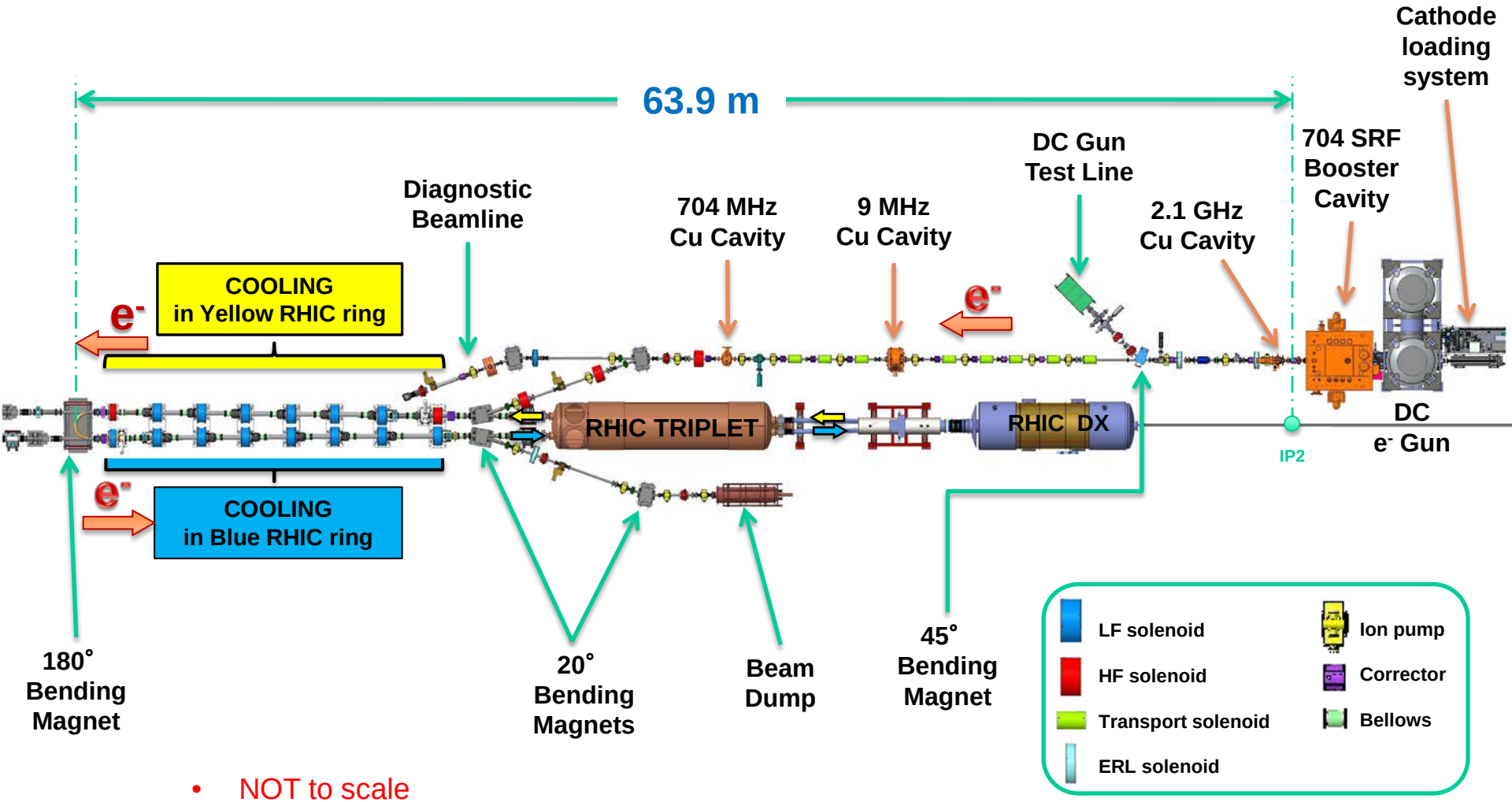
LEReC layout*



- NOT to scale
  Karim 9 14 16

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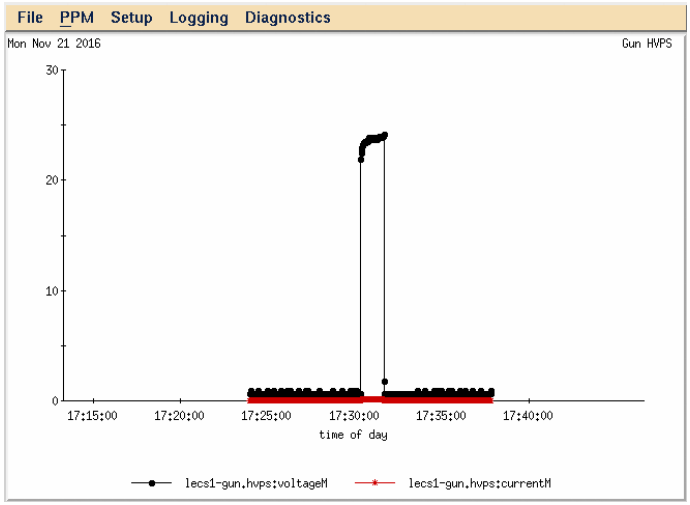
DC Gun Conditioning

- Water pump fault prevented power supply test
- Also some issues with controls wiring



