SPS TMCI with flat chamber (without SC): can we better explain some past HEADTAIL simulations?

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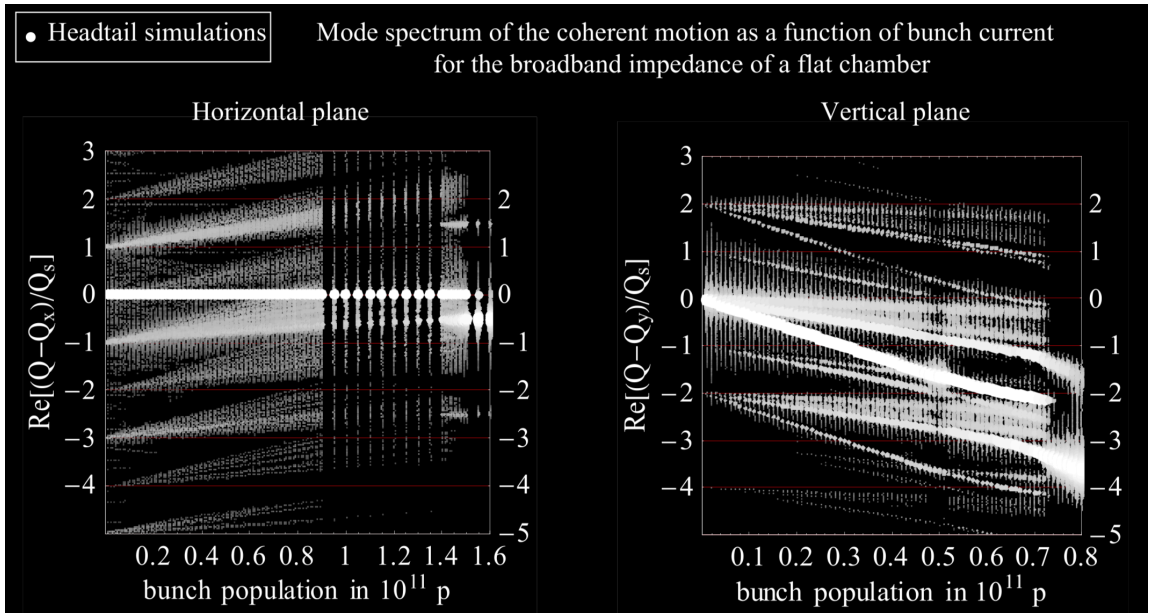
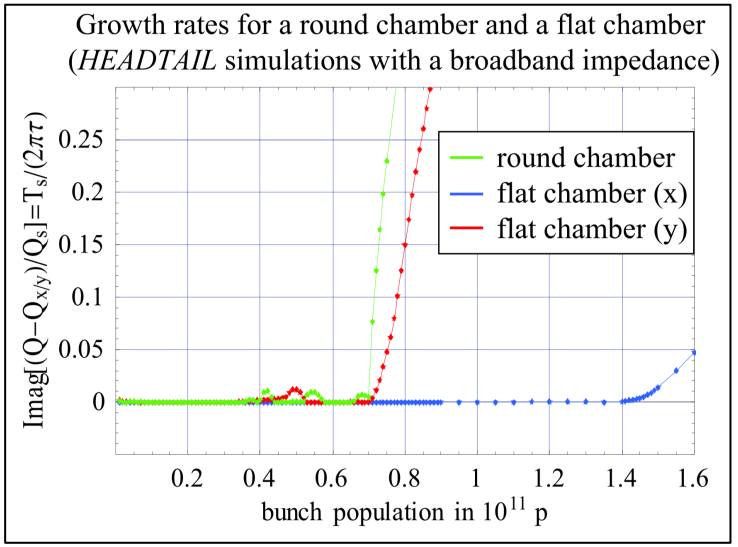
(Many thanks to XavierB as benchmarking with him, I could found a sign error somewhere…=> Some results from 05/08/19 with BB+SC will need to be corrected…)

- See PHD thesis from BenoitS (pages 151 and 152 of http://cds.cern.ch/record/1274254/files/CERN-THESIS-2010-087.pdf)
- How does this compare to recent analyses of the effect of the detuning impedance (see HSC meetings)?

