

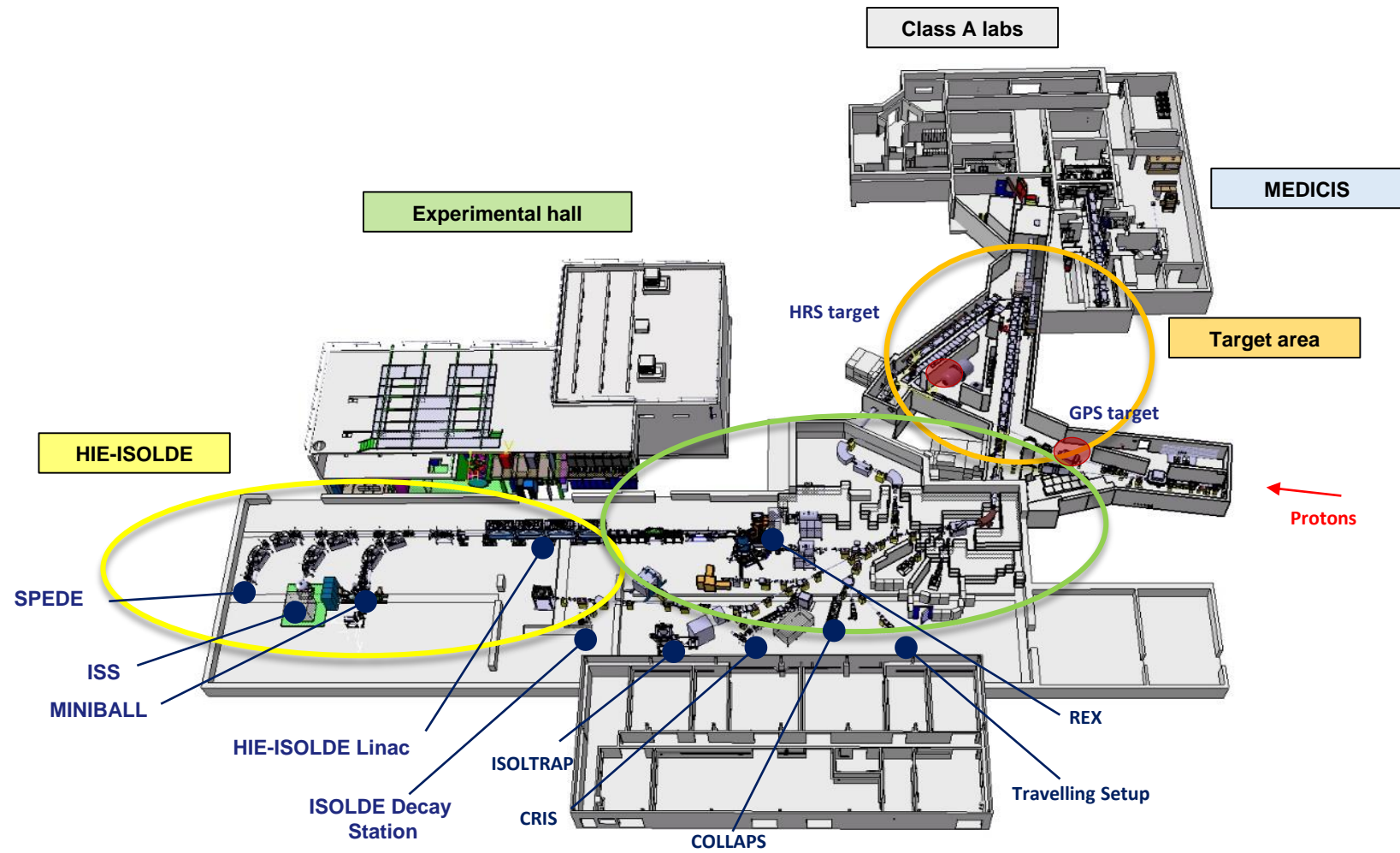
The boundary conditions for operating LIEBE at ISOLDE

