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# NASA TECH BRIEF

## *Marshall Space Flight Center*



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### Electromagnetic Simulation of Microwave Backscatter from the Ocean Surface: A Feasibility Study

A feasibility study was conducted on various techniques for obtaining a simulated microwave backscattering from the ocean surface and analyzing the backscatter pattern. An area of  $2.59 \times 10^6 \text{ m}^2$  (1 square mile) of ocean surface is represented on a light-activated etching of a silicon surface. The radar system is represented by a laser beam, a beam chopper, a detector, a detector amplifier, and a recorder.

The backscatter analytic technique has doubtful industrial application; however, the photo-etching process might be adapted to integrated circuit and thin film semiconductor fabrications.

Several methods of microsurface forming techniques discussed are: Mechanical machining; laser machining; electron beam machining; thermoplastic recording; photochemical etching; photosublimation; photoepitaxial growth; multilayer etching; and multilayer deposition.

In the photochemical etching process, the most successful of those attempted, a negative is first made. The transmissivity property of the negative represents the vertical variation of the surface. When the image is focused on a semiconductor in an etching solution, electron-hole pairs are created in the semiconductor. These pairs may react with the etchant to remove an atom of the semiconductor. The intensity of the light determines the density of electron-hole pairs and, consequently, the amount of material

etched from the surface. The limitations of this method with respect to resolution are determined by: Optical resolution limits; optical system mechanical vibration limits; turbulence in the etchant; and properties of the semiconductor material, such as diffusion constant, lifetime, impurity and fault density. A horizontal resolution of 10 was attained, a figure that should improve with equipment refinement.

#### Note:

The following documentation may be obtained from:

National Technical Information Service  
Springfield, Virginia 22151  
Single document price \$3.00  
(or microfiche \$0.95)

#### Reference:

NASA-CR-98454 (N69-28068), Electromagnetic Simulation of Microwave Backscatter from the Ocean Surface: A Feasibility Study

#### Patent status:

No patent action is contemplated by NASA.

Source: Robert B. Ward of  
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Category 01