

# Presentation at the spin meeting of 10-26-05

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This is work to find a good matching of the Cold Snake and the Warm Snake to the AGS lattice, using eight quadrupoles at:

A17, A19, B1 and B3 for the CSNK, and

E17, E19, F1 and F3 for the WSNK

and two tune quadrupoles

QH and QV

We start from an assigned “Qpath”, i.e. a path for the betatron tunes vs. proton energy in the AGS, with the goal to bring the vertical tune as close as possible to the integer 9, and leaving the horizontal tune free to behave.

This Qpath is used in a Unix Script that runs MAD8 for the AGS at energies between  $\gamma=2.5$  to 26.

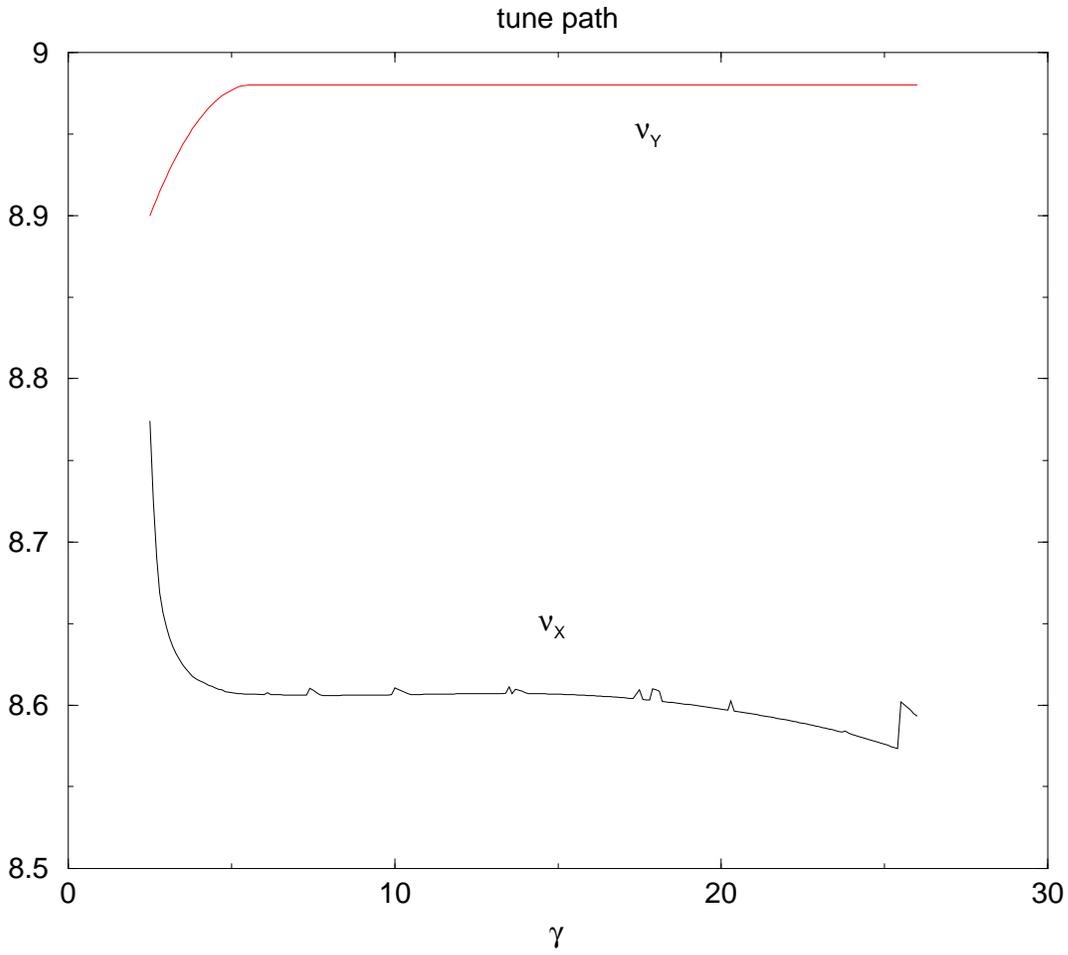
MAD8 starts from values of the K's for the quadrupoles obtained at the lowest energy by matching the superperiods containing the snakes to the bare lattice (no snakes). Matching is done for the twiss parameters  $\alpha$  and  $\beta$  only.

Afterwards, we continue by letting the K's to decay as  $1/(\beta\gamma)^2$ , since all elements of the snake matrices have the same behaviour. Recall that the matrices for the snakes have been calculated from the numerical maps of the snake field scaled at a field of 2.5 Tesla for the CSNK (+ a 0.7 solenoid) and 1.53 Tesla for the WSNK. Maps for the CSNK have been furnished by Ramesh Gupta, and for the WSNK by Masahiro Okhamura and Jumpei Takano).

We present three solutions, temporarily called

- (1) First Solution High Tunes,
- (2) First Solution Low Tunes,
- (3) Second Solution High Tunes.

