ABSTRACT

Research on electromagnetic waves often involves physical experiments that require high costs and considerable time. As an alternative, simulations based on numerical computational methods can be used to overcome these challenges. One of the methods employed is Finite Difference Time Domain (FDTD) with the Yee Grid scheme, which has several advantages compared to other methods. This study implements one-dimensional FDTD to compare the performance of Absorbing Boundary Conditions (ABC) between the Perfectly Matched Layer (PML) and Dirichlet methods in handling boundary condition problems at the edge of the computational domain. Both methods were tested in a vacuum and dielectric medium. Additionally, an analysis was conducted on the optimal PML condition by varying the parameters R_0 *(theoretical flat surface reflection) and* m *(grading order). The results show that PML with a medium thickness of* $d = 20\Delta x$*,* $R_0 = 10^{-5}$*, and* $m = 2$ *results in very low numerical reflection, i.e., 0.004, although slightly larger than Dirichlet, which is 0.00061. However, when both methods were applied in a dielectric medium, the Dirichlet method still exhibited high numerical reflection. On the other hand, the PML method was able to reduce the wave by up to 100 times smaller than the Dirichlet method. The conclusion of this study is that PML performs better than Dirichlet when the medium parameters are varied to the domain's boundaries.*

Keywords : *Electromagnetic waves, finite difference time domain, absorbing boundary condition, perfectly matched layer, Dirichlet, dielectric medium, numerical reflection error.*