Some LOLA Results

M. Hüning, A. Bolzmann,
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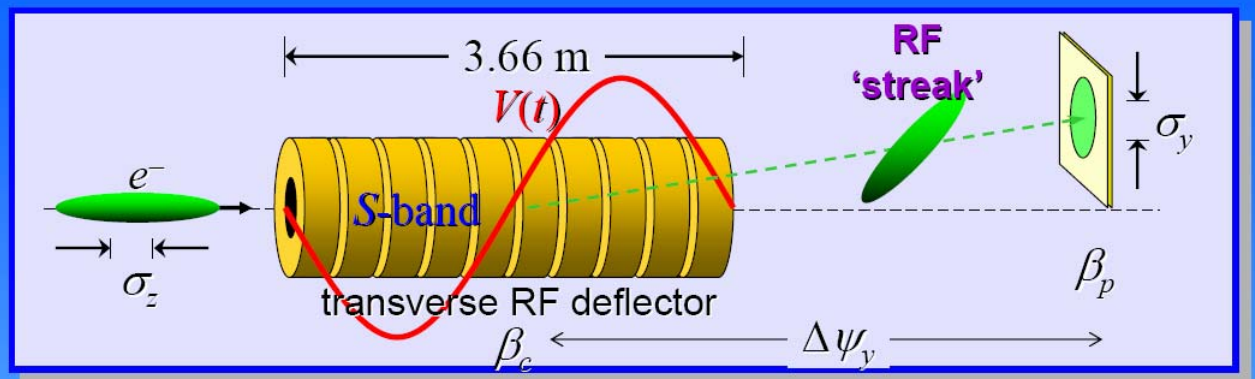
Setup



$$\sigma_y = \sqrt{\sigma_{y0}^2 + \sigma_z^2 \beta_c \beta_p \left(\frac{2\pi e V_0}{\lambda E_0} \sin \Delta\psi_y \cos\varphi \right)^2}$$

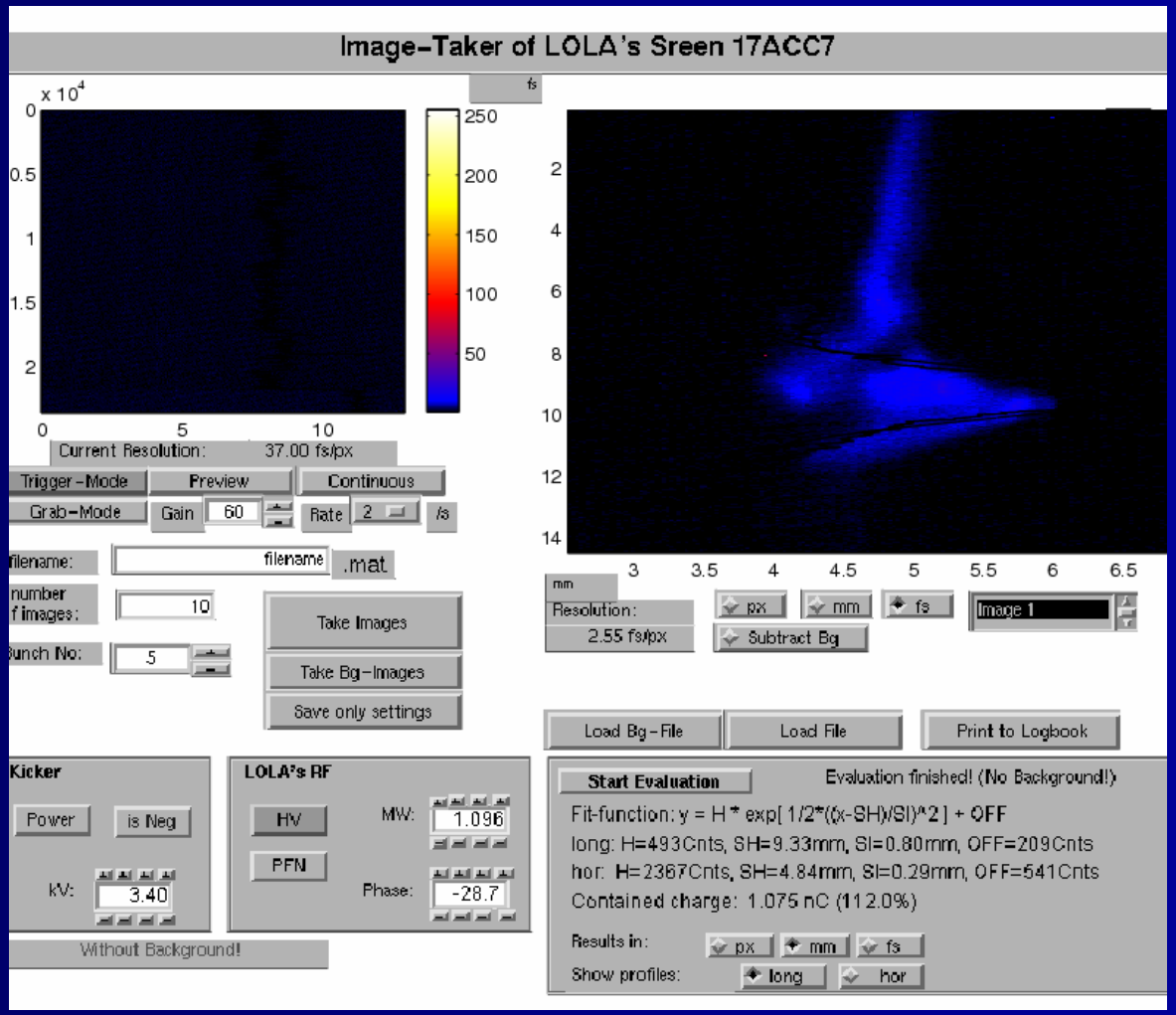
$$\langle \Delta y \rangle = \frac{e V_0}{E_0} \sqrt{\beta_c \beta_p} \sin \Delta\psi_y \sin\varphi , \qquad V_0 \approx \left(1.6 \text{ MV/m/MW}^{1/2} \right) L \sqrt{P_0}$$

