

# K4LED

## Georgia Amateur Radio Astronomy Observatory

**Observation Date:** 07-11-2018, 0:00:00 to 23:59:00 UTC

**Location:** Lat. 34.42322 N, Lon. -84.49413 W (Jasper, GA 30143)

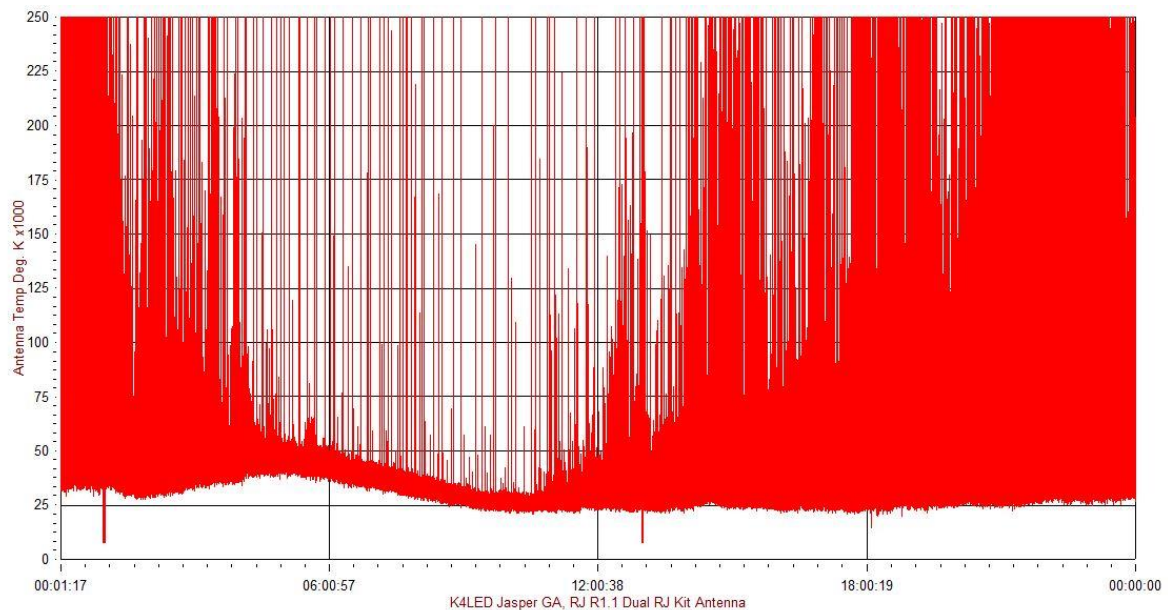
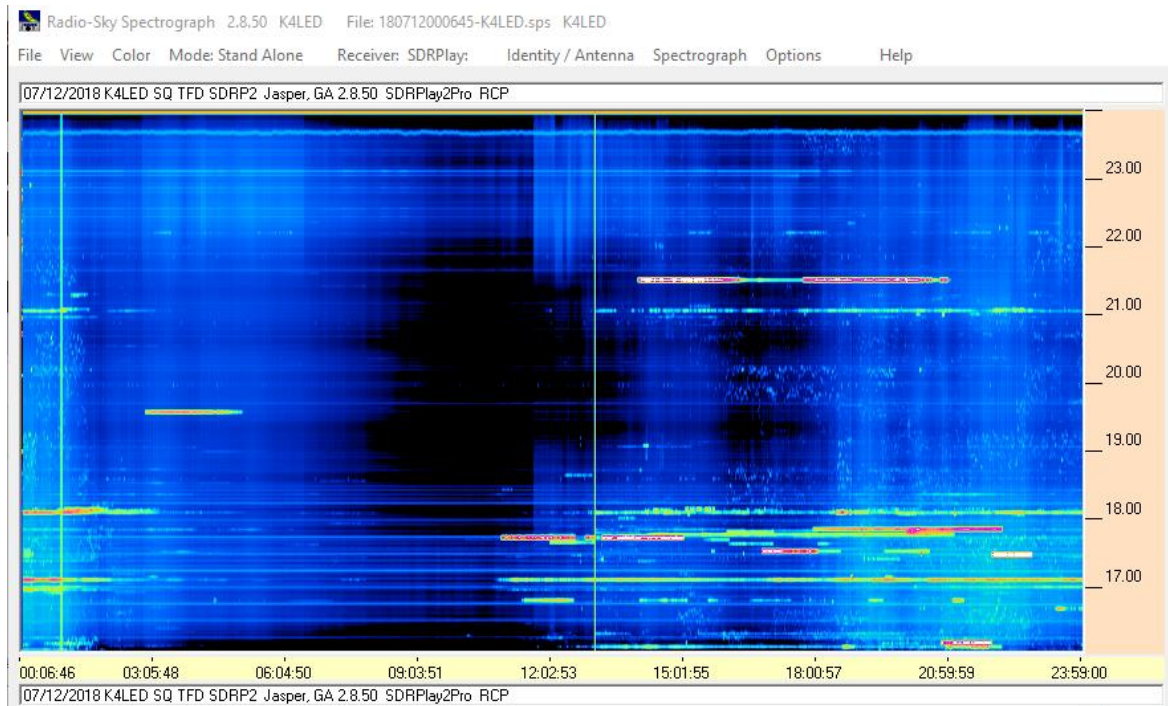
**Object:** TP, GB, Lightning, Io-B

