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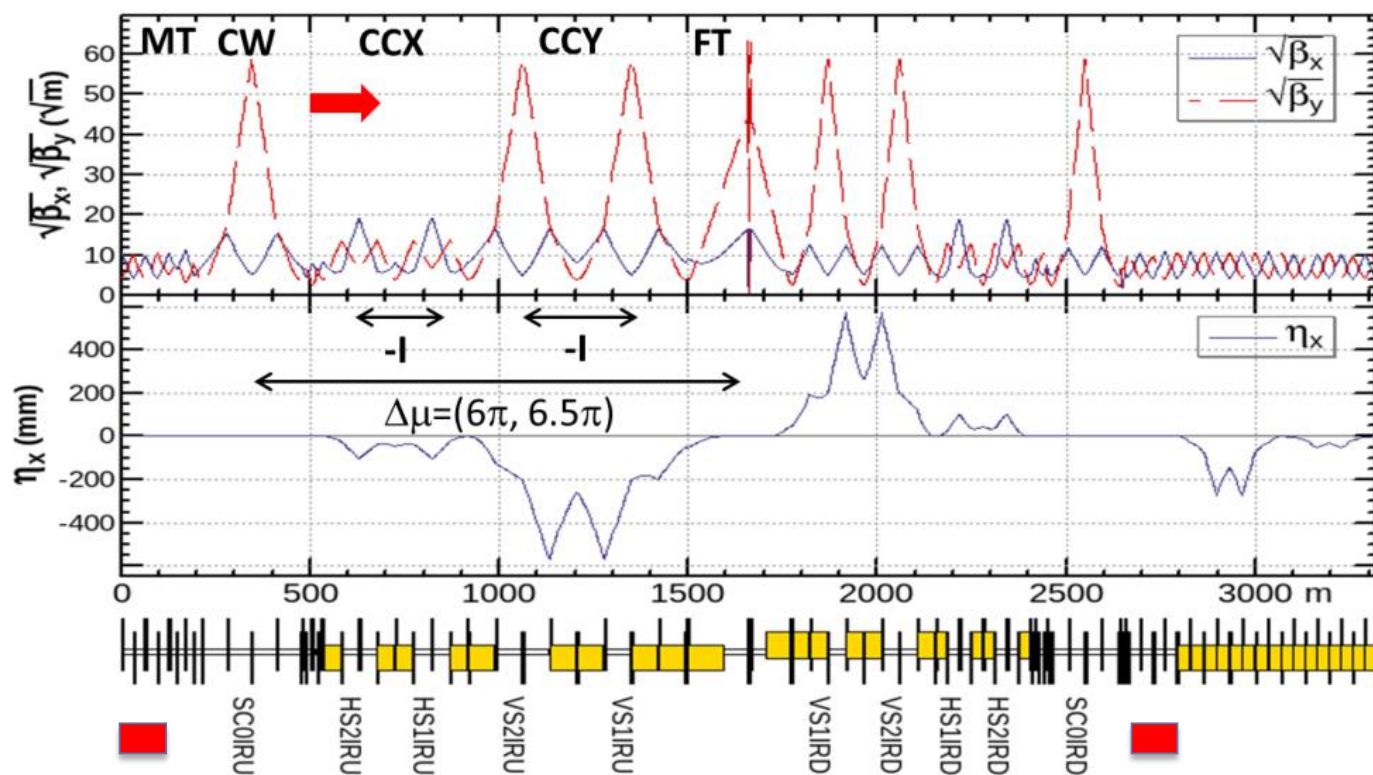
# Spin rotator in the Interaction Region

