Wire compensation performance, SPS MDs, pulsed system

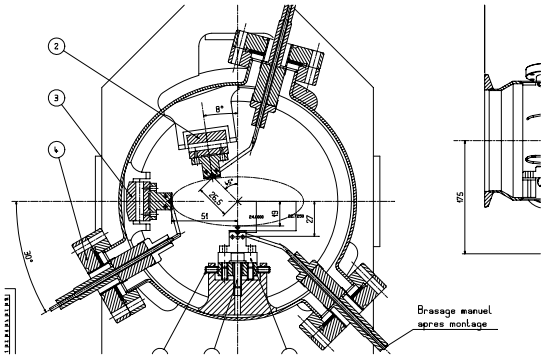
Ulrich Dorda

CARE-HHH-APD IR'07

OUTLINE

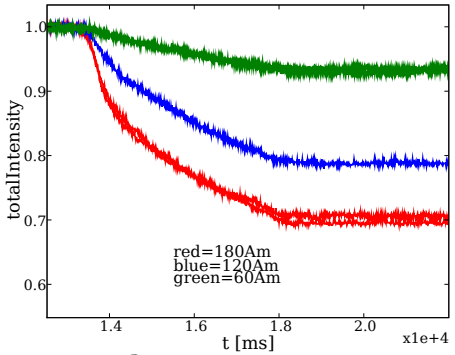
1. SPS MD's
2. PULSED BBLR a la F. Caspers
3. Conclusions & Thanks

