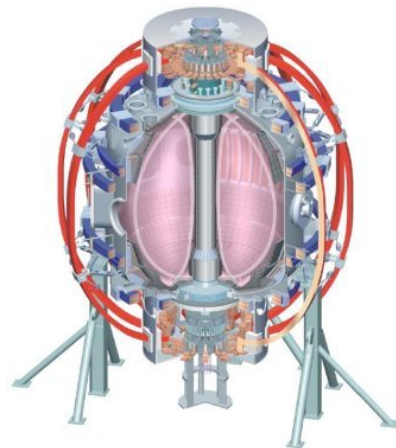


XP-901: Exploration of Fast Discharge Shut-Down Using Coaxial Helicity Injection

S. P. Gerhardt, R. Raman, D. Mueller

NSTX Results Review

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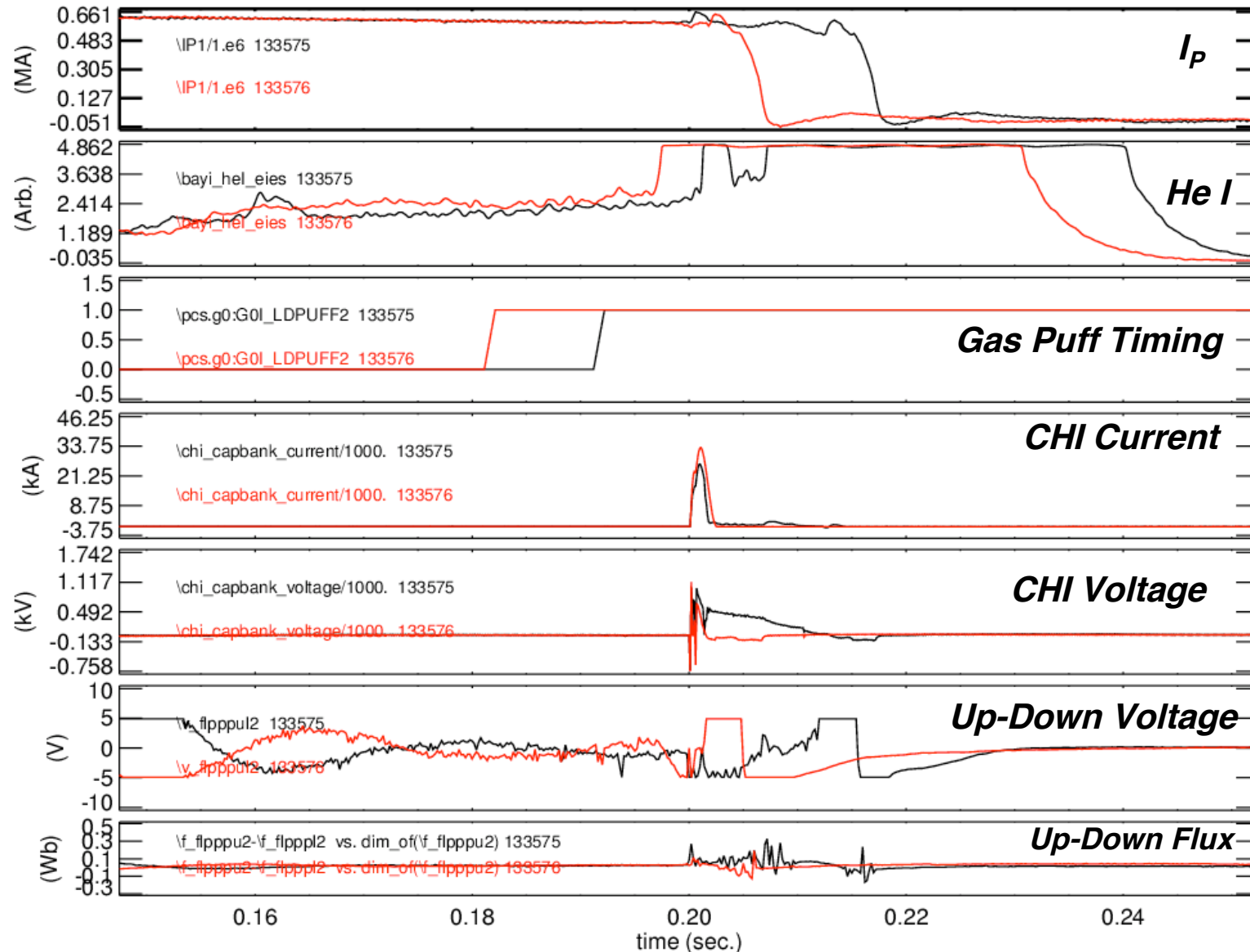


