Reflection Coefficient of Internal Calibration Standards

Raul A. Monsalve
raul.monsalve@colorado.edu

CASA, University of Colorado Boulder
SESE, Arizona State University

August 16, 2017

Here we show the reflection coefficient of the internal OSM reflection standards attached to the 4-position switch of the Low-Band receivers. These reflection coefficients are measured and calibrated in the lab, after measuring the reflection coefficient of the Keysight 3.5-mm absolute calibration standards at the receiver input. Measuring the reflection of the internal OSM is part of the approach that we call 'the alternative method' in report #102, for calibration of the antenna reflection coefficient measurement. We point the reader to that report for a description of this method.

Compared to the S-parameters of the front-end network, which are computed in the traditional method (see report #102) and represent a combination of devices in a more abstract way, the reflections of the internal standards are a quantity that can be associated with a specific device and provide more intuition for performance evaluation. If the reflections of the internal OSM standards are computed for different repetitions of the receiver characterization, we can monitor their stability over time, their dependence on temperature, etc.

We show the calibrated reflection of the internal OSM of the Low-Band 1 and Low-Band 2 receivers. In particular, for the Low-Band 1 receiver we show measurements done in 2015 with the receiver at $15°$C, $25°$C, and $35°$C, and also done in 2017-05 and 2017-07 at those same temperatures. For Low-Band 2 receiver we show measurements done in 2016-06 and 2016-09, both at $25°$, before the receiver was taken to the field.

1 Results

The calibrated measurements are shown in the following figures. In summary:

1. For the Low-Band 1 receiver (Figures 1 and 2), the measurements of the internal match in 2015 and 2017 show high scatter, especially the phase. The 2015 measurements were done at three temperatures, but no pattern is observed as a function of temperature. In 2017 there is a clear change in the phase at $15°$C, relative to $25°$C, but at $35°$C there is no significant change.

2. For the Low-Band 2 receiver (Figures 3 and 4) we have less measurements and all at $25°$C but, especially for the match, they show significantly lower scatter.

