Deep Space Exploration Society
Science Meeting

DSES Pulsar Simulator is used
to test our equipment

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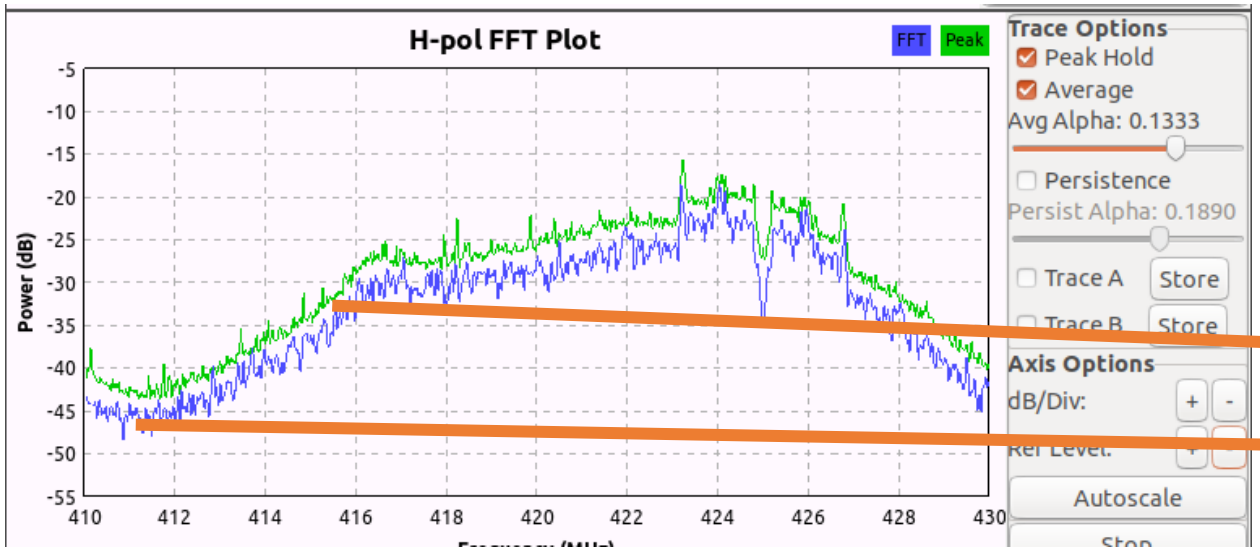
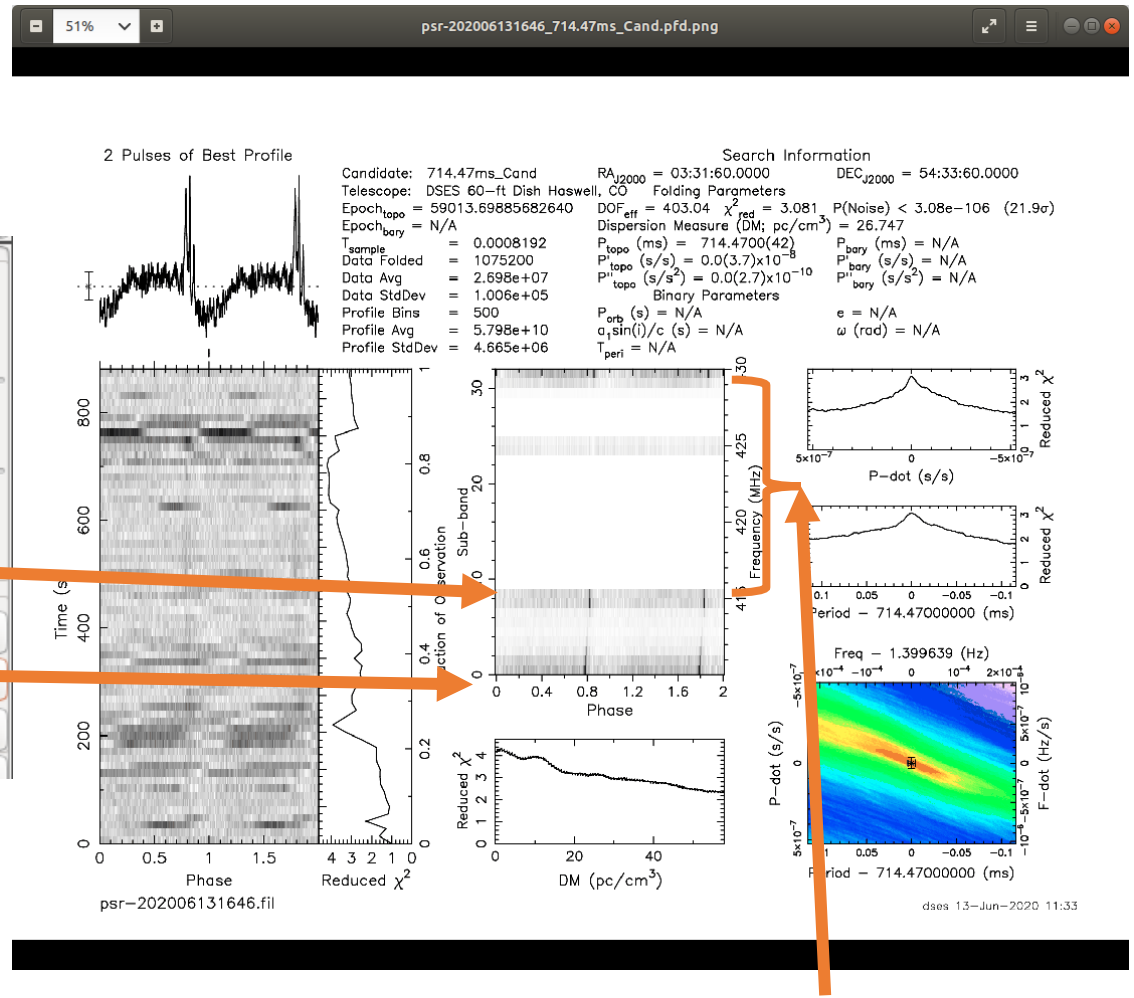
Information

