

APA DUNE Wire Analyzer Update

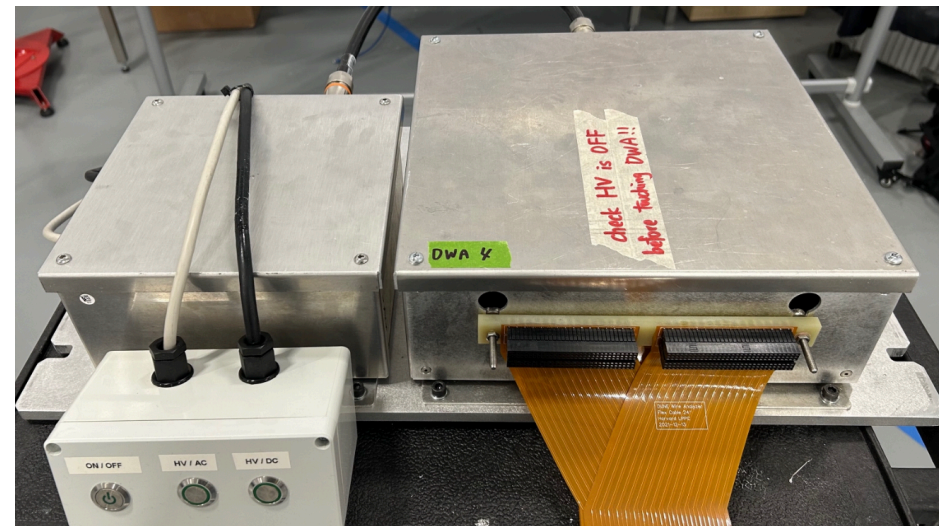
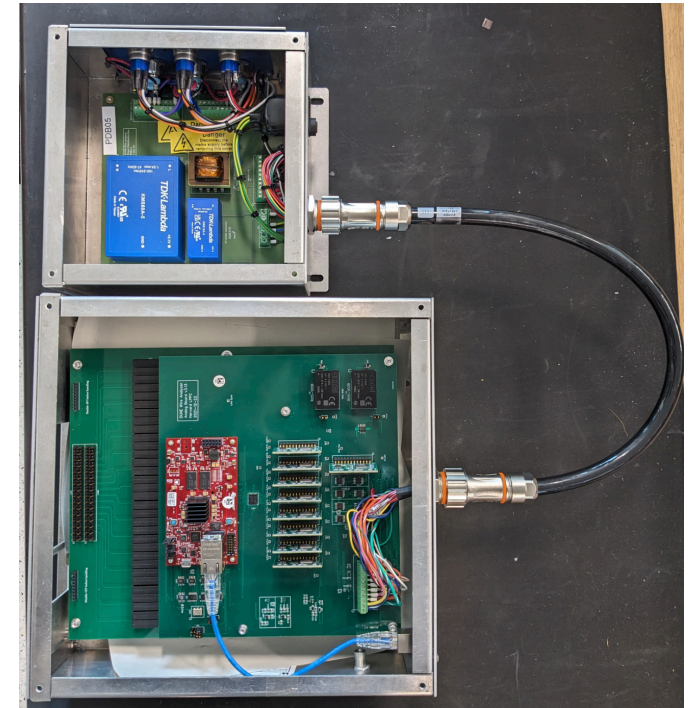
Brian Rebel and Justin Evans
Anyssa Navrer-Agasson
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- DUNE Wire Analyzer Status and Progress
- Repeatability Tests
- Additional Studies



- DWA group from Manchester and Imperial have put a lot of effort into improving the system over the last year
 - Better electrical connections
 - System tests using dedicated stand at Manchester
 - Engineering note and safety reviews
- Used at CERN for the cold tests
- Coordinating with APA factory at Daresbury for tests

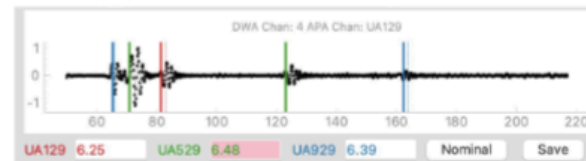


Wires sampled

- Layer G & X: all wires
- Layer U and V:
headboards #1, #3, #8
 - Wires chosen to represent all possible configurations of number of segments and a variety of lengths

U and V layers

- U and V layers are more complex than X and G layers, as it can have up to 3 different resonances in one channel.
- This is due to the wrapping geometry of the APA, and there are multiple wire segments in one channel.



