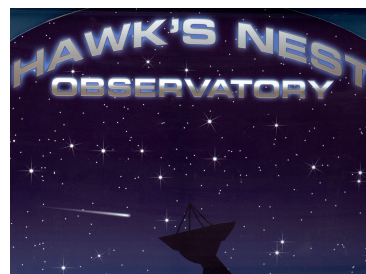


**HNRAO Observing Log**  
**40.673181 N – 80.437885 W**  
**EN90sq**



**Date: January 24, 2019**

**Object: Jupiter – Io-B**

**Observer: Unattended**

|                                |               |                               |               |
|--------------------------------|---------------|-------------------------------|---------------|
| <b>Start - Time UT:</b>        | <b>1425</b>   | <b>Planetary K-index:</b>     |               |
| <b>Jupiter Altitude (deg):</b> | <b>27.1</b>   | <b>Jupiter Azimuth (deg):</b> | <b>184.9</b>  |
| <b>Jupiter CML:</b>            | <b>126.84</b> | <b>Jupiter Io Phase:</b>      | <b>069.16</b> |
| <b>Jupiter RA (hr/min):</b>    | <b>16:59</b>  | <b>Jupiter Dec (hr/min):</b>  | <b>-22:05</b> |
| <b>Hour Angle (hr/min):</b>    | <b>00:19</b>  | <b>Polarization</b>           | <b>RCP</b>    |
| <b>Sun Altitude (deg):</b>     | <b>16.5</b>   | <b>Sun Azimuth (deg):</b>     | <b>135.8</b>  |
| <b>Sun RA (hr/min):</b>        | <b>20:18</b>  | <b>Sun Dec (hr/min):</b>      | <b>-19:38</b> |

|                                |               |                               |               |
|--------------------------------|---------------|-------------------------------|---------------|
| <b>End – Time UT:</b>          | <b>1453</b>   | <b>De:</b>                    | <b>-2.8</b>   |
| <b>Jupiter Altitude (deg):</b> | <b>26.3</b>   | <b>Jupiter Azimuth (deg):</b> | <b>192.1</b>  |
| <b>Jupiter CML:</b>            | <b>143.76</b> | <b>Jupiter Io Phase</b>       | <b>073.15</b> |
| <b>Hour Angle (hr/min):</b>    | <b>00:47</b>  | <b>Duration (min):</b>        | <b>28</b>     |
| <b>Sun Altitude (deg):</b>     | <b>20.0</b>   | <b>Sun Azimuth (deg):</b>     | <b>141.7</b>  |
| <b>Max Frequency MHz</b>       | <b>24</b>     | <b>Min Frequency MHz</b>      | <b>20</b>     |

### Observatory Configuration

| Spectrograph Receiver | Antenna       | Polarization             | System Loss          | Multicoupler     | Multicoupler port            | Calibrated                 |
|-----------------------|---------------|--------------------------|----------------------|------------------|------------------------------|----------------------------|
| FSX-8S                | TFD           | RCP<br>LCP               | -8.35 dB<br>-7.59 dB | #2 RCP<br>#1 LCP | Port 1 +10dB<br>Port 1 +10dB | Twice daily<br>Twice daily |
| FSX-2                 | LWA           | RCP/LCP<br>manual select |                      | N/A              | N/A                          | N/A                        |
| SDRPlay RSP2          | TFD           | RCP                      | -8.35 dB             | #2 RCP           | Port 2 +3dB                  | Twice daily                |
| SDRPlay RSP2          | TFD           | LCP                      | -7.59 dB             | #1 LCP           | Port 2 +3dB                  | Twice daily                |
| JOVE 1                | TFD           | RCP                      | -8.35 dB             | #2 RCP           | Port 3 +3 dB                 | 04/20/2018                 |
| JOVE 1                | TFD           | LCP                      | -7.59 dB             | #1 LCP           | Port 3 +3 dB                 | 04/20/2018                 |
| JOVE II               | Jove dipoles  | Linear                   | -3.66 dB             | #3 Linear        | Port 4 +3 dB                 | 08/21/2018                 |
| SDRPlay RSP1          | Experimental* |                          |                      |                  |                              |                            |
|                       |               |                          |                      |                  |                              |                            |

JOVE dipoles phased @ 32 degrees for 2017-2018 season

TFD array phased @ 35 degrees for 2017-2018 season

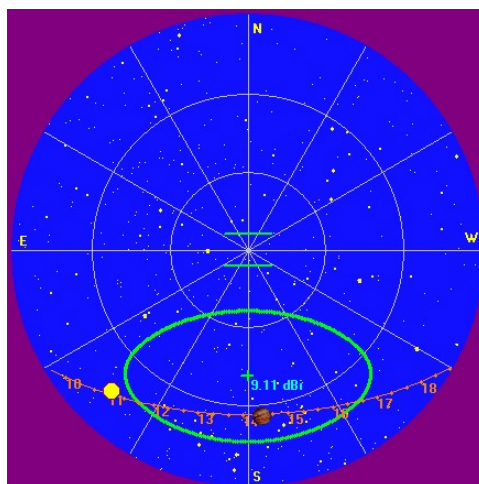
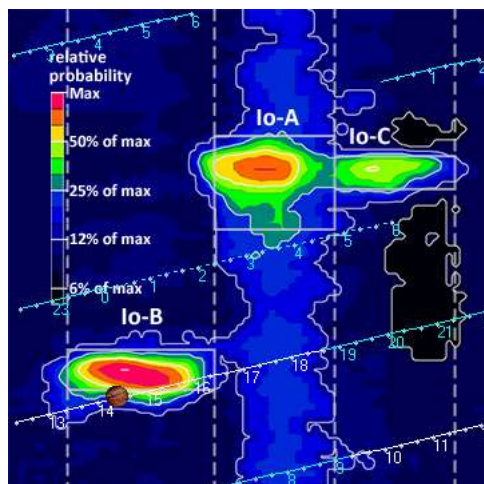
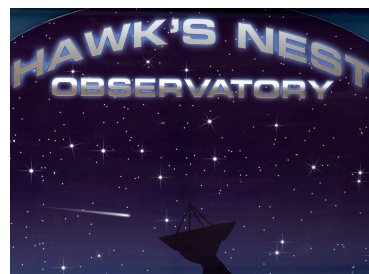
LWA antenna phased @ 35 degrees and orientation for observation: 45 degrees

