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# **HOM Detector Commissioning for CC1 and CC2 (10-12-17 Run)**

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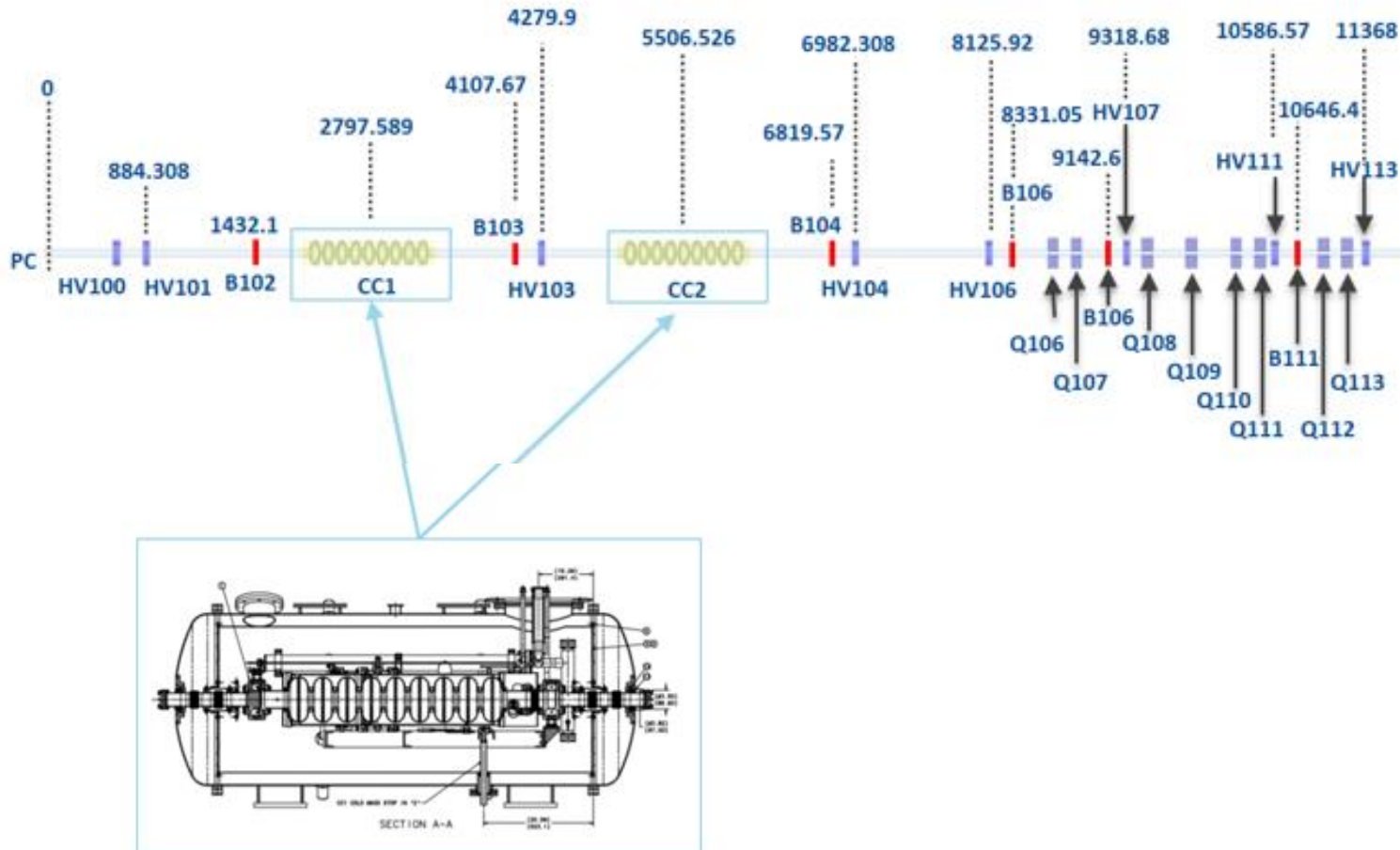
# Introduction

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- Primary goal is to reduce beam steering offsets and possible emittance dilution by monitoring and minimizing HOM modes in the cavities.
- Two HOM couplers are installed in both CC1 and CC2: upstream (US) and downstream (DS).
- Signals can be processed for TM<sub>110</sub> dipole modes from 1.6-1.9 GHz using passband of filters.
- Filters also used to reject 1.3 GHz and >2.2 GHz.
- Studies on 10-12-17 were for the installation and commissioning of Peter's detector boxes with filters and zero-bias Schottky detectors. Generate ACNET device signals.
- Tests of Chip's script for stepping corrector currents while tracking HOM signals and rf BPMS also included.

