Lattice Upgrade

H. Koiso
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- No major change in arcs.
- Only the interaction region in Tsukuba will be fully reconstructed.

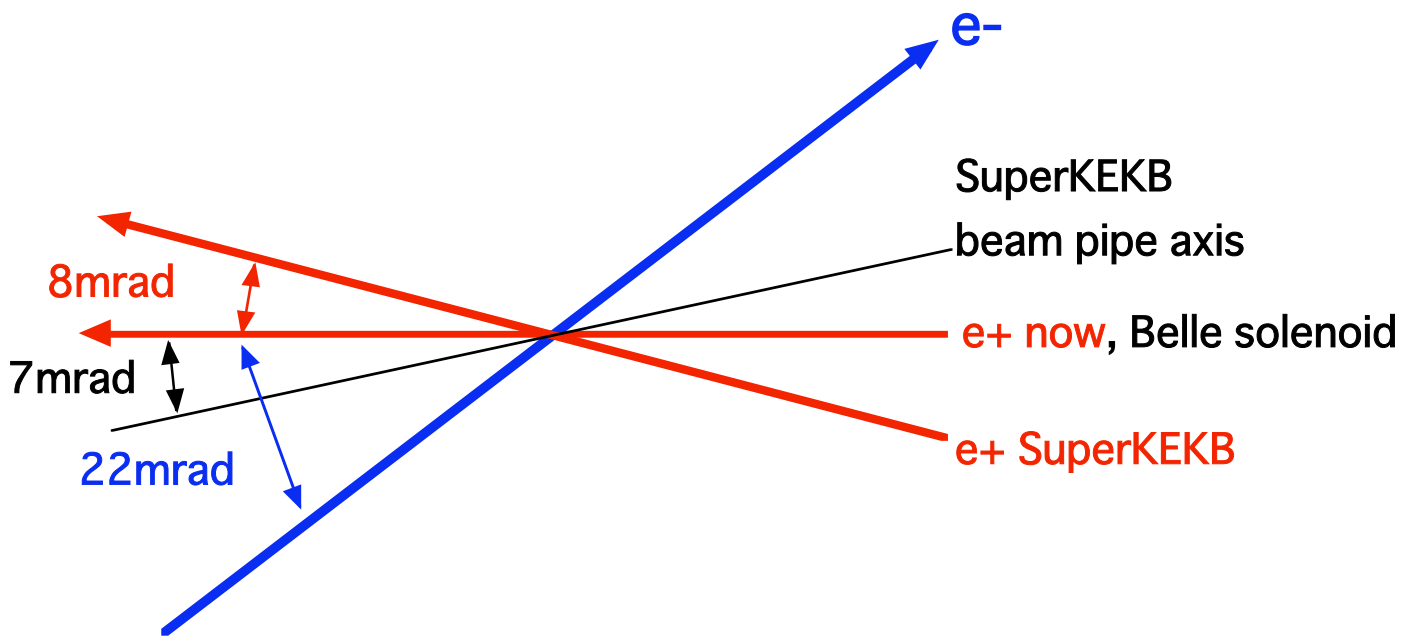
Lattice Parameters

	LER	HER	
Horizontal emittance	24	24	nm
Beta function@IP	20/0.3	20/0.3	cm
Momentum compaction	2.7E-4	1.7E-4	
RF voltage	15	20	MV
Bunch length	3	3	mm

