
Data for Impedance Determination

2007-12-12

Note-2007-40.tex

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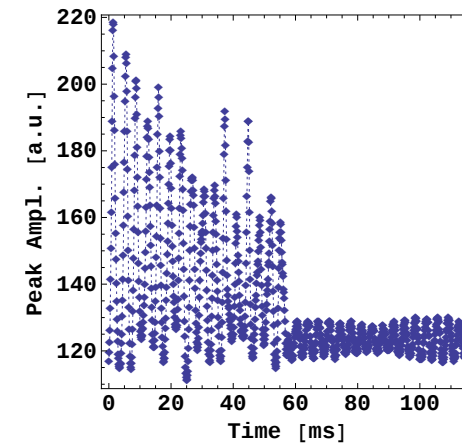
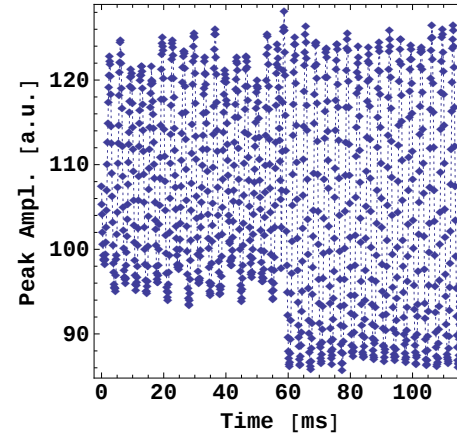
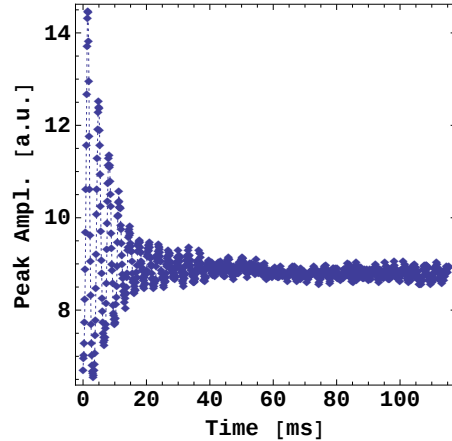
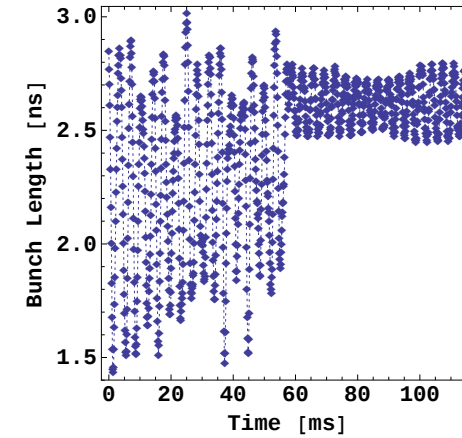
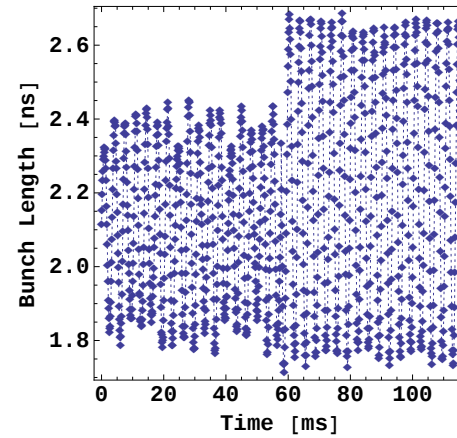
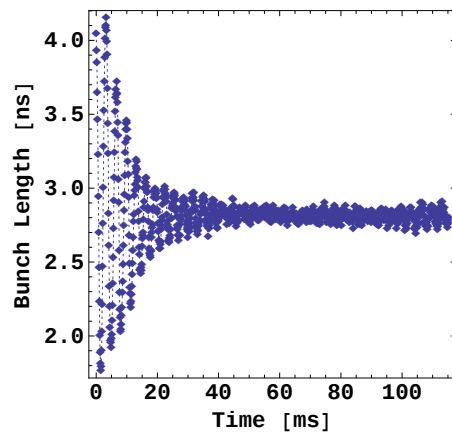
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Measurements

