DIY Astronomy

Remote Control of Radio Telescope using Raspberry Pi

Doug Holland

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

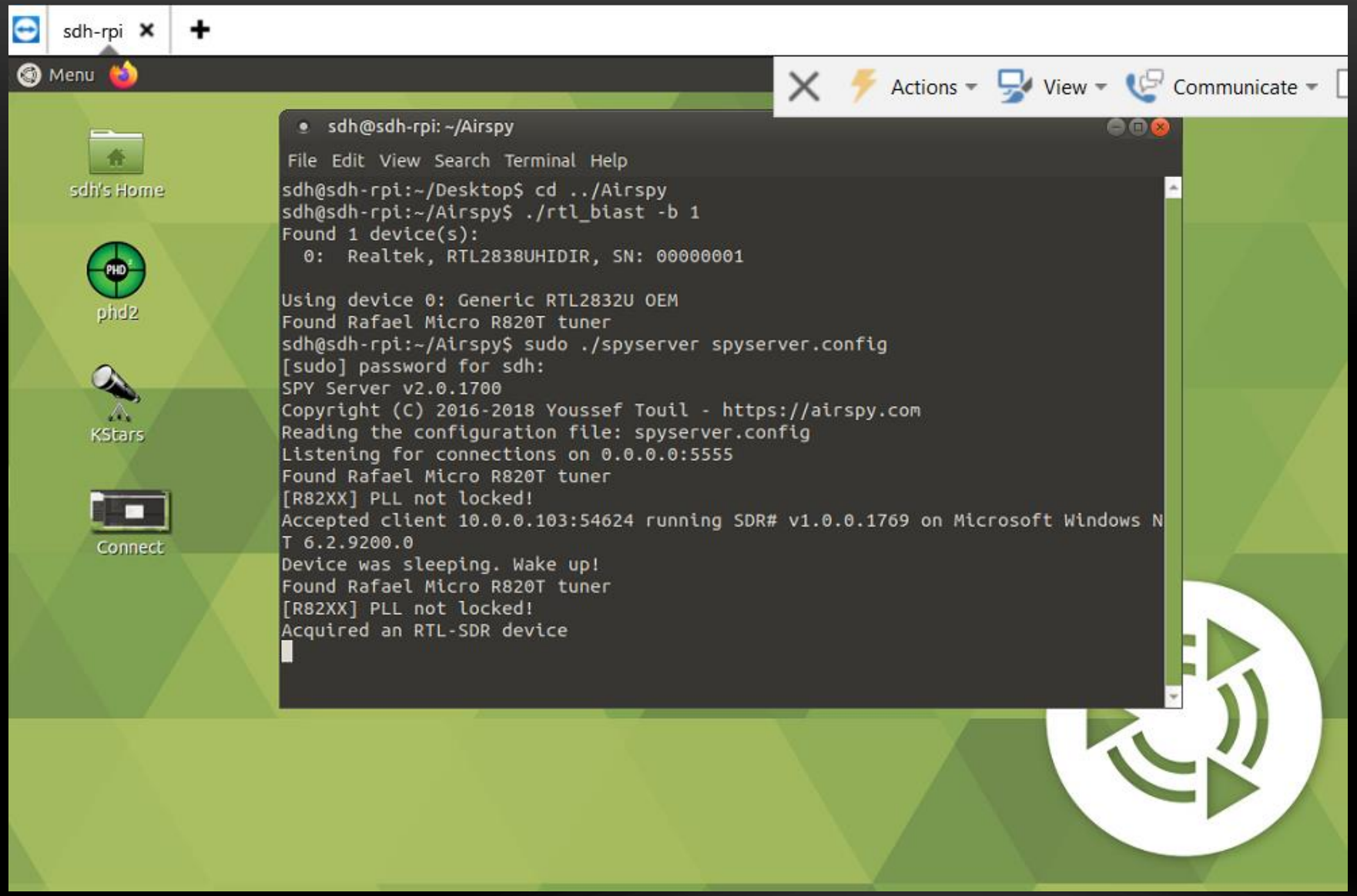
WiFi

Driver Server