Today

- Water group to repair water system
- Fix wiring issues
- Begin PS test again – sweep tunnel at 4:15 pm

Tomorrow

- Remove SF6 – install DC gun to HV resistor if time allows

Monday

- Install DC gun to HV resistor if time allows
- Start DC gun conditioning – sweep tunnel at 4:15 pm

Cost and Schedule Review 11/16/2016

Production/Fabrication/Installation schedules complete

Final Review before sending to DOE

- Complete update of schedule underway now.
  - **a) Complete to end of project**
  - **b) Completed Sept 28, meeting with system leaders**
  - **c) Preliminary discussion with G. Capps**
  - **d) Send to DOE (G. Capps) for review October 21**

- ***Update cost estimate to complete.***
  - **a) Calculate earned value on procurements to date**
  - **b) Identify cost overruns and determine contingency needs**
  - **c) Goal to complete October 15, Update Risk List**
  - **d) Send to DOE November 1**

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Critical Dates

- **DC Gun conditioning at Cornell underway 10/3/16**
- **DC Gun Arrival at BNL 10/18/16**
- **LEReC Cost and Schedule update 10/3/2016**
- **DC Gun conditioning underway ~~11/2/16~~ ~~11/10/16~~ 11/22/16**
- **DOE Review 11/16/2016**

DOE Review Photograph Wishlist – 11/17/2016

a. **DC Gun installed, conditioning**

b. **DC Gun line stands** and beam dump installed

c. 45° magnet, solenoids, quads, halo monitor, LE profile monitor

~~*d. Cathode transfer system in place*~~

e. **Laser optics tables installed in tunnel, 1002F back in place**

f. 1002D: **Power Supplies and Diagnostic Electronics installed**

g. Cable trays installed, ~~pulling cables~~

DC Gun

- Conditioned for operations 12/29/16

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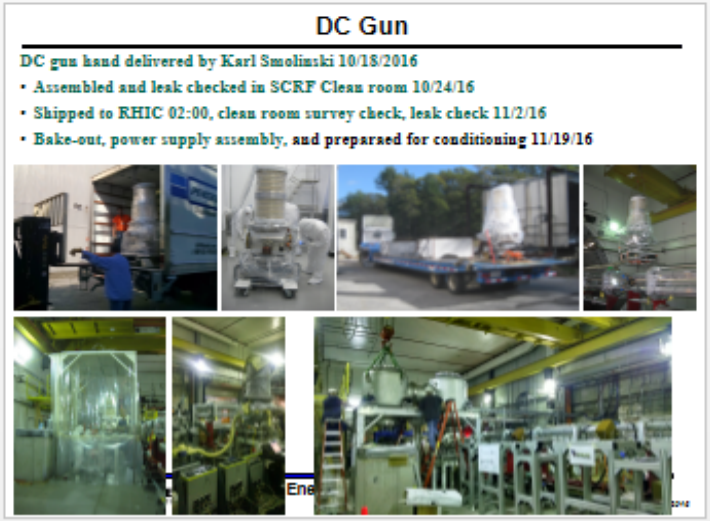
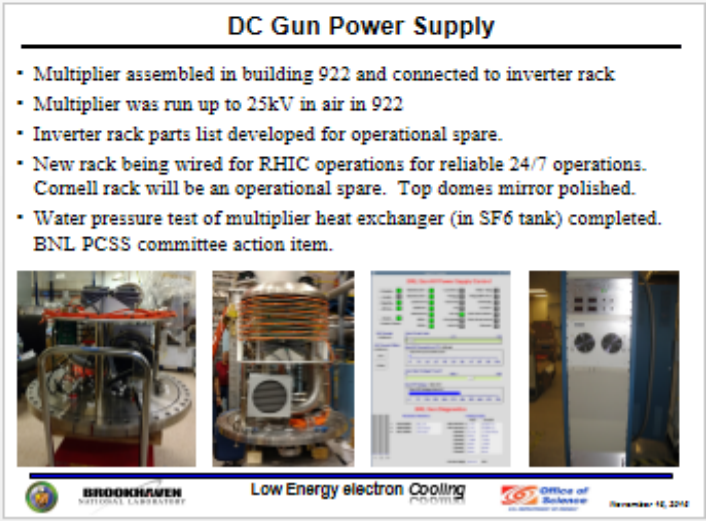
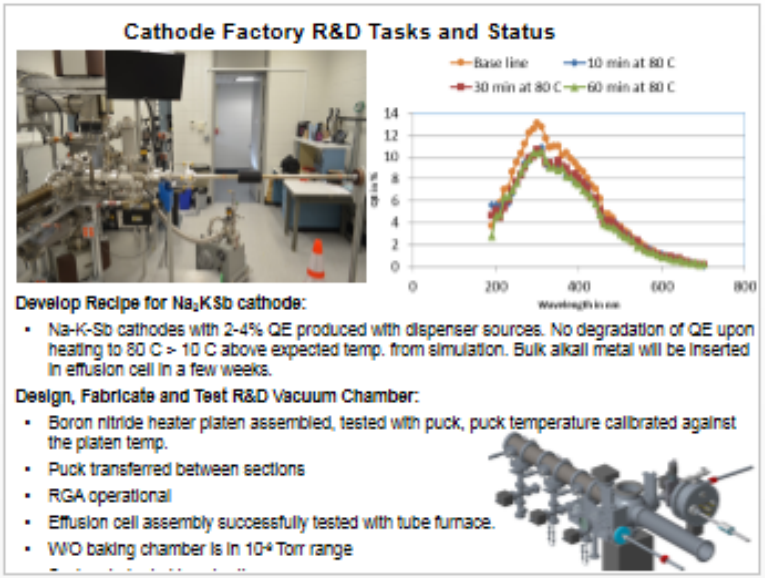




