EDGES MEMO #210

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To: EDGES Group

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Subject: Second low band antenna and balun tests

Figure 1 shows the second low band antenna on small metal ground plane for an initial test at Haystack. The top cap plate height and panel gap were adjusted to the value of the low band blade antenna currently in operation at the MRO as shown in Figure 2.

In testing the antenna, the top plate was a tight fit and when disassembled after S11 test the center conductor had rotated and broke the solder joint at the connector. Upon study it was found that while the LORD 305-1/2 epoxy bonded well to the outer brass tube it did not bond securely to the center conductor owing to the presence of a coating used to protect the copper plating. The center conductor was removed and the coating was removed in the area where the epoxy bond takes place. In addition, a 60° chamfer bit tool was used to increase the area of contact between the polystyrene spacer and the center conductor as shown in Figure 3. Figure 4 shows the solder joint between the center conductor and the antenna connector and Figure 5 shows the S11 measured. The ripples in the S11 are due to nearby objects.

The loss was measured on the bench with the end open but covered with an extension to the tube and shorted as shown in Figure 8. The S11 open and short results are shown in Figures 6 and 7 respectively and are close to the measurements made on a "test" balun reported in memo 181. It is suggested that balun open and short measurements be made in the field during antenna and receiver installation.

The loss of this balun was measured at the MRO in June 2017. Figures 9 and 10 show the results and comparison with model using

44.5" length for S11_open_balun_2017_152.txt

43.2" length for S11_shorted_balun_2017_152.txt

The conductivity for the brass tube was assumed to be 0.29 times that of the copper inner conductor. The SC3792 connector was modeled using the manufacturer's dimensions, a dielectric constant of 2.05, conductivities of 0.024 and 0.24 for the outer and inner conductors and 100 ps delay.

Figure 1. Second low band antenna under test at Haystack.

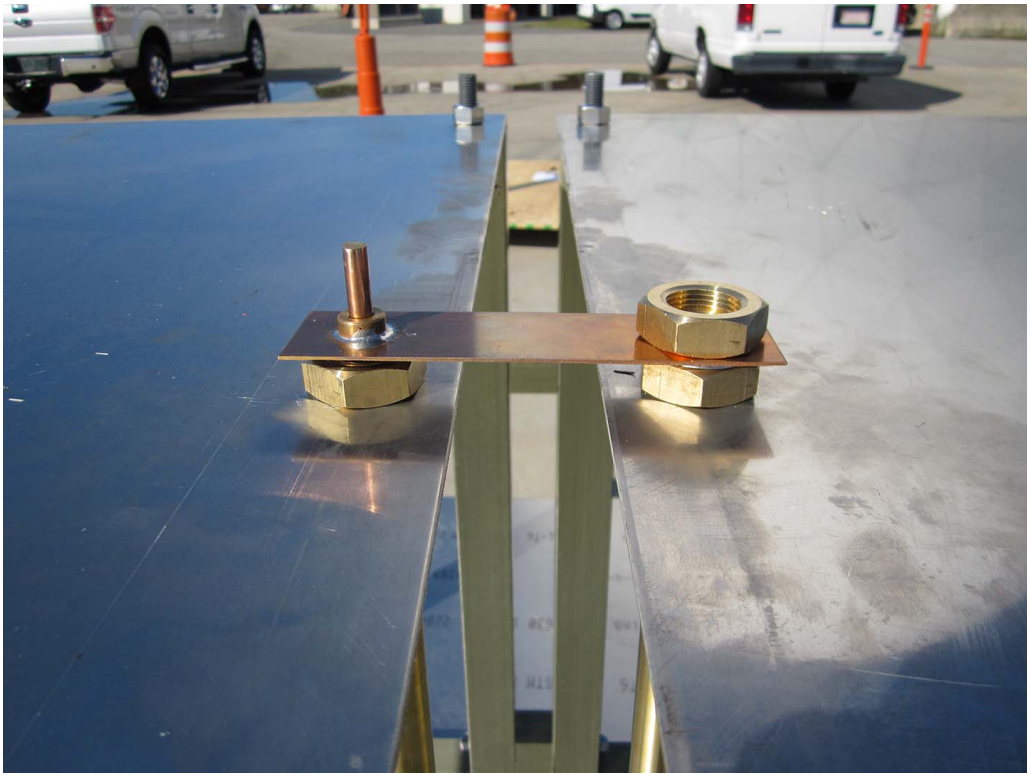

Figure 2. Top cap plate adjusted to 0.61” from panel set to gap of 1.955”.

