DAΦNE TECHNICAL NOTE

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Note: **L-9**

REVIEW OF DAΦNE LATTICES

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1. INTRODUCTION

The definition of the DAΦNE main ring lattices is presently completed. Each ring is composed by two arcs[1], short and long, (see Fig. 1) and shares with the other ring the two Interaction Regions (IRs), where the central beam trajectory passes off-axis in all magnetic elements and intersects the opposite beam trajectory at the IP, with a nominal half crossing angle of 12.5 mrad.

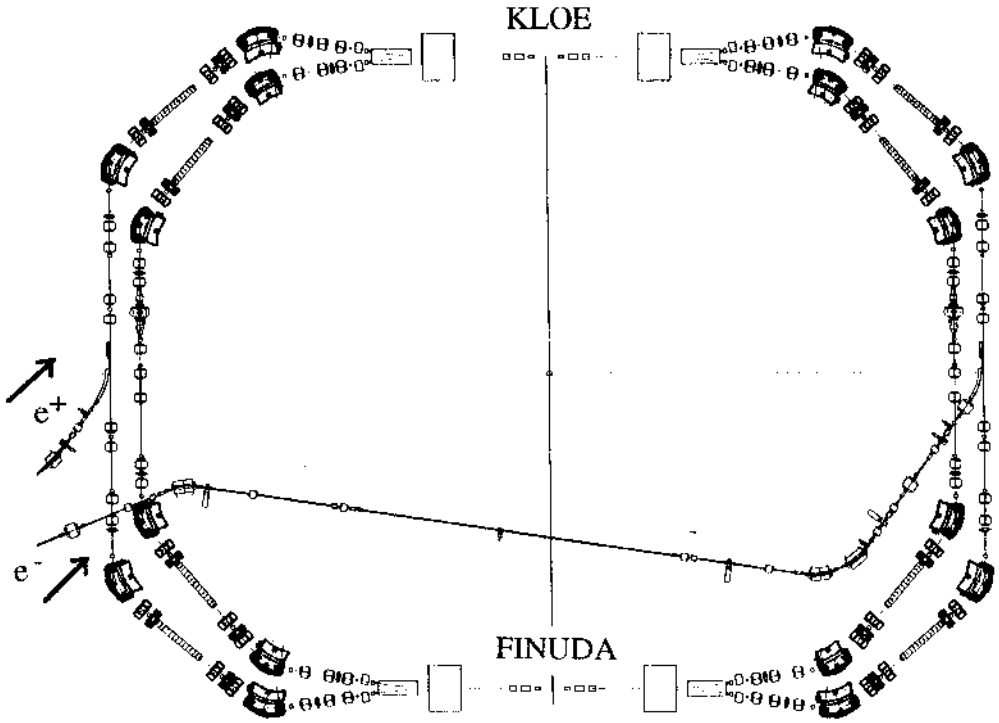

Fig. 1 - DAΦNE layout

The crossing half angle can be changed from 10 to 15 mrad tuning the splitter field and switching on an horizontal correcting dipole placed near the splitter[2] .

Two experiments will be installed in the two DAΦNE IRs: KLOE[3] and FINUDA[4]. Their size and magnetic fields deeply interfere with the machine structure. The mechanical constraints on the size and position of the low-β quadrupoles are faced with permanent magnet quadrupoles. Due to the relatively low particle energy the solenoidal fields of the experimental detectors strongly influence the beam dynamics. The two detectors having different geometry and parameters the machine has no symmetry.

The commissioning will be accomplished without solenoids and with electromagnetic quadrupoles for the low-β triplet.

To work with different IR configurations an approach which we have defined *transparency* has been adopted in the ring design: the structure of the regular lattice, the **arcs**, remains as much as possible unchanged whatever is the experiment or the magnetic structure in the two IRs because the IR designs have almost the same transfer matrix and are easily interchangeable. Almost the same phase advance between sextupoles is kept in all the different lattices, in order to have similar sextupole configurations and dynamic apertures even with different chromaticities.

In all the IRs there is the possibility to create a vertical orbit bump and separate the two beams. This can be used at injection, for more than 30 bunches, in order to avoid the beam-beam interaction at the parasitic crossings. Moreover, when only one experiment is running, the beams can be separated at the other IP to optimize the luminosity.

The optical functions in the short and in the long arcs are plotted in Figs. 2a and 2b.

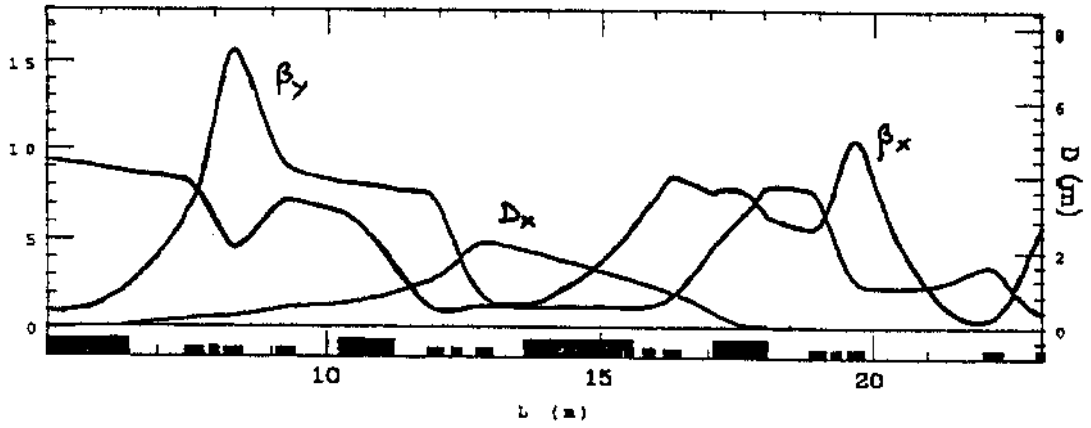

Fig. 2a - Optical functions in the short arc

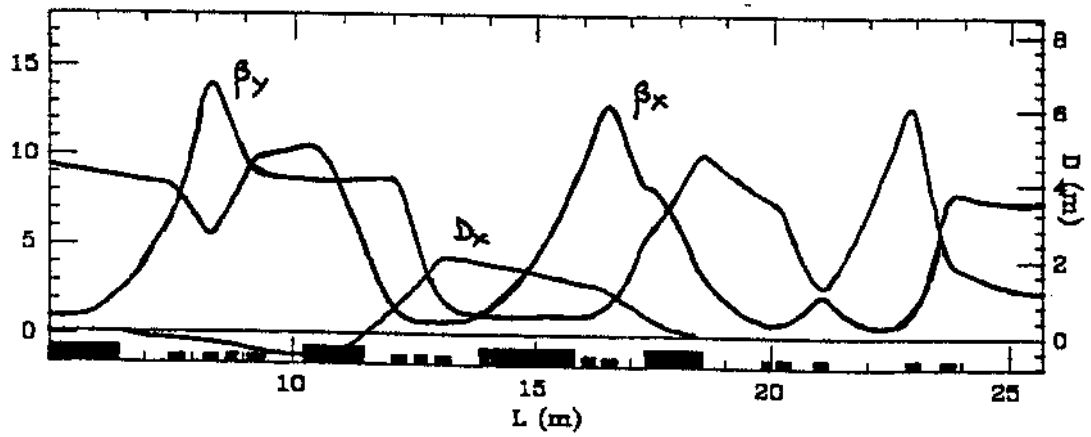

Fig 2b.- Optical functions in the long arc

In Section 2 the IR designs are described. In Section 3 the different lattice configurations are listed with their main features. In Table I the DAΦNE single ring parameters are summarized.

TABLE I *- DAΦNE single ring parameters list*

Energy (MeV)		510.
Circumference (m)		97.69
Dipole bending radius (m)		1.4
Wiggler bending radius (m)		0.94
Wiggler length (m)		2.0
Momentum compaction		.0059
Energy loss/turn (keV):	Bend. magnets	4.27
	Wigglers	4.96
	Total	9.3
Damping times (msec):	τ_s	17.8
	τ_x	36.02
	τ_y	35.73
Natural emittance (m rad)		10^{-6}
Natural relative rms energy spread		$3.97\ 10^{-4}$
Natural bunch length σ_z (cm)		.48
Turbulent bunch length σ_z (cm)	@ Z/n = 1 Ω	3.0
Turbulent rms energy spread	@ Z/n = 1 Ω	10^{-3}
RF frequency (MHz)		368.25
RF harmonic number		120
Maximum number of particle/bunch		9.10^{10}
Maximum bunch peak current (A)		57
Maximum total average current (A)		5.3
Maximum synchrotron power/beam (kW)		49
V_{RF} (kV)		254
Parasitic losses (keV/Ω)	@ σ_z = 3 cm	7

2. INTERACTION REGIONS

Three IR configurations have been designed: KLOE, FI.NU.DA., and the commissioning (DAY-ONE). The FI.NU.DA. IR has been designed on the basis of a preliminary scheme of the experiment. All the IRs have at the IP β_x = 4.5 m and β_y = 0.045 m.

Recently it has been suggested to use four of the old ADONE quadrupoles for the DAY-ONE configuration. They could be placed as the third quadrupole of each triplet, with respect to the IP, as their dimensions and maximum gradients fit all the requirements. A version of this lattice with the ADONE quadrupole has been designed (DAY-ONE ADONE), and a detuned version, i.e. without low-β, has been also computed. For this option the transparency criterion is of course not completely fulfilled.

The KLOE and FI.NU.DA. IRs have similar magnetic structures, since the total integrated field of the detector will be the same, so they have been designed to have the same first order transfer matrix in both planes. At the splitter entrance the beam central trajectory and angle (Δx, $\Delta x'$), the phase advances from the IP ($\delta Q_{x,y}$) and the optical functions ($\alpha_{x,y}$, $\beta_{x,y}$) coincide (see Table II). The dispersion and its slope, created since the main trajectory passes off-axis in the magnetic elements, are slightly different and are matched in the arcs. They are computed as derivatives of two trajectories at different energies. The optical functions are of course different inside the IR but they are nearly the same in the arcs. The chromaticity also is slightly different for KLOE or FI.NU.DA. and the sextupole strengths will be readjusted to optimize the dynamic aperture switching from one experiment to the other.

In Table II the main parameters of the IR designs are listed. In Table III the transfer matrices from the IP to the IR end are reported.

TABLE II - *Interaction Region main parameters summary*

	KLOE	**FI.NU.DA.**	**DAY-ONE**	**DAY-ONE ADONE**	**DAY-ONE ADONE Detuned**
@ IP					
β_X (m)	4.5	4.5	4.5	4.5	8.78
β_y (m)	0.045	0.045	0.045	0.045	8.0
@ Splitter entrance					
β_X (m)	9.385	9.385	9.640	9.147	6.765
α_X	.256	.256	.264	.248	-.326
δQ_X	.129	.129	.126	.131	.128
D_X(m)*	-.035	-.037	-.040	-.033	-.003
D'_X *	-.020	-.021	-.020	-.018	0.0
β_y (m)	1.000	1.000	1.107	1.255	6.923
α_y	.374	.374	.445	.557	.167
δQ_y	.412	.412	.389	.374	.093
Δx (mm) *	58.75	58.75	58.75	58.75	69.30
$\Delta x'$ (mrad) *	4.375	4.375	4.375	4.375	13.23
C_X	-.5	-.6	-.4	-.3	-.1
C_y	-2.7	-2.5	-3.4	-3.5	-.1

* for a half crossing angle θ = 12.5 mrad

N.B.: The D_X and D'_X are negative entering the SHORT and positive entering the LONG.

TABLE III - Half IR first order transfer matrices

KLOE IR

Horizontal		*Vertical*	
0.9974	4.6999	-4.0137	0.1113
-0.1385	0.3500	-0.9720	-0.2222

FINUDA IR

Horizontal		*Vertical*	
0.9973	4.7000	-4.0137	0.1113
-0.1385	0.3499	-0.9721	-0.2222

DAY ONE IR

Horizontal		*Vertical*	
1.0253	4.7000	-3.7949	0.1436
-0.1364	0.3500	-1.3572	-0.2121

DAY ONE ADONE

Horizontal		*Vertical*	
0.9704	4.7000	-3.7133	0.1689
-0.1405	0.3500	-1.3445	-0.2081

DAY ONE ADONE DETUNED

Horizontal		*Vertical*	
0.6101	5.5439	0.7755	4.1104
-0.0639	1.0587	-0.0929	0.7968

2.1. KLOE

The magnetic field of the KLOE detector solenoid (B_z = 0.6 T) is extended for a length of ±2.10 m around the IP (total integrated field 2.56 T m). Since a very large solid angle is required for the experiment, the machine components must be installed within a cone of 9° maximum half-aperture. The low-β is obtained with a permanent magnet quadrupole triplet on each side at a distance of 46 cm from the IP, immersed in the solenoidal field. A compensation scheme of new conception[5] has been adopted to locally decouple the transverse planes, consisting of rotation of the low-β quadrupoles and two compensating solenoids.

To cancel the coupling the total field integral along the trajectory must be zero. Two compensating superconducting solenoids, placed on each side of the detector, will produce a total magnetic field integral equal in magnitude but opposite in sign with respect to the detector. The quadrupoles will be rotated, following the rotation in the (x-y) plane due to the longitudinal detector field B_z, by the angle:

$$\theta(z) = \int \frac{B_z}{2B\rho}\, dz$$

where the integral is performed from the IP to the quadrupole longitudinal position z. This means that each quadrupole should actually be rotated as a helix; since this solution is technically difficult to realize, each quadrupole is rotated as a whole, by the average angle. To eliminate the small residual coupling, due to this approximation, three independent supplementary rotations plus a correction in the compensator field (which can be seen as an angle $\delta\theta_c$) will be applied.

The complete IR layout, proceeding from the left to the right side of KLOE, is as follows:

- a compensator, rotating the phase plane by $-(\theta_c + \delta\theta_c)$
- three quadrupoles, rotated by $-(\theta_i + \delta\theta_i)$
- the IP
- three quadrupoles, rotated by $(\theta_i + \delta\theta_i)$
- a compensator, rotating the phase plane by $-(\theta_c + \delta\theta_c)$.

Superimposed is the KLOE solenoidal field that rotates the normal modes by $2\theta_c$. To take into account the fringing fields each solenoid is simulated as 3 uniform solenoids: a central one with the maximum field and the two 0.3 m long on both sides with a half field.

The main characteristics of the IR elements, including the rotation angles, are listed in Table IV. In Fig 3 is a sketch of the KLOE IR.

TABLE IV *- KLOE IR elements for half insertion*

Element	Length (m)	Position (m from IP)	K2 (m-2)	B (T)	θ (deg)	dθ (deg)
KLOE solenoid	0.460	0.000		0.6		
Q1 + KLOE solenoid	0.200	0.460	3.483964	0.6	+ 5.66°	+ 0.31°
KLOE solenoid	0.170	0.660		0.6		
Q2 + KLOE solenoid	0.350	0.830	-6.049274	0.6	+ 10.15°	+ 0.02°
KLOE solenoid	0.150	1.180		0.6		
Q3 + KLOE solenoid	0.270	1.330	3.101060	0.6	+ 14.80°	+ 0.27°
KLOE solenoid	0.350	1.600		0.6		
KLOE solenoid	0.300	1.950		0.3		
Drift	1.205	2.250				
Compensator	0.300	3.455		0.7438		
Compensator	0.540	3.755		1.4876	- 21.22°*	+ 0.18°*
Compensator	0.300	4.295		0.7438		
Drift	0.455	4.595				

* Corresponds to the total compensator rotation angle

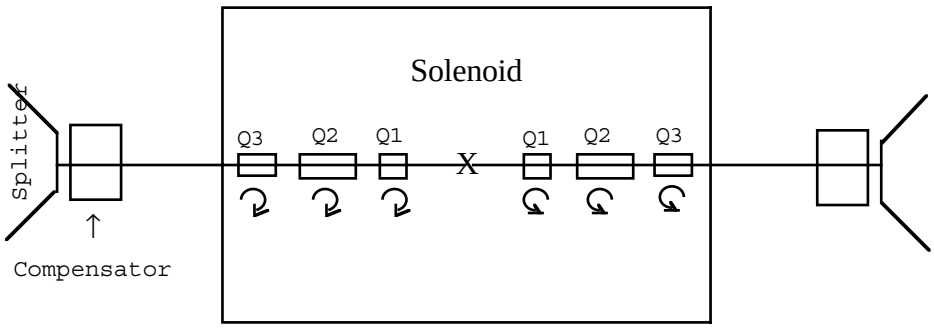

Fig . 3 - KLOE layout

The optical functions and the beam horizontal half separation for 12.5 mrad crossing half angle in half IR are plotted in Fig. 4. The optical functions are computed in a frame following the rotation of the normal betatron modes.

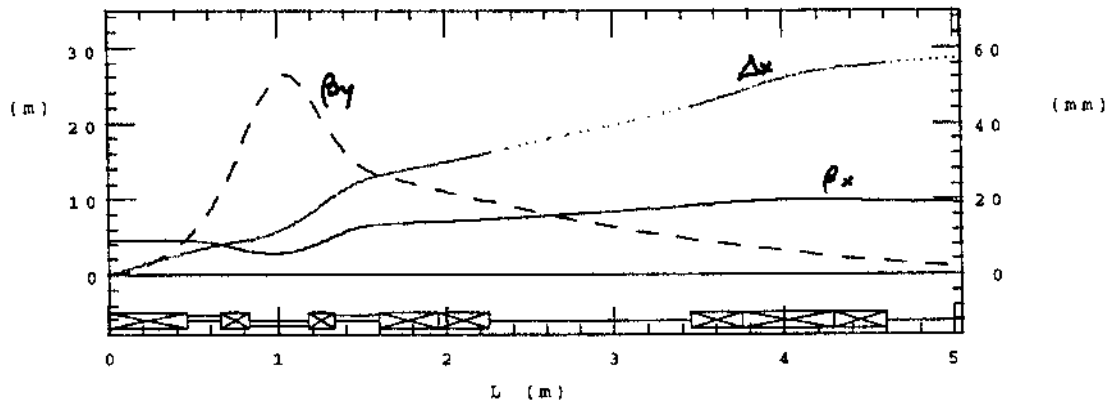

Fig . 4 - KLOE IR optical functions and beam trajectory

2.2. FI.NU.DA.

The preliminary characteristics of the FI.NU.DA. detector are a magnetic field of 1.5 T for a total length of about 2 m, so the integrated magnetic field, 3 T m, is of the same order of KLOE's one and the lattice design is very similar.

The last quadrupole of each triplet is placed outside the detector. The solid angle required by the detector will be much smaller than in KLOE, so leaving more space to the machine components.

The total first order transport matrix of the FI.NU.DA. IR is the same as the KLOE one (see Table III); to match this transparency criterion the compensator length has been used as free parameter, so that it results longer than the one in KLOE IR.

Table V summarizes the characteristics of the IR elements. Detector and compensator are represented, as in KLOE, by rectangular solenoids. Fig. 5 shows the IR layout and Fig. 6 the optical functions and the beam horizontal half separation for a half crossing angle of 12.5 mrad.

TABLE V *- FI.NU.DA. IR*

Element	**Length (m)**	**Position (m from IP)**	**K2 (m-2)**	**B (T)**	**θ (deg)**	**dθ (deg)**
FINUDA solenoid	0.460	0.000		1.5		
Q1 + FINUDA solenoid	0.200	0.460	2.565280	1.5	+ 14.15°	+ 0.14°
FINUDA solenoid	0.190	0.660		1.5		
Q2 + FINUDA solenoid	0.300	0.850	-6.190030	0.75	+ 23.37°	+ 0.13°
Drift	0.274	1.150				
Q3	0.200	1.424	3.302029		+ 25.26°	+ 0.41°
Drift	1.329	1.624				
Compensator	0.300	2.953		0.7491		
Compensator	0.696	3.253		1.4983	- 25.26°*	- 0.31°*
Compensator	0.300	3.949		0.7491		
Drift	0.801	4.249				

* Corresponds to the total compensator rotation angle

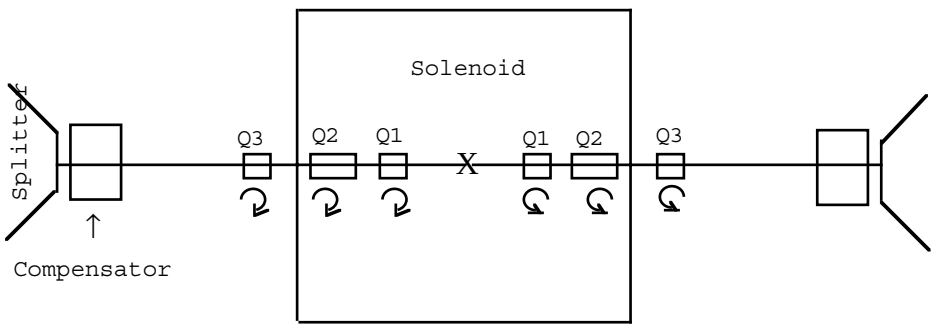

Fig . 5 - FI.NU.DA. layout

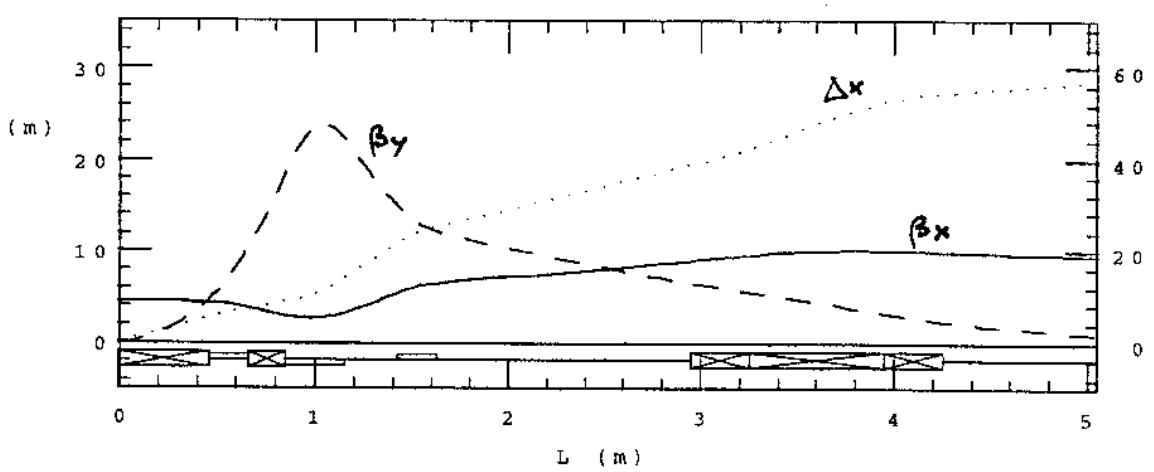

Fig 6- FI.NU.DA. IR optical functions and beam trajectory

2.3. DAY-ONE

For the machine commissioning a symmetric configuration of the two IRs has been adopted, with electromagnetic quadrupoles which can be tuned to optimize the beam sizes at the IP and the luminosity.

The DAY-ONE IR has no solenoids. The horizontal separation at the splitter entrance is the same as the previous lattices, while the IR transport matrix is slightly different, with beta functions and phase advances very similar to the KLOE and FI.NU.DA. ones (see Table II).

In Table VI is the lattice structure of the DAY-ONE IR. For the three quadrupoles the radius of the equivalent gradient bending magnet, used to simulate the off-axis trajectory at 12.5 mrad, is also given. The optical functions are shown in Fig. 7. In Table VII the DAY-ONE ADONE IR characteristics are shown. The quadrupole strengths for the detuned version are also given. As shown in Table I for the detuned IR the beam separation at the splitter entrance is different from the other IR's, so a small angle (5 mrad) in the corrector after the splitter is necessary to bring the trajectory on axis.

TABLE VI *- DAY-ONE IR*

Element	**Length (m)**	**Position (m from IP)**	**K^2 (m^{-2})**	**ρ eq (m)**
Drift	0.150	0.000		
Q1	0.300	0.150	0.97243	277.25
Drift	0.710	0.450		
Q2	0.300	1.160	-4.60014	13.32
Drift	0.620	1.460		
Q3	0.300	2.080	2.19612	10.14
Drift	2.670	2.380		

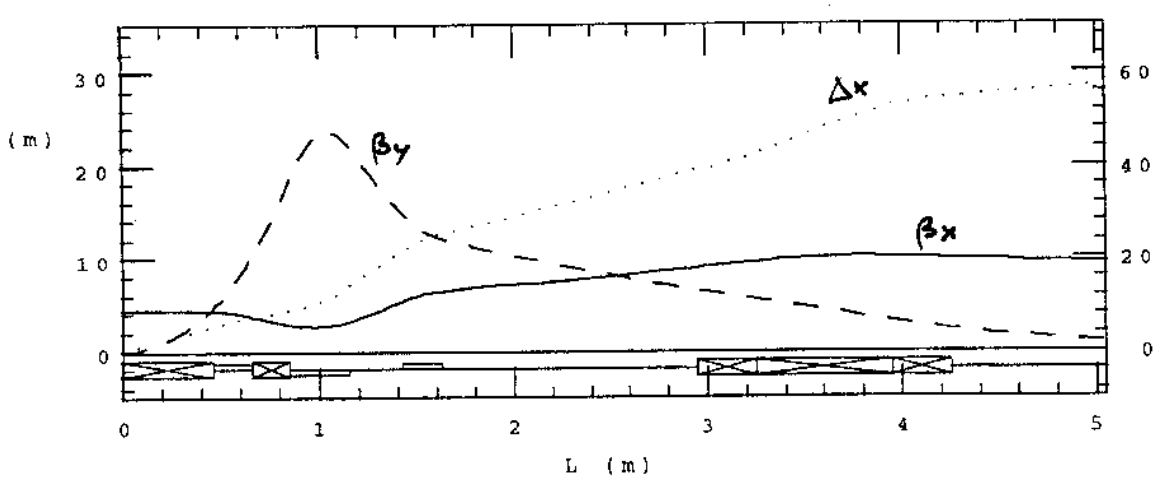

Fig. 7 - Day-One IR optical functions and beam trajectory

***TABLE VII** - DAY-ONE ADONE IR*

Element	**Length (m)**	**Position (m from IP)**	**K^2 (m^{-2})**	**ρ eq (m)**
Drift	0.170	0.000		
Q1	0.300	0.170	1.015843 (0.877372*)	248.99 (359.80*)
Drift	0.710	0.470		
Q2	0.300	1.180	-4.619404 (-1.403966*)	13.15 (55.97*)
Drift	0.490	1.480		
Q3	0.532	1.970	1.280745 (0.293000*)	17.89 (135.03*)
Drift	2.548	2.502		

* Detuned IR

3. DAΦNE RING CONFIGURATIONS

The different ring configurations which have been studied in more detail are listed below. Total tunes and phase advances for half-short and half-long, chromaticities, momentum compaction, number of sextupole families are listed in Table VIII for each lattice. For the asymmetric lattice (D17) the phase advances for the two different half-short and half-long sections are given.

In Appendix A a list of the optical functions and a table of the lattice elements and in Appendix B the dynamic apertures and the sextupole strengths are given.

TABLE VIII - *General characteristics of DAΦNE configurations*

	D13	**D14**	**D15**	**D16**	**D17**
Q_x	5.18	5.18	5.18	5.18	5.18
Q_y	6.15	6.15	6.15	4.15	5.15
$\delta Q_x^{(hshort)*}$	1.17	1.17	1.17	1.17	1.17
$\delta Q_y^{(hshort)*}$	1.569	1.569	1.569	1.069	1.069
$\delta Q_x^{(hlong)*}$	1.42	1.42	1.42	1.42	1.414 /1.426
$\delta Q_y^{(hlong)*}$	1.506	1.506	1.506	1.006	1.009/1.003
C_x	-9.3	-9.2	-9.0	-7.9	-9.3
C_y	-23.0	-19.6	-20.0	-8.6	-14.3
α_c	.0059	.0059	.0059	.0053	.0060
NF_{sex}	8	7	7	6	6

***** From IP to arc symmetry point.

D13: *the DAY-ONE*

This lattice is dedicated to the commissioning phase. It is symmetric with respect to the axis intercepting the injection straight section (LONG) and the central quadrupole of the SHORT. The low-β quadrupoles are conventional. The IRs are the DAY-ONE described above.

The dynamic aperture[6] using 8 sextupole families is quite good for off-energy particles also, the smallest being at +1%. The dynamic apertures with systematic and random errors have been also computed [7,8].

The dynamic aperture sensitivity to quadrupole gradient errors has been checked. Several machines have been simulated assuming different sets of gradient errors, belonging to a Gaussian distribution, in all machine quadrupoles including the low-β triplets. A value of 6×10^{-4} [T/m] has been used as sigma of the gradient distribution. No substantial variations of the dynamic aperture have been observed.

An analysis of the orbit distortions due to magnet displacements, rotations and field errors has been carried out using the computer code MAD[9]. Ten different machines have been simulated using the following errors (rms):

displacement $\Delta x = \Delta y$	0.15 mm
rotation $\Delta\theta = \Delta\phi$	0.5 mrad
error field $\Delta B/B$	5×10^{-4}

In each ring there are 54 monitors (horizontal and vertical), 22 horizontal correctors and 30 vertical ones, including those used to create a vertical orbit bump at the IP. The layout of monitors and correctors is shown in Appendix C.

The residual maximum orbit distortion after the correction along the machine is reported in Table IX, for both transverse planes, together with the corresponding corrector strengths:

TABLE IX - *Residual orbit after correction and corrector strengths*

X_{max}(mm)	0.98 ± .35	X_{rms}(mm)	0.23 ± .08
Y_{max}(mm)	0.88 ± .53	Y_{rms}(mm)	0.21 ± .10
Θx_{max}(mrad)	1.33 ±.53	Θx_{rms}(mrad)	0.49 ±.12
Θy_{max}(mrad)	0.93± .53	Θy_{rms}(mrad)	0.37 ± .21

D14: ***KLOE + FI.NU.DA.***

This lattice has the two experiments in the IRs. The arc lattice is nearly symmetric, with small differences due to the different dispersion behaviour in KLOE and FI.NU.DA. The tunes are the same as D15 and D13.

The dynamic aperture[10] is practically the same as the D15 lattice.

D15: ***two interaction regions with KLOE***

This lattice is symmetric. A study of the dynamic aperture has shown that a horizontal phase advance between the arc sextupoles (SD and SF) closer to 180° gives better results. The largest possible phase advance is 110° in the SHORT and 130° in the LONG.

The dynamic aperture[10] with 7 sextupole families is good. A study with systematic and random errors has also been performed[7,8] and shows satisfactory results.

A version of this lattice with a lower horizontal tune and the same emittance has also been studied. No dynamic aperture studies have been performed yet.

D16: ***detuned DAY-ONE***

A detuned version of the DAY-ONE ADONE lattice has been designed for early commissioning. It is a symmetric lattice with high beta values at the IP. This lattice has been designed with the same phase advance between sextupoles as in the D13 except for the two IRs where the vertical tune is lower by one integer due to the higher β_y value. Therefore the vertical tune is 2 integers lower and the vertical chromaticity is much lower than the DAY-ONE lattice.

The dynamic aperture[10] with 6 sextupole families is quite large for off-energy particles too.

D17: *KLOE + detuned*

This configuration has the KLOE IR on one side and the detuned IR (no low-β) on the other. It might be adopted if only one experiment is running: the beams would be separated in vertical to avoid crossing in the detuned insertion.

The dynamic aperture[10] is large for particles with $\Delta p/p = 0$ and +1%, while is slightly smaller, but always larger than $10\sigma_x$ for particles with a $2\sigma_y$ vertical amplitude, for $\Delta p/p$=-1%.

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APPENDIX A.1.a

D13 Half-short optical functions and lattice elements

NL	TYP	BETX	ALFX	BETY	ALFY	DX	DPX	MUX	MUY	dy	dpy
0	0	4.3000	0.0000	3.0450	0.1034	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1	2	4.3050	-5.0554	3.4889	-3.3353	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	4	4.3851	1.3455	4.7743	-11.1836	-0.000176	-0.000138	0.026175	0.233938	0.000000	0.000000
3	1	[illegible]	0.7550	33.0883	-34.8043	-0.000349	-0.000138	0.049838	0.243733	0.500000	0.000000
4	4	4.0391	-7.7834	37.3834	30.8038	0.001554	0.000948	0.065478	0.243943	0.000000	0.000000
5	2	9.5597	-6.4375	34.9831	13.4567	0.031886	0.530755	0.083944	0.348434	0.000000	0.000000
6	4	11.4417	0.5564	31.4893	3.3505	0.052488	-0.520878	0.388188	0.352165	0.300000	0.000000
7	1	5.8431	0.3441	1.1060	0.8451	-0.340548	-0.520078	0.136147	0.390935	0.000000	0.000000
8	4	8.6988	0.3481	2.8683	-1.1137	0.343433	0.133948	0.153329	0.598486	0.000000	0.000000
9	1	8.7269	0.3014	3.1087	-2.5408	0.353367	0.153848	0.158331	0.613981	0.000033	0.300098
10	1	8.7267	0.3014	3.1037	3.5408	0.383367	0.113319	0.158301	0.613981	0.000033	0.300098
11	1	8.6254	0.1716	3.0383	-3.4588	0.134476	0.133848	0.192856	0.635325	0.000000	0.000000
12	1	8.4354	0.5726	3.3381	-3.8388	0.134488	0.135948	0.192486	0.625325	0.000000	0.000000
13	1	8.5213	0.1284	5.4518	-3.8368	0.174341	0.133918	0.168888	0.493328	0.000000	0.000000
14	3	7.4418	3.3217	4.7888	-5.8158	0.383433	0.493693	0.175589	3.489188	1.000000	0.000000
15	1	6.3439	3.8788	12.8788	-1.5432	0.353088	0.493483	0.185959	4.663308	0.000000	0.000000
16	3	4.7189	-3.4733	13.8865	4.3459	0.378518	0.988875	0.198145	3.888558	4.000000	0.000000
17	1	8.3345	-3.8075	12.5354	1.8741	0.333068	0.858875	3.303501	3.863496	0.000000	0.000000
18	1	3.9848	-3.7435	10.7865	9.4899	0.373988	0.858875	3.308135	3.640777	0.000000	3.000000
19	1	4.7305	-3.8771	9.7155	3.4353	0.488968	3.259875	3.318150	0.881573	0.000000	3.000000
20	2	7.1301	6.8958	8.3057	3.3659	3.488404	3.300398	3.337520	0.868583	0.000000	0.000000
21	1	8.4688	6.5561	7.8875	0.3554	3.560739	5.300088	3.330883	0.885816	0.000000	0.000000
22	4	3.1919	3.2562	7.6788	9.0985	3.083359	3.465780	3.369788	0.768343	0.000000	0.000000
23	1	6.5989	3.1705	7.6888	9.0877	3.313731	3.465780	3.314856	0.728184	0.000000	0.000000
24	3	6.0255	0.0948	4.8888	8.3719	3.345043	3.343558	0.351883	0.734277	0.000000	0.000000
25	1	1.0138	-6.1555	4.8548	8.8878	3.433543	3.348888	0.389384	0.730543	0.000000	0.000000
26	1	1.0134	-6.1556	4.8148	5.5936	3.813543	3.343558	0.388384	0.730587	0.000000	0.000000
27	1	1.3841	-8.5183	3.8833	2.4338	3.319880	3.342588	0.488831	0.749318	0.000000	0.000000
28	1	1.1549	0.2393	1.9881	3.5519	3.384396	-0.407740	0.483888	0.774958	0.500000	0.000000
29	1	1.3481	-8.3595	1.7337	0.8533	3.003550	-0.407740	0.495564	0.888935	0.300000	0.000000
30	1	1.3481	-8.2465	1.7337	0.0656	3.003550	-0.385881	0.598564	0.886935	0.500000	0.000000
31	4	1.3859	-8.8788	1.1863	-6.8813	1.962537	-0.387843	0.584488	0.857578	0.300000	0.300000
32	3	1.1399	-1.2318	1.1485	0.0331	1.988577	-0.385333	0.588888	0.857579	0.580088	0.300000
33	3	1.3399	-8.3332	1.3985	0.8381	1.993537	-0.330838	0.588838	0.857578	0.300000	0.300000
34	4	1.4144	-8.2838	1.1888	0.1058	1.888738	0.347339	0.583888	0.883917	0.500000	0.300000
35	3	1.4144	-8.3333	1.1888	0.8333	3.888375	-0.333738	0.584388	0.883915	0.588833	0.380000
36	3	1.4144	-3.3558	1.3888	0.8465	1.888733	-0.388588	0.888388	0.863939	0.000000	0.330000
37	4	1.4535	-3.7894	1.3988	-0.3313	3.844583	-0.383165	0.378361	0.837695	0.088033	0.300000
38	3	1.4755	-3.3888	1.3848	-0.3678	1.344543	-0.388837	0.378291	0.873686	0.000000	0.385035
39	3	1.4755	-3.4835	1.1748	0.1856	3.944543	-0.388365	0.378291	0.873636	0.000000	0.358035
40	4	1.5385	-3.4833	1.3933	-0.3815	3.920381	-0.388183	0.588788	3.888395	0.038000	0.085000
41	3	1.5385	-3.4886	1.1933	-0.0481	3.920381	-0.388758	0.588743	3.888385	0.005000	0.000000
42	3	1.5385	-0.5814	1.5933	0.5881	1.920381	-0.188517	0.588743	3.888385	3.008000	0.000000
43	4	1.7017	-0.4198	1.3013	-0.3743	1.853378	-0.888175	0.655881	3.993434	0.000000	0.000000
44	3	1.7017	0.5733	1.5014	0.0343	1.853378	-0.883387	0.693883	3.935886	0.000000	0.088000
45	3	1.7017	-0.3935	1.3013	0.8817	1.853178	-0.893355	0.603388	3.905834	3.003888	0.000000
46	4	1.7988	-0.4387	1.1593	-0.6144	1.813955	-0.588935	0.608785	3.918384	3.005888	0.000000
47	3	1.7988	-0.8188	3.1983	-0.8258	1.853938	-0.535428	0.888888	3.903384	3.000000	0.000000
48	3	1.7988	-0.8883	1.1593	0.0377	1.853938	-0.515321	0.888888	3.935384	0.000000	0.000000
49	3	3.8853	-0.6133	3.3038	-3.8888	1.773848	-0.517649	0.838883	3.938837	0.000000	0.000000
50	3	3.8858	-0.8988	3.3088	-3.8887	1.773848	-0.435577	0.838885	0.938837	0.000000	0.000000
51	3	3.4853	-0.8788	3.8888	3.0539	1.773838	-0.338838	0.838885	0.938837	0.000000	0.000300
52	4	3.1838	-0.8395	3.3087	-3.8788	1.707455	-0.838783	0.839888	0.948318	0.000000	0.000000
53	3	3.1838	-0.8338	3.8887	3.8838	1.707455	-0.338738	0.839888	0.948318	0.000000	0.000000
54	3	3.1438	-0.8878	3.7087	3.0544	1.707455	-0.383838	0.839883	0.948215	0.300000	0.588000
55	4	3.7883	-0.8883	3.3838	-0.0138	1.888383	-0.359174	0.835033	0.558883	0.300055	0.850000
56	3	3.7883	-0.8888	3.3838	3.0033	1.883343	-0.388337	0.835035	0.458833	0.380000	0.880000

