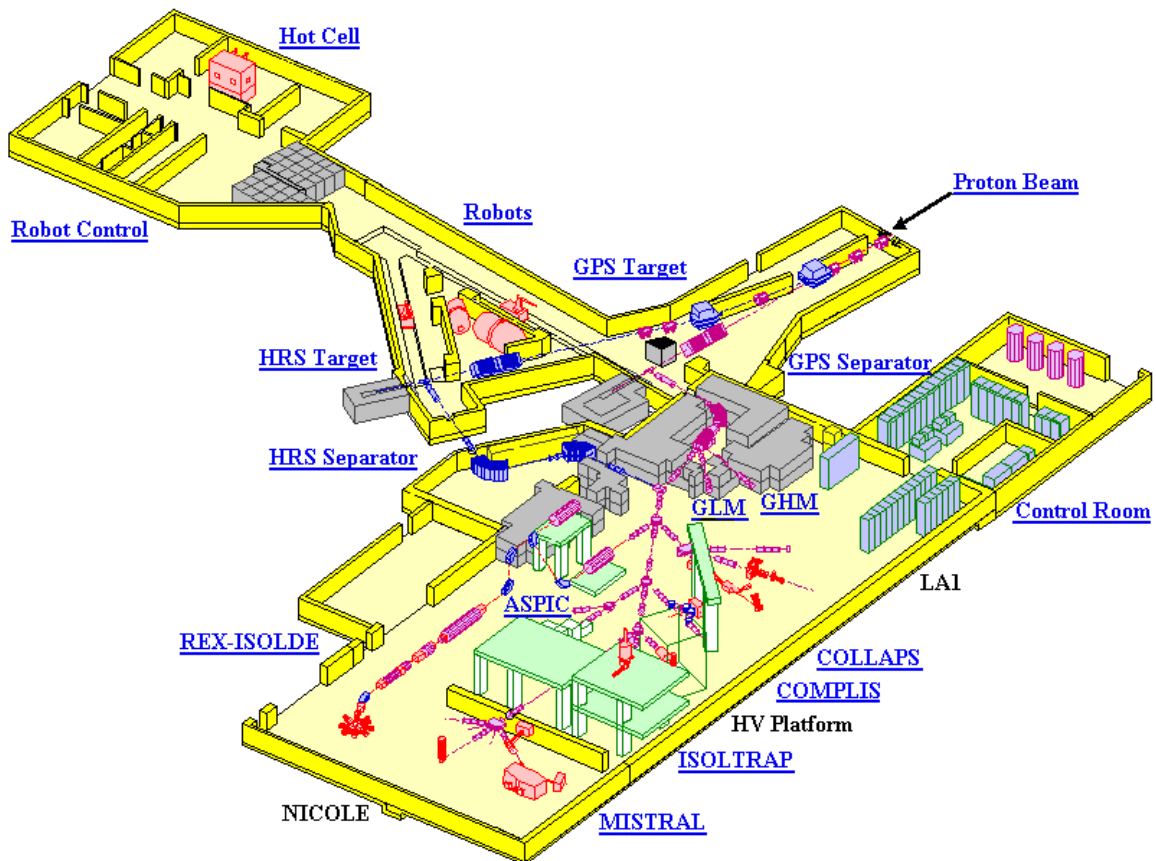


An ISOLDE Machine Supervisor's guide to:
Target Change and Beam Setup
At ISOLDE HRS/GPS
Mass separators



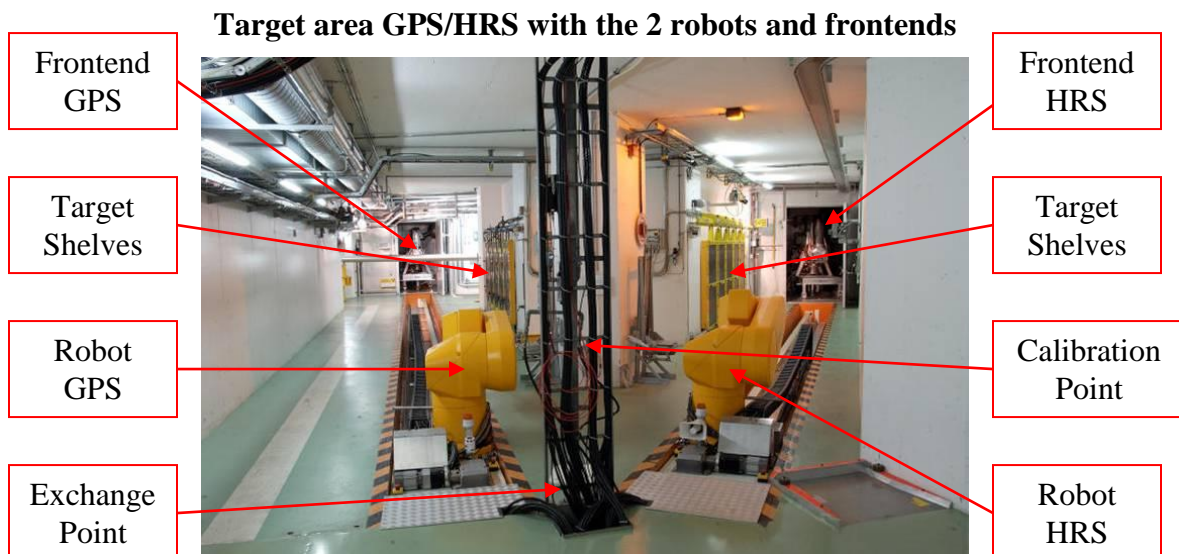
Page Index:

Target change - <i>Preparing for the change.</i>	3
Target change (GPS) - <i>Operation of robots.</i>	4
Target change (GPS) - <i>Pickup cycle.</i>	7
Setting up the new target (GPS) – <i>Preparation.</i>	9
Gas Filling – <i>Entering the HT-room and make necessary connections.</i>	10
Setting up the new target (GPS) - <i>Gas mixing application.</i>	12
Setting up the new target (GPS) – <i>Beamline synoptics.</i>	14
Setting up the new target (GPS) – <i>Beam tuning.</i>	15
Target change – <i>After the change.</i>	16
eLogbook	17
Logfile.....	19
Target change (HRS) - <i>Operation of robots.</i>	22
Target change (HRS) - <i>Pickup cycle.</i>	23
Setting up the new target (HRS) – <i>Preparation.</i>	24
Setting up the new target (HRS) - <i>Gas mixing application.</i>	25
Setting up the new target (HRS) – <i>Beamline synoptics</i>	27
Setting up the new target (HRS) – <i>Beam tuning.</i>	28
Mass separators – <i>The use of bending magnets.</i>	30
Tapestation.....	32
Proton Scan – <i>Optimize the ION-source on a surface ionizer (setup).</i>	33
Proton Scan – <i>Optimize the ION-source on a surface ionizer (tuning).</i>	34
Proton Scan – <i>Optimize the ION-source on plasma target (setup).</i>	36
Release Curve	37
Extraction Electrode.....	38
Move the Extraction Electrode using a LINUX-console.....	39
Scanner Front End Computer (FEC).....	40
Vistar.....	40

Target change - *Preparing for the change.*

There are a couple of things that has to be done before the target change can be done:

- The target change should have been planned and discussed with the Physics Coordinator and at the weekly ISOLDE coordination meetings.
- The target change should be planned in such a way that minimal downtime for the experiments is achieved. It is also favorable to arrange any other maintenance work depending on proton downtime to be done at the same time.
- Users of both the GPS and HRS should be notified since a target change will require the proton request to stop for both separators during target area access.
- The old target needs to be cooled down, extraction electrode moved out, frontend valves close and frontend set to atmosphere.
- Before entering the target area the IMS has to switch the zone to “Access mode”, this can be done in one of the racks in the ISOLDE Control Room and should be done a minimum of 30 minutes before access. Reason for this is that the air in the target area should be changed 3 times (each taking 10 minutes) to minimize risks of contamination.
- The new target should be picked up at the ISOLDE workshop by the IMS using a CERN car. The IMS should coordinate with the target developers about a convenient time for the pickup and also handle the target with great care; targets are delicate and expensive equipment and can easily break or get damages that affect the physics runs negatively.
- The responsible person from the Radio Protection group has to be contacted so that he can attend the target change. He will measure radiation levels in the target area before entering and also make sure that rules and regulations are followed. Access without this person is not possible!
- During target area access it is obligatory for the IMS to wear his dosimeter and film badge. He should also wear protection to minimize radioactive contamination, a coat or suit and shoe protection is provided from TIS/RP.

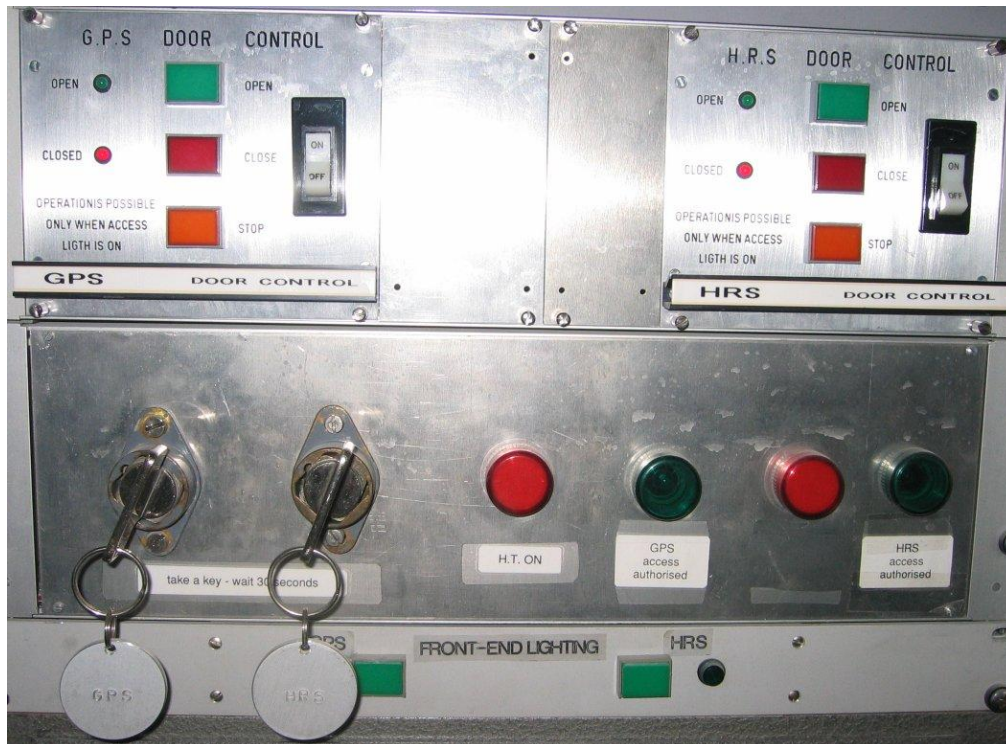


Target change (GPS) - Operation of robots.

- Turn on cameras and screens.
- Switch to GPS on the switchbox.



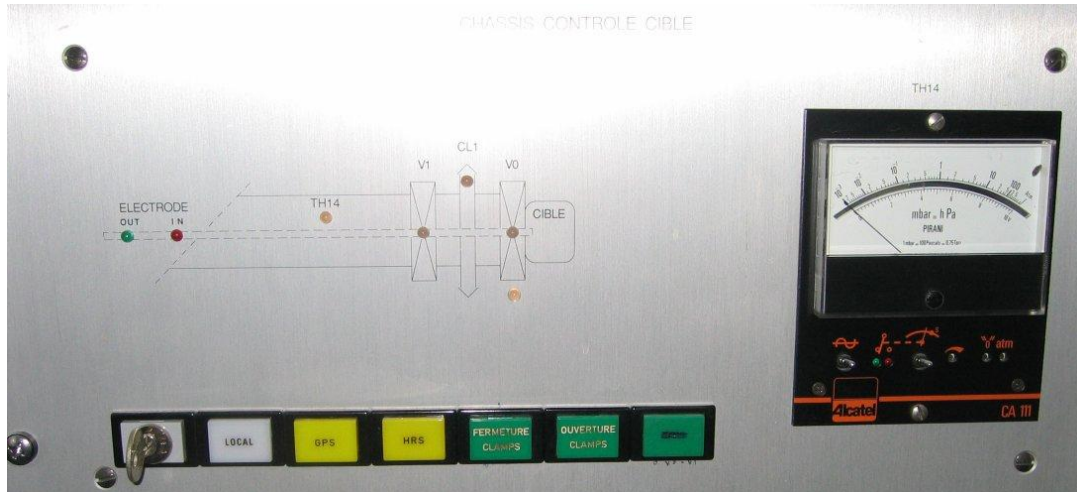
- Turn the “GPS doors control key” and wait ~30 seconds.



- Press green button for GPS door control to “OPEN”.

