e-Callisto Solar Burst Monitoring Network ~ 100% Coverage accomplished

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In 2002 we started to build solar radio spectrometers out of cheap consumer electronics to observe dynamic radio bursts from the sun. The project at that time was called PMS (Poor Man Spectrometer) and it was intended to expand existing local facilities to get more observation time compared to a maximum of 14 hours in Switzerland. The instruments were mainly manufactured by apprentices of the physics department as part of their education and training.

In 2006 we were invited to participate in the IHY2007 (International Heliophysical Year 2007) activities and to support developing countries with instruments, knowhow and training. Within this framework, supported by NASA and UN office for outer space affairs in Vienna, we started to deploy Callisto spectrometers all over the world, starting in India, Siberia and South Korea. Other locations followed like Belgium, Mexico, Costa Rica, Brazil, Mauritius, Egypt, Kenya, Czech Republic, Slovakia, Germany and others. Then in 2011 IHY2007 was officially closed but found continuation in ISWI (International Space Weather Initiative). ISWI perfectly fits into the data output of Callisto, namely dynamic solar radio burst detection which can be used to understand coronal heating processes and can also be used to determine the speed of CME related particle traveling to earth (for example, see SARA journal issue Sept-Oct. 2012, Estimation of CME Shock Wave Speed Out of Type II Solar Bursts, page 38-44).

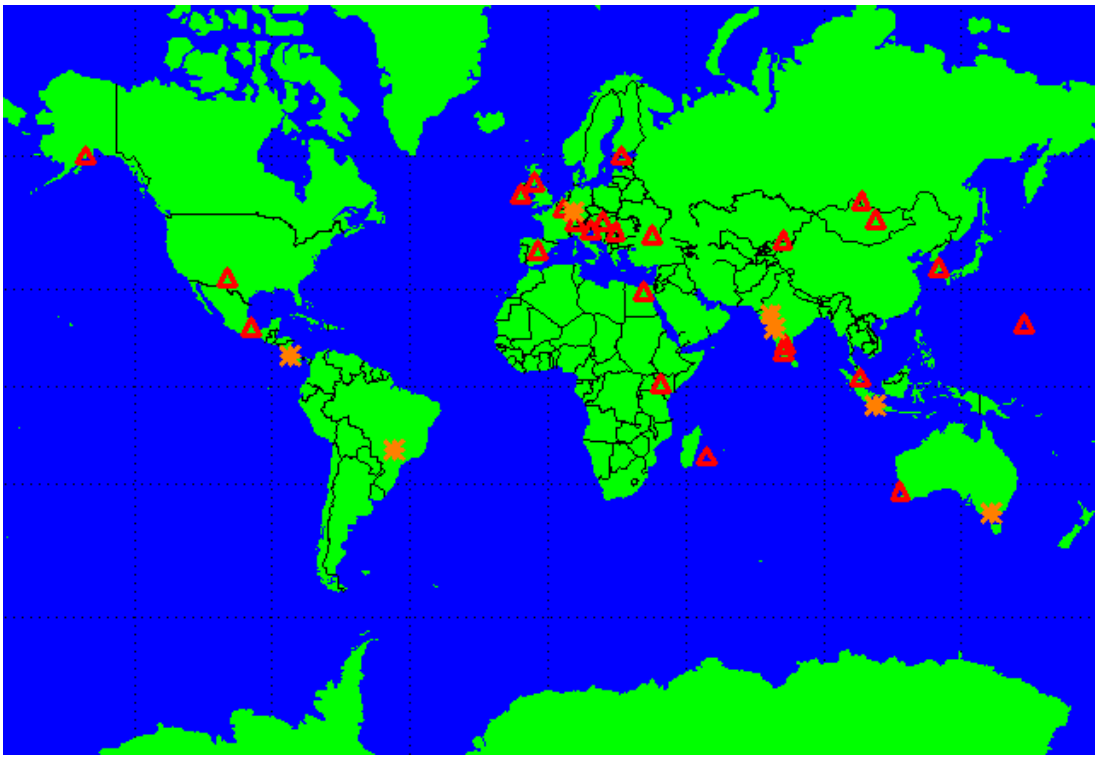

Figure 1: Current distribution of Callisto instruments on the world map. Red triangles denote to observatories that constantly provide data to the archive while orange stars do not provide data or do not provide data anymore..

For quite some time the American/Pacific region was not very well covered, and we had a gap in winter until beginning of 2012. Luckily Stan Nelson in Roswell, New Mexico set up a Callisto instrument on private funding. Before long he got 1st light (see Stan's own article in this journal). Now in March 2013 we finally reached 100% coverage all over the year assuming all instruments are working and supply data. Of course, if one of the instrument fails the coverage also goes below 100%. Therefore it is important to have a redundant system, redundant in longitude and in frequency range of observation. If we can guarantee 100% coverage throughout the year, it will be of high scientific value. A nice example of considerable redundancy is given by the M1.1 burst from March 15th this year. More information about Callisto may be found here: http://e-callisto.org/

