EN Engineering Department

ALARA level II – Group 1 - ISOLDE YETS 2017-2018 and operation 2018

Justification, optimisation and REX

EDMS 1570850

24/08/2018

EN-STI-LP/RBS/TCD sections

Introduction – YETS 2017-2018

1. Introduction
2. Target transfer to ISR3
3. Reorganization of the targets in ISR 3
4. FE maintenance
5. SEMGRID beam alignment
6. Laser window exchange maintenance and tests
7. LIEBE target tests
8. Inspection of the HRS and GPS FE
9. Cleaning of the 179 and 838
10. Montrac maintenance and tests
11. List (LIST) Tests
12. Retrieval of the target #501 and test laser on HRS FE
13. Additional maintenance of the MONTRAC
14. HRS FE patch-panel replacement
15. Conclusion

1. Introduction

WDP	WDP N°	WDP state	Est Coll. Dose (µSv)	Real Coll. Dose (µSv)	Δ Real-est. Coll. Dose (%)	Est Max Ind. Dose (µS)	Real Max Ind. Dose (µS)	Δ Real-est. Ind. Dose (%)	Group 1	Group 2	Impact N°	Impact state	Period
Target transfer to ISR3	1055/1	Approved	419	493	+18	126	134	+6	2	3	105026	Approved	YETS
Reorganization of the targets	1084/1	Approved	222	75	-66	98	61	-38	1	1	106618	Approved	YETS
FE maintenance and micro switch system replacement	1093/1	Approved	3248	2766	-15	879	757	-14	2	3	107149	Approved	YETS
SEMGRID beam alignment	1111/2	Approved	116	134	+16	66	84	+27	2	3	107007	Approved	YETS
Laser window exchange	1090/1	Approved	99	13	-87	49	10	-80	1	3	107256	Approved	YETS
LIEBE target tests	1114 / 1	Approved	1322	1058	-20	699	429	-39	2	1	108540	Approved	YETS
Inspection of the FE on HRS and GPS	1094/1	Approved	800	115	-86	267	62	-77	2	2	107103	Approved	YETS
Cleaning of the 179 and 838	1095/1	Approved	379	30	-92	181	28	-85	2	2	107270	Approved	YETS
MONTRAC maintenance and tests	1081/1	Approved	706	196	-72	433	66	-85	2	2	106492	Approved	YETS

1. Introduction

WDP	WDP N°	WDP state	Est Coll. Dose (µSv)	Real Coll. Dose (µSv)	Δ Real-est. Coll. Dose (%)	Est Max Ind. Dose (µS)	Real Max Ind. Dose (µS)	Δ Real-est. Ind. Dose (%)	Group 1	Group 2	Impact N°	Impact state	Period
LIST TEST	1123 /1	Approved	82	28	-66	27	13	-52	1	2	109149	Approved	YETS
Retrieval of the target #501 and test laser on HRS FE	1141 /1	Approved	35	14	-60	35	11	-69	1	2	110064	Approved	YETS
Additional MONTRAC maintenance	1125 /1	Approved	736	86	-88	371	69	-81	2	2	109180	Approved	YETS
ISOLDE HRS FE patch panel replacement	1157/1	Approved	1664	546	-67	456	243	-47	2	2	111111	Approved	YETS

1. Introduction
2. Target transfer to ISR3

2. Target transfer to ISR3

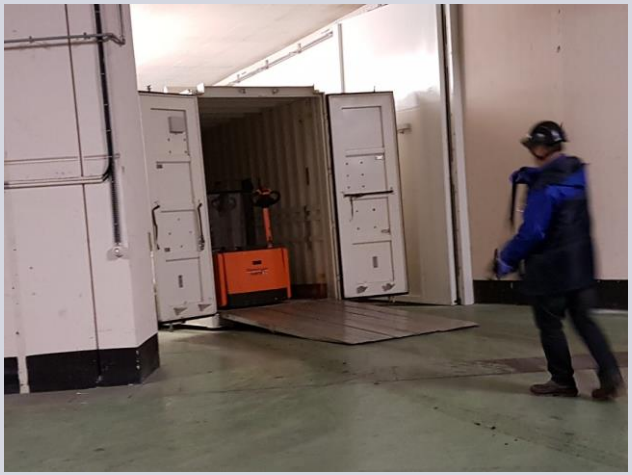
JUSTIFICATION
Targets removed to reduce dose rate for maintenance interventions inside the target area.
Targets removed to free storage space for the following operation year.

OPTIMIZATION	PICTURE
Intervention performed every year → Expertise allows faster and more precise interventions.	
Transport done outside working hours because dose rate at contact of the truck may be > 2mSv/h	
Targets placed in the boxes using the KUKA robot and transported by remote forklift	 

2. Target transfer to ISR3

OPTIMIZATION	PICTURE
Gabarit inside truck to ensure a sufficient distance between the box and the container walls to reduce dose rate at contact of the truck	
Distance kept free from cabin driver (an empty box or a box with cold targets is placed at the first position inside the truck).	
RP measurements on truck done with telescopic monitor	
RP measurements on each target done using the KUKA robot	
Optimisation of target distribution inside boxes ("hot" targets are shielded by less irradiated targets)	

2. Target transfer to ISR3

OPTIMIZATION	PICTURE
Camera placed in the Target Area to help the robot operator	
Communication with the robot operator established with walkie-talkies to avoid phone network problems	
Forklift used to shield the last box (dose reduced during opening/closing of the truck doors)	

2. Target transfer to ISR3

REX	RESULTS / ACTION / PICTURE
New fixed ramp installed to cross the entrance of building 179 with the forklift more easily (see REX from EDMS 1570850)	**R =** Forklift with box did not get stack at the exit of the building 
Integrity of the targets checked before putting them inside the boxes in order to detect any problems (see REX from EDMS 1570850)	**R =** It permits to detect traces of a leak on target #611 planned to be reused for 2018 operation. This target was moved manually to an ISR waste disposal box. 
The number of plugs available was not enough for all the targets and some old plugs had to be decontaminated	***A =*** ***-*** *plugs should be checked and ordered if needed before starting the activity* *- Add to procedure 1449875*

2. Target transfer to ISR3

REX	RESULTS / ACTION / PICTURE
Some back up targets brought from the ISR the previous year were forgotten	**A =** - check all the targets present in the shelves before arranging the boxes, - check also the cupboards in building 179 - *add to procedure 1449875*
The target distribution inside the ISR was not consistent with the excel sheet and targets were not placed in the planned spot	**A =** - Check and update this file before transport *- update the Excel file EDMS 1278074* *- add to procedure 1449875*
The Walkie-Talkies run out of batteries during the target distribution	**A =** - *always charge the batteries before the activity* *- add to procedure 1449875*
Additional targets irradiated in 2016 were added to the list of the targets to bring back after the beginning of the intervention. As it was not planned, targets #530 and #587 were put manually into the boxes manually.	**R=** Increased of the dose received **A =** - Check the list of all the targets to repatriate with RP, the operation and physics before the beginning of the intervention *- add to procedure 1449875*

