QD2 tolerances and tuning

Hector Garcia Morales[1,2],
Jochem Snuverink[2], Rogelio Tomas[2]

[1] Universitat Politècnica de Catalunya, Barcelona
[2] CERN, Geneve

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Context

Final Focus Systems

- Comparison Traditional Final Focus vs Local Chromaticity Scheme.
- Traditional Scheme:
  - Dedicated sections for Chromaticity correction in each plane. (CCX, CCY)
  - Longer system.
  - No local correction.
  - Bandwidth limitation.
- Local Correction Scheme
  - Chromaticity corrected locally.
  - Shorter system.
  - Wider Bandwidth

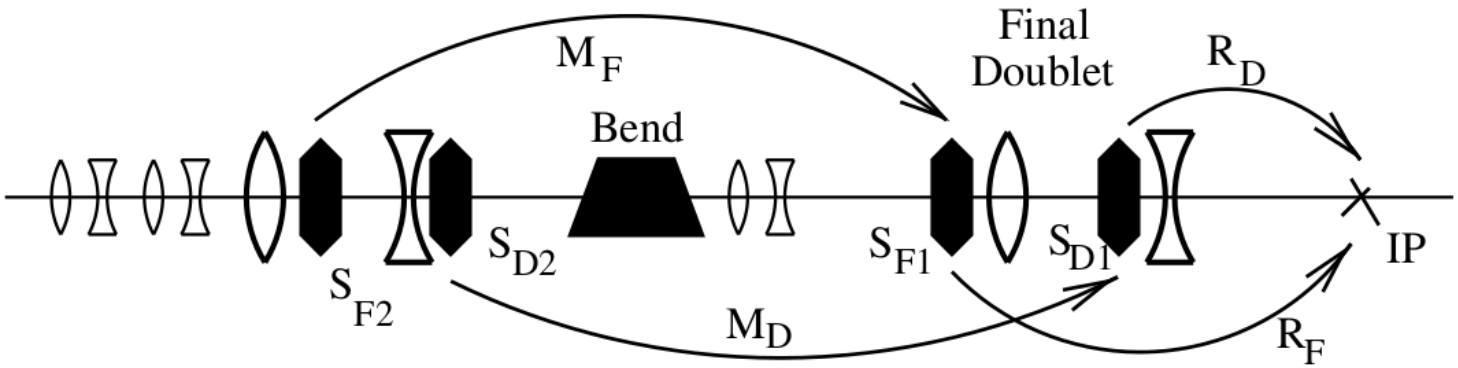
To know more about the comparison see my talk in IWLC11 (Granada).

