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SRF Processing at ANL: Progress and Plans

November 17, 2008

ANL: Mike Kelly, Scott Gerbick

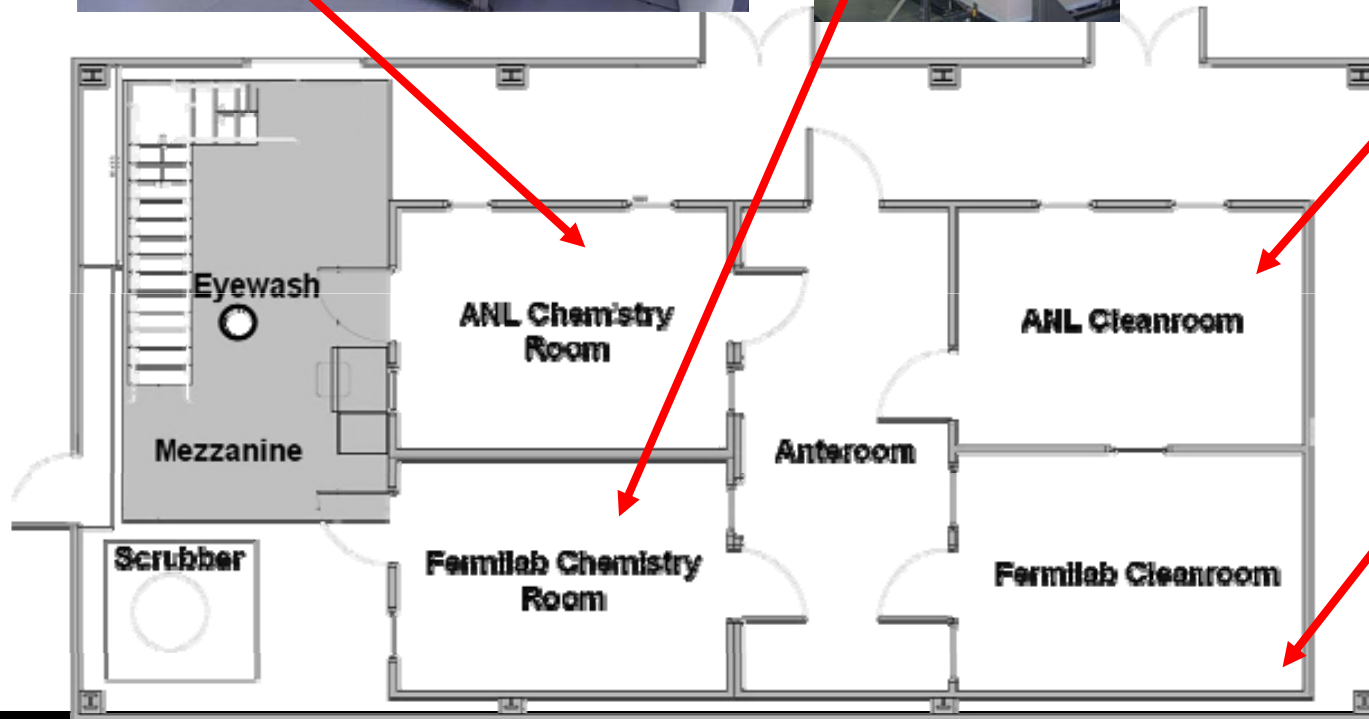
FNAL: Dan Olis, Allan Rowe

Speaker: Mike Kelly

Joint ANL/FNAL 2000 ft² Cavity Processing Facility at Argonne



**Chemical
polishing**



SRF Activities, Goals, Manpower

■ *ILC*

- Electropolishing; have demonstrated a 30 MV/m+ cavity
- High-pressure rinsing and clean assembly for 9-cell cavities
- **1.0 ANL FTE FY08** (Half of this used in Q1; ¼ FTE over remainder of 08)

■ *ATLAS Upgrade*

- 7-cavity upgrade cryomodule
- Demonstration of FRIB technology
- **2.5 ANL FTE FY08** (75% of available ANL SRF manpower)

■ *FRIB (Facility for Rare Isotope Beams)*

- Proposal submitted (Have CD0, waiting for ANL/MSU site selection Dec. 08)
- **0.25 ANL FTE**

