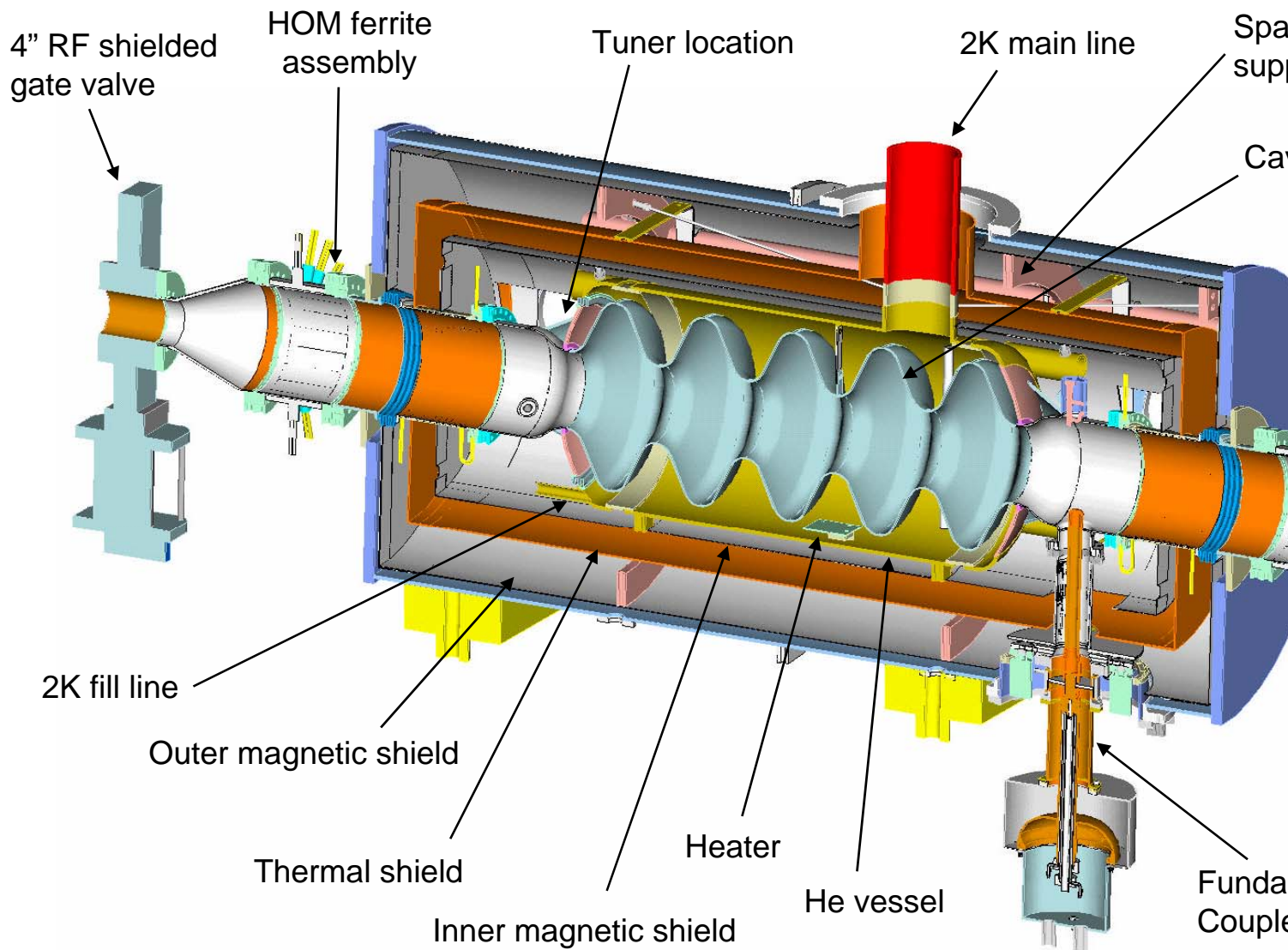
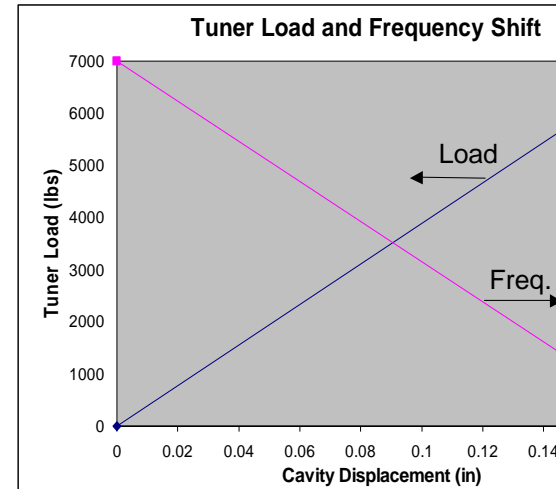
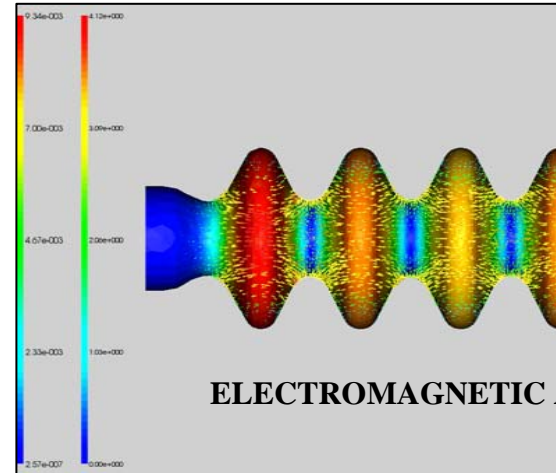
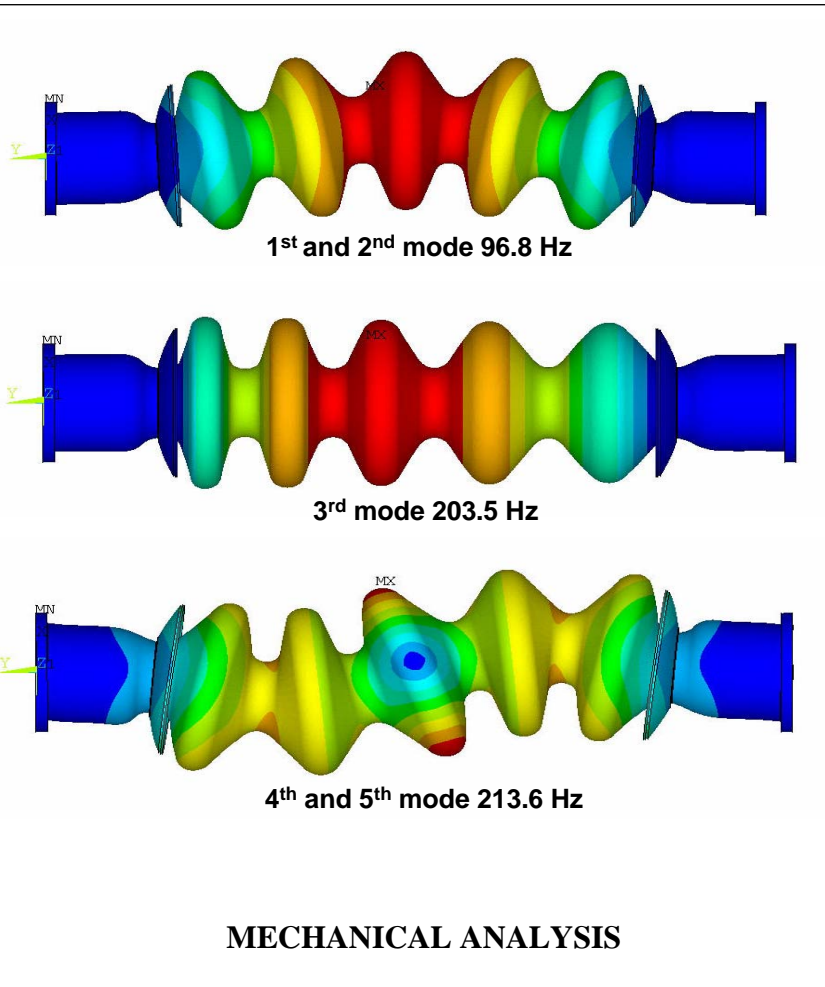