$\sigma_z \approx 25\ \mu\text{m}$
$E_0 \approx 0.6$ GeV
$(\beta_c\beta_p)^{1/2} \approx 51$ m
$\gamma\varepsilon_y \approx 5\ \mu\text{m}$

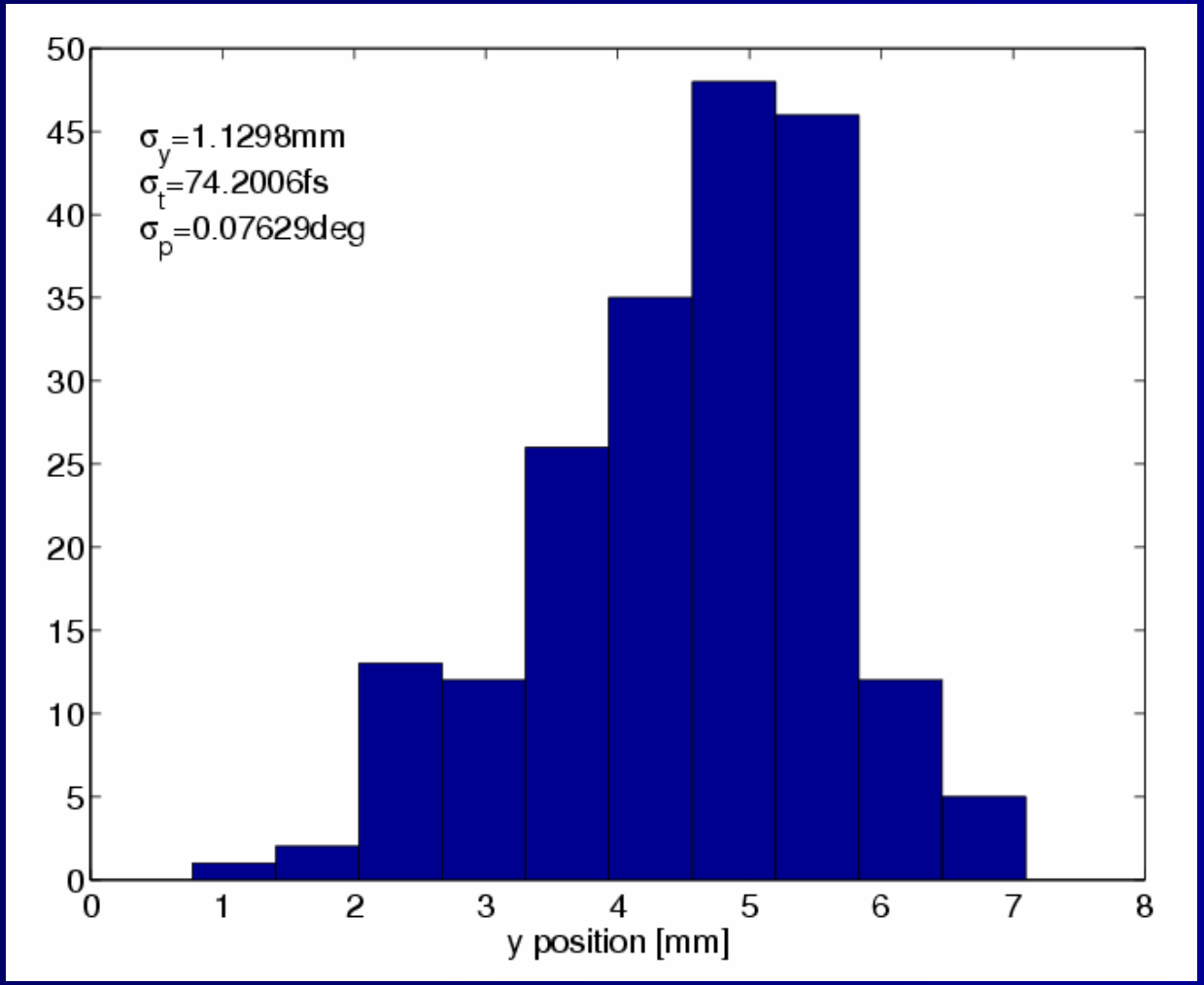
$\Delta\psi_y \approx 15.8°$
$\varphi \approx 0°$
$\lambda \approx 105$ mm
$\sigma_{y0} \approx 317\ \mu\text{m}$

