Observations of VHF Type III Solar Radio Bursts at Cohoe, Alaska on 3 July 2021

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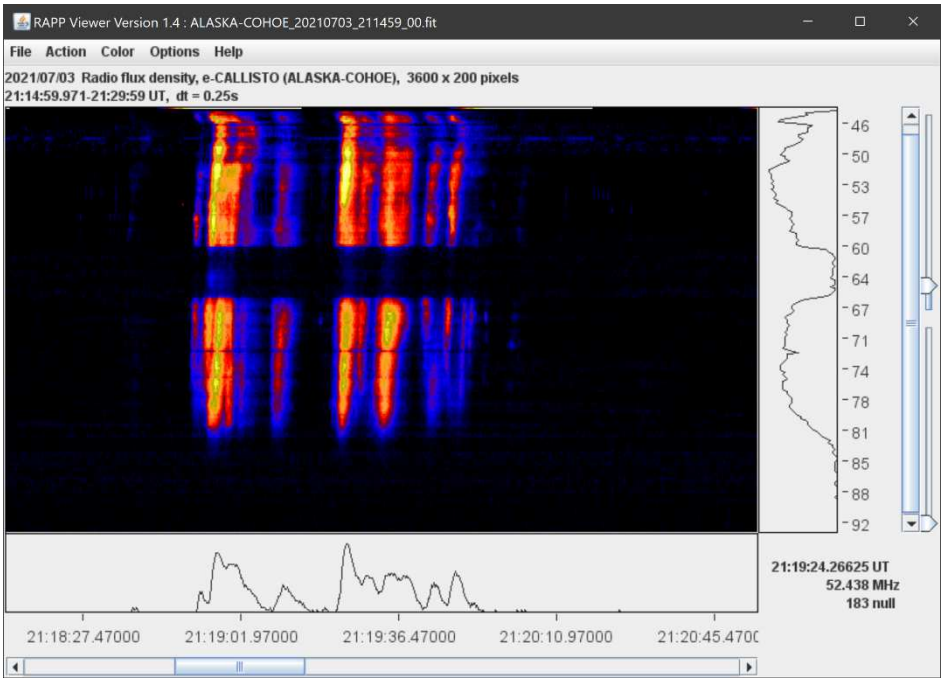
Solar activity continues to be relatively high compared to a year ago. In early July, the Sun produced numerous flares, coronal mass ejections, radio bursts and radio sweeps. In particular, Type III bursts were observed at Cohoe Radio Observatory in Cohoe, Alaska at 2119 UTC on 3 July {e-CALLISTO} (figure 1). According to Space Weather Prediction Center Event report {SWPC-EVNT}, the events involved solar Active Region 2835, which also produced a small B5.1 x-ray flare. Type VI bursts and a radio blackout also were observed earlier in the day.



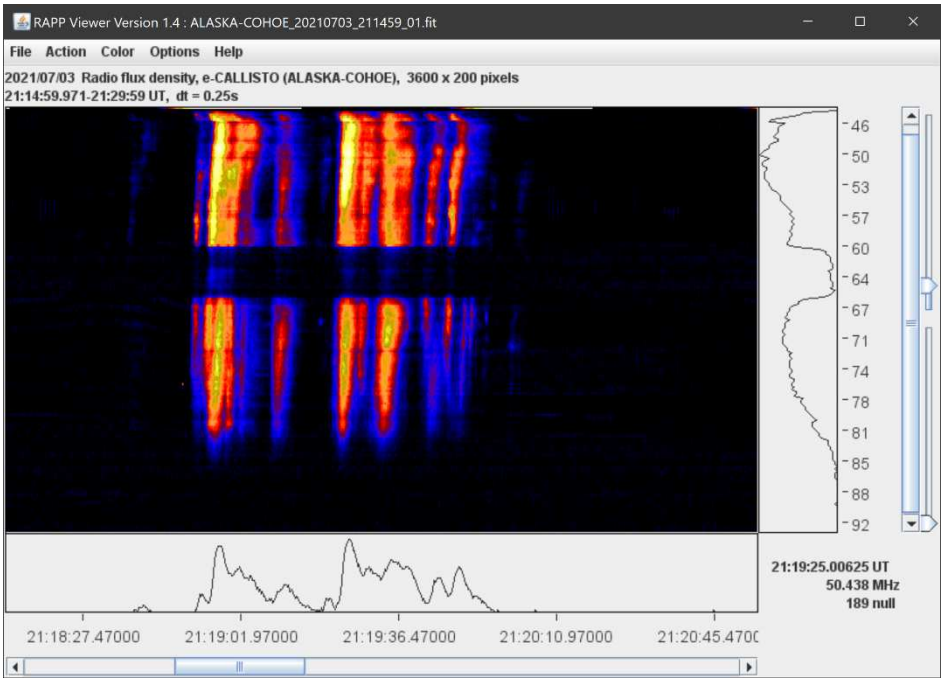


Figure 1 ~ Type III fast-drift radio bursts observed between 45 and 85 MHz.

Upper: Right-Hand Circular Polarization (RHCP).
Lower: Left-Hand Circular Polarization (LHCP).