2. Target transfer to ISR3

REX	RESULTS / ACTION / PICTURE
Because of the weather forecast, the target transfer was shifted from Saturday 20-01-18 to Friday 19-01-18 at 18h (night)	A = additional light projectors added at the entrance of blg 179  

1. Introduction
2. Target transfer to ISR3
3. Reorganization of the targets in ISR 3

3. Reorganization of the targets in ISR 3

JUSTIFICATION

Optimize the distribution of the targets stored inside the ISR 3 by :

- Changing the boxes of 3 targets by boxes of 6 targets to save space
- Regrouping on the shelves the boxes with targets in order not to have free spaces between the boxes

Reduce the dose received while making the transport back by :

- Having free space to put the targets that are going back to ISOLDE far away from the rest of the targets

OPTIMIZATION

RP measurements done with telescopic monitor

Rearrangement of the targets done at the entrance of the ISR 3 to avoid being exposed to the dose rate of the other targets stored on the shelves

To reduce the dose received, rearrangement of the target planned in advance with the Excel File containing the location of all the boxes and targets

3. Reorganization of the targets in ISR 3

REX	RESULTS / ACTION / PICTURE
The Excel file was not properly updated after rearranging the targets which lead to misunderstanding during the target transport	see REX slide 10
Some of the rearranged targets are needed for future operation and/or tests	**A=** Always check with the target responsible before moving targets

1. Introduction
2. Target transfer to ISR3
3. Reorganization of the targets in ISR 3
4. FE maintenance

Phase I - Worksite preparation and shielding installation

JUSTIFICATION
Reduce the *Dose rate reduced by a factor :* ➢ *40% inside GPS Faraday Cage* ➢ *30% inside HRS Faraday Cage* By installing Shielding on dumps and beam windows,
Cost of installation lower than collective dose saved over YETS

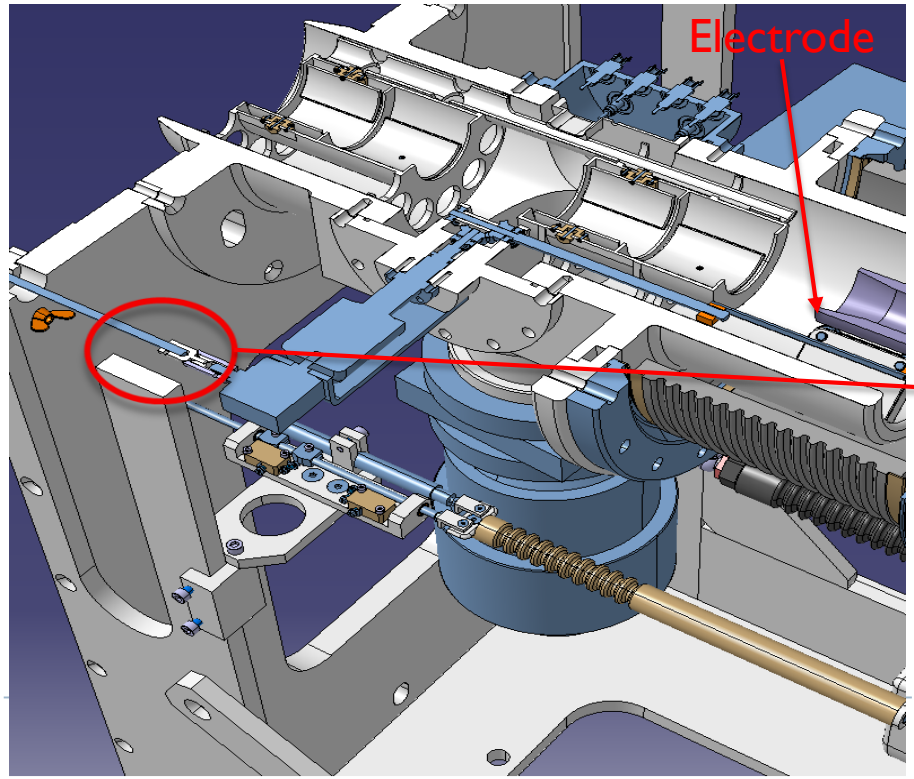
OPTIMIZATION
Intervention performed every year → *Expertise allows faster and more precise interventions*
Shielding installed before performing any intervention inside the Faraday Cage
Shielding is part of the optimisation process

Phase I - Worksite preparation and shielding installation

REX	RESULTS / ACTION / PICTURE
Dose received during the removal of the MONTRAC cover was higher than expected (x2)	**R1=** the seal melted and additional screwdrivers were used to remove the MONTRAC cover **A=** - The MONTRAC cover should setup without seal. - Add procedure 1564564 /*Julien Riegert* – EN/STI **R2=** No impact on the ventilation of the faraday cage has been observed since that remounting without seal
During the replacement of the electrode on GPS side, the electrode didn't come back properly into its place. At the beginning, it was assumed that the problem came from the electrode which didn't engage properly on the threading : the initial solution was to manually hold the electrode and to turn it to put it back on the thread.	**R1=** This operation done manually didn't work and conduced to an important increased of the dose received of 400 uSv. (240uSv initially planned)

