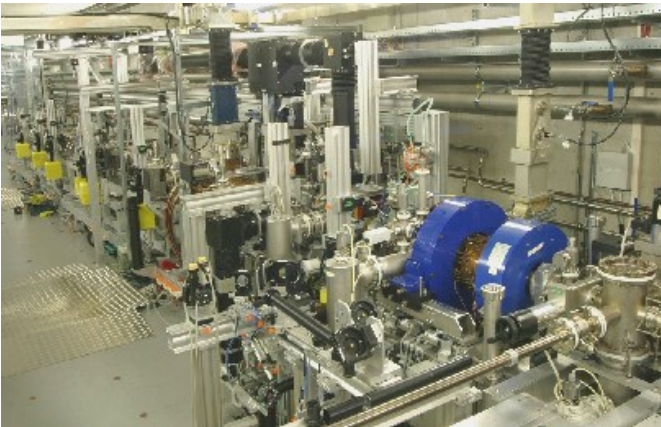


# Video-system and Laser BBA

## Short Intro

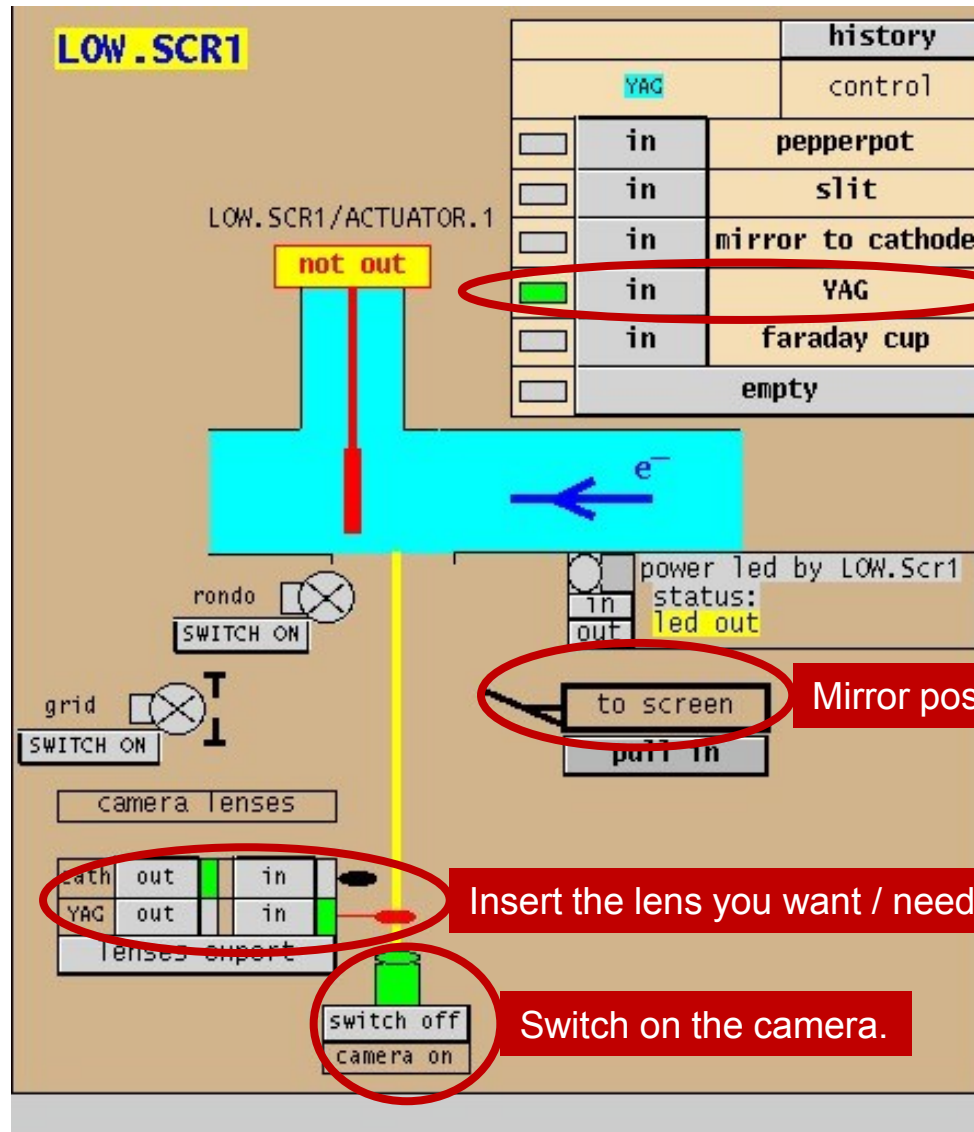
Marek Otevrel

29.01.2015



# Video system

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



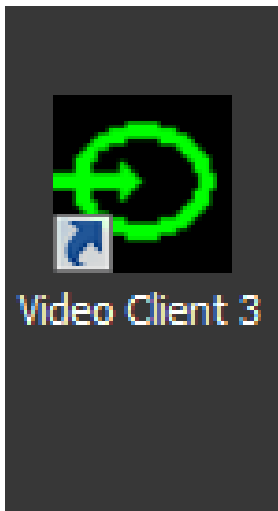
Insert the screen.