■ *APS Upgrade*

- SRF for ERL or recirculating linac
- Minimal effort due to 08 budget



SRF Activities, Goals, Manpower

■ ***HINS, Project-X***

- Have performed BCP, HPR on SSR1 (350 MHz single-spoke)
- Will perform similar procedure on 2nd spoke cavity
- 2 ANL man-weeks/procedure
- Will assist FNAL with additional processing

ANL/FNAL SRF Effort for ILC

■ *Electropolishing*

- System operational; 2 FTE can perform 3 procedures/week
- Have electropolished
 - *4 single-cell cavities (3 tested at FNAL)*
 - *1 nine-cell cavity (tested at JLab)*

■ *High-Pressure Water Rinsing*

- FNAL has installed HPR in FNAL portion of the facility
 - *Clean rooms substantially re-configured (“class 10” drying area)*
 - *HPR pump installed and tested*
 - *HPR tool delivered to ANL & assembled and tested*
 - *Control system programming being completed*
- ANL will operate a 2nd HPR starting summer of '09 (rinse ALD treated cavities)

ANL/FNAL SRF Effort for ILC

■ *Ultrasonic cleaning*

- Large 400-liter 2-meter tall tank
- Vertical cleaning for all existing niobium cavities
- FNAL → fixturing for 9-cell cavities; ANL → electrical hook up
- *Required for 9-cell processing at ANL; complete Dec. 08*

■ *Clean room assembly* (FNAL lead)

- Cavity pump out and back fill system, clean room tools, fixturing, ancillary systems (couplers, pickups)
- Prepare clean room for class-10 operations
 - *Critical path for complete single-cell processing; complete Dec. 08*

FY09 Effort (manpower) for ILC at joint ANL/FNAL Facility

■ *ANL Effort*

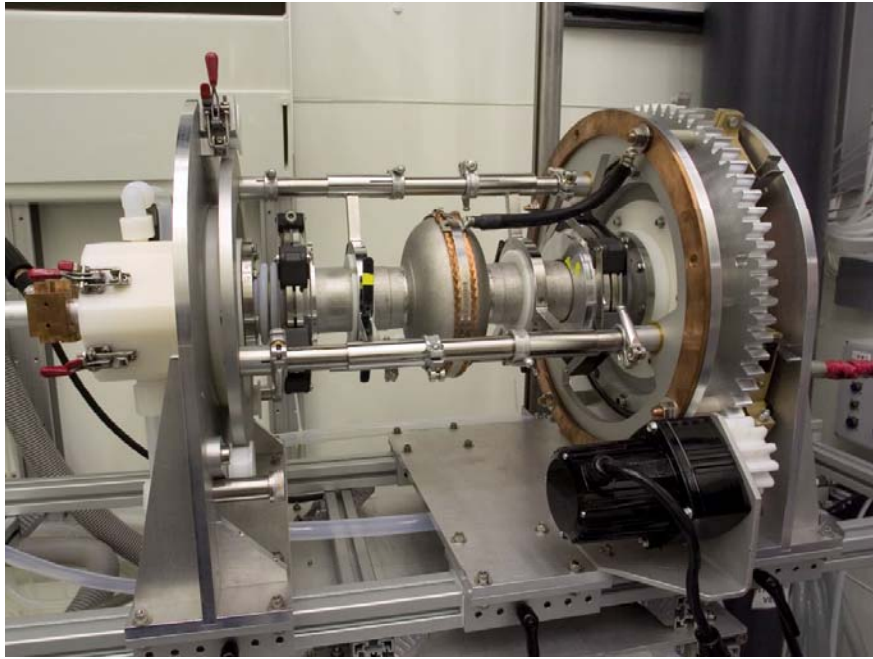
- 1.25 FTE (mostly on electropolishing)
 - *1 procedure/month (electropolish) Oct. 08 - March 09*
 - *2-3 EP /month through April 09 - Sept. 09*
 - *~17 total EP procedures for FY09*

■ *FNAL Effort*

- 3 FTE
 - *2 FNAL personnel to be trained on EP (D. Bice, G. Wu)*
 - *All HPR and clean assembly after EP starting Dec.08*

We should have a complete single- and 9-cell cavity chemical processing, cleaning and clean room assembly capability starting around the 1st of the year