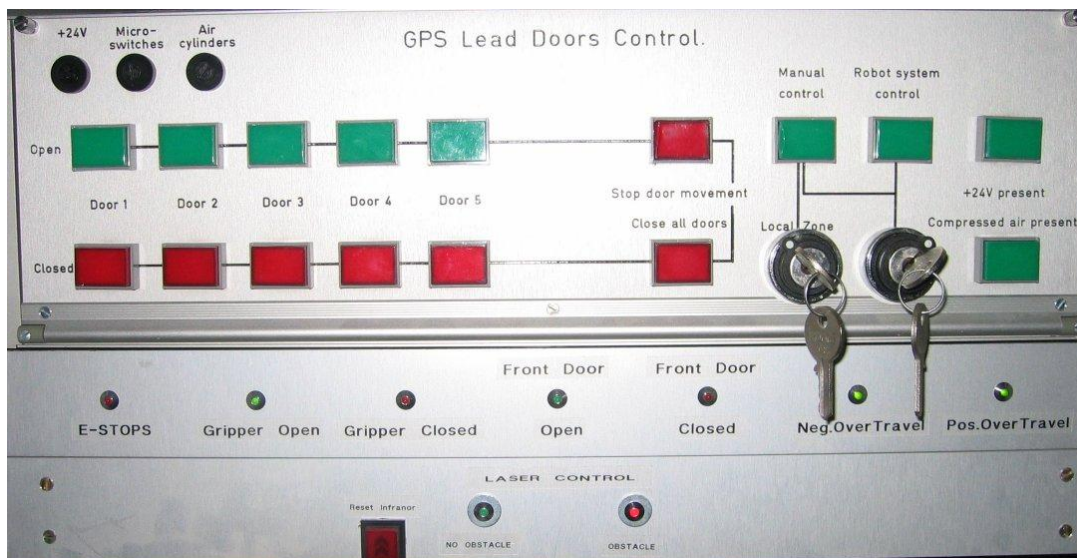
On the rack marked “Chassis Control Cible”:

- Turn the key at the same time as pressing it.
- Press the GPS button (should light up in green).
- Press button “Fermeture Clamps”.
- Press button “Ouverture Clamps” to release target from the Frontend (CL1 should light up in green).



On the rack marked “GPS lead door controls”:

- Switch to “Manual Control”.
- Open door (verify that wanted storage place is free, check with camera).
- Close (all) doors.
- Switch back to “Robot System Control”



Check calibration of robot:

- Always start with pressing the red button “Reset Infranor”
- In the console choose “2. Manual control of operations”.
- Choose “7. Perform test calibration”
- Verify that you get a green light on diode marked “Robot check point”
- Choose “8. Accept/Reject test calibration”
- Choose whether you want to accept or not.

The following 3 points might not be needed:

- In main menu choose “1. Automatic Operations and system control”
- Proceed with “2. Reset alarm & continue”
- On the GPS cupboard press blinking green button marked “ARM power ON/OFF” to turn ON.



Target change (GPS) - Pickup cycle.

First we need to take the existing target from the frontend and store it on the target shelf:

- In the console choose “1. Automatic Operations and system control”.
- Choose “1. Start a pick and place cycle”.
- At “Select pickup location”, choose “From Frontend”.
- On question on where to take the target choose “To target shelf”.
- Answer questions “Target number?”, “Behind which door?”, “On which shelf?” and “Which position?” with the numbers that corresponds to the wanted storage position. Select “0” on question about dust cap.
- Verify entries are correct and start the pickup cycle with “Y” or abort with “N”.
- Wait until console displays “Operation performed successfully” and status “Idle”.
- Update the whiteboard with information at the new storage place (Target number, type etc.)

Now we need to place the new target onto the frontend:

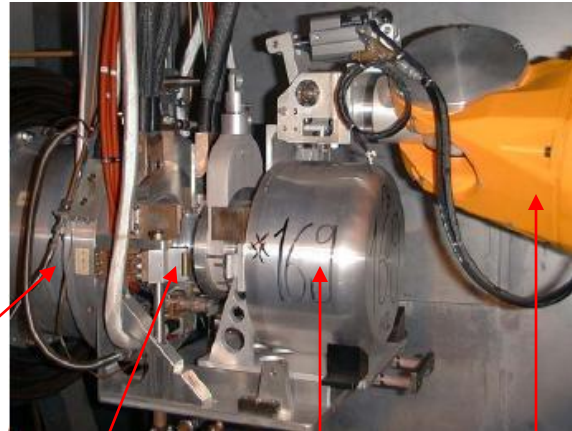
- In the console choose “1. Automatic Operations and system control”.
- Choose “1. Start a pick and place cycle”.
- At “Select pickup location”, choose “4. From exchange”.
- On question on where to take the target choose “To frontend”.
- Verify that entries are correct and start the pickup cycle with “Y” or abort with “N”.
- Wait until console displays “Operation performed successfully” and is in status “Idle”.
- Update the whiteboard with information about target that has been placed on the Frontend (Target number, type etc.)

Here is a list of the following pick & place alternatives:

1. Storage Shelf
2. Frontend
3. Transport
4. Exchange point

On "Chassis Control Cible" we now need to close the clamps to make sure that the new target is firmly attached to the frontend:

- First, press button marked "Ouverture clamps".
- Secondly, close clamps with button "Fermeture Clamps".
- Check that the diode (CL1) now has turned red (Closed position).
- Turn the key.



- Switch off cameras & monitors.
- On the "GPS door control"-rack press "Closed" and wait for the red diode to light up (takes about 30 seconds).
- Turn the GPS key.
- On the console choose "1. Automatic Operations and system control", then turn of robots with "5. Stop current operations".

		GPS				
		31-4.49	32-170.76	33-65.03	34-0	35-0
		7	6	5	4	3
FE	2.64 Fb/Bx MKS	X	X	X	X	X
		731	631	531	431	331
			flip	2.97 Uc MK7	300 UAC W	302 UAC e-hub W
		721 X	621 D22	522	421	321 322 221
				2.88 C10 MKS	2.94 UAC MKS	2.94 UAC MKS
EXCHANGE		711	611	512 511	412 411	312 311 211

		HRS				
		31-0.01	32-164.44	33-56.6	34-0	35-0
		1	2	3	4	5
FE	303 U2_C	X	X	X	X	X
		131	231	232 331	332 431	432 531
				306 U2_C MKS		
		121	221	222 321	322 421	422 521
		2.90 MKS	2.98 Uc/Bx MKS	301 Uc/Bx MKS		
		111	112 211	212 311	312 411	412 511

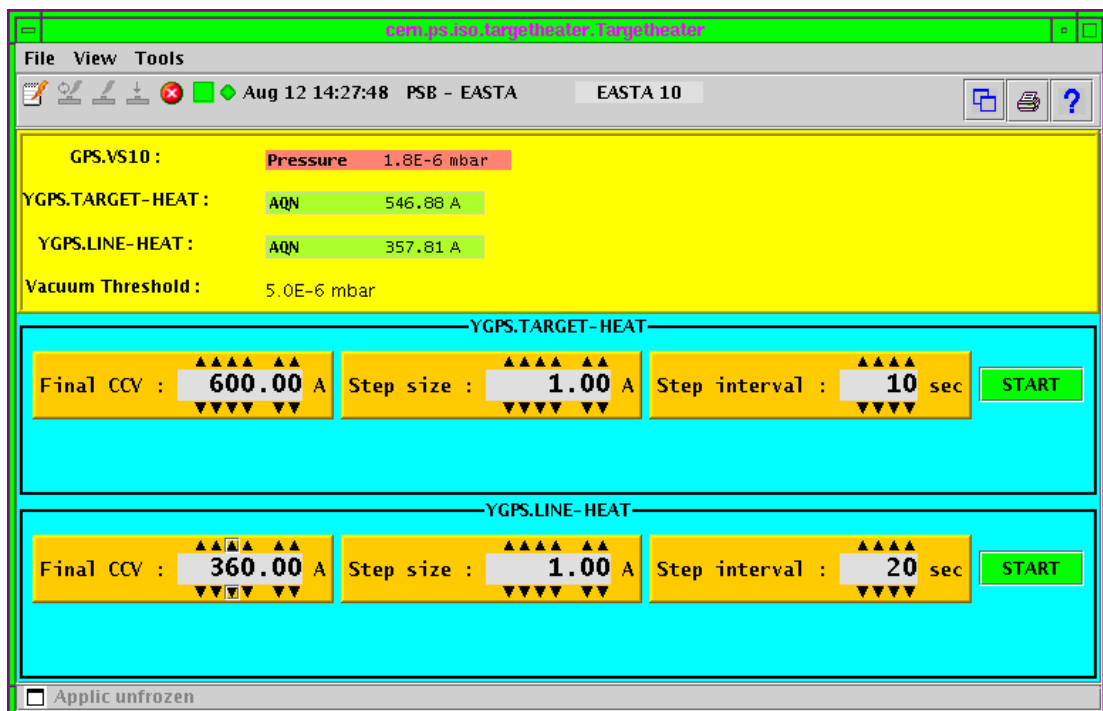
Do NOT USE 2nd SHELF POSITIONS

CR. idj! { Login name eic (see Record) #236 in str
 " password isolde (see WALEs)

(Finally, once again make sure that you have provided the information about the targets new positions onto the whiteboard.)

Setting up the new target (GPS) – Preparation.

- First step is to pump the frontend to vacuum. Just after a target change the vacuum system status should display “70”. We want to reach status “39” (Vacuum)
- Make sure GPS.VV55 (frontend vacuum valve) is closed.
- Open up knob GPS.VS10 and GPS.VS20.
(These controls the turbo pumps needed to reach vacuum on the frontend.)
Turn them “ON”.
- Wait until status “39” is reached.
- During the wait to reach vacuum the necessary connections for HT should be done in the HT-room.
- When frontend has reached vacuum we can start the heating of the target, this heating should be applied slowly to minimize risk of damage to the target. Use the “Automatic target heater” –application to have the target heated to set values.
- It is very common that the target outgases making the vacuum worse; therefore the target heater-application has a built-in vacuum threshold that can be set manually. If the set values are not met, the heater program will stop until vacuum improves. A good value for this threshold is 5.0E-6 mbar.



- When target and line heating has completed we are ready to start tuning the beam.

Gas Filling – Entering the HT-room and make necessary connections.

When using a plasma target you normally need to fill the gasline with a supporting gas, this can be done with the ISOLDE Linux Consoles using the gas mixing application.

First step is however to make sure that you have a bottle of the required gas mixture connected to the frontend. This connection is done up in the HT-room.

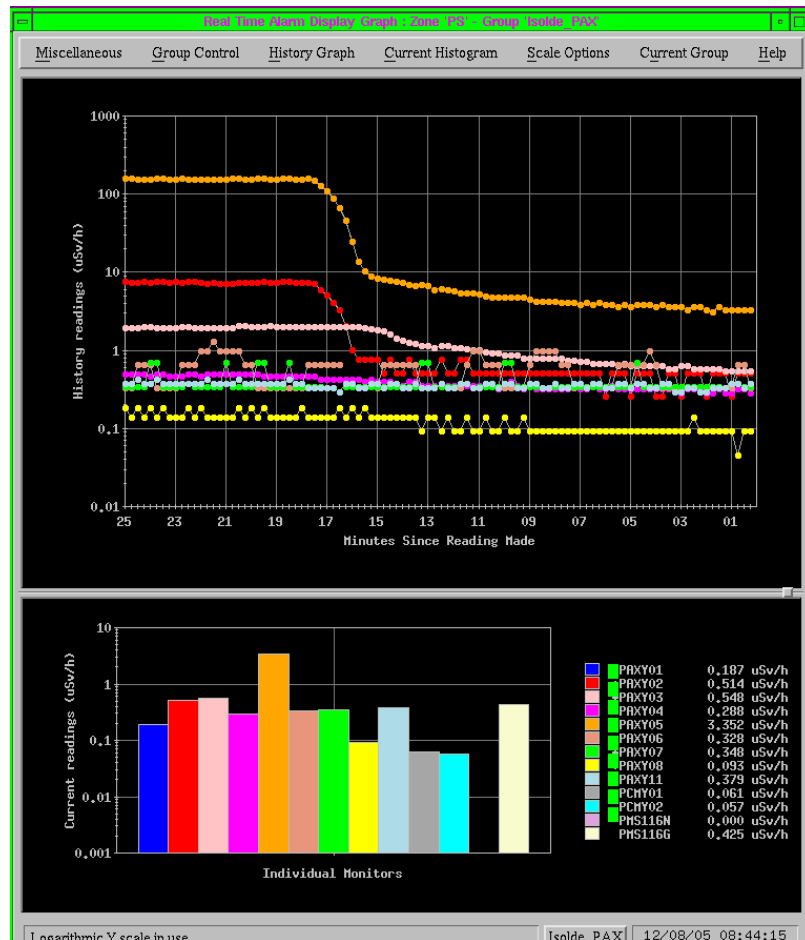
Inform users that you are going to need an access to the HT-room.

Before entering the HT-room one must make sure that proton requests for both GPS and HRS is turned off and that the radioactive levels are within reasonable limits.

This is especially important when protons have been taken recently.