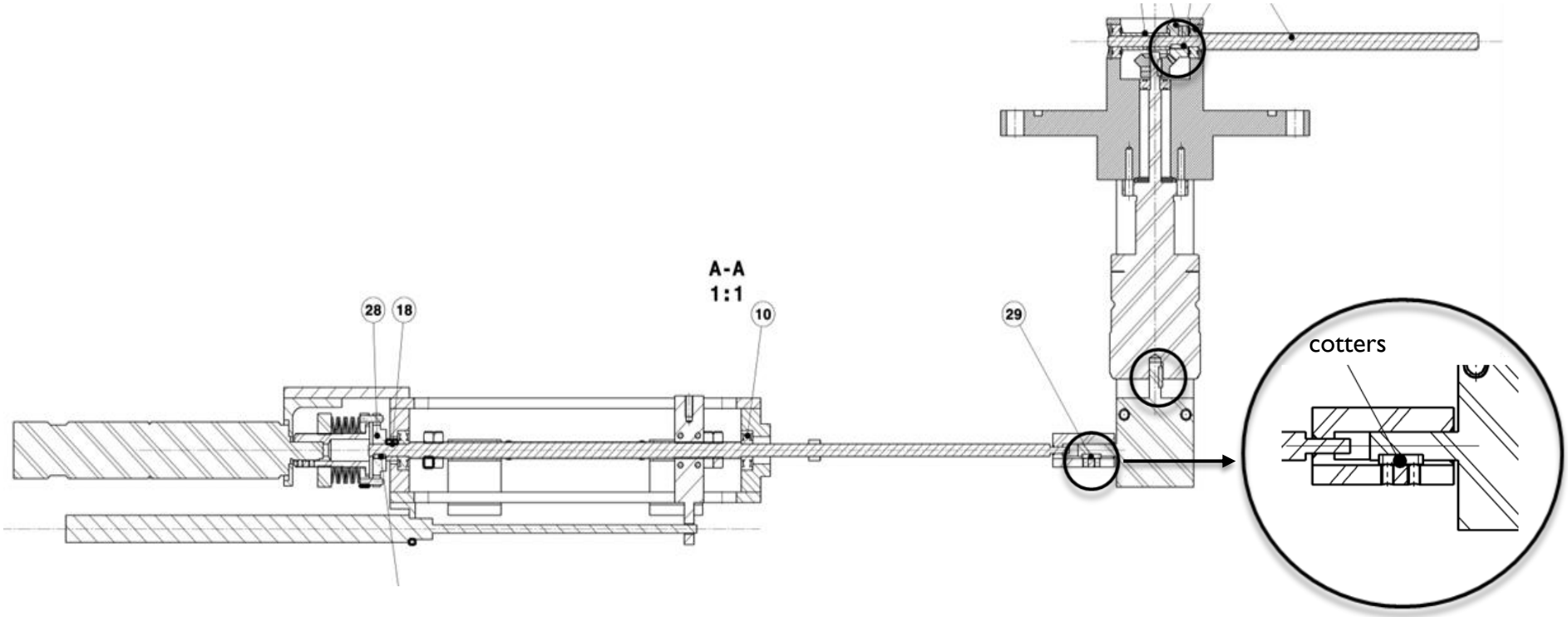
Phase I - Worksite preparation and shielding installation

REX	RESULTS / ACTION / PICTURE
The next day, a second operator examined the FE, and found that the problem was linked to two screws untighten that had caused calibration problems (see following slide)	A= On next generation of FE installed during LS2, a system with cotters will replace theses screws and remove this type of problem / Stefano Marzari – EN/STI

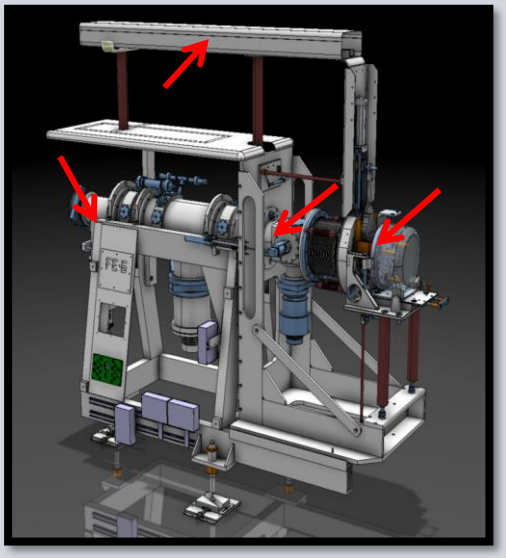


Position of screws to tight
(Offline 2 picture)

Phase I - Worksite preparation and shielding installation



Phase II - Annual FE Maintenance

JUSTIFICATION	PICTURE
Lubrication to avoid failure during the operation year.	
Cleaning to avoid sparking between ground and HV.	
Visual inspection to detect any anomalies.	

OPTIMIZATION
Intervention performed every year → *Expertise allows faster and more precise interventions.*
Intervention done after 3 months of cooling time
Beam dumps and beam window shielded before intervention

Phase II - Annual FE Maintenance

REX	RESULTS / ACTION / PICTURE
The switches on GPS and HRS were inspected.	R= No problems were found so there were not replaced
During the reinstallation of the MONTRAC cover, it was difficult to screw the support (which permit to attach the MONTRAC cover)	A = - To optimize the duration of removal and reinstallation of the MONTRAC cover, an electric screwdriver must be used - Add to procedure EDMS 1564564 / Julien Riegert – EN/STI
The attachments of the MONTRAC cover come on a bar that is fixed against the wall. That bar was removed by mistake during the removal of the MONTRAC cover	A = precise in the next WDP that only the MONTRAC cover has to be removed / Julien Riegert– EN/STI
During the reinstallation of the bar mentioned in the previous point, 2 threading on 4 were damaged, thus the bar stays in position only with 2 screws instead of 4	A = Reinstall this bar with 4 specific screws during the LS2 / Stefano Marzari – Bernard Crepieux– EN/STI

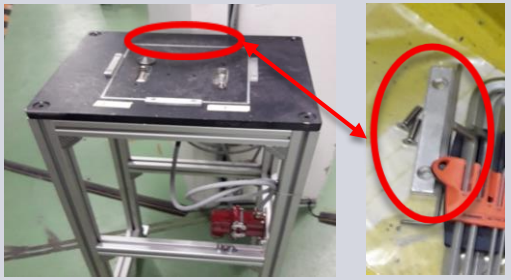
1. Introduction
2. Target transfer to ISR3
3. Reorganization of the targets in ISR 3
4. FE maintenance
5. SEMGRID beam alignment

5.SEMGRID beam alignment

JUSTIFICATION
Proton beam optimization

OPTIMIZATION
Intervention performed every year → Expertise allows faster and more precise interventions
According to the 2016-2017 REX, HRS is more difficult to setup so it is done first
Target placed and removed partially with robot : During this shutdown, the target is also transferred from the exchange point to the HRS and GPS Front-End with the KUKA robot and not manually: this reduces the dose received
Connect the SEMGRID cable on the SEMGRID target in the middle of the trenches instead of connecting it on the FE

5.SEMGRID beam alignment

REX	RESULTS / ACTION / PICTURE
The base of the SEMGRID target is bigger than usual targets therefore a stop piece has been removed on the exchange point to install the SEMGRID target on it	A = precise in the next WDP that the stop piece should be removed / Julien Riegert – EN/STI 
Due to the bad condition of the SEMGRID cable, to avoid moving the SEMGRID target with the cable with the robot, it was decided to plug it directly when the SEMGRID target is on the FE instead of doing it in the middle of the trenches	R= The dose received was higher than expected (+16% for collective dose and +27% for individual dose) A= Replace the SEMGRID cable during the LS2 / Richard Catherall – EN/STI 

