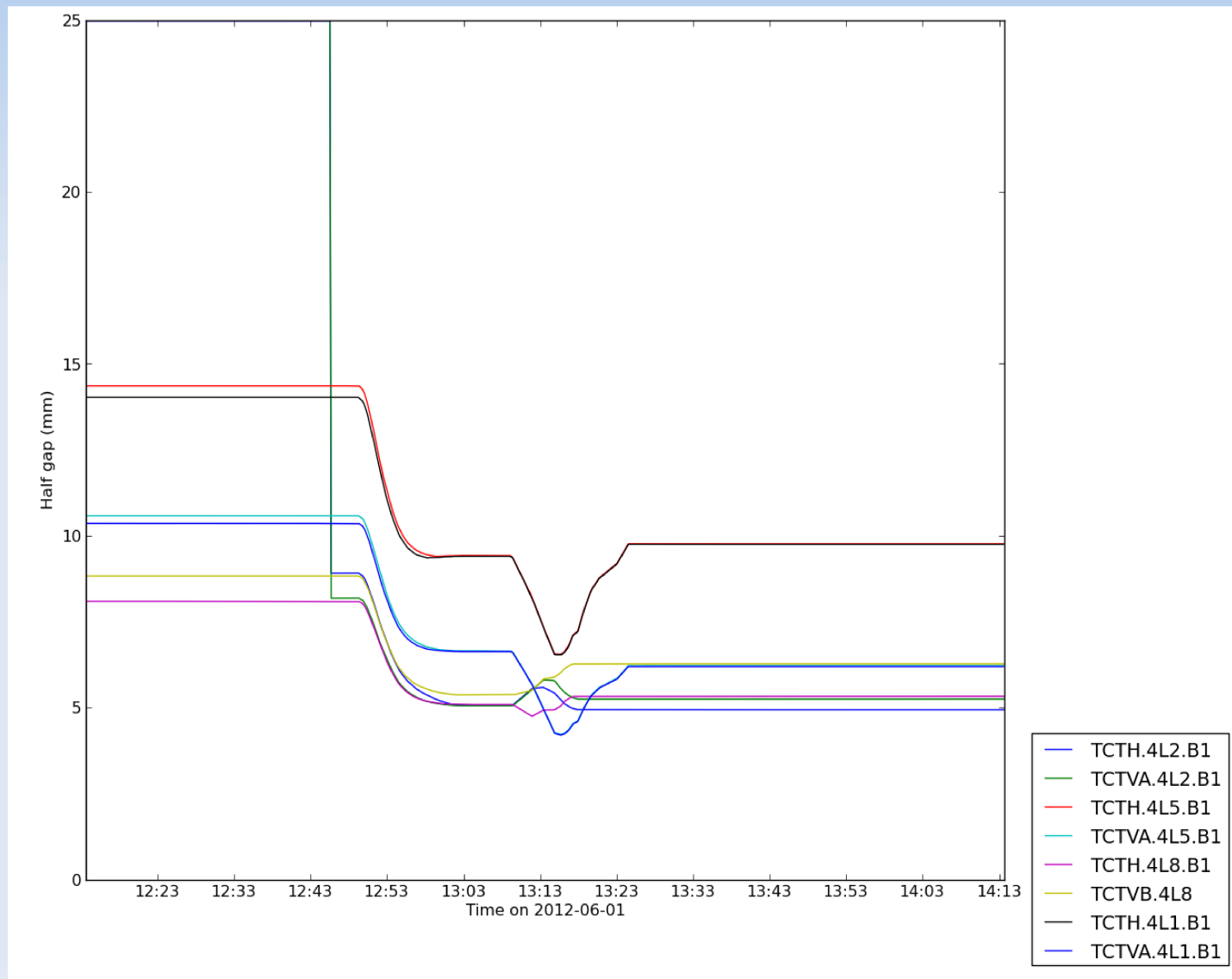


Status of the impedance model with tight settings

N. Mounet and E. Métral

Evolution during squeeze

- Only TCTs (and TCL) move during the squeeze:

