Talk title: Optically Transparent Antennas Technologies works up to the millimeter-wave band

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The development of wireless communications and the increase of radio applications, such as UMTS, Bluetooth, GPS, WLAN, etc., in dense urban areas are an environmental challenge requiring innovative technological solutions. To restrict the visual impact of the associated antenna networks and to improve their location in the city, an attractive possibility is to develop optically transparent antennas. In this field area of interests, thin-film materials deposited on see-through substrates provide innovative solutions.

Such transparent antennas are usually fabricated from transparent conducting oxide (TCO) films, such as indium tin oxide (ITO), fluorine tin oxide (FTO), or multilayers such as TCO/metal/TCO deposited on glass substrates. However, these solutions imply a limitation in sheet resistance Rs and/or optical transparency, T values. To circumvent these restrictions, we have developed an original approach: the fabrication of mesh metal films which exhibit very low sheet resistance value: Rs=0.05 ohm/sq (to restrict the ohmic loss) combined with high thickness: 6 μm (to limit the skin depth effect) and high transparency: T=80% in the visible light spectrum. This novel solution provides the best radiating efficiency at microwave frequency. In this communication, we report on ITO films, ITO/metal/ITO multilayers, and silver/titanium films deposited on Corning glass substrates by R.F. sputtering and the fabrication of the mesh metal structures. We investigate the microwave performance of various transparent antennas made from such materials with different levels of transparency and sheet resistance values. Each transparent antenna performance is compared with that of a reference counterpart made from a continuous (opaque) metal film.

Many passive and active antennas examples will be presented and discussed during the communication.