

Preliminary w_a Analysis with EndGame datasets

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Analysis Overview

dataset with full DQC (subrun level)

- Reconstructed and corrected by Recon West method
- gm2pro_daq_full_run1_EndGame_5040A_goldList

Correction:

- in-fill gain and STDP default in the dataset (Gain)
- Shadow pulse method with ADT (Pileup)
- Time dependent frequency (CBO)
- Triple coincidence (Lost Muon)

T-Method:

- (E,T) spectrums
- 20 Parameters fitting
- FFT and pull
- Correlation Matrices
- Start scan
- Calo by calo consistency

Systematic Uncertainty:

- *Pileup*
- *CBO*
- Lost Muon
- *VW*
- *Bin Size*
- *Random Seed*

Fitting Function

- During the Fitting, the χ^2 of the fit function is minimized
- The final 20 parameters fit function:

5+8(CBO)+LM+4(VW)+2(DCBO)

$$N = N_0 \Lambda N_{cbo} N_{2cbo} N_{vw} e^{-t/\tau} (1 - A A_{cbo} \cos(\omega_a t + \phi \phi_{cbo}))$$

$$N_{cbo} = 1 - A_{1cbo} e^{-\frac{t}{\tau_{cbo}}} \cos(\omega_{cbo} t + \phi_{1cbo})$$

$$N_{2cbo} = 1 - A_{2cbo} e^{-\frac{t}{\tau_{cbo}}} \cos(2\omega_{cbo} t + \phi_{2cbo})$$

$$N_{vw} = 1 - A_{vw} e^{-\frac{t}{\tau_{vw}}} \cos(\omega_{vw} t + \phi_{vw})$$

$$A_{cbo} = 1 - A_{Acbo} e^{-\frac{t}{\tau_{cbo}}} \cos(\omega_{cbo} t + \phi_{Acbo})$$

$$\phi_{cbo} = 1 - A_{\phi_{cbo}} e^{-\frac{t}{\tau_{cbo}}} \cos(\omega_{cbo} t + \phi_{\phi_{cbo}})$$

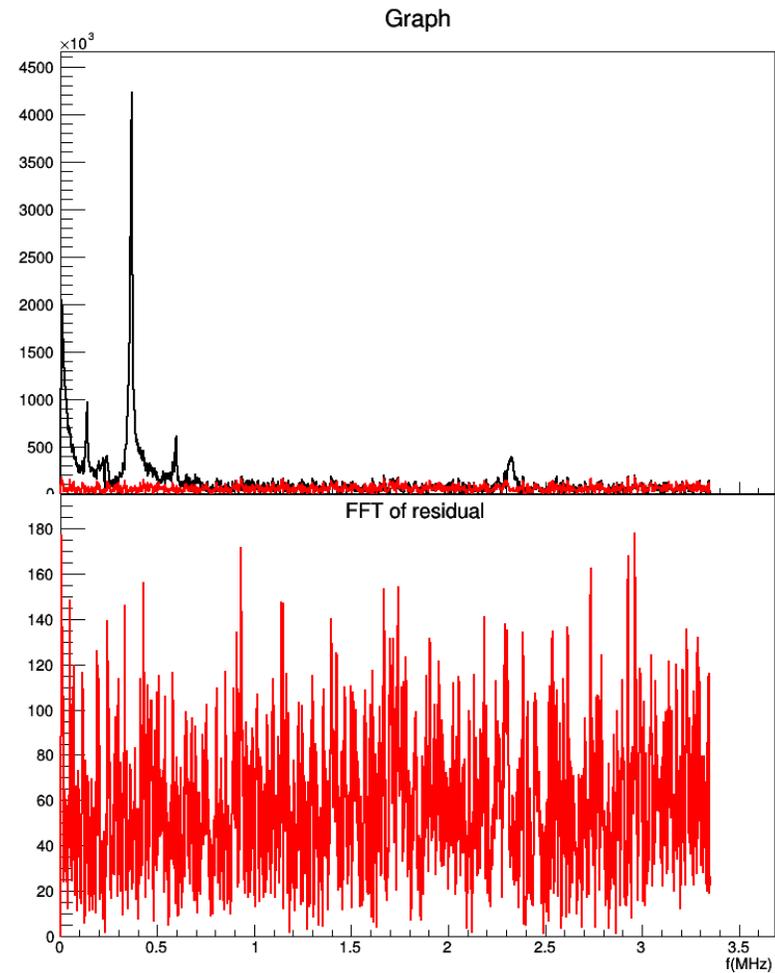
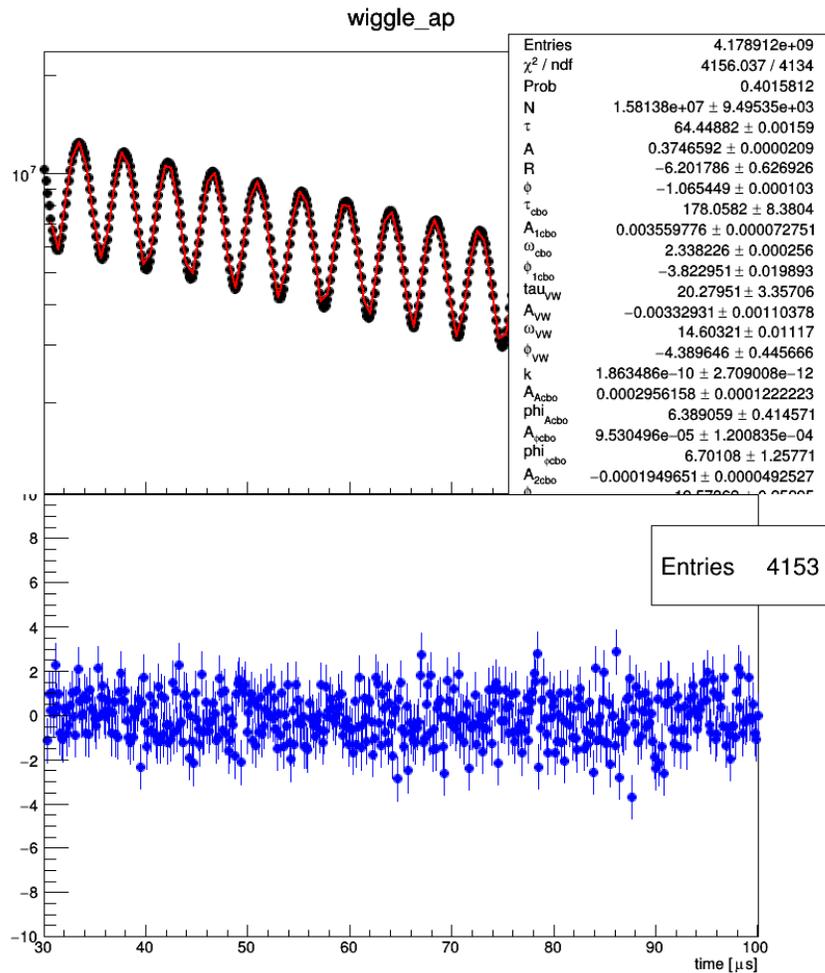
$$\omega_{cbo} = \omega_0 (1 + 2.875 e^{-\frac{t}{76}/\omega_0 t} + 5.47 e^{-\frac{t}{8.85}/\omega_0 t})$$

