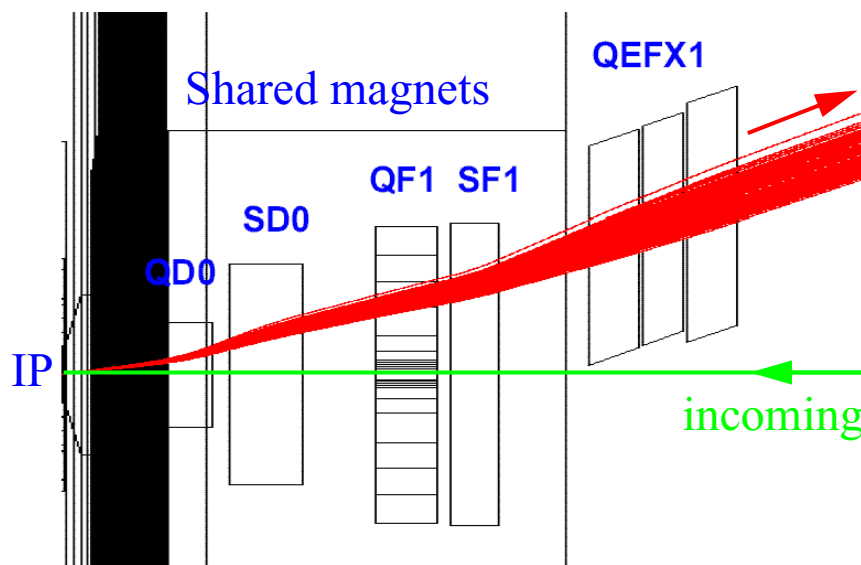


Extraction Line Optics for 2 mrad Crossing Angle

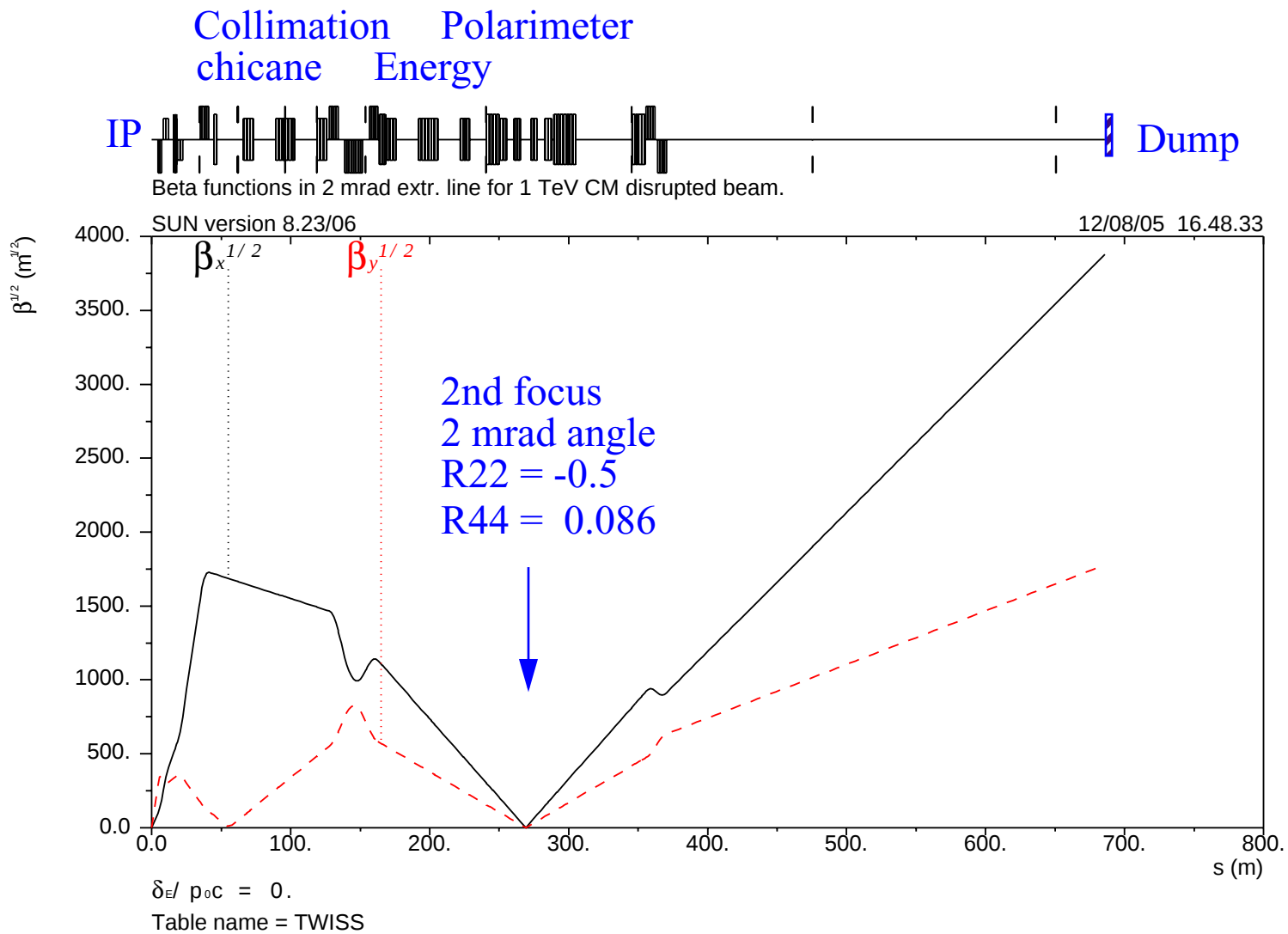
Features:

- Final Focus and extraction magnets up to 1 TeV CM.
- Dedicated diagnostic section for energy and polarization measurements.
- No extraction sextupoles for minimal beam size growth at the Compton IP.
- Dedicated collimation chicane and various collimators to protect magnets from low energy losses.

Schematic of 2 mrad crossing

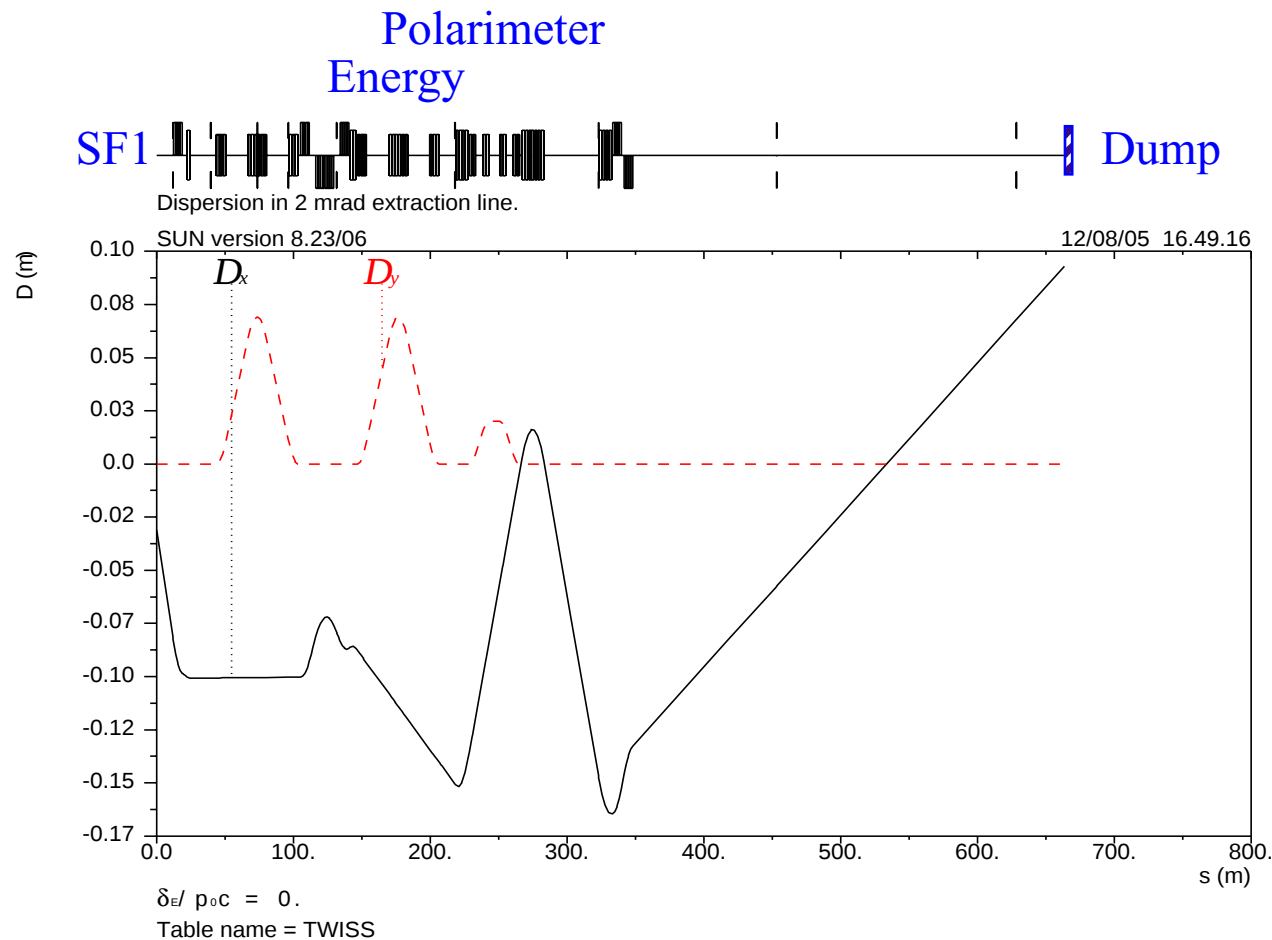


Beam optics

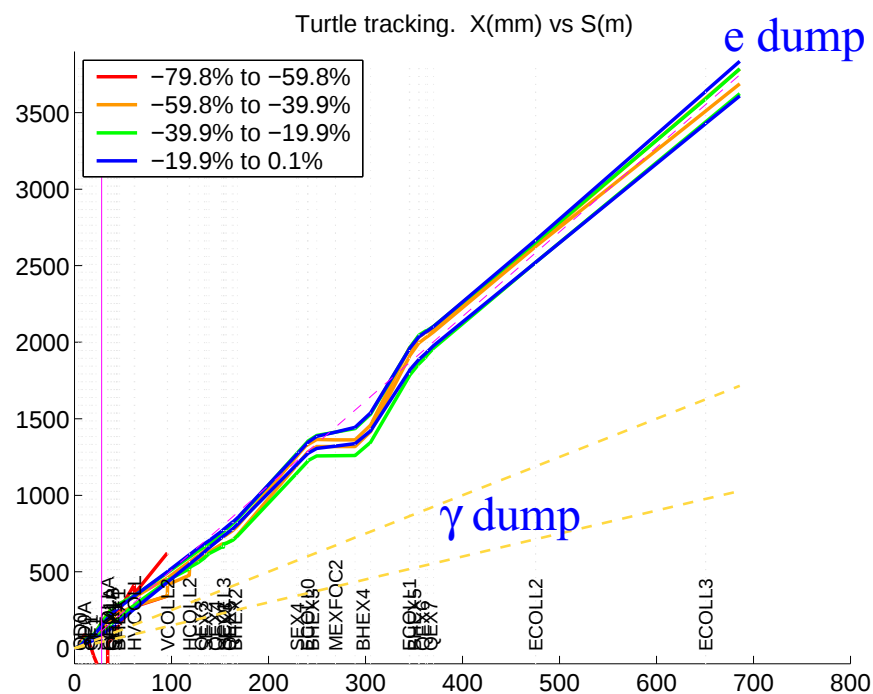
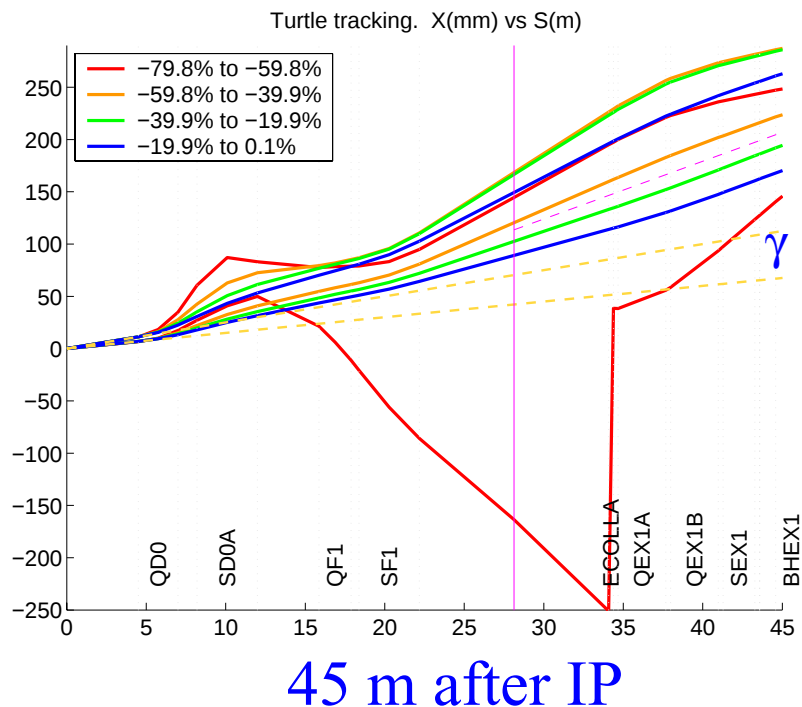


