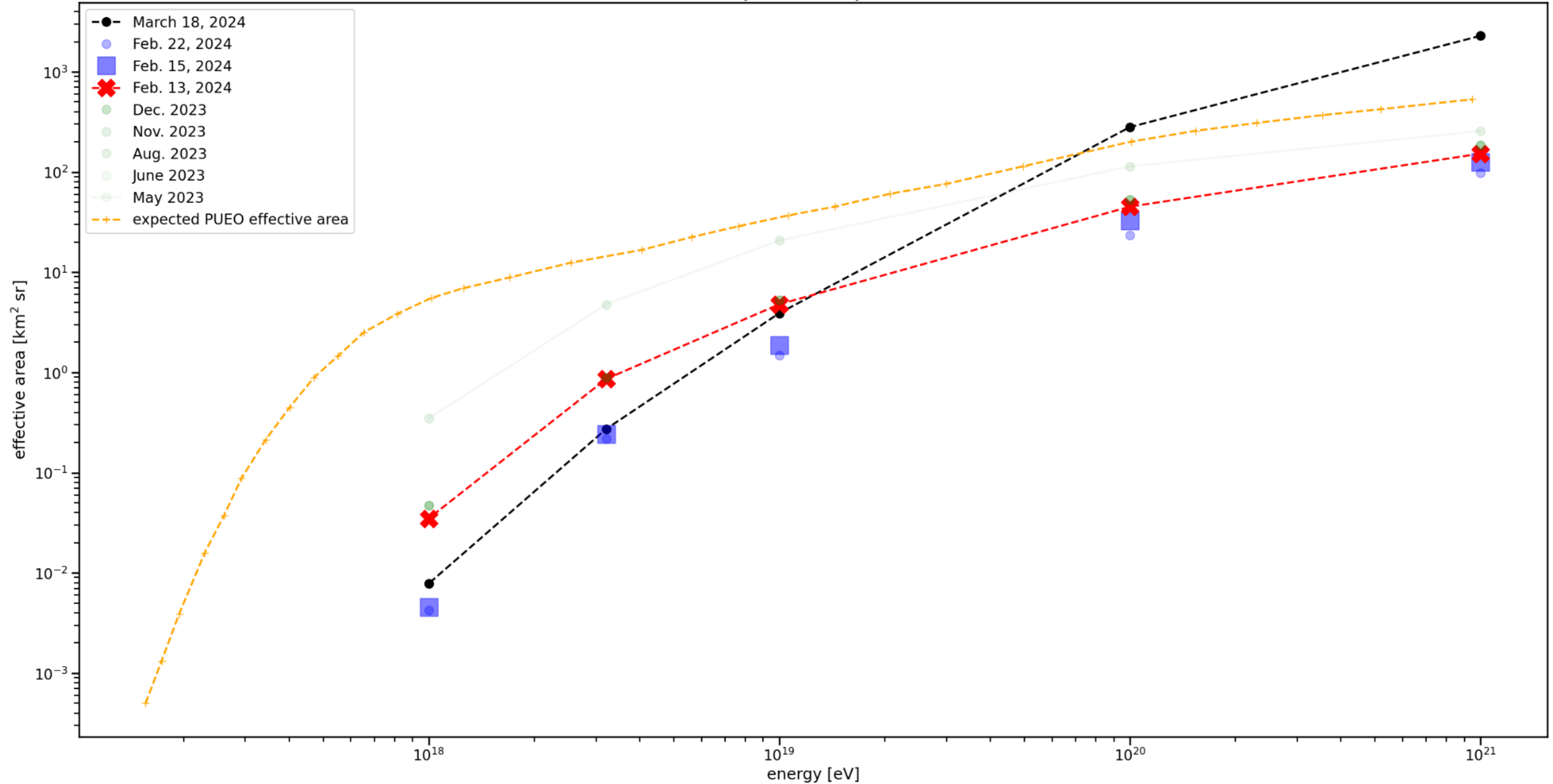# Effective Area Updates

Kaeli Hughes, with help from the entire simulation team, especially:
William Luszczak, Jason Yao, Christoph Welling, Amy