Software: SPY Server

Client / Application

Software: SDR#, IF Average Plugin



Driver Server Side

⇒ Load SPY Server

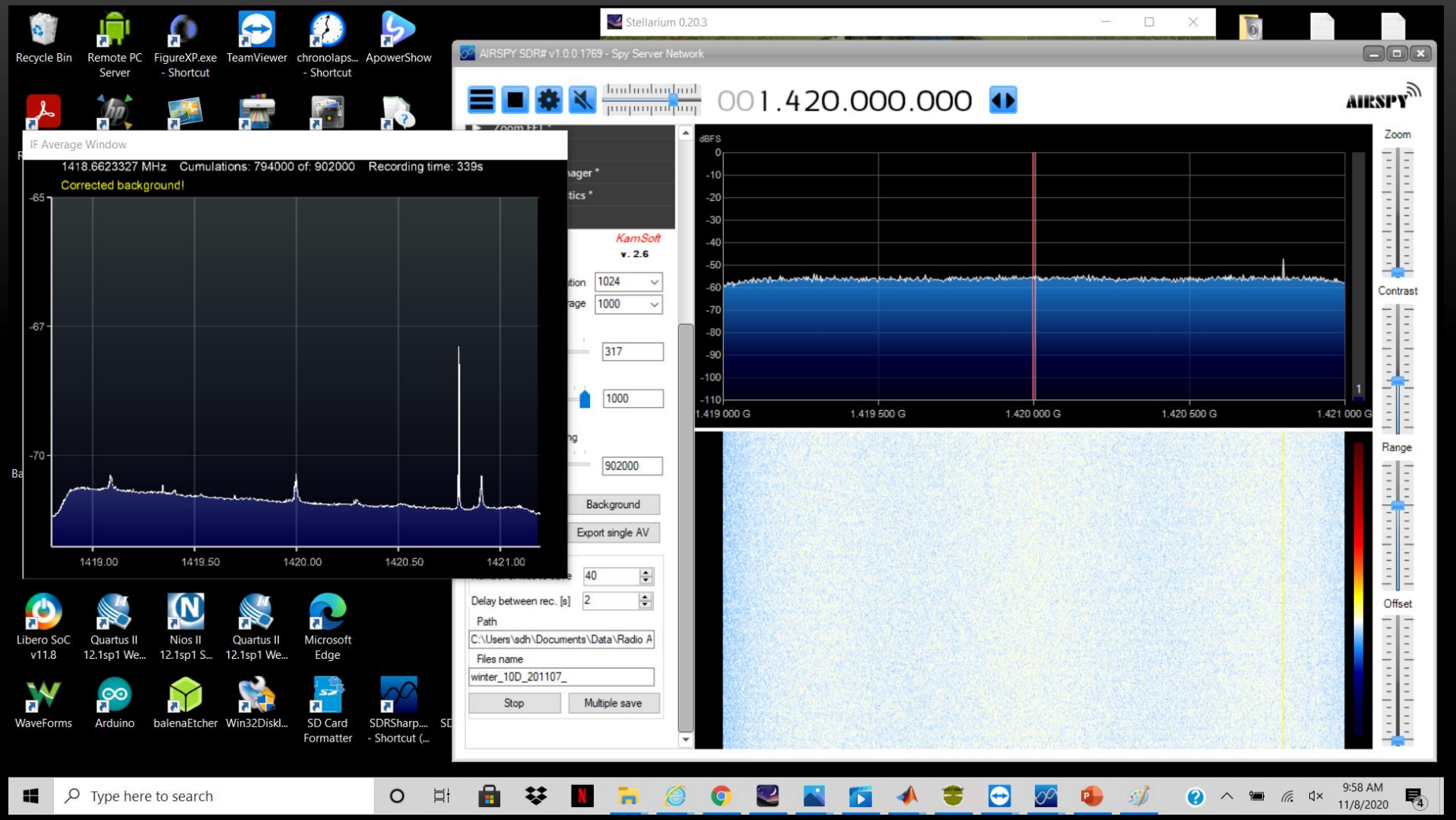
⇒ Run command to turn on Bias T (DC power to LNA)