# eCx Cryomodule Assembly Configuration



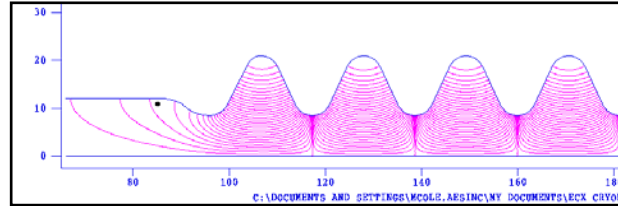
# Mechanical and Electromagnetic Analysis

Finite element models were used to evaluate the thermal, structural, and FEM of the cavities under thermal load, pressure load, and loads from the cavity



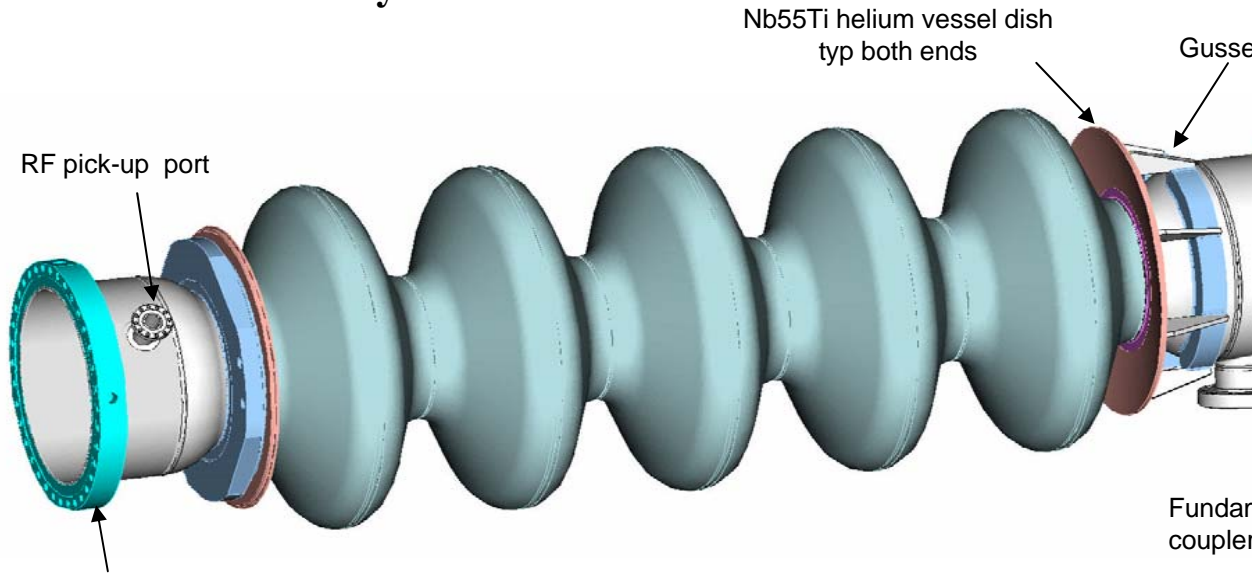
# RF Analysis / Cavity Configuration

Cavity Frequency	703.781 MHz
Energy Gain ( $E_0TL$ )	15 MV
$E_0$ (Iris to Iris, $L = 1.065m$ )	20.356 MV/m
Max Design E Field at Iris, $E_{peak}$	27.861 MV/m
Max Design H Field at Wall, $H_{peak}$	64870.6 A/m or 6.487 mT
Avg Design H Field over Walls, $H_{avg}$	61887.2 A/m or 6.189 mT
Design Stored Energy	126.931 Joules
Residual Resistivity used in SUPERFISH	10 nOhms
$Q_0$ at 2K	$1.51 \times 10^{10}$



