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Nb_3Sn Quarter Cryomodule (Gray Enid I) First Beam Test Objective, Key Metrics, and Interface Parameters

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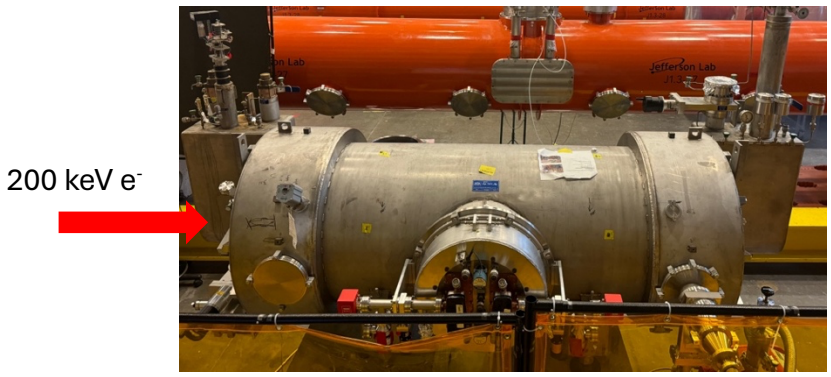
Objective: Run an electron beam through the two 5-cell CEBAF-style Nb_3Sn cavities at Upgraded Injector Test Facility (UITF).

Table 1 Key Beam Test Performance Metrics

Parameter	Objective	Achieved
Injection beam energy [keV]	200	
Injection beam current [μA]	0.1	
	10 (stretch goal)	
Exit beam energy [MeV]	5.2	
	7.5 (stretch goal)	
Cavity temperature [K]	4.3	
Stable beam operation [hr]	2	

Table 2 Key Cavity Target Metrics

Parameter	Unit	Objective	Achieved
Upstream cavity frequency at 4.3 K	MHz	1496.555	
Upstream cavity gradient setpoint	MV/m	Up to 12.6	
Downstream cavity frequency at 4.3 K	MHz	1496.555	
Downstream cavity gradient setpoint	MV/m	Up to 7.5	



Upstream cavity = cavity 5C75-RI-NbSn01 = cavity 7 = cavity at Supply End Cap side = Left cavity
Downstream cavity = cavity 5C75-RI-04 = cavity 8 = cavity at Return End Cap side = Right cavity

Figure 1: Beam entrance location and cavity nomenclature.

Table 3 Nb_3Sn Cryomodule Mechanical Interface Dimensions

#	Dimension Name	Dimension Value on DWG 11100-0008	Dimension value Actual
1	Footprint	133.59 in x 49.92 in	
2	End-to-End Length	133.59 in	
3	Beamline Valve Location (from vacuum vessel center)	52.81 in (supply end)	
		48.88 in (return end)	
4	Pump Drop Location	See Fig. 2, 3, 4	
5	Pump Drop Size	See DWG # JL0096225	
6	Waveguide Location	See Fig. 2, 3,4	
7	Vent Relief	See Fig. 2	

