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A Chromatic Correction Scheme for the Antisymmetric RHIC Lattice. The First Approximation.

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A Chromatic Correction Scheme for the Antisymmetric RHIC Lattice.
The First Approximation.

Armando Antillon¹

March 7, 1985

Abstract

We use special families of sextupoles in the arcs, with antisymmetric distribution. The chromatic behavior of the machine functions are, in general, better than with only two families.

Natural Chromaticity: $\xi_x = -56.6$, $\xi_y = -56.5$

tunes: $\nu_x = 28.40867$, $\nu_y = 28.37187$

Sextupoles: SF = -0.15194 , SD = $+0.3111$ for $\xi_x = \xi_y = 1$

$\beta_x^* = \beta_y^* = 3.00001$

Special Families of Sextupoles

In Figure 5 we show the distribution of the sextupole. There are four families in one arc with a total number of eight families. The dashed lines in all the figures correspond to the values of sextupoles that we next are giving and obviously they have to be optimized by Harmon³ or SYNCH⁴. On the other hand, the scheme must be optimized to reduce the phase space distortions related with the linear contribution to the W-vector introduced by Guignard⁵. For the moment, the four families per arc is in accordance with the number he suggests for a 90° lattice.

For one arc:

Family one: S80=D2=H2=Z2= -0.04934

Family two: B2=F2=J2= $.045$

Family three: A2=E2=I2= $.03533$

Family four: C2=G2=K2= -0.15268

For the other arc:

Family five: S8I=D1=H1=Z1= $.01953$

Family six: B1=F1=J1= $.0037$

Family seven: A1=E1=I1= -0.075

Family eight: C1=G1=K1= $.1120$

The effective sextupole will be SF or SD plus one of the above ones. We see that the larger sextupole is about 1.5 larger than SD. For these values, SF and SD have to be readjusted to keep $\xi_x = \xi_y = 1$. The new values are

SF = -0.1301

SD = $+0.3052$

The change with respect to the original values is small.

1. A. Antillon, RHIC-8, BNL (1985).
2. S. Y. Lee, private communication.
3. G. Guignard reported at Sardinia School very good results using Harmon.
4. J. Claus, private communication.
5. G. Guignard. Lecture given at Sardinia School, March 1985.

