ATTENUATION OF HIGH-FREQUENCY GROUND WAVES OVER AN INHOMOGENEOUS EARTH

Rayner K. Rosich

The primary objective of this study was to obtain theoretical estimates of the effect of inhomogeneities in the earth's surface upon ground-wave propagation along a particular set of land-sea paths.

The results were obtained by numerically solving the integral equation

$$f^*(d) = f(d) + \int g(d, \theta)\, f(-d \cos \theta)\, f^*(d \cos \theta)\, d\theta,$$

where f^* is the attenuation function for the inhomogeneous case, f is the Sommerfeld function, and g is obtained essentially from the spherical Green's function by a steepest-descent type integration.

Sharp phase and amplitude changes in the attenuation function occur when crossing an "island" or inhomogeneity in the paths. The greater the difference in conductivity and dielectric constant between the island and the rest of the path, the greater are these changes. Also noted is the "recovery" or "focusing" effect found in the amplitude and phase. The effect of moving the transmitting antenna across a coastline was also studied and the results were quite similar to the above.

Computations were performed for three paths at frequencies of 10, 15, 20, and 25 MHz. The results are displayed in tabular and graphical form.

This report is a revised and updated version of an earlier study (Rosich, 1968) which is now out of print.

Key Words: Electromagnetic waves; ground wave; integral equations; propagation; radio waves; Sommerfeld solution; surface waves