

Recent Progress in Optically Transparent Antennas

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A class of optically transparent patch and slot antennas that consist of an optically transparent electrically conductive film deposited on glass or plastic substrates has been demonstrated from 2 to over 20 GHz. The antenna can be fabricated at low cost using conventional IC fabrication techniques. At these frequencies, these antennas offer potential NASA and commercial applications for wireless communications. Some advantages of these antennas include:

- Space reuse (terrestrial): the antenna can be printed on the video display for compact packing and efficient integration in communications devices (palmtop computer, digital telephone, flat-panel display etc.) Recently, an example of such use has been reported (C. F. Huang and L. Chan, Electronics Letters, Vol. 38, No. 20, September 2002).
- Space reuse (spacecraft): the antenna subsystem saves weight by reusing space on photovoltaic or on Earth-facing sensors.
- Covertness or aesthetics: 'hidden' antennas blend with the background. Transparent antennas can be mounted unobtrusively on automobile windshields or other location for communications purpose.

This paper presents an overview of past works and most recent progress on optically transparent antennas development at NASA GRC. The types of antennas that have been investigated include patch, slot and ring antennas, as well as 2x2 arrays of patch and slot ring elements. In addition to return losses and pattern measurements, a close proximity video links has been demonstrated with these antennas in the laboratory environment. Preliminary results indicated that these types of antennas are capable of broadband operation, and therefore, have high commercial potentials. Detailed designs of different antenna types, their performance characteristics and fabrication technique will be presented and discussed.