Slide by S.Kubota

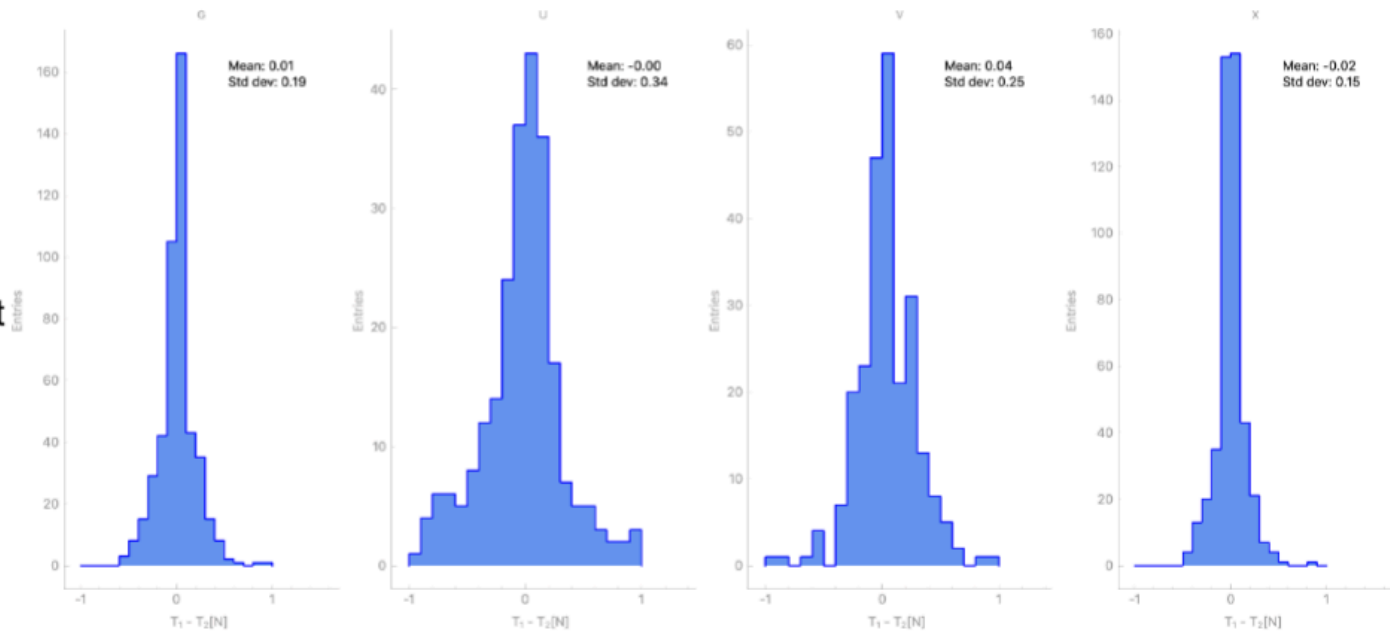
----- Comb:
creates node, responsible for making multiple peaks in one resonance



- One question about the DWA performance is the reliability of the measurements
- Tested APAs 11 and 13 at DL a couple of days apart to get an idea