Mirror position "to screen".

Insert the lens you want / need.

Switch on the camera.

# Video system: VC3 (VideoClient 3)

A screenshot of the AVINE Video Client 3 software interface. The window title is "AVINE Video Client 3 - empty image". The interface includes a menu bar (Application, Image, Background, View, Help) and a toolbar with various controls. The main display area is black with a yellow crosshair and a dashed yellow rectangle. The status bar at the bottom shows a timestamp and a message: "[26.01.2015 14:43:30:801] Background was cleared, because address of live image source was changed by user." A red circle highlights the "Normalization" dropdown menu, which is currently set to "FG1LR2J: Not Connected".

Application Image Background View Help

Toolbar

Override Scale	x-Scale (mm/px)	<x> (px)	x RMS (px)	Normalization	Live Image Source	Switch...	DAQ Discard
	(unset)	0.500000	221.70232		FG1LR2J: Not Connected		
	y-Scale (mm/px)	<y> (px)	y RMS (px)	X-Ray Filtering	FF: Sum of Pixels	Poll Mode	DAQstart
	(unset)	0.500000	165.69928	0.000000			

Background empty

Browse Individual Images

Snap Image

[26.01.2015 14:43:30:801] Background was cleared, because address of live image source was changed by user.

Polled/Dropped Frames: -/- [%]

# Video system: VC3 (VideoClient 3)

AVINE Video Client 3 - empty image

Application Image Background View Help

Toolbar

Override Scale	x-Scale (mm/px)	<x> (px)	x RMS (px)	Normalization	Live Image Source:	Switch...	DAQ Discard
	(unset)	0.500000	221.70232		FG1LR2J: Not Connected		
y-Scale (mm/px)	<y> (px)	y RMS (px)	X-Ray Filtering	FF: Sum of Pixels	Poll Mode	DAQstart	
	(unset)	0.500000		165.69928			0.000000

Background: empty

Browse Individual Images: [ << <5 < 1 > 5> >> ]

Snap Image

[26.01.2015 14:43:30:801] Background was cleared, because address of live image source was changed by user.

Polled/Dropped Frames: -/-. [%]

# Video system: VC3 (VideoClient 3)

AVINE Video Client 3 - empty image

Application Image Background View Help

Toolbar

Override Scale

x-Scale (mm/px) <x> (px) x RMS (px)

(unset) 0.500000 221.70232

y-Scale (mm/px) <y> (px) y RMS (px)

(unset) 0.500000 165.69928

Background empty

Live Image Source: FG1L.R2J: Not Connected

FF: Sum of Pixels 0.000000

Normalization X-Ray Filtering

DAQ Discard DAQstart

Switch... Poll Mode Snap Image

Browse Individual Images

<< <5 < 1 > 5 >>

VS\_ControlPanel

Camera Filter

Camera	Server	Conn. Camera	FrameRate	Layer	Conn. Server	Conn. Camera
Not Connected	Not Connected	Not Connected	0.0	Not Connected	Not Connected	Not Connected
Low.Scr1 (Colour)	FG1S.Prosilica	Not Connected	0.0	FG1L.R2J	Not Connected	Not Connected
Low.Scr1 (Mono)	FG2S.Prosilica	Not Connected	0.0	FG2L.R2J	Not Connected	Not Connected
Low.Scr1 (Mono-Bin2x2)	FG6S.Prosilica	Not Connected	0.0	FG6L.R2J	Not Connected	Not Connected
Low.Scr2 (Full)				FG5L.R2J	Error	Error
Low.Scr2 (Bin2x2)						
Low.Scr3 (Full)						
Low.Scr3 (Bin2x2)						
<u>Disp1.Scr1 (Bin2x2)</u>						
Disp1.Scr1 (Full)						
High1.Scr1 (Full)						
High1.Scr1 (Bin2x2)						
High1.Scr2 (Full)						
High1.Scr2 (Bin2x2)						

