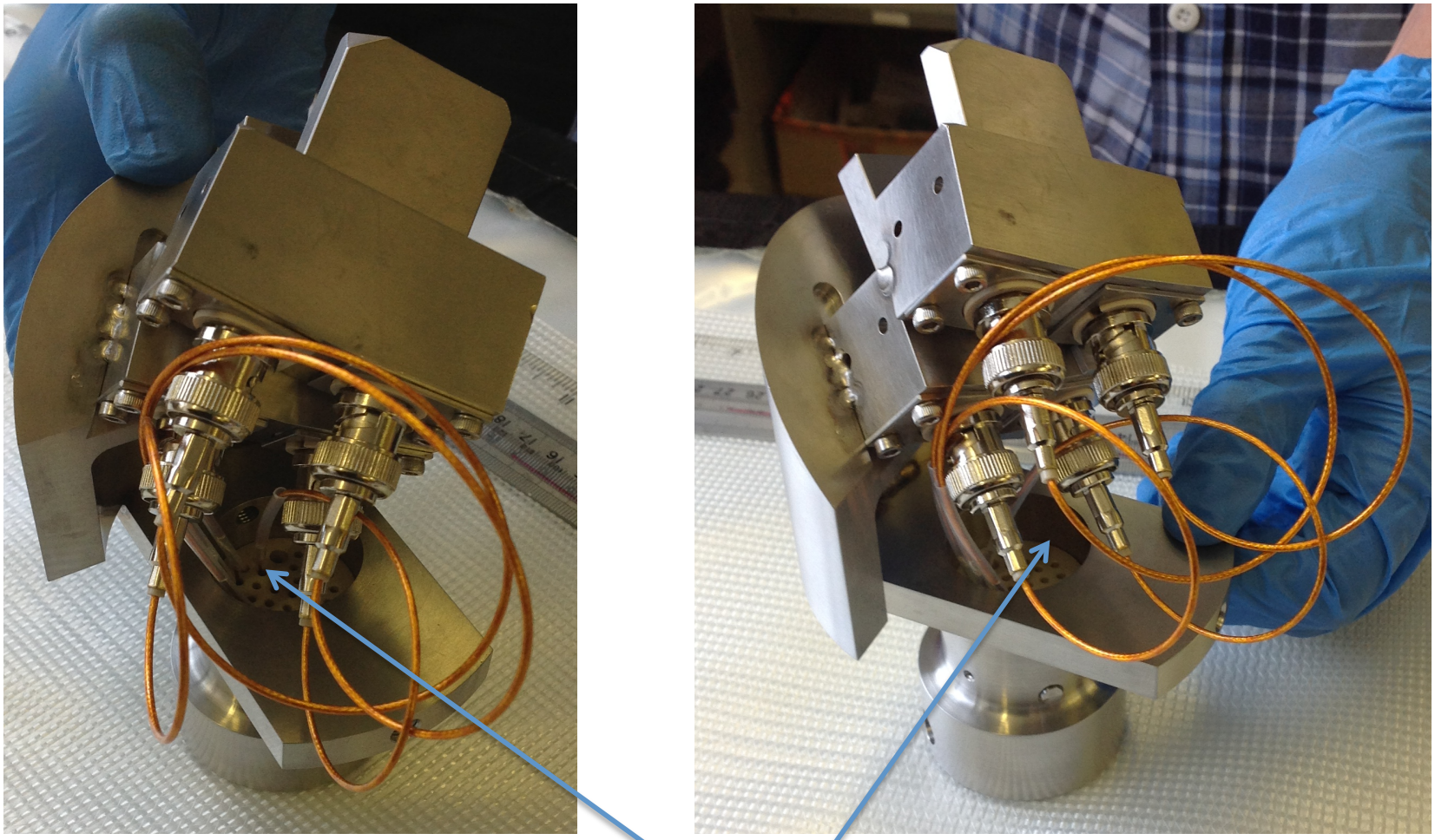