Connolly, Rachel Scrandis, and Juan Ammerman-Yebra
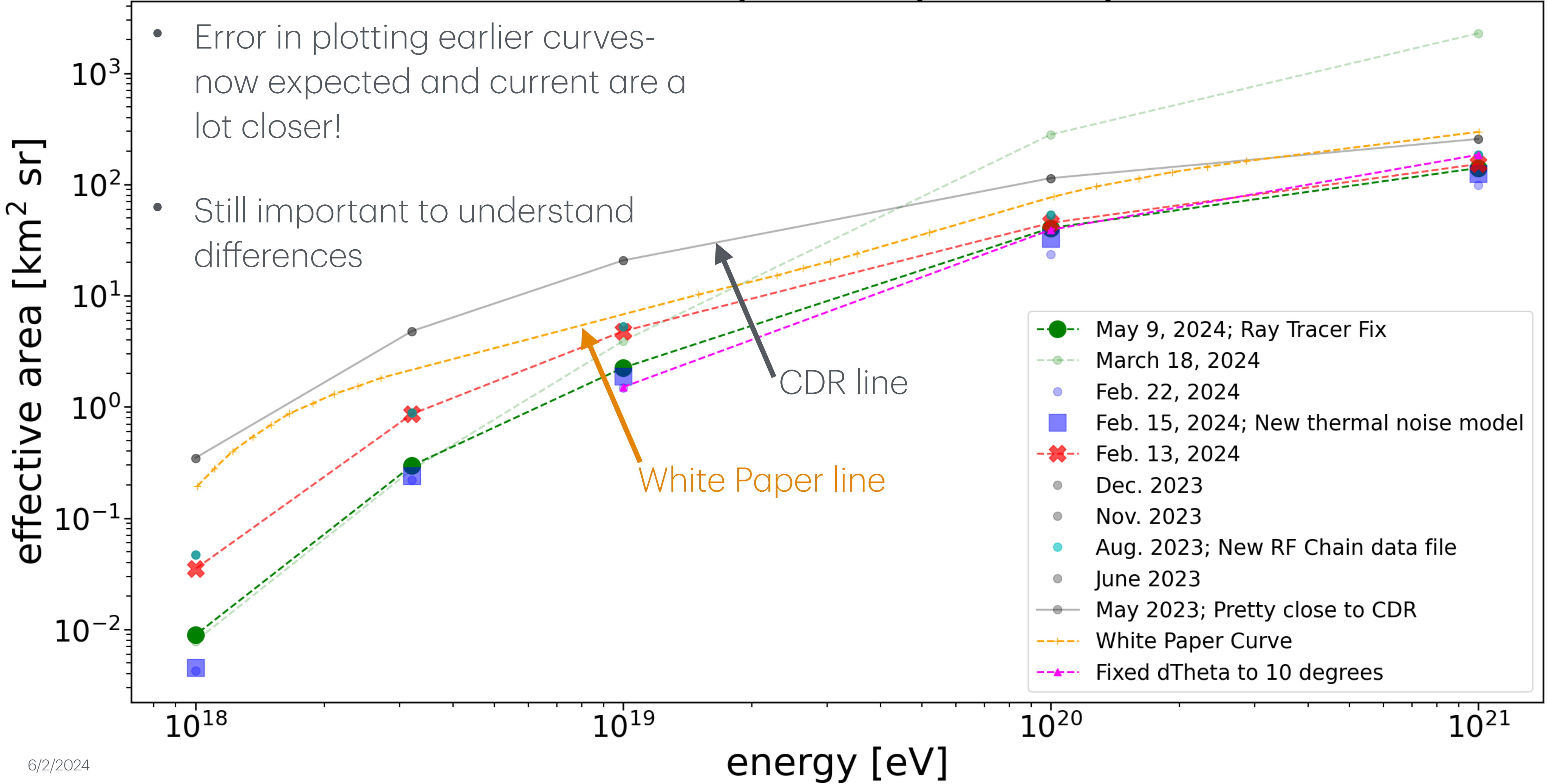
From last time

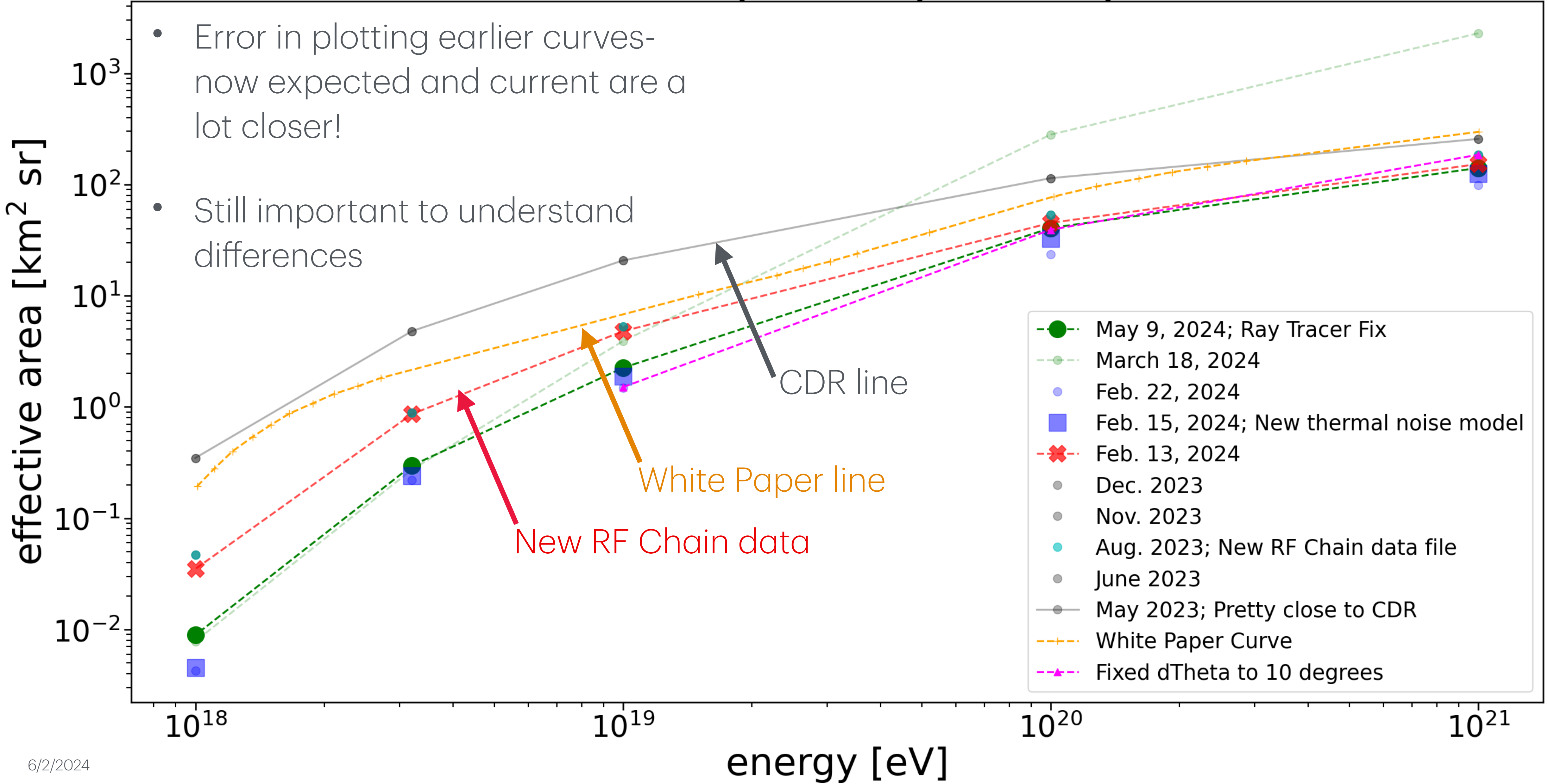effective area history between May 2023 and March 2024