Connect camera to server

Connect layer to server

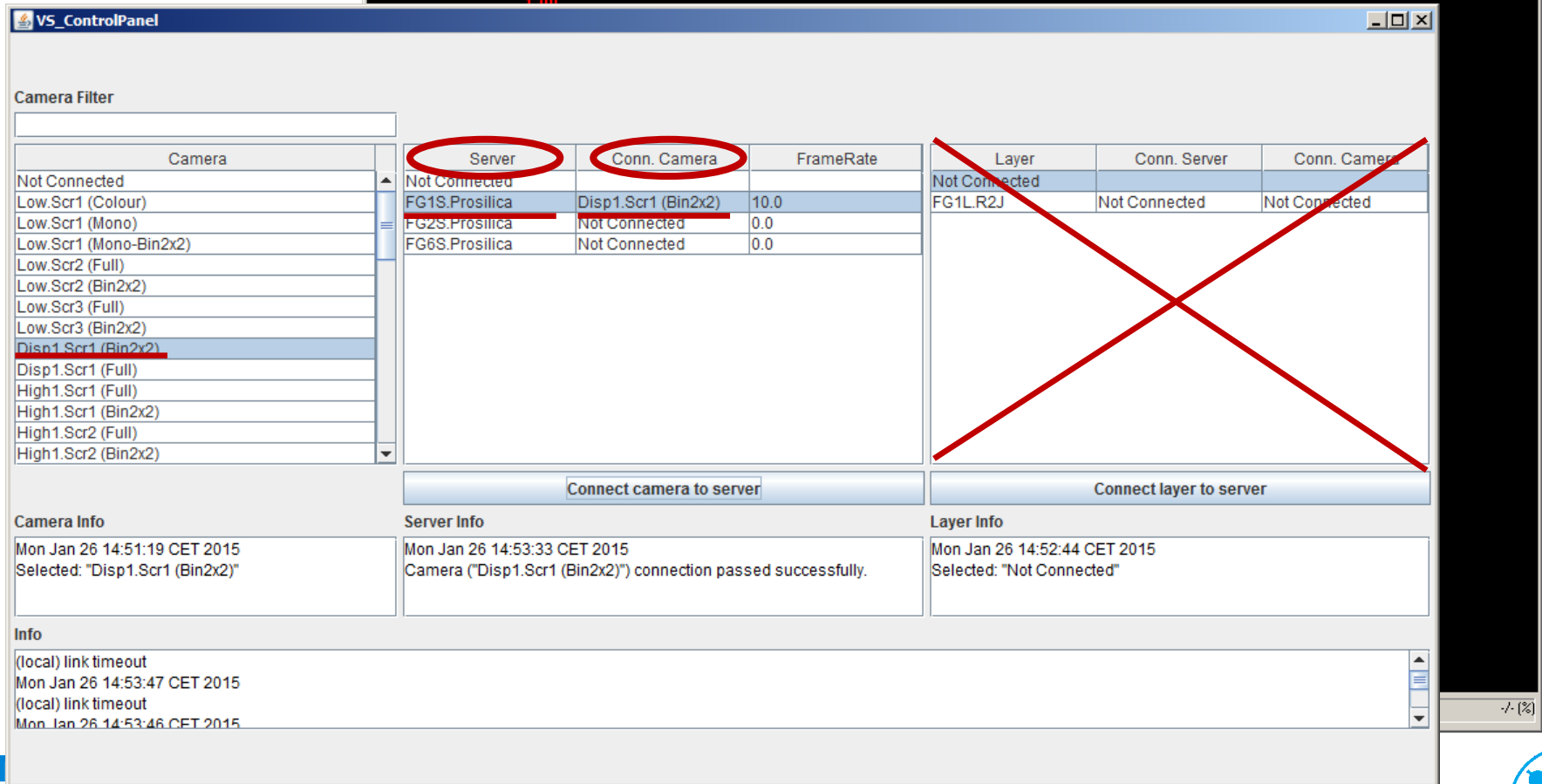
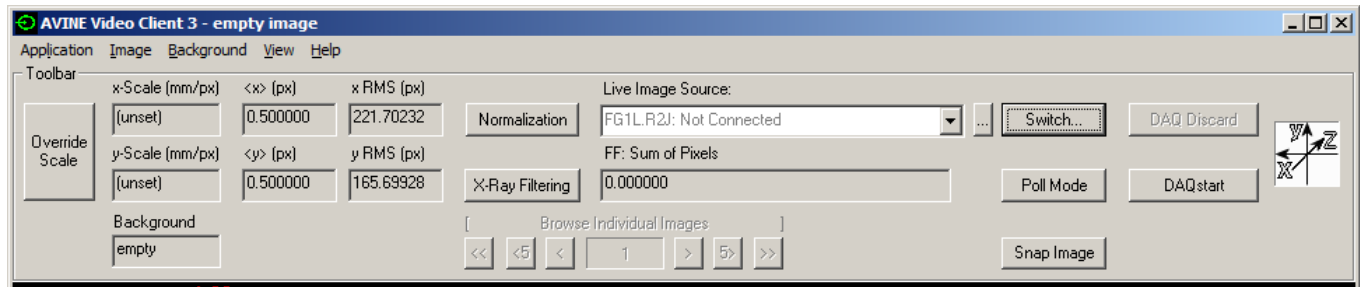
Camera Info  
Mon Jan 26 14:51:19 CET 2015  
Selected: "Disp1.Scr1 (Bin2x2)"

