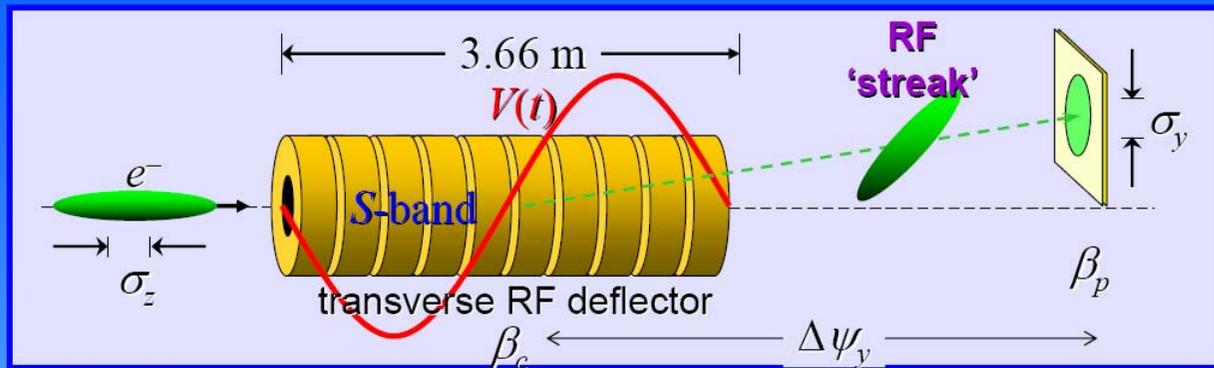


Some LOLA Results

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09.06.2005

Setup



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

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

$\sigma_z \approx 25 \mu\text{m}$	$\Delta\psi_y \approx 15.8^\circ$	} $L \approx 3.66 \text{ m}, V_0 \approx 25 \text{ MV},$ $P_0 \approx 18 \text{ MW}$ $\sigma_y \approx 925 \mu\text{m}$
$E_0 \approx 0.6 \text{ GeV}$	$\varphi \approx 0^\circ$	
$(\beta_c \beta_p)^{1/2} \approx 51 \text{ m}$	$\lambda \approx 105 \text{ mm}$	
$\gamma \epsilon_y \approx 5 \mu\text{m}$	$\sigma_{y0} \approx 317 \mu\text{m}$	

Operator's Panel

Image-Taker of LOLA's Sreen 17ACC7

Image Display: The main image shows a blue-toned view of a screen. The vertical axis is labeled from 0 to 14, and the horizontal axis is labeled from 3 to 6.5. A color scale on the left indicates intensity from 0 to 250, with a multiplier of $\times 10^4$ at the top. The current resolution is 37.00 fs/px.

Control Panel: Includes buttons for 'Trigger-Mode', 'Preview', 'Continuous', 'Grab-Mode', 'Gain' (set to 60), and 'Rate' (set to 2 /s). A 'filename' field is set to 'filename.mat'. A 'number of images' field is set to 10, and a 'Bunch No.' field is set to 5. Buttons for 'Take Images', 'Take Bg-Images', and 'Save only settings' are present.

