HF2014 Summary - IR

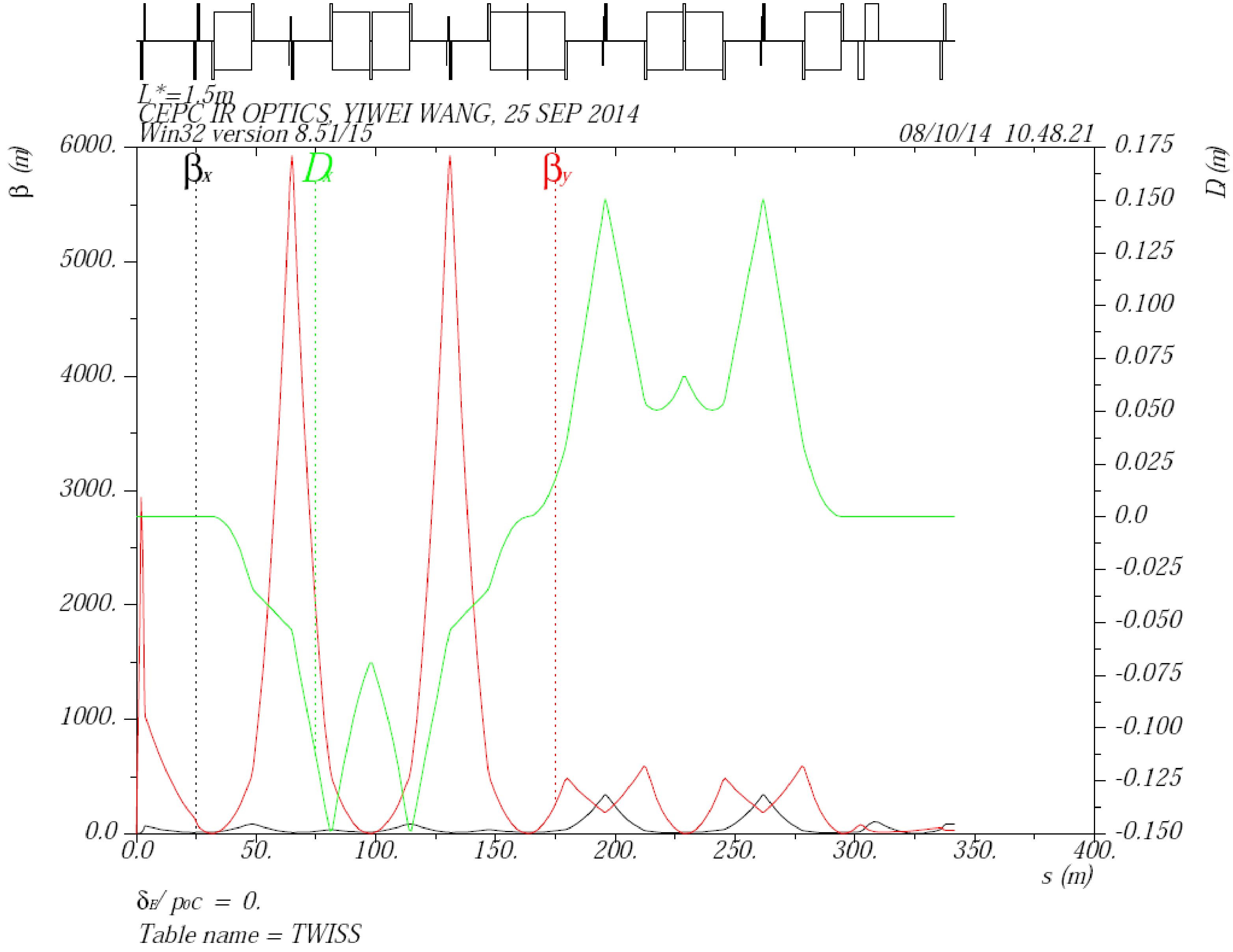
Roman Martin

FCC-ee Accelerator meeting

3 November 2014

CEPC interaction region

Yiwei Wang

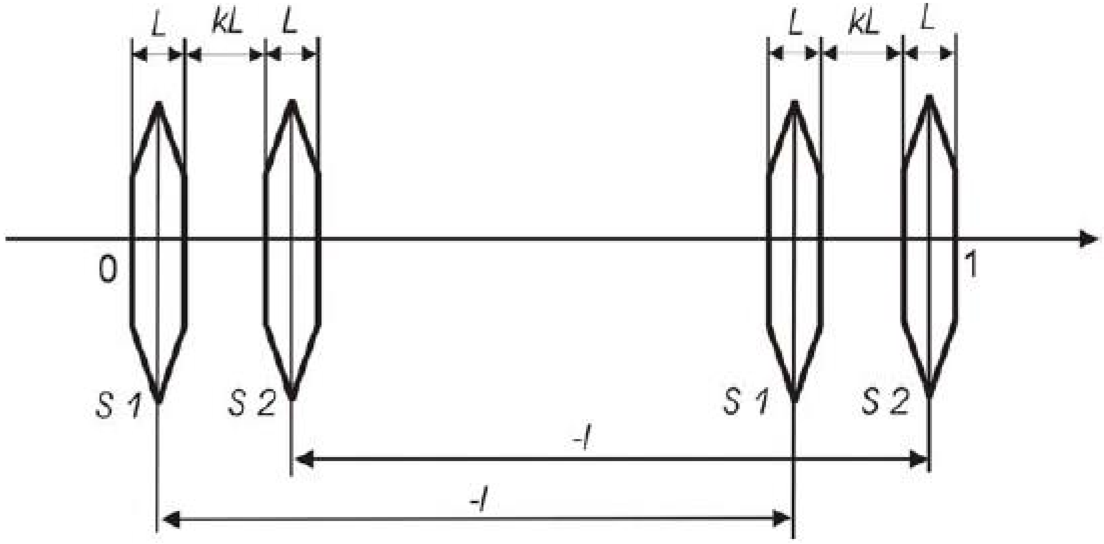


- Based on design by Yunhai Cai
- L* = 1.5m
- Local chromaticity correction
- Also comes from Linear Colliders

CEPC interaction region

Yiwei Wang

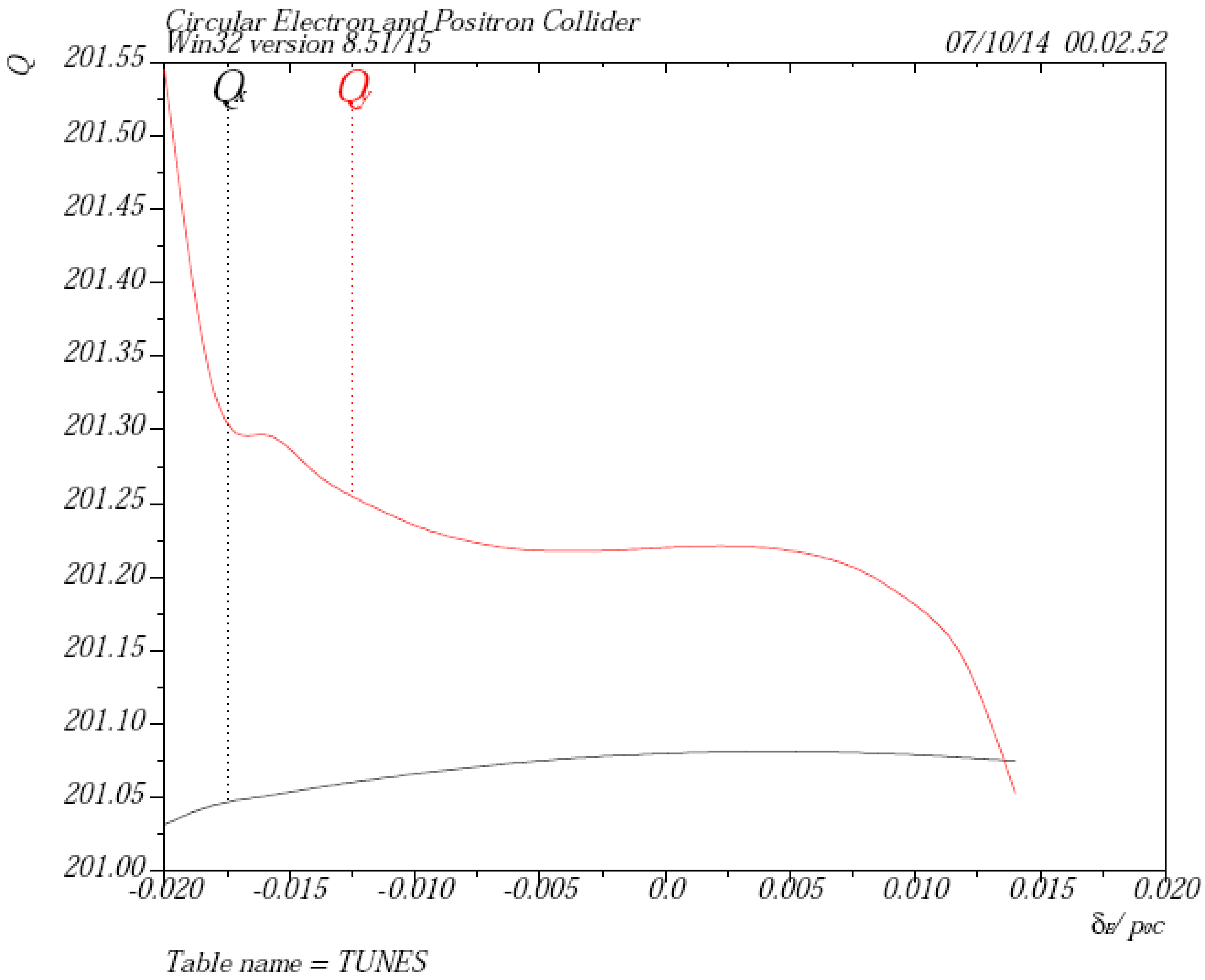
- Higher order sextupole correction based on scheme by A.Bogomyagkov et al. (to compensate finite length)
- Weak correction sextupoles next to Chromaticity sextupoles



