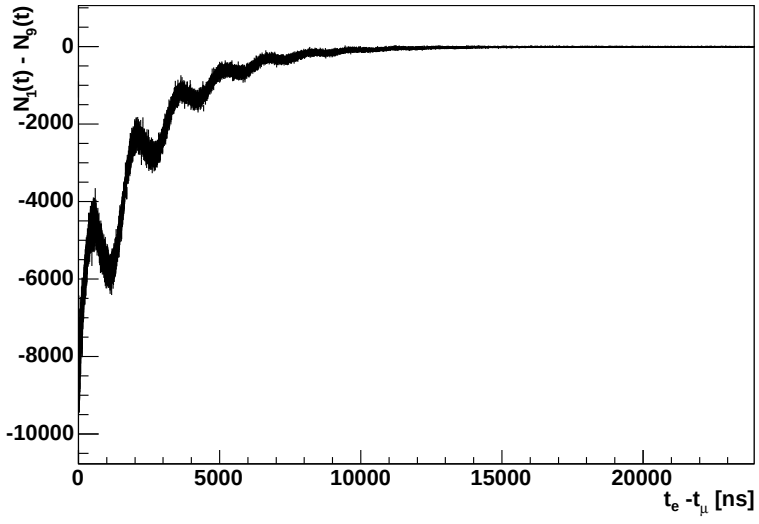
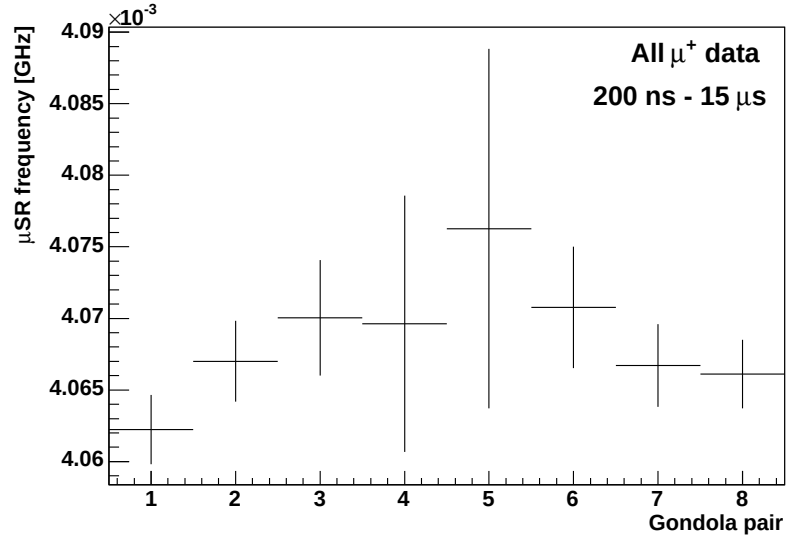
A snapshot of the μ^+ Analysis: Work in progress

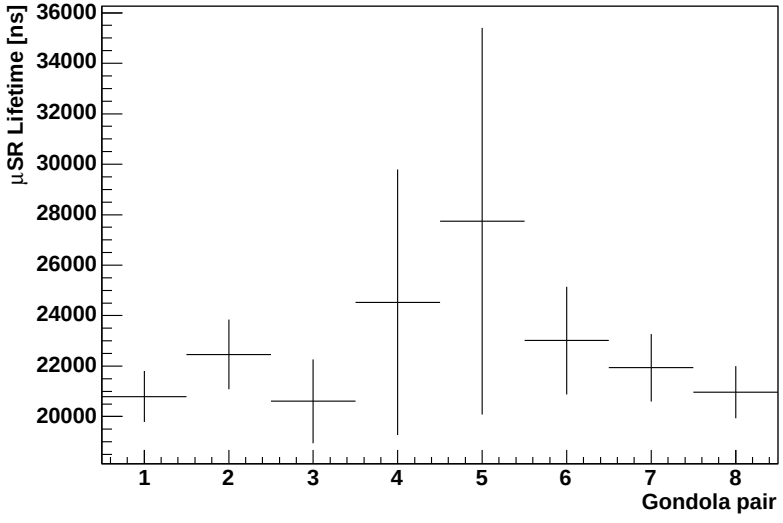
Fred Gray, University of California, Berkeley

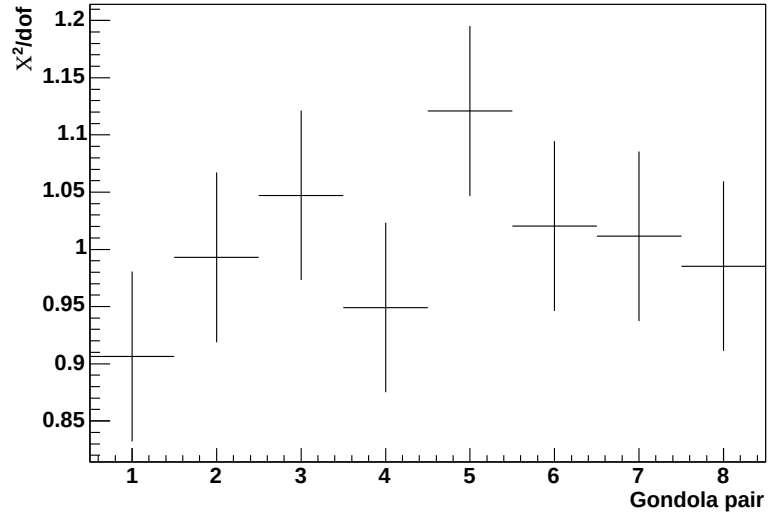
μCap collaboration meeting, Urbana, April 30-May 3, 2005