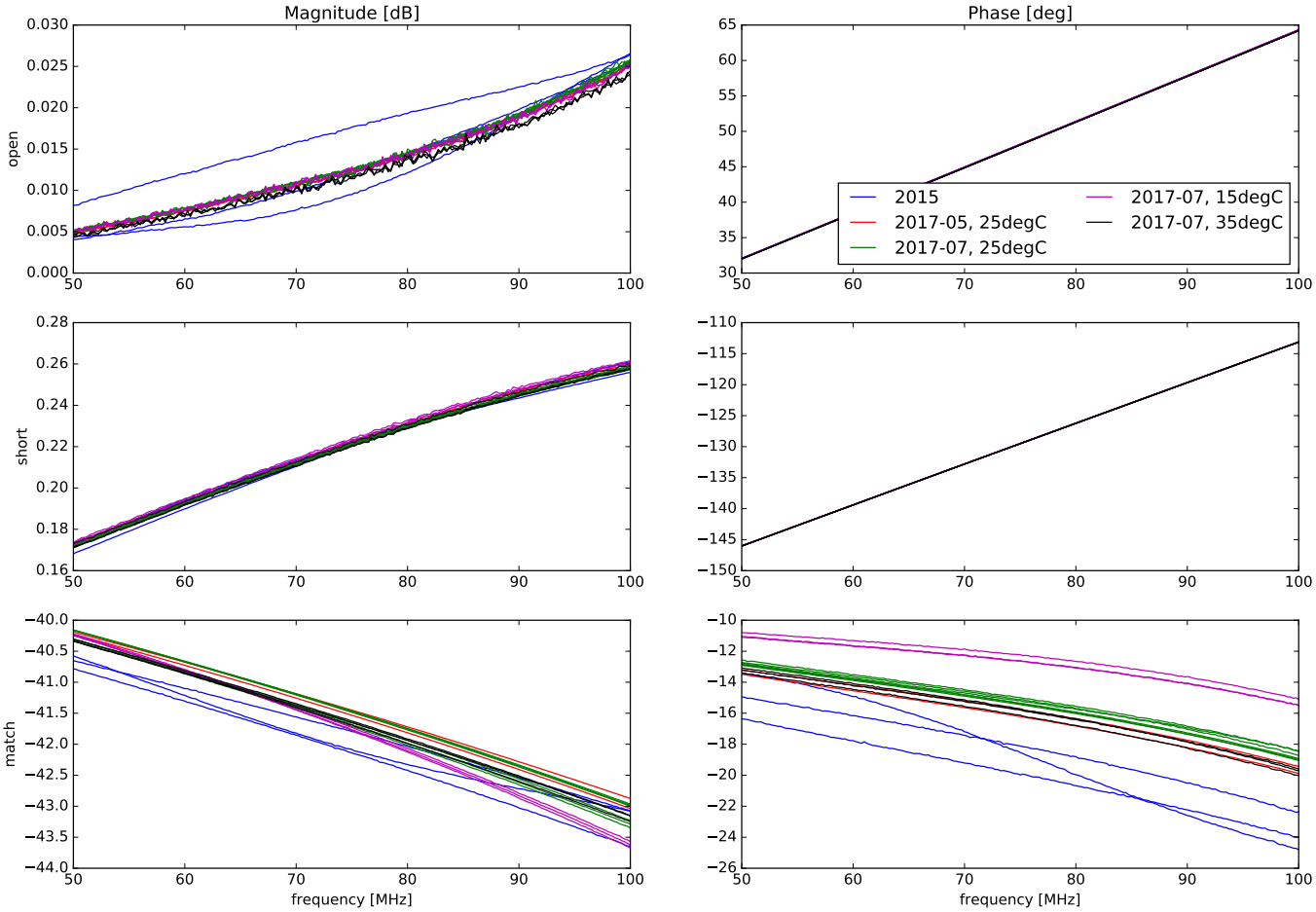

Figure 1: Calibrated reflection coefficient of the internal open-short-match standards connected to the 4-position switch of the Low-Band 1 receiver. Notice the large scatter in the measurements of the match. The measurements were done in 2015 and 2017. For 2015, the blue traces correspond to the three temperatures (15°C, 25°C, and 35°C), but since the scatter does not follow a pattern, the same color was used.

