

Collimator setting proposal for 3.5 TeV

RWA and AR

Aperture (n1) at 3.5 TeV

- Collimator settings must be adapted to the available aperture.
- Available aperture is given by n1 from MADX and aperture model.
- At the moment treat only the overall aperture bottleneck in x-y space. Cannot distinguish between n1 in x and y planes without manual analysis of aperture
 → Conservative collimator settings (can open one plane more than shown here).
- Will work further on adapting x and y gaps independently.
- Assume as baseline: Intermediate Settings for Collimators as presented and approved at Chamonix and LMC.
- Do not distinguish between beam 1 and beam 2: these are close, we take the overall minimum.
- Optics used: 3.5 TeV, no external crossing, separation on, spectrometers on
 β^* : IP1&5 = 2m, IP2 = 10m, IP8 = 3m

Overall Available Aperture (Bottlenecks)

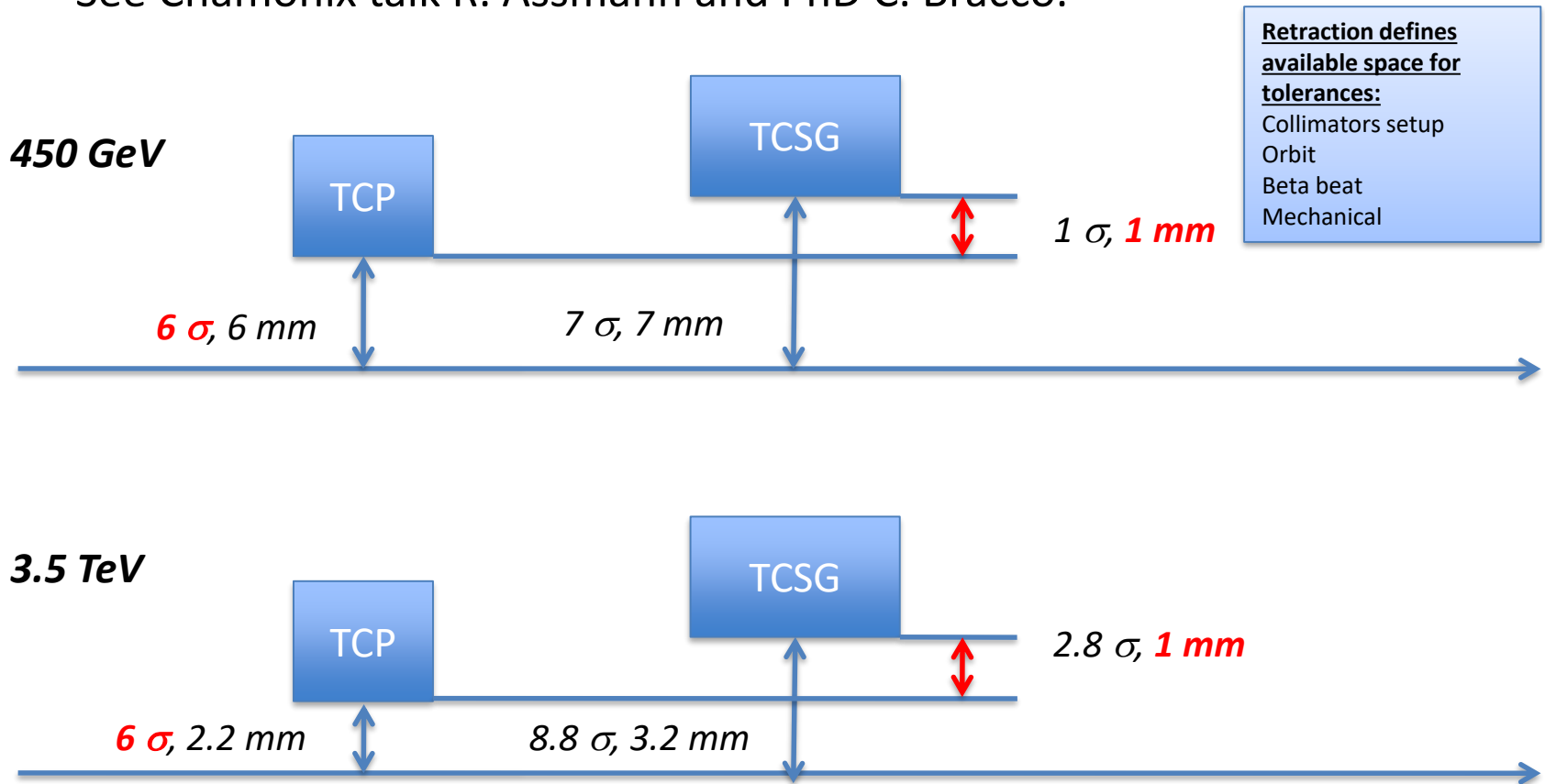
Location	Minimum n1 [σ]	Available x/y aperture [σ]	Maximum allowed TCT setting [σ]
Arcs	19.4		
LSS1, TCT to triplet	11.6	14.0	13.0
LSS1, DS	21.1	25.4	
LSS2, TCT to triplet	26.1	31.4	30.4
LSS2, DS	20.3	24.3	
LSS5, TCT to triplet	11.6	14.0	13.0
LSS5, DS	21.1	25.4	
LSS8, TCT to triplet	13.7	16.5	15.5
LSS8, DS	20.9	25.0	