Fits to difference spectra

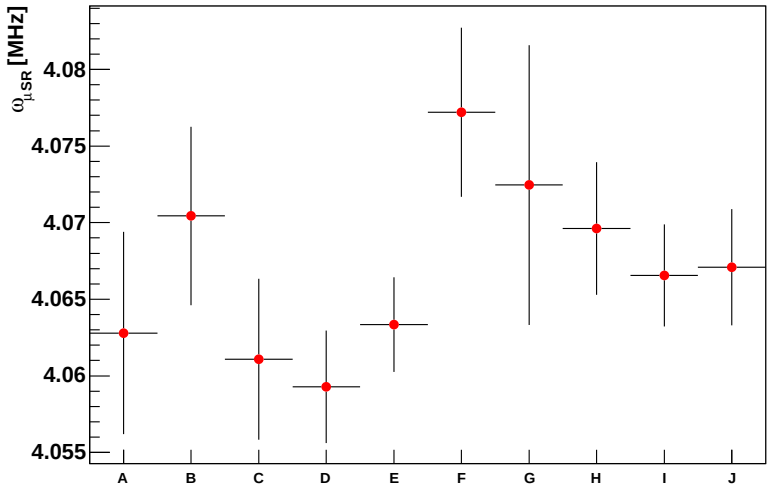


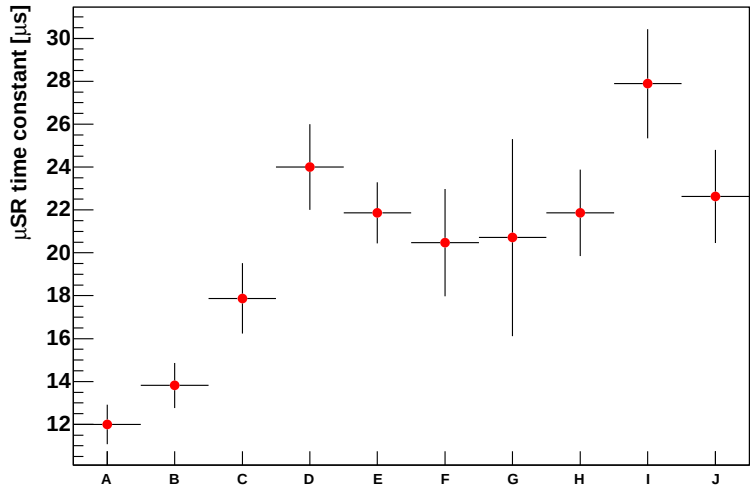


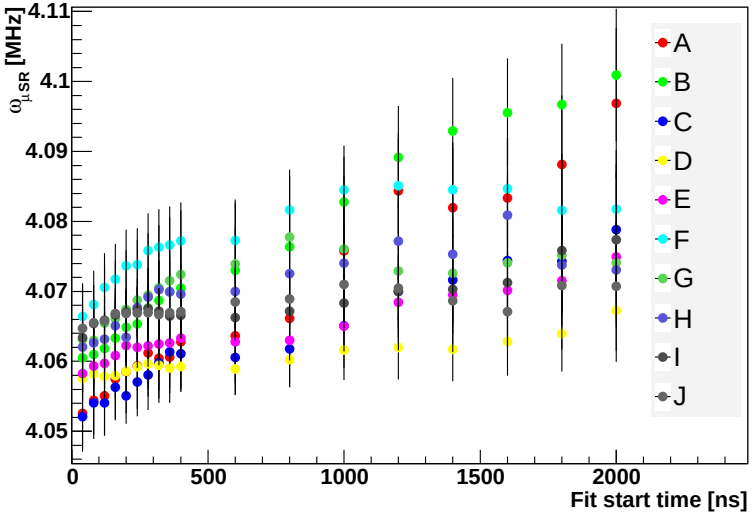


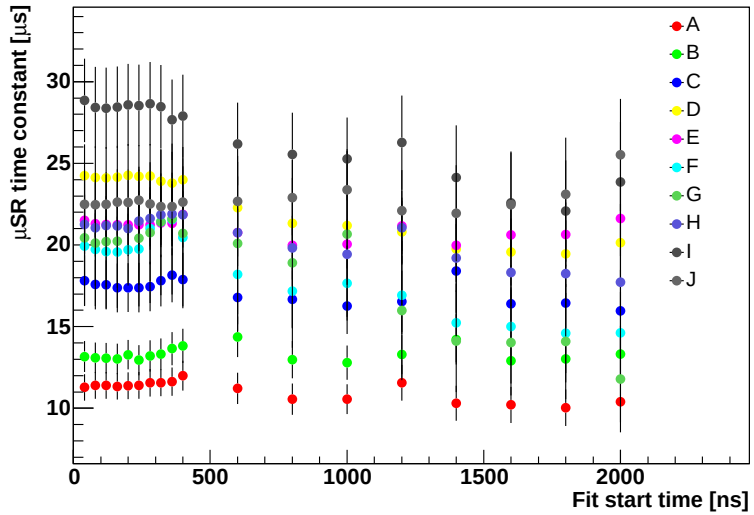


Data subsets: μSR

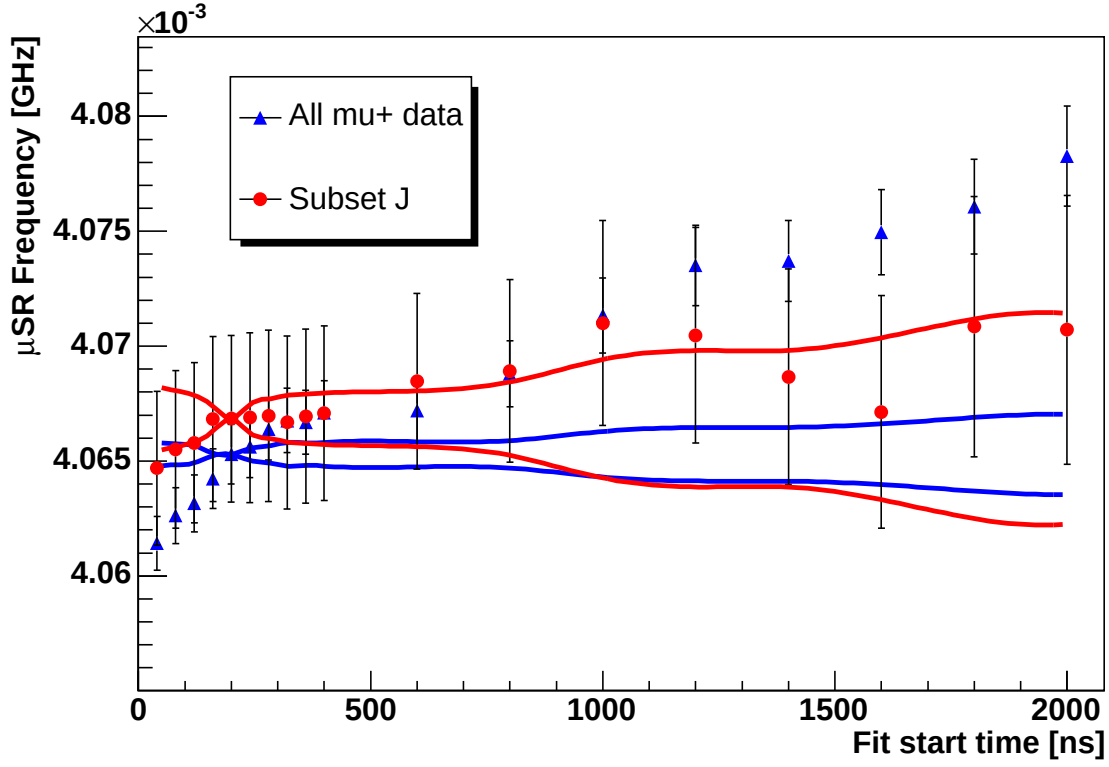






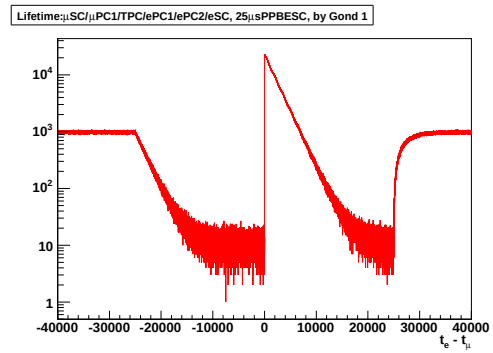


Stability of μSR parameters



- Mixing dissimilar data sets increases difficulty of describing μSR frequency/envelope

