

# Transmission analysis update

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# Experiments analyzed

- TCN17020: Characterizing He3 detector
- TCN17022: UGD01 - SS guide offsite polished
- ~~• TCN17024: UGD02 - SS guide offsite polished~~
- TCN17027: UGD03 - SS guide from UWpg
- TCN17028: Rotary valve experiments
- TCN17028a: Leakage in rotary valve
- TCN17030: Cu 90 degree bend

# How transmission was analyzed

- TCN17020 experiment was used to get a “zero” reading.
- A ratio of UCN counts in the He3 Detector vs the Li6 Detector was measured.
- He3 position doesn't change.
- The difference in the ratio of different geometries gives the transmission.

# Weights

- There were many runs of each experiment and many cycles in each run.
- For each run the weighted mean of each cycle was taken using the error as the weights (~ **total counts in Li6 detector in each cycle**)

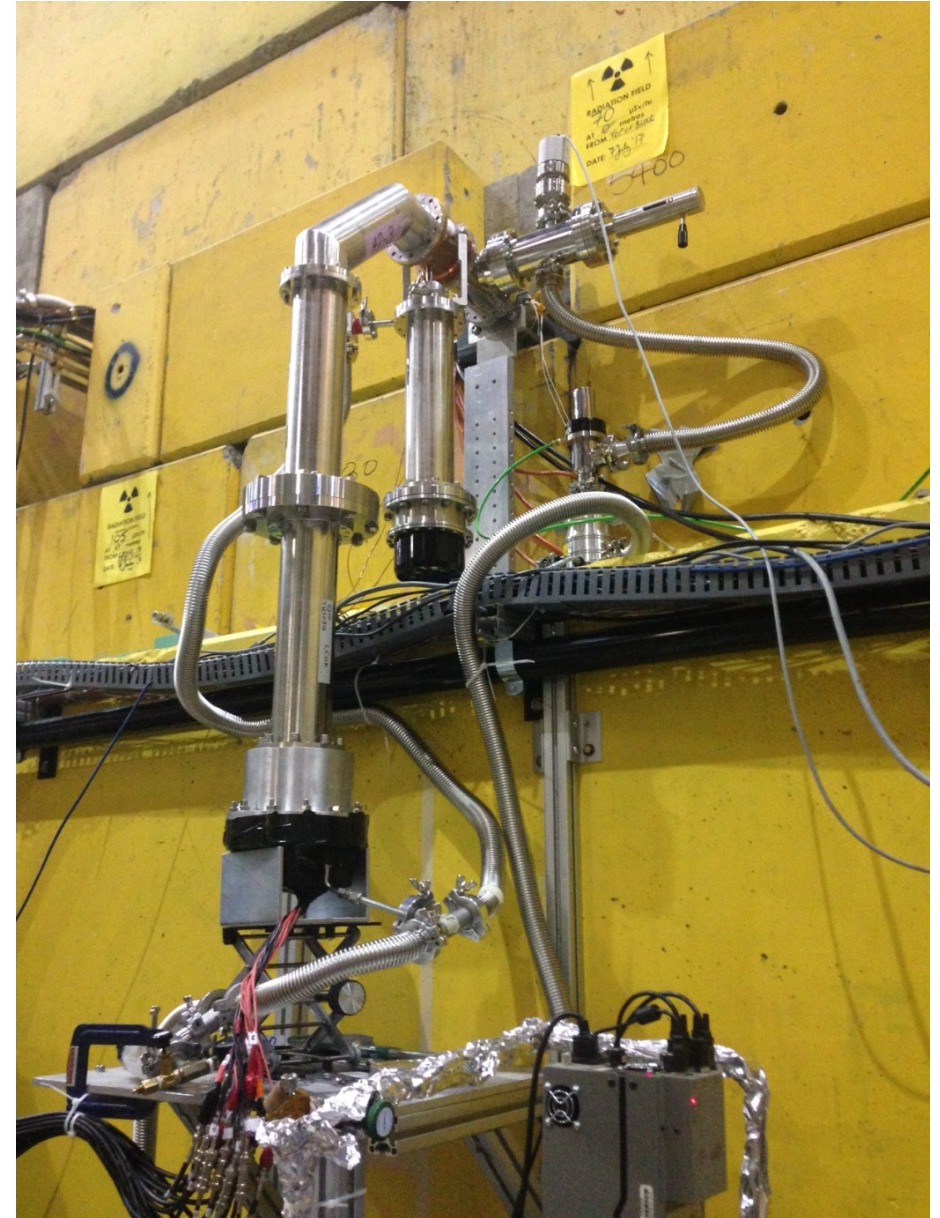
$$\bar{x} = \frac{\sum_{i=1}^n (x_i \sigma_i^{-2})}{\sum_{i=1}^n \sigma_i^{-2}},$$

