Final Focus Optics with Permanent Q

Permanent Mgnet

Unit of magnet

| PMQ 1 | PMQ2 | PMQ3 | PMQ2 | PMQ 1 |

d/2   d   d   d   d   d/2
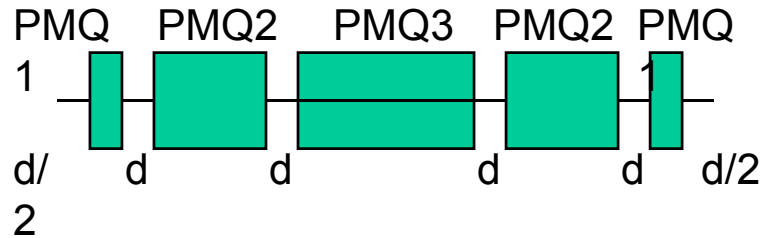
Dimensions
L[PMQ1]=a, L[PMQ2]=b, L[PMQ3]=c
a:b:c:=1.81046: 5: 6.37909 (Iwashita)
2a+2b+c=20cm
1cm Drift space between Q (d=1cm)

Qs are rotated by θ(PMQ1,3) and - θ(PMQ2) to adjust K1.

Permanent QD0

As QD0, 12 units of magnet are used.
Total length is 301cm including half drift spaces at both sides.

Installation of Permanent QD0

Starting with 'ilc2006b.ilcbds1'(14mrad version)
Since the original QD0 is of 2.2m length, adjustment of drift space is required
to keep the total length unchanged.

D1B(QF1-SD0) L : 1.35 → 0.945m
D0 (L*) L : 3.51 → 3.105m

Procedure of Fine Tuning for Optics with Permanent Q

Starting with 'ilc2006b.ilcbds1'(14mrad version), permanent QD0 is installed.

1. Linear Optics Matching

Since the permanent QD0 changed not only α^* and β^* but also η^*, we need to adjust some Q in dispersion region(FF section). QF1 is chosen as that knob because there is no change of transfer matrices between SXs upstream.

Variables for the matching:
K1 of QM(matching Q) and QF1
θ of PMQ(Fixed field gradient of 140T/m is assumed)
Matching requirement:
$\alpha x = \alpha y = 0$, $\beta x = 0.021m$, $\beta y = 400um$, $\eta x = 0$ at IP
Final θ of PMQ is 6.58 degree.

2. Off-Momentum Matching

Since the FF optics downstream of QF1 has been changed, we need to re-optimize K2 of SXs.

3. Fine Tuning of K2 of SXs looking at the beam size at IP.

Final beam size obtained: $\sigma x/\sigma y = 656 / 5.44nm$
for $\gamma\varepsilon x/\gamma\varepsilon y = 9.2e-6/3.4e-8m$ and $\sigma\delta = 6e-4$.
(636 / 5.25nm for original design)

QNAME	K1[1/m]	
	before	after
QM16	-0.00876	-0.00829
QM15	-0.00200	0.00128
QM14	0.00898	0.0156
QM13A	-0.0110	0.0117
QM13B	0.0423	0.0429
QM12	-0.0190	-0.0321
QM11	0.0179	0.0201
QF1	0.0963	0.0994

SXNAME	K2[1/m^2]	
	before	after
SF6	0.843	0.888
SF5	-0.217	-0.188
SD4	1.65	1.68
SF1	-1.09	-1.26
SD0	2.32	2.51

Strength of SF1&SD0 must be checked.

	DP				
	-6e-4	-3e-4	0	3e-4	6e-4
αx	-0.0372	-0.0184	-3.22e-7	0.0180	0.0357
βx	0.0210	.0210	0.0210	0.0210	00210
αy	0.252	0.124	7.82e-6	-0.120	-0.236
βy	4.19e-4	4.03e-4	4.00e-4	4.09e-4	4.30e-4
ηx	7.48e-6	3.62e-6	6.16e-11	-3.37e-6	-6.50e-6

