FEATHER: Feedback AT High Energy Requirements

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<Contents of this presentation>

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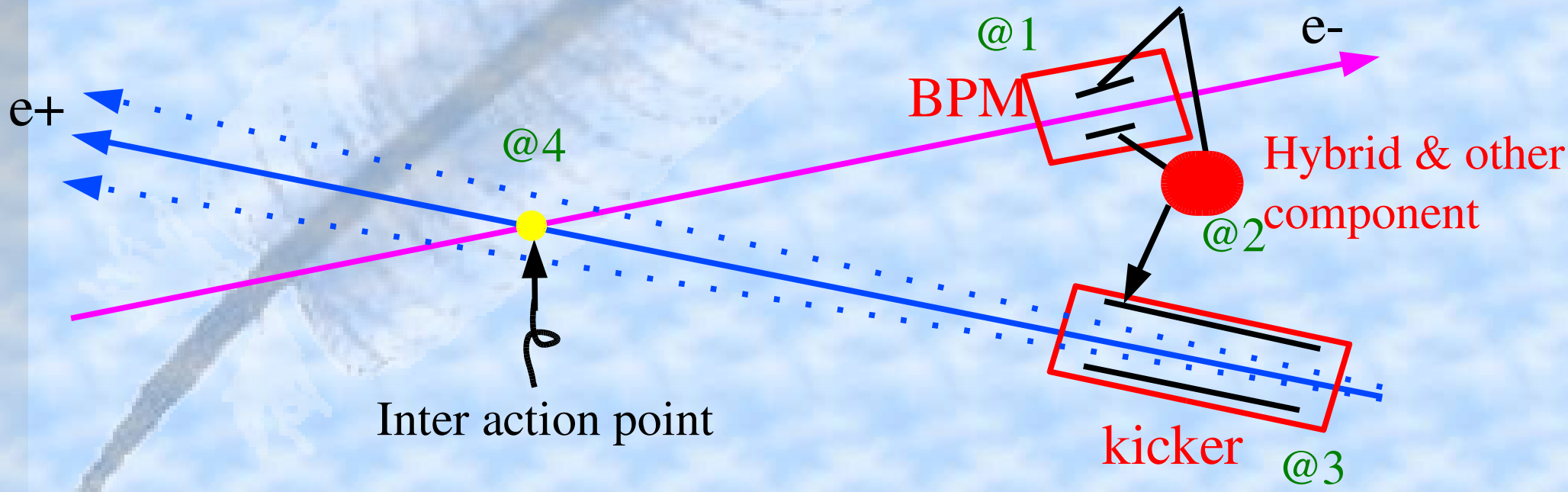
Purpose of the FEATHER

The purpose of the FEATHER is getting the high luminosity at the very high energy liner collider to use the feedback loop. We use the signal of the BPM(@1) and convert that signal (@2), put that signal into the kicker (@3). So, at first, beam go through · · · · ► , after using the FEATHER system, beam go through ——► . We can get the lower vertical offset(@4).



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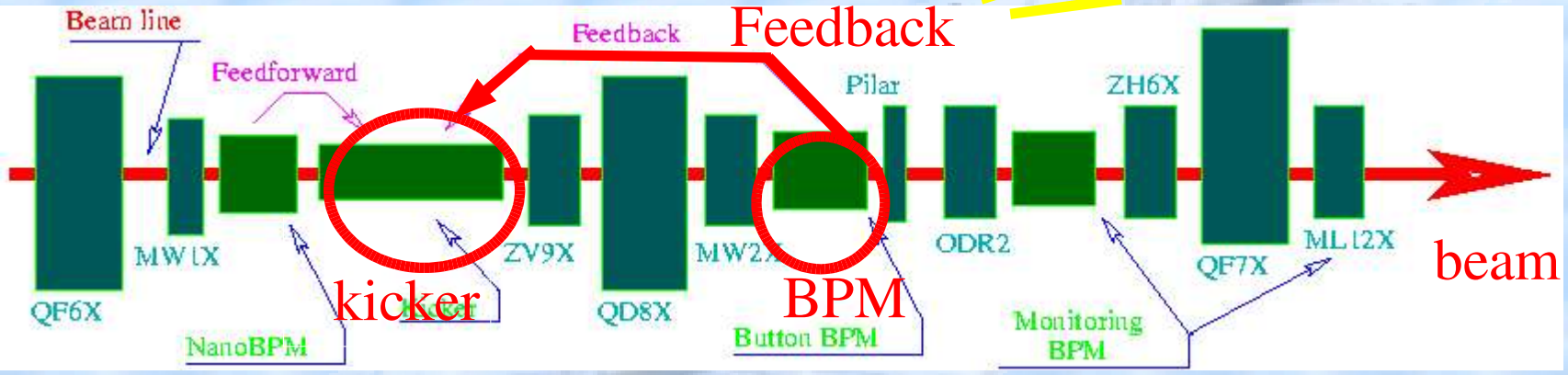
Lay out of the extraction line (ATF at KEK)



- We uses the button BPM and the stripline kicker .
- The kicker & the BPM have the movable electrodes. We can adjust both gaps. Because we want to raise the accuracy by “movable”.)
- We put the stepping motor in the kicker & the BPM, so we can do good calibration for BPM.