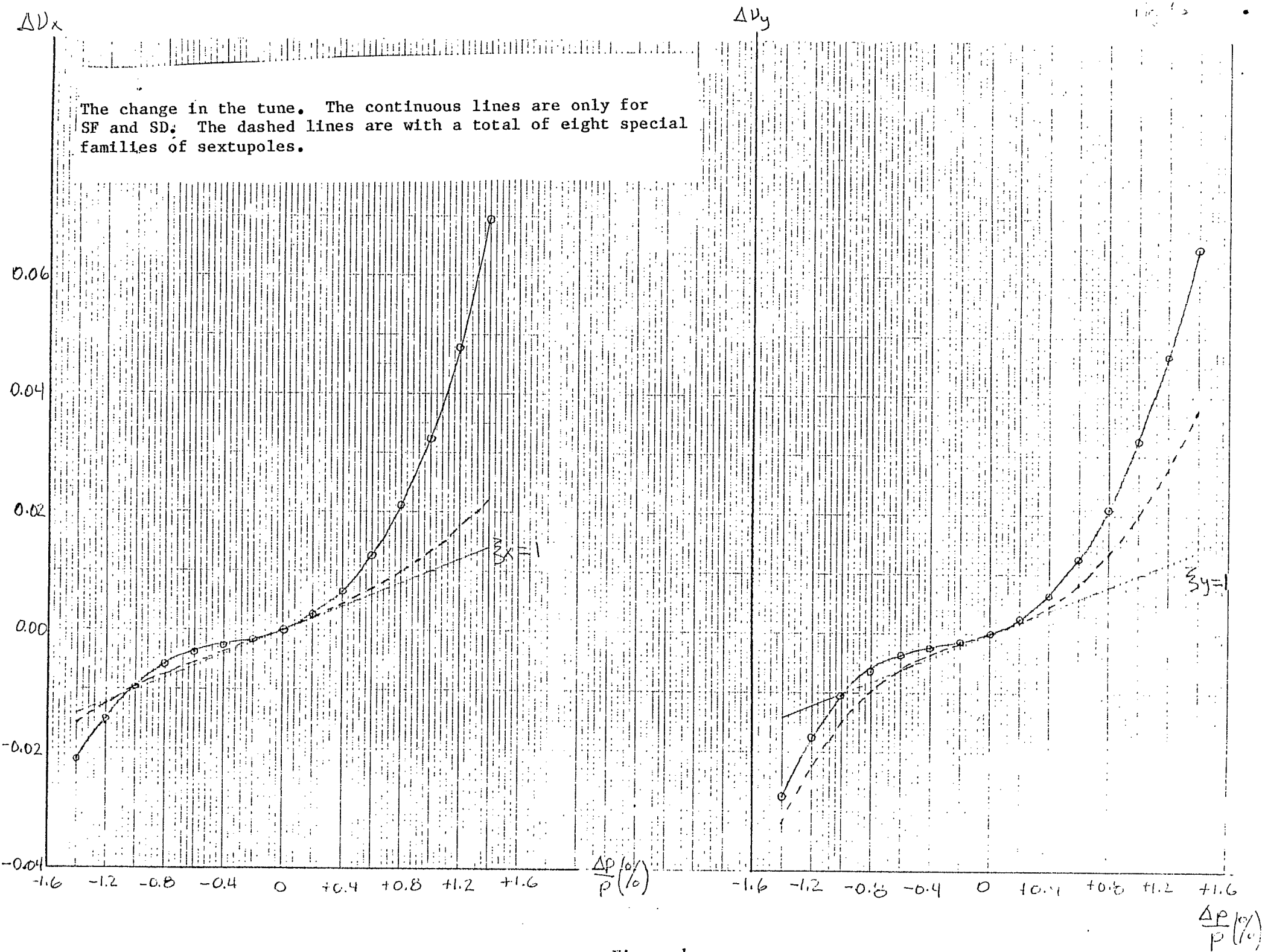
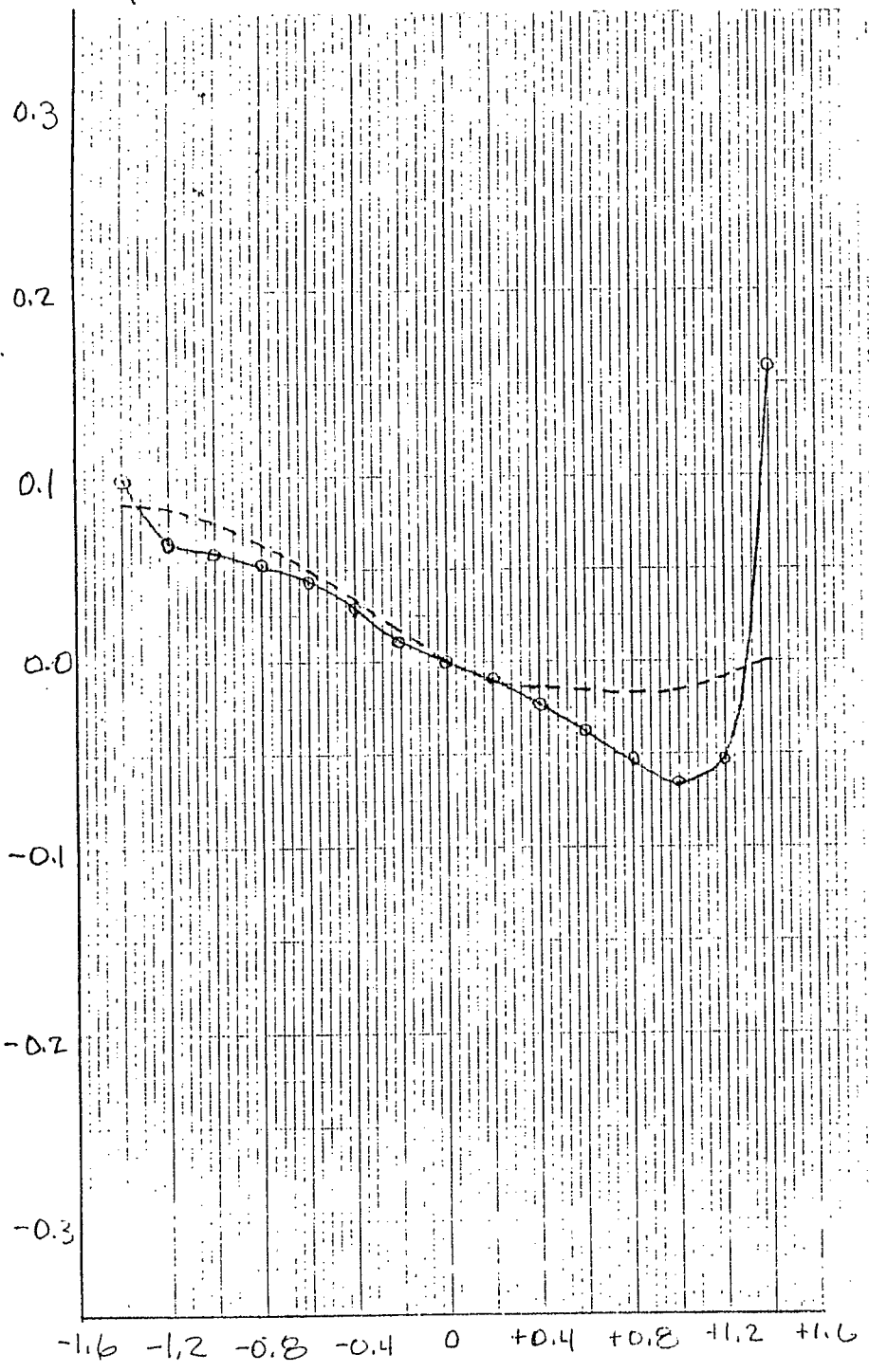


Figure 1.

