Video-system and Laser BBA

Short Intro

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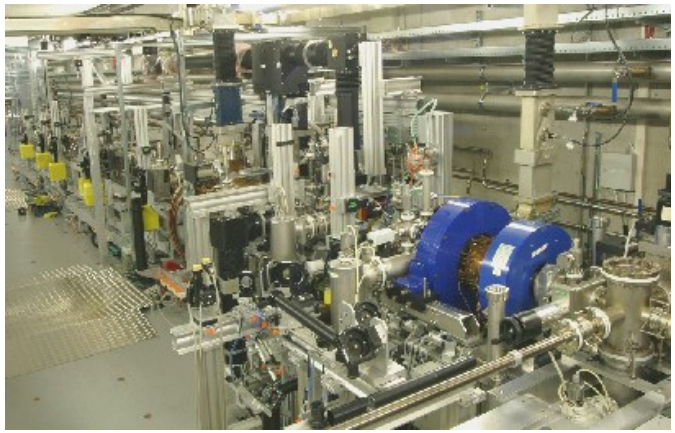
29.01.2015



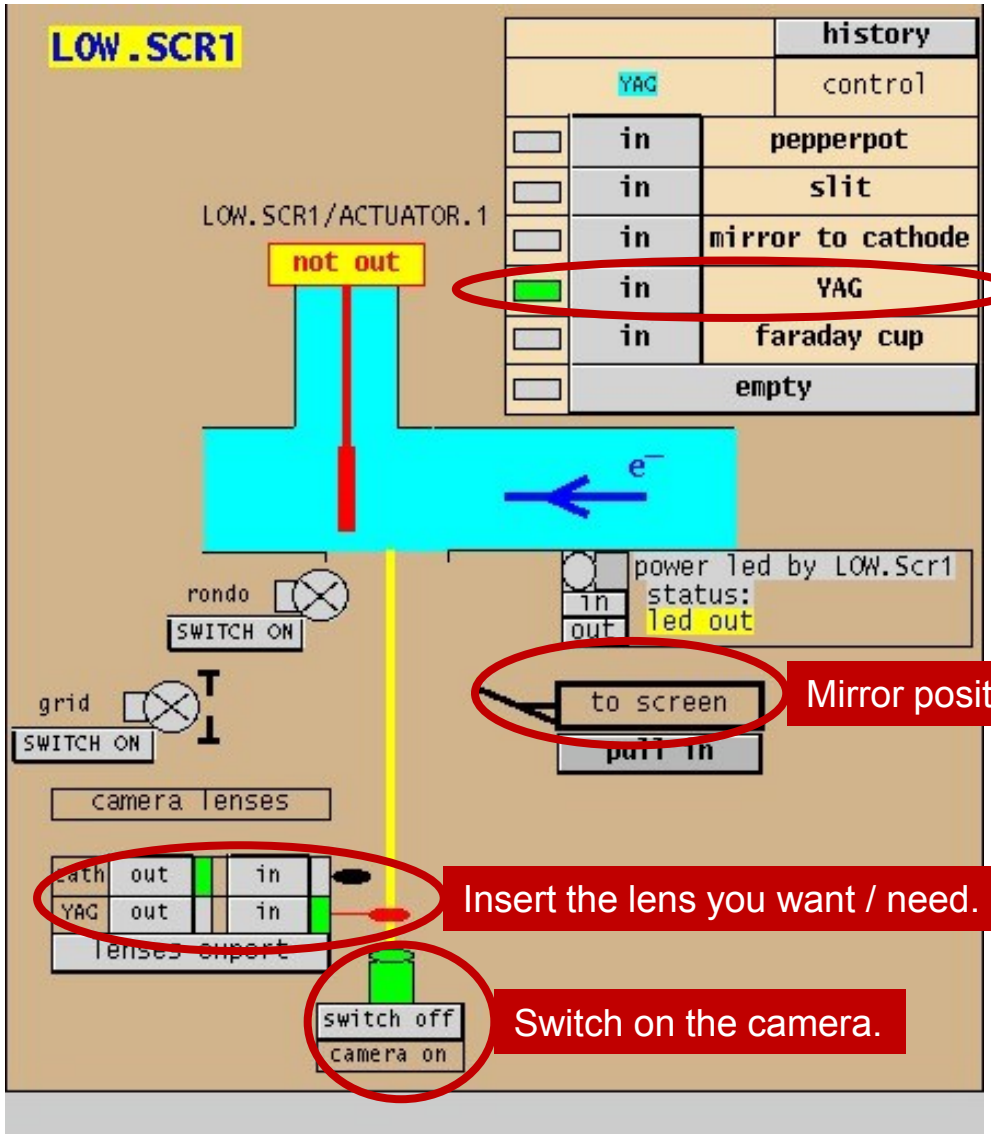
HELMHOLTZ ASSOCIATION

PITZ Photo Injector Test Facility Zeuthen

DESY

Video system

Video system: *The Sattinger's law of electronics: Switch on the camera!*



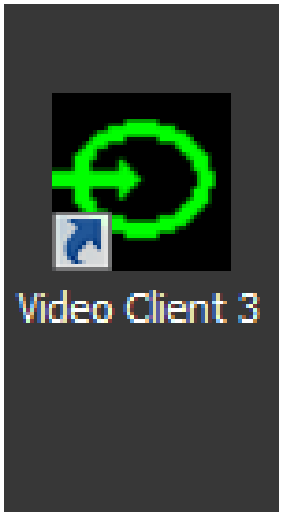
Insert the screen.