Xia Wenhao

2022. 01. 18

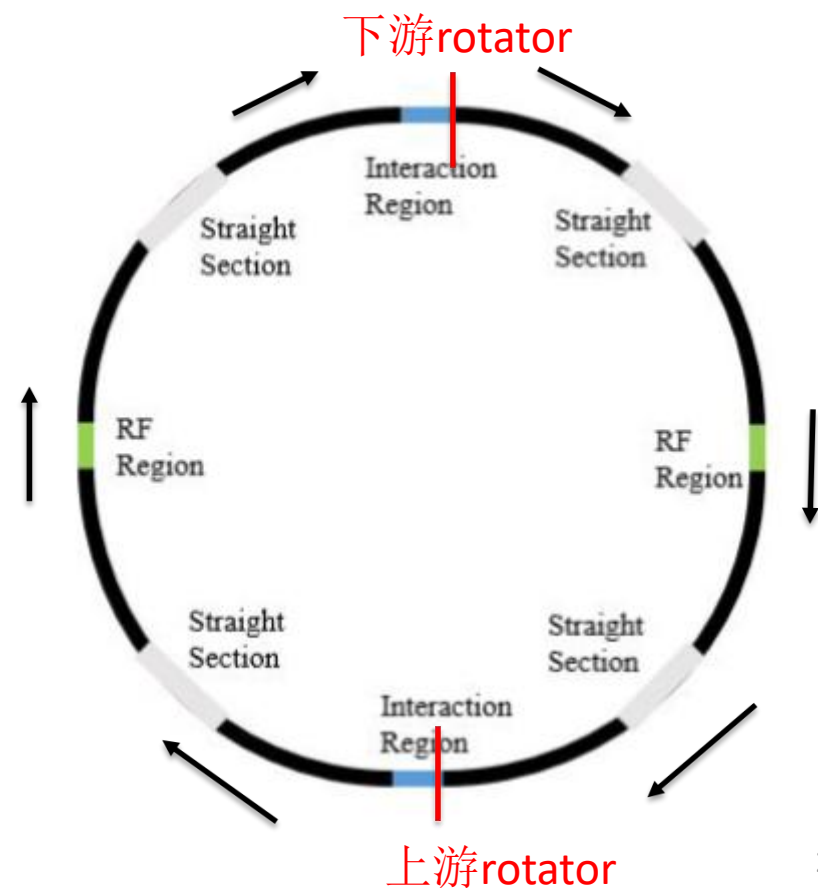
# 自旋旋转器的插入方案1:IR

- 位置选取：
  - 对撞区上下游,
  - 插入点满足 $\alpha_x / \alpha_y = 0$  ;