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Easy timing estimation

- There is ~1.5 meter between our kicker and our BPM

  So, Beam flight 5ns

  Cable delay 7.5ns
- The response time of our amplifier has been measured 5.6ns
- Various electronics delay should be less than ?ns

  (Total ~(18.1+?)ns)

ATF (at KEK):

- 20 bunches at ~2.8ns make a ~56ns train.

  So, Should be possible to test !

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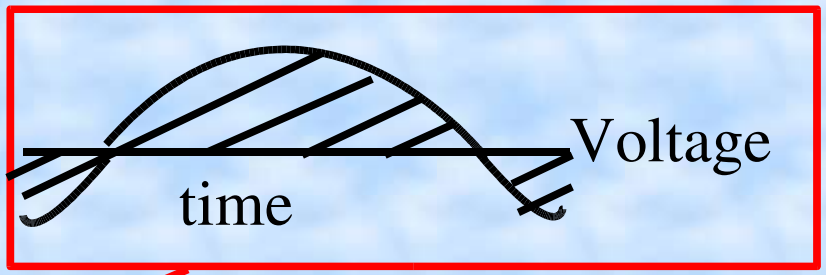
Calculation of the effect of the kick

$$kick\ effect\ of\ the\ E = \frac{(q \times V \times distance)}{(mc^2 \times gamma \times gap)}$$

$$kick\ effect\ of\ the\ B = \frac{(q \times V \times distance \times length \times u \times b)}{(2 \times pi \times mc \times gamma \times R)} \int_0^a \left(\frac{da}{(a+b)^{1.5}} \right)$$

We want to use the 357MHz pulse, if possible.
The signal voltage in the electrode of the kicker is not only positive, but also negative.
So, when we use our electrode of the kicker,



$$Total\ kick\ effect = effect\ of\ the\ (E+B) \times 0.67$$

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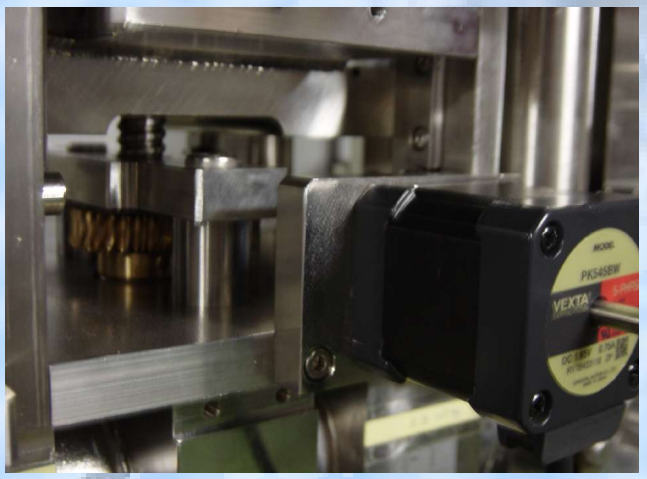
The new kicker & the new BPM

kicker



Motor (for moving the electrodes)

BPM

gauge(for finding the electrode)

We want to adjust the position of the electrodes. Accuracy is 10 um for kicker &1um for BPM because of the estimation. So we introduced the stepping motor & the gauge.

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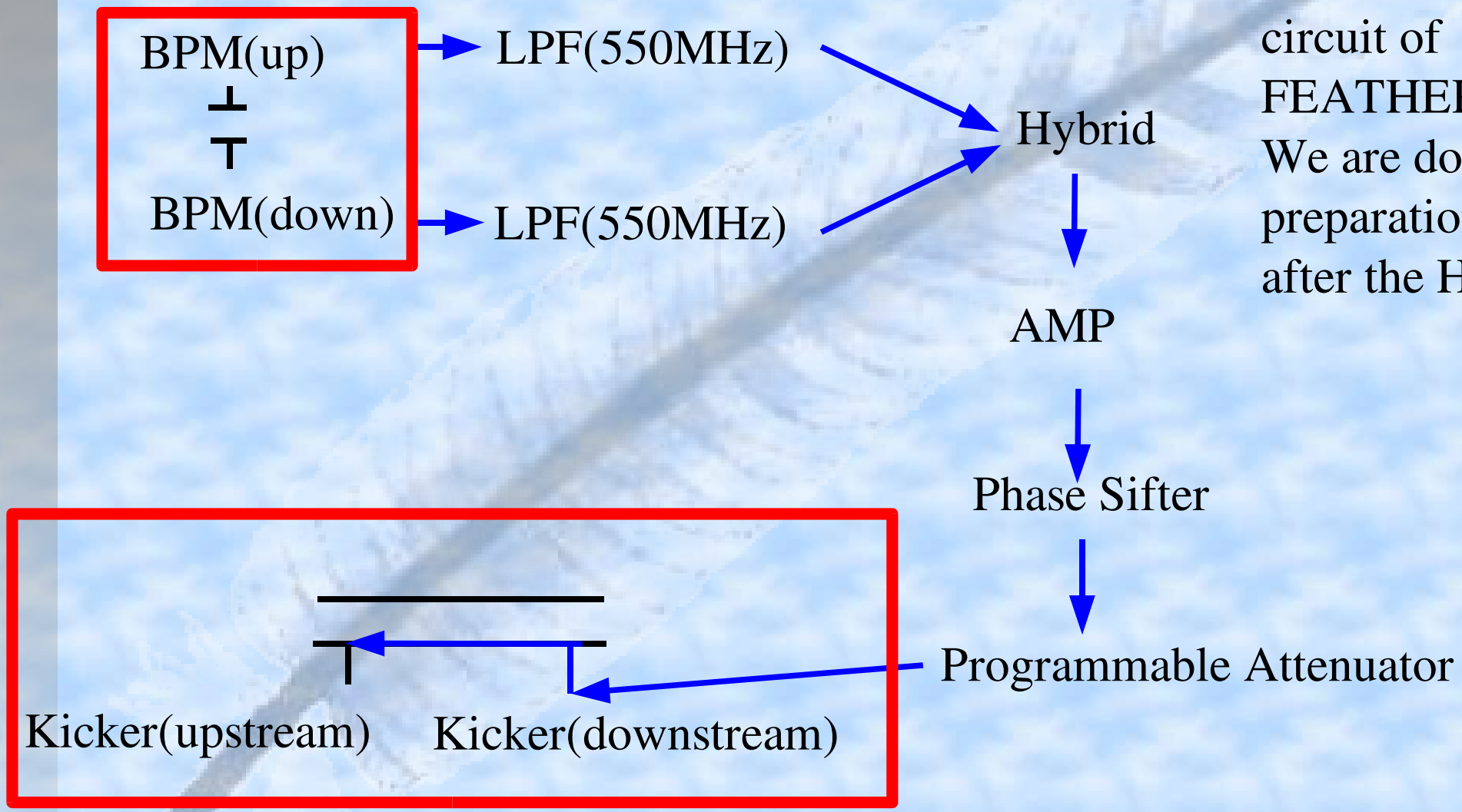
Electrical circuit



