Antenna S_{11} Measured Between Nov 07 and 10, 2014

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November 10, 2014

Description

This report shows the antenna S_{11} measured at the MRO between Nov 07 and 10, 2014. These measurements were done taking advantage of a few days when the receiver was not running due to a problem with the temperature control. Therefore, the front-end was not temperature-controlled when doing the S_{11} measurements either. In principle, this is not a problem since there are corrections available to keep the measurement plane calibrated despite the temperature changes.

A total of $\sim$ 51 hours of measurements were taken, at a rate of almost exactly 1 trace per minute. The measurements started on UTC Nov 07, 22:30, which corresponds to Nov 08, 06:30 at the MRO. The first two hours of data were discarded as a precaution since the switch that chooses between the antenna and the VNA calibration standards was varying quickly, reaching thermal equilibrium with its surroundings. Therefore, a total of $\sim$ 49 hours of data are shown in the following slides, starting at 08:30 local time.

This is meant to be a superficial analysis, presenting only first-order changes in antenna S_{11}.

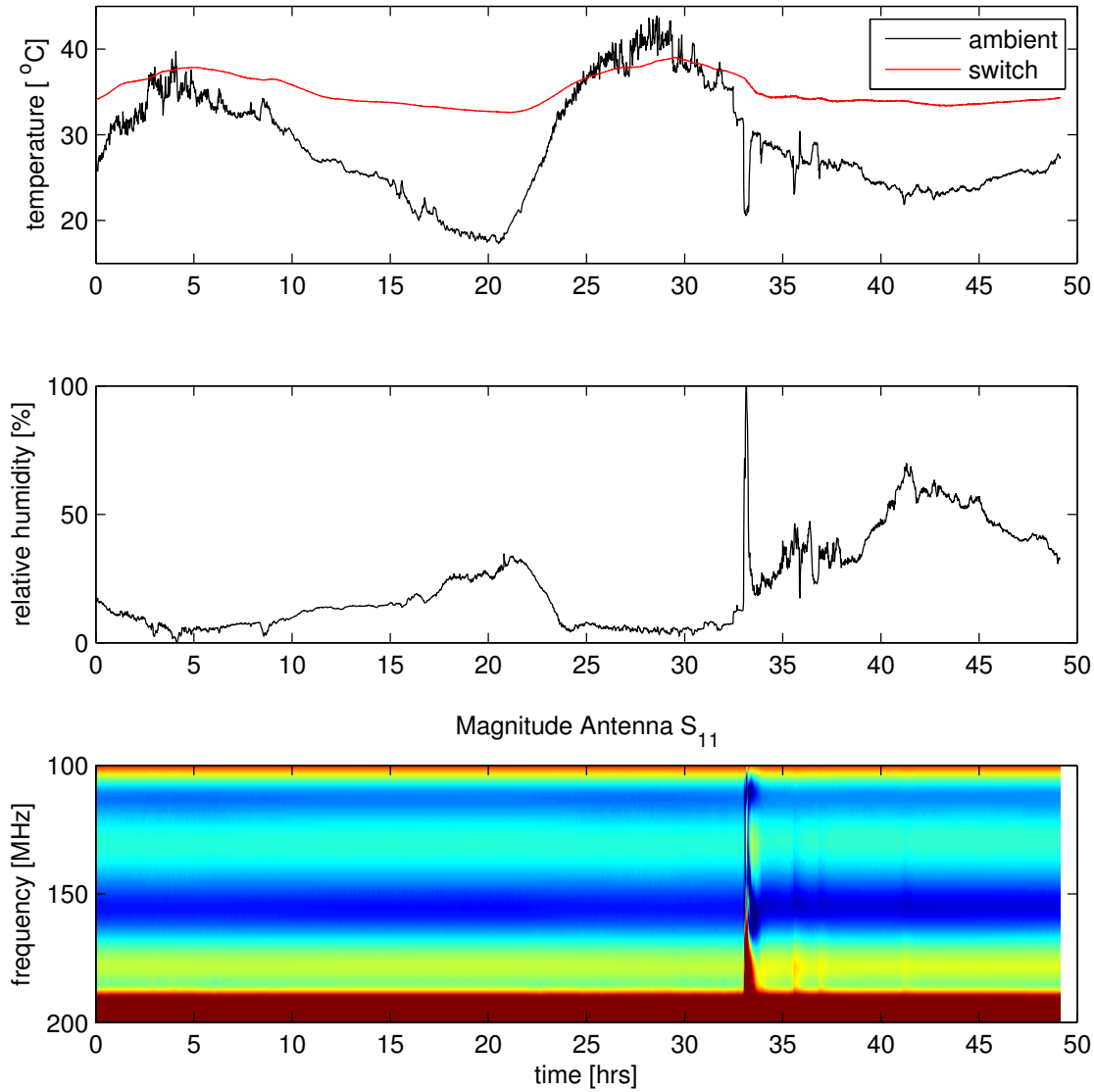

Figure: (1) TOP: Temperature of air and of the VNA switch inside receiver. MIDDLE: Relative humidity. The peak at $\sim$ 33 hours evidences rain, which is also consistent with the drop in ambient temperature at the same time. BOTTOM: Rain clearly affected S_{11} at $\sim$ 33 hours. Other significant changes are observed between 35 and 37, and at $\sim$ 42 hours. The plots start at 08:30 local time.

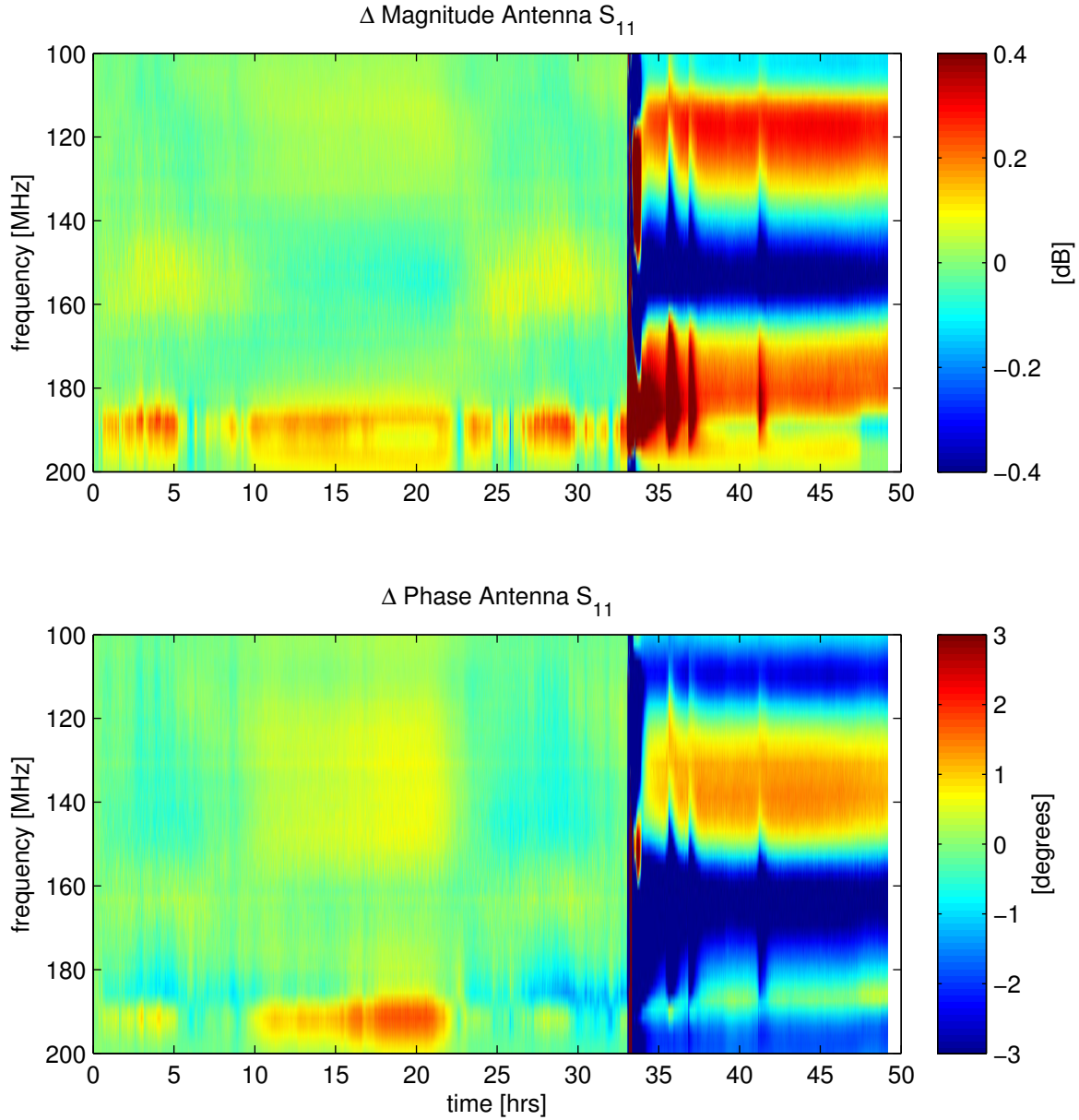

Figure: (2) Changes in S_{11} relative to the first trace. The most prominent feature is the change due to rain at 33 hours, which remains even after the last shaking at 42 hours. This would need to be assumed as the new state of the antenna.