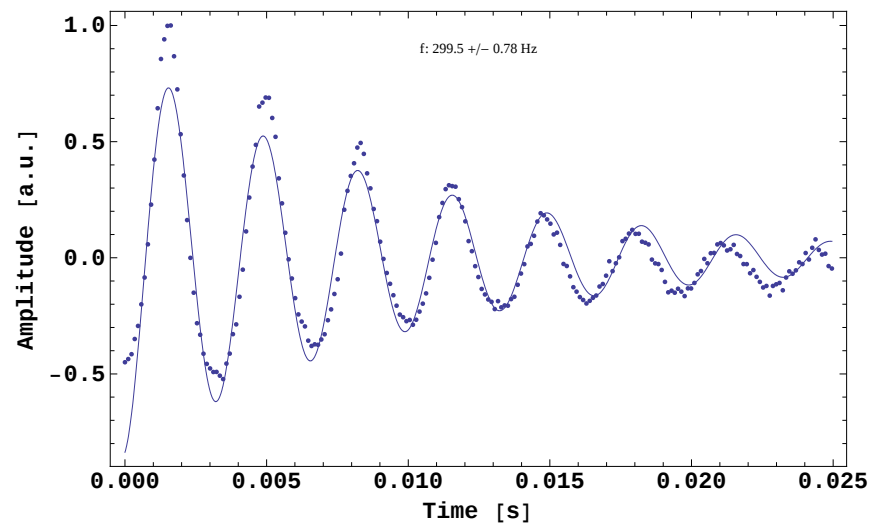
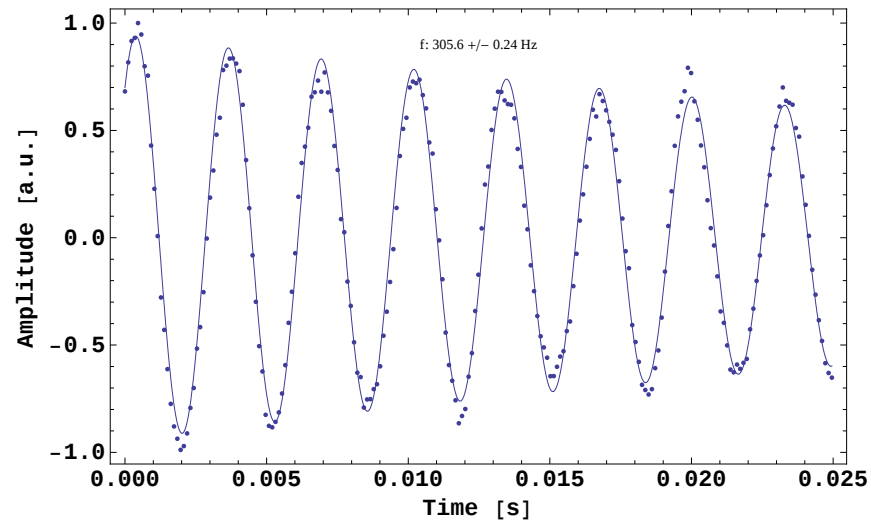
- BCT intensity
 - at some time after injection
 - discard losses at injection
- long. emittance (PS) from tomoscope
- bunch length at injection
 - from PS (BSM at extraction)
 - bunch profile, raw (uncorrected) data, FWHM, τ_i
- bunch peak amplitude at injection
- bunch length at 600 ms, τ_f , from bunch profile, raw (uncorrected) data, FWHM, $\tau_f = (\tau_{\max} + \tau_{\min})/2$ for $t > 600$ ms
- quadrupole oscillation frequency measurements
 - peak detected signal on scope

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- * use cursor functions to measure time between peaks (LPF recommended)
 - * observation time (how many peaks)
 - peak detected signal on LF spectrum analyser
 - * observation several 100 ms after injection (transient)
 - * measures either coh. of incoh. frequency depending on osc. amplitude
 - peak detected signal obtained from bunch profiles (peak amplitude from simple peak detection of raw data or Gauss fit after full correction)

