

Solar Radio Spectrometers in Slovakia – status report



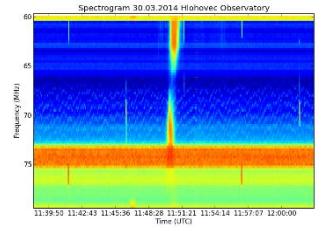
I. Dorotovič¹, J. Karlovský², V. Karlovský²

¹ Slovak Central Observatory, Komárňanská 134, SK-94701 Hurbanovo, Slovak Republic;
E-mail: ivan.dorotovic@suh.sk

² Astronomical Observatory and Planetarium of M. R. Štefánik, Sládkovičova 41, SK-92001 Hlohovec, Slovak Republic;
E-mail: jan.karlovsky@gmail.com, astrokar@gmail.com

ABSTRACT

This contribution presents the solar radio spectrometers installed in three Slovak astronomical observatories. One Callisto spectrometer, kindly provided by the ETH, Zürich, Switzerland (Ch. Monstein) in the frame of the ISWI e-Callisto network is installed in the Slovak Central Observatory in Hurbanovo and second Callisto is installed in the Astronomical Observatory in Roztoky. Moreover, there is other solar radio spectrometer, set up by J. Karlovský, installed in Hlohovec (<http://www.karlovsky.info/sid/rtl/>). Results on registration of solar radio bursts are presented as well.



1. INTRODUCTION

Detailed information on the CALLISTO spectrometer and the e-CALLISTO network can be found at <http://www.e-callisto.org>.

2. SOLAR RADIO SPECTROMETERS IN SLOVAKIA

2.1. CALLISTO IN HURBANOVO



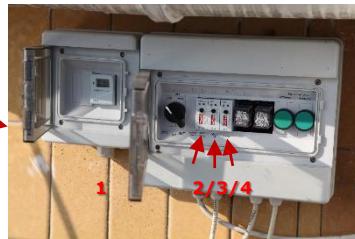
CALLISTO site is located in the Slovak Central Observatory (SCO) in Hurbanovo [47.9° N, 18.2° E, 115 m a.s.l., GMT + 01h]. Callisto radio spectrometer has been installed in the SCO in December 2011. Detailed information on installation, radio frequency interference (RFI) in Hurbanovo, first results, etc. is published in Dorotovič and Pintér (2014).

Here we present only some changes in the CALLISTO set up that contributed to better sensitivity of the registered radio spectrograms:

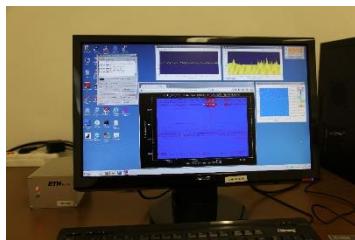
- both the rotator and the tracking controller were installed for better sensitivity to observe morning and evening events (rotations in steps of 30° in every 2 hours),
- the amplifier was mounted very close to the antenna,
- coaxial cable was shortened to ~8 meters to lower signal loss.



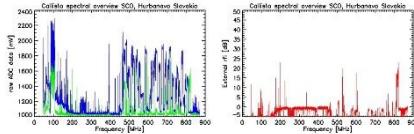
Log-Periodic Antenna CLP-5130-2N



Controllers for the morning start time (1), time interval of one single rotation (2), duration of single antenna rotation (3), and evening stop time (4).



CALLISTO eC50 + PC



Callisto spectral overview SCO

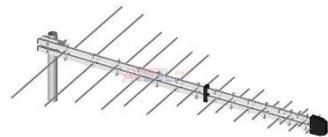
2.2. CALLISTO IN ROZTOKY



CALLISTO radio spectrometer has been installed in the Astronomical Observatory (AO) in Roztoky [49.4° N, 21.5° E, 490 m a.s.l., GMT + 01h] in May 2013. The results of solar radio observations and radio interference monitoring at the CALLISTO observing station in Roztoky were published in Monstein and Baludánský (2013). Shortly thereafter, in summer 2013, the radio measurements were interrupted due to technical reasons. Solar radio observations should be re-initiated during this spring.

2.3. SOLAR RADIO SPECTROMETER IN HLOHOVEC

Another very simple and cheap solar radio spectrometer has been installed in the Astronomical Observatory and Planetarium of M. R. Štefánik in Hlohovec [48.42° N, 17.8° E, 231 m a.s.l., GMT + 01h] in the end of 2013. It was set up by J. Karlovský using a LPD antenna, a software radio receiver RTL-SDR, and an amplifier with gain of 25 dB.



