

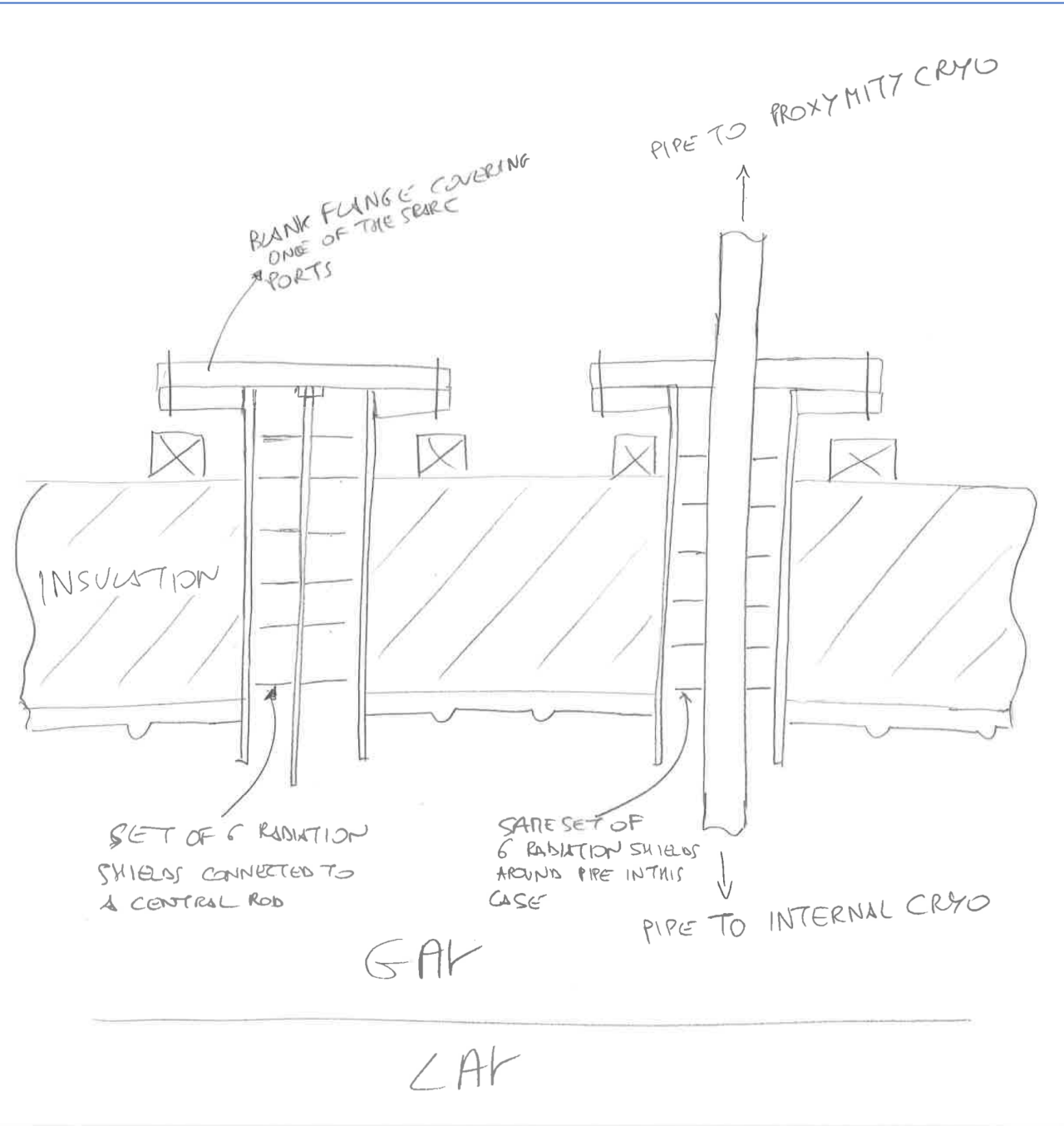
Radiation Shields in the penetrations of NP-02

