

# Summary of Tomography Commissioning

**Week 03: 16/01- 22/01 2012**

**Night shifts with G. Asova and B. Marchetti**

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Summary of Tomography commissioning  
PPS, 26.01.2012

# Outline

- > Preparation
- > Commissioning
- > Preliminary data taking
- > Summary and next goals



# Preparation (12/01 – 18/01)

- > **Optics** alignment and cleaning in each PST Screen Station:
  - Mirrors
  - Lenses
  - Grid
  - Camera
  
- > **Camera orientation** check, **Timing** and **Calibration** (by Grygorii and Galina)
  
- > **PST.Scr1** update:
  - OTR has been exchanged with another YAG screen for the (bottom read-out)
  - Both setups functional, but “old OTR” (bottom) is now the default one



# Preparation (12/01 – 17/01)

## > Problems encountered:

- Movable mirror on [PST.Scr5](#) doesn't reach the same position every time when changing from YAG to OTR (and vice versa)
- Same for actuator of the f200 lens in [PST.Scr3](#) when moving in and out (end-switch temporarily fixed by Grygorii).
- Camera in [PST.Scr4](#) had been damaged (by radiation ?)

Status

?

?

✓

## > Other observations:

- Actuator on [PST.Scr1YAG](#) moves slowly
- Two missing top [covers](#) on top of the last PST screens

?

✓



# Commissioning (16/01 – 22/01)

## > Achieved intermediate steps:

- Adjustment of the **laser**, measurement of **charge** (BSA 1.2 mm / 0.5nC for data)
- Set up the Gun, measurements on **LEDA** (on crest phase , max power)
- Set up the Booster, measurements on **HEDA** (on crest phase, >6MW)
- Slit scan, **EMSY I** (~10 pulses, I<sub>main</sub> close to focus)
- Quadrupole **steering** and transport (until Pst.Scr5)
- **Matching**, MAD + manual adjustment for fine tuning
- **Data taking**



# Commissioning (16/01 – 22/01)

## > Problems encountered (tomography related):

- RFD.St1 is no longer in the beamline
- High1.StA2 under unknown status
- PST.St1 moves only vertically
- PSTSt6 power supply failures
- High1.Q5 maximum current limited to 3A
- Control of the tomography screen stations by the data taking software
- EMSY III GUI not available

Status

x

✓

✓?

✓

✓

✓

x

## > General problems:

- Frequent spark-generated interlocks
- Strong beam position jitter
- Positioning of the solenoid

?

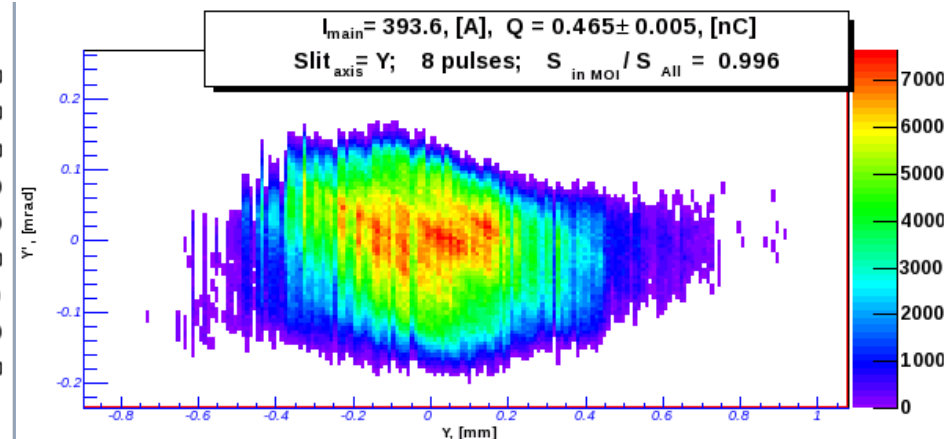
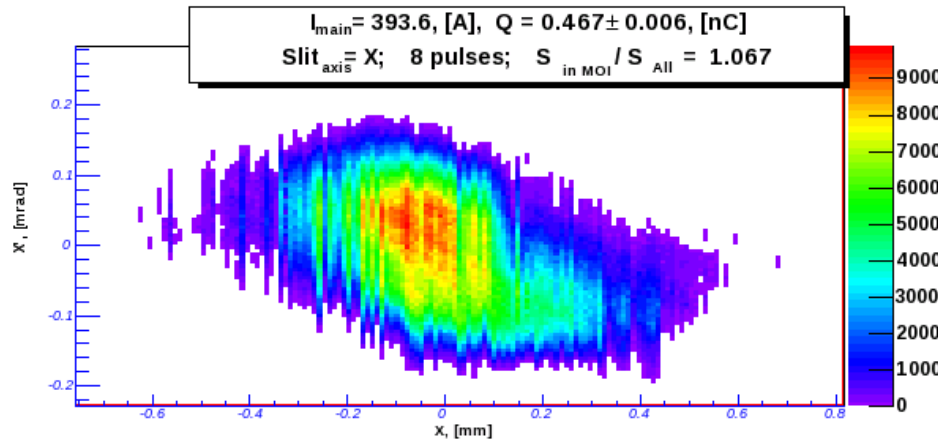
?

?