Credit: Jason Yao

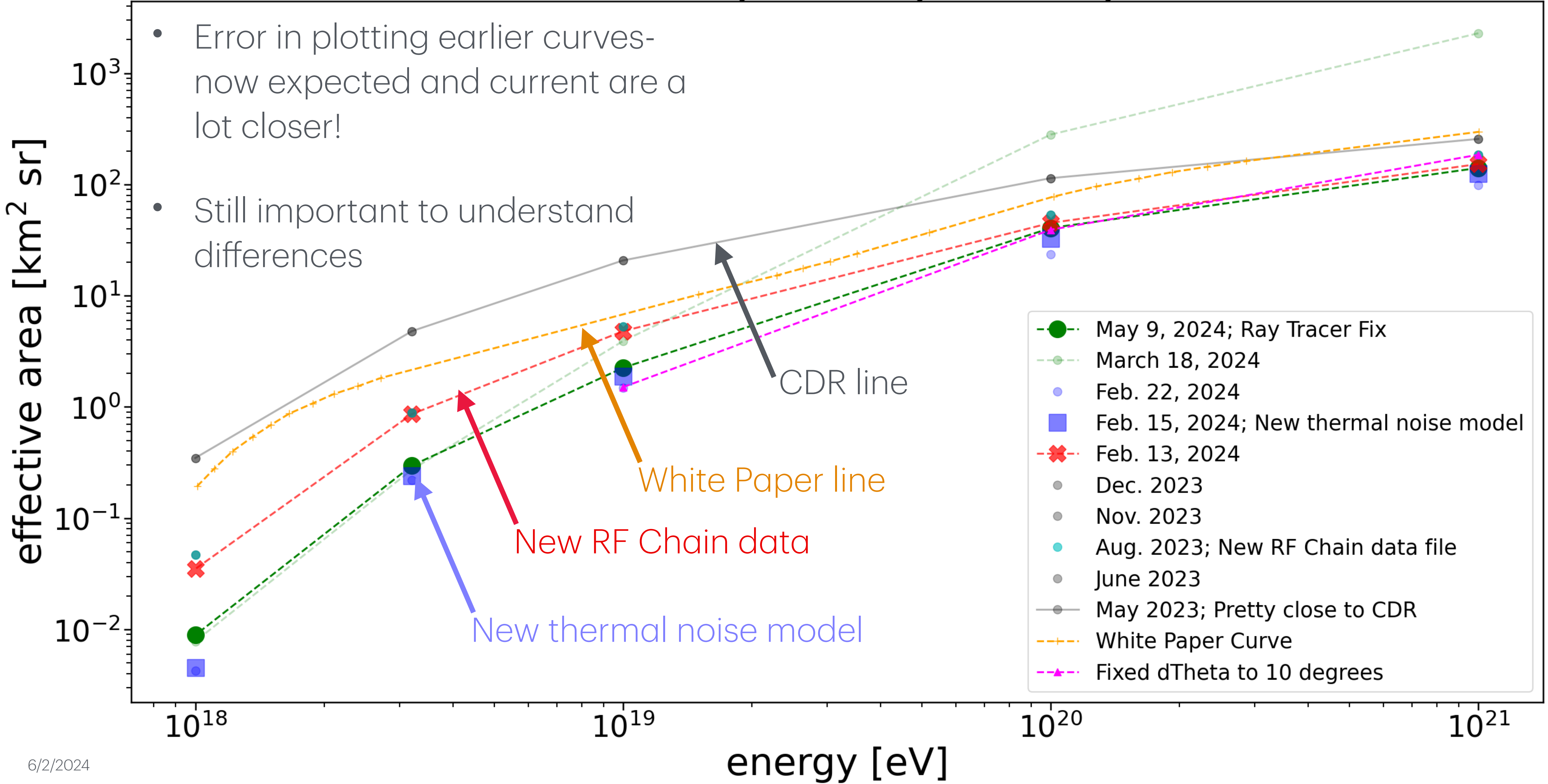# Current Status

effective area history between May 2023 and May 2024

- Error in plotting earlier curves- now expected and current are a lot closer!

- Still important to understand differences

CDR line

White Paper line

Legend:
- May 9, 2024; Ray Tracer Fix
- March 18, 2024
- Feb. 22, 2024
- Feb. 15, 2024; New thermal noise model
- Feb. 13, 2024
- Dec. 2023
- Nov. 2023
- Aug. 2023; New RF Chain data file
- June 2023
- May 2023; Pretty close to CDR
- White Paper Curve
- Fixed dTheta to 10 degrees

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6/2/2024

4

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Things to consider: trigger efficiency change