$$\sigma_{\bar{x}} = \sqrt{\frac{1}{\sum_{i=1}^n \sigma_i^{-2}}},$$

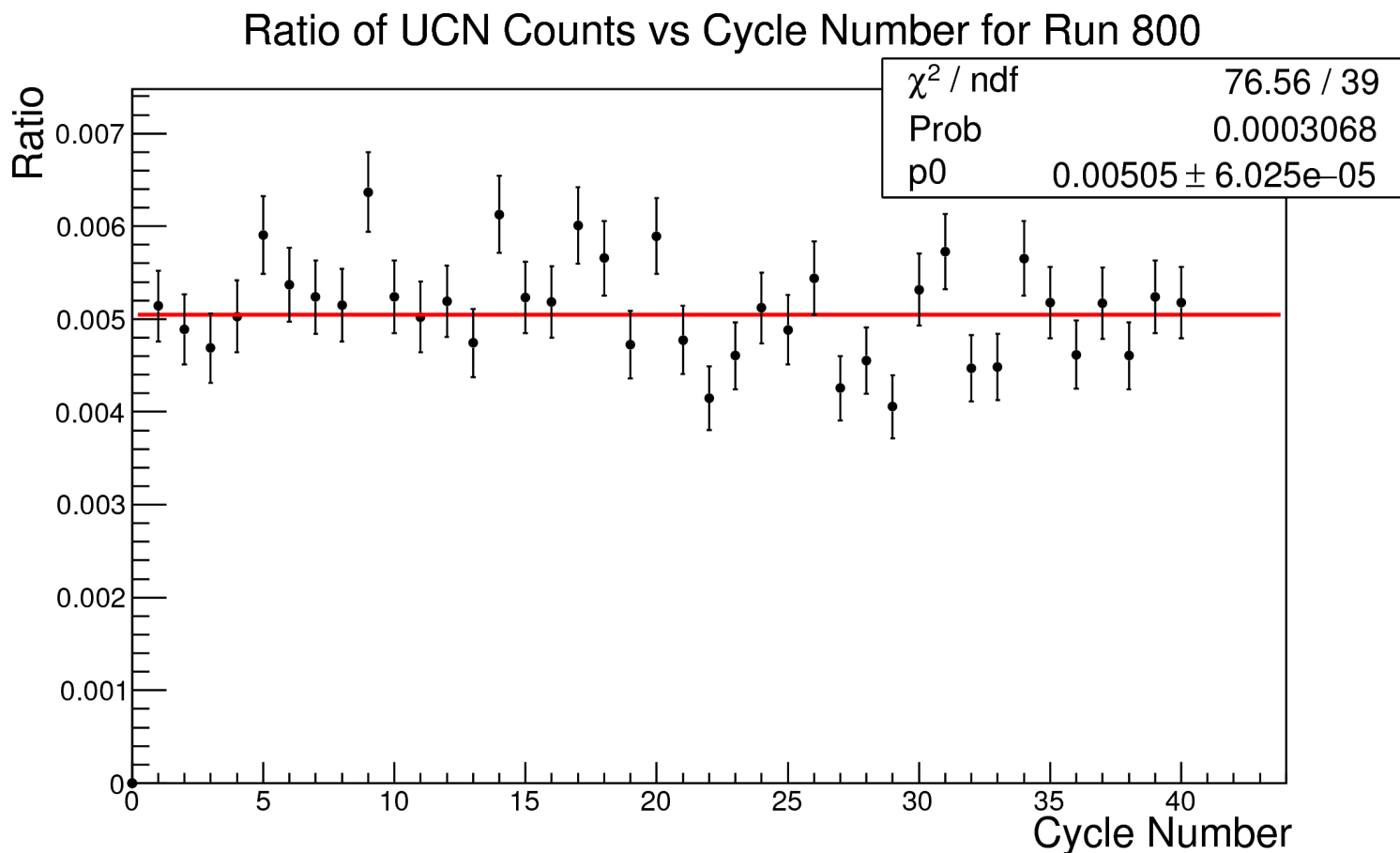
- The weighted mean for all the runs was taken for each experiment.

