Prototype Cryomodule Construction

Warren Funk

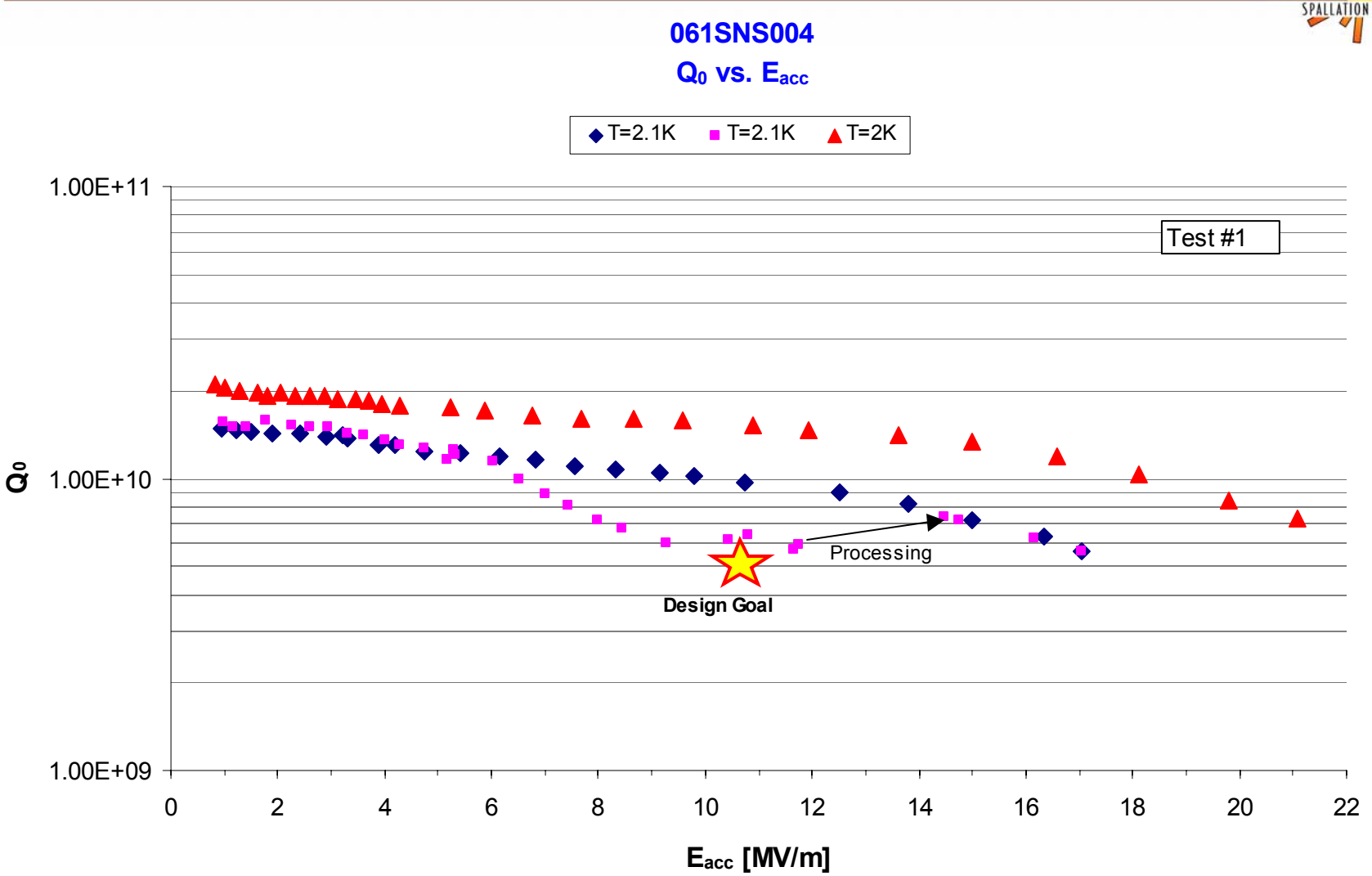
May 8, 2002

Outline

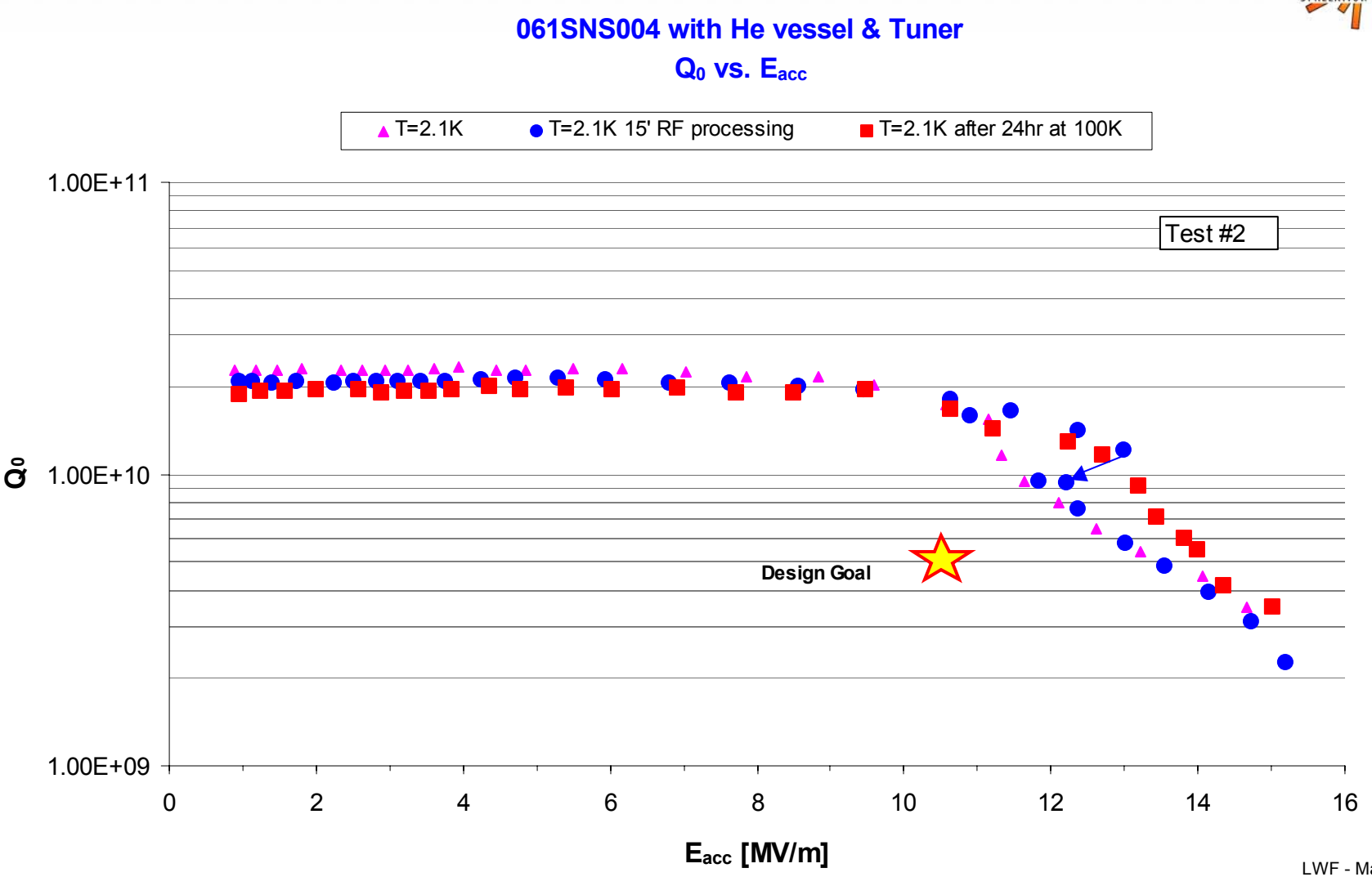
- Cavity String Assembly
- Cold Mass Completion
- Assembly into Vacuum Vessel
- Cryomodule Test Facility
- Prototype Cryomodule Test Program
- Test Program Review
- Testing Progress