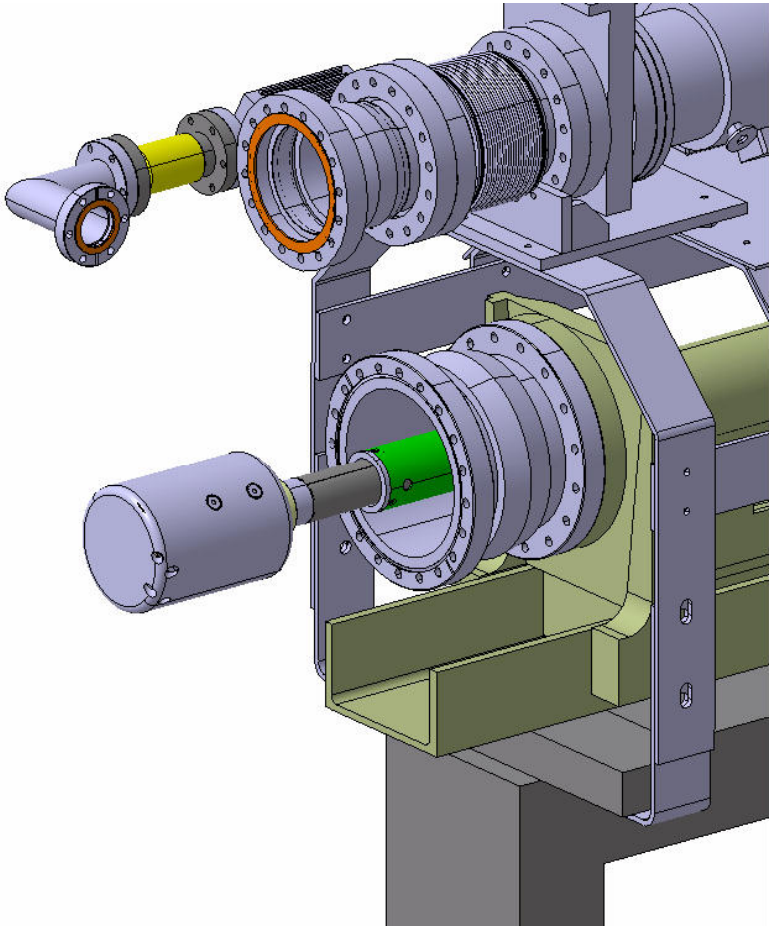
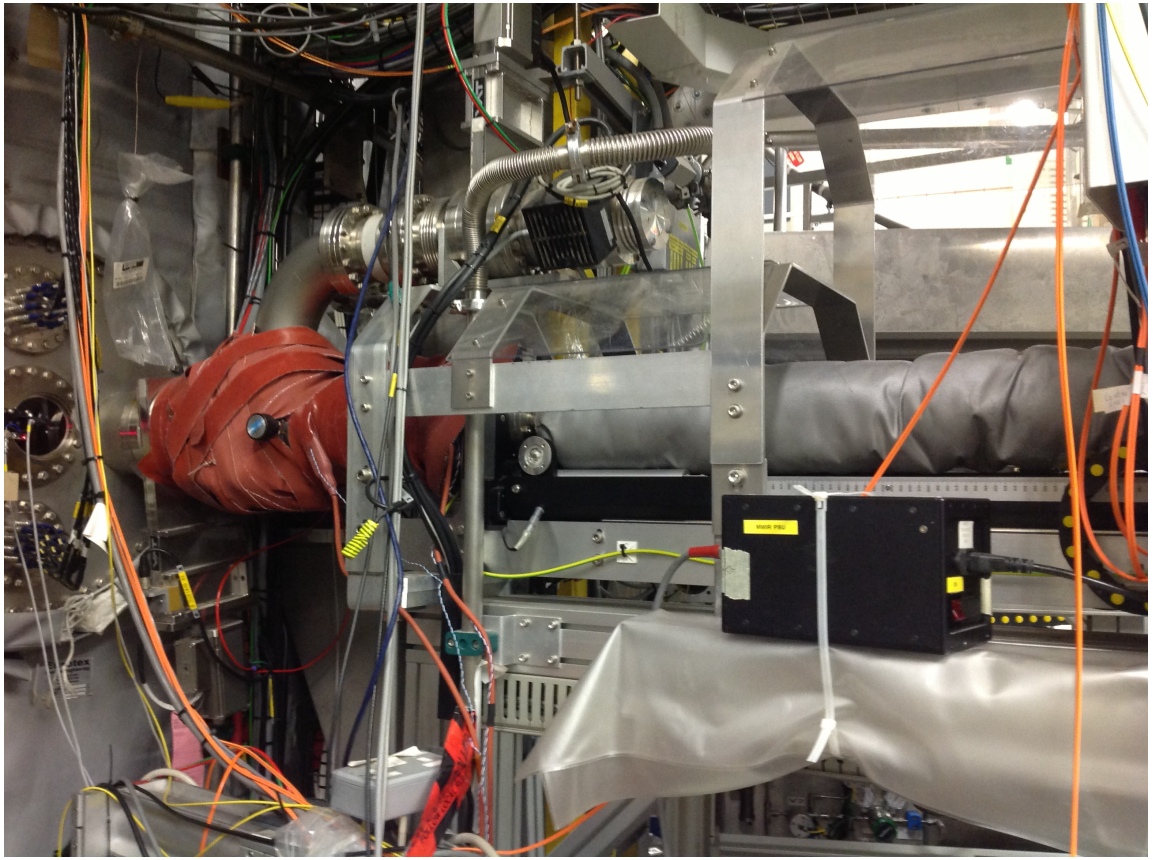