- 9 ft Dish – Down because hard drive crashed
- SuperSID – Down because of hard drive crash
- Radio Jupiter – still need to get a new receiver and setup at site (new member project?)
- Pulsar – Last observation trip Saturday – still can only get B0329+54
  - Learned the limits on setting up BW on N210 receiver
  - Improving the pulsar observing tool being built on EXCEL
  - Used the pulsar simulator to test the settings for the next observation trip
- SARA East Conference – recommend everyone virtually attend: August 1-2 www.radio-astronomy.org
- DSES Pulsar featured on Neutron Star Group website http://www.neutronstar.joataman.net/

6-13-20 Observing Session:
Issue with the gain of the N210 over the bandwidth

B0329+54
First attempt at 20 MHZ
Problem: Worse than 10 MHZ
Can I fix in RF and/or in PRESTO?





Ettus Research N210
- 20 MHz BW
- Get same shape on both 60 ft dish and home yagi

so I believe it is the N210
- Can I fix this - make it flatter so PRESTO uses the entire BW?

It appears that the white area is not being used
- Is there a setting in PRESTO to allow me to recover this area?

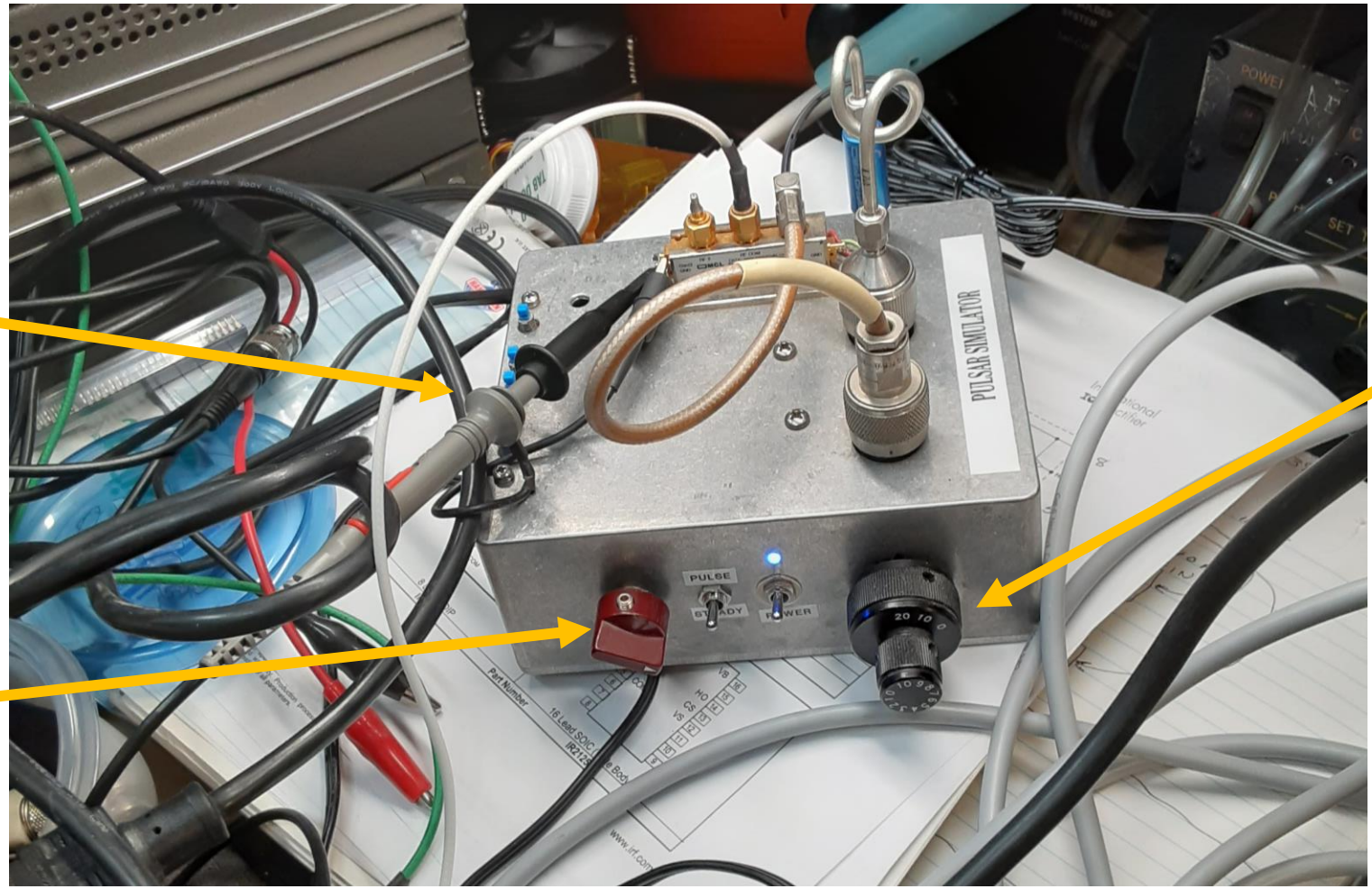
Issue

- Gain is not flat across bandwidth
- Solution appears to be that BW needs to be even integer of 100/BW
- Ray and Rich took system to Ray's lab
- Used Ray's pulsar simulator and was able to synthesize a pulsar signal!

