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Design, Simulation and Tests of a Low-cost Microstrip Patch Antenna Arrays for the Wireless Communication

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**Abstract:** Typical low-cost, low-weight microstrip base station antenna arrays with beam-scanning capabilities are taken into account. In downtowns of large cities like New York, Chicago, and in historical cities like Istanbul, where high buildings are separated by narrow but densely occupied streets, antenna arrays with approximately 20° -35° beam-widths are required to complete the cellular communication coverage. To meet this requirement, new antenna arrays are designed with 35° beam-widths and 60° electronic scanning capabilities. Their characteristics are investigated both numerically and experimentally. An FDTD-based antenna simulation package (M-PATCH) is prepared, tested on canonical structures and against the literature first, for verification and calibration. Then, the characteristics of the designed arrays are investigated via M-PATCH. Finally, the arrays are experimentally verified. It is illustrated that, the results of simulations and experiments agree very well, and the arrays meet the design criteria.

**Key Words:** Wireless communication, microstrip, patch antenna array, beam scanning, beam forming, FDTD, numerical simulation

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