Richard Catherall EN-STI-RBS
ISOLDE Technical Coordinator

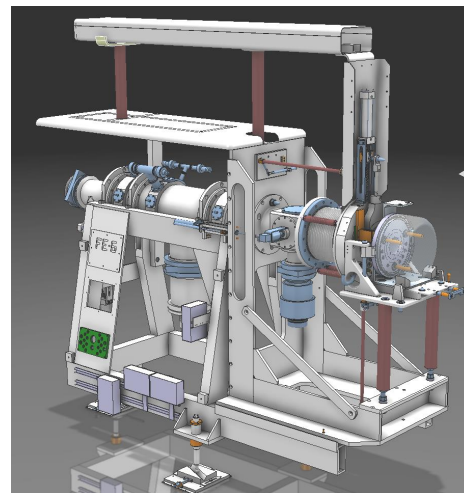
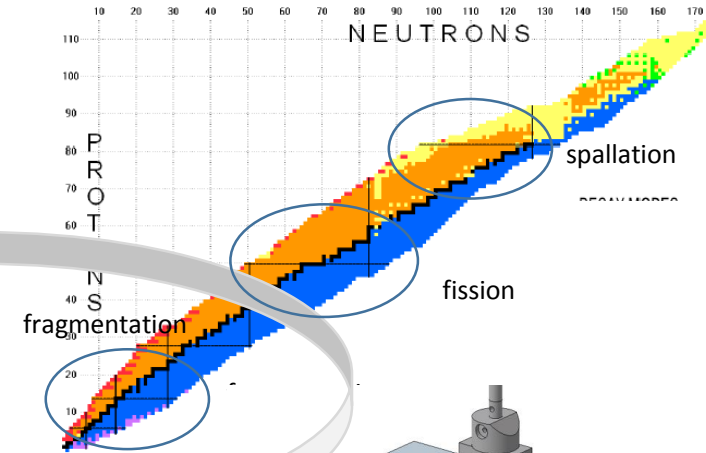
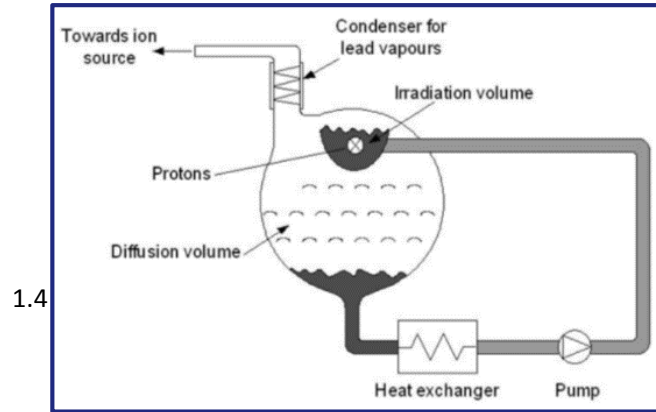
Outline

- A quick introduction to ISOLDE
- Operation at ISOLDE and constraints
- Off-line testing
- Resources
- Basic risk analysis
- Summary

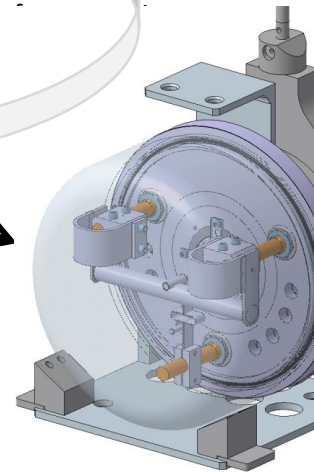
The ISOLDE Facility



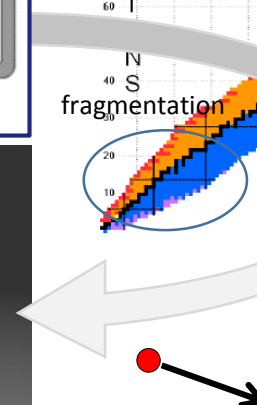
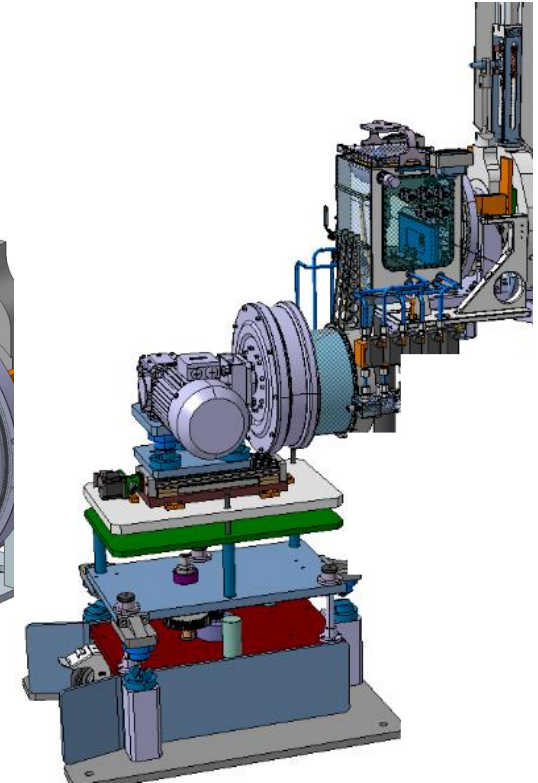
The production method



