

Discoveries in the Hunt for Wakefields

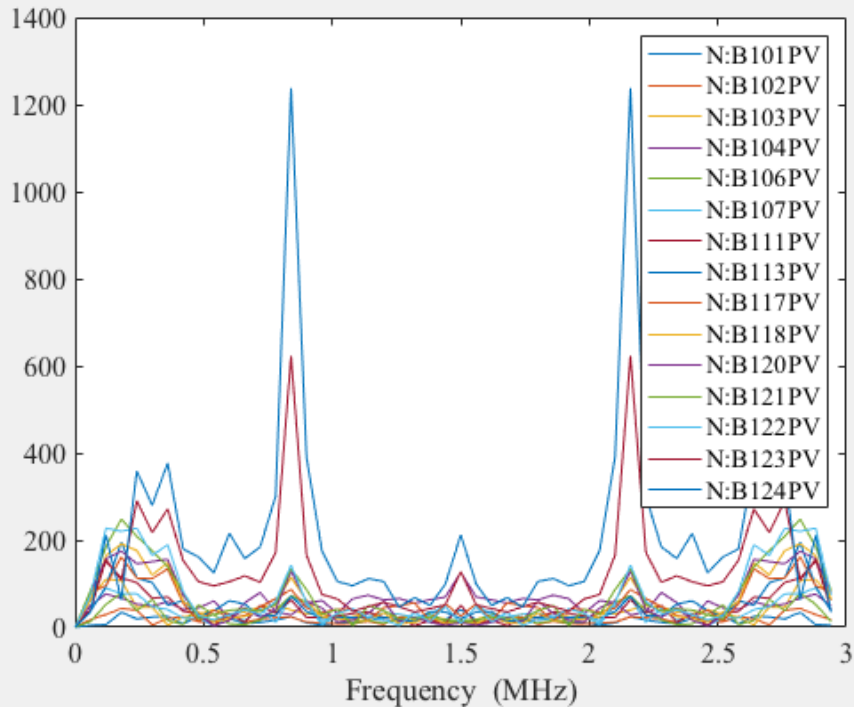
Randy Thurman-Keup
FAST Operations Retreat 2017

Opening Act
“Beware the Bremsstrahlung”