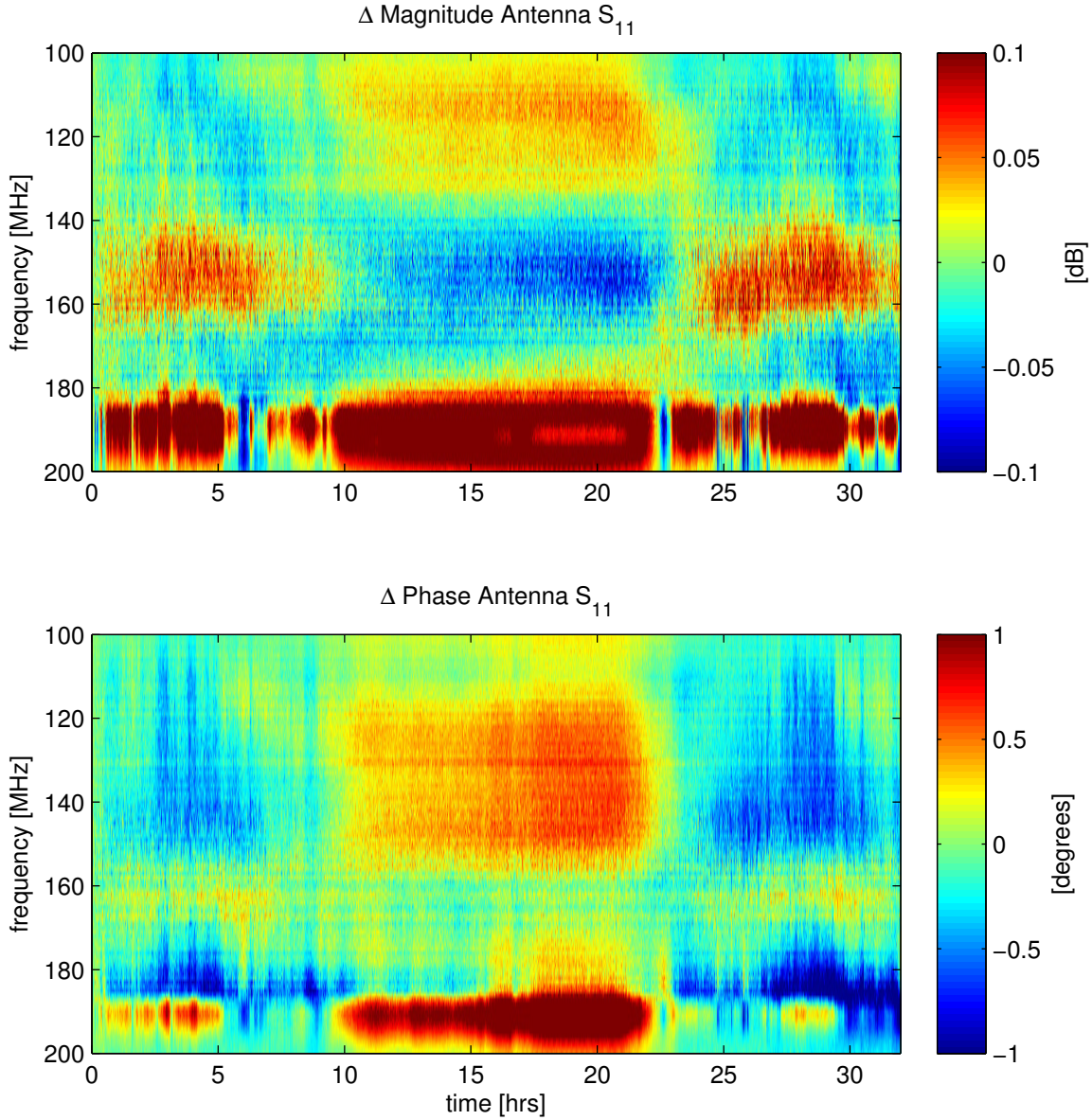

Figure: (3) Detail of changes in S_{11} relative to the first trace, for the first 33 hours (before the rain). Discounting the data above 180 MHz which show large changes, S_{11} varies within ± 0.07 dB and $\pm 0.7°$. The air temperature variation was $\sim 25°$C. As expected, to first order the variations are repeatable every 24 hours.