Cathodes and beam line



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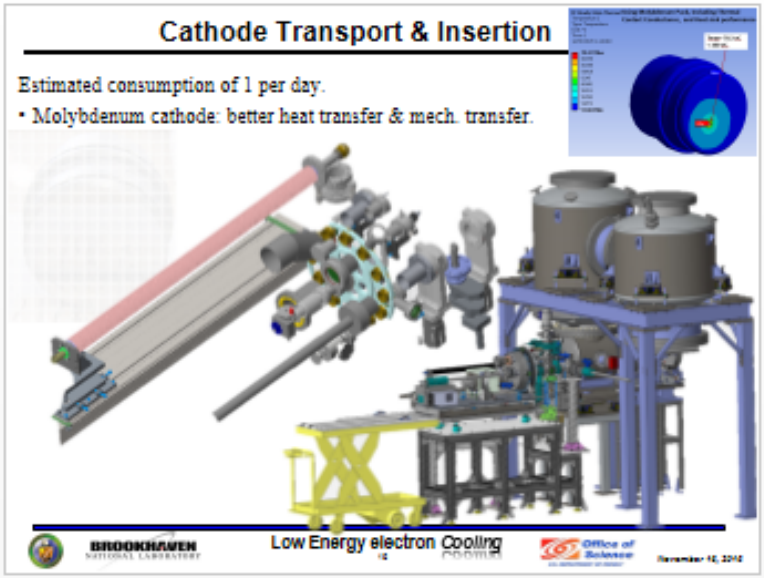

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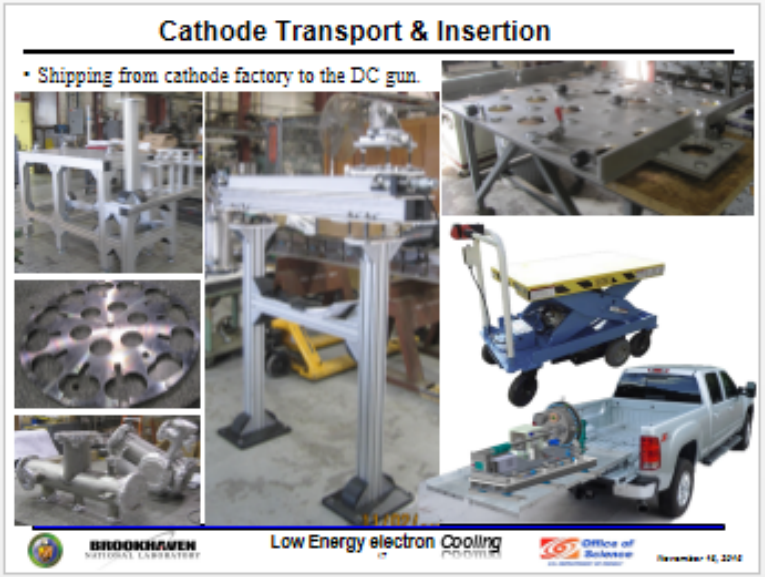
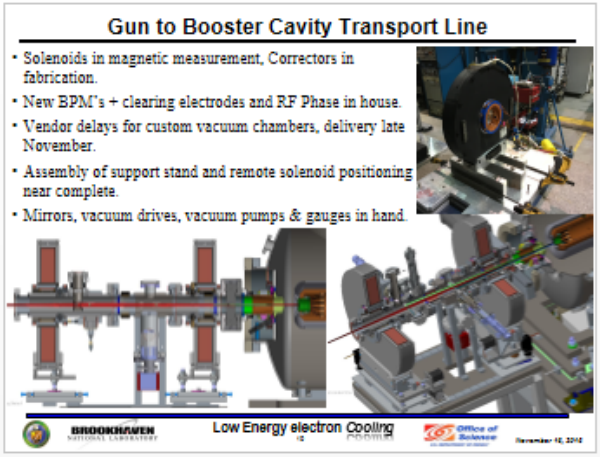


- Unique cathode transport system, should review design with other laboratories
- Tight schedule for installation, resource (staff) availability

Beam Line Components

- Tight schedule for installation, resource (staff) availability
- Late parts delivery – expedite delivery



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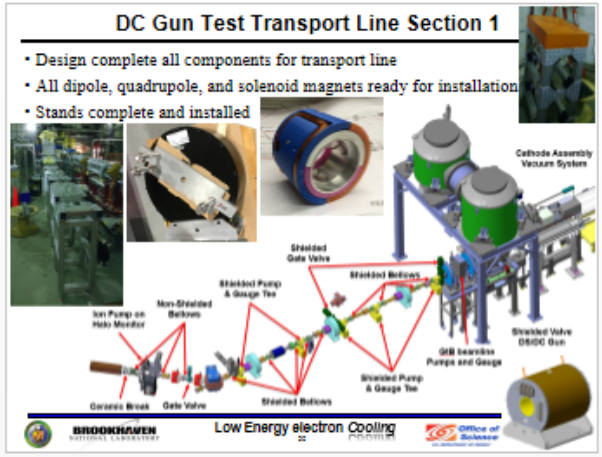

