Measurements and Models for 38-GHz Point-to-Multipoint Radiowave Propagation

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IEEE Journal on Selected Areas in Communications
Volume 18, Issue 3
March 2000
Pages 310-321

Abstract:

This article presents results of a wide-band measurement campaign conducted at 38 GHz. The objective of the research was to determine multipath and time varying channel behavior of short-hop millimeter-wave point-to-multipoint radio links during various weather events. 73963 power delay profiles (PDPs) were captured on three links, each comparable to proposed local multipoint distribution systems (LMDS) in a campus environment. Multipath was observed in unobstructed LOS links during rain but not during clear weather. Short-term variation of the received signal over 1-2 min observation periods is described by a Rician distribution with a K factor which varies as a function of rain rate. Measured rain attenuation exceeds Crane's (1996) model predictions by several decibels. A novel prediction technique is presented that applies canonical antenna patterns and site specific information to estimate worst case multipath channel characteristics including relative power, time of arrival (TOA), and angle of arrival (AOA) of each multipath component. New metrics, the excess delay zone and relative power zone, are defined and contour plots are developed to determine potential reflectors from an area site map. These results and models provide useful guidelines for the design of millimeter-wave wireless communication systems

Index Terms:
38 GHz, LMDS, MBS, millimeter-wave propagation, rain attenuation