858 kHz in the BPM Positions

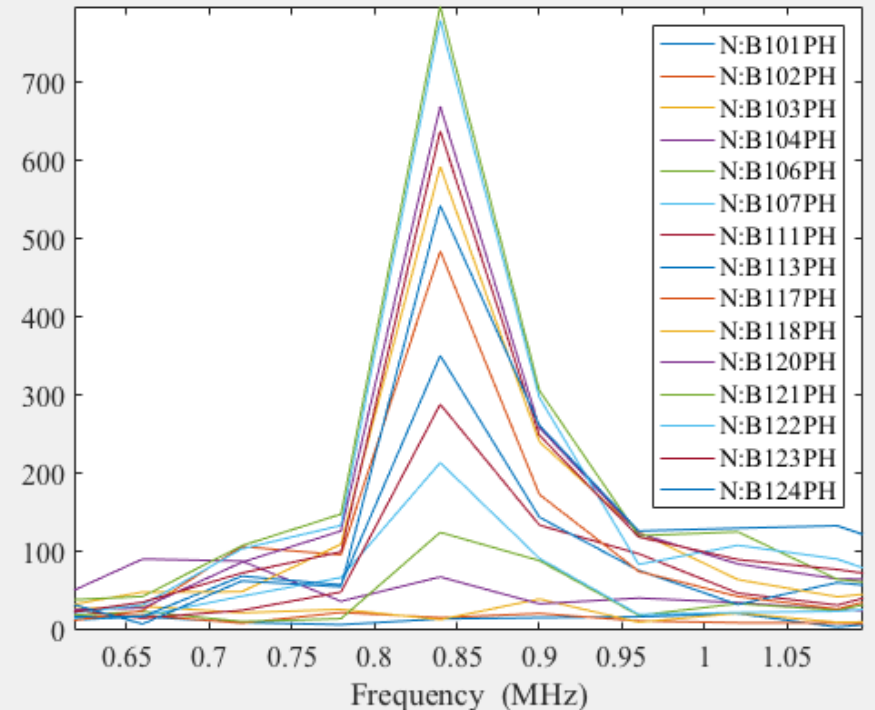
Vertical BPMs



Vertical BPMs: Mostly present in the dump line

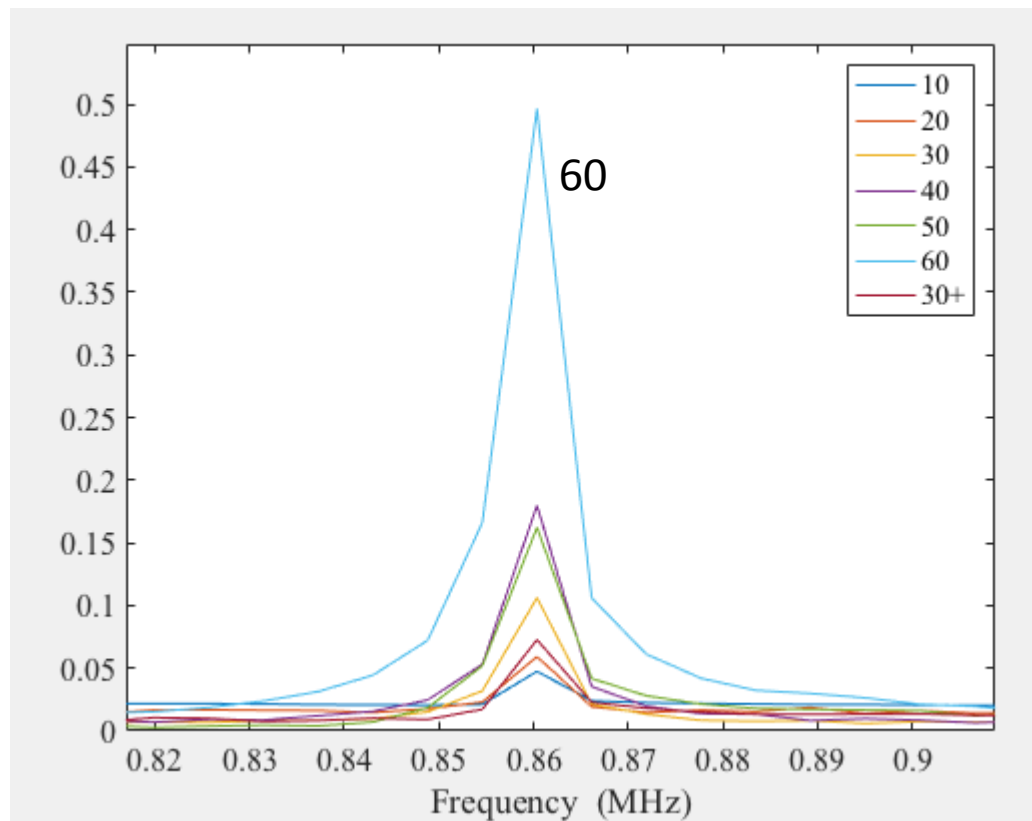
Horizontal BPMs: Present everywhere, at similar levels to vertical in the dump

Horizontal BPMs

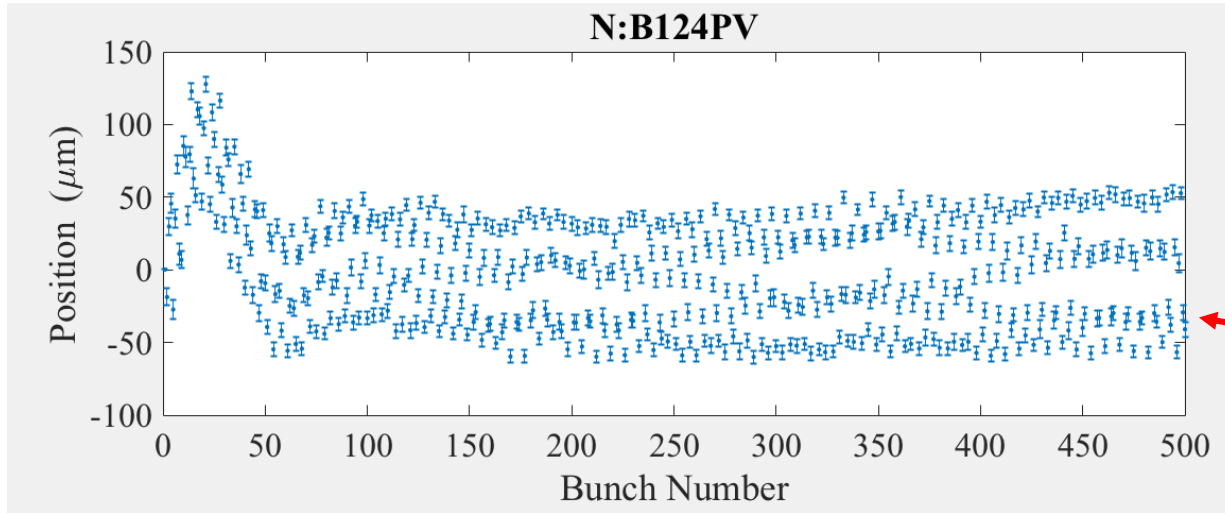


858 kHz in the BPM Positions

- Accidentally discovered source when trying to detune CC2
- FFT of CC2 gradient shows the 858 kHz and that it is a function of the proportional gain. Normally ran at a gain of 50.



858 kHz in the BPM Positions



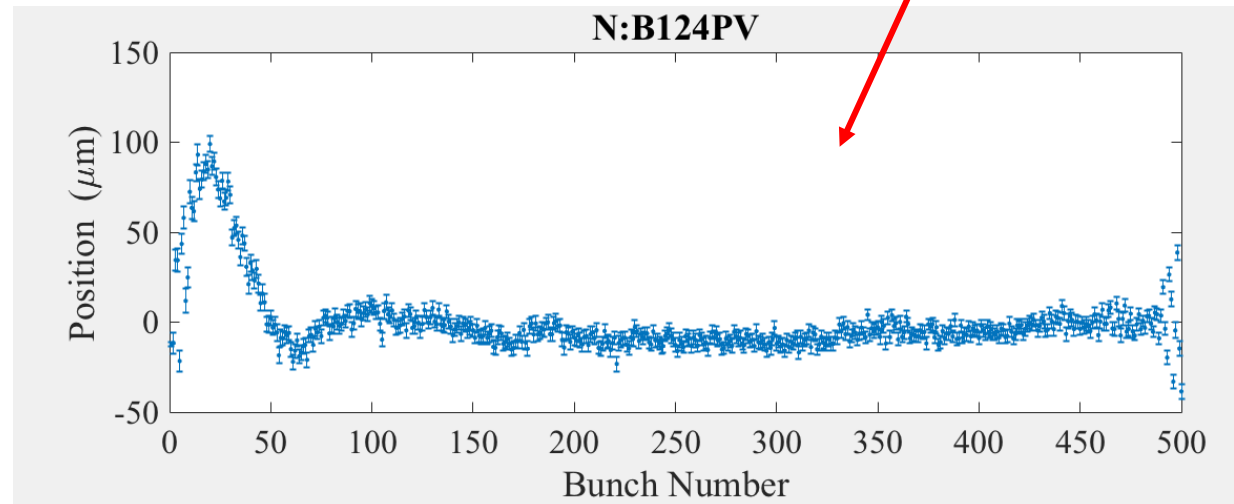
Since it is fairly narrow, it can be filtered out of the position data

