

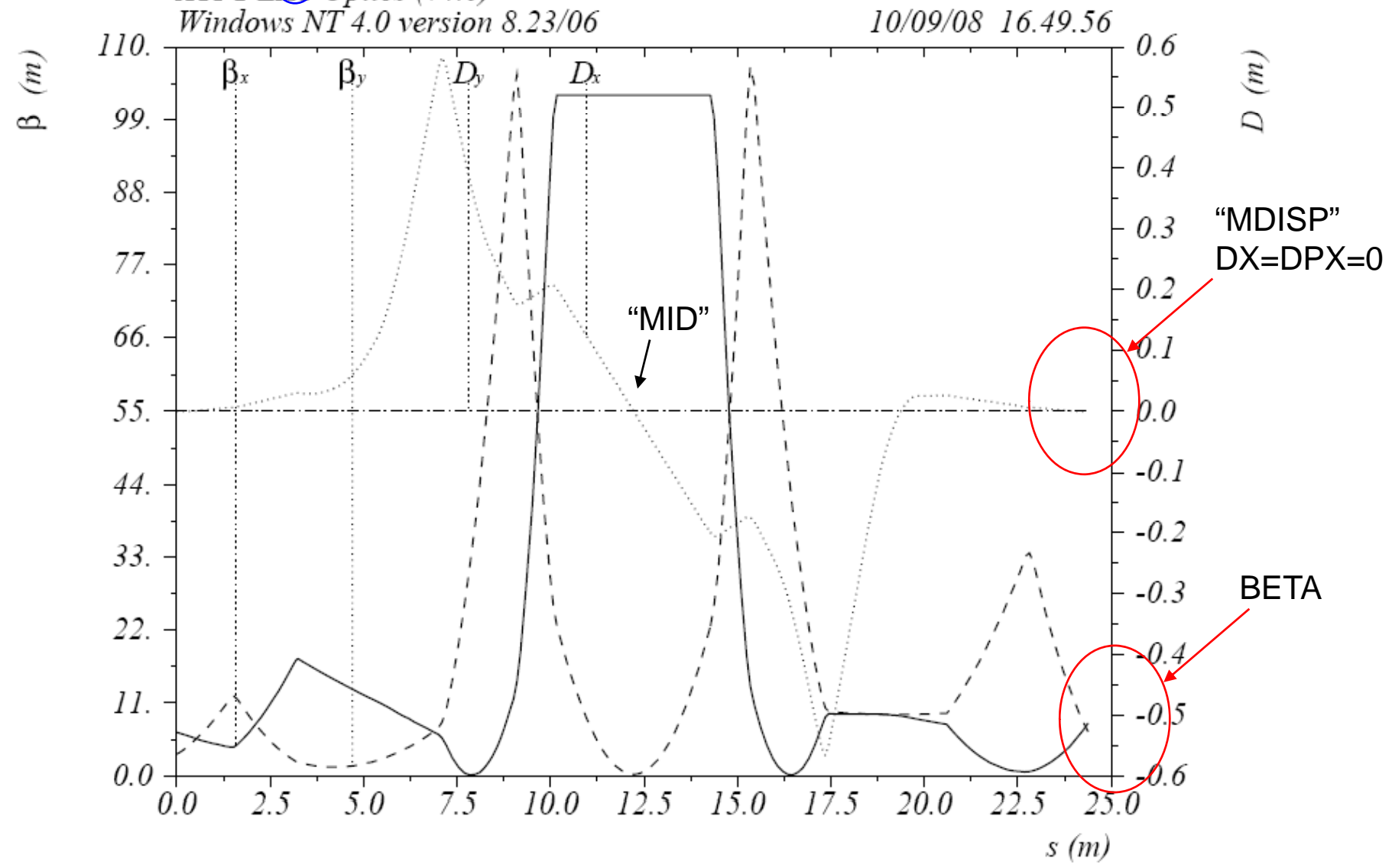
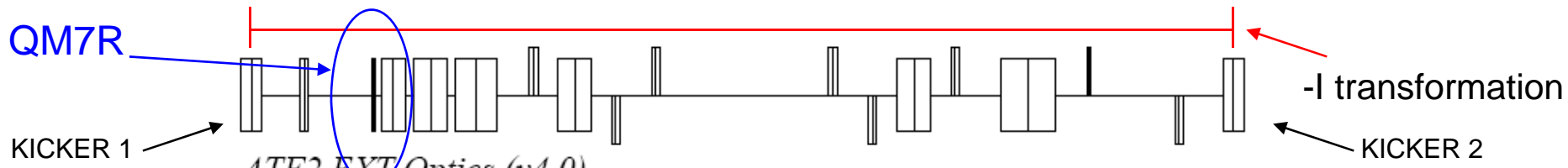


