JOURNAL OF RESEARCH of the National Bureau of Standards—D. Radio Propagation
Vol. 64D, No. 4, July–August 1960

Preface to ELF Papers

The remaining papers in this issue (and the first three papers in the next) were presented at the Conference on the Propagation of Electromagnetic Waves at Extremely Low Frequencies (ELF). This conference was held at the Boulder Laboratories of the National Bureau of Standards on January 26, 1960, under the guidance of A. D. Watt, Assistant Chief of the Radio Communication and Systems Division.

Extremely low frequencies are defined here as the range from 3 kc down to about 1.0 cps, and they are well below those currently used in communications. Lightning discharges, however, produce considerable energy in this range, and the radiated fields have been used for studying the nature of lightning phenomena for many years at frequencies as low as 10 cps. Other natural sources of both a terrestrial and an extraterrestrial nature also radiate electromagnetic energy in this frequency range but usually to a lesser extent than lightning.

Since ELF signals have been observed to propagate with very low attenuation, it has been suggested from time to time that they would be useful for communications on a worldwide scale. Furthermore, because of certain magneto-ionic phenomena, these waves may penetrate the ionosphere and enable communication with space vehicles. This is particularly so in the vicinity of 3 kc where a "window" in the ionosphere appears to exist. Another aspect of ELF waves is that the wavelength is extremely large (being 3,000 km at 100 cps) and consequently, the signals may easily be diffracted around planetary objects. Such signals also penetrate with relatively small loss into conducting media such as rocks and soil. In fact, frequencies in this range have been used for many years in geophysical exploration.

JAMES R. WAIT, *Editor.*