# solution 1 – High Tunes

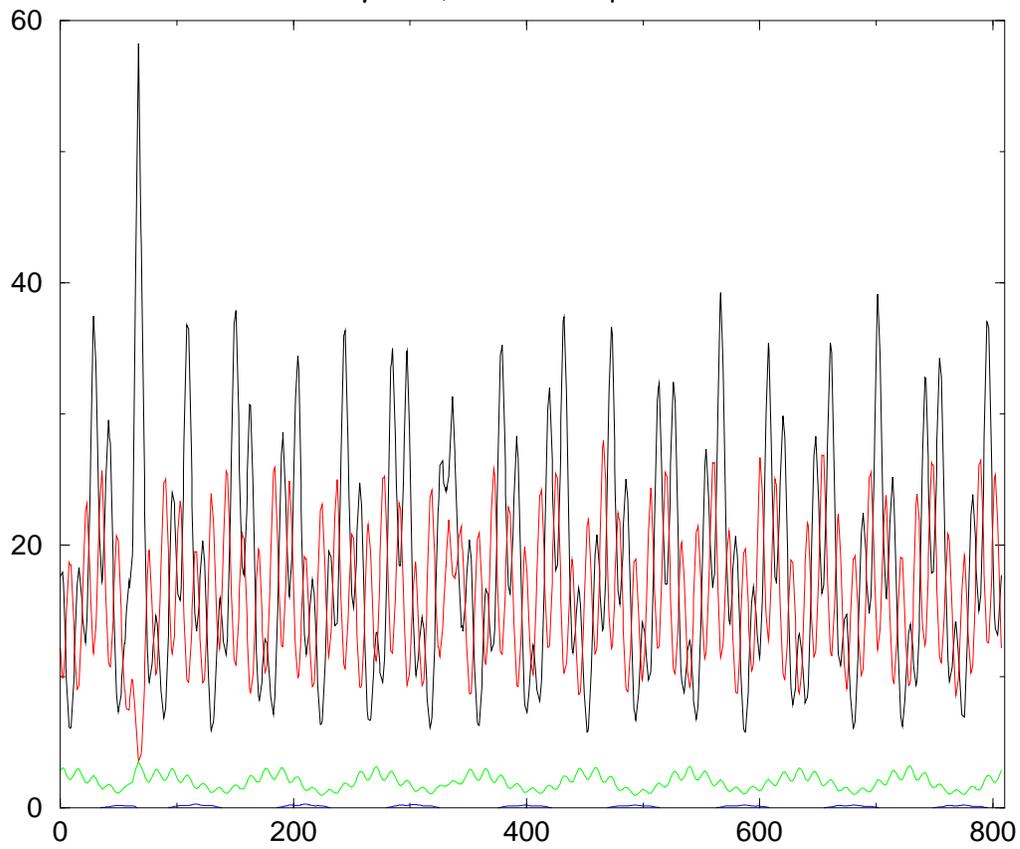


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Figure 1: (1) First Solution High Tunes, Qpath

