EAST-WEST PON Experiment

Sandip Das

October 18, 2020

The aim of this experiment is to demonstrate the operation of EAST-WEST-PON. We perform a 2-ONU and one-OLT network with our proposed splitter loopback.

1 Experimental Setup

1. Figure 1 shows the experimental setup. Board-1 generates Emulated traffic for two ONUs that are Ethernet encapsulated. The data frames for these ONUs are time division multiplexed. These continuous Ethernet streams are sent over through two GTH 10G interface of HTG-FMC-X4SFP module (gt-X0Y24 and X0Y25).

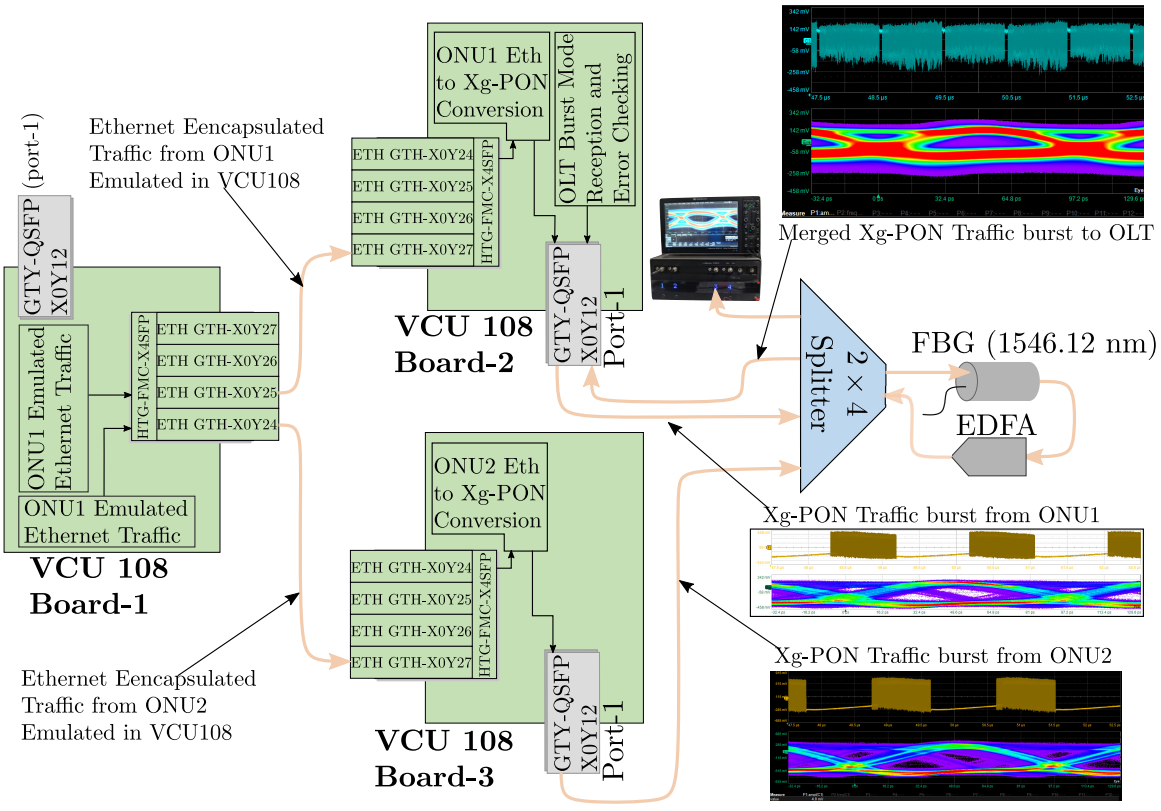

Figure 1: Experimental Set up.

2. These two continuous Ethernet streams (carrying data for two ONUs) are received into two other VCU-108 boards at GTH 10G interface of HTG-FMC-X4SFP module (on gt-X0Y27). In Each of these boards, an ONU packet processing module receives and decodes the Ethernet frame into packet, and then generates XG-PON like burst by adding XG-PON preamble (0x05560556) and delimiter (0xB2C50FA1) pattern on top of the packet.

