Abstracts

Ultralow DC power VCO based on InP-HEMT and heterojunction interband tunnel diode for wireless applications

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The monolithic integration of tunneling diodes (TDs) with other semiconductor devices such as high electron-mobility transistors (HEMTs) or HBTs, creates novel quantum functional nonlinear devices and circuits with unique properties: the negative differential resistance and the extremely low dc power consumption. In this paper, we present a family of InP-HEMT-TD-based voltage-controlled oscillators operating in the 4-6-GHz band suitable for wireless applications, along with an effective analytical treatment of the stability issues. Prototypes having different circuit topologies of HEMT-TD devices have been designed and fabricated. The circuits generated an output power in the range of -11 to -18 dBm when operated at a bias current of 1.75 mA at 500 mV. Phase noise characteristics and tuning capability of the circuit configuration have been experimentally determined. The maximum tuning range of 150 MHz and the maximum single sideband-to-carrier ratio of -97 dBc/Hz at 200 kHz have been achieved.

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