$L \approx 3.66$ m, $V_0 \approx 25$ MV,
$P_0 \approx 18$ MW
$\sigma_y \approx 925\ \mu\text{m}$

Operator‘s Panel



Phase Stability

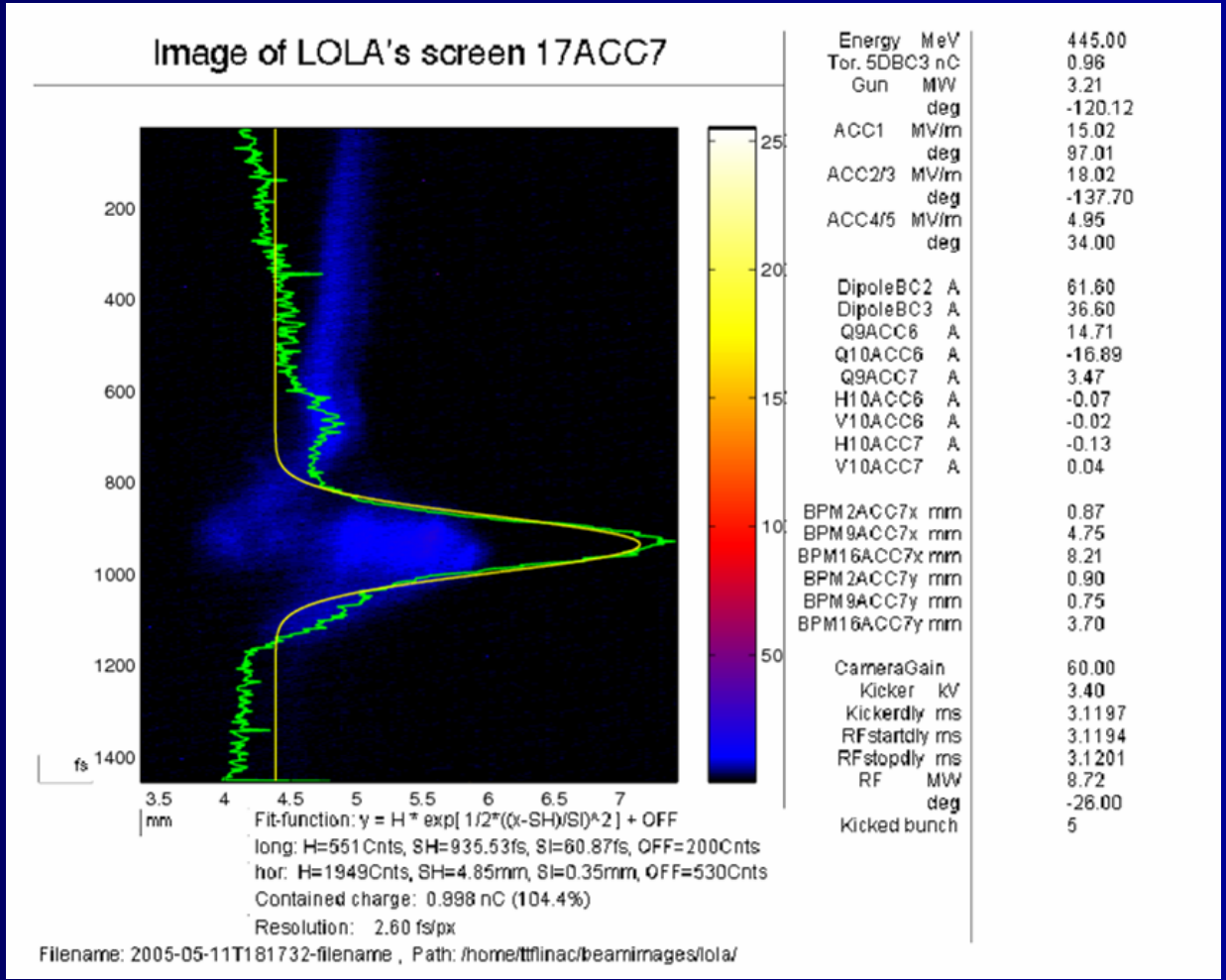


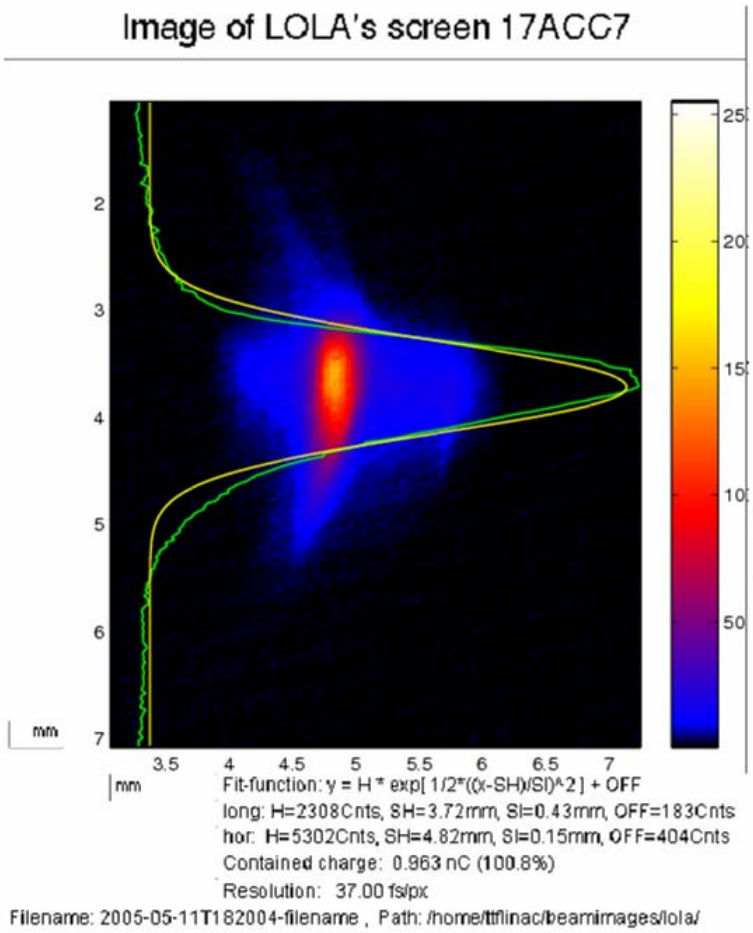
This is the jitter LOLA-beam,

The same was measured with the klystron alone,

To explain these numbers the beam energy would have to be good to 10^{-4}, which was NOT confirmed

