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A Novel Approach for Optimal Design of Multilayer Wideband Microwave Absorber Using Wind Driven Optimization Technique

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Abstract

In general, cost function for optimal design of multilayer microwave absorbers found in literature had not taken account of normal and oblique incidence (TE & TM polarization) of wave in optimization problem which leads to sub-optimal design limited only for particular incidence of wave, either a normal or oblique incidence of wave at a time. To overcome the above problem, this paper focuses on optimal design of multilayer absorbers through a proposed cost function which can work for both normal and oblique incidence of wave up to wide angle of incidence (0 to 60 degree) with TE & TM polarization simultaneously. The objective of this optimization process is to reduce maximum reflection coefficient of the absorber by selecting suitable layers of materials from the available database in literature and optimize the total thickness to possible minimum level. Five models of four layer multilayer absorbers are proposed using WDO algorithm for different frequency bands (ranging from 2–8, 8–12, 12–18, 2–12 and 2–18GHz). A detailed analysis are done and it shows that the application of WDO yields improved numerical results in terms of thickness and oblique incidence of wave as compared with the earlier reported results.

Index Terms—Multilayer microwave absorber, Metaheuristic algorithms, WDO, Chew's recursive formula, Reflection loss.