SETUP



$DA_{geom} = 4\sigma$ at 26Gev

$\beta \approx 50m$

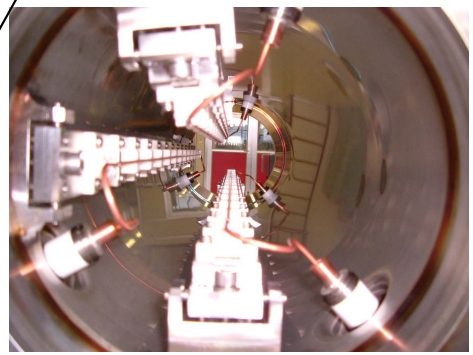


$I_{max} = 360Am$

$\Delta\Phi \approx 3°$

$Q_x = 0.31,\ Q_y = 0.28$

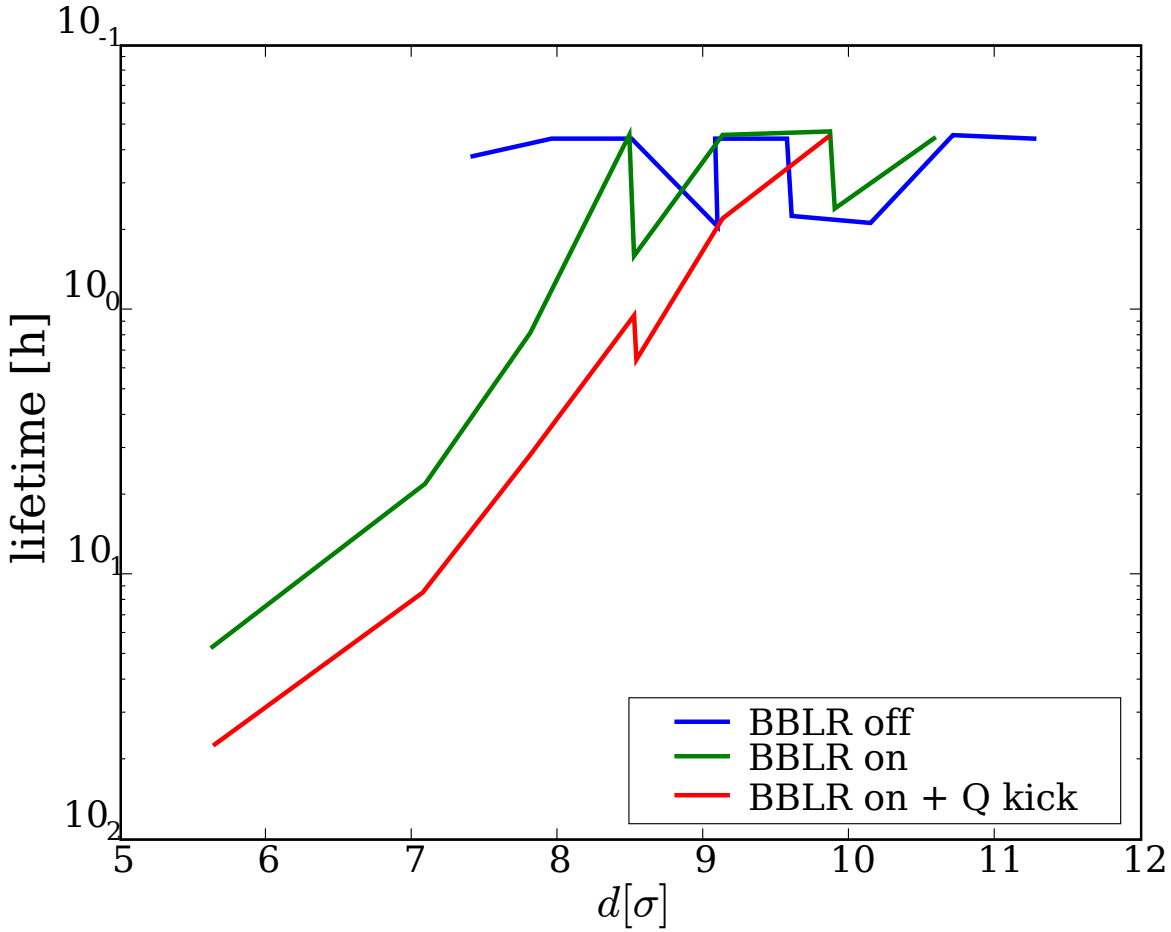
orbit,tune compensate



no HO, keep as simple as possible

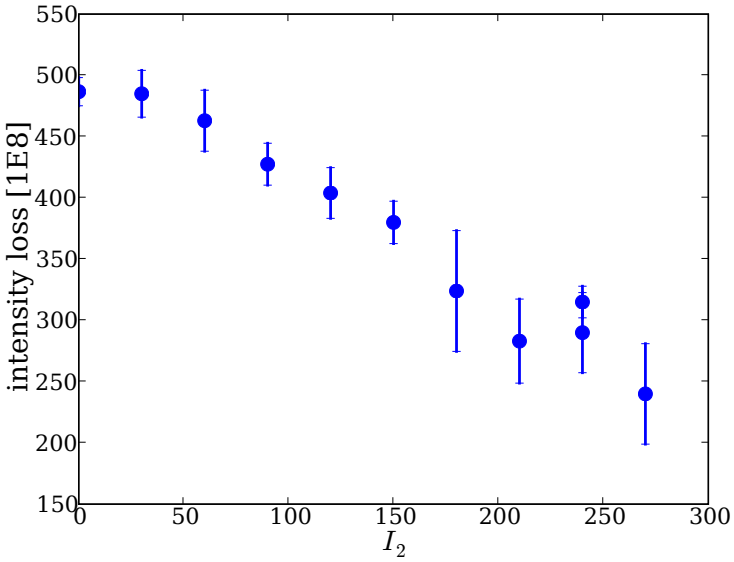
BBLR2 movable by 5mm

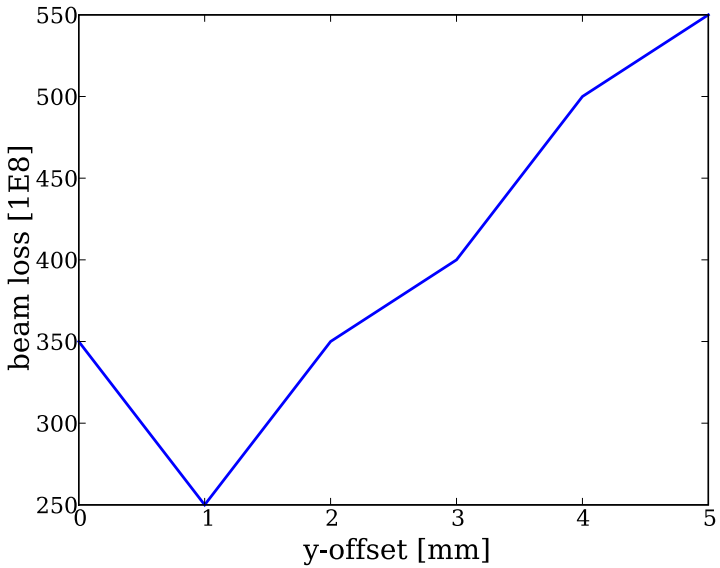
2002: BASICS, NOMINAL LHC?

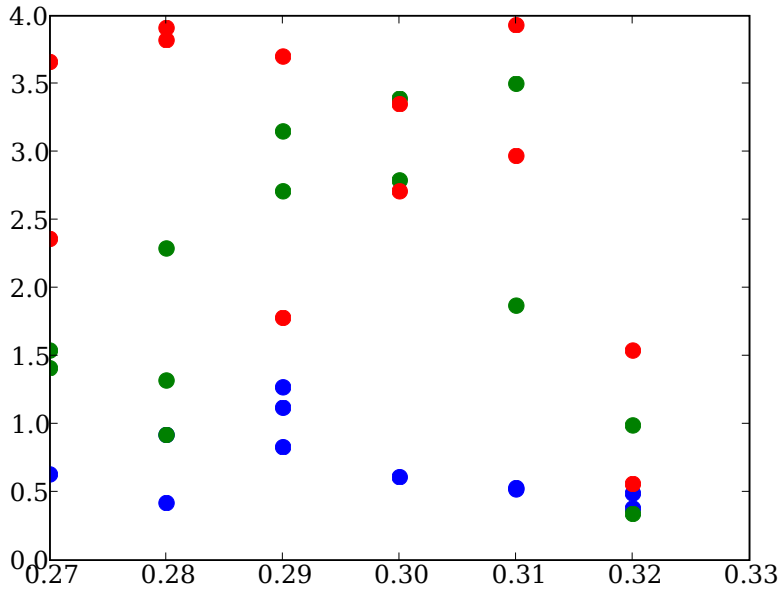


It seems that nominal LHC is ok, but mind the experimental precision....
(+no HO ...)