This is electrical circuit of FEATHER.
We are doing the preparation about after the Hybrid.

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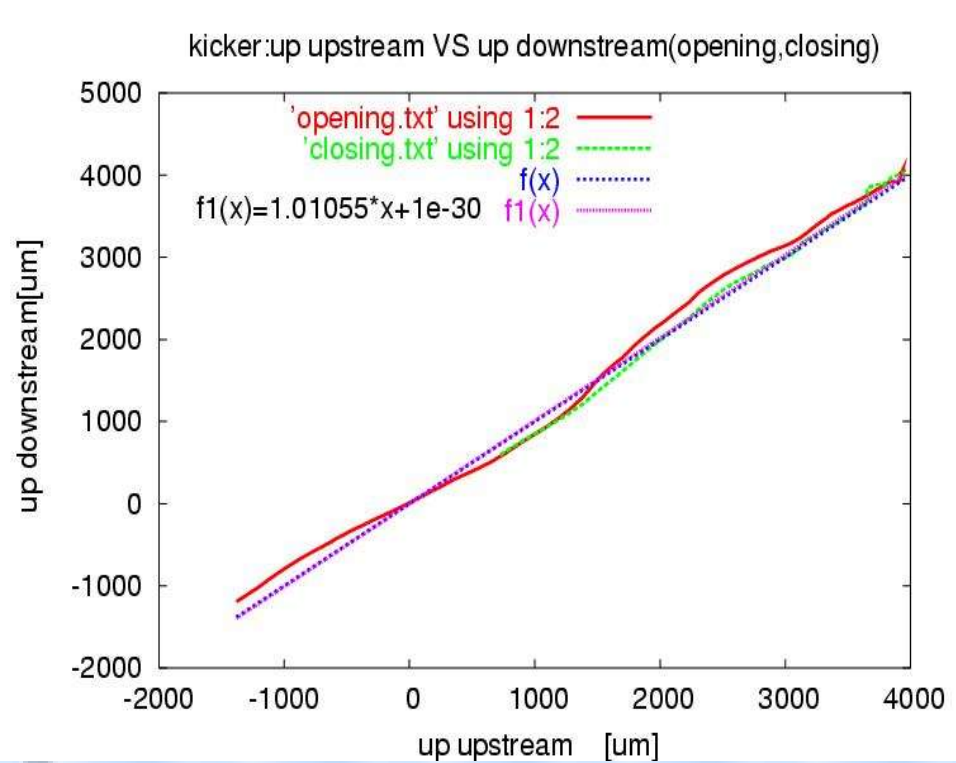
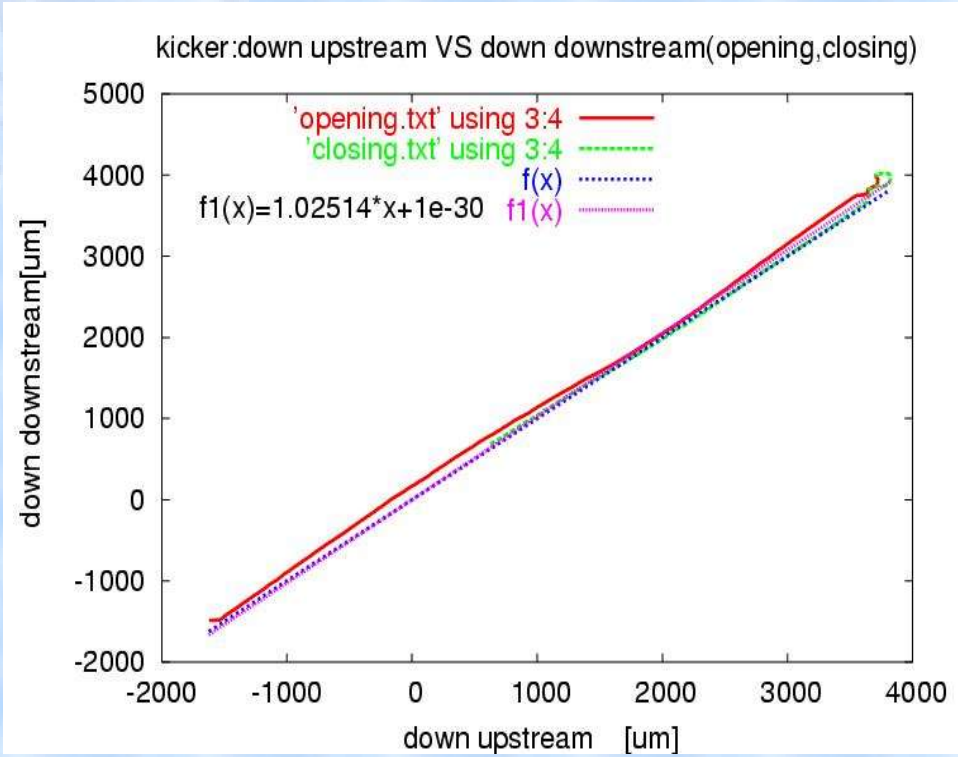
The position accuracy of the kicker & the BPM