Optics with Permanent Q

Original optics
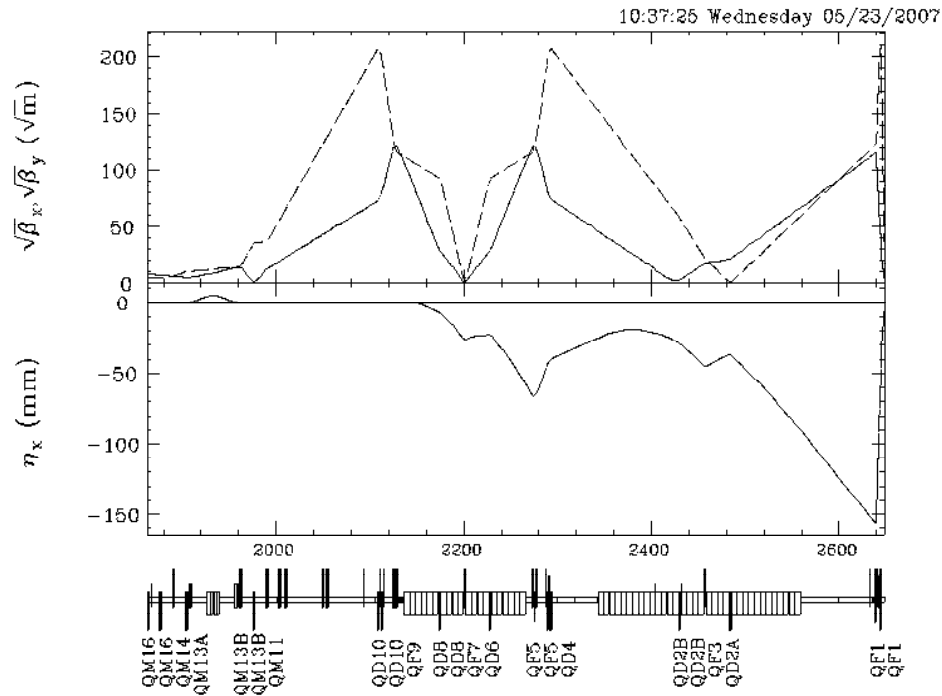
Optics with permanent QD0
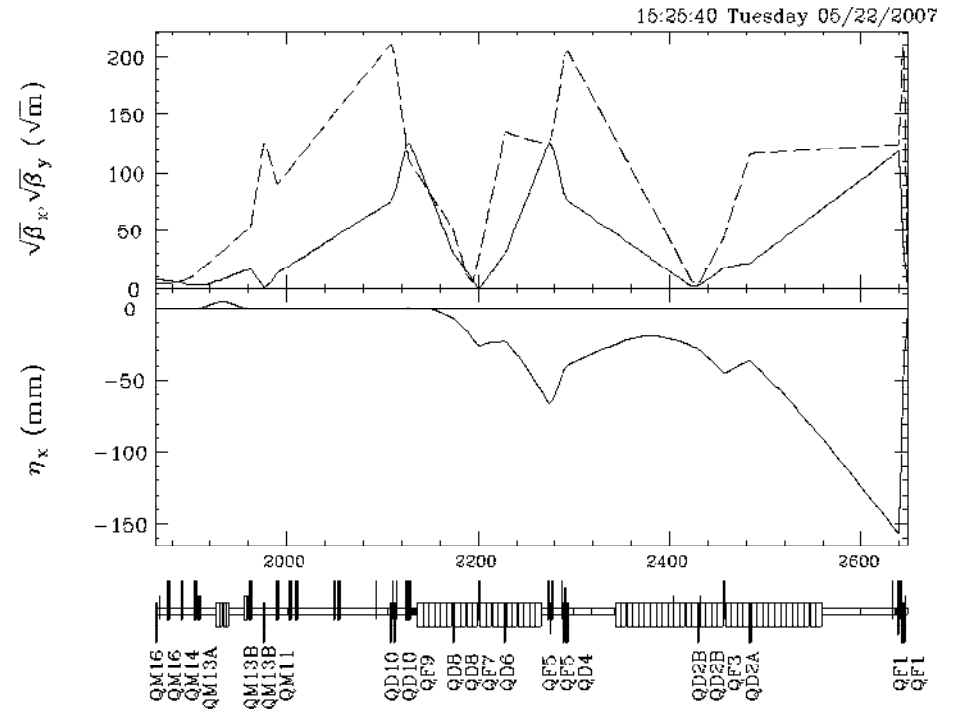
Optics with permanent QD0 is somewhat ugly.
Need to restore symmetry around the B section of s ≈ 2200m?
Optimization is not perfect(e.g. Octupole magnets were not touched...).

Need someone to complete the design.
  deck file is available at SAD computer:
        '/users/kuroda/sad/jlc/ilc2006b.ebds1ForPMQ'