RFI MEMO #035

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September 6, 2006

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To: RFI Group

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Subject: Comparison of Galactic Noise at Potential EDGES Sites

The choice of deployment site (and date) for an EOR global signature measurement with the EDGES system is important for the overall success of the experiment. In addition to little or no RFI, the ideal site will also possess the correct geometry to reduce the exposure of the system to periods of high Galactic noise. This memo explores five potential sites for the experiment:

1. Mileura Station, Western Australia (latitude –26 deg)
2. Palmyra Atoll, Pacific Ocean (latitude, +6 deg)
3. Florida (latitude +26 deg)
4. Green Bank / California / Nevada (latitude +38 deg)
5. Near the Arctic Circle (latitude +60 deg)

For the purposes of determining the antenna temperature, T_{ant}, due to sky noise, only the latitude of the sites is relevant. Figure 1 shows the antenna temperature expected as a function of local sidereal time (LST) for the different sites. Figures 2-6 give examples of the estimated antenna power response pattern on the sky at times of lowest Galactic noise.

In order to have the lowest noise part of the sky transit at midnight, the best time to observe for sites in the northern hemisphere is around mid-March. For Mileura Station, in the southern hemisphere, it is around November. Generally, at any site, decent sky noise is found between November and March—when the Galactic center transits during the day.

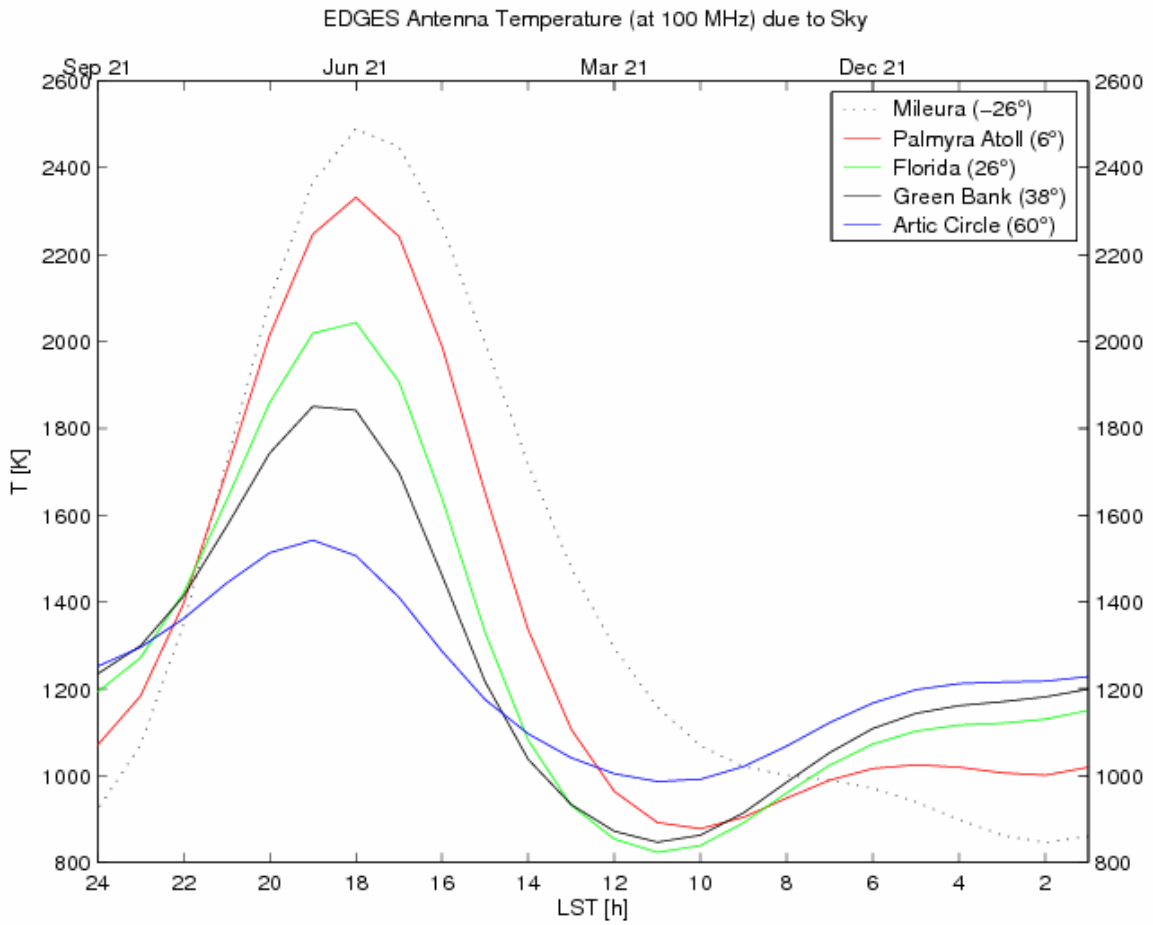

Figure 1. Predicted EDGES antenna temperature as a function of LST for sites at five different latitudes. For sites in the northern hemisphere, the best time to observe is around LST = 11 h (mid-March). For Mileura Station, in the southern hemisphere, the ideal observing time would be LST = 2 h (November).

