Influence of Slope of Flat-Top Optical Bandpass Filter on a Stabilized Quadruple OTDM Multiplier for RZ/CS-RZ Optical Clock

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Optical clock multiplier is an important function for ultrafast optical signal processing, optical time-division multiplexing (OTDM) and microwave/mm-wave photonics [1, 2]. So far, we have proposed and demonstrated a phase-stabilized quadruple OTDM optical clock multiplier [3]. In the previous work, a narrow-band optical bandpass filter (OBPF) was used to filter the desired sideband from the multiplexed output. The influence of crosstalk has been calculated and the filtered OBPF output was used for the stabilization [4]. The configuration of a quadruple multiplier is shown in Fig. 1.

In this work, the OBPF characteristic has been approximated by a trapezoid shape with a 21.4 GHz top and 2 equal slopes (Fig. 2). The value 21.4 GHz has been evaluated by fitting our experimental curve. When the center frequency of the OBPF is tuned to the 0th order sideband, the +/-1st order sidebands still remain and RZ output is obtained when OBPF output power is minimized. If the slope is not steep, the other undesired sidebands create an additional crosstalk that increases the minimum OBPF output. Fig. 3 shows the calculated normalized minimum OBPF output power versus the slope. It is possible to do a linear approximation of this curve. Further calculations have been made for a CS-RZ configuration, where the OBPF filters center frequency is set to 20 GHz. The same way we can do a linear approximation around the center frequency of 20 GHz.

Therefore an approximation is possible near the frequency of either 0 GHz or 20 GHz. Further details will be discussed in the meeting.

References