

Radiation Monitor: Concepts for an Advanced Read Out

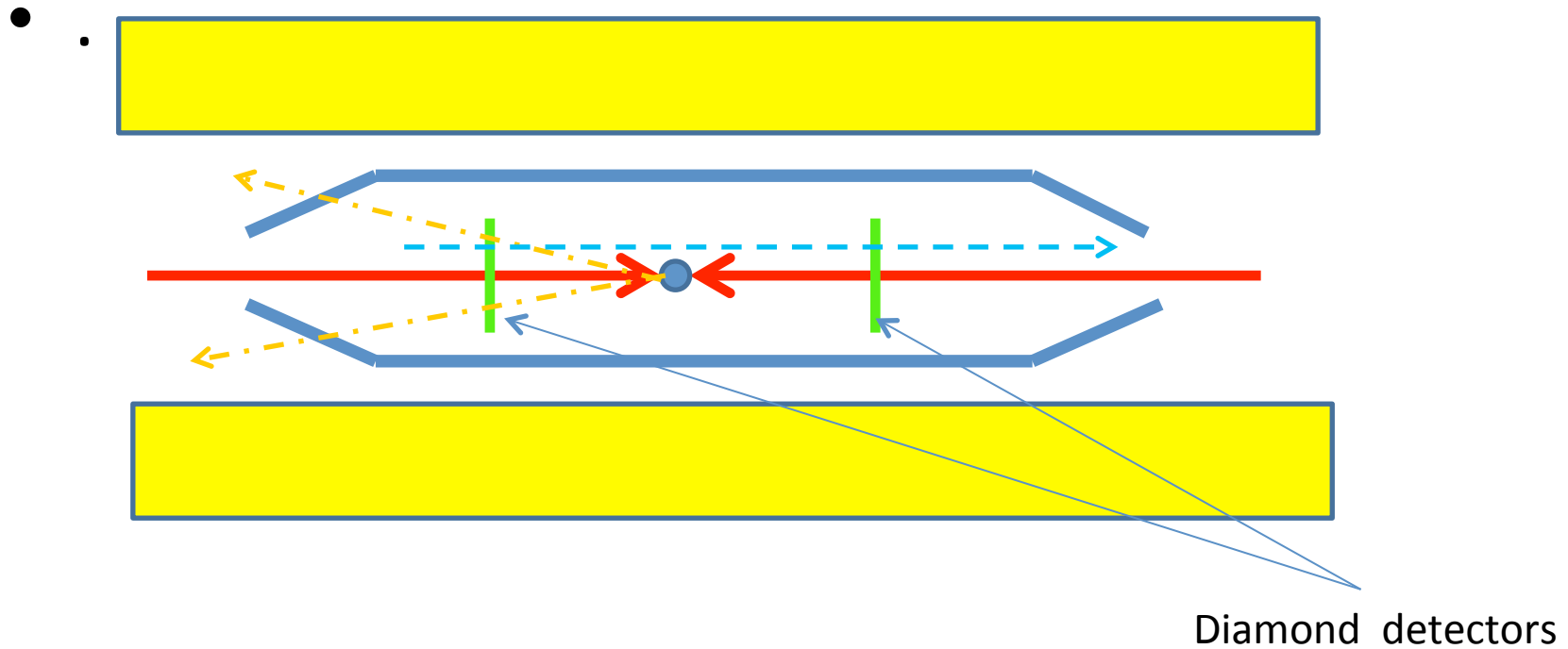
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2nd Super-B Collaboration meeting 13/11/2011