\* Used for testing and evaluating antenna systems

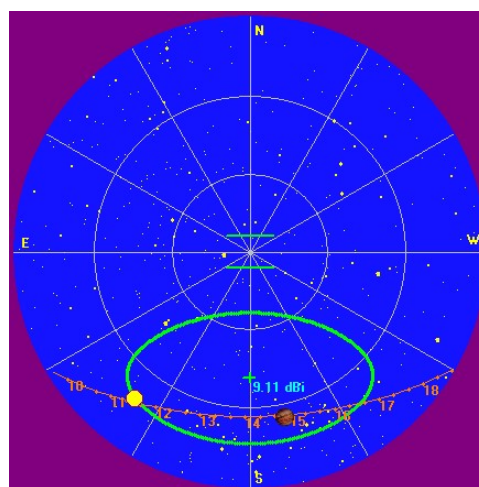
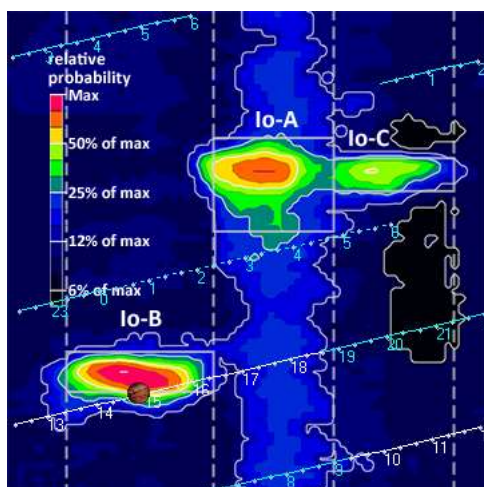
Software Radio Sky Spectrograph 2.8.50

Red = Offline

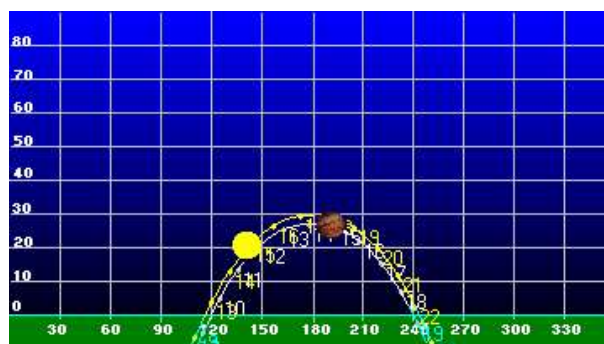
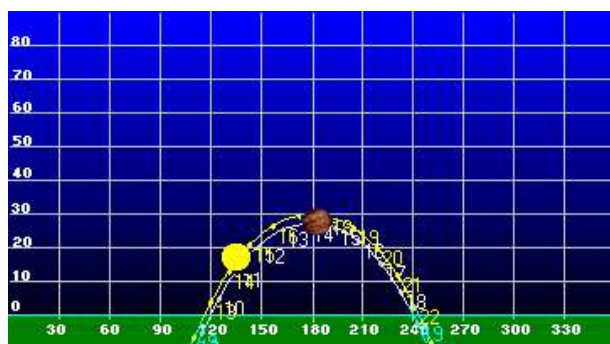
HNRAO Observing Log  
 40.673181 N – 80.437885 W  
 EN90sq



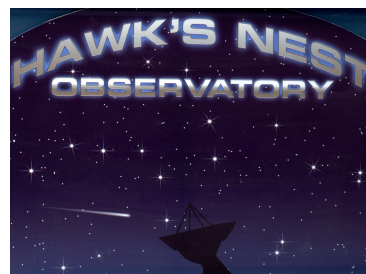
Beginning of Pass



End of Pass



**HNRAO Observing Log**  
**40.673181 N – 80.437885 W**  
**EN90sq**



| MODE     | CML RANGE   | Io RANGE  | MAX F | POLAR | ARC   | NOTES                       |
|----------|-------------|-----------|-------|-------|-------|-----------------------------|
| Io-D     | 0-200       | 95-130    | 18    | LH    | Early | Also called "fourth source" |
| Io-B     | (105 - 185) | (80-110)  | 39.5  | RH    | Early | Also called "early source"  |
| non Io-B | 80-200      | 0-360     | 38    | RH    | Early | Voyager info                |
| Io-A     | (200-270)   | (205-260) | 38    | RH    | Late  | Also called "main source"   |
| non-Io-A | (230-280)   | 0-360     | 38    | RH    | Late  |                             |
| Io-C     | (300-20)    | (225-260) | 36    | RH&LH | Late  | Also called "third source"  |
| non-Io-C | 300-360     | 0-360     | 32    | RH&LH | Late  | Voyager info                |