# TCN17020: Characterizing He3 detector

- Midas runs 799, 800, 801, 802
- Runs 801, 802 had lower beam currents but the ratio of counts between the two detector was the same.



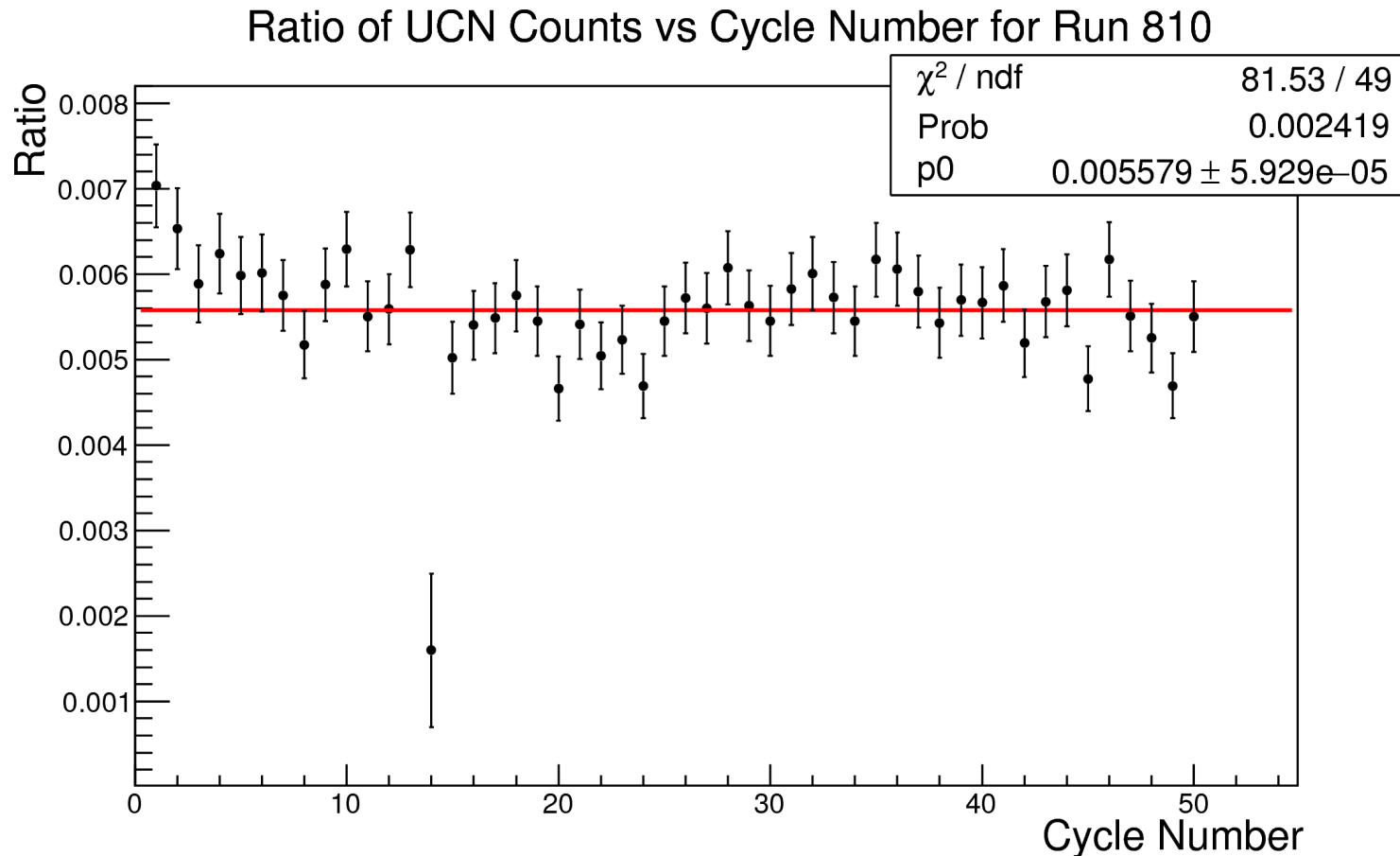
# TCN17020: Characterizing He3 detector



# TCN17020: Characterizing He3 detector

- The weighted mean of the ratio of counts of the runs was calculated to be  
 $4.96\text{E-}03 \pm 9.97\text{E-}05$