Bunch Length and Peak Amplitude

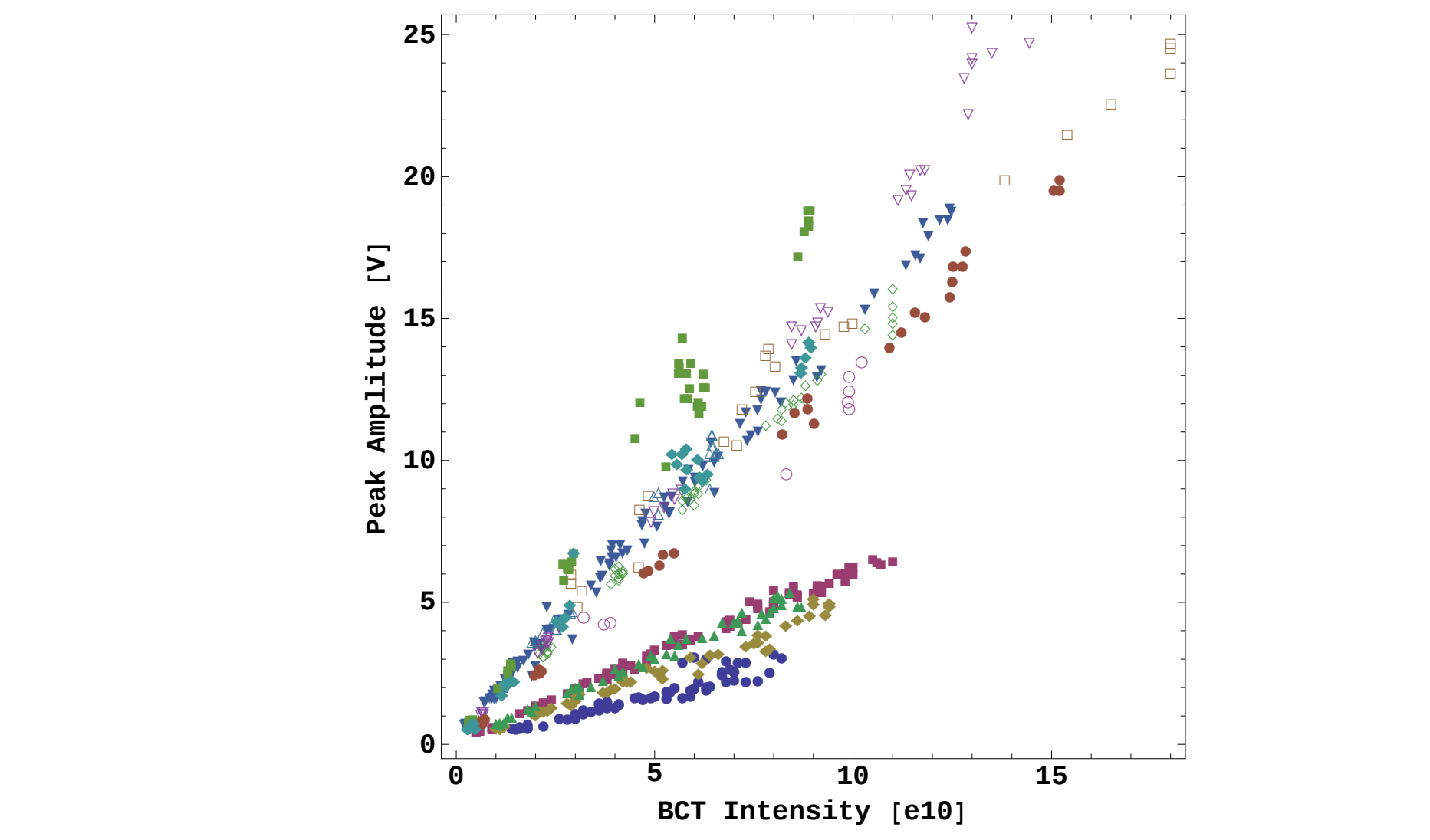


Peak Amplitude and Quadr. Osc. Freq.



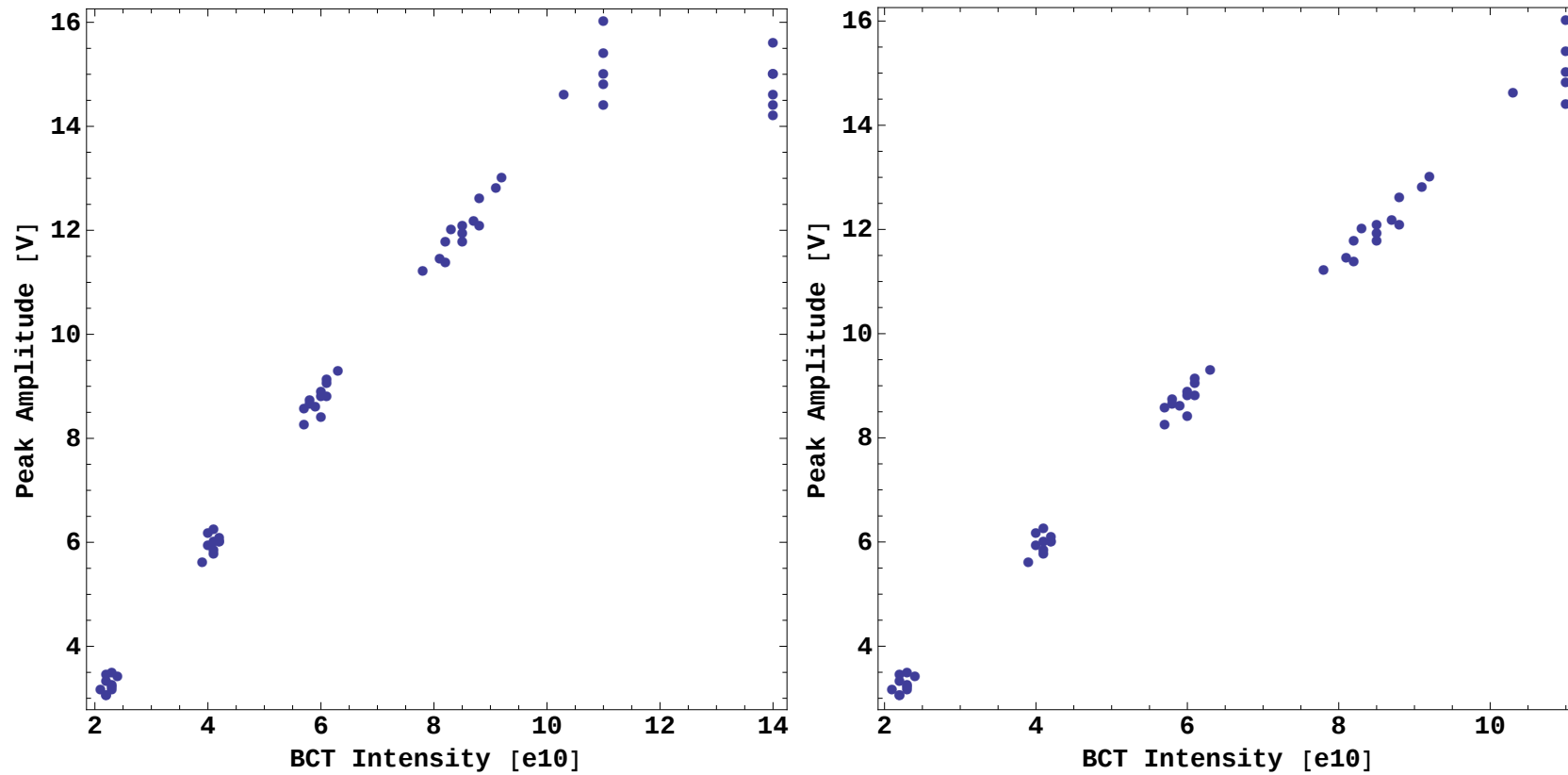
Measurement History

1	1999-11-15
2	1999-11-25
3	2001-08-07_1
4	2001-08-07_2
5	2003-09-04
6	2006-10-27_1
7	2006-10-27_2
8	2006-11-17
9	2007-07-20
10	2007-11-01_1
11	2007-11-01_2
12	2007-11-01_3
13	2007-11-01_4



