(1) Cavity EP
(2) Cavity Clean Room Assembly
(3) Cavity String Assembly

October 2011 Project X collaboration meeting

Speaker: Mike Kelly

October 25, 2011

ANL/FNAL SRF Processing Capabilities

- ***Electropolishing, chemical polishing***
  - Two operational chemistry laboratories;
    - G150 for prototyping (Building 203)
      - BCP for (small numbers of) prototype low- and high-beta cavities
      - Niobium pre-weld etching
    - Joint ANL/FNAL facility (Building 208)
      - Full capability to do high volume EP for 1.3 GHz elliptical cavities
        - » 2-3 cavities per week with 2 dedicated FTE
      - Similar throughput possible for quarter-wave, half-wave or spoke resonators given an additional 3-man months and modest M&S for setup

- ***High-Pressure Water Rinsing***
  - Three operational HPR systems
    - G150 HPR for cavity prototyping and ATLAS cavity maintenance
    - A dedicated 1.3 GHz-cavity high-pressure rinse stand in the joint ANL/FNAL facility
    - A multi-use high-pressure rinse system for QWR, HWR, spoke and elliptical cavities

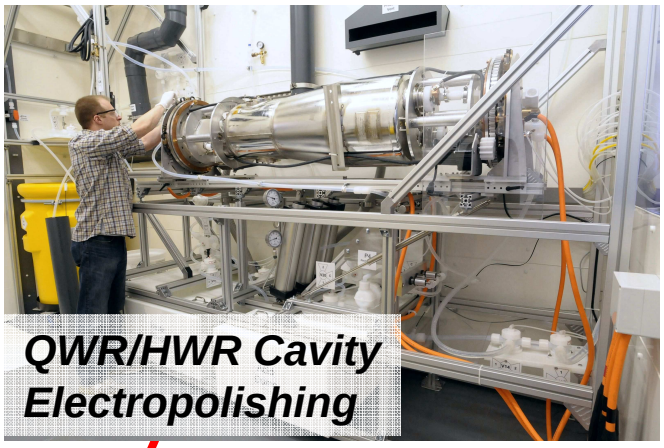
ANL SRF Processing Capabilities

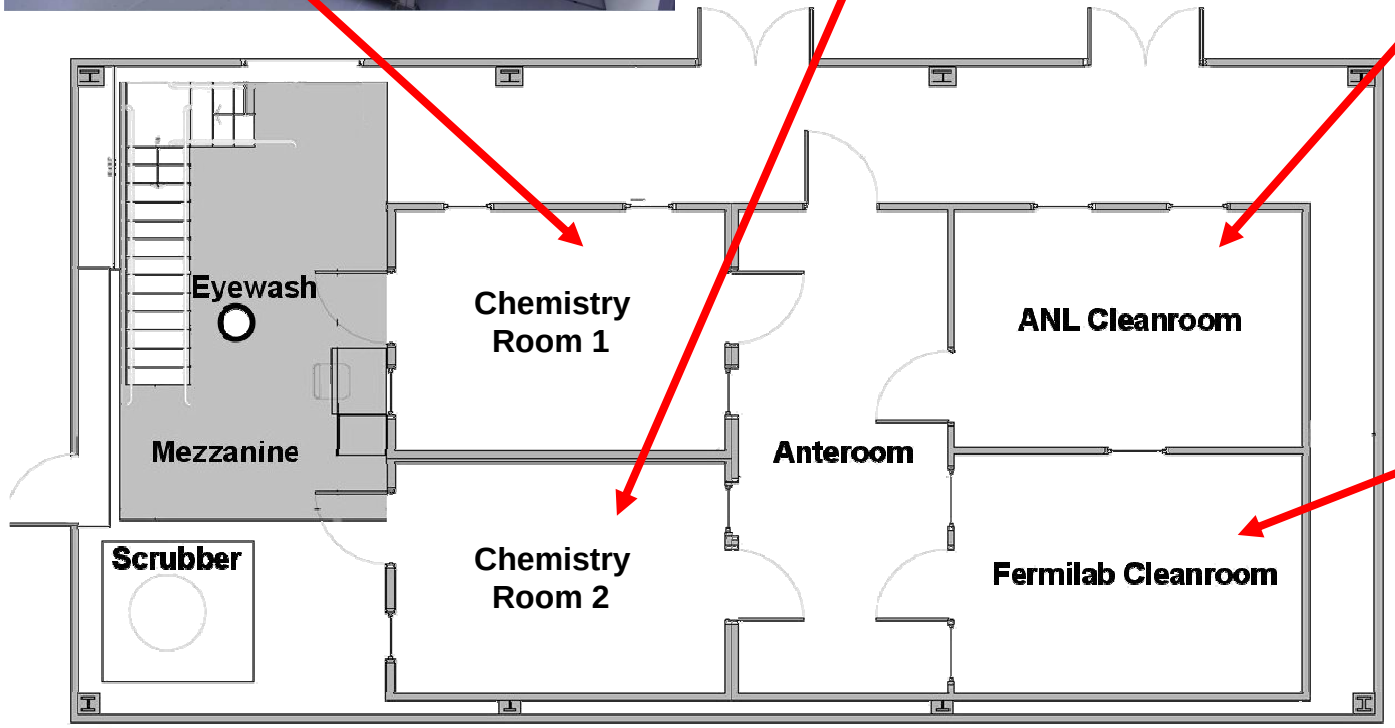
- ***Ultrasonic cleaning***
  - Large 500-liter 2-meter tall ½ x ½ meter wide tank
  - Vertical cleaning in class-1000 clean area for all existing niobium cavities

