

from Xfel-beam/talks

2012.05.07: Analysis of bunch compression studies (PDF)

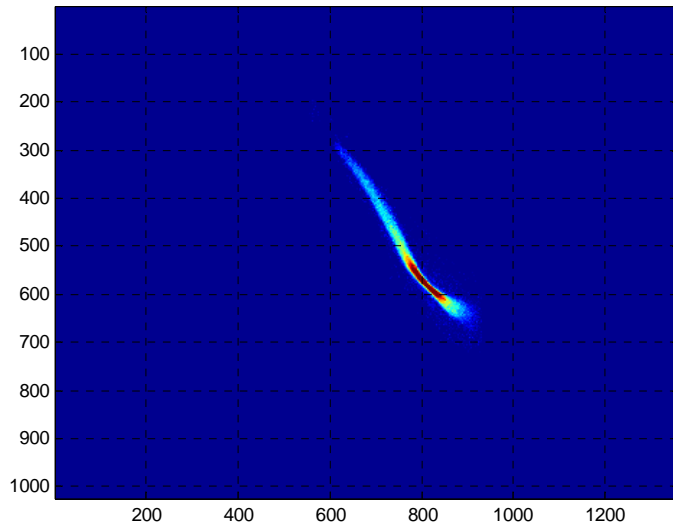
# “11 LOLA Mystery”



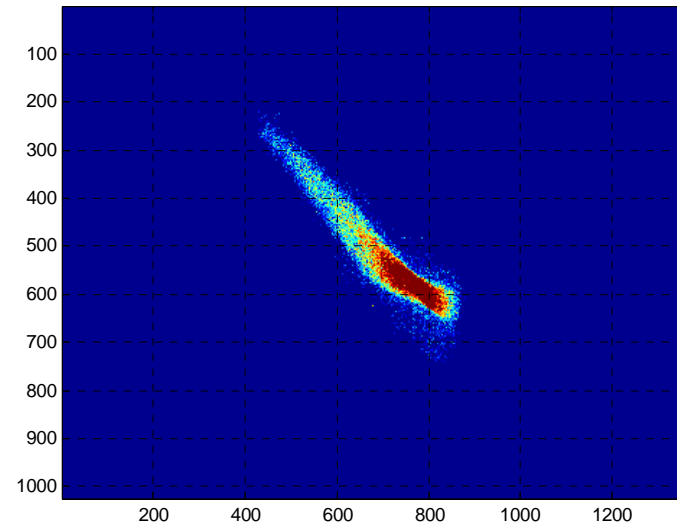
# 11 LOLA Mystery

f.i. measurements 61&62

zero-crossing #1



zero-crossing #2, flipped



15.4 fsec per pixel

really the same Lola settings?

time	index	rf settings (phases/deg, amplitudes/MV)							
		P1	P2	P3	P4	A1	A2	A3	A4
220515	measurement 61	7.5	-6.6	0	-57.9	164.7	18.1	300.0	253.0
220806	time calibration	-----	???	new LOLA amplitude	-----				
221209	time calibration	-----	???	old LOLA amplitude	-----				
221415	measurement 62	7.5	-6.6	0	-57.9	164.7	18.1	300.0	253.0

perhaps not, but there is more ...



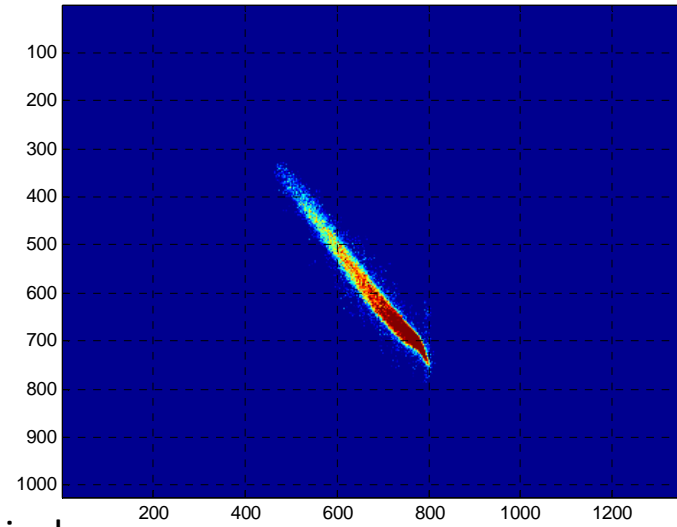
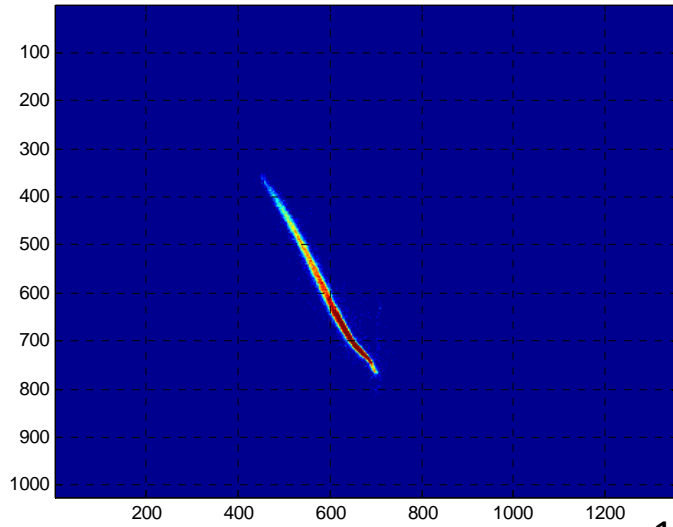
# 57&58

time		index
213255	measurement	57
213442	measurement	58

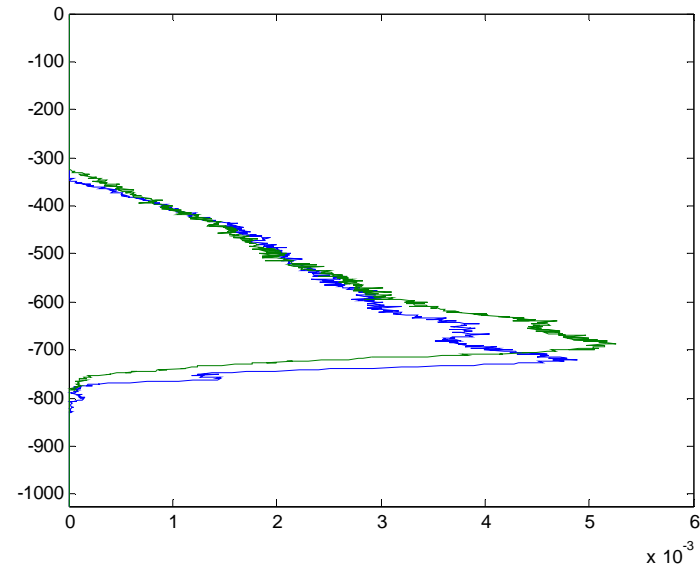
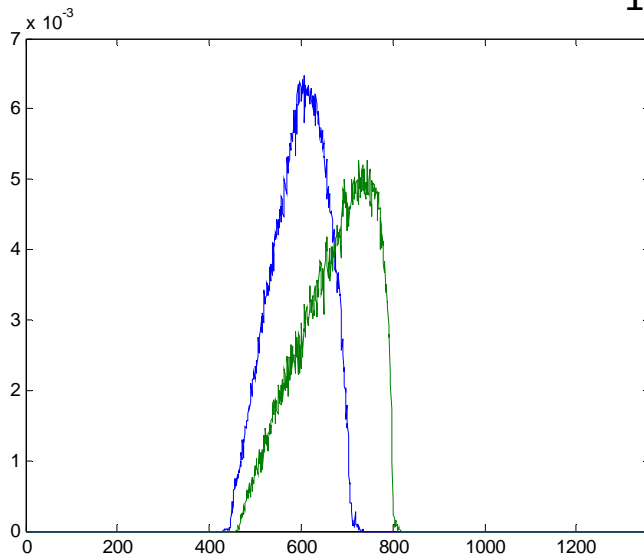
rf settings (phases/deg, amplitudes/MV)

P1	P2	P3	P4	A1	A2	A3	A4	index-2
7.5	-6.6	0	-57.9	164.7	18.1	300.0	253.0	110
7.5	-6.6	0	-57.9	164.7	18.1	300.0	253.0	112

no calibration between measurements !!!