1. Introduction
2. Target transfer to ISR3
3. Reorganization of the targets in ISR 3
4. FE maintenance
5. SEMGRID beam alignment
6. Laser window exchange maintenance and tests

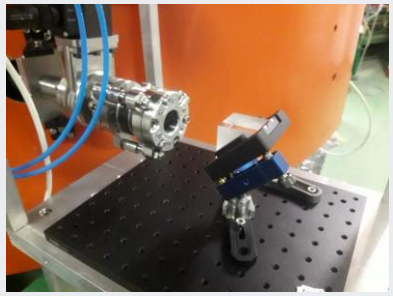
6. Laser window exchange

JUSTIFICATION

Several mechanisms can lead to a non-transparent coating on the GPS (MAG70) and HRS (MAG90) laser windows during the operation year (UV-induced carbon coating, ion beam deposits on internal window surface). This reduces the reliability of laser beam transport to the ion source. Window replacement during shut-down is required because we have seen that it is not possible to reliably judge the window cleanliness by visual inspection only

OPTIMIZATION

Intervention performed and coordinated by EN-STI-LP as decided during the YETS 2015/2016

REX	RESULTS / ACTION / PICTURE
Separators correctly pumped down to reduce radon releases during intervention	
To pull the HRS window out from the flange once the outer window holder has been removed, the use a small suction pad (<30 mm diameter) is needed	**A=** add to laser windows exchange procedure (EDMS **1132987** for HRS side and **1108892** for GPS side) / Bruce Marsh – EN/STI  

1. Introduction
2. Target transfer to ISR3
3. Reorganization of the targets in ISR 3
4. FE maintenance
5. SEMGRID beam alignment
6. Laser window exchange maintenance and tests
7. LIEBE target tests

7. LIEBE target tests

JUSTIFICATION
Complete the tests performed during YETS 2016-2017, Test the setting up of the target cooling SKID, the real target (instead of a mock-up target) and the pump
Test the alignment procedure
New Cabling installation and hypertac tested before intervention
Separate in the Boris tube, the power supply cables and the sensors cables otherwise the electrical interferences stops the use of the thermocouples
Task repetition will allow a faster intervention when the target will be installed.
Task training and tests needed in order to anticipate problems and be ready for target irradiation
Irradiation of the LIEBE target foreseen at the end of this year's operation period

7. LIEBE target tests

OPTIMIZATION	PICTURE
Intervention performed during the shut-down period instead of at the end of next years run when dose rates will be much higher	
Intervention performed after 3 months of cooling time	
Beam dumps and beam window shielded before intervention	
Shielding used to reduce dose rate during cabling installation on Boris Tube	
Cables pulled from the HV room (outside the highly radioactive area)	

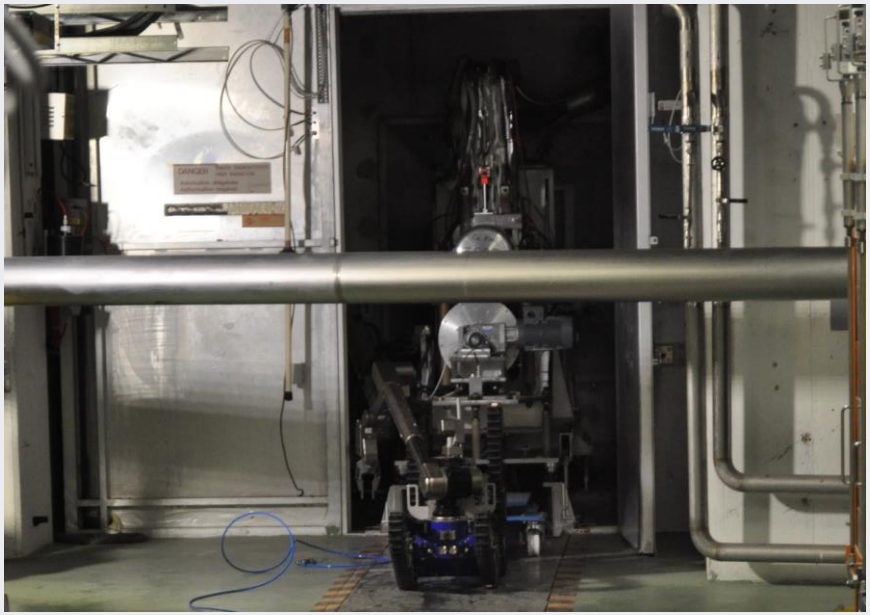
7. LIEBE target tests

REX : PUMP SETUP TESTS	RESULTS / ACTION / PICTURE
Table successfully placed on the stand by the Telemax.	
The hose for the compressed air connected to the trolley was an obstacle in the trajectory of the Telemax during the whole operation	A= A spiral tube must be used to have the cable stretched / Ferran Boix Pamies – EN/STI
The lowering speed of the trolley is too high to position the table safely	A= Adjust the pneumatic system to reduce the lowering speed / Ferran Boix Pamies – EN/STI
The Telemax had difficulty getting the trolley up on the ramp	A= the ramp will be modified to have a finer interface with the ground / Ferran Boix Pamies – EN/STI
During decoupling of the compressed gas cable from the trolley by the Telemax, involuntary pressing of the trolley's push-button is possible, which can cause the table to fall	A= Disconnection with Telemax of the cable must be made after positioning the table and outside the support / Ferran Boix Pamies – EN/STI

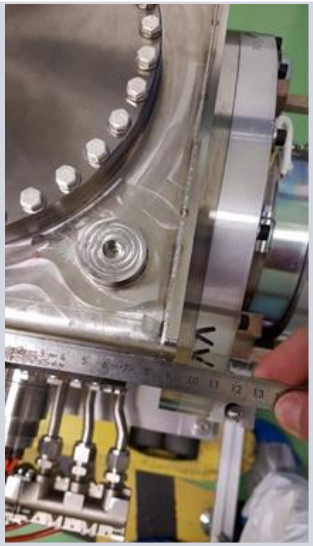
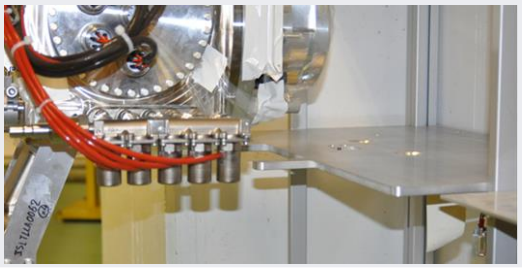
New tests are foreseen in September 2018 outside the controlled area
for these aspects by EN/SMM/ESA (geometers) and EN/SMM/MRO (telemax operator)

REX : REPEATABILITY OF TABLE/SUPPORT POSITION TESTS	RESULTS / ACTION / PICTURE
After installation of the table by the Telemax twice, the distance between the position of the table after first and second installation was measured. Spacing Max=1mm (support)+0.8 (table)=1.8mm in the axis parallel to the front end, deviations in other directions about 0.5mm (pending final results of the surveyors' report). The maximum distance between the cylinder of the LIEBE target and the pump is 3.8mm in a perfect alignment case	A= - the consequence of the accumulation of errors in several directions should be tested outside the controlled area in September 2018 by EN/SMM/ESA (geometers) and EN/SMM/MRO (telemax operator) / Ferran Boix Pamies – EN/STI - Alignment measurements can be made by installing a camera at the Telemax ➔ No human presence would then be required for the alignment of LIEBE in the target area. 