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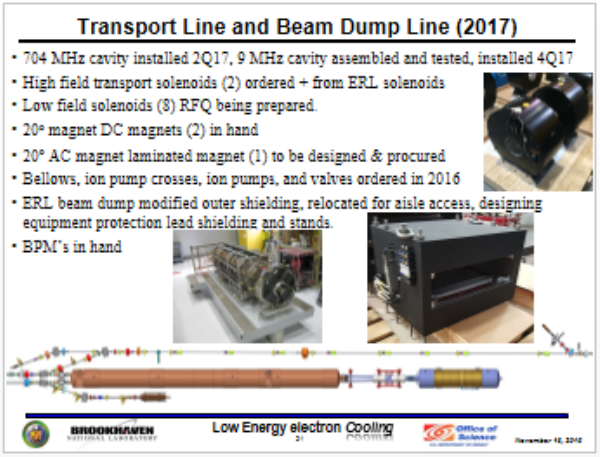

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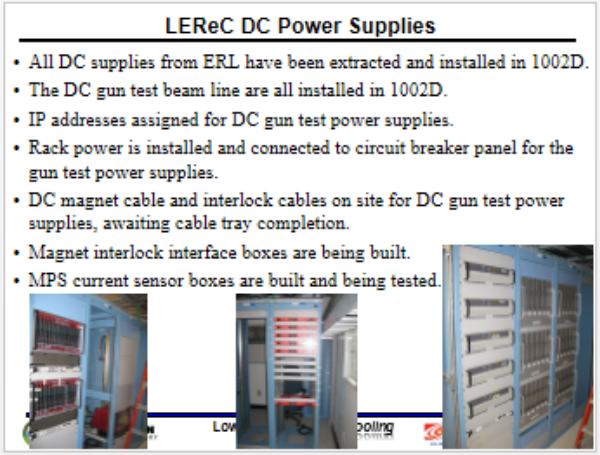

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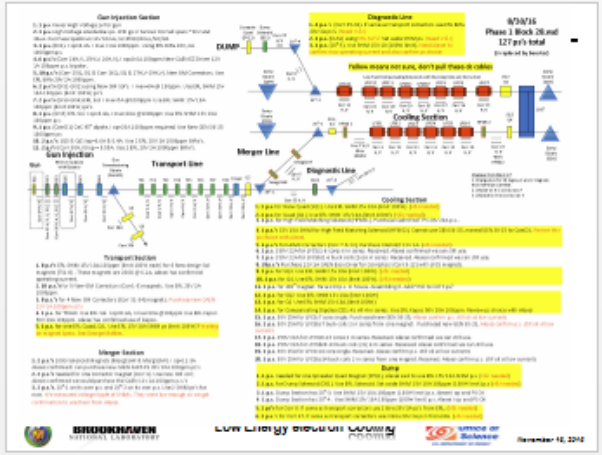

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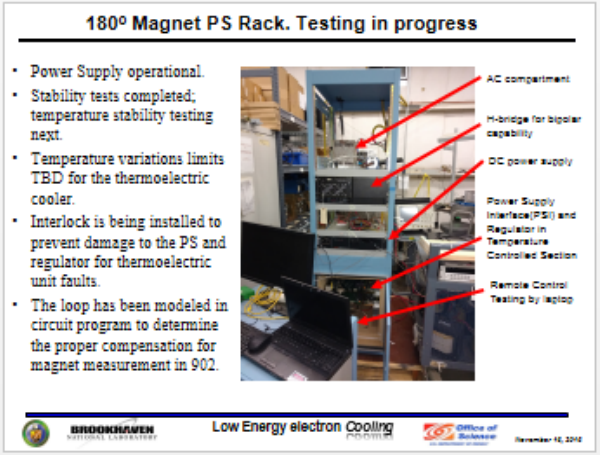

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Cryogenic Systems

- On time component delivery, resource (staff) availability

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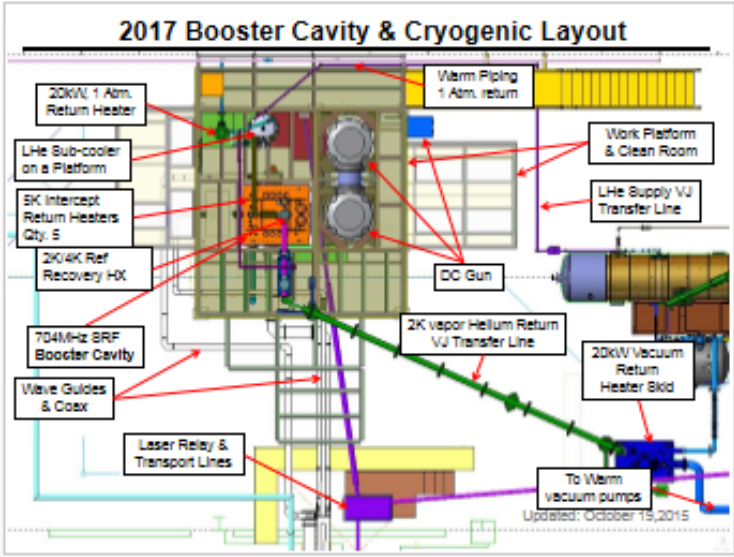

