Silicon-Germanium Voltage-Controlled Oscillator at 105 GHz

A group at UCLA, in collaboration with the Jet Propulsion Laboratory, has designed a voltage-controlled oscillator (VCO) created specifically for a compact, integrated, electronically tunable frequency generator useable for submillimeter-wave science instruments operating in extremely cold environments. The VCO makes use of SiGe heterojunction bipolar transistors (HBTs). The SiGe HBTs have a 0.13-micrometer emitter width. A differential design was used with two VCOs connected to form a quadrature signal. A 2.5-V supply is required to power the circuit. A cross-coupled CMOS pair is used for emitter-degeneration of the SiGe HBTs, and the design uses coupled load and base inductors. The circuit oscillates at 105 GHz. A linear superposition of VCOs has been designed to achieve four times the oscillation frequency of the fundamental oscillator.

This work was done by Alden Wong, Tim Larocca, and M. Frank Chang of UCLA, and Lorene A. Samoska of Caltech for NASA’s Jet Propulsion Laboratory. Further information is contained in a TSP (see page 1), NPO-47116.

Estimation of Coriolis Force and Torque Acting on Ares-1

A document discusses a pulse generator with subnanosecond resolution implemented with a low-cost field-programmable gate array (FPGA) at low power levels. The method used exploits the fast carry chains of certain FPGAs. Prototypes have been built and tested in both Actel AX and Xilinx Virtex 4 technologies. In-flight calibration or control can be performed by using a similar and related technique as a time interval measurement circuit by measuring a period of the stable oscillator, as the delays through the fast carry chains will vary as a result of manufacturing variances as well as the result of environmental conditions (voltage, aging, temperature, and radiation).

This work was done by David W. Robinson of Goddard Space Flight Center. Further information is contained in a TSP (see page 1), GSC-15790-1.

High-Precision Pulse Generator

A document discusses a pulse generator with subnanosecond resolution implemented with a low-cost field-programmable gate array (FPGA) at low power levels. The method used exploits the fast carry chains of certain FPGAs. Prototypes have been built and tested in both Actel AX and Xilinx Virtex 4 technologies. In-flight calibration or control can be performed by using a similar and related technique as a time interval measurement circuit by measuring a period of the stable oscillator, as the delays through the fast carry chains will vary as a result of manufacturing variances as well as the result of environmental conditions (voltage, aging, temperature, and radiation).

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