WBS 3 Diagnostics

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NCSX Project Meeting

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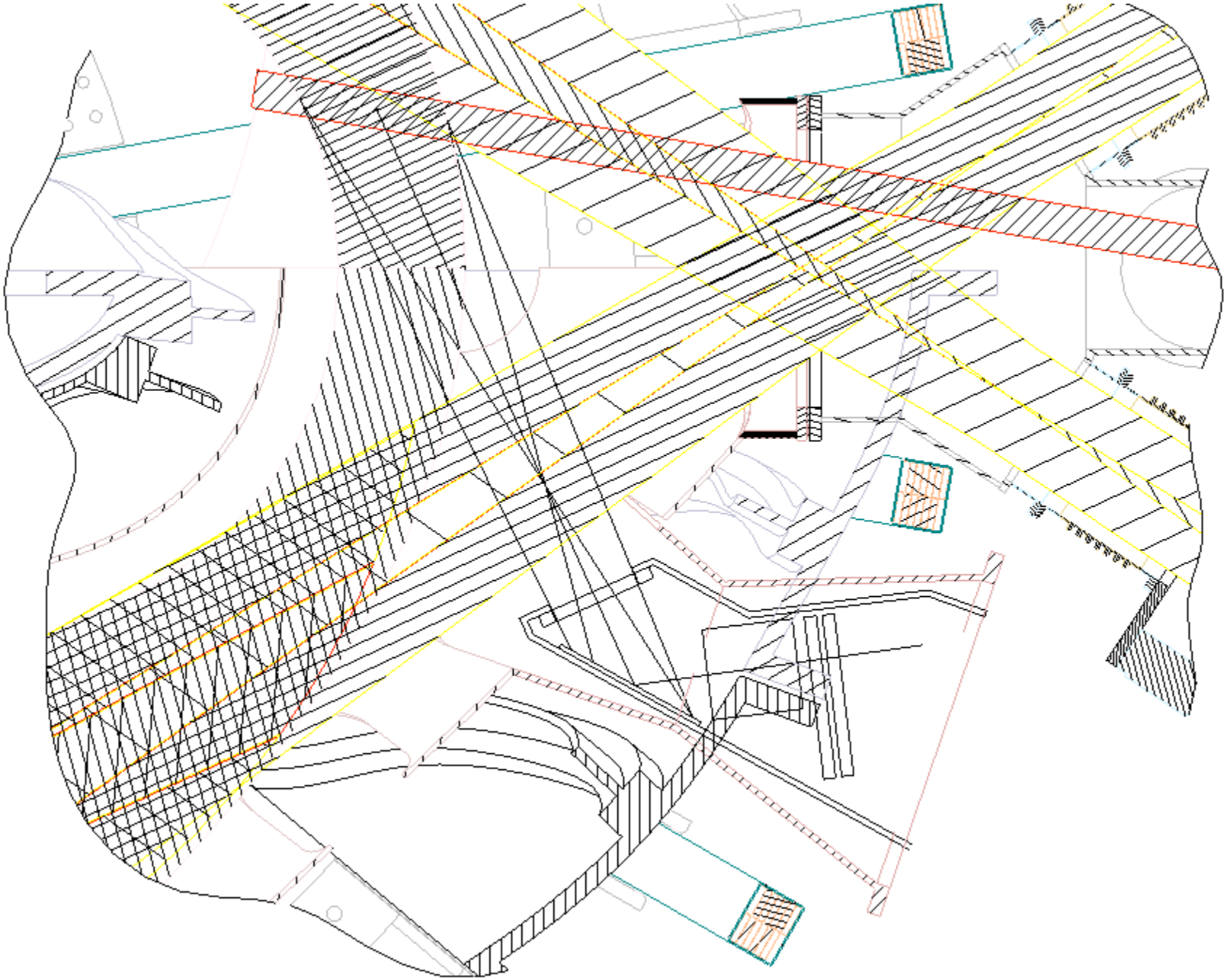
WBS 3 Elements in FY03