15.4 fsec per pixel

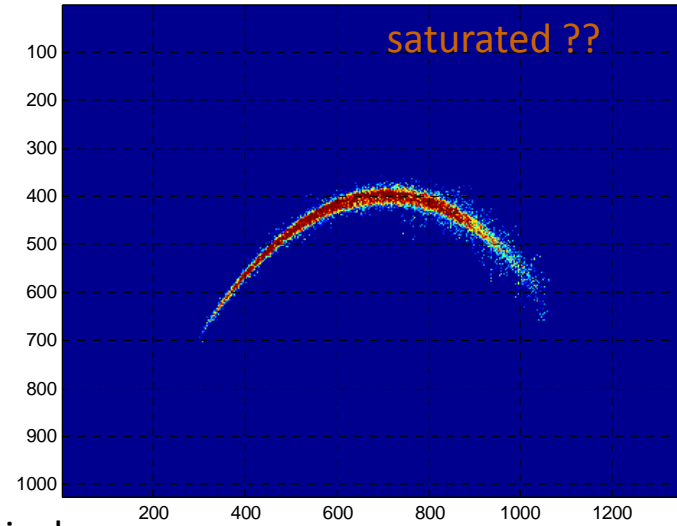
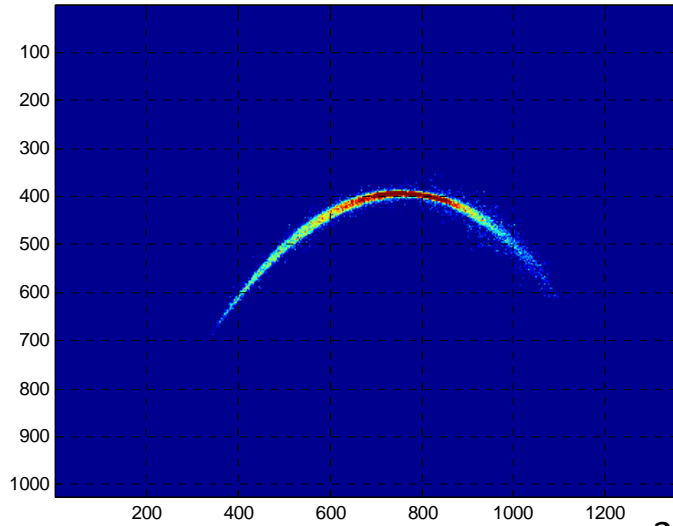


and measurements 1..9

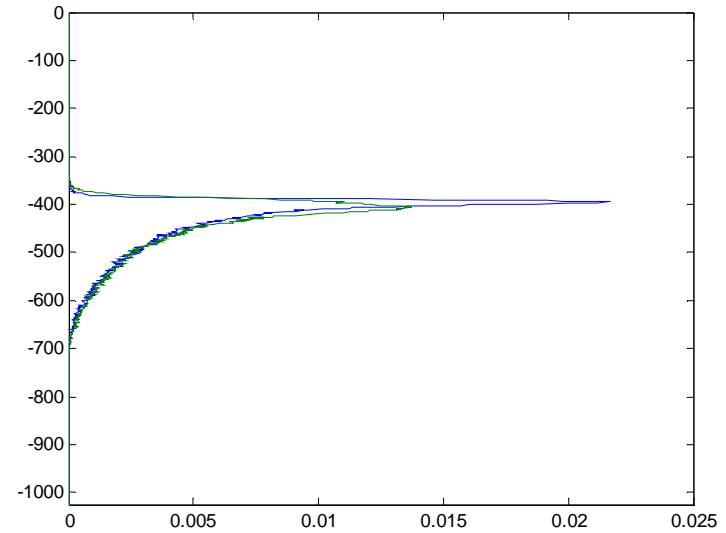
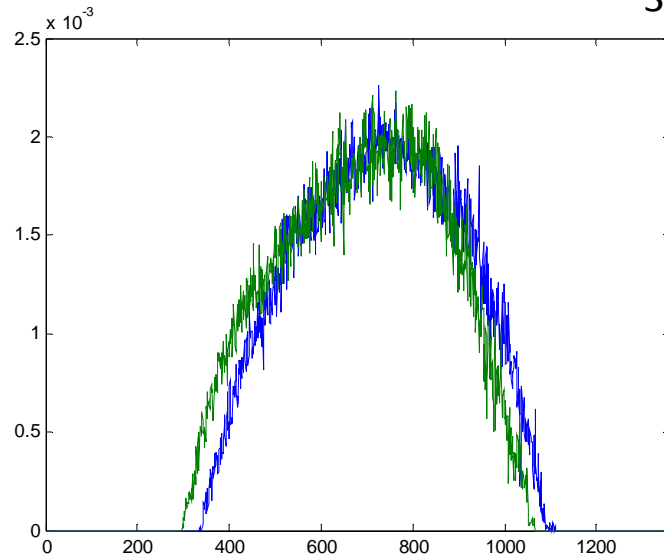


# 1+&1-

time		index	P1	P2	P3	P4	A1	A2	A3	A4	index-2
210357	measurement	1+	0	0	0	-58	163.3	18	300.0	249.0	3
211751	measurement	1-	0	0	0	-58	163.3	18	300.0	249.0	4

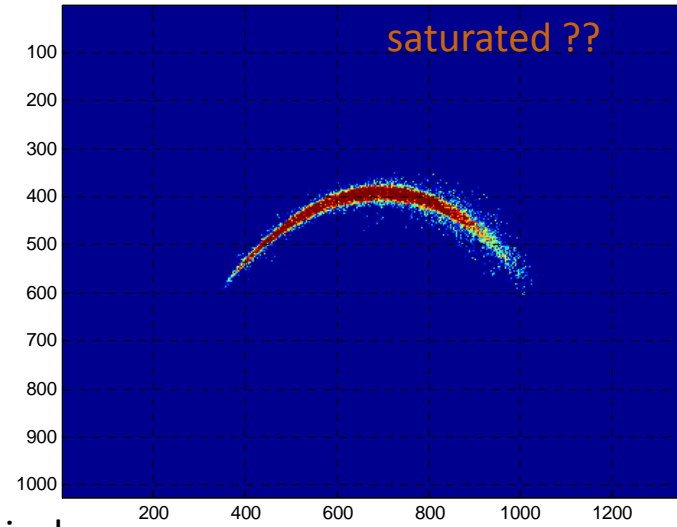
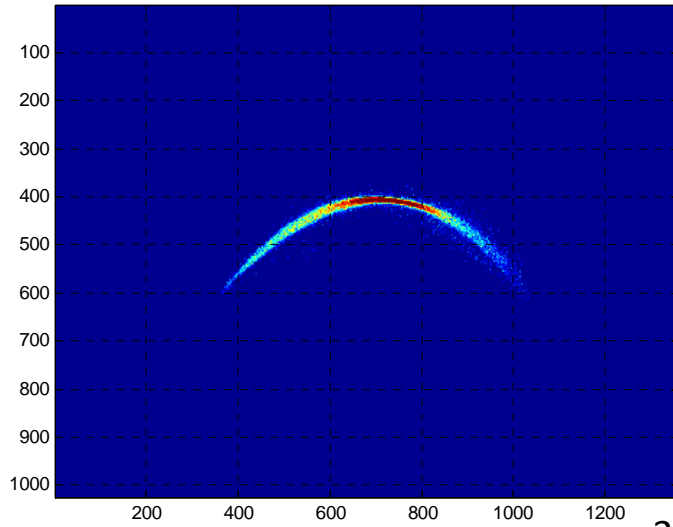


36.3 fsec per pixel

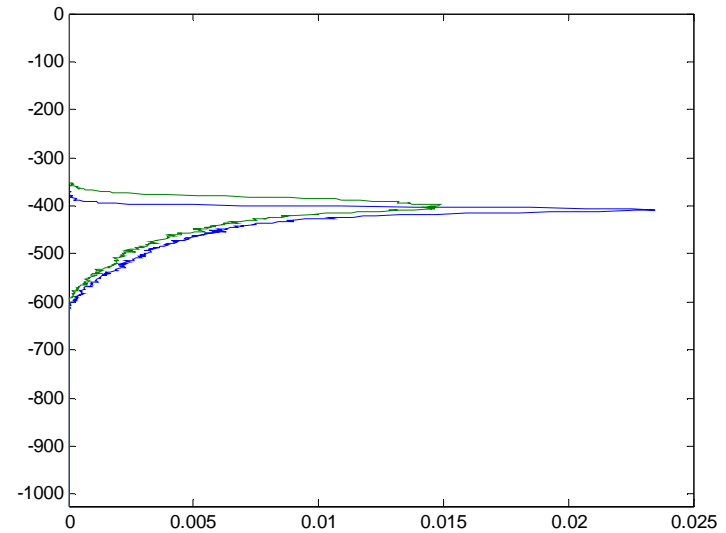
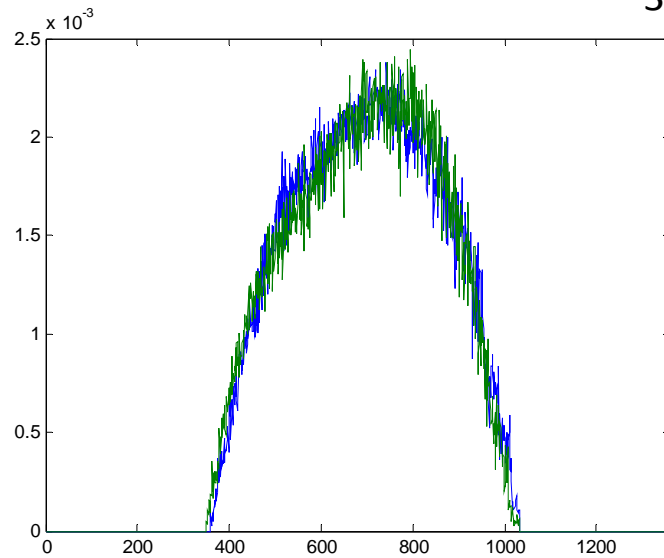