57	3	2.2862	-0.9117	1.2018	0.0114	1.683263	-0.261299	0.635025	0.958835	0.000000	0.000000
58	4	2.4334	-0.9213	1.2054	-0.0554	1.659071	-0.341403	0.640441	0.969457	0.000000	0.000000
59	3	2.4334	-0.9487	1.2054	-0.0418	1.659071	-0.312738	0.640441	0.969457	0.000000	0.000000
60	3	2.4334	-1.1682	1.2054	0.0669	1.659071	-0.173079	0.640441	0.969457	0.000000	0.000000
61	4	2.6088	-1.0111	1.2000	0.0000	1.635797	-0.406460	0.645506	0.980087	0.000000	0.000000
62	4	2.7565	-0.8248	1.2054	-0.0669	1.593898	-0.636906	0.650265	0.990717	0.000000	0.000000
63	3	2.7565	-1.0734	1.2054	0.0418	1.593898	-0.491127	0.650265	0.990717	0.000000	0.000000
64	3	2.7565	-1.1044	1.2054	0.0554	1.593898	-0.475195	0.650265	0.990717	0.000000	0.000000
65	4	2.9338	-1.1031	1.2018	-0.0114	1.552623	-0.553095	0.654756	1.001339	0.000000	0.000000
66	3	2.9338	-1.1361	1.2018	0.0021	1.552623	-0.535628	0.654756	1.001339	0.000000	0.000000
67	3	2.9338	-1.1691	1.2018	0.0156	1.552623	-0.518160	0.654756	1.001339	0.000000	0.000000
68	4	3.1211	-1.1636	1.2047	-0.0512	1.511347	-0.510130	0.658977	1.011964	0.000000	0.000000
69	3	3.1211	-1.1987	1.2047	-0.0376	1.511347	-0.493127	0.658977	1.011964	0.000000	0.000000
70	3	3.1211	-1.4803	1.2047	0.0711	1.511347	-0.356794	0.658977	1.011964	0.000000	0.000000
71	4	3.5241	-1.0056	1.2034	-0.0629	1.446175	-0.453192	0.666647	1.033247	0.000000	0.000000
72	3	3.5241	-1.3235	1.2034	0.0457	1.446175	-0.322738	0.666647	1.033247	0.000000	0.000000
73	3	3.5241	-1.3631	1.2034	0.0592	1.446175	-0.306468	0.666647	1.033247	0.000000	0.000000
74	4	3.7415	-1.3440	1.1992	-0.0077	1.421983	-0.296234	0.670165	1.043890	0.000000	0.000000
75	3	3.7415	-1.3861	1.1992	0.0058	1.421983	-0.280237	0.670165	1.043890	0.000000	0.000000
76	3	3.7415	-1.4282	1.1992	0.0193	1.421983	-0.264239	0.670165	1.043890	0.000000	0.000000
77	4	3.9690	-1.4041	1.2015	-0.0477	1.397790	-0.338463	0.673479	1.054540	0.000000	0.000000
78	3	3.9690	-1.4488	1.2015	-0.0342	1.397790	-0.322738	0.673479	1.054540	0.000000	0.000000
79	3	3.9690	-1.8068	1.2015	0.0742	1.397790	-0.196648	0.673479	1.054540	0.000000	0.000000
80	4	4.4518	-1.1719	1.1993	-0.0601	1.332618	-0.613337	0.679529	1.075889	0.000000	0.000000
81	3	4.4518	-1.5735	1.1993	0.0461	1.332618	-0.493127	0.679529	1.075889	0.000000	0.000000
82	3	4.4518	-1.6236	1.1993	0.0615	1.332618	-0.478134	0.679529	1.075889	0.000000	0.000000
83	4	4.7094	-1.5832	1.1948	-0.0056	1.291343	-0.550156	0.682319	1.086569	0.000000	0.000000
84	3	4.7094	-1.6362	1.1948	0.0078	1.291343	-0.535628	0.682319	1.086569	0.000000	0.000000
85	3	4.7094	-1.6892	1.1948	0.0212	1.291343	-0.521100	0.682319	1.086569	0.000000	0.000000
86	4	4.9770	-1.6428	1.1968	-0.0460	1.250067	-0.507190	0.684957	1.097261	0.000000	0.000000
87	3	4.9770	-1.6988	1.1968	-0.0325	1.250067	-0.493127	0.684957	1.097261	0.000000	0.000000
88	3	4.9770	-1.8108	1.1968	-0.0056	1.250067	-0.464999	0.684957	1.097261	0.000000	0.000000
89	4	5.1146	-1.6151	1.1985	-0.0391	1.231135	-0.478327	0.686222	1.102595	0.000000	0.000000
90	3	5.1146	-1.7302	1.1985	-0.0121	1.231135	-0.450626	0.686222	1.102595	0.000000	0.000000
91	3	5.1146	-1.7877	1.1985	0.0013	1.231135	-0.436775	0.686222	1.102595	0.000000	0.000000
92	4	5.3973	-1.7321	1.2037	-0.0656	1.196680	-0.421588	0.688653	1.113239	0.000000	0.000000
93	3	5.3973	-1.7928	1.2037	-0.0521	1.196680	-0.408125	0.688653	1.113239	0.000000	0.000000
94	1	6.2436	-1.9685	1.2693	-0.2395	1.104852	-0.408125	0.694824	1.142372	0.000000	0.000000
95	1	6.2436	-1.9685	1.2693	-0.2395	1.104852	-0.408125	0.694824	1.142372	0.000000	0.000000
96	1	7.8297	-2.2613	1.5661	-0.5519	0.951806	-0.408125	0.703364	1.185218	0.000000	0.000000
97	2	8.3002	0.7529	2.1849	-1.5879	0.778270	-0.737839	0.709177	1.211642	0.000000	0.000000
98	1	7.4647	0.6396	4.6705	-2.5549	0.335567	-0.737839	0.721320	1.241714	0.000000	0.000000
99	3	7.4647	-1.3266	4.6705	-1.3247	0.335567	-0.649448	0.721320	1.241714	0.000000	0.000000
100	4	6.4573	2.1688	7.8715	-1.9086	0.000000	0.000000	0.742232	1.267817	0.000000	0.000000
101	3	6.4573	0.4679	7.8715	0.1648	0.000000	0.000000	0.742232	1.267817	0.000000	0.000000
102	1	6.1935	0.4113	7.7843	0.1257	0.000000	0.000000	0.749785	1.273918	0.000000	0.000000
103	1	6.0744	0.3830	7.7495	0.1061	0.000000	0.000000	0.753677	1.276992	0.000000	0.000000
104	1	5.8616	0.3263	7.6976	0.0670	0.000000	0.000000	0.761681	1.283175	0.000000	0.000000
105	3	5.8964	-4.0004	6.2473	4.4442	0.000000	0.000000	0.769446	1.289838	0.000000	0.000000
106	1	10.4912	-6.9866	3.2234	3.1155	0.000000	0.000000	0.776933	1.304043	0.000000	0.000000
107	2	10.5226	4.8916	2.2934	0.2648	0.000000	0.000000	0.781271	1.322465	0.000000	0.000000
108	1	0.4791	-0.3675	3.4174	-0.7711	0.000000	0.000000	1.055234	1.468202	0.000000	0.000000
109	3	1.1320	-2.0147	2.9364	2.2168	0.000000	0.000000	1.125500	1.482577	0.000000	0.000000
110	1	5.2928	-4.7596	0.9731	0.9797	0.000000	0.000000	1.165868	1.541761	0.000000	0.000000
111	2	6.0393	0.0000	0.8322	0.0000	0.000000	0.000000	1.170000	1.569000	0.000000	0.000000

MOMENTUM COMPACTION = 0.2342D-01
D = 0.6614D-01
ENERGY SPREAD = 0.3916D-03
RADIAL EMITTANCE = 0.1000D-05

I	TY	LENGTH	DL	STRENGTH	ANGLE
1	1	0.150	0.150	0.000000	0.000000
2	4	0.450	0.300	-66965.0154	-0.001142
3	1	1.160	0.710	0.000000	0.000000
4	4	1.460	0.300	1016.3271	0.020175
5	1	2.080	0.620	0.000000	0.000000
6	4	2.380	0.300	-224.8426	-0.029574
7	1	5.050	2.670	0.000000	0.000000
8	4	6.500	1.450	0.000000	0.152705
9	1	6.875	0.375	0.000000	0.000000
10	1	6.875	0.000	0.000000	0.000000
11	1	7.125	0.250	0.000000	0.000000
12	1	7.125	0.000	0.000000	0.000000
13	1	7.500	0.375	0.000000	0.000000
14	2	7.800	0.300	1.387059	0.000000
15	1	8.200	0.400	0.000000	0.000000
16	3	8.500	0.300	-2.837979	0.000000
17	1	8.700	0.200	0.000000	0.000000
18	1	8.900	0.200	0.000000	0.000000
19	1	9.100	0.200	0.000000	0.000000
20	2	9.400	0.300	1.161403	0.000000
21	1	10.200	0.800	0.000000	0.000000
22	4	11.190	0.990	0.000000	0.706858
23	1	11.790	0.600	0.000000	0.000000
24	3	12.090	0.300	-2.089017	0.000000
25	1	12.290	0.200	0.000000	0.000000
26	1	12.290	0.000	0.000000	0.000000
27	1	12.690	0.400	0.000000	0.000000
28	2	12.990	0.300	2.460462	0.000000
29	1	13.590	0.600	0.000000	0.000000
30	3	13.590	0.000	-0.011250	0.000000
31	4	13.670	0.080	0.000000	0.042495
32	3	13.670	0.000	-0.011250	0.000000
33	3	13.670	0.000	-0.022501	0.000000
34	4	13.710	0.040	0.000000	0.042495
35	3	13.710	0.000	-0.022501	0.000000
36	3	13.710	0.000	-0.011250	0.000000
37	4	13.791	0.080	0.000000	0.042495
38	3	13.791	0.000	-0.011250	0.000000
39	3	13.791	0.000	-0.011250	0.000000
40	4	13.871	0.080	0.000000	-0.042495
41	3	13.871	0.000	-0.011250	0.000000
42	3	13.871	0.000	-0.090206	0.000000
43	4	14.031	0.161	0.000000	-0.169979
44	3	14.031	0.000	-0.090206	0.000000
45	3	14.031	0.000	-0.011250	0.000000
46	4	14.112	0.080	0.000000	-0.042495
47	3	14.112	0.000	-0.011250	0.000000
48	3	14.112	0.000	-0.011250	0.000000
49	4	14.192	0.080	0.000000	0.042495
50	3	14.192	0.000	-0.011250	0.000000
51	3	14.192	0.000	-0.090206	0.000000
52	4	14.353	0.161	0.000000	0.169979
53	3	14.353	0.000	-0.090206	0.000000
54	3	14.353	0.000	-0.011250	0.000000
55	4	14.433	0.080	0.000000	0.042495
56	3	14.433	0.000	-0.011250	0.000000
57	3	14.433	0.000	-0.011250	0.000000
58	4	14.513	0.080	0.000000	-0.042495
59	3	14.513	0.000	-0.011250	0.000000
60	3	14.513	0.000	-0.090206	0.000000
61	4	14.593	0.080	0.000000	-0.084989
62	4	14.674	0.080	0.000000	-0.084989
63	3	14.674	0.000	-0.090206	0.000000

64	3	14.674	0.000	-0.011250	0.000000
65	4	14.754	0.080	0.000000	-0.042495
66	3	14.754	0.000	-0.011250	0.000000
67	3	14.754	0.000	-0.011250	0.000000
68	4	14.834	0.080	0.000000	0.042495
69	3	14.834	0.000	-0.011250	0.000000
70	3	14.834	0.000	-0.090206	0.000000
71	4	14.995	0.161	0.000000	0.169979
72	3	14.995	0.000	-0.090206	0.000000
73	3	14.995	0.000	-0.011250	0.000000
74	4	15.075	0.080	0.000000	0.042495
75	3	15.075	0.000	-0.011250	0.000000
76	3	15.075	0.000	-0.011250	0.000000
77	4	15.155	0.080	0.000000	-0.042495
78	3	15.155	0.000	-0.011250	0.000000
79	3	15.155	0.000	-0.090206	0.000000
80	4	15.316	0.161	0.000000	-0.169979
81	3	15.316	0.000	-0.090206	0.000000
82	3	15.316	0.000	-0.011250	0.000000
83	4	15.396	0.080	0.000000	-0.042495
84	3	15.396	0.000	-0.011250	0.000000
85	3	15.396	0.000	-0.011250	0.000000
86	4	15.476	0.080	0.000000	0.042495
87	3	15.476	0.000	-0.011250	0.000000
88	3	15.476	0.000	-0.022501	0.000000
89	4	15.516	0.040	0.000000	0.042495
90	3	15.516	0.000	-0.022501	0.000000
91	3	15.516	0.000	-0.011250	0.000000
92	4	15.597	0.080	0.000000	0.042495
93	3	15.597	0.000	-0.011250	0.000000
94	1	15.822	0.225	0.000000	0.000000
95	1	15.822	0.000	0.000000	0.000000
96	1	16.197	0.375	0.000000	0.000000
97	2	16.497	0.300	1.258505	0.000000
98	1	17.097	0.600	0.000000	0.000000
99	3	17.097	0.000	-0.263408	0.000000
100	4	18.087	0.990	0.000000	0.706858
101	3	18.087	0.000	-0.263408	0.000000
102	1	18.387	0.300	0.000000	0.000000
103	1	18.537	0.150	0.000000	0.000000
104	1	18.837	0.300	0.000000	0.000000
105	3	19.137	0.300	-2.200184	0.000000
106	1	19.537	0.400	0.000000	0.000000
107	2	19.837	0.300	3.069875	0.000000
108	1	22.057	2.220	0.000000	0.000000
109	3	22.357	0.300	-3.216849	0.000000
110	1	22.971	0.614	0.000000	0.000000
111	2	23.121	0.150	5.764938	0.000000

APPENDIX A.1.b

D13 Half-long optical functions and lattice elements

EL.	TIP	BETX	ALFX	BETY	ALFY	DX	DPX	QX	QY
0	0	4.5000	0.0000	0.0450	0.0000	0.000000	0.000000	0.000000	0.000000
1	1	4.5050	-0.0333	0.5450	-3.3333	0.000000	0.000000	0.005303	0.203613
2	4	4.1613	1.1455	4.7713	-11.1620	0.000170	0.001125	0.016179	0.233836
3	1	2.8148	0.7510	33.8902	-29.8505	0.000969	0.001125	0.049438	0.242727
4	4	3.6193	-3.7924	37.1234	20.6020	-0.001594	-0.018799	0.065476	0.243982
5	1	9.9557	-6.4275	15.9822	13.4967	-0.013250	-0.018799	0.081944	0.248034
6	4	11.8417	0.5604	11.2352	3.3505	-0.013055	0.020076	0.086199	0.251715
7	1	9.6401	0.2641	1.1010	0.4451	0.040548	0.020076	0.126397	0.388905
8	4	8.8945	0.2461	2.0981	-1.1327	-0.041422	-0.132919	0.151325	0.590446
9	1	8.7267	0.2014	3.1007	-1.5408	-0.091267	-0.132919	0.158101	0.613931
10	1	8.7267	0.2014	3.1007	-1.5408	-0.091267	-0.132919	0.158101	0.613931
11	1	8.6334	0.1716	3.9391	-1.8128	-0.124496	-0.132919	0.162686	0.625325
12	1	8.6334	0.1716	3.9391	-1.8128	-0.124496	-0.132919	0.162686	0.625325
13	1	8.5215	0.1269	5.4518	-2.2209	-0.174341	-0.132919	0.169646	0.638218
14	2	7.7282	2.4391	7.4620	-4.6762	-0.205975	-0.076416	0.175445	0.645818
15	1	5.9208	2.0794	11.6933	-5.9020	-0.236541	-0.076416	0.184861	0.652635
16	3	5.9843	-2.3065	12.5747	3.1852	-0.287121	-0.267013	0.193187	0.656429
17	1	6.9492	-2.5178	11.3361	3.0079	-0.340524	-0.267013	0.198124	0.659095
18	1	7.9985	-2.7290	10.1684	2.8306	-0.393926	-0.267013	0.202394	0.662060
19	1	9.1323	-2.9402	9.0715	2.6534	-0.447329	-0.267013	0.206119	0.665375
20	2	10.1213	-0.2607	8.2759	0.0750	-0.507073	-0.128405	0.211015	0.670966
21	1	10.6060	-0.3452	8.2337	-0.0223	-0.609797	-0.128405	0.223316	0.686415
22	4	5.0706	3.7207	8.4655	-0.1693	-0.041813	1.008090	0.246511	0.709563
23	1	1.6596	1.9643	8.7124	-0.2422	0.563041	1.008090	0.279669	0.720691
24	3	0.9589	0.5284	7.1840	4.9842	0.934501	1.510403	0.319228	0.726524
25	1	0.8009	0.2616	5.3342	4.2648	1.236581	1.510403	0.355873	0.731667
26	1	0.8009	0.2616	5.3342	4.2648	1.236581	1.510403	0.355873	0.731667
27	1	0.8050	-0.2720	2.4980	2.8259	1.840743	1.510403	0.438866	0.749142
28	2	0.8540	0.1236	1.5661	0.5519	2.033676	-0.252923	0.495084	0.774477
29	1	1.1336	-0.5897	1.2037	0.0521	1.881922	-0.252923	0.599458	0.846457
30	3	1.1336	-0.6025	1.2037	0.0656	1.881922	-0.231751	0.599458	0.846457
31	4	1.2359	-0.6712	1.1985	-0.0013	1.863332	-0.231385	0.610256	0.857101
32	3	1.2359	-0.6851	1.1985	0.0121	1.863332	-0.210422	0.610256	0.857101
33	3	1.2359	-0.7129	1.1985	0.0391	1.863332	-0.168496	0.610256	0.857101
34	4	1.2928	-0.7037	1.1968	0.0056	1.855742	-0.209676	0.615308	0.862435
35	3	1.2928	-0.7328	1.1968	0.0325	1.855742	-0.167921	0.615308	0.862435
36	3	1.2928	-0.7473	1.1968	0.0460	1.855742	-0.147043	0.615308	0.862435
37	4	1.4181	-0.8122	1.1948	-0.0212	1.843973	-0.146165	0.624746	0.873126
38	3	1.4181	-0.8282	1.1948	-0.0078	1.843973	-0.125420	0.624746	0.873126
39	3	1.4181	-0.8442	1.1948	0.0056	1.843973	-0.104675	0.624746	0.873126
40	4	1.5587	-0.9061	1.1993	-0.0615	1.832204	-0.188534	0.633340	0.883807
41	3	1.5587	-0.9236	1.1993	-0.0481	1.832204	-0.167921	0.633340	0.883807
42	3	1.5587	-1.0642	1.1993	0.0601	1.832204	-0.002645	0.633340	0.883807
43	4	1.8841	-0.9436	1.2015	-0.0742	1.791765	-0.499938	0.648200	0.905156
44	3	1.8841	-1.1135	1.2015	0.0342	1.791765	-0.338310	0.648200	0.905156
45	3	1.8841	-1.1347	1.2015	0.0477	1.791765	-0.318152	0.648200	0.905156
46	4	2.0705	-1.1856	1.1992	-0.0193	1.762913	-0.400644	0.654667	0.915806
47	3	2.0705	-1.2089	1.1992	-0.0058	1.762913	-0.380811	0.654667	0.915806
48	3	2.0705	-1.2322	1.1992	0.0077	1.762913	-0.360978	0.654667	0.915806
49	4	2.2721	-1.2788	1.2034	-0.0592	1.734061	-0.357819	0.660557	0.926448
50	3	2.2721	-1.3043	1.2034	-0.0457	1.734061	-0.338310	0.660557	0.926448
51	3	2.2721	-1.5093	1.2034	0.0629	1.734061	-0.181887	0.660557	0.926448
52	4	2.7193	-1.2490	1.2047	-0.0711	1.693622	-0.320695	0.670793	0.947732
53	3	2.7193	-1.4943	1.2047	0.0376	1.693622	-0.167921	0.670793	0.947732
54	3	2.7193	-1.5249	1.2047	0.0512	1.693622	-0.148867	0.670793	0.947732
55	4	2.9667	-1.5563	1.2018	-0.0156	1.681853	-0.144341	0.675290	0.958357
56	3	2.9667	-1.5897	1.2018	-0.0021	1.681853	-0.125420	0.675290	0.958357
57	3	2.9667	-1.6230	1.2018	0.0114	1.681853	-0.106498	0.675290	0.958357
58	4	3.2295	-1.6487	1.2054	-0.0554	1.670084	-0.186710	0.679417	0.968979
59	3	3.2295	-1.6851	1.2054	-0.0418	1.670084	-0.167921	0.679417	0.968979
60	3	3.2295	-1.9764	1.2054	0.0669	1.670084	-0.017269	0.679417	0.968979
61	4	3.5317	-1.7800	1.2000	0.0000	1.659262	-0.252202	0.683195	0.979609
62	4	3.7983	-1.5324	1.2054	-0.0669	1.629645	-0.485314	0.686679	0.990239
63	3	3.7983	-1.8750	1.2054	0.0418	1.629645	-0.338310	0.686679	0.990239
64	3	3.7983	-1.9177	1.2054	0.0554	1.629645	-0.319976	0.686679	0.990239

65	4	4.1068	-1.9242	1.2018	-0.0114	1.600793	-0.398820	0.689913	1.000860
66	3	4.1068	-1.9704	1.2018	0.0021	1.600793	-0.380811	0.689913	1.000860
67	3	4.1068	-2.0166	1.2018	0.0156	1.600793	-0.362801	0.689913	1.000860
68	4	4.4307	-2.0159	1.2047	-0.0512	1.571941	-0.355995	0.692907	1.011485
69	3	4.4307	-2.0658	1.2047	-0.0376	1.571941	-0.338310	0.692907	1.011485
70	3	4.4307	-2.4655	1.2047	0.0711	1.571941	-0.196511	0.692907	1.011485
71	4	5.1211	-1.7938	1.2034	-0.0629	1.531502	-0.306072	0.698246	1.032769
72	3	5.1211	-2.2557	1.2034	0.0457	1.531502	-0.167921	0.698246	1.032769
73	3	5.1211	-2.3133	1.2034	0.0592	1.531502	-0.150691	0.698246	1.032769
74	4	5.4908	-2.2894	1.1992	-0.0077	1.519733	-0.142517	0.700655	1.043411
75	3	5.4908	-2.3511	1.1992	0.0058	1.519733	-0.125420	0.700655	1.043411
76	3	5.4908	-2.4129	1.1992	0.0193	1.519733	-0.108322	0.700655	1.043411
77	4	5.8758	-2.3804	1.2015	-0.0477	1.507963	-0.184886	0.702903	1.054062
78	3	5.8758	-2.4465	1.2015	-0.0342	1.507963	-0.167921	0.702903	1.054062
79	3	5.8758	-2.9766	1.2015	0.0742	1.507963	-0.031893	0.702903	1.054062
80	4	6.6878	-2.0332	1.1993	-0.0601	1.467525	-0.470690	0.706960	1.075410
81	3	6.6878	-2.6365	1.1993	0.0481	1.467525	-0.338310	0.706960	1.075410
82	3	6.6878	-2.7117	1.1993	0.0615	1.467525	-0.321800	0.706960	1.075410
83	4	7.1186	-2.6518	1.1948	-0.0056	1.438673	-0.396996	0.708811	1.086091
84	3	7.1186	-2.7319	1.1948	0.0078	1.438673	-0.380811	0.708811	1.086091
85	3	7.1186	-2.8119	1.1948	0.0212	1.438673	-0.364625	0.708811	1.086091
86	4	7.5647	-2.7422	1.1968	-0.0460	1.409820	-0.354171	0.710551	1.096783
87	3	7.5647	-2.8273	1.1968	-0.0325	1.409820	-0.338310	0.710551	1.096783
88	3	7.5647	-2.9975	1.1968	-0.0056	1.409820	-0.306588	0.710551	1.096783
89	4	7.7935	-2.6996	1.1985	-0.0391	1.397099	-0.327244	0.711383	1.102117
90	3	7.7935	-2.8750	1.1985	-0.0121	1.397099	-0.295809	0.711383	1.102117
91	3	7.7935	-2.9626	1.1985	0.0013	1.397099	-0.280091	0.711383	1.102117
92	4	8.2625	-2.8774	1.2037	-0.0656	1.375068	-0.268778	0.712974	1.112761
93	3	8.2625	-2.9704	1.2037	-0.0521	1.375068	-0.253308	0.712974	1.112761
94	1	9.6594	-3.2378	1.2693	-0.2395	1.318074	-0.253308	0.716983	1.141894
95	1	9.6594	-3.2378	1.2693	-0.2395	1.318074	-0.253308	0.716983	1.141894
96	1	12.2549	-3.6837	1.5661	-0.5519	1.223083	-0.253308	0.722470	1.184740
97	2	12.3022	3.5353	2.3059	-2.0558	1.044178	-0.922013	0.726247	1.210717
98	1	8.4548	2.8770	5.5887	-3.4156	0.490970	-0.922013	0.735615	1.237443
99	3	8.4548	0.0940	5.5887	-1.5761	0.490970	-0.760406	0.735615	1.237443
100	4	3.5714	2.8840	10.3155	-2.3304	0.000000	0.000000	0.766658	1.262915
101	3	3.5714	1.7084	10.3155	1.0651	0.000000	0.000000	0.766658	1.262915
102	1	1.7173	0.9404	8.9258	0.9202	0.000000	0.000000	0.812265	1.274536
103	1	1.2518	0.6112	8.3923	0.8582	0.000000	0.000000	0.845062	1.280054
104	1	0.9114	0.0077	7.5109	0.7444	0.000000	0.000000	0.931149	1.291088
105	3	1.1407	-0.8067	6.1368	3.6244	0.000000	0.000000	0.979809	1.297963
106	1	2.2486	-1.5013	3.1881	2.5187	0.000000	0.000000	1.028253	1.315268
107	2	2.2151	1.5967	2.9865	-1.7555	0.000000	0.000000	1.048239	1.331873
108	1	0.6991	0.3469	6.5566	-2.8215	0.000000	0.000000	1.156051	1.360075
109	1	1.2877	-1.0312	12.4205	-3.9969	0.000000	0.000000	1.336634	1.375265
110	3	2.5988	-3.7509	11.2485	7.5211	0.000000	0.000000	1.364142	1.379114
111	1	7.1488	-6.3603	5.5158	5.2181	0.000000	0.000000	1.380789	1.388212
112	2	9.1662	0.2140	3.8502	0.7958	0.000000	0.000000	1.386442	1.399024
113	1	8.9263	0.1358	2.9581	0.5048	0.000000	0.000000	1.398523	1.431599
114	1	8.8129	0.0742	2.5366	0.2757	0.000000	0.000000	1.408218	1.463180
115	1	8.7647	0.0000	2.3574	0.0000	0.000000	0.000000	1.420000	1.506000

MOMENTUM COMPACTION =-0.9873D-02
D =-0.9877D-01
ENERGY SPREAD = 0.4057D-03
RADIAL EMITTANCE = 0.1000D-05

I	TY	LENGTH	DL	STRENGTH	ANGLE
1	1	0.150	0.150	0.000000	0.000000
2	4	0.450	0.300	-66965.0154	0.001142
3	1	1.160	0.710	0.000000	0.000000
4	4	1.460	0.300	1016.3271	-0.020175
5	1	2.080	0.620	0.000000	0.000000
6	4	2.380	0.300	-224.8426	0.029574
7	1	5.050	2.670	0.000000	0.000000
8	4	6.500	1.450	0.000000	-0.152705
9	1	6.875	0.375	0.000000	0.000000
10	1	6.875	0.000	0.000000	0.000000
11	1	7.125	0.250	0.000000	0.000000
12	1	7.125	0.000	0.000000	0.000000
13	1	7.500	0.375	0.000000	0.000000
14	2	7.800	0.300	0.983141	0.000000
15	1	8.200	0.400	0.000000	0.000000
16	3	8.500	0.300	-2.471266	0.000000
17	1	8.700	0.200	0.000000	0.000000
18	1	8.900	0.200	0.000000	0.000000
19	1	9.100	0.200	0.000000	0.000000
20	2	9.400	0.300	0.961207	0.000000
21	1	10.200	0.800	0.000000	0.000000
22	4	11.410	1.210	0.000000	0.863938
23	1	12.010	0.600	0.000000	0.000000
24	3	12.310	0.300	-2.274180	0.000000
25	1	12.510	0.200	0.000000	0.000000
26	1	12.510	0.000	0.000000	0.000000
27	1	12.910	0.400	0.000000	0.000000
28	2	13.210	0.300	2.966330	0.000000
29	1	13.810	0.600	0.000000	0.000000
30	3	13.810	0.000	-0.011250	0.000000
31	4	13.890	0.080	0.000000	0.042495
32	3	13.890	0.000	-0.011250	0.000000
33	3	13.890	0.000	-0.022501	0.000000
34	4	13.930	0.040	0.000000	0.042495
35	3	13.930	0.000	-0.022501	0.000000
36	3	13.930	0.000	-0.011250	0.000000
37	4	14.011	0.080	0.000000	0.042495
38	3	14.011	0.000	-0.011250	0.000000
39	3	14.011	0.000	-0.011250	0.000000
40	4	14.091	0.080	0.000000	-0.042495
41	3	14.091	0.000	-0.011250	0.000000
42	3	14.091	0.000	-0.090206	0.000000
43	4	14.251	0.161	0.000000	-0.169979
44	3	14.251	0.000	-0.090206	0.000000
45	3	14.251	0.000	-0.011250	0.000000
46	4	14.332	0.080	0.000000	-0.042495
47	3	14.332	0.000	-0.011250	0.000000
48	3	14.332	0.000	-0.011250	0.000000
49	4	14.412	0.080	0.000000	0.042495
50	3	14.412	0.000	-0.011250	0.000000
51	3	14.412	0.000	-0.090206	0.000000
52	4	14.573	0.161	0.000000	0.169979
53	3	14.573	0.000	-0.090206	0.000000
54	3	14.573	0.000	-0.011250	0.000000
55	4	14.653	0.080	0.000000	0.042495
56	3	14.653	0.000	-0.011250	0.000000
57	3	14.653	0.000	-0.011250	0.000000
58	4	14.733	0.080	0.000000	-0.042495
59	3	14.733	0.000	-0.011250	0.000000
60	3	14.733	0.000	-0.090206	0.000000
61	4	14.813	0.080	0.000000	-0.084989
62	4	14.894	0.080	0.000000	-0.084989
63	3	14.894	0.000	-0.090206	0.000000

64	3	14.894	0.000	-0.011250	0.000000
65	4	14.974	0.080	0.000000	-0.042495
66	3	14.974	0.000	-0.011250	0.000000
67	3	14.974	0.000	-0.011250	0.000000
68	4	15.054	0.080	0.000000	0.042495
69	3	15.054	0.000	-0.011250	0.000000
70	3	15.054	0.000	-0.090206	0.000000
71	4	15.215	0.161	0.000000	0.169979
72	3	15.215	0.000	-0.090206	0.000000
73	3	15.215	0.000	-0.011250	0.000000
74	4	15.295	0.080	0.000000	0.042495
75	3	15.295	0.000	-0.011250	0.000000
76	3	15.295	0.000	-0.011250	0.000000
77	4	15.375	0.080	0.000000	-0.042495
78	3	15.375	0.000	-0.011250	0.000000
79	3	15.375	0.000	-0.090206	0.000000
80	4	15.536	0.161	0.000000	-0.169979
81	3	15.536	0.000	-0.090206	0.000000
82	3	15.536	0.000	-0.011250	0.000000
83	4	15.616	0.080	0.000000	-0.042495
84	3	15.616	0.000	-0.011250	0.000000
85	3	15.616	0.000	-0.011250	0.000000
86	4	15.696	0.080	0.000000	0.042495
87	3	15.696	0.000	-0.011250	0.000000
88	3	15.696	0.000	-0.022501	0.000000
89	4	15.736	0.040	0.000000	0.042495
90	3	15.736	0.000	-0.022501	0.000000
91	3	15.736	0.000	-0.011250	0.000000
92	4	15.817	0.080	0.000000	0.042495
93	3	15.817	0.000	-0.011250	0.000000
94	1	16.042	0.225	0.000000	0.000000
95	1	16.042	0.000	0.000000	0.000000
96	1	16.417	0.375	0.000000	0.000000
97	2	16.717	0.300	1.937606	0.000000
98	1	17.317	0.600	0.000000	0.000000
99	3	17.317	0.000	-0.329158	0.000000
100	4	18.527	1.210	0.000000	0.863938
101	3	18.527	0.000	-0.329158	0.000000
102	1	19.227	0.700	0.000000	0.000000
103	1	19.527	0.300	0.000000	0.000000
104	1	20.077	0.550	0.000000	0.000000
105	3	20.377	0.300	-1.525810	0.000000
106	1	20.857	0.480	0.000000	0.000000
107	2	21.157	0.300	4.646462	0.000000
108	1	21.937	0.780	0.000000	0.000000
109	1	22.797	0.860	0.000000	0.000000
110	3	23.097	0.300	-3.200522	0.000000
111	1	23.547	0.450	0.000000	0.000000
112	2	23.847	0.300	2.817789	0.000000
113	1	24.533	0.686	0.000000	0.000000
114	1	25.073	0.540	0.000000	0.000000
115	1	25.723	0.650	0.000000	0.000000

APPENDIX A.2.a

D14 Optical functions and lattice elements for the half short arc close to the FINUDA IR (the half arc close to KLOE is the same as DIS, see A.3.a)

EL.	TIP	BETX	ALFX	BETY	ALFY	DX	DPX	QX	QY	dy	dpy
0	0	9.3851	0.2562	1.0001	0.3739	-0.037000	-0.021000	0.000000	0.000000	0.000000	0.000000
8	4	8.6735	0.2308	2.3120	-1.2786	0.043595	0.131949	0.025589	0.201310	0.000000	0.000000
9	1	8.5174	0.1853	3.4312	-1.7060	0.093076	0.131949	0.032535	0.222564	0.000000	0.000000
10	1	8.5174	0.1853	3.4312	-1.7060	0.093076	0.131949	0.032535	0.222564	0.000000	0.000000
11	1	8.4324	0.1549	4.3554	-1.9909	0.126063	0.131949	0.037231	0.232863	0.000000	0.000000
12	1	8.4324	0.1549	4.3554	-1.9909	0.126063	0.131949	0.037231	0.232863	0.000000	0.000000
13	1	8.3333	0.1094	6.0089	-2.4183	0.175544	0.131949	0.044353	0.244540	0.000000	0.000000
14	2	7.2915	3.2184	8.4668	-6.1106	0.203536	0.052733	0.050354	0.251376	0.000000	0.000000
15	1	4.9660	2.5953	14.0798	-7.9220	0.224629	0.052733	0.060941	0.257208	0.000000	0.000000
16	3	4.6737	-1.5388	15.1026	4.8107	0.270718	0.261103	0.071291	0.260343	0.000000	0.000000
17	1	5.3181	-1.6830	13.2423	4.4910	0.322939	0.261103	0.077677	0.262594	0.000000	0.000000
18	1	6.0201	-1.8271	11.5098	4.1713	0.375159	0.261103	0.083304	0.265172	0.000000	0.000000
19	1	6.7798	-1.9712	9.9053	3.8515	0.427380	0.261103	0.088287	0.268154	0.000000	0.000000
20	2	7.2388	0.4964	8.6781	0.3848	0.481541	0.096729	0.094983	0.273397	0.000000	0.000000
21	1	6.5548	0.3586	8.1471	0.2789	0.558924	0.096729	0.113509	0.288563	0.000000	0.000000
22	4	3.4365	2.2483	7.7245	0.1480	0.848560	0.463826	0.144201	0.308477	0.000000	0.000000
23	1	1.3728	1.1911	7.5945	0.0686	1.126856	0.463826	0.188745	0.320957	0.000000	0.000000
24	3	1.0023	0.1182	6.2677	4.0823	1.374492	1.212073	0.231198	0.327671	0.000000	0.000000
25	1	0.9954	-0.0841	4.7475	3.5186	1.616906	1.212073	0.263283	0.333508	0.000000	0.000000
26	1	0.9954	-0.0841	4.7475	3.5186	1.616906	1.212073	0.263283	0.333508	0.000000	0.000000
27	1	1.2246	-0.4888	2.3836	2.3912	2.101735	1.212073	0.322285	0.352477	0.000000	0.000000
28	2	1.3121	0.2187	1.5643	0.5366	2.226102	-0.398157	0.358914	0.378229	0.000000	0.000000
29	1	1.3372	-0.2605	1.2168	0.0426	1.987208	-0.398157	0.433731	0.449837	0.000000	0.000000
30	3	1.3372	-0.2755	1.2168	0.0563	1.987208	-0.375800	0.433731	0.449837	0.000000	0.000000
31	4	1.3842	-0.3090	1.2131	-0.0099	1.956964	-0.377671	0.443123	0.460359	0.000000	0.000000
32	3	1.3842	-0.3246	1.2131	0.0037	1.956964	-0.355656	0.443123	0.460359	0.000000	0.000000
33	3	1.3842	-0.3557	1.2131	0.0310	1.956964	-0.311623	0.443123	0.460359	0.000000	0.000000
34	4	1.4115	-0.3248	1.2119	-0.0021	1.943547	-0.356886	0.447692	0.465628	0.000000	0.000000
35	3	1.4115	-0.3566	1.2119	0.0252	1.943547	-0.313155	0.447692	0.465628	0.000000	0.000000
36	3	1.4115	-0.3725	1.2119	0.0388	1.943547	-0.291289	0.447692	0.465628	0.000000	0.000000
37	4	1.4739	-0.4041	1.2110	-0.0275	1.920124	-0.292256	0.456551	0.476181	0.000000	0.000000
38	3	1.4739	-0.4207	1.2110	-0.0139	1.920124	-0.270654	0.456551	0.476181	0.000000	0.000000
39	3	1.4739	-0.4373	1.2110	-0.0003	1.920124	-0.249052	0.456551	0.476181	0.000000	0.000000
40	4	1.5465	-0.4674	1.2164	-0.0665	1.896700	-0.334493	0.465014	0.486714	0.000000	0.000000
41	3	1.5465	-0.4848	1.2164	-0.0529	1.896700	-0.313155	0.465014	0.486714	0.000000	0.000000
42	3	1.5465	-0.5243	1.2164	0.0569	1.896700	-0.142061	0.465014	0.486714	0.000000	0.000000
43	4	1.7218	-0.4570	1.2194	-0.0755	1.833059	-0.548897	0.480622	0.507755	0.000000	0.000000
44	3	1.7218	-0.6123	1.2194	0.0345	1.833059	-0.483544	0.480622	0.507755	0.000000	0.000000
45	3	1.7218	-0.6317	1.2194	0.0482	1.833059	-0.462921	0.480622	0.507755	0.000000	0.000000
46	4	1.8252	-0.6559	1.2169	-0.0178	1.792553	-0.546212	0.487828	0.518250	0.000000	0.000000
47	3	1.8252	-0.6764	1.2169	-0.0041	1.792553	-0.526045	0.487828	0.518250	0.000000	0.000000
48	3	1.8252	-0.6970	1.2169	0.0096	1.792553	-0.505878	0.487828	0.518250	0.000000	0.000000
49	4	1.9389	-0.7187	1.2207	-0.0564	1.752046	-0.503255	0.494619	0.528739	0.000000	0.000000
50	3	1.9389	-0.7405	1.2207	-0.0427	1.752046	-0.483544	0.494619	0.528739	0.000000	0.000000
51	3	1.9389	-0.9154	1.2207	0.0675	1.752046	-0.325498	0.494619	0.528739	0.000000	0.000000
52	4	2.1959	-0.6700	1.2202	-0.0647	1.688405	-0.465459	0.506954	0.549734	0.000000	0.000000
53	3	2.1959	-0.8681	1.2202	0.0454	1.688405	-0.313155	0.506954	0.549734	0.000000	0.000000
54	3	2.1959	-0.8928	1.2202	0.0591	1.688405	-0.294160	0.506954	0.549734	0.000000	0.000000
55	4	2.3404	-0.9058	1.2160	-0.0069	1.664982	-0.289385	0.512589	0.560229	0.000000	0.000000
56	3	2.3404	-0.9322	1.2160	0.0068	1.664982	-0.270654	0.512589	0.560229	0.000000	0.000000
57	3	2.3404	-0.9585	1.2160	0.0205	1.664982	-0.251922	0.512589	0.560229	0.000000	0.000000
58	4	2.4951	-0.9682	1.2181	-0.0455	1.641558	-0.331623	0.517875	0.570733	0.000000	0.000000
59	3	2.4951	-0.9962	1.2181	-0.0318	1.641558	-0.313155	0.517875	0.570733	0.000000	0.000000
60	3	2.4951	-1.2213	1.2181	0.0780	1.641558	-0.165076	0.517875	0.570733	0.000000	0.000000
61	4	2.6787	-1.0600	1.2108	0.0117	1.618990	-0.396911	0.522811	0.581260	0.000000	0.000000
62	4	2.8338	-0.8682	1.2143	-0.0546	1.577917	-0.625882	0.527443	0.591803	0.000000	0.000000
63	3	2.8338	-1.1238	1.2143	0.0550	1.577917	-0.483544	0.527443	0.591803	0.000000	0.000000
64	3	2.8338	-1.1557	1.2143	0.0686	1.577917	-0.465792	0.527443	0.591803	0.000000	0.000000
65	4	3.0193	-1.1539	1.2086	0.0022	1.537410	-0.543341	0.531810	0.602356	0.000000	0.000000
66	3	3.0193	-1.1879	1.2086	0.0158	1.537410	-0.526045	0.531810	0.602356	0.000000	0.000000
67	3	3.0193	-1.2219	1.2086	0.0294	1.537410	-0.508748	0.531810	0.602356	0.000000	0.000000
68	4	3.2151	-1.2158	1.2092	-0.0370	1.496904	-0.500384	0.535909	0.612931	0.000000	0.000000
69	3	3.2151	-1.2520	1.2092	-0.0234	1.496904	-0.483544	0.535909	0.612931	0.000000	0.000000
70	3	3.2151	-1.5420	1.2092	0.0856	1.496904	-0.348514	0.535909	0.612931	0.000000	0.000000

