A major problem for rural areas is inaccessibility to affordable broadband Internet connections. This may force companies and people into a difficult decision: whether to leave a specific region or stay behind and hope for better connectivity. To reduce the costs of backhauling in rural regions, alternative solutions are discussed to provide high-bandwidth satisfying the needs of today’s customers for triple play services. One of these approaches are:

**WiFi based Long-Distance Networks (WiLD)**

These networks use WiFi hardware and directional antennas for long-distance links. Due to its distribution in the consumer sector, the required hardware is well developed, well priced, have a low energy consumption and offer a stable performance in license free bands.

**Research Motivation and Questions:**

- Which physical propagation models can be used for WiLD links with directional antennas to accomplish an accurate network planning process and monitor propagation issues.
- Can the WiFi MAC layer mechanism on WiLD links be predicated and therefore numerically optimized or is an alternative (token based) MAC protocol preferable?
- Which interference effects occur among WiFi radios operating on the same channel with directional antennas?
- What is the current outdoor spectrum occupancy in the unlicensed bands? Is the spectrum already overcrowded?
- What is the design of an intelligent and centralized frequency algorithm to reduce internal- and external interferences?
- Is it possible to map the scenario of a WiLD network to modern network architectures like Software Defined Networking (SDN)?

**Publications:**

- Interference of simulated IEEE 802.11 links with directional antennas. Rademacher, M.; and Jonas, K. In 7th WiReD Days, pages 27–32, Porto, mar 2017 IEEE.
- A Token-Based MAC For Long-Distance IEEE802.11 Point-To-Point Links. Rademacher, M.; Chauschet, M.; and Jonas, K. VDE ITG Fachbericht Mobilkommunikation, 2016.

The cost benefit of WiLD networks relies on the usage of Commercial Off-the-Shelf hardware and license free spectrum. To build a WiLD node, we use Single-Board Computer (SBC) with multiple slots holding the WiFi transmitter. These SBC are placed in outdoor suitable enclosures. For every WiLD link, two WiFi transmitters are needed.