$(\Delta\beta_x/\beta_x)_{\max}$, inc.



$(\Delta\beta_y/\beta_y)_{\max}$, inc

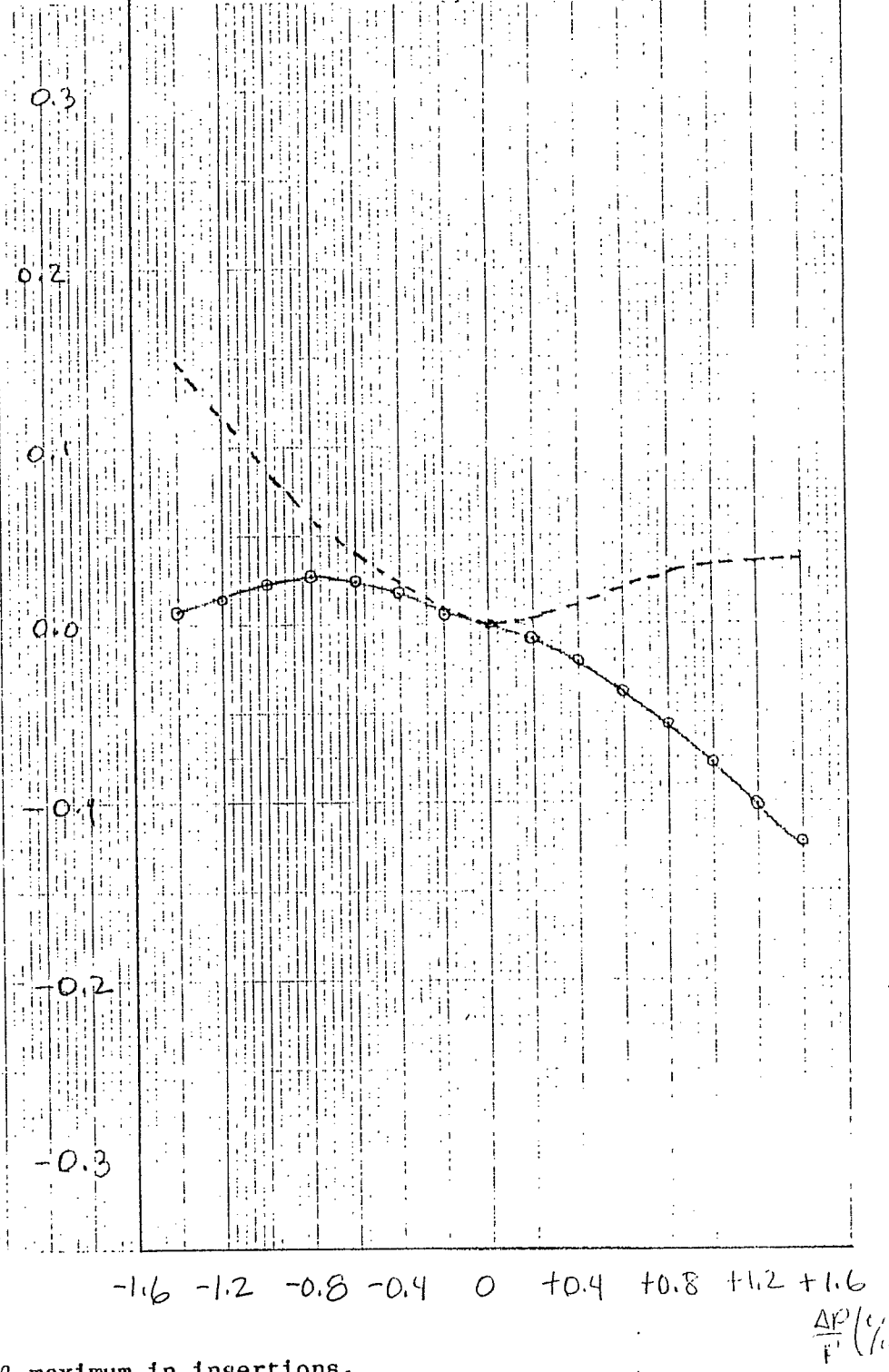


Figure 2. $\Delta\beta/\beta$ maximum in insertions.

