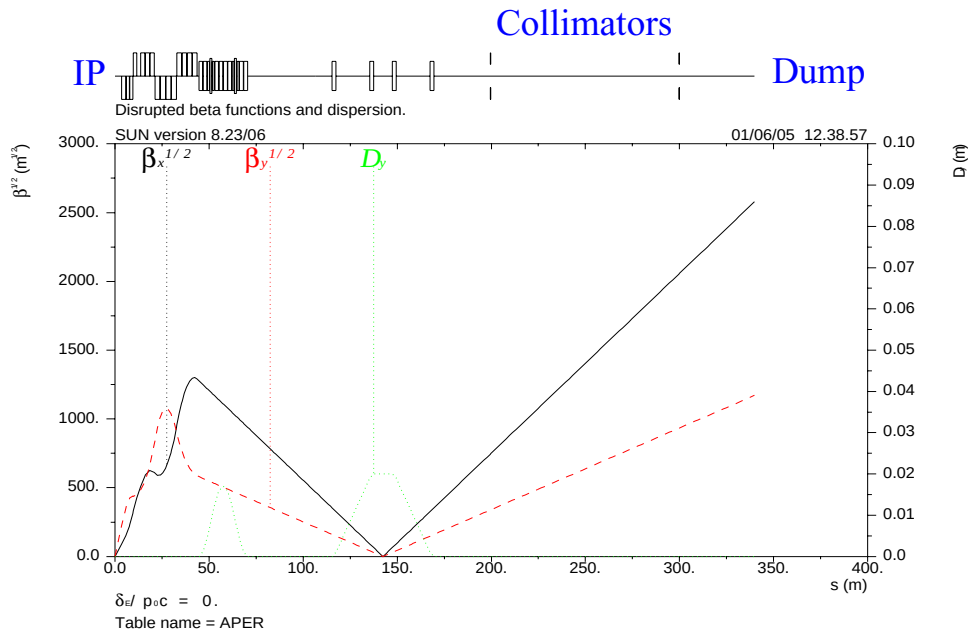
20 MRAD EXTRACTION LINE WITH ENLARGED BEAM SIZE AT DUMP

- In the present optics, the undisrupted beam size at dump is too small for a practical dump design. At 0.5 TeV CM, the present value of undisrupted $\sigma_x\sigma_y$ = 0.87 x 0.10 mm^2 at dump needs to be increased a factor of 10.
- The proposed solution is to allow the beam size grow naturally in a field-free region by moving the dump from s = 200 m to 340 m with respect to IP. Also, the quad doublet after the polarimeter chicane is removed to cancel focusing at the dump.
- To fit the divergent disrupted electron and beamstrahlung photon beams for the dump window, two round collimators with r = 8.8 cm and 13.2 cm are placed at s ~ 200 m and 300 m, respectively, to reduce maximum beam size at dump to 15 x 15 cm.



Undisrupted beam size at dump

Comparison of undisrupted beam size at dump for the present and new optics

E_{CM}	Option	$\sigma_x\sigma_y$ (mm^2)	
		Present (dump at 202 m)	New (dump at 340 m)
0.5 TeV	nominal	0.87 x 0.10 = 0.087	3.16 x 0.28 = 0.885
	high lumi	1.25 x 0.12 = 0.150	4.58 x 0.34 = 1.557
1 TeV	nominal	0.51 x 0.35 = 0.179	1.87 x 0.62 = 1.159
	high lumi	0.89 x 0.35 = 0.312	3.24 x 0.62 = 2.009

* Sync. radiation helps to increase the vertical beam size, especially at higher energy.

Disrupted beam loss

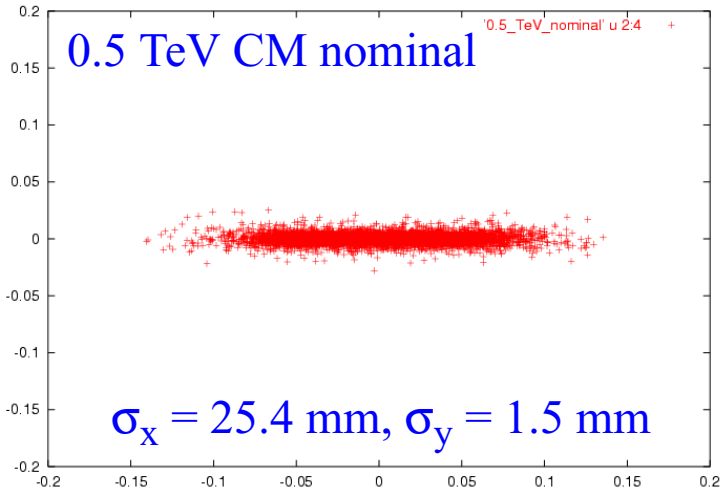
- Low statistics files with full energy spread (7e4 particles) were used for beam loss in collimators. The "tail-only" high statistics files would not cover all losses at the collimators.
- Collimators 1 and 2 are at s = 200 m and 300 m and have round aperture of r = 8.8 cm and 13.2 cm, respectively, to reduce maximum beam size at dump to 15 x 15 cm.
- Some changes to the previous beam loss results are due to the recent update of DIMAD which fixed the algorithm of finding the exact element where particle is lost.