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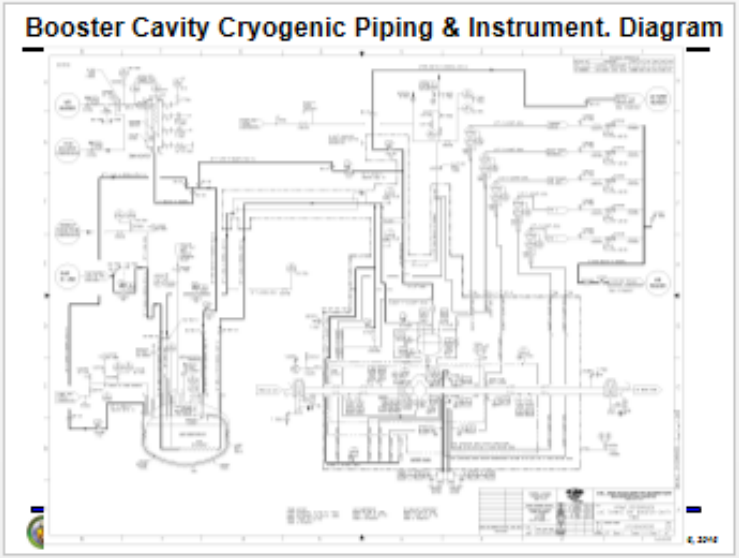
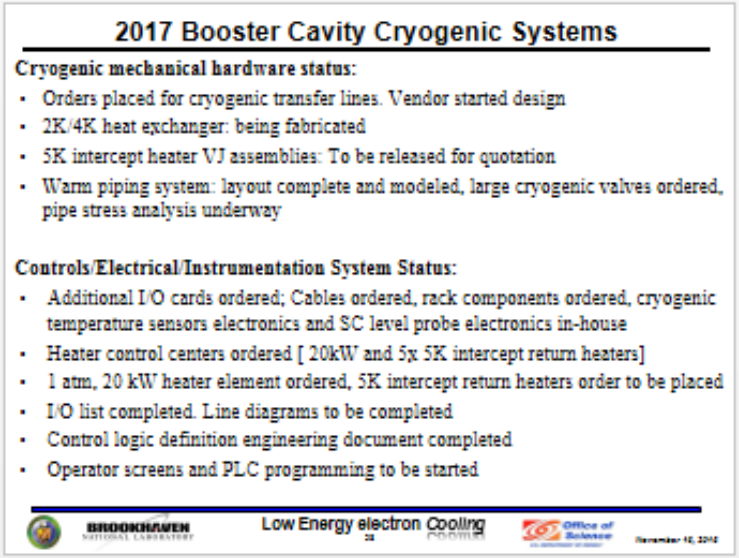
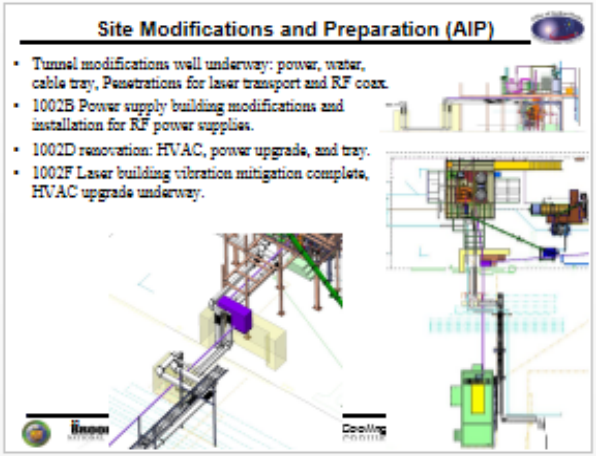




Site support

- Significant progress for site modifications
- Need to complete laser transport, cable tray, work platform, RF PA and waveguide/coax installation



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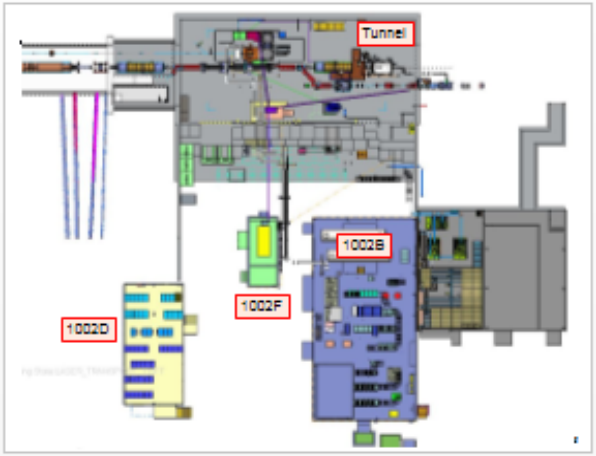