	Goal	gauge	diff. upstream from downstream
Kicker :	10um	2um	~~100um <- don't need to think~~
BPM :	1 um	1um	





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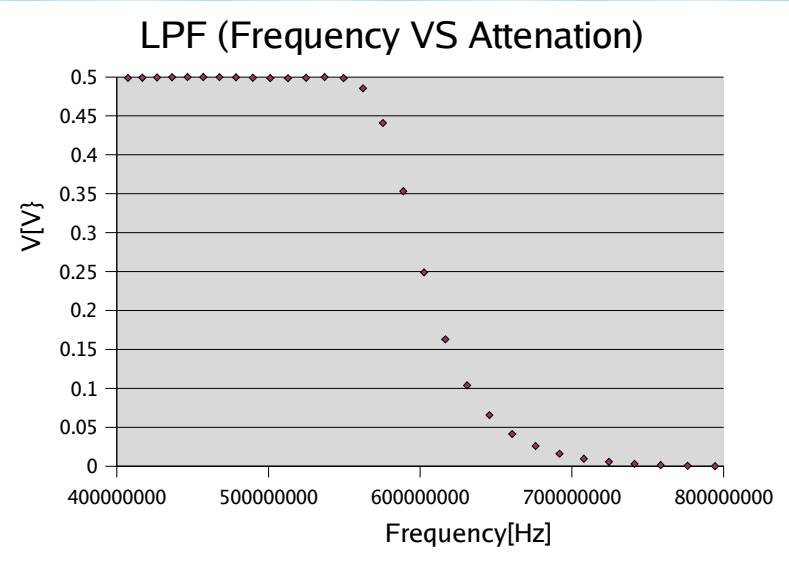
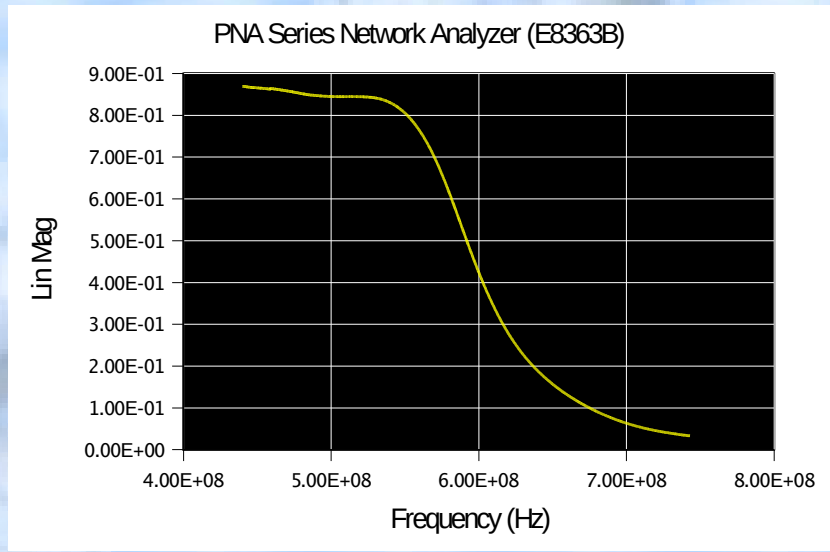
The LPF performance





Simulation (spice)

Measurement
(network analyzer)

For simulation, I used the model of chevishef-type LPF and I compare with our LPF (at 550MHz).
So, we can calculate the signal shapes with spice program after the circuit of this components.