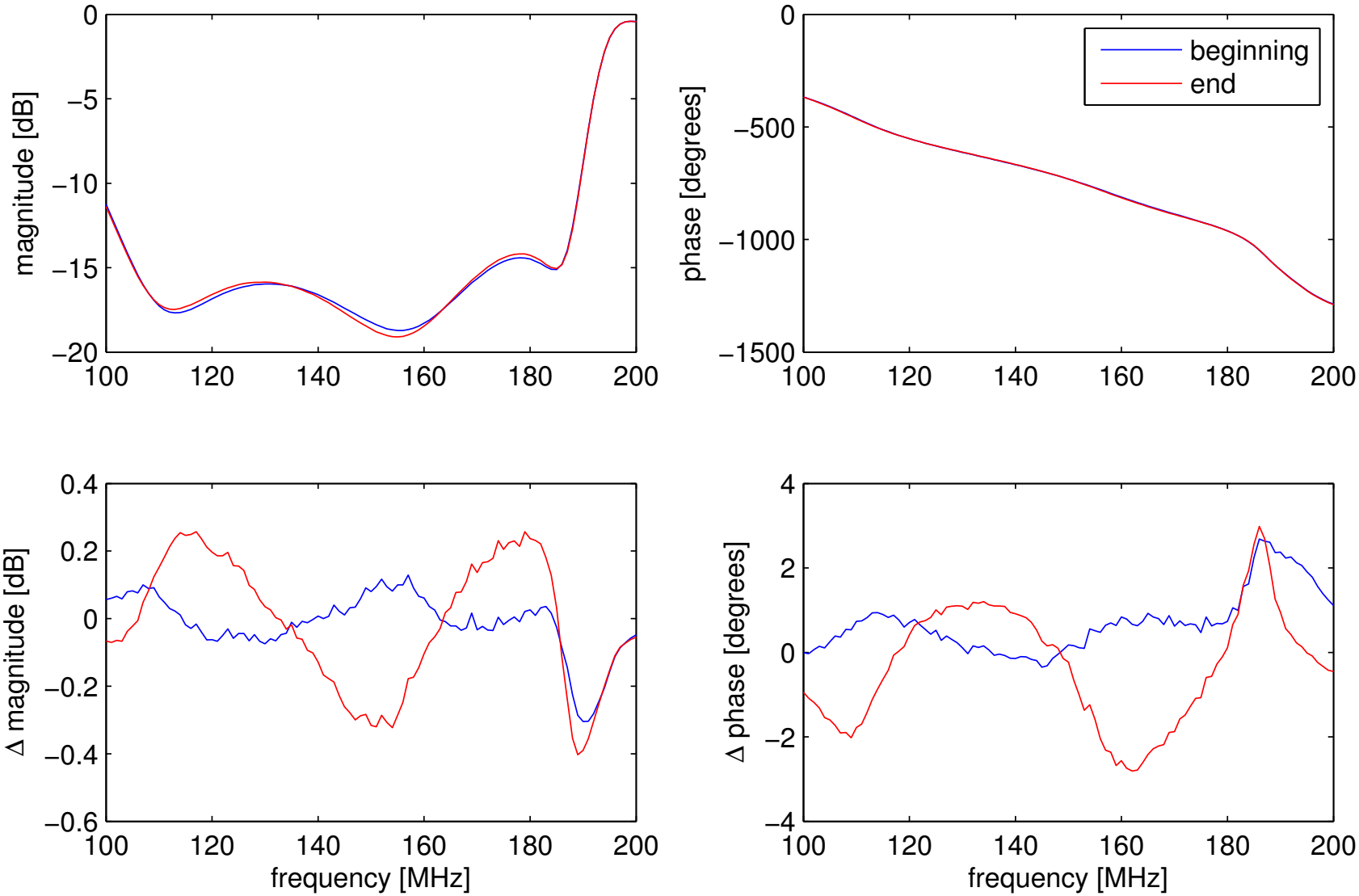

Figure: (4) TOP: Magnitude and phase of the first and last traces of the 49-hour measurement. The difference between the two (not evident for the phase) is due to the rain episode. BOTTOM: Difference between first and last traces of the present analysis, relative to the trace measured on day 301 after tuning (made available as "day2.txt").