

Beam Stay Clear and Phase Advances at BBLRs

Table 1: Assumed center positions of the BBLRs in SPS optics:

BBLR	Position [m]
21951	1774.515 (11.093 m behind quad end at 1763.312+0.11*)
21952	1775.563 (12.143 behind quad)
51760	5168.1719
51771	5169.0289
51775	5170.3919
51777	5171.2489

*MAD file gives the effective quad length at 3.791 m, while according to the layout the real length is 4.011 m. There is a difference of 22 cm. This means that the actual distance of the monitor is 11 cm further away from the quad than I assume in MAD.

Table 2: Beam stay clear for FT and LHC beam (units of sigma)

Aperture (σ)	FT Beam $\delta=0$	FT beam $\delta=1e-3$	LHC $\delta=0$	LHC $\delta=1e-3$
X	8	7.5	22.5	13
Y	3.4	3.4	7.6	7.6
45 degree	4.5	4.5	11	9

Table 3: Phases of the BBLRs for LHC beam (tunes 0.185, 0.13) for the position assumed above.

BBLR	PhaseX [2π]	PhaseY [2π]
21951	6.7453	6.6899
21952	6.7492	6.6929
51760	19.6040	19.5210
51771	19.6068	19.5237
51775	19.6110	19.5284
51777	19.6135	19.5315

Phase difference between 51760&51771 and 51775&51777 is 2.43 degree in X, and 2.736 degree in Y., or on average 2.583 degrees.

Table 4: Beam sizes and clearances in x,y and at 45 degree for the BBLRs in Point 2 and Point 5, for the LHC beam with rms emittances of 0.1 micron in both planes and rms momentum spread of 1e-3. Values for zero momentum spread are shown in parentheses.

plane	Rms size	beam size	Minimum clearance	β	D	Aperture
LSS5 BBLR51760 (start)						
Y	2.30 (2.30)	mm	17.48mm	51.19 m		19 mm
LSS5 BBLR51775 (start)						
X	2.36 (2.28)	mm	30.68 mm	53.71 m	-0.616 m	51.5 mm
Y	2.16 (2.16)	mm	16.42 mm	44.99 m		19 mm
45	2.25 (2.22)	mm	20.25 mm			26.5 mm
LSS5 BBLR51777 (end)						
X	2.46 (2.37)	mm	31.98 mm	56.36 m	-0.632 m	51.5 mm
Y	2.07 (2.07)	mm	15.73 mm	442.76 m		19 mm
45	2.24 (2.21)	mm	20.16 mm			26.5 mm
LSS2 BBLR21951 (start)						
X	2.02 (2.02)	mm	26.26 mm	42.27 m	-0.121 m	51.5 mm
Y	2.44 (2.44)	mm	18.54 mm	57.58 m		19 mm
45	2.20 (2.20)	mm	19.80 mm			26.5 mm
LSS2 BBLR21952 (end)						
X	2.12 (2.12)	mm	27.56 mm	45.00 m	-0.112 m	51.5 mm
Y	2.33 (2.33)	mm	17.71 mm	54.30 m		19 mm
45	2.22 (2.22)	mm	19.98 mm			26.5 mm

Table 5: Beam sizes and clearances in x,y and at 45 degree for the BBLRs in Point 2 and Point 5, for the FT beam with rms emittances of 0.8/0.5 microns in the two planes and an rms momentum spread of 1e-3. Values for zero momentum spread are shown in parentheses.

plane	Rms size	beam	Minimum clearance	β	D	Aperture
LSS5 BBLR51760 (start)						
Y	5.12 (5.12)	mm	17.41 mm	50.56 m		19 mm
LSS5 BBLR51775 (start)						
X	6.43 (6.42)	mm	48.23 mm	53.34 m	-0.326 m	51.5 mm
Y	4.79 (4.79)	mm	16.29 mm	44.34 m		19 mm
45	5.43 (5.43)	mm	24.44 mm			26.5 mm
LSS5 BBLR51777 (end)						
X	6.70 (6.69)	mm	50.25 mm	56.03 m	-0.334 m	51.5 mm
Y	4.59 (4.59)	mm	15.61 mm	42.10 m		19 mm
45	5.35 (5.35)	mm	24.08 mm			26.5 mm
LSS2 BBLR21951 (start)						
X	5.67 (5.67)	mm	42.53 mm	41.76 m	-0.049 m	51.5 mm
Y	5.41 (5.41)	mm	18.39 mm	56.55 m		19 mm
45	5.54 (5.54)	mm	24.93 mm			26.5 mm
LSS2 BBLR21952 (end)						
X	5.97 (5.97)	mm	44.78 mm	44.51 m	-0.043 m	51.5 mm
Y	5.16 (5.16)	mm	17.54 mm	53.28 m		19 mm
45	5.52	mm	24.84 mm			26.5 mm

(5.52)

Figure 1: Apertures for LHC beam with rms emittances of 0.1 micron and 1e-3 rms momentum spread.

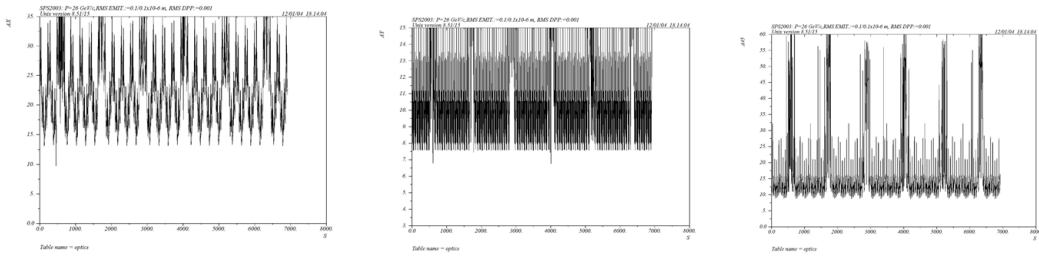


Figure 2: Apertures for FT beam with rms emittances of 0.8 and 0.5 micron and 1e-3 rms momentum spread.