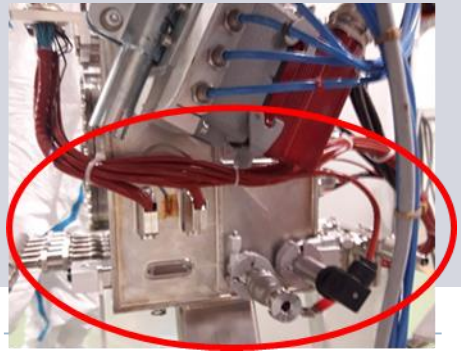
7. LIEBE target tests

REX : REPEATABILITY OF TABLE/SUPPORT POSITION TESTS	RESULTS / ACTION / PICTURE
Decoupling performed	
The metal cylinders that help to connect the hypertacks make it difficult to decouple by means of the Telemax	A= -shortening of the cylinders ➔ New tests are foreseen in September 2018 outside the controlled area / Ferran Boix Pamies – EN/STI 

7. LIEBE target tests

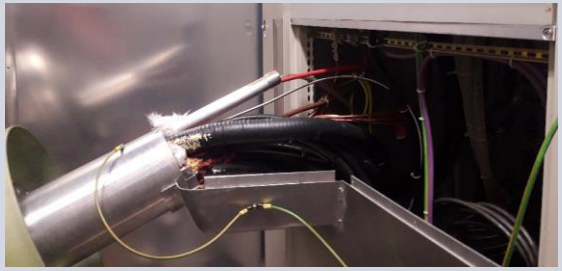
REX : TARGET TESTS	RESULTS / ACTION / PICTURE
The handle was not correctly positioned for direct gripping to the robot: the handle was moved to allow the target to be correctly positioned on the Front End	A= the position of the handle must be marked on the target in order to be able to reposition it correctly in case of removal - 9 cm from the rear face 
The target could not be positioned on the shelves: because of the solenoid valves	A= provide and fix wedges on the shelves to be able to position the LIEBE target / Fix also the position of the solenoid valves as there is a risk of collision with the front end ground braids if the solenoid valves change positions. This has been simulated with the 3D model software CATIA 

7. LIEBE target tests

REX : TARGET TESTS	RESULTS / ACTION / PICTURE
Coupling test of the target on the Front End: the cone, the underside of the target, the guides are protected with plastic and tarlatane to avoid contaminating the target	A=clean with alcohol the guides after removal of the tape to remove glue deposits 
Position the hypertac behind the grounding braids of the Front-End as there is a risk of catching them when the target is removed	A= to add in the new version of the WDP / Julien Riegert – EN/STI
Push the LIEBE cables closer to the target	A= - to add in the new version of the WDP / Julien Riegert – EN/STI - Use of radiation resistant collars to hang cables (no plastic collar 

7. LIEBE target tests

REX : SETUP OF THE SKID	RESULTS / ACTION / PICTURE	
Time to setup the skid ~ 3min45 ➔ Plan to unwind the cables in advance of the skid (loss of time to untangle the pipes)	A= to add in the new version of the WDP / Julien Riegert – EN/STI	

REX : PULLING OF THE CABLE (through the Boris tube from HV room)	RESULTS / ACTION / PICTURE
A 15m needle was pushed from HV room to GPS front end. The needle was unrolled and inserted straight without twisting.	R= It ensured a good introduction of the needle and avoided blockages inside the Boris tube. 

7. LIEBE target tests

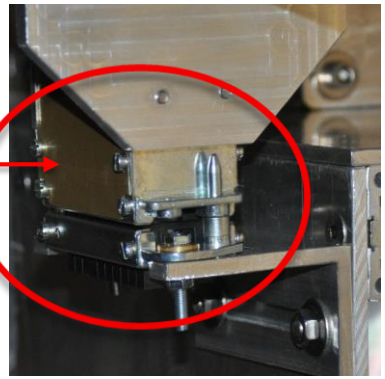
REX : PULLING OF THE CABLE (through the Boris tube from HV room)	RESULTS / ACTION / PICTURE
At the entrance of the target area, cables were attached on the needle behind lead panels to reduce the dose received	
From HV room, the needle was extracted with the cables attached	

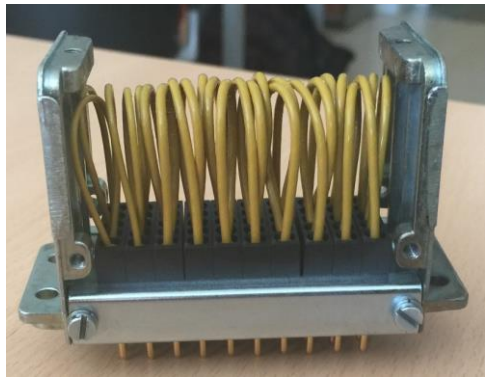
REX : PULLING OF THE CABLE (from Target area)	RESULTS / ACTION / PICTURE
There was a problem to put in place the coiffe where the cables are situated. The first team didn't manage to do this because of the volume of cable which is too large. The intervention had been stopped and an experienced operator did the operation the day after.	A= - The experienced operator tightened the cables with a collar to reduce the volume and was then able to put the cap (coiffe) back in place. - The cap (coiffe) must be changed during the LS2 / Stefano Marzari – Bernard Crepieux – EN/STI

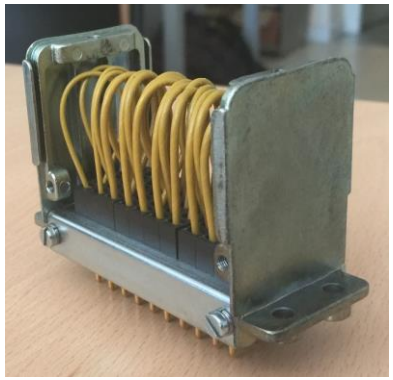
7. LIEBE target tests

REX : PULLING OF THE CABLE (from Target area)	RESULTS / ACTION / PICTURE
The cover on the hypertacs couldn't be remounted	A= - There were remounted without their cover : theses hypertacs will be used once, by consequence it is not important if there will be damaged (without their cover) during their removal after LIEBE intervention at the end of the year.

