

ADDRESS Expert Guide

Ver. 25.01.2012

Contents

Optics	3
PGM	3
<i>Initialization.....</i>	<i>3</i>
<i>Reboot.....</i>	<i>4</i>
<i>Trobleshooting.....</i>	<i>4</i>
<i>Energy stabilization daemon</i>	<i>6</i>
<i>Evaluation of the offsets</i>	<i>6</i>
<i>Setting the offsets.....</i>	<i>6</i>
RIXS Endstation	7
CCD Server	7
ARPES Endstation.....	8
Bakeout-off procedure.....	8
Control system.....	9
Viewing history	9
PVs handling	9
Re-definition of the default printer.....	9
Connection to beamline console from outside	9
Connection to ARPES control PC from outside	9
Software development.....	10
<i>Python scripts</i>	<i>10</i>
<i>Matlab applications.....</i>	<i>10</i>
<i>Connection to the Linux cluster.....</i>	<i>11</i>
<i>Updating Launcher.....</i>	<i>11</i>
Useful data	12
Flux-optimal C_{ff} for different gratings and orders.....	12
Resolution.....	13
Flux normalized to resolving power.....	14
Flux normalized to slit width = 10 μm	15
Contacts.....	16

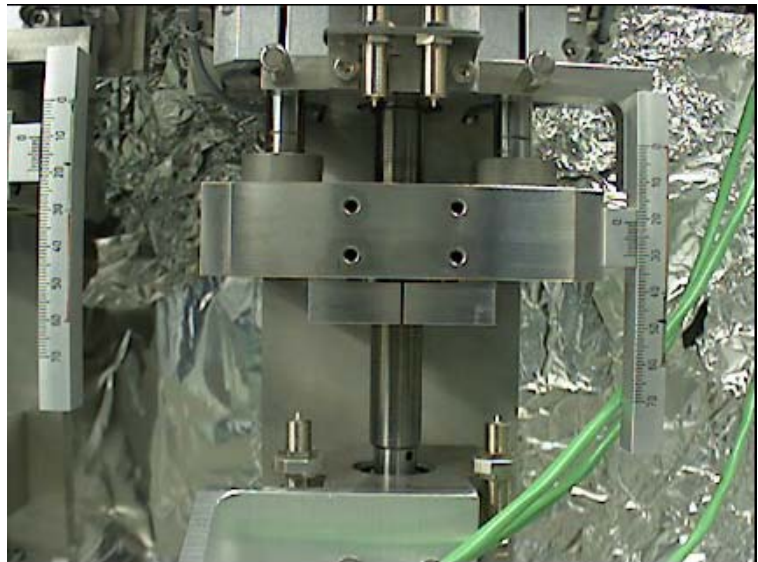
Optics

PGM

Initialization

- (1) If necessary, reboot the mono crate (see 'Reboot' below)
- (2) Launch the Encoder Expert Control Panel: Click 'Encoders' in the PGM Expert Panel
- (3) Open the live image of the PGM motors monitored by the web camera at <http://x03ma-cam-2.psi.ch>. The right ruler corresponds to the mirror, and the left to the monochromator. The green and red lines on the rulers mark two zones. If the at least one of the indicators (mirror or grating, or both) has its zero mark within the green zone, the movement is safe. If both indicators appear in the red zone, the mirror and grating may crash.

If the at least one of the indicators (mirror or grating, or both) has its zero mark within the green zone, the movement is safe. If both indicators appear in the red zone, the mirror and grating may crash.



- (4) It may be useful to have open the motor panel: Click 'Motors' in the PGM Expert Control Panel.

- (5) From the Encoder Expert Control Panel, first initialize the mirror. The order of actions is in the bottom of the panel:

- Click 'Crash motors off'
- Click a few times 'Reference' of the cards 1 and 2 till the status changes from 'Idle' to 'Reference X1/X2'. Try the same for the grating cards 1 and 2. If after a few attempts any of the cards do not respond, reboot the monochromator crate (see Troubleshooting).
- Click 'set open-loop'
- Click 'Search Reference'. The encoders are now frozen and wait for the reference mark. The motor starts search. Watch the movement of the indicator along the ruler. Upon touching the end switch the movement is reversed. **In case of unexpected crash risk situation during the reference search immediately stop the motors by the red button 'Halt' (or by 'STOP' buttons directly in the motor panels).** When the reference mark (indicator zero at ~5 mm for the mirror and 40 mm for the grating) is detected, the status indicators are changed to 'Idle'. The control loop will automatically switch to the close-loop state, and 'Use encoder readback' show 'Yes'.
- Change the update rate from 'Passive' to '0.01 s'.
- Click 'enc. track on'
- Click 'set open-loop' and then 'Use encoder readback'. This restores the close-loop motor settings. In the motor panel, check if the settings are correct (see below).

- (6) Repeat (5) for the grating motor.