3. These XG-PON like bursts are then sent over through GTY-10G interface of QSFP module. This is the PON interface side. A 2x4 spliter is used, two bursts are fed onto two ports of the 4-port side of the splitter. on the other side of the splitter, two ports are looped using FBG and EDFA for the WLB action. The multiplexed output is observed on the port-4, of the 4-port side of the splitter, and multiplexed output on port-3 is fed onto the OLT.

4. Multiplexed output of the ONU bursts that is obtained from the port-3, is inspected in the FPGA after the Burst mode clock and data recovery. As we are sending same frame in each ONU bursts, therefore, we have a reference local copy of the frame that ONU is sending. For each recovered frame at the OLT, the BER is calculated by bit-comparing the recovered frame with the local-copy. The instantaneous BER is displayed for each frame using Vivado's Virtual Input/Output (VIO) probes.

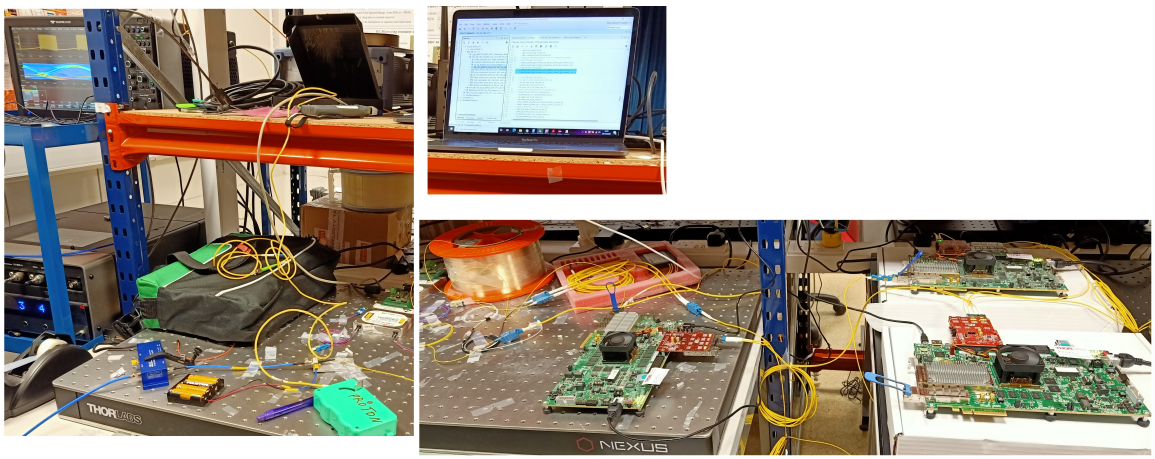

Figure 2: Test Set up.

2 Results

Figure 3 shows the ONU-1 bursts and its corresponding eye performance. The eye output appears to be a bit strange and unlike the one that we had achieved on oue JOCN experiment. Is this because we are using the GTY interface at QSFP port instead of the GTH ports in th FMC-GTH (that wee used for our JOCN experiment)? Seems like there are two different phase signals coming in or may be something else.

Figure 3 shows the ONU-2 bursts and its corresponding eye performance. (Again, similar performance as we have seen on the previous one). However, one thing I have observed, the signal quality that is coming out of the FMC-GTH port is much better the QSFP-GTY port.

Figure 5 shows the two-ONU multiplexed bursts which is fed onto and its corresponding eye performance. One thing to note here is that BER is a bit high (around 10^{-3}) for input power around -8dBm. Is it because of the signal quality that is coming out of the QSFP-GTY port? Or is it because of the multiplexing of bursts? We previously had much better performance for the same power.

The BER performance that we are also observing in the FPGA VIO, using the Bit checking is also close and on agreement with what we are observing from the scope.