To check current radiation levels, you should look at the radiation monitors:

- Left click on desktop and choose “Tools”.
- Choose “Radiation monitor” and the application should launch.
- On the bottom of the application there is a button called “SUD”, press it and choose “Isolde_PAX.grp” from the list, confirm with “OK”.
- Look at “PAXY05” and verify that level is below 100uSv/h, if it isn't you have to wait until the radiation has dropped below that level. If not, a security alarm will



be triggered at the MCR and a security chain has to be reset before any proton requests can be sent again at the end of the HT-access (EOA).

- Take the HT-room key from the rack in the ICR and unlock front door to access the area.
- Switch off transformer for the wanted separator frontend by turning and removing the key on the wall mounted control system box.
- Wait about ~30sec for the security system to unlock cage door.
- Put the HT-rack to ground.
- Open rack door where gas bottle(s) should be connected.
- The bottle(s) should be firmly connected with appropriate tube and connectors to one of the 4 inlets that can be found here.
- Once connected, open up the gas bottle and slowly fill until pressure meter reads between 2 and 5mbar then close bottle again.
- Once gas bottle(s) have been connected and gas filled, leave cage.

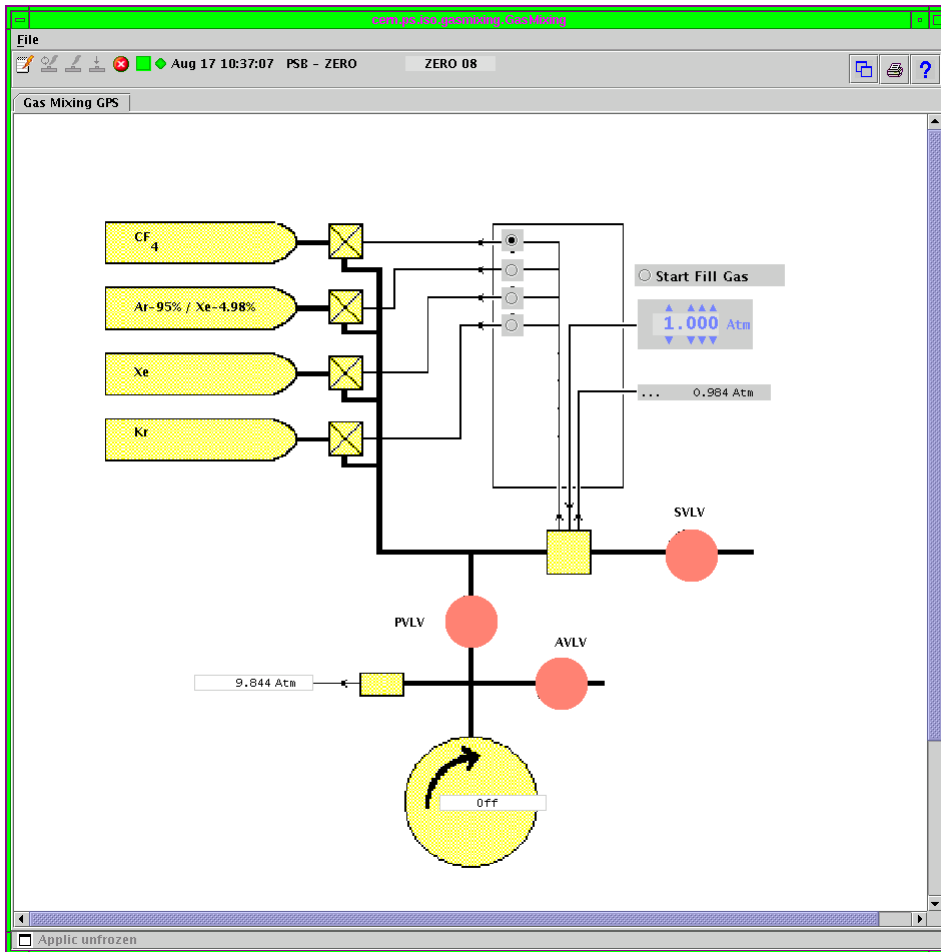
Remember to put back the grounding pole into its holder otherwise a micro switch prevents HT from being restarted.

- Put key back into the box and turn, press button to turn on transformers.
- Turn off lights and close door.
- Lock front door to the HT-room and finally turn the key in the End of Access (EOA) keyhole.
- Return key and turn it in the rack located in the ICR.

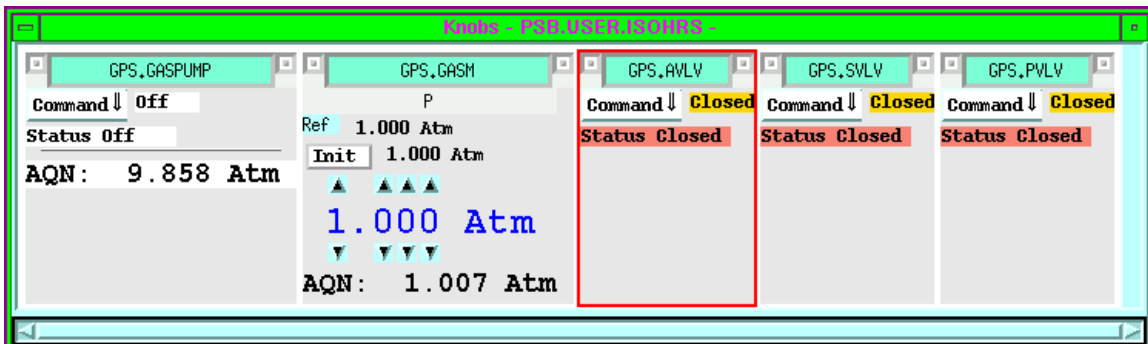
Setting up the new target (GPS) - Gas mixing application.

To start the program, do the following:

- From the ISOLDE Console Manager choose “GPS”.
- Choose “Gas Mixing” and application will launch.



- Open up the corresponding workingset and open up knobs “GPS.GASPUMP”, “GPS.GASM”, “GPS.AVLV”, “GPS.PVLV” and “GPS.SVLV”.

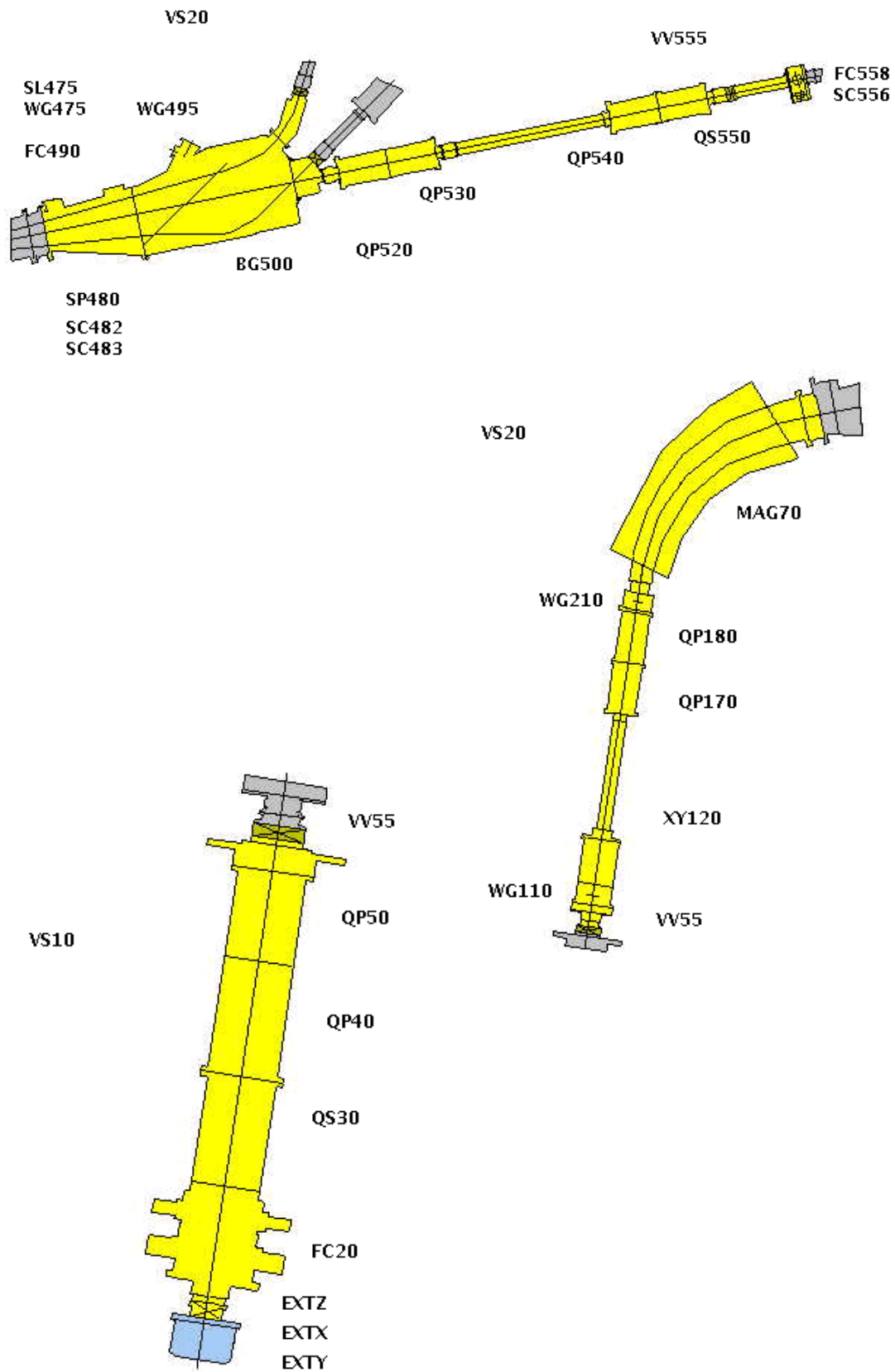


To start filling the gasline do the following:

- Open up valves “GPS.PVLV” and “GPS.SVLV”
- Turn on gas pump “GPS.GASPUMP” and wait 2-3 minutes for pump to pump out old gas/air.
- Place a dot in radio button that indicates the valve to the connected bottle.
- Close “GPS.PVLV” and press “Start Fill Gas” (leave “GPS.GASPUMP” running).
- Wait until “GPS.GASM” reaches a value of $>1.000\text{atm}$ (at this level the gas filling should automatically stop if you have set it as the target value)
- Open “GPS.PVLV” to pump out the gas you just pumped in!
- Close “GPS.PVLV” and “Start Fill Gas” for the 2nd time. Reason for this is that you want to be sure that you have only the wanted gas mixture and no rest gasses from earlier)
- When the “GPS.GASM” once again reaches $>1.000\text{atm}$ stop the gas pump
- Close “GPS.SVLV”
- Open “GPS.AVLV” for 2 seconds then close again.

Done, the gas filling sequence has completed!

Setting up the new target (GPS) – *Beamline synoptics*



Setting up the new target (GPS) – Beam tuning.

- Load the GPS workingset. →
- Open vacuum valve, GPS.VV55.
- Insert Faraday cup GPS.FC20 and measure total amount of beam (note it down).
- Take GPS.FC20 out!
- Have a look at the beam by inserting the first wiregrid (GPS.WG110) in the beam.
- If beam is not satisfactory use quadrupoles (GPS.QS30, GPS.QP40 & GPS.QP50) to center the beam and optimize the intensity.
- Take beam to GPS.WG210 and look at beam.
- Optimize the beam character using GPS.XY120, GPS.QP170 & GPS.QP180.
- Choose a stable Isotope suitable for setting up the beam.
- Cycle the mass separator magnet, MAG70 for that Isotope.
- Make sure that GPS Main Beamgate is open.
- Make sure that wiregrid GPS.WG475 is not “IN” it will block the beam.
- Look at beam scanner, GPS.SC483 – has the magnet separated the Isotope?
- Measure the intensity with GPS.FC490 and note it down.
- Move out GPS.FC490!
- Open the central beamgate for GPS.
- Open the vacuum valve for the GPS central beamline, GPS.VV555.
- Verify that the GPS Low Mass deflector plate, GLM.DP10 is not in the way of the beam, it should read a value >445mm.
- Verify that the GPS Low Mass kicker, GLM.KI08 is not in the way of the beam, it should read a value <1600mm.
- Take beam down to beam scanner GPS.FC556 using the quadrupoles GPS.QP520, GPS.QP530, GPS.QP540 & GPS.QS550 to correct beam position and optimize intensity.
- Move in Faraday cup, GPS.FC558 and measure the value, note it down!
- Move out GPS.FC558!
- Save QP-array, note down in logbook.

