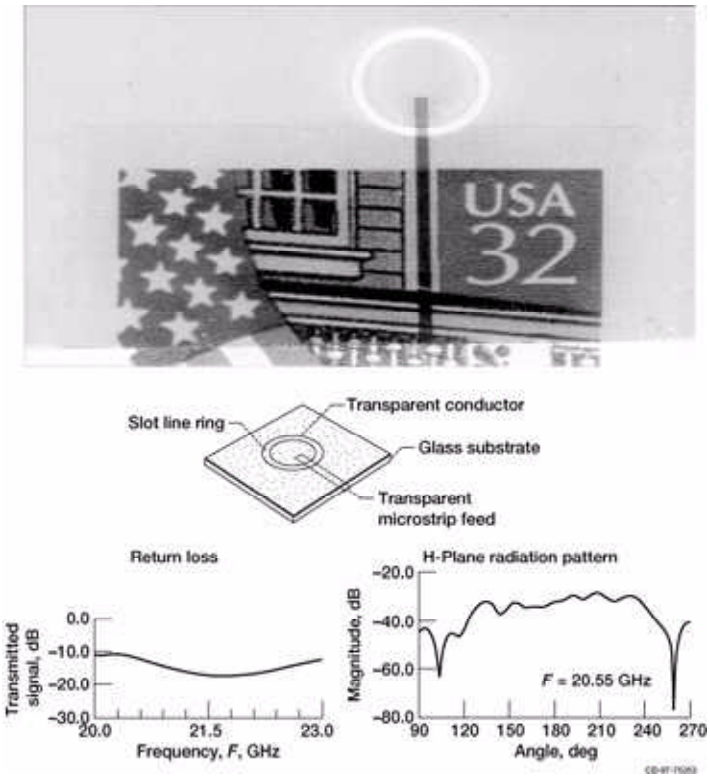
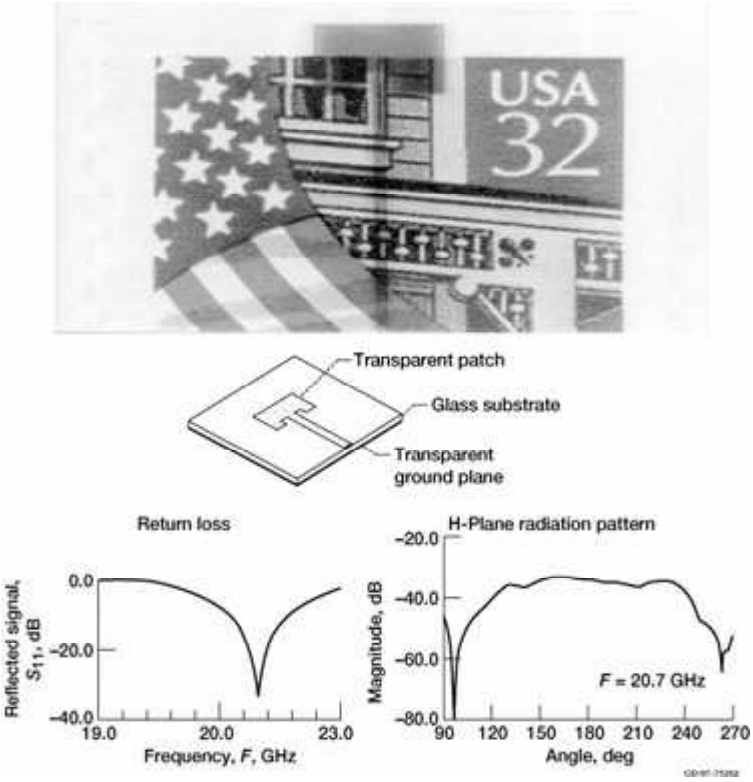
Conformal, Transparent Printed Antenna Developed for Communication and Navigation Systems

Conformal, transparent printed antennas have advantages over conventional antennas in terms of space reuse and aesthetics. Because of their compactness and thin profile, these antennas can be mounted on video displays for efficient integration in communication systems such as palmtop computers, digital telephones, and flat-panel television displays. As an array of multiple elements, the antenna subsystem may save weight by reusing space (via vertical stacking) on photovoltaic arrays or on Earth-facing sensors. Also, the antenna could go unnoticed on automobile windshields or building windows, enabling satellite uplinks and downlinks or other emerging high-frequency communications.

Recently, a class of transparent patch and slot antennas consisting of an ultrathin film of electrically conductive material deposited on glass or plastic substrates has been developed jointly by the NASA Lewis Research Center and the Federal Data Corporation. A prototype antenna has been demonstrated with the antenna fabricated on either glass or plastic substrates. The multistep liftoff lithographic technique is used to fabricate antennas are on glass substrates. Two of the tested transparent antennas--a slot ring and a rectangular patch antenna are shown along with their performance data in the following figures. The antennas have demonstrated very broadband characteristics, good impedance matching, and radiation patterns for frequencies ranging from 2 to 30 gigahertz (GHz). We believe that these antennas can be further developed to operate in the Federal Communication Commission’s (FCC) newly opened, high-frequency bands above 30 GHz. Finally, a 2-by-2 array has been fabricated and is currently being characterized.



Transparent, electromagnetically coupled ring-slot optically transparent conducting (OTC) antenna. Top: Shown placed on top of a U.S. stamp. Bottom: Attachment details and performance data.



Transparent, rectangular microstrip optically transparent conducting (OTC) patch antenna. Top: Shown placed on top of a U.S. stamp. Bottom: Attachment details and performance data.

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