CLIC FFS overview

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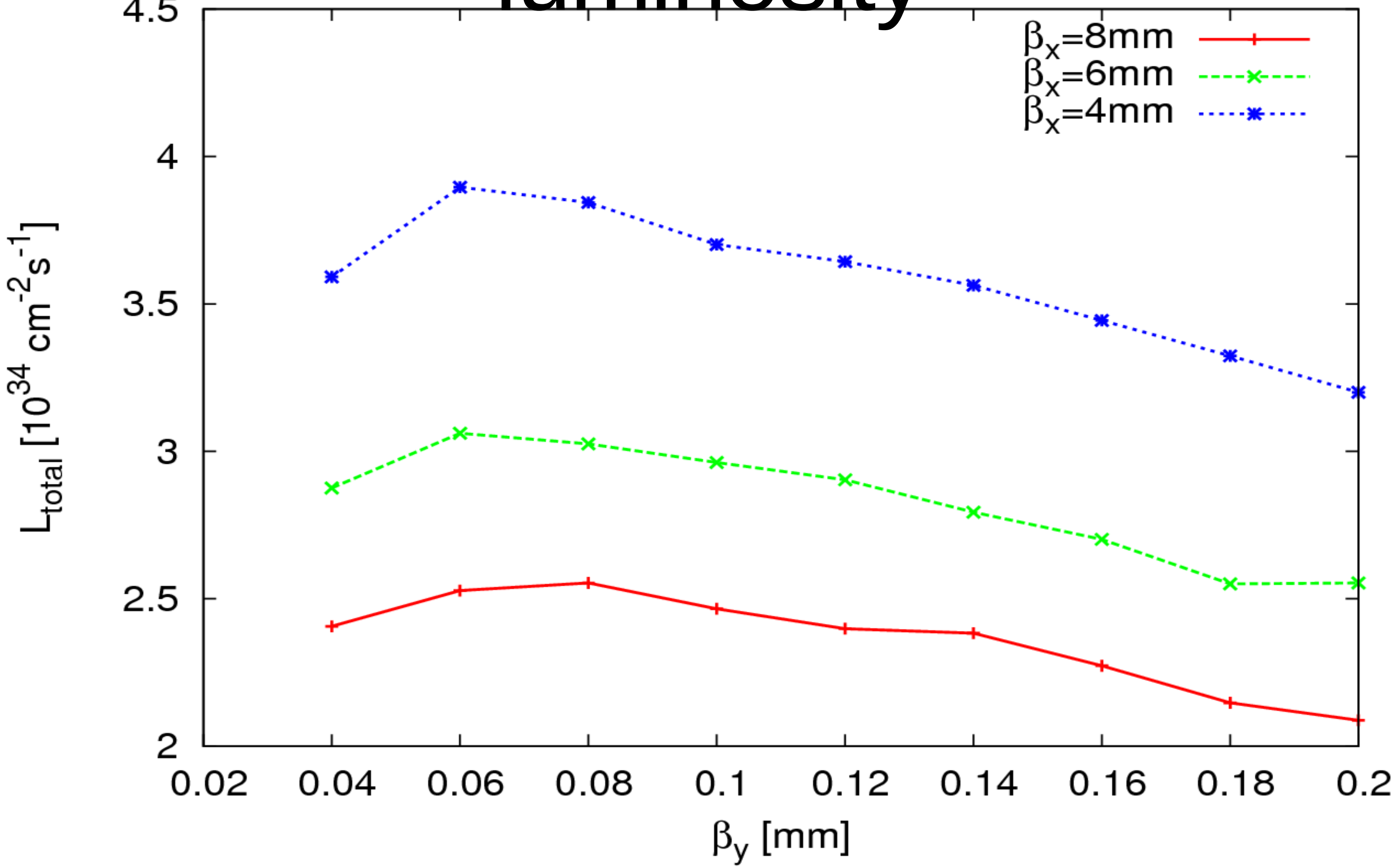
Contents

- CLIC 3 TeV FFS fully characterized in CDR
- New philosophy for the 350 GeV FFS:
  - New optimization at 350 GeV with lower betax
  - Compatibility with ILC FFS:
    - Tolerances
    - QD0
  - ATF2 as common ILC-CLIC R&D ground
- Tools development:
  - Synchrotron radiation optimization tools
  - Parallel Mapclass2 with new functionalities
  - Evaluation of Solenoid induced luminosity loss

