EDGES MEMO #238

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Subject: Tests of LNA input S11 and switch contact resistance

The input S11 of the LNA with 3 dB attenuator on its input followed by a 10 dB attenuators, 2×60-60135 amplifier, another 10 dB attenuator and a spectrum analyzer was measured at input levels of -30 and -25 dBm. The results shown in Figures 1 and 2 are in very good agreement. Separate tests show that saturation effects start to influence the measured S11 at VNA output level above -25 dBm.

In order to reduce the effects of temperature gradient changes in the receiver the failsafe Dowkey 401u-2208 switch (see Figure 2 memo 116) is to be replaced by a latching switch (see Figure 10 memo 116) in order to avoid any difference in heating between period when the switch is fixed in the "antenna" position for S11 measurements and when the switch is running during the acquisition of spectral data. While future receivers may include the ability to measure the LNA S11 in the field the current receiver relies on the measurements in the lab so that the effect of switch contact resistance changes with time are a concern. The DC resistance of the signal path through several switches was measured and the results given in Table 1.

Switch	D.C. resistance ohms
Dowkey 401U-2208	0.018
Dowkey R401K-480852	0.018
Teledyne CCR-33580	0.020
Minicircuits MSP2T-18-12+	0.031

Table 1. D.C. resistance of signal path

Dowkey shows some data on the change of resistance with the number of operations which indicate that for the lifetime of 10 million operations the resistance should remain under 0.05Ω. At an LNA input S11 of -40 dB a change of 0.05 results in a change of 0.4 dB which is significant so lifetime testing may be required in order to select the best switch.

