



Contribution ID: 217

Type: Mini Oral and Poster

## A 10 Gbps Driver/Receiver ASIC and Optical Modules for Particle Physics Experiments

Wednesday 14 October 2020 16:10 (1 minute)

We present the design and test results of a Drivers and Limiting AmplifierS operating at 10 Gbps (DLAS10) and Miniature Optical Transmitter/Receiver/Transceiver modules (MTx+, MRx+, and MTRx+) based on DLAS10. DLAS10 can drive two Transmitter Optical Sub-Assemblies (TOSAs) of Vertical Cavity Surface Emitting Lasers (VCSELs), receive the signals from two Receiver Optical Sub-Assemblies (ROSAs) that have no embedded limiting amplifiers, or drive a VCSEL TOSA and receive the signal from a ROSA, respectively. Each channel of DLAS10 consists of an input Continuous Time Linear Equalizer (CTLE), a four-stage limiting amplifier (LA), and an output driver. The LA amplifies the signals of variable levels to a stable swing. The output driver drives VCSELs or impedance-controlled traces. DLAS10 is fabricated in a 65 nm CMOS technology. The die is 1 mm × 1 mm. DLAS10 is packaged in a 4 mm × 4 mm 24-pin quad-flat no-leads (QFN) package. DLAS10 has been tested in MTx+, MRx+, and MTRx+ modules. Both measured optical and electrical eye diagrams pass the 10 Gbps eye mask test. The input electrical sensitivity is 40 mV, while the input optical sensitivity is -12 dBm. The total jitter of MRx+ is 29 ps (P-P) with a random jitter of 1.6 ps (RMS) and a deterministic jitter of 9.9 ps (P-P). Each MTx+/MTRx+ module consumes 82 mW/ch and 174 mW/ch, respectively. Irradiation tests will be carried out and reported at the conference.

### Minioral

Yes

### IEEE Member

No

### Are you a student?

Yes

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**Session Classification:** Poster session C-01

**Track Classification:** Front End Electronics and Fast Digitizers