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ENHANCING QUALITY RESEARCH & INNOVATION for SOCIETAL DEVELOPMENT

P-76 Effects of Frequency on Fade Slope Based on Measured Rain Attenuation Data in Malaysia

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There is an ever increasing demand for radio-frequency (RF) spectrum by the nations of the world, in order to satisfy the growing demand for long-distance communications. As C-band (4/6 GHz) is already congested, and Ku-band (12/14 GHz) is filling up rapidly, currently interest focus on the utilization of higher bands. Some systems are already designed to operate at Ka-band (20/30 GHz), and it is probable that serious consideration to utilize V-band (40/50 GHz) in the future will be given. However, when operating at the higher frequency Ku-band, the strength of the signal may be temporarily reduced under severe rain conditions. Rain attenuation is an obstacle in a design of radio systems especially in microwave frequencies. Generally, rain attenuation increases as the signal frequency increases, but does this affect the fade slope which is defined as the rate of change of attenuation in (dB/s). This paper will highlight the effect of frequency on fade slope based on measured data of rain attenuation in Malaysia between May 1998 to April 2000 at four different frequencies (15, 23, 26 and 38GHz). The effect of the link length will be also highlighted.

P-77 Smart Antenna Design Based on Direction of Arrival (DOA) and Beamforming Optimization

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This poster presents the design of 16-element linear array antenna based on direction of arrival estimation and beamforming algorithms. Microstrip antenna is used for the array design with optimized dimensions at the operating frequency of 1.85GHz. The paper also investigates the pseudospectra solutions of direction of arrival (DOA) estimation algorithms namely Bartlett, Minimum Variance Distortionless Response (MVDR), Linear Prediction and MUSIC DOA Estimates. The description, comparison, the performance and resolution analyses of these algorithms and how sensitive is their resolution to the changes of the parameters related to antenna design like the number of elements is also examined. The paper further investigates the performance and robustness of three adaptive beamforming algorithms namely, Least Mean Square (LMS), Recursive Least Squares (RLS) and Sample Matrix Inversion (SMI). Among these algorithms, Least Mean Square (LMS) method is chosen and subjected to further analysis to examine how sensitive is its performance to the changes of the parameters related to array antenna design such as the number of elements and array elements spacing. Effects of the iteration number to the mean square error as well as the tracking and convergence rate are also investigated. The information from the chosen DOA algorithm is then fed to the LMS beamforming algorithms to steer the beam to the direction of the desired user while nulling that of the interferer. Using Matlab, the LMS algorithm creates complex weights which are then fed to the array antenna using the commercial EM simulator software namely CST Microwave Studio.