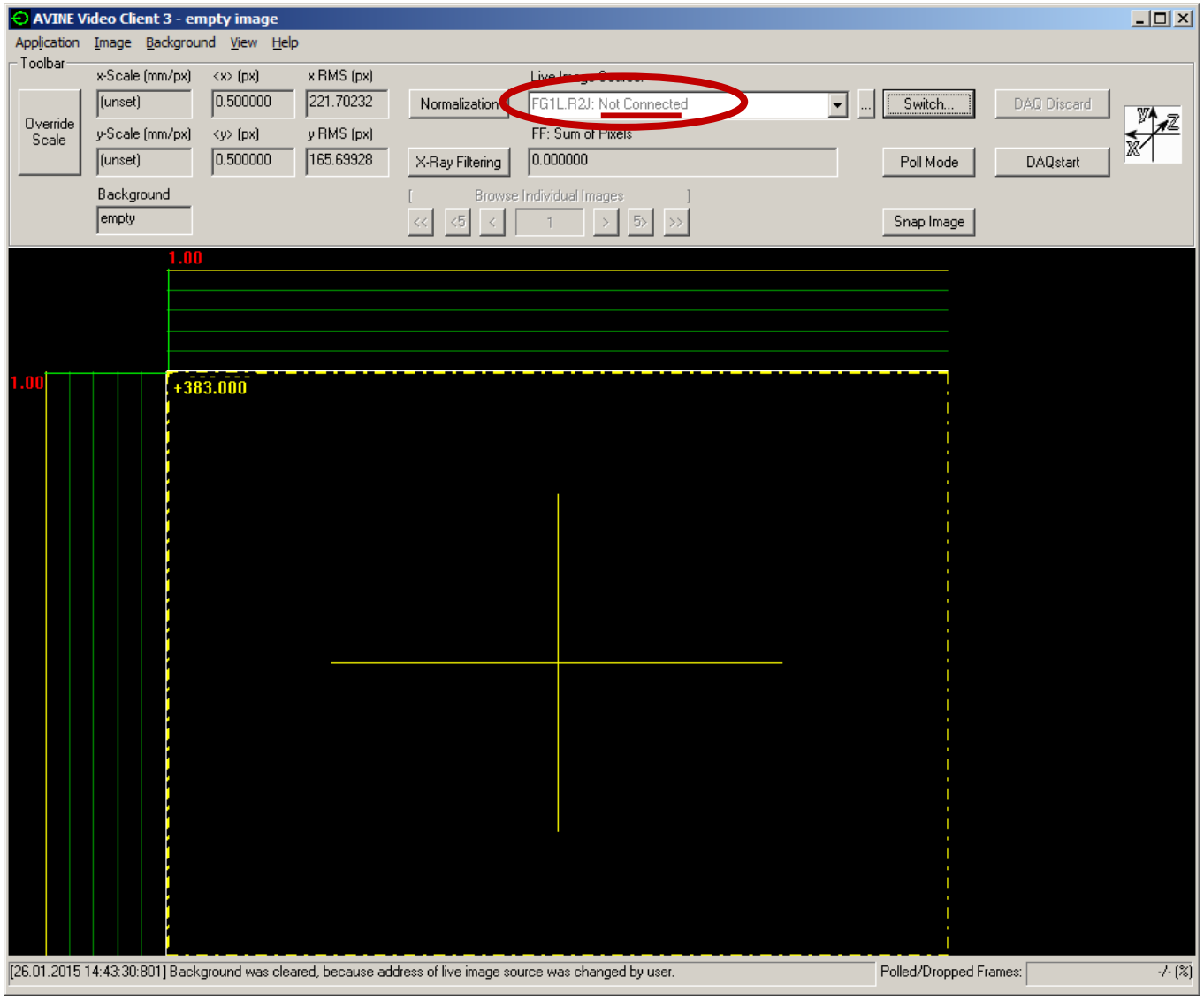
Mirror position “to screen”.

Insert the lens you want / need.

Switch on the camera.

