

CALLISTO status report

Questions to potential users

Since our man power is very limited, we would like to design the necessary software in such a way that we get some useful tools as soon as possible with the option to update it in a later step. The following list shall be discussed to find a common understanding and an acceptable solution.

1. Do you really want polarization information?
 - a. Yes, I will measure LEFT and RIGHT circular polarization
 - b. No, I'm happy with one linear polarization, that saves me a lot of money and time
 - c. No, I'm happy with two linear polarizations, that saves me a lot of money and time
 - d. I don't know , it's still TBD

2. If your answer in (1) is a=YES, do you have a potential supplier for a 90° 3dB-quadrature hybrid (ANAREN, MERRIMAC, NARDA, etc.)?
 - a. Yes, I have a supplier for full bandwidth from ~40MHz - ~860MHz
 - b. No, but I have access to several sub band hybrids and we want to switch hybrids in real-time
 - c. No, but we are happy with one sub band and thus we don't need hybrid switching

Remarks:

Switching of the hybrids in the FPU is technical possible, it among others is used in PHOENIX-2 to select L- or R-polarization. Switching of hybrids needs a lot of rather expensive PIN-switches and they produce a lot of NF (noise figure). One has to know that these switching signals produce a lot of 'man made noise'. Both, rising and falling edges of the switch control signal are in the range of 20nsec to 50nsec depending on cable quality and cable length. Although shielded twisted pair cables are used, the edges produce a broad band radio spectrum mainly within 20MHz and 50MHz including some unwanted harmonics in the higher bands. Switching of the FPU is no problem if it should be the one and only radio telescope. But as soon as there are other telescopes in the same area one has to be very careful not to disturb the other instruments.

The decision for polarization or not, whether switching or not influences the start up design of the software on RCU (receiver control unit) and also the software on the Host controller and to some extend also the software in the FPU (focal plane unit controller). At the moment our tests are made with no switching within the FPU. We fed both polarization signals of the hybrid with two separate coax cables to 2 separate receivers. L- and R-signals are thus measured in parallel at the same time. Up to now (nowhere in the world) we have found any hybrid which is capable to work from ~40MHz up to ~865MHz. We have only access to an ANARAN-hybrid working from 250MHz to

1GHz. If you are aware of a potential supplier for broad band hybrids we were really interested to know about. Another solution might be to work with broad band circular polarized antennas instead of using linear polarized antennas plus 90° hybrid but I have no idea where to get such an antenna. A third solution could be to work with one CALLISTO above 250MHz including polarization from one FPU with linear antennas and hybrid. Additionally, a second CALLISTO on a separate antenna plus FPU below 250MHz could be used in linear mode.

Actual work:

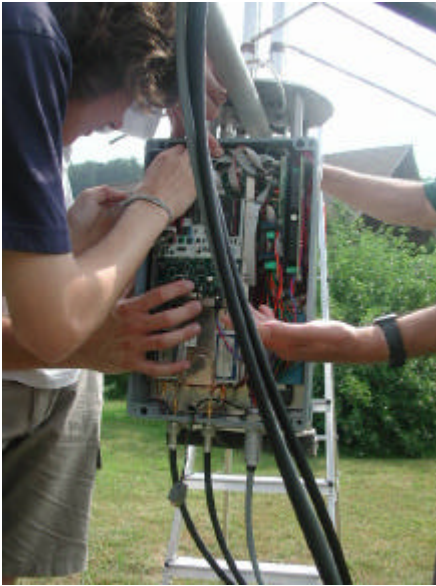
A test setup has been installed at (private) observatory Ottoberg to get familiar with 'out of the office' effects. The chosen place is quite quiet in terms of electromagnetic noise. A steel tower is available to control the log per antenna in both azimuth and elevation. Calibration data have been produced to check hardware and software. These results will be sent out in another document.



Pierre Aubry HB9XM in front and myself behind pushing the heavy stainless steel tower. We are trying to set up the antenna system at Ottoberg observatory. Hansueli is on the pulley to lift it up (not visible).



Here is another view of antenna and FPU. The fuel canister on the right side is filled with pure water to counter balance the heavy antenna on the elevation rotor. The antenna without reflector has only little gain. Thus the quiet sun can only be seen by applying appropriate software tools and methods to the raw data. A reflector of at least 5m diameter is necessary to 'see' quiet sun.



Apprentice Pascal fixes some boards and cables in the FPU before lifting up the whole system. On the bottom of the FPU we see 2 coax cables coming out for both polarizations and a gray control – and power cable to supply the FPU.



From left to right:

- power supply FPU and power supply receiver + RCU
- gray plastic box contains 2 receivers and the RCU (receiver control unit)
- 1st laptop one to control RCU and to save observation data
- 2nd laptop to control the FPU
- 3rd laptop for software updates and documentation

Comment: One should have laptops with at least 3 free RS232 interfaces! For the future it might be easier to take an ordinary PC with 3 RS232 connectors.

All the stuff behind the first row doesn't belong to CALLISTO project, it represents toys of Pierre.