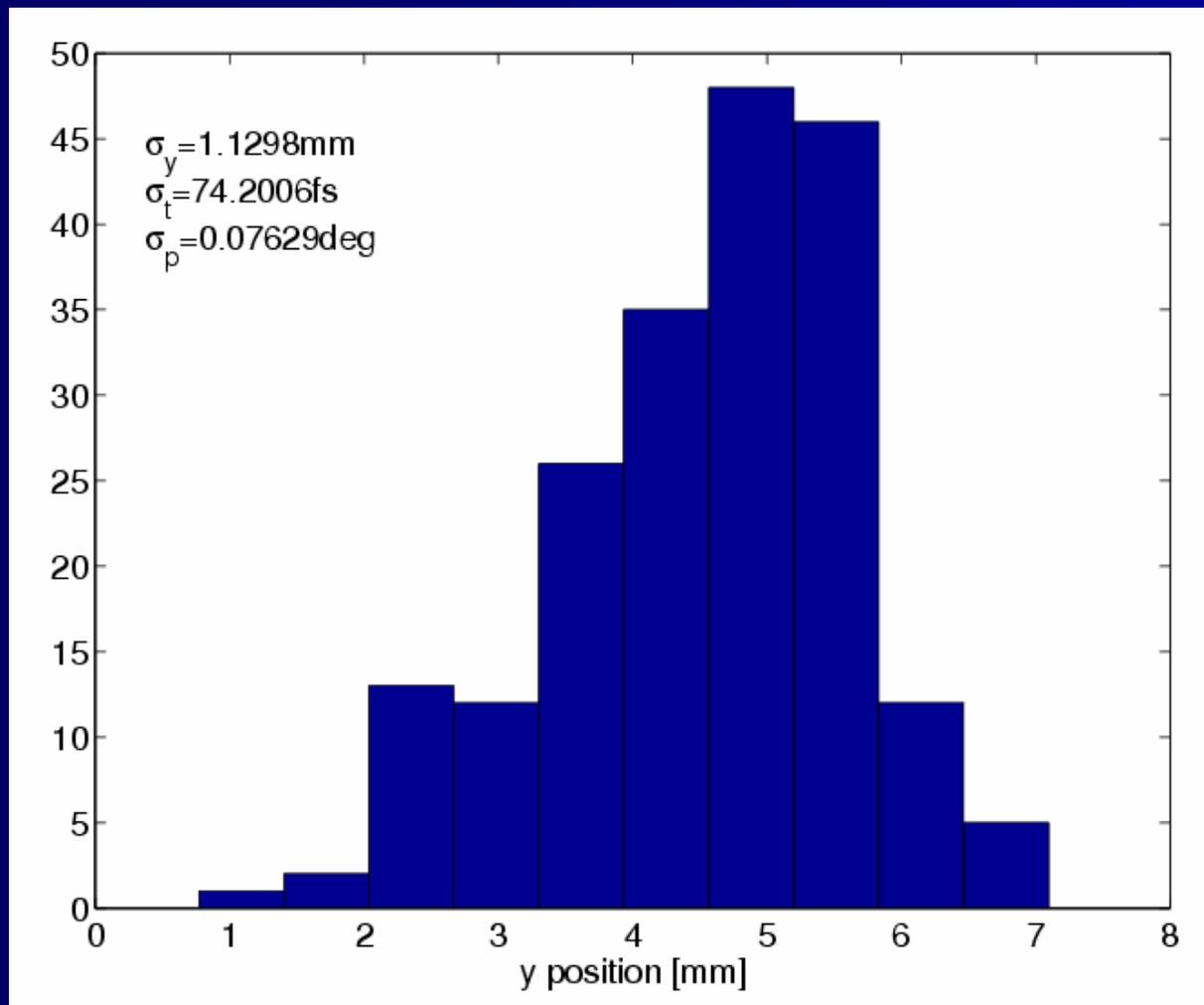
Kicker: 'Power' is set to 'is Neg'. 'KV' is set to 3.40.

LOLA's RF: 'HV' is set to 1.096. 'Phase' is set to -28.7.

Evaluation Results: 'Start Evaluation' button is active. 'Evaluation finished! (No Background!)'.
Fit-function: $y = H * \exp[1/2*((x-SH)/SI)^2] + OFF$
long: H=493Cnts, SH=9.33mm, SI=0.80mm, OFF=209Cnts
hor: H=2367Cnts, SH=4.84mm, SI=0.29mm, OFF=541Cnts
Contained charge: 1.075 nC (112.0%)

