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The ESS Accelerator Project External Interfaces

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The ESS accelerator project external interfaces

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Acronyms

A2CF – Interface between the accelerator project and conventional facilities

A2T – Interface between the accelerator project and the target project

AD – Accelerator division

AP – Accelerator project

CF – Conventional Facilities

CS – Cryo system

CW – Cooling water

DI – Deionized

FE – Front end

HEBT – High energy beam transport

HP – High purity

HVAC – Heating, ventilation and air conditioning

ICD – Interface control documents

ICS – Integrated control system

LOTO – Lockout and tagout access safety procedures

VS – Vacuum system

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1. PURPOSE

The present document defines the accelerator project (AP) external interfaces that shall be handled according to the interface management procedure [1].

2. SCOPE

This document applies to the interfaces between the accelerator and the following external systems:

- 2.1.1. Conventional Facilities (CF)
- 2.1.2. Vacuum system (VS)
- 2.1.3. Cryo system (CS)
- 2.1.4. Integrated control system (ICS)
- 2.1.5. Accelerator to Target area (A2T)

3. DEFINITIONS

Some of the terms used in Figure 1 through Figure 10 and in Table 1 are defined as follows.

- 3.1.1. **Compressed air.** Regular compressed air.
- 3.1.2. **Crane.** Overhead crane(s).
- 3.1.3. **Cryo.** The cryo transfer line.
- 3.1.4. **DI CW.** Deionized cooling water.
- 3.1.5. **HEBT dogleg.** The HEBT section where the proton beam is steered to be at the same target point elevation.
- 3.1.6. **HP air.** High purity compressed air.
- 3.1.7. **HVAC.** Heating, ventilation and air conditioning.
- 3.1.8. **LOTO & access.** Lockout and tagout access safety procedures and systems to control access to critical areas of the accelerator.
- 3.1.9. **Primary electrical system.** Electrical system that guarantees a high level of reliability of service.
- 3.1.10. **Remote handling.** Transport system to remotely haul heavy radio activated loads.
- 3.1.11. **Water supply.** Regular cooling water.

4. INTERFACING SYSTEMS

Figure 1 through Figure 9. present a graphical view of the interfaces between the accelerator project and the external system listed in §§2.1.1 – 2.1.4. Table 1 summarizes Figure 1 through Figure 9. Figure 10 shows the interfaces between VS, ICS, CS and AP / CF.

It must be noted that the AP systems when interfacing with Vacuum, Cryo and and ICS will require a higher granularity. This is achieved by the increased number of ICDs addressing such interfaces according to the interface management procedure described in [1].

		Tunnel	FE loading	Gallery	Cryo test facility	HEBT loading	Cryo lab	Machine Shop	Metrology lab	Vacuum lab
CF	Building	X	X	X	X	X	X	X	X	X
	Primary electrical system	X		X	X		X			X
	Electrical system	X	X	X	X	X	X	X	X	X
	HVAC	X	X	X	X	X	X	X	X	X
	HP air	X		X	X		X			X
	Compressed air	X	X	X	X		X	X	X	X
	DI CW	X		X	X					X
	Water supply	X	X	X	X			X		X
	Elevator		X							
	Crane				X	X		X		
LOTO & access	X	X	X	X	X	X				
Vacuum	X									
ICS	X		X	X						
Cryo	X			X						

Table 1 – Interfaces between AP and relevant external systems.

5. A2CF SYSTEM NEEDS

The list of systems required by the accelerator project and provided by CF (A2CF) is given in Table 1.

Regular water systems
Cold tap water system
Hot tap water system
Hot water circulation system
Process water systems
Cold tap water system - deionised
Compressed air systems
Compressed air system without any demand of special purity
Compressed air for service
Compressed air system with demand of special purity
Compressed air for pneumatic control systems
High Purity air for Klystrons
System for nitrogen
Process waste water system
Hazardous waste water system
Cooling systems - Water
Process cooling system - High temperature
Process cooling system - Medium temperature
Process cooling system - Low temperature
Controlled access systems
Intrusion alarm and assault alarm
Intrusion alarm system
Area monitoring alarm system
Emergency signal system
Evacuation alarm system
Control systems
Access control system
Door control system
CCTV
Event Activated system
Entrance signals
Communication systems
Phone systems
Gate telephone system
Mobile telephone system
Audio and video systems
Data communication net

