

Reconfigurable beam reflectarray antenna for frequencies in the range of terahertz and millimeter wave

The reflectarray antenna consists of a flat array of phase-shifter cells (reflectarray) illuminated by a feeder, which produces an electronically reconfigurable collimated or shaped beam, where the cells (3b) consist of several stacked layers of conductive elements (4c, 4e, 4d, 4f) on a dielectric substrate (7c, 7d) alternated with layers of liquid crystal (5c, 5d) and a conductive plane (9). Applying bias voltages in the conducting elements, the dielectric constant of the liquid crystal varies producing a phase shift of the reflected field in each cell, allowing for a electronic beam scanning or reconfiguration. Including multiple layers of conductive elements and liquid crystal, improves the bandwidth and the performance of the beam scanning or reconfiguration. The antenna can be applied to observation satellites, communications and security systems.

The Challenge

Prior reconfigurable antennas demonstrators are based on liquid crystals, with a single liquid crystal layer and where the bias voltage applied to the liquid crystal is varied continuously in order to conduct an electronic beam scanning. This prior technology has two limitations:

- 1) Continuous control of liquid crystal polarization is unstable and doesn't allow electronic beam sweeping or reconfiguration in real time.
- 2) A single layer of liquid crystal is not enough to obtain sufficient phase variation for a full beam reconfiguration, being the reconfiguration capabilities very limited in the beam shaping and in bandwidth.

The Technology

The invention solves these two problems mentioned above. The liquid crystals are polarized into two extreme states only, so that the phase control is more stable and switching times are lower. Stacking several layers printed elements with liquid crystal, with independent polarization voltages for each layer, leading to various phase states (more than 2 bits) to allow a more accurate electronic beam scanning and / or reconfiguration.

Innovative advantages

This reflectarray antenna based on multilayer liquid crystal cells for electron beam scanning or reconfiguration can be used as an alternative to reflectors with mechanical sweeping with the following advantages:

- Reduced weight and volume
- Improved reliability and beam scanning speed
- Low cost

Current stage of development

The invention is in a conceptual stage. A demonstrator will be manufactured in 2 years.

Applications and Target Market

Applications:

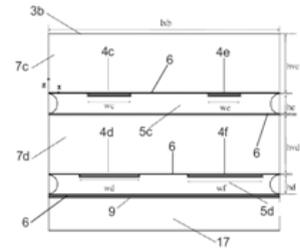
- Space: Instruments for observation of the Earth
- Communications: high-bandwidth communications
- Radars: in the range of sub-millimeter frequency bands
- Security: for image reconstruction equipment for weapon and explosive detection.

Target Market: Security, communications, aerospace.

Reference number

MKT2011/0026_I

New reflectarray antenna based on multilayer liquid crystal cells



An alternative to reflectors with mechanical sweeping

Important reduction of weight and volume

Business Opportunity

Technology available for licensing with technical cooperation

Patent Status

Patent priority application filed

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