To: EDGES Group
From: Alan E.E. Rogers
Subject: EDGES Noise

The theoretical 1-Sigma noise for EDGES is given by

$$\sigma = \left(a^2 + b^2 + c^2\right)^{1/2} \left(BT/3\right)^{1/2} K$$

Where

- \(a = T_s + T_R\)
- \(b = (T_s - T_L)(T_L + T_R)/T_{cal} - T_R - T_L\)
- \(c = -(T_s - T_L)(T_L + T_R)/T_{cal} + T_L - T_s\)

- \(T_s\) = sky temperature
- \(T_L\) = load temperature
- \(T_R\) = receiver temperature
- \(T_{cal}\) = noise calibration temperature
- \(B\) = resolution bandwidth
- \(T\) = total integration time
- \(T/3\) = integration time in each position of the 3-position cycle

For \(T_s = T_L = T_{cal} = 300K\), \(T_R = 100K\), \(B = 400\) kHz and \(T = 100\) hrs the theoretical rms noise is 2.6 mK.

For \(T_s = 1700\), \(T_R = 200\), \(T_L = 300\) and \(T_{cal} = 1000\) the rms is 13 mK. The systems in the field are 50% efficient so that for 100 hrs of actual time the theoretical number are about 3.7 and 18 mK for high and low band respectively.