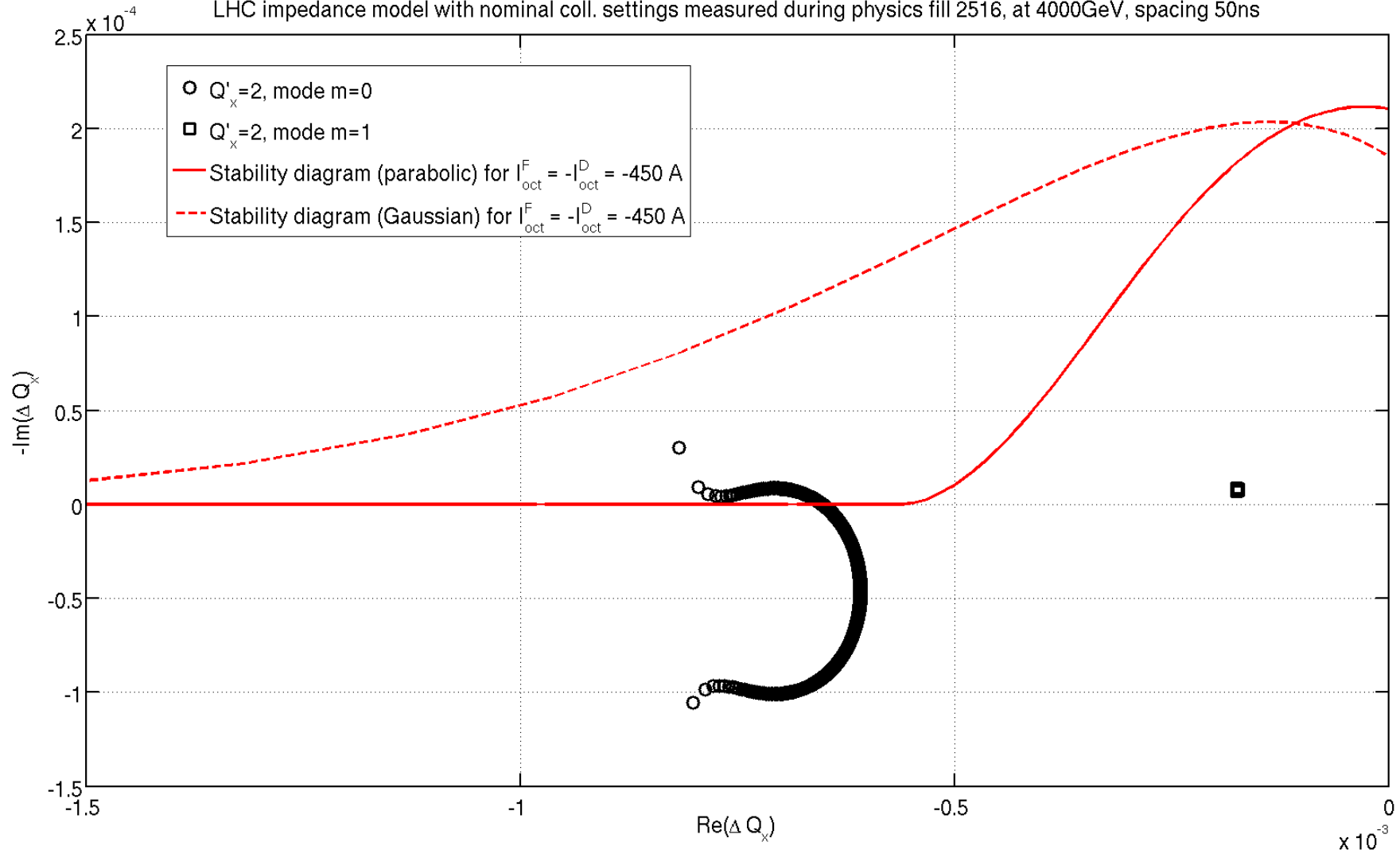


Stability diagrams

- All coupled-bunch modes (50ns), $m=0$ and 1, with octupoles (horizontal):

Sacherer horizontal tune shifts for unstable coupled-bunch modes, with stab. diagram at $\epsilon_x=2, \epsilon_y=2, \sigma_\delta=0, N_b \text{ part.}=1.6 \cdot 10^{11}, \sigma_z \text{ (rms)}=9.3685\text{cm}$,

LHC impedance model with nominal coll. settings measured during physics fill 2516, at 4000GeV, spacing 50ns