<https://www.radiosky.com/jupmodes.html>

| Modulation Lanes Designations*                                                                           |                     |
|----------------------------------------------------------------------------------------------------------|---------------------|
| L - Burst                                                                                                | S-Burst             |
| L1 – No lanes                                                                                            | S1 – No lanes       |
| L2 - Positive slope                                                                                      | S2 – Positive slope |
| L3 - Cross hatched                                                                                       | S3 – Cross hatched  |
| L4 – Negative slope                                                                                      | S4 – Negative slope |
| *Modulation Lanes in the Dynamic Spectra of Jovian L-bursts, J.J. Riihimaa, Astron. & Astrophys. 4, 1970 |                     |

**HNRAO Observing Log**  
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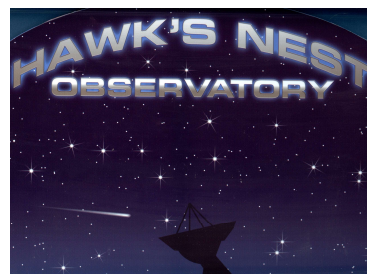
The beginning of the observation was affected by a snow storm at the observatory. These snow showers were intermittent throughout the observing period. Temperatures were below 30 degrees F.

An unremarkable Io-B storm with very little and weak emissions. First signs of emission were at 1426 UT @ 21 MHz. Emissions were so weak here it is difficult to tell if these were S-bursts or L-bursts. The next observed emission S-burst group began at 1431 UT at 24 MHz and it's clear that the emissions began above 24 MHz. This can not be confirmed with the equipment here as these emissions were too weak to be viewed with either FSX spectrographs. This group appeared to be about 1 MHz in width with negative drift to below 22 MHz. There was about a minute pause then the S-burst emissions resumed at 22.5 MHz with negative drift to about 21 MHz. This grouping was relatively stronger as compared to others in this storm. There was another pause in emissions from 1434 UT until 1435 UT when weak S-burst emissions resumed from 23 MHz to 21 MHz. There was a one-minute pause, then emissions began again at 1436 UT. This S-burst group centered around 22 MHz. This group lasted until 1436:35 UT. Another long pause before another weak group began at 1439 UT, centered at 22 MHz and ended at 1441 UT. The beginning of what might be called a short N-event started at 23 MHz at 1441:45 UT and began a slow negative drift. A relatively stronger grouping at 1443:45 UT demonstrated double band emissions at 22.5 MHz. This grouping ended at 21 MHz at 1446 UT. Emissions were then observed to have risen above 23 MHz through 1453 UT. No other emissions were observed at this location.

Emissions observed at this location were weak S-bursts. If there were any L-bursts, they were not apparent. Emissions were between above 24 MHz and 21 MHz.