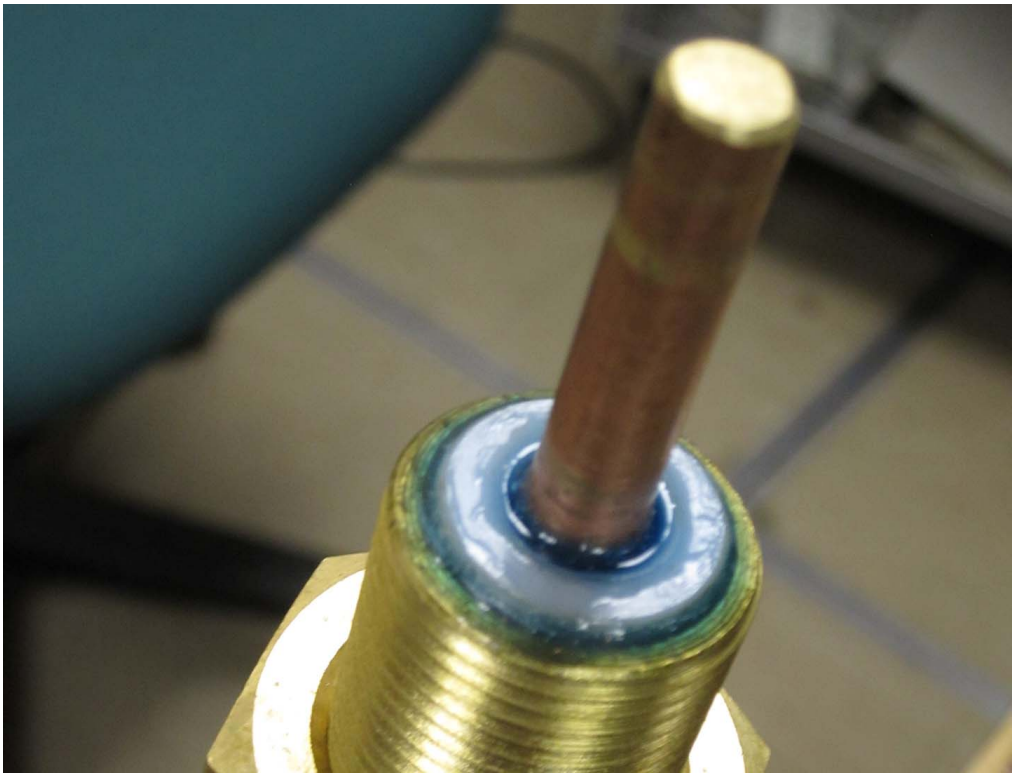

Figure 3. Balun center conductor bonded to balun tube using LORD 305-1/2 epoxy.