- (7) PGM Expert Panel: confirm the grating selection by the gray selector 'select grating' and then 'change grating'. Set some C_{ff} and energy.

Reboot

Tumble the 'Inhibit' switch at the PGM rack into the position '1' and after a few seconds return to '0'. Run the initialization procedure.

Troubleshooting

(1) *Problem:* After an attempt to set energy in the PGM Expert Panel after the initialization, the motors are disabled which is indicated by black 'theta' and 'beta' fields.

Reason: The monochromator is in crash risk.

Solution: Return to the live image of the monochromator motors. If you are confident there is no crash risk (mirror or grating in the green zone) in the PGM Expert Panel click 'crash monitor OFF' and set some reasonable energy, watching if the monochromator all the way stays in the no-risk zone. After returning to 'no risk' position the 'crash monitor ON' returns. If you are not confident, go to the motor panels and manually move into the no-risk zone, and proceed as above.

(2) *Problem:* During the initialization the indicators of the PGM motors at the rulers (see the live image) in the show the crash risk situation (zero marks of both indicators are in the red zone).

Reason: Motors out of control.

Solution: First of all, **immediately stop the motors** from the motor panels. In the Monochromator Expert Panel set the selector 1 to 'crash monitor off'. In the RON Expert Control Panel click the gray button 'open-loop'. In the motor panel the 'Use Readback' field will turn 'No'. Carefully move the motors manually away from the crash risk zone. Repeat the initialization and set the switch 'crash monitor on'.

(3) *Problem:* During the initialization or normal changes of photon energy or C_{ff} , PGM does not find the desired position and keep uncontrollably moving. Normally in the RON Expert Control panel in the field 4 there appears a red message 'ENC TRACK ERR'.

Reason: The motor travel is too large for the desired accuracy of the final position.

Solution: Stop the motors by clicking the red button 'EMERGENCY STOP'. Acknowledge the error message by clicking 'ACK' on the right. Put greater value in the tolerance field 5. Resume the motor movement. Upon reaching the final position you can return the smaller tolerance movement and make another movement iteration.

(4) *Problem:* PGM misses the desired energy by a few tenth of eV.

Reason: Predictor-corrector scheme and tolerance of the monochromator energy change trajectory, as well as the motor settings are not optimal. The panels given in this document show the normal settings for the mirror and grating motors.

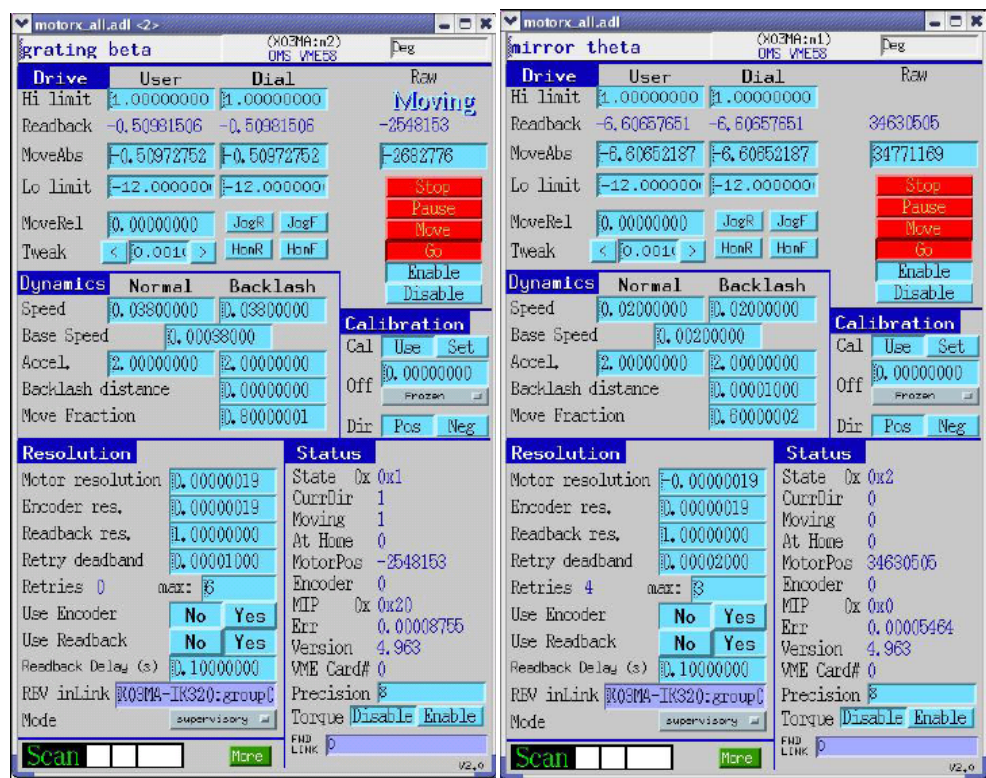
Solution: Try to correct the following parameters in the motor panels:

- 'Retries'. Usual settings: 6 times for the grating and 3 times for the mirror (which is heavier).
- 'Retry deadband' which is essentially the tolerance.

