First look on 915MHz HOM in SPS cavities

P. Kramer
915MHz HOM characteristics

• Longitudinal mode
• Moderate R/Q, high Q, lower phase advance per cell $\varphi$
  • compared to 630MHz modes: $\varphi \approx 82^\circ$
• Two high impedance modes in 3-sections:
  \[
  \varphi = \frac{3\pi}{11} \text{ (50°), } f=914.7\text{MHz}
  \]
  \[
  \varphi = \frac{10\pi}{33} \text{ (55°), } f=913.6\text{MHz}
  \]
630MHz-coupler performance on 915-HOM

- 630MHz-coupler also heavily damps 915MHz HOM
  - Factor 100 on bare 3-sections
630MHz-coupler performance on 915-HOM

- 630MHz-coupler also heavily damps 915MHz HOM
  - Factor 100 on 3-sections
- Impact of 938-couplers position dep.
  - Improvement in Wake
- No improvement/ deterioration due to new 630MHz-damping scheme

<table>
<thead>
<tr>
<th></th>
<th>3\pi/11 (MHz)</th>
<th>10\pi/33 (MHz)</th>
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<tr>
<td>f [MHz]</td>
<td>914.7</td>
<td>913.6</td>
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<tr>
<td>Q</td>
<td>2800</td>
<td>5900</td>
</tr>
<tr>
<td>R/Q [Ω]</td>
<td>22</td>
<td>22</td>
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With pre-LS2 long. damping scheme
Coupler improvement for 915MHz

• Can 915MHz-damping be improved?
  • At first, disregarding 630MHz

• Critical coupling to 915MHz
  • Shorter pickup & 25Ω impedance
  • Slightly improved damping in pre-LS2 configuration

• No improvement with couplers having longer pickups
Improving new 630MHz-scheme for 915-HOMs

- So far: No improvement of 915-HOM damping by adding couplers to the new damping scheme for 630MHz-HOMs
- Reasons
  - Coupler crosstalk and structural (top/ bot.) asymmetry
  - Deterioration of 630MHz impedance by adding HOM-couplers
- FPCs seem to have a larger impact on 915MHz than on 630MHz
  - Damping depends on attached matching/ short
  - Worst case phase dependent
BLonD: 3-sections

- Frequency shift in comparison to BLonD
  - Different stem length used in simulations
- 938MHz transverse couplers have significant damping effect on 915MHz longitudinal modes
BLonD: 3-sections

- Frequency shift in comparison to BLonD
  - Different stem length used in simulations
- 938MHz transverse couplers have significant damping effect on 915MHz longitudinal modes
- No improvement due to new damping scheme for 630MHz HOMs
  - Using only four 938MHz couplers
Conclusions

• Status so far: Compromising on 630MHz damping might be required to also damp 915MHz HOMs
• Coupler cross-talk makes improvement of damping in 630 AND 915MHz ranges difficult