

# DIY Astronomy

Remote Control of Radio Telescope using Raspberry Pi

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21cm Radio Telescope  
(21cm => 1.42GHz)  
Hydrogen Emission

- Raspberry Pi Configuration



Sawbird Low Noise Amplifier  
with Hydrogen bandpass  
(1420MHz)

Software Defined Radio  
(SDR) receiver

Raspberry Pi 3B+

**SDR**  
Software  
Defined  
Radio

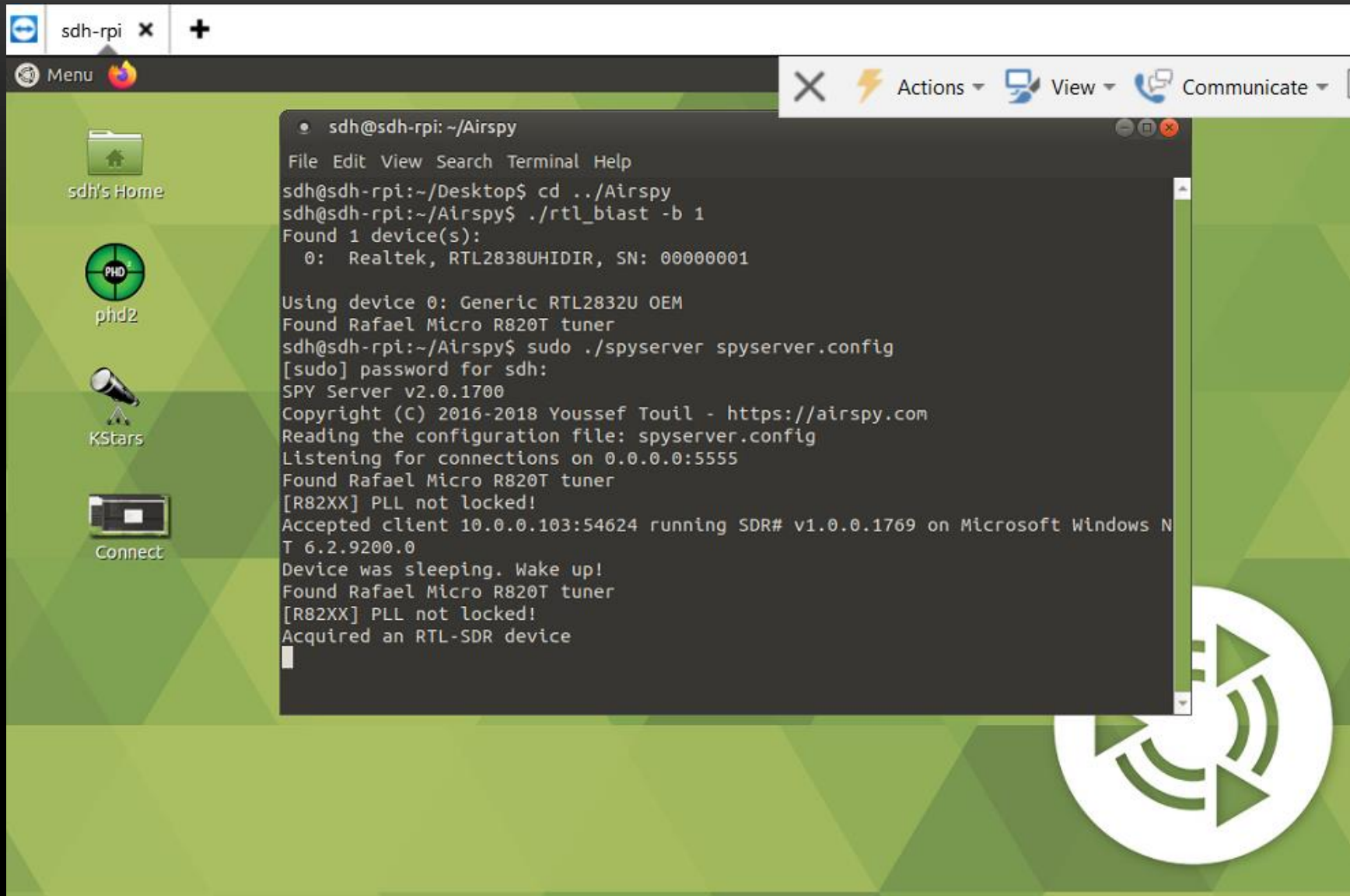


Wifi



**Driver Server**  
Software: SPY Server

**Client / Application**  
Software: SDR#, IF  
Average Plugin



## Driver Server Side

⇒ Load SPY Server

⇒ Run command to turn on Bias T (DC power to LNA)