- 'Move fraction'. It gives the predictor movement as a fraction of the total movement. It determines the number of approaches when going to the desired position. Usual settings: 0.8 for the grating and 0.6 for the mirror.

- 'Acceleration', 'Speed' and 'Base speed' can be reduced.

- 'Readback delay'. This is a settle time in



each step before reading the encoder value. Normally not very important.

Use only the motor panels and do not touch the RON Expert Control Panel

Further notes:

- 'Backlash' has no influence in the close-loop mode

- 'Motor resolution', 'Encoder resolution' and 'Readback resolution' should normally not be changed. These values are restored when rebooting VME.

The **last reasonable motor settings** are given on the page 84 of the Instrumental Book.

Attention: Switching open/close loop in the Encoder Expert Panel restores the default motor settings.

(5) *Problem:* PGM does not move.

Reason 1: Encoders stalled. To check this, go to the Mono Expert Panel and look at the encoder readings: If the encoders work, they yield fluctuating readings. Furthermore, you can click Debug in this panel, which takes you to IK320 Signal Diagnostics panel, and try to ping the encoders by clicking the yellow buttons 'Reset (POST)'. If the encoders work, the green indicators 2 change to 'POST' and then back to 'Idle'. *Reason 2:* The CPU of the PGM's VME is overloaded. In this case the green LED at the VME is permanently lit without blinking.

Solution: In any case, reboot and initialize the monochromator.

Reason 2: Lost channel access to the motors. To check this, go directly to the Motor Panels and try to move the motors from there. If the fields do not accept values or the motors do not move, the channel access is lost.

Solution: Reboot the VME. Reboot and initialize the monochromator.

Reason 3: The motor cards hang up. To check this, look at the motor cards in the monochromator rack. If their LEDs are red, the cards are hang up.

Solution: Reboot the motors power supply (reboot of the whole crate is not necessary). Find the power switch on its backside, and switch it off and on.

(6) *Problem:* PGM seems to respond, makes few steps towards the desired energy, and then stops.

Reason: Encoder-motor feedback error.

Solution: Make sure the encoder cards work (see the above problem). If work, try two things (a) check if a red message 'ENC TRACK ERR' appeared. Acknowledge it by clicking 'ACK' next to it; (b) click 'open-loop' and a few seconds later 'close-loop'.

Energy stabilization daemon

To enable/disable the energy stabilization daemon, set the stabilization status X03MA-PGM:STS to 1/0, respectively.

Evaluation of the offsets

Login to pc3863 as [ssh username@pc3863](ssh://username@pc3863) (login as x03maop is not allowed) and `run /usr/local/bin/offset`. The interface is self-explaining. Apart from the interface, data can be loaded from file. The sign of the corrections has to be verified experimentally.

Setting the offsets

The offset values for the pre-mirror and grating are set through X03MA-PGM:THTOFF2.XXX and X03MA-PGM:BETAOFF2.XXX, respectively, where XXX=A, B and C for the 800/mm, 2000/mm and 4200/mm.gratings, respectively.

RIXS Endstation

CCD Server

To launch the CCD server,

- Switch on CCD
 - start the PC in the rack (User: slsuser, Password: SLS_user)
 - establish connection to the **x03maop** account: Click the **Beamline Explorer** shortcut and then **x03maop** shortcut
 - launch the CCD application and its EPICS connection by **Start CCD EPICS** icon. It runs a connection script and then shows two windows: **Roper Server** and **Winspec**. In the first window, check the **Update Commands** box to verify the connection to CCD (see running calls to CCD in the window) and then uncheck this box
 - launch LINUX client: ADDRESS Launcher> RIXS> **SAXES control program**
- * Note that the EPICS connection should be done before the launch of SAXES control program.

ARPES Endstation

Bakeout-off procedure

- The ion pump: Unplug its heating. Shortly outgas: Switch on and, when within a few minutes the pressure settles, off. If the protection shuts down the pump, start a few times.
- Activate the NEG pump: Switch on the power supply. Slowly set 2 A (voltage ~50V, large inertia of the voltage and current) and keep for 10 min. Watch the pressure and if the turbos stay on. Then set 3A for 10 min. Then 4 A, switch on the ion pump, and keep for 45 min. Switch off the ion pump. Close the NEG pump valve.
- Stop baking of the station by the software: Click "Stop" in the BakeOutControl window, then "Yes" in the pop-up window Cool Down With Ramp.

Manipulator

- To deactivate the motion restriction control, `caput X03MA-MA-INHIB.ACTIVE 0`, and to reactivate 1
- After dismounting/mounting the encoders, connect them to the system: Go to the motor panels and in the Readback fields click 'No' and again 'Yes'.