Linear dispersion

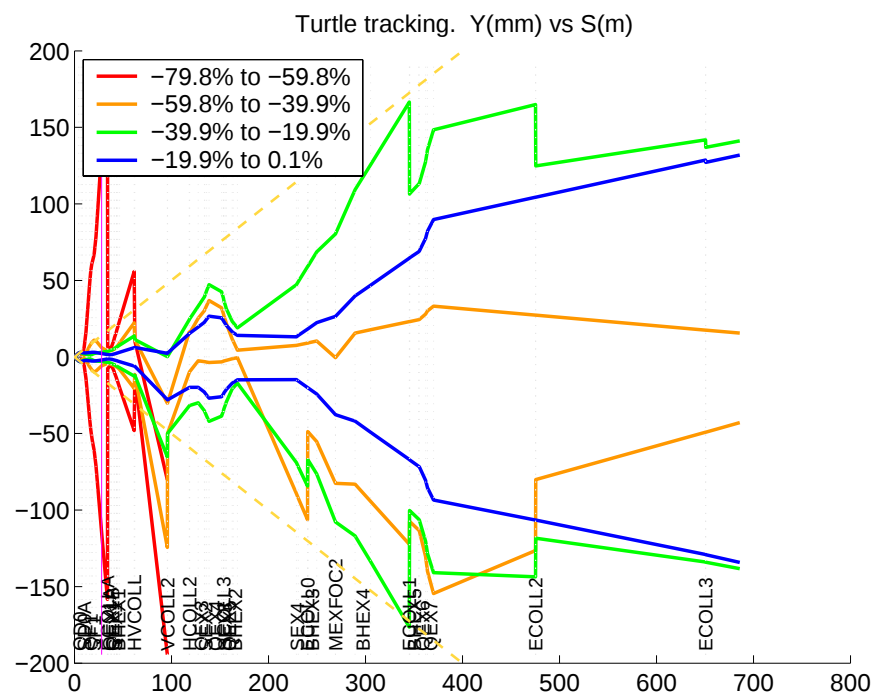
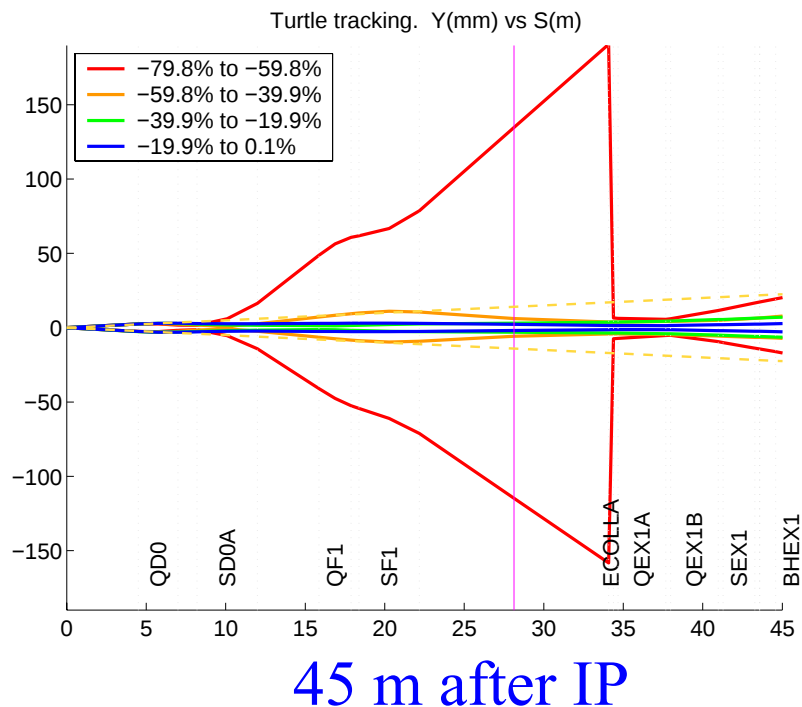
- At collimator chicane: $\eta_x = -10.0$ cm, $\eta_y = 6.9$ cm
- At energy chicane: $\eta_x = -11.4$ cm, $\eta_y = 6.9$ cm
- At the 2nd focus: $\eta_x = -7.0$ cm, $\eta_y = 2.0$ cm
- At dump: $\eta_x = 9.3$ cm, $\eta_y = 0$



