Abstracts

Optically induced measurement anomalies with voltage-tunable analog-control MMIC's

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Monolithic microwave integrated circuits (MMIC's) may be measured under relatively high-intensity lighting conditions. Later, when they are packaged, any anomalies found in subsequent measurements could be attributed to unwanted parasitics or box modes associated with the packaging. However, optical effects may not always be considered by radiofrequency (RF) and microwave engineers. For the first time, a qualitative assessment is given for the effects of photonic absorption on three broad-band voltage-tunable analog-control circuits. Each circuit has a different function, with each field-effect transistor (FET) operating in a different mode: a hot FET in a variable-gain amplifier, a cold FET in an analog attenuator, and an FET varactor in an analog phase shifter. All three circuit functions have been implemented using two different FET-based technologies. The first with ion-implanted 0.5-/spl mu/m GaAs metal-semiconductor FET's (MESFET's) in circuits operating at either 3 or 10 GHz. The second employs epitaxially grown 0.25-/spl mu/m AlGaAs-InGaAs pseudomorphic high electron-mobility transistors (HEMT's) in circuits operating at 38 GHz. All the MMIC's were fabricated using commercial foundry processes and illuminated under conventional optical microscope lighting conditions. Prominent error peaks have been found at bias points unique to the three different circuit topologies. Large error peaks are found with the MESFET-based circuits, while much smaller error peaks are achieved with the corresponding pseudomorphic HEMT (pHEMT) based circuits.

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