./rtl_biast –b 1

⇒ Run command to turn start SPY Server

./spyserver spyserver.config

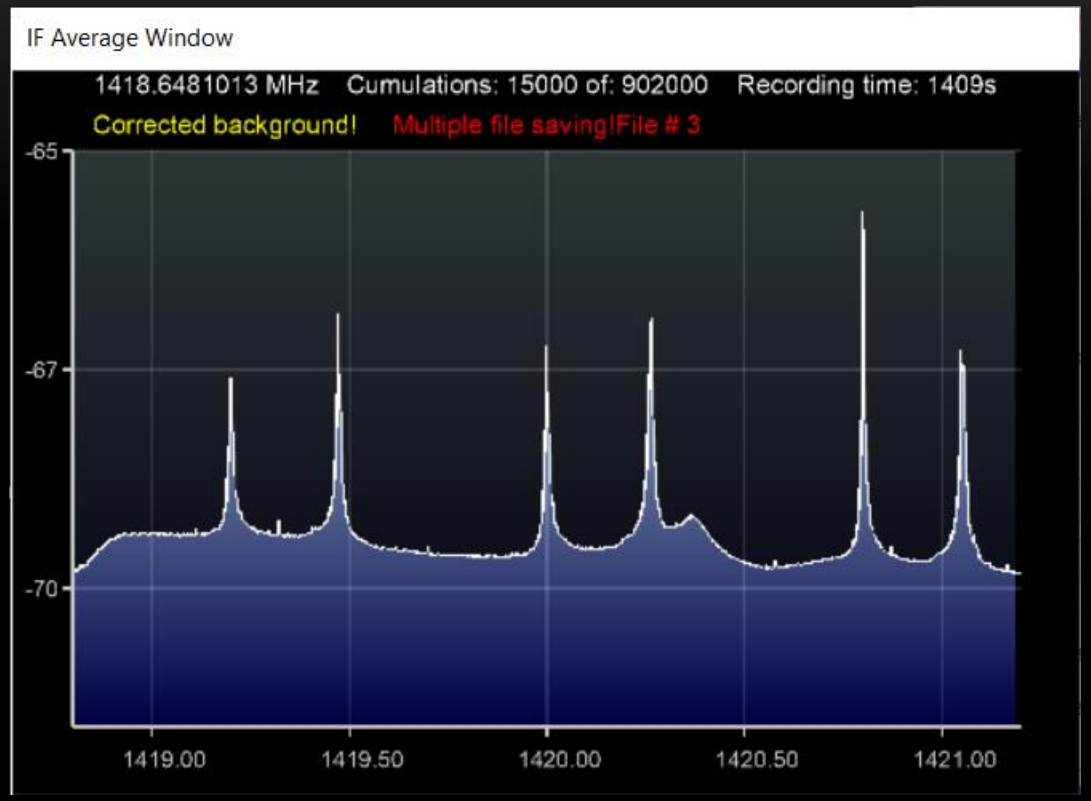
SPY Server running on Raspberry Pi