Frascati

Radiation Monitor

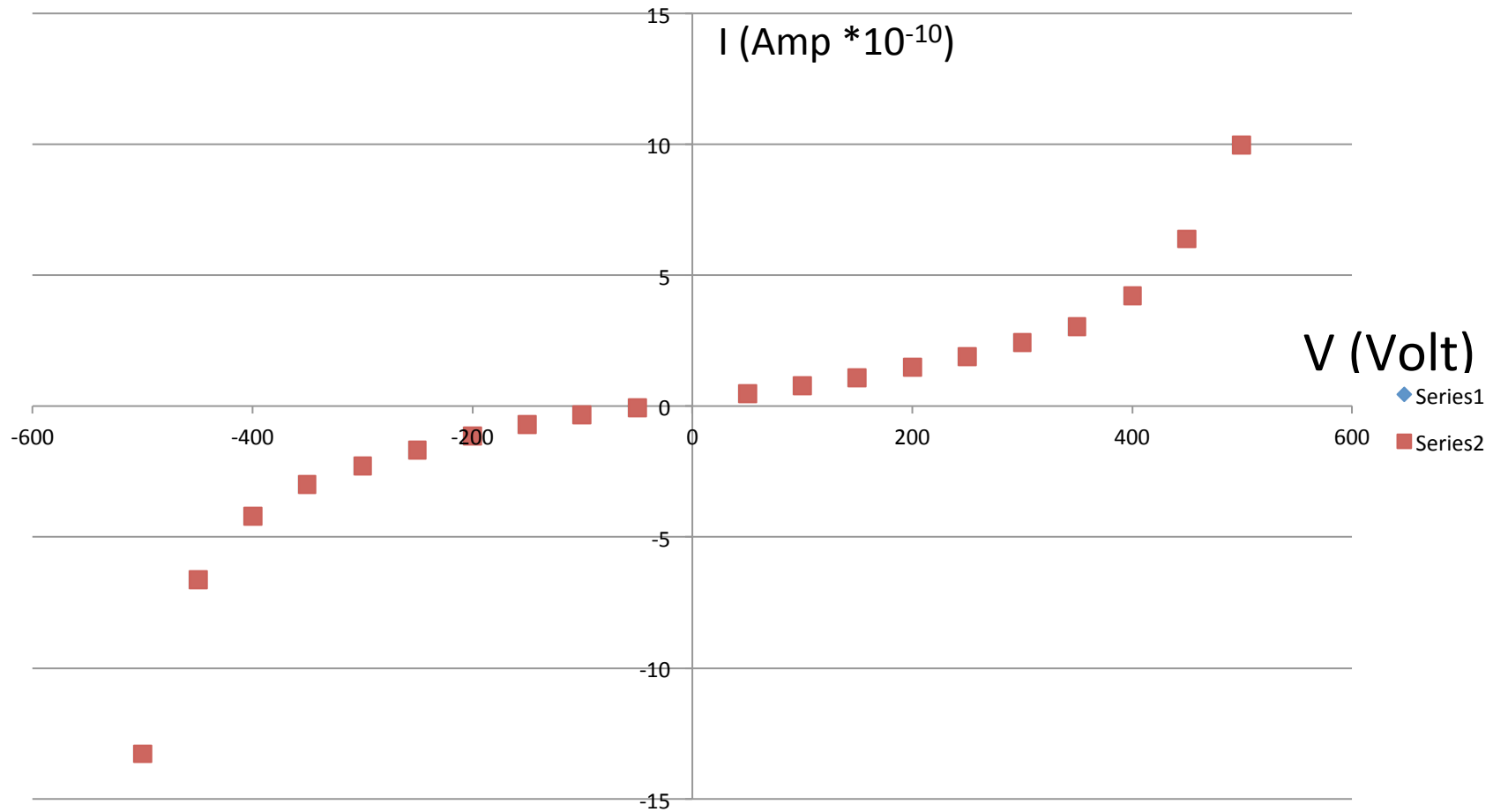


Idea: time of flight measurements to distinguish collisions events from background

