A 20 GHz – 100 GHz Low Cost, Compact, Conformal, Wideband Phased Array For 5G Applications

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We present a novel, low cost, compact, conformal, wideband phased-array design for 5G mobile applications covering the 20 GHz – 100 GHz band continuously. The conformal stripline-fed array was designed using Duroid 5880 PCB (ε_r = 2.2) with minimum feature size of 5 mils, which can be fabricated with current fabrication technologies. The linearly polarized array is a variation of the tightly coupled dipole array (TCDA) topology (J. P. Doane, K. Sertel and J. L. Volakis, IEEE Trans. Antennas Propag., vol. 61, no. 6, pp. 3017 – 3025, 2013), and consists of tapered, balanced, antipodal dipole elements with overlapping arms, and a ground plane formed using a series of shorting pins. By balancing the inductance due to the ground plane and dipole arms with the capacitance introduced through the overlapping of the adjacent elements, a compact design having unit-cell dimensions of 1.02mm by 0.76mm by 1.75mm can be achieved. This unit cell size corresponds to approximately $\lambda/8.5$ at 20 GHz, and the element exhibits a wide operational bandwidth, continuously covering 20 GHz to 100 GHz (5:1 impedance bandwidth, VSWR < 2.2 at broadside). The phased array can be used to scan up to ±35° in both the *E*- and *H*-planes with VSWR < 3. As such, this array integrates all the proposed 5G mobile bands range from 24GHz to 86GHz (ITU, WRC-15, 2015), and its compact, conformal design allows for convenient installation along the edges of modern smartphones without increasing the overall size. The wide impedance bandwidth and scanning performance also allows for beam scanning agility as well as MIMO capability for 5G applications.