

# Investigation of Depolarization and Cross Polarization over Ku-band Satellite Links in a Guinea Savanna Location, Nigeria

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## Abstract

In communication systems engineering, designers tend to optimize the channel capacity of radio links through frequency re-use by deploying dual independent orthogonally polarized channels in the same frequency band. Such frequency re-use techniques via linear or circular polarization are severely impaired by the interference of cross-polarized signals, because the energy from one polarization is transferred to the other orthogonal state. Depolarization effects on satellite links are described in terms of cross polar discrimination (XPD). The parameters mainly responsible for causing depolarization at Ku-band due to scattering by oblate spheroid raindrops were computed from satellite beacon footprint data. Measured data from Ku-band, EUTELSALAT (W4/W7) at a frequency of 12.245 GHz and elevation angle of 036° E over Jos (9.8965° N, 8.8583° E, 1192 m) were analyzed. Also the distribution of one minute rain rate was obtained from Davis Vantage Vue weather station. These data were applied to the ITU-R procedure in recommendation 618-7, to estimate the cross polarization discrimination due to rain on earth satellite path. Result gave useful models and thresholds values for radio communication planning in the region For positive values of XPD, threshold of rain rate was 37mm/h, while the threshold for co-polar attenuation was found to be 6.7 dB. Also, the results showed very low XPD values of about -100dB, indicating that very high incidences of interference and cross talks occur in the region; and inhibits frequency re-use in Guinea Savanna region of Nigeria.

**Keywords:** Guinea Savanna region, Ku-frequency band, Depolarization, Cross polarization discrimination (XPD)