HNRAO Observing Log
40.673181 N – 80.437885 W
EN90sq

Date: 10 January 2017

Object: Io-A / Io-C

Observer: JB - 0625 UT-0800 UT / Unattended - 0800 UT – 1025 UT

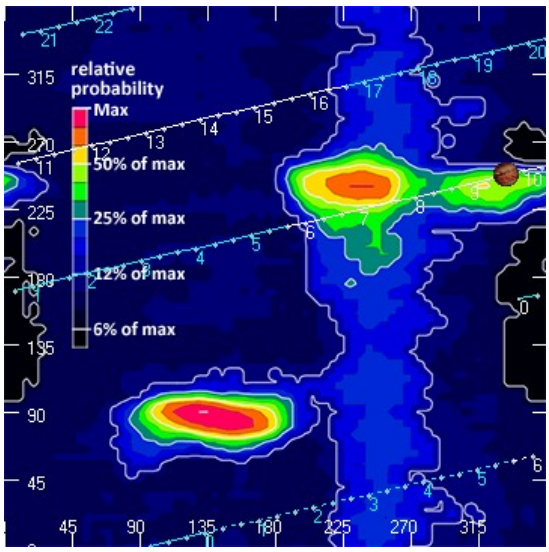
Start of pass:	**0941 UT**		
Jupiter Altitude:	**36.7 degrees**	**Jupiter Azimuth:**	**147.8 degrees**
Jupiter CML:	**333.62**	**Jupiter Io Phase:**	**247.82**
Jupiter RA:	**13:22**	**Jupiter Dec:**	**-07:12**
Sun Altitude:	**-32.9 degrees**	**Sun Azimuth:**	**092.1 degrees**
Sun RA:	**19:20**	**Sun Dec:**	**-22:10**

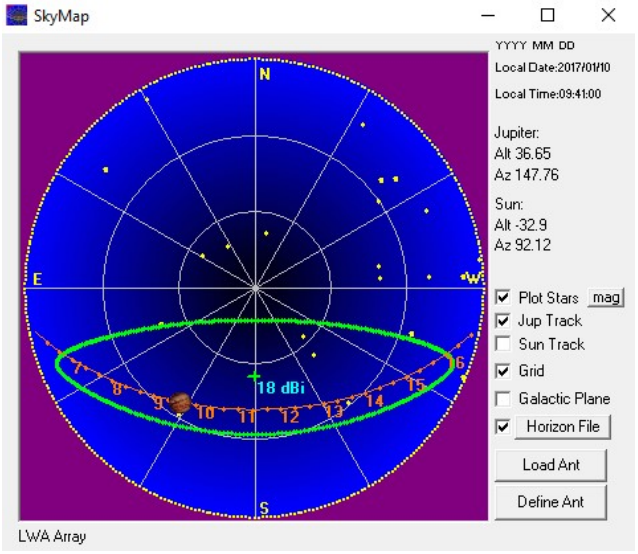
End of pass:	**1025 UT**		
Jupiter Altitude:	**40.3 degrees**	**Jupiter Azimuth:**	**161.0 degrees**
Jupiter CML:	**.22**	**Jupiter Io Phase**	**254.08**
Sun Altitude:	**-24.6 degrees**	**Sun Azimuth:**	**098.6 degrees**

Observations made using:

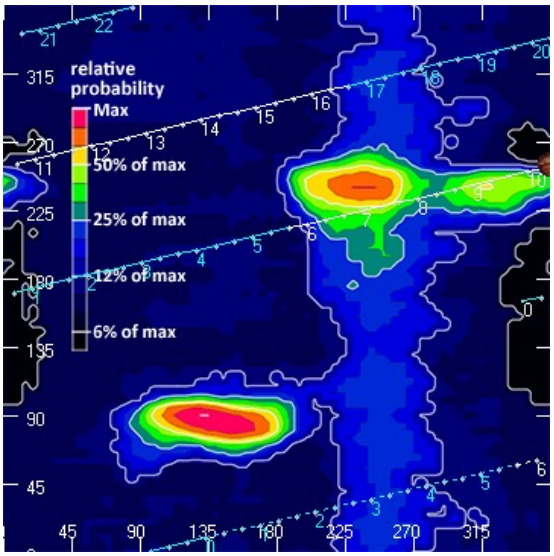
1. FSX-8S fed by the TFD array
    a. Connect to array through HNRAO Multicoupler #1 and #2, port 2
        i. HNRAO Multicoupler #1 – TFD/LCP
        ii. HNRAO Multicoupler #2 – TFD/RCP
        iii. Port 1 having 10 dB of gain, all other ports on Multicoupler have approximately 3 dB gain.
2. FSX-2 fed by the LWA array directly
    a. LWA element configuration – 90 degrees
3. JOVE 2 receiver fed by phased JOVE dipoles @ 10’ – phased for 2016-17 season
    a. Calibrated 28 Nov. 2016
    b. Connected to dipoles through HNRAO Multicoupler #3, port 1.
4. Icom R75 receiver fed by experimental DDRR antenna directly.
    a. Calibrated 28 Nov. 2016

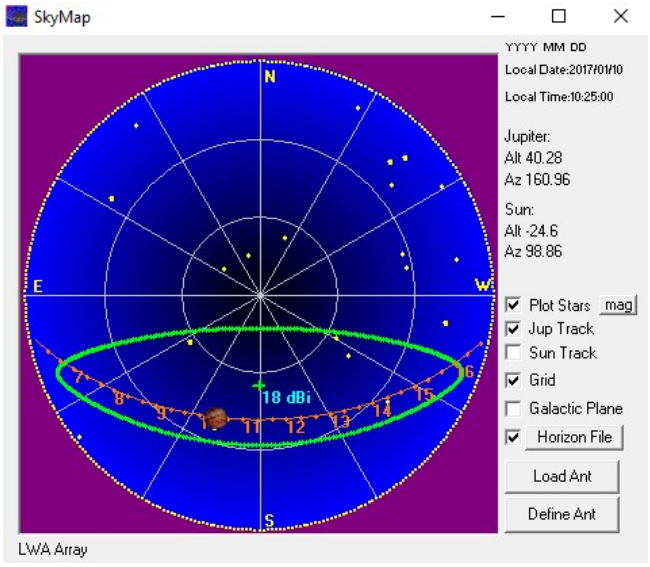
HNRAO Observing Log
40.673181 N – 80.437885 W
EN90sq





