

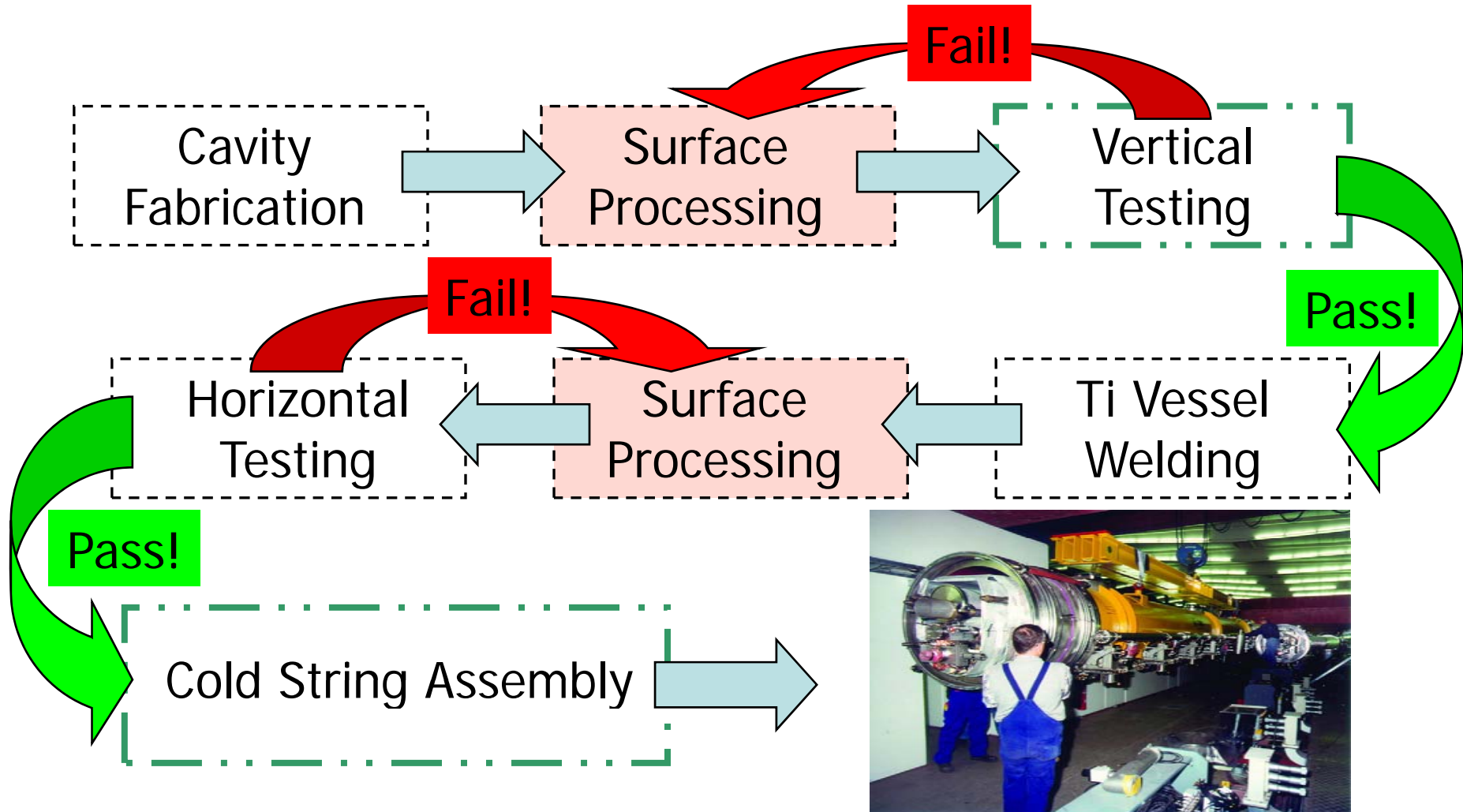


Status of the ILCTA_MDB Horizontal Test Stand

Andy Hocker

FNAL-TD

ILC R&D Meeting, 23-MAY-2007

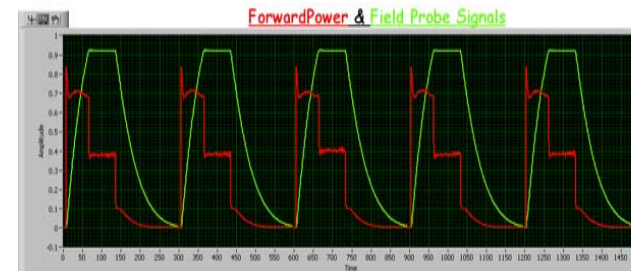
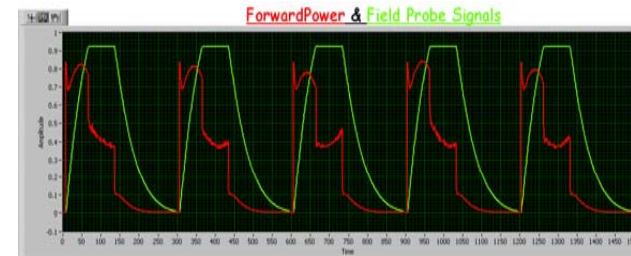
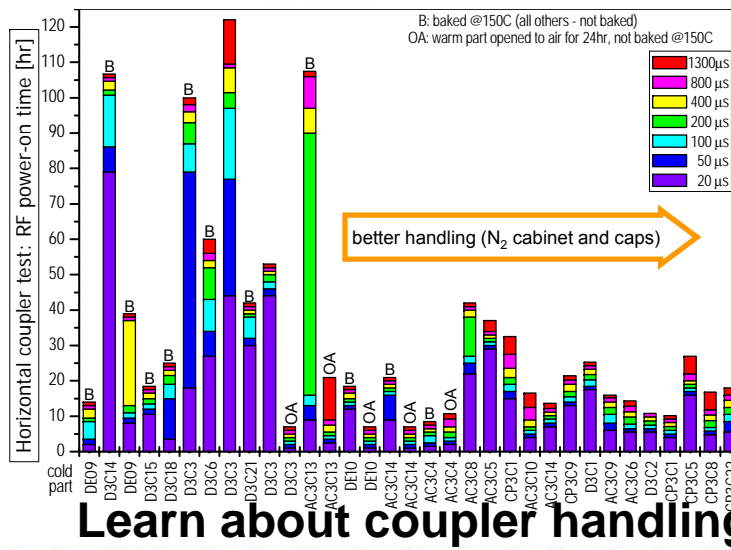
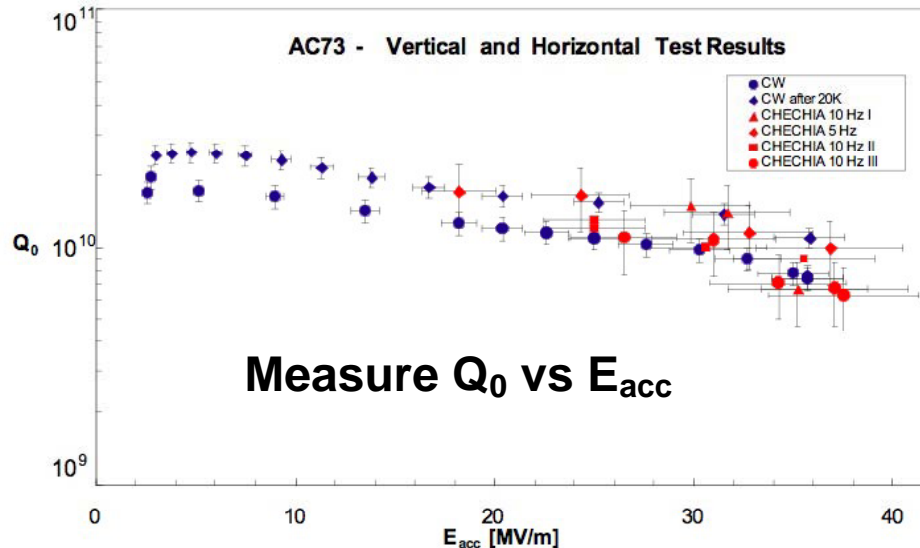




- Shielding cave (X rays from cavity)
- RF power
 - **Klystron/modulator/charging supply for high pulsed RF power**
 - **Waveguide for RF delivery to coupler**
 - **LLRF: control of forward power via feedback loop**
- Cryogenics
 - **Keep cavity in superfluid He at 1.8 K**
- Horizontal test cryostat (HTC)
 - **Insulating vacuum vessel with easy access**
 - **Ports for vacuum, coupler, instrumentation**
- Vacuum
 - **Insulating vacuum for cryostat, clean vacuum for cavity**
- Diagnostics
 - **X ray detectors, Faraday cups (cavity dark current), etc.**