$$\Lambda = 1 - K_{loss} \int L(t') e^{t'/64.4} dt$$

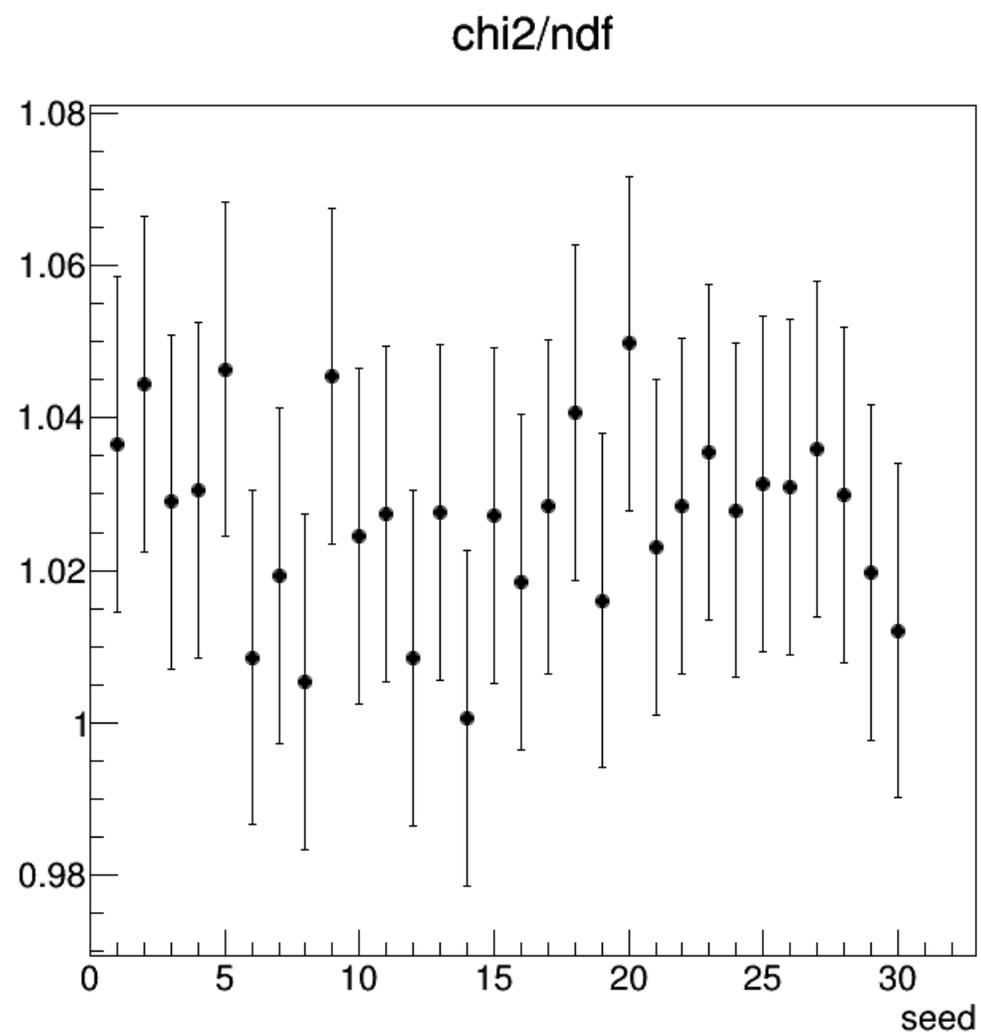
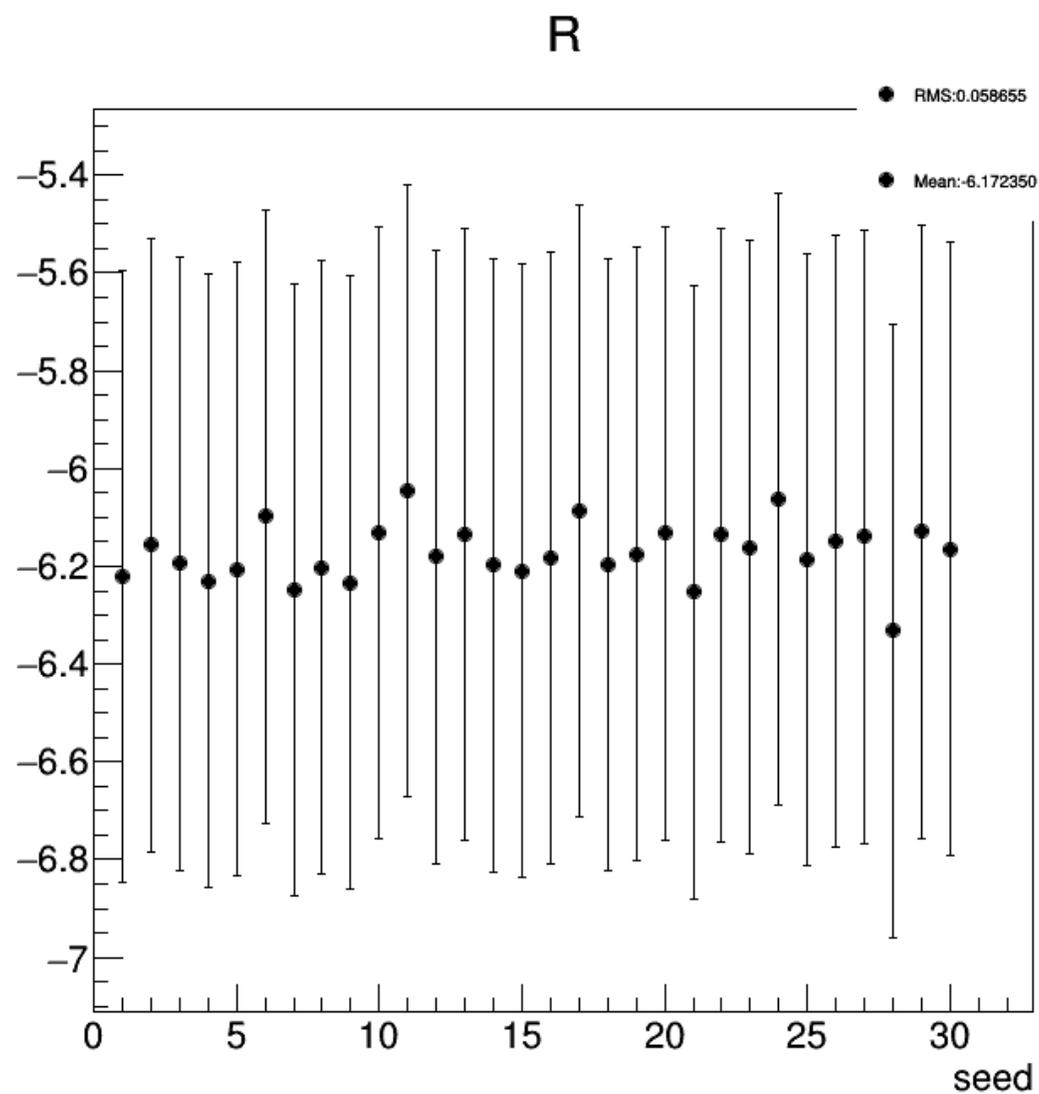
$$\chi^2 = \sum_{i=1}^{ndf} \left[\frac{N_{bin} - N_{fit}}{\sigma(N_{bin})} \right]^2$$