Beginning of Pass





End of Pass

HNRAO Observing Log
40.673181 N – 80.437885 W
EN90sq

There was no Io-A activity observed here, but there was LCP Io-C activity during that portion of the pass. First sign of emissions began at 0941 UT with one strong burst at 21 MHz. There is indications of of weak vertical L-bursts at approximately the same time from 21 to 24 MHz. The strong burst at 940 UT appears to be the beginning of an N-event composed of L-bursts or S-bursts. Since both are observed in this portion of the Io-C zone, resolution makes this determination difficult. However, the bandwidth and intensity of the bursts suggest S-bursts. The most evident of this is between 0950 UT and 0953 UT. Starting at about 1000 UT, activity began between 15-17 MHz. These appear to be S-bursts. The most intense activity was between 1021 UT and 1025 UT with several strong vertical L-bursts. Modulation lanes are evident in this period of the emisions. Emissions passed below 15 MHz at this point. This appeared to be the end of observable emissions from here. A comparison of the FSX-2/LWA array and the FSX-8S/TFD array is shown below. Emissions were all below the Radio JOVE frequency.

- Step calibration of JOVE2/dipoles 0545 UT
- Step calibration of FSX-8S @ 0556 UT
- Step calibration of FSX-2 @ 05559UT
    - Steps 94 kK, 188 kK, 375 kK, 747 kK, 1.5 MK, 3 MK, 6 MK, 12 MK, 24 MK, 47 MK
- Very quiet conditions
    - Only cable tv wavy lines on FSX-2. No line noise.
    - Mild line noise hash on FSX-8S
    - Very quiet trace on SkyPipe/Jove2 receiver.
- Outside temperature at observatory, 28 degrees F.
    - Cloudy
    - Under a freezing rain advisory in effect from 7 AM – 3 PM
    - If precipitation is heavy enough, precipitation static will affect observations.
- Closest lightning discharges from observatory are 1973 miles reported by Weather Bug.
- Solar activity was very low and no spots were present on the visible disk. No Earth-directed CMEs were observed in available coronagraph imagery.
- Unable to verify any spectrograph data. HNRAO is the only spectrograph showing up on the serving list.
- FSX-2 in RCP configuration. Will switch to LCP configuration in Io-C portion of pass.

HNRAO Observing Log
40.673181 N – 80.437885 W
EN90sq

1. **0625 UT**
    a. GB measurements
        i. HNRAO JOVE 26 kK
        ii. LGM JOVE 63 kK TFD 55 kK
        iii. AJ4CO JOVE 25 kK TFD 29 kK

2. **0633 UT**
    a. 08:33 LMST
    b. RJP Jupiter @ 35% probability

3. **0638 UT**
    a. Line noise on SkyPipe for 14 sec.
        i. Repeats at random intervals, but always approximately 14 seconds in duration

4. **0648 UT**
    a. 08:48 LMST
    b. RJP Jupiter @ 36% probability
        i. Altitude 11.42 degrees
        ii. Azimuth 110.02 degrees
    c. GB measurements
        i. HNRAO JOVE 26 kK
        ii. LGM JOVE 100 kK TFD 51 kK
        iii. AJ4CO JOVE 25 kK TFD 29 kK

5. **0700 UT**
    a. 09:00 LMST
    b. 2:00 AM Local
    c. RJP Jupiter @ 39% probability
    d. GB measurements
        i. HNRAO JOVE 26 kK
        ii. LGM JOVE 57 kK TFD 50 kK
        iii. AJ4CO JOVE 23 kK TFD 29 kK

6. **0715 UT**
    a. 09:15 LMST
    b. Jupiter
        i. Altitude 15.47 degrees
        ii. Azimuth 114.36 degrees

iii. RJP 41% probability

c. GB Measurements

i.	HNRAO JOVE	26 kK		
ii.	LGM JOVE	57 kK	TFD	49 kK
iii.	AJ4CO JOVE	24 kK	TFD	29 kK

7. 0730 UT

a. 09:30 LMST
b. 2:30 AM Local
c. RJP Jupiter 45% probability
   i. Altitude 18.21 degrees
   ii. Azimuth 117.18 degrees
d. GB measurements

i.	HNRAO JOVE	26 kK		
ii.	LGM JOVE	62 kK	TFD	53 kK
iii.	AJ4CO JOVE	24 kK	TFD	29 kK

8. 0745 UT

a. 09:45 LMST
b. 02:45 AM Local
c. All spectrographs now on list.
d. RJP Jupiter 39% probability
   i. Altitude 20.38 degrees
   ii. Azimuth 119.72 degrees
e. GB measurements

i.	HNRAO JOVE	26 kK		
ii.	LGM JOVE	106 kK	TFD	53 kK
iii.	AJ4CO JOVE	23 kK	TFD	28 kK

9. 0800 UT

a. 10:00 LMST
b. 3:00 AM local
c. RJP Jupiter 34% probability
   i. Altitude 22.5 degrees
   ii. Azimuth 122.34 degrees
d. GB measurements

i.	HNRAO JOVE	26 kK		
ii.	LGM JOVE	60 kK	TFD	52 kK
iii.	AJ4CO JOVE	23 kK	TFD	28 kK

e. No Io-A emissions observed.
f. Observations unattended at this point

g. Switching FSX-2 to LCP configuration for Io-C portion of pass

10. 0941 UT

a. LCP Io-C emissions begin.
   i. First sign of emissions began at 0941 UT with one strong burst at 21 MHz. There is indications of of weak vertical L-bursts at approximitely the same time from 21 to 24 MHz.
   ii. The strong burst at 940 UT appears to be the beginning of an N-event composed of L-bursts or S-bursts.

11. 0950 UT

a. Stronger N-event sequence between 0950 UT and 0953 UT.

12. 1000 UT

a. Activity began between 15-17 MHz.
   i. These appear to be S-bursts.