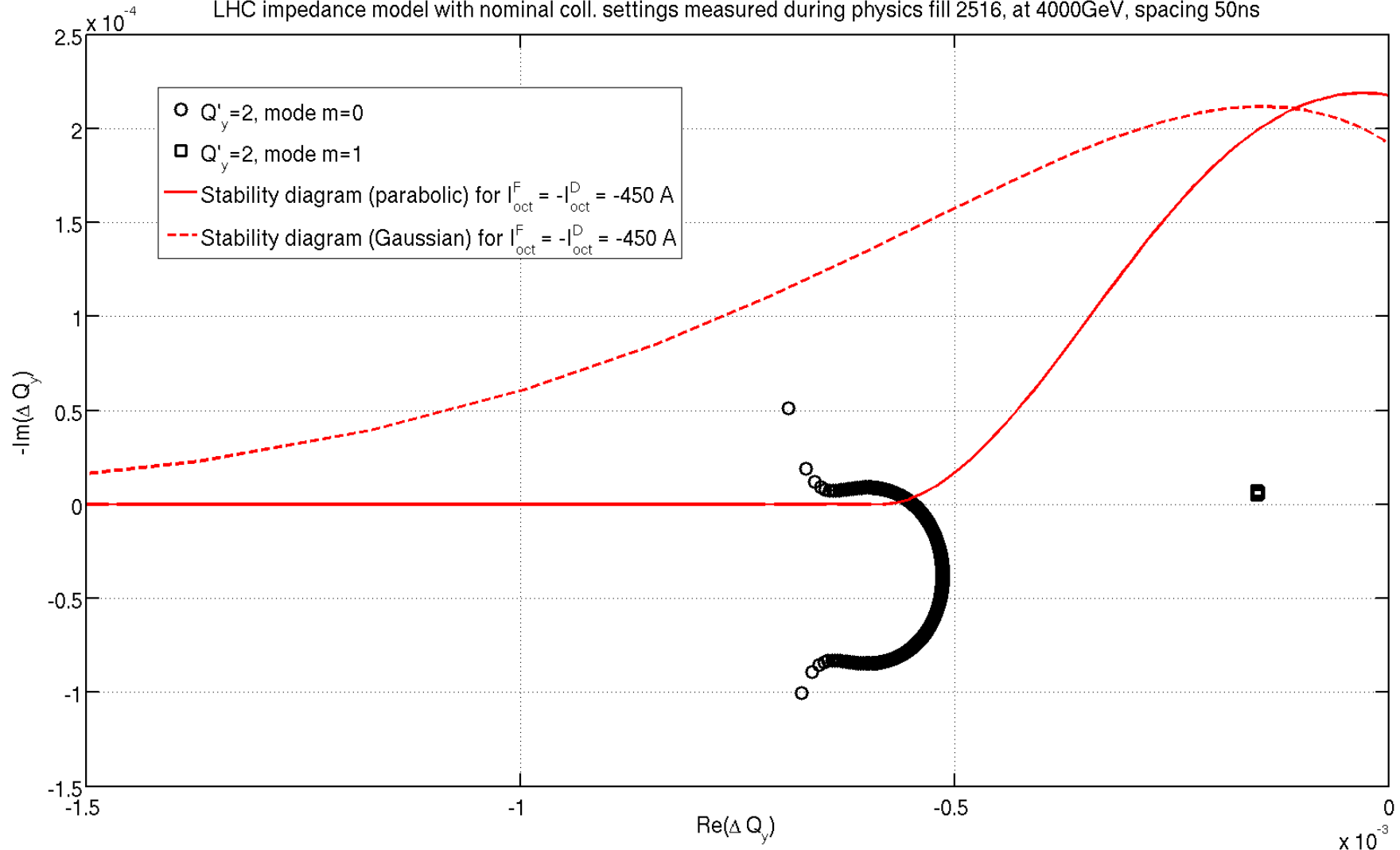


Stability diagrams

- All coupled-bunch modes (50ns), for $m=0$ and 1, with octupoles (vertical):

Sacherer vertical tune shifts for unstable coupled-bunch modes, with stab. diagram at $\epsilon_x=2, \epsilon_y=2, \sigma_\delta=0, N_b \text{ part.}=1.6 \cdot 10^{11}, \sigma_z \text{ (rms)}=9.3685\text{cm},$

