

Fourier Transform Validation

Overview

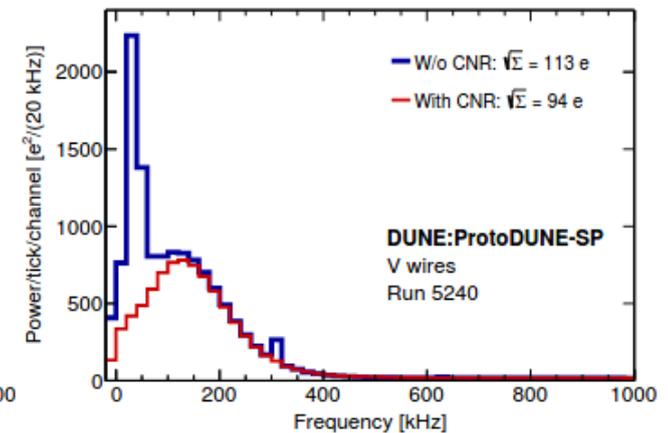
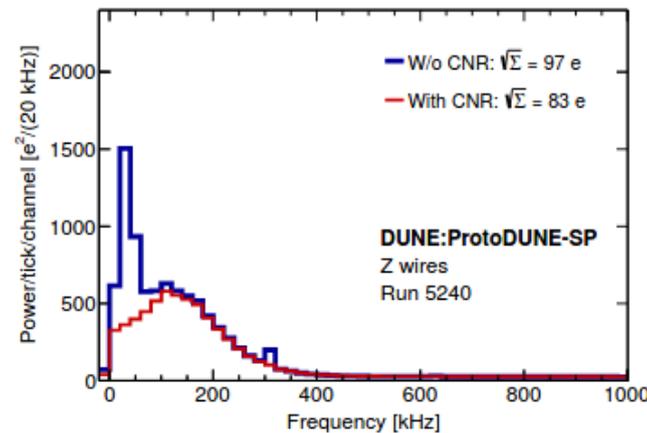
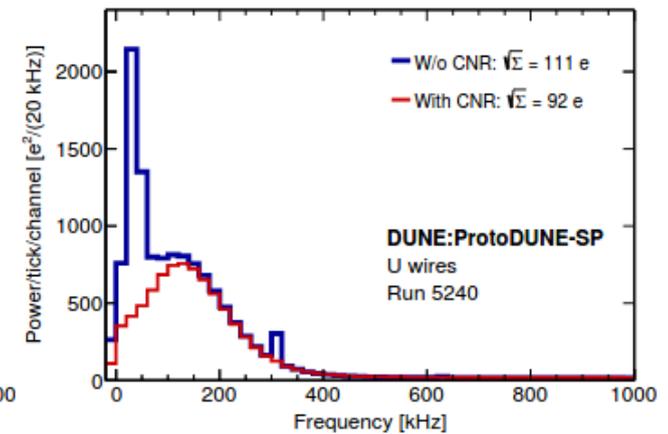
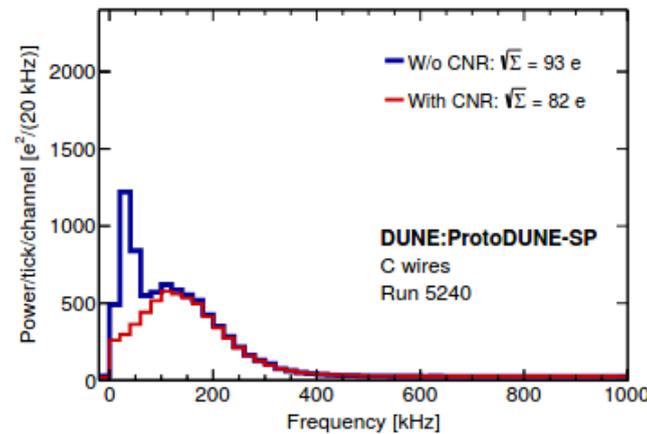
- Previously, we presented benchmarking of collecting time series and performing fast Fourier Transforms. Were looking at processing time without inspecting results.
- Now we have cleaned up the results and plotted them so we can check they look as we expect.
- Drawing the plots also gives us an opportunity to assess the impact of downsampling.

