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PXIE RFQ Commissioning Status

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PXIE RFQ LBNL/FNAL Collaboration Meeting

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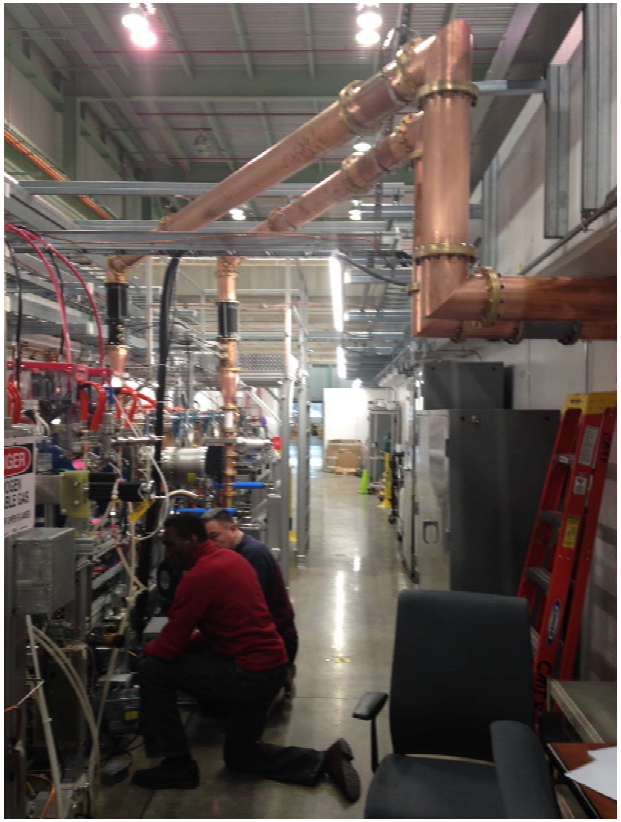
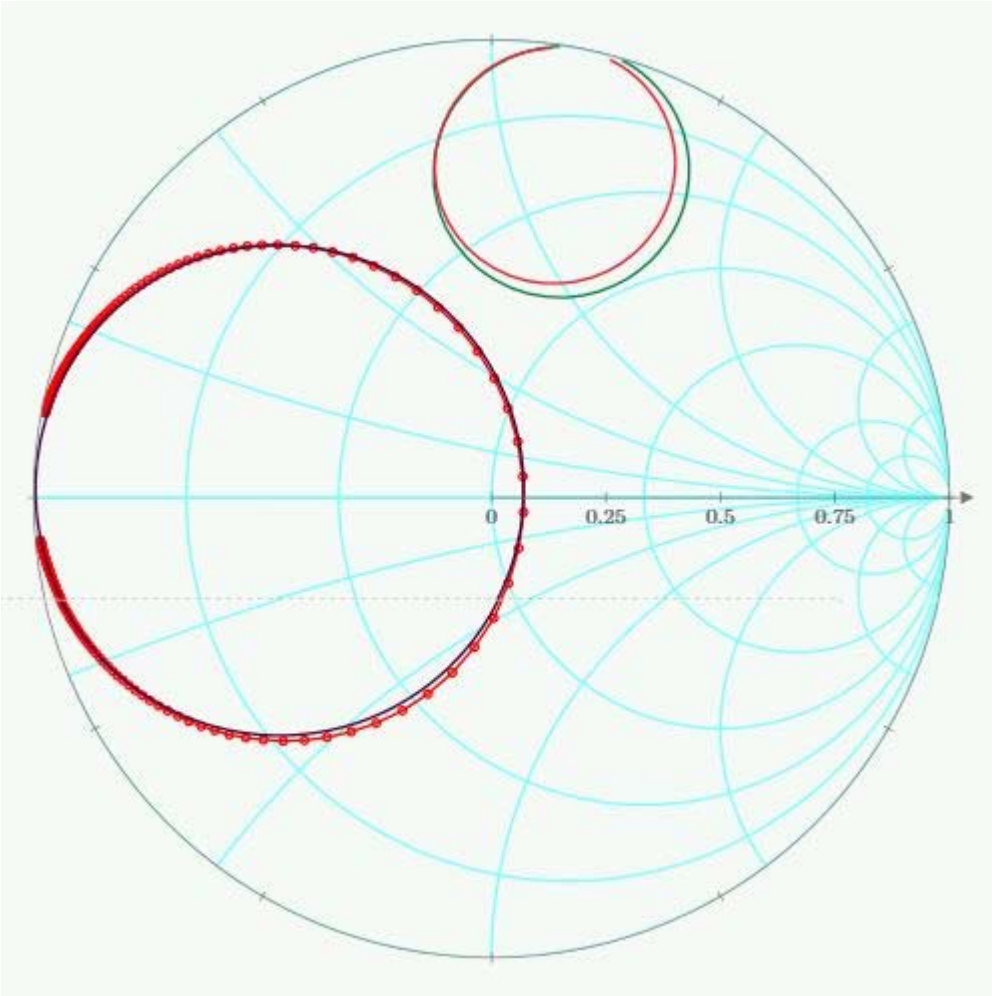
RFQ Installation Status

- Input couplers installed and under vacuum.
- Power RF distribution installation complete.
- LLRF and RF interlock systems installed and on-line.
- Water system hardware fully operational. Just need to verify interlocks and temperature control.
- Resonance controls system exercised, results shown in previous talk.