# 2+&2-

time	index	P1	P2	P3	P4	A1	A2	A3	A4	index-2
212906	measurement 2-	1	-1	0	-58	163.3	18	300.0	249.0	6
213336	time calibration									
213542	measurement 2+	1	-1	0	-58	163.3	18	300.0	249.0	8

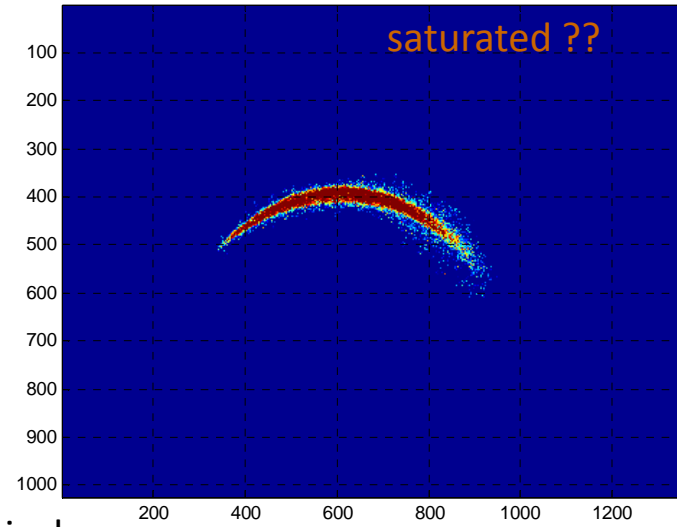
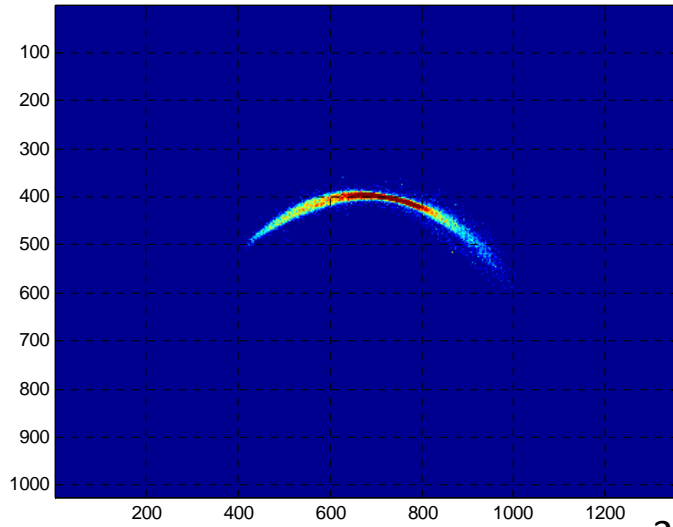


36.3 fsec per pixel

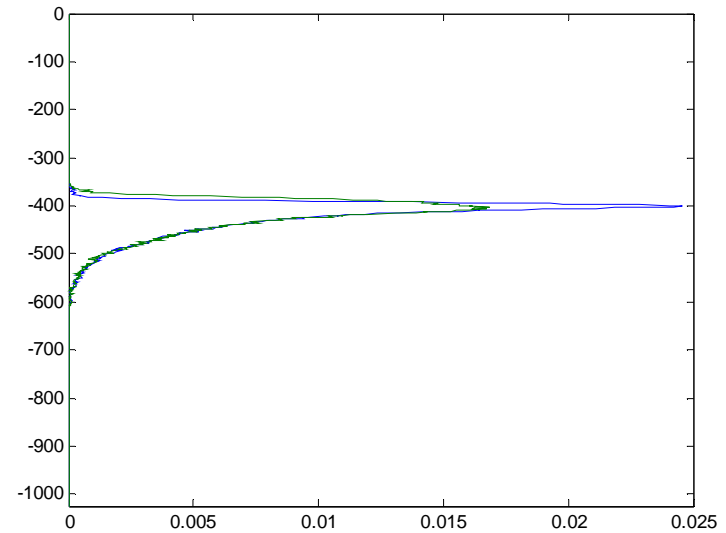
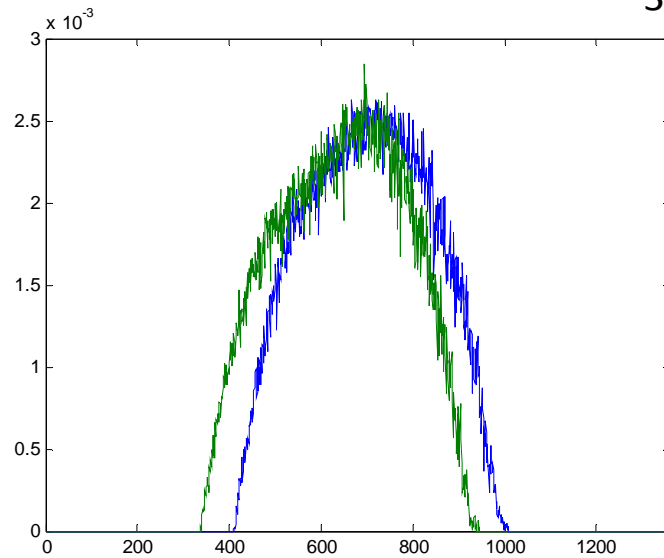


# 3+&3-

time	index	P1	P2	P3	P4	A1	A2	A3	A4	index-2
214802	measurement 3+	2	-2	0	-58	163.4	18	300.0	249.0	10
215100	measurement 3-	2	-2	0	-58	163.4	18	300.0	249.0	12

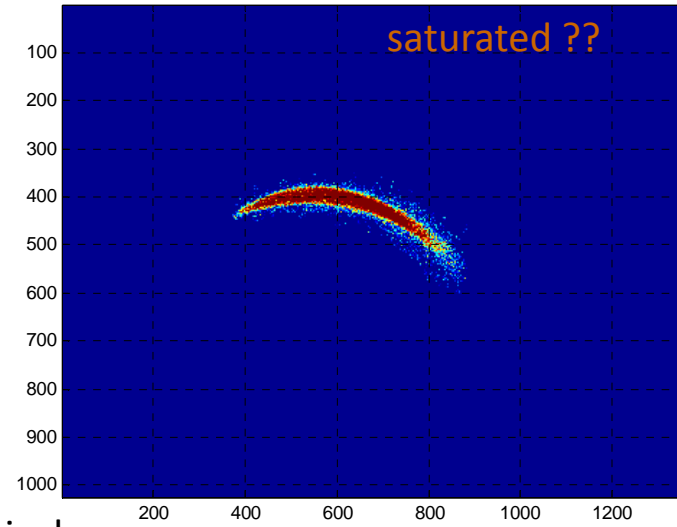
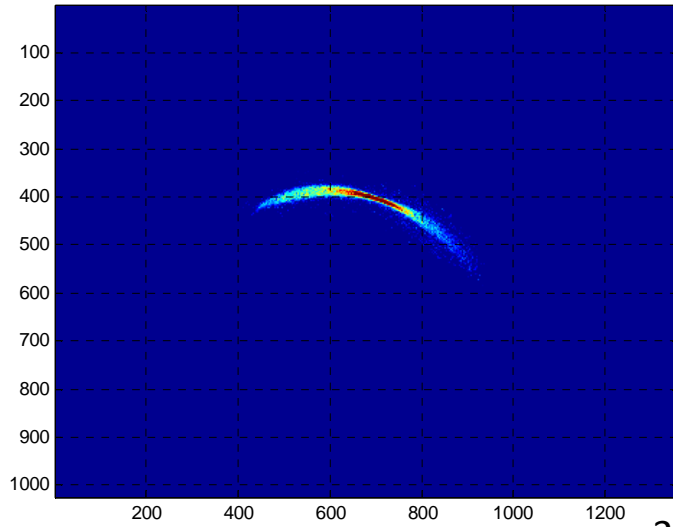