Options for Matching the Extraction line

Mauro Pivi, Mark Woodley, Andrei Seryi SLAC; “Beta Matching” group
at KEK: Kiyoshi Kubo

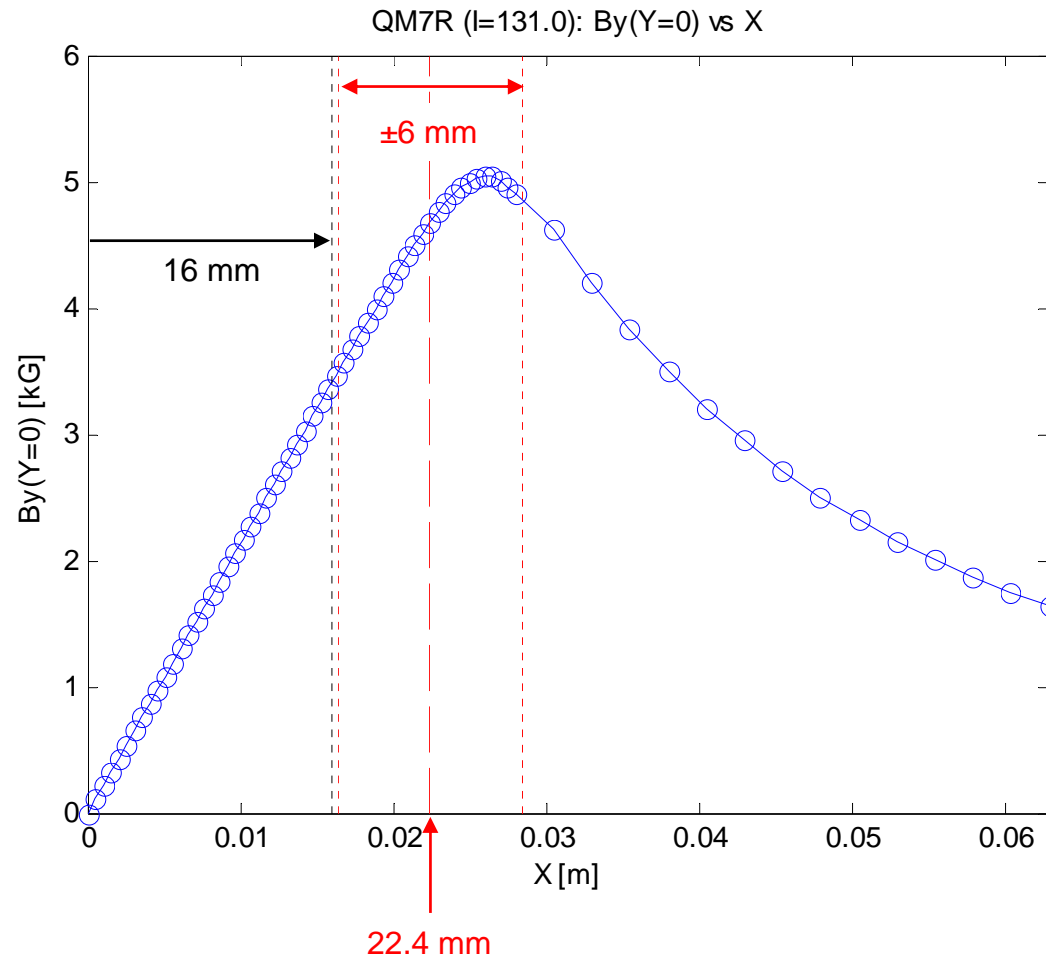
October 7, 2008





ATF2 EXTRACTION LINE

Cherrill Spencer's POISSON simulation of QM7R (POISSONPredQ7SmallerDXR1.xls)
[midplane data (Y=0) only]



In QM7R, the beam is supposed to pass off-axis by 22.4 mm

QM7R

- Cherrill's Poisson model agrees with ATF magnetic measurements to ~4%
- Bend angle of QM7R, assuming nominal extraction position $X=22.4$ mm, agrees with SAD/MAD deck value to ~1%
- KL of QM7R, assuming nominal extraction position $X=22.4$ mm, is 24% weaker than SAD/MAD deck value

Beta Matching - Extraction line

Assuming QM7R field to vary between the nominal 100% down to 0%.

