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To: EDGES Group

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Subject: Sensitivity of absorption signature search on ground plane loss.

The ground plane loss has been discussed in memos 88, 136 and 179. The resistive loss from memo 179 is only about 0.01% at 50 MHz for a wire mesh conductivity of 10^6 S/m. The bulk of the loss is from the soil which extends beyond the edges of the ground plane. This loss is estimated from the departure of the average gain from unity. The loss for the original 10×10 m ground plan on soil with dielectric constant 3.5 and conductivity $2e-2$ is shown in terms of temperature in Figure 1. Smoothing has been applied using 5-term fit. The loss for the extended ground plane (see memo 204 for description) is estimated to be one quarter of that for the 10×10 m ground plane based on the scaling with size discussed in memo 88. The results from FEKO while in the vicinity of 0.5% have some negative values which casts some doubt on their validity so for this study a constant frequency independent loss of 0.5% is assumed.

In order to test the effect of the ground loss an analysis similar to that of memos 236 and 237 is conducted with the results given in Table 1.

Test	4-terms 60-99 MHz				5-terms 65-95 MHz				
	Freq MHz	SNR	Amp K	Width MHz	Freq MHz	SNR	Amp K	Width MHz	
Ref.	78.1	31.2	0.49	20.3	78.1	19	0.44	18.5	N
No ground loss	78.1	31.1	0.49	20.3	78.1	19	0.44	18.5	N
Ref.	78.1	57.2	0.56	19.0	78.1	22	0.49	18.5	0
No ground loss	78.1	48.6	0.71	18.6	78.1	22	0.49	18.4	0

Table 1. Signature search results with and without ground loss correction. N, data from 2016_259 to 2017_017. 0 = data from 2015_284 to 2016_246.

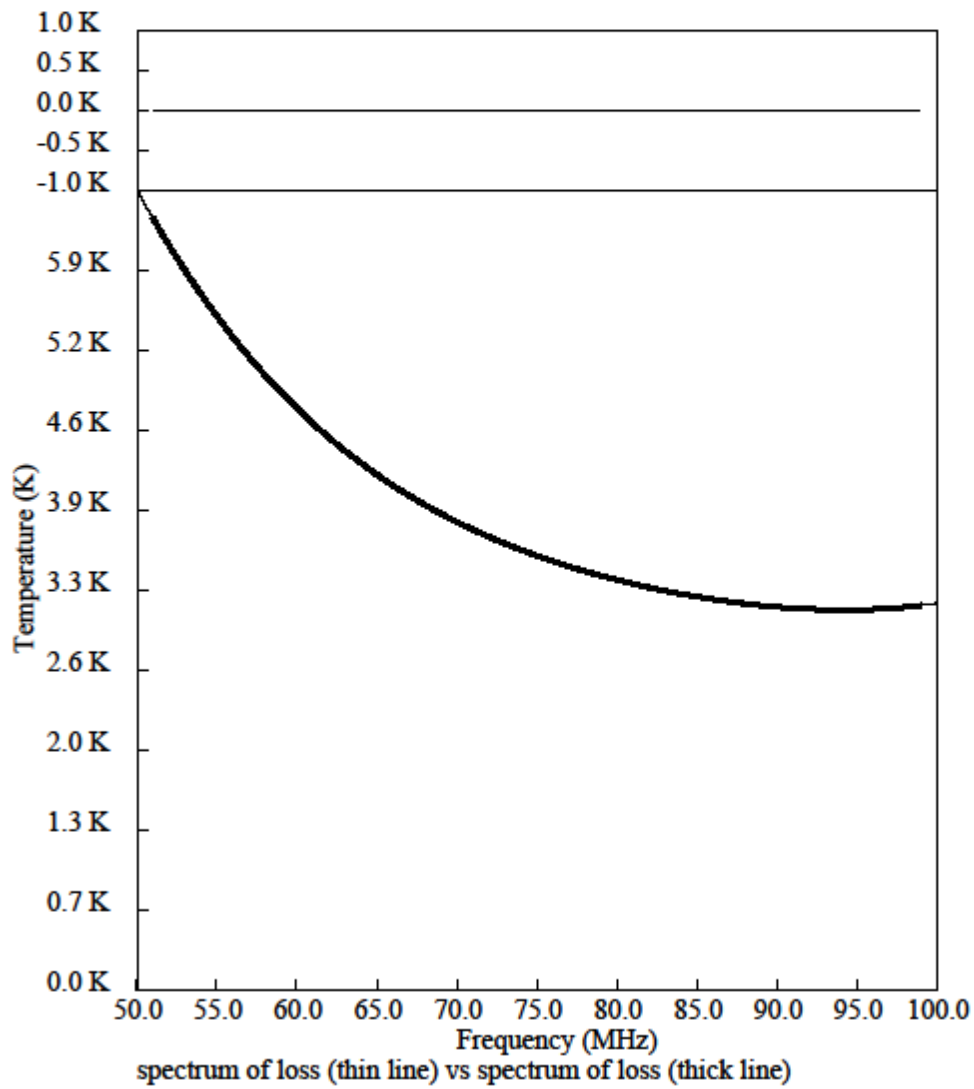


Figure 1. 5 term polynomial fit to ground loss for 10×10 m ground plane over soil with dielectric 3.5 and conductivity 2e-2.