Cavity String Assembly

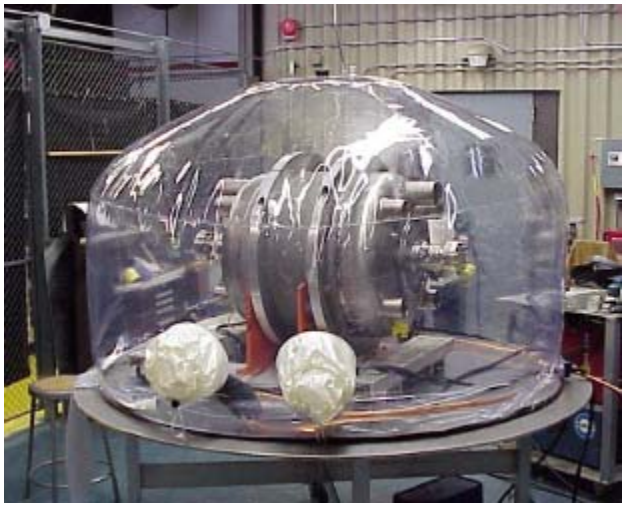
Prototype Cryomodule Cavity #4 Initial



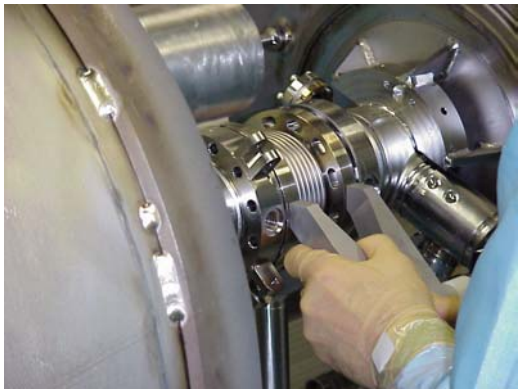
Prototype Cryomodule Cavity #4 w/He Vessel