The screenshot shows the GPS control software interface with the following data tables:

Name	Status	CCV	AQN	Un
YGPS.ISOLA-TRAF0	On			PR
YGPS.TARGET-HEAT	On	550.00	546.88	A
YGPS.LINE-HEAT	On	355.00	357.81	A
YGPS.SRCMAG	On	4.20	4.11	A
YGPS.ANODE1	On	90.00	89.41	V
YGPS.ANODE2	On	160.00	159.55	V
YGPS.OVEN1	On	15.00	14.53	A
YGPS.OVEN2	On	0.00	-0.06	A
YGPS.ELDEFL	off	0.00	0.00	V
YGPS.ELBOMB	off	0.00	0.00	V

Name	Status	P	AQN	ADC
GPS.VTARG				0.81
GPS.VLINE				2.68
GPS.TEMP1				23.82
GPS.TEMP2				12.29
GPS.GASPUMP	off		9.861	
GPS.GASM		1.000	1.009	
GPS.ALV	Closed			
GPS.SLV	Closed			
GPS.FVL	Closed			

Name	pos
GPS.EXTX	-300.000
GPS.EXTY	0.000
GPS.EXTZ	54.937

Name	Status	AQN	AQN-H	AQN-V
GPS.QS30	On	777.02	70.74	-3.34
GPS.QP40	On	1621.99		
GPS.QP50	On	882.37		
GPS.XY120	On		82.30	-0.13
GPS.QP170	On	148.64		
GPS.QP180	On	333.01		

Name	Status	CCV	AQN
GPS.MAG70	On	0.19015	0.19015

Name	Status	CCV	AQN	Unit
YGPS.SEPMAG70DEG	On	0.00	83.75	-

Name	Status	AQN	AQN-H	AQN-V
GPS.QP520	On	1061.65		
GPS.BE560	On	1490.74		
GPS.QP530	On	1340.15		
GPS.QP540	On	1379.14		
GPS.QS550	On	1317.87	100.26	-29.52

Buttons at the bottom: Open Knob, Update, Freeze, Log View, Describe

Target change – *After the change.*

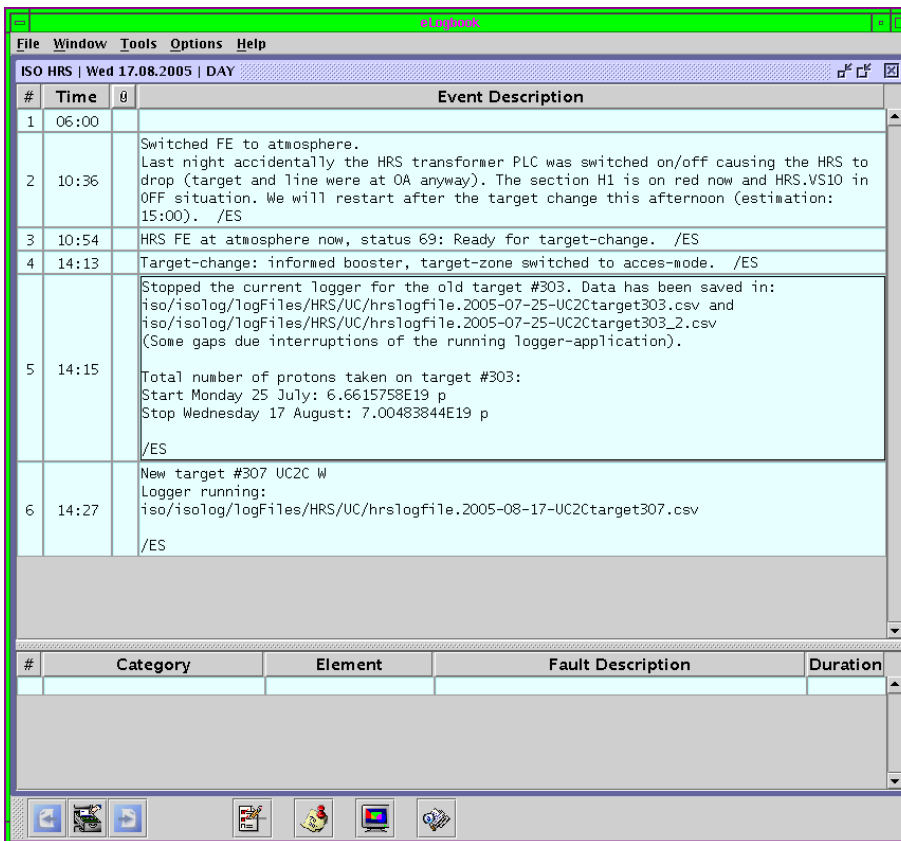
- The IMS must check his contamination on the hand & foot monitor at exit of the target area.
- He should also in the dosimeter logbook outside the zone note down the taken amount of radiation (if any).
- Back in the ICR, the IMS should switch back the zone to “Beam Mode”.
- In the elogbook the IMS should provide all necessary new information about the new target(s) this includes (target name, type, massmarker connections etc.)
- IMS should start the new logfile (see [Logfile](#) pages).
IMS also writes down (in logbook) the amount of pulses and protons that the previous target took.
- The IMS then informs users that target change has been completed, requests protons for the other separator (if wanted by the users) and starts setting up the new target.



eLogbook

The eLogbook is a very important tool for the IMS as well as Isolde users and other people concerned. This application should be used as frequently as possible so that people can see status of the machine or a running experiment. Here the IMS can report about settings, changes to the setup, measurements, contact persons, target info, problems and solutions and anything else that might be of interest. This logbook can be read from any machine in the ICR by starting the eLogbook application from the ISOLDE controls menu. Or by any computer connected to the Internet by following the link from the ISOLDE home page, <http://isolde.cern.ch>

The eLogbook is divided in one part that covers the GPS and another that is for HRS.



The screenshot shows the eLogbook application window. The title bar reads "eLogbook". The menu bar includes "File", "Window", "Tools", "Options", and "Help". The main window title is "ISO HRS | Wed 17.08.2005 | DAY". The main content area is a table with columns "#", "Time", and "Event Description".

#	Time	Event Description
1	06:00	
2	10:36	Switched FE to atmosphere. Last night accidentally the HRS transformer PLC was switched on/off causing the HRS to drop (target and line were at OA anyway). The section H1 is on red now and HRS.VS10 in OFF situation. We will restart after the target change this afternoon (estimation: 15:00). /ES
3	10:54	HRS FE at atmosphere now, status 69: Ready for target-change. /ES
4	14:13	Target-change: informed booster, target-zone switched to acces-mode. /ES
5	14:15	Stopped the current logger for the old target #303. Data has been saved in: iso/isoLog/logFiles/HRS/UC/hrslogfile.2005-07-25-UC2Ctarget303.csv and iso/isoLog/logFiles/HRS/UC/hrslogfile.2005-07-25-UC2Ctarget303_2.csv (Some gaps due interruptions of the running logger-application). Total number of protons taken on target #303: Start Monday 25 July: 6.6615758E19 p Stop Wednesday 17 August: 7.00483844E19 p /ES
6	14:27	New target #307 UC2C W Logger running: iso/isoLog/logFiles/HRS/UC/hrslogfile.2005-08-17-UC2Ctarget307.csv /ES

Below the main table is a summary table with columns "#", "Category", "Element", "Fault Description", and "Duration".

#	Category	Element	Fault Description	Duration

By clicking on the last number in the # -column you get a new entry that can be filled in, this entry is logged with the time for that moment.

Within the eLogbook you also have the ability to jump to old "shifts" if you have the need to go to an earlier date for some of the logged information.

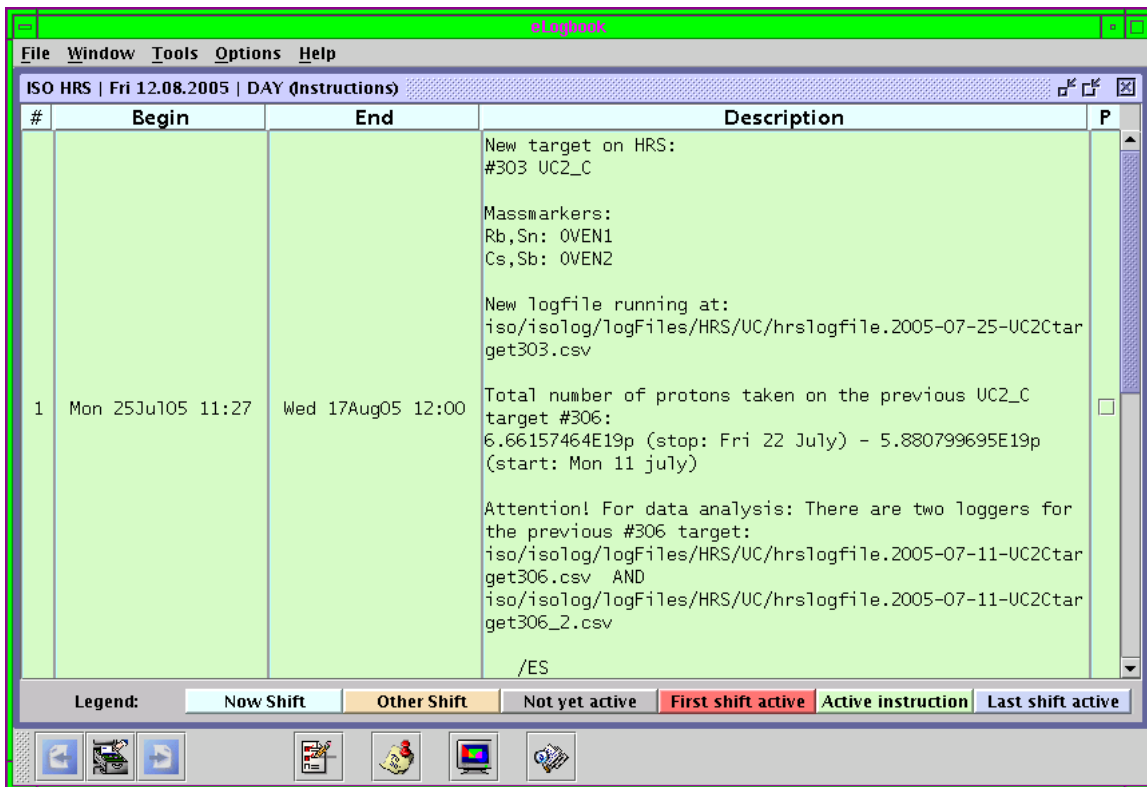
Remember:

*Always use a proper language when you add something (Anyone can read this!)
Also add your initials at the end of an entry so that people know who to contact if questions need to be asked.*

One part of the eLogbook is called the “Consignes”, here we store more general information like:

- Current target number, type and useful data (massmarker, gas etc.)
- Responsible IMS and telephone numbers.
- Known problems and existing remedy’s.
- Other contact persons.
- Known events

This is an example of how an entry in the consignes can look:



Logfile

When a new target has been put on either of the frontends it is necessary for the IMS to start a new logfile so that data can be collected during the operation of the target. This data is essential to have for analyzing what could have gone wrong in an eventual target break or for instance a non-planned machine stop.

To start a new logfile (in this case for HRS) do the following:

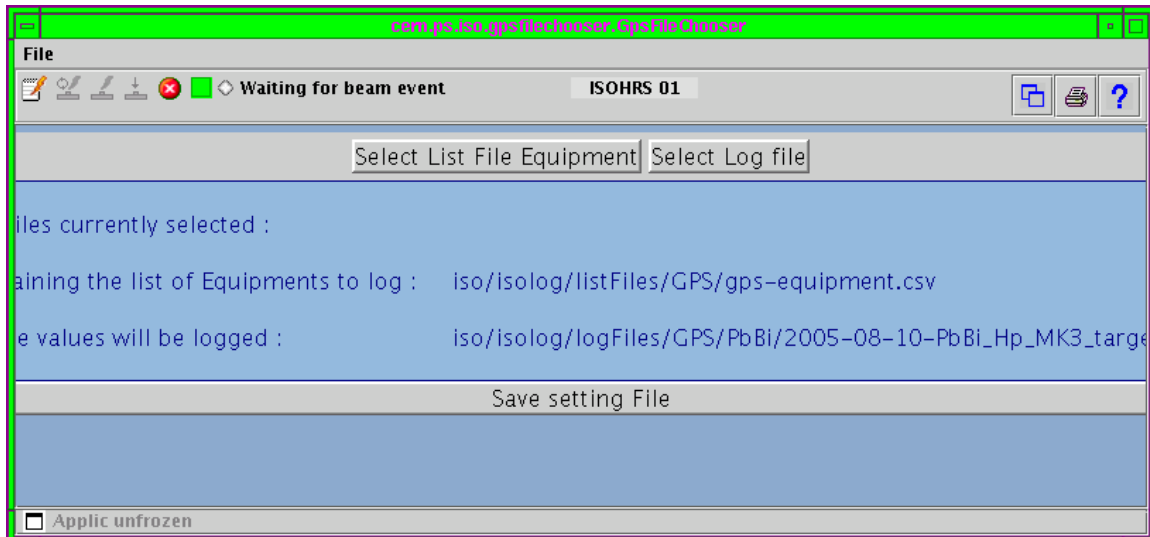
In the Console Manager choose GPS → File Chooser for GPS

To STOP the current logfile:

1. Select List File Equipment → Stop File → Select “Stopfile.csv”
2. Save Setting File

To START a new logfile:

1. Select Logfile → ex. “2005-08-10-PbBi_Hp_Mk3_target264.csv” should be saved in folder /logFiles/GPS/PbBi since it in this case is a Led Bismuth hot-plasma target.
2. Select Listfile EQP
3. Choose GPS-Equipment.csv
4. Save settings File

