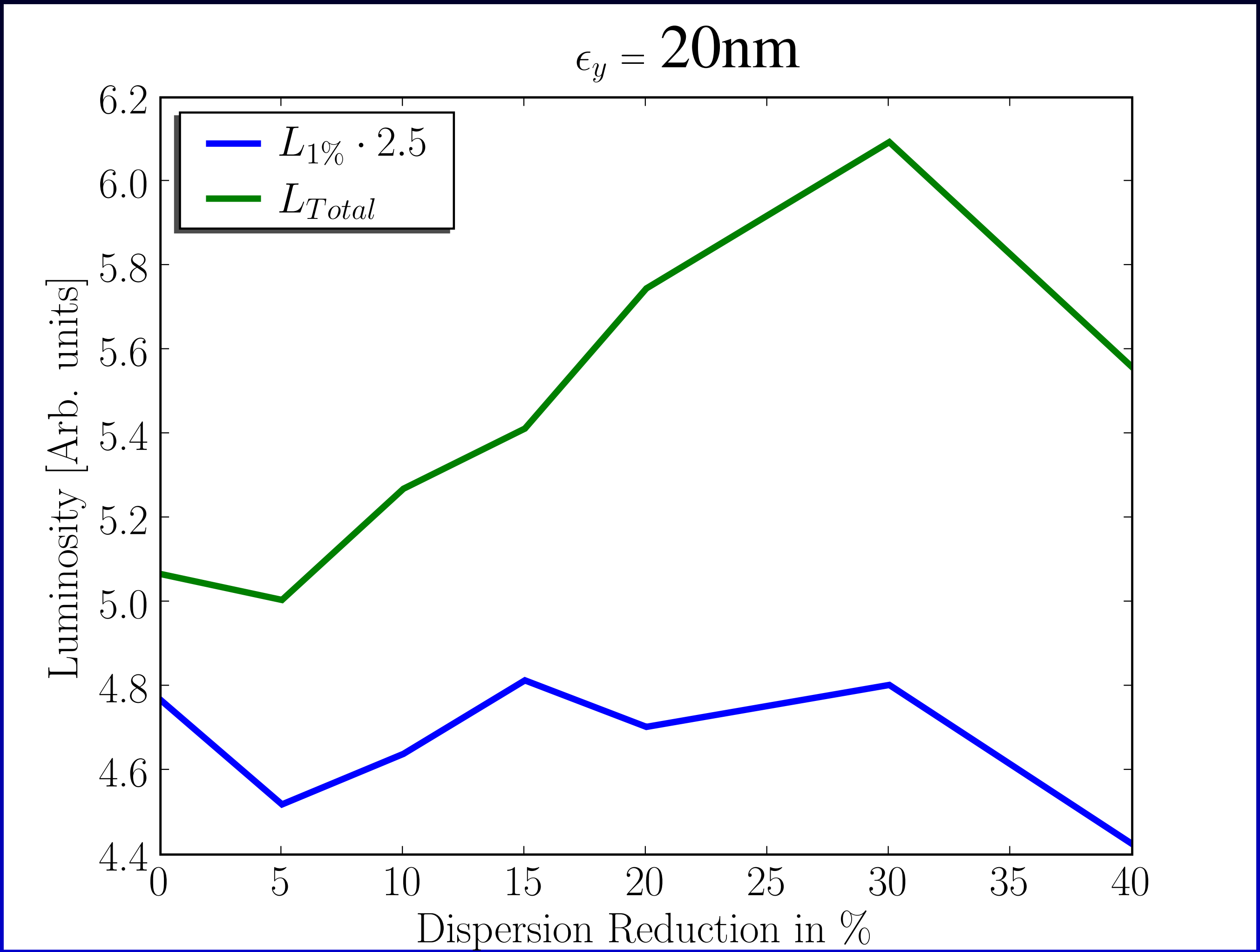
Dispersion optimization: old parameters



$\sigma_z = 35\mu$m

Optimum between 20-30% dispersion reduction.

Dispersion optimization: new parameters



$\sigma_z = 44\mu\text{m}$

Peak Luminosity saturated?