With 858 kHz

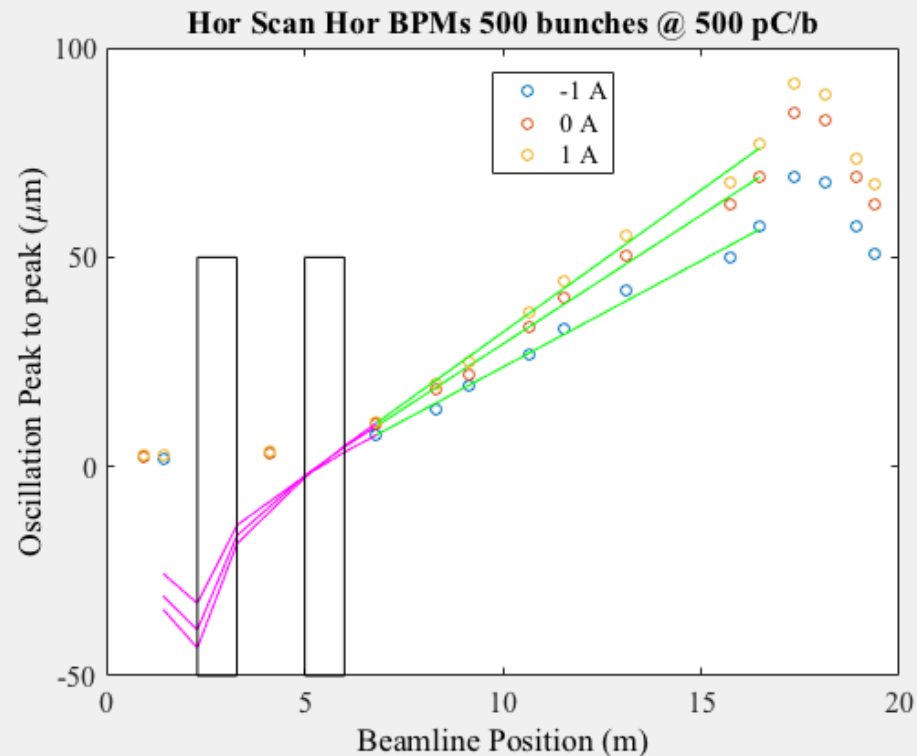
Without 858 kHz

Outstanding question

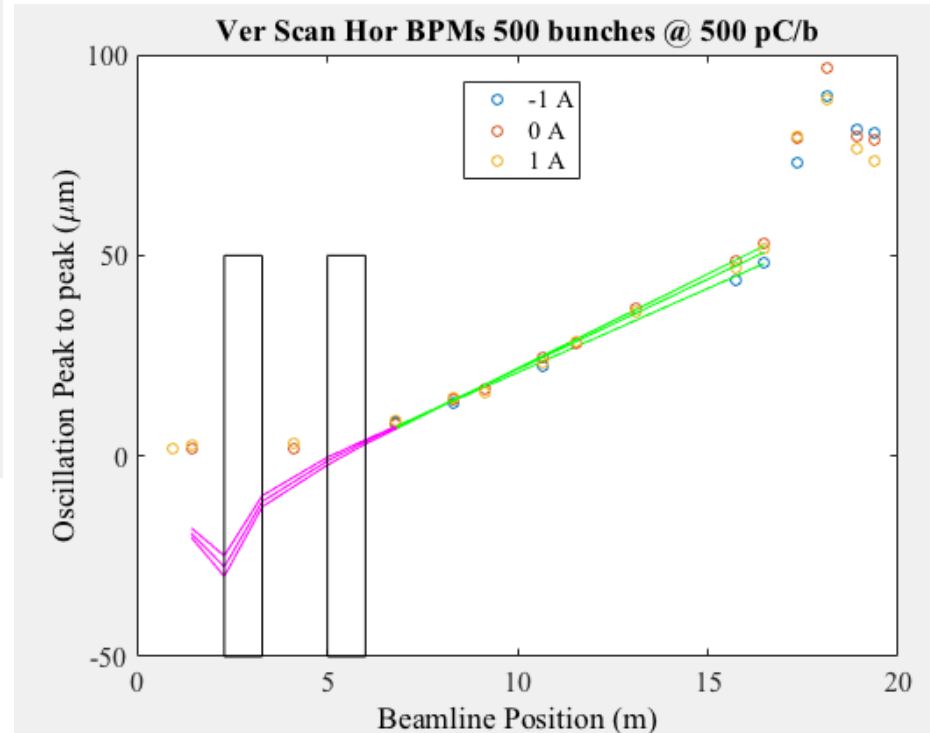
If the 858 kHz is purely a gradient(energy) issue, then why is it so large in the horizontal BPMs all along the line?