Culham Sci Ctr
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Overview

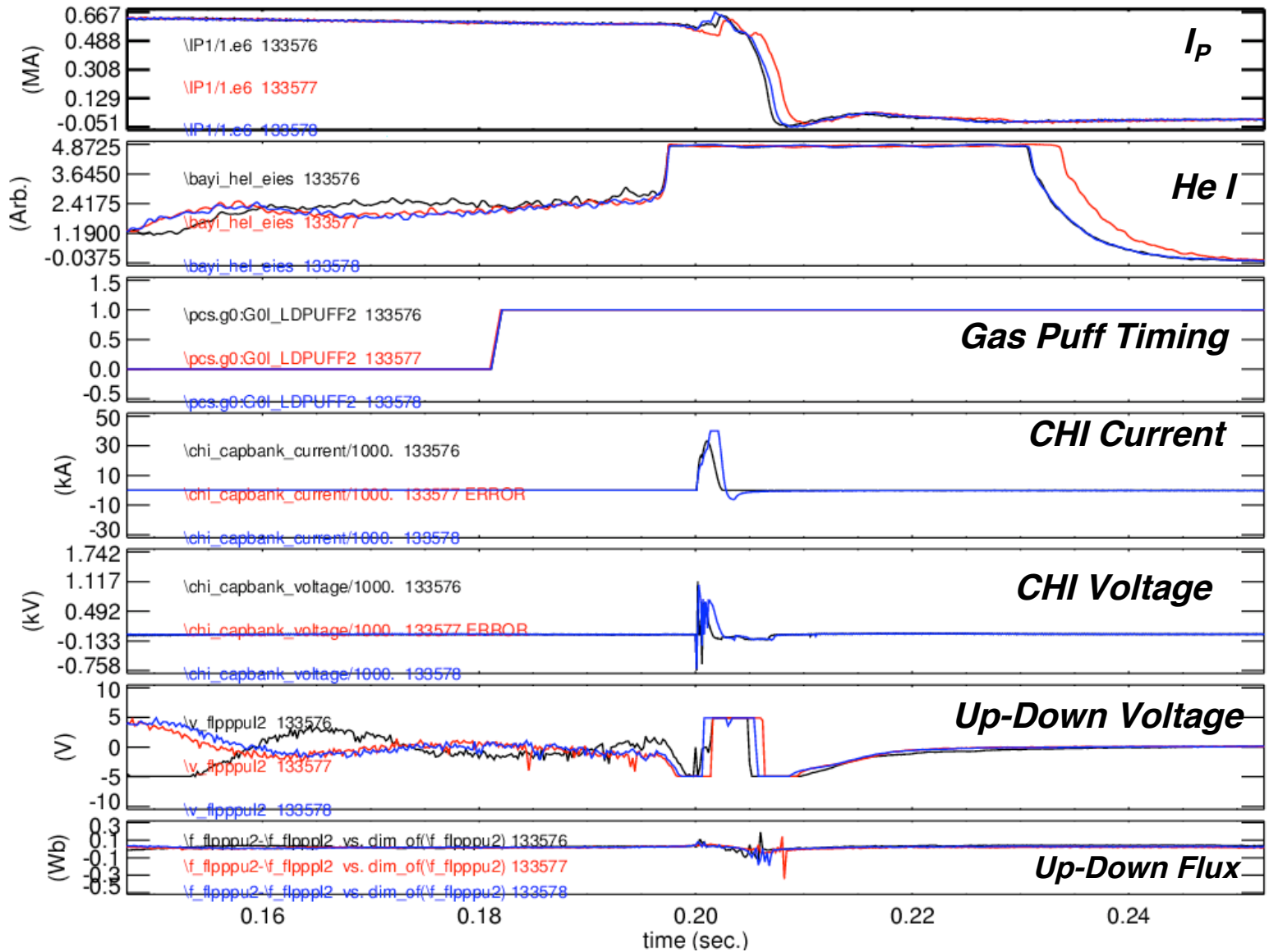
- CHI could be an effective way to rapidly shut down a tokamak discharge if a disruption was deemed imminent.
 - Could be faster than neutral gas propagation.
 - Could bring in heavy (radiating) impurities.
 - Could do so axisymmetrically.
 - Could drive stochastic fields, which may suppress the RE avalanche.
- 4 hour run on May 19th
- Injected Helium from the LDGIS, into D₂ discharge.
 - No HFS gas.
 - After this XP, Roger developed better discharges with only LFS gas, that might have been better.
- Big problem with absorber arcs.
 - Tried many things to eliminate these arcs, like pushing over the upper X-point, increasing the upper elongation, reducing the inner gap, increasing the injector flux.
 - These arcs cause power to be dissipated in the absorber region, instead of directing gas into the discharge.
- Did not achieve desired rapid shutdown.
 - Disruptions were of course achieved, but all were “slow” and vertically unstable.
- If we try again:
 - Consider using the PFAB coils for absorber arc suppression.
 - Revisit the target shot...might other shapes/gas/beams be better?

