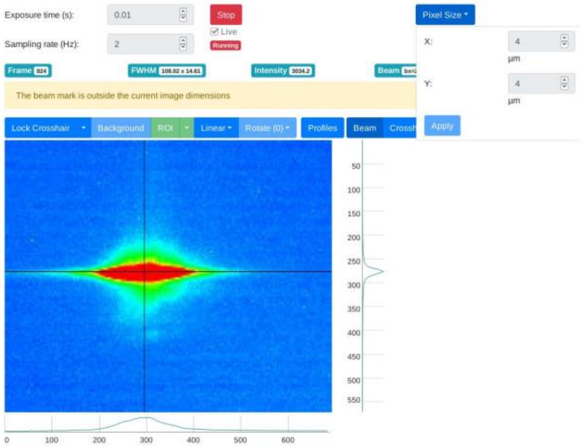
2022.06.10 Toroidal mirror reflected beam imaged by new I0 chamber

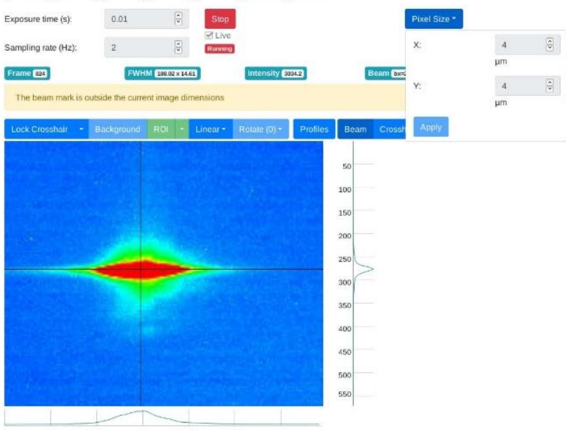
Camera focus

poly beam, u17=25mm, ps=0.1x0.1mm2, chopper_step 10us, ss2vg=0.003

--> we optimized xeyef (motor controlling the lens position) in order the smallest beam vertical size.

xeyef set at 0 (user) in this configuration





pixel size of the camera 3.75 um, magnification of microscope x2 so effective **pixel size should be 3.75/2**

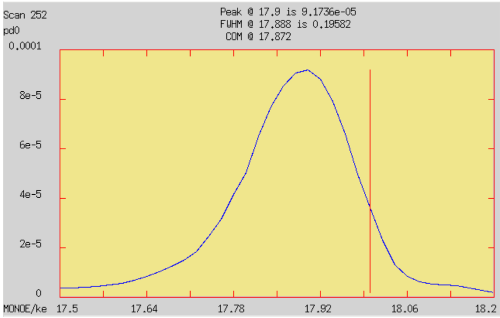
Beamline alignment

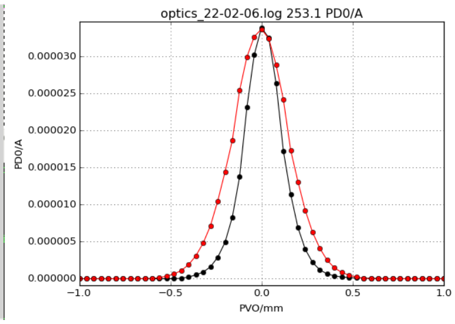
Primary slits

scanned in monochromatic mode (18 kev)

beam emittance: 139 pm x 14 pm (HxV)

mono @ 18 keV, u17 @ 9.2 mm gap (corresponding to a peak energy of 17.9 keV)

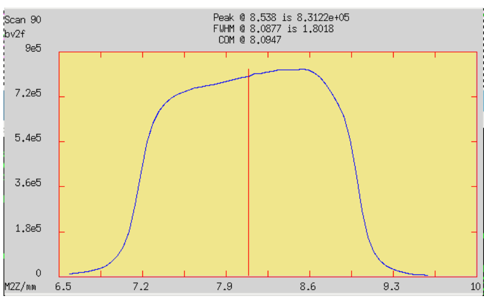




--> slits centered and motor positions set to zero after the scans

Mirror alignment

mirror @ 2.5 mrad inclination, meridional radius @ 7.5 km



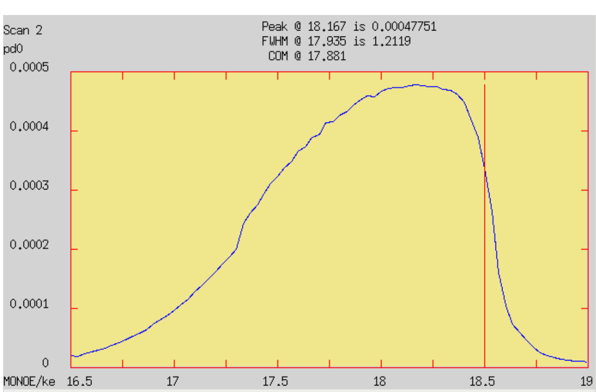
vertical scan of the mirror --> mirror vertical position centred on the beam

