Crabs Cavity Prelim Design

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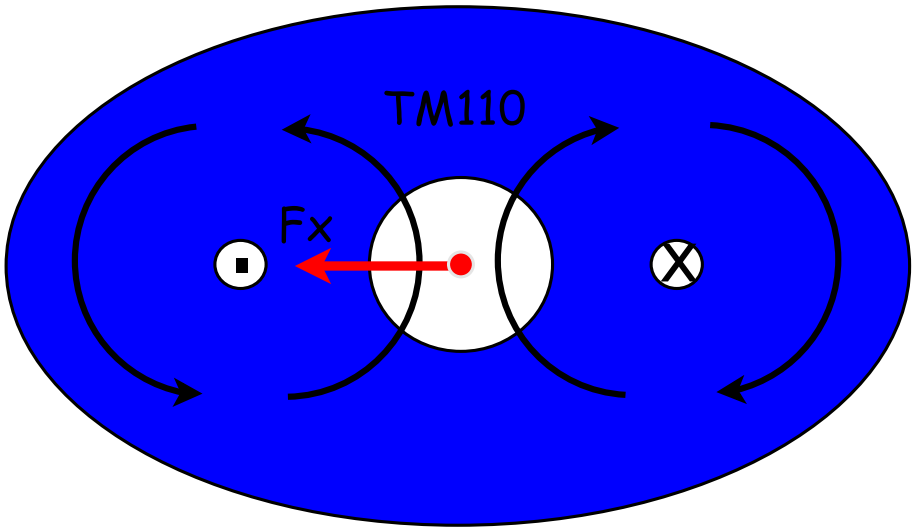
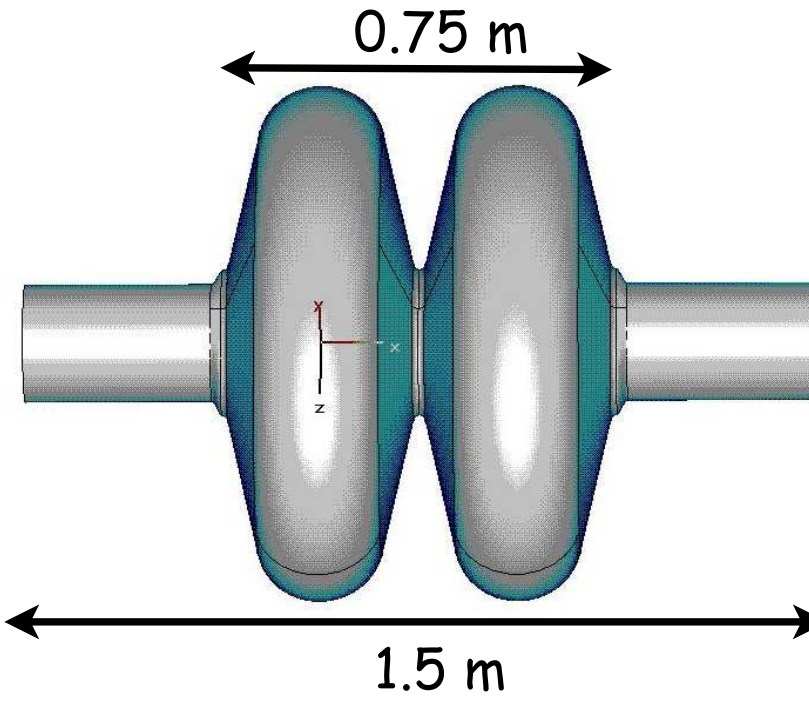
September 19, 2006

Topics

- Baseline Design (400 MHz)
- Orbit Oscillations & Tune Spread
- Emittance Growth (WIP)
- CC Longitidunal and Transverse Impedance (WIP)
- Possible Exotic Schemes (WIP)

