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Title :

The Transfer Line TL2

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The Transfer Line TL2

Introduction

The booster-ring transfer line in SESAME machine [1], designed to transport the 800MeV- injected beam, has been slightly modified. That was due to the fact that the real dimensions of the existing thick septum are larger than what was seen from the drawings. These modifications included changing the bending angle of the injection septum and some distances between some magnetic elements.

1. The booster- storage ring transfer line

The real measured dimensions of the thick septum were larger than those used in the pre-designed structure of the transfer line [1]. Consequently the transfer line must go through some modifications in order to become practical; i.e. to avoid overlapping between the thick septum and the ring vacuum chamber or sextupole magnet. Starting from the last transfer line structure [1], the following modifications were made:

- The bending angle of the injection septum was changed from 8^o to 9^o keeping the same septum length (0.5m).
- The thick septum has been moved away from the injection septum by 45cm. To keep the same transfer line length, the distance between the booster and the first bending magnet has been shortened by 45cm.
- The distances between some quadrupoles were modified to have required lattice flexibility.

Hence, the new structure of the transfer line is given in Table 1. The given quadrupole strengths are for full optical matching condition (Fig. 1-a).

The transfer line lattice showed high flexibility by achieving optical matching to different conditions with reasonable quadrupole strengths. Fig. 1 shows different optics for different optical matching conditions. In all cases of the optical matching the maximum quadrupole strength was within the limit (i.e. $k < 4.5\ m^{-2}$) [2]. The quadrupole strengths for the cases of Fig.1-b and c are given in Table 2.

The transfer line has been equipped with a total of 6 horizontal-vertical correctors (STXY) put where the high values of beta functions are. Their positions were a result of compromise between the horizontal and vertical optics as well as the available space.

Consequently one corrector was split into horizontal (STX) and vertical (STY) ones put in different positions. For the diagnostic needs, five foil monitors (FOM) were distributed along the transfer line in addition to two fast current transformers (FCT), one at its beginning and the other at its end. Fig. 2 shows the layout of the equipped transfer line.

Table 1

Element	θ (^{o})	ρ (m)	Length (m)	k (m^{-2})
Extraction septum	10	5.874	1.0252	
D			2.7	
QD			0.25	-4.047502
D			0.4	
QF			0.25	3.57487
D			.8	
QD			0.25	-0.72519
D			2.497	
BEND1	23.5	2.66852	1.0945	
D			3.45	
QD			0.25	-3.40795
D			0.35	
QF			0.25	3.171242
D			1.816	
BEND2	23.5	2.66852	1.0945	
D			3.221	
QD			0.25	-2.964534
D			0.5	
QF			0.25	2.386243
D			2.352	
Thick septum	15	2.66852	0.6986	
D			1.015	
Injection septum	9	3.18311	0.5	