RF Field Profile as calculated by SUPERFISH

## RF Parameters as calculated by SUPERFISH



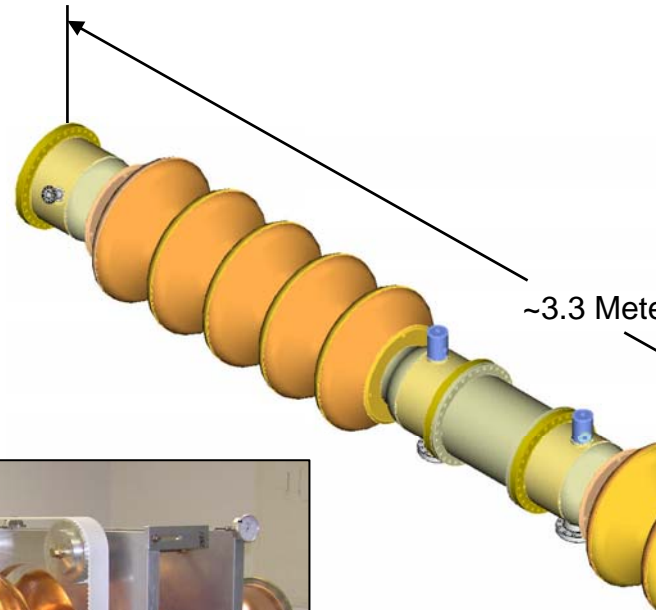
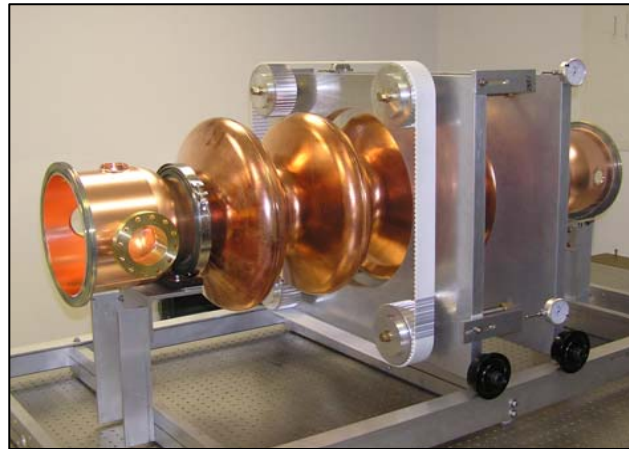
## CAVITY DESIGN