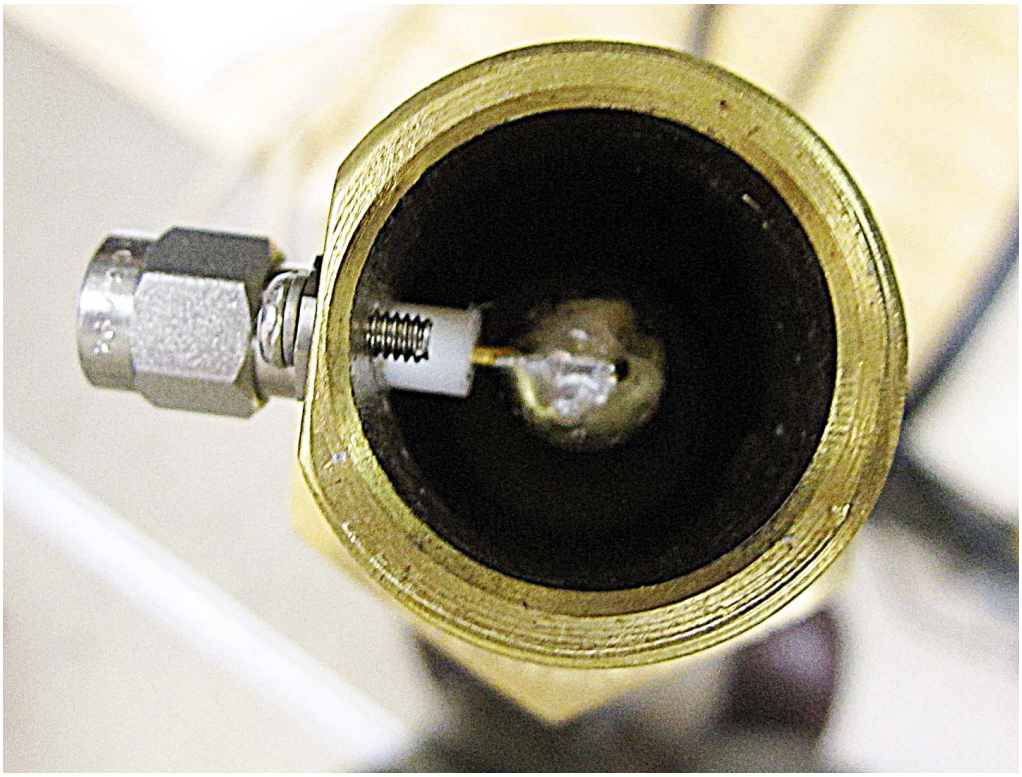

Figure 4. Center conductor soldered to Fairchild microwave SC3792 SMA male connector shown with polystyrene plug removed.