71	4	3.6355	-1.0516	1.2032	-0.0481	1.433263	-0.442444	0.543349	0.634177	0.000000	0.000000
72	3	3.6355	-1.3796	1.2032	0.0604	1.433263	-0.313155	0.543349	0.634177	0.000000	0.000000
73	3	3.6355	-1.4205	1.2032	0.0740	1.433263	-0.297030	0.543349	0.634177	0.000000	0.000000
74	4	3.8621	-1.4002	1.1967	0.0069	1.409839	-0.286515	0.546758	0.644831	0.000000	0.000000
75	3	3.8621	-1.4436	1.1967	0.0204	1.409839	-0.270654	0.546758	0.644831	0.000000	0.000000
76	3	3.8621	-1.4871	1.1967	0.0338	1.409839	-0.254793	0.546758	0.644831	0.000000	0.000000
77	4	4.0989	-1.4616	1.1967	-0.0333	1.386416	-0.328752	0.549968	0.655514	0.000000	0.000000
78	3	4.0989	-1.5077	1.1967	-0.0199	1.386416	-0.313155	0.549968	0.655514	0.000000	0.000000
79	3	4.0989	-1.8775	1.1967	0.0881	1.386416	-0.188092	0.549968	0.655514	0.000000	0.000000
80	4	4.6010	-1.2203	1.1901	-0.0471	1.322774	-0.602866	0.555824	0.676989	0.000000	0.000000
81	3	4.6010	-1.6353	1.1901	0.0602	1.322774	-0.483544	0.555824	0.676989	0.000000	0.000000
82	3	4.6010	-1.6871	1.1901	0.0736	1.322774	-0.468662	0.555824	0.676989	0.000000	0.000000
83	4	4.8686	-1.6446	1.1837	0.0058	1.282268	-0.540471	0.558523	0.687761	0.000000	0.000000
84	3	4.8686	-1.6994	1.1837	0.0191	1.282268	-0.526045	0.558523	0.687761	0.000000	0.000000
85	3	4.8686	-1.7542	1.1837	0.0324	1.282268	-0.511619	0.558523	0.687761	0.000000	0.000000
86	4	5.1465	-1.7056	1.1839	-0.0354	1.241762	-0.497514	0.561074	0.698561	0.000000	0.000000
87	3	5.1465	-1.7635	1.1839	-0.0221	1.241762	-0.483544	0.561074	0.698561	0.000000	0.000000
88	3	5.1465	-1.8793	1.1839	0.0045	1.241762	-0.455603	0.561074	0.698561	0.000000	0.000000
89	4	5.2893	-1.6765	1.1849	-0.0294	1.223214	-0.468566	0.562298	0.703954	0.000000	0.000000
90	3	5.2893	-1.7955	1.1849	-0.0027	1.223214	-0.441043	0.562298	0.703954	0.000000	0.000000
91	3	5.2893	-1.8550	1.1849	0.0106	1.223214	-0.427281	0.562298	0.703954	0.000000	0.000000
92	4	5.5826	-1.7968	1.1887	-0.0571	1.189528	-0.411924	0.564648	0.714727	0.000000	0.000000
93	3	5.5826	-1.8596	1.1887	-0.0438	1.189528	-0.398542	0.564648	0.714727	0.000000	0.000000
94	1	6.4598	-2.0393	1.2510	-0.2334	1.099856	-0.398542	0.570613	0.744261	0.000000	0.000000
95	1	6.4598	-2.0393	1.2510	-0.2334	1.099856	-0.398542	0.570613	0.744261	0.000000	0.000000
96	1	8.1016	-2.3387	1.5446	-0.5495	0.950403	-0.398542	0.578867	0.787734	0.000000	0.000000
97	2	8.5587	0.8746	2.1667	-1.6039	0.778270	-0.737839	0.584491	0.814470	0.000000	0.000000
98	1	7.5834	0.7509	4.6850	-2.5933	0.335567	-0.737839	0.596355	0.864623	0.000000	0.000000
99	3	7.5834	-1.2466	4.6850	-1.3592	0.335567	-0.649648	0.596355	0.864623	0.000000	0.000000
100	4	6.3880	2.2460	7.9719	-1.9609	0.000000	0.000000	0.617214	0.870519	0.000000	0.000000
101	3	6.3880	0.5633	7.9719	0.1389	0.000000	0.000000	0.617214	0.870519	0.000000	0.000000
102	1	6.0686	0.5015	7.9000	0.1006	0.000000	0.000000	0.624886	0.876537	0.000000	0.000000
103	1	5.9228	0.4705	7.8727	0.0814	0.000000	0.000000	0.628868	0.879564	0.000000	0.000000
104	1	5.6590	0.4087	7.8354	0.0431	0.000000	0.000000	0.637119	0.885645	0.000000	0.000000
105	3	6.5782	-3.6693	6.3918	4.4518	0.000000	0.000000	0.645205	0.892177	0.000000	0.000000
106	1	9.8654	-4.5487	3.3514	3.1490	0.000000	0.000000	0.653111	0.905948	0.000000	0.000000
107	2	9.8598	4.5658	2.4178	0.2402	0.000000	0.000000	0.657737	0.923528	0.000000	0.000000
108	1	0.5076	-0.3531	3.5073	-0.7310	0.000000	0.000000	0.927443	1.061505	0.000000	0.000000
109	3	1.1335	-1.9225	3.0197	2.2034	0.000000	0.000000	0.995382	1.075527	0.000000	0.000000
110	1	5.0579	-4.4670	1.0445	1.0125	0.000000	0.000000	1.036669	1.131728	0.000000	0.000000
111	2	5.7580	0.0000	0.8588	0.0000	0.000000	0.000000	1.041000	1.167000	0.000000	0.000000

CROMATISMO	:	CX =	1.57345	CY =	1.94278
K*Beta*sin(2fi)	:		0.31766		-0.64405
K*Beta*cos(2fi)	:		1.21724		-0.61997
SESTUPOLI	:	KF(95) =	3.65172	KD(26) =	-3.83495
K*BetaX**1.5	:		59.95532		-3.80875
K*BetaY**1.5	:		5.10979		-39.67004

MOMENTUM COMPACTION = 0.2988D-01
D = 0.6703D-01
ENERGY SPREAD = 0.3918D-03
RADIAL EMITTANCE = 0.1005D-05

I	TY	LENGTH	DL	STRENGTH	ANGLE
8	4	1.450	1.450	0.000000	0.152705
9	1	1.825	0.375	0.000000	0.000000
10	1	1.825	0.000	0.000000	0.000000
11	1	2.075	0.250	0.000000	0.000000
12	1	2.075	0.000	0.000000	0.000000
13	1	2.450	0.375	0.000000	0.000000
14	2	2.750	0.300	1.378698	0.000000
15	1	3.150	0.400	0.000000	0.000000
16	3	3.450	0.300	-2.864349	0.000000
17	1	3.650	0.200	0.000000	0.000000
18	1	3.850	0.200	0.000000	0.000000
19	1	4.050	0.200	0.000000	0.000000
20	2	4.350	0.300	1.194807	0.000000
21	1	5.150	0.800	0.000000	0.000000
22	4	6.140	0.990	0.000000	0.706858
23	1	6.740	0.600	0.000000	0.000000
24	3	7.040	0.300	-2.024438	0.000000
25	1	7.240	0.200	0.000000	0.000000
26	1	7.240	0.000	0.000000	0.000000
27	1	7.640	0.400	0.000000	0.000000
28	2	7.940	0.300	2.434957	0.000000
29	1	8.540	0.600	0.000000	0.000000
30	3	8.540	0.000	-0.011250	0.000000
31	4	8.620	0.080	0.000000	0.042495
32	3	8.620	0.000	-0.011250	0.000000
33	3	8.620	0.000	-0.022501	0.000000
34	4	8.660	0.040	0.000000	0.042495
35	3	8.660	0.000	-0.022501	0.000000
36	3	8.660	0.000	-0.011250	0.000000
37	4	8.741	0.080	0.000000	0.042495
38	3	8.741	0.000	-0.011250	0.000000
39	3	8.741	0.000	-0.011250	0.000000
40	4	8.821	0.080	0.000000	-0.042495
41	3	8.821	0.000	-0.011250	0.000000
42	3	8.821	0.000	-0.090206	0.000000
43	4	8.981	0.161	0.000000	-0.169979
44	3	8.981	0.000	-0.090206	0.000000
45	3	8.981	0.000	-0.011250	0.000000
46	4	9.062	0.080	0.000000	-0.042495
47	3	9.062	0.000	-0.011250	0.000000
48	3	9.062	0.000	-0.011250	0.000000
49	4	9.142	0.080	0.000000	0.042495
50	3	9.142	0.000	-0.011250	0.000000
51	3	9.142	0.000	-0.090206	0.000000
52	4	9.303	0.161	0.000000	0.169979
53	3	9.303	0.000	-0.090206	0.000000
54	3	9.303	0.000	-0.011250	0.000000
55	4	9.383	0.080	0.000000	0.042495
56	3	9.383	0.000	-0.011250	0.000000
57	3	9.383	0.000	-0.011250	0.000000
58	4	9.463	0.080	0.000000	-0.042495
59	3	9.463	0.000	-0.011250	0.000000
60	3	9.463	0.000	-0.090206	0.000000
61	4	9.543	0.080	0.000000	-0.084989
62	4	9.624	0.080	0.000000	-0.084989
63	3	9.624	0.000	-0.090206	0.000000
64	3	9.624	0.000	-0.011250	0.000000
65	4	9.704	0.080	0.000000	-0.042495
66	3	9.704	0.000	-0.011250	0.000000
67	3	9.704	0.000	-0.011250	0.000000
68	4	9.784	0.080	0.000000	0.042495
69	3	9.784	0.000	-0.011250	0.000000
70	3	9.784	0.000	-0.090206	0.000000

71	4	9.945	0.161	0.000000	0.169979
72	3	9.945	0.000	-0.090206	0.000000
73	3	9.945	0.000	-0.011250	0.000000
74	4	10.025	0.080	0.000000	0.042495
75	3	10.025	0.000	-0.011250	0.000000
76	3	10.025	0.000	-0.011250	0.000000
77	4	10.105	0.080	0.000000	-0.042495
78	3	10.105	0.000	-0.011250	0.000000
79	3	10.105	0.000	-0.090206	0.000000
80	4	10.266	0.161	0.000000	-0.169979
81	3	10.266	0.000	-0.090206	0.000000
82	3	10.266	0.000	-0.011250	0.000000
83	4	10.346	0.080	0.000000	-0.042495
84	3	10.346	0.000	-0.011250	0.000000
85	3	10.346	0.000	-0.011250	0.000000
86	4	10.426	0.080	0.000000	0.042495
87	3	10.426	0.000	-0.011250	0.000000
88	3	10.426	0.000	-0.022501	0.000000
89	4	10.466	0.040	0.000000	0.042495
90	3	10.466	0.000	-0.022501	0.000000
91	3	10.466	0.000	-0.011250	0.000000
92	4	10.547	0.080	0.000000	0.042495
93	3	10.547	0.000	-0.011250	0.000000
94	1	10.772	0.225	0.000000	0.000000
95	1	10.772	0.000	0.000000	0.000000
96	1	11.147	0.375	0.000000	0.000000
97	2	11.447	0.300	1.295766	0.000000
98	1	12.047	0.600	0.000000	0.000000
99	3	12.047	0.000	-0.263408	0.000000
100	4	13.037	0.990	0.000000	0.706858
101	3	13.037	0.000	-0.263408	0.000000
102	1	13.337	0.300	0.000000	0.000000
103	1	13.487	0.150	0.000000	0.000000
104	1	13.787	0.300	0.000000	0.000000
105	3	14.087	0.300	-2.167699	0.000000
106	1	14.487	0.400	0.000000	0.000000
107	2	14.787	0.300	3.020020	0.000000
108	1	17.007	2.220	0.000000	0.000000
109	3	17.307	0.300	-3.079071	0.000000
110	1	17.921	0.614	0.000000	0.000000
111	2	18.071	0.150	5.669667	0.000000

APPENDIX A.2.b

D14 Optical functions and lattice elements for the half long arc close to the FINUDA IR (the half arc close to KLOE IR is the same as DIS, see A.3.b)

EL.	TYP	BETX	ALFX	BETY	ALFY	DX	DPX	QX	QY	dy	dpy
0	0	9.3851	0.2562	1.0001	0.3738	0.037000	0.021000	0.000000	0.000000	0.000000	0.000000
8	4	8.6735	0.2308	2.3120	-1.2786	-0.043595	-0.131949	0.025589	0.201310	0.000000	0.000000
9	1	8.5174	0.1853	3.4312	-1.7060	-0.093076	-0.131949	0.032535	0.222564	0.000000	0.000000
10	1	8.5174	0.1853	3.4312	-1.7060	-0.093076	-0.131949	0.032535	0.222564	0.000000	0.000000
11	1	8.4324	0.1549	4.3554	-1.9909	-0.126063	-0.131949	0.037231	0.232863	0.000000	0.000000
12	1	8.4324	0.1549	4.3554	-1.9909	-0.126063	-0.131949	0.037231	0.232863	0.000000	0.000000
13	1	8.3333	0.1094	6.0089	-2.4183	-0.175544	-0.131949	0.044353	0.244540	0.000000	0.000000
14	2	7.5603	2.3902	8.2058	-5.1213	-0.206767	-0.074657	0.050281	0.251443	0.000000	0.000000
15	1	5.7901	2.0351	12.8338	-6.4486	-0.236530	-0.074657	0.059909	0.257649	0.000000	0.000000
16	3	5.8621	-2.2934	13.7592	3.5977	-0.286891	-0.266650	0.068418	0.261109	0.000000	0.000000
17	1	6.8217	-2.5058	12.3607	3.3951	-0.340220	-0.266650	0.073452	0.263550	0.000000	0.000000
18	1	7.8567	-2.7192	11.0432	3.1924	-0.393550	-0.266650	0.077798	0.266275	0.000000	0.000000
19	1	8.9971	-2.9326	9.8068	2.9897	-0.446880	-0.266650	0.081582	0.269334	0.000000	0.000000
20	2	9.9921	-0.2878	8.8765	0.2002	-0.506489	-0.127868	0.086546	0.274526	0.000000	0.000000
21	1	10.5219	-0.3745	8.6311	0.1065	-0.608784	-0.127868	0.098976	0.289093	0.000000	0.000000
22	4	5.0789	3.6937	8.5449	-0.0353	-0.040582	1.007888	0.122245	0.311592	0.000000	0.000000
23	1	1.6844	1.9638	8.6295	-0.1056	0.564151	1.007888	0.155127	0.322722	0.000000	0.000000
24	3	0.9785	0.5433	7.0896	4.8938	0.933657	1.496168	0.193947	0.328627	0.000000	0.000000
25	1	0.8141	0.2785	5.2728	4.1899	1.232891	1.496168	0.229916	0.333834	0.000000	0.000000
26	1	0.8141	0.2785	5.2728	4.1899	1.232891	1.496168	0.229916	0.333834	0.000000	0.000000
27	1	0.8031	-0.2509	2.4839	2.7823	1.831358	1.496168	0.312276	0.351461	0.000000	0.000000
28	2	0.8421	0.1325	1.5691	0.5325	2.022595	-0.249616	0.368992	0.376839	0.000000	0.000000
29	1	1.1181	-0.5925	1.2247	0.0417	1.872826	-0.249616	0.475092	0.448080	0.000000	0.000000
30	3	1.1181	-0.6051	1.2247	0.0554	1.872826	-0.228546	0.475092	0.448080	0.000000	0.000000
31	4	1.2209	-0.6757	1.2210	-0.0103	1.854501	-0.227978	0.486032	0.458535	0.000000	0.000000
32	3	1.2209	-0.6894	1.2210	0.0034	1.854501	-0.207115	0.486032	0.458535	0.000000	0.000000
33	3	1.2209	-0.7169	1.2210	0.0309	1.854501	-0.165387	0.486032	0.458535	0.000000	0.000000
34	4	1.2782	-0.7092	1.2199	-0.0020	1.847044	-0.206173	0.491144	0.463769	0.000000	0.000000
35	3	1.2782	-0.7379	1.2199	0.0255	1.847044	-0.164614	0.491144	0.463769	0.000000	0.000000
36	3	1.2782	-0.7523	1.2199	0.0392	1.847044	-0.143834	0.491144	0.463769	0.000000	0.000000
37	4	1.4044	-0.8191	1.2189	-0.0267	1.835540	-0.142763	0.500682	0.474254	0.000000	0.000000
38	3	1.4044	-0.8349	1.2189	-0.0130	1.835540	-0.122113	0.500682	0.474254	0.000000	0.000000
39	3	1.4044	-0.8507	1.2189	0.0007	1.835540	-0.101462	0.500682	0.474254	0.000000	0.000000
40	4	1.5462	-0.9145	1.2240	-0.0651	1.824036	-0.185135	0.509353	0.484720	0.000000	0.000000
41	3	1.5462	-0.9319	1.2240	-0.0514	1.824036	-0.164614	0.509353	0.484720	0.000000	0.000000
42	3	1.5462	-1.0713	1.2240	0.0590	1.824036	-0.000074	0.509353	0.484720	0.000000	0.000000
43	4	1.8748	-0.9558	1.2262	-0.0726	1.784126	-0.495942	0.524309	0.505635	0.000000	0.000000
44	3	1.8748	-1.1249	1.2262	0.0381	1.784126	-0.335003	0.524309	0.505635	0.000000	0.000000
45	3	1.8748	-1.1460	1.2262	0.0518	1.784126	-0.314931	0.524309	0.505635	0.000000	0.000000
46	4	2.0631	-1.1987	1.2232	-0.0138	1.755539	-0.397254	0.530805	0.516073	0.000000	0.000000
47	3	2.0631	-1.2219	1.2232	0.0000	1.755539	-0.377504	0.530805	0.516073	0.000000	0.000000
48	3	2.0631	-1.2451	1.2232	0.0137	1.755539	-0.357753	0.530805	0.516073	0.000000	0.000000
49	4	2.2670	-1.2933	1.2262	-0.0519	1.726952	-0.354431	0.536712	0.526512	0.000000	0.000000
50	3	2.2670	-1.3188	1.2262	-0.0381	1.726952	-0.335003	0.536712	0.526512	0.000000	0.000000
51	3	2.2670	-1.5233	1.2262	0.0725	1.726952	-0.179221	0.536712	0.526512	0.000000	0.000000
52	4	2.7192	-1.2666	1.2241	-0.0591	1.687042	-0.316795	0.546960	0.547427	0.000000	0.000000
53	3	2.7192	-1.5119	1.2241	0.0513	1.687042	-0.164614	0.546960	0.547427	0.000000	0.000000
54	3	2.7192	-1.5425	1.2241	0.0651	1.687042	-0.145634	0.546960	0.547427	0.000000	0.000000
55	4	2.9696	-1.5754	1.2189	-0.0008	1.675538	-0.140963	0.551455	0.557893	0.000000	0.000000
56	3	2.9696	-1.6089	1.2189	0.0130	1.675538	-0.122113	0.551455	0.557893	0.000000	0.000000
57	3	2.9696	-1.6423	1.2189	0.0267	1.675538	-0.103262	0.551455	0.557893	0.000000	0.000000
58	4	3.2356	-1.6694	1.2199	-0.0392	1.664034	-0.183335	0.555575	0.568377	0.000000	0.000000
59	3	3.2356	-1.7058	1.2199	-0.0255	1.664034	-0.164614	0.555575	0.568377	0.000000	0.000000
60	3	3.2356	-1.9977	1.2199	0.0845	1.664034	-0.014508	0.555575	0.568377	0.000000	0.000000
61	4	3.5414	-1.8023	1.2117	0.0183	1.653456	-0.248906	0.559345	0.578892	0.000000	0.000000
62	4	3.8115	-1.5551	1.2141	-0.0480	1.624124	-0.481509	0.562818	0.589433	0.000000	0.000000
63	3	3.8115	-1.8989	1.2141	0.0615	1.624124	-0.335003	0.562818	0.589433	0.000000	0.000000
64	3	3.8115	-1.9418	1.2141	0.0752	1.624124	-0.316731	0.562818	0.589433	0.000000	0.000000
65	4	4.1240	-1.9494	1.2073	0.0087	1.595537	-0.395454	0.566040	0.599992	0.000000	0.000000
66	3	4.1240	-1.9958	1.2073	0.0223	1.595537	-0.377504	0.566040	0.599992	0.000000	0.000000
67	3	4.1240	-2.0422	1.2073	0.0359	1.595537	-0.359553	0.566040	0.599992	0.000000	0.000000
68	4	4.4521	-2.0427	1.2069	-0.0307	1.566950	-0.352631	0.569020	0.610583	0.000000	0.000000
69	3	4.4521	-2.0928	1.2069	-0.0171	1.566950	-0.335003	0.569020	0.610583	0.000000	0.000000
70	3	4.4521	-2.4944	1.2069	0.0917	1.566950	-0.193654	0.569020	0.610583	0.000000	0.000000

71	4	5.1517	-1.8211	1.1990	-0.0424	1.527040	-0.302362	0.574331	0.631886	0.000000	0.000000
72	3	5.1517	-2.2859	1.1990	0.0658	1.527040	-0.164614	0.574331	0.631886	0.000000	0.000000
73	3	5.1517	-2.3438	1.1990	0.0792	1.527040	-0.147434	0.574331	0.631886	0.000000	0.000000
74	4	5.5263	-2.3206	1.1917	0.0119	1.515536	-0.139163	0.576724	0.642581	0.000000	0.000000
75	3	5.5263	-2.3828	1.1917	0.0253	1.515536	-0.122113	0.576724	0.642581	0.000000	0.000000
76	3	5.5263	-2.4450	1.1917	0.0387	1.515536	-0.105062	0.576724	0.642581	0.000000	0.000000
77	4	5.9165	-2.4132	1.1909	-0.0288	1.504032	-0.181534	0.578958	0.653313	0.000000	0.000000
78	3	5.9165	-2.4798	1.1909	-0.0154	1.504032	-0.164614	0.578958	0.653313	0.000000	0.000000
79	3	5.9165	-3.0135	1.1909	0.0921	1.504032	-0.028941	0.578958	0.653313	0.000000	0.000000
80	4	6.7397	-2.0649	1.1831	-0.0439	1.464122	-0.467075	0.582985	0.674904	0.000000	0.000000
81	3	6.7397	-2.6728	1.1831	0.0628	1.464122	-0.335003	0.582985	0.674904	0.000000	0.000000
82	3	6.7397	-2.7487	1.1831	0.0761	1.464122	-0.318531	0.582985	0.674904	0.000000	0.000000
83	4	7.1764	-2.6891	1.1764	0.0079	1.435535	-0.393654	0.584821	0.685741	0.000000	0.000000
84	3	7.1764	-2.7698	1.1764	0.0211	1.435535	-0.377504	0.584821	0.685741	0.000000	0.000000
85	3	7.1764	-2.8505	1.1764	0.0344	1.435535	-0.361353	0.584821	0.685741	0.000000	0.000000
86	4	7.6287	-2.7809	1.1764	-0.0339	1.406948	-0.350831	0.586548	0.696609	0.000000	0.000000
87	3	7.6287	-2.8668	1.1764	-0.0207	1.406948	-0.335003	0.586548	0.696609	0.000000	0.000000
88	3	7.6287	-3.0384	1.1764	0.0058	1.406948	-0.303345	0.586548	0.696609	0.000000	0.000000
89	4	7.8607	-2.7384	1.1773	-0.0283	1.394360	-0.323876	0.587372	0.702038	0.000000	0.000000
90	3	7.8607	-2.9152	1.1773	-0.0019	1.394360	-0.292502	0.587372	0.702038	0.000000	0.000000
91	3	7.8607	-3.0037	1.1773	0.0114	1.394360	-0.276815	0.587372	0.702038	0.000000	0.000000
92	4	8.3363	-2.9184	1.1809	-0.0568	1.372594	-0.265443	0.588950	0.712881	0.000000	0.000000
93	3	8.3363	-3.0122	1.1809	-0.0435	1.372594	-0.250001	0.588950	0.712881	0.000000	0.000000
94	1	9.7530	-3.2841	1.2434	-0.2344	1.316344	-0.250001	0.592922	0.742605	0.000000	0.000000
95	1	9.7530	-3.2841	1.2434	-0.2344	1.316344	-0.250001	0.592922	0.742605	0.000000	0.000000
96	1	12.3860	-3.7372	1.5386	-0.5526	1.222593	-0.250001	0.598353	0.786301	0.000000	0.000000
97	2	12.4309	3.5964	2.2769	-2.0508	1.044178	-0.922013	0.602090	0.812684	0.000000	0.000000
98	1	8.5187	2.9239	5.5610	-3.4226	0.490970	-0.922013	0.611375	0.839649	0.000000	0.000000
99	3	8.5187	0.1199	5.5610	-1.5922	0.490970	-0.760406	0.611375	0.839649	0.000000	0.000000
100	4	3.5623	2.9026	10.3448	-2.3614	0.000000	0.000000	0.642339	0.865148	0.000000	0.000000
101	3	3.5623	1.7101	10.3448	1.0437	0.000000	0.000000	0.642339	0.865148	0.000000	0.000000
102	1	1.6895	0.9454	8.9826	0.9023	0.000000	0.000000	0.688391	0.876716	0.000000	0.000000
103	1	1.2231	0.6091	8.4594	0.8417	0.000000	0.000000	0.721852	0.882194	0.000000	0.000000
104	1	0.8922	-0.0074	7.5945	0.7307	0.000000	0.000000	0.810102	0.893124	0.000000	0.000000
105	3	1.1277	-0.8125	6.2372	3.5897	0.000000	0.000000	0.859568	0.899909	0.000000	0.000000
106	1	2.2469	-1.5191	3.3040	2.5211	0.000000	0.000000	0.908320	0.916769	0.000000	0.000000
107	2	2.2549	1.4960	3.1042	-1.7675	0.000000	0.000000	0.928183	0.932730	0.000000	0.000000
108	1	1.2696	0.9073	4.7769	-2.3122	0.000000	0.000000	0.967138	0.949708	0.000000	0.000000
109	1	0.7670	0.3185	6.8962	-2.8569	0.000000	0.000000	1.035333	0.961087	0.000000	0.000000
110	1	0.7472	-0.2703	9.4622	-3.4016	0.000000	0.000000	1.126420	0.969168	0.000000	0.000000
111	1	1.2103	-0.8591	12.4749	-3.9463	0.000000	0.000000	1.197364	0.975175	0.000000	0.000000
112	3	2.3457	-3.2758	11.3248	7.4119	0.000000	0.000000	1.227230	0.979007	0.000000	0.000000
113	1	6.3066	-5.5262	5.6543	5.1892	0.000000	0.000000	1.245893	0.987962	0.000000	0.000000
114	2	8.0387	0.2479	4.0269	0.6851	0.000000	0.000000	1.252321	0.998402	0.000000	0.000000
115	1	7.5732	0.0000	2.7406	0.0000	0.000000	0.000000	1.291000	1.094000	0.000000	0.000000

CROMATISMO	: CX =	1.90481	CY =	2.71068
K*Beta*sin(2fi)	:	0.04746		-0.65606
K*Beta*cos(2fi)	:	0.90861		-1.25550
SESTUPOLI	: KF(95) =	2.31979	KD(26) =	-5.82395
K*BetaX**1.5	:	70.65719		-4.27811
K*BetaY**1.5	:	3.21655		-70.51523

MOMENTUM COMPACTION =-0.1219D-01
D =-0.9786D-01
ENERGY SPREAD = 0.4059D-03
RADIAL EMITTANCE = 0.1006D-05

I	TY	LENGTH	DL	STRENGTH	ANGLE
8	4	1.450	1.450	0.000000	-0.152705
9	1	1.825	0.375	0.000000	0.000000
10	1	1.825	0.000	0.000000	0.000000
11	1	2.075	0.250	0.000000	0.000000
12	1	2.075	0.000	0.000000	0.000000
13	1	2.450	0.375	0.000000	0.000000
14	2	2.750	0.300	0.991605	0.000000
15	1	3.150	0.400	0.000000	0.000000
16	3	3.450	0.300	-2.490387	0.000000
17	1	3.650	0.200	0.000000	0.000000
18	1	3.850	0.200	0.000000	0.000000
19	1	4.050	0.200	0.000000	0.000000
20	2	4.350	0.300	0.963440	0.000000
21	1	5.150	0.800	0.000000	0.000000
22	4	6.360	1.210	0.000000	0.863938
23	1	6.960	0.600	0.000000	0.000000
24	3	7.260	0.300	-2.209200	0.000000
25	1	7.460	0.200	0.000000	0.000000
26	1	7.460	0.000	0.000000	0.000000
27	1	7.860	0.400	0.000000	0.000000
28	2	8.160	0.300	2.952727	0.000000
29	1	8.760	0.600	0.000000	0.000000
30	3	8.760	0.000	-0.011250	0.000000
31	4	8.840	0.080	0.000000	0.042495
32	3	8.840	0.000	-0.011250	0.000000
33	3	8.840	0.000	-0.022501	0.000000
34	4	8.880	0.040	0.000000	0.042495
35	3	8.880	0.000	-0.022501	0.000000
36	3	8.880	0.000	-0.011250	0.000000
37	4	8.961	0.080	0.000000	0.042495
38	3	8.961	0.000	-0.011250	0.000000
39	3	8.961	0.000	-0.011250	0.000000
40	4	9.041	0.080	0.000000	-0.042495
41	3	9.041	0.000	-0.011250	0.000000
42	3	9.041	0.000	-0.090206	0.000000
43	4	9.201	0.161	0.000000	-0.169979
44	3	9.201	0.000	-0.090206	0.000000
45	3	9.201	0.000	-0.011250	0.000000
46	4	9.282	0.080	0.000000	-0.042495
47	3	9.282	0.000	-0.011250	0.000000
48	3	9.282	0.000	-0.011250	0.000000
49	4	9.362	0.080	0.000000	0.042495
50	3	9.362	0.000	-0.011250	0.000000
51	3	9.362	0.000	-0.090206	0.000000
52	4	9.523	0.161	0.000000	0.169979
53	3	9.523	0.000	-0.090206	0.000000
54	3	9.523	0.000	-0.011250	0.000000
55	4	9.603	0.080	0.000000	0.042495
56	3	9.603	0.000	-0.011250	0.000000
57	3	9.603	0.000	-0.011250	0.000000
58	4	9.683	0.080	0.000000	-0.042495
59	3	9.683	0.000	-0.011250	0.000000
60	3	9.683	0.000	-0.090206	0.000000
61	4	9.763	0.080	0.000000	-0.084989
62	4	9.844	0.080	0.000000	-0.084989
63	3	9.844	0.000	-0.090206	0.000000
64	3	9.844	0.000	-0.011250	0.000000
65	4	9.924	0.080	0.000000	-0.042495
66	3	9.924	0.000	-0.011250	0.000000
67	3	9.924	0.000	-0.011250	0.000000
68	4	10.004	0.080	0.000000	0.042495
69	3	10.004	0.000	-0.011250	0.000000
70	3	10.004	0.000	-0.090206	0.000000

71	4	10.165	0.161	0.000000	0.169979
72	3	10.165	0.000	-0.090206	0.000000
73	3	10.165	0.000	-0.011250	0.000000
74	4	10.245	0.080	0.000000	0.042495
75	3	10.245	0.000	-0.011250	0.000000
76	3	10.245	0.000	-0.011250	0.000000
77	4	10.325	0.080	0.000000	-0.042495
78	3	10.325	0.000	-0.011250	0.000000
79	3	10.325	0.000	-0.090206	0.000000
80	4	10.486	0.161	0.000000	-0.169979
81	3	10.486	0.000	-0.090206	0.000000
82	3	10.486	0.000	-0.011250	0.000000
83	4	10.566	0.080	0.000000	-0.042495
84	3	10.566	0.000	-0.011250	0.000000
85	3	10.566	0.000	-0.011250	0.000000
86	4	10.646	0.080	0.000000	0.042495
87	3	10.646	0.000	-0.011250	0.000000
88	3	10.646	0.000	-0.022501	0.000000
89	4	10.686	0.040	0.000000	0.042495
90	3	10.686	0.000	-0.022501	0.000000
91	3	10.686	0.000	-0.011250	0.000000
92	4	10.767	0.080	0.000000	0.042495
93	3	10.767	0.000	-0.011250	0.000000
94	1	10.992	0.225	0.000000	0.000000
95	1	10.992	0.000	0.000000	0.000000
96	1	11.367	0.375	0.000000	0.000000
97	2	11.667	0.300	1.947463	0.000000
98	1	12.267	0.600	0.000000	0.000000
99	3	12.267	0.000	-0.329158	0.000000
100	4	13.477	1.210	0.000000	0.863938
101	3	13.477	0.000	-0.329158	0.000000
102	1	14.177	0.700	0.000000	0.000000
103	1	14.477	0.300	0.000000	0.000000
104	1	15.027	0.550	0.000000	0.000000
105	3	15.327	0.300	-1.491360	0.000000
106	1	15.807	0.480	0.000000	0.000000
107	2	16.107	0.300	4.492526	0.000000
108	1	16.517	0.410	0.000000	0.000000
109	1	16.927	0.410	0.000000	0.000000
110	1	17.337	0.410	0.000000	0.000000
111	1	17.747	0.410	0.000000	0.000000
112	3	18.047	0.300	-3.139526	0.000000
113	1	18.497	0.450	0.000000	0.000000
114	2	18.797	0.300	2.811001	0.000000
115	1	20.674	1.878	0.000000	0.000000

APPENDIX A.3.a

D15 Half-short arc optical functions and lattice elements

EL.	TIP	BETX	ALFX	BETY	ALFY	DX	DPX	QX	QY	dy	
0	0	9.3852	0.2560	1.0000	0.3738	-0.035000	-0.020000	0.000000	0.000000	0.000000	0.
8	4	8.6740	0.2307	2.3123	-1.2788	0.047016	0.132905	0.025588	0.201308	0.000000	0.
9	1	8.5181	0.1851	3.4316	-1.7062	0.096855	0.132905	0.032534	0.222559	0.000000	0.
10	1	8.5181	0.1851	3.4316	-1.7062	0.096855	0.132905	0.032534	0.222559	0.000000	0.
11	1	8.4331	0.1548	4.3560	-1.9911	0.130082	0.132905	0.037229	0.232858	0.000000	0.
12	1	8.4331	0.1548	4.3560	-1.9911	0.130082	0.132905	0.037229	0.232858	0.000000	0.
13	1	8.3341	0.1093	6.0096	-2.4185	0.179921	0.132905	0.044351	0.244533	0.000000	0.
14	2	7.2888	3.2290	8.4711	-6.1242	0.207883	0.051570	0.050352	0.251367	0.000000	0.
15	1	4.9564	2.6019	14.0978	-7.9425	0.228511	0.051570	0.060951	0.257194	0.000000	0.
16	3	4.6572	-1.5204	15.1298	4.8030	0.274734	0.263167	0.071329	0.260325	0.000000	0.
17	1	5.2938	-1.6626	13.2723	4.4848	0.327367	0.263167	0.077741	0.262571	0.000000	0.
18	1	5.9873	-1.8048	11.5420	4.1667	0.380000	0.263167	0.083396	0.265143	0.000000	0.
19	1	6.7376	-1.9470	9.9390	3.8485	0.432634	0.263167	0.088409	0.268115	0.000000	0.
20	2	7.1877	0.5009	8.7154	0.3749	0.487155	0.097052	0.095150	0.273338	0.000000	0.
21	1	6.4977	0.3617	8.1993	0.2702	0.564797	0.097052	0.113824	0.288423	0.000000	0.
22	4	3.4007	2.2273	7.7926	0.1407	0.853319	0.461348	0.144816	0.308185	0.000000	0.
23	1	1.3590	1.1756	7.6709	0.0621	1.130128	0.461348	0.189833	0.320549	0.000000	0.
24	3	0.9962	0.1067	6.3293	4.1338	1.377749	1.214551	0.232647	0.327196	0.000000	0.
25	1	0.9941	-0.0963	4.7901	3.5623	1.620659	1.214551	0.264854	0.332978	0.000000	0.
26	1	0.9941	-0.0963	4.7901	3.5623	1.620659	1.214551	0.264854	0.332978	0.000000	0.
27	1	1.2336	-0.5025	2.3975	2.4191	2.106479	1.214551	0.323672	0.351808	0.000000	0.
28	2	1.3266	0.2155	1.5661	0.5519	2.231002	-0.399620	0.359961	0.377469	0.000000	0.
29	1	1.3520	-0.2578	1.2037	0.0521	1.991230	-0.399620	0.433895	0.449449	0.000000	0.
30	3	1.3520	-0.2730	1.2037	0.0656	1.991230	-0.377218	0.433895	0.449449	0.000000	0.
31	4	1.3985	-0.3054	1.1985	-0.0013	1.960868	-0.379180	0.443188	0.460092	0.000000	0.
32	3	1.3985	-0.3211	1.1985	0.0121	1.960868	-0.357119	0.443188	0.460092	0.000000	0.
33	3	1.3985	-0.3526	1.1985	0.0391	1.960868	-0.312998	0.443188	0.460092	0.000000	0.
34	4	1.4255	-0.3207	1.1968	0.0056	1.947393	-0.358436	0.447711	0.465427	0.000000	0.
35	3	1.4255	-0.3528	1.1968	0.0325	1.947393	-0.314618	0.447711	0.465427	0.000000	0.
36	3	1.4255	-0.3688	1.1968	0.0460	1.947393	-0.292709	0.447711	0.465427	0.000000	0.
37	4	1.4872	-0.3993	1.1948	-0.0212	1.923852	-0.293761	0.456487	0.476118	0.000000	0.
38	3	1.4872	-0.4161	1.1948	-0.0078	1.923852	-0.272117	0.456487	0.476118	0.000000	0.
39	3	1.4872	-0.4328	1.1948	0.0056	1.923852	-0.250473	0.456487	0.476118	0.000000	0.
40	4	1.5591	-0.4618	1.1993	-0.0615	1.900311	-0.335997	0.464878	0.486799	0.000000	0.
41	3	1.5591	-0.4794	1.1993	-0.0480	1.900311	-0.314618	0.464878	0.486799	0.000000	0.
42	3	1.5591	-0.6200	1.1993	0.0601	1.900311	-0.143198	0.464878	0.486799	0.000000	0.
43	4	1.7324	-0.4491	1.2015	-0.0742	1.836436	-0.650665	0.480374	0.508148	0.000000	0.
44	3	1.7324	-0.6054	1.2015	0.0342	1.836436	-0.485007	0.480374	0.508148	0.000000	0.
45	3	1.7324	-0.6249	1.2015	0.0477	1.836436	-0.464347	0.480374	0.508148	0.000000	0.
46	4	1.8346	-0.6480	1.1992	-0.0193	1.795812	-0.547712	0.487540	0.518798	0.000000	0.
47	3	1.8346	-0.6687	1.1992	-0.0058	1.795812	-0.527508	0.487540	0.518798	0.000000	0.
48	3	1.8346	-0.6893	1.1992	0.0077	1.795812	-0.507305	0.487540	0.518798	0.000000	0.
49	4	1.9470	-0.7101	1.2034	-0.0592	1.755188	-0.504754	0.494300	0.529440	0.000000	0.
50	3	1.9470	-0.7320	1.2034	-0.0457	1.755188	-0.485007	0.494300	0.529440	0.000000	0.
51	3	1.9470	-0.9076	1.2034	0.0629	1.755188	-0.326678	0.494300	0.529440	0.000000	0.
52	4	2.2010	-0.6594	1.2047	-0.0711	1.691313	-0.467185	0.506595	0.550724	0.000000	0.
53	3	2.2010	-0.8580	1.2047	0.0376	1.691313	-0.314618	0.506595	0.550724	0.000000	0.
54	3	2.2010	-0.8828	1.2047	0.0512	1.691313	-0.295590	0.506595	0.550724	0.000000	0.
55	4	2.3438	-0.8949	1.2018	-0.0156	1.667772	-0.290880	0.512219	0.561349	0.000000	0.
56	3	2.3438	-0.9213	1.2018	-0.0021	1.667772	-0.272117	0.512219	0.561349	0.000000	0.
57	3	2.3438	-0.9477	1.2018	0.0114	1.667772	-0.253354	0.512219	0.561349	0.000000	0.
58	4	2.4967	-0.9565	1.2054	-0.0554	1.644231	-0.333116	0.517499	0.571971	0.000000	0.
59	3	2.4967	-0.9846	1.2054	-0.0418	1.644231	-0.314618	0.517499	0.571971	0.000000	0.
60	3	2.4967	-1.2098	1.2054	0.0669	1.644231	-0.166298	0.517499	0.571971	0.000000	0.
61	4	2.6783	-1.0476	1.2000	0.0000	1.621556	-0.398370	0.522434	0.582601	0.000000	0.
62	4	2.8314	-0.8552	1.2054	-0.0669	1.580356	-0.627565	0.527068	0.593231	0.000000	0.
63	3	2.8314	-1.1106	1.2054	0.0418	1.580356	-0.485007	0.527068	0.593231	0.000000	0.
64	3	2.8314	-1.1425	1.2054	0.0554	1.580356	-0.467228	0.527068	0.593231	0.000000	0.
65	4	3.0148	-1.1400	1.2018	-0.0114	1.539732	-0.544831	0.531440	0.603852	0.000000	0.
66	3	3.0148	-1.1739	1.2018	0.0021	1.539732	-0.527508	0.531440	0.603852	0.000000	0.
67	3	3.0148	-1.2078	1.2018	0.0156	1.539732	-0.510186	0.531440	0.603852	0.000000	0.
68	4	3.2082	-1.2011	1.2047	-0.0512	1.499109	-0.501873	0.535547	0.614477	0.000000	0.
69	3	3.2082	-1.2372	1.2047	-0.0376	1.499109	-0.485007	0.535547	0.614477	0.000000	0.
70	3	3.2082	-1.5266	1.2047	0.0711	1.499109	-0.349778	0.535547	0.614477	0.000000	0.
71	4	3.6237	-1.0363	1.2034	-0.0629	1.435233	-0.444085	0.543007	0.635761	0.000000	0.
72	3	3.6237	-1.3632	1.2034	0.0457	1.435233	-0.314618	0.543007	0.635761	0.000000	0.
73	3	3.6237	-1.4040	1.2034	0.0592	1.435233	-0.298471	0.543007	0.635761	0.000000	0.
74	4	3.8475	-1.3832	1.1992	-0.0077	1.411693	-0.287999	0.546428	0.646403	0.000000	0.
75	3	3.8475	-1.4265	1.1992	0.0058	1.411693	-0.272117	0.546428	0.646403	0.000000	0.
76	3	3.8475	-1.4698	1.1992	0.0193	1.411693	-0.256235	0.546428	0.646403	0.000000	0.
77	4	4.0816	-1.4439	1.2015	-0.0477	1.388152	-0.330235	0.549651	0.657054	0.000000	0.
78	3	4.0816	-1.4898	1.2015	-0.0342	1.388152	-0.314618	0.549651	0.657054	0.000000	0.
79	3	4.0816	-1.8580	1.2015	0.0742	1.388152	-0.189398	0.549651	0.657054	0.000000	0.
80	4	4.5777	-1.2029	1.1993	-0.0601	1.324277	-0.604465	0.555535	0.678403	0.000000	0.
81	3	4.5777	-1.6158	1.1993	0.0481	1.324277	-0.485007	0.555535	0.678403	0.000000	0.
82	3	4.5777	-1.6673	1.1993	0.0615	1.324277	-0.470109	0.555535	0.678403	0.000000	0.
83	4	4.8421	-1.6247	1.1948	-0.0056	1.283653	-0.541950	0.558247	0.689083	0.000000	0.
84	3	4.8421	-1.6791	1.1948	0.0078	1.283653	-0.527508	0.558247	0.689083	0.000000	0.
85	3	4.8421	-1.7336	1.1948	0.0212	1.283653	-0.513067	0.558247	0.689083	0.000000	0.