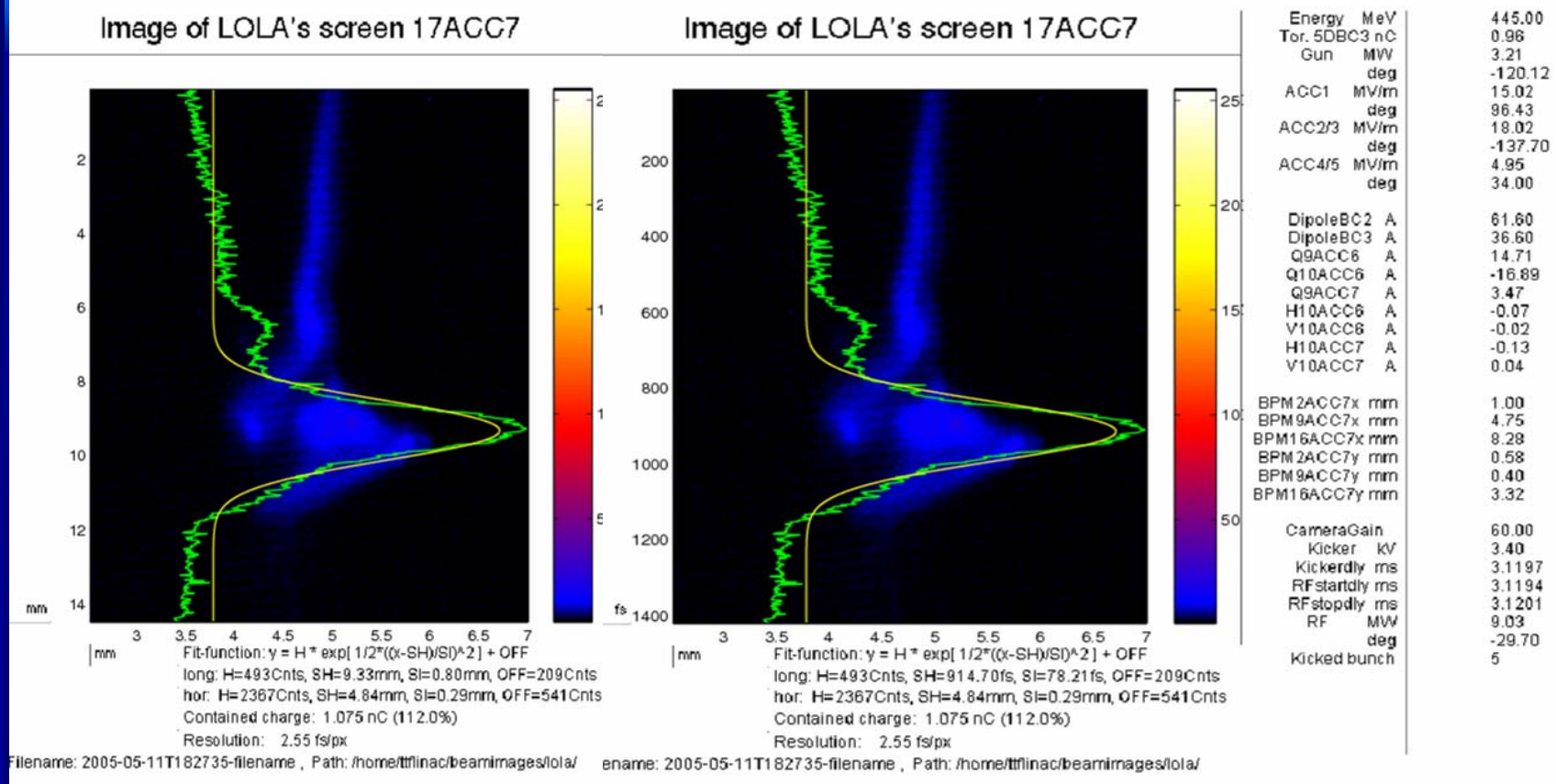
Example: SASE conditions





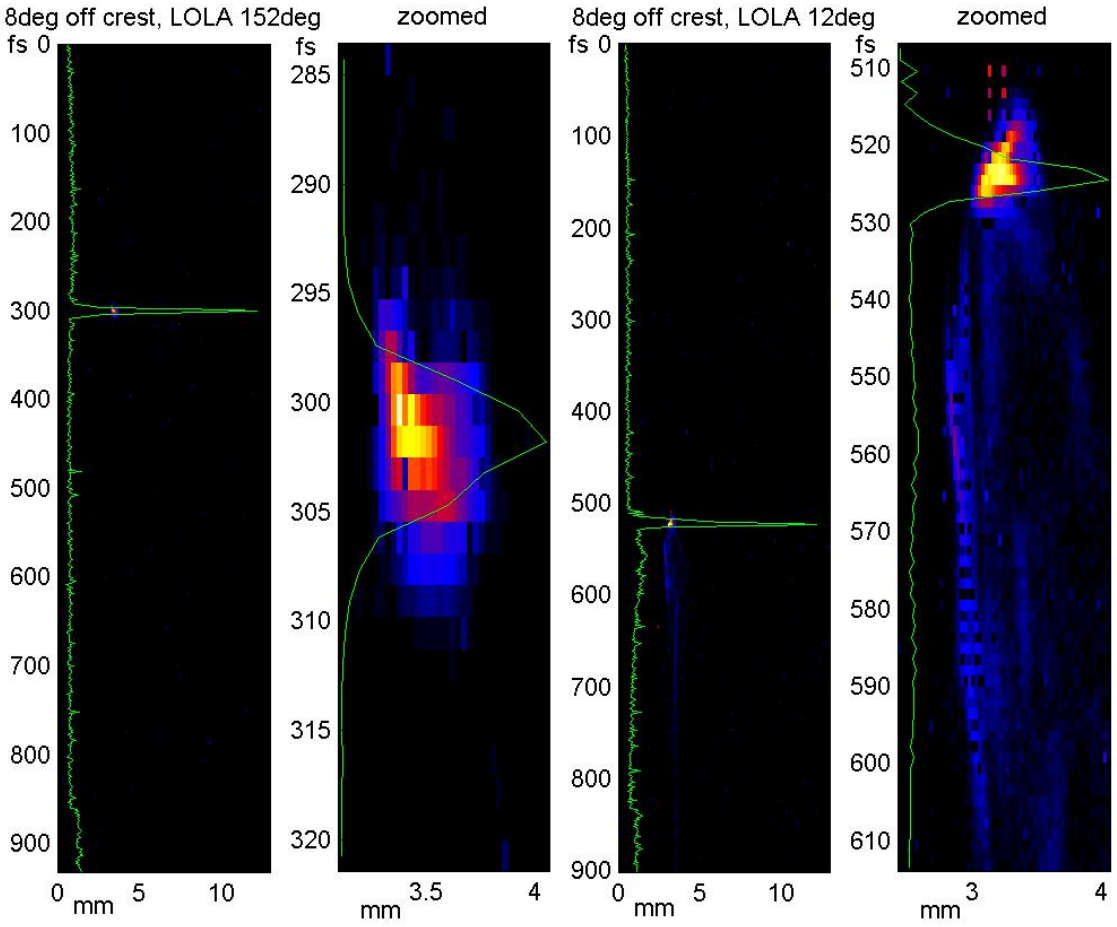
Energy	MeV	445.00
Tor. 5DBC3	nC	0.96
Gun	MW	3.21
	deg	-120.12
ACC1	MV/m	15.02
	deg	96.58
ACC2/3	MV/m	18.02
	deg	-137.70
ACC4/5	MV/m	4.95
	deg	34.00
DipoleBC2	A	61.60
DipoleBC3	A	36.60
Q9ACC6	A	14.71
Q10ACC6	A	-16.89
Q9ACC7	A	3.47
H10ACC6	A	-0.07
V10ACC6	A	-0.02
H10ACC7	A	-0.13
V10ACC7	A	0.04
BPM2ACC7x	mm	0.83
BPM9ACC7x	mm	4.68
BPM16ACC7x	mm	8.47
BPM2ACC7y	mm	1.12
BPM9ACC7y	mm	0.35
BPM16ACC7y	mm	3.13
CameraGain		60.00
Kicker	kV	3.40
Kickerdly	ns	3.1197
RFstartdly	ns	3.1194
RFstopdly	ns	3.1201
RF	MW	0.10
	deg	-26.00
Kicked bunch		5