Video system: *VC3 (VideoClient 3)*





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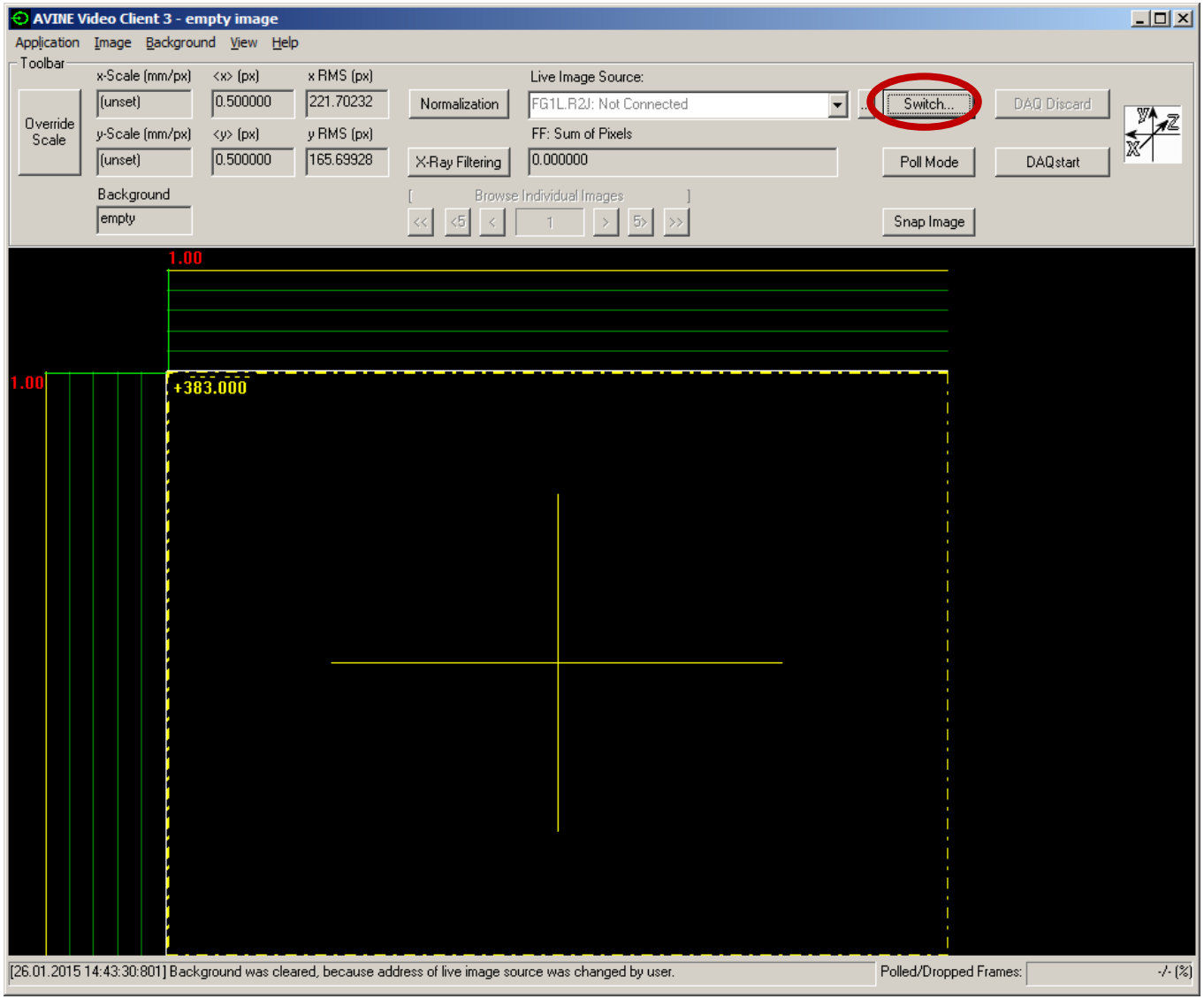