上游rotator

下游rotator

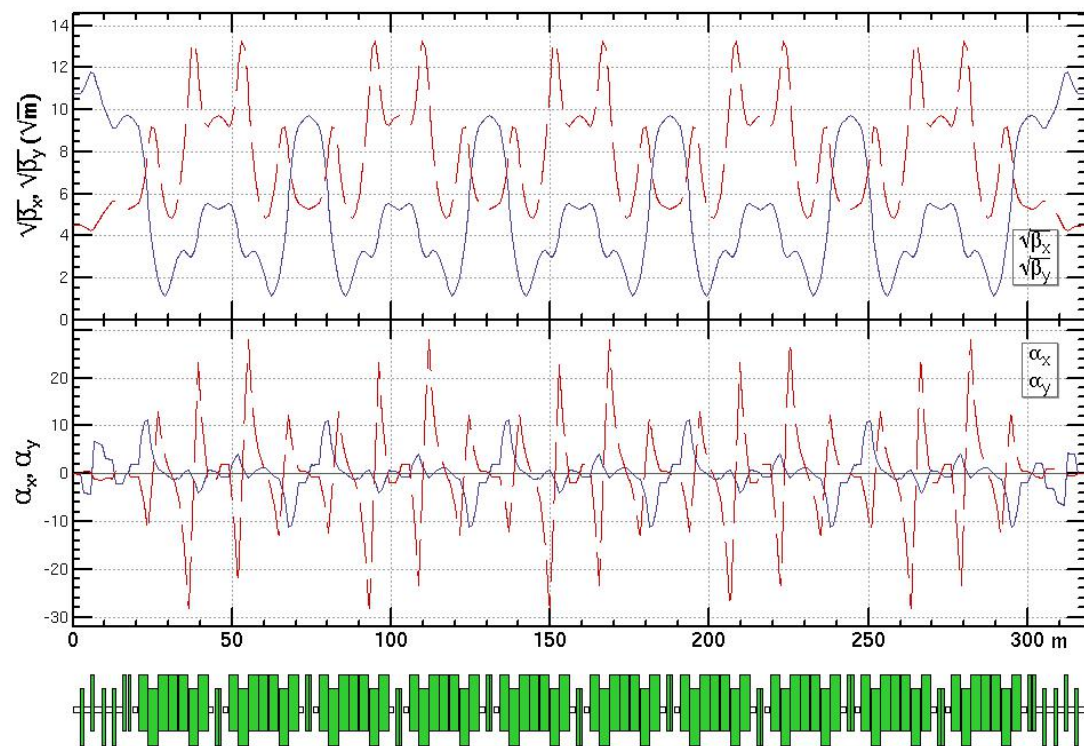


# 上下游自旋旋转器的TWISS匹配

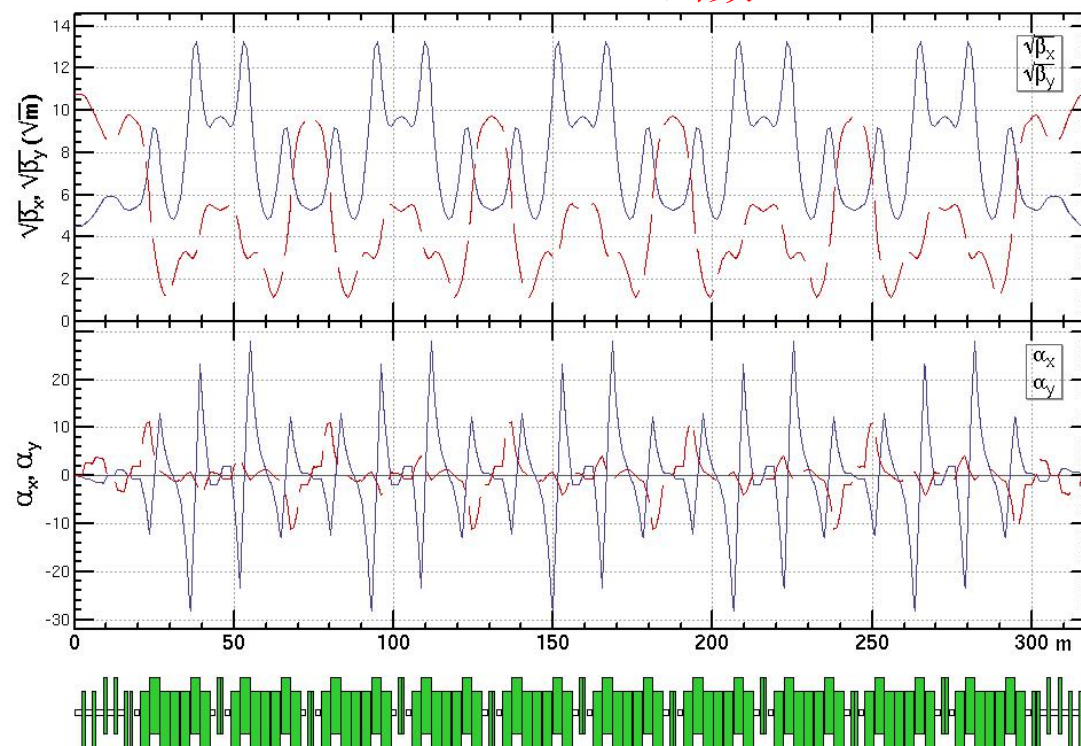
- 上游：
  - “MIRU”+ROTATOR+“MENTIRU”,  $b_x/b_y=116.25/20.22$ ,  $a_x/a_y=0$
- 下游：
  - “MENTIRD”+ROTATOR+ “MGM1”,  $b_x/b_y=20.22/116.40$ ,  $a_x/a_y=0$

我们在匹配时,注意:

- 1: ROTATOR两侧分别有5个Q铁, 用于optics匹配;
- 2: 除用于optics匹配的Q铁外, 上下游对应位置Q铁强度互为相反数。从而可以反转头尾处的beta函数。