Basline: Elliptical & Squashed

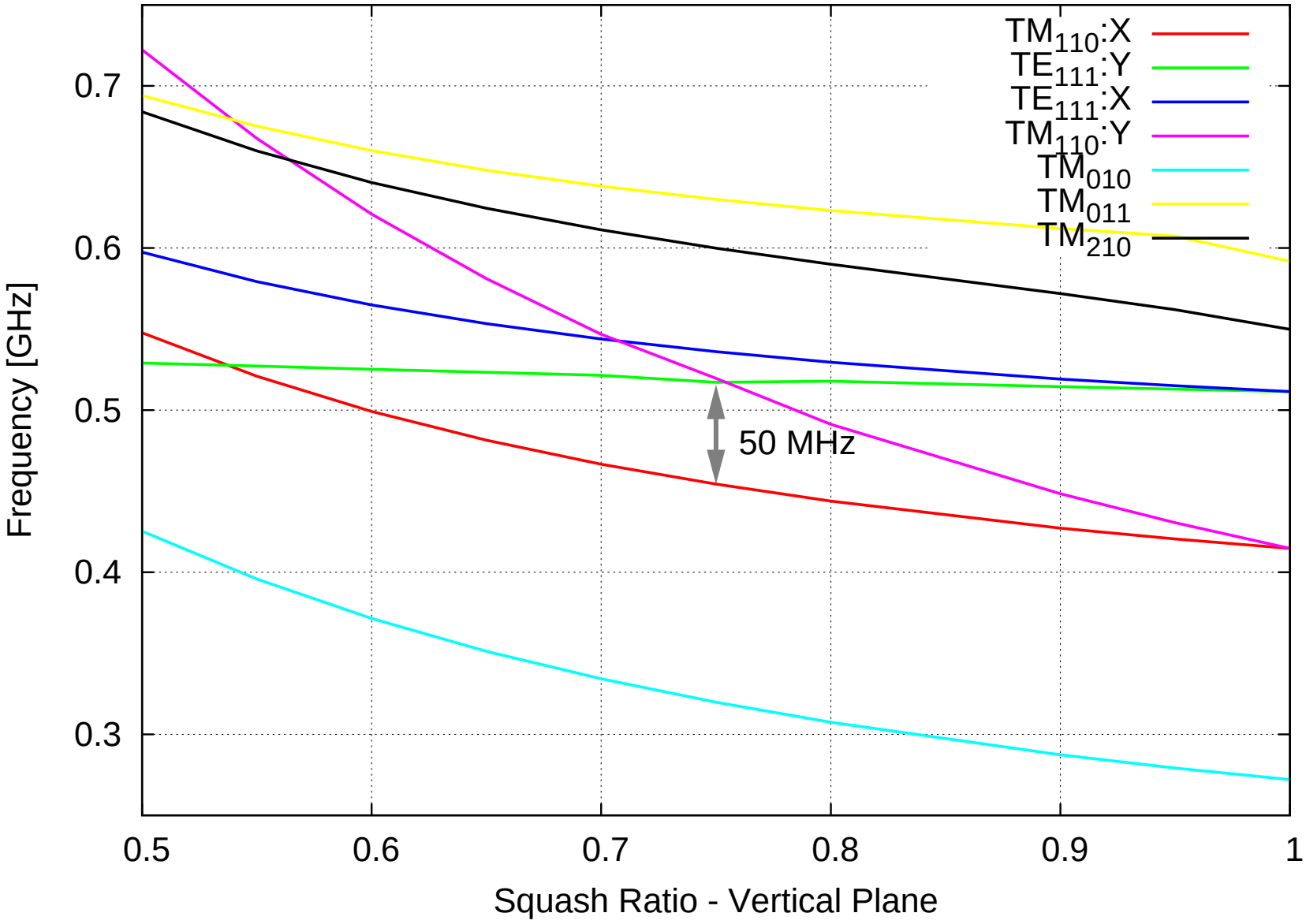




Half Cell Length, $L = \frac{\lambda\beta}{4}$	18.75 [cm]
Two Cells + Beam Pipe	$\sim$ 1.5 [m]
Horizontal Eq. Radius, R_{iris}	53 [cm]
Horizontal Eq. Radius, R_{iris}	37.5 [cm]
Squash Ratio	0.75
Beam Pipe Radius	15 [cm]
Wall Angle, α	$\sim$ 6 [deg]
Equator Dome Radius	12.0 [cm]
Cavity Beta, $\beta = \frac{v}{c}$	1.0

- 8 mrad crossing angle: 111 M
- Requires: $\sim$ 46 Cells (2.5 MV/
- Longitudinal Space: 35 m

