

Quick Look at Changes in Antenna Reflection Coefficient When Applying Heat with Heat Guns

Raul Monsalve

SESE, Arizona State University

June 20, 2013

Description

The reflection coefficient of the antenna was measured when the air temperature was $30 \pm 1^\circ\text{C}$, and there was no Sun light hitting the antenna.

Hot air at $\sim 60^\circ\text{C}$ was applied sequentially to different parts of the antenna. Between each case, some time was given for the antenna to recover where no heat was applied.

The next plot summarizes the results.

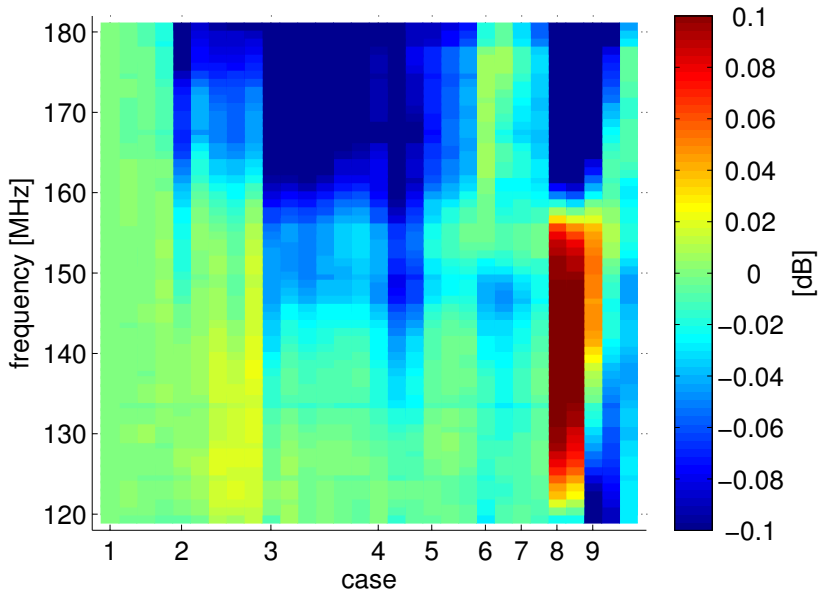


Figure: Results of heat application to the antenna.

Discussion

- ▶ The plot presents the changes in magnitude with respect to the first trace. Each trace is a vertical stripe.
- ▶ The traces were taken two minutes apart.
- ▶ The horizontal axis is labeled in terms of the different cases. The numbers indicate the beginning of each case. They correspond to:
 1. case 1: Reference traces (4 traces).
 2. case 2: Heat applied to 4 aluminum panels (5 traces).
 3. case 3: No heat applied (6 traces).
 4. case 4: Heat applied to 4 edge capacitors (3 traces).
 5. case 5: No heat applied (3 traces).
 6. case 6: Heat applied to tuner capacitor (2 traces).
 7. case 7: No heat applied (2 traces).
 8. case 8: Heat applied to copper plate (2 traces).
 9. case 9: No heat applied (3 traces).

Discussion

- ▶ Case 2 shows that when applying heat to the panels, the changes are of ~ 0.1 dB, focused on the high-frequency end, although with time changes of ~ 0.03 dB started to appear at low frequencies.
- ▶ In Case 3 the antenna was left alone for ~ 12 minutes, but instead of going back to the reference traces, an even larger change appeared at high frequencies which saturates the color scale. In fact it seems that the antenna took all the way to the end of Case 7 to get back to the reference.
- ▶ Applying heat to the edge capacitors in Case 4 seems to affect a little the already altered state of the antenna. These changes again appear at higher frequencies.
- ▶ By Case 6 the antenna seems to be approaching the reference, and applying heat to the tuner capacitor does not leave a clear signature.
- ▶ Applying heat to the copper plate in Case 8 has a very significant effect on the reflection coefficient. The perturbation peaks are larger than 0.1 dB, centered at 140 MHz and 170 MHz while pivoting at 160 MHz.
- ▶ In Case 9 the antenna takes 3 traces (~ 6 minutes) to converge to the reference again, with some residuals of ~ 0.04 dB.