HNRAO Observing Log
40.673181 N – 80.437885 W
EN90sq

Date: 19 February 2017

Object: Jupiter – Io-B

Observer: JB

Start of pass:	**0615 UT**	**Planetary K-index:**	**3**
Jupiter Altitude:	**30.1 degrees**	**Jupiter Azimuth:**	**134.1 degree**
Jupiter CML:	**112.71**	**Jupiter Io Phase:**	**078.40**
Jupiter RA:	**13:26**	**Jupiter Dec:**	**-07:27**
Hour Angle:	**-02:35**	**Polarization**	**RCP**
Sun Altitude:	**-59.4 degrees**	**Sun Azimuth:**	**022.9 degrees**
Sun RA:	**22:04**	**Sun Dec:**	**-11:52**

End of pass:	**0816 UT**		
Jupiter Altitude:	**41.2 degrees**	**Jupiter Azimuth:**	**168.8 degrees**
Jupiter CML:	**185.87**	**Jupiter Io Phase**	**095.37**
Hour Angle:	**-00:34**		
Sun Altitude:	**-43.3 degrees**	**Sun Azimuth:**	**064.0 degrees**

Observations made using:

1. FSX-8S fed by the TFD array
    a. 7.7 dB loss between TFD and Multicouplers.
    b. Connect to array through HNRAO Multicoupler #1 and #2, port 2
        i. HNRAO Multicoupler #1 – TFD/LCP
        ii. HNRAO Multicoupler #2 – TFD/RCP
            1. Port 1 having 10 dB of gain, all other ports have 3 dB gain.
2. FSX-2 fed by the LWA array directly
    a. LWA element configuration – 90 degrees
3. JOVE 2 receiver fed by phased JOVE dipoles @ 10’
    a. 12’ phase cable - phased for 2016-17 season
    b. Calibrated 4 February 2017
    c. Connected to dipoles through HNRAO Multicoupler #3, port 1.
        i. 3.165 dB loss between Multicoupler and dipoles.
4. Icom R75 receiver fed by experimental DDRR antenna directly.
    a. Calibrated 4 February 2017

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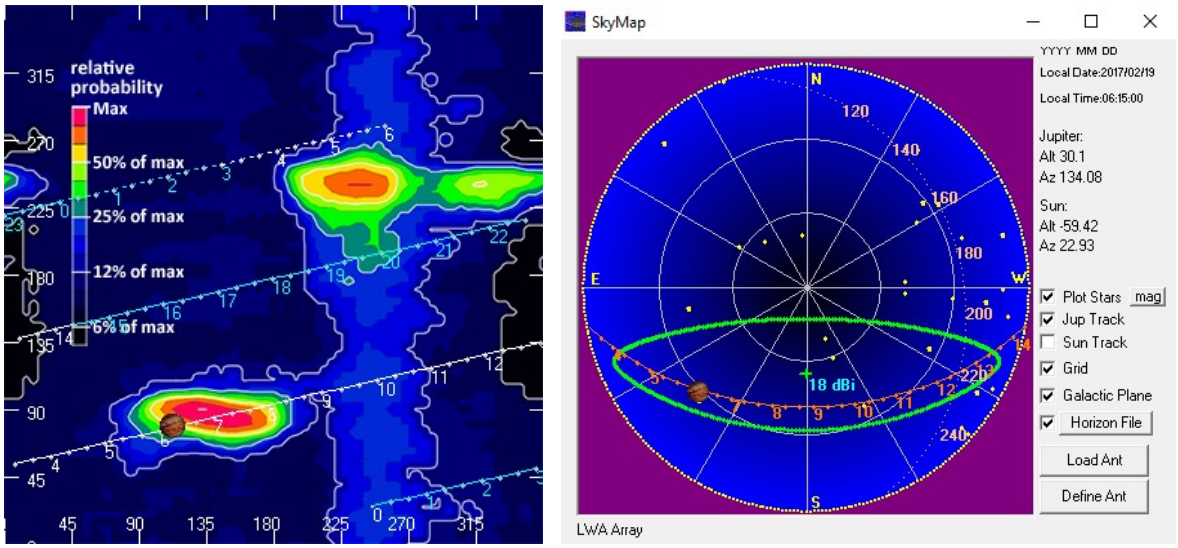
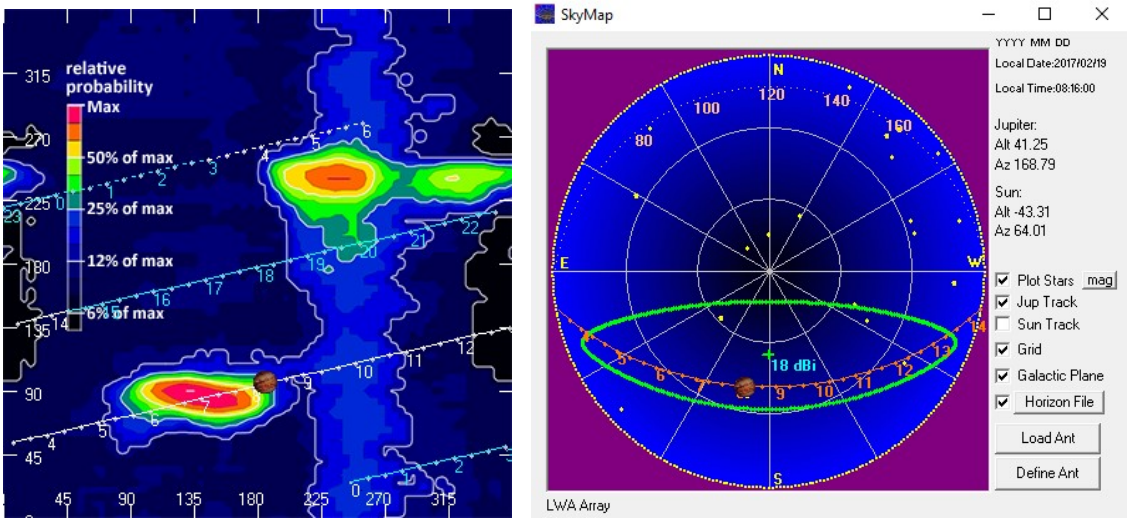


Beginning of Pass



End of Pass

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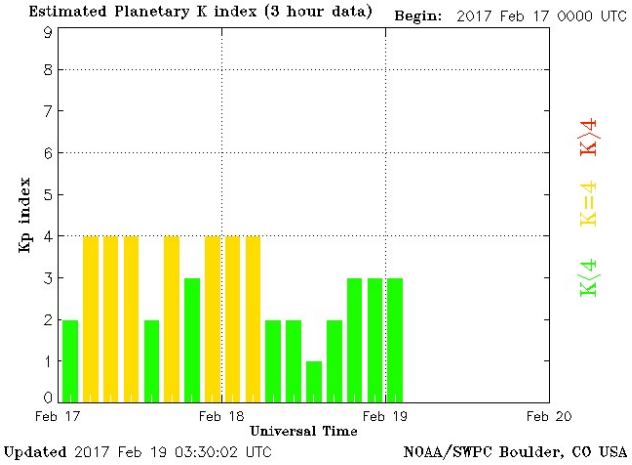
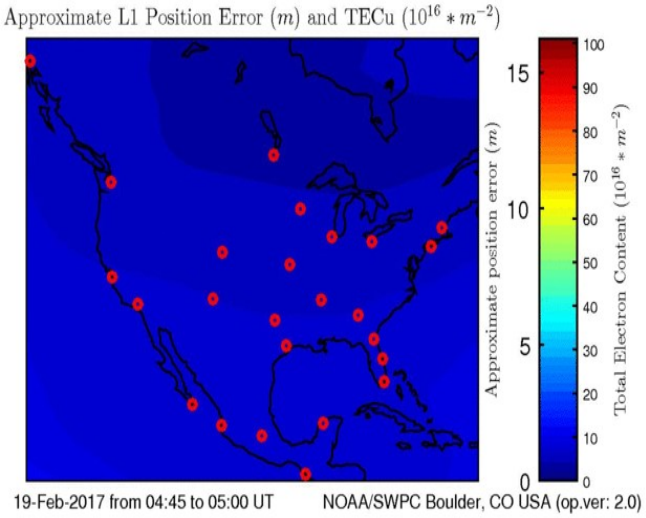
Observing conditions:

Temperature 50 degrees F, 61% humidity
Bad power line RFI. S-bursts will be difficult to identify.
Earth's magnetic field is on the verge of minor storming as our planet moves deeper into a stream of solar wind that arrived on Feb. 16th
Solar wind speed: 566.3 km/sec. density: 7.8 protons/cm3
X-ray Solar Flares: 6-hr max: B2 1952 UT Feb18, 24-hr: B3 0319 UT Feb18



Planetary K Index



Total Electron Count

The observatory was plagued with terrible power line RFI. Thus, resolution of the emissions is poor.

