Recalibration of Lowband Receiver 02 25C

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Introduction

One of the motivations to redo the calibration was to check if the calibration procedure and equipment being used for calibration were all working as expected. Because we didn't get expected calibration results from Receiver 03 whose calibration was performed in July/August.

- Here we show the calibration results for the Low Band 2 receiver at 25°C.
- The specific calibrations considered correspond to Low-Band 2 receiver done in 2018_09.
- The calibration coefficients were estimated for the following frequency ranges:
  - 50-190 MHz.
  - 50-100 MHz
- The Calibration coefficients over the 50-190MHz were calculated for two cases and compared:
  - 7 terms for constants & 9 terms for Noise wave parameters
  - 6 terms for constants & 8 terms for Noise wave parameters
- The calibration results for the 50-100 MHz range was compared with those obtained in March 2017 (Memo 92)
- As a precaution, in order to avoid periods of instability of the calibrators, we remove ~ 5% of the data at the beginning of each period covered by the listed spectra files.
Files used:
/data5/edges/data/Receiver02_2018_09_24_040_to_200/25C

Corrected s11:
/data5/edges/data/Receiver02_2018_09_24_040_to_200/25C/S11/corrected

Note: The s11’s used in this report were the first measurement in each set.

**Standards used:**

- Male standard -50.177 ohm (25 degC)
- Female Standard - 49.999 ohm (25 degC)
Temperature of calibration loads @ 25C

Figure 2: Temperature of the calibration loads and antenna simulator 3.
Spectra data @ 25C for the loads

Figure 1: Raw spectra of the calibration loads. Top panel- blue is the data & red is the fit. Bottom panel shows the residues of the fit to the data.
There is a lot of RFI observed in the Antsim3 spectra below 60MHz (as shown in figures a & b). This is the reason the calibration of Antsim3 is show only for 60-190MHz.
Reflection coefficients of the loads @25C; Freq: 50-190MHz

Figure 3a: Reflection coefficients (Mag -top panel & phase- bottom panel) of the LNA and the calibration loads.
Reflection coefficients of the loads @25C

**Figure 3b:** Reflection coefficients (Mag -top panel & phase- bottom panel) of the LNA and the calibration loads.
Reflection coefficients of the loads @25°C; Freq: 50-100MHz

Figure 3a: Reflection coefficients (Mag -top panel & phase- bottom panel) of the LNA and the calibration loads. Also shown for comparison is the S11 obtained from 2017 measurements.
Reflection coefficients of the loads @25C

**Figure 3b:** Reflection coefficients (Mag - top panel & phase - bottom panel) of the LNA and the calibration loads. Also shown for comparison is the S11 obtained from 2017 measurements.
Cal coefficients derived from 25C; Freq: 50-190MHz

**Figure 4:** Calibration parameters for the Low-Band 1 receiver. Over 50-190 MHz, we use 6 terms to model $C_1$ & $C_2$ and 8 terms to model $T_u$, $T_c$, $T_s$. 
Figure 4: Calibration parameters for the Low-Band 2 receiver. Over 50-100 MHz, we use 7 terms to model all the calibration coefficients for both the 2017 & 2018 calibrations.
Calibration Cross check for 25 C; Freq: 50-190 MHz
Case1 - 6 terms for constants and 8 terms for noise wave parameters

**Figure 6**: Cross checks for calibration of Low-Band 2, 2018-09
Calibration Cross check for 25 C; Freq: 50-190 MHz
Case2 - 7 terms for constants and 9 terms for noise wave parameters

Figure 6: Cross checks for calibration of Low-Band 2, 2018-09
Calibration Cross check for 25 C; Freq: 50-100 MHz
Case 1 - 7 terms for constants and 7 terms for noise wave parameters

The rms of the residues obtained with Sim2 connected to Rcv2 (March 2017) is 24mK. This agrees with results in Memo 92.

**Figure 6:** Cross checks for calibration of Low-Band 2, 2017-03
Calibration Cross check for 25 C; Freq: 50-100 MHz
Case1 - 7 terms for constants and 7 terms for noise wave parameters

The residues from all the calibration loads are similar to values obtained in March 2017 calibration (compare previous slide). The RMS obtained with Antsim3 is higher than what was seen with Sim2.

**Figure 6:** Cross checks for calibration of Low-Band 2, 2018-09