Matching Procedure:

- Main compensation is obtained by letting the TWISS vary ($\pm 30\%$) at entrance of extraction line:
 - Perfect matching obtained for 50% ● QM7R ● 100%.
- Inserting an existing spare QUAD ($KL_{max}=0.3$) in phase with QM7R:
 - allows good matching further down to QM7R – 30%
 - QUAD located in phase (2π) with QM7R, 5cm downstream of BH2XB

QM7R compensation

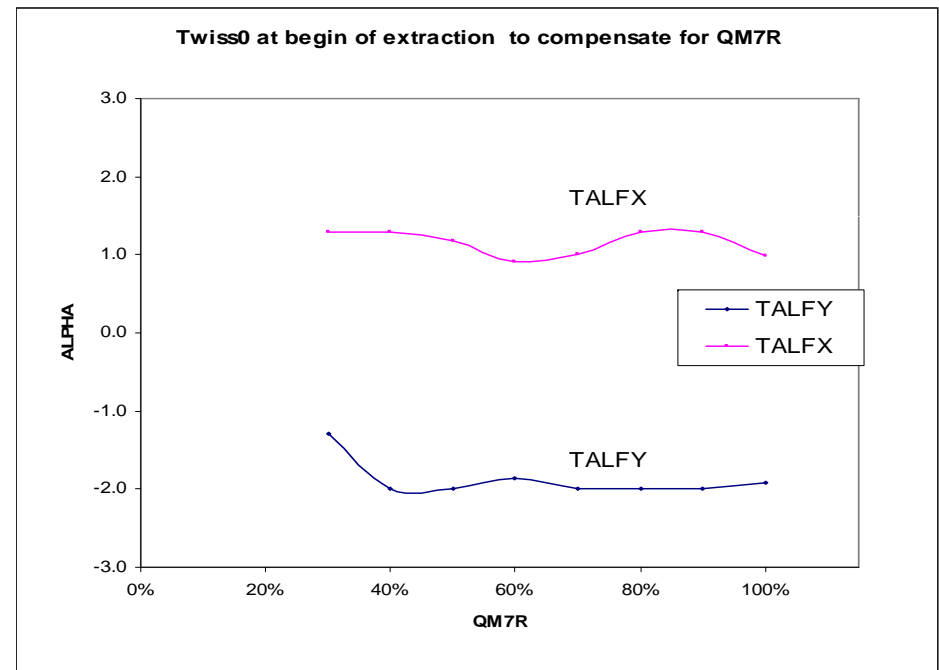
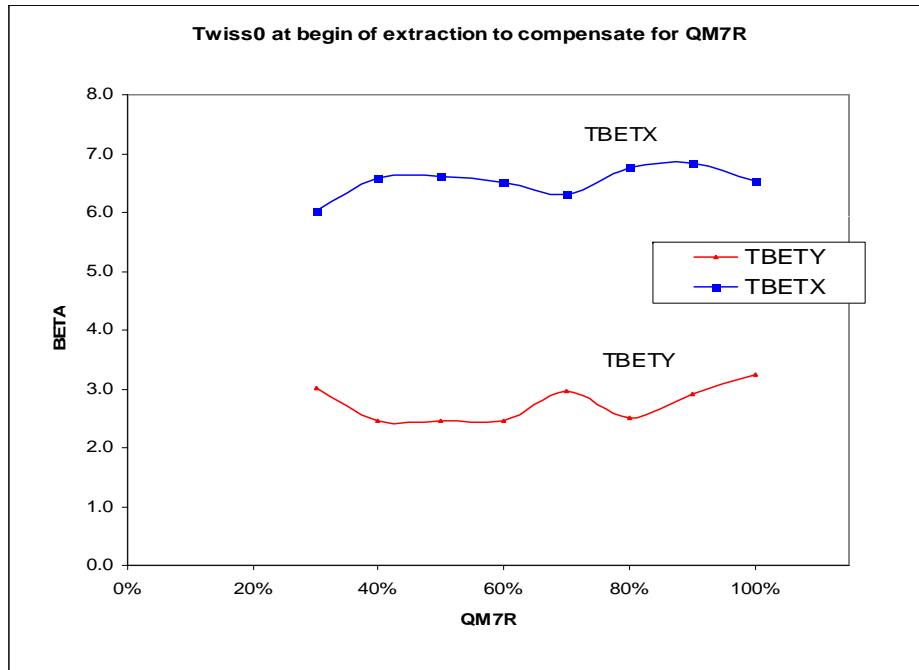
Results of matching with a weaker QM7R, by varying Twiss parameters (TWISS0) at begin of extraction line and by inserting an extra spare QUAD ~ in phase with QM7R.