Fit function



$$f(t) = S(t - t_o) + B(t - t_o)$$

$$A_{\mu SR}(t) = e^{-t/\tau_{\mu SR}}(A_{\mu SR-C}\cos\omega_{\mu SR}t + A_{\mu SR-S}\sin\omega_{\mu SR}t)$$

$$T(t) = \frac{1}{2}\left[1 + \mathrm{erf}\left(\frac{t\tau - \sigma_t^2}{\sqrt{2}\sigma_t\tau}\right)\right]$$

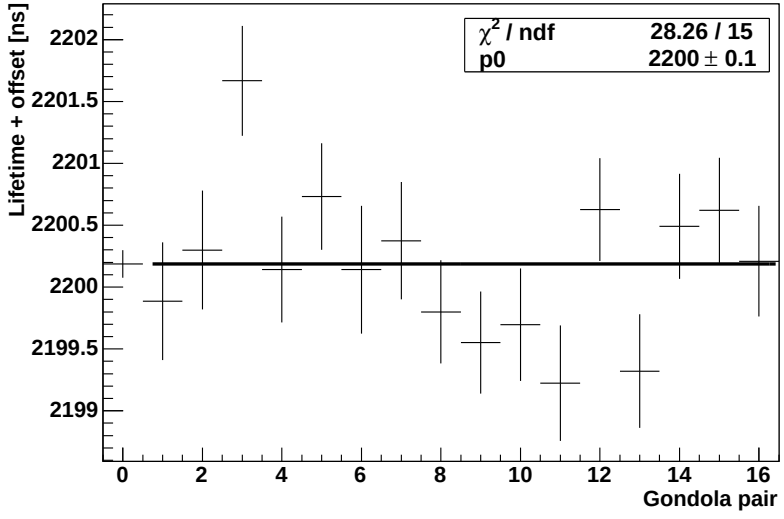
$$S(t) = e^{-t/\tau}[\frac{N}{\tau} - A_{\mu SR}(t)]T(t)$$

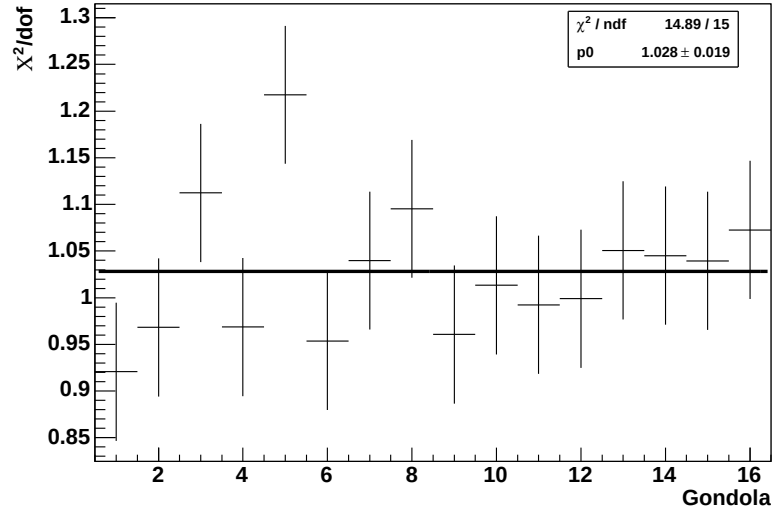
$$B(t) = \begin{cases} P + B, & t < -T_{PU} \\ Pe^{-(t+T_{PU})/\tau} + B, & -T_{PU} < t < T_{PU} \\ P(1 + e^{-(t+T_{PU})/\tau} - e^{-(t-T_{PU})/\tau}) + B(t), & t > T_{PU} \end{cases}$$

Primary changes from last year:

- Dropped 50 MHz terms (rebin by 32 for now)
- Fit $N = n\tau$ instead of simply n (reduced correlation)

