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RADIO SYSTEMS IN VEGETATION ENVIRONMENTS

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Research Group: Radio Systems

The Radio Systems Research Group conducts advanced research on radio wave propagation, channel modelling and wireless communication systems, with particular emphasis on complex natural and built environments. The group brings together researchers with complementary expertise in electromagnetics, wireless communications, experimental measurements and system level design, combining solid theoretical foundations with strong experimental validation. The research of the group focuses on understanding and modelling the interaction between radio waves and complex propagation media, especially in scenarios where classical models fail to provide reliable predictions. These include vegetation rich environments, rural and peri urban areas, indoor and industrial scenarios, and emerging application domains linked to digitalization and sustainability. A distinctive strength of the group is its long-term expertise in radio propagation in the presence of vegetation, addressing attenuation, scattering, temporal variability and frequency dependent effects across a wide range of frequencies, from VHF and UHF to microwave bands.

Keywords: **Propagation within forests and shrubbery | Digitization of forestry activities | Rural communication systems**

Research Focus:

Analysis, modelling and design of radio communication systems operating in vegetation-rich environments, such as forests, shrublands and complex rural areas. Vegetation introduces specific propagation effects - including attenuation, scattering, diffraction and temporal variability - that significantly impact wireless system performance, particularly in VHF, UHF, microwave bands and emerging frequency ranges used for IoT and future 5G/6G systems.
The research combines theoretical and empirical radio propagation modelling, experimental measurement campaigns in real environments, and the development of communication solutions adapted to forestry and rural applications. The overall aim is to improve coverage prediction, link reliability and energy efficiency in scenarios where traditional propagation models are insufficient, thereby supporting the digital transformation of forestry activities and rural connectivity.

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