Changed: ε_x 33→24 nm, β^*_x 30→15→20 cm

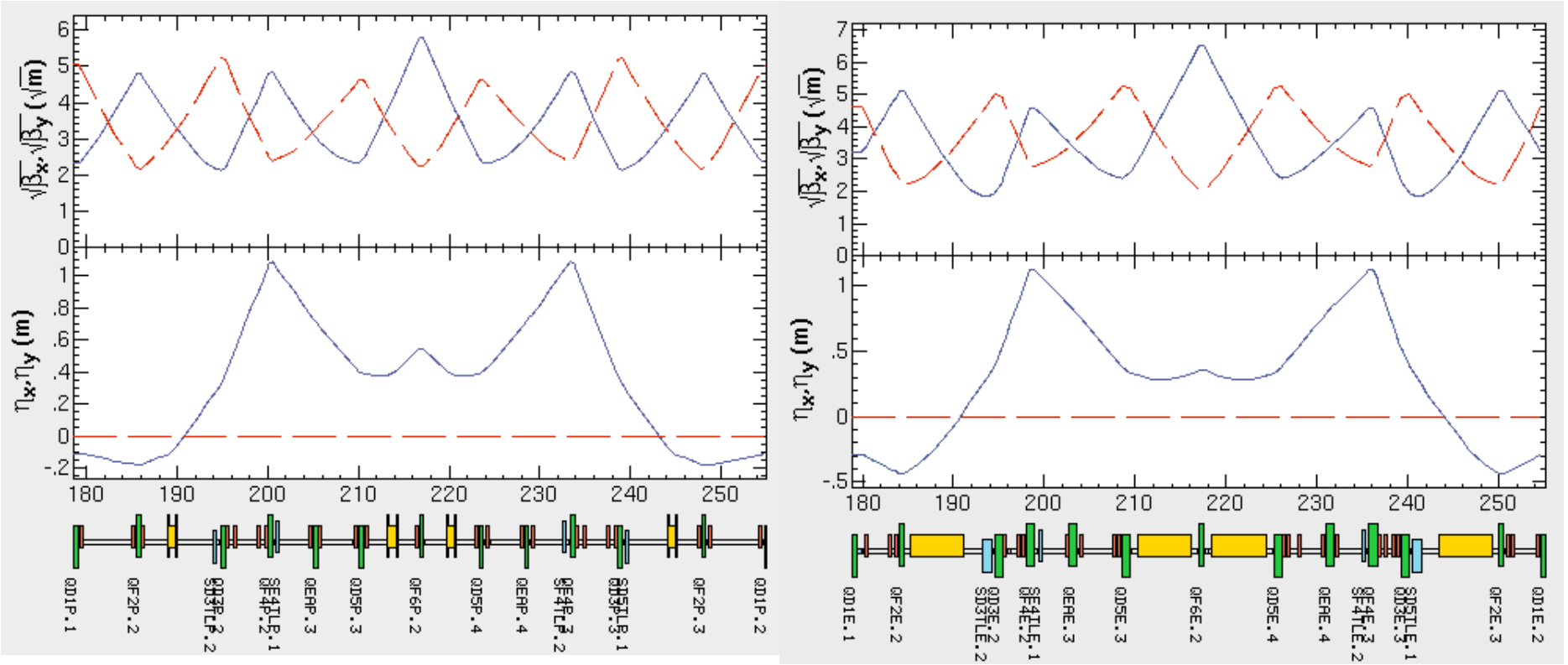
Geometrical Conditions

- **Both rings geometrically are adjusted in the accuracy of a few mm.**
  - **The position of IP is same as that of KEKB**
- **Crossing angle at IP is satisfied the requirements.**



