Instrument Safety Readiness Review

DREAM: Overview of Instrument Hazards Analysis

DREAM Team

Documentation index and status

DREAM: Safety Readiness Review (SRR)

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Specific to DREAM

Start **adding filters** in the filter tools menu.

Risk assessment (IHA) (Radiological, Conventional, Motion, Equipment Protection)	Document - number, type	Status
Instrument Hazard Analysis	ESS-0454185	CHESS RELEASED REV 3
Motion Risk Analysis of Neutron Instruments	ESS-5467337	ESS-5467337 CHESS RELEASED REV 1
Risk Assessment for pressurized systems 1. PRA for DREAM (Water cooling , IA, Gas system)	ESS-5770346	CHESS RELEASED REV 1
Risk assessment Bunker Cooling System	ESS-5941505	ESS-5941505 CHESS RELEASED REV 1
Risk assessment D01, D03, E01, E02, Instrument air	ESS-5843991	ESS-5843991 CHESS RELEASED REV 1
Risk Assessment for pressurized systems-NSS Vacuum Systems	ESS-5846555	ESS-5846555 CHESS RELEASED REV 2
General Local Rules for Safety in the Experimental Halls Areas and Associated Lab Buildings	ESS-5666329	ESS-5666329 CHESS RELEASED REV 2
DREAM Local Rules for Safety	ESS-6007318	CHESS RELEASED REV 1
DREAM - Operations and Maintenance task risk assessment (TRA)	ESS-5972865	CHESS RELEASED REV 1
DREAM - Area Risk Assessment	ESS-5969230	CHESS RELEASED REV 1

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Specific Task Risk Assessment for Installation and removal of DREAM sample vessel	ESS-6018271	CHESS RELEASED REV 1

Instrument Hazard Analysis

DREAM Instrument Hazard Analysis (ESS-0454185)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1		Radiation Hazard Identification										Risk Estimation and Reduction				
2		1		2	3	4	5	6	7	8	9	10	11	12	13	14
3	Building	Instrument Area	Instrument Sub-area	Radiation Hazard Number	Mode	Cause / Initiating Event	Person Affected	Hazard	Radiation Level exceeds	Source of Hazard	Sub Mode / Task	Likelihood per year (From H Category) ESS-0000004	Severity	Likelihood X Severity (non-H1 event only)	Target Risk (From ESS Target Risk for Rad Haz) ESS-0000004	Actions to Mitigate Risk (Risk Controls)

IHA OBJECTIVES:

Identifies hazards

- System, Category, Description, Likelihood, Effect

Assesses risk = Severity x Likelihood

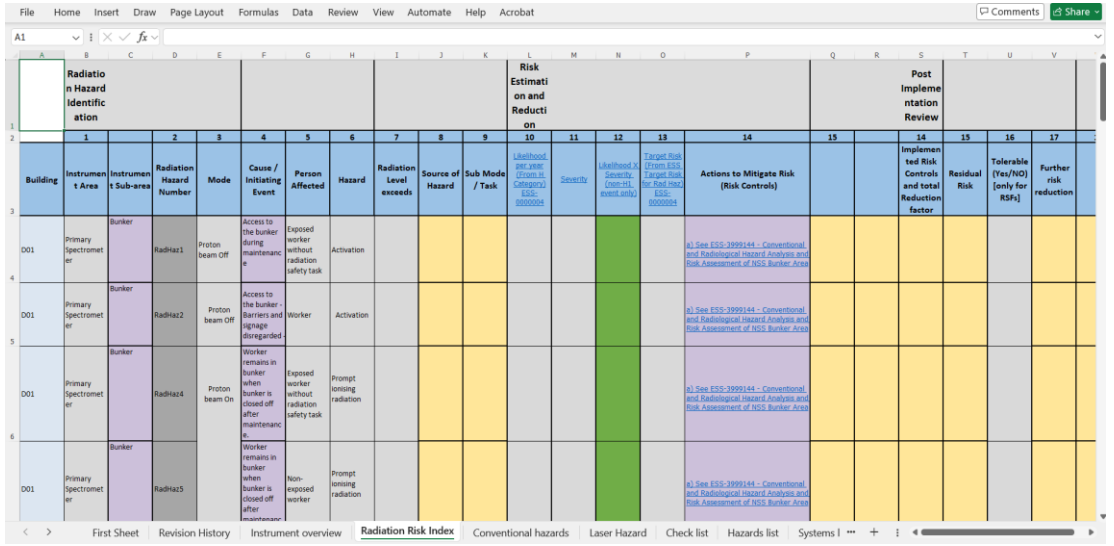
- **Acceptable**, **Tolerable**, **Unacceptable**

