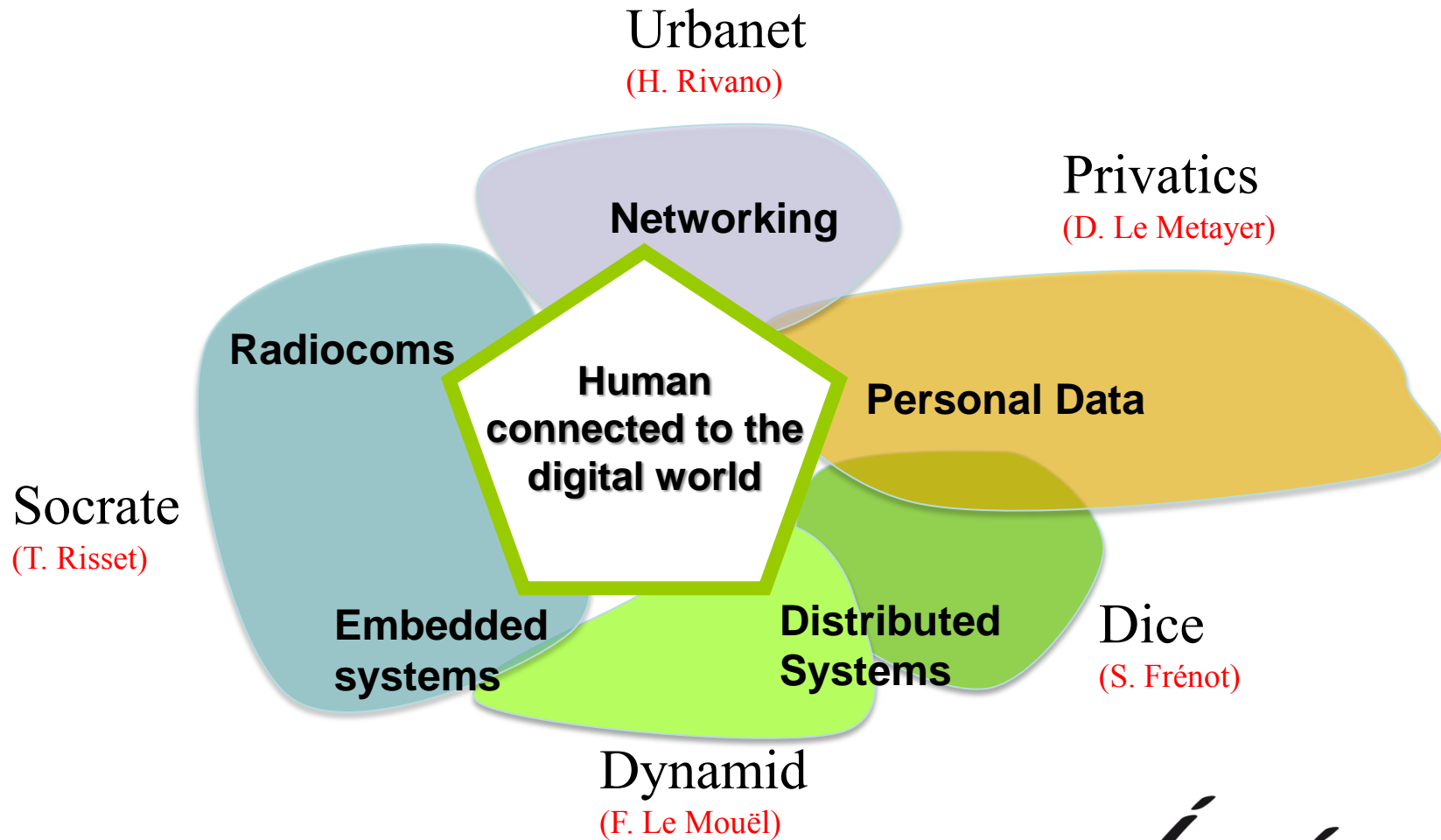


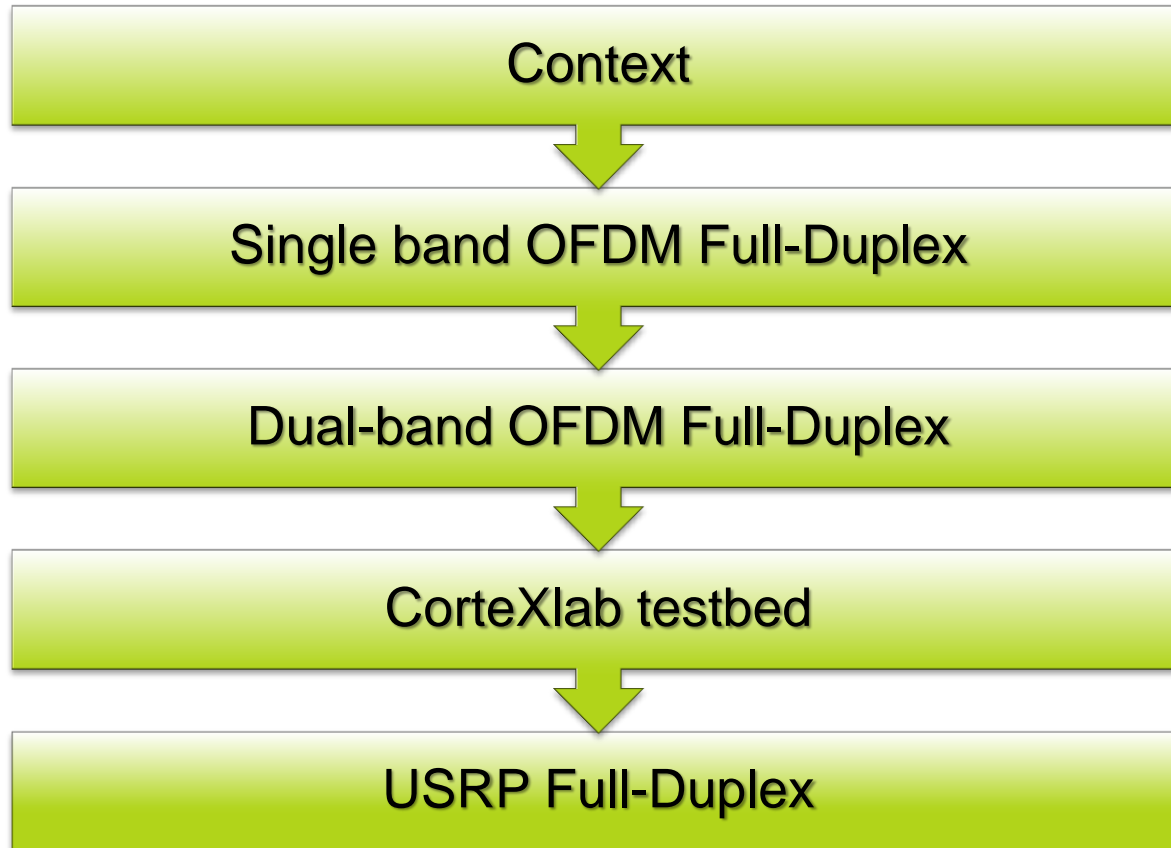
Study of a Full-Duplex Dual-Band OFDM Transceiver