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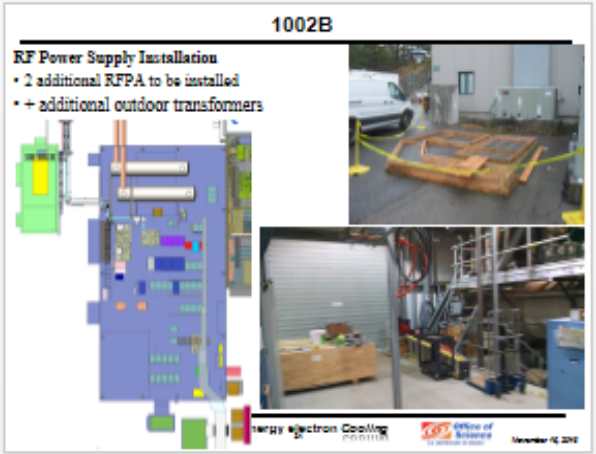

Other Systems

Laser system installation and operation preparation: (Zhi)

- A lot of progress has been made with the laser system.
- Issues with vibrations of the building have been addressed.
- The drive laser system has advanced significantly since the last review. The laser proper is meeting most of its operational goals.
- Simulations laser time jitter onto the electron beam momentum spread have been carried out and showed the appropriateness of the specifications.

RF (Kevin Smith)

- The RF/SRF presentation detailed a lot of work to be done, & same group also responsible for the RF systems for the CeC.
- The more similar the RF and SRF solutions for CeC and LEReC, the better.
- There are questions about phase locking with the RHIC RF.
- The LEReC gun and (SRF) booster will be operating under challenging conditions in terms of beam average current and power.

Other Systems

Diagnostic Line (Kevin Smith)

- The LEReC longitudinal diagnostic beamline is a unique instrument, and properly utilizing it will be essential to the success of the LEReC system.
- The engineering designs of the extraction and diagnostics beam line still require iteration with physicists. Closing the loop quickly on the remaining open questions is necessary to be ready for installation (Summer 2017).

MPS (Sergei Seletsky)

- The presentation on the Machine Protection System was thorough, well-thought out, and generally rather complete. The conclusion was that the system needs to respond in less than 20 usec. An external review is planned.
- Response times should be allocated for the three different MPS activities: detecting an input; evaluating the response; and stopping the beam. Without this, none of the people responsible for the three activities has a clear goal, and the total time may exceed the specification.

DC Gun Commissioning (Alexei)

- The DC Gun test plan presented gave a list of parameters that should be demonstrated, rather than a plan.

Significance and Merit

Findings:

- The 2015 Nuclear Science Advisory Committee (NSAC) Long Range Plan for Nuclear Science states one of the major goals for the field of Heavy Ion physics is to "Map the phase diagram of QCD with experiments planned at RHIC."
- This is to be carried out through the Beam Energy Scan II.
- The Low Energy RHIC electron Cooling (LEReC) Accelerator Improvement Project (AIP) is designed to provide the luminosities needed to collect data on Au-Au collisions at the lowest energies needed to execute the Beam Energy Scan II at RHIC.

Comments:

- The LEReC project remains a project of high scientific merit and significance.

Recommendations:

- None

Technical Status

12 Findings

- Mostly good comments on progress and studies (laser, diagnostic line, vibrations, DC gun systems,
- Concern about cathode system, DC gun commissioning plan, laser system reliability testing,

21 Comments

- Concerns about: 2016 shutdown schedule completion, 2017 design specifications, beam-beam effects, cathode ferris wheel, 2017 commissioning plans and luminosity goals, multiple operating mods for MPS, back stream electrons,
- A draft Commissioning Plan to reach the project KPPs with a similar level of detail to the updated Gun Test Plan should be prepared for the next Review.

3 Recommendations

- Perform long-duration (multiple day) operational tests of the drive laser as soon as possible, prior to beam tests.
- Prepare a document describing the planned conduct of experiments for the gun test.
- Prepare a draft LEReC commissioning plan, including tasks, milestones, and estimated time to complete by the next review.

Budget and Schedule

11 Findings:

- Basically on budget and schedule, still need contingency for risk items, schedule in good shape, need more resource loading.
- The project has little float on the activities for the current shutdown, and in some cases has zero float.
- Float contingency for 2018 shutdown & completion milestones appear reasonable.
- Need to resource load schedule for remaining design & installation
- Update the risk register

17 Comments:

- WBS and schedule scored well, organized, complete, and up to date.
- Critical off project work is in the schedule

Recommendations:

- Report on the level of resource loading (estimate to complete) at the next review.
- Project should update the Risk Register to reflect the latest information and submit to NP by January 15, 2017.

Management and ES&H

10 Findings:

- A large amount of progress since the last Review, both in the physics area and, more visibly, in the amount of equipment already installed.
- The project is pushing hard on the installation of the gun and diagnostic beamline to enable early testing of the gun.

8 Comments:

- The Recommendations from the last review were addressed thoroughly and thoughtfully.
- The Panel was assured that C-AD would continue to make the necessary workforce available to keep the project on track.