ARPES software

- The executables and corresponding data files developed by PSI are stored at the ARPES-PC in <C:\Program Files\SPECS\PSI Tools>
- Data access: (1) From the ARPES-PC, connect to the data server as the network drive X:\ by clicking the icon on the desktop; (2) From any other PC over the network, use Windows Explorer to map the disk <\\x03ma\x03maop\Data1\ARPES> as the drive X:\ with username = `x03maop`, psw = `adress`

Control system

Viewing history

- To view the archive of all X03MA channels, go to <http://archif.psi.ch/archiver/>, find the section 'Beamlines archived data' and click the button 'X03MA Short Term'. The archive contains history of all X03MA PVs for the last 24 hours
- Make a selection of required PVs in the 'Selection Channels' field. 'Channel Name / Pattern' with 'Search Pattern' can be used to retrieve a list of available archived channels in a separate panel.
- Push 'Next', select the plotting options including the time span, and push 'Plot'
- The data can be exported to Matlab, Excel or text files

PVs handling

To find a PV, type: `findrecord XXX`, where XXX is any known part of the PV. If there appear too many PVs, you can try to filter the output using pipe to grep: `findrecord XXX | grep YYY`, where YYY (without quotes) is a pattern to meet in the output

Re-definition of the default printer

In the terminal window, type: `export PRINTER="PrinterName"` To see the default printer, type `echo $PRINTER`. This will work only for the current window. To change the printer for the whole console, add the above line to the configuration file `.bashrc` and log off/ log on.

Connection to beamline console from outside

- Launch ReflexionX to `s1slc03`
 - Launch Terminal window, type `'cb /work'` and then `'launcher.tcl X_X03MA &'`. This will launch the beamline Launcher. Now you can start any application as usual
 - Note that applications may pop up on any of the multiple console screens. As your PC shows only one, they may be not seen. To bring all applications into one screen, right click on the desktop, then go to 'Windows' and then to 'Unclutter Windows'. This should be repeated each time you launch a new application popping up outside the main screen
- * From remote PC you can only view the applications but not run them

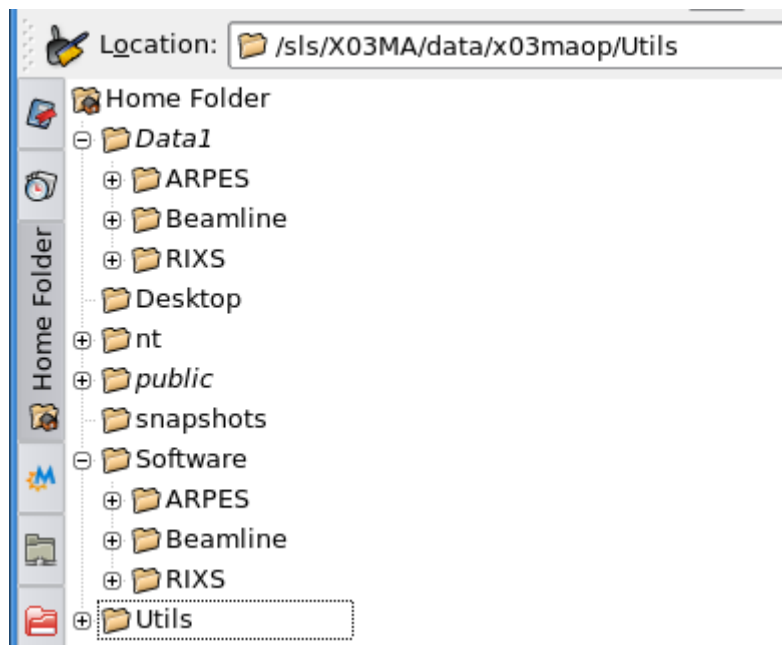
Connection to ARPES control PC from outside

- Launch NX Client to `s1slc06`
- Connect to the beamline gateway by `ssh x03ma-gw` with your NT name and password

- Launch VNCViewer by `vncviewer &` and in the popup window put `pc7645::22`
- After work, close the connection window, and then the connection to the gateway by `exit`

Software development

File system



Python scripts

Various Python scripts are in `/sls/X03MA/data/x03maop/Software/Beamline/EasyScan` as `*.py` files

- Edit and save the `*.py`. Better save as new files rather than overwrite the old ones.
- Run the scripts as `python *.py`
- If necessary, the scripts can be interrupted by Ctrl-C. If still engaged with scan panels, the panels should be aborted

Available scripts:

- (1) `id-energy-scan-all-pol.py` to calibrate the ID offsets for all polarizations. It emulates pushing buttons on scan panels. The panels should be activated and properly set up. The scans are saved in standard `*.mda` files. In the beginning of the script it has a table of ID energy settings and corresponding scans of the mono. Edit it as necessary.

Matlab applications

- Matlab compiles applications in an executable plus a separate shell script `run_<application>.sh`. To run the application, run the script as `run_<application>.sh /opt/matlab/2008a/` where the latter parameter is the Matlab installation directory.

