

Lightning destroys low noise amplifier in a new Callisto observatory

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At the end of April 2013 a new Callisto solar radio observation system was installed at Hvezdaren (observatory) in Roztoky, Slovakia. Within just a few days nice solar radio bursts were recorded as shown in the Callisto Blog here: <http://e-callisto.blogspot.ch/>. Unfortunately, the antenna lightning protection was not completely finished and there was also no protection circuit or filter installed for the electrical mains.

On May 21st there was a strong local thunderstorm with lightning as can be seen in the radio spectra in figure 1. The vertical, short duration structures look like a group of type III solar radio bursts. The physical process behind lightning (a hot plasma and magnetic fields) is similar to solar radio bursts, but it is not the same source of course. Nevertheless, these terrestrial bursts are quite dangerous to a radio telescope, especially when it is not protected from them. Fatal consequences – radio spectra observed with a lightning-damaged amplifier - are shown in figure 2.

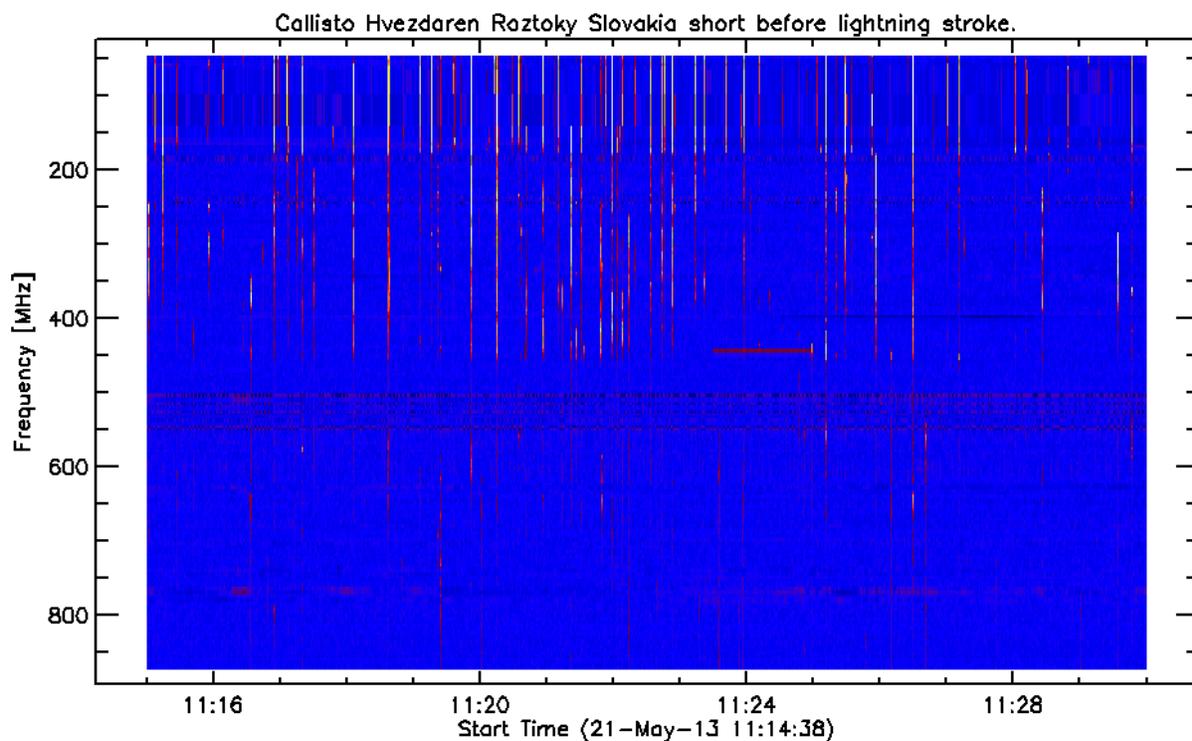


Figure 1: Radio spectrum with large amount of individual lightning strokes (bright vertical structures). Horizontal structures are due to local RFI (broadcast television-transmitters). Blue color denotes to background noise of the receiver and sky.

