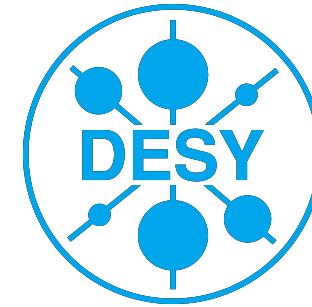


Preparation for ZZ and recovery after access

Thomas Wamsat

February 5, 2019



Topics

- ◆ Magnet current during ZZ
- ◆ ZZ Injector
- ◆ Restart Injector after ZZ
- ◆ ZZ XTL
- ◆ Restart XTL after ZZ
- ◆ ZZ XTD-1-3-4-7-
- ◆ Restart XTD-1-3-5-7 after ZZ
- ◆ ZZ XTD-2-4-10-
- ◆ Restart XTD-2-4-10- after ZZ
- ◆ ZZ and Restart XTD6 and XTD9
- ◆ Useful hint

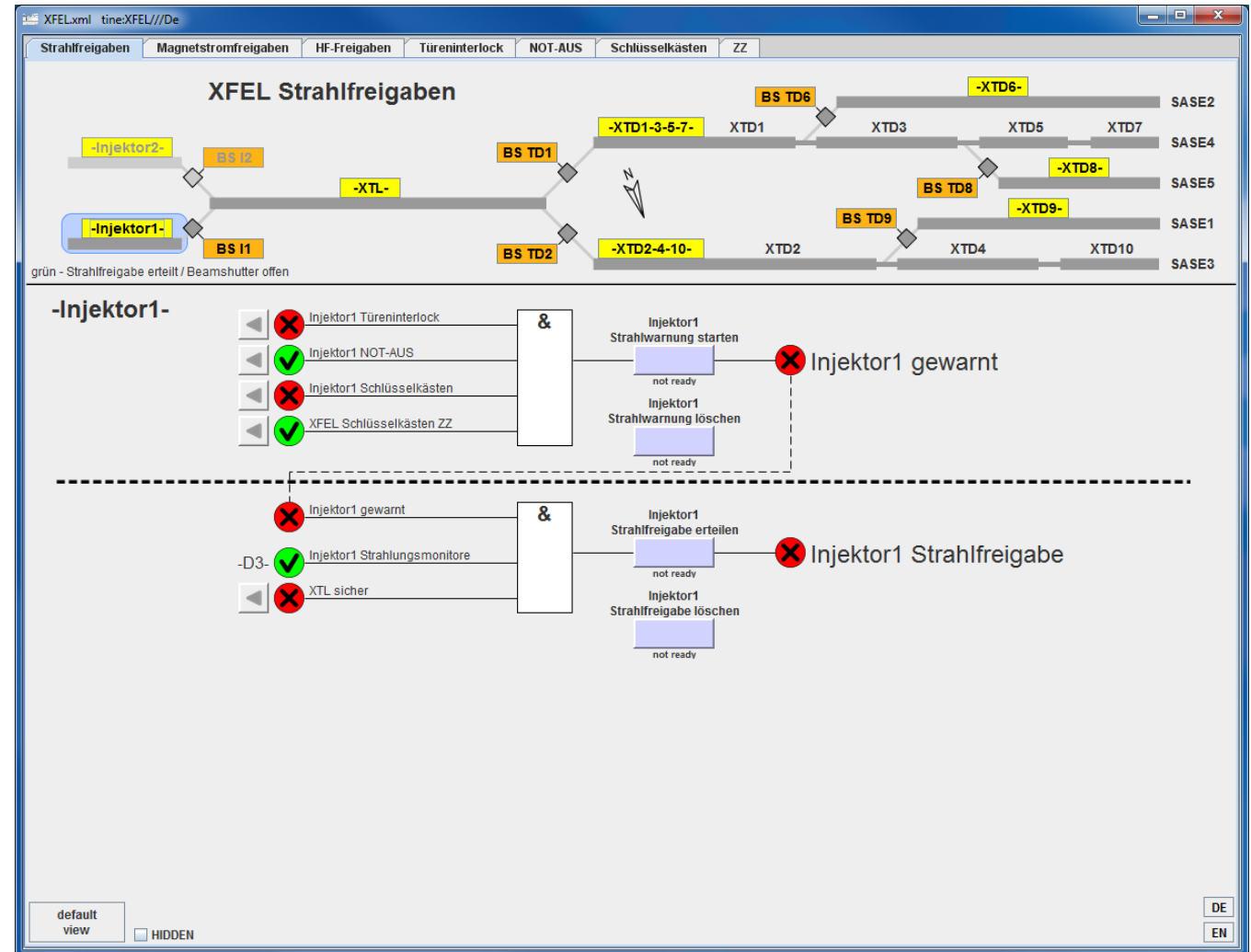
Magnet current during ZZ

- ◆ Before ZZ with magnets under current, MXL or RCs make a safety audit to ensure that there is no work near the beam pipe
- ◆ Point out to the colleagues who enter the tunnel that the magnet current is on
- ◆ Also the shift leaders should point that out while the ZZ team enters the ZZ door
- ◆ Under this conditions ZZ with magnets under current and without attendance of MKK colleagues is permitted

- ◆ Injector and XTL all magnet connections are covered
- ◆ XTD1-3-5-7 and XTD2-4-10 not every magnet connection is covered sufficiently
 - ◆ In XTD1-3-5-7 and XTD2-4-10 using a bike with magnets under current is prohibited

ZZ areas

- ◆ Injector
- ◆ XTL
- ◆ XTD1-3-5-7 (SASE2 branch)
- ◆ XTD2-4-10 (SASE1 branch)
- ◆ XTD6 (SASE2 Photon tunnel)
- ◆ XTD9 (SASE1 photon tunnel)
- ◆ XTD8 (empty tunnel)