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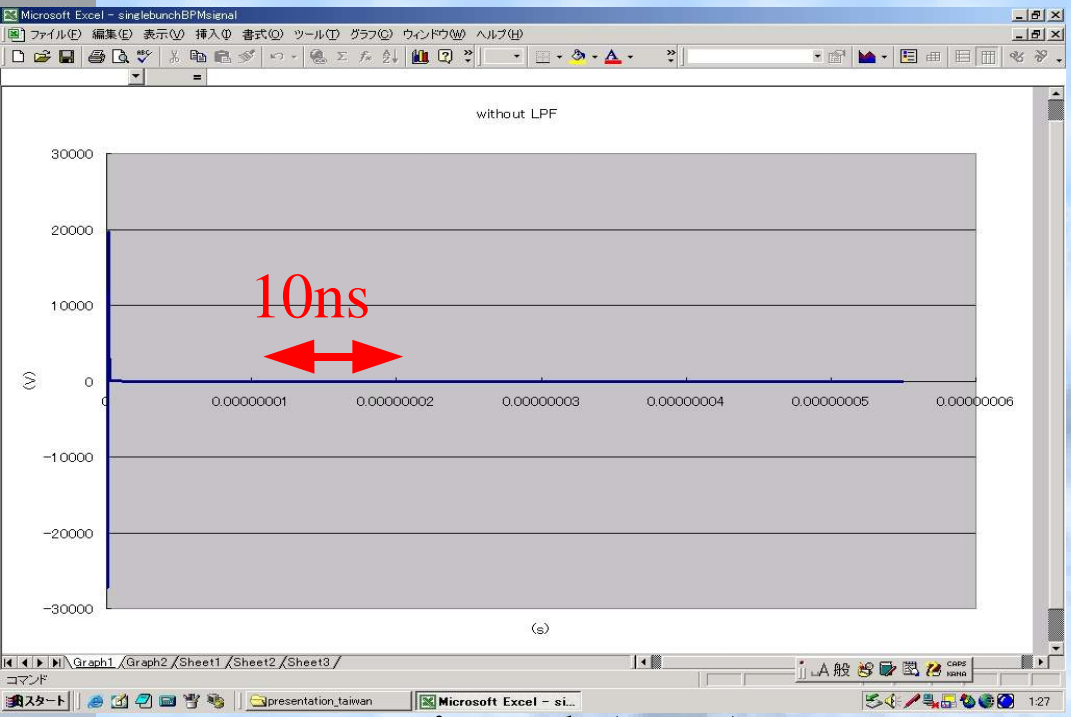
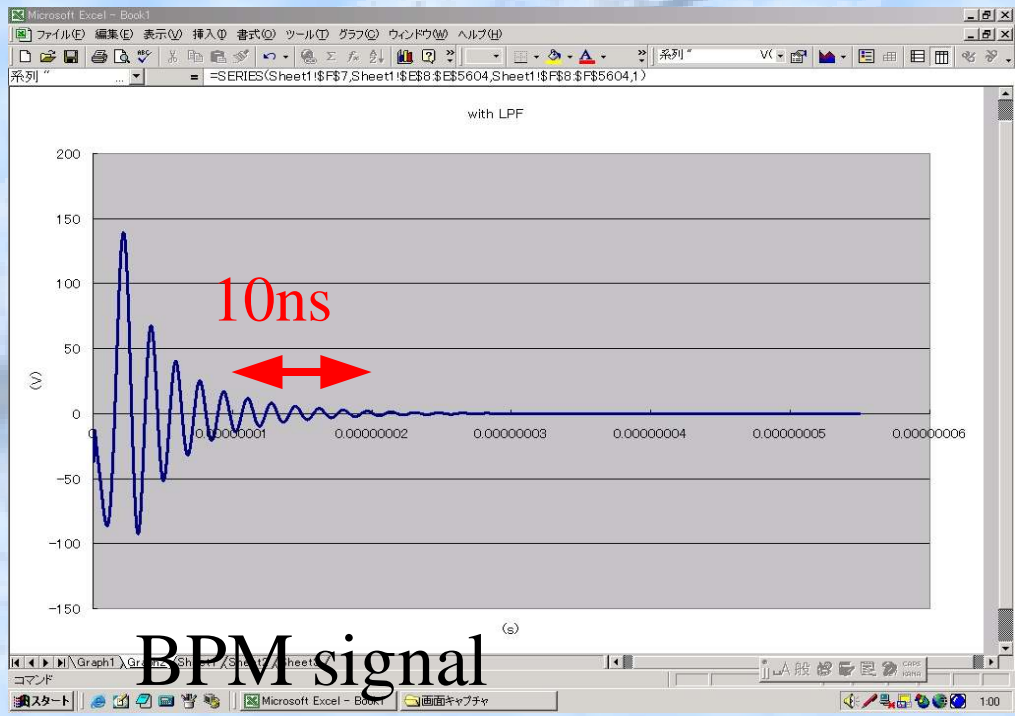
Single-bunch BPM signal (simulation)



BPM signal (raw)



BPM signal (after the LPF (550MHz))

This is the consequence of the “SPICE” simulation. One is the raw signal, the other is the signal after the LPF.