20P Fitting Function

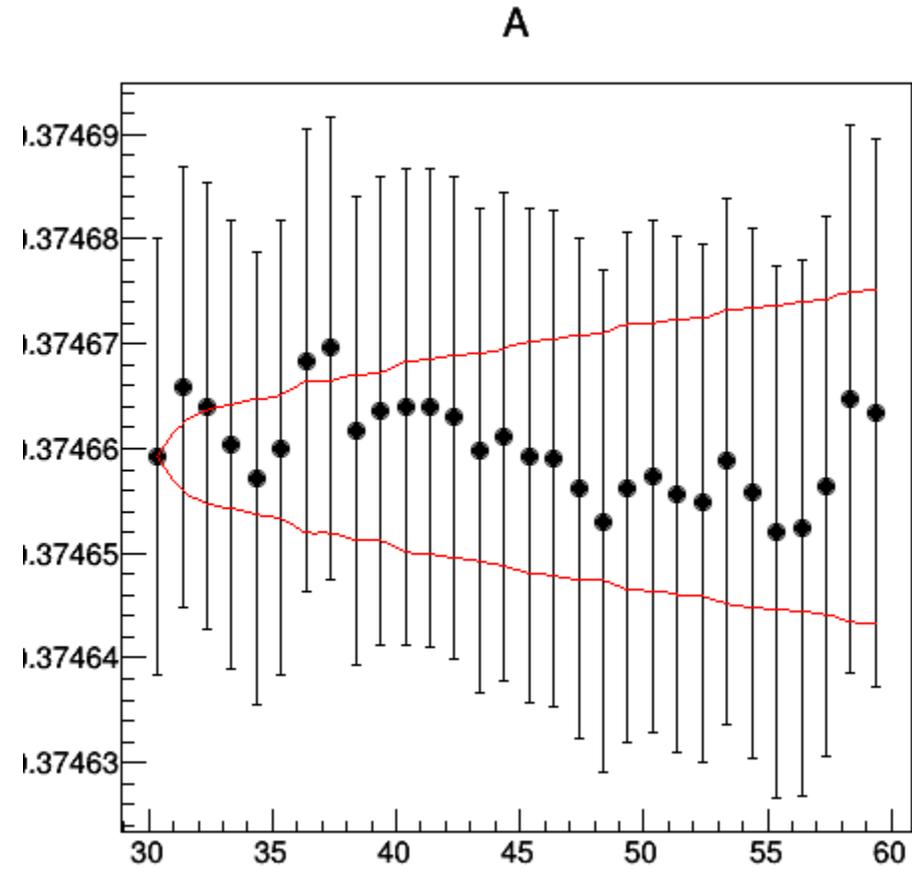
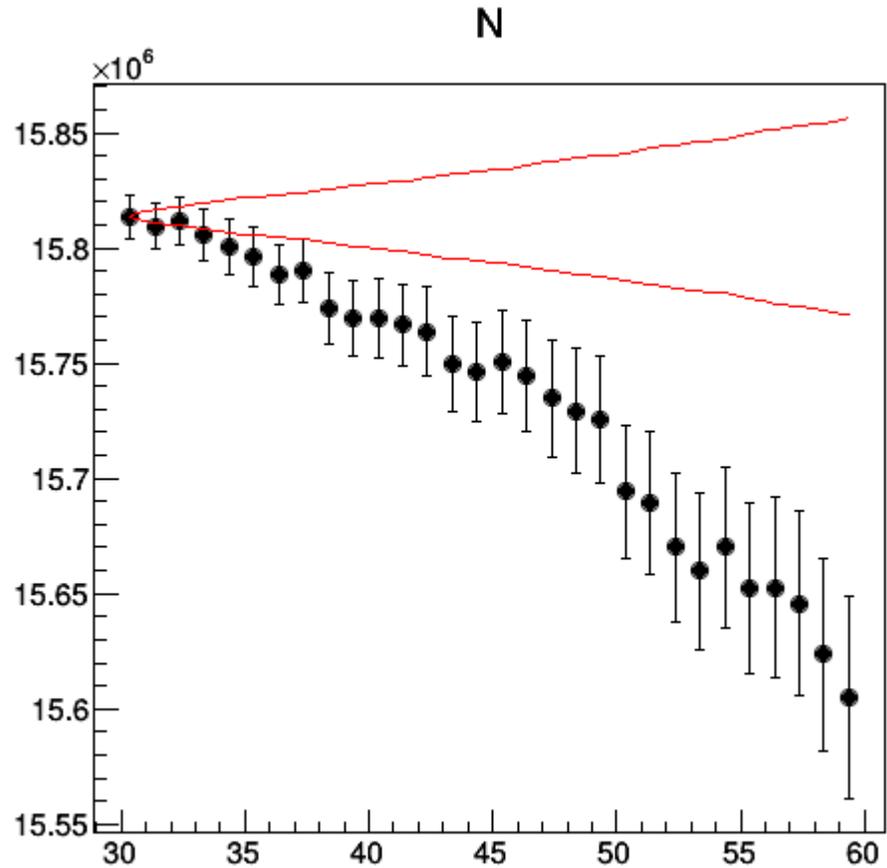
- The right choice of start time should be zero crossing at around $30\mu\text{s}$
- $\omega_a t + \phi = 270 + 360n$
- Starting time of $30.3622\mu\text{s}$ is chosen ($204 * 0.1492 = 30.3622\mu\text{s}$)