86	4	5.1167	-1.6849	1.1967	-0.0460	1.243029	-0.498992	0.560813	0.699775	0.000000	0.
87	3	5.1167	-1.7424	1.1967	-0.0325	1.243029	-0.485007	0.560813	0.699775	0.000000	0.
88	3	5.1167	-1.8575	1.1967	-0.0056	1.243029	-0.457038	0.560813	0.699775	0.000000	0.
89	4	5.2578	-1.6558	1.1985	-0.0391	1.224422	-0.470056	0.562044	0.705109	0.000000	0.
90	3	5.2578	-1.7741	1.1985	-0.0121	1.224422	-0.442506	0.562044	0.705109	0.000000	0.
91	3	5.2578	-1.8332	1.1985	0.0013	1.224422	-0.428731	0.562044	0.705109	0.000000	0.
92	4	5.5476	-1.7750	1.2037	-0.0656	1.190619	-0.413400	0.564409	0.715753	0.000000	0.
93	3	5.5476	-1.8374	1.2037	-0.0521	1.190619	-0.400005	0.564409	0.715753	0.000000	0.
94	1	6.4143	-2.0148	1.2693	-0.2395	1.100618	-0.400005	0.570414	0.744886	0.000000	0.
95	1	6.4143	-2.0148	1.2693	-0.2395	1.100618	-0.400005	0.570414	0.744886	0.000000	0.
96	1	8.0364	-2.3106	1.5661	-0.5519	0.950616	-0.400005	0.578730	0.787732	0.000000	0.
97	2	8.4887	0.8618	2.1904	-1.6089	0.778269	-0.737839	0.584401	0.814134	0.000000	0.
98	1	7.5285	0.7386	4.7109	-2.5920	0.335566	-0.737839	0.596358	0.844037	0.000000	0.
99	3	7.5285	-1.2445	4.7109	-1.3511	0.335566	-0.649448	0.596358	0.844037	0.000000	0.
100	4	6.3547	2.2257	7.9739	-1.9448	-0.000001	0.000000	0.617348	0.869858	0.000000	0.
101	3	6.3547	0.5519	7.9739	0.1555	-0.000001	0.000000	0.617348	0.869858	0.000000	0.
102	1	6.0420	0.4903	7.8921	0.1170	-0.000001	0.000000	0.625057	0.875878	0.000000	0.
103	1	5.8996	0.4595	7.8599	0.0977	-0.000001	0.000000	0.629056	0.878910	0.000000	0.
104	1	5.6424	0.3979	7.8128	0.0592	-0.000001	0.000000	0.637335	0.885004	0.000000	0.
105	3	6.5619	-3.6593	6.3686	4.4385	-0.000001	-0.000001	0.645443	0.891557	0.000000	0.
106	1	9.8402	-4.5365	3.3379	3.1383	-0.000001	-0.000001	0.653368	0.905382	0.000000	0.
107	2	9.8346	4.5536	2.4071	0.2405	-0.000001	0.000001	0.658006	0.923036	0.000000	0.
108	1	0.5088	-0.3528	3.5051	-0.7351	0.000000	0.000001	0.927581	1.061492	0.000000	0.
109	3	1.1346	-1.9228	3.0190	2.2026	0.000000	0.000001	0.995406	1.075518	0.000000	0.
110	1	5.0582	-4.4654	1.0445	1.0122	0.000001	0.000001	1.036669	1.131728	0.000000	0.
111	2	5.7580	0.0000	0.8988	0.0000	0.000001	0.000000	1.041000	1.157000	0.000000	0.

CROMATISMO	:	CX =	1.56785	CY =	1.94539
K*Beta*sin(2fi)	:		0.31625		-0.65691
K*Beta*cos(2fi)	:		1.20967		-0.62103
SESTUPOLI	:	KF(26) =	**********	KD(22) =	**********
K*BetaX**1.5	:		**********		**********
K*BetaY**1.5	:		**********		**********

MOMENTUM COMPACTION = 0.3012D-01
D = 0.6781D-01
ENERGY SPREAD = 0.3917D-03
RADIAL EMITTANCE = 0.1000D-05

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 F I N A L      V A L U E S
I          X(I)                F(I)

1      -.216164670D+01      -.381777943D-13

2      0.301969476D+01      0.102971017D-12

3      -.308341805D+01      0.466293670D-14

4      0.566738201D+01      -.5023759190-14

FF  = 0.1211D-25
FRACTION OF STEP = 0.1000D+01
NUMBER OF CALLS  =    86
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I	TY	LENGTH	DL	STRENGTH	ANGLE
8	4	1.450	1.450	0.000000	0.152705
9	1	1.825	0.375	0.000000	0.000000
10	1	1.825	0.000	0.000000	0.000000
11	1	2.075	0.250	0.000000	0.000000
12	1	2.075	0.000	0.000000	0.000000
13	1	2.450	0.375	0.000000	0.000000
14	2	2.750	0.300	1.383674	0.000000
15	1	3.150	0.400	0.000000	0.000000
16	3	3.450	0.300	-2.863033	0.000000
17	1	3.650	0.200	0.000000	0.000000
18	1	3.850	0.200	0.000000	0.000000
19	1	4.050	0.200	0.000000	0.000000
20	2	4.350	0.300	1.193216	0.000000
21	1	5.150	0.800	0.000000	0.000000
22	4	6.140	0.990	0.000000	0.706858
23	1	6.740	0.600	0.000000	0.000000
24	3	7.040	0.300	-2.032664	0.000000
25	1	7.240	0.200	0.000000	0.000000
26	1	7.240	0.000	0.000000	0.000000
27	1	7.640	0.400	0.000000	0.000000
28	2	7.940	0.300	2.435481	0.000000
29	1	8.540	0.600	0.000000	0.000000
30	3	8.540	0.000	-0.011250	0.000000
31	4	8.620	0.080	0.000000	0.042495
32	3	8.620	0.000	-0.011250	0.000000
33	3	8.620	0.000	-0.022501	0.000000
34	4	8.660	0.040	0.000000	0.042495
35	3	8.660	0.000	-0.022501	0.000000
36	3	8.660	0.000	-0.011250	0.000000
37	4	8.741	0.080	0.000000	0.042495
38	3	8.741	0.000	-0.011250	0.000000
39	3	8.741	0.000	-0.011250	0.000000
40	4	8.821	0.080	0.000000	-0.042495
41	3	8.821	0.000	-0.011250	0.000000
42	3	8.821	0.000	-0.090206	0.000000
43	4	8.981	0.161	0.000000	-0.169979
44	3	8.981	0.000	-0.090206	0.000000
45	3	8.981	0.000	-0.011250	0.000000
46	4	9.062	0.080	0.000000	-0.042495
47	3	9.062	0.000	-0.011250	0.000000
48	3	9.062	0.000	-0.011250	0.000000
49	4	9.142	0.080	0.000000	0.042495
50	3	9.142	0.000	-0.011250	0.000000
51	3	9.142	0.000	-0.090206	0.000000
52	4	9.303	0.161	0.000000	0.169979
53	3	9.303	0.000	-0.090206	0.000000
54	3	9.303	0.000	-0.011250	0.000000
55	4	9.383	0.080	0.000000	0.042495
56	3	9.383	0.000	-0.011250	0.000000
57	3	9.383	0.000	-0.011250	0.000000
58	4	9.463	0.080	0.000000	-0.042495
59	3	9.463	0.000	-0.011250	0.000000
60	3	9.463	0.000	-0.090206	0.000000
61	4	9.543	0.080	0.000000	-0.084989
62	4	9.624	0.080	0.000000	-0.084989
63	3	9.624	0.000	-0.090206	0.000000
64	3	9.624	0.000	-0.011250	0.000000
65	4	9.704	0.080	0.000000	-0.042495
66	3	9.704	0.000	-0.011250	0.000000
67	3	9.704	0.000	-0.011250	0.000000
68	4	9.784	0.080	0.000000	0.042495

69	3	9.784	0.000	-0.011250	0.000000
70	3	9.784	0.000	-0.090206	0.000000
71	4	9.945	0.161	0.000000	0.169979
72	3	9.945	0.000	-0.090206	0.000000
73	3	9.945	0.000	-0.011250	0.000000
74	4	10.025	0.080	0.000000	0.042495
75	3	10.025	0.000	-0.011250	0.000000
76	3	10.025	0.000	-0.011250	0.000000
77	4	10.105	0.080	0.000000	-0.042495
78	3	10.105	0.000	-0.011250	0.000000
79	3	10.105	0.000	-0.090206	0.000000
80	4	10.266	0.161	0.000000	-0.169979
81	3	10.266	0.000	-0.090206	0.000000
82	3	10.266	0.000	-0.011250	0.000000
83	4	10.346	0.080	0.000000	-0.042495
84	3	10.346	0.000	-0.011250	0.000000
85	3	10.346	0.000	-0.011250	0.000000
86	4	10.426	0.080	0.000000	0.042495
87	3	10.426	0.000	-0.011250	0.000000
88	3	10.426	0.000	-0.022501	0.000000
89	4	10.466	0.040	0.000000	0.042495
90	3	10.466	0.000	-0.022501	0.000000
91	3	10.466	0.000	-0.011250	0.000000
92	4	10.547	0.080	0.000000	0.042495
93	3	10.547	0.000	-0.011250	0.000000
94	1	10.772	0.225	0.000000	0.000000
95	1	10.772	0.000	0.000000	0.000000
96	1	11.147	0.375	0.000000	0.000000
97	2	11.447	0.300	1.290075	0.000000
98	1	12.047	0.600	0.000000	0.000000
99	3	12.047	0.000	-0.263408	0.000000
100	4	13.037	0.990	0.000000	0.706858
101	3	13.037	0.000	-0.263408	0.000000
102	1	13.337	0.300	0.000000	0.000000
103	1	13.487	0.150	0.000000	0.000000
104	1	13.787	0.300	0.000000	0.000000
105	3	14.087	0.300	-2.161647	0.000000
106	1	14.487	0.400	0.000000	0.000000
107	2	14.787	0.300	3.019695	0.000000
108	1	17.007	2.220	0.000000	0.000000
109	3	17.307	0.300	-3.083418	0.000000
110	1	17.921	0.614	0.000000	0.000000
111	2	18.071	0.150	5.667382	0.000000

IFAIL = 0

APPENDIX A.3.b

D15 Half-long arc optical functions and lattice elements

EL.	TIP	BETX	ALFX	BETY	ALFY	DX	DPX	QX	QY	dy
0	0	9.3852	0.2560	1.0000	0.3738	0.035000	0.020000	0.000000	0.000000	0.000000
8	4	8.6740	0.2307	2.3123	-1.2788	-0.047016	-0.132905	0.025588	0.201308	0.000000
9	1	8.5181	0.1851	3.4316	-1.7062	-0.096855	-0.132905	0.032534	0.222559	0.000000
10	1	8.5181	0.1851	3.4316	-1.7062	-0.096855	-0.132905	0.032534	0.222559	0.000000
11	1	8.4331	0.1548	4.3560	-1.9911	-0.130082	-0.132905	0.037229	0.232858	0.000000
12	1	8.4331	0.1548	4.3560	-1.9911	-0.130082	-0.132905	0.037229	0.232858	0.000000
13	1	8.3341	0.1093	6.0096	-2.4185	-0.179921	-0.132905	0.044351	0.244533	0.000000
14	2	7.5638	2.3818	8.2041	-5.1121	-0.211267	-0.074515	0.050277	0.251436	0.000000
15	1	5.7995	2.0289	12.8230	-6.4350	-0.241073	-0.074515	0.059895	0.257645	0.000000
16	3	5.8773	-2.3075	13.7428	3.6013	-0.291796	-0.269931	0.068386	0.261109	0.000000
17	1	6.8434	-2.5227	12.3430	3.3980	-0.345782	-0.269931	0.073406	0.263553	0.000000
18	1	7.8955	-2.7379	11.0244	3.1947	-0.399768	-0.269931	0.077737	0.266282	0.000000
19	1	9.0337	-2.9531	9.7872	2.9914	-0.453755	-0.269931	0.081506	0.269346	0.000000
20	2	10.0283	-0.2649	8.8636	0.1768	-0.513801	-0.127447	0.086450	0.274549	0.000000
21	1	10.5205	-0.3503	8.6551	0.0838	-0.615758	-0.127447	0.098859	0.289106	0.000000
22	4	5.0429	3.6905	8.6227	-0.0570	-0.044663	1.011949	0.122213	0.311472	0.000000
23	1	1.6580	1.9511	8.7330	-0.1268	0.562506	1.011949	0.155480	0.322485	0.000000
24	3	0.9583	0.5347	7.1734	4.9736	0.933618	1.503294	0.195043	0.328319	0.000000
25	1	0.7981	0.2664	5.3275	4.2560	1.234276	1.503294	0.231765	0.333469	0.000000
26	1	0.7981	0.2664	5.3275	4.2560	1.234276	1.503294	0.231765	0.333469	0.000000
27	1	0.7997	-0.2704	2.4967	2.8209	1.835594	1.503294	0.315223	0.350960	0.000000
28	2	0.8503	0.1171	1.5661	0.5519	2.027701	-0.251139	0.371771	0.376299	0.000000
29	1	1.1389	-0.5982	1.2037	0.0521	1.877017	-0.251139	0.476130	0.448278	0.000000
30	3	1.1389	-0.6110	1.2037	0.0656	1.877017	-0.230022	0.476130	0.448278	0.000000
31	4	1.2426	-0.6799	1.1985	-0.0013	1.858570	-0.229548	0.486874	0.458922	0.000000
32	3	1.2426	-0.6939	1.1985	0.0121	1.858570	-0.208638	0.486874	0.458922	0.000000
33	3	1.2426	-0.7218	1.1985	0.0391	1.858570	-0.166819	0.486874	0.458922	0.000000
34	4	1.3002	-0.7125	1.1968	0.0056	1.851052	-0.207787	0.491898	0.464257	0.000000
35	3	1.3002	-0.7417	1.1968	0.0325	1.851052	-0.166137	0.491898	0.464257	0.000000
36	3	1.3002	-0.7563	1.1968	0.0460	1.851052	-0.145312	0.491898	0.464257	0.000000
37	4	1.4269	-0.8213	1.1948	-0.0212	1.839426	-0.144330	0.501280	0.474948	0.000000
38	3	1.4269	-0.8374	1.1948	-0.0078	1.839426	-0.123636	0.501280	0.474948	0.000000
39	3	1.4269	-0.8534	1.1948	0.0056	1.839426	-0.102942	0.501280	0.474948	0.000000
40	4	1.5690	-0.9154	1.1993	-0.0615	1.827799	-0.186701	0.509819	0.485629	0.000000
41	3	1.5690	-0.9331	1.1993	-0.0481	1.827799	-0.166137	0.509819	0.485629	0.000000
42	3	1.5690	-1.0746	1.1993	0.0601	1.827799	-0.001259	0.509819	0.485629	0.000000
43	4	1.8975	-0.9524	1.2015	-0.0742	1.787646	-0.497783	0.524577	0.506977	0.000000
44	3	1.8975	-1.1235	1.2015	0.0342	1.787646	-0.336526	0.524577	0.506977	0.000000
45	3	1.8975	-1.1449	1.2015	0.0477	1.787646	-0.316415	0.524577	0.506977	0.000000
46	4	2.0855	-1.1957	1.1992	-0.0193	1.758937	-0.398816	0.530999	0.517628	0.000000
47	3	2.0855	-1.2192	1.1992	-0.0058	1.758937	-0.379027	0.530999	0.517628	0.000000
48	3	2.0855	-1.2427	1.1992	0.0077	1.758937	-0.359239	0.530999	0.517628	0.000000
49	4	2.2889	-1.2891	1.2034	-0.0592	1.730227	-0.355992	0.536845	0.528270	0.000000
50	3	2.2889	-1.3149	1.2034	-0.0457	1.730227	-0.336526	0.536845	0.528270	0.000000
51	3	2.2889	-1.5213	1.2034	0.0629	1.730227	-0.180449	0.536845	0.528270	0.000000
52	4	2.7394	-1.2582	1.2047	-0.0711	1.690074	-0.318592	0.547007	0.549554	0.000000
53	3	2.7394	-1.5053	1.2047	0.0376	1.690074	-0.166137	0.547007	0.549554	0.000000
54	3	2.7394	-1.5362	1.2047	0.0512	1.690074	-0.147123	0.547007	0.549554	0.000000
55	4	2.9887	-1.5674	1.2018	-0.0156	1.678448	-0.142519	0.551470	0.560179	0.000000
56	3	2.9887	-1.6010	1.2018	-0.0021	1.678448	-0.123636	0.551470	0.560179	0.000000
57	3	2.9887	-1.6346	1.2018	0.0114	1.678448	-0.104753	0.551470	0.560179	0.000000
58	4	3.2533	-1.6601	1.2054	-0.0554	1.666822	-0.184890	0.555567	0.570800	0.000000
59	3	3.2533	-1.6967	1.2054	-0.0418	1.666822	-0.166137	0.555567	0.570800	0.000000
60	3	3.2533	-1.9902	1.2054	0.0669	1.666822	-0.015780	0.555567	0.570800	0.000000
61	4	3.5576	-1.7919	1.2000	0.0000	1.656131	-0.250425	0.559317	0.581430	0.000000
62	4	3.8259	-1.5420	1.2054	-0.0669	1.626668	-0.483262	0.562776	0.592060	0.000000
63	3	3.8259	-1.8872	1.2054	0.0418	1.626668	-0.336526	0.562776	0.592060	0.000000
64	3	3.8259	-1.9302	1.2054	0.0554	1.626668	-0.318226	0.562776	0.592060	0.000000
65	4	4.1364	-1.9363	1.2018	-0.0114	1.597959	-0.397005	0.565987	0.602682	0.000000
66	3	4.1364	-1.9828	1.2018	0.0021	1.597959	-0.379027	0.565987	0.602682	0.000000
67	3	4.1364	-2.0294	1.2018	0.0156	1.597959	-0.361050	0.565987	0.602682	0.000000
68	4	4.4623	-2.0283	1.2047	-0.0512	1.569250	-0.354181	0.568960	0.613307	0.000000
69	3	4.4623	-2.0785	1.2047	-0.0376	1.569250	-0.336526	0.568960	0.613307	0.000000
70	3	4.4623	-2.4810	1.2047	0.0711	1.569250	-0.194970	0.568960	0.613307	0.000000
71	4	5.1569	-1.8038	1.2034	-0.0629	1.529096	-0.304071	0.574261	0.634591	0.000000
72	3	5.1569	-2.2690	1.2034	0.0457	1.529096	-0.166137	0.574261	0.634591	0.000000
73	3	5.1569	-2.3270	1.2034	0.0592	1.529096	-0.148935	0.574261	0.634591	0.000000
74	4	5.5287	-2.3025	1.1992	-0.0077	1.517470	-0.140708	0.576653	0.645233	0.000000
75	3	5.5287	-2.3647	1.1992	0.0058	1.517470	-0.123636	0.576653	0.645233	0.000000
76	3	5.5287	-2.4269	1.1992	0.0193	1.517470	-0.106564	0.576653	0.645233	0.000000
77	4	5.9159	-2.3938	1.2015	-0.0477	1.505844	-0.183079	0.578886	0.655883	0.000000
78	3	5.9159	-2.4603	1.2015	-0.0342	1.505844	-0.166137	0.578886	0.655883	0.000000
79	3	5.9159	-2.9940	1.2015	0.0742	1.505844	-0.030301	0.578886	0.655883	0.000000
80	4	6.7324	-2.0435	1.1993	-0.0601	1.465690	-0.468741	0.582916	0.677232	0.000000
81	3	6.7324	-2.6508	1.1993	0.0481	1.465690	-0.336526	0.582916	0.677232	0.000000
82	3	6.7324	-2.7265	1.1993	0.0615	1.465690	-0.320037	0.582916	0.677232	0.000000
83	4	7.1655	-2.6659	1.1948	-0.0056	1.436981	-0.395194	0.584754	0.687912	0.000000
84	3	7.1655	-2.7465	1.1948	0.0078	1.436981	-0.379027	0.584754	0.687912	0.000000
85	3	7.1655	-2.8271	1.1948	0.0212	1.436981	-0.362861	0.584754	0.687912	0.000000

86	4	7.6140	-2.7565	1.1968	-0.0460	1.408272	-0.352370	0.586483	0.698604	0.000000	0.
87	3	7.6140	-2.8421	1.1968	-0.0325	1.408272	-0.336526	0.586483	0.698604	0.000000	0.
88	3	7.6140	-3.0135	1.1968	-0.0056	1.408272	-0.304839	0.586483	0.698604	0.000000	0.
89	4	7.8440	-2.7135	1.1985	-0.0391	1.395623	-0.325428	0.587310	0.703938	0.000000	0.
90	3	7.8440	-2.8900	1.1985	-0.0121	1.395623	-0.294025	0.587310	0.703938	0.000000	0.
91	3	7.8440	-2.9782	1.1985	0.0013	1.395623	-0.278324	0.587310	0.703938	0.000000	0.
92	4	8.3154	-2.8921	1.2037	-0.0656	1.373734	-0.266979	0.588891	0.714582	0.000000	0.
93	3	8.3154	-2.9856	1.2037	-0.0521	1.373734	-0.251524	0.588891	0.714582	0.000000	0.
94	1	9.7193	-3.2539	1.2693	-0.2395	1.317141	-0.251524	0.592875	0.743715	0.000000	0.
95	1	9.7193	-3.2539	1.2693	-0.2395	1.317141	-0.251524	0.592875	0.743715	0.000000	0.
96	1	12.3274	-3.7010	1.5661	-0.5519	1.222820	-0.251524	0.598328	0.786562	0.000000	0.
97	2	12.3664	3.5788	2.3069	-2.0596	1.044178	-0.922013	0.602084	0.812535	0.000000	0.
98	1	8.4738	2.9088	5.5963	-3.4229	0.490971	-0.922013	0.611418	0.839237	0.000000	0.
99	3	8.4738	0.1196	5.5963	-1.5808	0.490971	-0.760406	0.611418	0.839237	0.000000	0.
100	4	3.5444	2.8864	10.3374	-2.3374	0.000000	0.000000	0.642544	0.864665	0.000000	0.
101	3	3.5444	1.7197	10.3374	1.0653	0.000000	0.000000	0.642544	0.864665	0.000000	0.
102	1	1.6839	0.9382	8.9472	0.9207	0.000000	0.000000	0.688795	0.876259	0.000000	0.
103	1	1.2215	0.6032	8.4134	0.8587	0.000000	0.000000	0.722335	0.881763	0.000000	0.
104	1	0.8957	-0.0109	7.5312	0.7452	0.000000	0.000000	0.810454	0.892769	0.000000	0.
105	3	1.1323	-0.8122	6.1832	3.5474	0.000000	0.000000	0.859703	0.899614	0.000000	0.
106	1	2.2498	-1.5158	3.2839	2.4929	0.000000	0.000000	0.908320	0.916600	0.000000	0.
107	2	2.2564	1.4969	3.0914	-1.7672	0.000000	0.000000	0.928167	0.932641	0.000000	0.
108	1	1.2095	-0.8586	12.4748	-3.9544	0.000000	0.000000	1.197342	0.975177	0.000000	0.
109	3	2.3448	-3.2759	11.3266	7.4140	0.000000	0.000000	1.227225	0.979007	0.000000	0.
110	1	6.3062	-5.5274	5.6546	5.1905	0.000000	0.000000	1.245893	0.987961	0.000000	0.
111	2	8.0387	0.2479	4.0269	0.6851	0.000000	0.000000	1.252321	0.998402	0.000000	0.
112	1	7.5732	0.0000	2.7406	0.0000	0.000001	0.000000	1.291000	1.094000	0.000000	0.

CROMATISNO	:	CX = 1.90254	CY =	2.72035
K*Beta*sin(2fi)	:	0.05002		-0.67506
K*Beta*cos(2fi)	:	0.90492		-1.26021
SESTUPOL1	:	KF(26) = -15.34663	KD(22) =	-173.26856
K*BetaX**1.5	:	-10.94220		-1962.19434
K*BetaY**1.5	:	-188.71285		-4387.19042

MOMENTUM COMPACTION =-0.1242D-01
D =-0.9896D-01
ENERGY SPREAD = 0.4060D-03
RADIAL EMITTANCE = 0.1000D-05

```
 F I N A L      V A L U E S
I          X(I)                F(I)


1      -.147654512D+01      0.337528616D-12

2      0.448479799D+01      0.408388601D-12

3      -.314193432D+01      0.6106226640-15

4      0.281167864D+01      -.152933222D-13

FF  = 0.2809D-24
FRACTION OF STEP = 0.1000D+01
NUMBER OF CALLS  =    86
```

I	TY	LENGTH	DL	STRENGTH	ANGLE
8	4	1.450	1.450	0.000000	-0.152705
9	1	1.825	0.375	0.000000	0.000000
10	1	1.825	0.000	0.000000	0.000000
11	1	2.075	0.250	0.000000	0.000000
12	1	2.075	0.000	0.000000	0.000000
13	1	2.450	0.375	0.000000	0.000000
14	2	2.750	0.300	0.987706	0.000000
15	1	3.150	0.400	0.000000	0.000000
16	3	3.450	0.300	-2.490322	0.000000
17	1	3.650	0.200	0.000000	0.000000
18	1	3.850	0.200	0.000000	0.000000
19	1	4.050	0.200	0.000000	0.000000
20	2	4.350	0.300	0.974562	0.000000
21	1	5.150	0.800	0.000000	0.000000
22	4	6.360	1.210	0.000000	0.863938
23	1	6.960	0.600	0.000000	0.000000
24	3	7.260	0.300	-2.225841	0.000000
25	1	7.460	0.200	0.000000	0.000000
26	1	7.460	0.000	0.000000	0.000000
27	1	7.860	0.400	0.000000	0.000000
28	2	8.160	0.300	2.960013	0.000000
29	1	8.760	0.600	0.000000	0.000000
30	3	8.760	0.000	-0.011250	0.000000
31	4	8.840	0.080	0.000000	0.042495
32	3	8.840	0.000	-0.011250	0.000000
33	3	8.840	0.000	-0.022501	0.000000
34	4	8.880	0.040	0.000000	0.042495
35	3	8.880	0.000	-0.022501	0.000000
36	3	8.880	0.000	-0.011250	0.000000
37	4	8.961	0.080	0.000000	0.042495
38	3	8.961	0.000	-0.011250	0.000000
39	3	8.961	0.000	-0.011250	0.000000
40	4	9.041	0.080	0.000000	-0.042495
41	3	9.041	0.000	-0.011250	0.000000
42	3	9.041	0.000	-0.090206	0.000000
43	4	9.201	0.161	0.000000	-0.169979
44	3	9.201	0.000	-0.090206	0.000000
45	3	9.201	0.000	-0.011250	0.000000
46	4	9.282	0.080	0.000000	-0.042495
47	3	9.282	0.000	-0.011250	0.000000
48	3	9.282	0.000	-0.011250	0.000000
49	4	9.362	0.080	0.000000	0.042495
50	3	9.362	0.000	-0.011250	0.000000
51	3	9.362	0.000	-0.090206	0.000000
52	4	9.523	0.161	0.000000	0.169979
53	3	9.523	0.000	-0.090206	0.000000
54	3	9.523	0.000	-0.011250	0.000000
55	4	9.603	0.080	0.000000	0.042495
56	3	9.603	0.000	-0.011250	0.000000
57	3	9.603	0.000	-0.011250	0.000000
58	4	9.683	0.080	0.000000	-0.042495
59	3	9.683	0.000	-0.011250	0.000000
60	3	9.683	0.000	-0.090206	0.000000
61	4	9.763	0.080	0.000000	-0.084989
62	4	9.844	0.080	0.000000	-0.084989
63	3	9.844	0.000	-0.090206	0.000000
64	3	9.844	0.000	-0.011250	0.000000
65	4	9.924	0.080	0.000000	-0.042495
66	3	9.924	0.000	-0.011250	0.000000
67	3	9.924	0.000	-0.011250	0.000000
68	4	10.004	0.080	0.000000	0.042495

69	3	10.004	0.000	-0.011250	0.000000
70	3	10.004	0.000	-0.090206	0.000000
71	4	10.165	0.161	0.000000	0.169979
72	3	10.165	0.000	-0.090206	0.000000
73	3	10.165	0.000	-0.011250	0.000000
74	4	10.245	0.080	0.000000	0.042495
75	3	10.245	0.000	-0.011250	0.000000
76	3	10.245	0.000	-0.011250	0.000000
77	4	10.325	0.080	0.000000	-0.042495
78	3	10.325	0.000	-0.011250	0.000000
79	3	10.325	0.000	-0.090206	0.000000
80	4	10.486	0.161	0.000000	-0.169979
81	3	10.486	0.000	-0.090206	0.000000
82	3	10.486	0.000	-0.011250	0.000000
83	4	10.566	0.080	0.000000	-0.042495
84	3	10.566	0.000	-0.011250	0.000000
85	3	10.566	0.000	-0.011250	0.000000
86	4	10.646	0.080	0.000000	0.042495
87	3	10.646	0.000	-0.011250	0.000000
88	3	10.646	0.000	-0.022501	0.000000
89	4	10.686	0.040	0.000000	0.042495
90	3	10.686	0.000	-0.022501	0.000000
91	3	10.686	0.000	-0.011250	0.000000
92	4	10.767	0.080	0.000000	0.042495
93	3	10.767	0.000	-0.011250	0.000000
94	1	10.992	0.225	0.000000	0.000000
95	1	10.992	0.000	0.000000	0.000000
96	1	11.367	0.375	0.000000	0.000000
97	2	11.667	0.300	1.942921	0.000000
98	1	12.267	0.600	0.000000	0.000000
99	3	12.267	0.000	-0.329158	0.000000
100	4	13.477	1.210	0.000000	0.863938
101	3	13.477	0.000	-0.329158	0.000000
102	1	14.177	0.700	0.000000	0.000000
103	1	14.477	0.300	0.000000	0.000000
104	1	15.027	0.550	0.000000	0.000000
105	3	15.327	0.300	-1.476545	0.000000
106	1	15.807	0.480	0.000000	0.000000
107	2	16.107	0.300	4.484798	0.000000
108	1	17.747	1.640	0.000000	0.000000
109	3	18.047	0.300	-3.141934	0.000000
110	1	18.497	0.450	0.000000	0.000000
111	2	18.797	0.300	2.811679	0.000000
112	1	20.674	1.878	0.000000	0.000000