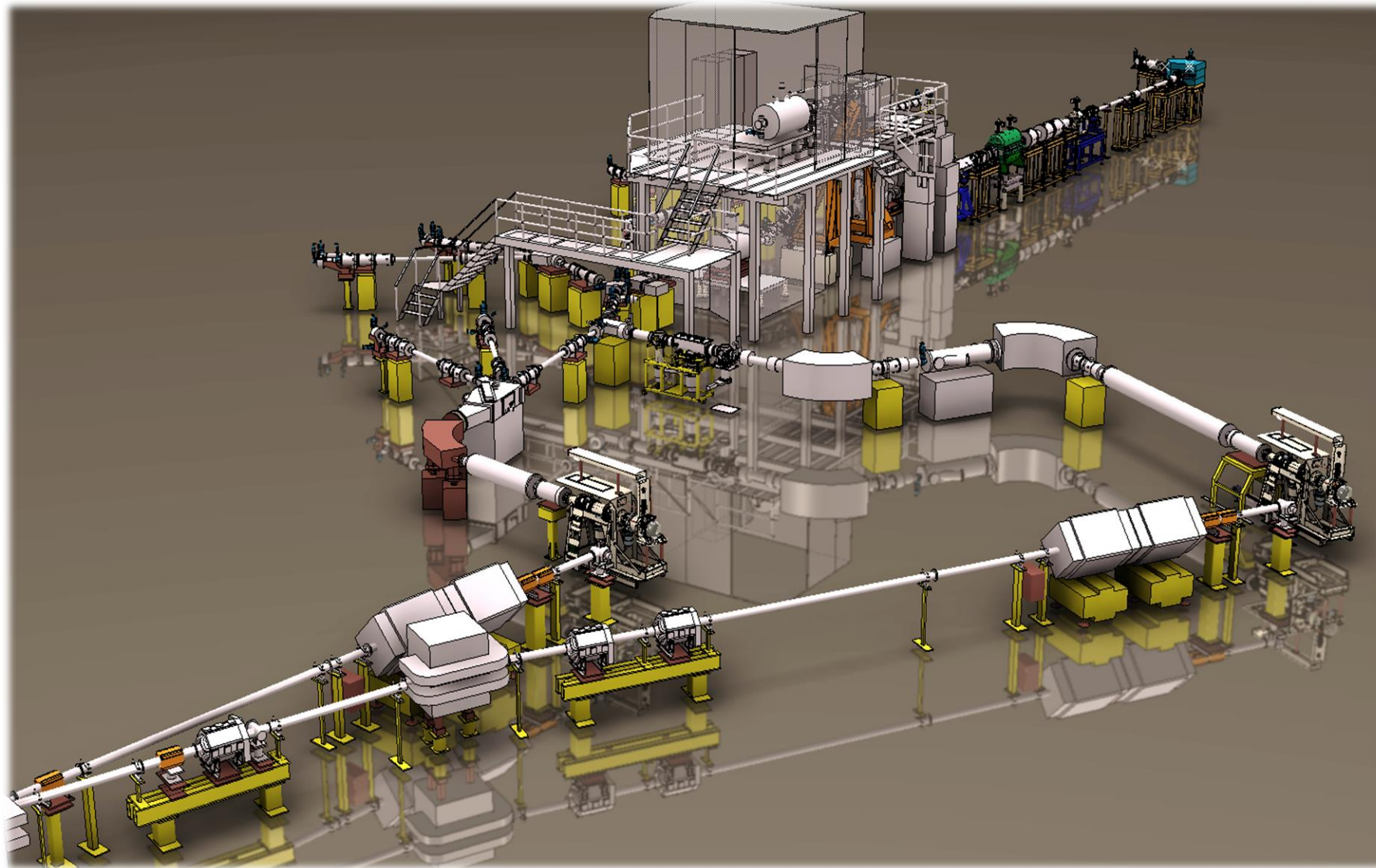
Front End (target station)



