HFSS Investigation of a Microwave Filter Response and Mode Conversion of Corrugated Waveguides

By
Du'a Mohammad Al-Odat
Bachelor of Telecommunication Engineering, Yarmouk University, 2011

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Committee members
Prof. Mohammad Hussein Bataineh (Chairman)
Dr. Asem Shehadeh Al-Zoubi (Member)
Prof. Omar Rafiq Al-Asfar (External Examiner)

Signature

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Abstract

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A waveguide with periodic structure can be used as a microwave filter, a coupler, or a mode converter. Bragg reflection phenomenon is the most important property that results when the wave propagates down a corrugated waveguide leading to the presence of a forbidden gap in the electromagnetic spectrum. Consequently, filtering properties of corrugated waveguides like stop-bands and pass-bands could be identified.

Wave propagation into a rectangular and circular corrugated waveguide is studied and investigated. Sinusoidal and square-wave corrugations are employed to demonstrate the filtering response of such structures. The effect of various parameters on the spectral response is considered. Narrow-band and multiband filter response are demonstrated by changing the corrugation profile of the waveguide. Also, in this thesis circular corrugated waveguide is studied as a mode converter. The parameters that affect transferring the power of a certain mode into another are investigated. Using High Frequency Structure Simulator (HFSS), which is an effective tool used for modeling
electromagnetic structures, the aforementioned properties are verified and examined thoroughly.

Key words: Bragg reflection, Corrugated waveguides, Filtering response, Mode conversion, Multiband filter, Narrow-band filter, Periodic structures.