SDR# Application running on Laptop

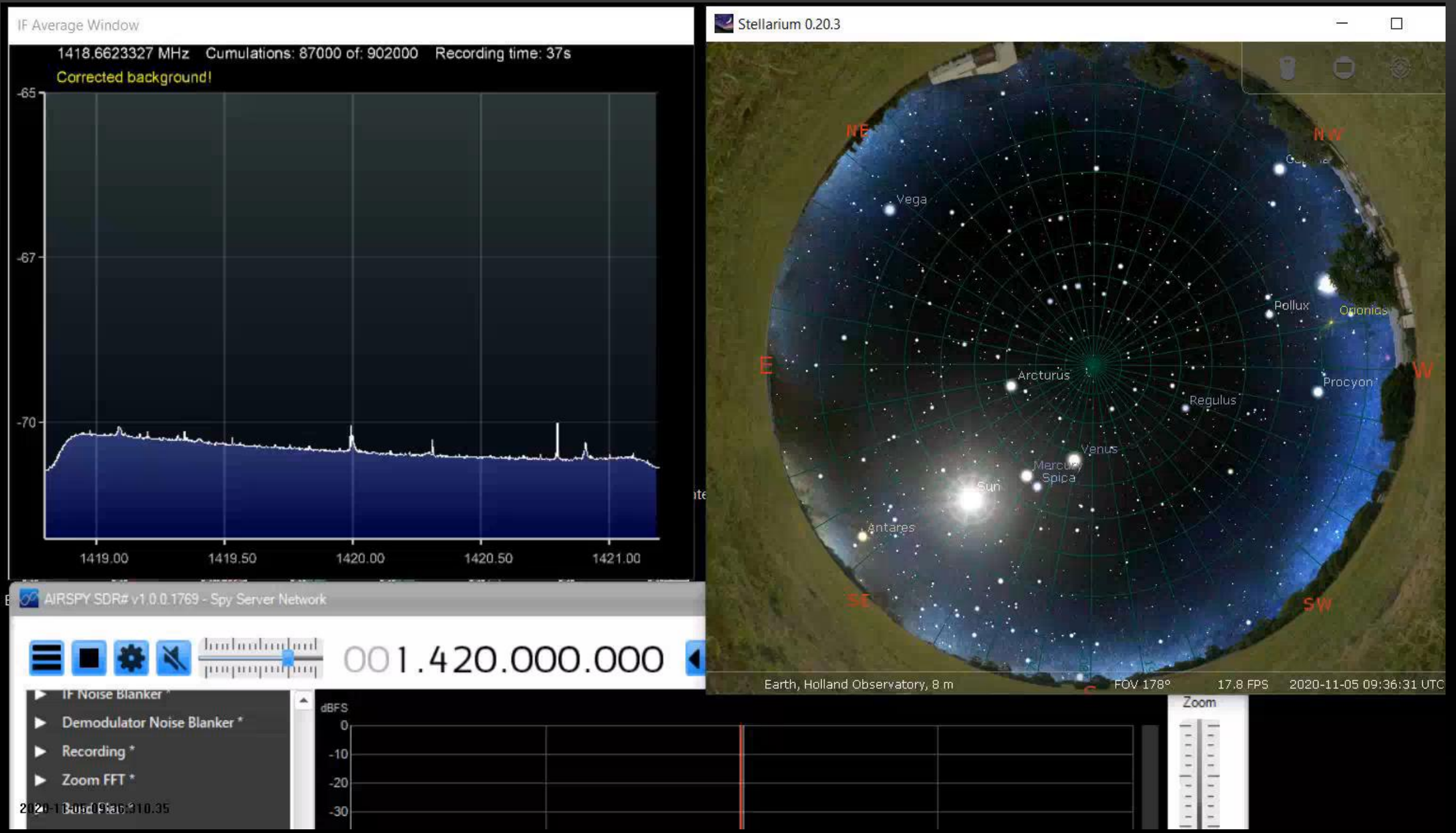
Problems Encountered

Significant noise problems

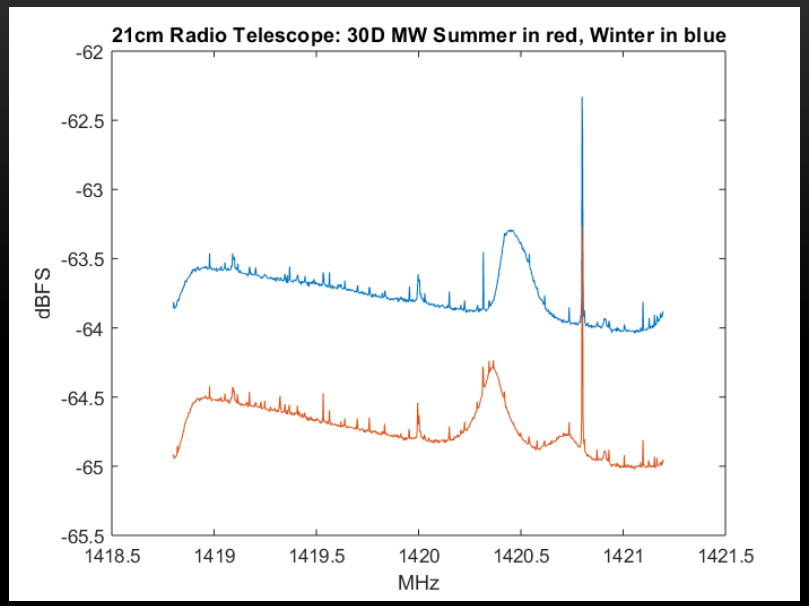