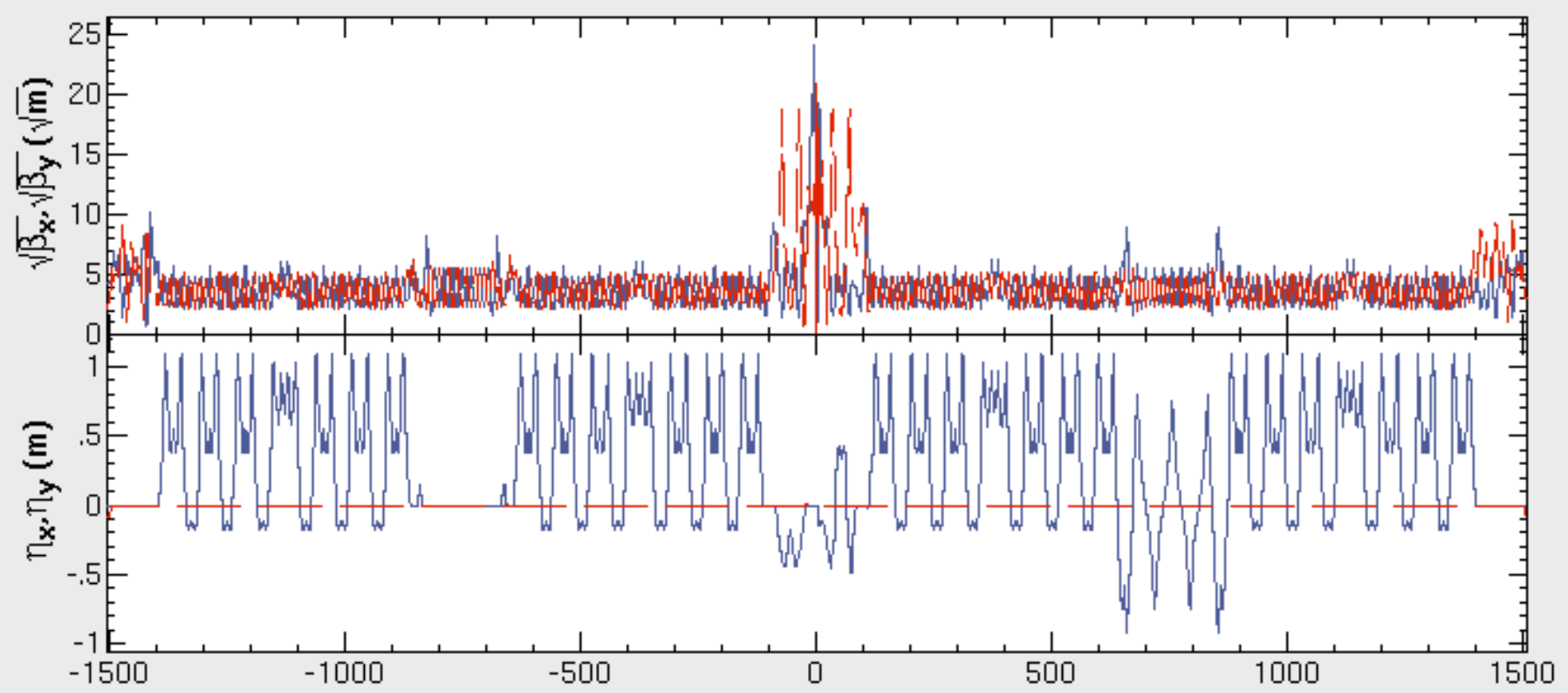
Unit Cell

εx =24 nm LER (left), HER(right)