IFAIL = 0

APPENDIX A.4.a

D16 Half-short optical functions and lattice elements

EL.	TYP	BETX	ALFX	BETY	ALFY	DX	DPX	QX	QY	dy	
0	0	8.7800	0.0000	8.0000	0.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00C
1	1	8.7833	-0.0194	8.0036	-0.0212	0.000000	0.000000	0.003081	0.003382	0.000000	0.00C
2	4	8.1288	2.1433	8.6774	-2.2835	0.000124	0.000823	0.008659	0.009188	0.000000	0.00C
3	1	5.4322	1.6547	12.2810	-2.7920	0.000708	0.000823	0.025697	0.020143	0.000000	0.00C
4	4	5.1338	-0.6186	12.3929	2.4349	0.000193	-0.004294	0.034935	0.023932	0.000000	0.00C
5	1	5.8047	-0.7506	10.1408	2.1610	-0.001911	-0.004294	0.049240	0.030891	0.000000	0.00C
6	4	6.1657	0.0908	8.7394	0.5457	-0.003044	0.000063	0.063216	0.040015	0.000000	0.00C
7	1	6.7647	-0.3259	6.9227	0.1673	-0.002884	0.000063	0.127763	0.093132	0.000000	0.00C
8	4	7.8957	-0.4486	6.7498	-0.0480	0.102565	0.145108	0.159441	0.127155	0.000000	0.00C
9	1	8.2535	-0.5056	6.8066	-0.1037	0.156972	0.145108	0.166836	0.135963	0.000000	0.00C
10	1	8.2535	-0.5056	6.8066	-0.1037	0.156972	0.145108	0.166836	0.135963	0.000000	0.00C
11	4	8.5158	-0.5436	6.8678	-0.1408	0.193368	0.166083	0.171582	0.141784	0.000000	0.00C
12	1	8.5158	-0.5436	6.8678	-0.1408	0.193368	0.166083	0.171582	0.141784	0.000000	0.00C
13	1	8.9449	-0.6007	6.9943	-0.1965	0.248149	0.166083	0.178423	0.150399	0.000000	0.00C
14	2	8.1939	2.9965	8.0684	-3.5350	0.275369	0.033445	0.183883	0.156893	0.000000	0.00C
15	1	5.9916	2.5093	11.1641	-4.2041	0.288747	0.033445	0.192974	0.163603	0.000000	0.00C
16	3	5.5729	-1.0301	11.6180	2.7860	0.325810	0.217387	0.201494	0.167669	0.000000	0.00C
17	1	5.9997	-1.1040	10.5346	2.6334	0.369288	0.217387	0.207000	0.170547	0.000000	0.00C
18	1	6.4561	-1.1780	9.5113	2.4827	0.412765	0.217387	0.212115	0.173727	0.000000	0.00C
19	1	6.9421	-1.2519	8.5484	2.3321	0.456243	0.217387	0.216871	0.177257	0.000000	0.00C
20	2	7.1758	0.4929	7.8108	0.1882	0.503471	0.095479	0.223552	0.183176	0.000000	0.00C
21	1	6.4980	0.3543	7.5946	0.0821	0.579854	0.095479	0.242241	0.199737	0.000000	0.00C
22	4	3.4105	2.2269	7.3618	-0.0491	0.863339	0.453170	0.273187	0.220588	0.000000	0.00C
23	1	1.3673	1.1785	7.6685	-0.1286	1.135241	0.453170	0.317999	0.233142	0.000000	0.00C
24	3	1.0128	0.0775	6.3708	4.1747	1.385967	1.244914	0.360380	0.239759	0.000000	0.00C
25	1	1.0215	-0.1211	4.8166	3.5962	1.634949	1.244914	0.391880	0.245506	0.000000	0.00C
26	1	1.0215	-0.1211	4.8166	3.5962	1.634949	1.244914	0.391880	0.245506	0.000000	0.00C
27	1	1.2774	-0.5185	2.4025	2.4391	2.132915	1.244914	0.448818	0.264264	0.000000	0.00C
28	2	1.3647	0.2492	1.5661	0.5519	2.260746	-0.408502	0.483945	0.289909	0.000000	0.00C
29	1	1.3459	-0.2178	1.2037	0.0521	2.015645	-0.408502	0.556939	0.361888	0.000000	0.00C
30	3	1.3459	-0.2329	1.2037	0.0656	2.015645	-0.385825	0.556939	0.361888	0.000000	0.00C
31	4	1.3858	-0.2646	1.1985	-0.0013	1.984571	-0.388328	0.566295	0.372532	0.000000	0.00C
32	3	1.3858	-0.2802	1.1985	0.0121	1.984571	-0.366001	0.566295	0.372532	0.000000	0.00C
33	3	1.3858	-0.3114	1.1985	0.0391	1.984571	-0.321347	0.566295	0.372532	0.000000	0.00C
34	4	1.4096	-0.2797	1.1968	0.0056	1.970739	-0.367843	0.570865	0.377866	0.000000	0.00C
35	3	1.4096	-0.3114	1.1968	0.0325	1.970739	-0.323500	0.570865	0.377866	0.000000	0.00C
36	3	1.4096	-0.3273	1.1968	0.0460	1.970739	-0.301329	0.570865	0.377866	0.000000	0.00C
37	4	1.4645	-0.3574	1.1948	-0.0212	1.946485	-0.302897	0.579758	0.388558	0.000000	0.00C
38	3	1.4645	-0.3739	1.1948	-0.0078	1.946485	-0.280999	0.579758	0.388558	0.000000	0.00C
39	3	1.4645	-0.3904	1.1948	0.0056	1.946485	-0.259100	0.579758	0.388558	0.000000	0.00C
40	4	1.5296	-0.4191	1.1993	-0.0615	1.922232	-0.345136	0.588295	0.399238	0.000000	0.00C
41	3	1.5296	-0.4363	1.1993	-0.0481	1.922232	-0.323500	0.588295	0.399238	0.000000	0.00C
42	3	1.5296	-0.5743	1.1993	0.0601	1.922232	-0.150103	0.588295	0.399238	0.000000	0.00C
43	4	1.6889	-0.4083	1.2015	-0.0742	1.856938	-0.661396	0.604142	0.420587	0.000000	0.00C
44	3	1.6889	-0.5607	1.2015	0.0342	1.856938	-0.493889	0.604142	0.420587	0.000000	0.00C
45	3	1.6889	-0.5797	1.2015	0.0477	1.856938	-0.472998	0.604142	0.420587	0.000000	0.00C
46	4	1.7838	-0.6031	1.1992	-0.0193	1.815601	-0.556816	0.611502	0.431238	0.000000	0.00C
47	3	1.7838	-0.6231	1.1992	-0.0058	1.815601	-0.536390	0.611502	0.431238	0.000000	0.00C
48	3	1.7838	-0.6432	1.1992	0.0077	1.815601	-0.515964	0.611502	0.431238	0.000000	0.00C
49	4	1.8889	-0.6643	1.2034	-0.0592	1.774265	-0.513850	0.618462	0.441880	0.000000	0.00C
50	3	1.8889	-0.6856	1.2034	-0.0457	1.774265	-0.493889	0.618462	0.441880	0.000000	0.00C
51	3	1.8889	-0.8560	1.2034	0.0629	1.774265	-0.333839	0.618462	0.441880	0.000000	0.00C
52	4	2.1278	-0.6180	1.2047	-0.0711	1.708970	-0.477660	0.631158	0.463164	0.000000	0.00C
53	3	2.1278	-0.8099	1.2047	0.0376	1.708970	-0.323500	0.631158	0.463164	0.000000	0.00C
54	3	2.1278	-0.8339	1.2047	0.0512	1.708970	-0.304274	0.631158	0.463164	0.000000	0.00C
55	4	2.2628	-0.8469	1.2018	-0.0156	1.684717	-0.299952	0.636980	0.473788	0.000000	0.00C
56	3	2.2628	-0.8724	1.2018	-0.0021	1.684717	-0.280999	0.636980	0.473788	0.000000	0.00C
57	3	2.2628	-0.8978	1.2018	0.0114	1.684717	-0.262045	0.636980	0.473788	0.000000	0.00C
58	4	2.4078	-0.9077	1.2054	-0.0554	1.660463	-0.342181	0.642452	0.484410	0.000000	0.00C
59	3	2.4078	-0.9348	1.2054	-0.0418	1.660463	-0.323500	0.642452	0.484410	0.000000	0.00C
60	3	2.4078	-1.1520	1.2054	0.0669	1.660463	-0.173716	0.642452	0.484410	0.000000	0.00C
61	4	2.5807	-0.9970	1.2000	0.0000	1.637134	-0.407219	0.647572	0.495040	0.000000	0.00C
62	4	2.7264	-0.8132	1.2054	-0.0669	1.595169	-0.637783	0.652383	0.505670	0.000000	0.00C
63	3	2.7264	-1.0592	1.2054	0.0418	1.595169	-0.493889	0.652383	0.505670	0.000000	0.00C

64	3	2.7264	-1.0898	1.2054	0.0554	1.595169	-0.475943	0.652383	0.505670	0.000000	0.000
65	4	2.9014	-1.0890	1.2018	-0.0114	1.553833	-0.553871	0.656924	0.516292	0.000000	0.000
66	3	2.9014	-1.1216	1.2018	0.0021	1.553833	-0.536390	0.656924	0.516292	0.000000	0.000
67	3	2.9014	-1.1543	1.2018	0.0156	1.553833	-0.518909	0.656924	0.516292	0.000000	0.000
68	4	3.0864	-1.1493	1.2047	-0.0512	1.512496	-0.510905	0.661193	0.526917	0.000000	0.000
69	3	3.0864	-1.1841	1.2047	-0.0376	1.512496	-0.493889	0.661193	0.526917	0.000000	0.000
70	3	3.0864	-1.4625	1.2047	0.0711	1.512496	-0.357452	0.661193	0.526917	0.000000	0.000
71	4	3.4846	-0.9941	1.2034	-0.0629	1.447202	-0.454046	0.668949	0.548201	0.000000	0.000
72	3	3.4846	-1.3084	1.2034	0.0457	1.447202	-0.323500	0.668949	0.548201	0.000000	0.000
73	3	3.4846	-1.3476	1.2034	0.0592	1.447202	-0.307218	0.668949	0.548201	0.000000	0.000
74	4	3.6996	-1.3292	1.1992	-0.0077	1.422949	-0.297008	0.672507	0.558843	0.000000	0.000
75	3	3.6996	-1.3709	1.1992	0.0058	1.422949	-0.280999	0.672507	0.558843	0.000000	0.000
76	3	3.6996	-1.4125	1.1992	0.0193	1.422949	-0.264990	0.672507	0.558843	0.000000	0.000
77	4	3.9246	-1.3891	1.2015	-0.0477	1.398695	-0.339236	0.675858	0.569493	0.000000	0.000
78	3	3.9246	-1.4333	1.2015	-0.0342	1.398695	-0.321500	0.675858	0.569493	0.000000	0.000
79	3	3.9246	-1.7073	1.2015	0.0742	1.398695	-0.197329	0.675858	0.569493	0.000000	0.000
80	4	4.4024	-1.1605	1.1993	-0.0601	1.333401	-0.614170	0.681977	0.590842	0.000000	0.000
81	3	4.4024	-1.5576	1.1993	0.0481	1.333401	-0.493889	0.681977	0.590842	0.000000	0.000
82	3	4.4024	-1.6072	1.1993	0.0615	1.333401	-0.478888	0.681977	0.590842	0.000000	0.000
83	4	4.6574	-1.5677	1.1948	-0.0056	1.292064	-0.550926	0.684798	0.601522	0.000000	0.000
84	3	4.6574	-1.6201	1.1948	0.0078	1.292064	-0.536390	0.684798	0.601522	0.000000	0.000
85	3	4.6574	-1.6725	1.1948	0.0212	1.292064	-0.521854	0.684798	0.601522	0.000000	0.000
86	4	4.9224	-1.6272	1.1968	-0.0460	1.250728	-0.507960	0.687465	0.612214	0.000000	0.000
87	3	4.9224	-1.6825	1.1968	-0.0325	1.250728	-0.493889	0.687465	0.612214	0.000000	0.000
88	3	4.9224	-1.7933	1.1968	-0.0056	1.250728	-0.465747	0.687465	0.612214	0.000000	0.000
89	4	5.0587	-1.5999	1.1985	-0.0391	1.231765	-0.479103	0.688745	0.617548	0.000000	0.000
90	3	5.0587	-1.7138	1.1985	-0.0121	1.231765	-0.451388	0.688745	0.617548	0.000000	0.000
91	3	5.0587	-1.7707	1.1985	0.0013	1.231765	-0.437530	0.688745	0.617548	0.000000	0.000
92	4	5.3387	-1.7162	1.2037	-0.0656	1.197249	-0.422356	0.691202	0.628192	0.000000	0.000
93	3	5.3387	-1.7762	1.2037	-0.0521	1.197249	-0.408887	0.691202	0.628192	0.000000	0.000
94	1	6.1774	-1.9513	1.2693	-0.2395	1.105250	-0.408887	0.697440	0.657325	0.000000	0.000
95	1	6.1774	-1.9513	1.2693	-0.2395	1.105250	-0.408887	0.697440	0.657325	0.000000	0.000
96	1	7.7504	-2.2432	1.5661	-0.5519	0.951917	-0.408887	0.706069	0.700172	0.000000	0.000
97	2	8.2213	0.7330	2.1843	-1.5859	0.778270	-0.737839	0.711940	0.726597	0.000000	0.000
98	1	7.4091	0.6208	4.6668	-2.5515	0.335567	-0.737839	0.724188	0.756685	0.000000	0.000
99	3	7.4091	-1.3308	4.6668	-1.3222	0.335567	-0.649448	0.724188	0.756685	0.000000	0.000
100	4	6.4345	2.1456	7.8619	-1.9052	0.000000	0.000000	0.745215	0.782814	0.000000	0.000
101	3	6.4345	0.4507	7.8619	0.1657	0.000000	0.000000	0.745215	0.782814	0.000000	0.000
102	1	6.1809	0.3946	7.7742	0.1265	0.000000	0.000000	0.752789	0.788923	0.000000	0.000
103	1	6.0667	0.3666	7.7392	0.1069	0.000000	0.000000	0.756688	0.792001	0.000000	0.000
104	1	5.8636	0.3105	7.6869	0.0677	0.000000	0.000000	0.764697	0.798193	0.000000	0.000
105	3	6.8867	-3.9391	6.2615	4.3714	0.000000	0.000000	0.772460	0.804856	0.000000	0.000
106	1	10.4217	-4.8984	3.2783	3.0868	0.000000	0.000000	0.779977	0.818926	0.000000	0.000
107	2	10.4516	4.8079	2.3670	0.2226	0.000000	0.000000	0.784347	0.836896	0.000000	0.000
108	1	0.4763	-0.3145	3.5640	-0.7618	0.000000	0.000000	1.050207	0.975360	0.000000	0.000
109	3	1.0745	-1.8607	3.0760	2.2350	0.000000	0.000000	1.122551	0.989140	0.000000	0.000
110	1	4.9268	-4.4115	1.0658	1.0379	0.000000	0.000000	1.165559	1.044221	0.000000	0.000
111	2	5.6186	0.0000	0.9165	0.0000	0.000000	0.000000	1.170000	1.069000	0.000000	0.000

I	TY	LENGTH	DL	STRENGTH	ANGLE
1	1	0.170	0.170	0.000000	0.000000
2	4	0.470	0.300	-113580.00	0.000834
3	1	1.180	0.710	0.000000	0.000000
4	4	1.480	0.300	4398.14	-0.005360
5	1	1.970	0.490	0.000000	0.000000
6	4	2.502	0.532	-5341.90	0.003940
7	1	5.050	2.548	0.000000	0.000000
8	4	6.500	1.450	0.000000	0.145517
9	1	6.875	0.375	0.000000	0.000000
10	1	6.875	0.000	0.000000	0.000000
11	4	7.125	0.250	0.000000	0.000976
12	1	7.125	0.000	0.000000	0.000000
13	1	7.500	0.375	0.000000	0.000000
14	2	7.800	0.300	1.419076	0.000000
15	1	8.200	0.400	0.000000	0.000000
16	3	8.500	0.300	-2.025607	0.000000
17	1	8.700	0.200	0.000000	0.000000
18	1	8.900	0.200	0.000000	0.000000
19	1	9.100	0.200	0.000000	0.000000
20	2	9.400	0.300	0.841483	0.000000
21	1	10.200	0.800	0.000000	0.000000
22	4	11.190	0.990	0.000000	0.706858
23	1	11.790	0.600	0.000000	0.000000
24	3	12.090	0.300	-2.126848	0.000000
25	1	12.290	0.200	0.000000	0.000000
26	1	12.290	0.000	0.000000	0.000000
27	1	12.690	0.400	0.000000	0.000000
28	2	12.990	0.300	2.462288	0.000000
29	1	13.590	0.600	0.000000	0.000000
30	3	13.590	0.000	-0.011250	0.000000
31	4	13.670	0.080	0.000000	0.042495
32	3	13.670	0.000	-0.011250	0.000000
33	3	13.670	0.000	-0.022501	0.000000
34	4	13.711	0.040	0.000000	0.042495
35	3	13.711	0.000	-0.022501	0.000000
36	3	13.711	0.000	-0.011250	0.000000
37	4	13.791	0.080	0.000000	0.042495
38	3	13.791	0.000	-0.011250	0.000000
39	3	13.791	0.000	-0.011250	0.000000
40	4	13.871	0.080	0.000000	-0.042495
41	3	13.871	0.000	-0.011250	0.000000
42	3	13.871	0.000	-0.090206	0.000000
43	4	14.032	0.161	0.000000	-0.169979
44	3	14.032	0.000	-0.090206	0.000000
45	3	14.032	0.000	-0.011250	0.000000
46	4	14.112	0.080	0.000000	-0.042495
47	3	14.112	0.000	-0.011250	0.000000
48	3	14.112	0.000	-0.011250	0.000000
49	4	14.192	0.080	0.000000	0.042495
50	3	14.192	0.000	-0.011250	0.000000
51	3	14.192	0.000	-0.090206	0.000000
52	4	14.353	0.161	0.000000	0.169979
53	3	14.353	0.000	-0.090206	0.000000
54	3	14.353	0.000	-0.011250	0.000000
55	4	14.433	0.080	0.000000	0.042495
56	3	14.433	0.000	-0.011250	0.000000
57	3	14.433	0.000	-0.011250	0.000000
58	4	14.513	0.080	0.000000	-0.042495
59	3	14.513	0.000	-0.011250	0.000000
60	3	14.513	0.000	-0.090206	0.000000
61	4	14.593	0.080	0.000000	-0.084989

62	4	14.674	0.080	0.000000	-0.084989
63	3	14.674	0.000	-0.090206	0.000000
64	3	14.674	0.000	-0.011250	0.000000
65	4	14.754	0.080	0.000000	-0.042495
66	3	14.754	0.000	-0.011250	0.000000
67	3	14.754	0.000	-0.011250	0.000000
68	4	14.834	0.080	0.000000	0.042495
69	3	14.834	0.000	-0.011250	0.000000
70	3	14.834	0.000	-0.090206	0.000000
71	4	14.995	0.161	0.000000	0.169979
72	3	14.995	0.000	-0.090206	0.000000
73	3	14.995	0.000	-0.011250	0.000000
74	4	15.075	0.080	0.000000	0.042495
75	3	15.075	0.000	-0.011250	0.000000
76	3	15.075	0.000	-0.011250	0.000000
77	4	15.155	0.080	0.000000	-0.042495
78	3	15.155	0.000	-0.011250	0.000000
79	3	15.155	0.000	-0.090206	0.000000
80	4	15.316	0.161	0.000000	-0.169979
81	3	15.316	0.000	-0.090206	0.000000
82	3	15.316	0.000	-0.011250	0.000000
83	4	15.396	0.080	0.000000	-0.042495
84	3	15.396	0.000	-0.011250	0.000000
85	3	15.396	0.000	-0.011250	0.000000
86	4	15.476	0.080	0.000000	0.042495
87	3	15.476	0.000	-0.011250	0.000000
88	3	15.476	0.000	-0.022501	0.000000
89	4	15.517	0.040	0.000000	0.042495
90	3	15.517	0.000	-0.022501	0.000000
91	3	15.517	0.000	-0.011250	0.000000
92	4	15.597	0.080	0.000000	0.042495
93	3	15.597	0.000	-0.011250	0.000000
94	1	15.822	0.225	0.000000	0.000000
95	1	15.822	0.000	0.000000	0.000000
96	1	16.197	0.375	0.000000	0.000000
97	2	16.497	0.300	1.255543	0.000000
98	1	17.097	0.600	0.000000	0.000000
99	3	17.097	0.000	-0.263408	0.000000
100	4	18.087	0.990	0.000000	0.706858
101	3	18.087	0.000	-0.263408	0.000000
102	1	18.387	0.300	0.000000	0.000000
103	1	18.537	0.150	0.000000	0.000000
104	1	18.837	0.300	0.000000	0.000000
105	3	19.137	0.300	-2.161424	0.000000
106	1	19.537	0.400	0.000000	0.000000
107	2	19.837	0.300	3.037722	0.000000
108	1	22.057	2.220	0.000000	0.000000
109	3	22.357	0.300	-3.085318	0.000000
110	1	22.971	0.614	0.000000	0.000000
111	2	23.121	0.150	5.745983	0.000000

APPENDIX A.4.b

D16 Half-long optical functions and lattice elements

EL.	TIP	BETX	ALFX	BETY	ALFY	DX	DPX	QX	QY	dy	
0	0	8.7800	0.0000	8.0000	0.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000
1	1	8.7833	-0.0194	8.0036	-0.0212	0.000000	0.000000	0.003081	0.003382	0.000000	0.000
2	4	8.1288	2.1433	8.6774	-2.2835	-0.000124	-0.000823	0.008659	0.009188	0.000000	0.000
3	1	5.4322	1.6547	12.2810	-2.7920	-0.000708	-0.000823	0.025697	0.020143	0.000000	0.000
4	4	5.1338	-0.6186	12.3929	2.4349	-0.000193	0.004294	0.034935	0.023932	0.000000	0.000
5	1	5.8047	-0.7506	10.1408	2.1610	0.001911	0.004294	0.049240	0.030891	0.000000	0.000
6	4	6.1657	0.0908	8.7396	0.5457	0.003044	-0.000063	0.063216	0.040015	0.000000	0.000
7	1	6.7647	-0.3259	6.9227	0.1673	0.002884	-0.000063	0.127763	0.093132	0.000000	0.000
8	4	7.8957	-0.4486	6.7498	-0.0480	-0.102565	-0.145108	0.159441	0.127155	0.000000	0.000
9	1	8.2535	-0.5056	6.8066	-0.1037	-0.156972	-0.145108	0.166836	0.135963	0.000000	0.000
10	1	8.2535	-0.5056	6.8066	-0.1037	-0.156972	-0.145108	0.166836	0.135963	0.000000	0.000
11	4	8.5158	-0.5436	6.8678	-0.1408	-0.193368	-0.146083	0.171582	0.141784	0.000000	0.000
12	1	8.5158	-0.5436	6.8678	-0.1408	-0.193368	-0.146083	0.171582	0.141784	0.000000	0.000
13	1	8.9449	-0.6007	6.9943	-0.1965	-0.248149	-0.146083	0.178423	0.150399	0.000000	0.000
14	2	8.5992	1.7219	7.7102	-2.2534	-0.261476	-0.074603	0.183795	0.156990	0.000000	0.000
15	1	7.2955	1.5375	9.6390	-2.5587	-0.311317	-0.074603	0.191836	0.164378	0.000000	0.000
16	3	7.3095	-1.5864	9.9385	1.6136	-0.354309	-0.215060	0.198517	0.169153	0.000000	0.000
17	1	7.9634	-1.6826	9.3075	1.5411	-0.397321	-0.215060	0.202689	0.172463	0.000000	0.000
18	1	8.6557	-1.7789	8.7056	1.4686	-0.440333	-0.215060	0.206524	0.176000	0.000000	0.000
19	1	9.3864	-1.8751	8.1326	1.3961	-0.483345	-0.215060	0.210055	0.179783	0.000000	0.000
20	2	10.0374	-0.2571	7.7278	-0.0235	-0.534835	-0.126718	0.216933	0.185859	0.000000	0.000
21	1	10.5167	-0.3421	7.8483	-0.1271	-0.636209	-0.126718	0.227338	0.202237	0.000000	0.000
22	4	5.0295	3.6883	8.3453	-0.2637	-0.057169	1.023525	0.250728	0.226122	0.000000	0.000
23	1	1.6488	1.9461	8.7324	-0.3614	0.556945	1.023525	0.284133	0.257318	0.000000	0.000
24	3	0.9613	0.5032	7.2262	5.0267	0.934191	1.535186	0.323805	0.243122	0.000000	0.000
25	1	0.8122	0.2425	5.3609	4.2997	1.241228	1.535186	0.360143	0.248237	0.000000	0.000
26	1	0.8122	0.2425	5.3609	4.2997	1.241228	1.535186	0.360143	0.248237	0.000000	0.000
27	1	0.8268	-0.2790	2.5028	2.8456	1.855303	1.535186	0.441303	0.265652	0.000000	0.000
28	2	0.8695	0.1495	1.5661	0.5519	2.051271	-0.258174	0.496204	0.290972	0.000000	0.000
29	1	1.1134	-0.5560	1.2037	0.0521	1.896366	-0.258174	0.600575	0.362952	0.000000	0.000
30	3	1.1134	-0.5685	1.2037	0.0656	1.896366	-0.236840	0.600575	0.362952	0.000000	0.000
31	4	1.2102	-0.6367	1.1985	-0.0013	1.877355	-0.236796	0.611585	0.373595	0.000000	0.000
32	3	1.2102	-0.6503	1.1985	0.0121	1.877355	-0.215673	0.611585	0.373595	0.000000	0.000
33	3	1.2102	-0.6775	1.1985	0.0391	1.877355	-0.173432	0.611585	0.373595	0.000000	0.000
34	4	1.2643	-0.6690	1.1968	0.0056	1.869554	-0.215238	0.616748	0.378930	0.000000	0.000
35	3	1.2643	-0.6975	1.1968	0.0325	1.869554	-0.173172	0.616748	0.378930	0.000000	0.000
36	3	1.2643	-0.7117	1.1968	0.0460	1.869554	-0.152139	0.616748	0.378930	0.000000	0.000
37	4	1.3838	-0.7763	1.1948	-0.0212	1.857364	-0.151567	0.626409	0.389621	0.000000	0.000
38	3	1.3838	-0.7918	1.1948	-0.0078	1.857364	-0.130671	0.626409	0.389621	0.000000	0.000
39	3	1.3838	-0.8074	1.1948	0.0056	1.857364	-0.109775	0.626409	0.389621	0.000000	0.000
40	4	1.5185	-0.8691	1.1993	-0.0615	1.845173	-0.193931	0.635224	0.400302	0.000000	0.000
41	3	1.5185	-0.8862	1.1993	-0.0481	1.845173	-0.173172	0.635224	0.400302	0.000000	0.000
42	3	1.5185	-1.0231	1.1993	0.0601	1.845173	-0.006726	0.635224	0.400302	0.000000	0.000
43	4	1.8316	-0.9088	1.2015	-0.0742	1.803896	-0.506184	0.650494	0.421651	0.000000	0.000
44	3	1.8316	-1.0740	1.2015	0.0342	1.803896	-0.343561	0.650494	0.421651	0.000000	0.000
45	3	1.8316	-1.0946	1.2015	0.0477	1.803896	-0.323267	0.650494	0.421651	0.000000	0.000
46	4	2.0116	-1.1457	1.1992	-0.0193	1.774622	-0.406027	0.657149	0.432301	0.000000	0.000
47	3	2.0116	-1.1683	1.1992	-0.0058	1.774622	-0.386062	0.657149	0.432301	0.000000	0.000
48	3	2.0116	-1.1910	1.1992	0.0077	1.774622	-0.366097	0.657149	0.432301	0.000000	0.000
49	4	2.2066	-1.2379	1.2034	-0.0592	1.745348	-0.363197	0.663213	0.442943	0.000000	0.000
50	3	2.2066	-1.2627	1.2034	-0.0457	1.745348	-0.343561	0.663213	0.442943	0.000000	0.000
51	3	2.2066	-1.4617	1.2034	0.0629	1.745348	-0.186120	0.663213	0.442943	0.000000	0.000
52	4	2.6401	-1.2124	1.2047	-0.0711	1.704071	-0.326890	0.673755	0.464227	0.000000	0.000
53	3	2.6401	-1.4505	1.2047	0.0376	1.704071	-0.173172	0.673755	0.464227	0.000000	0.000
54	3	2.6401	-1.4802	1.2047	0.0512	1.704071	-0.154001	0.673755	0.464227	0.000000	0.000
55	4	2.8805	-1.5125	1.2018	-0.0156	1.691880	-0.149705	0.678387	0.474852	0.000000	0.000
56	3	2.8805	-1.5449	1.2018	-0.0021	1.691880	-0.130671	0.678387	0.474852	0.000000	0.000
57	3	2.8805	-1.5773	1.2018	0.0114	1.691880	-0.111637	0.678387	0.474852	0.000000	0.000
58	4	3.1360	-1.6039	1.2054	-0.0554	1.679689	-0.192069	0.682636	0.485474	0.000000	0.000
59	3	3.1360	-1.6392	1.2054	-0.0418	1.679689	-0.173172	0.682636	0.485474	0.000000	0.000
60	3	3.1360	-1.9221	1.2054	0.0669	1.679689	-0.021654	0.682636	0.485474	0.000000	0.000
61	4	3.4301	-1.7331	1.2000	0.0000	1.668482	-0.257434	0.686527	0.496104	0.000000	0.000
62	4	3.6898	-1.4943	1.2054	-0.0669	1.638412	-0.491556	0.690114	0.506734	0.000000	0.000
63	3	3.6898	-1.8271	1.2054	0.0418	1.638412	-0.343561	0.690114	0.506734	0.000000	0.000

64	3	3.6898	-1.8686	1.2054	0.0554	1.638412	-0.325129	0.690114	0.506734	0.000000	0.000
65	4	3.9905	-1.8765	1.2018	-0.0114	1.609138	-0.404165	0.693443	0.517355	0.000000	0.000
66	3	3.9905	-1.9214	1.2018	0.0021	1.609138	-0.386062	0.693443	0.517355	0.000000	0.000
67	3	3.9905	-1.9663	1.2018	0.0156	1.609138	-0.367959	0.693443	0.517355	0.000000	0.000
68	4	4.3065	-1.9673	1.2047	-0.0512	1.579865	-0.361335	0.696524	0.527980	0.000000	0.000
69	3	4.3065	-2.0157	1.2047	-0.0376	1.579865	-0.343561	0.696524	0.527980	0.000000	0.000
70	3	4.3065	-2.4042	1.2047	0.0711	1.579865	-0.201048	0.696524	0.527980	0.000000	0.000
71	4	4.9806	-1.7543	1.2034	-0.0629	1.538587	-0.311962	0.702015	0.549264	0.000000	0.000
72	3	4.9806	-2.2036	1.2034	0.0457	1.538587	-0.173172	0.702015	0.549264	0.000000	0.000
73	3	4.9806	-2.2596	1.2034	0.0592	1.538587	-0.155863	0.702015	0.549264	0.000000	0.000
74	4	5.3418	-2.2378	1.1992	-0.0077	1.526397	-0.147844	0.704491	0.559906	0.000000	0.000
75	3	5.3418	-2.2979	1.1992	0.0058	1.526397	-0.130671	0.704491	0.559906	0.000000	0.000
76	3	5.3418	-2.3580	1.1992	0.0193	1.526397	-0.113499	0.704491	0.559906	0.000000	0.000
77	4	5.7181	-2.3279	1.2015	-0.0477	1.514206	-0.190207	0.706802	0.570557	0.000000	0.000
78	3	5.7181	-2.3923	1.2015	-0.0342	1.514206	-0.173172	0.706802	0.570557	0.000000	0.000
79	3	5.7181	-2.9081	1.2015	0.0742	1.514206	-0.036581	0.706802	0.570557	0.000000	0.000
80	4	6.5125	-1.9926	1.1993	-0.0601	1.472928	-0.476428	0.710969	0.591905	0.000000	0.000
81	3	6.5125	-2.5801	1.1993	0.0481	1.472928	-0.343561	0.710969	0.591905	0.000000	0.000
82	3	6.5125	-2.6534	1.1993	0.0615	1.472928	-0.326990	0.710969	0.591905	0.000000	0.000
83	4	6.9342	-2.5964	1.1948	-0.0056	1.443655	-0.402306	0.712870	0.602586	0.000000	0.000
84	3	6.9342	-2.6744	1.1948	0.0078	1.443655	-0.386062	0.712870	0.602586	0.000000	0.000
85	3	6.9342	-2.7525	1.1948	0.0212	1.443655	-0.369821	0.712870	0.602586	0.000000	0.000
86	4	7.3710	-2.6859	1.1968	-0.0460	1.414381	-0.359473	0.714656	0.613277	0.000000	0.000
87	3	7.3710	-2.7688	1.1968	-0.0325	1.414381	-0.343561	0.714656	0.613277	0.000000	0.000
88	3	7.3710	-2.9346	1.1968	-0.0056	1.414381	-0.311737	0.714656	0.613277	0.000000	0.000
89	4	7.5950	-2.6451	1.1985	-0.0391	1.401449	-0.332594	0.715509	0.618612	0.000000	0.000
90	3	7.5950	-2.8160	1.1985	-0.0121	1.401449	-0.301060	0.715509	0.618612	0.000000	0.000
91	3	7.5950	-2.9014	1.1985	0.0013	1.401449	-0.285293	0.715509	0.618612	0.000000	0.000
92	4	8.0545	-2.8197	1.2037	-0.0656	1.378997	-0.274073	0.717142	0.629256	0.000000	0.000
93	3	8.0545	-2.9103	1.2037	-0.0521	1.378997	-0.258559	0.717142	0.629256	0.000000	0.000
94	1	9.4237	-3.1748	1.2693	-0.2395	1.320821	-0.258559	0.721253	0.658389	0.000000	0.000
95	1	9.4237	-3.1748	1.2693	-0.2395	1.320821	-0.258559	0.721253	0.658389	0.000000	0.000
96	1	11.9702	-3.6157	1.5661	-0.5519	1.223861	-0.258559	0.726874	0.701235	0.000000	0.000
97	2	12.0439	3.3843	2.3031	-2.0446	1.044178	-0.922013	0.730737	0.727222	0.000000	0.000
98	1	8.3550	2.7639	5.5664	-3.3943	0.490970	-0.922013	0.740262	0.754019	0.000000	0.000
99	3	8.3550	0.0137	5.5664	-1.5621	0.490970	-0.760406	0.740262	0.754019	0.000000	0.000
100	4	3.6408	3.8611	10.2514	-2.3098	0.000000	0.000000	0.771189	0.779623	0.000000	0.000
101	3	3.6408	1.6627	10.2514	1.0645	0.000000	0.000000	0.771189	0.779623	0.000000	0.000
102	1	1.8197	0.9389	8.8631	0.9188	0.000000	0.000000	0.815025	0.791321	0.000000	0.000
103	1	1.3494	0.6287	8.3305	0.8564	0.000000	0.000000	0.845684	0.796879	0.000000	0.000
104	1	0.9706	0.0600	7.4514	0.7420	0.000000	0.000000	0.925472	0.807998	0.000000	0.000
105	3	1.1703	-0.7561	6.0735	3.6356	0.000000	0.000000	0.971979	0.814934	0.000000	0.000
106	1	2.2055	-1.4007	3.1227	2.5120	0.000000	0.000000	1.020268	0.832512	0.000000	0.000
107	2	2.1152	1.6577	2.9260	-1.7654	0.000000	0.000000	1.040890	0.849489	0.000000	0.000
108	1	1.6437	-1.2483	12.5005	-4.0727	0.000000	0.000000	1.347008	0.893195	0.000000	0.000
109	3	2.9656	-4.2941	11.4091	7.3610	0.000000	0.000000	1.371280	0.897007	0.000000	0.000
110	1	8.1576	-7.2438	5.7637	5.1844	0.000000	0.000000	1.385861	0.905844	0.000000	0.000
111	2	10.4721	0.1855	4.1508	0.6344	0.000000	0.000000	1.390815	0.916026	0.000000	0.000
112	1	10.1239	0.0000	2.9597	0.0000	0.000000	0.000000	1.420000	1.006000	0.000000	0.000

I	TY	LENGTH	DL	STRENGTH	ANGLE
1	1	0.170	0.170	0.000000	0.000000
2	4	0.470	0.300	-113580.00	-0.000834
3	1	1.180	0.710	0.000000	0.000000
4	4	1.480	0.300	4398.14	0.005360
5	1	1.970	0.490	0.000000	0.000000
6	4	2.502	0.532	-5341.90	-0.003940
7	1	5.050	2.548	0.000000	0.000000
8	4	6.500	1.450	0.000000	-0.145517
9	1	6.875	0.375	0.000000	0.000000
10	1	6.875	0.000	0.000000	0.000000
11	4	7.125	0.250	0.000000	-0.000976
12	1	7.125	0.000	0.000000	0.000000
13	1	7.500	0.375	0.000000	0.000000
14	2	7.800	0.300	0.893718	0.000000
15	1	8.200	0.400	0.000000	0.000000
16	3	8.500	0.300	-1.421730	0.000000
17	1	8.700	0.200	0.000000	0.000000
18	1	8.900	0.200	0.000000	0.000000
19	1	9.100	0.200	0.000000	0.000000
20	2	9.400	0.300	0.575929	0.000000
21	1	10.200	0.800	0.000000	0.000000
22	4	11.410	1.210	0.000000	0.863938
23	1	12.010	0.600	0.000000	0.000000
24	3	12.310	0.300	-2.327356	0.000000
25	1	12.510	0.200	0.000000	0.000000
26	1	12.510	0.000	0.000000	0.000000
27	1	12.910	0.400	0.000000	0.000000
28	2	13.210	0.300	2.991442	0.000000
29	1	13.810	0.600	0.000000	0.000000
30	3	13.810	0.000	-0.011250	0.000000
31	4	13.890	0.080	0.000000	0.042495
32	3	13.890	0.000	-0.011250	0.000000
33	3	13.890	0.000	-0.022501	0.000000
34	4	13.931	0.040	0.000000	0.042495
35	3	13.931	0.000	-0.022501	0.000000
36	3	13.931	0.000	-0.011250	0.000000
37	4	14.011	0.080	0.000000	0.042495
38	3	14.011	0.000	-0.011250	0.000000
39	3	14.011	0.000	-0.011250	0.000000
40	4	14.091	0.080	0.000000	-0.042495
41	3	14.091	0.000	-0.011250	0.000000
42	3	14.091	0.000	-0.090206	0.000000
43	4	14.252	0.161	0.000000	-0.169979
44	3	14.252	0.000	-0.090206	0.000000
45	3	14.252	0.000	-0.011250	0.000000
46	4	14.332	0.080	0.000000	-0.042495
47	3	14.332	0.000	-0.011250	0.000000
48	3	14.332	0.000	-0.011250	0.000000
49	4	14.412	0.080	0.000000	0.042495
50	3	14.412	0.000	-0.011250	0.000000
51	3	14.412	0.000	-0.090206	0.000000
52	4	14.573	0.161	0.000000	0.169979
53	3	14.573	0.000	-0.090206	0.000000
54	3	14.573	0.000	-0.011250	0.000000
55	4	14.653	0.080	0.000000	0.042495
56	3	14.653	0.000	-0.011250	0.000000
57	3	14.653	0.000	-0.011250	0.000000
58	4	14.733	0.080	0.000000	-0.042495
59	3	14.733	0.000	-0.011250	0.000000
60	3	14.733	0.000	-0.090206	0.000000
61	4	14.813	0.080	0.000000	-0.084989

62	4	14.894	0.080	0.000000	-0.084989
63	3	14.894	0.000	-0.090206	0.000000
64	3	14.894	0.000	-0.011250	0.000000
65	4	14.974	0.080	0.000000	-0.042495
66	3	14.974	0.000	-0.011250	0.000000
67	3	14.974	0.000	-0.011250	0.000000
68	4	15.054	0.080	0.000000	0.042495
69	3	15.054	0.000	-0.011250	0.000000
70	3	15.054	0.000	-0.090206	0.000000
71	4	15.215	0.161	0.000000	0.169979
72	3	15.215	0.000	-0.090206	0.000000
73	3	15.215	0.000	-0.011250	0.000000
74	4	15.295	0.080	0.000000	0.042495
75	3	15.295	0.000	-0.011250	0.000000
76	3	15.295	0.000	-0.011250	0.000000
77	4	15.375	0.080	0.000000	-0.042495
78	3	15.375	0.000	-0.011250	0.000000
79	3	15.375	0.000	-0.090206	0.000000
80	4	15.536	0.161	0.000000	-0.169979
81	3	15.536	0.000	-0.090206	0.000000
82	3	15.536	0.000	-0.011250	0.000000
83	4	15.616	0.080	0.000000	-0.042495
84	3	15.616	0.000	-0.011250	0.000000
85	3	15.616	0.000	-0.011250	0.000000
86	4	15.696	0.080	0.000000	0.042495
87	3	15.696	0.000	-0.011250	0.000000
88	3	15.696	0.000	-0.022501	0.000000
89	4	15.737	0.040	0.000000	0.042495
90	3	15.737	0.000	-0.022501	0.000000
91	3	15.737	0.000	-0.011250	0.000000
92	4	15.817	0.080	0.000000	0.042495
93	3	15.817	0.000	-0.011250	0.000000
94	1	16.042	0.225	0.000000	0.000000
95	1	16.042	0.000	0.000000	0.000000
96	1	16.417	0.375	0.000000	0.000000
97	2	16.717	0.300	1.921961	- 0.000000
98	1	17.317	0.600	0.000000	0.000000
99	3	17.317	0.000	-0.329158	0.000000
100	4	18.527	1.210	0.000000	0.863938
101	3	18.527	0.000	-0.329158	0.000000
102	1	19.227	0.700	0.000000	0.000000
103	1	19.527	0.300	0.000000	0.000000
104	1	20.077	0.550	0.000000	0.000000
105	3	20.377	0.300	-1.547935	0.000000
106	1	20.857	0.480	0.000000	0.000000
107	2	21.157	0.300	4.747874	0.000000
108	1	22.797	1.640	0.000000	0.000000
109	3	23.097	0.300	-3.142776	0.000000
110	1	23.547	0.450	0.000000	0.000000
111	2	23.847	0.300	2.789410	0.000000
112	1	25.724	1.878	0.000000	0.000000

APPENDIX A.5.a

D17 Short optical functions and lattice elements
(from the detuned IP to the matching point)