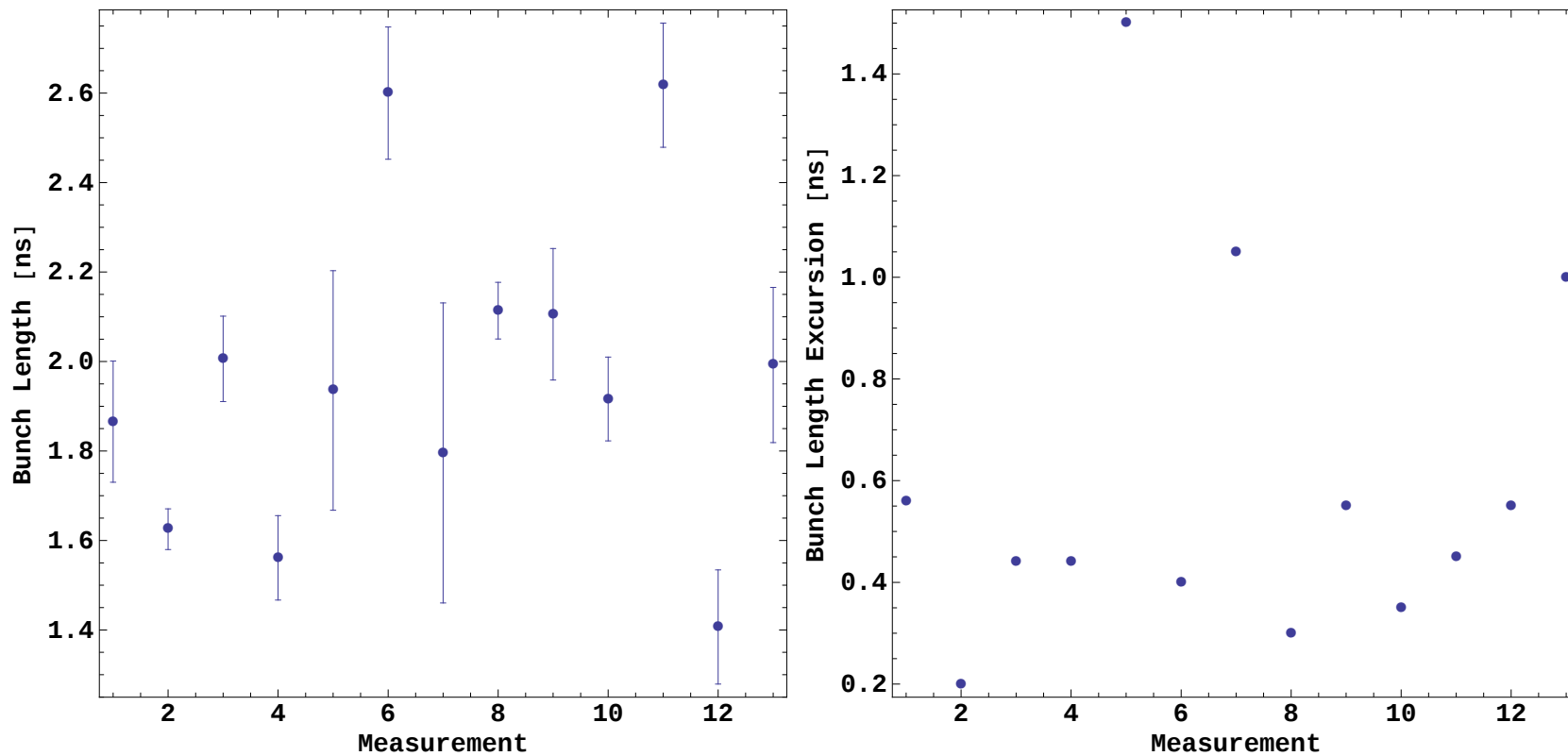
Peak Amplitude

● 2006-11-17



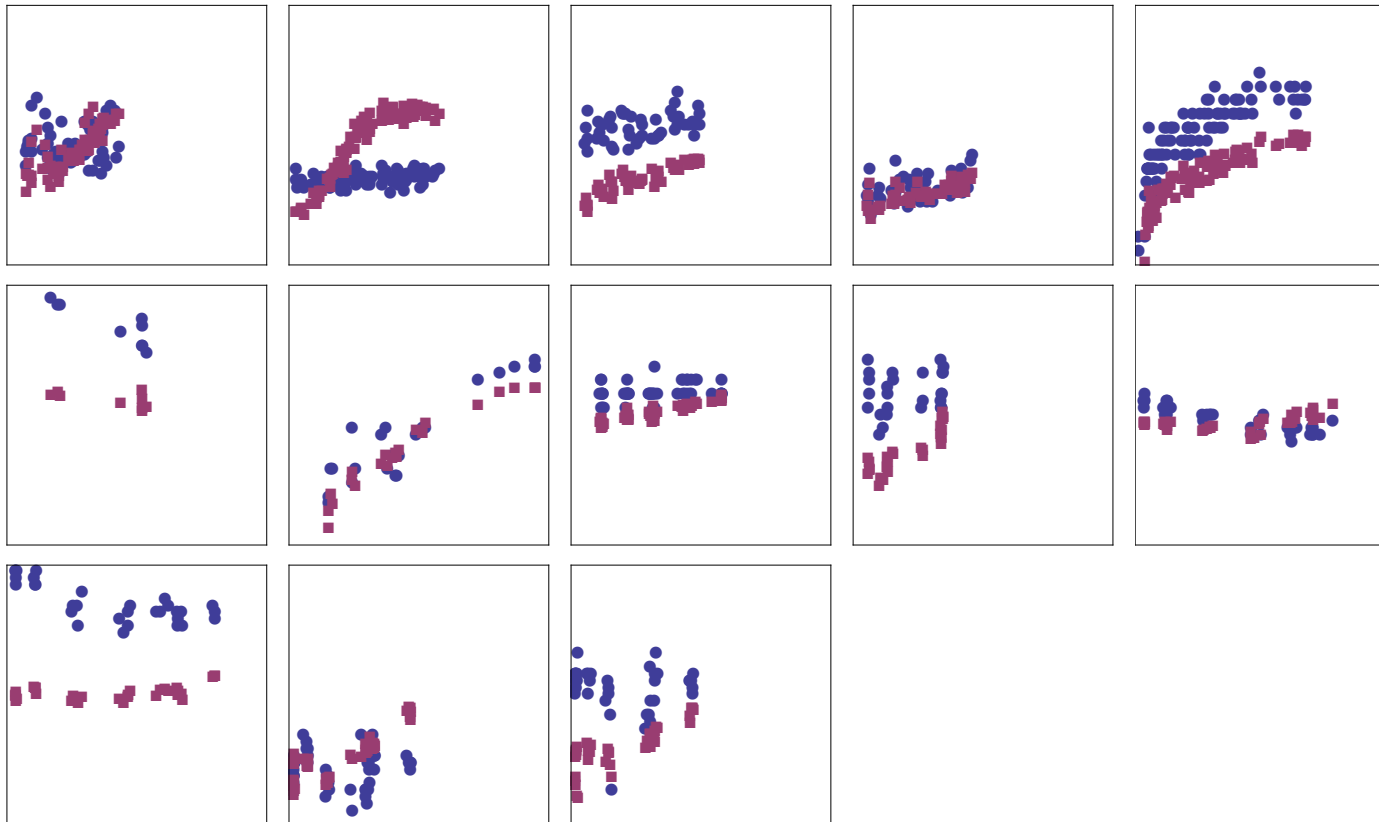
Bunch Length at Injection