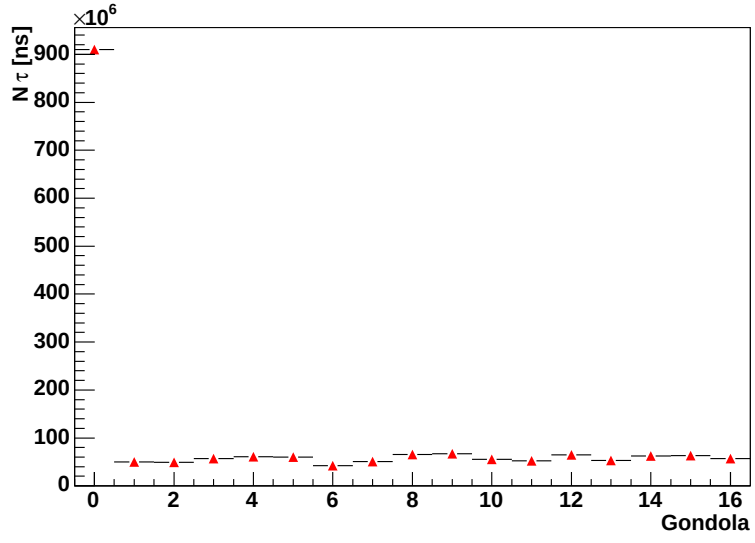
Parameters vs. gondola

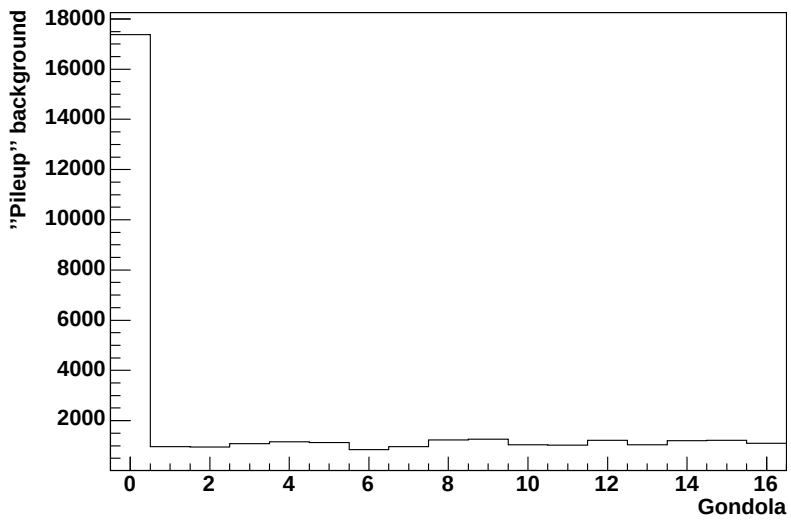


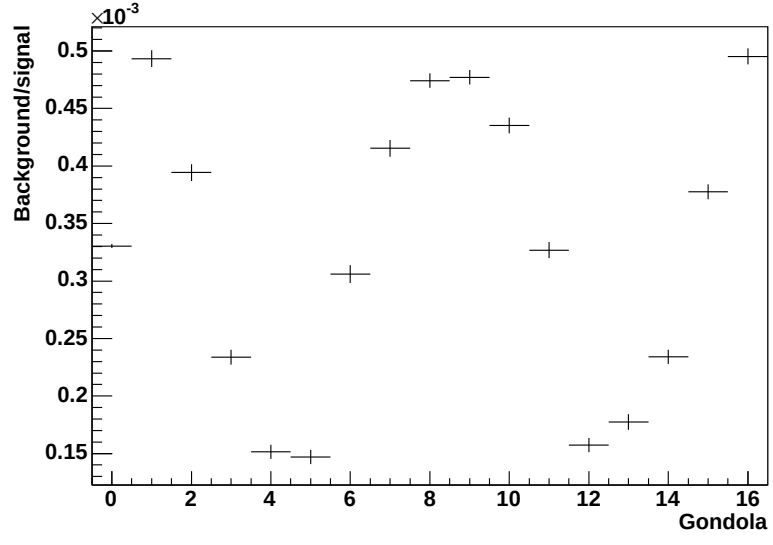


- Fit range: 200 ns - 15 μs
- Sum of all data

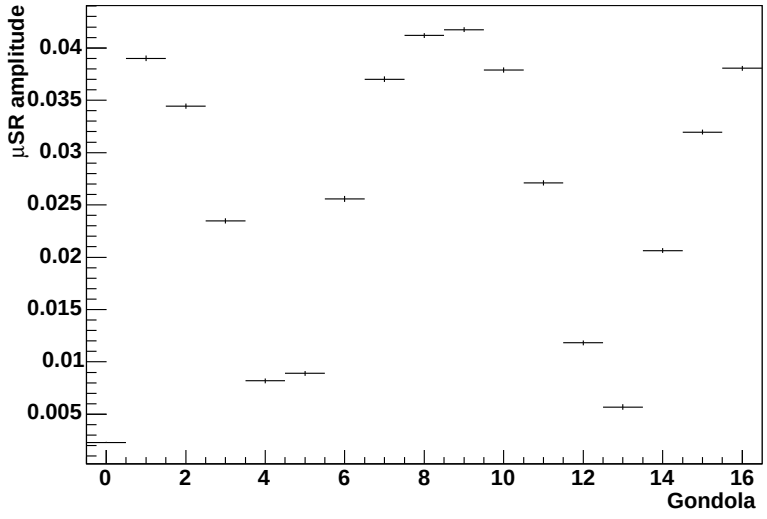
Parameters vs. gondola

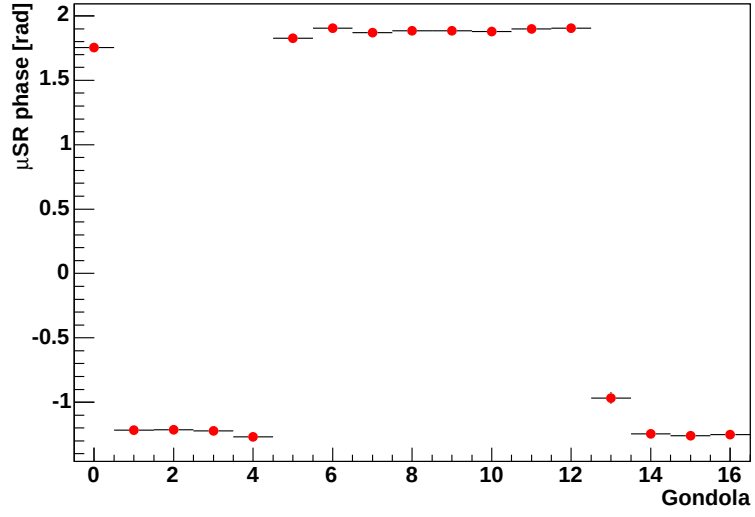


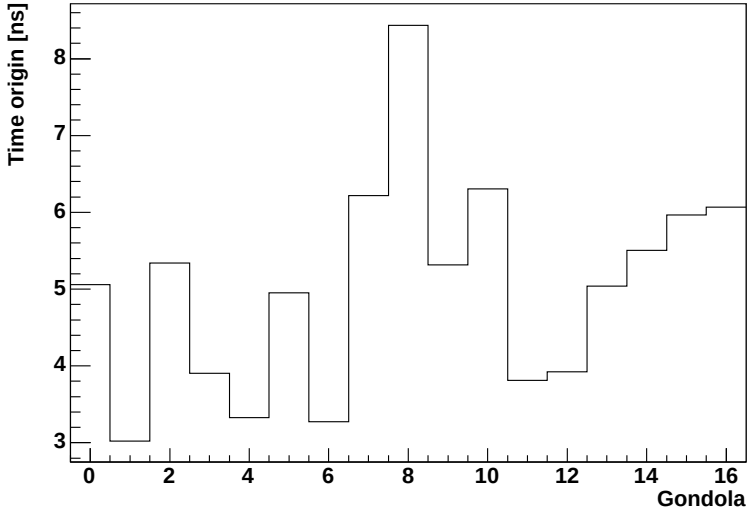


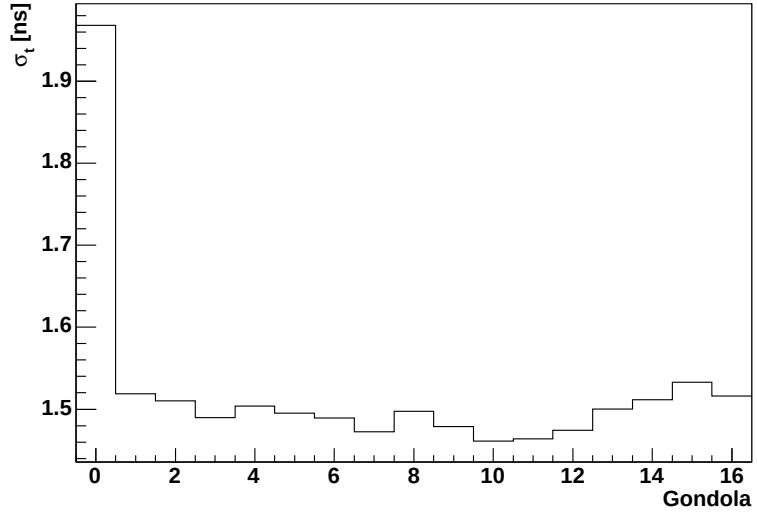