`./rtl_biast -b 1`

⇒ Run command to turn start SPY Server

`./spyserver spyserver.config`

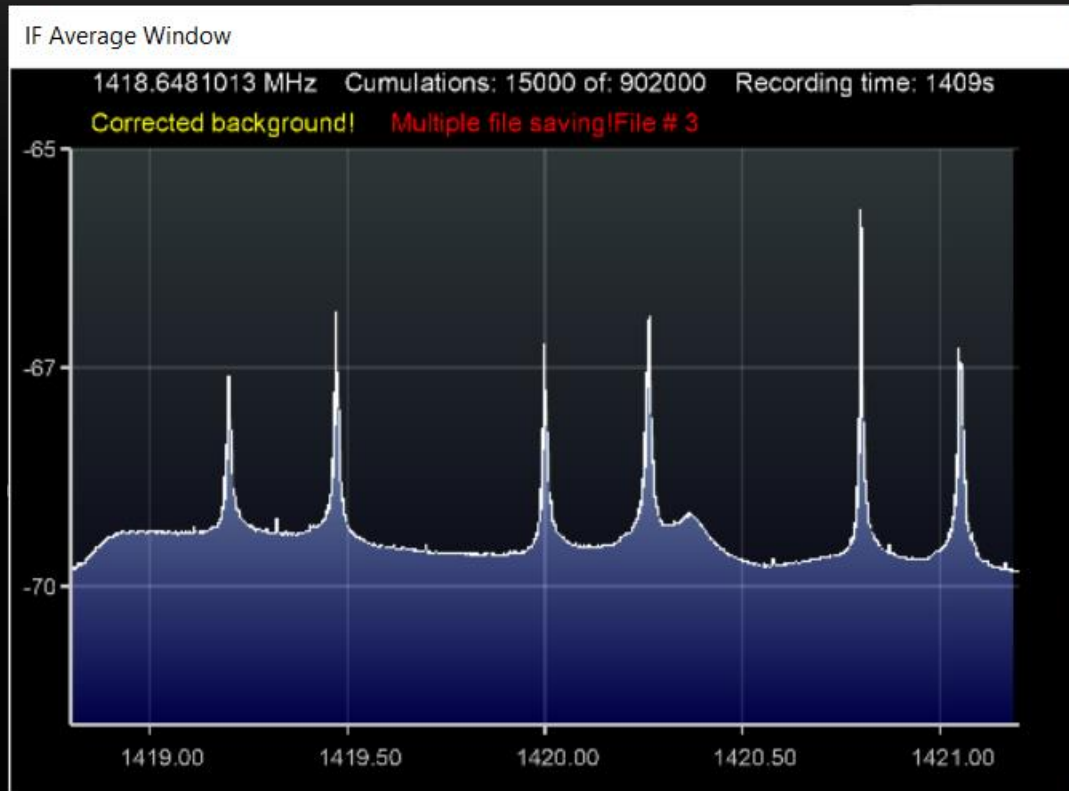
**SPY Server running on Raspberry Pi**

The screenshot displays the AIRSPY SDR# v1.0.0.1769 application running on a Windows laptop. The application window is titled "AIRSPY SDR# v1.0.0.1769 - Spy Server Network". The main interface shows a frequency display at 001.420.000.000. The spectrum plot on the left shows a peak at 1418.6623327 MHz with a corrected background. The waterfall plot on the right shows a signal at 1.4200000 GHz. The application interface includes various controls like zoom, contrast, range, and offset. The Windows taskbar at the bottom shows the time as 9:58 AM on 11/8/2020.