- ***Clean room assembly***
  - Two single cavity assembly areas
    - High-quality (better than class 100) area for all single QWR and HWR in the joint facility
  - A cryomodule assembly clean room in the *ATLAS booster area*
  - *An additional cryomodule clean assembly space will be required for Project X*

- ***Cavity cold testing***
  - 2 operational vertical test cryostats
    - *Long term 4 K tests of QWR or HWR*
  - A large diameter top-loading 2 Kelvin test cryostat
    - *Accommodates all existing cavity types*

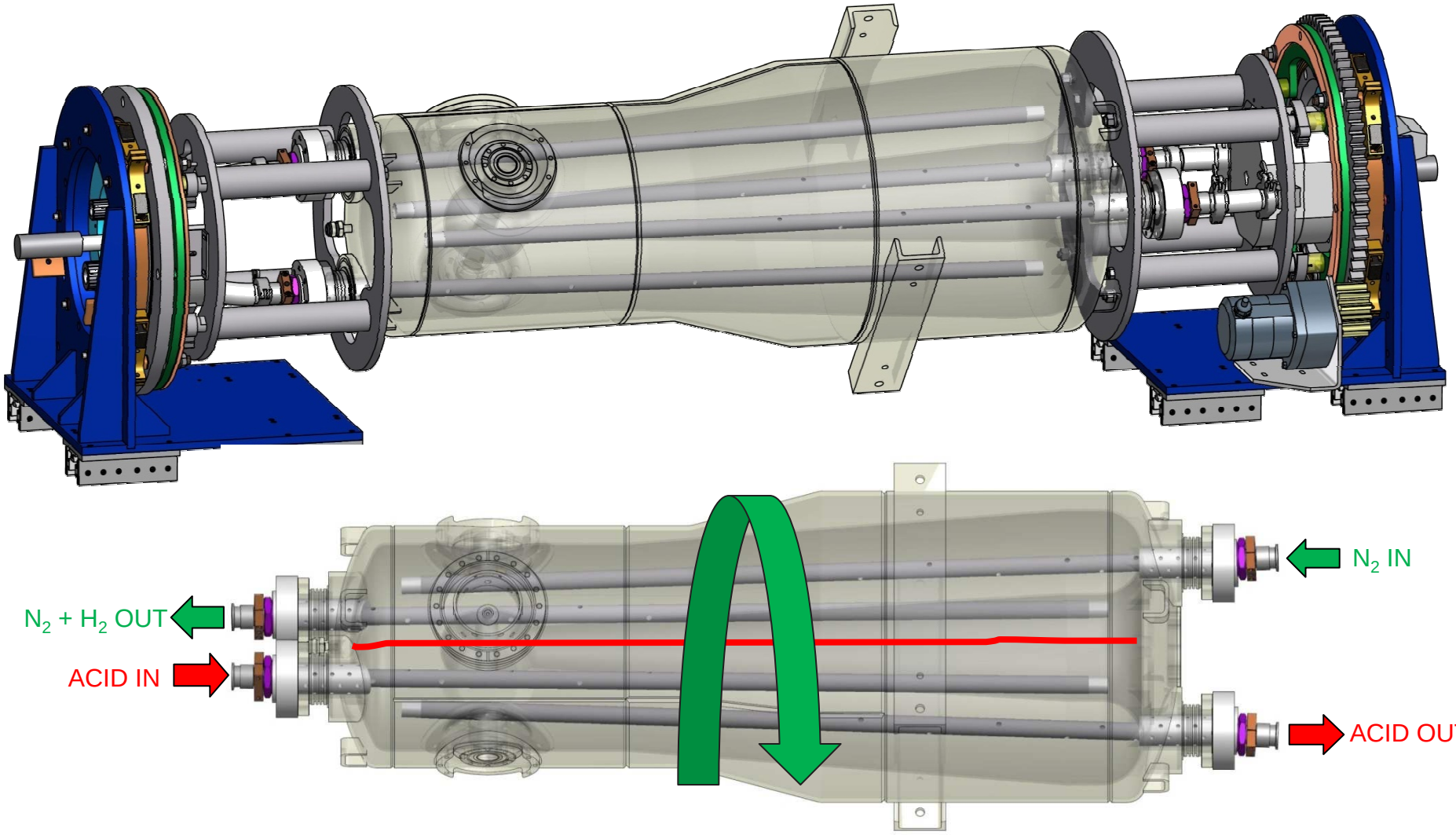
Joint ANL/FNAL 2000 ft^2 Cavity Processing Facility at Argonne