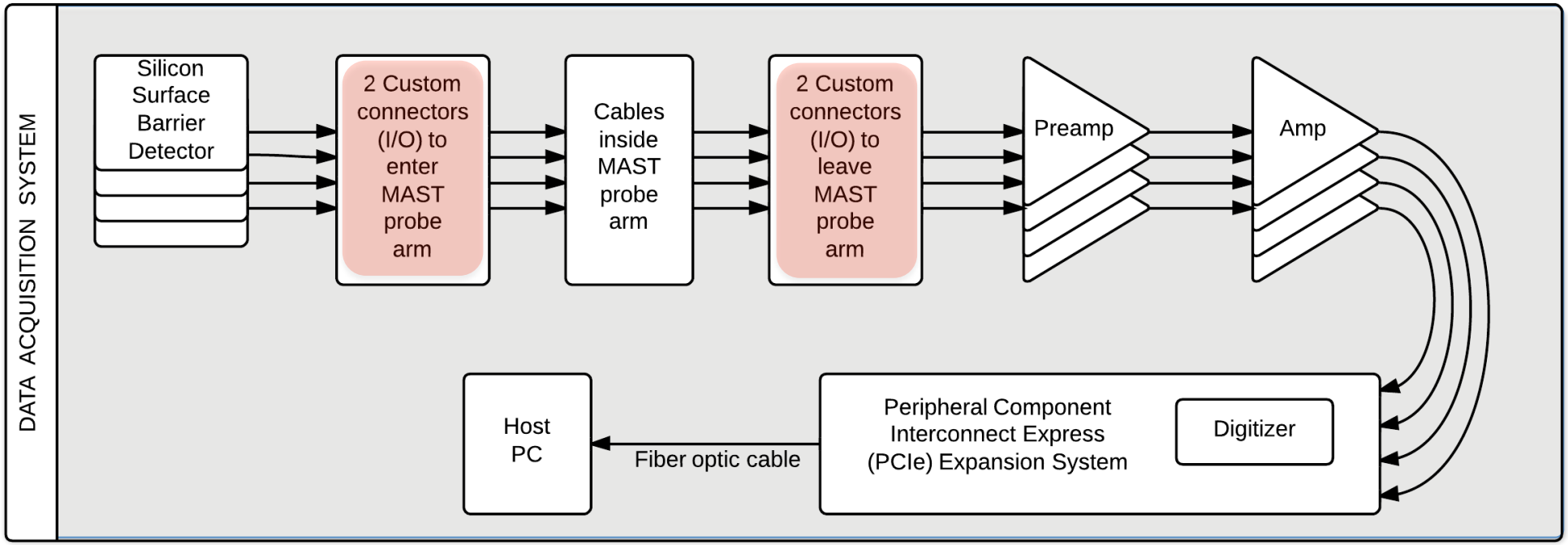