An overall weak Io-B storm, given the fact that it was a near center pass. First signs of emission began here at approximately 0616 UT as possible L-bursts at 27 MHz. Since Io-B is vertex early, there must have been emission prior to the first observed here. LGM observatory confirmed the early vertex of emission. A later emission observed here at 0726 UT does show the early vertex positive drift emission. A visual explanation of early vs late vertex is shown at the end of this report.

L-bursts and S-bursts were visible, although from this observatory, it appeared that the early emissions were dominated by S-bursts. Positive slope modulation lanes were present. There were good S-bursts recorded on my SkyPipe chart from 0626 UT through 0730 UT, and at the end of the pass, L-bursts were recorded.

Most notable during this pass were the large number of horizontal emissions. N-events or S-burst trains, predominantly in the upper frequencies near 27 MHz, were visible off and on during the entire pass eventually drifting down to 21 MHz. Early ones were composed of S-bursts, while the later ones near the end of pass were L-bursts.

0616 UT
Something. Probably RFI. Looks like N-event @ 26+ MHz.
Only on FSX-2/LWA
Not on FSX-8S/TFD nor AJ4CO spectrograph
0626 UT
SkyPipe seems to show S-burst activity. Also on LGM and AJ4CO.
No evidence on spectrographs, HNRAO, LGM or AJ4CO
0628 UT
Clear N-event @ 26 MHz
More apparent S-burst on SkyPipe
0629 UT
More SkyPipe S-bursts
Not on LGM or AJ4CO
Corresponding to Spectrograph emissions
0632 UT
Weak L-bursts at 26 MHz
0637 UT
More apparent weak "N-event" like activity at 25 MHz
0639 UT
Clear S-bursts at 17 MHz
0640 UT
More activity at 24 MHz
Strong S-bursts at 17 MHz
0642 UT
Stronger single burst at 23 MHz
0647 UT
S-bursts at 23 MHz
0649 UT
S-bursts at 16-17 MHz and 23 MHz.
23 MHz line appears to be N-event
0652 UT
Much stronger N-event @ 23 MHz
Seems to be strongest emissions so far.
0656 UT
More S-bursts 17 MHz dropping to 15 MHz
0704 UT
S-bursts 17 MHz
0705 UT
S-bursts 25 MHz
0706 UT

S-bursts on SkyPipe

0714 UT
21 MHz

0715 UT
S-bursts SkyPipe

0716 UT
Line of S-bursts 26 MHz

0718 UT
19-17 MHz

0719 UT
S-bursts SkyPipe

0720 UT
Stronger S-bursts
Train? N-event? 27 MHz

0722 UT
S-bursts SkyPipe
Train/N event continues

0726 UT
Stronger emissions

0730 UT
L-bursts SkyPipe

0731 UT
L-bursts 26 MHz

0737 UT
L-bursts 25 MHz
N-event

0749 UT
Weak l-bursts 17-15 MHz

0752 UT
Very weak L-burst 17-19 MHz

0756 UT
Weak L-bursts 17 MHz

0800 UT
Weak L-bursts 15-17 MHz

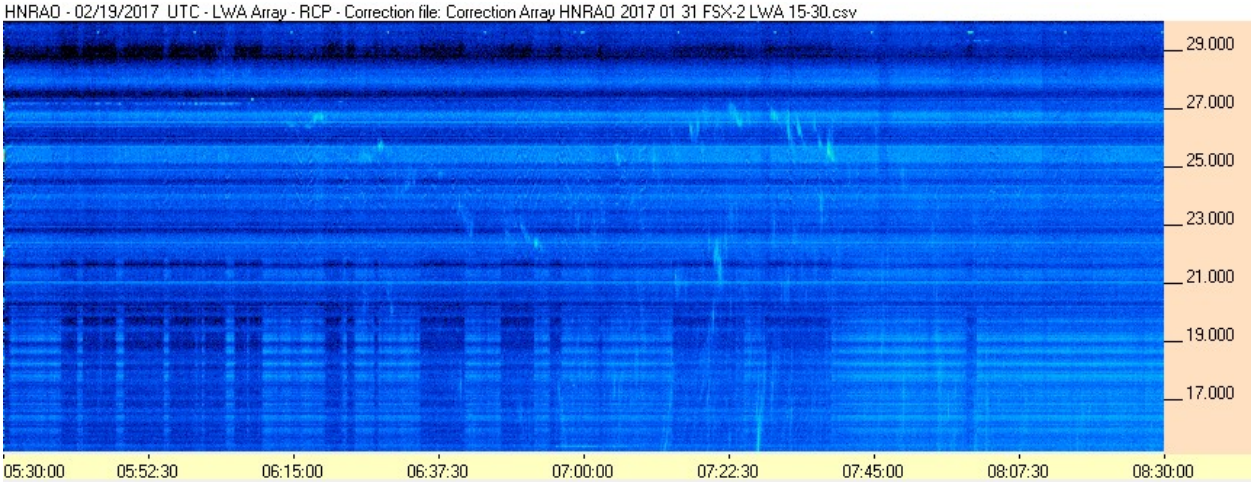
0802 UT

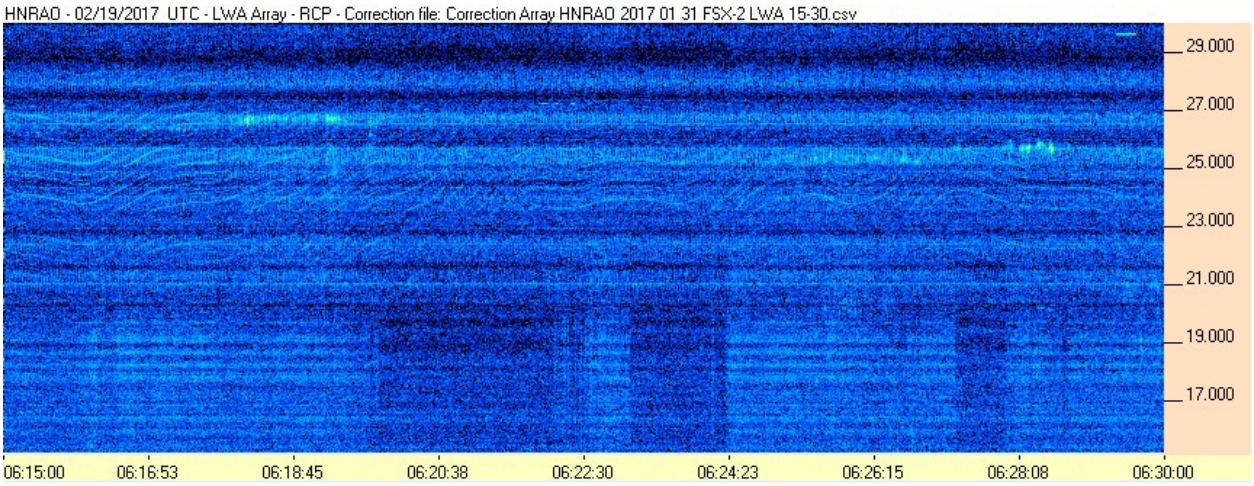
0816 UT
Last emissions

End of report.

For comparison purposes, I show identical times for the FSX-2/LWA and FSX-8S/TFD

FSX-2/LWA Pair





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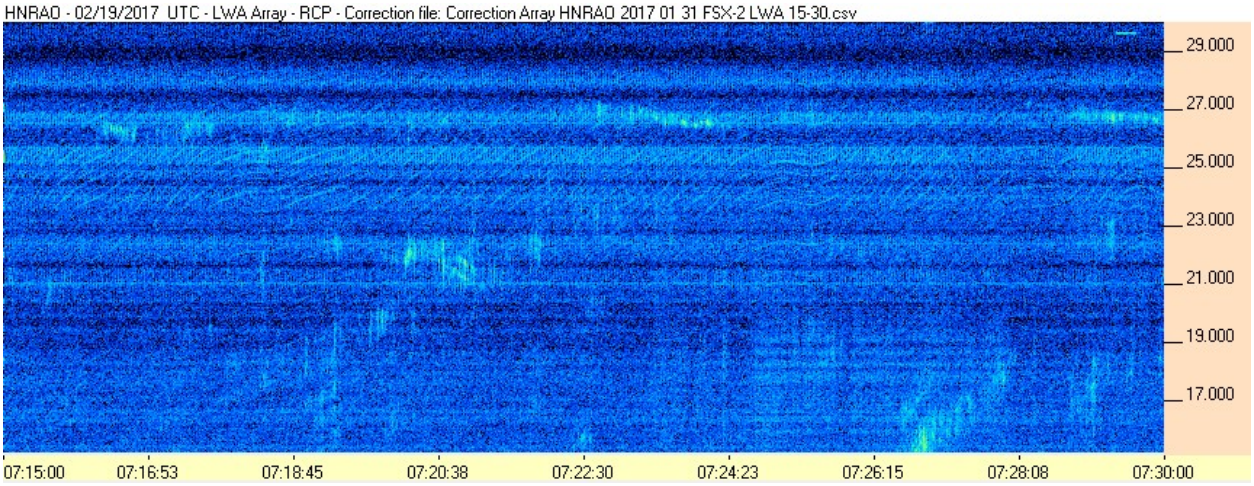