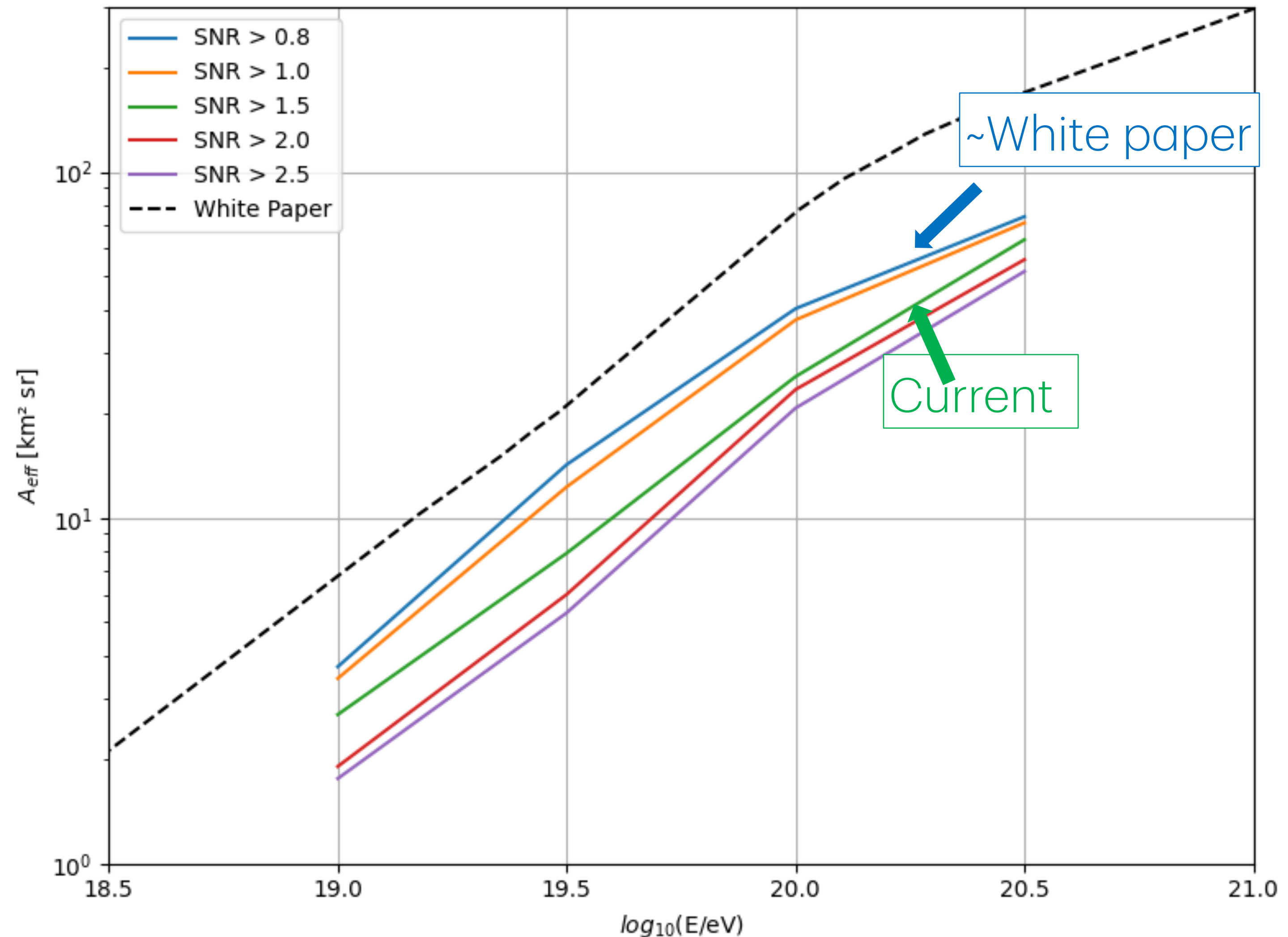From white paper

New simulation

Credit: Christoph Welling, Will Luszczak
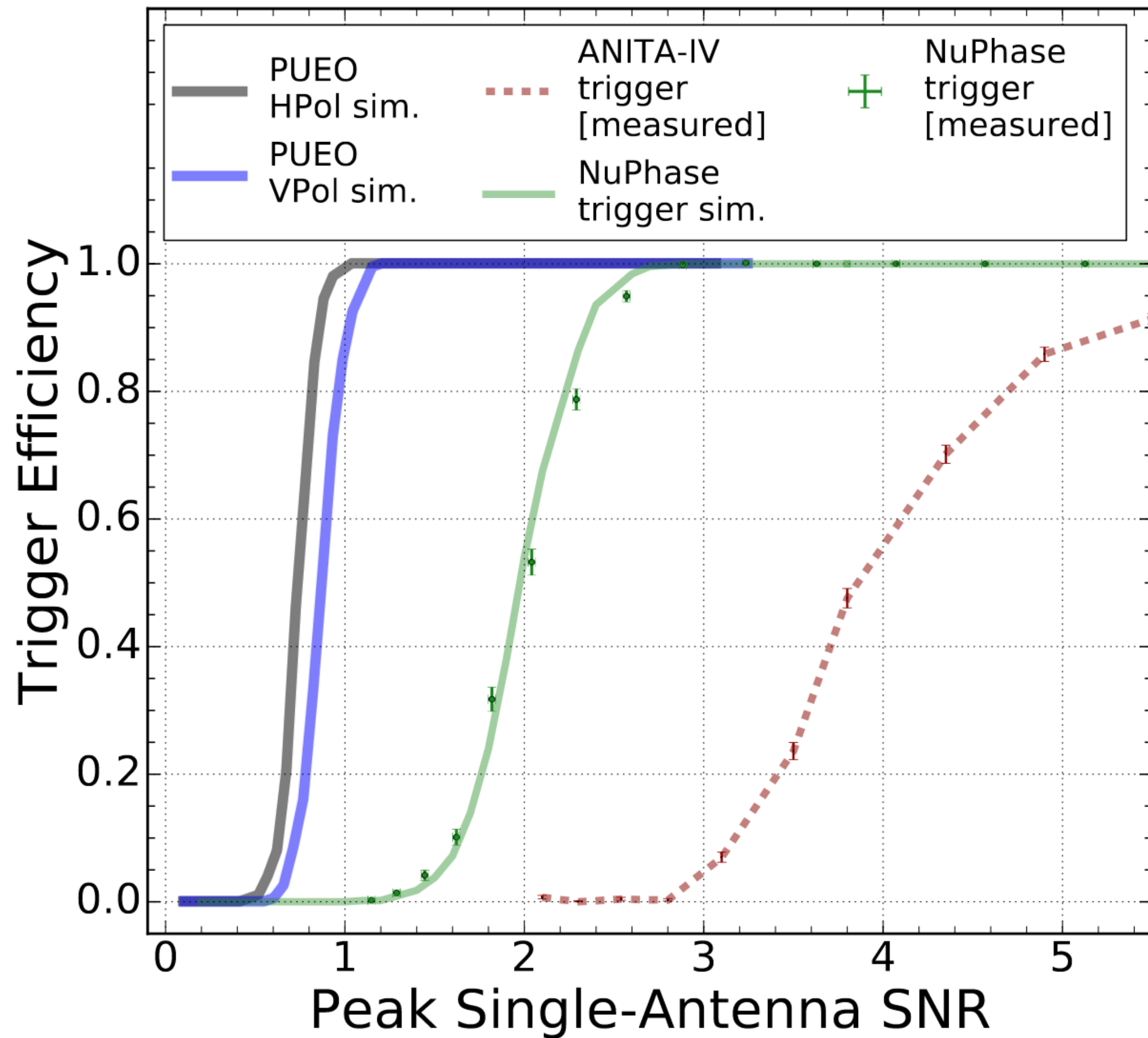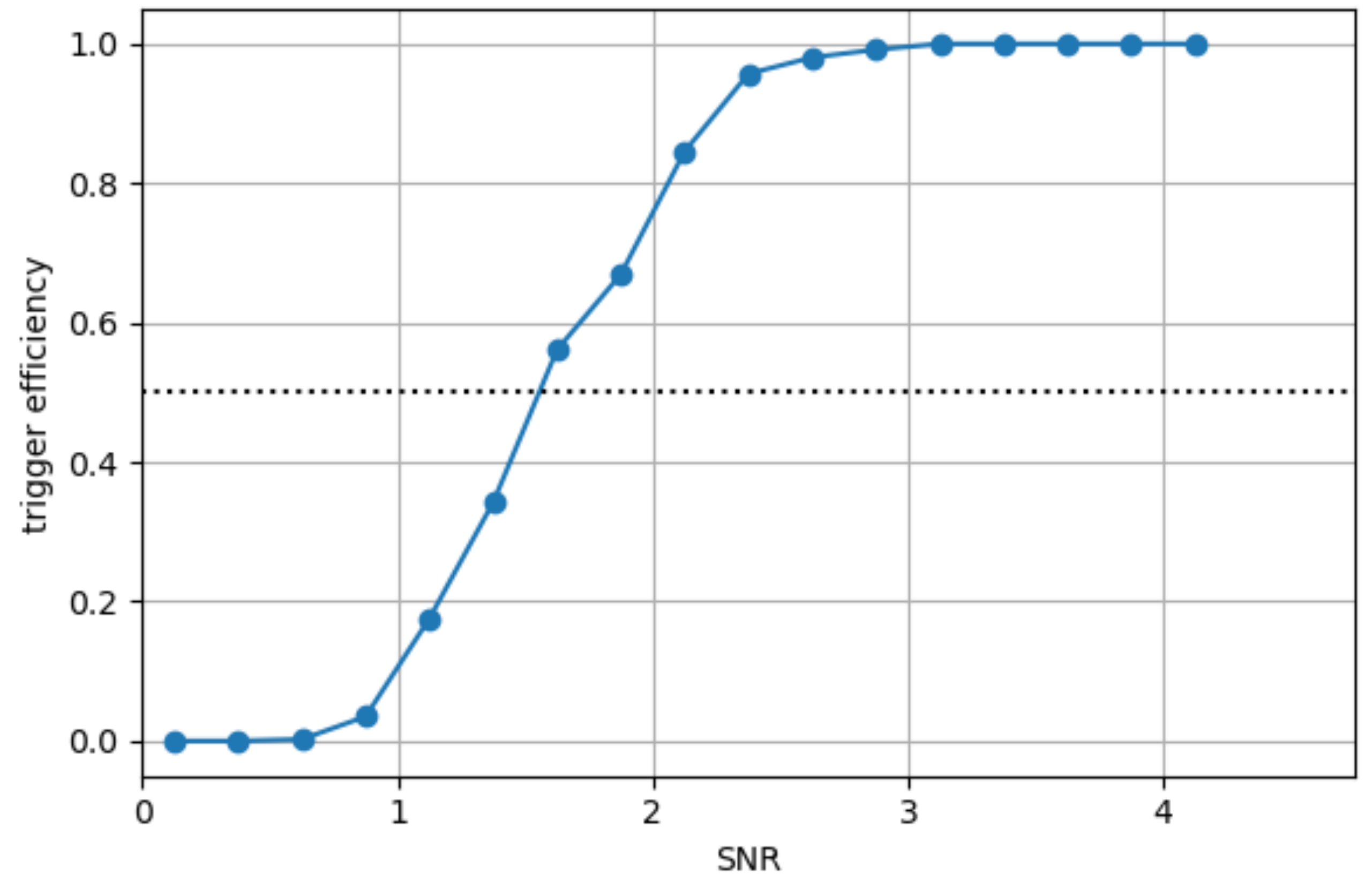
# Could it just be trigger efficiency change?

- Study done by Christoph shows that trigger efficiency does have an impact

- Does not explain the entire difference between expected and current, but it's a step towards understanding

Credit: Christoph Welling

# Things to consider: Updated RF Chain

- At some point, RF Chain was updated to have the correct gain of ~65 dB

- An attenuator was accidentally included in the file we were using

- Previously, noise was added to waveform separately from RF chain; now we send noise and signal through the chain