Guillaume VILLEMAUD,
Zhaowu Zhan, Florin Hutu, Tanguy Risset,
Jean-Marie Gorce

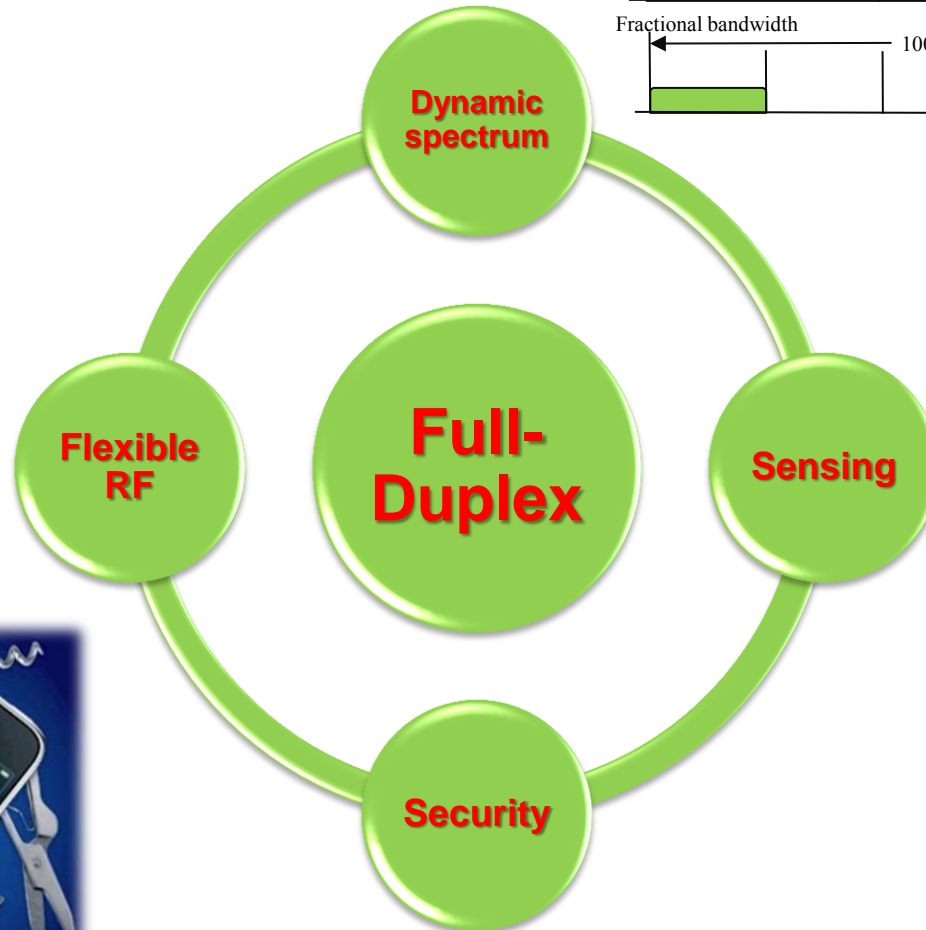
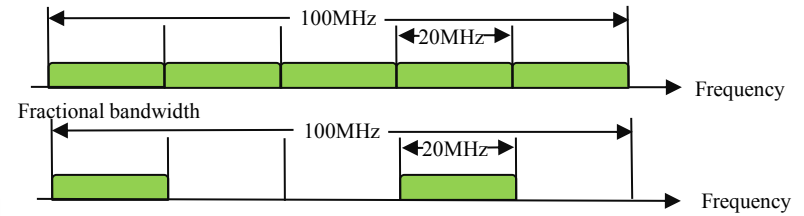
DUPLO Workshop, CrownCom 2014