What you can do with HTS

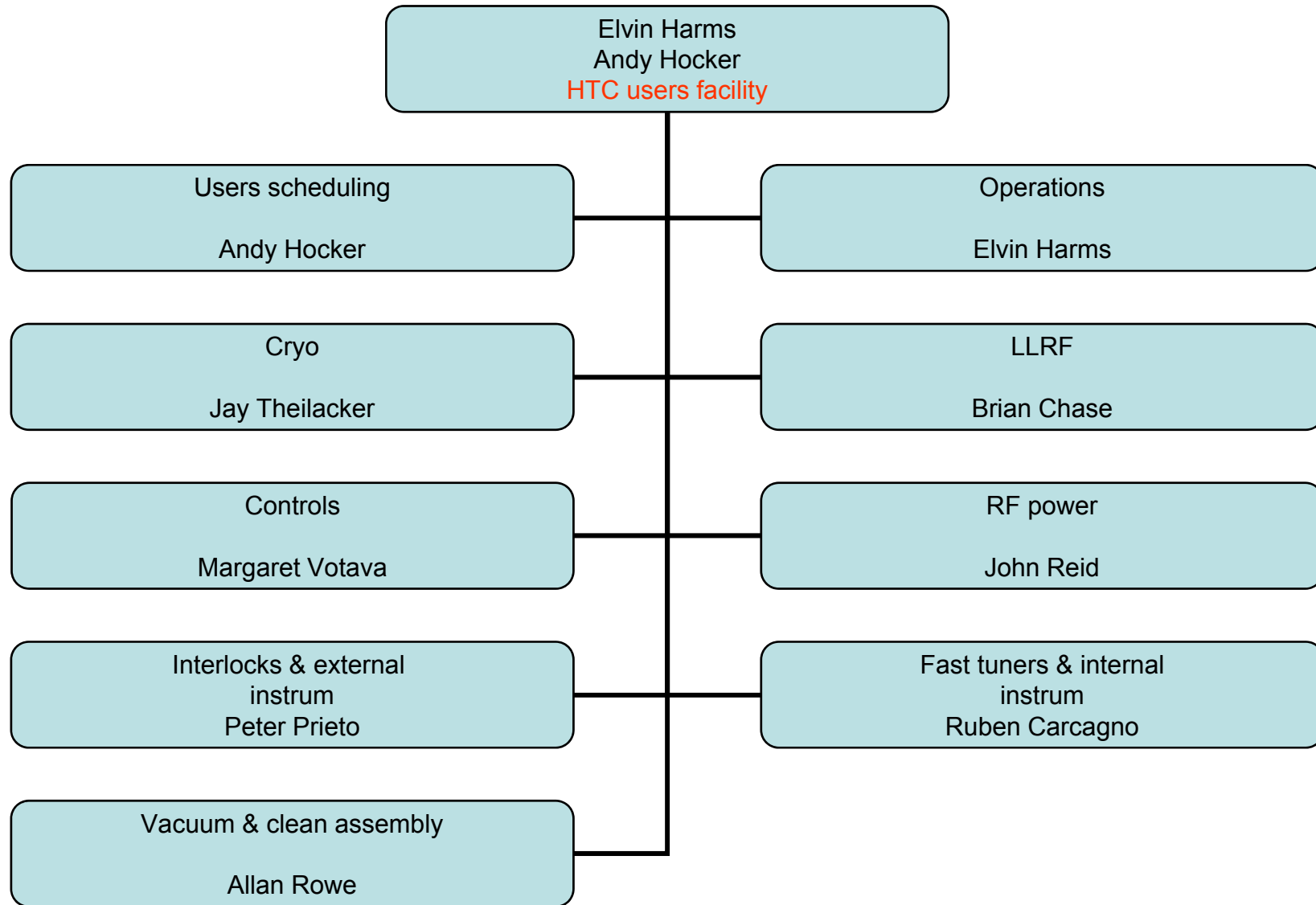


Study Lorentz force detuning
Compensation (CC2 result!)

etc...

