Swiss Light Source

Beamline X11MA

Surface / Interface: Microscopy

Manual



Version: 1.1 C. Quitmann 25-Mar-04

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1.) Contact / Phone numbers

List of people and their phone numbers to contact in case of problems.

Location:

- · Phones are available @ the PEEM, and in all control hutches
- PSI telephone numbers: dial the 4-digit number directly.
- Swiss numbers: dial 0 + area code + number
- International: call 111 (switchboard) and ask to be connected

EMERGENCY		3333
F. Nolting	Beamline scientist	5111
C. Quitmann	Beamline scientist	4560
J. Raabe	Postdoc	5193
T. Ramsvik	Postdoc	4758
Local contact	Cell phone	0 079 385 0420
Backup local contact	Cell phone	0 079 385 0450
Beamline portable phone	PSI only	5978
Controls hutch		5139
PEEM		5102
SLS operator	Control room	5503

Potential problems:

> At night the switchboard operator might take a while to answer. Hang on.

2.) Safety

Where to get help in case of an accident.

Paul Scherrer Institut Emergency Instructions

[deutsche Version]

Alarm Signals	Emergency Instructions
Building Evacuation Alarm	Close the windows
	 Switch off PCs and small ventilators
acoustic signal: • • • • • • • • •	 Bring experiments in a safe state
	 Evacuate any building in which an alarm is sounding
Signal lasts 90 seconds	
Blue lights flashing in buildings where alarms are	 Follow the "Emergency Exit" signs to the marked assembly
sounding	point
Sections of NFO staff in action	 At the encomply point, whit for instructions from the NEO stoff.
	 At the asseniory point, wait for instructions from the for o stan, and follow them
	and follow utem
Emergeny Alarm	Stay where you are
	 Close all doors and windows
acoustic signal:	 If possible, obtain information via the PSI-Intranet
C	 Wait for instructions from the NFO staff, and follow them
Signal lasts 90 seconds	
Complete NFO staff in action	
End of Alarm	 All emergency instructions lifted
	 Resume normal activity
acoustic signal:	
Continuous tone lasts 60 seconds	



Ausserhalb der Arbeitszeit: 3333Homepage of PSI safety staff:

http://services.web.psi.ch/safety/

3.) Data Saving & Directory Structure

Where to save data and how to access them.

3.1.)Windows

Location:

- Logical: Any Windows PC on the SLS-net
- Physically: PC4030 @ PEEM or PC3653 & PC2505 @ controls hutch

You should save your data under the eaccount assigned to you. This eaccount contains a folder public. Anybody has read access on this folder but only the eaccount holder has write access. By using this public folder of your eaccount, the beamline staff will be able to look at your data and assist you in case of questions later on.

Connect to your Eaccount:

 Click on the "SLS Beamline Explorer" located on the PC desktop:



	🖆 \\slsfs01\winconfpub\BeamlineLogon					
	<u>File E</u> dit <u>V</u> iew F <u>a</u> vorites <u>T</u> ools	Help			💦 🕺	
	🚱 Back 👻 📀 👻 🏂 Searc	:h 😥 Folders 🛛 🖟	è 论 🗙 🍫 👔	.		
	Address 🛅 \\slsfs01\winconfpub\Beamlin	eLogon			💌 🔁 Go	
	Name 🔺	Size	Туре	Date Modified		
	🚞 Script		File Folder	26.03.2003 15:17		
	🚞 x04sa		File Folder	28.10.2003 16:09		
	🚞 x05da		File Folder	24.09.2003 09:42		
	🚞 x05db		File Folder	07.03.2003 15:03		
	🚞 x05la		File Folder	24.09.2003 09:43		
	🚞 x06sa 🥒		File Folder	23.10.2003 10:22		
	🚞 x07ma		File Folder	11.08.2003 13:14		
	🚞 x09la		File Folder	30.09.2003 12:46		
Q	🚞 x11ma		File Folder	21.10.2003 16:23		
	1125a		File Folder	07.03.2003 15:03		

Click on x11ma

0

- o Select your eaccount from the list
- Type in your password

Your eaccount is now mounted as drive X:

Public accounts are mounted as drive Y:\ and have public read access.