Outline

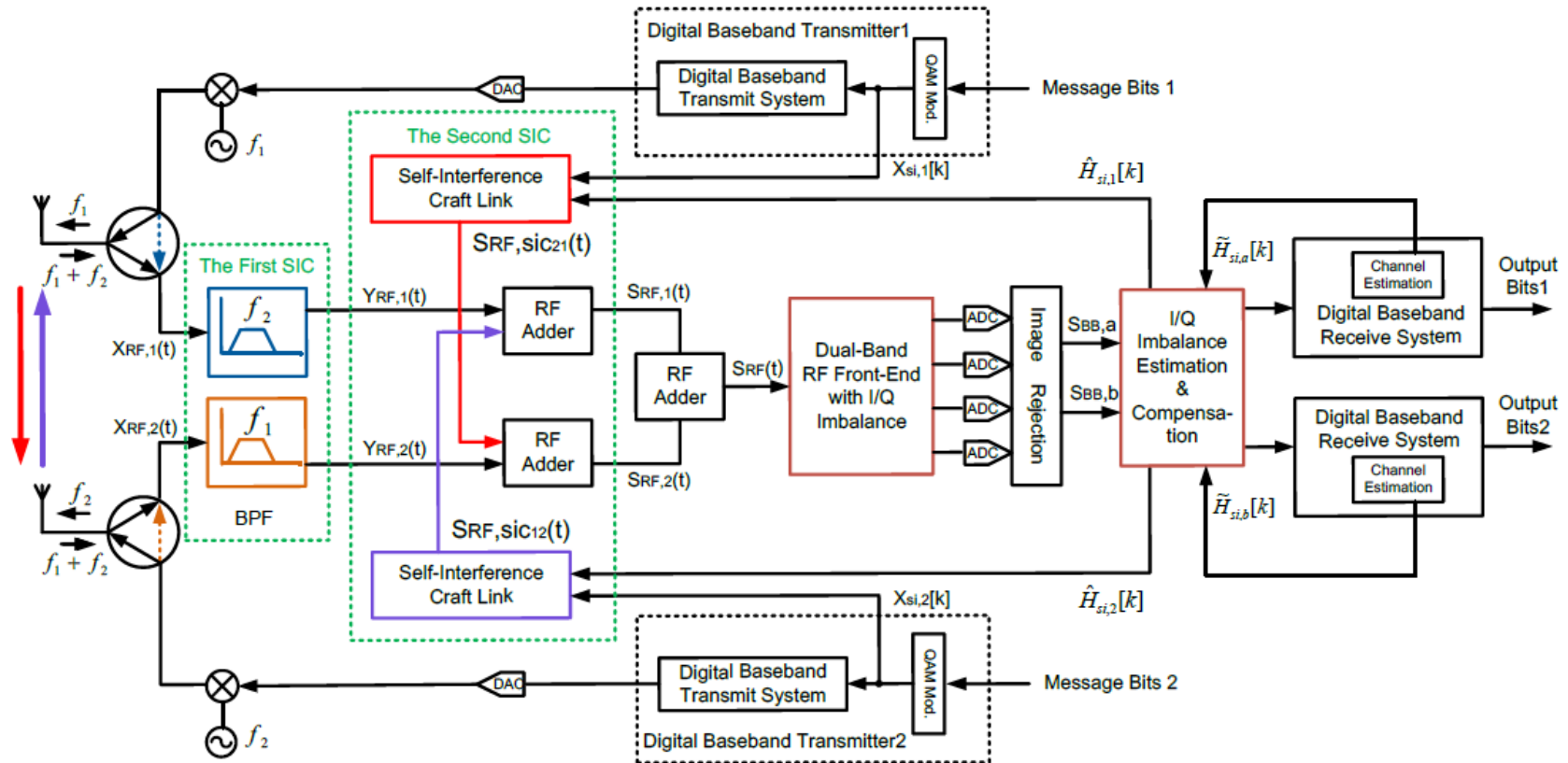


Brief context



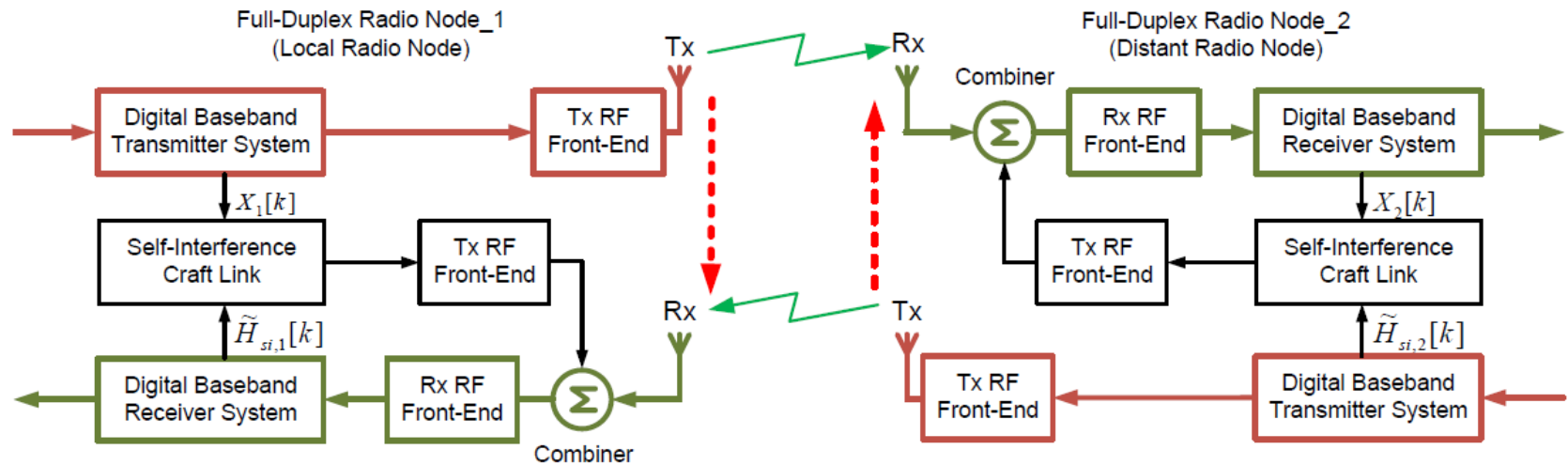
Overview of the structure

Full-Duplex Dual-Band OFDM Transceiver

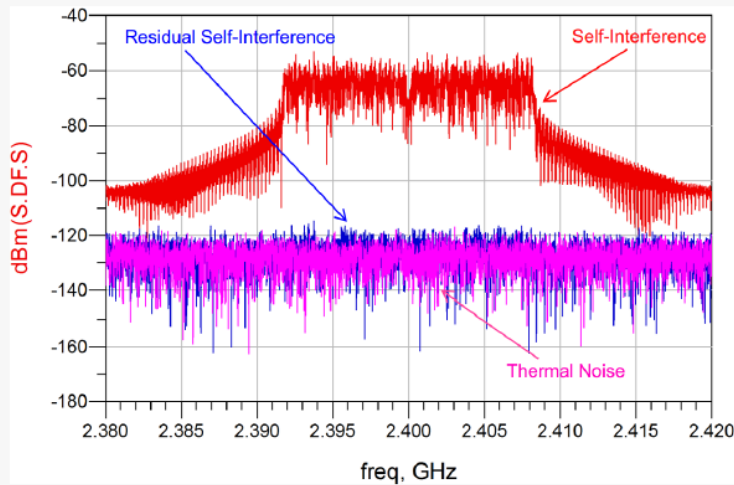
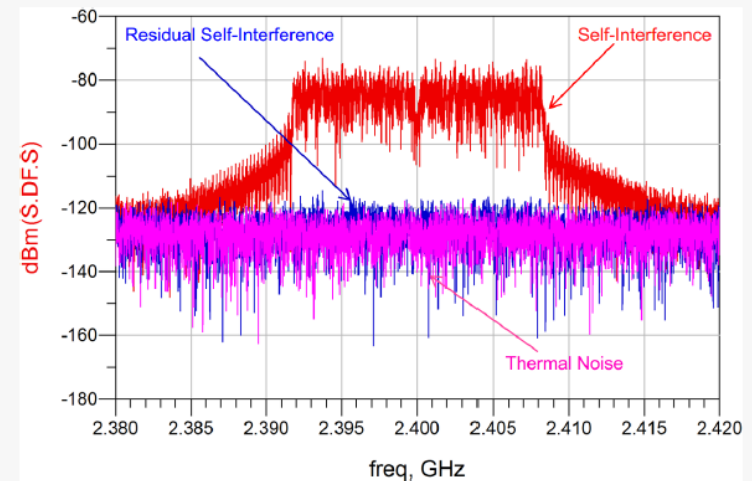