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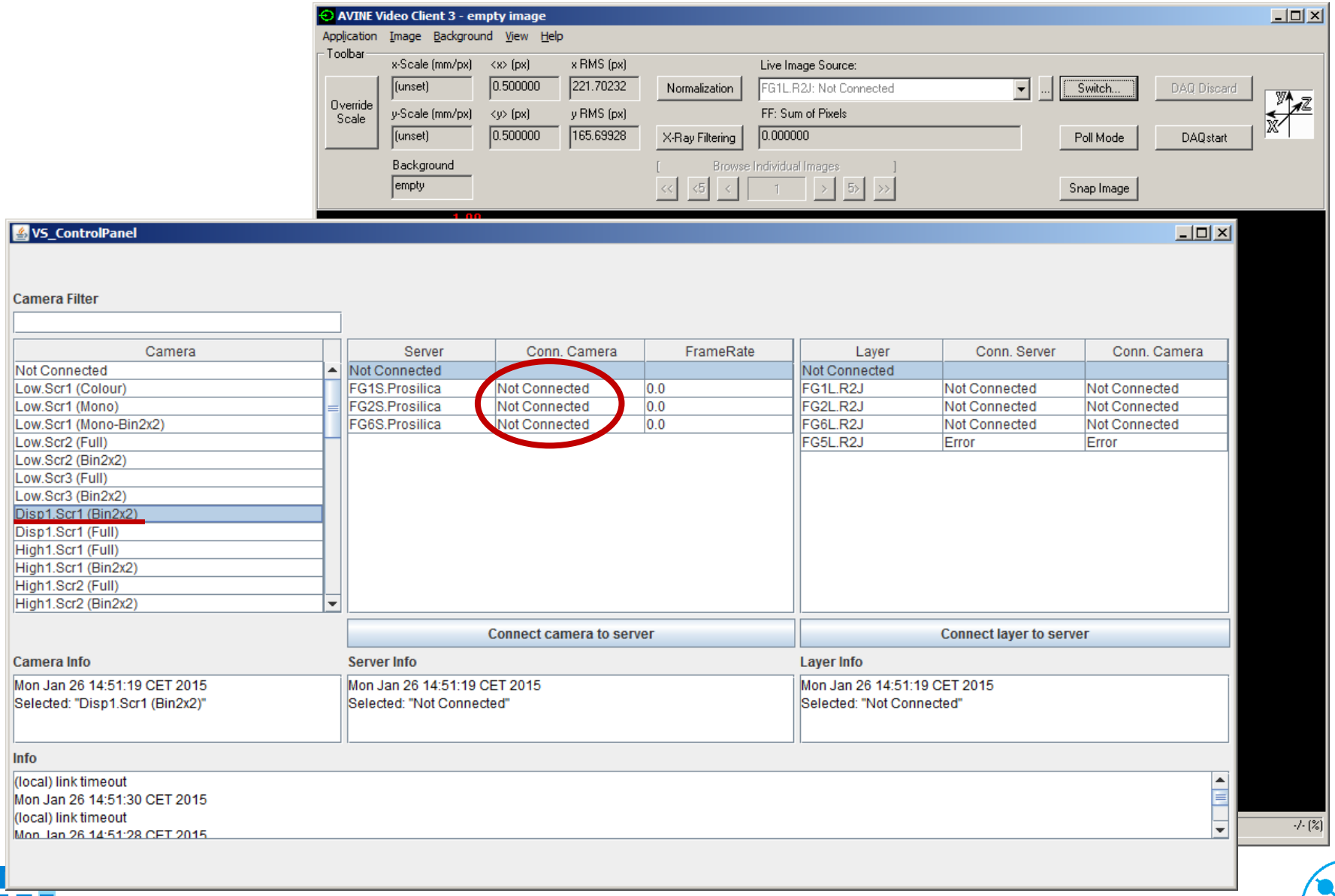
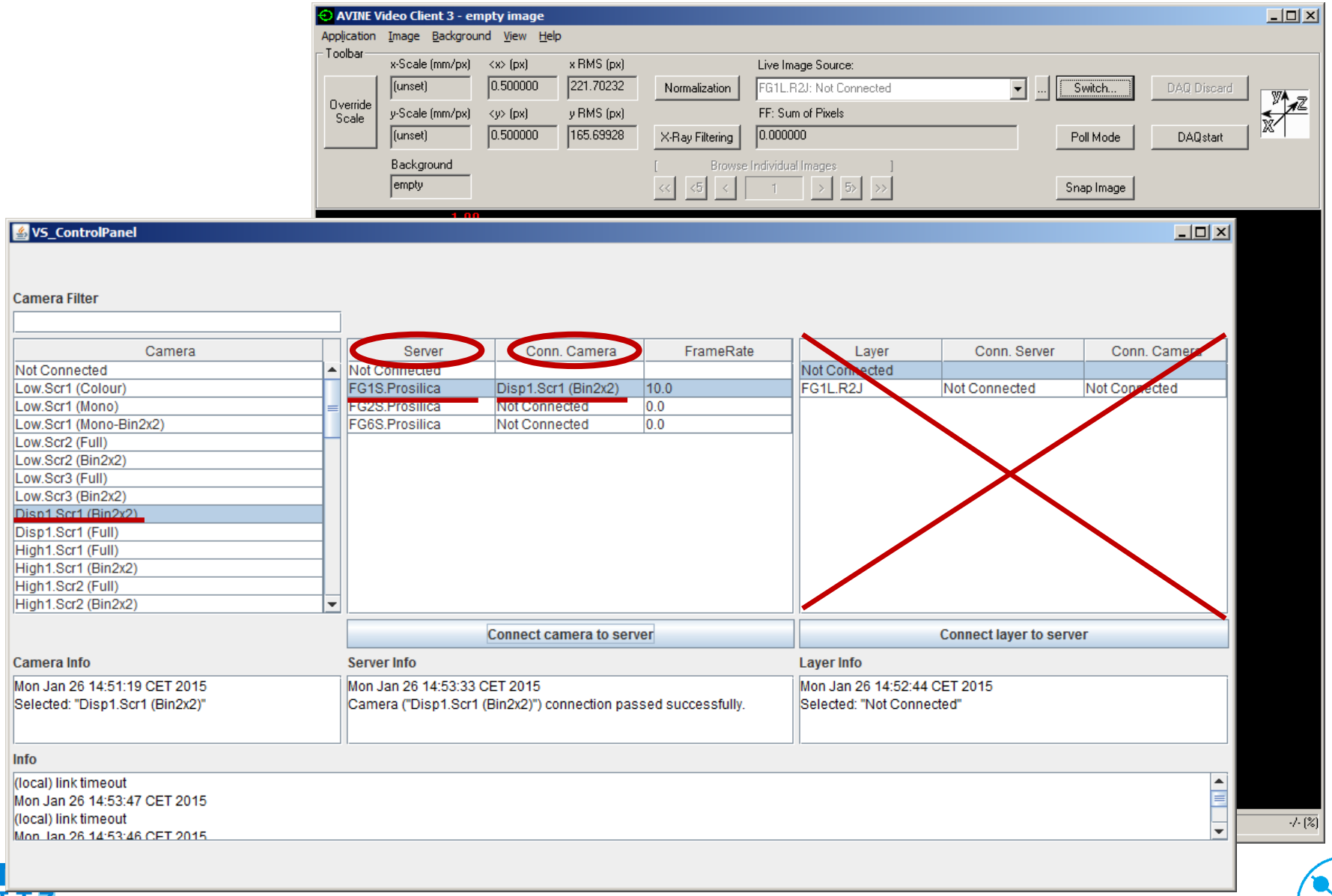