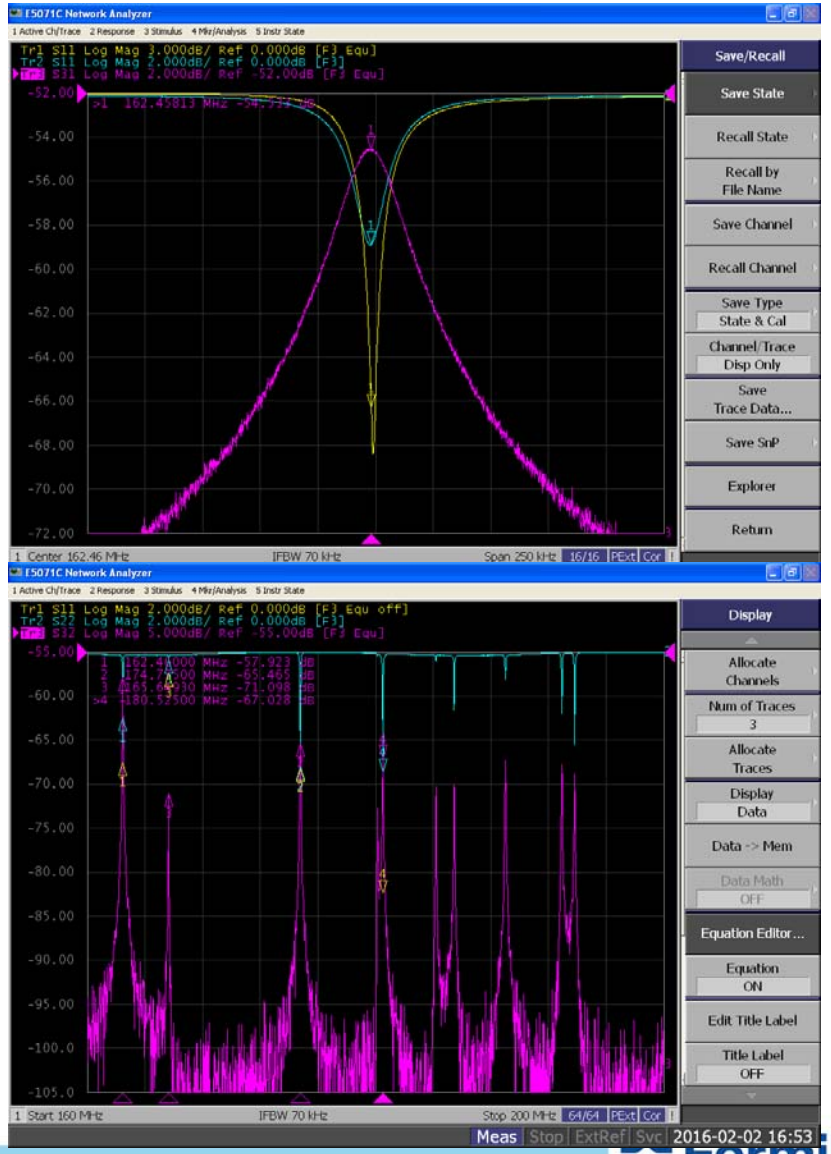
RFQ Coupling Parameters

- Plot at right shows Smith Chart of RFQ reflection measurements.
- Small green and red, solid color circles show S11 for each port.
- Large circle shows sum mode reflection into RFQ.
- We are overcoupled to allow for match at 5mA (r = 1.16).
- Q_L is about 6100.



RFQ Calibration

- All directional coupler signals calibrated to their destinations and monitors.
- All pickup loop, switch positions were verified, and pickup loops were calibrated to the rack monitors. Top plot shows typical response.
- Higher order mode measurement also performed. Bottom plot shows RFQ response over 50 MHz.