# Data taking – Case 1 (21/01)

- Charge 500 pC at 27.9 MeV/c |  $I_{\text{main}} = 394$  A (focus + 2A) | BSA of 1.2 mm, (3/21\3 ps)



Results			
Plot system ver. Jan 14 2012 05:46:48			
Lasers:			
rms size	$\langle x^2 \rangle_0 = 0.29000$ ,	$\langle y^2 \rangle_0 = 0.32000$ ,	[mm]
Electron beam:			
Momentum gun:	6.58000	$\pm 0.0176$ ,	[MeV/c]
Momentum boo:	27.87000	$\pm 0.1157$ ,	[MeV/c]
$\sigma_{yag}$	0.33810		[mm]
$\sigma_{scan}$	0.16731		[mm]
divergence	0.07246		[mrad]
covariance	-0.00584		[mm mrad]
sheared div	0.01062		[mrad]
$\epsilon_{sheared}^{scaled}$	1.131		[mm mrad]
$\epsilon_{2D}^{noscaled}$	0.579		[mm mrad]
$\epsilon_{2D}^{scaled}$	1.171		[mm mrad]

Comments: EMSY1X\_394A\_2012\_01\_22\_04\_48\_16\_\_from66\_50-to68\_25\_fast

Results			
Plot system ver. Jan 14 2012 05:46:48			
Lasers:			
rms size	$\langle x^2 \rangle_0 = 0.29000$ ,	$\langle y^2 \rangle_0 = 0.32000$ ,	[mm]
Electron beam:			
Momentum gun:	6.58000	$\pm 0.0176$ ,	[MeV/c]
Momentum boo:	27.87000	$\pm 0.1157$ ,	[MeV/c]
$\sigma_{yag}$	0.39020		[mm]
$\sigma_{scan}$	0.21852		[mm]
divergence	0.06777		[mrad]
covariance	-0.00295		[mm mrad]
sheared div	0.01451		[mrad]
$\epsilon_{sheared}^{scaled}$	1.378		[mm mrad]
$\epsilon_{2D}^{noscaled}$	0.791		[mm mrad]
$\epsilon_{2D}^{scaled}$	1.413		[mm mrad]