Table 2 – A2CF system needs

Interfaces between tunnel and CF, VC, ICS, CS

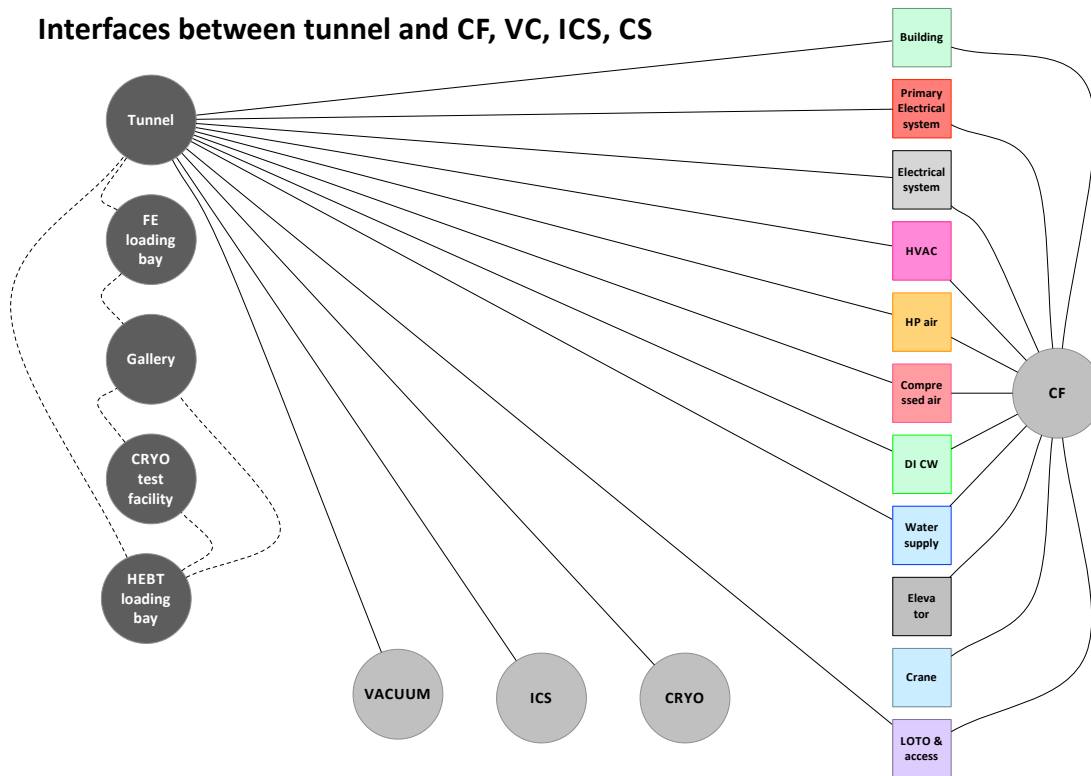


Figure 1 - Interfaces between tunnel and CF, VC, ICS, CS.

