CALLISTO status report/newsletter #101

After 18 years of visual inspection of thousands of FIT-files every day I had to stop this very time consuming task due to severe health issues, triggered by this exhausting activity.
From January 2025 onwards burst detection and reporting is performed by the Spanish group from university of Alcalá, based of AI/ML processes running periodically on a LINUX system.
Access to burst lists still here: https://soleil.i4ds.ch/solarradio/data/BurstLists/2010-yyyy_Monstein/
For more information about automatic burst-detection, see:
Bussons Gordo, J., Fernández Ruiz, M., Prieto Mateo, M. *et al.* Automatic Burst Detection in Solar Radio Spectrograms Using Deep Learning: deARCE Method. *Sol Phys* **298**, 82 (2023). https://doi.org/10.1007/s11207-023-02171-0

Callisto Visnjan, Croatia

Hardware description of Callisto station at Visnjan Observatory

Marko Radolović, Matej Marković et al.

Due to frequent system malfunctions in 2023-2024, we decided to redesign our system. From Aug 23 until June 24, time was spent debugging our faulty system. Without a VNA, any assumption that was made about a possible faulty component was meaningless. After many hours spent debugging, the conclusion is that we spent a year with a faulty LNA. Therefore, we acquired a LNA from 9A4QV – LNA4ALL, as well as a Nano VNA.

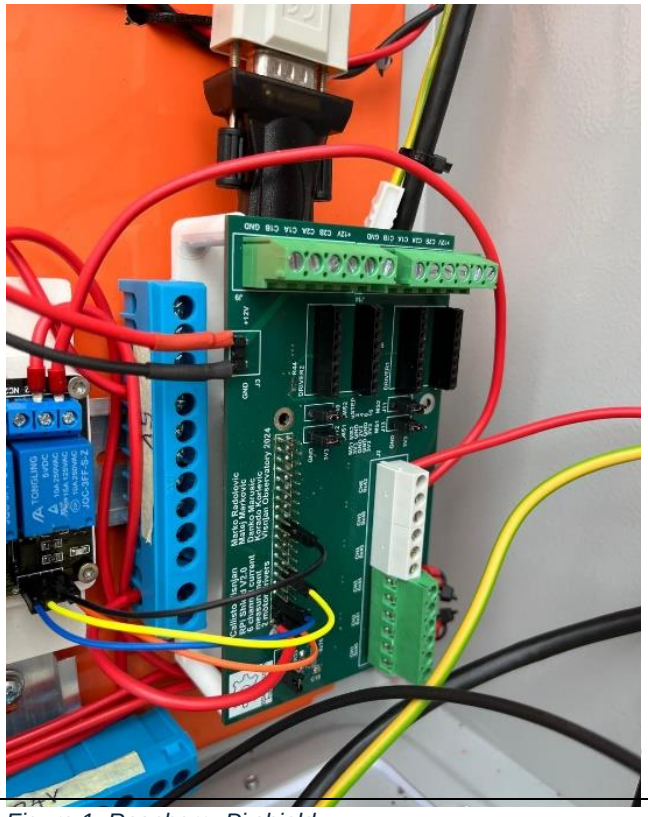

Figure 1: Raspberry Pi shield

Soon after installing the new LNA, we had our first „big burst“. See FIT from 20240830@1215UTC.
In order to have an autonomous system, we need to have real-time current and temperature monitoring. Our system runs off of a single Raspberry Pi 3B+. A shield for the Pi was made. The shield consists of six INA219 current measurement channels and a BME280 sensor, which measures temperature, relative humidity and air pressure.
The additional female headers will be used to hold two TMC2209 stepper motor drivers, for the RA and DEC axis, respectively.

The current and temperature sensors use the I2C bus. TMC2209 enables the use of the UART bus, as well as GPIO pin driving. As of Jan 25, the drivers haven't been tested yet.
Inside of the electronics enclosure, we currently use a 40 W heater, made out of car light bulbs, to heat up the air when there is possible condensation. The heater is activated via a relay. Sometimes, the Callisto serial communication glitches, after which Callisto needs to be restarted. That is done with a relay which is normally closed. A 5s disengagement of the contacts is enough to fully restart the device. RPi shield gerbers, as well as all the software used can be found at github.com/mradolovic/callisto. For any additional information, please contact Marko Radolović at marko.radolovic [at] fer.hr.
Due to strong RFI from local FM stations, as well as the GSM network, we must use a FM notch filter (https://lna4all.blogspot.com/2015/10/diy-fm-trap-or-88-108-mhz-band-stop.html) and a low pass filter (MiniCircuits SXLP-4+).

