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To: EDGES Group
From: Alan E.E. Rogers
Subject: Tests of EDGES-3 antenna input S-parameters

EDGES-3 has a short input path of about 1.5 inches of semi-rigid cable plus a 90deg SMA bend between the input connector reference plane and the reference plane of the SOL calibration connectors defined by the 8-position (S8) switch as shown in Figure 1 of memo of memo 303. In order to use the S8 reference plane the S-parameters of this input path are needed as part of the antenna loss in a manner similar to the balun loss which is needed for EDGES-2.

In order to obtain the S-parameters of this path a separate set of Keysight 85033E SOL calibration kit are placed on the EDGES-3 input connector prior to connecting the antenna box, as shown in Figure 14 of memo 300, and each is measured with the automated EDGE-3 s11 calibration. The results of the calibrated s11 measurements of the SOL are shown in Figure 1 along with the model in Figure 2. The loss of this short path is about 0.13% at 75 MHz as shown in Figure 3 in units of Kelvin for a cable physical temperature of 300 K for a perfectly matched antenna. Figure 4 shows the simulated loss using the EDGES-3 s11 from a FEKO simulation of the EDGES-3 antenna.

In summary the input cable loss in EDGES-3 is treated in the same manner as the balun in EDGES-2. This loss is much smaller than the loss in EDGES-2 and in addition adds a path delay of only 0.3 ns compared with about 4 ns delay in the low-band balun.