Mitigation

- Eliminate, Mitigate, Transfer, Observe

Hazard treatment

CE Marked equipment: Not considered (OM manual)



DREAM Instrument Hazard Analysis (ESS-0454185): Radiation Safety

Area:
- Bunker, Guide housing, Cave, Experimental Hall

Hazard type
- Prompt ionizing radiation / Activation

Risk = Severity x Likelihood
- H1/H2/H3 scenarios
- All risk are **Acceptable**

Mitigations in place
- ESS-3999144 in bunker
- Shielding
- Procedure: Work order/ RP work permit
- PSS, Radiation survey/monitoring

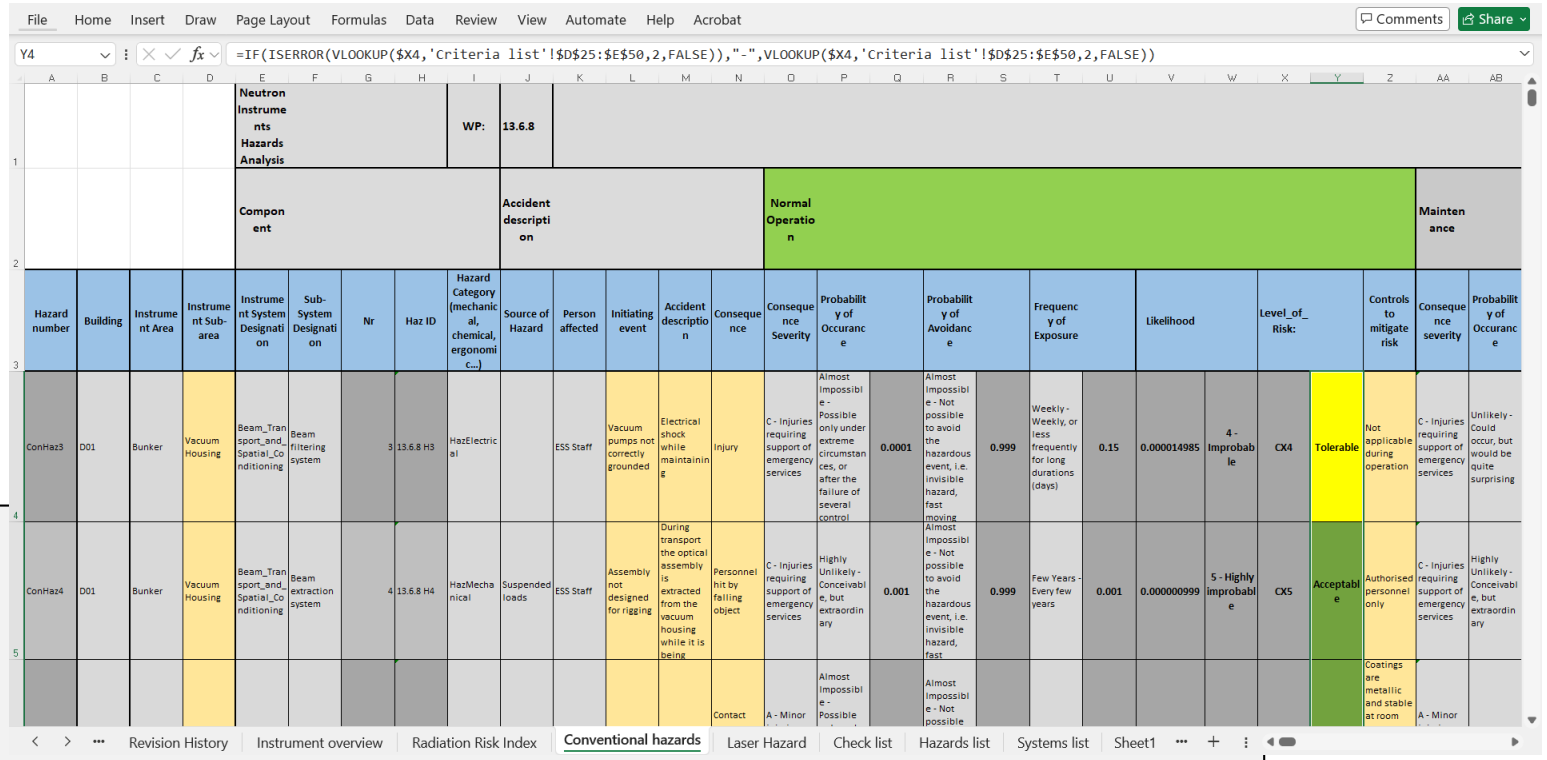
1		Radiation Hazard Identification									Risk Estimation and Reduction					
2		1		2	3	4	5	6	7	8	9	10	11	12	13	14	15
3	Building	Instrument Area	Instrument Sub-area	Radiation Hazard Number	Mode	Cause / Initiating Event	Person Affected	Hazard	Radiation Level exceeds	Source of Hazard	Sub Mode / Task	Likelihood per year (From H Category) ESS-0000004	Severity	Likelihood X Severity (non-H1 event only)	Target Risk (From ESS Target Risk for Rad Haz) ESS-0000004	Actions to Mitigate Risk (Risk Controls)	
4	D01	Primary Spectrometer	Bunker	RadHaz1	Proton beam Off	Access to the bunker during maintenance	Exposed worker without radiation safety task	Activation								a) See ESS-3999144 - Conventional and Radiological Hazard Analysis and Risk Assessment of NSS Bunker Area	