Fist step: Full-Duplex OFDM

Main problem: deal with the self-interference
Focus: Analog cancellation

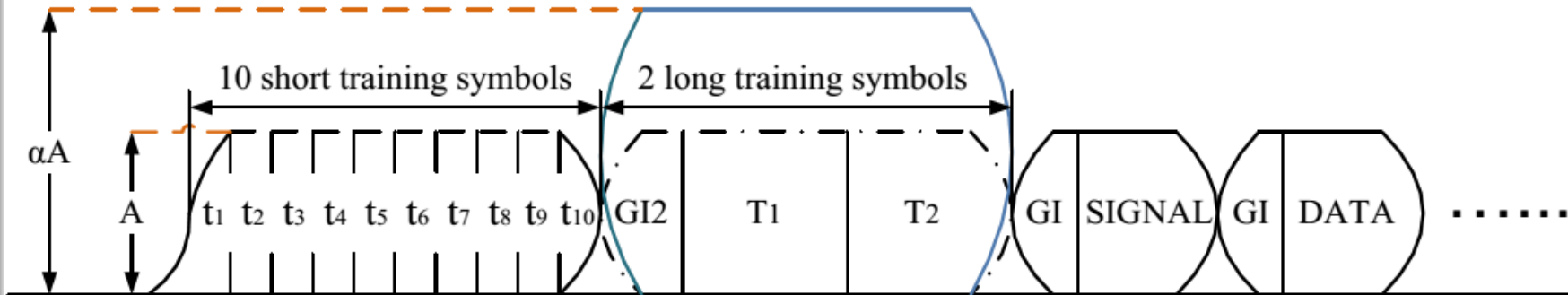


Residual self-interference

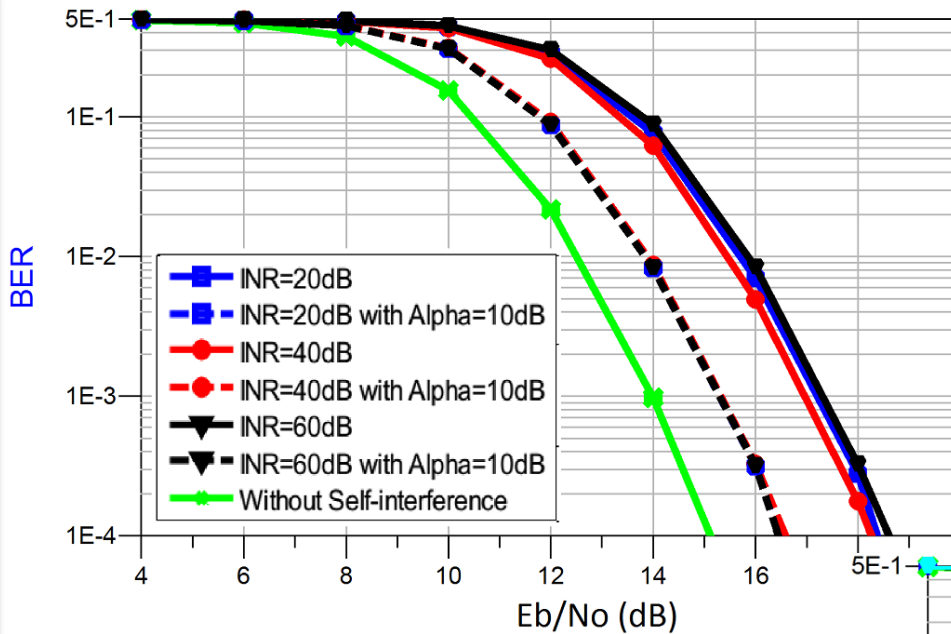


- (1). INR=20dB
- (2). INR=40dB
- (3). INR=60dB

Enhanced preamble



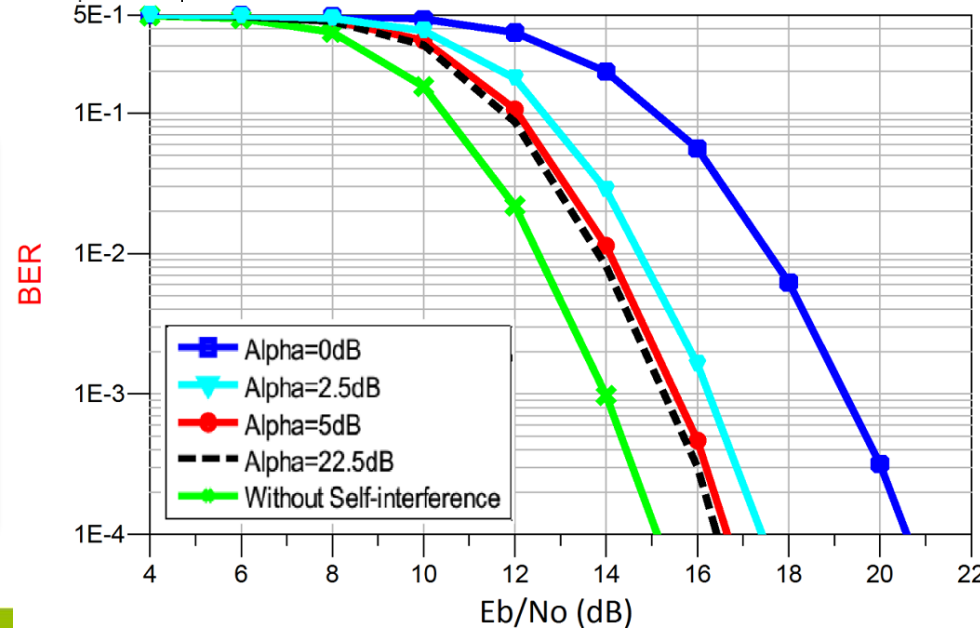
Effect of enhanced preamble



Self-interference can be reduced to noise level when $INR=20, 40, 60\text{dB}$.

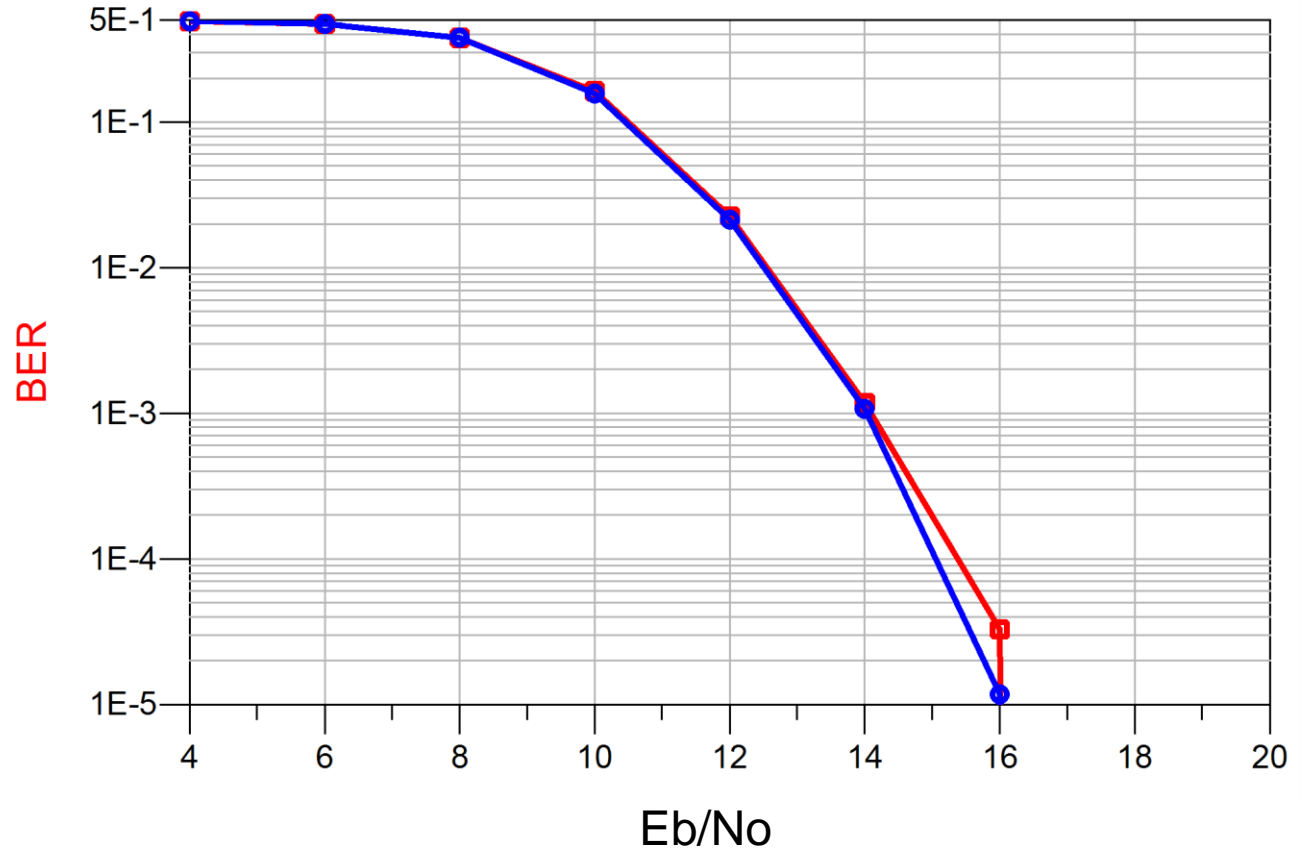
Self-interference can further be reduced to under noise floor when $\alpha=10\text{dB}$.

Even for low self-interference, e.g. $INR=5\text{dB}$, self-interference can be reduced to under noise floor when $\alpha \geq 5\text{dB}$ by using the power difference method.