David Montanari

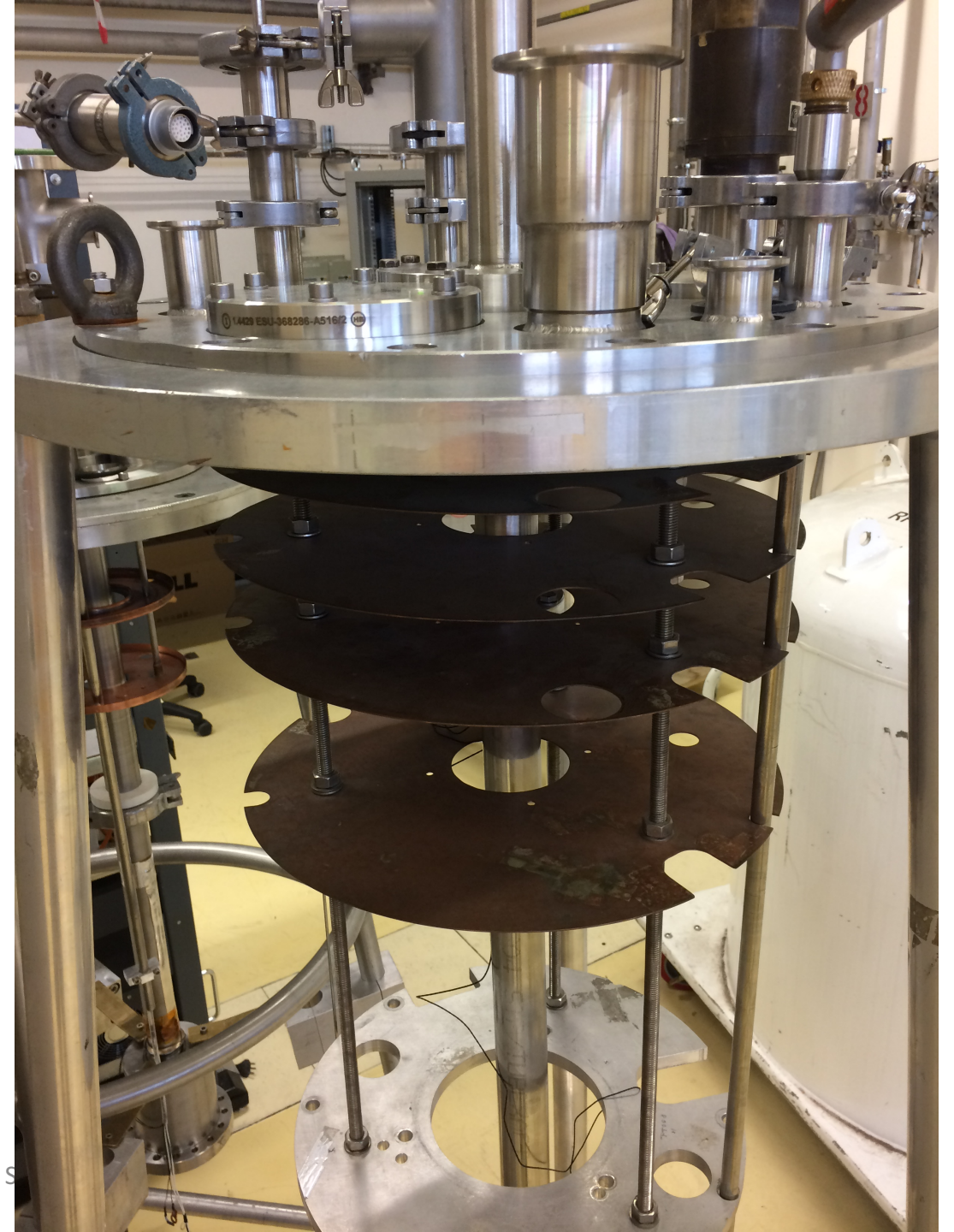
Wed Jun 14, 2017

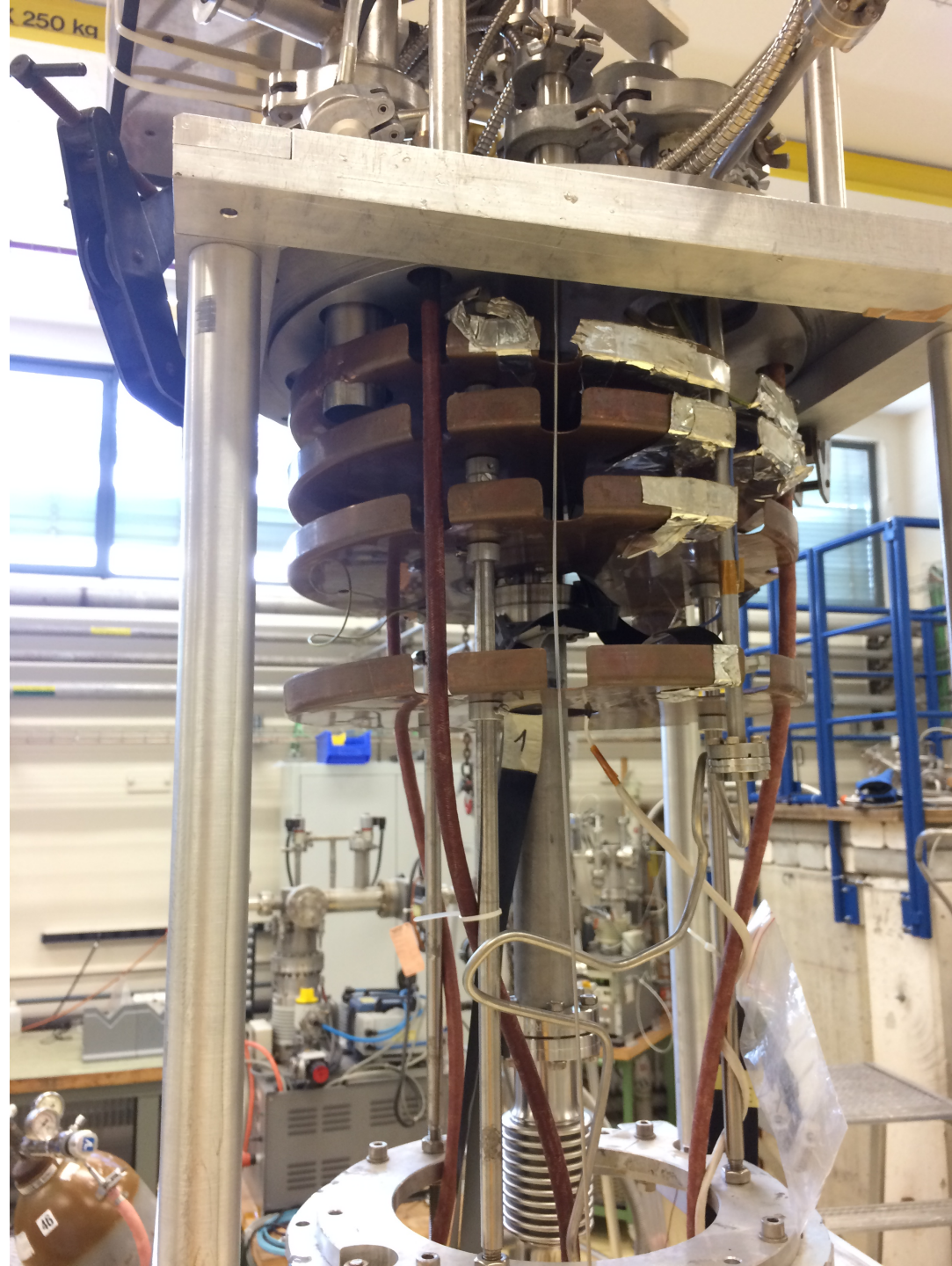
Motivation

- To reduce the radiation heat leak (to the LAr) coming from the spare penetrations, and other penetrations, if any:
 - Spare Detector Penetrations.
 - Spare Cryo Penetrations.
 - Manhole.
 - Maybe other Detector penetrations not fully utilized?