上游ROTATOR

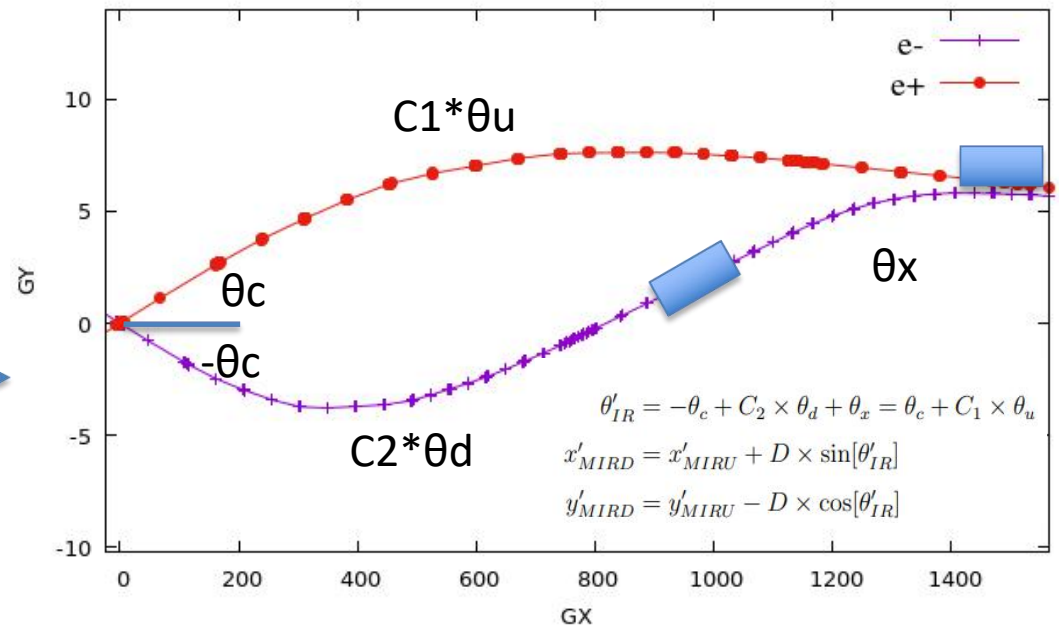
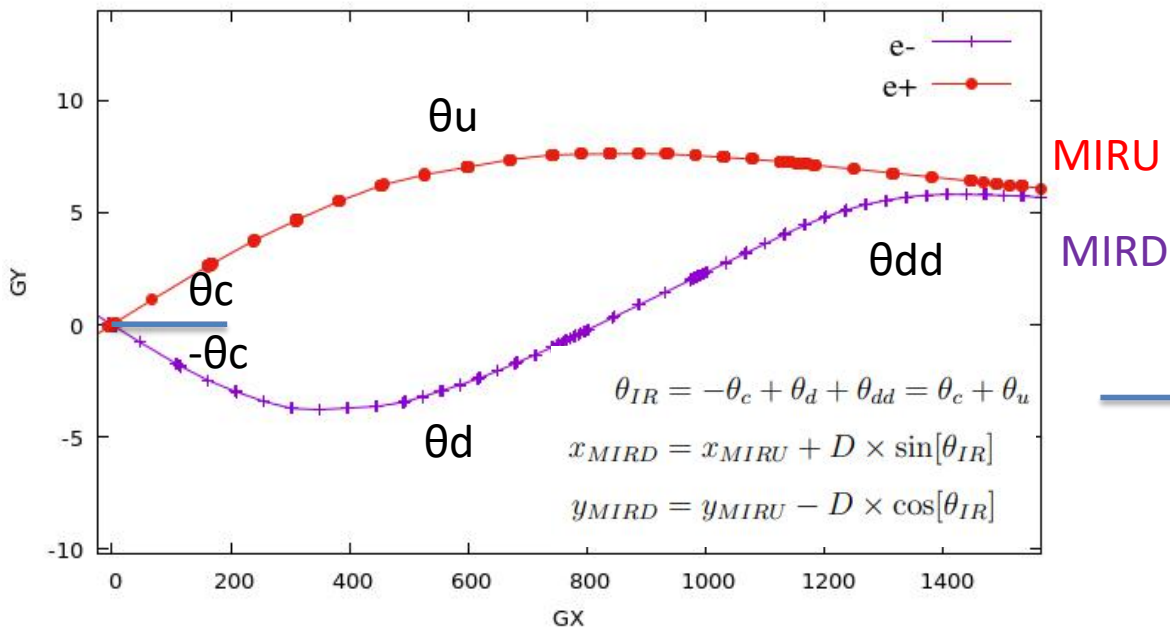
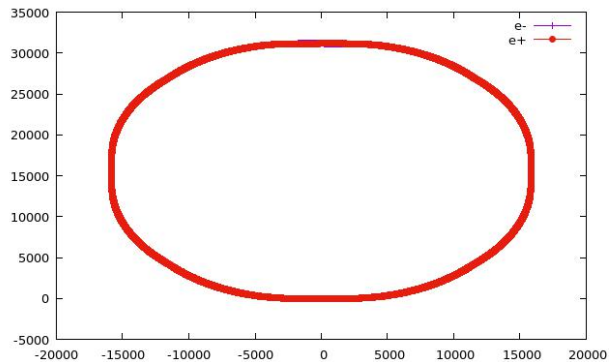


