**Abstract**

High speed Serializer-Deserializer interfaces (SerDes) are a recurrent solution for communications in FPGAs, representing an alternative to parallel buses running at a lower rate. Although these interfaces save limited input/output resources, high rate communication demands special signal conditioning to overcome noise and interference.

Modern FPGAs such as Xilinx Virtex 7 [1] offer SerDes modules called Multi-Giga Transceivers (MGTs). They incorporate the hardware infrastructure required for high speed communication, allowing the user to calibrate the signal conditioning parameters for optimal results in different applications using the Xilinx Vivado Design Suite [2].

The calibration for MGTs communicating between different FPGAs should be performed manually, which is a painful process given the numerous parameter combinations. In order to overcome this difficulty, we have developed a tuning system in Python, aiming to automate the tuning process of Xilinx MGT transceivers.

**GTH Transceiver**

The GTH [3] is a MGT transceiver for optical and backplane communication.

- Performance up to 13.1 Gb/s
- Support to many industry standard protocols
- Transmission signal conditioning
  - Emphasis (TX Diff Swing, Pre-cursor, Post-Cursor)
  - Equalization (DFE)

In this simplex transmission between two GTHs, the emphasis happens at transmitter side, while the equalization is done at receiver side.

**Vivado & IBERT**

Xilinx Vivado Design Suite and the Integrated Bit Error Ratio Tester (IBERT) IP core are used to evaluate the GTHs performance and calibrate them for a specific application. Only one JTAG chain can be accessed at a time. Tuning must be done manually. [4]

**Tuning System**

Python scripts interface with Vivado subprocesses. They search for an optimal configuration, changing the tuning parameters and measuring the performance for each case.

**Results**

Improvements were observed at the links performance. The figure shows a comparison of the eye scans of one channel before (a) and after tuning (b) Notice the wider opening in the second case.

**References**