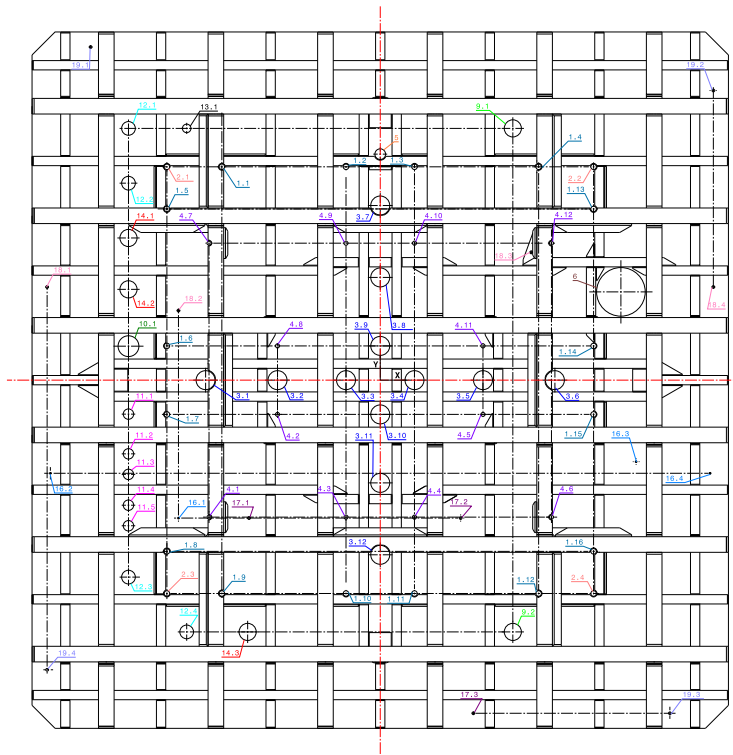


Not to scale





Front view
1:25



Detector penetrations

Pos.	Diameter (mm)	X	Y	Description
1.1	Ø80	-2313	3115	Field Cage Suspension
1.2		-500	3115	Field Cage Suspension
1.3		500	3115	Field Cage Suspension
1.4		2313	3115	Field Cage Suspension
1.5		-3115	2500	Field Cage Suspension
1.6		-3115	500	Field Cage Suspension
1.7		-3115	-500	Field Cage Suspension
1.8		-3115	-2500	Field Cage Suspension
1.9		-2313	-3115	Field Cage Suspension
1.10		-500	-3115	Field Cage Suspension
1.11		500	-3115	Field Cage Suspension
1.12		2313	-3115	Field Cage Suspension
1.13		3115	2500	Field Cage Suspension
1.14		3115	500	Field Cage Suspension
1.15		3115	-500	Field Cage Suspension
1.16		3115	-2500	Field Cage Suspension
2.1	Ø80	-3115	3115	Slow Control Chimneys
2.2		3115	3115	Slow Control Chimneys
2.3		-3115	-3115	Slow Control Chimneys
2.4		3115	-3115	Slow Control Chimneys
3.1	Ø277	-2550	0	Signal Chimneys FTS
3.2		-1500	0	Signal Chimneys FTS
3.3		-500	0	Signal Chimneys FTS
3.4		500	0	Signal Chimneys FTS
3.5		1500	0	Signal Chimneys FTS
3.6		2550	0	Signal Chimneys FTS
3.7		0	2550	Signal Chimneys FTS
3.8		0	1500	Signal Chimneys FTS
3.9		0	500	Signal Chimneys FTS
3.10		0	-500	Signal Chimneys FTS
3.11		0	-1500	Signal Chimneys FTS
3.12		0	-2550	Signal Chimneys FTS
4.1	Ø60	-2500	-2000	Anode Suspensions FTS
4.2		-1500	-500	Anode Suspensions FTS
4.3		-500	-2000	Anode Suspensions FTS
4.4		500	-2000	Anode Suspensions FTS
4.5		1500	-500	Anode Suspensions FTS
4.6		2500	-2000	Anode Suspensions FTS
4.7		-2500	2000	Anode Suspensions FTS
4.8		-1500	500	Anode Suspensions FTS
4.9		-500	2000	Anode Suspensions FTS
4.10		500	2000	Anode Suspensions FTS
4.11		1500	500	Anode Suspensions FTS
4.12		2500	2000	Anode Suspensions FTS
5	Ø156	0	3300	High Voltage Feedthrough
6	Ø710	3514	1289	Manhole
9.1	Ø250	1936	3676	Spare
9.2		1936	-3676	Spare



