# A Source-Model Technique for the Analysis of Transient Electromagnetic Scattering by a Periodic Array of Cylinders

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*Abstract*—The source-model technique is applied to the solution of the problem of electromagnetic scattering by a periodic array of perfectly conducting cylinders illuminated by a transient plane wave. Special attention is given to the non-causality problem arising in the case of oblique incidence. This problem is alleviated by utilizing a transformation specifically tailored to the source-model formulation in a manner that significantly reduces the number of unknown future values that are required at each time step. Using this transformation, together with a band-limited extrapolator, it is possible to obtain a relatively stable solution that provides a satisfactory degree of accuracy for a wide range of incidence angles. To exemplify the use of this technique, we apply it to the case of circular cylinders.

circumvents the non-causality problem was also proposed in [28].

This paper studies the feasibility of using of the source-model technique (SMT) in the context of transient electromagnetic scattering by periodic structures. The SMT has been used extensively in frequency domain solution of scattering by both finite size bodies as well as periodic structures [30]–[35] and was found to be a viable alternative to techniques in which ordinary surface formulations amenable to conventional moment method solutions are used. A discussion of the advantages of the SMT can be found in [31]. Recently, a time domain SMT (TD-SMT) solver for calculating electromagnetic transient scattering by a