Parameters vs. gondola

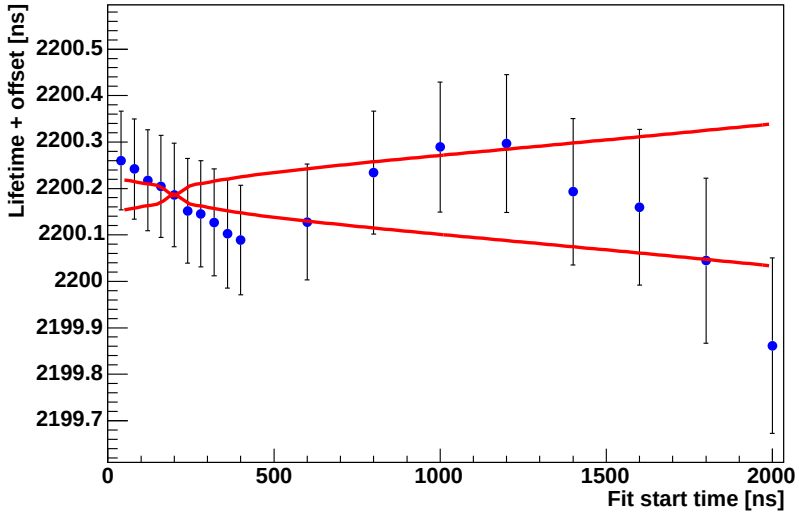


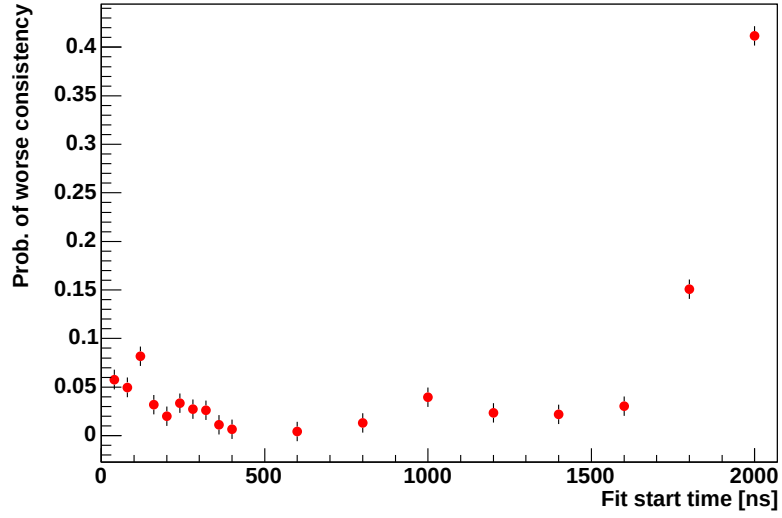


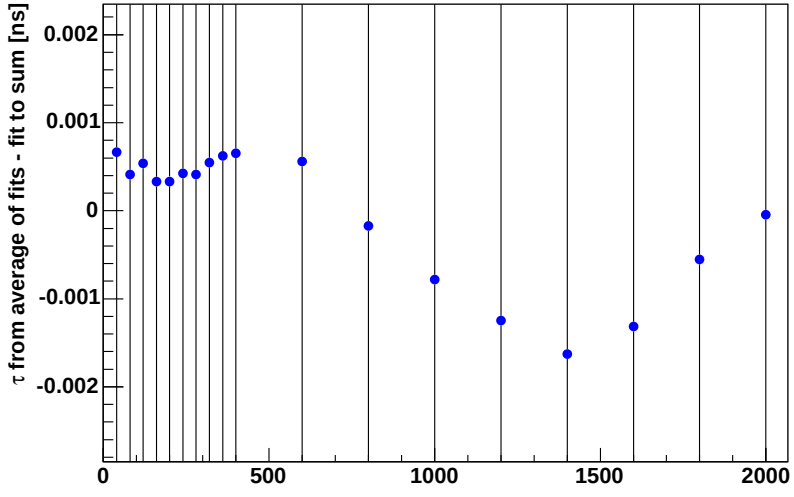




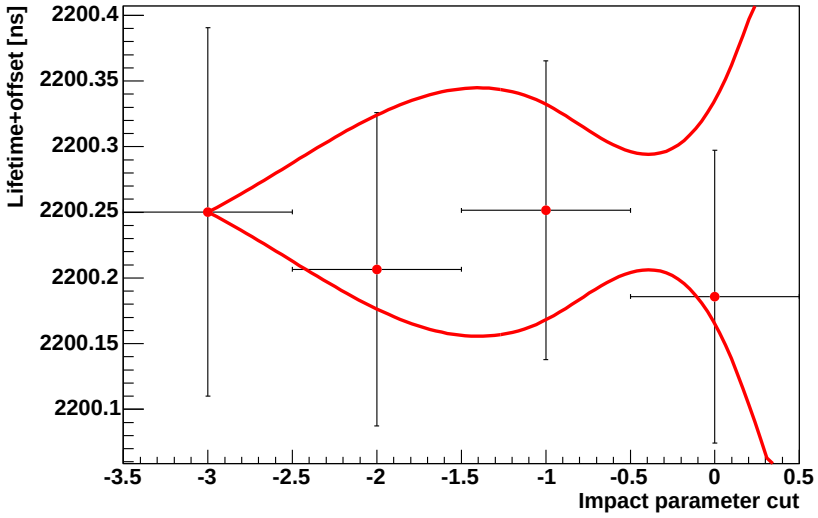
Fit consistency vs. start time

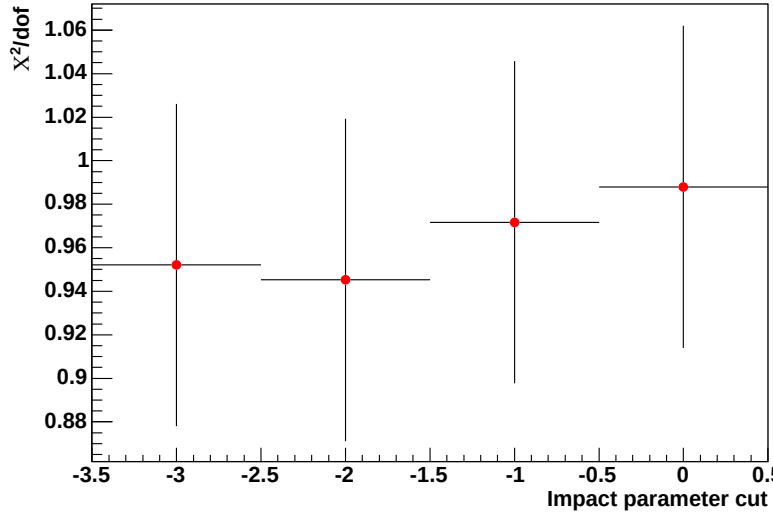


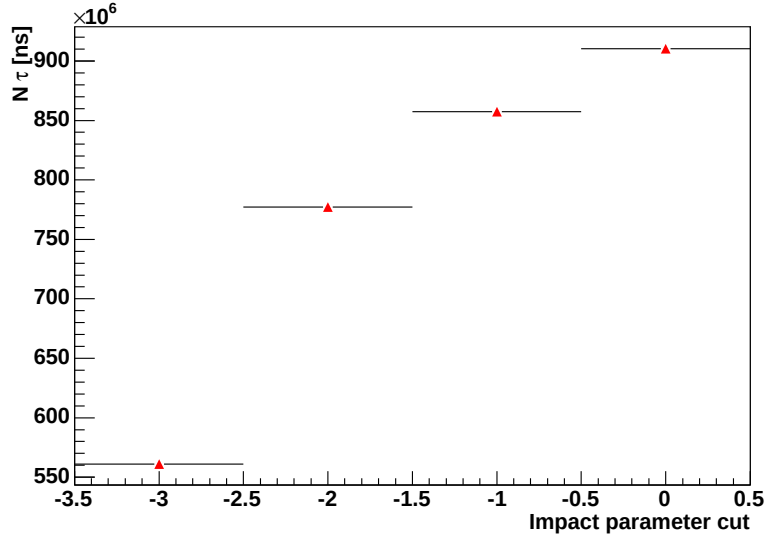




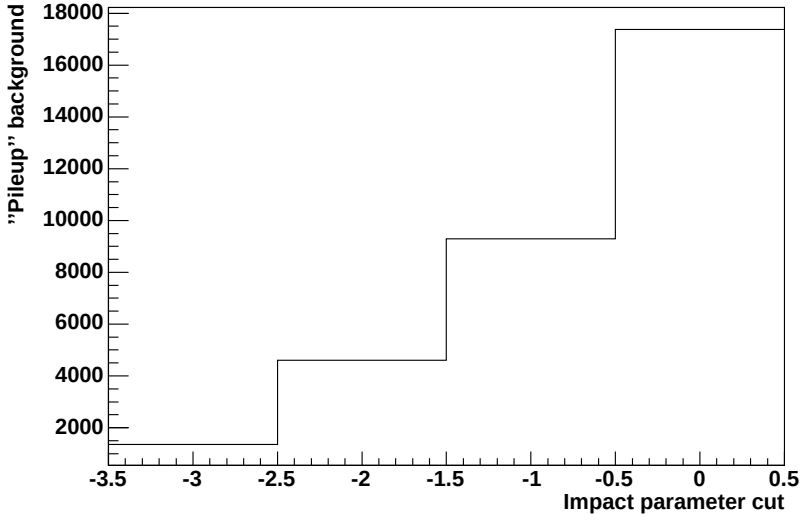
Impact parameter cuts