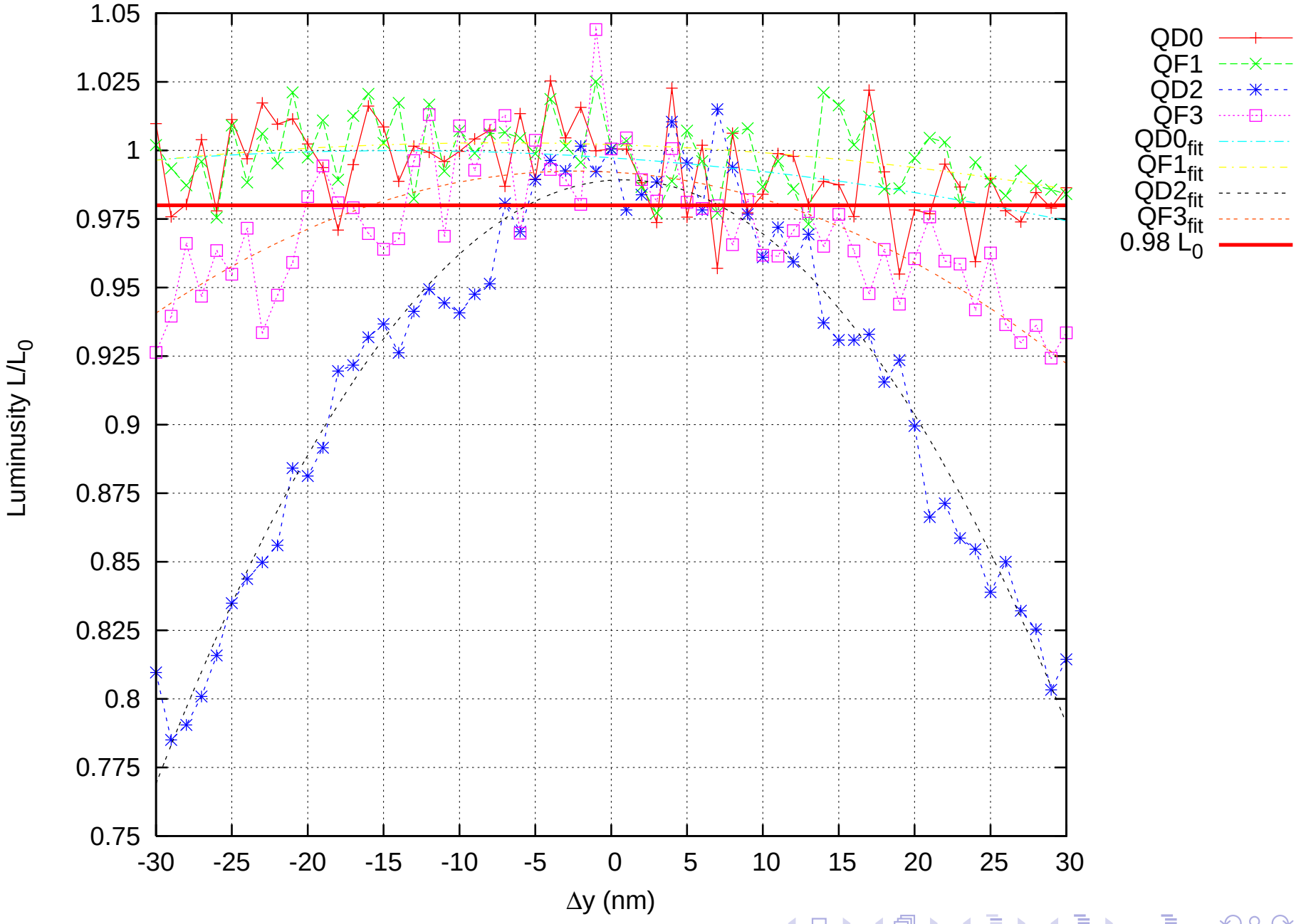
Final Focus tuning

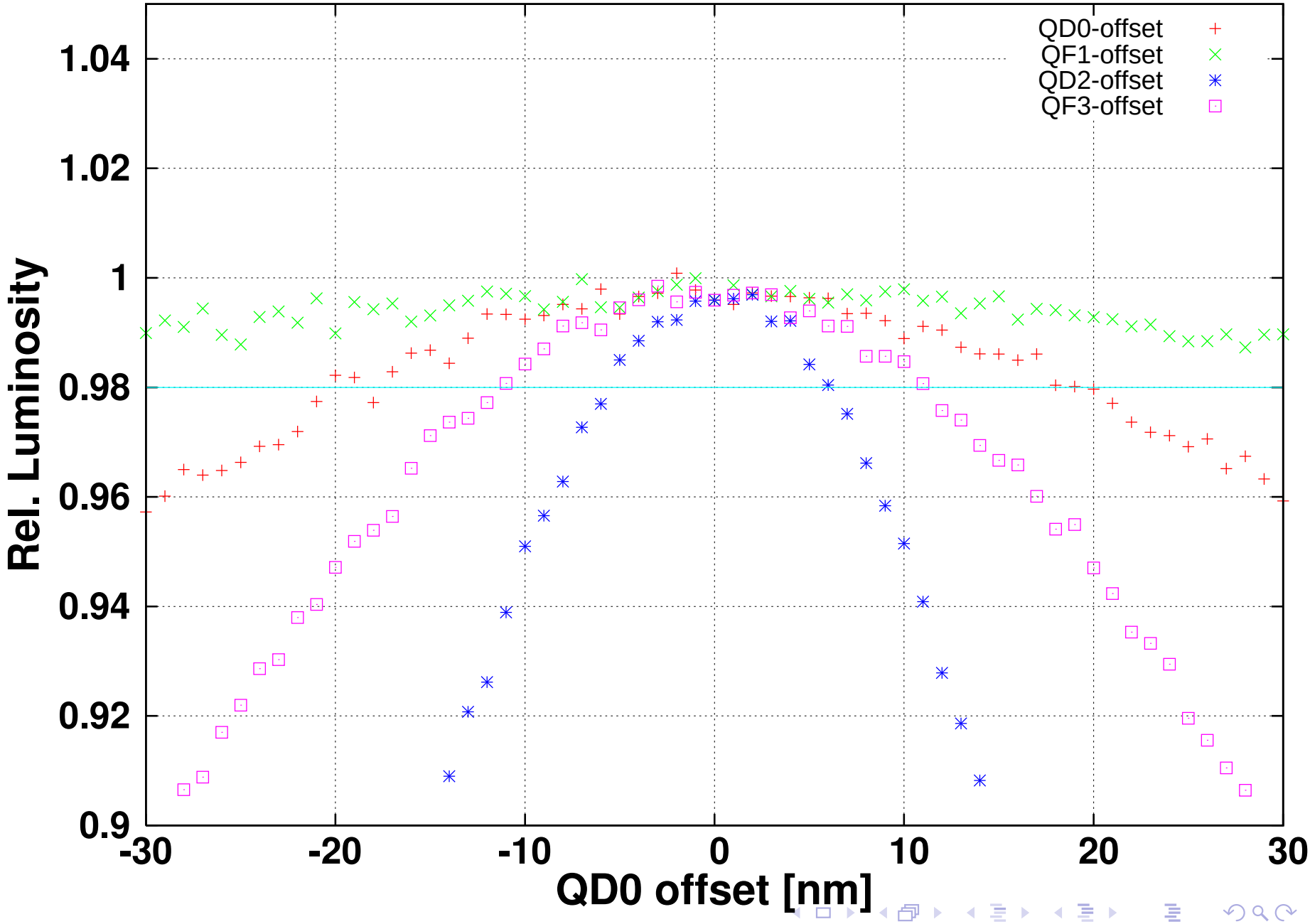
- Simplex optimization works better when we have a reduced number of variables.
- In the Traditional scheme the number of quadrupoles doubles the number in the Local scheme.
- We need a reduction of variables (quads) to carry out the optimization in the Traditional scheme.
- In principle, it was considered that the most sensitive magnets in terms of the reduction of luminosity due to quad misalignment were QD0 and QF1.
- But...