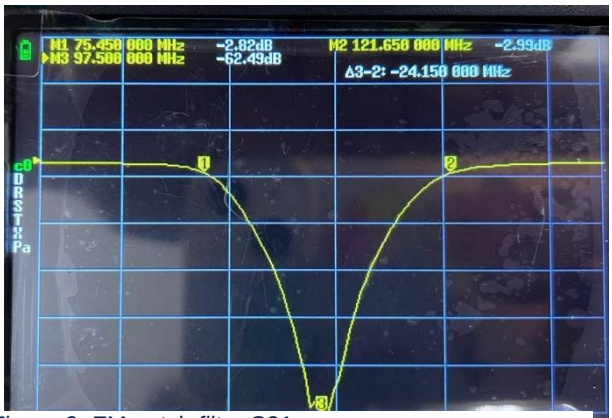

Figure 2: FM notch filter S21

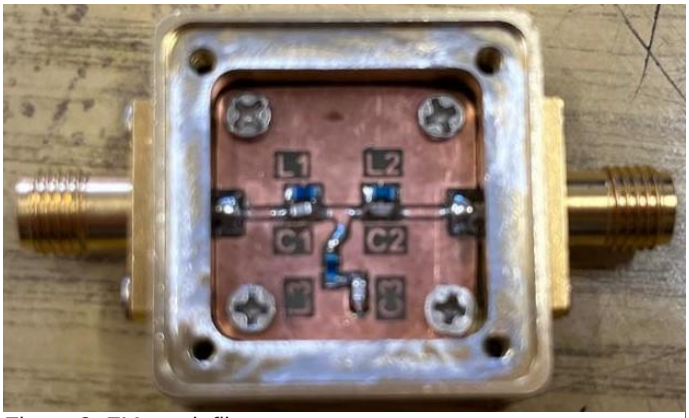

Figure 3: FM notch filter


Figure 4: LNA in enclosure


Figure 5: Complete electronics in enclosure

The FM notch filter has a bandwidth of 24MHz, from 75MHz to 121MHz. It's a DIY version using 0603 components and an aluminum box from AliExpress. Beware if using this box! The sellers claim that it has a conductive coating, but it is anodised. Remove the coating with a grinder before assembling the circuit.
We couldn't find an appropriate milled enclosure for the LNA, so we used a die-cast box. Connection with a short piece of coax isn't ideal, but it shouldn't cause reflections under 1GHz.