Pulsar System Test Setup

Pulsar Simulator

Designed and Built by Ray Uberecken

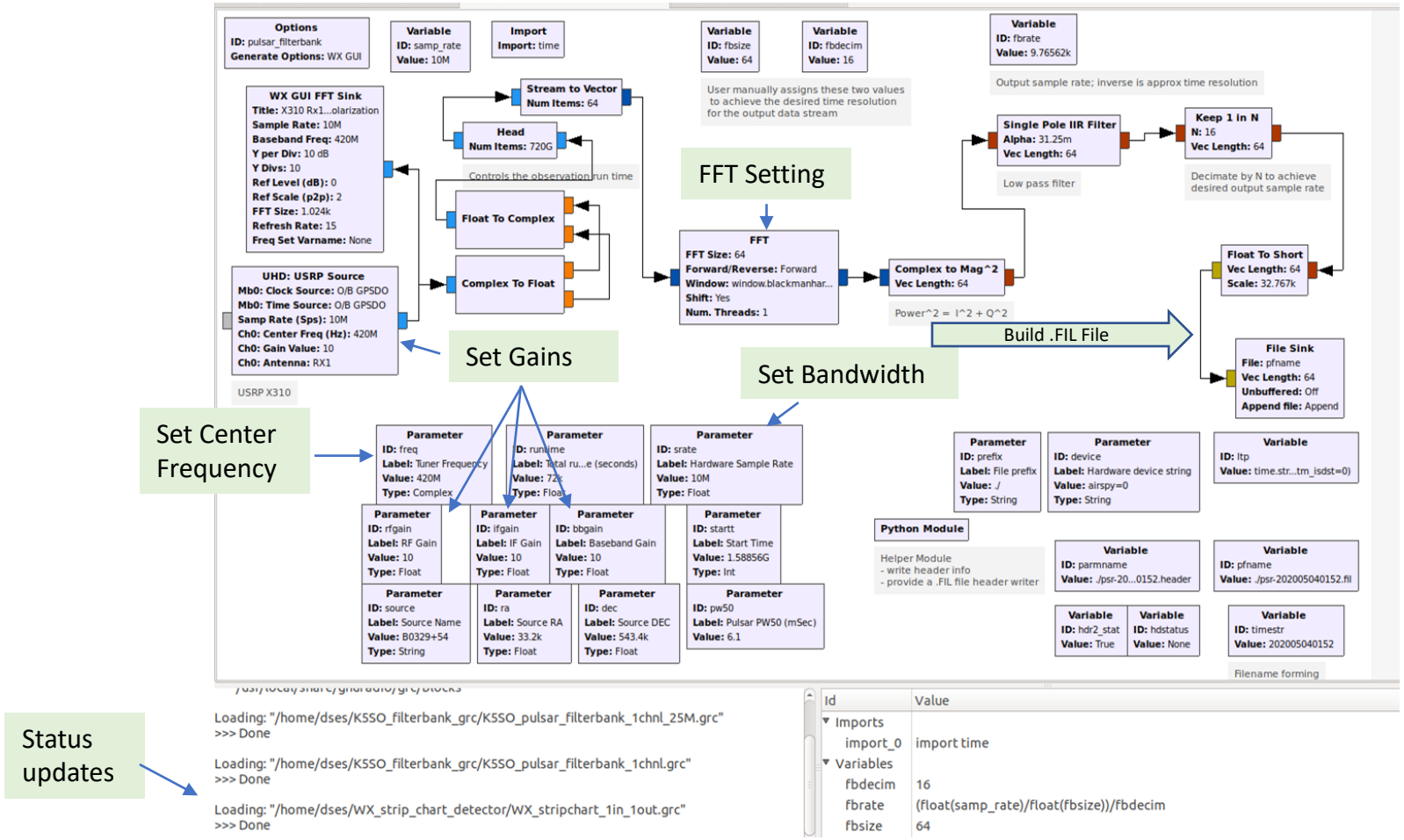


Pulse Width selector

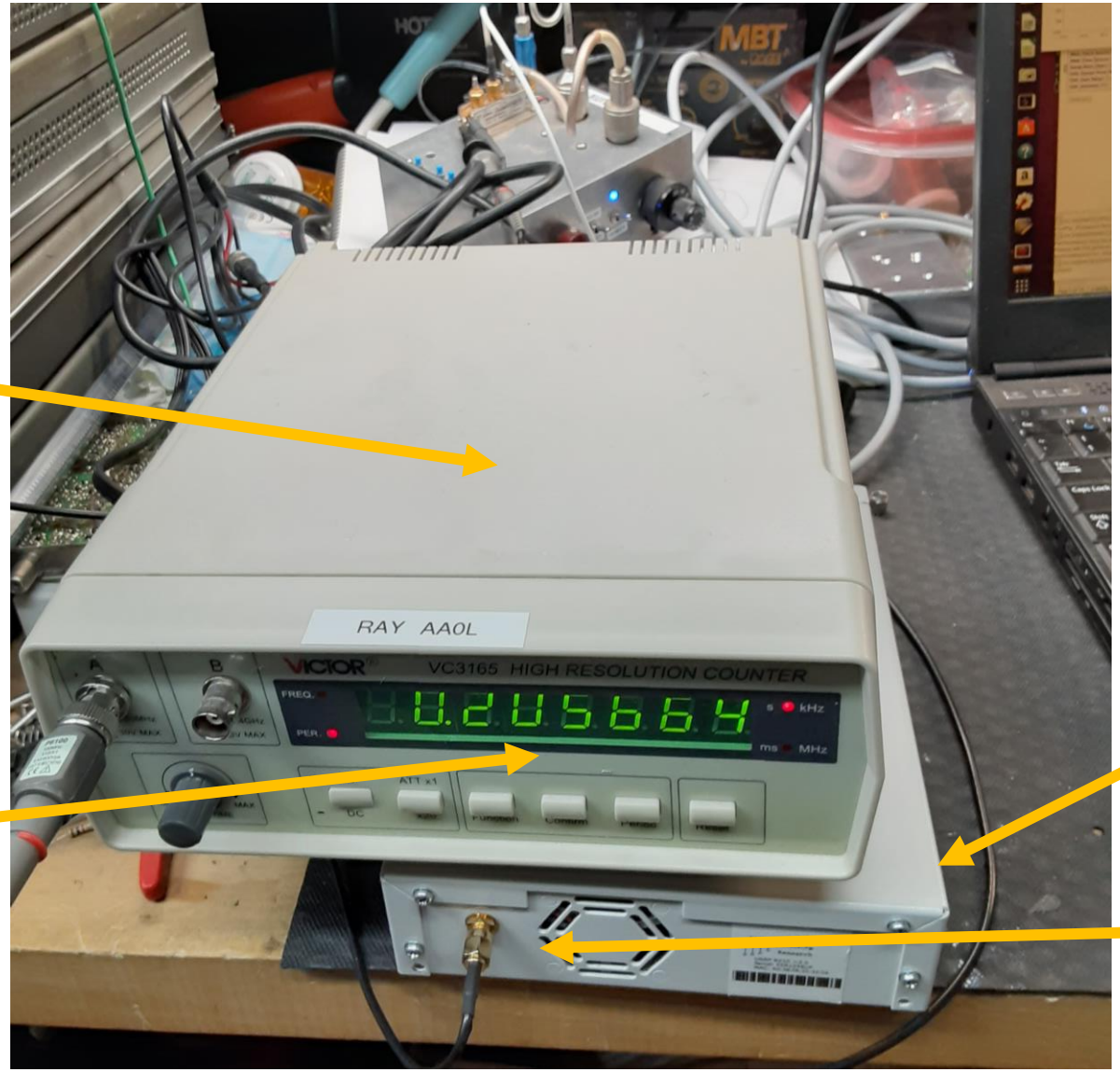
Pulse rate selector

Attenuator

GNU Software



Frequency Counter and N210 Receiver



Frequency Counter

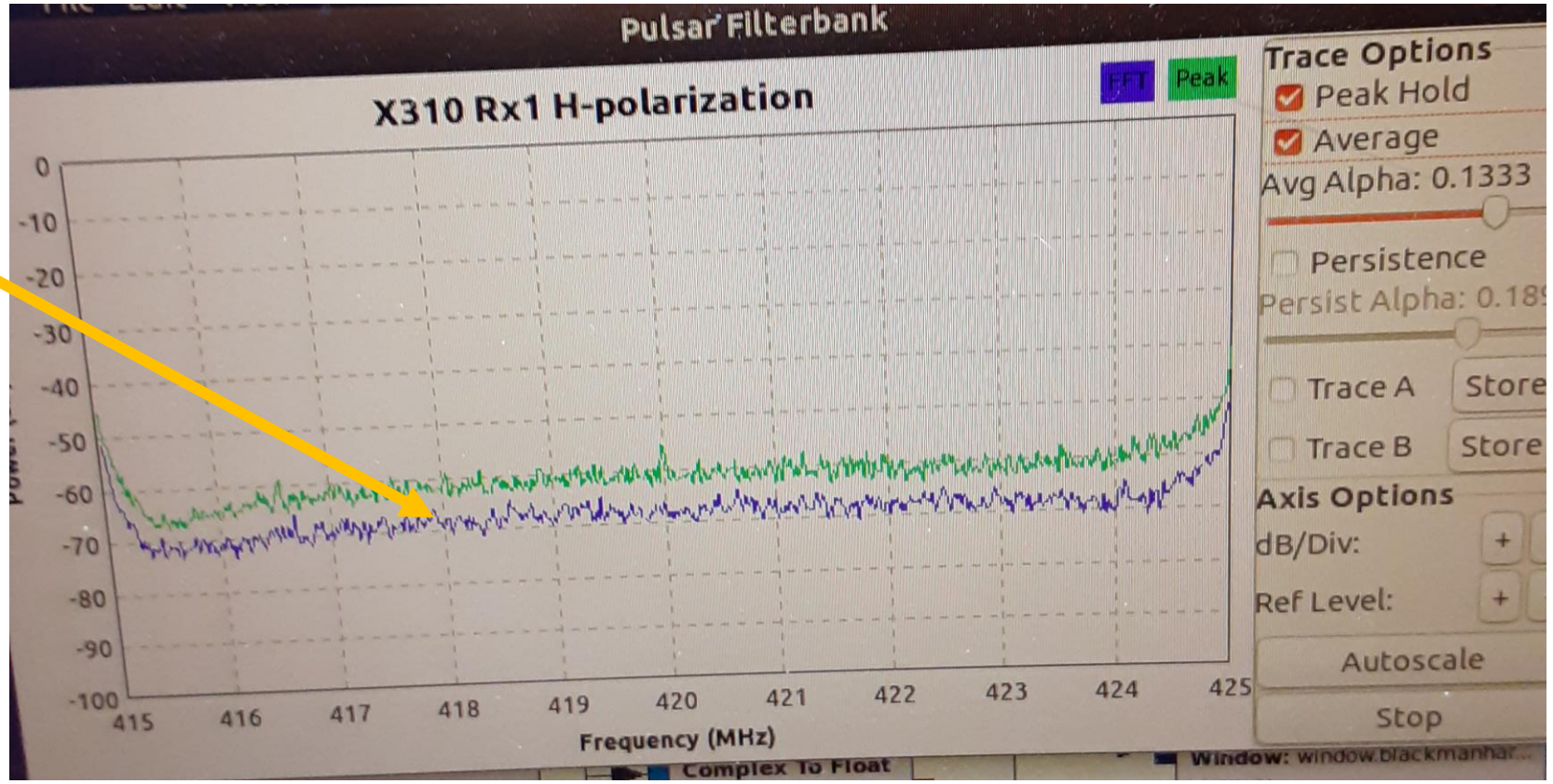
Pulse rate

N210 Receiver

GPS Antenna Input