**Observer:** Larry E. Dodd

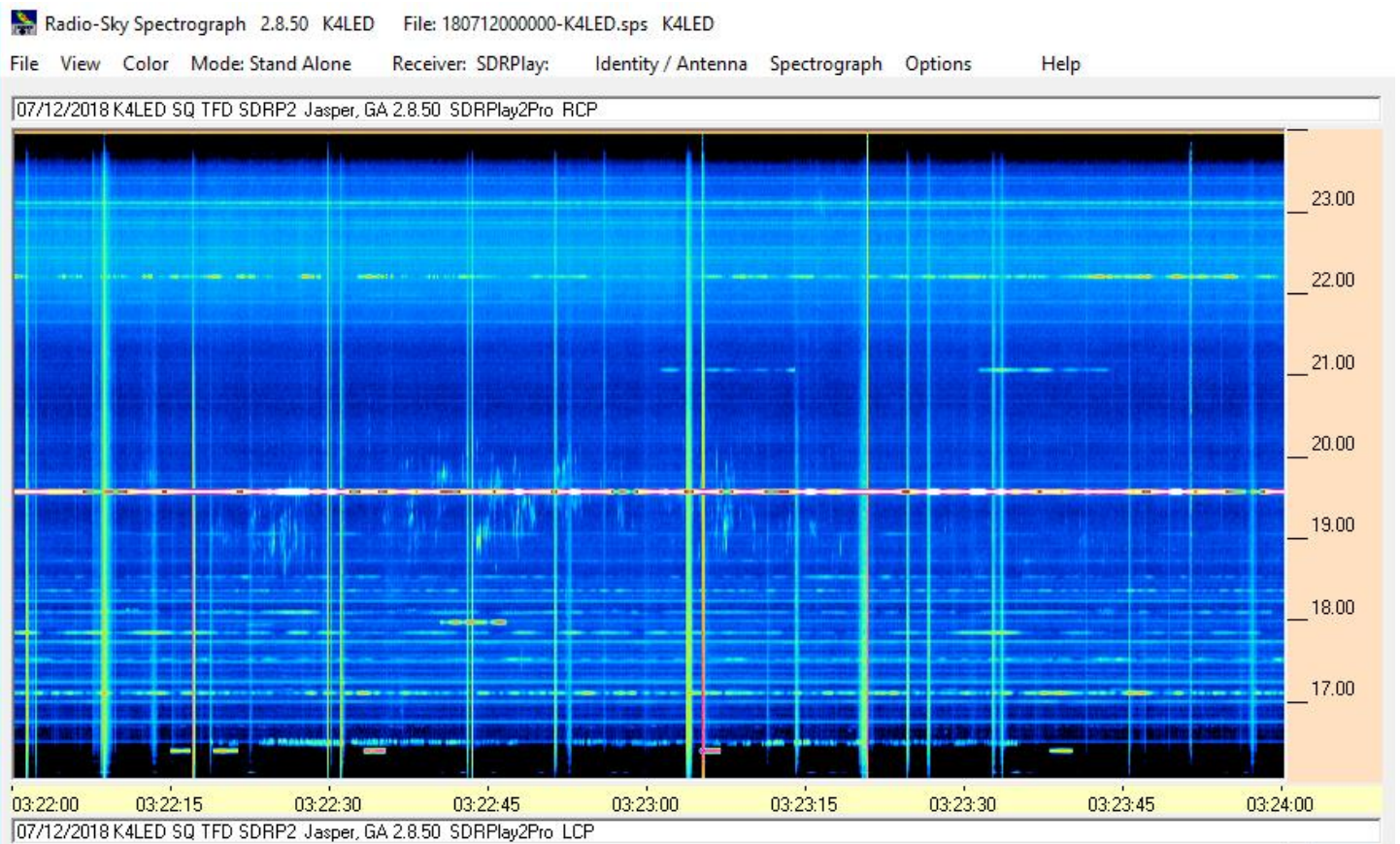