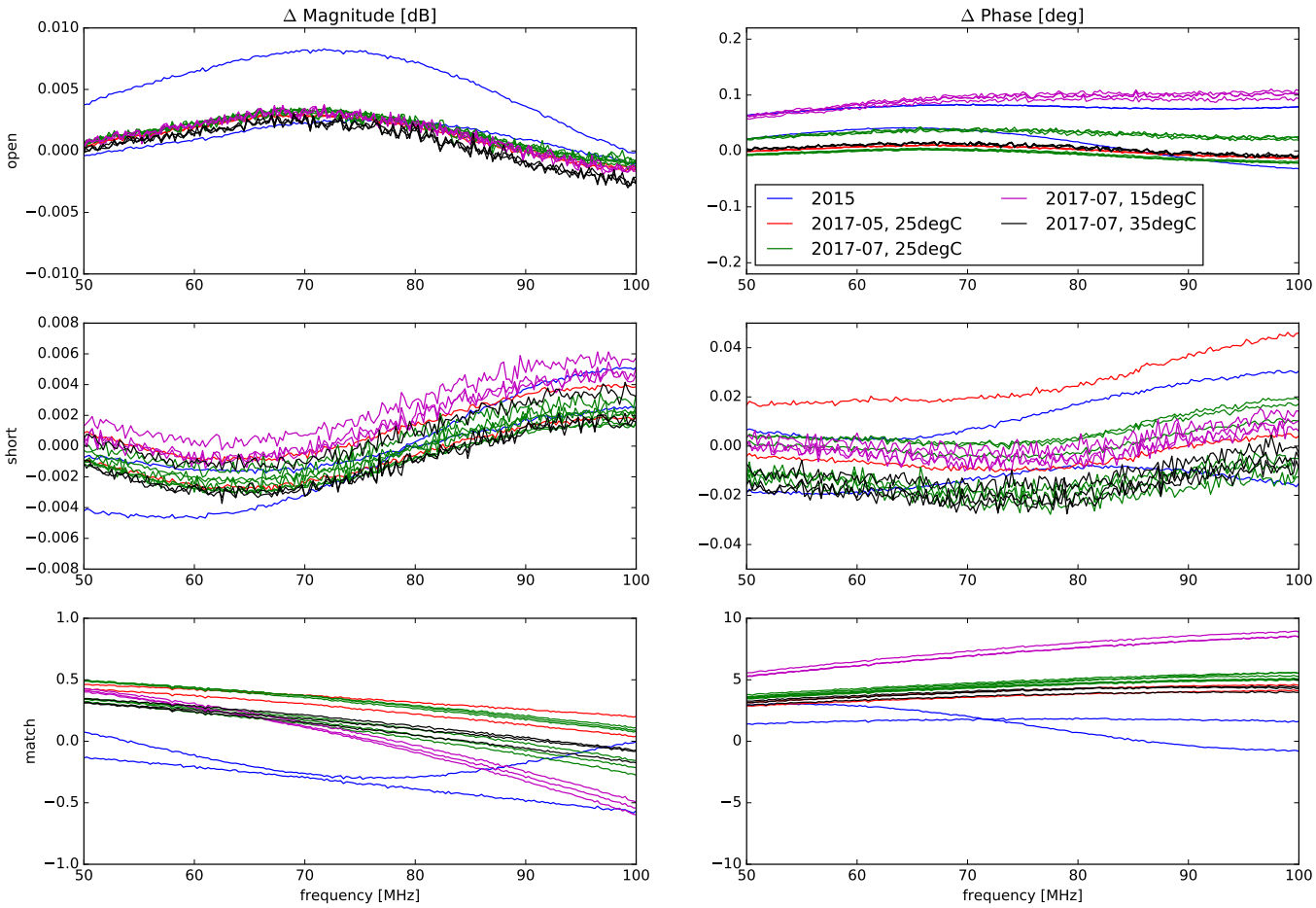

Figure 2: Difference between the measurements shown in Figure 1 and the case from 2015 at 25°C.

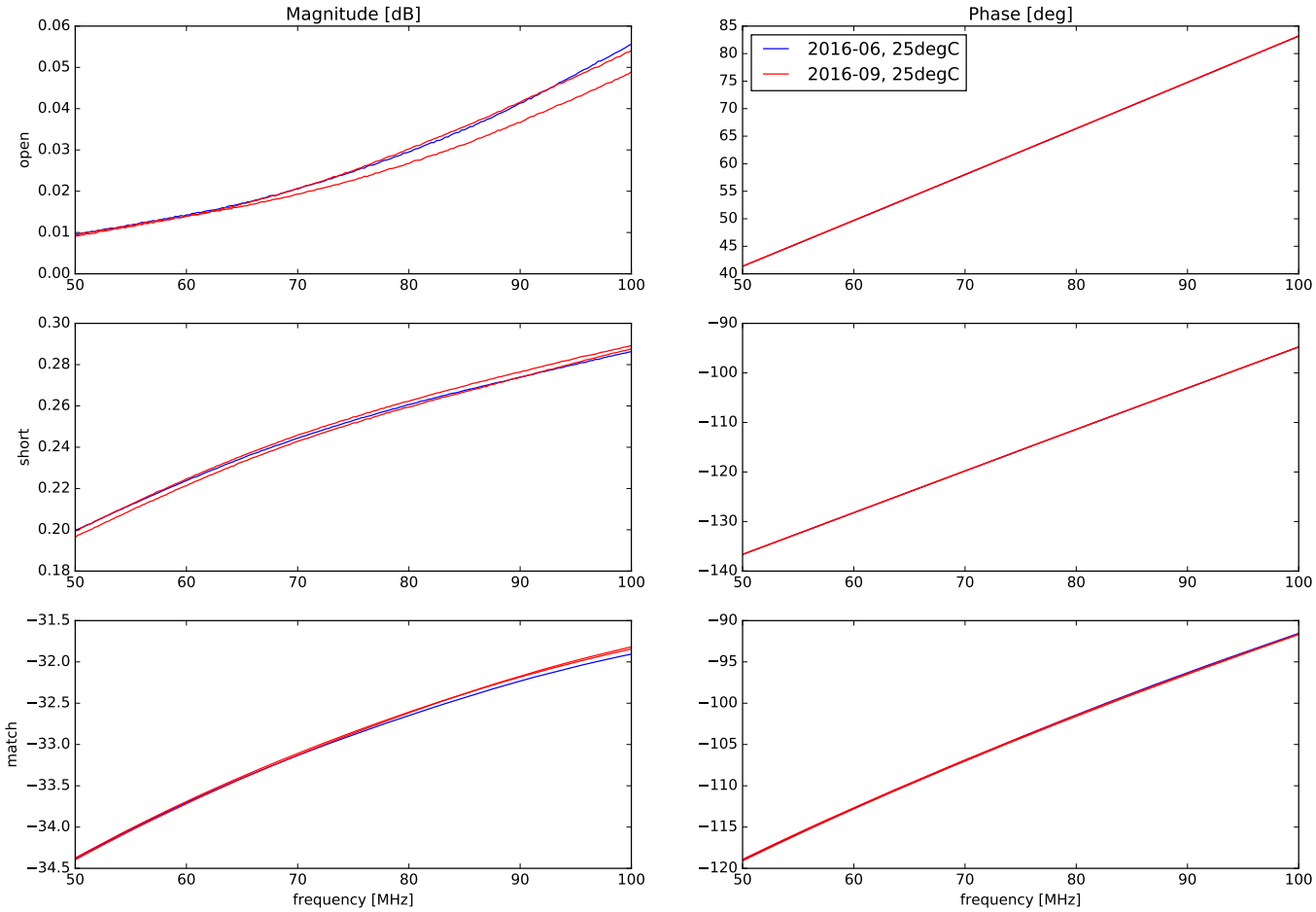

Figure 3: Calibrated reflection coefficient of the internal open-short-match standards connected to the 4-position switch of the Low-Band 2 receiver.