Combination of RF and Digital

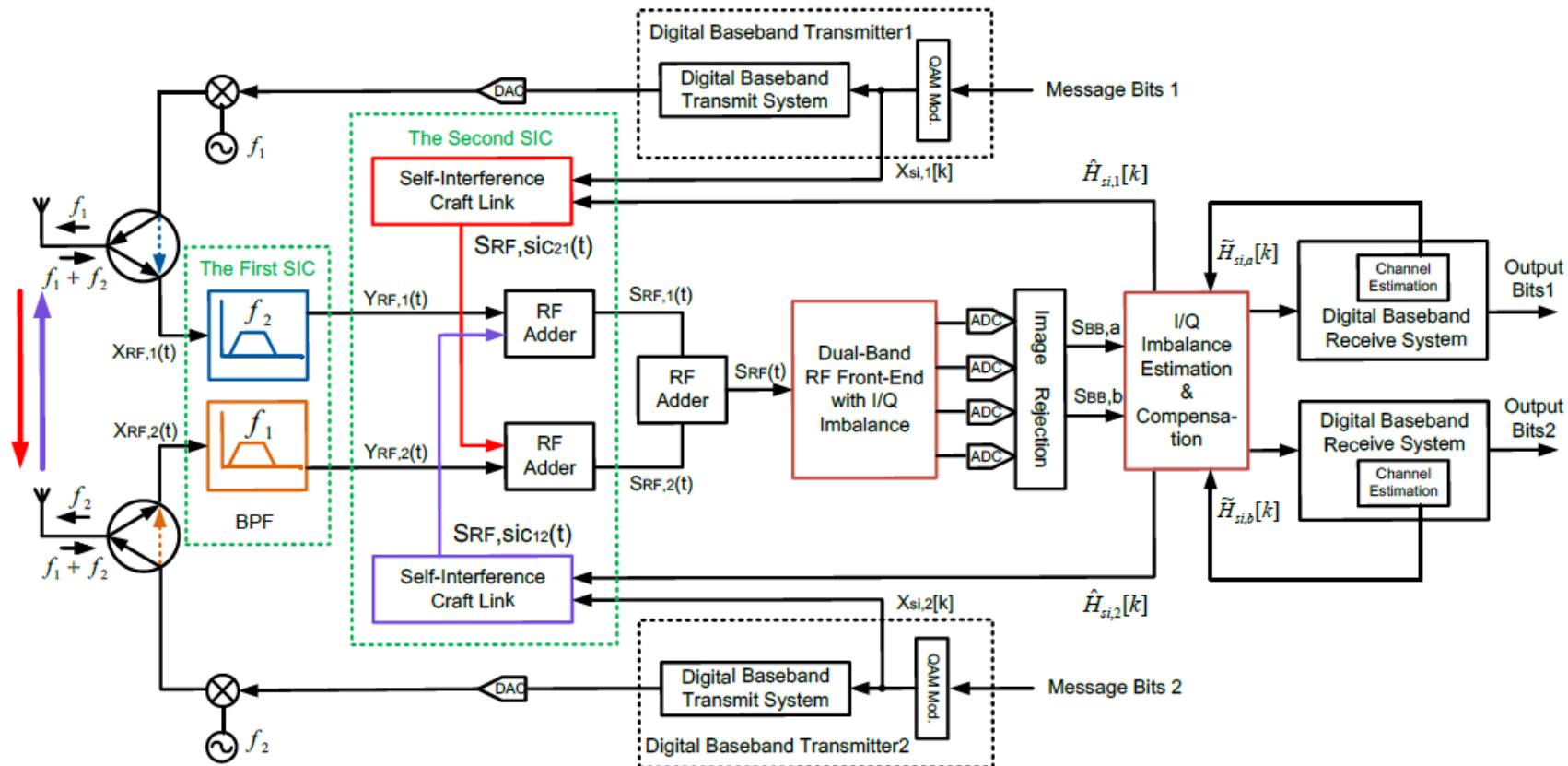


Blue line: conventional receiver w/o interference

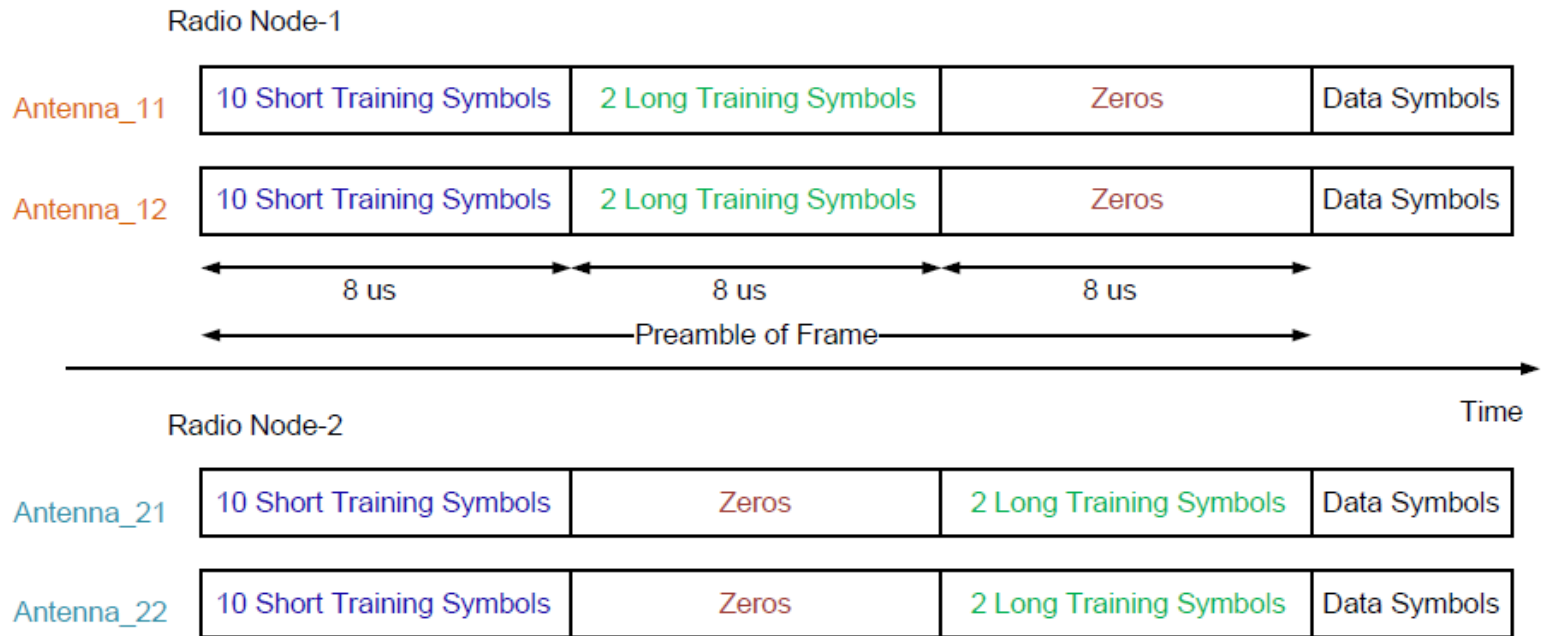
Red line: FD receiver with Analog and Digital cancellation

