Active field error correction at the MST poloidal gap

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Present scheme: passive correction
- 8 single-turn correction coils are fed by portion of poloidal field drive current
- Horizontal, vertical correction coils are driven by capacitor bank
- Passive system reduces field error but has wrong waveform
- Passive system is inflexible, optimized for particular type of discharge

Feedback system will replace passive correction
- 38 coils, 50 turns each
- Switching amps (20 kHz, 600 A, 450 V)
- Coils 100 uH, so 4.5 A / usec -- may be fast enough to correct spikes at sawtooth crash
- Need robust coils, access is difficult
- Analog processor couples 32 pickup coils to 38 drive coils, allows mode selection

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Conclusion and next steps
We thank Brian Nelson and the RFX group for sharing details of their feedback system

Acknowledgments
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MST Reversed Field Pinch

- Plasma current: 500 kA
- Discharge duration: 60 usec
- Best confinement time: 10 usec
- Typical ne = 10^15 m^-3
- Highest T_e = 800 eV
- R / a = 1.5, a = 0.52 m
- 50 mm thick aluminum wall with poloidal, toroidal gaps

Radial field errors cause problems
- Magnetic fluctuations may lock to gap errors
- Locked mode amplitudes grow, degrade confinement
- Radial errors at gap cause increased wall interaction, impurity influx

Initial tests use single coil, switching amp from HIT
- 28-turn coil of #4 1/4 Litz wire
- HIT amp: 20 kHz, up to 900 V / 800 A
- Feedback uses single internal sense coil

Coupling test shows correction field is localized

Simple filament current model gives approximate coupling coefficients