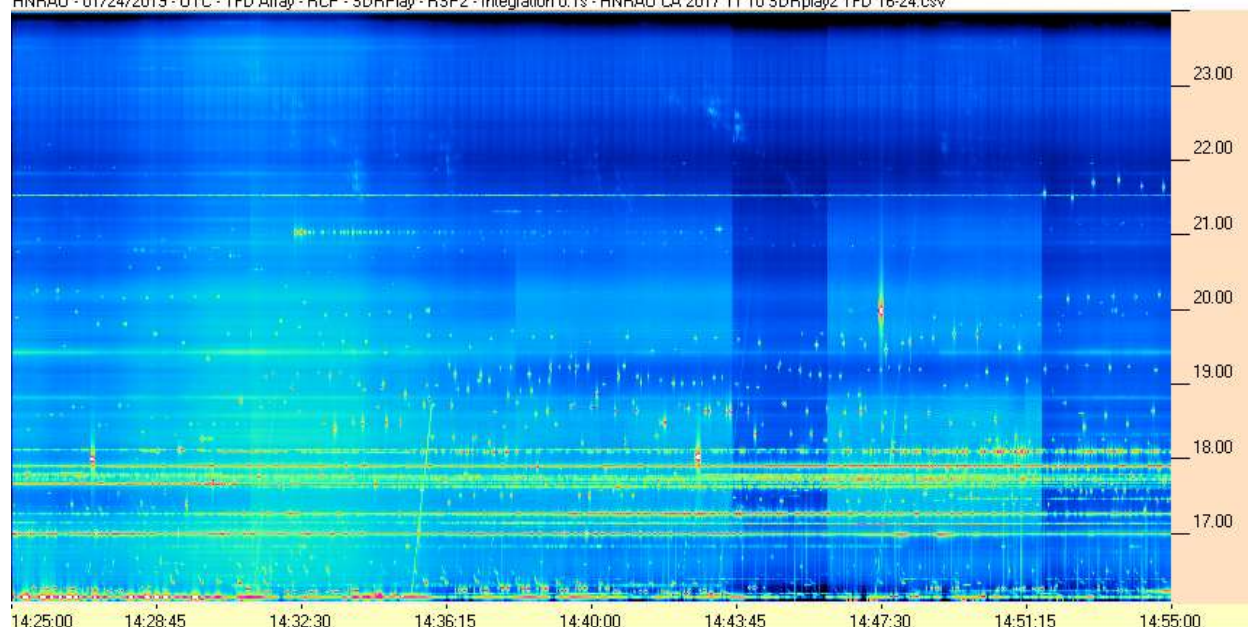
EOR

**HNRAO Observing Log**  
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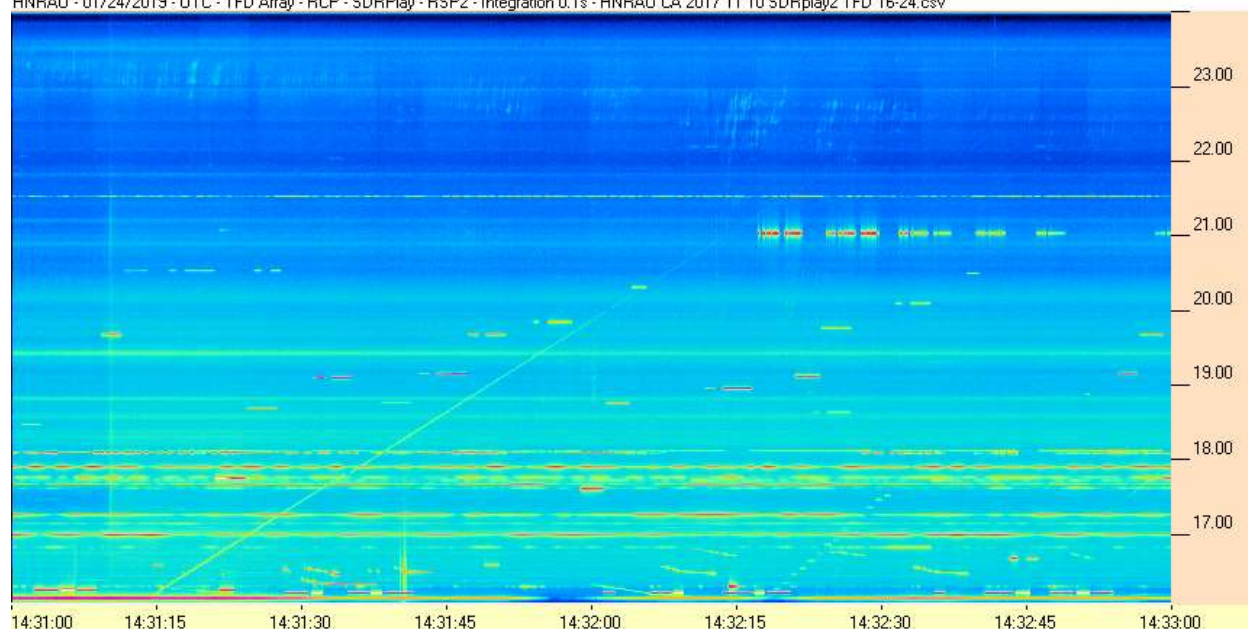


**SDRPlay RSP2/TFD Array**

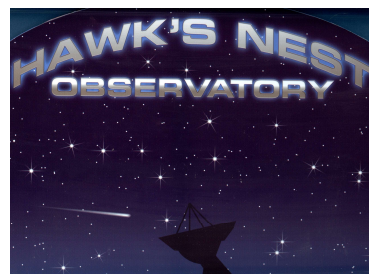
HNRAO - 01/24/2019 - UTC - TFD Array - RCP - SDRPlay - RSP2 - Integration 0.1s - HNRAO CA 2017 11 10 SDRplay2 TFD 16-24.csv



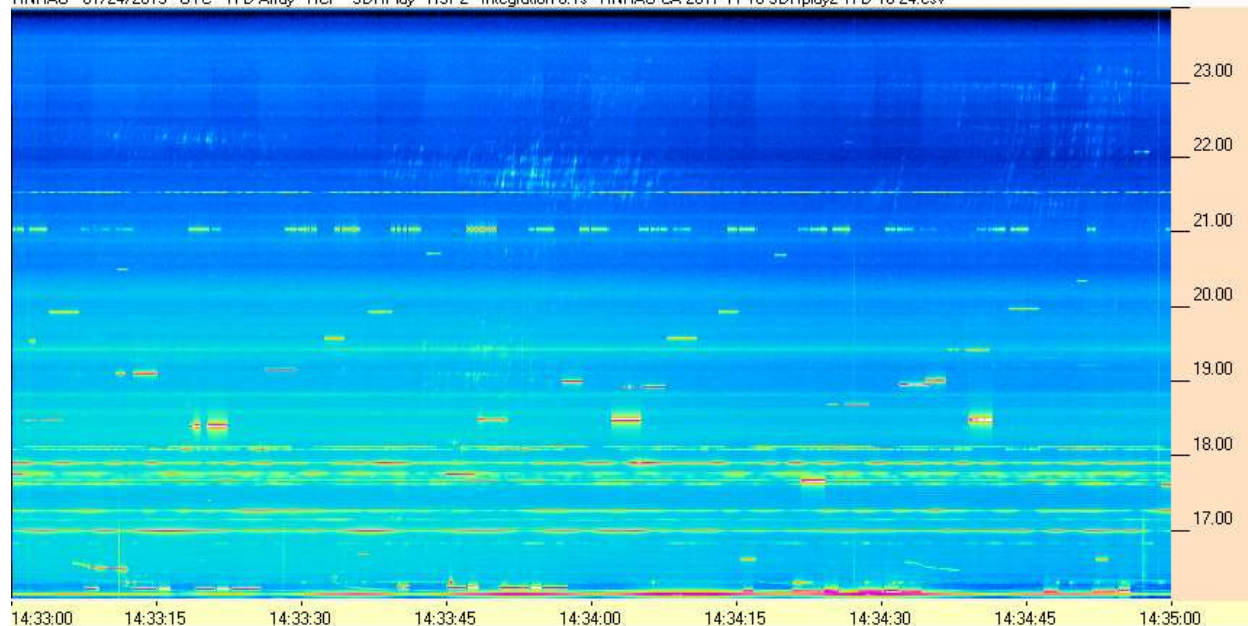
HNRAO - 01/24/2019 - UTC - TFD Array - RCP - SDRPlay - RSP2 - Integration 0.1s - HNRAO CA 2017 11 10 SDRplay2 TFD 16-24.csv