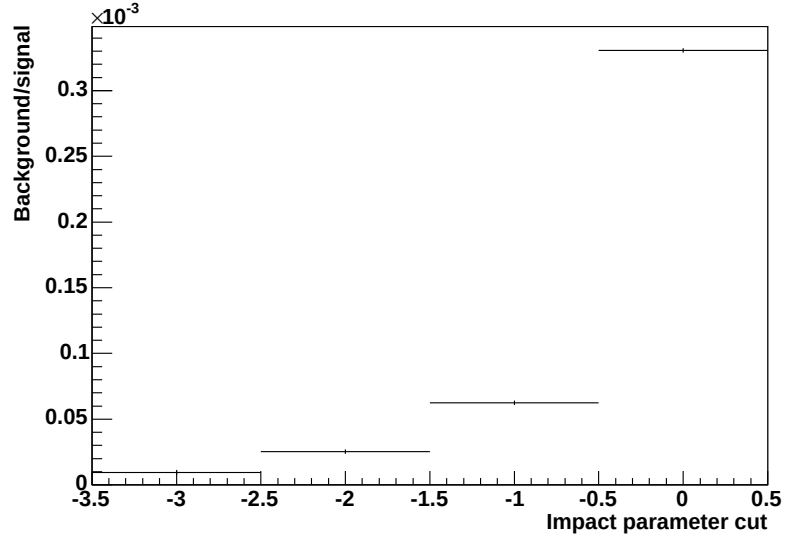


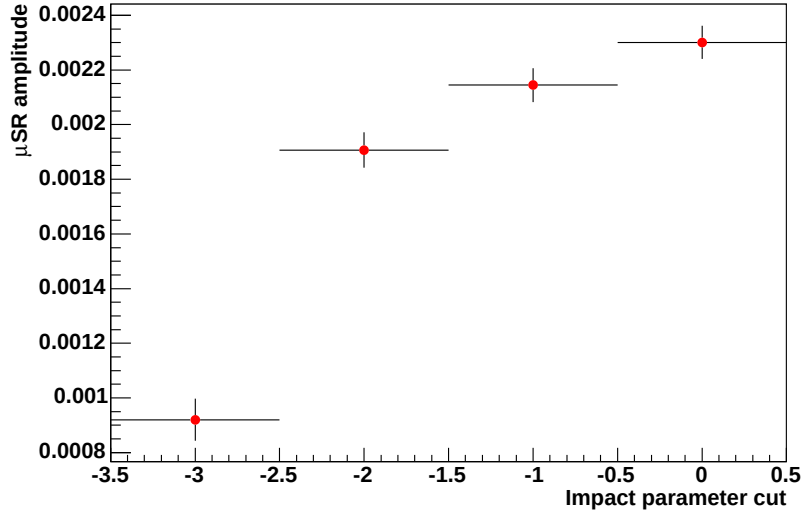


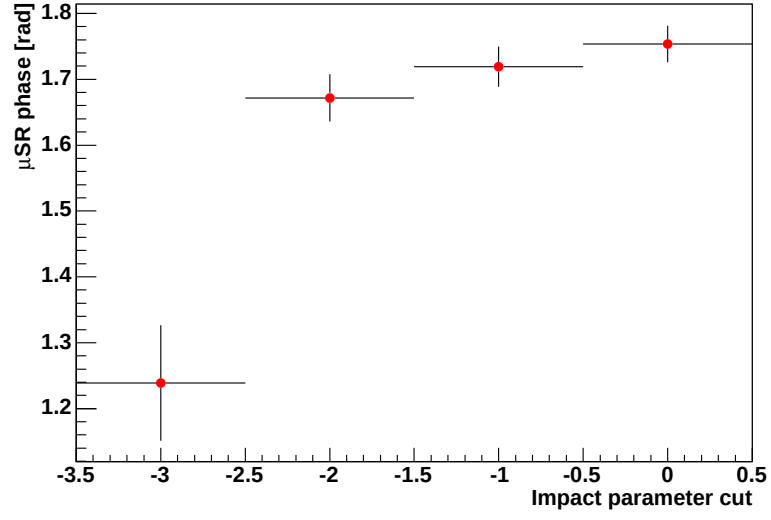


Impact parameter cuts

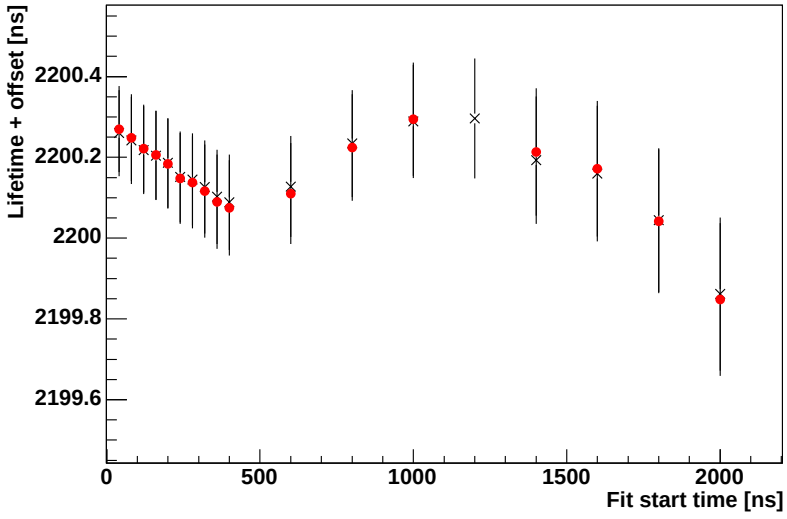


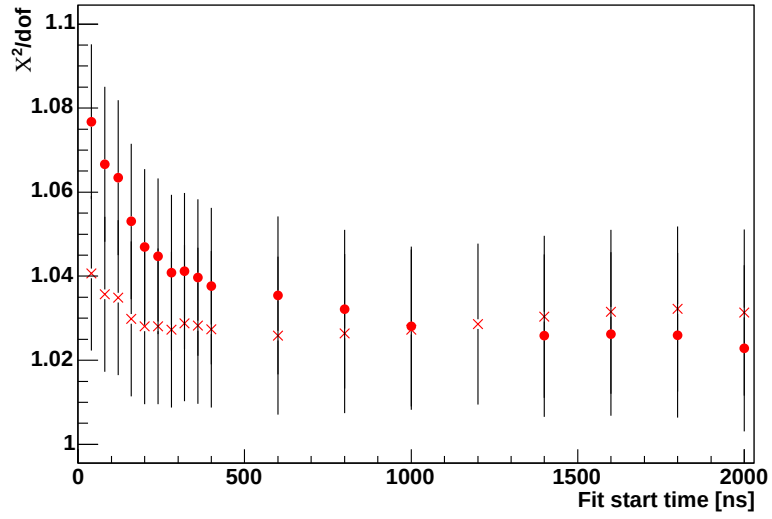




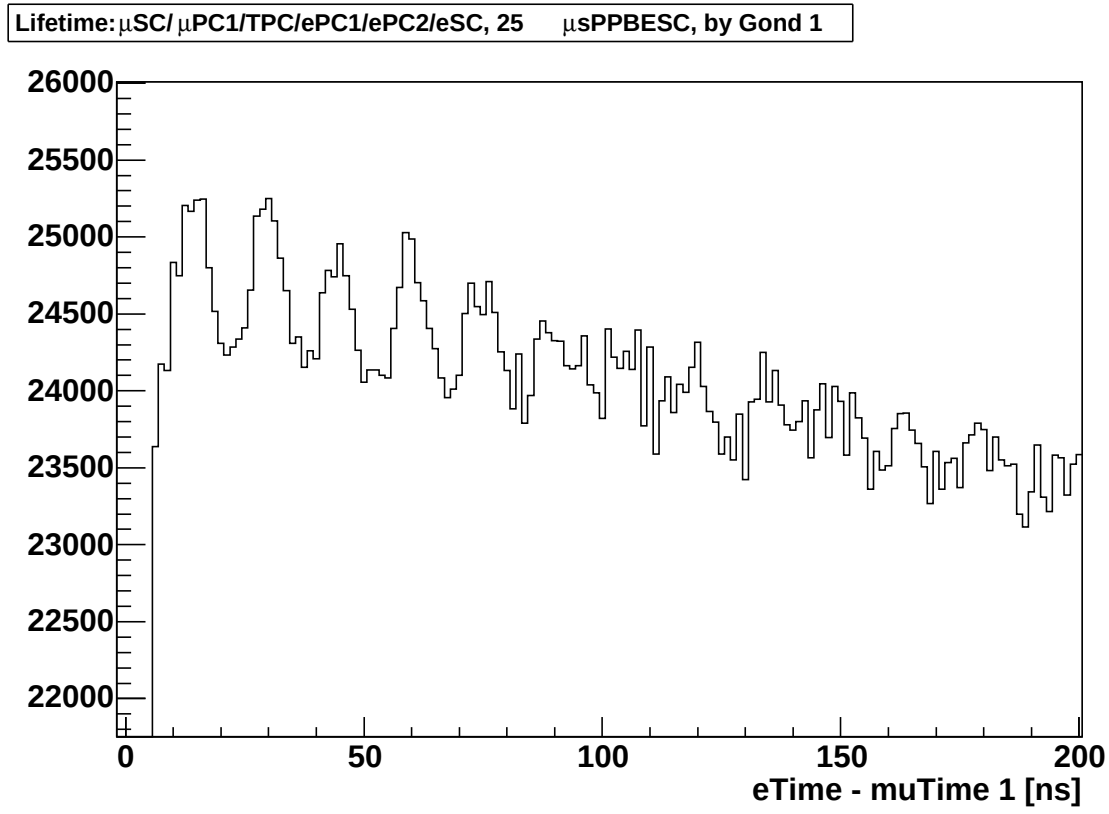


Uncertainty from μSR envelope



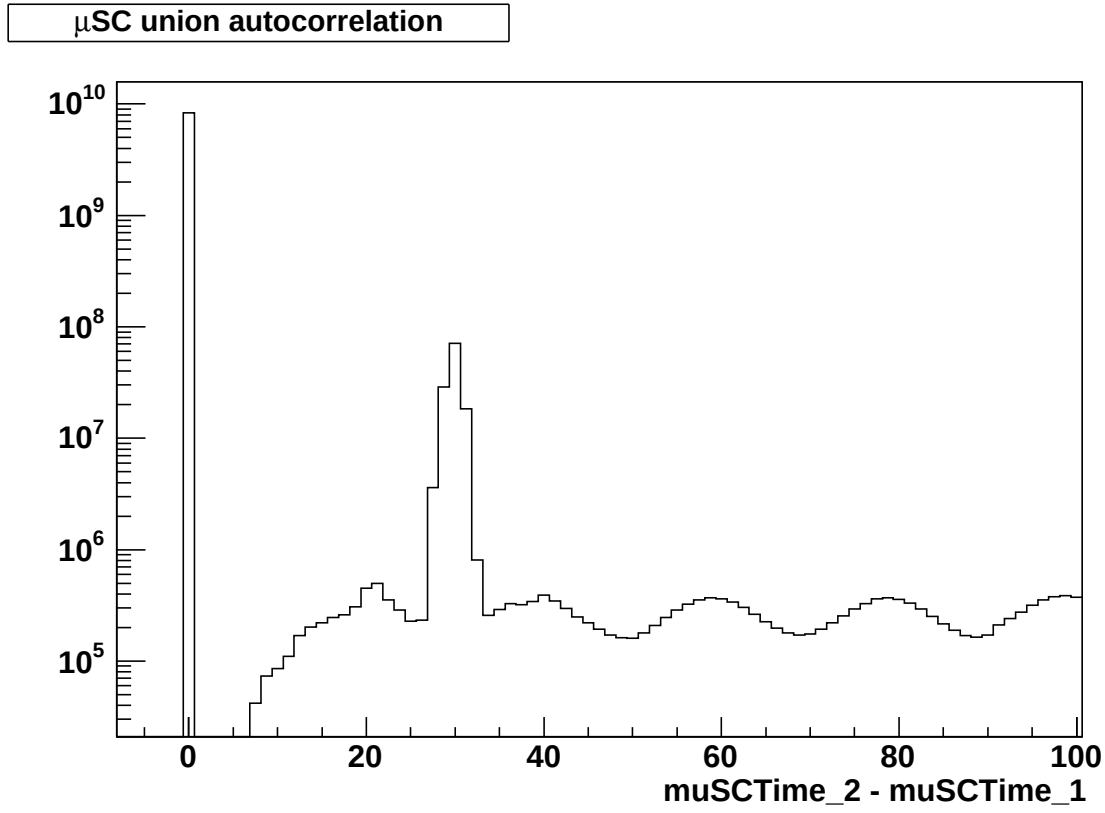


Early-time oscillations



