



IQ Imbalance Estimation with 1-bit Quantization at the Receiver

Studienarbeit / Diplomarbeit / SHK

Problem Statement

Future communications systems with data rates of 100 Gb/s and above are facing a major challenge in terms of energy-efficiency. A promising solution is to employ 1-bit quantization at the receiver to reduce power consumption. For such systems conventional signal processing algorithms cannot be applied. It is an open problem how to deal with IQ imbalances in 1-bit quantized systems. The estimation of the IQ offsets is challenging as only 1-bit quantized observations are available. Moreover, theoretical bounds on the estimation performance are to be investigated.

Tasks

- Literature research on conventional IQ imbalance compensation
- Analysis of the impact of 1-bit quantization on IQ imbalance estimation
- Theoretical derivation of IQ imbalance estimation algorithms
- Implementation of 1-bit synchronization algorithms

The tasks can be freely adjusted towards theoretical studies or a practical software implementation, depending on your preferences.

Expected Skills

- Basic knowledge of communication systems
- Basic experience with python or MATLAB

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Please include a recent transcript of your grades when getting in contact

Recommended References

- G. Fettweis, M. Dörpinghaus, S. Bender, L. Landau, P. Neuhaus, and M. Schlüter, "Zero crossing modulation for communication with temporally oversampled 1-bit quantization," in Proc. Asilomar Conf. Signals, Syst., Comput., Pacific Grove, CA, USA, Nov. 2019, pp. 207–214.