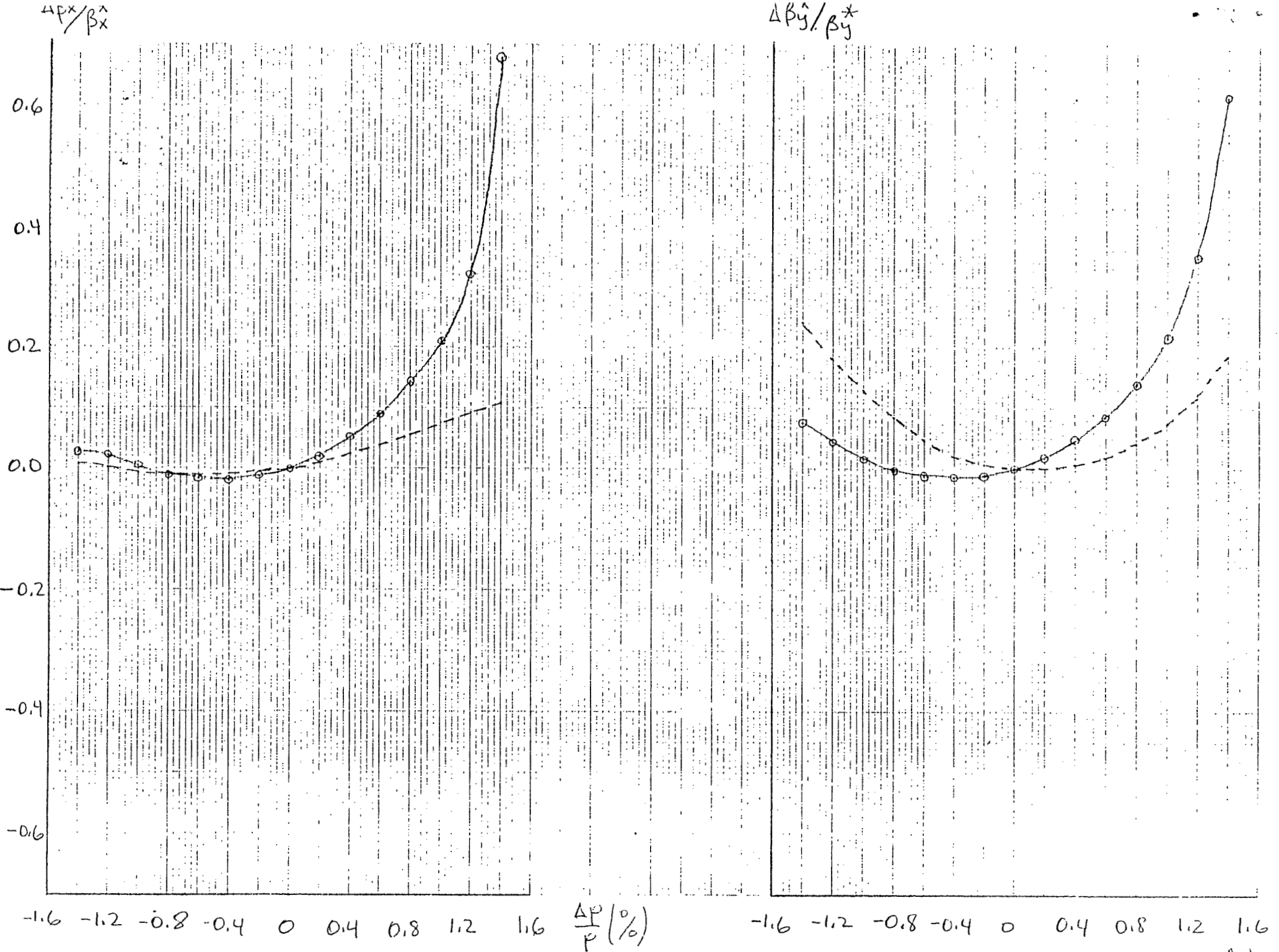


Figure 3. $\Delta\beta/\beta$ at crossing points.