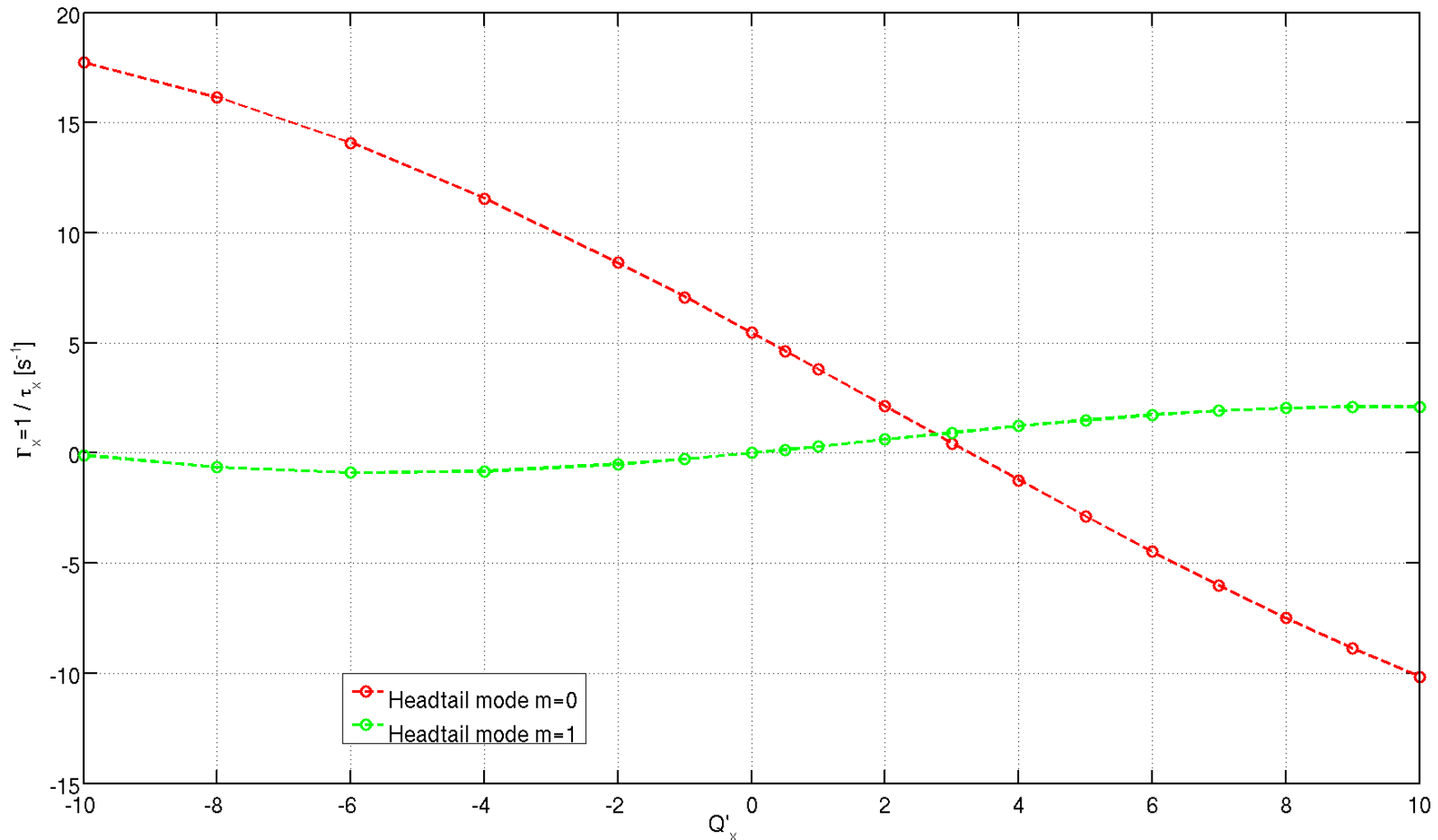
LHC impedance model with nominal coll. settings measured during physics fill 2516, at 4000GeV, spacing 50ns



