T0 Determination by STT

- Abs. timing of STT hits necessary for drift time determination (isochrone calc.)
- Ref. time from other detectors (MVD, SciTil) not existend for all tracks in STT

- Check if absolute time information can be extracted from STT raw hits
- Raw hits: TDC LE-time & TE-time, time-over-threshold ToT = TE – LE time

- Procedure for T0 determination
  - Step 1: hit to track association using raw hits
    - Channel cluster (neighbour hits)
    - Time cumulation
  - Step 2: Simple T0 calculation from sum of track hits (no fit!)
    - $\Sigma r(t) / N_{hits} \sim 2.5$ mm (= avg. isochrone radius)
    - Simplified $r(t) \sim P_0 + P_1 \times (t_{dr} - t_0)$
    - Extract t_0

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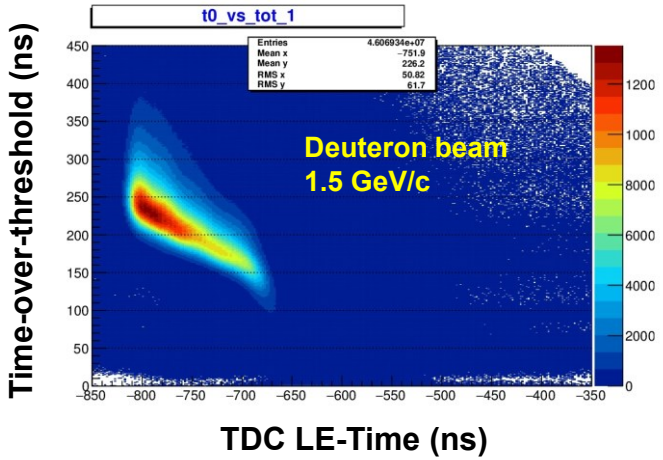
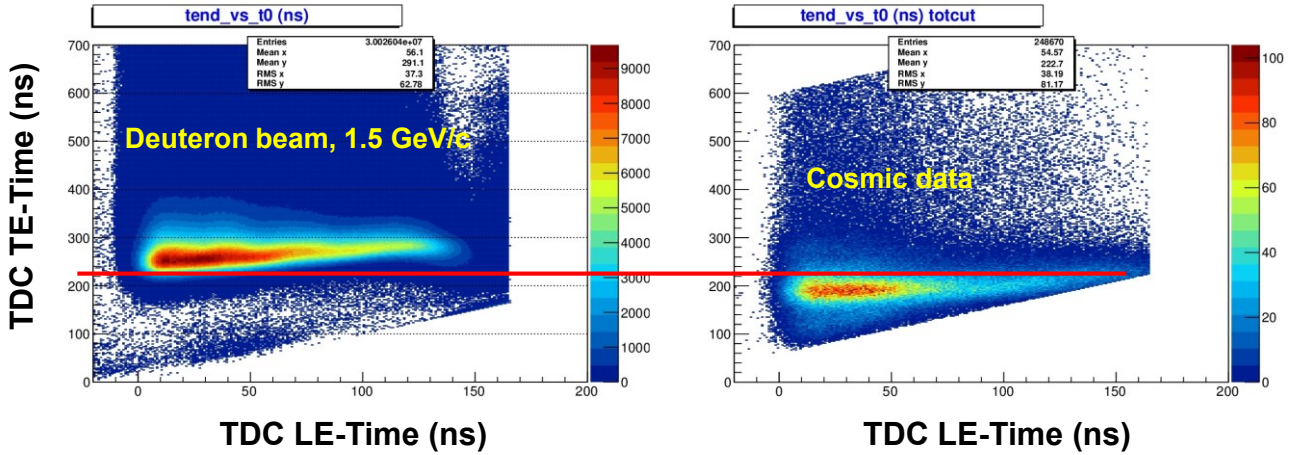
T0 Determination by STT (Step 1)