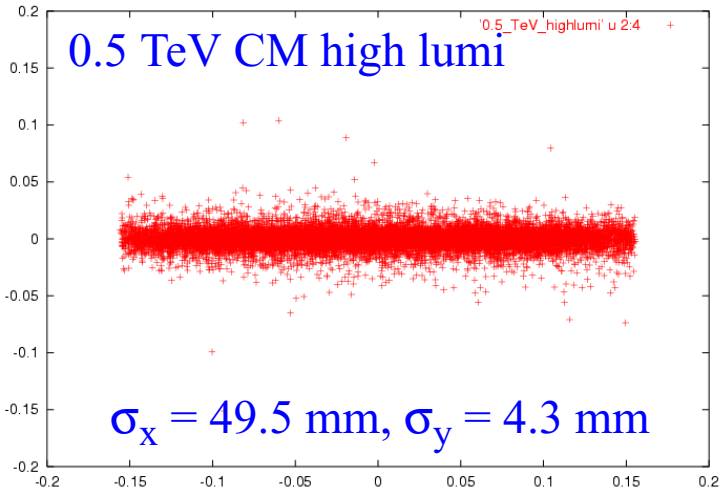
E_{CM}	y-offset (nm)	e-loss in collimators (kW)		γ-loss in collimators (kW) (results by L. Keller)		Max. e-loss density in magnets (W/m)		
		Coll. 1	Coll. 2	Coll. 1	Coll. 2	SC quads	Warm quads	Bends
0.5 TeV nominal	0	0	0	0	0	0	0	0
	200	0	0	0.15	0.05	0	0	0.13
0.5 TeV high lumi	0	47.4	74.5	2.8	0.7	15 (2.1*)	60	37
	120	47.2	95.3	151	10.3	3.8 (0*)	95	372
1 TeV nominal	0	0.85	0	0	0	0	1.8	4.8
	100	4.8	0.11	0	0	0	7.1	77
1 TeV high lumi	0	64.1	43.6	1.5	0.2	1106	4379	2032
	80	129	15.4	69	9.5	1071	5391	7362

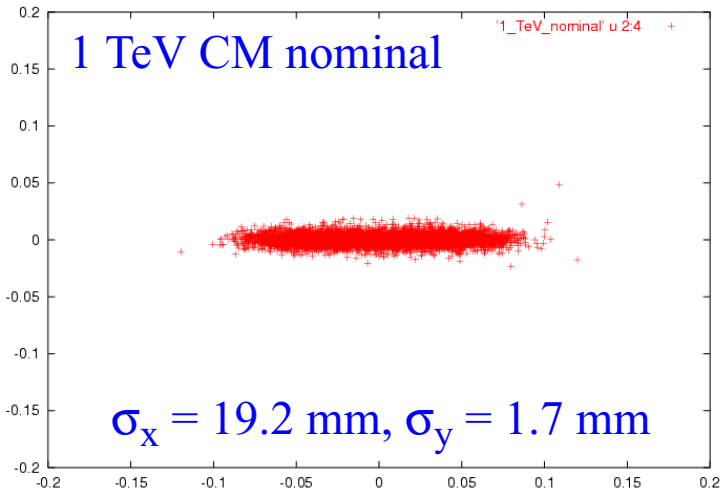
* After increasing aperture in QDEX1C and QFEX2A to r = 25 and 36 mm, respectively.

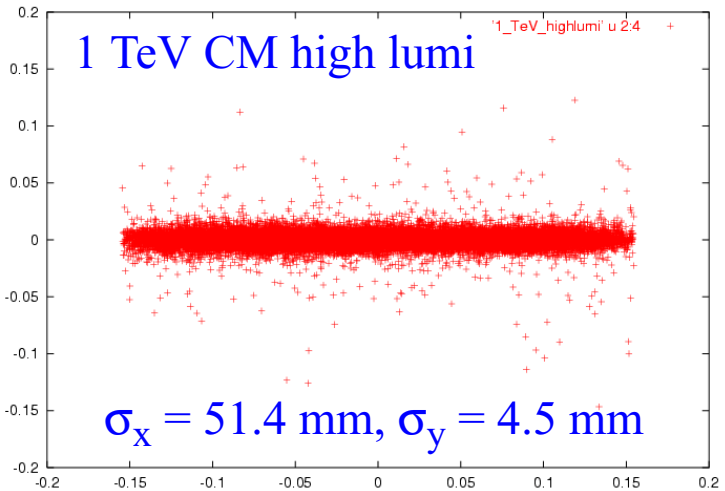
X-Y disrupted distribution at dump (no IP offset)

(scale in meters)









Magnet parameters at 1 TeV CM

Quad	L (m)	G (T/m)	B (T) at pipe	R (mm)
QDEX1A SC	2.2	-38.46	-0.5	13
QDEX1B SC	1.5421	-80.00	-1.2	15
QDEX1C SC	1.5421	-57.14	-1.2	21
QFEX2A SC	1.8058	42.86	1.2	28
QFEX2B,C,D	2.2583	24.39	1.0	41
QDEX3A,B	2.6254	-24.39	-1.0	41
QDEX3C	2.6254	-20.41	-1.0	49
QDEX3D	2.6254	-16.67	-1.0	60
QFEX4A	2.4306	14.08	1.0	71
QFEX4B,C,D	2.4306	12.05	1.0	83

- Chicane bends are L = 2 m long with B = 0.8339 T field at 1 TeV CM.