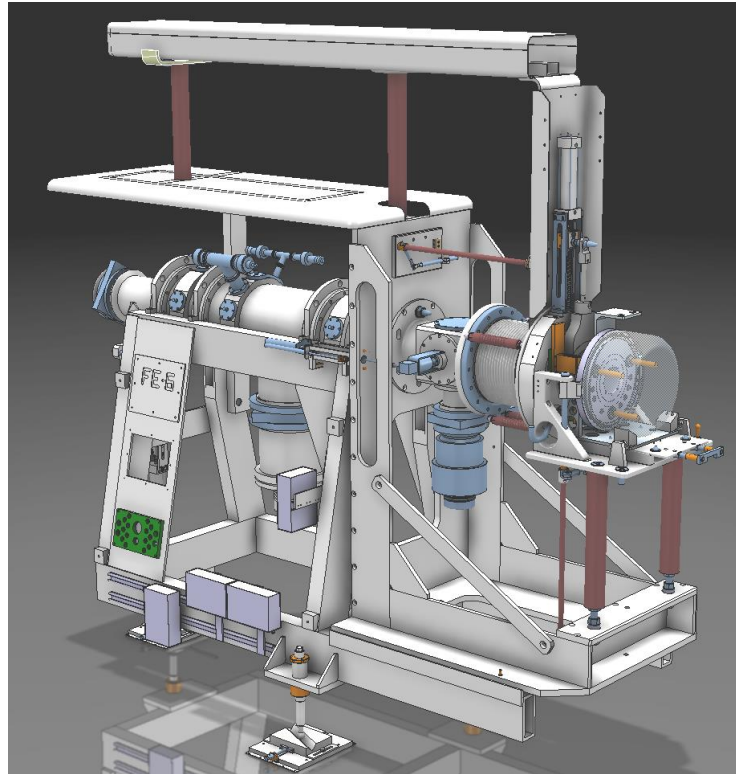
Target Unit



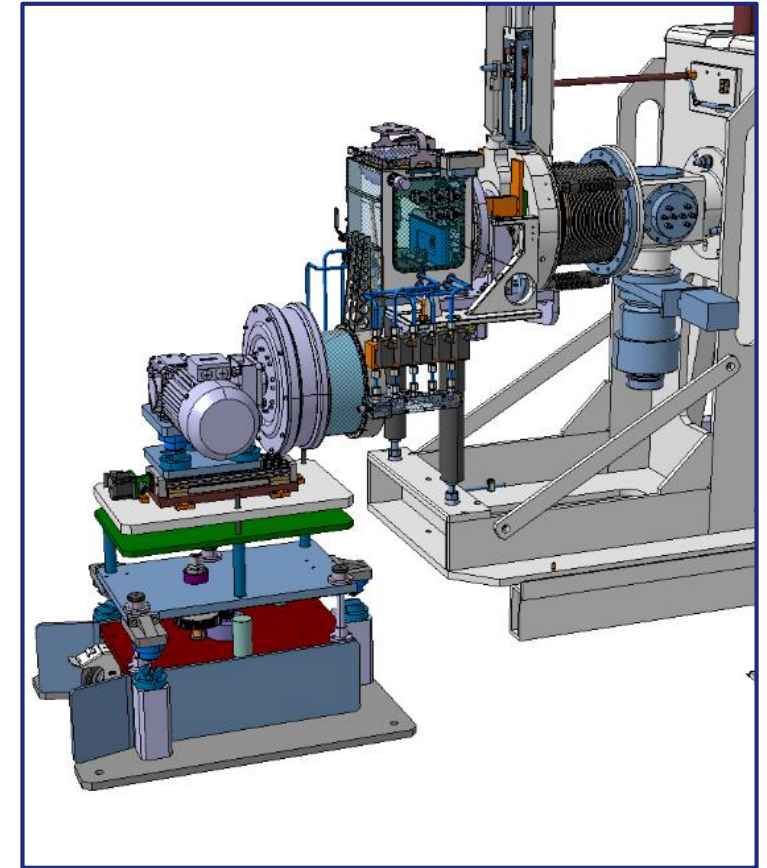
The ISOLDE Separators



