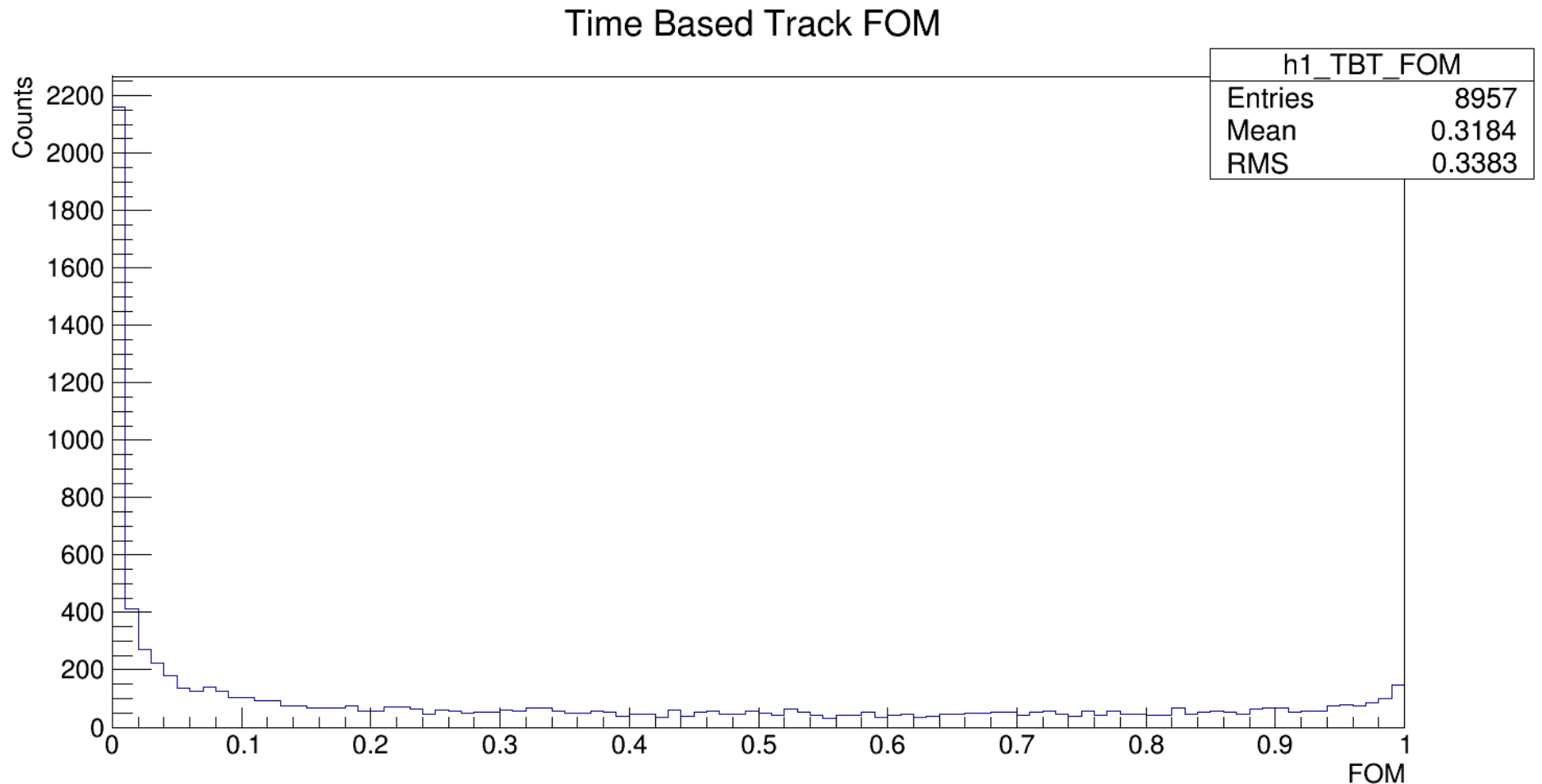


ST Online Efficiency Calculations

How do I get the Efficiency

- Loop over the Charged track then get the best track FOM from which we get a single time based track (TBT).
- Cut on the FOM of this TBT with 3 sigma cut (FOM =0.0027)