- This is a work in progress to double check relative strength of signal and noise
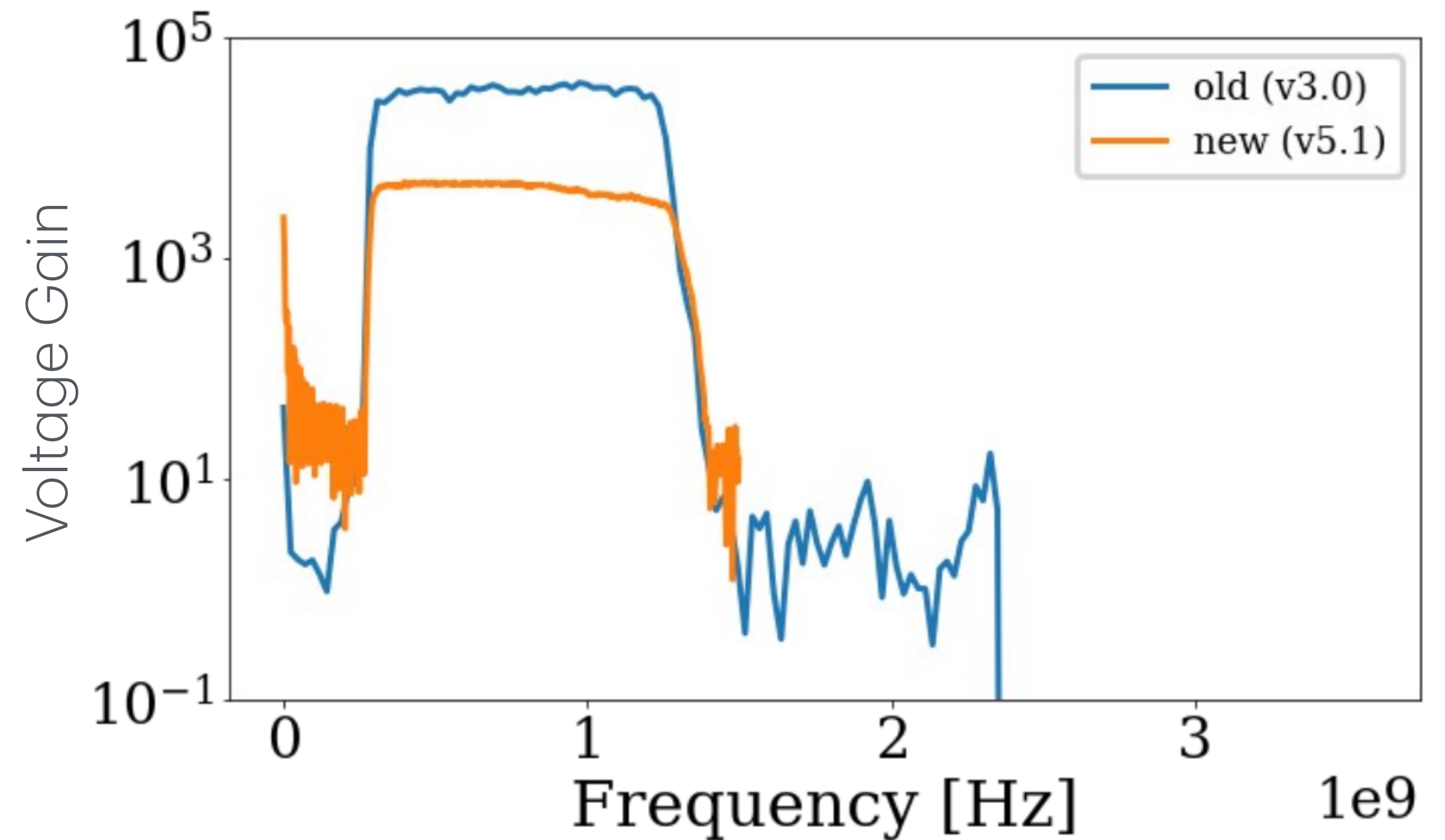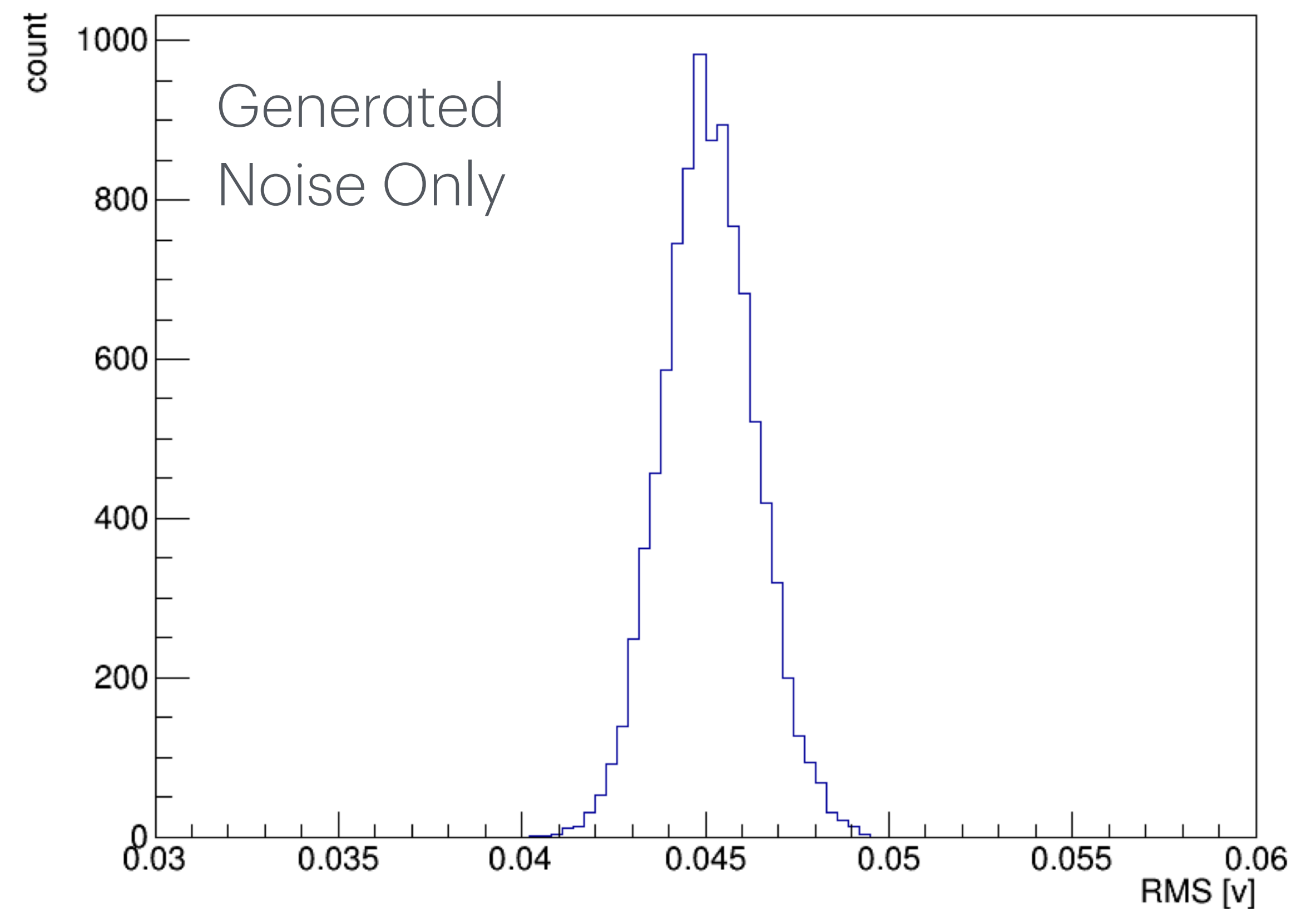
Things to consider: Noise RMS

