National Aeronautics and Space Administration

Ultra-compact & Ultra-Wide-Band CMOS System-on-Chip Based Ground Penetrating Radar for a Mars Science Helicopter

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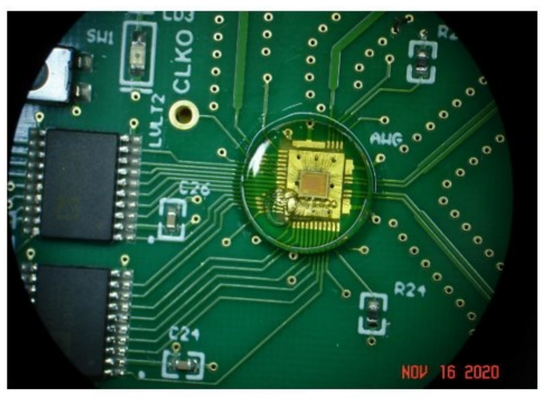
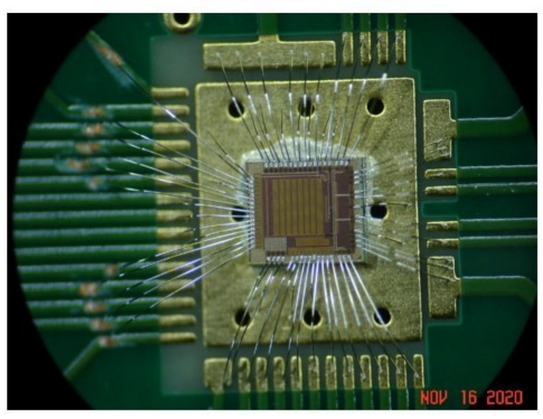
Program: FY22 R&TD Strategic Initiative
Strategic Focus Area: Micro Instruments for Mars Helicopter and Small Spacecraft Missions -
Strategic Initiative Leader: Yonggyu Gim

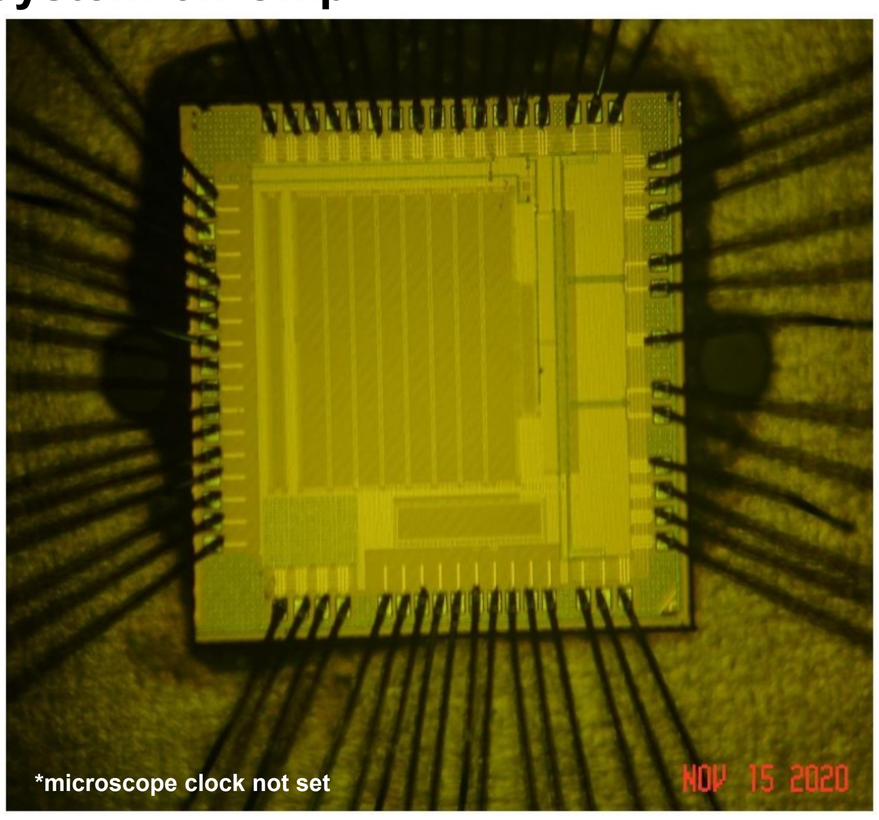
Objectives & Background:

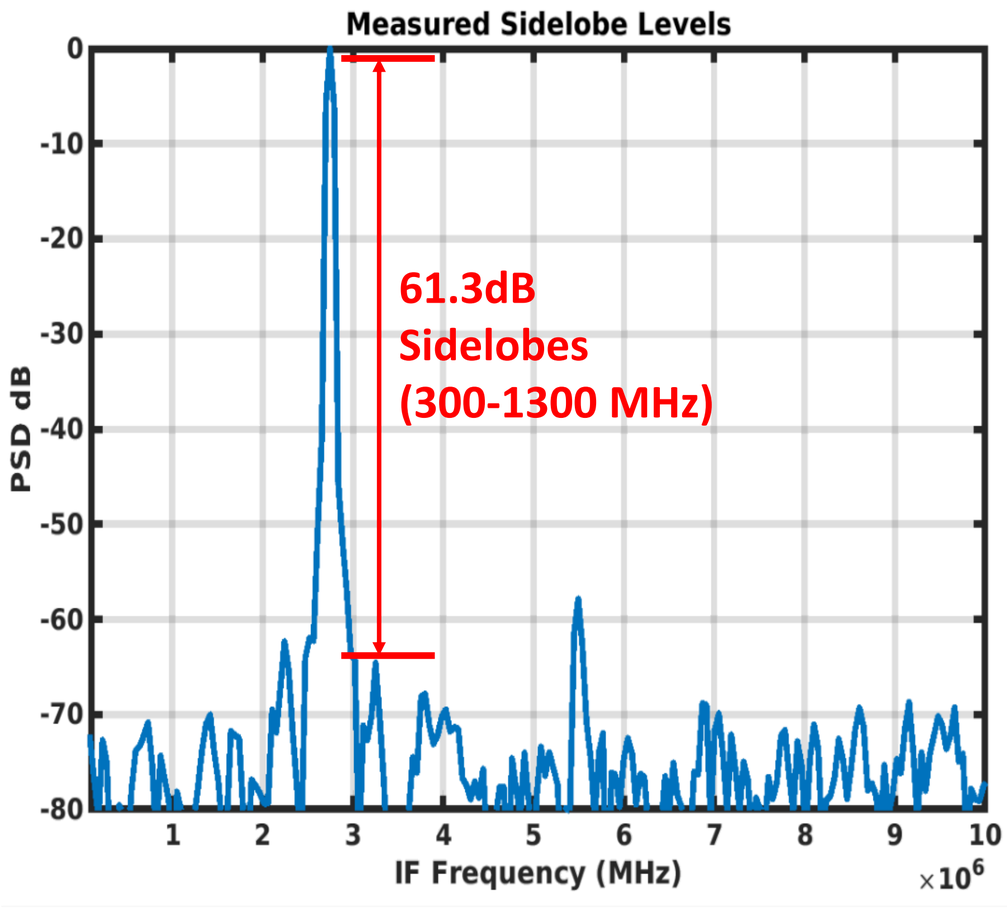
This purpose of this task is to develop an extremely low mass, low power, and wideband ground penetrating radar (GPR) that is compatible with Mars Science Helicopter. The GPR is developed with a set of CMOS chips to provide waveform generation and processing (receiver), and synchronization.