Diamond detector under tests

- Mono crystal diamond
- thickness 0,5 mm
- Area 4 x 4 mm²
- HV 400 Volt

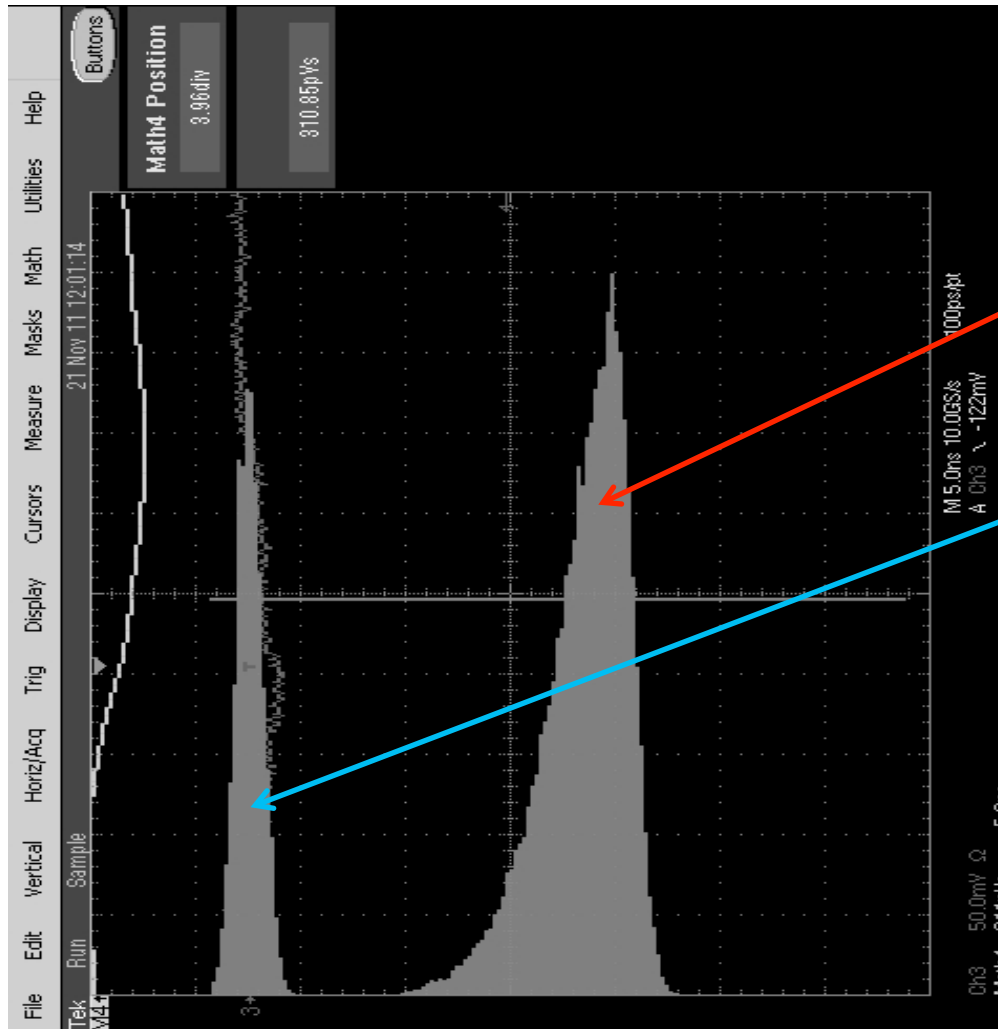
Current vs HV (sCVD- diamond detector)



Two stage ac amplifier, AC, (BJT Si BFQ67)

- Voltage supply 5 Volt
- Sensitivity 6 mV/fC
- noise 4000 e⁻ RMS
- Input impedance 50 Ohm
- B.W. 30 MHz
- Power consumption 10 mW/ch
- Low cost 2 – 3 eur./ch

Alfa Americium – 241



Alfa Americium-241

Noise

BJT Si v.s. SiGe

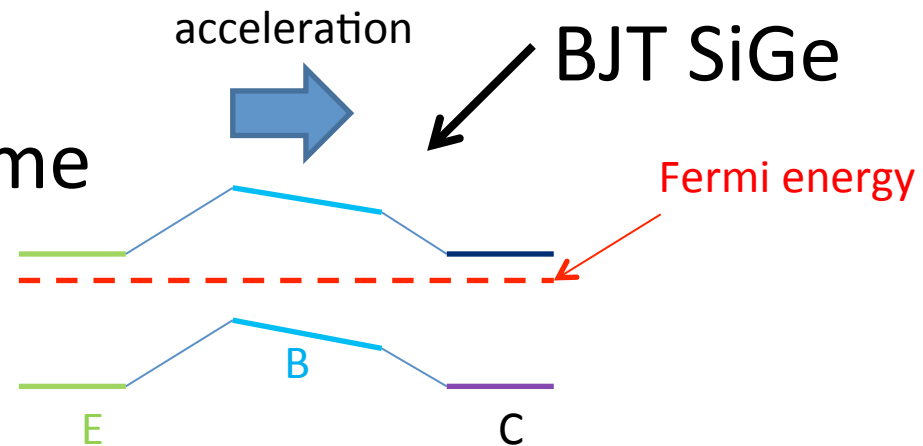
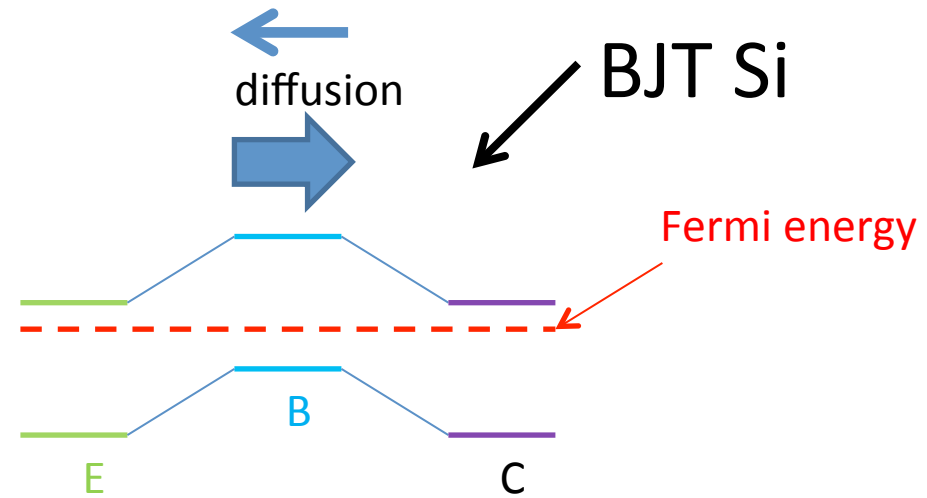
BJT performances