2004 - COMPENSATION

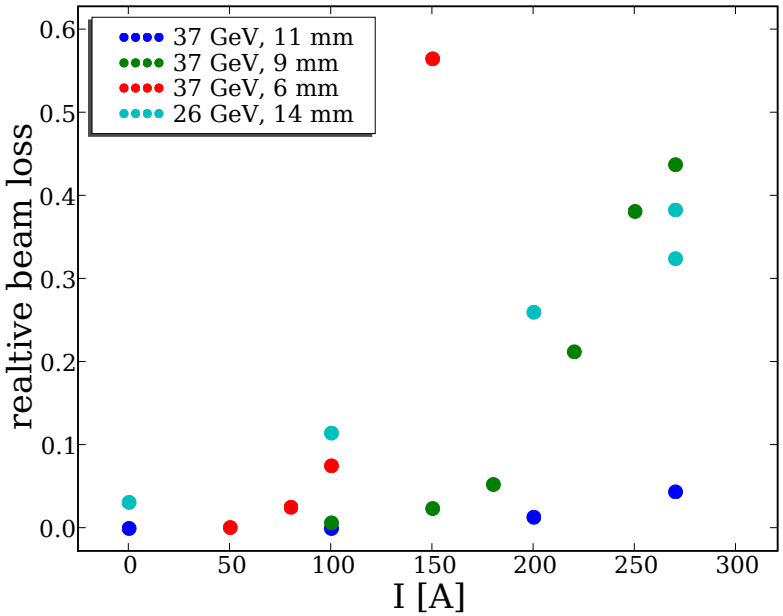




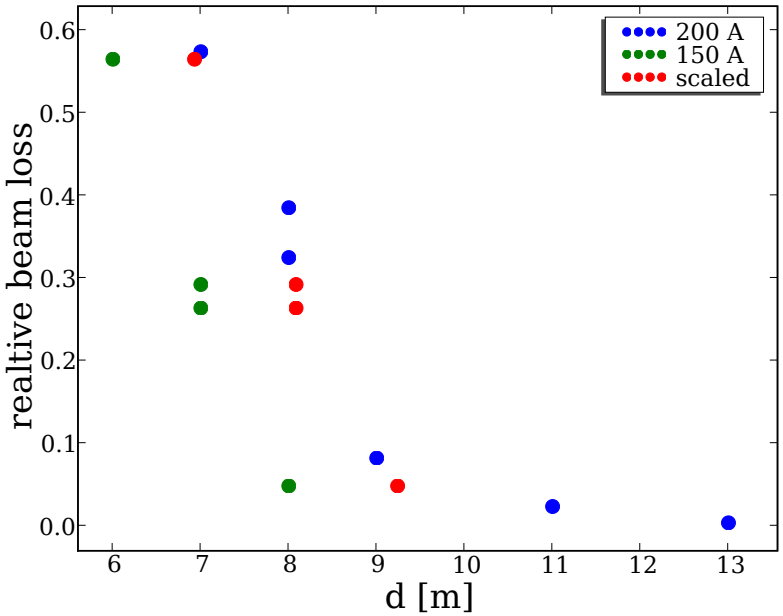


and more, eg: crossing schemes

THIS YEAR 1!



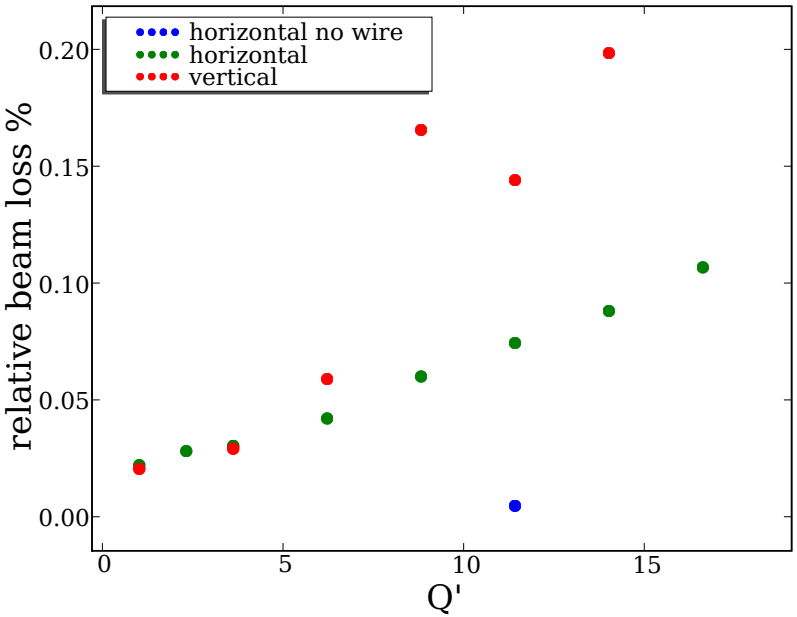
Hoping for a threshold effect. 14 mm $\approx 8.4\sigma$ at 26 GeV. 11 mm $\approx 8.6\sigma$ at 37 GeV. 6 mm $\approx 4.3\sigma$. at 37GeV

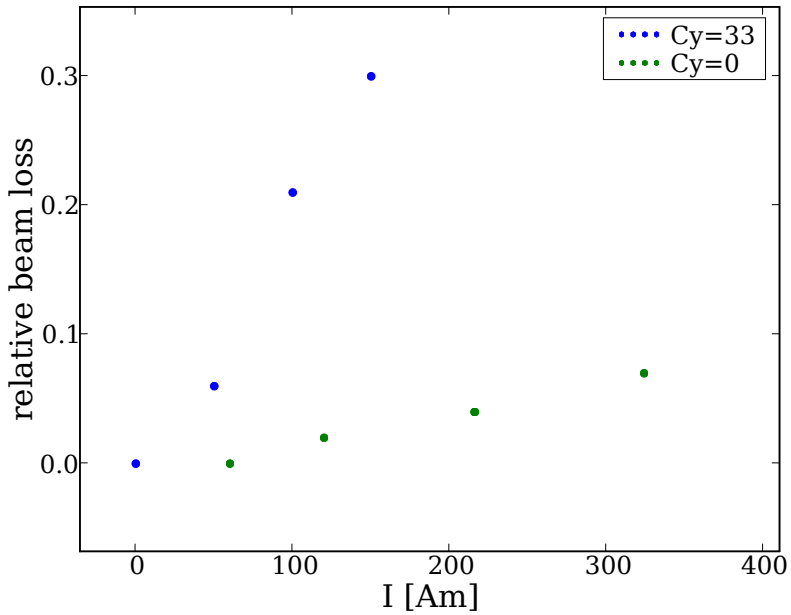


Scaling works
but why are they parallel?