Hypertac cover







Hypertac without cover

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4. FE maintenance and micro switch system replacement
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8. Inspection of the GPS and HRS FE

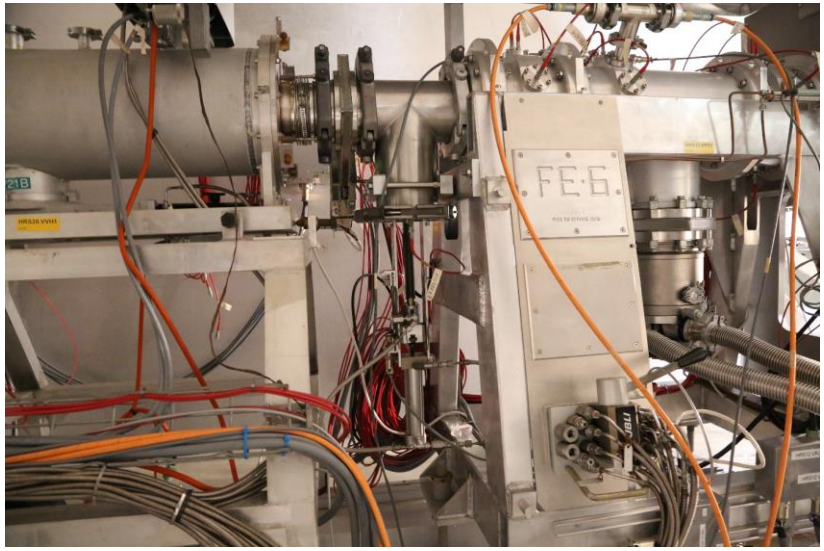
8.Inspection of the GPS and HRS FE

JUSTIFICATION
Inspect the state of the equipment of the FE in order to develop the modifications if necessary for the LS2
Update the designs of the FE 10 et 11 (LS2)
Inspect the cable tray for the replacement of the FE (LS2)
Collect information missing from the drawings

OPTIMIZATION
Intervention done after 3 months of cooling time
Beam dumps and beam window shielded before intervention
Targets are evacuated from the target area
Intervention is supervised and performed by an experienced person
Rehearsal of the intervention on the OFFLINE FE
Localization of the check points on the 3D model

8.Inspection of the GPS and HRS FE

REX : PULLING OF THE CABLE (from Target area)	RESULTS / ACTION / PICTURE
The intervention was faster than estimated	R= The dose received was lower.



HRS Front-End
(picture taken during inspection)

GPS Front-End
(picture taken during inspection)

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9. Cleaning of the 179 and 838

9. Cleaning of the 179 and 838

JUSTIFICATION
Cleaning of the areas after the shutdown interventions
Cumulated dirt under the aluminium plates induces the lifting of these plates and causes friction with the door

OPTIMIZATION
Intervention done after 3 months of cooling time
Beam dumps and beam window shielded before intervention
Targets are evacuated from the target area

REX	RESULTS / ACTION / PICTURE
Cleaning was correctly done without any problems	A= - The ground beneath the aluminium plates should be cleaned every year during the shut-down - Add to the Front-Ends maintenance document EDMS **993790** / Julien Riegert – EN/STI

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10. Montrac maintenance and tests

JUSTIFICATION
Annual maintenance
New components installed based on the results of the previous tests
Further tests needed to: ➢ Validate the system before it starts to operate ➢ Prevent failures during operation
OPTIMIZATION
Beam dumps and beam window shielded before intervention
Targets are evacuated from the target area
Maintenance done on the MEDICIS side first (non classified area) to gain experience and speed ➔ Optimisation of the time spent inside the Target Area
Expertise allows faster and more precise interventions : Maintenance of the irradiation point already performed last year *(EDMS **1564564**)*

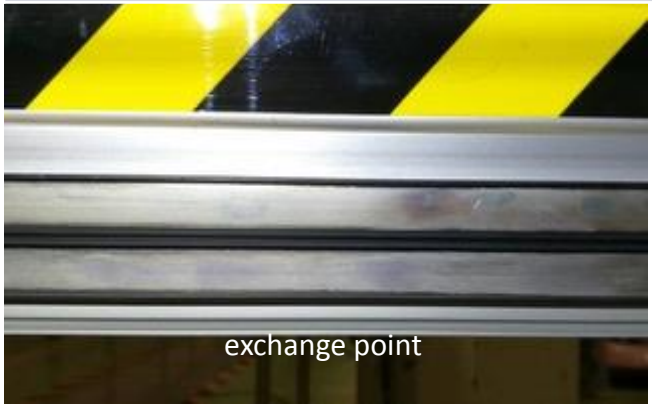
10. Montrac maintenance and tests

OPTIMIZATION

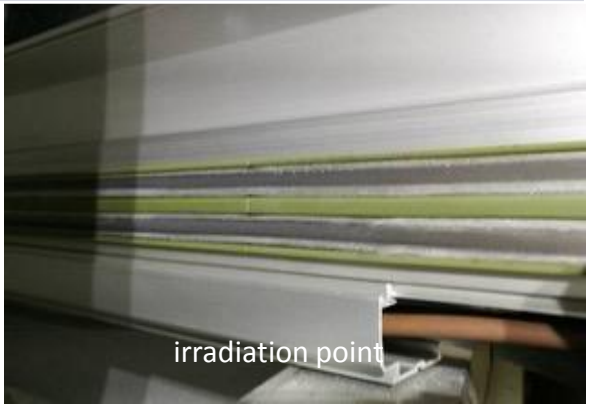
Interventions outside the Faraday Cage performed with Faraday Cage shielding and after 3 months of cooling time	
Most of the tests performed outside the high radiation area	

10. Montrac maintenance and tests

REX	RESULTS / ACTION / PICTURE
During MONTRAC test, some problems appeared to reach the Irradiation Point with all the available shuttles. After inspection, the deterioration of the power rail (dust presence), as long as the presence of dust this fault caused a poor electrical contact between the shuttle wheels and the power rail.	**R / A =** After analysis, it was decided to clean the power rails without changing any spare parts because of their unavailability : This intervention was performed in another impact (see details part 14.) The identification of this default during MONTRAC maintenance has avoided failure during MEDICIS operation.


exchange point


middle of HRS corridor


irradiation point

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10. Montrac maintenance and tests
11. LIST Tests