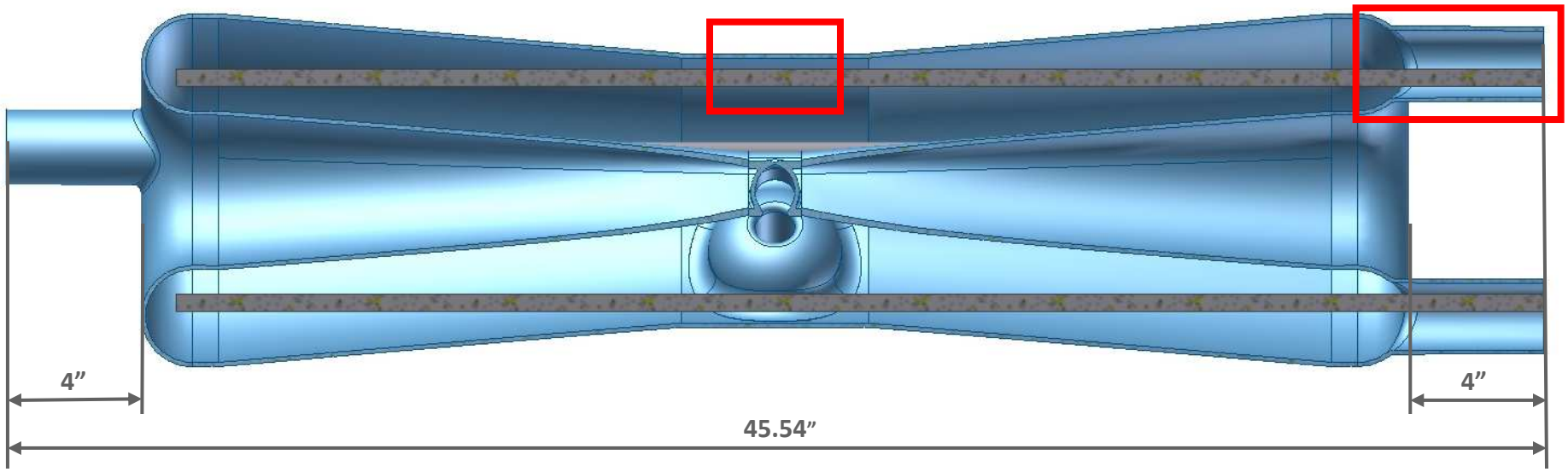
(1) Electropolishing

Electropolishing for Project X 162 MHz HWR: Same basic scheme as for 72 MHz QWR



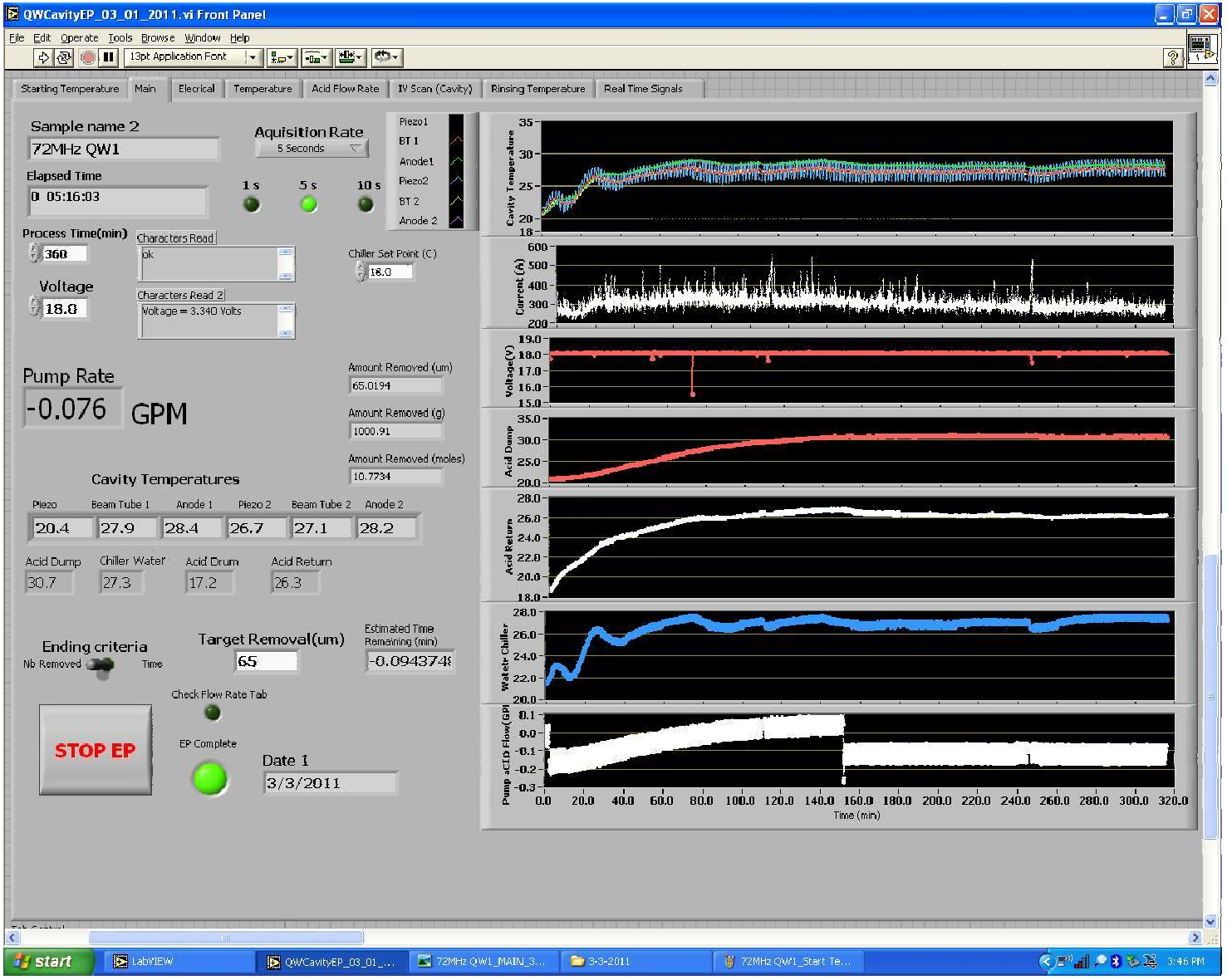
Engineering design by S. Gerbick

Electropolishing for Project X
162 MHz HWR



Cathode clearance is a little tight for the re-entrant HWR, however, this is no particular problem