Results in: px, mm, fs
Show profiles: long, hor

Phase Stability



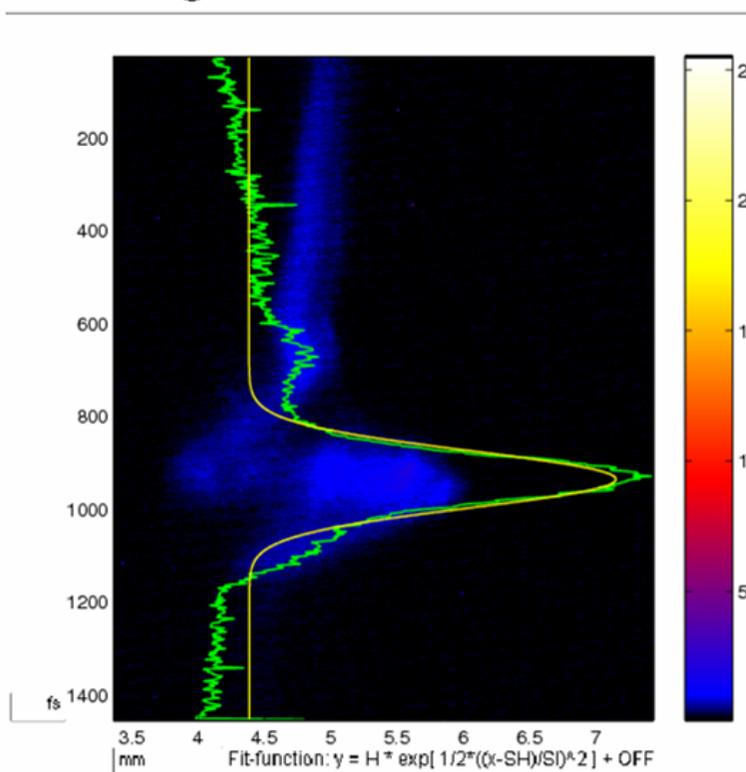
This is the jitter
LOLA-beam,

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

Image of LOLA's screen 17ACG7

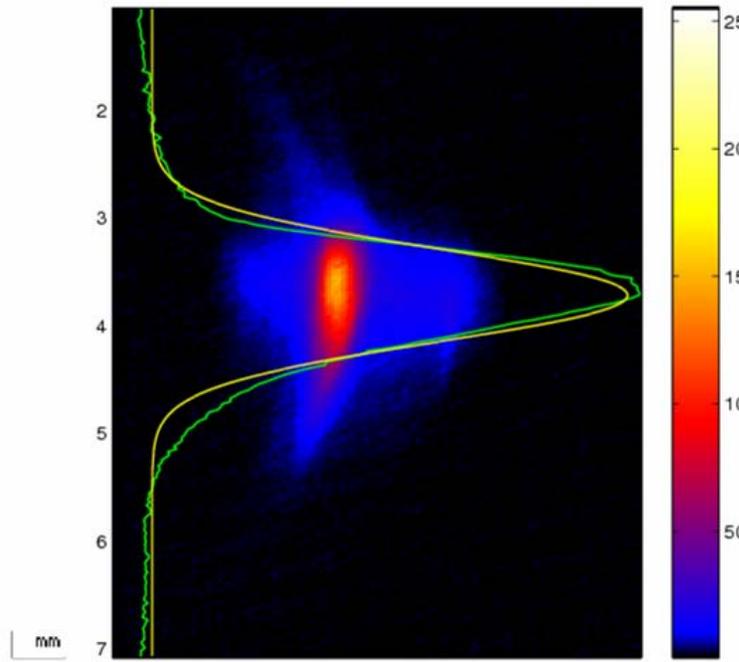


Fit-function: $y = H * \exp[1/2 * ((x-SH)/SI)^2] + OFF$
 long: H=551Cnts, SH=935.53fs, SI=60.87fs, OFF=200Cnts
 hor: H=1949Cnts, SH=4.85mm, SI=0.35mm, OFF=530Cnts
 Contained charge: 0.988 nC (104.4%)
 Resolution: 2.60 fs/px

Filename: 2005-05-11T181732-filename , Path: /home/ttflinac/beamimages/lola/

Energy	MeV	445.00
Tor. 5DBC3	nC	0.98
Gun	MV	3.21
	deg	-120.12
ACC1	MV/m	15.02
	deg	97.01
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	0.87
BPM9ACC7x	mm	4.75
BPM16ACC7x	mm	8.21
BPM2ACC7y	mm	0.90
BPM9ACC7y	mm	0.75
BPM16ACC7y	mm	3.70
CameraGain		60.00
Kicker	kV	3.40
Kickerdly	ms	3.1197
RFstartdly	ms	3.1194
RFstopdly	ms	3.1201
RF	MW	8.72
	deg	-26.00
Kicked bunch		5

Image of LOLA's screen 17ACC7



Fit-function: $y = H * \exp[1/2*((x-SH)/SI)^2] + OFF$
 long: H=2308Cnts, SH=3.72mm, SI=0.43mm, OFF=183Cnts
 hor: H=5302Cnts, SH=4.82mm, SI=0.15mm, OFF=404Cnts
 Contained charge: 0.863 nC (100.8%)
 Resolution: 37.00 fs/px

Filename: 2005-05-11T182004-filename , Path: /home/ttflinac/beamimages/lola/

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	ms	3.1197
RFstartdly	ms	3.1194
RFstopdly	ms	3.1201
RF	MW	0.10
	deg	-26.00
Kicked bunch		5

With SASE (1 μ J)