5	D01	Primary Spectrometer	Bunker	RadHaz2	Proton beam Off	Access to the bunker - Barriers and signage disregarded -	Worker	Activation								a) See ESS-3999144 - Conventional and Radiological Hazard Analysis and Risk Assessment of NSS Bunker Area	
	D01	Primary Spectrometer	Bunker	RadHaz4	Proton beam On	Worker remains in bunker when bunker is closed off	Exposed worker without radiation	Prompt ionising radiation								a) See ESS-3999144 - Conventional and Radiological Hazard Analysis and Risk Assessment of NSS Bunker Area	

First Sheet | Revision History | Instrument overview | Radiation Risk Index | Conventional hazards | Laser Hazard | Check list | Hazards list | Systems I

DREAM Instrument Hazard Analysis (ESS-0454185): Conventional hazards

Running mode:

- **Operation**
  U=7 **T=19** **A=41**
- **Maintenance**
  U=9 **T=48** **A=10**



Running mode:

- Operation, Maintenance

Area:

- Bunker, Guide housing, Cave

Hazard sources

- Suspended loads, Toxic substances, Projectiles, Exposed conductors, Unprotected heights, Arching (HV), Flammable material, Sharp edges, Cold surfaces, Wet environment, Oxygen depletion, Magnetic fields, Hot surfaces, Negligence, Laser radiation, Motorized components

