

Reflection Coefficient Measurements of the EDGES High-Band Fourpoint Antenna Starting on 2015/06/06

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Description

The reflection coefficient of the high-band fourpoint EDGES antenna was measured between UTC 2015/06/06-03:51:00 and 2015/06/10-18:37:00 (~ 4.5 days). There were clear skies and stable weather during that period, which allows to quantify the stability of the antenna under good conditions.

The time resolution of the calibrated measurements is 1 minute. In other words, within 1 minute the automated system measures the reflection standards (open, short, match) and the antenna. At this rate, 6612 calibrated antenna reflection traces were produced for the ~ 4.5 days.

The first-level calibration references the antenna measurement to the 4-position switch (where the standards are connected), and the final calibration yields the antenna reflection referenced to the $50\text{-}\Omega$ impedance at the input of the receiver. With the receiver kept at 25°C , the 4-position switch stayed at a temperature of $\sim 29 \pm 1^\circ\text{C}$ throughout the measurement (after a 30-minute stabilization period).

The dew point temperature stayed at least 3.6°C below air temperature. This closest approach occurred in the first night of measurements when the relative humidity reached $\sim 80\%$.

In summary, the variations in reflection coefficient stay within ± 0.05 dB and $\pm 0.4^\circ$ below 190 MHz, in the ambient temperature range $11.8^\circ\text{C} - 29.2^\circ\text{C}$, after sufficient noise averaging.

The results are presented in the following figures.

Results

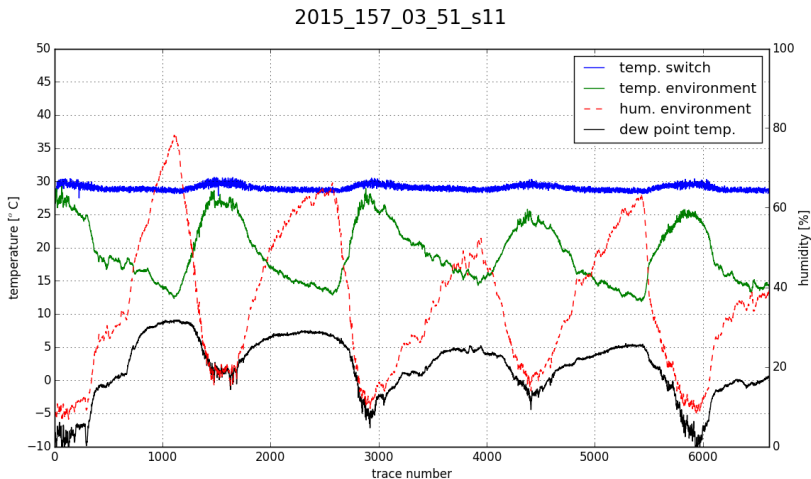


Figure : (1): Temperature of the 4-position switch, along with ambient temperature, humidity, and dew point temperature, which stayed at least 3.6°C below ambient temperature.

Results

2015_157_03_51_s11

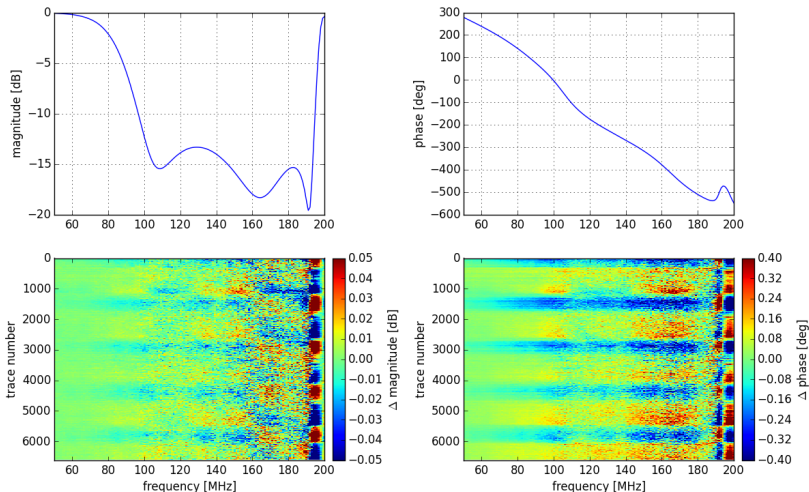


Figure : (2): (TOP) Average reflection coefficient, and (BOTTOM) variations from the average. The variations stay within ± 0.05 dB and $\pm 0.4^\circ$ below 190 MHz, in the ambient temperature range $11.8^\circ\text{C} - 29.2^\circ\text{C}$, after sufficient noise averaging.

Results

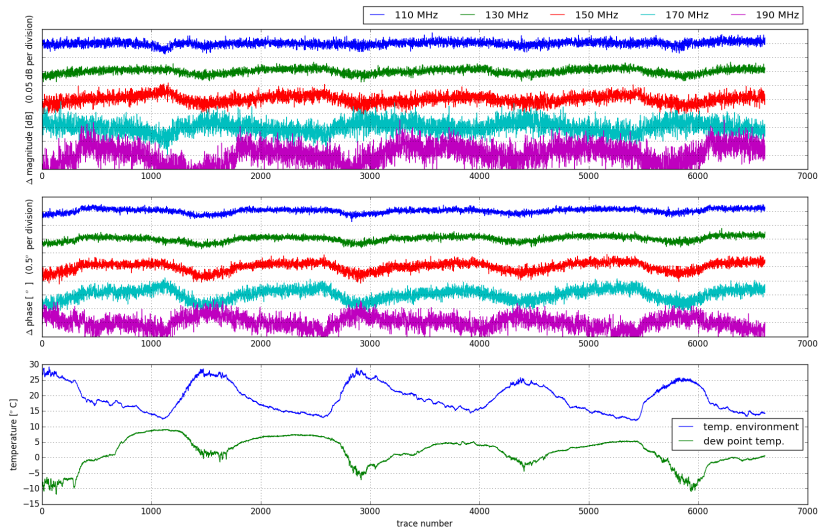


Figure : (3): Time evolution of 5 representative frequency channels (110, 130, 150, 170, and 190 MHz), and corresponding temperatures.

Results

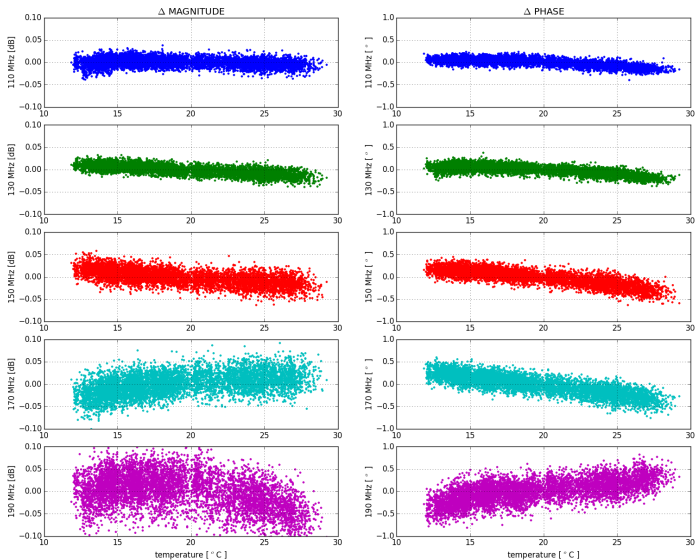


Figure : (4): Correlations between reflection and ambient temperature.