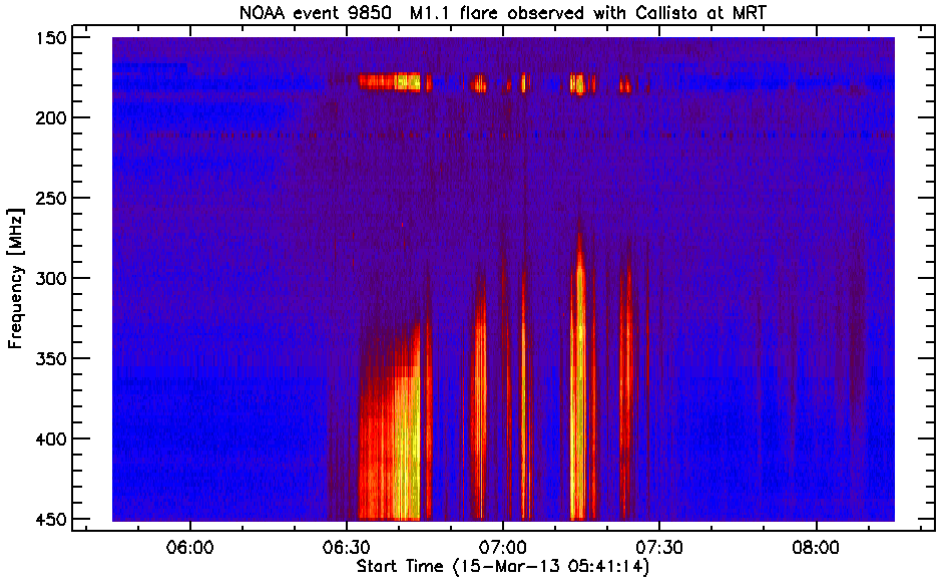

Figure 2: Two hours of observation at University of Mauritius with a simple vertically mounted broadband LPDA.

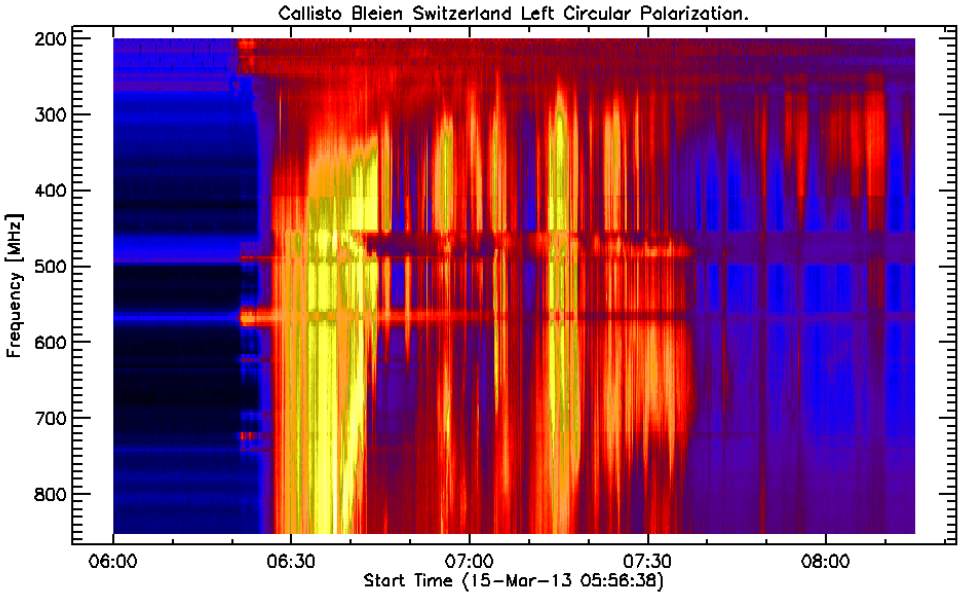

Figure 3: The same burst observed with a 7m parabolic dish tracking the sun in left circular polarization. In right circular polarization there was almost nothing to observe. Spectrum is brighter with more details but we lost some parts due to late sunrise around 06:45 UT.

Further reading:

CALLISTO - A new concept for solar radio
Arnold O. Benz , Christian Monstein , Hansueli Meyer : http://arxiv.org/abs/astro-ph/0410437

Observations of Low Frequency Solar Radio Bursts from the Rosse Solar-Terrestrial Observatory
P. Zucca, E. P. Carley, J. McCauley, P. T. Gallagher, C. Monstein, R. T. J. McAteer:
http://arxiv.org/pdf/1204.0943.pdf

Meet the author: Christian Monstein is a native of Switzerland and lives in Freienbach. He obtained Electronics Engineer, B.S. degree at Konstanz University, Germany. Christian is a SARA member and is licensed as amateur radio operator, HB9SCT. He has experience designing test systems in the telecommunications industry and is proficient in several programming languages including C and C++. He presently works at ETH-Zürich on the design of digital radio spectrometers (frequency agile and FFT) and is responsible for the hardware and software associated with the e-CALLISTO Project. He also has participated in the European Space Agency space telescope Herschel (HIFI), European Southern Observatory project MUSE for VLT in Chile, NASA/ESA project STIX, and NANTEN2 (delivery of the radio spectrometer for the Submillimeter Observatory at Pampa la Bola, Chile). Currently he is quite involved in setting up an infra-red laboratory. He plays also the role of a coordinator of SetiLeague in Switzerland and he is also representing Switzerland within CRAF.

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