DAΦNE TECHNICAL NOTE

INFN - LNF, Accelerator Division

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Note: **L-17**

OPTIMIZATION OF THE DAY-ONE INTERACTION REGION

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A new layout for the DAY-ONE Interaction Region (IR) is proposed. Relaxing slightly the transparency conditions it is possible to decrease the vertical chromaticity which in the previous version[1] was higher than in KLOE and FI.NU.DA. IRs.

66 "Accumulator-type" quadrupoles will be now probably purchased from Tesla Engineering Ltd. We need 54 such quads in the DAΦNE lattice. In addition, if the γ-γ tagging experiment will run together with the KLOE experiment, it will need 4 "large" quads, thus leaving 4 more "Accumulator-type" quads available. We can therefore use 12 or 16 of these quads for the DAY-ONE IR, plus four quadrupoles coming from the ADONE ring. The characteristics of these quads are summarized in Table I.

TABLE I - IR quadrupoles general characteristics

	Magnetic length (mm)	Maximum Gradient (T/m)	Gap between poles (mm)
Type 1 (Accumulator)	300	12	100
Type 2 (ADONE)	532	3	220(h) x 90(v)

Along the IR the beam vacuum chamber is common to both rings; due to the crossing angle at the Interaction Point (IP) the Beam Stay Clear (BSC) increases along the IR away from the IP: the aperture of the magnetic elements must follow its shape. Type 1 quads have a small aperture and for this reason they can be used only within ~ 1 m from the IP, while the ADONE quadrupoles are large enough to be used in any place in the IR.

It has been chosen to add one more quadrupole to each IR triplet, as in the present FI.NU.DA. design[2], so that one more free parameter is available to adjust IR phase advances or optical functions.

The ADONE quad is used as the last one of the quadruplet. Since the other three quadrupoles cannot be placed within 1 m, one quadrupole can be placed exactly centered at the IP, thus saving space and still leaving four free parameters.

The IR layout is described in Table II. Figure 1 shows the optical functions and the separation along half IR. Half IR transport matrix is given in Table III. The main IR optics parameters are listed in Table IV. The separation and its slope are the nominal ones. The tunes have been chosen similar to those of the present KLOE design[3], but there is flexibility enough to change them by about 10%, without affecting the matching to the arcs. The vertical chromaticity for half IR is smaller by one unity with respect to previous design, thus decreasing by 4 units the total ring vertical chromaticity. The BSC, computed with the usual assumptions[4] is plotted in Fig. 2, and is compared to the actual apertures of the magnets.

TABLE II - DAY-ONE IR elements for half IR

	Length (m)	Position (m from IP)	Center position (m from IP)	K2 (m^{-2})	G (T/m)
Q0	0.150	0.000	0.000	2.866310	4.873
Drift	0.290	0.150			
Q1	0.300	0.440	0.590	-0.896576	1.524
Drift	0.300	0.740			
Q2	0.300	1.040	1.190	-4.967798	8.445
Drift	0.340	1.340			
Q3	0.532	1.680	1.946	1.550163	2.635
Drift	2.838	2.120			
End IR		5.050			

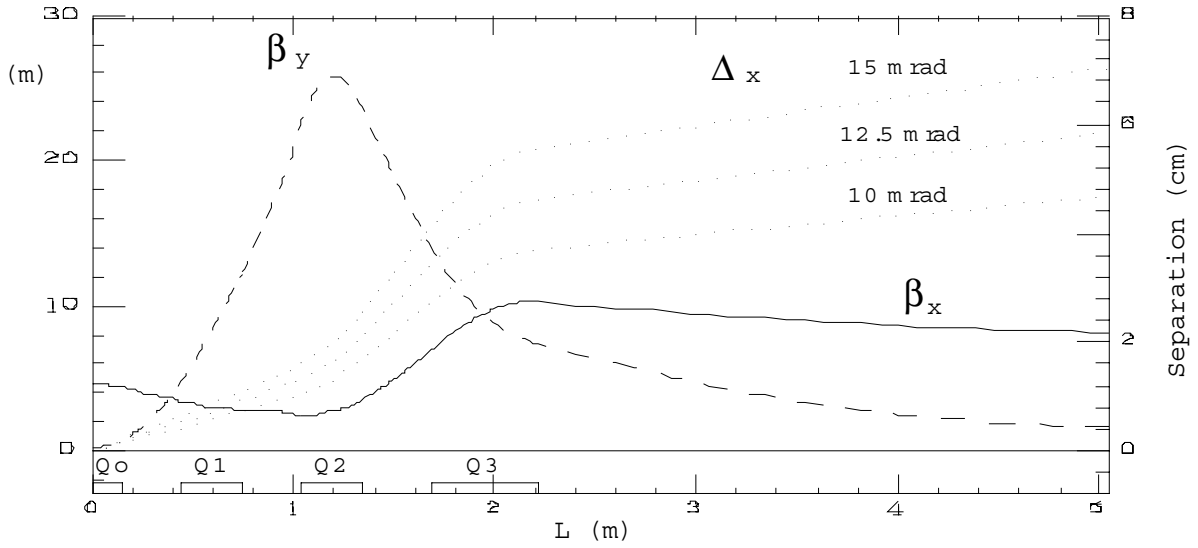

Fig. 1 - Optical functions and beam separation for half IR

TABLE III - Half IR first order transport matrix

0.820717	4.700000	0.000000	0.000000
-0.151649	0.350000	0.000000	0.000000
0.000000	0.000000	-5.062550	0.125243
0.000000	0.000000	-1.645972	-0.156809

TABLE IV - IR optic parameters

@IP	
β_x (m)	4.5
α_x	0.0
β_y(m)	0.045
α_y	0.0
Δx(m)	0.0
Δx'(mrad)	12.5
@ splitter input	
β_x (m)	7.9400
α_x	0.1945
β_y(m)	1.5019
α_x	0.6145
Δx(cm)	5.8750
Δx'(mrad)	4.375
D_x (m)	-0.040
D_x'	-0.020
For Half IR	
ΔQ_x	0.144
ΔQ_y	0.420
Horizontal chromaticity	- 0.37
Vertical chromaticity	- 2.46

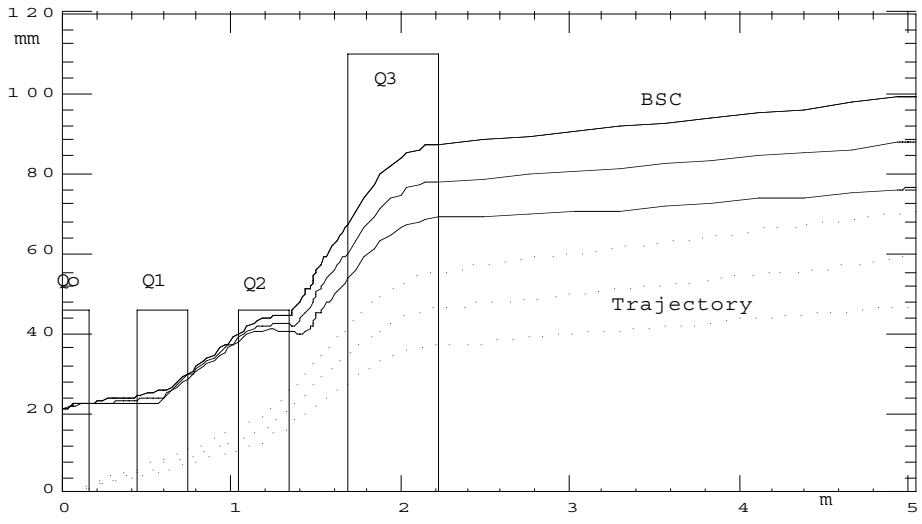

Fig. 2 - Quadrupole apertures, BSC apertures (solid lines) for 10,12.5,15 mrad crossing angles, and corresponding beam central trajectory (dotted lines)

The IR has been matched to the ring (D19 optics). The total ring main parameters are listed in Table V. Figure 3 shows the optical functions in the short and in the long arc. The quadrupole gradients and the optical functions are listed for the short and long arc in the Appendix I. The dynamic aperture computed with the DAΦNE code[5] is shown in Fig. 4; it is larger with respect to the previous one by about $4\sigma_x$ in the horizontal plane; the tune behaviours with momentum and amplitude are given in Fig. 5.