# 1.st solution – High Tunes

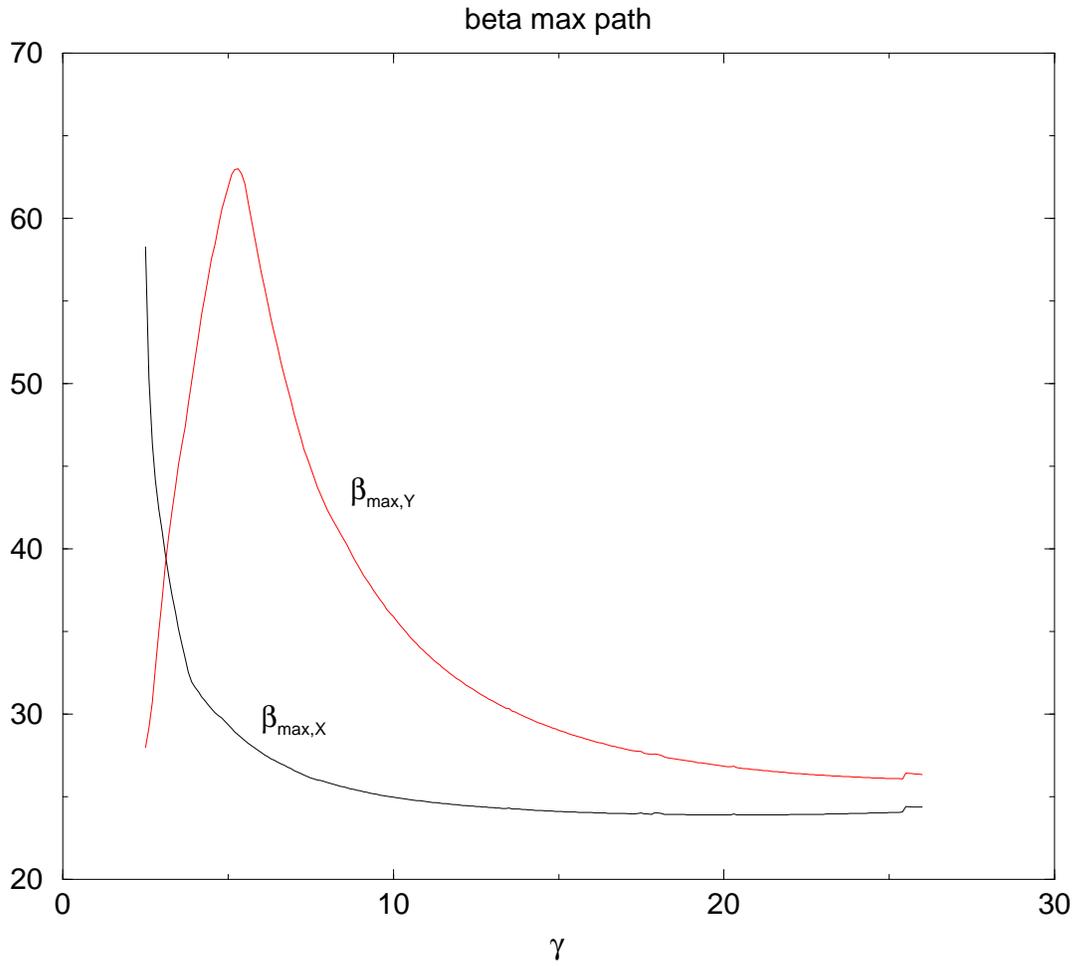
$\gamma = 2.5$ , beta and dispersion



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Figure 2: (1) FirstSolution High Tunes, Beta functions at  $\beta=2.5$

# solution 1 – High tunes

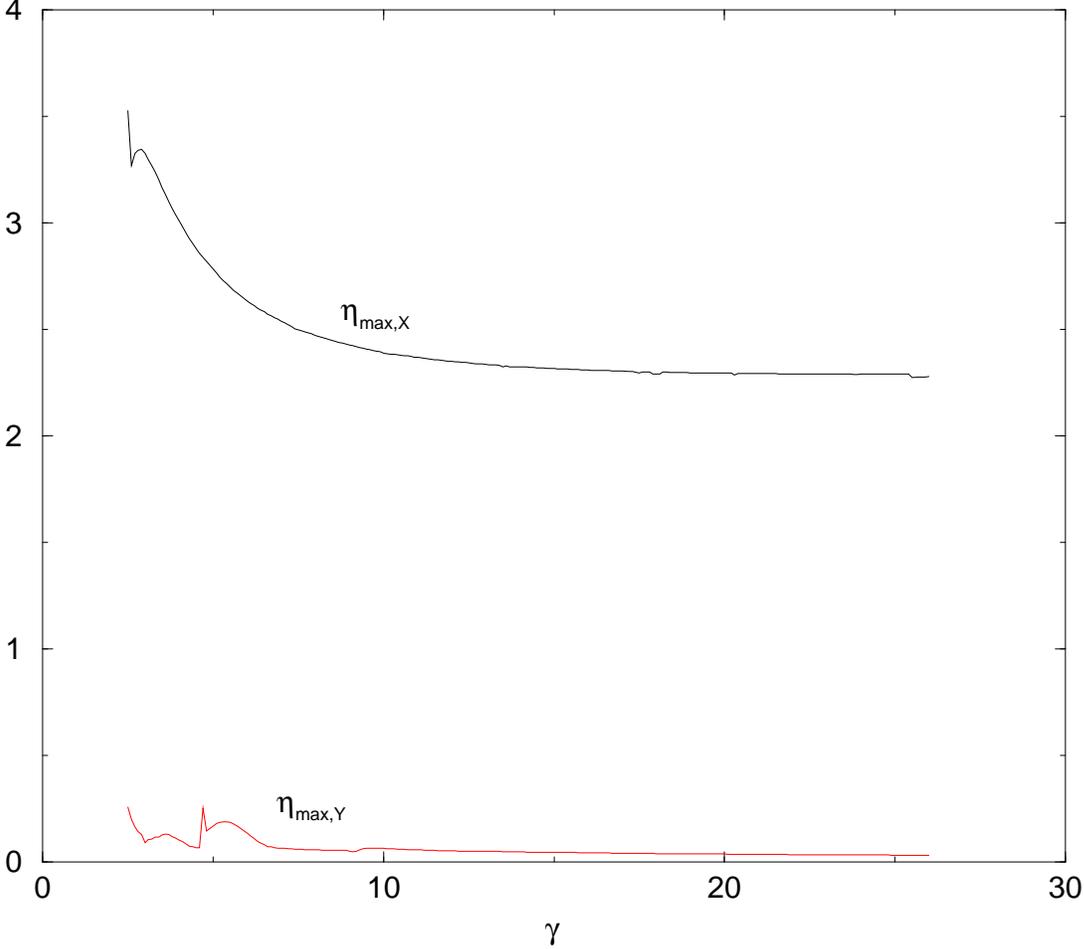


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Figure 3: (1) First Solution High Tunes, max  $\beta$  vs.  $\gamma$