EL.	TIP	BETX	ALFX	BETY	ALFY	DX	DPX	QX	QY	dy	dpy
0	0	8.7800	0.0000	8.0000	0.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1	1	8.7833	-0.0194	8.0036	-0.0212	0.000000	0.000000	0.003081	0.003382	0.000000	0.000000
2	4	8.1288	2.1433	8.6774	-2.2835	0.000124	0.000823	0.008659	0.009188	0.000000	0.000000
3	1	5.4322	1.6547	12.2810	-2.7920	0.000708	0.000823	0.025697	0.020143	0.000000	0.000000
4	4	5.1338	-0.6186	12.3929	2.4349	0.000193	-0.004294	0.034935	0.023932	0.000000	0.000000
5	1	5.8047	-0.7506	10.1408	2.1610	-0.001911	-0.004294	0.049240	0.030991	0.000000	0.000000
6	4	6.1657	0.0908	8.7394	0.5457	-0.003044	0.000063	0.063216	0.040015	0.000000	0.000000
7	1	6.7647	-0.3259	6.9227	0.1673	-0.002884	0.000063	0.127763	0.093132	0.000000	0.000000
8	4	7.8957	-0.4486	6.7498	-0.0480	0.102565	0.145108	0.159441	0.127155	0.000000	0.000000
9	1	8.2535	-0.5056	6.8066	-0.1037	0.156972	0.145108	0.166836	0.135963	0.000000	0.000000
10	1	8.2535	-0.5056	6.8066	-0.1037	0.156972	0.145108	0.166836	0.135963	0.000000	0.000000
11	4	8.5158	-0.5436	6.8678	-0.1408	0.193368	0.146083	0.171582	0.141784	0.000000	0.000000
12	1	8.5158	-0.5436	6.8678	-0.1408	0.193368	0.146083	0.171582	0.141784	0.000000	0.000000
13	1	8.9449	-0.6007	6.9943	-0.1965	0.248149	0.146083	0.178423	0.150399	0.000000	0.000000
14	2	8.1939	2.9965	8.0684	-3.5350	0.275369	0.033445	0.183883	0.156893	0.000000	0.000000
15	1	5.9916	2.5093	11.1641	-4.2041	0.288747	0.033445	0.192974	0.163603	0.000000	0.000000
16	3	5.5729	-1.0301	11.6180	2.7840	0.325810	0.217387	0.201494	0.167669	0.000000	0.000000
17	1	5.9997	-1.1040	10.5346	2.6334	0.369288	0.217387	0.207000	0.170547	0.000000	0.000000
18	1	6.4561	-1.1780	9.5113	2.4827	0.412765	0.217387	0.212115	0.173727	0.000000	0.000000
19	1	6.9421	-1.2519	8.5484	2.3321	0.456243	0.217387	0.216871	0.177257	0.000000	0.000000
20	2	7.1758	0.4929	7.8108	0.1882	0.503471	0.095479	0.223552	0.183176	0.000000	0.000000
21	1	6.4980	0.3543	7.5946	0.0821	0.579854	0.095479	0.242241	0.199737	0.000000	0.000000
22	4	3.4105	2.2269	7.5618	-0.0491	0.863339	0.453170	0.273187	0.220588	0.000000	0.000000
23	1	1.3673	1.1785	7.6685	-0.1286	1.135241	0.453170	0.317999	0.233142	0.000000	0.000000
24	3	1.0128	0.0775	6.3708	4.1747	1.385967	1.244914	0.360380	0.239759	0.000000	0.000000
25	1	1.0215	-0.1211	4.8166	3.5962	1.634949	1.244914	0.391880	0.245506	0.000000	0.000000
26	1	1.0215	-0.1211	4.8166	3.5962	1.634949	1.244914	0.391880	0.245506	0.000000	0.000000
27	1	1.2774	-0.5185	2.4025	2.4391	2.132915	1.244914	0.448818	0.264264	0.000000	0.000000
28	2	1.3647	0.2492	1.5661	0.5519	2.260746	-0.408502	0.483945	0.289909	0.000000	0.000000
29	1	1.3459	-0.2178	1.2037	0.0521	2.015645	-0.408502	0.556939	0.361888	0.000000	0.000000
30	3	1.3459	-0.2329	1.2037	0.0656	2.015645	-0.385825	0.556939	0.361888	0.000000	0.000000
31	4	1.3858	-0.2646	1.1985	-0.0013	1.984571	-0.388328	0.566295	0.372532	0.000000	0.000000
32	3	1.3858	-0.2802	1.1985	0.0121	1.984571	-0.366001	0.566295	0.372532	0.000000	0.000000
33	3	1.3858	-0.3114	1.1985	0.0391	1.984571	-0.321347	0.566295	0.372532	0.000000	0.000000
34	4	1.4096	-0.2797	1.1968	0.0056	1.970739	-0.367843	0.570865	0.377866	0.000000	0.000000
35	3	1.4096	-0.3114	1.1968	0.0325	1.970739	-0.323500	0.570865	0.377866	0.000000	0.000000
36	3	1.4096	-0.3273	1.1968	0.0460	1.970739	-0.301329	0.570865	0.377866	0.000000	0.000000
37	4	1.4645	-0.3574	1.1948	-0.0212	1.946485	-0.302897	0.579758	0.388558	0.000000	0.000000
38	3	1.4645	-0.3739	1.1948	-0.0078	1.946485	-0.280999	0.579758	0.388558	0.000000	0.000000
39	3	1.4645	-0.3904	1.1948	0.0056	1.946485	-0.259100	0.579758	0.388558	0.000000	0.000000
40	4	1.5296	-0.4191	1.1993	-0.0615	1.922232	-0.345126	0.588295	0.399238	0.000000	0.000000
41	3	1.5296	-0.4363	1.1993	-0.0481	1.922232	-0.323500	0.588295	0.399238	0.000000	0.000000
42	3	1.5296	-0.5743	1.1993	0.0601	1.922232	-0.150103	0.588295	0.399238	0.000000	0.000000
43	4	1.6889	-0.4083	1.2015	-0.0742	1.856938	-0.661396	0.604142	0.420587	0.000000	0.000000
44	3	1.6889	-0.5607	1.2015	0.0342	1.856938	-0.493889	0.604142	0.420587	0.000000	0.000000
45	3	1.6889	-0.5797	1.2015	0.0477	1.856938	-0.472998	0.604142	0.420587	0.000000	0.000000
46	4	1.7838	-0.6031	1.1992	-0.0193	1.815601	-0.556816	0.611502	0.431238	0.000000	0.000000
47	3	1.7838	-0.6231	1.1992	-0.0058	1.815601	-0.536390	0.611502	0.431238	0.000000	0.000000
48	3	1.7838	-0.6432	1.1992	0.0077	1.815601	-0.515964	0.611502	0.431238	0.000000	0.000000
49	4	1.8889	-0.6643	1.2034	-0.0592	1.774265	-0.513850	0.618462	0.441880	0.000000	0.000000
50	3	1.8889	-0.6856	1.2034	-0.0457	1.774265	-0.493889	0.618462	0.441880	0.000000	0.000000
51	3	1.8889	-0.8560	1.2034	0.0629	1.774265	-0.333839	0.618462	0.441880	0.000000	0.000000
52	4	2.1278	-0.6180	1.2047	-0.0711	1.708970	-0.477660	0.631158	0.463164	0.000000	0.000000
53	3	2.1278	-0.8099	1.2047	0.0376	1.708970	-0.323500	0.631158	0.463164	0.000000	0.000000
54	3	2.1278	-0.8339	1.2047	0.0512	1.708970	-0.304274	0.631158	0.463164	0.000000	0.000000
55	4	2.2628	-0.8469	1.2018	-0.0156	1.684717	-0.299952	0.636980	0.473788	0.000000	0.000000
56	3	2.2628	-0.8724	1.2018	-0.0021	1.684717	-0.280999	0.636980	0.473788	0.000000	0.000000

57	3	2.2628	-0.8978	1.2018	0.0114	1.684717	-0.262045	0.636980	0.473788	0.000000	0.000000
58	4	2.4078	-0.9077	1.2054	-0.0554	1.660463	-0.342181	0.642452	0.484410	0.000000	0.000000
59	3	2.4078	-0.9348	1.2054	-0.0418	1.660463	-0.323500	0.642452	0.484410	0.000000	0.000000
60	3	2.4078	-1.1520	1.2054	0.0669	1.660463	-0.173716	0.642452	0.484410	0.000000	0.000000
61	4	2.5807	-0.9970	1.2000	0.0000	1.637134	-0.407219	0.647572	0.495040	0.000000	0.000000
62	4	2.7264	-0.8132	1.2054	-0.0669	1.595169	-0.637783	0.652383	0.505670	0.000000	0.000000
63	3	2.7264	-1.0592	1.2054	0.0418	1.595169	-0.493889	0.652383	0.505670	0.000000	0.000000
64	3	2.7264	-1.0898	1.2054	0.0554	1.595169	-0.475943	0.652383	0.505670	0.000000	0.000000
65	4	2.9014	-1.0890	1.2018	-0.0114	1.553833	-0.553871	0.656924	0.516292	0.000000	0.000000
66	3	2.9014	-1.1216	1.2018	0.0021	1.553833	-0.536390	0.656924	0.516292	0.000000	0.000000
67	3	2.9014	-1.1543	1.2018	0.0156	1.553833	-0.518909	0.656924	0.516292	0.000000	0.000000
68	4	3.0864	-1.1493	1.2047	-0.0512	1.512496	-0.510905	0.661193	0.526917	0.000000	0.000000
69	3	3.0864	-1.1841	1.2047	-0.0376	1.512496	-0.493889	0.661193	0.526917	0.000000	0.000000
70	3	3.0864	-1.4625	1.2047	0.0711	1.512496	-0.357452	0.661193	0.526917	0.000000	0.000000
71	4	3.4846	-0.9941	1.2034	-0.0629	1.447202	-0.454046	0.668949	0.548201	0.000000	0.000000
72	3	3.4846	-1.3084	1.2034	0.0457	1.447202	-0.323500	0.668949	0.548201	0.000000	0.000000
73	3	3.4846	-1.3476	1.2034	0.0592	1.447202	-0.307218	0.668949	0.548201	0.000000	0.000000
74	4	3.6996	-1.3292	1.1992	-0.0077	1.422949	-0.297008	0.672507	0.558843	0.000000	0.000000
75	3	3.6996	-1.3709	1.1992	0.0058	1.422949	-0.280999	0.672507	0.558843	0.000000	0.000000
76	3	3.6996	-1.4125	1.1992	0.0193	1.422949	-0.264990	0.672507	0.558843	0.000000	0.000000
77	4	3.9246	-1.3891	1.2015	-0.0477	1.398695	-0.339236	0.675858	0.569493	0.000000	0.000000
78	3	3.9246	-1.4333	1.2015	-0.0342	1.398695	-0.323500	0.675858	0.569493	0.000000	0.000000
79	3	3.9246	-1.7873	1.2015	0.0742	1.398695	-0.197329	0.675858	0.569493	0.000000	0.000000
80	4	4.4024	-1.1605	1.1993	-0.0601	1.333401	-0.614170	0.681977	0.590842	0.000000	0.000000
81	3	4.4024	-1.5576	1.1993	0.0481	1.333401	-0.493889	0.681977	0.590842	0.000000	0.000000
82	3	4.4024	-1.6072	1.1993	0.0615	1.333401	-0.478888	0.681977	0.590842	0.000000	0.000000
83	4	4.6574	-1.5677	1.1948	-0.0056	1.292064	-0.550926	0.684798	0.601522	0.000000	0.000000
84	3	4.6574	-1.6201	1.1948	0.0078	1.292064	-0.536390	0.684798	0.601522	0.000000	0.000000
85	3	4.6574	-1.6725	1.1948	0.0212	1.292064	-0.521854	0.684798	0.601522	0.000000	0.000000
86	4	4.9224	-1.6272	1.1968	-0.0460	1.250728	-0.507960	0.687465	0.612214	0.000000	0.000000
87	3	4.9224	-1.6825	1.1968	-0.0325	1.250728	-0.493889	0.687465	0.612214	0.000000	0.000000
88	3	4.9224	-1.7933	1.1968	-0.0056	1.250728	-0.465747	0.687465	0.612214	0.000000	0.000000
89	4	5.0587	-1.5999	1.1985	-0.0391	1.231765	-0.479103	0.688745	0.617548	0.000000	0.000000
90	3	5.0587	-1.7138	1.1985	-0.0121	1.231765	-0.451388	0.688745	0.617548	0.000000	0.000000
91	3	5.0587	-1.7707	1.1985	0.0013	1.231765	-0.437530	0.688745	0.617548	0.000000	0.000000
92	4	5.3387	-1.7162	1.2037	-0.0656	1.197249	-0.422356	0.691202	0.628192	0.000000	0.000000
93	3	5.3387	-1.7762	1.2037	-0.0521	1.197249	-0.408887	0.691202	0.628192	0.000000	0.000000
94	1	6.1774	-1.9513	1.2693	-0.2395	1.105250	-0.408887	0.697440	0.657325	0.000000	0.000000
95	1	6.1774	-1.9513	1.2693	-0.2395	1.105250	-0.408887	0.697440	0.657325	0.000000	0.000000
96	1	7.7504	-2.2432	1.5661	-0.5519	0.951917	-0.408887	0.706069	0.700172	0.000000	0.000000
97	2	8.2213	0.7330	2.1843	-1.5859	0.778270	-0.737839	0.711940	0.726597	0.000000	0.000000
98	1	7.4091	0.6208	4.6668	-2.5515	0.335567	-0.737839	0.724188	0.756685	0.000000	0.000000
99	3	7.4091	-1.3308	4.6668	-1.3222	0.335567	-0.649448	0.724188	0.756685	0.000000	0.000000
00	4	6.4345	2.1456	7.8619	-1.9052	0.000000	0.000000	0.745215	0.782814	0.000000	0.000000
01	3	6.4345	0.4507	7.8619	0.1657	0.000000	0.000000	0.745215	0.782814	0.000000	0.000000
02	1	6.1809	0.3946	7.7742	0.1265	0.000000	0.000000	0.752789	0.788923	0.000000	0.000000
03	1	6.0667	0.3666	7.7392	0.1069	0.000000	0.000000	0.756688	0.792001	0.000000	0.000000
04	1	5.8636	0.3105	7.6869	0.0677	0.000000	0.000000	0.764697	0.798193	0.000000	0.000000
05	3	6.8867	-3.9391	6.2615	4.3714	0.000000	0.000000	0.772460	0.804856	0.000000	0.000000
06	1	10.4217	-4.8984	3.2783	3.0868	0.000000	0.000000	0.779977	0.818926	0.000000	0.000000
07	2	10.4486	4.8170	2.3678	0.2201	0.000000	0.000000	0.784348	0.836894	0.000000	0.000000
08	1	0.4774	-0.3254	3.5728	-0.7629	0.000000	0.000000	1.051846	0.975098	0.000000	0.000000
09	3	1.0854	-1.8858	3.0803	2.2491	0.000000	0.000000	1.123714	0.988849	0.000000	0.000000
10	1	4.9855	-4.4641	1.0595	1.0411	0.000000	0.000000	1.166240	1.044059	0.000000	0.000000
11	1	4.9855	-4.4641	1.0595	1.0411	0.000000	0.000000	1.166240	1.044059	0.000000	0.000000
12	2	5.0031	4.4159	1.0513	-1.0091	0.000000	0.000000	1.175007	1.094093	0.000000	0.000000
13	1	1.1243	1.8992	3.0151	-2.1883	0.000000	0.000000	1.216698	1.150150	0.000000	0.000000
14	3	0.5075	0.3429	3.4966	0.7341	0.000000	0.000000	1.284930	1.164205	0.000000	0.000000
15	1	9.8373	-4.5455	2.4063	-0.2430	0.000000	0.000000	1.553043	1.302920	0.000000	0.000000
16	2	9.8403	4.5366	3.3379	-3.1384	0.000000	0.000000	1.557680	1.320576	0.000000	0.000000
17	1	6.5619	3.6593	6.3687	-4.4386	0.000000	0.000000	1.565606	1.334401	0.000000	0.000000
18	3	5.6423	-0.3979	7.8129	-0.0592	0.000000	0.000000	1.573713	1.340954	0.000000	0.000000
19	1	6.3547	-0.5519	7.9739	-0.1555	0.000000	0.000000	1.593700	1.356100	0.000000	0.000000

MOMENTUM COMPACTION = 0.1990D-01
D = 0.6943D-01
ENERGY SPREAD = 0.3917D-03
RADIAL EMITTANCE = 0.1000D-05

I	TY	LENGTH	DL	STRENGTH	ANGLE
1	1	0.170	0.170	0.000000	0.000000
2	4	0.470	0.300	-113580.00	0.000834
3	1	1.180	0.710	0.000000	0.000000
4	4	1.480	0.300	4398.14	-0.005360
5	1	1.970	0.490	0.000000	0.000000
6	4	2.502	0.532	-5341.90	0.003940
7	1	5.050	2.548	0.000000	0.000000
8	4	6.500	1.450	0.000000	0.145517
9	1	6.875	0.375	0.000000	0.000000
10	1	6.875	0.000	0.000000	0.000000
11	4	7.125	0.250	0.000000	0.000976
12	1	7.125	0.000	0.000000	0.000000
13	1	7.500	0.375	0.000000	0.000000
14	2	7.800	0.300	1.419076	0.000000
15	1	8.200	0.400	0.000000	0.000000
16	3	8.500	0.300	-2.025607	0.000000
17	1	8.700	0.200	0.000000	0.000000
18	1	8.900	0.200	0.000000	0.000000
19	1	9.100	0.200	0.000000	0.000000
20	2	9.400	0.300	0.841483	0.000000
21	1	10.200	0.800	0.000000	0.000000
22	4	11.190	0.990	0.000000	0.706858
23	1	11.790	0.600	0.000000	0.000000
24	3	12.090	0.300	-2.126848	0.000000
25	1	12.290	0.200	0.000000	0.000000
26	1	12.290	0.000	0.000000	0.000000
27	1	12.690	0.400	0.000000	0.000000
28	2	12.990	0.300	2.462288	0.000000
29	1	13.590	0.600	0.000000	0.000000
30	3	13.590	0.000	-0.011250	0.000000
31	4	13.670	0.080	0.000000	0.042495
32	3	13.670	0.000	-0.011250	0.000000
33	3	13.670	0.000	-0.022501	0.000000
34	4	13.711	0.040	0.000000	0.042495
35	3	13.711	0.000	-0.022501	0.000000
36	3	13.711	0.000	-0.011250	0.000000
37	4	13.791	0.080	0.000000	0.042495
38	3	13.791	0.000	-0.011250	0.000000
39	3	13.791	0.000	-0.011250	0.000000
40	4	13.871	0.080	0.000000	-0.042495
41	3	13.871	0.000	-0.011250	0.000000
42	3	13.871	0.000	-0.090206	0.000000
43	4	14.032	0.161	0.000000	-0.169979
44	3	14.032	0.000	-0.090206	0.000000
45	3	14.032	0.000	-0.011250	0.000000
46	4	14.112	0.080	0.000000	-0.042495
47	3	14.112	0.000	-0.011250	0.000000
48	3	14.112	0.000	-0.011250	0.000000
49	4	14.192	0.080	0.000000	0.042495
50	3	14.192	0.000	-0.011250	0.000000
51	3	14.192	0.000	-0.090206	0.000000
52	4	14.353	0.161	0.000000	0.169979
53	3	14.353	0.000	-0.090206	0.000000
54	3	14.353	0.000	-0.011250	0.000000
55	4	14.433	0.080	0.000000	0.042495
56	3	14.433	0.000	-0.011250	0.000000
57	3	14.433	0.000	-0.011250	0.000000
58	4	14.513	0.080	0.000000	-0.042495
59	3	14.513	0.000	-0.011250	0.000000
60	3	14.513	0.000	-0.090206	0.000000
61	4	14.593	0.080	0.000000	-0.084989
62	4	14.674	0.080	0.000000	-0.084989
63	3	14.674	0.000	-0.090206	0.000000

64	3	14.674	0.000	-0.011250	0.000000
65	4	14.754	0.080	0.000000	-0.042495
66	3	14.754	0.000	-0.011250	0.000000
67	3	14.754	0.000	-0.011250	0.000000
68	4	14.834	0.080	0.000000	0.042495
69	3	14.834	0.000	-0.011250	0.000000
70	3	14.834	0.000	-0.090206	0.000000
71	4	14.995	0.161	0.000000	0.169979
72	3	14.995	0.000	-0.090206	0.000000
73	3	14.995	0.000	-0.011250	0.000000
74	4	15.075	0.080	0.000000	0.042495
75	3	15.075	0.000	-0.011250	0.000000
76	3	15.075	0.000	-0.011250	0.000000
77	4	15.155	0.080	0.000000	-0.042495
78	3	15.155	0.000	-0.011250	0.000000
79	3	15.155	0.000	-0.090206	0.000000
80	4	15.316	0.161	0.000000	-0.169979
81	3	15.316	0.000	-0.090206	0.000000
82	3	15.316	0.000	-0.011250	0.000000
83	4	15.396	0.080	0.000000	-0.042495
84	3	15.396	0.000	-0.011250	0.000000
85	3	15.396	0.000	-0.011250	0.000000
86	4	15.476	0.080	0.000000	0.042495
87	3	15.476	0.000	-0.011250	0.000000
88	3	15.476	0.000	-0.022501	0.000000
89	4	15.517	0.040	0.000000	0.042495
90	3	15.517	0.000	-0.022501	0.000000
91	3	15.517	0.000	-0.011250	0.000000
92	4	15.597	0.080	0.000000	0.042495
93	3	15.597	0.000	-0.011250	0.000000
94	1	15.822	0.225	0.000000	0.000000
95	1	15.822	0.000	0.000000	0.000000
96	1	16.197	0.375	0.000000	0.000000
97	2	16.497	0.300	1.255543	0.000000
98	1	17.097	0.600	0.000000	0.000000
99	3	17.097	0.000	-0.263408	0.000000
100	4	18.087	0.990	0.000000	0.706858
101	3	18.087	0.000	-0.263408	0.000000
102	1	18.387	0.300	0.000000	0.000000
103	1	18.537	0.150	0.000000	0.000000
104	1	18.837	0.300	0.000000	0.000000
105	3	19.137	0.300	-2.161424	0.000000
106	1	19.537	0.400	0.000000	0.000000
107	2	19.837	0.300	3.040907	0.000000
108	1	22.057	2.220	0.000000	0.000000
109	3	22.357	0.300	-3.094740	0.000000
110	1	22.971	0.614	0.000000	0.000000
111	1	22.971	0.000	0.000000	0.000000
112	2	23.271	0.300	5.706189	0.000000
113	1	23.885	0.614	0.000000	0.000000
114	3	24.185	0.300	-3.073233	0.000000
115	1	26.405	2.220	0.000000	0.000000
116	2	26.705	0.300	3.016689	0.000000
117	1	27.105	0.400	0.000000	0.000000
118	3	27.405	0.300	-2.161704	0.000000
119	1	28.155	0.750	0.000000	0.000000

APPENDIX A.5.b

D17 Long optical functions and lattice elements
(from the detuned IP to the matching point)

EL.	TIP	BETX	ALFX	BETY	ALFY	DX	DPX	QX	QY	dy	dpy
0	0	8.7800	0.0000	8.0000	0.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1	1	8.7833	-0.0194	8.0036	-0.0212	0.000000	0.000000	0.003081	0.003382	0.000000	0.000000
2	4	8.1288	2.1433	8.6774	-2.2835	-0.000124	-0.000823	0.008659	0.009188	0.000000	0.000000
3	1	5.4322	1.6547	12.2810	-2.7920	-0.000708	-0.000823	0.025697	0.020143	0.000000	0.000000
4	4	5.1338	-0.6186	12.3929	2.4349	-0.000193	0.004294	0.034935	0.023932	0.000000	0.000000
5	1	5.8047	-0.7506	10.1408	2.1610	0.001911	0.004294	0.049240	0.030891	0.000000	0.000000
6	4	6.1657	0.0908	8.7394	0.5457	0.003044	-0.000063	0.063216	0.040015	0.000000	0.000000
7	1	6.7647	-0.3259	6.9227	0.1673	0.002884	-0.000063	0.127763	0.093132	0.000000	0.000000
8	4	7.8957	-0.4486	6.7498	-0.0480	-0.102565	-0.145108	0.159441	0.127155	0.000000	0.000000
9	1	8.2535	-0.5056	6.8066	-0.1037	-0.156972	-0.145108	0.166836	0.135963	0.000000	0.000000
10	1	8.2535	-0.5056	6.8066	-0.1037	-0.156972	-0.145108	0.166836	0.135963	0.000000	0.000000
11	4	8.5158	-0.5436	6.8678	-0.1408	-0.193368	-0.146083	0.171582	0.141784	0.000000	0.000000
12	1	8.5158	-0.5436	6.8678	-0.1408	-0.193368	-0.146083	0.171582	0.141784	0.000000	0.000000
13	1	8.9449	-0.6007	6.9943	-0.1965	-0.248149	-0.146083	0.178423	0.150399	0.000000	0.000000
14	2	8.5992	1.7219	7.7102	-2.2534	-0.281476	-0.074603	0.183795	0.156990	0.000000	0.000000
15	1	7.2955	1.5375	9.6390	-2.5687	-0.311317	-0.074603	0.191836	0.164378	0.000000	0.000000
16	3	7.3095	-1.5864	9.9385	1.6136	-0.354309	-0.215060	0.198517	0.169153	0.000000	0.000000
17	1	7.9634	-1.6826	9.3075	1.5411	-0.397321	-0.215060	0.202689	0.172463	0.000000	0.000000
18	1	8.6557	-1.7789	8.7056	1.4686	-0.440333	-0.215060	0.206524	0.176000	0.000000	0.000000
19	1	9.3864	-1.8751	8.1326	1.3961	-0.483345	-0.215060	0.210055	0.179783	0.000000	0.000000
20	2	10.0374	-0.2571	7.7278	-0.0235	-0.534835	-0.126718	0.214933	0.185859	0.000000	0.000000
21	1	10.5167	-0.3421	7.8483	-0.1271	-0.636209	-0.126718	0.227338	0.202237	0.000000	0.000000
22	4	5.0295	3.6883	8.3453	-0.2837	-0.057169	1.023525	0.250728	0.226122	0.000000	0.000000
23	1	1.6488	1.9461	8.7324	-0.3614	0.556946	1.023525	0.284133	0.237318	0.000000	0.000000
24	3	0.9613	0.5032	7.2262	5.0267	0.934191	1.535186	0.323805	0.243122	0.000000	0.000000
25	1	0.8122	0.2425	5.3609	4.2997	1.241228	1.535186	0.360143	0.248237	0.000000	0.000000
26	1	0.8122	0.2425	5.3609	4.2997	1.241228	1.535186	0.360143	0.248237	0.000000	0.000000
27	1	0.8268	-0.2790	2.5028	2.8456	1.855303	1.535186	0.441303	0.265652	0.000000	0.000000
28	2	0.8695	0.1495	1.5661	0.5519	2.051271	-0.258174	0.496204	0.290972	0.000000	0.000000
29	1	1.1134	-0.5560	1.2037	0.0521	1.896366	-0.258174	0.600575	0.362952	0.000000	0.000000
30	3	1.1134	-0.5685	1.2037	0.0656	1.896366	-0.236840	0.600575	0.362952	0.000000	0.000000
31	4	1.2102	-0.6367	1.1985	-0.0013	1.877355	-0.236794	0.611585	0.373595	0.000000	0.000000
32	3	1.2102	-0.6503	1.1985	0.0121	1.877355	-0.215673	0.611585	0.373595	0.000000	0.000000
33	3	1.2102	-0.6775	1.1985	0.0391	1.877355	-0.173432	0.611585	0.373595	0.000000	0.000000
34	4	1.2643	-0.6690	1.1968	0.0056	1.869554	-0.215238	0.616748	0.378930	0.000000	0.000000
35	3	1.2643	-0.6975	1.1968	0.0325	1.869554	-0.173172	0.616748	0.378930	0.000000	0.000000
36	3	1.2643	-0.7117	1.1968	0.0460	1.869554	-0.152139	0.616748	0.378930	0.000000	0.000000
37	4	1.3838	-0.7763	1.1948	-0.0212	1.857364	-0.151567	0.626409	0.389621	0.000000	0.000000
38	3	1.3838	-0.7918	1.1948	-0.0078	1.857364	-0.130671	0.626409	0.389621	0.000000	0.000000
39	3	1.3838	-0.8074	1.1948	0.0056	1.857364	-0.109775	0.626409	0.389621	0.000000	0.000000
40	4	1.5185	-0.8691	1.1993	-0.0615	1.845173	-0.193931	0.635224	0.400302	0.000000	0.000000
41	3	1.5185	-0.8862	1.1993	-0.0481	1.845173	-0.173172	0.635224	0.400302	0.000000	0.000000
42	3	1.5185	-1.0231	1.1993	0.0601	1.845173	-0.006726	0.635224	0.400302	0.000000	0.000000
43	4	1.8316	-0.9088	1.2015	-0.0742	1.803896	-0.506284	0.650494	0.421651	0.000000	0.000000
44	3	1.8316	-1.0740	1.2015	0.0342	1.803896	-0.343561	0.650494	0.421651	0.000000	0.000000
45	3	1.8316	-1.0946	1.2015	0.0477	1.803896	-0.323267	0.650494	0.421651	0.000000	0.000000
46	4	2.0116	-1.1457	1.1992	-0.0193	1.774622	-0.406027	0.657149	0.432301	0.000000	0.000000
47	3	2.0116	-1.1683	1.1992	-0.0058	1.774622	-0.386062	0.657149	0.432301	0.000000	0.000000
48	3	2.0116	-1.1910	1.1992	0.0077	1.774622	-0.366097	0.657149	0.432301	0.000000	0.000000
49	4	2.2066	-1.2379	1.2034	-0.0592	1.745348	-0.363197	0.663213	0.442943	0.000000	0.000000
50	3	2.2066	-1.2627	1.2034	-0.0457	1.745348	-0.343561	0.663213	0.442943	0.000000	0.000000
51	3	2.2066	-1.4617	1.2034	0.0629	1.745348	-0.186120	0.663213	0.442943	0.000000	0.000000
52	4	2.6401	-1.2124	1.2047	-0.0711	1.704071	-0.326890	0.673755	0.464227	0.000000	0.000000
53	3	2.6401	-1.4505	1.2047	0.0376	1.704071	-0.173172	0.673755	0.464227	0.000000	0.000000
54	3	2.6401	-1.4802	1.2047	0.0512	1.704071	-0.154001	0.673755	0.464227	0.000000	0.000000
55	4	2.8805	-1.5125	1.2018	-0.0156	1.691880	-0.149705	0.678387	0.474852	0.000000	0.000000
56	3	2.8805	-1.5449	1.2018	-0.0021	1.691880	-0.130671	0.678387	0.474852	0.000000	0.000000
57	3	2.8805	-1.5773	1.2018	0.0114	1.691880	-0.111637	0.678387	0.474852	0.000000	0.000000
58	4	3.1360	-1.6039	1.2054	-0.0554	1.679689	-0.192069	0.682636	0.485474	0.000000	0.000000
59	3	3.1360	-1.6392	1.2054	-0.0418	1.679689	-0.173172	0.682636	0.485474	0.000000	0.000000
60	3	3.1360	-1.9221	1.2054	0.0669	1.679689	-0.021654	0.682636	0.485474	0.000000	0.000000
61	4	3.4301	-1.7331	1.2000	0.0000	1.668482	-0.257434	0.686527	0.496104	0.000000	0.000000
62	4	3.6898	-1.4942	1.2054	-0.0669	1.638412	-0.491356	0.690114	0.506734	0.000000	0.000000
63	3	3.6898	-1.8271	1.2054	0.0418	1.638412	-0.343561	0.690114	0.506734	0.000000	0.000000
64	3	3.6898	-1.8686	1.2054	0.0554	1.638412	-0.325129	0.690114	0.506734	0.000000	0.000000

65	4	3.9905	-1.8765	1.2018	-0.0114	1.609138	-0.404165	0.693443	0.517355	0.000000	0.000000
66	3	3.9905	-1.9214	1.2018	0.0021	1.609138	-0.386062	0.693443	0.517355	0.000000	0.000000
67	3	3.9905	-1.9663	1.2018	0.0156	1.609138	-0.367959	0.693443	0.517355	0.000000	0.000000
68	4	4.3065	-1.9673	1.2047	-0.0512	1.579865	-0.361335	0.696524	0.527980	0.000000	0.000000
69	3	4.3065	-2.0157	1.2047	-0.0376	1.579865	-0.343561	0.696524	0.527980	0.000000	0.000000
70	3	4.3065	-2.4042	1.2047	0.0711	1.579865	-0.201048	0.696524	0.527980	0.000000	0.000000
71	4	4.9806	-1.7543	1.2034	-0.0629	1.538587	-0.311962	0.702015	0.549264	0.000000	0.000000
72	3	4.9806	-2.2036	1.2034	0.0457	1.538587	-0.173172	0.702015	0.549264	0.000000	0.000000
73	3	4.9806	-2.2596	1.2034	0.0592	1.538587	-0.155863	0.702015	0.549264	0.000000	0.000000
74	4	5.3418	-2.2378	1.1992	-0.0077	1.526397	-0.147844	0.704491	0.559906	0.000000	0.000000
75	3	5.3418	-2.2979	1.1992	0.0058	1.526397	-0.130671	0.704491	0.559906	0.000000	0.000000
76	3	5.3418	-2.3580	1.1992	0.0193	1.526397	-0.113499	0.704491	0.559906	0.000000	0.000000
77	4	5.7181	-2.3279	1.2015	-0.0477	1.514206	-0.190207	0.706802	0.570557	0.000000	0.000000
78	3	5.7181	-2.3923	1.2015	-0.0342	1.514206	-0.173172	0.706802	0.570557	0.000000	0.000000
79	3	5.7181	-2.9081	1.2015	0.0742	1.514206	-0.036581	0.706802	0.570557	0.000000	0.000000
80	4	6.5125	-1.9926	1.1993	-0.0601	1.472928	-0.476428	0.710969	0.591905	0.000000	0.000000
81	3	6.5125	-2.5801	1.1993	0.0481	1.472928	-0.343561	0.710969	0.591905	0.000000	0.000000
82	3	6.5125	-2.6534	1.1993	0.0615	1.472928	-0.326990	0.710969	0.591905	0.000000	0.000000
83	4	6.9342	-2.5964	1.1948	-0.0056	1.443655	-0.402304	0.712870	0.602586	0.000000	0.000000
84	3	6.9342	-2.6744	1.1948	0.0078	1.443655	-0.386062	0.712870	0.602586	0.000000	0.000000
85	3	6.9342	-2.7525	1.1948	0.0212	1.443655	-0.369821	0.712870	0.602586	0.000000	0.000000
86	4	7.3710	-2.6859	1.1968	-0.0460	1.414381	-0.359473	0.714656	0.613277	0.000000	0.000000
87	3	7.3710	-2.7688	1.1968	-0.0325	1.414381	-0.343561	0.714656	0.613277	0.000000	0.000000
88	3	7.3710	-2.9346	1.1968	-0.0056	1.414381	-0.311737	0.714656	0.613277	0.000000	0.000000
89	4	7.5950	-2.6451	1.1985	-0.0391	1.401449	-0.332594	0.715509	0.618612	0.000000	0.000000
90	3	7.5950	-2.8160	1.1985	-0.0121	1.401449	-0.301060	0.715509	0.618612	0.000000	0.000000
91	3	7.5950	-2.9014	1.1985	0.0013	1.401449	-0.285293	0.715509	0.618612	0.000000	0.000000
92	4	8.0545	-2.8197	1.2037	-0.0656	1.378997	-0.274073	0.717142	0.629256	0.000000	0.000000
93	3	8.0545	-2.9103	1.2037	-0.0521	1.378997	-0.258559	0.717142	0.629256	0.000000	0.000000
94	1	9.4237	-3.1748	1.2693	-0.2395	1.320821	-0.258559	0.721253	0.658389	0.000000	0.000000
95	1	9.4237	-3.1748	1.2693	-0.2395	1.320821	-0.258559	0.721253	0.658389	0.000000	0.000000
96	1	11.9702	-3.6157	1.5661	-0.5519	1.223861	-0.258559	0.726874	0.701235	0.000000	0.000000
97	2	12.0439	3.3843	2.3031	-2.0446	1.044178	-0.922013	0.730737	0.727222	0.000000	0.000000
98	1	8.3550	2.7639	5.5664	-3.3943	0.490970	-0.922013	0.740262	0.754019	0.000000	0.000000
99	3	8.3550	0.0137	5.5664	-1.5621	0.490970	-0.760406	0.740262	0.754019	0.000000	0.000000
100	4	3.6408	2.8611	10.2514	-2.3098	0.000000	0.000000	0.771189	0.779623	0.000000	0.000000
101	3	3.6408	1.6627	10.2514	1.0645	0.000000	0.000000	0.771189	0.779623	0.000000	0.000000
102	1	1.8197	0.9389	8.8631	0.9188	0.000000	0.000000	0.815025	0.791321	0.000000	0.000000
103	1	1.3494	0.6287	8.3305	0.8564	0.000000	0.000000	0.845684	0.796879	0.000000	0.000000
104	1	0.9706	0.0600	7.4514	0.7420	0.000000	0.000000	0.925472	0.807998	0.000000	0.000000
105	3	1.1666	-0.7426	6.0959	3.5699	0.000000	0.000000	0.972027	0.814925	0.000000	0.000000
106	1	2.1859	-1.3809	3.1882	2.4877	0.000000	0.000000	1.020618	0.832289	0.000000	0.000000
107	2	2.1201	1.5688	2.9947	-1.7559	0.000000	0.000000	1.041355	0.848860	0.000000	0.000000
108	1	1.3653	-1.1086	12.4210	-3.9918	0.000000	0.000000	1.334227	0.892190	0.000000	0.000000
109	3	2.7516	-3.9424	11.2896	7.3986	0.000000	0.000000	1.360160	0.896034	0.000000	0.000000
110	1	7.5173	-6.6478	5.6306	5.1769	0.000000	0.000000	1.375933	0.905022	0.000000	0.000000
111	2	9.5877	0.3463	4.0201	0.6426	0.000000	0.000000	1.381321	0.915499	0.000000	0.000000
112	1	8.6989	0.1270	2.8461	-0.0173	0.000000	0.000000	1.414277	1.009156	0.000000	0.000000
113	1	8.6338	-0.0923	4.1502	-0.6772	0.000000	0.000000	1.449034	1.101139	0.000000	0.000000
114	2	6.7210	5.9325	5.7781	-5.1902	0.000000	0.000000	1.455048	1.111304	0.000000	0.000000
115	1	2.4723	3.5091	11.4285	-7.3661	0.000000	0.000000	1.472653	1.120122	0.000000	0.000000
116	3	1.2440	0.9620	12.5375	4.0224	0.000000	0.000000	1.501328	1.123927	0.000000	0.000000
117	1	2.2515	-1.5763	3.0296	1.7752	0.000000	0.000000	1.783269	1.166795	0.000000	0.000000
118	2	2.2666	1.5332	3.2253	-2.5153	0.000000	0.000000	1.803025	1.183175	0.000000	0.000000
119	1	1.1354	0.8236	6.1634	-3.6057	0.000000	0.000000	1.851388	1.200343	0.000000	0.000000
120	3	0.8958	0.0109	7.5311	-0.7452	0.000000	0.000000	1.900593	1.207196	0.000000	0.000000
121	1	3.5444	-1.7197	10.3374	-1.0653	0.000000	0.000000	2.068500	1.235300	0.000000	0.000000

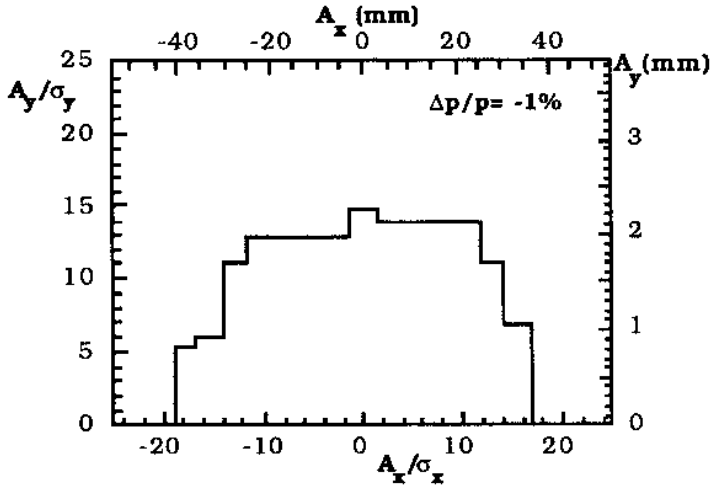
MOMENTUM COMPACTION =-0.8055D-02
D =-0.1024D+00
ENERGY SPREAD = 0.4065D-03
RADIAL EMITTANCE = 0.1000D-05