TABLE V- General lattice parameters

Q_x	5.18	Q_y	6.15
δQ_x*(hshort)	1.1896	δQ_y*(hshort)	1.5599
δQ_x*(hlong)	1.4004	δQ_y**(hlong)	1.5154
β_x**(short) (m)	6.19	β_y**(short) (m)	0.66
β_x**(long) (m)	8.20	β_y**(long) (m)	1.32
C_x	-8.5	C_y	-18.8
α_c	0.0062	Sextupoles families	8

* From IP to midpoint of straight section
** At straight section midpoint

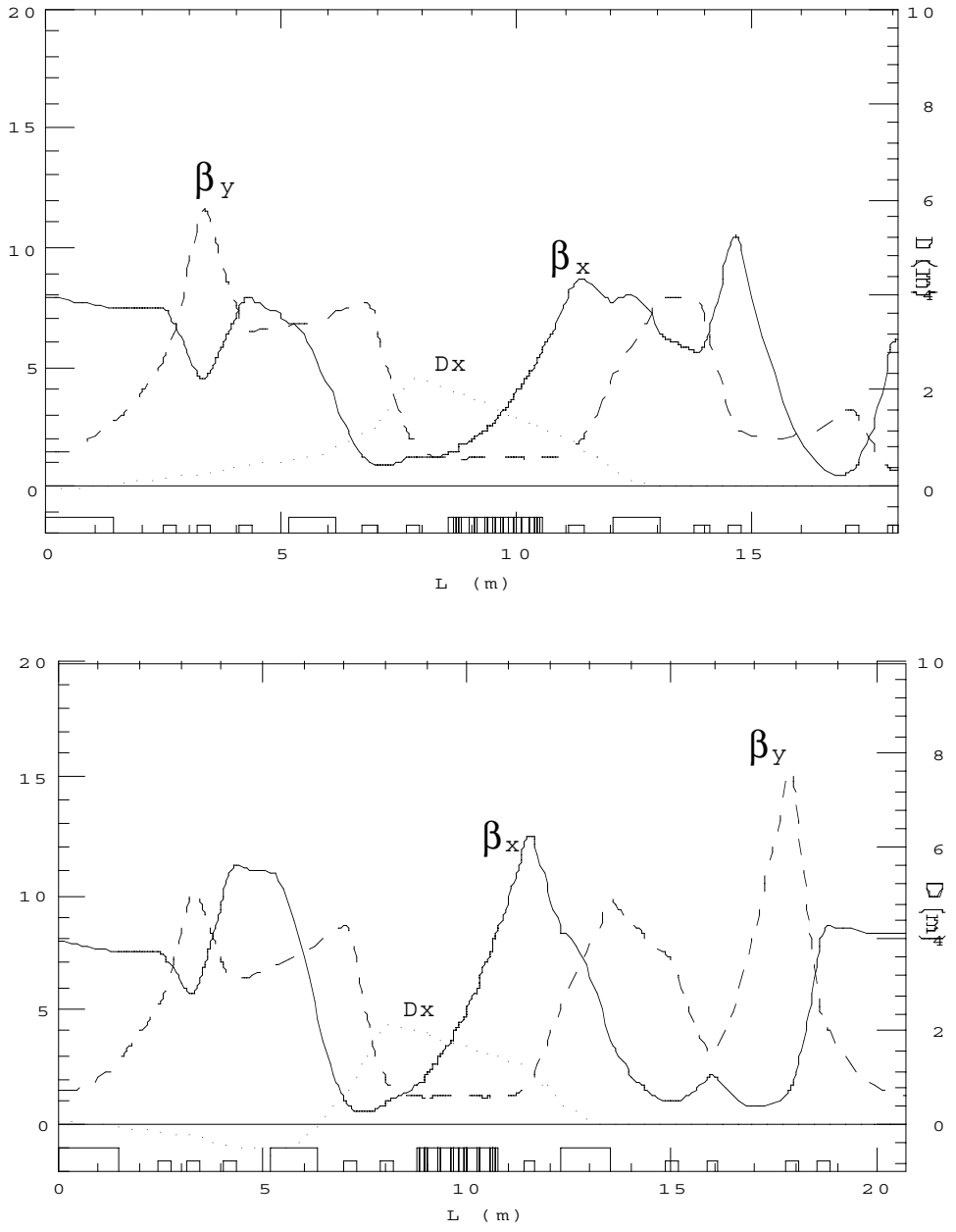

Fig. 3 - Optical functions in the short and in the long arc

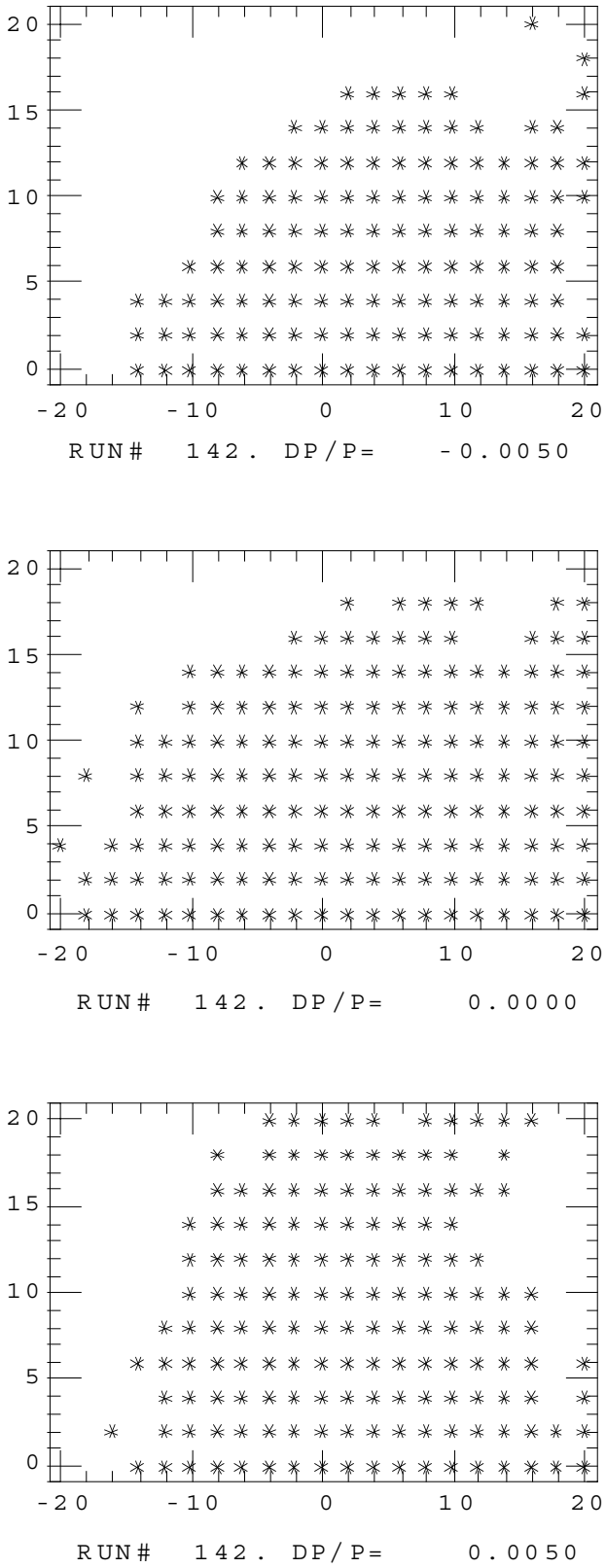

Fig. 4 - Dynamic aperture of the lattice for $\Delta p/p$ = - 0.5%, 0., 0.5%

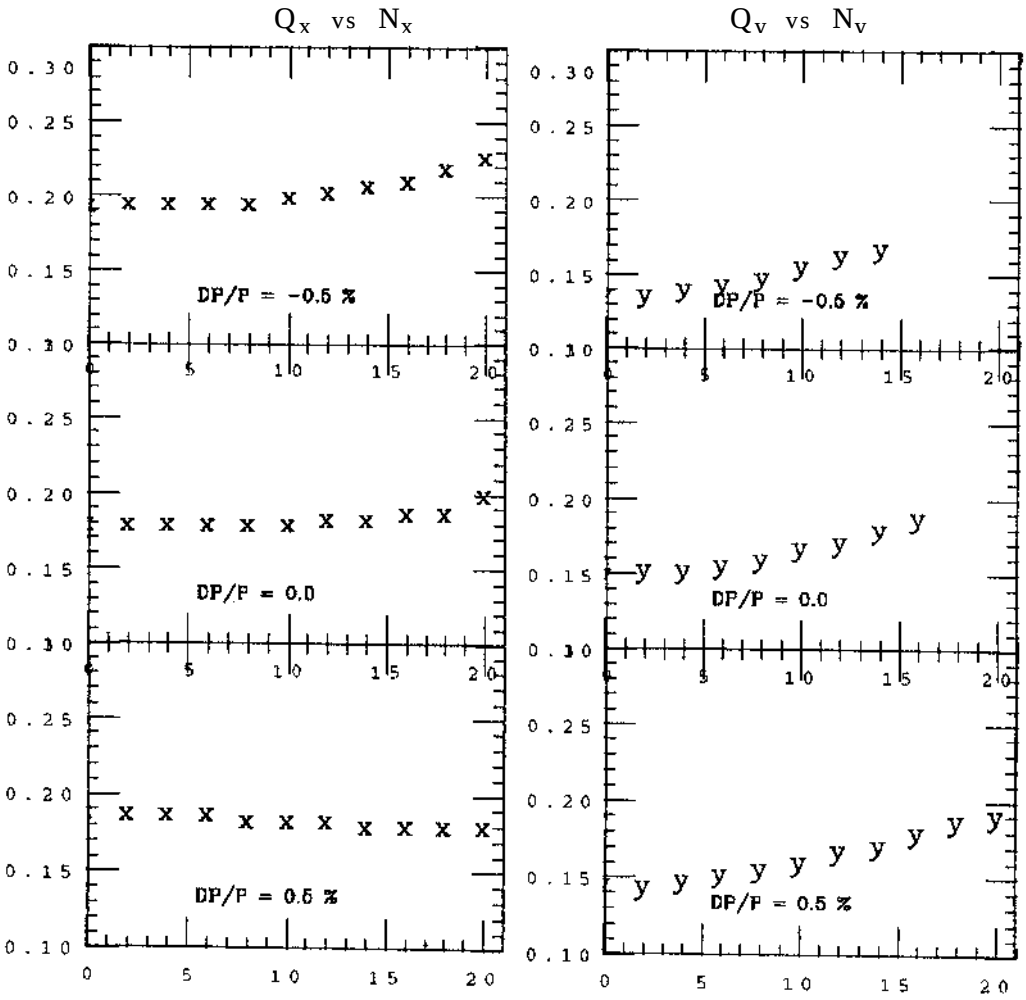

Fig. 5 - Tune behaviour with amplitude in units of σ's for Δp/p = - 0.5%, 0., 0.5%

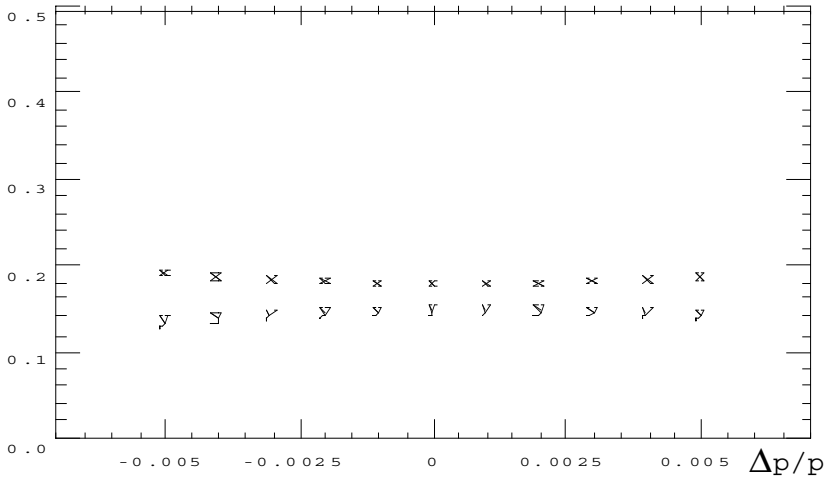

Fig. 6 - Fractional part of tune versus momentum

Compatibility with the compensators

The superconducting solenoids which will be used to compensate the solenoidal field of KLOE[6] and FI.NU.DA[2]. detectors can be installed in the DAY-ONE IR since they are compatible with the quadrupole layout and vacuum chamber apertures; this will make installation and commissioning of both experiments easier.

The compensators can be also turned up to study the effect of the solenoidal field, of the residual coupling and of errors in the compensation on the machine and on beam dynamics.

In this case the two compensators installed in the same IR should be powered with opposite currents, so that coupling is canceled outside the IR. In between the two solenoids, the seven quadrupoles should be rotated by the same angle, corresponding to the total rotation introduced by each solenoid:

$$\Theta_{rot} = \frac{\int B_s \, ds}{2B\rho}$$