- bad conditions: 6, 11, 12(?) (bunch length); 5, 7 (bunch length excursion)



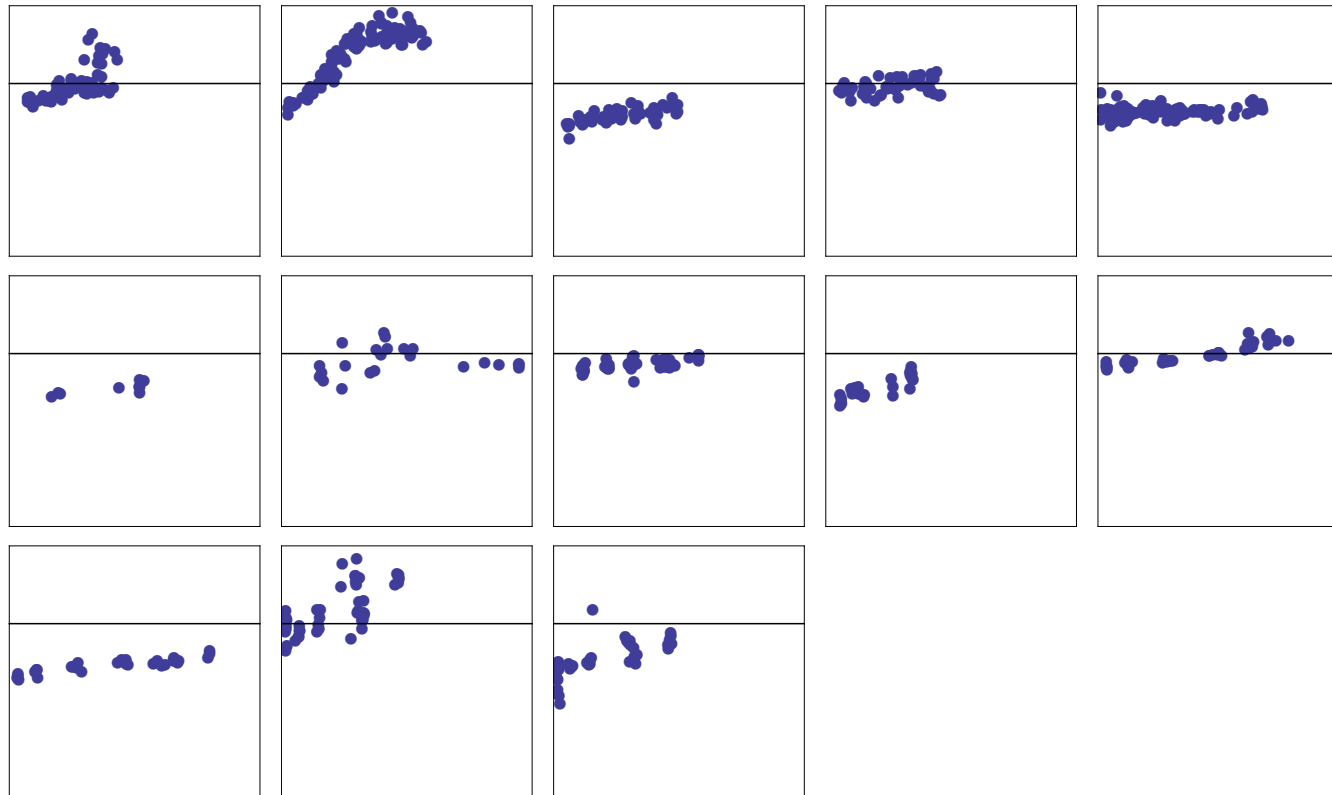
Bunch Length at injection and after 600 ms

