NSTX

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NSTX-Upgrade Magnetics And Related Diagnostics

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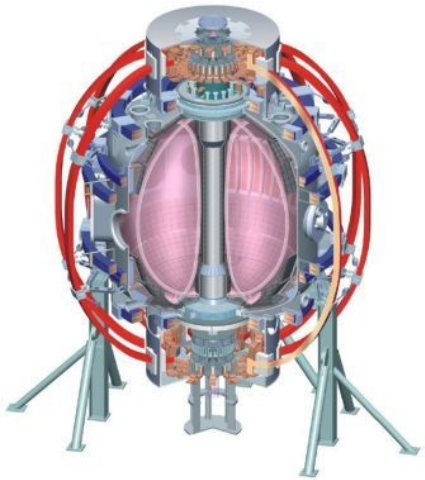
Basic goal is to restore previous functionality and support machine operations and protection.



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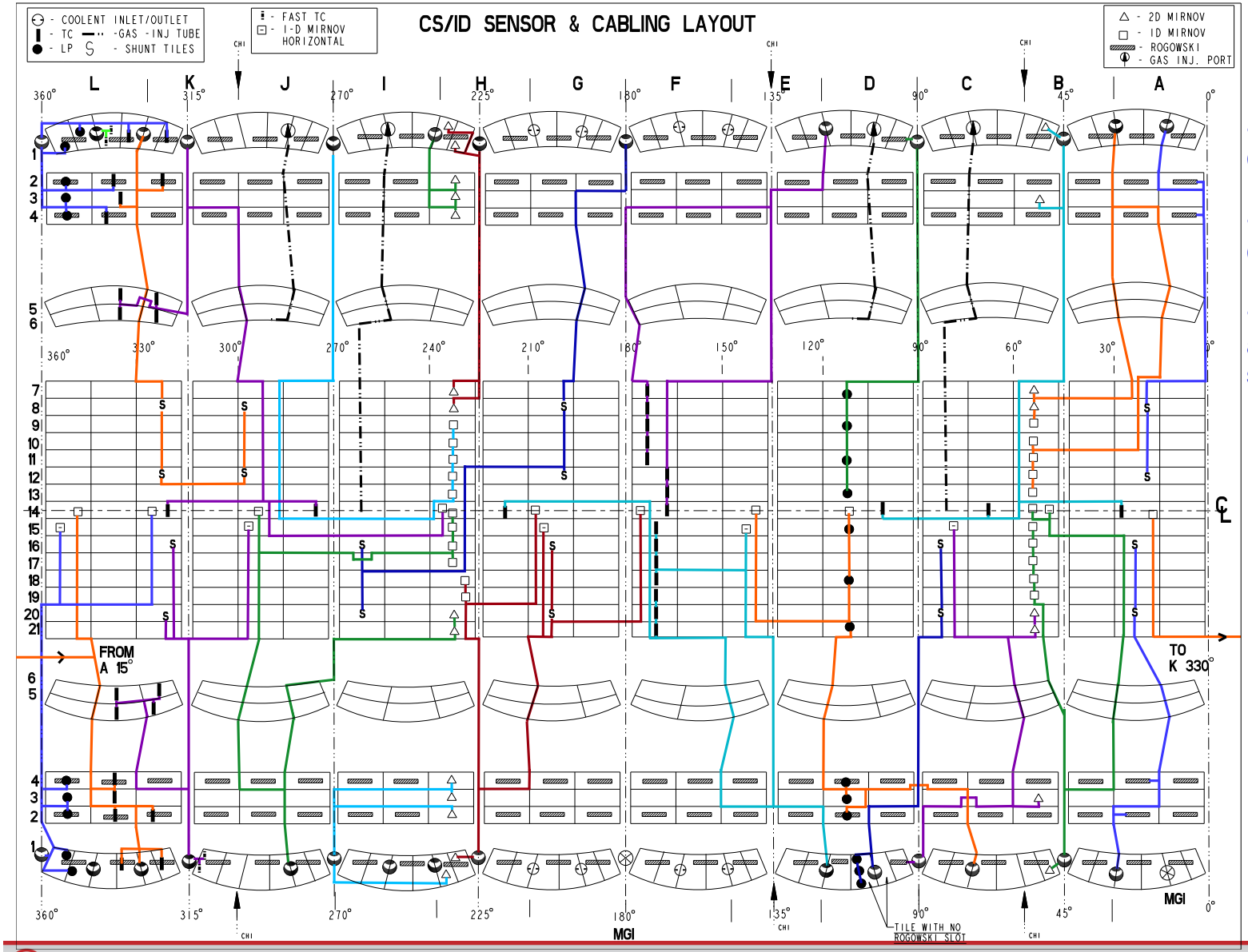
R. Kaita and K. Tressmer Have Lead Effort to Develop CS Magnetics Even Better than for NSTX



- 5 New B_T Sensors for CS midplane HCs.
- 18 CS shunt tiles for CS HCs.
- Additional poloidal array with 27 B_R and B_P sensors.

DCPS and Vessel Changes May Mandate Upgrades to the System

- DCPS = "Digital Coil Protection System"…realtime code calculating mechanical and thermal stresses/forces on coils and their mounting systems.
  - Rectifiers can make currents that can break the machine.
- High degree of redundancy is required in terms of both sensors and calculations.
  - Every current (coils & plasma), is measured two different ways
  - The measurements are compared, and if they differ, the shot is interdicted.
- As presently envisioned, loss of either of the two rogowskis would preclude further operation.
  - Rogowskis can fail in ways that mandate substantial machine disassembly for repair.
- *Can make a strong case that installing a 3rd Rogowski is appropriate.*
- Both rogowskis are processed through a single analog computer called the "I_P Calculator".
  - Common loops voltages, power supplies, data transmission,…for both rogowskis.
  - May need to add redundancy in these systems.
    - For instance, when flux loops are reinstalled, install 2 (pairs) instead of a single at each location.
- Must also add channels to I_p calculator system for additional linked divertor coils, and make modifications for changes to inner-vessel resistances.
- May need to add more flux loops, I_P calculator channels, for additional conducting structures in the new CS.
- Some of this is NSTX-U scope, some maybe not…I don't know.

NSTX-U magnetics must be considered in the context of the DCPS.

Grounding and Other Issues

- Desire to improve noise immunity for CHI, other operations. Two contributing factors are:
  - Long, fairly high-inductance ground connections for magnetics racks.
  - Multitude of diagnostics and other facility electronics mixed in with the magnetics.
- Would like to improve rack grounding.
  - Present ground both racks with #2 cables.
  - Would like to replace with bus bar.
- Cat. 3 racks moving to 119' platform, while Cat. 4 racks staying at 100' level.
  - Would like to connect Cat. 3 racks to inner vessel at the top of the machine.
- Want to eliminate intermixing of bolometers, stepper motor controllers, other electronics, with magnetics.
- Additional electronics needed:
  - Inner vessel: ~31 channels of new integrators, and a single SAD for bringing data to realtime system.
  - Outer vessel: None new, but some gains modified.

Diagnostics for Divertor/Halo/Hiro Currents on Outer Vessel Not Yet Specified

- FY-10/11 run had 12 shunt tiles and 4 LLD rogowskis.
  - Used for disruption, ELM, SOLC, HHFW studies.

See first content slide for inner vessel halo current measurements.

- LLD removal eliminates the rogowskis and 6 of the shunt tiles.

- Basic installation/restoration would be to restore 6-8 tiles per row, in each of rows 2,3, & 4.
  - Should be worked out with interested parties.