UNIVERSITAT DE BARCELONA

Institut de Ciències del Cosmos

TB 2012: Signal Shape and ICECAL

Upgrade of the front end electronics of the LHCb calorimeter

E. Picatoste

Universitat de Barcelona

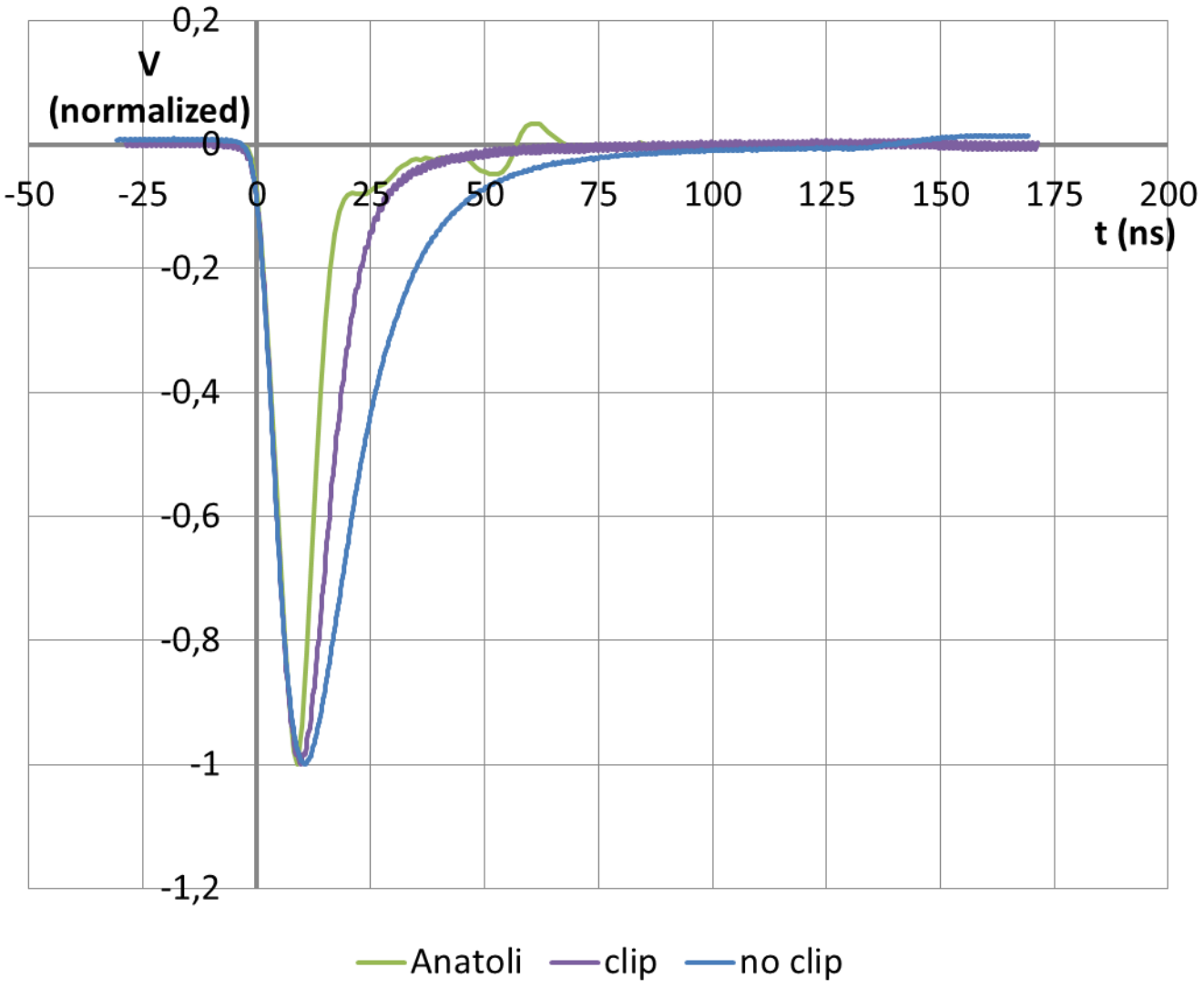