Interfaces between front end loading bay and CF, VC, ICS, CS

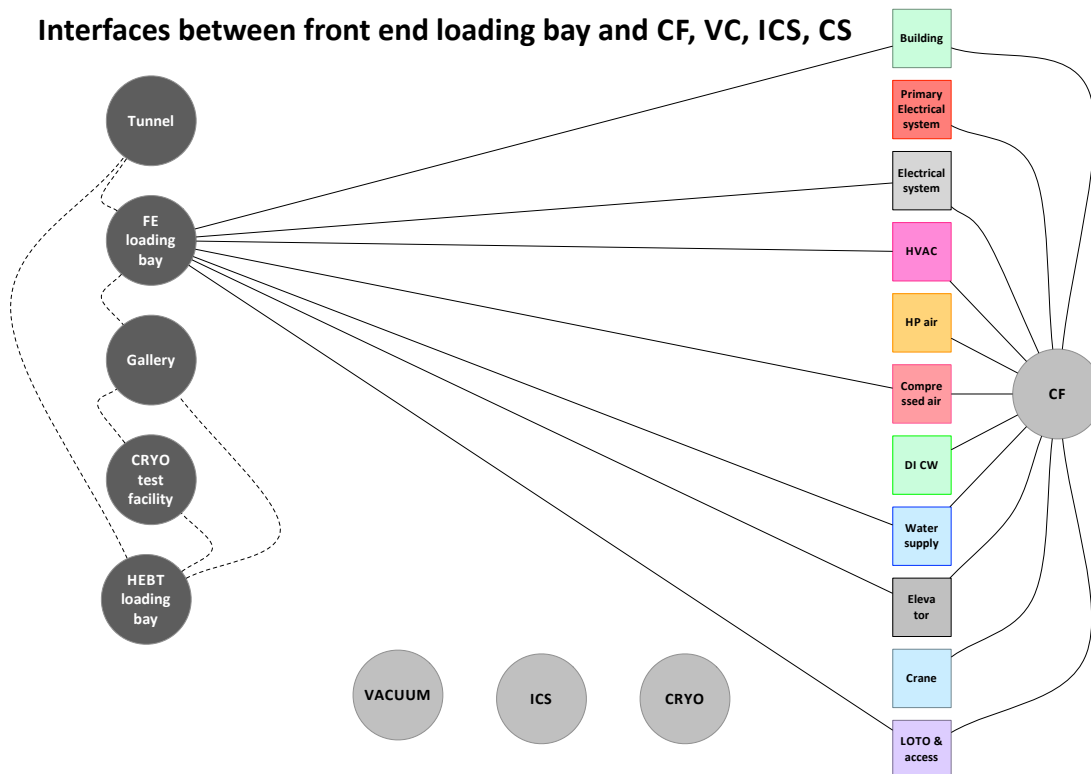


Figure 2 - Interfaces between front end loading bay and CF, VC, ICS, CS.

Interfaces between gallery and CF, VC, ICS, CS

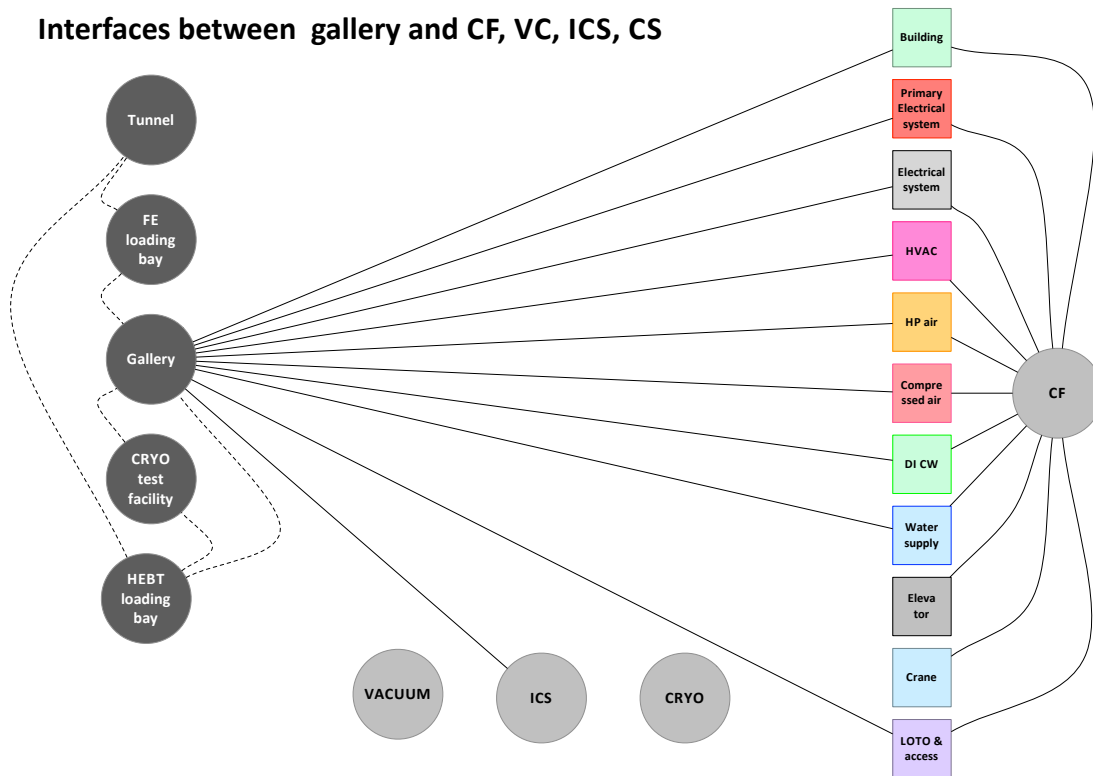


Figure 3 – Interfaces between gallery and CF, VC, ICS, CS.