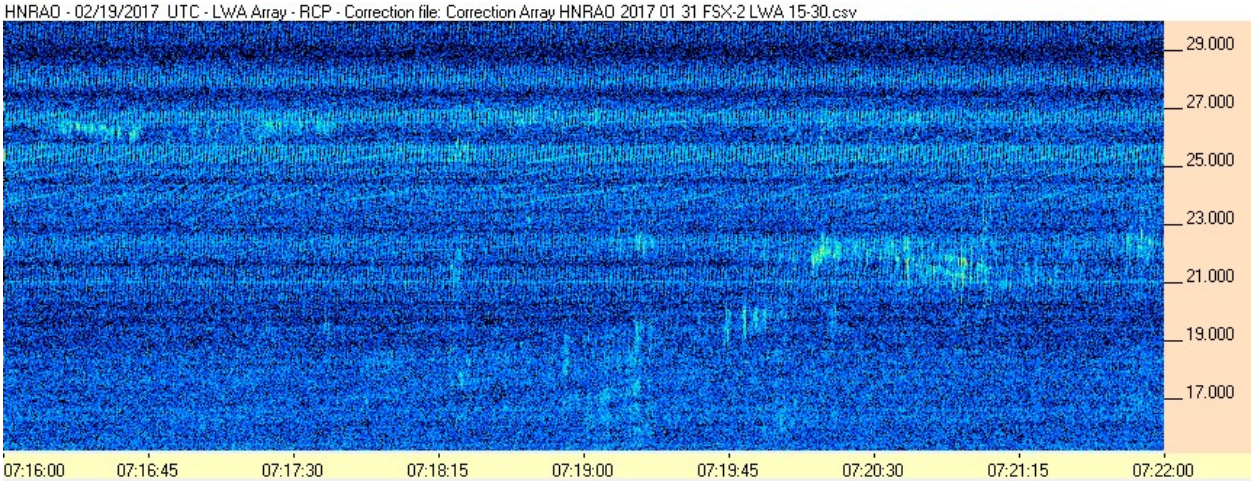

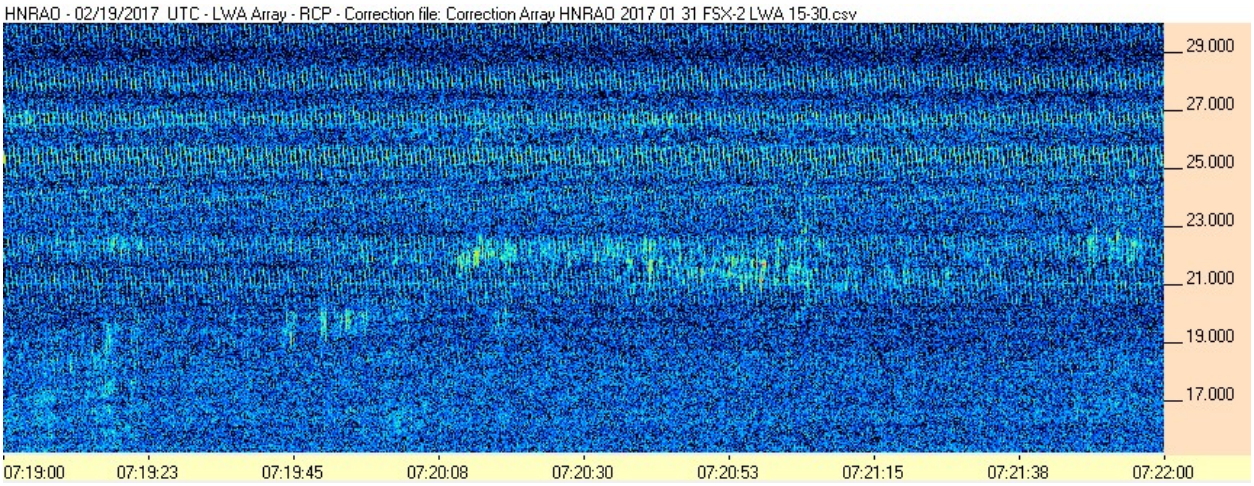

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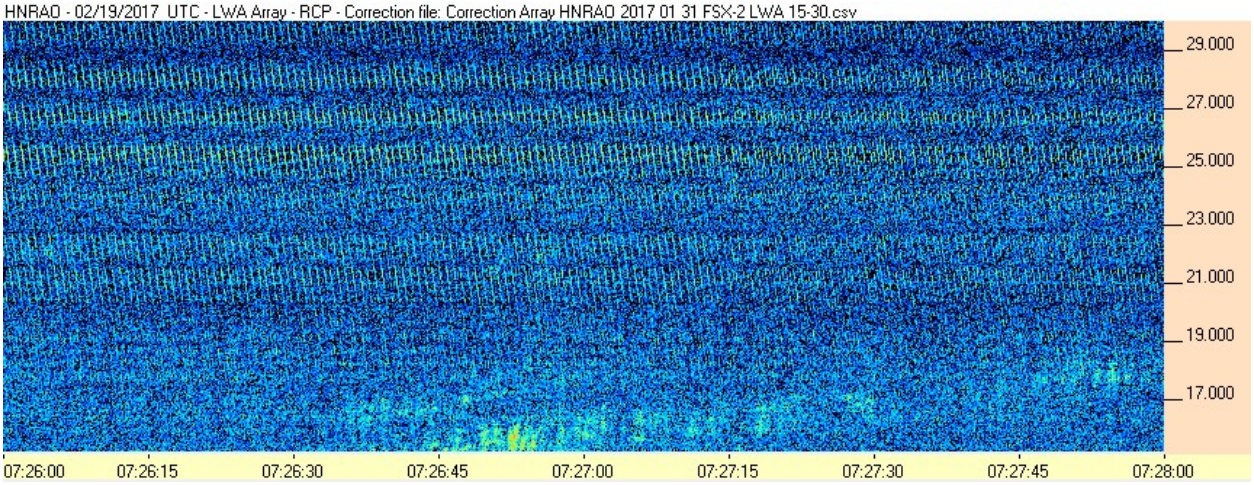

