Cryomodule Specification

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Heat load and alignment

		8 C + 1 Q	9 C + NoQ.
Number		627	1188
Heat Load	at 2K	11.7 W	11.2 W
(Static + Dynamic)	at 5K	14.2 W	16.5 W
	at 40K	149.4 W	161.7 W
Alignment Tolerance [RMS]	Cavity offset w.r.t. cryomodule	0.3 mm	0.3 mm
	Quadrupole offset w.r.t cryomodule	0.3 mm	NA
	Quadrupole rotation w.r.t. design	0.3 mrad	NA
	Cavity pitch w.r.t. cryomodule	0.2 mrad	0.2 mrad
	Cavity yaw w.r.t. cryomodule	1 mrad	1 mrad
	Cryomodule offset w.r.t. design	0.2 mm	0.2 mm
	Cryomodule pitch w.r.t. design	0.02 mrad	0.02 mrad
	Cryomodule yaw w.r.t. design	0.1 mrad	0.1 mrad

Heat Load : referred to RDR data by Tom Peterson
have to be updated by proceeding calculation and test of cryomodule
Alignment Tolerance : by communication with Kubo (Optics Group)

Vacuum Vessel

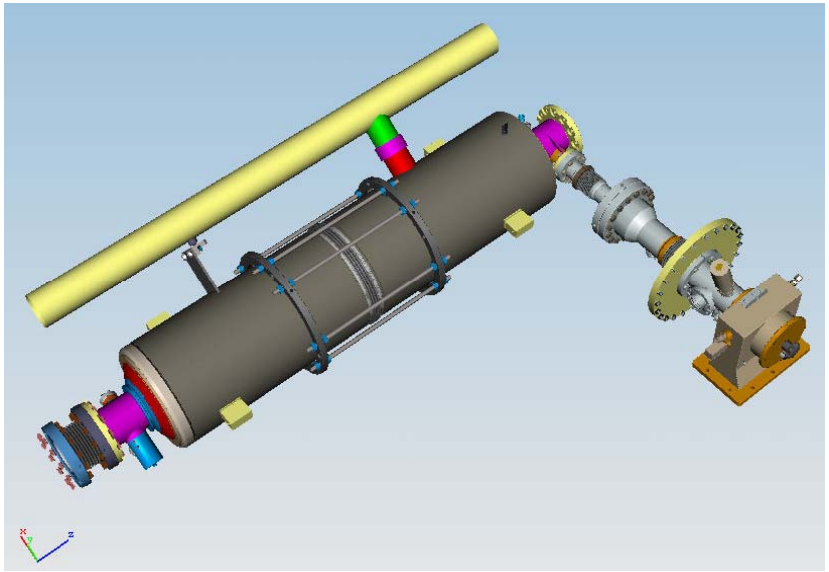
Vacuum vessel	Cryomodule slot length	12679.6	12679.6
	Material (demagnetized)	Carbon Steel	Carbon Steel
	Length (+ vacuum bellow length)	11829.6 (+850)	11829.6 (+850)
	tolerance of length	± 3	± 3
	Outer diameter	965.2	965.2
	Inner diameter	955.7	955.7
	Height of vessel center axis from the support base level	832	832
	Input coupler port	8	9
	Main Coupler #1 z position	-4744.1	-4744.1
	Main Coupler #2 z position	-3417.4	-3417.4
	Main Coupler #3 z position	-2090.7	-2090.7
	Main Coupler #4 z position	-764	-764
	Main Coupler #5 z position	(Quadrupole PKG)	562.7
	Main Coupler #6 z position	1889.4	1889.4
	Main Coupler #7 z position	3216.1	3216.1
	Main Coupler #8 z position	4542.8	4542.8
	Main Coupler #9 z position	**5869.5**	5869.5
	(Tuner driver-shaft port)	8	9
	Port for current leads	1	0
	current lead terminals (quadrupole, 2 dipoles)	6	0
	Port for signal wires	2	2
	Port for vacuum	2	2
	Residual magnetic field on the beam line	< 0.1 Gauss	< 0.1 Gauss

The values in the table are referred to Type 4 cryomodule design.
In RDR, the cryomodule slot length = 12652 mm

