The method described is free from additional assumptions about path length, path curvature, altitude, ionospheric stratification, geomagnetic field. The method needs experimental care, but gives results without ambiguity.

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RADIOPHYSICS

38-Mc/s Radiation from Jupiter

SOON after the discovery by Burke and Franklin[1] in 1954 of 22-Mc/s sporadic-type radiation from Jupiter, an attempt was made by F. G. Smith[2] to detect similar radiation at higher frequencies from old records taken with the Cambridge 38- and 81-Mc/s interferometers. Suitable records were available for 16 days in 1952 and 1953 at 38 Mc/s and for 10 days in 1955 at 81 Mc/s. In spite of the fact that both aerial systems were considerably more sensitive than anything normally utilized in the study of Jupiter at frequencies close to 20 Mc/s no emission was detected. For the next few years it was tacitly assumed by most workers, with the notable exception of Douglas[3], that some frequency below 38 Mc/s represented an upper limit to the Jupiter radiation.

As other investigations progressed, however, it became clear that, not only did the radiation become much less intense at higher frequencies (see, for example, accounts of 27-Mc/s observations by Franklin and Burke[4], Gardner and Shain[5], and Carr *et al.*[6]), it also became much less prolific. I have pointed out[7] that the emission mechanism might be such that at higher frequencies, on rare occasions, an event might occur which would contain bursts of a sufficient strength to be detectable on the Earth. It is possible that if F. G. Smith had had records of 38 Mc/s observations available for a longer period he might have found a Jupiter event recorded.

Warwick[8] has recently reported that a few events extending to frequencies in the 38 Mc/s region have been recorded by the High Altitude Observatory dynamic spectrograph. Radiation at 38 Mc/s has also been detected at Florida State University during 1962 using a phase-switched interferometer consisting of two square corner reflectors, each containing a single half-wave dipole and separated by six wave-lengths. A more sensitive system was not desirable for the purpose of the experiment, which was to demonstrate low day-by-day frequency of occurrence as the dominant feature rather than low radiated power. The records examined by F. G. Smith should already have revealed some emission were it simply a matter of using higher sensitivity.

Observations were made nightly during April 25–August 25, 1962. All observations were monitored by an observer. During this period two events from Jupiter were recorded. The first, recorded on June 18, lasted for about 1 min only. The second, recorded on August 18, lasted for about 30 min and contained a number of weak bursts of estimated intensity about 5×10^{-22} W m^{-2} (c/s)$^{-1}$. On both occasions strong bursts of noise were observed simultaneously on lower frequencies between 16 and 22 Mc/s and receiving conditions were good. The second event was recorded while the most active region of the planet was facing the Earth. This is shown in Fig. 1. A histogram of 18 Mc/s observations for the corresponding period is shown for comparison. The histograms have been made on the basis of a rotation period of 9 h 55 m 29·37 s, the value which has been provisionally

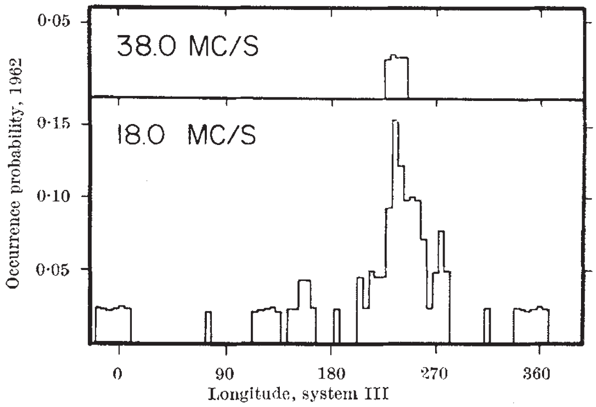

Fig. 1. Histograms comparing occurrence probability of Jupiter radiation at 38 and 18 Mc/s for 1962 as a function of System III central meridian longitude

adopted by the International Astronomical Union for Compilation of a System III Ephemeris[9]. The first event was of such short duration that it cannot be represented on the histogram, which is computed for 5° intervals of central meridian longitude. This event occurred when the System III central meridian longitude was 325°. The experiment is to be repeated at a slightly higher frequency next year.

It is worth noting that there are indications[10,11] that the increase in day-by-day frequency of occurrence continues to the lowest frequencies of observation, close to 5 Mc/s rather than reaching a maximum around 18 Mc/s as was originally suspected. Some disagreement exists, however, concerning average intensities at the lowest frequencies. Those reported by Ellis[10] are rather less than typical values for 18 Mc/s, whereas those reported by Carr *et al.*[11] are higher.

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Abrupt Phase Shifts on *MSF** (60 kc/s)

Watt-Carter and Corke[1] have reported phase variations on the *GBR* (16 kc/s) transmissions from Rugby as a result of aerial detuning by changes in weather conditions and aerial sway. We report here man-made phase jumps on the *MSF* (60 kc/s) transmissions.

Daily phase measurements of *MSF* (60 kc/s) against local frequency sources are made at the Signals Research and Development Establishment and our chart records show occasions when abrupt phase changes of about 12° occurred. Between April 25 and July 11, 1962, there were 20 days on which one abrupt phase change occurred. It was always in the same sense and was completed in less than a few seconds. The changes were always found within −3 to +10 min of the nominal start of the *MSF* transmission at 1430 G.M.T.

Investigation revealed that the phase jumps resulted from earthing the *GBR* aerial system during its main-

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