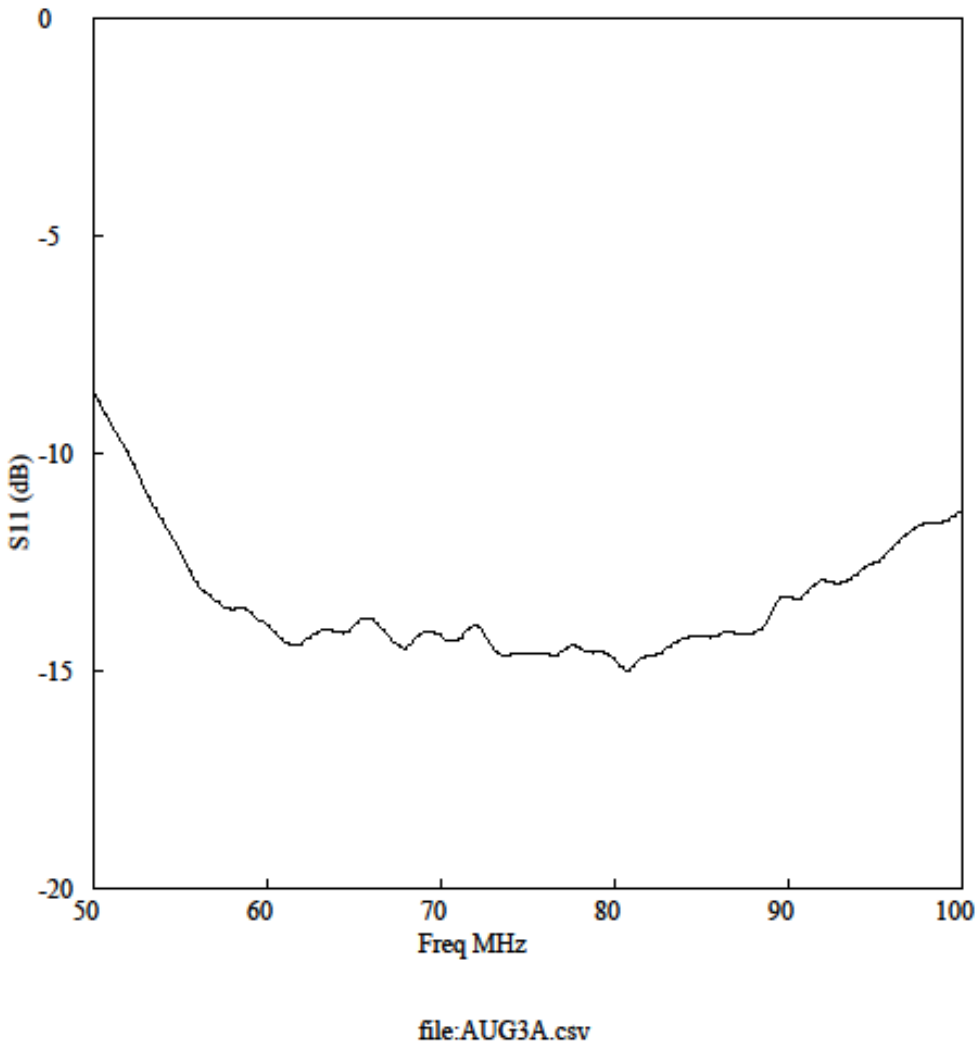

Figure 5. Antenna S11 magnitude on test ground plane.

