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Atmospheric gas impact on fixed satellite communication link a study of its effects at Ku, Ka and V bands in Nigeria

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Abstract:

The total atmospheric absorption due to Oxygen and water vapour on the earth-space path at Ku (12/14 GHz), Ka (20/30 GHz), and V (40/50 GHz) bands was evaluated for communication with Nigeria communication satellite (Nigcomsat1) on both uplink and down link at 0.01 % unavailability of an average year. The basic input climatic data used include monthly and yearly mean meteorological parameters of surface and vertical profiles of pressure, temperature, and relative humidity obtained from recent measurement from space by the Atmospheric Infrared Sounder (AIRS) instrument on NASA's Aqua spacecraft for the period 2002 to 2006. The International Telecommunication Union Radio Propagation Recommendation (ITU-RP 676, 2009) procedure was used for the computation of gaseous attenuation for each of the 37-stations in Nigeria. Attenuation values were obtain for both uplink and downlink frequencies, at Ku, Ka and V bands, total atmospheric absorption was determined to be between (0.11 to 0.24) dB, (0.7 to 1.1) dB and (0.82 to 3.1) dB for Ku, Ka, and V bands respectively. Contour maps showing a consistent signal absorption due to Oxygen is generally higher in the South-West region and water-vapour attenuation higher in the South-South part of Nigeria are presented.

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