3.2.)Linux

Location:

- Logical: Any LINUX PC on the SLS-net
- Physically: PC3187 next to PEEM or PC3670 in controls hutch

Connect to your eaccount:

- Open shell and type: blmount x11ma exxxx (where exxxx is your eaccount number)
- Type your password.

Your eaccount is now mounted as /sls/X11MA/data/X11MA/slbl/X11ma/exxxx.

o To unmount type: blunmount.

X11MA / SIM-Beamline Manual

Known problems:

- Only one eaccount can be connected at any given time: Disconnect the other eaccount and connect your own.
- The passwords for the Digital Users Office (DUO) and for the eaccount are different! You can change your DUO password by going to: http://sls.web.psi.ch/goto.php/duo/lost_passwd.php
- > If you don't know your eaccount number:

-			
e10081	blop11	BLOP X11MA	rene.kapeller@psi.ch
e10087	blop11	e10087	christoph.quittmann@psi.ch
e10111	Urs Staub	e10111	urs.staub@psi.ch
e10143	Jin Won Seo	e10143	jinwon.seo@epfl.ch
e10161	Kapeller Rene	e10161	rene.kapeller@psi.ch
e10251	Beamline User	e10251	wider@physik.unizh.ch
e10252	Beamline User	e10252	arantxa@fysik.uu.se
e10253	Beamline User	e10253	Mathias@Klaeui.de
e10254	Beamline User	e10254	andreas.scheybal@psi.ch
e10255	Beamline User	e10255	eric.dooryhee@grenoble.cnrs.fr
e10256	Beamline User	e10256	kristiaan.temst@fys.kuleuven.ac.be
e10257	Beamline User	e10257	urs.staub@psi.ch
e10258	Beamline User	e10258	valerio.scagnoli@psi.ch
e10259	Beamline User	e10259	christoph.quitmann@psi.ch
e10260	Beamline User	e10260	peter.fischer@mf.mpg.de
e10261	Beamline User	e10261	frithjof.nolting@psi.ch
e10262	Beamline User	e10262	joerg.raabe@psi.ch
e10263	Beamline User	e10263	andreas.scheybal@psi.ch
e10264	Beamline User	e10264	stefano.rusponi@epfl.ch
e10265	Beamline User	e10265	jinwon.seo@epfl.ch
e10266	Beamline User	e10266	bernhard.schnyder@psi.ch
e10267	Beamline User	e10267	hillebre@ifp.fzk.de
e10268	Beamline User	e10268	greber@physik.unizh.ch
e10269	Beamline User	e10269	amarty@cea.fr
e10270	Beamline User	e10270	jean-marc.tonnerre@grenoble.cnrs.fr

> If you forgot your password:

Go to the SLS DUO website [http://sls.web.psi.ch/goto.php/duo/lost_passwd.php] using any web browser. Provide your email and it will be sent to you.

4.) Start & Stop Beamline

How to open the beamline for the experiment & how close it when you're done.

Location

- Physical: any Linux terminal (controls hutch: PC3670, PEEM: PC4030)
- Software: use X11MA User Panel

4.1.)Start

Opening the beamline initially.

- o Set Operation Info Panel to attended.
- o Check polarization of IDs using ID Panel.

Using X11MA User Panel:

- Check that PGM+ID1 or PGM+ID1+ID2 is selected
- Set FE-slits to CLOSED.
- Open beamline valves by pressing TRY OPEN.
- Open endstation valves by pressing TRY OPEN (PEEM: 1, XMCD: 2, ES4: 4 valves).
- Open the shutter by pressing TRY OPEN (wait ~20sec).
- o Adjust intensity by increasing FE-Slit size: typical 1x1 mm

4.2.)Standby

Temporary turning the light off when going for lunch etc.

- o Set Operation Info Panel to unattended.
- o Close vale to endstation
- o Close FE-slit.

4.3.)Stop

Turning the light off when going home etc.

- Set Operation Info Panel to offline.
- o Close valve to endstation.
- Close the shutter by pressing *CLOSE* (wait ~20sec).

Known problems:

- > If photon shutter doesn't open check for LAC or EPS alarm.
- If FE-slit is opened to wide, this causes a pressure burst automatically shutting down the beamline. Reopen using EPS & LAC.

5.) X11MA User Panel

How to set the relevant beamline parameters using the GUI on a LINUX PC.