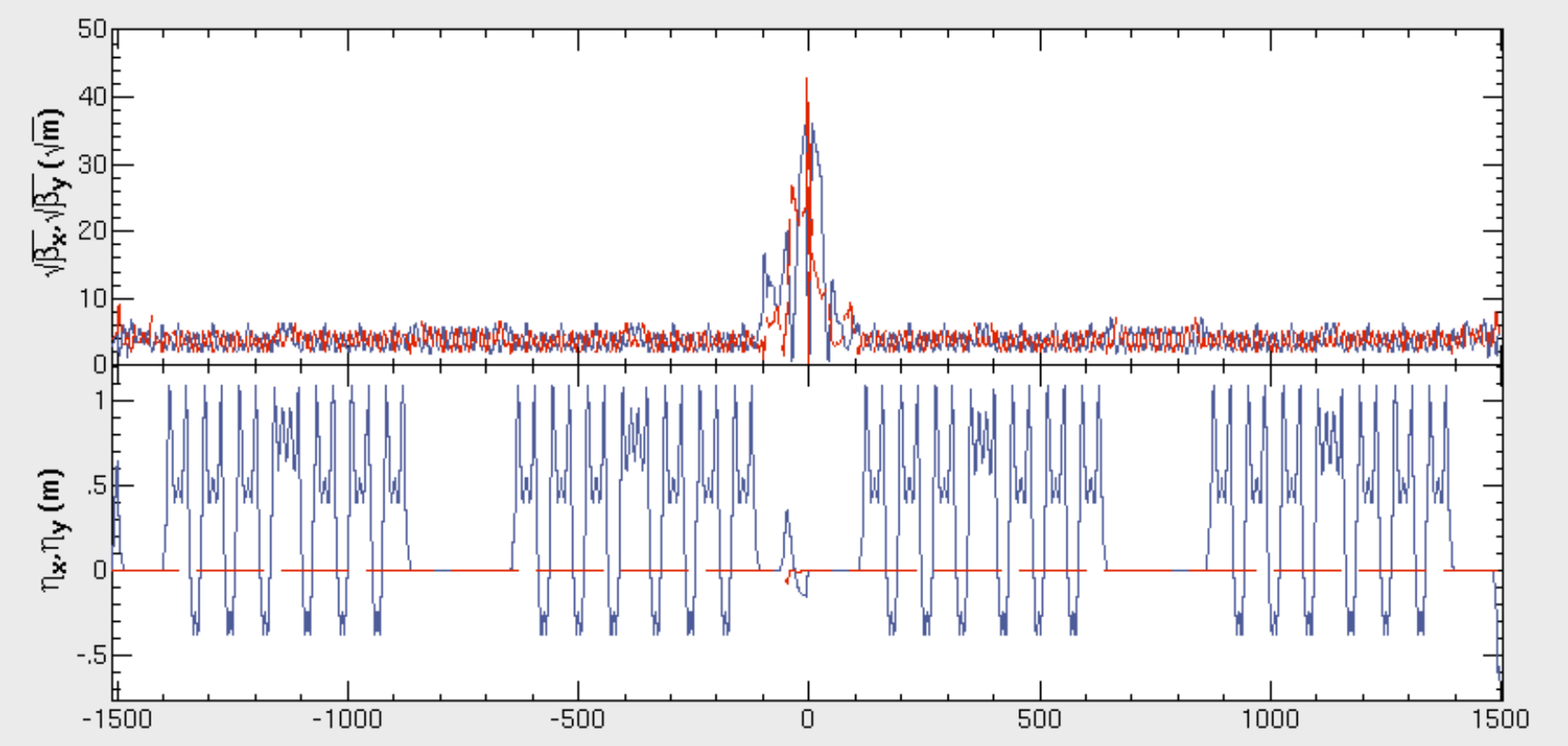


Both rings reserve sufficient tuning range of εx and α.

LER ring


$\sqrt{\beta_x}, \sqrt{\beta_y}$ ($\sqrt{m}$)
25
20
15
10
5
0
η_x, η_y (m)
1
.5
0
-.5
-1
-1500
-1000
-500
0
500
1000
1500
RF
RF
IP
wiggler
RF