Institut de Ciències del Cosmos ICC-UB

Calo Upgrade Test Beam Data Analysis Meeting – December 3rd 2012

Outline

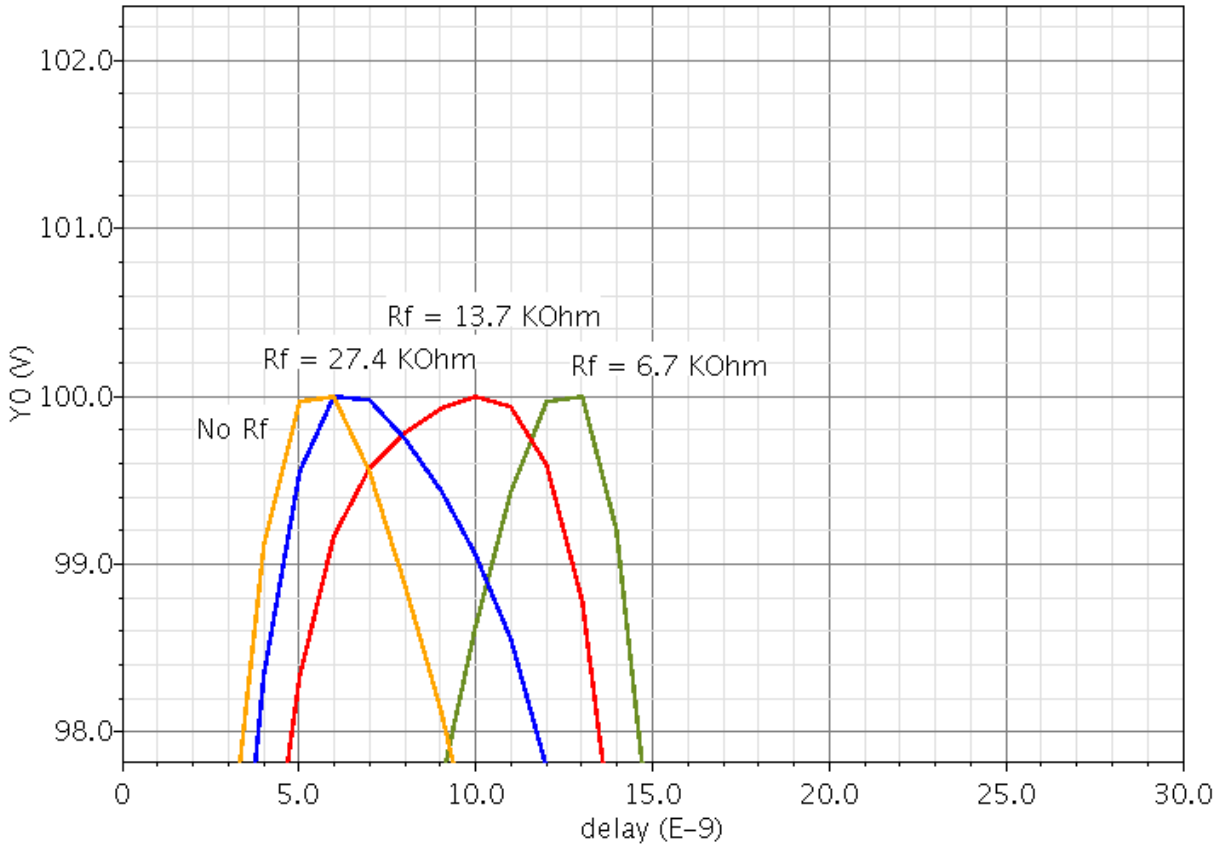
I. Signal Shapes
II. ICECAL integrator simulations
III. Pole-zero filtering