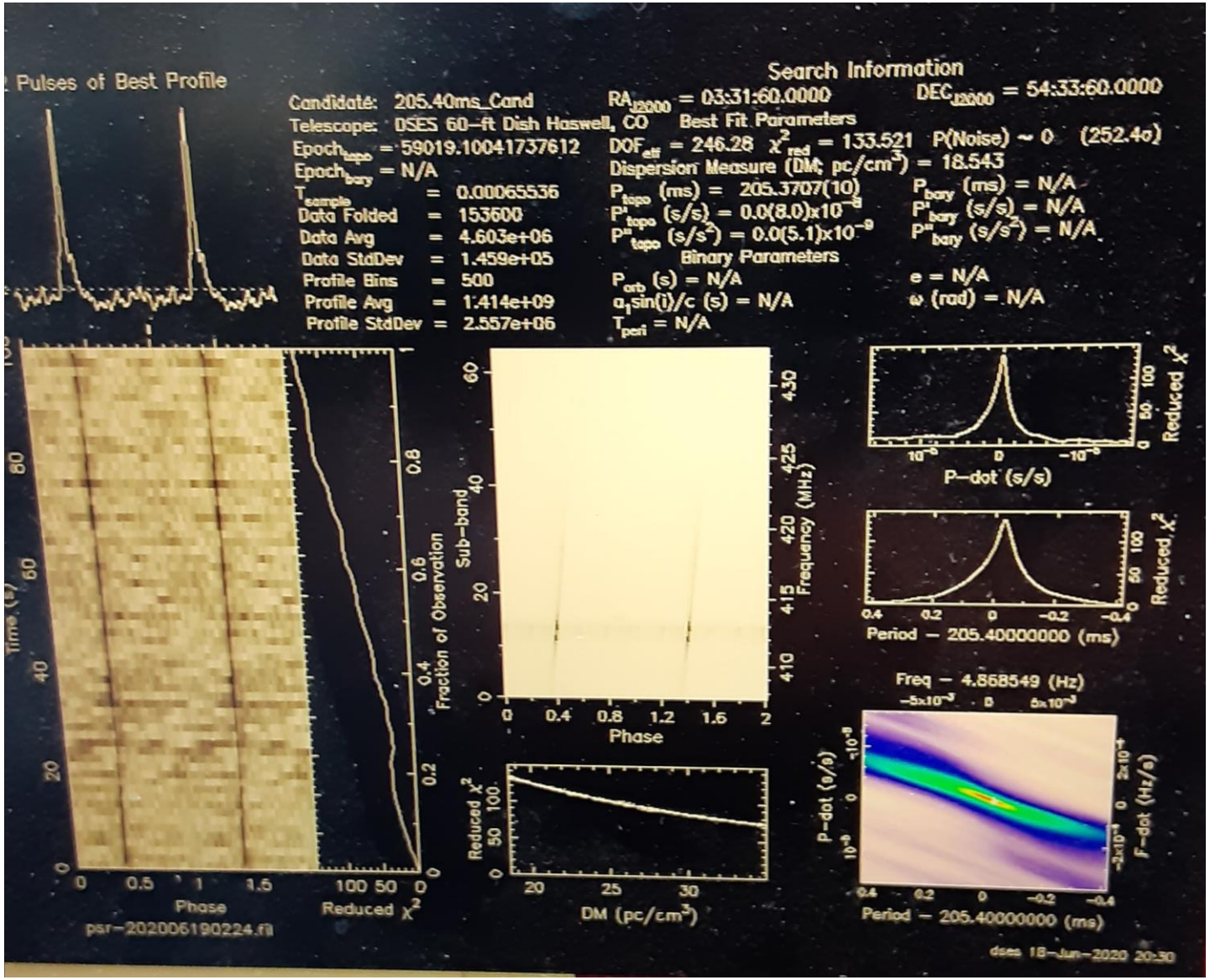
Acquisition

Spectrum



Bandwidth

PRESTO Output using pulsar simulator



Pulsar Observing Team 6-13-20

Pulsar Equation

$$\Delta S_{min} = \beta \frac{2k_b\,(S/N_{min})T_{sys}}{A_e\sqrt{n_p\,t_{int}\,\Delta f}}\sqrt{\frac{W}{P-W}}$$

ΔS_{min} = minimum detectable flux density (watts per square metre per hertz - averaged over the period of the pulse)
β = factor for imperfections in the observatory system, usually near to 1 (values >1 makes the system less sensitive)
k_b = Boltzmann's constant ($1.38064852 \times 10^{-23}$ Joules • K^{-1})
S/N_{min} = required minimum linear S/N for validation of result (professional require at least 6, amateurs ≥ 4)
T_{sys} = System noise temperature (K^o)
A_e= antenna aperture (m^2)
n_p = number of polarisations (usually 1 for amateurs, generally a maximum of 2)
t_{int} = integration time (observation time in seconds)
Δf = pre-detection bandwidth (Hz)
W = width of pulse (seconds)
P = period of pulse (seconds)

http://www.neutronstar.joataman.net/amateur_challenges/

SARA Virtual Eastern Conference

www.radio-astronomy.org

Questions?