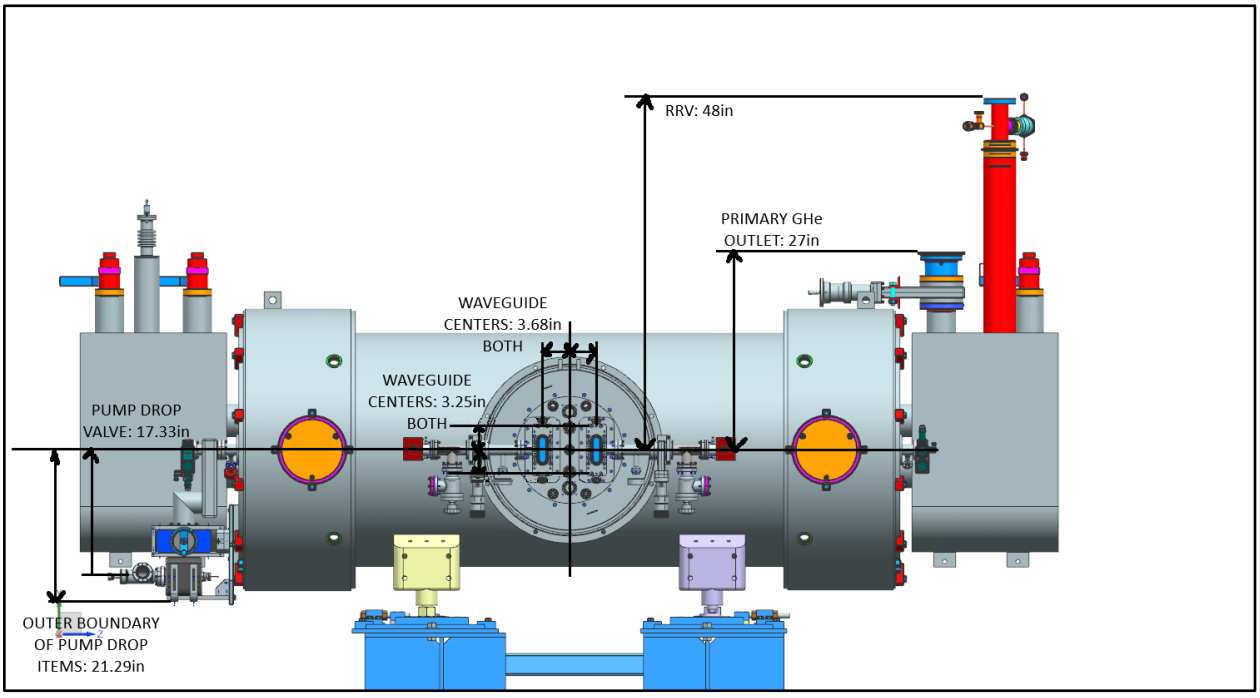


Figure 2: Side view facing the waveguides.

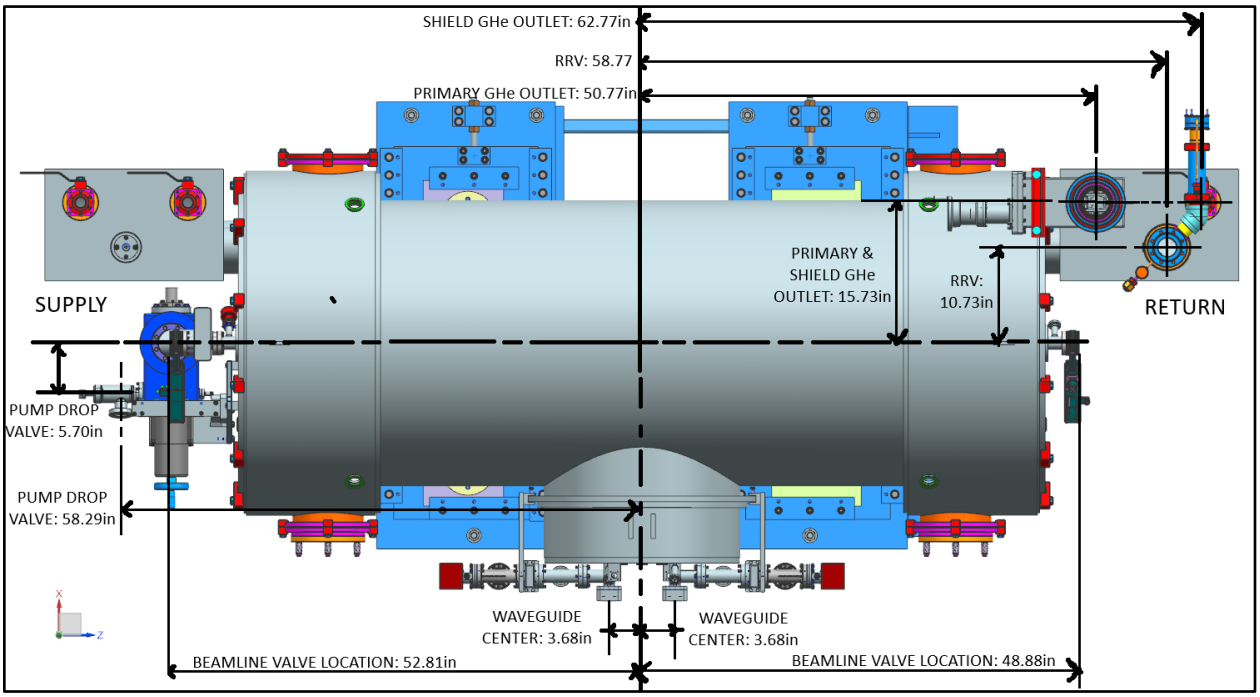


Figure 3: Top view.

