Design, implementation and testing of a CDMA-augmented Wireless CAN protocol

Motivation

The Controller Area Network (CAN) bus protocol is used for cabled broadcast networks in industrial and automation environments. It is favored because it guarantees low latency, prioritization of messages and heavy network loading. One of the unique features of CAN busses is it's medium access control protocol, the CSMA/NDA protocol. Thanks to a concept of dominant and recessive bits on the communication bus, the CSMA/NDA implements a protocol that determines which nodes gets access to the medium without losing any time or bandwidth.

It was commonly thought that CSMA/NDA could only be implemented in cabled networks, but we've recently proven that it is possible to define a wireless PHY layer protocol that is compatible with the CSMA/NDA protocol of the MAC layer. In a proof-of-concept experiment, we designed and tested wireless transceivers that are fully compatible with the CAN controller of our microcontroller systems, proving the feasibility of wireless CAN (WiCAN) communications.
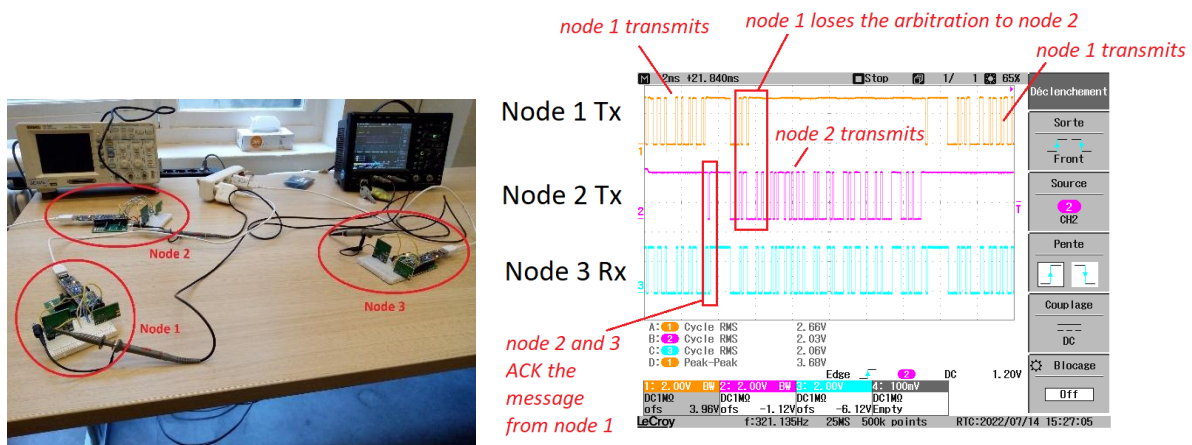

Figure: Concept of beam scanning at 28 GHz and picture of our 28 GHz SDR

Objective

This Master's thesis will start from our proof-of-concept experiment, and provide a more robust version of our WiCAN transceivers by introducing a layer of CDMA (code division multiple access) over the CAN protocol, allowing for more robust communications.

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