

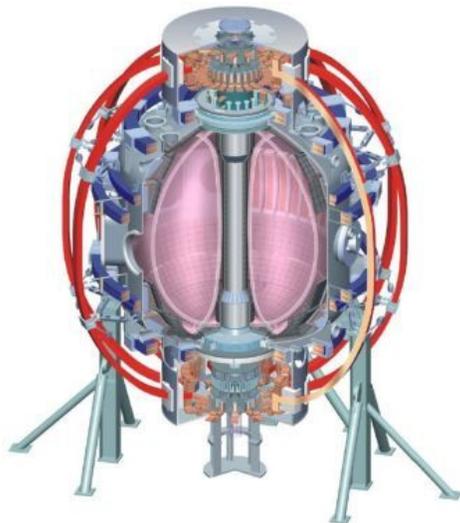
Initial results from XP 1004

Application of early error field correction to advanced scenarios

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**NSTX Physics Meeting
June 7, 2010**



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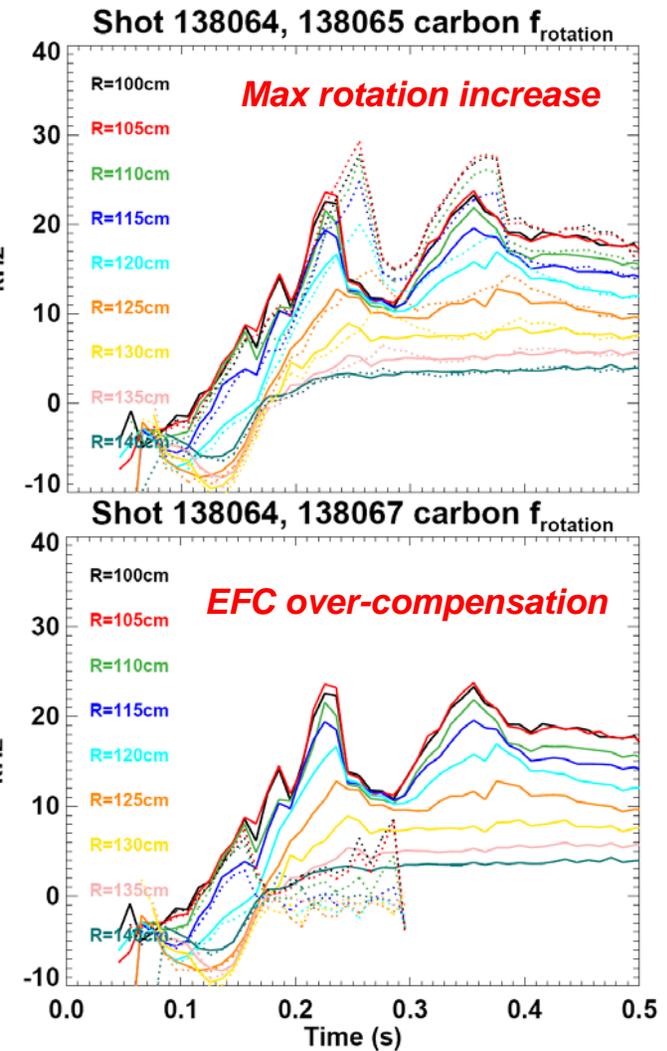
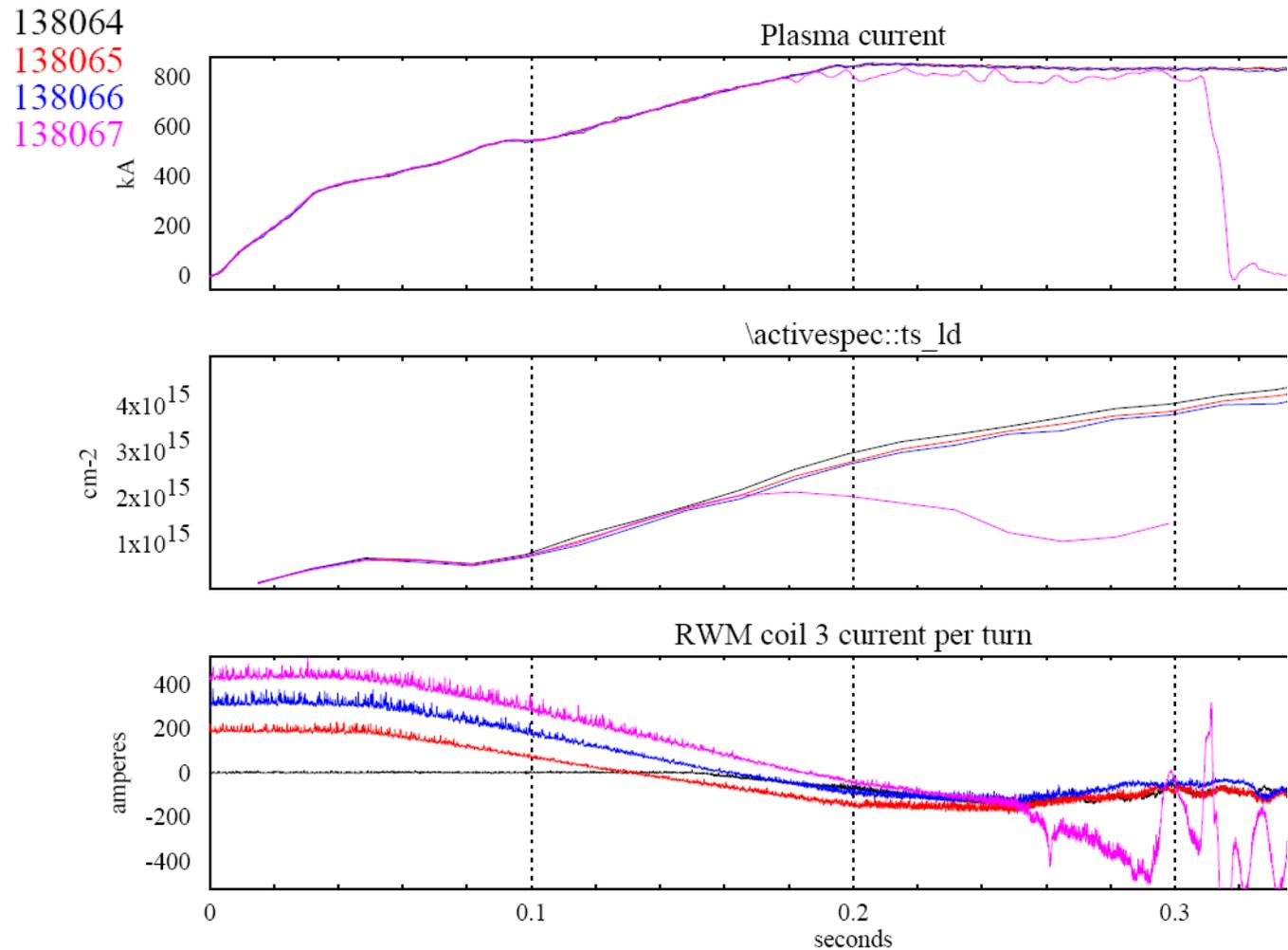
Shot Plan Completion