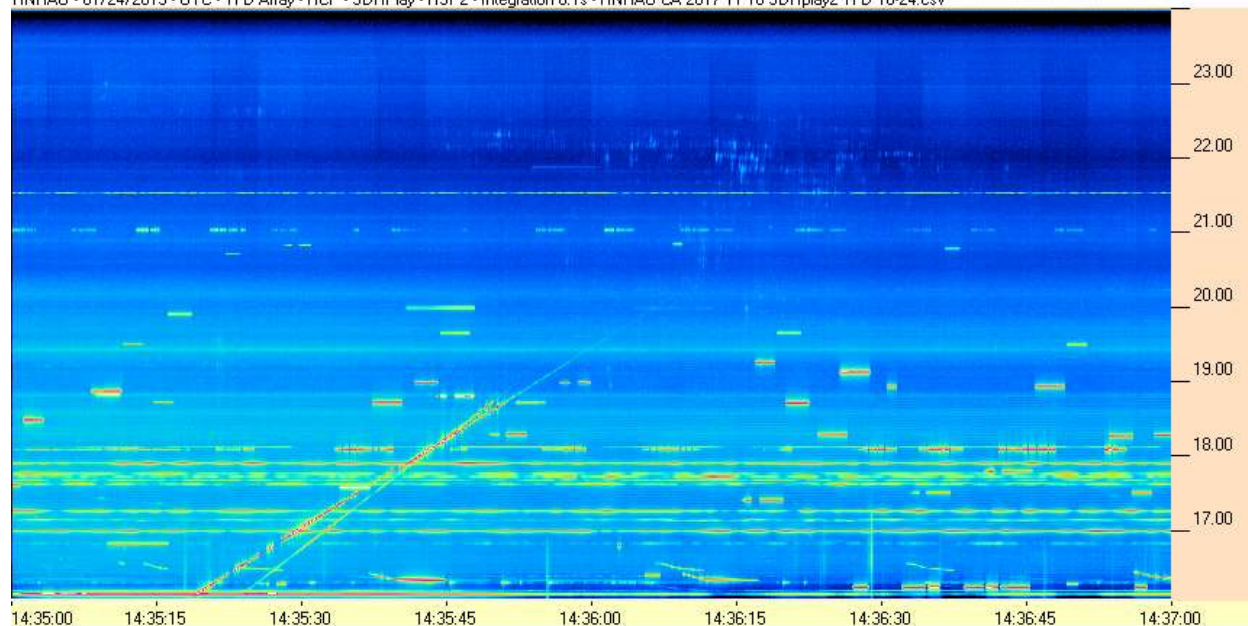
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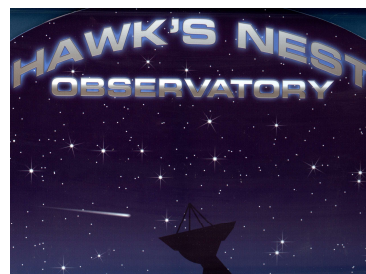
HNRAO - 01/24/2019 - UTC - TFD Array - RCP - SDRPlay - RSP2 - Integration 0.1s - HNRAO CA 2017 11 10 SDRplay2 TFD 16-24.csv