Image of LOLA's screen 17ACC7

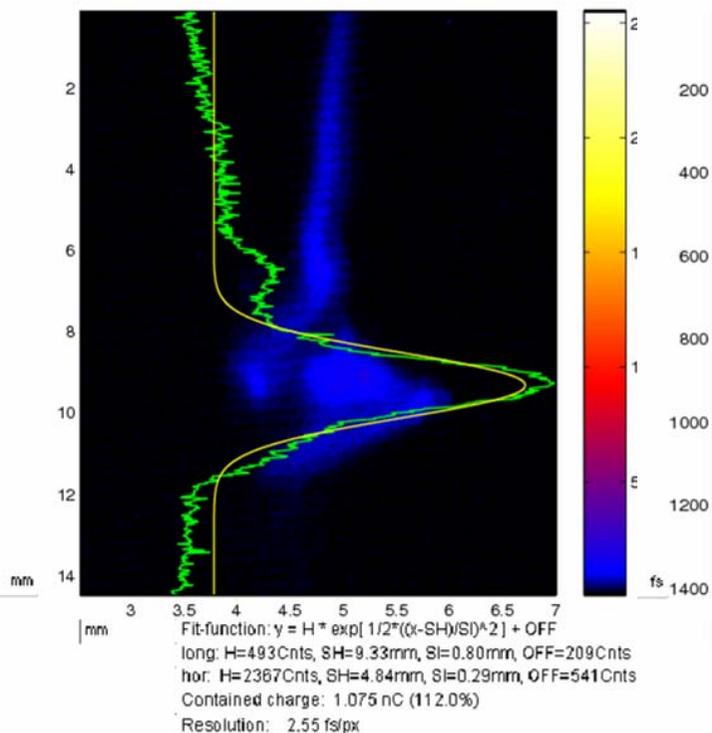
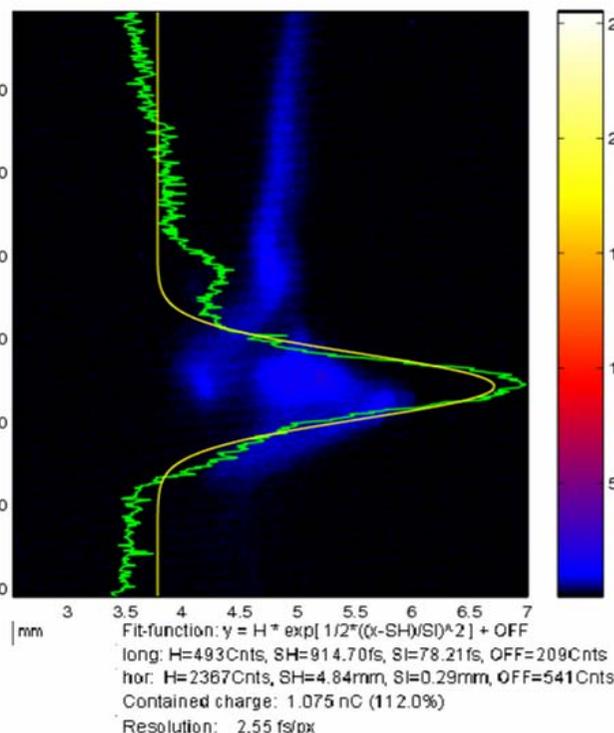