- if ϵ indep. of intensity, then τ_f at low intensity is a measure of it
- scale: 0 to 19×10^9 , 1.0 ns to 2.9 ns



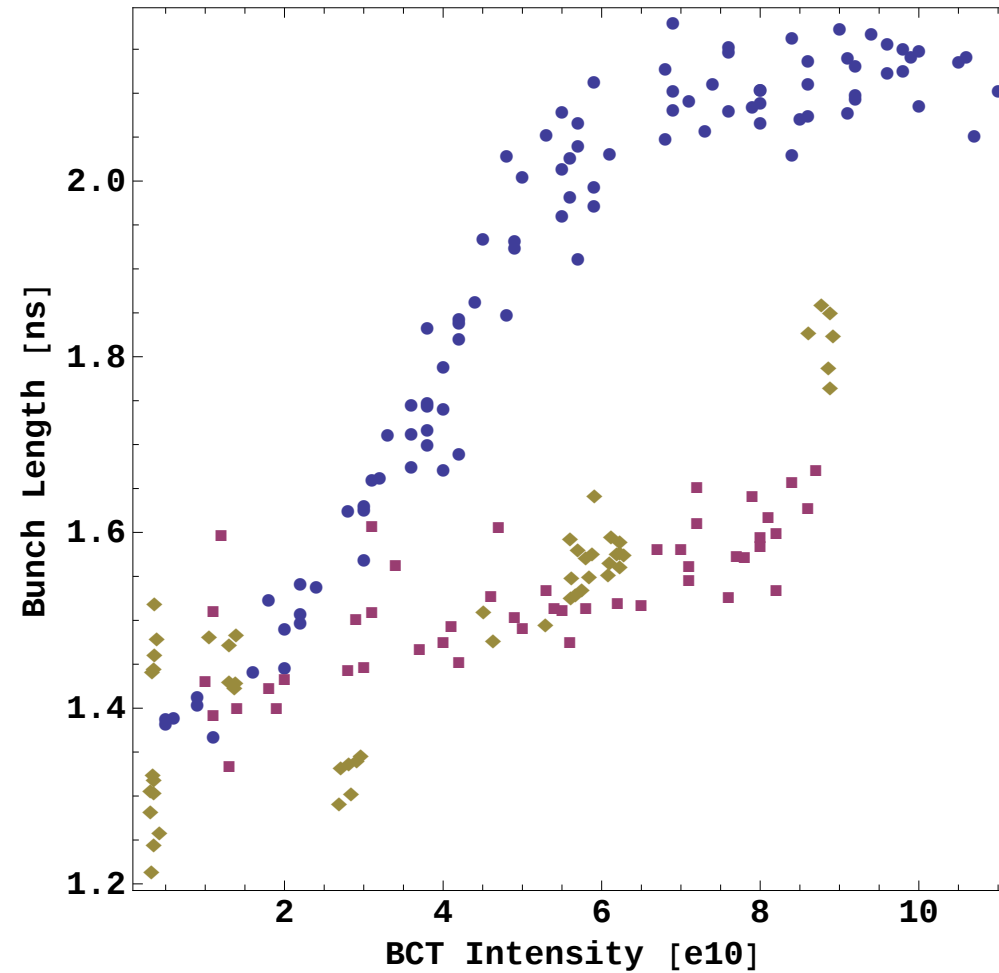
Bunch Length Ratio

- τ_f/τ_i ; scale: 0 to 19×10^9 , 0.0 to 1.45
- considered bad (from injection conditions): 5, 6, 7, 11



