SEASONS Abstract.doc

This paper discusses the effects of the ionosphere on radar systems that have a strategic transionospheric mission. Observations of scintillation from equatorial satellite beacons and from radar track measurements of transionospheric propagation are discussed. Satellite beacon measurements from the Wideband satellite experiment are used to calculate the degradation caused by scintillation in the radar coherent integration process. Coherent integration will be required in any space based radar to process synthetic aperture images and/or to achieve separation in Doppler of moving targets from the large return of the earth. Measurements of ionospheric scintillation in the equatorial region taken with the VHF/UHF ALTAIR radar in the Marshall Islands are described. A numerical technique is illustrated to calculate realizations or sample functions of wide bandwidth radar signals that have passed through the ionosphere. This technique gives realizations that are consistent with the ALTAIR observations. Mitigation strategies are given to improve the performance of radar target detection.

Short Biography of Dr. Dennis L. Knepp

Dr. Dennis Knepp has performed significant original research in the key technology areas involved in the hardening of U.S. communications and radar systems against the effects of ionospheric propagation disturbances. He developed both analytic and numerical techniques to calculate the effects of structured ionization on EM propagation through random ionized media. Numerical techniques for signal propagation included the first multiple phase screen code that applied to the propagation of wide bandwidth signals. Recently Dr. Knepp was Principal Investigator for the Ionospheric Data Collection (IDC) program in support of the Upgraded Early Warning Radar (UEWR). The goal of IDC was to develop mitigation techniques to enable the UEWR to perform detection, track acquisition, track, classification, and intercept support during ionospheric disturbances that are a natural occurrence in the polar region. Dr. Knepp was also Principal Investigator under several contracts to Lockheed Martin for the development of the new UHF Navy satellite communications system (MUOS - Mobile User Objective System). His work led to the development of the ionospheric and terrestrial scintillation models used to test MUOS against signal propagation disturbances. Dr. Knepp is an IEEE Fellow, an associate editor for Radio Science, and a member of URSI Commissions B and G.