



BTOF Hit Rate Analysis

RecHit Analysis

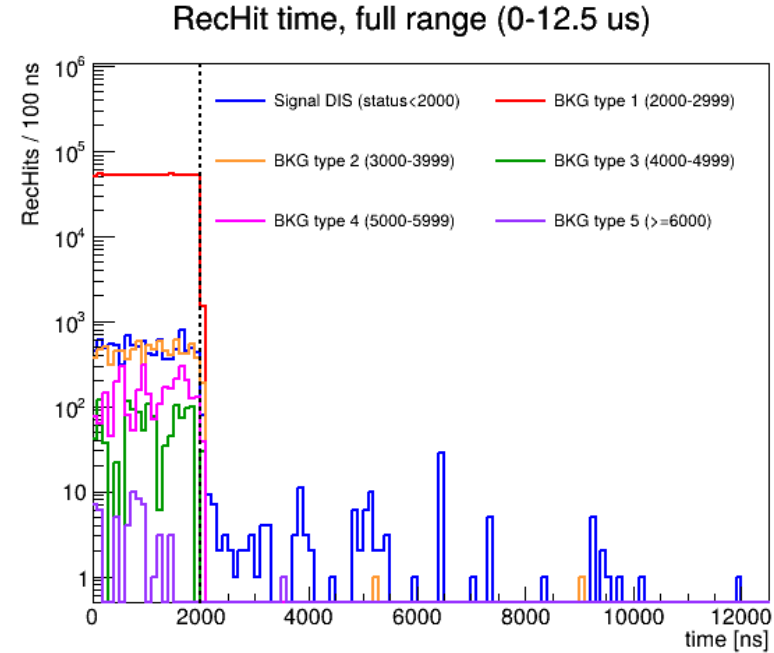
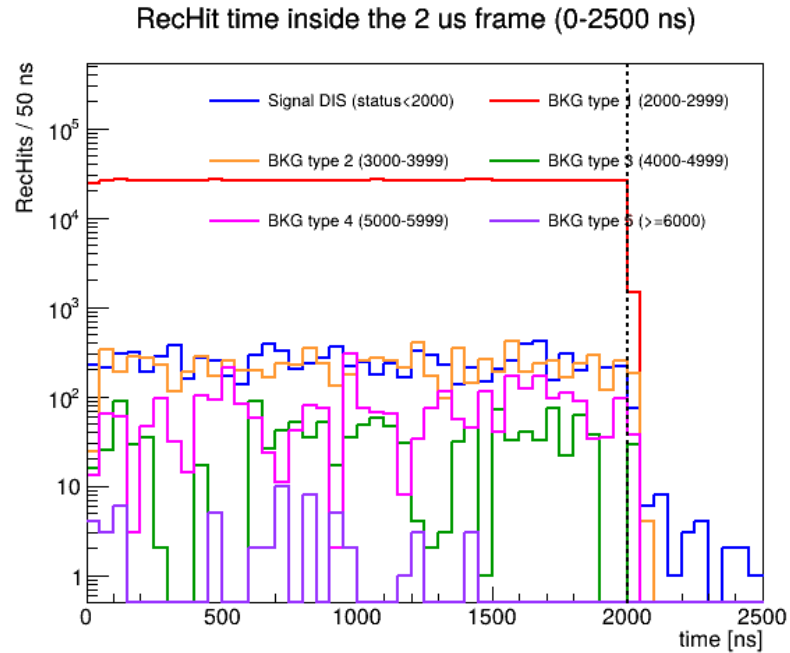
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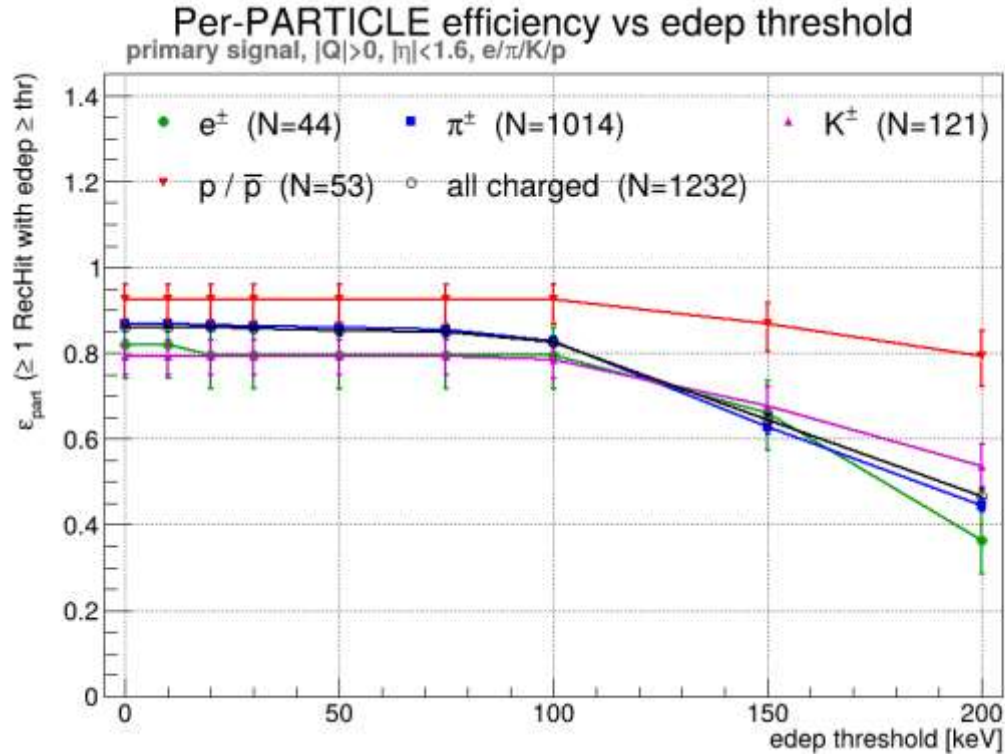
University Mohammed First in Oujda, Faculty of Sciences