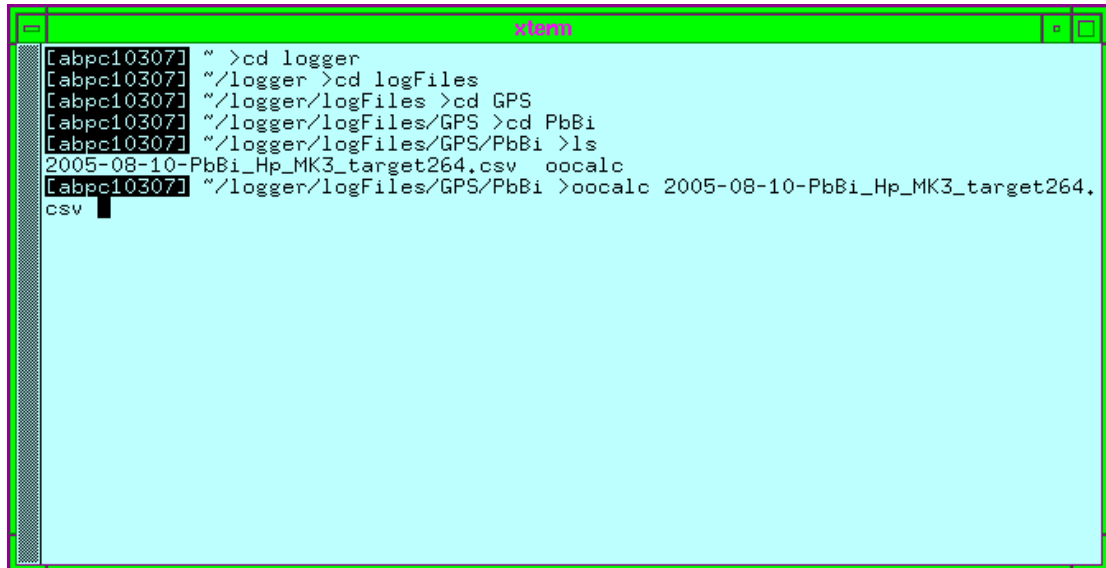


Attention:

It is important to not forget that the file must end with .csv (comma separated format) in order to easily be read by various document readers.

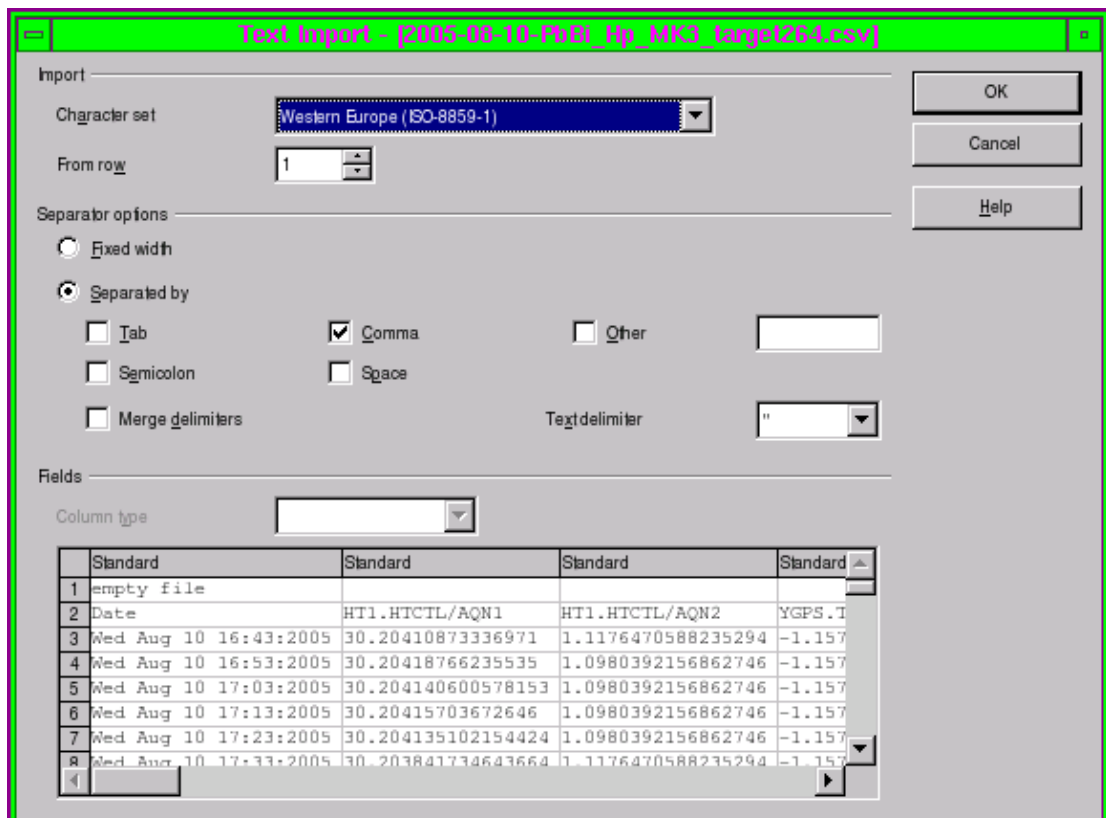
How do I know if the logfile is running?

1. Start an XTERM-session (left click on desktop choose Terminal → XTERM).
2. Use Linux-commands to get to the wanted folder: cd logger/logFiles/GPS/PbBi



```
[abpc10307] ~ >cd logger
[abpc10307] ~/logger >cd logFiles
[abpc10307] ~/logger/logFiles >cd GPS
[abpc10307] ~/logger/logFiles/GPS >cd PbBi
[abpc10307] ~/logger/logFiles/GPS/PbBi >ls
2005-08-10-PbBi_Hp_MK3_target264.csv  oocalc
[abpc10307] ~/logger/logFiles/GPS/PbBi >oocalc 2005-08-10-PbBi_Hp_MK3_target264.
csv
```

3. Open the created logfile by typing:
OOCALC 2005-08-10-PbBi_Hp_Mk3_target264.csv



Text Import - [2005-08-10-PbBi_Hp_MK3_target264.csv]

Import

Character set: Western Europe (ISO-8859-1)

From row: 1

Separator options

Fixed width

Separated by

Tab Comma Other

Semicolon Space

Merge delimiters

Text delimiter: "

Fields

Column type

	Standard	Standard	Standard	Standard
1	empty file			
2	Date	HT1.HTCTL/AQN1	HT1.HTCTL/AQN2	YGPS.T
3	Wed Aug 10 16:43:2005	30.20410873336971	1.1176470588235294	-1.157
4	Wed Aug 10 16:53:2005	30.20418766235535	1.0980392156862746	-1.157
5	Wed Aug 10 17:03:2005	30.204140600578153	1.0980392156862746	-1.157
6	Wed Aug 10 17:13:2005	30.20415703672646	1.0980392156862746	-1.157
7	Wed Aug 10 17:23:2005	30.204135102154424	1.0980392156862746	-1.157
8	Wed Aug 10 17:33:2005	30.203841734643664	1.1176470588235294	-1.157

4. Check that the file has new entries in the different columns.

1	A	B	C	D	E	F	G	H
2	empty file							
3	Date	HT1.HTCTL/AQN1	HT1.HTCTL/AQN2	YGPS.TARGET-HEAT/AQN	YGPS.TARGET-HEAT/AQN1	GPS.VTARG/AQN2	YGPS.LINE-HEAT/AQN	YGPS.LINE-HEAT/AQN1
3	Wed Aug 10 16:43:2005	30.2	1.12	-1.16	0.01	0	357.81	
4	Wed Aug 10 16:53:2005	30.2	1.1	-1.16	0.01	0	357.81	
5	Wed Aug 10 17:03:2005	30.2	1.1	-1.16	0.01	0	357.81	
6	Wed Aug 10 17:13:2005	30.2	1.1	-1.16	0.01	0	357.81	
7	Wed Aug 10 17:23:2005	30.2	1.1	-1.16	0.01	0	357.81	
8	Wed Aug 10 17:33:2005	30.2	1.12	-1.16	0.01	0	357.81	
9	Wed Aug 10 17:43:2005	30.2	1.1	-1.16	0.01	0	357.81	
10	Wed Aug 10 17:53:2005	30.2	1.1	-1.16	0.01	0	357.81	
11	Wed Aug 10 18:03:2005	30.2	1.1	-1.16	0.01	0	357.81	
12	Wed Aug 10 18:13:2005	30.2	1.1	-1.16	0.01	0	357.81	
13	Wed Aug 10 18:23:2005	30.2	1.1	-1.16	0.01	0	357.81	
14	Wed Aug 10 18:33:2005	30.2	1.1	-1.16	0.01	0	357.81	
15	Wed Aug 10 18:43:2005	30.2	1.1	-1.16	0.01	0	357.81	
16	Wed Aug 10 18:53:2005	30.2	1.1	-1.16	0.01	0	357.81	
17	Wed Aug 10 19:03:2005	30.2	1.1	-1.16	0.01	0	357.81	
18	Wed Aug 10 19:13:2005	30.2	1.1	-1.16	0.01	0	357.81	
19	Wed Aug 10 19:23:2005	30.2	1.1	-1.16	0.01	0	357.81	
20	Wed Aug 10 19:33:2005	30.2	1.1	-1.16	0.01	0	357.81	
21	Wed Aug 10 19:43:2005	30.2	1.1	-1.16	0.01	0	357.81	
22	Wed Aug 10 19:53:2005	30.2	1.08	-1.16	0.01	0	357.81	
23	Wed Aug 10 20:03:2005	30.2	1.08	-1.16	0.01	0	357.81	
24	Wed Aug 10 20:13:2005	30.2	1.1	-1.16	0.01	0	357.81	
25	Wed Aug 10 20:23:2005	30.2	1.1	-1.16	0.01	0	357.81	
26	Wed Aug 10 20:33:2005	30.2	1.1	-1.16	0.01	0	357.81	
27	Wed Aug 10 20:43:2005	30.2	1.08	-1.16	0.01	0	357.81	
28	Wed Aug 10 20:53:2005	30.2	1.08	-1.16	0.01	0	357.81	
29	Wed Aug 10 21:03:2005	30.2	1.1	-1.16	0.01	0	357.81	
30	Wed Aug 10 21:13:2005	30.2	1.1	-1.16	0.01	0	357.81	
31	Wed Aug 10 21:23:2005	30.2	1.1	-1.16	0.01	0	357.81	
32	Wed Aug 10 21:33:2005	30.2	1.08	-1.16	0.01	0	357.81	
33	Wed Aug 10 21:43:2005	30.2	1.08	-1.16	0.01	0	357.81	

5. Exit OOCALC and importantly, *DO NOT SAVE THE FILE!*

Target change (HRS) - Operation of robots.

- Turn on cameras and screens.
- Switch to HRS on the switchbox.
- Turn the “HRS doors control key” and wait ~30 seconds.
- Press green button for HRS door control to “OPEN”.

On the rack marked “Chassis Control Cible”:

- Turn the key at the same time as pressing it.
- Press the HRS button (should light up in green).
- Press button “Fermeture Clamps”.
- Press button “Ouverture Clamps” to release target from the Frontend.

On the rack marked “HRS lead door controls”:

- Switch to “Manual Control”.
- Open door (verify that wanted storage place is free, check with camera).
- Close (all) doors.
- Switch back to “Robot System Control”

Check calibration of robot:

- In the console choose “2. Manual control of operations”.
- Choose “7. Perform test calibration”
- Verify that you get a green light on diode marked “Robot check point”
- Choose “8. Accept/Reject test calibration”
- Choose whether you want to accept or not.

- In main menu choose “1. Automatic Operations and system control”
- Proceed with “2. Reset alarm & continue”
- On the HRS cupboard press blinking green button marked “ARM power ON/OFF” to turn ON.

Target change (HRS) - Pickup cycle.

First we need to take the existing target from the frontend and store it on the target shelf:

- In the console choose “1. Automatic Operations and system control”.
- Choose “1. Start a pick and place cycle”.
- At “Select pickup location”, choose “From Frontend”.
- On question on where to take the target choose “To target shelf”.
- Answer questions “Target number?”, “Behind which door?”, “On which shelf?” and “Which position?” with the numbers that corresponds to the wanted storage position. Select “0” on question about dust cap.
- Verify entries are correct and start the pickup cycle with “Y” or abort with “N”.
- Wait until console displays “Operation performed successfully” and status “Idle”.
- Update the whiteboard with information at the new storage place (Target number, type etc.)

Now we need to place the new target onto the frontend:

- In the console choose “1. Automatic Operations and system control”.
- Choose “1. Start a pick and place cycle”.
- At “Select pickup location”, choose “From exchange point”.
- On question on where to take the target choose “To frontend”.
- Verify that entries are correct and start the pickup cycle with “Y” or abort with “N”.
- Wait until console displays “Operation performed successfully” and is in status “Idle”.
- Update the whiteboard with information about target that has been placed on the Frontend (Target number, type etc.)