HER ring

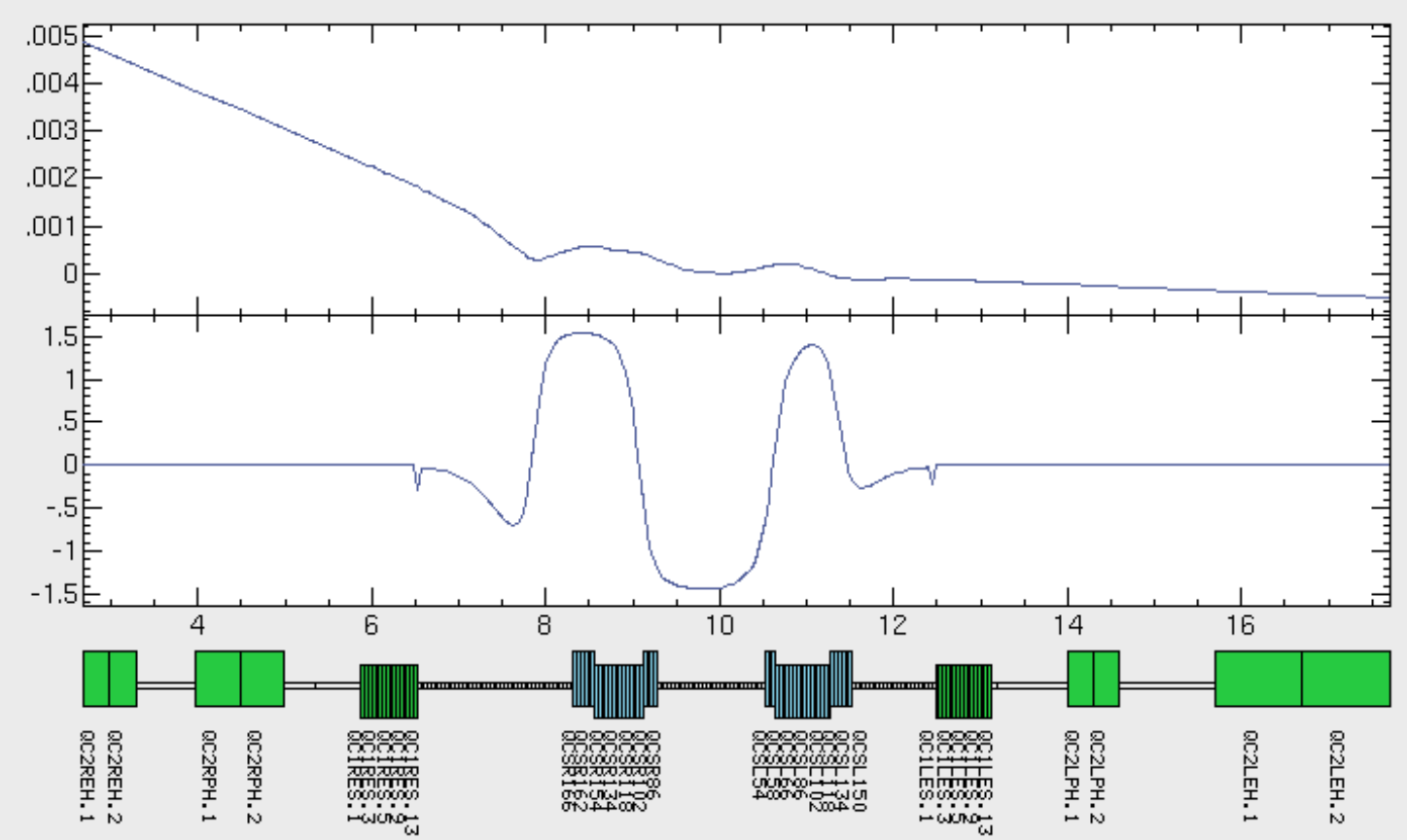


RF IP RF

IR Lattice

- X-y coupling components and H/V dispersions are all corrected to zero at IP, and are localized on each side of IP with 4~6 skew quadrupoles and H/V dipoles.
- SuperBelle solenoid field is compensated on each side of IP.
- Field distributions of solenoids, QCS, and QC1 are given by 4-cm slices with a constant fields.
- Conditions for Crab cavities have not yet satisfied.