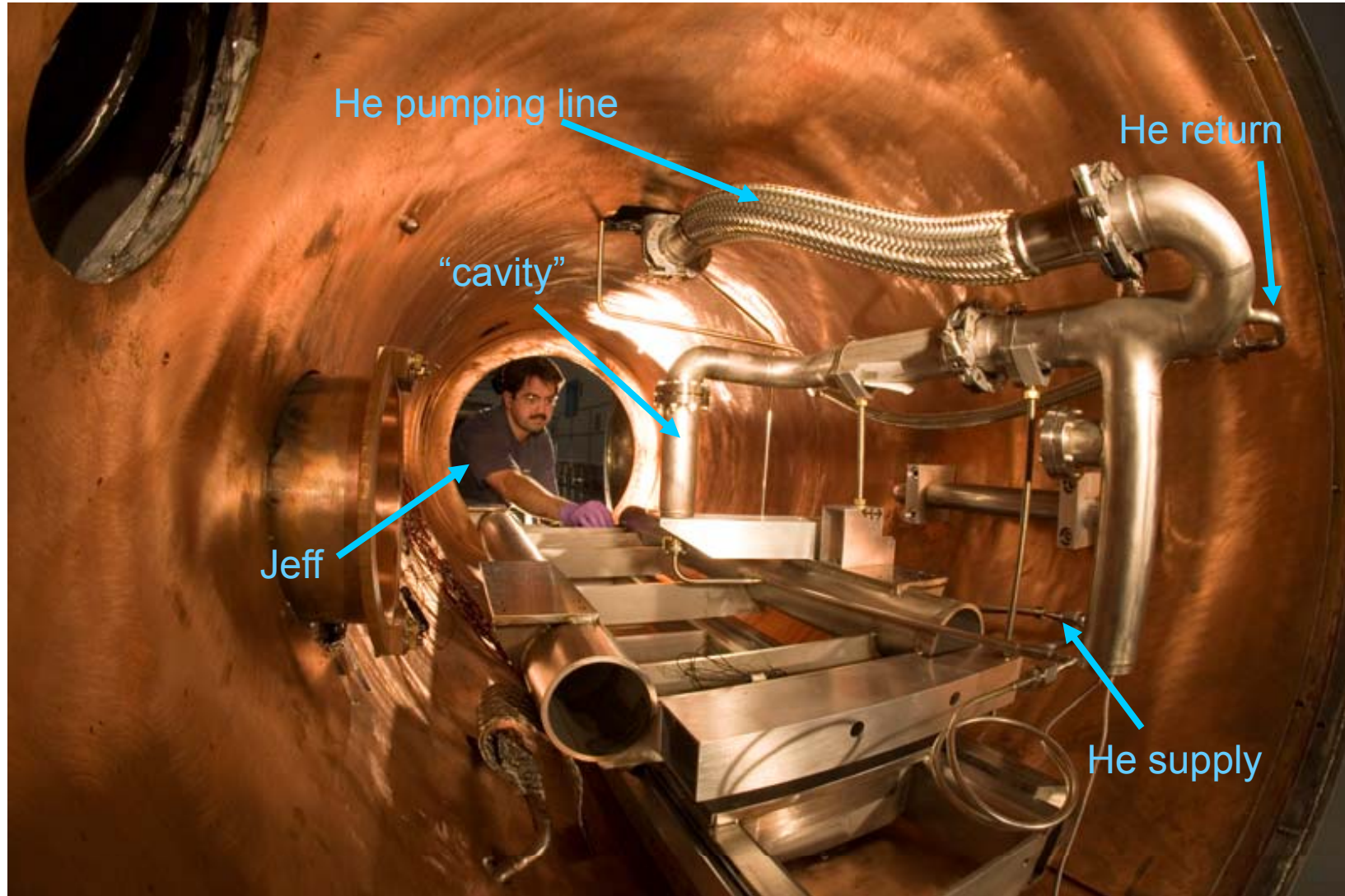


HTS Organization



- First few months of its life at MP9
 - **Mods, prep work, leak checks, etc.**
- Moved to cave in MDB in Jan 2007
- Began interface to cryo distribution feed can
 - ...which led to more mods, repairs, etc.
- Eventually ready for cooldown by mid-February







Cryo commissioning experience



- First problem was getting the HTC to pump down
 - **Bad seal between HTC and feed can**
 - **Kludged for commissioning, repaired afterward**
- Cooled to 80K, introduced He to circuit
 - **Leak inside HTC, too small to pinpoint while warm, made wholesale seal replacement**
- Reached 1.8 K on 14-MAR-2007
 - **Impact on CC2 cryo was minimal**
 - **Found a few problem thermometers**
 - **Some uncertainty on 5 K shield temperature**
 - Lots more thermometry added to diagnose