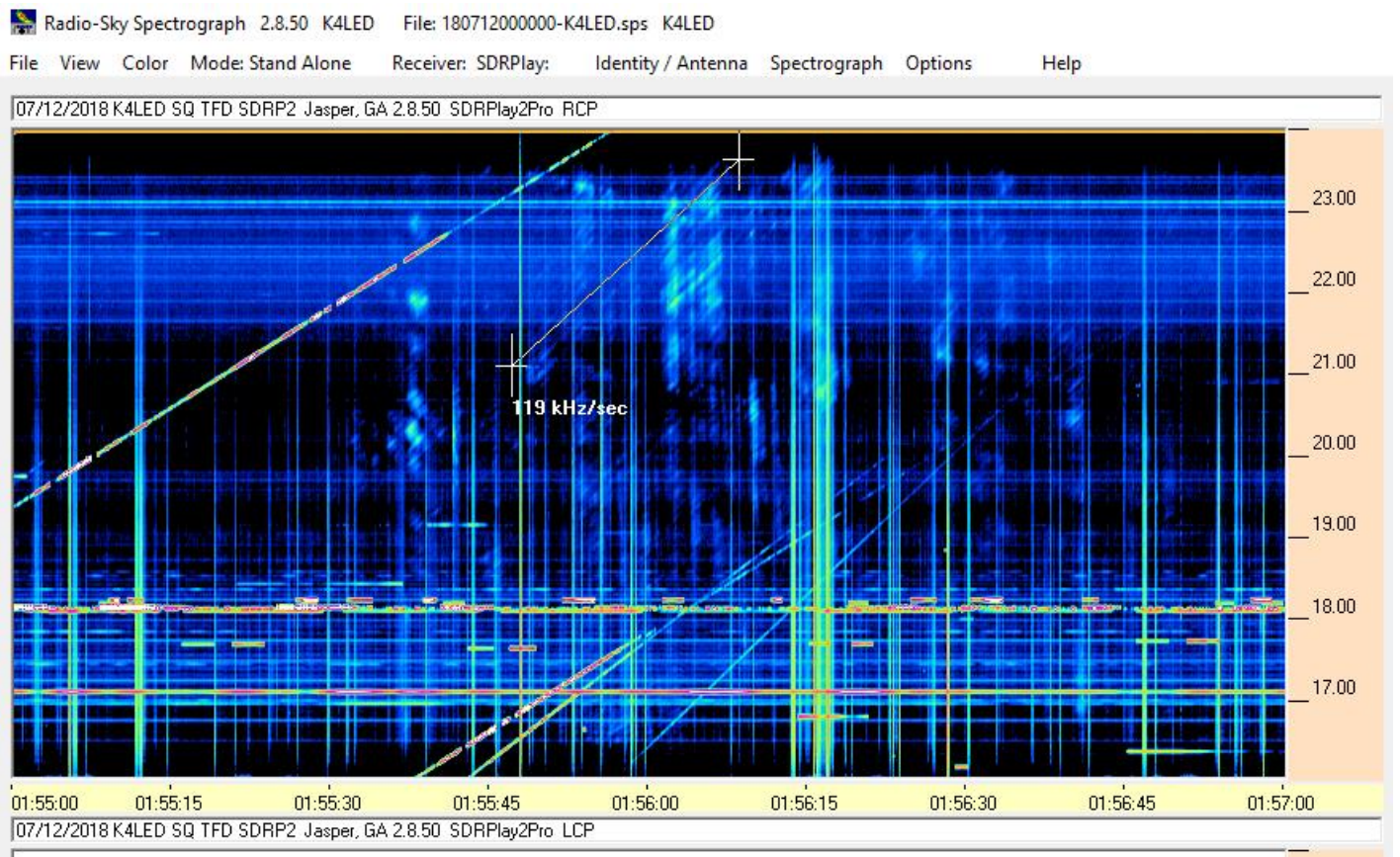
**Receivers:** FSX11, SDRPlay2PRO, RJ1.1

