

# Analytical Expressions for Spatial-Domain Green's Functions in Layered Media

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Abstract— Accurate and efficient formulas for computing spatial-domain Green's functions are presented in this paper. To apply the formulas, we only require a set of sample points of the spectral-domain Green's function (SDGF) on an integration path avoiding its singularities and an infinite domain tail path. Since the sampling is carried out for the integrand excluding the Bessel function, the number of sample points required is much smaller than the numerical integration method. This aspect of the proposed method proves to be very advantageous for evaluating closed-form Green's functions at large source observer distances. It is shown that the proposed formulas provide accurate results for both the near- and far-field regions as well as a wide range of material parameters such as lossless, lossy, left-handed materials as well as multilayered substrates.