Interfaces between cryo test facility and CF, VC, ICS, CS

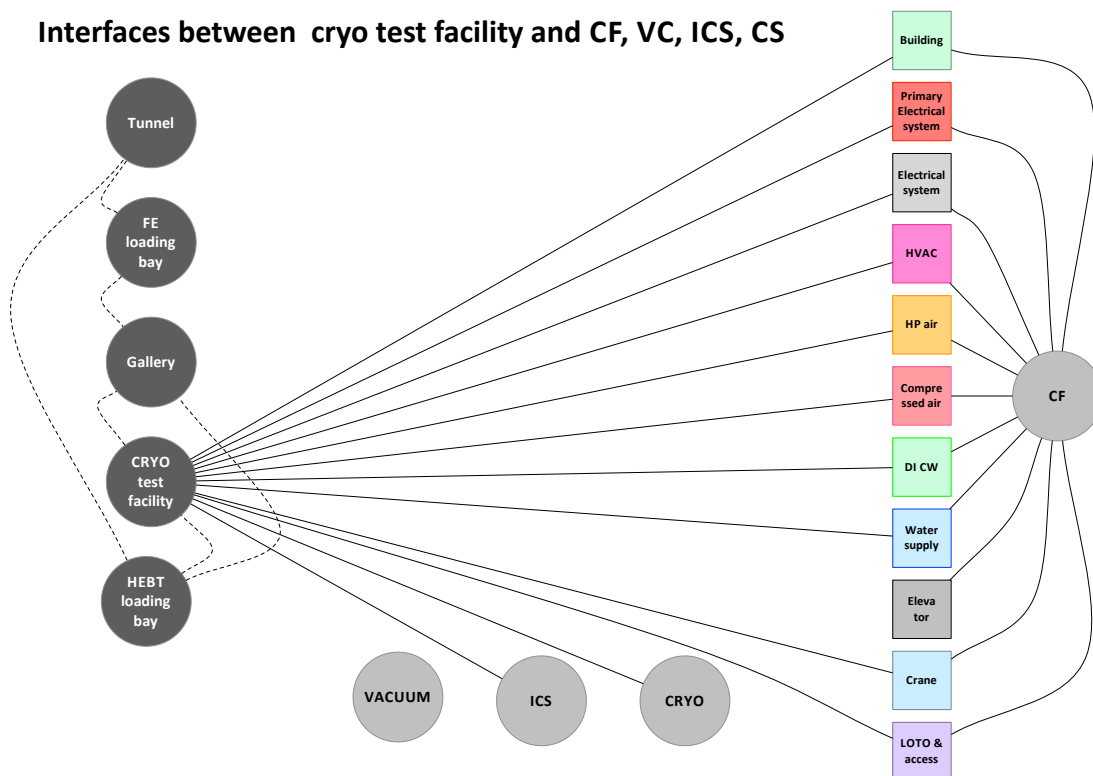


Figure 4 – Interfaces between cryo test facility and CF, VC, ICS, CS.

