

Design of Liquid Crystal Based Tunable Reflectarray Antenna Using Slot Embedded Patch Element Configurations

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Abstract : This paper presents the design and analysis of Liquid Crystal (LC) based tunable reflect array antenna with different design configurations within X-band frequency range. The effect of LC volume used for unit cell element on frequency tunability and reflection loss performance has been investigated. Moreover different slot embedded patch element configurations have been proposed for LC based tunable reflect array antenna design with enhanced performance. The detailed fabrication and measurement procedure for different LC based unit cells has been presented. The waveguide scattering parameter measured results demonstrated that by using the circular slot embedded patch elements, the frequency tunability and dynamic phase range can be increased from 180 MHz to 200 MHz and 120° to 124° respectively. Furthermore the circular slot embedded patch element can be designed at 10 GHz resonant frequency with a patch volume of 2.71 mm³ as compared to 3.47 mm³ required for rectangular patch without slot.

Keywords : liquid crystal, tunable reflect array, frequency tunability, dynamic phase range

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