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Analysis of tropospheric scintillation in Ku-band in Malaysian tropical climate

Rahim, Nadirah Binti Abdul ; Shah, Nur Hazierah Binti Mohd; Badron, Khairayu Binti

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[a] Electrical and Computer Engineering Department, Kulliyyah of Engineering, International Islamic University Malaysia (IIUM), Kuala Lumpur, 50728, Malaysia

Abstract

This research is the continuation from the previous paper which has been published. The focus of this paper is to analyse the tropospheric scintillation which consists of both fades and enhancements and the worst-month of scintillation fades and enhancements. This analysis is then compared against the six scintillation prediction models, namely Karasawa, ITU-R, Van de Kamp, Otung, Anthony-Mandeep and Nadirah-Rafiqul. The result shows that both measured scintillation fades and enhancements are 0.50 dB and 0.48 dB at 0.01% of time. Whereas the other six scintillation models have the following

reading for the scintillation amplitude (both fades and enhancements) respectively: 0.44 dB and 0.36 dB (Karasawa), 0.42 dB (ITU-R only for fades but not enhancements), 0.23 dB for both (Van De Kamp), 0.70 dB and 0.68 dB (Anthony & Mandeep) and 0.38 dB and 0.33 dB (Nadirah & Rafiqul) at 0.01% of time. Otung has the highest scintillation fades and enhancements with values of 1.29 dB and 0.67 dB respectively. On the other hand, the measured worst-month of both scintillation fades and enhancements have the highest amplitude at 0.01% of time, which are 0.88 dB and 0.90 dB if compared to the annual cumulative distribution function (CDF), which yield 0.50 dB and 0.48 dB respectively. The month of February 2016 is declared to be the worst-month because it has the highest values for the scintillation fades and enhancements. Furthermore, the percentage fractional error and Root Mean Square (RMS) error are shown. Particularly at 0.01% of time, Van de Kamp has the highest fractional error for both scintillation fades and enhancements which are 100.8% and 100% respectively. Similarly, the same for RMS errors for both scintillation fades and enhancements with the values of 78.3% and 65.3% respectively. Whereas the other models have higher values for both percentage fractional error and RMS error except for Karasawa with the values of 11.6% and 17.2% for fades and enhancements respectively. Thus, this model is suitable to be used in Malaysia. © 2022 COSPAR

Author keywords

Cumulative distribution function (CDF); Percentage fractional error and Root Mean Square (RMS) error; Tropospheric scintillation ; Worst-month

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Rahim, N.B.A.; Electrical and Computer Engineering Department, Kulliyyah of Engineering, International Islamic University Malaysia (IIUM), Kuala Lumpur, Malaysia; email:nadirahabdulrahim@iium.edu.my

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