Interfaces between HEBT loading bay and CF, VC, ICS, CS

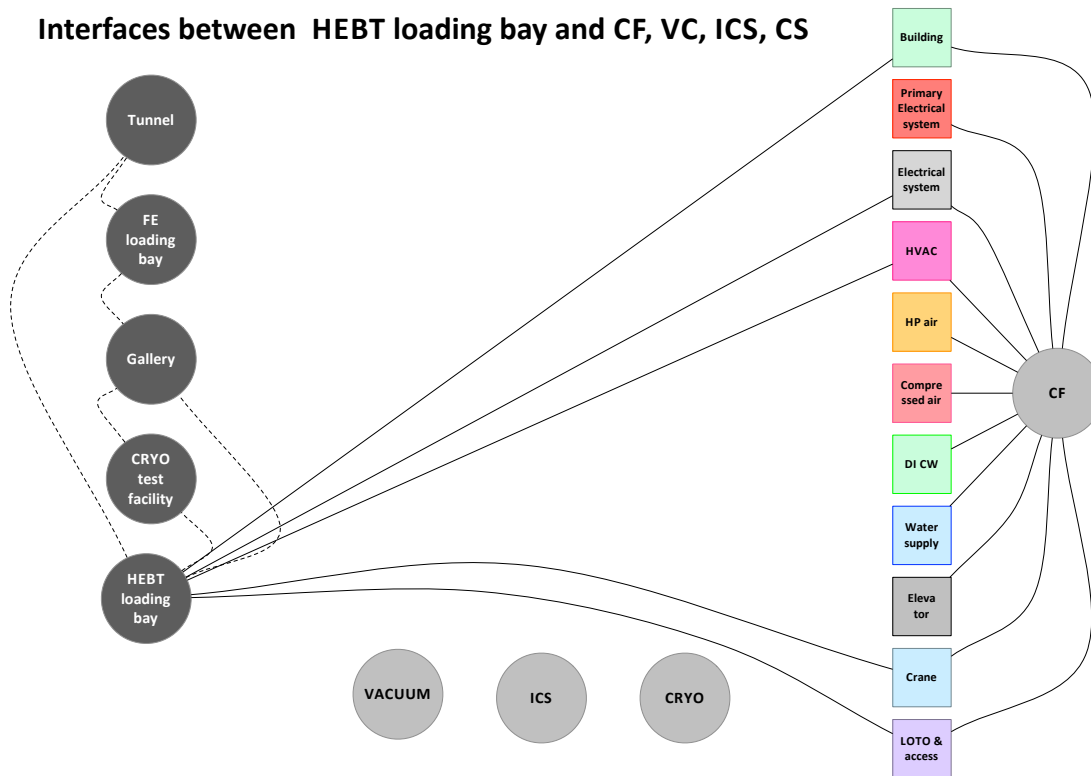


Figure 5 - Interfaces between HEBT loading bay and CF, VC, ICS, CS.

Interfaces between cryo lab and CF

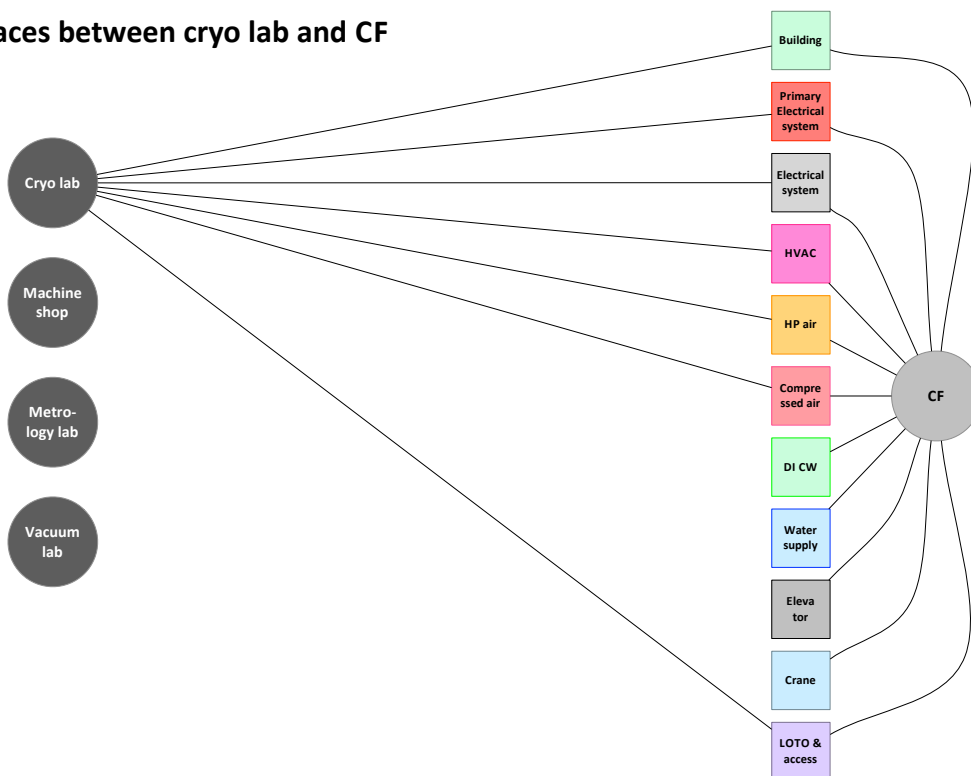


Figure 6 - Interfaces between cryo lab and CF.