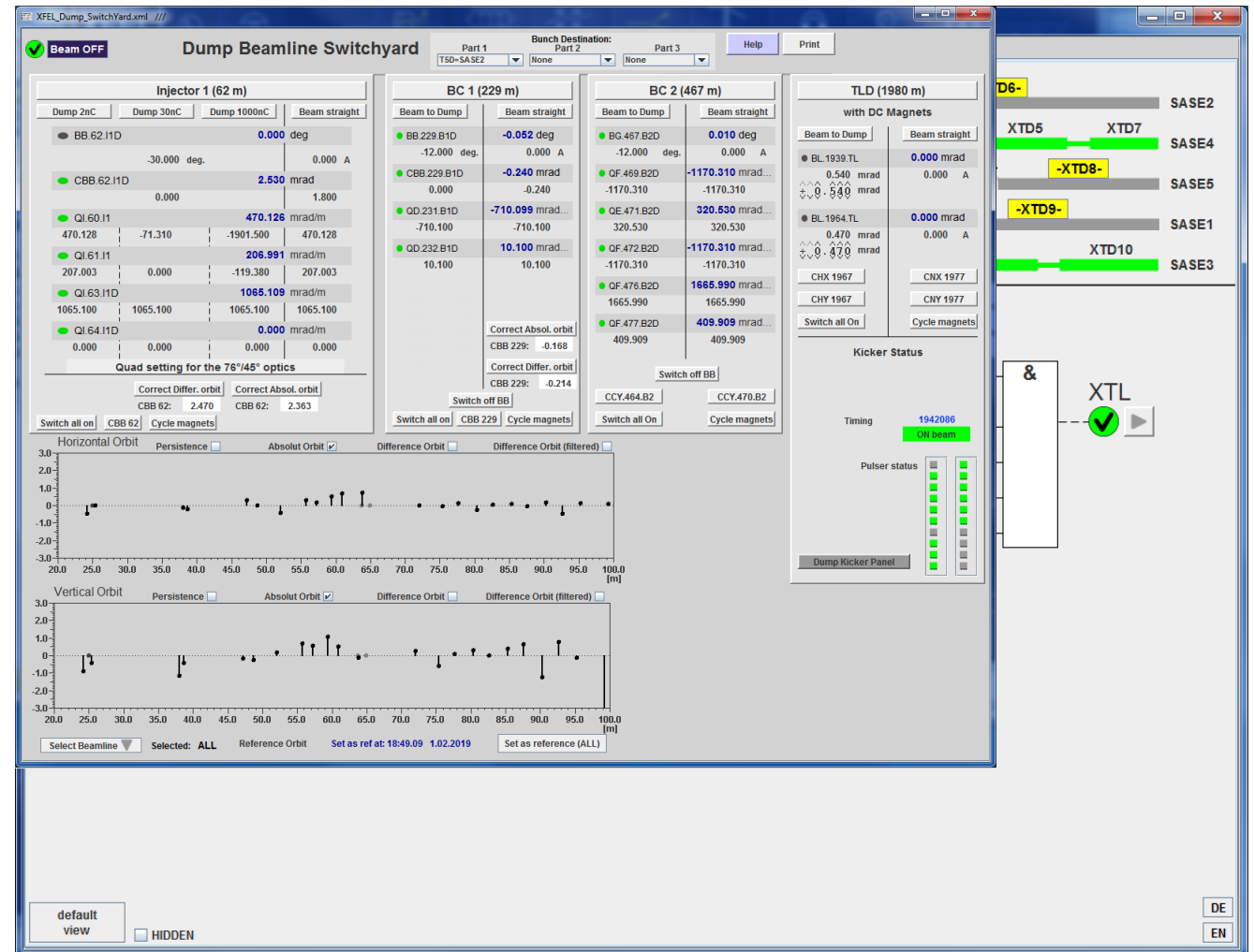
ZZ Injector

- ◆ Save a file (sequencer)
- ◆ Use sequence “Separate Injector from XTL” (required to close BS TD1)
- ◆ Switch of RF
 - ◆ GUN
 - ◆ A1 and AH1 (with energy manager)
 - ◆ Injector TDS (uncheck RF on/off)
- ◆ In case of work near beam pipe, switch off and ground magnets
 - ◆ Use ‘Magnet overview’ panel to switch off magnets and ask MKK for grounding (also Dump dipole will be switched off, no effect on XTL beam permission)



Restart Injector after ZZ

- ◆ Ask MKK to unground magnets
- ◆ Switch on magnets and load file values
- ◆ Switch on BB.62.11D (use “Dump Switch” panel)
- ◆ Switch on RF
 - ◆ GUN (see training “GUN operation”)
 - ◆ A1 and AH1 with energy manager
 - ◆ Injector TDS
- ◆ Use sequence “Join Injector with XTL”