Detailed parameters monitoring: Temps, I,V, flow

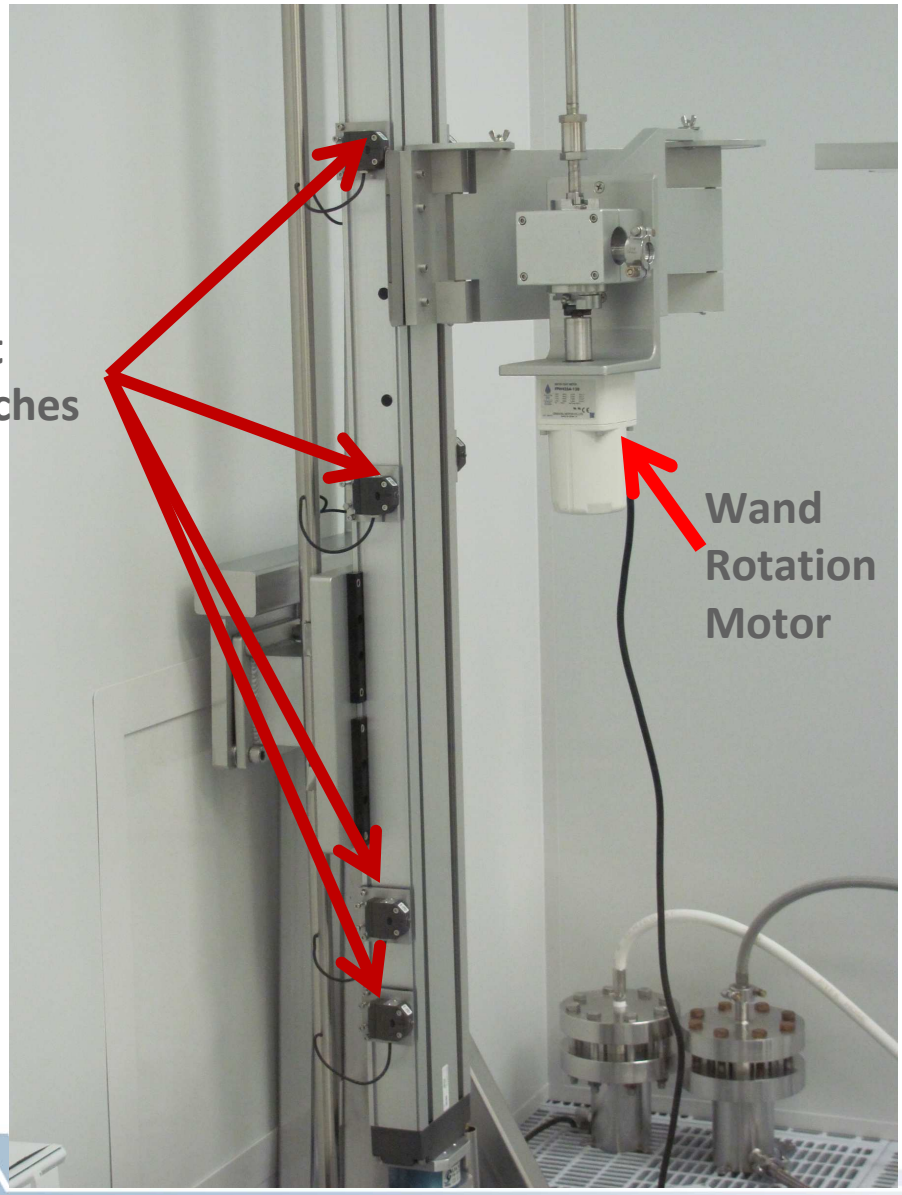


(2) Cavity String Assembly

Manual high-pressure rinsing of subcomponents

- Couplers
- RF pickup(s)
- Pumping spools
- Inter-cavity bellows
- Beam line valve spools
- Nuts, bolts, CF gaskets

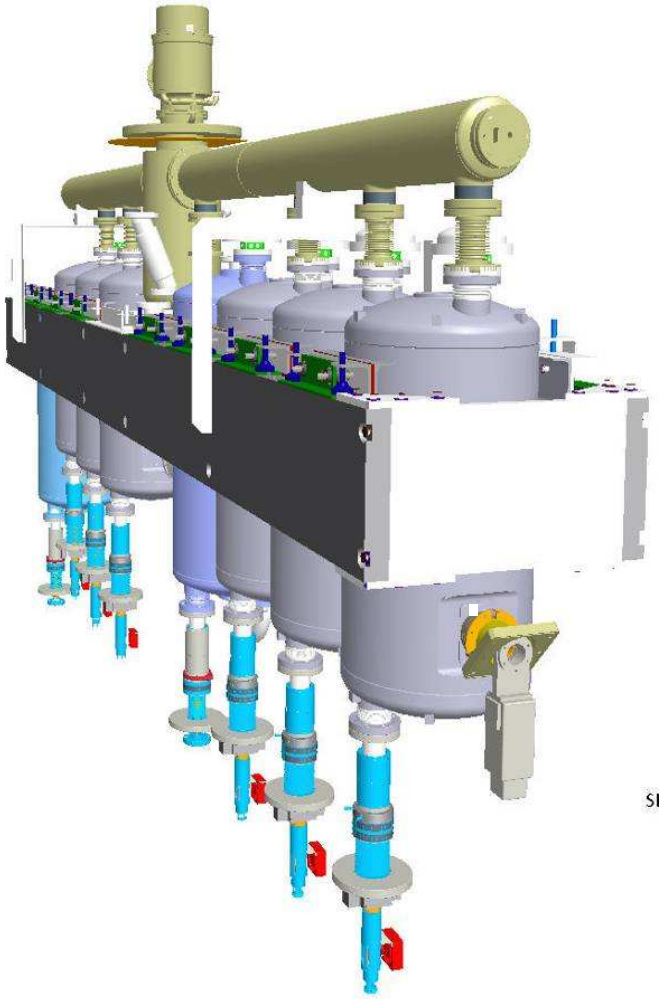
Cavity spray wand and translation carriage assembly