From old to new parameters

Cost of new parameters:

ϵ_y[nm]	$\sigma_s[\mu$m]	$\Delta L_{tot}[\%]$	$\Delta L_{1\%}[\%]$	
10	35	0	0	
10	44	-3	-5	
20	35	-32	-33	*
20	44	-32	-37	

(*doubling ϵ_y should cost 29%)

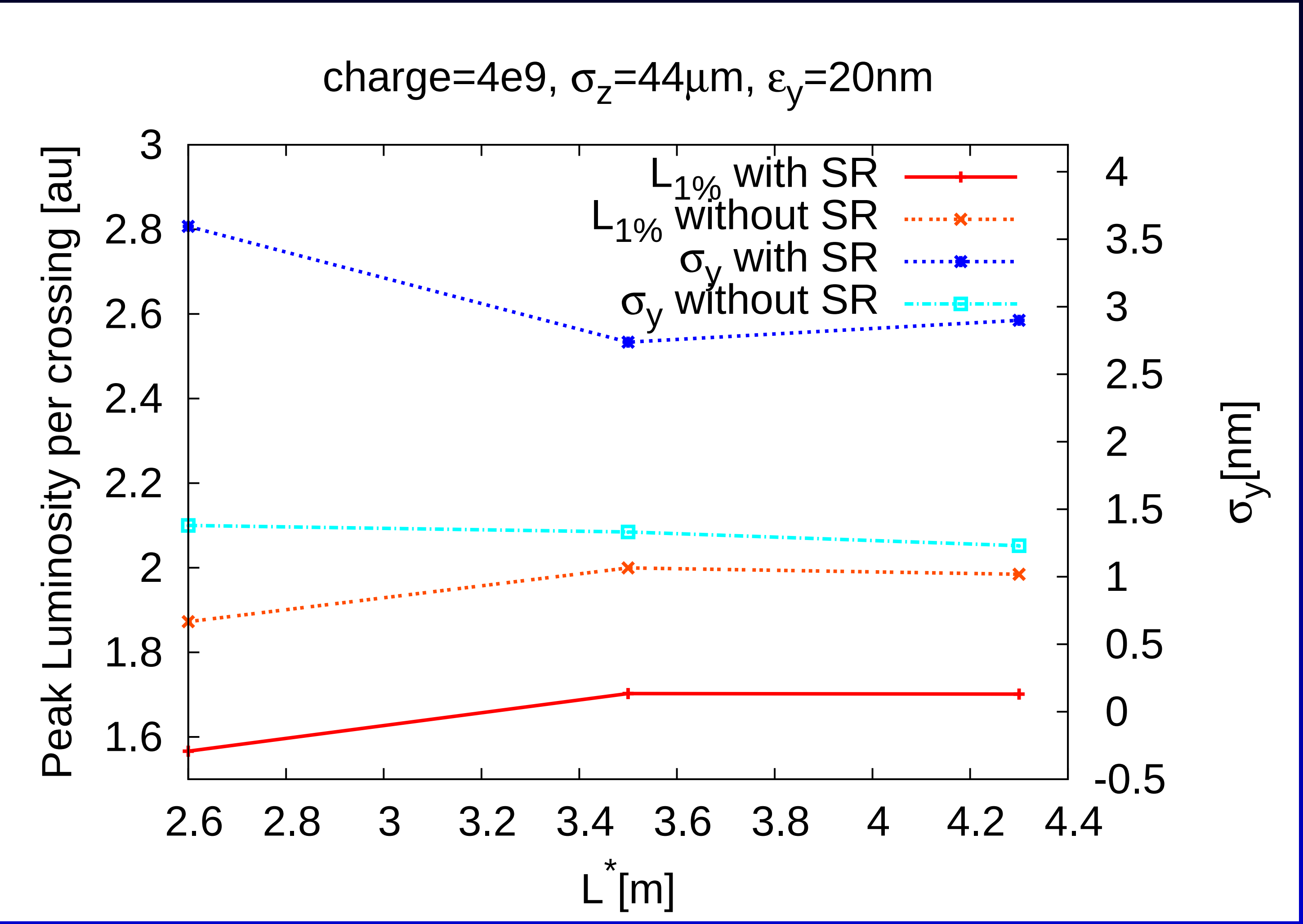
Bremsstrahlung: $n_\gamma \propto \sigma_s^{1/3}/\sigma_x^{2/3}$ (for CLIC)

