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HALCA Spacecraft Calibration

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Abstract. On February 12, 1997 the world's first dedicated VLBI spacecraft, HALCA, was successfully launched as the space borne element of the VSOP mission. This paper describes the calibration observations that have been undertaken so far with this spacecraft.

1. Introduction

Figure 1 shows a simplified block diagram of the HALCA spacecraft and Table 1 provides a summary, as a function of the three observing bands, of the calibration observations undertaken so far with HALCA.

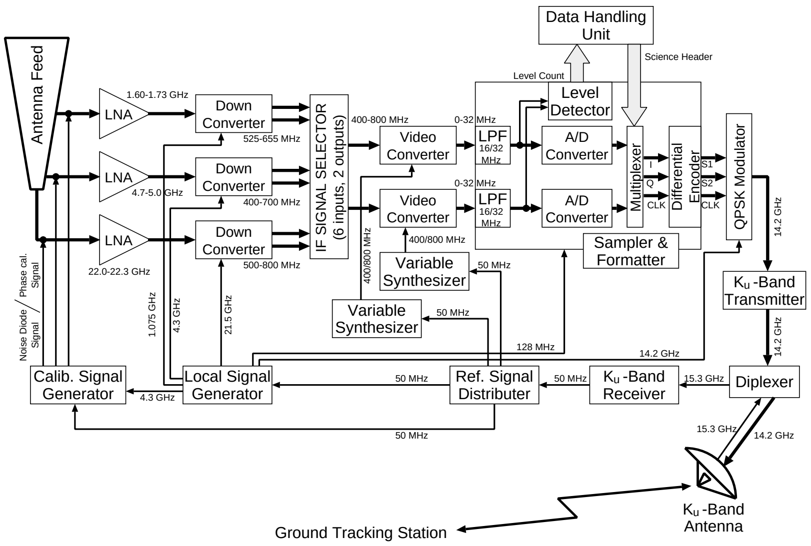

Figure 1. Simplified diagram of the HALCA science subsystem.

Table 1. Summary of HALCA calibration observations.

Measurement	1.6 GHz	5 GHz	22 GHz
System temperature: frequency characteristics	X	X	X
System temperature: temporal stability	X	X	X
System temperature: eclipse length dependence	-	-	-
Pointing offset determination	X	-	-
Aperture efficiency	X	-	-
2-bit sampler statistics	-	X	-
Antenna temp increase due to the Earth	X	X	X
IF power as function of LO freq	X	X	X
IF power as function of D/C attenuator level	X	X	X

2. Major Results

- The 1.6 GHz and 5 GHz system temperatures are better than their pre-launch nominal values and are measured to be ≈ 80 K and ≈ 100 K at the input to their respective LNAs.

- Unfortunately, the system temperature measured at the input to the 22 GHz LNA is twice the nominal pre-launch value of 200 K. Observations of the Earth have led to the conclusion that there is an increased attenuation between the feed and the 22 GHz LNA. It is hypothesized that this attenuation increase is due to distortion of the waveguide from launch vibrations. The impact of this increased attenuation on the VSOP 22 GHz scientific program is currently being assessed.

- L-band pointing offset measurements, using a 5-point cross scan technique, have been undertaken with the OH maser sources W49N and Sgr B2. C-band and K-band pointing offsets are presently being determined.

- The L-band aperture efficiency has been measured to be 40% ($\pm$ 5%) which is close to the predicted pre-launch value of 38%.

3. Conclusions

With the exception of the K-band system temperature, calibration observations of the HALCA spacecraft have shown that the science subsystem is performing well.