# Low Power RF Test Cavities

AES fabricated two cold models and delivered them to BNL for RF design v



**5-CELL 703.75 MHz  
COPPER LOW POWER  
RF TEST CAVITIES IN  
TUNING FIXTURE**



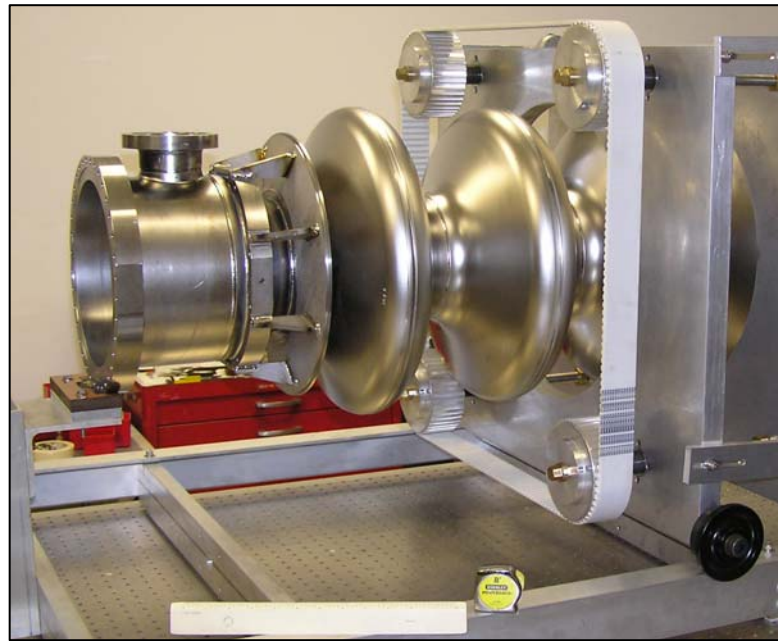
# Niobium Cavity Fabrication



**CAVITY  
PRE-WELD  
ASSEMBLY**

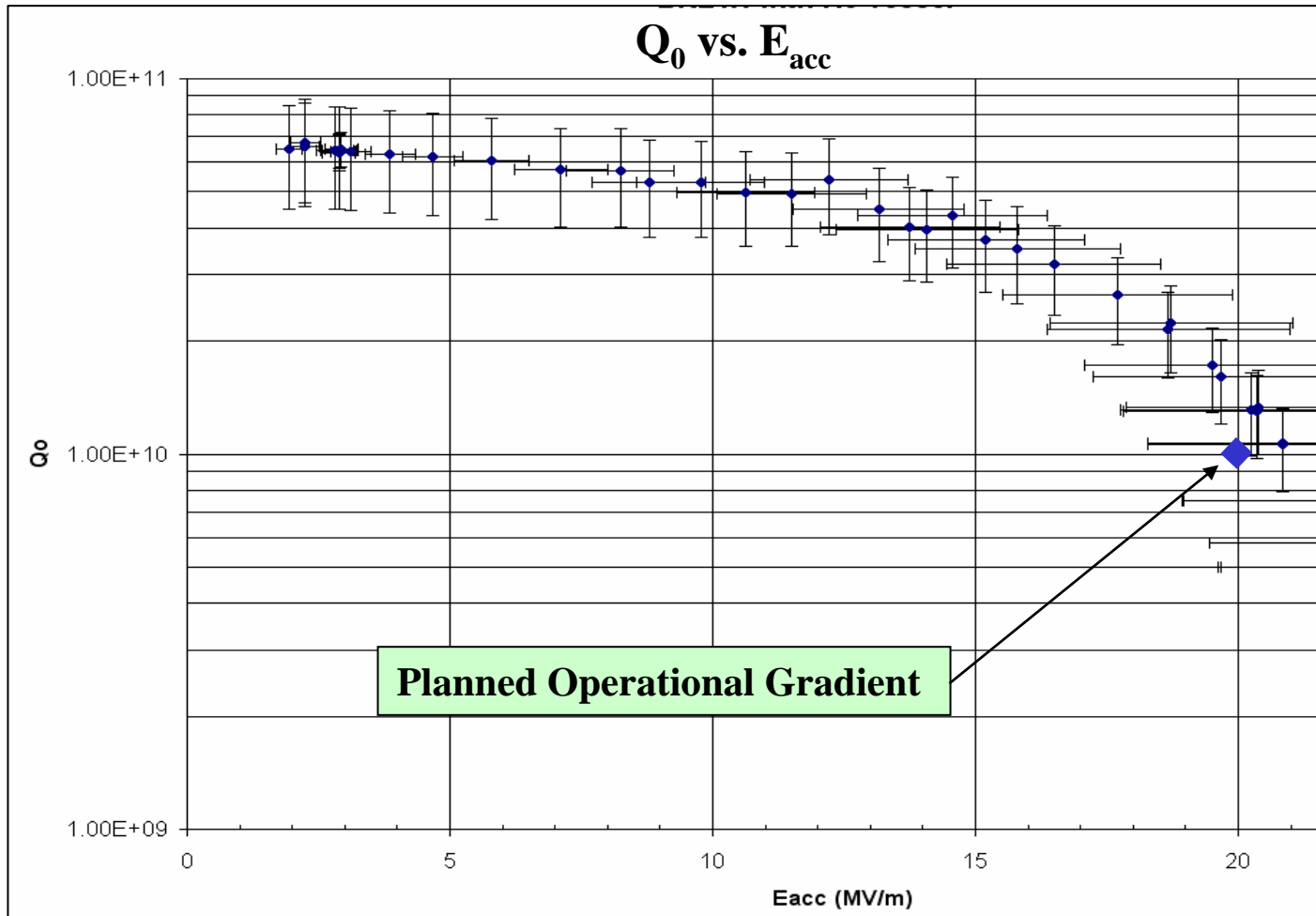


