e-Callisto network:
the CALLISTO station at INAF-Astronomical Observatory of Trieste

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CALLISTO spectrometer

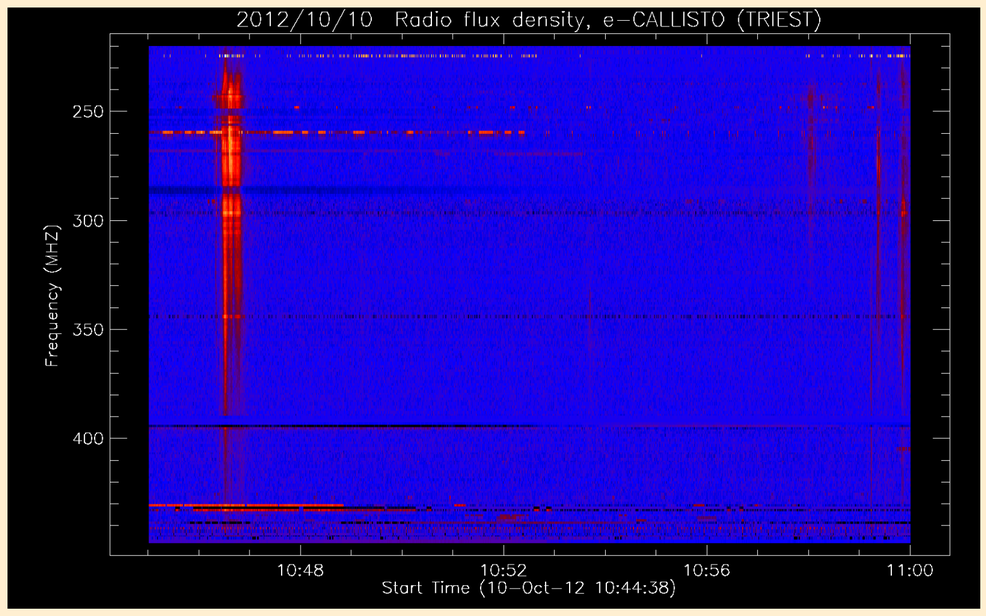
The CALLISTO spectrometer is a programmable heterodyne receiver designed at ETH Zurich, Switzerland during 2006 in the framework of International Heliophysical Year (IHY2007) and International Space Weather Initiative (ISWI). CALLISTO is an acronym standing for '**C**ompound **A**stronomical **L**ow frequency **L**ow cost **I**nstrument for **S**pectroscopy and **T**ransportable **O**bservatory'. The main applications are observation of solar radio bursts for astronomical science, education, outreach and citizen science as well as rfi-monitoring.

Specifications of the CALLISTO

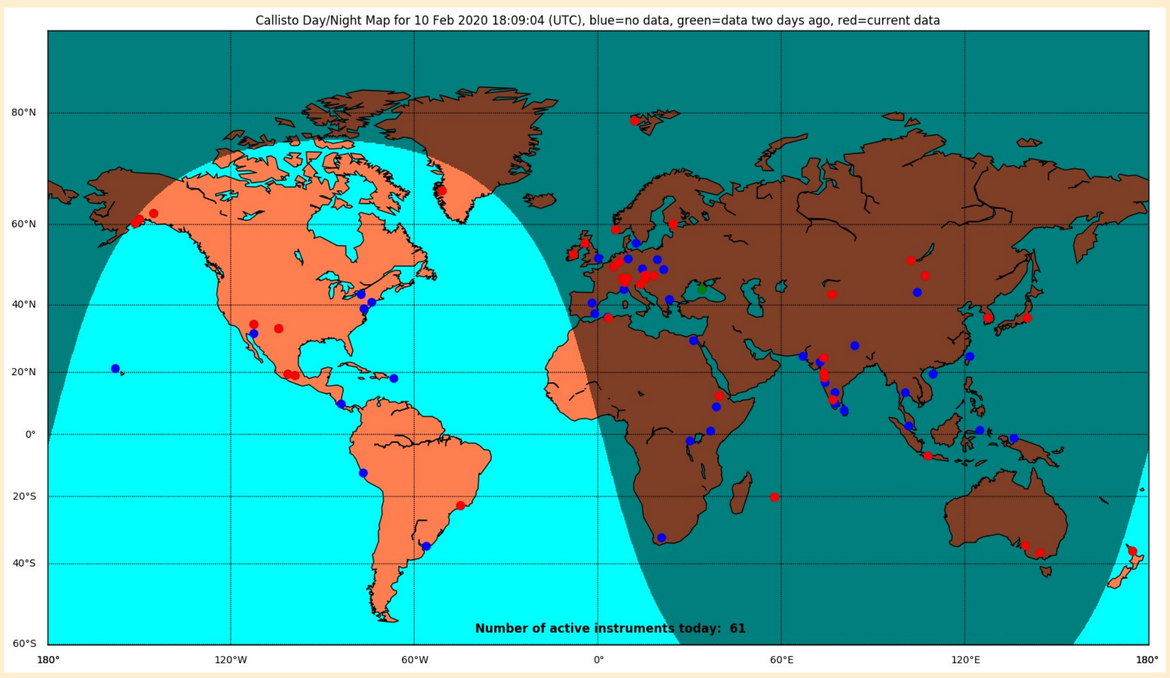
Parameter	Specification
Frequency range	45.0–870.0 MHz (in three sub-bands)
Frequency resolution	62.5 KHz
Radiometric bandwidth	300 KHz at -3 dB
Dynamic range	50 dB at -70 to -30 dBm maximum rf level
Sensitivity	25 ± 1 mV/dB
Noise figure	<10 dB (measured at the rf input connector)
Maximum sampling	Internal clock 800 S/s, external clock 1,000 S/s
Number of channels	Selectable 1–500, nominal 200 frequencies per sweep
Power supply	DC 12 ± 2 V/225 mA
Weight	800 g
Dimensions	110 mm 9 80 mm 9 205 mm
Material cost	<200 US$
Input data	Three files (configuration, frequency, scheduler)
Output data	Two files (one FITS-file per 15 min and one log file per day)