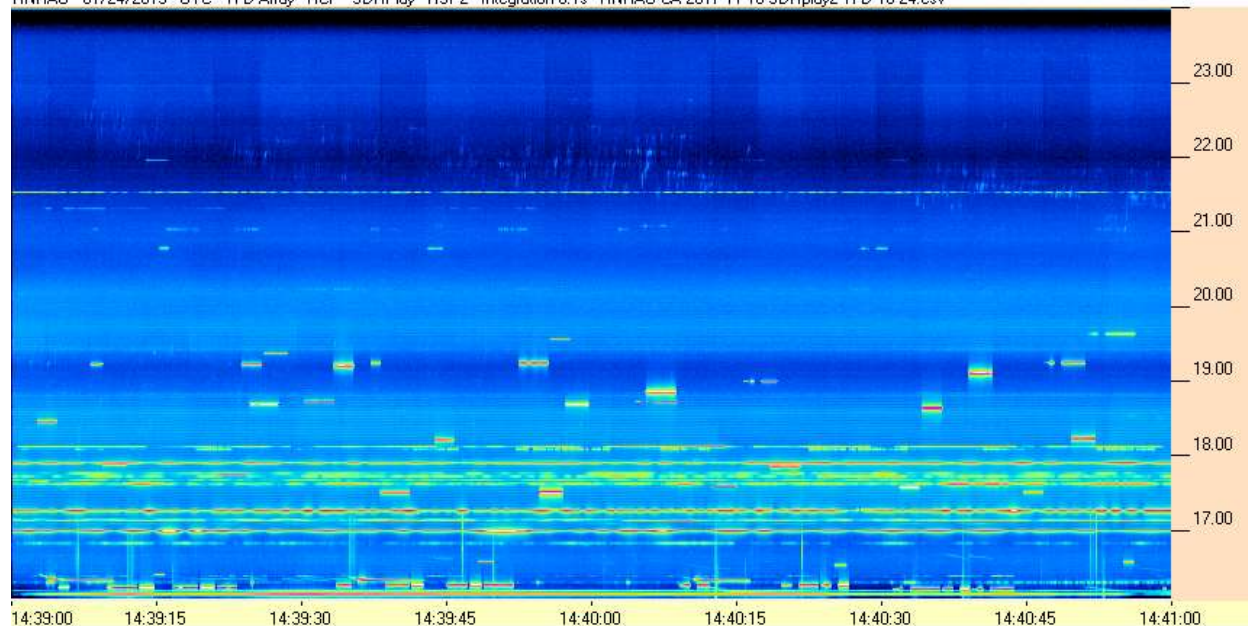
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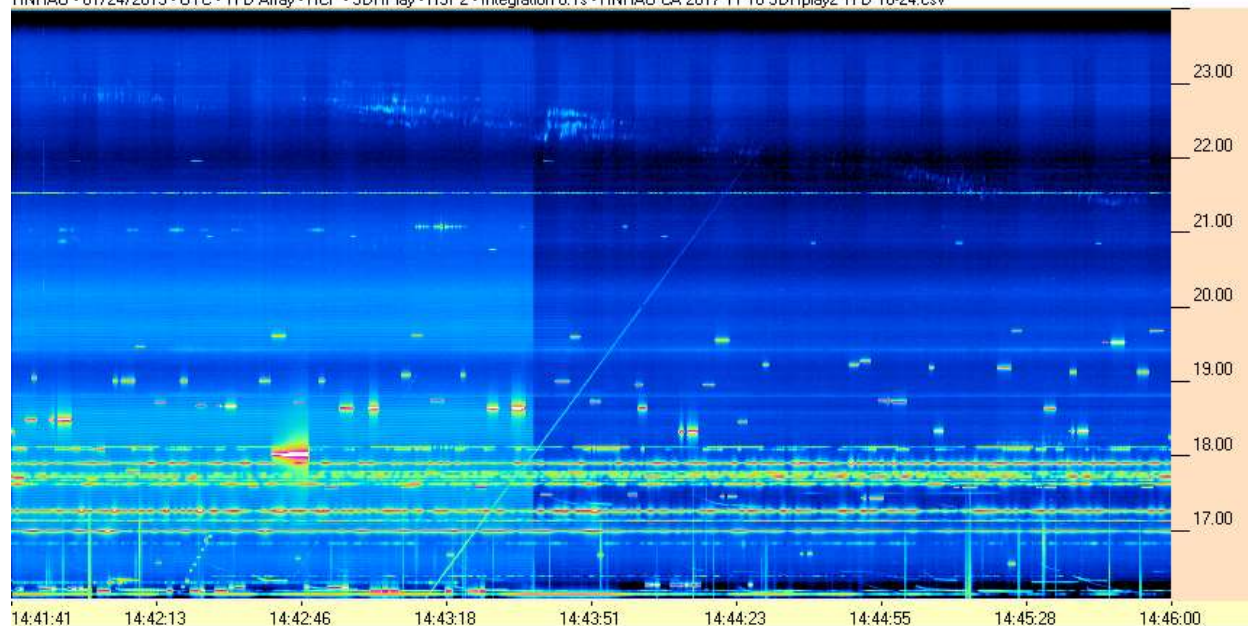
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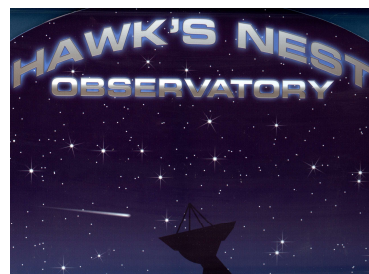
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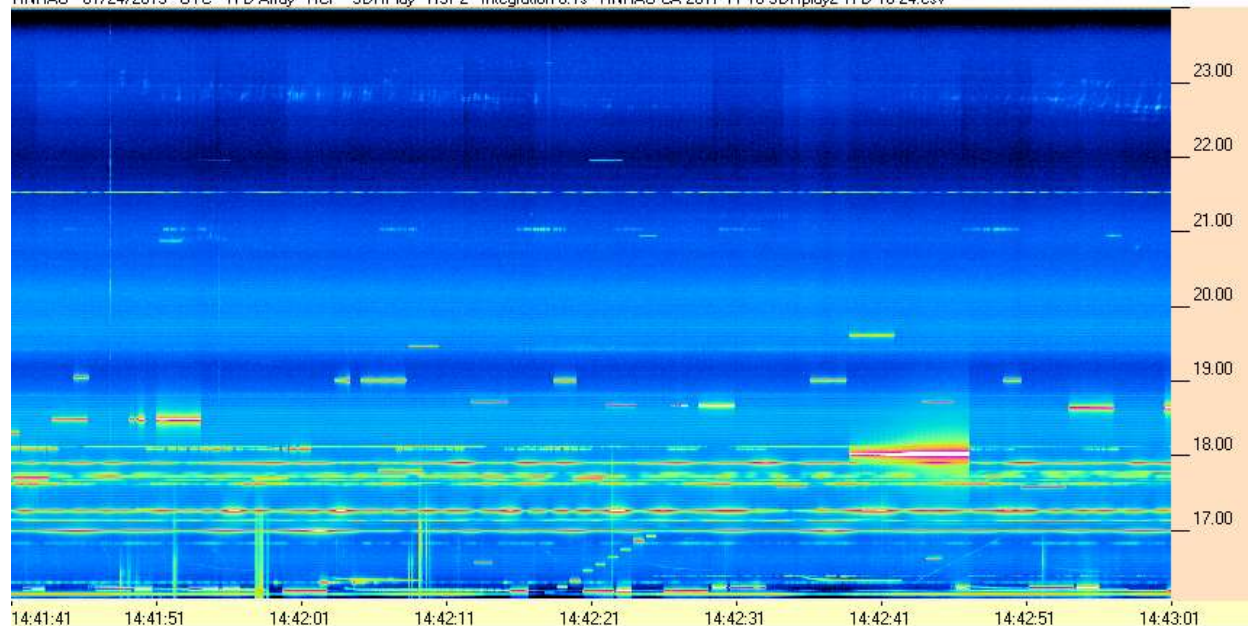
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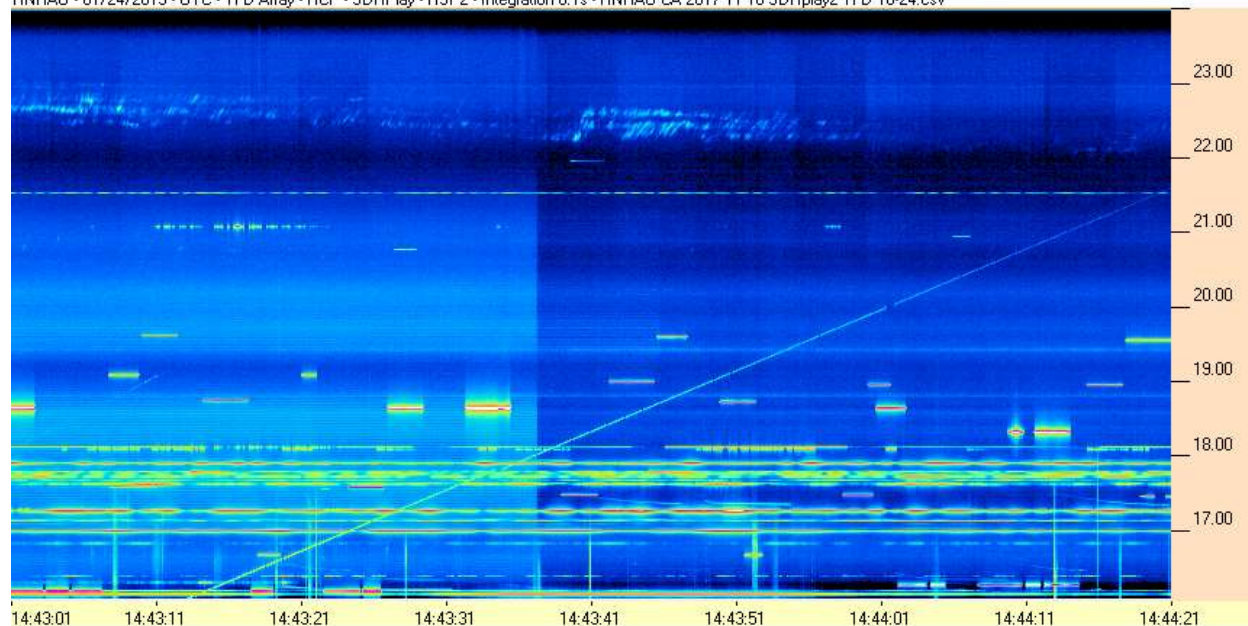
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HNRAO - 01/24/2019 - UTC - TFD Array - RCP - SDRPlay - RSP2 - Integration 0.1s - HNRAO CA 2017 11 10 SDRplay2 TFD 16-24.csv



