Analysis of High-speed Double Transverse Coupled Cavity VCSELs

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1. Theoretical model TCC- VCSEL: The proposed structure of the TCC-VCSEL is schematically illustrated in Fig. 1. The VCSEL is laterally coupled with two external cavities through an oxide aperture [1,2].

2. Results and discussions.

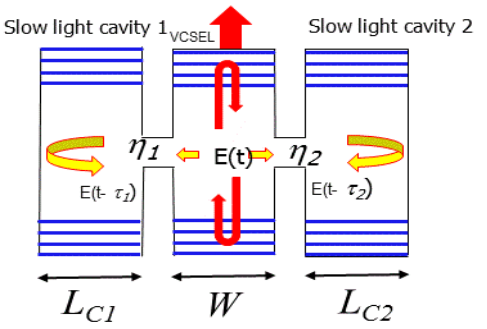

Fig.1. Schematic of DTCC-VCSEL

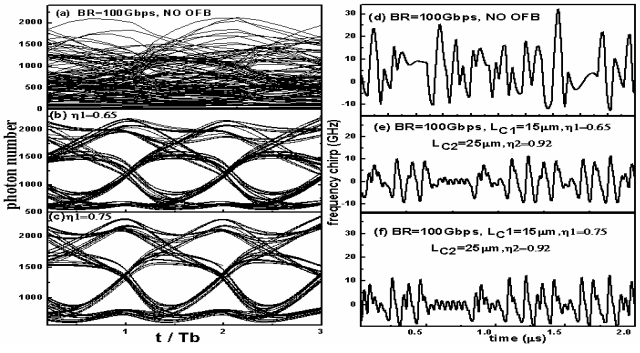

Figure (3): (a-c) Eye diagrams for NRZ modulation, and (d-f) frequency chirp

Figure 2(a) shows that the eye diagram of a conventional VCSEL for the bit rate of 100Gbps, the fluctuations seen at the steady-state power of both logic levels are also manifestation of the pattern effect, and the bit slot Tb becomes shorter than the setting time of the relaxation oscillations. As seen in the figure, there are different turn-on edges and bulges-on-top of the eye, which result in closure of the eye diagram. In Figs. 2(b) and 2(c) we plots eye diagram of DTCC-VCSEL with higher modulation bandwidth over a VCSEL without feedback. Figure 2(b)-2(c) shows two examples of eye diagrams and frequency chirp of the DTCC-VCSEL at different values of coupling ratio η_1 which the results in the improved eye diagram over those of the VCSEL without feedback. When the lengths of the DTCC are L_{C1} = 15μm and L_{C2}= 25 μm and a bit rate is 100 Gbps. The eye diagrams given in Fig. 2(b) are characterized by small improved of eye diagram. When the coupling ratio of the first cavity is η_1 = 0.65 but still partially closed. When OFB of the second cavity becomes stronger with η_1= 0.75, Fig. 2(c) shows that the eye diagram is clearly open. Fig.2(f) A transient chirp can be reduced with increasing the coupling strengths

4. Conclusions: The modeling of large signal modulation performance of DTCC-VCSELS is carried out.

5. References

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