Due to the focusing effect of the solenoids the optics inside the IR changes; two solutions are presented, one for the nominal current of the solenoids, corresponding to $\Theta_{rot} \sim 22°$, and one for half its value. The gradients of the quadrupoles with the IR layout are listed in Tab. VI, the optical functions shown in Figs. 7 and 8; the optical parameters are given in Tab. VII.

TABLE VI - DAY-ONE IR elements for half IR with compensator on

	Length (m)	Center position (m from IP)	K2 (Θ_{rot}=11°) (m^{-2})	K2 (Θ_{rot}=22°) (m^{-2})
Q0	0.150	0.000	3.20	3.35
Drift	0.290			
Q1	0.300	0.590	-0.85	-0.80
Drift	0.300			
Q2	0.300	1.190	-4.86	-4.70
Drift	0.340			
Q3	0.532	1.946	1.38	1.15
Drift	1.273			
Compensator	1.150	4.060		
Drift	0.415			
End IR		5.050		

TABLE VII - IR optical parameters with compensator on

Θ_{rot}	**11°**	**22°**
@IP (normal modes in the rotated plane)		
β_x (m)	4.5	4.5
α_ξ	0.0	0.0
β_y(m)	0.045	0.045
α_y	0.0	0.0
Δx(m)	0.0	0.0
Δx'(mrad)	12.5	12.5
@ splitter input		
β_x (m)	8.7228	9.8601
α_x	-0.1047	0.1702
β_y(m)	1.3421	0.9840
α_x	0.1703	0.2717
Δx(cm)	6.4902	6.6924
Δx'(mrad)	5.5388	2.8920
D_x (m)	-0.032	-0.029
D_x'	-0.020	-0.030
For Half IR		
ΔQ_x	0.159	0.164
ΔQ_y	0.415	0.421
Horizontal chromaticity	- 0.32	-0.45
Vertical chromaticity	- 2.48	-2.52

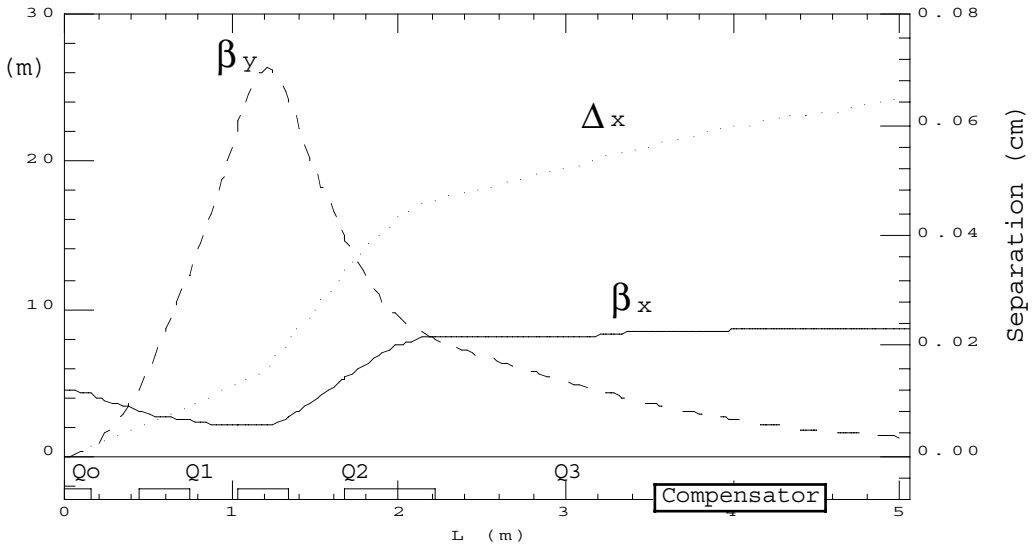

Fig. 7 - Optical functions and horizontal projection of beam trajectory for ±12.5 mrad crossing angle in half IR with compensator on and Θ_{rot}=11°

The BSC with the compensator on are compatible with those corresponding to the layout without compensator. Fig.9 shows the BSC corresponding to the case with maximum compensator field (Θ_{rot} = 22°) (solid lines), compared to the BSC without compensator (dotted lines), already reported in Fig. 2. Both are computed for a crossing angle of ±15 mrad and a vertical bump of 2.5mm at the IP.