Figure 5: Complete electronics in enclosure

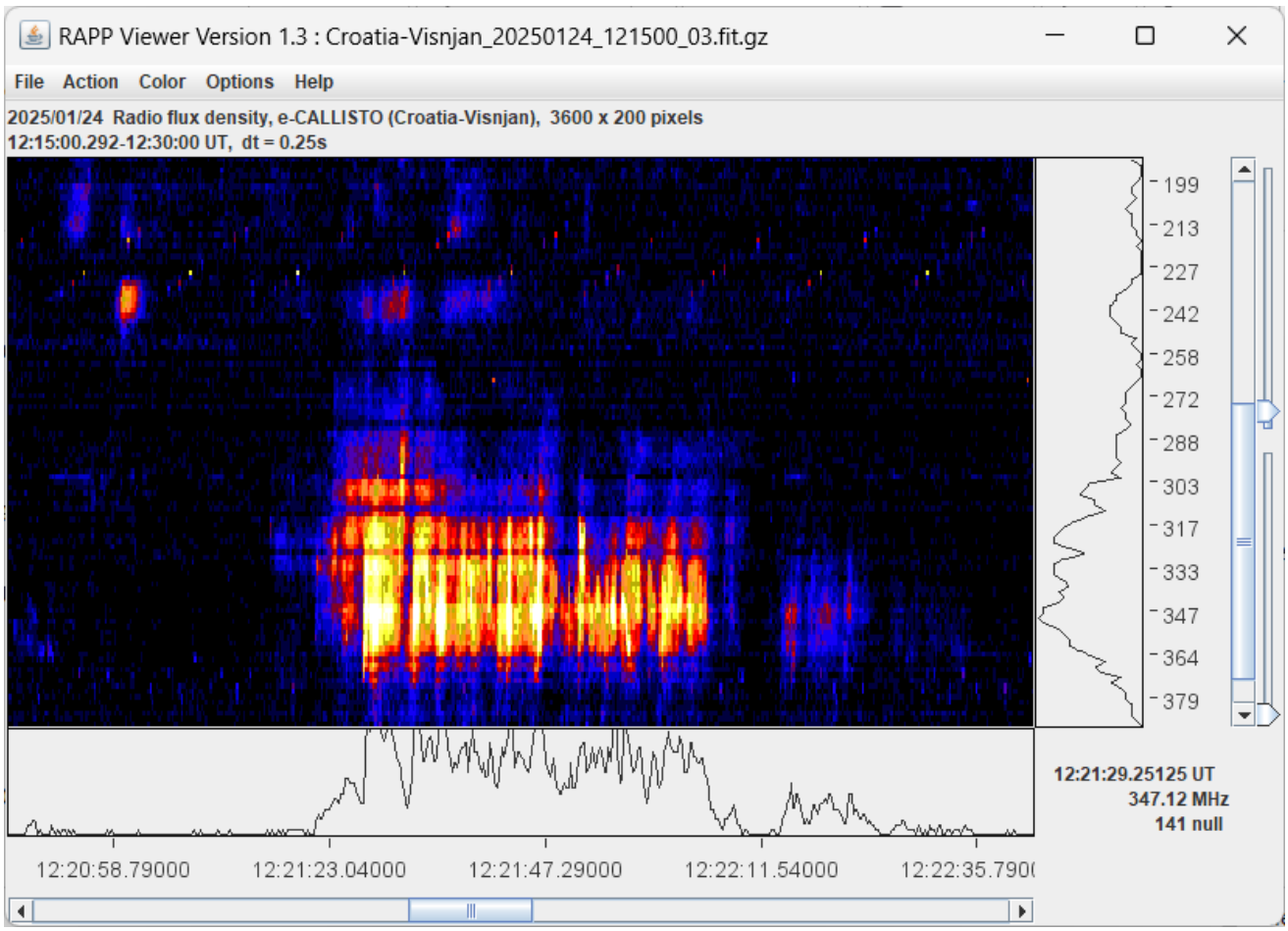

Fig. 6: Recent observation, a group of type III solar radio bursts.