CLIC 500 GeV CDR parameters

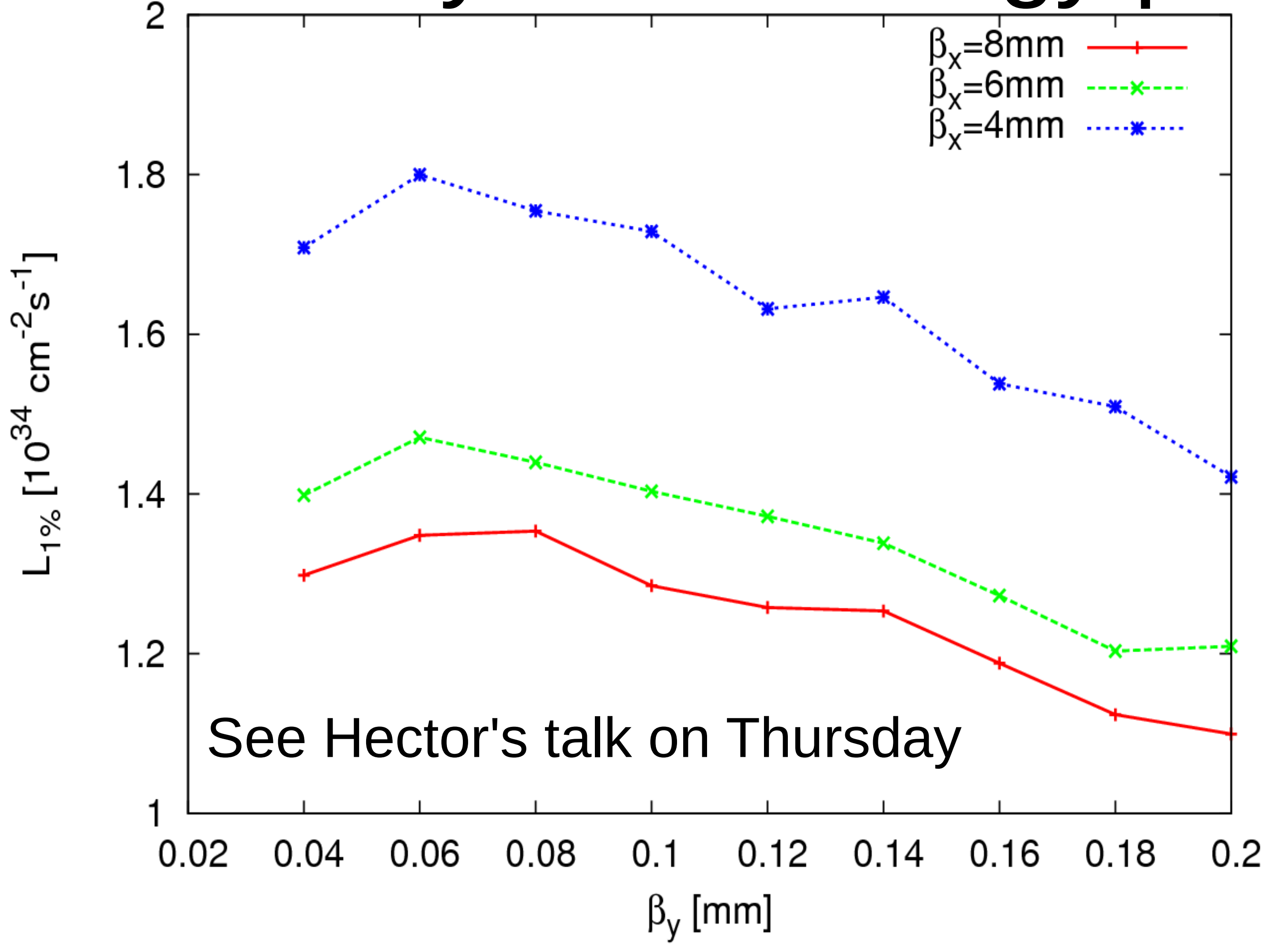
Parameter	**Units**	CLIC500
Beam energy E_0	GeV	250
Bunches per beam n_b		354
$e^{\pm}$ per bunch N	10^9	6.8
Repetition rate f_{rep}	Hz	50
$\epsilon_x^N/\epsilon_y^N$	nm	2400/25
β_x/β_y	mm	8/0.10
σ_x^*/σ_y^*	nm	200/2
Bunch length σ_z	μm	72
Energy spread δ	%	1
Luminosity $\mathcal{L}_T/\mathcal{L}_{1\%}$	$10^{34}\cdot \text{s}^{-1}\text{cm}^2$	2.3/1.4

Redefining IP beta functions: Total luminosity



Computing luminosity with ideal distributions versus beta functions

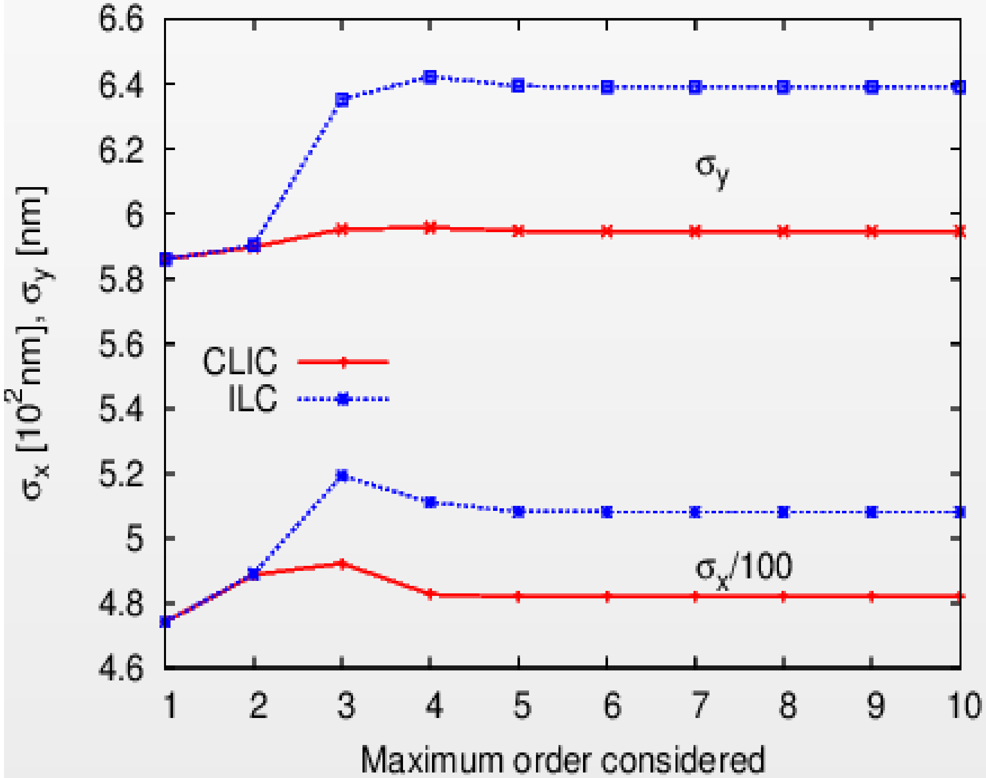
Redefining IP beta functions: Luminosity in the energy peak



Optimum betay between 0.06-0.08mm

Concerning betax we have to explore 4mm & lower

Using CLIC FFS lattice for ILC?