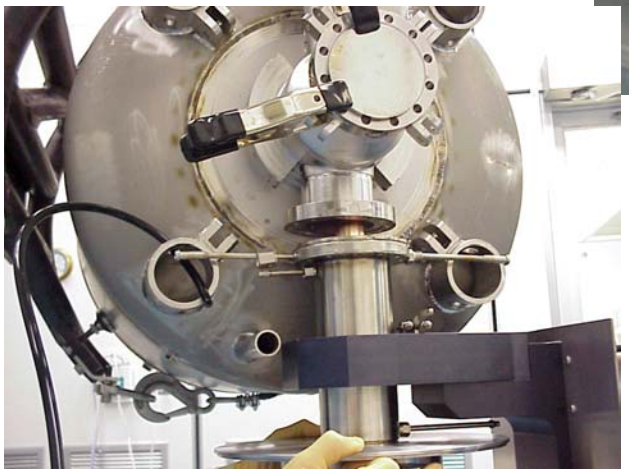


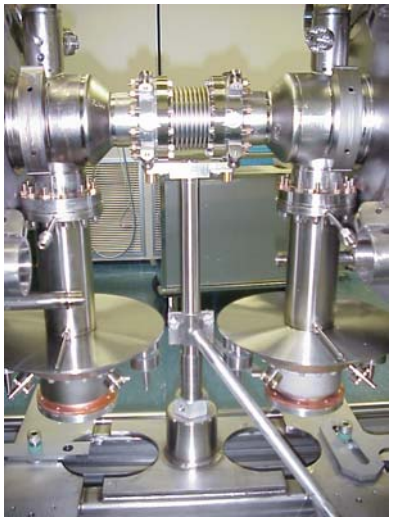
Cavity String Assembly - 2



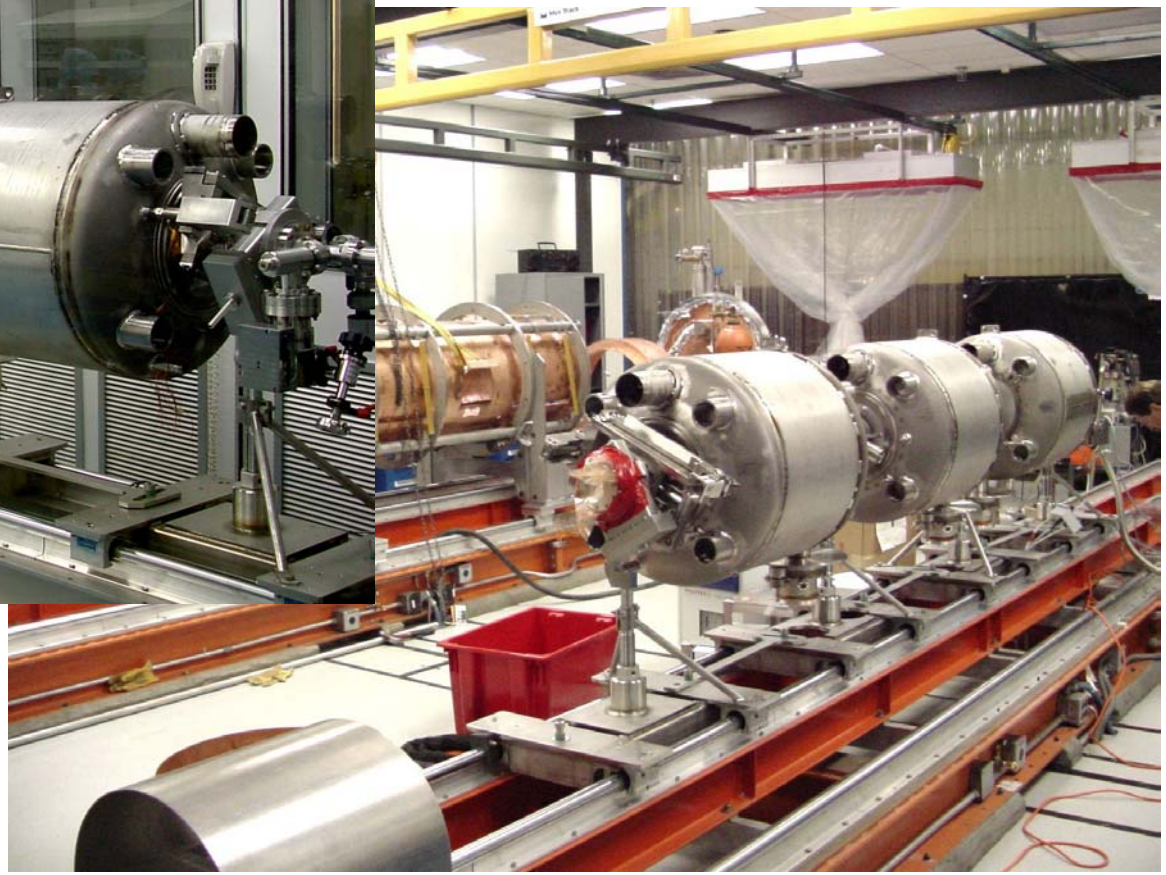
Cavity String Assembly - 3



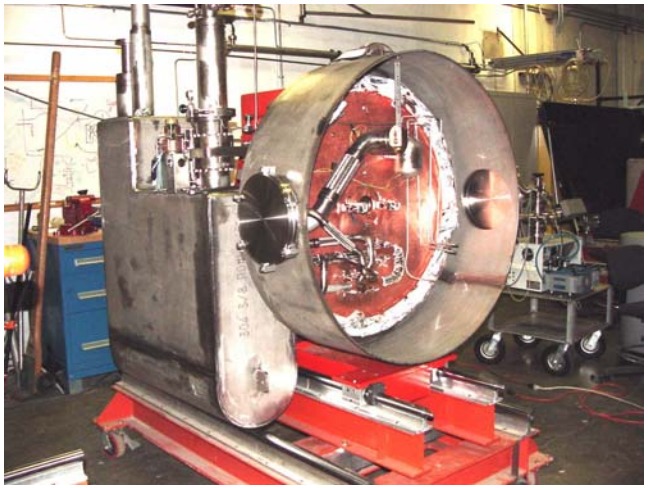