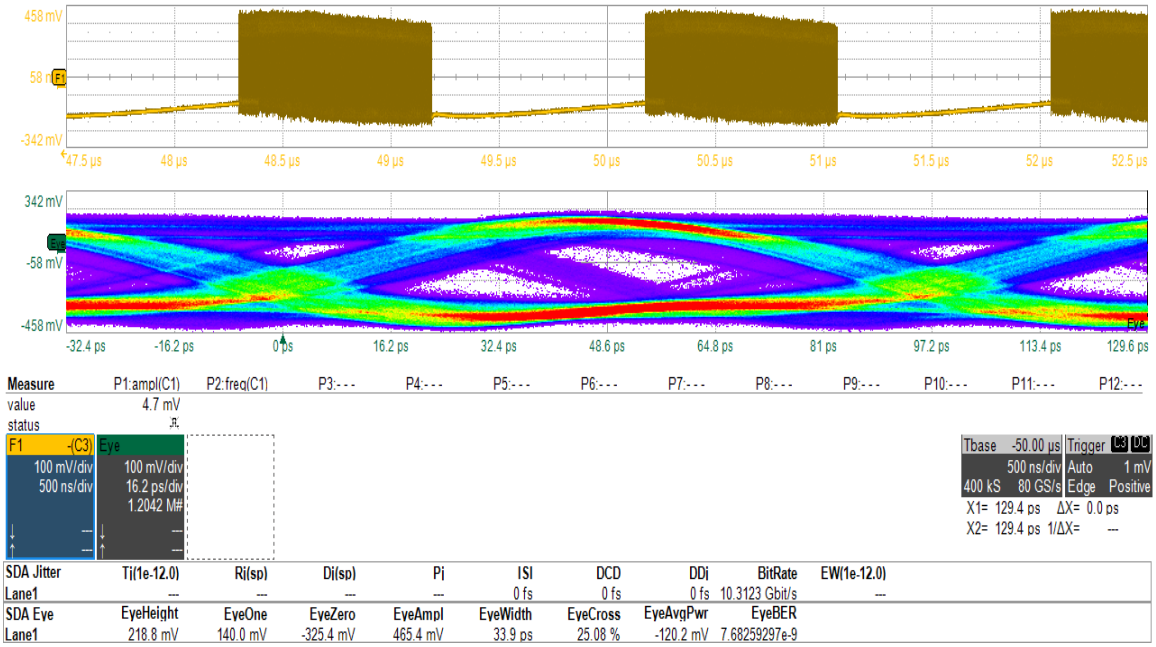

Figure 3: Output bursts from ONU1.