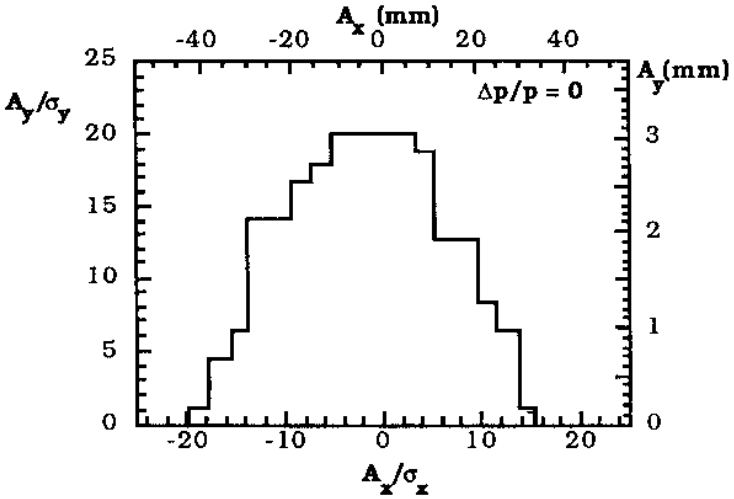
I	TY	LENGTH	DL	STRENGTH	ANGLE
1	1	0.170	0.170	0.000000	0.000000
2	4	0.470	0.300	-11358.00	-0.000834
3	1	1.180	0.710	0.000000	0.000000
4	4	1.480	0.300	4398.14	0.005360
5	1	1.970	0.490	0.000000	0.000000
6	4	2.502	0.532	-5341.90	-0.003940
7	1	5.050	2.548	0.000000	0.000000
8	4	6.500	1.450	0.000000	-0.145517
9	1	6.875	0.375	0.000000	0.000000
10	1	6.875	0.000	0.000000	0.000000
11	4	7.125	0.250	0.000000	-0.000976
12	1	7.125	0.000	0.000000	0.000000
13	1	7.500	0.375	0.000000	0.000000
14	2	7.800	0.300	0.893718	0.000000
15	1	8.200	0.400	0.000000	0.000000
16	3	8.500	0.300	-1.421730	0.000000
17	1	8.700	0.200	0.000000	0.000000
18	1	8.900	0.200	0.000000	0.000000
19	1	9.100	0.200	0.000000	0.000000
20	2	9.400	0.300	0.575929	0.000000
21	1	10.200	0.800	0.000000	0.000000
22	4	11.410	1.210	0.000000	0.863938
23	1	12.010	0.600	0.000000	0.000000
24	3	12.310	0.300	-2.327356	0.000000
25	1	12.510	0.200	0.000000	0.000000
26	1	12.510	0.000	0.000000	0.000000
27	1	12.910	0.400	0.000000	0.000000
28	2	13.210	0.300	2.991442	0.000000
29	1	13.810	0.600	0.000000	0.000000
30	3	13.810	0.000	-0.011250	0.000000
31	4	13.890	0.080	0.000000	0.042495
32	3	13.890	0.000	-0.011250	0.000000
33	3	13.890	0.000	-0.022501	0.000000
34	4	13.931	0.040	0.000000	0.042495
35	3	13.931	0.000	-0.022501	0.000000
36	3	13.931	0.000	-0.011250	0.000000
37	4	14.011	0.080	0.000000	0.042495
38	3	14.011	0.000	-0.011250	0.000000
39	3	14.011	0.000	-0.011250	0.000000
40	4	14.091	0.080	0.000000	-0.042495
41	3	14.091	0.000	-0.011250	0.000000
42	3	14.091	0.000	-0.090206	0.000000
43	4	14.252	0.161	0.000000	-0.169979
44	3	14.252	0.000	-0.090206	0.000000
45	3	14.252	0.000	-0.011250	0.000000
46	4	14.332	0.080	0.000000	-0.042495
47	3	14.332	0.000	-0.011250	0.000000
48	3	14.332	0.000	-0.011250	0.000000
49	4	14.412	0.080	0.000000	0.042495
50	3	14.412	0.000	-0.011250	0.000000
51	3	14.412	0.000	-0.090206	0.000000
52	4	14.573	0.161	0.000000	0.169979
53	3	14.573	0.000	-0.090206	0.000000
54	3	14.573	0.000	-0.011250	0.000000
55	4	14.653	0.080	0.000000	0.042495
56	3	14.653	0.000	-0.011250	0.000000
57	3	14.653	0.000	-0.011250	0.000000
58	4	14.733	0.080	0.000000	-0.042495
59	3	14.733	0.000	-0.011250	0.000000
60	3	14.733	0.000	-0.090206	0.000000
61	4	14.813	0.080	0.000000	-0.084989
62	4	14.894	0.080	0.000000	-0.084989

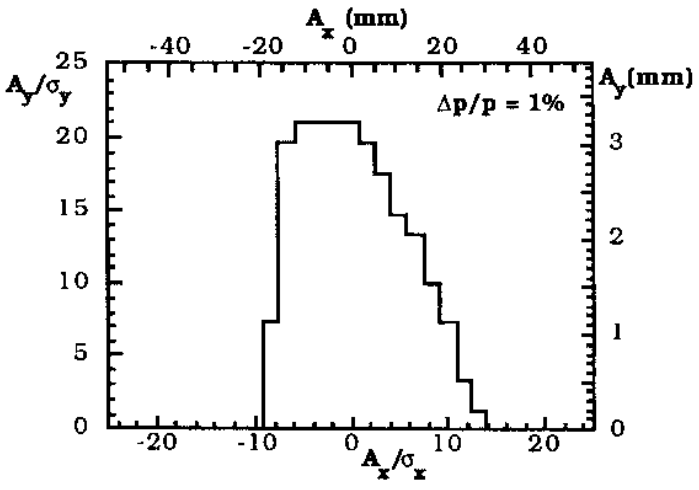
63	3	14.894	0.000	-0.090206	0.000000
64	3	14.894	0.000	-0.011250	0.000000
65	4	14.974	0.080	0.000000	-0.042495
66	3	14.974	0.000	-0.011250	0.000000
67	3	14.974	0.000	-0.011250	0.000000
68	4	15.054	0.080	0.000000	0.042495
69	3	15.054	0.000	-0.011250	0.000000
70	3	15.054	0.000	-0.090206	0.000000
71	4	15.215	0.161	0.000000	0.169979
72	3	15.215	0.000	-0.090206	0.000000
73	3	15.215	0.000	-0.011250	0.000000
74	4	15.295	0.080	0.000000	0.042495
75	3	15.295	0.000	-0.011250	0.000000
76	3	15.295	0.000	-0.011250	0.000000
77	4	15.375	0.080	0.000000	-0.042495
78	3	15.375	0.000	-0.011250	0.000000
79	3	15.375	0.000	-0.090206	0.000000
80	4	15.536	0.161	0.000000	-0.169979
81	3	15.536	0.000	-0.090206	0.000000
82	3	15.536	0.000	-0.011250	0.000000
83	4	15.616	0.080	0.000000	-0.042495
84	3	15.616	0.000	-0.011250	0.000000
85	3	15.616	0.000	-0.011250	0.000000
86	4	15.696	0.080	0.000000	0.042495
87	3	15.696	0.000	-0.011250	0.000000
88	3	15.696	0.000	-0.022501	0.000000
89	4	15.737	0.040	0.000000	0.042495
90	3	15.737	0.000	-0.022501	0.000000
91	3	15.737	0.000	-0.011250	0.000000
92	4	15.817	0.080	0.000000	0.042495
93	3	15.817	0.000	-0.011250	0.000000
94	1	16.042	0.225	0.000000	0.000000
95	1	16.042	0.000	0.000000	0.000000
96	1	16.417	0.375	0.000000	0.000000
97	2	16.717	0.300	1.921961	0.000000
98	1	17.317	0.600	0.000000	0.000000
99	3	17.317	0.000	-0.329158	0.000000
100	4	18.527	1.210	0.000000	0.863938
101	3	18.527	0.000	-0.329158	0.000000
102	1	19.227	0.700	0.000000	0.000000
103	1	19.527	0.300	0.000000	0.000000
104	1	20.077	0.550	0.000000	0.000000
105	3	20.377	0.300	-1.509819	0.000000
106	1	20.857	0.480	0.000000	0.000000
107	2	21.157	0.300	4.605712	0.000000
108	1	22.797	1.640	0.000000	0.000000
109	3	23.097	0.300	-3.158955	0.000000
110	1	23.547	0.450	0.000000	0.000000
111	2	23.847	0.300	2.847356	0.000000
112	1	25.724	1.878	0.000000	0.000000
113	1	27.602	1.878	0.000000	0.000000
114	2	27.902	0.300	2.754333	0.000000
115	1	28.352	0.450	0.000000	0.000000
116	3	28.652	0.300	-3.124230	0.000000
117	1	30.292	1.640	0.000000	0.000000
118	2	30.592	0.300	4.605712	0.000000
119	1	31.072	0.480	0.000000	0.000000
120	3	31.372	0.300	-1.509819	0.000000
121	1	32.922	1.550	0.000000	0.000000

APPENDIX B.1

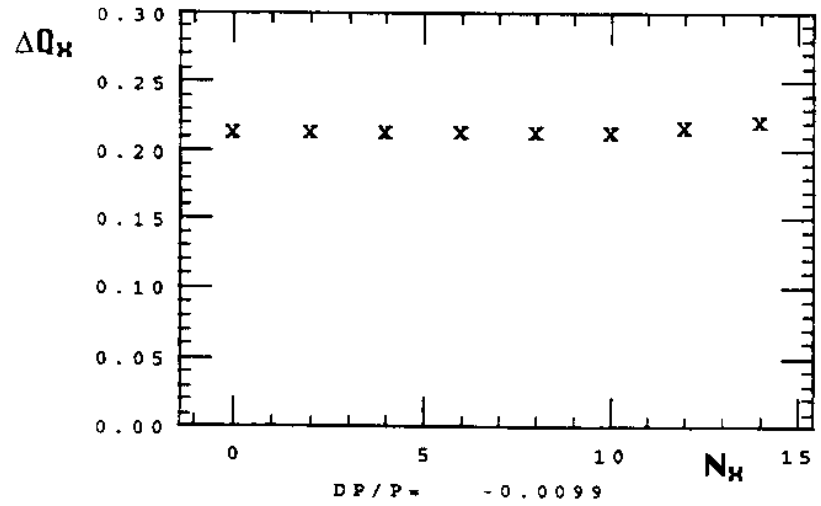
D13 Dynamic aperture without errors

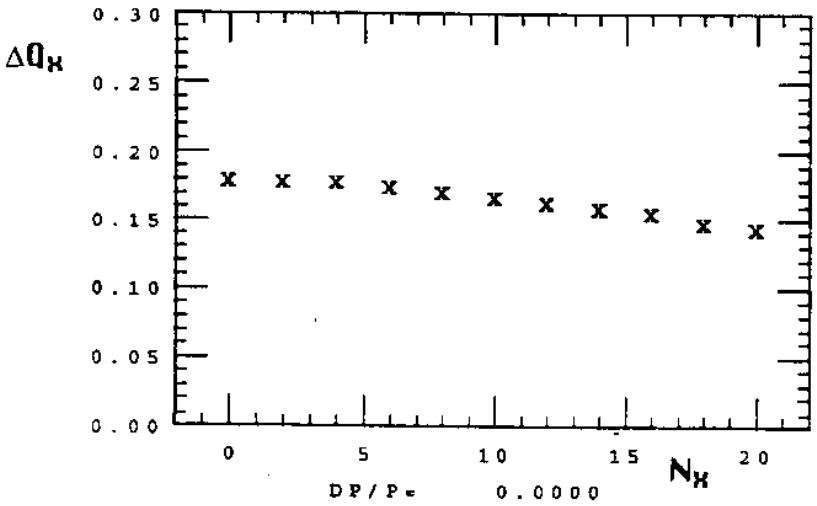


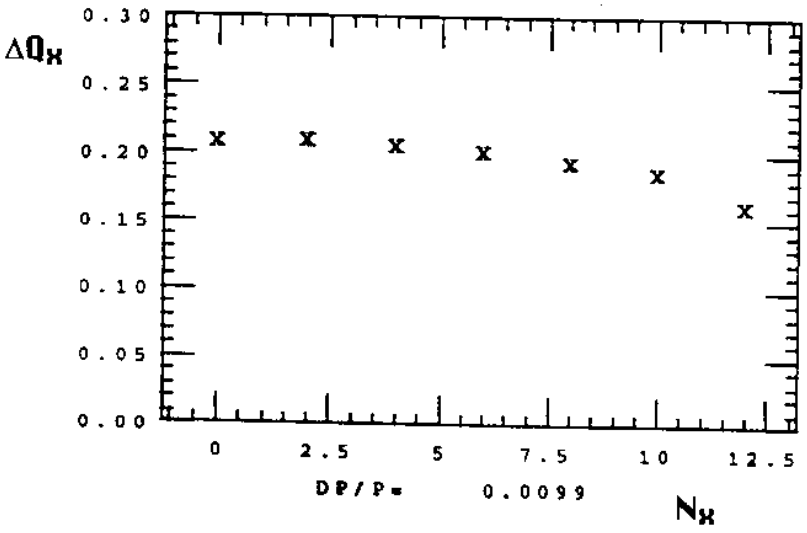




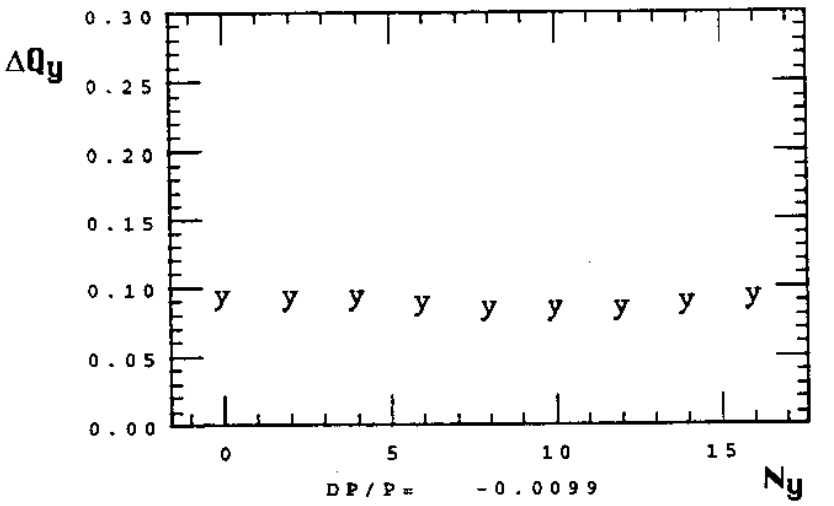
D13 Horizontal tune with amplitude

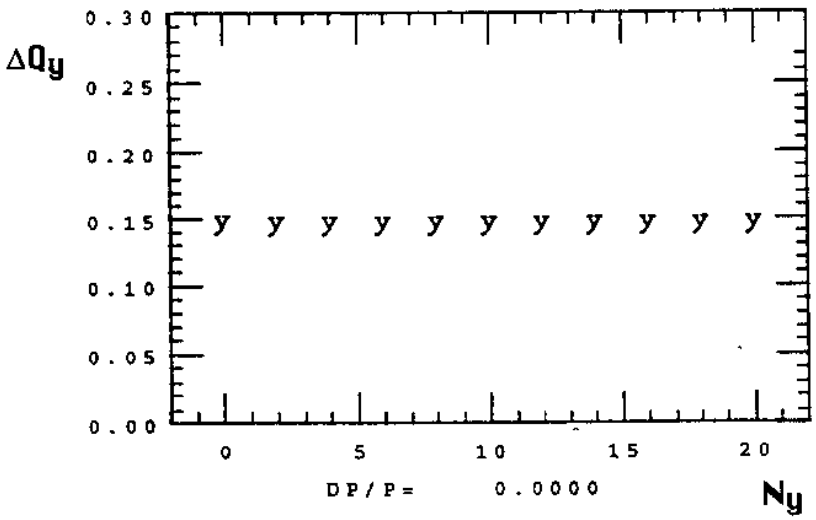


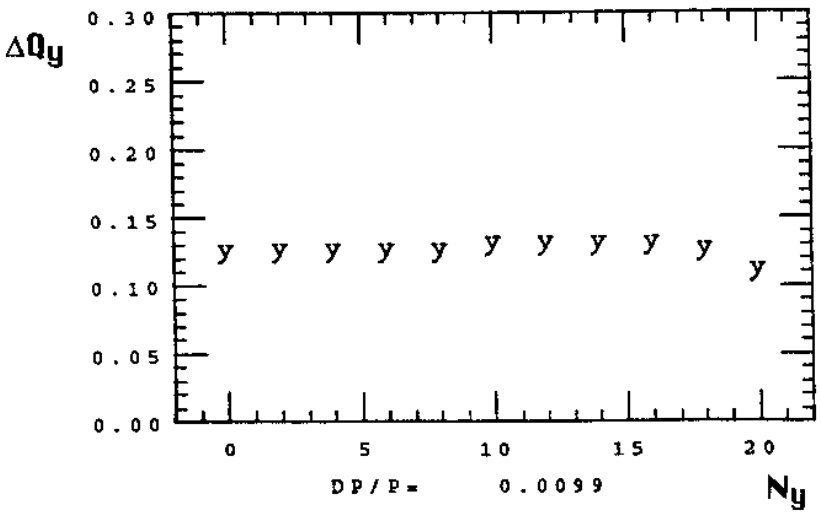




D13 Vertical tune with amplitude

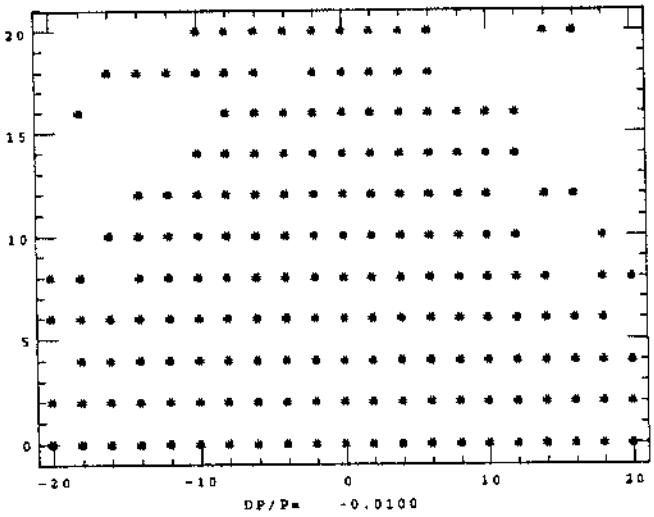


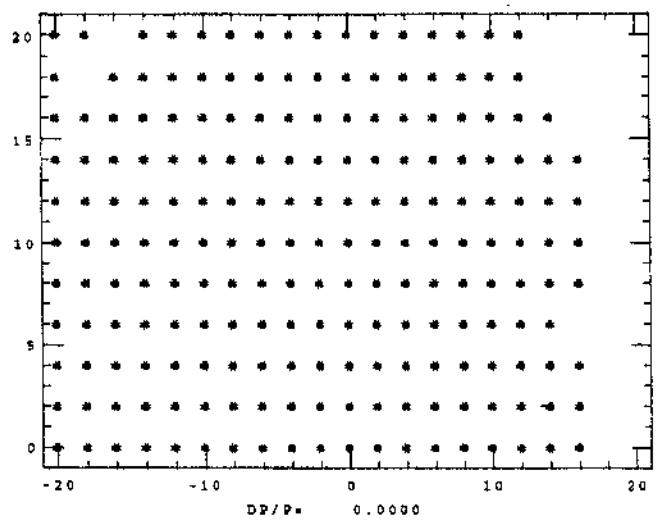


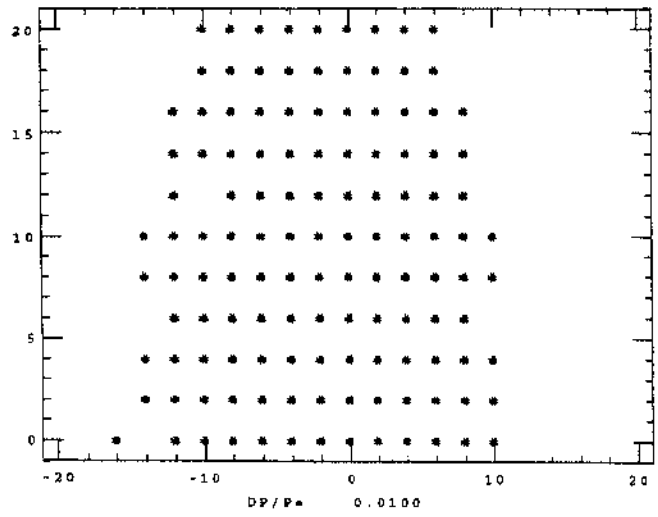


APPENDIX B.2

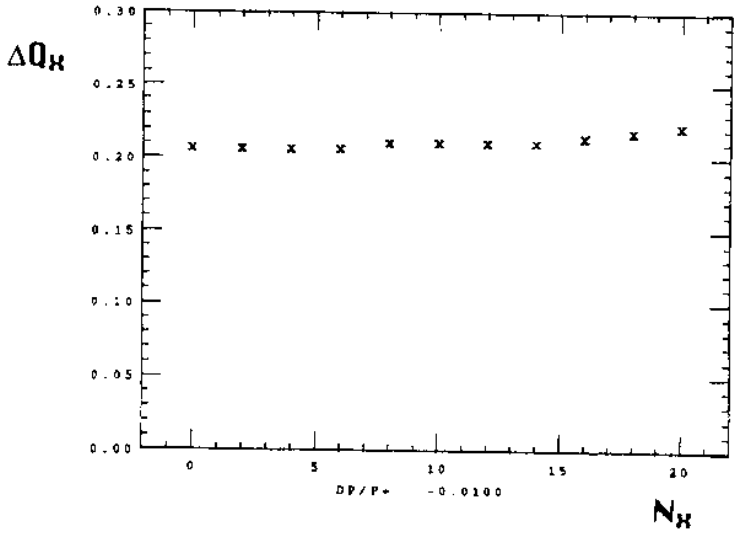
D14 Dynamic aperture without errors

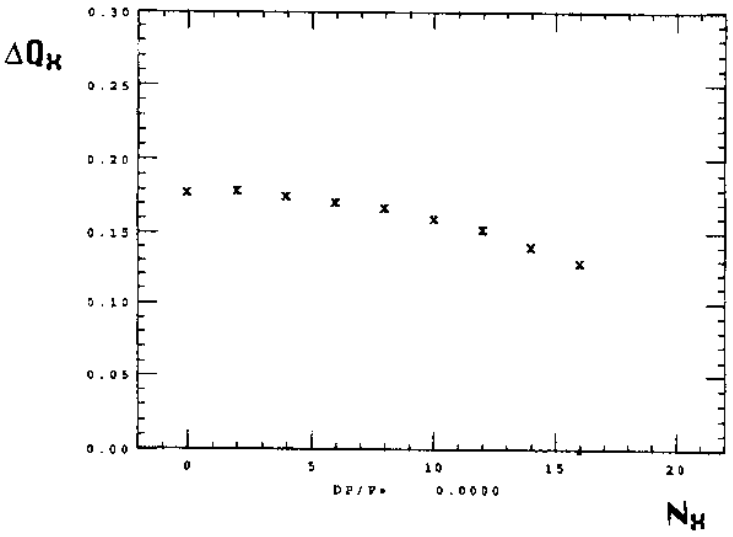


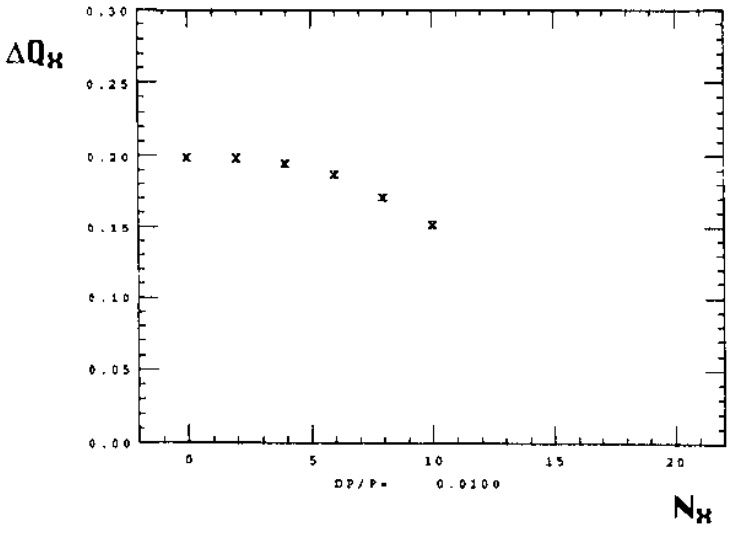




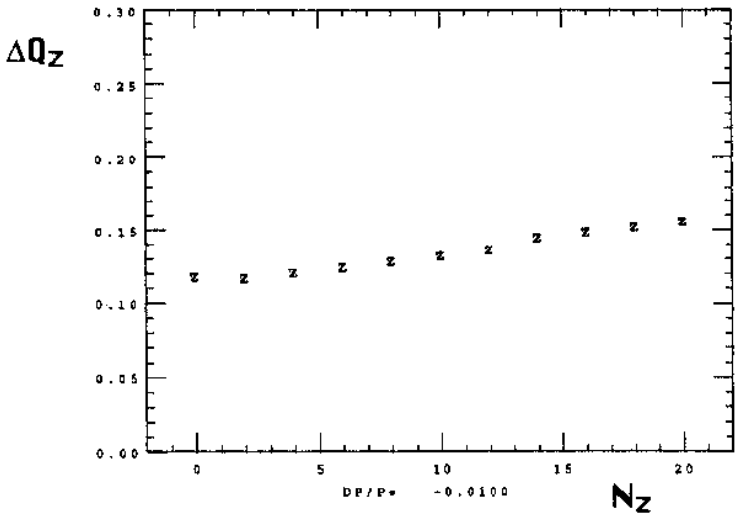
D14 Horizontal tune with amplitude

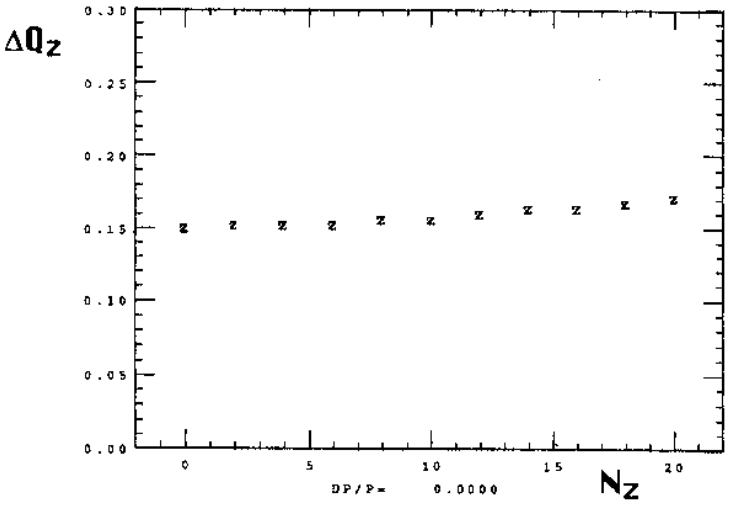


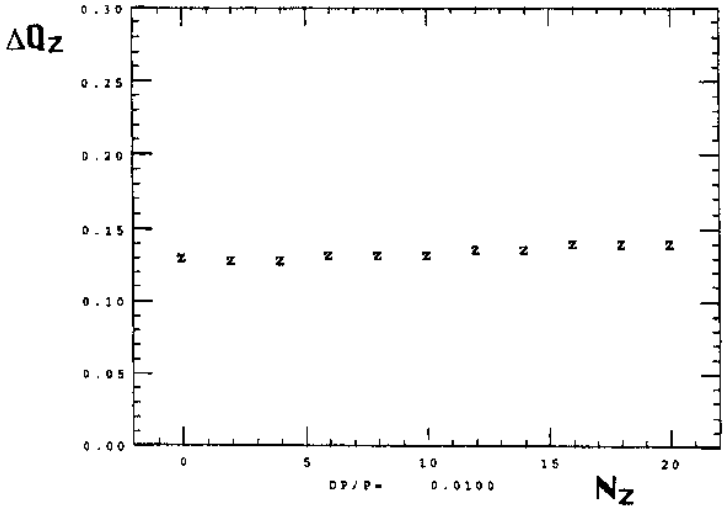




D14 Vertical tune with amplitude

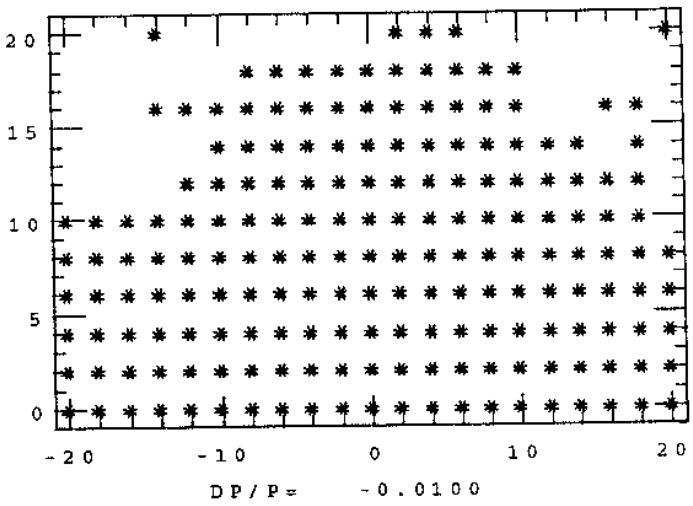


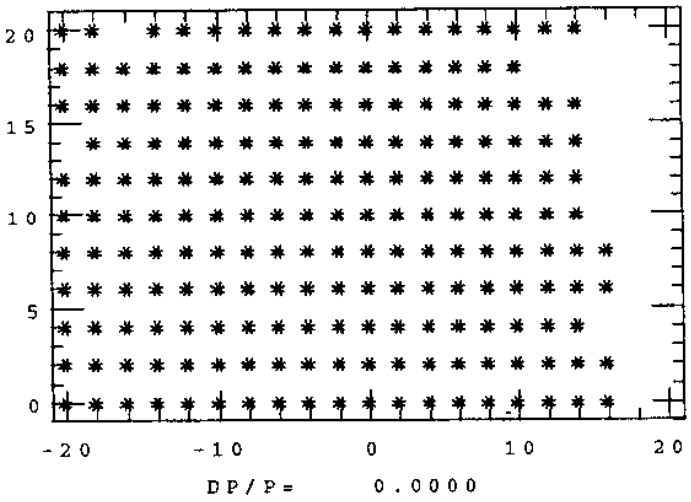


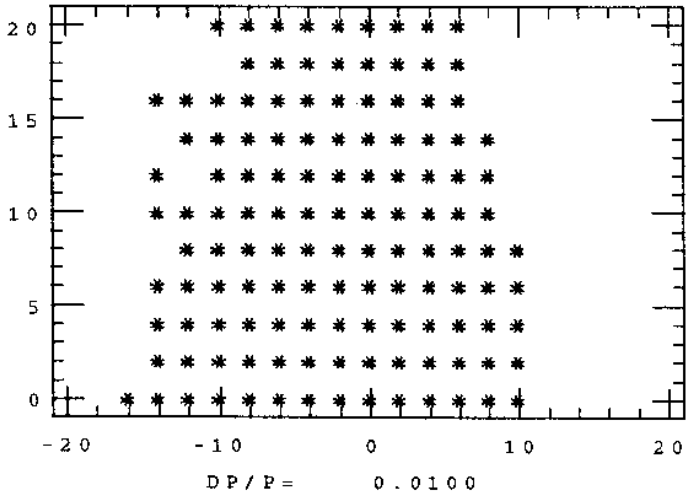


APPENDIX B.3

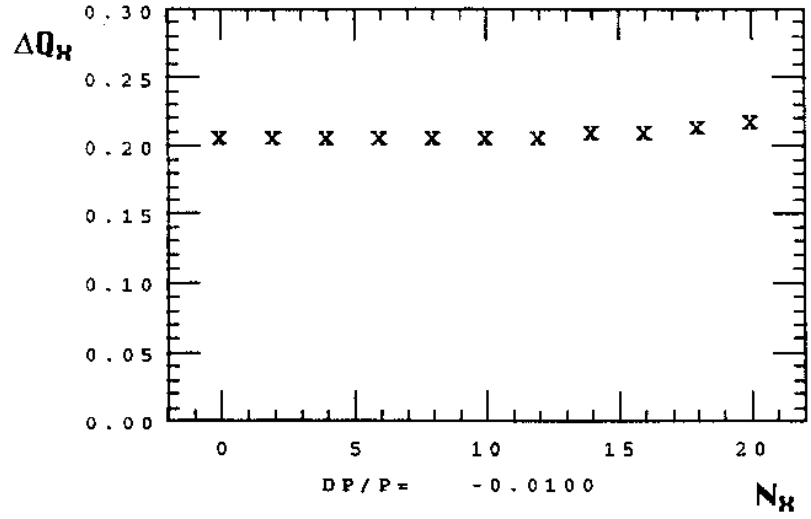
D15 Dynamic aperture without errors

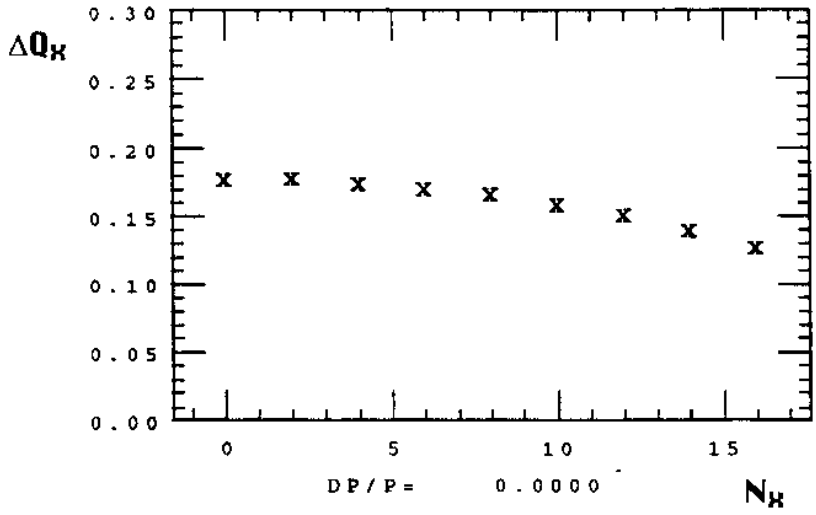


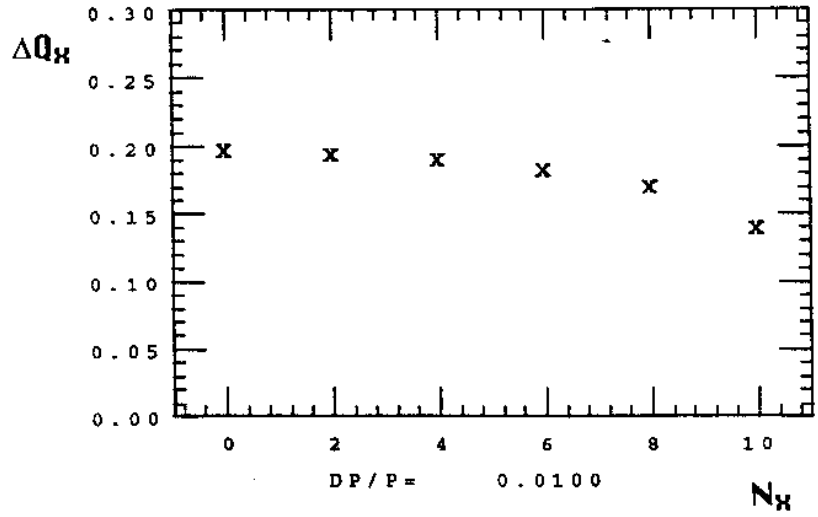




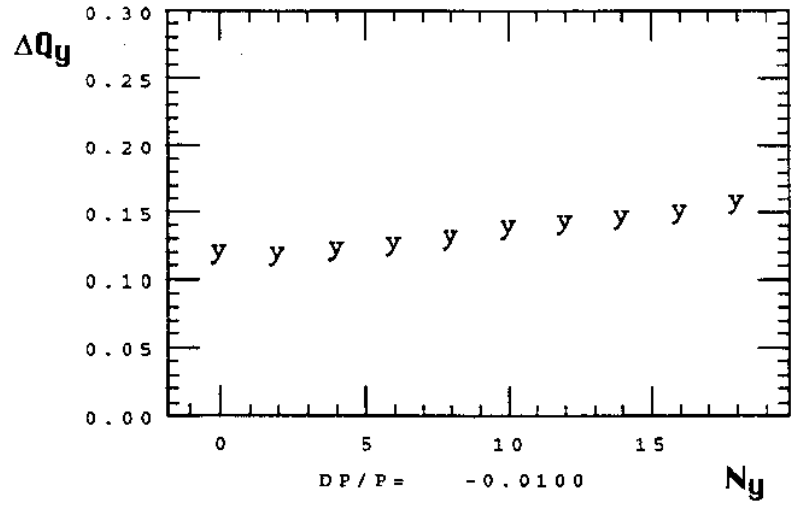
D15 Horizontal tune with amplitude

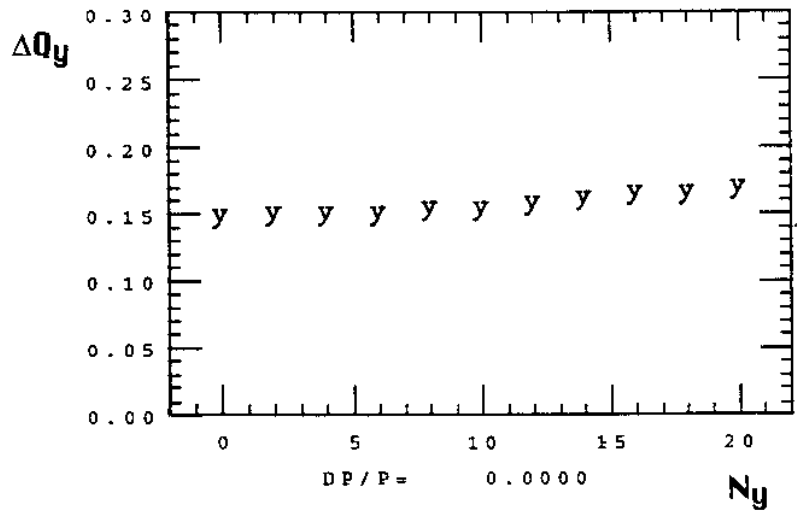


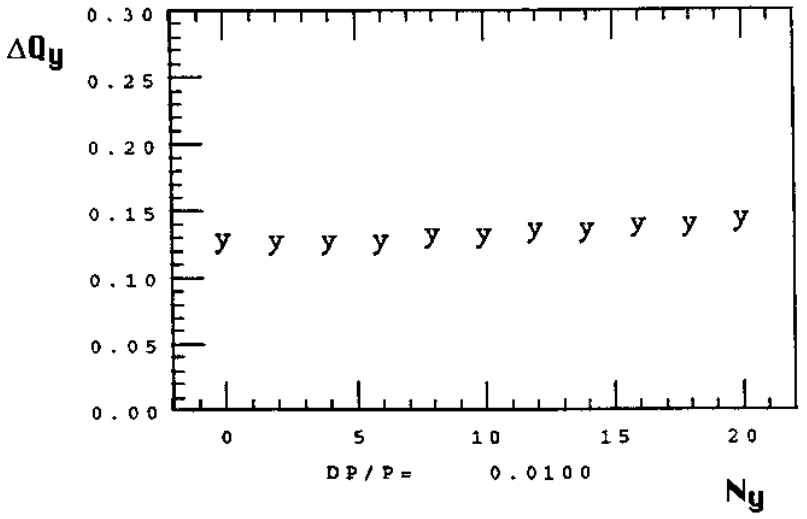




D15 Vertical tune with amplitude

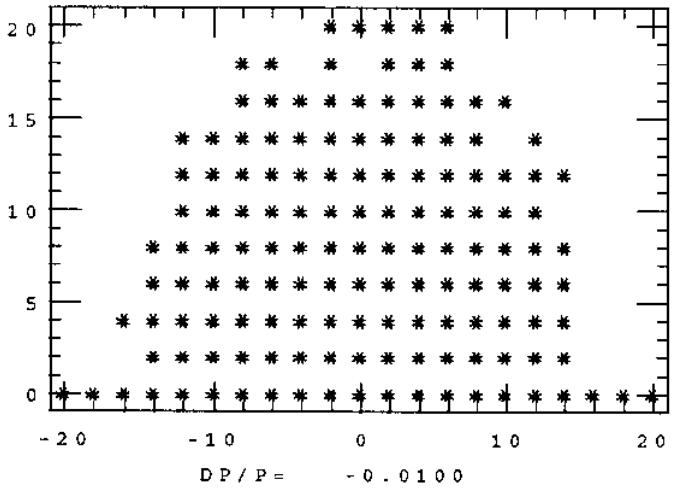


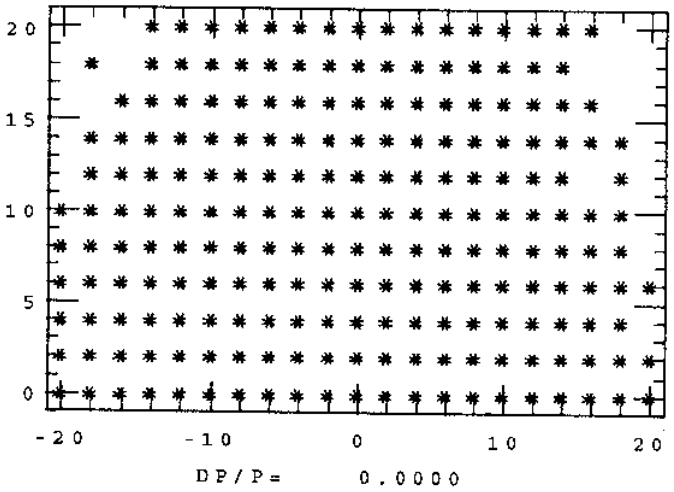


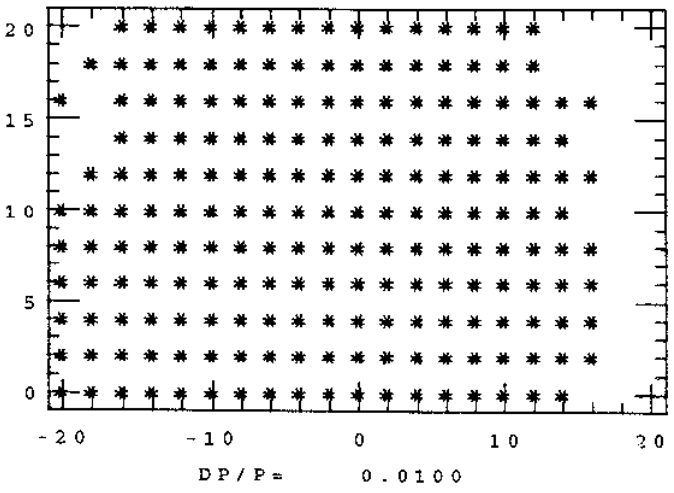


APPENDIX B.4.