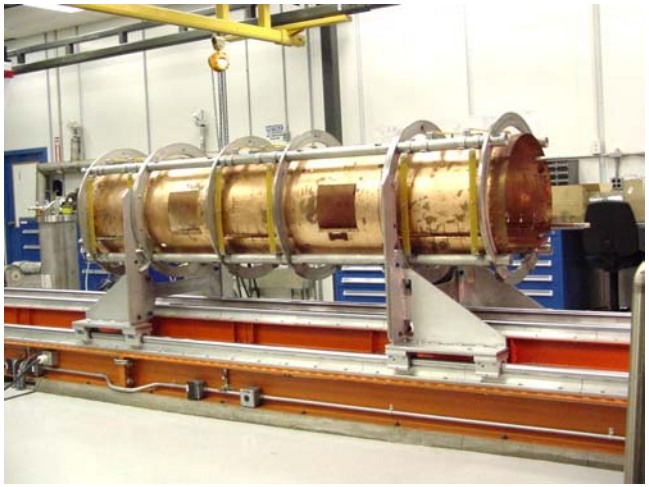


Cavity String Assembly – 4



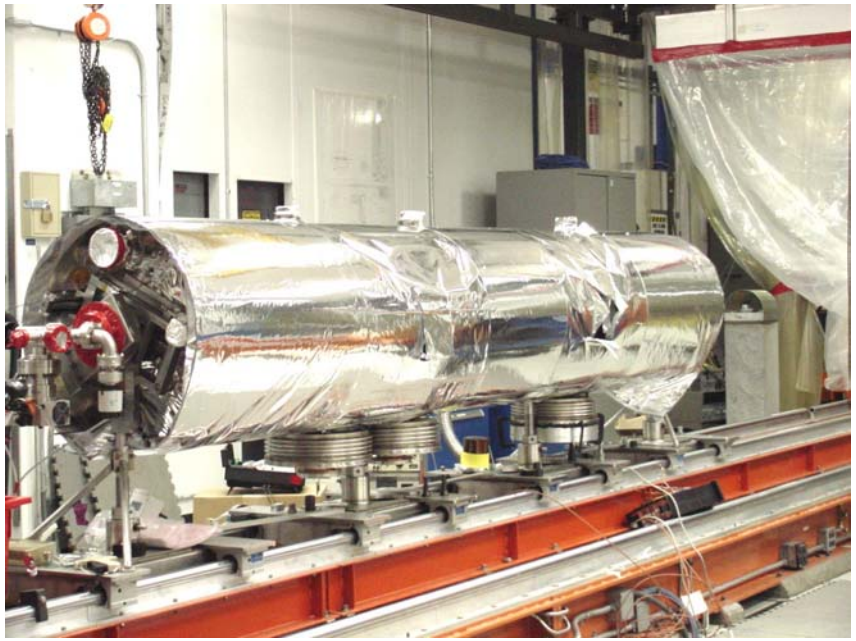
Cryomodule Assembly



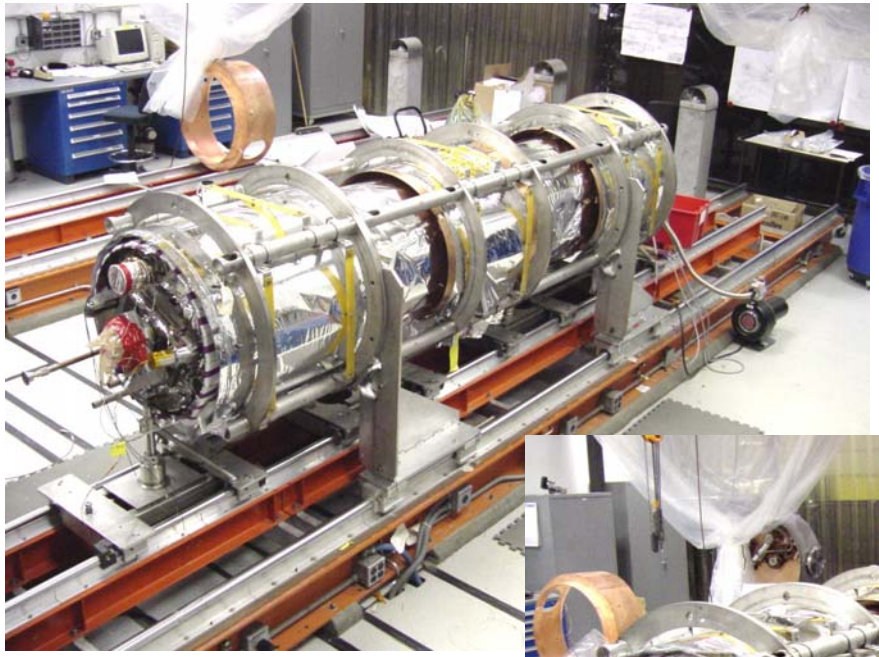


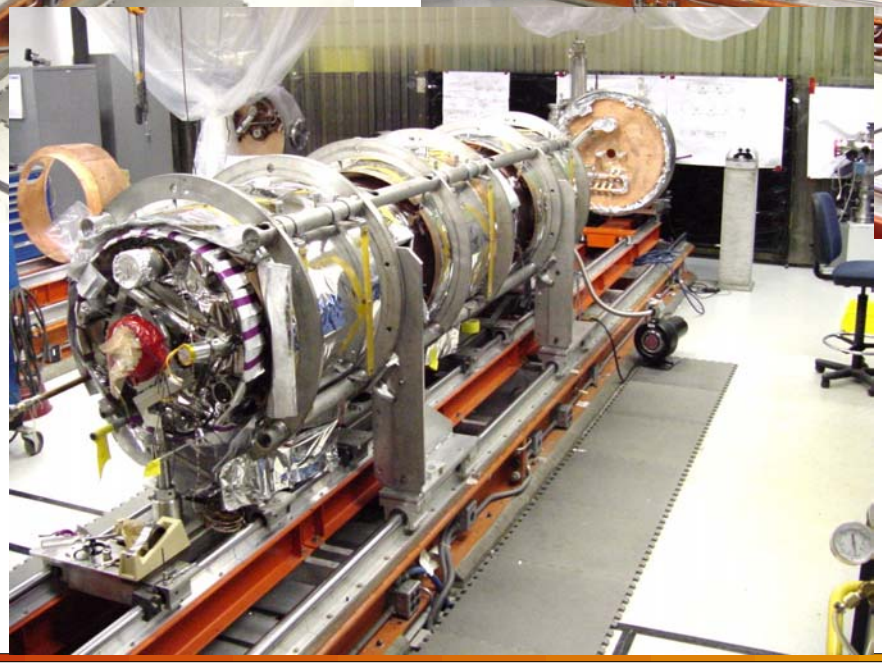
- Tuner motors, harmonic drives
- Instrumentation, wiring harnesses
- Process piping
- Inner magnetic shields
- Numerous leak-checking, alignment and wiring check-out steps
- Application of multi-layer insulation, results in …

