

## Self produced radio interference due to badly designed dc power supply

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In early May 2013 I put an additional low noise amplifier for an L-band antenna on the roof of the radio observatory, about 2 meters away from the low frequency biconical antenna which covers 10 to 80 MHz. This amplifier was powered by a 20 year old switched power supply, providing 4.5 volts at 45 mA. I never thought that this might produce a problem and, unfortunately, I did not immediately realize that the observation at lower frequencies became unusable due to RFI. Later, on May 14<sup>th</sup>, I switched off the L-band receiver and with that the new low noise amplifier. Suddenly the situation changed as seen in the light curves in figure 1. Additional measurements of the received spectrum with and without the switched power supply are shown in figures 2 and 3.

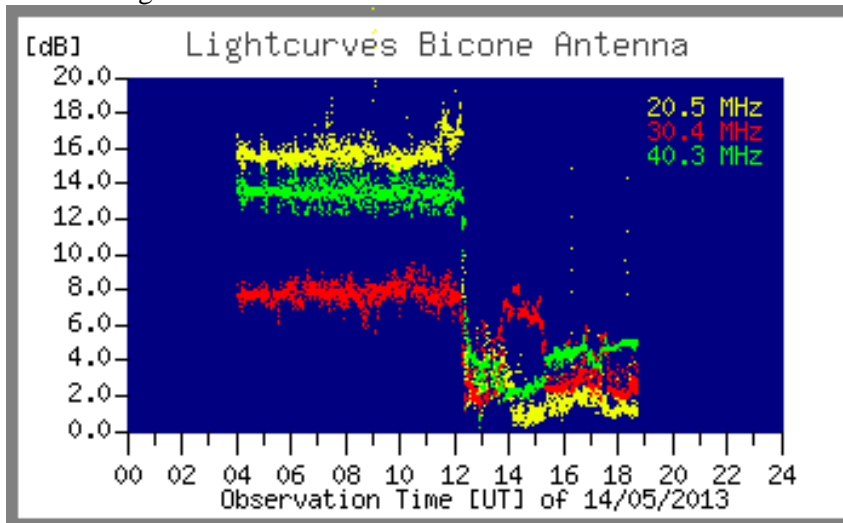


Figure 1: Light curves (relative power measured by the receiver) at three different frequencies during the time when I turned off the switched power supply. The reduction in RFI-level is at least 14 dB at 20.5 MHz.

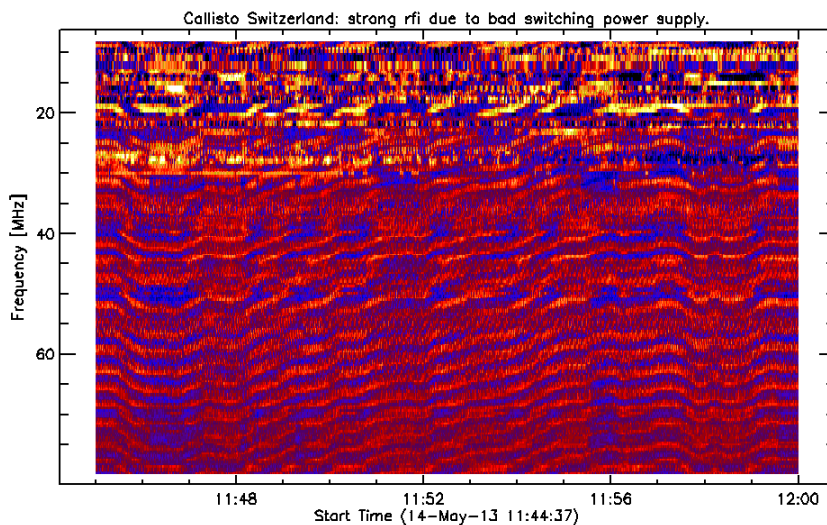


Figure 2: Very noisy radio spectrum due to strong RFI from an old switched power supply. Blue color denotes to quiet background while red and yellow show strong interference, many dB above noise.

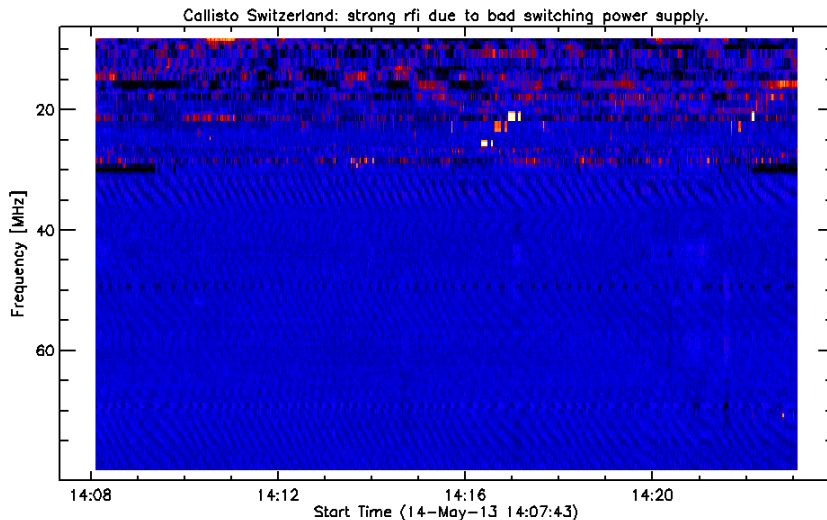


Figure 3: Improved spectrum after switching off the noisy old switched power supply.

### What did we learn?

Before using an unknown power supply in radio astronomy, first check it with a spectrum analyzer connected via a DC-block (capacitor) to the DC-output. If you find any interference coming out of the DC output, drop the power supply into the garbage bin or sell it as a broad band noise source on eBay.

### Further reading:

R-RA-769 : Protection criteria used for radio astronomical measurements

<http://www.itu.int/rec/R-REC-RA.769/en>

National Telecommunications and Information Administration

<http://www.ntia.doc.gov/legacy/osmhome/international/CISPR.html>



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. Email: [monstein\(at\)astro.phys.ethz.ch](mailto:monstein(at)astro.phys.ethz.ch)