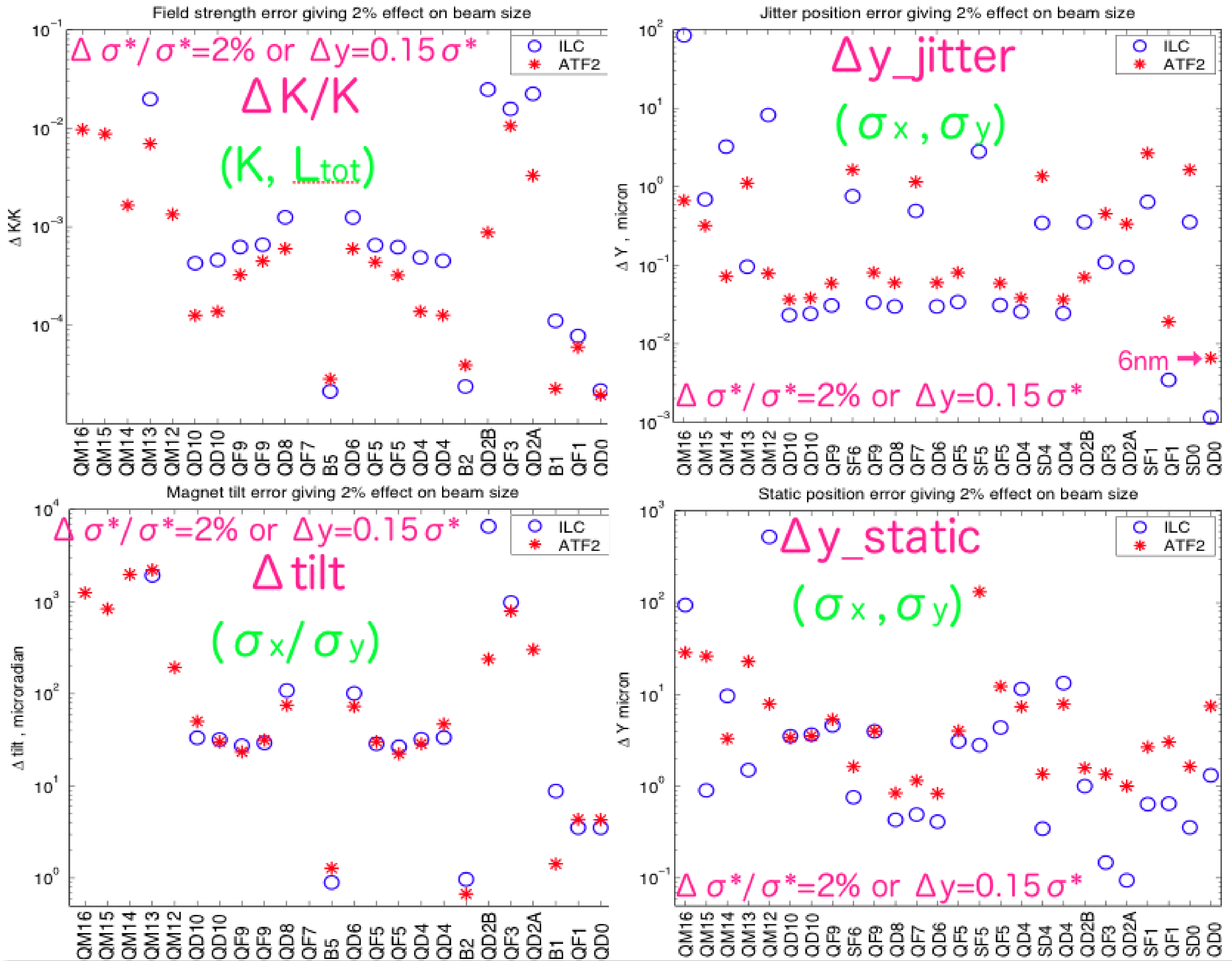


Placet+GuineaPig

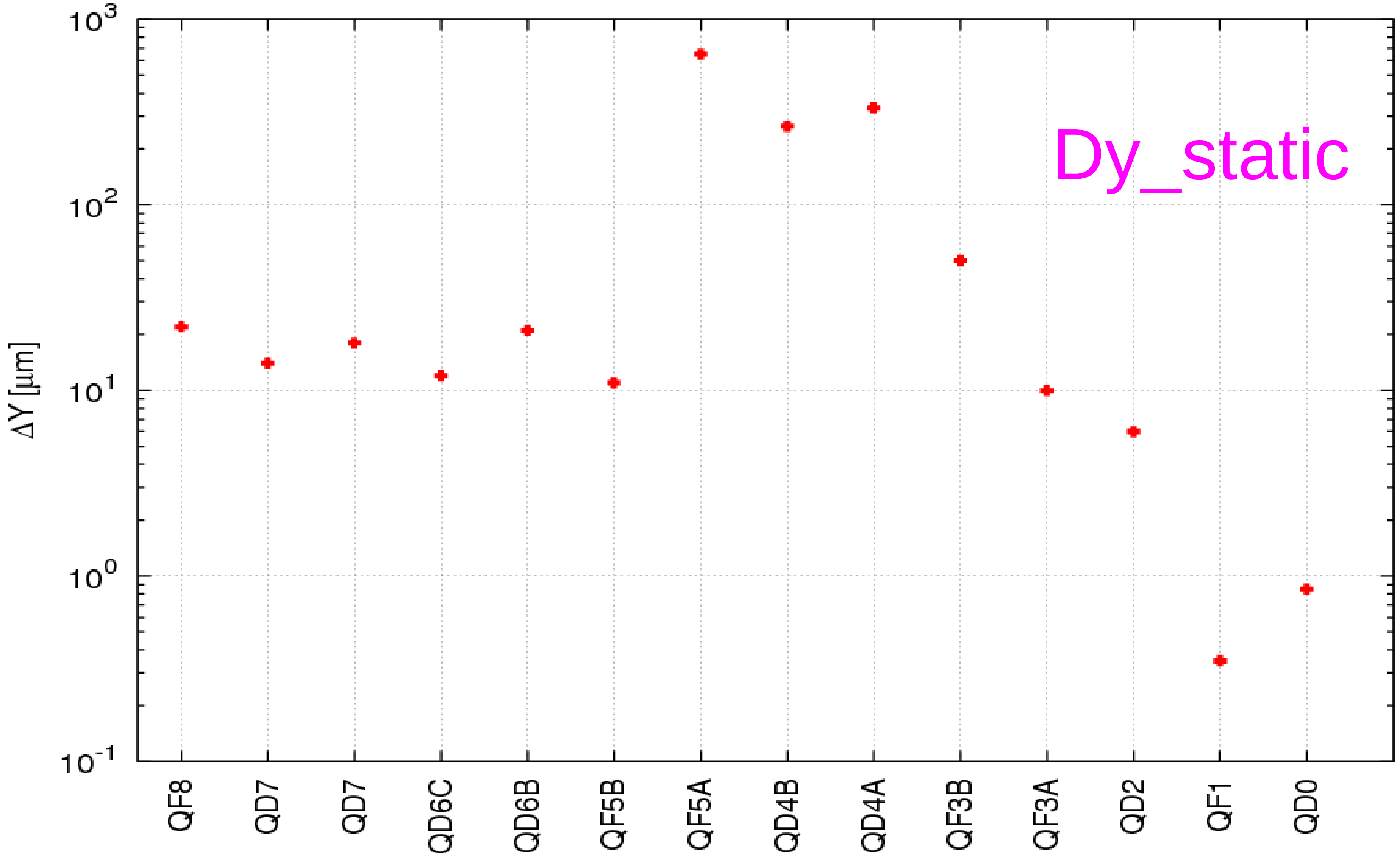
Parameter	ILC	CLIC-based
Length [m]	800	553
β_x^*/β_y^* [mm]	11/0.48	11/0.48
σ_x^{core} [nm]	499.3	483.7
σ_y^{core} [nm]	6.03	5.89
$\mathcal{L}_T$ [$10^{34}\,\mathrm{cm}^{-2}\mathrm{s}^{-1}$]	1.39	1.47
$\mathcal{L}_{1\%}$ [$10^{34}\,\mathrm{cm}^{-2}\mathrm{s}^{-1}$]	0.86	0.89