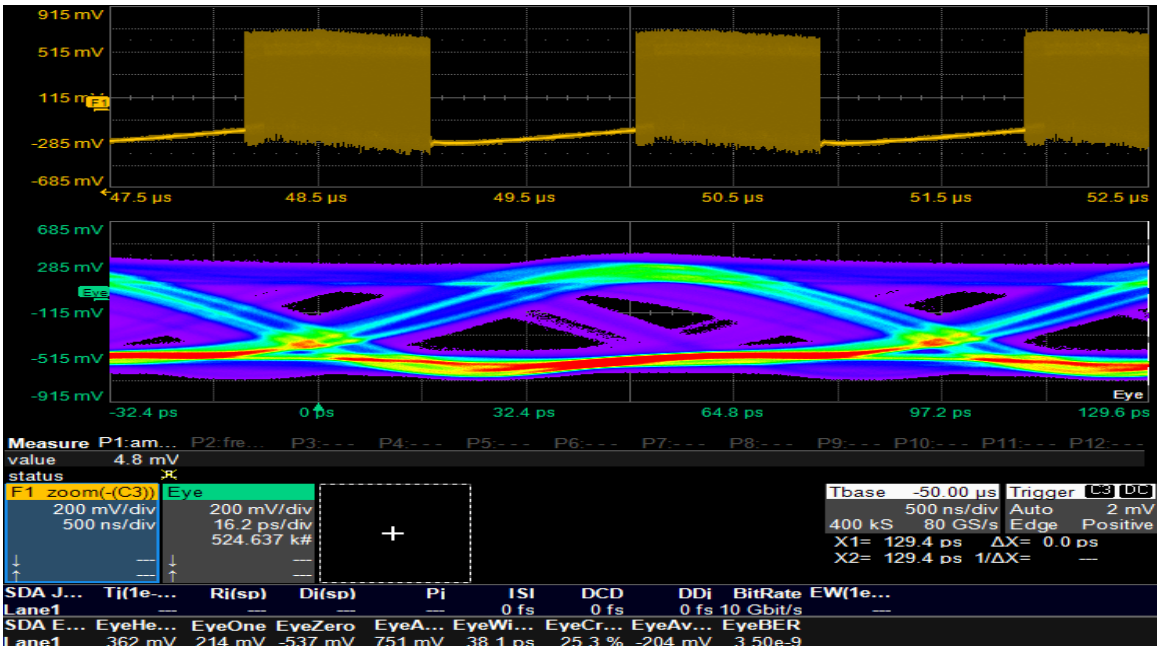

Figure 4: Output bursts from ONU2.

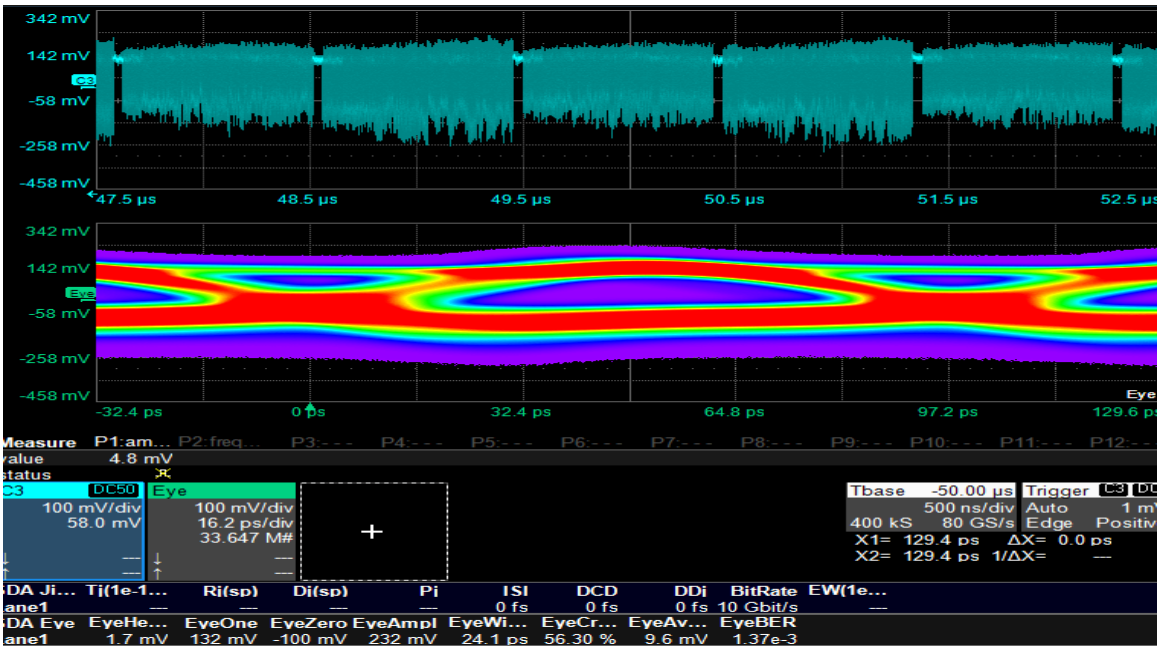

Figure 5: Multiplexed bursts of ONU1 and ONU2 (input to OLT).