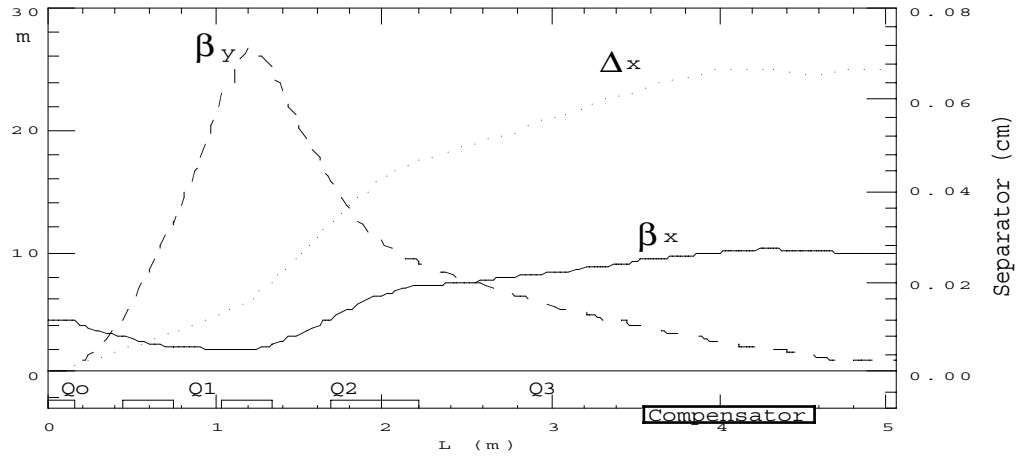

Fig. 8 - Optical functions and horizontal projection of beam trajectory for ±12.5 mrad crossing angle in half IR with compensator on and Θ_{rot}=22°

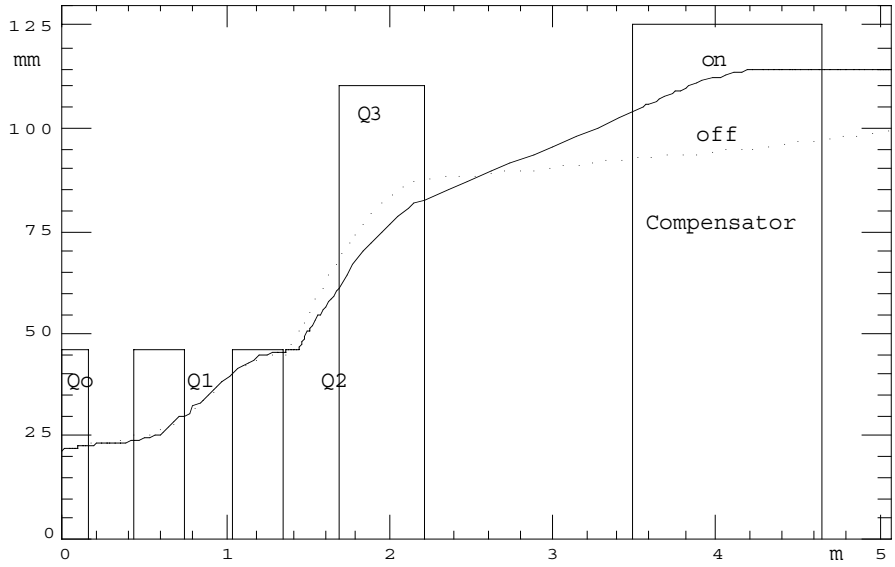

Fig.9 - BSC with compensator on (Θ_{rot}=22°) (solid lines) and BSC without compensator (dotted lines)

REFERENCES

[1] M.E.Biagini, C.Biscari, S.Guiducci, J.Lu, M.R.Masullo, G.Vignola - "Review of DAΦNE Lattices" DAΦNE Technical Note - L-9, October 1993.

[2] C.Biscari- "FI.NU.DA. Interaction Region" DAΦNE Technical Note - L-15, May 1994.

[3] M.E.Biagini - private communication.

[4] C.Biscari - "DAΦNE Stay-Clear apertures" DAΦNE Technical Note L-6, March 1993.

[5] M.E.Biagini - "DAΦNE: a tracking program for the Frascati Φ-factory" DAΦNE Technical Note L-7, May 1993.

[6] M.E.Biagini - "KLOE Interaction Region Update" DAFNE Technical Note L-13, March 1994.