# solution 1 – High Tunes

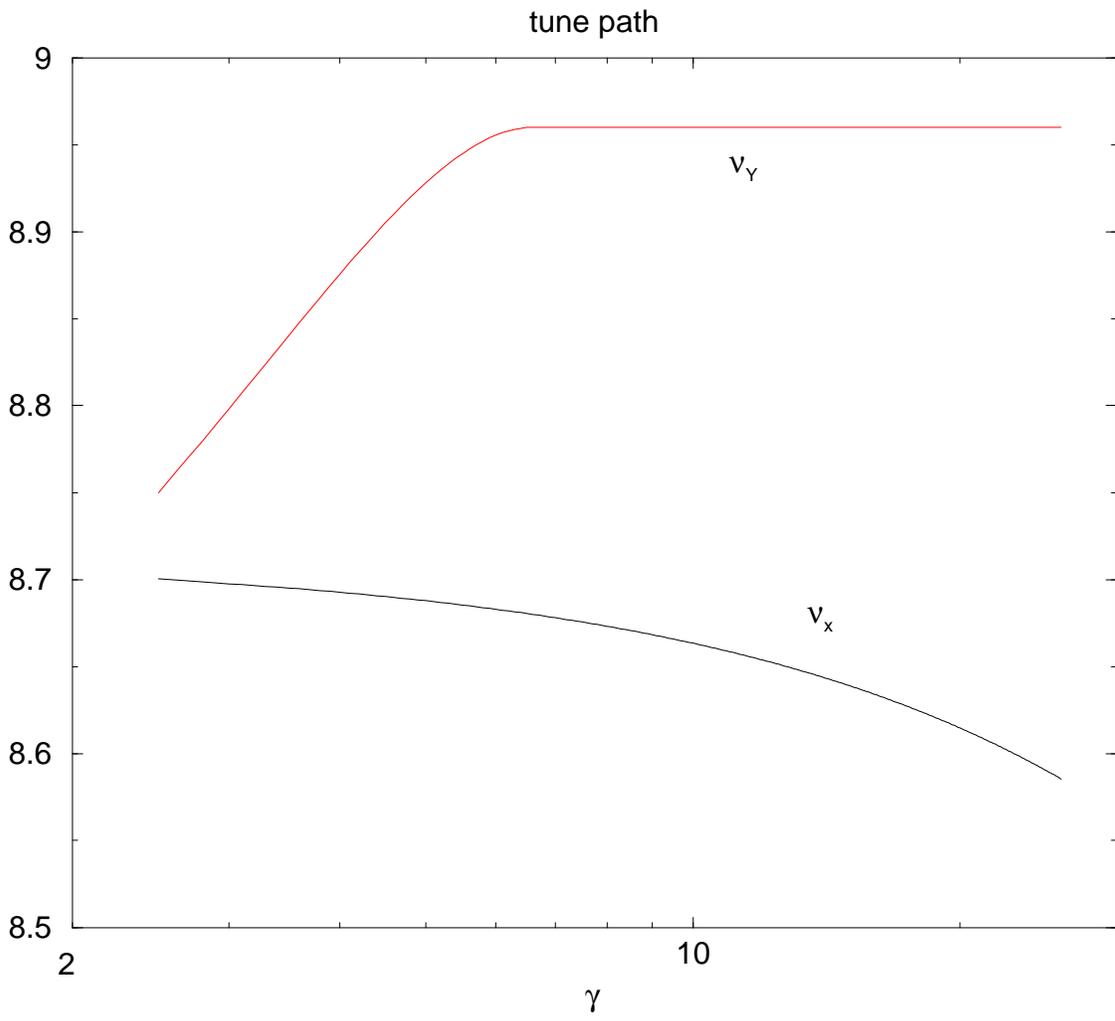
max dispersion



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Figure 4: (1) First Solution High Tunes, max dispersion  $\eta$  vs.  $\gamma$

# solution 1 – Low Tunes



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Figure 5: (2) First Solution Low Tunes, Qpath