下游ROTATOR

# 正负电子环几何匹配

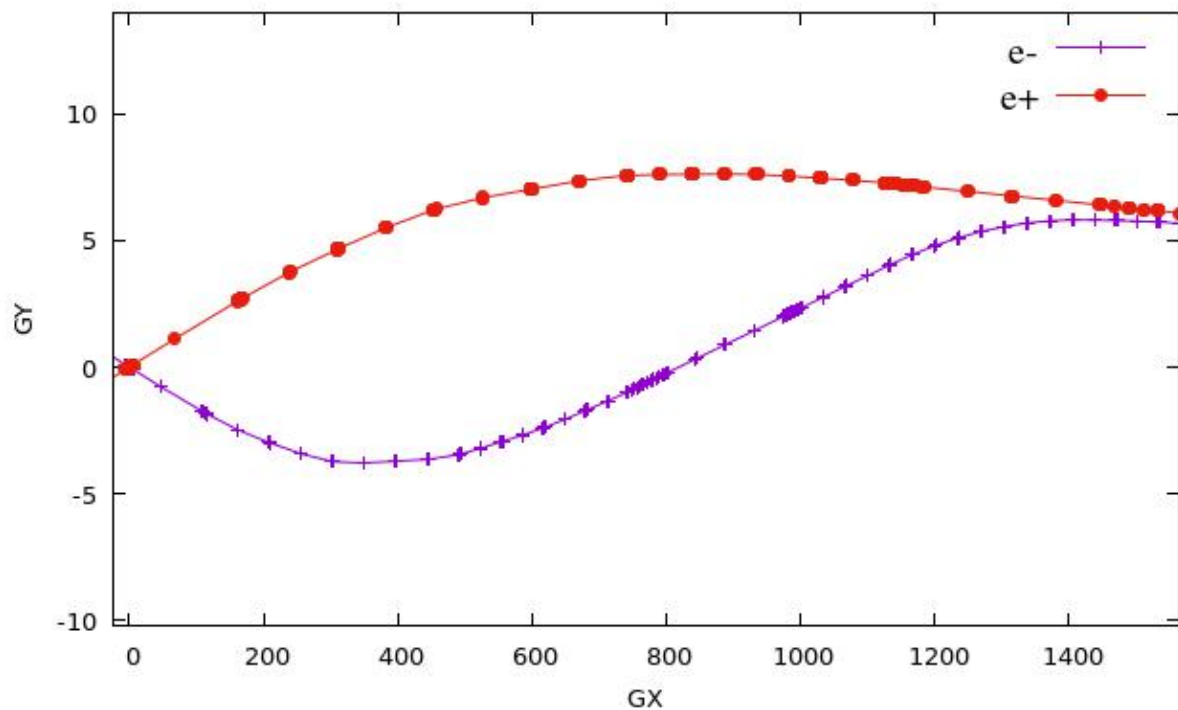
- 满足条件：
  - 几何IP:  $\theta_c=0.0165\text{rad}$ ; 末端两环平行, 且 $D=0.35\text{m}$
  - 极化:

$$\begin{aligned} a\gamma C_1 \times \theta_u &= \frac{-\pi}{2} \\ a\gamma C_2 \times \theta_d &= \frac{\pi}{2} \end{aligned}$$