Cryogenic penetrations

Pos.	Diameter (mm)	X	Y	Description
10.1	Ø304	-3676	496	GAz Combo
11.1	Ø152	-3676	-496	LAz Cooldown
11.2		-3676	-1076	LAz Distribution
11.3		-3676	-1376	Spare
11.4		-3676	-1826	LAz Cooldown to Condenser
11.5		-3676	-2126	GAz Boil Off
12.1	Ø200	-3676	3676	Spare
12.2		-3676	2876	Spare
12.3		-3676	-2876	Backup PSV/VSV
12.4		-2826	-3676	Spare
13.1	Ø125	-2826	3676	Instrumentation
14.1	Ø250	-3676	2076	Spare & Instrumentation
14.2		-3676	1326	Spare & Instrumentation
14.3		-1936	-3676	Main PSV/VSV



GTT penetrations

Pos.	Diameter (mm)	X	Y	Qty.	Description
16.1	Ø25	-2946	-2014	4	Primary insulation space supply
16.2		-4816	-1360		Secondary insulation space supply
16.3		3736	-1190		Primary insulation space exhaust
16.4		4816	-1360		Secondary insulation space exhaust
17.1	Ø40	-1916	-2014	3	Primary insulation space PT002
17.2		1174	-2014		Primary insulation space PT003
17.3		1360	-4864		Secondary insulation space PT001
18.1	Ø40	-4864	1360	4	Primary insulation space PRV CF003
18.2		-2946	1016		Secondary insulation space PRV CF001
18.3		2204	1866		Primary insulation space PRV CF004
18.4		4864	1360		Secondary insulation space PRV CF002
19.1	Ø40	-4229	4864	4	Temperature sensors
19.2		4864	4229		Temperature sensors
19.3		4229	-4864		Temperature sensors
19.4		-4864	-4229		Temperature sensors

David Montanari - Radiation Shields in the penetrations

SCALE	1:1	DATE	2023/07/20
PROJECT	STEEL STRUCTURE WA 105X2	DESIGNER	DAVID MONTANARI
CLIENT	CEN105CR0247	CHECKER	
REVISION		DATE	

Detector penetrations

Pos.	Diameter [mm]	X	Y	Description
1.1	Ø80	-2313	3115	Field Cage Suspension
1.2		-500	3115	Field Cage Suspension
1.3		500	3115	Field Cage Suspension
1.4		2313	3115	Field Cage Suspension
1.5		-3115	2500	Field Cage Suspension
1.6		-3115	500	Field Cage Suspension
1.7		-3115	-500	Field Cage Suspension
1.8		-3115	-2500	Field Cage Suspension
1.9		-2313	-3115	Field Cage Suspension
1.10		500	-3115	Field Cage Suspension
1.11		500	-3115	Field Cage Suspension
1.12		2313	-3115	Field Cage Suspension
1.13		3115	2500	Field Cage Suspension
1.14		3115	500	Field Cage Suspension
1.15		3115	-500	Field Cage Suspension
1.16		3115	-2500	Field Cage Suspension
2.1	Ø80	-3115	3115	Slow Control Chimneys
2.2		3115	3115	Slow Control Chimneys
2.3		-3115	-3115	Slow Control Chimneys
2.4		3115	-3115	Slow Control Chimneys
3.1	Ø277	-2550	0	Signal Chimneys FTS
3.2		-1500	0	Signal Chimneys FTS
3.3		-500	0	Signal Chimneys FTS
3.4		500	0	Signal Chimneys FTS
3.5		1500	0	Signal Chimneys FTS
3.6		2550	0	Signal Chimneys FTS
3.7		0	2550	Signal Chimneys FTS
3.8		0	1500	Signal Chimneys FTS
3.9		0	500	Signal Chimneys FTS
3.10		0	-500	Signal Chimneys FTS
3.11		0	-1500	Signal Chimneys FTS
3.12		0	-2550	Signal Chimneys FTS
4.1	Ø60	-2500	-2000	Anode Suspensions FTS
4.2		-1500	-500	Anode Suspensions FTS
4.3		-500	-2000	Anode Suspensions FTS
4.4		500	-2000	Anode Suspensions FTS
4.5		1500	-500	Anode Suspensions FTS
4.6		2500	-2000	Anode Suspensions FTS
4.7		-2500	2000	Anode Suspensions FTS
4.8		-1500	500	Anode Suspensions FTS
4.9		-500	2000	Anode Suspensions FTS
4.10		500	2000	Anode Suspensions FTS
4.11		1500	-500	Anode Suspensions FTS
4.12		2500	2000	Anode Suspensions FTS
5	Ø156	0	3300	High Voltage Feedthrough
6	Ø710	3514	1289	Manhole
9.1	Ø250	1936	3676	Spare
9.2		1936	-3676	Spare

