for the curvature of the earth's motion introduced in formula (17).

It should be noted that formulas (4), (6), and (16) differ from the very simple approximation formulas (20) and (21) only by the value of the relativistic correction (19). This correction is quite small and is commensurate with other errors of measurement: the error resulting from our ignorance of the exact value of the velocity of light in a vacuum and the correction for the influence of the interplanetary medium.

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Reviewer's Comment

Advancement in any field of scientific endeavor requires a continual review of pertinent parameters and the techniques used in applying them to specific problems. A prime example of this is the accuracy of radar measurements. Prior to the "space age," radars were required to provide information about objects at relatively short ranges with low velocities. As the state of the art progresses, not only do the target range and velocities increase, but also the accuracy with which they must be measured. In order to accomplish this, a greater number of sources of error must be considered, since those which were once considered secondary in nature are now significant. In V. M. Vakhnin's paper two sources of error are discussed which are not commonly considered, that is, earth's motion and special relativity effects. This is not meant to imply that he is the first to consider these effects, for there are a number of papers in which the author either studies them to a certain degree or acknowledges their existence and suggests further study. However, an admittedly incomplete survey of the literature on the subject does indicate that Vakhnin's work is current enough to be a significant contribution. His paper is well written and straightforward with regard to the development of equations and results. There are, however, two apparent errors. The first, Eq. (1), should read $2l = v_E(t_3 - t_1) = v_E T$. The second occurs in the third term of Eqs. (15) and (16) which should contain a factor $\cos E$ based on a combination of Eqs. (9), (10), and (12). It should be emphasized that these are not errors in theory or development but mistakes either in copying or omissions.

The following three papers deal with essentially the same subjects and might be of interest for purposes of comparison and/or clarification. The first is: "Relativistic reaction systems and asymmetry of time scales" by K. I. Kowalski, with reference appearing in Astronautics Information, Open Literature Survey, California Institute of Technology: J. P. L., in which time dilation due to the asymmetry of time scales between inertial and noninertial reference frames is illustrated. The second paper is "Principles of Doppler inertial guidance" by Dworetzky and Edwards, contained in a Space Anthology by General Precision Incorporated, which includes some considerations of earth's angular velocity effects on radar measurements. The third paper, considered to be the most significant by virtue of its recent publication, is "Relativistic and classical Doppler electronic tracking accuracies" by J. Hoffman, presented in March 1963 at a symposium of the American Institute of Aeronautics and Astronautics.

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Geomagnetic Effects of Explosions in the Lower Atmosphere

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This paper reports the results of work on the study of geomagnetic effects in the lower atmosphere (below 80 km), published in 1959–61. It is assumed that the initial changes of the field in the geomagnetic effect due to the explosion near Christmas Island were caused by the penetration through the ionosphere of a shock wave formed as a result of that explosion, whereas the shock waves of the explosions over Johnston Island induced a strengthening of the field upon penetration through the *F* layer of the ionosphere. The delay time of the variation after the explosion near Christmas Island was equal to the time of penetration of the shock wave from the location of the explosion (about 10^6 cm over the earth's surface) to the *E* layer of the ionosphere. The speed of the shock wave is taken equal to about 3.3×10^4 cm/sec. The time of penetration of shock waves from the point of the explosions over Johnston Island to an altitude of about 200–300 km is fixed according to a formula for a point explosion in an inhomogeneous atmosphere, and turns out to be equal to 1–2 min for the explosion of August 1, 1958, and 2–9 min for the explosion of August 12, 1958, which agrees with the delay of positive impulses as observed, equal, respectively, to 2.0 and about 5 min.

THE first studies of the geomagnetic effects due to explosions in the lower atmosphere appeared in 1958. It was first considered in Ref. 1, in which the variation of the magnetic field of the earth was reported as observed in the magnetic observatory in Apia, after the nuclear explosion carried out by the United States in the atmosphere over the central part of the Pacific Ocean. The geomagnetic effects of this (August 1, 1958) and also the next (August 12, 1958) explosions over Johnston Island were studied in Refs. 2–10. The basic interest in these studies was directed toward the morphology

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