K=1, S1/S1 = -0.1

CEPC interaction region

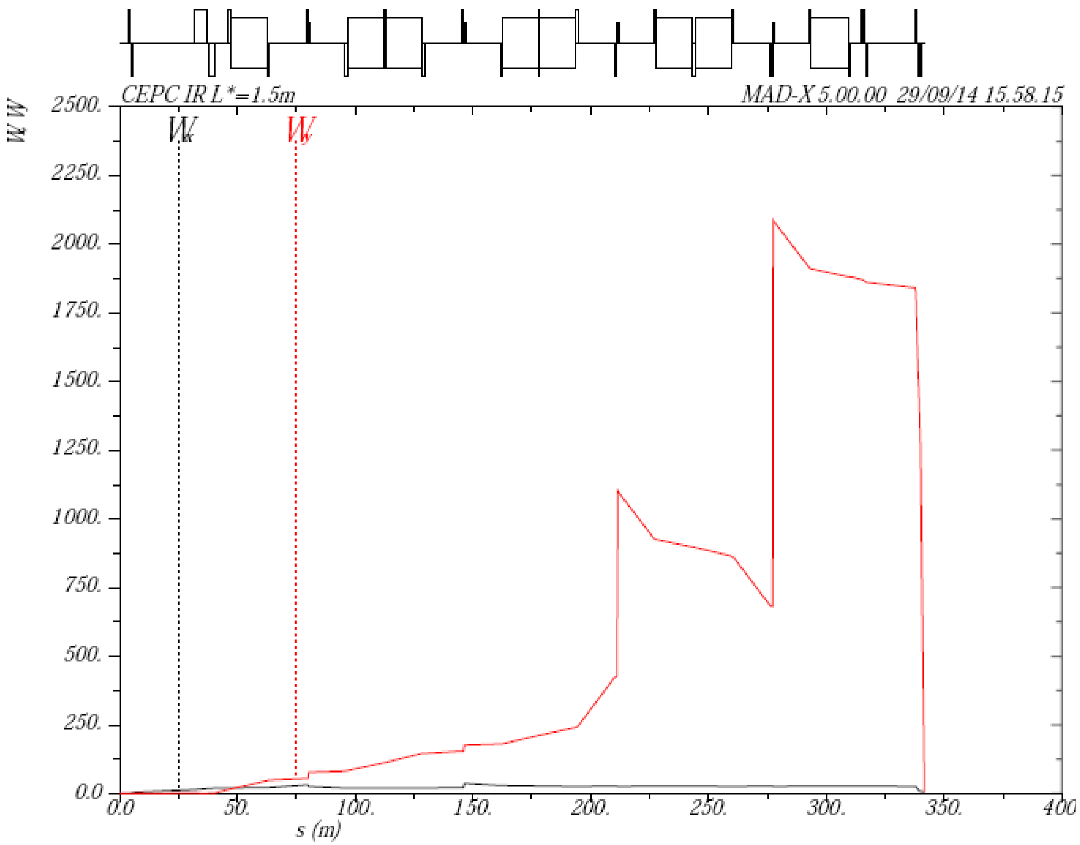
Yiwei Wang

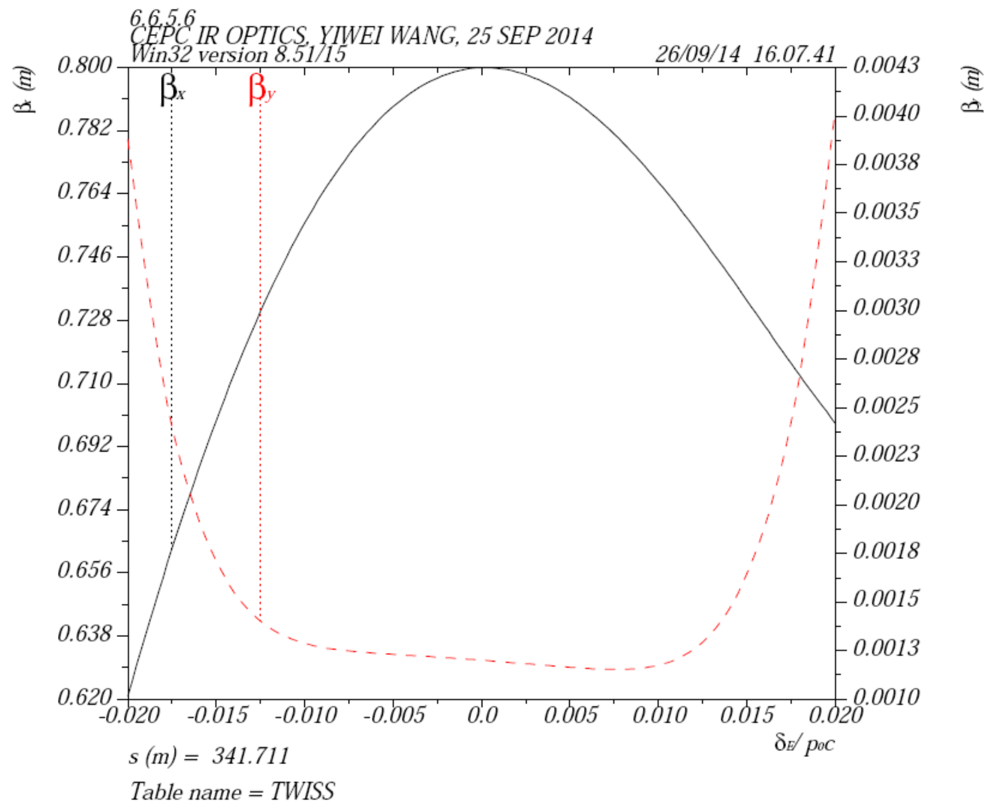


- Working point: .08 / .25 according to beam-beam studies
- Q' matched to 0.5 by arc sextupoles
- “good region of ± 1%”
- Goal is ±2%