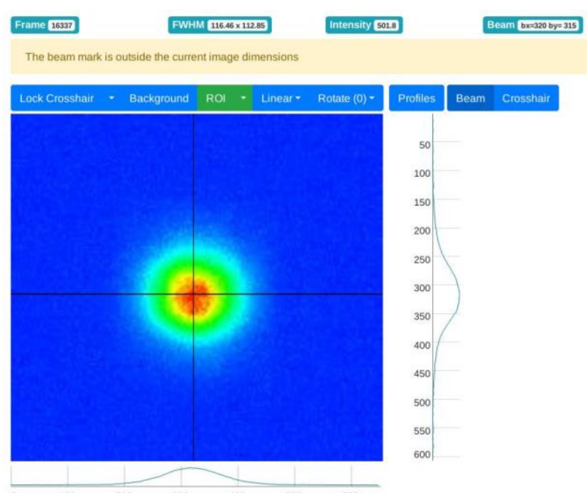
horizontal position of the mirror optimized by scanning m2y while checking the beam height in the monochromatic beamviewer --> m2y set at zero where beam is lower

OPTICS spec log file: /data/id09/archive/logspecfiles/optics/2022/optics_22-06-10.log

Effect of phg on spectrum

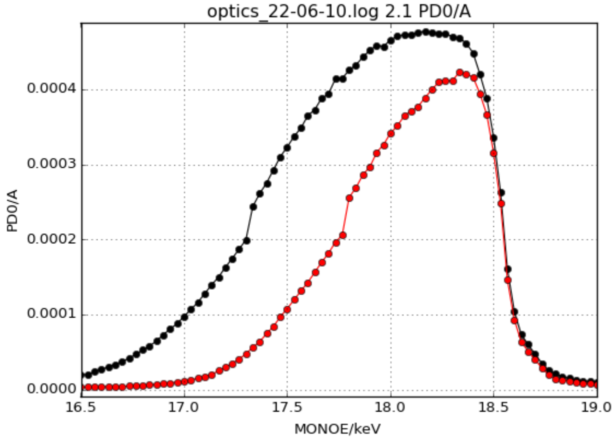
undulator gap = 10.095 mm which theoretically should corresponds to a resonant energy **18.543 keV**
scan#2: phg=1mm, pvg=1mm



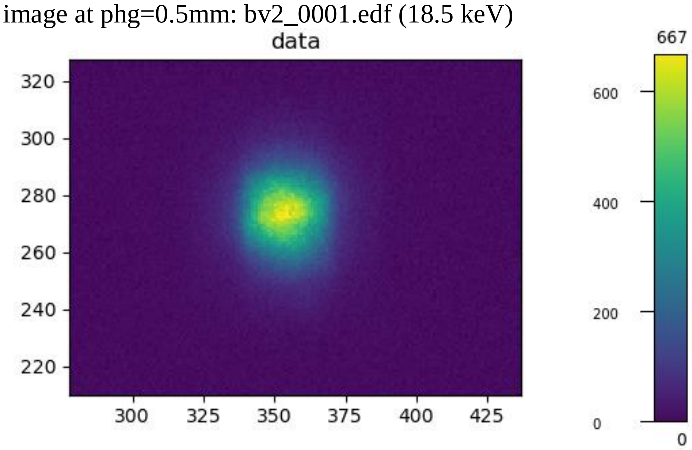


/mnt/multipath-shares/data/id09/inhouse/levantin/20220610/bv2_ps_1_1_18p5keV_0000.edf

scan#3: phg=0.5mm, pvg=1mm



Black curve is scan #2 and Red curve is scan #3: the resonant energy in both is 18.5 keV
from now on images will be called bv2_....
image at phg=0.5mm: bv2_0001.edf (18.5 keV)



scan#4: phg=0.25 mm, pvg=1 mm (green below)