- $\beta = \tau_c / \tau_t$
- $f_t = 1 / \tau_t$
- $N = K * \tau_t$

τ_c = base life time

τ_t = base transient time

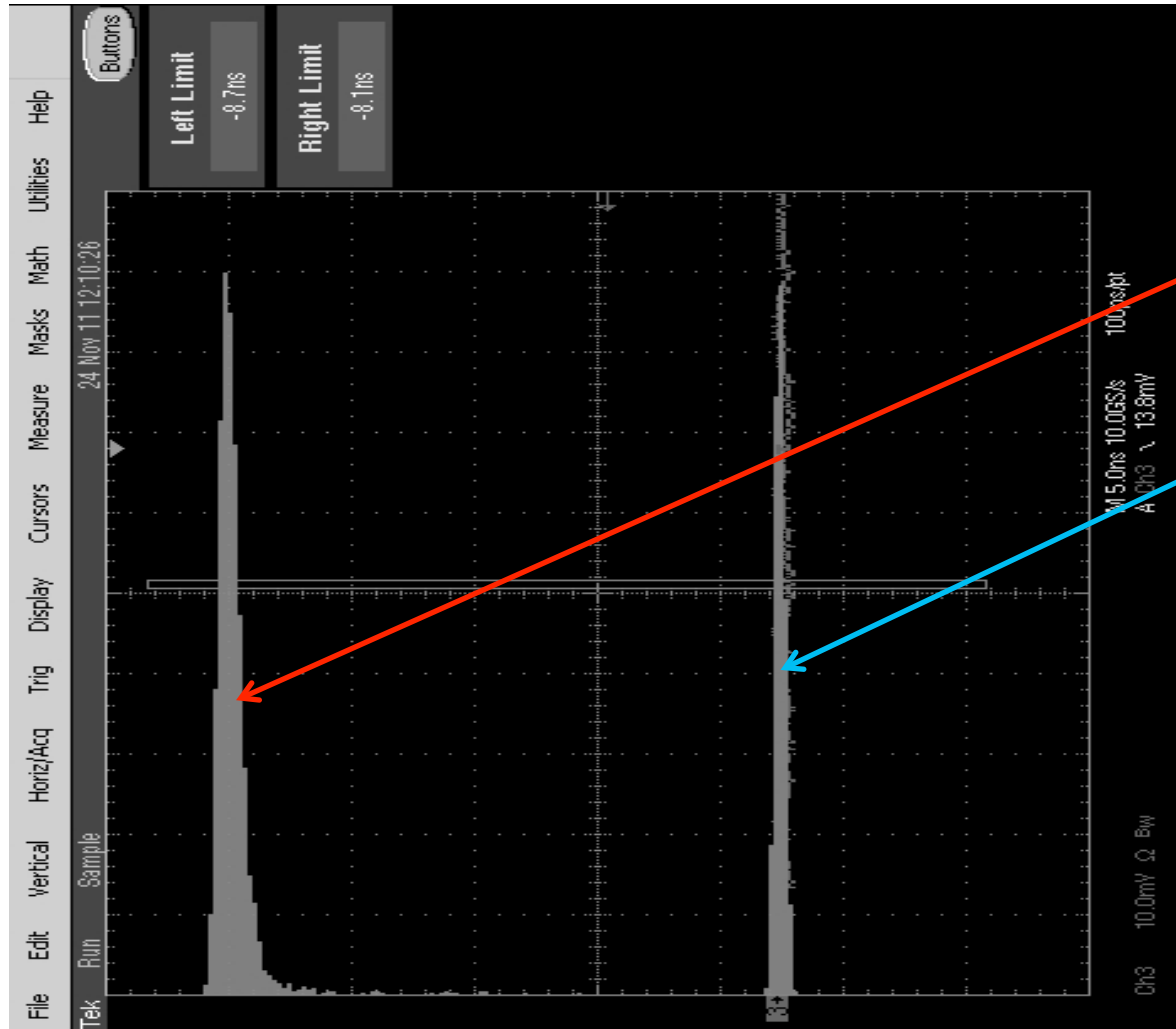
τ_t (Si) \gg τ_t (SiGe)