- CLIC lattice can also operate at ILC parameters with similar performance (Hector's talk on Thursday)
- Hardware aspects are under investigation (Michele Modena's talk on Thursday)

ILC + ATF2 tolerances



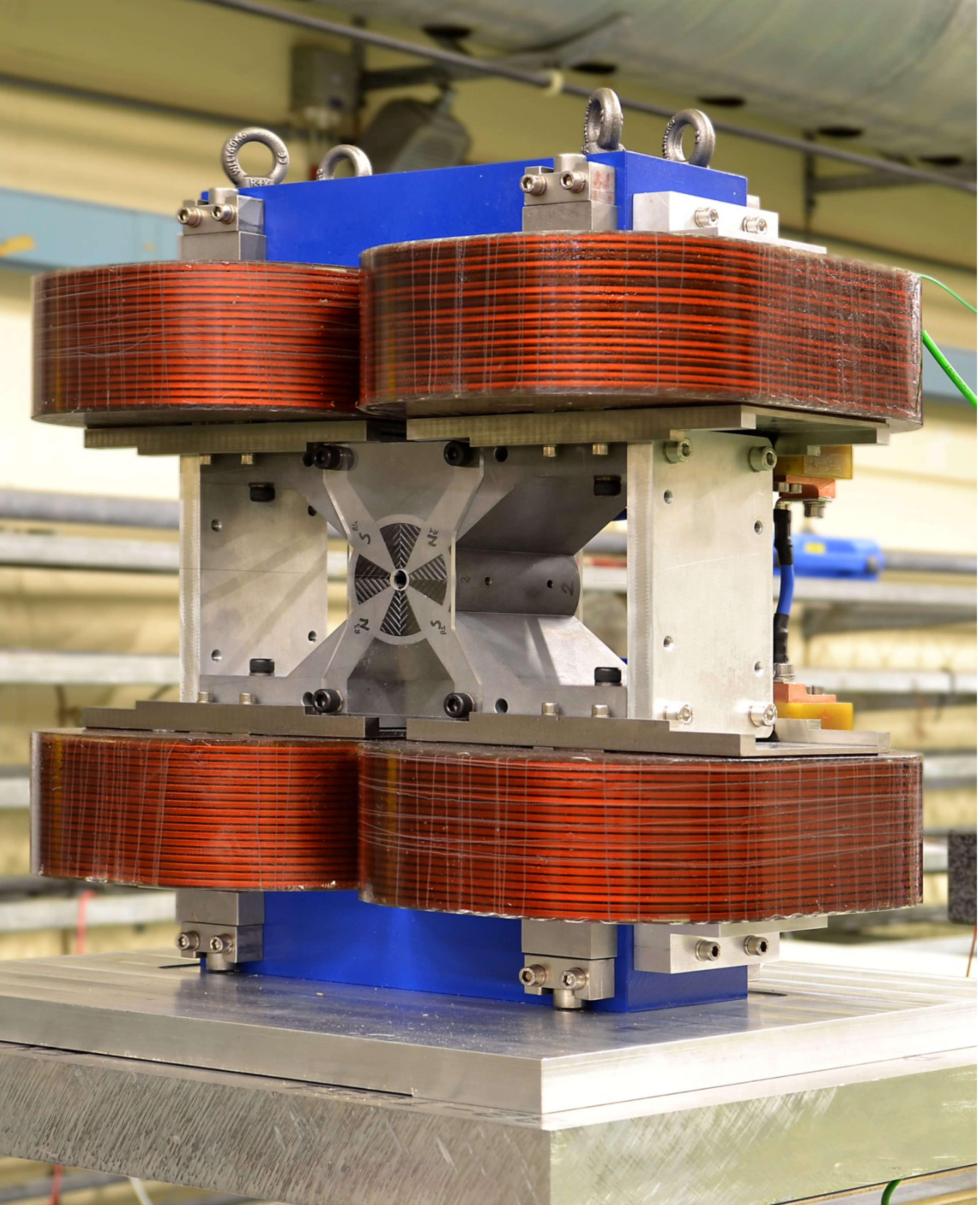
ILC tolerances with CLIC-based FFS



- CLIC-based tolerances similar or more relaxed than for the current ILC lattice

ILC-CLIC low-E parameters

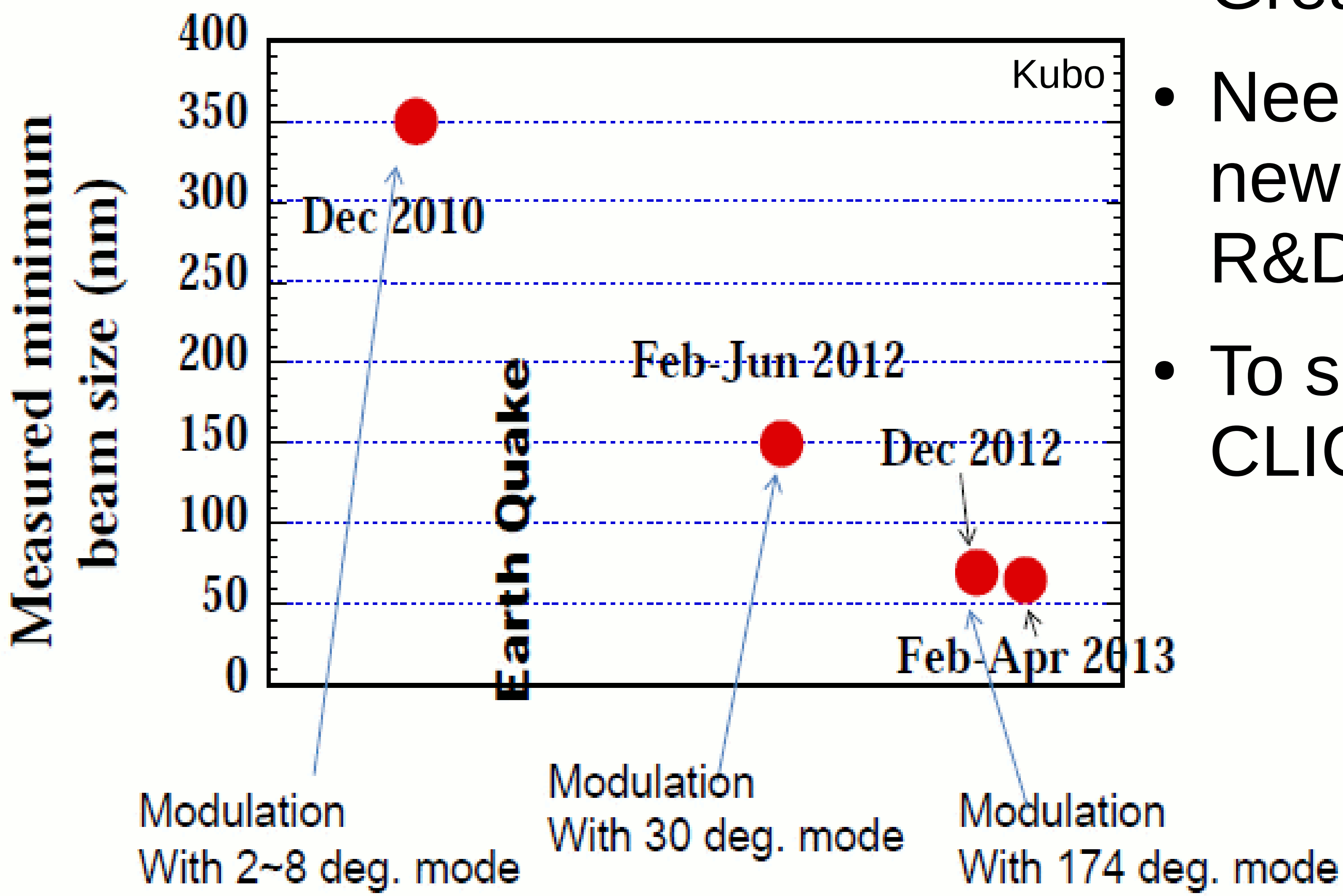
- ILC CM energies are 250 and 500 GeV
- CLIC is 350 GeV