Random seed scan



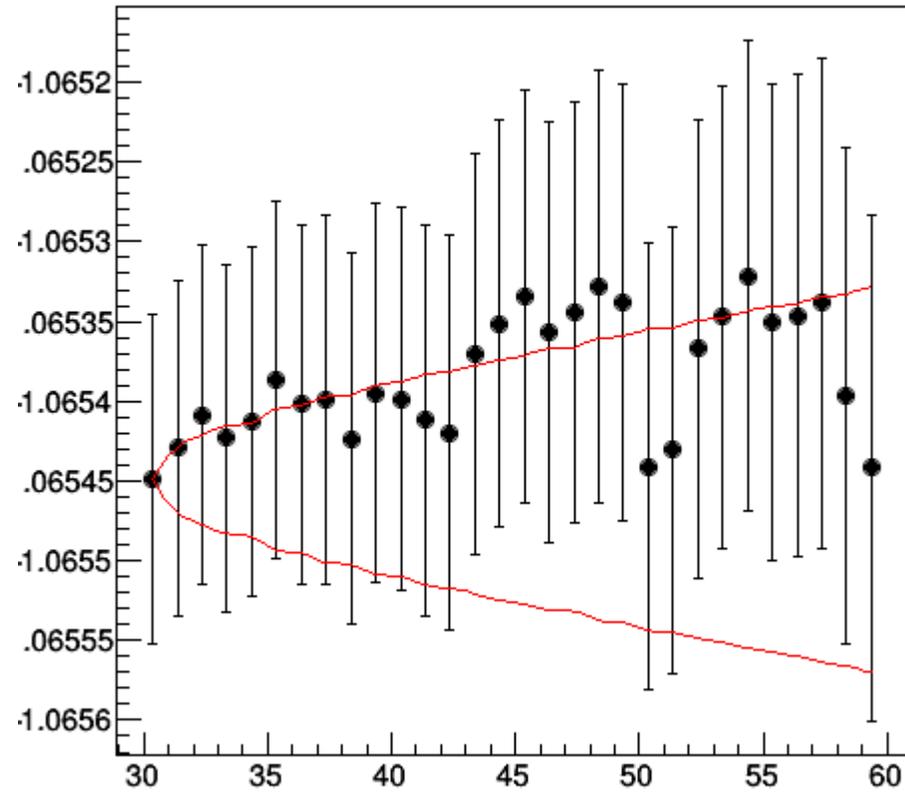
Start time scan



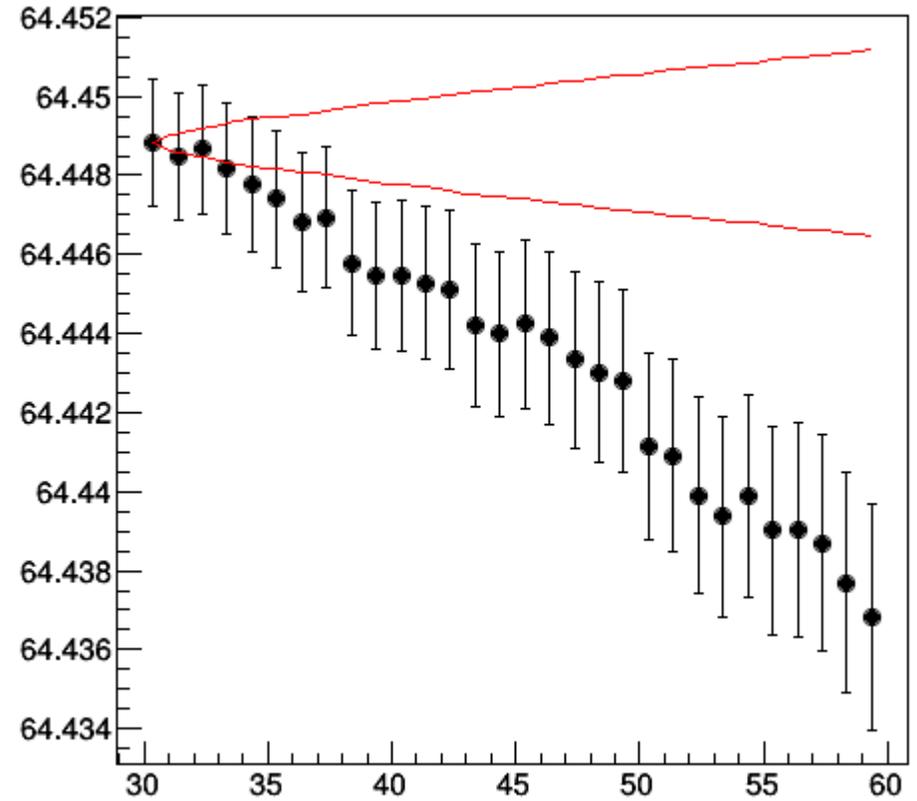
Khaw band: $\sqrt{(\text{Par}[bf])^2 - \text{Par}[af]^2}$