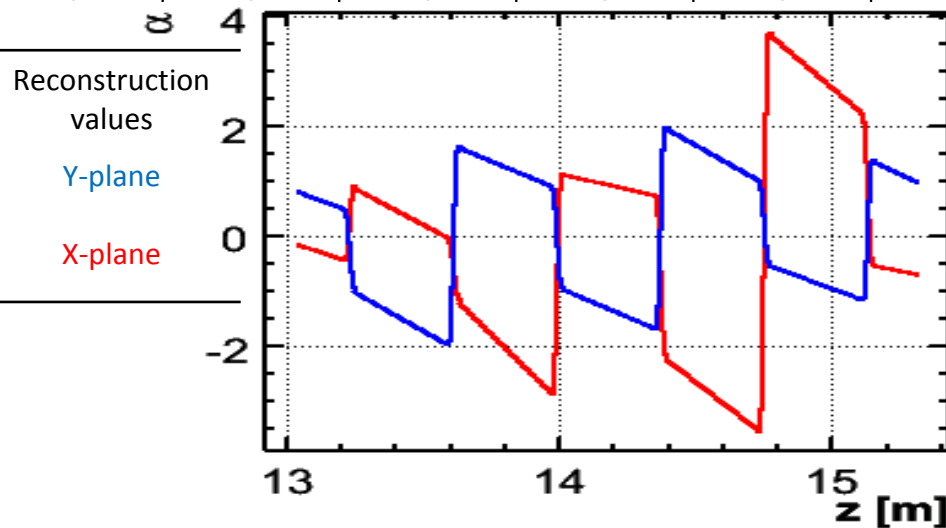
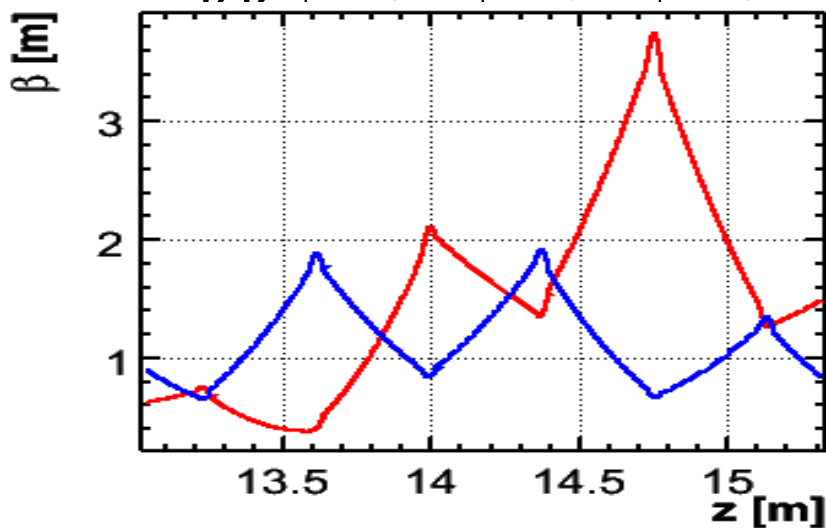
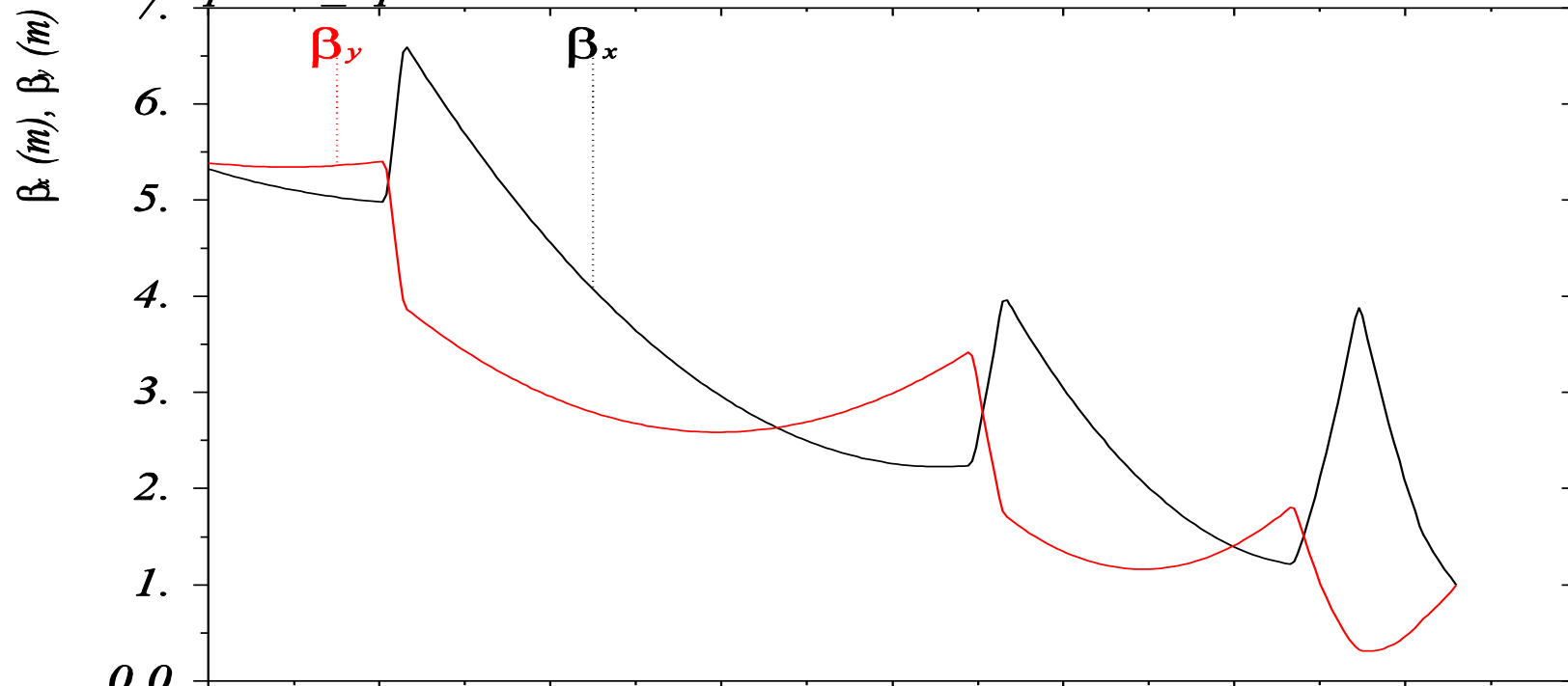
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# Data taking – Case 1 (21/01)