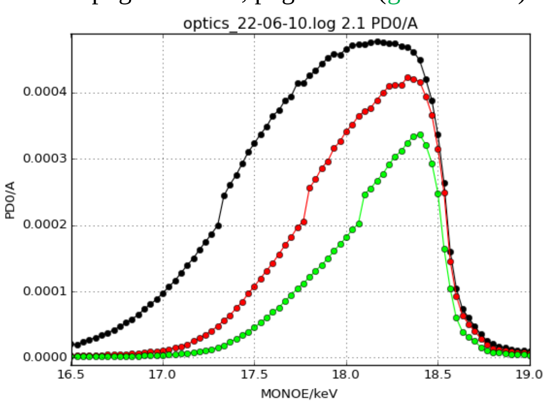
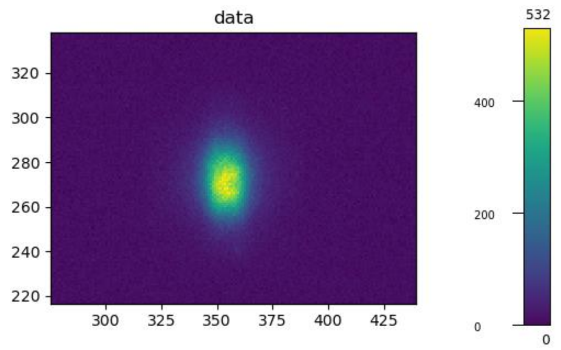


image at phg=0.25 mm: bv2_0002.edf (18.5 keV)



scan#5: phg=0.1 mm, pvg=1 mm (magenta curve)

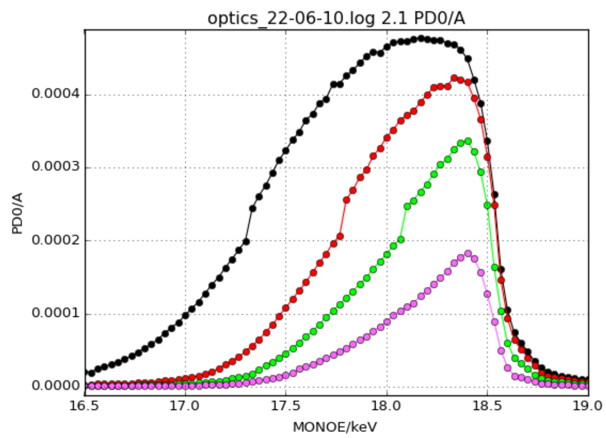
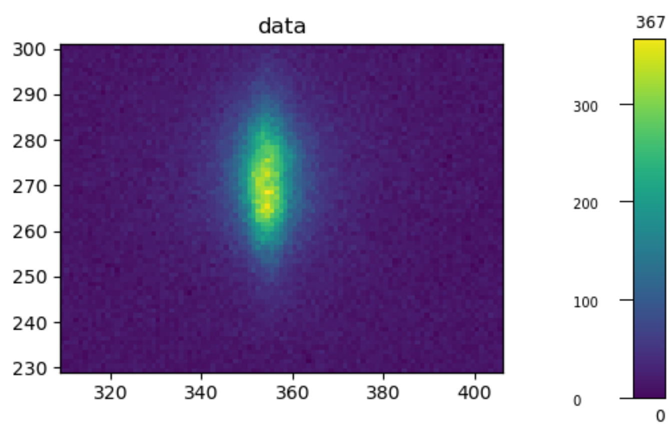


image at phg=0.1 mm: bv2_0003.edf (18.5 keV)



Energy scans at Xeye, defocused

E_Scan: pgh=1 mm

We go back to phg=1 mm (vgh=1 mm)

Attenuators:

```
1. Zr 250um   OFF
2. Mo 50um    ON
3. Ag 12.5um  ON
4. Au 5um     ON
```

including beamline windows:

```
2131.LAUE> p get_att_status()
0.9mm CVD-diamond, 0.4mm Be, 5um Au, 12.5um Ag, 50um Mo
```