Tried to Optimize the Timing of Gas/CHI Gas Shut-Down the Plasma, CHI only “Tweaked” it.



CHI Voltage Doesn't Help With Shutdown...only the He

- 0 Capacitors
- 5 Capacitors
- 10 Capacitors



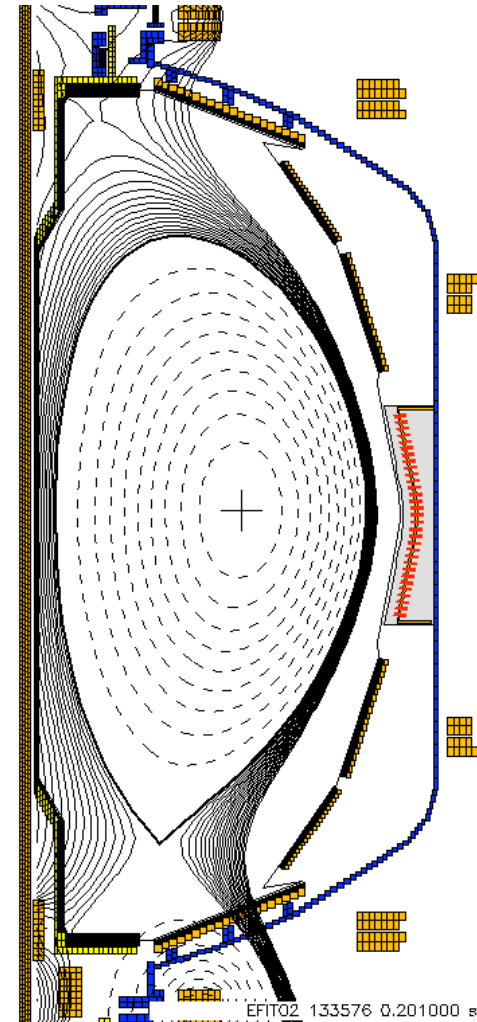
Magnetic Topologies Chosen In An Attempt to Suppress Absorber Arcs

Try to put the upper X-point in the absorber
(Upper Vessel Break)
However, there was always some connection
All cases developed absorber arcs.

Explains the inability of CHI voltage to modify the shutdown.

May have been limited by target discharge?
High I_i in this shot makes it become vertically unstable after not much time, forcing us to fire CHI early, when there are substantial eddy currents impacting the upper field null.

May need to try using Absorber Coils?



CHI Apparently Drives Helium Up More Rapidly

0 Caps

/p/nstxusr3/miro/2009/Miro_133577.cin at 200.859 ms



5 Caps

/p/nstxusr3/miro/2009/Miro_133576.cin at 200.810 ms



10 Caps

/p/nstxusr3/miro/2009/Miro_133578.cin at 200.875 ms