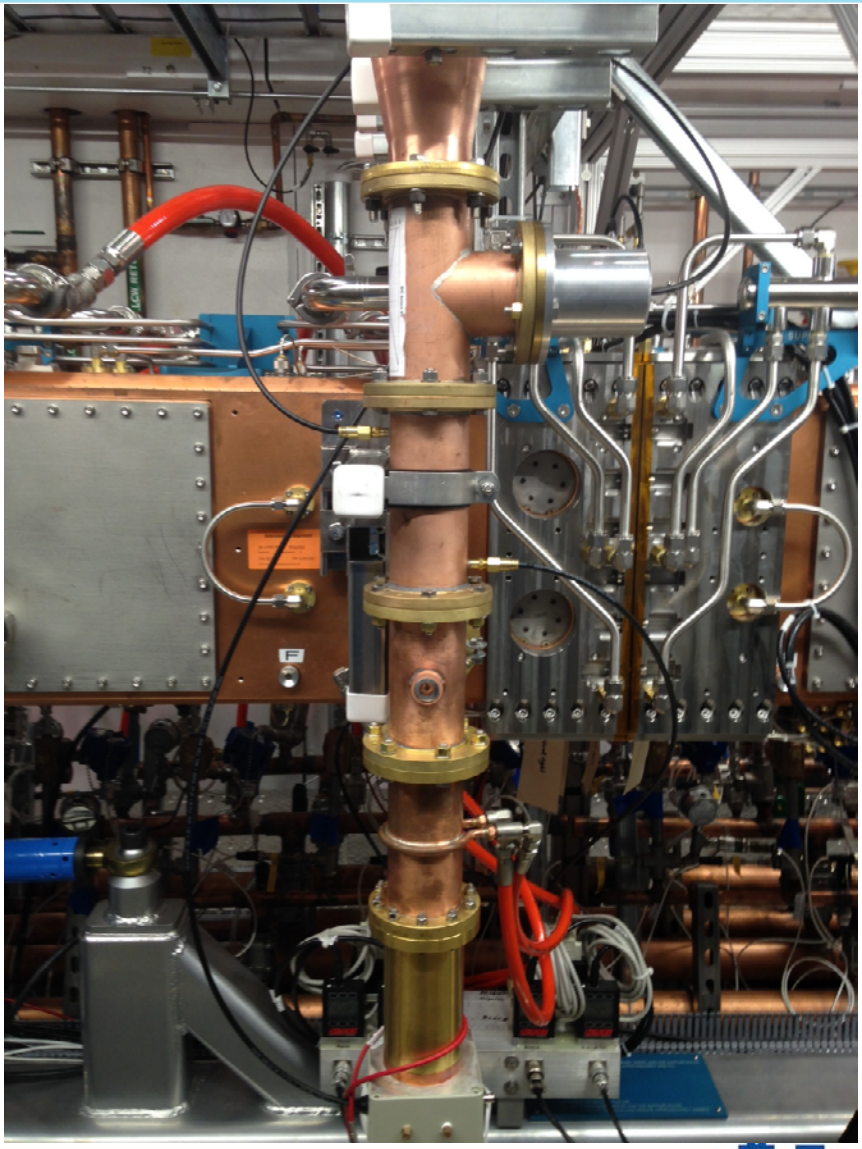


Safety Walkthrough

- Items needing correction before RFQ amplifier operation.
  - Approved and signed RFQ LOTO document (Second draft approved, needs to be distributed for signatures).
  - Input coupler air flow and temperature monitoring must be in place (Air flow and temperature monitors installed and already reading back in raw units. Values need to be scaled).
  - All amplifier interlocks must be tested (Water and vacuum interlocks tested and verified. Still need to test air and RF interlocks).
  - High voltage labels must be placed on input coupler enclosures (This request is inconsistent with other AD standards. Further discussion with AD/Safety ongoing).

Input Coupler Cooling

- Input coupler water cooling connected to LEBT-LCW manifold.
- Air cooling installed and tested through antenna and DC block.
- Air exhaust is captured to verify flow and measure temperature.
- Air flow and temperature sensors are installed and connected to interlocks.



Order of RFQ Activity

Test RF interlocks

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Turn on RFQ amplifiers and confirm interlocks

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Run low power (100W) to RFQ and verify LLRF system.

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Condition RFQ to full field at 2% duty

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Measure internal x-ray spectrum

Conditioning Process

- Table on right was presented to rad safety as breakpoints for measuring x-ray levels.
- Plan to get RFQ (and couplers) up to full field with short pulses, first.
- Continue to expand duty factor to limits of LLRF system operation in pulsed mode.

RFQ Pulsed Conditioning Power Breakpoints

Pulse Width	Frequency	Max Average Power
50µs	1Hz	4W
500µs	1Hz	40W
500µs	10Hz	400W
1ms	20Hz	1600W
1ms	20Hz	2000W

Tentative Schedule

- Feb 10 Test RF Interlocks
- Feb 11 Turn on amplifiers and confirm interlocks
- Feb 11-12 Verify LLRF system
- Feb 15 Begin conditioning
- Reminder – No access to PXIE enclosure while conditioning RFQ.