# SDR# Application running on Laptop

# Problems Encountered

Significant noise problems



With 6' USB Cable between RPi & SDR

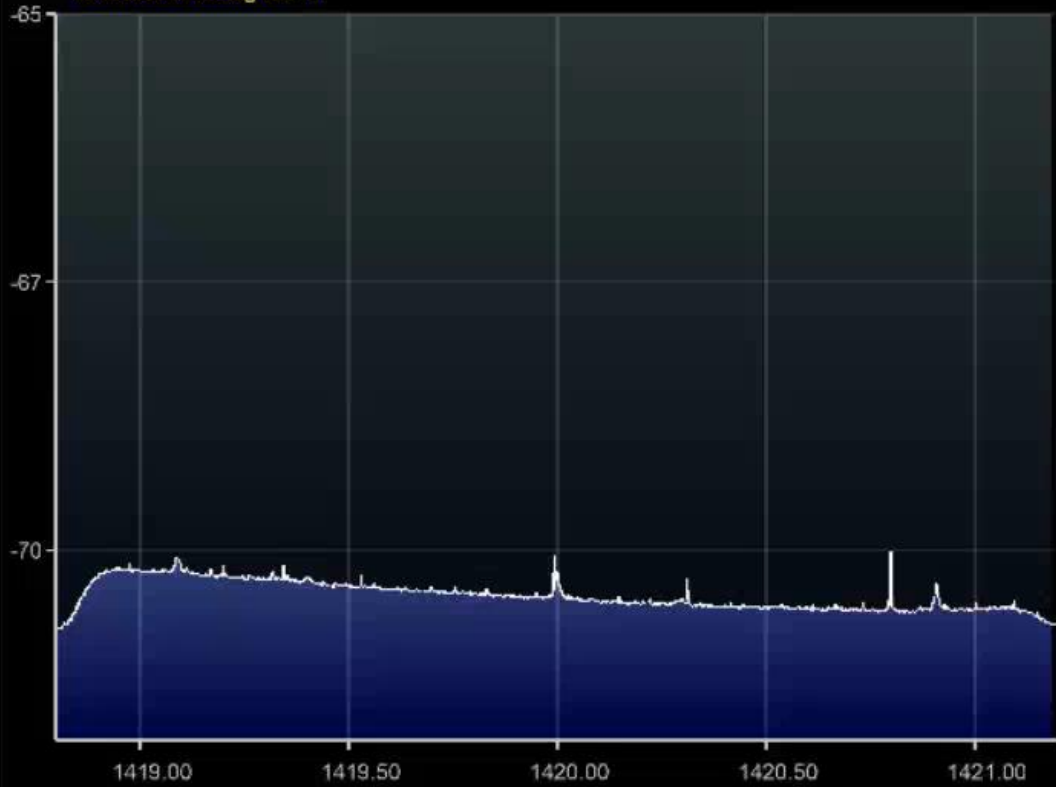


With no cable between RPi & SDR  
(direct connection)

IF Average Window

1418.6623327 MHz Cumulations: 87000 of: 902000 Recording time: 37s

Corrected background!



AIRSPY SDR# v1.0.0.1769 - Spy Server Network

UI controls including a menu icon, a square button, a gear icon, a speaker icon, and a frequency slider.

