# DIY Astronomy

## Radio Telescope Part 3:
## Solar System Distance from Center of Milky Way;
## The Sun

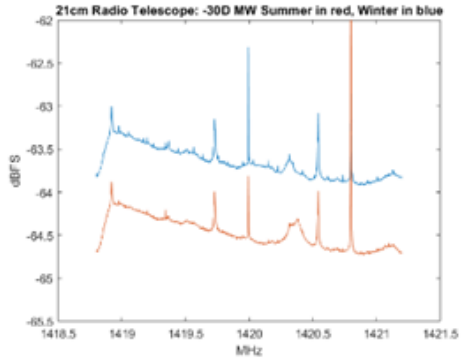
Doug Holland

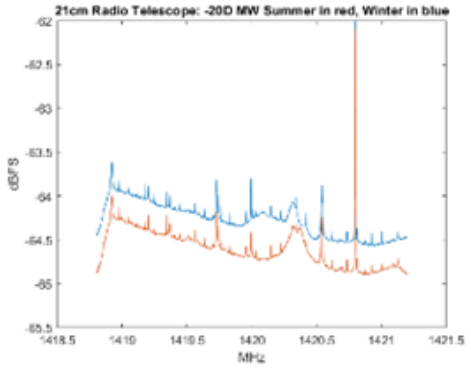
21cm Radio Telescope
(21cm => 1.42GHz)
Hydrogen Emission

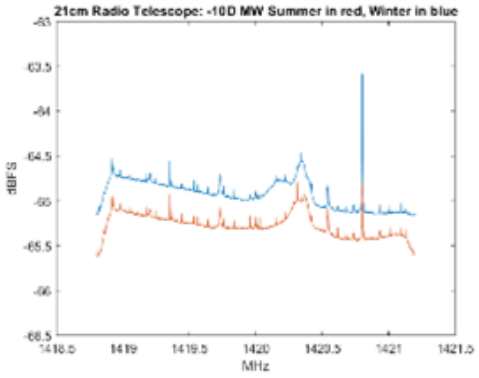
- WiFi Antenna, Software Defined Radio (SDR)
- Raspberry Pi Configuration

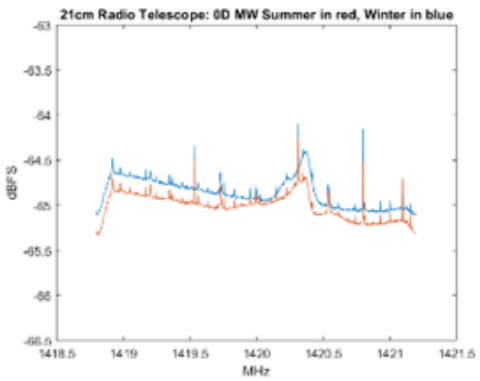
Data gathered along *galactic equator*
11/3 to 11/17, 2020

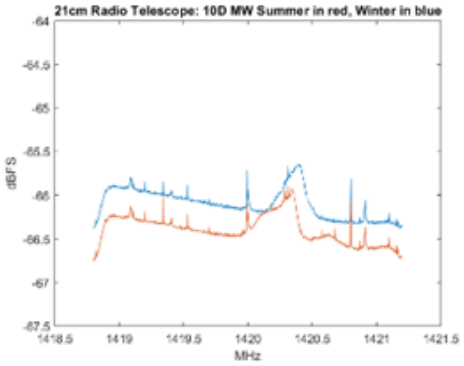
# 21cm Plots at Galactic Equator – Spaced at 10 Degrees Declination