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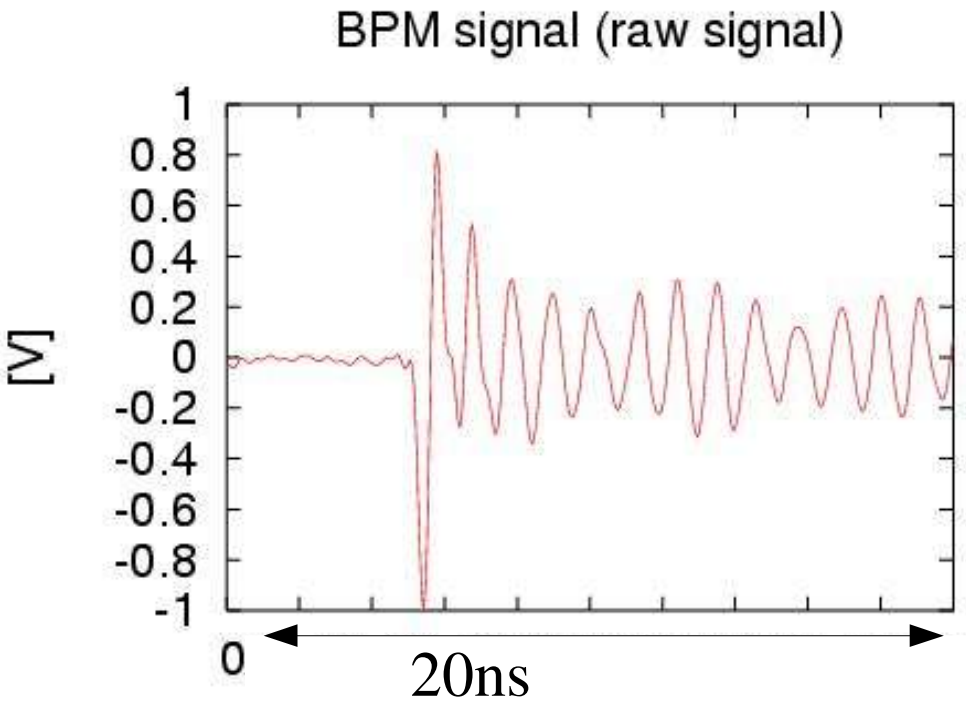
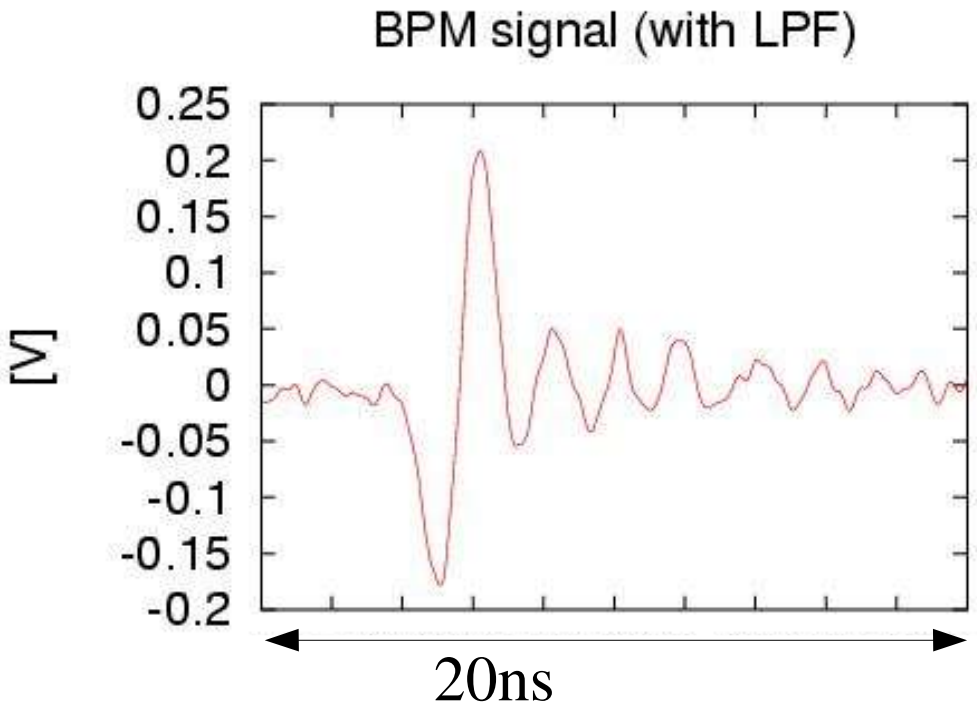
Single-bunch BPM signal (experiment)





Maybe, in case of with LPF, the signal is like the simulation.
But ,in case of raw signal, the signal is not like the simulation.
Maybe, raw signal is very fast, so we can't use easily.

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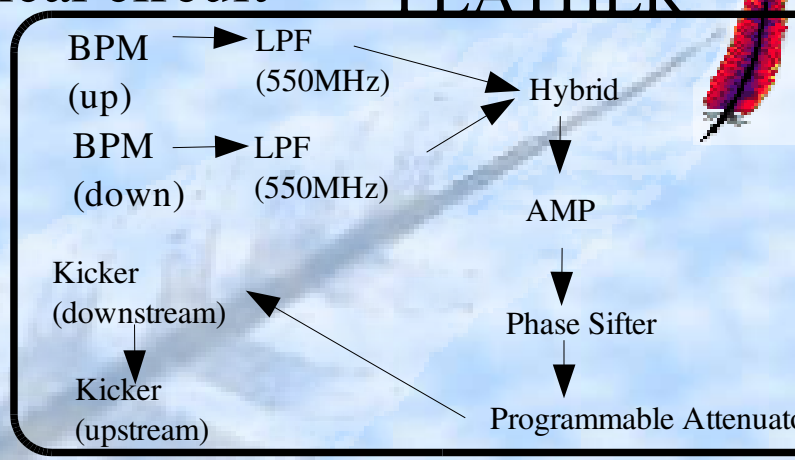

Schedule

- Calibration of the BPM.
- Test of the hybrid .
- Calibration of the BPM using the hybrid.
- Calibration of the BPM using the hybrid and AMP.
- Kick the signal from signal generator and see the kick effect by the BPM.
- Kick the signal from the BPM and see the kick effect by the BPM.
- Kick the signal from the BPM and see the kick effect by the BPM with movable phase shifter.
- Control with the force of the kick using the programmable attenuator.