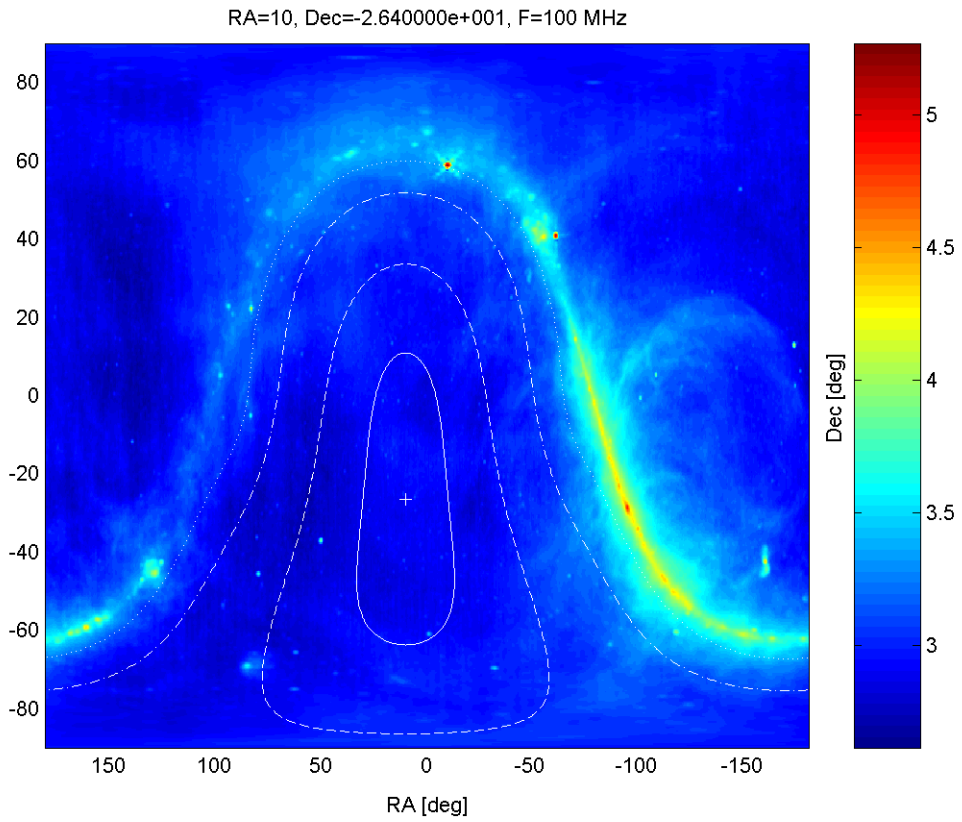

Figure 2. Sky map showing location of EDGES beam that produces minimal antenna temperature due to the Galactic background for a deployment at Mileura, Western Australia (latitude=-26.4). Color scale is $\log_{10}$ of antenna temperature due to sky. The lines give the 90% (solid), 50% (dash), 10% (dash-dash), and 1 % (dash-dot) power contours of an idealized EDGES beam when LST is 00:40 (when RA=10 deg is transiting at the site) -- for example, around midnight on October 1.