- This poses extra constrains in a common path
- Higgs mass is well known now, how come the target energies are not the same?
- CLIC detector is OK with 18-20mrad crossing angle, why ILC needs 14mrad?



CLIC QD0 prototype

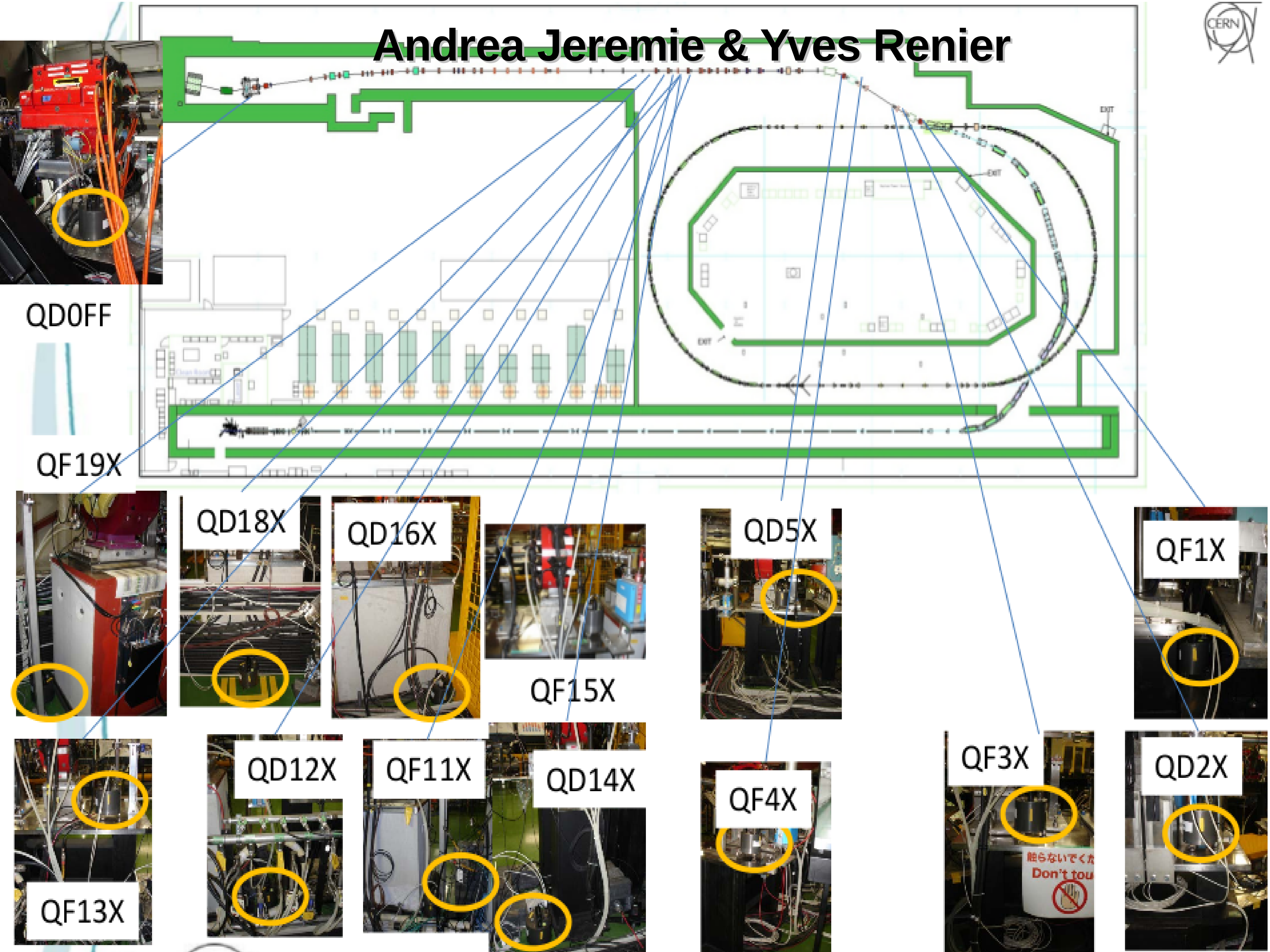
- Compact
- Robust (no SC coil vibration)
- Demonstrated technology
- Should ILC take it?
- See Michele's presentation on Thursday

ATF2



- Great progress
- Need to think on new challenging R&D goals
- To serve both for CLIC and ILC

