Evaluation of Ku-Band Geostationary Satellite Link Latency Under Tropical Rainfall

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Abstract

Satellite communication still faces the challenges of the effect of rainfall on Ku-band link. This study aims to measure and analyse suitable parameters that represent rainfall intensity and latency to evaluate their relationship. Rainfall data was collected using a tipping bucket rain sensor and subsequently processed to determine rainfall rate. Latency data was collected by connecting the received signal of SES 12 from the antenna to a computer via a router and a 'ping' operation was performed to obtain the needed latency values. Both sets of data were collected from July to December 2024. Cumulative Distribution Function (CDF) were plotted for rainfall rate and latency. The CDF analysis implied that Ku-band affected by rainfall rates higher than 50 mm/h. This study shows rainfall rate significantly affect the latency and network reliability of the Ku-Band satellite link. © 2025 IEEE.

Author keywords

ku-band; latency; rain attenuation; satellite communication

Indexed keywords

Engineering controlled terms

Antennas; Distribution functions; Electromagnetic wave attenuation; Function evaluation; Geostationary satellites; Reliability analysis; Satellite communication systems

Engineering uncontrolled terms

Cumulative distribution function; Effects of rainfalls; Ku band; Latency; Rain attenuation; Rainfall data; Rainfall intensity; Rainfall rates; Satellite communications; Tropical rainfall

Engineering main heading

Rain

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