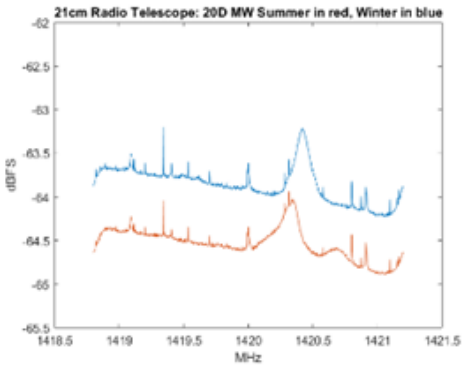


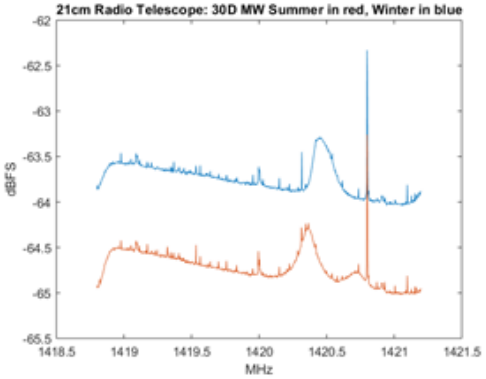



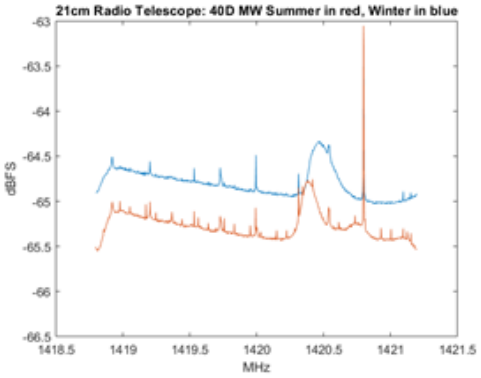



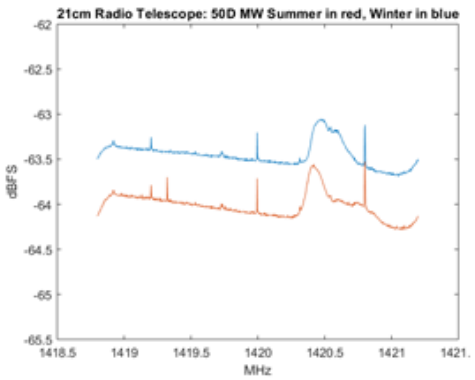



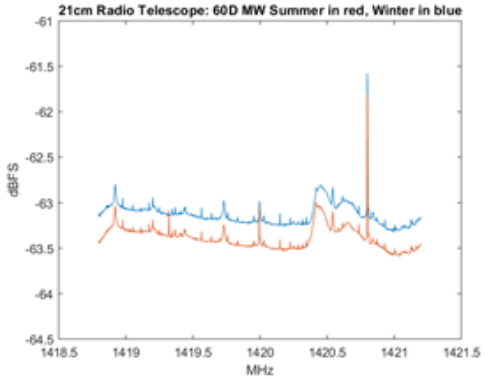



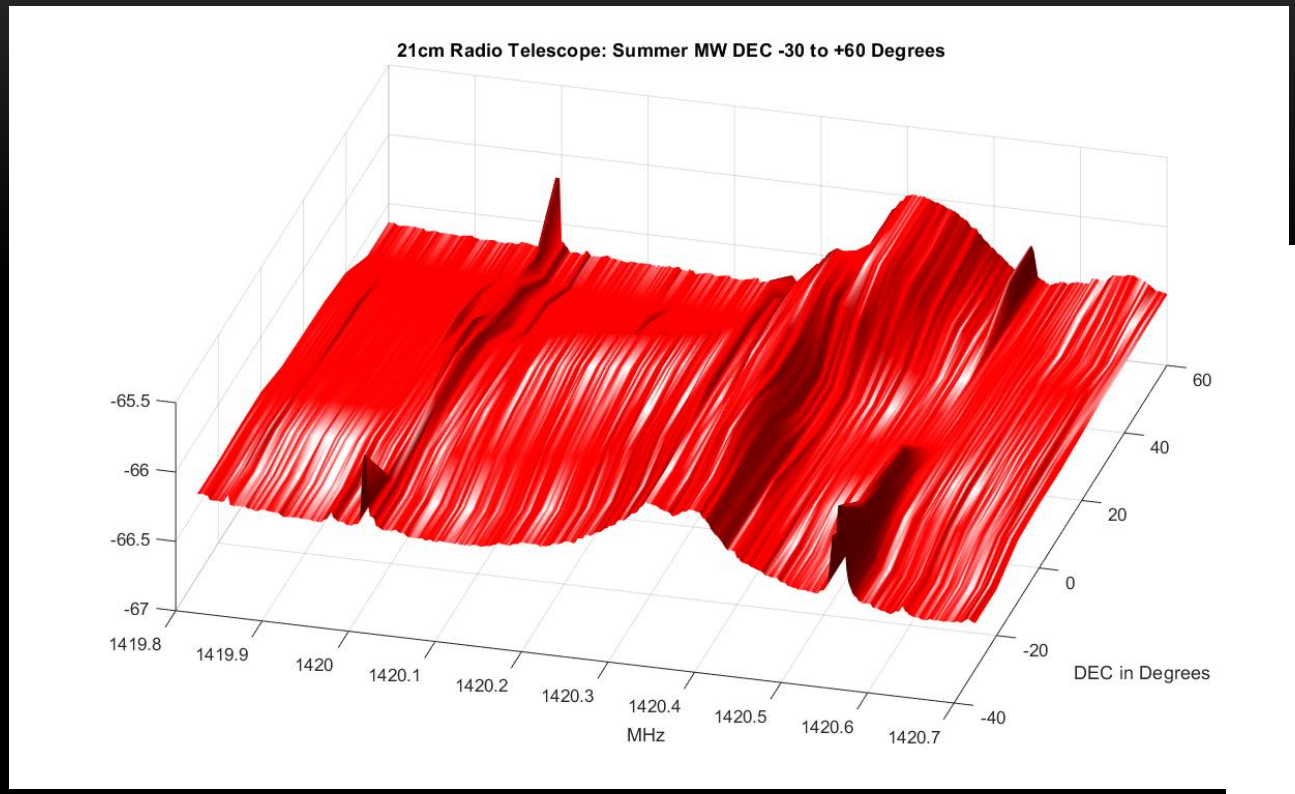