001.420.000.000

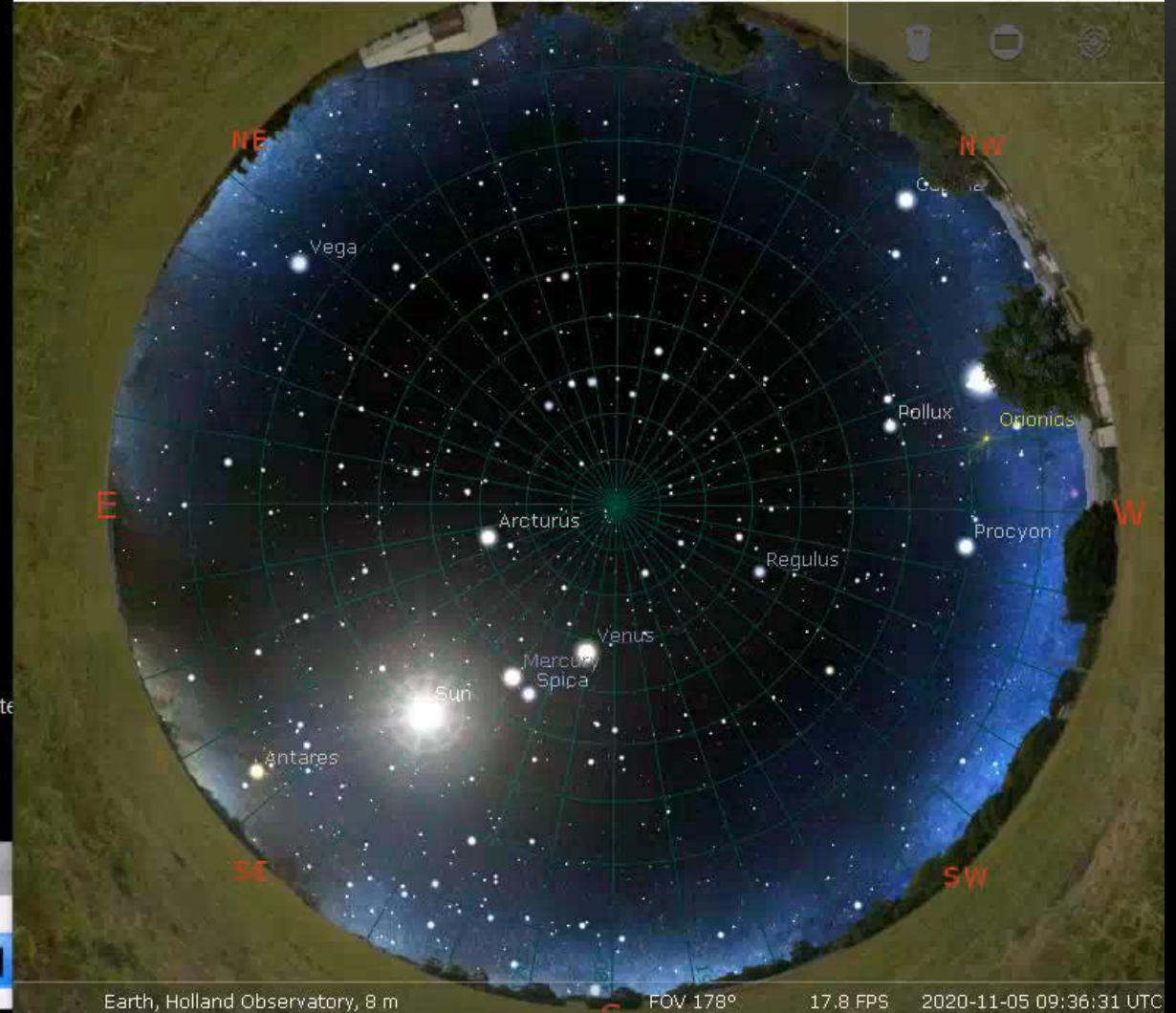
- ▶ IF Noise Blanker \*
- ▶ Demodulator Noise Blanker \*
- ▶ Recording \*
- ▶ Zoom FFT \*