Log-periodic dipole antenna



RTL-SDR receiver

Parameters of the RTL-SDR:

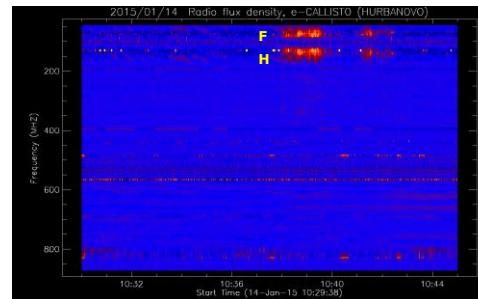
Frequency range	45 - 900 MHz
ADC resolution	8 bit
Sampling frequency	3.2 Msps
Actual usable bandwidth	2.8 MHz
Dynamic range	48 dB

The radio spectrometer registers solar radio flux using a Python software tool in the ranges of 60 – 80 MHz and 120 – 140 MHz, respectively. Data collection is carried out by scanning of the whole frequency range with a lag of 250 kHz, i.e. one single measurement is done in ~5 s (temporal resolution).

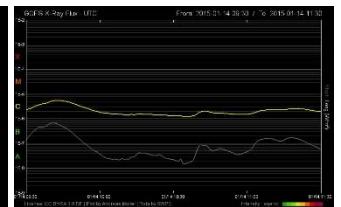


3. DETECTION OF SOLAR RADIO BURSTS

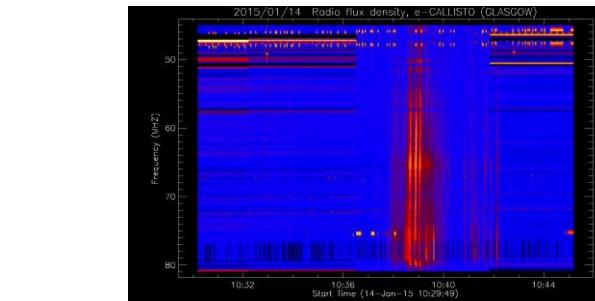
3.1. HURBANOVO



Dynamic spectrum of the type III/2 radio bursts on 14 January 2015 at 10:38 UT. This bursts shows fundamental (F) and harmonic (H) emission.

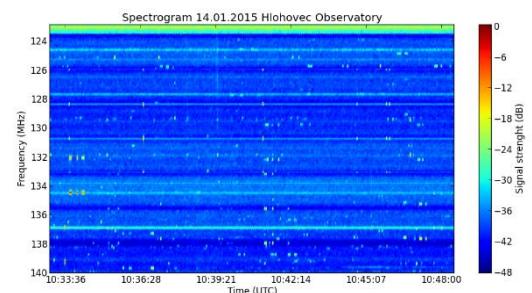
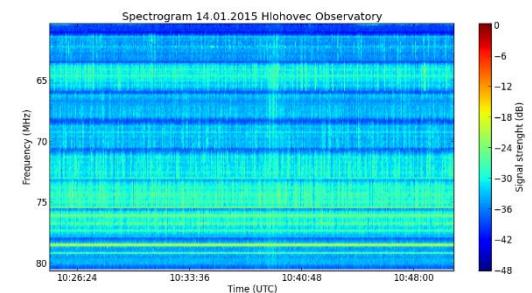


GOES X-ray flux on 2015-01-14 from 9:30 to 11:30 UT.



Radio flux density registration at lower frequencies from GLASGOW site for comparison.

3.2. HLOHOVEC



Radio spectrograms from the Hlohovec Observatory, 14-01-2015.

Current spectroheliograms can be found at: <http://www.karlovsky.info/sid/rtl/>.

Acknowledgements

One of the authors (I.D.) is grateful to C. Monstein from the ETH Zurich, Switzerland for providing the CALLISTO spectrometers and kind assistance in their installation in the Slovak Central Observatory (SCO) in Hurbanovo and in the Astronomical Observatory in Roztoky, and to the staff of the Optical and Mechanical Workshop of the SCO for technical assistance during the installation of the CALLISTO in Hurbanovo.

REFERENCES

- Archive of AOS, Argos, Phoenix-3, Phoenix-4 and e-Callisto (>2002): <http://soleil.i4ds.ch/solarradio/callistoQuicklooks/>
- Benz, A., Monstein, Ch., Meyer, H.: 2006, Callisto A New Concept for Solar Radio Spectrometers, *Solar Phys.*, **226**, 143.
- Dorotovič, I., Pintér, T.: 2014, Solar Radio Spectrometer CALLISTO in Hurbanovo - first results, *Sun and Geosphere*, **9** (2), 105.
- Monstein, C., Baludánský, D.: 2013, Solar radio observations and radio interference monitoring in Roztoky, *Contrib. Astron. Obs. Skalnaté Pleso*, **43**, 81.
- e-Callisto website <http://www.e-callisto.org/>