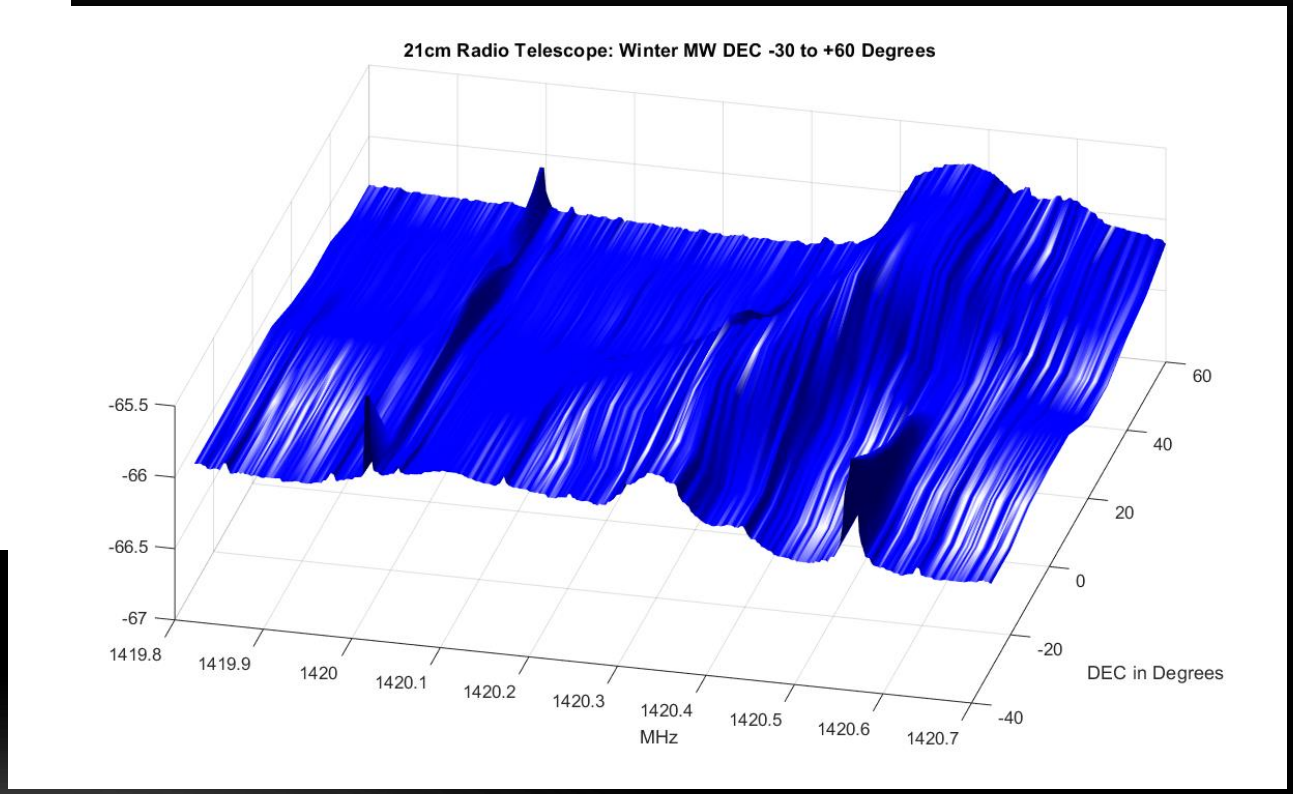



# 3D Surface Plots of Summer (Red) and Winter (Blue) Milk Way Data



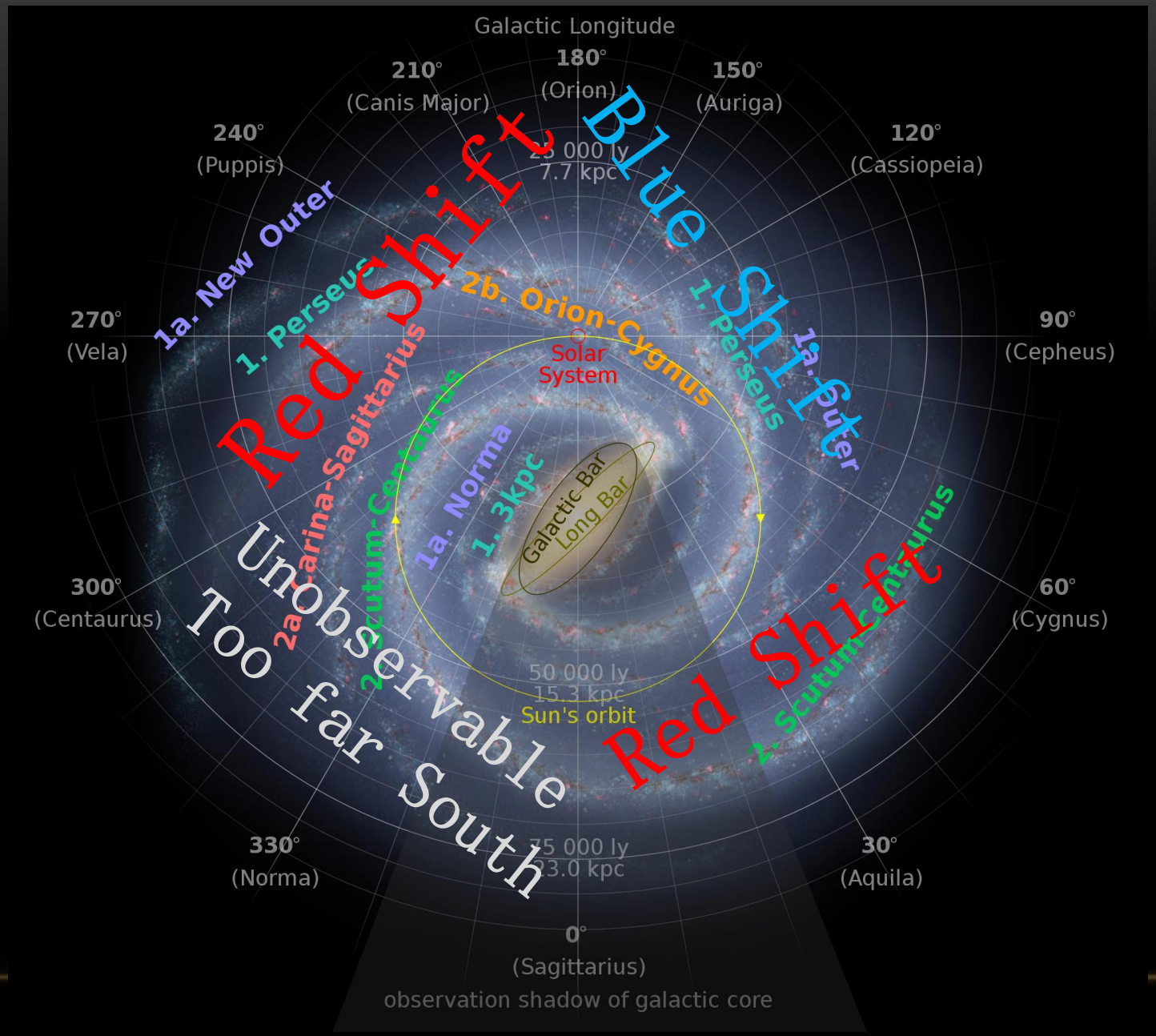

- The **diameter of** the luminous **Milky Way** is between 100,000 and 120,000 light years across.