APPENDIX I

Short arc

EL.	TIP	BETX	ALFX	BETY	ALFY	DX	DPX	QX	QY	CX	CY
0	0	7.9400	0.1945	1.5019	0.0614	-0.040000	-0.020000	0.000000	0.000000	0.000000	0.000000
11	4	7.4736	0.1246	2.7290	-0.9077	0.042074	0.132985	0.030019	0.127064	0.010023	0.003433
12	1	7.3993	0.0737	3.5038	-1.1583	0.091943	0.132985	0.038049	0.146413	0.010023	0.003433
13	1	7.3993	0.0737	3.5038	-1.1583	0.091943	0.132985	0.038049	0.146413	0.010023	0.003433
14	1	7.3710	0.0397	4.1247	-1.3254	0.125190	0.132985	0.043437	0.156887	0.010023	0.003433
15	1	7.3710	0.0397	4.1247	-1.3254	0.125190	0.132985	0.043437	0.156887	0.010023	0.003433
16	1	7.3603	-0.0113	5.2127	-1.5760	0.175059	0.132985	0.051544	0.169772	0.010023	0.003433
17	2	6.6117	2.4162	6.8738	-4.1588	0.204872	0.063975	0.058268	0.177897	0.213659	-0.166020
18	1	4.8442	2.0025	10.6266	-5.2234	0.230462	0.063975	0.069526	0.185348	0.213659	-0.166020
19	3	4.7934	-1.8199	11.1670	3.5676	0.278465	0.262376	0.079840	0.189559	-0.079338	0.551727
20	1	5.5573	-1.9998	9.7892	3.3218	0.330940	0.262376	0.086009	0.192604	-0.079338	0.551727
21	1	6.3932	-2.1797	8.5096	3.0759	0.383415	0.262376	0.091351	0.196092	-0.079338	0.551727
22	1	7.3011	-2.3596	7.3285	2.8300	0.435890	0.262376	0.096010	0.200123	-0.079338	0.551727
23	2	7.8338	0.6560	6.5292	-0.0591	0.486892	0.074196	0.102198	0.207168	0.168672	0.333723
24	1	6.9011	0.5099	6.7221	-0.1820	0.546249	0.074196	0.119550	0.226434	0.168672	0.333723
25	4	3.4360	2.3868	7.2332	-0.3342	0.818425	0.452569	0.149454	0.249107	0.439756	0.480325
26	1	1.2734	1.2174	7.0896	-0.4264	1.089966	0.452569	0.195757	0.261925	0.439756	0.480325
27	3	0.9059	0.0902	6.4548	4.2574	1.343930	1.269315	0.242409	0.268475	0.383590	0.877356
28	1	0.9143	-0.1323	4.8704	3.6648	1.597793	1.269315	0.277672	0.274153	0.383590	0.877356
29	1	0.9143	-0.1323	4.8704	3.6648	1.597793	1.269315	0.277672	0.274153	0.383590	0.877356
30	1	1.1982	-0.5775	2.4126	2.4796	2.105519	1.269315	0.340080	0.292768	0.383590	0.877356
31	2	1.3361	0.1532	1.5661	0.5519	2.238165	-0.401759	0.376731	0.318379	0.461936	0.763561
32	1	1.4280	-0.3064	1.2037	0.0521	1.997110	-0.401759	0.448247	0.390358	0.461936	0.763561
33	3	1.4280	-0.3225	1.2037	0.0656	1.997110	-0.379291	0.448247	0.390358	0.460658	0.764639
34	4	1.4821	-0.3512	1.1985	-0.0013	1.966577	-0.381382	0.457030	0.401002	0.458935	0.759018
35	3	1.4821	-0.3679	1.1985	0.0121	1.966577	-0.359258	0.457030	0.401002	0.457608	0.760091
36	3	1.4821	-0.4012	1.1985	0.0391	1.966577	-0.315008	0.457030	0.401002	0.454955	0.762237
37	4	1.5129	-0.3646	1.1968	0.0056	1.953015	-0.360701	0.461295	0.406337	0.455955	0.752330
38	3	1.5129	-0.3986	1.1968	0.0325	1.953015	-0.316757	0.461295	0.406337	0.453246	0.754273
39	3	1.5129	-0.4156	1.1968	0.0460	1.953015	-0.294785	0.461295	0.406337	0.451892	0.755344
40	4	1.5818	-0.4423	1.1948	-0.0212	1.929303	-0.295961	0.469555	0.417028	0.450398	0.749810
41	3	1.5818	-0.4601	1.1948	-0.0078	1.929303	-0.274256	0.469555	0.417028	0.448982	0.750880
42	3	1.5818	-0.4779	1.1948	0.0056	1.929303	-0.252550	0.469555	0.417028	0.447565	0.751949
43	4	1.6605	-0.5029	1.1993	-0.0615	1.905590	-0.338195	0.477438	0.427709	0.454563	0.761750
44	3	1.6605	-0.5215	1.1993	-0.0481	1.905590	-0.316757	0.477438	0.427709	0.453077	0.762823
45	3	1.6605	-0.5713	1.1993	0.0601	1.905590	-0.144861	0.477438	0.427709	0.441157	0.771432
46	4	1.8467	-0.4773	1.2015	-0.0742	1.841374	-0.653249	0.491979	0.449057	0.484253	0.844347
47	3	1.8467	-0.6439	1.2015	0.0342	1.841374	-0.487146	0.491979	0.449057	0.470997	0.852972
48	3	1.8467	-0.6647	1.2015	0.0477	1.841374	-0.466430	0.491979	0.449057	0.469343	0.854047
49	4	1.9550	-0.6834	1.1992	-0.0193	1.800578	-0.549904	0.498702	0.459708	0.475262	0.863361
50	3	1.9550	-0.7054	1.1992	-0.0058	1.800578	-0.529647	0.498702	0.459708	0.473511	0.864434
51	3	1.9550	-0.7274	1.1992	0.0077	1.800578	-0.509390	0.498702	0.459708	0.471761	0.865508
52	4	2.0731	-0.7435	1.2034	-0.0592	1.759783	-0.506944	0.505047	0.470350	0.473162	0.860526
53	3	2.0731	-0.7669	1.2034	-0.0457	1.759783	-0.487146	0.505047	0.470350	0.471306	0.861603
54	3	2.0731	-0.9539	1.2034	0.0629	1.759783	-0.328402	0.505047	0.470350	0.456425	0.870242
55	4	2.3377	-0.6784	1.2047	-0.0711	1.695566	-0.469707	0.516608	0.491634	0.473477	0.836207
56	3	2.3377	-0.8892	1.2047	0.0376	1.695566	-0.316757	0.516608	0.491634	0.456696	0.844855
57	3	2.3377	-0.9155	1.2047	0.0512	1.695566	-0.297681	0.516608	0.491634	0.454603	0.845934
58	4	2.4853	-0.9227	1.2018	-0.0156	1.671854	-0.293064	0.521907	0.502259	0.456214	0.841462
59	3	2.4853	-0.9507	1.2018	-0.0021	1.671854	-0.274256	0.521907	0.502259	0.453989	0.842538
60	3	2.4853	-0.9787	1.2018	0.0114	1.671854	-0.255447	0.521907	0.502259	0.451764	0.843614
61	4	2.6429	-0.9824	1.2054	-0.0554	1.648141	-0.335299	0.526891	0.512880	0.458889	0.852377
62	3	2.6429	-1.0122	1.2054	-0.0418	1.648141	-0.316757	0.526891	0.512880	0.456523	0.853457
63	3	2.6429	-1.2506	1.2054	0.0669	1.648141	-0.168084	0.526891	0.512880	0.437552	0.862109

64	4	2.8298	-1.0734	1.2000	0.0000	1.625308	-0.400500	0.531557	0.523510	0.464293	0.894818
65	4	2.9858	-0.8652	1.2054	-0.0669	1.583924	-0.630025	0.535947	0.534140	0.486837	0.927347
66	3	2.9858	-1.1346	1.2054	0.0418	1.583924	-0.487146	0.535947	0.534140	0.465404	0.936000
67	3	2.9858	-1.1681	1.2054	0.0554	1.583924	-0.469326	0.535947	0.534140	0.462731	0.937079
68	4	3.1728	-1.1603	1.2018	-0.0114	1.543129	-0.547007	0.540097	0.544762	0.468454	0.945347
69	3	3.1728	-1.1960	1.2018	0.0021	1.543129	-0.529647	0.540097	0.544762	0.465613	0.946425
70	3	3.1728	-1.2317	1.2018	0.0156	1.543129	-0.512286	0.540097	0.544762	0.462773	0.947499
71	4	3.3697	-1.2196	1.2047	-0.0512	1.502334	-0.504047	0.544003	0.555387	0.468742	0.943572
72	3	3.3697	-1.2575	1.2047	-0.0376	1.502334	-0.487146	0.544003	0.555387	0.465725	0.944650
73	3	3.3697	-1.5615	1.2047	0.0711	1.502334	-0.351626	0.544003	0.555387	0.441536	0.955298
74	4	3.7911	-1.0379	1.2034	-0.0629	1.438117	-0.446484	0.551120	0.576671	0.484897	0.926967
75	3	3.7911	-1.3799	1.2034	0.0457	1.438117	-0.316757	0.551120	0.576671	0.457683	0.935605
76	3	3.7911	-1.4225	1.2034	0.0592	1.438117	-0.300577	0.551120	0.576671	0.454289	0.936683
77	4	4.0174	-1.3961	1.1992	-0.0077	1.414404	-0.290168	0.554393	0.587313	0.460183	0.933236
78	3	4.0174	-1.4413	1.1992	0.0058	1.414404	-0.274256	0.554393	0.587313	0.456586	0.934309
79	3	4.0174	-1.4865	1.1992	0.0193	1.414404	-0.258343	0.554393	0.587313	0.452989	0.935383
80	4	4.2537	-1.4550	1.2015	-0.0477	1.390692	-0.332407	0.557482	0.597963	0.461317	0.943115
81	3	4.2537	-1.5028	1.2015	-0.0342	1.390692	-0.316757	0.557482	0.597963	0.457509	0.944189
82	3	4.2537	-1.8865	1.2015	0.0742	1.390692	-0.191308	0.557482	0.597963	0.426974	0.952814
83	4	4.7534	-1.1964	1.1993	-0.0601	1.326475	-0.606802	0.563138	0.619312	0.497428	1.010349
84	3	4.7534	-1.6252	1.1993	0.0481	1.326475	-0.487146	0.563138	0.619312	0.463306	1.018958
85	3	4.7534	-1.6787	1.1993	0.0615	1.326475	-0.472222	0.563138	0.619312	0.459051	1.020031
86	4	5.0192	-1.6302	1.1948	-0.0056	1.285680	-0.544111	0.565753	0.629993	0.465643	1.027262
87	3	5.0192	-1.6867	1.1948	0.0078	1.285680	-0.529647	0.565753	0.629993	0.461150	1.028337
88	3	5.0192	-1.7431	1.1948	0.0212	1.285680	-0.515182	0.565753	0.629993	0.456656	1.029401
89	4	5.2948	-1.6886	1.1968	-0.0460	1.244884	-0.501151	0.568230	0.640684	0.468381	1.026484
90	3	5.2948	-1.7481	1.1968	-0.0325	1.244884	-0.487146	0.568230	0.640684	0.463641	1.027555
91	3	5.2948	-1.8673	1.1968	-0.0056	1.244884	-0.459135	0.568230	0.640684	0.454160	1.029698
92	4	5.4363	-1.6565	1.1985	-0.0391	1.226192	-0.472235	0.569420	0.646019	0.475427	1.024817
93	3	5.4363	-1.7789	1.1985	-0.0121	1.226192	-0.444645	0.569420	0.646019	0.465693	1.026963
94	3	5.4363	-1.8400	1.1985	0.0013	1.226192	-0.430850	0.569420	0.646019	0.460826	1.028036
95	4	5.7267	-1.7759	1.2037	-0.0656	1.192217	-0.415556	0.571709	0.656662	0.472712	1.025309
96	3	5.7267	-1.8403	1.2037	-0.0521	1.192217	-0.402144	0.571709	0.656662	0.467585	1.026387
97	1	6.5937	-2.0127	1.2693	-0.2395	1.101735	-0.402144	0.577538	0.685795	0.467585	1.026387
98	1	6.5937	-2.0127	1.2693	-0.2395	1.101735	-0.402144	0.577538	0.685795	0.467585	1.026387
99	1	8.2109	-2.2999	1.5661	-0.5519	0.950931	-0.402144	0.585653	0.728642	0.467585	1.026387
100	2	8.6422	0.9181	2.1889	-1.6034	0.778271	-0.737839	0.591214	0.755049	0.730395	0.970532
101	1	7.6172	0.7901	4.7003	-2.5822	0.335567	-0.737839	0.602994	0.784997	0.730395	0.970532
102	3	7.6172	-1.2163	4.7003	-1.3441	0.335567	-0.649448	0.602994	0.784997	0.670728	0.969056
103	4	6.3562	2.2705	7.9468	-1.9352	0.000001	0.000000	0.623859	0.810892	0.970629	1.242937
104	3	6.3562	0.5962	7.9468	0.1580	0.000001	0.000000	0.623859	0.810892	0.837392	1.409508
105	1	6.0177	0.5322	7.8636	0.1193	0.000000	0.000000	0.631582	0.816933	0.837392	1.409508
106	1	5.8133	0.4896	7.8211	0.0935	0.000000	0.000000	0.636965	0.820992	0.837392	1.409508
107	1	5.5819	0.4362	7.7824	0.0613	0.000000	0.000000	0.643952	0.826093	0.837392	1.409508
108	3	6.5035	-3.7114	6.2987	4.5482	0.000000	0.000000	0.652149	0.832689	0.526079	1.797071
109	1	9.8362	-4.6202	3.2111	3.1710	0.000000	0.000000	0.660112	0.846863	0.526079	1.797071
110	2	9.8534	4.5682	2.2449	0.3390	0.000000	0.000000	0.664743	0.865514	1.276803	1.608611
111	1	0.5086	-0.3588	3.1873	-0.7636	0.000000	0.000000	0.935276	1.021327	1.276803	1.608611
112	3	1.1710	-2.0758	2.6939	2.2321	0.000000	-0.000001	1.002415	1.036805	1.213767	1.866670
113	1	5.4311	-4.8604	0.7897	0.8682	-0.000001	-0.000001	1.041571	1.105983	1.213767	1.866670
114	2	6.1933	0.0000	0.6648	0.0000	-0.000001	0.000000	1.045600	1.139900	1.620175	1.818341