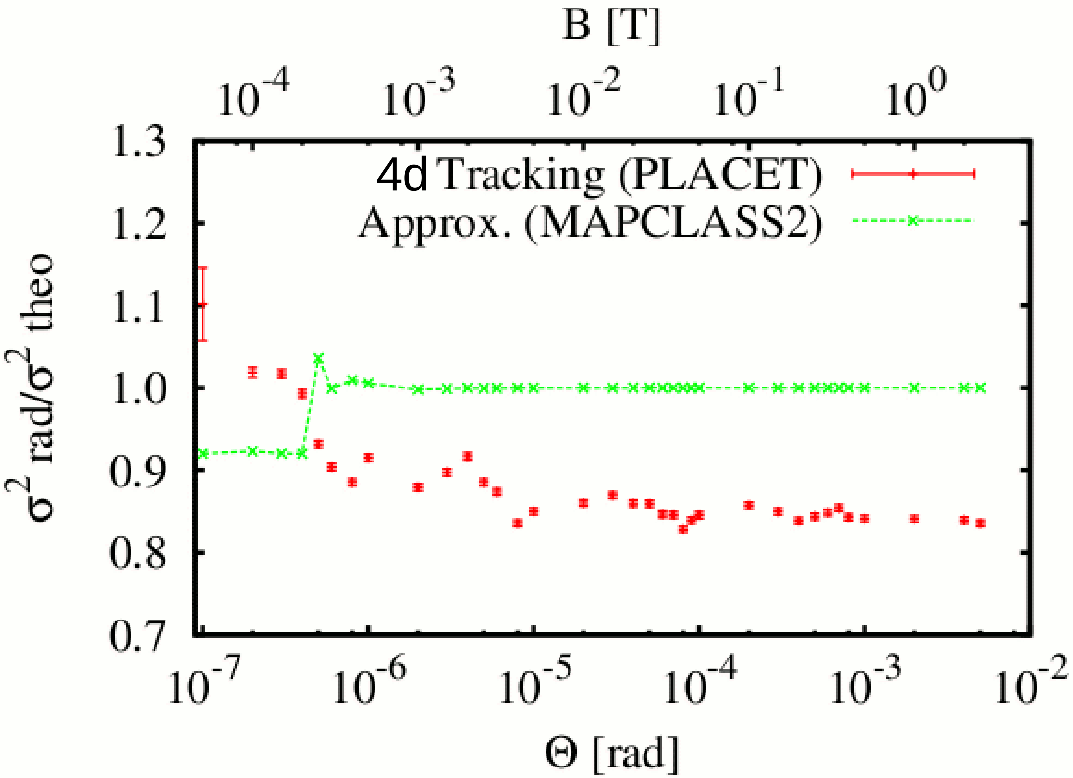
Andrea Jeremie & Yves Renier

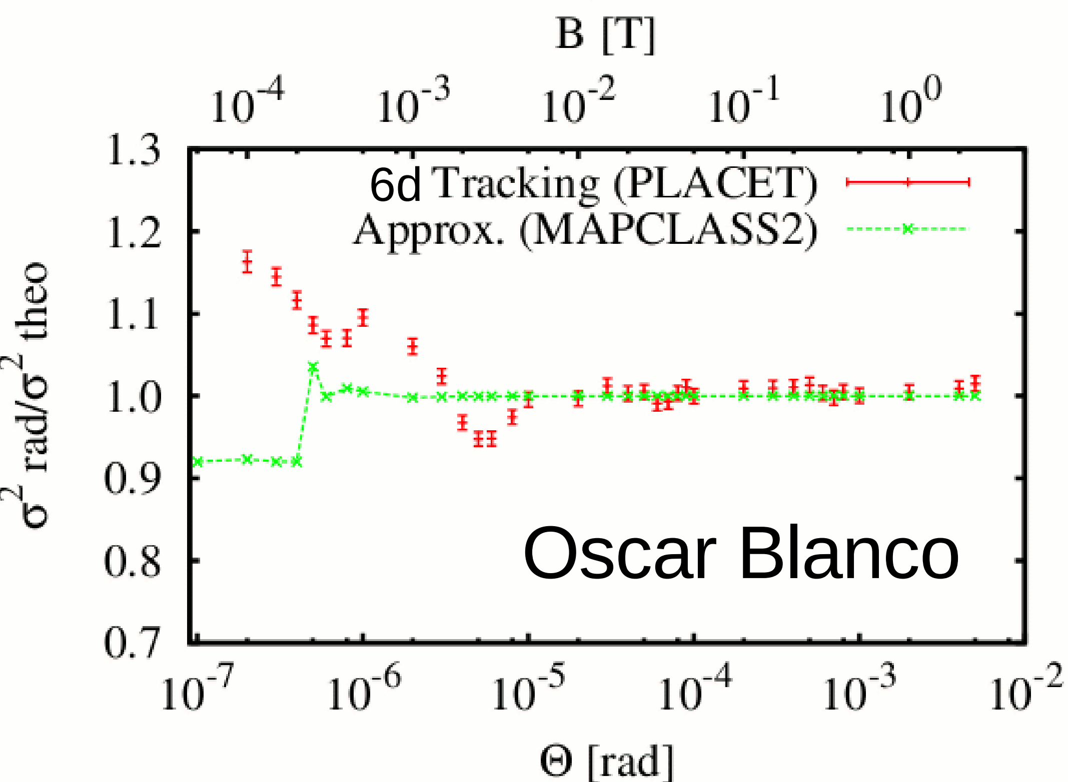


Ultra-low beta* and new QD0 based on CLIC technology?