Solar Radio Bursts

A solar radio burst (SRB) is the intense solar radio emission often related to a solar flare and one of the possibly extreme space weather events which may affect Earth's ionosphere and signal propagation, wireless communication and navigation systems. If an SRB occurs with the enhancement in L band radio flux, it could influence the Global Navigation Satellite Systems (GNSS) signals through direct radio wave interferences. The major space weather events like solar flares and coronal mass ejections are usually accompanied by solar radio bursts, which can be used for a real-time space weather forecast.



Solar radio bursts at Trieste CALLISTO Station equipped with 10m dish



Map of current distribution of Callisto instruments end of November 2019. One dot can represent up to 5 instruments.

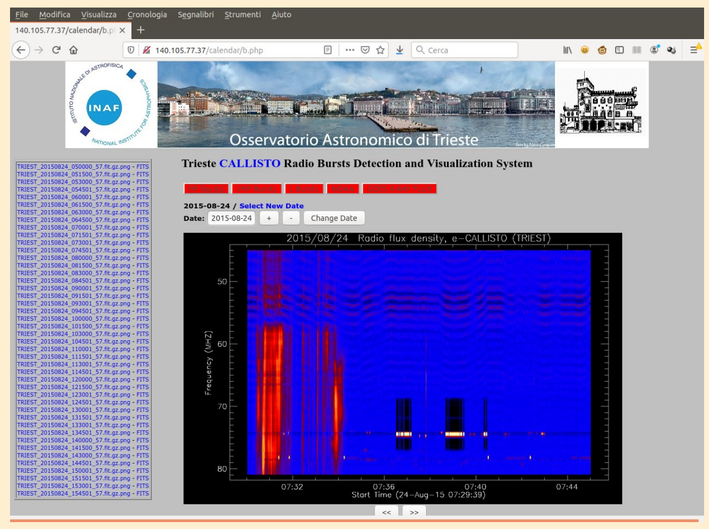
E-Callisto Network

Many CALLISTO instruments have already been deployed worldwide through the IHY/UNBSSI and ISWI instrument deployment program, CALLISTO is able to continuously observe the solar radio spectrum for 24h per day through all the year. All CALLISTO spectrometers together form the e-Callisto network. Data from individual instruments are automatically uploaded by FTP to the central server at FHNW (University of Applied Sciences and Arts Northwestern Switzerland) and are available at http://www.e-callisto.org/ together with CALLISTO technical documentation.
https://www.facebook.com/groups/788389237975335/

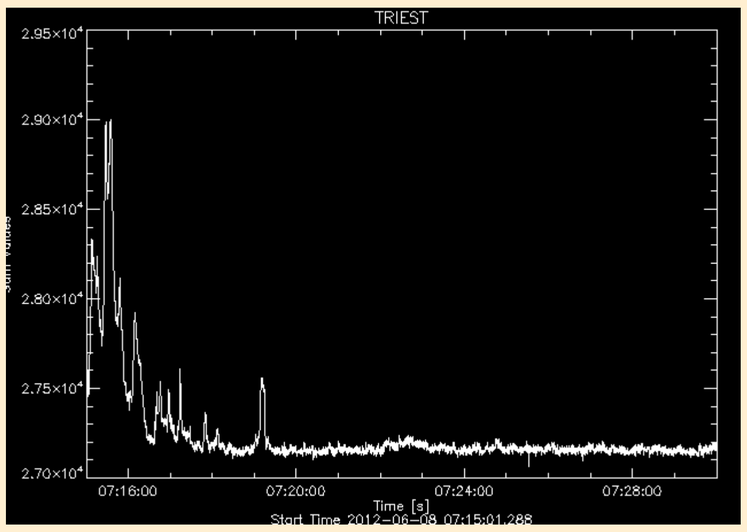
INAF – Astronomical Observatory of Trieste 10m dish

Trieste CALLISTO Station

Three CALLISTO spectrometers are currently active at INAF - Astronomical Observatory of Trieste, monitoring VHF, UHF and L-band. Data are uploaded to the central server at FHNW and are also stored locally to be available online. A specific website has been set up to access local data and an experimental automatic radio burst detection system is active (http://radiosun.oats.inaf.it). Students' internships and dissertations using CALLISTO spectrograms are being offered.



Trieste CALLISTO station website screenshot



SRB detection pipeline: CALLISTO Spectrogram intensity plot

Astronomical Observatory of Trieste VHF, UHF and L-band antennas

Links:
http://www.e-callisto.org/
http://radiosun.oats.inaf.it