Expectations

Noise spectra from ProtoDUNE performance paper:

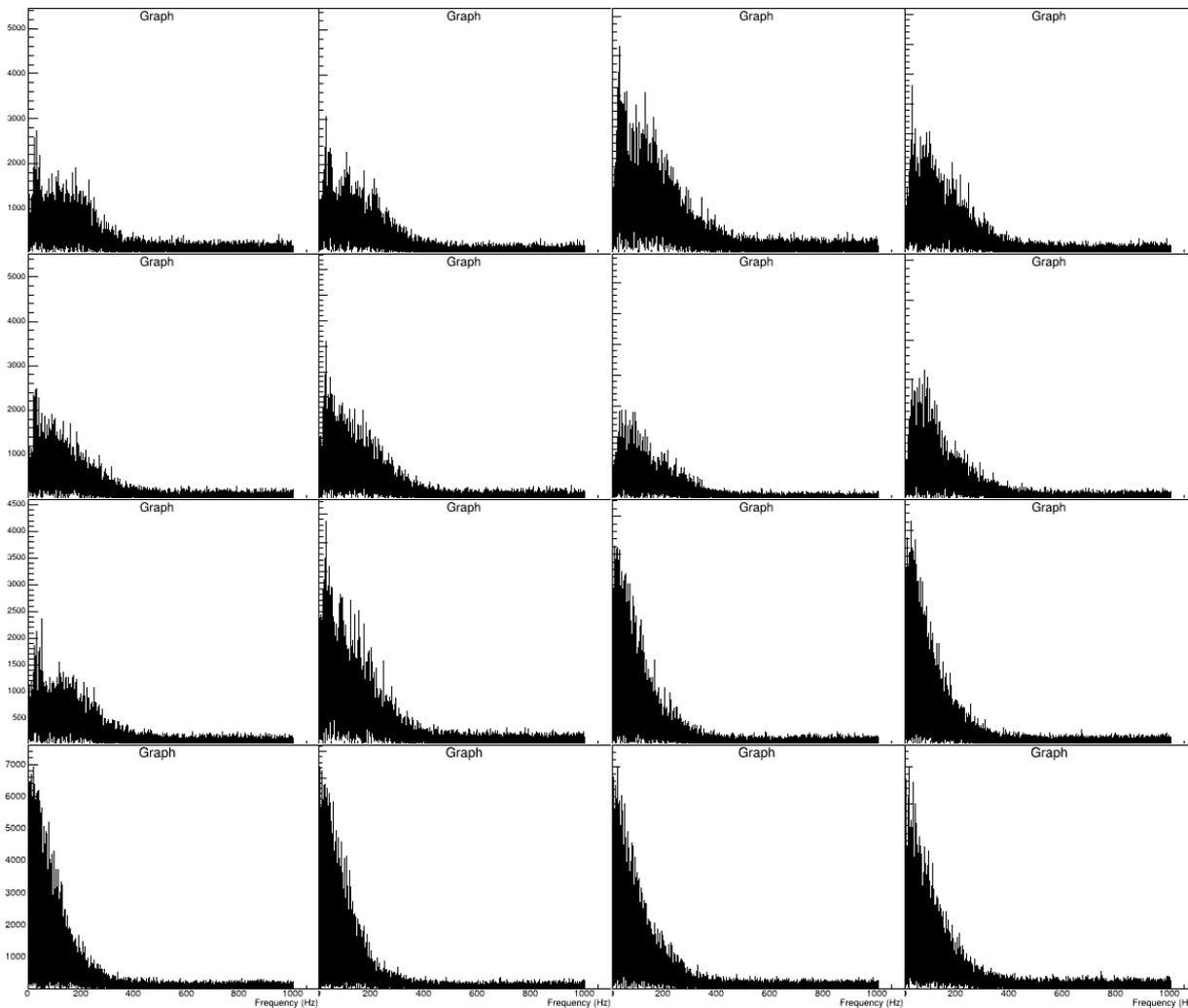
- Spike of coherent noise around 50 kHz
- Broad peak centred around 125 kHz, dying off at ~400 kHz.

N.B. these plots are aggregated over an entire wire plane; our plots are describing a single wire.