Location

- Physical: any Linux terminal (controls hutch: PC3670, PEEM: PC3187)
- Software: X11MA-Launcher \Rightarrow Synoptic Panel



Cooling, must be open Typically:

Typically: Grating2 Open & close beamline valves. Un

Undulator info



Advanced panel:



6.) Operation Info Panel

Displays storage ring information and operator messages. Provides operator with BL-status

Location

- Physical: any Linux terminal (controls hutch: PC3670, next to PEEM: PC3187)
- Software: X11MA-Launcher \Rightarrow Operation Info Panel

X-⊨ Operation	n Info Panel						• • ×	
File Viev	File View Help					Help		
1			A	ccelerator Statu	is, Mode:		- 143 	
Gun T	riaaer	TRIG		Kicker Mode	disarmed	Ini. Mode	TOP-UP	
Beam	current I	300.4	mA '	Top-Up to	300.0 mA	Top-Up step	1.00 mA	
Beam	lifetime T	7.5 h		Orbit FB X-Mod	e slow	Orbit X-RMS	1.16 µm	
Produ	ct I*T	2.25 A	h (Orbit FB Y-Mod	e slow	Orbit Y-RMS	0.33 µm	
		11-		Operator Me	sages			Attended:
Msg	1: 09.11.03	08:28	Att.	: Beamdump	Monday at	07:00h		user @ beamline
Msg	2: 08.11.03	14:46	300	mA Top-Up U	ser Opera	tion		
Msg	3:							Unattended:
Msa	4:							experiment running,
Msa	5							but user not @ beamline
- Wiog								
			Be	amline & Experi	ment Status			Offline: no experiment
Beamline	Insertio	n Devic	e	ID Status	Shutter	Experiments	_ Msg Status	
MS	X04SA	-ID-GA	P	8.0 mm	Open	unattended		
PX	X06SA	-ID-GA	P	7.64 mm	Open	attended		Confirm to
Lucia	X07MA-	ID1-GA	۱P	44.00 mm	Closed	unattended		turn sound
SIS	X09LA	-ID1-M	V	+30 A	Closed	unattended		off
	X09LA	-ID2-M	V	+30 A				
SIM	X11MA-	ID1-GA	١P	40.3 mm	Open (attended	All Read	D
-	X11MA-	ID2-GA	۱P	100.1 mm				
-								

7.) ID Panel

Setting photon energy, polarization and harmonic for the IDs.

Location:

• On Linux PC used to control beamline. Can be opened using OP Launcher(/work)⇒Undulator⇒ID1 Energy





Panel for ID2 is identical.

Change polarization / harmonic

If you are not using ImagePro software, you can set polarization / harmonic directly on the ID panels.

o Select polarization :CIRC+, CIRC-, LIN: hor., LIN: vert.

0	Select harmonic:	1 st :	146 – 971 eV
		3^{rd} :	283.7 – 2915 eV
		AUTO:	automatically selects right harmonic

Known problems:

Gap taper: To protect the mechanics the ID measures both upstream & downstream gaps. If their difference exceeds a limit it blocks the ID: "Gap Taper Error" this error can only be detected by going to the ID-Gap panel. Call the SLS-operator and ask to reset ID. For this they have to go to the ID rack, manually

Call the SLS-operator and ask to reset ID. For this they have to go to the ID rack, manually remove the taper and reset the SPS (~30min).

- Shift asymmetry: Same as gap taper, but happens for the longitudinal shift system. Call the SLS-operator and ask to reset ID. For this they have to go to the ID rack, manually remove the shift asymmetry and reset the SPS (~30min).
- Communication error: Loss of communication between programmable logic controller [PLC] and VME rack. Needs manual reset, call SLS-operator.

7.2.)ID1 / ID2 Gap panel

Detect error in ID due to taper / asymmetry.

Location:

• On Linux PC used to control beamline.

Can be opened using OP Launcher(/work) \Rightarrow Undulator \Rightarrow ID1 Gap / ID2 Gap



Use of ID1 / ID2 gap panel

Only used for diagnostics!

Known problems:

If TAPER or ASYMMETRY have value > 50µm: The ID can no longer be moved by software. It needs to be reset manually. Call SLS-operator.