Dual-band Full-Duplex

Simultaneous emission and reception on two separate bandwidths

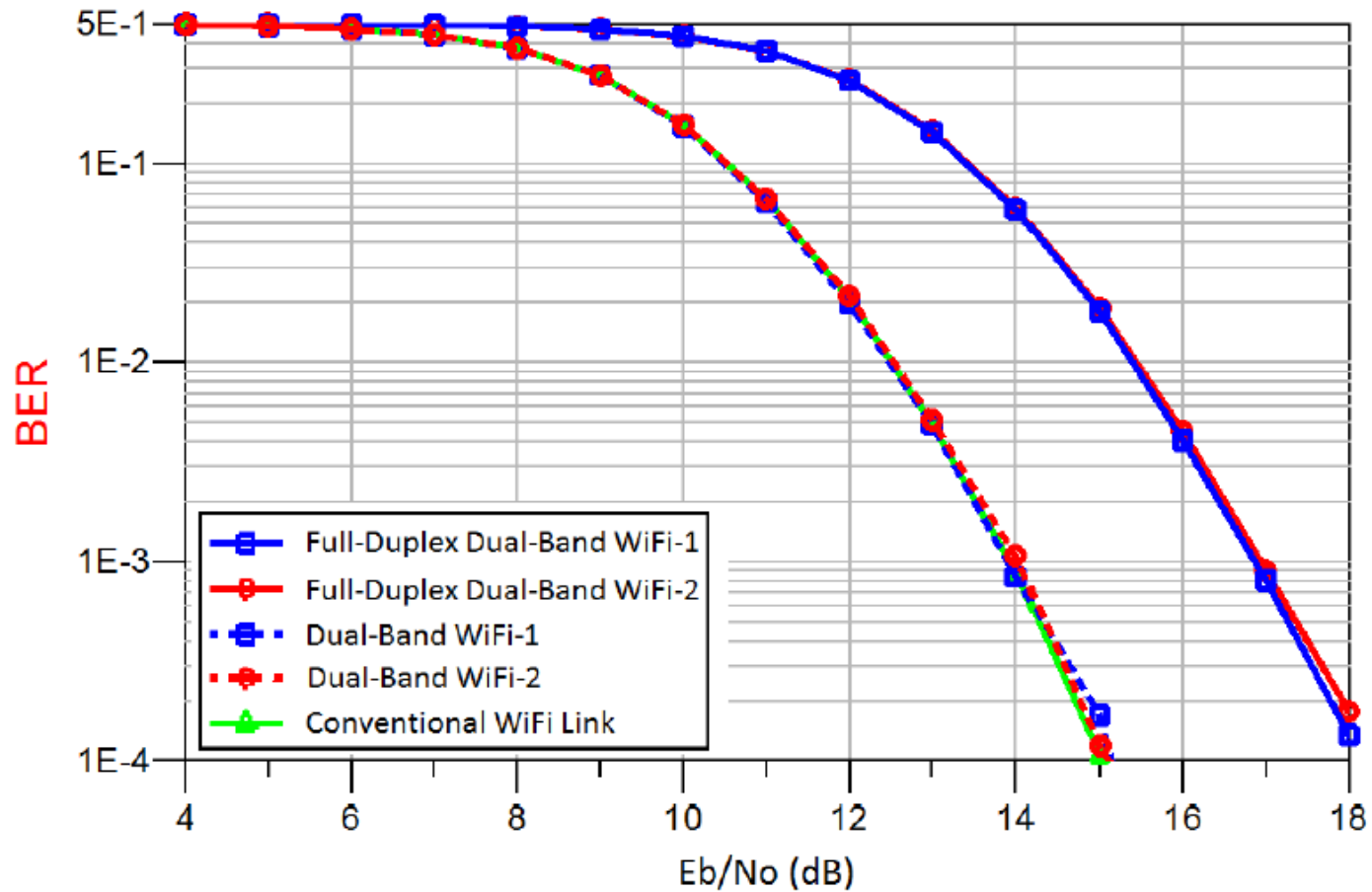


FD-Dualband frame structure

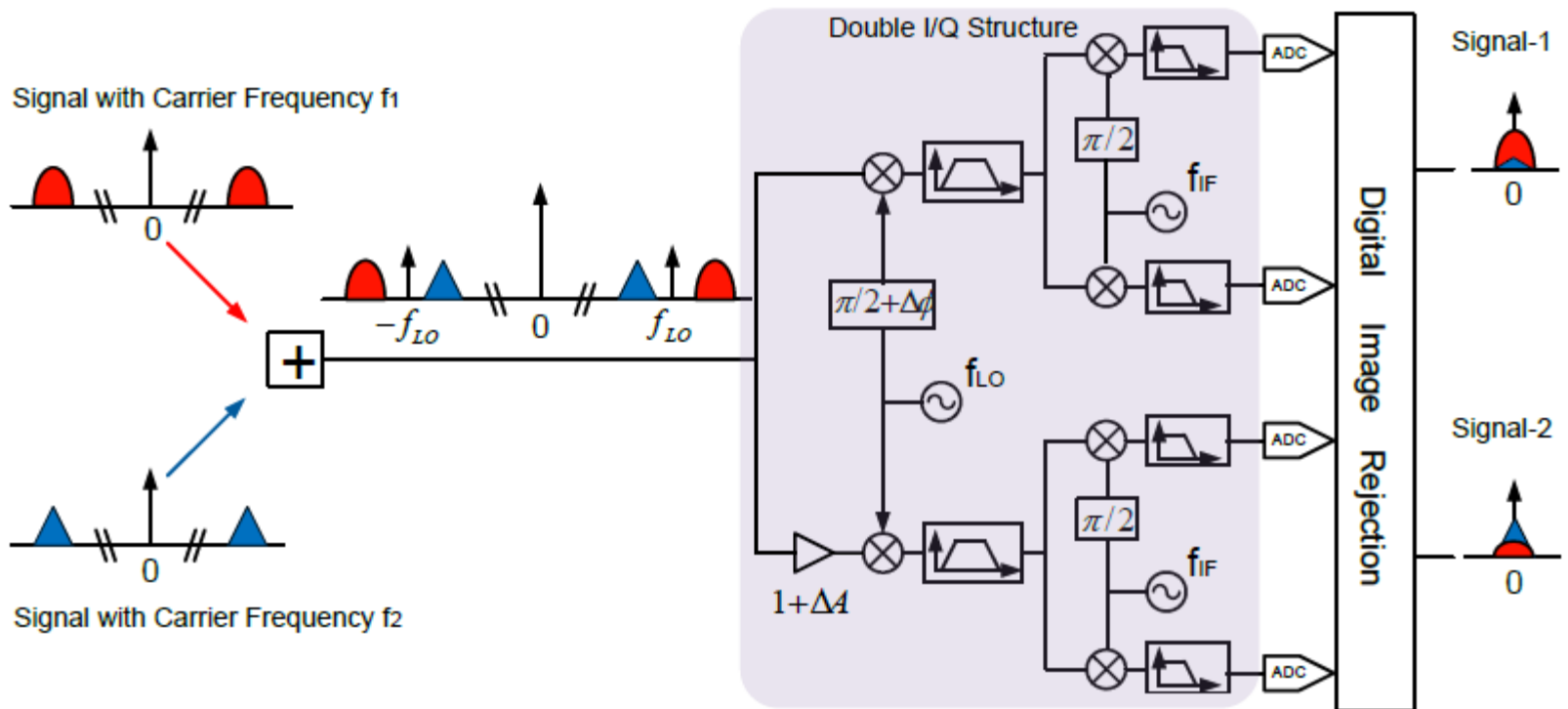




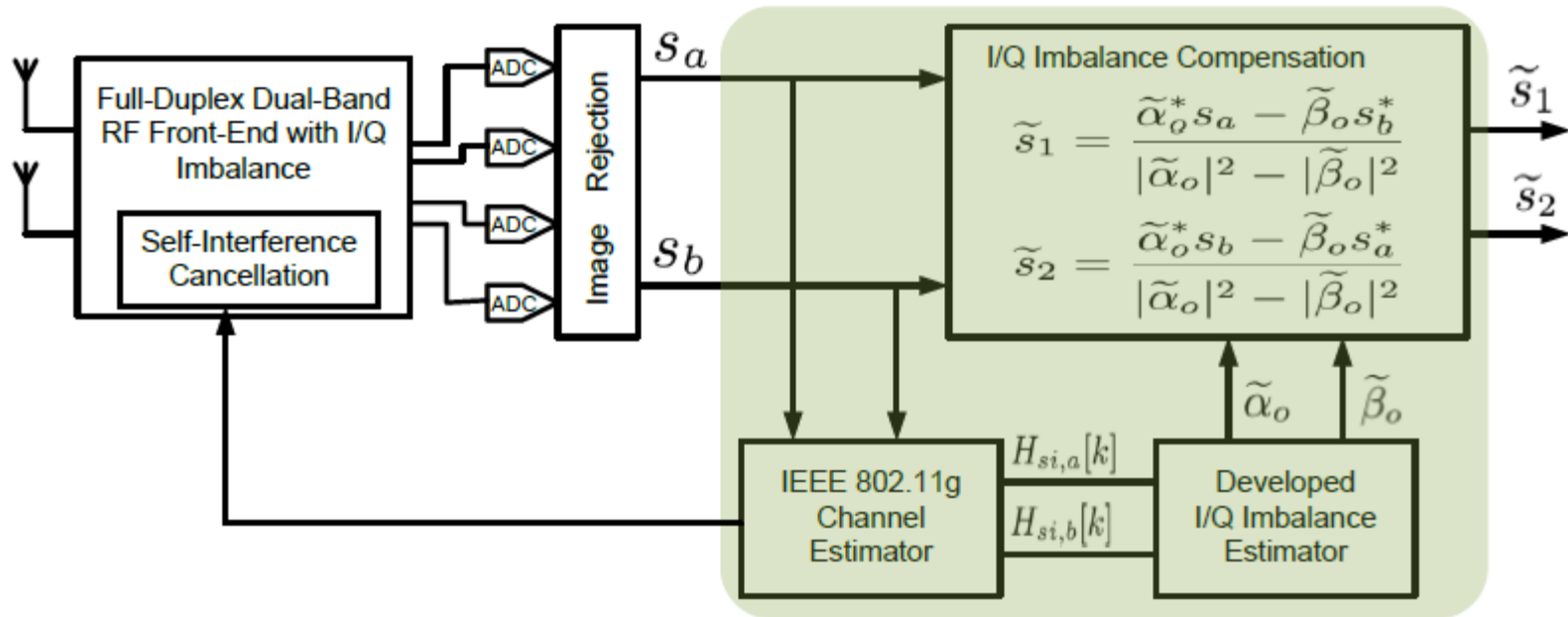
FD-Dualband simulated results



FD-Dualband with IQ imbalance