Reminder on BenoitS' results (PHD thesis)

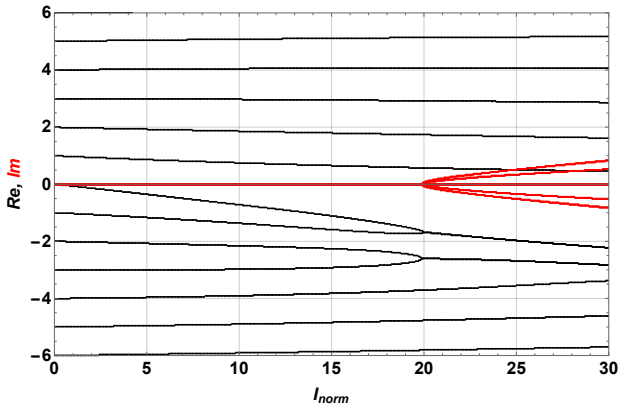




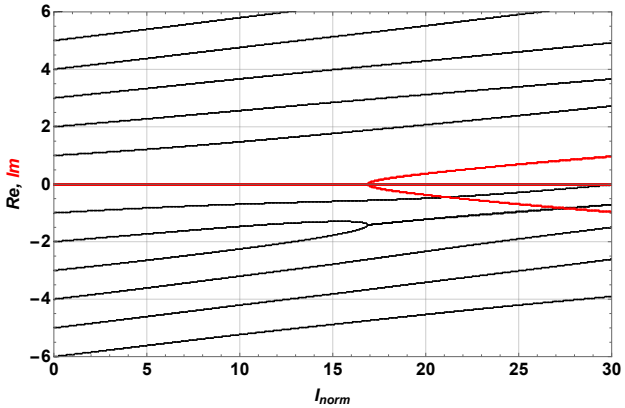
=> $N_b^{th,x} / N_b^{th,round} \approx 2$ $N_b^{th,y} / N_b^{th,round} \approx 1$

Results from Burov-Danilov_1998 formalism (extended to BB resonator => $f_r \tau_b = 2.8$)

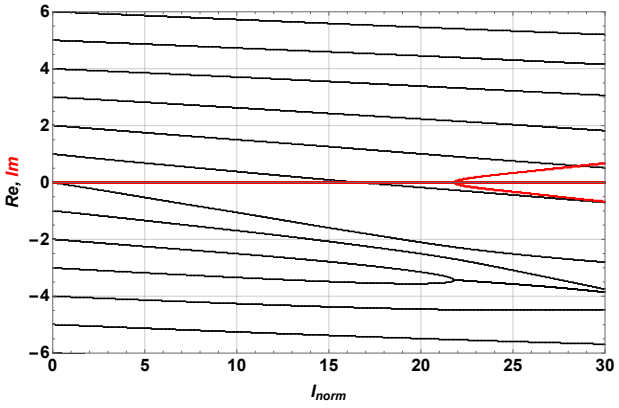
$\kappa = 0$ $(round)$



$\kappa = 1$ $(flat\ x)$



$\kappa = -1/2$ $(flat\ y)$



$I_{norm}^{th,round} = 19.9$

$I_{norm}^{th,x} = 16.9$

$I_{norm}^{th,y} = 21.8$

Yokoya dipolar factor

=> $N_b^{th,x} / N_b^{th,round} = \frac{16.9}{19.9} \times \frac{24}{\pi^2} \approx 2.1$

$N_b^{th,y} / N_b^{th,round} = \frac{21.8}{19.9} \times \frac{12}{\pi^2} \approx 1.3$

Conclusion

- Be careful when comparing the different κ-cases, as for each case the I_{norm} is normalised by the dipolar impedance (which includes a Yokoya dipolar factor): **1** for round ($\boldsymbol{\kappa = 0}$), $\frac{\boldsymbol{\pi^2}}{\boldsymbol{24}}$ for flat x ($\boldsymbol{\kappa = 1}$) and $\frac{\boldsymbol{\pi^2}}{\boldsymbol{12}}$ for flat y ($\boldsymbol{\kappa = -1/2}$)
- Seems that the effect of the asymmetry (flat chamber) on the TMCI intensity threshold (for this SPS case) can be explained mainly by the Yokoya dipolar factor (as also discussed in BenoitS' PHD thesis)
- Next: would be interesting now to analyse in detail the effect(s) of the radial modes…