Engineering design by R. Murphy

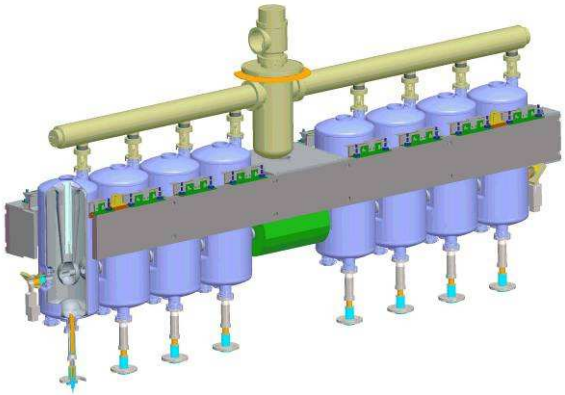
(3) Cavity Clean Room Assembly

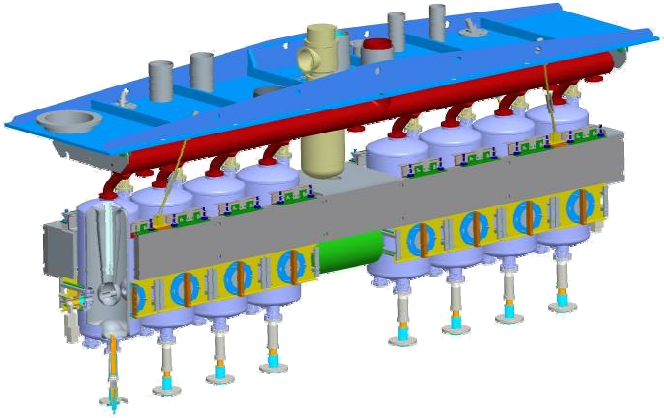
Clean String Assembly

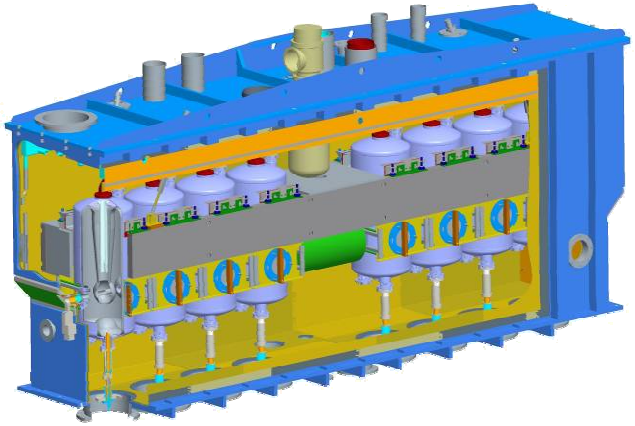


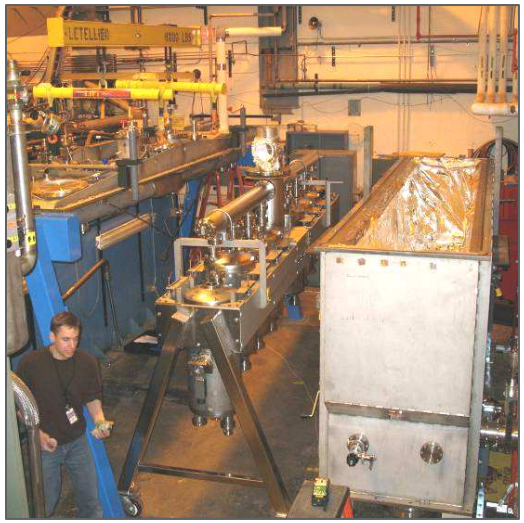
- Minimize the number of parts in cleanroom
- Cavities pre-assembled w/couplers
- Cavity assembly installed on support frame
- Inter-cavity bellows & vacuum manifold installed
- Beam valve spools installed
- Cavity string sealed