Server Info  
Mon Jan 26 14:51:19 CET 2015  
Selected: "Not Connected"

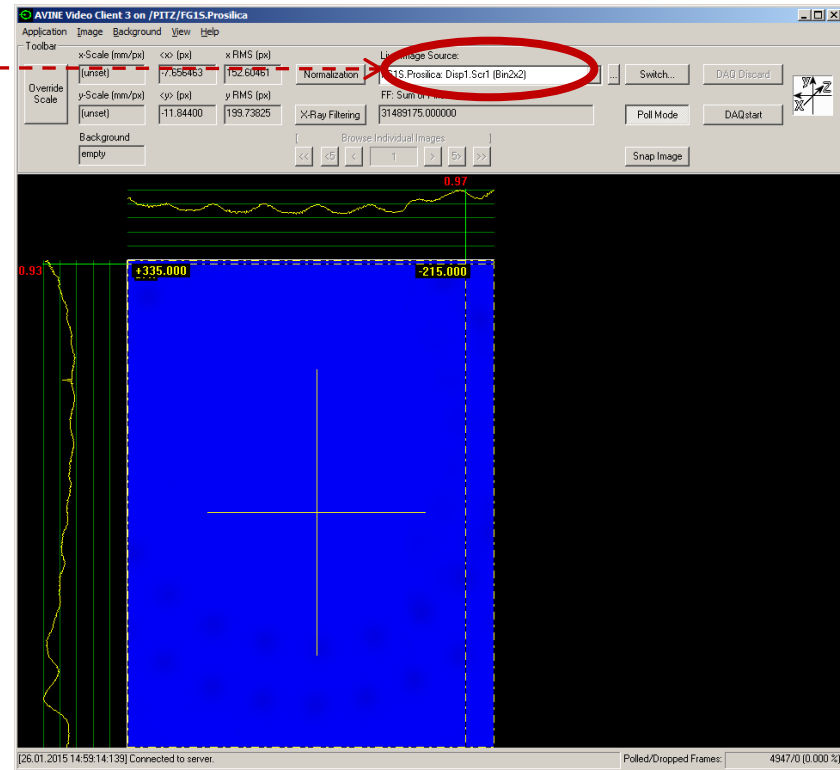
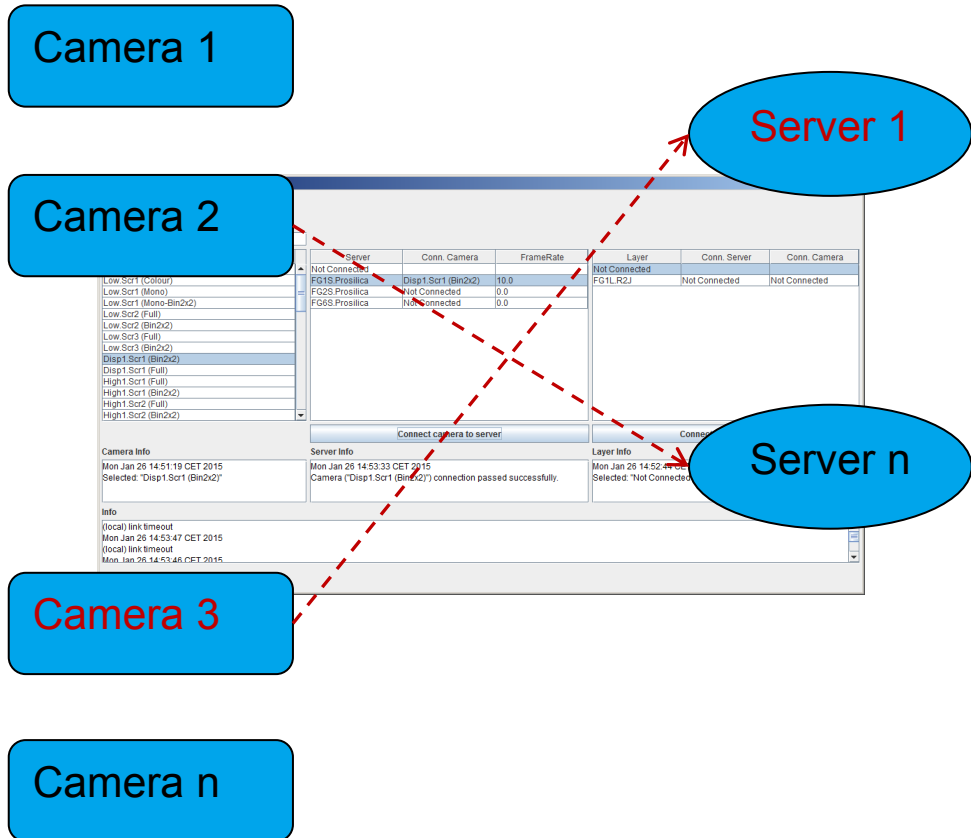
Layer Info  
Mon Jan 26 14:51:19 CET 2015  
Selected: "Not Connected"