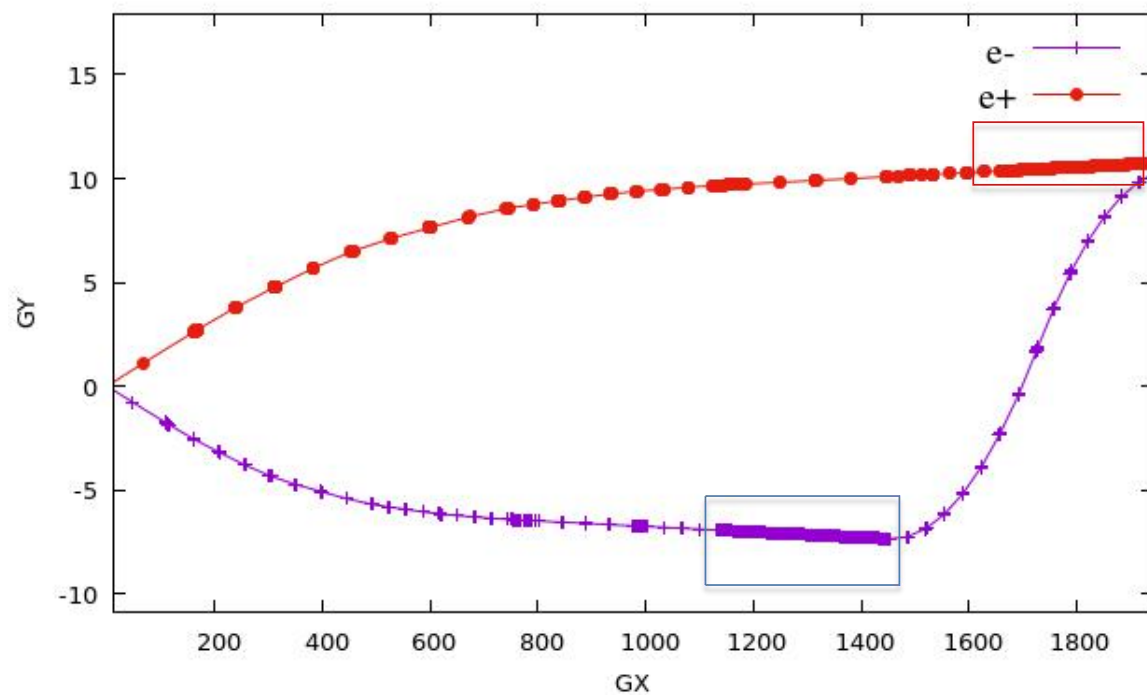


# 正负电子环几何匹配

- 对撞区几何前后对比:



w/o rotators



w/ rotators

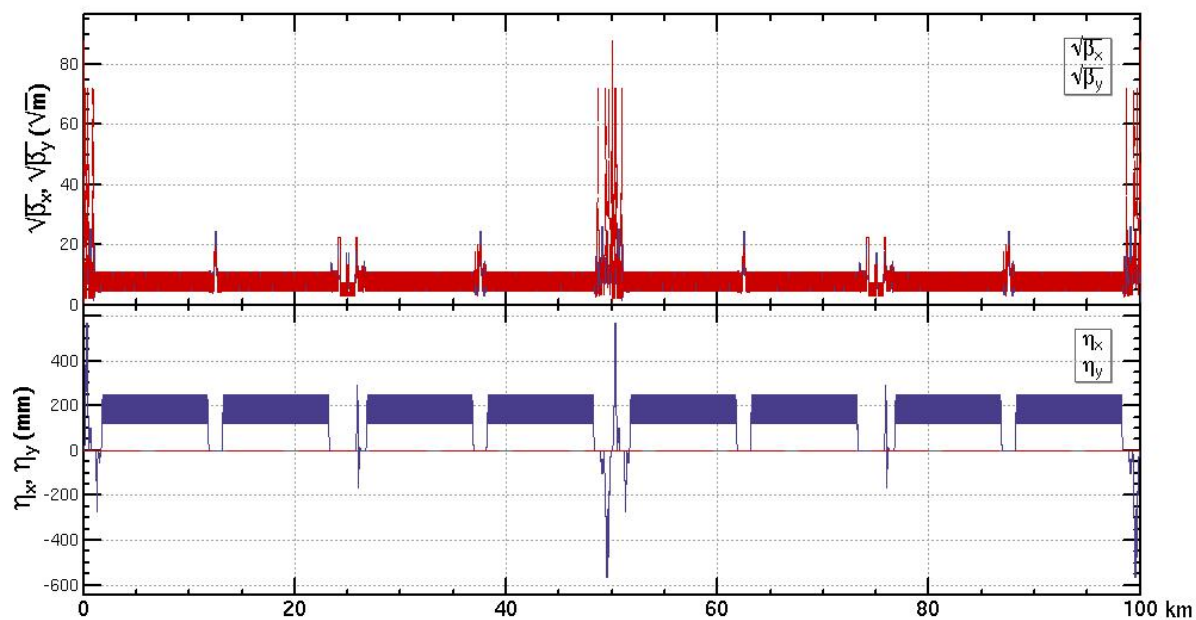


# TWISS参数

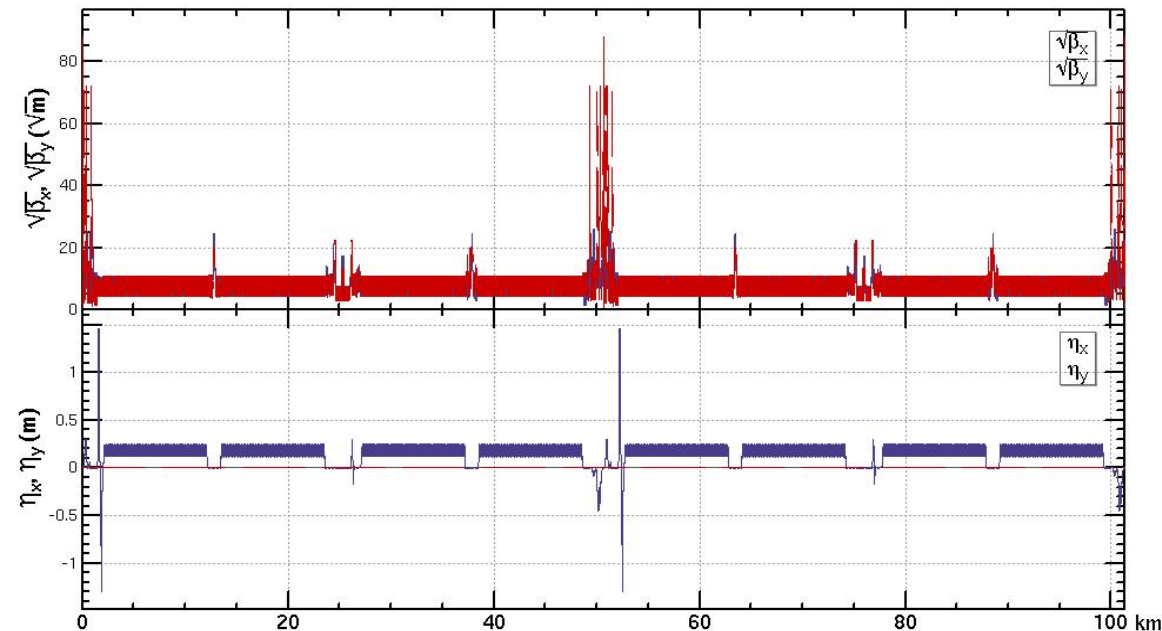
- TWISS参数:

```
AX ##### # -2.986E-8 $$$      f BX' ##### # .200000 $$$      f N $\ddot{x}$  ##### # 363.11000
AY ##### # 5.6927E-7 $$$      f BY' ##### # .001000 $$$      f N $\ddot{y}$  ##### # 365.22000
LENG ##### # 100016.35
```

```
AX ##### # 4.5205E-5 $$$      f BX' ##### # .200005 $$$      f N $\ddot{x}$  ##### # 377.35985
AY ##### # -4.450E-4 $$$      f BY' ##### # .001000 $$$      f N $\ddot{y}$  ##### # 379.54883
LENG ##### # 101290.15
```



