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To: EDGES Group

From: Alan E.E. Rogers

Subject: EDGES temperature monitor

In memo #91 it was shown while the largest source of systematics are expected from errors in S11 measurements it will also be important to monitor the temperature of the EDGES LNA/3-position switch module. This data can then be used to make corrections to the LNA S11 and noise wave parameters based on their temperature coefficients measured in a laboratory environment.

To maintain the very simple single coax interface to the EDGES front-end the temperature is monitored using an Analog Devices AD22100TKZ probe and AD7741BRZ synchronous voltage to frequency converter. The temperature in deg °C is given by

$$T = \left(\left(f - 0.3072\right)/0.7864 - 1.375\right)\Big/22.5 \times 10^{-3}$$

Where f is the frequency in MHz. The signal from the monitor is coupled into the r.f. output along with the out of band noise and the output of the LNA. This signal which lies in the range of 1.3885 MHz for 0 °C to 2.2733 MHz for 50 °C is below the added out of band noise and can be easily extracted from the spectrum in the EDGES pc spectrometer. Following calibration in the laboratory this should provide temperature data accurate to 0.1 °C.