- Sun (Solar System) is 1/2 to 2/3rds from center (www.universetoday.com)




Declination vs. Amplitude vs. Frequency
$-30^0$ DEC: Center of galaxy (Sagittarius)
$+60^0$ DEC: Most Northerly point of galactic equator (all data taken along galactic equator)

=> Transition between red shift and blue shift is approx. 1/2 to 2/3 from center of galaxy to most Northerly point

# Matlab Demo




https://earthsky.org/upl/2020/01/milky-way-arms-suns-location-orion-cygnus-arm.png

# The Sun

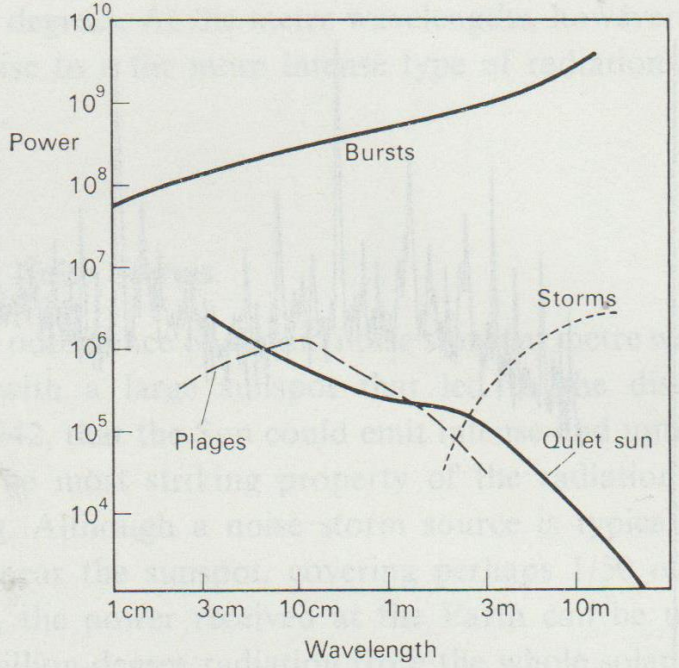
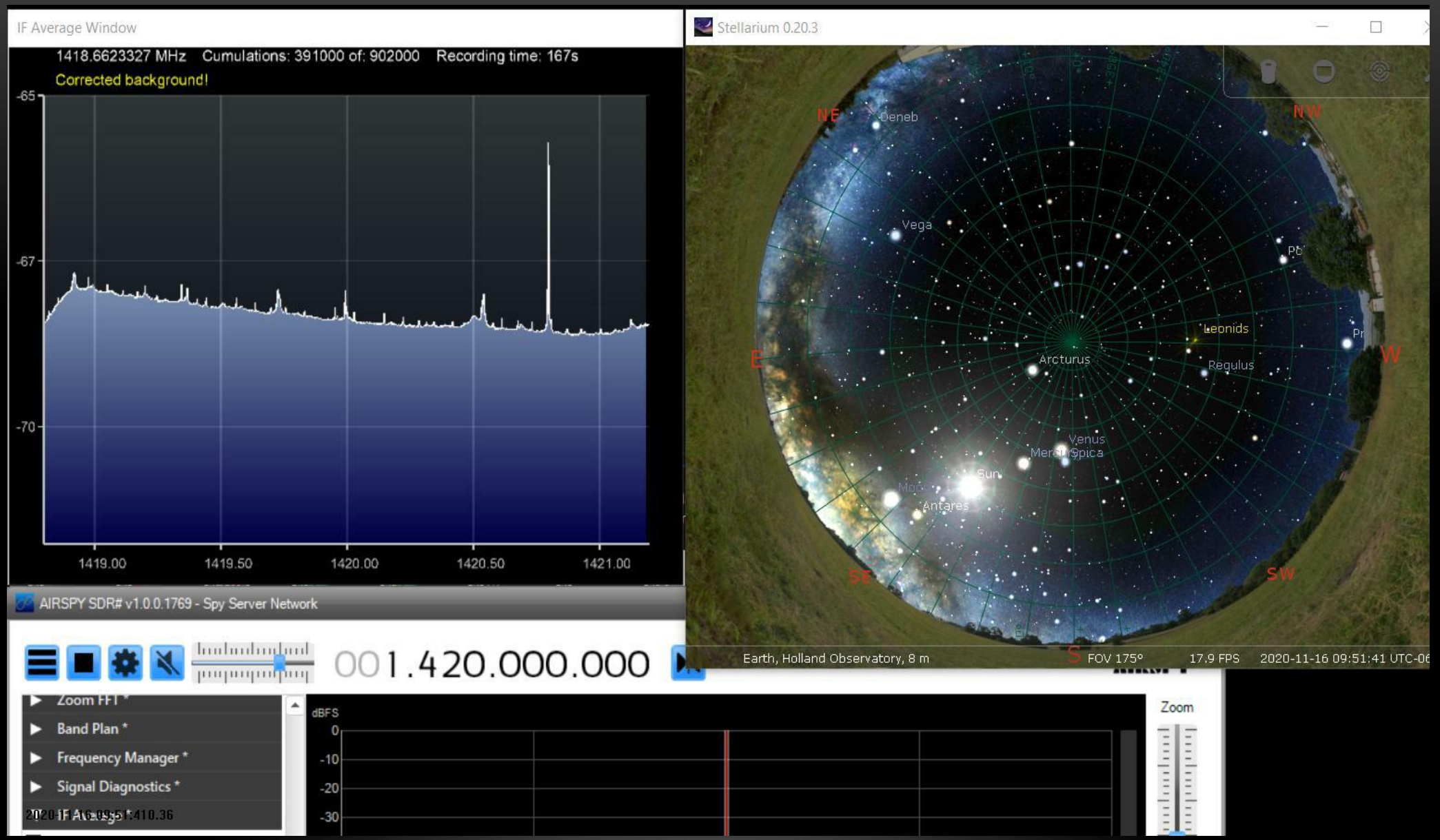