CEPC interaction region

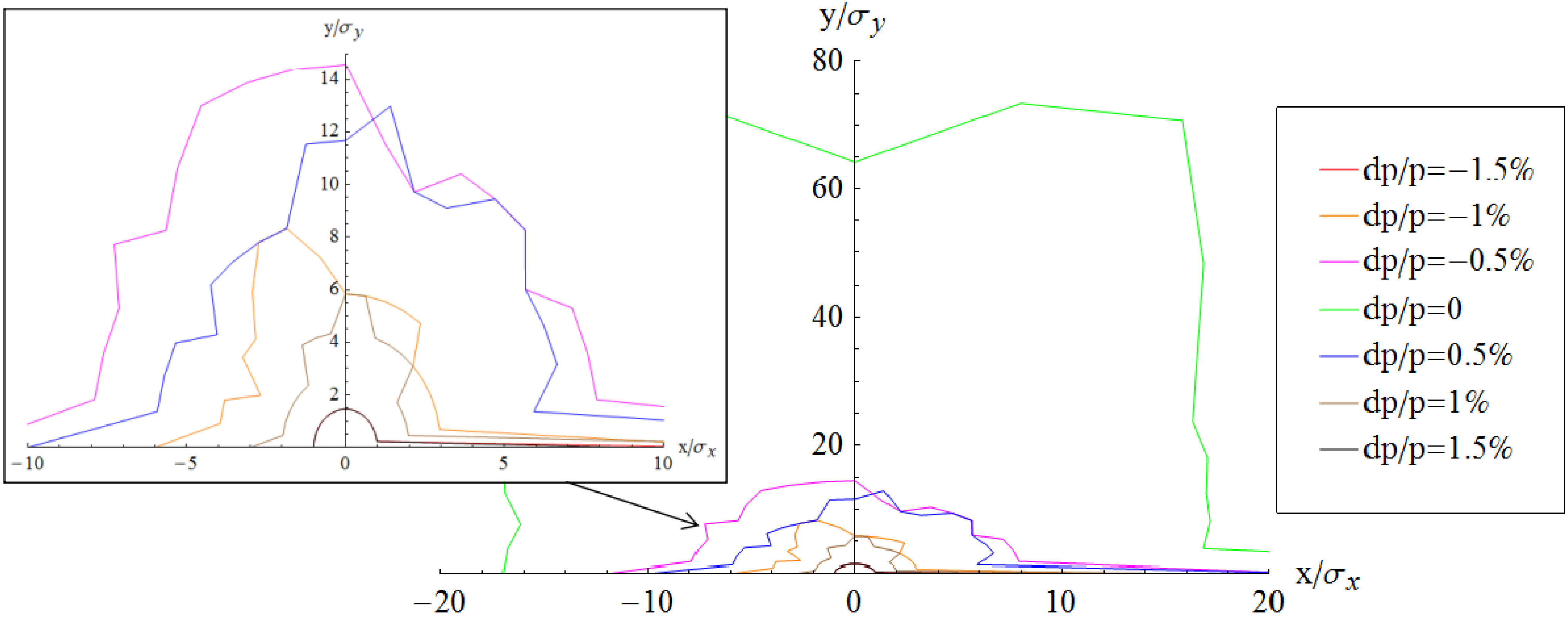
Yiwei Wang





CEPC interaction region

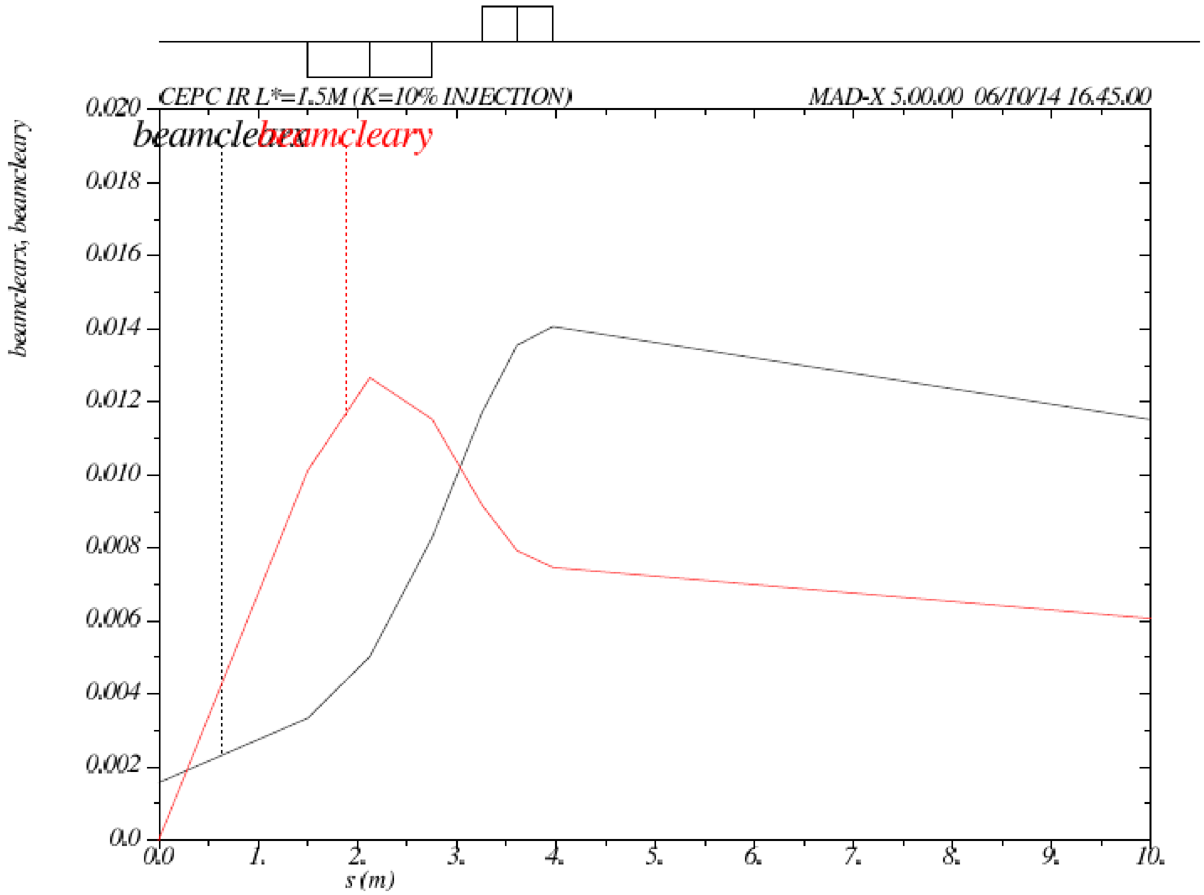
Yiwei Wang



- Tracking 3x damping time
- No radiation or magnet errors
- Required DA: 40 σ

CEPC interaction region

Yiwei Wang



- coil inner radius = 20 mm
- gradient = 300 T/m

CEPC interaction region

Yiwei Wang

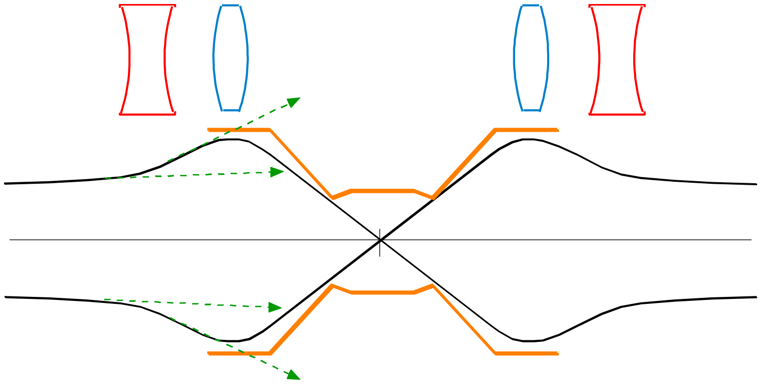
- Critical energy in last bend: 958 keV
- Power in last bend: 50 kW
- If all dipoles are the same: 800 kW per IP (dipoles only)
- Comparison:

E = 120 GeV	CEPC	FCC-ee (CERN	FCC-ee (BINP)
E_crit [keV]	958	160	365
P_last [kW]	50	7.4	8.0
P_tot [kW]	800	140	1400
Length [m]	340	790	490