THIS YEAR 2!

RHIC promised it...





d=6.6σ at 55GeV

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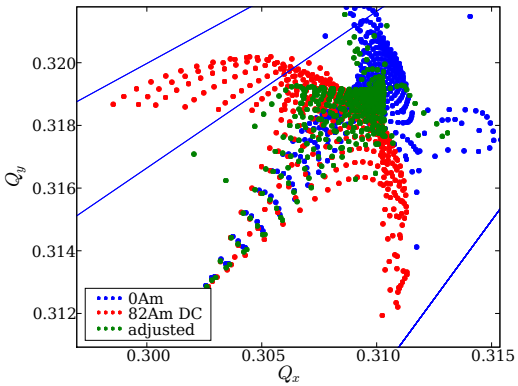
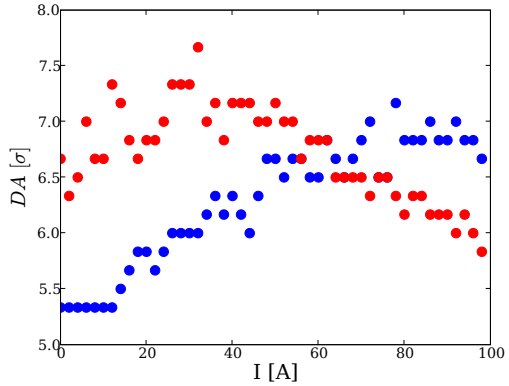
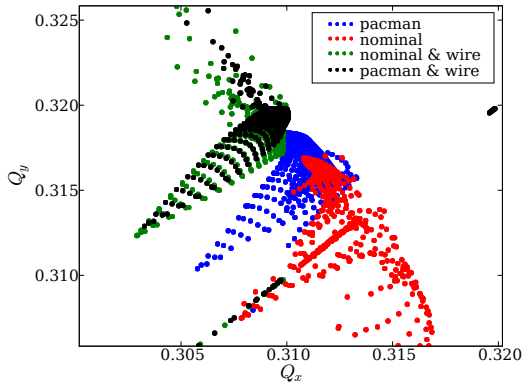
WHY A PULSED BBLR?



(a) minimize footprint for all bunches



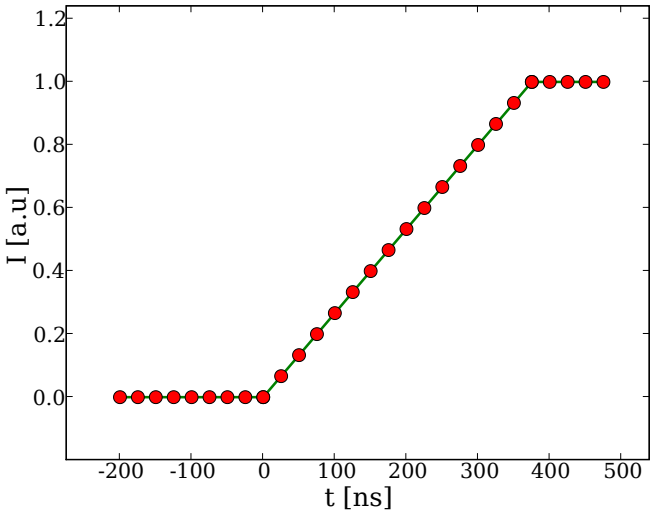
(b) optimize DA for all bunches



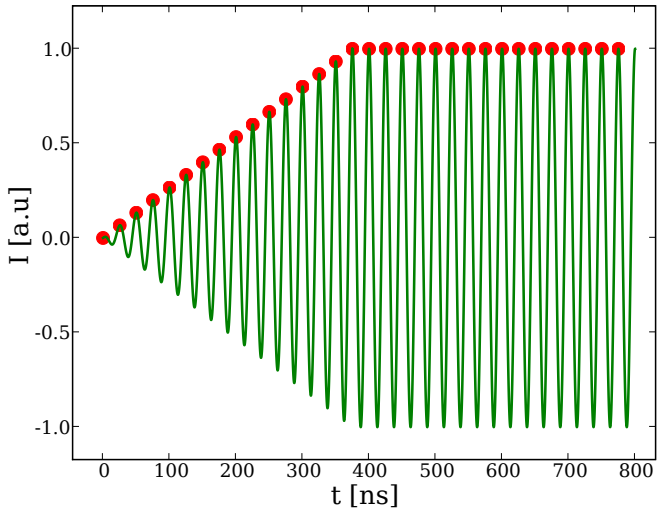
(c) For HH-crossing fans

or any one who is afraid of the PACMAN effect (orbits, tunes..)

WHAT IS A RF-BBLR?

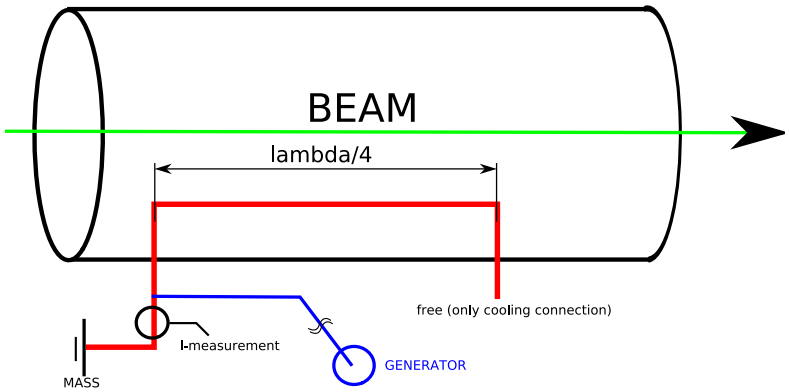


(d) pulsed DC BBLR

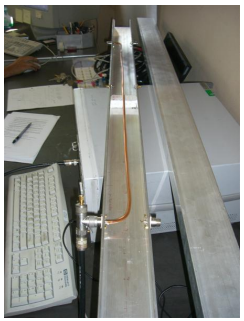


(e) RF-BBLR

RF-BBLR!