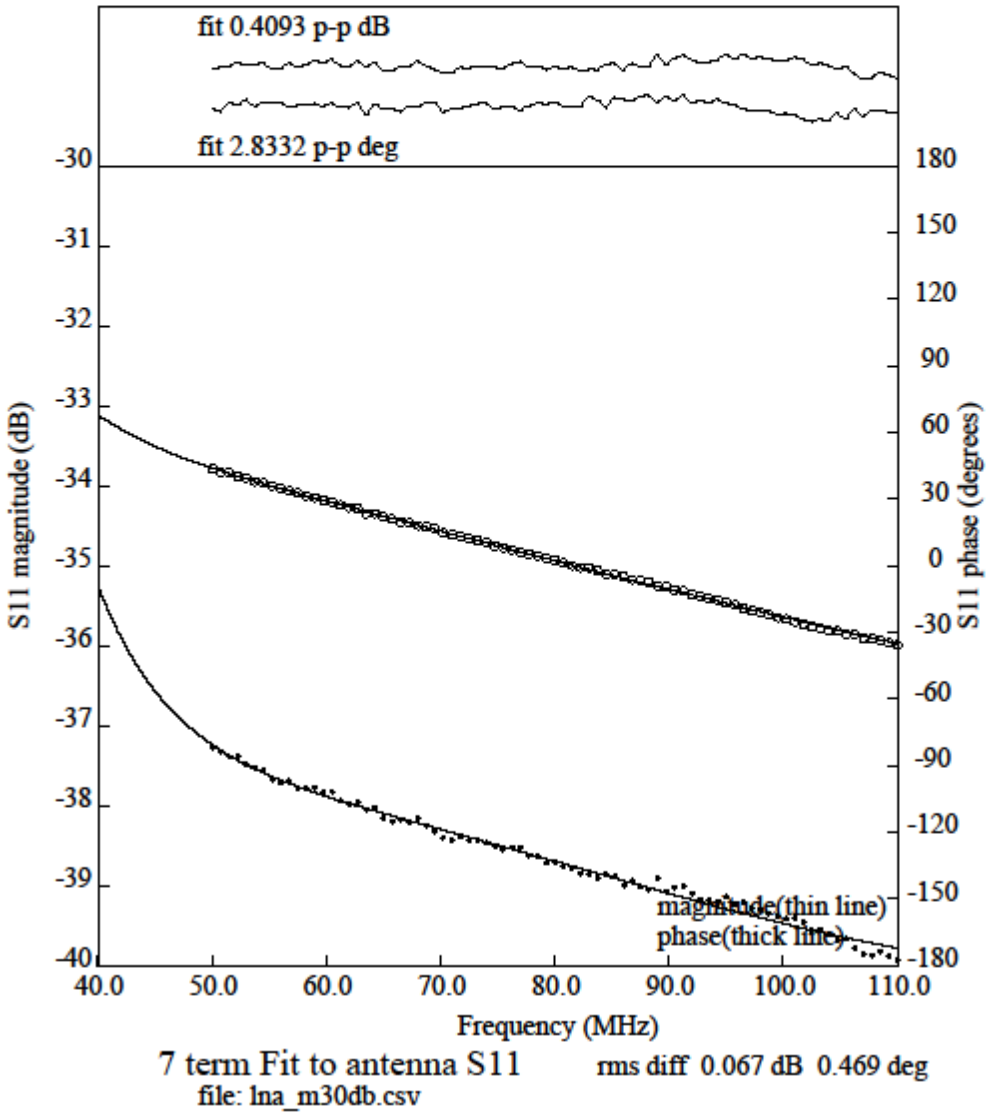

Figure 1. LNA S11 at VNA level of -30 dBm.

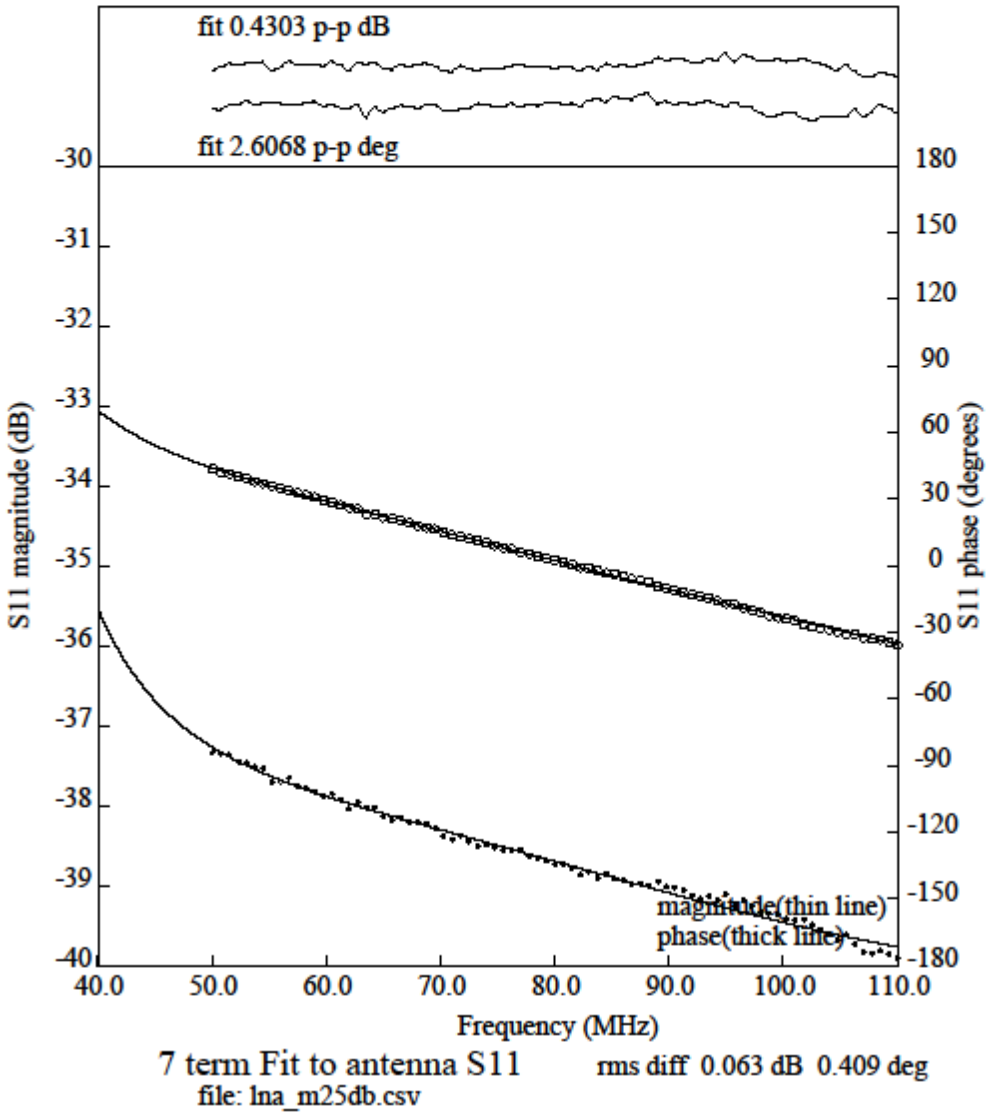

Figure 2. LNA S11 at VNA level of -25 dBm.