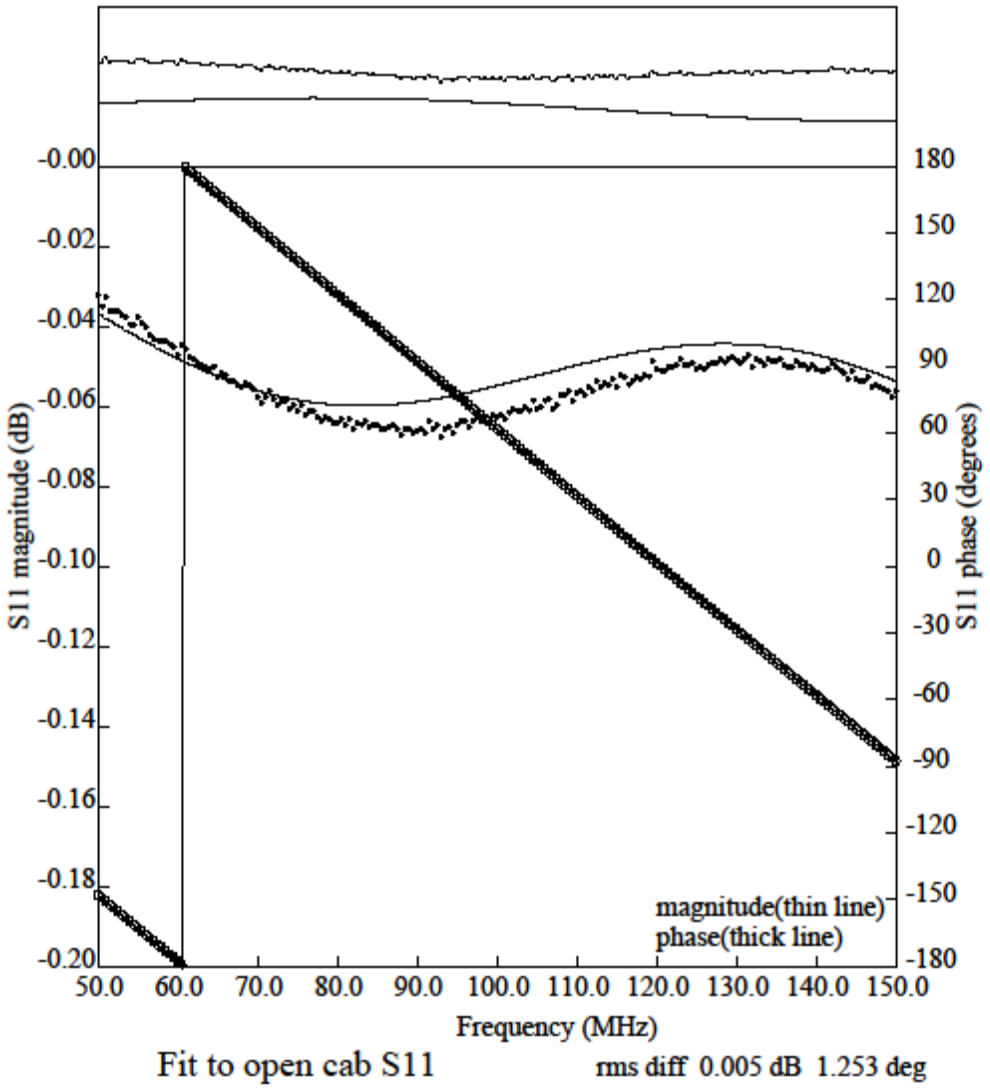

Figure 6. Balun S11 measured with open end.

