First look on 915MHz HOM in SPS cavities

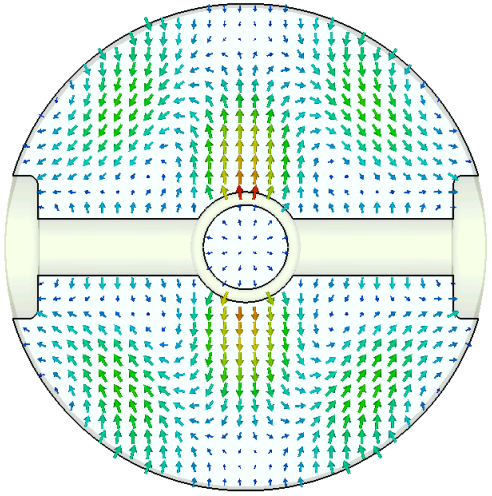
P. Kramer

915MHz HOM characteristics

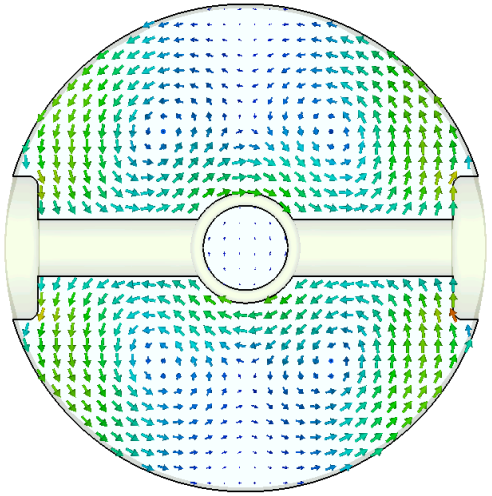
- Longitudinal mode
- Moderate R/Q, high Q, lower phase advance per cell φ
  - compared to 630MHz modes: φ≈82°
- Two high impedance modes in 3-sections:

φ = 3π/11 (50°), f=914.7MHz

E-field

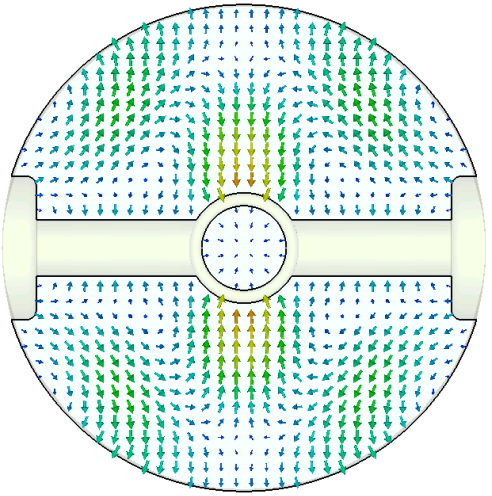


H-field

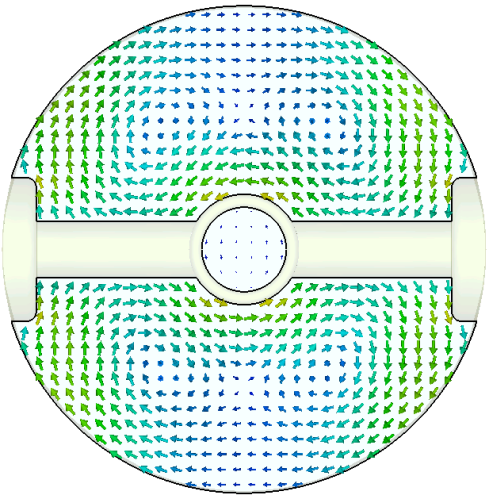


φ = 10π/33 (55°), f=913.6MHz

E-field

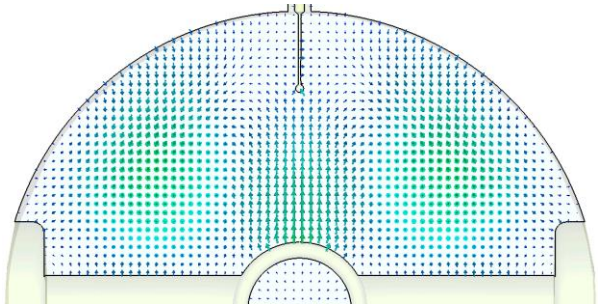


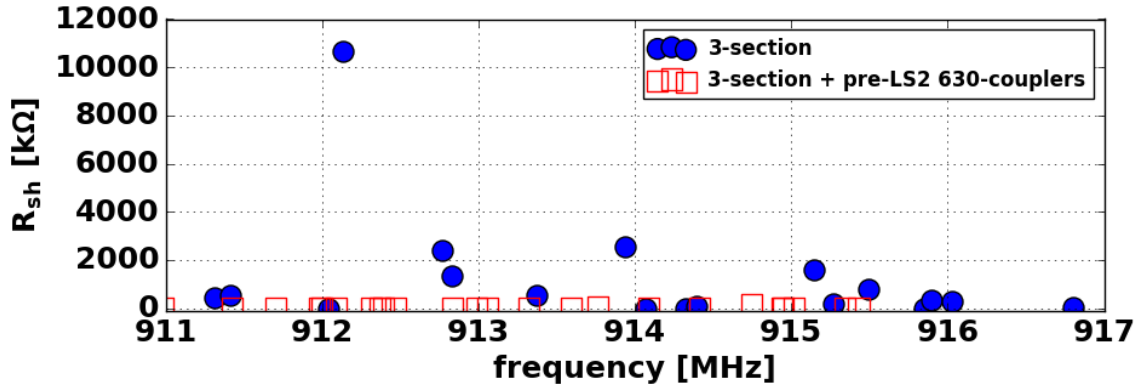
H-field

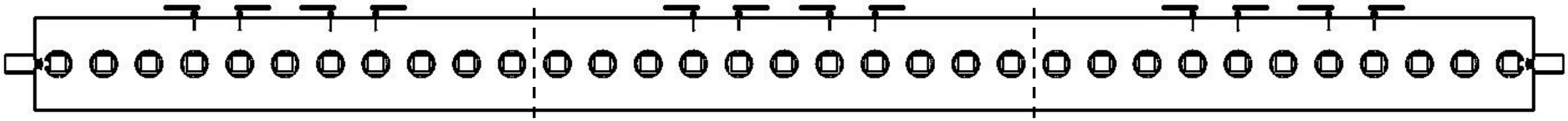


630MHz-coupler performance on 915-HOM

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





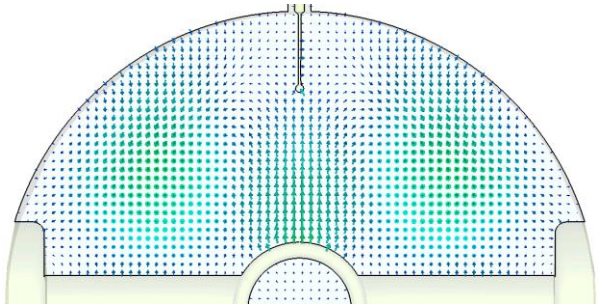


