APPENDIX A

SYSTEM PARAMETER TABLE

A.1 General

In the following tables are collected the design parameters of the solenoid magnet:

Table A.1: Magnet Design Parameters

GENERAL	
Overall Inner Diameter	1065.6 mm
Overall Outer Diameter	1415.5 mm
Overall Length	2730.0 mm
Design Central Field	2.0 T
Approximate Cryostat Weight	2550 kg
Radiation Length Thickness	0.87
COIL	
Inner Diameter	1170.3 mm
Layer 1	1174.7 mm
Layer 2	1206.7 mm
Winding Length	2566.0 mm
Design Operating Current	4825 A
Guaranteed Operating Current	5066 A
Winding Scheme	Two Layer, Outer Support
Number of Turns	1010
Inductance	0.48 H
Stored Energy	5.6 MJ
Charge Time	7 min
Operating Temperature (nominal)	4.7 K
Operating Temperature (charging)	4.9 K

Table A.1: Magnet Design Parameters (cont)	
COIL DISCHARGE	
Fast Time Constant	10 sec
Protection Resistor	48 milliohms
Maximum Discharge Voltage	232 V
Slow Time Constant	320 sec
CONDUCTOR	
General	High-Purity Aluminum Stabilized Cu/NbTi
Overall Dimensions	
Grade 1	5.125 x 15 mm
Grade 2	3.820 x 15 mm
Al:Cu:NbTi Ratios	
Grade 1	19.3:1.3:1.0
Grade 2	13.8:1.3:1.0
Peak Field at Conductor	2.2 T
Conductor Current Density	
Grade 1	6276 A/cm^2
Grade 2	8421 A/cm^2
NbTi Alloy	Nb-45 50 w% Ti
Strand Cu:SC	1.3:1.0
Strand Diameter	0.808 mm
Short Sample Critical Currents	
Strand	368 A @ 7 T, 4.2 K
Strand	1150 A @ 2 T, 4.2 K
Cable	5586 A @ 7 T, 4.2 K
Cable	18400 A @ 2 T, 4.2 K
I_{op}/I_c (load line)	55% (2.2 T, 4.9 K)
Total Length	3950 m
Total Weight	1050 kg

Table A.1: Magnet Design Parameters (cont)	
INSULATION	
Turn to Turn	0.5 mm G10 equivalent
Layer to Layer	1.0 mm G10 equivalent
Conductor to Ground	2.2 mm G10 equivalent
RADIATION DAMAGE	
Charged Particles	2.0×10^4 Rads
Neutrons	$4.0 \times 10^{13} cm^{-2}$
LORENTZ FORCES	
Support Cylinder Hoop Stress	23.3 MPa
Compressive Axial Stress at Midplane	11.0 MPa
Conductor Stress (Von Mises)	27.9 Mpa
Axial Decentering	6.9×10^4 N/m
Radial Decentering	1.1×10^4 N/m
VACUUM VESSEL	
Inner Shell material/OD/thickness	Al 5083 / 1081.5 mm / 7.94 mm
Outer Shell material/OD/thickness	Al 5083 / 1414.5 mm / 6.35 mm
Total Radial Thickness	174.5 mm
External Pressure Design	One Atmosphere
Internal Pressure Design	44 kPa
RADIATION SHIELDS	
Inner Shield material/thickness	Al 1100 / 1.6 mm
Outer Shield material/thickness	Al 1100 / 1.6 mm
OUTER SUPPORT CYLINDER	
Material/OD/thickness	Al 5083 / 1271.1 mm / 15 mm
CHIMNEY THERMAL INSULATION	
300 K to 80 K	3M Al tape 425 + Vacuum
80 K to 4 K	3M Al tape 425 + Vacuum

Table A.1: Magnet Design Parameters (cont)	
CONTROL DEWAR INSULATION	
300 K to 80 K	MLI + Vacuum
80 K to 4 K	MLI + Vacuum
LIQUID NITROGEN CRYOGENICS	
Cooling Mode	Forced Flow
Heat Load Magnet Cryostat	165.3 W
Heat Load Service Chimney	108 W
Heat Load Control Dewar	8.2 W
COLD MASS SUPPORT SYSTEM	
Cold Axial Loading	1 g
Cold Radial Loading	2 g
LIQUID HELIUM CRYOGENICS	
Cooling Mode	Forced Flow, Indirect
Heat Load Magnet (Steady State)	12.5 W
Heat Load Magnet (Charging)	32.5 W
Heat Load Service Chimney	1.5 W
Heat Load Control Dewar	3.9 W + 28.2 l/hr
Magnet Inlet Quality	0% vapor
Magnet Exit Exit Quality	
At 5 g/s	20% vapor
At 15 g/s	8.5% vapor
Pressure Drop Across Magnet	11 kPa at 15 g/s, 4.6 K
Cooling Tube on Support Cylinder	
Length	60.4 m
Inner Diameter	15 mm
Liquid Capacity	11 l
Quench Pressure	1.7 MPa
He Liquid Capacity in Chimney	19 l
He Liquid Capacity in Control dewar	32 l
He Liquid Capacity of Storage dewar	2000 l
Magnet Cold Mass	1460 kg
Magnet Cooldown time	4.6 days