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

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**Performance analysis of rain attenuation on earth-to-satellite microwave links design in Libya**

(Conference Paper)

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**Abstract**[View references \(13\)](#)

Performances of earth-to-satellite microwave links operating in Ku, Ka, and V-bands are degraded by the environment and strongly attenuated by rain. Rain attenuation is the most significant consideration and challenge to design a reliable earth-to-satellite microwave links for these frequency bands. Hence, it is essential for satellite link designer to take into account rain fade margin accurately before system implementation. Rain rate is the main measured parameter to predict of rain attenuation. Rainfall statistical data measured and recorded in Libya for the period of 30 years are collected from 5 locations. The prediction methods require one minute integration time rain intensity. Therefore, collected data were analyzed and processed to convert into one-minute rain rate cumulative distribution in Libya. The model proposed by ITU-R is used to predict and investigate rain fade based on converted 1-minute rain rate data. Rain fade predicted at two locations are used for performance analysis in terms of link spectral efficiency and throughput. V-band downlink shows that 99.99% availability is possible in all the Southern part stations in Libya at 0.29 bps/Hz spectral efficiency and 20.74 Mbps throughput when 72 MHz transponder band width is used which is not feasible in Northern part. Results of this paper will be a very useful resource to design highly

reliable earth-to-satellite communication links in Libya. © Published under licence by IOP Publishing Ltd.

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Compendex keywords

[Cumulative distribution](#) [Measured parameters](#) [Performance analysis](#) [Prediction methods](#) [Satellite communication links](#) [Spectral efficiencies](#) [Statistical data](#) [System implementation](#)

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