e-Callisto burst statistics whole year 2025

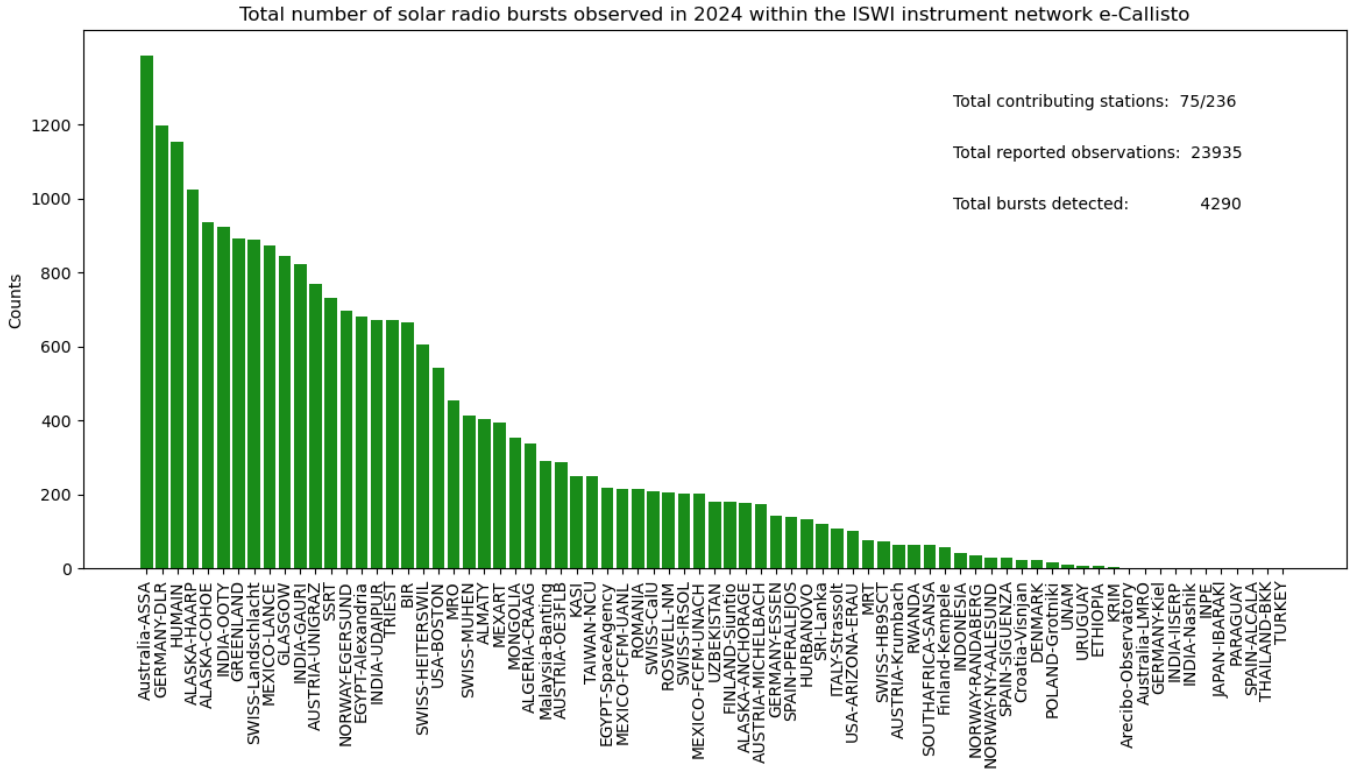

Fig. 6: Compilation of all visually detected bursts from all Callisto-stations which provide data to the e-Callisto network. There are clear 'winners' of the 2025-'competition', Australia-ASSA.
Last 4 burst-plots are always available here: **https://e-callisto.org/Data/data.html**

CESRA NEWS

https://heliowiki.smce.nasa.gov/wiki/index.php/SolarNuggets

CESRA nuggets:
Observations of coronal holes with the Siberian Radio Heliograph
by Altyntsev et al.
https://www.astro.gla.ac.uk/users/eduard/cesra/?p=3879

A Possible Indication of the Insufficiency of Simplistic Homogeneous Models for Estimating Magnetic Fields of CMEs using Gyrosynchrotron Emission
by Devojyoti Kansabanik et al.
https://www.astro.gla.ac.uk/users/eduard/cesra/?p=3871

Spectral cleaving in solar type II radio bursts: Observations and interpretation
by A. Koval et al.
https://www.astro.gla.ac.uk/users/eduard/cesra/?p=3902

Temporally resolved Type III solar radio bursts in the frequency range 3-13 MHz
by A. Vecchio et al.
https://www.astro.gla.ac.uk/users/eduard/cesra/?p=3896

Observation of an Extraordinary Type V Solar Radio Burst: Nonlinear Evolution of the Electron Two-Stream Instability,
by A. O. Benz et al.
https://www.astro.gla.ac.uk/users/eduard/cesra/?p=3915

Flare Accelerated Electron Transport in Type III Solar Radio Bursts: large-scale transport and super-diffusive beam expansion
by E. P. Kontar et al.
https://www.astro.gla.ac.uk/users/eduard/cesra/?p=3930

AOB

- If you have some stuff to present to the Callisto community, please let me know
- CALLISTO or Callisto denotes to the spectrometer itself while e-Callisto denotes to the worldwide network.
- General information and data access here: https://e-callisto.org/
- e-Callisto data are hosted at University of Applied Sciences, Institute for Data Science FHNW in Brugg/Windisch, Switzerland. Additionally, data are available at ESA site here: ESA Space Weather Portal (https://swe.ssa.esa.int/).
- From now on Bussons Gordo Javier javier.bussons(at)uah.es from Alcalá is the new Co-PI and will support my activities related to CALLISTO instrument and e-Callisto network.
- In case you (as the responsible person for operating and maintenance of Callisto) are leaving the institute or, if you are retiring, please send me name and email address of the successor.

Please do **NOT** respond to the email-address of the list-server where you have got this document from, it is a computer/robot. This computer will not give you any useful answer…
Respond instead directly to me at: cmonstein(at)swissonline.ch and to the new Co-PI javier.bussons(at)uah.es

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