pitz18\_7q

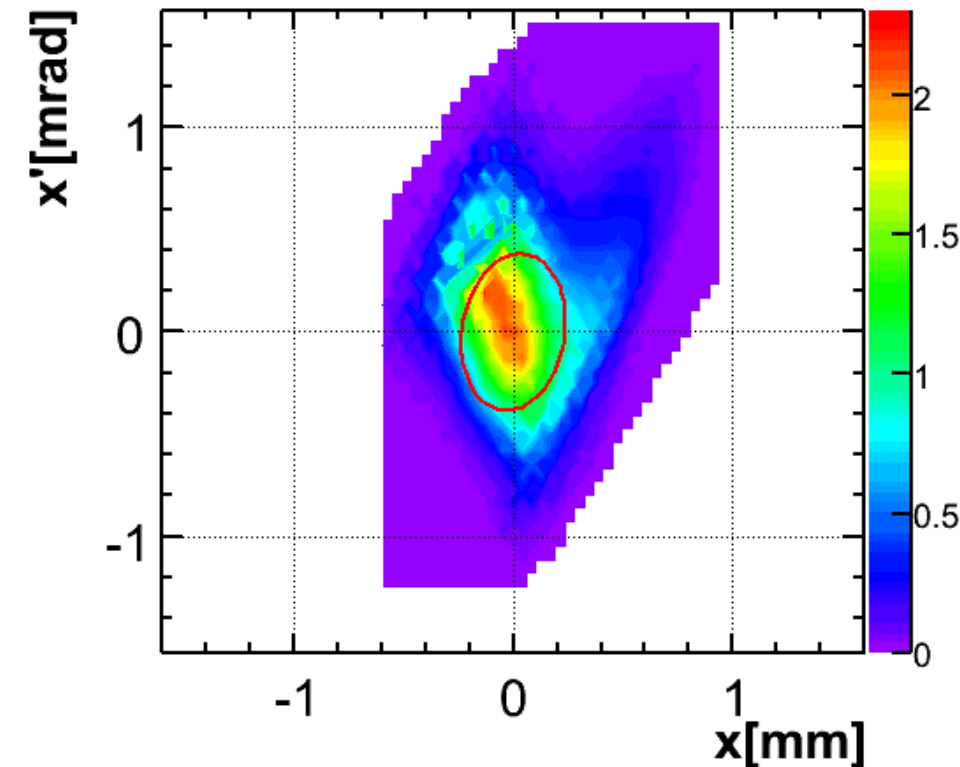
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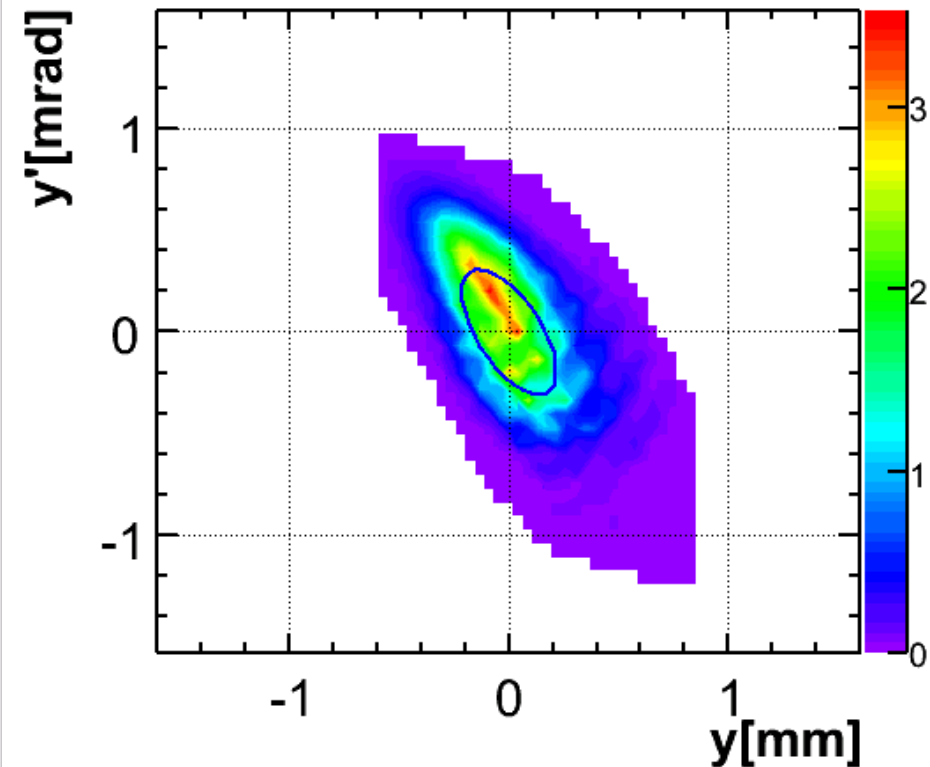
# Data taking – Case 1 (21/01)

$\epsilon_x = 5.106$  mm mrad



$\sigma_x = 0.238191$  mm  
 $\sigma_{x'} = 0.383388$  mrad  
 $\sigma_{xx'} = 0.013031$  mm mrad  
.....:  $\beta = 0.627702$   
.....:  $\alpha = -0.144172$

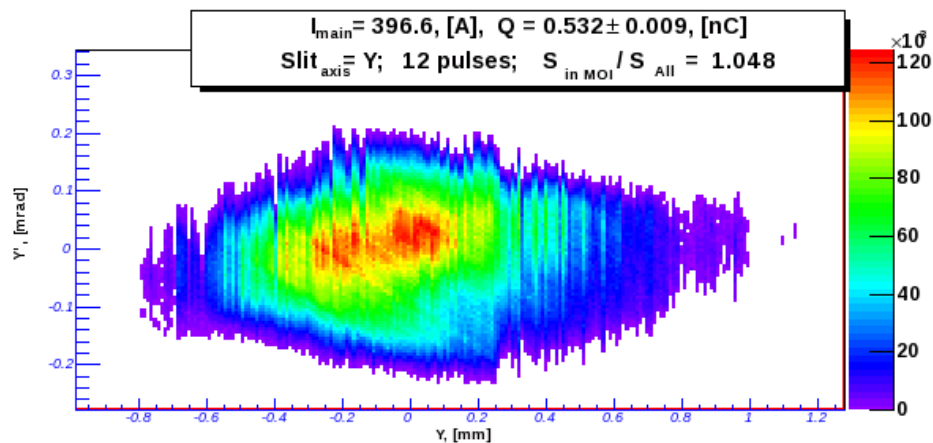
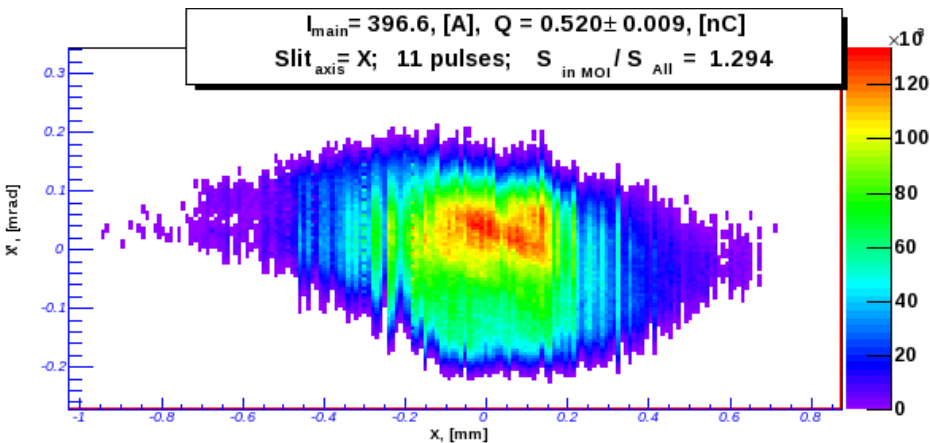
$\epsilon_y = 2.909$  mm mrad