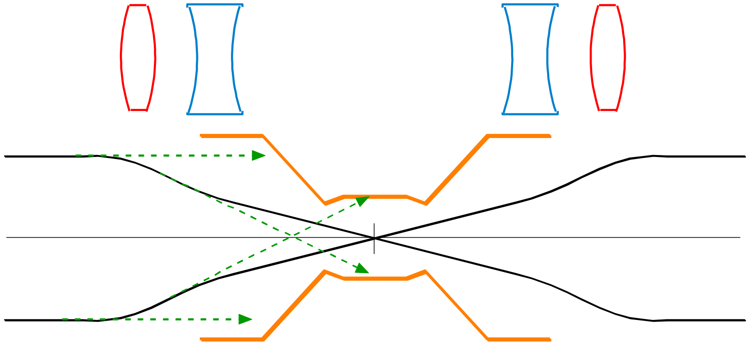
SR studies

M. Sullivan

- Vertical focusing no problem
- SR from horizontal focusing more difficult to shield
- FFS quads: high critical energy (20 MeV in CEPC) → penetration, back/forward scattering, secondary/tertiary photons
- Also last bend should be as weak and as far away from IP as possible



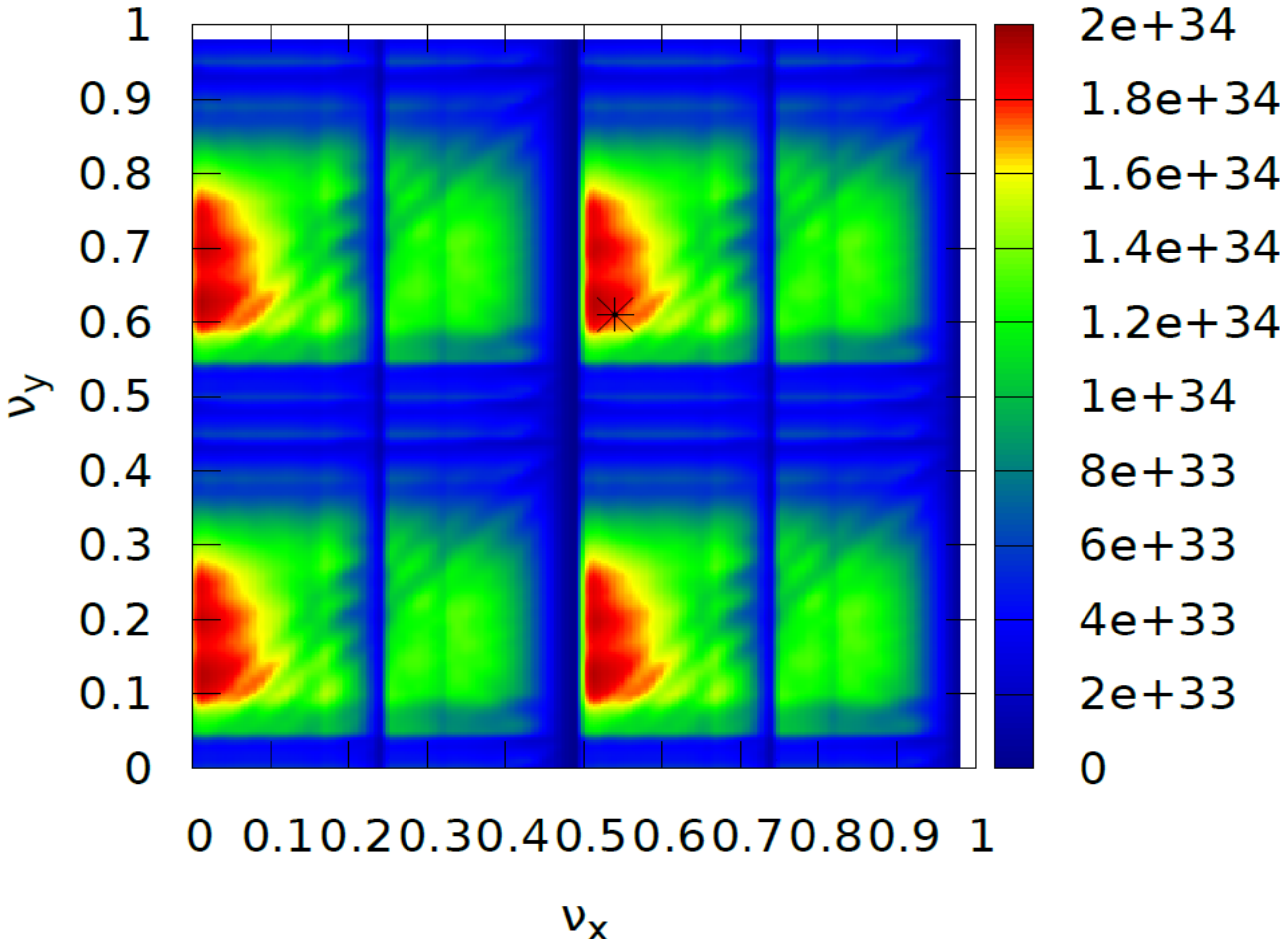
Vertical beam focusing (side view)



Horizontal beam focusing (plan view)

Working point (CEPC)