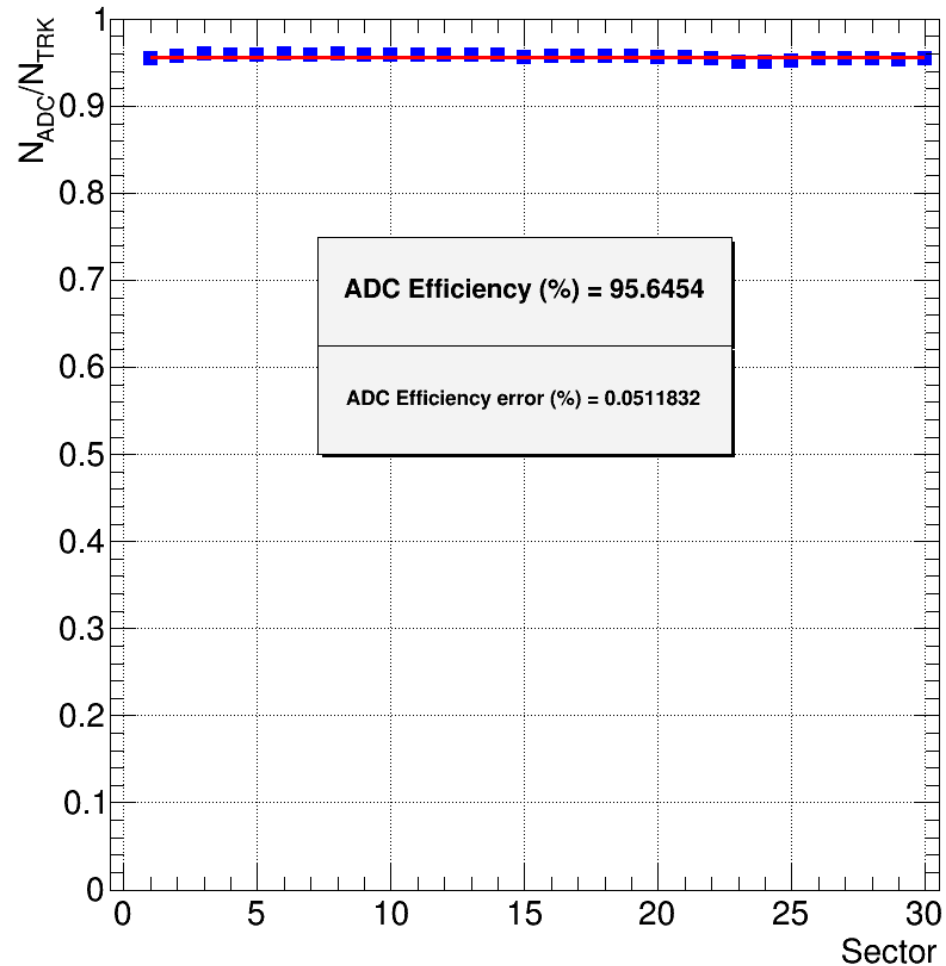
- Grab the ST hit match params object and cut only on tracks matched to the ST.
- Get the time based track position (vertex).
- Cut on the target length ($50 < z_v < 80$ cm).
- Cut on the radius of scattering chamber ($r_v < 3.745$ cm).
- Count the number of tracks expected to hit the ST: N_{TRK}
- Count the number of actual hits to ST: N_{HIT}
- Hit Efficiency = $N_{\text{HIT}} / N_{\text{TRK}}$
- ADC Efficiency = $N_{\text{ADC}} / N_{\text{TRK}}$

- Eff->Divide(N_{HIT} , N_{TRK} , 1, 1, "B"); This divide the two histograms and calculate the binomial errors in each bin of the histogram
- To calculate the total weighted average of the efficiency:
- $\text{Eff} = \text{sum}(\text{B_content} * \text{B_err}) / \text{sum}(\text{B_err})$
- $$\bar{x} = \frac{\sum_{i=1}^n w_i x_i}{\sum_{i=1}^n w_i},$$