Info  
(local) link timeout  
Mon Jan 26 14:51:30 CET 2015  
(local) link timeout  
Mon Jan 26 14:51:28 CET 2015

# Video system: VC3 (VideoClient 3)

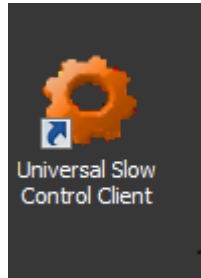


# Video system: VC3 (VideoClient 3)





# Video system: *USC Client: Managing the cameras*

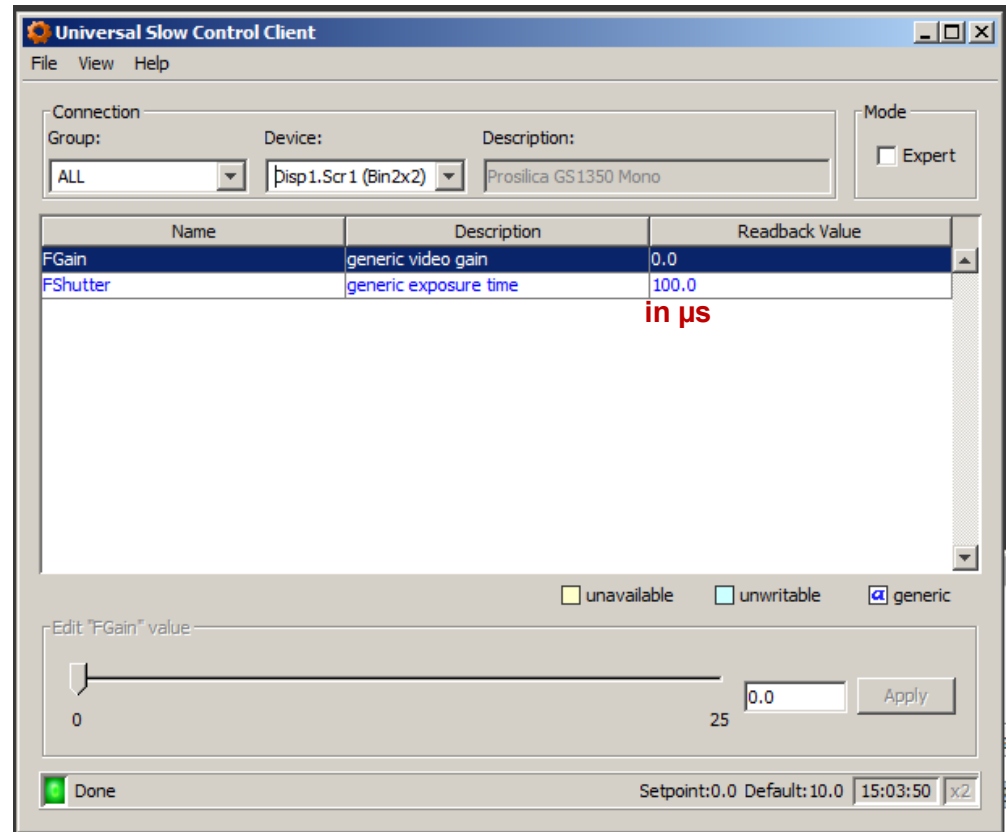


OR

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



