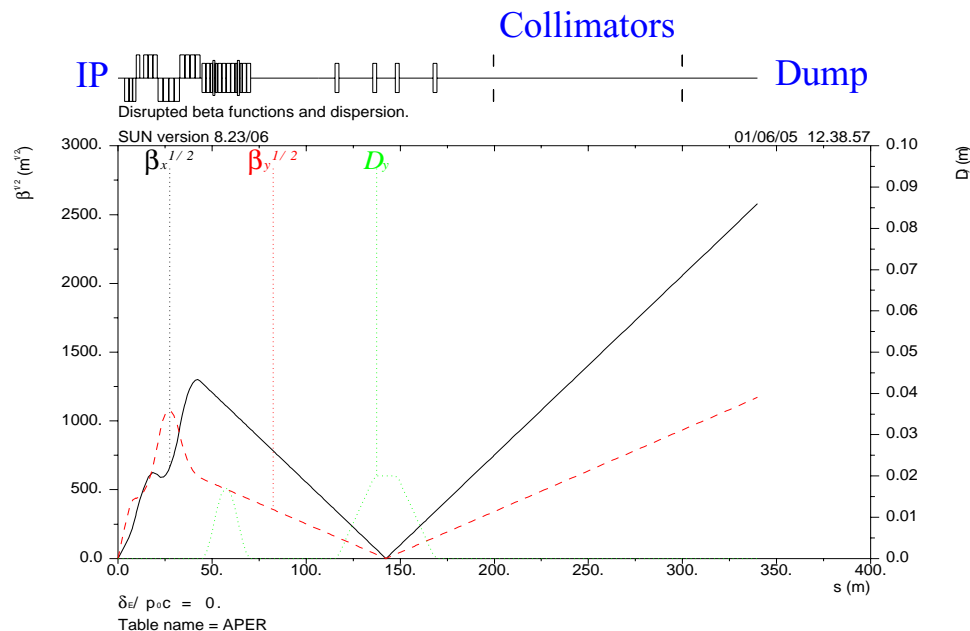


20 MRAD EXTRACTION LINE WITH ENLARGED BEAM SIZE AT DUMP

- 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 $\sigma_x \sigma_y = 0.87 \times 0.10 \text{ mm}^2$ 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 $s = 200 \text{ m}$ 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 $r = 8.8 \text{ cm}$ and 13.2 cm are placed at $s \sim 200 \text{ m}$ and 300 m , respectively, to reduce maximum beam size at dump to $15 \times 15 \text{ cm}$.



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 15×15 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)	Loss in collimators (W)		Max. loss density in magnets (W/m)		
		Coll. 1	Coll. 2	SC quads	Warm quads	Bends
0.5 TeV nominal	0	0	0	0	0	0
	200			0	0	0.13
0.5 TeV high lumi	0	47444	74455	15 (2.1*)	60	37
	120			3.8 (0*)	95	372
1 TeV nominal	0	850	0	0	1.8	4.8
	100	4812	109	0	7.1	77
1 TeV high lumi	0	64092	43564	1106	4379	2032
	80			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)