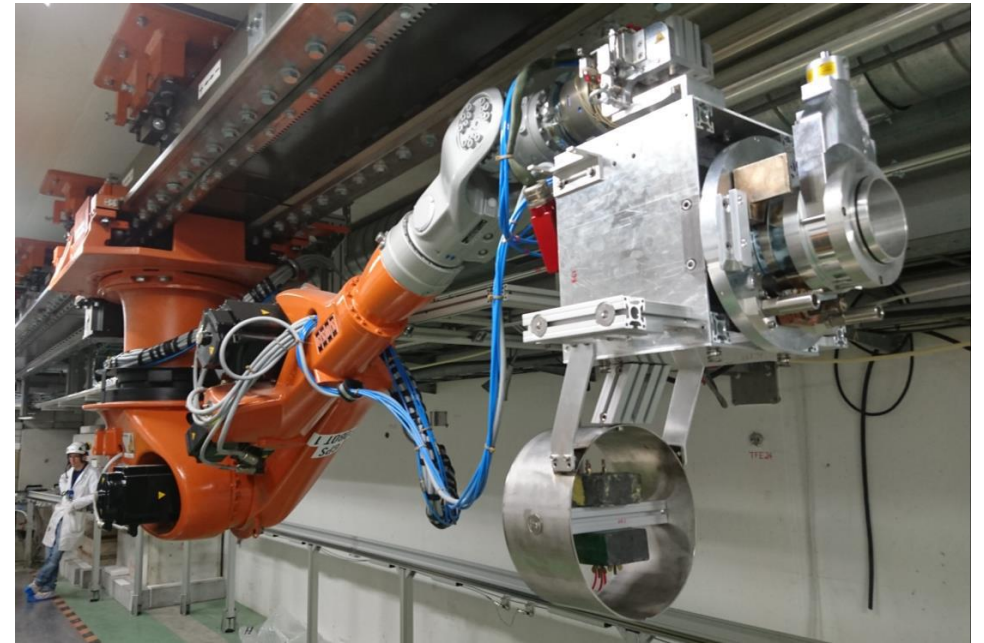
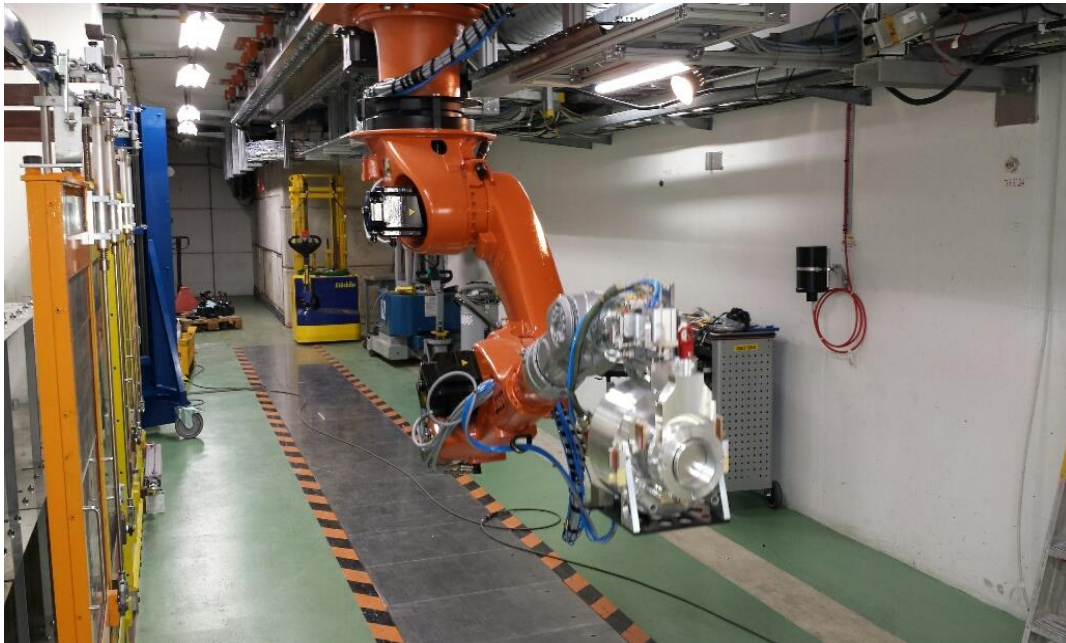
Operational constraints 1: Geometry