Connection to the Linux cluster

`ssh -X username@s1slc05`

Updating Launcher

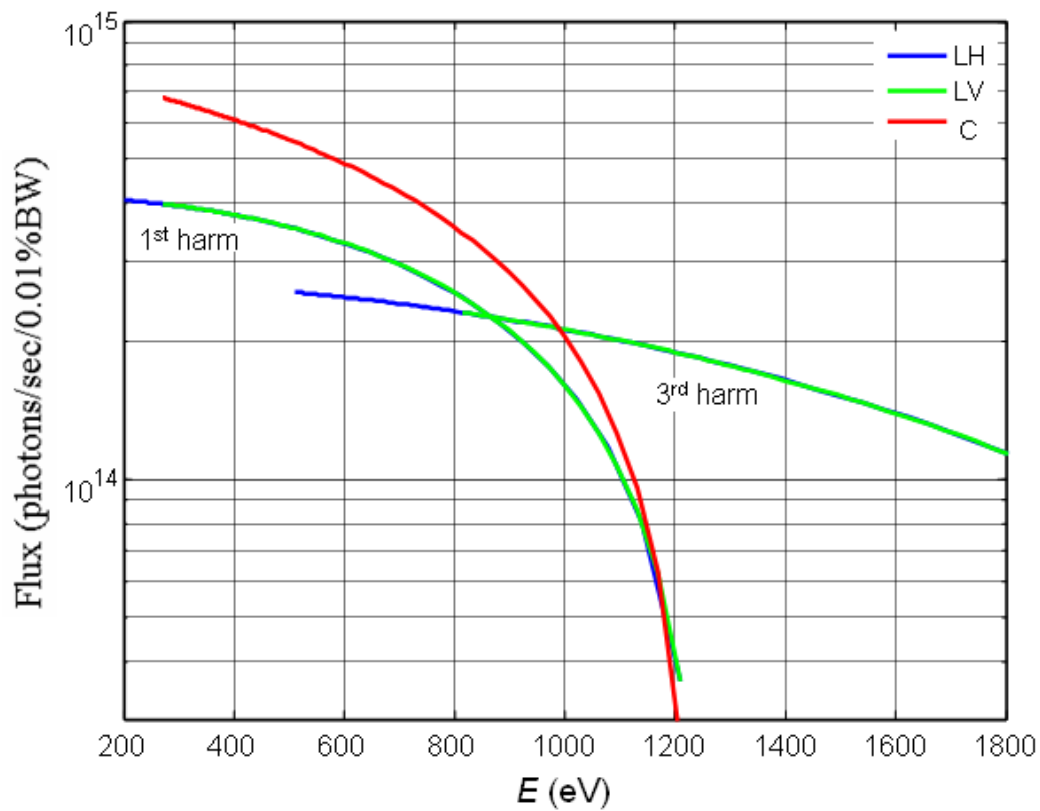
- You should be registered at the CVS repository and have the corresponding entry at your AFS home directory
 - Log in to your AFS account: `ssh username@s1slc05`
 - Locate the CVS directory, for example xxx. Change to the X03MA directory in it: `cd xxx/X/X03MA`. It should contain the applications directory /App and other directories corresponding to different subsystems of the beamline such as FE, OP2, ES1, etc.
 - In `/App/config/launcher` find the Launcher configuration file `X_X03MA.config`, then edit it in any text editor and save
 - Launcher has a hierarchical structure with sub-Launchers. In the above configuration file, this is reflected by references to other launchers corresponding to the beamline subsystems. To change them, you should return to `xxx/X/X03MA`, change the directory to the required subsystem, and then to the `/App/config/launcher` directory in it. Edit and save the corresponding sub-Launcher file similarly to the main one
 - confirm the changes: `cvs up`
 - issue an information about the updates: `cvs ci -m "Your Note on the Update"`. It will be available for everybody who want to modify this Launcher
 - To generate the new Launcher, go up to the directory which contains the App directory of the config file you just edited, for example, `xxx/X/X03MA`. Change the base: `cb work`. Generate Launcher: `swit -a -V`. If a few config files were edited, this should be done for each corresponding /App directory
 - Finally, update the Launcher panel: Click 'File', then 'Update config'.

Notes:

- The PGM section is different, because it is shared between different beamlines. Activate the PGM section: `cvs co X/MO/PGM`. Go to `/X/MO/PGM/App/config/launcher` and edit `X_MO_PGM_X03MA.config`.
- To update an medm application, save it in the CVS repository in the `../X03MA/App/config/medm` directory. If the application is at the beamline account, first mount the beamline by `blmount x03ma x03maop`, and then copy the files into the CVS repository (if beamline fails to mount, the files can be transferred via Exchange). If the file is new in the repository, run `cvs add`. Make sure the file does not have executable attribute, otherwise remove it by `chmod a-x`. Roll the whole update procedure above starting from `cvs up`.