Final Assembly







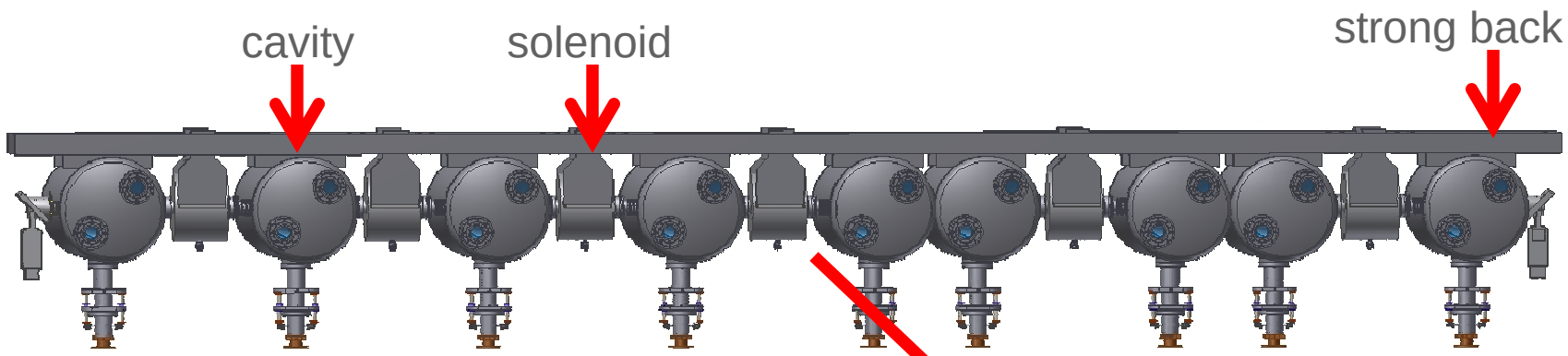


Sealed cavity string outside the cryostat box

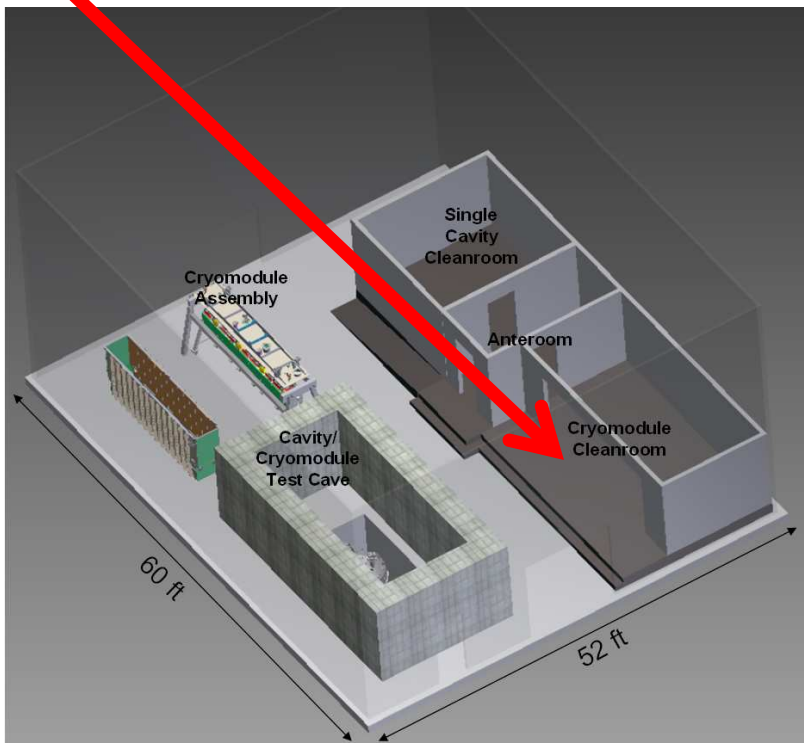
Cavity string fully assembled with cryogenics and tuners

Final loading into the cryomodule box

Half-wave cavity clean string assembly (schematic)