36.3 fsec per pixel

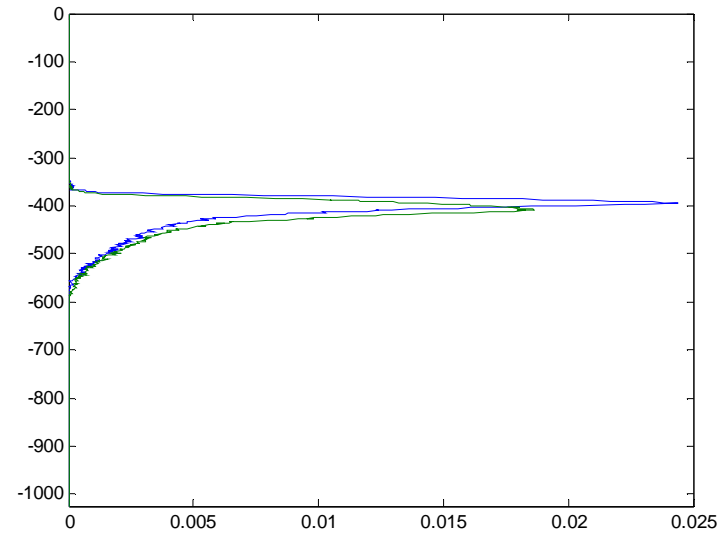
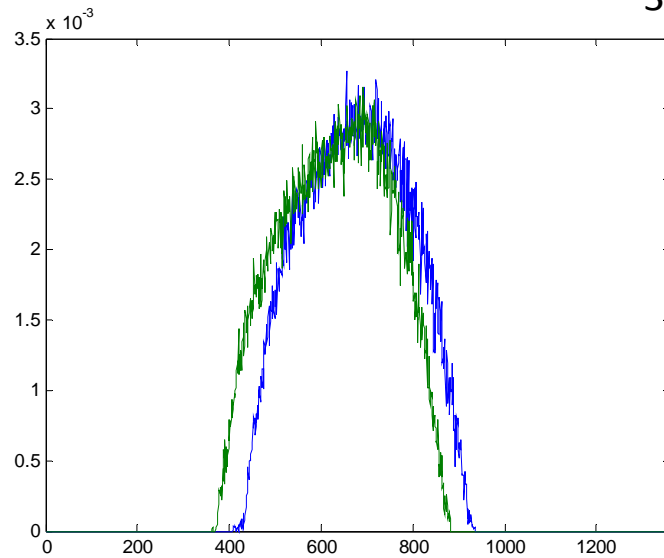


# 4+&4-

time		index	P1	P2	P3	P4	A1	A2	A3	A4	index-2
215425	measurement	4-	3	-3	0	-58	163.5	18	300.0	249.0	14
215653	measurement	4+	3	-3	0	-58	163.5	18	300.0	249.0	16



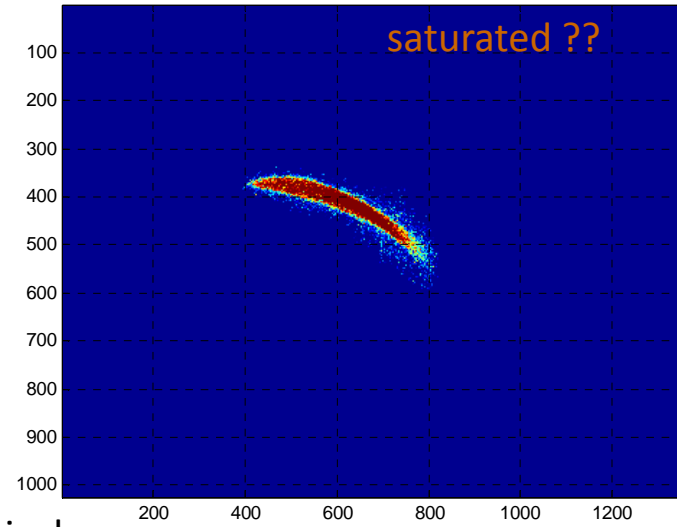
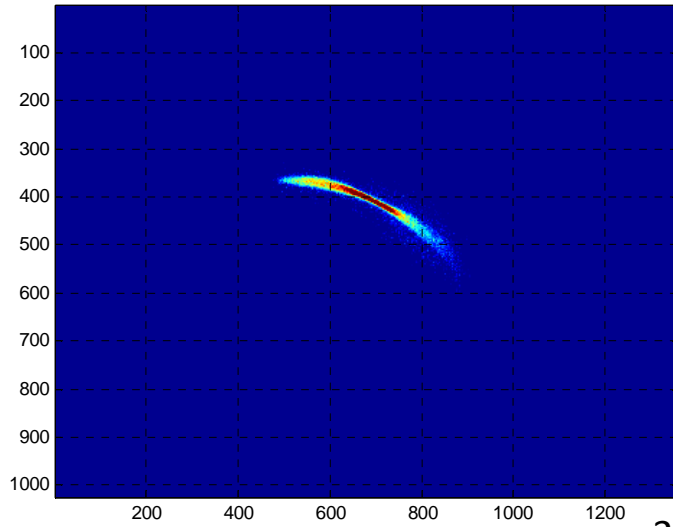
36.3 fsec per pixel



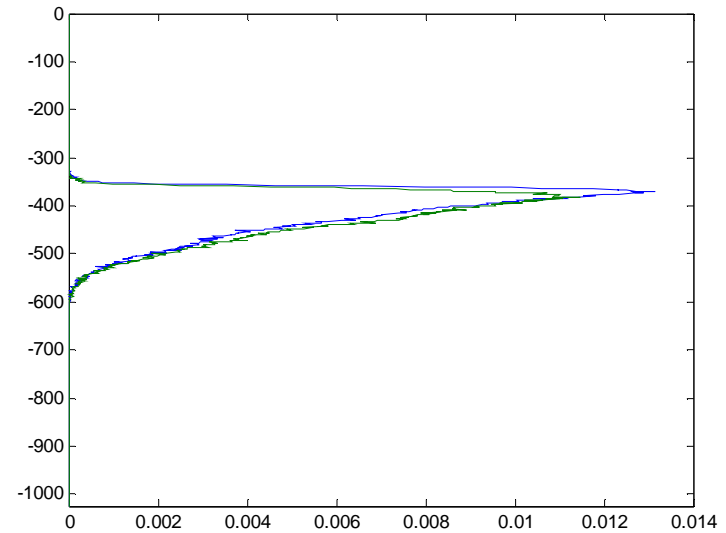
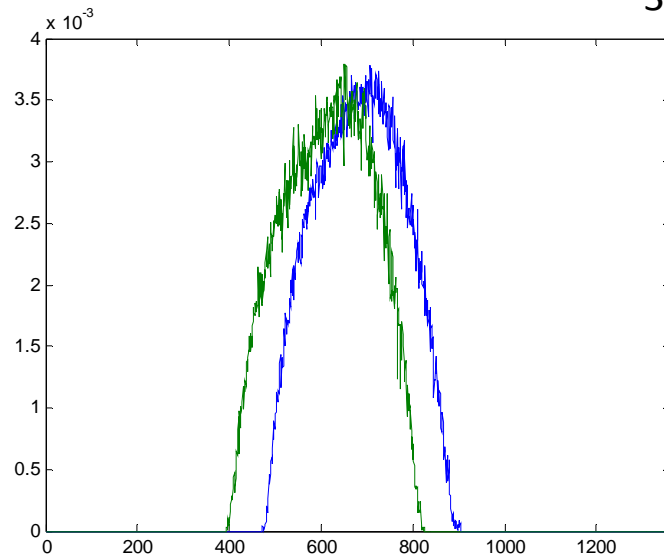


# 5+&5-

time		index	P1	P2	P3	P4	A1	A2	A3	A4	index-2
220313	measurement	5+	4	-4	0	-58	163.7	18.1	300.0	249.0	18
220513	measurement	5-	4	-4	0	-58	163.7	18.1	300.0	249.0	20