QD2 tolerance

- We see that in the Traditional scheme, more or less (besides QD0 and QF1) all the quads have the same impact in the luminosity due to misplacements.
- No possible reduction of variables $\Rightarrow$ Simplex does not work well.
- We wanted to check what happens for the Local Scheme,
- And QD2 turns out to be the most relevant magnet!




Luminusity L/L0
Δy (nm)
1.05
1.025
1
0.975
0.95
0.925
0.9
0.875
0.85
0.825
0.8
0.775
0.75
-30
-25
-20
-15
-10
-5
0
5
10
15
20
25
30
QD0
QF1
QD2
QF3
QD0fit
QF1fit
QD2fit
QF3fit
0.98 L0


QD0-offset
QF1-offset
QD2-offset
QF3-offset
Rel. Luminosity
1.04
1.02
1
0.98
0.96
0.94
0.92
0.9
-30
-20
-10
0
10
20
30
QD0 offset [nm]

Checking with MAPCLASS and ATF2

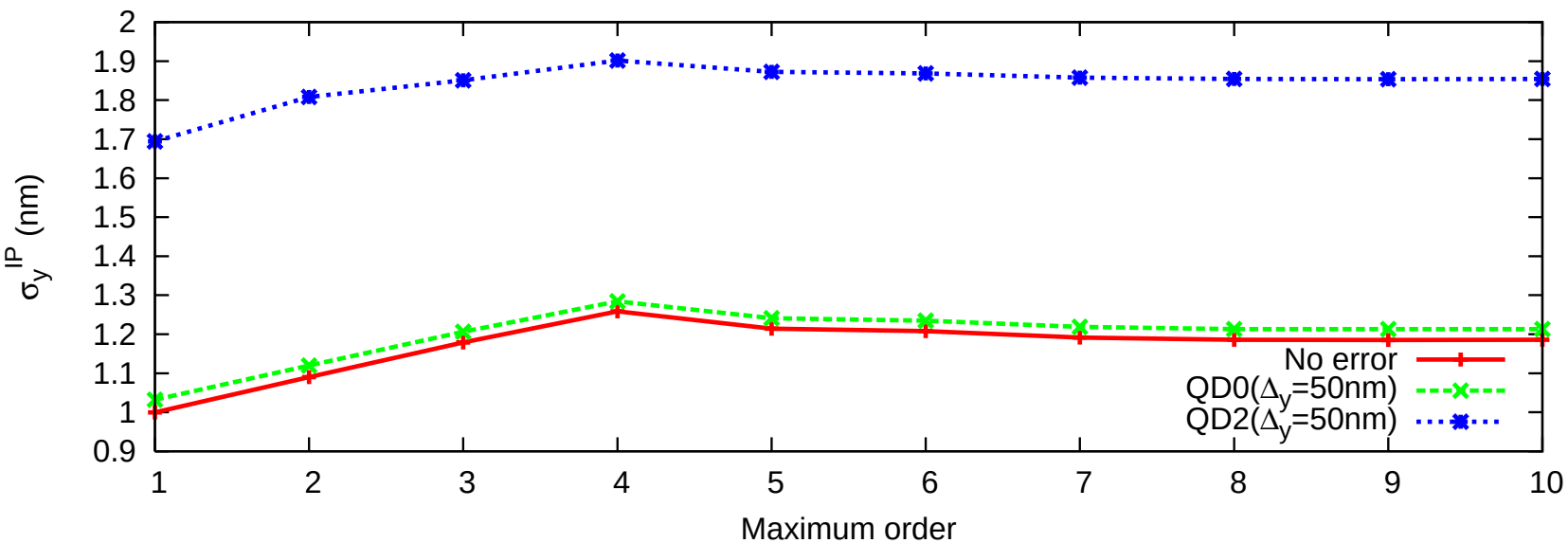
- We need to verify the results to avoid some possible mistake in the code.

Quad	ATF2-UL($\Delta_y = 5\mu$m)	CLIC ($\Delta_y = 50$nm)
	σ_y^*(nm)	σ_y^*(nm)
None	24.24	1.207
QD0	24.86	1.234
QF1	34.38	1.222
QD2	75.70	1.868
QF3	51.95	1.411

- We see that the effect is a characteristic of the Local scheme.

Possible explanation

- This is a first order effect.
- The displaced QD2 generates a dispersion that is amplified at QD0.
- Quad offset induces coupling.
- Result: bigger beam size ⇒ reduction of luminosity.



Possible consequences

- All the effort has been put in the Final Doublet.
- Should we focus on the pseudo Final Doublet (QD2 and QF3)?
- Redirect the tuning procedure?