Results — RecHit Time Structure

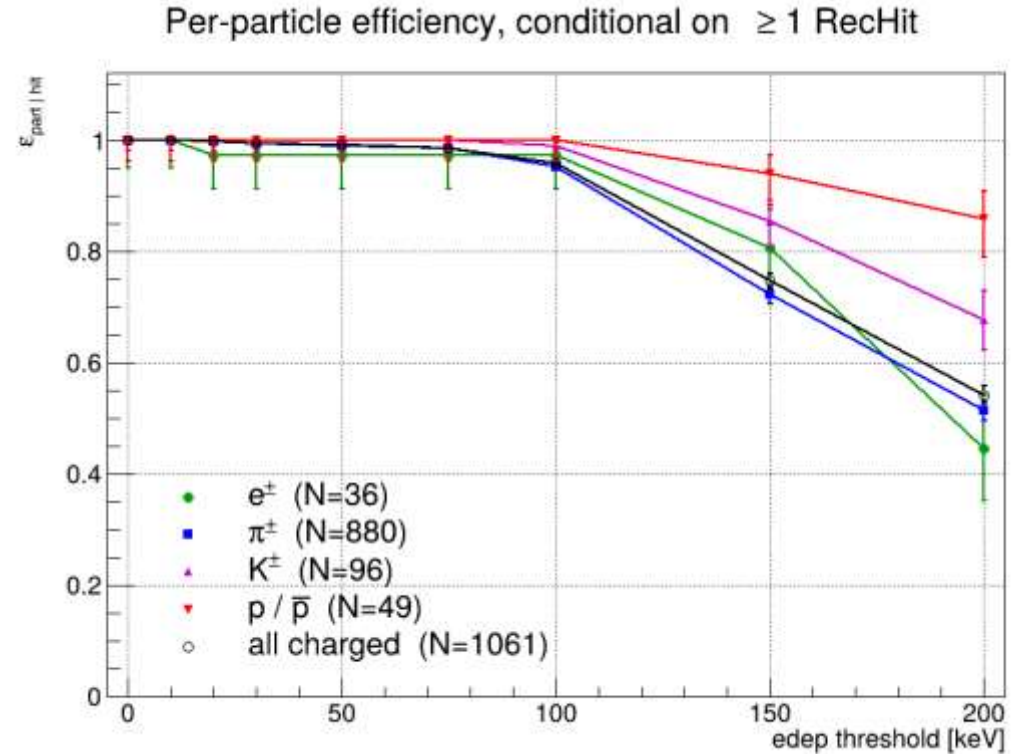


- **Inside the frame (left):** signal and all 5 background types are flat in time. Type 1 is $\sim 100\times$ larger than the signal; type 2 is comparable to it.
- **Sharp edge at 2000 ns** for every background type: the 2 μ s window is confirmed. Absolute time alone does not separate signal from background.
- **Beyond 2 μ s (right):** only the signal has a tail, as isolated spikes of a few hits (≈ 30 hits near 6.4 μ s), likely single particles — under investigation.

