PXIE CAD and Mechanical Systems Update

PIP-II Meeting, 24-Feb-2014
C. Baffes of behalf of:

PX Doc DB ID: Project X-doc-1354
PXIE Mechanical Systems Update

- CAD Status
- PXIE/CMTF Mechanical Systems Update
- PXIE Cryo Distribution
CAD Status

• Top-level models have been stable since October drafts

• CAD work visible at the top level has been concentrated in the details of LEBT, RFQ and MEBT
LEBT CAD Work

- Detailed CAD model in step with evolving design
- Upcoming work
  - Beam stop design
  - Bend incorporation

Andrews, Hamerla, Snee
RFQ CAD Work

- LBL CAD model (solidworks) near completion
  - Stand design just reviewed and finalized
  - LBL water manifold design still needed
  - Update for top-level PXIE models requested
MEBT CAD Work

- Focused on RFQ commissioning
- Phases of RFQ commissioning modeled in separate arrangements

Alvarez, Baffes, Chen, Jones, Oplt
System-Level CAD Work

- Top level PXIE models being maintained by TD design group, with draft pdf drawings generated periodically.

Coghill, Kurnat, Wesseln
System-Level CAD Work

- Near-term updates planned
  - RFQ update
  - RFQ cooling system
  - Cryo reconfiguration?

- Hope to incorporate these updates in March and publish draft drawing update in April

Coghill, Kurnat, Wesseln
• Lab-wide P&ID study is ongoing

• Current PXIE P&ID work
  • Proceeds as dictated by cognizant engineers
  • AutoCAD schematics
  • Simplified 3D representations in NX
Schematics – Vacuum

- Vacuum schematics being done in NX
- Schematic overlay on projection from 3D model is convenient on current small but highly-branched systems

Baffes, Chen
PXIE Mechanical Systems Update

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Mechanical Systems - Fluids

- Most work is focused on component-level tasks, as reported in other presentations

- CMTF LCW
  - Chiller received, awaiting concrete pad
  - LCW piping in construction
    - Pumproom work to wrap up in 1-2 weeks
    - Distribution to PXIE expected in ~2 months
  - LCW will run at ~28C (~83F) to accommodate RFQ circulator operation
• Vacuum hardware for Ion Source + LEBT is in operation
• Vacuum hardware for RFQ is ready for installation
• Vacuum for other sections is being developed, along with the progress of the project.
PXIE Mechanical Systems Update

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Background

• “Baseline” cryo distribution enters cave near ion source, then runs along the floor at the East wall.
  ▪ Area is congested with water piping, and design of RFQ water distribution is becoming complicated.
  ▪ No accepted solution for 8” cryo relief headers

• Have been investigating alternate routings for distribution and relief lines
  ▪ Initial iteration (with only modest impact to cave layout) did not pass muster in radiation assessment
  ▪ Motivates us to consider more invasive solutions
Possible Alternate Routing

Routing Shown in Following Slides
Possible Alternate Routing
Possible Alternate Routing

Cryo distribution

Relief lines (2) and He Suction

BEAM
Possible Alternate Routing

Does not affect design of roof layers

Significant bump-out to East of existing cave
Penetration Details – Plan View

A few blocks are just outside of crane coverage (OK)
Penetration Details - Section

3’ wall thickness preserved outboard of penetration

Beam Out of page
Implications to facility

Shielding requires almost all space available between building columns
- 3’ aisle is preserved
- Space for chopper racks and chiller is affected
Installation Plan

East supplemental shielding installed early

Darker section of piping indicates prefabricated section craned into slot

Covering blocks (not shown) can be craned in over piping

Field weld locations are accessible
Rough Penetration Assessment (T. Leveling)

- Spreadsheet calculation suggests proposed implementation is OK
- To be verified in future MARS analysis w/ ability to assess multiple adjacent penetrations

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<th>Area 2</th>
<th>Length 2</th>
<th>Attenuation</th>
<th>Dose Rate</th>
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Proposed changes to PXIE Cryo Routing

• Changes to cryo routing offer significant benefit
  ▪ Alleviates potential interferences
  ▪ Provides solution for relief headers
  ▪ Facilitates parallel cryo installation and MEBT commissioning

• Preliminary “Oks” from shielding, cryo and facilities folks

• Open Issues
  ▪ Need to make sure chopper hardware accommodated
Proposed changes to PXIE Cryo Routing

- Timing of implementation
  - Proposed solution is invasive to existing East cave wall
  - Modifications would best be made this spring, before RFQ delivery
  - Must reach resolution relatively soon
Questions/Discussion?