The gap between 60 and 66 MHz is caused by intermodulation distortion in the antenna active electronics from nearby FM broadcast transmitters.

The lower frequency is limited by the native frequency range of the Callisto instrument (45 MHz). The upper frequency is limited by filters with a high frequency cutoff near 85 MHz.

Frequency in MHz is shown on the right vertical scale and time in UTC is on the horizontal scale at the bottom. The colors indicate relative intensity with black-blue being lower and red-yellow being higher. The text in the lower-right corner indicates the time, frequency and relative power of the cursor location when the image was taken (the cursor is not visible in these images).

These images are screenshots of the RAPP Viewer software.

Type III fast-drift radio emissions are thought to be caused by electron streams launched by magnetic instabilities and plasma turbulence through the solar corona at roughly one-third the speed of light. Type VI bursts are a series of Type III bursts over 10 or more minutes with no gap exceeding 30 minutes. See {SOLAR} for information on the types and characteristics of solar radio emissions.

Instrumentation: An LWA crossed-dipole antenna and two Callisto spectrometers were used for these observations (figure 2). The Callistos have an instantaneous bandwidth of 300 kHz and an integration time of 1 ms. The Callisto software collects data as Flexible Image Transport System (FITS) files, which are stored locally. The files also are uploaded automatically to Fachhochschule Nordwestschweiz (FHNW) University of Applied Sciences & Arts website {FHNW} for permanent archiving.

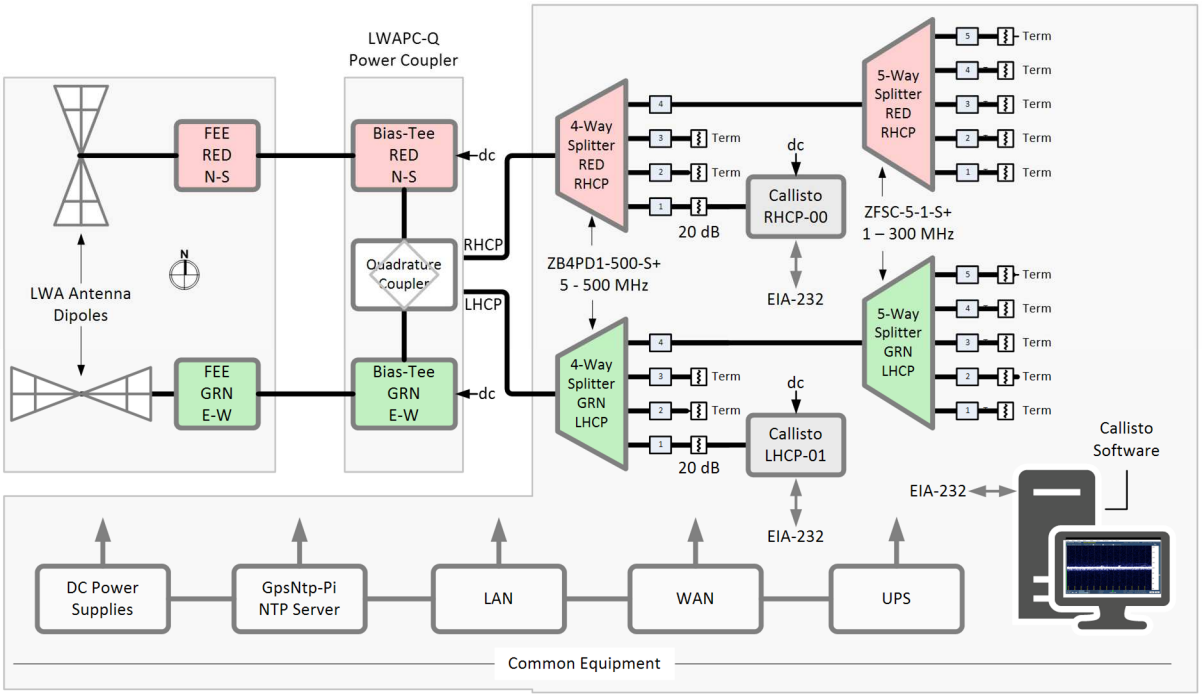


Figure 2 ~ System block diagram shows the components associated with the LWA Antenna and Callisto instruments and the common equipment shared across the observatory. Polarizations are color-coded: Red, RHCP; Green, LHCP. The Callistos are frequency agile and programmed to sweep through 200 channels between 45 and 92 MHz every 250 ms; in this configuration, the frequency resolution is 250 kHz. The data are collected by the Callisto software through EIA-232 serial interfaces and formatted as FITS files for archiving.

References & Weblinks:

{e-CALLISTO} http://soleil.i4ds.ch/solarradio/data/BurstLists/2010-yyyy_Monstein/2021/e-CALLISTO_2021_07.txt

{FHNW} http://soleil.i4ds.ch/solarradio/callistoQuicklooks/

{SWPC-EVNT} ftp://ftp.swpc.noaa.gov/pub/indices/events/

{SOLAR} http://www.reeve.com/Solar/Solar.htm