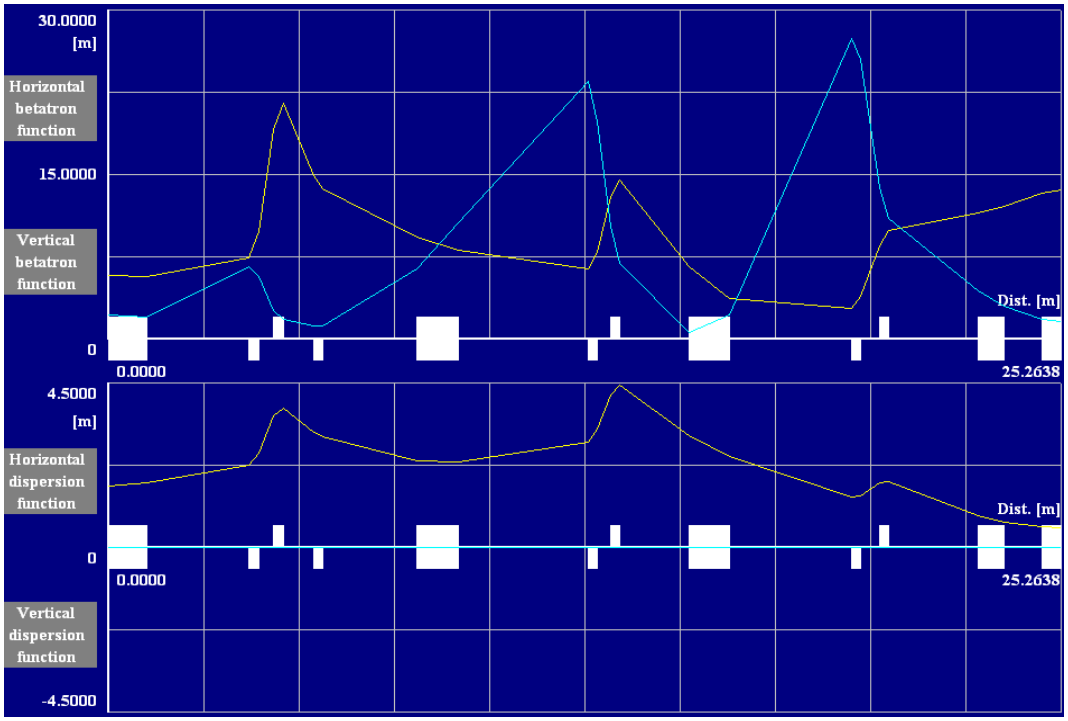

Figure1-a: The transfer line optics with full matching to the ring one: β_x = 13.61m, β_z = 1.61m, η_x = 0.53 and $\alpha_x = \alpha_z = \eta_x' = 0$.

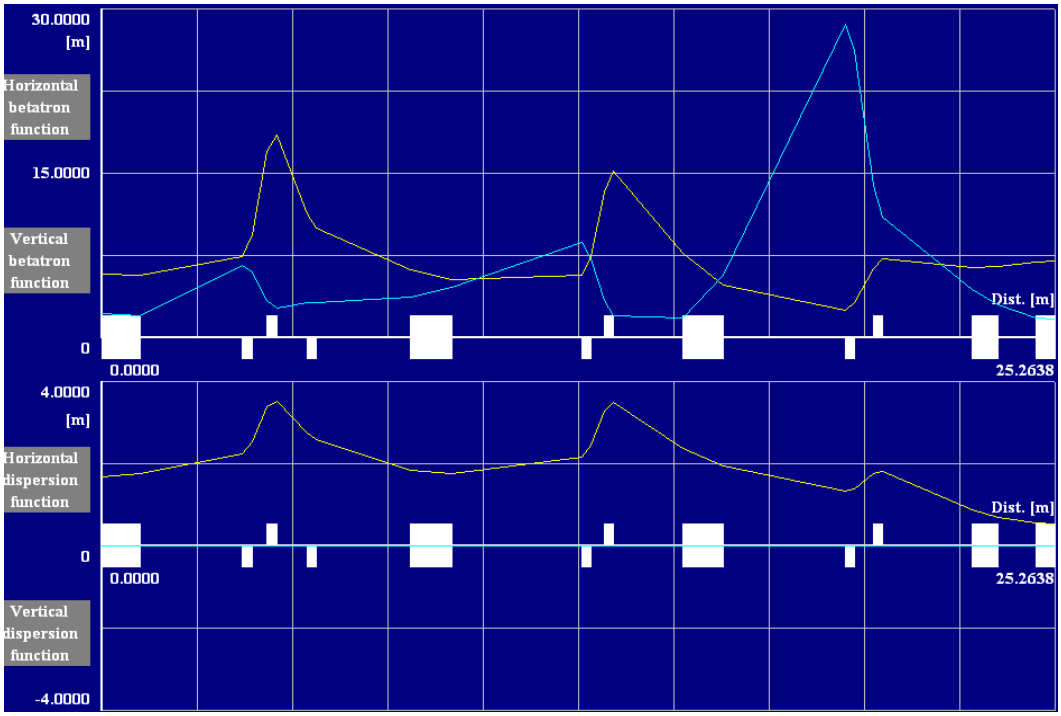

Figure1-b: The transfer line optics matched to the conditions: β_x = 7m, β_z = 1.61m, η_x = 0.53 and $\alpha_x = \alpha_z = \eta_x' = 0$.