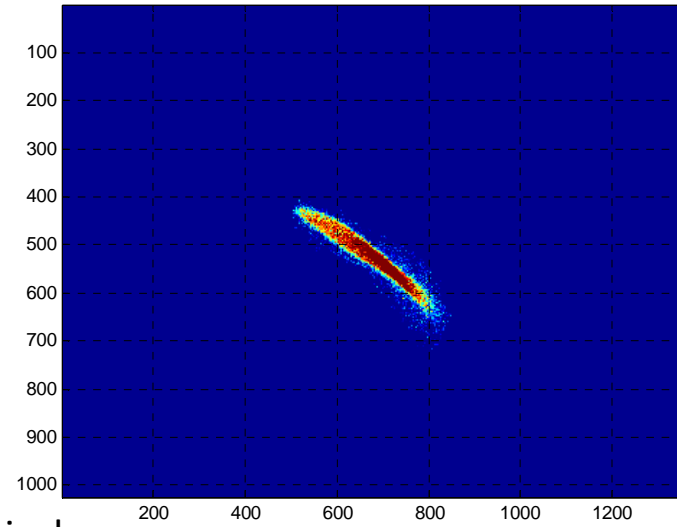
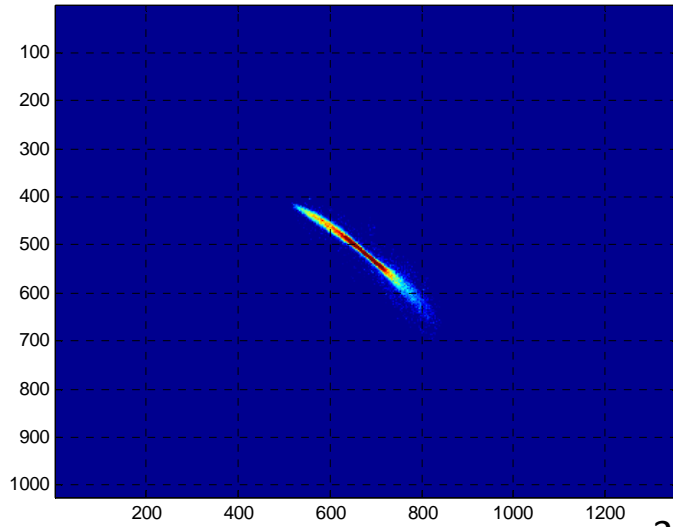


36.3 fsec per pixel

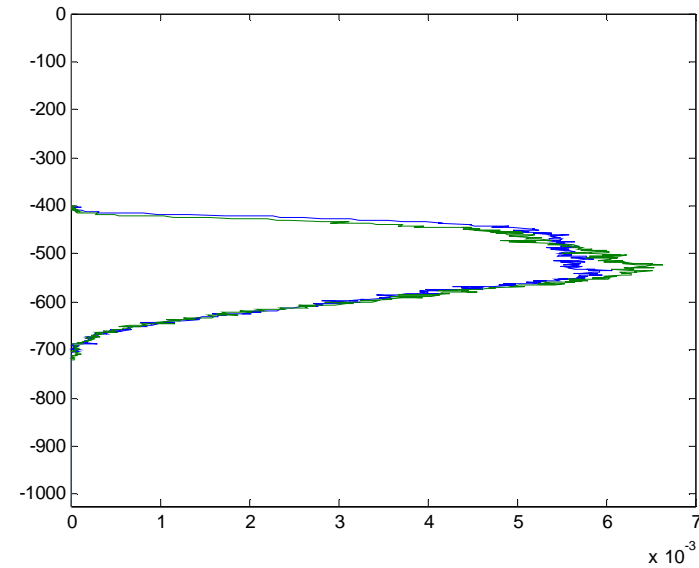
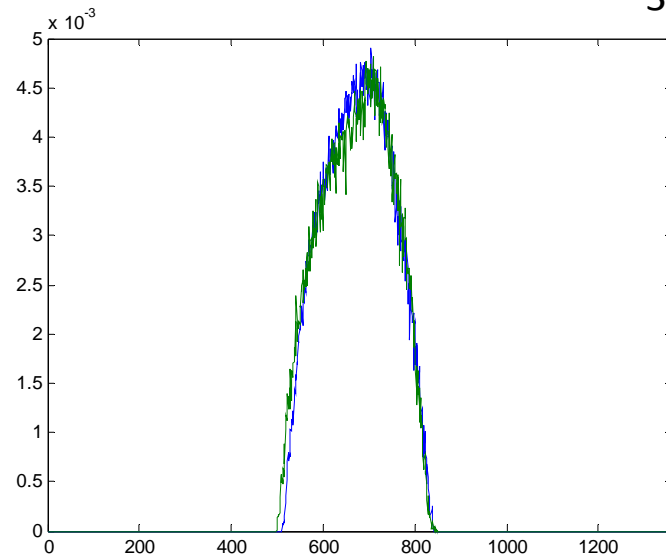


# 6+&6-

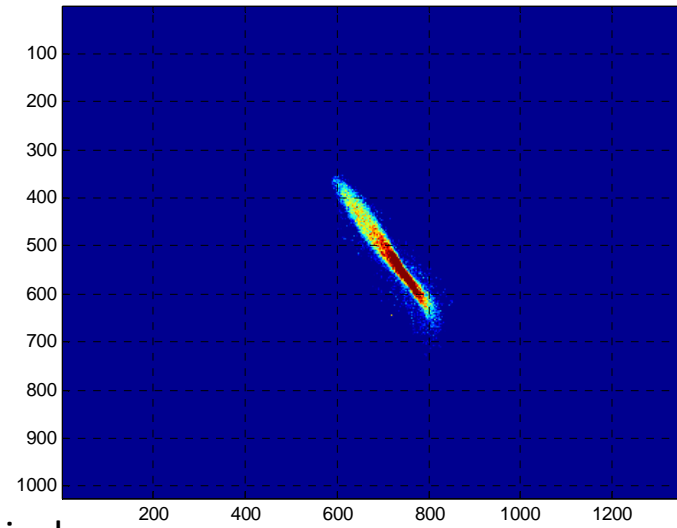
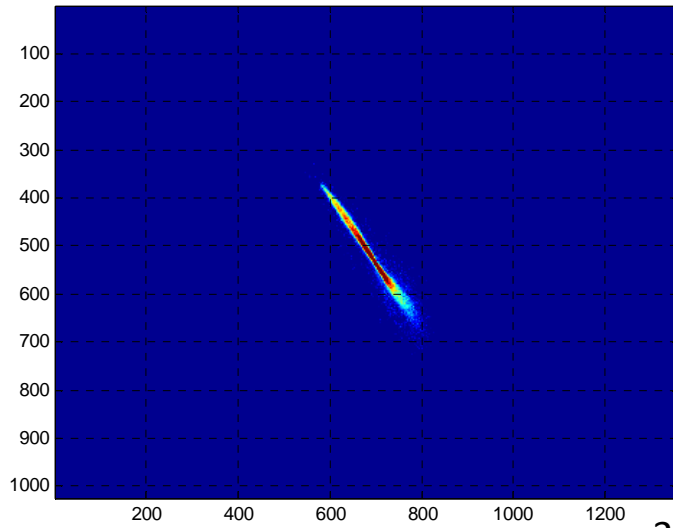
time		index	P1	P2	P3	P4	A1	A2	A3	A4	index-2
221246	measurement	6-	5	-5	0	-58	163.8	18.1	300.0	249.0	22
221729	measurement	6+	5	-5	0	-58	163.8	18.1	300.0	249.0	24