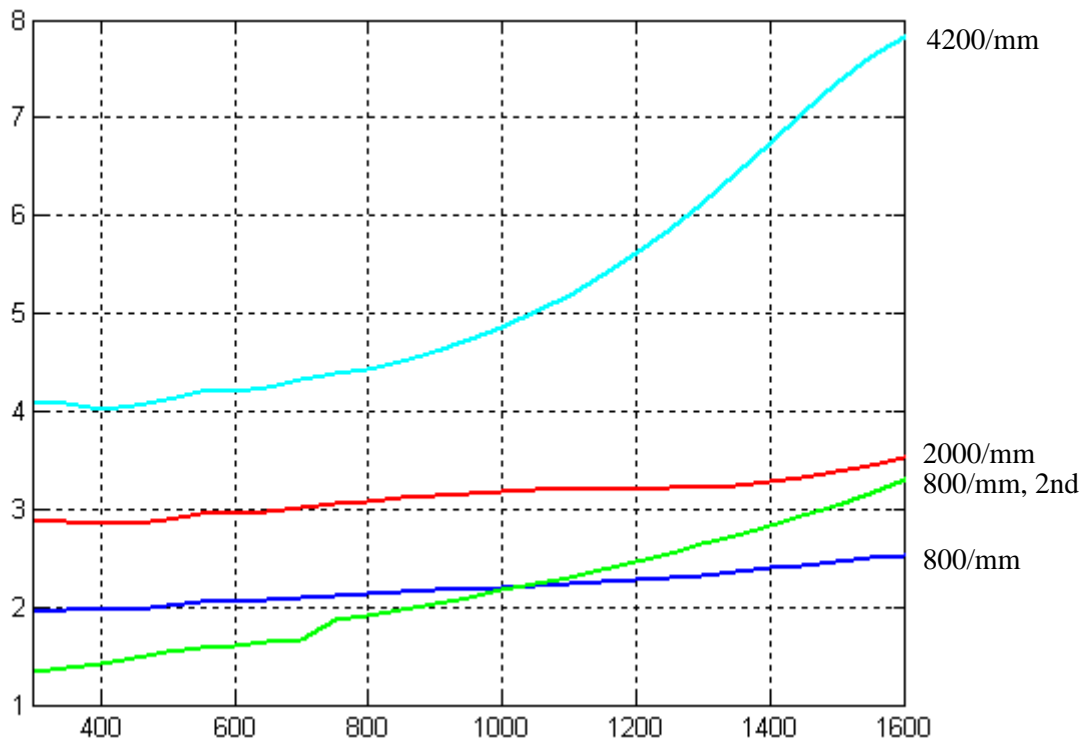
Useful data

ID flux curves

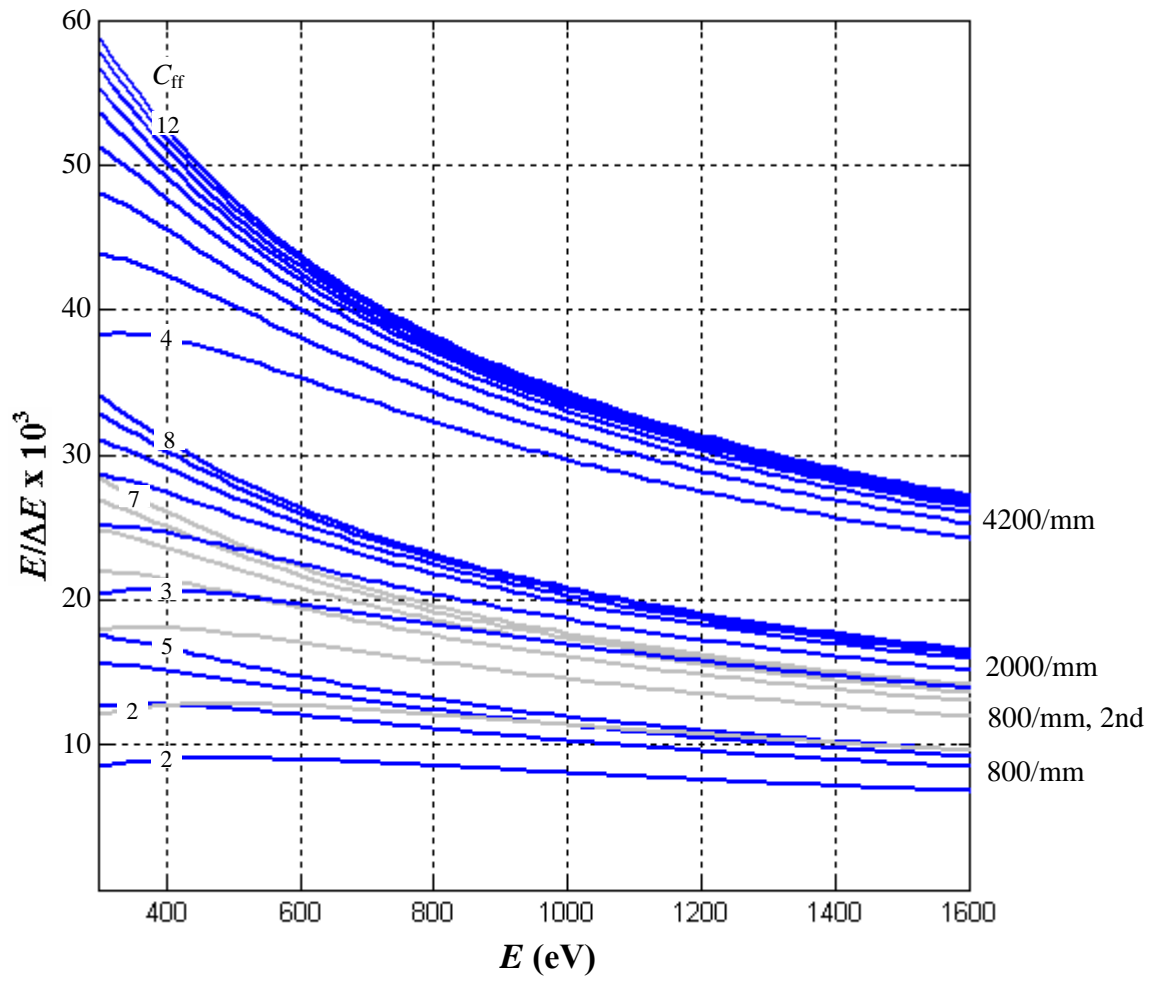


- Experimentally, the 1st to 3rd harmonic