8.) Equipment Protection System (EPS)

Using the EPS to diagnose problems (vacuum, cooling, ...).

See separate manual written by M. Spielmann (red binder @ controls hutch)

9.) Local Access Control [LAC]

Open photon shutter, reset LAC problems.

> Access to optical hutch requires dosimeter and approval of local contact!

Location:

- Box right of door to optical hutch.
- ٠



9.1.)Reset LAC Alarm

- Sometimes the LAC produces alarms, indicated by a lit alarm LED on the panel.
- Reset the alarm by pressing the three buttons marked in the above photo at the same time.

Attention – LAC:

- > There are no user serviceable parts in the optical hutch.
- > For LAC problems contact the SLS operator.

10.) Start and stop PEEM

Turning PEEM on in preparation for image acquisition and turning it off at the end of the experiment.



10.1.) Channelplate



10.1.1 Turn ON

- o Check that both potentiometers are zero
- o Switch supply ON
- Increase voltages waiting ~5sec between each step:

U _{MCP}	UPhosphor
0	1000
250	2000
500	3000
750	4000
1000	5200
1250	5200

10.1.2 Operating MCP

0	U _{MCP} :	1100 – 1350 V	adjust to change image intensity
0	U _{Phosphor} :	5200 V	keep fixed

10.1.3 Turn MCP OFF

• Decrease voltages waiting ~5sec between each step:

U _{MCP}	UPhosphor
Start value	2500
0	2500
0	0

• Switch MCP supply OFF.

Attention - Channelplate:

- Channelplate is expensive (20KCHF) and easily damaged!
- > U_{MCP} must always be smaller than $U_{Phosphor}$, but voltage difference < 4500 V
- To high intensity destroys channelplate. Watch out for bright spots on sample. Rule of thumb: exposure 100 ms, intensity < 25% or < 1000 counts.</p>
- > Do not exceed $U_{MCP} = 1350 \text{ V!}$

10.2.) Turn PEEM high voltage ON



- o Switch HV: ON
- Increase HV to 10 kV in ca. 30 sec.
- Increase in 1 kV steps to 20 kV watching the pressure (MAIN on vacuum gauge) $p(HV=0) \sim 1 \ 10^{-9} \text{ mbar}$ $p(HV=20 \text{ kV}) \leq 4 \ 10^{-9} \text{ mbar}$

Attention – Discharge:

- Discharges between the 20 kV and ground can happen. Usually they are harmless, but intense discharges may destroy the electronics, large numbers of discharges may destroy the sample.
- Smaller discharge: Start voltage is set to 1 kV and maybe energy analyzer is switched off.
 Wait for about 2 minutes, usually start voltage returns to set value automatically. If not click on corresponding fields in LEEM 2000 panel.
- Big discharge: HV and channel plate switch off! Start again: potentiometers for channel plate and HV = zero press HV-reset, HV-ON, start channelplate

10.3.) LEEM 2000 Software

This software controls all functions of the microscope. It is used for initial sample/image alignment.

Location

• Physical: PC4030 on desk next to PEEM racks



Field of view

10.4.) ImagePro Software

The ImagePro panel contains all software for image acquisition using the PEEM including all macros.

Location:

- Physical: PC4030 on desk right of PEEM racks
- Logical:



Start preview / acquisition:

- o Click: Acquire, Video opening Sensicam Cooke Driver panel.
- o Click Preview tab and Preview for preview
- Click acquire for single image acquisition

Using ImagePro macros:

o Click: Macro to get pull-down list of macros:



Saveimage	Saves current image using automatic file name
Configuration	Configures beamline & data path. Should be used after
	starting imagepro
Beamline	Sets beamline parameters like photon energy &
	polarization
LEEM2000	Sets parameters of microscope like objective lens, start
	voltage,
two_images	Acquires two images with different energy or polarization,
	displays ratio and saves images
absorption_spectrum	Acquires X-ray absorption scan for ≤ 5 predefined regions
	over selectable energy range
Photoemission_spectrum	Acquires photoemission spectrum for ≤ 5 predefined
	regions by scanning startvoltage
image_operation	Allows manipulation of any two open images (+, -, *, /)
MoveAndDivide	Manually move (x, y) an image and divide it by reference
	image
sp	All macros under sp are for beamline scientists only!