- Generated noise has a higher RMS (45 mV) than expected (30 mV) - under investigation

PueoSim_May30 Noise Waveform (event 0, antenna 95)
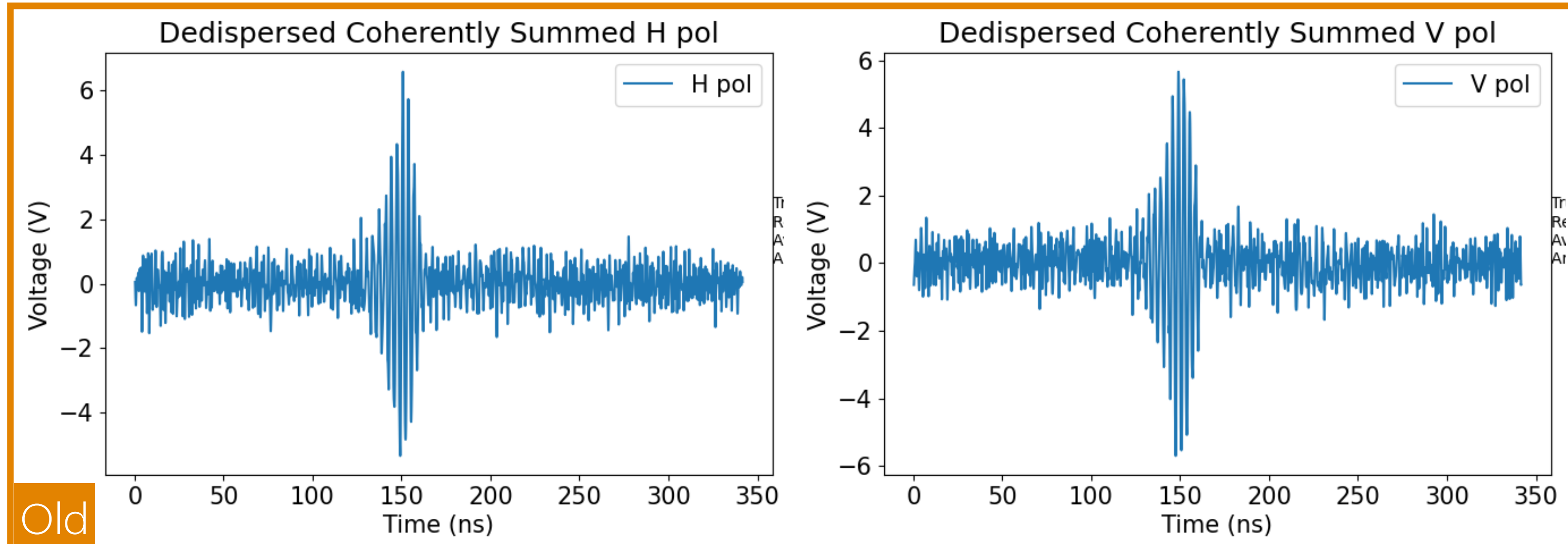
The average RMS (total 9600 waveforms) is 0.04511 and the mean is 0.00000.
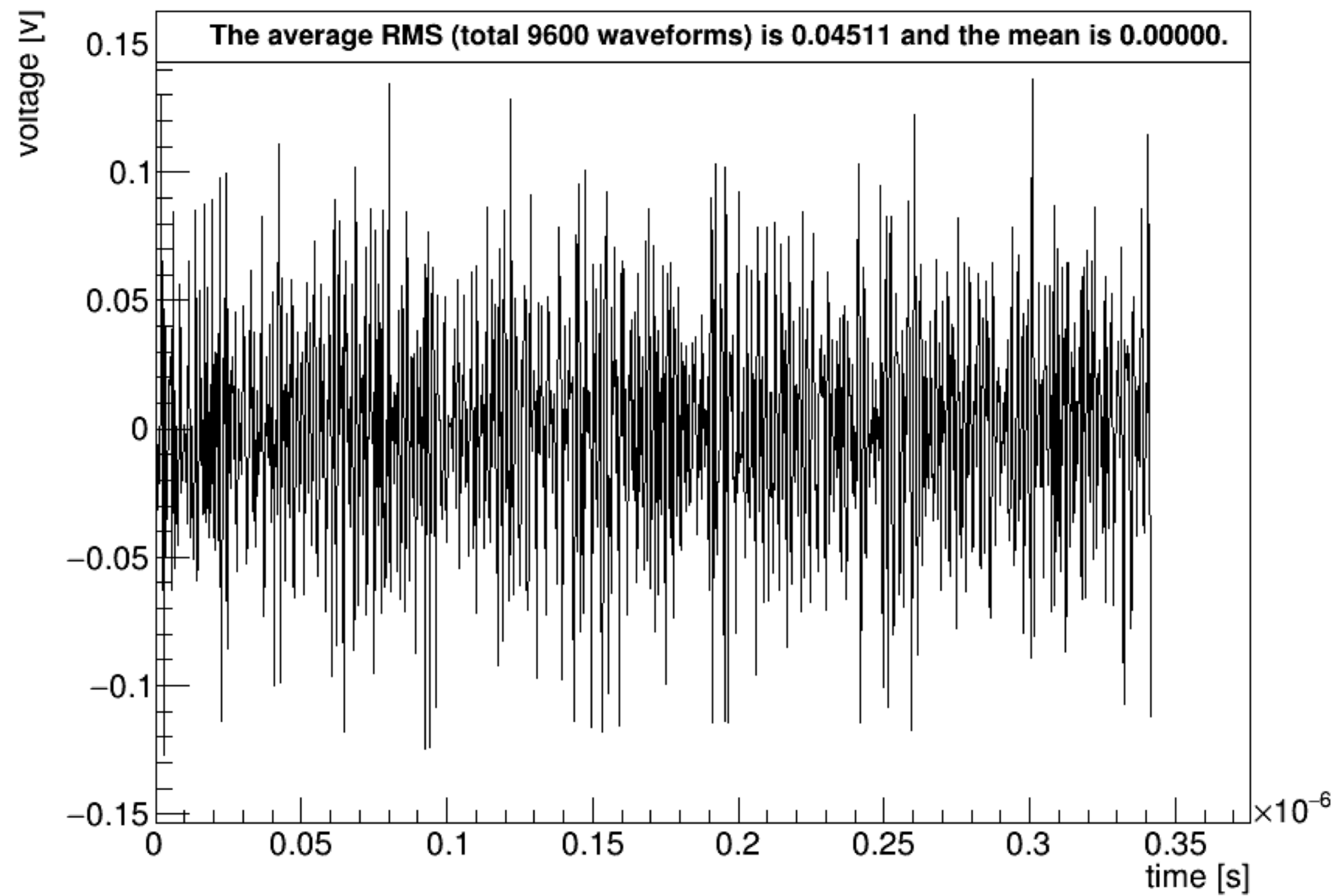
(Unweighted) RMS Histogram