# Schematic of FAST 50-MeV Beamline Before Chicane.

- Linac layout including cavities, correctors, and rf BPMs.

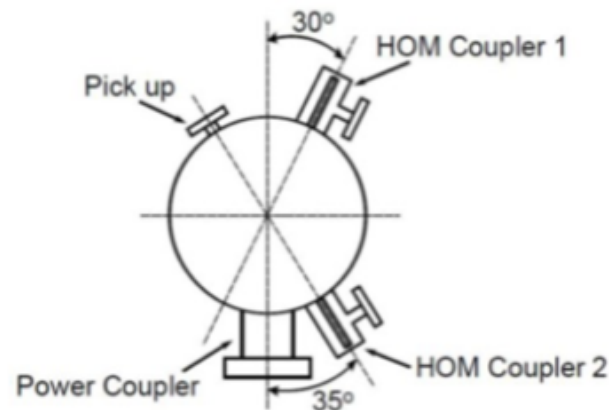
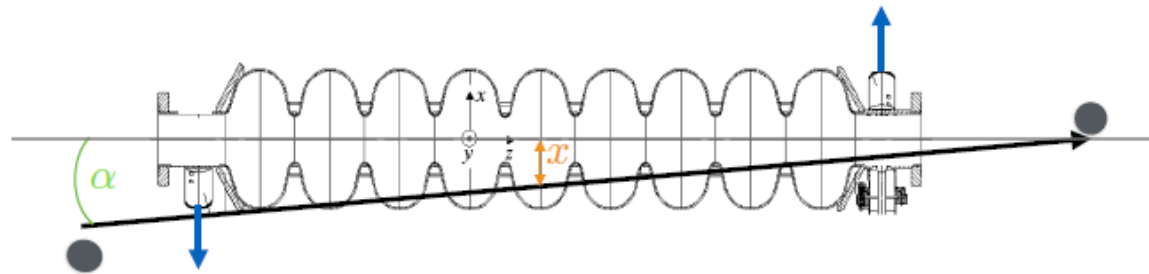


### > TESLA CAVITY

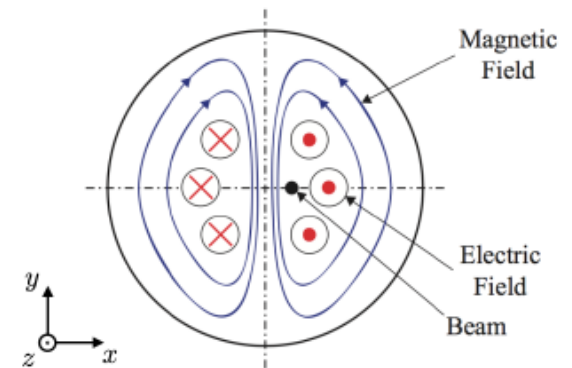
- 2 HOM couplers

### > DIPOLE HOM

- $V_x(t) \propto x \cdot e^{-\frac{t}{2\tau}} \sin(\omega t)$
- $V_{x'}(t) \propto x' \cdot e^{-\frac{t}{2\tau}} \cos(\omega t)$