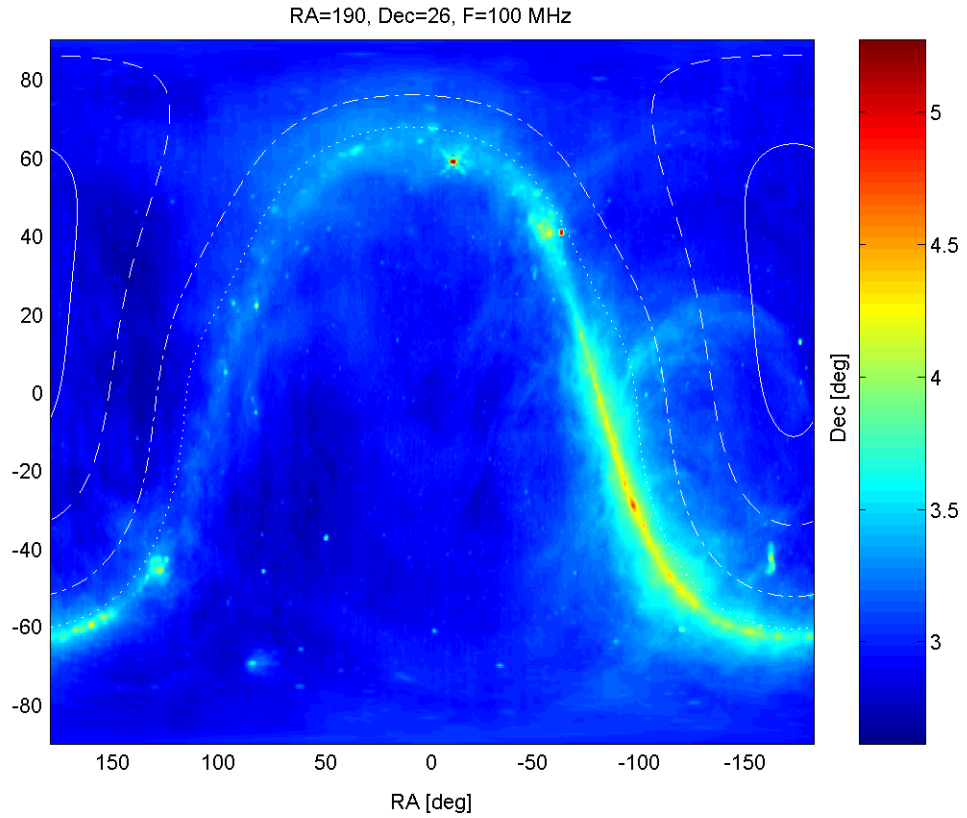

Figure 3. Lowest noise beam at Florida.

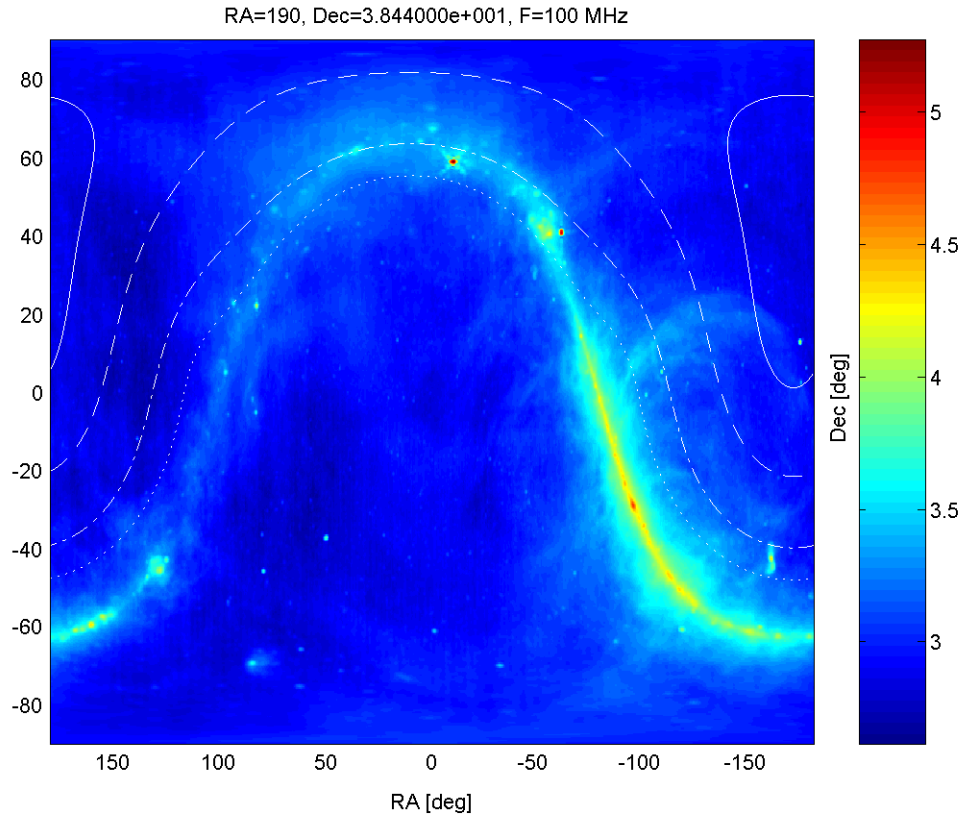

Figure 4. Lowest noise beam in Green Bank.