- Drift time (LE-time) range: ~160 ns (~ 200 ns @ B=2T)
- ToT range: several 100 ns (dE/dx Landau-tail)
- TE-time shows smaller variation
- TE-time is specific for individual track (dE/dx ↔ ToT)





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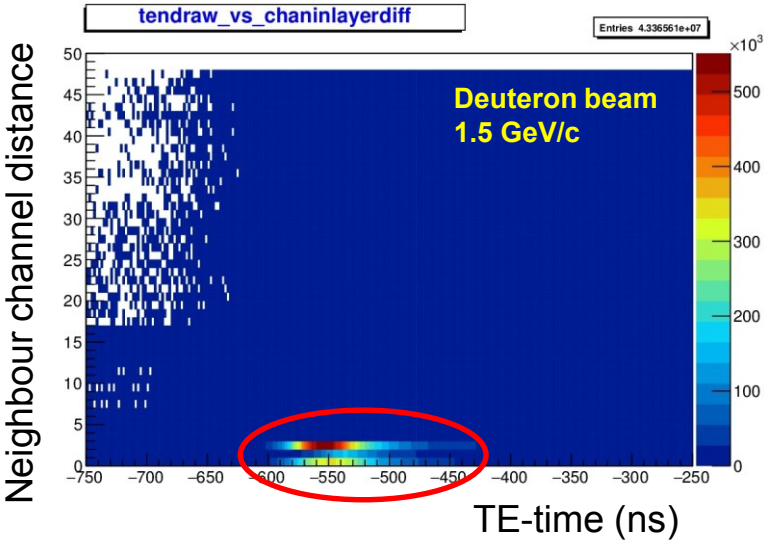
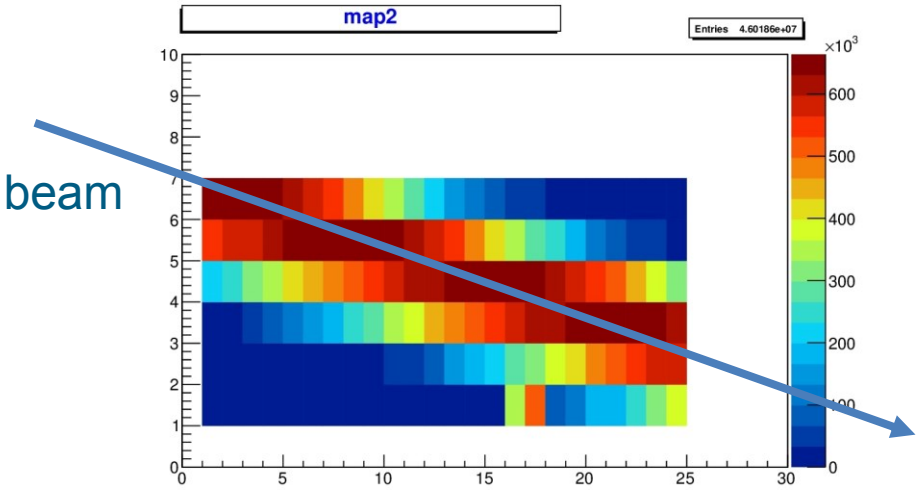
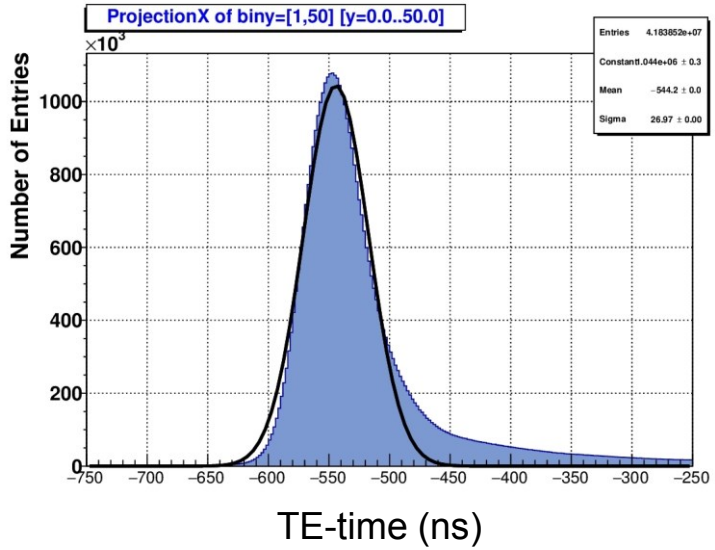
T0 Determination by STT (Step 1)

