

An Energy Efficient Spectrum Shaping Scheme for Substrate Integrated Waveguides Based on Spread Reshaping Code

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Abstract : In the microwave and millimeter-wave transmission region, substrate-integrated waveguide (SIW) is a very promising candidate for the development of circuits and components. It facilitates the transmission at the data rates in excess of 200 Gbit/s. An SIW mimics a rectangular waveguide by approximating the closed sidewalls with a via fence. This structure suppresses the low frequency components and makes the channel of the SIW a bandpass or high pass filter. This channel characteristic impedes the conventional baseband transmission using non-return-to-zero (NRZ) pulse shaping scheme. Therefore, mixers are commonly proposed to be used as carrier modulator and demodulator in order to facilitate a passband transmission. However, carrier modulation is not an energy efficient solution, because modulation and demodulation at high frequencies consume a lot of energy. For the first time to our knowledge, this paper proposes a spectrum shaping scheme of low complexity for the channel of SIW, namely spread reshaping code. It aims at matching the spectrum of the transmit signal to the channel frequency response. It facilitates the transmission through the SIW channel while it avoids using carrier modulation. In some cases, it even does not need equalization. Simulations reveal a good performance of this scheme, such that, as a result, eye opening is achieved without any equalization or modulation for the respective transmission channels.

Keywords : bandpass channel, eye-opening, switching frequency, substrate-integrated waveguide, spectrum shaping scheme, spread reshaping code

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