Run3079: all files

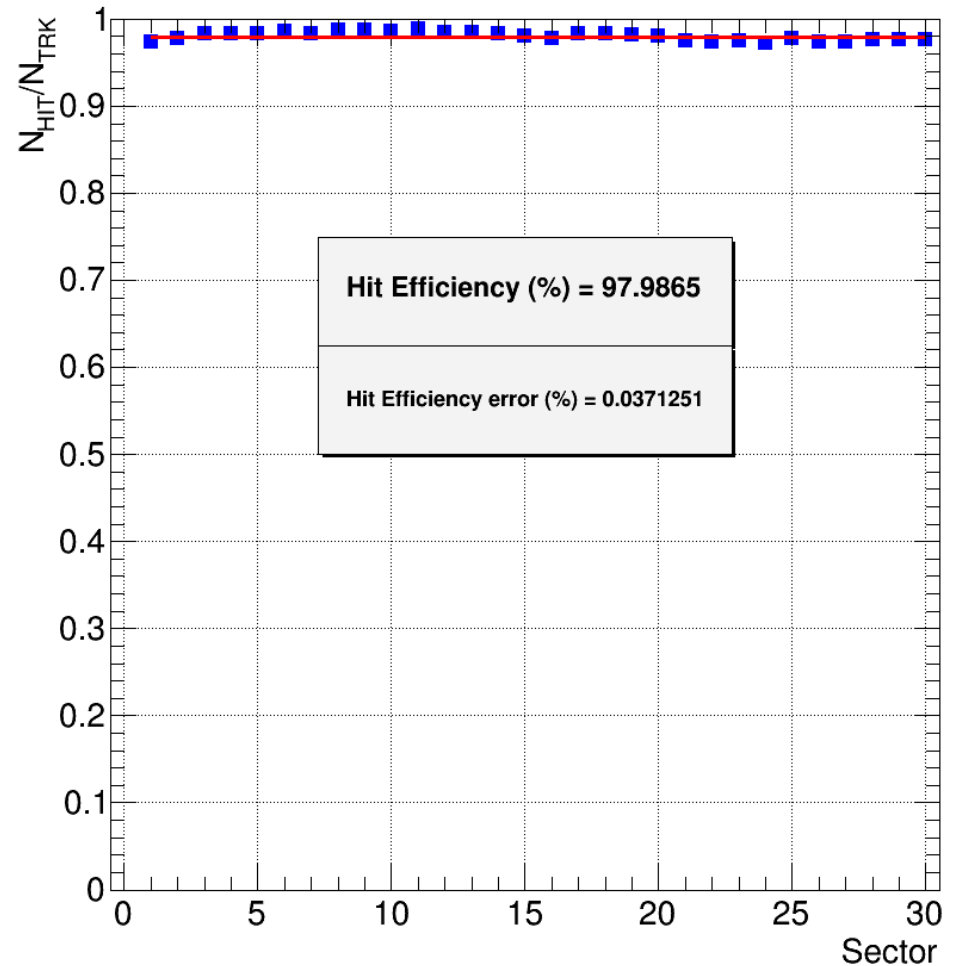
DSCDigiHit

ADC Efficiency



DSCHit

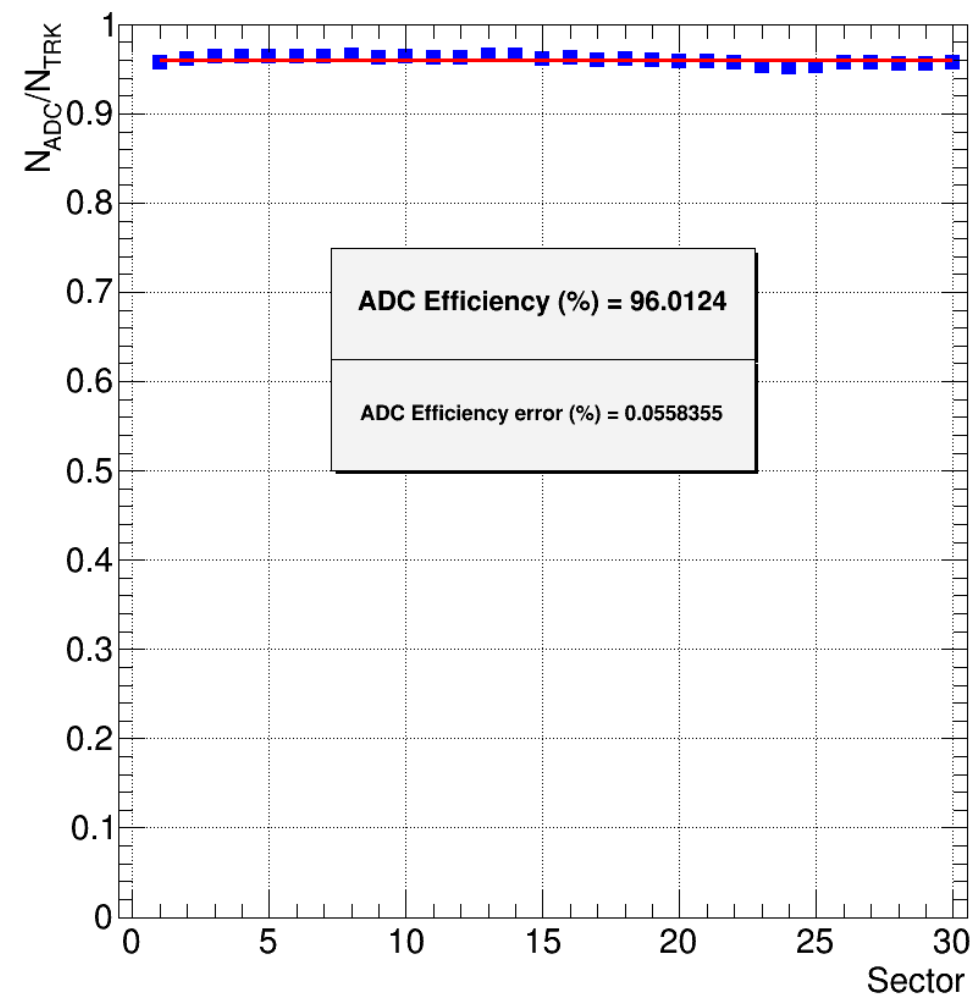