# TCN17022: UGD01 - SS guide offsite polished



Again, the weighted mean of all runs was calculated and found to be  $5.52E-03 \pm 1.02E-04$

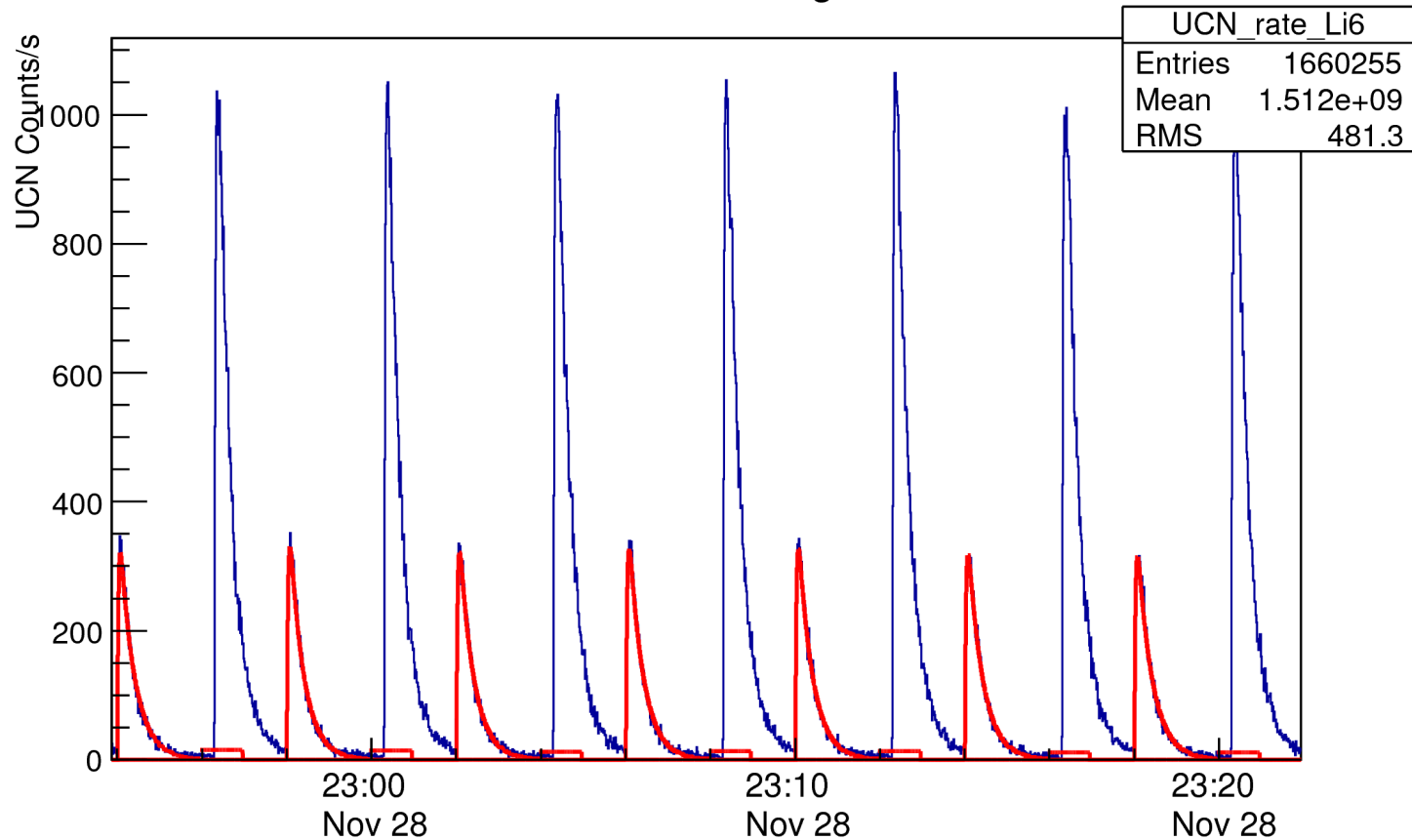


# TCN17024: UGD02 - SS guide offsite polished

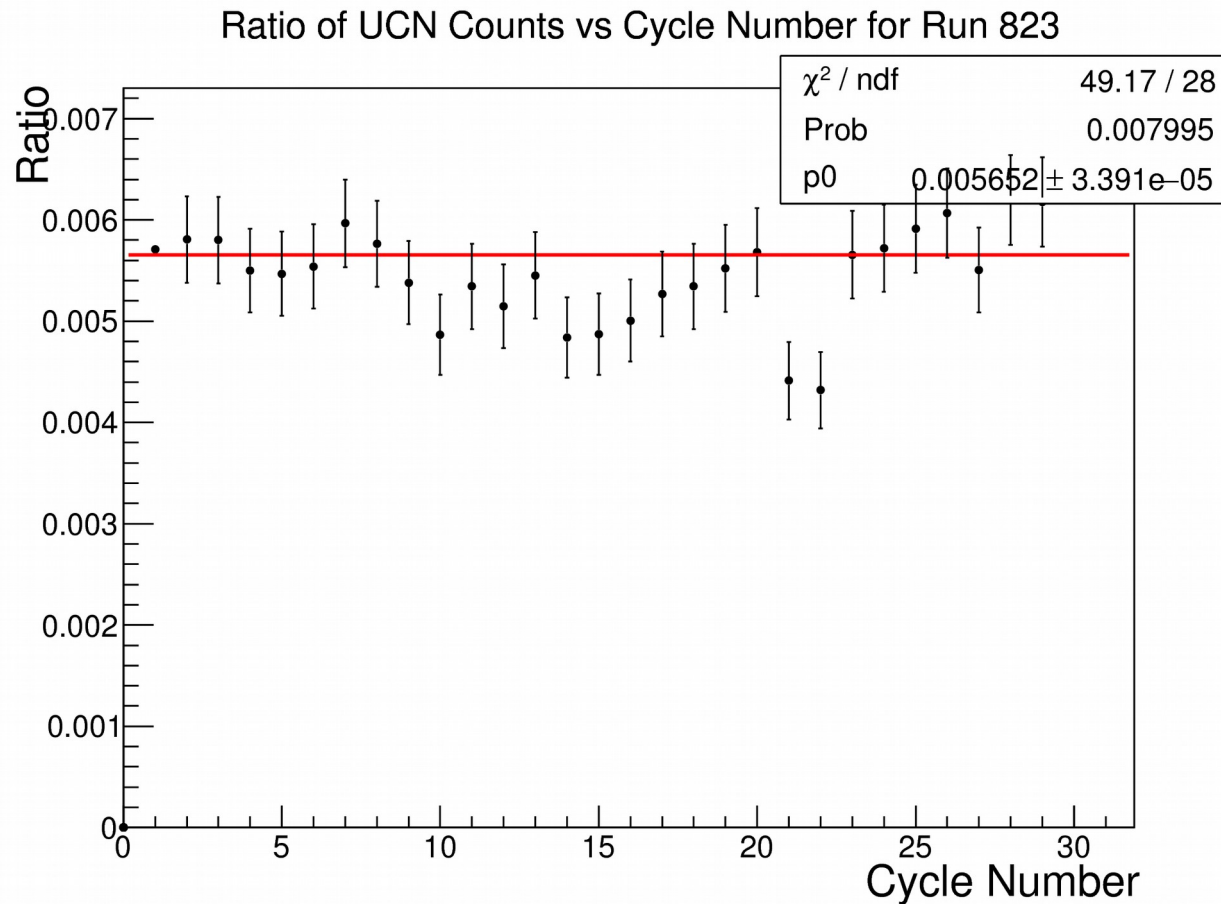
- There appears to be timing issues with the MIDAS run data (shown on next slide).
- It might be possible to integrate over the double peaks to get the total number of UCN counts per cycle in the Li6 detector.
- Only one run was done for this experiment and it was unusable at this time.

