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Title:Very small footprint 60 GHz stacked Yagi antenna array

Authors:Kramer, Olivier (1); Djerafi, Tarek (1); Wu, Ke (1)

Author affiliation:(1) Département de Génie Électrique, Poly-Grames Research Center, École Polytechnique de Montréal, Montréal, QC H3T1J4, Canada

Corresponding author:Kramer, O.(olivier.kramer@polymtl.ca)

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Abstract: Millimeter wave applications such as short-range high-speed wireless links require modular, compact-size and high-directivity antennas. In this paper, high-gain compact stacked multilayered Yagi designs are proposed and demonstrated in the V-band. This novel design shows for the first time an antenna array of Yagi elements in millimeter wave stacked structure. To demonstrate the proposed concepts and design features, a 4 × 4 antenna array is created having excellent gain performance as well as very small footprint. A single element stacked Yagi antenna fed with microstrip is studied in order to obtain the desired performance. An analysis is performed to define the structure limitations. Measured results of the fabricated antenna prototypes are in good agreement with simulated results The measured Yagi antenna attains 11 dBi gain over 4.2% bandwidth with a size of 6.5 × 6.5 × 3.4 mm3. A 4 × 4 array of Yagi antenna using an SIW (Substrate Integrated Waveguide) feeding technique is conceived. Both simulated and measured results match with each other very well. The 4 × 4 array has a size of 28 × 24 × 2.4 mm3 , and reaches a measured gain of 18 dBi over 7% bandwidth. An alternate configuration of the array using angled Yagi antenna elements allows a significant improvement of the side lobe level (SLL) with a low impact on the gain performances. The proposed antennas are excellent candidates for integrated low-cost millimeter-wave and even terahertz systems. The small foot print, the antenna design flexibility as well as its easy adaptation to automatic fabrication processes are good assets for making short range portable imaging systems.