Growth rate vs. chromaticity

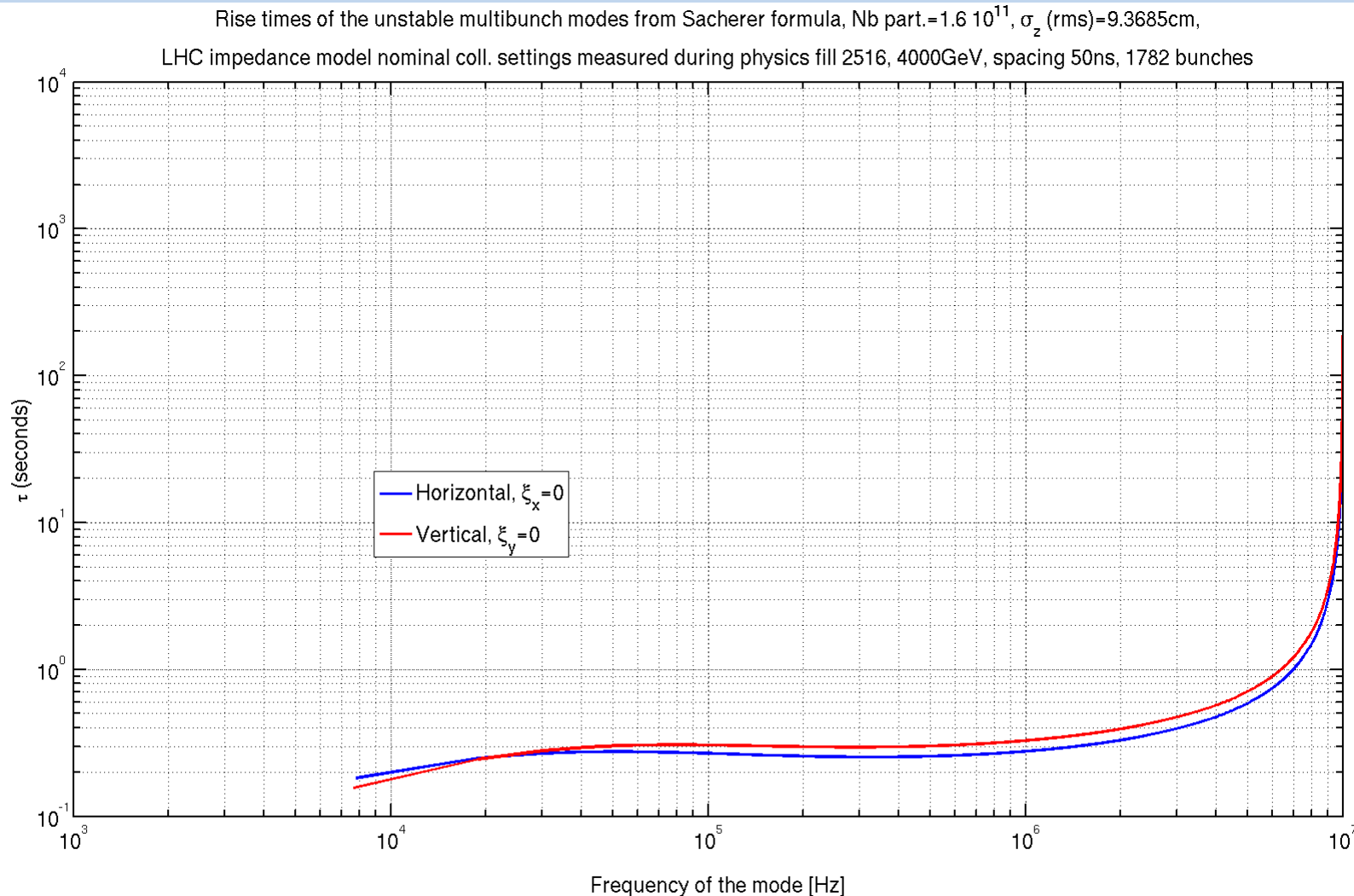
- For the most unstable coupled-bunch mode (50ns), $m=0$ and 1

Horizontal growth rates of the most unstable multibunch modes from Sacherer formula, $N_b \text{ part.} = 1.6 \cdot 10^{11}$, $\sigma_z \text{ (rms)} = 9.3685\text{cm}$,
LHC impedance model nominal coll. settings measured during physics fill 2516, 4000GeV, spacing 50ns, 1782 bunches



Rise time vs. coupled-bunch mode frequency

- For rigid-bunch modes ($m=0$), rise time more or less flat vs frequency, up to ~ 1 Mhz:



Summary

- Very little variation of impedance during squeeze.
- Coupled-bunch modes with $|m|=1$ are well inside the stability diagram of the octupoles, even considering parabolic distribution cut at 3.2σ .
- Coupled-bunch modes with $m=0$ (rigid-bunch), if not damped by feedback, could be out of stability diagram (with octupoles only) if transverse distributions are cut.
- Optimum vs chromaticity, for both modes 0 and 1, close to current choice ($Q'=2$). Slightly higher ($Q'=5$) would damp mode 0, slightly lower ($Q'<0$) would damp mode 1.