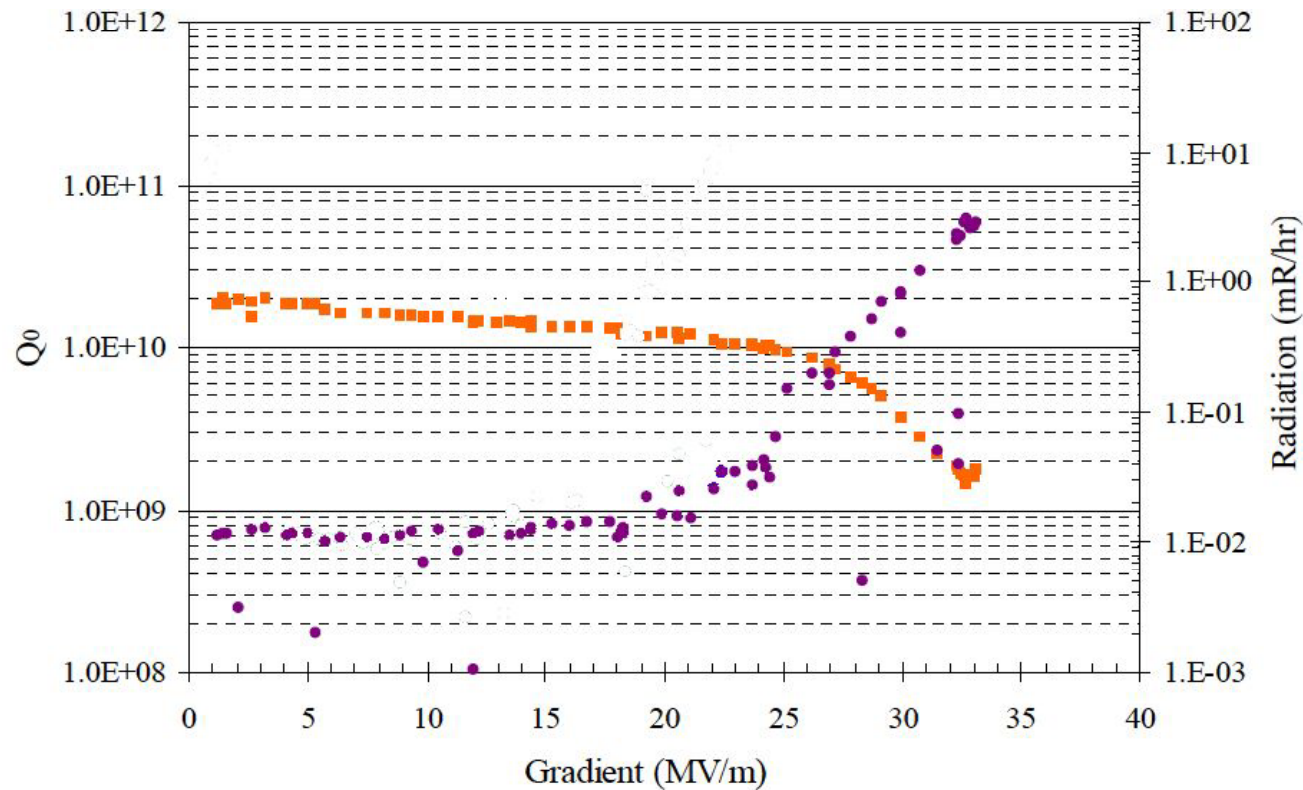
Electropolishing system for 1.3 GHz elliptical cavities



- First 1.3 GHz cavity electropolished in August 2007
- Reconfigured for 9-cell Q1 '08
- May be reconfigured for different cavity lengths in ~1/2 day