CMOS Wideband GPR System-on-Chip

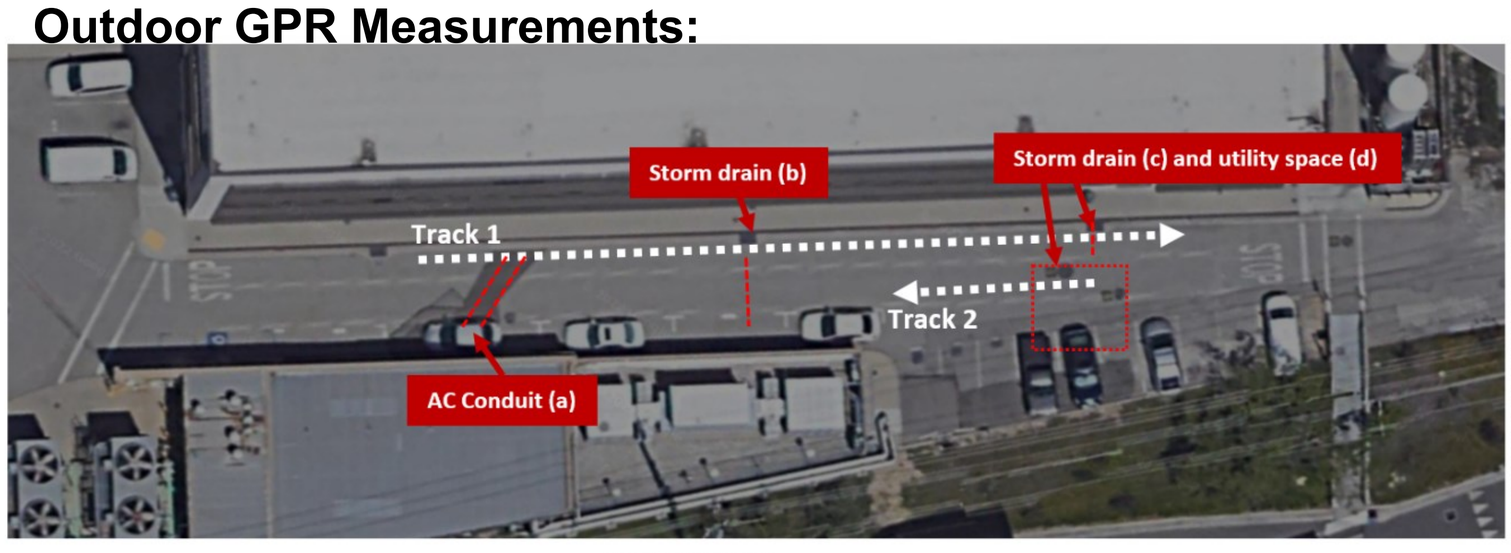


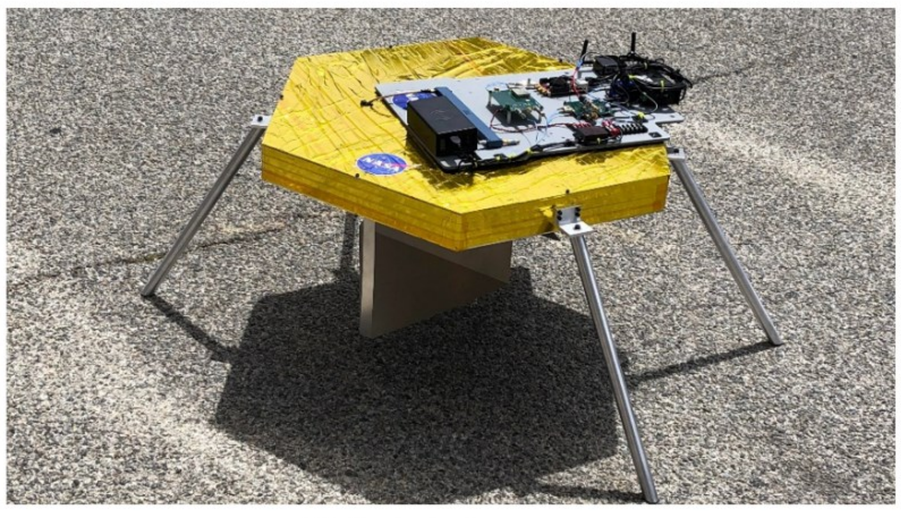


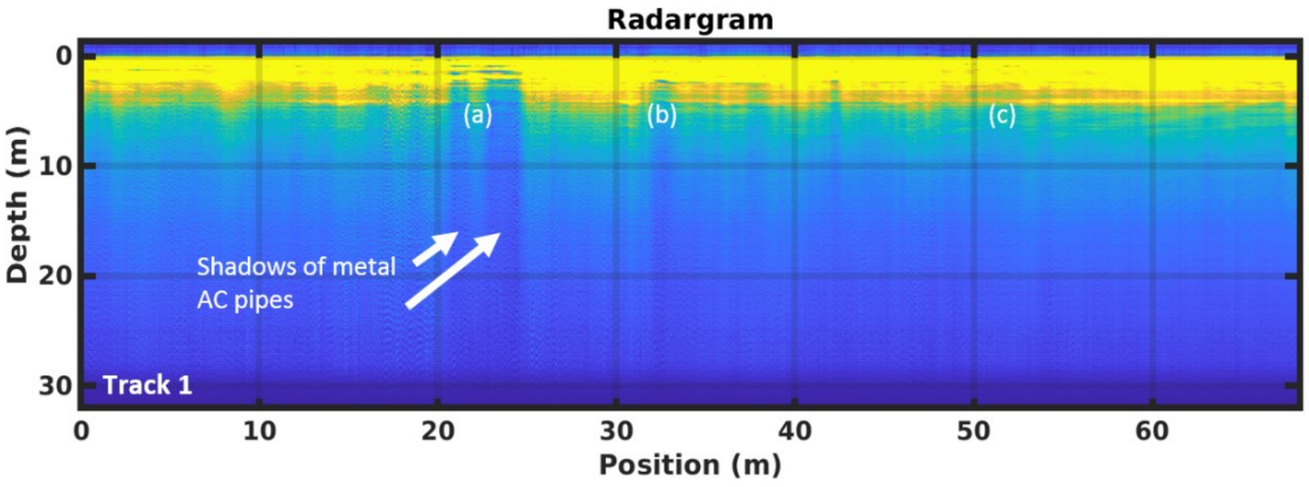


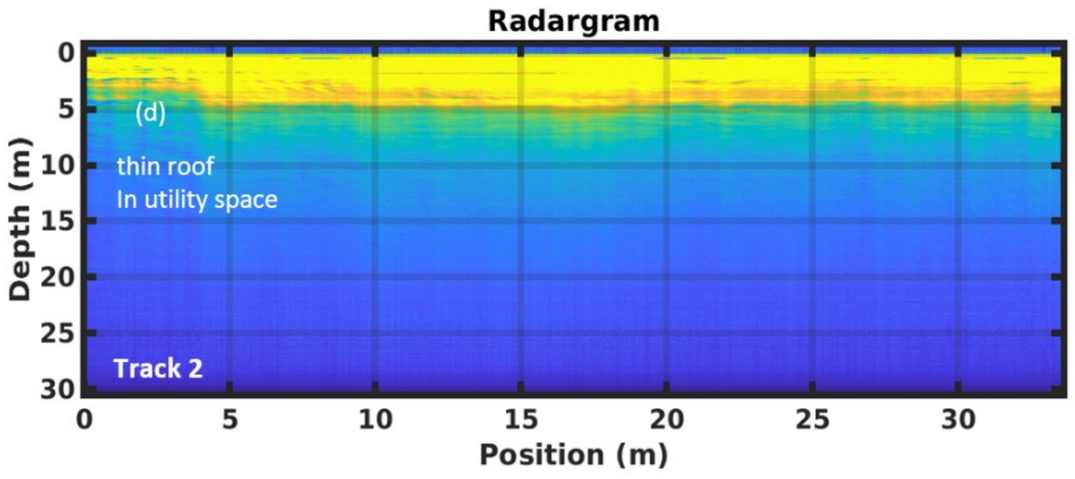


Outdoor GPR Measurements:









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Publications:

- A. Tang, E. Decrossas, Y. Gim, R. Huang, R. Beauchamp, M-C. Frank Chang, "Surface Cancellation in Wideband Ground Penetrating Radar Employing Genetic Algorithm AI for Waveform Synthesis" International Microwave Symposium 2021.
- A. Tang, E. Decrossas. S. Culaclii, Y. Gim, R Beauchamp, "A 300-1300 MHz Single Antenna Digital-FMCW Ground Penetrating Radar with Switched-Gain Calibration to Improve Dynamic Range" –IEEE International Microwave Symposium 2022

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