CROMATISMO :	CX = 1.62017	CY =	1.81834
K*Beta*sin(2fi) :	0.22680		-0.72696
K*Beta*cos(2fi) :	1.27947		-0.04969

MOMENTUM COMPACTION = 0.2898D-01
Q = 0.6338D-01
ENERGY SPREAD = 0.3921D-03
RADIAL EMITTANCE = 0.1000D-05

I	TY	LENGTH	DL	STRENGTH	ANGLE
11	4	1.450	1.450	0.000000	0.152705
12	1	1.825	0.375	0.000000	0.000000
13	1	1.825	0.000	0.000000	0.000000
14	1	2.075	0.250	0.000000	0.000000
15	1	2.075	0.000	0.000000	0.000000
16	1	2.450	0.375	0.000000	0.000000
17	2	2.750	0.300	1.200000	0.000000
18	1	3.150	0.400	0.000000	0.000000
19	3	3.450	0.300	-2.650399	0.000000
20	1	3.650	0.200	0.000000	0.000000
21	1	3.850	0.200	0.000000	0.000000
22	1	4.050	0.200	0.000000	0.000000
23	2	4.350	0.300	1.345766	0.000000
24	1	5.150	0.800	0.000000	0.000000
25	4	6.140	0.990	0.000000	0.706858
26	1	6.740	0.600	0.000000	0.000000
27	3	7.040	0.300	-2.275187	0.000000
28	1	7.240	0.200	0.000000	0.000000
29	1	7.240	0.000	0.000000	0.000000
30	1	7.640	0.400	0.000000	0.000000
31	2	7.940	0.300	2.516172	0.000000
32	1	8.540	0.600	0.000000	0.000000
33	3	8.540	0.000	-0.011250	0.000000
34	4	8.620	0.080	0.000000	0.042495
35	3	8.620	0.000	-0.011250	0.000000
36	3	8.620	0.000	-0.022501	0.000000
37	4	8.660	0.040	0.000000	0.042495
38	3	8.660	0.000	-0.022501	0.000000
39	3	8.660	0.000	-0.011250	0.000000
40	4	8.741	0.080	0.000000	0.042495
41	3	8.741	0.000	-0.011250	0.000000
42	3	8.741	0.000	-0.011250	0.000000
43	4	8.821	0.080	0.000000	-0.042495
44	3	8.821	0.000	-0.011250	0.000000
45	3	8.821	0.000	-0.090206	0.000000
46	4	8.981	0.161	0.000000	-0.169979
47	3	8.981	0.000	-0.090206	0.000000
48	3	8.981	0.000	-0.011250	0.000000
49	4	9.062	0.080	0.000000	-0.042495
50	3	9.062	0.000	-0.011250	0.000000
51	3	9.062	0.000	-0.011250	0.000000
52	4	9.142	0.080	0.000000	0.042495
53	3	9.142	0.000	-0.011250	0.000000
54	3	9.142	0.000	-0.090206	0.000000
55	4	9.303	0.161	0.000000	0.169979

56	3	9.303	0.000	-0.090206	0.000000
57	3	9.303	0.000	-0.011250	0.000000
58	4	9.383	0.080	0.000000	0.042495
59	3	9.383	0.000	-0.011250	0.000000
60	3	9.383	0.000	-0.011250	0.000000
61	4	9.463	0.080	0.000000	-0.042495
62	3	9.463	0.000	-0.011250	0.000000
63	3	9.463	0.000	-0.090206	0.000000
64	4	9.543	0.080	0.000000	-0.084989
65	4	9.624	0.080	0.000000	-0.084989
66	3	9.624	0.000	-0.090206	0.000000
67	3	9.624	0.000	-0.011250	0.000000
68	4	9.704	0.080	0.000000	-0.042495
69	3	9.704	0.000	-0.011250	0.000000
70	3	9.704	0.000	-0.011250	0.000000
71	4	9.784	0.080	0.000000	0.042495
72	3	9.784	0.000	-0.011250	0.000000
73	3	9.784	0.000	-0.090206	0.000000
74	4	9.945	0.161	0.000000	0.169979
75	3	9.945	0.000	-0.090206	0.000000
76	3	9.945	0.000	-0.011250	0.000000
77	4	10.025	0.080	0.000000	0.042495
78	3	10.025	0.000	-0.011250	0.000000
79	3	10.025	0.000	-0.011250	0.000000
80	4	10.105	0.080	0.000000	-0.042495
81	3	10.105	0.000	-0.011250	0.000000
82	3	10.105	0.000	-0.090206	0.000000
83	4	10.266	0.161	0.000000	-0.169979
84	3	10.266	0.000	-0.090206	0.000000
85	3	10.266	0.000	-0.011250	0.000000
86	4	10.346	0.080	0.000000	-0.042495
87	3	10.346	0.000	-0.011250	0.000000
88	3	10.346	0.000	-0.011250	0.000000
89	4	10.426	0.080	0.000000	0.042495
90	3	10.426	0.000	-0.011250	0.000000
91	3	10.426	0.000	-0.022501	0.000000
92	4	10.466	0.040	0.000000	0.042495
93	3	10.466	0.000	-0.022501	0.000000
94	3	10.466	0.000	-0.011250	0.000000
95	4	10.547	0.080	0.000000	0.042495
96	3	10.547	0.000	-0.011250	0.000000
97	1	10.772	0.225	0.000000	0.000000
98	1	10.772	0.000	0.000000	0.000000
99	1	11.147	0.375	0.000000	0.000000
100	2	11.447	0.300	1.281756	0.000000
101	1	12.047	0.600	0.000000	0.000000
102	3	12.047	0.000	-0.263408	0.000000
103	4	13.037	0.990	0.000000	0.706858
104	3	13.037	0.000	-0.263408	0.000000
105	1	13.337	0.300	0.000000	0.000000
106	1	13.537	0.200	0.000000	0.000000
107	1	13.787	0.250	0.000000	0.000000
108	3	14.087	0.300	-2.233670	0.000000
109	1	14.487	0.400	0.000000	0.000000
110	2	14.787	0.300	3.049245	0.000000
111	1	17.007	2.220	0.000000	0.000000
112	3	17.307	0.300	-3.494156	0.000000
113	1	17.921	0.614	0.000000	0.000000
114	2	18.071	0.150	5.736890	0.000000