**The camera must be connected before you can manage it!**



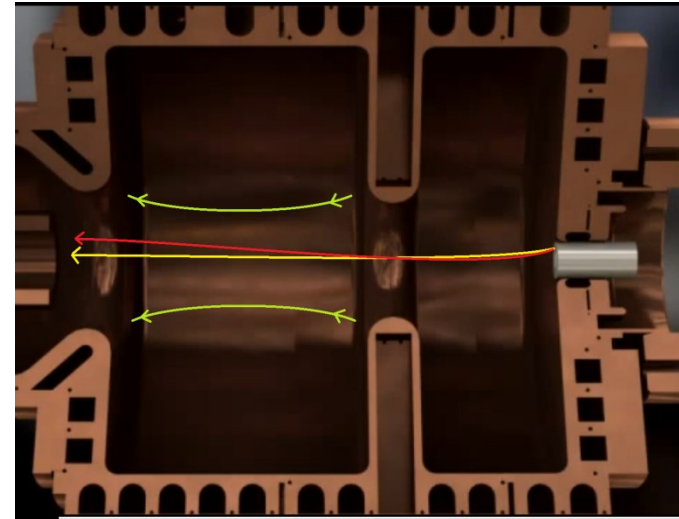
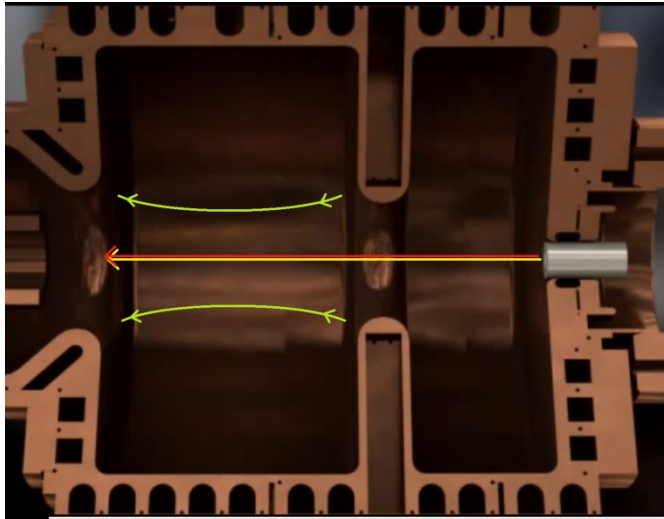
# Laser BBA

# 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*

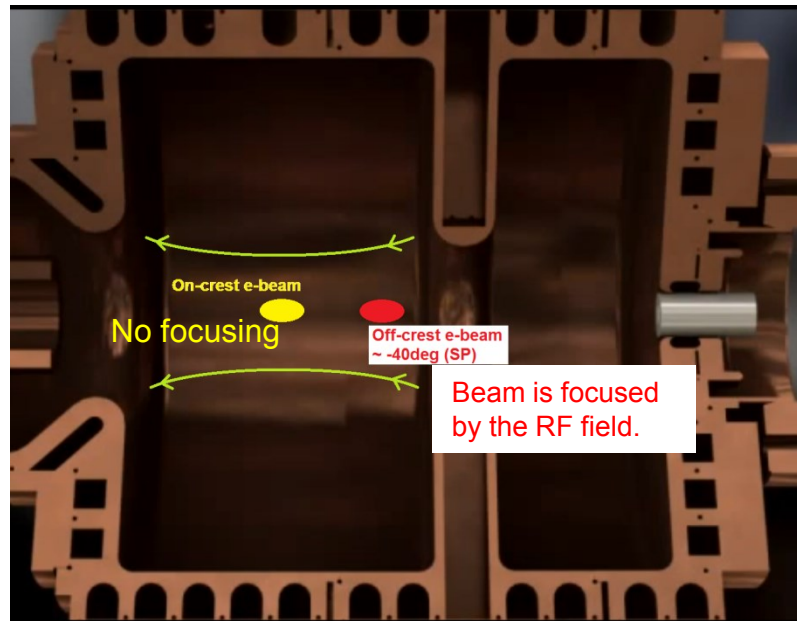
- If an electron sees **only** the **RF field** ...

-> **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).