dBFS



2020-11-05 09:36:31.35

Stellarium 0.20.3



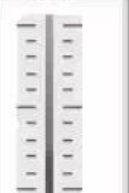
Earth, Holland Observatory, 8 m

FOV 178°

17.8 FPS

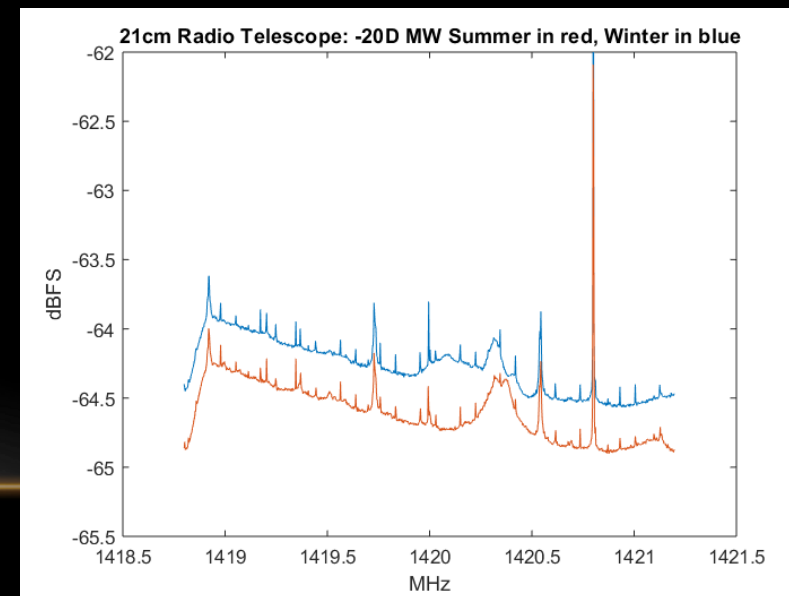
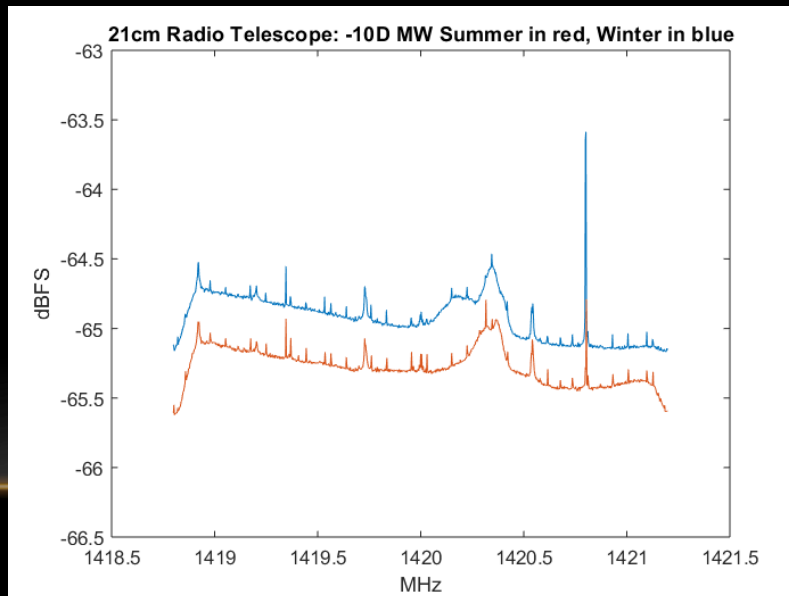