Image of LOLA's screen 17ACC7

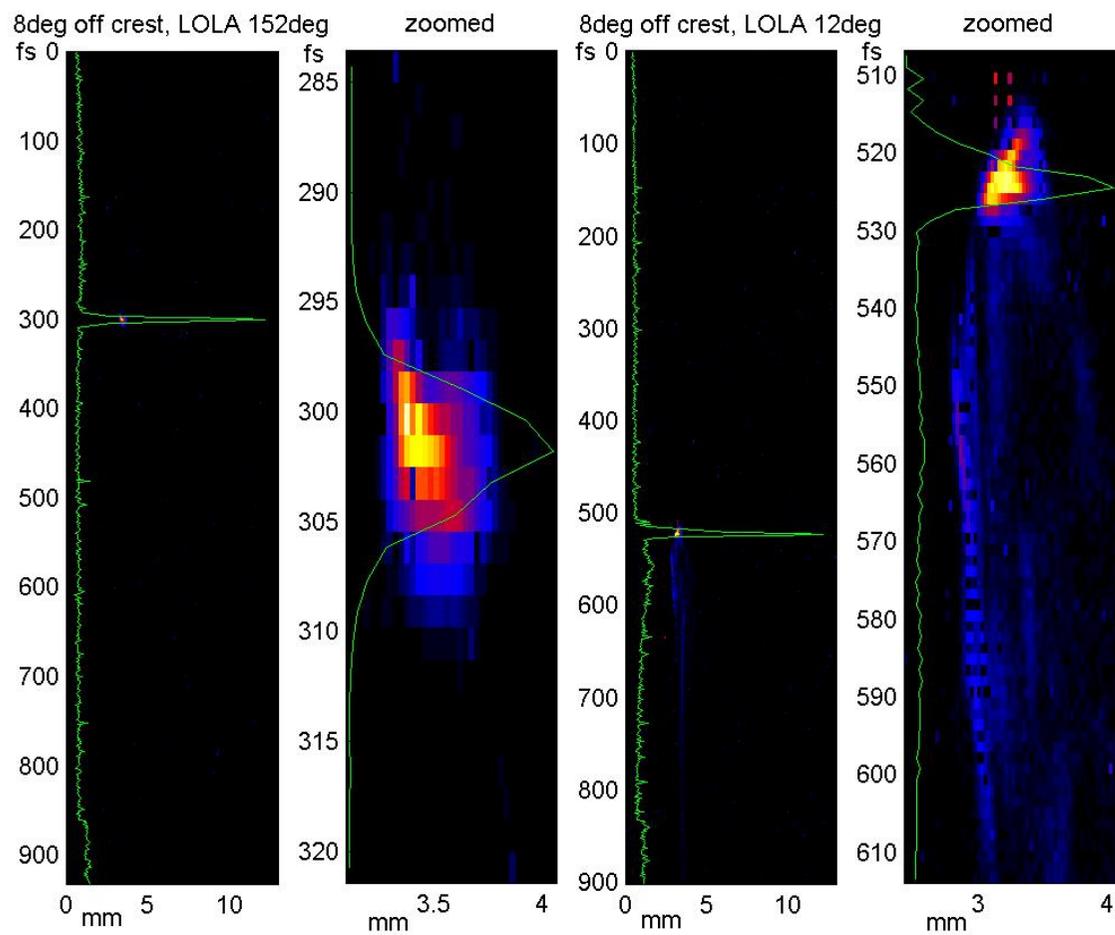


Energy	MeV	445.00
Tor. 5DBC3	nC	0.96
Gun	MW	3.21
	deg	-120.12
ACC1	MV/m	15.02
	deg	96.43
ACC2/3	MV/m	18.02
	deg	-137.70
ACC4/5	MV/m	4.95
	deg	34.00
DipoleBC2	A	61.60
DipoleBC3	A	36.60
Q9ACC6	A	14.71
Q10ACC6	A	-16.89
Q9ACC7	A	3.47
H10ACC6	A	-0.07
V10ACC6	A	-0.02
H10ACC7	A	-0.13
V10ACC7	A	0.04
BPM2ACC7x	mm	1.00
BPM9ACC7x	mm	4.75