Generated
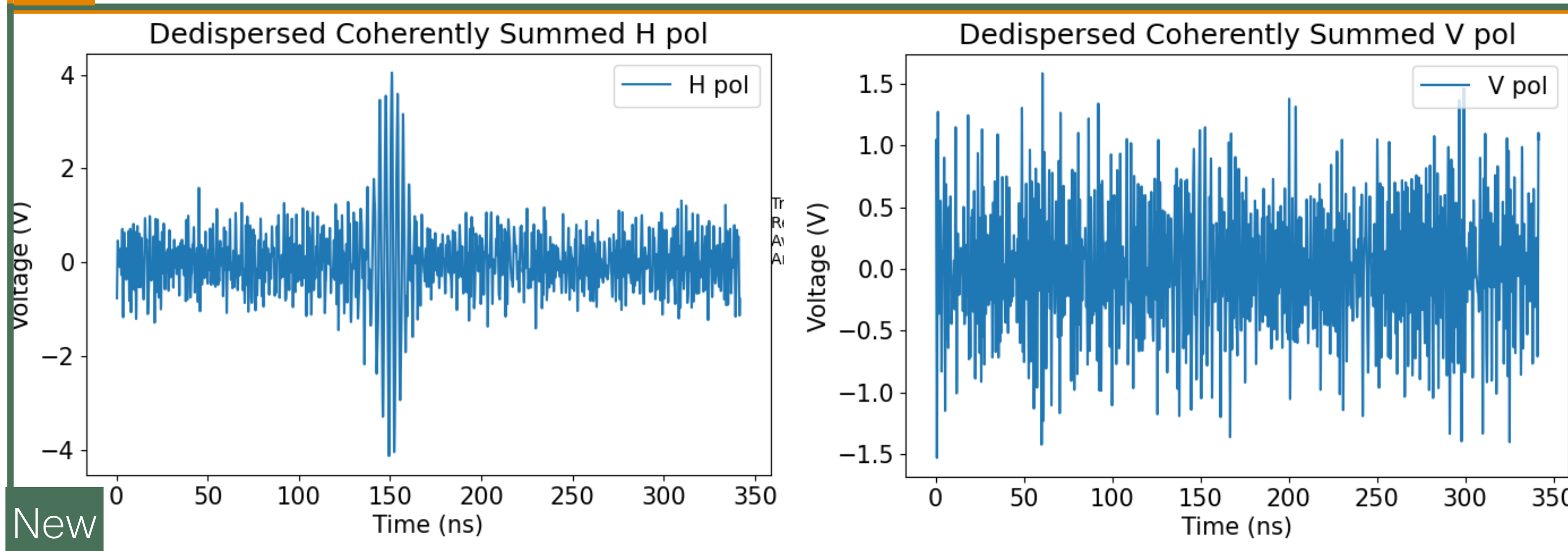Noise Only

Credit: Jason Yao (OSU)

Things to consider: polarization bug

- Juan found a bug in which cosmic ray events were too strong in V pol – code was not properly adjusting polarization

- This is now fixed for CR events; still double checking how much this impacts neutrino events (if at all)

Credit: Juan Ammerman-Yebra

Conclusions

- Situation is not nearly as dire as we thought in May- good news!

- Still, lower than we had originally projected.

- Working to understand each step of the simulation to make sure the correct things are simulated: our goal is not to match our earlier projections, but to be simulating our actual instrument!

- Still some additional, small lingering bugs that could boost the sensitivity slightly

  - Chance in hell cut may not be using reasonable threshold

  - Viewing angle may be defined too narrowly