### Dipole Mode



# Initial looks at HOM signals on Oscilloscope

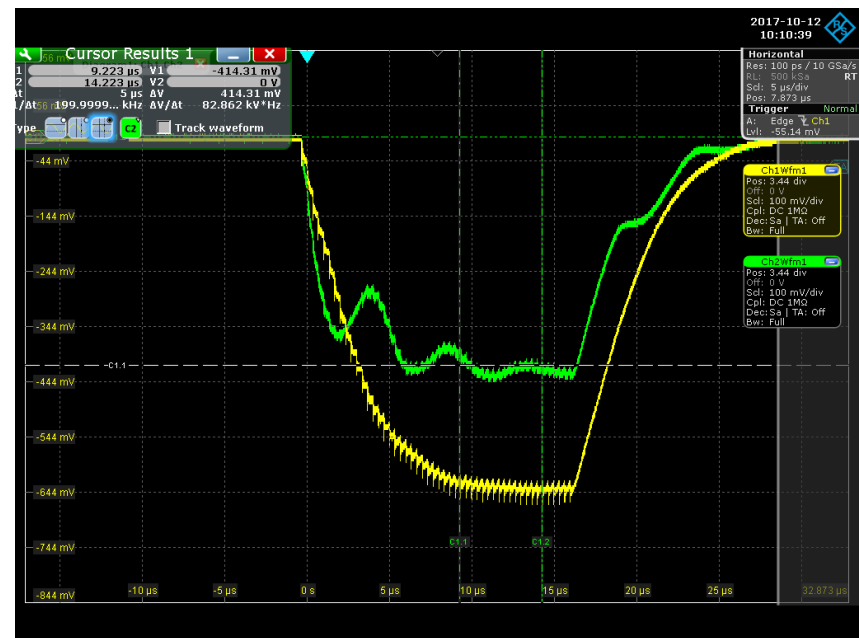
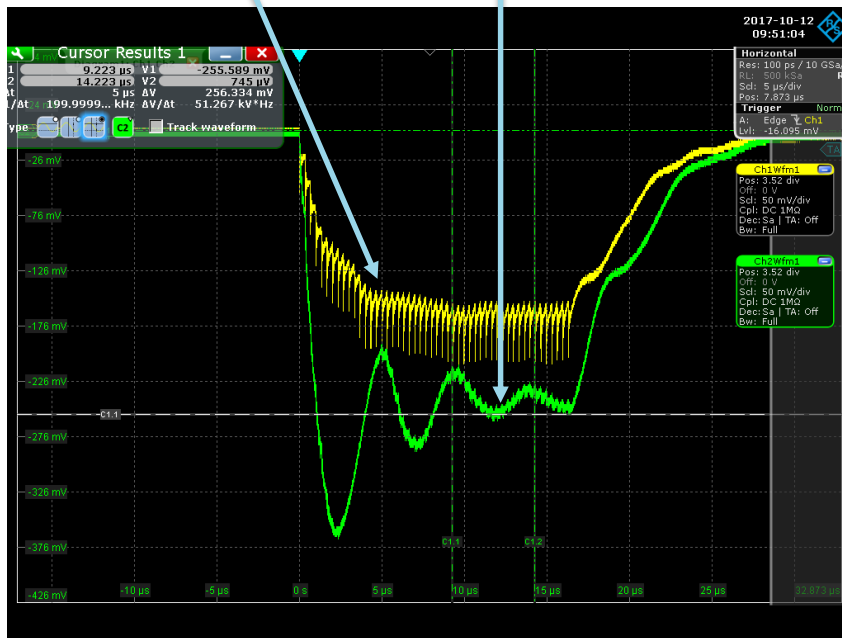
- Beam: 500 pC/b, 50 b, 31 MeV