Simulation

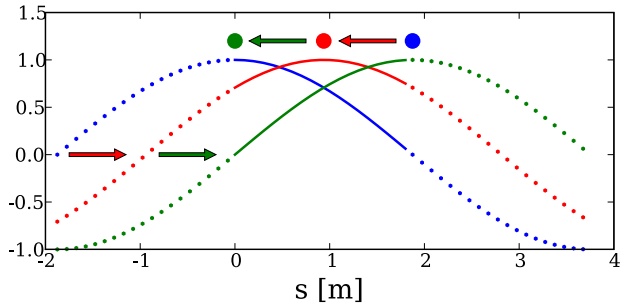


Test devices

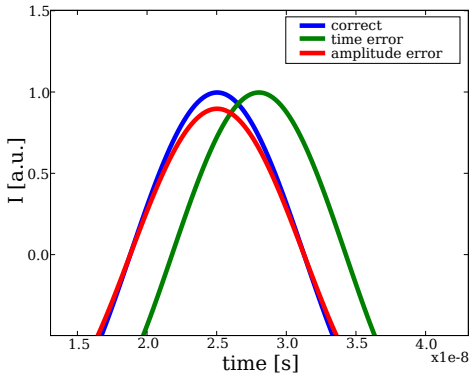
SPS BBLR

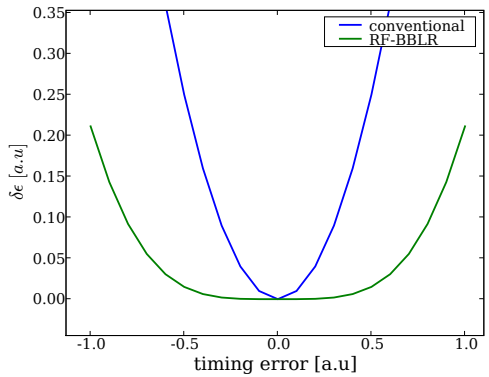
ADVANTAGES OF A RF-BBLR

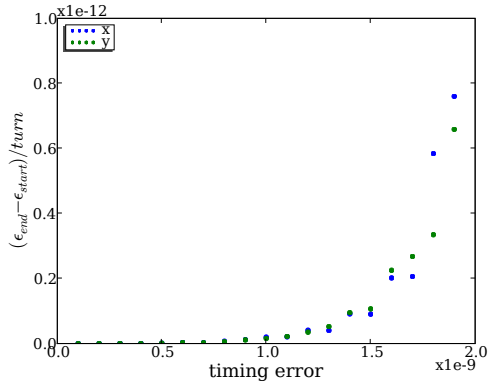
- Reduced slope $\downarrow \Rightarrow$ timing precision $\downarrow$
- Available RF technology should be usable
- RF field easier to shield
- Conterpropagating wave $\Rightarrow$ double effect $\Rightarrow$ I $\downarrow$, P $\downarrow\downarrow$
- Resonator $\Rightarrow$ P $\downarrow\downarrow$
- Power generator on the surface, only passive transformer in the tunnel
- Fritz C.