**Software:** SkypipeII 2.7.34, Spectrograph 2.8.50

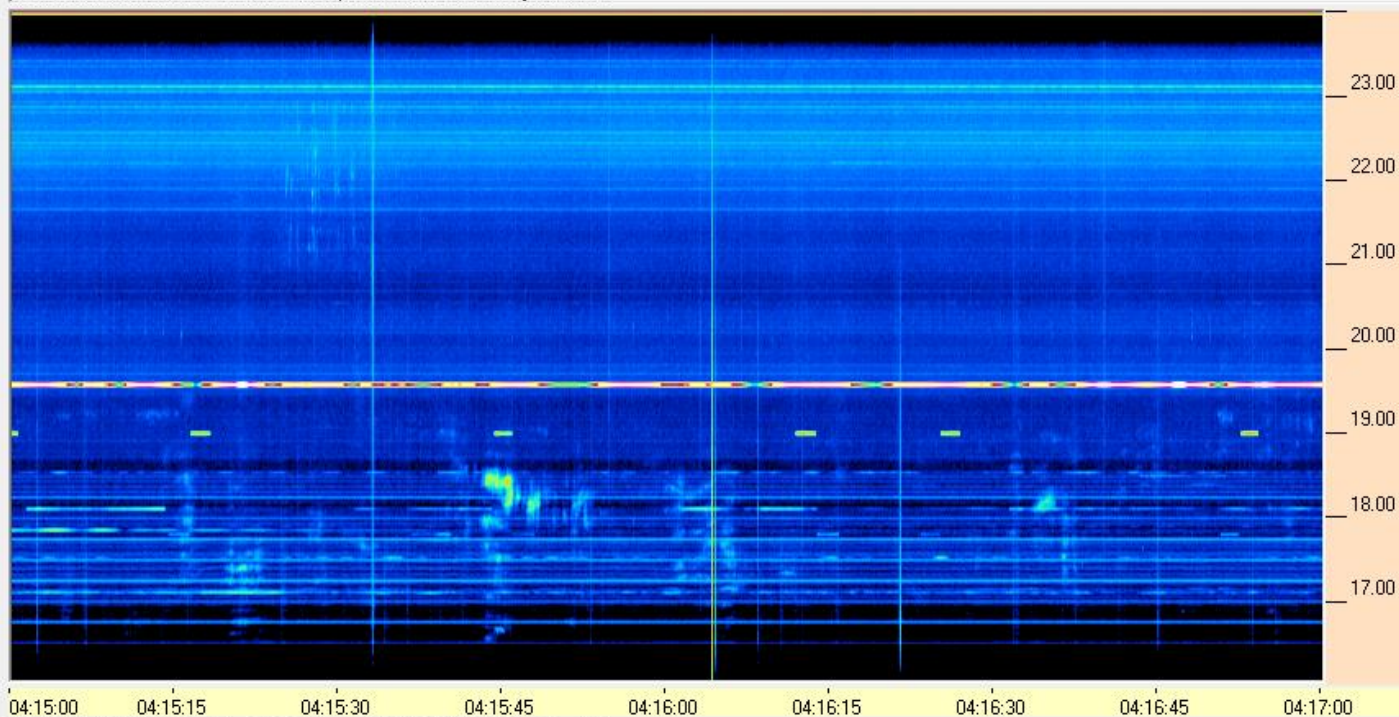
**Antennas:** Radio Jove Dual Dipole Kit, Typinski Square TFD