multi-pin probe head connector



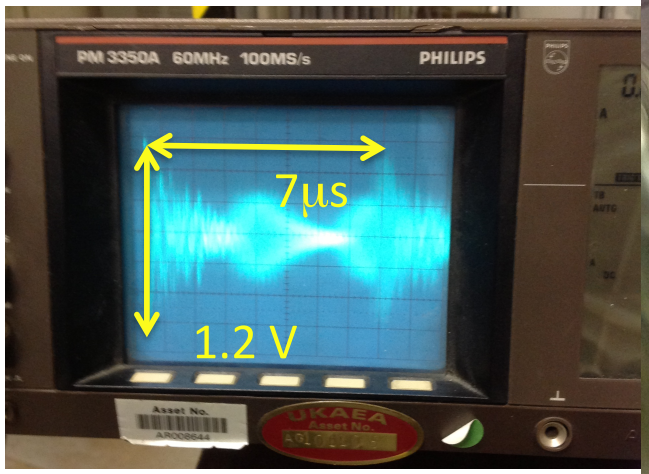


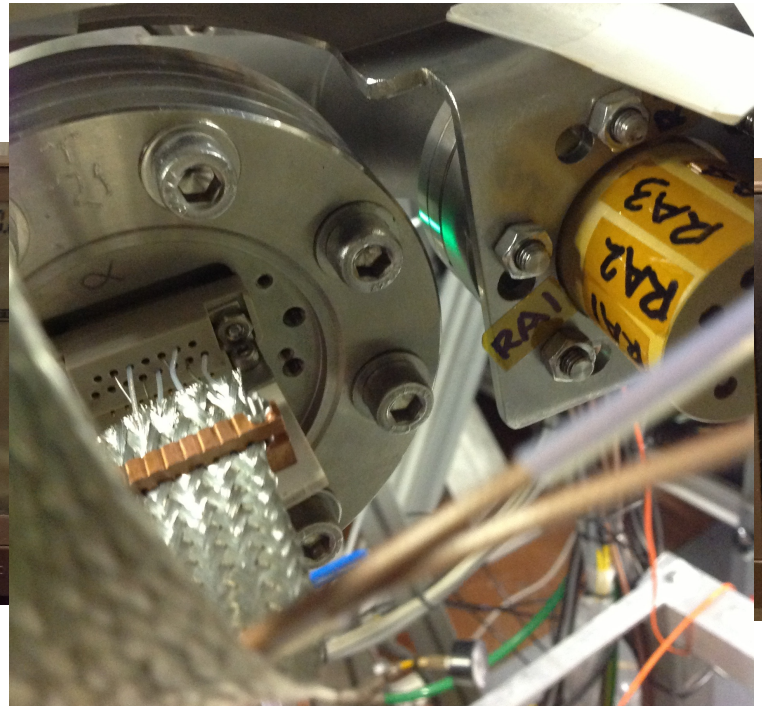
Data Acquisition

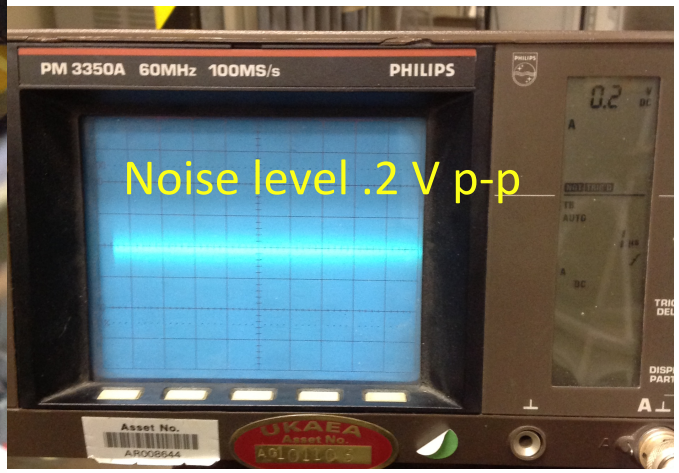


- Custom written software in LabVIEW controls how the digitizer collects data during shots and then writes the data files.
- Sending the signal through custom connectors considerably contributes to noise levels. Floating coaxial feed-throughs should be used to transfer the signal between air and vacuum and any mechanical probe arm flanges.