### solution 1 – Low Tunes

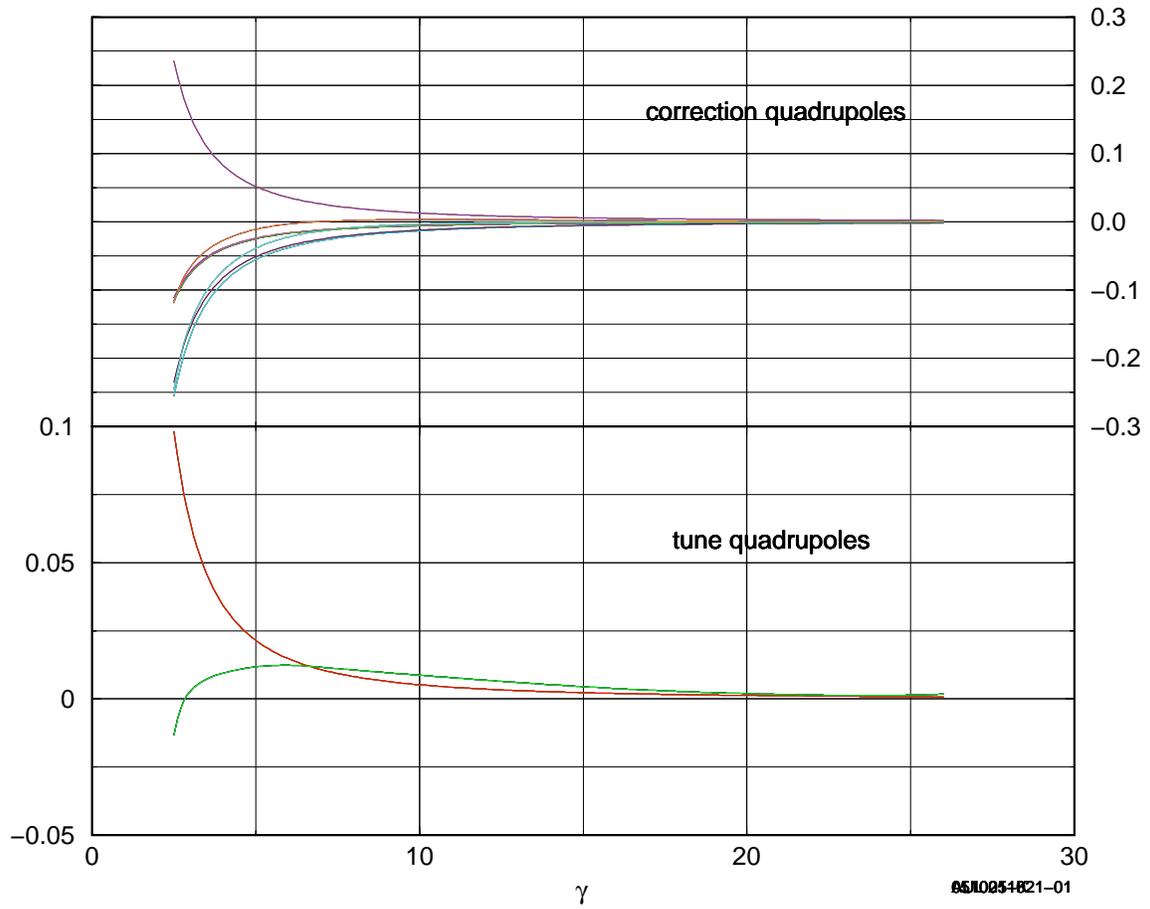


Figure 6: (2) First Solution Low Tunes, match quadrupoles K values

# solution 1 – Low Tunes

max beta and dispersion