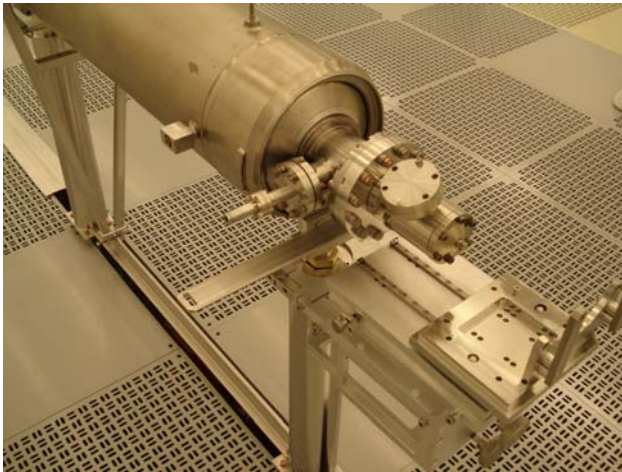
- DESY sent us 3 junky (~20 MV/m) TESLA cavities (in He vessels) to play with (2 for CAF-MP9, 1 for HTS)
 - **Input couplers too**
- C22 is 1996 vintage
 - **He return pipe in “wrong” position (actually no pipe at all)**
 - **Support lugs different**
 - **No HOM feedthrus**
 - **Sat around open to air for years**
- Sent to TJNL for HPR and vertical test
 - **Achieved 17 MV/m**



C22 prep work (“dressing”)



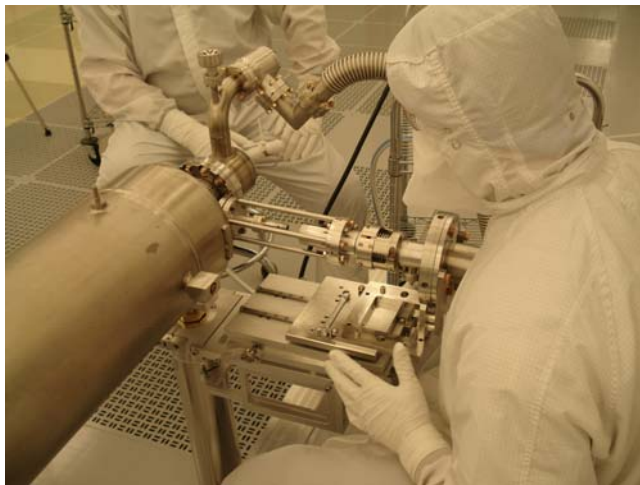
- Welded a Ti-to-SST transition elbow to C22 vessel for He return pipe
 - Tried here, but eventually done elsewhere
- CAF-MP9 clean room work
 - Installation of HTS end flange (burst disc, pump-out port w/ VAT valve)
 - Installation of input coupler “cold part”
 - Pumped down
- Installation of slow tuner (Saclay lever type) and fast tuner (piezo actuator)
- Installation of magnetic shielding (CC1)



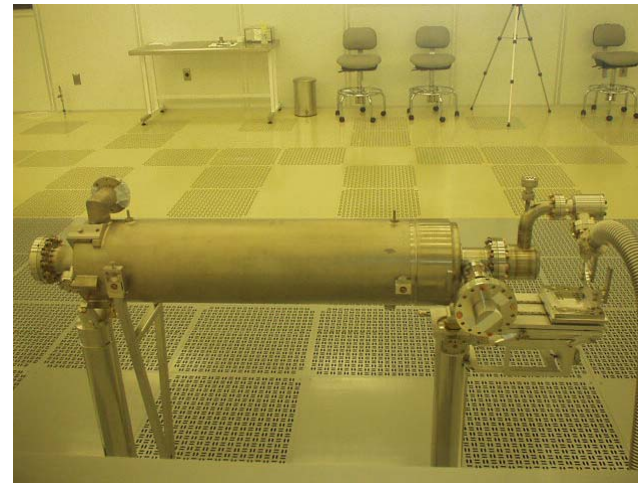
C22 as arrived from TJNL



Installation of burst disc/pump-out flange



Installation of coupler "cold part"



Done, pumping down



Transporting C22 (MP9 → MDB)