K. Ohmi, Y. Zhang

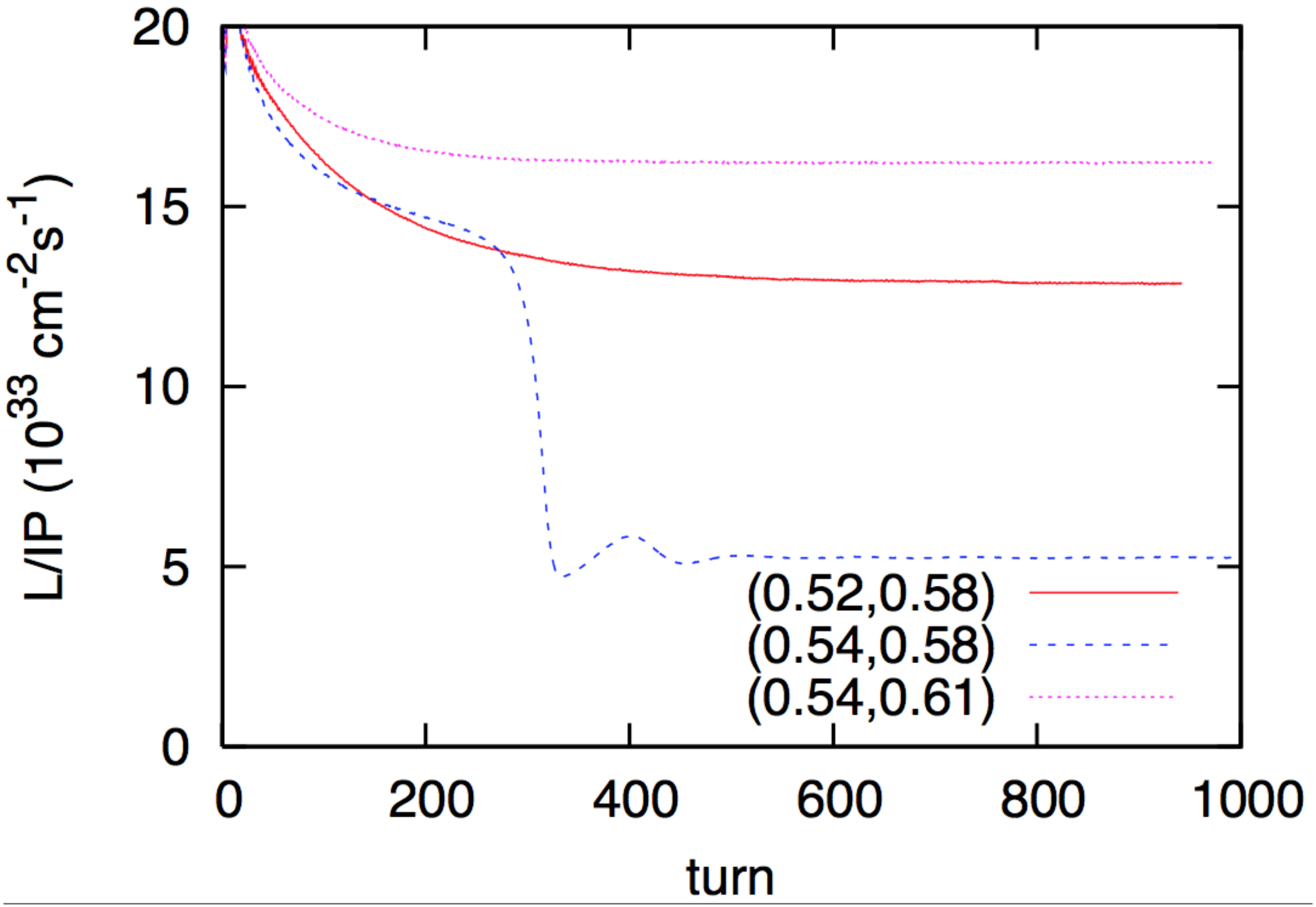


- Beam-Beam weak-strong simulation

Beam-Beam studies

K. Ohmi

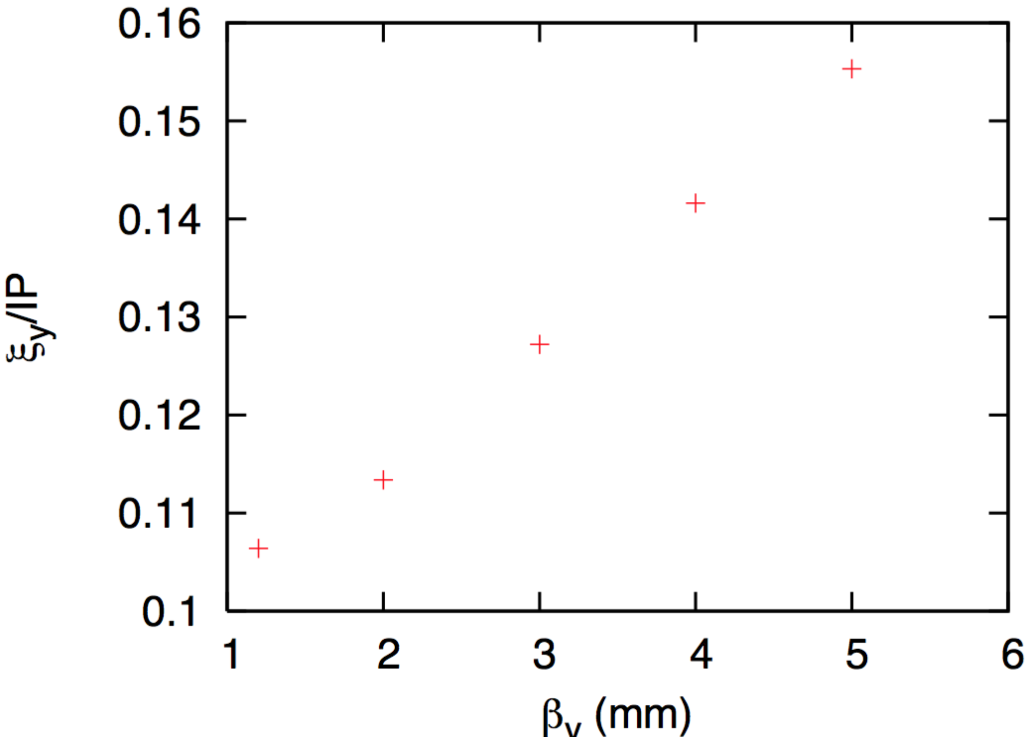
- Strong-strong simulation for CEPC

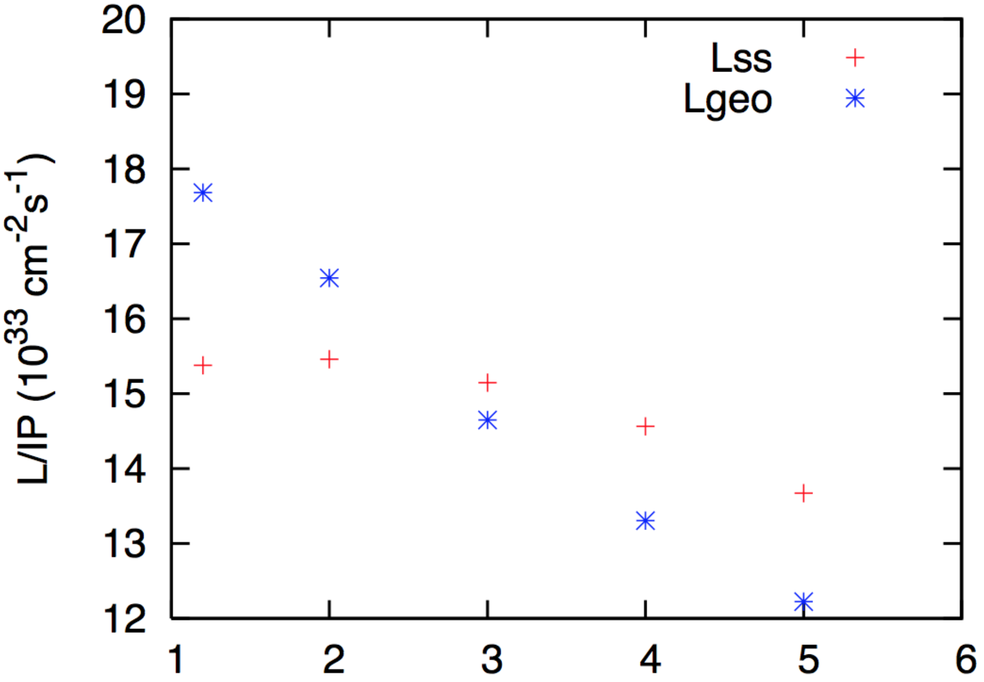


Beam-Beam studies

K. Ohmi

- Dependence on βy* (CEPC)
- βy* = 2 mm seems best choice