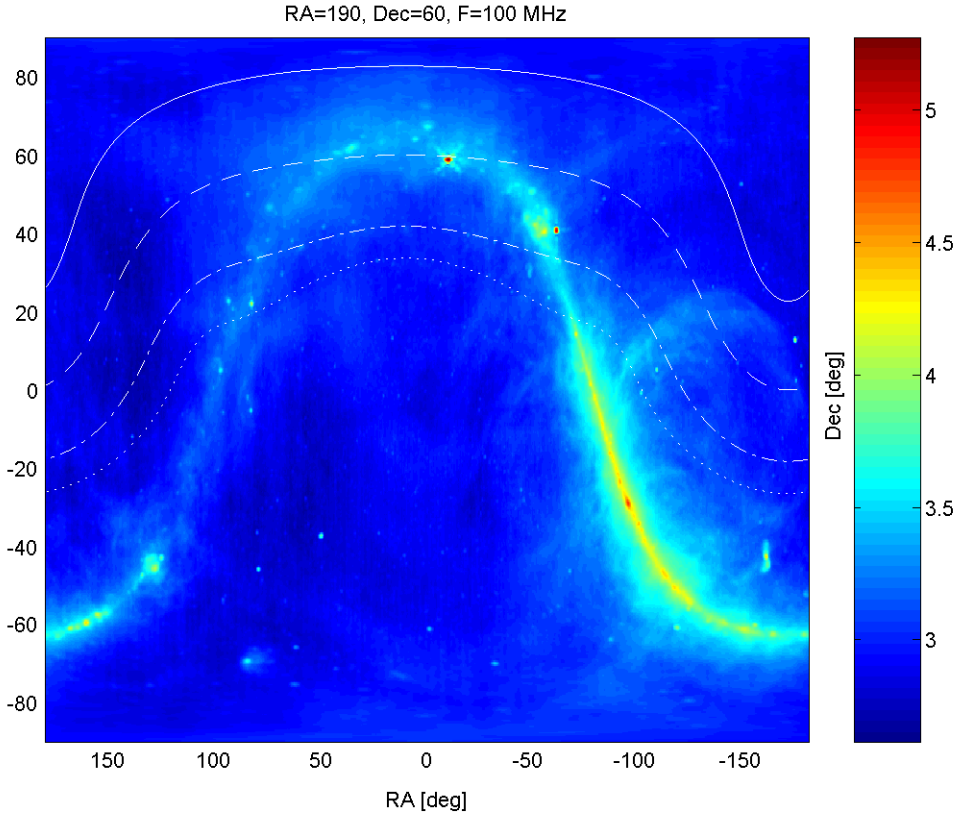

Figure 5. Lowest noise beam near the Arctic Circle.

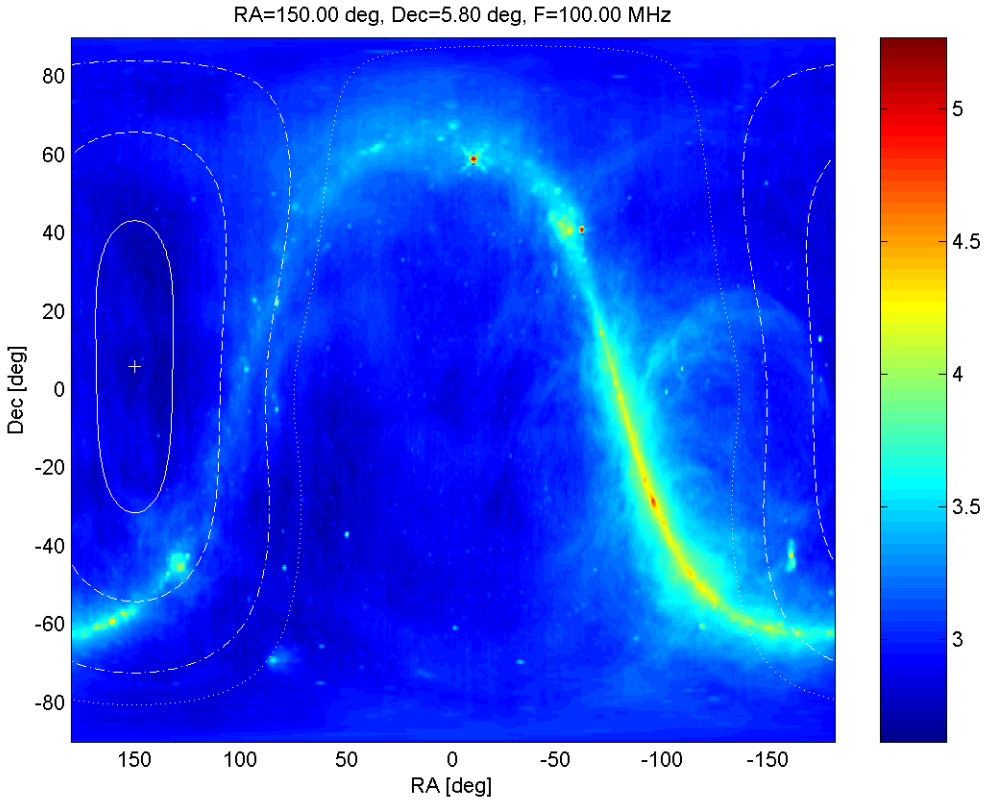

Figure 5. Lowest noise beam at Palmyra Atoll in the Pacific Ocean.