Solenoid Field

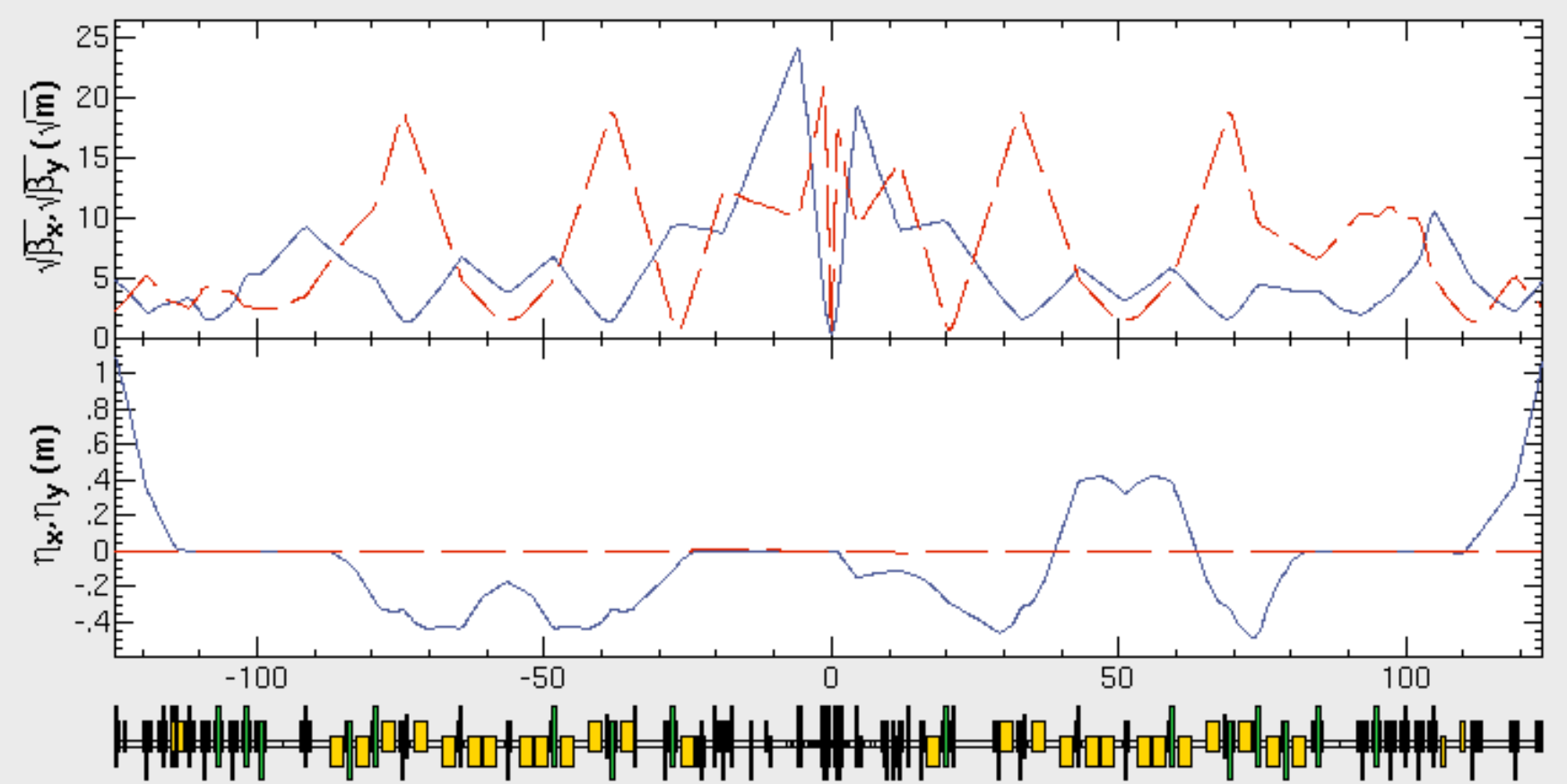


HER vertical orbit (m) **(top)**
Solenoid field (T) **(bottom)**

←beam

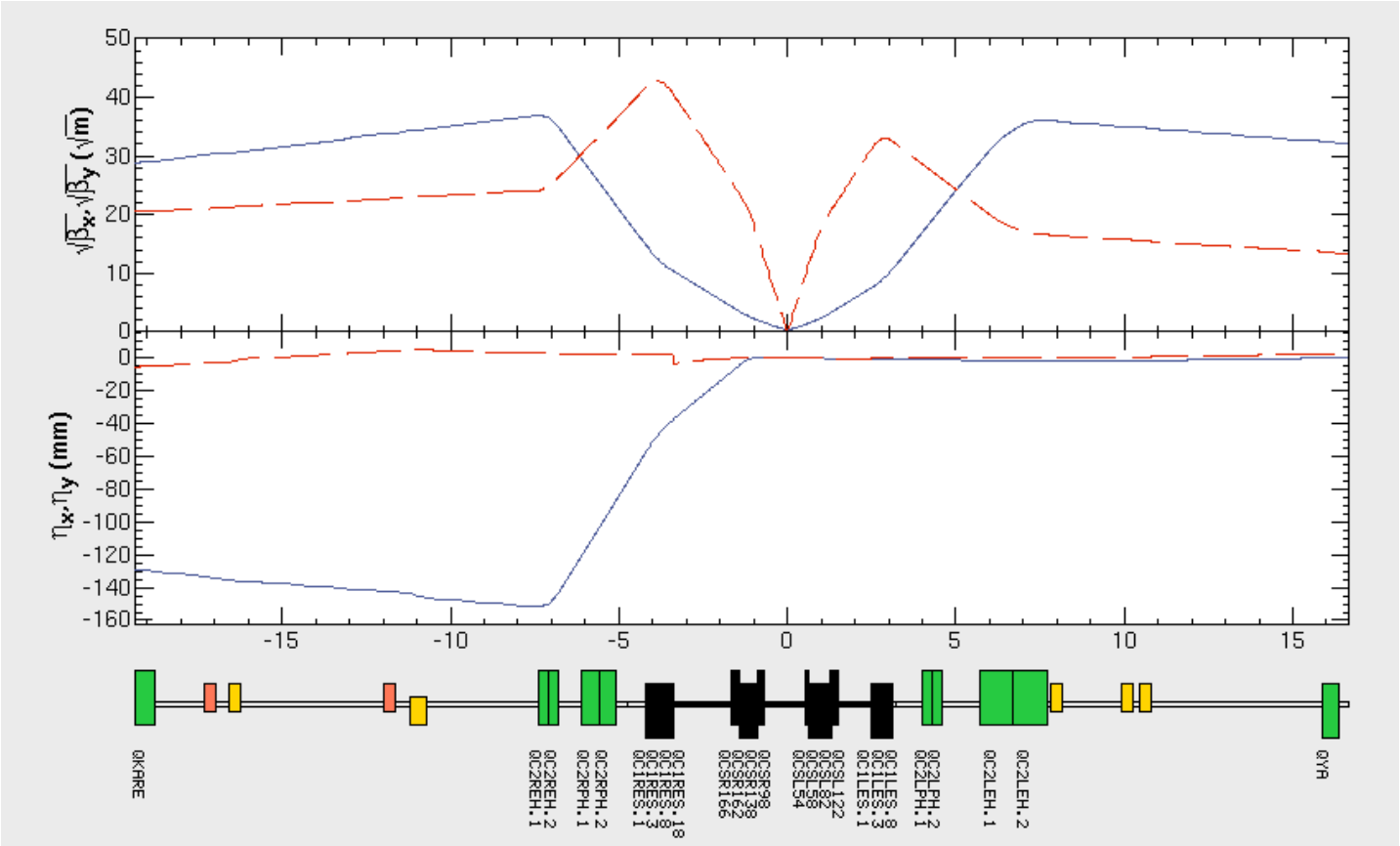
LER IR (BX/BY= 20/0.3 cm)

LER IR with local chromaticity correction.