Hit Efficiency



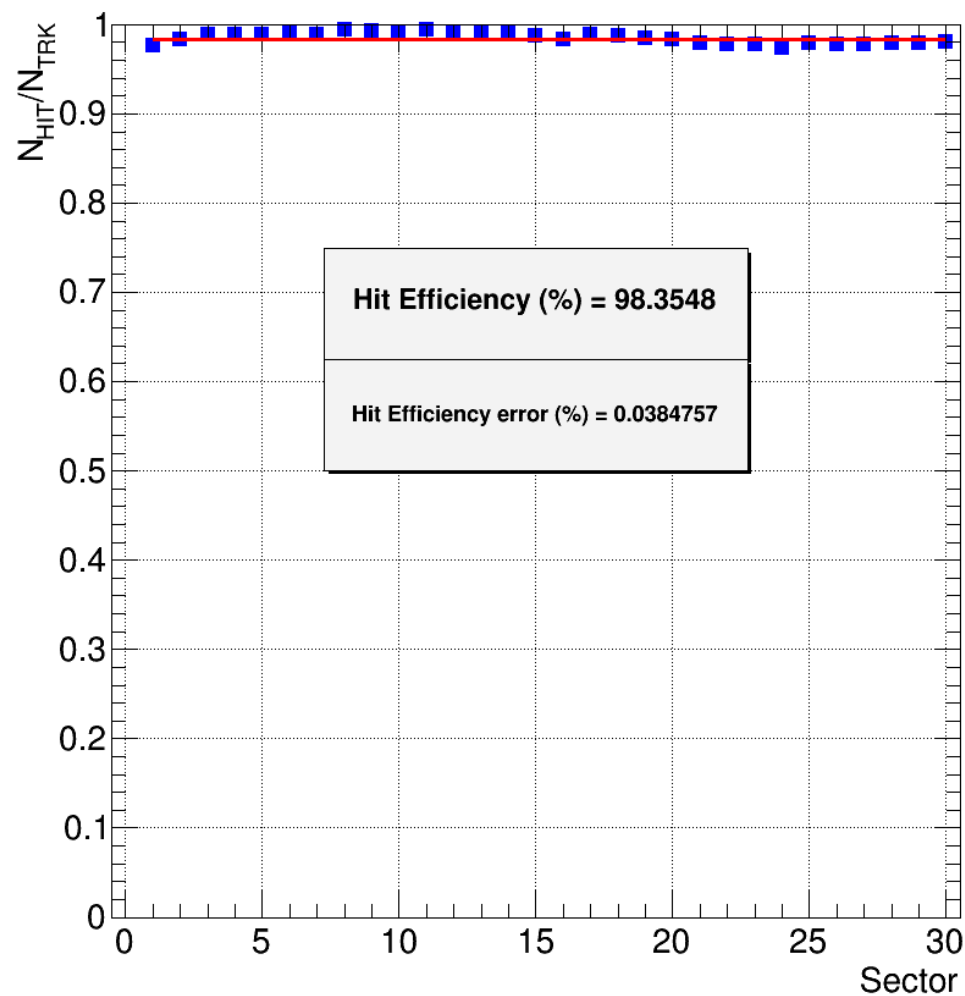
Run3079: all files

2 sigma cut

ADC Efficiency



Hit Efficiency