**CAVITY ASSEMBLY**



**CAVITY ASSEMBLY IN TUNING**

# Vertical Test Results

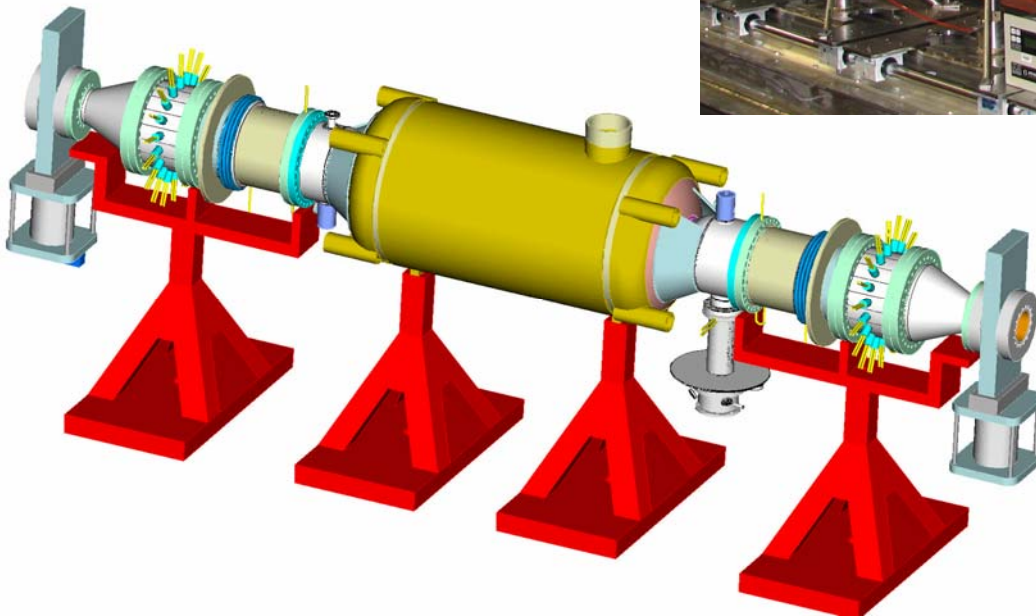


# Beam Pipes

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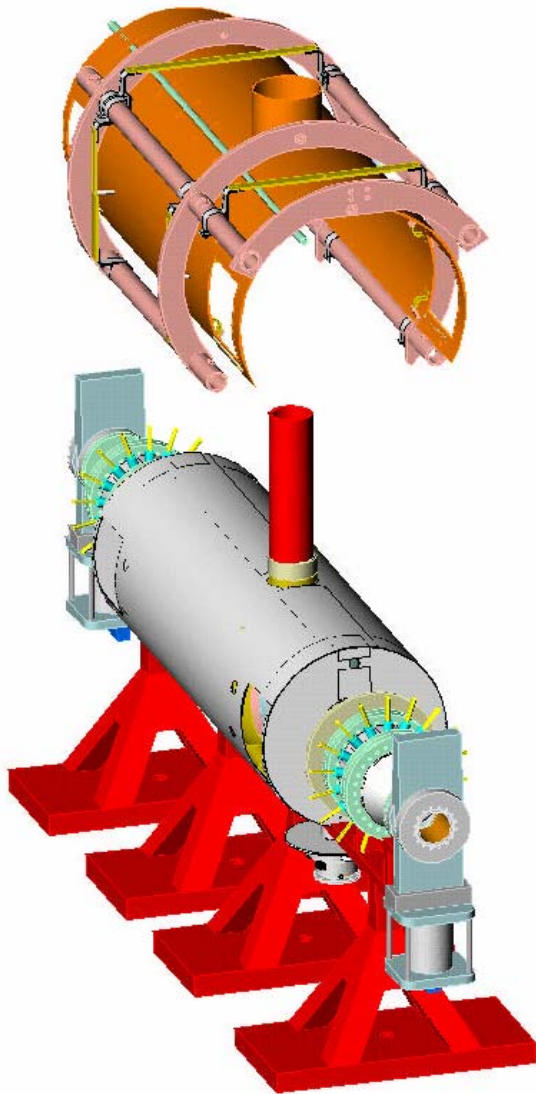


# Cavity String Assembly





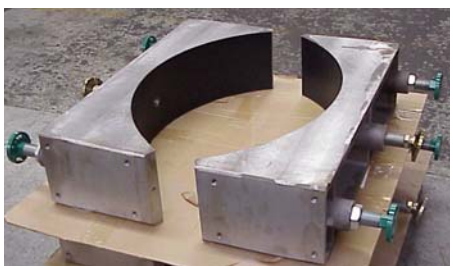
# Space Frame and Thermal Shield Insta



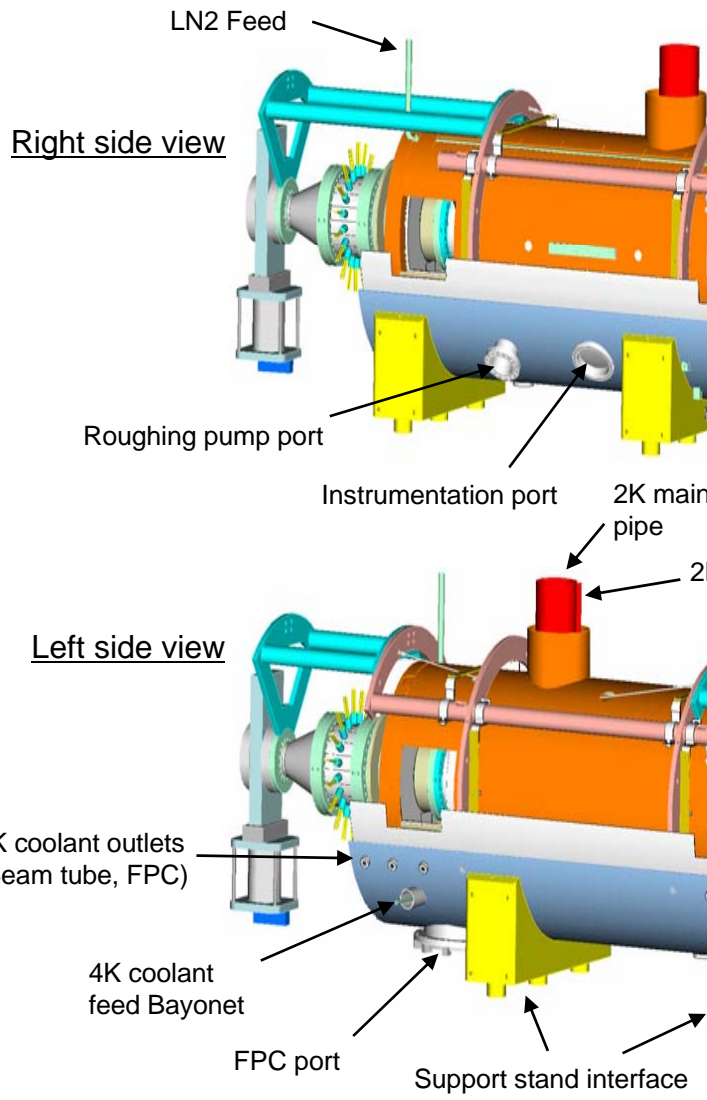
# Vacuum Vessel Components / Cryomodule I



