Ultrahigh-Frequency Short Pulse Generation based on All-Optical Semiconductor Gating

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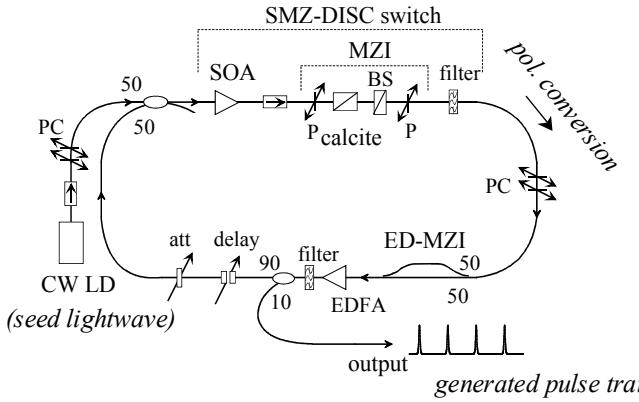
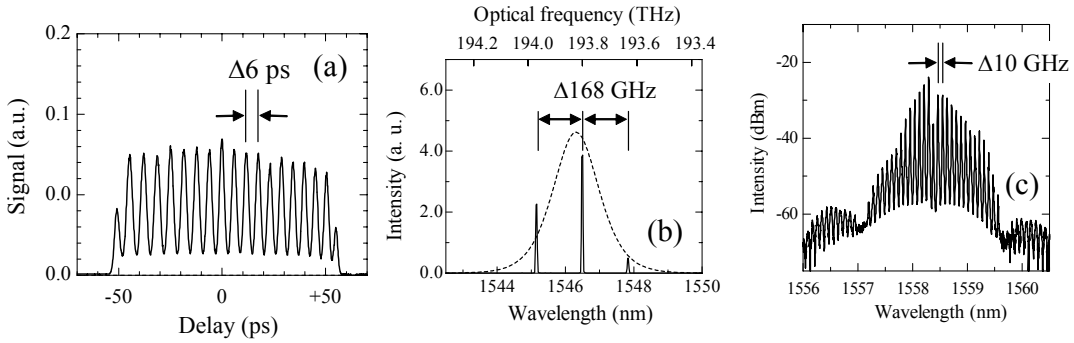


DISC-Loop-type ring oscillator

We have been exploring ultrahigh-frequency, short pulse generation based on a new nonlinear optical mechanism, which differs significantly from the conventional mode-locking, and its high-precision control techniques. As has originally been proposed by this author and his coworkers in 2000-2001, the optical center frequency, the pulse width, and the repetition frequency of the generated pulse train are *independently* controllable, respectively, by tuning the optical frequency of the seed cw light, the timing width of the all-optical semiconductor gate (DISC), and the harmonic cavity frequency of the oscillator, in principle.



(a), (b): 1.5-ps, 168-GHz DISC-gating window shape and its Fourier-transformed spectrum*)

(c): Optical-comb spectrum from the 5-ps, 10-GHz pulse generation (Y. Ueno et al., Appl. Phys. Lett., 2001)*)

*) observed by the present author and his coworkers at NEC Corp., Tsukuba.

To date, a 10-GHz, 5-ps pulse train has been observed (Fig. (c)). Regarding the DISC-type all-optical gate that was separately proposed by this author and his coworkers, a 168-GHz, 1.5-ps-wide gate window has been demonstrated. The DISC-loop-oscillator mechanism will offer a brand-new option in the fields of high-precision optical metrology.