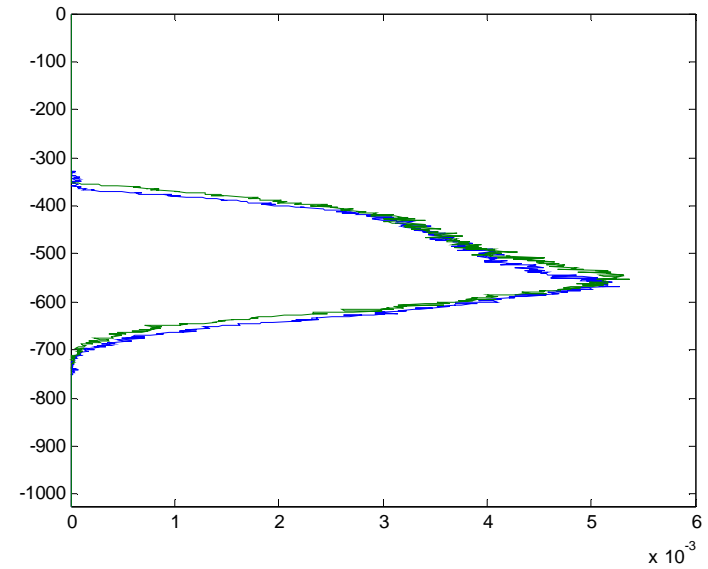
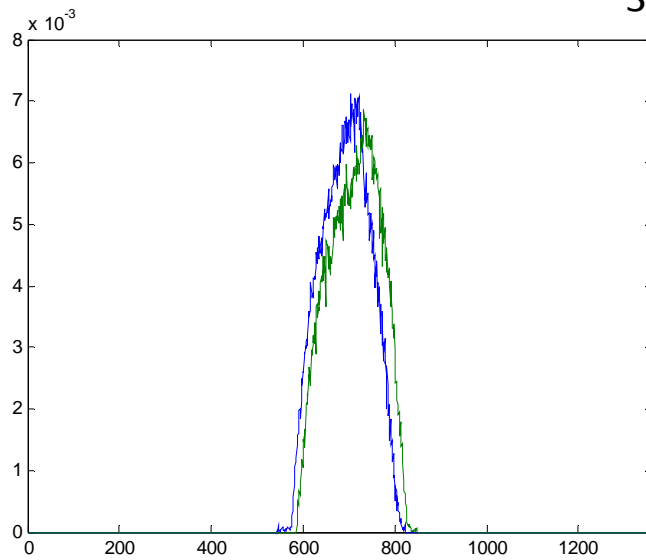
36.3 fsec per pixel



# 7+&7-

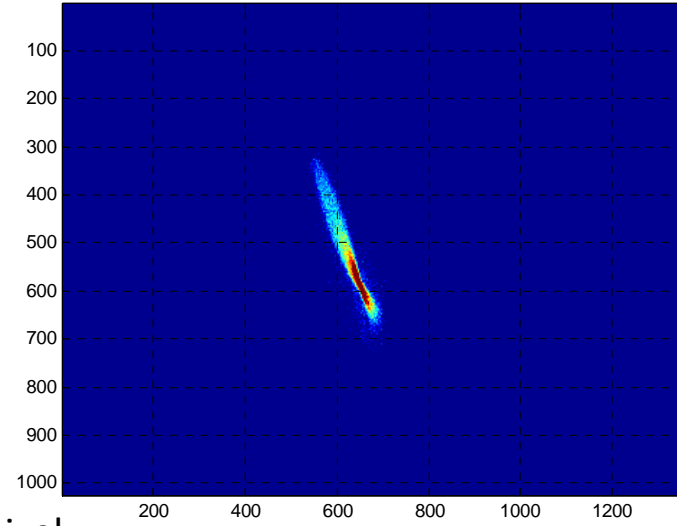
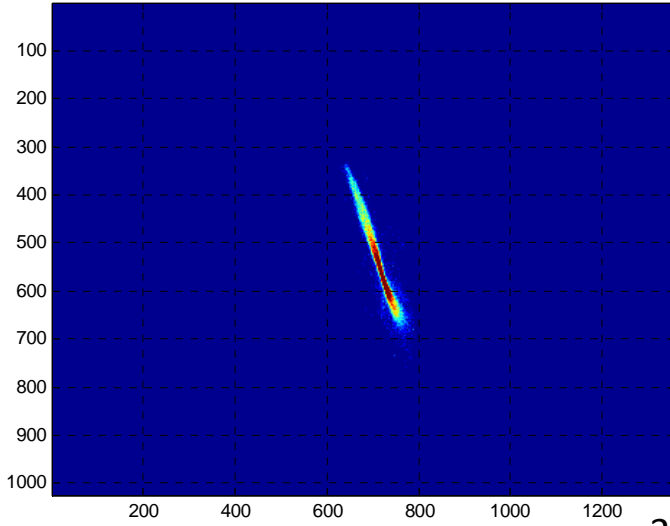


36.3 fsec per pixel

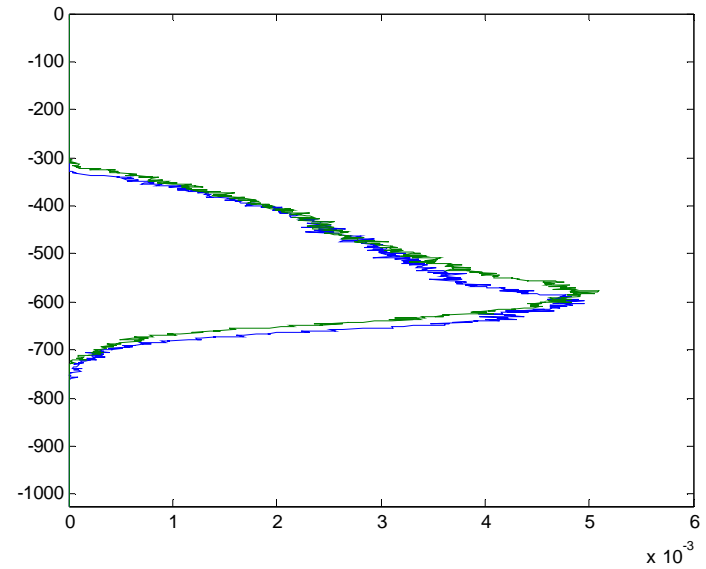
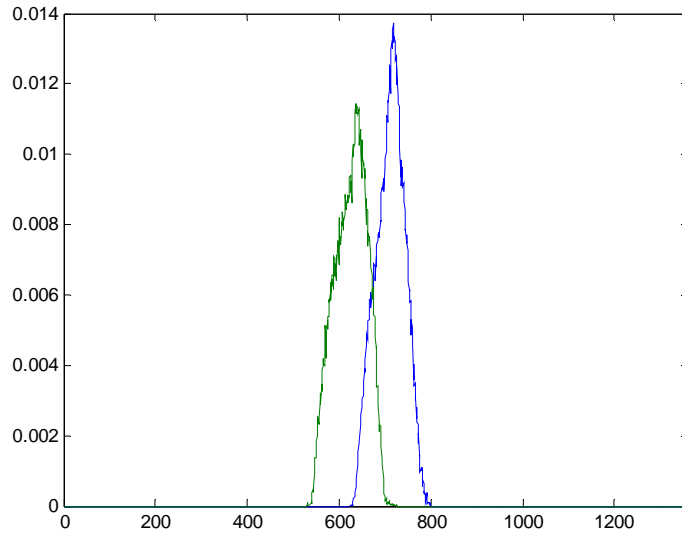


# 8+&8-

time		index	P1	P2	P3	P4	A1	A2	A3	A4	index-2
222447	measurement	8-	7	-7	0	-58	164.5	18.2	300.0	249.0	30
222624	measurement	8+	7	-7	0	-58	164.5	18.2	300.0	249.0	32

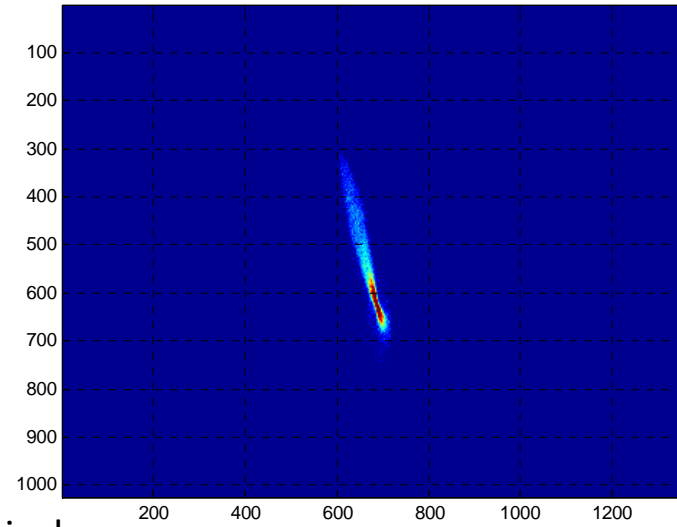
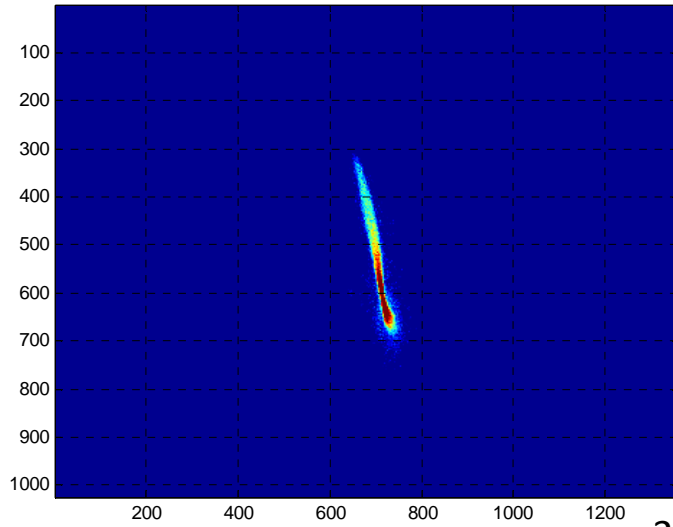