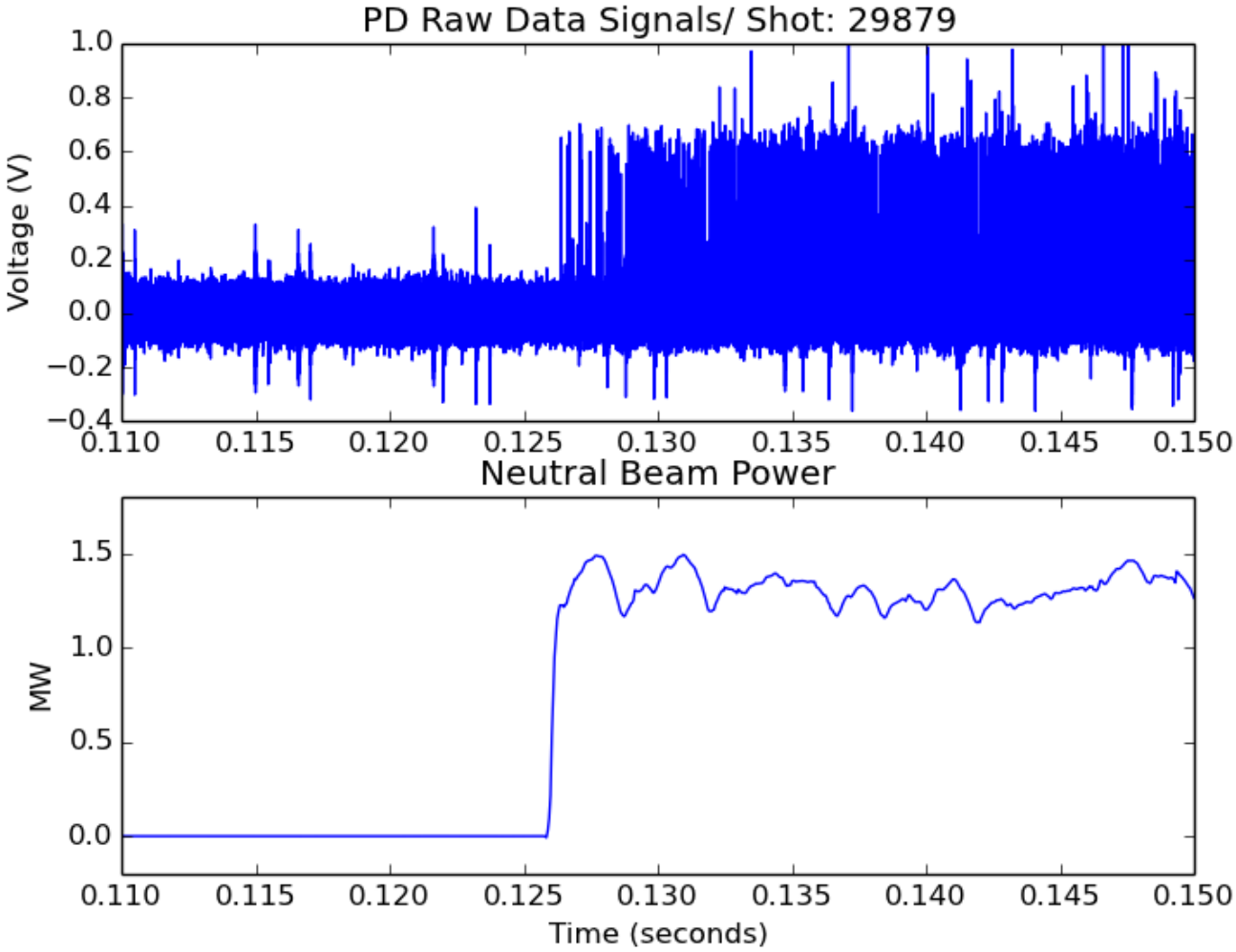
Electrical Noise





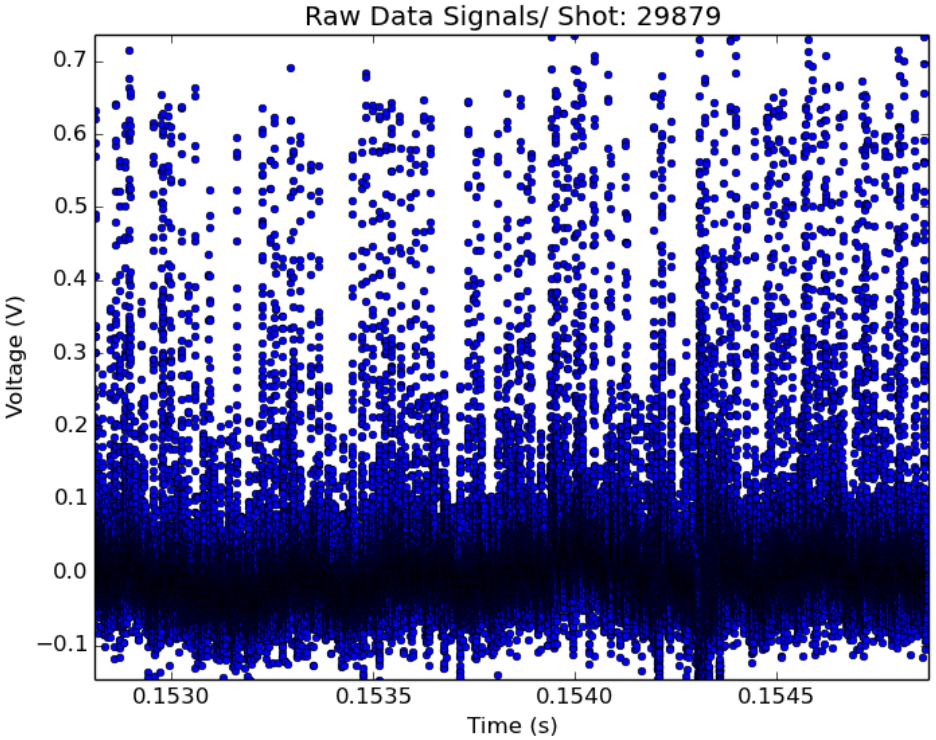


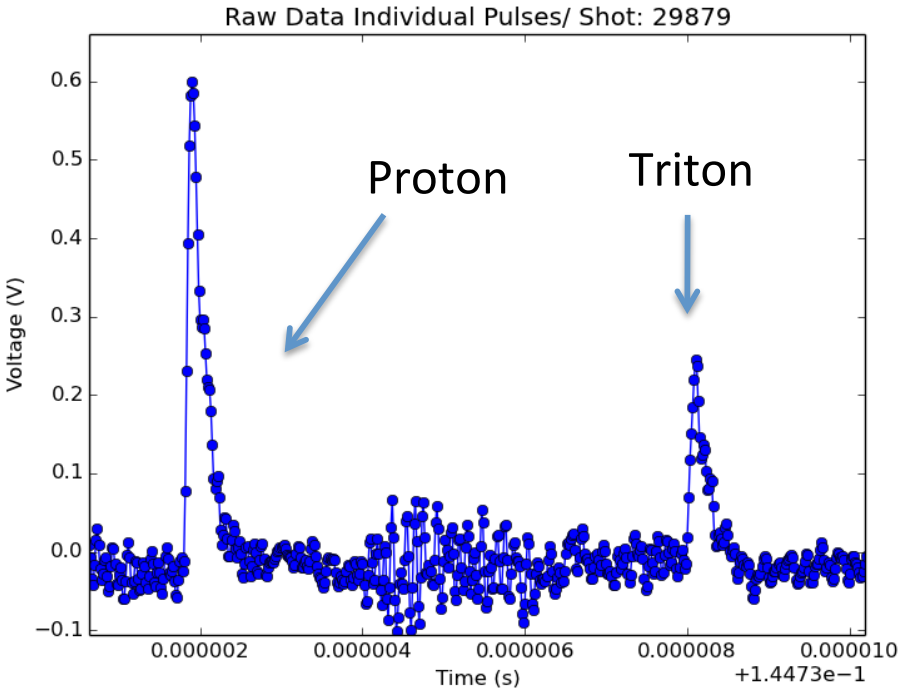
Raw Data: Signals



- Data was continuously sampled during the shot at 60MHz with a high-speed digitizer.
- The observed count rates and pulses showed a clear dependence on the neutral beam power.
- The voltage signals are proportional to the particle's initial energy deposited into the silicon surface barrier detector.

