LBNF Hadron Absorber

Preliminary Design Review

LBNF Hadron Absorber Interfaces

Abhishek Deshpande

June 26 , 2020

Overview

- Introduction
- Interfaces
  - Interfaces with CF
  - Interfaces with other beamline systems
- Discussion

Introduction

- The Absorber needs to work with other beamline systems.
- Interfaces are defined as boundaries where the Absorber connects to other supporting systems.
- There are hard and soft interfaces. Hard interfaces are where the Absorber physically interacts with other systems.
- A soft interfaces describe how design changes in upstream or downstream systems affect the Absorber design; example how Target design affects the Absorber.

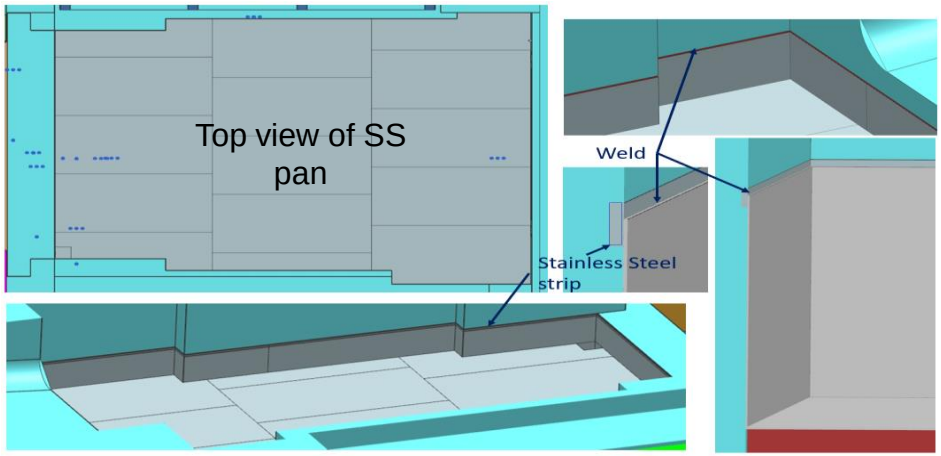
Interfaces: CF

- Broadly, the physical interfaces may be categorized into:
  - Interfaces with CF systems (Conventional Facilities)
  - Interfaces with beamline systems
- The interfaces with CF are highlighted in: https://edms.cern.ch/project/CERN-0000206753
- Relevant ones are circled.

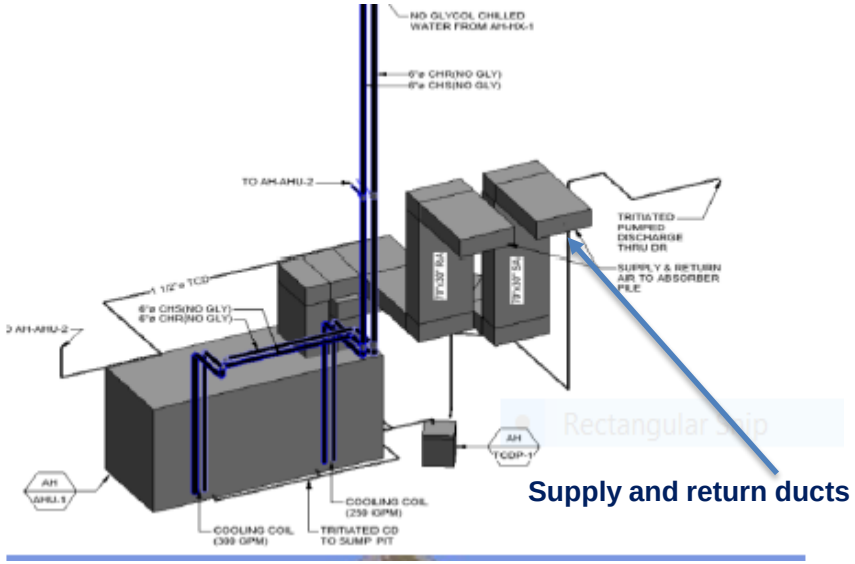
Item	LBNF Near Site CF Provides	Beamline Provides	Interface Point
SS Liner Embeds in the Bunker	NSCF provides SS embedment on the Absorber Bunker walls for the welding of the SS pan.	Beamline (…) provides the SS pan at the bottom of the bunker and welds it to the embedment.	Absorber Bunker Wall Embeds
Absorber Pile Stability Embeds in the Bunker	NSCF provides carbon steel embeds for the welding of the Absorber Pile Steel to provide stability.	Beamline (…) provides the shielding steel and welds them to the embeds.	Stability Embeds in Absorber Bunker
Cable Trays in Absorber Complex	NSCF provides cable trays connecting the Instrumentation room and the RAW room of the Absorber Complex	Beamline (…) provides the cable pulls between the levels	Cable Trays
Penetrations for RAW	NSCF provides penetrations upward out of the RAW, laterally through the instrumentation room to the truck bay at the grade level.	Beamline (…) provides the pipe runs through the penetrations and seals the space between the penetration and the piping.	Penetration Path/Envelope from RAW room to Truck Bay
Supply and Return Ducting to the Absorber Bunker	NSCF provides supply and return ducting stubs to the Absorber Bunker that feeds in the 25,000 cfm air circulation as shown in drawing, M-AH-403, 100% NSCF PD.	Beamline (…) provides the ducting run from the stubbed supply duct to circulate the air within the bunker and returns it to the return duct stub.	Supply and Return Duct Stubs (See Figure 2)