Bunch Length after 600 ms

- blue: 1999-11-25, red: 2001-08-07_2, yellow: 2007-11-01_3

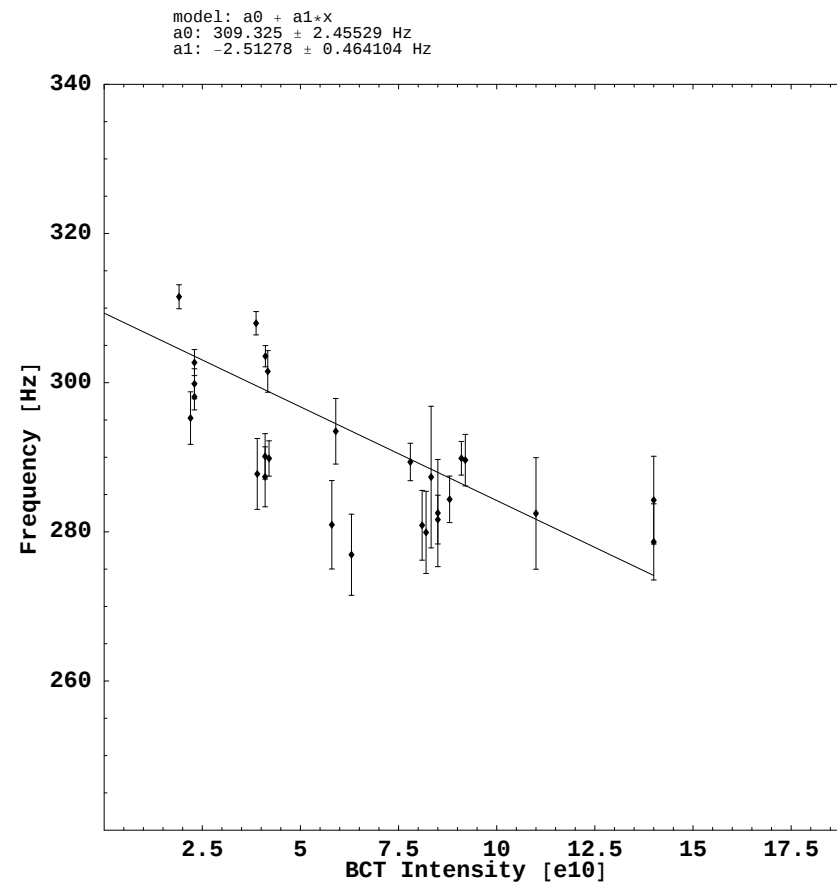


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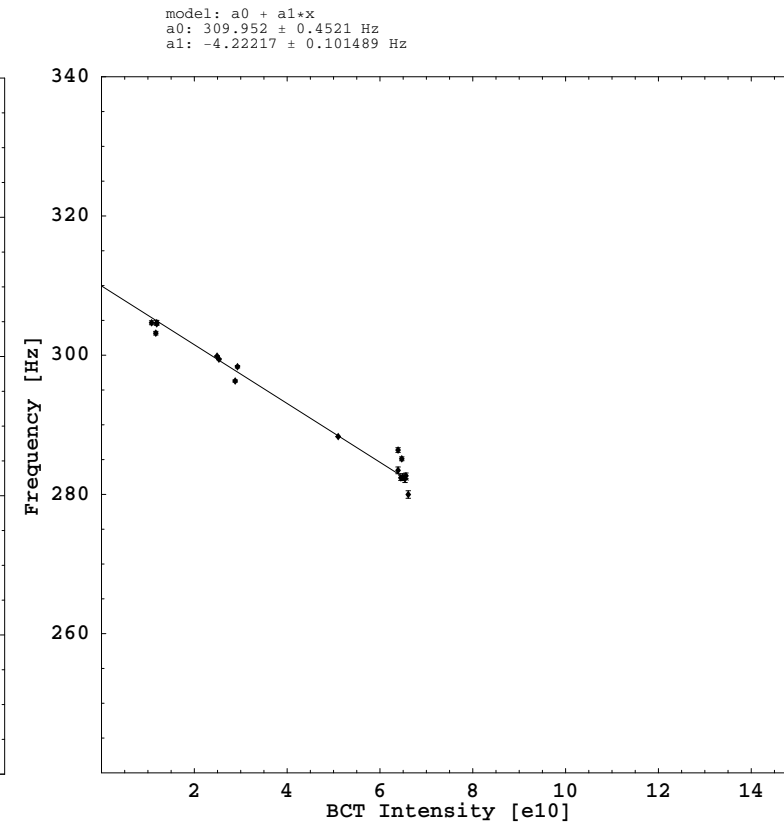
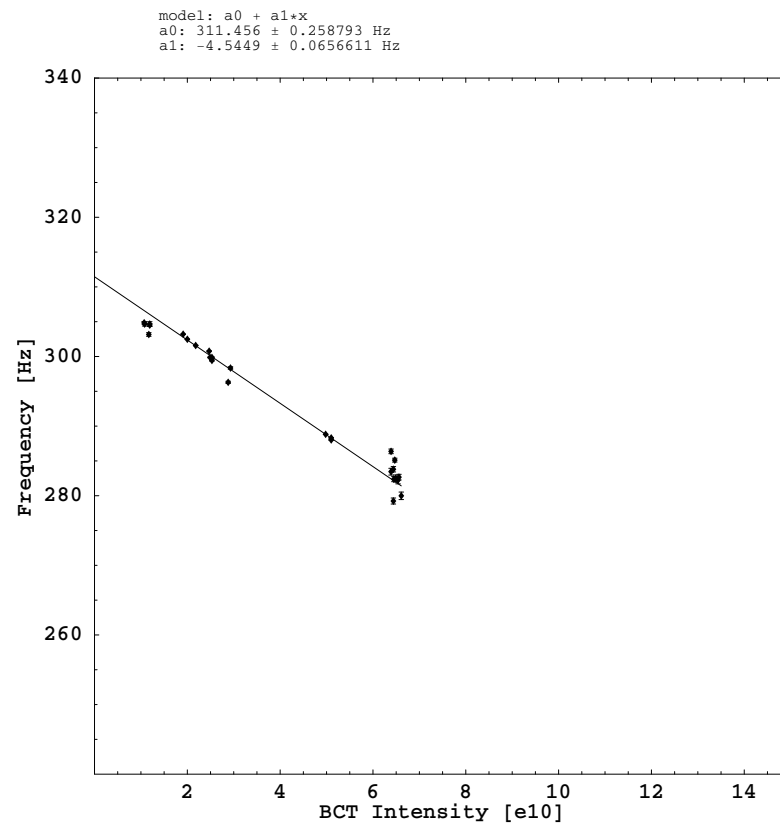
Frequency Measurements

