Energy per bit optimization for APSK in multiphase hardware L-prime systems

M. Sc. Thesis Description

---

2022-11-14
Background

Energy efficiency is becoming increasingly important in wireless communication networks as it has impact on the environment. Non-conventional hardware, based on energy accumulation in transmission lines\(^1\), provide potential methods for energy efficient communication. However, due to inherent limitations, conventional, standardized physical layer cannot be used. Therefore, new methods for communication needs to be investigated.

Main goal

The main goal of the thesis is to investigate novel radio frequency transmitter hardware that utilizes the low-frequency-inductance (L\(^\prime\)) in transmission lines. This includes development of codingschemes and examination of parameters such as energy and spectral efficiency. The L\(^\prime\) system performance shall further be benchmarked to standard solutions such as Doherty RFPA\(\text{s}\). The thesis will be performed at Ericsson Research, Lindholmen, in collaboration with the Communication Systems group at Chalmers University of Technology.

Scope

- Study L\(^\prime\) hardware functionality with multiphase transmission lines
- Develop a mathematical model, including probability functions for transmission line idle states, of previously mentioned hardware
- Find an analytical expression for the channel capacity
- Derive an analytical expression for energy efficiency (Joule/bit)
- Benchmark performance with suitable conventional RFPA

Qualification

Solid background in mathematics is required. Knowledge in information theory and communication systems is beneficial.

Application

1-2 students, 1 semester, 30 ECTS points.
Attach your resume, transcript, and cover letter stating your interests and thoughts of the proposed thesis area. Send your application to supervisor ulfgustavsson@ericsson.com, sverker.sander@ericsson.com and examiner Thomas Eriksson thomase@chalmers.se.

\(^1\)Patent, US2011254594, Sub Sampling Electrical Power Conversion