Start time scan

ϕ

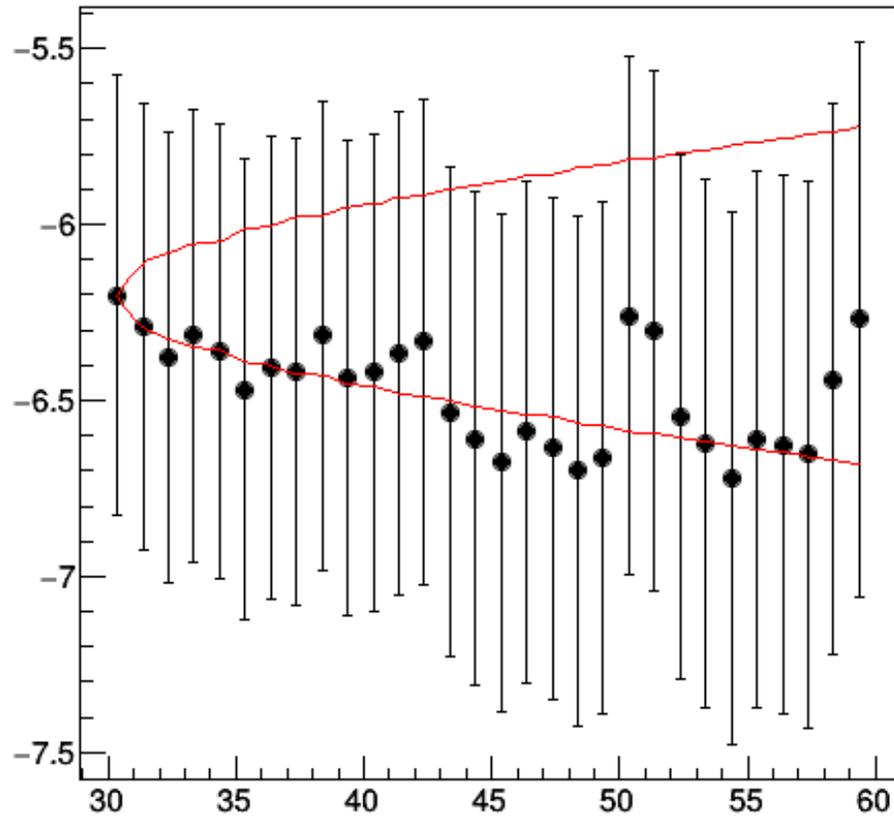


lifetime

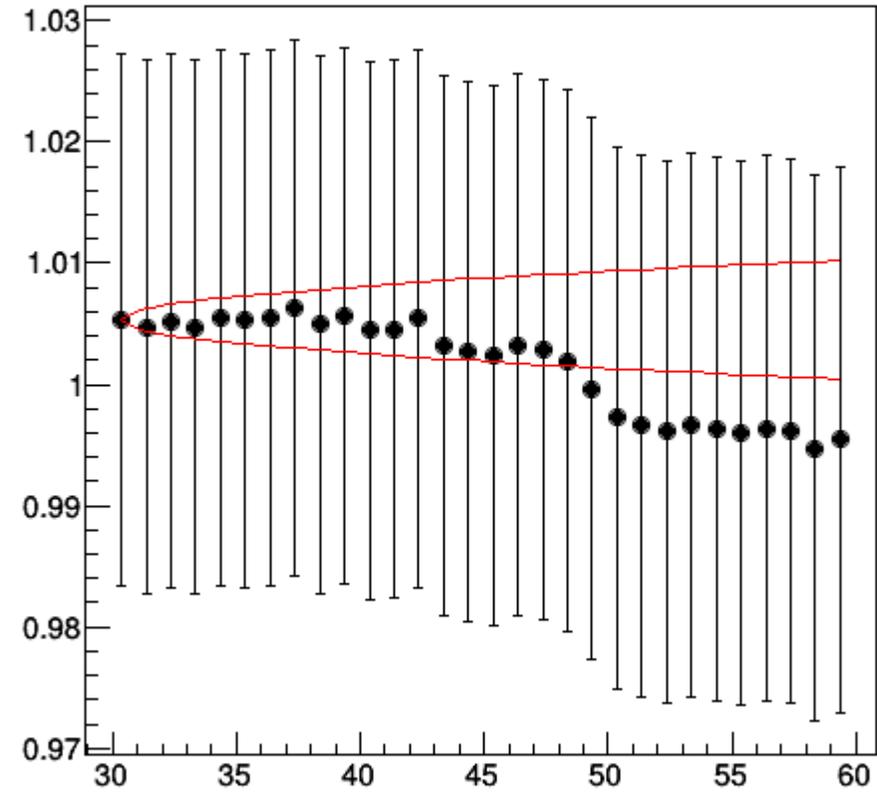


Start time scan

R

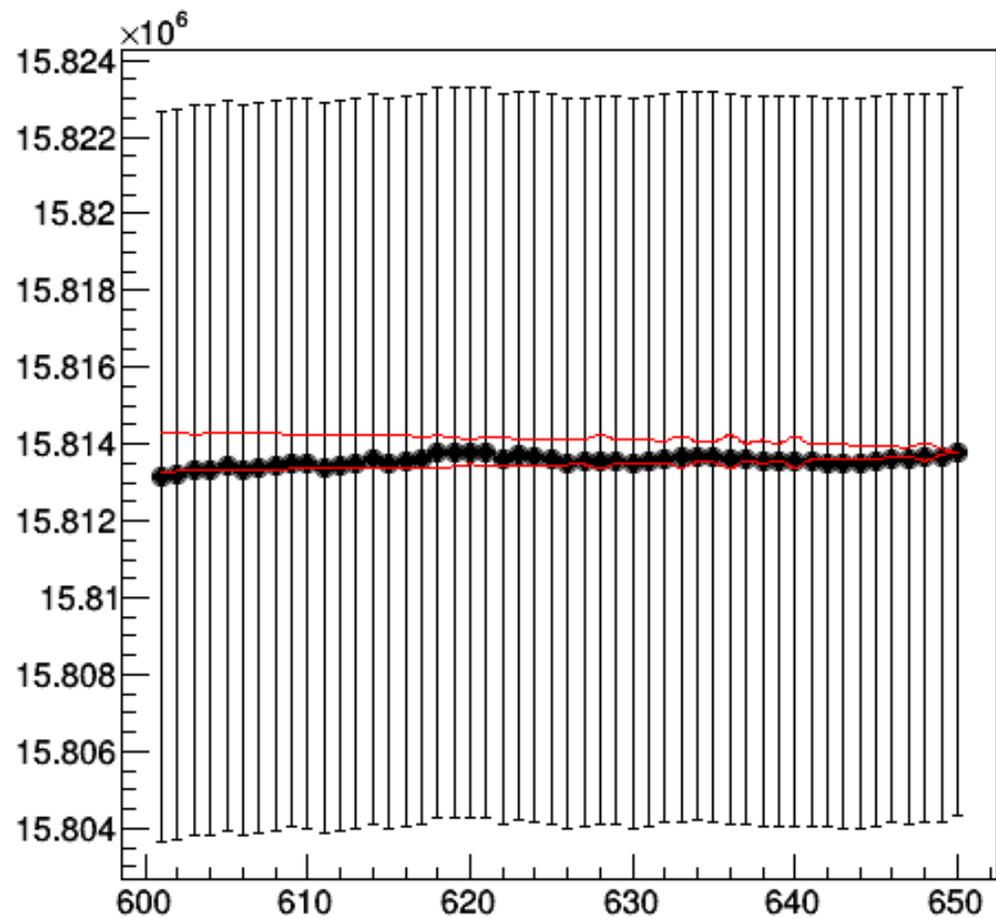


