LF Radiative Properties of Metallic Fences

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Electromagnetic Interference (EMI) and Continuous Wave Immersion (CWI) tests require illuminating large targets from 100 KHz to above 1 GHz in uniform RF fields for the purpose of measuring facility RF leakage. Unfortunately the efficiency of low frequency (LF) antennas is very low when the antenna is physically small compared to wavelength; at 100 KHz the wavelength is 3 Km! Matching to a 50 Ohm source is only realistic when the antenna impedance is within an order of magnitude of 50 Ohms, or above 5 Ohms. Hertzian (short) dipoles can be in the milli-Ohm range, making it impossible to match, since losses through matching circuits are considerably higher.

In this paper we discuss preliminary LF measurements of several thousand foot long galvanized metallic chain link fence between 100 KHz and 1 MHz and compare the **E** and **H** fields of a fence at 100KHz with the **E** and **H** fields of a half wavelength inverted "V" antenna operating at 4.5 MHz. The EMI targets of interest are two mobile communication trailers and their respective antennas.

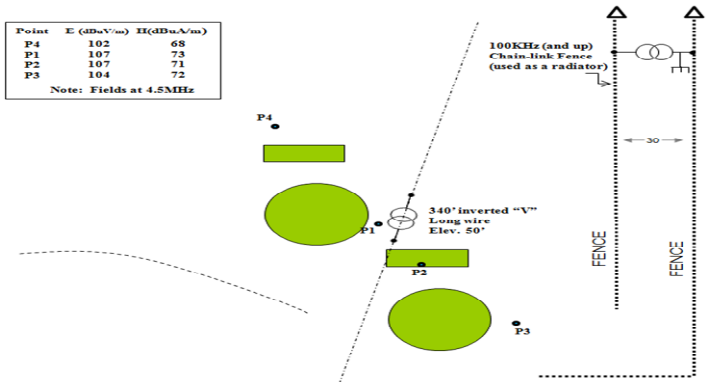

Figure 1 *EMI targets (green) are illuminated from a chain link fence at 100 KHz and from an inverted "V" antenna, 50 ft elevation at 4.5 MHz. Top left side table represents the inverted "V" antenna **E** and **H** fields at 4 test point locations. The chain link fence **E** and **H** fields are within a factor of two lower. Both radiators are driven by a 40 W source.*

The complex impedances of different chain link fence feed points were measured and recorded on a vector network analyzer. Figure 1 shows the relative location of the targets of interest with respect to the two radiators. An optimum match was found driving two fences that are 30 ft apart. Soil dielectric and conductivity measurements were also recorded. The paper discusses the comparison of the chain link fence as a 100 KHz radiator vs. the 4.5 MHz half wavelength inverted "V" antenna and includes the relative antenna efficiencies.