APA 11

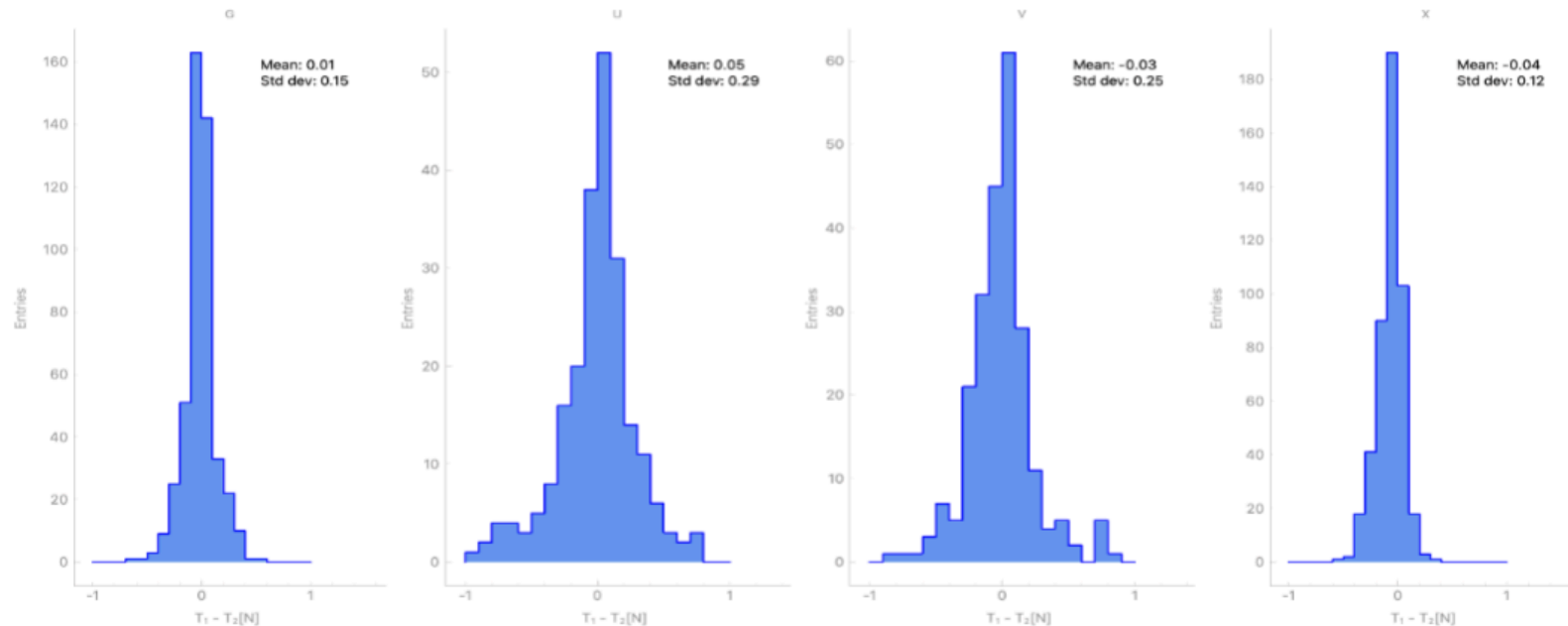
- Distribution of $T_{run1} - T_{run2}$
- Only consider wire segments with length > 1m
- Means consistent with zero difference
- Study will be repeated with higher statistics



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- Runs were taken two days apart, only wires with $L > 1$ m are shown
- Distributions are centered at 0 with standard deviations between $0.15N$ - $0.34N$ depending on the layer

APA 13



The mean of each distribution is consistent with zero!

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- Runs were taken four days apart
- Distributions are centered at 0 with standard deviations between 0.12N - 0.29N depending on the layer



- These tests show the measurements are repeatable as the distributions are centered at 0 with standard deviations of $< 0.3N$
- Only two sets of measurements were used, so we would like to have a larger sample set
 - Possibly measure the same subset of wires multiple times in rapid succession
 - Could also measure a single APA more times over a longer period
- We should look into the outliers to see if those segments always have a larger dispersion from one test to the next
- The laser system should have a similar repeatability test performed in a systematic manner - would have to be done one layer at a time though



- The DWA analysis time can be large if there are several segments where the peak finding algorithm has difficulty
- We need to spend some time improving that algorithm to reduce the amount of intervention needed....which can also affect repeatability
- We have also noticed the data are sometimes noisier than others
- We have some idea of a potential cause - poor POGO pin connection between the probe board and APA head boards
- Considerable progress has been made, but there is more work to be done