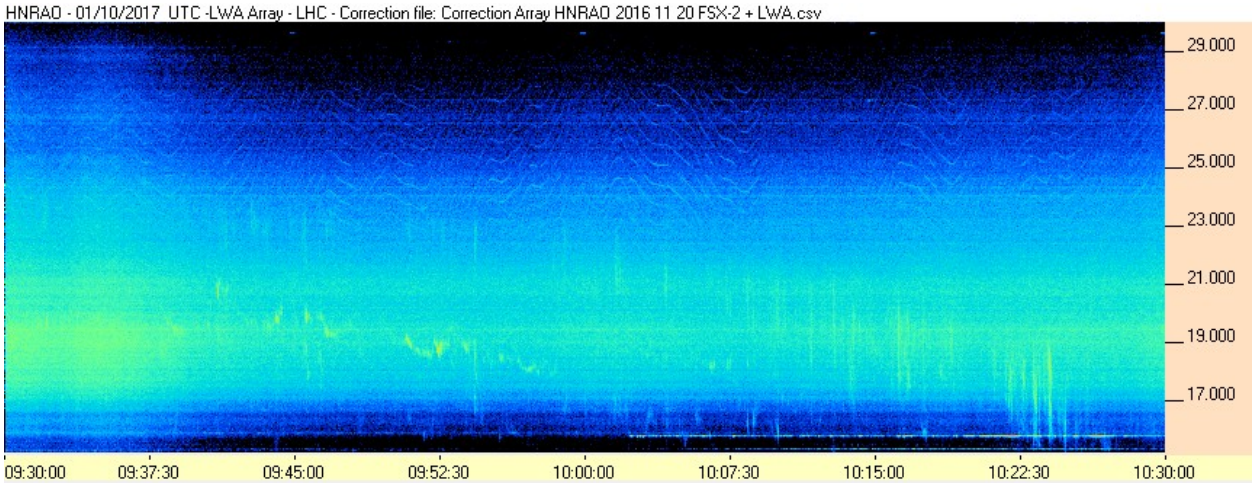
13. 1021 UT

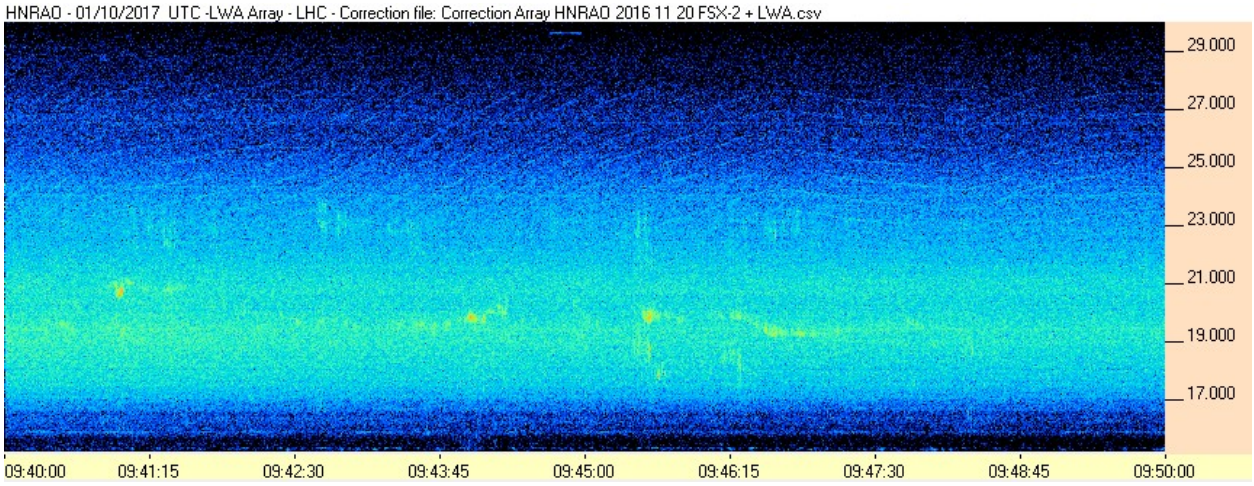
a. The most intense activity was between 1021 UT and 1025 UT with several strong vertical L-bursts.
b. Modulation lanes are evident in this period of the emisions. Emissons passed below 15 MHz at this point.

14. 1025 UT

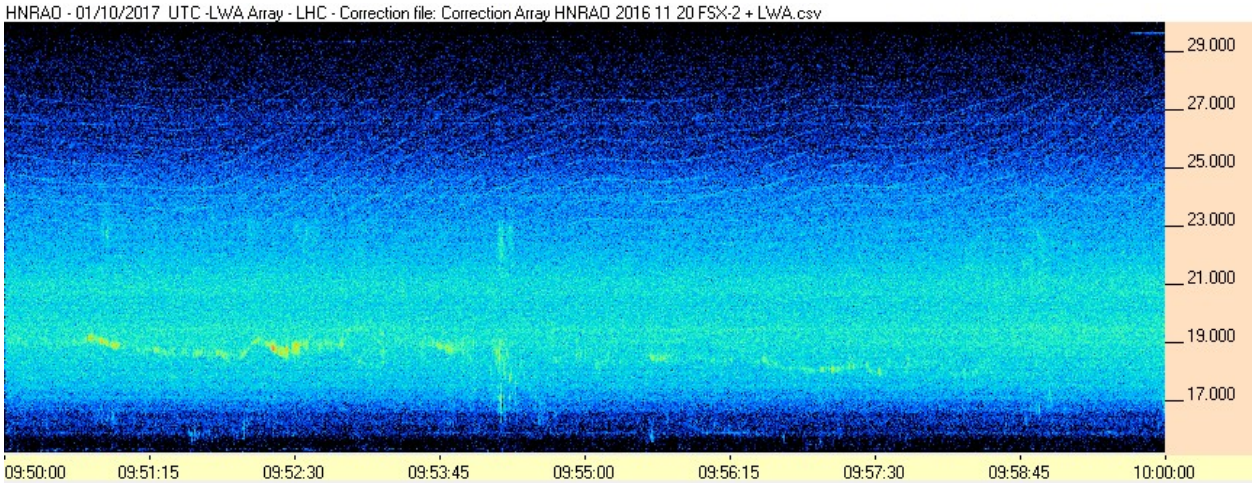
a. This appeared to be the end of observable emissions from here.