Cryomodule Assembly –2



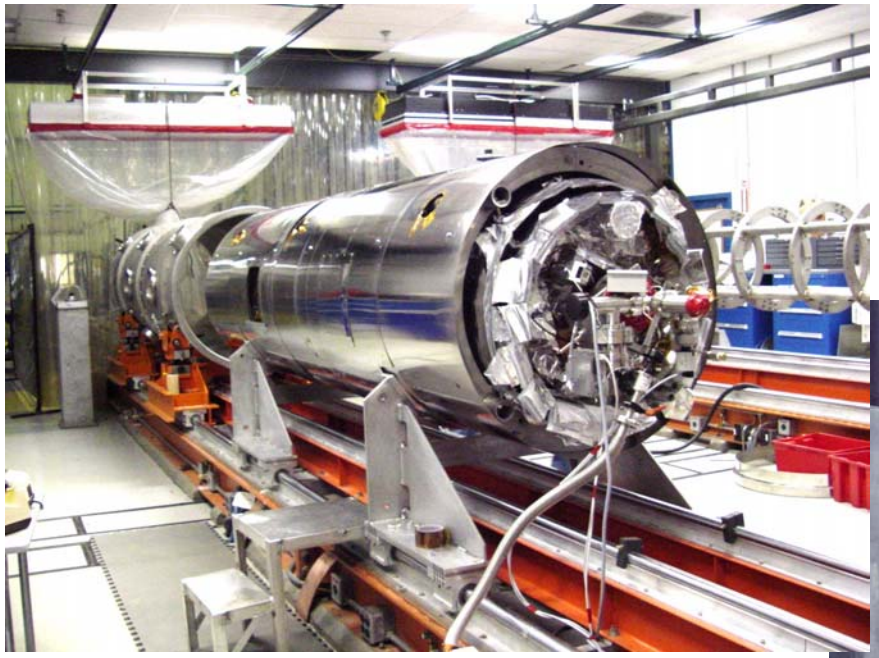
Cryomodule Assembly -3



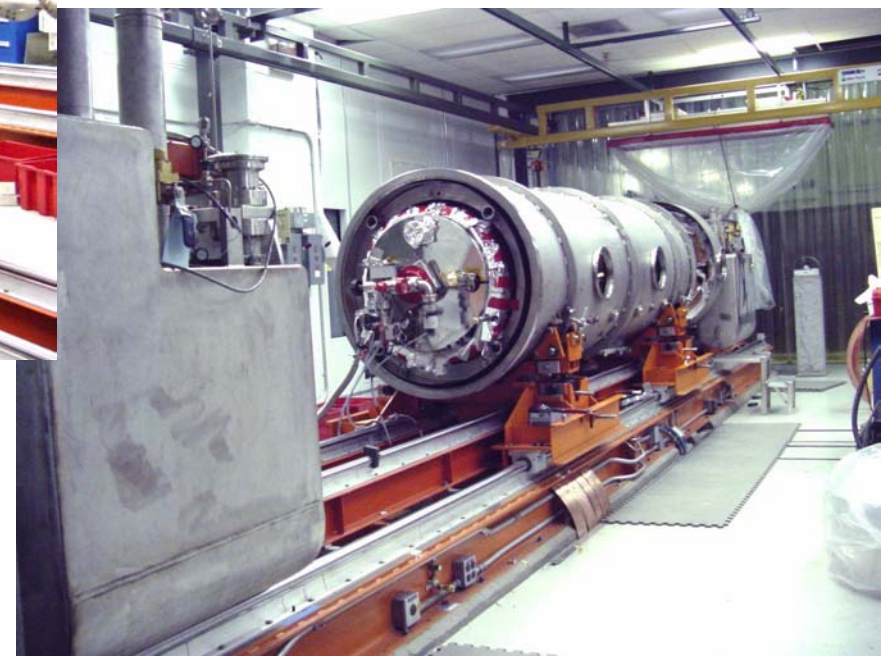


Addition of thermal shield, more multi-layer insulation and insertion into space frame …