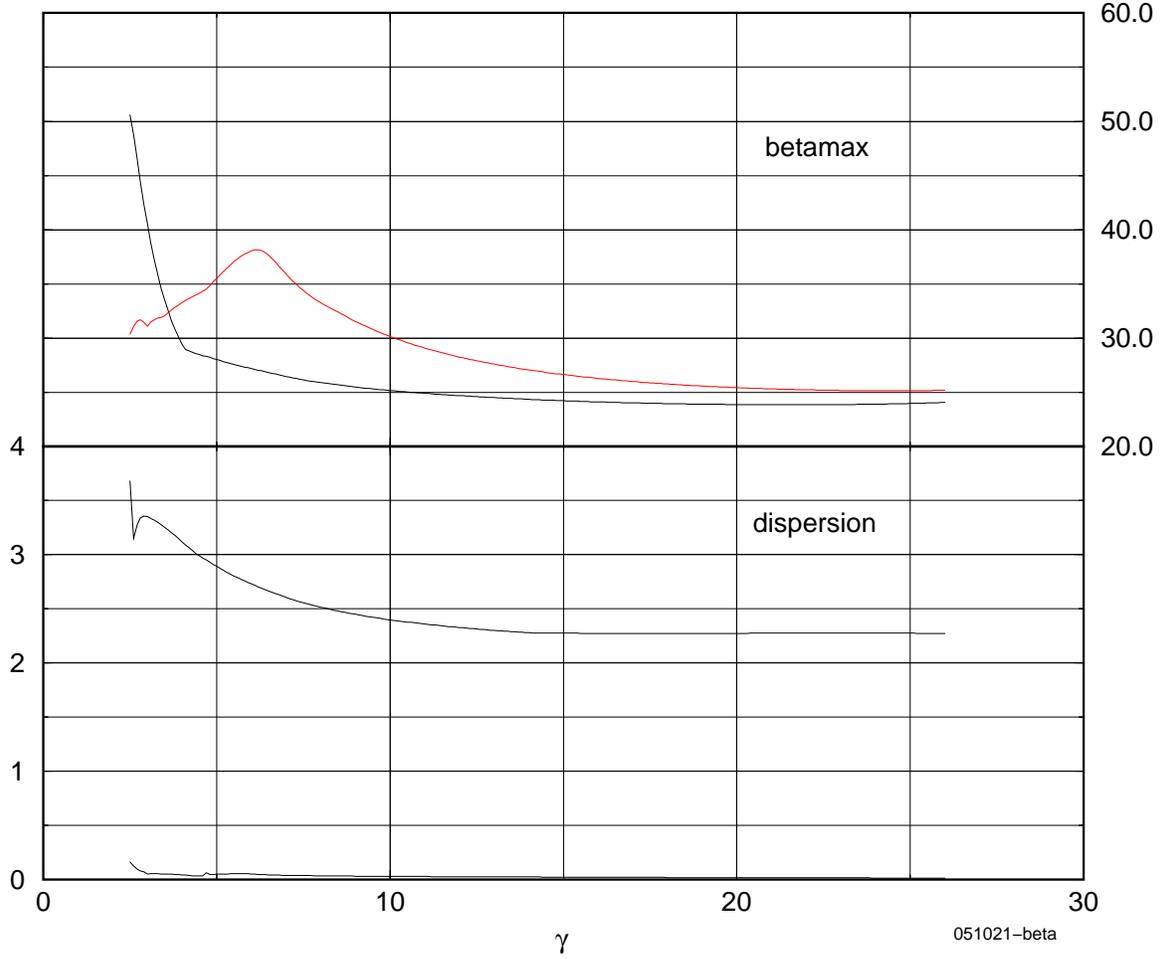


Figure 7: (2) First Solution Low Tunes, maximum  $\beta$

# solution 2 – High Tunes

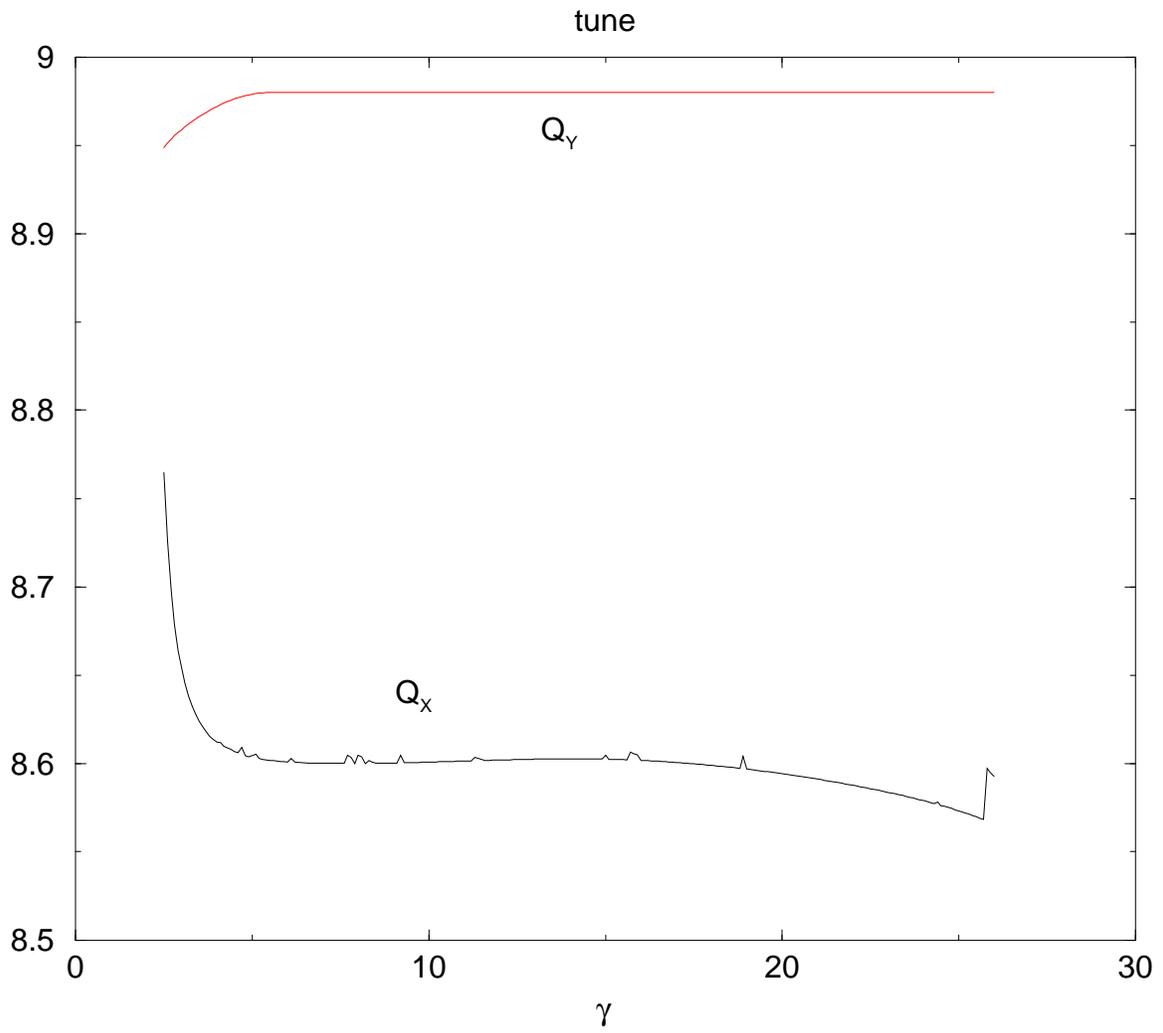


Figure 8: (3) Second Solution High Tunes, Q path