Amplifier, AC, (BJT SiGe, BFP650)

- Voltage supply 5 Volt
- Sensitivity 6 mV/fC
- noise 1000 e⁻ RMS
- Input impedance 50 Ohm
- B.W. 30 MHz
- Power consumption 10 mW/ch
- Low cost 2 – 3 eur./ch
- Radiation hardness 50 Mrad, 10¹⁵ n cm⁻²

Alfa Americium – 241



Alfa Americium-241

noise

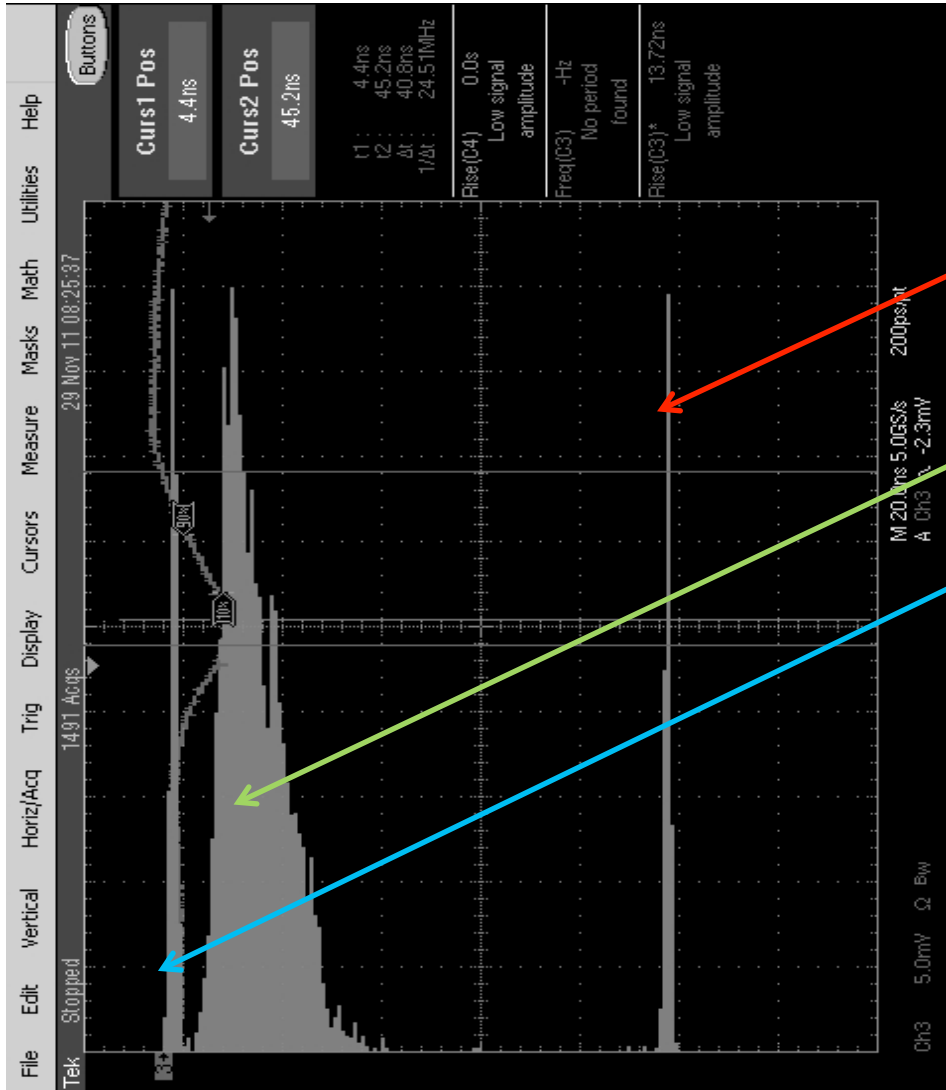
Signal minimum ionization particle



Amplifier, AC, (BJT SiGe, BFP740)

