

# 2D-STAR

## Two-Dimensional Synthetic Aperture Radiometer

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2D-STAR is a synthetic aperture radiometer that uses aperture synthesis in two dimensions. The instrument was developed under NASA's Instrument Incubator Program by a team at the Goddard Space Flight Center, the University of Massachusetts and ProSensing, Inc. This is an aircraft instrument operating at L-band designed to image in a nadir-pointing mode. The antenna consists of an array of dual polarized patch antennas. The array is full, but only selected elements are connected to a receiver. The current configuration consists of a "cross" of active elements (Figures 1-2). 2D-STAR made its maiden flight in August, 2002. It flew on the NASA P-3 together with ESTAR over the Delmarva Peninsula south of Goddard's Wallops Flight Facility. The two instruments flew again in September over research forest sites in Virginia. Evaluation of the instrument performance and analysis of the flight data is currently underway.

TABLE I: INSTRUMENT CHARACTERISTICS

Frequency	1.413 GHz (L-band)
Polarization	V and H (switched)
Bandwidth	20 MHz
Integration time	0.10 seconds (minimum)
Element spacing	$0.53 \lambda$
Elements per arm	11

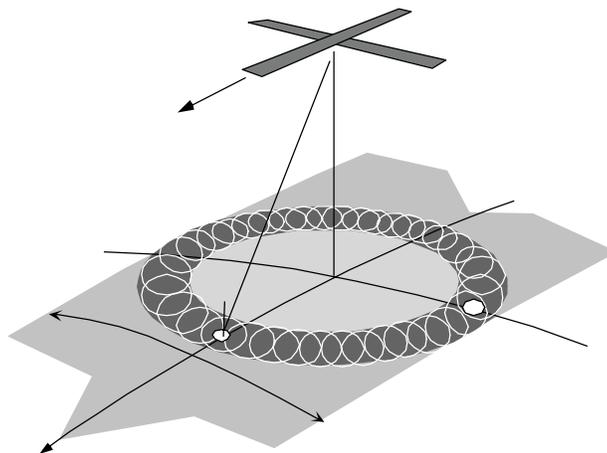


Figure 1: The imaging configuration for the 2D-STAR instrument. The antenna consists of an array of patch antennas oriented to look toward nadir.

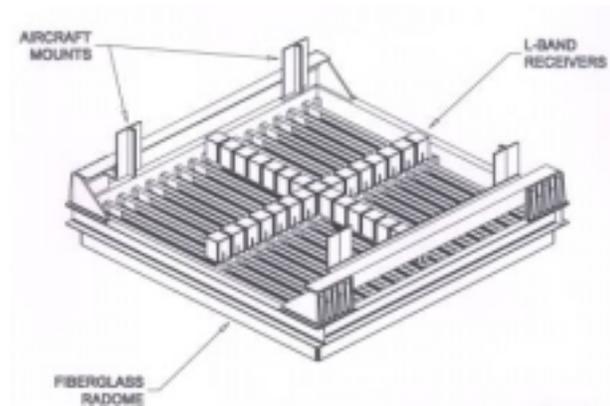


Figure 2: Drawing showing the back of the antenna array with receivers connected in the form of a cross. Each receiver is connected to dual-polarized patch antenna on the front side of the array (figure 3). The array is covered by the fiberglass radome. This box is enclosed and mounted in a nadir looking orientation in the bomb bay of the aircraft (figures 4-5). Analog signals from the receivers go to the digital processor located in the aircraft.



Figure 3: The 2D-STAR antenna array with the radome (left) removed to show the individual dual polarized patch antennas. In the current configuration only elements in the form of a cross (Figure 2) are connected to receivers. The antenna and receivers are housed in the aluminum box and during flights this box is mounted in the bomb bay of the NASA Orion P-3 (Figure 4-5). The digital electronics, computer and power supplies are in the cabin of the aircraft and connected via cables to this box.



Figure 4: The NASA P-3 on the tarmac at WFF. The instruments are mounted in the bomb bay, just forward of the wings, and covered by a fairing.



Figure 5: Close up view of the 2D-STAR antenna array installed in the bomb bay of the P-3. At the far right, a piece of the ESTAR antenna can be seen (black frame with white radome). The two flew together on the P-3 during test flights in Aug-Sept, 2002.