Abstracts

Adjustment of a temperature compensated Ka-band ring resonator VCO using fully automated laser-trimming

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A new Ka-band voltage controlled oscillator (VCO) using a planar ring resonator (RR) and a GaAs PHEMT microwave monolithic integrated circuit (MMIC) is presented. The resonator operates at harmonic frequencies and is manufactured on a temperature stable calcium magnesium titanate substrate using photolithographic thin-film processes. An innovative fully automated active laser-trimming procedure is used to adjust the frequency of the free-running oscillator as well as the varactor tuning sensitivity. In addition, automated laser-trimming is used to equalize the electrical length between the ring resonator and the MMIC. High unloaded quality factors of more than 350 have been obtained for the harmonic ring resonator. With these high quality factors a single side-band phase noise of better than -110 dBc/Hz is achieved at an offset frequency of 1 MHz. In addition, the frequency tuning range of the laser-trimming procedure is larger than 10% without any significant change of the VCO's characteristics such as phase noise and varactor tuning sensitivity. The typical temperature drift of the oscillator frequency is less than 4 ppm/K. We use a RR-VCO with an electrical length of four wavelengths, which is phase-locked to an external reference, as a local oscillator in our latest microwave Point-to-Multipoint (PMP) transceivers.

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