EVM optimization for
the on-board AWG
implemented on
FPGA for a satellite
mission

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Bachelor/Research/Master Thesis – Bachelor-/Forschung/Master-Arbeit

Project:
In the framework of the EIVE Project the Institute of Robust Power Semiconductor Systems (ILH) is developing a 6-Unit CubeSat, flying in the Low Earth Orbit (LEO). An arbitrary waveform generator (AWG) has to be efficiently implemented in Programming Logic (FPGA) and Programming Software (CPU).

Scientific Mission:
• (1) PRBS transmission with various modulation schemes (QPSK, n-QAM, ...) and different data rates for in-depth data-link analysis;
• (2) E-Band Link Budget calculation, considering all the atmospheric effects;
• (3) Download high resolution images stored on-board for Earth observation applications.

Your Tasks:
1. Investigate possible coding/filter algorithms for the raw PRBS data to improve the system (FPGA+DAC) Error Vector Magnitude (EVM);
2. Implement on the FPGA and on the CPU the selected algorithms and draw the conclusion about the energy efficiency and feasibility;
3. Measure the resulting EVM in different scenarios;
4. (Optional) Implement the decoding algorithms in the receiver.

Your Qualifications:
• Digital communication systems/algorithms knowledge;
• Hands-on experience in developing C/Matlab/Python codes;
• Knowledge with software development: VHDL and/or Verilog, Xilinx Vivado is advantageous;
• Passionate for producing high-quality, space-ready and well-tested code;
• Knowledge of analogue communication systems is a plus;
• Knowledge of communication protocols is an asset;
• Availability for team working is required.

Your Benefits:
1. Consolidate your knowledge in various (satellite) communication systems;
2. Get ready for a (space) industry career;
3. Learn about different coding techniques;
4. Learn about FPGAs and DACs and acquire hands-on experience;
5. Learn about digital and analogue communication systems to provide high performance radio communication solutions;
6. Develop team working skills.

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German description also available at request.