Signal Shapes



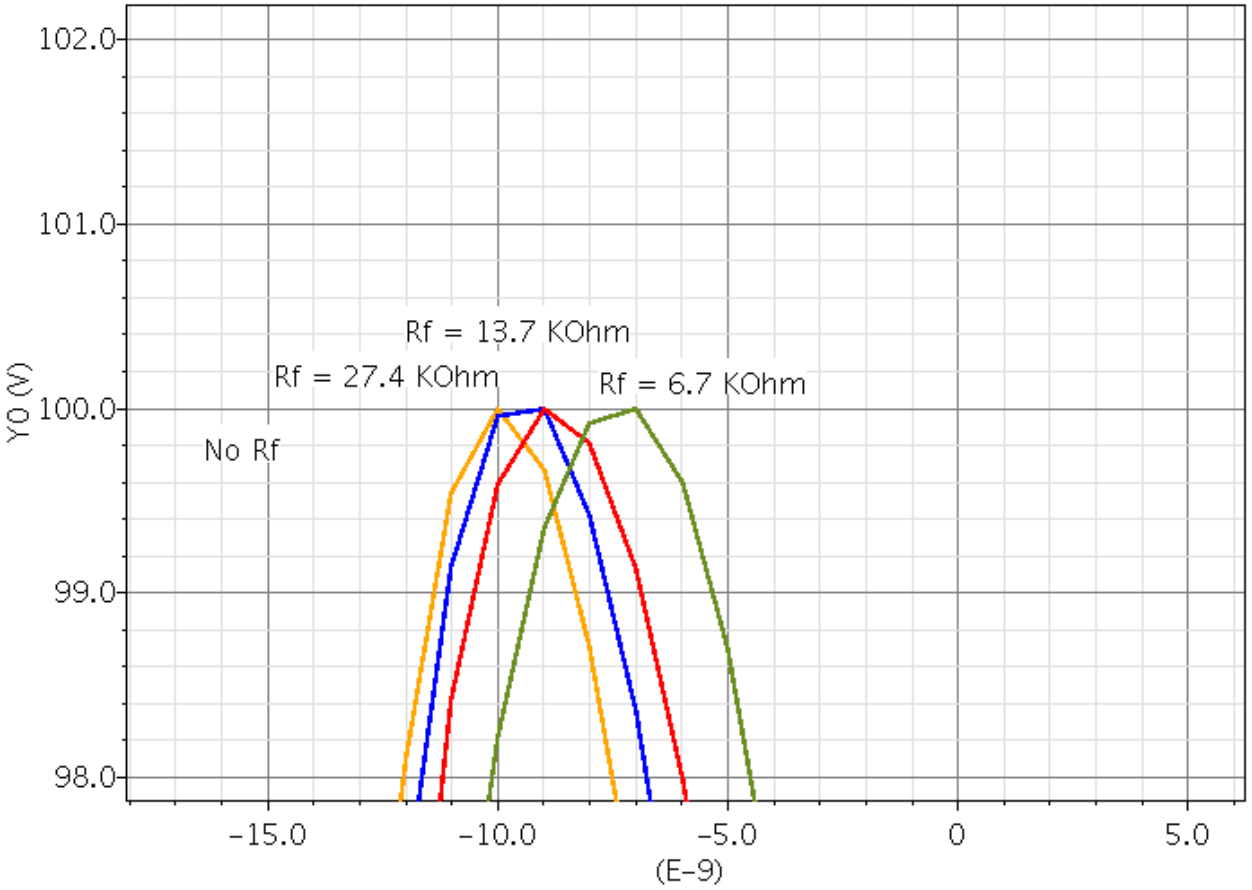
Simulations: Plateau

- Plateau for different Rf:
  - ASIC Rf=13.7 KOhm
- Use Anatoli's wave form
- Scan different phases