858 kHz in the BPM Positions

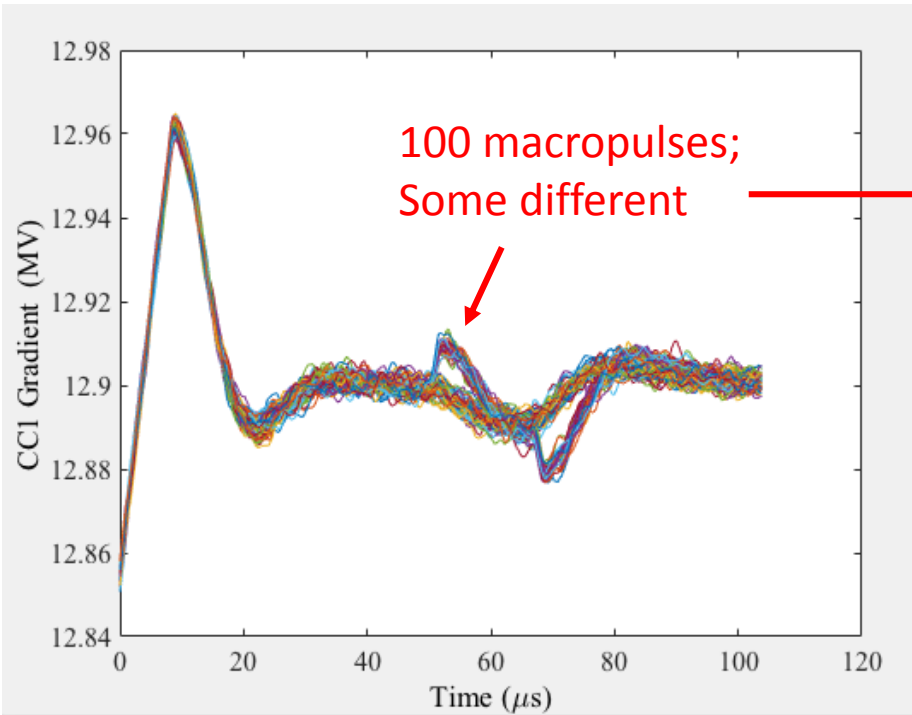


Project back to find source of 858 kHz in horizontal BPMs



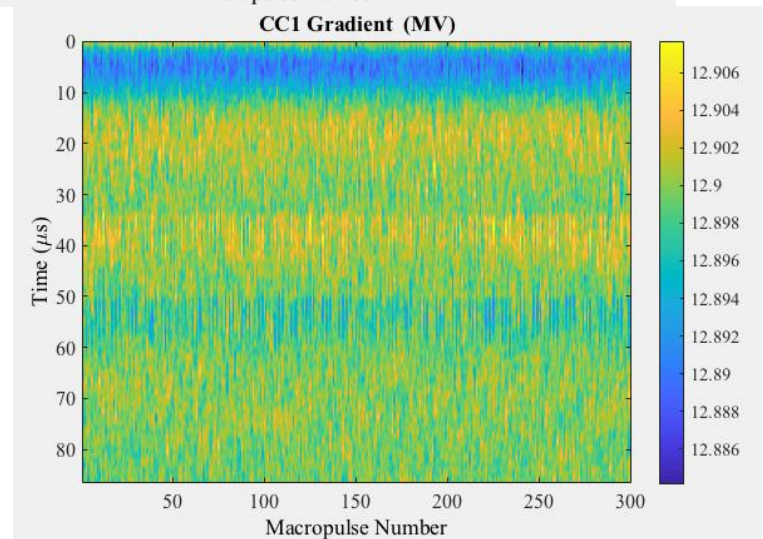
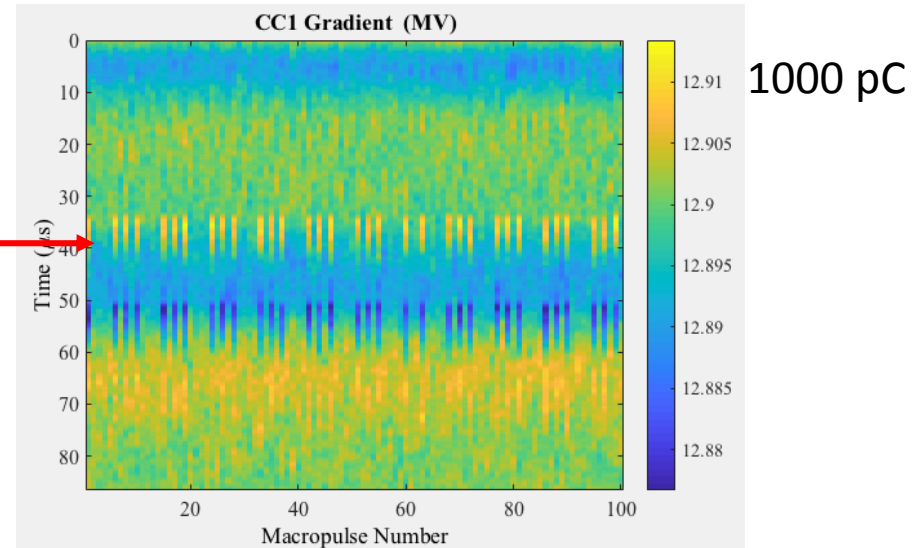
No HOM in CC2 that maps to 858 kHz.
There is one in CC1, but it doesn't seem to be originating there.

Beam Compensation Issues?



