

A 77 GHz Rotman lens on a High Resistivity Silicon wafer for Automotive Radars



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A silicon based 77 GHz microstrip Rotman lens [1] has been designed to develop a low cost small form factor MEMS based FMCW automotive radar sensor. The 19.7 mm x 15.6 mm footprint area lens realizes a passive beamforming and beamsteering capability to replace a significant amount of microelectronic circuitry as used in conventional automotive radars to realize the world's

smallest form factor automotive radar. The lens has 3 beam ports, 5 array ports, and 16 dummy ports. The lens has been designed to have a bandwidth of 8 GHz centered at 77 GHz with less than 0.5 degrees maximum beam to array phase error. The lens exhibits excellent insertion loss, return loss, and isolation values. The small size and single mask easy fabrication of the lens paves the way to realize low cost small form factor high performance radar on a chip in future to improve highway safety. The lens has been fabricated in the Western University Nanofabrication Facility and has been tested to be working properly.

Sponsors: Auto21, OCE, CMC Microsystems, Invotronics Inc.

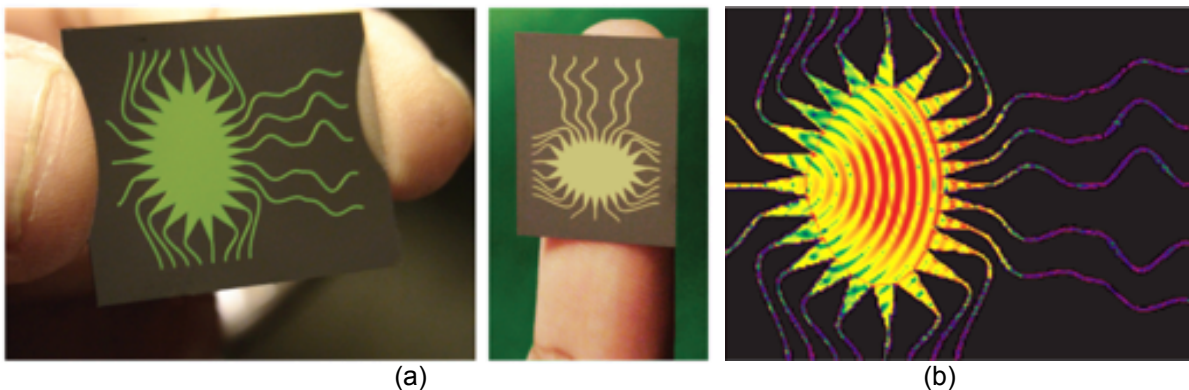


Fig. 1. (a) Rotman lens geometry, (b) Current propagation through the lens.

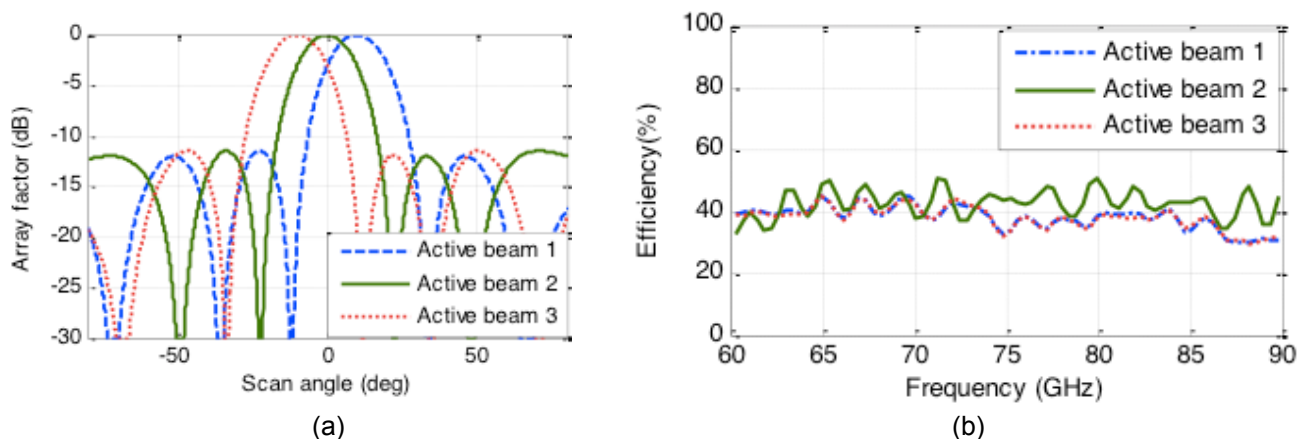


Fig. 2. (a) Array factor and (b) Power efficiency of the proposed Rotman lens for 3 beam ports.