- To this point: rebin and ignore
- Plan: double-check frequencies, quantify effect by shifting rebin interval

Pileup veto inefficiency



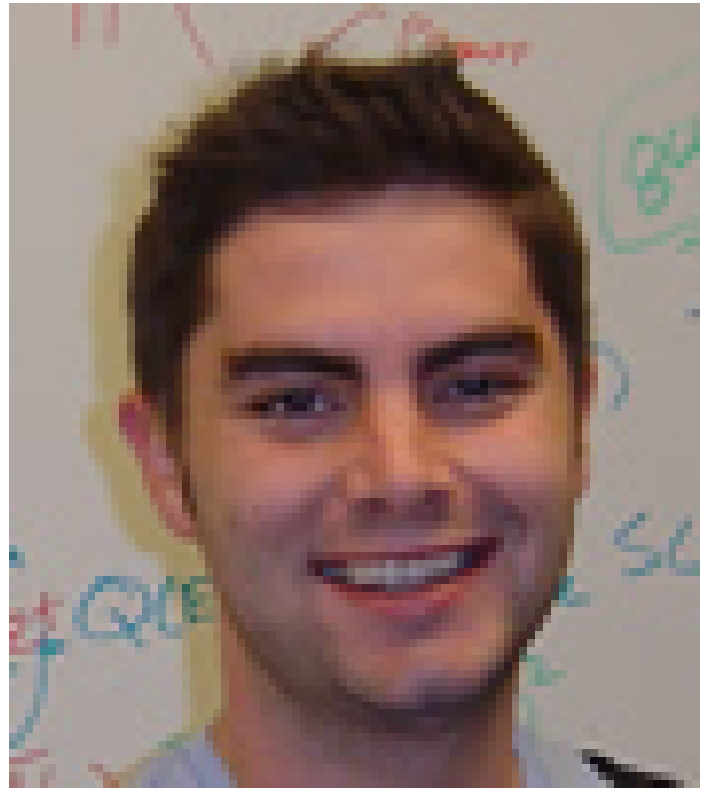
- 1.2×10^{-4} per muon probability of undetected pileup

Systematics to be evaluated

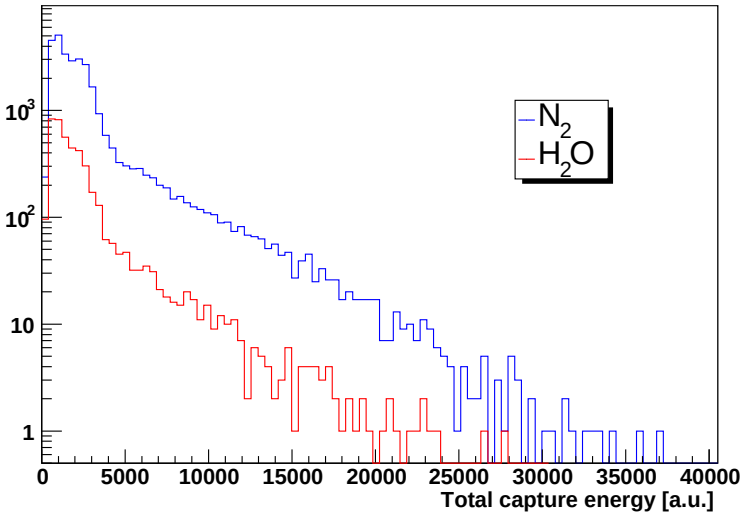
- Uncertainty in muSR frequency/envelope
- “50 MHz” oscillations (CAEN artifacts, etc.)