Interfaces: CF

Item	LBNF Near Site CF Provides	Beamline Provides	Interface Point
SS Liner Embeds in the Bunker	NSCF provides SS embedment on the Absorber Bunker walls for the welding of the SS pan.	Beamline (…) provides the SS pan at the bottom of the bunker and welds it to the embedment.	Absorber Bunker Wall Embeds
Absorber Pile Stability Embeds in the Bunker	NSCF provides carbon steel embeds for the welding of the Absorber Pile Steel to provide stability.	Beamline (…) provides the shielding steel and welds them to the embeds.	Stability Embeds in Absorber Bunker
Cable Trays in Absorber Complex	NSCF provides cable trays connecting the Instrumentation room and the RAW room of the Absorber Complex	Beamline (…) provides the cable pulls between the levels	Cable Trays
Penetrations for RAW	NSCF provides penetrations upward out of the RAW, laterally through the instrumentation room to the truck bay at the grade level.	Beamline (…) provides the pipe runs through the penetrations and seals the space between the penetration and the piping.	Penetration Path/Envelope from RAW room to Truck Bay
Supply and Return Ducting to the Absorber Bunker	NSCF provides supply and return ducting stubs to the Absorber Bunker that feeds in the 25,000 cfm air circulation as shown in drawing, M-AH-403, 100% NSCF PD.	Beamline (…) provides the ducting run from the stubbed supply duct to circulate the air within the bunker and returns it to the return duct stub.	Supply and Return Duct Stubs (See Figure 2)



Vladimir Sidorov, Dune-doc-14314



CF 100% design review, Dune-doc-18427

Interfaces: With beamline systems

Hard interfaces are highlighted below:

New WBS	Owner	L4 Sub Project Interface Doc	Magnets	Magnet Po	Primary W	Beam Instrum	Primary Va	Lattice Optic	Magnet Inst	Beam Windows	Target	Horns	Horn	Absorber	TH Sh	RAW	Radia	Remote Handling	Mars	Contr	Interlo	Alignr	Installation Coordination	Conven	Main I	Neutrin	Cable
131.01.03.03.02.02	George Velev	Magnets		1	2	3	5	6	141													57	68				153
131.01.03.03.02.03	Steve Hays	Magnet Power Supplies	01		4			7												37	50		69	85			154
131.01.03.03.02.04	Karl Williams	Primary Water Systems	02	04					143	150			14			35			112	38			70	86	103		155
131.01.03.03.02.05	Nathan Eddy	Beam Instrumentation	03				8	9	113		12	152								39	51	58	71		104	999	156
131.01.03.03.02.06	Kevin Duel	Primary Vacuum	05			08		10	114	11							117			40		59	72	151	105		157
131.01.03.03.02.07	John Johnstone	Lattice Optics & Beam loss ca	06	07		09	10		115		13											60		88	106		
131.01.03.03.02.08	Kevin Duel	Magnet Installation	141	142	143	113	114	115														145	146	147	148		
131.01.03.03.04.04	Dave Pushka	Beam Windows			150		11		116						20	21		30	122	41		61	73	89			
131.01.03.03.03.02	Pat Hurh	Targetry (& Baffle)				12		13				17			22	23		31	123	42		62	74			134	158
131.01.03.03.03.03	Cory Crowley	Horns									17		18		24	25		32	124	43		63	75	149			159
131.01.03.03.03.04	Ken Quinn	Horn Power Supplies			14							18			100					44	53	999	76	90			160
131.01.03.03.04.02	Dave Pushka	Decay Pipe												26			118		125	45		64		91			161
131.01.03.03.04.03	Abhishek Deshpande	Absorber									19					28	119	33	126	46		65	77	92		135	162
131.01.03.03.03.05	Matt Slabaugh	TH Shield Pile								20	22	24	100			29	120	34	127	47		66	78	93		172	163
131.01.03.03.03.06	Karl Williams	RAW Water Systems								21	23	25	27	28	29		121	35		48	54		79	94			164
combine with modeling	Kamran Vaziri	Radiation Physics							117					119	120	121			129					133			
131.01.03.03.03.07	Vladimir Sidorov	Remote Handling								30	31	32		33	34	35			130	49	55	67	80	95		999	165
131.01.03.03.01.01	Nikolai MokhoV	MARS Modeling			112					122	123	124		126	127	128	129	130			132					136	
131.01.03.03.05.02	Greg Vogel	Controls	36	37	38	39	40		144	41	42	43	44	46	47	48		49			56		81	96	107	137	166
131.01.03.03.05.03	Adam Olson	Interlocks		50		51	52						53	131		54		55	132	56			82	97	108		167
131.01.03.03.05.04	Virgil Bocean	Alignment	57			58	59	60	145	61	62	63		65	66			67					83	98	109	138	
131.01.03.03.05.05	Cons Gattuso	Installation Coordination	68	69	70	71	72		146	73	74	75	76	77	78	79		80		81	82	83		99	110	139	168
	Kennedy Hartsfield	Conventional Facilities, Near Site		85	86		151	88	147	89		149	90	92	93	94	133	95		96	97	98	99		111	140	
	Dave Capista	Main Injector	101	102	103	104	105	106	148											107	108	109	110	111			169
131.01.03.03.04.05	Jon Paley	Neutrino Beam Instrumentation									134			135					136	137		138	139	140			170
	Cons Gattuso	Cable Cordination	153	154	155	156	157				158	159	160	162	163	164		165		166	167		168		169	170	

Interface ID

https://fermipoint.fnal.gov/project/LBNF/Near%20Site/Beamline/Shared%20Documents/Forms/AllItems.aspx

Interfaces: With beamline systems

Interface ID definitions:

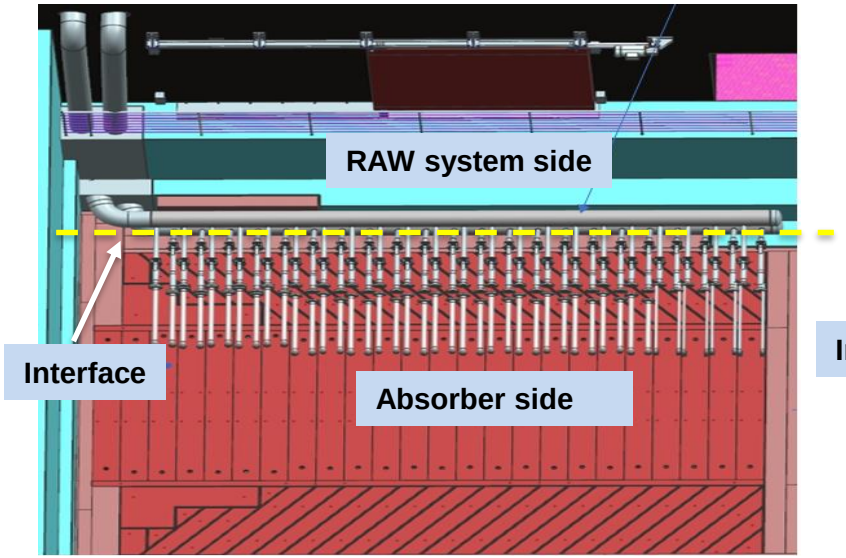
	A	B	C	D	E	F	G	H	I	J	K
1	Matrix I	WBS Code #1	WBS 1 Discription	Owner 1	WBS Code #2	WBS 2 Discription	Owner 2	ITEM	Interface Point WBS #1	Interface Point WBS #2	
27									Around-Box.	the DP and a DS DP Window.	
28	27	131.01.03.03.03.04	Horn Power Supplies	Ken Quinn	131.01.03.03.03.06	RAW Water Systems	Karl Williams		WBS# 131.01.03.03.03.04 does not interface the RAW system	WBS# 131.01.03.03.03.06 does not interface the Horn PS.	
29	28	131.01.03.03.04.03	Absorber	Abhishek Deshpa	131.01.03.03.03.06	RAW Water Systems	Karl Williams		WBS 131.01.03.03.04.03 Absorber will provide: 07 provides: Entry port (simple open area) into the absorber pile for RAW piping; installation space in the absorber pile; radiation shielding at the piping/electrical penetration between the RAW room and the Absorber Hall; piping requirements, RAW flow rate, pressure drop, and temperature increase for the water-cooled absorber blocks.	WBS 131.01.03.03.03.06 will provide : entry port dimensions and location; piping/electrical air seal at the ports (seal design, materials, and finished components); piping/electrical air seal installation; RAW system for the water-cooled panels. 3D CAD models for layout work. we will also provide provides pipes to manifolds in the Absorber Hall, connecting to the manifolds at each connection. WBS 130.02.03.07 will supply the manifolds, and these go through the concrete wall and tie into the main header manifolds. The main header manifolds together with the piping from the core blocks module to these manifolds will be provided by the Absorber WBS (see Figure 1). Connections will be at top of shielding modules. Suitable fitting are required by AH components to match connections.	
30	29	131.01.03.03.03.05	TH Shield Pile	Matt Slabaugh	131.01.03.03.03.06	RAW Water Systems	Karl Williams		WBS 131.01.03.03.03.05 TH Shield pile provides: Will provide fedthrough in the battlement. Feedthrough into the target pile is for RAW piping; installation space in the target pile; radiation shielding at the piping/electrical penetration between the RAW room and the target hall; piping requirements, RAW flow rate, pressure drop, and temperature increase for the water-cooled panels.	WBS 131.01.03.03.03.05 TH Shield pile provides: port closure plate; piping/electrical air seal at the ports (seal design, materials, and finished components); piping/electrical air seal installation; RAW system for the water-cooled panels. 3D CAD models for layout work.	Radiation Safety provides the shielding requirements: materials, thicknesses, s locations.