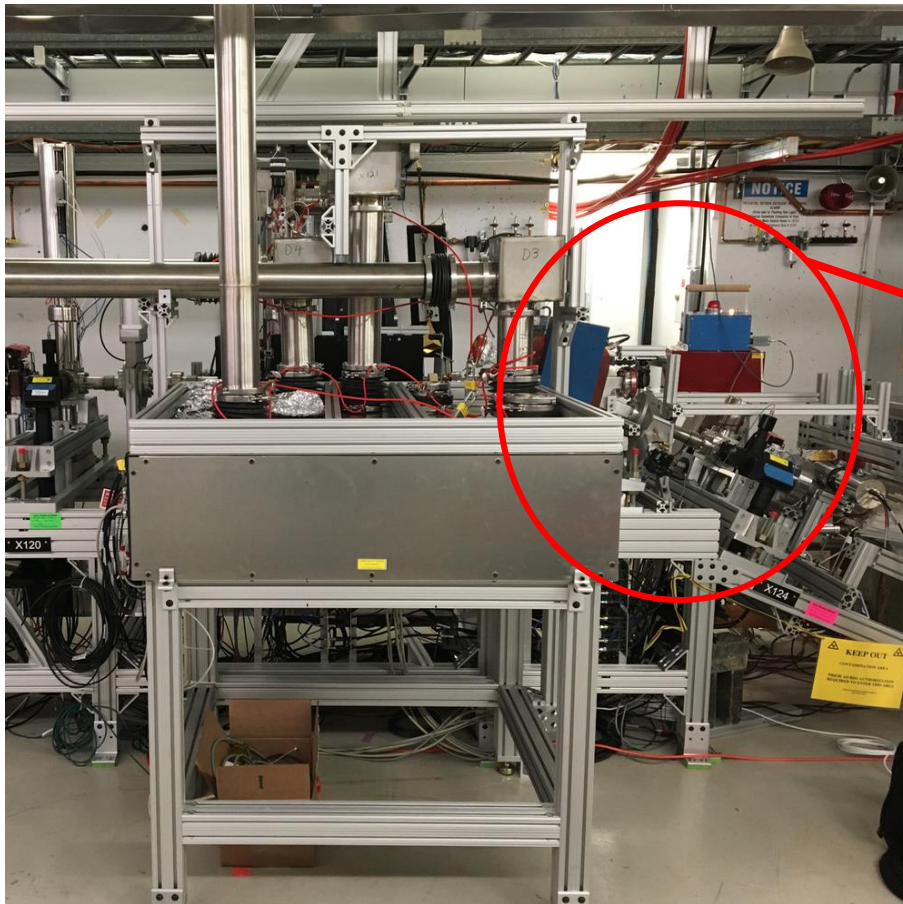
CC1 gradient at flatop w/ beam compensation on

300 pC



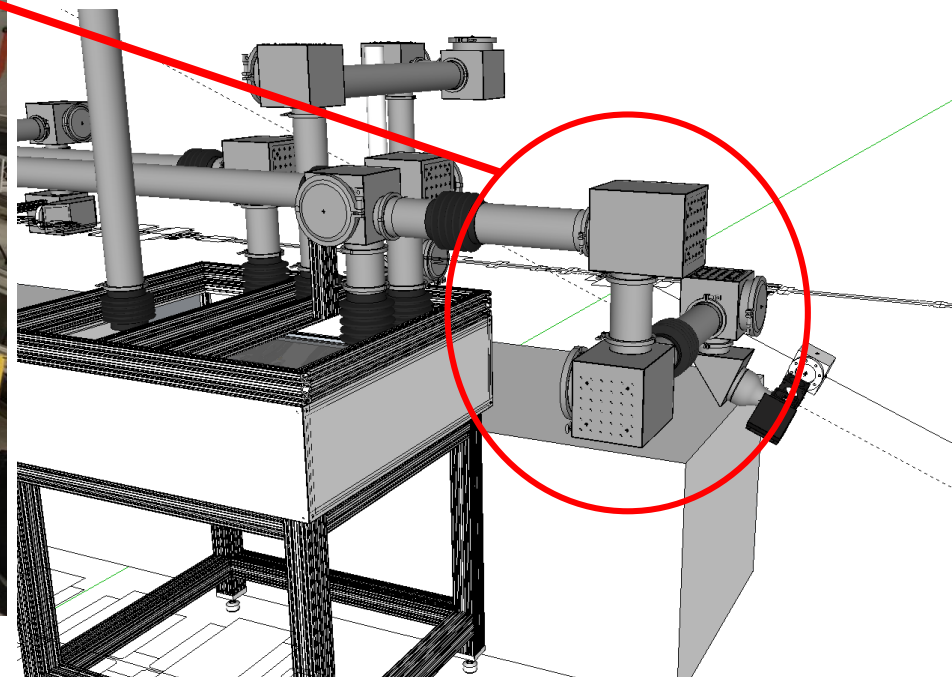
Instrument X124 with Streak Camera

(more cowbell)