- Beam RF structure
- Muon pileup veto inefficiency

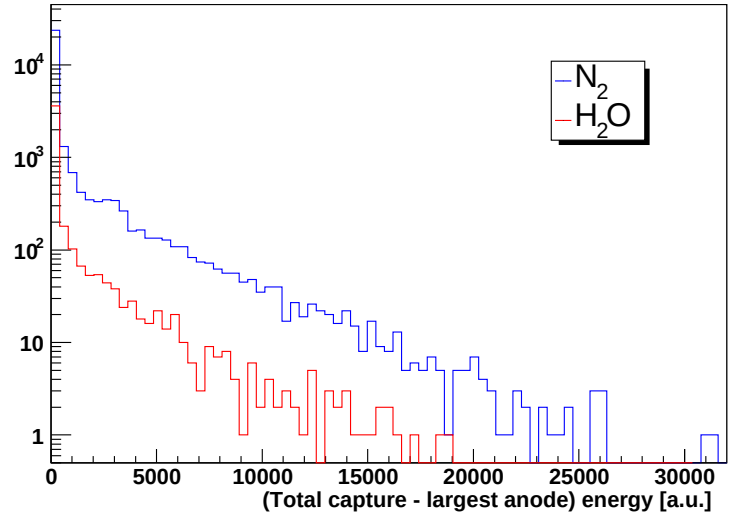
FADC data

- Insert Jordan's talk here.



FADC data


10^3
10^2
10
1
0
5000
10000
15000
20000
25000
30000
35000
40000
Total capture energy [a.u.]
N_2
H_2O


10^4
10^3
10^2
10
1
0
5000
10000
15000
20000
25000
30000
(Total capture - largest anode) energy [a.u.]
N_2
H_2O