# Io-B

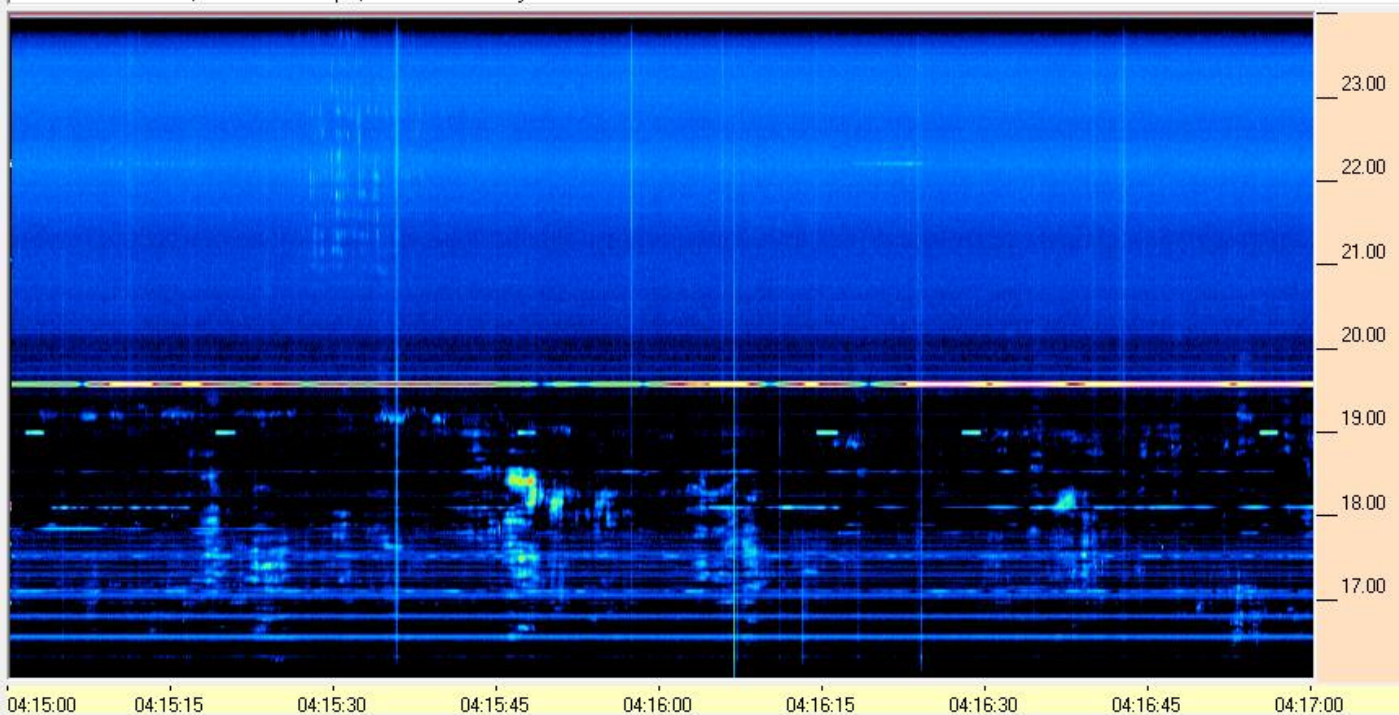


07/12/2018 K4LED SQ TFD SDRP2 Jasper, GA 2.8.50 SDRPlay2Pro RCP



07/12/2018 K4LED SQ TFD SDRP2 Jasper, GA 2.8.50 SDRPlay2Pro LCP

07/12/2018 K4LED SQ TFD SDRP2 Jasper, GA 2.8.50 SDRPlay2Pro LCP



07/12/2018 K4LED SQ TFD SDRP2 Jasper, GA 2.8.50 SDRPlay2Pro LCP



Station YYYY DAY DDD HHMMSS P1 FFS S AXN PPS IGA PS  
Eglin AFB 2018 Jul11 192 030000 RSF 1 713 100 03+ 79

foF2 4.975  
foF1 N/A  
foF1p N/A  
foE N/A  
foEp 0.38  
fxI 5.55  
foEs 2.53  
fmin 2.23