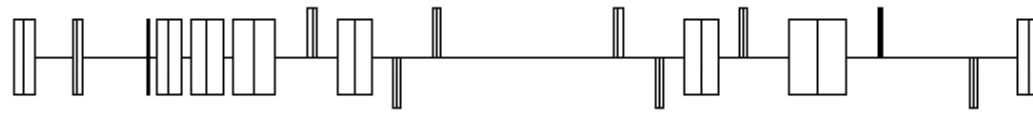
Note: to match with $50\% < \text{QM7R} < 100\%$ we used variation of Twiss0 ONLY. No need to insert QD6X2.

QM7R	TWISS0 AT ENTRANCE				QUAD VALUES		RMATRIX: KICKER1/KICKER2				DISP @ MDISP		TWISS @ END				penalty
	TALFY	TALFX	TBETY	TBETX	KLQD6X2	LOCATION	R11	R12	R21	R22	dx	dpx	BETX	ALFX	BETY	ALFY	
100%	-1.918	0.996	3.238	6.543	0.000	0.05	-1.000	0.000	-0.730	-1.000	-9.38E-13	-9.05E-14	0.86286	0.00000	4.86958	0.00000	2.43E-11
90%	-2.000	1.285	2.901	6.826	0.000	0.05	-1.000	0.000	-0.730	-1.000	-9.38E-13	-9.05E-14	0.86286	0.00000	4.86958	0.00000	2.43E-11
80%	-2.000	1.285	2.504	6.758	0.000	0.05	-1.000	0.000	-0.730	-1.000	-9.38E-13	-9.05E-14	0.86286	0.00000	4.86958	0.00000	2.43E-11
70%	-2.000	0.999	2.954	6.312	0.000	0.05	-1.000	0.000	-0.730	-1.000	-9.38E-13	-9.05E-14	0.86286	0.00000	4.86958	0.00000	2.43E-11
60%	-1.854	0.911	2.450	6.500	0.000	0.05	-1.000	0.000	-0.730	-1.000	-9.38E-13	-9.05E-14	0.86286	0.00000	4.86958	0.00000	2.43E-11
50%	-2.000	1.180	2.455	6.620	0.000	0.05	-1.000	0.000	-0.730	-1.000	-9.38E-13	-9.05E-14	0.86286	0.00000	4.86958	0.00000	2.43E-11
40%	-2.000	1.300	2.450	6.575	0.284	0.05	-1.005	-0.002	-0.790	-0.996	-2.48E-04	7.61E-06	0.86473	-0.00005	4.86959	0.00000	4.96E-05
30%	-1.300	1.300	3.009	6.028	0.300	0.05	-1.050	-0.015	-0.834	-0.965	-3.92E-03	1.10E-04	0.88073	-0.00056	4.86967	0.00001	5.97E-03
20%	-2.000	1.300	2.450	6.070	0.300	0.05	-1.093	-0.294	-0.839	-1.141	-1.84E-02	6.89E-04	0.86286	0.00000	4.86958	0.00000	1.88E-01
10%	-2.000	1.300	2.450	5.700	0.297	0.05	-1.196	-0.689	-0.914	-1.362	-2.31E-02	9.79E-04	0.86286	0.00000	4.86958	0.00000	8.98E-01
0%	-2.000	1.300	2.450	5.360	0.300	0.05	-1.303	-1.019	-0.975	-1.530	-2.70E-02	1.18E-03	0.86286	0.00000	4.86958	0.00000	1.95E+00

QUAD ~ in phase with QM7R and its location

Results of matching with a weaker QM7R, by varying Twiss parameters (TWISS0) at begin of extraction line.