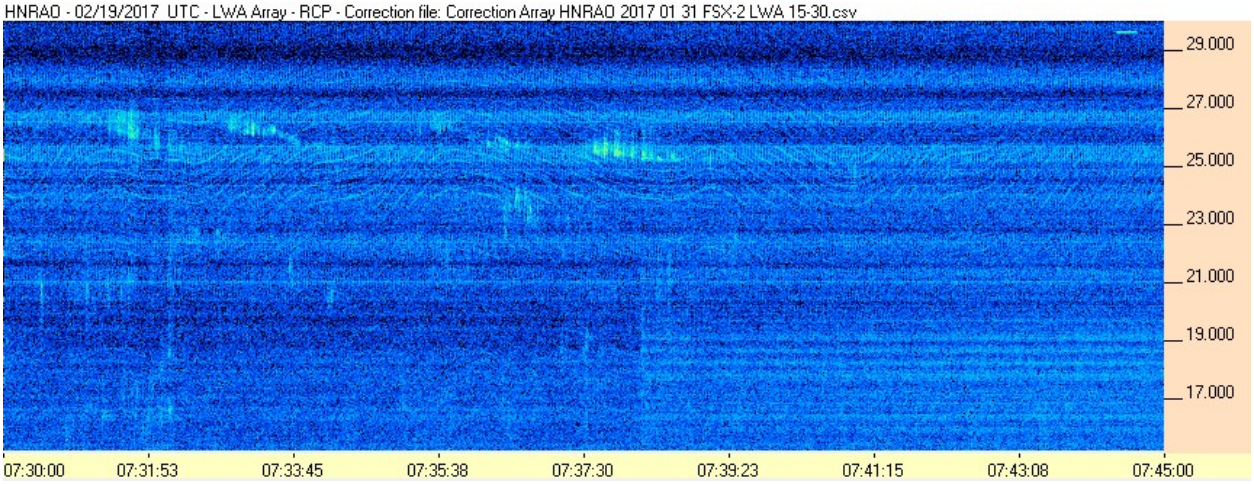

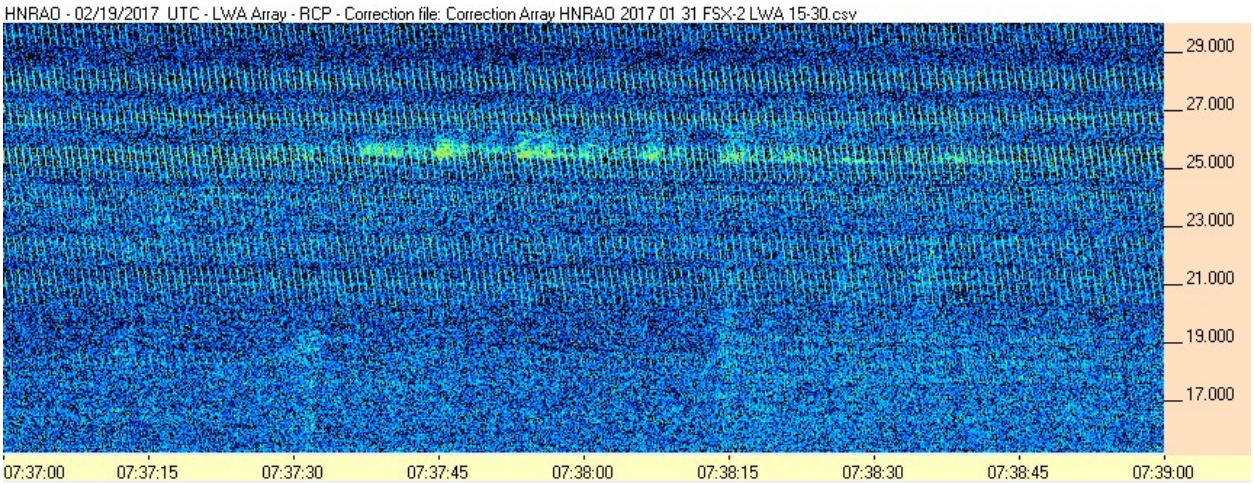

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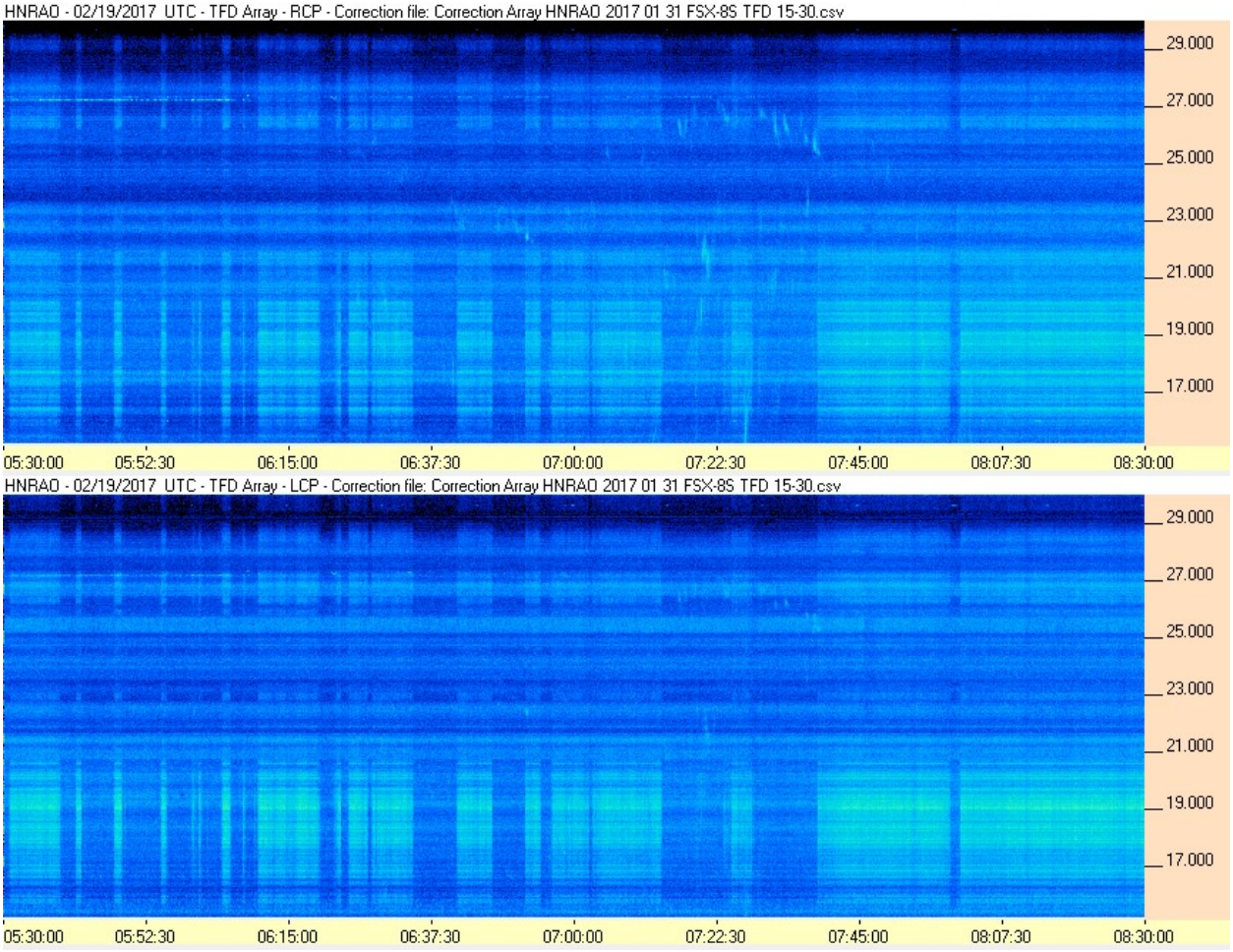
FSX-8S/TFD Pair



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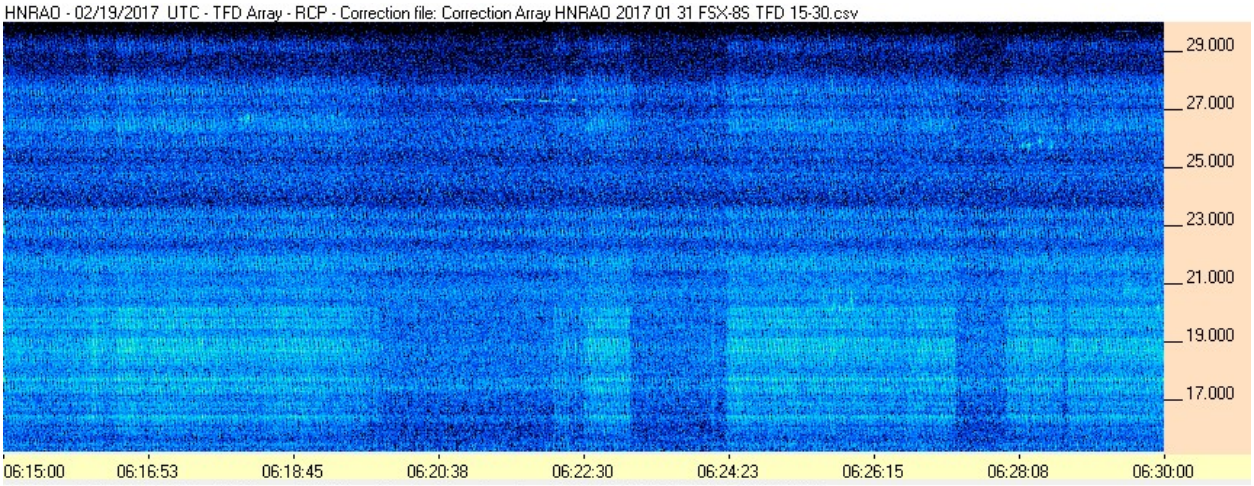

