4071802821: MAJOR ELECTRICAL ENGINEERING

KEY WORDS: METEOR TRAIL / METEOR BURST COMMUNICATION / RADIO WAVE SCATTERING / PROPAGATION MODEL / FULL WAVE ANALYSIS

DHEERASAK ANANTAKUL: THESIS TITLE (A MODEL FOR RADIO WAVE PROPAGATION BY SCATTERING FROM METEOR TRAILS IN THE LOW LATITUDE REGION) THESIS ADVISOR: ASSOC. PROF. CHATCHAI WAIYAPATTANAKORN, 132 pp. ISBN 974-03-1540-2

Electron columns called meteor trails formed when meteoroids entering the earth, rubbing with the air molecules, and producing ionized particles can scatter radio waves. The capability in scattering radio waves can be used for data communication. Complexity of the problem of radio wave scattering from a meteor trail is due to both the electrical properties of the trail and the scattering geometry. Thus use of the radio wave scattering capability of meteor trails needs good models for prediction of propagation characteristics for both the single trail scattering and the statistical aspects. For the single trail scattering characteristics, this dissertation proposes the stratified trail model in conjunction with the full wave analysis in order to analyze the scattering characteristics. The stratified trail model treats a meteor trail as many infinitely long electron columns lying on the same axis and the radial electron distribution is Guasian. Using the full wave analysis, the radio wave scattering characteristics can be analyzed with no discontinuity as that of the two approximate models: the underdense and the overdense models. This dissertation also studies the effects in changing the communication range and the trail orientation by using this full wave treatment. It is found that results in the case of changing the communication range agree well with those from approximate models while the case of changing the trail orientation shows some disagreements.

In order to verify the validity of the stratified model and the full wave analysis in determining the characteristics of the scattered wave, experimental links are built in this work for measuring the radio wave scattering from meteor trails. The results from the analysis and the measured data agree well with each other. Results from the analysis and the measured data have correlation coefficients better than 0.8. The measured data from the experimental links are also used in forming the statistical model. It can be concluded that the outcome of this work can be used as a propagation model for the radio wave scattering from meteor trails in the low latitude region.