$\sigma_y = 0.215186$  mm  
 $\sigma_{y'} = 0.3092$  mrad  
 $\sigma_{yy'} = -0.0421229$  mm mrad  
.....:  $\beta = 0.899063$   
.....:  $\alpha = 0.817863$

# Data taking – Case 2 (22/01)

- Charge 500 pC at 27.9 MeV/c |  $I_{\text{main}} = 397$  A (focus + 2A)  
BSA of 1.2 mm, (3/21\4 ps)



Results			
Plot system ver. Jan 14 2012 05:48:48			
Laser:			
rms size	$\langle x^2 \rangle_0 = 0.29000$	$\langle y^2 \rangle_0 = 0.31000$	[mm]
Electron beam:			
Momentum gun:	6.65000	$\pm 0.0202$	[MeV/c]
Momentum boo:	27.89000	$\pm 0.0859$	[MeV/c]
$\sigma_{yag}$	0.33490		[mm]
$\sigma_{scan}$	0.19919		[mm]
divergence	0.08159		[mrad]
covariance	-0.00405		[mm mrad]
sheared div	0.01574		[mrad]
$\epsilon_{sheared}^{scaled}$	1.416		[mm mrad]
$\epsilon_{2D}^{noscaled}$	0.859		[mm mrad]
$\epsilon_{2D}^{scaled}$	1.444		[mm mrad]

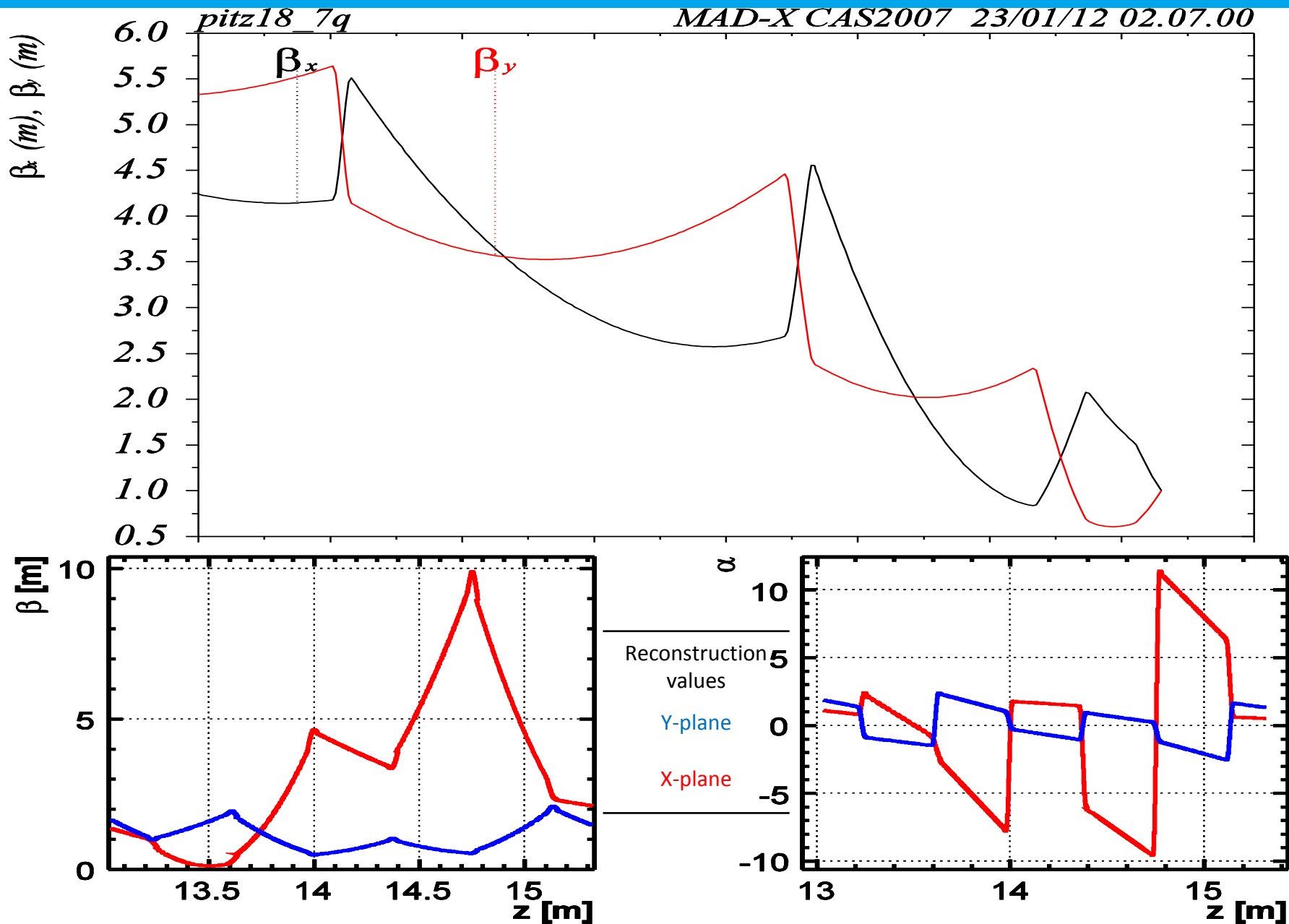
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Results			
Plot system ver. Jan 14 2012 05:48:48			
Laser:			
rms size	$\langle x^2 \rangle_0 = 0.29000$	$\langle y^2 \rangle_0 = 0.31000$	[mm]
Electron beam:			
Momentum gun:	6.65000	$\pm 0.0202$	[MeV/c]
Momentum boo:	27.89000	$\pm 0.0859$	[MeV/c]
$\sigma_{yag}$	0.41820		[mm]
$\sigma_{scan}$	0.28894		[mm]
divergence	0.07873		[mrad]
covariance	0.00187		[mm mrad]
sheared div	0.02267		[mrad]
$\epsilon_{sheared}^{scaled}$	1.758		[mm mrad]
$\epsilon_{2D}^{noscaled}$	1.237		[mm mrad]
$\epsilon_{2D}^{scaled}$	1.791		[mm mrad]