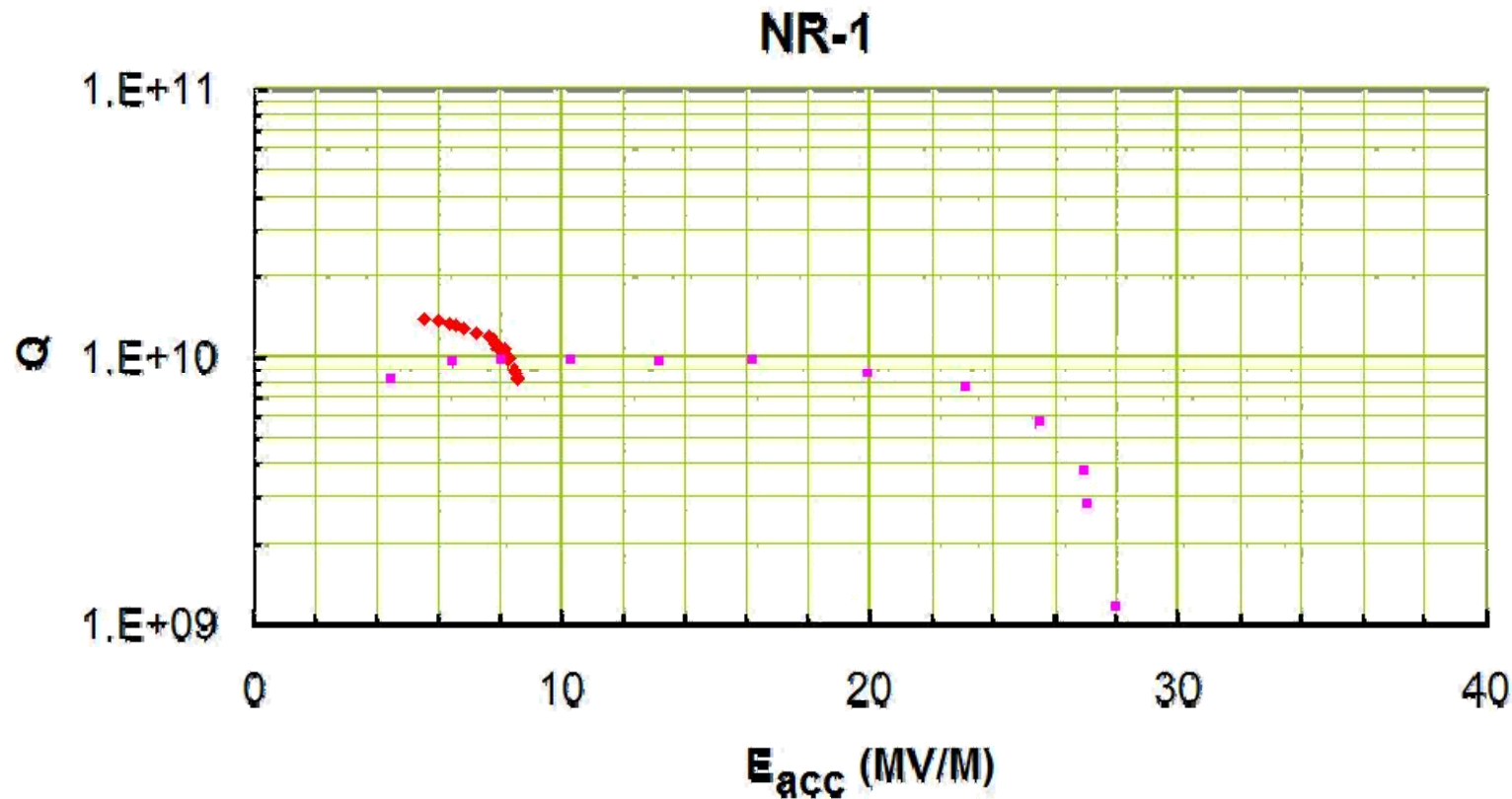


1-cell Cavity AES 4



- Initially BCP'd at Cornell and tested at $E_{ACC}=25$ MV/m
- Followed by 65 microns EP at ANL; HPR at FNAL
- Cold tested at FNAL → RF power limited at $E_{ACC}=33$ MV/m
- Tried 120°C in-situ bake → increased field emission

1-cell Cavity NR-1, Nov. 14, 2008



- Initially BCP'd at Cornell and tested at $E_{ACC}=28$ MV/m
- Followed by ~100 microns EP at ANL; HPR at FNAL
- Cold tested at FNAL → Quench at $E_{ACC}=8$ MV/m
- ??

LEWA High-pressure Pump commissioned Oct. 08



FNAL High-Pressure Rinse at ANL for 1.3 GHz elliptical cavities



- Based on Cornell design
- Tested with LEWA pump, Oct. 08
- First operation w/ 1-cell in December 08.

Summary/Plan

- **At ANL/FNAL processing facility**
 - 5 electropolish procedures for ILC performed
 - 3 cavities cold tested
 - Reached 33 MV/m after EP with recent single cell
 - Will perform additional single-cell procedure(s) before going on to 9-cell

- **Ultrasonic cleaning for 9-cells available Dec. 08**

- **FNAL high-pressure rinsing tool operational; need to finish setting up for clean assembly**

- **FY09 Plan–**
 - ANL will do electropolishing (~1.25 FTE) & train 2 FNAL people
 - FNAL will lead HPR and clean clean assembly
 - Goal is 16-20 complete procedures (EP, Ultrasonic, HPR, clean assembly)