Cavity Helium Jacket

Cavity Helium jacket	Cavity slot length	1326.7
	Material	SUS or Ti
	Length (between connection flanges)	1247.4
	Maximum outer diameter	240
	Position of cavity center w.r.t. the vacuum vessel center (x,y)	(0., -247.)
	Support lugs (fabricated on the horizontal surface of jacket center)	
	lug1-to-Main coupler center distance	197.5
	lug2-to-Main coupler center distance	947.5
	Machining tolerance of lugs w.r.t. design , mm	0.1
	2-phase pipe cross connect, z position w.r.t. main coupler axis	755
	LHe precooling pipe location on the jacket (x,y, z)	105
	Maximum design pressure , bar	2 at warm (4 at cold)

The values in the table are referred to Type 4 cryomodule design.
Cavity slot length = 1326.7 mm
Cavity length from connection flanges = 1247.4
DESY cavity =1283.4, STF-BL=1258.6, STF-LL=1254.5



Cooling Pipes-1

Cooling pipes		
2.2 K subcooled supply pipe	Material	SUS
	Inner diameter , mm	60
	Maximum design pressure , bar	20
	Position w.r.t. the cavity center (x,y)	(219, 481.5)
Major return header (GRP)	Material	SUS
	Inner diameter , mm	300
	Maximum design pressure , bar	2 at warm (4 at cold)
	Position w.r.t. the cavity center (x,y)	(0., 356)
5K shield and intercept (supply)	Material	Al 1050 or equivalent material
	Inner diameter , mm	56.1
	Maximum design pressure , bar	20
	Position w.r.t. the cavity center (x,y)	(225.5, 362.5)
8K shield and intercept (return)	Material	Al 1050 or equivalent material
	Inner diameter , mm	70
	Maximum design pressure , bar	20
	Position w.r.t. the cavity center (x,y)	(-252, 210)

Inner diameter and maximum pressure of cooling pipes are decided by the cryogenic system parameters.

Pipe locations are referred to Type 4 cryomodule design.

The location can be modified after the 5k shield discussion.

Cooling Pipes-2

40K-80K shield and intercept (supply)	Material	Al 1050 or equivalent material
	Inner diameter , mm	72
	Maximum design pressure , bar	20
	Position w.r.t. the cavity center (x,y)	(355, 325)
40K-80K shield and intercept (return)	Material	Al 1050 or equivalent material
	Inner diameter , mm	80
	Maximum design pressure , bar	20
	Position w.r.t. the cavity center (x,y)	(-367, 326)
2-phase pipe	Material	SUS or Ti
	Inner diameter , mm	72.1
	Maximum design pressure , bar	2 at warm (4 at cold)
	Position w.r.t. the cavity center (x,y)	(210.6, 170.6)
Cooldown and Warmup	Material	SUS
	Inner diameter , mm	38.9
	Maximum design pressure , bar	2 at warm (4 at cold)
	Position w.r.t. the cavity center (x,y)	(-170, 200)
Helium vessel to 2-phase pipe cross-connect	Material	SUS or Ti
	Inner diameter , mm	54.9
	Maximum design pressure , bar	2 at warm (4 at cold)

Thermal Shield, Support Post etc

GRP as the support structure	Machining tolerance of the connection flanges	
	to the support post w.r.t. design , mm	0.1
	Machining tolerance of the support feet for	
	cavities and quad w.r.t. design , mm	0.1
Thermal radiation shield (inner)	Material	Al 1050 or equivalent material
	Thickness (upper), mm	6
	Thickness (lower), mm	3
	Layers of SI on the shield	10
	Operation temperature , K	5 ~ 8
Thermal radiation shield (outer)	Material	Al 1050 or equivalent material
	Thickness (upper), mm	6
	Thickness (lower), mm	3
	Layers of SI on the shield	30
	Operation temperature , K	40 ~ 80
Support post (furnished with	Number of posts	3
alignment target base)	Z positions of three post centers, mm	-5697.3, 0., 6132.3
	Maximum load for one post , N	
	Distance between the beam line and target center, mm	932.6
Quadrupole package	Length , mm	< cavity slot length>
	Maximum outer diameter , mm	< cavity jacket maximum radius>
	Operation temperature , K	2
All components in Cryomodule	Max. temperature difference during the cool-down	
	and warm-up , K	

The maximum load of the support post and maximum temperature different (gradient) in the cryomodule will be decided after getting progress in these study for cool-down and transportation.