

ANNEX TO NPL CERTIFICATE FOR ADJUSTABLE DIPOLE ANTENNAS

Antenna Factor

The antenna factors quoted apply when the mismatch between the antenna and the receiver is attenuated.

If the antenna is used in an undamped screened room the use of these antenna factors may not give the absolute value of field strength, but a calibration provides an essential check that the antenna is working properly. The antenna factors can be used to compare measurements made in an identical set-up using a different antenna of the same type.

The antenna factors are valid for any separation distance from the source exceeding two wavelengths. For shorter distances the change in antenna factor with distance becomes significant. For example, for a resonant dipole, when the source is another similar antenna, the antenna factor increases by 0.26 dB and 0.8 dB for separations of one wavelength and a half wavelength respectively.

When the antenna is vertically polarised, a feed cable dropped vertically behind the antenna can cause a change in reading of the order of ± 1 dB. At NPL it has been found necessary to extend the cable at least 10 m behind the antenna to reduce this effect to less than ± 0.5 dB. It is recommended that the user experiments with the cable layout to ascertain this contribution to the uncertainty of measurement. Reflections from metal components on masts, motors in particular, have been found to cause significant effects.

If the balun of a dipole antenna is unbalanced then the current distribution on the radiating elements is asymmetrical and current is driven onto the outside surface of the coaxial feed cable. This effect contributes to the measurement uncertainty when the cable is parallel to the antenna element. Previous experience with antennas of the same type as the AUT suggests that if they are used with resonant elements then balun imbalance is not a problem. It is recommended that the user conducts test of his own to quantify the effect in his particular measurement configuration.

Note that the two cable effects mentioned above are distinct. In the first case the cable is acting as a parasitic element. In the second case the cable is acting as a driven element due to imperfections in the balun.

When the antenna is placed above a metal ground plane, the antenna factor may change. Corrections to the antenna factor are tabulated in Reference [1].

References:

- [1] Alexander M J and Salter M J, Corrections to antenna factors of resonant dipole antennas used over a ground plane, DES Report 131, November 1993.