V Disruption: $D_y \propto \sigma_s/(\sigma_y\sigma_x)$

H Disruption: $D_x \propto \sigma_s/\sigma_x^2$

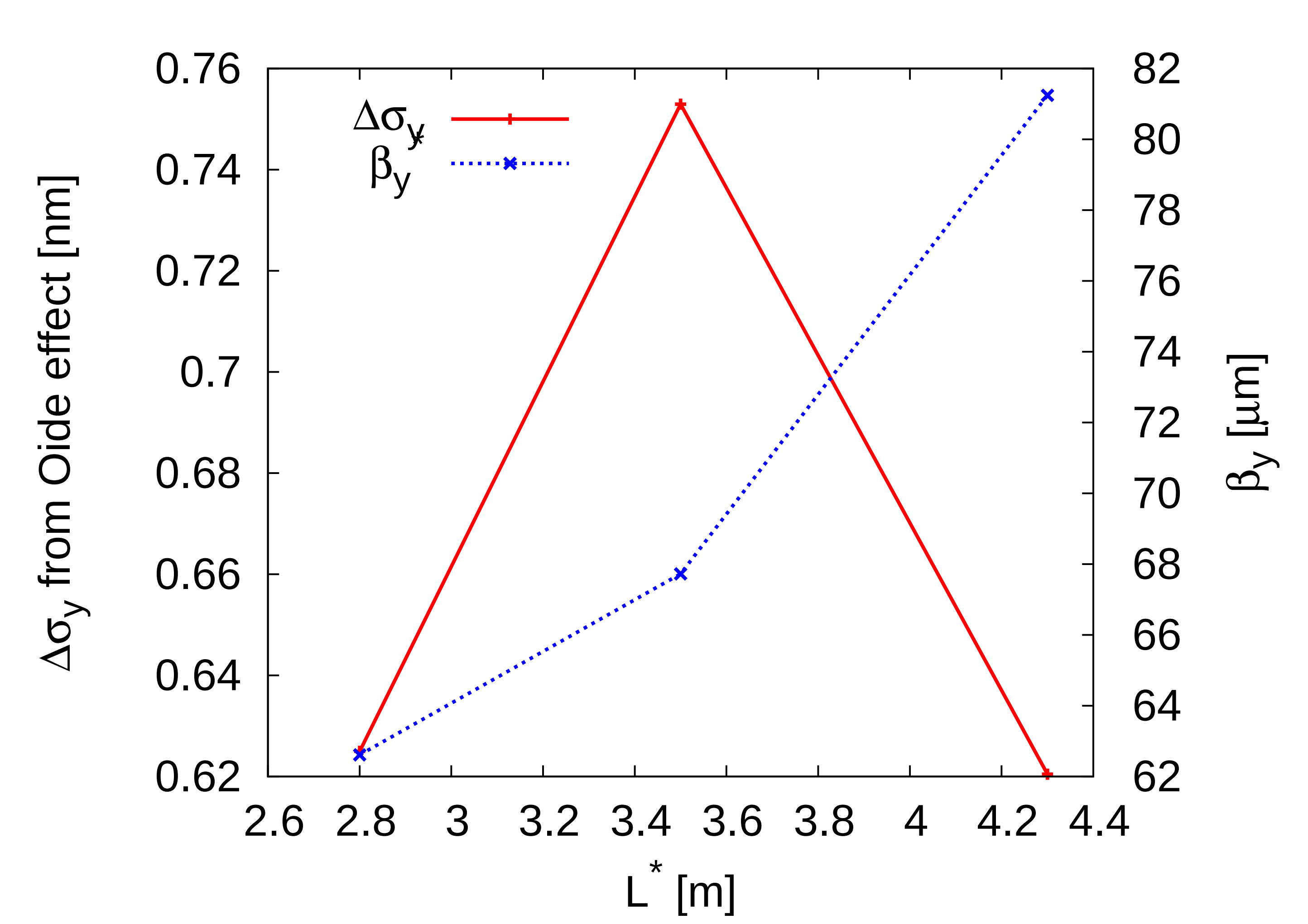
$\rightarrow$ Trends roughly in agreement

