

Feedback Control for Absorber CHI Coils

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- Description of supplies
- Commissioning coils (at UW and PPPL)
- Phase I: Nulling fields at sensors
- Phase II: Controlling combinations of sensors

Power Supplies

H-bridge IGBT supply: max \sim 800 A at 1 kV CW. Multiple units can be run in parallel with common firing signals.

A feedback sensor (e.g., flux loop, B-probe, Rogowski, etc.) is integrated and compared with a function generator produced (negative) demand.

H-bridge firing signals are generated by a PWM controller to make the integrated sensor null the (negative) demand.

Fault detection for over voltage (V_{ce}) and over current

Feedback control system on HIT-II is faster than 1 ms.

Power Supply Construction and Commissioning

Parts are ordered and supplies are being constructed at UW. Simulations (SPICE, LRDIAG, and others) will be performed.

Initial testing will be at the UW into similar coils with a short time cap bank.

During this time Ron Hatcher will visit UW. Integration with the NSTX control and fault systems will be laid out.

The UW engineer Dan Lotz and Brian Nelson will assist during installation and commissioning at PPPL.

Will need to replace the UW PWM controller integrator with the longer time drift-free capability of the PPPL integrators.

Controlling Absorber Fields will be in Two Phases

Phase I: Nulling fields at sensors

Nulling the field at the sensors will simply use the UW PWM controller with a shorted demand.

Phase II: Controlling fields away from sensors

Nulling the field someplace inside the absorber would require an algorithm applied to several sensors (to be determined). The NSTX control computer will generate the PWM controller demand and/or feedback signal in real time.

This work will involve Dave Gates, Charles Nuemeyer, *et al.* Dennis Mueller suggests we test these algorithms on Ohmic discharges before use on CHI.

Summary

- Supplies being built, initial testing, at UW
- Integration and modifications for NSTX will be designed and implemented with visits from Ron Hatcher
- Installation at PPPL, with UW help
- Feedback control on NSTX in two phases: Nulling fields at sensors; then controlling combinations of sensors