chi2/ndf

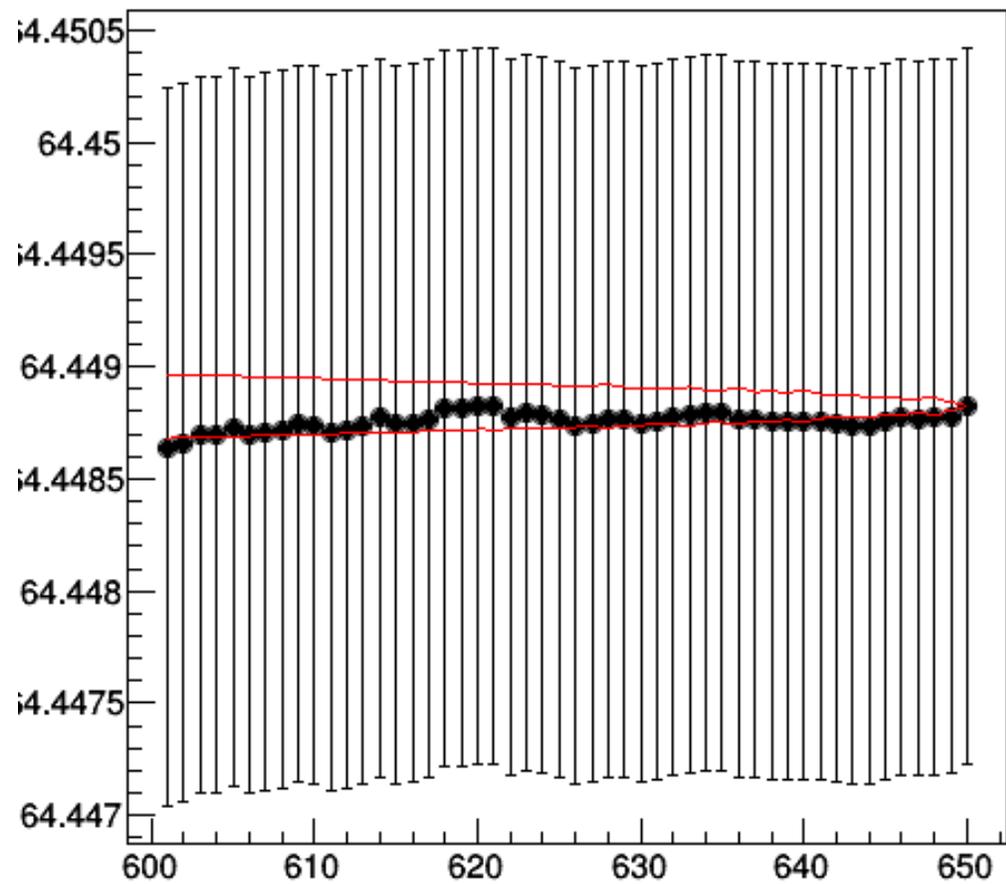


Endtime scan

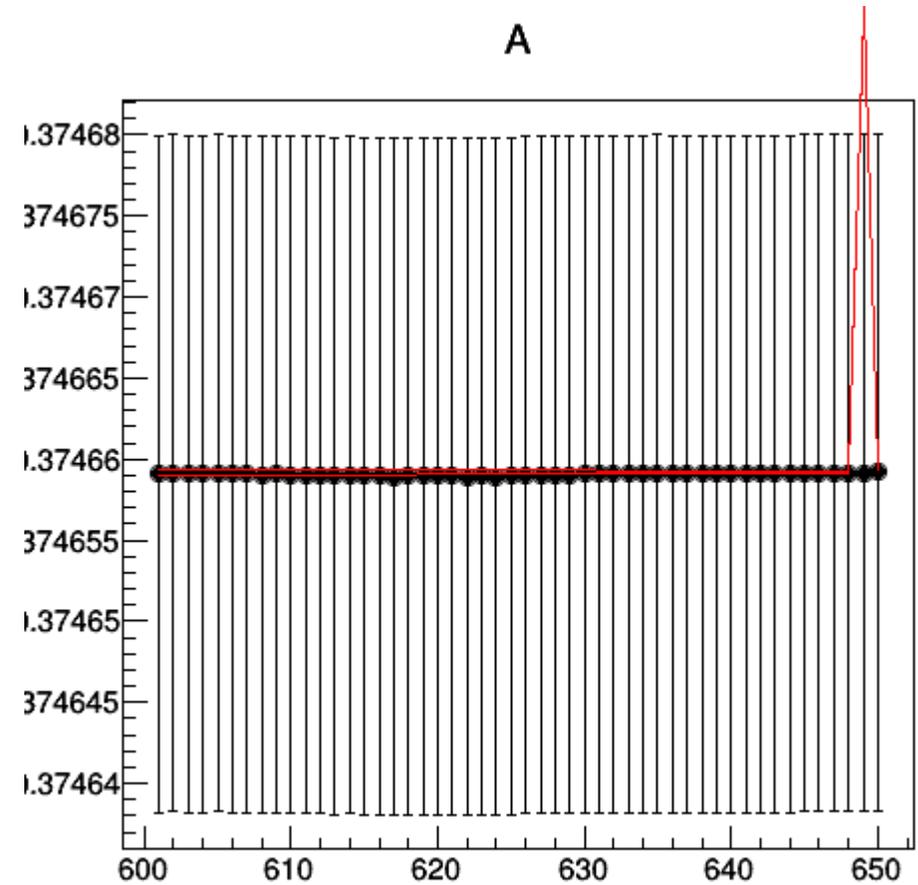
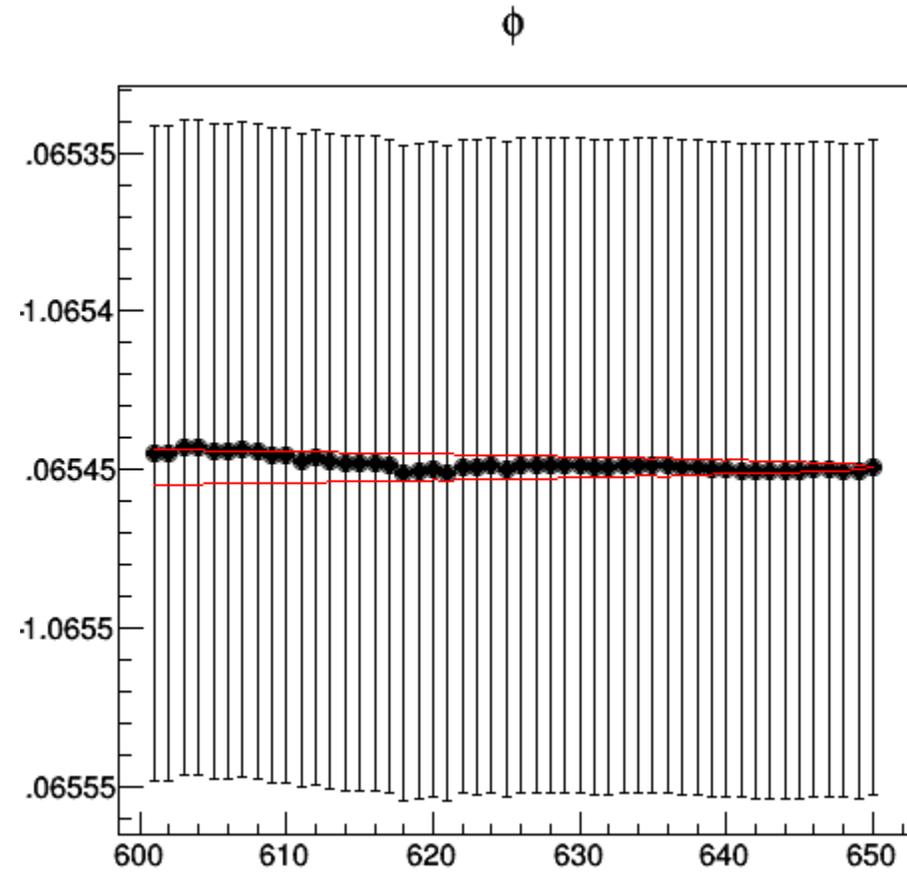
N