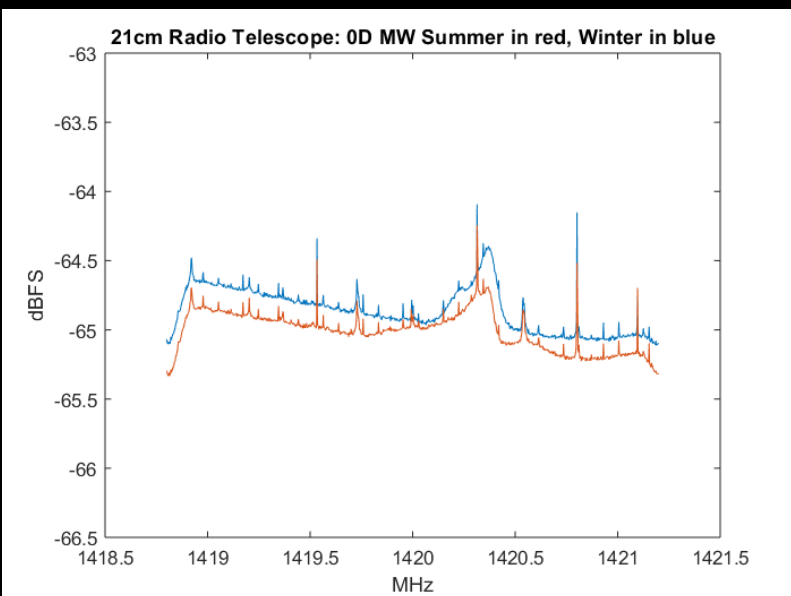
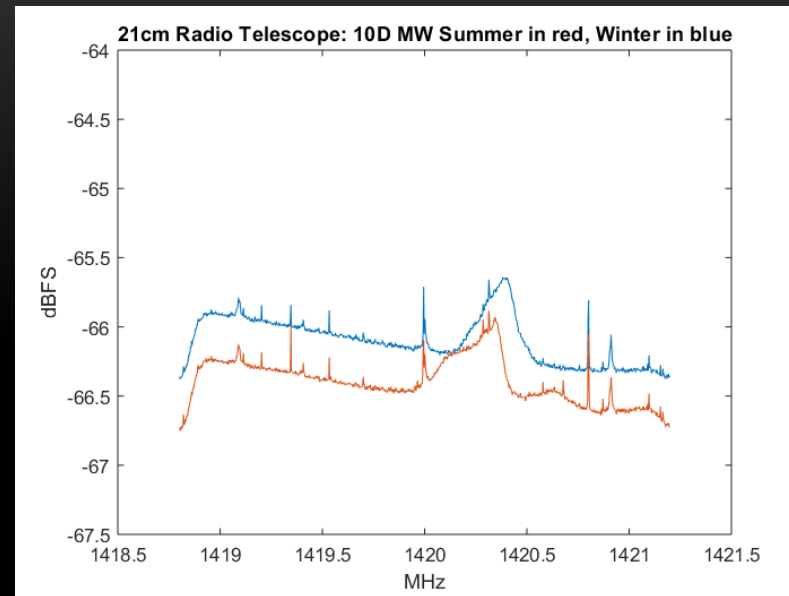
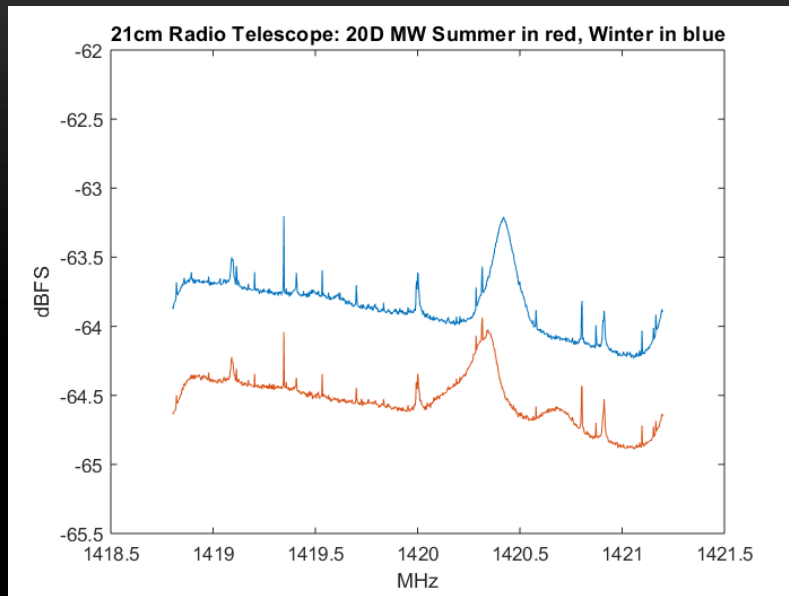
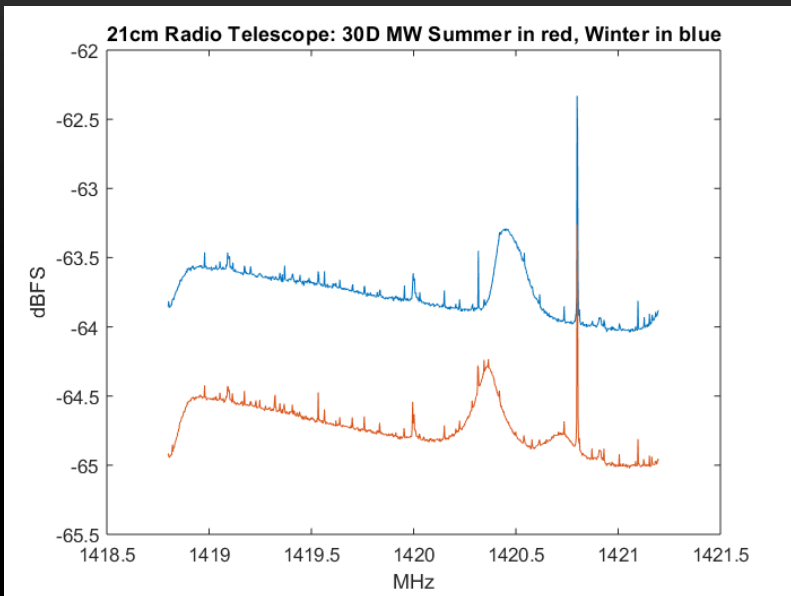
2020-11-05 09:36:31 UTC