With SASE (1μJ)

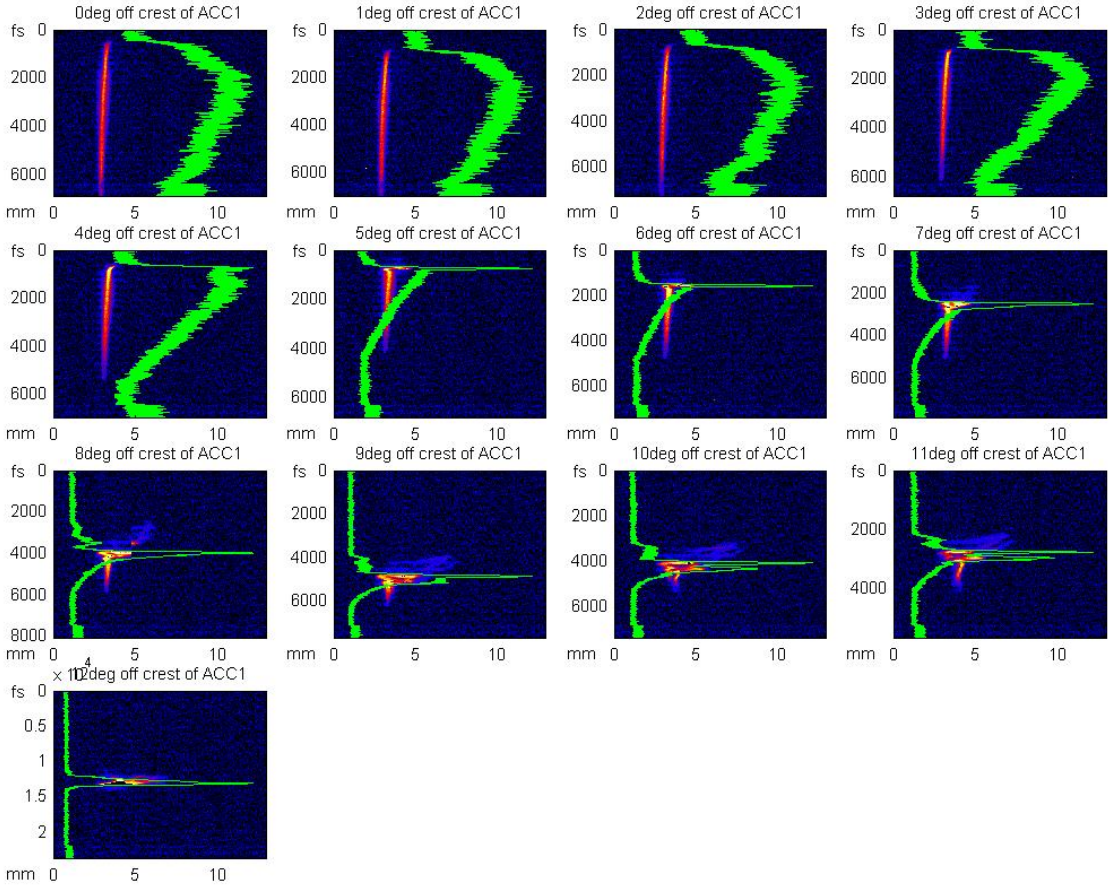


0.8mm vs 0.4 mm, subtraction: 78fs→66fs

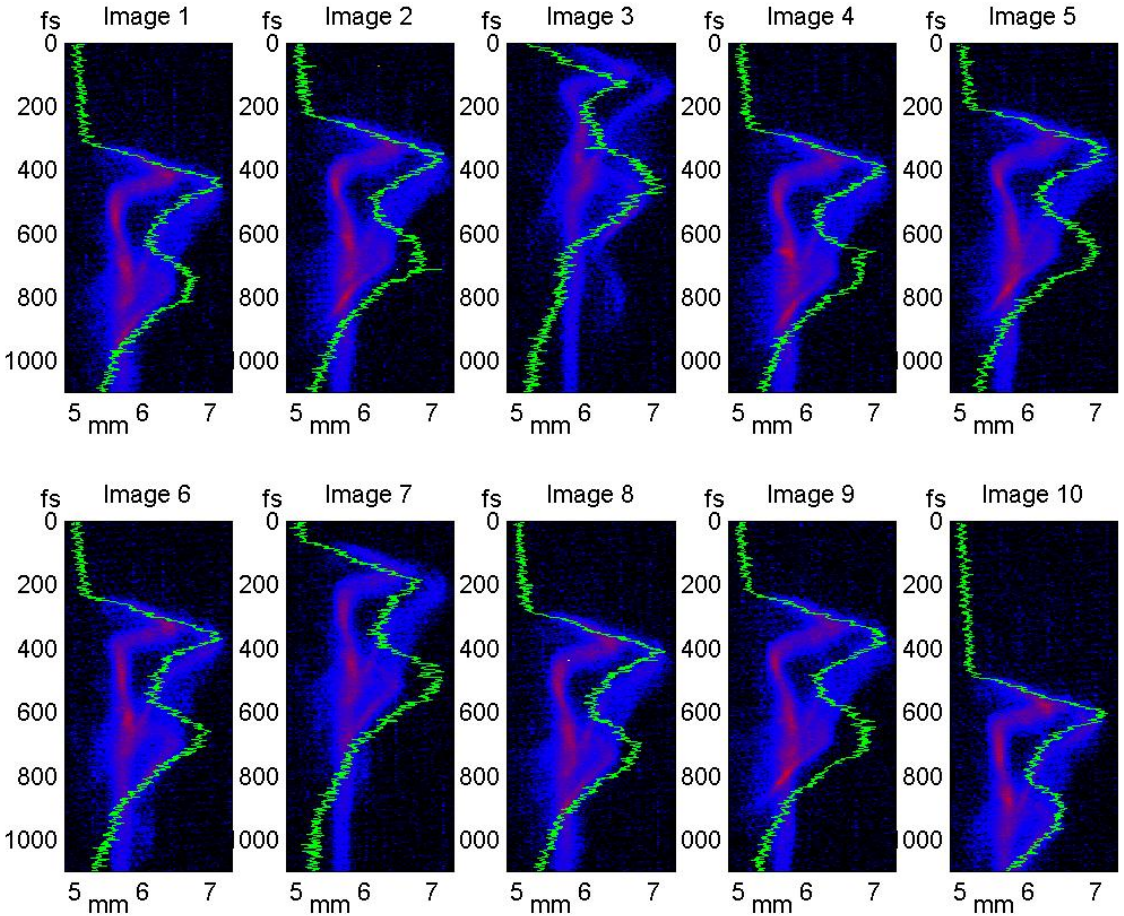
BC3 off


8deg off crest, LOLA 152deg
zoomed
8deg off crest, LOLA 12deg
zoomed
fs
mm

Scan ACC1


0deg off crest of ACC1
1deg off crest of ACC1
2deg off crest of ACC1
3deg off crest of ACC1
4deg off crest of ACC1
5deg off crest of ACC1
6deg off crest of ACC1
7deg off crest of ACC1
8deg off crest of ACC1
9deg off crest of ACC1
10deg off crest of ACC1
11deg off crest of ACC1
12deg off crest of ACC1
fs
mm
0
2000
4000
6000
8000
5
10
0.5
1
1.5
2
× 10^4

