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Total Attenuation of Satellite Signal on Earth-Space Link in West Africa

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Abstract:

The study examines the consequence of total attenuation impairments on fixed satellite communication link on earth-space path in West Africa for 0.01 % unavailability of an average year. The International Telecommunication Union Radio Propagation Recommendation (ITU-RP 618, 2012) procedure and study group 3 data bank base was used for the computation of total attenuation for seventeen (17) West Africa countries for both uplink and downlink frequencies. The results reveal lowest value at C-band which gradually increases at Ku and Ka bands while the highest values of total attenuation are experienced at v- band for all the locations. Both uplink and downlink results at v-bands show constantly

that total attenuation is more severe (more than 100 dB) in countries like Togo (139.64 dB), Liberia (138.55 dB), Ghana (138.20 dB), Benin (134.19 dB), Ivory Coast (132.75 dB), and Nigeria (122.42 dB). It should be noted that all stations are in the tropical region of West Africa where rainfall is very high and therefore will experience more signal loss due to the presence of rain, cloud, oxygen, and water vapor even in clear-sky or none rainy conditions. The overall results will be helpful for system planning and better performance of satellite communication link in West Africa region.

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I. Introduction

In a design of satellite communication systems most importantly at Ku band and above propagation impairment such as gases, rain, cloud and scintillation are major concerned in propagation link [1]. These impairments affect the quality and accessibility of radio wave signal service. Although, the dominance of rain attenuation cannot be underscored, others propagation losses must also be considered in the design of earth-satellite links [2].

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