A Pattern-Reconfigurable, Wideband, High Gain, Parasitic Array Antenna

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Demand for reconfigurable antennas to change radiation pattern has been increasing rapidly in order to improve security, save energy by directing pattern towards users, and avoid known noise source for better signal transmission / reception. Over the decade, PIN diode switches have been prevalently used in pattern reconfigurable antennas successfully for simplicity, low cost, and fast switching speed.

In this paper, a radiation-pattern-reconfigurable, high-gain antenna with wideband is introduced. Fig. 1 shows the configuration of the proposed antenna. The single set of a wideband, high-gain antenna [see Fig. 1(a)] consists of a driven element (driver) and parasitic elements (director and reflectors). Conical shapes are employed in the driver and director to increase the bandwidth. For the reflector, a set of two wires that are 64° apart is used. Both wires are placed vertically and they are conformal to the hemisphere that encloses both the driver and director. The bandwidth of the antenna is 34% and the realized gain in average across the bandwidth is 9.7 dBi in the director direction. The front-to-back ratio in average is 14.5 dB across the bandwidth. Next, to switch the radiation pattern in four directions, three additional sets of Fig. 1(a) are added every 90° and PIN diode switches are located at the bottom of all parasitic elements as shown in Fig. 1(b). The radiation pattern reconfigurability is achieved by controlling the PIN diode switches. When the PIN diode switches of one set are ON and those of the other set are left OFF, negligible current flow is observed on the disconnected (OFF) parasitic elements. Therefore, the antenna can provide switchable, highly directive radiation patterns in four directions with minimal impact on the antenna performance.

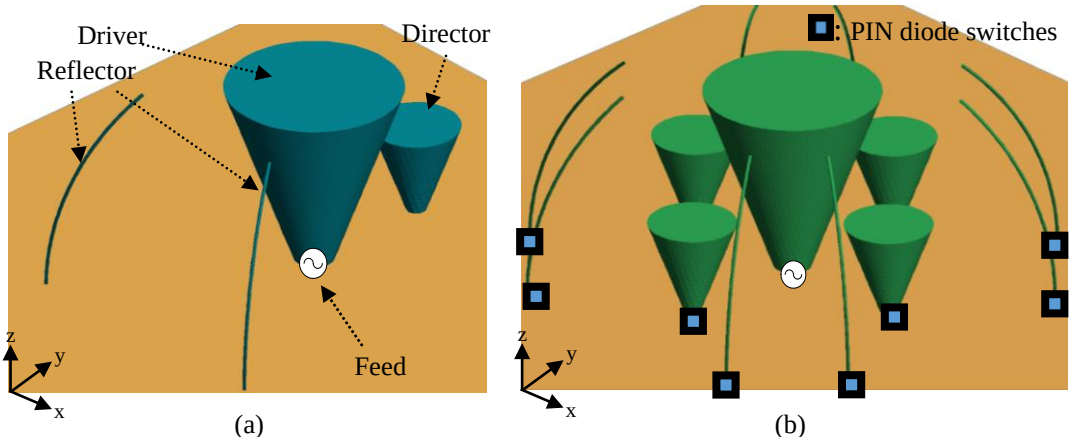

Fig. 1. Configuration of the proposed antenna, (a) Single set, (b) Four sets