Abstracts

A direct Ku-band linear subharmonically pumped BPSK and I/Q vector modulator in multilayer thin-film MCM-D (Aug. 2001 [T-MTT])

G.J. Carchon, D.M.M.-P. Schreurs, W. De Raedt, P. Van Loock and B.K.J.C. Nauwelaers. "A direct Ku-band linear subharmonically pumped BPSK and I/Q vector modulator in multilayer thin-film MCM-D (Aug. 2001 [T-MTT])." 2001 Transactions on Microwave Theory and Techniques 49.8 (Aug. 2001 [T-MTT] (Mini-Special Issue on the 2000 IEEE Radio and Wireless Conference (RAWCON))): 1374-1382.

A direct Ku-band linear subharmonically pumped binary phase-shift keying (BPSK) and in-phase/quadrature (I/Q) vector modulator have been developed using multilayer thin-film multichip module (MCM-D) technology. All passives are integrated in the low cost MCM-D substrate. To the authors knowledge, this is the first modulator based on thin-film integrated passive components. The subharmonic mixing is performed using a beam-lead antiparallel diode pair mounted onto the MCM using thermocompression. A custom diode model has been developed and verified using nonlinear network analyzer measurements: an excellent agreement between the measured and simulated powers and phases for more than nine harmonics is demonstrated. Additionally, it is shown that an optimal reactive termination for the third harmonic of the local oscillator (LO) exists such that a very flat BPSK mixer conversion is obtained. This is validated by measurements that indicate a /spl plusmn/0.25-dB variation on the conversion loss for an LO frequency varying from 6.8 to 7.6 GHz. The I/Q vector modulator consists of a Wilkinson power divider, a coplanar-waveguide Lange coupler, and two BPSK modulators. It has a measured image rejection better than -27 dB over the RF range of 13.4-15.2-GHz band (corresponding to a vector phase and amplitude error lower than 2/spl deg/ and 1%). The image rejection is even better than -32 dB over the very small aperture terminal band (RF: 14-14.5 GHz).

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