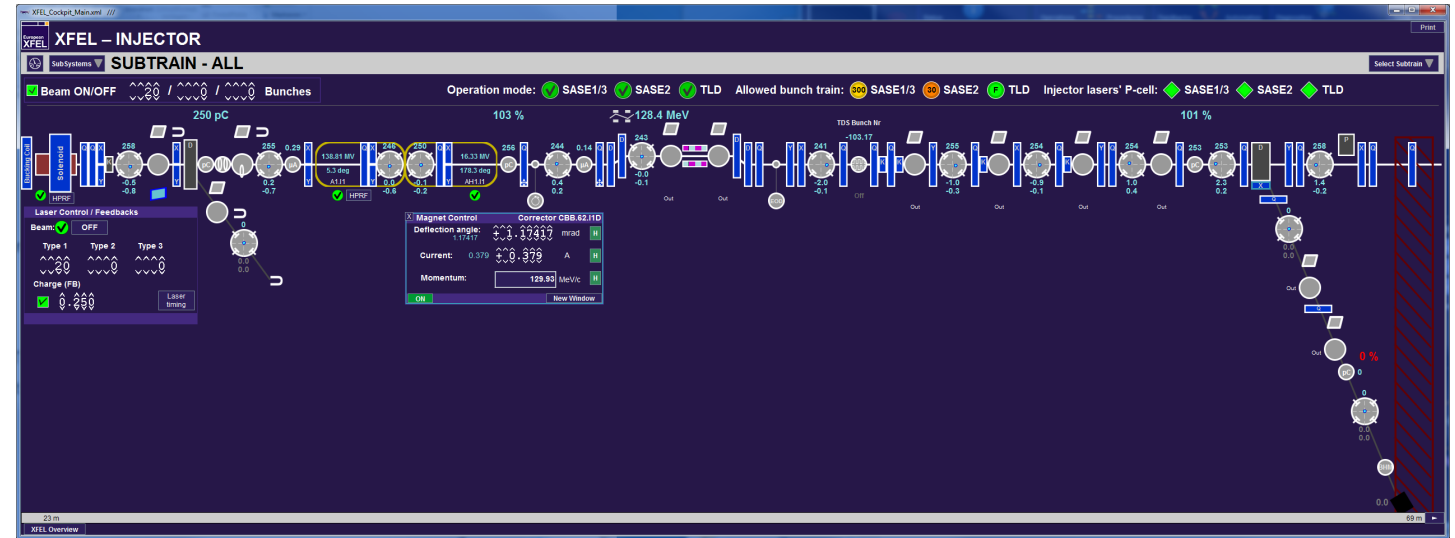
ZZ XTL

- ◆ Save a file
- ◆ Set golden orbit in orbit FBs
- ◆ Use sequence “Separate Injector from XTL” to keep Injector running
- ◆ Shut down RF by using “Linac Energy Manager”
- ◆ Shut down TDS B2 (press STBY)
- ◆ In case of work near beam pipe, switch off and ground magnets
 - ◆ Use ‘Magnet overview’ panel to switch off magnets by clicking on each section and press Switch off
 - ◆ Ask MKK for grounding



Restart XTL after ZZ

- ◆ Unground magnets
- ◆ Switch on magnets and load file
- ◆ Cycle all main magnets
- ◆ Ask Shift leader for beam permission
- ◆ Restart RF using the 'Linac Energy Manager'
 - ◆ See training "LLRF"
- ◆ Use sequence "Join Injector with XTL"
- ◆ Use corrector CBB.62.I1D to correct orbit and re-establish transmission
- ◆ Switch on orbit FBs to re-establish transmission



ZZ XTD1-3-5-7 (South branch SASE2)

- ◆ Save a file
- ◆ Set golden orbit in orbit FBs
- ◆ Use sequence “Separate SASE2 from XTL”
- ◆ In case of work near beam pipe, switch off and ground magnets
 - ◆ Use ‘Magnet overview’ panel to switch off magnets by clicking on each section and press Switch off
 - ◆ Ask MKK for grounding

Sequencer Control

SEQUENCE: Separate SASE2 from XTL
Filename: separate_xtl_sase2.xml

Sequencer Control: STATUS: Idle

User Parameters
Close valve: yes

enabled	description	status	remarks	restore	check	user actions
<input checked="" type="checkbox"/>	1 Switch off special grounding magnets	-		6 data	6 data	

XFEL MAGNET OVERVIEW

Some magnets need cycling
Cycling: show | hide

Magnet groups for entire beamlines (gun to dump):
Gun-G1D Gun-I1D Gun-B1D Gun-B2D Gun-T1D Gun-T4D Gun-T5D

MAG_I1D

Show: ☒ All ☐ Busy ☐ On ☐ Clean ☐ Error ☐ Off ☐ Dirty

Switch Group Magnets:

Number of magnets: 30
Ignored: none

✓ All OK
○ Some/all off
! Cycling needed
✓ All Idle

SOLA.23.11	SOLB.23.11	QLN.23.11	QLS.23.11	CKX.23.11	CKY.23.11	CKX.24.11	CKY.24.11	CKX.25.11	CKY.25.11	Q.37.11	CY.37.11
ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON
air coil	air coil	air coil	air coil	air coil	air coil	air coil	air coil	air coil	air coil	need cycling	need cycling
0.0096 T	0.2002 T	0.01 rad/m	0.01 rad/m	0.725 mrad	0.882 mrad	0.707 mrad	0.670 mrad	0.023 mrad	0.003 mrad	-0.49 rad/m	0.408 mrad
24.10 A	333.70 A	0.27 A	0.53 A	1.93 A	2.34 A	1.88 A	1.78 A	0.06 A	0.01 A	-2.22 A	1.11 A
PS	PS	PS	PS	PS	PS	PS	PS	PS	PS	PS	PS
Switched on	Switched on	Switched on	Switched on	Switched on	Switched on	Switched on	Switched on	Switched on	Switched on	Switched on	Switched on
No fault	No fault	No fault	No fault	No fault	No fault	No fault	No fault	No fault	No fault	No fault	No fault

Restart XTD1-3-5-7 after ZZ

- ◆ Use sequence “Join SASE2 with XTL”
- ◆ Cycle special grounded magnets
- ◆ In case magnets were grounded, unground, switch on and reload file and cycle main magnets
- ◆ Switch on orbit FB to re-establish transmission

The screenshot displays the XFEL control interface. The top window, titled 'XFEL Strahlfreigaben', shows a beamline diagram with various components like injectors, beam splitters (BS), and X-ray tubes (XTD). Below the diagram, a sequence of steps is shown: 'Strahlfreigabe XTD1-3-5-7' (checked), 'BS TD1 öffnen' (not ready), and 'BS TD1 öffnen' (checked). A second window, titled 'T1/T2 SPECIAL MAGNET GROUNDING', is overlaid on the first. It contains a red circle with the text '!!!! Use sequences instead of this panel !!!!'. Below this, there are sections for 'T1 Special Grounding for XTD1 Access' and 'T2 Special Grounding for XTD2 Access', each with a list of magnets and their status (grounded or ungrounded). A third window, titled 'SEQUENCE: Join SASE2 and XTL', is also visible, showing a table with columns for 'tatus', 'remarks', 'restore', 'check', and 'user actions'.

T1 Special Grounding for XTD1 Access

!!!! Use sequences instead of this panel !!!!

Access blocked (magnets not grounded)

Ground Magnets (Permit Access) Unground Magnets (Block Access)

Circuit BD.1.T1: ☒ BD.2077.T1 ☒ BD.2079.T1 ☒ BD.2080.T1 ☒ BD.2082.T1

Circuit QF.6.T1: ☒ QF.2083.T1

Circuit BD.3.T1: ☒ BD.2084.T1

Circuit BD.4.T1: ☒ BD.2097.T1

Circuit QF.7.T1: ☒ QF.2098.T1

Circuit QF.8.T1: ☒ QF.2110.T1

T2 Special Grounding for XTD2 Access

Access blocked (magnets not grounded)

Ground Magnets (Permit Access) Unground Magnets (Block Access)

Circuit QF.1.T2: ☒ QF.2072.T2 ☒ QF.2087.T2 ☒ QF.2102.T2 ☒ QF.2117.T2

QF.2132.T2

Circuit BD.10.T2: ☒ BD.2079.T2

BD.10.T2 > I_{min}

SEQUENCE: Join SASE2 and XTL

STATUS: idle CLOSE window

tatus	remarks	restore	check	user actions
-			1 data	
-		2 data	2 data	
-			1 data	
-		1 data	1 data	
-			6 data	
-		6 data	6 data	
-		1 data	1 data	

ZZ XTD2-4-10 (North branch SASE1/3)

- ◆ Save a file
- ◆ Set golden orbit in orbit FBs
- ◆ Use sequence “Separate SASE1/3 from XTL”
- ◆ In case of work near beam pipe, switch off and ground magnets
 - ◆ Use ‘Magnet overview’ panel to switch off magnets by clicking on each section and press Switch off
 - ◆ Ask MKK for grounding