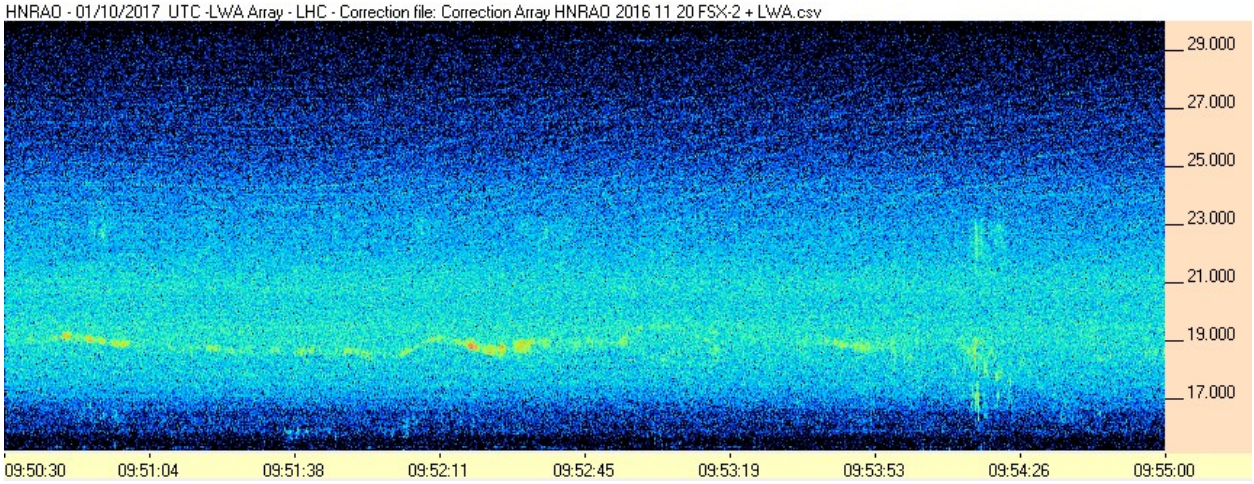
FSX-2

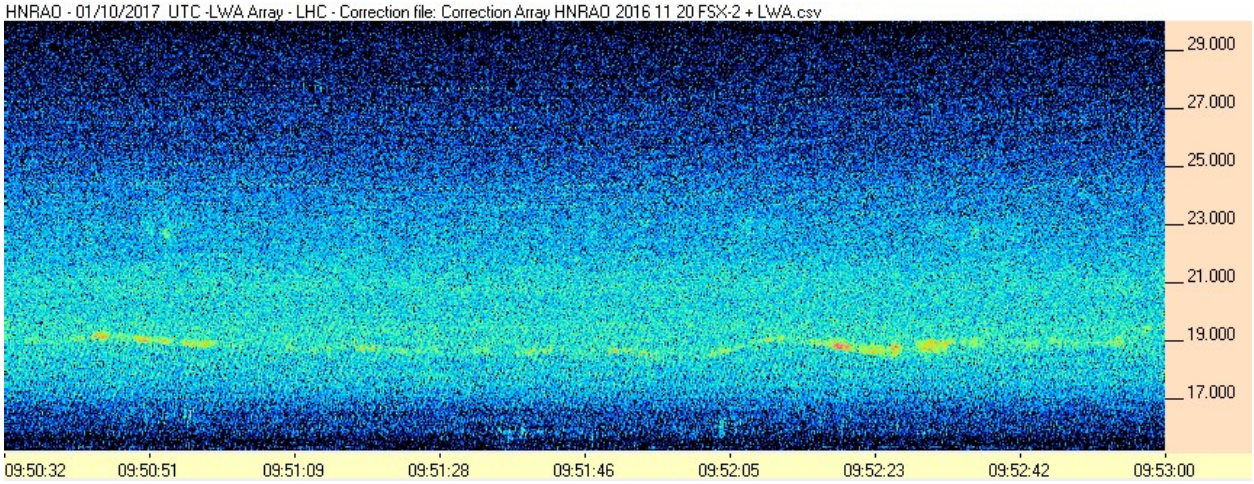

HNRAO - 01/10/2017 UTC -LWA Array - LHC - Correction file: Correction Array HNRAO 2016 11 20 FSX-2 + LWA.csv
29.000
27.000
25.000
23.000
21.000
19.000
17.000
09:30:00
09:37:30
09:45:00
09:52:30
10:00:00
10:07:30
10:15:00
10:22:30
10:30:00


HNRAO - 01/10/2017 UTC -LWA Array - LHC - Correction file: Correction Array HNRAO 2016 11 20 FSX-2 + LWA.csv
29.000
27.000
25.000
23.000
21.000
19.000
17.000
09:40:00
09:41:15
09:42:30
09:43:45
09:45:00
09:46:15
09:47:30
09:48:45
09:50:00

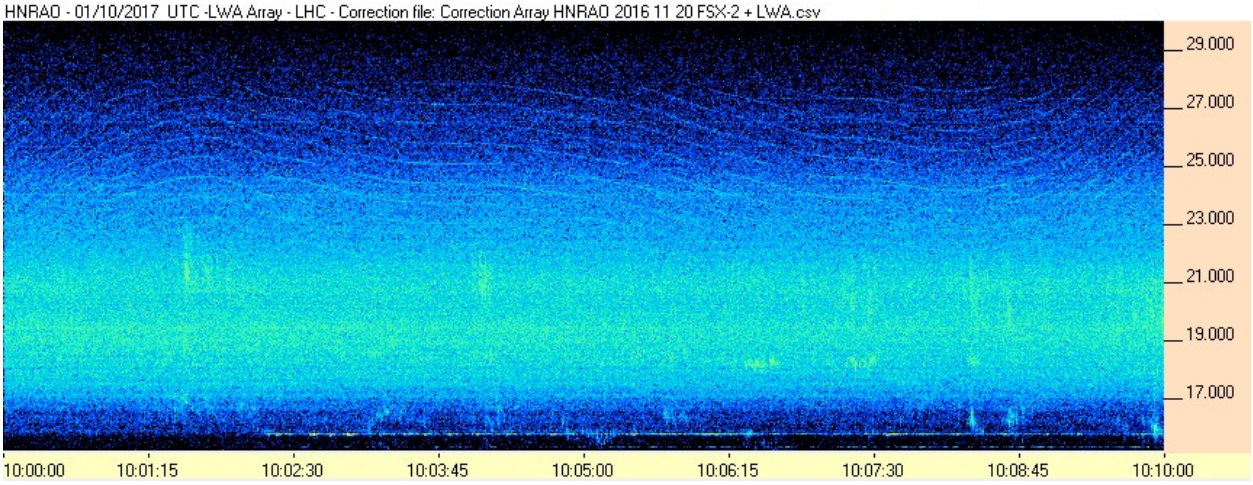
HNRAO Observing Log
40.673181 N – 80.437885 W
EN90sq