Risk = Severity x Likelihood

- **Acceptable , Tolerable, Unacceptable (ODH, Loads, Magnetic fields)**

Mitigations in place

- Ventilation (ODH assessment ESS-4246467 , Training, Warning sign for Pacemaker

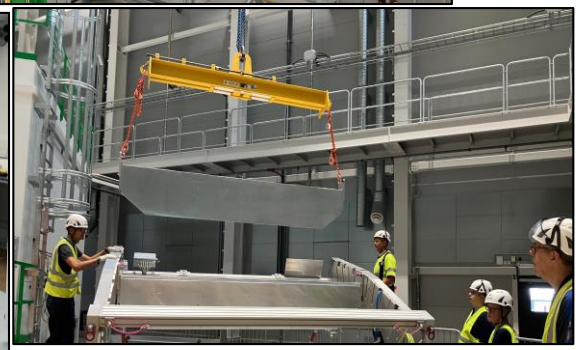
Area Risk Assessment

DREAM Area Risk Assessment (ESS-5969230)









Experimental Cave
- **DREAM cave 1:**
  - **D01.100.5123**
  - **D01.105.5123**
  - **D01.110.5123**
- **DREAM cave 1 roof:**
  - **D01.120.5123**
- **DREAM cave 2:**
  - **D01.100.5122**
  - **D01.105.5122**
- **DREAM cave 2 roof:**
  - **D01.120.5122**

Sample Preparation
- **DREAM sample preparation lab:**
  - **D01.105.5127**

Control Room
- **DREAM control hutch:**
  - **D01.110.5127**

Elevated floor
- **DREAM external elevated floor:**
  - **D01.105.5120**

Cabinets Rack Utilities
- **DREAM cave cabinets area:**
  - **D01.105.5124,**
  - **D01.110.5126**
- **DREAM front utilities area:**
  - **D01.100.5125**
- **DREAM maintenance area:**
  - **D01.100.5121**
- **DREAM beam-line: (bunker?)**
  - **D01.100.5128**

DREAM Area Risk Assessment (ESS-5969230): Examples

Experimental Cave

Activated materials/samples
- ➔ **Survey , handling, Storage according to RP guidance**
- ➔ **Labeling and storage according to RP guidance**
- ➔ **Appropriate RP trainings.**

Installation of sample environments
- ➔ **Crane training, authorization and lifting plan**
- ➔ **Utilize lifting equipment**
- ➔ **Minimize solo lifting**
- ➔ **Use as many people to lift as needed to lift safely**
- ➔ **Lock on crane and Sliding platform**

Detector and monitor gas
- ➔ **Normal operations: ODH monitors in the cave**
- ➔ **Maintenance: Personal ODH monitor recommended**

Procedures how user samples are handled still to be developed.

Reference:
ESS Experiment Safety Review Procedure (ESS-0024107).

Sample Preparation (Dry "laboratory" No chem. ➔ D08)

(Hazardous) user samples / "Usual" chemicals
- ➔ **Proper labeling and instructions for handling samples**
- ➔ **Sample/Chemicals stored in chemical cabinets**
- ➔ **SDS sheets available**
- ➔ **Chemicals shall be registered in the chemical database**
- ➔ **Use correct PPE**

DREAM Area Risk Assessment (ESS-5969230): Mitigations

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	HazId No.	Hazard type	Is hazard present in the area?	Hazard description	What are the possible Consequence?	Severity	Likelihood	Initial risk	Existing mitigations to control risk	Severity 2	Likelihood 2	Residual risk	Further action needed	Owne
22	4.3	Are any other gases present that could be an ODH?	X	Ar/CO2 mixture is used for the detectors and monitors	ODH	3	2	L	- ODH monitors are installed in the cave - If working directly with the gas system in the cave a personal ODH monitor is recommended - Evacuate if the ODH alarm goes off	3	1	L		
27	5.3	Activated or contaminated material?	X	Activated material from exposure to neutron beam	Exposure to secondary radiation	3	3	M	All material exposed to beam shall be surveyed and handled/stored according to RP guidance. Take appropriate RP trainings.	3	1	L		

ARA Cave and Cave roof | ARA Sample Prep room | ARA Control Room | ARA Gas bundle area | ARA Elevated floors | Risk Matrix (5x5) | Revisi

DREAM Area Risk Assessment (ESS-5969230)