FIG. 5.8. Radio spectrum of the quiet Sun, large bursts, storms, and plages. Power flux density in units of $10^{-26}$ W m$^{-2}$ Hz$^{-1}$. (After Wild, 1963.)

The Radio Universe, 2nd Edition by J.S. Hey

## The Sun's Spectrum




# Video of the Sun Spectrum over an Approximate 4.5 Hour Period

Presentation posted on webpage: www.holland-observatory.net

# The End

# Member's Minute

## Cederblad 214 – Emission Nebula in Cepheus

Doug Holland


## Imaging System:

*Newtonian Telescope*

⇒ 200mm aperture

⇒ f/5

⇒ MPCC Coma Corrector

*Kodak KAF-8300 based CCD camera*

=>Baader Narrowband Filters

## Guiding System:

*Empire Refractor*

=>50mm aperture

=>f/12

*Micron MT9M034 based CMOS camera*

Eldorado Star Party 2020

SII
29x15min

Ha
31x15min

OIII
33x15min

Total 93x15min => 23hours, 15 minutes

# Narrowband Imaging

# Processing

- Calibration: DSS (Deep Sky Stacker) [Provided better results than PixInsight (PI)]
- PI Dynamic Crop
- PI MultiScale Linear Transform (MLT) noise reduction for SII & OIII
- Photoshop (PS) Levels & Curves, Ha Smart Sharpen with star mask
- PS LRGB combine
- PI Correct Magenta Stars script
- PS Star blur w/ star mask
- PS Reduce Color Noise
- PS Dust & Scratches
- PI Subtractive Color Noise Reduction (SCNR) 87% + Color Mask script 13% to fix colors