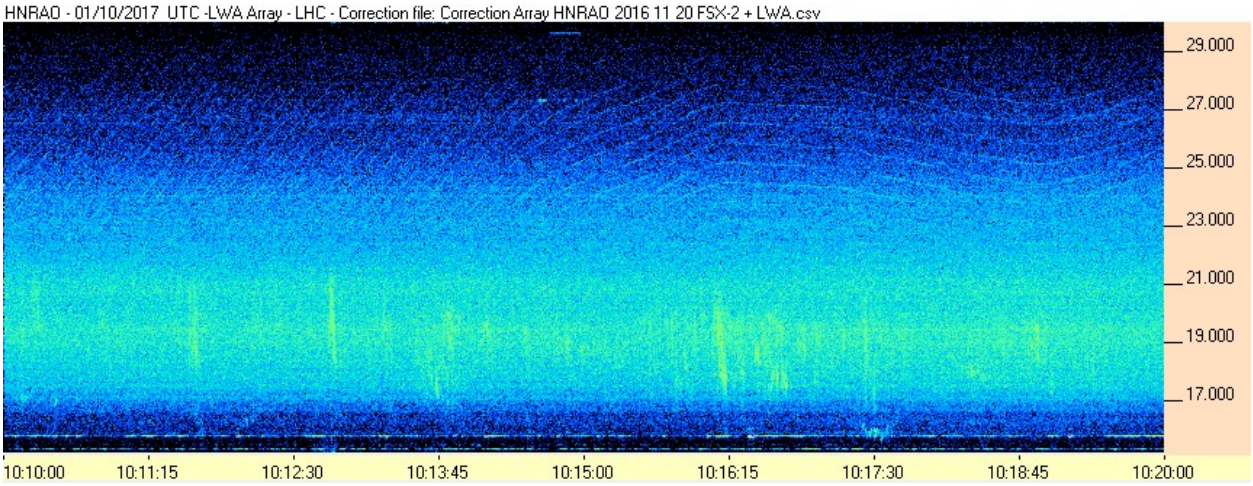




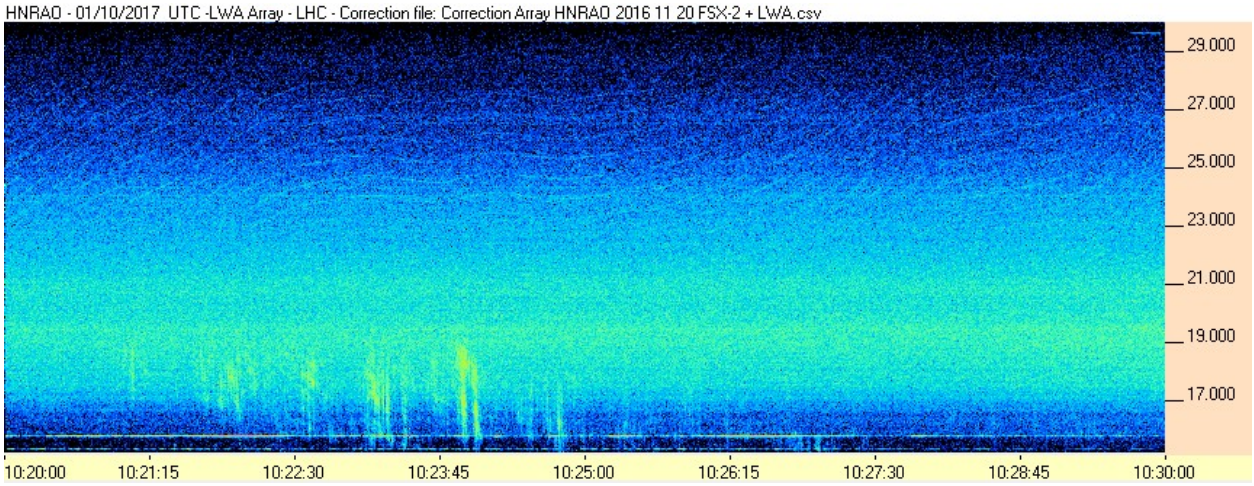


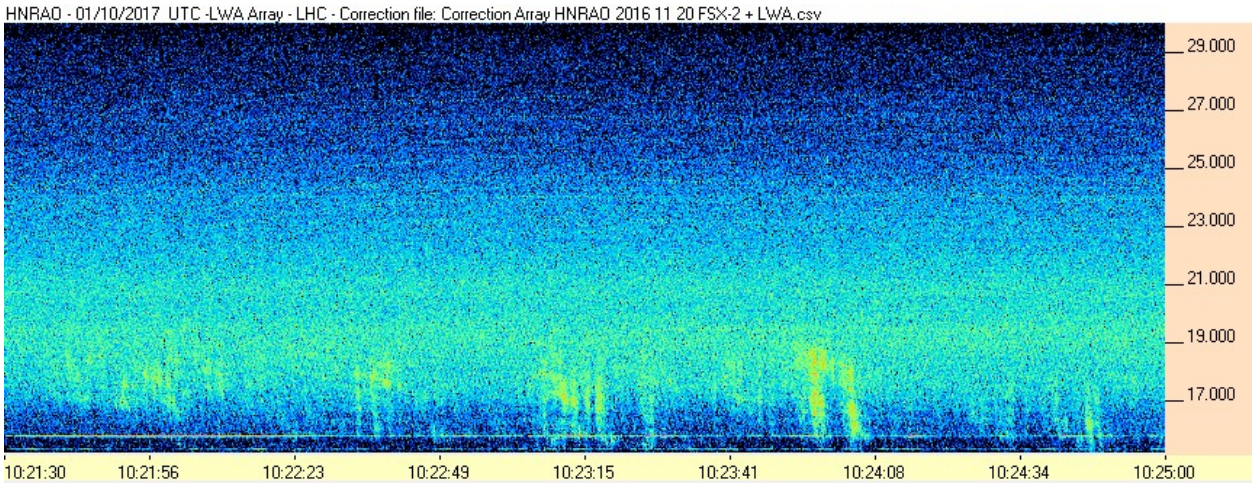
HNRAO Observing Log
40.673181 N – 80.437885 W
EN90sq