36.3 fsec per pixel

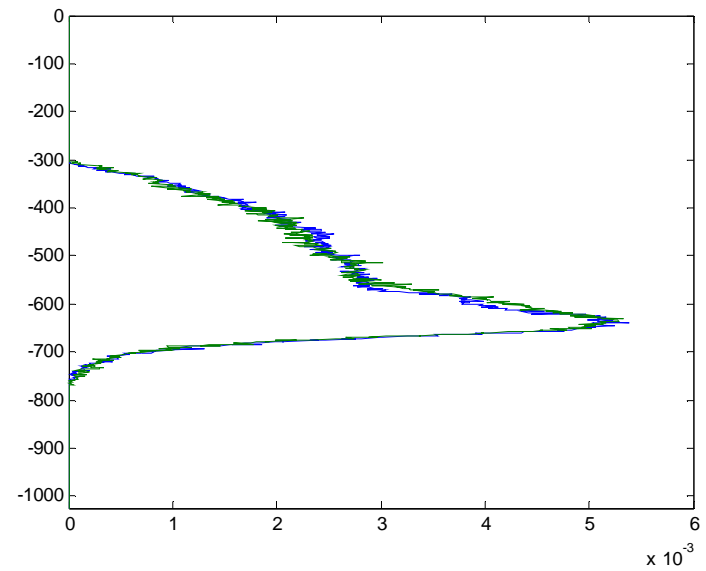
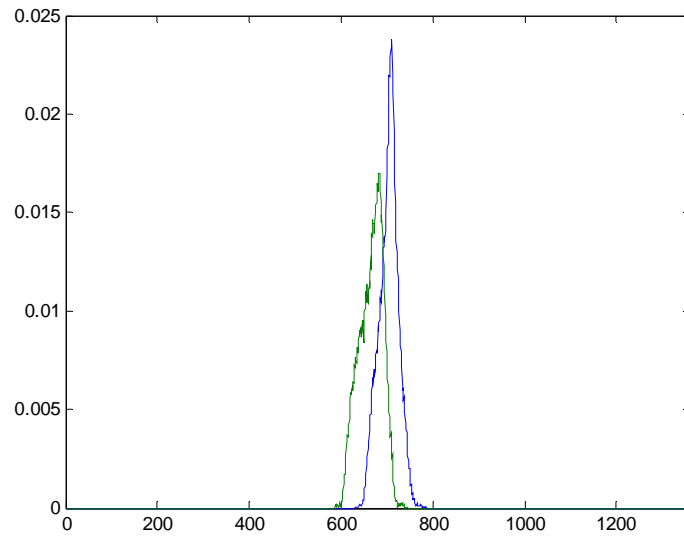


# 9+&9-

time		index	P1	P2	P3	P4	A1	A2	A3	A4	index-2
222904	measurement	9+	7.5	-7.5	0	-58	164.7	18.2	300.0	249.0	34
223058	measurement	9-	7.5	-7.5	0	-58	164.7	18.2	300.0	249.0	36



36.3 fsec per pixel



# 11 LOLA Mystery

Lola imaging matrix for 15.4 fsec/pixel:

$$P = 5.3 \times 10^5$$

$$Ene = 7 \times 10^8$$

desired effect

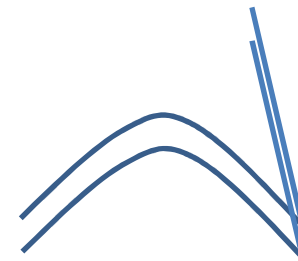
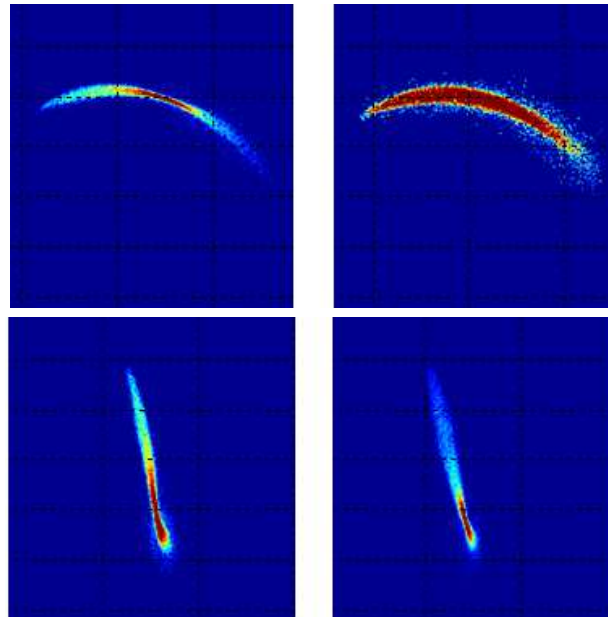
$$\begin{array}{l}
 \text{"time" axis} \\
 \text{"energy" axis}
 \end{array}
 \begin{pmatrix}
 1 & 0 & 0 & 0 & 0 & 0 \\
 0 & 0 & 1 & 0 & 0 & 0
 \end{pmatrix}
 \cdot T(Vy, Ene) = \begin{pmatrix}
 1 & 12.686 & 0.332 & 0.636 & 0.081 & 0.872 \\
 0 & 0 & 0.831 & 11.388 & 3.734 & 0
 \end{pmatrix}$$

$$\begin{pmatrix}
 1 & 0 & 0 & 0 & 0 & 0 \\
 0 & 0 & -1 & 0 & 0 & 0
 \end{pmatrix}
 \cdot T(-Vy, Ene) = \begin{pmatrix}
 1 & 12.686 & -0.332 & -0.636 & 0.081 & 0.872 \\
 0 & 0 & -0.831 & -11.388 & 3.734 & 0
 \end{pmatrix}$$

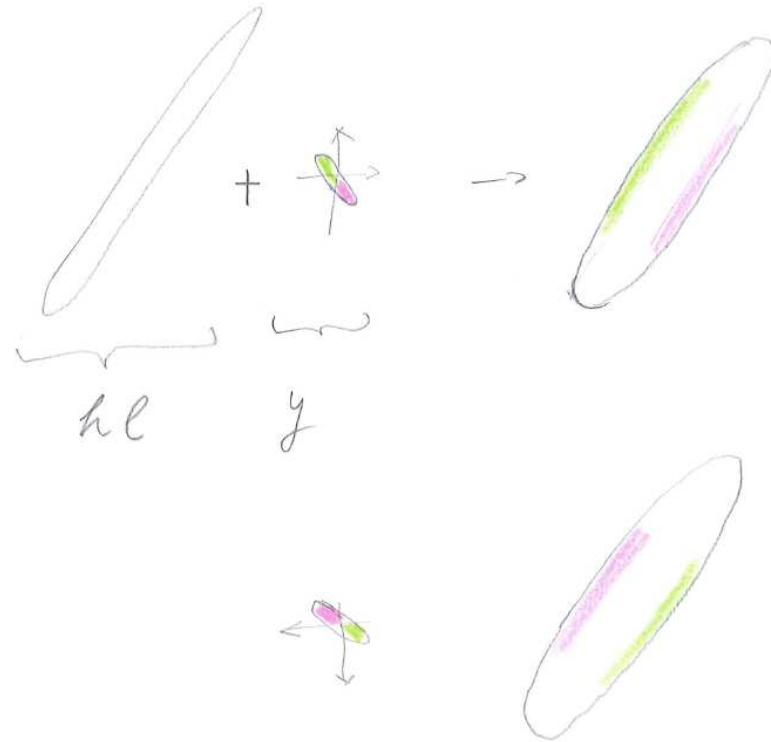
$$\begin{pmatrix}
 x \\
 x' \\
 y \\
 y' \\
 s \\
 \delta
 \end{pmatrix}$$

focusing does not change with sign of streak  
 uncorrelated hor/vert/long should produce the same picture  
 is there correlation ???

