

DEUTERIUM ARRAY MEMO #020
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To: Deuterium Array Group

From: Alan E.E. Rogers

Subject: Options for improving the rejection of RFI from horizon

The current proposed location of the Deuterium array is close to the Westford site and is line of sight through the trees. The strongest RFI in the 250 kHz band centered at 327.4 MHz is from the unshielded area in the base of the tower. We need to reduce these signals by about 23 dB to bring them down to an acceptable level (see memo #019).

I suggest the following:

1] Shield the area in the base of the Westford tower

An inexpensive method is to place wire mesh on the outside of the concrete base. At 327 MHz this should provide at least 10 dB reduction in the signal strength.

2] Surround each 5x5 site array with a fence

The attenuation of a fence can be estimated using the Fresnel knife-edge diffraction. The excess path ϕ to a point at a distance d from the fence and a distance h from the top is

$$\phi = \frac{2\pi}{\lambda} \left((h^2 + d^2)^{1/2} - d \right) = \pi/2v^2$$

where λ = wavelength

ϕ = phase path

v = Fresnel integral (Cornu's spiral) parameter

If each site is surrounded by a circular 10 foot high fence* with a diameter of 100 feet a point in the center 5 feet from the ground signals from the horizon will be attenuated by about 12 dB ($v=0.6$).

* Using galvanized welded "chicken" wire mesh at about \$.30 per square foot.

3] Add a quarter wave high square fence on the outside of the 5x5 array frame. Simulations using EZNEC show that this should improve the rejection of signals at zero elevation with respect to the array frame by about 6 dB.

The combination of these 3 measures should provide enough rejection of the signals from Westford and other RFI signals observed at the present site of the RFI monitor trailer. A rough estimate of the added cost is \$1000 per 5x5 for a total added cost of about \$32,000.