$\frac{\Delta p}{p} (\%)$

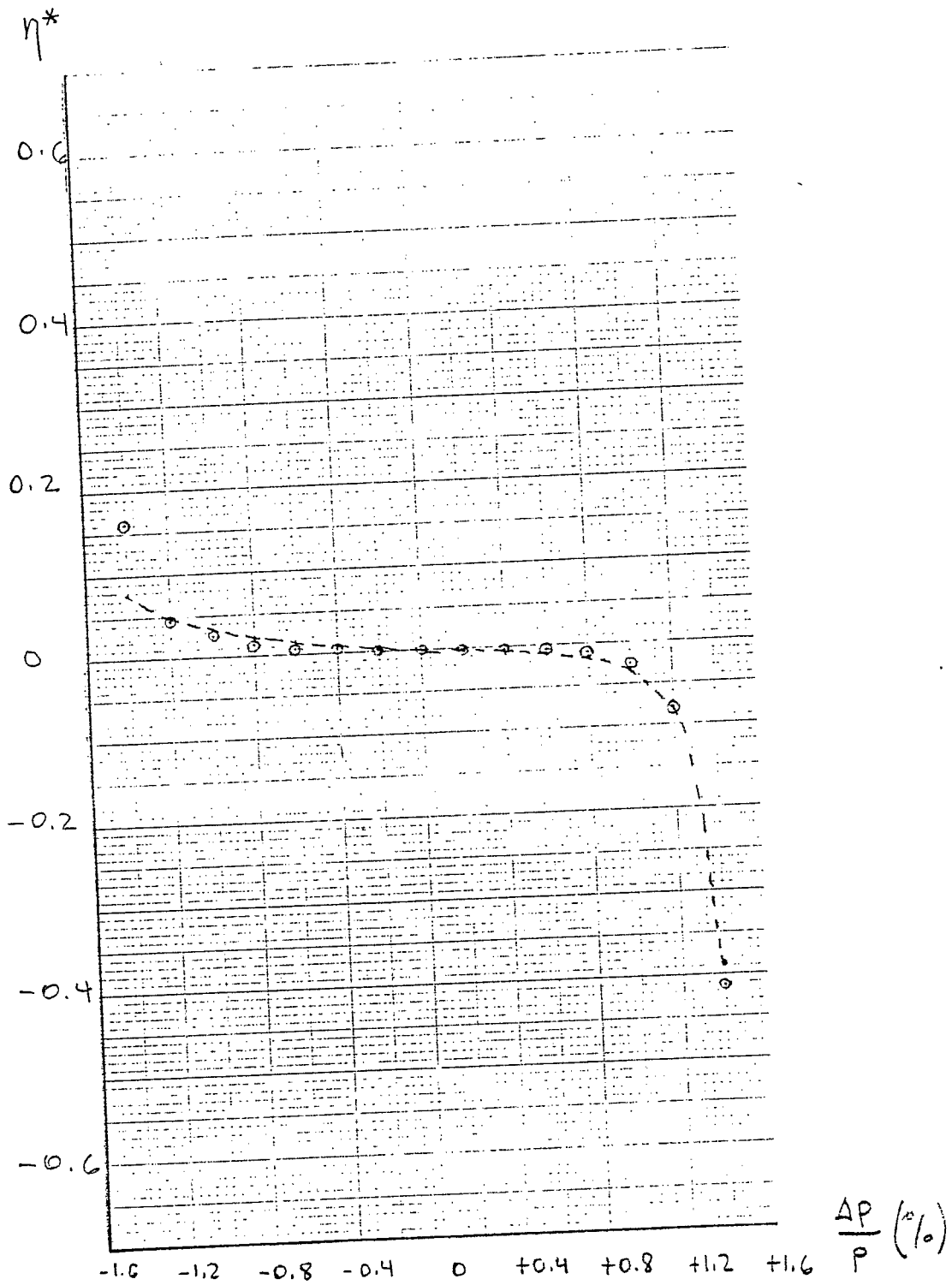


Figure 4. Dispersion at crossing points.