crossover is ~1025 eV for LV and ~1200 eV for LH.

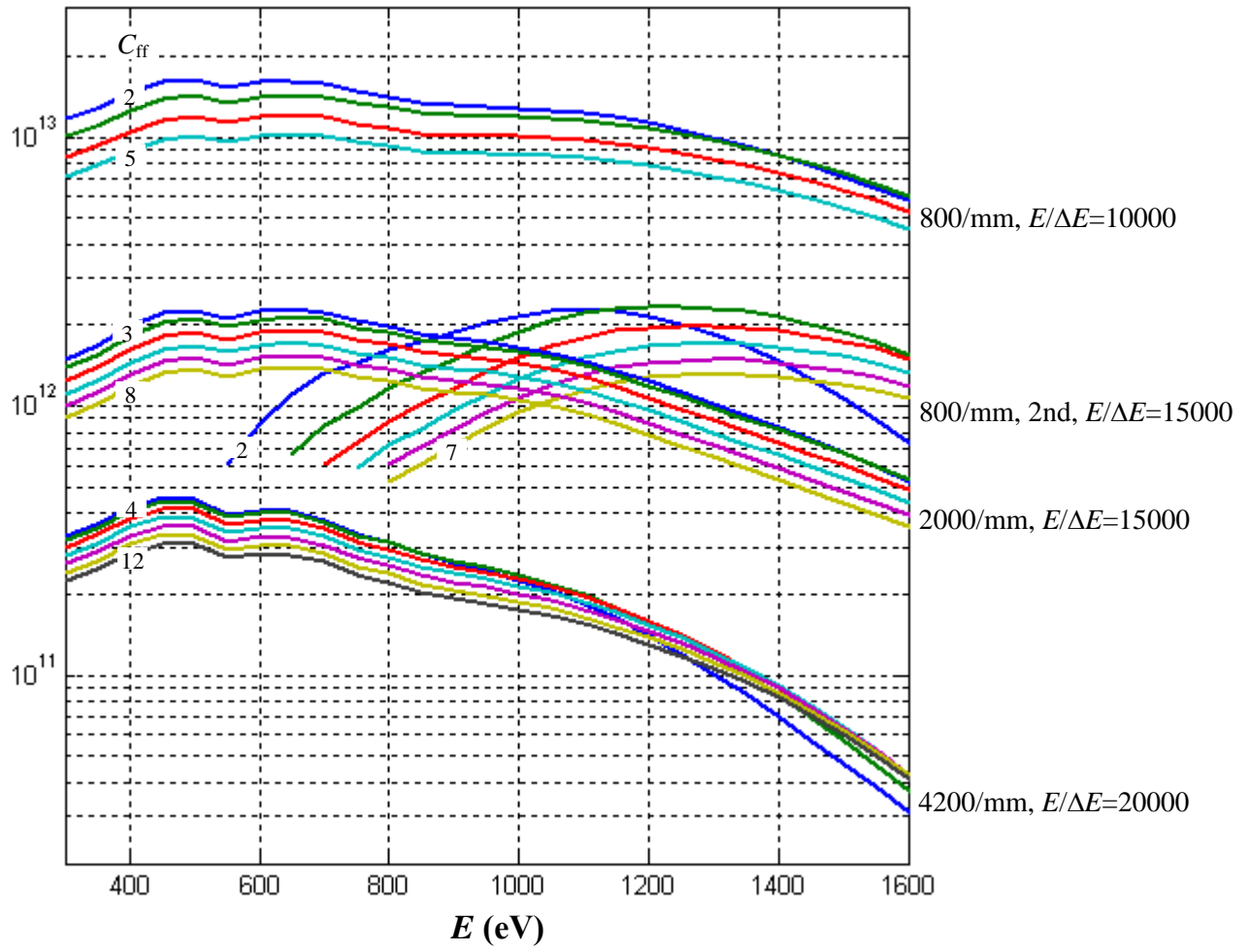
Flux-optimal C_{ff} for different gratings and orders