Shipping fixture

HTS installation cart

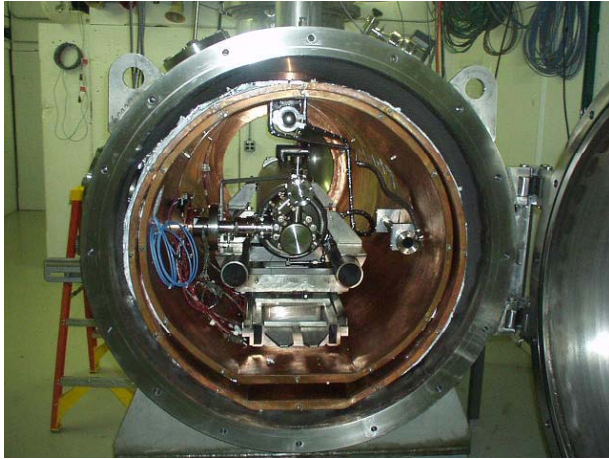


HTS cavity support "feet"

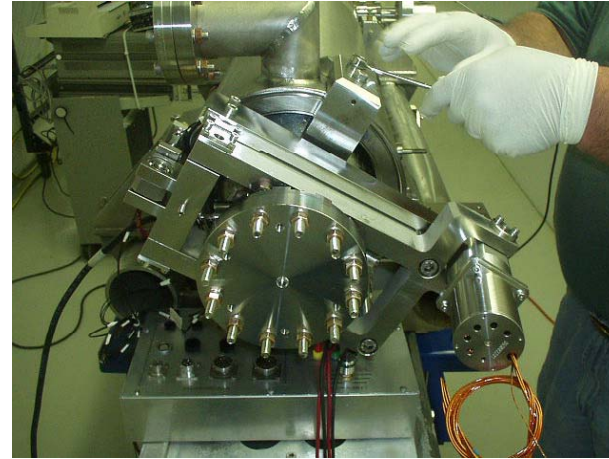
Crane over to HTS cart



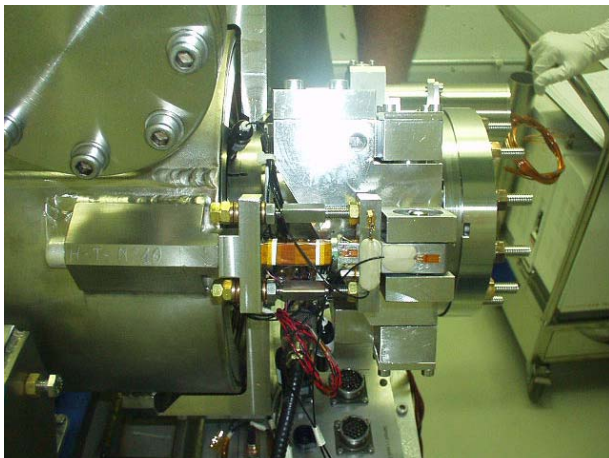
Rotate 90° and unbolt fixturing



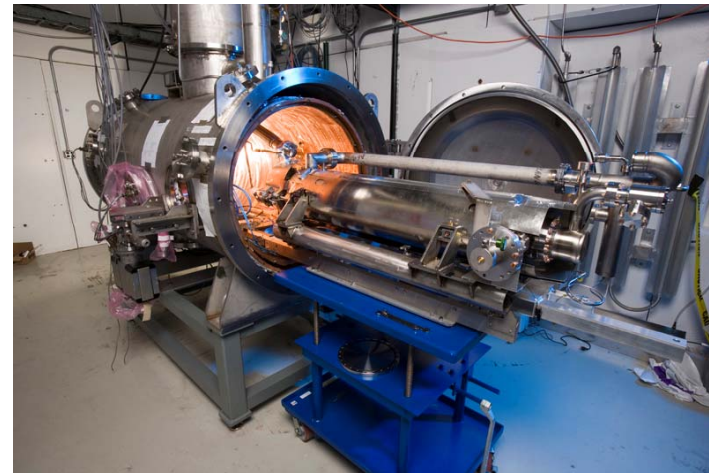
Temporary install to pressure test helium vessel (~2 lbs differential)



Slow tuner (Saclay lever type)