Long arc

EL.	TIP	BETX	ALFX	BETY	ALFY	DX	DPX	QX	QY	CX	CY
0	0	7.9400	0.1945	1.5019	0.0614	0.040000	0.020000	0.000000	0.000000	0.000000	0.000000
8	4	7.4736	0.1246	2.7290	-0.9077	-0.042074	-0.132985	0.030019	0.127064	0.010023	0.003433
9	1	7.3993	0.0737	3.5038	-1.1583	-0.091943	-0.132985	0.038049	0.146413	0.010023	0.003433
10	1	7.3993	0.0737	3.5038	-1.1583	-0.091943	-0.132985	0.038049	0.146413	0.010023	0.003433
11	1	7.3710	0.0397	4.1247	-1.3254	-0.125190	-0.132985	0.043437	0.156887	0.010023	0.003433
12	1	7.3710	0.0397	4.1247	-1.3254	-0.125190	-0.132985	0.043437	0.156887	0.010023	0.003433
13	1	7.3603	-0.0113	5.2127	-1.5760	-0.175059	-0.132985	0.051544	0.169772	0.010023	0.003433
14	2	6.9072	1.4886	6.6105	-3.1845	-0.208820	-0.090859	0.058169	0.177999	0.135246	-0.097862
15	1	5.7908	1.3023	9.4277	-3.8586	-0.245164	-0.090859	0.068242	0.186066	0.135246	-0.097862
16	3	6.2119	-2.8005	9.7782	2.7682	-0.298889	-0.273401	0.076481	0.190872	-0.179685	0.441929
17	1	7.3890	-3.0852	8.7074	2.5910	-0.353569	-0.273401	0.081180	0.194321	-0.179685	0.441929
18	1	8.6800	-3.3698	7.7064	2.4138	-0.408249	-0.273401	0.085155	0.198208	-0.179685	0.441929
19	1	10.0849	-3.6545	6.7763	2.2367	-0.462930	-0.273401	0.088557	0.202613	-0.179685	0.441929
20	2	11.1574	0.2135	6.1997	-0.2435	-0.517843	-0.089280	0.092976	0.210120	0.140468	0.253530
21	1	10.8758	0.1385	6.6987	-0.3802	-0.589267	-0.089280	0.104544	0.229929	0.140468	0.253530
22	4	4.5018	3.7483	7.8690	-0.5870	0.013189	1.022353	0.128863	0.256578	0.674102	0.756988
23	1	1.2073	1.7425	8.6349	-0.6895	0.626601	1.022353	0.170289	0.268173	0.674102	0.756988
24	3	0.6121	0.3861	7.2278	5.0283	1.015501	1.618022	0.229243	0.273997	0.624544	1.240379
25	1	0.5494	-0.1771	4.5381	3.9373	1.500907	1.618022	0.315776	0.282338	0.624544	1.240379
26	1	0.5494	-0.1771	4.5381	3.9373	1.500907	1.618022	0.315776	0.282338	0.624544	1.240379
27	1	0.8246	-0.7402	2.5030	2.8464	1.986314	1.618022	0.389298	0.296523	0.624544	1.240379
28	2	1.1447	-0.2291	1.5661	0.5519	2.188701	-0.299193	0.436976	0.321845	0.696744	1.103088
29	1	1.7505	-0.7807	1.2037	0.0521	2.009185	-0.299193	0.506639	0.393822	0.696744	1.103088
30	3	1.7505	-0.8004	1.2037	0.0656	2.009185	-0.276589	0.506639	0.393822	0.695177	1.104165
31	4	1.8818	-0.8333	1.1985	-0.0013	1.986882	-0.279045	0.513678	0.404466	0.693541	1.098459
32	3	1.8818	-0.8545	1.1985	0.0121	1.986882	-0.256692	0.513678	0.404466	0.691856	1.099532
33	3	1.8818	-0.8969	1.1985	0.0391	1.986882	-0.211986	0.513678	0.404466	0.688487	1.101678
34	4	1.9518	-0.8475	1.1968	0.0056	1.977436	-0.258684	0.517010	0.409801	0.690106	1.091390
35	3	1.9518	-0.8914	1.1968	0.0325	1.977436	-0.214191	0.517010	0.409801	0.686612	1.093533
36	3	1.9518	-0.9134	1.1968	0.0460	1.977436	-0.191944	0.517010	0.409801	0.684864	1.094604
37	4	2.1008	-0.9415	1.1948	-0.0212	1.961954	-0.193762	0.523319	0.420492	0.683328	1.088949
38	3	2.1008	-0.9652	1.1948	-0.0078	1.961954	-0.171690	0.523319	0.420492	0.681447	1.090018
39	3	2.1008	-0.9888	1.1948	0.0056	1.961954	-0.149617-	0.523319	0.420492	0.679567	1.091088
40	4	2.2616	-1.0135	1.1993	-0.0615	1.946471	-0.236089	0.529180	0.431173	0.688516	1.101014
41	3	2.2616	-1.0390	1.1993	-0.0481	1.946471	-0.214191	0.529180	0.431173	0.686485	1.102088
42	3	2.2616	-1.2430	1.1993	0.0601	1.946471	-0.038607	0.529180	0.431173	0.670251	1.112647
43	4	2.6170	-0.9498	1.2015	-0.0742	1.898641	-0.555849	0.539639	0.452521	0.730622	1.185047
44	3	2.6170	-1.1859	1.2015	0.0342	1.898641	-0.384580	0.539639	0.452521	0.711836	1.193672
45	3	2.6170	-1.2153	1.2015	0.0477	1.898641	-0.363220	0.539639	0.452521	0.709493	1.194748
46	4	2.8133	-1.2280	1.1992	-0.0193	1.866076	-0.448075	0.544346	0.463172	0.717124	1.204314
47	3	2.8133	-1.2596	1.1992	-0.0058	1.866076	-0.427081	0.544346	0.463172	0.714606	1.205388
48	3	2.8133	-1.2913	1.1992	0.0077	1.866076	-0.406087	0.544346	0.463172	0.712087	1.206462
49	4	3.0214	-1.2994	1.2034	-0.0592	1.833510	-0.405207	0.548727	0.473814	0.714838	1.201222
50	3	3.0214	-1.3334	1.2034	-0.0457	1.833510	-0.384580	0.548727	0.473814	0.712133	1.202299
51	3	3.0214	-1.6060	1.2034	0.0629	1.833510	-0.219186	0.548727	0.473814	0.690445	1.210938
52	4	3.4709	-1.1672	1.2047	-0.0711	1.785680	-0.375270	0.556582	0.495098	0.714488	1.174483
53	3	3.4709	-1.4803	1.2047	0.0376	1.785680	-0.214191	0.556582	0.495098	0.689572	1.183131
54	3	3.4709	-1.5194	1.2047	0.0512	1.785680	-0.194102	0.556582	0.495098	0.686465	1.184209
55	4	3.7144	-1.5123	1.2018	-0.0156	1.770197	-0.191605	0.560139	0.505723	0.688987	1.179352
56	3	3.7144	-1.5541	1.2018	-0.0021	1.770197	-0.171690	0.560139	0.505723	0.685662	1.180428
57	3	3.7144	-1.5959	1.2018	0.0114	1.770197	-0.151775	0.560139	0.505723	0.682337	1.181504
58	4	3.9697	-1.5832	1.2054	-0.0554	1.754715	-0.233932	0.563465	0.516344	0.693000	1.190657
59	3	3.9697	-1.6279	1.2054	-0.0418	1.754715	-0.214191	0.563465	0.516344	0.689446	1.191737
60	3	3.9697	-1.9860	1.2054	0.0669	1.754715	-0.055905	0.563465	0.516344	0.660950	1.200389