NOISE





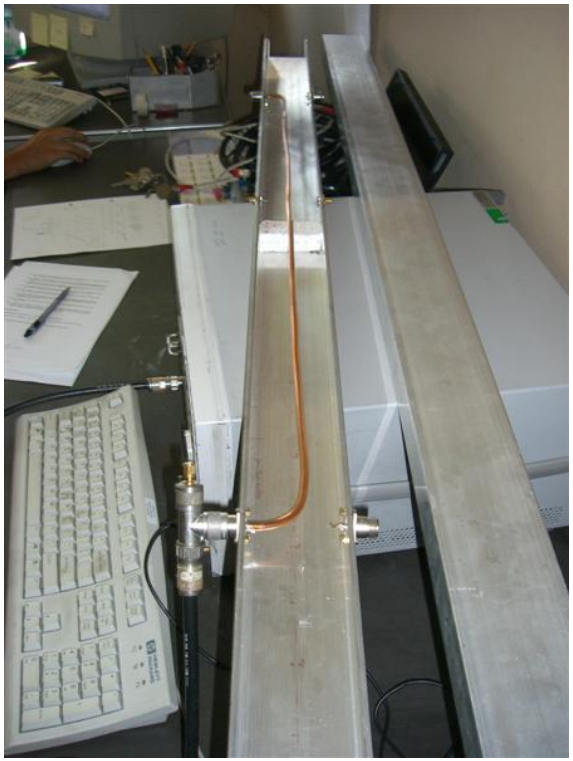


Timing vs. amplitude error Noise: RF vs. pulsed Simulation

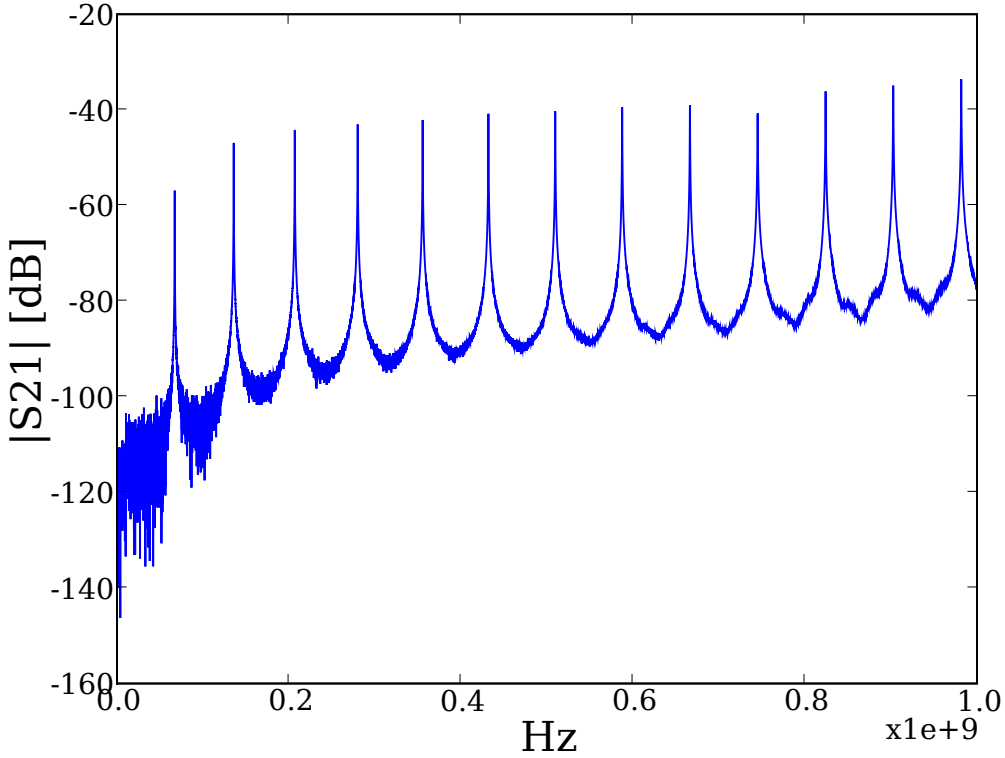
for $\Delta\epsilon < 10\%$ in 20h:
pulsed BBLR: Amplitude noise: $\Delta I < 3\text{mA} = \Delta t < 0.02ns$
RF-BBLR: $\Delta t < 0.126ns$