Comparison of different L*: $L_{1\%}$



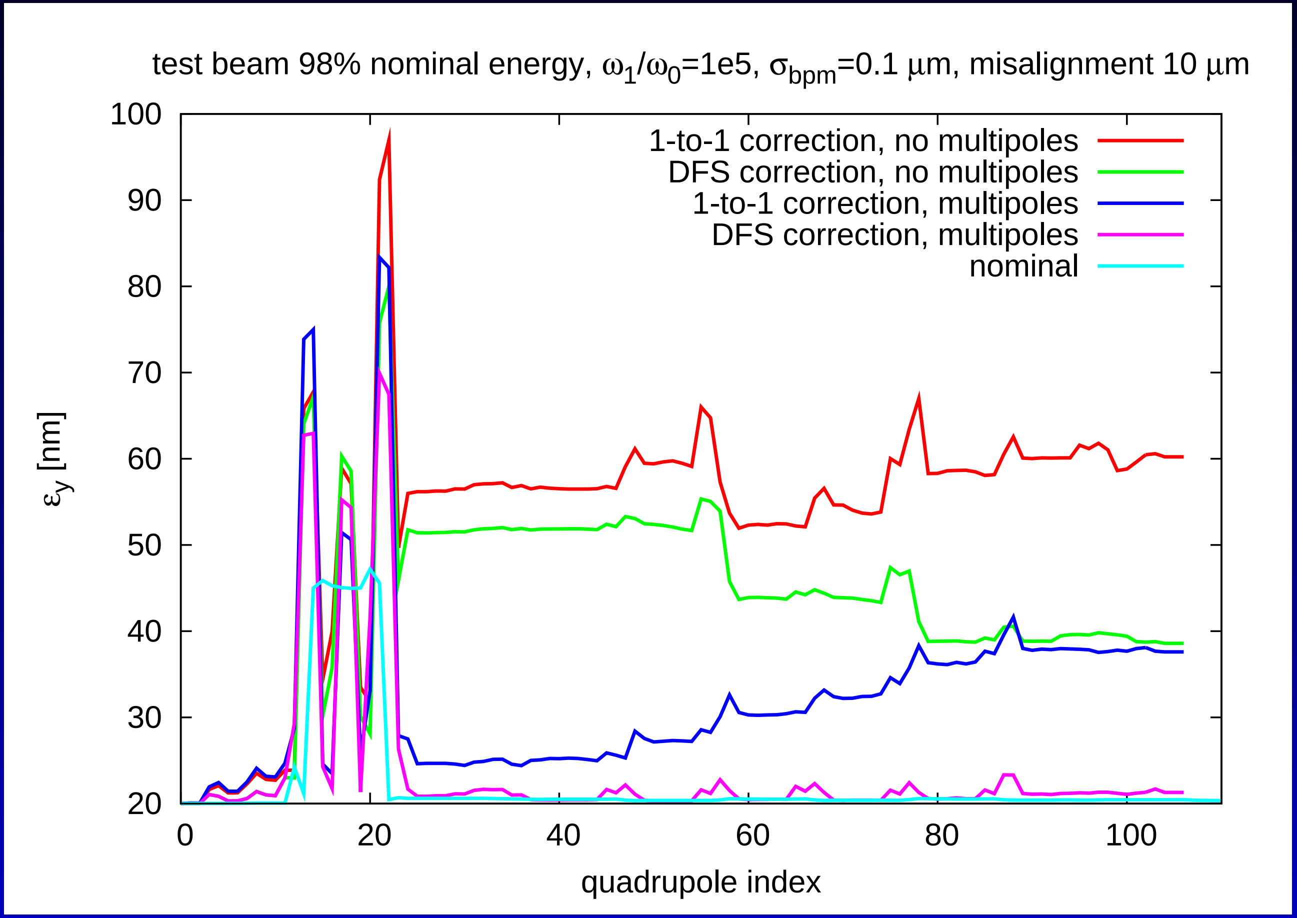
From peak luminosity L*=3.5m and 4.3m perform similarly.