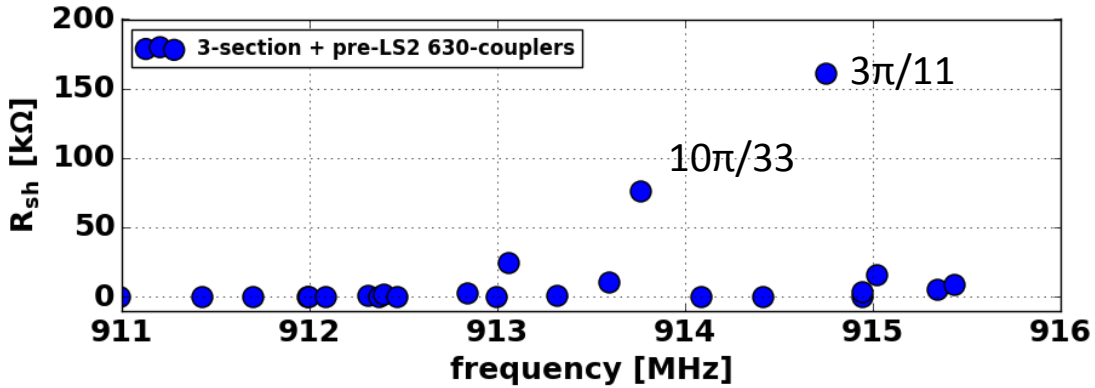
630MHz-coupler performance on 915-HOM

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

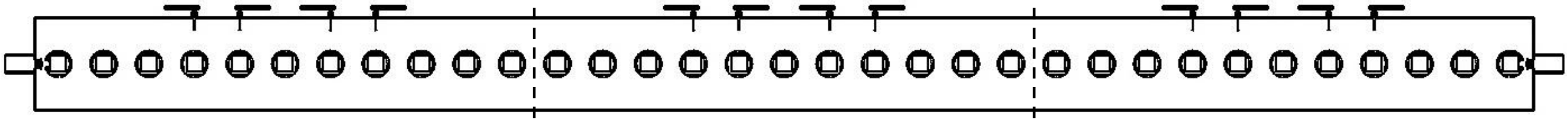
With pre-LS2 long. damping scheme

	3π/11	10π/33
f [MHz]	914.7	913.6
Q	2800	5900
R/Q [Ω]	22	22



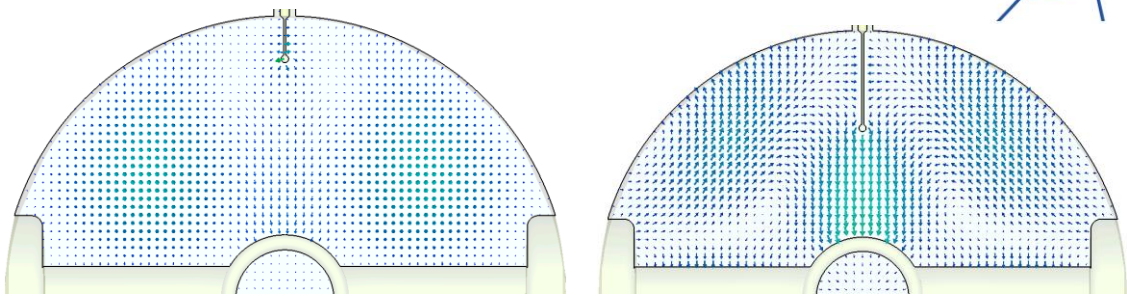


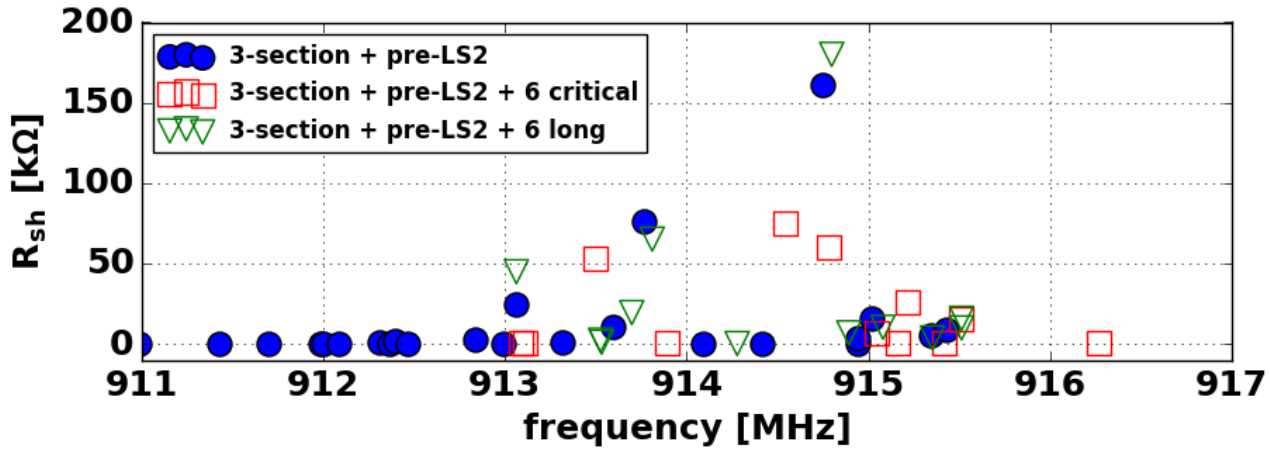
- Impact of 938-couplers position dep.
  - Improvement in Wake
- No improvement/ deterioration due to new 630MHz-damping scheme