β_x

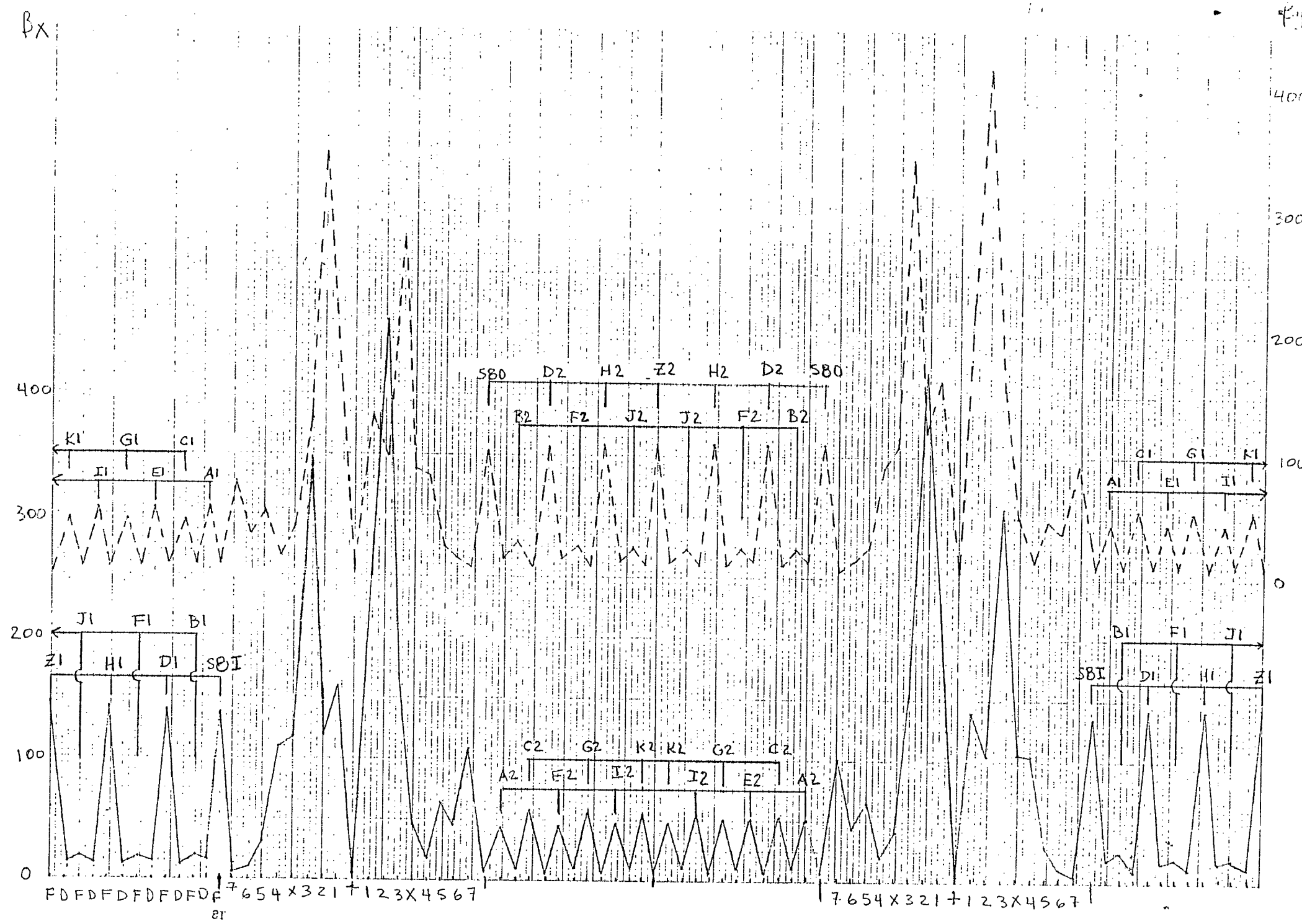


Figure 5. Behaviour of β_x , β_y in one superperiod for $\Delta p/p = +1.4\%$ and only SF, SD. We show in this figure the distribution of special families.

