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LINK QUALITY PARAMETERS IN VSAT NETWORKS FOR EFFECTIVE OPERATION AND FOR WEATHER MONITORING

Abstract

Tens of thousands of VSATs are installed all over the world. Most of them are earthbound stations but also mobile VSATs exist (e.g. installed on vessels for mobile maritime satellite services). Since VSATs access satellites in geosynchronous orbits, the link quality is a function of the tropospheric and atmospheric situation along the fixed slant path between terminal and satellite. However, there is also a variety of other parameters like the orbital perturbation of the satellite, the pointing accuracy of the terminal, and thermal drifts of the transmitter/receiver that degrade the link quality. Even dew that has accumulated on the dish or the feed, and raindrops that have not fully evaporated after a rain shower, have an influence on the data throughput. When looking at the time series and the spatial correlation of signal parameters, all these effects come together. When investigating one terminal only, the above mentioned effects can hardly be extracted. However, when looking on the "big data" of a whole network in combination with weather and atmospheric information it seems reasonable. For this purpose, recently a project entitled "SatcomWeather" was initiated to extract all those parameters from an operational VSAT network. The goal is to support VSAT operators who have a commercial interest in optimizing VSAT networks and their data throughput. In operation centres hundreds of millions of measured VSAT signal and throughput logs/records are available, spanning several years, which is an enormous potential and challenge. Also the scientific propagation community that carries out slant path propagation measurements with unmodulated beacon signals should benefit from these activities. By analysing VSATs from nearly all land covered regions of the world, measured statistics can be derived and compared against propagation models. However, the extraction of attenuation statistics from VSAT network is much more complex than analysing beacon receiver signal levels. The benefit, however, is that two independent measurements are available, as VSATs operate at different frequencies (e.g. 20/30 GHz for down- and uplink). This study focuses on the principal procedures to identify orbital movements of the satellite in signal parameter time series at clear sky conditions. Once antenna gain variations due to the satellite movements are compensated, attenuation time series are derived and compared against operational weather data. Further, the study gives an outlook on the data handling of the enormous amount of satellite and weather data involved.