To: EDGES Group  
From: Alan E.E. Rogers  
Subject: Estimate of the Spectral flatness of a hot filament source.

The lamp chosen for the “antenna simulator” chosen to test the EDGES2 electronics has a helical coiled tungsten filament with the following approximate dimensions.

Dimensions:
- Wire diameter: 15 Microns
- Coil diameter: 80 microns
- Coil length: 1 cm
- Number of turns: 330

The measured DC resistance at 25 °C is 24 ohms and the estimated inductance of the helical coil is about 100 nh. If we model the filament as 3 thermal sources:

1] Lead resistance at ambient  
2] Ends of filament at intermediate temperature  
3] Filament at high temperature

If these sources are in series and in series with the inductance and we ignore the lead resistance the spectrum is flat with a temperature, after correction for the mismatch, equal to the average temperature of the filament. The lack of a frequency dependence is the result of the filament wire radius being smaller than the skin depth.

The introduction of the lead resistance results in a frequency dependence which is estimated to produce a temperature error of about

$$750(f/50)^{1/2}\ mK$$

for a filament temperature of 2000 K based on a lead resistance of 0.1 ohm where $f$ is in MHz.