	Before mitigations				After mitigation			
Cave	1	12	13	0	1	18	7	0
Sample Prep	1	4	4	0	2	6	1	0
Control Room	0	3	1	0	0	3	1	0
Gas bundles	0	2	5	0	0	7	0	0
Elevated floor	0	2	9	0	0	8	3	0

Risk

- Very Low
- Low
- Medium
- High

Worst residual risk (as of today)

	Electric	Fire Chemical	Biological	Cryo ODH	Ionizing rad.	Optical rad.	Laser	Mag. Fields	Cold Heat Fire	Motion Saf.	Mechan. Saf.	Lifting	Pressure Vacuum	Work place	Ergonomics	Security
Cave	X	X		X	X				X	X		X	X	X	X	X
Sample Prep.	X	X											X	X		X
Control Room	X													X		X
Gas bundles	X			X									X	X	X	
Elevated floors	X	X								X		X		X	X	

Task Risk Assessment

DREAM Task Risk Assessment (ESS-5972865)

Task Risk Assessment: General operational, maintenance, handling & support activities on DREAM

General users All authorized personnel DREAM team	Ergonomics Ionizing radiation Mechanical safety	Workplace Chemical Safety Cryogenic Safety & ODH
		Tech. measures Authorization / Procedure PPE

Ref. no	Location	What is the Task or Activity?	What is the Hazard?	What are the possible Consequence?	Who is affected?	Initial rating			Mitigations to control risk	Residual rating		
						Severity	Likelihood	Risk H, M, L, VL		Severity	Likelihood	Risk H, M, L, VL
		Transporting, positioning, connecting and operating detector and beam monitor gas	High-pressure gas, bundle tipping, regulator/connection failure, oxygen-defiency (ODH) if major leak	Impact injury, gas release, ODH effects, equipment damage	DREAM team personnel, authorized technicians or ESS technical personnel	4	3	H	Secure bundle during transport, if needed be two people, use appropriate pallet-truck, inspect gas bundle, regulators, valves, and hoses before connection, wear appropriate PPE, connect the anti-whip protection for the hoses, ensure adequate ventilation, keep valves closed when swapping bundles or when not actively in use, enroll the gas cylinder handling training. Only trained personnel who is competent to the do the work should handle and connect gas bundles and pressurize system. Ensure coordination with other parties.	3	1	L
		Installation/removal of the sample vessel via DREAM instrument crane	Falling load, collision, manual handling, tools slipping, pinching, crushing	Impact injury, musculoskeletal injuries, pinch injuries, equipment damage	Authorized crane operators (DREAM team, rigging team), nearby personnel	4	3	H	Only authorized/trained personnel are allowed to do this operration, wear appropriate PPE, avoid awkward working position. Only trained and authorized crane operators may use the crane, inspect the crane, hook, and all lifting accessories before use, confirm the safe working load of both the crane and slings, attach the load securely and lift slowly, maintain clear communication with nearby personnel, establish a clearly marked exclusion zone—no personnel under a suspended load, ensure the travel path is clear, avoid sudden movements, perform a Pre-Job Safety Check, follow the ESS Rigging Handbook and the applicable Lifting Plan, stop immediately if instability or unsafe conditions occur.	4	1	M

Worst Risks before mitigation (2/3)

DREAM Task Risk Assessment (ESS-5972865)

	Use of DREAM instrument crane for lifting and moving equipment	Dropped load, swing of suspended load, pinch points, collision with structures, failure of slings/rigging	Crush injuries, severe injury, equipment damage	Auhorized DREAM personnel, rigging team	5	2	H	Only trained and authorized crane operators may use the crane, inspect the crane, hook, and all lifting accessories before use, confirm the safe working load of both the crane and slings, attach the load securely and lift slowly, maintain clear communication with nearby personnel, establish a clearly marked exclusion zone—no personnel under a suspended load, ensure the travel path is clear, avoid sudden movements, perform a Pre-Job Safety Check, follow the ESS Rigging Handbook and the applicable Lifting Plan, stop immediately if instability or unsafe conditions occur.	5	1	M