Comparison of different L*: Oide effect



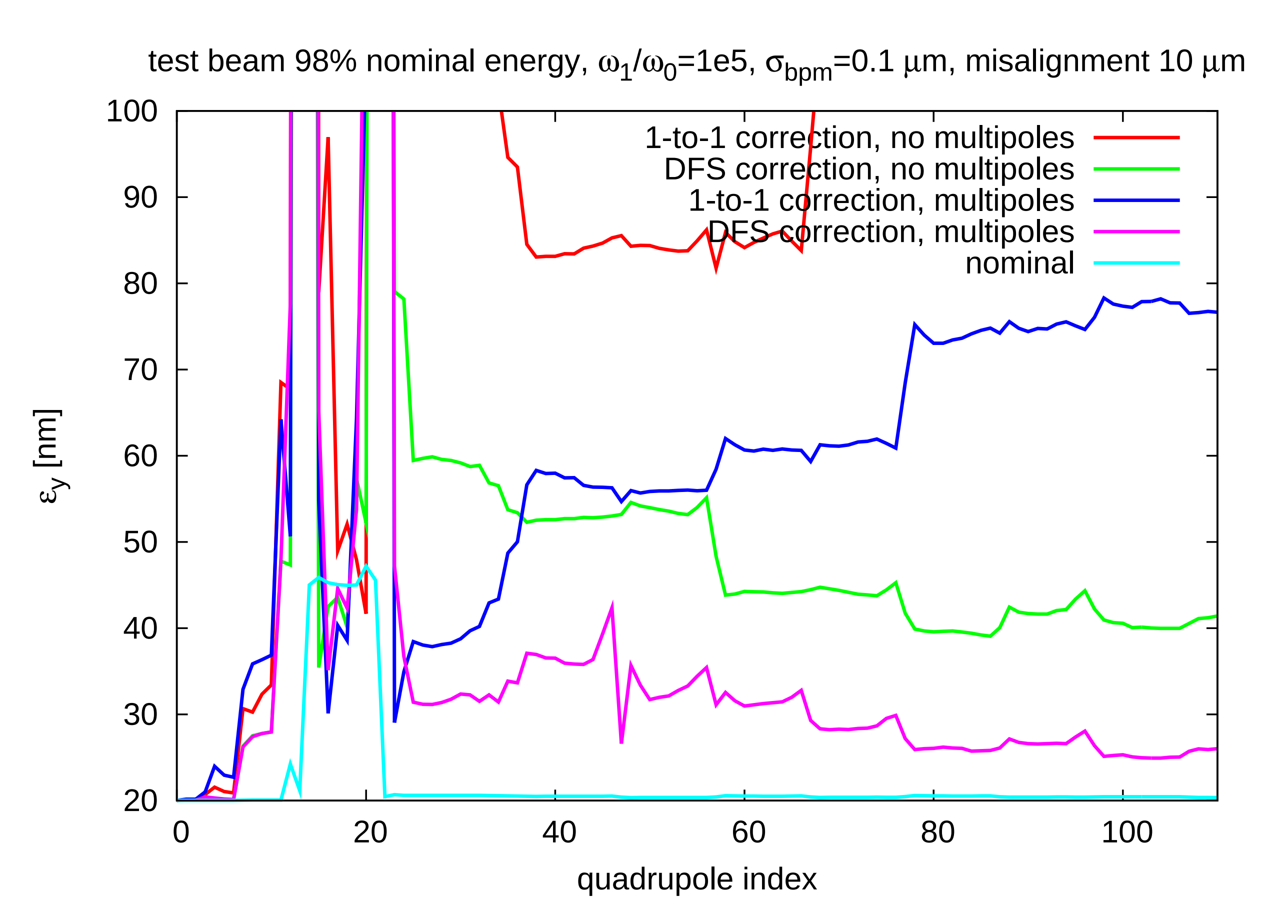
Peak Oide effect at L*=3.5m, possible optimization.