Video system: *VC3 (VideoClient 3)*



Video system: *VC3 (VideoClient 3)*

Camera 1

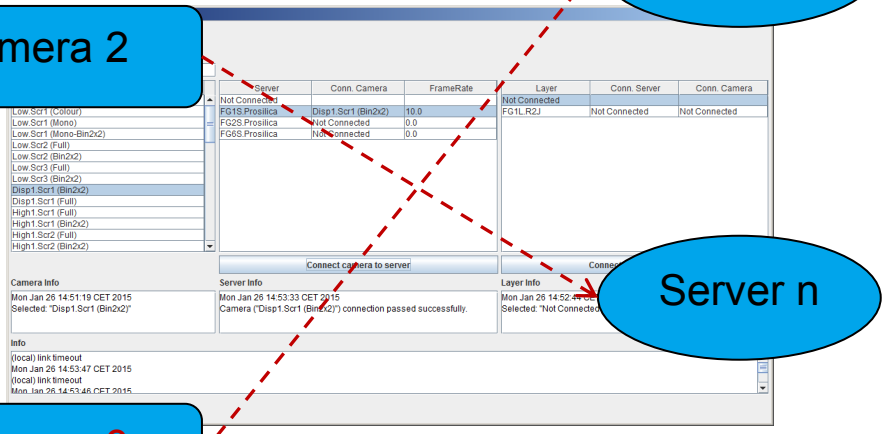
Camera 2

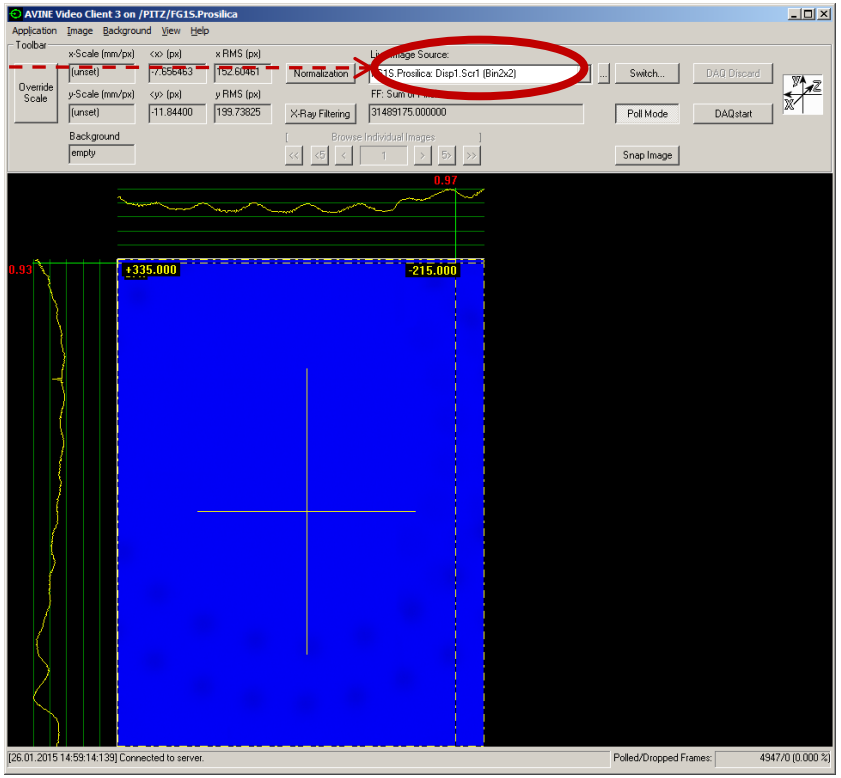
Camera 3

Camera n

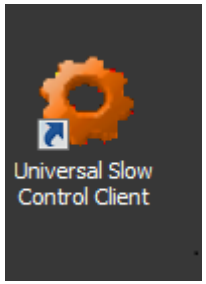
Server 1

Server n





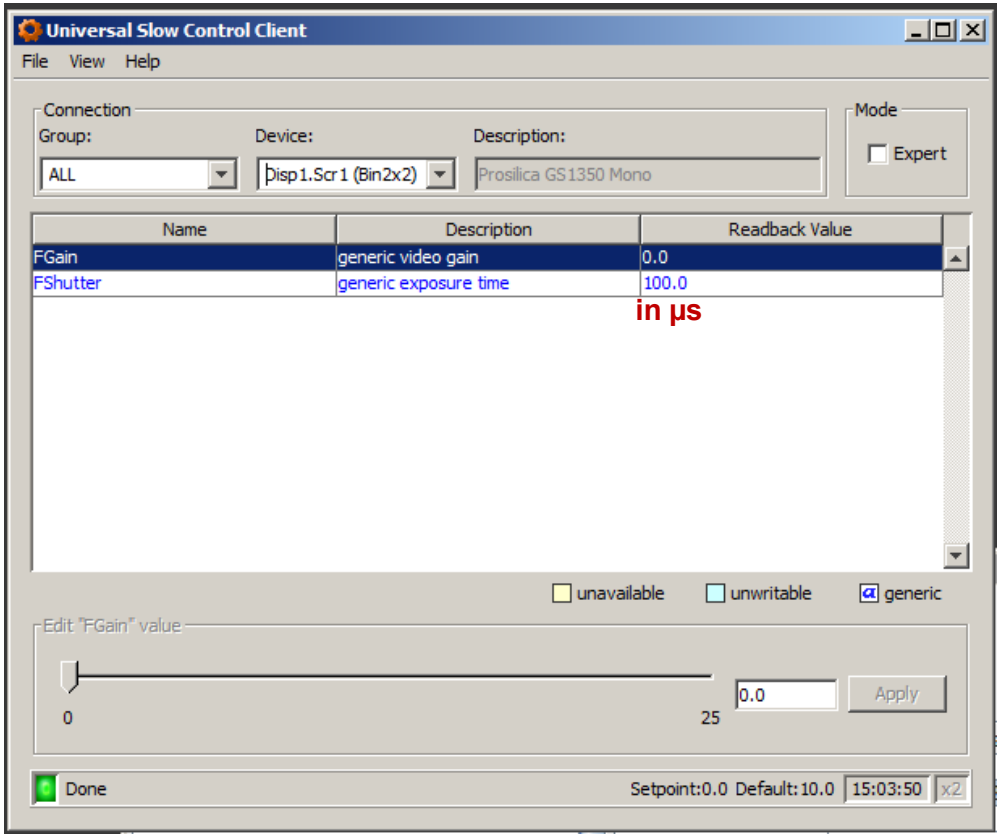
Video system: *USC Client: Managing the cameras*