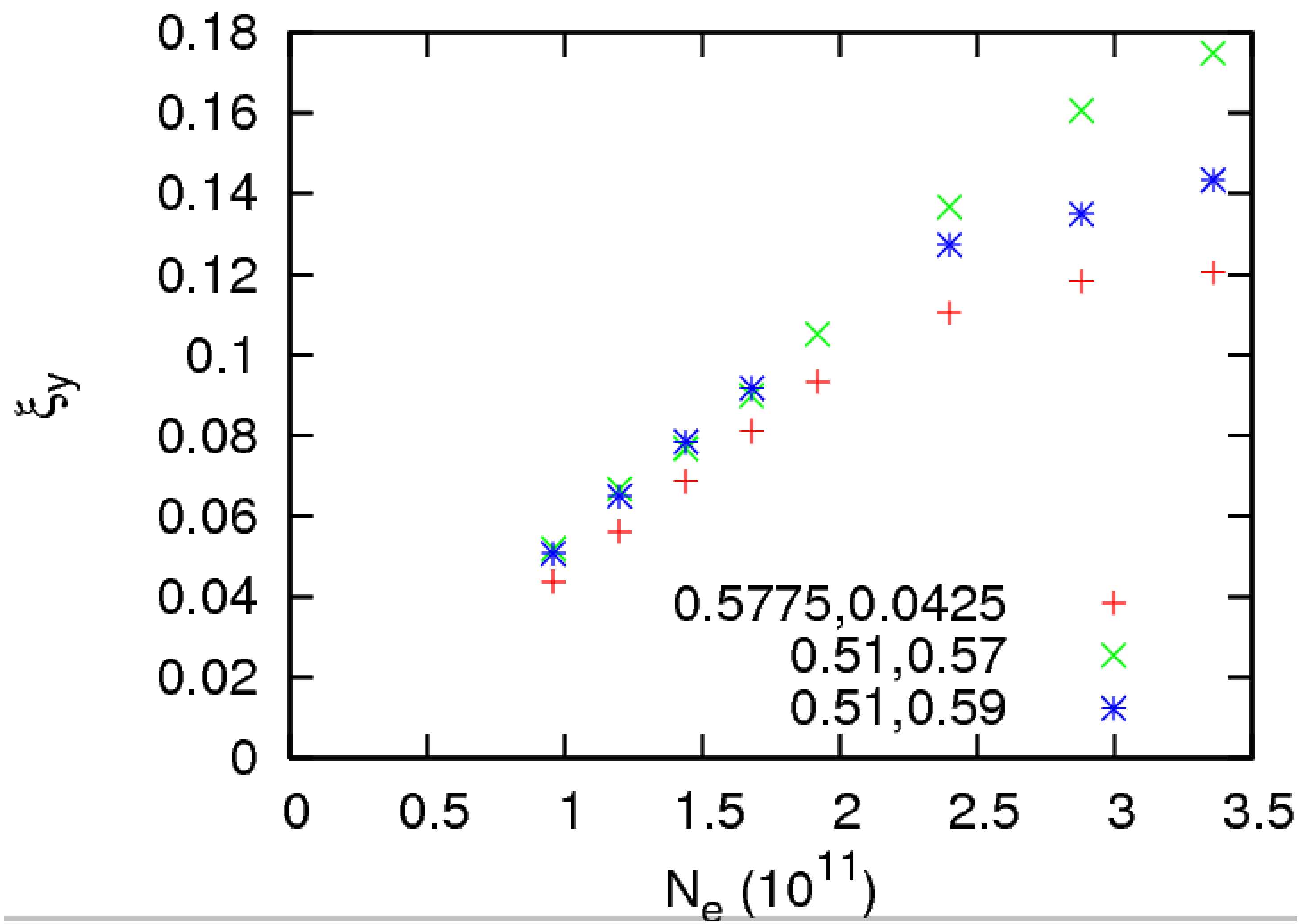




Current dependence of luminosity

K. Ohmi

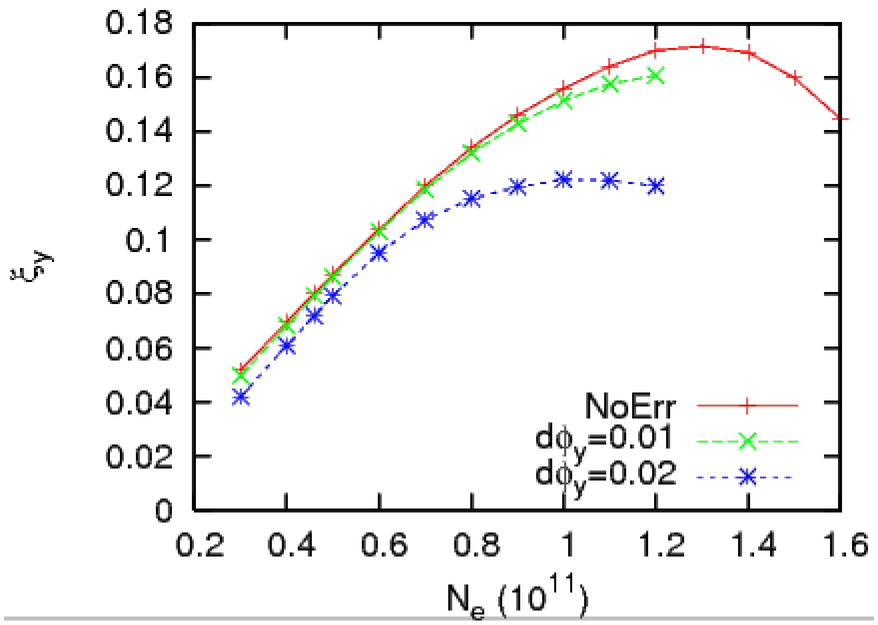
- Strong-Strong simulation for LEP1



Effect of phase error between IPs

K. Ohmi

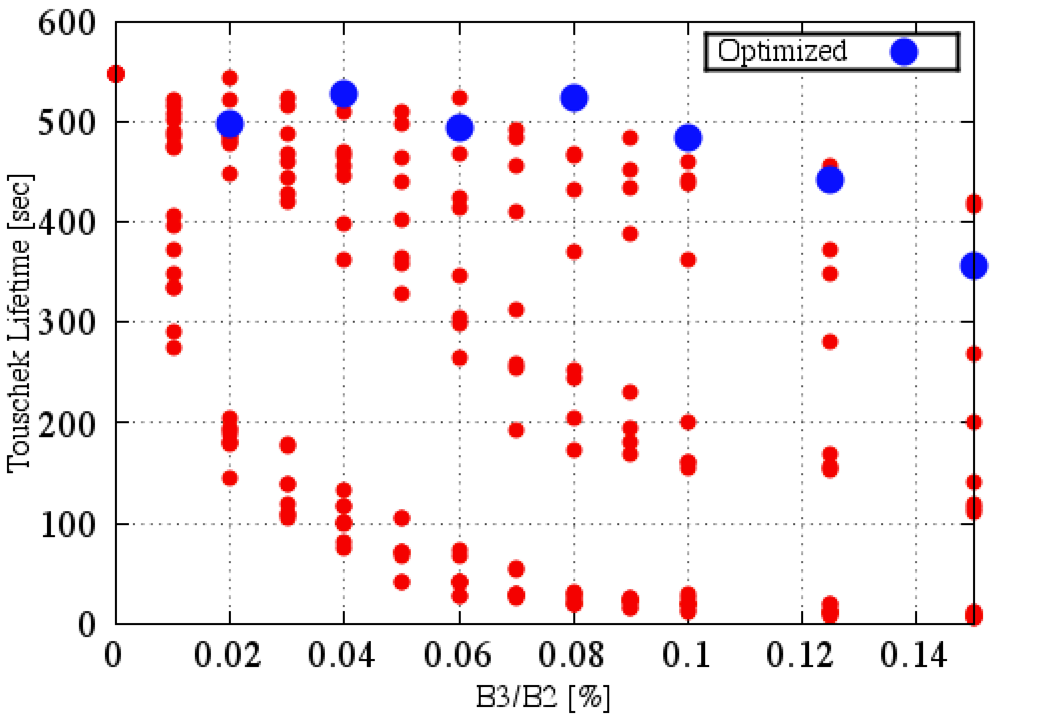
- Weak-strong simulation of FCC-ee



DA studies for SuperKEKB

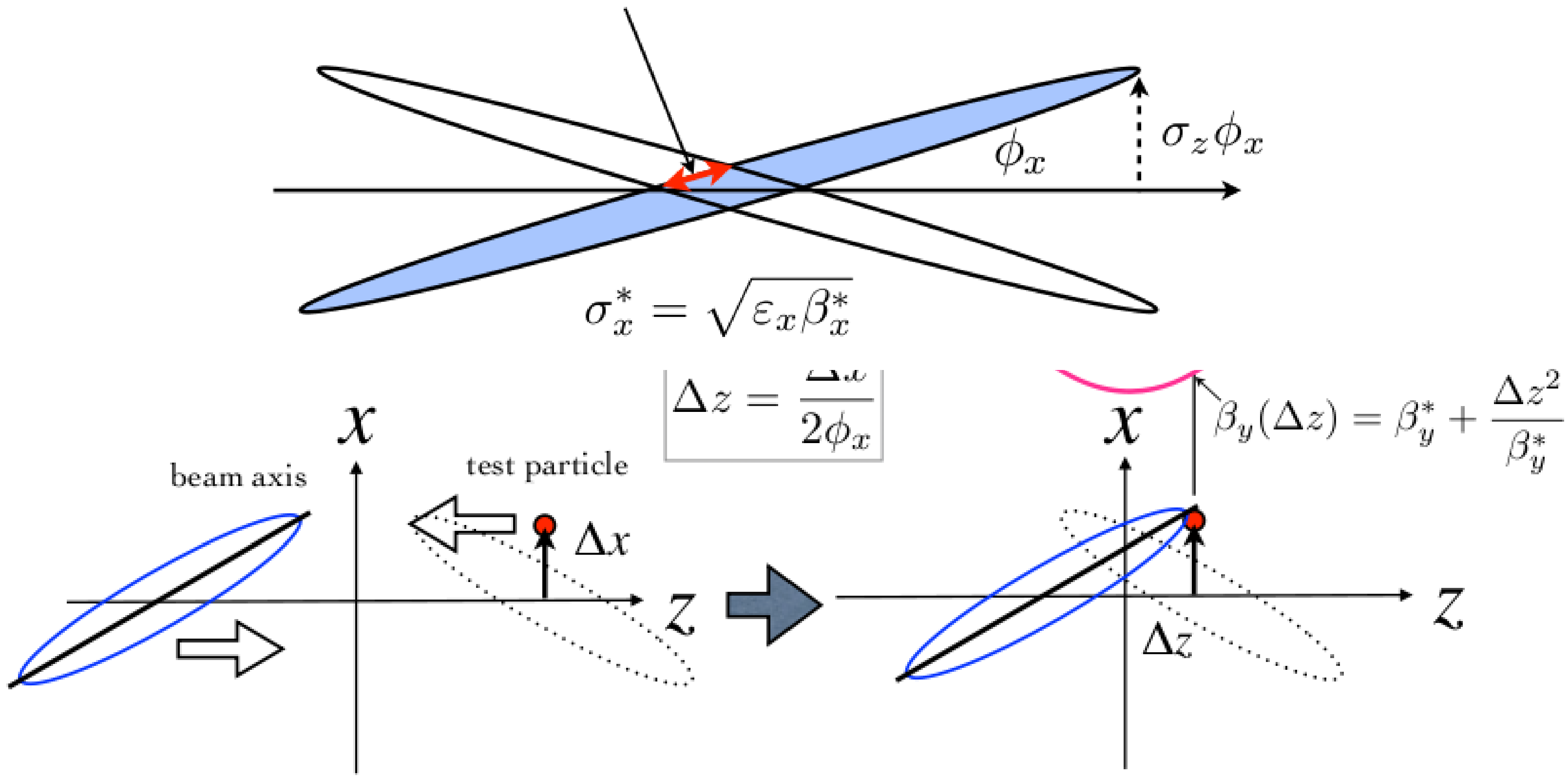
H. Sugimoto