- The geometry of the LIEBE target is outside the “standard” target geometry.
- All infrastructure has been installed and tested.
 - But in beginning of 2017
- Although tested, its behaviour on-line during operation is unknown
- Multiple interfaces



Operational constraints 2: Handling



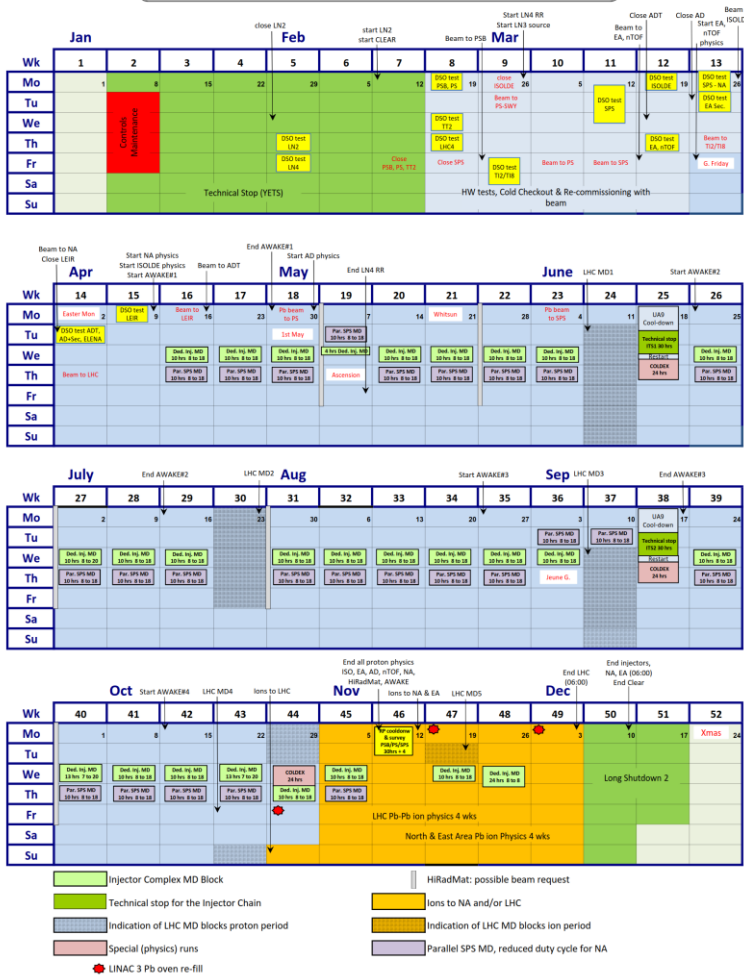
- The remote handling of the LEIBE target has been fully tested.
- Although bigger and heavier, the interfaces between the LEIBE target and the Frontend and target storage position are compatible.
- Removal from target area and waste management?

Operation

RS

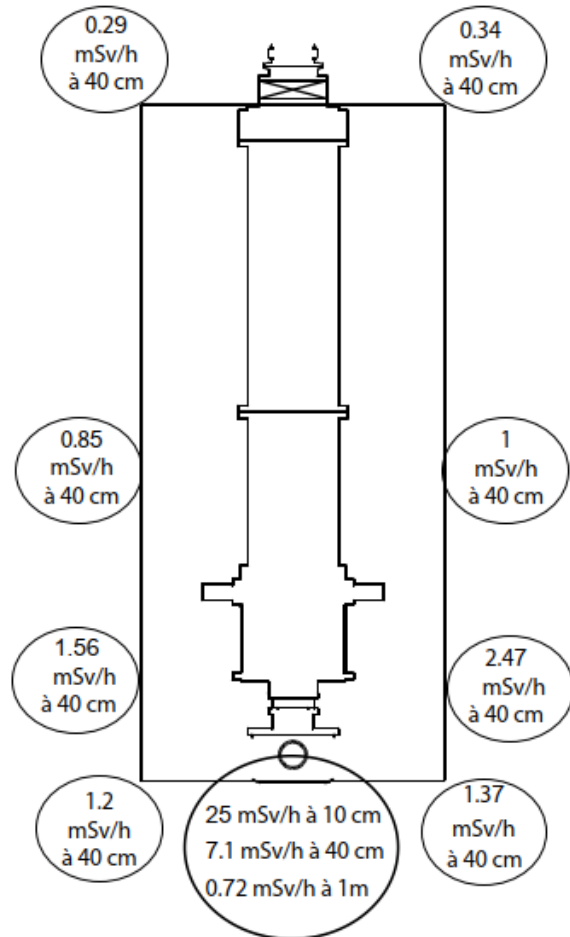
June 6, 2018
ver. 1.6

Injector Accelerator Schedule 2018
Approved by Research board on 06.12.2017

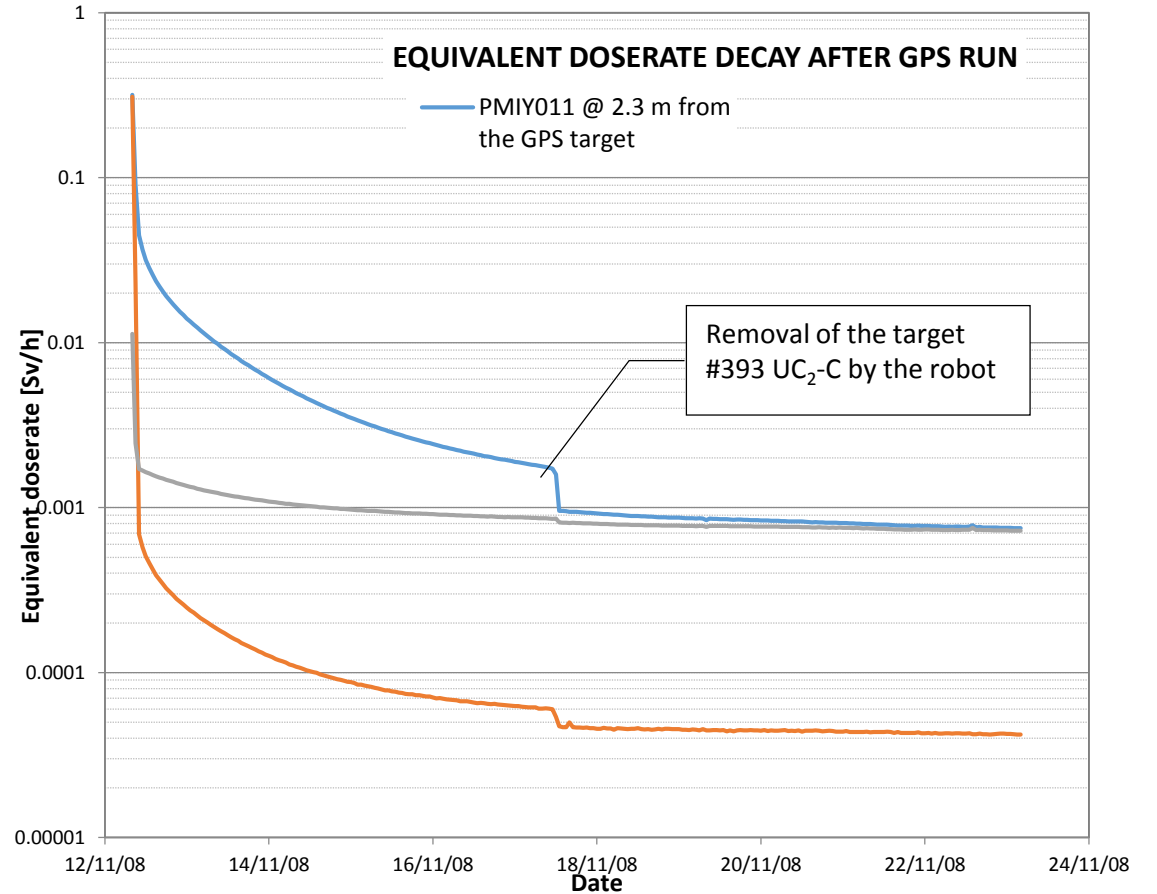


- Between 25 and 30 targets produced and operated each year.
- Physics program from April – November
 - Cold check out as from ~1st March
 - Stable or long-lived isotopes until December
- Over 100 target and ion source combinations. Targets built upon request by users.
- Continuous target and ion source development program for new radioactive ion beams.
- Target lifetime ~ 10 days ($\sim 5 \times 10^{18}$ protons).

Operational constraints 3: Radiation

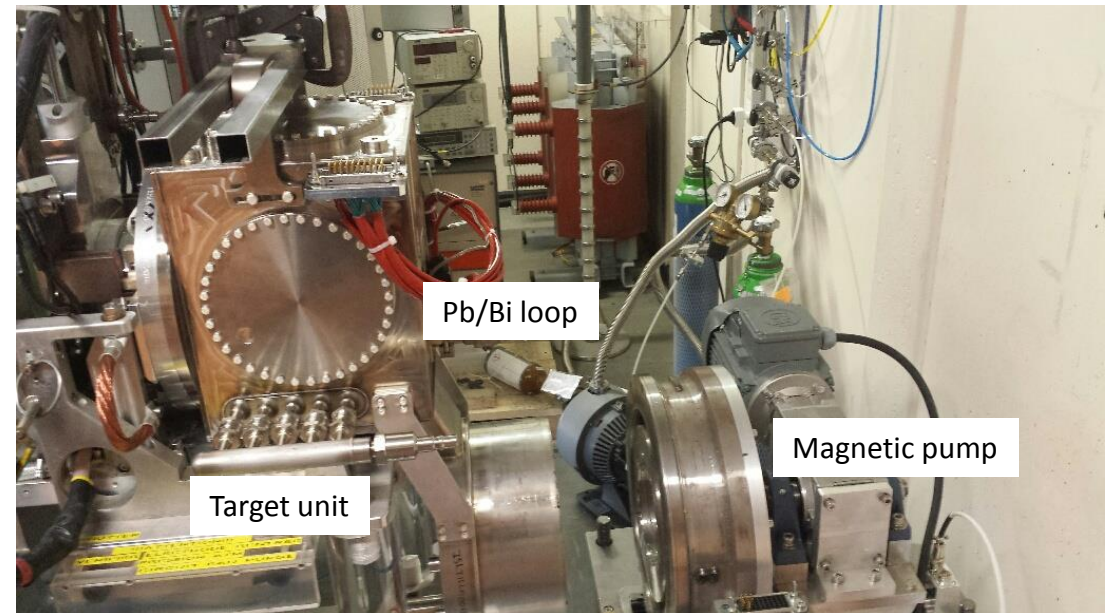


Dose rates of HRS Frontend – removed from target area last Monday



Off-line testing

- LIEBE target coupled to Off-line mass separator in October 2017
- Easy access
- No radiation constraints
- Handling done manually
- Hands on approach for testing all systems.



LIEBE target coupled to off-line separator

Resources

- Financial
- CERN's financial situation makes further funding for the LIEBE target difficult.
 - Need to assure target production and other TISD priorities
- Financial resources should be sought elsewhere
- Manpower
- For similar reasons, little manpower availability for LIEBE
- Manpower should be secured from other sources
- Infrastructure
- The off-line test stand could be available for testing – needs to be checked against TISD, target production and future use
- Limited availability for on-line operation
 - Preferably after an EYETS
 - But preferably not after LS2 – new FEs

Risk analysis

Consequence	catastrophic	2	2	3	3
	major	1	2	3	3
	moderate	1	2	2	2
	insignificant	1	1	1	2
		rare	possible	likely	frequent
		Likelihood			

Risk Categories

- 1 - time
- 2 - cost
- 3 - schedule
- 4 - environmental
- 5 - personnel

Basic On-line operation risk analysis

Risk	Risk cat.	Cause	Consequence	Mitigation	Rate
Inability to operate LIEBE	Time schedule	Equipment failure	Delay ~ 2 weeks	Cancel tests on-line	1
Inability to install LIEBE	Time Personnel schedule	unforeseen	Delay ~ 1 week	Re-evaluate installation	1
Failure of monitoring devices	Time	Damage to target	Delay ~ 1-2 weeks	Cancel tests on-line	1
Failure of Pb/Bi loop	Time schedule	Failure to maintain temperature Failure of pump	Delay ~ 1-2 weeks	Cancel tests on-line	1
Damage to Frontend	Time Schedule cost	Mechanical shock Pb/Bi leaks into FE	Delay ~ 1 year	Operate with 1 FE only	2
Inability to decouple LIEBE	Time schedule	Mechanical adherence	Delay 1 week to 1 year	Operate with 1 FE only	2

To conclude

- Everything is ready to accept a LIEBE target on-line. The major constraints are known and have been addressed.
 - But more verification will be required
- Technically challenging but may open new windows for future high-power facilities. Technology may lead to the production of short-lived isotopes from liquid metal targets.
- A failure is possible and the consequences could have an impact on the ISOLDE physics program
- Off-line testing is a possibility if the off-line mass separator is available.
 - But resources are required to complete the project