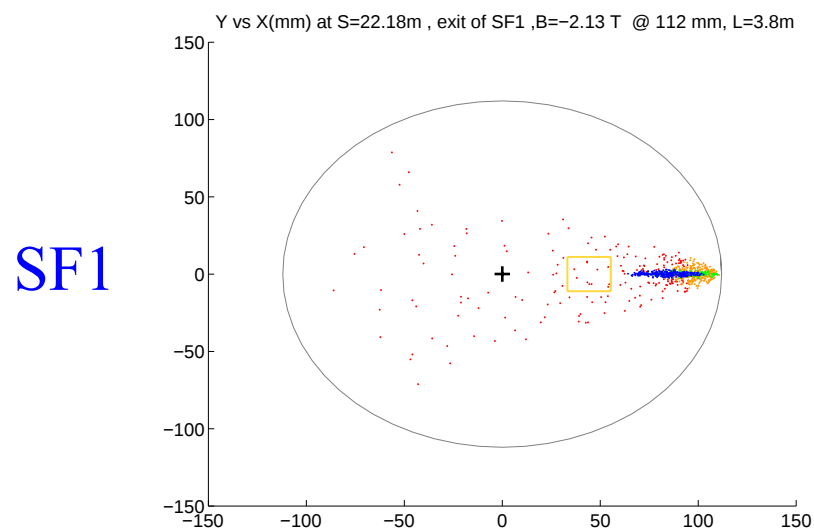
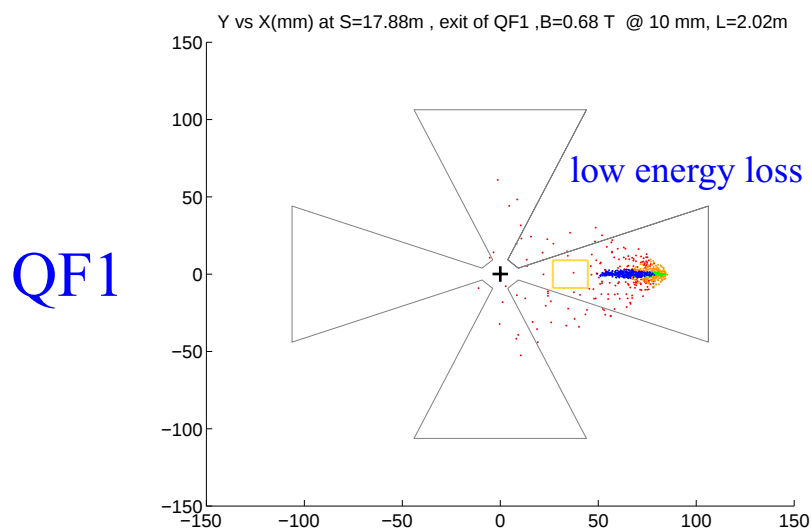
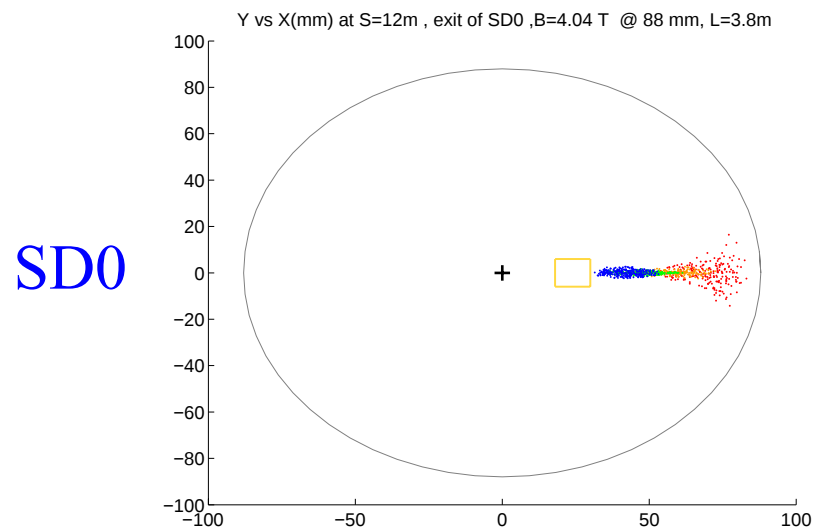
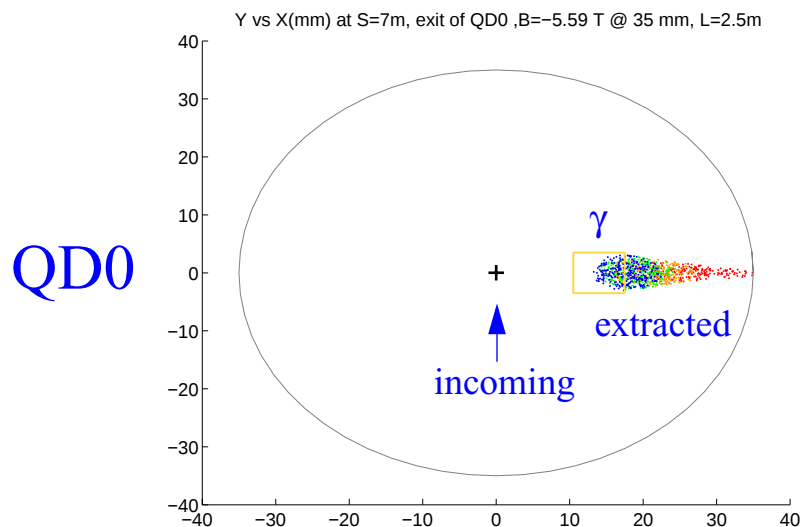
1 TeV CM horizontal disrupted beam envelopes for ranges of $\Delta E/E$ from 0 to -80%