Recommendations:

- None

- As expected at this stage of the project, there is no apparent showstopper for realizing the KPPs; however, there is still a lot to do to deliver on the luminosity increase promises. It would be beneficial to start looking at the amount of beam time that is needed in FY 2019 to ensure a successful physics run in FY 2020. As a point of reference, it took ~2 years for Fermilab's electron cooler to go from cooling demonstration to peak cooling performance and stable continuous operation.
- A draft Commissioning Plan to reach the project KPPs with a similar level of detail to the updated Gun Test Plan should be prepared for the next Review. In addition, an overview of the proposed process to reach the ultimate performance parameters (UPPs) should be included. This need not be a final product, but should provide sufficient detail as to allow DOE to understand the LEReC project's identified experimental dependencies and estimated time requirements for conducting the commissioning during the run in FY 2019 and a less developed first look at the FY 2020 run.

LEReC Timeline

FY2017 (1st QTR) RHIC shutdown 2 :

- ✓ **DC gun delivery/re-assembly BNL cleanroom**
- **DC gun installation at IP 02:00, conditioning**
- **DC gun to Booster cavity transport installation**
- **Transport line (DC gun diagnostic line) component installation: diagnostics (BPM, PM, DCCT, ICT, Halo M, Slits, FCT), vacuum, magnets, PS, . . .,**
- **Cathode Systems**
- **Cable tray, water cooling, work platform installations**
- **2.1 GHz and 704 MHz cavity installation**
- ***Booster cavity modification and testing (continues)***
- ***Diagnostic line design***
- ***High Power Beam dump line design***
- ***Cooling section 180º spectrometer magnet design and procurement***
- ***Cooling section magnetic shielding testing and procurement***

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LEReC Timeline

FY2017 (2nd , 3rd QTR's – RHIC run 17):

- DC Gun and beamline, Cathode Systems, 2.1 GHz cavity, and 704 MHz cavity commissioning
- Booster cavity testing (continues)
- Diagnostic line design, procurement/fabrication
- High Power Beam dump line design, procurement/fabrication
- Cooling section: 180 magnet system assembly and measurement, magnetic shielding testing and procurement, corrector magnets
- Cable tray, water cooling, work platform modifications/installations

FY2017 (4th QTR) & FY 2018 (1st & 2nd QTR's)

- Complete component installations: SCRF booster cavity & cryogenics, transport beam line, diagnostic line, cooling section (180º spectrometer, diagnostics, magnetic shielding, multipole correctors), beam dump & transport line.