Interfaces between machine shop and CF

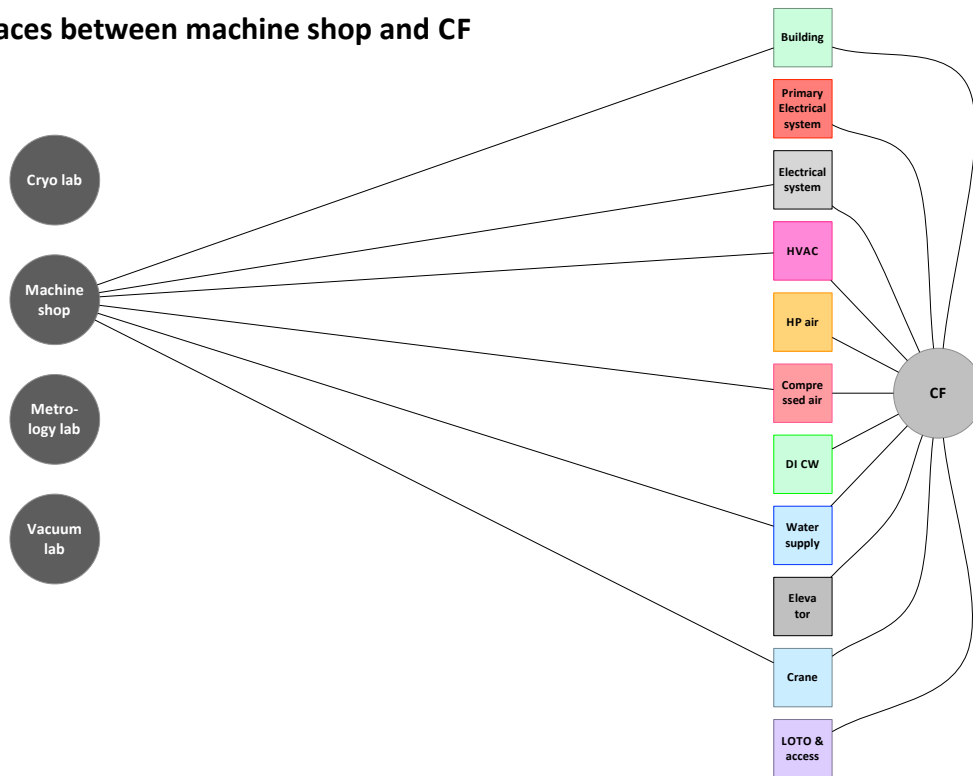


Figure 7 – Interfaces between machine shop and CF.

Interfaces between metrology lab and CF

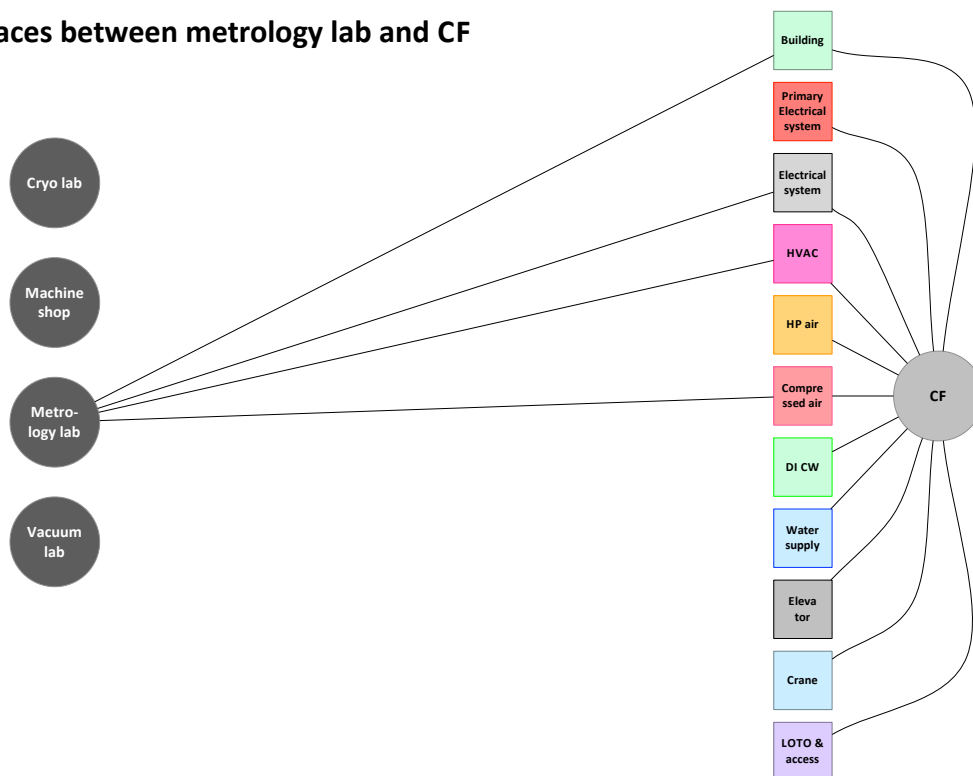


Figure 8 – Interfaces between metrology lab and CF.