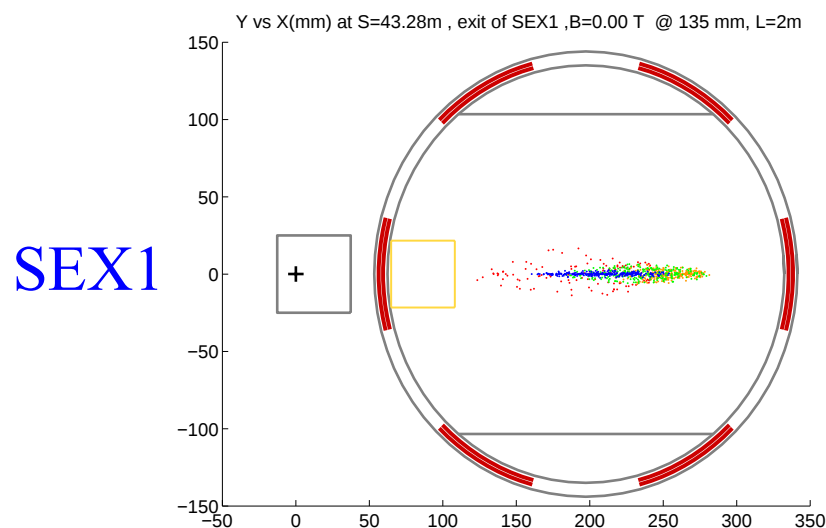
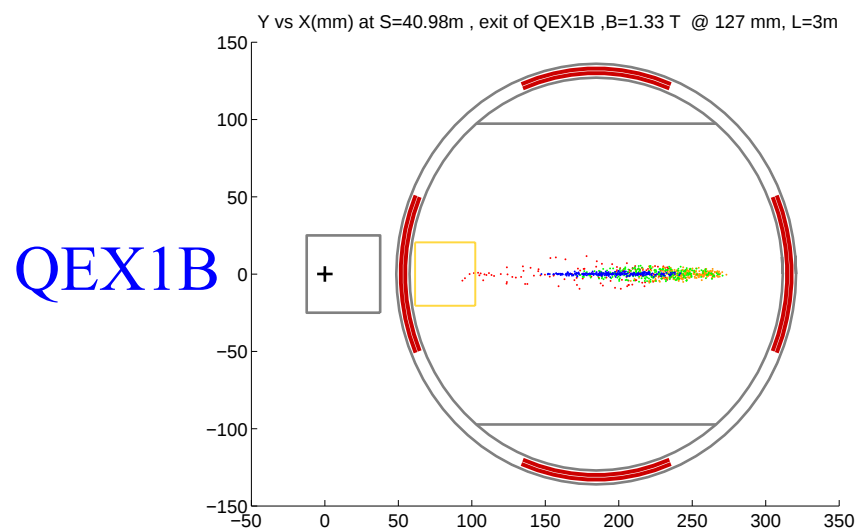
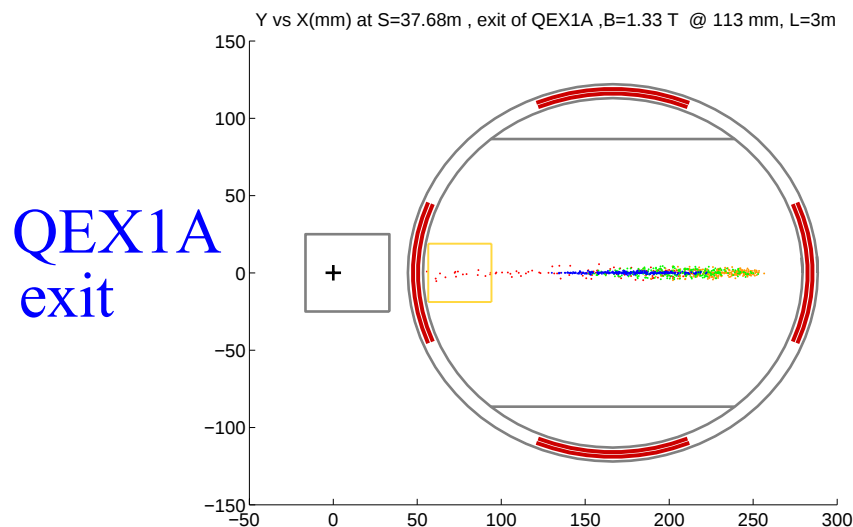
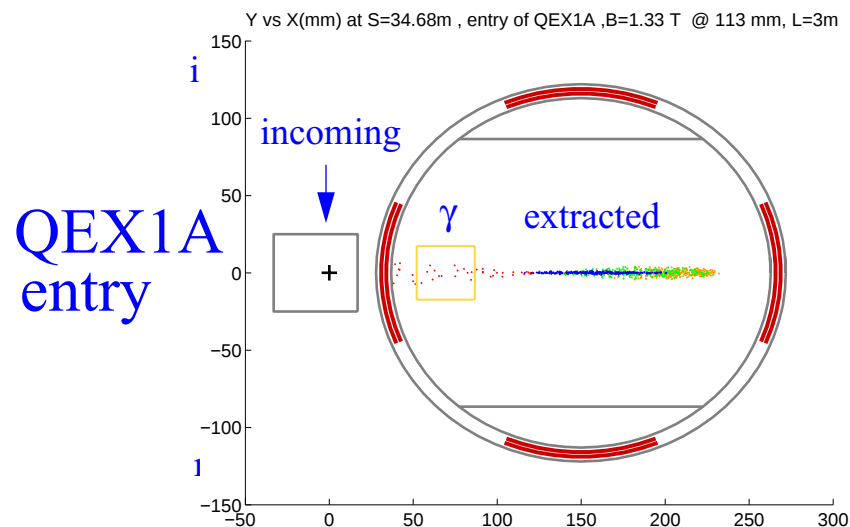
1 TeV CM vertical disrupted beam envelopes for ranges of $\Delta E/E$ from 0 to -80%.