**VACUUM  
VESSEL  
SECTIONS**



**SUPPORT STANDS**



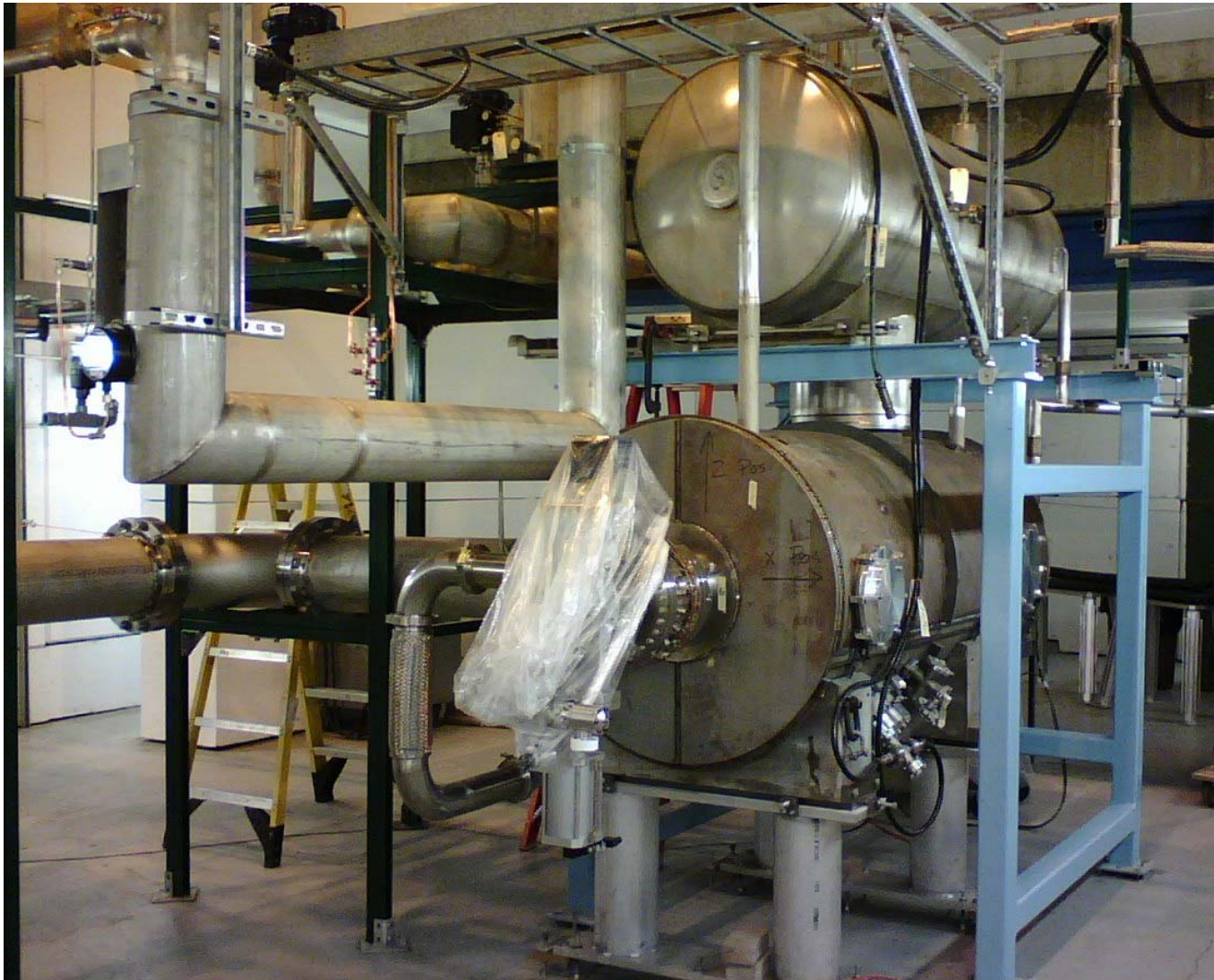
# Cryomodule Assembly

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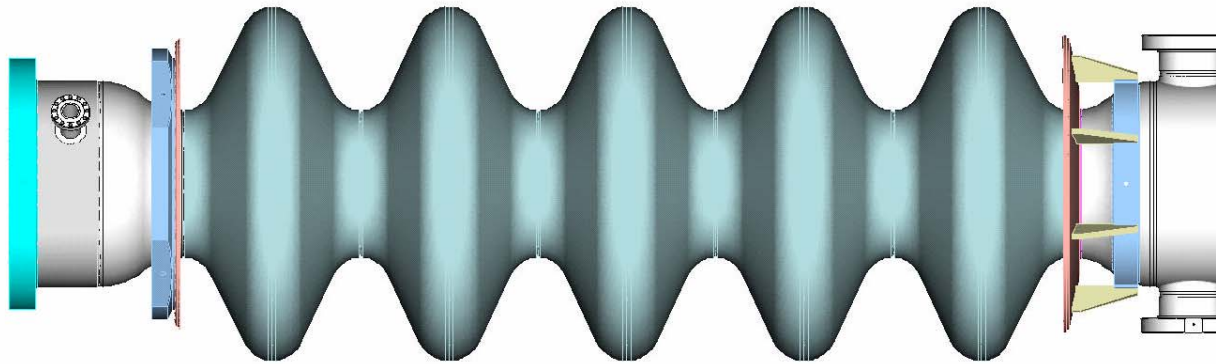
# Cryomodule Installation

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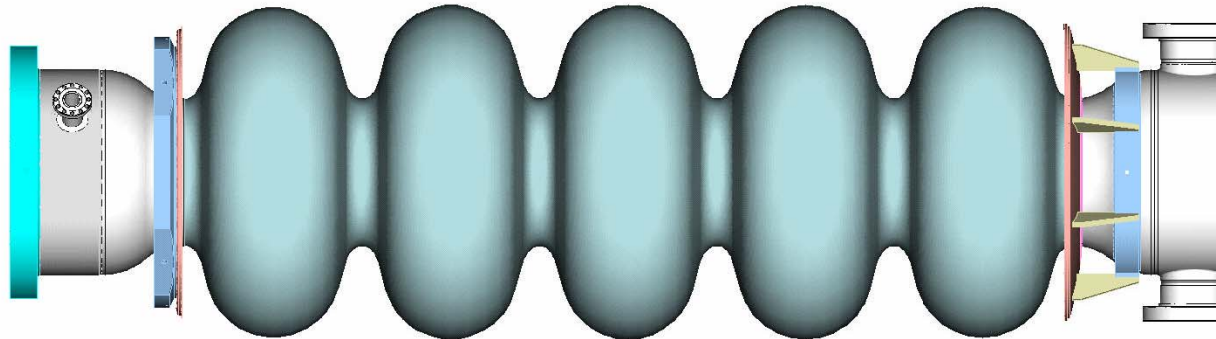