Worst Risks before mitigation (3/3)

Risks before mitigation:

VL=1 L=1 M=15 H=3

Risks after mitigation:

VL=1 L=17 M=2 H=0

Specific Task Risk Assessment

DREAM Specific Task Risk Assessment (ESS-6018271)

Task Risk Assessment (TRA)

Work package, Project or System: Sample vessel

Area Coordinator (AC): Anna Fornell

Responsible Manager (RM): Mikhail Feygenson

Ref. no	Location	What is the Task or Activity?	What is the Hazard?	What are the possible Consequence?	Who is affected?	Initial rating			Mitigations to control risk	Residual rating			Further action needed	Owner	RM	Ref. doc.	Follow up
						Severity	Likelihood	Risk H, M, L, VL		Severity	Likelihood	Risk H, M, L, VL					
1	DREAM	Transport of sample vessel and support table to/from DREAM storage location to DREAM cave using a pallet jack	Collision with people, walls, other equipment.	Minor injury, damage to equipment	All personnel	3	3	M	Maintain clear walkways. Ensure the pallet jack is suitable for the load and is stable when moving, if a lack of visibility or unstable consider two persons.	3	1	L					
2	DREAM cave	Installation/Removal of the support table with DREAM crane (see ESS-5989291 for detailed instructions and photos)	- Collision with people, walls, other equipment - Falling load - Pinching, crushing	Injury, equipment damage	DREAM team personnel or ESS technical personnel	3	3	M	Only trained and authorized crane operator may use the crane. Inspect the crane hook and all lifting accessories before use. Confirm the safe working load of both the crane and slings, attach the load securely and lift slowly, maintain clear communication with nearby personnel. Follow the ESS Rigging Handbook and the applicable Lifting Plan (ESS-6018268), stop immediately if instability or unsafe conditions occur.	3	1	L	Write lifting plan (ESS-6018268)	IOE (Anna Fornell)			
3	DREAM cave	Installation/Removal of the sample vessel with DREAM crane (see ESS-5584346 for detailed instructions and photos)	- Collision with people, walls, other equipment - Falling load - Pinching, crushing	Injury, equipment damage	DREAM team personnel or ESS technical personnel	4	3	H	Only trained and authorized crane operator may use the crane. Inspect the crane hook and all lifting accessories before use. Confirm the safe working load of both the crane and slings, attach the load securely and lift slowly, maintain clear communication with nearby personnel. Follow the ESS Rigging Handbook and the applicable Lifting Plan (ESS-6018268), stop immediately if instability or unsafe conditions occur.	4	1	M	Write lifting plan (ESS-6018268)	IOE (Anna Fornell)			
4	DREAM cave	Connection of the sample vessel to the vacuum cones (see ESS-5584346 for detailed instructions and photos)	- Pinching - Use of manual tools (screw driver)	Injury, equipment damage	DREAM team personnel or ESS technical personnel	2	2	VL	Follow Task Risk Assessment for DREAM General activities ESS-5972865	2	2	VL					
5																	

Specific TRA Installation and removal of DREAM sample vessel

	Name	Role/Title
Owner	Anna Fornell	DREAM IOE
Reviewer	Tim Birkin	OHS Officer
Approver	Mikhail Feygenson	Head of Diffraction and Imaging Division

Local Rules

DREAM Local Rules for Safety (ESS-6007318)

DREAM Local Rules & Workplace Hazards

The General Local Rules for the Experimental Halls apply ESS-5666329
The Area Risk Assessment for D01+D03 Instrument Halls apply ESS-4751874

This notice identifies the local hazards present and highlights specific rules that apply to this area.

Refer also to the Experiment Safety Document (ESD) posted outside the cave.