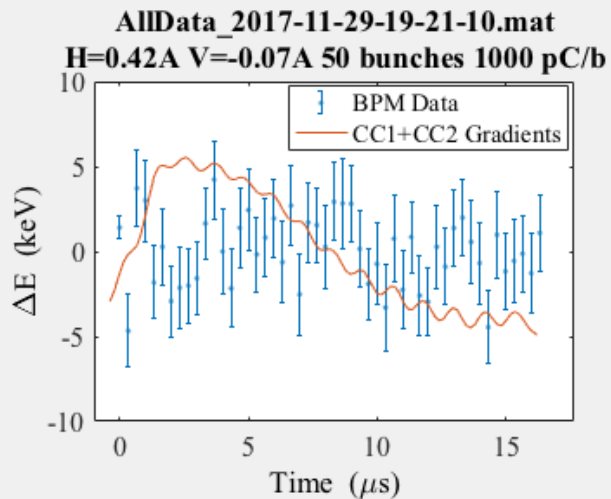
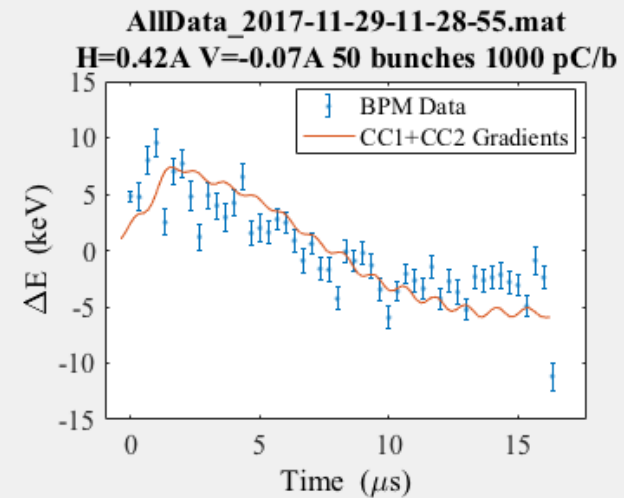
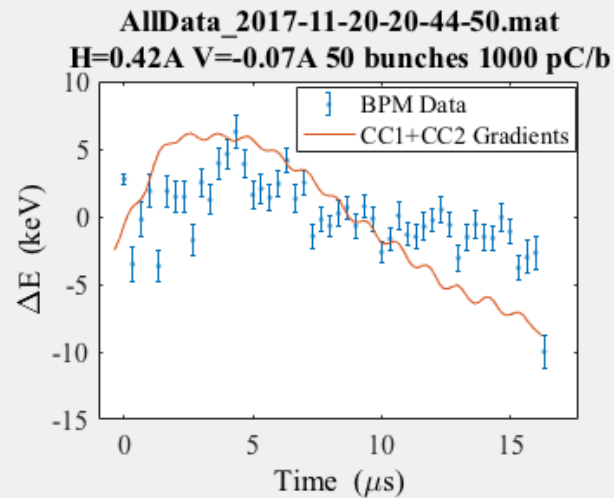
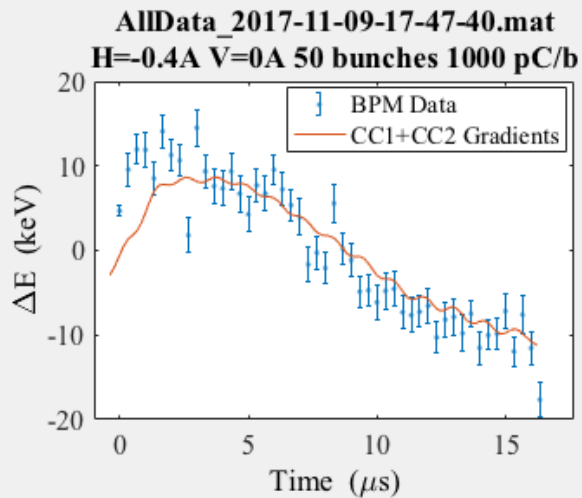
Add cube with beam splitter to X124 optics line and connect to streak camera

- E vs t : Uncompressed bunch
- E vs $bunch$: Better resolution than BPMs(?) for longitudinal wakefields



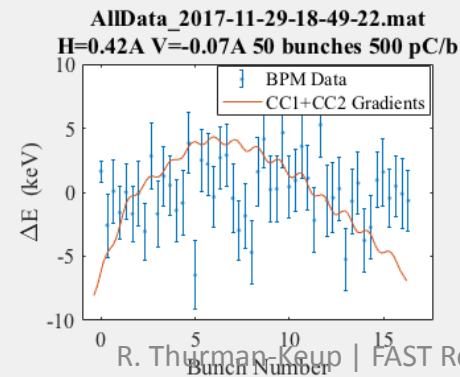
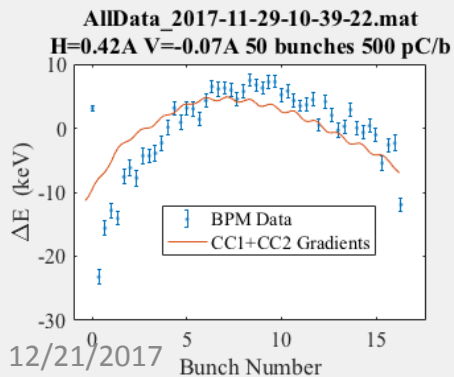
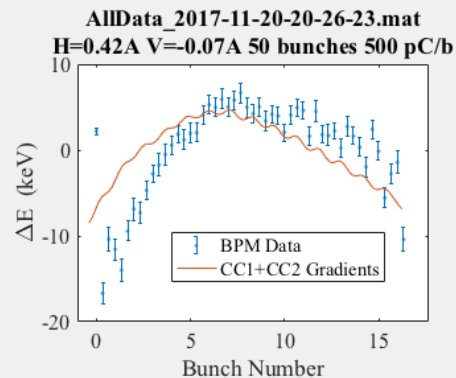
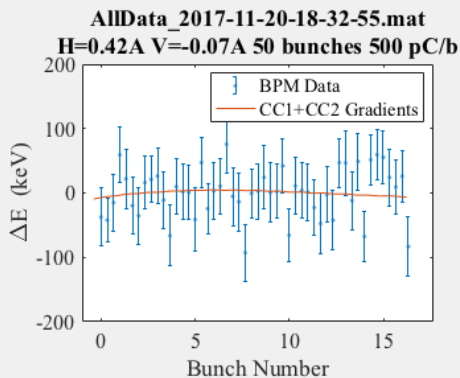
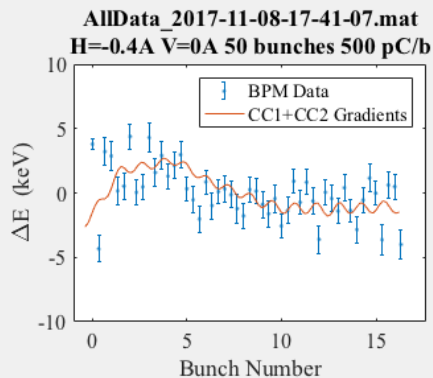
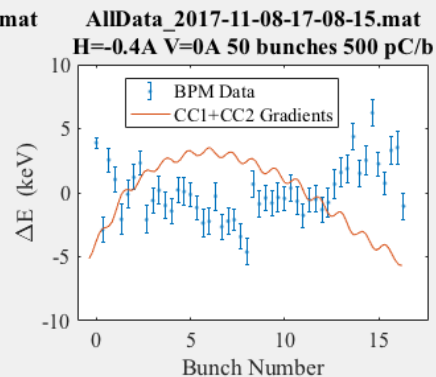
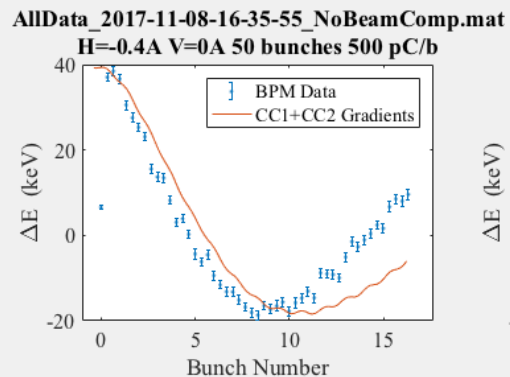
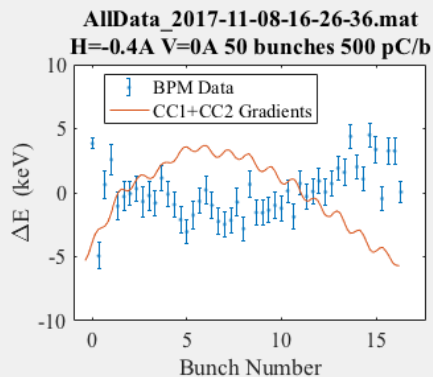
Extra Stuff