# BNL Improved Cavity Shape

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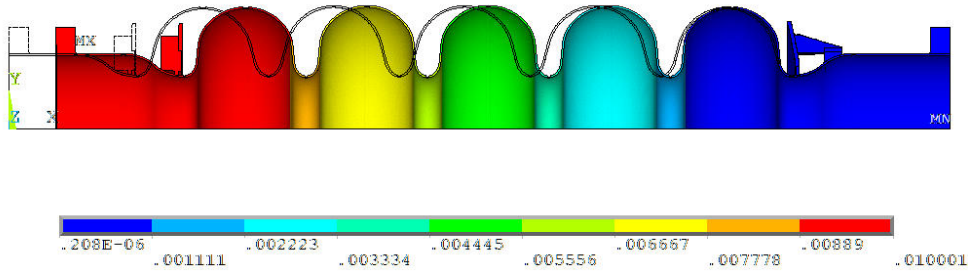


Original BNL eCx Cavity Shape

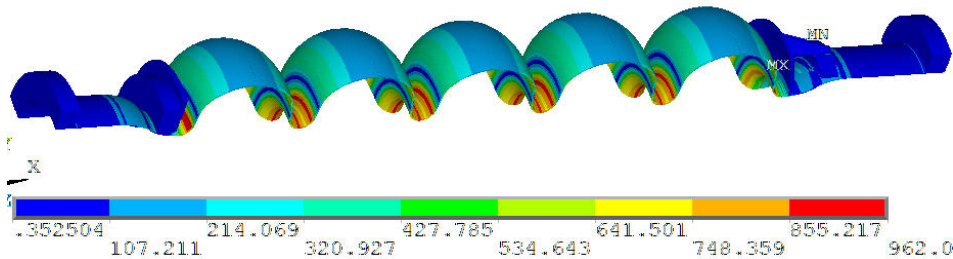


New Cavity Shape

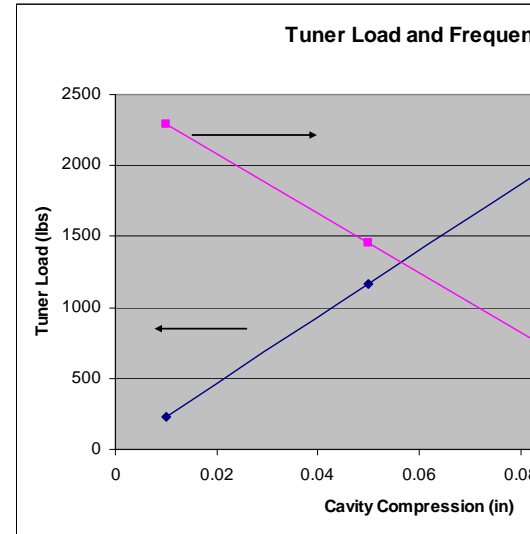
# Cavity Deflection, Tuner Load and Frequency



Deflection (in)



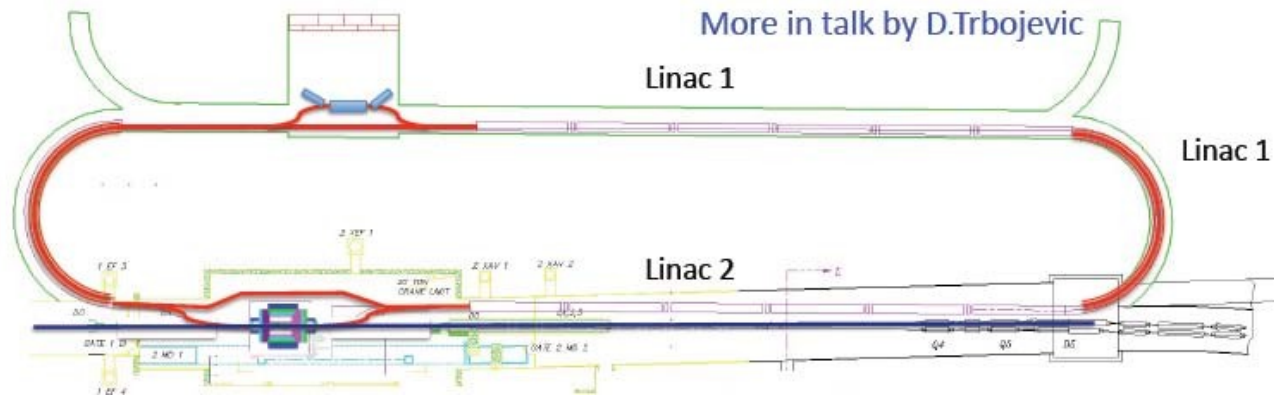
Stress (psi)