Aligning the Collimation section



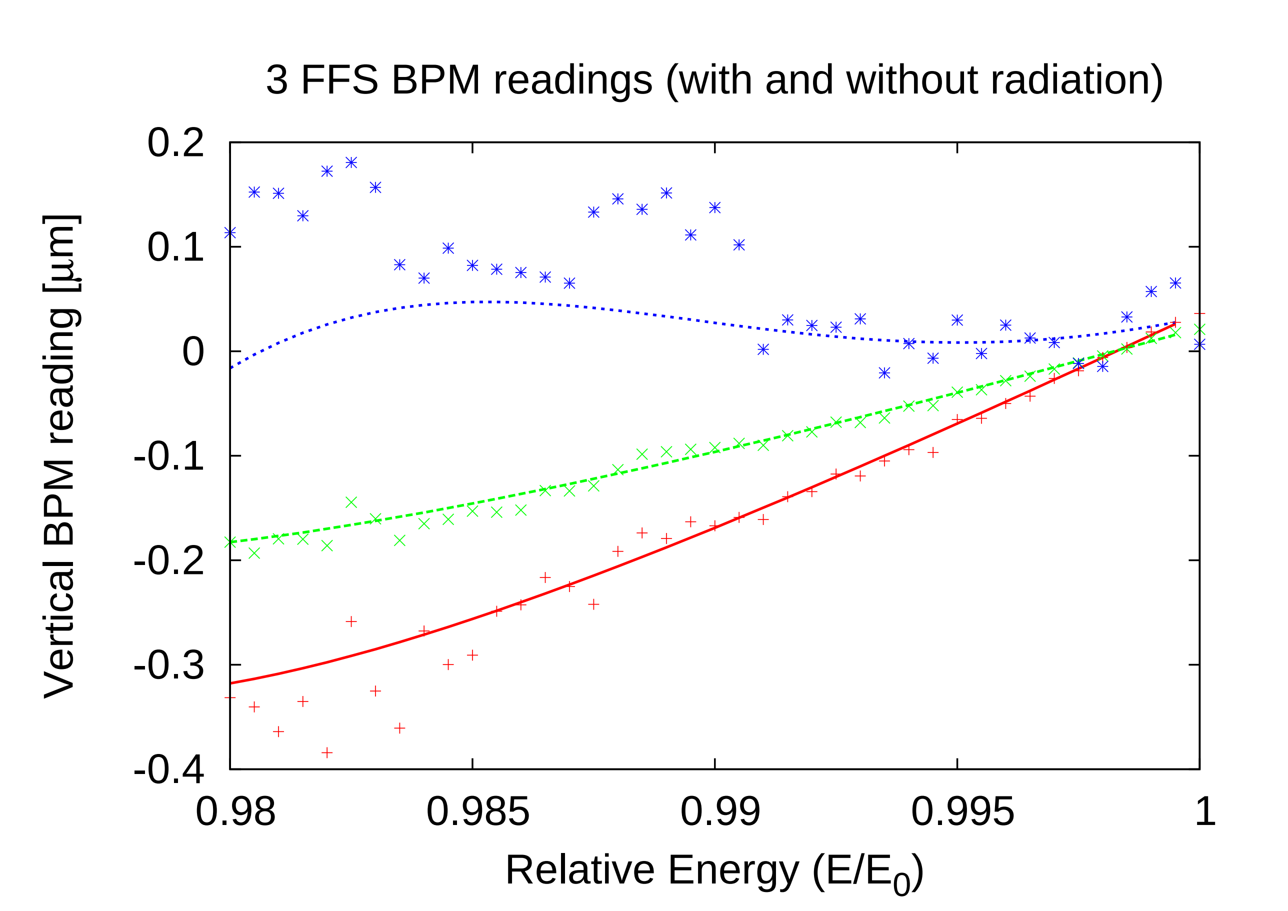
5% emittance growth after aligning only the collimation section.

Aligning the full BDS?



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

Looking into the FFS



Large error due to radiation

Apparent linear and non-linear dispersion

Summary and such

- Be collimators on the edge: Needs further study
- Peak luminosity saturated with new parameters and Oide effect: Needs optimization
- DFS works for the collimation section
- FFS alignment under investigation
- New CLIC lattices web repository: http://cern.ch/CLICr/