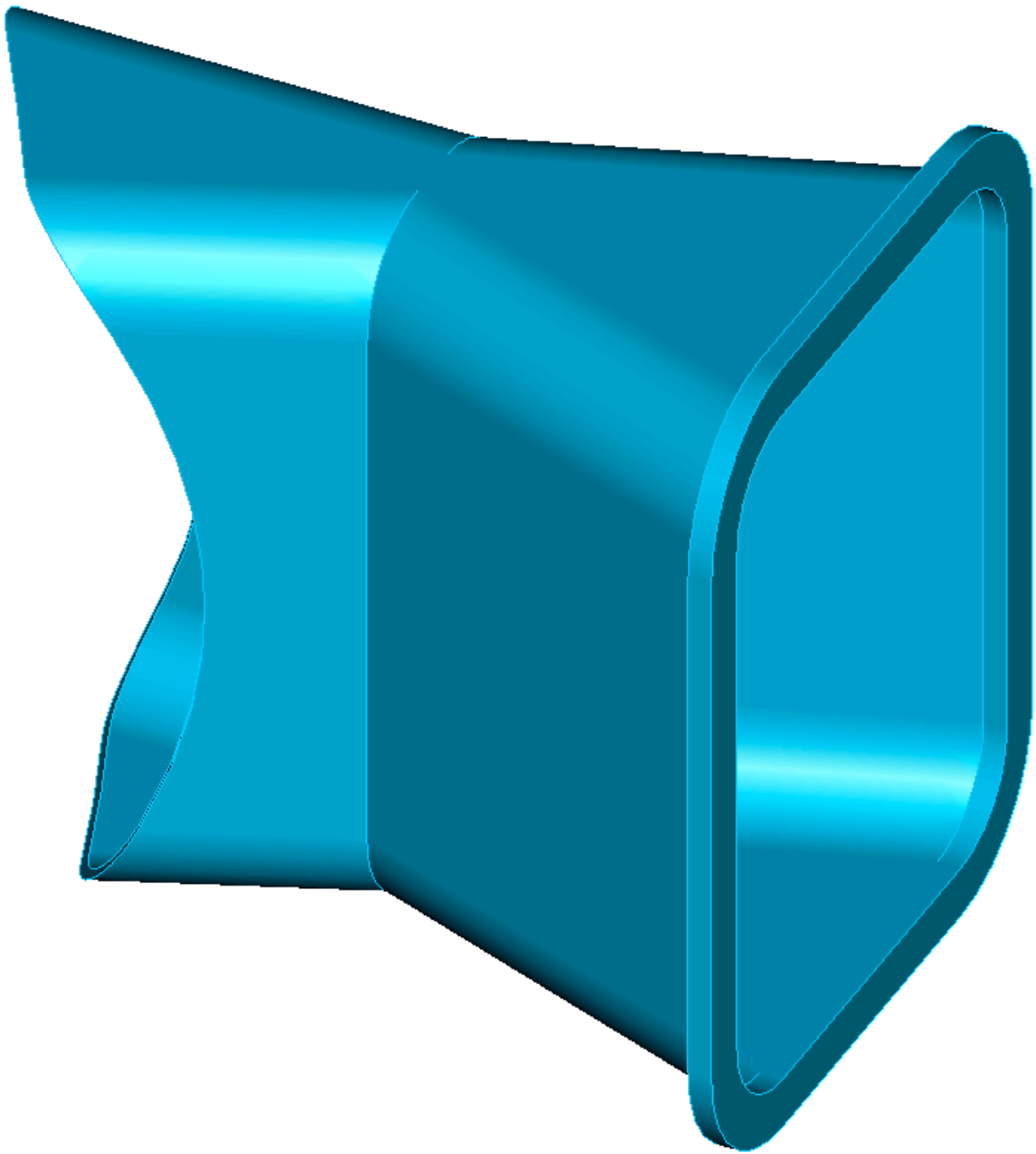
- Port configuration definition
- Magnetic sensor definition
- e-beam concepts

Port Configuration Definition

- Optimized viewing ports for CHERS/MSE are being considered (R. Feder to report on progress in engineering meeting next Wednesday, 3/27) New design will have some cost impact.
- With recent changes in vessel and modular coils, M. Cole has preliminary port arrangement. Will likely want to mount some ports with axis normal to vessel surface rather than aimed at machine center.
- At current rate, port orientation optimization will likely need to continue beyond PDR.
- Large vertical ports at beam positions will be in high demand by diagnostics, divertor components, and PFC heating/cooling tubes. Is there a problem accommodating these needs? Will generate scope sheets requesting information from other WBS's.



SECTION A-A



Magnetic Sensor Definition

- Ed Lazarus has completed an assessment of equilibrium magnetic sensors specifying the type and an upper limit on the number needed. Draft ICD in circulation.
- Numbers are larger than originally anticipated. Will have to await outcome of ongoing numerical optimization (~ 1 year) before final count is known.

Type	**Location**	**# Instrumented**	**# Spare**	**Purpose**
coil flux	co-wound loops	50	50 -- 150	discharge programming
coil current	shunt or Rogowski	50	0	external field
saddle	loops on outer VV	132	132-264	equilibrium
B_C	coils on inner VV	132	132	equilibrium
shell saddle	loops on shells	36	0	error field
Rogowski coil	1 inside, one outside	2	2	equilibrium
diamagnetic loop	?	2	2	equilibrium
Total		**404**	**> 318**	

Magnetic Sensor Definition (cont'd)

- If this number of sensors is needed, cost in WBS 31 will increase significantly. Originally we were planning for ~ 100 sensors.

- Larger number of cables and digitizer channels will also drive costs higher in power systems (for cabling/trays) and central I&C (for digitizer channels), respectively.

- Also need to consider impact to assembly schedule of mounting a large number of precisely located sensors on inner and outer vessel, and routing and securing leads and terminations.

Magnetic Sensor Definition (cont'd)

- Many interface issues have been discussed:
  - J. Chrzanowski on loops co-wound with modular coils. Draft ICD completed.
  - Mike Kalish on loops co-wound with PFs, solenoid, TFs and trim coils. Draft ICD completed.
  - Paul Goranson on space envelopes and mounting strategy for loops on outer vessel, compatible with heating/cooling tubes started. ICD in draft.
  - Need to further discuss space envelopes, mounting strategies and lead routing and termination on inner vessel surface with Paul.

- Brent Stratton is leading an effort to examine candidate cable types and termination techniques. He is in contact with other groups and with cable manufacturers regarding candidate designs.

- Eric Fredrickson will define space requirements for fast Mirnov coils that are also mounted on inner vessel surface.

e-beam Mapping Definition

- In order to proceed with design concepts for the e-beam mapping system, requirements need to be defined.
- E. Fredrickson and H. Takahashi will lead an effort to better define these requirements.
- Simulations of various scenarios will be needed. Will likely need help from L.P. Ku and others.
- Hope to bring this work to CDR level by end of FY03.

Primary Goals of Next 4 Weeks

- Complete definition of space envelopes for magnetic sensors.
- Continue to refine concepts for mounting, routing leads, termination, and feedthrus on inner and outer vessel surfaces.
- Provide guidance on port locations and orientations. Update port map.
- Complete study of feasibility of optimized CHERS/MSE type port.
- Prepare for reassessment of cost and schedule.