## solution 2 – High Tunes

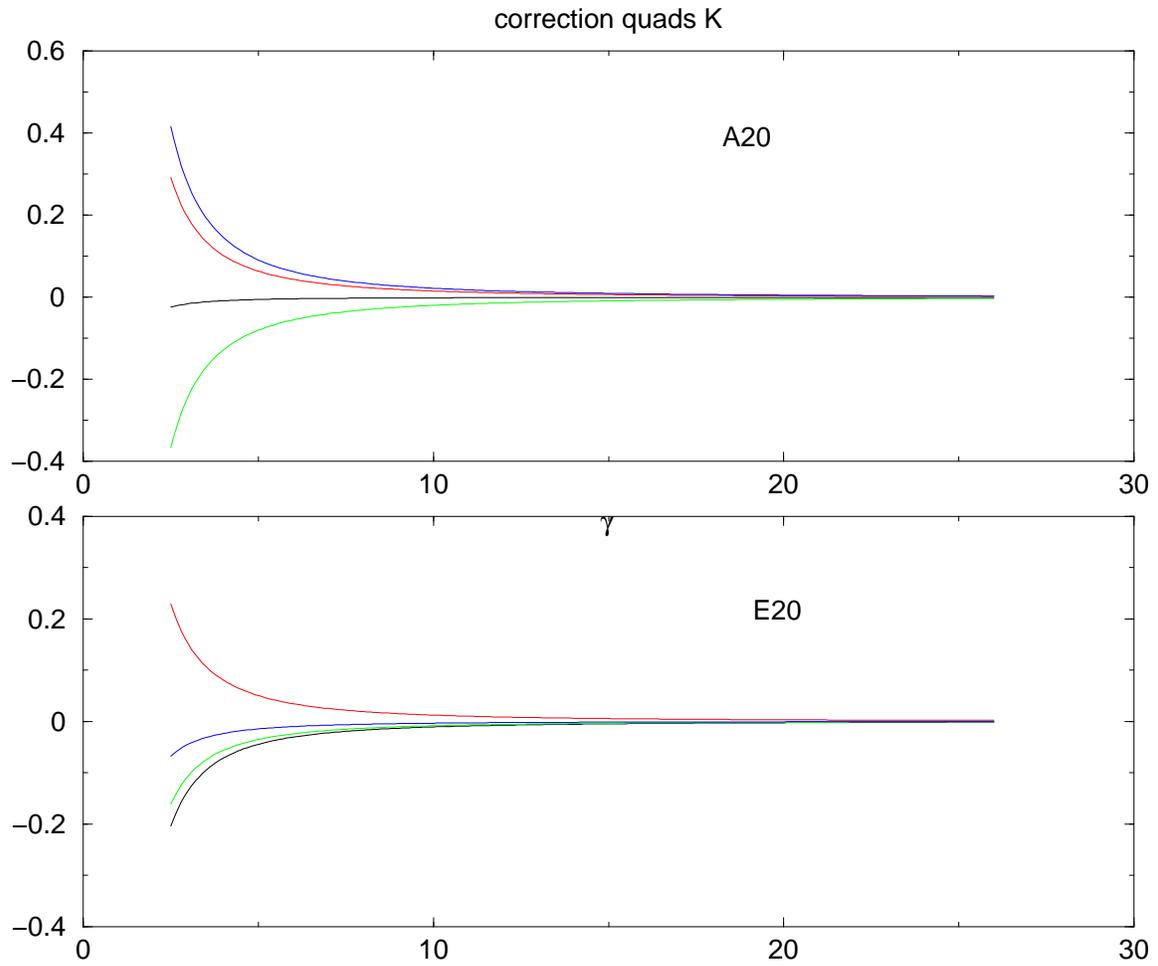


Figure 9: (3) Second Solution High Tunes, quadrupole K

# solution 2 – High Tunes

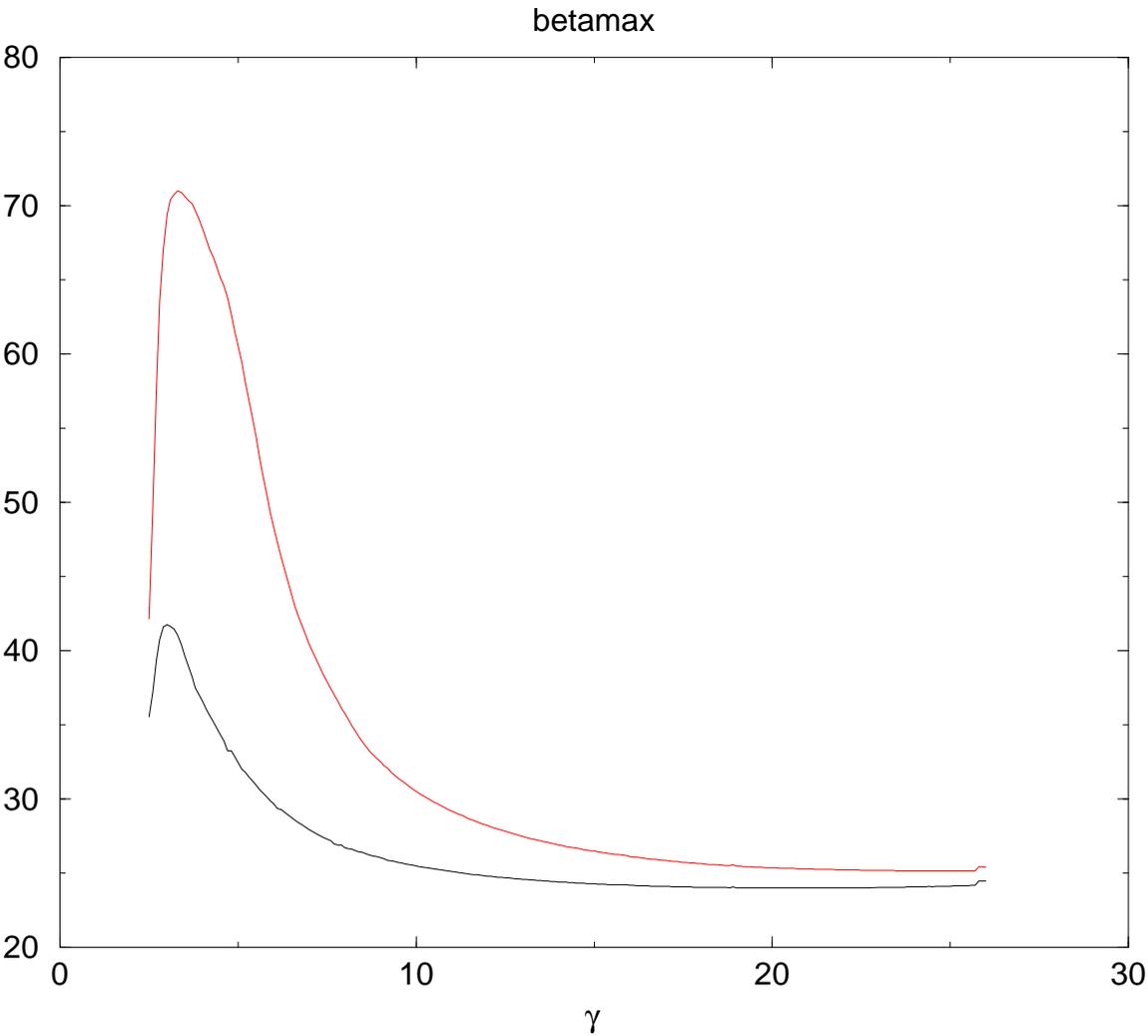