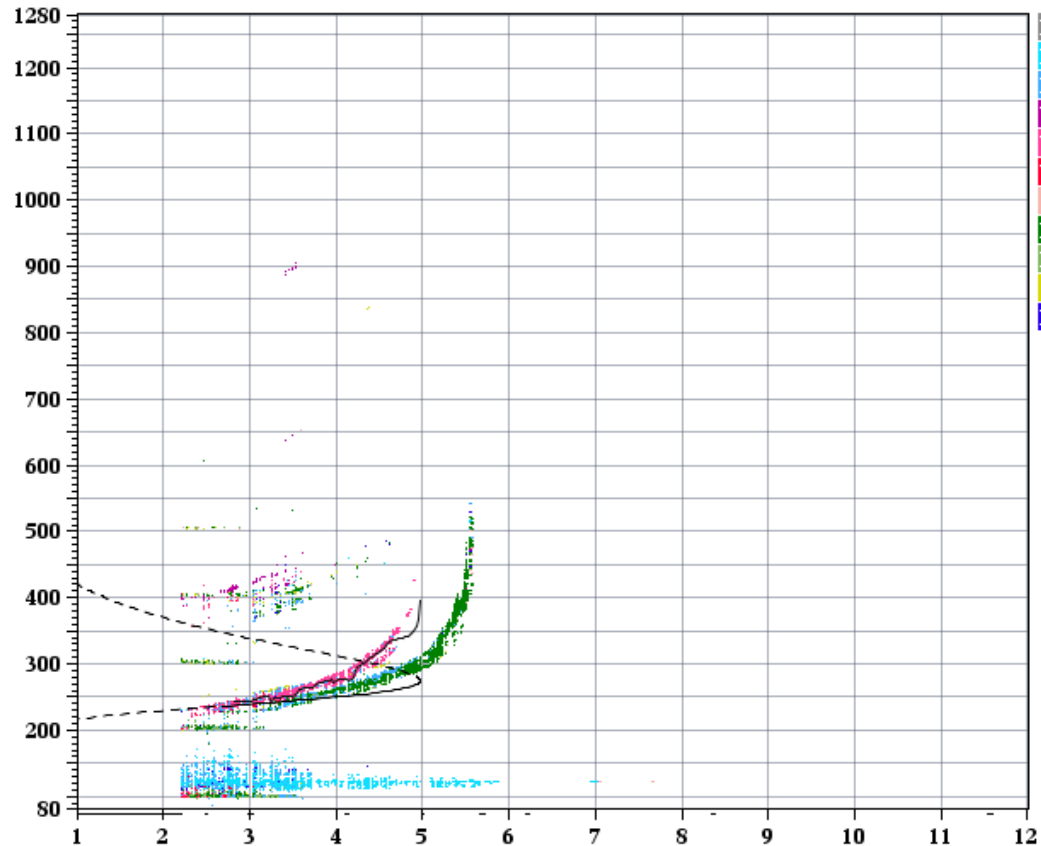
MUF(D) 16.41  
M(D) 3.30  
D N/A

h'F 240.0  
h'F2 240.0  
h'E N/A  
h'Es 97.5

hmF2 273.6  
hmF1 N/A  
hmE 110.0  
yF2 41.7  
yF1 N/A  
yE 20.0  
B0 39.5  
B1 2.47

C-level 33

Auto:  
Artist5  
500200



D 100 200 400 600 800 1000 1500 3000 [km]  
MUF 5.6 5.6 5.9 6.3 6.9 7.7 10.1 16.4 [MHz]  
14506427.tmp / 440fx512h 25 kHz 2.5 km / DPS-4D EG931 084 / 30.5 N 273.5 E