Longitudinal Wakefields



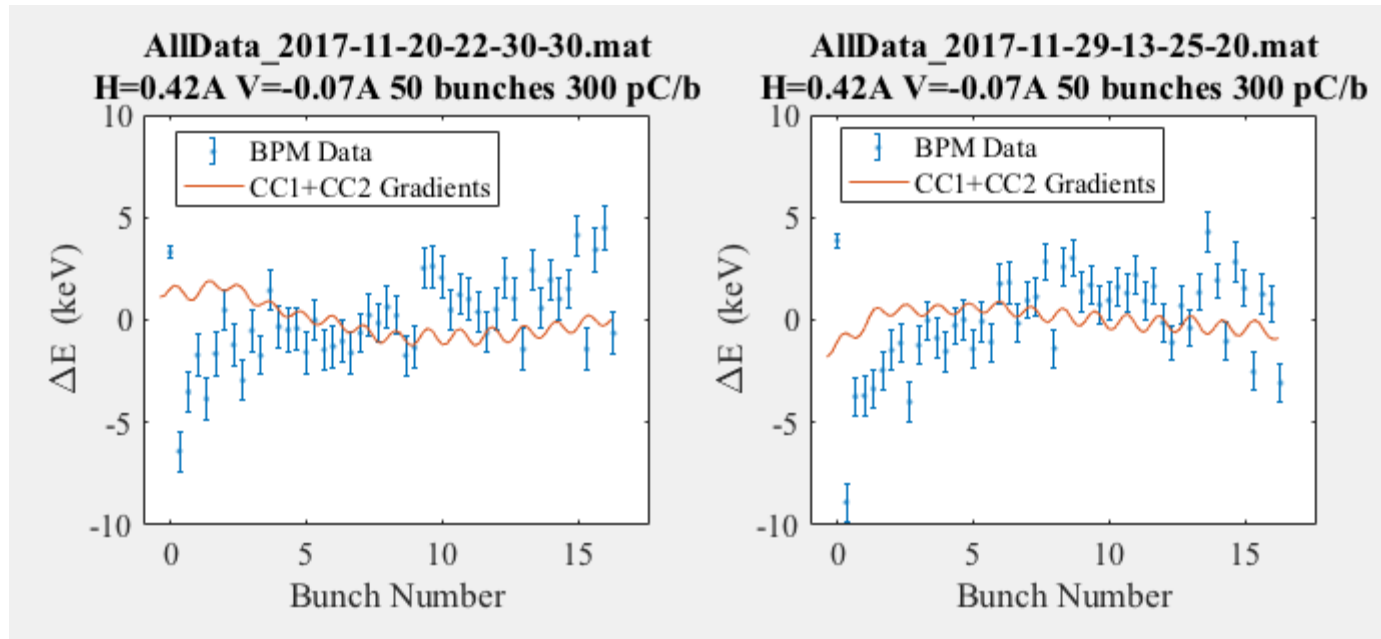
1000 pC

Longitudinal Wakefields



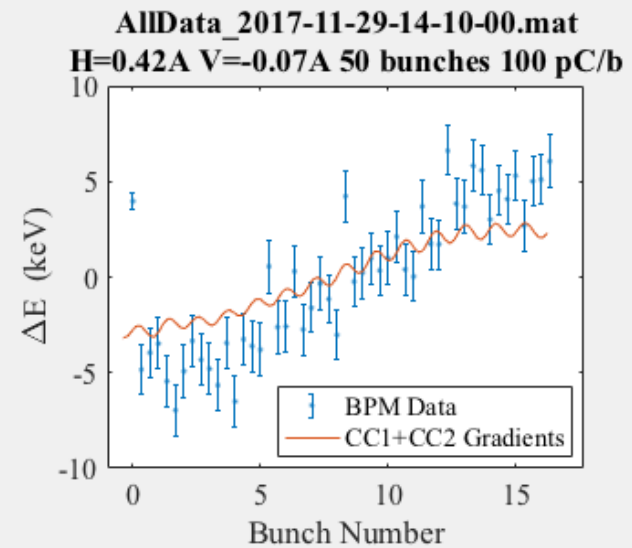
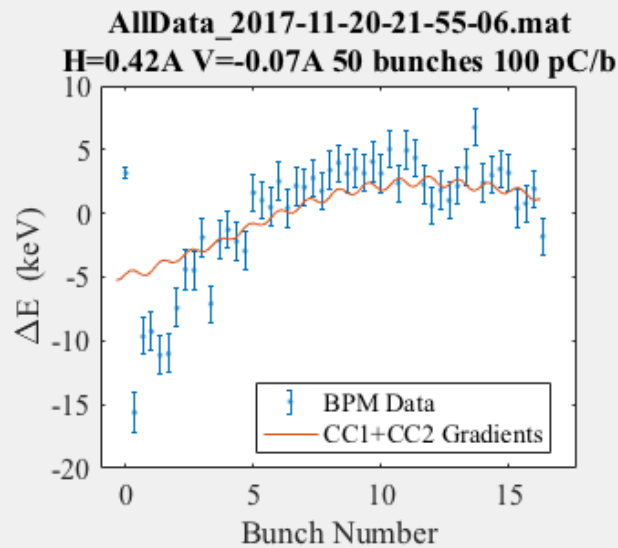
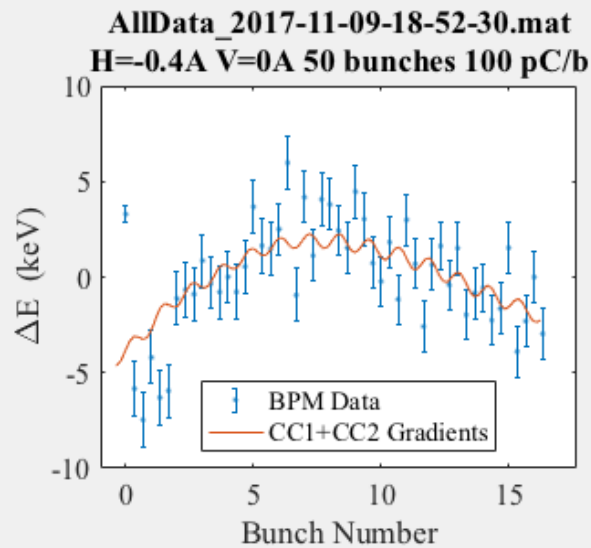
500 pC