Results — Per-Particle Efficiency vs. Threshold



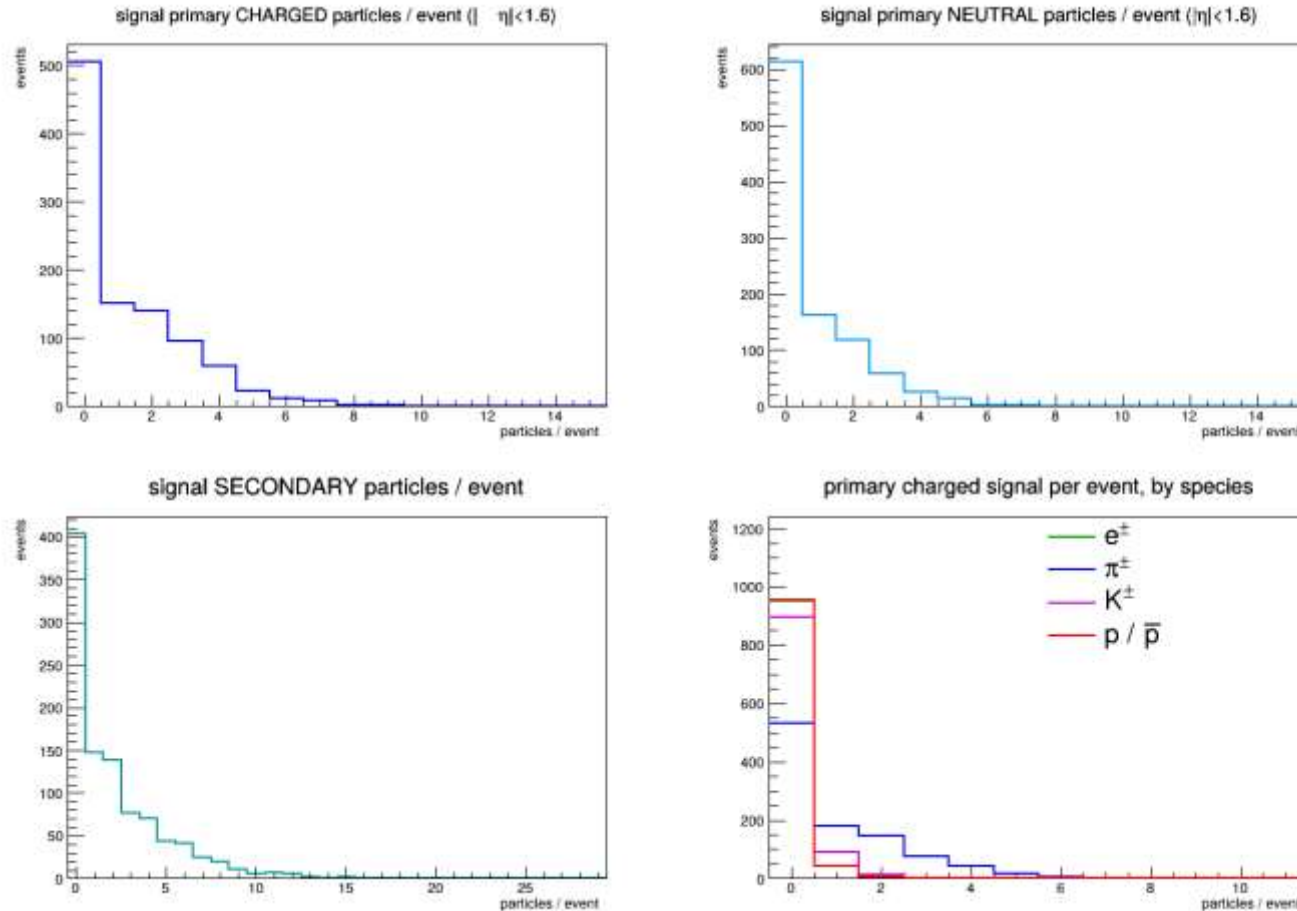
All particles in acceptance



Particles with ≥ 1 RecHit

- 86 % of primary charged particles have ≥ 1 RecHit; $\epsilon_{\text{part}}(50 \text{ keV}) = 0.85$ (all charged), nearly flat up to 75 keV.
- Given a hit: $\epsilon = 0.99$ at 50 keV, 0.96 at 100 keV, 0.75 at 150 keV, 0.54 at 200 keV. The missing 14 % is acceptance, not threshold.