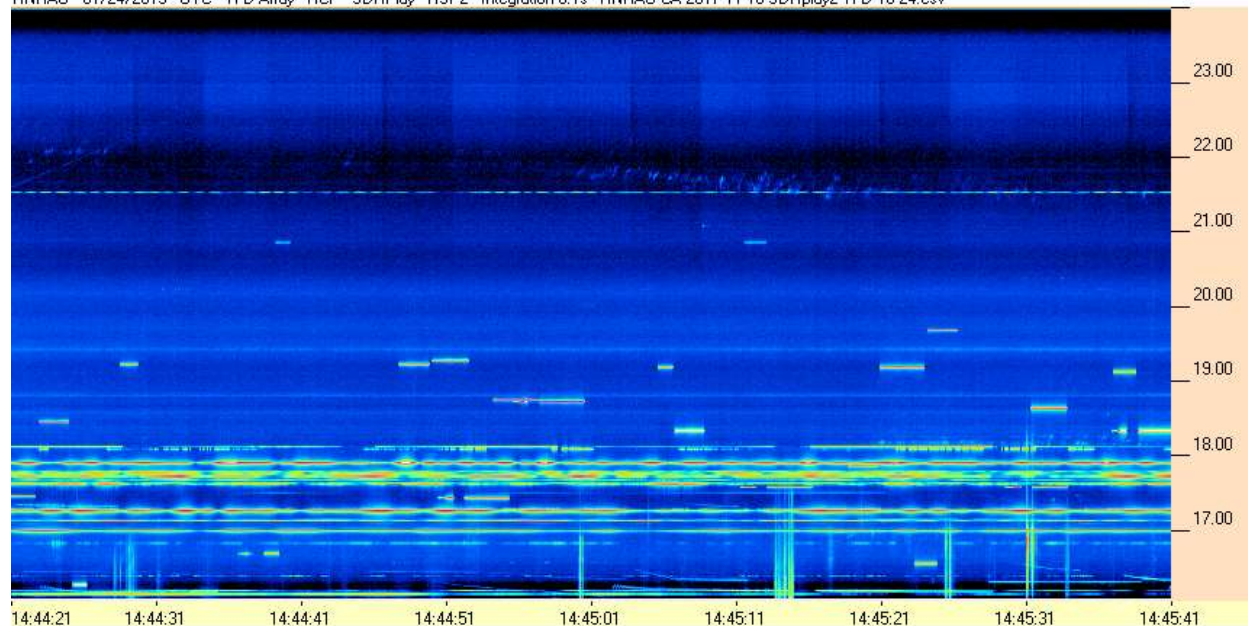
HNRAO - 01/24/2019 - UTC - TFD Array - RCP - SDRPlay - RSP2 - Integration 0.1s - HNRAO CA 2017 11 10 SDRplay2 TFD 16-24.csv



