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Some Considerations on Discharge Shut-Down, Halo Currents, and n=1 Control

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and the NSTX Research Team

Meeting name
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Date

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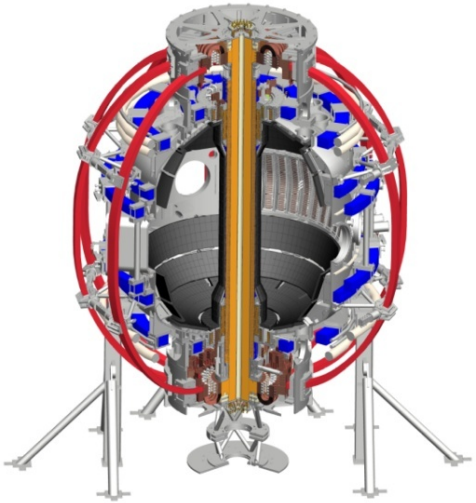
IPP, Garching
ASCR, Czech Rep



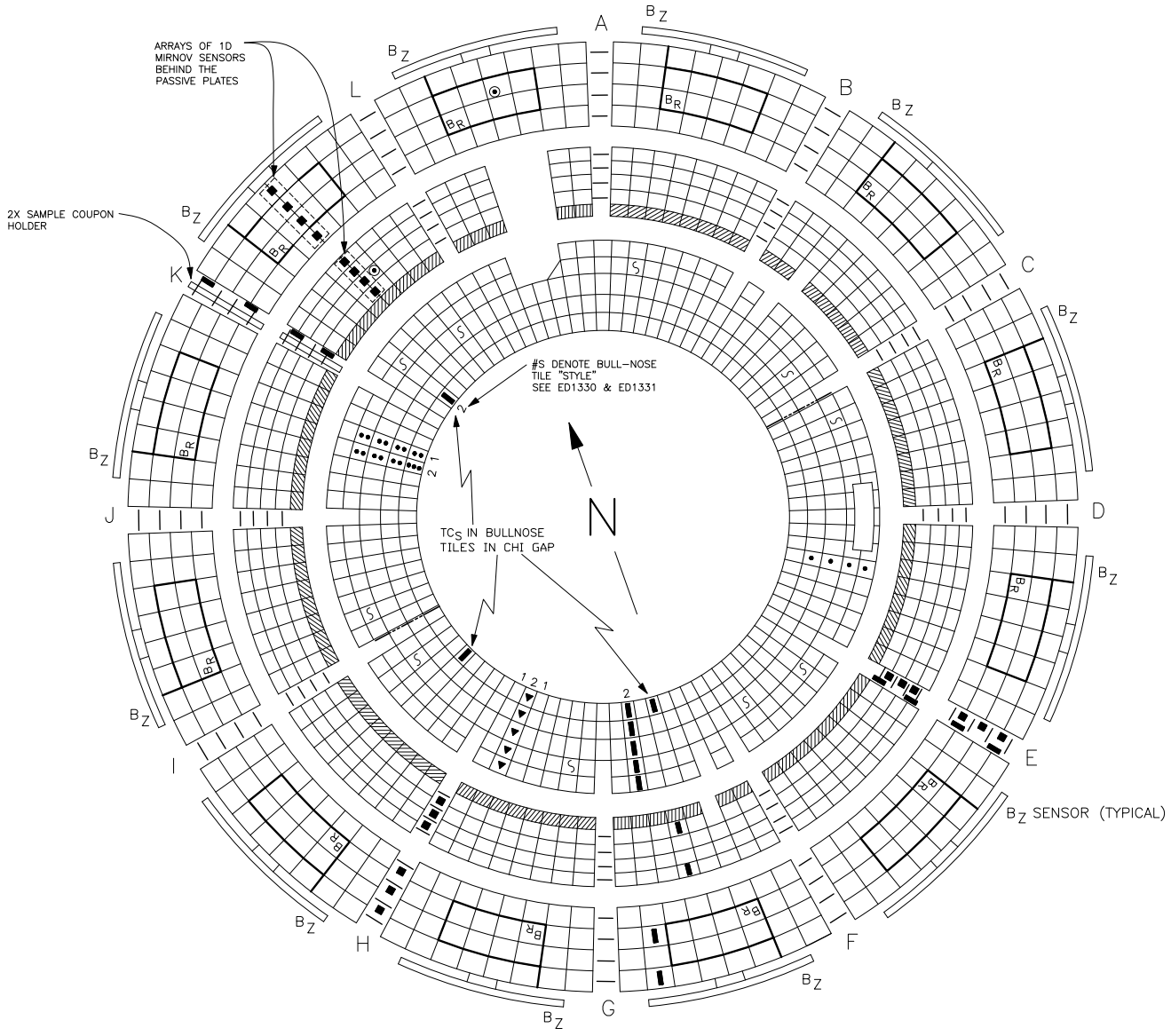
Automated Shutdown

- Had a peer review on a proposed discharge shut-down method back in Fall 2014.
  - Lots of feedback, including suggestions it was both too complicated and insufficiently complicated.
- Recall: my main goal is to define a system that will prevent significant vertical oscillations during disruption process.
  - I would be willing to accelerate the current quench in order to keep the plasma centered.
- I have defined a much simpler discharge shutdown system.
  - Idea is that it would run in the background all the time, even if a more sophisticated PAM system was trying to keep the plasma alive.
  - Primary actions (as presently envisioned): ramp down the beams and plasma current,
  - Secondary actions: turn off the S.P. controllers, go inner wall limited.
- Operate in the system category, so that it does not get in the way of any future “PAM” category.
  - Would run in the background while those are being developed.
- I believe that this should be commissioned in the first month of the run if at all possible…XMP-XX.
  - We want this to avoid DCPS trips if at all possible.

