**Optimization Tool**

The Optimization Tool is a software application developed by the Goddard Space Flight Center (GSFC) in Greenbelt, Maryland. This tool is designed to aid in the alignment of the James Webb Space Telescope (JWST) Integrated Science Instrument Module (ISIM) by providing a series of optical characterization tests. The ISIM includes the JWST optical telescope element (OTE) and its interfaces. The tool allows users to determine the locations and orientations of the ISIM with respect to the corresponding OTE optical interfaces. Any identified non-compliance will be adjusted to improve the performance of the ISIM. This tool is crucial for meeting the ISIM's optical requirements and is used to ensure the ISIM aligns properly with the JWST OTE. The ISIM Model tool was developed to help solve the multi-dimensional alignment problem, allowing users to determine how best to adjust the alignment of the ISIM with respect to the ideal telescope interfaces so that the 150 ISIM optical performance requirements can be satisfied. The tool has been found to be effective in achieving these goals.

This work was done by Brent Bos of Goddard Space Flight Center. Further information is contained in a TSP (see page 1). GSC-16698-1

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**Radar Range Sidelobe Reduction Using Adaptive Pulse Compression Technique**

Pulse compression has been widely used in radars so that low-power, long RF pulses can be transmitted, rather than a high-power short pulse. Pulse compression radars offer a number of advantages over high-power short pulsed radars, such as no need of high-power RF circuitry, no need of high-voltage electronics, compact size and light weight, better range resolution, and better reliability. However, range sidelobe associated with pulse compression has prevented the use of this technique on spaceborne radars since surface returns detected by range sidelobes may mask the returns from a nearby weak cloud or precipitation particles. Research on adaptive pulse compression was carried out utilizing a field-programmable gate array (FPGA) waveform generation board and a radar transceiver simulator. The results have shown significant improvements in pulse compression sidelobe performance. Pulse compression techniques could bring significant impact on future radar development. The novel feature of this innovation is the non-linear FM (NLFM) waveform design. The traditional linear FM has the limit (~20 log BT –3 dB) for achieving ultra-low-range sidelobe in pulse compression. For this study, a different combination of 20- or 40-microsecond chirp pulse width and 2- or 4-MHz chirp bandwidth was used. These are typical operational parameters for airborne or spaceborne weather radars. The NLFM waveform design was then implemented on a FPGA board to generate a real chirp signal, which was then sent to the radar transceiver simulator. The final results have shown significant improvement in sidelobe performance compared to that obtained using a traditional linear FM chirp.

This work was done by Lihua Li, Michael Coon, and Matthew McLinden of Goddard Space Flight Center. Further information is contained in a TSP (see page 1). GSC-16458-1