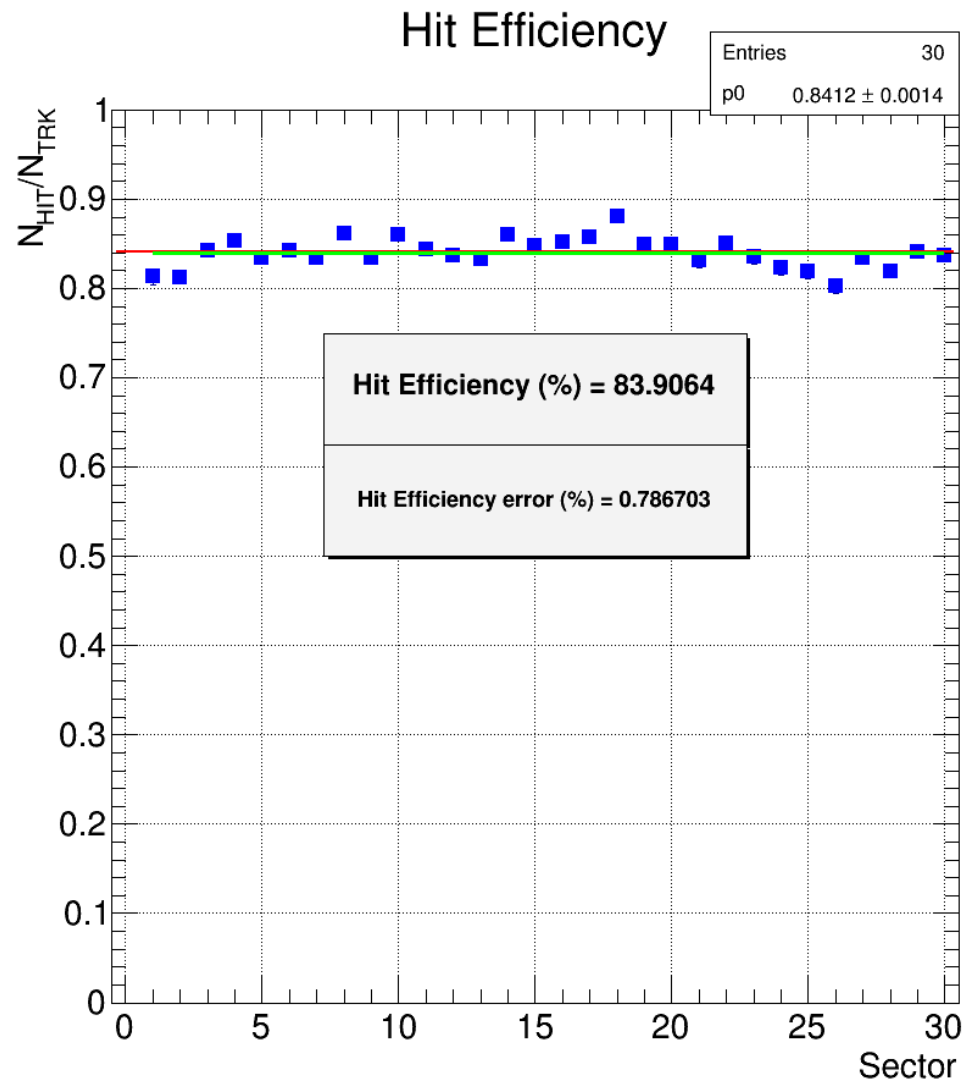
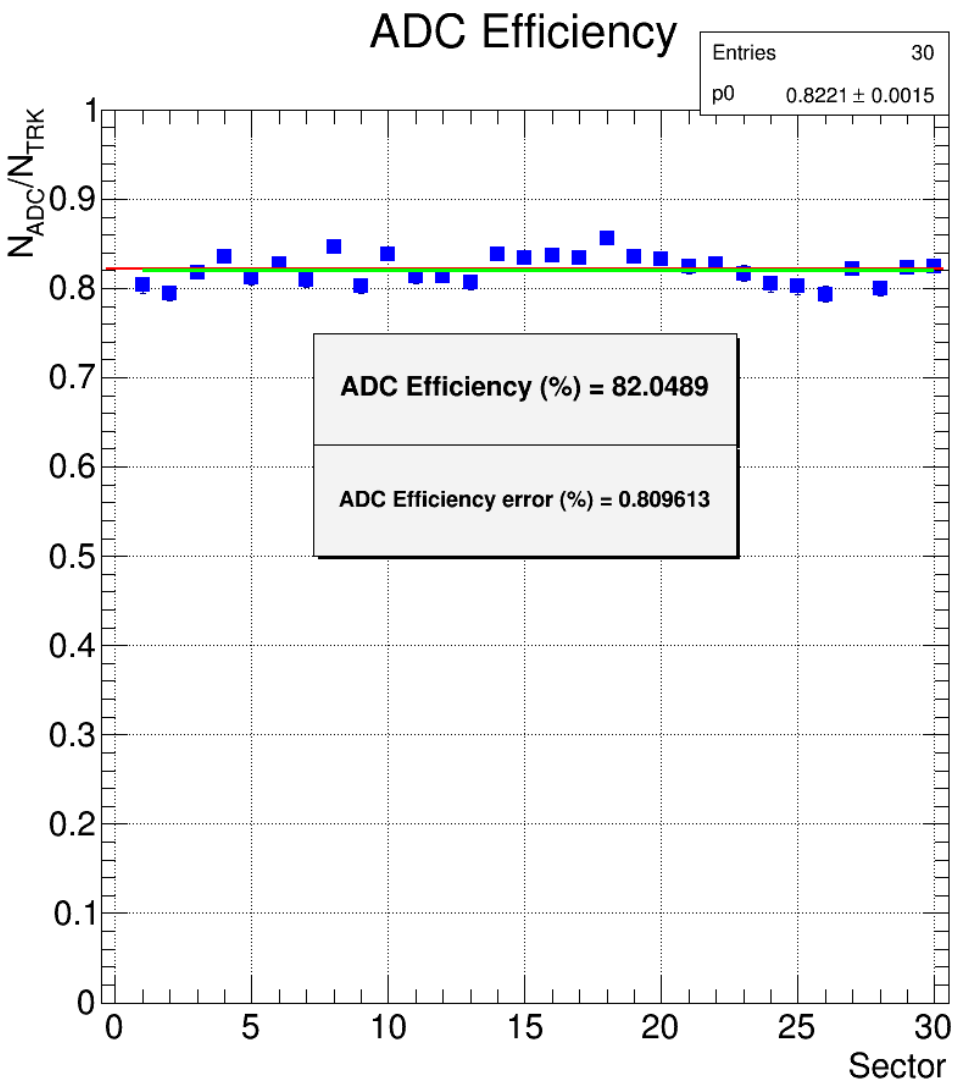
Old Code efficiency calculations TimeBasedTrack Loop (TBTL)