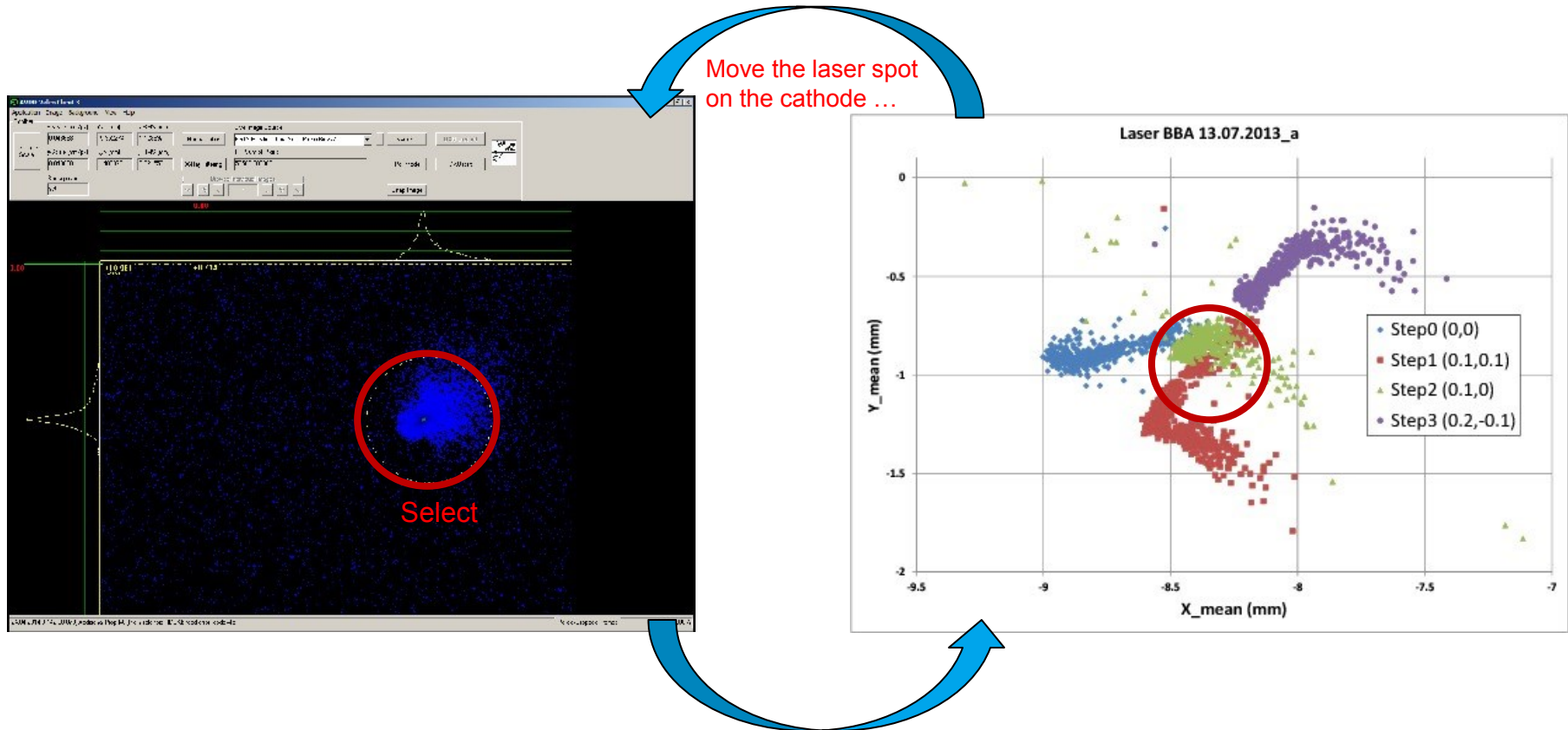
# Laser BBA: *Measurement conditions*

## - 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  $\sim 10$ deg (smaller for a Gaussian laser profile)
- Laser profile: Flat top, if available. Use long trains ( $\sim 100$  pulses) for signal enhancement.
  - > Check the camera timing! (not too short to see all pulses, not too long to suppress e.g. the dark current effects.)
- Bunch charge:  $\sim 10$ pc (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*