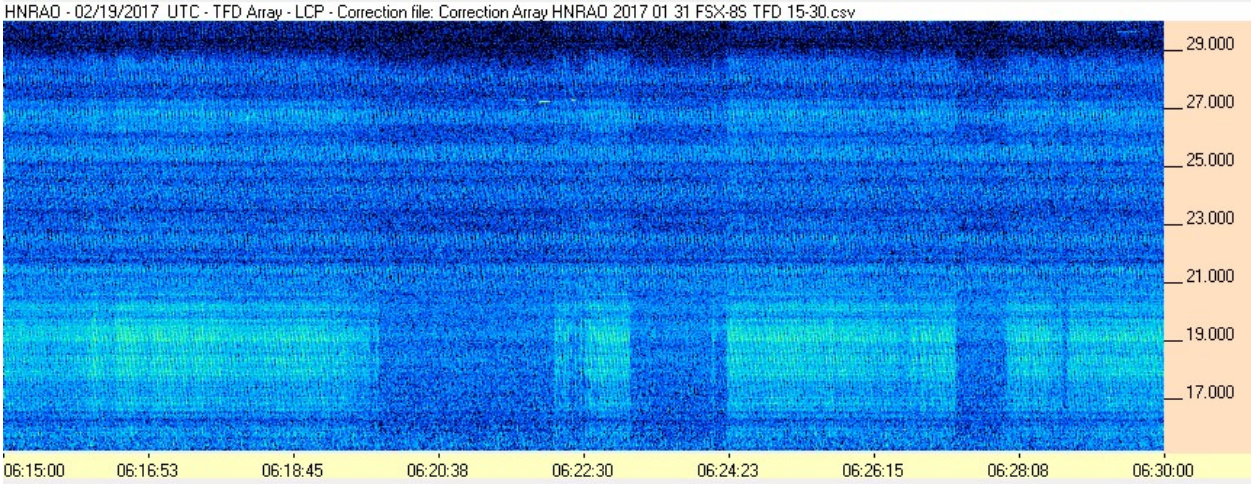

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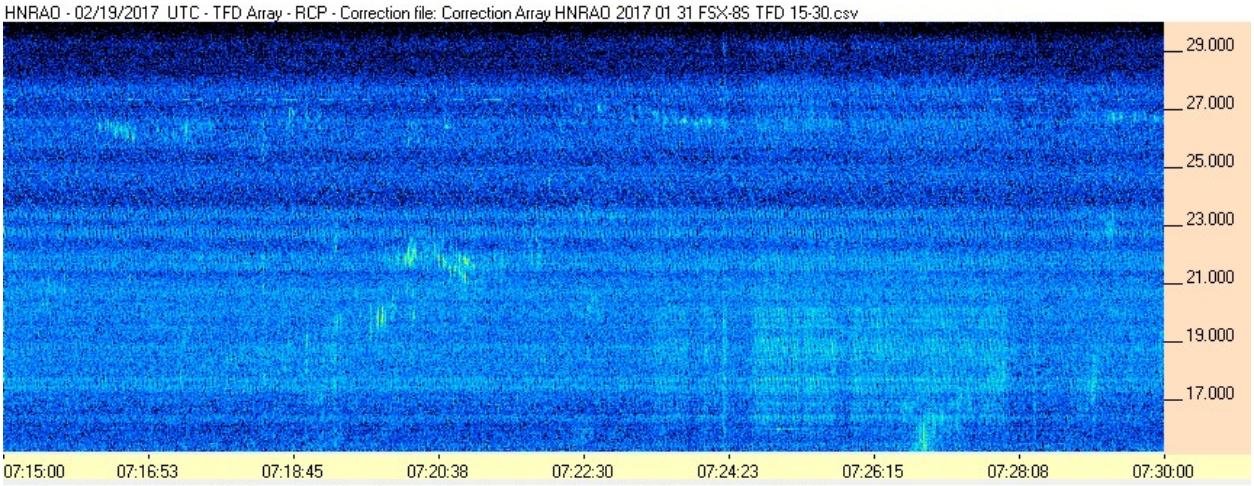

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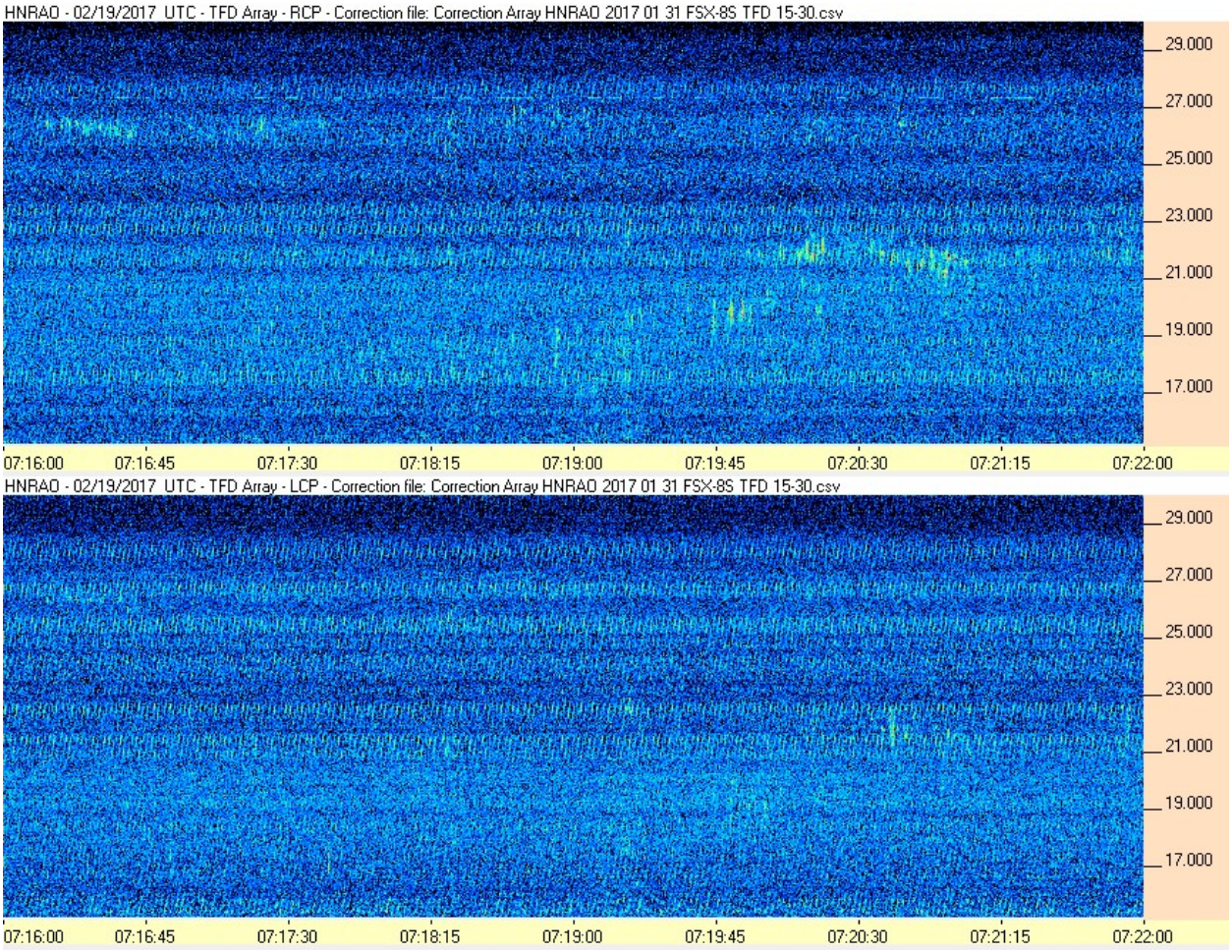

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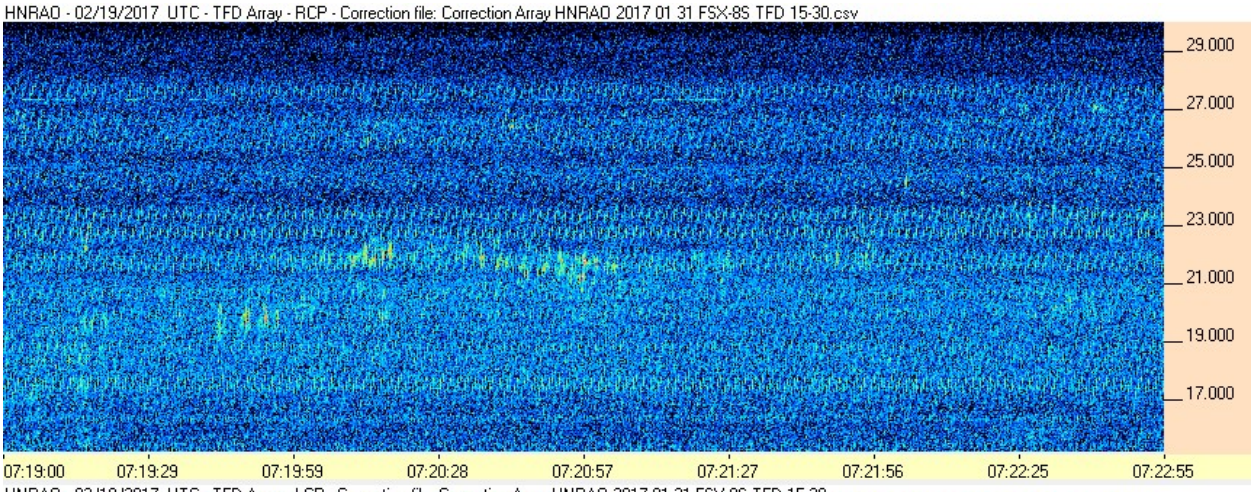