Halo Currents

- Sensors Installed:
  - 10 shunt tiles in the outboard divertor

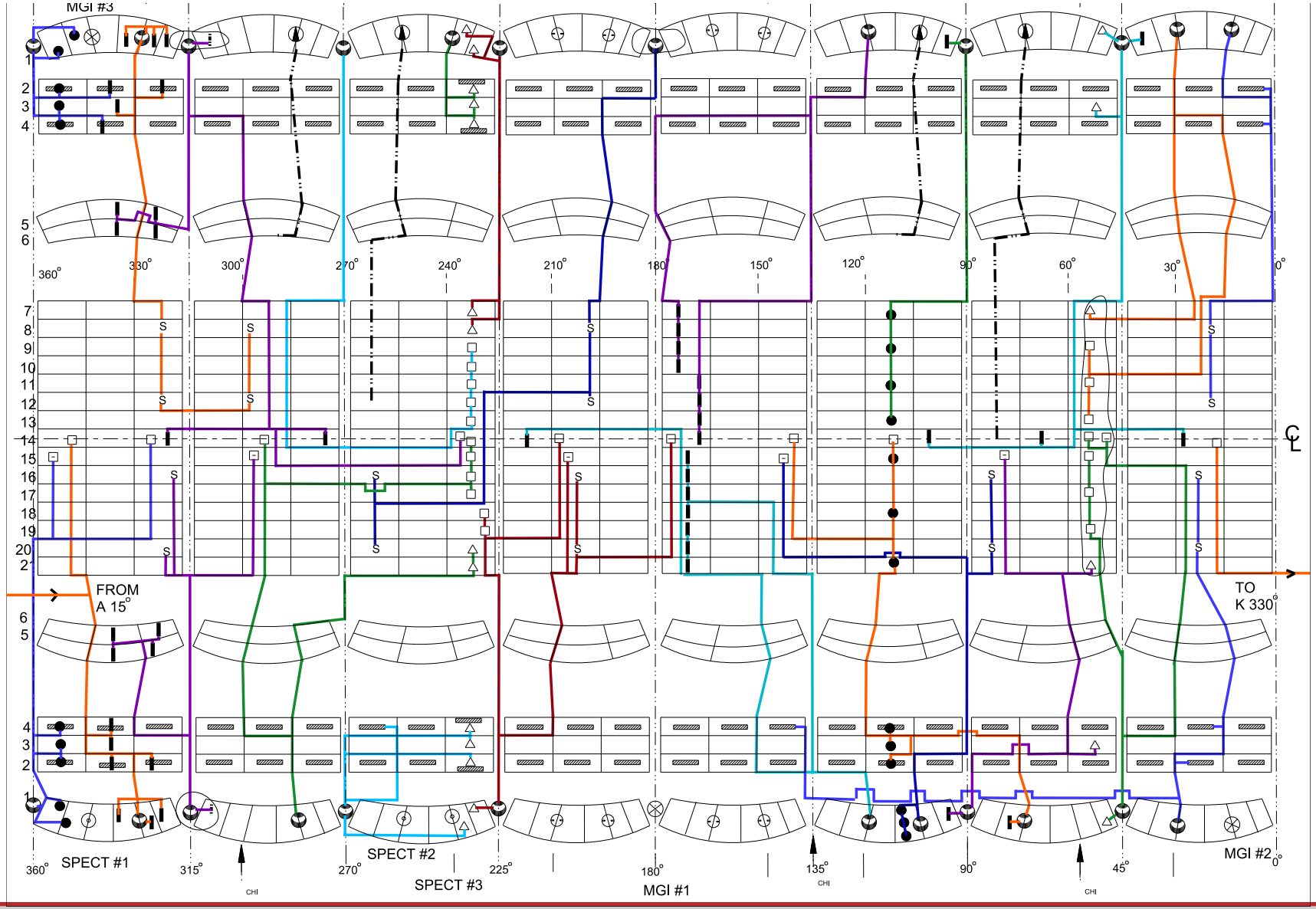
Lower Divertor Tiles-S



Halo Currents

- Sensors Installed:
  - 10 shunt tiles in the outboard divertor
  - 12 shunt tiles on the center column.
  - 5 “tilted Mirnovs” on the CS at the midplane.

CS Shunt Tiles - S



Halo Currents

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  - 10 shunt tiles in the outboard divertor
  - 12 shunt tiles on the center column.
  - 5 “tilted Mirnovs” on the CS at the midplane.
  - But, don’t at present have the electronics to process them all.
    - Need to work on that
- Sensors on CS motivated by question of non-axisymmetric halo currents on the CS.
  - JxB forces obviously have potential to be highest on the CS.
  - If the halo currents are non-axisymmetric, can lead to large sideways forces.
    - Note: NSTX-U has some shims installed at the top of the vessel to attempt to prevent bending of the CS.
- Is not clear that we need any XP/XMP for these, but we should aim to collect this data.
  - I hope we will see a reduction in HCs when the shutdown automator is on.

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Proportional RWM Control with 6 SPAs

- 6 SPAs were demonstrated functional the day before the TF failed.
  - I believe we will re-demonstrate their functionality in the ISTP just before the run.
- In looking back I found that I had OP-XMP-72 “Software Test for n=1 RWM and Error Field Control with 6 SPAs”
- Probably need to actually run this or something similar.
- Prerequisite:
  - Off-line RWM analysis software demonstrated functional.
  - Sensor compensations and mode-ID demonstrated functional in on-line code.
  - Probably plan to do this in the 4^{th}-6^{th} week of the run. (?)