The screenshot displays the European XFEL control interface. The top panel shows the 'Sequencer' window with the sequence 'Separate SASE1/3 from XTL' loaded. Below this is the 'Magnet Overview' panel, which shows a beamline diagram with magnets highlighted in green and yellow. A red circle highlights the 'Switch Off' button in the 'Magnet Overview' panel. The bottom panel shows a table of magnet groups and their status.

enabled	description	status	remarks	restore	check	user actions
<input checked="" type="checkbox"/>	1 Switch on BD.2079.T2	-		1 data	1 data	

Magnet groups for entire beamlines (gun to dump):																																																																																																			
Gun-G1D	Gun-I1D	Gun-B1D	Gun-B2D	Gun-T1D	Gun-T4D	Gun-T5D																																																																																													
<table border="1"> <thead> <tr> <th>MAG_1D</th> <th>SOLA.23.11</th> <th>SOLB.23.11</th> <th>QLN.23.11</th> <th>QLS.23.11</th> <th>CKX.23.11</th> <th>CKY.23.11</th> <th>CKX.24.11</th> <th>CKY.24.11</th> <th>CKX.25.11</th> <th>CKY.25.11</th> <th>Q.37.11</th> <th>CY.37.11</th> </tr> </thead> <tbody> <tr> <td>air coil</td> <td>air coil</td> <td>air coil</td> <td>air coil</td> <td>air coil</td> <td>air coil</td> <td>air coil</td> <td>air coil</td> <td>air coil</td> <td>air coil</td> <td>air coil</td> <td>need cycling</td> <td>need cycling</td> </tr> <tr> <td>0.0096 T</td> <td>0.2002 T</td> <td>0.01 rad/m</td> <td>0.01 rad/m</td> <td>0.725 mrad</td> <td>0.882 mrad</td> <td>0.707 mrad</td> <td>0.670 mrad</td> <td>0.023 mrad</td> <td>0.003 mrad</td> <td>-0.49 rad/m</td> <td>0.408 mrad</td> </tr> <tr> <td>24.10 A</td> <td>333.70 A</td> <td>0.27 A</td> <td>0.53 A</td> <td>1.93 A</td> <td>2.34 A</td> <td>1.88 A</td> <td>1.78 A</td> <td>0.06 A</td> <td>0.01 A</td> <td>-2.22 A</td> <td>1.11 A</td> </tr> <tr> <td>PS</td> <td>PS</td> <td>PS</td> <td>PS</td> <td>PS</td> <td>PS</td> <td>PS</td> <td>PS</td> <td>PS</td> <td>PS</td> <td>PS</td> <td>PS</td> </tr> <tr> <td>Switched on</td> <td>Switched on</td> <td>Switched on</td> <td>Switched on</td> <td>Switched on</td> <td>Switched on</td> <td>Switched on</td> <td>Switched on</td> <td>Switched on</td> <td>Switched on</td> <td>Switched on</td> <td>Switched on</td> </tr> <tr> <td>No fault</td> <td>No fault</td> <td>No fault</td> <td>No fault</td> <td>No fault</td> <td>No fault</td> <td>No fault</td> <td>No fault</td> <td>No fault</td> <td>No fault</td> <td>No fault</td> <td>No fault</td> </tr> </tbody> </table>														MAG_1D	SOLA.23.11	SOLB.23.11	QLN.23.11	QLS.23.11	CKX.23.11	CKY.23.11	CKX.24.11	CKY.24.11	CKX.25.11	CKY.25.11	Q.37.11	CY.37.11	air coil	air coil	air coil	air coil	air coil	air coil	air coil	air coil	air coil	air coil	air coil	need cycling	need cycling	0.0096 T	0.2002 T	0.01 rad/m	0.01 rad/m	0.725 mrad	0.882 mrad	0.707 mrad	0.670 mrad	0.023 mrad	0.003 mrad	-0.49 rad/m	0.408 mrad	24.10 A	333.70 A	0.27 A	0.53 A	1.93 A	2.34 A	1.88 A	1.78 A	0.06 A	0.01 A	-2.22 A	1.11 A	PS	PS	PS	PS	PS	PS	PS	PS	PS	PS	PS	PS	Switched on	Switched on	Switched on	Switched on	Switched on	Switched on	Switched on	Switched on	Switched on	Switched on	Switched on	Switched on	No fault	No fault	No fault	No fault	No fault	No fault	No fault	No fault	No fault	No fault	No fault	No fault
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Restart XTD2-4-10 after ZZ