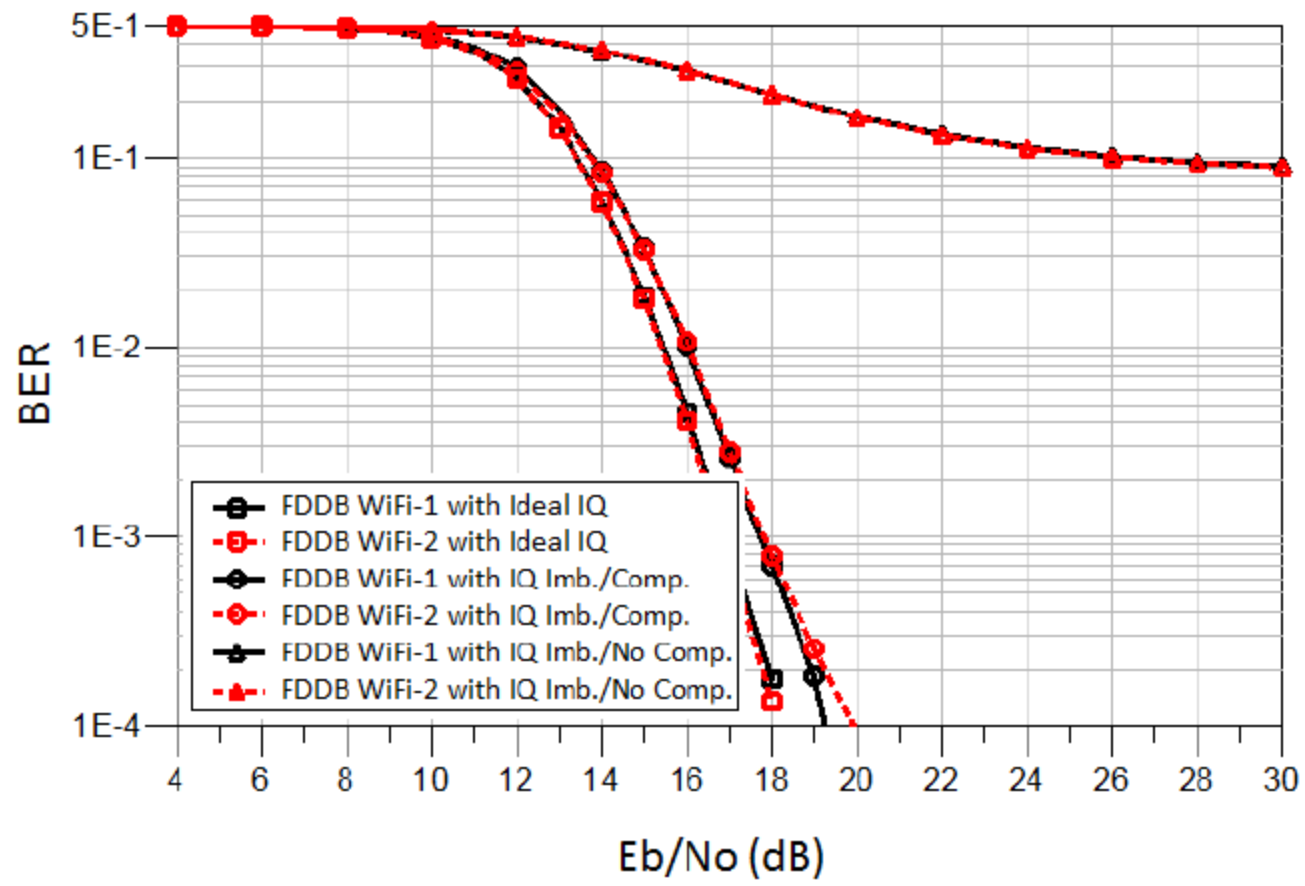


FD-Dualband with IQ compensation





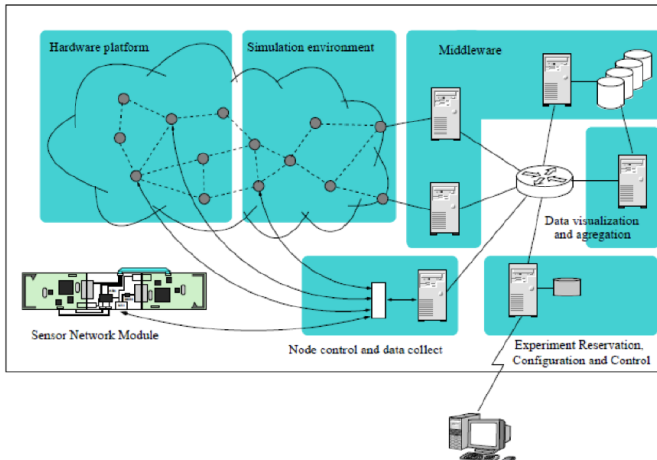
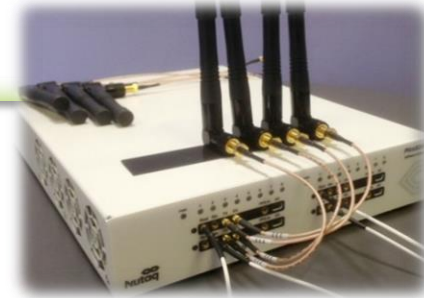
FD-Dualband simulated results



Cortex ~~X~~ lab

Large experimental testbed (200 m², faradized and partially anechoic), based on SDR and WSN radio nodes, with complete remote access.