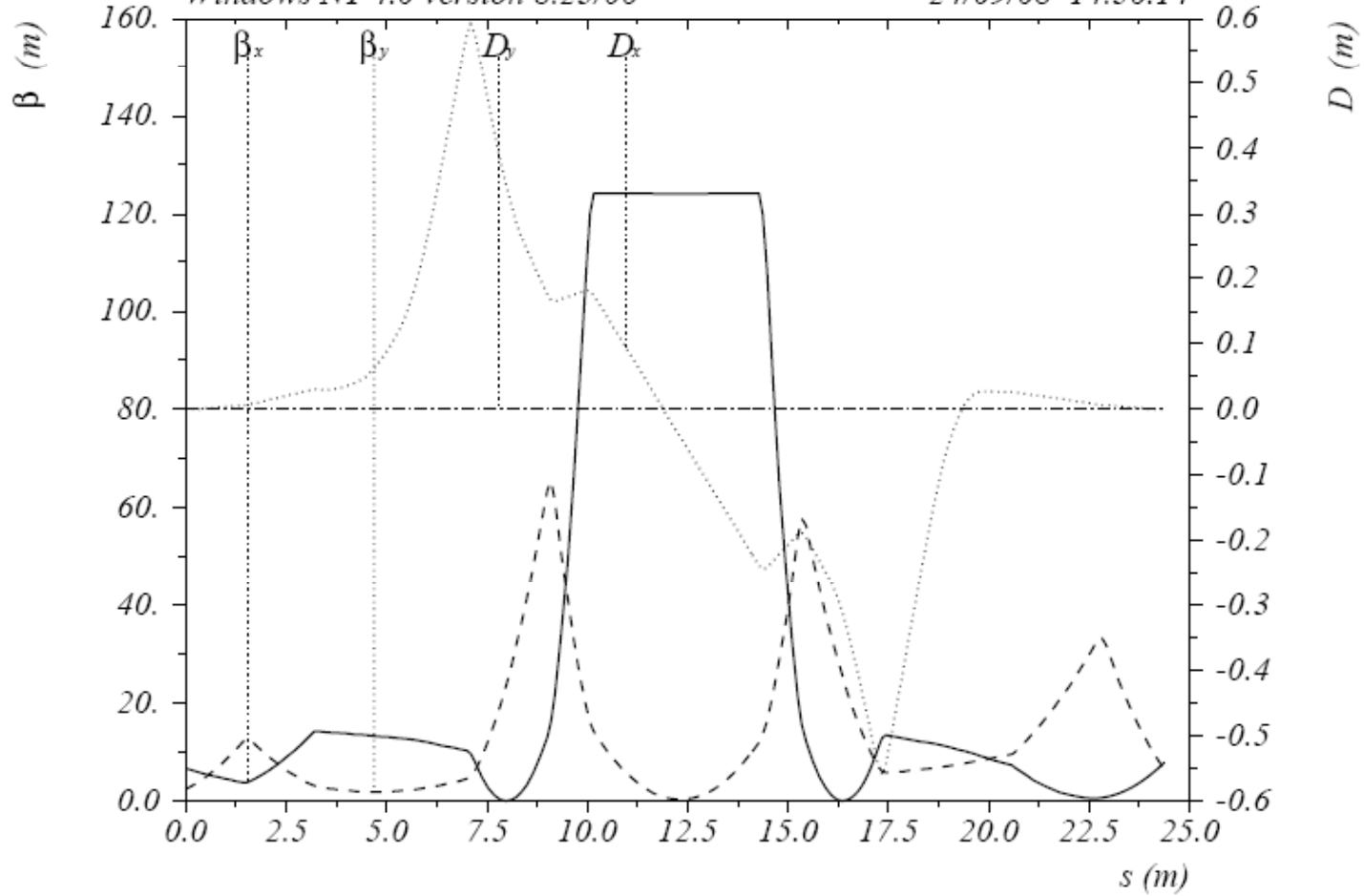




ATF2 EXT Optics (v4.0)