BPM16ACC7x	mm	8.28
BPM2ACC7y	mm	0.58
BPM9ACC7y	mm	0.40
BPM16ACC7y	mm	3.32
CameraGain		60.00
Kicker	kV	3.40
Kickerdly	ms	3.1197
RFstartdly	ms	3.1194
RFstopdly	ms	3.1201
RF	MW	9.03
	deg	-29.70
Kicked bunch		5

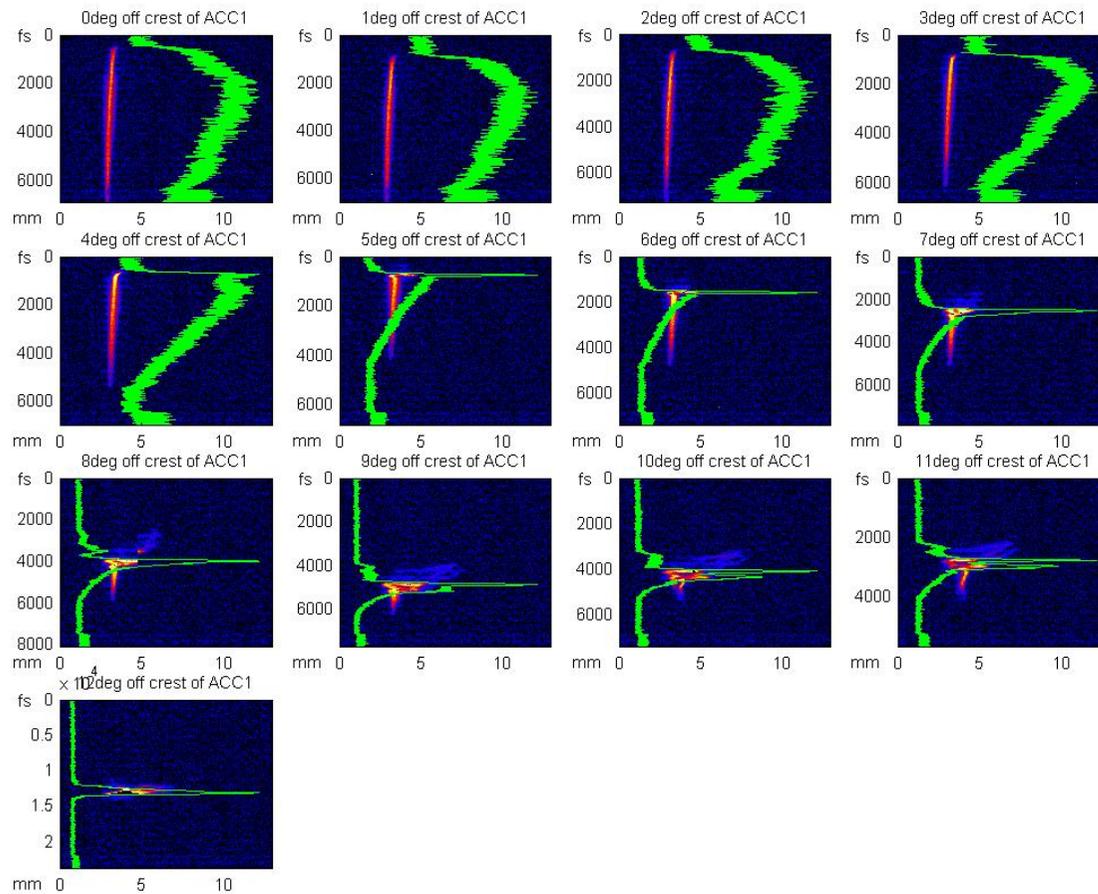
Filename: 2005-05-11T182735-filename , Path: /home/ttflinac/beamimages/lola/ filename: 2005-05-11T182735-filename , Path: /home/ttflinac/beamimages/lola/

