

telecommunication wavelength of 1,550 nm and uses a silicon-based sensor, sensitive from 0.5 to 1.0 micrometers, to determine the pointing direction. The scheme shown in the figure involves integrating a low-power 980-nm reference or boresight laser beam coupled to the 1,550-nm transmit beam via a wavelength-division-multiplexed fiber coupler. Both of these signals propagate through the optical fiber where they achieve an extremely high level of co-alignment before they are launched into the telescope. The telescope uses a dichroic beam splitter to reflect the 980-nm beam onto the silicon image sensor (a quad detector, charge-coupled device, or active-pixel-sensor array) while the 1,550-nm signal beam is transmitted through the optical assembly toward the remotely located receiver. Since the 980-nm reference signal originates from the same single-mode fiber-coupled source as the transmit signal, its position on the sensor is used to

accurately determine the propagation direction of the transmit signal.

The optics are considerably simpler in the proposed scheme due to the use of a single aperture for transmitting and receiving. Moreover, the issue of mechanical misalignment does not arise because the reference signal and transmitted laser beams are inherently co-aligned. The beam quality of the 980-nm reference signal used for tracking is required to be circularly symmetric and stable at the tracking-plane sensor array in order to minimize error in the centroiding algorithm of the pointing system. However, since the transmit signal is delivered through a fiber that supports a single mode at 1,550 nm, propagation of higher order 980-nm modes is possible. Preliminary analysis shows that the overall mode profile is dominated by the fundamental mode, giving a near symmetric profile. The instability of the mode was

also measured and found to be negligible in comparison to the other error contributions in the centroid position on the sensor array.

This work was done by Malcolm Wright, Gerardo Ortiz, and Muthu Jegathanan of Caltech for NASA's Jet Propulsion Laboratory. Further information is contained in a TSP (see page 1).

In accordance with Public Law 96-517, the contractor has elected to retain title to this invention. Inquiries concerning rights for its commercial use should be addressed to:

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High-Level Performance Modeling of SAR Systems

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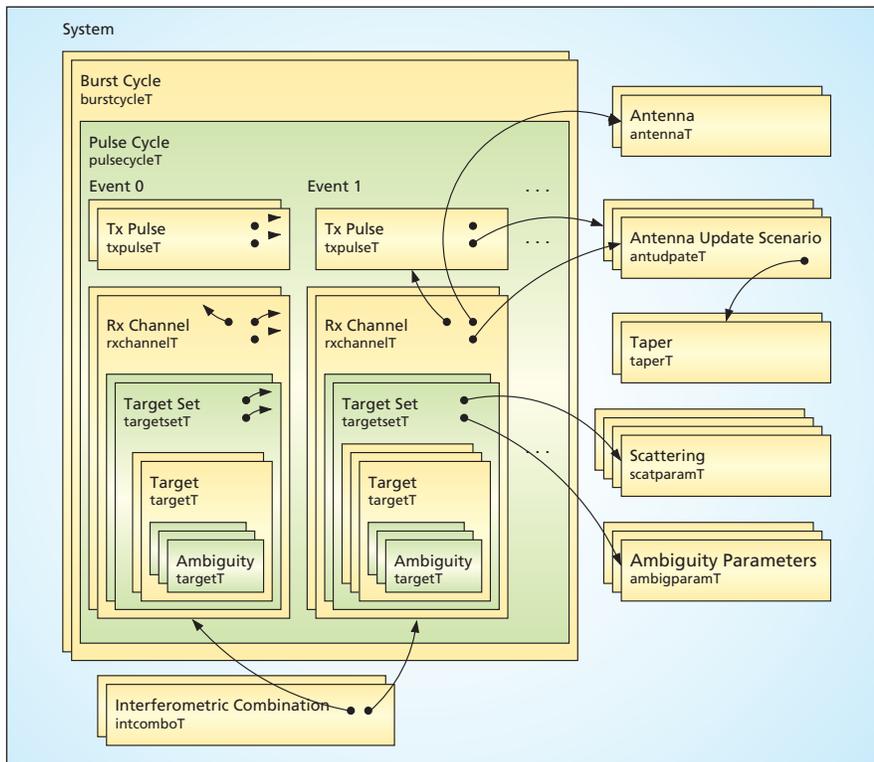
SAUSAGE (Still Another Utility for SAR Analysis that's General and Extensible) is a computer program for modeling (see figure) the performance of syn-

thetic-aperture radar (SAR) or interferometric synthetic-aperture radar (InSAR or IFSAR) systems. The user is assumed to be familiar with the basic principles of

SAR imaging and interferometry. Given design parameters (e.g., altitude, power, and bandwidth) that characterize a radar system, the software predicts various performance metrics (e.g., signal-to-noise ratio and resolution). SAUSAGE is intended to be a general software tool for quick, high-level evaluation of radar designs; it is not meant to capture all the subtleties, nuances, and particulars of specific systems. SAUSAGE was written to facilitate the exploration of engineering tradeoffs within the multidimensional space of design parameters. Typically, this space is examined through an iterative process of adjusting the values of the design parameters and examining the effects of the adjustments on the overall performance of the system at each iteration. The software is designed to be modular and extensible to enable consideration of a variety of operating modes and antenna beam patterns, including, for example, strip-map and spotlight SAR acquisitions, polarimetry, burst modes, and squinted geometries.

This program was written by Curtis Chen of Caltech for NASA's Jet Propulsion Laboratory. Further information is contained in a TSP (see page 1).

This software is available for commercial licensing. Please contact Karina Edmonds of the California Institute of Technology at (626) 395-2322. Refer to NPO-43373.



Logical Block Diagram shows how a radar system is modeled by SAUSAGE. Blocks represent software objects, which describe physical aspects of the system. Arrays are indicated by stacked blocks. Arrows represent pointers to other objects.