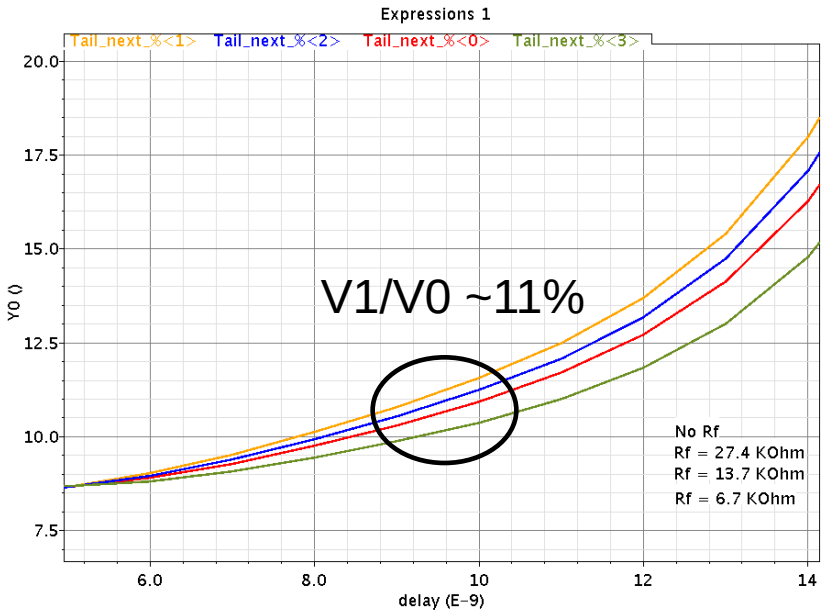
Simulations: Plateau

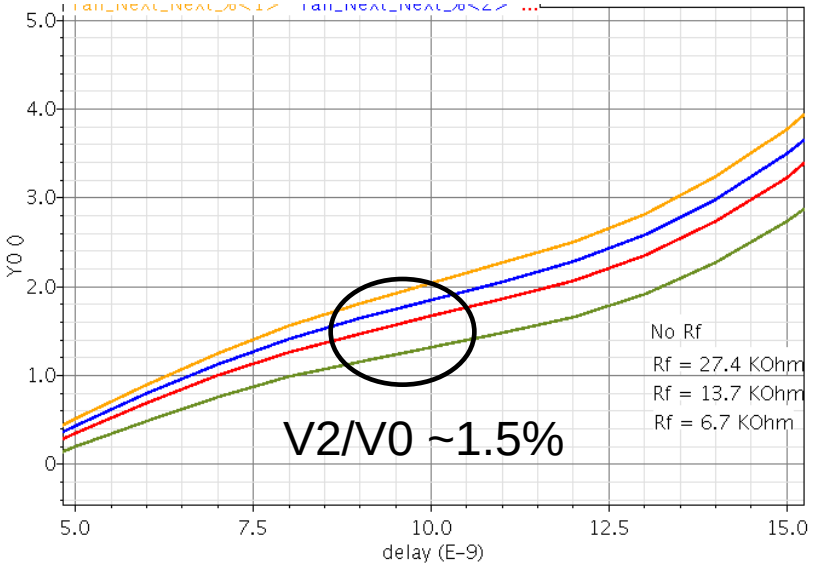
- Plateau for different Rf:
  - Lower Rf offer better plateau
  - Always less than 4ns
- Use TB2012 clipped shape
- Scan different phases



Simulations: Tail Effect

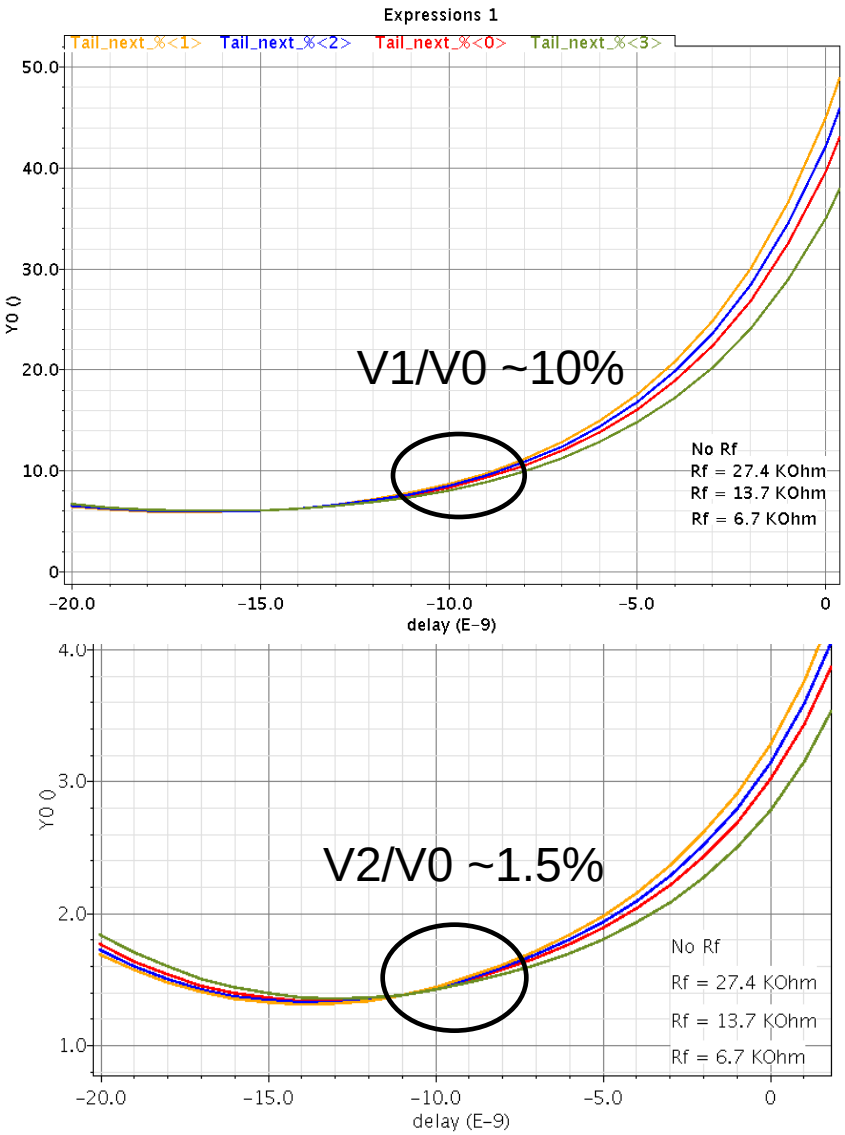
- Anatoli's shape
- Same data from the plateau test
- Optimal phase ~10ns
- Study the following output values after the main signal (V0):
  - V1/V0 ~11%
  - V2/V0 ~1.5%