Cryogenic penetrations

Pos.	Diameter [mm]	X	Y	Description
10.1	Ø304	-3676	496	Gar Combo
11.1	Ø152	-3676	-486	LAr Cooldown
11.2		-3676	-1076	LAr Distribution
11.3		-3676	-1376	Spare
11.4		-3676	-1826	LAr Cooldown to Condenser
11.5		-3676	-2126	Gar Boil Off
12.1	Ø200	-3676	3676	Spare
12.2		-3676	2876	Spare
12.3		-3676	-2876	Backup PSV/VSV
12.4		-2826	-3676	Spare
13.1	Ø125	-2826	3676	Instrumentation
14.1	Ø250	-3676	2076	Spare & Instrumentation
14.2		-3676	1326	Spare & Instrumentation
14.3		-1936	-3676	Main PSV/VSV

GTT penetrations

Pos.	Diameter [mm]	X	Y	Qty.	Description
16.1	Ø25	-2946	-2014	4	Primary insulation space supply
16.2		-4816	-1360	4	Secondary insulation space supply
16.3		3736	-1190	4	Primary insulation space exhaust
16.4		4816	-1360	4	Secondary insulation space exhaust
17.1	Ø40	-1916	-2014	3	Primary insulation space PT002
17.2		1174	-2014	3	Primary insulation space PT003
17.3		1360	-4864	3	Secondary insulation space PT001
18.1	Ø40	-4864	1360	4	Primary insulation space PRV CF003
18.2		-2946	1016	4	Secondary insulation space PRV CF001
18.3		2204	1866	4	Primary insulation space PRV CF004
18.4		4864	1360	4	Secondary insulation space PRV CF002
19.1	Ø40	-4229	4864	4	Temperature sensors
19.2		4864	4229	4	Temperature sensors
19.3		4229	-4864	4	Temperature sensors
19.4		-4864	-4229	4	Temperature sensors