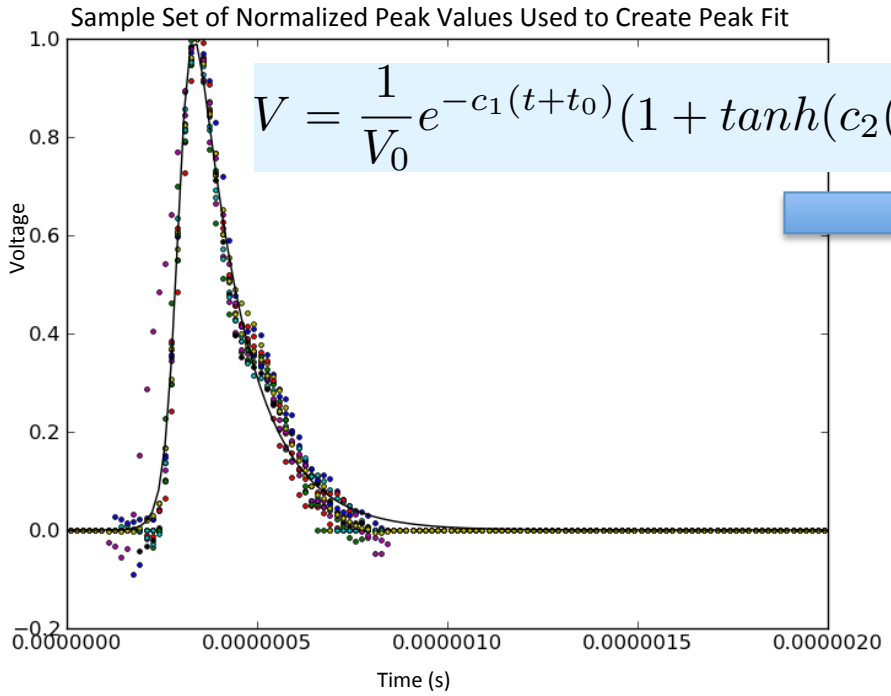
Raw Data: Particle Pulses



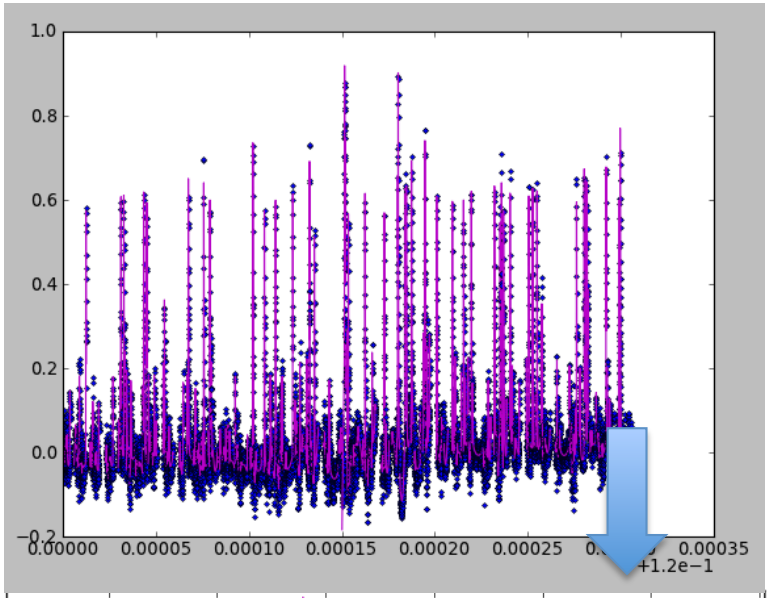


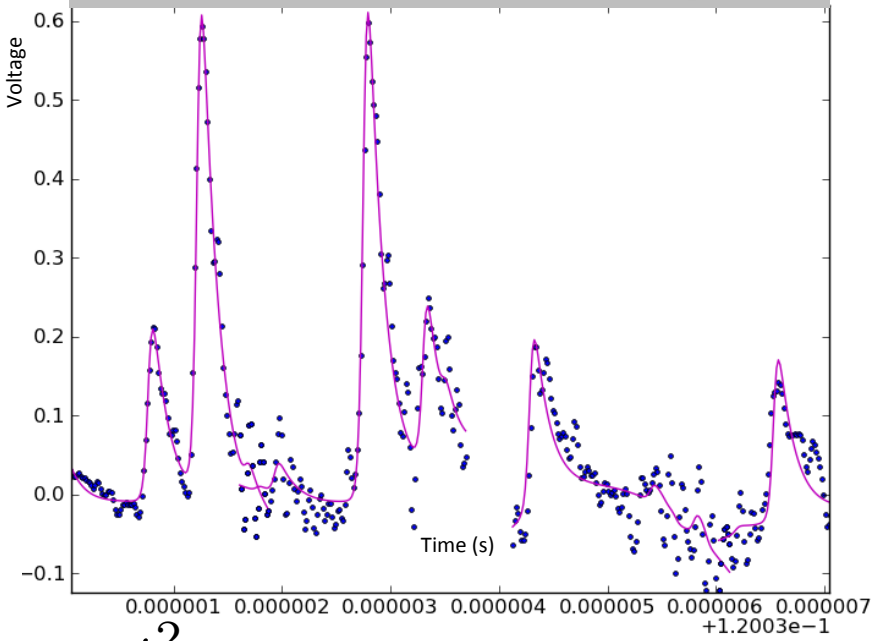
- Average peak height ~0.6V for 3MeV Proton and ~0.2V for a 1MeV Triton. The average peak width is ~100 - 500ns, epending on shaping parameters
- 0.8 MeV ^{3}He ion would have an average height of ~0.15V (or less due to energy loss in foil)
- ^{3}He could be identified so far