On “Chassis Control Cible” we now need to close the clamps to make sure that the new target is firmly attached to the frontend:

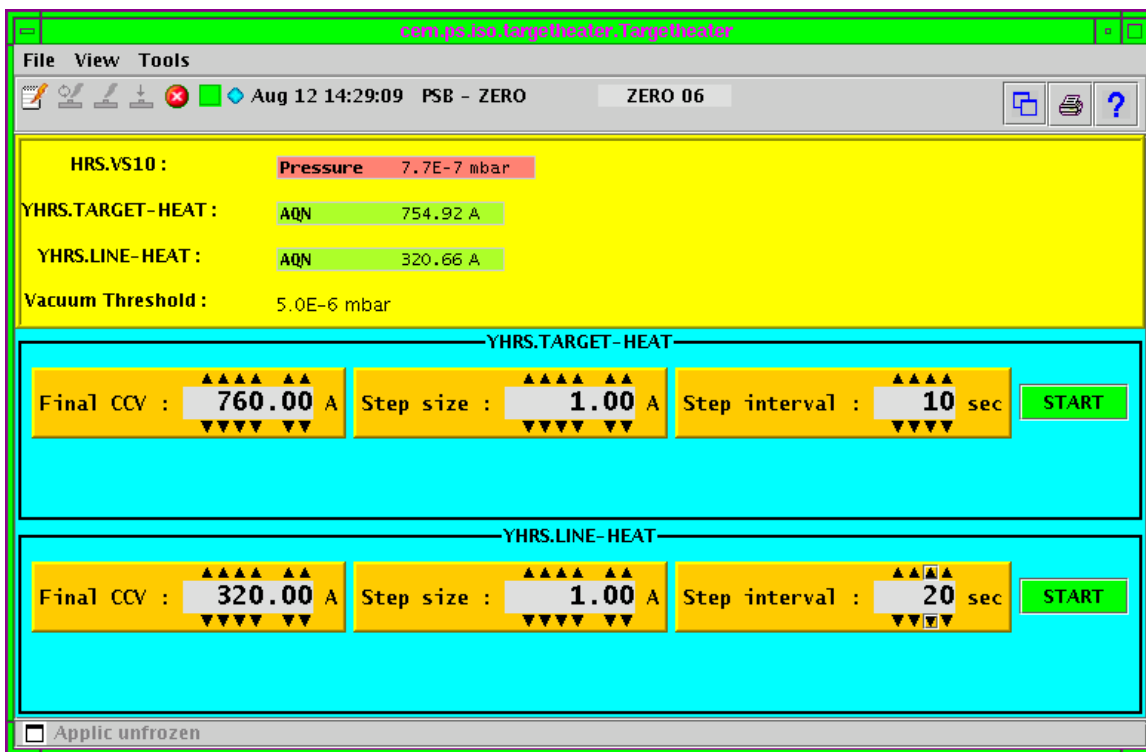
- First, press button marked “Ouverture clamps”.
- Secondly, close clamps with button “Fermeture Clamps”.
- Check that the diode (CL1) now has turned red (Closed position).
- Turn the key.

- Switch off cameras & monitors.
- On the “HRS door control”-rack press “Close” and wait for the red diode to light up.
- Turn the HRS key. On the console choose “1. Automatic Operations and system control” and proceed with “5. Stop current operations”, this to turn the robot off.

(Finally, once again make sure that you have provided the information about the targets new positions onto the whiteboard.)

Setting up the new target (HRS) – Preparation.

- First step is to pump the frontend to vacuum. Just after a target change the vacuum system status should display “70”. We want to reach status “39” (Vacuum)
- Make sure HRS.VV55 (frontend vacuum valve) is closed.
- Open up knob HRS.VS10 and HRS.VS20.
(These controls the turbo pumps needed to reach vacuum on the frontend.)
Turn them “ON”.
- Wait until status “39” is reached.
- During the wait to reach vacuum the necessary connections for HT should be done in the HT -room.
- When frontend has reached vacuum we can start the heating of the target, this heating should be applied slowly to minimize risk of damage to the target.
Use the “Automatic target heater” –application to have the target heated to set values.
- It is very common that the target outgases making the vacuum worse; therefore the target heater-application has a built-in vacuum threshold that can be set manually. If the set values are not met, the heater program will stop until vacuum improves. A good value for this threshold is 5.0E-6 mbar.

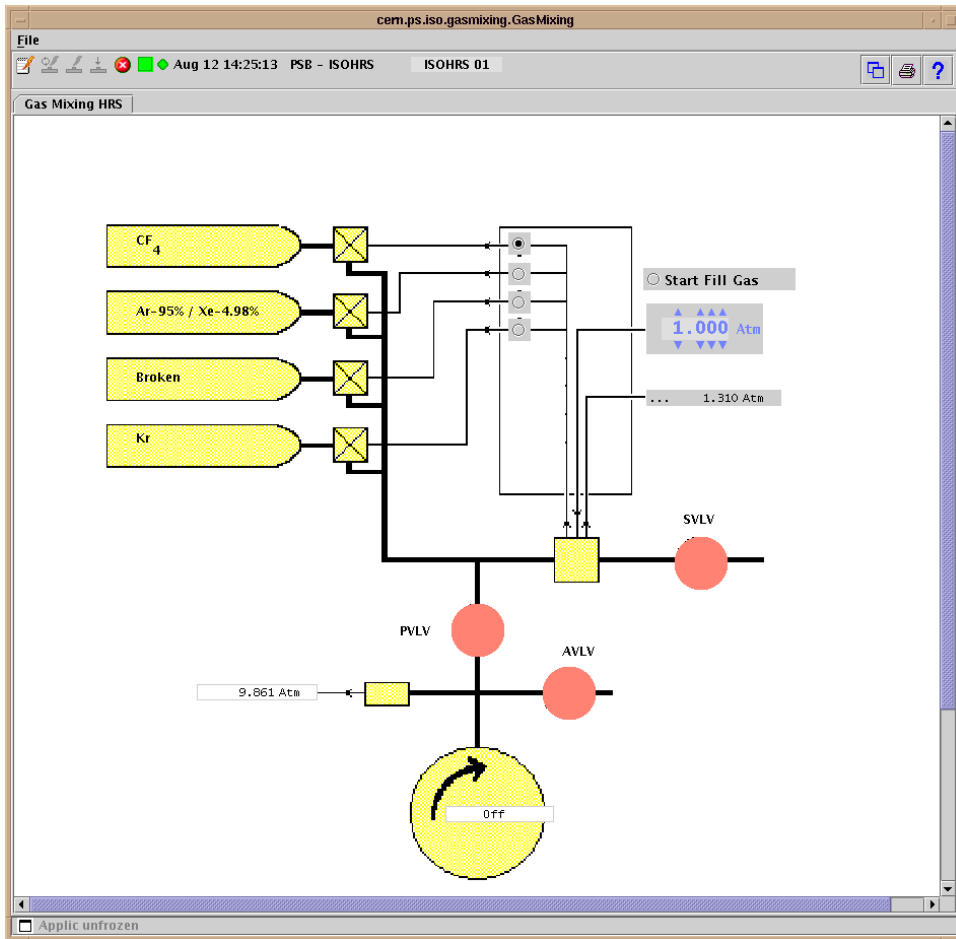


- When target and line heating has completed we are ready to start tuning the beam.

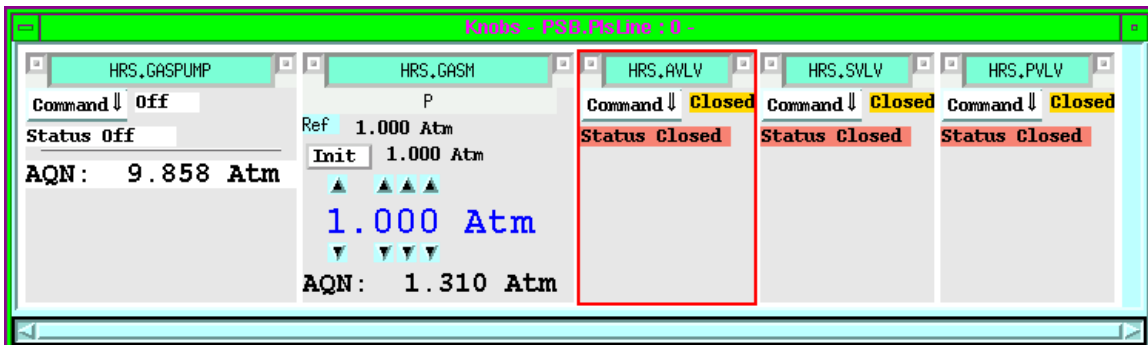
Setting up the new target (HRS) - Gas mixing application.

To start the program, do the following:

- From the ISOLDE Console Manager choose “HRS”.
- Choose “Gas Mixing” and application will launch.



- Open up the corresponding workingset and open up knobs “HRS.GASPUMP”, “HRS.GASM”, “HRS.AVLV”, “HRS.PVLV” and “HRS.SVLV”.

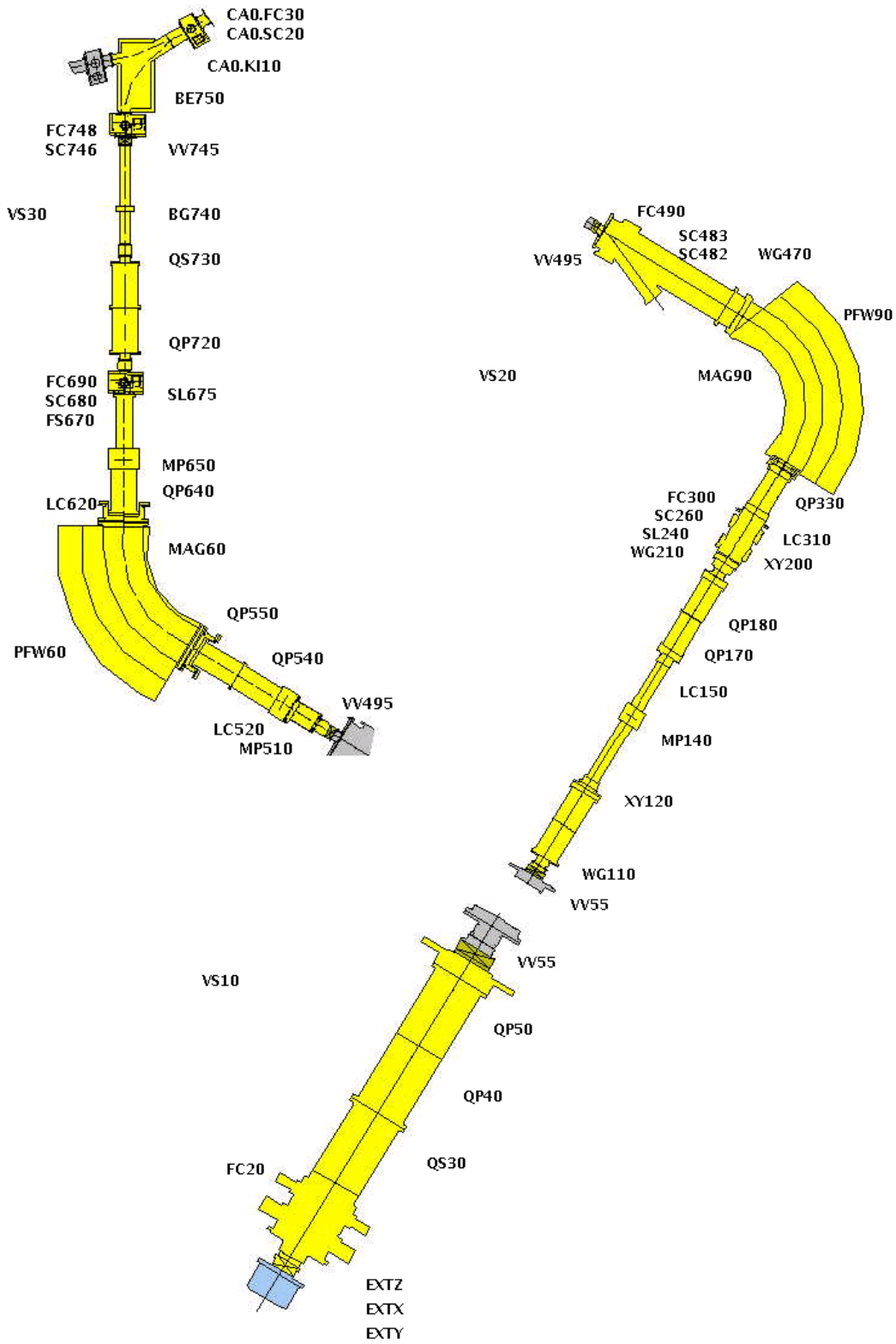


To start filling the gasline do the following:

- Open up valves “HRS.PVLV” and “HRS.SVLV”
- Turn on gas pump “HRS.GASPUMP” and wait 2-3 minutes for pump to pump out old gas/air.
- Place a dot in radio button that indicates the valve to the connected bottle.
- Close “HRS.PVLV” and press “Start Fill Gas” (leave “HRS.GASPUMP” running).
- Wait until “HRS.GASM” reaches a value of $>1.000\text{atm}$ (at this level the gas filling should automatically stop if you have set it as the target value)
- Open “HRS.PVLV” to pump out the gas you just pumped in!
- Close “HRS.PVLV” and “Start Fill Gas” for the 2nd time. Reason for this is that you want to be sure that you have only the wanted gas mixture and no rest gasses from earlier)
- When the “HRS.GASM” once again reaches $>1.000\text{atm}$ stop the gas pump
- Close “HRS.SVLV”
- Open “HRS.AVLV” for 2 seconds then close again.