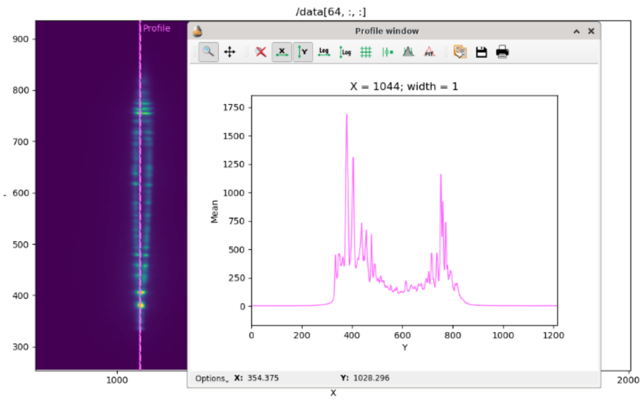
The Be thickness is actually 0.2 mm
This allows getting good images with 3 ms exposure time, M_radius = 20 km
images xeye_001

Saving data using the /data/id09/inhouse/levantin/20220610/data/xeye???.h5
quick scan
mse.ascan(mse.mono1e,start=16,stop=19,n=10,exp_time=3e-3,nimgs=10)
/data/id09/inhouse/levantin/20220610/data/xeye001.h5

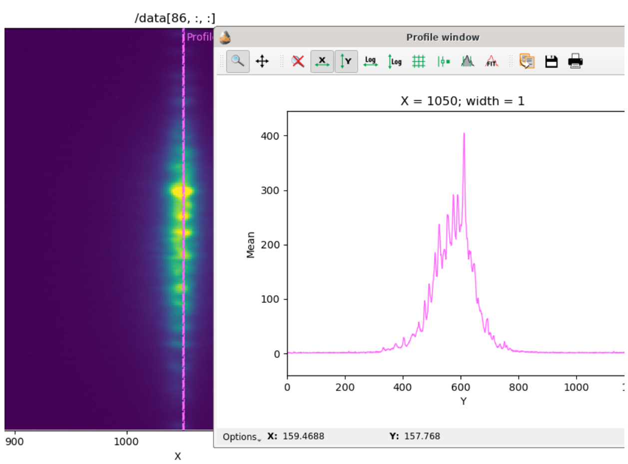
we see a bit of PD2 shadowing. We open the chamber and move pd2

In [116]: mse.ascan(mse.mono1e,start=16,stop=19,n=100,exp_time=3e-3,nimgs=30,save_average=True)
Will save in /data/id09/inhouse/levantin/20220610/data/xeye002.h5
Despite what is written in the data, pvg=phg=1 for xeye001 and xeye002

xeye002.h5. Example at **17.92 keV:**



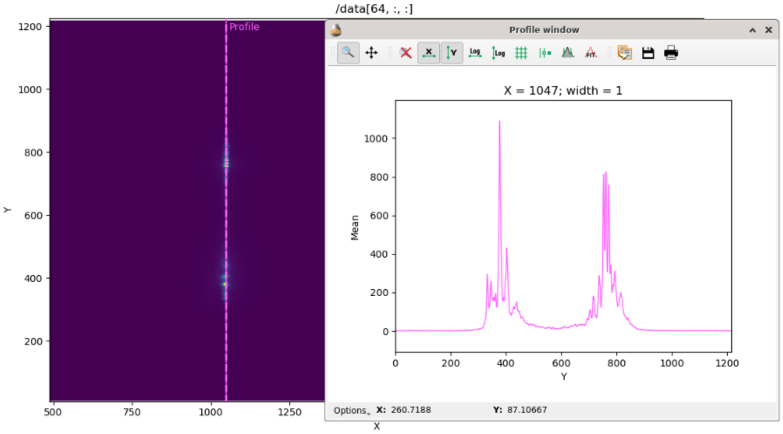
At **18.58 keV**



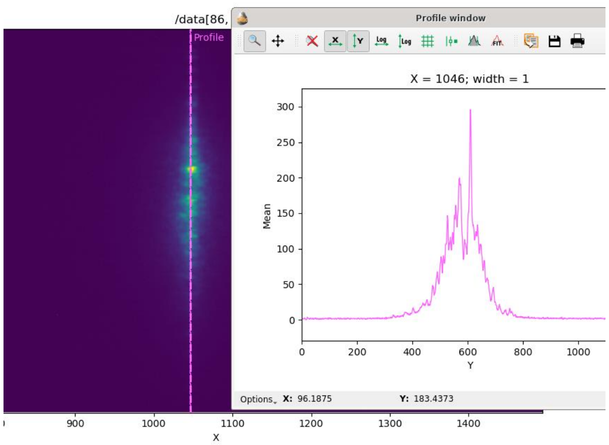
E_scan: phg=0.1mm

In [124]: mse.ascan(mse.mono1e,start=16,stop=19,n=100,exp_time=3e-3*2.5,nimgs=30,save_average=True)
Will save in /data/id09/inhouse/levantin/20220610/data/xeye003.h5

