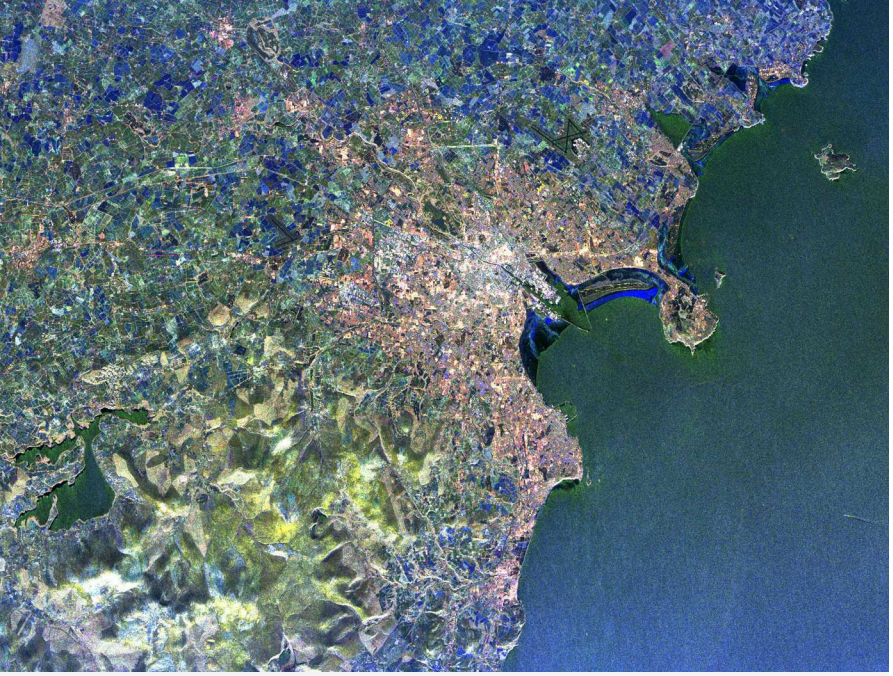

National Aeronautics and
Space Administration

technology solution

Environment

Low Frequency Wideband Step Frequency Inverse Synthetic Aperture Radar

A high-bandwidth, high-resolution ISAR technology for studying subsurface structures.

NASA Goddard Space Flight Center has developed a compact, lightweight, low frequency wideband Inverse Synthetic Aperture Radar (ISAR) and associated post-processing software. The software processes data received by the ISAR radar to extract down- and cross-range images of the target object. This ISAR system enables scientists and geologists to image 3D interior structure of a solid object to a depth of up to tens of meters. The system also features wide bandwidth, providing higher resolution than previous technologies such as conventional pulse ground penetrating radar (GPR) for analysis of thin layer pavements and geological subsurface structures.

BENEFITS

- Higher bandwidth compared to single pulse systems
- Higher resolution
- Higher signal-to-noise ratio
- Less expensive
- Compact and lightweight

THE TECHNOLOGY

This technology is a low frequency (25~100 MHz) wide band (75 MHz) subsurface imaging ISAR. Use of low frequencies allows the electromagnetic energy to penetrate to a greater depth, enabling observation of the interior of a solid object to a higher resolution than can be achieved with alternate technologies. Higher bandwidth has been used in earlier ISAR systems; however these require expensive high bandwidth RF components, and also higher speed data processing units. The new ISAR system uses a novel step frequency technique which eliminates both these requirements. The step frequency approach keeps the local bandwidth very small; enabling data processing at much lower speed. And by stepping through the frequencies, this ISAR achieves much higher overall bandwidth and consequently very high range resolution.

APPLICATIONS

The technology has several potential applications:

- Ground penetrating radars (thin layer pavements and geological subsurface structures)
- Study of the interior of asteroids, comets, and other small Near Earth Objects
- Characterization of the 3D structure of the lunar regolith

PUBLICATIONS

Patent No: 8138961

More Information

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NASA's Technology Transfer Program pursues the widest possible applications of agency technology to benefit US citizens. Through partnerships and licensing agreements with industry, the program ensures that NASA's investments in pioneering research find secondary uses that benefit the economy, create jobs, and improve quality of life.

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