Results

(1st 16 channels)



**Downsampling
factor: 1 (no
downsampling)**

**Benchmarking
results**

Time w/ saving: 635 s

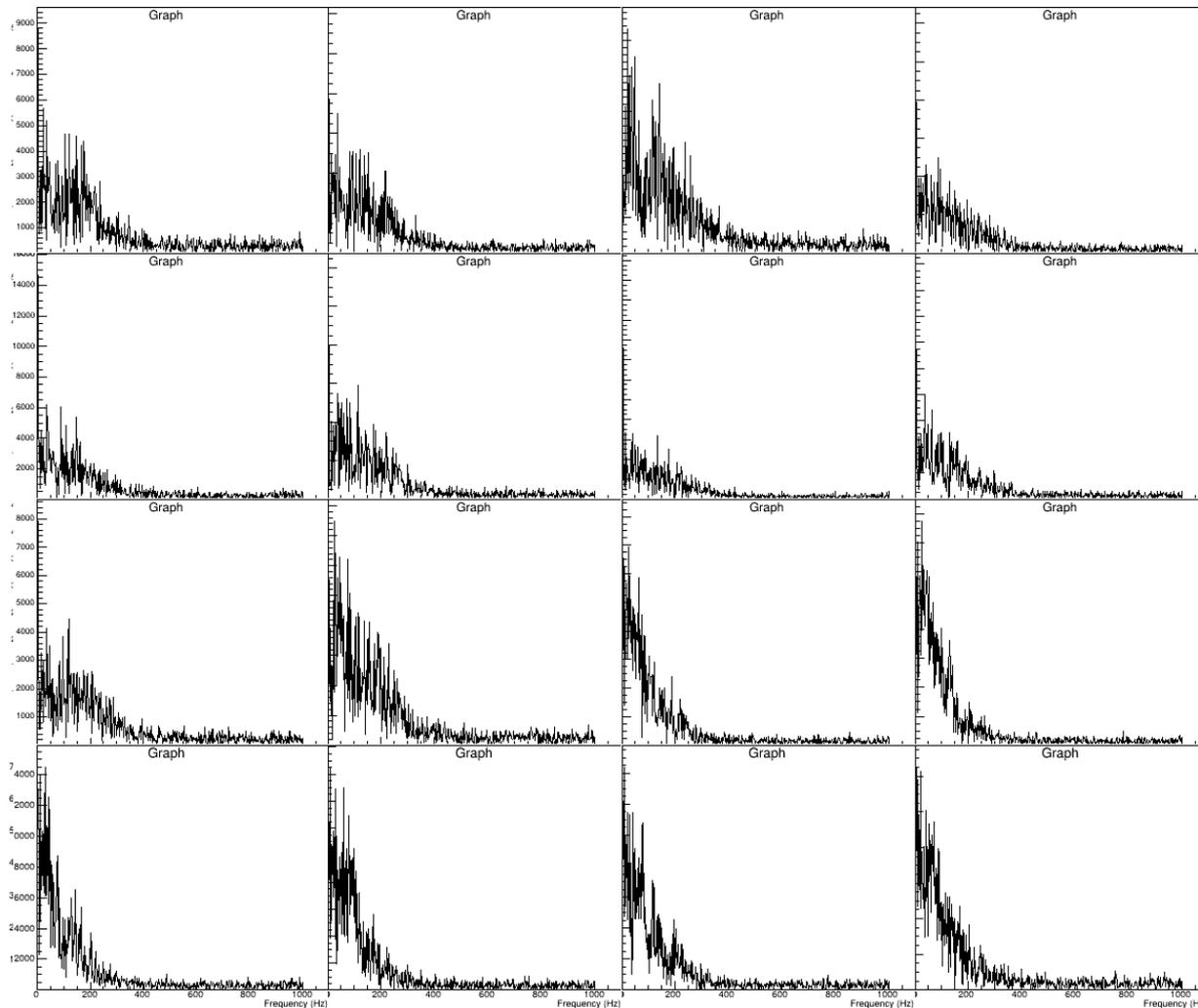
Time w/out saving: 271 s

Output filesize: 20M

N.B. processing results are for whole file (256 channels, 1 s); output filesize is for single batch (5 μ s). Whole file produces 213 output files.