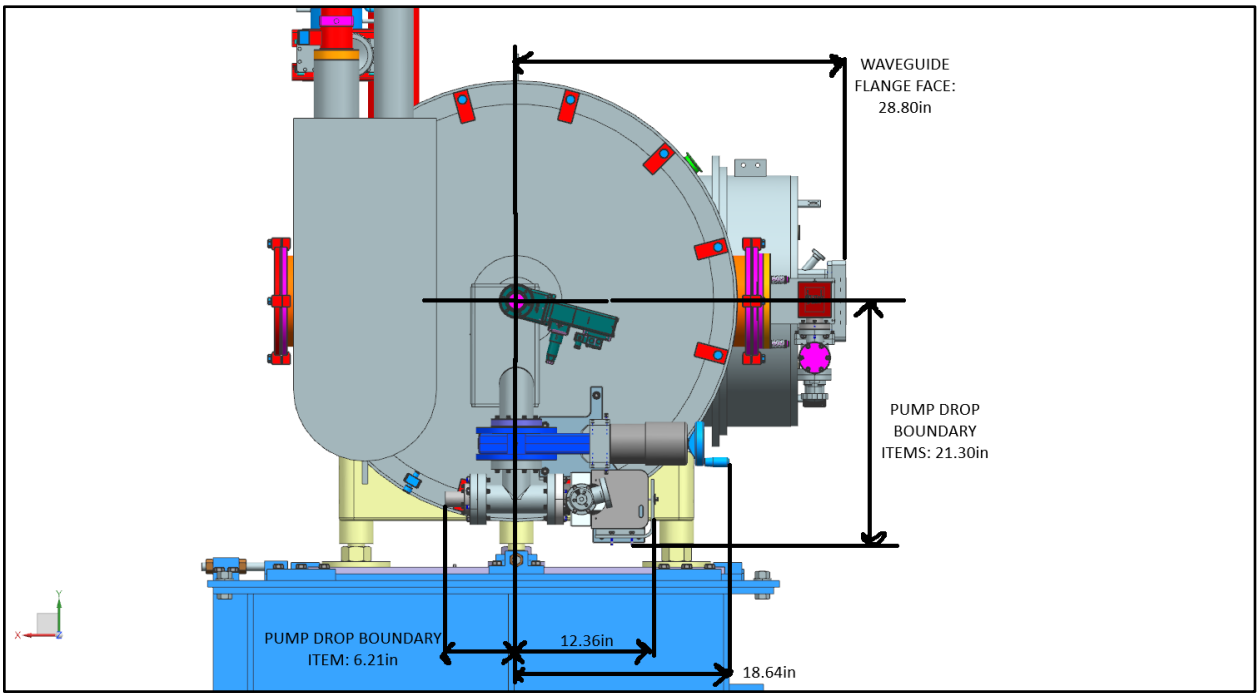


Figure 4: Upstream view.

Table 4 Nb_3Sn Cryomodule Electronic Interfaces

US=Up Stream; DS=Down Stream
SEC=Supply End Cap; REC=Return End Cap

Name	Location	EPICS Channel
Cernox temperature sensor #1	US cavity (Cav 7) flange next to US beam pipe (Fig. 5)	srfccon2:cha
Cernox temperature sensor #2	DS cavity (Cav 8) flange next to DS beam pipe (Fig. 5)	srfccon2:chb
Fluxgate magnetometer #1	US cavity (Cav 7) 2nd cell from US cavity flange (Fig. 5)	srf-crio-cmtf:SRFMAG:22
Fluxgate magnetometer #2	DS cavity (Cav 8) 2nd cell from DS cavity flange (Fig. 5)	srf-crio-cmtf:SRFMAG:23
Primary 2K helium supply diode	SEC primary 2K helium supply	CDTV46017 CDTV46018
Supply end beam tube diode	US cavity (Cav 7) beam tube next to US beam pipe	srfccon3:chc
Cavity 7 HOM Mid diode	US cavity (Cav 7) middle HOM	srfccon1:chd
Cavity 8 HOM Mid diode	DS cavity (Cav 8) middle HOM	srfccon1:chb
Return end beam tube diode	DS cavity (Cav 8) beam tube next to US beam pipe	srfccon5:chc
Primary 2K helium return diode	REC primary 2K helium return	CDTV46009 CDTV46010

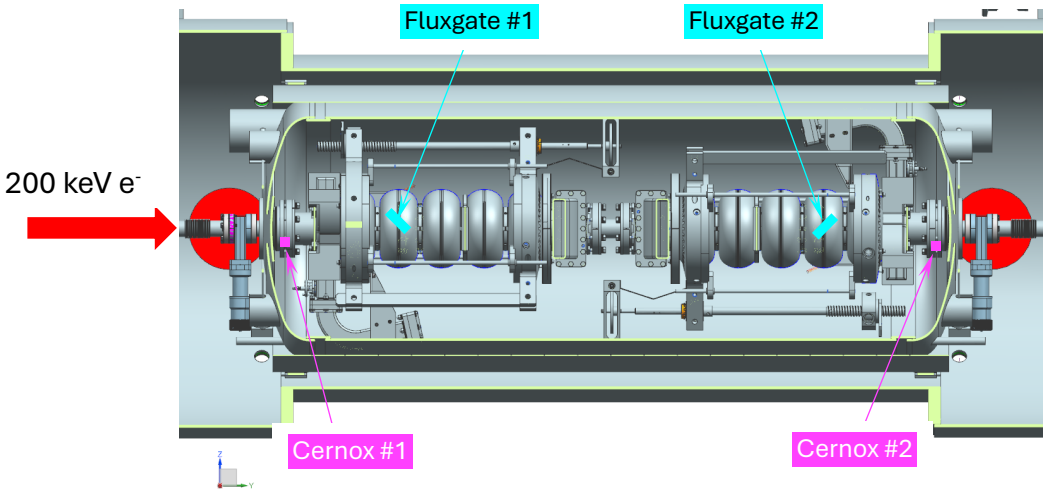


Figure 5: Locations of Cernox temperature sensors (a EA) & Fluxgate magnetometers (2 EA).