Peak Fitting



$$V = \frac{1}{V_0} e^{-c_1(t+t_0)}(1 + tanh(c_2(t+t_0)))$$

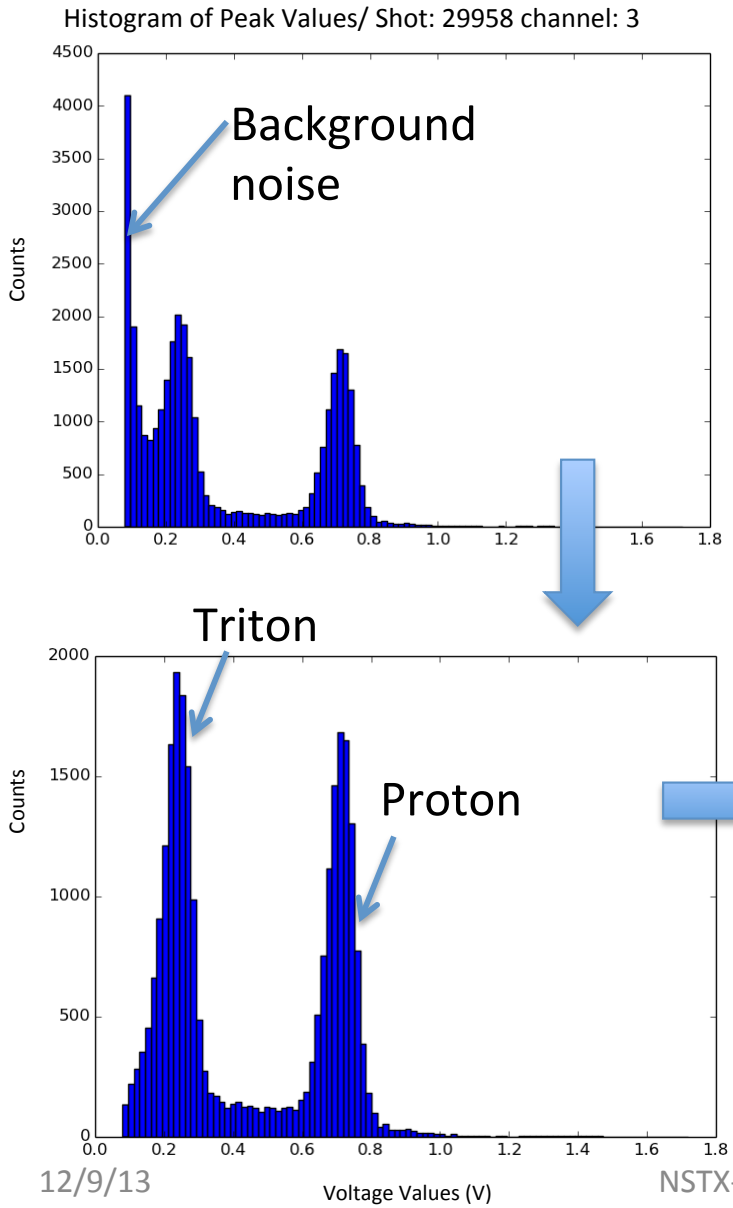




- A peak shape function from sampled peaks within each data channel.
- Sampled data are normalized to a maximum value of 1
- Normalized data are fitted determining C_1 and C_2 fit.
- Groups of peaks fitted with:

$$S(t, t_0) = AV_N(t, t_0) + a_0 + a_1 t + a_2 t^2$$

Particle Rates: Beam pulses



- Criteria of good signals: ratio of fitted amplitude error to amplitude value
- Cut on ratio to suppress noise
- Histogram amplitudes for given time bin
- Proton and triton are mono energetic
- Integrate over time bin