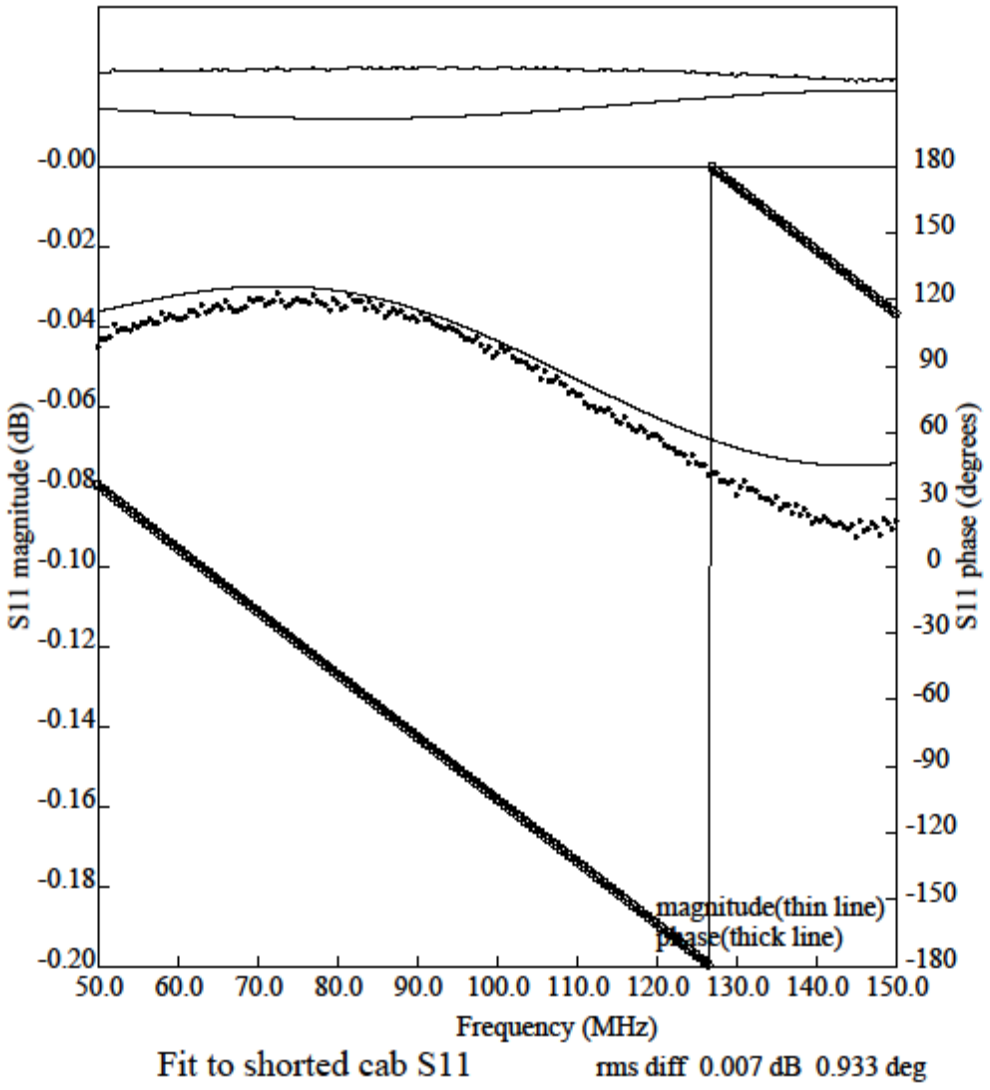

Figure 7. Balun S11 measured with short shown in Figure 8.