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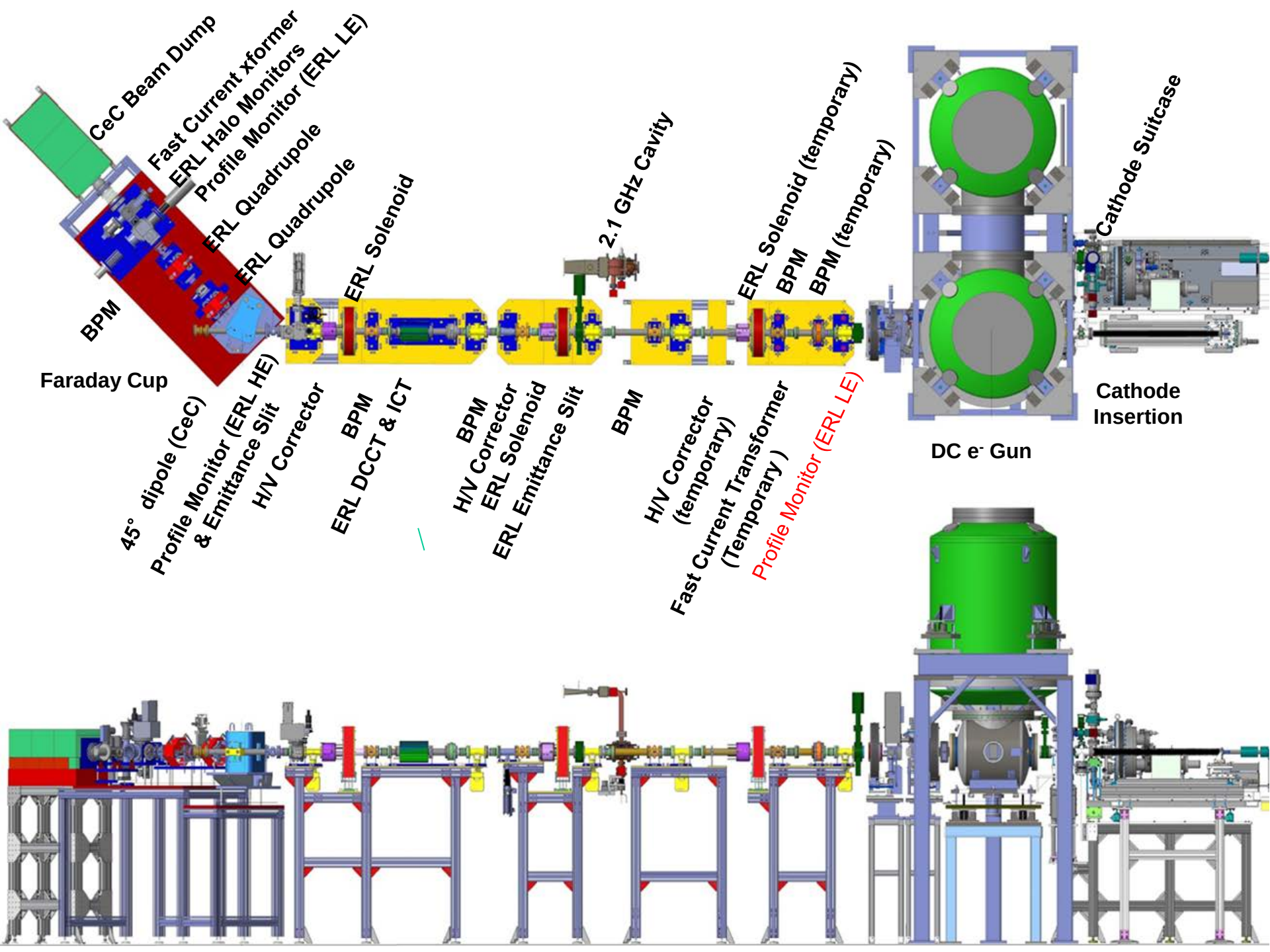
CeC Beam Dump
Fast Current xformer
ERL Halo Monitors
Profile Monitor (ERL LE)
ERL Quadrupole
ERL Quadrupole
BPM
Faraday Cup
ERL Solenoid
2.1 GHz Cavity
ERL Solenoid (temporary)
BPM
BPM (temporary)
Cathode Suitcase
Cathode Insertion
DC e- Gun
45° dipole (CeC)
Profile Monitor (ERL HE) & Emittance Slit
H/V Corrector
BPM
ERL DCCT & ICT
BPM
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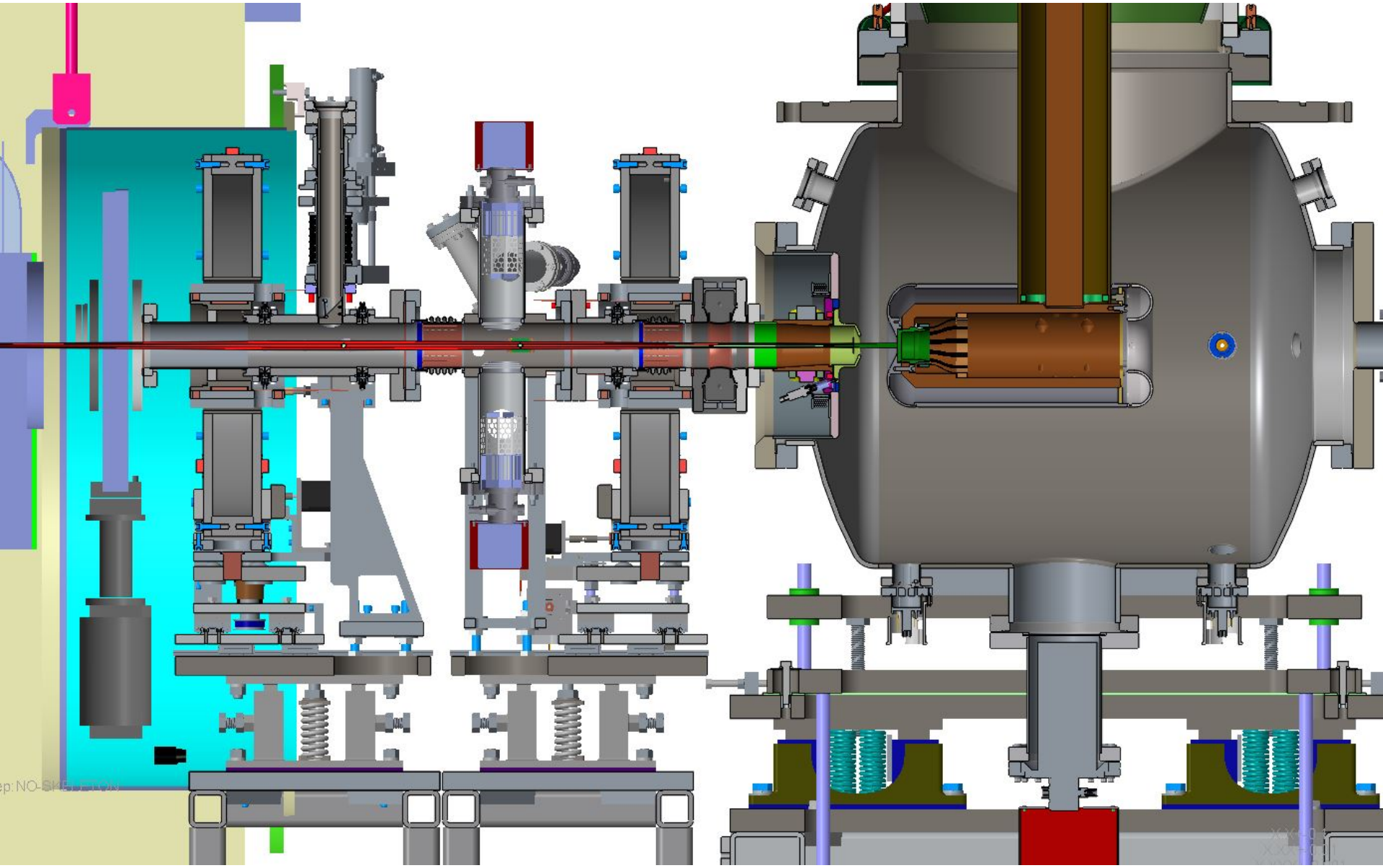
Fast Current Transformer (Temporary)
Profile Monitor (ERL LE)



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