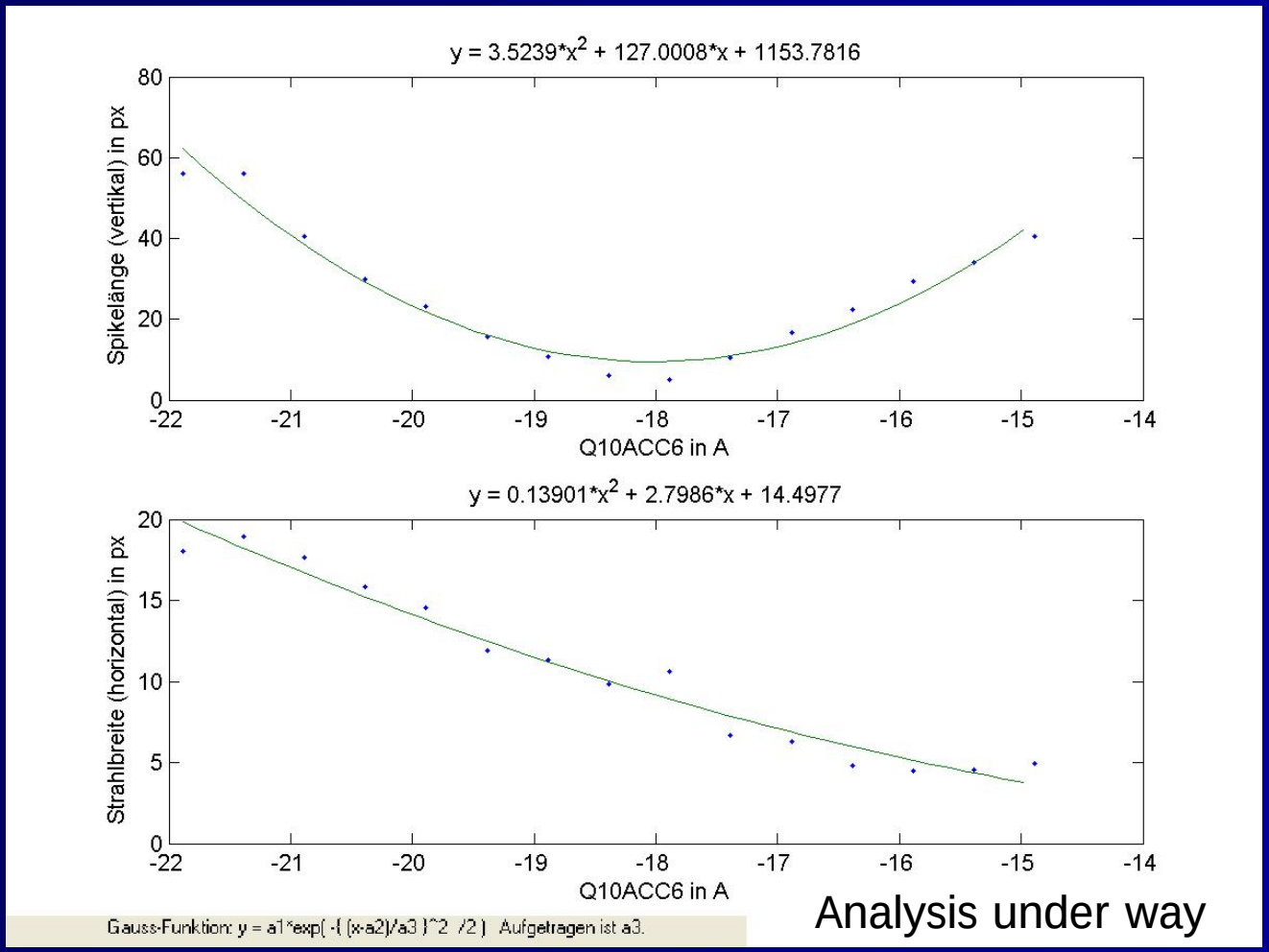
Stable SASE conditions



A Word on Dispersion

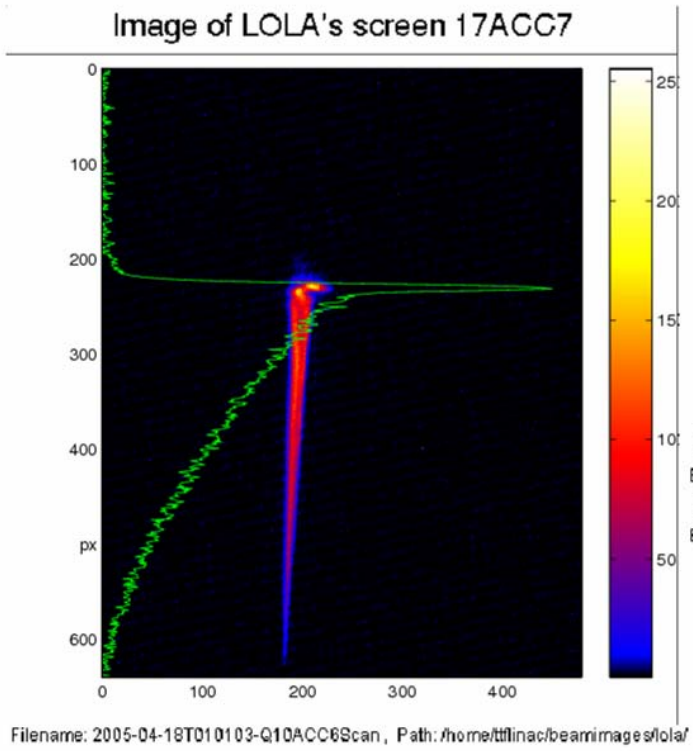
- The screen is off from the center (10mm), we use a kicker to get the beam there
- The dispersion created is 10mm
- To explain a horizontal beam size of 0.5mm (RMS) the energy spread would have to be 20MeV (RMS)

Quadrupole Scan on Spike



Analysis under way

One corresponding picture



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	deg	-161.00
ACC4/5	MV/m	6.00
	deg	29.00
DipoleBC2	A	61.60
DipoleBC3	A	36.60
Q9ACC6	A	14.71
Q10ACC6	A	-17.89
Q9ACC7	A	3.47
H10ACC6	A	0.04
V10ACC6	A	0.00
H10ACC7	A	-0.15
V10ACC7	A	-0.03
BPM2ACC7x	mm	-0.16
BPM9ACC7x	mm	4.83
BPM16ACC7x	mm	8.89
BPM2ACC7y	mm	1.31
BPM9ACC7y	mm	-0.09
BPM16ACC7y	mm	0.02
CameraGain		160.00
Kicker	kV	3.50
Kickerdly	ms	3.1157
RFstartdly	ms	3.1154
RFstopdly	ms	3.1161
RF	MW	0.35
	deg	44.60

Max Compression