- Loop over the time based tracks, cut on the FOM > 0.0027.
- Vertex cut: $50 \text{ cm} < z_v < 80 \text{ cm}$ & $r_v < 3.745 \text{ cm}$
- Grab the ST sector predicted to be hit by the time based track (No match to ST).
- Count the number of tracks expected to hit the ST: N_{TRK}

N_{TRK} after match to ST will be smaller

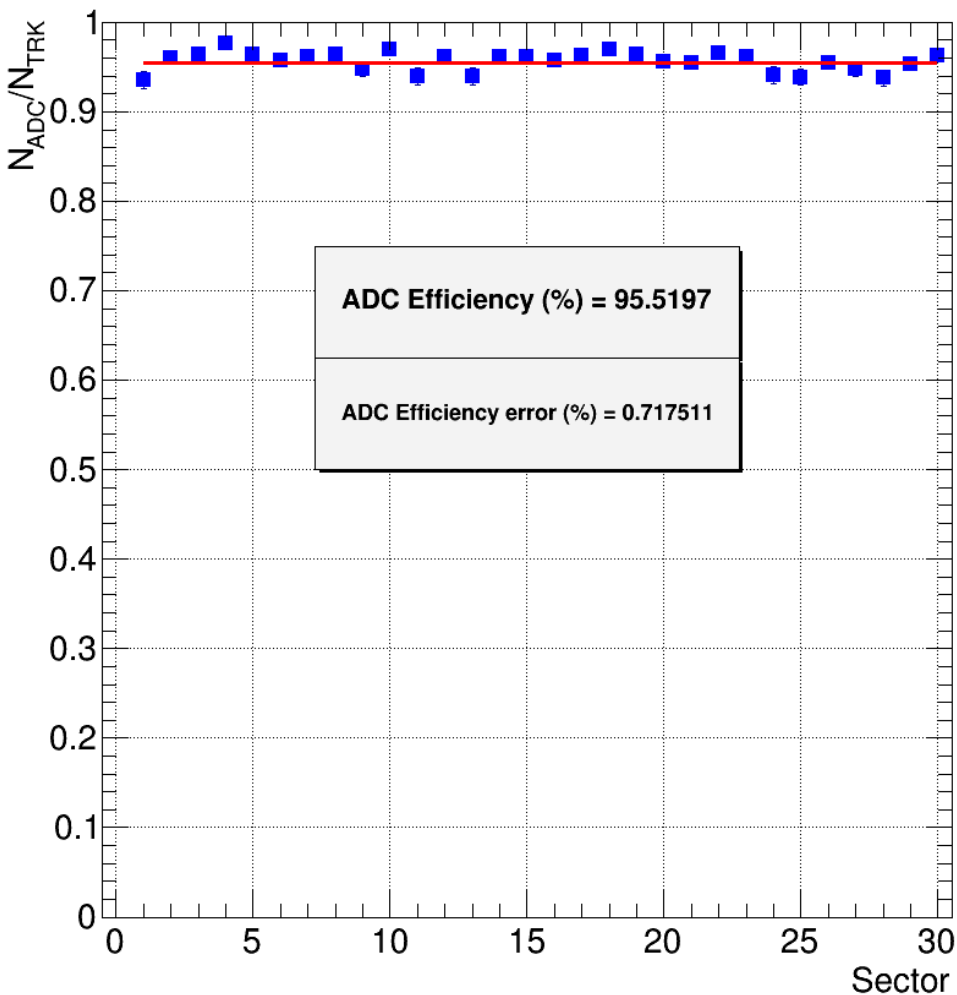
- Count the number of actual hits to ST: N_{HIT}
- Hit Efficiency = $N_{\text{HIT}} / N_{\text{TRK}}$
- ADC Efficiency = $N_{\text{ADC}} / N_{\text{TRK}}$
- To calculate the total weighted average of the efficiency:
- $\text{Eff} = \text{sum}(\text{B_content} * \text{B_err}) / \text{sum}(\text{B_err})$