Done, the gas filling sequence has completed!

Setting up the new target (HRS) – *Beamline synoptics*



Setting up the new target (HRS) – *Beam tuning.*

- Load the HRS workingset.
- Open vacuum valve, HRS.VV55.
- Insert Faraday cup HRS.FC20 and measure total amount of beam (note it down).
- Take HRS.FC20 out!
- Have a look at the beam by inserting the first wiregrid (HRS.WG110) in the beam.
- If beam is not satisfactory use quadropoles (HRS.QS30, HRS.QP40 & HRS.QP50) to center the beam and optimize the intensity.
- Take beam to HRS.WG210 and look at beam.
- Optimize the beam character using HRS.XY120, HRS.QP170 & HRS.QP180.
- Choose a stable Isotope suitable for setting up the beam.
- Cycle the mass separator magnets, MAG90 & MAG60 for that Isotope.
- Look at beam scanner, HRS.SC483 & wiregrid HRS.WG470 – has the magnet separated the Isotope, is the beam centered?
- Measure the intensity with HRS.FC490 and note it down.
- Move out HRS.FC490!
- Open the vacuum valve HRS.VV495.
- Take beam down to the 2nd mass separator using the quadropoles QP540 and QP550.
- Take beam through 2nd mass separator and look at scanner HRS.SC680.
- Is beam centered? If not, use mass calibration to move the beam.
- Move in Faraday cup, HRS.FC690 and measure the value, note it down!
- Move out HRS.FC690!
- Open vacuum valve HRS.VV745.
- Take beam down to scanner HRS.SC746 using quadropoles HRS.QP720 and HRS.QS730 to correct beam position and optimize intensity.
- Measure the intensity with HRS.FC748 and note it down.
- Move out HRS.FC748.

The screenshot shows the HRS control interface with the following data tables:

Name	Status	AQN	AQN-H	AQN-V
HRS.XY120	On		-151.53	-9.83
HRS.MP140	On			
HRS.QP170	On	1574.57		
HRS.QP180	On	2357.79		
HRS.XY200	On		-0.67	-0.13
HRS.QP330	On	1049.07		
HRS.MP510	On			
HRS.QP540	On	1.11		
HRS.QP550	On	0.40		
HRS.QP640	On	187.35		
HRS.MP650	On			
HRS.QP720	On	1854.31		
HRS.QS730	On	1514.03	18.23	0.00
HRS.BE750	On	3024.02		

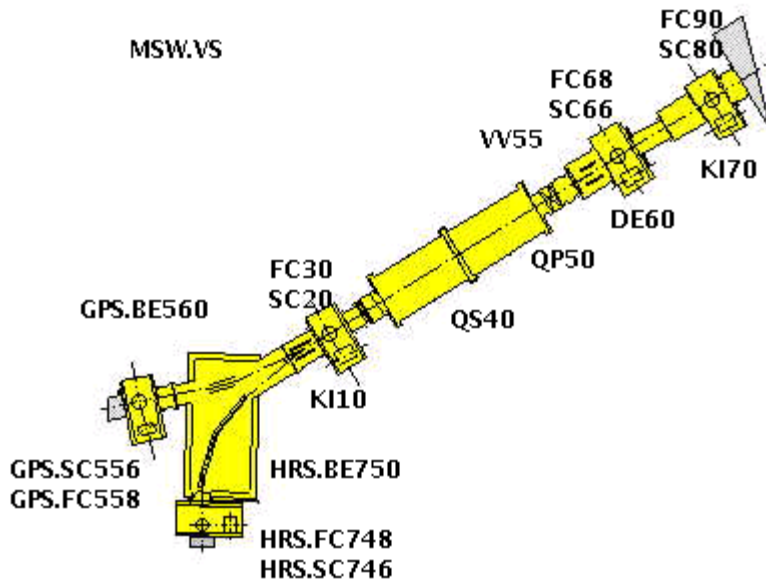
Name	Status	CCV	AQN
HRS.MAG60	On	0.41846	0.41846
HRS.MAG90	On	0.41916	0.41916

Name	Status	CCV	AQN	Unit
YHRS.SEPMAG60DEG	On	341.36	343.72	-
YHRS.SEPMAG90DEG	On	341.32	343.54	-

Name	Pos
HRS.FC20	Out
HRS.FC300	Out
HRS.FC490	Out
HRS.FC690	Out
HRS.FC748	Out

Name	Status	Pressure
HRS.VS10	Not OK	4.5E+01
HRS.VS20	OK	1.8E-06
HRS.VS30	OK	3.9E-07

Name	Status
HRS.VV55	Closed
HRS.VV495	Closed
HRS.VV745	Open



- Take beam through the merging switchyard and into the CA0-line by using the bender HRS.BE750.
- Look at scanner CA0.SC20 and verify that beam position is centered, if not you can use the kicker CA0.KI10 to “kick” the beam into position. You could also try the steering quadrupole HRS.QS730 to make some adjustment.
- When beam is centered insert the faraday cup CA0.FC20, measure value and note it down.
- Take CA0.FC20 out!
- Open vacuum valve CA0.VV55.
- Take beam to the 2nd scanner in the CA0-line, CA0.SC66.
- Correct beam position and optimize transmission with the quadrupoles CA0.QS40 and CA0.QP50.
- Insert Faraday cup CA0.FC68, measure and note down values.
- Take CA0.FC68 out.
- Check on the last scanner CA0.SC80 that the beam is centered.
- Insert Faraday cup CA0.FC90 and check that beam intensity looks reasonable, note down.
- Remove CA0.FC90!
- Save QP-array:
Example: “../iso/qparray/HRS_SEP_60kV_5-08-19.csv”
- Note down the filename in the logbook.

Mass separators – The use of bending magnets.

At Isolde the beam being produced from the target/frontend consists of (depending of target material) up to several hundreds of different Isotopes. In order to separate the wanted Isotope from the others mass separators are being used. The mass separator is a very large bending magnet which magnet field (measured in Tesla) can be controlled from the ICR using one of the mass separator programs that exists in the ISOLDE control system.

The idea of using magnets is that since the elements have different mass they bend differently when accelerated through the magnet. Lighter Isotopes bend more than the heavier ones and by setting a precise magnet field calculated by the following formula:

$$\beta = \sqrt{\left[\frac{V}{6 \times 10^4} \times \frac{A}{F} \right]}$$

V = High Tension (Volts)
 A = Mass
 F = Mass factor

We are fortunate because this is something that the mass separator program does for us!

Sometimes however the calibration of the magnet needs to be tweaked. If the beam that shows up on the beam scanner just after the magnet is off in the horizontal plane, the Mass Calibration Calculator can be used to compute a new magnetic field for the magnet and by this way move the beam either to the left or the right.

In the picture to the left we have computed a new field to move the beam 0.3mm to the right. The only thing that needs to be done is to send the values and wait for

the field to be set in the magnet.

The HRS has two bending magnets (MAG60 and MAG90) whereas the GPS only have one, (MAG70). The name indicates the number of degrees that the magnet bends the beam. Since the HRS is equipped with two magnets a higher resolution of the separation can be achieved.

The HRS-magnet is equipped with NMR probes that read back the magnetic field values and cycles the magnet until the field error is gone. The drawback with this is the increased time it takes for the magnet to set the correct field. A cycle of one of the HRS magnets takes about 10 minutes to complete (BH15 mode), the magnets work independently of each other so they can both be cycled at the same time.

The GPS does not have NMR probes for read back. It works in a faster not so precise mode meaning that the MAG70 will set the magnetic field with less precision but on the other hand the field will be set in just a few seconds. It should however be mentioned that the HRS-magnets also can be set to work in “fast mode” with less precision.

When users want to change the Isotope for their run all they need to do is to type in the new Isotope and make sure that the High Voltage is the one that they are using then press “Enter” to have the new required field calculated and then “Send” to send the values.

On the HRS it will display “Cycling” and then “Regulation” until the Field CCV and Field AQN are the same.

If the IMS calibrates the magnet he should note the Mass factor and HT in the logbook.

The screenshot shows the 'Mass Control for Isolde' software interface for the 'HRS line'. The window title is 'Mass Control for Isolde' and the menu bar includes 'File' and 'Control'. The status bar shows 'Aug 12 14:23:57' and 'ASYNC.PERIOD... ASYNC.PERI...'. The main interface is divided into three sections:

- Mass Calculator:** A table with the following data:

Isotope	137Sb	ok
Required Mass	136.935	
Mass factor	796.38	
High Voltage	60000.0 v	
Required field	0.41467	

 There is a 'Send' button to the right of the table.
- Field Readout:** A table with the following data:

Field CCV	0.41467 Tesla	HRS.MAG90
Field AQN	0.41467 Tesla	Regulation
Field Error	1.992E-7	
Measure Mass	136.94	
- Mass Calibration Calculator:** A table with the following data:

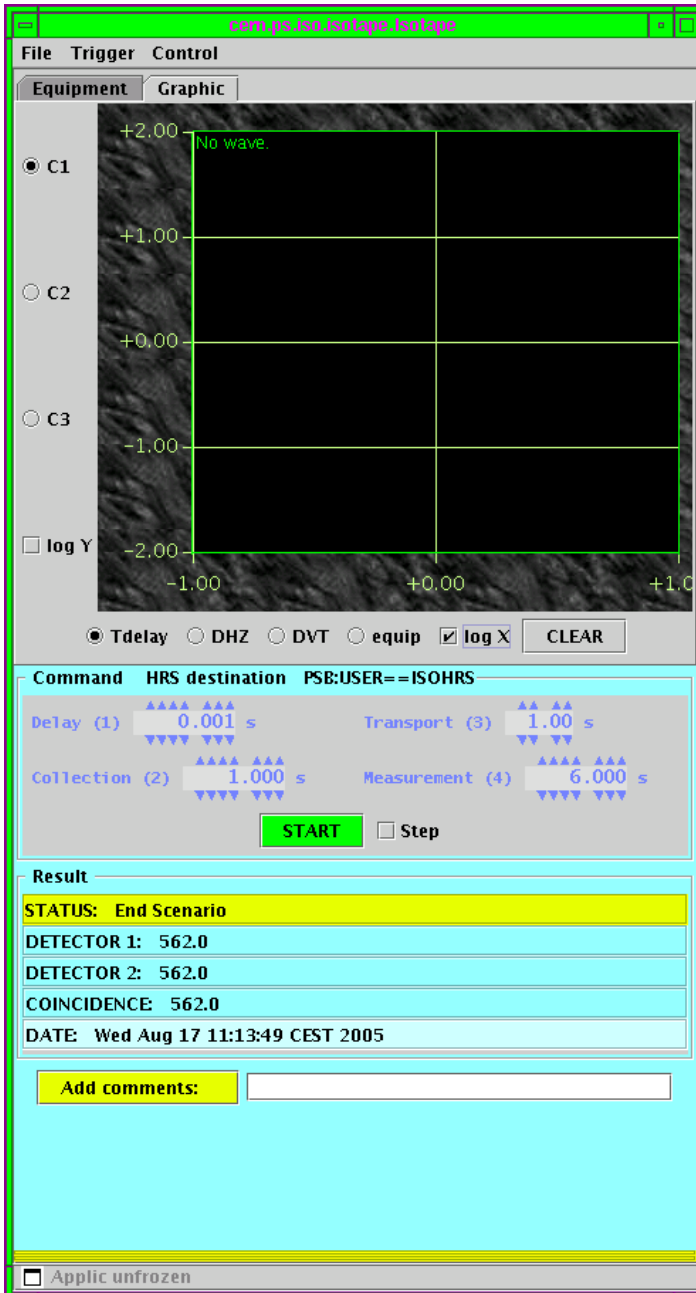
Current field	0.41467	Compute
Distance to move	0.00 mm	Send
Dispersion	1855.00	
New field		
New Mass Factor		

At the bottom left, there is a checkbox labeled 'Applic unfrozen'.

Tapestation

The tapestation is our tool to “record” a selected radioactive Isotope onto a tape and to measure the amount of that Isotope being produced in the Ionization chamber at a certain time from the proton impact has hit the target. By using this tool we can, during a run, see if yields have dropped since the start of the run.

The tapestations primary settings are:



Tinitial (Delay) (s) :

Delay for Isotopes to come out of target after proton impact.
(absolute minimum 0.006sec)

Tcollection (s):

Beamgate (open)time, software controlled.
(Time of Isotope collection)

Ttransport (s):

Delay for tapestation mechanics.

Tmeasure (s):

Time for measurement.
(If no old *pscan.csv* exists to take numbers from normally this value should be 1sec.)

Proton Scan – Optimize the ION-source on a surface ionizer (setup).

When setting up the beam it is important for the IMS to optimize the production from the ION-source. By tuning the position of where the proton beam hits the target container the optimum results can be achieved.