- Sextupole Errors in FFS quads can be corrected by corrector coils
- B3/B2 < 0.1% preferable



Beam-Beam for large horizontal orbit (SuperKEKB)

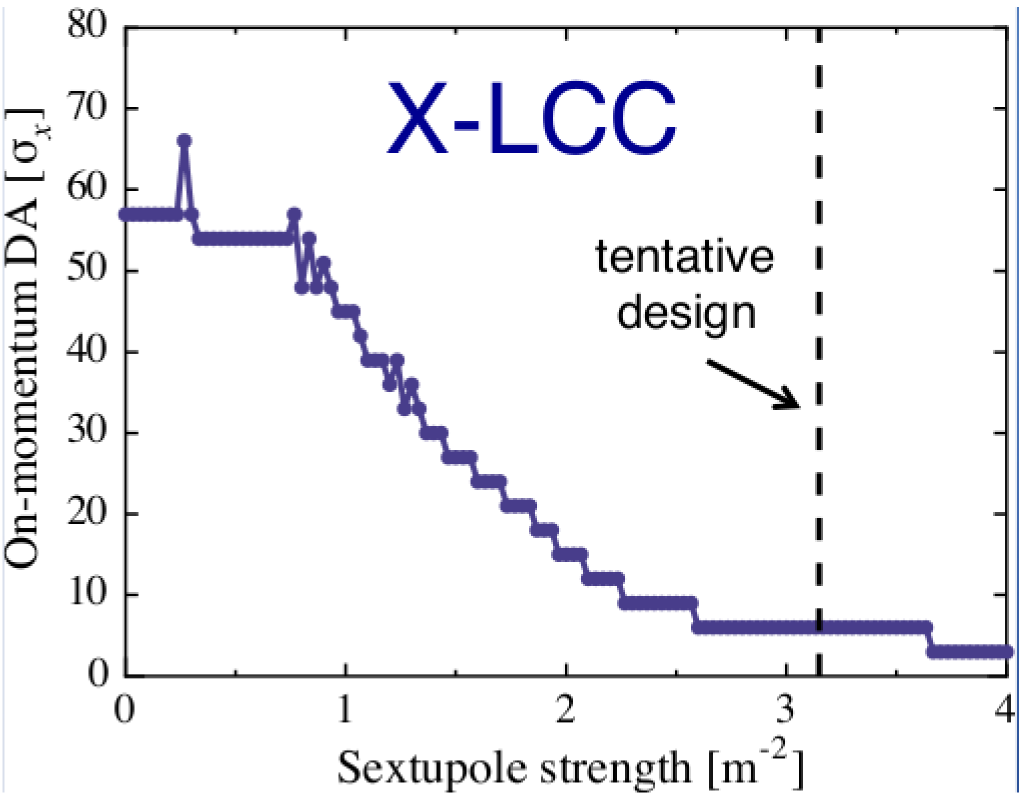
Y. Ohnishi

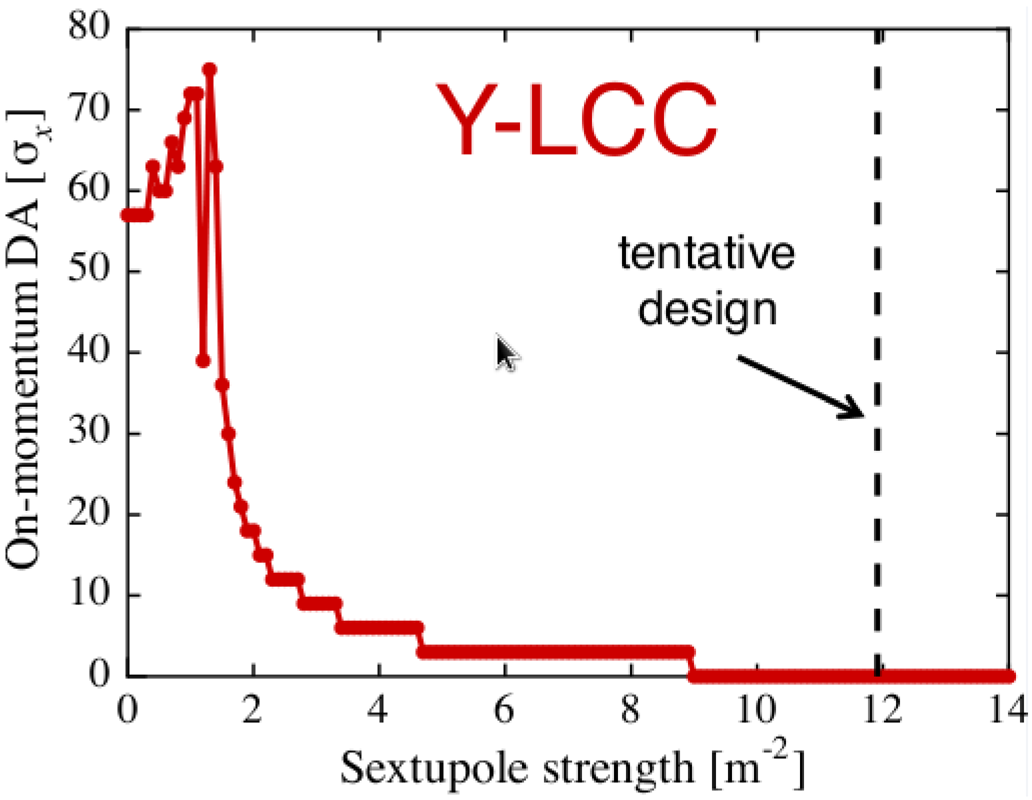


- Large horizontal orbit → beam-beam kick at high βy region → increase in vertical betatron oscillation