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Presentation have been finished.

Please give us many advices and a few questions (with very slow speaking)!

I like Taiwan, because the people is very kind and food is very good taste and so on. So I want to come again in my private time! 謝謝！

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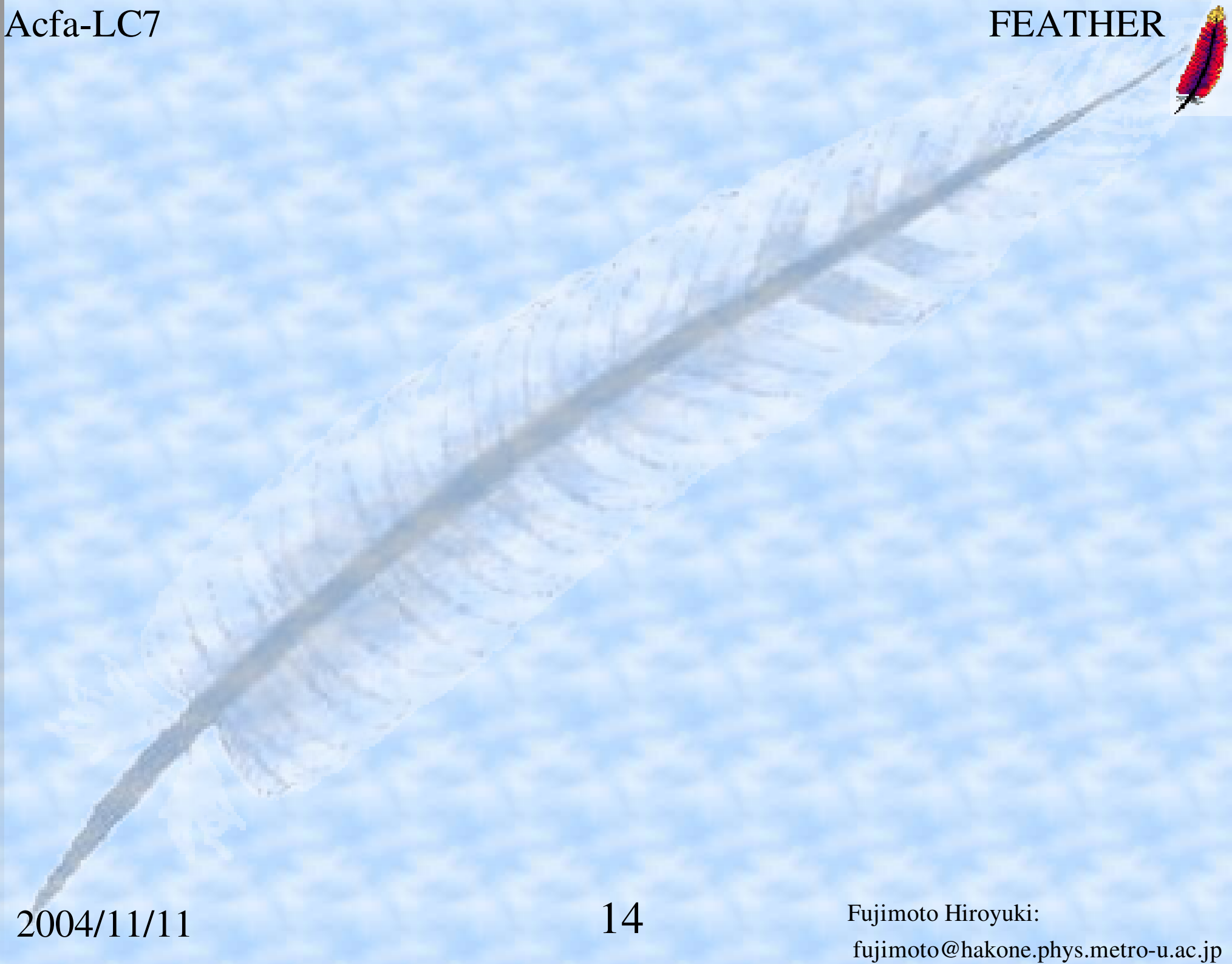