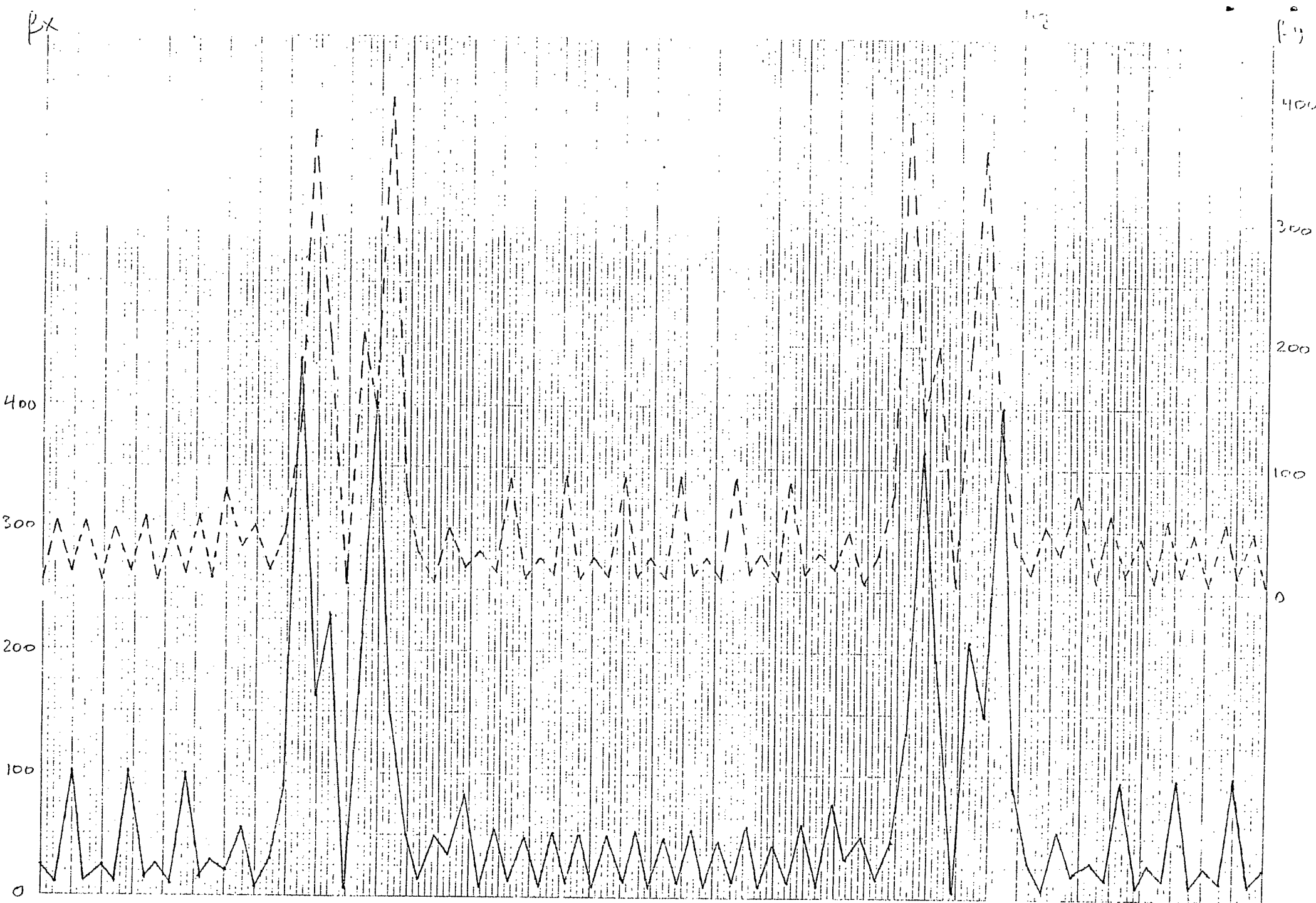


Figure 6. β_x , β_y for $\Delta p/p = -1.4\%$. SF, SD only. The characteristic pattern in arcs fits again with the sextupole distribution of Figure 5.