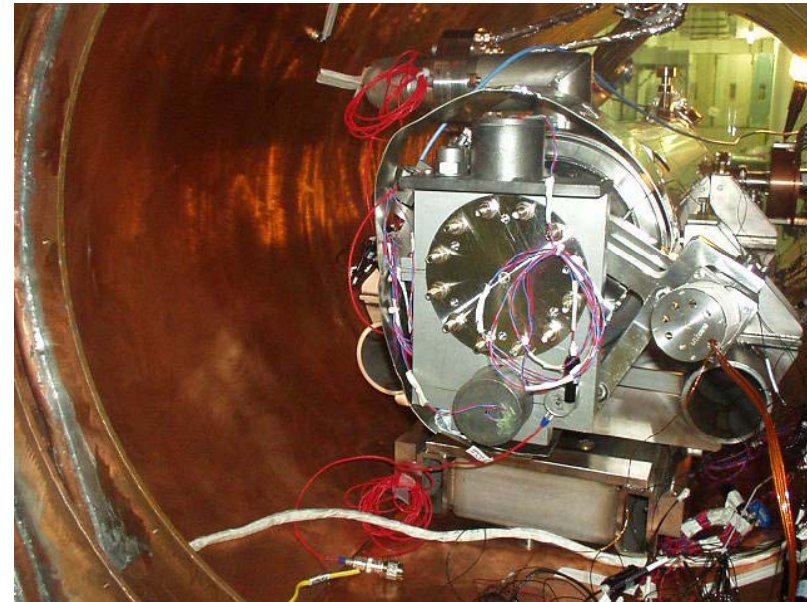


Fast tuner (piezo actuator)

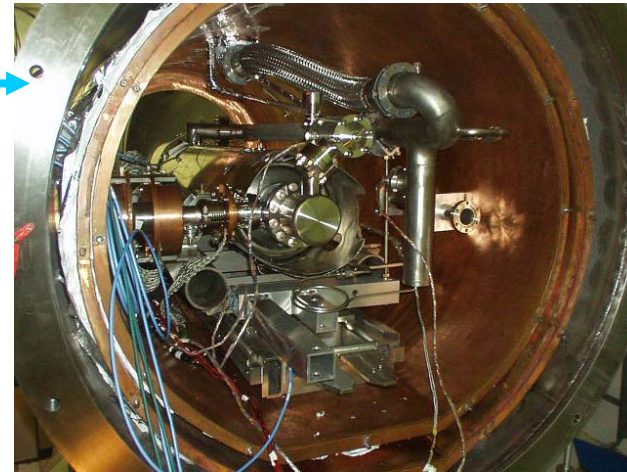


Fully dressed and ready to install

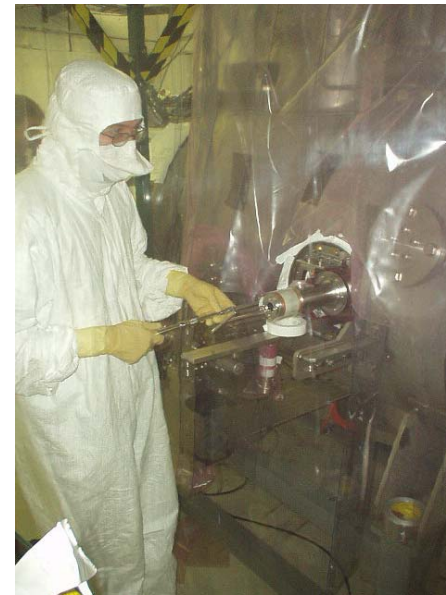
- Geophones installed to measure longitudinal and transverse vibration of cavity and supports
- Want to learn about response at cold temperatures
 - **Proposed package for first NML cryomodule**
 - **CC2 experience: vibes are an important diagnostic!**
- HTS serves for both cryomodule production and R&D



- Cavity installed →
- Internal instrumentation checkout
- Coupler warm part installation

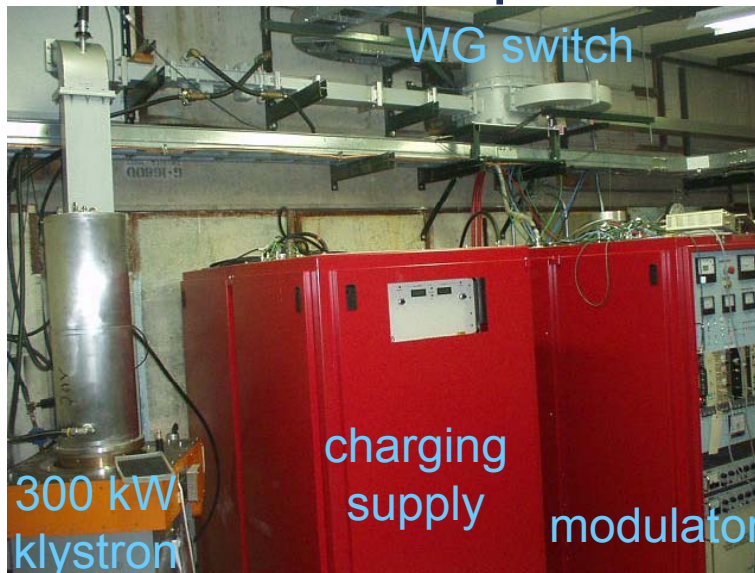


Planning



Doing!