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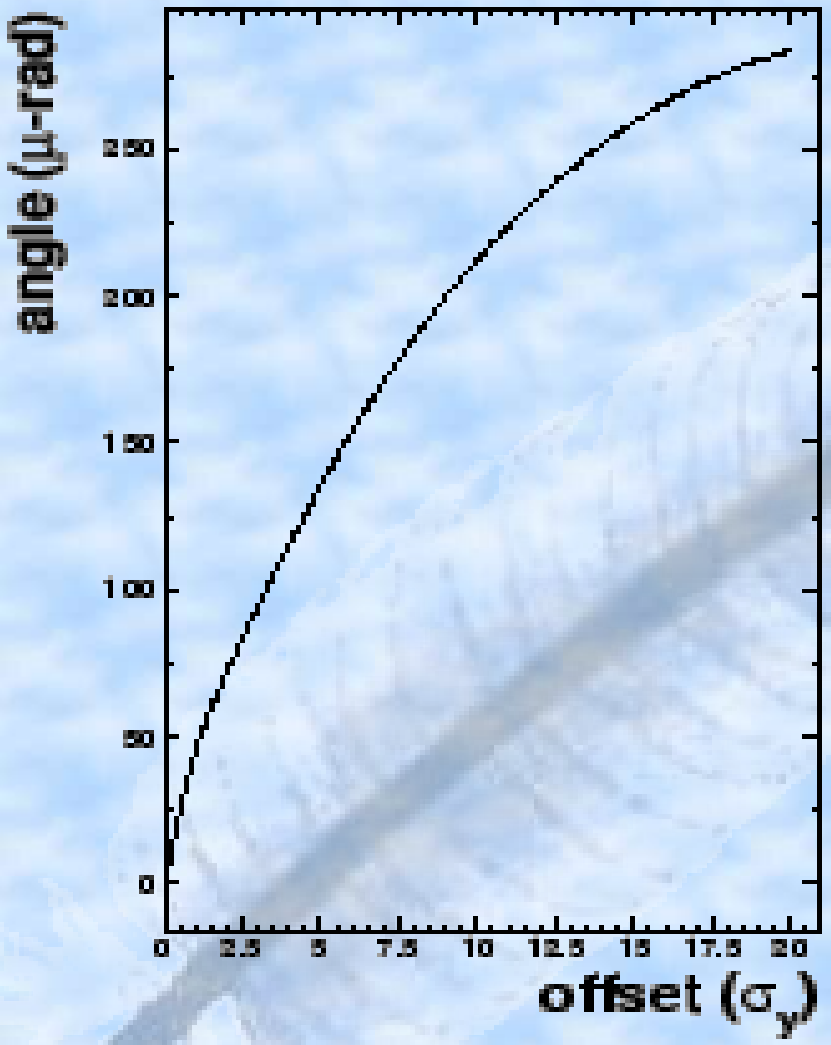

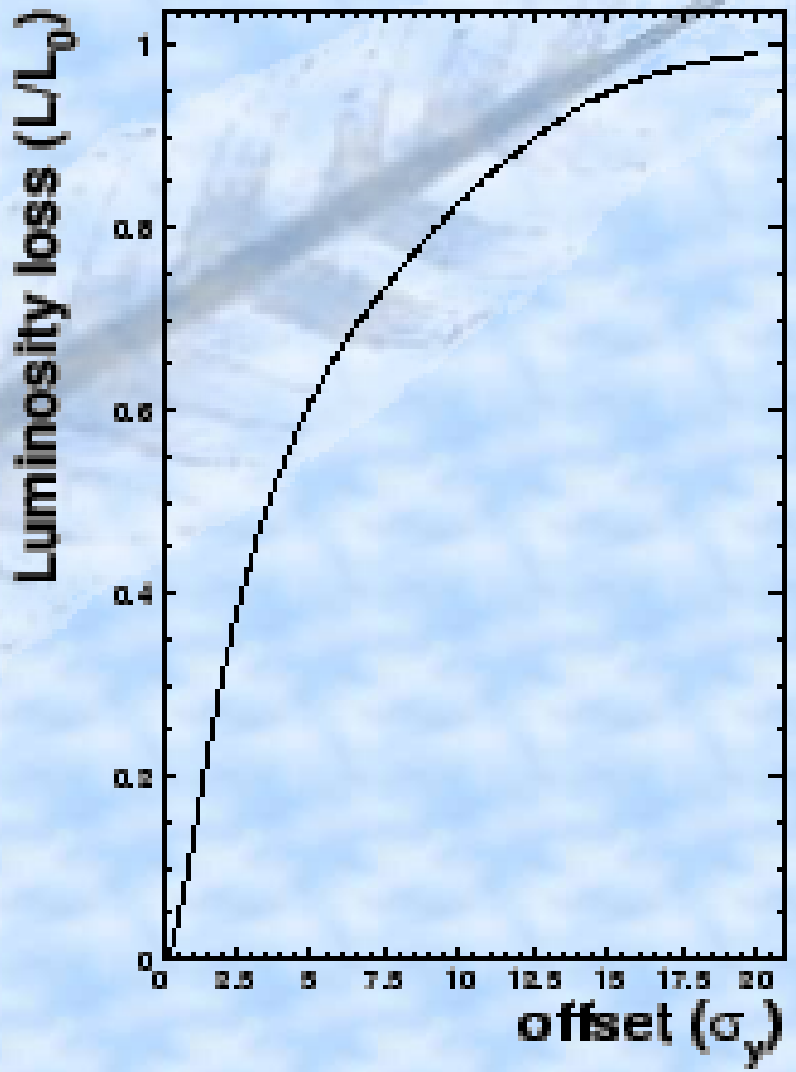

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