XY extracted beam distribution at FF magnets for 1 TeV CM beam with IP spread: $X'_{\max} = 496 \mu\text{rad}$, $Y'_{\max} = 566 \mu\text{rad}$, $\Delta E/E = 0$ to -80%



XY beam distribution at extraction magnets for 1 TeV CM beam with IP spread: $X'_{\max} = 496 \mu\text{rad}$, $Y'_{\max} = 566 \mu\text{rad}$, $\Delta E/E = 0$ to -80%

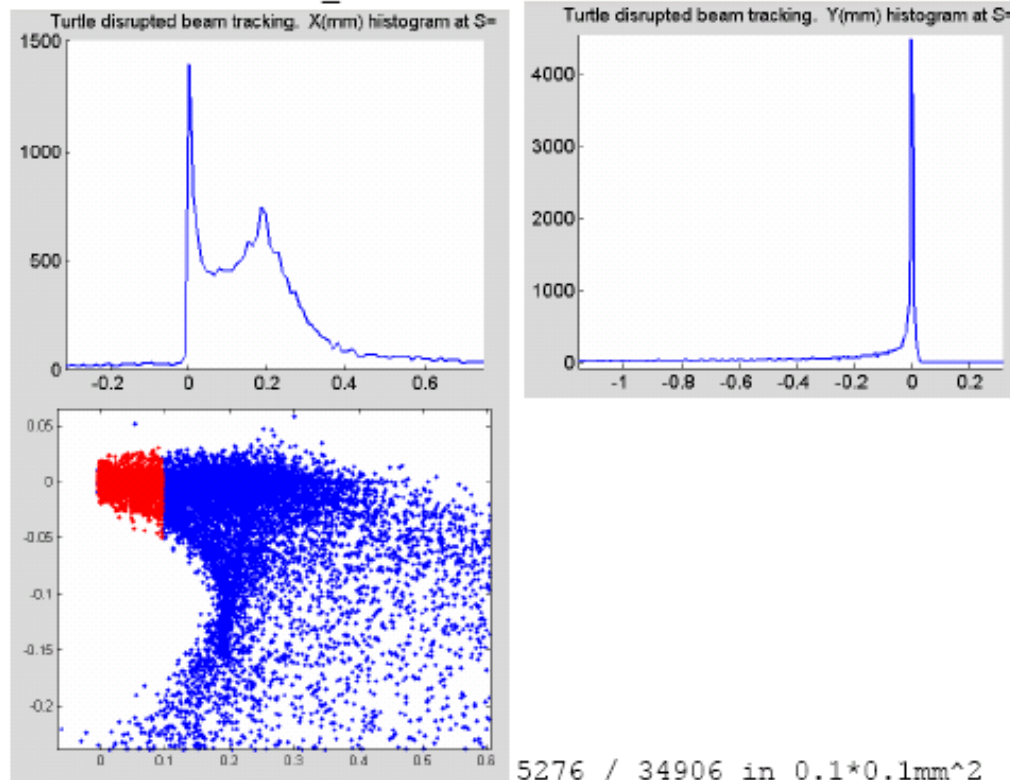


XY disrupted beam size at the 2nd IP for 1 TeV CM nominal and $\Delta y=0$

Low statistics, head-on, 1TeV nominal, N rays= 34906
=> *1/34906

POSITION	LABEL	RAYS	RATIO	~KW
89.180 M	BYCHIC	2	5.72e-5	0.51
95.780 M	VCOLL2	179	5.12e-3	46.15
118.480 M	HCOLL2	31	8.88e-4	7.99
153.580 M	HCOLL3	41	1.17e-3	10.57
TOTAL		253	7.24e-3	65.23

At mexfoc2: rms_x= 10.8325mm, rms_y= 2.3693mm, mean_xp= -
0.21107 mrad, min_E=-0.4182, max E=0



5276 / 34906 in 0.1*0.1mm²

(= 15%)

Disrupted beam power loss for 1 TeV CM nominal and $\Delta y = 0$

No sextupoles :

POSITION	LABEL	RAYS	RATIO	~KW
5.750 M	QD0	1	5.72e-8	0.00025
18.030 M	QF1 (similar as v.July 28?)			
34.080 M	ECOLLA	96	5.50e-6	0.0495
34.680 M	QEX1A	7	4.01e-7	0.0036
61.580 M	HCOLL	4	2.29e-7	0.0021
61.880 M	VCOLL	3	1.71e-7	0.0015
89.180 M	BYCHIC	46	2.63e-6	0.0237
91.480 M	BYCHIC	5	2.86e-7	0.0026
93.780 M	BYCHIC	6	3.43e-7	0.0031
95.780 M	VCOLL2	85914	4.92e-3	44.3028
118.480 M	HCOLL2	15628	8.95e-4	8.0588
153.580 M	HCOLL3	16305	9.34e-4	8.4079