0.8mm vs 0.4 mm, subtraction: 78fs \rightarrow 66fs

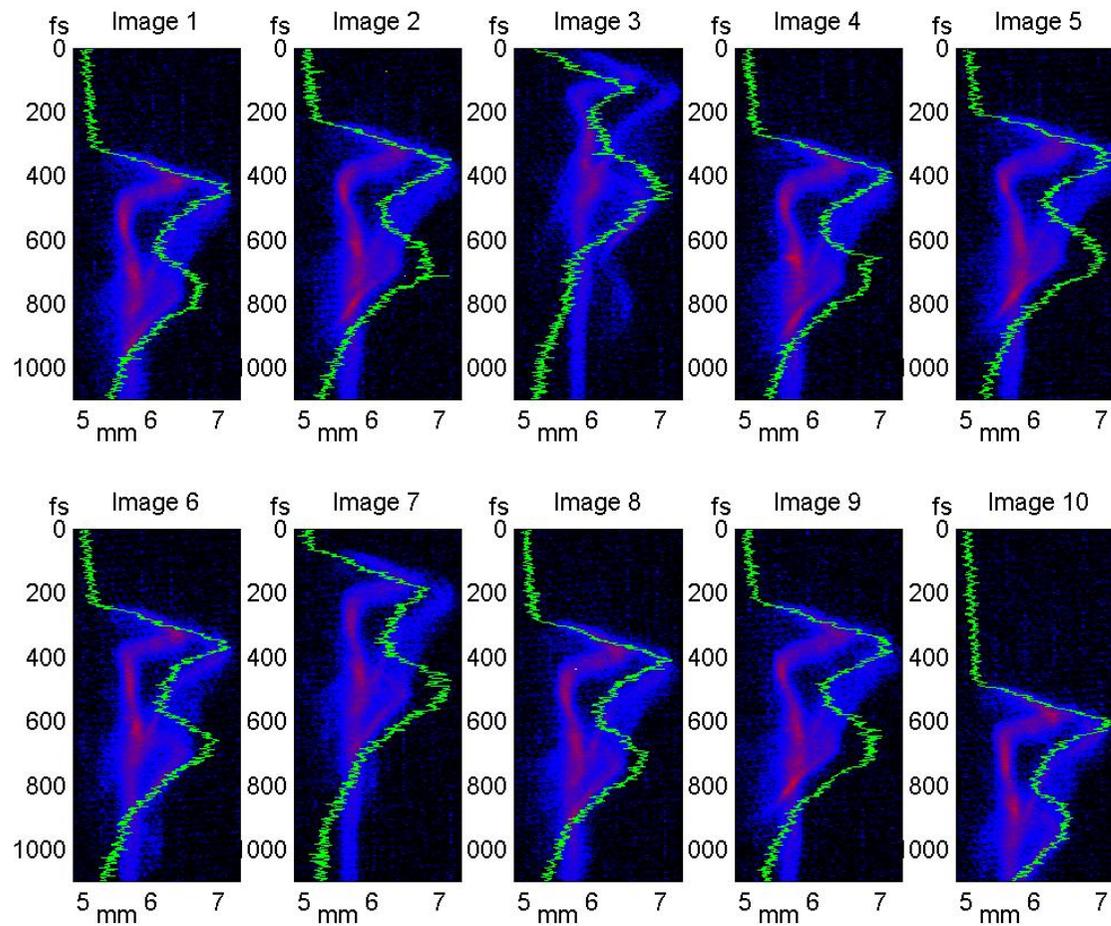
BC3 off



Scan ACC1



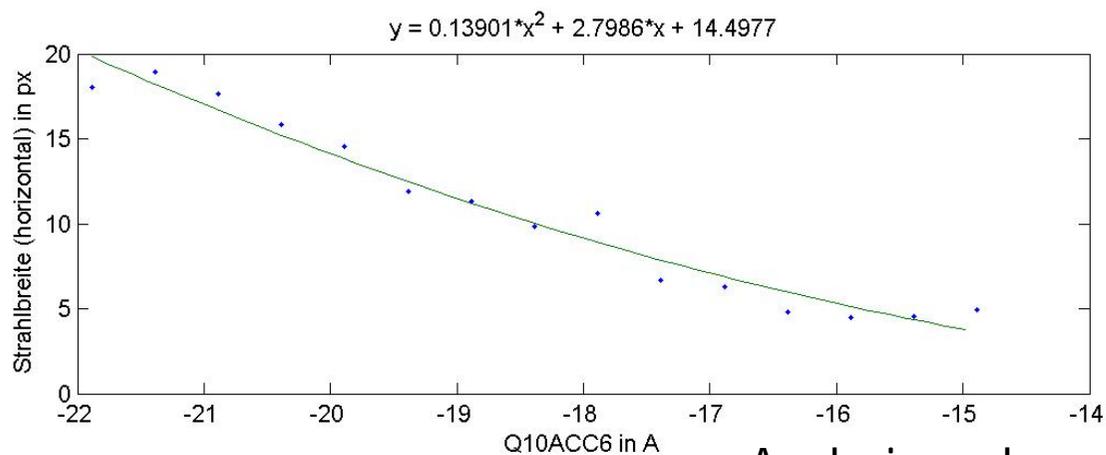
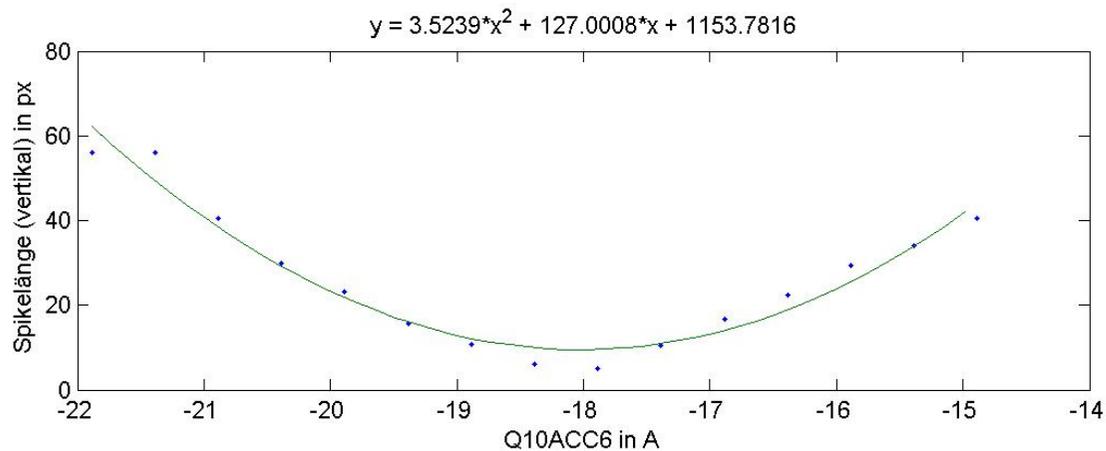
Stable SASE conditions



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)