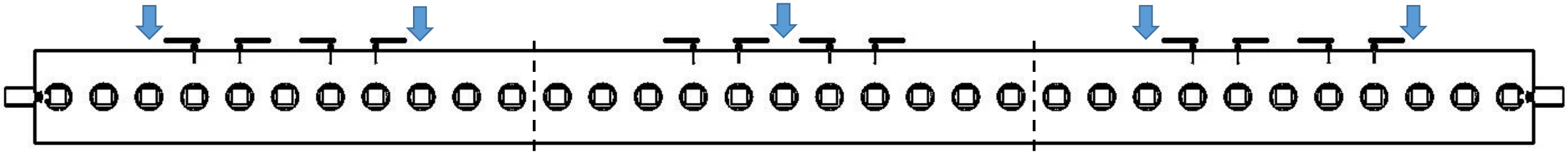


Coupler improvement for 915MHz

- 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

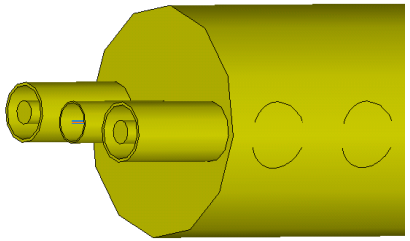


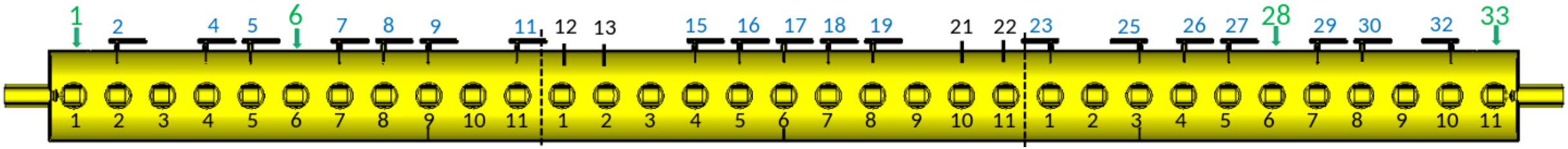




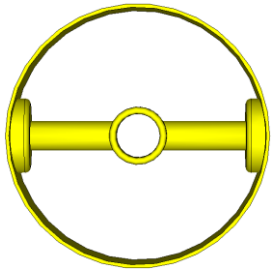
Improving new 630MHz-scheme for 915-HOMs