xeye003.h5. Example at **17.92 keV:**



xeye003.h5. **18.58 keV:**



M2_radius scans at Xeye

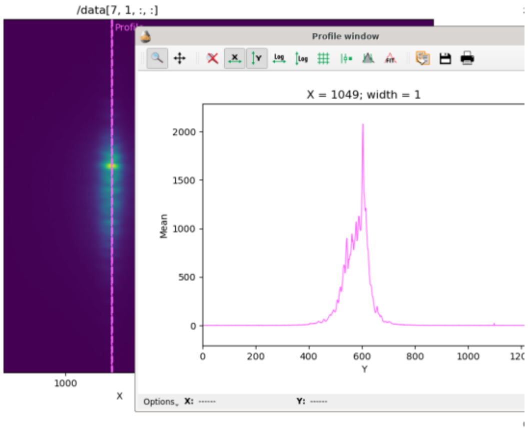
- Primary Slits: we go back to 1 x 1 mm^2
- We set the energy at **18.5 keV**
- Angle range scan: 20 km to 5 km
- Chopper was been removed, and all the attenuators where in place, but the camera was still saturating, therefore the **chopper is back! And same attenuators as the energy scans**

Coarse scan: 20 to 5 km

Best focus (at sample position) should be at 7.5 km

For each step there will be 3 images with different exposure times: 1, 3 and 10 ms

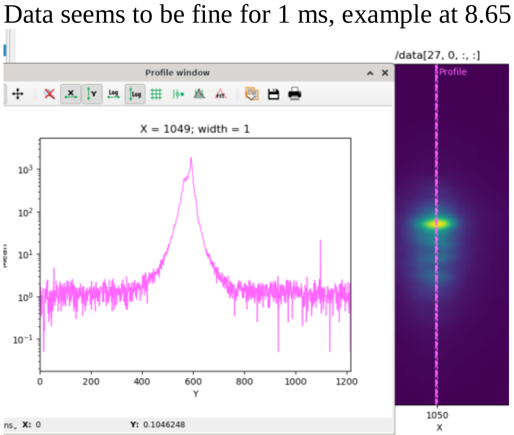
positions_coarse = np.arange(20,4,-1).
In [10]: mse.ascan_list(mse.m1bend,positions_coarse,exp_time=(1e-3,3e-3,10e-3),nimgs=10,save_average=True)
Will save in /data/id09/inhouse/levantin/20220610/data/xeye004.h5
Data looks pretty good, for example R=13km and 3ms:



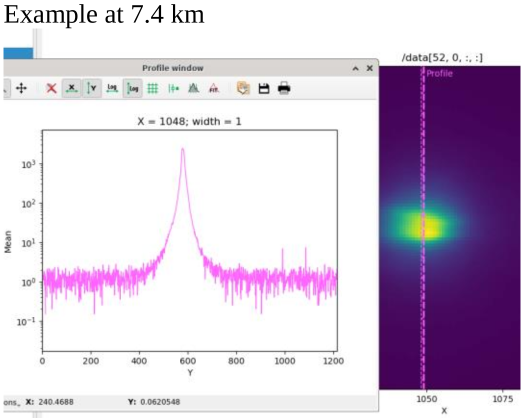
Fine scan: 10 to 5 km

positions_fine = np.linspace(10,5,101)
In [16]: mse.ascan_list(mse.m1bend,positions_fine,exp_time=(1e-3,3e-3),nimgs=20,save_average=True)
Will save in /data/id09/inhouse/levantin/20220610/data/xeye005.h5

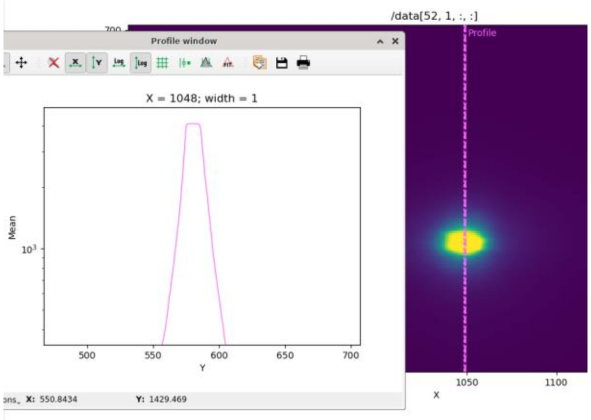
Data seems to be fine for 1 ms, example at 8.65 km:



Example at 7.4 km



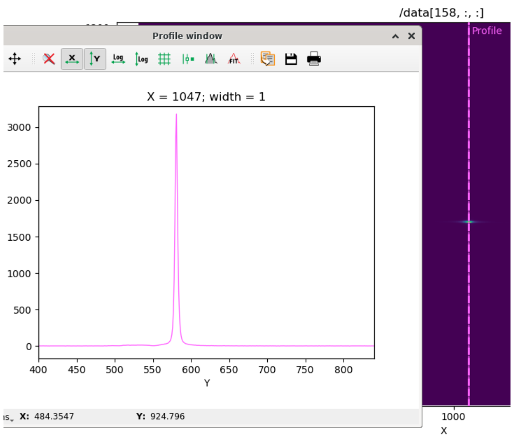
Nevertheless, it is not the case for 3 ms, because there was some saturation when focusing, for example at 7.4 km:



Slits scans test

We used the *ss1vo* with an aperture of 10 um, the distance between ss1vo and the screen is ~0.9 m.
mse.ascan(mse.ss1vo,start=-0.3,stop=0.6,n=360,nimgs=20,save_average=True,exp_time=0.02)
Will save in /data/id09/inhouse/levantin/20220610/data/**xeye006.h5**

At first glance, data seems to be OK, for example for 0.095 mm



Pink beam (Radius scans)

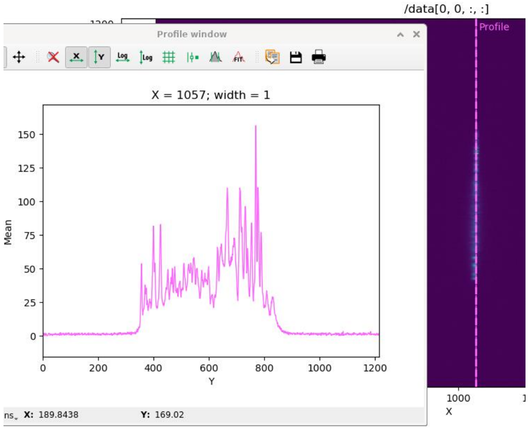
- phg=0.1 mm
- In this case we opened the undulator to 27 mm, which should correspond to the resonant energy (1st harmonic) ~19.9 keV?
- Used attenuators were the same as before

Pink_coarse scan: 20 to 5 km

For each step there will be 3 images with different exposure times: 1, 3 and 10 ms

In [32]: mse.ascan_list(mse.m1bend,positions_coarse,exp_time=(1e-3,3e-3,10e-3),nimgs=20,save_average=True)
Will save in /data/id09/inhouse/levantin/20220610/data/xeye007.h5

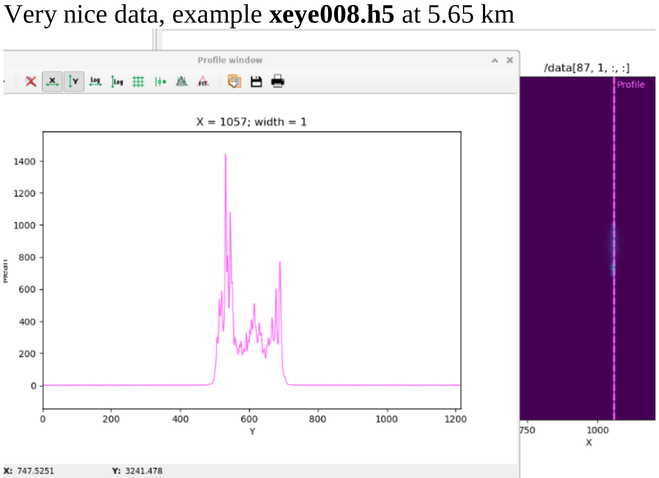
xeye007.h5 example 20 km



Pink_fine scan: 10 to 5 km

Two exposure times: 1 and 3 ms
In [35]: mse.ascan_list(mse.m1bend,positions_fine,exp_time=(1e-3,3e-3),nimgs=20,save_average=True)
Will save in /data/id09/inhouse/levantin/20220610/data/xeye008.h5

Very nice data, example **xeye008.h5** at 5.65 km



Very successful beamtime