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Invitation à la soutenance de thèse

MULTI-FREQUENCY CHARACTERIZATION OF THE PROPAGATION CHANNEL AND MODELLING OF THE INSTANTANEOUS FREQUENCY SCALING TO OPTIMIZE SATELLITE LINKS AT KA AND Q/V BANDS

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ISAE Supaéro, 10 Av. Edouard Belin, 31400 Toulouse,
Salle des thèses

Devant le jury composé de :

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Résumé

Current high throughput satellites systems provide Internet access to their users using Ka band for both user and feeder links (feeder links being the links between the satellite and the gateways, connected to the terrestrial infrastructure). In order to increase the throughput of these systems, the upcoming generation plans to give the full Ka band to the user links, and relies on a higher frequency band for the feeder links, such as Q/V band. At these frequencies, tropospheric attenuation becomes substantial, mainly due to rain and clouds. Consequently, fade mitigation techniques are necessary to avoid link unavailability. Two of these techniques, uplink power control and gateway diversity, require an accurate knowledge of the attenuation along the feeder uplink in real time. The most accurate way to estimate atmospheric attenuation is to measure the power sent by satellite beacons, at the frequency of the downlink, along with frequency scaling techniques to obtain the attenuation at the target frequency on the uplink.

This study focuses on both beacon power measurements and frequency scaling models. Concerning beacon power measurements, models have been proposed to characterise various sources of errors, and when possible, to correct them. Examples of such sources of errors are thermal noise, tropospheric scintillation effects, time desynchronization of the receivers. Regarding frequency scaling, reference empirical models have been tested on a 7-year propagation database collected in Toulouse, allowing seasonal behaviours to be studied. Additionally, the interest of recent frequency scaling models relying on micro-physical descriptions is shown for tropical climates, using a 2-year database collected in Guadeloupe. These models are parametrized for the particular location, and potential improvements based on a learning of the rain drop size distribution for the particular location are discussed.

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Mots clés

Radiowave propagation, Very High Throughput Satellites, Frequency scaling