3. Experimental run plan

- A. Reproduce increased rotation w/ $n=1$ early EFC using fiducial or 700kA shot 135779 (4 shots) *Used fiducial*
- B. Scan EFC turn-on time, amplitude, phase to optimize EFC
 - a. Timing scan: -30, -20, -10, 0, +20, +40ms (5-7 shots) *Varied timing*
 - b. Amplitude scan: $\times 0.6, 0.8, 1, 1.2, 1.4$ (4-6 shots) *Varied amplitude*
 - c. Phasing scan: -30, -15, 0, 15, 30° (4-6 shots) *Did not vary phasing*
- C. Assess stability at low density with and without optimized $n=1$ EFC
 - a. Reduce density in 20% steps until LM disruption with $n=1$ EFC (8 shots) *Scanned density with and without EFC*
- D. Increase flat-top I_p and assess/optimize $n=1$ EFC
 - a. Scan EFC amplitude: $\times 0.8, 1.2$, etc. for 0.9MA, 1.1MA (6 shots) *Did not vary I_p*
- E. Assess impact of early EFC on breakdown by turning on EFC during OH pre-charge (2 shots) *Applied EFC during break-down for many shots*

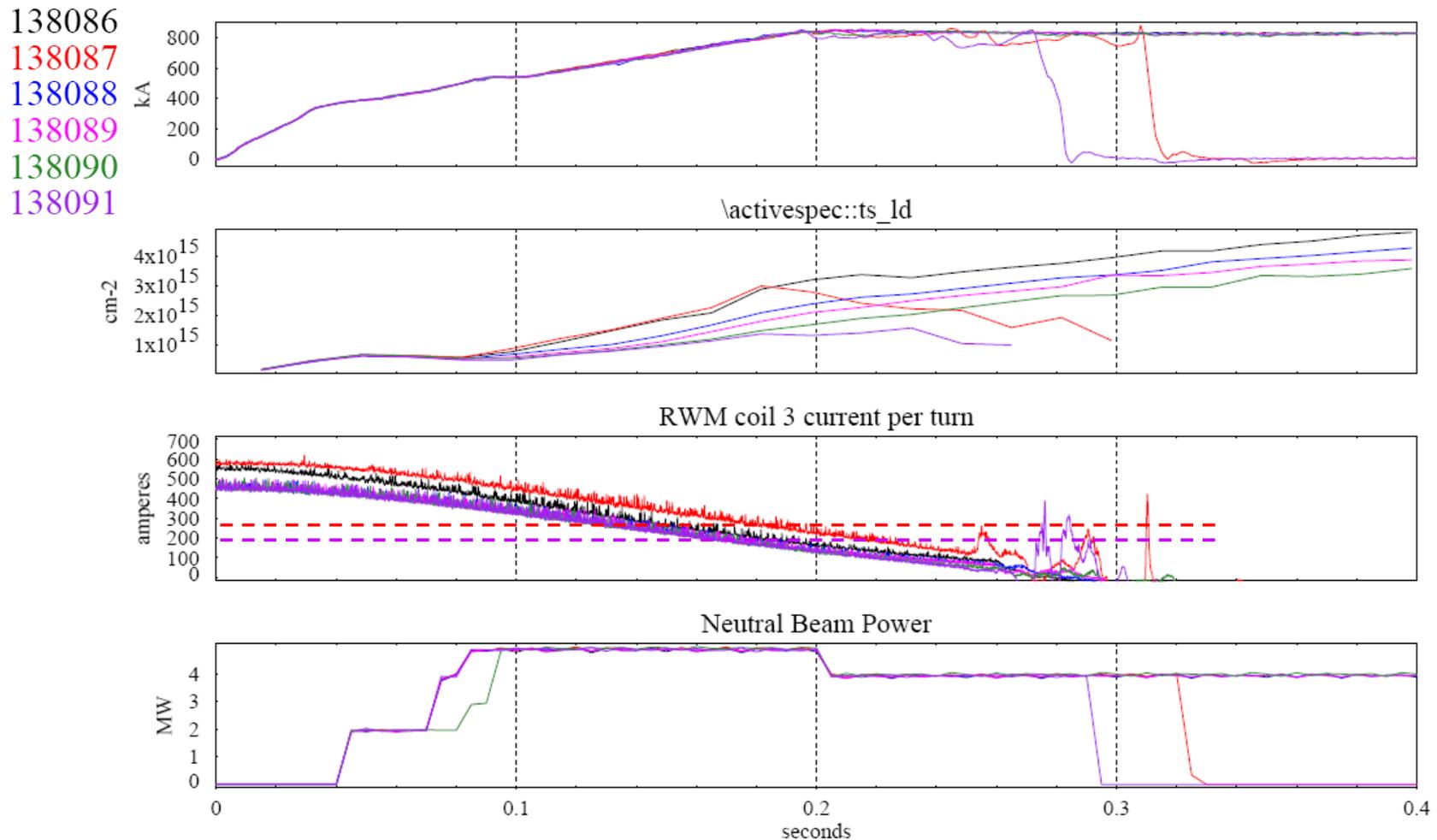
EFC amplitude scan determined values for increasing max rotation, and for EFC over-compensation (rotation reduction)

- Impact of EFC is measurable, but only 10-20% increase in rotation at best
 - NOTE: EFC is on starting from -50ms (through breakdown)



Density scan shows plasma is sensitive to EFC amplitude between t=100-200ms when density is reduced

- Density threshold for locking decreases by up to factor of 2 from over-compensated EFC → to near optimal EFC



Very carefully matched low density plasmas with and without EFC show EFC increases rotation 10-20% for t=120-180ms

- Delay of early H-mode by reduced early fueling reduces density by 30-40% at t=0.2s (vs. reference)
 - Similar to what typically happens with increased LITER evaporation

• **Additional EFC phase, amplitude scans might be able to further increase rotation at reduced density**