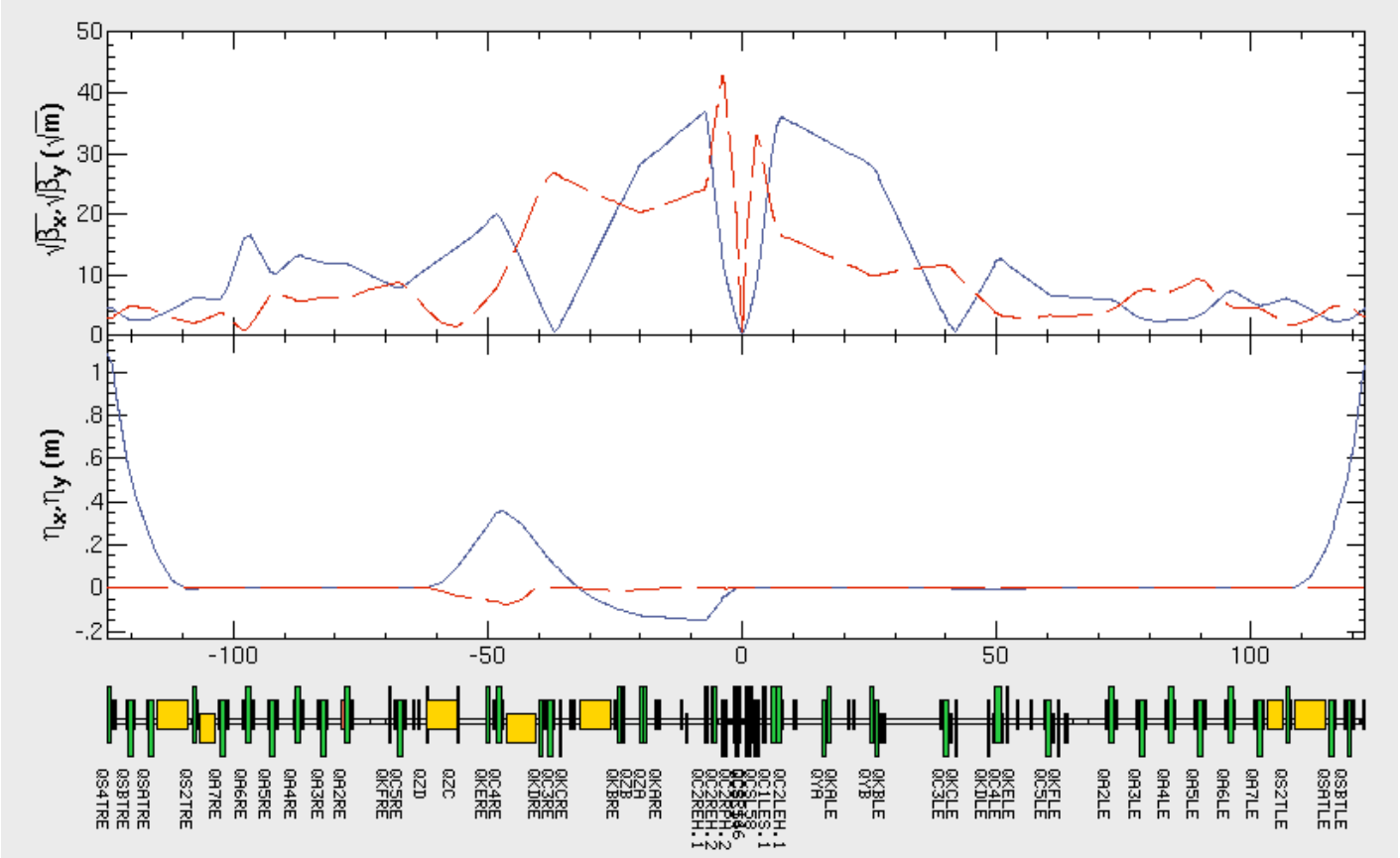
HER IP

BX/BY=20/0.3 cm



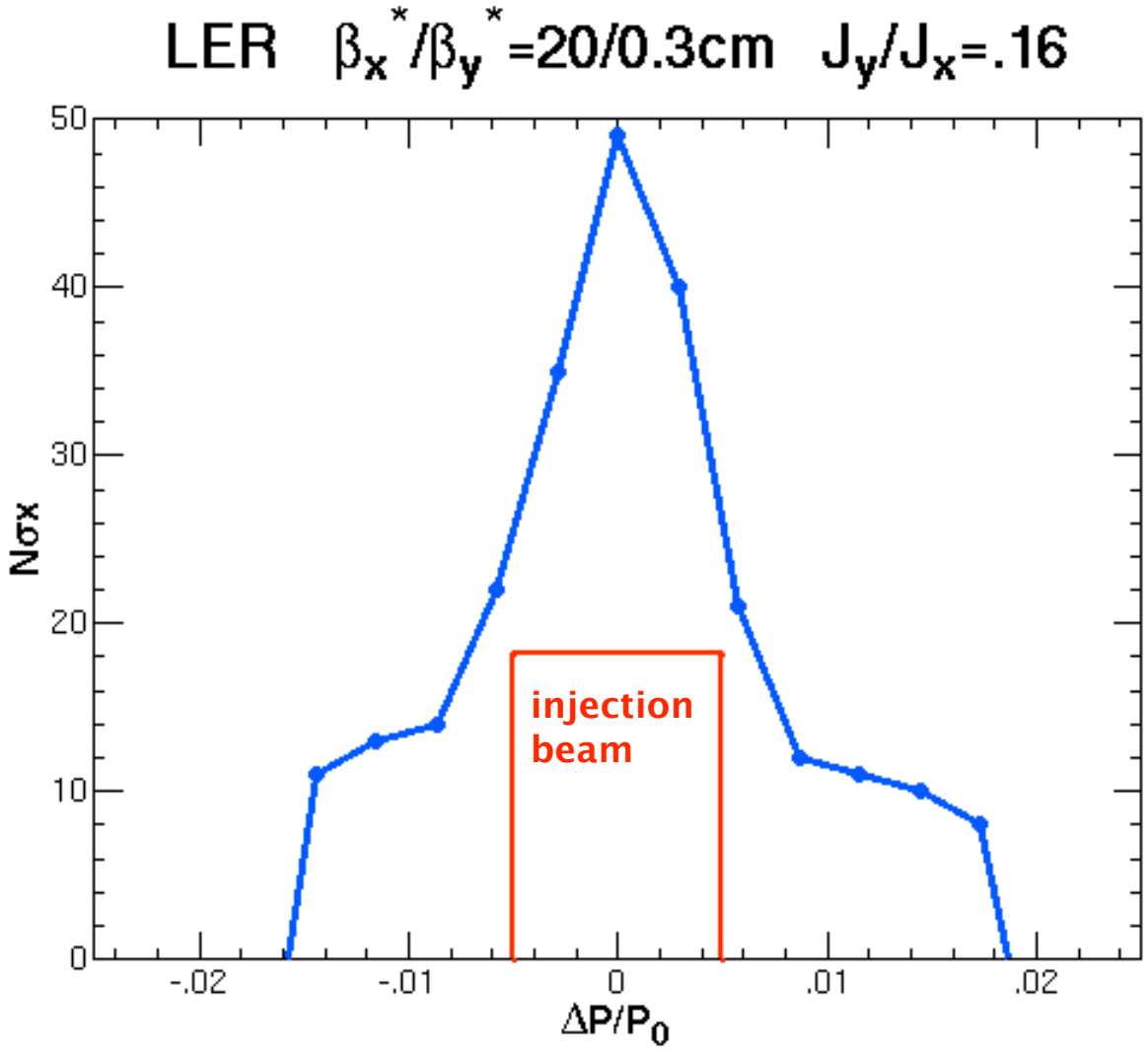
←beam

HER IR


$\sqrt{\beta_x}, \sqrt{\beta_y}$ ($\sqrt{m}$)
η_x, η_y (m)
50
40
30
20
10
0
1
.8
.6
.4
.2
0
-.2
-100
-50
0
50
100
QS4TRE
QSBTRE
QSATRE
QS2TRE
QA7RE
QA6RE
QA5RE
QA4RE
QA3RE
QA2RE
QC5RE
QKFRE
QZD
QZC
QC4RE
QKERE
QKCRE
QC3RE
QKDRE
QKBRE
QZB
QZA
QKARE
QC2REH.1
QC2REH.2
QC1LES.1
QC2LEH.1
QKALE
QYA
QKBLE
QYB
QKCLE
QC3LE
QKELE
QC4LE
QKDLE
QKFLE
QC5LE
QA2LE
QA3LE
QA4LE
QA5LE
QA6LE
QA7LE
QS2TLE
QSBTLE
QSATLE

LER dynamic aperture

bare lattice BXBY=20/.3 cm



Summary

- In the case of BX=20cm, LER dynamic aperture satisfies the modified requirements for transverse acceptances at injection:
  - H/V 6.0/0.7 → 7.5/1.2 ($\times 10^{-6}$m)
- HER aperture still needs improvement. Stronger sextupoles might be necessary. (~48)
- Dynamic apertures of both rings will be improved further optimization of sextupoles.
- Sextupole movers will be used for optics correction since orbit bumps are unusable at high current.