Detector penetrations							Radiation Shields	Suggested OD of shields
Position	Hole D	Name	Pipe Ext D (OD)	Pipe Int D (ID)	Flange Type	Flange Ext D (OD)		
1.1		Field Cage Suspension	80	60	DN150	202		
1.2		Field Cage Suspension	80	60	DN150	202		
1.3		Field Cage Suspension	80	60	DN150	202		
1.4		Field Cage Suspension	80	60	DN150	202		
1.5		Field Cage Suspension	80	60	DN150	202		
1.6		Field Cage Suspension	80	60	DN150	202		
1.7		Field Cage Suspension	80	60	DN150	202		
1.8	80	Field Cage Suspension	80	60	DN150	202		
1.9		Field Cage Suspension	80	60	DN150	202		
1.1		Field Cage Suspension	80	60	DN150	202		
1.11		Field Cage Suspension	80	60	DN150	202		
1.12		Field Cage Suspension	80	60	DN150	202		
1.13		Field Cage Suspension	80	60	DN150	202		
1.14		Field Cage Suspension	80	60	DN150	202		
1.15		Field Cage Suspension	80	60	DN150	202		
1.16		Field Cage Suspension	80	60	DN150	202		
2.1		Slow Control Chimney	80	60	DN250	306		
2.2	80	Slow Control Chimney	80	60	DN250	306		
2.3		Slow Control Chimney	80	60	DN250	306		
2.4		Slow Control Chimney	80	60	DN250	306		
3.1		Signal Chimney FTS	277	257	DN??	324		
3.2		Signal Chimney FTS	277	257				
3.3		Signal Chimney FTS	277	257				
3.4		Signal Chimney FTS	277	257				
3.5		Signal Chimney FTS	277	257				
3.6	277	Signal Chimney FTS	277	257				
3.7		Signal Chimney FTS	277	257				
3.8		Signal Chimney FTS	277	257				
3.9		Signal Chimney FTS	277	257				
3.10		Signal Chimney FTS	277	257				
3.11		Signal Chimney FTS	277	257				
3.12		Signal Chimney FTS	277	257				
4.1		Anode Suspensions FTS	60	40	DN150	202		
4.2		Anode Suspensions FTS	60	40	DN150	202		
4.3		Anode Suspensions FTS	60	40	DN150	202		
4.4		Anode Suspensions FTS	60	40	DN150	202		
4.5		Anode Suspensions FTS	60	40	DN150	202		
4.6	60	Anode Suspensions FTS	60	40	DN150	202		
4.7		Anode Suspensions FTS	60	40	DN150	202		
4.8		Anode Suspensions FTS	60	40	DN150	202		
4.9		Anode Suspensions FTS	60	40	DN150	202		
4.10		Anode Suspensions FTS	60	40	DN150	202		
4.11		Anode Suspensions FTS	60	40	DN150	202		
4.12		Anode Suspensions FTS	60	40	DN150	202		
5	156	High Voltage Feedthrough	156	136	DN160	202		
6	710	Manhole	710	694	Custom (4)	774	YES	688
9.1	250	Spare	250	230	DN250	306	YES	224
9.2		Spare	250	230	DN250	306	YES	224

Notes:

- 1) Suggest to keep at least 3 mm of clearance for the GAR purge.
- 2) Available height from gasket to end of crossing pipe is 1.27 m.
- 3) Suggest 6 radiation shields equally spaced at about 200 mm, with the lower surface polished.
- 4) Drawings of thr manhole flange are available.

Cryogenic penetrations							Radiation Shields	Suggested OD of shields
Position	Hole D	Name	Pipe Ext D (OD)	Pipe Int D (ID)	Flange Type	Flange Ext D (OD)		
10.1	304	GAr Combo	304	284	DN300	362		
11.1		LAr cooldown	152	132	DN160	202		
11.2		LAr distribution	152	132	DN160	202		
11.3	152	Spare	152	132	DN160	202	YES	126
11.4		LAr cooldown to condenser	152	132	DN160	202		
11.5		GAr boil off	152	132	DN160	202		
12.1		Spare	250	230	DN250	306	YES	224
12.2	200	Spare	250	230	DN250	306	YES	224
12.3		Cryostat Backup PSV/VSV	250	230	DN250	306	YES	224
12.4		Spare	250	230	DN250	306	YES	224
13.1	125	Instrumentation	125	105	DN160	202	MAYBE	99
14.1		Spare & Instrumentation	250	230	DN250	306	YES	224
14.2	250	Spare & Instrumentation	250	230	DN250	306	YES	224
14.3		Cryostat Main PSV/VSV	250	230	DN250	306		
15.1	350	LAr Pump	350	n/a	n/a	n/a		

Notes:

- 1) Suggest to keep at least 3 mm of clearance for the GAr purge.
- 2) Available height from gasket to end of crossing pipe is 1.27 m.
- 3) Suggest 6 radiation shields equally spaced at about 200 mm, with the lower surface polished.

What/When is needed?

- Confirmation of size and location of the Detector Spare penetrations and size of the Flange sealing them.
- Size and location of other penetrations potentially available (and the available footprint) and size of the Flange sealing them. In general, this would predominantly cables/wires/etc. that may be easy to bundle altogether and run through an (or multiple) opening(s) in the radiation shields.
- When: **by end of this week.**
- Between NP-02 and NP-04, Detector and Cryo there are quite some penetrations to fit (~20).
- We need to order the flanges, start preparing the shields, etc.
- There is available manpower now for this work, we should take advantage of it.