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Author: Dr. Franz Teschl
Joanneum Research, Austria

Dr. Michael Schönhuber
Joanneum Research, Austria
Mr. Veikko Hovinen
Centre for Wireless Communications, University of Oulu, Finland
Prof. Fernando Pérez Fontán
University of Vigo, Spain
Mr. Roberto Prieto-Cerdeira
ESA, The Netherlands

LESSONS LEARNED FROM MOBILE SATCOM PROPAGATION MEASUREMENT CAMPAIGNS AT C, S, AND K-BAND

Abstract

In the last few years Joanneum Research has carried out several measurement campaigns within ESA/ESTEC contracts. The campaigns focused on both the satellite to indoor and the mobile satellite channel. Measurements have been carried out at C-, S-, and K- bands. Both continuous wave and wideband data (from a PropSound channel sounding device) have been measured. All measurement campaigns have used aircraft as platform for the transmitter. The measurements delivered unprecedented datasets that allowed determining path loss and delay- and angle- spreading of the received signal, which are the main parameters when modelling the channel, and indeed channel models have already been developed. This study, however, not only presents the main findings of the campaigns, but also looks "behind the stage" of the measurement setup and the logistics of such measurements and addresses the lessons learned. When carrying out measurement campaigns with mobile transmitters and/or receivers, it is also the recorded auxiliary data that plays an important role. The exact position of the Tx and Rx, their attitude, the directions of pointing antennas, and the surroundings of the Rx have to be available with high accuracy and rapid succession in order to gain valuable data. In the presented campaigns the aircraft have been equipped with GPS sensors and inertial measurement units. These datasets were also recorded for the analysis and the data post processing in order to have a precise view on the signal path geometry. With the knowledge of this geometry the buildings' entry losses could be related to the structures and materials they penetrated (glass, metal facades, concrete structures, etc.). Equivalently, also in the mobile satellite case the attenuation of various types of roadside vegetation could be determined from the knowledge of the signal path geometry. Surveillance cameras with fish-eye-lenses have been used to record the direct surrounding of the Rx in both the satellite to indoor case and the mobile satellite case. With all additional information it was possible to explain certain effects in the signal caused by moving persons in the indoor case and by shadowing or reflections due to buildings, vegetation and traffic in the mobile case.