- Hit cluster finder
  - check neighbour straw (next layer)
  - 3D-space: ∆chan / ∆TE-time / ∆LE-time
- TE-time: σ ~ 27 ns, but landau shape
- ~ 20-30% of hits in Landau tail
- Track angle dependence to be checked







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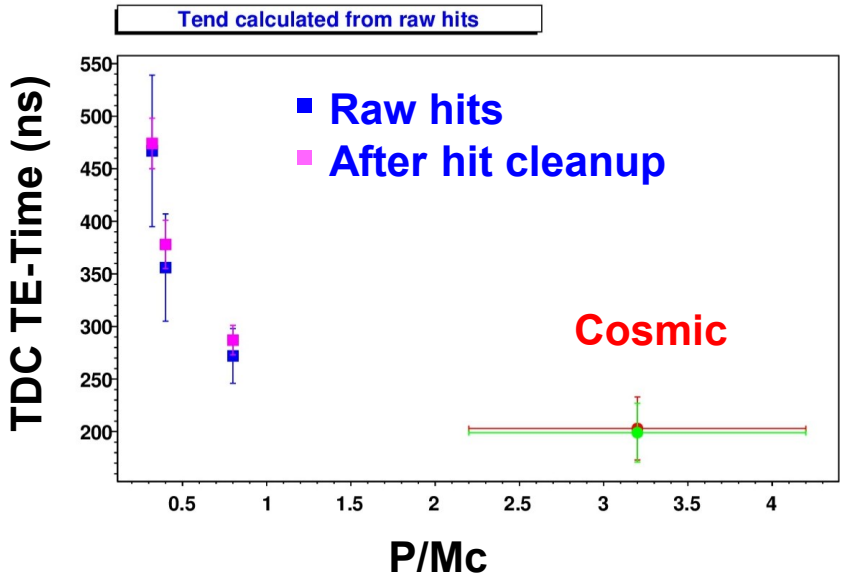
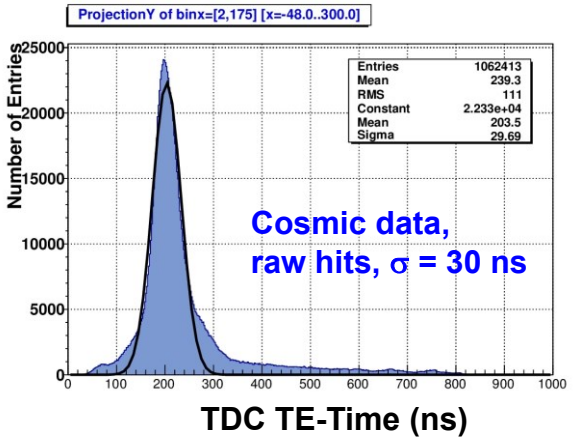
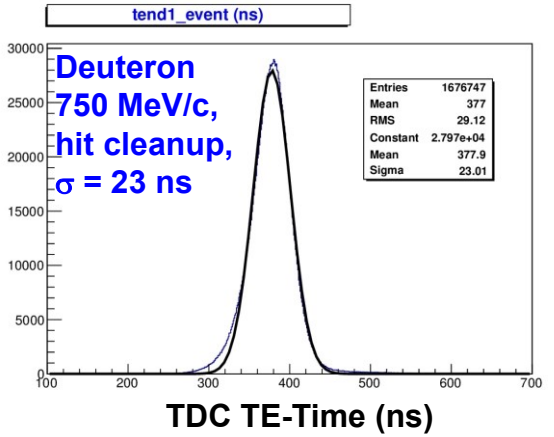
T0 Determination by STT (Step 1)