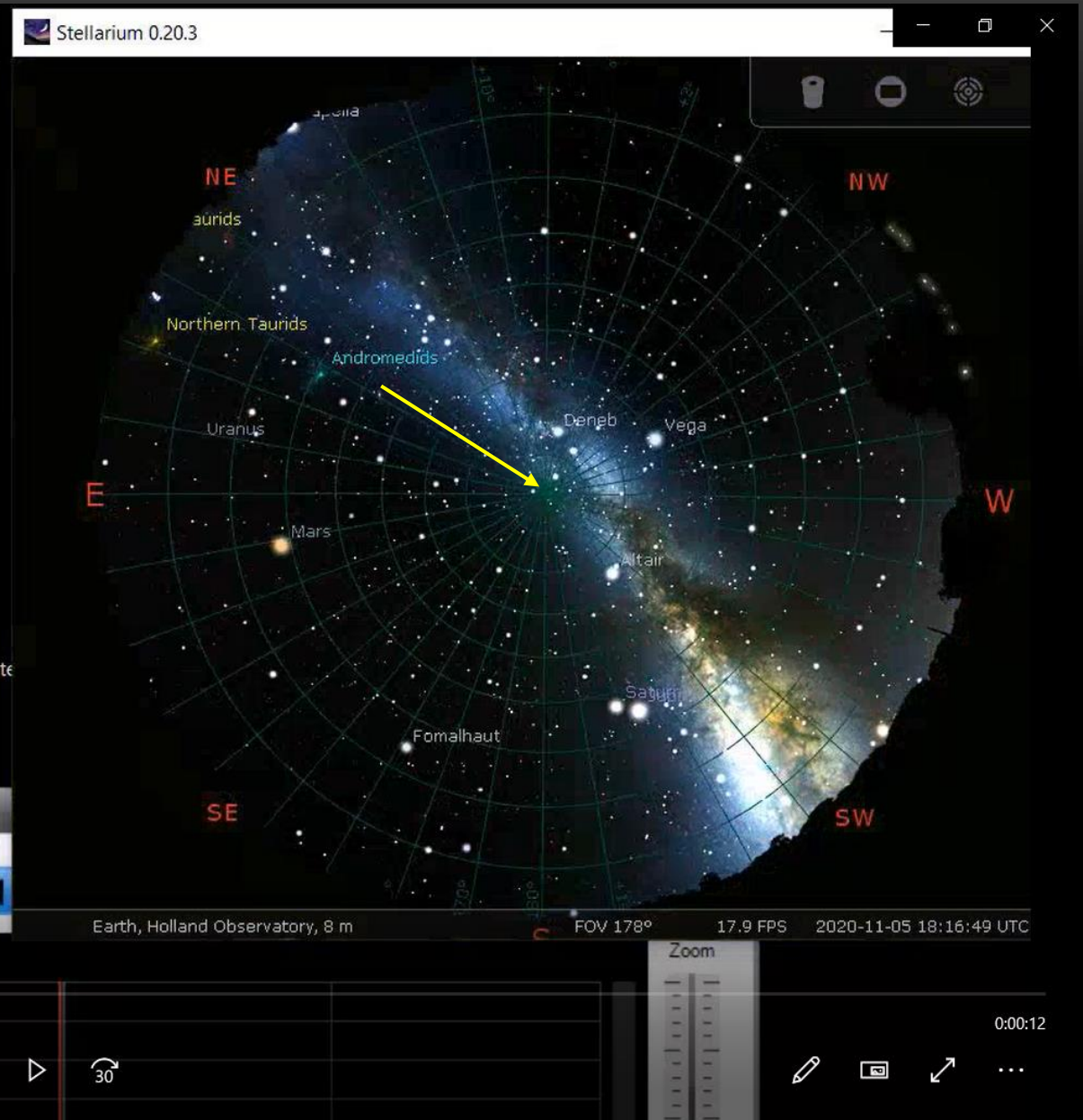
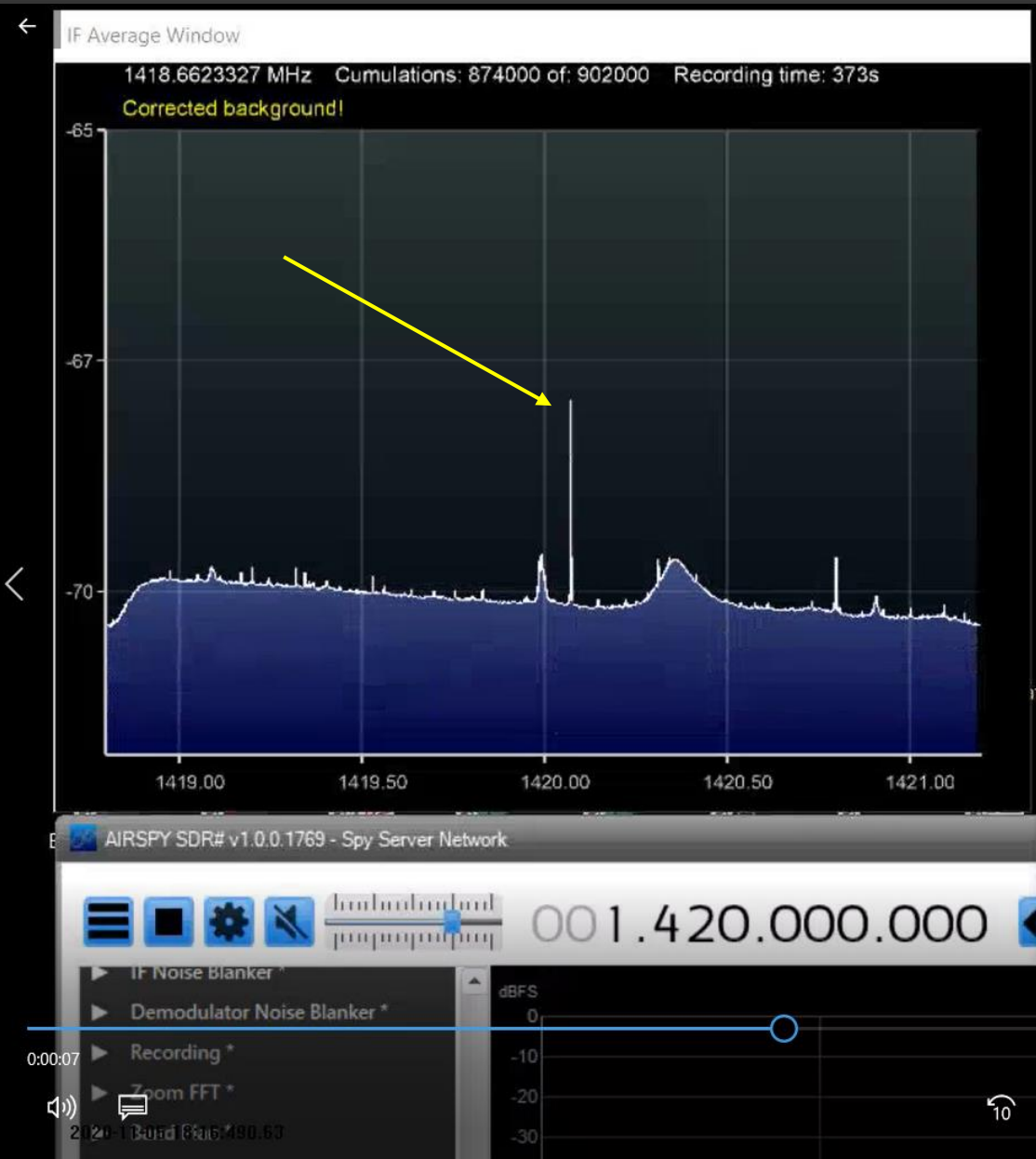
Zoom





# Some comparisons of Summer & Winter Milky Way





Detection of signal in direction of radio source at Cygnus Loop Super Nova Remnant (SNR)

Cygnus Loop  
SNR  
ESP 2020



The Holland Observatory  
Eldorado Star Party  
10/12.13/20

The Veil Nebula / Cygnus Loop in Cygnus  
Western Veil: NGC6960 (Witches Broom)  
Eastern Veil NGC6992/6995 (Network / Waterfall Nebula)  
Pickering's Triangle in middle  
58x4min, 200mm fl Canon Lens at f/3.2

[Link to Source of Design](#)

<https://www.rtl-sdr.com/cheap-and-easy-hydrogen-line-radio-astronomy-with-a-rtl-sdr-wifi-parabolic-grid-dish-lna-and-sdrsharp/>

Presentation posted on webpage: [www.holland-observatory.net](http://www.holland-observatory.net)

**The End**

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