ShowIonogram v 1.0

Rectangular Scan

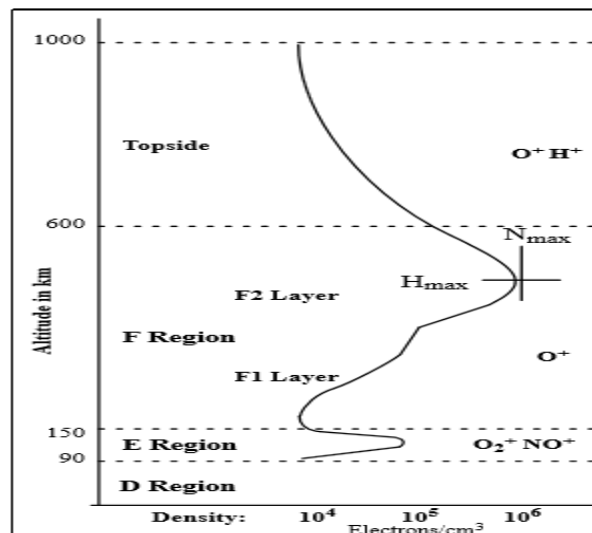
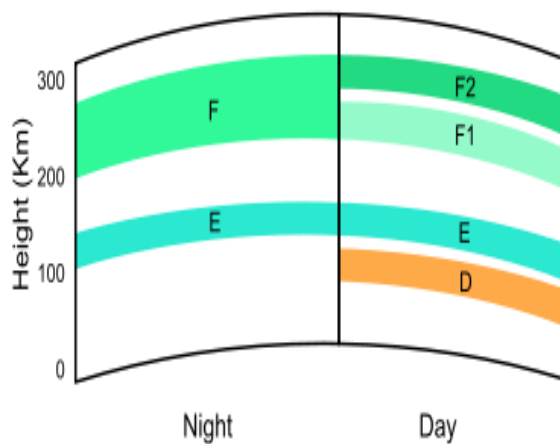
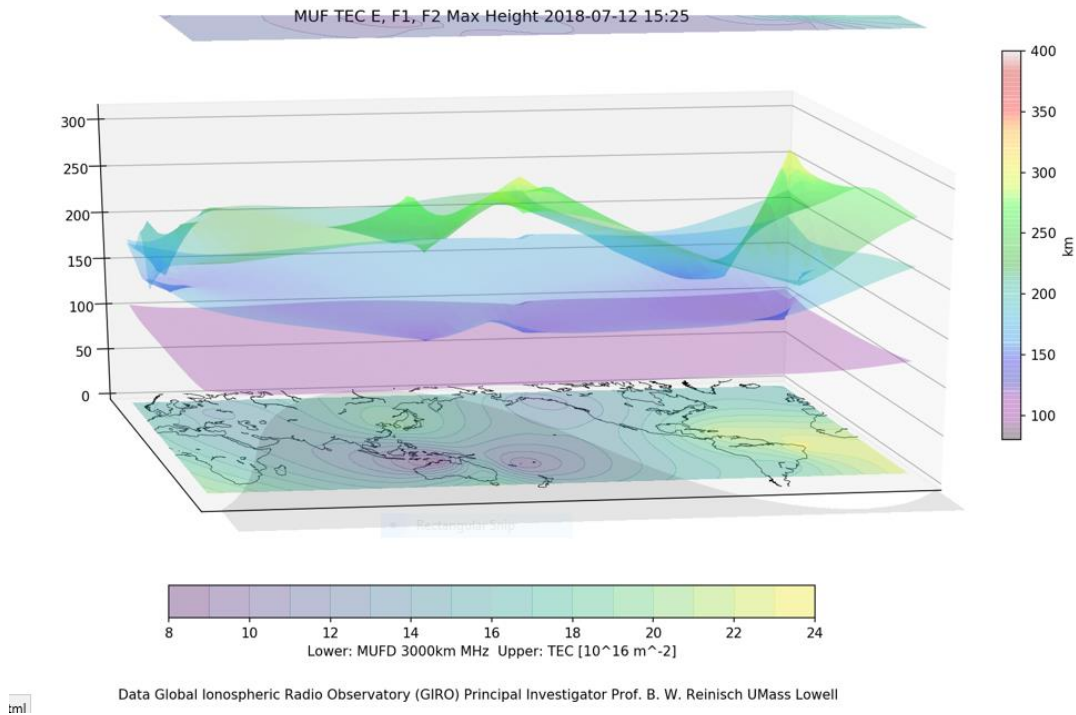
### References for Interpreting the Ionogram:

[http://www.sws.bom.gov.au/IPSHosted/INAG/uag\\_23a/UAG\\_23A\\_indexed.pdf](http://www.sws.bom.gov.au/IPSHosted/INAG/uag_23a/UAG_23A_indexed.pdf)

<http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.404.5517&rep=rep1&type=pdf>

<https://www.hfunderground.com/wiki/index.php/Ionosonde>

## Ionosphere Layers, MUF, Total Electron Content



The **critical frequency** is the limiting frequency at or below which a radio wave is reflected by an ionospheric layer at vertical incidence. If the transmitted frequency is higher than the **plasma frequency** of the ionosphere, then the electrons cannot respond fast enough, and they are not able to re-radiate the signal. It is calculated as shown below:

$$f_{\text{critical}} = 9 \times \sqrt{N}$$

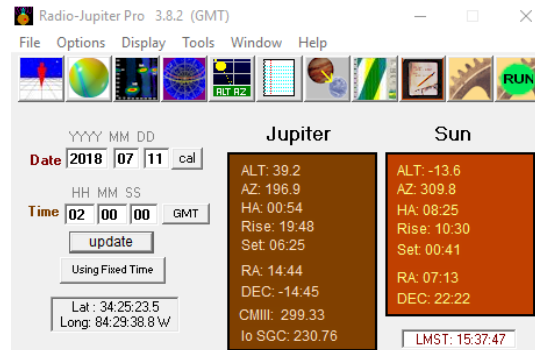
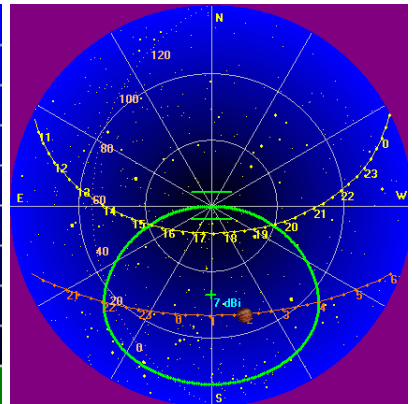
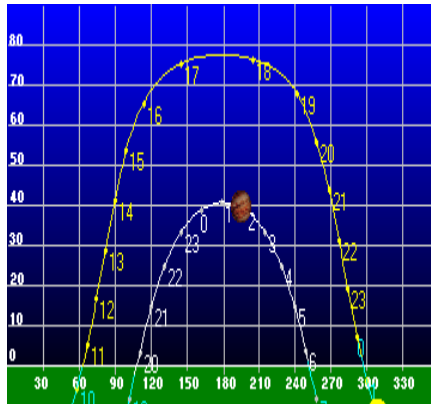
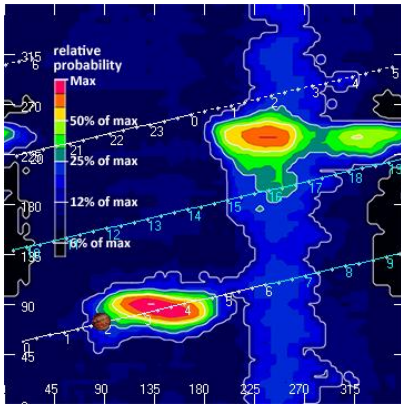
where  $N$  = electron density per  $\text{m}^3$  and  $f_{\text{critical}}$  is in Hz.

The Maximum Usable Frequency (MUF) is defined as the upper frequency limit that can be used for transmission between two points at a specified time.

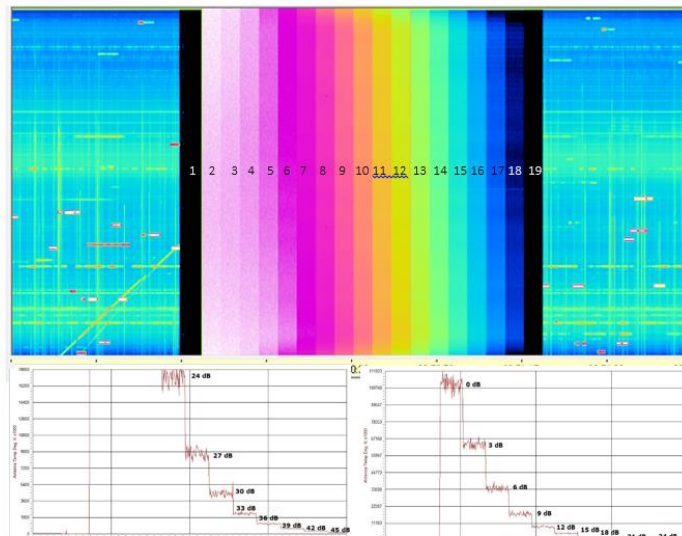
$$f_{\text{muf}} = \frac{f_{\text{critical}}}{\sin \alpha}$$

where  $\alpha$  = **angle of attack**, the angle of the wave relative to the **horizon**, and  $\sin$  is the **sine** function.

**Reference:** <https://en.wikipedia.org/wiki/Ionosphere>



# AUTOMATED CALIBRATION COLOR BAR TEST PATTERN AND DATA ACTUAL MEASURED DATA



| STEP | TEMPERATURE | ATTENUATION |
|------|-------------|-------------|
| 1    | >1 kK       | 101 dB      |
| 2    | 104.0 MK    | 0 dB        |
| 3    | 66.9 MK     | 3 dB        |
| 4    | 36.3 MK     | 6 dB        |
| 5    | 19.1 MK     | 9 dB        |
| 6    | 9.6 MK      | 12 dB       |
| 7    | 4.5 MK      | 15 dB       |
| 8    | 2.3 MK      | 18 dB       |
| 9    | 1.2 MK      | 21 dB       |
| 10   | 602.0 kK    | 24 dB       |
| 11   | 296.6 kK    | 27 dB       |
| 12   | 133.0 kK    | 30 dB       |
| 13   | 92.2 kK     | 33 dB       |
| 14   | 51.6 kK     | 36 dB       |
| 15   | 32.0 kK     | 39 dB       |
| 16   | 22.6 kK     | 42 dB       |
| 17   | 17.9 kK     | 45 dB       |
| 18   | 12.0 kK     | 48 dB       |
| 19   | >1 kK       | 101 dB      |