- H101=0.75 A, V101=0.89A

H101=1.25 A

CC1 US=-173 mV, DS=-256 mV

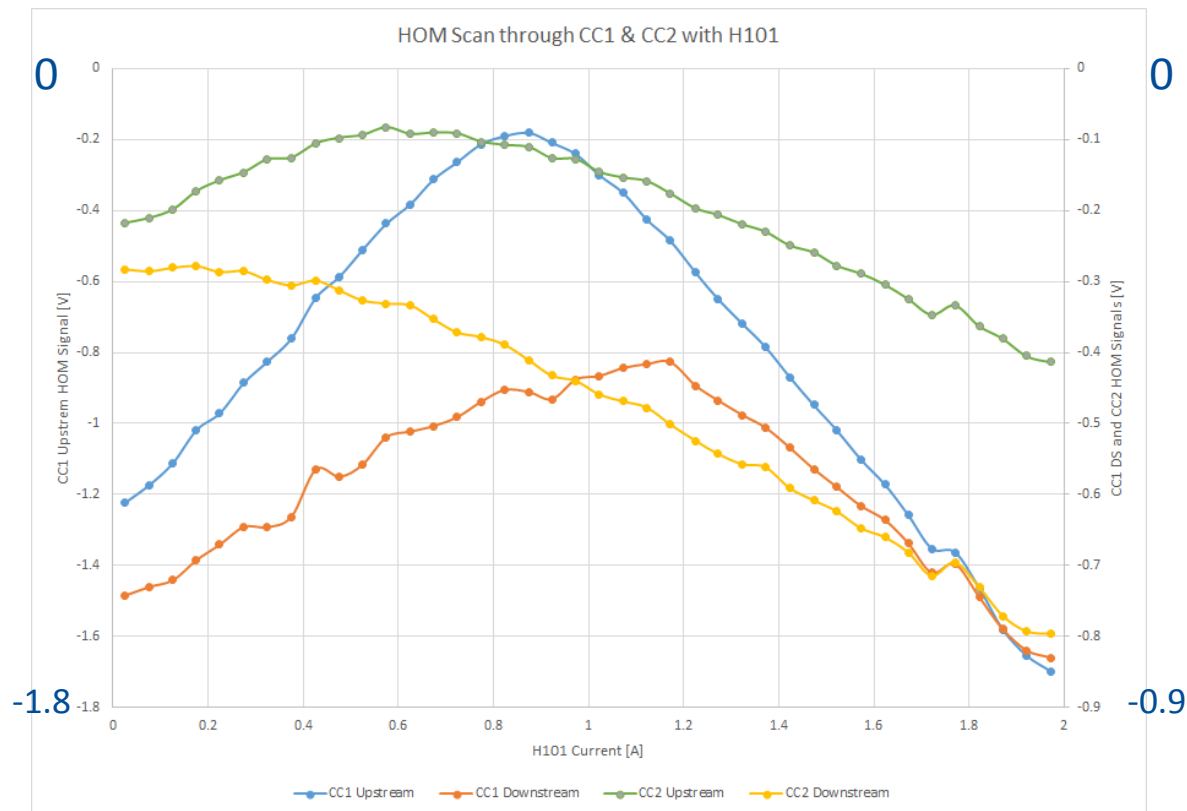
CC1 US=-628 mV, DS=-415 mV



US detector-yellow, DS detector-green

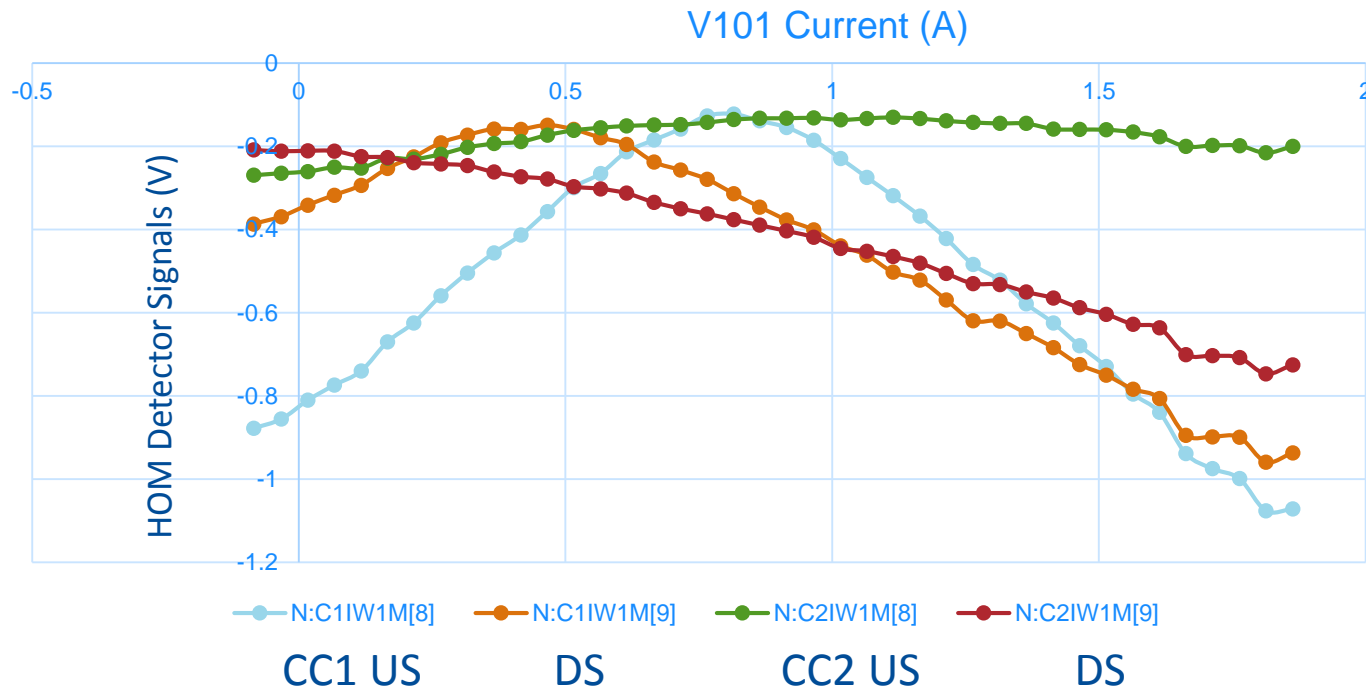
# Chip's Script Used to Scan Correctors and Track Signals (1)

- Track HOM signals and rf BPMs, B101-106 including bunch by bunch position data as vary upstream corrector currents.
- 500 pC/b, 50 b, ~30 MeV. Elog entry for H101 scan.