"smearing" on "energy" axis?:



if there is no  $hl$  to  $y$  correlation



same smearing !



from Xfel-beam/talks

2012.02.06: Simulated LOLA Measurements (PDF)

# “Simulated LOLA Measurements”





# LOLA setup

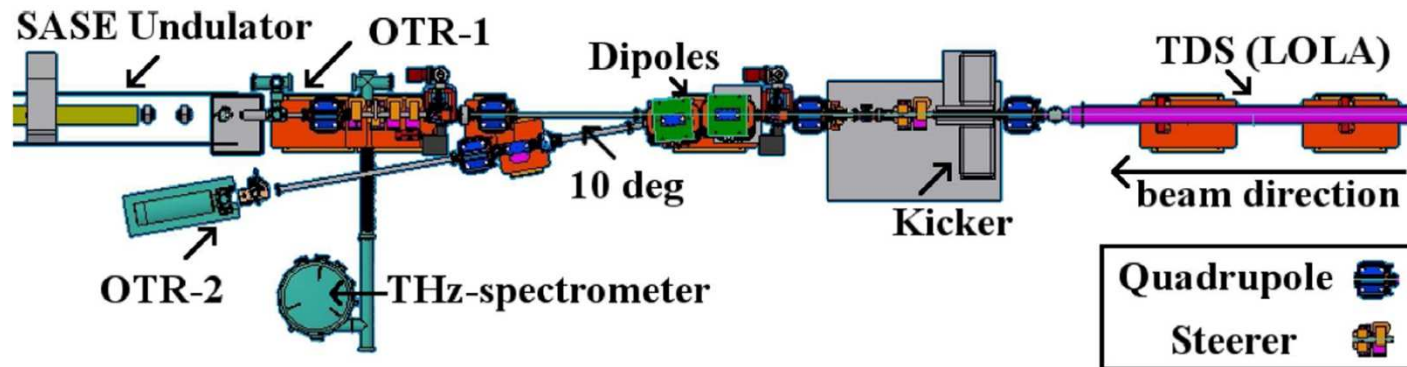


Figure: Aktuelles Design: Installiert im Februar 2010.

LOLA  $L = 3.826$  m; 2.856 GHz

Drift  $L = 2.693$  m

Bend  $L = 0.447$  m;  $-5$  deg

Drift  $L = 0.131$  m

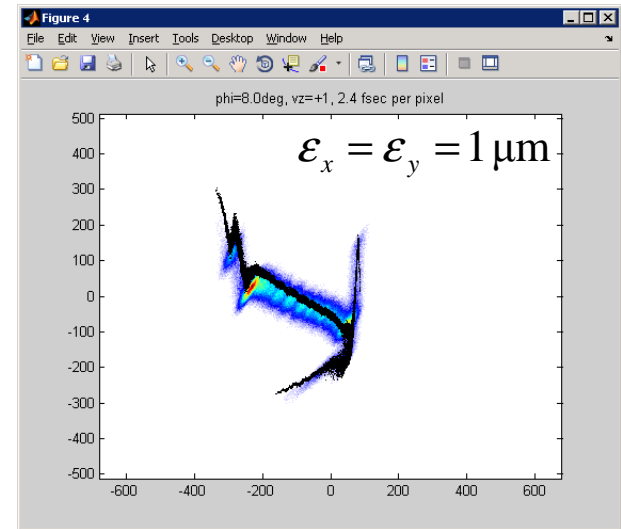
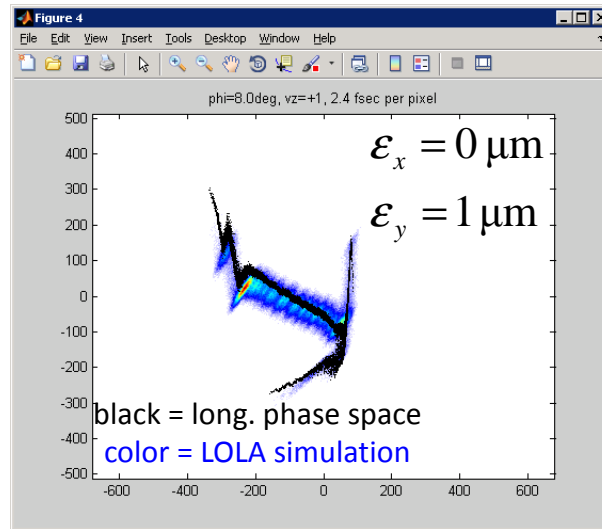
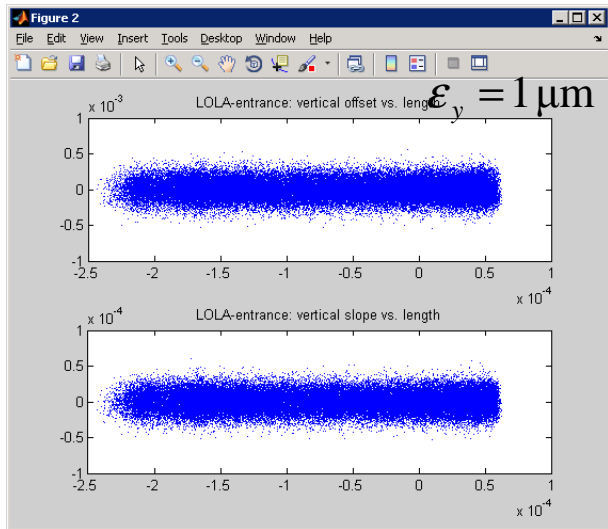
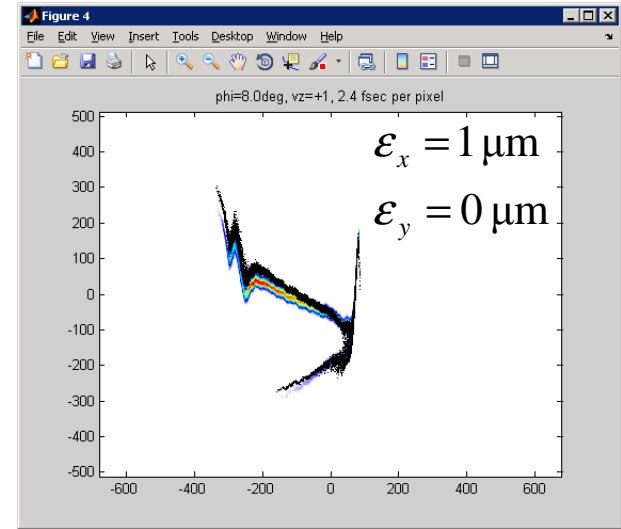
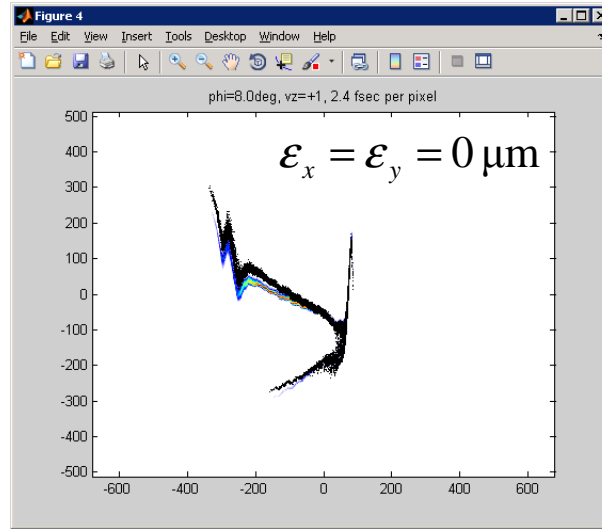
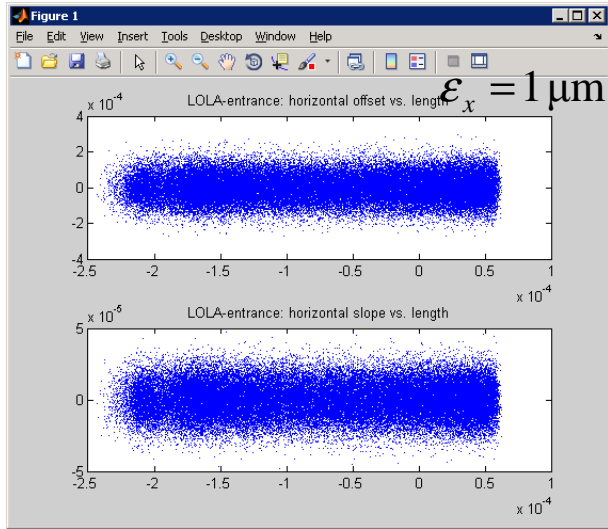
Bend  $L = 0.447$  m;  $-5$  deg

Drift  $L = 4.481$  m

OTR  $17.5 \mu\text{m} / \text{pixel}$



# simulated LOLA measurement: gaussian transverse shape



so far no difference for  $vz=\pm 1$



# simulated LOLA measurement, no emittance but coupler kick

$\phi = 8.0 \text{ deg}$

only time dependent part of CK

transverse due to CK

hor.+vert. CK

hor. CK

vert. CK