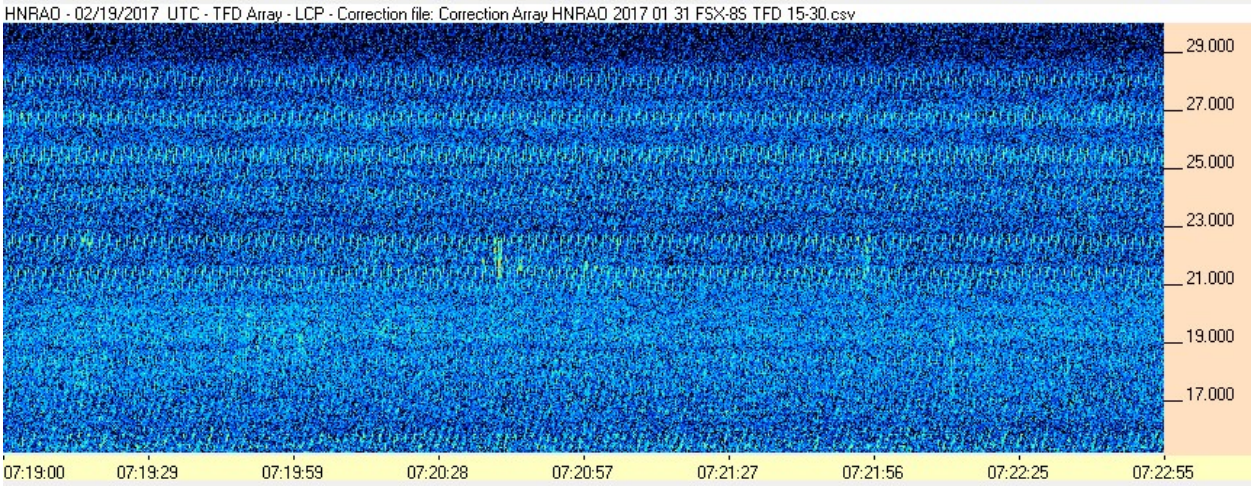

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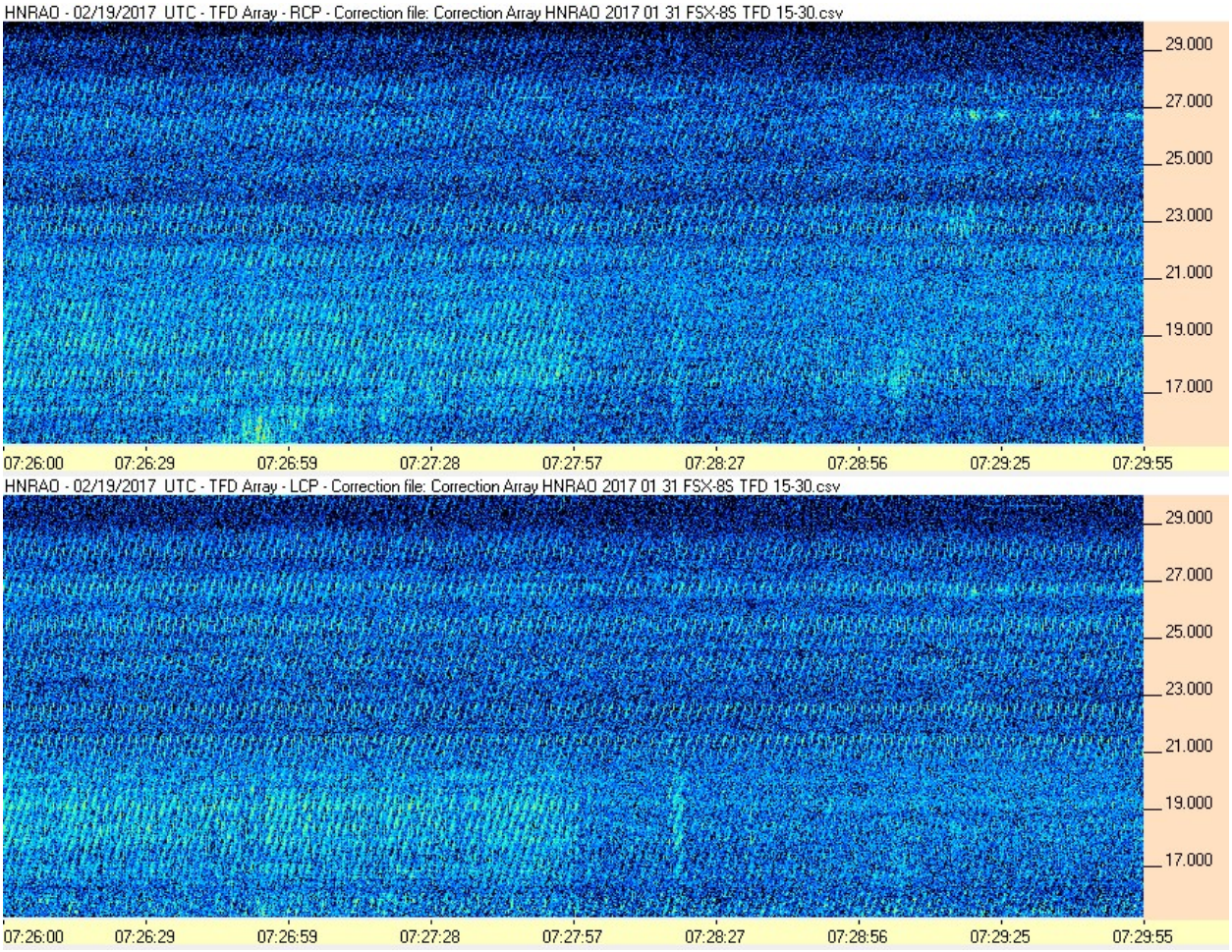

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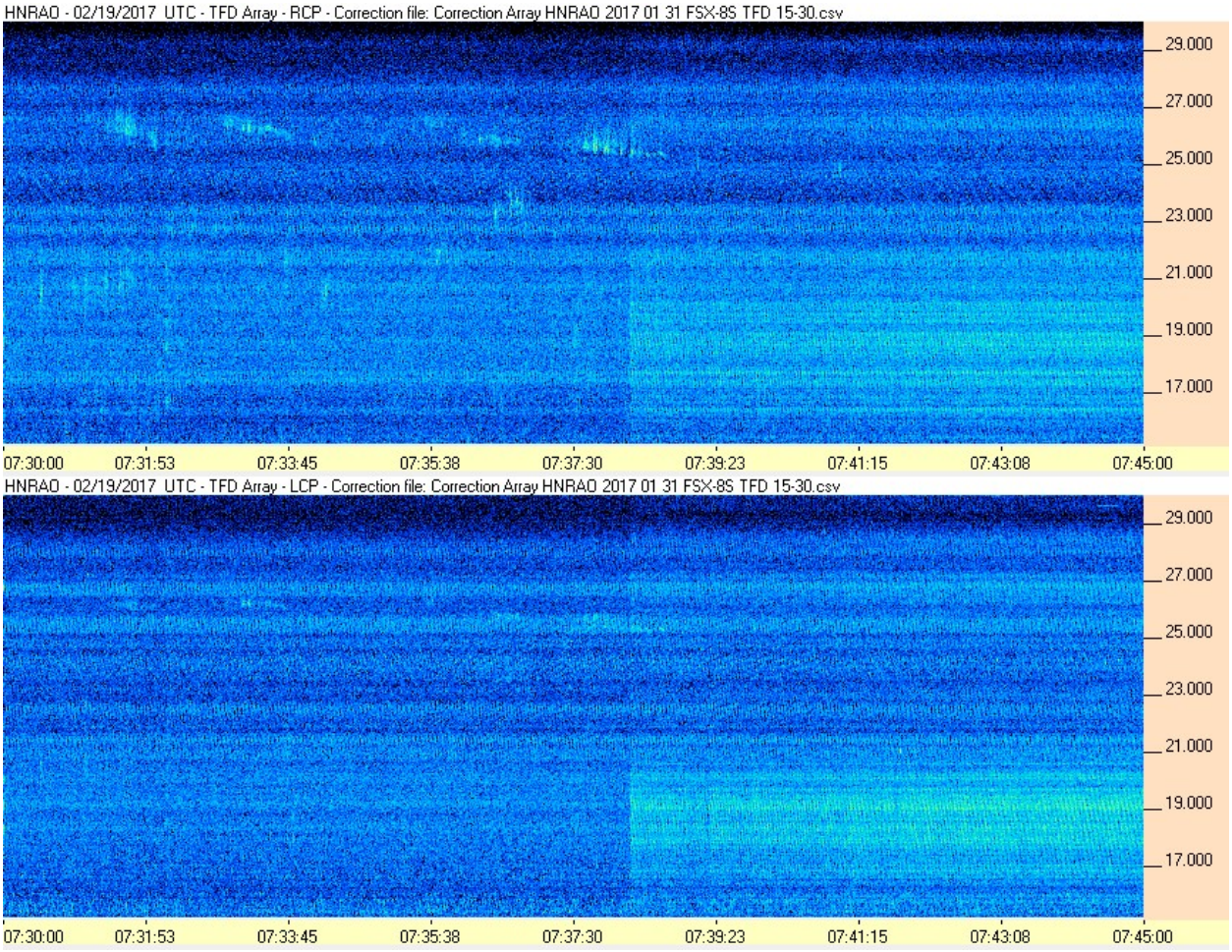