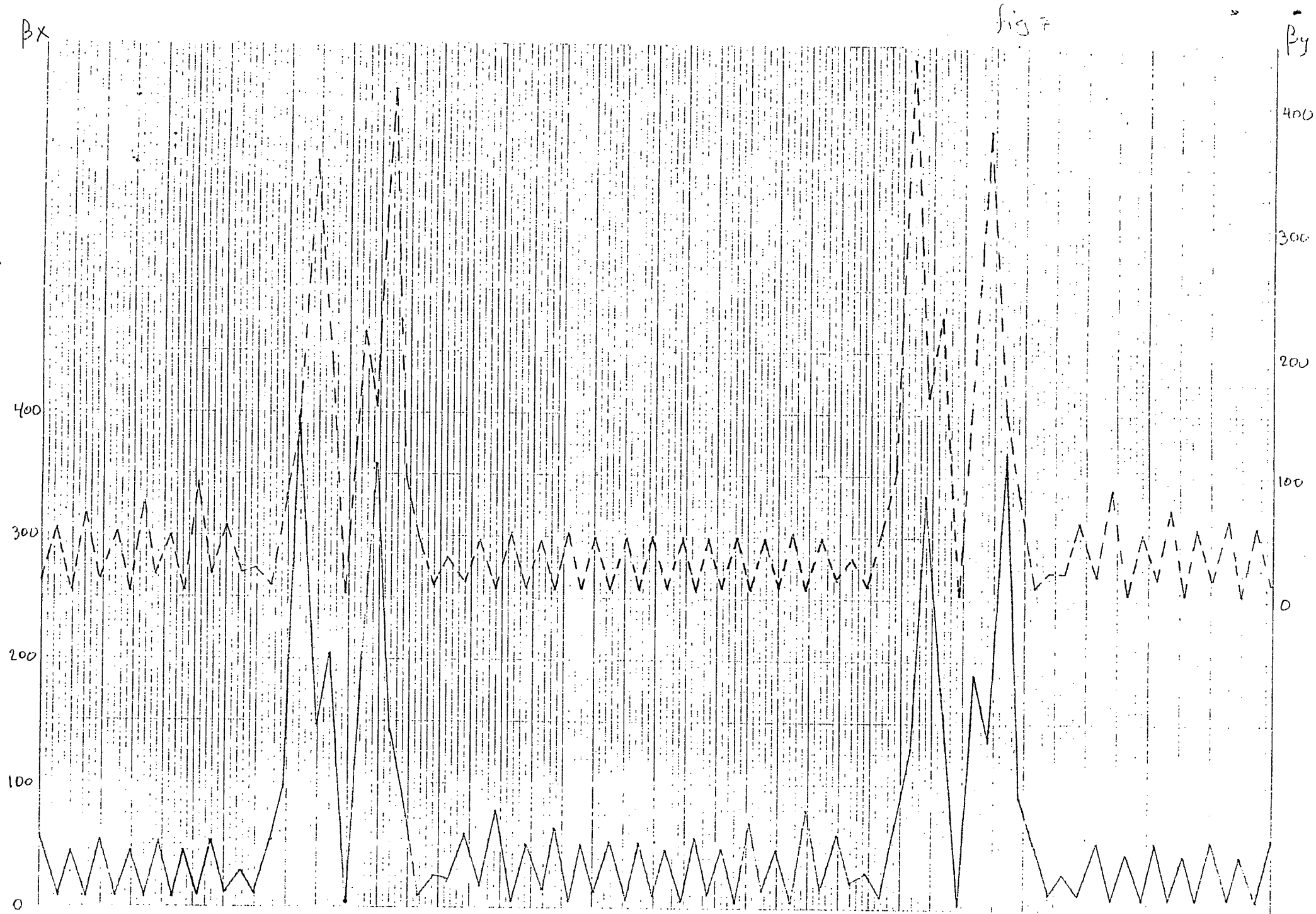


Figure 7. β_x , β_y for $\Delta p/p = +1.4$ and special families.

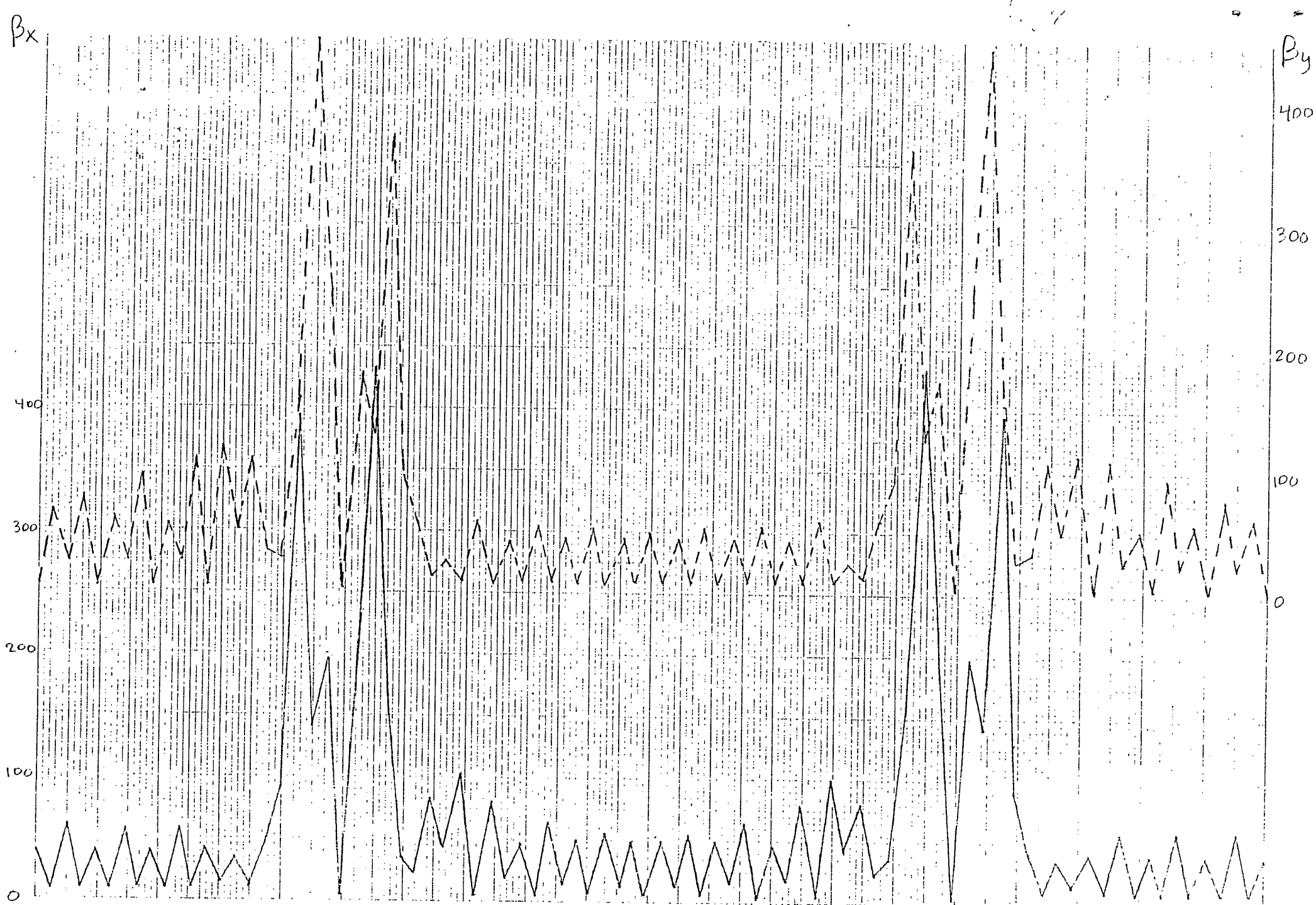


Figure 8. β_x, β_y for $\Delta p/p = -1.4$ and special families.