Interfaces between vacuum lab and CF

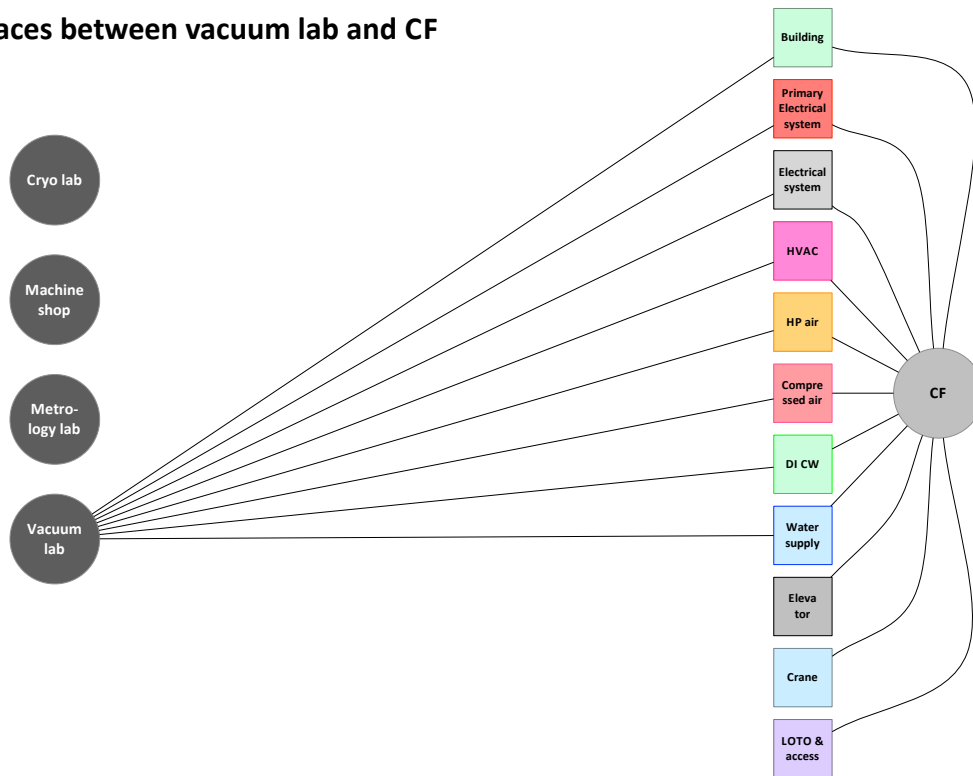


Figure 9 – Interfaces between vacuum lab and CF.

Interfaces between VS, ICS, CS and AP / CF

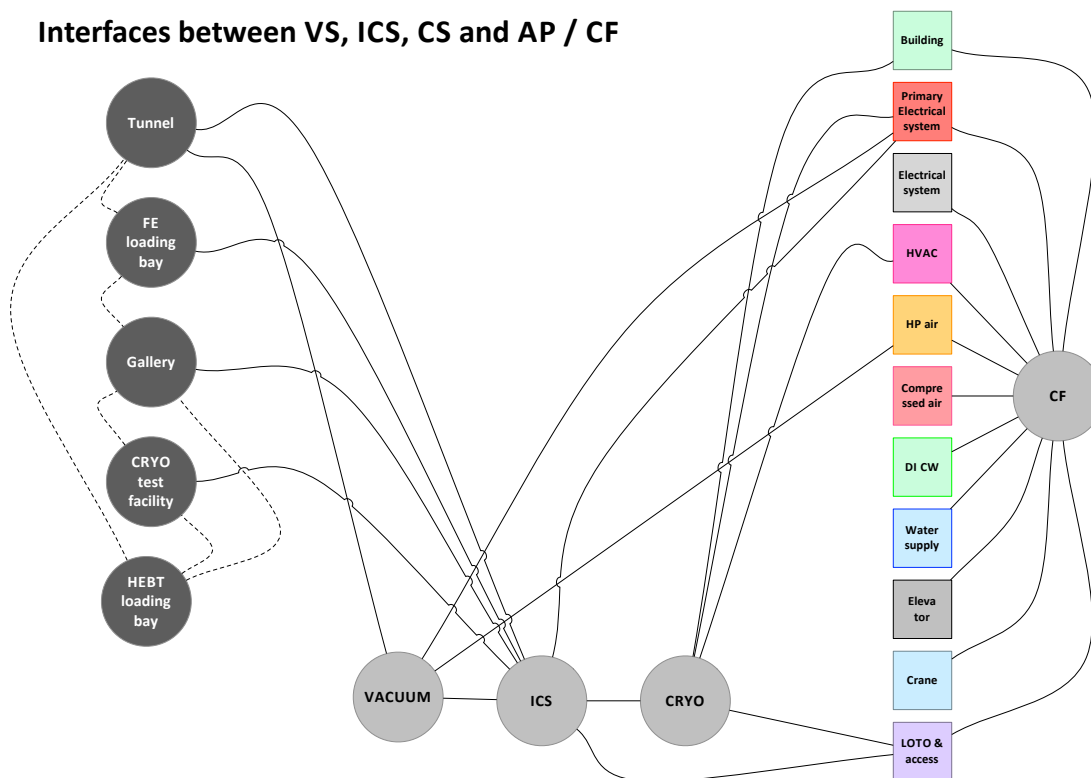


Figure 10 – Interfaces between VS, ICS, CS and AP / CF.