- Current QD0 is OK for nominal ATF2 optics
- For ultra-low beta* there are 3 options:
  - Increase beta_x → σ_y = 23 nm
  - Replace QD0 → σ_y = 26 nm
  - *New!* 2 new octupoles → σ_y = 23 nm
- See Eduardo Marin's talk on Wednesday

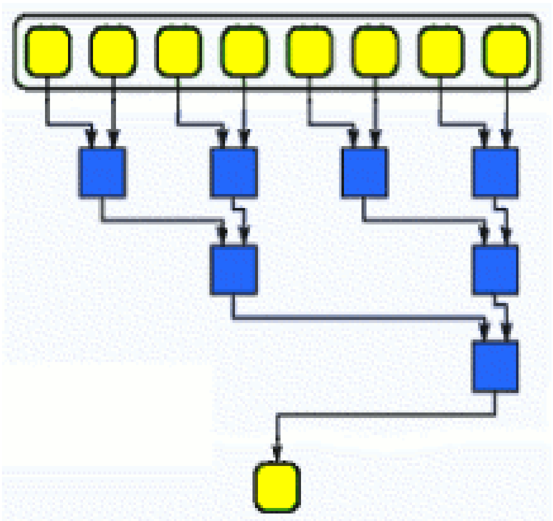
SR effects



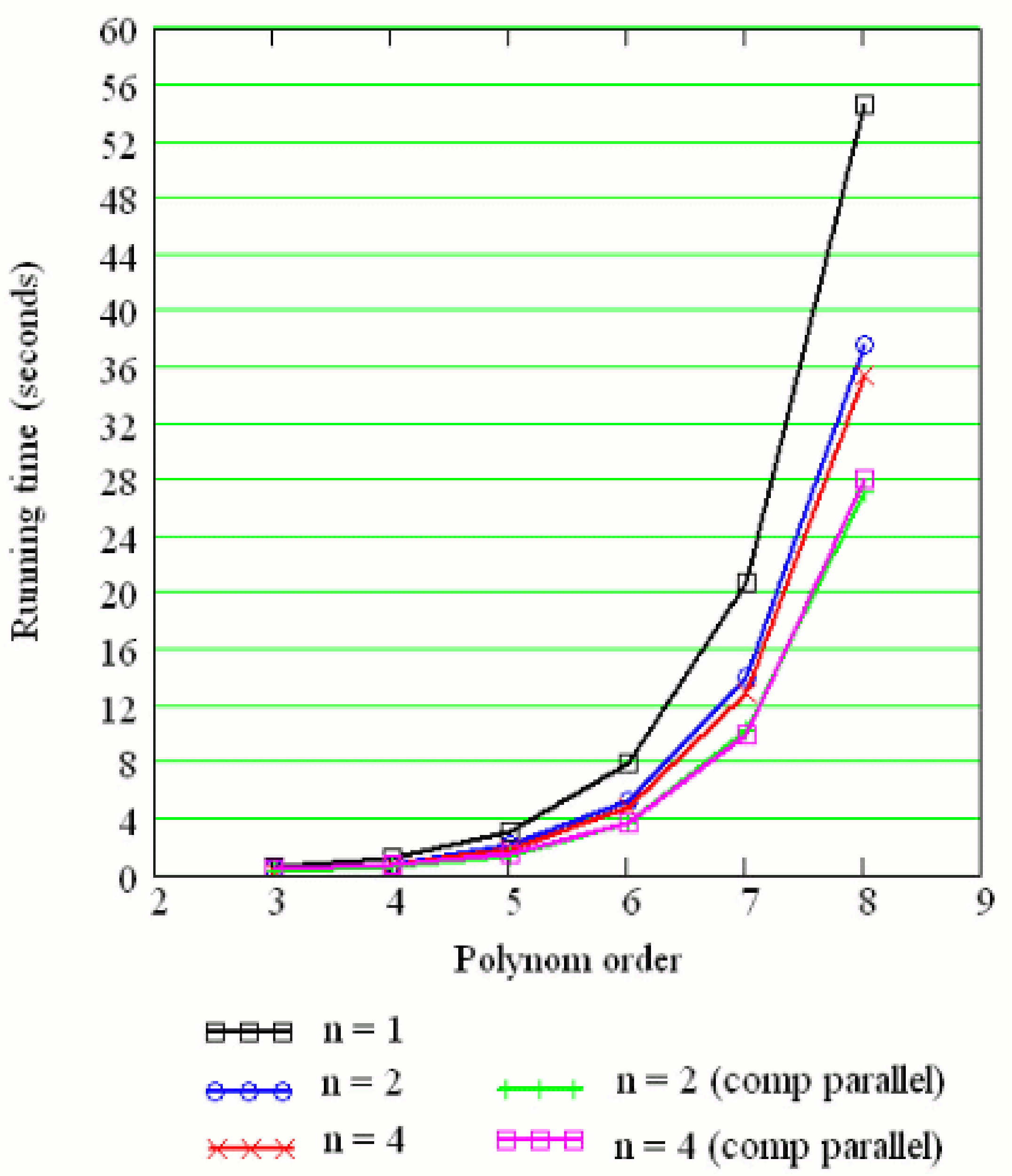


- Analytical estimates of SR in MAPCLASS
- Allow to optimize lattice including SR
- Allow to compare to tracking codes
- PLACET 6D SR option proves more accurate than the previously default 4D.