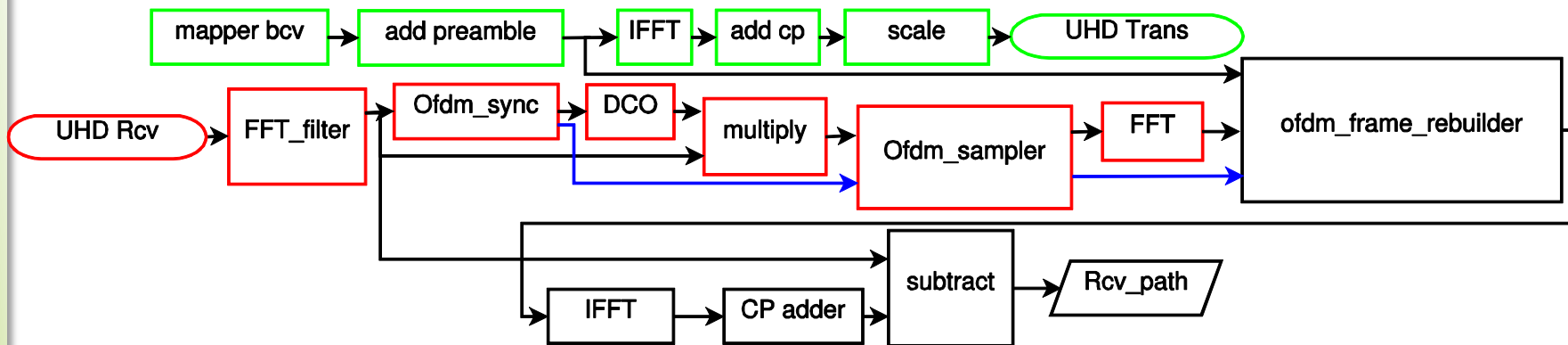
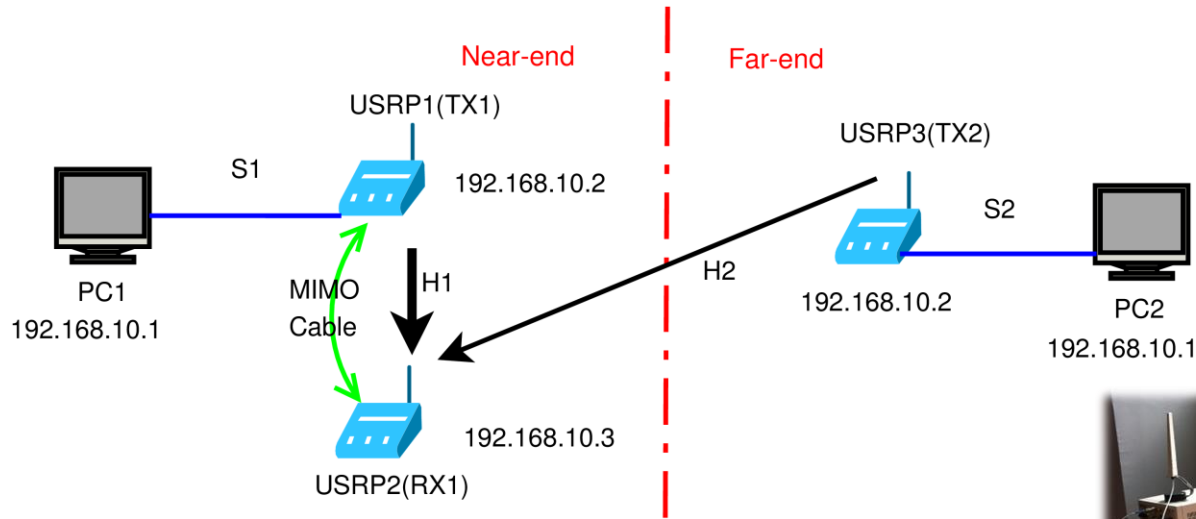
- 18 picoSDR Nutaq (5 MIMO 4x4, 13 MIMO 2x2)
- 24 USRP National Instruments
- 42 industrial PC Aplus



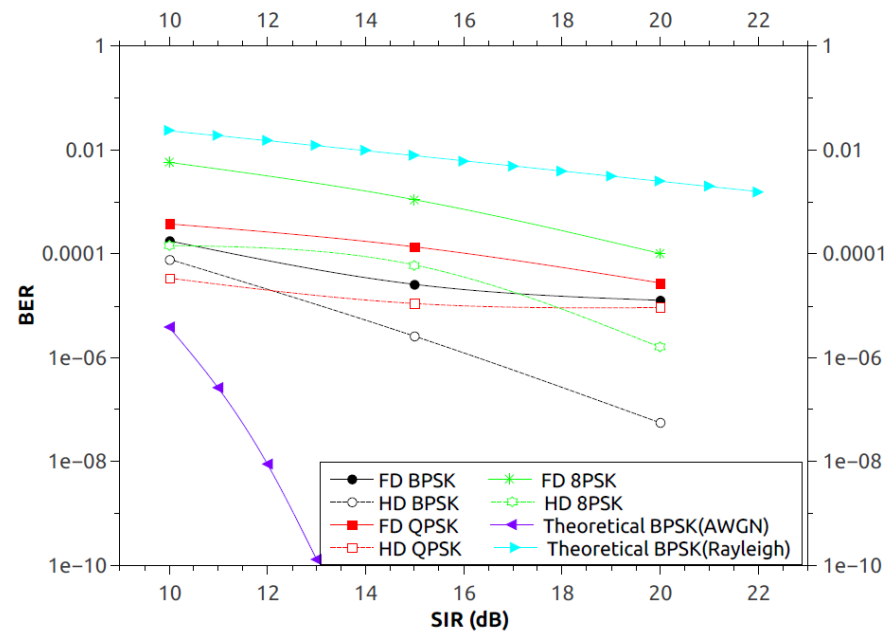
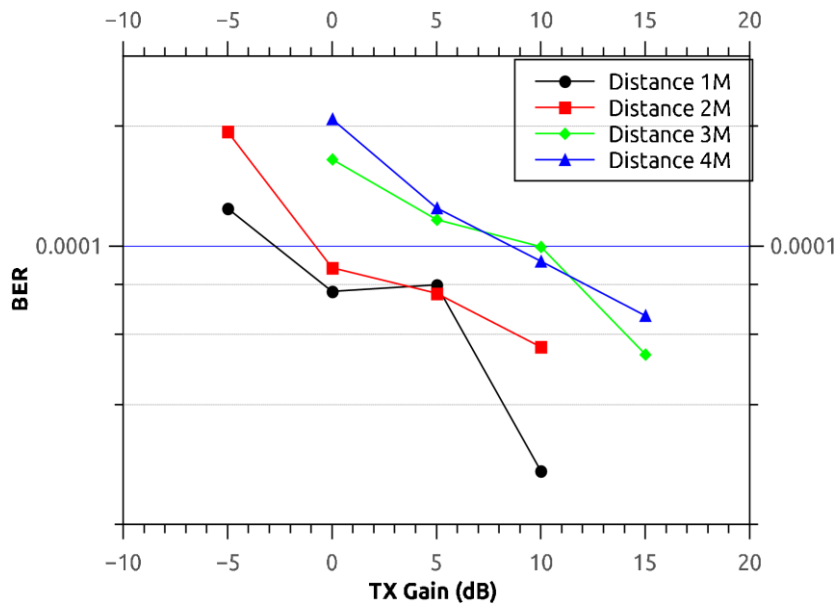
www.cortexlab.fr



FD-Prototype of OFDM on GNURadio and USRPs



USRP, first results



Thank you for your attention, questions ?



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guillaume.villemaud@insa-lyon.fr