- 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

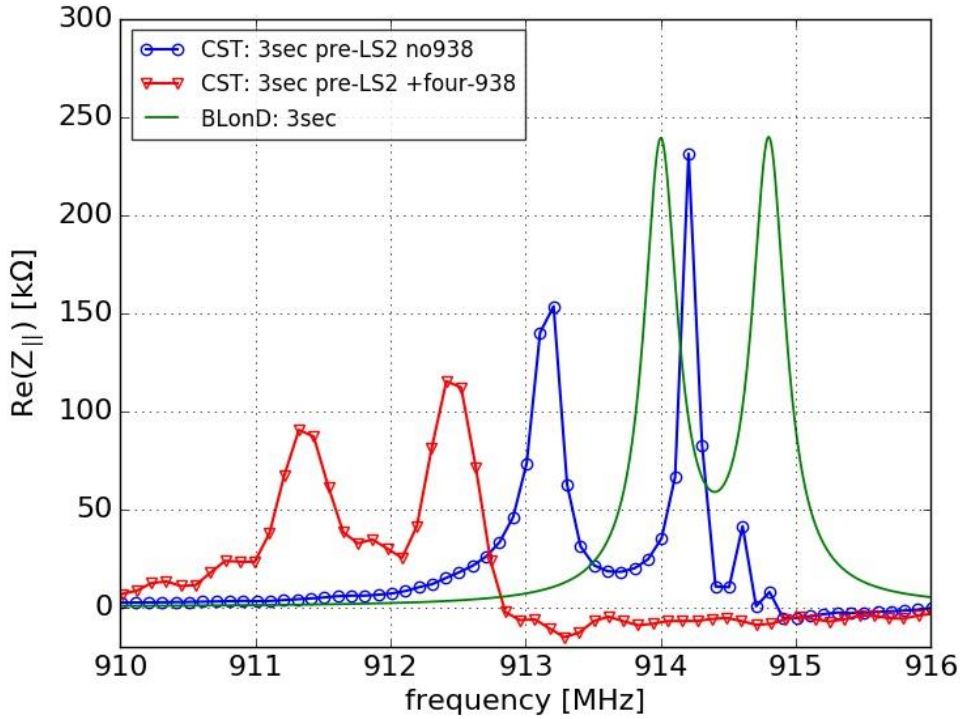


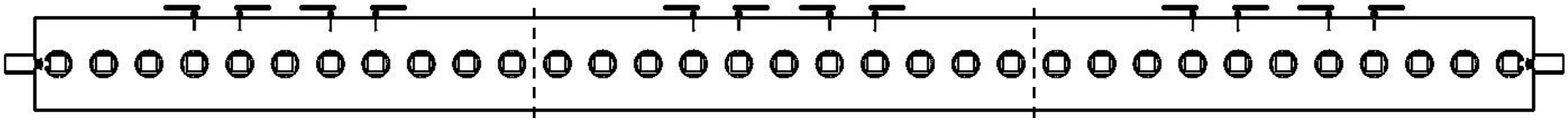


BLonD: 3-sections



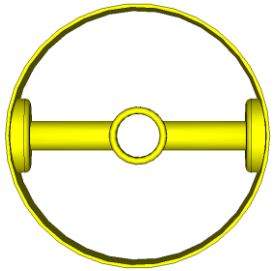
- Frequency shift in comparison to BLonD
  - Different stem length used in simulations
- 938MHz transverse couplers have significant damping effect on 915MHz longitudinal modes

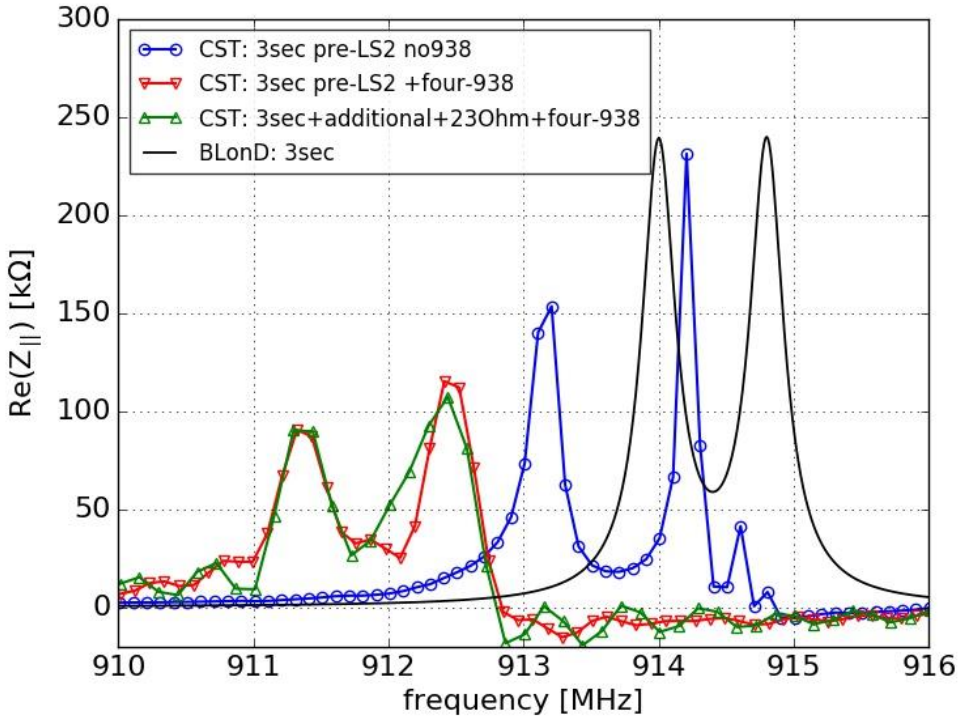




BLonD: 3-sections

- 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