Take 1 σ safety margin

Overall ring aperture is given by triplet apertures in LSS1 and LSS5 → This defines overall collimator settings. Tertiary collimators, however, must be adjusted to local aperture.

Intermediate Collimator Settings

- Primary collimators kept at nominal setting (6σ).
- All other families keep same absolute distance to primary collimator (in mm) for all energies.
- See Chamonix talk R. Assmann and PhD C. Bracco.



Intermediate Settings

Family	setting 450 GeV [σ]	setting 3.5 TeV [σ]
TCP IR7	6.0	6.0
TCSG IR7	7.0	8.8
TCLA IR7	10.0	17.2
TCDQ	8.0	11.6
TCS TCDQ	7.5	10.2
TCP IR3	8.3	8.3
TCSG IR3	9.6	11.9
TCLA IR3	10.3	13.9
TCLP	n/a	13.7

Minimal allowed TCT setting = TCDQ + margin \rightarrow **12.6 σ** for 1 σ margin

	Family	setting 3.5 TeV [σ]
LSS7	TCP IR7	6.0
	TCSG IR7	8.8
	TCLA IR7	17.2
LSS6	TCDQ	11.6
	TCS TCDQ	10.2
LSS3	TCP IR3	8.3
	TCSG IR3	11.9
	TCLA IR3	13.9
LSS1	TCTH	12.8
	TCTV	12.8
	TCLP	13.7
LSS2	TCTH	30.2
	TCTV	30.2
LSS5	TCTH	12.8
	TCTV	12.8
	TCLP	13.7
LSS8	TCTH	15.3
	TCTV	15.3

INTERMEDIATE SETTINGS SUMMARY

Note that Triplet Aperture (14σ) is $\sim 3.8\sigma$ larger than TCS TCDQ settings

1.2 σ at TCT's taken to have equal tolerances for protection of TCTs with TCDQs and protection of the triplets with TCT's (IP1 & 5): Good protection with hopefully comfortable margin to learn

Early collimator setup, tertiary collimators as tight as necessary but not tighter (Background)

Proposed operational range for TCT's

Location	Minimum [σ]	Nominal [σ]	Maximum [σ]
IP1/5	12.6	12.8	13.0
IP2	12.6	30.2	30.4
IP8	12.6	15.3	15.5

- In IP1 and IP5 not much room for moving TCT's (e.g. for background tuning).
- 1σ tolerance is kind of arbitrary, but probably not too comfortable for the first year operations
 - Note that for $\beta^* = 2\text{m}$ at IP1/5
 - 1σ at triplets $\approx 1\text{ mm}$
 - 1σ at TCT's $\approx 0.6\text{ mm}$