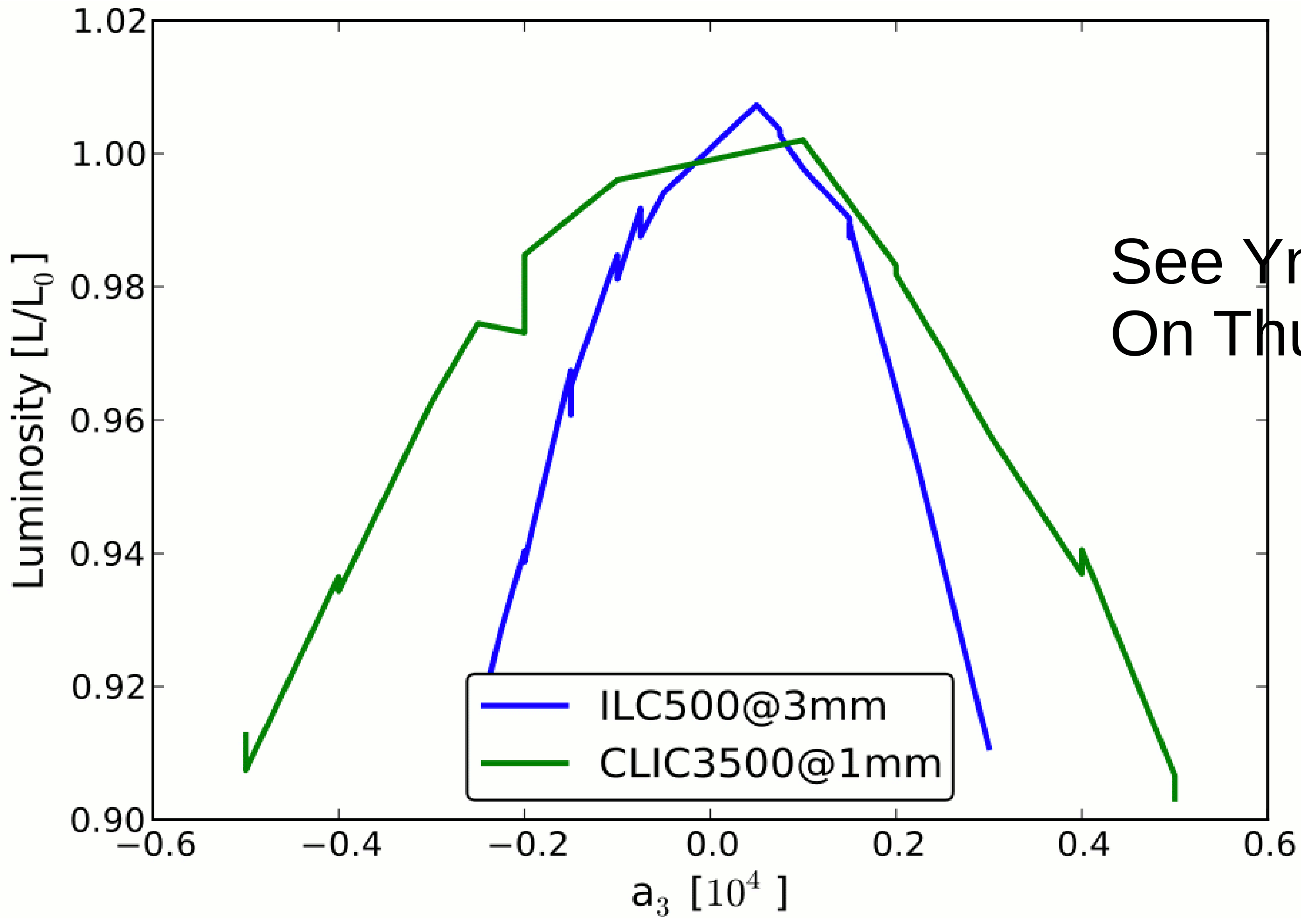
MAPCLASS upgrades



- Parallelization limited by load imbalance
- Turning libraries to C++
- New features



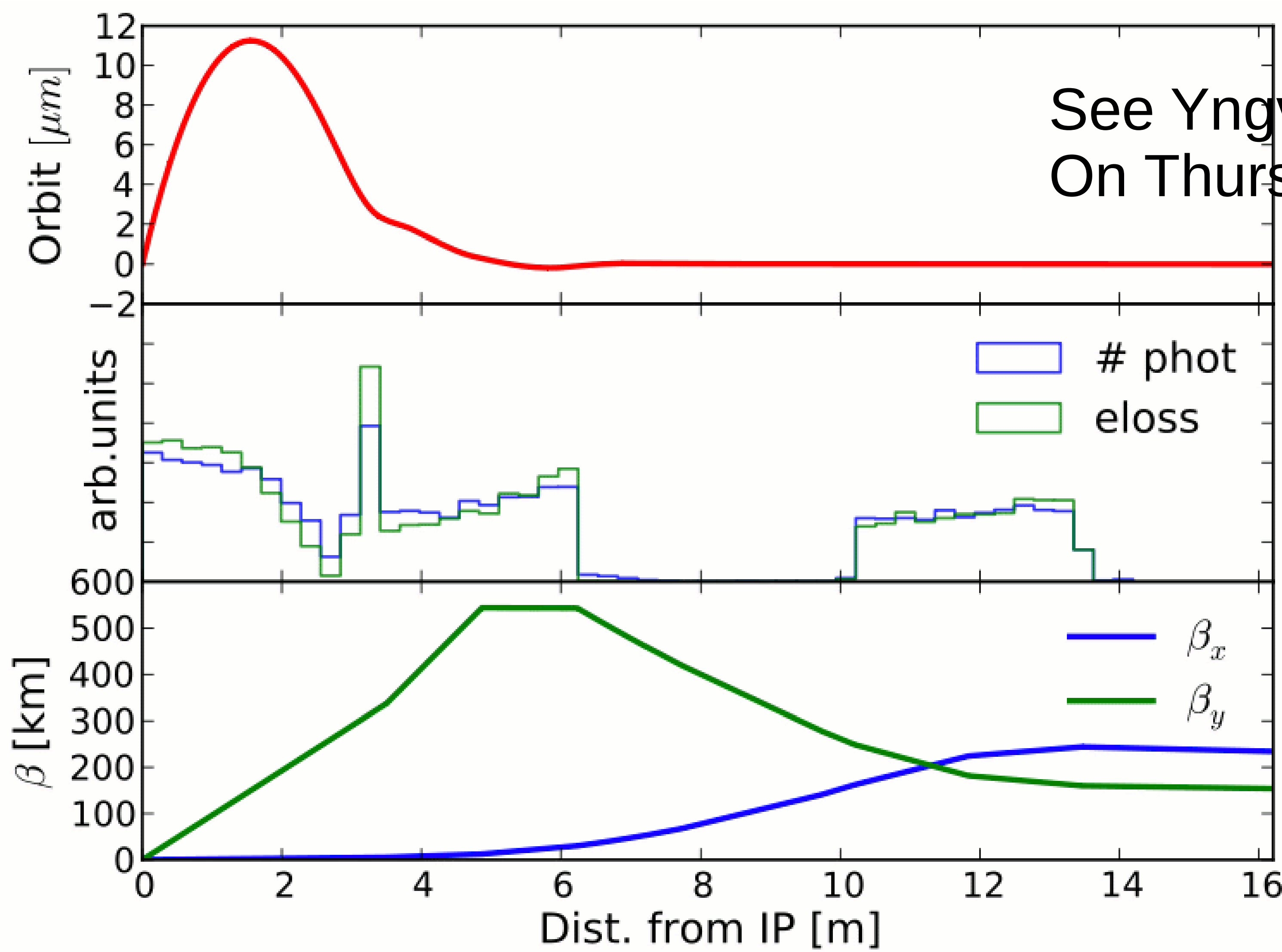
Field quality tolerances, e.g. QF1



See Yngve's talk
On Thursday

- ILC and CLIC have similarly challenging tolerances for skew components in QF1

Solenoid luminosity loss evaluation



See Yngve's talk
On Thursday

- Automatic procedures to determine luminosity loss from solenoid+SR

Summary & outlook

- A new CLIC-ILC path with a common FFS seems possible, but not obstacle free:
  - QD0 technology
  - Design energies, crossing angles
- ATF2: the excellent playground for both projects
- CLIC is redesigning low energy with probably more pushed IP parameters:
  - Parameter optimization
  - Tools development: MAPCLASS, SR, solenoid, etc