Parastic Mode Separation

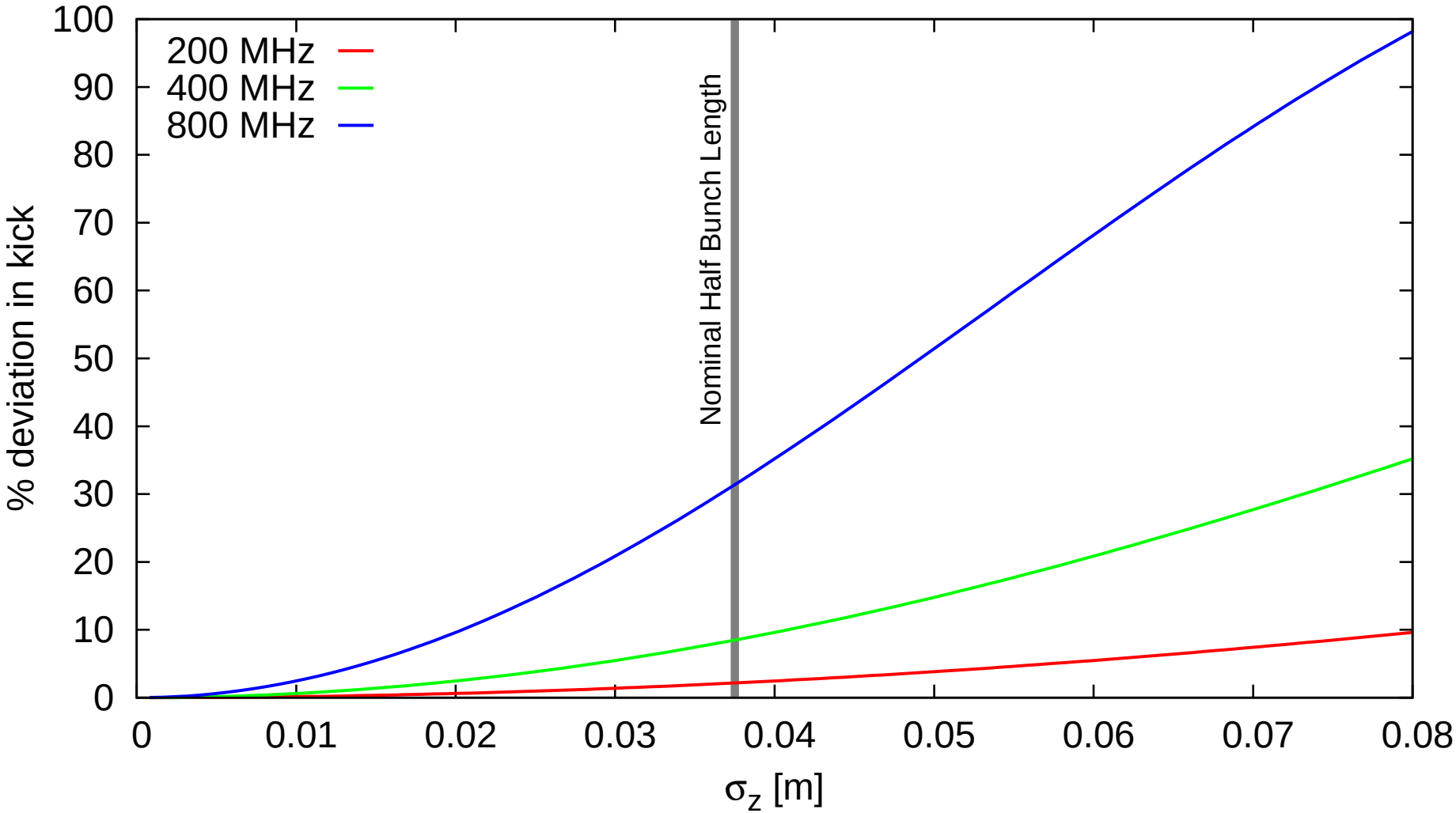


RF Parameters

$$
\begin{aligned}
F_\perp &= e(\vec{E} + c\vec{\beta} \times \vec{B}) \\
V_\perp &= \sqrt{\omega U \frac{R_\perp}{Q_0}} \\
\frac{R_\perp}{Q_0} &= \frac{1}{(kr)^2 \omega U} \int_0^L E_{z(r=r_0)} e^{ikz} dz \\
V_{crab} &= \frac{cE_0 \tan(\theta_C/2)}{\omega_{RF}\sqrt{\beta_{crab}\beta^*}} \quad \{\sigma_z \ll \lambda_{RF}\}
\end{aligned}
$$

Frequency [MHz]	400
Number of cells	2×2, 4×2
R/Q [Ω]	95
Q_0 BCS @ 2K	10^9
Beam Power [kW/mm]	$\sim$ 25
E_p/B_{kick}	??
H_p/B_{kick} $[mT/MV/m]$	??
cell to cell coupling	??%
$k_{\|\|}$ $(\sigma_z - 1cm)$ [V/pC]	??
$k_\perp$ $(\sigma_z - 1cm)$ [V/pC/m]	??

RF Curvature



Orbit Oscillation & Tune Spread