TBTL Run3079 , 100k events

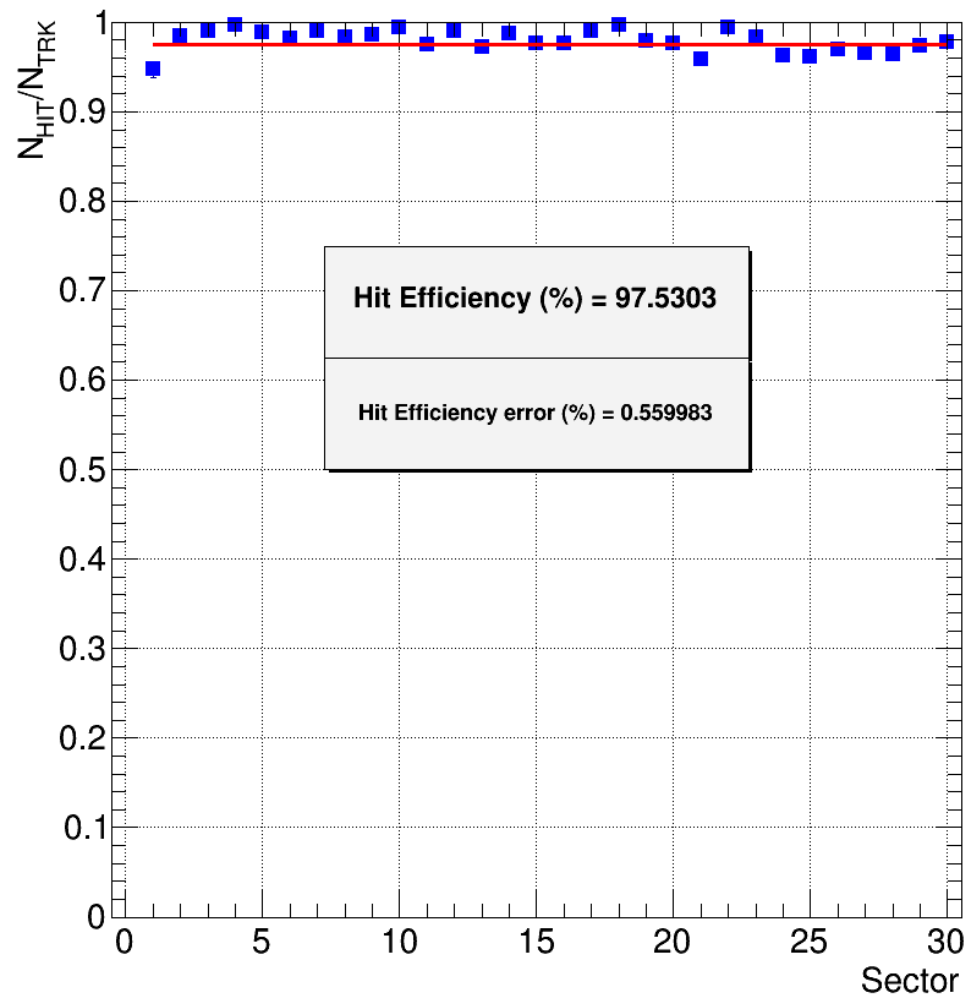


Charged Track Loop Run3079 , 100k events

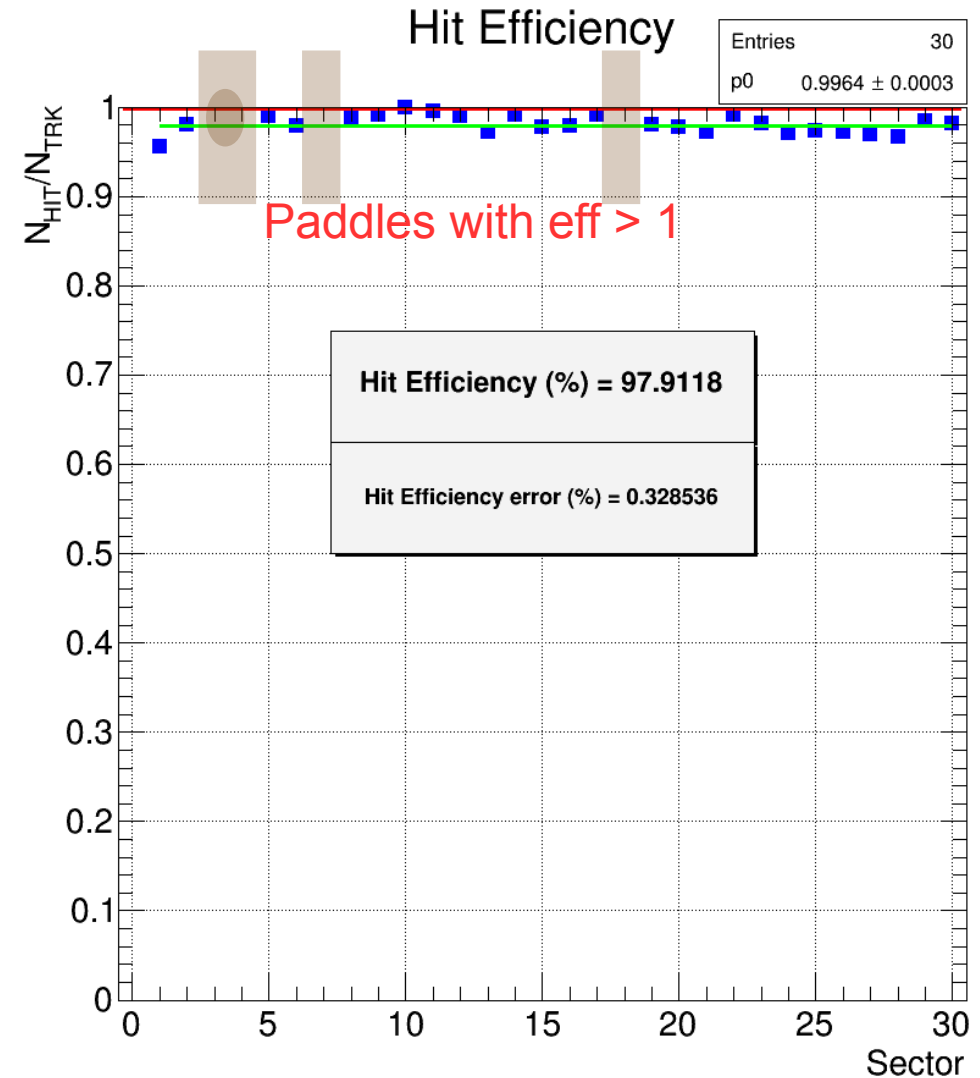
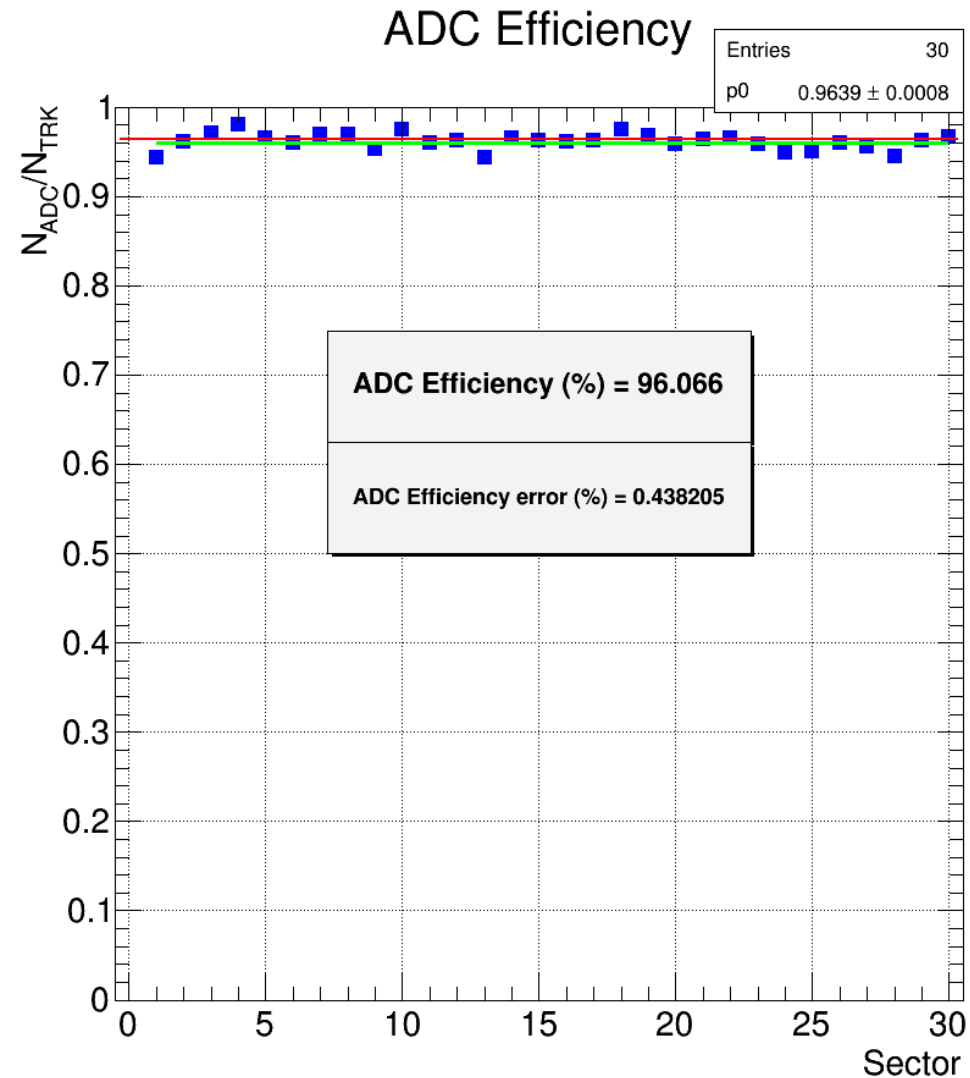
ADC Efficiency



Hit Efficiency



Modified Old Code efficiency calculations



- Backup Slides

```
***** eventnumber = 58*****
TBT mass = 0.13957 *****
TBT FOM = 0.500474 *****
The charge of the track = 1
  st_pred_id = 23
TBT mass = 0.493677 *****
TBT FOM = 0.244556 *****
The charge of the track = 1
  st_pred_id = 23
TBT mass = 0.938272 *****
TBT FOM = 0.169305 *****
The charge of the track = 1
  st_pred_id = 23
```

```
***** eventnumber = 58*****
TBT mass = 0.13957
TBT mass = 0.500474
The charge of the track = 1
  st_pred_id = 23
.....
```