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APERTURE LIMITATIONS DUE TO NON-LINEAR COUPLING

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The sextupoles for correcting chromaticity and the eddy current sextupole fields can drive the $2\nu_x - 2\nu_y = o$ coupling resonance.

y - motions that start at $y_o = 27mm$ at QD, corresponding to $\varepsilon_y = 50 \times 10^{-6}$, will grow as large as 38mm, depending on the choice of ν_x, ν_y.

The next two graphs show the implications of this non-linear growth on the acceptable emittance.

Depending on one's assumptions, the acceptable emittance could be as low as $\varepsilon_y = 38 \times 10^{-6}$.

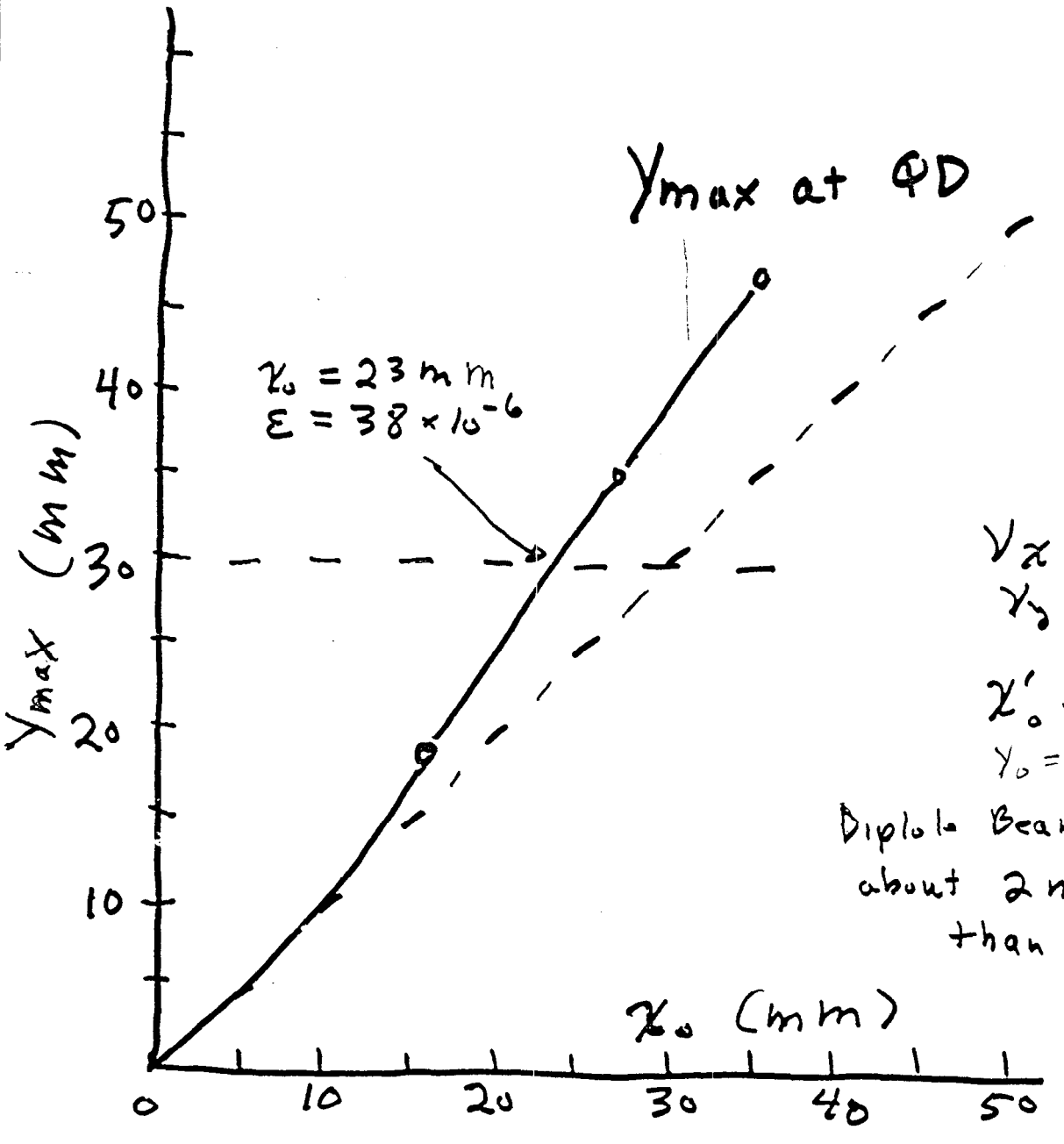
This non-linear effect could be avoided by moving ν_x, ν_y about .05 from the $\nu_x = \nu_y$ resonance. However this may not be desirable as this puts ν_x, ν_y in a region where there are many higher order resonance lines.

It is possible that this non-linear effect could be corrected by a system of octupole correctors, since octupoles can also excite the $2\nu_y - 2\nu_x = o$ resonance.

The first figure plots the maximum value of y at QD, y_{max}, against the initial value of χ at QF, χ_o. If one assumes that the largest safe value of y_{max} is 30mm, then the largest allowed χ_o is 23mm corresponding to $\varepsilon = 38 \times 10^{-6}$.

The second figure shows the effect of the ν_x, ν_y choice on the non-linear coupling. ν_x is held constant at $\nu_x = 4.82$ while ν_y is varied from 4.75 to 4.89. The largest coupling occurs at $\nu_x \simeq \nu_y$ and the coupling is removed by going .05 away from the $\nu_x = \nu_y$ resonance. The coupling depends on the choice of the initial phase of χ, and two curves are shown for two different choices of χ_o and χ'_o.

Non-Linear y-growth



Non-Linear Coupling