61	4	4.2664	-1.7013	1.2000	0.0000	1.740491	-0.298305	0.566566	0.526974	0.702570	[illegible]
62	4	4.5133	-1.3676	1.2054	-0.0669	1.706885	-0.538551	0.569474	0.537604	0.736760	[illegible]
63	3	4.5133	-1.7748	1.2054	0.0418	1.706885	-0.384580	0.569474	0.537604	0.704362	[illegible]
64	3	4.5133	-1.8255	1.2054	0.0554	1.706885	-0.365477	0.569474	0.537604	0.700291	[illegible]
65	4	4.8041	-1.7945	1.2018	-0.0114	1.674319	-0.443918	0.572217	0.548226	0.709282	[illegible]
66	3	4.8041	-1.8485	1.2018	0.0021	1.674319	-0.427081	0.572217	0.548226	0.704942	[illegible]
67	3	4.8041	-1.9026	1.2018	0.0156	1.674319	-0.408244	0.572217	0.548226	0.700068	[illegible]
68	4	5.1066	-1.8649	1.2047	-0.0512	1.641754	-0.403050	0.574795	0.558851	0.709244	[illegible]
69	3	5.1066	-1.9223	1.2047	-0.0376	1.641754	-0.384580	0.574795	0.558851	0.704072	[illegible]
70	3	5.1066	-2.3830	1.2047	0.0711	1.641754	-0.236484	0.574795	0.558851	0.668015	[illegible]
71	4	5.7443	-1.5510	1.2034	-0.0629	1.593924	-0.357973	0.579491	0.580135	[illegible]	[illegible]
72	3	5.7443	-2.0692	1.2034	0.0457	1.593924	-0.214191	0.579491	0.580135	0.686886	[illegible]
73	3	5.7443	-2.1338	1.2034	0.0592	1.593924	-0.196259	0.579491	0.580135	0.681743	[illegible]
74	4	6.0824	-2.0746	1.1992	-0.0077	1.578441	-0.189448	0.581651	0.590777	0.689721	[illegible]
75	3	6.0824	-2.1430	1.1992	0.0058	1.578441	-0.171690	0.581651	0.590777	0.684275	[illegible]
76	3	6.0824	-2.2114	1.1992	0.0193	1.578441	-0.153932	0.581651	0.590777	0.678830	[illegible]
77	4	6.4322	-2.1444	1.2015	-0.0477	1.562959	-0.231775	0.583693	0.601427	0.692520	[illegible]
78	3	6.4322	-2.2168	1.2015	-0.0342	1.562959	-0.214191	0.583693	0.601427	0.686761	[illegible]
79	3	6.4322	-2.7970	1.2015	0.0742	1.562959	-0.073202	0.583693	0.601427	0.640588	[illegible]
80	4	7.1640	-2.7174	1.1993	-0.0601	1.515129	-0.521254	0.587439	0.622776	0.755592	[illegible]
81	3	7.1640	-2.3637	1.1993	0.0481	1.515129	-0.384580	0.587439	0.622776	0.704166	[illegible]
82	3	7.1640	-2.4443	1.1993	0.0615	1.515129	-0.367534	0.587439	0.622776	0.697753	[illegible]
83	4	7.5492	-2.3525	1.1948	-0.0056	1.482563	-0.443760	0.589176	0.633456	0.709339	[illegible]
84	3	7.5492	-2.4375	1.1948	0.0078	1.482563	-0.427081	0.589176	0.633456	0.702581	[illegible]
85	3	7.5492	-2.5224	1.1948	0.0212	1.482563	-0.410402	0.589176	0.633456	0.695822	[illegible]
86	4	7.9463	-2.4218	1.1967	-0.0460	1.449998	-0.400893	0.590825	0.644148	0.711606	[illegible]
87	3	7.9463	-2.5112	1.1967	-0.0325	1.449998	-0.384580	0.590825	0.644148	0.704492	[illegible]
88	3	7.9463	-2.6900	1.1967	-0.0056	1.449998	-0.351954	0.590825	0.644148	0.690264	[illegible]
89	4	8.1493	-2.3648	1.1985	-0.0391	1.435421	-0.374377	0.591618	0.649482	0.720108	[illegible]
90	3	8.1493	-2.5481	1.1985	-0.0121	1.435421	-0.342079	0.591618	0.649482	0.705517	[illegible]
91	3	8.1493	-2.6398	1.1985	0.0013	1.435421	-0.325930	0.591618	0.649482	0.698221	[illegible]
92	4	8.5642	-2.5256	1.2037	-0.0656	1.409677	-0.315437	0.593147	0.660126	0.714097	[illegible]
93	3	8.5642	-2.6219	1.2037	-0.0521	1.409677	-0.299578	0.593147	0.660126	0.706340	[illegible]
94	1	10.2201	-2.8977	1.3099	-0.3020	1.319803	-0.299578	0.598252	0.698522	0.706340	[illegible]
95	1	10.2201	-2.8977	1.3099	-0.3020	1.319803	-0.299578	0.598252	0.698522	[illegible]	[illegible]
96	1	12.0415	-3.1736	1.5661	-0.5519	1.229930	-0.299578	0.602556	0.737126	0.706340	[illegible]
97	2	11.9773	3.3759	2.2810	-1.9584	1.044177	-0.922012	0.606426	0.758172	1.256651	[illegible]
98	1	8.2988	2.7549	5.3942	-3.2303	0.490969	-0.922012	0.616010	0.785530	1.273603	[illegible]
99	3	8.2988	0.0232	5.3942	-1.4548	0.490969	-0.760406	0.616010	0.785530	1.019255	[illegible]
100	4	3.6049	2.8392	9.7606	-2.1538	0.000000	0.000000	0.647198	0.812194	1.427251	1.662178
101	3	3.6049	1.6526	9.7606	1.0590	0.000000	0.000000	0.647198	0.812194	1.332806	1.917842
102	1	2.2111	1.1351	8.7560	0.9503	0.000000	0.000000	0.675535	0.820806	1.332806	1.917842
103	1	1.6231	0.8246	8.2053	0.8851	0.000000	0.000000	0.700845	0.826441	1.332806	1.917842
104	1	1.0292	0.2553	7.2975	0.7656	0.000000	0.000000	0.770802	0.837762	1.332806	1.917842
105	3	1.0582	-0.3548	6.7461	2.6332	0.000000	0.000000	0.817932	0.844731	1.308581	2.081975
106	1	2.0327	-1.0783	3.2522	1.7695	0.000000	0.000000	0.894665	0.868835	1.308581	2.081975
107	2	1.9817	1.2279	5.3475	-2.1238	0.000000	0.000000	0.917144	0.884202	1.408780	1.789862
108	1	1.3578	-0.8474	14.7412	-4.8235	0.000000	0.000000	1.170250	0.921704	1.608780	1.789862
109	3	2.5506	-3.5190	13.2206	9.3740	0.000000	0.000000	1.197342	0.924956	1.363481	2.961907
110	1	6.7803	-5.8803	6.1452	6.3490	0.000000	0.000000	1.214598	0.932905	1.363481	2.961907
111	2	8.6321	0.2289	3.9901	1.4217	0.000000	0.000000	1.220585	0.942960	1.893202	2.642171
112	1	8.2023	0.0000	1.3206	0.0000	0.000000	0.000000	1.256400	1.095400	1.893202	2.642171

CROMATISMO :	CX =	1.89320	CY = 2.64217
K*Beta*sin(2fi) :		-0.05798	-0.90930
K*Beta*cos(2fi) :		1.13246	-0.72745

MOMENTUM COMPACTION =-0.1058D-01
D =-0.9357D-01
ENERGY SPREAD = 0.4054D-03
RADIAL EMITTANCE 0.1000D-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	0.727600	0.000000
15	1	3.150	0.400	0.000000	0.000000
16	3	3.450	0.300	-2.274852	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	1.239877	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	-2.462823	0.000000
25	1	7.560	0.300	0.000000	0.000000
26	1	7.560	0.000	0.000000	0.000000
27	1	7.860	0.300	0.000000	0.000000
28	2	8.160	0.300	2.992393	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	11.067	0.300	0.000000	0.000000
95	1	11.067	0.000	0.000000	0.000000
96	1	11.367	0.300	0.000000	0.000000
97	2	11.667	0.300	1.800000	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	13.977	0.500	0.000000	0.000000
103	1	14.277	0.300	0.000000	0.000000
104	1	14.827	0.550	0.000000	0.000000
105	3	15.127	0.300	-1.001377	0.000000
106	1	15.807	0.680	0.000000	0.000000
107	2	16.107	0.300	3.945711	0.000000
108	1	17.747	1.640	0.000000	0.000000
109	3	18.047	0.300	-3.338281	0.000000
110	1	18.497	0.450	0.000000	0.000000
111	2	18.797	0.300	2.767790	0.000000
112	1	20.674	1.878	0.000000	0.000000