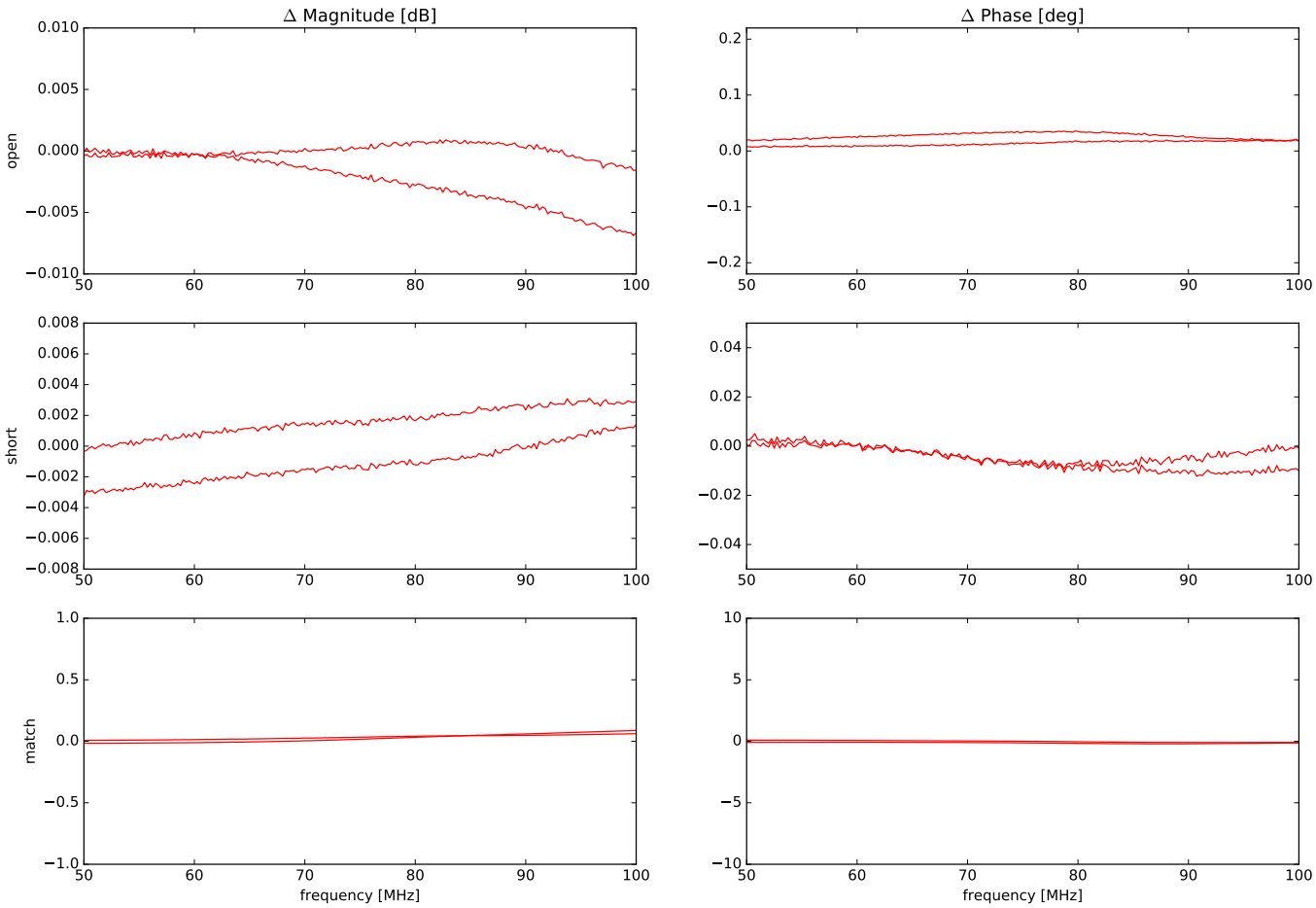

Figure 4: Difference between the measurements shown in Figure 3 and the case from 2016-06 at 25°C.