

# FPGA-based RONJA Twister

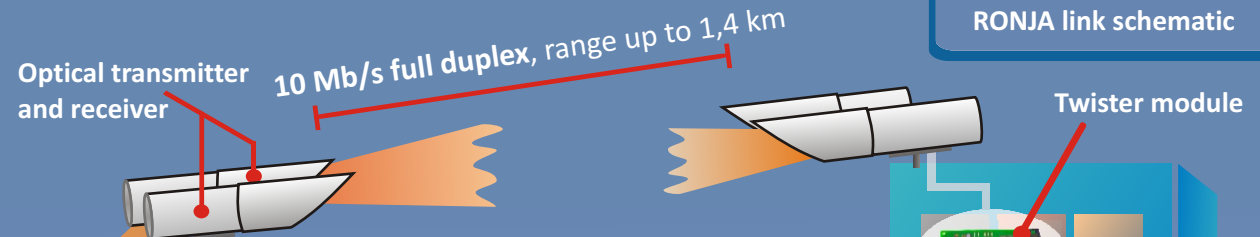
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## What is RONJA

RONJA is an open-source project whose result is a device for outdoor short-to-mid range wireless networking. RONJA belongs to a class of so called *Free Space Optical* devices, which means that a visible-light beam sent through atmosphere is used for wireless data transmission.

## RONJA Twister module

RONJA Twister is a key part of RONJA device, since it forms an interface between metallic Ethernet 10Base-T and the actual wireless optical transmission. Modul

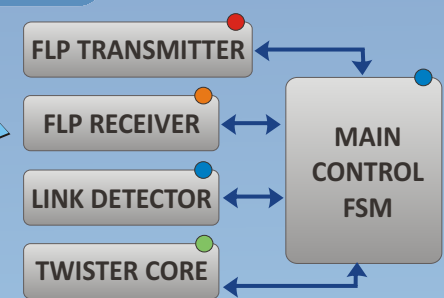


## Aim of the thesis

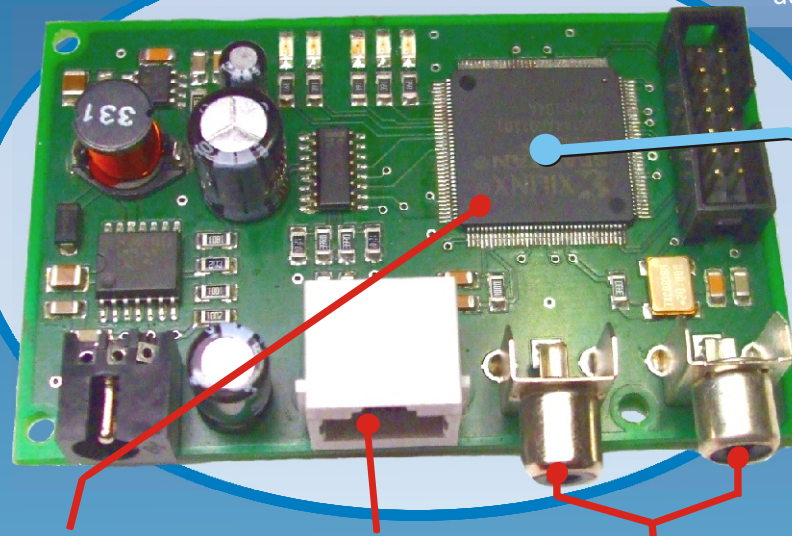
The author's aim was to design and implement a prototype of RONJA Twister on a FPGA platform.

The original Twister design was significantly extended by adding fully stateful Ethernet PHY w/Auto-Negotiation, which considerably simplifies Twister deployment.

## System structure



	Original RONJA Twister	EXTENDED TWISTER w/ FPGA
Technology	discrete logic IO	FPGA logic array
Ethernet interface	stateless; does not consider link speed&duplex	fully stateful Ethernet PHY implementation
Link mode configuration	manual link segment configuration only	fully automatic (Auto-Negotiation)
PCB size	10,3 cm x 8,2 cm	reduced by 45 % <sup>1)</sup>
Power cons.	2,1 W	reduced by 30 %
Extensibility in future	Extensions not possible	simply achievable (FPGA reconfig.)

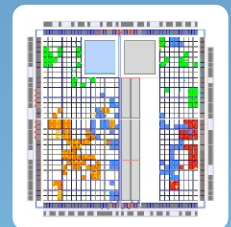


Xilinx Spartan-3AN FPGA

Ethernet 10Base-T twisted-pair interface

Optical link interface

The current prototype is **ready for future extensions and enhancements** as approx. 65 % of the FPGA chip resources is not yet occupied.



<sup>1)</sup> Considerable PCB dimensions reduction allows to integrate RONJA Twister with the transmitter module and thus significantly reduce the complexity of whole RONJA device assembly.