11. List Tests

JUSTIFICATION
Annual maintenance
Test with the robot the following requirements for the List Target : ➢ Trajectory ➢ Coupling / uncoupling on FE
Further tests needed to: ➢ Validate the system before it starts to operate ➢ Prevent failures during operation

OPTIMIZATION
Intervention done after 3 months of cooling time
Targets are evacuated from the target area
Beam dumps and beam window shielded before intervention
Shielding used with lead panels to reduce dose rate during the reading of the tension value on multimeter
Test done with a non irradiated modified target #593 (RF plug added to the target)

11. List Tests

REX	RESULTS / ACTION / PICTURE
The support of the RF connector had been setup on the GPS plug target #593	
Verification of RF cable was performed from HT room after confirmation of the procedure at offline	
Coupling was tested after this modification and was conclusive	
For the robot test including the transducer box setup on the GPS plug target #593, the clamping of the target was not possible due to presence of cable on the Front-End which collided with the transducer box	A= the design was modified (reduction of the height between the support and the transducer box and 90°rotation of the transducer box) 

11. List Tests

REX	RESULTS / ACTION / PICTURE
When the LIST target was put on the front end, there was a problem related to the RF part of the ion source. To allow the physics program to continue, a diagnosis and tuning of the RF part was carried out on the LIST target, which had not been irradiated but only coupled.	**R** = No problems were found during this inspection. When the target was coupled again, it functioned very well. The problem was coming from a bad connection of the feedthroughs currently used.  *Feedthroughs currently used* **A** = Upgrade new frontends with new RF feedthroughs suggested by RF group during LS2 / Sebastian Rothe – EN/STI Reinhard Heinke – EP/UIS Have 2 RF couplers will allow to suppress the transducer box. So that the target handling will be simplified  *New feedthroughs to install*

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11. Lists Tests
12. Retrieval of the target #501 and test laser on HRS FE

12. Retrieval of the target #501 and test laser on HRS FE

JUSTIFICATION
The target #501 (power meter target) was reported to be leaking in the technical meeting and was required to be verified, before discarding the target.
Pieces of the target – such as the installed power meter can be re-used
The leak could occur through bad coupling rather than a defective target : the vacuum information on the frontend when the target was coupled could not be retrieved via TIMBER therefore it was not clear if it was pumped or not.

OPTIMIZATION
Target box transported by remote forklift
Container type A used for transport
RP measurements on truck done with telescopic monitor
Inspection of the target #501 inside the fume hood of the laboratory 179/R-002
Intervention done after 12 months of cooling time inside the ISR 3
The target #501 was inside a box of 6 non-irradiated targets. This box was situated in the middle of the ISR3 surrounded by irradiated targets. After the removal of the target #501 at the beginning of the ISR3, this box was placed at the beginning of the ISR3 to reduce the dose received

12. Retrieval of the target #501 and test laser on HRS FE

REX	RESULTS / ACTION / PICTURE
Target #501 transfer from ISR3 to bldg. 179 without problems	
The Argon bottle needed to do the leak test on the pump stand was empty	A= Check before pumpstand intervention if the quantity of gas available is sufficient / Bernard Crepieux – Michael Owen – EN/STI
After the leak test on the pump stand, the target #501 didn't have any leaks.	R= This target was probably not well clamped before.
A function test was made and we noticed an opened circuit. And we reattached the wire inside the target.	R= This target worked well without any problem after this intervention

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12. Retrieval of the target #501 and test laser on HRS FE
13. Additional maintenance of the MONTRAC

13. Additional maintenance of the MONTRAC

JUSTIFICATION

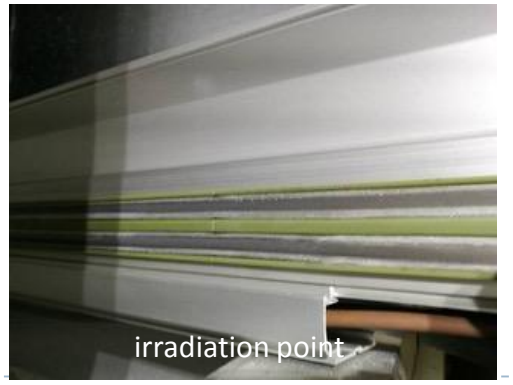
During MONTRAC test (see part.11), some problems appeared to reach the Irradiation Point. All the available shuttles were used with similar results ➔ After inspection, this fault was due to the poor electrical contact between the shuttle wheels and the power rail. The main problem is the deterioration of the power rail, with the presence of dust, which visibly increase while approaching the HRS Front End

The additional actions of maintenance of the MONTRAC are :

- Inspection, cleaning of the rails and functioning tests
- Option 1 : change the conductor bands without the isolators on the rail activated
- Option 2 : change the conductor bands with the isolators on the rail activated
- Option 3 : Clean the shuttles wheels


exchange point


middle of HRS corridor

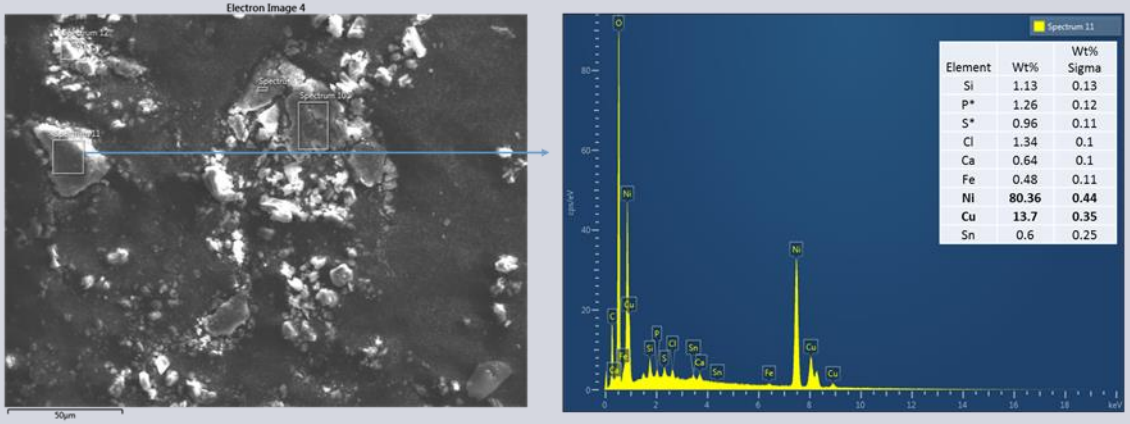

irradiation point

13. Additional maintenance of the MONTRAC

OPTIMIZATION
Intervention done after 3 months of cooling time
Targets are evacuated from the target area
Beam dumps and beam window shielded before intervention
Shielding used with lead panels to reduce dose rate during the additional maintenance
The cleaning of the rails is carried out with the arm extended, the body being as far as possible from the active elements

REX	RESULTS / ACTION / PICTURE
The spare part were not available for the intervention, consequently only a cleaning was performed	A= The replacement of spare parts is foreseen during the LS2 / Regis Seidenbinder – EN/STI
This first action (cleaning of the rails) allowed the removal of a lot of dusts on the rails	R= the first tests with the shuttles were conclusive and the shuttles moved correctly on the rails without stopping.