Cryomodule Assembly - 4



Outer magnetic shields

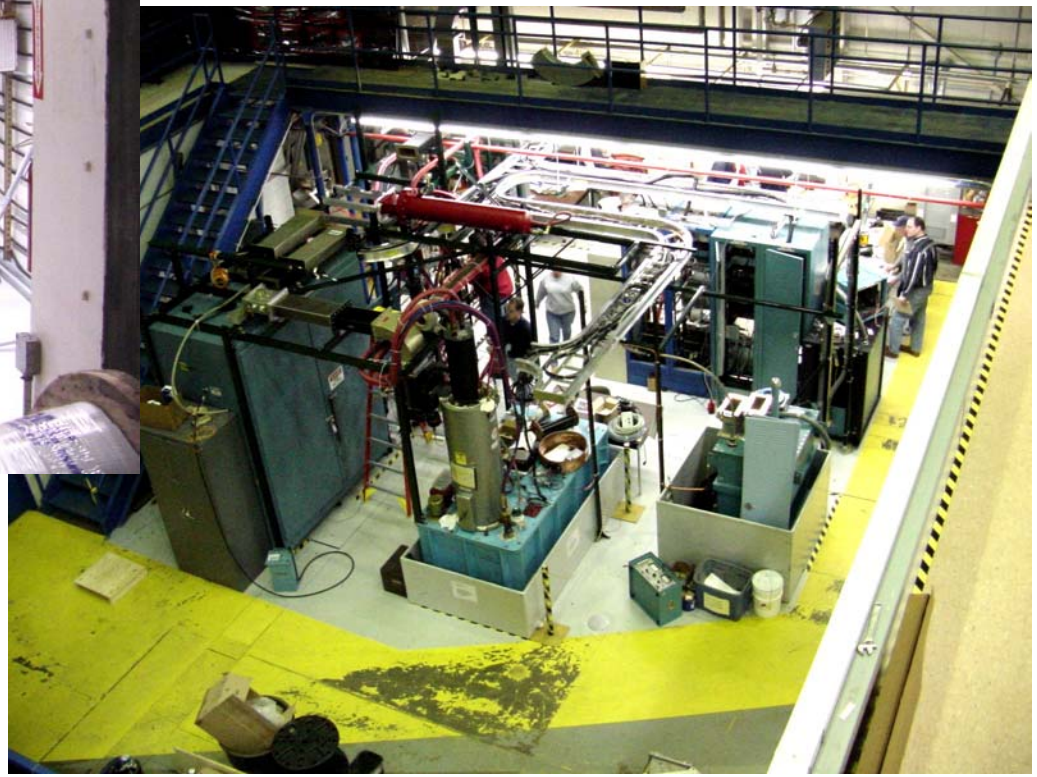


Vacuum vessel

Cryomodule Assembly - 5

LWF - May 8, 2002

Cryomodule Test Facility



Prototype Cryomodule Test Program – Top Level

1. Checkouts
2. Cooldown
3. Low Power Measurements
4. Cavity 4 Qualification
5. Cavity 3 Qualification
6. Cavity 2 Qualification
7. Microphonics
8. Dynamic Lorenz Force Detuning
9. Transportation Test
10. Potentially Destructive Tests

Program Details – Cavity 4 Qualification

Cavity 4 qualification	Procedure Status	Principle Investigator	Duration (days)	Link to Test Plan
Cavity #4 Maximum gradient with 1 MW system (Pulsed)	0.5	Campisi	2	Gradient_specifications
Cavity #4 Q vs. E with 1 MW system (Pulsed)	0.5	Campisi	1	Qo
Change to 20 kW system	0	Campisi	1	
Cavity #4 Low Power Waveguide Iris Coupler Calibration	1	Campisi	2	iriscoupler
Cavity #4 Stub tuner setting at 20 kW	0	Campisi	2	
Cavity #4 Loaded Q measurements	1	Campisi	1	LoadedQ
Cavity #4 Qo and Field Emission 20 kW	1	Campisi	2	Qo
Cryomodule Static Heat Load (Primary and Shield)	0.5	Preble/Daly	1	primary_mass_flow
Mechanical tuner resolution Range and Hysteresis	0.5	Daly	3	Tuner_Performance
Piezo tuner Resolution, range and hysteresis	0	Daly	2	

Program Review

SNS Prototype Cryomodule Test Plans

Charge

- Is the Test Plan addressing all the appropriate activities within the scope of the Prototype Cryomodule qualification?
- Is the measurement sequence logical and optimal to achieve all the objectives and extract the most complete information from the tests?
- Are we implementing the right type of measurements? Can they be simplified?
- Is there any interference between components of the test plan?
- Are all the safety aspects correctly identified and dealt with?
- Are the potentially destructive tests in the proposed sequence the correct ones to achieve the best benefit/risk potential even in case of a catastrophic failure?

SNS Prototype Cryomodule Test Plans Review, 3 April 2002

Program Review Outcome

- Committee report was favorable

  "We would like to acknowledge at the outset the effort that has gone into the preparation of the test program and the high quality of the end product. We look forward to seeing the results of the test program."

- Several valuable suggestions for improvements confirmed that this is a value-added process.

Current Status

- Initial cooldown scheduled for this week.