compatible to J.P K's idea about a 3 turn delay feedback,

EXPERIMENTAL SETUP

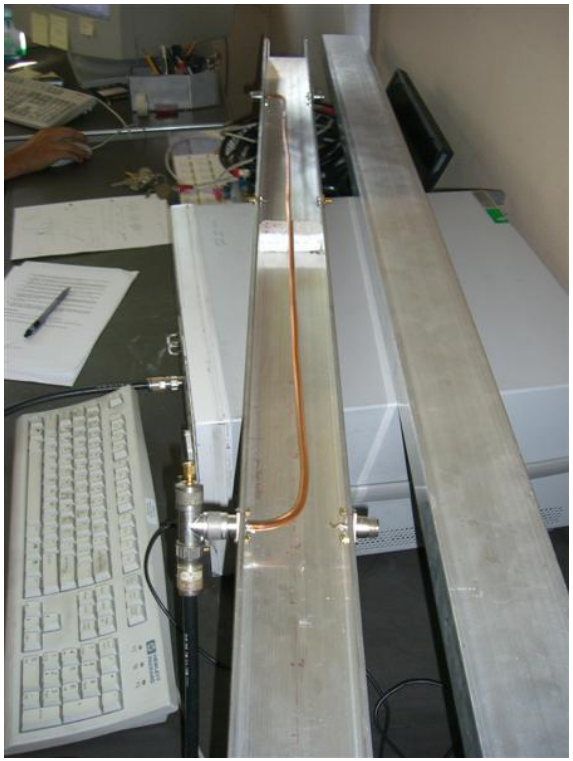


Experimental setup

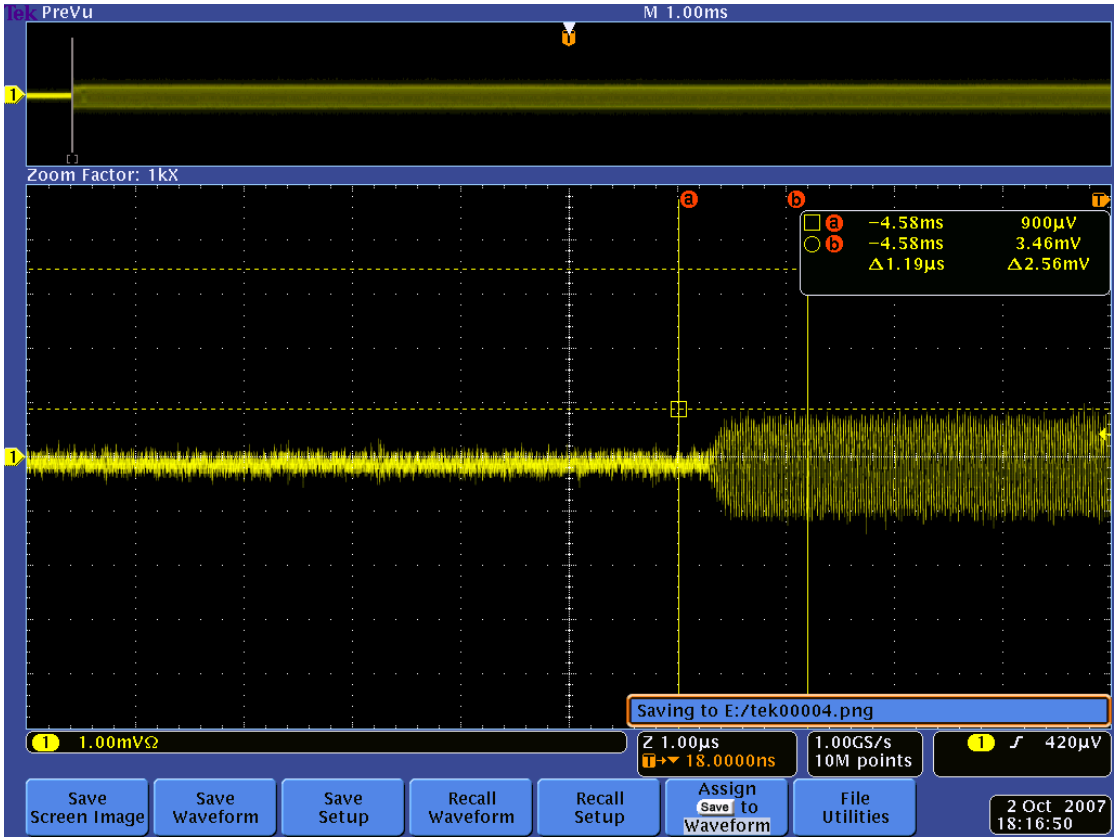


S11

EXPERIMENTAL SETUP

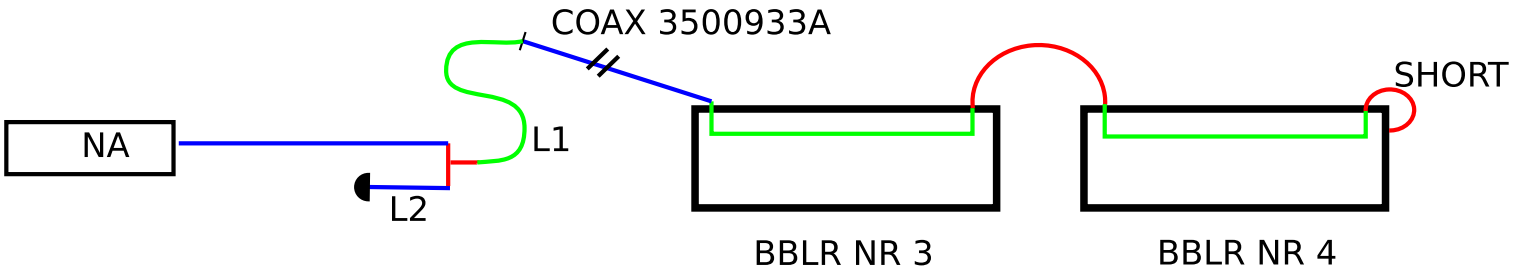


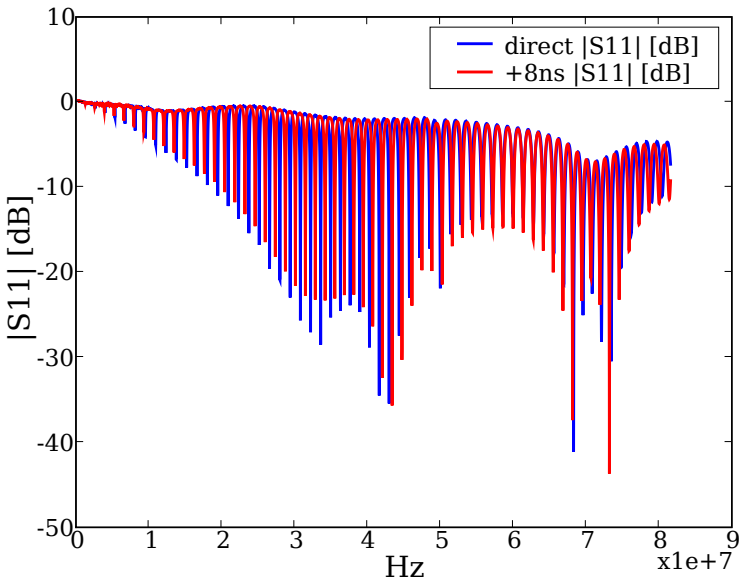
Experimental setup

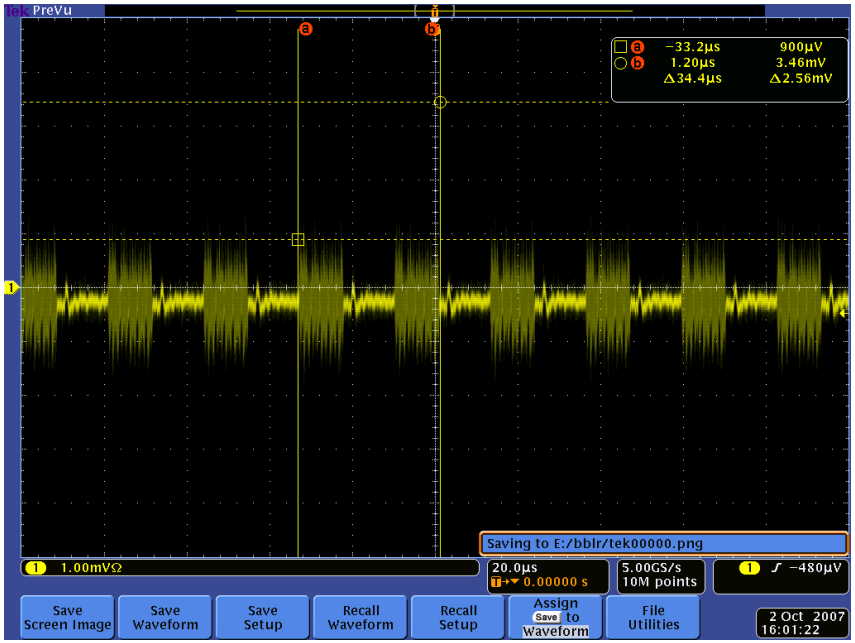


first RF-BBLR

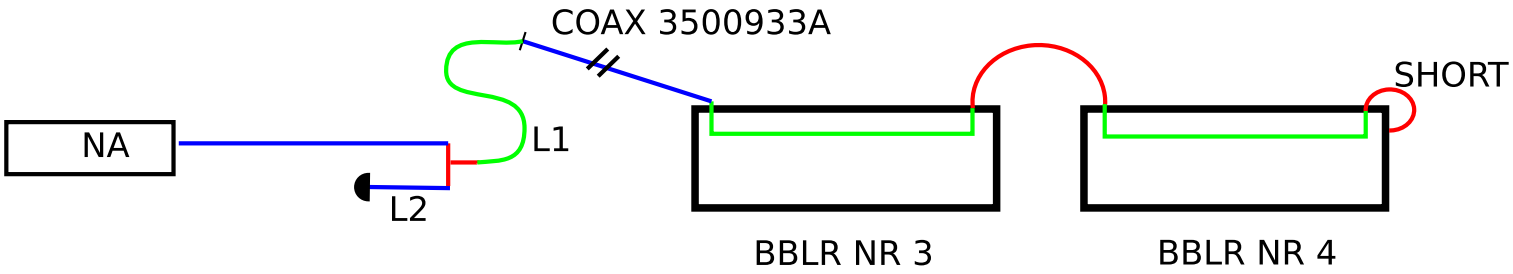
SPS BBLR

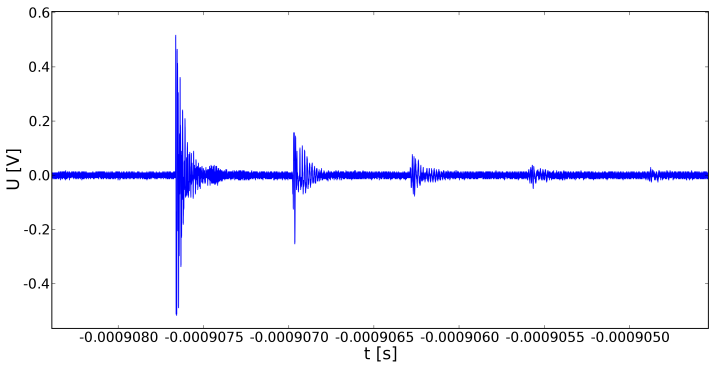

COAX 3500933A
SHORT
NA
L1
L2
BBLR NR 3
BBLR NR 4

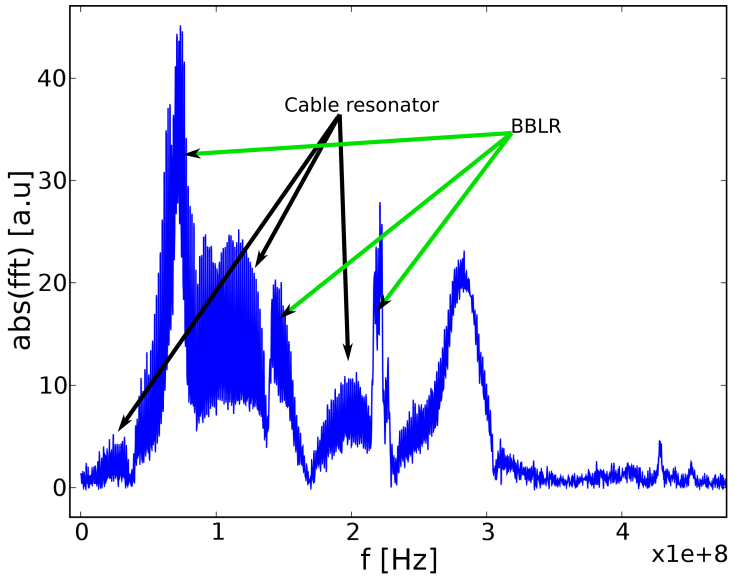

direct |S11| [dB]
+8ns |S11| [dB]
|S11| [dB]
Hz
x1e+7


PreVu
Saving to E:/bblr/tek00000.png
Save Screen Image
Save Waveform
Save Setup
Recall Waveform
Recall Setup
Assign Save to Waveform
File Utilities

SPS BBLR

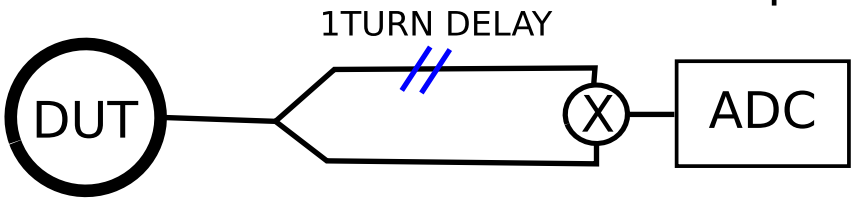

COAX 3500933A
SHORT
NA
L1
L2
BBLR NR 3
BBLR NR 4


U [V]
t [s]
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.0009080 -0.0009075 -0.0009070 -0.0009065 -0.0009060 -0.0009055 -0.0009050


Cable resonator
BBLR
abs(fft) [a.u]
f [Hz]
x1e+8
40
30
20
10
0
0
1
2
3
4

NEXT STEPS

- build Phasenoise measure setup:



  should be filtered to our needs & be extremely sensitive!
- HFSS field simulations of BBLR
- build higher power versions
- Needs budged.

OUTLINE

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Conclusions & Thanks

- Keep wire compensation in mind when designing the triplet (d-spread)
- Chromaticity issue raised at RHIC confirmed
- RF-BBLR advancing
- RHIC & SPS experiments are important: RHIC: $\tau \Uparrow\Uparrow$, SPS: allows more losses and faster repetition rate.

Thanks to:
F.Zimmermann
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The RHIC BBLR Team