Area	DREAM
Area Responsible	Anna Fornell (DREAM IOE)
Telephone	+46 72 179 26 81
DREAM Area Risk Assessment	ESS-5969230
Radiation Protection (RP) Group	+46 46 888 35 25

Hazard	Hazard Description	Specific Location & Rules
	General Danger Fara	There are multiple simultaneous operations taking place in the D01 Instrument Hall. **Remain alert and follow all posted signs. Only trained personnel may enter the cave.**
	Ionising radiation Radioaktiva ämnen	Ionising radiation hazard is present. **Follow access and ESS Sample Handling Procedure (ESS-0024112). Do not move or alter shielding without authorization from Radiation Protection.**
	Electrical Livsfarlig ledning	Electrical hazards are present. **All electrical work must follow Rules for Co-ordination of Electrical Safety (ESS-0328120).**
	Oxygen Deficiency Hazard Risk för syrebrist	Low oxygen level may occur in the cave. **If the ODH alarm in the cave sounds, evacuate the cave immediately.**
	Overhead load Hängande last	The DREAM instrument crane and D01 overhead crane are present and regularly operated in this area. **Remain aware of the cranes, keep clear of their operating zones, maintain eye-contact with crane operators, and follow all posted safety procedures while the cranes are in use.**

Safety is everybody's job - all day, every day

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DREAM Local Rules & Workplace Hazards

Hazard	Hazard Description	Specific Location & Rules
	Vehicles moving Fordon i rörelse	Forklifts may be present around DREAM. **Personnel must remain alert for forklifts operating in the area.**
	Drop Fallrisk	In the cave, stairs, elevated floor, and the top of the cave. **Exercise caution and remain aware of the various working levels around the instrument area.**
	Obstacles Snubbelrisk	Trip hazards and general obstacles are present around DREAM. **Stay aware of the surroundings and maintain good housekeeping.**
	Crushing Klämrisk	Motion systems are present (goods lift, local crane and sliding platform). **Maintain a safe distance from all motion systems and follow the guidance in the motion risk assessment (ESS-5467337).**
	Harmful Health hazard Skadliga ämnen Hälsofarliga ämnen	Lead is present at DREAM. Hazardous sample may be present in the sample preparation room and in the cave. **Follow ESS Rules for safe handling and storage of lead (ESS-3884148). Personnel handling chemicals must have chemical safety training. Any chemical use requires a specific risk assessment. Refer also to the Experiment Safety Document (ESD) posted outside the cave.**
	Flammable Brandfarligt ämne	Small quantities of flammable liquids may be present – e.g. Isopropyl alcohol (IPA) **Personnel handling chemicals must have chemical safety training. Any use requires a specific risk assessment. Keep flammables away from ignition sources.**
	Pressurised cylinders Gasbehållare under tryck	Pressurized cylinders are located on the backside of the cave. **Only trained and authorized personnel may handle cylinders.**

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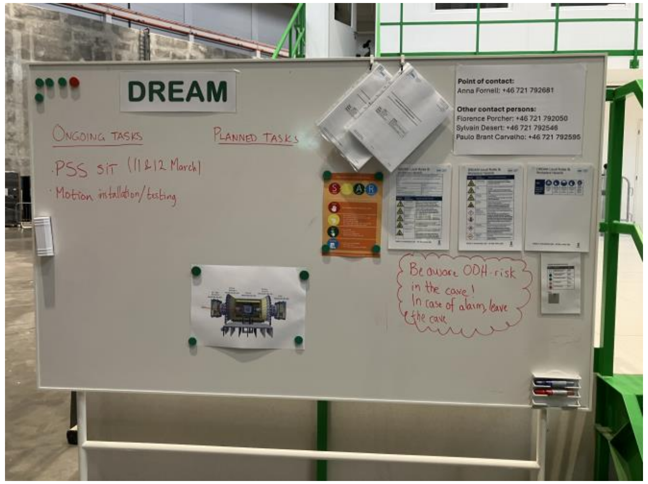
DREAM Local Rules & Workplace Hazards

PPE					PPD
State when required if not at all times	Required as per D01 ARA	Depending on the task risk assessment	Depending on the task risk assessment	Depending on the task risk assessment	When radiation hazard is present



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Thank you!