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ABSTRACTS

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where
\[
\Phi^\pm(\lambda) = \frac{1}{2} F(\lambda) + \frac{1}{2 \pi i} \int_{-\infty}^{\infty} \frac{F(a)}{a - \lambda} da.
\]  

(7)

Solving in the same way Dirichlet problem for the source \(u_0(x, y, -2a - x', y')\) and the abovementioned Neumann problems we obtain the desired solution for the slot.

References


Waves produced by a traveling line current pulse with high-frequency filling

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Generation of electromagnetic waves produced by current pulses of finite duration with high-frequency filling propagating along a straight segment is investigated.

The filling (modulation) term is represented in the form \(\exp[ik(vt - z)]\). Here \(t\) is the time variable, \(z\) the direction of current pulse propagation, and \(k = \omega/v\), where \(\omega\) is the angular modulation frequency while \(v\) represents the phase velocity, which can be subluminal, luminal, or superluminal \((0 < v < \infty)\).

Solutions are constructed by solving the system of inhomogeneous Maxwell equations in the space-time domain with the help of V.I. Smirnov method of incomplete separation of variables [1], using the electromagnetic field representation via the Whittaker-Bromwich potential [2].

For arbitrary slowly varying envelope of the current pulse, a closed-form quadrature expression is obtained for the magnetic component of the field, which enables the entire field to be reconstructed at long distances from the source. In contrast to the general consideration [1], separation of the modulating factor from the envelope enable one to illustrate and analytically describe the following phenomena:

- Directionality of the emanated waves.
- Transformation of the frequency of the electromagnetic wave carrier with respect to the initial frequency of the source current modulation, which takes place for certain wave regimes and manifests itself as the red or ultraviolet shift for the modulation factors \(\exp[ik(vt - z)]\) and \(\exp[ik(vt + z)]\) correspondingly.
- In certain space-time domains, the waves of two different frequencies, fundamental and shifted, are excited, which leads to formation of beating-type interferential patterns. The structure of these beatings become more and more complicated as the current pulse velocity tends to the velocity of light.

As far as in some intermediate stage the solving scheme reduces the electromagnetic problem to a scalar problem containing the wave equation, results obtained may be readily generalized to the case of scalar waves, the wave process being completely described by the wavefunction in both near and far zones.

References


(http://www.cheniere.org/misc/Whittak/whit1904.pdf)