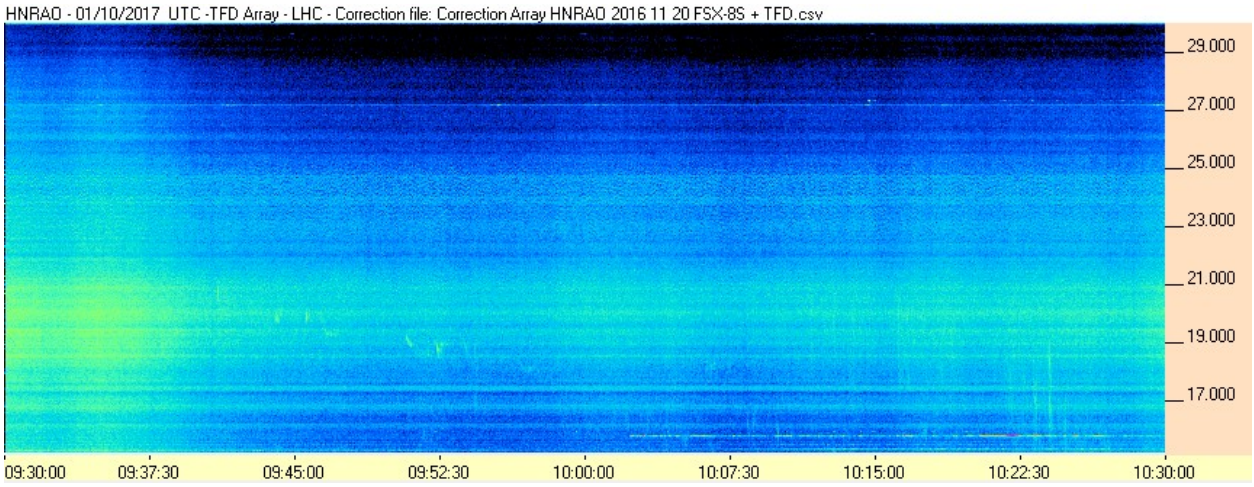
HNRAO Observing Log
40.673181 N – 80.437885 W
EN90sq

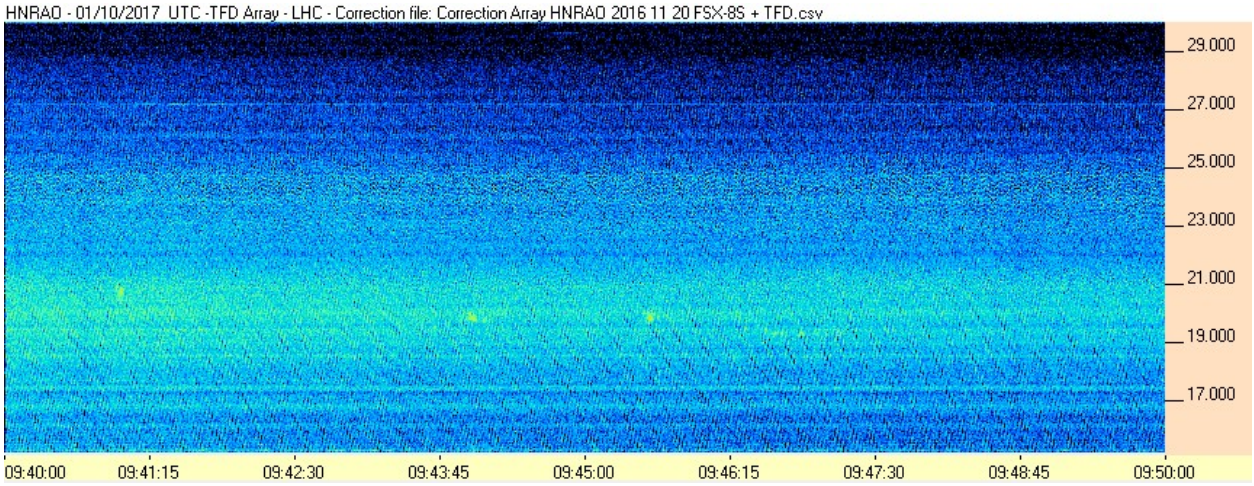




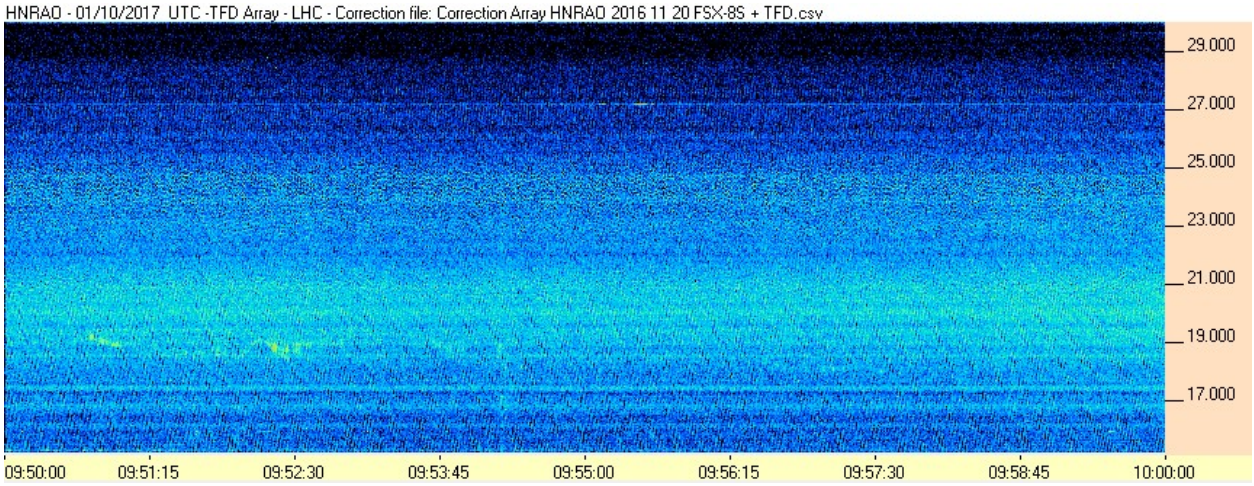
HNRAO Observing Log
40.673181 N – 80.437885 W
EN90sq