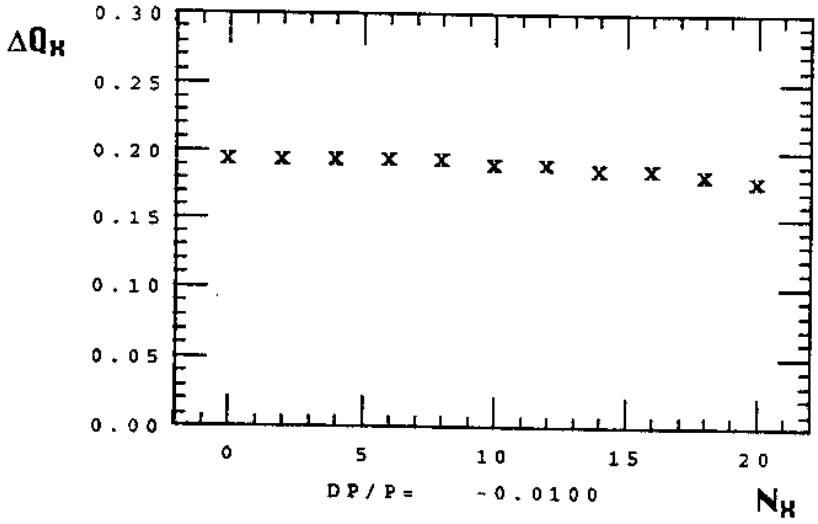
D16 Dynamic aperture without errors

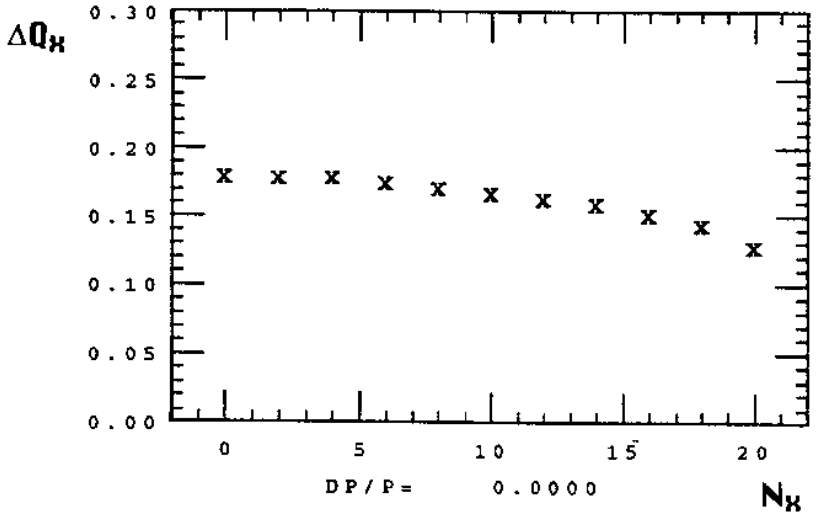


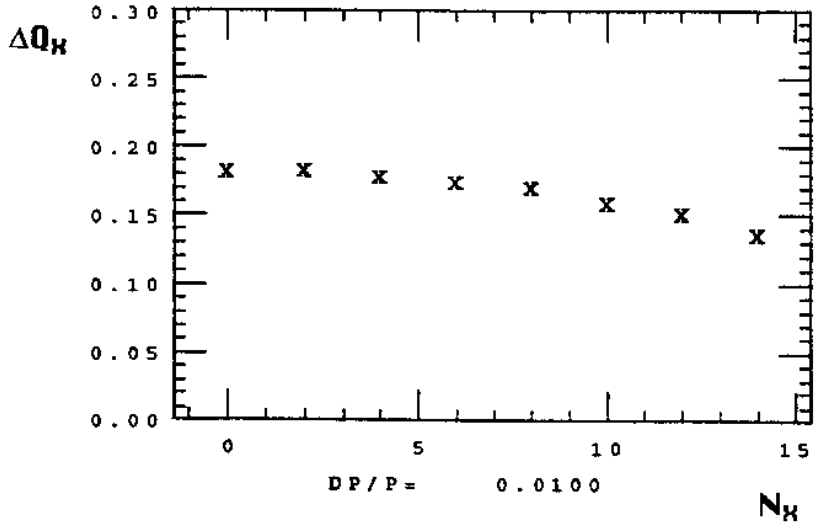




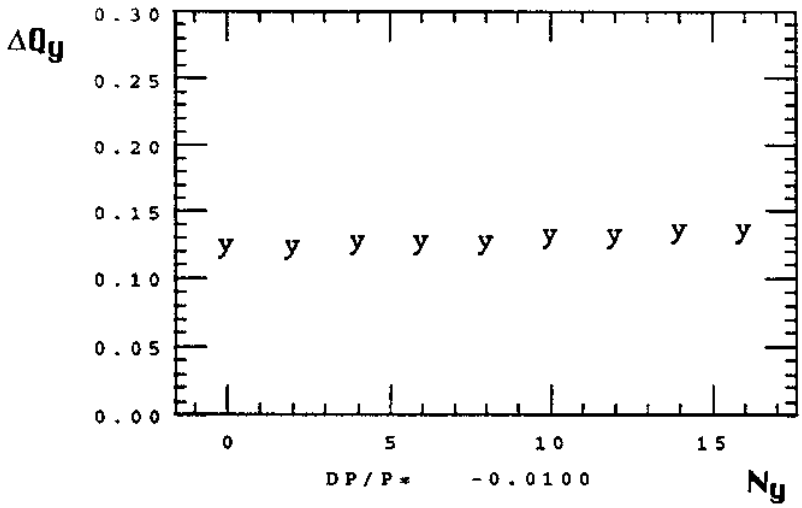
D16 Horizontal tune with amplitude

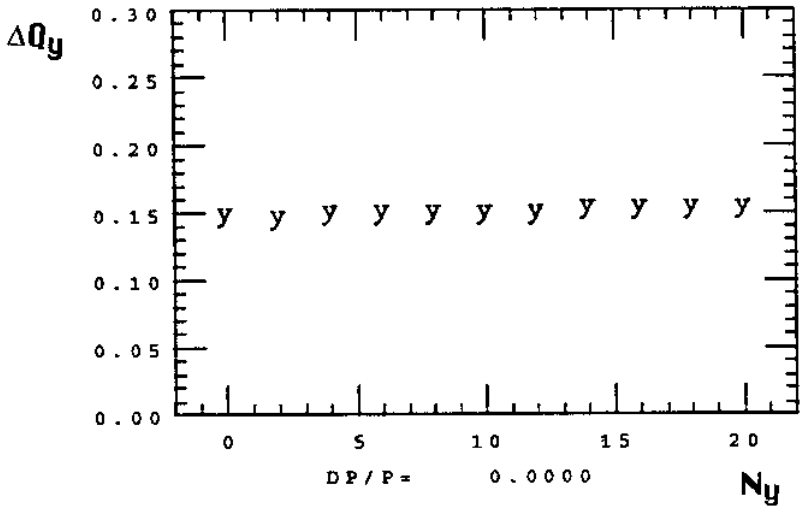


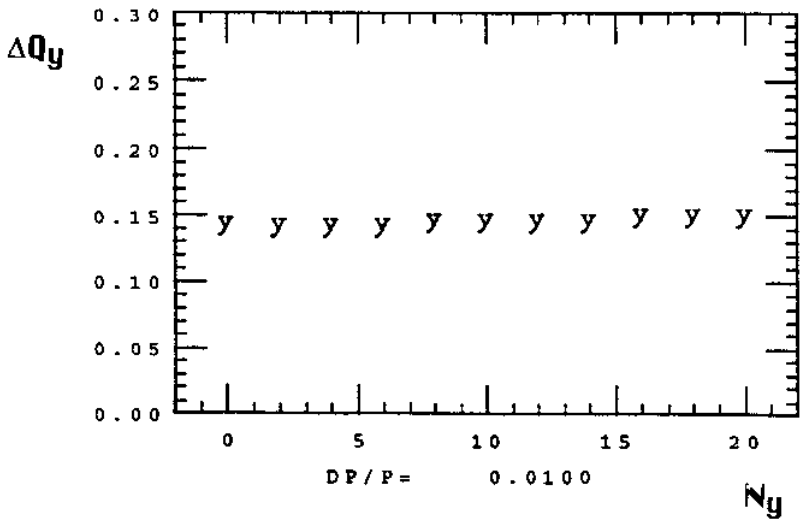




D16 Vertical tune with amplitude

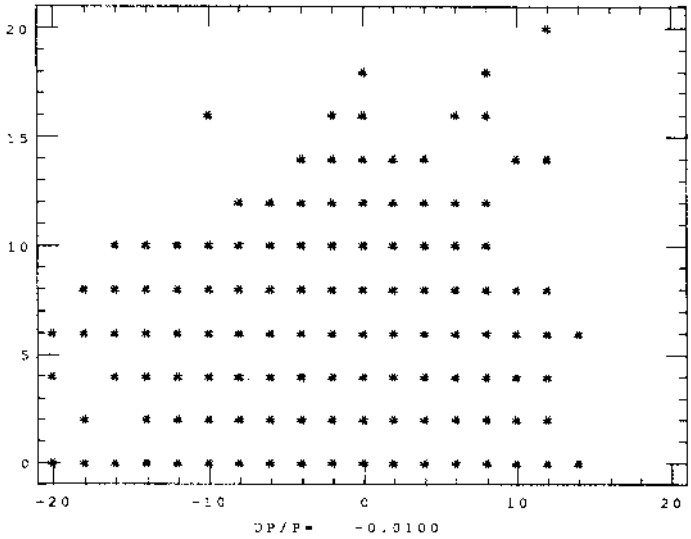


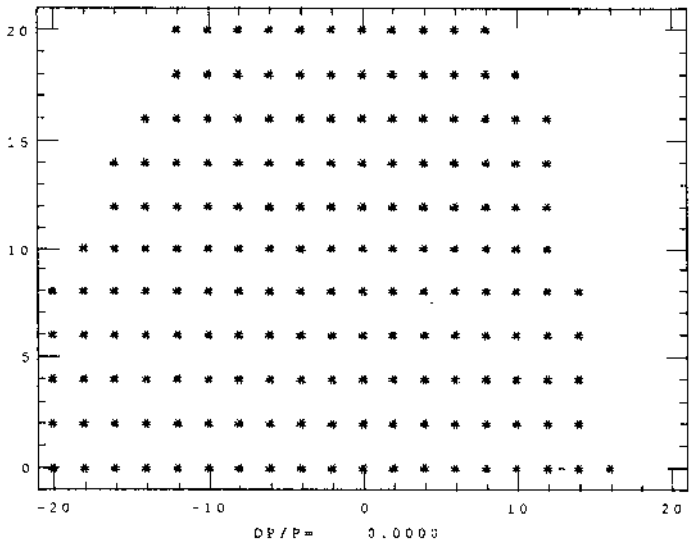


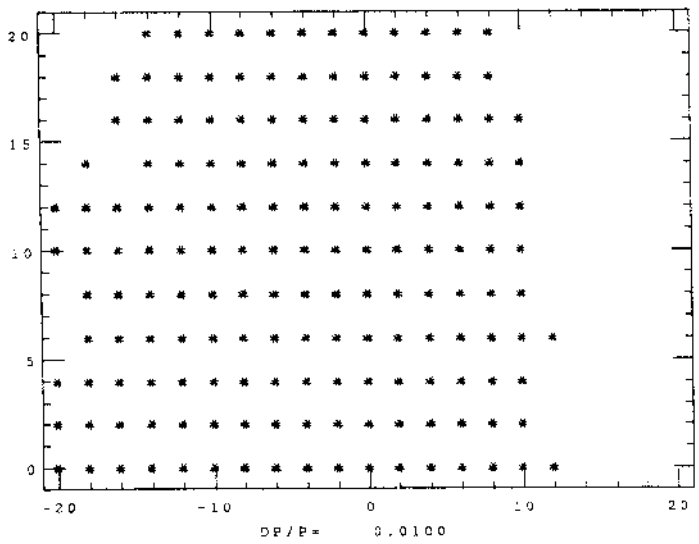


APPENDIX B.5

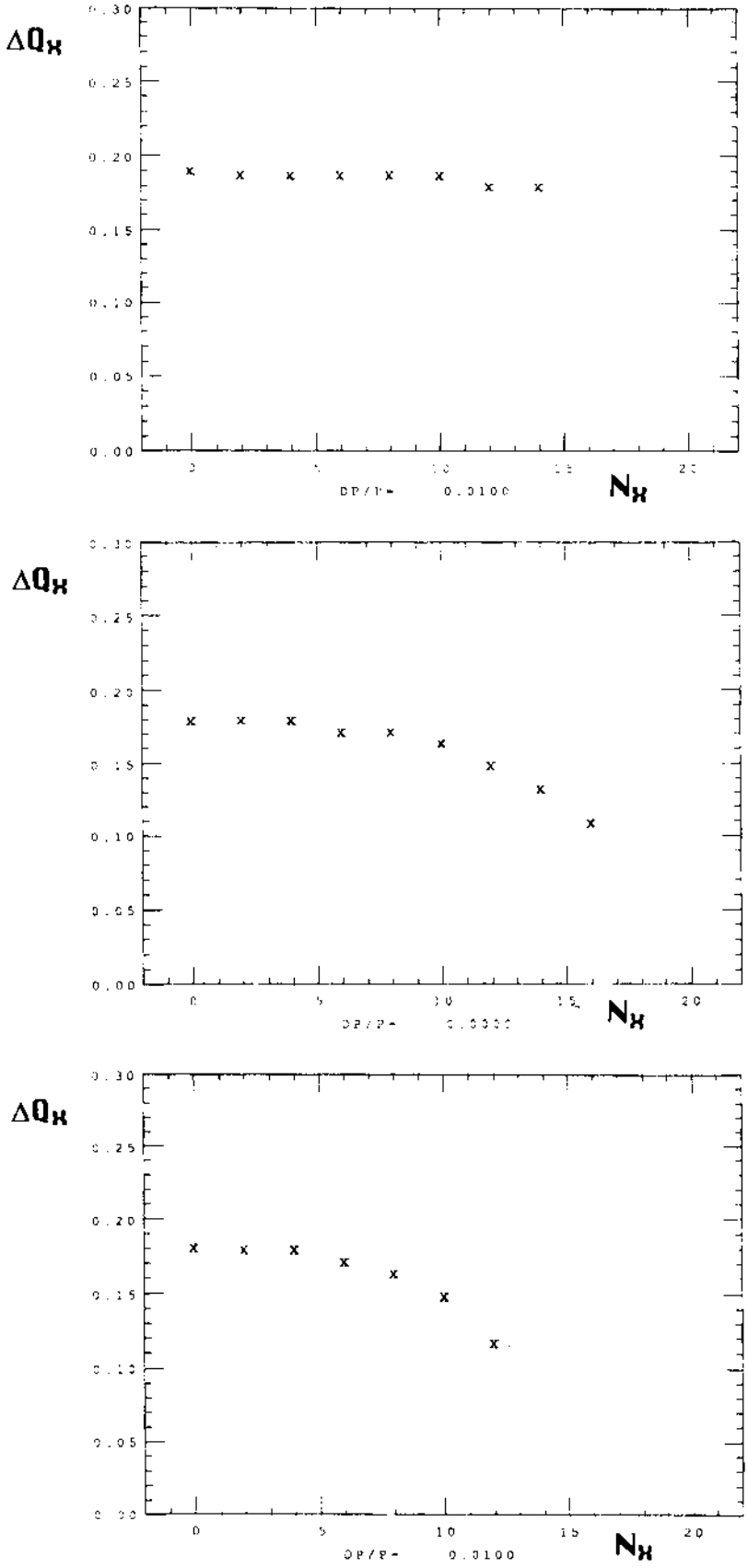
D17 Dynamic aperture without errors



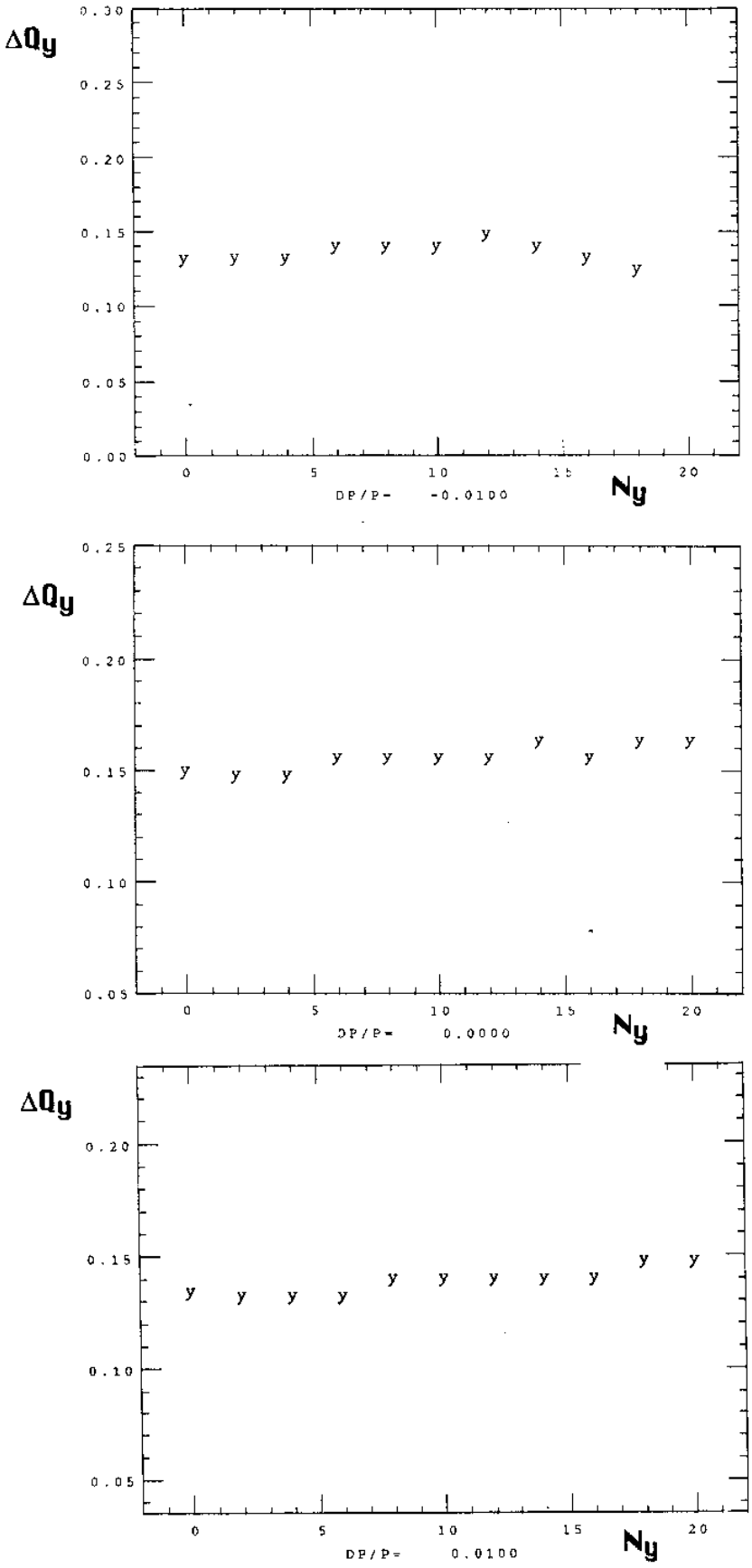




D17 Horizontal tune with amplitude



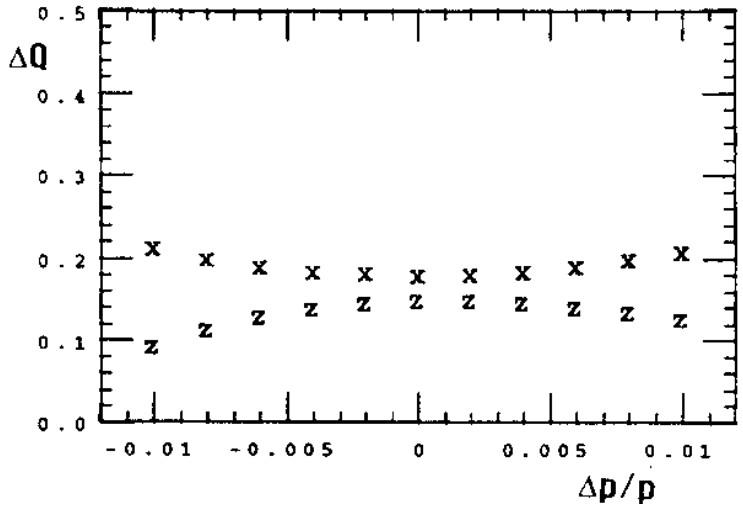
D17 Vertical tune with amplitude



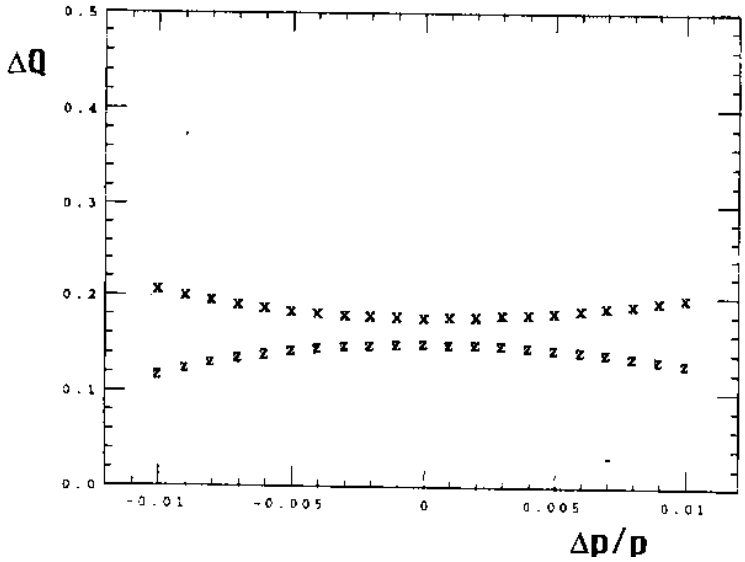
APPENDIX B.6

Horizontal and Vertical fractional tunes with particle momentum deviation

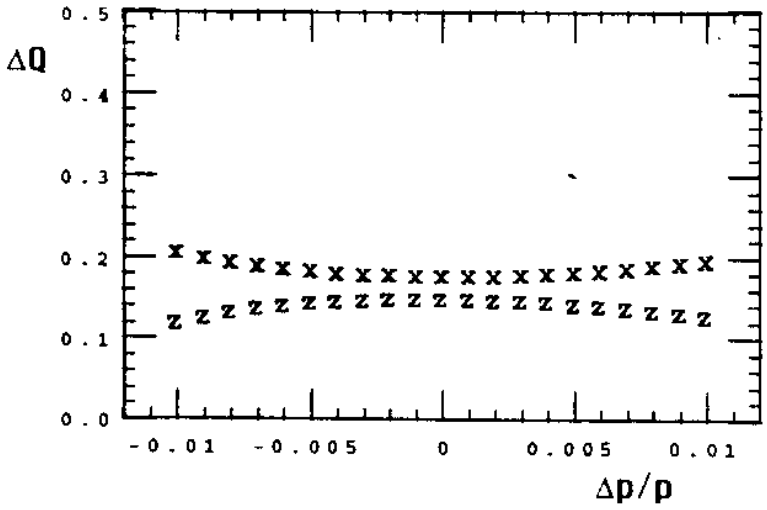
D13



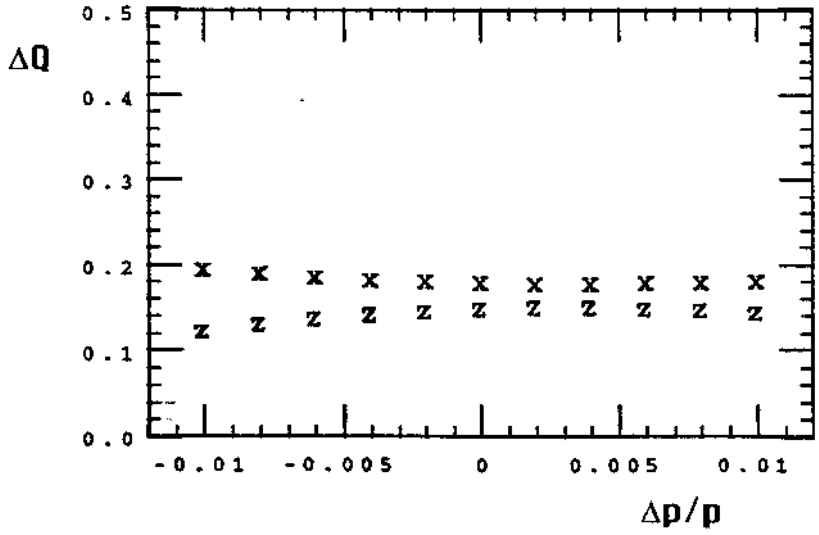
D14



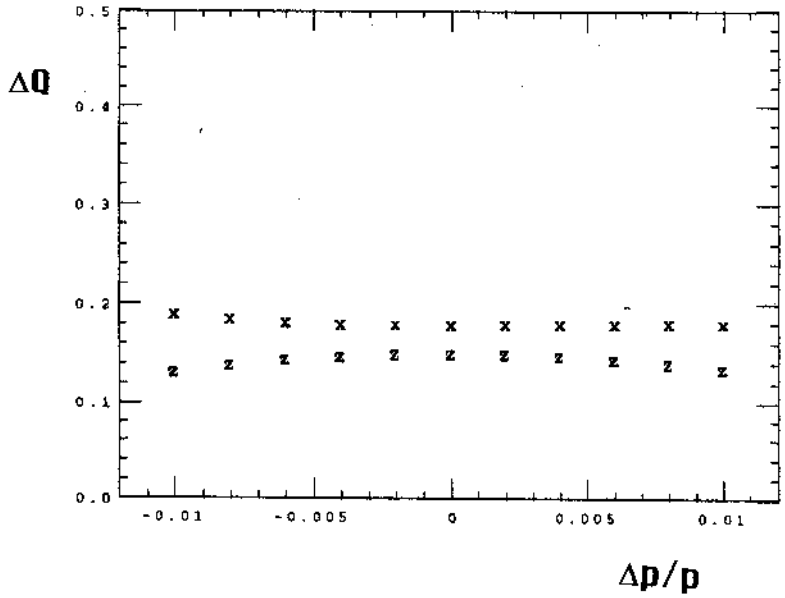
D15



D16


ΔQ
0.5
0.4
0.3
0.2
0.1
0.0
-0.01
-0.005
0
0.005
0.01
Δp/p

D17


ΔQ
0.5
0.4
0.3
0.2
0.1
0.0
-0.01
-0.005
0
0.005
0.01
Δp/p

APPENDIX B.7

Sextupole tables

D13

NEL	NSEX	TYP	BETAX	BETAZ	ETAX	QX	QZ	KS(m-2)
16	1	8	6.178	10.124	0.213	0.180	0.649	0.900
26	2	8	1.011	4.815	1.634	0.389	0.731	12.404
95	3	7	6.244	1.269	1.105	0.695	1.142	-3.365
105	4	8	8.595	4.602	0.000	0.774	1.296	0.500
120	5	8	8.595	4.602	0.000	1.566	1.842	0.500
130	6	7	6.244	1.269	1.105	1.645	1.996	-3.365
199	7	8	1.011	4.815	1.634	1.951	2.407	12.404
209	8	8	6.178	10.124	0.213	2.160	2.489	0.900
242	9	7	7.463	10.743	-0.367	2.540	3.799	-2.600
250	10	8	0.801	5.334	1.237	2.696	3.870	7.400
319	11	7	9.659	1.269	1.318	3.057	4.280	-5.600
327	12	8	0.958	7.817	0.000	3.237	4.425	4.200
346	13	8	0.958	7.817	0.000	4.283	4.863	4.200
354	14	7	9.659	1.269	1.318	4.463	5.008	-5.600
423	15	8	0.801	5.334	1.237	4.824	5.418	7.400
431	16	7	7.463	10.743	-0.367	4.980	5.489	-2.600

D14

NEL	NSEX	TYP	BETAX	BETAZ	ETAX	QX	QZ	KS(m-2)
60	1	8	6.066	11.092	0.214	0.184	0.667	0.800
71	2	8	0.995	4.748	1.617	0.392	0.746	10.690
140	3	7	6.460	1.251	1.100	0.699	1.156	-2.448
150	4	8	8.134	4.741	0.000	0.778	1.310	0.000
167	5	8	8.113	4.724	0.000	1.561	1.829	0.000
177	6	7	6.414	1.269	1.101	1.640	1.981	-2.448
246	7	8	0.994	4.790	1.621	1.946	2.393	10.690
257	8	8	6.060	11.102	0.218	2.156	2.471	0.800
423	9	7	7.358	11.675	-0.373	2.544	3.815	-2.000
431	10	8	0.798	5.328	1.234	2.700	3.884	6.600
500	11	7	9.719	1.269	1.317	3.061	4.294	-5.500
508	12	8	0.936	7.837	0.000	3.243	4.439	1.500
529	13	8	0.934	7.896	0.000	4.275	4.849	1.500
537	14	7	9.752	1.243	1.316	4.457	4.996	-5.500
606	15	8	0.814	5.273	1.233	4.820	5.405	6.600
614	16	7	7.333	11.691	-0.367	4.974	5.474	-2.000

D15

NEL	NSEX	TYP	BETAX	BETAZ	ETAX	QX	QZ	KS(m-2)
82	1	8	6.060	11.103	0.218	0.184	0.667	0.800
93	2	8	0.994	4.790	1.621	0.394	0.745	10.835
162	3	7	6.414	1.269	1.101	0.699	1.157	-2.357
172	4	8	8.113	4.723	0.000	0.778	1.309	0.000
189	5	8	8.114	4.723	0.000	1.561	1.829	0.000
199	6	7	6.414	1.269	1.101	1.640	1.981	-2.357
268	7	8	0.994	4.790	1.621	1.946	2.393	10.835
279	8	8	6.060	11.102	0.218	2.156	2.471	0.800
445	9	7	7.359	11.674	-0.373	2.544	3.815	-2.000
453	10	8	0.798	5.327	1.234	2.700	3.884	6.600
522	11	7	9.720	1.269	1.317	3.061	4.294	-5.500
530	12	8	0.936	7.837	0.000	3.243	4.439	1.500
551	13	8	0.936	7.838	0.000	4.275	4.850	1.500
559	14	7	9.720	1.269	1.317	4.457	4.995	-5.500
628	15	8	0.798	5.327	1.234	4.818	5.405	6.600
636	16	7	7.359	11.673	-0.373	4.974	5.474	-2.000

D16

NEL	NSEX	TYP	BETAX	BETAZ	ETAX	QX	QZ	KS(m-2)
16	1	7	7.170	11.841	0.358	0.184	0.151	-0.200
26	2	8	0.922	4.788	1.574	0.380	0.238	4.476
95	3	7	6.919	1.269	1.091	0.686	0.650	-2.560
105	4	8	7.272	4.820	0.000	0.766	0.801	0.000
120	5	8	7.272	4.820	0.000	1.574	1.337	0.000
130	6	7	6.919	1.269	1.091	1.654	1.488	-2.560
199	7	8	0.922	4.788	1.574	1.960	1.900	4.476
209	8	7	7.170	11.841	0.358	2.156	1.987	-0.200
242	9	7	8.754	9.938	-0.495	2.540	2.300	-0.500
250	10	8	0.830	5.355	1.253	2.698	2.368	4.200
319	11	7	9.247	1.269	1.323	3.059	2.778	-3.500
327	12	8	1.106	7.708	0.000	3.225	2.924	0.000
346	13	8	1.106	7.708	0.000	4.295	3.364	0.000
354	14	7	9.247	1.269	1.323	4.461	3.510	-3.500
423	15	8	0.830	5.355	1.253	4.822	3.920	4.200
431	16	7	8.754	9.938	-0.495	4.980	3.988	-0.500

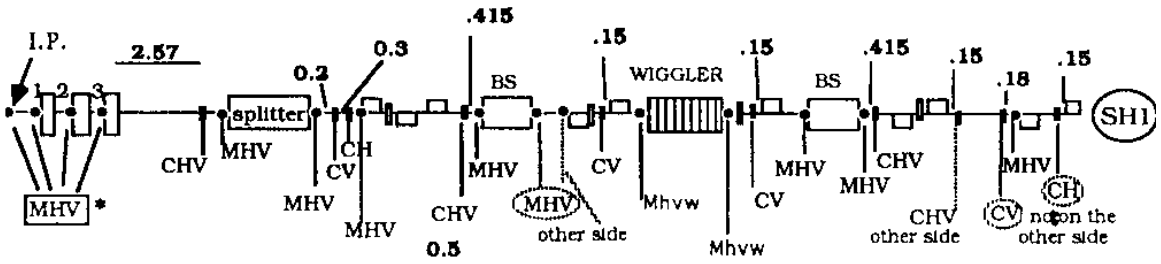
D17

NEL	NSEX	TYP	BETAX	BETAZ	ETAX	QX	QZ	KS(m-2)
82	1	8	6.060	11.103	0.218	0.184	0.667	0.800
93	2	8	0.994	4.790	1.621	0.394	0.745	7.800
162	3	7	6.414	1.269	1.101	0.699	1.157	-2.000
172	4	8	8.113	4.723	0.000	0.778	1.309	0.000
189	5	8	8.558	4.641	0.000	1.563	1.827	0.000
199	6	7	6.177	1.269	1.105	1.642	1.981	-0.957
268	7	8	1.022	4.816	1.635	1.948	2.393	4.060
278	8	8	7.044	9.549	0.282	2.152	2.478	0.400
311	9	7	8.305	9.002	-0.423	2.544	2.812	-1.700
319	10	8	0.812	5.360	1.244	2.700	2.886	6.300
388	11	7	9.424	1.269	1.323	3.061	3.296	-5.000
396	12	8	1.036	7.756	-0.004	3.233	3.442	0.000
417	13	8	0.936	7.837	-0.004	4.275	3.849	1.500
425	14	7	9.720	1.269	1.307	4.458	3.994	-5.500
494	15	8	0.798	5.327	1.238	4.819	4.405	6.600
502	16	7	7.359	11.673	-0.365	4.975	4.473	-2.000

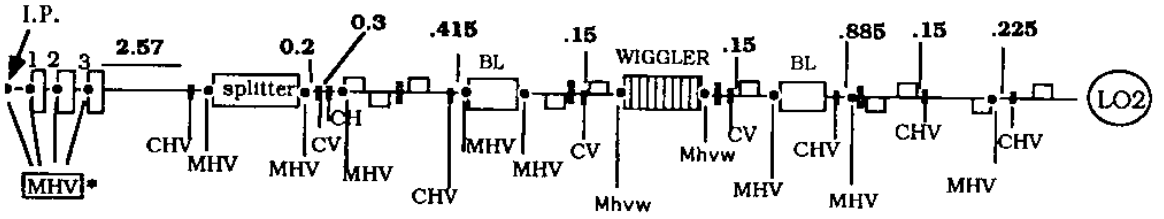
APPENDIX C

Layout of elements for closed orbit correction

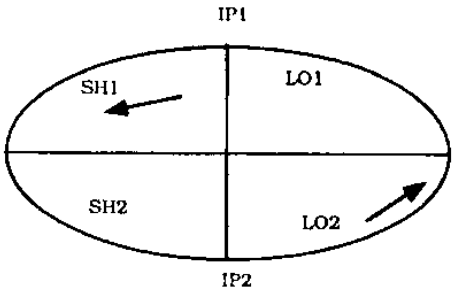
HALF SHORT



HALF LONG



- **SEXTUPOLE**
- **CORRECTOR** 17 CHV, 13 CV, 5 CH
- **MONITOR** 40 MHV + 14 MHV for low-beta regions =54
- ---- 1,2,3 are striplines, all the others are buttons



-- All measures are in meters

In the previous scheme the parts SH1 & LO2 are showed -
SH2 & LO1 are referred as "other side"

* In the two parts SH2 & LO1 the monitors of the low-beta region are moved on the opposite side of the local quads.