OR

http://www-zeuthen.desy.de/pitz/apps/

The camera must be connected before you can manage it!



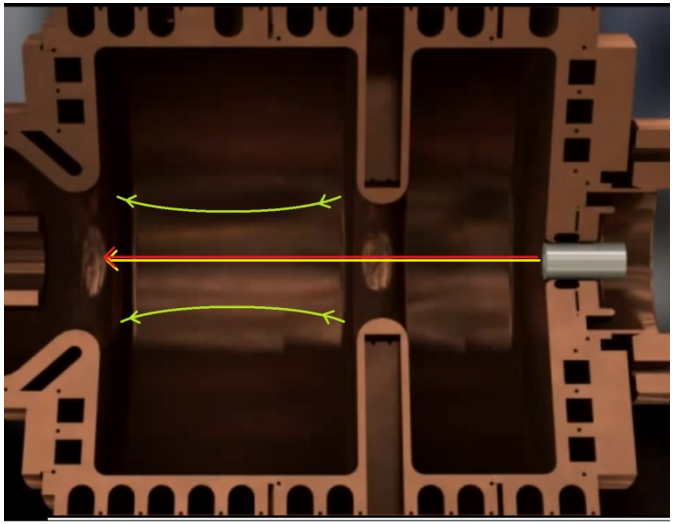
Laser BBA

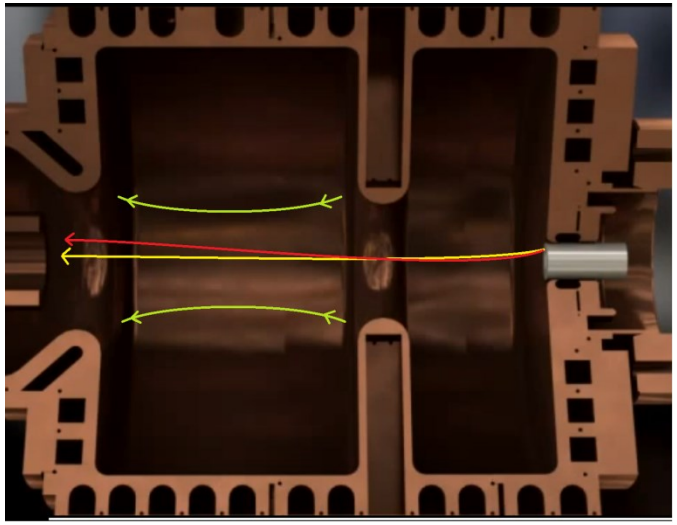
Laser BBA: *Idea*

The radial component of the RF field on the axis of symmetry is always identically equal to zero.

-> If an electron sees only the RF field and if it moves along the axis, the trajectory is independent on the RF field phase.

-> For not-aligned beam however the beam trajectory (and therefore the beam position on a screen) will show a dependence on the RF field phase.





Laser BBA: *Fundamental measurement conditions*

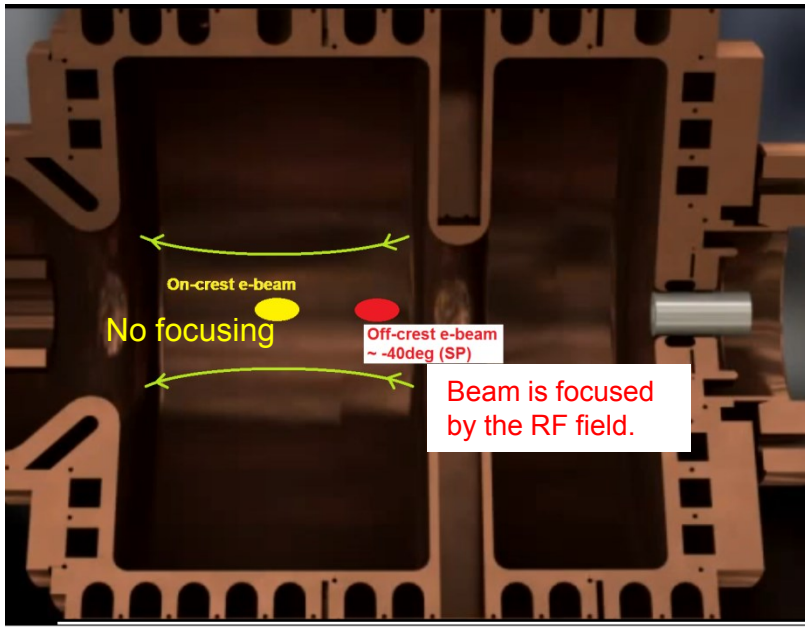
- If an electron sees only the RF field …

  -> All magnets, most importantly both Solenoids must be switched off!!!