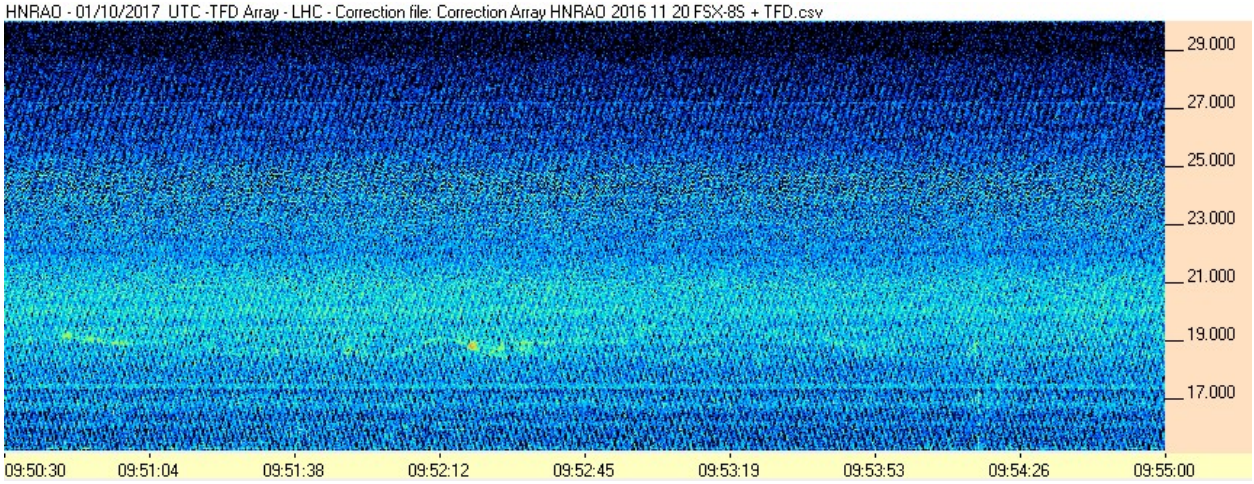
FSX-8S



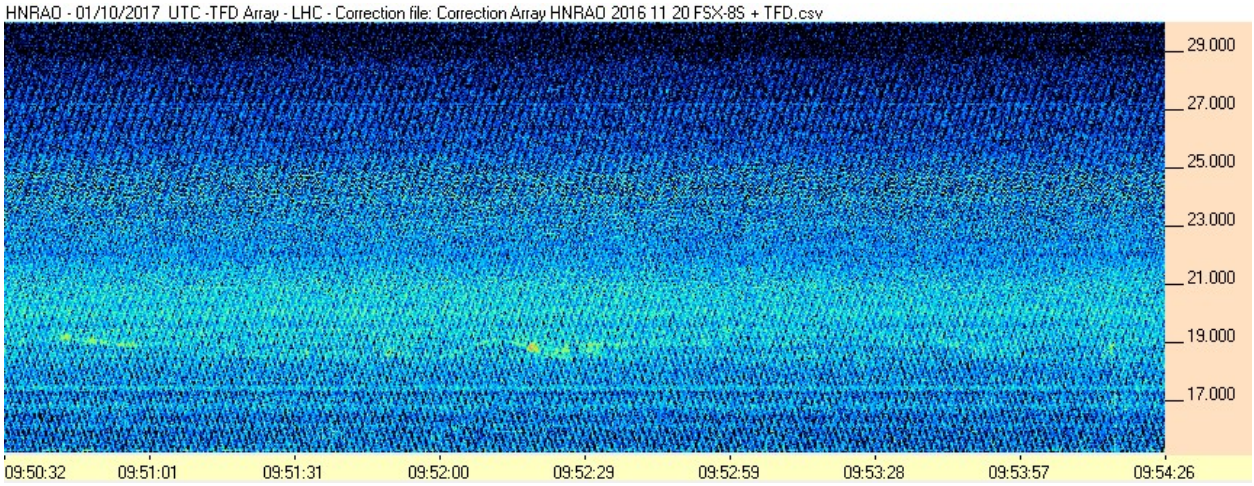


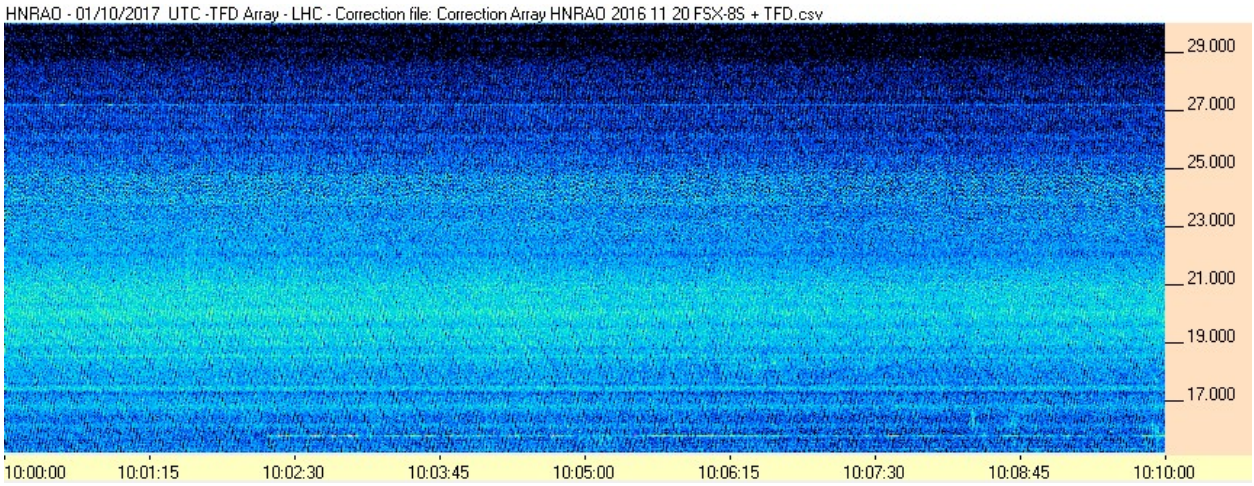
HNRAO Observing Log
40.673181 N – 80.437885 W
EN90sq