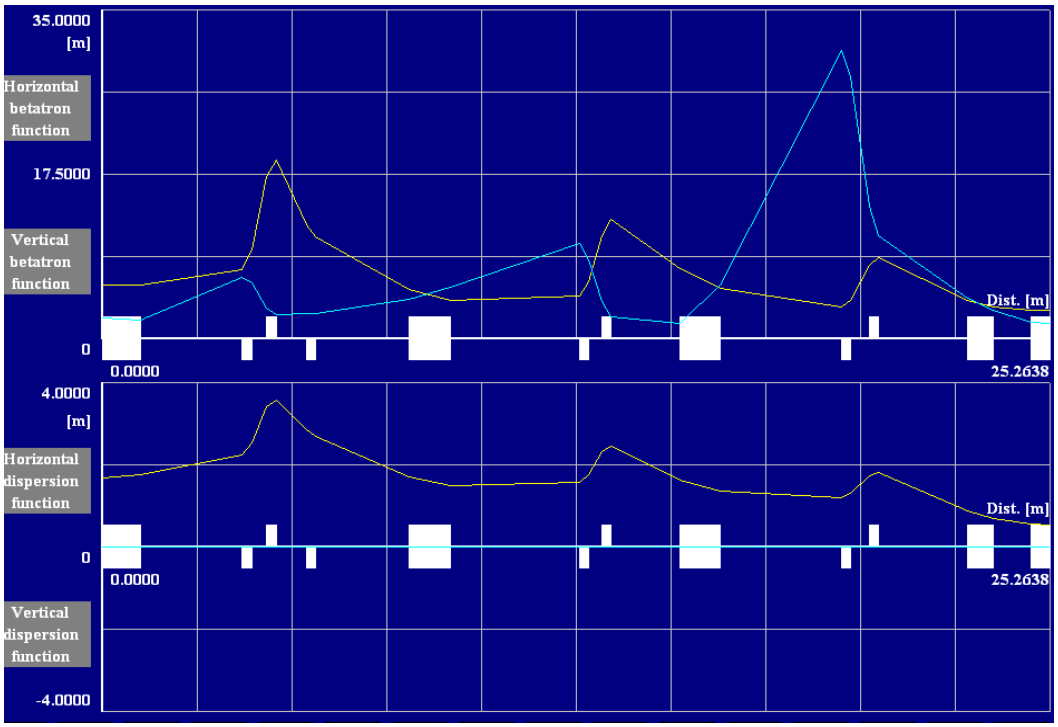

Figure1-c: The transfer line optics matched to the conditions: β_x = 3m, β_z = 1.61m, η_x = 0.53 and $\alpha_x = \alpha_z = \eta_x' = 0$.

Table 2

Quadrupole k-value Fig. 1-b	Quadrupole k-value Fig. 1-c
-3.3887	-3.4882
3.5627	3.5099
-1.0369	-0.7485
-3.8704	-3.7799
3.3994	3.3410
-2.7974	-2.9372
2.5107	2.8000

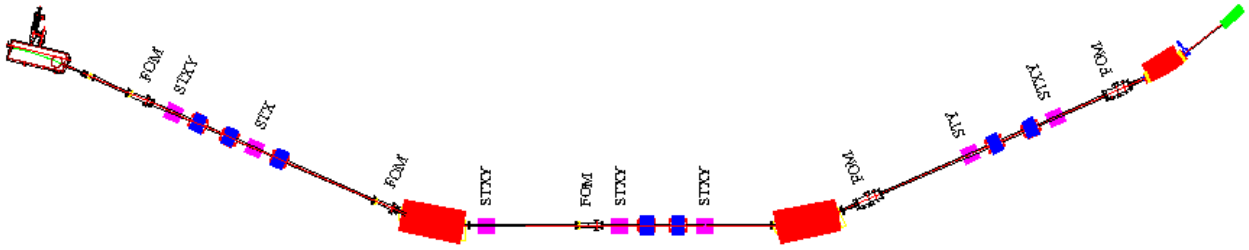

Figure 2: Lay out of the transfer line; the first left element is the extraction septum, bending magnets and thick septum are in red, injection septum is in green, correctors are in pink, quadrupoles are in blue and FOMs are color free.

The shielding wall path has been slightly modified in order not to cross any magnet or diagnostic element. This is shown in Fig. 3.