  -> Fundamental limitation: the Earth magnetic field can not be switched off. ☹

- But if the solenoids are switched off, an (on-crest) e-bunch would not be focused and we could not observe it on a screen!

  -> The BBA must be done using off-crest e-beams (ca. -40deg).



Laser BBA: *Measurement conditions*

- All magnets off

- Gun power: 1.0 - 1.5MW peak (low dark current)

- Gun phase: -50deg to -30deg w.r.t max. mean momentum gain phase (on-crest phase)
  - Scan range usually ~10deg (smaller for a Gaussian laser profile)

- Laser profile: Flat top, if available. Use long trains (~100 pulses) for signal enhancement.
  -> Check the camera timing! (not to short to see all pulses, not to long to suppress e.g. the dark current effects.))

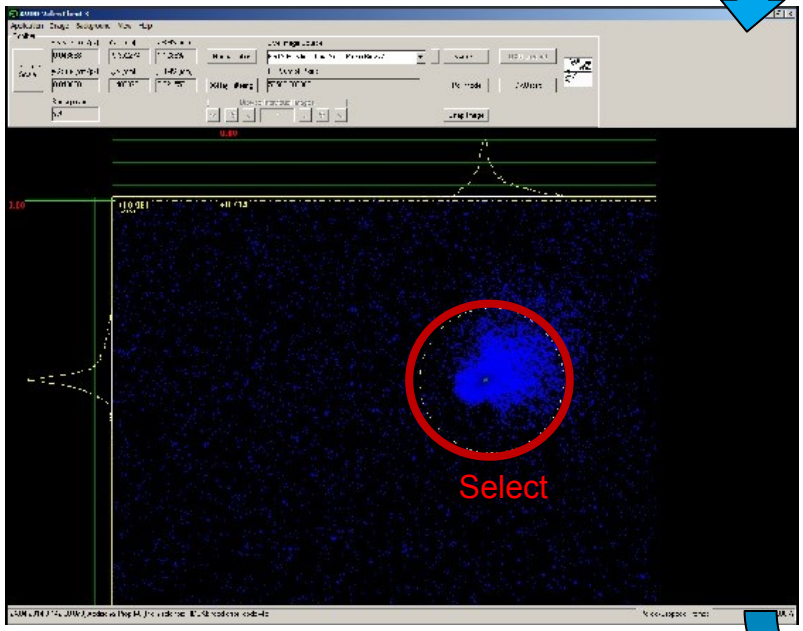
- Bunch charge: ~10pc (for nominal flat-top laser profile; depends on the transverse size as well)

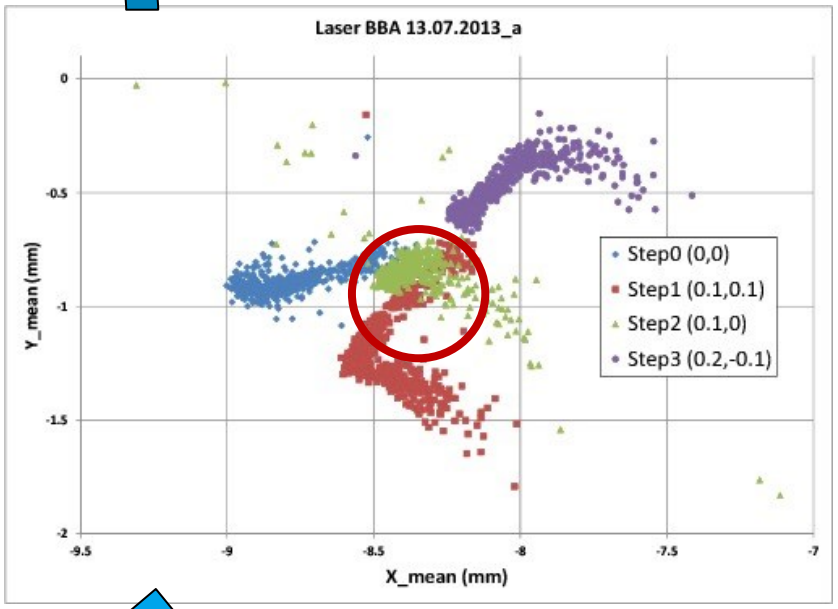
- Observation screen: Low.Scr1 (the closest one to the gun)

Laser BBA: *Measurement goal & procedure*

Move the laser spot on the cathode and find such position, for which the beam spot centroid does not move on the observation screen, as the phase changes.