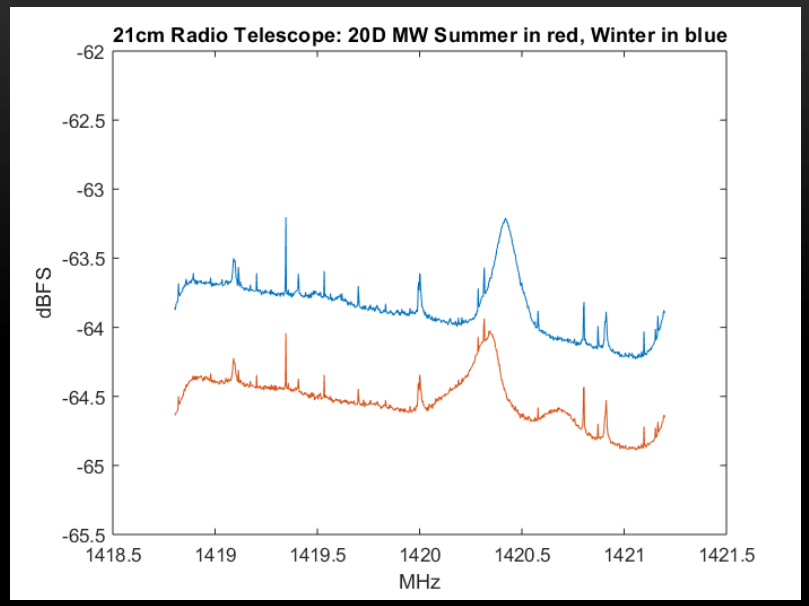
With 6’ USB Cable between RPi & SDR

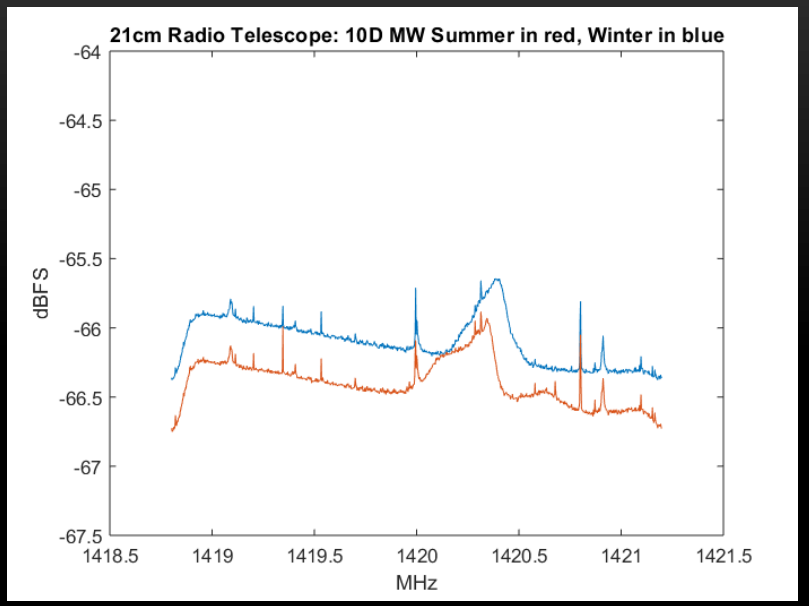
With no cable between RPi & SDR (direct connection)