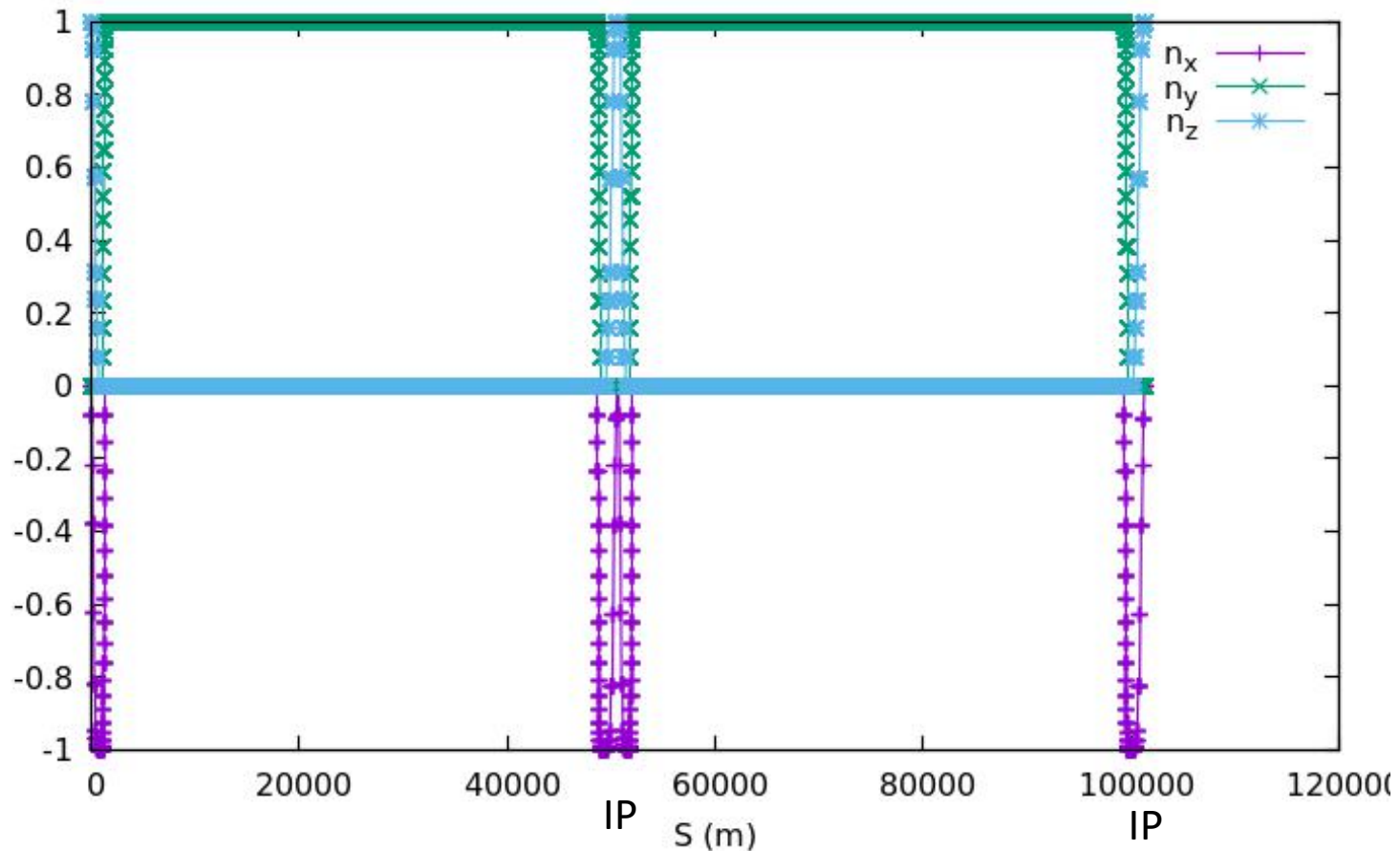
w/o rotators



w/ rotators

# 极化方向n0

- 极化方向沿全环的分布：
  - IP:  $n_z=1$ , 满足极化设计要求;



# 自旋旋转器的插入方案1:IR

- 自旋旋转器的插入方案1:
  - 对撞区，匹配TWISS和几何结构；
  - 主环周长增加4个ROTATOR长度，约1300米。
  - 非对撞区B铁乘以相应系数，维持全环轨道偏转 $2\pi$ 。  
RF区B铁维持不变，用于Bypass.
  - IP处， $n_z=1$
  - 全环的工作点发生了变化，可能会影响DA, 工作点有待于进一步优化，
  - 下一步：色品优化，工作点优化，提高DA
- 具体lattice见192.168.36.154
  - `home/xiawh/CEPC_Z_lattice/SPINROTATOR/rotator_fitting_ywwang/IR/success/CEPC_Z_ROTATOR_IR_GEO.sad`



# 工作点匹配

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- 超周期为2，以半环为例：