Beam scanning leaky wave CRLH-TL antenna by frequency change or at fixed frequency with capacitor placement

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Abstract

Composite right/left-handed transmission line metamaterial leaky wave antenna with ability of space scan by changing frequency and at a fixed frequency with lumped element is designed in this study. Considering the ability to rotate antenna beam by changing the frequency of the leaky wave antenna, the rotation of the desired antenna pattern was evaluated by changing the frequency. The introduced antenna can scan a wide spatial area from [-15]° to [+42]° by changing the frequency in the 2.5 GHz bandwidth (from 9 to 11.5 GHz) without a stop band and with maximum gain of 15 db. In the second part, by placement three Lumped elements (capacitors) in each unit cell of mentioned CRLH-TL leaky wave antenna that has the ability to scan the space in several fixed frequencies (9.6-10-10.4-11 GHz) has been designed. In this case, the antenna can scan from [-5]° to [+12]° at 9.6 GHz and from [-18]° to [-46]° at 11 GHz with an average gain of 11 db. For wider scanning in negative and positive angles, it is suggested to use a double-port switch to feed from both inputs of the CRLH-TL leaky wave antenna to increase the overall space scanning angle.

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