Research of an ultra-fast optical sampling system and its application

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In this paper, I describe an optical sampling system, which can observe more than 160-Gb/s opticdal signal waveforms for future ultra-high speed optical transmissions.

There are a few methods to observe an ultra-high speed optical waveform, but an optical sampling method, which uses a nonlinear optical crystal, is the most desirable mothod. To fabricate an optical sampling system, I explained details of nonlinear optical crystals, and compared the performances of a $KTiOPO_4$(KTP) crystal and a periodically polled $LiNbO_3$(PPLN) crystal.

An optical sampling system, which used a KTP crystal, had a 1.25-ps time resolution, a 160-fs system jitter, a 35-nm wavelength bandwidth, and a 3-mW minimum sensitivity. Furthermore, an eye-diagram of a 200-Gb/s optical signal was ofserved.

An optical sampling system, which used a PPLN crystal, had an 800-μW minimum sensitivity that is 4 times smaller than the optical sampling system with a KTP.

As another application, I proposed an optical pulse source, which had a 775-nm wavelength, 650-fs pulse width, and a 4.9-mW optical power by using a PPLN crystal and a pulse-compression technique.

In these circumstances, I described research materials and a guede of an optical sampling system as a future measurement instrument.