# TCN17024: UGD02 - SS guide offsite polished

UCN-rate Histogram



# TCN17027: UGD03 - SS guide from UWpg



Again, the weighted mean of all runs was calculated and found to be  $5.50E-03 \pm 1.76E-05$

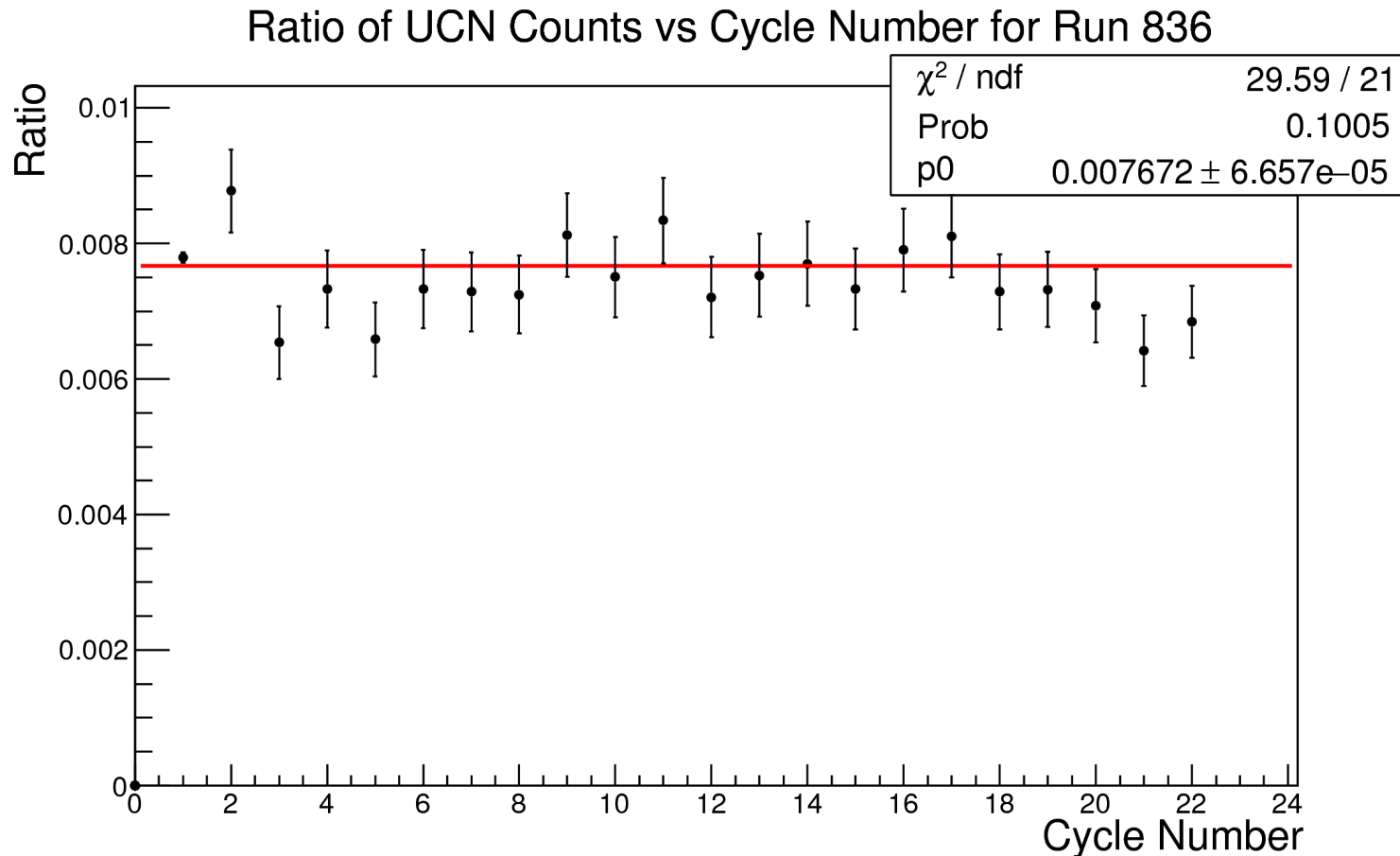
# TCN17030: Cu 90 degree bend



# TCN17030: Cu 90 degree bend

- MIDAS Runs 835, 836, 837
- Run 837 was an empty MIDAS run and gave no data. Not sure what happened.
- Run 835 MIDAS data had double counting for the last few cycles. They were excluded for now. The first 34 cycles gave a good fit.
- Run 836 was good.

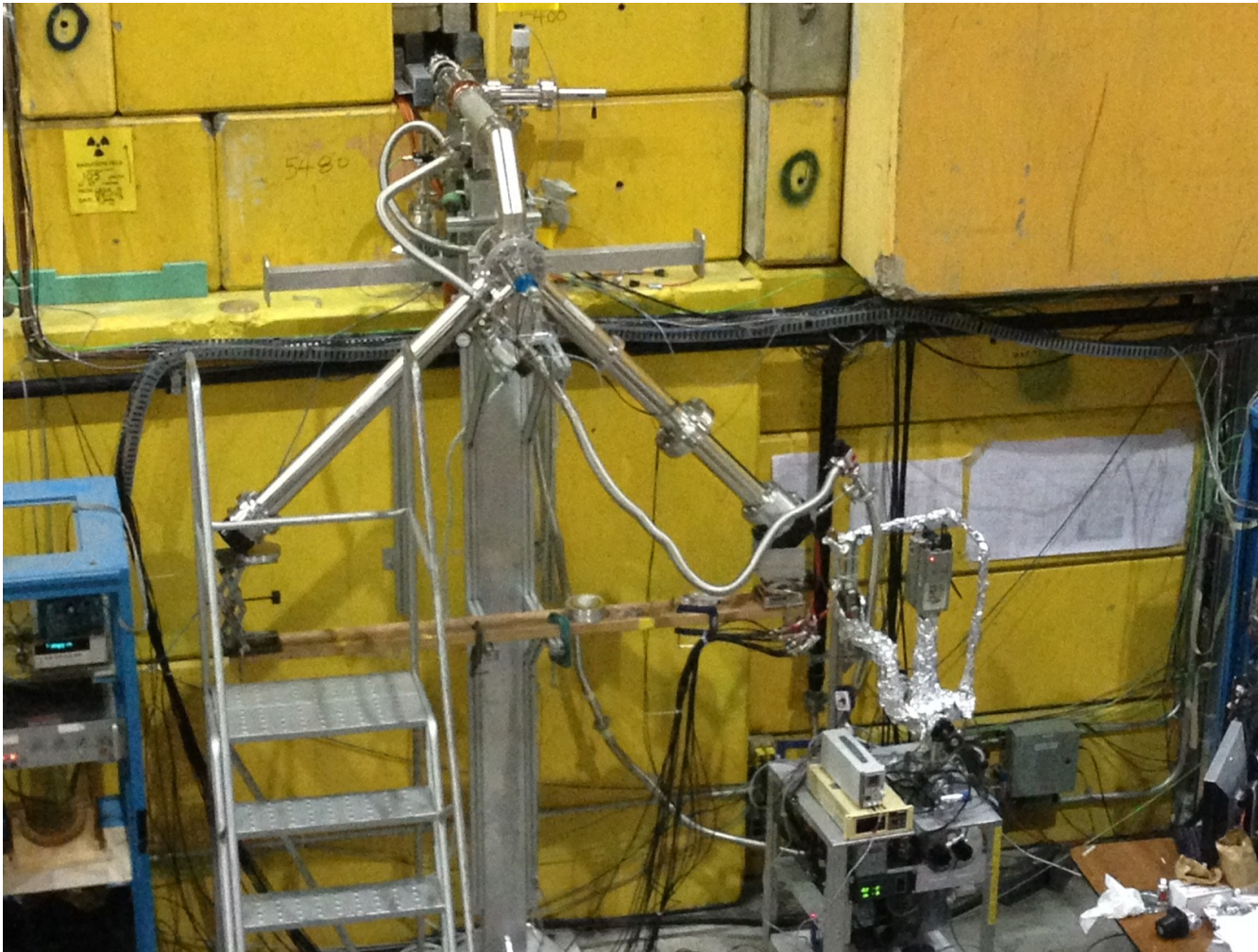
# TCN17030: Cu 90 degree bend



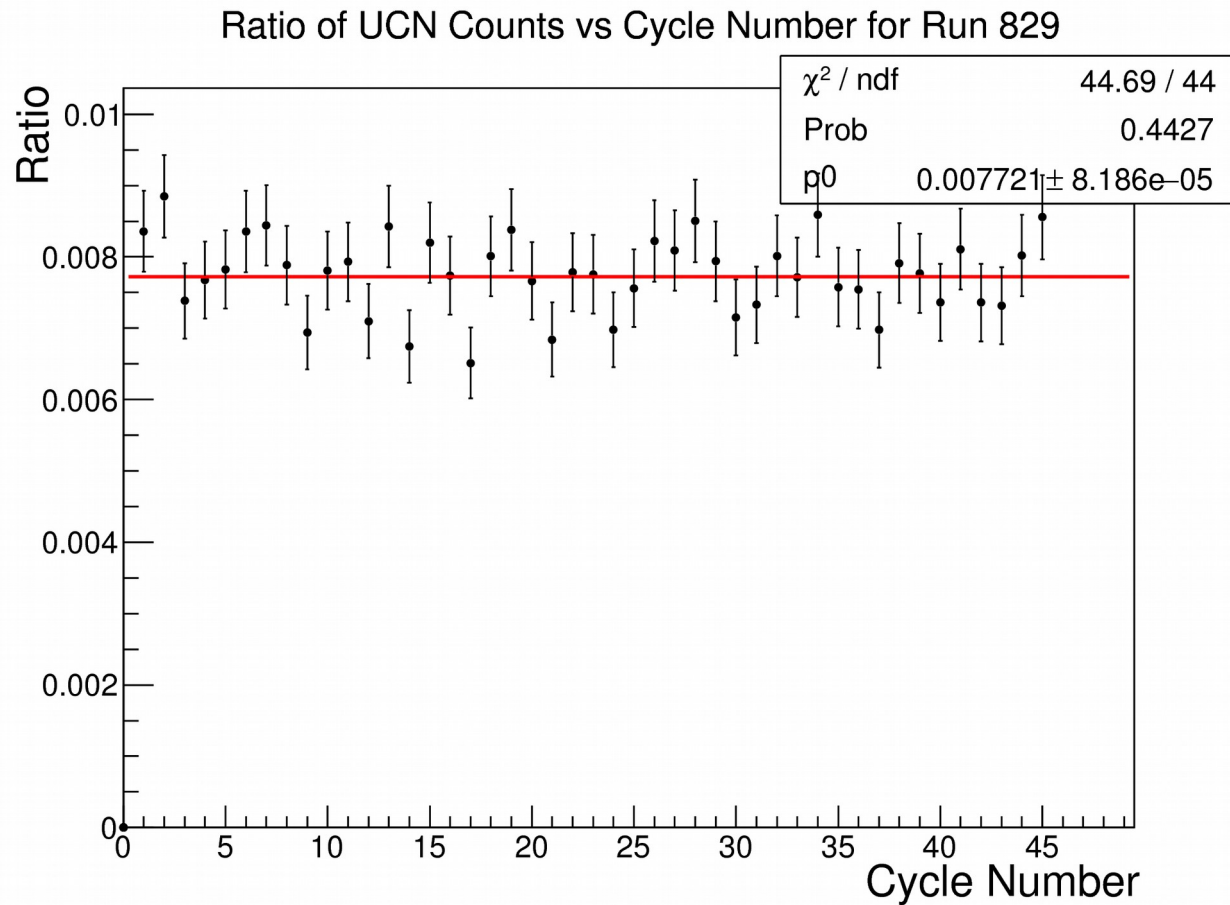
The weighted mean of all runs was calculated and found to be  $7.74E-03 \pm 7.40E-05$



# TCN17028: Rotary valve experiments



# TCN17028: Rotary valve experiments





# TCN17028: Rotary valve experiments

- Analyzed this transmission the same way.
- There were two runs. Took the weighted average of the two runs.
- For the leakage measurement the rotary valve was not oriented in the direction of the Li6 detector.
- Used ratio of Li6 detector count from the reference measurement and leakage set up.

The weighted mean of all runs was calculated for transmission through the rotary valve and found to be  $7.66\text{E-}03 \pm 1.72\text{E-}05$

# Results

Experiment	Transmission (%)	Error (%)
SS EP guide (UGD01)	89.70	2.45
SS EP guide (UGD02)	-	-
SS UWpg guide (UGD03)	90.17	1.84
Rotary valve	64.67	1.95
Rotary valve leakage	0.14	0.01
90 degree bend + 30 cm pipe	64.02	1.43
90 degree bend (corrected)	67.35	2.84

# Results

- Within error there was no difference between the polishing of the SS guides. The transmission was ~90 % per m for both cases.
- Transmission through the rotary valve was ~65 % and the leakage was found to be < 1%
- There was a ~67 % loss/m from the 90 degree bend

# Future Analysis

- **Currently:** TCN17015: Detector comparison
- TCN17018,19: Pinhole storage time experiments
- Determine a good parameter to normalize Li6 counts (beam current, number of cycles, bottle temperature) to be used for the leakage measurement.
- Try to understand if we expect to get UCN bouncing back into the He3 detector in experiments with bends, perhaps from simulations.