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High SHF band RF Signal over Multi-Mode Fiber Employing Directly Modulated VCSEL

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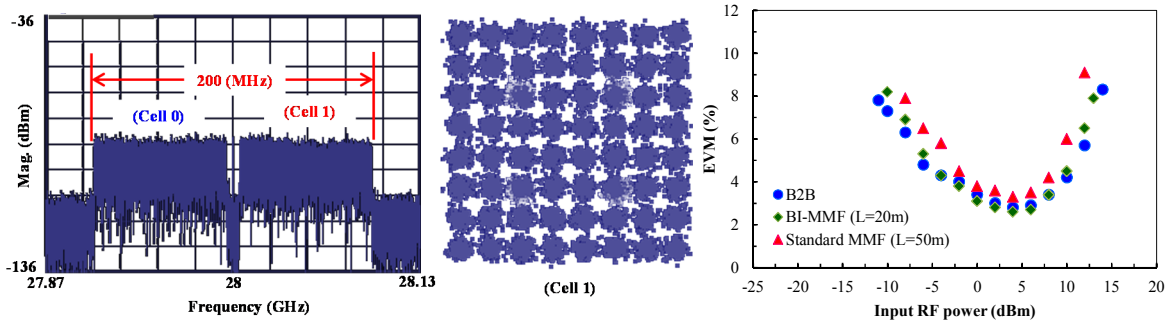
The mobile traffic has been increased with progress of cellular phone and mobile devises [1]. The Internet of Things (IoT) is also one of its factors. The IoT applies much data through wireless communication. To increase the capacity of wireless communication, using of high SHF band RF signal with high bandwidth is considered such as the 5th generation mobile access system (5G). On the other hand, there is concern for increasing of radio insensitive area due to high free space propagation loss and directivity of high SHF band signals. The radio over fiber is candidate for radio signal relay technique to solve these concerns [2]. Particularly, radio over multi-mode fiber has the advantage of the cost because of relaxed alignment tolerance and simplified packaging. Furthermore, the optical waveform transmission is suitable for relay of RF signals in terms of high spectral efficiency and low latency transmitting. From these motivations, we have tried analog radio over multi-mode fiber (A-RoMMF) transmission employing directly modulated Vertical Cavity Surface Emission Laser (VCSEL) for SHF band signal with 200 MHz bandwidth at carrier frequency of up to 28 GHz.

Figure 1 shows transmission characteristics of A-RoMMF for high SHF band signals with 200 MHz bandwidth. The measured OFDM spectrum of transmitted RF signal and 64 QAM constellation at input power of -11 dBm are shown in figure 1 (a) and (b), respectively. The EVM of figure 1 (b) is 7.8 %, and this result is specified signal quality of 64 QAM which is required EVM below 8%. In addition, the EVM as a function of input RF power for back to back (B2B) and test MMFs are shown in figure 1 (c). It is confirmed that the EVM characteristics of B2B and 20m-long BI-MMF are almost the same, and there are 3 dB penalties for minimum received power of 50 m-long standard MMF ones due to whose transmission bandwidth. These results shows A-RoMMF can support short distance high SHF band RF signal transmission, and which is powerful technique for high SHF band radio signal relay as a solution of radio insensitive areas and so on.



(a) OFDM spectrum (b) 64QAM constellatoion (c) EVM characteristics

Figure 1. Transmission characteristics of radio over multi-mode fiber for B2B and test MMFs

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