Scavenger hunt (2013)

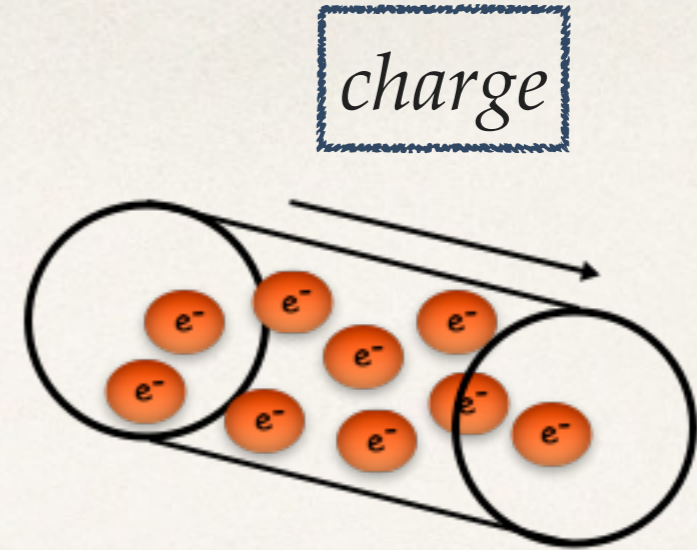*charge*

Goal:
Calibrate the charge monitors

BCM Calibration Status
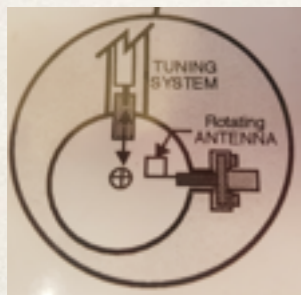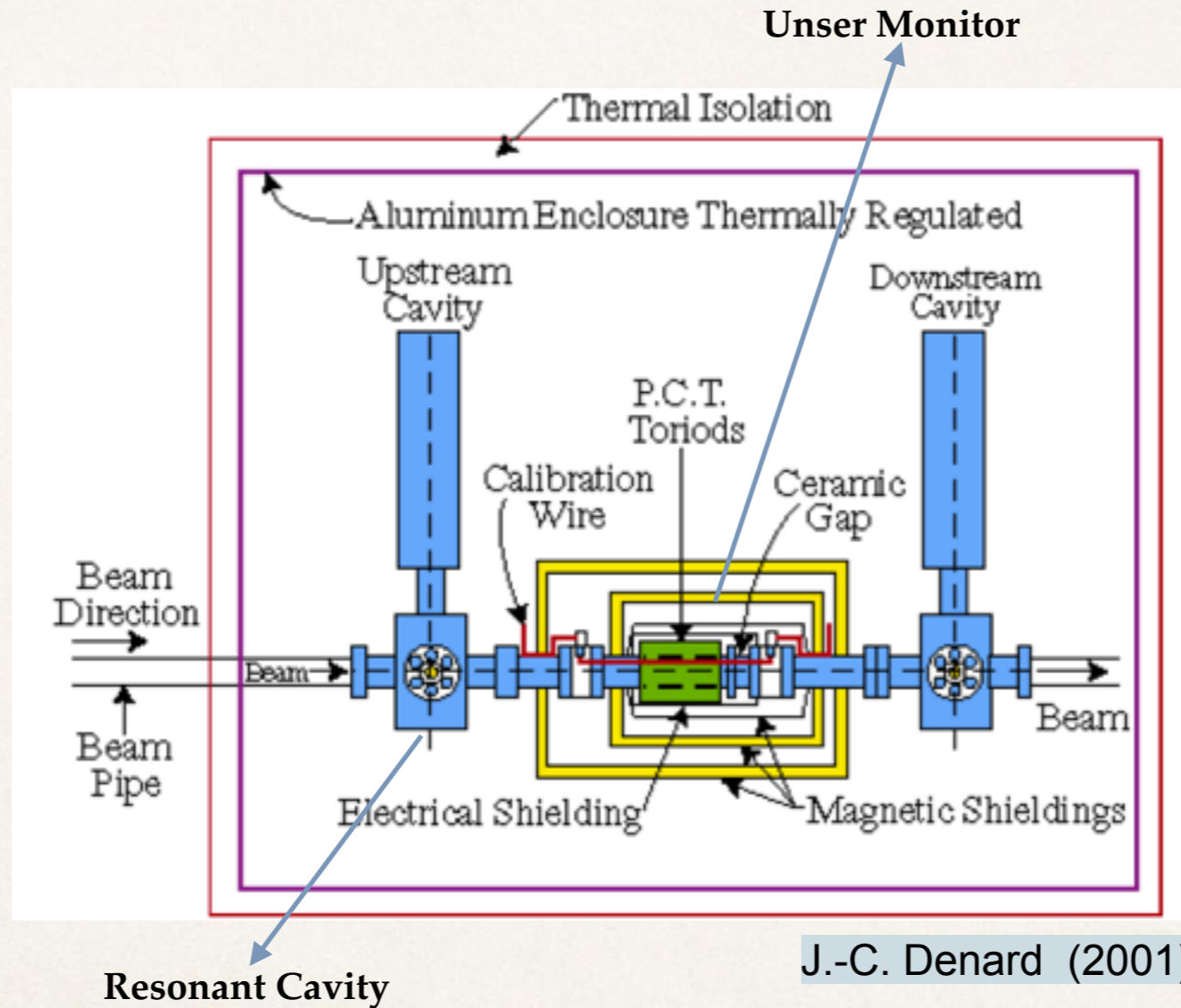
Nathaly Santiesteban

Date: October 24/2017

Hall A Charge Monitor

Hall A charge monitor consists of an Unser monitor (from the name of its inventor) surrounded by two resonant cavities.
All three devices are inclosed in a big grey thermostabilized box which is the first object in the beam line

Unser Monitor

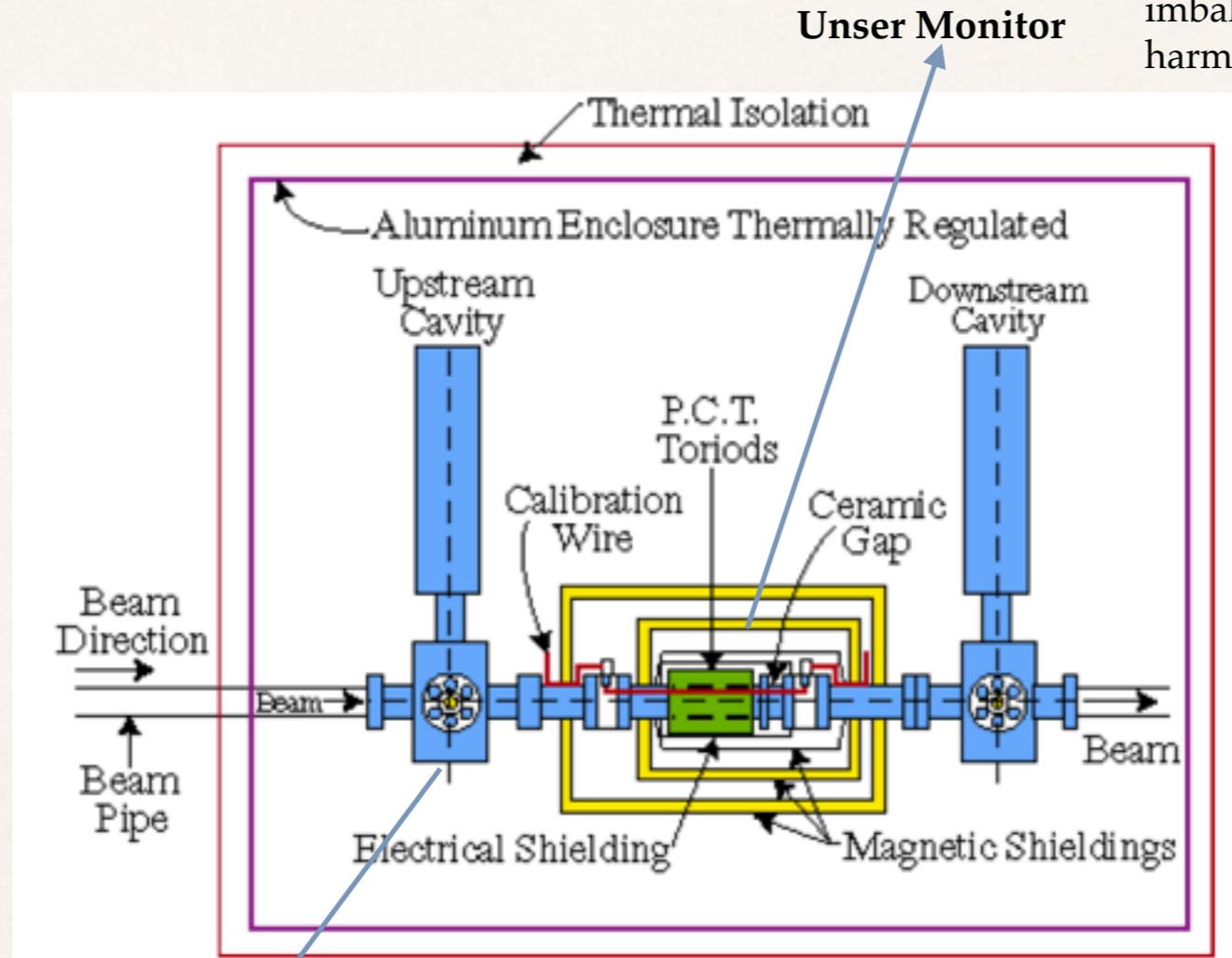**Resonant Cavity**

J.-C. Denard (2001)

Hall A Charge Monitor

Hall A charge monitor consists of an Unser monitor (from the name of its inventor) surrounded by two resonant cavities.
All three devices are inclosed in a big grey thermostabilized box which is the first object in the beam line

"DC Current transformer" composed of 2 identical toroidal cores driven in opposite ways by an external source. In absence of any current, the sum of the output signals from the sense windings around each core his zero. A dc current through the cores produces a flux imbalance, thus an output signal at even harmonics of the excitation frequency.

Unser Monitor

J.-C. Denard (2001)
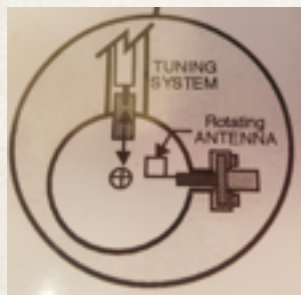
Resonant Cavity

Cylindrical wave guide tuned by a micrometrical screw to the nominal frequency of the beam: 1.497 GHz.
A magnetic field probe (loop antenna) is located on the circumference, where the electric field is minimum and the magnetic field is maximum.
The probe is coupled to one of the resonant modes of the cavity to get the signal out.
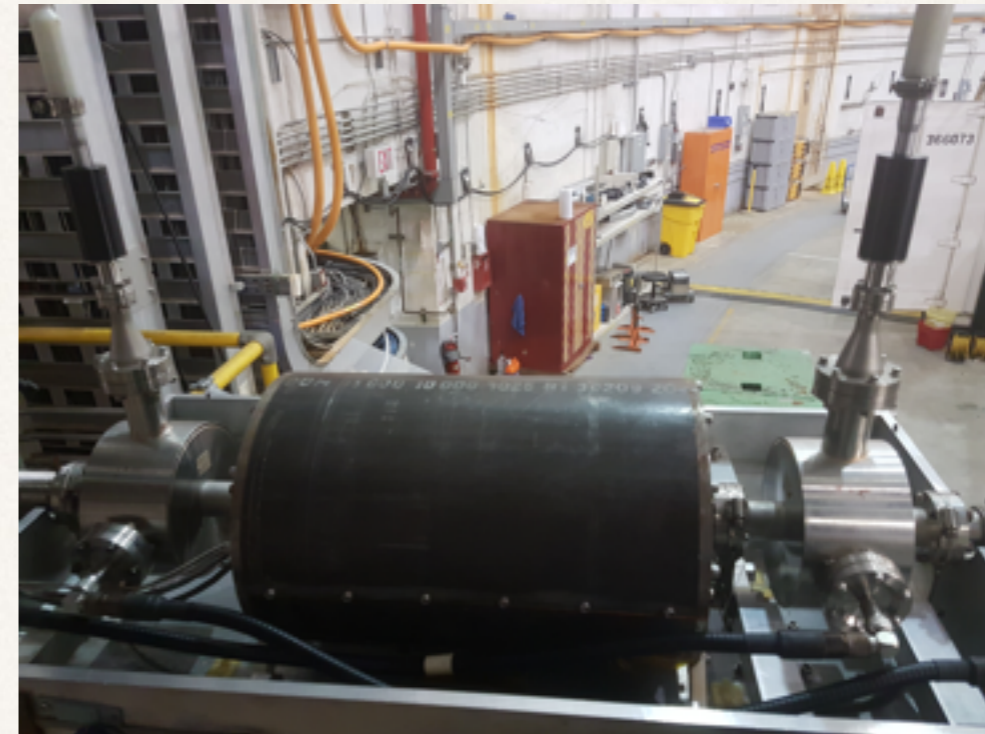Thus the output signal is proportional to the current.

Unser:

Absolute monitor (measure the actual current)
Too sensitive to the temperature, changes magnetic fields and acoustic waves.

Resonant Cavities (BCM):

Relative measurement of the current
More stable

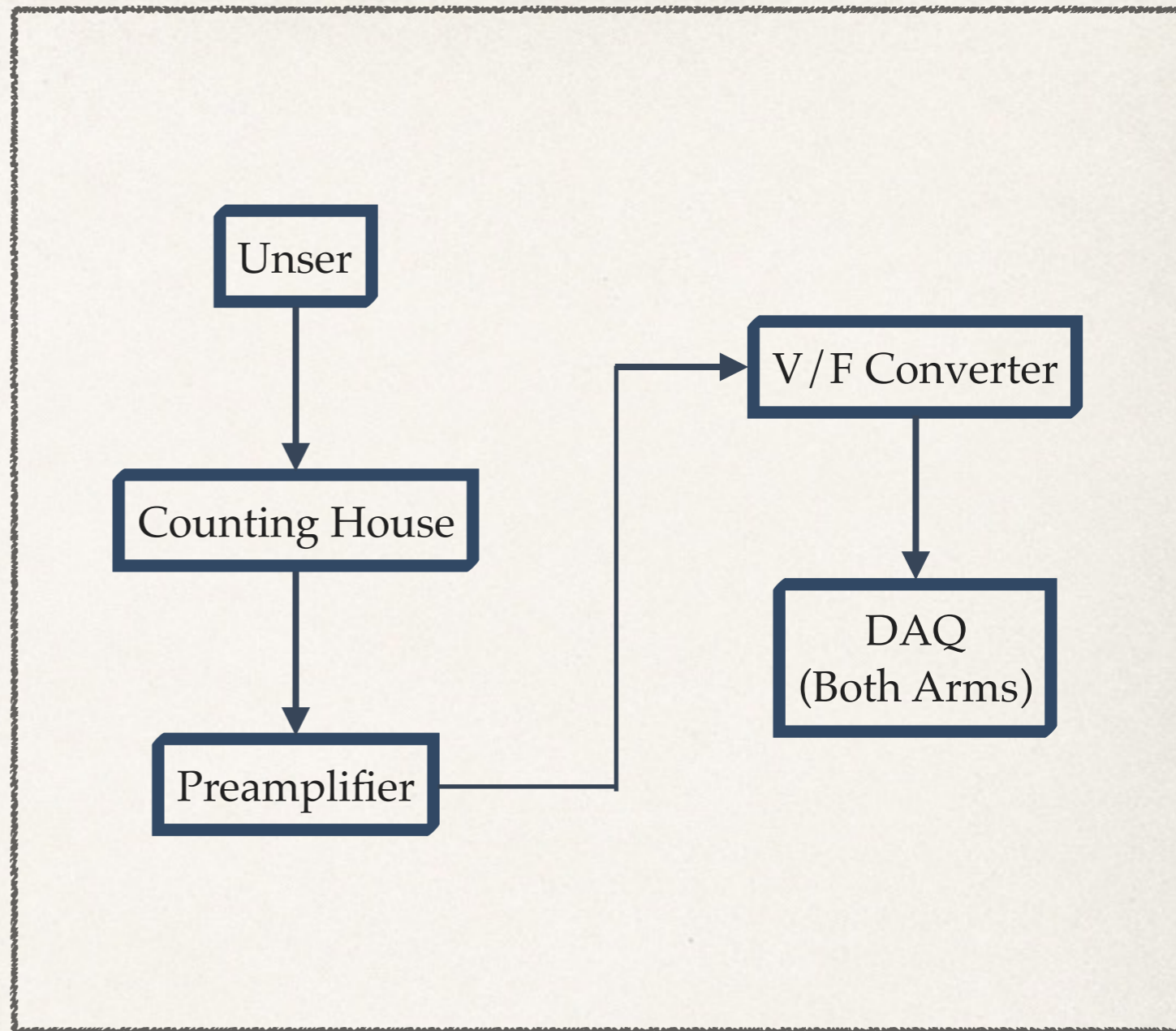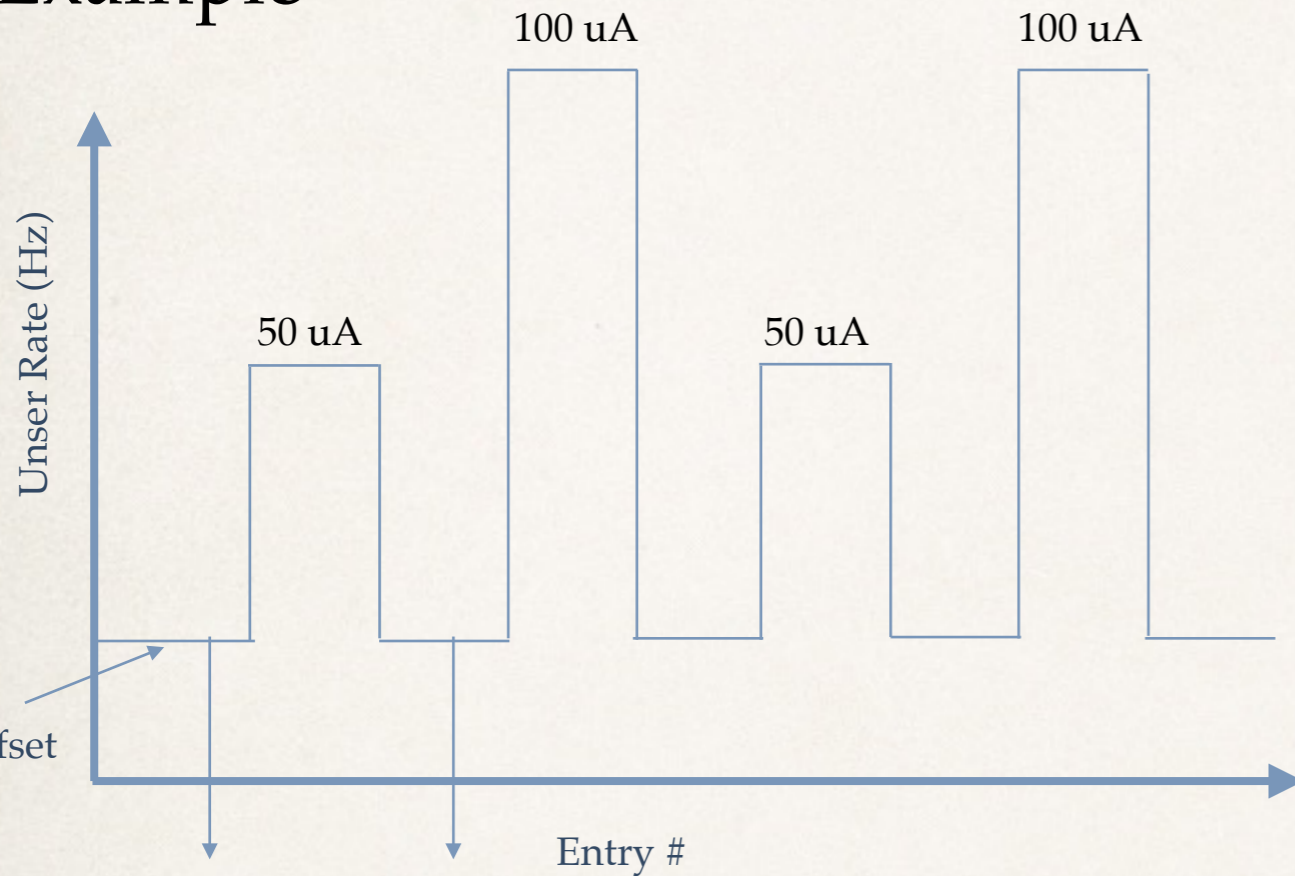The Unser is used to calibrate the BCMs,.

Today: The unser

What has been done so far?

*The calibration wire was fixed.
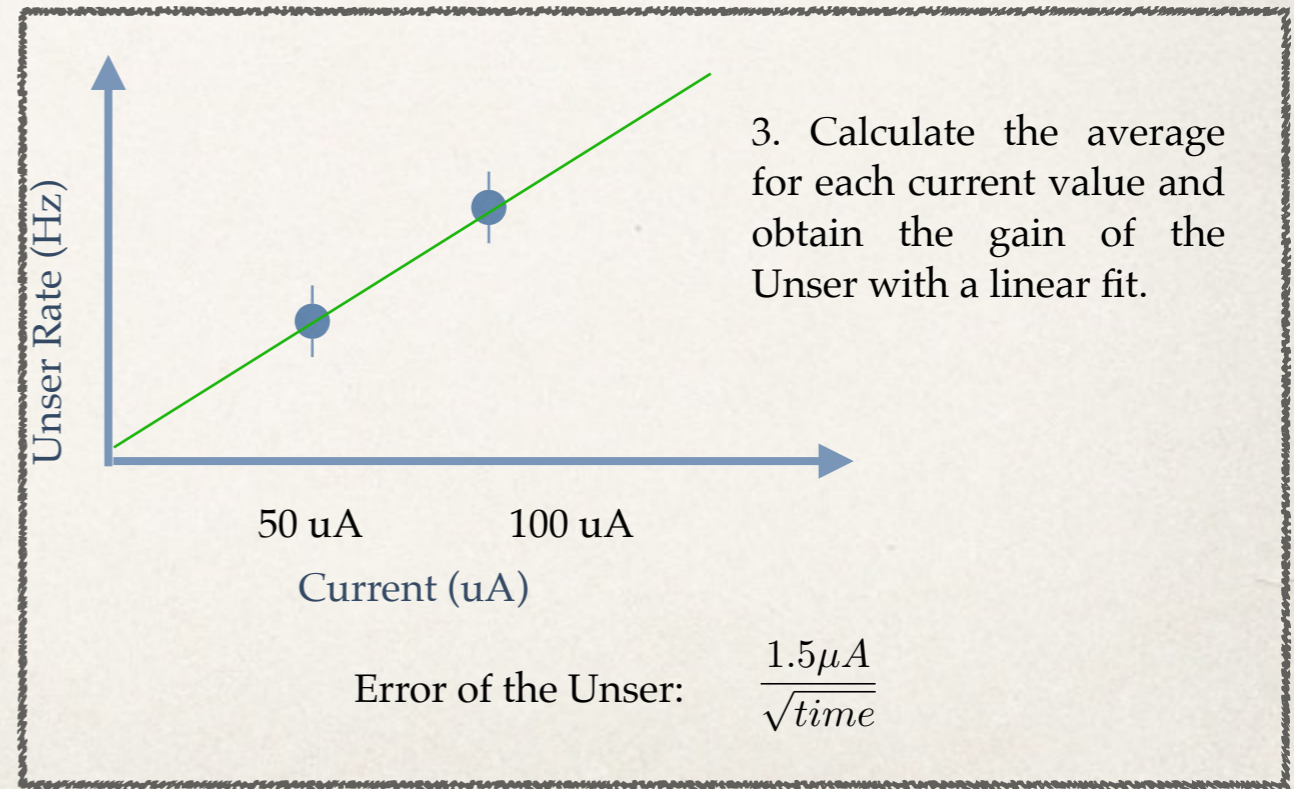
*The calibration wire was tested.

Unser → Counting House → Preamplifier → V/F Converter → DAQ (Both Arms)

Example

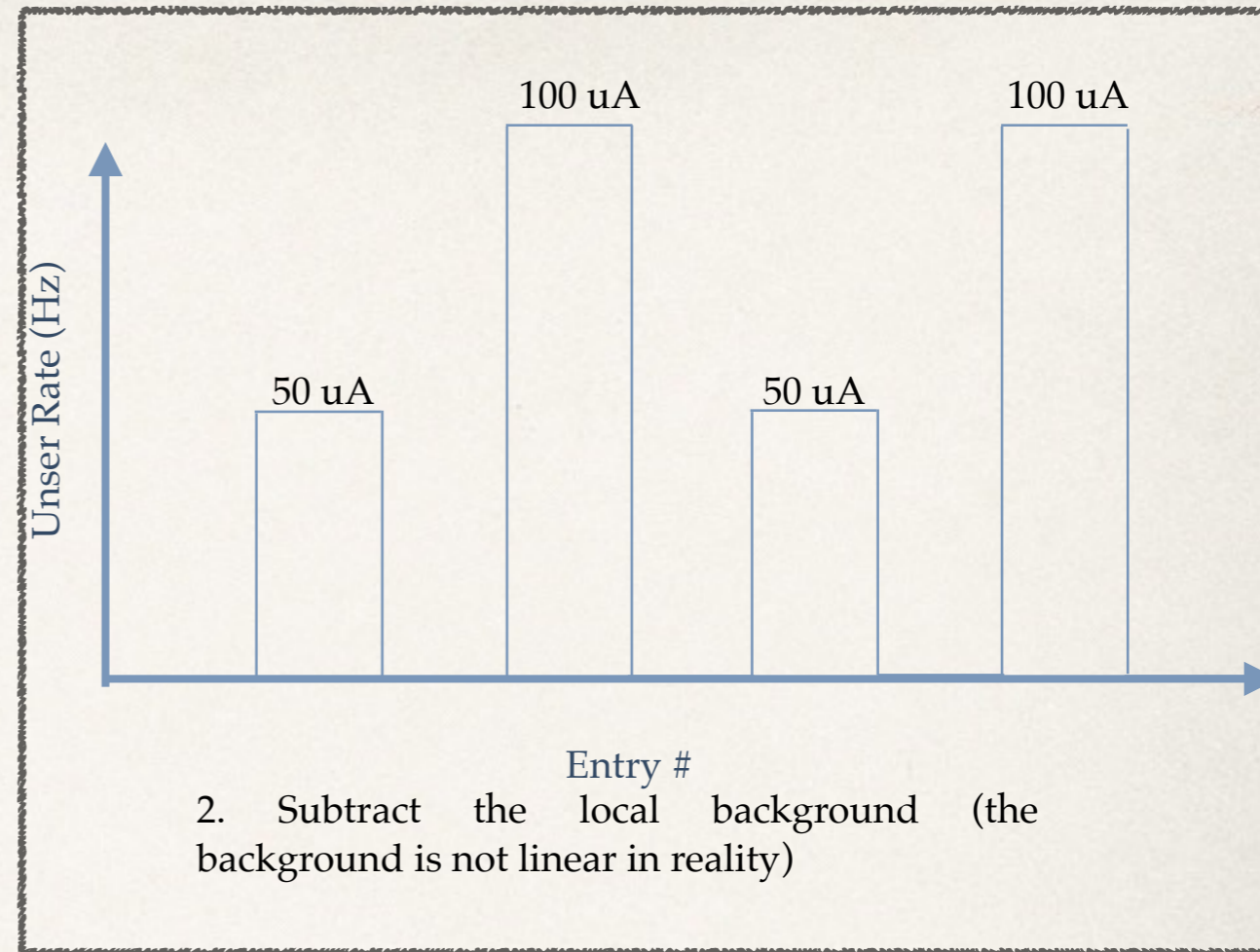Unser Rate (Hz)

100 uA

50 uA

100 uA

50 uA

Offset

Entry #

Average local background for each one of the peaks.

Calibration of the Unser:

1. Using a current source, send a set of known current values and check the response in the rate of the unser.

Unser Rate (Hz)

100 uA

50 uA

100 uA

50 uA

Entry #

2. Subtract the local background (the background is not linear in reality)

Unser Rate (Hz)

50 uA   100 uA

Current (uA)

3. Calculate the average for each current value and obtain the gain of the Unser with a linear fit.

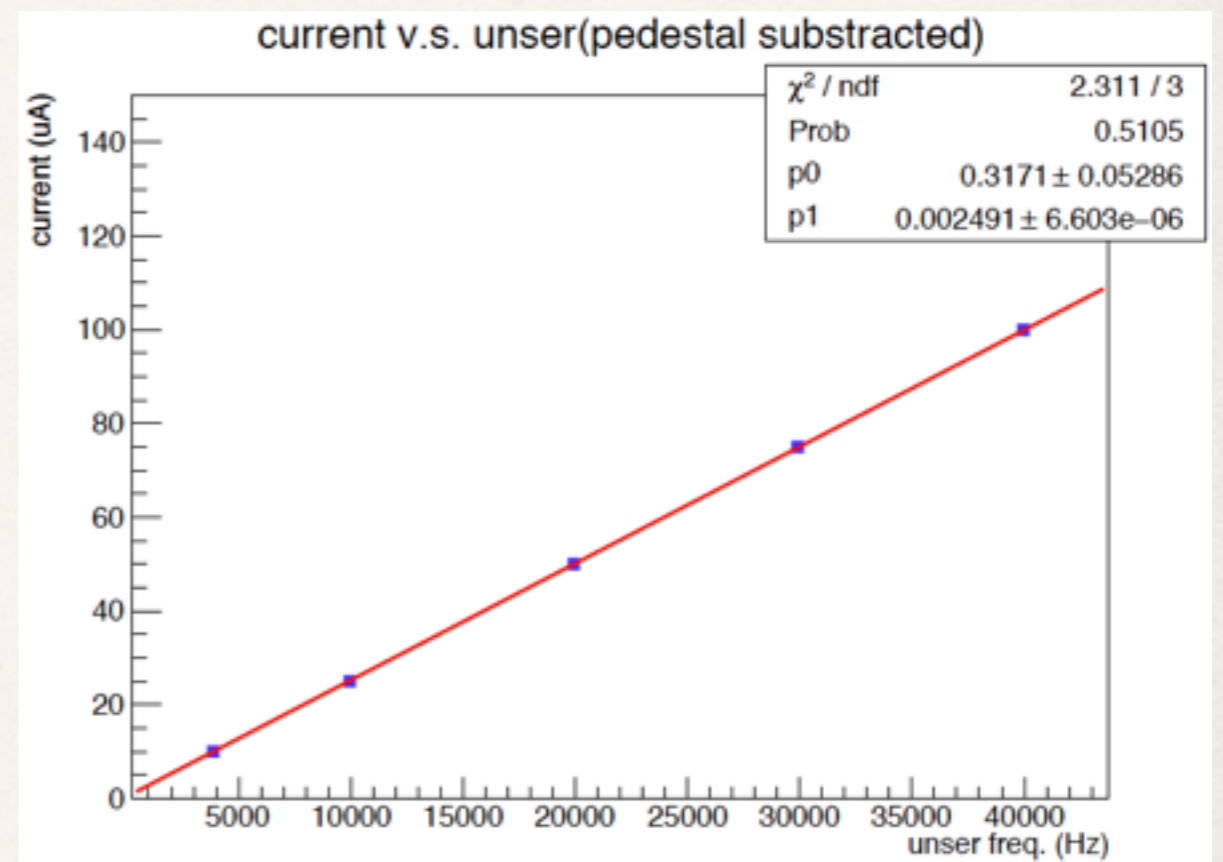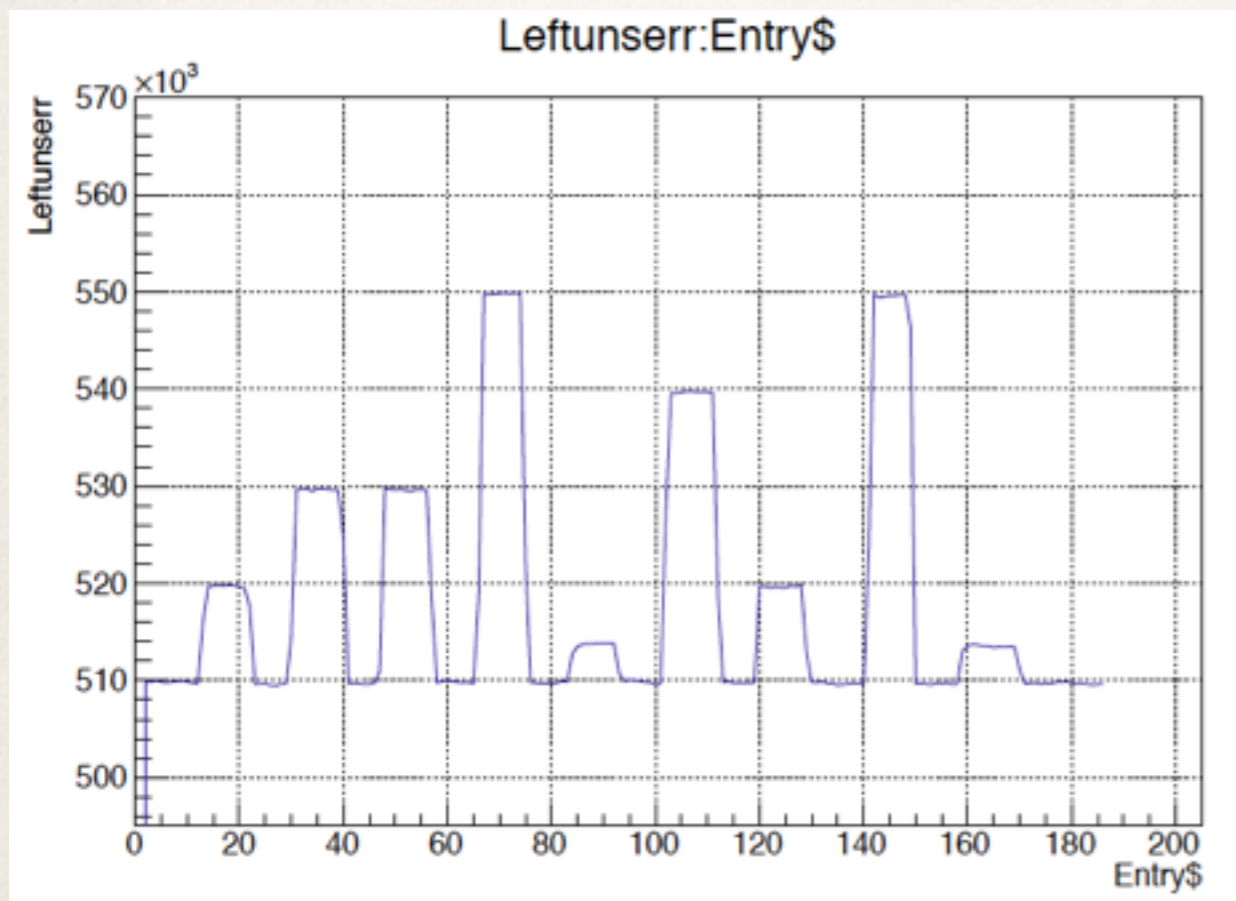Error of the Unser: $\dfrac{1.5\,\mu A}{\sqrt{time}}$

Left Arm Test with the Old Current Source

Run Number: 335   Time ~25 minutes

Sent currents: 10,25,50,75,100 (uA)
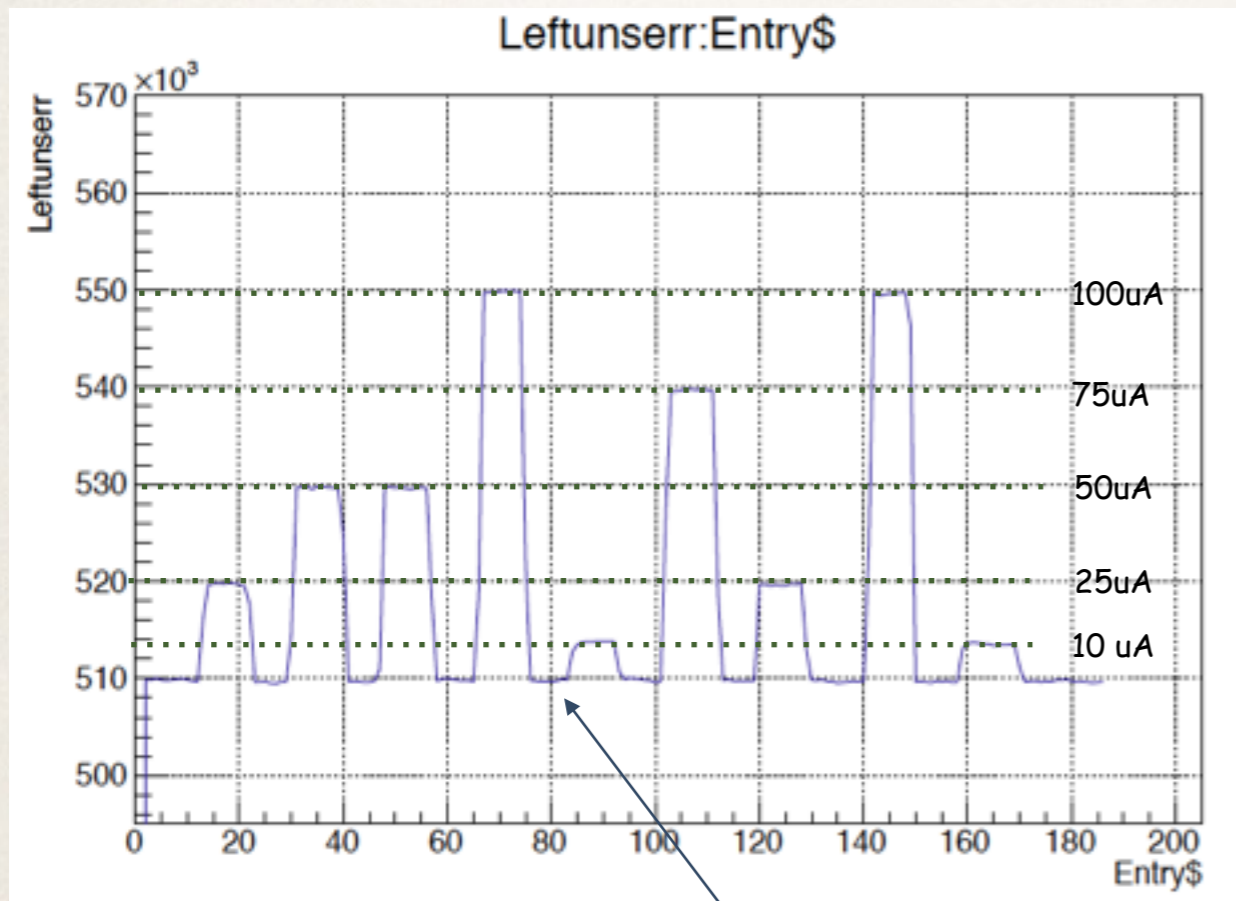
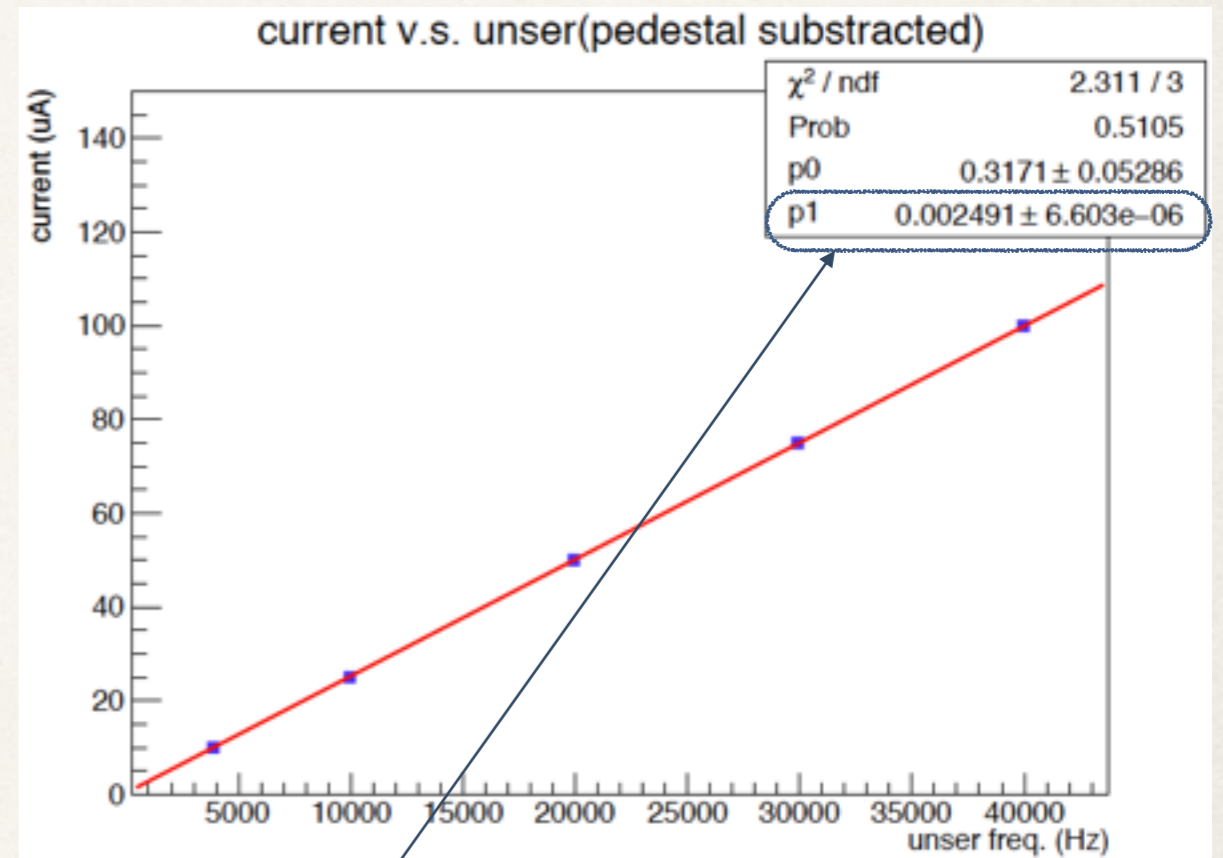# Left Arm Test with the Old Current Source

Run Number: 335   Time ~25 minutes

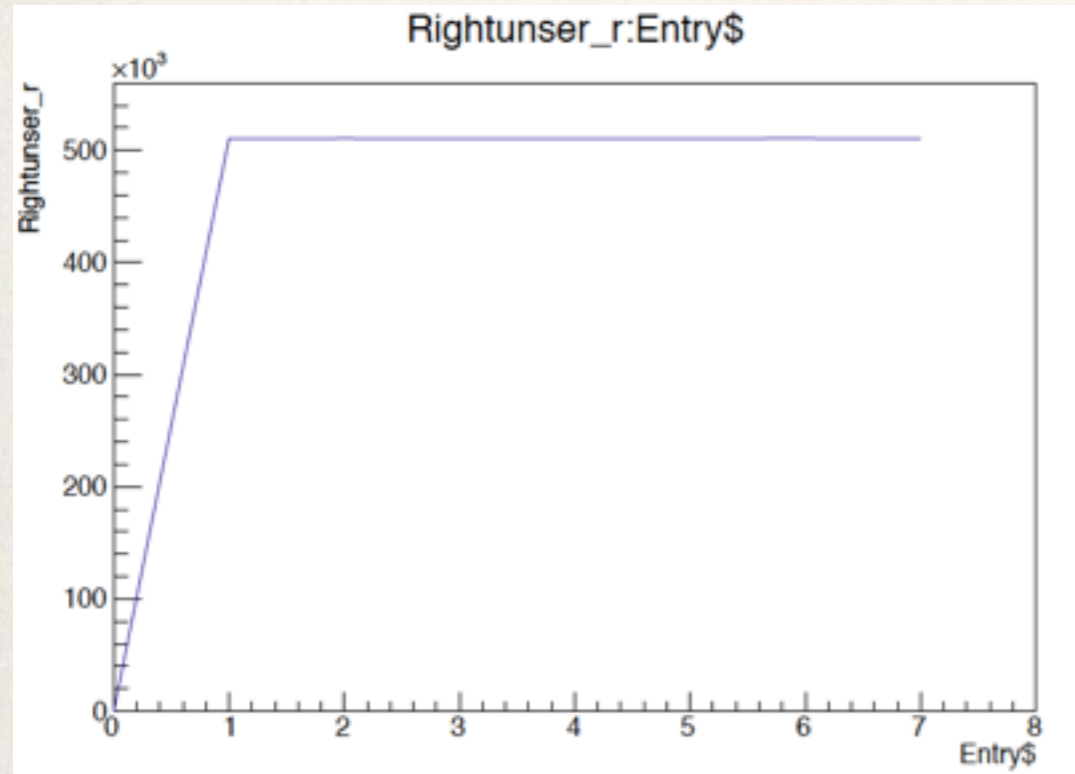Sent currents: 10,25,50,75,100 (uA)

Offset

Reference to compare:
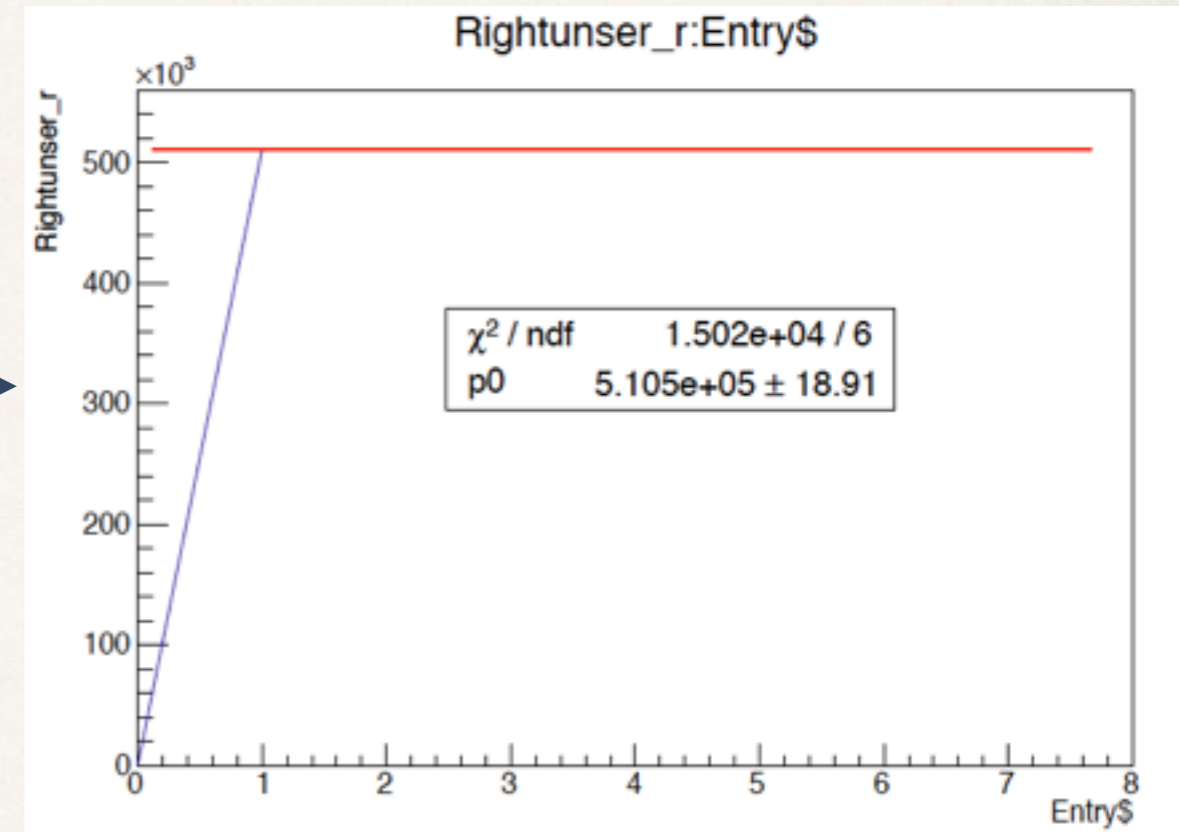Argon unser calibration
p1 0.00248 ± 4.024e-07

Right Arm Test with no Current Source
Background Check

Run Number: 90186   Time ~3 minutes

Constant
Fit

Current source was not woking at this point, but we could check the background.

To do:

Replace the current source.

Make a complete wire calibration with both arms at the same time.

Working with Dave Mack and Deepak Bhetuwal

Next time: bcm!