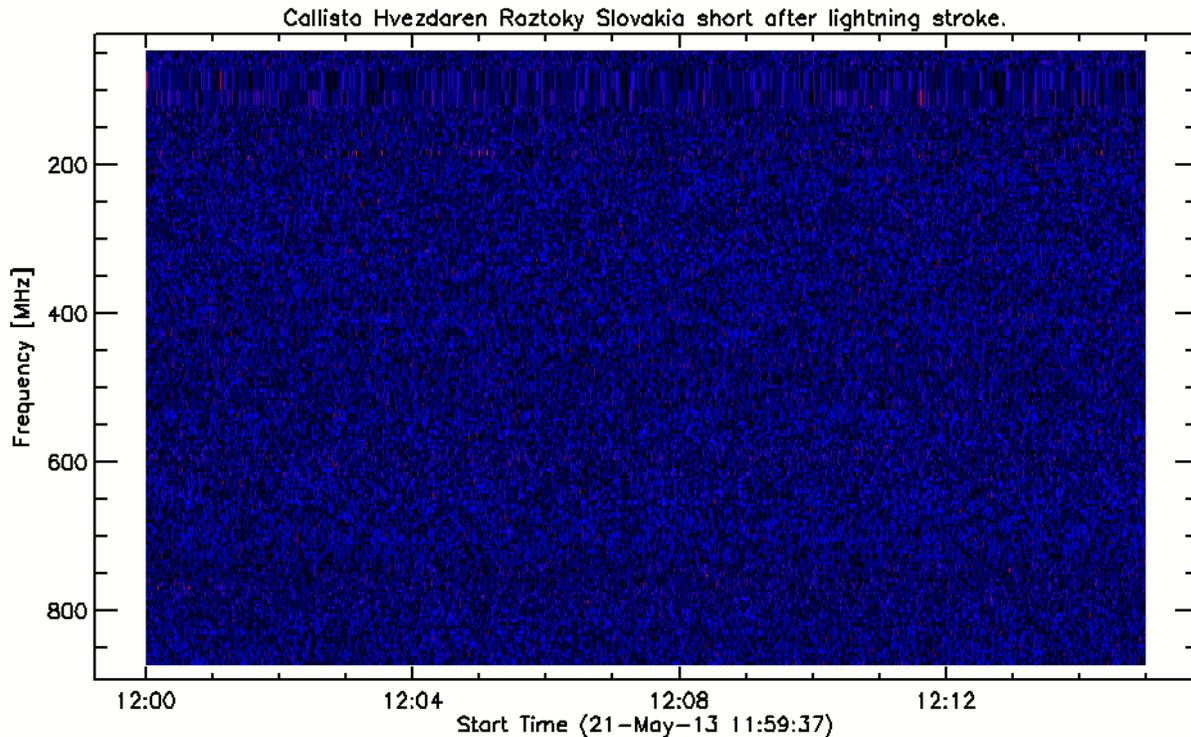


Figure 2: Spectrum after lightning strokes damaged the preamplifier, a Mini-Circuits low noise amplifier. The amplifier no longer provides amplification, and we only see receiver noise and no signature of any local RFI from nearby transmitters. One might get the impression the installation is in a radio quiet area with no RFI but this is obviously wrong.

What did we learn?

Before installing sensitive devices like a low noise amplifier or a receiver and connecting it to an antenna, one should really take care of an appropriate lightning protection system.

Further reading:

http://www.lightningsafety.com/nlsi_lhm/lpts.html

<http://www.lightning.org/>

http://www.serec.ethz.ch/EVENTS%20WEF%202011/LIGHTNING_14OCT11/5_The%20IEC%20EN62305%20Standard_BOUQUEGNEAU.pdf