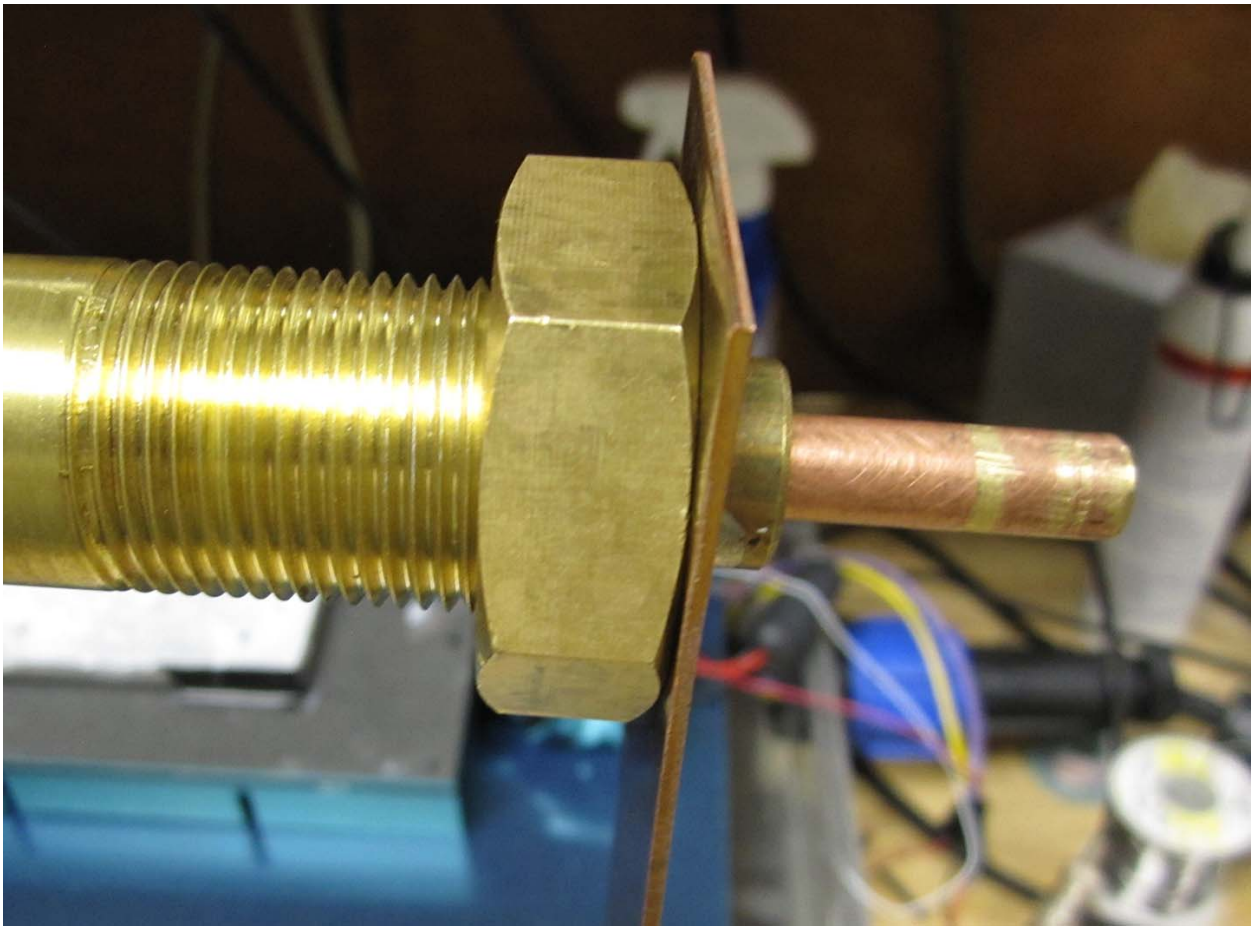

Figure 8. Balun end shorted with nut tightened against top cap.

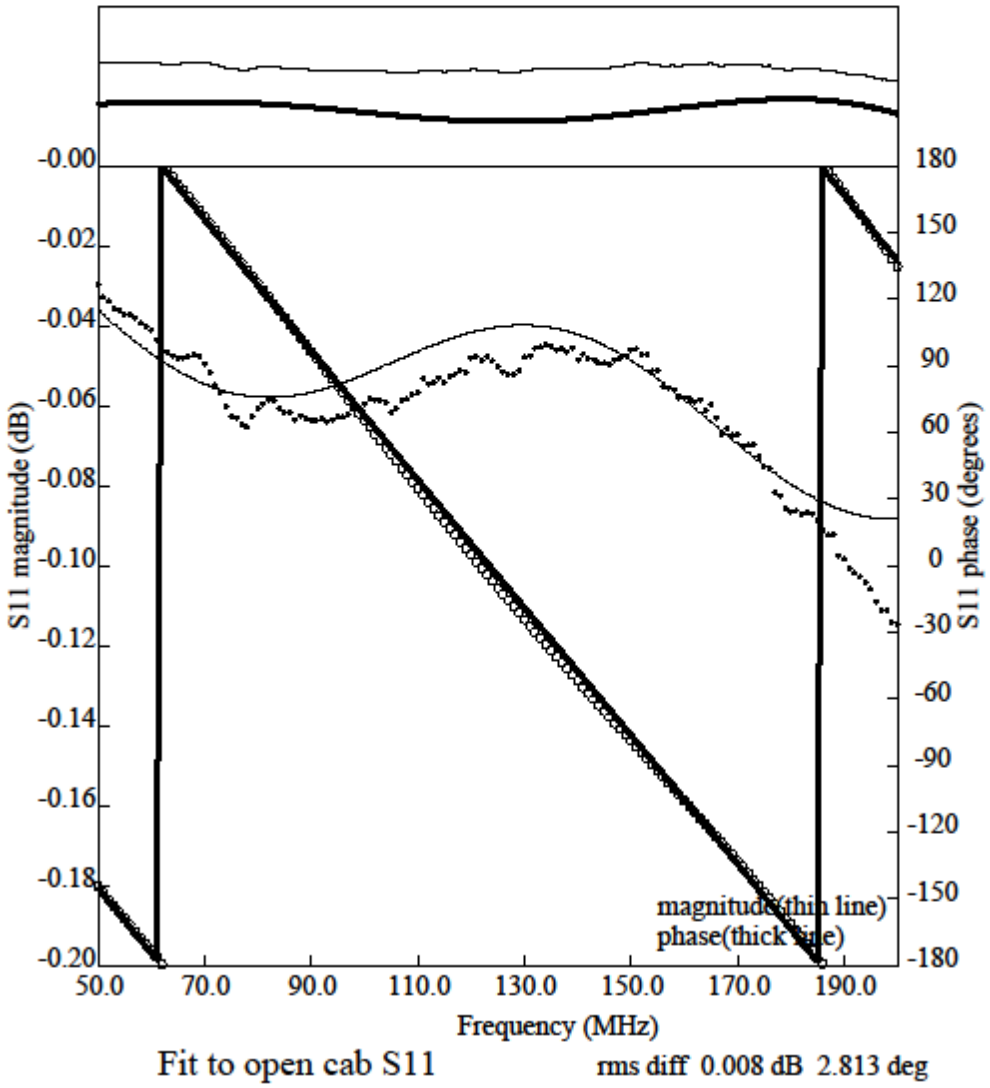

Figure 9. Measurement at the MRO in June 2017.