Impact of CCS sextupoles on DA

H. Sugimoto

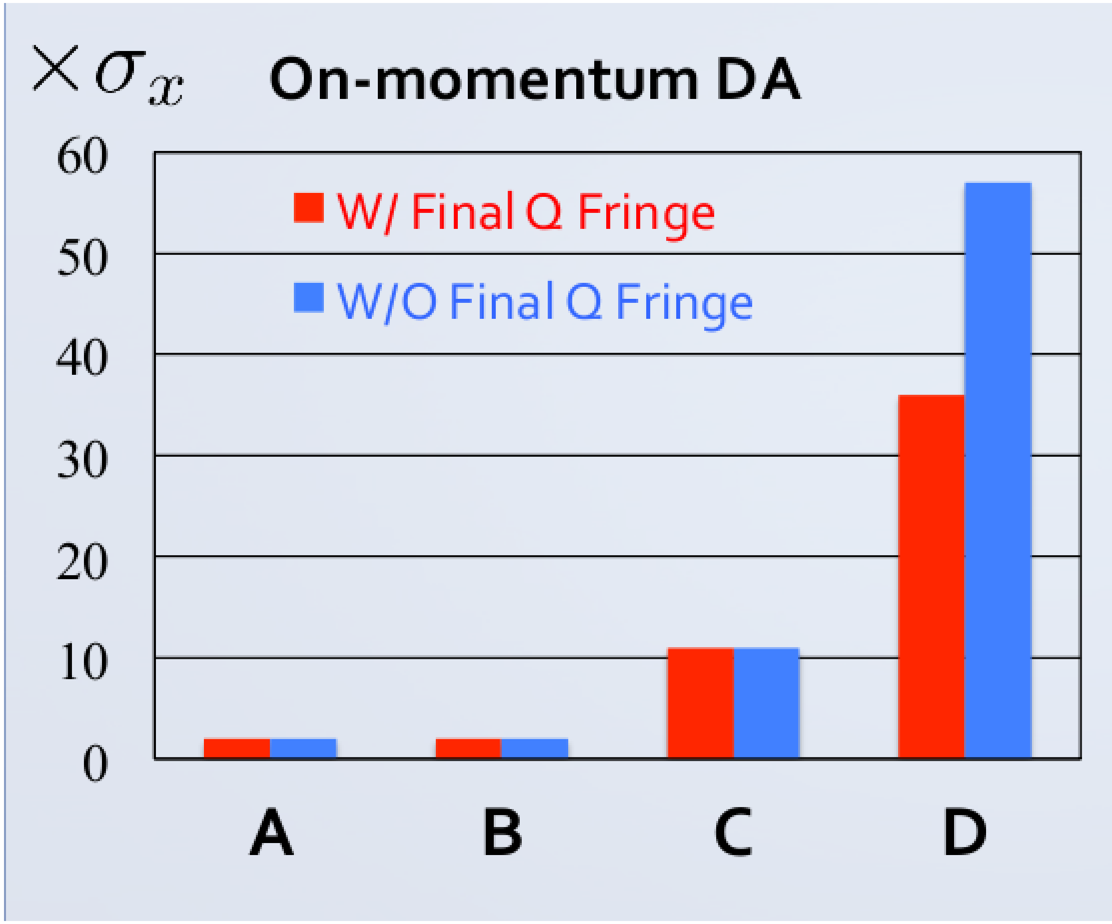




- Studies based on outdated CECP IR lattice
- No arc sextupoles, SR, fringe effects, etc.

Fringe field effects in CEPC

H. Sugimoto

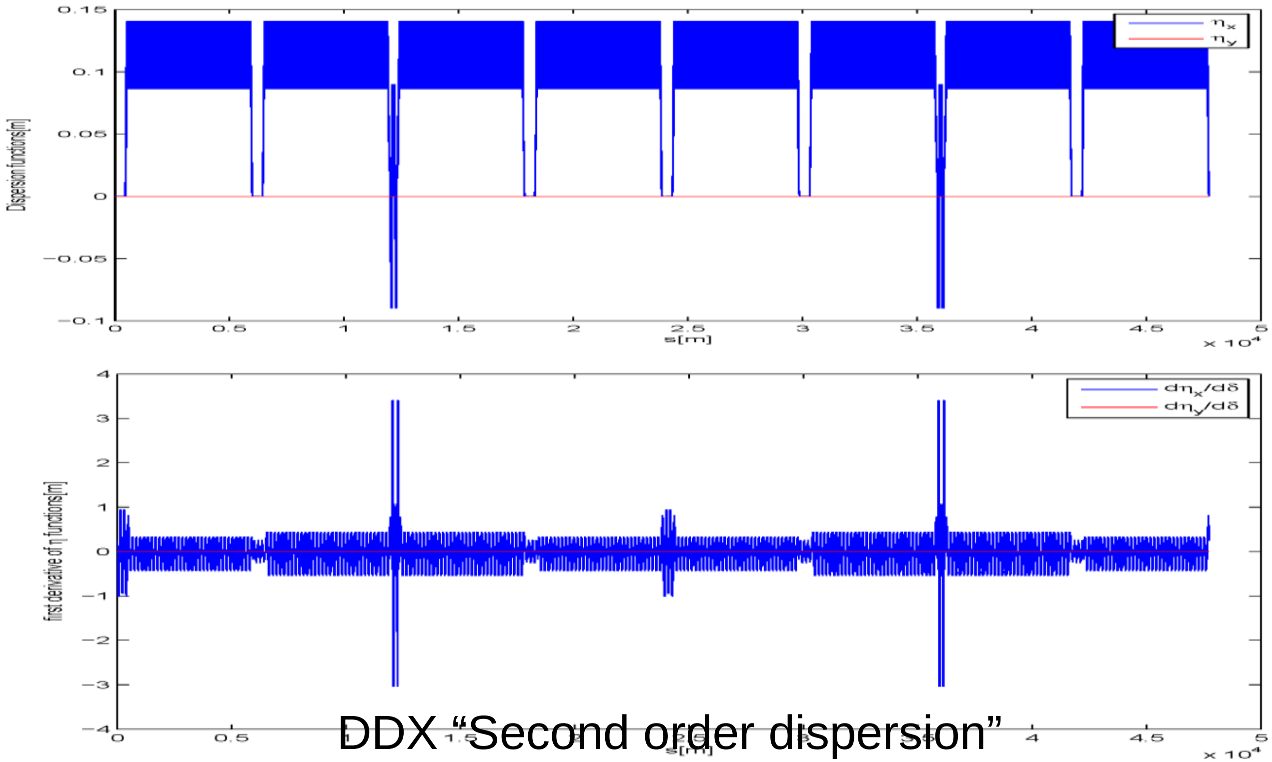


Case	Arc Sext.	LCC Sext.
A	*On*	*On*
B	Off	*On*
C	*On*	Off
D	Off	Off

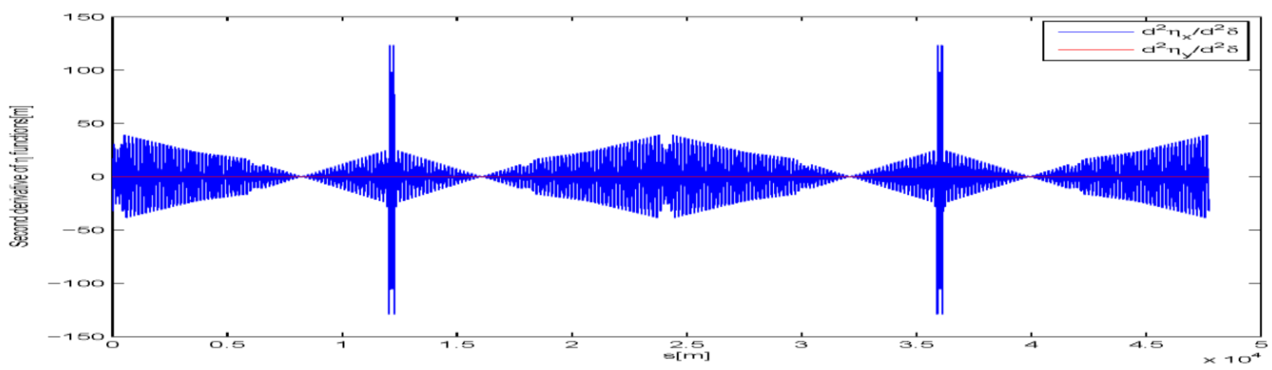
- Studies based on outdated CECP IR lattice
- When side effects of sextupoles are minimized, fringe effects must be suppresed (Octupoles?)

Higher order chromaticity

Yunhai Cai



DDX "Second order dispersion"



- Second order dispersion leaks out of IR → reduced off-momentum DA