- 2006-11-17: $m = -2.5 \pm 0.5$



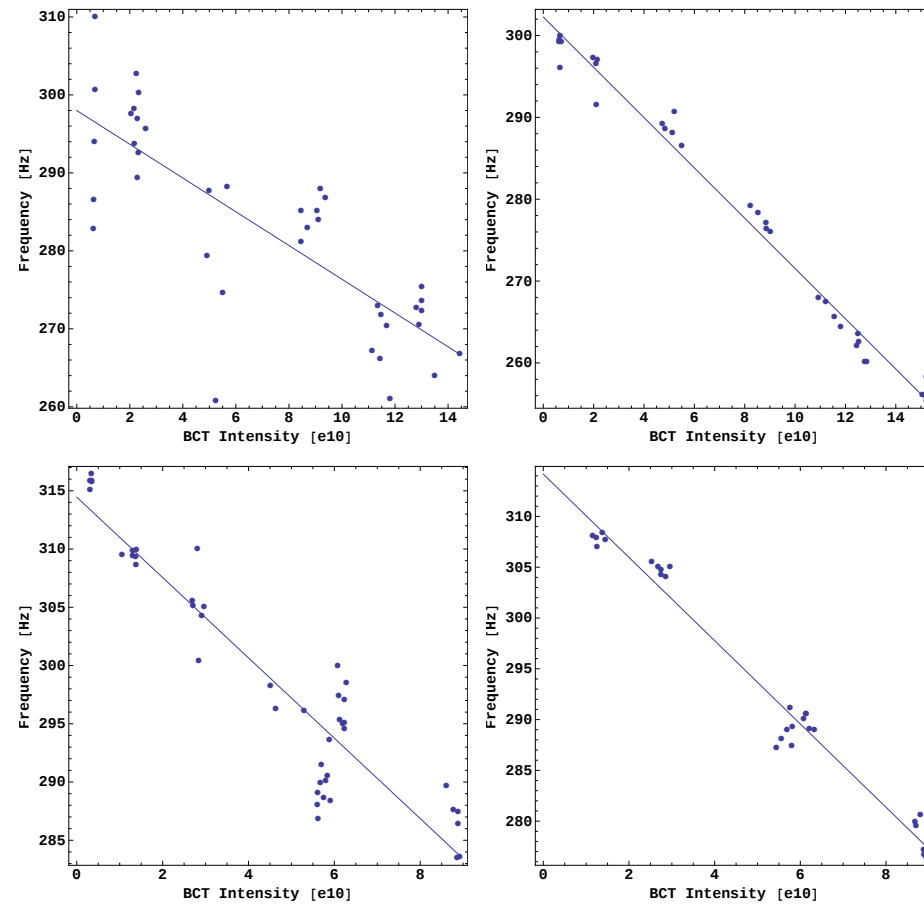
Frequency Measurements

- 2007-07-20: $m = -4.5 \pm 0.1$, $m = -4.2 \pm 0.1$ (τ_i selection)



Frequency Measurements

- 2007-11-01: freq. error typical 1 Hz



Frequency Measurements

Meas.	Date	τ_i	m	Remarks
1	1999-11-15	2.0		t_{obs} too short
2	1999-11-25	1.6		t_{obs} very short
3	2001-08-07_1	2.0		no $2f_s$ data yet
4	2001-08-07_2	1.6		no $2f_s$ data yet
5	2003-09-04	1.9		no $2f_s$ data yet
6	2006-10-27_1	2.6	-3.0 ± 0.2	
7	2006-10-27_2	1.8	-2.7 ± 0.6	
8	2006-11-17	2.1	-2.7 ± 0.4	
9	2007-07-20	2.1	-4.5 ± 0.1	
10	2007-11-01_1	1.9	-2.2 ± 0.3	2x80MHz, shaving off
11	2007-11-01_2	2.6	-3.1 ± 0.1	1x80MHz, shaving off
12	2007-11-01_3	1.4	-3.4 ± 0.2	2x80MHz, shaving on
13	2007-11-01_4	2.0	-4.1 ± 0.1	1x80MHz, shaving on

Outstanding

- longitudinal emittance
- quadrupole oscillation amplitude vs intensity
- f_s data for early machine developments
- stable phase measurements

Conclusions

- difficulty of comparison
- importance of initial bunch length and longitudinal emittance
- for comparison with the past, a comparative set of τ_i and ϵ is needed in each case