Windows NT 4.0 version 8.23/06

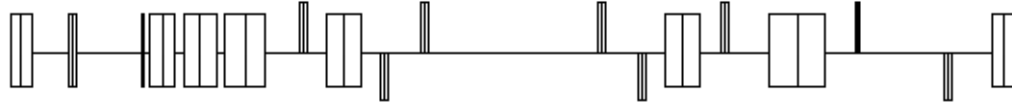
24/09/08 14.36.14



$$\delta_E / p_0 c = 0.$$

Table name = TWISS

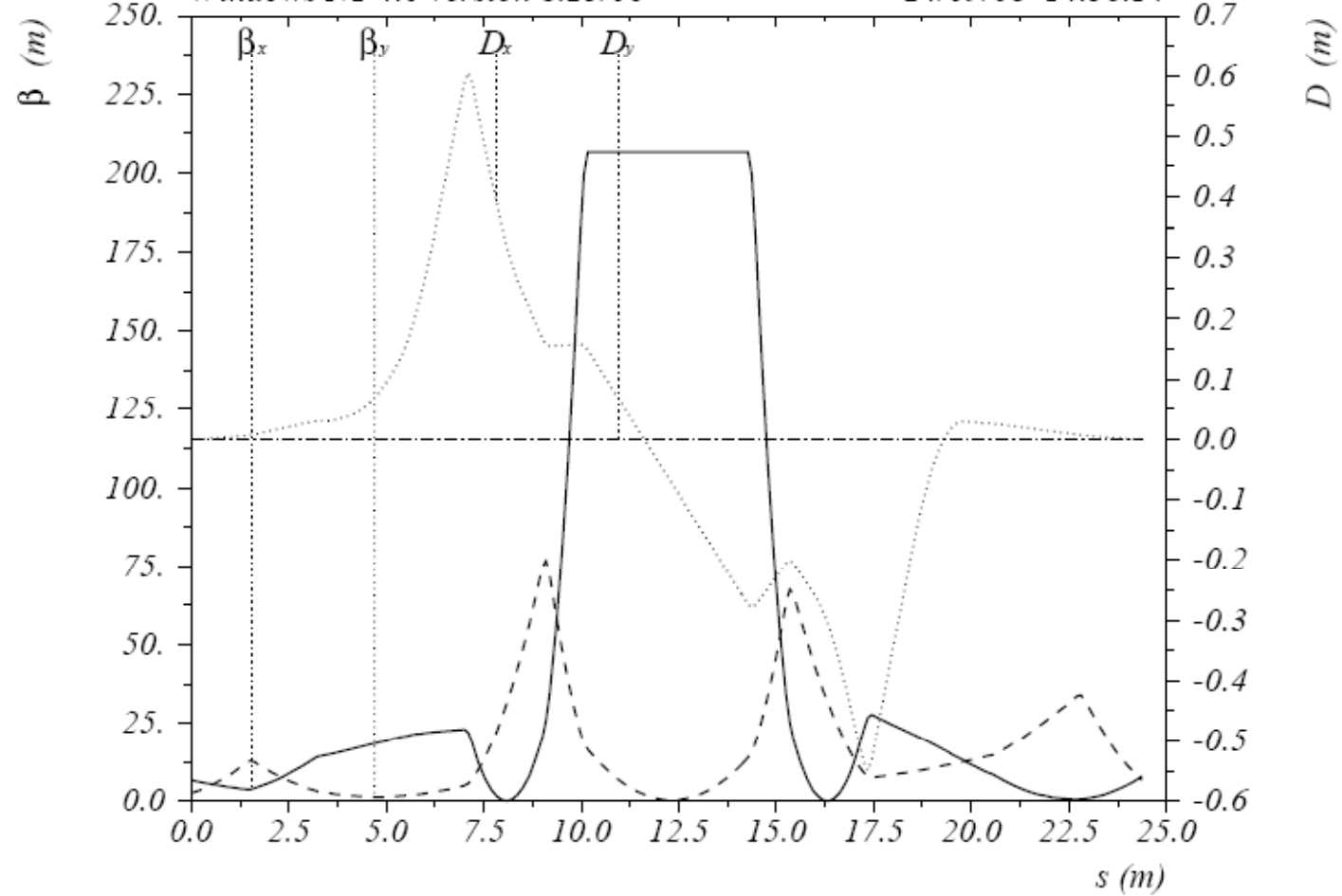
QM7R @ 80%



ATF2 EXT Optics (v4.0)

Windows NT 4.0 version 8.23/06

24/09/08 14.36.14



$\delta_E / p_{oc} = 0.$

Table name = TWISS

QM7R @ 50%

ATF2 shifts proposals: December 08

- Suggestions from (Responsible are): Mauro Pivi:
- **Beam induced measurements of the QM7R magnet error**
 - **Request = 1 shift**
 - (provided a good method to measure it will be selected)
- **Beta matching DR=>EXT currents**
 - **Request = 1 shift**
 - (dedicated?)

Continue: Beta matching

Also looked at other ways to obtain matching:

- Inserting the existing spare QUAD ($KL_{max}=0.3$) at 12.3 m from KICKER1 (“MID” marker) - had small effect on matching.
- Using only 2 extra quadrupoles (at MID and in phase with QM7R) helped the matching very little.
- Varied spacing between dipoles dLLX1 and dLLX2 only:
 - Matching obtained for: 70% ● QM7R ● 100%.
 - Although, when fixing the spacing to work at one value of QM7R, then the matching is not good for the other QM7R values.
- Briefly looked also at arranging 2 quads between MDISP and MSKEW
 - Not much out of that

Extra slides

contributions of individual multipole components