Comments: EMSY1Y\_397A\_2012\_01\_23\_00\_51\_47\_from65\_20-to67\_50\_fast

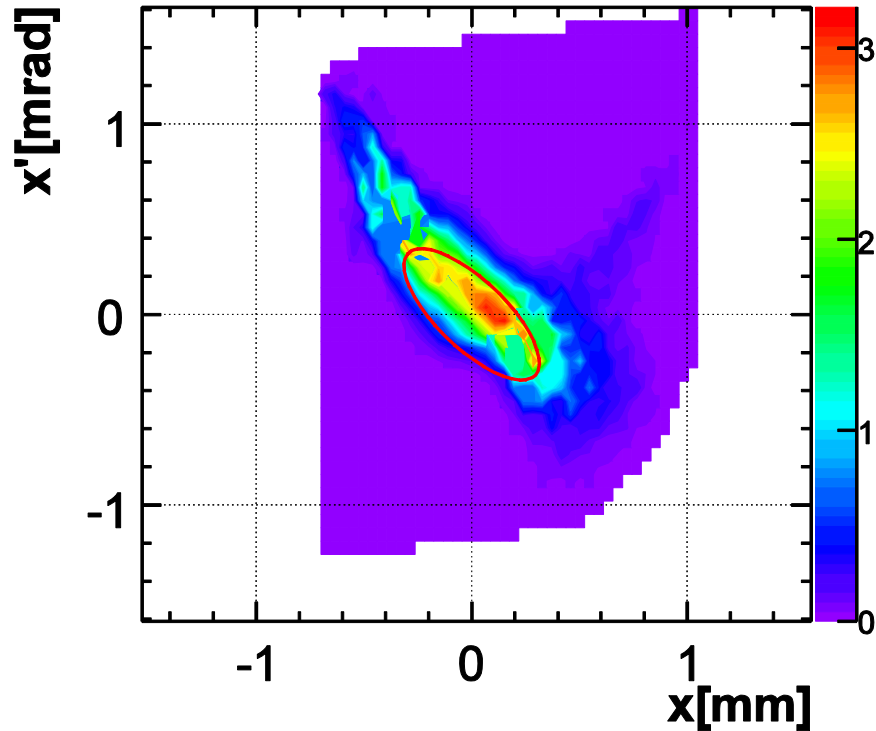


# Data taking – Case 2 (22/01)



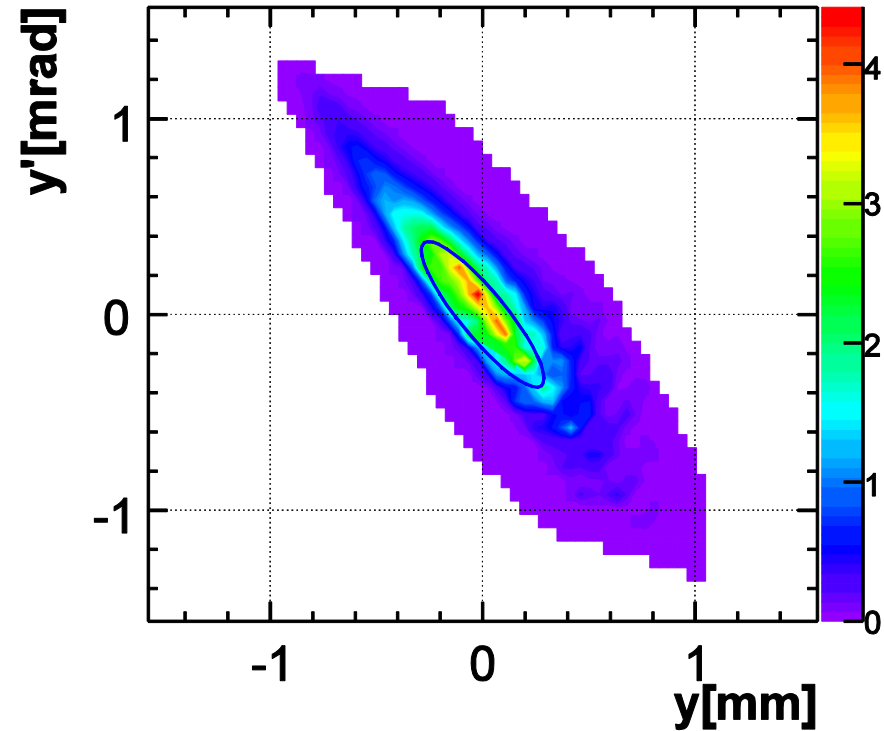
# Data taking – Case 2 (22/01)