10.5.) Turn PEEM OFF

- Reduce HV to zero without waiting
- Switch off the high voltage (small High voltage on/off button)
- o Close beamline valve
- Turn channelplate off (10.1.3).

11.) Get first PEEM image

Getting initial image, once PEEM is turned on.

- Move sample to x = 0, y = 0
- \circ HV = 20 kV
- \circ Remove exit slit from energy analyzer (dial indicator = 10.5)
- Start ElmiView program

1 Shortcut to Ee2000

- o Set: Startvoltage = 0, FOV = $120 \mu m$, Objective = 1650 mA, Channelplate U_{MCP} = 1100V
- o Turn X-rays on by opening last valve
- o Adjust z-distance of sample so that image is bright in the center
- o Close X-rays by closing last valve
- o Start UV-lamp, wait 2 min, open UV-aperture
- \circ If necessary increase U_{MCP} ~ 1250 V
- Coarse align tilt:
 - Reduce intensity by closing UV-aperture ~ 90% Reduce Objective slowly to 1200 mA Center bright spot by turning tilt screws R_x and R_y Increase objective back to 1650 mA Open UV-aperture fully
- \circ Zoom to FOV = 50 μ m
- Find object to focus to (move x- & -y and focus using objective)
- $\circ~$ Adjust SEL: Changing SEL by ca. $\pm~0.2$ V should cause a movement of the image. Optimum setting for SEL is at turning point
- Focus again using objective
- ο Insert 25 μ m exit slit to energy analyzer (dial indicator = 16.5, 3 $\frac{1}{2}$ turns CW)
- Reduce channelplate ($U_{MCP} \sim 1100 \text{ V}$), close UV-aperture
- o Turn X-rays ON by opening last valve
- \circ Set start voltage = 0.4 V
- o Focus using objective
- o Exit ElmiView
- Start ImagePro:
 - \Rightarrow Acquire \Rightarrow Video \Rightarrow Preview
 - \Rightarrow Macro \Rightarrow configuration
 - \Rightarrow Macro \Rightarrow config beamline
- o Start data taking

This gives first X-ray image Check data path Configures beamline



12.) PCs @ X11MA

All PCs located at the beamline and used for data acquisition, analysis and WWW access.

Name	OP-System	Location	Network	Main purpose	
PC4030	∎-XP	PEEM desk (left)	SLS	PEEM data acquisition &	
		2 screens		analysis	
PC3187	LINUX	PEEM desk (right)	SLS	Beamline settings for PEEM	
				experiment	
PC3670	LINUX	Controls hutch	SLS	Beamline commissioning	
		2 screens		_	
PC2460	LINUX	Controls hutch	SLS	LINUX data analysis	
PC3653	I → AP	Controls hutch	PSI	Data analysis	
		next to printer		email	
				www access	
PC3188	LINUX	Laser cage	SLS	Magnetization dynamics	
		-		experiment	
PC2505	⊞ -XP	Controls hutch	SLS	XMCD experiment	

PCs available @ X11MA

Accounts available @ X11MA

System	Username	Password	Purpose
LINUX	Slsop	welcome	Connect to Keithley application
			Login for commissioning
VME	x11ma	welcome	Reboot VME.
			Must NOT be done by user!
⊞ -XP	EXXXX	Set by user	Set path for saving user data and
			retrieving it.
⊞ -XP	Slsuser	slsuser	Data analysis, email, www-
			access,

13.) Reopening beamline

Opening beamline after shutdown forced by EPS (pressure burst, cooling failure, ...).

Location:

- Prepare beamline using X11MA users panel on beamline control PC.
- Open shutter at LAC panel next to door of optical hutch.

Sequence to open photon shutter:



- Open cooling using X11MA user panel.
- Open beamline valves using X11MA user panel.
- Press TRY OPEN for the photon shutter using X11MA user panel. (This only sends a request to the LAC)



• Open the photon shutter by pressing OPEN on the LAC panel.

Known problems:

- After pressing TRY OPEN on the X11MA user panel you have ~30 sec topress the button on the LAC panel. If it doesn't work, try again and hurry up.
- If the door is not locked, press LOCK. Don't enter the hutch. In this case a hutch search would have to be performed by the SLS operator.