

Field-Programmable Gate Array-Based Baseband Signals Generator of X-Band Transmitter for Micro Satellite/CubeSat

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Abstract : This paper introduces a FPGA-based baseband signals generator (BSG) of X-band transmitter developed by National Space Organization (NSPO), Taiwan, for earth observation. In order to gain more flexibility for various applications, a number of modulation schemes, QPSK, DeQPSK and 8PSK 4D-TCM are included. For micro satellite scenario, the maximum symbol rate is up to 150Mbps, and the EVM is as low as 1.9%. For CubeSat scenario, the maximum symbol rate is up to 60Mbps, and the EVM is less than 1.7%. The maximum data rates are 412.5Mbps and 165Mbps, respectively. Besides, triple modular redundancy (TMR) scheme is implemented in order to reduce single event effect (SEE) induced by radiation. Finally, the theoretical error performance is provided based on comprehensive analysis, especially when BER is lower and much lower than 10^{-6} due to low error bit requirement of modern high-resolution earth remote-sensing instruments.

Keywords : X-band transmitter, FPGA (Field-Programmable Gate Array), CubeSat, micro satellite

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