TOTAL		118015	6.76e-3	60.8561

Disrupted beam power loss for 1 TeV CM nominal and $\Delta y = 100$ nm

No sextupoles:

POSITION	LABEL	RAYS	RATIO	~KW
5.750 M	QD0	3	2.96e-7	0.0014
18.030 M	QF1 (similar as v.July 28?)			
10.095 M	SD0A	3	2.96e-7	0.0014
34.080 M	ECOLLA	277	2.73e-5	0.2463
34.680 M	QEX1A	15	1.48e-6	0.0133
61.580 M	HCOLL	6	5.92e-7	0.0053
61.880 M	VCOLL	7926	7.82e-4	7.0468
89.180 M	BYCHIC	55	5.43e-6	0.0489
91.480 M	BYCHIC	7	6.91e-7	0.0062
93.780 M	BYCHIC	5	4.93e-7	0.0044
95.780 M	VCOLL2	74108	7.32e-3	65.8874
118.480 M	HCOLL2	62097	6.13e-3	55.2088
153.580 M	HCOLL3	26468	2.61e-3	23.5320
240.280 M	ECOLL0	4964	4.90e-4	4.4134
345.180 M	ECOLL1	87799	8.67e-3	78.0597
475.280 M	ECOLL2	12743	1.25e-3	11.3295
TOTAL		276473	2.73e-2	245.8047

Magnet parameters at 1 TeV CM

Name	N	L (m)	dB_y/dx (T/m)	R (mm)
QD0	1	2.5	-159.78	35 (40)
QF1	1	2.0	67.93	10
QEX1A	1	3.0	11.76	113
QEX1B	1	3.0	10.46	127
QEX3	2	3.0	6.83	~150
QEX4	4	3.0	-7.42	~150
QEX5	2	3.0	6.83	~150
QEX6	2	3.0	5.77	~150
QEX7	2	3.0	-5.59	~150

Name	N	L (m)	d^2B_y/dx^2 (T/m ²)	R (mm)
SD0	1	3.8	1043.07	88
SF1	1	3.8	-340.13	112

Name	N	L (m)	B (T)	Θ (mrad)
BHEX1	1	2.0	0.417	0.5
BHEX2	2	2.0	-0.598	-0.717
BHEX3	4	2.0	0.929	1.114
BHEX4	7	2.0	-0.867	-1.040
BHEX5	4	2.0	0.806	0.967
BYCHIC	6	2.0	0.834	1.0
BYCHICM	6	2.0	-0.834	-1.0
BYENE	6	2.0	0.834	1.0
BYENEM	6	2.0	-0.834	-1.0
BYPOL	4	2.0	0.834	1.0
BYPOLM	4	2.0	-0.834	-1.0