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Impact of Different Integration Times on Distributions of Rain Rates for Predictions of Rain Attenuation

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[Hassan, Mohammad Rofiqul](#)^a; [Rafiqul, Islam Md.](#)^a ; [Habaebi, Mohamed Hadi](#)^a; [Suriza, Ahmad Zabidi](#)^a; [Badron, Khairayu](#)^a; +2 authors

^a Department of Electrical and Computer Engineering, Faculty of Engineering, International Islamic University Malaysia, Jalan Gombak, Kuala Lumpur, 53100, Malaysia

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Abstract

All wireless communication systems are moving towards higher and higher frequencies day by day which are severely attenuated by rains in outdoor environment. To design a reliable RF system, an accurate prediction method of rain attenuation is established and used globally based on local rain intensity measurement. Required rain intensity used for attenuation prediction is generally measured at a point with 1-min integration time or converted from higher integration time to 1-min. Recent measurements of rain intensity with a 10-second integration time indicate that intensity is not uniform over a 1-minute duration. Consequently, the statistics of rain intensity distribution and attenuation predictions are influenced by measurements with integration times shorter than 1 minute. It has been established that an integration time of 0.01% provides the optimal fit for actual

rain rate data. This paper presents the rain intensity distributions from data measured with 2-min, 1-min, 30-sec, 20-sec, and 10-sec integration times, and it has impact on rain rate distributions as well as rain attenuation predictions. © 2025, Electromagnetics Academy. All rights reserved.

Indexed keywords

Engineering uncontrolled terms

1 minutes; High frequency HF; Integration time; Intensity distribution; Outdoor environment; Rain attenuation; Rain rates; Rain-intensity; RF system; Wireless communication system

Corresponding authors

Corresponding
author

I.Md. Rafiqul

Affiliation

Department of Electrical and Computer Engineering, Faculty of Engineering,
International Islamic University Malaysia, Jalan Gombak, Kuala Lumpur,
53100, Malaysia

Email address

rafiq@iium.edu.my

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