Bachelor Thesis

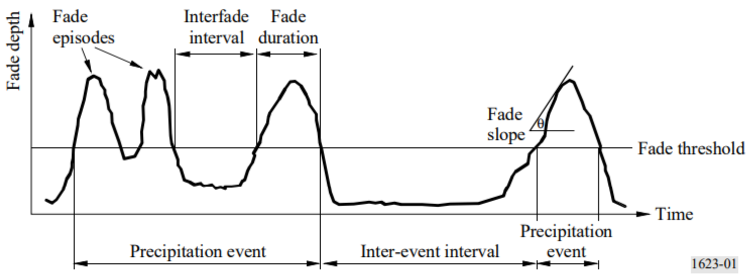
Analysis of fade dynamics in satellite signals

In the design of any wireless communication system, the dynamic characteristics of fading need to be understood in order to guarantee a certain reliability or to optimize the data throughput. The dynamic of fading is closely related to the operating frequency. Since the first communication satellites were launched in the 1960s, the satellite radio communication services have been constantly increasing their coverage, availability, quality, and data rate which led to a continuous expansion towards higher frequencies [1]. However, the higher the frequency, typically the more severe is the signal degradation due to tropospheric effects, e.g. rain, snow.

The fade dynamics of satellite signals can be described by several parameters like fade duration, interfade interval and fade slope as illustrated in Figure 1. Fade duration and fade slope are key parameters in the process of choosing forward error correction codes and best modulation schemes.

FIGURE 1

Features characterizing the dynamics of fade events



Source: ITU-R P.1623-1

Your Tasks

- Analyze satellite signal time series
- Identify tropospheric and non-tropospheric effects
- Retrieve propagation statistics in accordance with the databanks of the International Telecommunication Union (ITU)
- Document your findings and compare them with statistics of other regions of the world and/or with statistics at different frequencies

Your Profile

- Interest in satellite communications, signal processing, weather observation and meteorology
- Experience with Python or MATLAB is advantageous

Contact

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[1] Riva C, Martellucci A. Preface to the special issue on the Alphasat Aldo Paraboni propagation experiment. Int J Satell Commun Network. 2019; 37: 385–386. https://doi.org/10.1002/sat.1314