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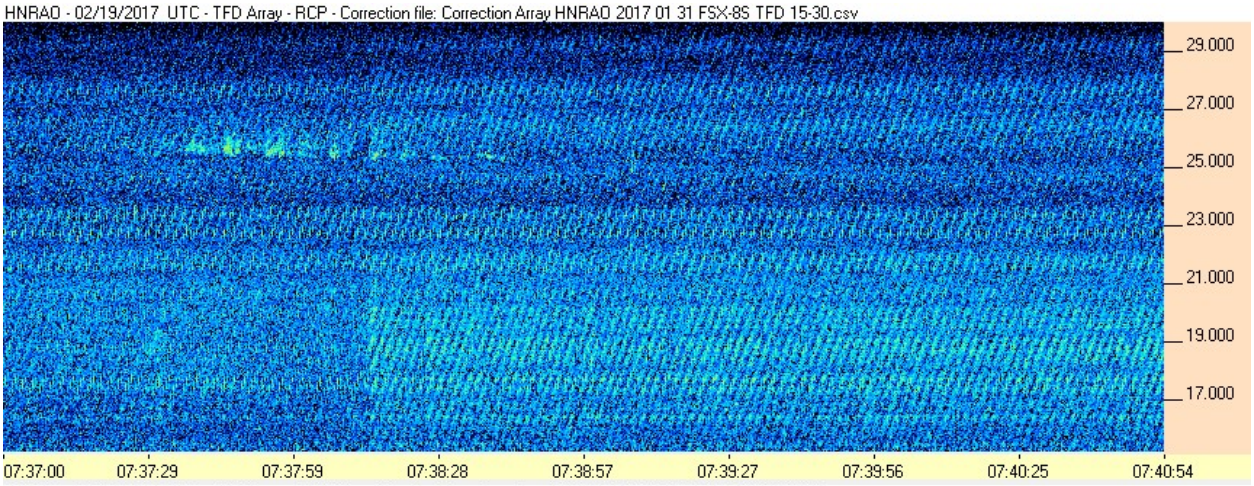

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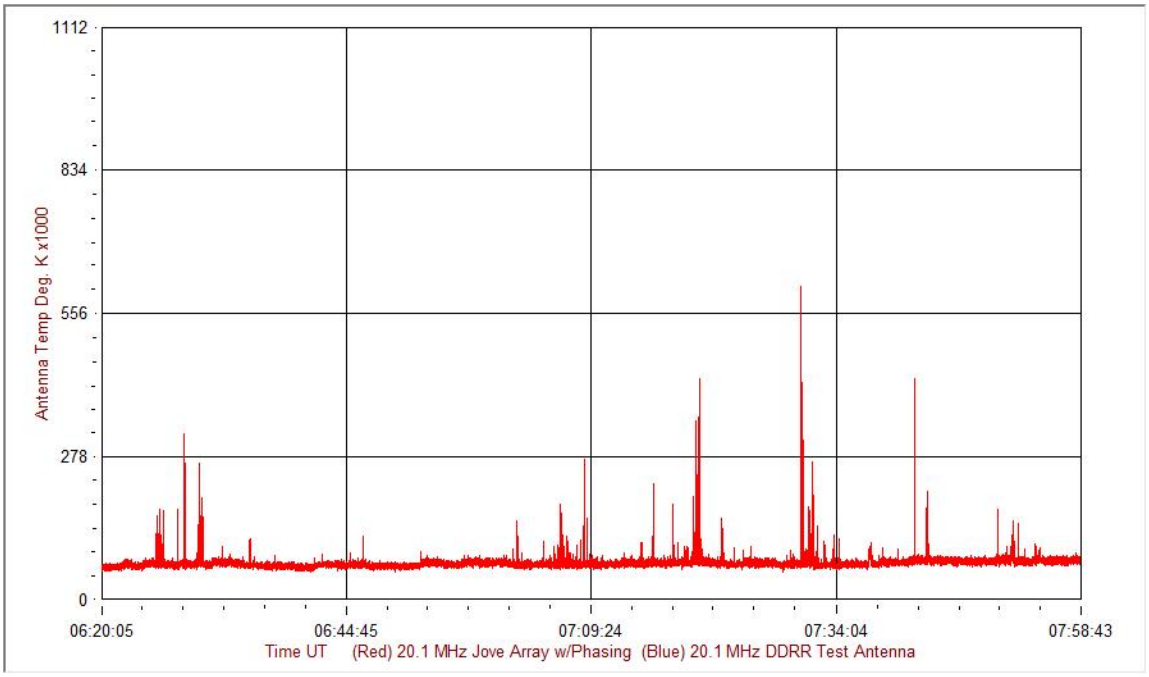
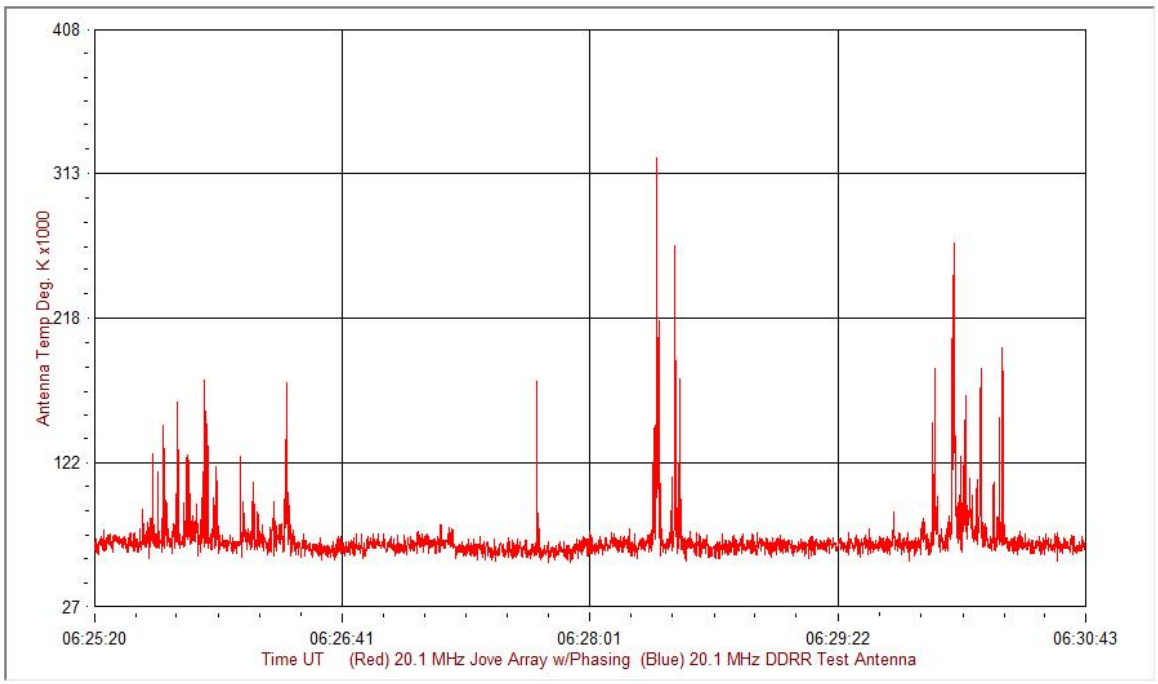
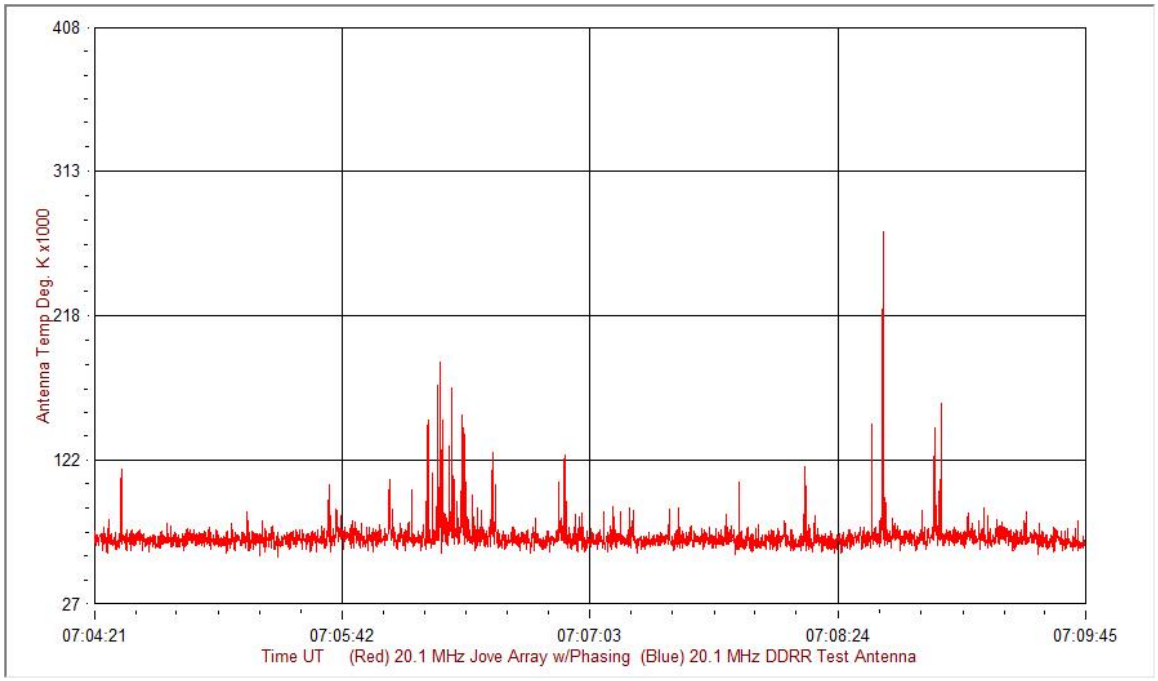
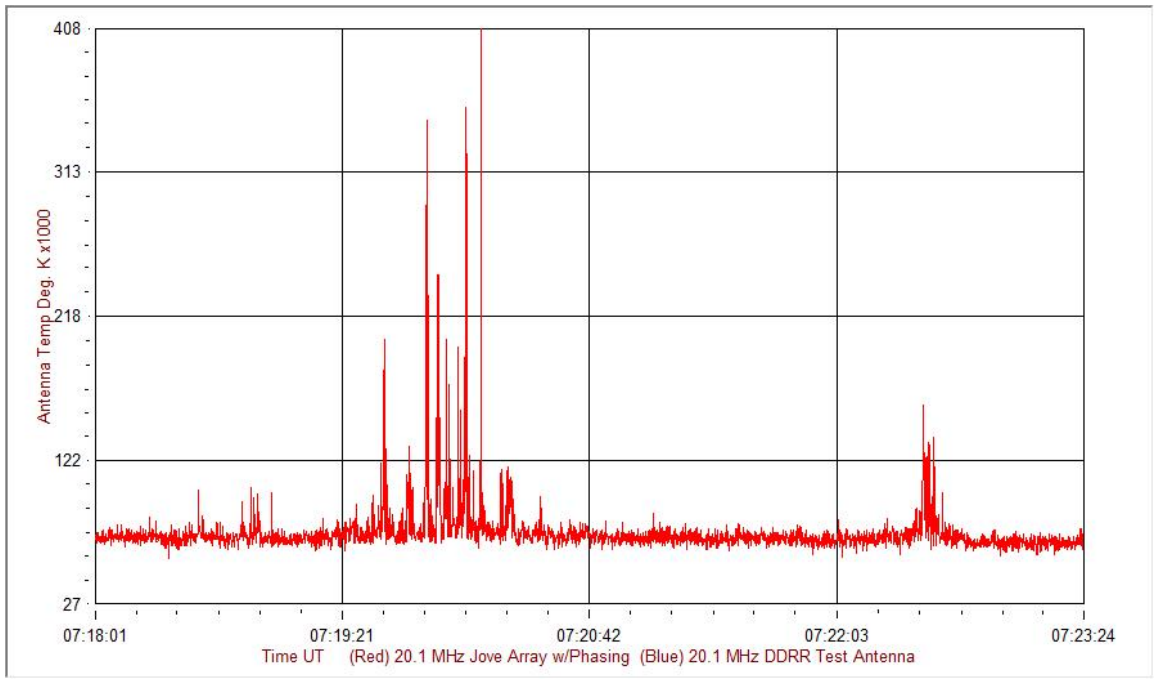
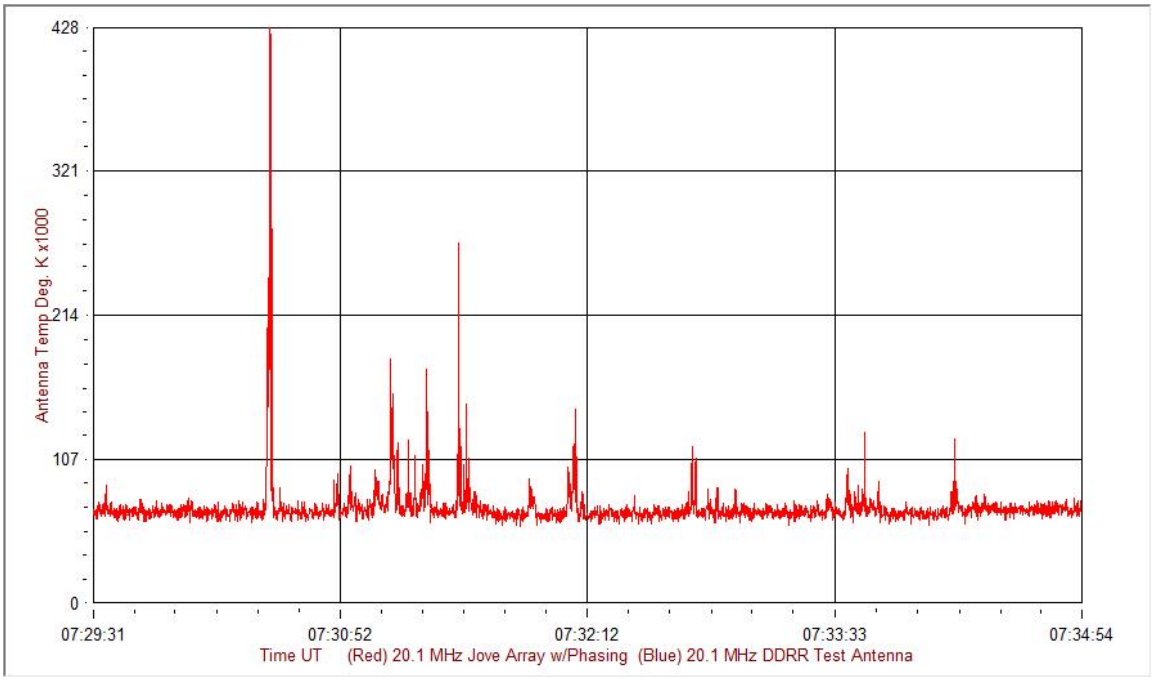
SkyPipe/JOVE Dipoles