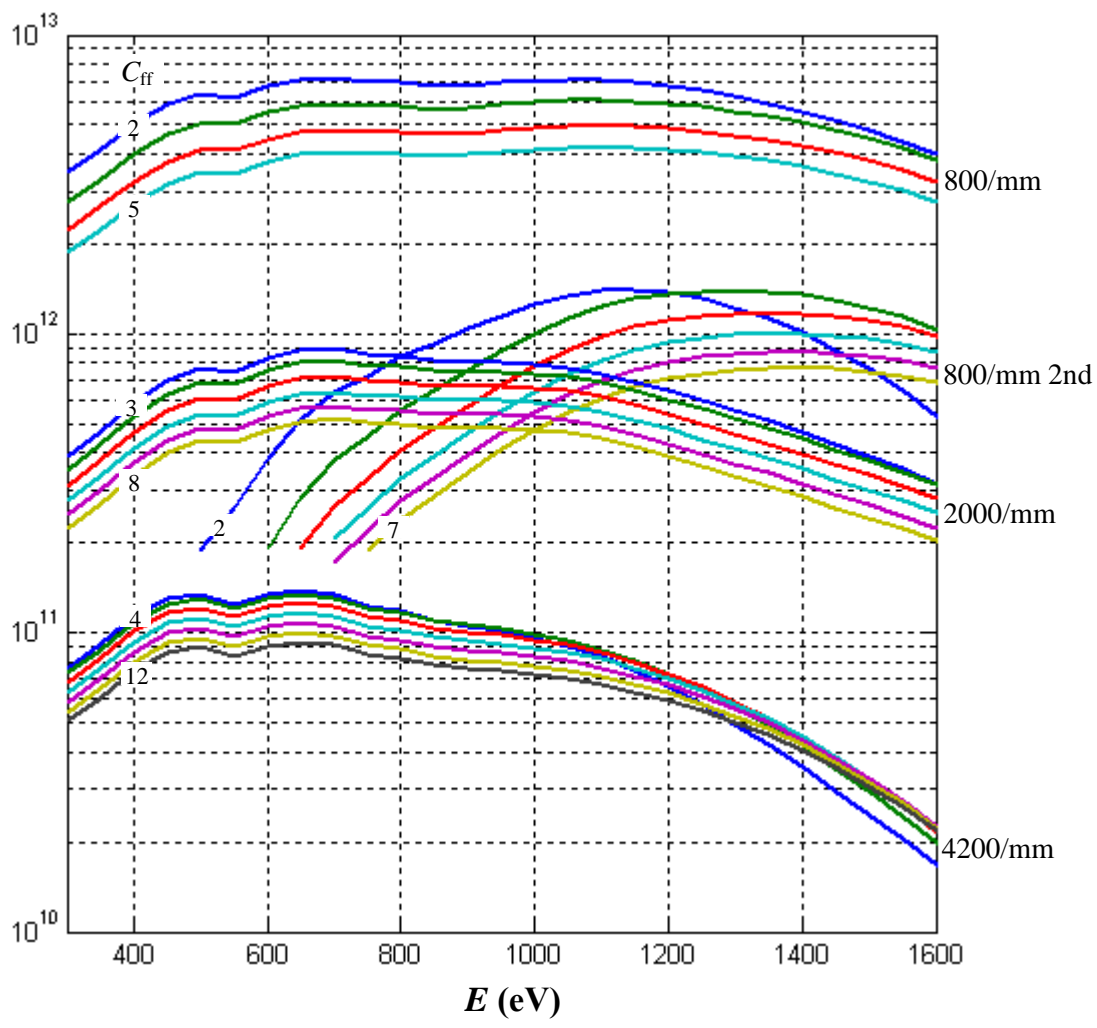
Resolution



Flux normalized to resolving power



Flux normalized to slit width = 10 μm



Contacts

Beamline technician: Christoph Hess, tel. 3266 (in emergency 079 422 7672)

LAC problems: Beat Blarer , tel. 4657

Launcher support: Jose Gabadinho, tel. 5518

blmount support: Heiner Billich, tel. 3602

Beamline control system: Xiaoqiang Wang, tel. 3380 (in emergency home telephone 061 554 9768, mobile 076 495 0146)

Juraj Krempasky, tel. 5131

EPS: Christian Luescher, tel. 3039; Pierre Mueller, tel. 3495