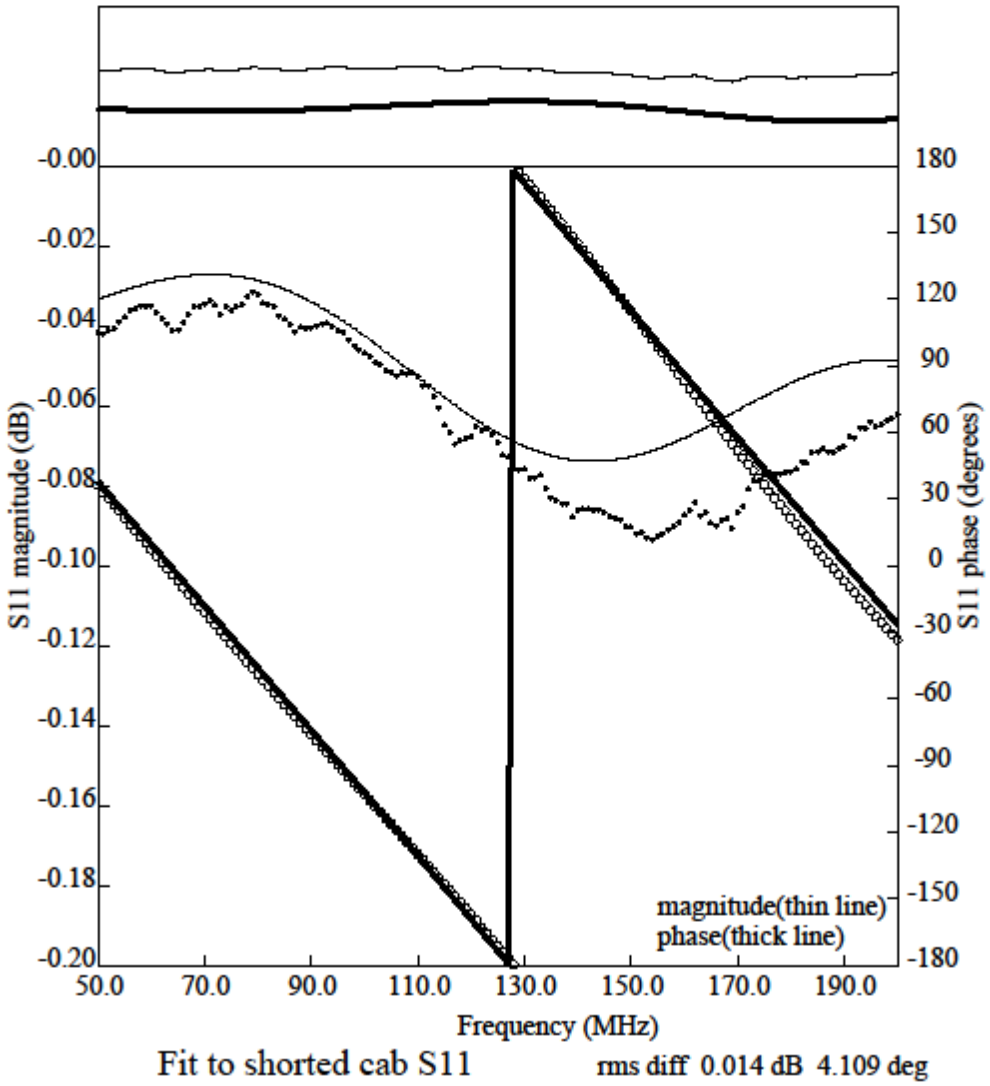

Figure 10. Measurement at the MRO in June 2017.