RECOMMENDATION ITU-R PN.833-1

ATTENUATION IN VEGETATION

(Question ITU-R 202/3)

(1992-1994)

The ITU Radiocommunication Assembly,

considering

a) that attenuation in vegetation can be important in several practical applications,

recommends

1. that the content of Annex 1 be used for evaluating attenuation through woodland between 30 MHz and 10 GHz.

ANNEX 1

Attenuation in vegetation can be important, in some circumstances, for both terrestrial and Earth-space systems. However, the wide range of conditions and types of foliage makes it difficult to develop a generalized prediction procedure.

Two types of measurement are described in the literature:

a) ground-to-ground measurements, over paths of the order of 100 m or more, in woodland, forest or jungle with antenna heights of 2-3 m above ground, with only part of the ray path passing through foliage;

b) short ground-to-ground or slant-path measurements through the foliage of individual trees, with foliage depths of no more than say 10-15 m.

For convenience, these categories are designated as “long” and “short” paths, respectively.

Figure 1 shows curves of measured specific attenuation for “long” paths at frequencies from 30 MHz to 3 GHz, plus a single measurement just above 10 GHz shown as a diamond. Measurements for “short” paths are shown as squares, with dB/m values up to seven times those for “long” paths. The data refer only to the additional attenuation caused by woodland to a ray passing through it and represent an approximate average for all types of woodland.

It should be noted that when the attenuation inside vegetation becomes large (for example more than 30 dB), the possibility of diffraction or surface-wave modes has to be considered.

At frequencies above about 1 GHz, no definite dependence on polarization is evident, whereas at lower frequencies the vertical structure of woodland (tree trunks) may be a significant factor. At frequencies of the order of 10 GHz, the specific attenuation through trees in leaf appears to be about 20% greater (in dB/m) than for leafless trees. There can also be variations of attenuation due to the movement of foliage, such as due to wind.

FIGURE 1

Specific attenuation in vegetation