Move the laser spot on the cathode …



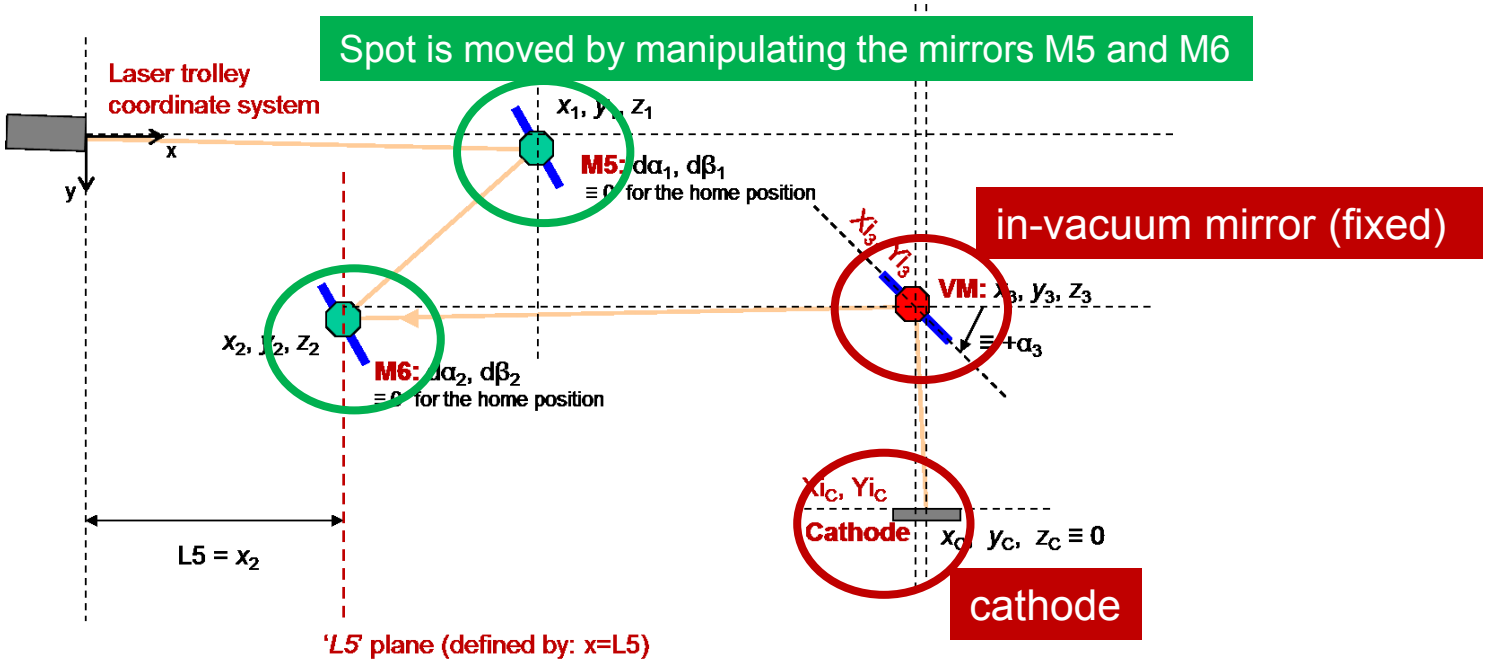


Scan the phase, record, plot …

Mirror56

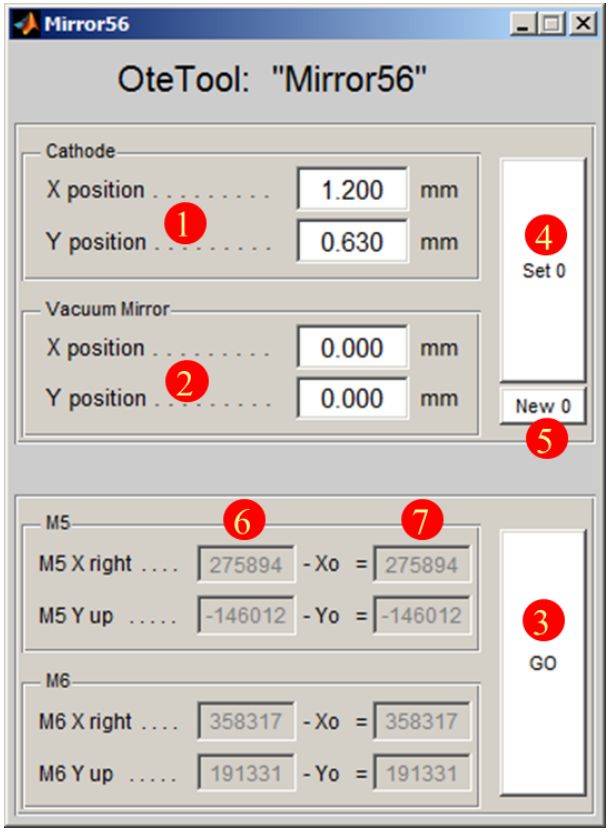
Mirror56: *A tool to move the laser on the cathode*

Laser trolley setup



"Mirror56" is capable to move the laser spot on the cathode while keeping fixed the position where the laser hits the in-vacuum mirror.

Mirror56: *A tool to move the laser on the cathode*



1: Define the desired relative *x-y* movements of the laser spot on the **cathode**

2: Define the desired relative *x-y* movements of the laser spot on the **vacuum mirror**

3: Press the "GO" button to move the mirrors – and wait

The home position (means that all the values in 1 and 2 are set to 0) is defined as the position at the moment of starting the application.

Mirror56: *A tool to move the laser on the cathode*

To run Mirrror56 please start MATLAB under LINUX, then change the directory as follows:

-> **/doocs/measure/ Cathodes/_MatlabScripts** and type **“mirror56”**

Or

-> **/doocs/measure/scripts** and type **“otetool mirror56”**

- User’s guide in the logbook: doc / Procedures / scripts

The End…