The tools used for this operation is the tapestation in combination with the horizontal/vertical proton beam adjusters:

	GPS	HRS
Horizontal	BTY.DHZ211	BTY.DHZ323
Vertical	BTY.DVT212	BTY.DVT324

Before tuning can start the beam must be transported down to the tapestation.

Example (**GPS**):

- Load a recent tapestation QP-array for a similar target with same HT.
- Verify that CA0.VV55 is open.
- Cycle magnet for a stable Isotope.
- Look at scanner CA0.SC66 and make sure beam is looking good.
- Measure beam intensity with GPS.FC490 and CA0.FC68, compare results and calculate transmission efficiency between these faraday cups.
A reasonable “Good” transmission is 70-90% for HRS and 80-90% for GPS.
- Cycle magnet for a radioactive isotope.
- Set beamgates to be remote controlled.
- Move deflector CA0.DE60 so beam deflects to tapestation. This is done by applying a current of 4600A (when running 60kV) and 2300A (when at 30kV).
- Launch tapestation application and set collection values, verify that program uses PPM-trigger, show graphic window and save file in:
“..iso/isotope/HRS/<targetnumber>/pscan.csv”.
- Open up knobs BTY.DHZ211 and BTY.DVT212.
- Call booster operator and ask for a single proton pulse of 1.0E13 protons.
- Turn on GPS proton request.
- Start measuring.

Remember:

If you are taking protons, and want to change mass in mass separator(s), always close the beamgate! The reason is that otherwise you risk getting long-lived isotopes into your beamlines.

Proton Scan – Optimize the ION-source on a surface ionizer (tuning).

We start tuning horizontally to find the best value for BTY.DHZ211.

Prepare a paper sheet that looks something like this, where you enter the measured values.

BTY.DHZ211	BTY.DVT212	Measured value (example)
35	0	522
30	0	1912
25	0	3679
20	0	5708
15	0	8180
10	0	10194
5	0	12350
0	0	13403
-5	0	12792
-10	0	11896
-15	0	9591
-20	0	7288
-25	0	4920
-30	0	3278
-35	0	1695

In the above measurement we find the best value when BTY.DHZ211 is at 0A. We now use this value for the vertical optimization and change BTY.DVT212 instead, as below.

BTY.DHZ211	BTY.DVT212	Measured value (example)
0	35	214
0	30	617
0	25	1683
0	20	2749
0	15	4911
0	10	8197
0	5	10938
0	0	13403
0	-5	14428
0	-10	15176
0	-15	15084
0	-20	13869
0	-25	12179
0	-30	9781
0	-35	6922

Optimum results have been achieved for BTY.DHZ211 at **0A** and BTY.DVT212 at **-10A**. Of course even better results might be obtained with a little bit of fine-tuning; it could be a good idea to try values close to the ones we found above.

Try values on either side of 0A on BTY.DHZ211 and either side of -10A for BTY.DVT212.

Also remember to note these numbers down in the logbook (+ where the file was stored) as they might come in handy later on in a physics run.

Re-tuning of an ION-source could be necessary if yields drop after some downtime or if booster has changed the alignment of the proton beam!

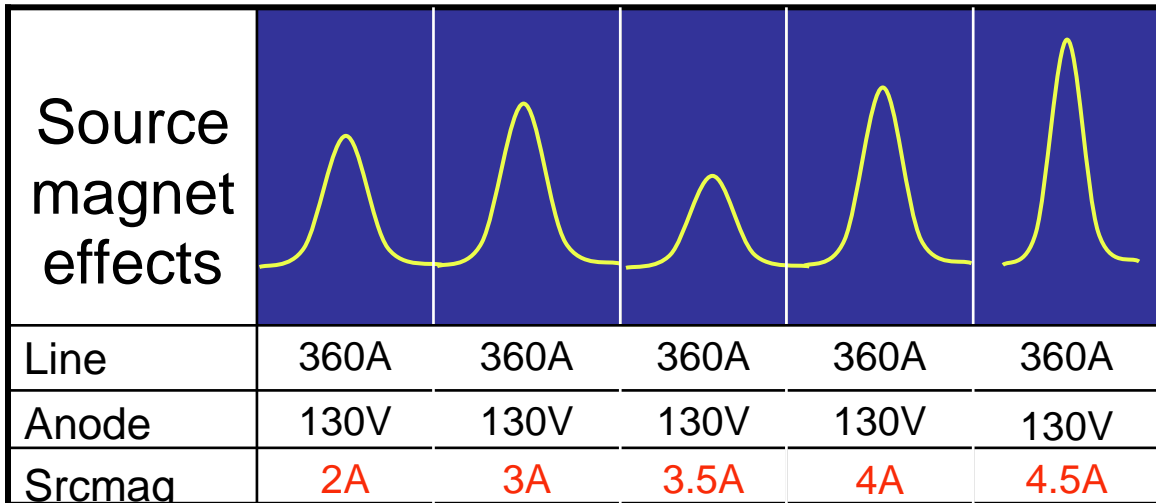
Proton Scan – Optimize the ION-source on plasma target (setup).

When tuning this type of Ionizer we have a few more parameters to play with.

1. Line heating current (A)
2. Source Magnet (SRCMAG)
3. Anode voltage (V)
4. Extraction Electrode distance (mm)

First the line has to be heated, normally somewhere in the range 250-380A. Then the anode needs a voltage somewhere between 100 and 200V. The change of focus and beam intensity is not directly proportional when increasing the current on the source magnet, this makes tuning a bit more difficult. The optimum values cannot be calculated so it is necessary to go through its whole range and measure the production for different currents. The values for the SRCMAG should not exceed 6A.

The figure below displays how beam intensity and focus could change, as different SRCMAG values are applied:



When tuning the different parameters these are good values to use as increase/decrease steps:

	Tuning	Fine-tuning
Line	10A	3A
Anode	10V	1-3V
SRCMAG	0.3A	0.1A

Plasma sources might also need re-tuning occasionally because of out-gassing so beam profile should normally be checked every 24 hours. When not using stable beam it is advisable to reduce the line current with about 10% in order to prolong target lifetime.

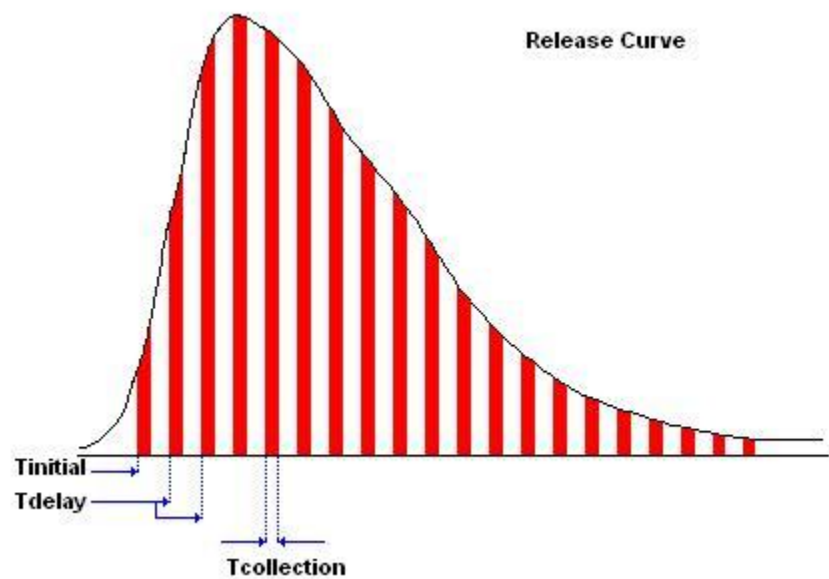
Release Curve

A release curve can be achieved by doing a proton scan but with different Tinitial – settings.

- Start tapestation application.
- Choose to save the file into the folder i.e.
“..iso/isotope/HRS/UC/<targetnumber>/release<Isotope>.csv”.
- Display the graphic view and check “Tdelay” and “log X”.
- Start measuring.

Increase Tdelay with
the logarithmic steps:

0.010 sec
0.020 sec
0.050 sec
0.100 sec
0.200 sec
0.500 sec
1.000 sec
2.000 sec
5.000 sec
10.000 sec
Etc.



When finished, do not forget to put CA0.DE60 back to 0!

Extraction Electrode

SIMATIC

How to verify/change the extraction electrode offset in the SIMATIC:

The SIMATIC is located in rack No.? (To the left when entering ISOLDE Control Room)
If the SIMATIC is left in one of its submenus, you can reach the initial menu by pressing “ESC” repeatedly.

1. From the initial menu choose “Extraction Electrodes”.
2. Choose either GPS or HRS by pressing “Shift”+ “GPS/HRS” -button simultaneously.
3. Set the SIMATIC to work in “Local” –mode.
4. Move with arrows to the place where “offset” for depth (Z) can be changed, set value.
5. Change back to “Remote Control”.

What values should be set?

- For plasma targets i.e. (Mk3, Mk5 & Mk7), always set the offset to 60mm (Z=60).
- Other target types, Surface/RILIS i.e. (Mk1, Mk2, Mk8) offset should be 0mm (Z=0).

When should the IMS do this?

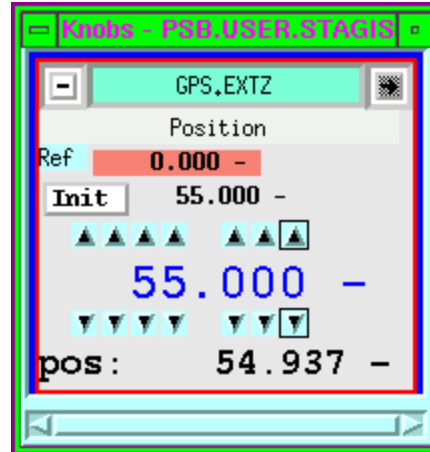
This should be done every time that you have done a target change!

It might be that you have the same target-type as the last used one but make it a rule to always verify that the set values are the correct one for the specific target before you proceed.

Move the Extraction Electrode using a LINUX-console.

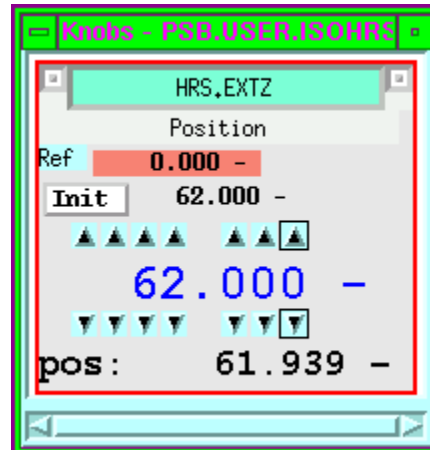
GPS:

1. In the Console Manager choose Working Sets → GPS
2. Open knob “GPS.EXTZ”.
3. Set value to 62mm (62mm is the value that current beam optics is calculated around and this should be the initial value, however in some situations lowering this number can improve the intensity of the beam since distance between the anode and cathode decreases.)



HRS:

1. In the Console Manager choose Working Sets → HRS
2. Open knob “HRS.EXTZ”.
3. Set value to 62mm (62mm is the value that current beam optics is calculated around and this should be the initial value, however in some situations lowering this number can improve the intensity of the beam since distance between the anode and cathode decreases.)



Normally, values between 55-62mm should be considered to be used in the first hand as higher values broadens the beam and gives less intensity and lower distances will increase the possibilities of sparks, causing the High Tension to trip.

Scanner Front End Computer (FEC).

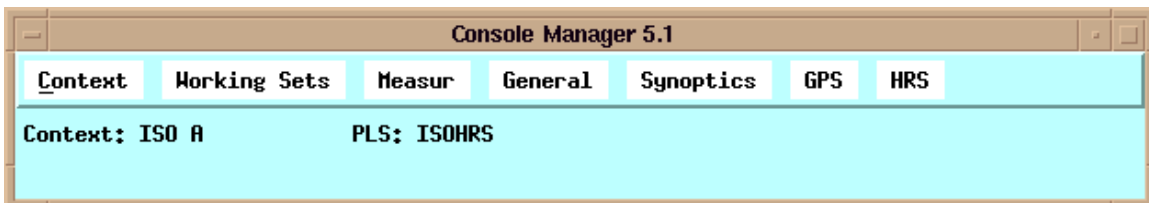
In the ICR, in rack “RA06” there is a Windows PC located.
This PC controls the various beam scanners that exists along the beam lines in the hall.
Occasionally this PC might block or the application running on it might crash, if this happens a reboot might be needed.
The FEC-program is located in the Windows autostart folder and should launch automatically upon next logon.

The following user information should be used while logging on:

User:
Password:

Vistar

The Vistar application sends its information onto the many TV-screens situated around CERN. Here one can find information about status of the booster, which accelerators taking proton beam etc. When the IMS starts his duty he should update the Vistar info so that users can see who is in charge of the ISOLDE machine.
The Vistar information can be accessed from the ISOLDE Console Manager under “General” and then GPS/HRS Vistar Infos”.



The GPS/HRS Vistar info needs to be filled in separately.

Below is an example of how the entry window for the GPS Vistar looks:

