

Bo VST Update 02/20/12

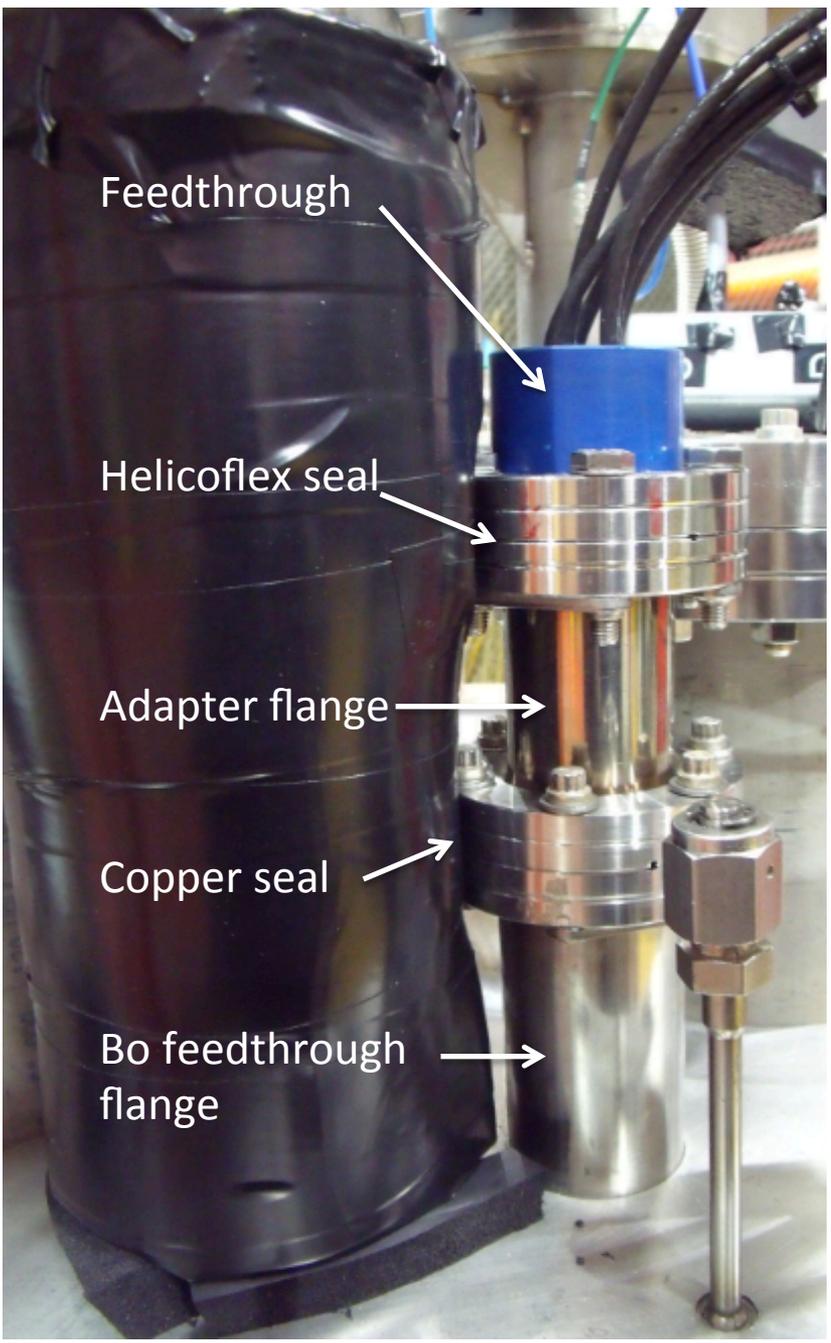
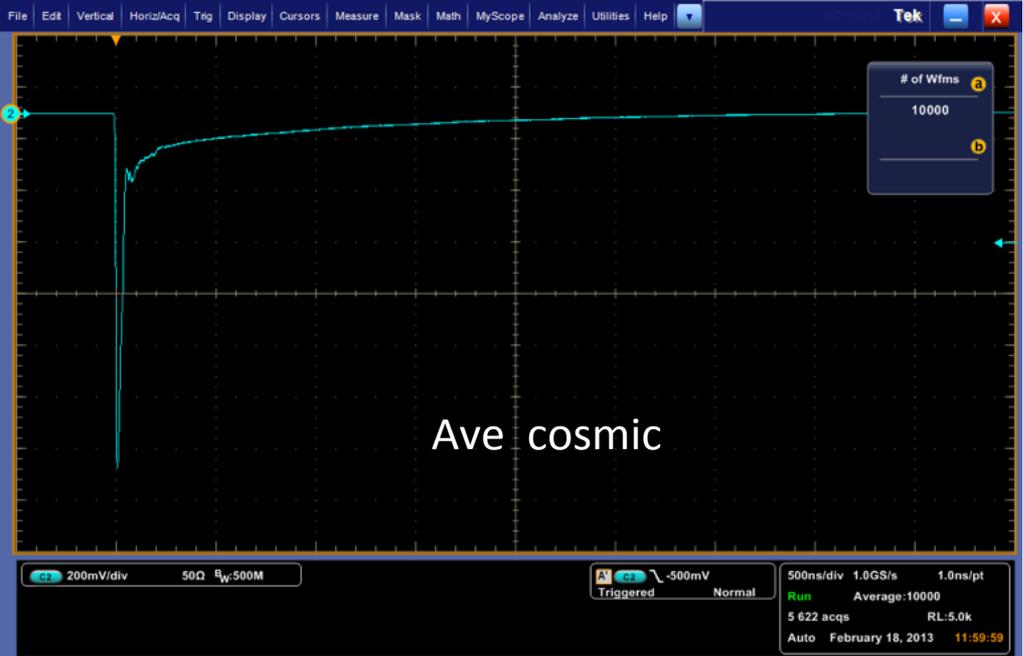
Ben Jones

Contents

- 1) Feedthrough testing / splitter work
- 2) O2 Monitoring
- 3) GQE progress

New Feedthrough

- Installation of new feedthrough successful
- Significant improvement to signal quality – long timescale ringing greatly reduced
- Some residual ringing on $\sim 50\text{ns}$ timescale (After pulse? Splitter?)





What is this ring?

All our splitters have it in some form, though not all identical

C2 2.0mV/div 50Ω R_w:350M

A1 C2 -2.28mV Triggered Normal

100ns/div 1.0GS/s 1.0ns/pt
Run Average:10000
52 500 acqs RL:1.0k
Auto February 18, 2013 12:03:49

Acquisition

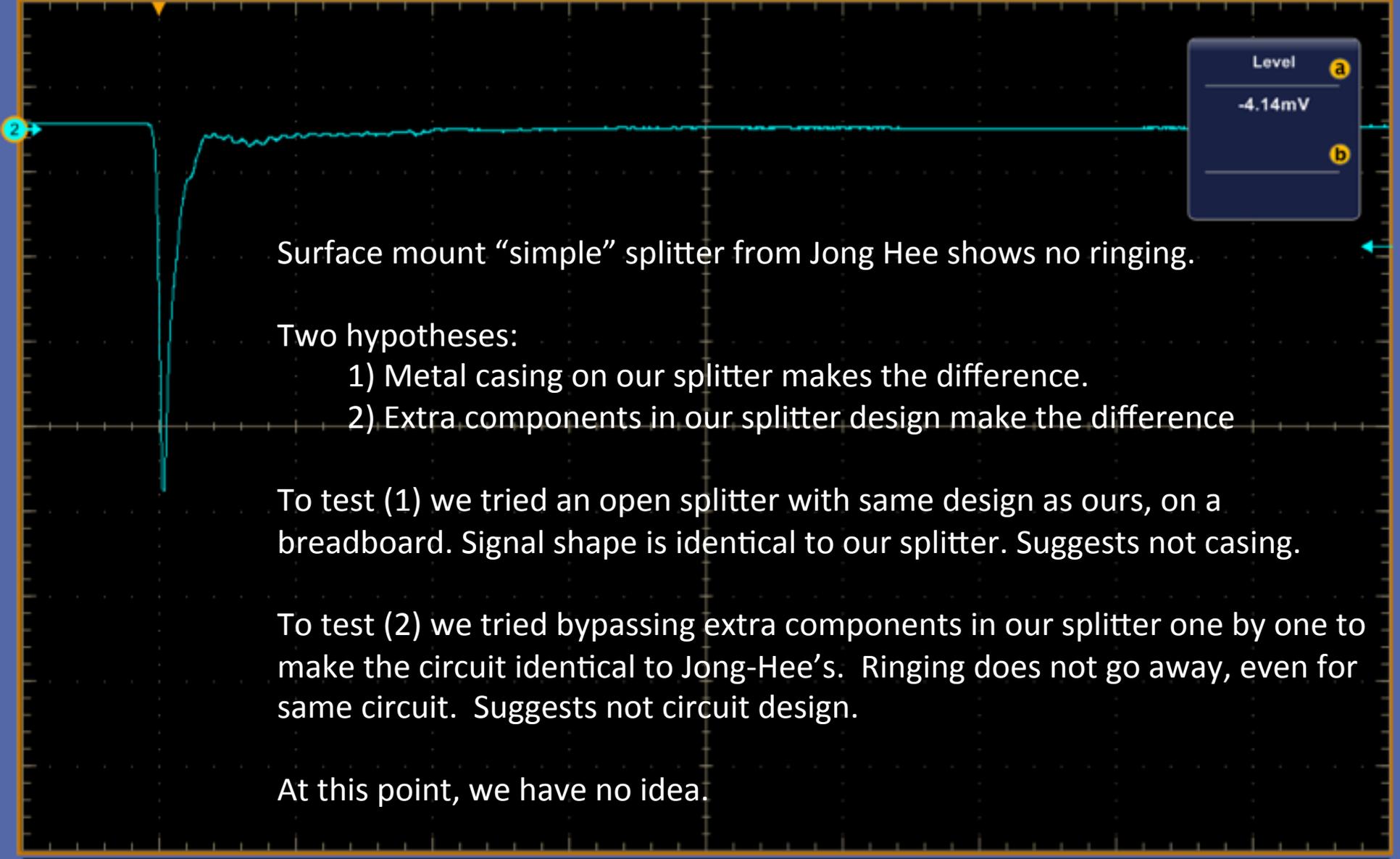


of Wfms

10000

a





Surface mount “simple” splitter from Jong Hee shows no ringing.

Two hypotheses:

- 1) Metal casing on our splitter makes the difference.
- 2) Extra components in our splitter design make the difference

To test (1) we tried an open splitter with same design as ours, on a breadboard. Signal shape is identical to our splitter. Suggests not casing.

To test (2) we tried bypassing extra components in our splitter one by one to make the circuit identical to Jong-Hee’s. Ringing does not go away, even for same circuit. Suggests not circuit design.

At this point, we have no idea.

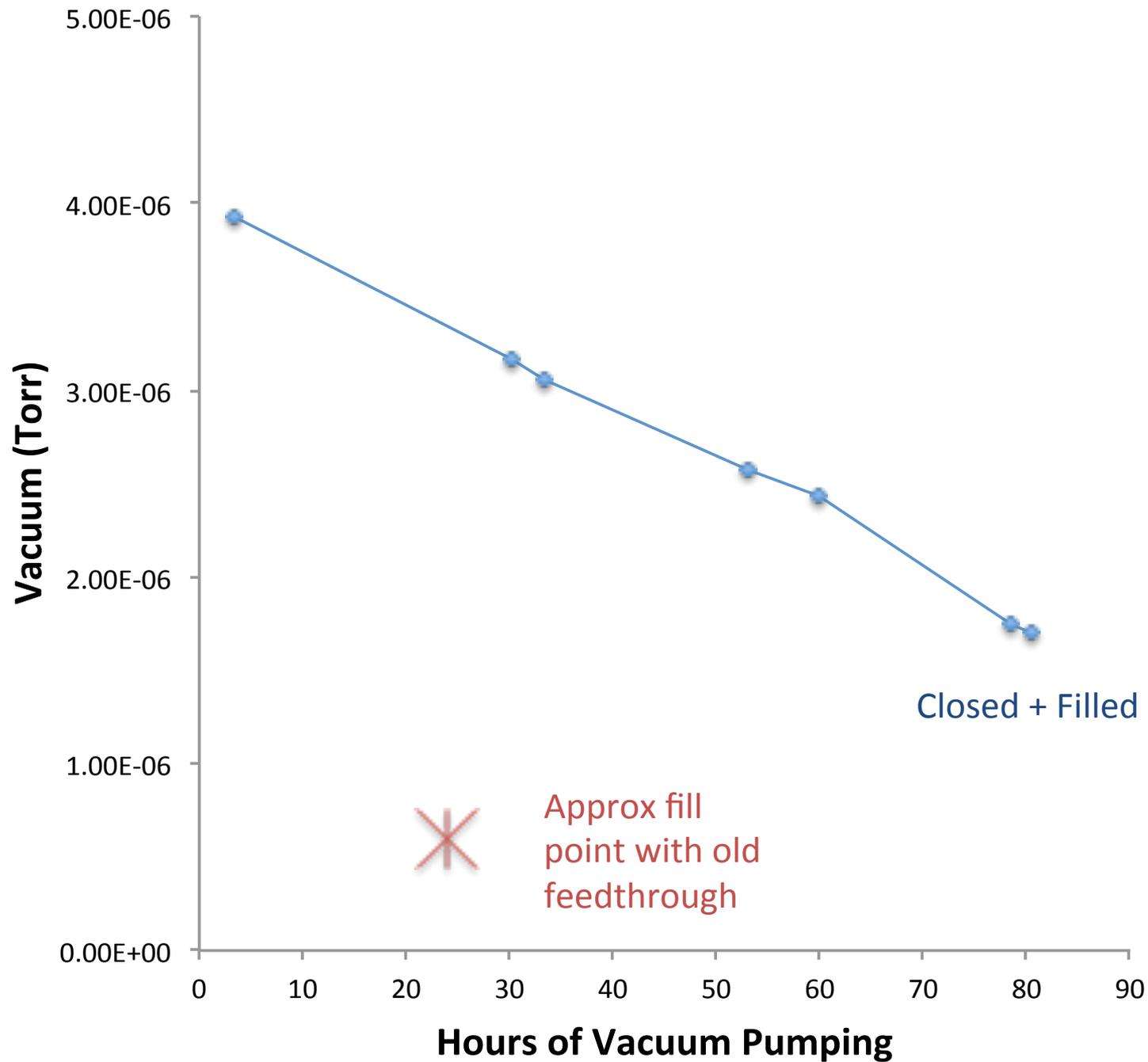
C2 3.0mV/div 50Ω BW:350M

A1 C2 -4.14mV Triggered Normal

100ns/div 1.0GS/s 1.0ns/pt
Run Average:10000
238 018 acqs RL:1.0k
Auto February 18, 2013 13:01:03

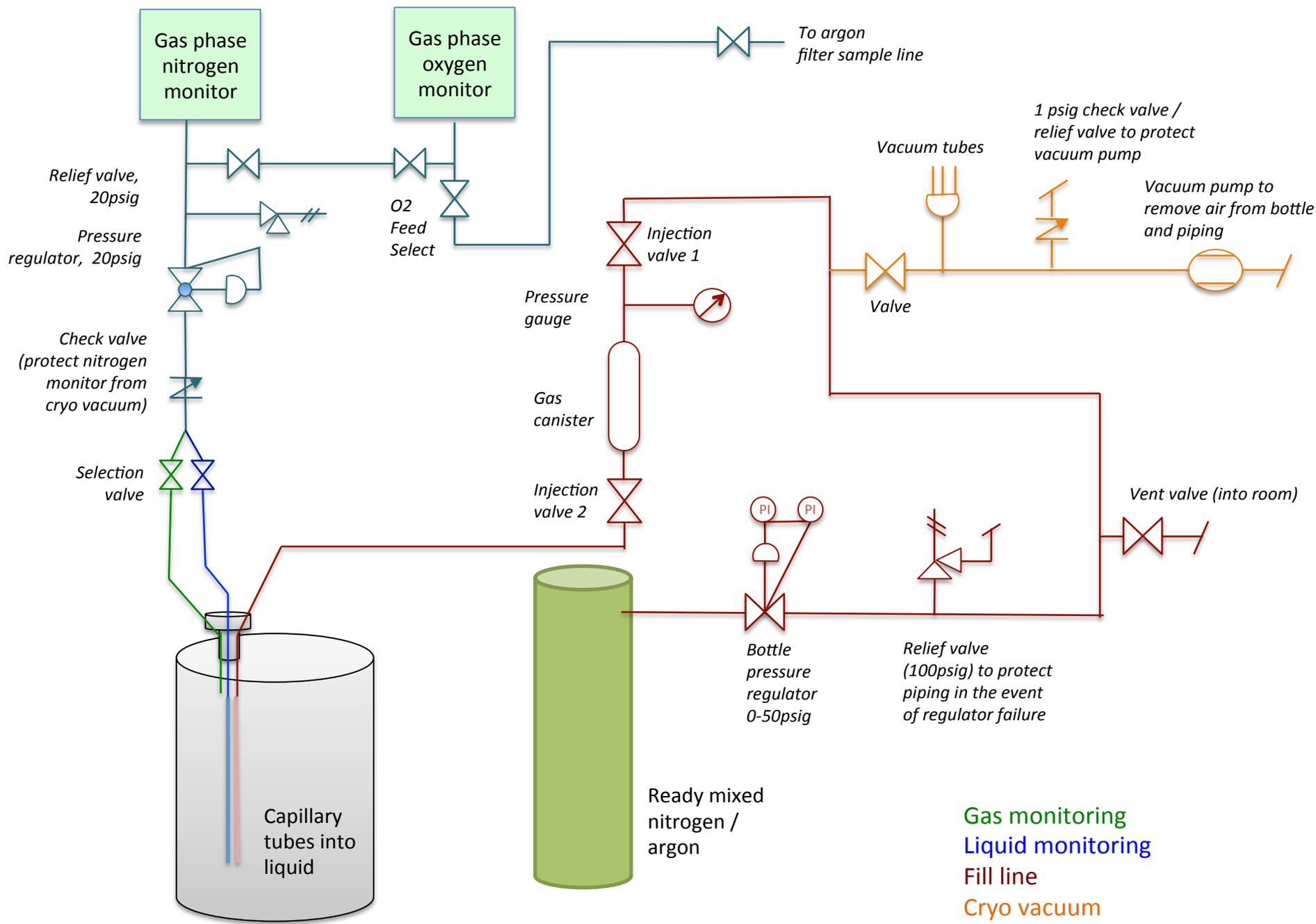
Outgassing / Purity

- Compared to previous feedthrough, vacuum pumpdown was very slow (fill delayed for 3 days to accommodate extra pumping)
- We also changed the plate – a known sponge for water. And added extra cables. So can't know if it is the feedthrough itself at this stage.
- But, cryo epoxy is known to outgas badly. Possible we are seeing slow water outgassing from new feedthrough
- Since MicroBooNE will not be vacuum pumped, MTS test of new feedthrough is an important test we need to do.

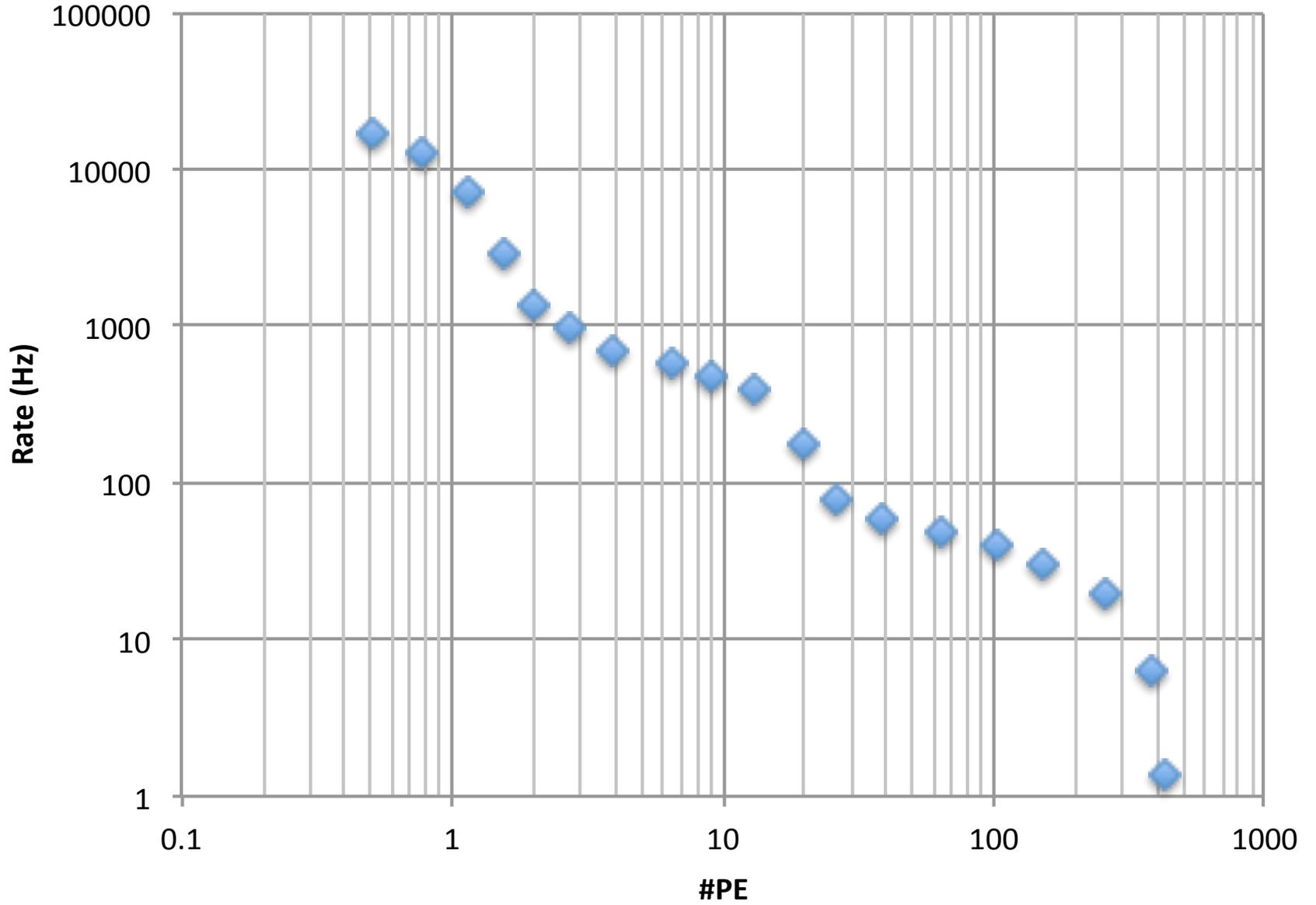


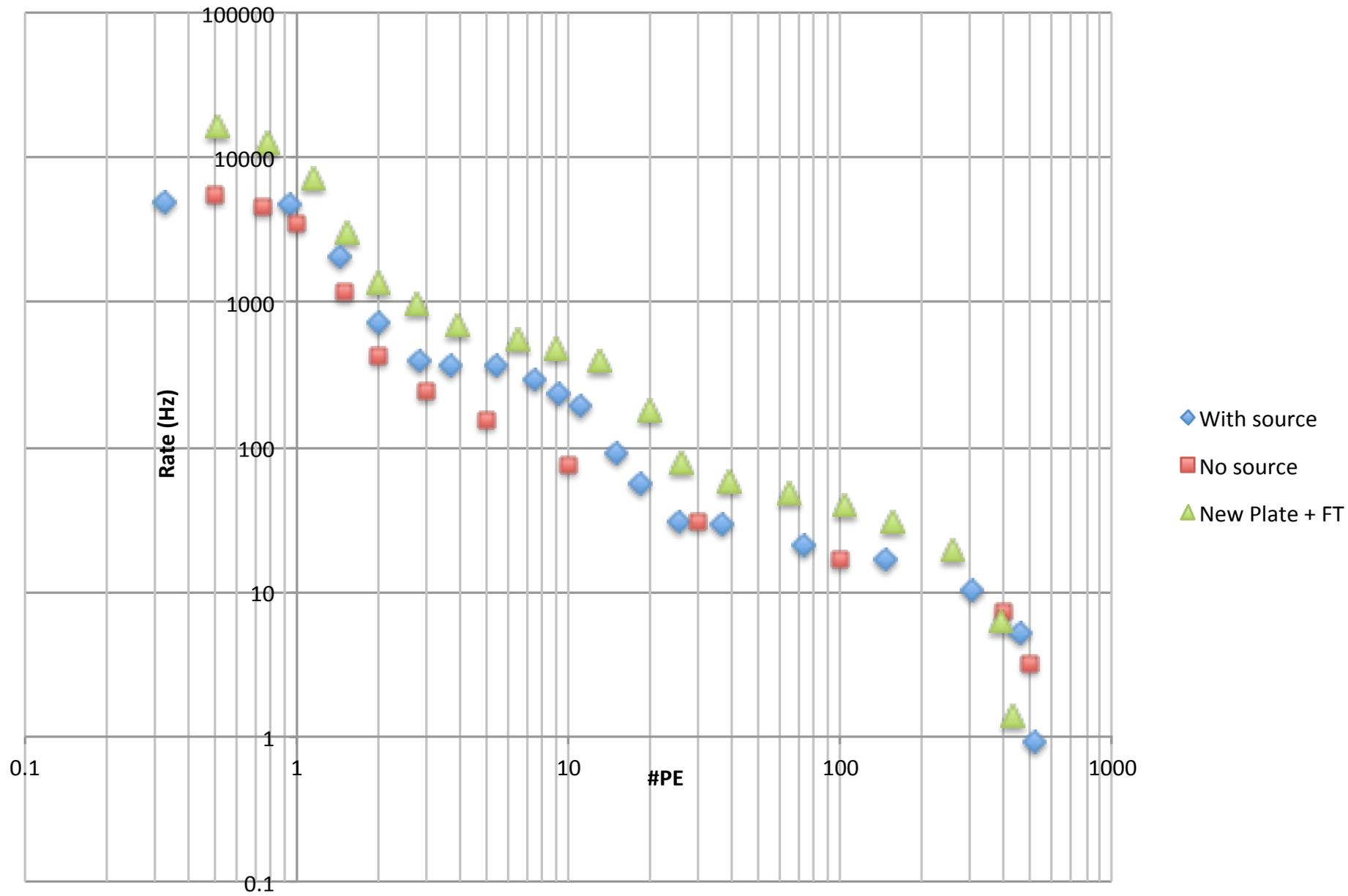
Oxygen Monitoring

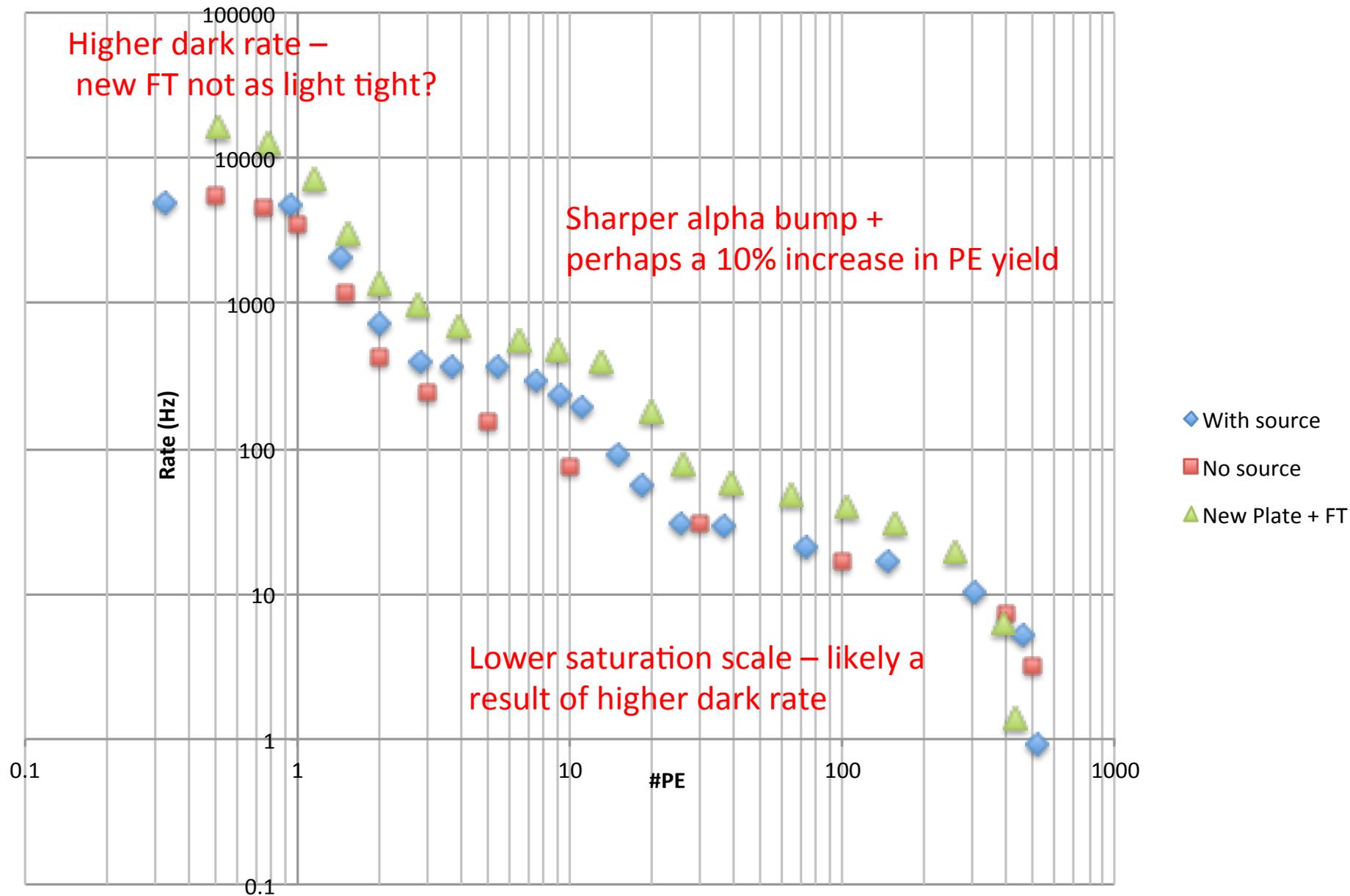
- O2 monitor plumbing is finished.
- Some initial (but boring) teething problems, but now O2 monitor working
- At least 1 day of continuous flow needed to purge system before monitor settles to real value
- In current scheme, O2 and N2 monitor sample same line simultaneously. O2 monitor can be closed off, (but N2 monitor pressure regulator must be re-tuned)
- Liquid phase O2 level in clean fill is < 80ppb.
- Liquid phase N2 level in clean fill is 70ppb



Rate Plot - New Feedthrough





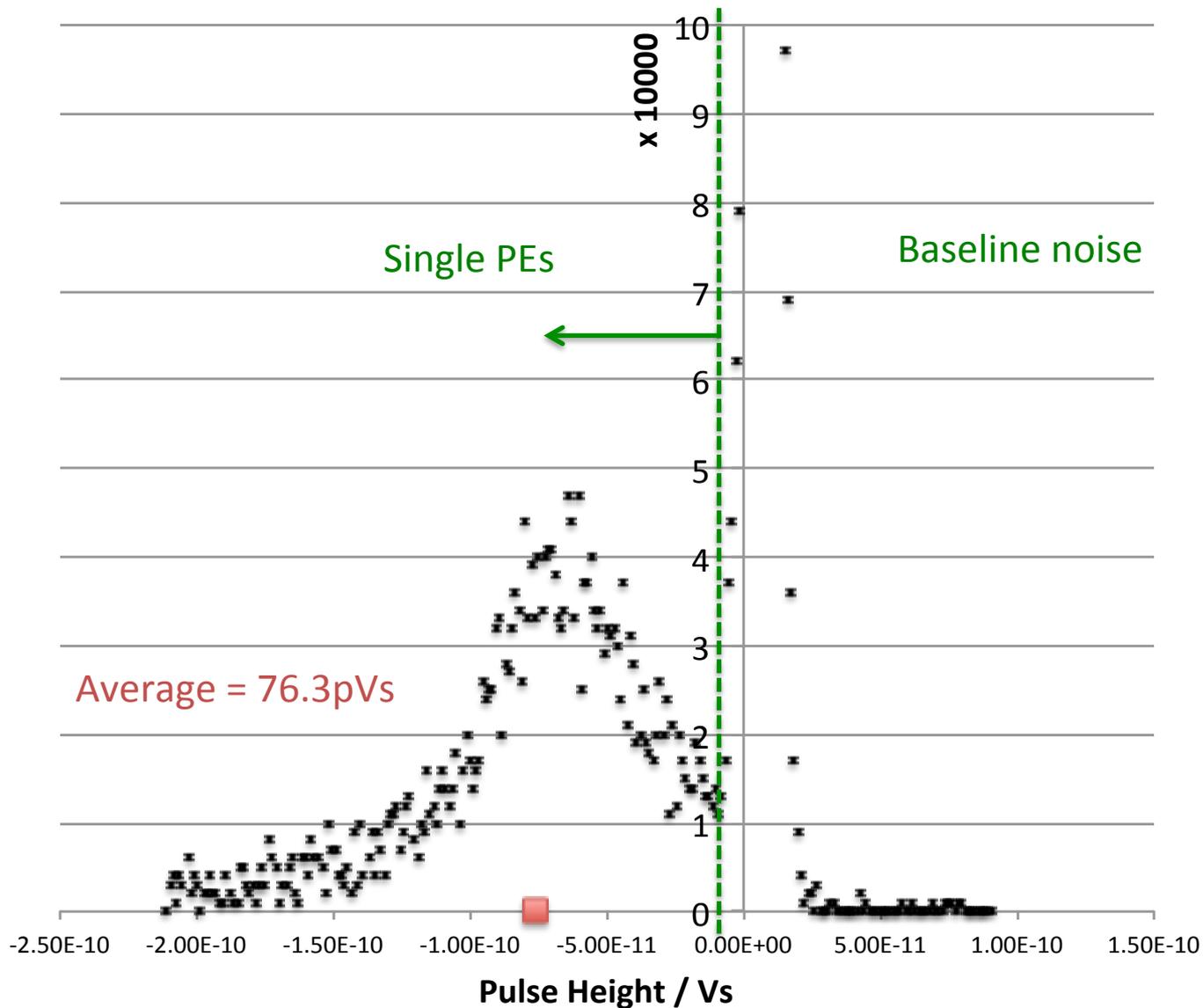


Improving GQE Method

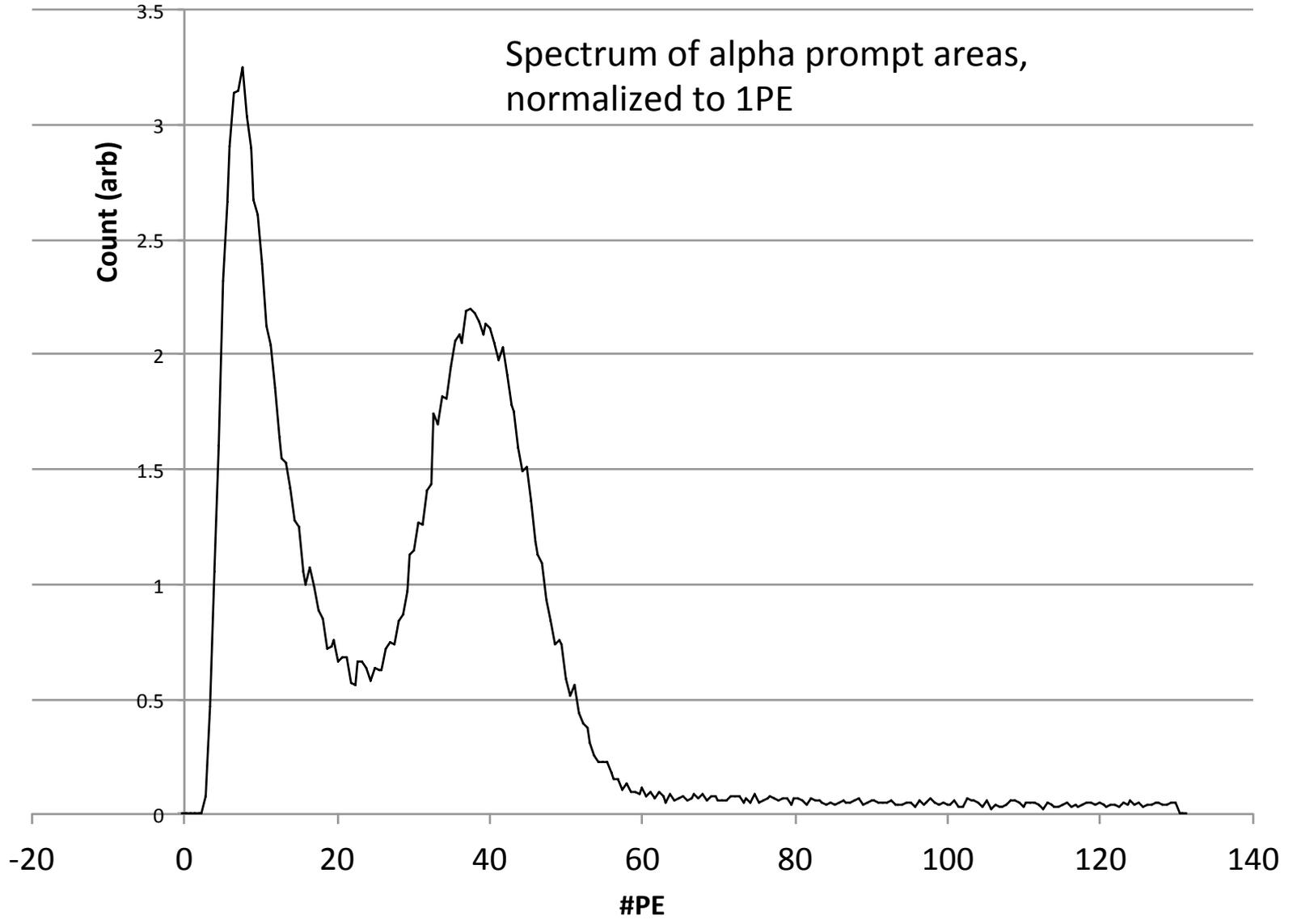
- For reasons we've talked about before, pulse amplitude is not a good way of measuring #PE – area is much better.
- Now we have cleaner pulses with less ringing, pulse area is a meaningful quantity once again
- We measure prompt light only (50ns) for two samples:
 - 1) Self triggered alpha enriched sample
 - 2) Single PE from LED

From this we should be able to extract a GQE number.

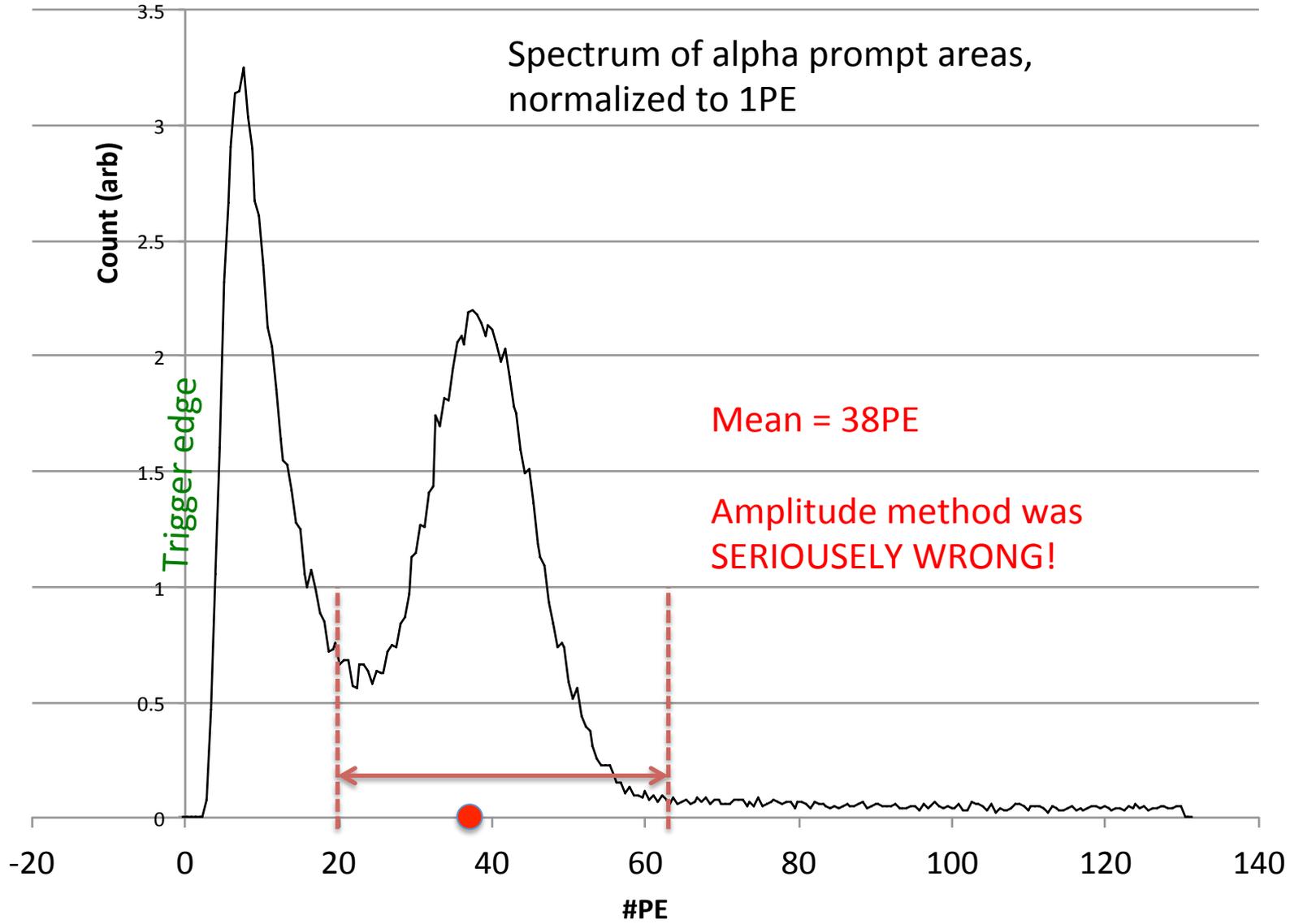
Single PE Pulse Areas



Spectrum of alpha prompt areas,
normalized to 1PE



Spectrum of alpha prompt areas,
normalized to 1PE

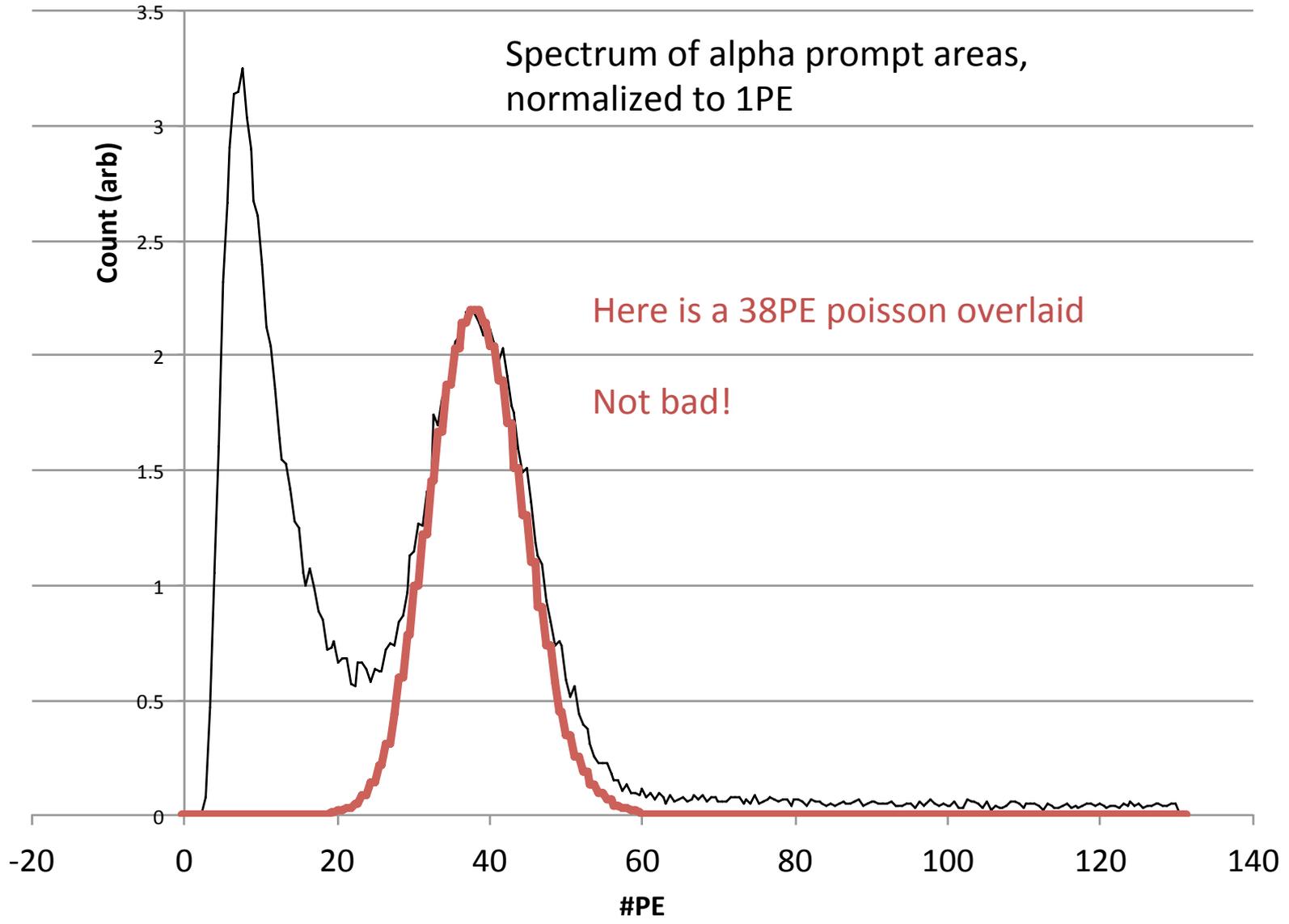


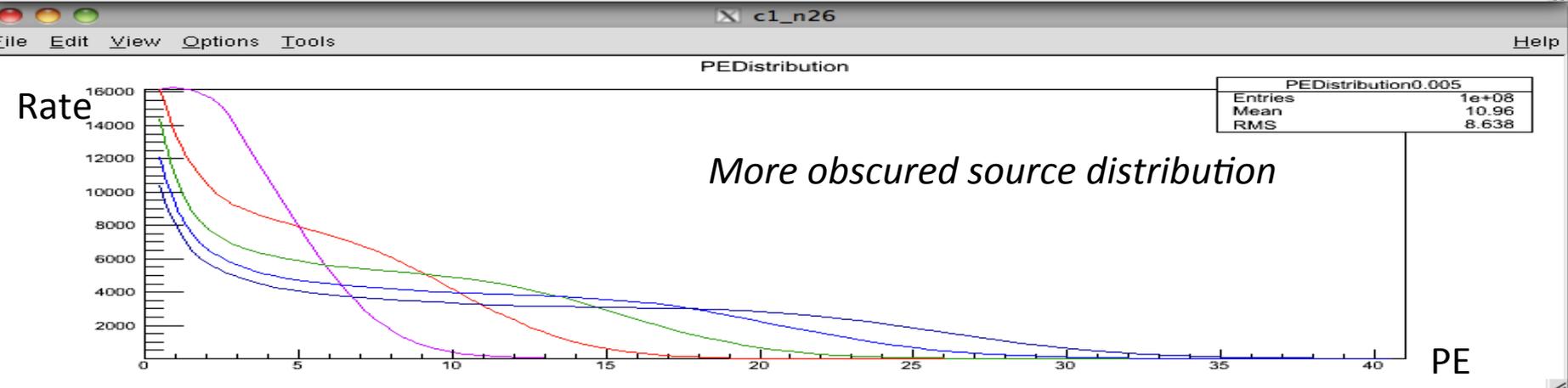
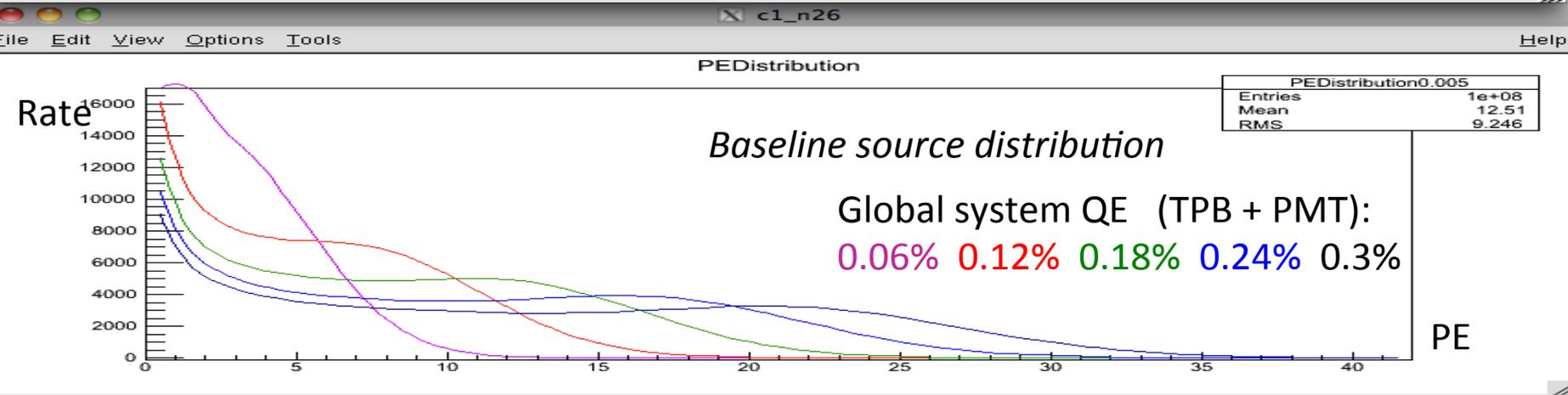
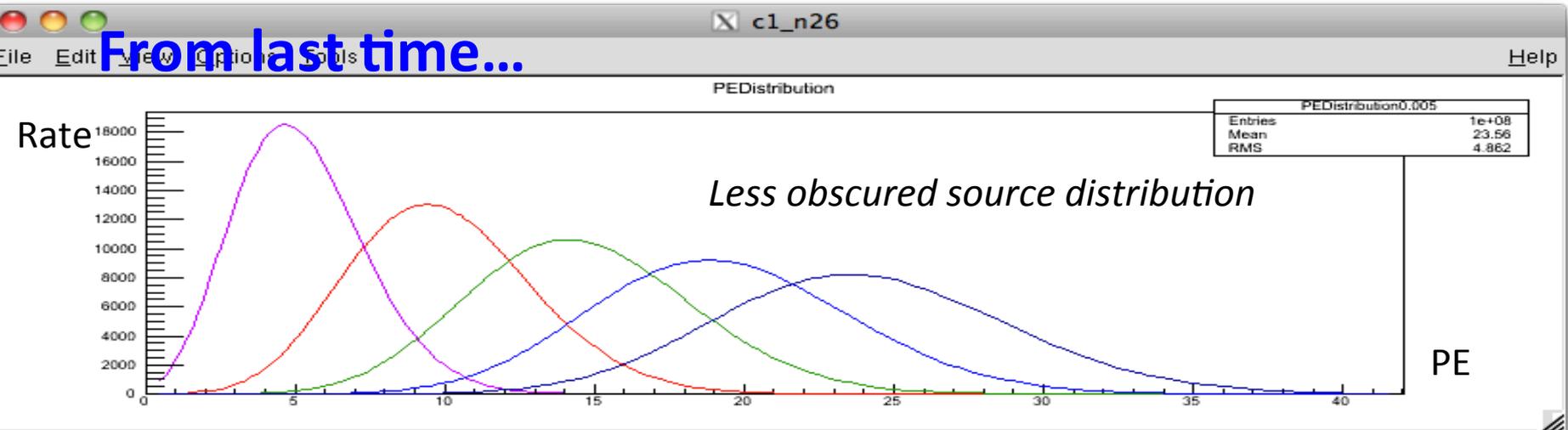
Spectrum of alpha prompt areas,
normalized to 1PE

Count (arb)

Here is a 38PE poisson overlaid

Not bad!





Accounting for all the effects we know so far...

- Our study has a brand new plate.
- We make no assumption about source distribution on disk. Last time I showed that this gives a $\pm 10\%$ systematic between extreme conditions, and here I'll take the baseline.
- We may have a 33% loss from absorption in the argon (needs more thought)
- Using numbers from last time and all these effects, GQE comes out to about

$$\sim 0.73 * (5.3 \text{ MeV} / E_{\alpha}) \%$$