- ◆ Use sequence “Join SASE1/3 with XTL”
- ◆ Cycle special grounded magnets
- ◆ In case magnets were grounded, unground, switch on and reload file and cycle main magnets
- ◆ Switch on orbit FB to re-establish transmission

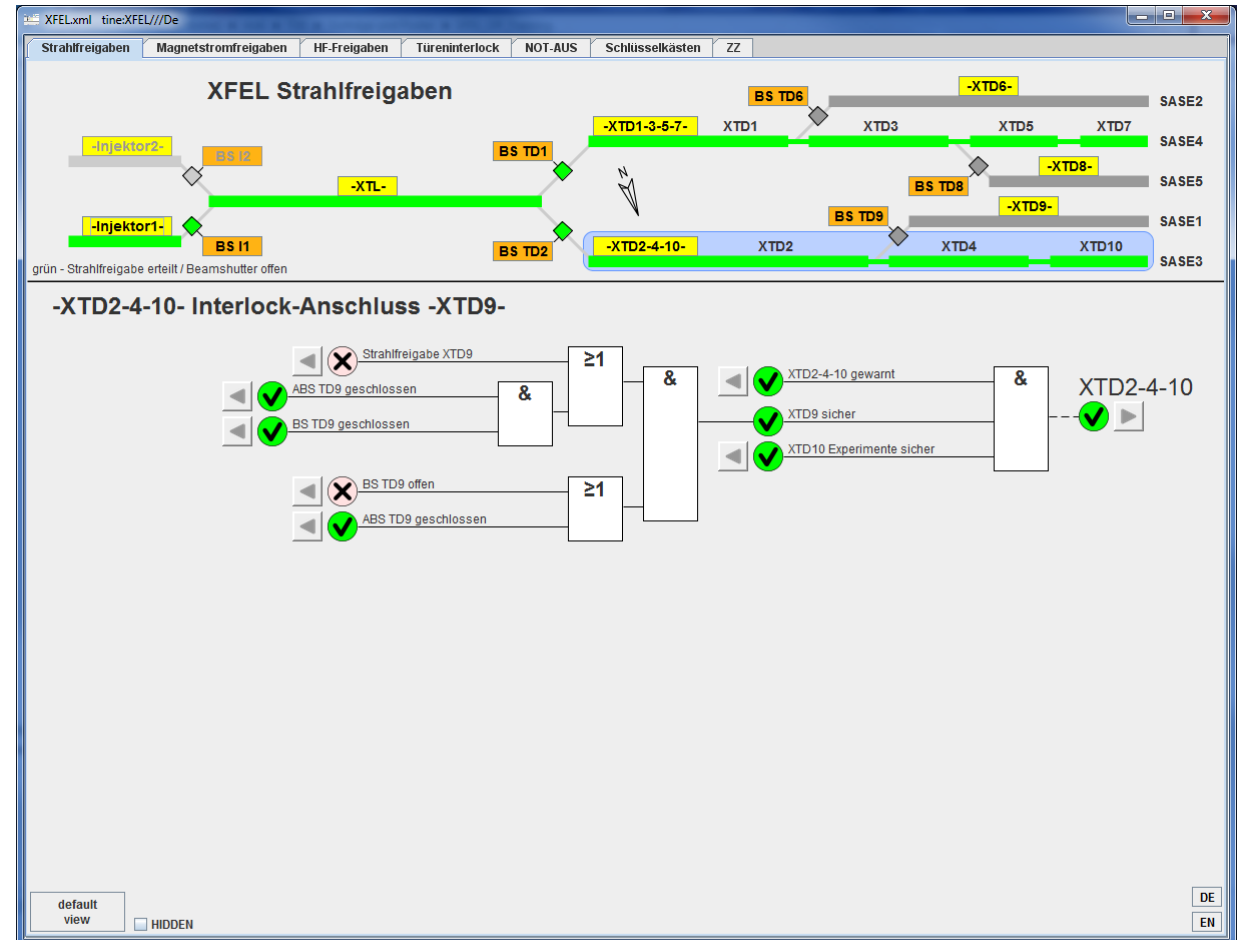
The screenshot displays the XFEL control interface with the following components:

- XFEL Strahlfreigaben**: A beamline diagram showing various magnets and beam shutters. The sequence includes: -Injektor2-, BS I2, -XTL-, BS I1, BS TD1, -XTD1-3-5-7-, XTD1, BS TD6, -XTD6-, SASE2, XTD3, XTD5, XTD7, SASE4, -XTD8-, BS TD8, -XTD9-, BS TD9, XTD4, XTD10, SASE3, and -XTD2-4-10-. A status message at the bottom reads: "grün - Strahlfreigabe erteilt / Beamshutter offen".
- BS TD2**: A control panel for beam shutter BS TD2. It shows a sequence: "Strahlfreigabe XTD2-4-10" (green checkmark), "BS TD2 öffnen" (blue button, "not ready"), and "BS TD2 öffnen" (green checkmark).
- Sequence Window**: A window titled "SEQUENCE: Join SASE1/3 and XTL" with a green status indicator.
- T1/T2 SPECIAL MAGNET GROUNDING**: A panel for managing magnet grounding. It includes:
 - T1 Special Grounding for XTD1 Access**: A warning "!!!! Use sequences instead of this panel !!!!", a red "X" icon, and the text "Access blocked (magnets not grounded)". It has buttons for "Ground Magnets (Permit Access)" and "Unground Magnets (Block Access)". Below are lists of magnets with checkboxes:
 - Circuit BD.1.T1: [X] BD.2077.T1, BD.2079.T1, BD.2080.T1, BD.2082.T1
 - Circuit QF.6.T1: [X] QF.2083.T1
 - Circuit BD.3.T1: [X] BD.2084.T1
 - Circuit BD.4.T1: [X] BD.2097.T1
 - Circuit QF.7.T1: [X] QF.2098.T1
 - Circuit QF.8.T1: [X] QF.2110.T1
 - T2 Special Grounding for XTD2 Access**: A similar warning and "Access blocked (magnets not grounded)" message. It also has "Ground" and "Unground" buttons. Below are lists of magnets:
 - Circuit QF.1.T2: [X] QF.2072.T2, QF.2087.T2, QF.2102.T2, QF.2117.T2
 - QF.2132.T2
 - Circuit BD.10.T2: [X] BD.2079.T2
 - BD.10.T2 > I_{min}
- STATUS: idle**: A status indicator with a "CLOSE window" button.
- Table**: A table with columns: status, remarks, restore, check, and user actions. It contains 12 rows of data.

status	remarks	restore	check	user actions
-			1 data	
-		2 data	2 data	
-			1 data	
-		1 data	1 data	
-			1 data	
-		1 data	1 data	
-		1 data	2 data	
-		1 data	1 data	
-		1 data	1 data	
-		1 data	1 data	
-		1 data	1 data	
-		1 data	1 data	

ZZ XTD6 and XTD9

- ◆ No magnets in this areas
- ◆ For ZZ in XTD6 close BS TD6
- ◆ For ZZ in XTD9 close BS TD9



Useful hint

- ◆ Beam warning, as requirement for beam permission, for any interlock section can only be given, when all interlock keys are locked

Thank you!

Questions?

