International Conference on

LASERS, OPTICS AND PHOTONICS

July 25-26, 2018 | Osaka, Japan

Dongsun Seo

Myongji University, Korea

Highly flat optical frequency comb generation based on passive modulation devices

Optical frequency combs (OFCs) with high spectral flatness and stability are ready for various applications, such as dense wavelength division multiplexing systems, optical orthogonal frequency division multiplexing systems, Radio over fiber systems. ultra-broadband RF signal generation, and microwave photonic filters. In this presentation, we propose a novel scheme to generate a large number of spectral lines within small spectral flatness by employing a dual parallel Mach-Zehnder modulator (DP-MZM) and phase modulators. Our method removes the requirement of a quasi-quadratic signal for phase modulation, by shaping narrow and flat-topped intensity pulse by properly operating a DP-MZM. To achieve output pulses, one (MZM 1) of the DP-MZM is biased at higher voltage than Vπ/2 and fully sinusoidal modulated. However, the high bias voltage induces low power side lobes and sinusoidal (not flat) shape at top. Next, a sinusoidal signal at the double frequency 2ωRF is applied to the other modulator (MZM 2) to produce the similar output to the side lobes of the MZM 1 output. Next, to remove the side lobes of the MZM 1 output, we add the MZM 1 and 2 outputs at out of phase. This side lobe cancelling process also flattens the top of the combined pulse signal. The shaped pulse fits within the quadratic period of the sinusoidal signal to drive the phase modulators, allowing strong frequency chirp. Hence, it allows widening of the frequency spacing without strict requirements to maintain a quasi-quadratic signal which requires high power RF amplifiers with large bandwidths to sustain the second harmonic signals. Based on suggested method we achieve 35 comb lines with less than 1 dB flatness (see the following figure), and extend the setup to obtain the 54 lines with 1.6 dB flatness by adding another phase modulator. Finally, we obtain 58 lines within 1.5 dB flatness by simply increasing the operating frequency from 10 GHz to 12 GHz. [Acknowledgment: This work was supported by the Civil Military Cooperation Center funded by the Ministry of Defense (#17DB1500) and by the IIT P(#2014-0-00501) and KRF (#2016R1D1A1B04930224) funded by the Ministry of Science and ICT.]

Biography

Dongsun Seo received the Ph.D. degree in electrical engineering (optoelectronics) from the University of New Mexico, in 1989. In 1990, he joined the faculty of Myongji University, Korea, where he is currently a Professor in the Department of Electronics. From 2002 to 2004, he was with Purdue University, as a Visiting Research Professor in the School of Electrical and Computer Engineering. He has published over 70 journal articles and over 100 conference papers. His current research interests are in the areas of optical pulse sources, ultrafast optics, high-capacity optical communications, optical processing, and photonics..

sdsphoto@mju.ac.kr