13. Additional maintenance of the MONTRAC

REX	RESULTS / ACTION / PICTURE
Samples were made on the MONTRAC rails to analyse the dusts. Analysis were made by EN-MME.	**R=** The results shows an important amount of Oxides (O).  **A=** During the LS2, 3 options are possible to fix this problem / Regis Seidenbinder – EN/STI: - OPTION 1: Change the rails for new rails with an oxidation resistant material (permanent solution) - OPTION 2: Cover the rails with a coating resistant to oxidation (permanent solution) - OPTION 3: Clean the rails (temporary solution to repeat)

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13. Montrac Maintenance and Tests
14. HRS FE patch-panel replacement

14. HRS FE patch-panel replacement

JUSTIFICATION
Insulation tests show a severe insulation breakdown problem during ISOLDE commissioning phase between the separator-area patch panel and the quadrupole electrodes T and R. Without proper insulation of the cables the HRS FE cannot be used
Replace all the patch panel connectors (which are not rad-hard) in order to avoid a future intervention during operation when dose rates will be higher

Risk Analysis for the irradiation hazard related to steps whose dose rate is higher than 2mSv/h

Task	Step where the dose rate is >2000uSv/h	Task Related Hazards	Hazard Risk Reduction	Action In Case Hazard Materialises
Disconnect the DE cables from the HRS FE (8 cables)	7000	Irradiation (= exceeding the authorized dose)	• The persons who train on the OFFLINE 2 and who perform the intervention according to the WDP are the same • There is no very high dose gradient because we do not have irradiated targets on site. • The intervention takes place mainly on the side of the Front-End which is closed and therefore the risk of contamination is low. • As usual, RP makes stopping points to check compliance with doses and avoid any drift. • The duration of each step are checked during the intervention	• RP Stops the activity • Alarm on DMC
Disconnect the QP cables from the HRS FE (12 cables)	2000			
Disconnect the cables from the old patch panel and connect them in the new patch panel one by one (30 cables 30 seconds per cable)	2500			
Connect the new DE cables to the HRS FE (8 cables)	7000			
Connect the new QP cables to the HRS FE (12 cables)	2000			

14. HRS FE patch-panel replacement

OPTIMIZATION
HRS beam dump and beam window shielded were left in place during commissioning phase as implementation of REX (EDMS 1570850)
Intervention rehearsed at ISOLDE off-line 2. Distances and positions measured to simulate the conditions at the HRS FC
Cables bunched by equipment and labelled outside the high radiation area
Pictures of the different cables and connections studied before the intervention
Cables and connectors pre-assembled outside the high radiation area
Working positions as far as possible from the beam dump
Additional light projectors added in front of the faraday cage to improve visibility during intervention
Preparation of the appropriate tools before intervention

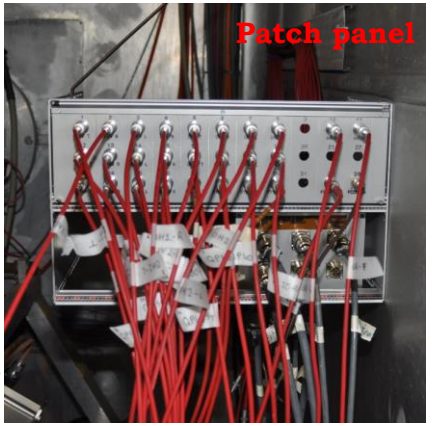
14. HRS FE patch-panel replacement

REX

Total Collective dose received was three time less than expected (525 µSv), the working positions were further from the beam dump than foreseen and calculated on the WDP

During the removal of the old cables connected to the FE and linked to the old patch panel, there were another cables entangled with them. It was necessary to disconnect them, untangle them with the old patch panel cable and reconnect them on the FE

The threshold of the DMC (dose received) was configured too low and the alarm activated prematurely. To communicate more easily in the Faraday cage (patch panel replacement step) it was necessary to go out to deactivate and reactivate the DMC



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15. Conclusion

CONCLUSION : MAIN POINTS

For the FE maintenance: The dose received during the replacement of the electrode on GPS side was higher than expected (~+66%), but on next generation of FE, the use of cotters will avoid this type of problem

For the LIEBE target tests: An extensive preparatory work and numerous tests have been carried out and will improve operations with the LIEBE target. New tests are foreseen in September 2018 outside the controlled area

For the additional maintenance of the MONTRAC: the cleaning of the rails was conclusive and the shuttles moved correctly on the rails without stopping. Action must be taken during the LS2 to avoid the recurrence of this problem.

For the target transfer: The WDPs and the procedures (target transfer) were updated according to the previous intervention folder.
A new ramp has been installed to cross more easily the entrance of building 179 with the forklift during the target transfer to and from ISR3.

For the patch panel replacement: The beam dump shielding was left until the end of the YETS to reduce the dose rates inside the Target Area. It was particularly beneficial for the patch panel replacement which occurred close to the FE in the end of the YETS and which was not foreseen.

For the next intervention folder, the risk analysis, for the irradiation hazard related to steps whose dose rate is higher than 2mSv/h, has to be included for each intervention (was included as comment in impact)

CONCLUSION : MAIN POINTS

Two interventions exceeded the individual and the collective dose foreseen:

WDP	Est Coll. Dose (µSv)	Real Coll. Dose (µSv)	Δ Real-est. Coll. Dose (%)	Est Max Ind. Dose (µS)	Real Max Ind. Dose (µS)	Δ Real-est. Ind. Dose (%)
Target transfer to ISR3	419	493	+18	126	134	+6
SEMGRID beam alignment	116	134	+16	66	84	+27

Target transfer to ISR3 : To optimize the transfer of the targets and avoid extra dose due to additional manual transfer, the list of all the targets to be moved should be checked with RP, the operation and physics before the beginning of the intervention. Estimation of the collective dose is based on past intervention with less margin.

The SEMGRID beam alignment : problems in connecting the SEMGRID cable are a recurring problem that lead to additional doses. To optimize this, a new SEMGRID target will be built and all the cables and connectors will be replaced during LS2.