$\varepsilon_x = 3.984$  mm mrad



$\sigma_x = 0.314354$  mm  
 $\sigma_{x'} = 0.345476$  mrad  
 $\sigma_{xx'} = -0.0804075$  mm mrad  
.....:  $\beta = 1.353680$   
.....:  $\alpha = 1.101473$

$\varepsilon_y = 2.771$  mm mrad



$\sigma_y = 0.2888$  mm  
 $\sigma_{y'} = 0.372007$  mrad  
 $\sigma_{yy'} = -0.0946803$  mm mrad  
.....:  $\beta = 1.642665$   
.....:  $\alpha = 1.864727$

# Summary

- > First (preliminary) data taken - tomography module is **commissioned**
  
- > Many **problems** solved, some remain:
  - F200 lens actuator on PST.Scr3
  - Movable mirror on PST.Scr5
  - PST.St1 (?)
  - EMSY 3 GUI preparation
  
- > **Next goals:**
  - Finalize optics after fixes
  - Transport, matching and measurements at maximum power, starting from low charges
  - Support measurements with EMSY 2 and 3 data



Thanks to: Barbara, Galina and Grygorii.

**THE END.**

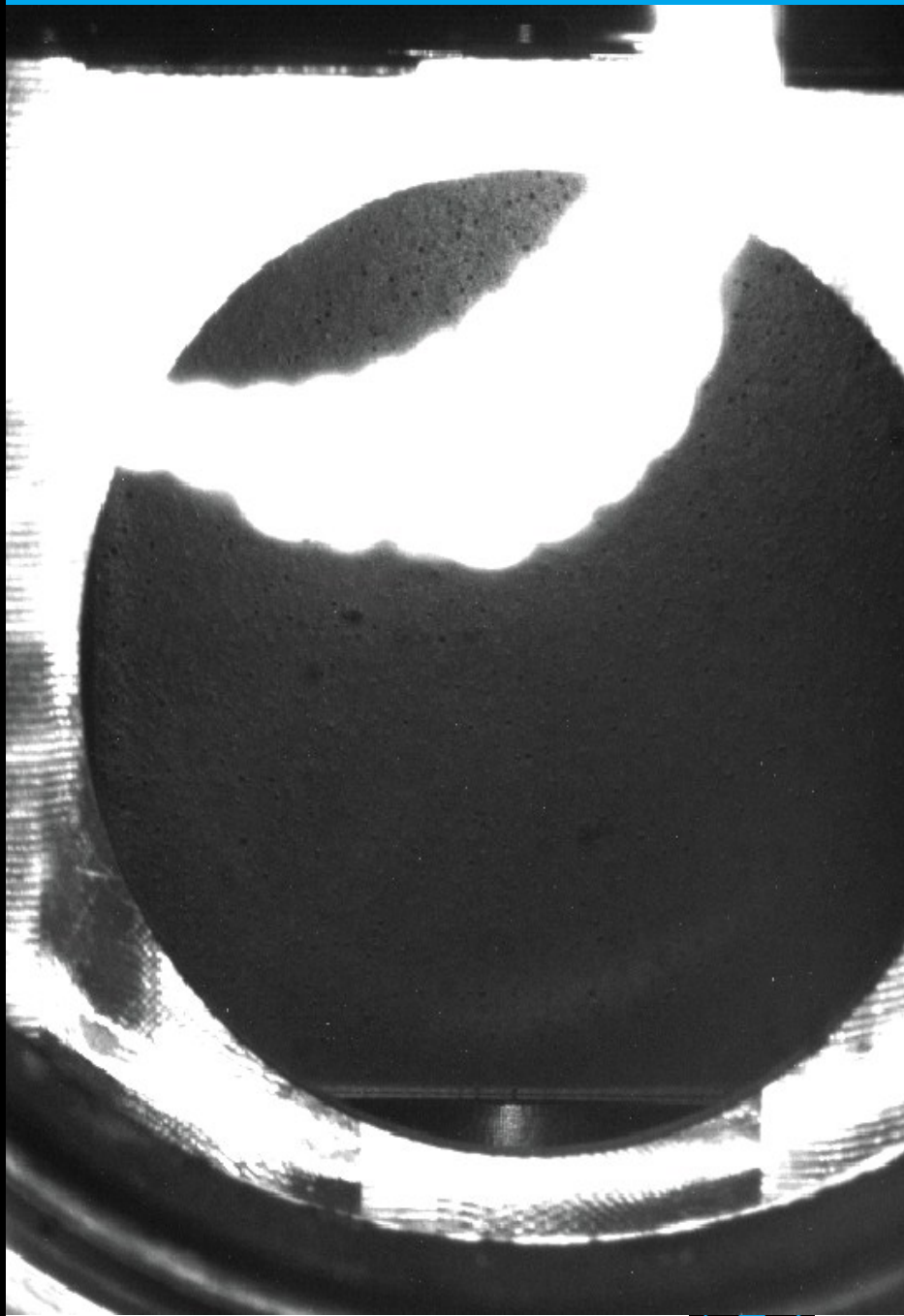
## Backup Slides



FILE

+11.476

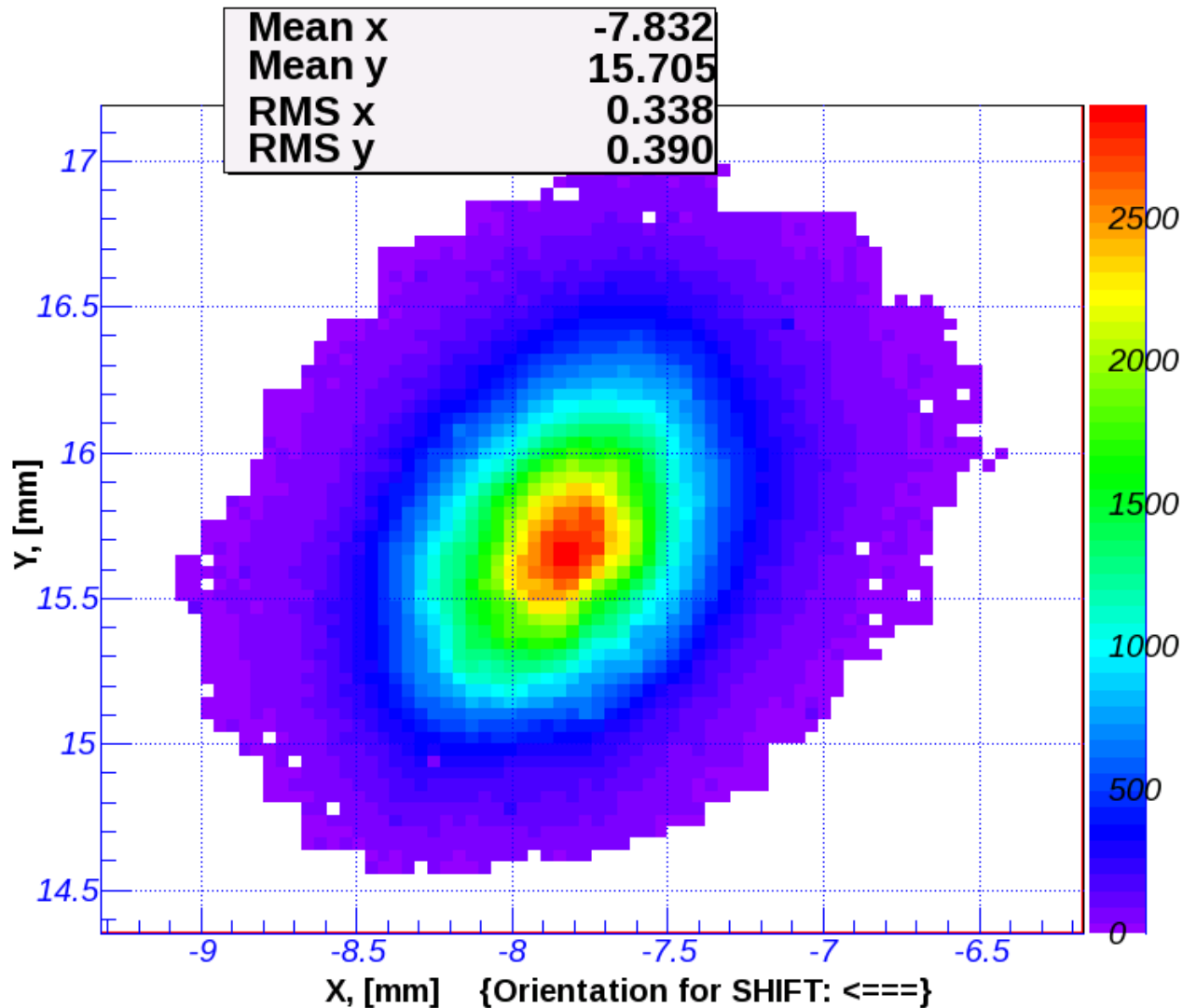
+2.625





# Data taking – Case 1 (21/01)

- Charge 500 pC at 27.87 MeV/c | I<sub>main</sub>= 394 A (focus + 2A) | BSA of 1.2 mm, (3/21\3 ps)



# Data taking – Case 2 (22/01)

- Charge 500 pC at 27.9 MeV/c |  $I_{\text{main}} = 397$  A (focus + 2A)  
BSA of 1.2 mm, (3/21\4 ps)