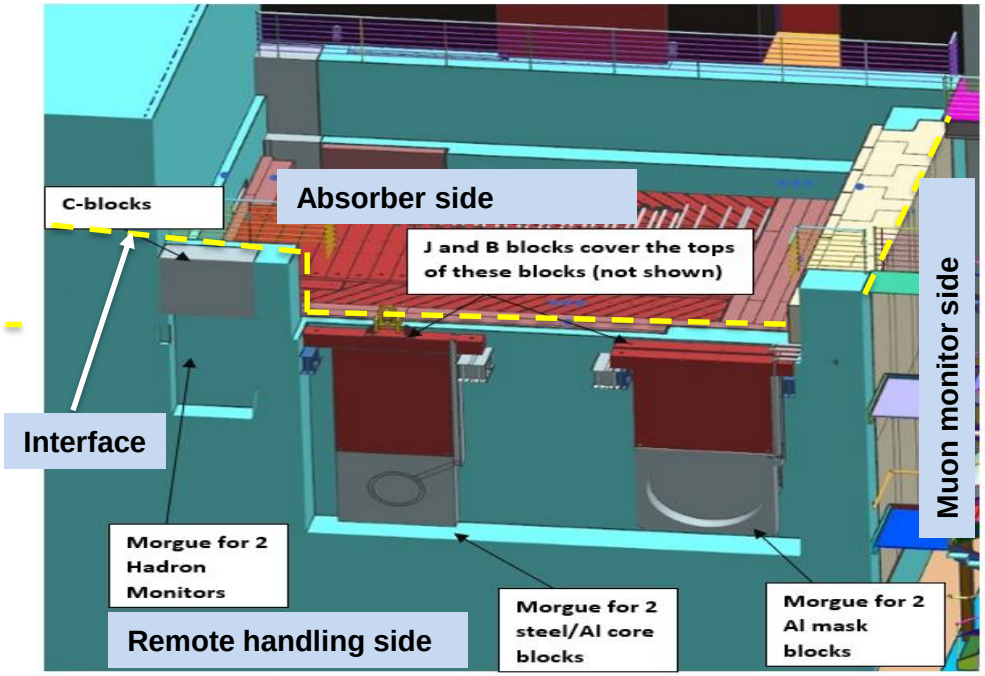
Interface ID #28. RAW system and Absorber

https://fermipoint.fnal.gov/project/LBNF/Near%20Site/Beamline/Shared%20Documents/Forms/AllItems.aspx

Interfaces: Beamline systems

- Some interfaces with non-CF systems are well defined, such as those with RAW systems, remote handling, controls, interlocks, and neutrino beam instrumentations (Muon monitors).
- However, interfaces with other systems such as the Decay Pipe are still under development due to scope reevaluation by CF.





Discussion