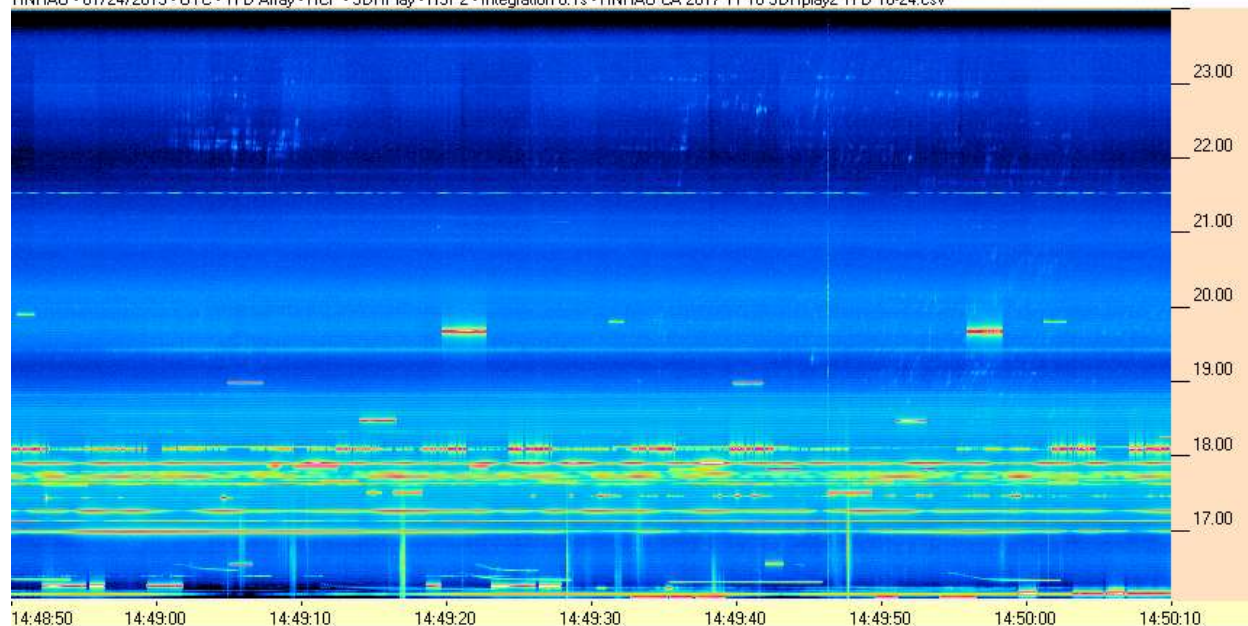
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HNRAO - 01/24/2019 - UTC - TFD Array - RCP - SDRPlay - RSP2 - Integration 0.1s - HNRAO CA 2017 11 10 SDRplay2 TFD 16-24.csv



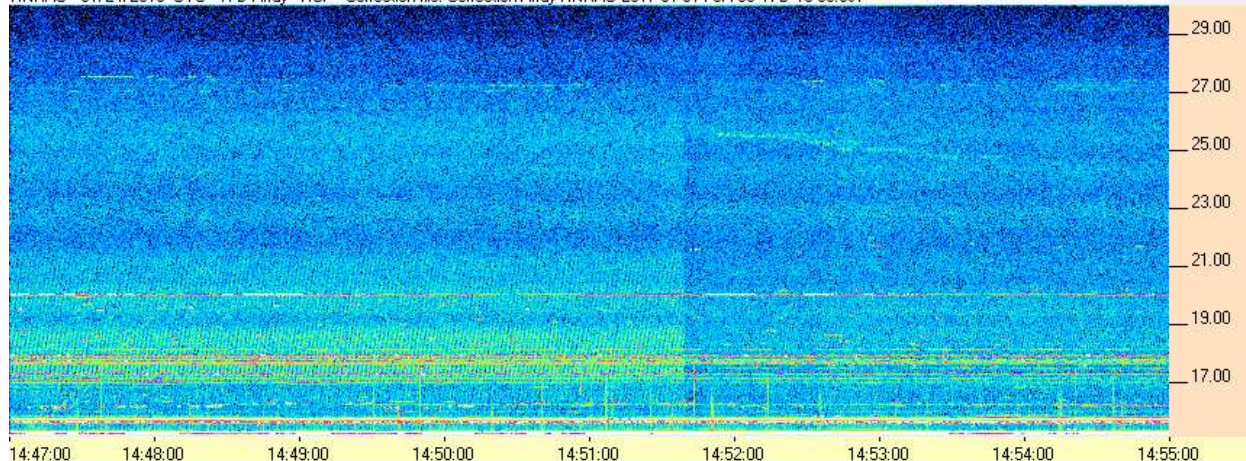
HNRAO - 01/24/2019 - UTC - TFD Array - RCP - SDRPlay - RSP2 - Integration 0.1s - HNRAO CA 2017 11 10 SDRplay2 TFD 16-24.csv



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HNRAO - 01/24/2019 UTC - TFD Array - RCP - Correction file: Correction Array HNRAO 2017 01 31 FSX-8S TFD 15-30.csv



HNRAO - 01/24/2019 UTC - TFD Array - LCP - Correction file: Correction Array HNRAO 2017 01 31 FSX-8S TFD 15-30.csv

