



NuSAR

Naval Research Laboratory (NRL) Unmanned Aerial Vehicle (UAV) Synthetic Aperture Radar

NuSAR Overview

The NuSAR system is a small high-bandwidth synthetic aperture radar (SAR) system that provides large area surveillance and reconnaissance for small manned and unmanned aircraft. Independent of weather and lighting conditions, NuSAR can detect manmade or metal objects with particular clarity, even through foliage and under topsoil.

The Space Dynamics Laboratory (SDL) created NuSAR through a joint effort with the Naval Research Laboratory (NRL), Brigham Young University (BYU), and Artemis, Inc. Under the DUSTER (Deployable UAV System for Targeting, Exploitation, and Reconnaissance) program, SDL and BYU initially designed, built, and field tested prototype SAR systems (MicroSAR) that operate at C-band and L-band frequencies. These systems weigh less than 5 lbs each and perform well from a UAV. Currently, SDL is testing a next-generation, 25 lb, SAR (NuSAR) providing 1-foot (30 cm) ground resolution in the L-band and X-band. NuSAR is designed to operate from a Tier II UAV and cover 120 square miles per hour. NuSAR processes SAR data in real-time within the sensor electronics to produce viewable NITF 2.1 files, which are immediately available for ground exploitation via a live data link.



MicroSAR Small SAR System

- C-Band (5.4 GHz) and L-Band (1.75 GHz)
- 1 Watt transmitter
- 1 Meter resolution
- Strip mode, bistatic, continuous wave design
- Less than 2 kg total weight
- Raw data stored to FLASH or output via Ethernet

NuSAR High Performance UAV SAR

- L-Band (1.75 GHz) and X-Band (9.75 GHz)
- 25 Watt transmitter
- 1/3 Meter resolution
- Strip mode, monostatic, pulsed design
- 25 lb system for Tier II UAVs (e.g. Shadow 200)
- Ethernet output in NITF image format or raw I&Q data
- Full real-time SAR image formation

MicroSAR

The MicroSAR system weighs less than 5 lbs and uses 16 watts (12 Vdc) of power, enabling long durations of operation, even from batteries. MicroSAR is a bistatic, continuous wave SAR with 160 MHz bandwidth. MicroSAR also features real-time de-ramping and provides on-board storage with multi-hour storage capability. Currently, MicroSAR is available at L-band and C-band frequencies. A commercial (ruggedized) version of MicroSAR operating at C-band is in its final stages of development.

C-band MicroSAR transmits 1 Watt using two microstrip antennas in a homodyne configuration. This transmission enables MicroSAR to operate from 200-2000 foot altitudes.

L-band MicroSAR provides real-time data transmission through an Ethernet connection as well as real-time ground data processing. L-band MicroSAR was tested in FY07 aboard manned aircraft flying over the Utah Test & Training Range. In conjunction with BYU, SDL manufactured and assembled both MicroSAR versions.