lifetime

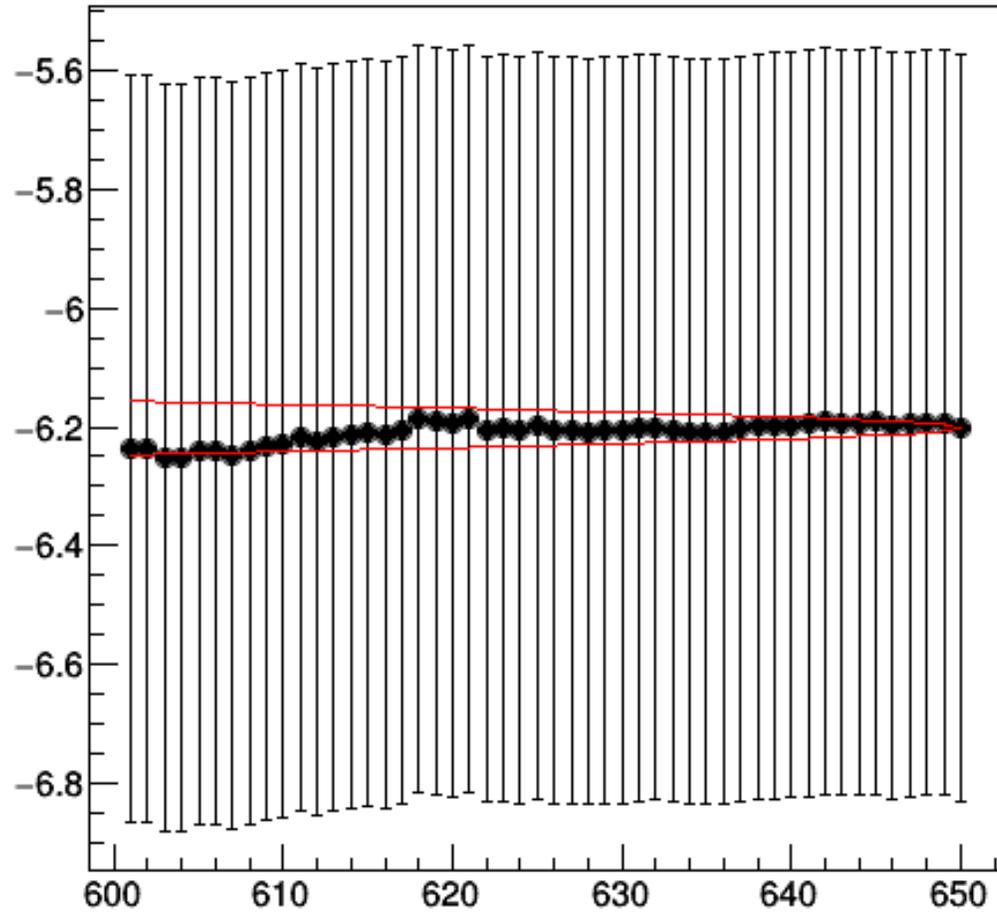


Endtime scan

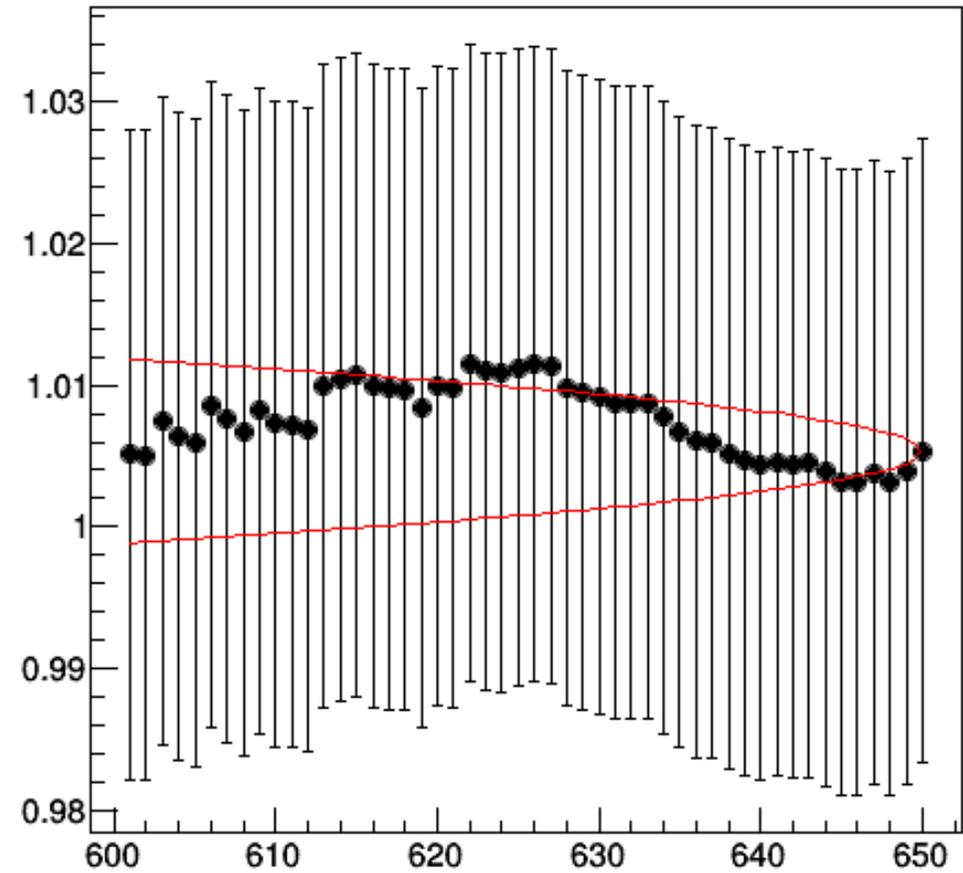


Endtime scan

R

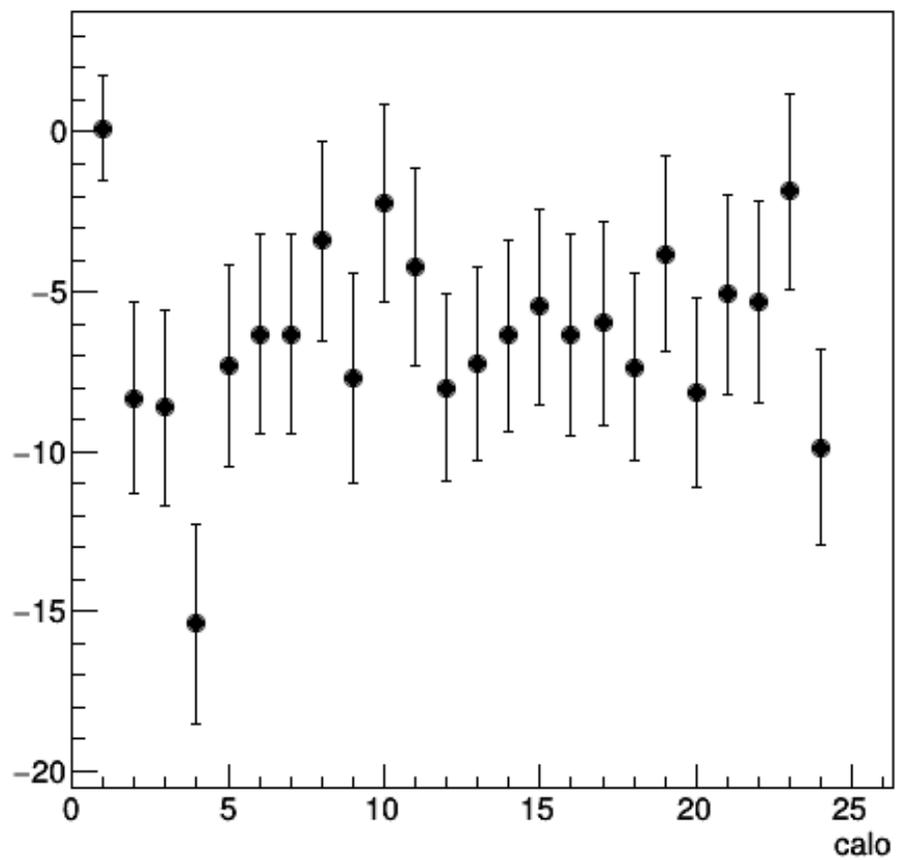


chi2/ndf

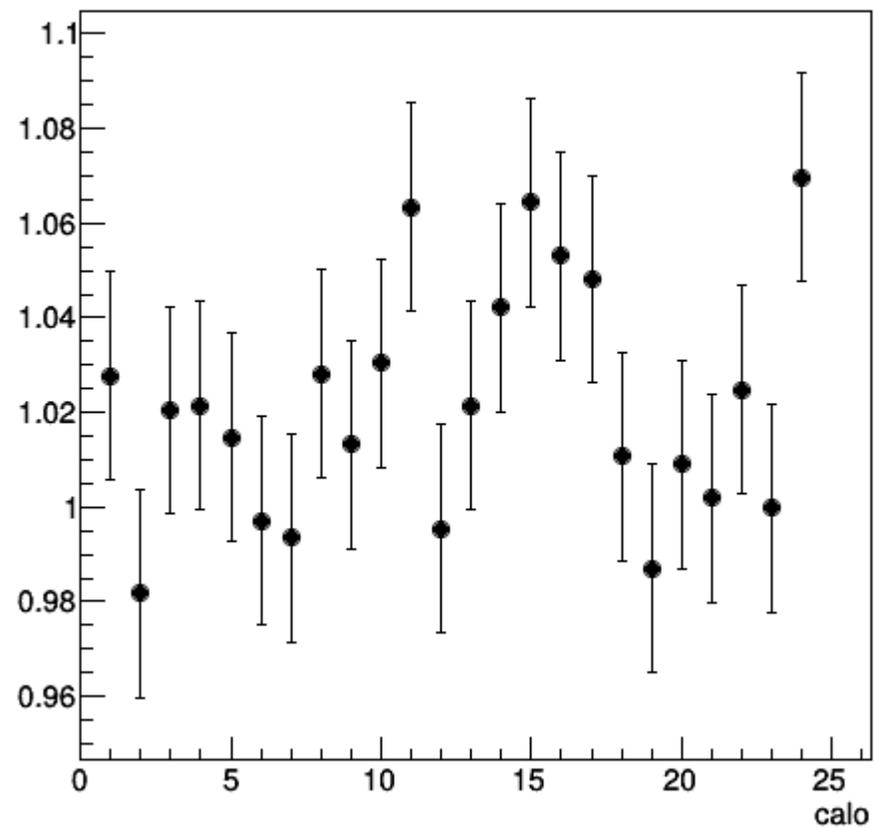


Calo by calo scan

R



chi2/ndf



Systematic Uncertainty: LM

	R value	R error	$\Delta R(\text{ppb})$
Quadruple Coincidence (120-220) Quadruple Coincidence (120--)	-6.20163 -6.19607	0.6269 0.6269	0.16 5.83
Double Coincidence (120-220) Double Coincidence (120--)	-6.20191 -6.19607	0.6269 0.6269	0.12 5.83
Triple Coincidence (120-220) Triple Coincidence (120--)	-6.20179 -6.19332	0.6269 0.6269	--- 8.47

Next

A .Systematic Uncertainty:

- *Pileup*
- *CBO*
- *VW*
- *Bin Size*
- *Random Seed*

B.Do gain correction

C.Do data production for Run2