- Check TE-time resolution (deuteron testbeam & cosmic)
- Covered dE/dx range ~ 5-50 keV/cm (= full signal dynamical range)
- Cosmic tracks with large θ-angle range, but only 2D-tracking done
- Resolution: σ ~ 25 ns (after cleanup)
- Resolution worse (σ~30ns) for cosmics as expected
- TE-time only for individual track (dE/dx)







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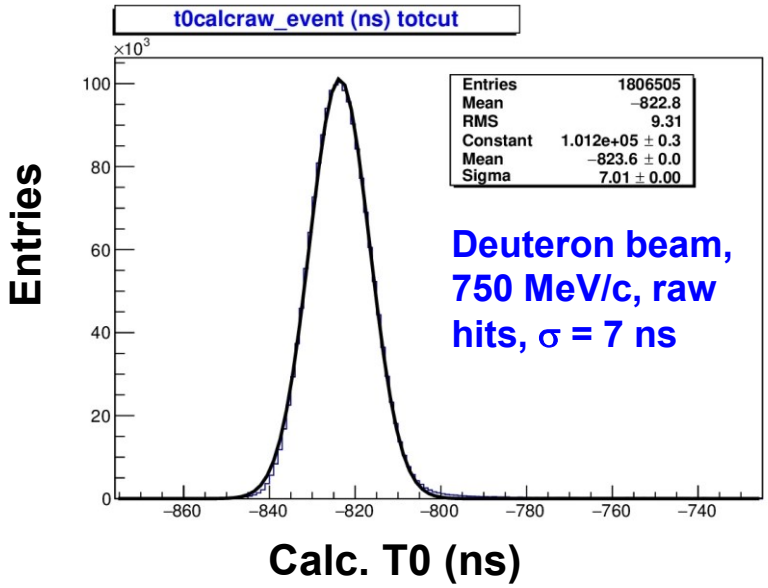
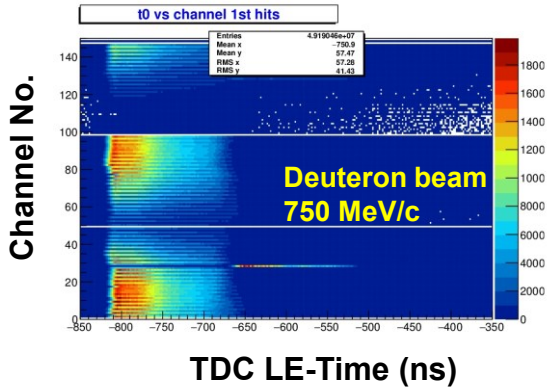
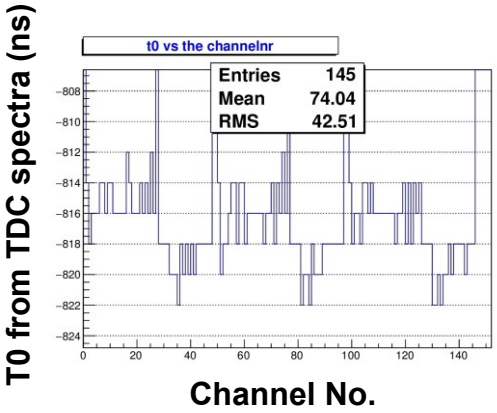
T0 Determination by STT (Step 2)

- Calculate T0 from raw TDC candidate hits (sum up hits, T0=shift)
- Calculated T0 in good agreement with T0 from TDC spectra
- Note: single channel time offset shifts (TDC)
- T0-resolution: σ = 7 ns (~ 6 ns after hit cleanup)