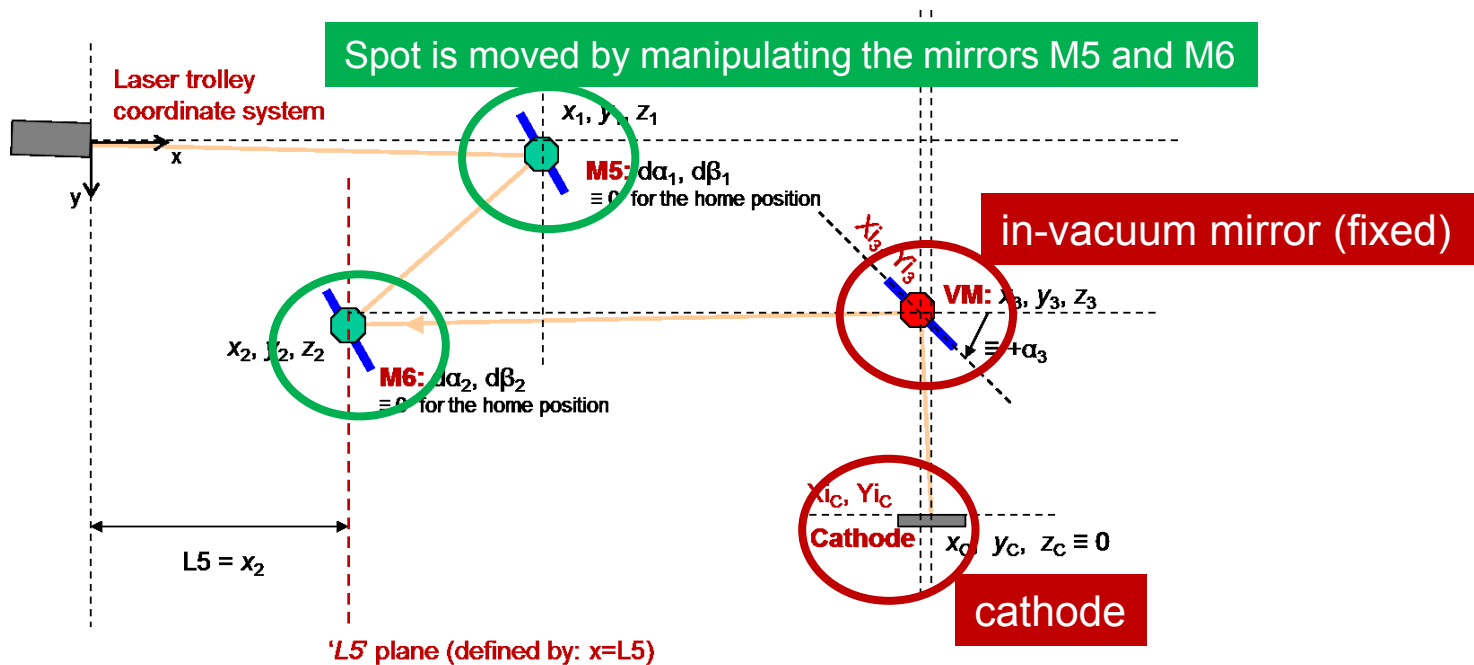
Move the laser spot on the cathode and find such position, for which the beam spot centroid does not move on the observation screen, as the phase changes.





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

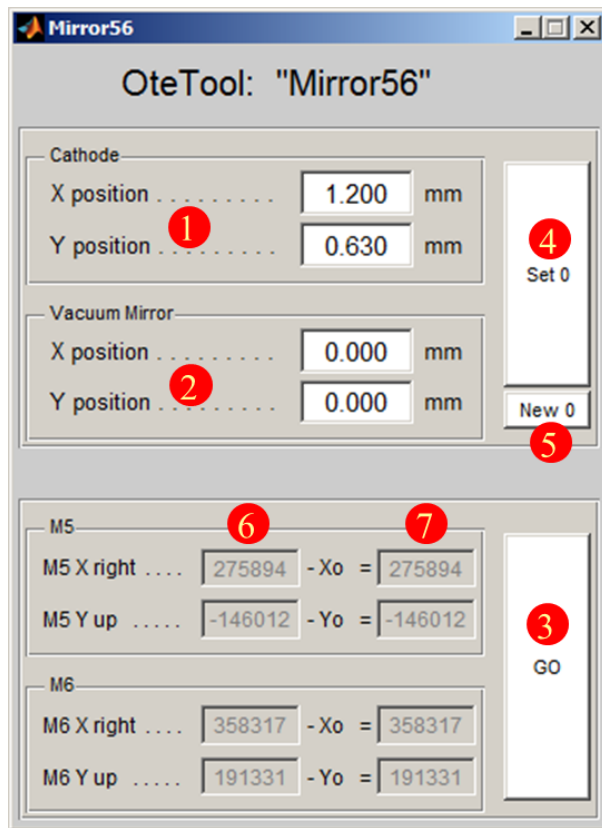
## Laser trolley setup



“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 Mirror56 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...