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Non-Linear Transmission Line

Yutaka EGAWA*

This article is devoted to a study of the propagation process of electromagnetic waves on non-linear semi-infinite transmission lines.

A signal propagating along a dispersionless transmission line with the distributed non-linear inductors and capacitors is subjected to the deformation, since different parts of the signal have different velocities that depend on the amplitude. This process of the deformation eventually forms an electromagnetic shock wave which has the steep wave-front. We have pointed out the method to decide the discontinuous points in the shock waves by energy conservation law. The wave-front in the shock waves is interpreted physically by the delay-time in flux change of inductors or in charge change of capacitors.

In the non-linear finite transmission lines, we have suggested the condition for non-reflection.

About non-linear semi-infinite transmission lines with dispersion, the influence of attenuation on the deformation of the wave form and the formation of the shock wave-front are analysed. This analysis is carried out by the method based on the fact that losses are small.

The experiments using a lumped non-linear parameter transmission line have been made good coincidence with the theory.

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