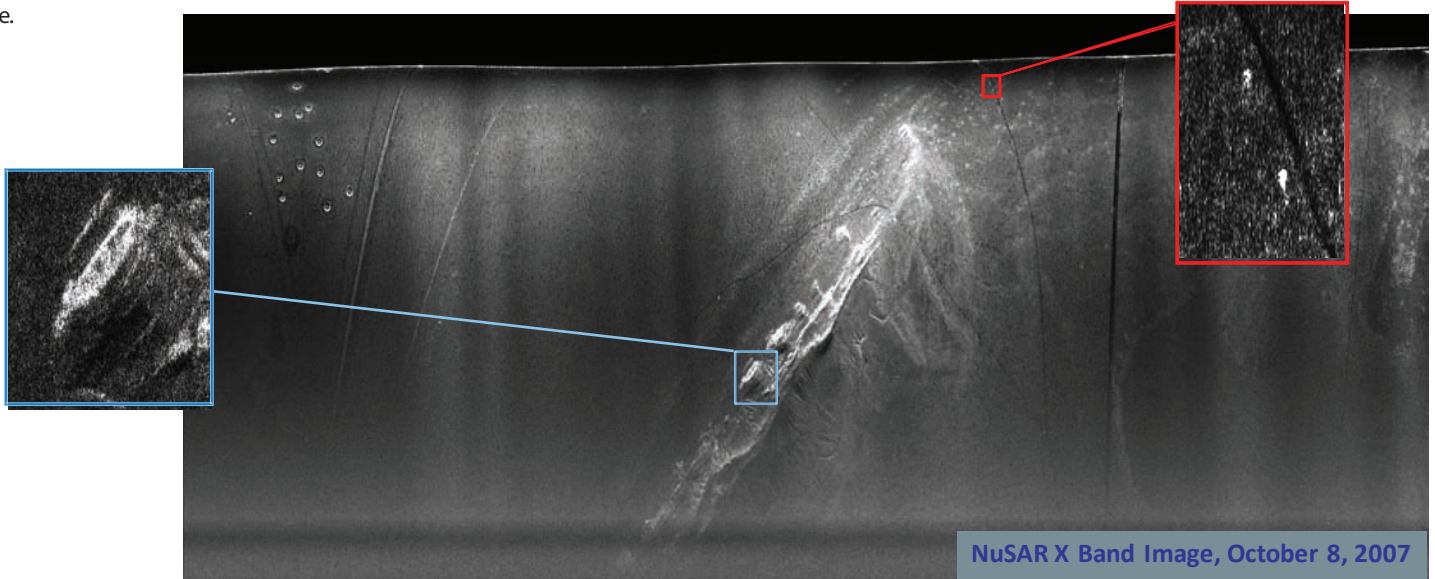


NuSAR

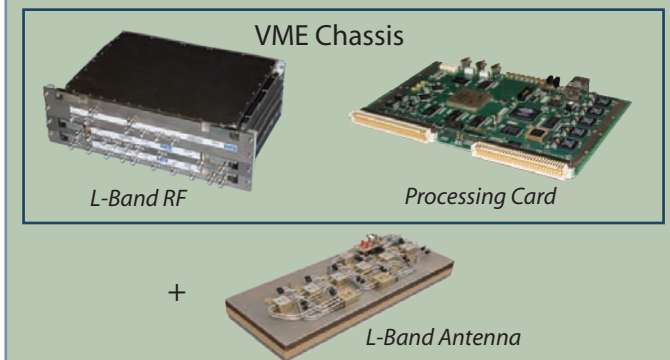
NuSAR is a new monostatic, pulsed SAR design with a form factor matching Tier II UAVs such as the Shadow 200. NuSAR is part of a larger suite of sensors and exploitation systems developed under the DUSTER program. NuSAR is designed to provide automatically-generated target cues to a high resolution interrogation sensor such as the SDL-developed VNIR/LWIR EyePod.

NuSAR operates at L-band and X-band frequencies. When operating at L-band (1.5-2.0 GHz) NuSAR is designed to detect metal objects of interest through weather and other impediments while still maintaining high resolution. The base L-band system consists of three RF generation boards, three image processing boards, and an L-band antenna. Two additional RF components allow the base system to operate at X-band capacity (9.5-10 GHz), thus enabling a collection of SAR imagery more sensitive to surface details. A simultaneous L- & X-band capability is currently being developed.

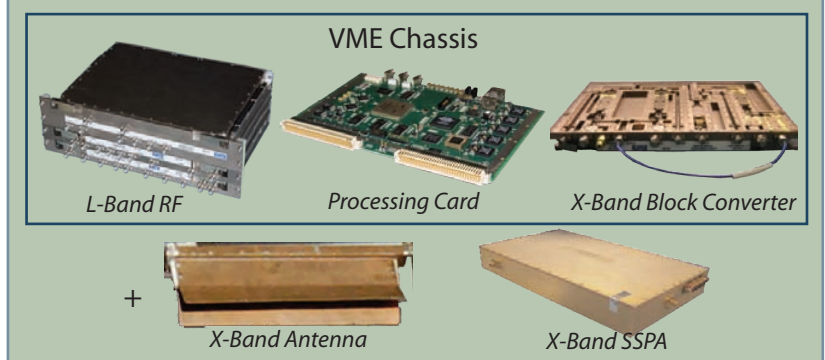
NuSAR is unique in that it provides real-time on-board SAR image processing and produces geo-registered NITF imagery over an Ethernet connection for immediate exploitation. For flexible applications, a simultaneous raw data output path provides I & Q data via the same Gigabit Ethernet interface.



NuSAR L-Band Base System (19 lbs)



NuSAR X-Band Expansion System (19 lbs)



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Artemis, Inc.

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