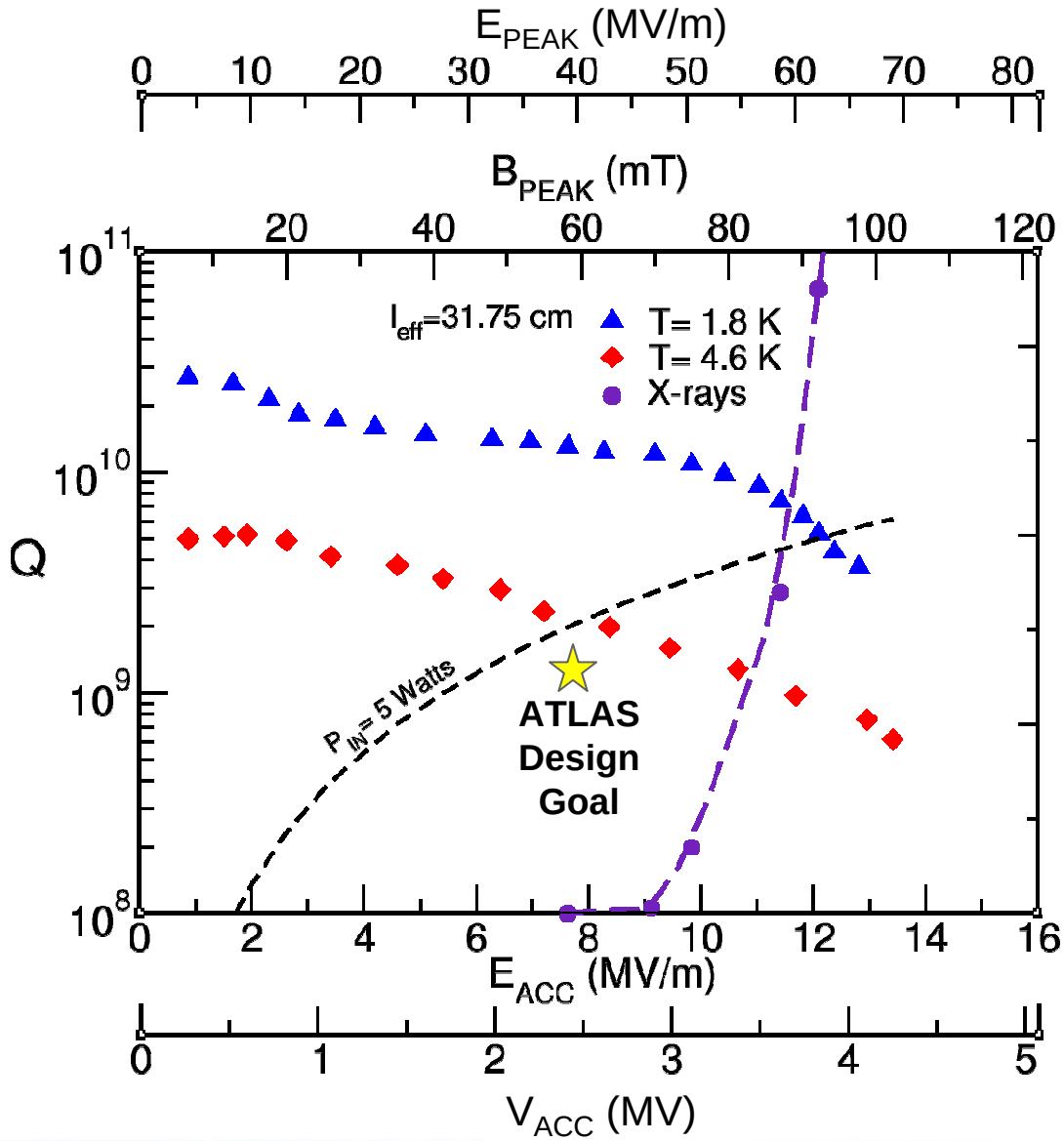


(pumping manifold, BPM – not yet shown)



Proposed in Building 208 D-wing
(100 ft from existing processing facility)

Latest techniques are demonstrated on the best performing QWR



Summary

- Single-cavity processing and assembly in excellent shape for Project X 162 MHz half-wave cavities

- Clean cryomodule assembly techniques similar to those for 2009 ATLAS upgrade and 2012 ATLAS Intensity Upgrade
  - Location for Project X HWR module assembly is unknown; we have a strong preference for a location next to the existing cavity processing and assembly area to make use of existing highly trained ATLAS and B101 personnel