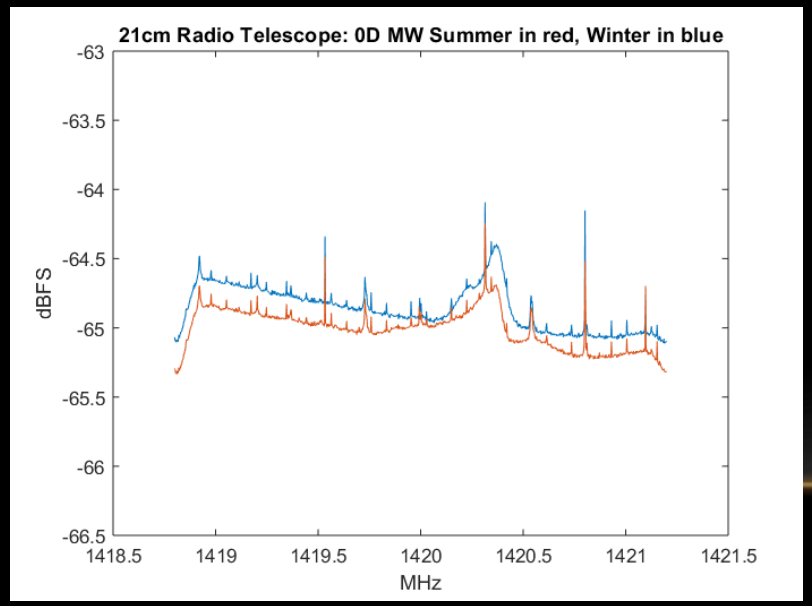

IF Average Window
1418.6623327 MHz Cumulations: 87000 of: 902000 Recording time: 37s
Corrected background!
-65
-67
-70
1419.00
1419.50
1420.00
1420.50
1421.00
Stellarium 0.20.3
NE
NW
E
W
SE
SW
Vega
Pollux
Procyon
Arcturus
Regulus
Venus
Mercury
Spica
Sun
Antares
Earth, Holland Observatory, 8 m
FOV 178°
17.8 FPS
2020-11-05 09:36:31 UTC
AIRSPY SDR# v1.0.0.1769 - Spy Server Network
001.420.000.000
IF Noise Blanker *
Demodulator Noise Blanker *
Recording *
Zoom FFT *
dBFS
0
-10
-20
-30
Zoom

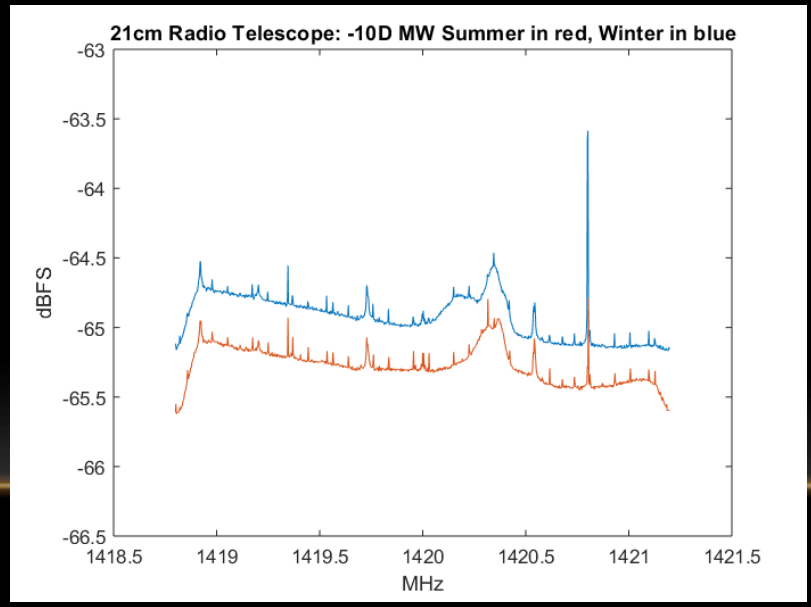
Some comparisons of Summer & Winter Milky Way