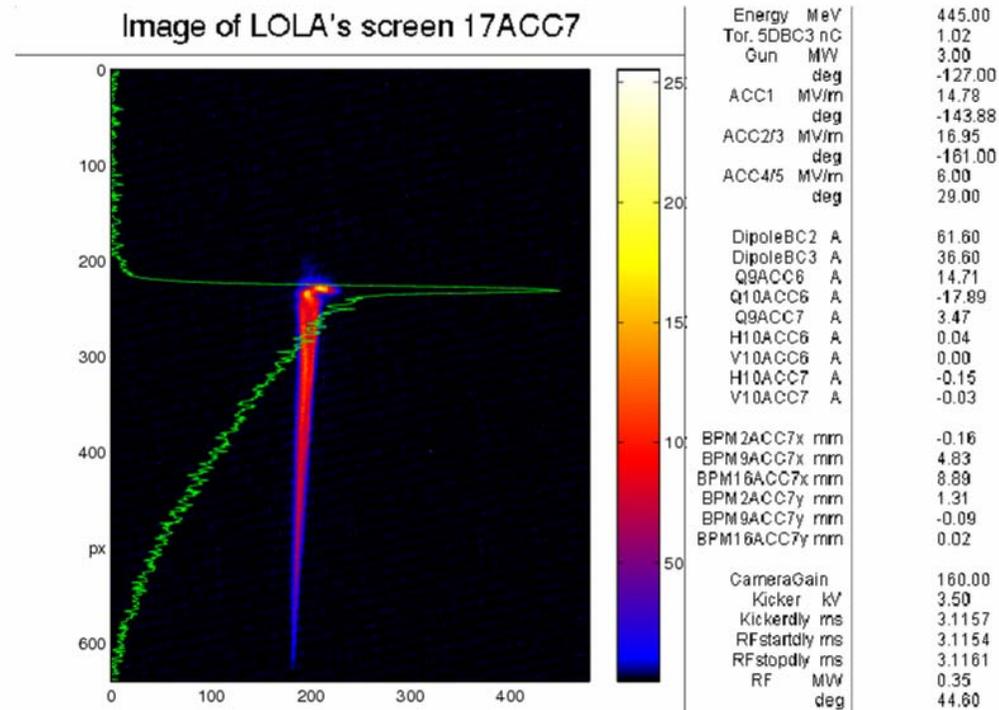
Quadrupole Scan on Spike



Gauss-Funktion: $y = a1 * \exp[-(x-a2)/a3]^2 / 2]$ Aufgetragen ist a3.

Analysis under way

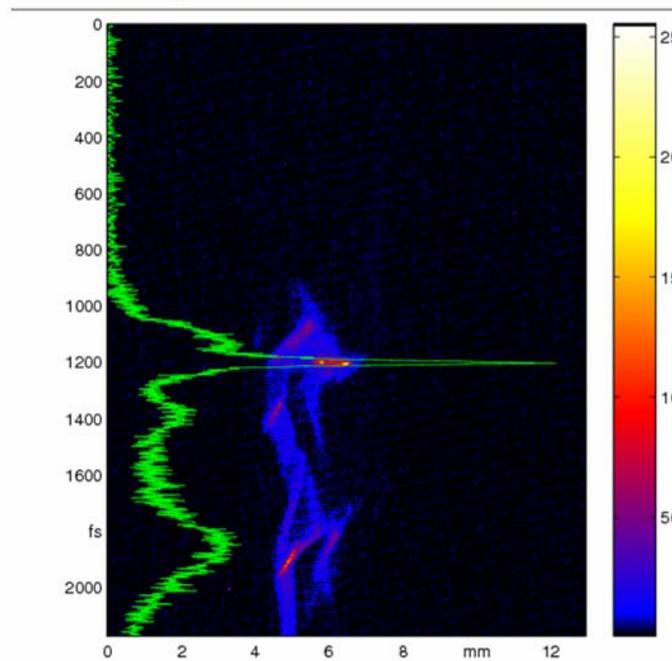
One corresponding picture



Filename: 2005-04-19T010103-Q10ACC6Scan, Path: /home/ttlinac/beamimages/loia/

Max Compression

Image of LOLA's screen 17ACC7



Energy	MeV	445.00
Tor. 5DBC3	nC	0.86
Gun	MW	2.98
ACC1	deg	-126.00
ACC2/3	MV/m	15.05
	deg	-131.00
ACC2/3	MV/m	17.13
	deg	-165.00
ACC4/5	MV/m	5.15
	deg	20.00
DipoleBC2	A	61.60
DipoleBC3	A	36.60
Q9ACC6	A	15.39
Q10ACC6	A	-18.42
Q9ACC7	A	3.47
H10ACC6	A	-0.00
V10ACC6	A	0.01
H10ACC7	A	-0.14
V10ACC7	A	-0.02
BPM2ACC7x	mm	2.16
BPM9ACC7x	mm	5.11
BPM16ACC7x	mm	8.86
BPM2ACC7y	mm	-0.07
BPM9ACC7y	mm	0.48
BPM16ACC7y	mm	3.84
CameraGain		213.00
Kicker	kV	2.40
Kickerdly	ms	3.1167
RFstartdly	ms	3.1165
RFstopdly	ms	3.1175
RF	MW	5.63
	deg	-59.00