Results

(1st 16 channels)



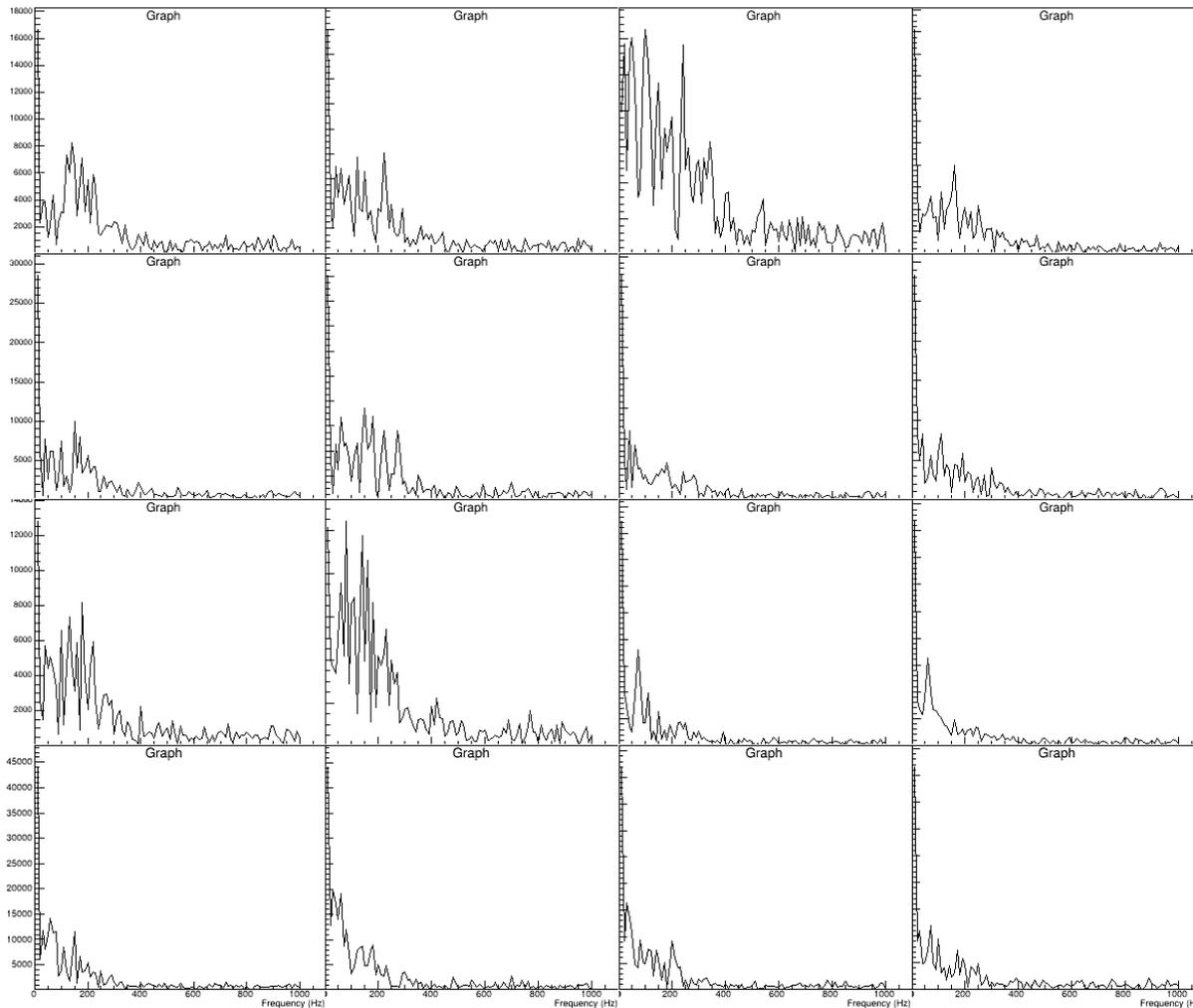
**Downsampling
factor: 10**

**Benchmarking
results**

Time w/ saving: 293 s

Time w/out saving: 255 s

Output filesize: 2M



**Downsampling
factor: 50**

**Benchmarking
results**

Time w/ saving: 266 s

Time w/out saving: 257 s

Output filesize: 407K

Downsampling Discussion

- Processing time before saving is fairly steady around 260 s.
- Including saving, the processing time varies strongly depending on the chosen downsampling factor.
 - This may be something we sidestep in the final implementation, as we only pass these files on.
 - The filesize of the output also grows proportionally.
- Even at ‘low’ downsampling factors, information loss is noticeable in the shape of the distributions.
- If we need to, we could do some online analysis of this data to simplify the information we’re sending on – but we want to cleave as closely as possible to the philosophy of sending on a complete dataset and doing analysis offline.