- Close up cryostat and pump down (start tomorrow if all goes well)
- Begin cooldown next week
 - In parallel, finish up RF system
- Warm back up and begin testing program





HTS test cycle/C22 plan



- Install cavity in HTC
- Warm, off-resonance coupler conditioning (high pulsed power processing)
- Cooldown to 1.8 K
- On-resonance conditioning of coupler/cavity
- Map out Q_0 vs E_{acc} curve
- Test new widgets, algorithms, etc.
- Warmup
- Remove cavity
- **CC2 experience + re-using CC2 systems = smooth commissioning**

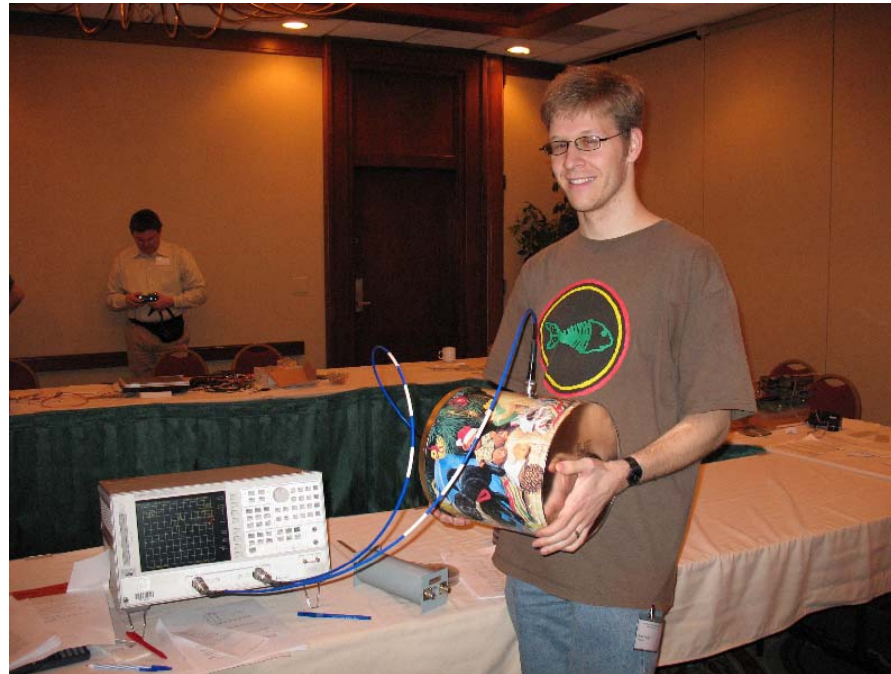


Post-commissioning plans



- If time permits, uninstall/reinstall C22 to check reproducibility
- Fix what we need to fix
- Open for business
 - **First “real” test: Third-harmonic accelerating cavity for DESY’s FLASH**
 - Install 3.9 GHz klystron (in operation at A0) and waveguide
- Interleave 3.9 GHz (at least six) and 1.3 GHz testing as cavity production schedule allows
- Got a gadget or an idea you want to test in something very like a cryomodule? Come talk to me!

- HTS commissioning about to begin!
- I'll start a pool for C22's max gradient in HTS
 - **In any event, it should do better than this one:**



USPAS in Houston, TX, January 2007 ($Q_0 = 2 \times 10^2$)



Many thanks to...



Elvin Harms, Helen Edwards, Ron Kellett, Ryan Montiel, Wade Muranyi, Allan Rowe, Rocky, John Reid, Tom Kubicki, Dan Olis, Brian DeGraff, Roger, Jay Theilacker, Arkadiy Klebaner, Rick Bossert, Bill Soyars, Christine Darve, Liujin Pei, Greg Johnson, Alex Martinez, Peter Prieto, Bob Dysert, Marv Olson, Dennis Nicklaus, Ron Rechenmacher, Margaret Votava, Mike Kucera, Brian Chase, Leon Beverley, Glenn Federwitz, Dan Wolff, Mike Andrews, Mayling Wong, Valeriy Poloubotko, Clark Reid, Tom Peterson, Tug Arkan, Brian Smith, Marco Battistoni, Timer Khabiboulline, Jeff Elliott, Fred Lewis, Paul Dubiel, Ruben Carcagno, Yuriy Pischalnikov, Mike McGee...