



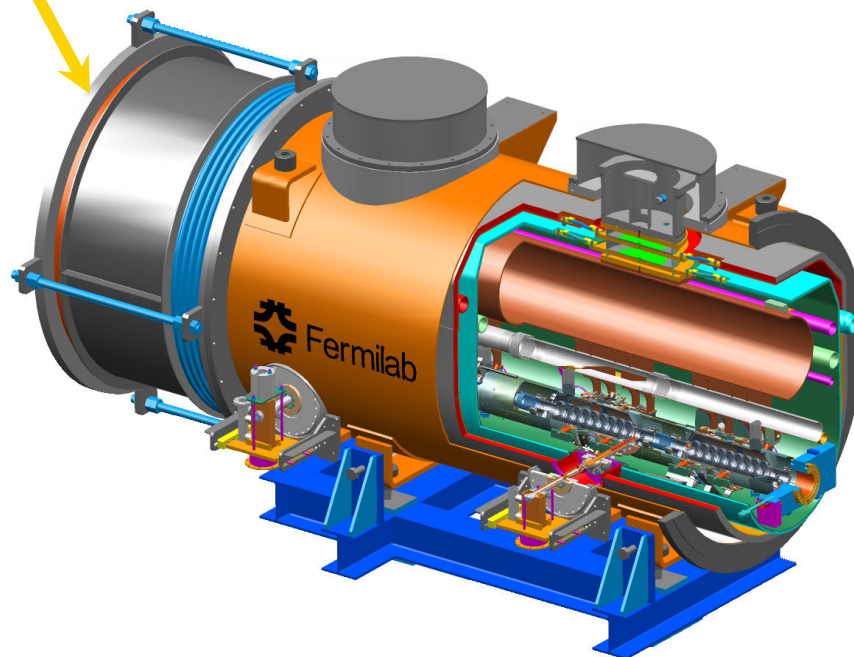
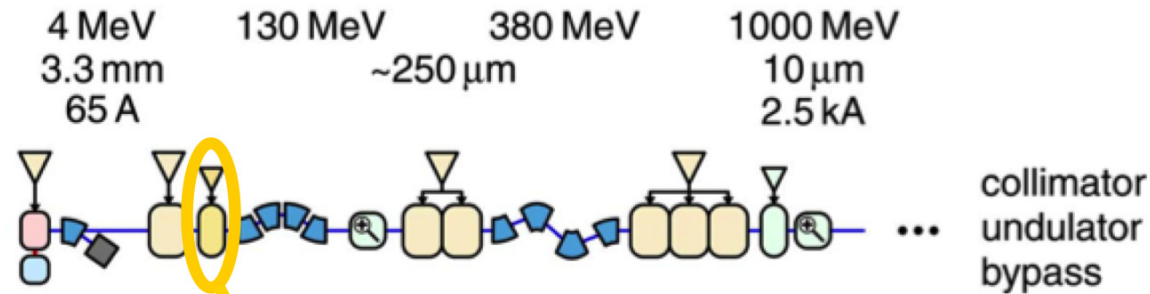
THP028 - Status of 3.9 GHZ Superconducting RF Cavity Technology at Fermilab

E. Harms, T. Arkan, V. Bocean, H. Carter, H. Edwards, M. Foley, T. Khabiboulline, M. McGee, D. Mitchell, D. Olis, A. Rowe, N. Solyak
on behalf of the FNAL 3rd Harmonic Team