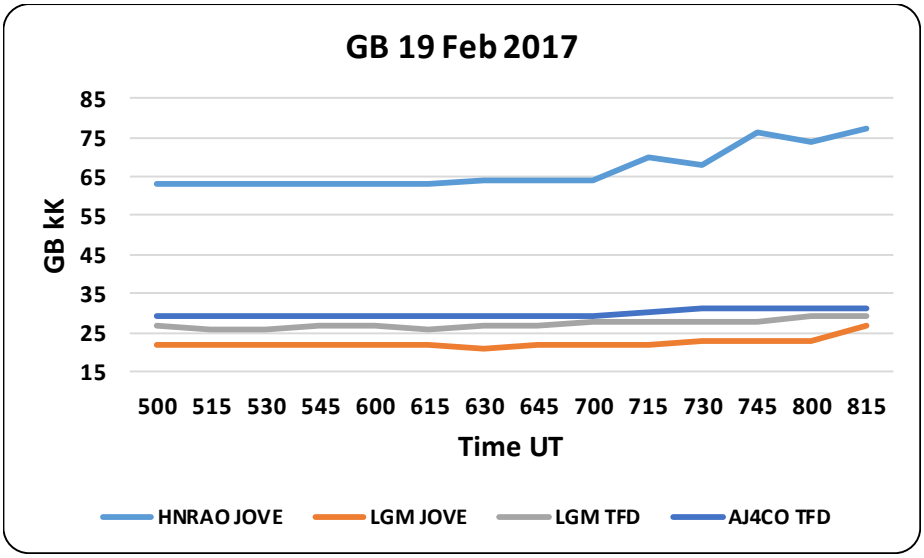




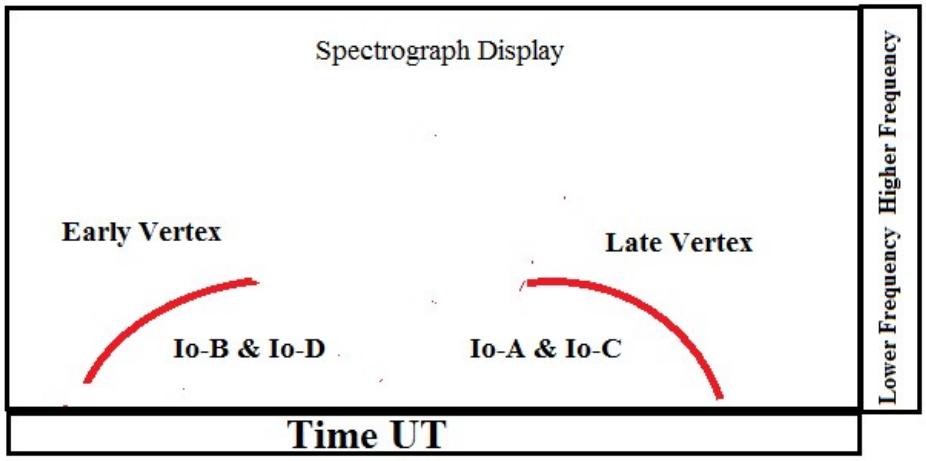

408
313
218
122
27
Antenna Temp Deg. K x1000
07:04:21
07:05:42
07:07:03
07:08:24
07:09:45
Time UT (Red) 20.1 MHz Jove Array w/Phasing (Blue) 20.1 MHz DDRR Test Antenna


408
313
218
122
27
Antenna Temp Deg. K x1000
07:18:01
07:19:21
07:20:42
07:22:03
07:23:24
Time UT (Red) 20.1 MHz Jove Array w/Phasing (Blue) 20.1 MHz DDRR Test Antenna





Galactic Background During Observation Session
HNRAO abnormally high due to power line RFI



Io-A & Io-B - Northern hemisphere of Jupiter
Io-C & Io-D - Southern hemiphere of Jupiter

For reference:

"Modeling of Io-Jupiter decameter arcs, emission beaming and energy source", S. Hess, B. Cecconi and P Zarka.