Longitudinal Wakefields



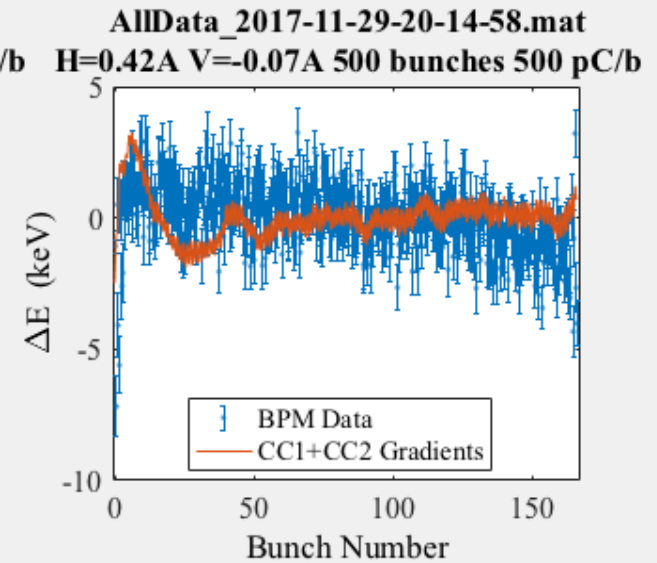
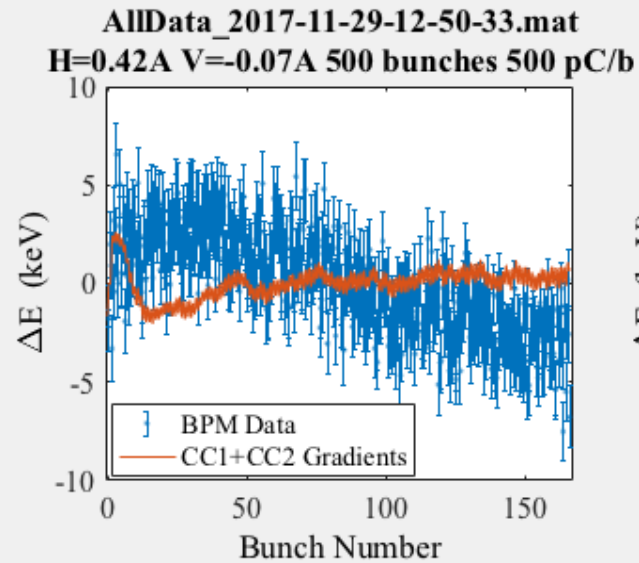
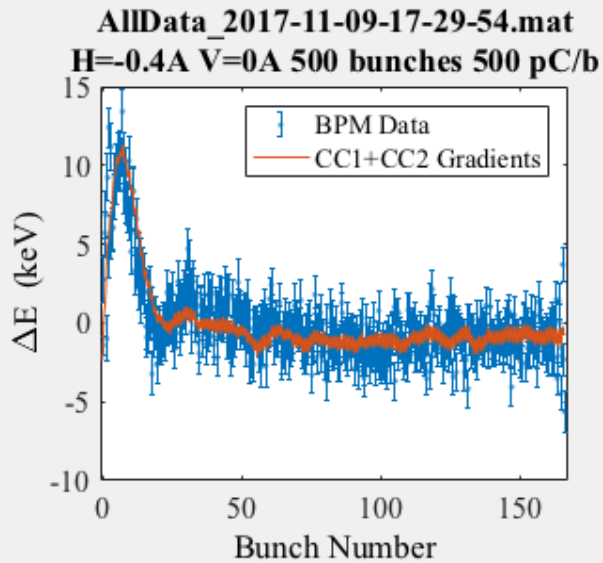
300 pC

Longitudinal Wakefields



100 pC

Longitudinal Wakefields



500 pC w/500 bunches