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Time Diversity Gain Analysis for Earth to Satellite Link Based on Measured Rain Rate (Conference Paper)

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Abstract

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Earth-to-satellite links are highly affected by propagation impairments especially by rain that operate at frequencies higher than 10 GHz. Therefore, the satellite communication system performance suffers from severe degradation at high frequencies in tropical and equatorial climate. Time diversity is one of the workable technique with suitable time delay between successive transmissions which is proposed by many researchers to mitigate rain fade. However, time diversity analysis requires measured rain attenuation data. For future high frequency link design those data are not available at most of the places. This paper proposes a method to utilize 1-minute rain rate to analyse time diversity gain at any desirable frequency. In proposed method, it is assumed that rain rate with delay can represent rain attenuation with delay for same period of time at same location. This assumption is valid as long as the attenuation causes due to rain. One year measured rain rate in Malaysia is used to predict rain attenuation gain. The measured gain at 12.225 GHz signal is compared with that predicted by ITU-R based on rain rate measurement and is found good agreement. Hence it is recommended that the time diversity gain can be predicted using measured rain rate for any desired frequencies. © 2018 IEEE.

Author keywords

Earth-to-satellite link Rain attenuation Rain rate Time diversity gain

Indexed keywords

Engineering controlled terms: Electromagnetic wave attenuation Frequency bands Satellite communication systems Satellite links Satellites

Engineering uncontrolled terms: Earth to satellite links Equatorial climate High frequency HF High frequency link Rain attenuation Rain rates Satellite communications Time diversity

Engineering main heading: Rain

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