## Chip's Script Used to Scan Correctors and Track Signals (2)

- Track HOM signals and rf BPMs, B101-106 including bunch by bunch position data as vary upstream corrector currents.
- 500 pC/b, 50 b, ~30 MeV. (Post talk plot of V101 scan-Peter.)



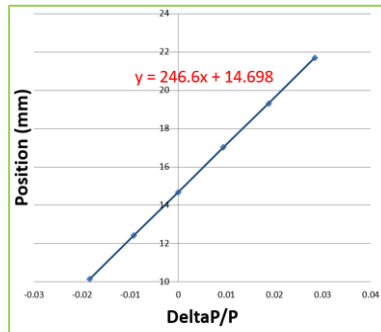
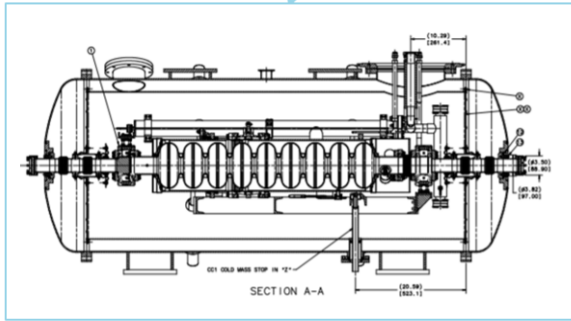
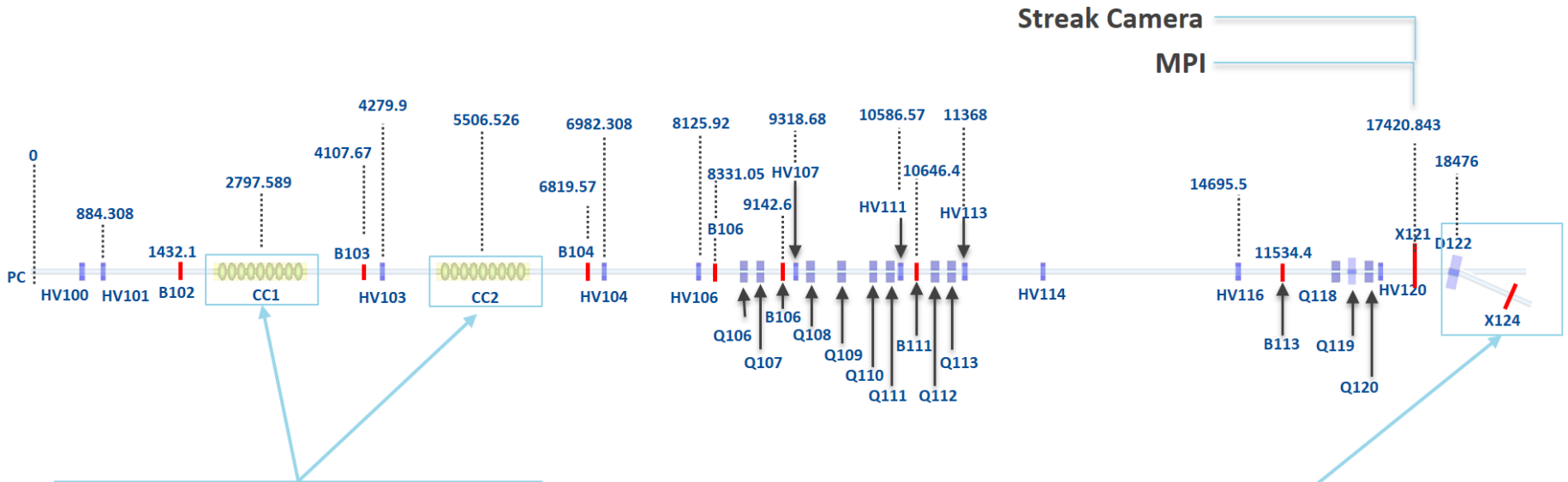
# Summary

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- All HOM detector commissioning objectives were achieved including tests of Chip's script for stepping corrector currents while tracking HOM signals and rf BPMS.
- Further data processing of V101 scan planned (**added**).
- Additional scans needed on CC2 HOMs for effects of H, V103 correctors located between the two cavities.
- These will be done within long-range wakefield studies although minimization of HOMs is also operational goal.
- Transverse HOM wakefield studies will use these detectors and the BPMS with bunch-by-bunch positions.



# Beamline Layout (50 MeV)



Measured Dispersion using X124  
 $\rightarrow \Delta(dP/P) \sim 1E-4$  of  $\Delta 25 \mu\text{m}$  @ X124