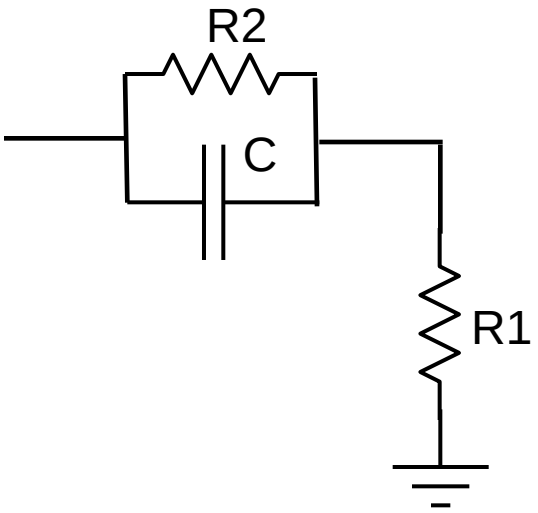


Simulations: Tail Effect

- TB2012 clipped shape
- Same data from the plateau test
- Optimal phase ~-9ns
- Study the following output values after the main signal (V0):
  - V1/V0 ~10%
  - V2/V0 ~1.5%



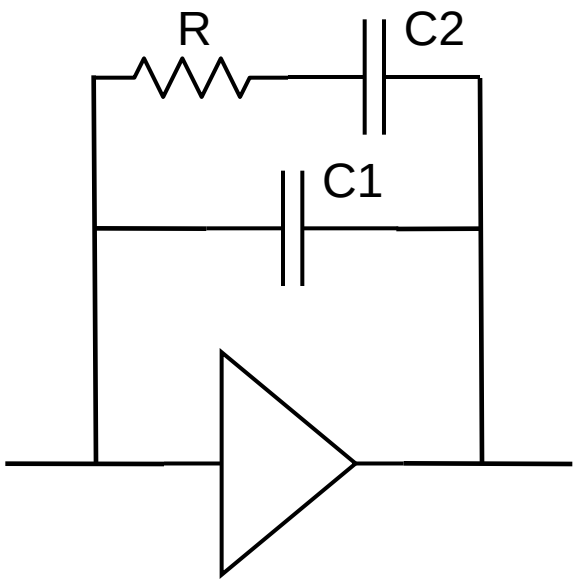
Pole-Zero Compensation



- The effect of the tail of the signal can be reduced with a pole-zero filter

$$\frac{Vo}{Vi} = \frac{R1}{R1+R2}\,\frac{1+R2Cs}{1+(R1||R2)Cs}$$

Integrator Pole-Zero Compensation



- The effect of the tail of the signal can be reduced with a pole-zero filter
- Adapt the idea to the integrator

$$\frac{Vo}{Ii} = \frac{1}{(C1+C2)s}\,\frac{1+RC2s}{1+R(C1||C2)s}$$

- To be studied in simulations.

FPGA Correction

- FPGA correction in two steps:
  - Pedestal subtraction: minimum of the 2 previous samples of the same subchannel.
  - Cable correction subtraction

- Cable correction subtraction proposal with shift registers and adders to be studied (~binary weighted coding)