References

[1] M. Attal & A. Amro, Technical Note I-1.

[2] SESAME yellow book, Injection chapter.

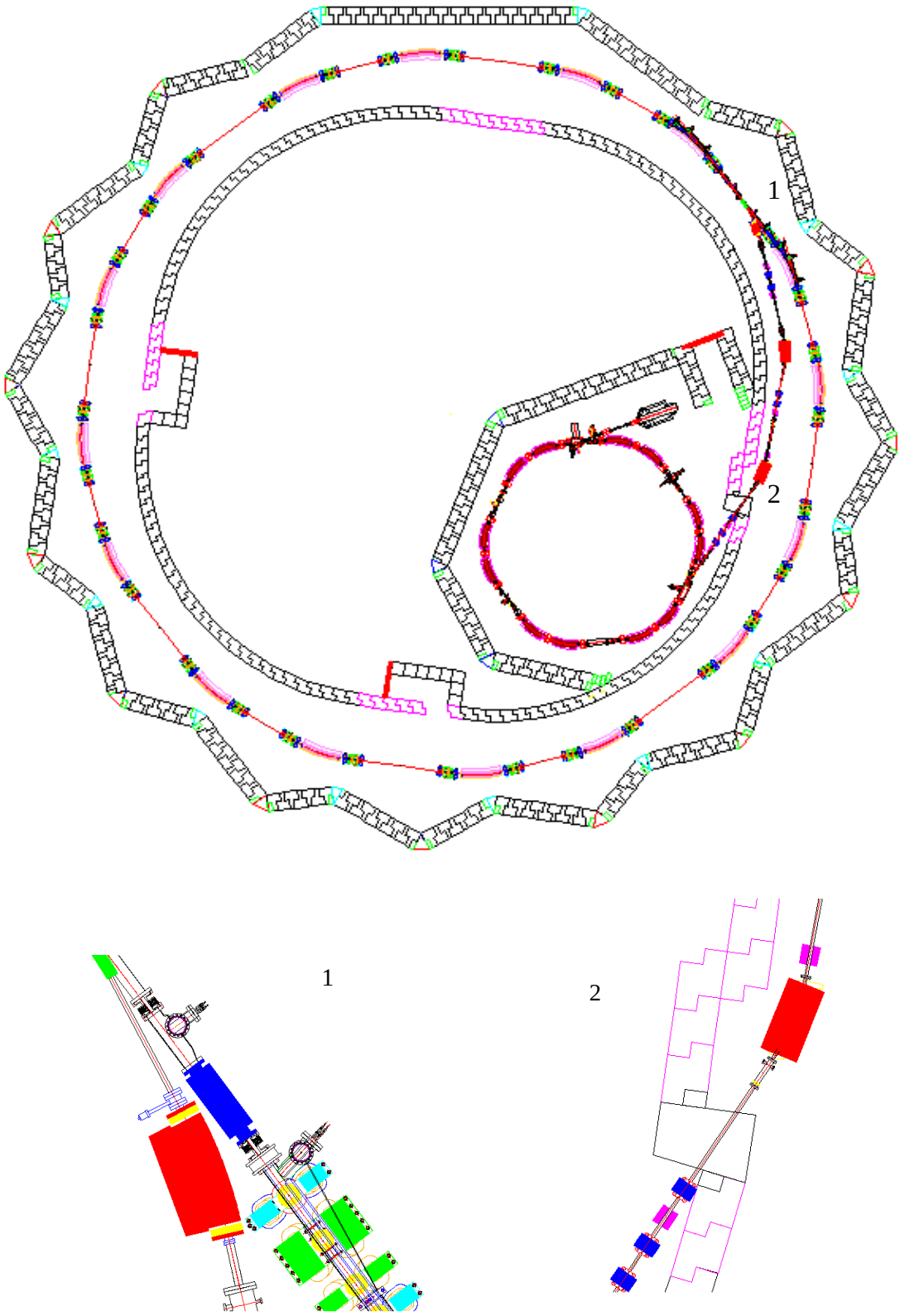

Figure 3: A total layout showing the booster, transfer line, storage ring and the shielding wall. The transfer line-ring connection (1) and transfer line-wall connection (2) points are magnified.