π/μ separation using KL and TOF

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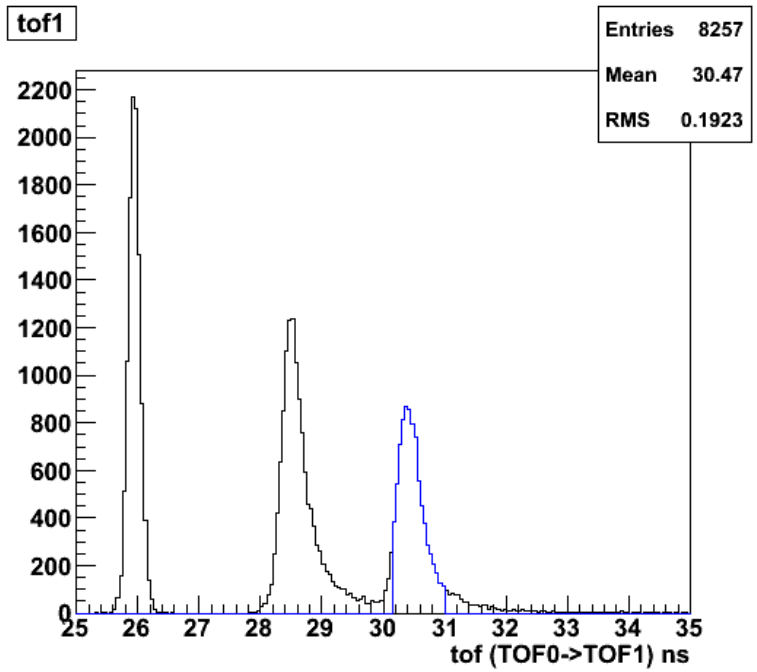
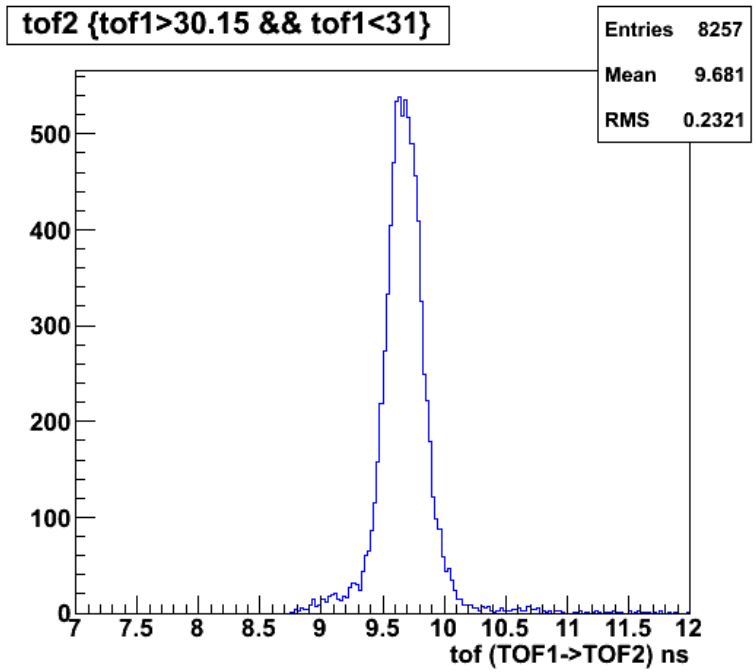
January 12, 2012

π decay

- π mean lifetime $\sim 2.6 \times 10^8$ s.
- μ mean lifetime $\sim 2.2 \times 10^6$ s.

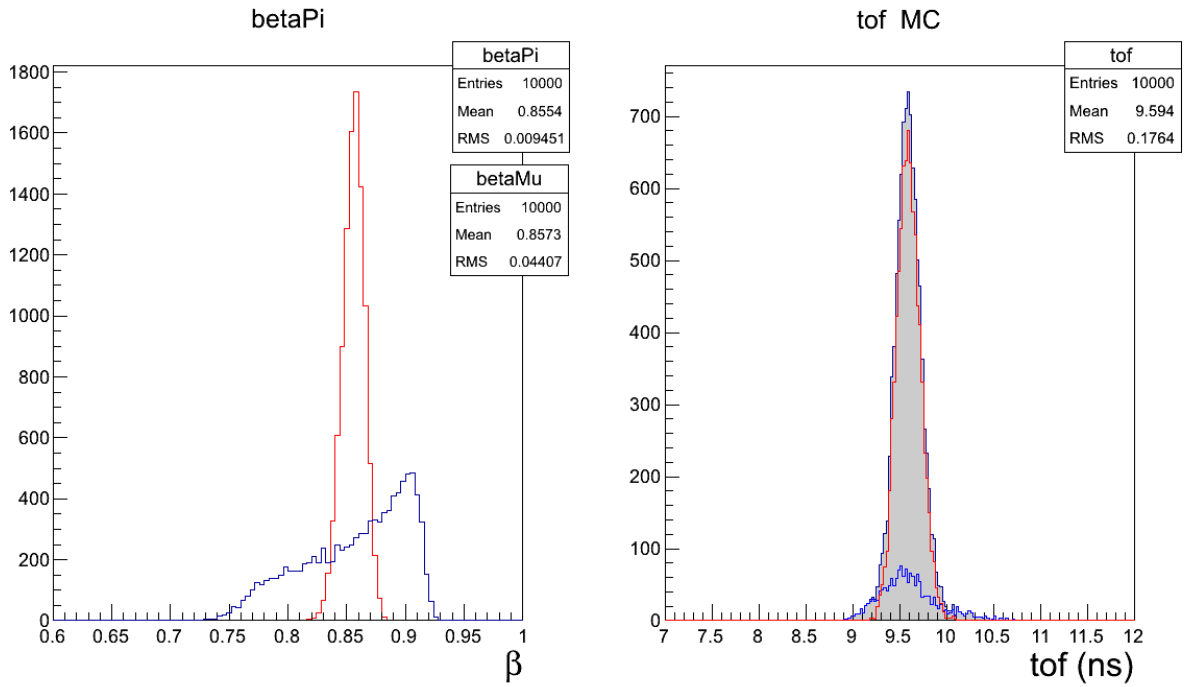




- Left: select event belonging to the so called "pion peak" in $TOF0 \rightarrow TOF1$ time-of-flight distribution (blue).
- Right: $TOF1 \rightarrow TOF2$ time-of-flight distribution of the selected events.

π decay - MC

Naive Monte Carlo of the pion decay in flight between TOF1 and TOF2 (see MCpiDecay.C):



- Left: velocity of the pions (red) and muons from pion decays (blue).
- Right: time-of-flight between TOF1 and TOF2 in the events when : the pion do not decay (red), the pion decays to muon (blue) and the total spectrum (gray).

Conclusion

There is a significant fraction of muons in the so called "pion peak".