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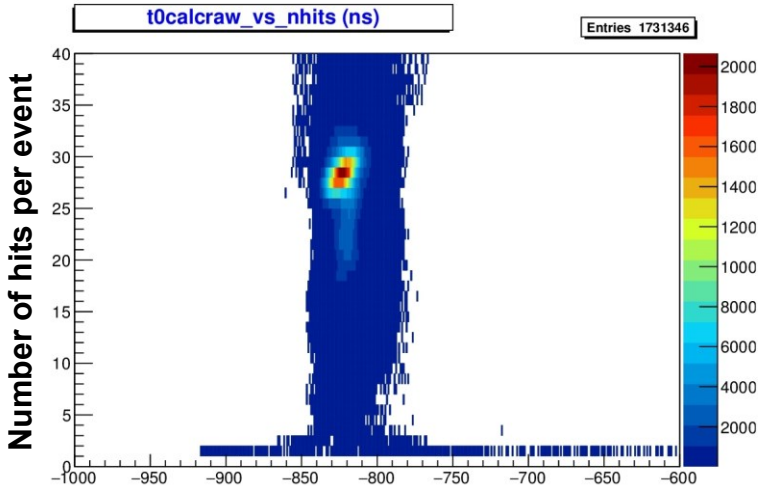
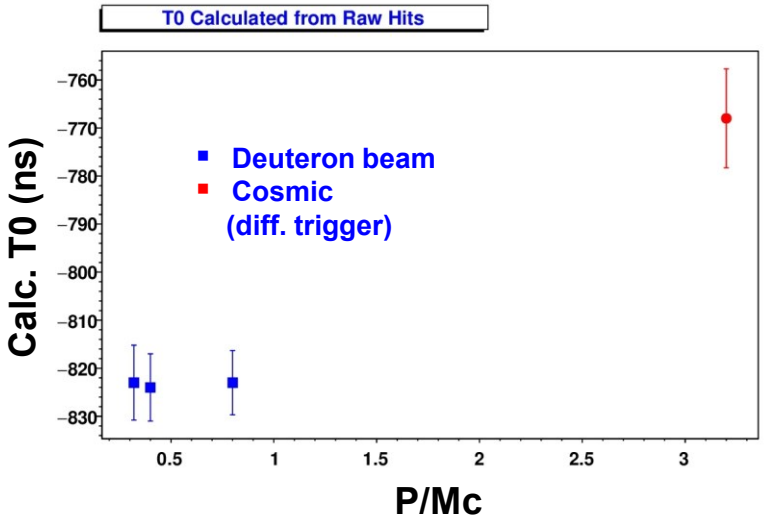
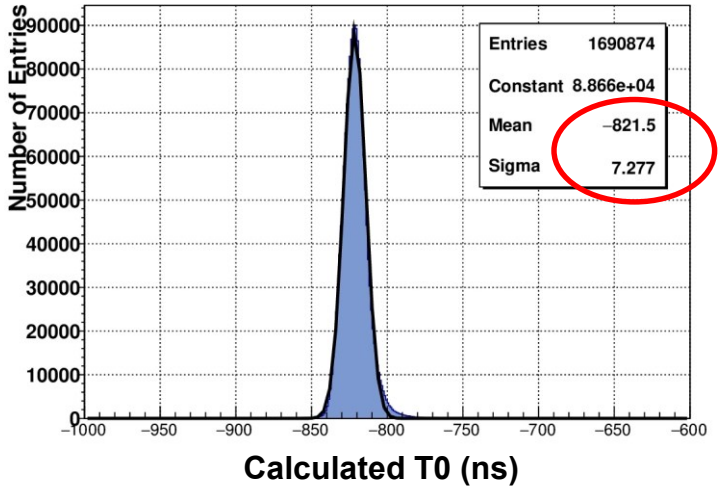
T0 Determination by STT (Step 2)

- Obtained T0 values independent on dE/dx (diff. deuteron momenta)
- σ (T0) = 11 ns for cosmics
  (larger θ-range, but only 2D-tracking $\rightarrow$ ToT spread)
- Cosmic T0 value shift due to diff. trigger
- T0 resolution sufficient for 1st tracking
- Then: T0 extraction from trackfit
- Preliminary results, further analysis ongoing







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