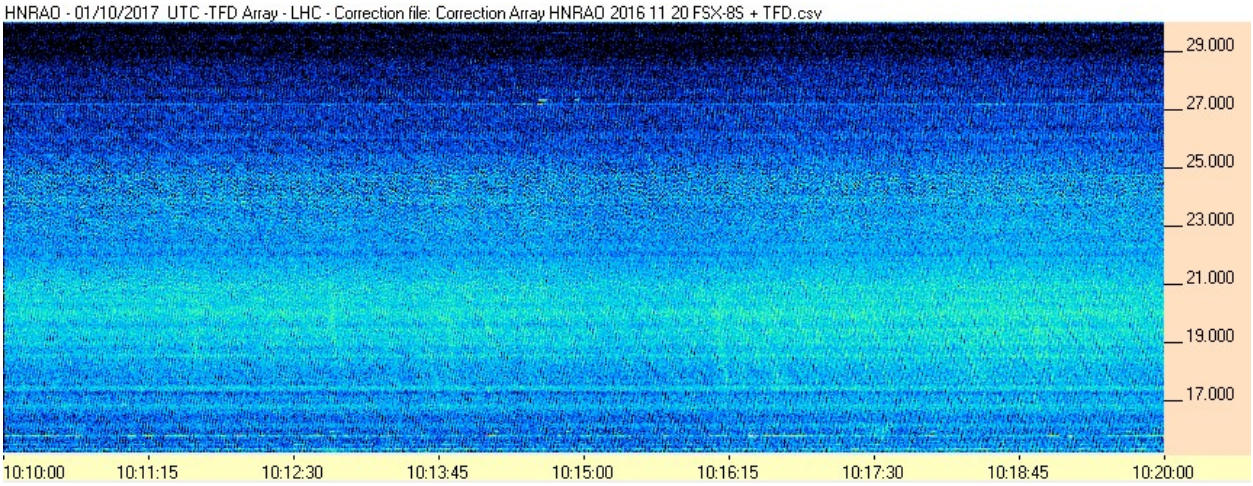


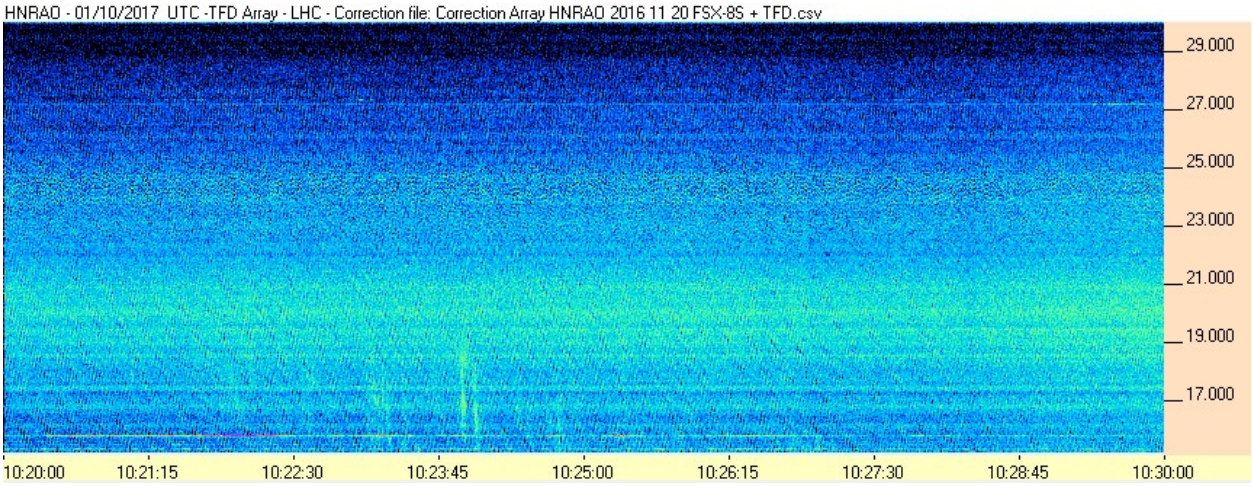
HNRAO Observing Log
40.673181 N – 80.437885 W
EN90sq



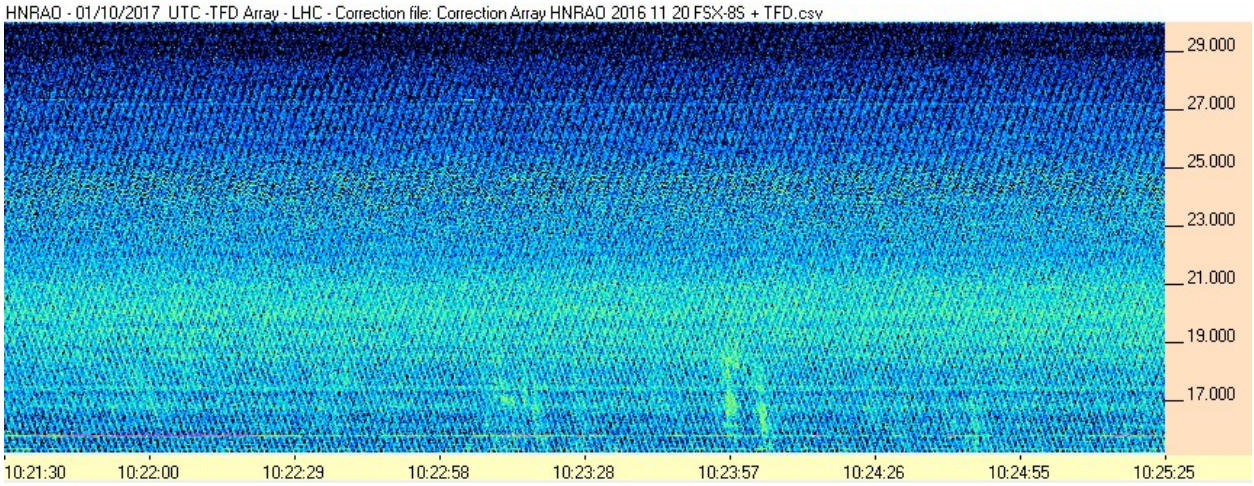


HNRAO Observing Log
40.673181 N – 80.437885 W
EN90sq





HNRAO Observing Log
40.673181 N – 80.437885 W
EN90sq



	Galactic Background Measurments kK				
Time	HNRAO JOVE	LGM JOVE	LGM TFD	AJ4CO JOVE	AJ4CO TFD
0635 UT	26	63	55	25	29
0648 UT	26	100	51	25	29
0700 UT	26	57	50	23	29
0715 UT	26	57	49	24	29
0730 UT	26	62	53	24	28
0745 UT	26	106	53	23	28
0800 UT	26	60	52	23	28