World Academy of Science, Engineering and Technology
International Journal of Materials and Metallurgical Engineering
Vol:12, No:05, 2018

Shuffled Structure for 4.225 GHz Antireflective Plates: A Proposal Proven by Numerical Simulation

Authors : Shin-Ku Lee, Ming-Tsu Ho

Abstract : A newly proposed antireflective selector with shuffled structure is reported in this paper. The proposed idea is made of two different quarter wavelength (QW) slabs and numerically supported by the one-dimensional simulation results provided by the method of characteristics (MOC) to function as an antireflective selector. These two QW slabs are characterized by dielectric constants $\varepsilon_r A$ and $\varepsilon_r B$, uniformly divided into N and N+1 pieces respectively which are then shuffled to form an antireflective plate with B(AB)N structure such that there is always one $\varepsilon_r A$ piece between two $\varepsilon_r B$ pieces. Another is A(BA)N structure where every $\varepsilon_r B$ piece is sandwiched by two $\varepsilon_r A$ pieces. Both proposed structures are numerically proved to function as QW plates. In order to allow maximum transmission through the proposed structures, the two dielectric constants are chosen to have the relation of $(\varepsilon_r A)^2 = \varepsilon_r B > 1$. The advantages of the proposed structures over the traditional anti-reflection coating techniques are two components with two thicknesses and to shuffle to form new QW structures. The design wavelength used to validate the proposed idea is 71 mm corresponding to a frequency about 4.225 GHz. The computational results are shown in both time and frequency domains revealing that the proposed structures produce minimum reflections around the frequency of interest.

Keywords : method of characteristics, quarter wavelength, anti-reflective plate, propagation of electromagnetic fields
Conference Title : ICAM 2018 : International Conference on Advanced Materials
Conference Location : Singapore, Singapore
Conference Dates : May 03-04, 2018