# Optically Reconfigurable Metacheckerboard

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Reconfigurability is a fundamental asset for modern communication systems, which often seek to offer several functionalities in a confined volume. Metasurfaces (MTSs) are especially attractive as support for reconfigurable devices, provided that they can be designed for controlling the propagation path of surfaces waves (SW) or for leaking SW power into space harmonics. In this work, we present an experimental demonstration of reconfigurable transmission line (TxL) using a checkerboard metasurfaces (CBMS).

CBMSs (González-Ovejero et al., IEEE Antennas Wireless Propag. Lett., 2015) consist of a checkerboard-type layout, made of electrically small complementary metallic patches and apertures on a grounded slab. Depending on whether the patches' vertices are interconnected or not, the structure may or may not support a propagating quasi-TEM mode. This feature offers the possibility of designing arbitrary TxL paths on the CBMS by dynamically changing the vertex connections. The CBMS TxL presents two important advantages over other slow-wave structures. First, the supported mode exhibits a very low dispersion over a very large bandwidth. Second, the vertices' dimensions can be reduced to the micrometer scale without impacting the CBMS TxL characteristic impedance. Therefore, the propagation path of the supported mode can be directed by acting on an extremely small region at the metallic patches' vertices. This can be efficiently done by locally changing the effective conductivity of a photo- sensitive substrate by focusing a limited level of optical power on the area of interest. The use of photo-conductive switches (Tripon-Canseliet et al., J. Lightw. Technol., 2012) is advantageous with respect to electronic switches, since they do not require bias lines.

The experiment consists of a Si-based CBMS TxL in an optoelectronic experimental environment, where a laser source at wavelength of 0.8 $\mu$m is focused on a spot to ensure the electrical connection between two patches using the photoconductive properties of the Silicon. The experimental results show the insertion losses for optical switches of different sizes when they are illuminated with several levels of optical power.