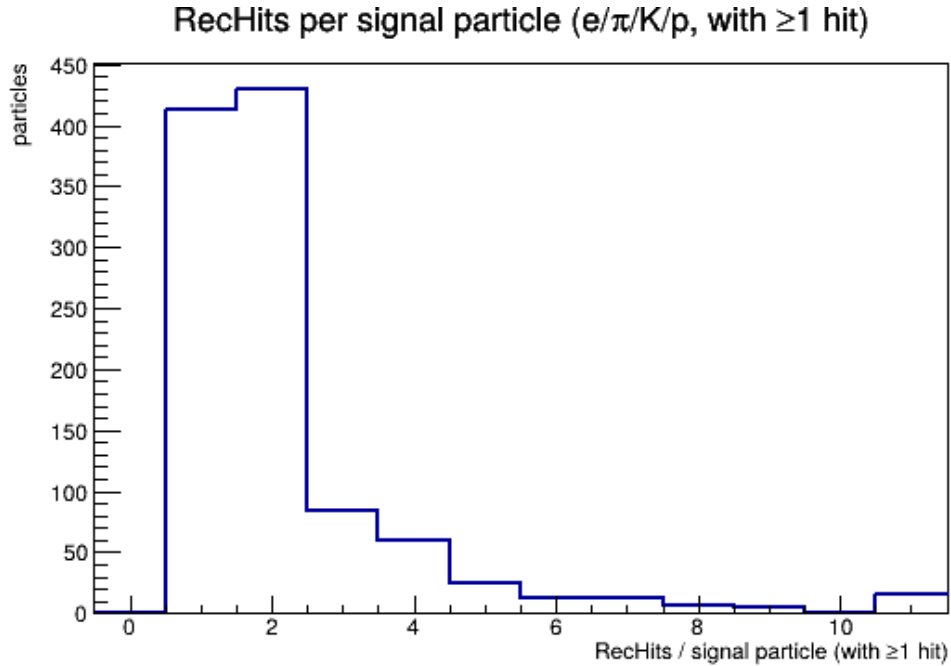
Results — Signal Particles per Event



Signal particles	per event
Primary charged	1.23
π	1.01
K	0.12
p	0.05
e	0.04
Primary neutral	0.80
Secondaries	2.09

- About half of the events have no primary charged particle in acceptance.
- Mostly pions: 1.01 per event.

Results — RecHits per Signal Particle

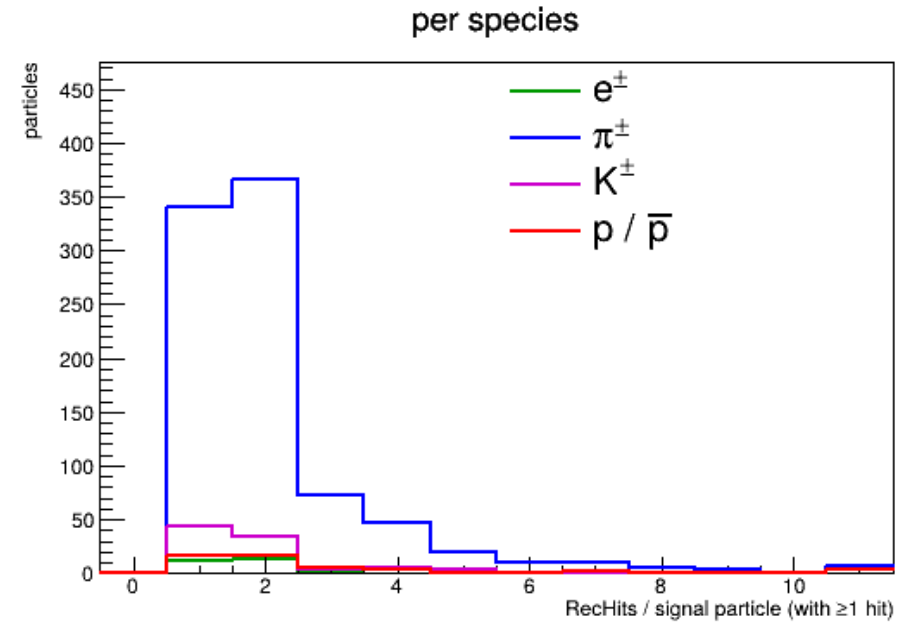


2.2

mean RecHits per charged primary (median 2)

$\approx 80\%$

of particles leave 1–2 hits



≈ 2.4

RecHits / event from final-state $e/\pi/K/p$

Are 1000 Events Enough?

Per-particle ϵ at 50 keV	N / 1000 evt	$\sigma(\epsilon)$ now	events for $\pm 2 \%$	events for $\pm 1 \%$
π	1014	$\pm 1.1 \%$	≈ 300	≈ 1200
all charged	1232	$\pm 1.0 \%$	≈ 250	≈ 1000
K	121	$\pm 3.7 \%$	≈ 3400	$\approx 13\,600$
p	53	$\pm 3.6 \%$	≈ 3300	$\approx 13\,000$
e	44	$\pm 6.1 \%$	≈ 9300	$\approx 37\,000$

1000 events are enough for

rates and multiplicity ($\approx 2 \%$ on the mean at 50 keV), S/B, π and all-charged efficiency; and the 50 vs 100 keV difference (-2.8 ± 0.6 points).

More events are needed for

K, p, e and any (p, η) binned efficiency: ≥ 10 k events, ideally a signal-only sample (background plays no role in the signal efficiency).

Thank you