The development of novel numerical technique for the analysis of the moving vehicle and moving source

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The numerical technique for the analysis of the electromagnetic field with moving body or a moving source are required for the effective modeling of new optical devices or microwave devices and also mobile communication field. We have previously proposed the Overset Grid Generation method coupled with FDTD method for the analysis of the EM field with moving boundaries considering Doppler Effect. For higher velocity value, Lorentz transformation is applied to the FDTD method. The time components that were changed in Lorentz transformation are fixed by using linear interpolation scheme in the Overset Grid Generation method. This allows a coherent point in time component with the FDTD method, which is an important element of this proposed numerical technique.

In this paper, the accuracy of this technique is verified by using standard deviation and relative error. This proposed Overset Grid Generation method combined with the FDTD method and Lorentz transformation is applied to the analysis of the EM field when the input source is moving towards the moving body. It is also applied at the condition where the two sources are moving towards each other. After verifying the accuracy of this technique, it is applied for the EM field at the inter section when the source and vehicle are moving. The numerical results of the moving case are compared with the stationary case. It can be seen that the amplitude and the phase are shifted by the motion. The unique features of the proposed numerical technique can be value to many practical engineering applications.