- Voltage supply 5 Volt
- Sensitivity 6 mV/fC
- noise 500 e⁻ RMS
- Input impedance 50 Ohm
- B.W. 30 MHz
- Power consumption 10 mW/ch
- Low cost 2 – 3 eur./ch
- Radiation hardness 50 Mrad, 10¹⁵ n cm⁻²

Americium-241 + Sr-90

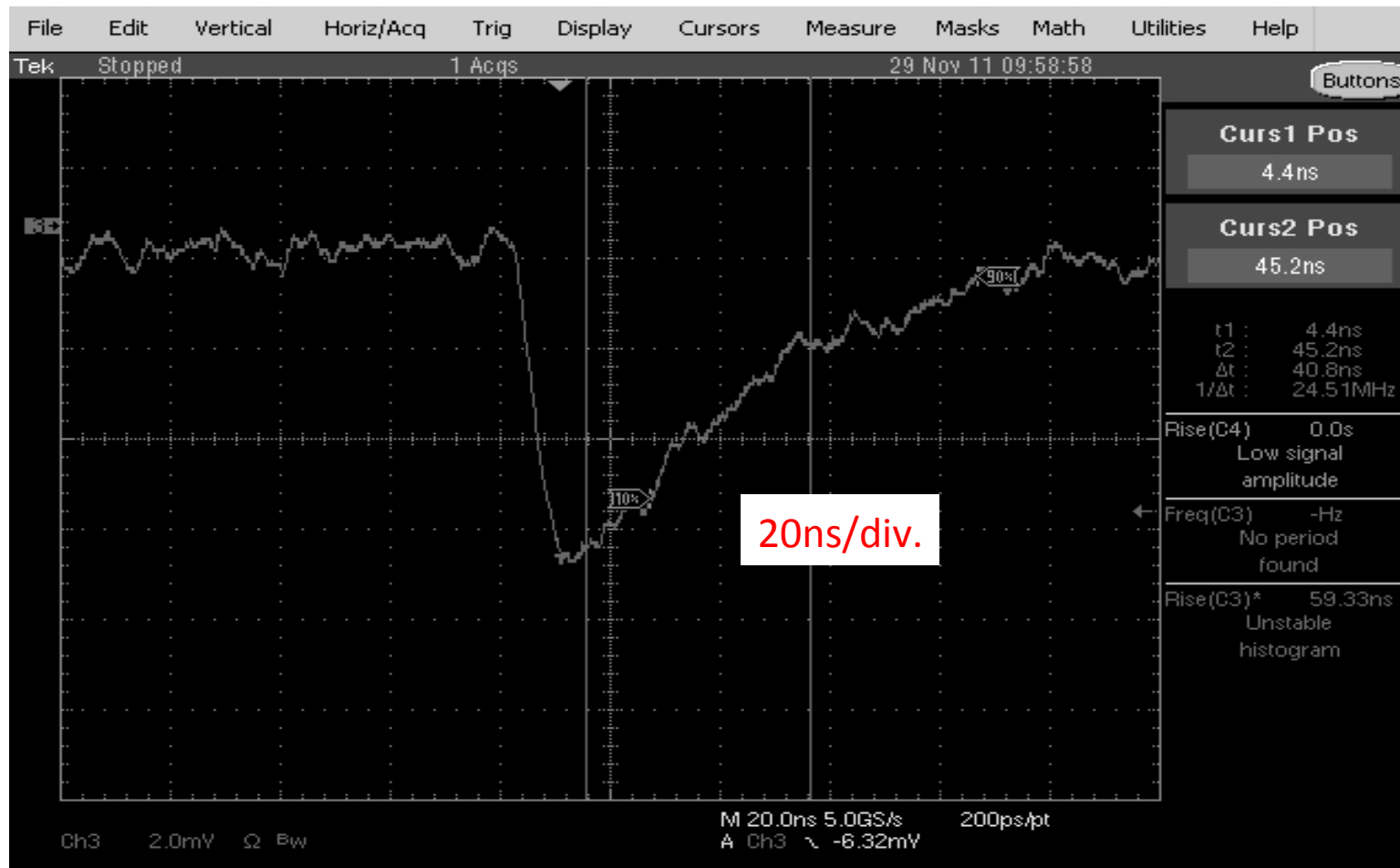


Am-241

Sr-90

noise

Signal minimum ionization particle



20ns/div.

Conclusions

- Next steps
 - Compare results with a pCVD sensors
 - Test at BTF (time allocated in January)
 - Geant4 MC simulation to study the best geometry of the system and the expected background

Noise distribution