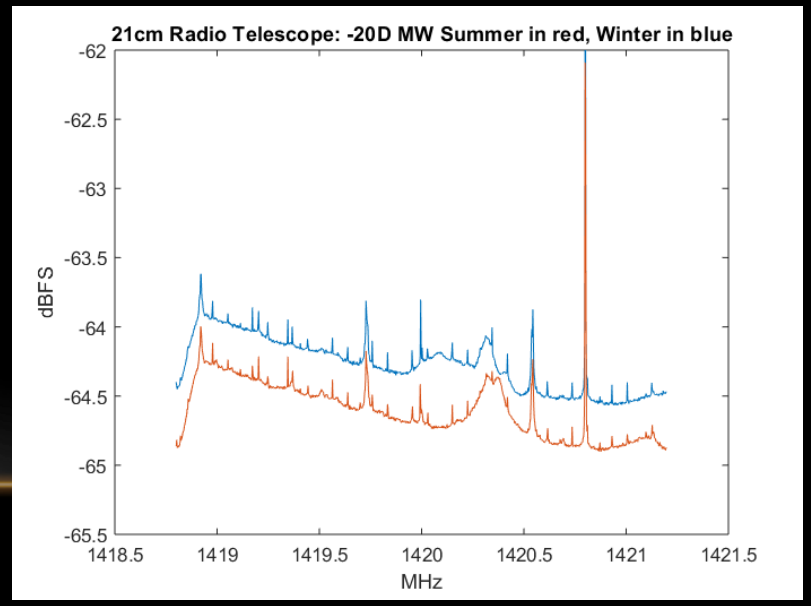


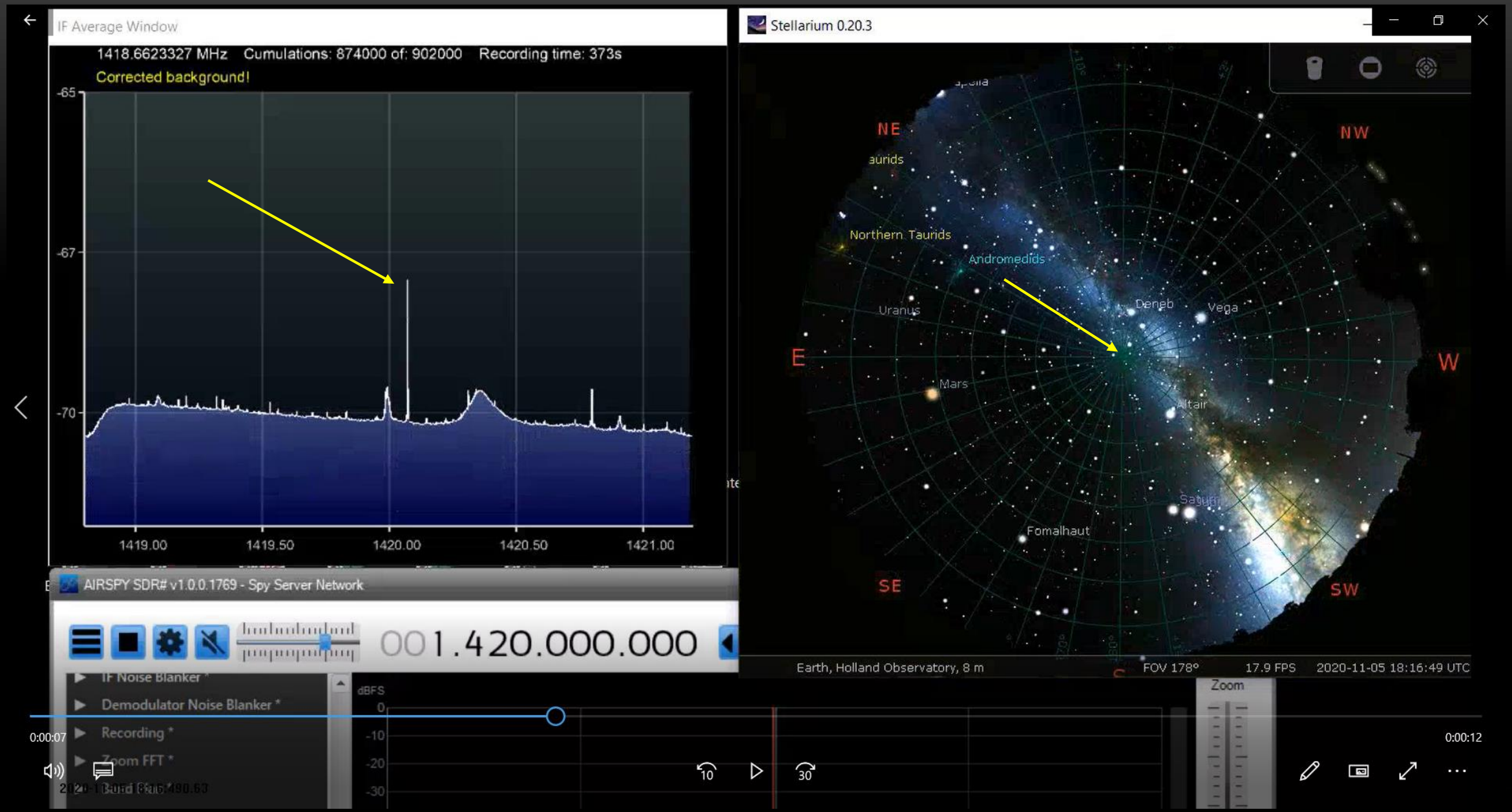












Detection of signal in direction of radio source at Cygnus Loop Super Nova Remnant (SNR)

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

The End