Figure 10: (3) Second Solution High Tunes, maximum  $\beta$

## solution 2 – High Tunes

dispersion

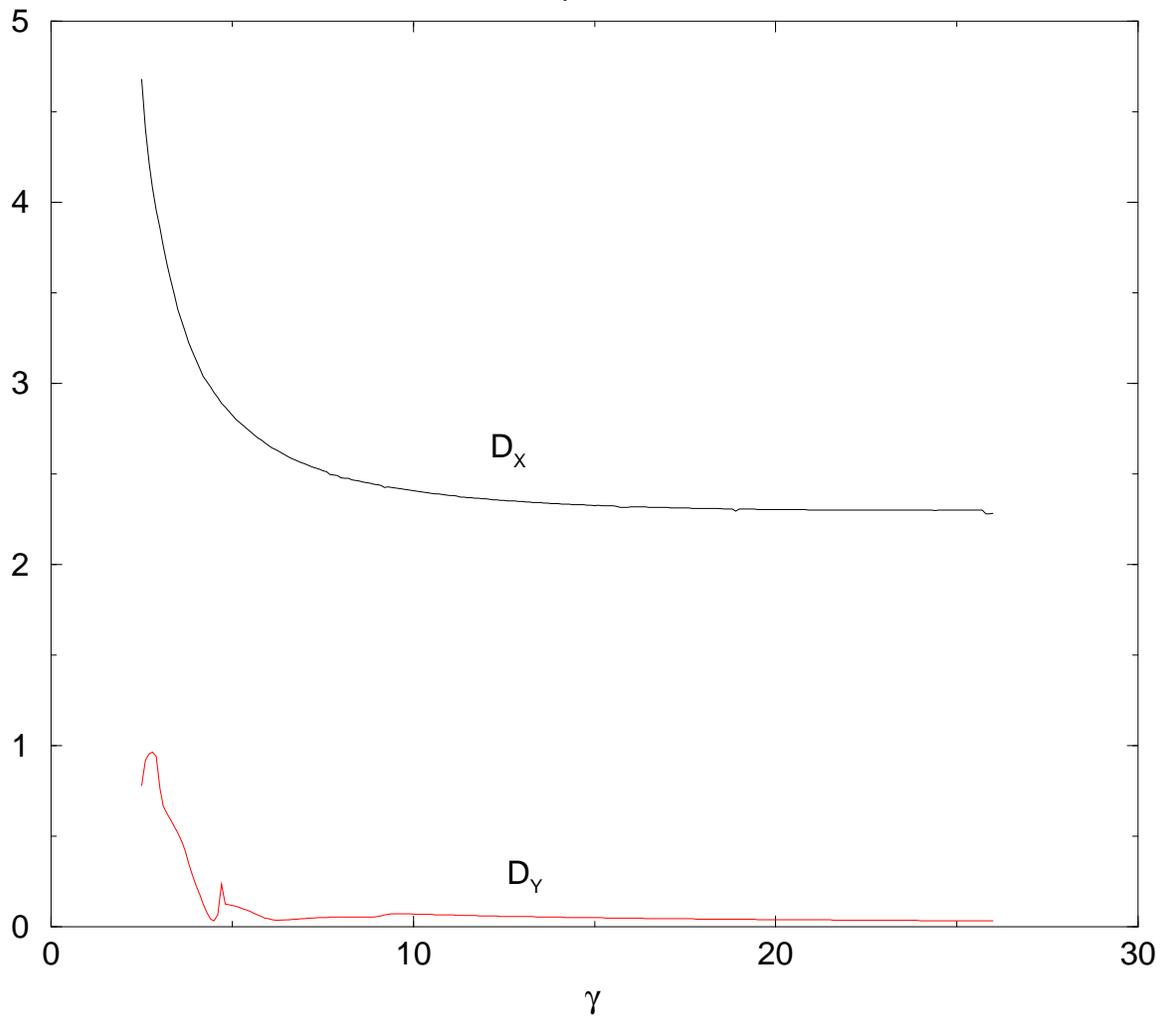


Figure 11: (3) Second Solution High Tunes, maximum dispersion