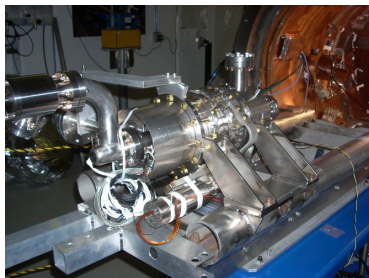
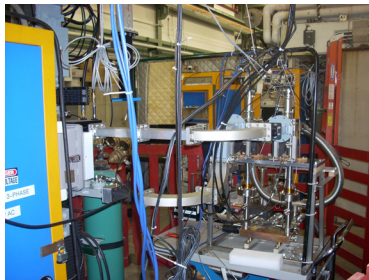
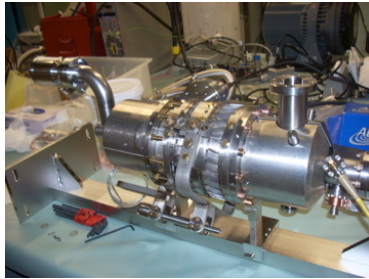
Fermilab is constructing a cryomodule containing four superconducting radio frequency (SRF) cavities operating at 3.9 GHz for the Free electron LASer in Hamburg (FLASH) facility at the Deutsches Elektronen-Synchrotron (DESY) laboratory. This cryomodule was proposed to linearize the energy distribution along a bunch upstream of the bunch compressor. The four 9-cell cavities were designed to operate at 2 K in the TM_{010} π -mode at an accelerating gradient $E_{acc} = 14$ MV/m.



FLASH linac with 3rd harmonic rf



Number of Cavities	4
Active Length	0.346 meter
Gradient	14 MV/m
Phase	-179°
R/Q [=U ² /(wW)]	750 Ω
E _{peak} /E _{acc}	2.26
B _{peak} (E _{acc} = 14 MV/m)	68 mT
Q _{ext}	1.3 X 10 ⁶
BBU Limit for HOM, Q	<1 X 10 ⁵
Total Energy	20 MeV
Beam Current	9 mA
Forward Power, per cavity	9 kW
Coupler Power, per coupler	45 kW



Cavity	Assembled by	Completion date	Test results and status
#1: 2-leg HOM	Fermilab	January 2006	Never tested: HOM membrane break during cleaning - Used as horizontal test prototype
#2: 2-leg HOM	Fermilab	February 2006	- Best vertical test: 12 MV/m limited by HOM heating - Fractured Formteils - Awaiting repair
#3: 2-leg trimmed HOM	Fermilab JLab	August 2006	- Best Vertical test: 24.5 MV/m, achieved after HOM trimming - Welded into Helium vessel - Dressed for Horizontal testing
#4: 2-leg trimmed HOM	Fermilab JLab	March 2007	- Best Vertical test: 23 MV/m - Final vertical test with HOM feedthroughs
#5: 2-leg trimmed HOM	Fermilab JLab	May 2007	- Best Vertical test: 24 MV/m - Welded into Helium vessel - Horizontal testing complete: 22.5 MV/m - Ready for string assembly
#6: 2-leg trimmed HOM	Fermilab JLab	May 2007	- Best Vertical test: 22 MV/m - Faulty welds repaired - Awaiting final vertical test with HOM feedthroughs
#7 single-post HOM	Fermilab JLab DESY	November 2007	- Best Vertical test: 24.5 MV/m - Welded into Helium Vessel - Awaiting dressing and horizontal test
#8 single- post HOM	Fermilab DESY	October 2007	- Vertical test: 24 MV/m - Welded into Helium vessel - Awaiting dressing and horizontal test



Fermilab is in the process of providing a 4-cavity 3.9 GHz cryomodule to DESY for installation in the FLASH facility. A sufficient number of cavities have now passed vertical testing and have helium vessels welded onto them. Horizontal testing of dressed cavities is in progress and string assembly will commence shortly.

It is intended to ship the completed module to DESY and RF test it in the Cryo-Module Test Bed (CMTB) prior to installation in FLASH.

Adjacent Posters:

THP027 - 'Welding Helium Vessels to the 3.9 GHz Superconducting Third Harmonic Cavities'

THP029 - 'Performance of 3.9 GHz Superconducting Cavities'

THP028 - Status of 3.9 GHz Superconducting RF Cavity Technology at Fermilab