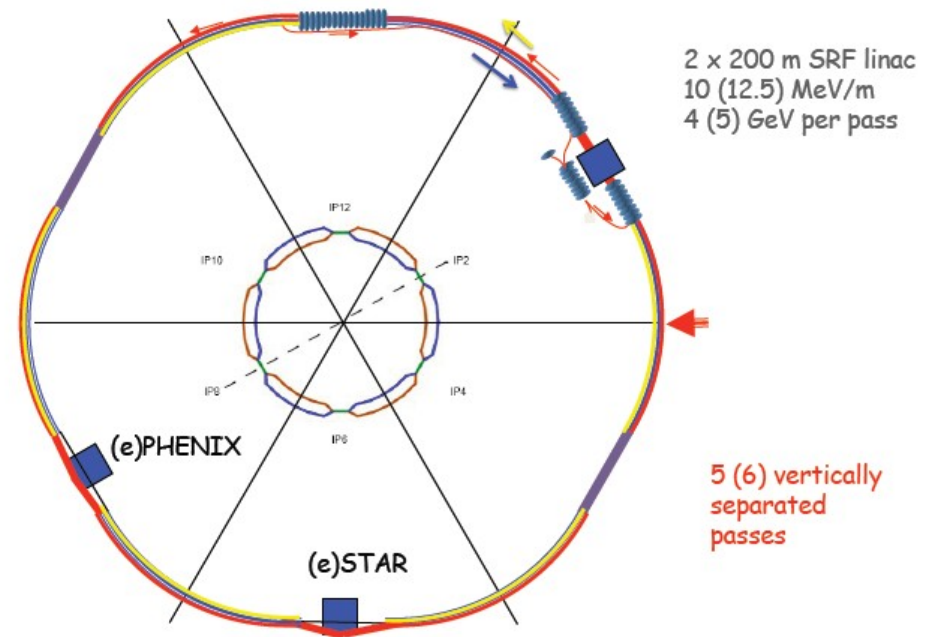
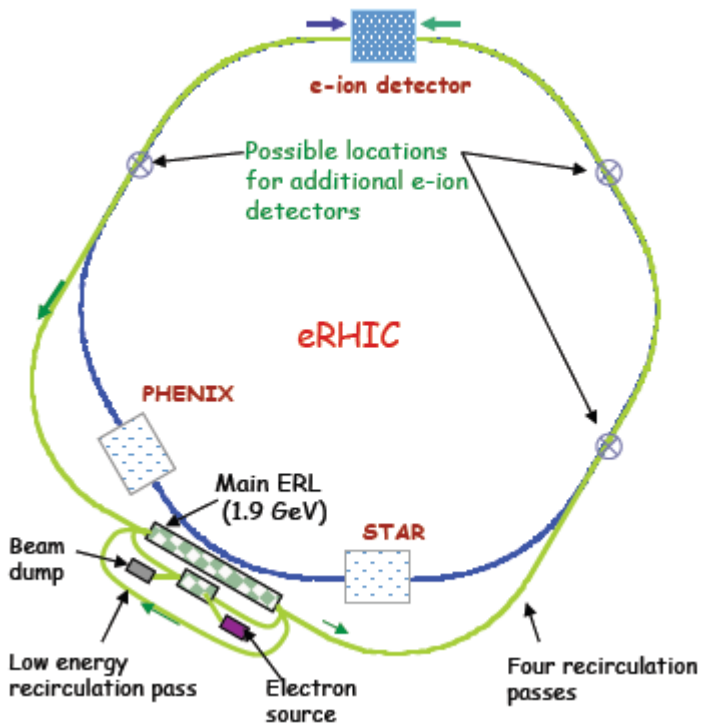
Cavity Compression (in)	Tuner Load (lbs)
.01	233
.05	1167
.10	2334

Cavity Spring Rate = 23,336 Lbs/in

# MeRHIC & eRHIC

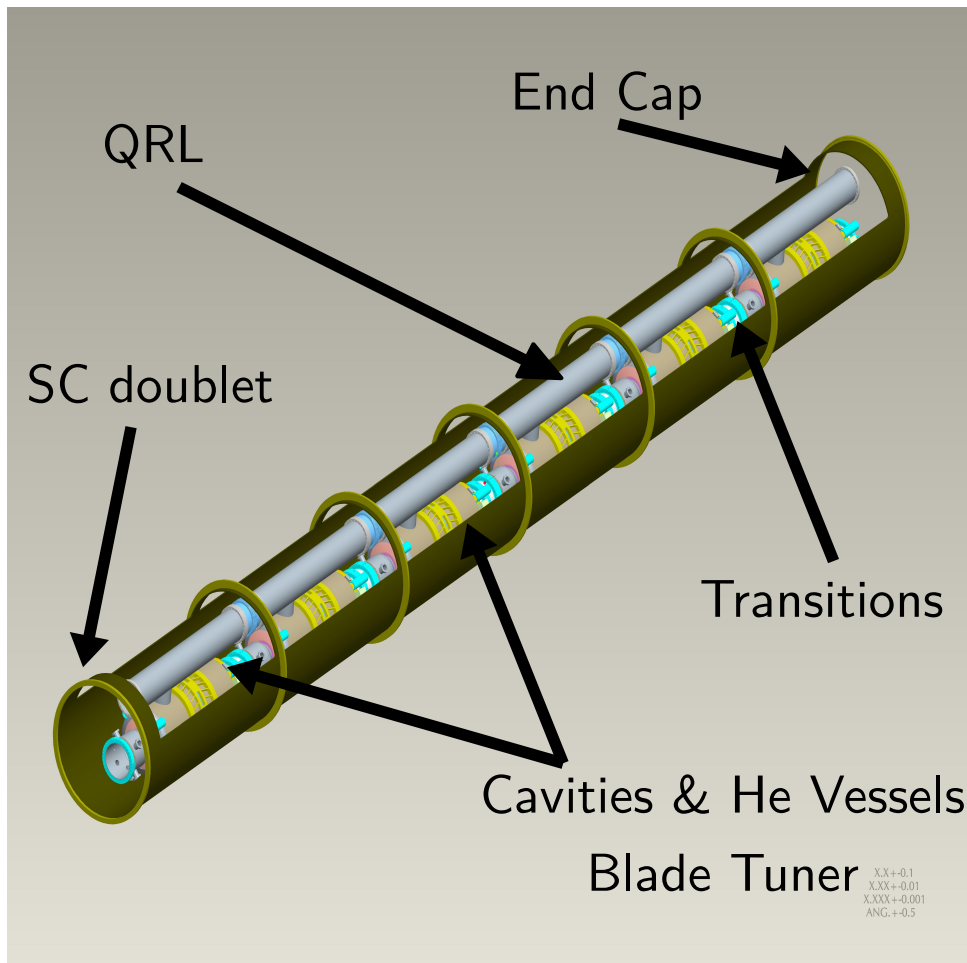


4 GeV  
LINAC, IR2



2 Options for eRHIC, 20 GeV, 5 pass ERL  
704 MHz SRF Cavities

# PRELIMINARY CRYOMODULE



String assembly of multiple cavities.  
Heat shielding and top covers removed  
for clarity.

Breakdown of the eRHIC Cryomodule

$N$  cavities = 6 (but can 4-8)

Module length = 9.6 m

$L$  period = 10.6 m

$E_{\text{acc}} = 18.0$  MV/m

$dE/ds = 10.2$  MeV/m