6. A2T

The A2T interface shows a high level of integration among the following stakeholders:

- AP
- Target
- CF
- Vacuum
- ICS.

Figure 11 is an overview of the a2T interface. Figure 12 present the complex system interdependence in the A2T area; for each branch at least one ICD needs to be written.

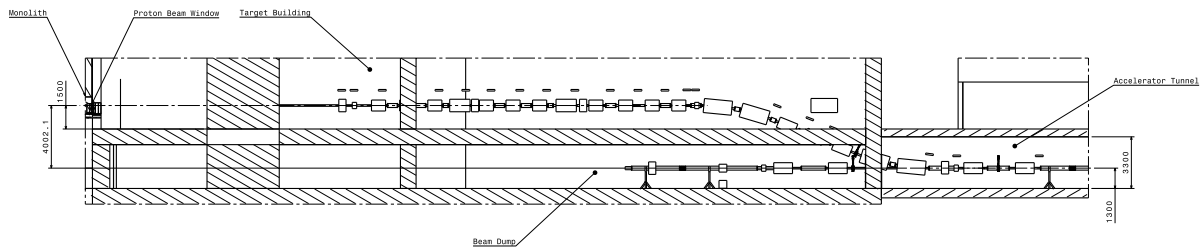


Figure 11 - Overview of the A2T interface

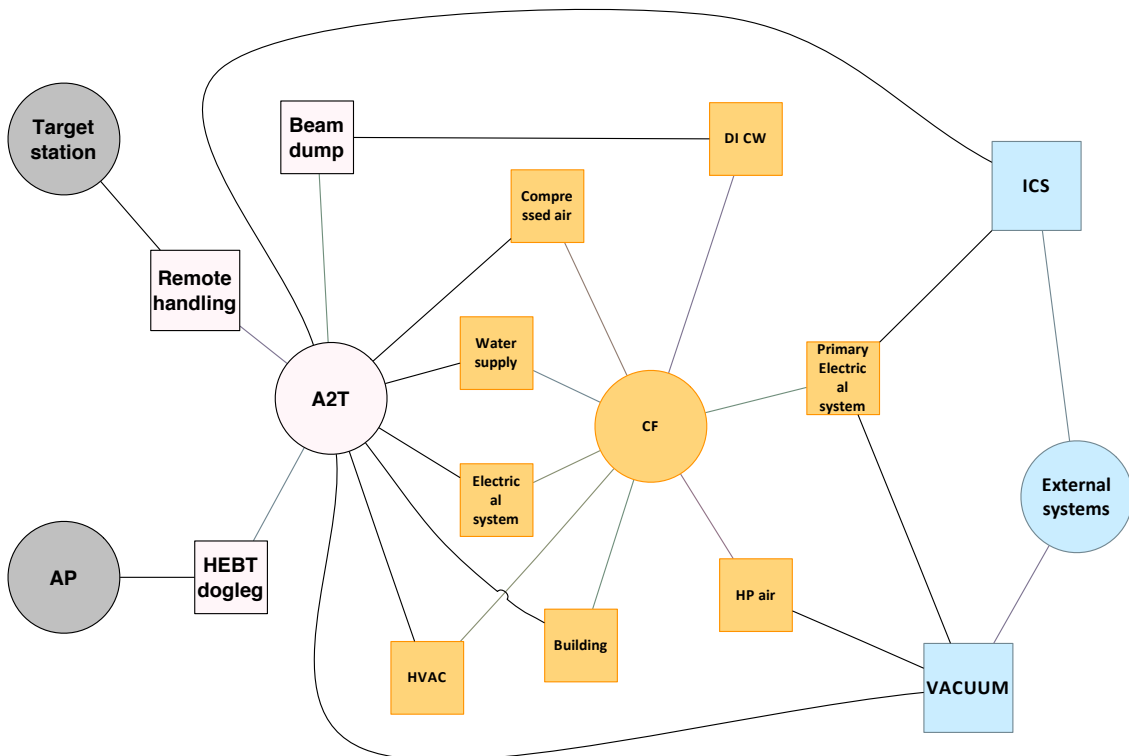


Figure 12 - A2T interface relationships.

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7. REFERENCES

- [1] G. Lanfranco, "The ESS accelerator project interface management procedure", ESS-0000###, Rev1
- [2] NASA/SP-2007-6105 Rev1 – NASA System Engineering Handbook.