Abstracts

Design, fabrication, and application of precise SAW delay lines used in an FMCW radar system

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An inexpensive frequency-modulated continuous-wave (FMCW) radar system is presented in this paper, which, nevertheless, meets all industrial requirements. The FMCW radar uses a low-cost nonlinear voltage-controlled oscillator (VCO), operating at an IF of 2.45 GHz to generate the frequency modulation of the radar system. This VCO signal is applied twice, first to generate the radar transmitter signal at 24 GHz, and then it is fed to a surface acoustic wave (SAW) delay line. The SAW delay line generates a fixed delay time, which corresponds with a fixed radar distance. Thus, all systematic nonlinearities and stochastic phase errors of the FMCW system can be monitored and, afterwards, can be compensated for in real time. This linearization technique leads to a significant enhancement in dynamic range for a FMCW radar system. For this FMCW system, SAW delay lines with a linear phase characteristic have been designed using a linear optimization program. The delay line consists of two chirped and weighted interdigital transducers. For high volume, low-cost, and high-yield production of the required SAW structures, with linewidths down to 0.3 /spl mu/m, technological improvements had to be achieved, especially in photolithography. Based on these design and fabrication techniques, delay lines at 2.45 GHz operating at the fundamental and third harmonic with bandwidths up to 800 MHz have been realized.

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