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## Comment

# Evanescent waves do contribute to the far field*

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In a series of papers [1], it has been claimed that evanescent waves contribute to the far field of a radiating dipole, i.e. that the amplitude of the sum of the evanescent waves decreases as $1/r$ with increasing distance, $r$, from the dipole. In spite of the fact that three recent papers [2] have demonstrated that these claims are incorrect and that they contradict well-established results relating to the far-zone behaviour of the angular spectrum representation of wavefields [3], the author continues to repeat this claim, most recently in a note with the title 'Evanescent waves do contribute to the far field'. It is the purpose of this note to point out an error in the previous publications [1] which has led to this erroneous conclusion.

In the previous papers [1] the author makes use of the angular spectrum representation of the Green dyadic, which he then evaluates on the $z$ axis. Next he replaces the axial distance $z$ with the radial distance $r$ and claims that the resulting expression is valid throughout the whole field. This claim is false because the $z$ direction plays a preferential role in the angular spectrum representation of the field. More specifically, the representation of the field in terms of propagating and non-propagating (evanescent) waves *requires* the choice of a special direction, in this case the $z$ direction. Therefore the spherical symmetry of the problem is broken when one considers only a subset of the contributing waves, here the evanescent waves. Whilst the results given in [1] are correct along the $z$ axis, they are wrong in all other directions. Xiao's analysis gives incorrect results not just in the far-zone, but indeed throughout the whole spaces except along the $z$ axis; in particular, the propagating and evanescent-wave contributions employed extensively by the author in the near field are incorrect.

*Xiao, M., 1999, *J. mod. Optics*, **46**, 729.

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Although the incorrectness of the claims made in [1] is evident both on simple mathematical and physical grounds, interested readers can find a rigorous derivation of the far field contribution to the electromagnetic Green's tensor from evanescent waves in a recent publication [4] which likewise contradicts the claims that evanescent waves contribute to the farfield.

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**References**

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[4] Shchegrov, A. V., and Carney, P. S., 1999, *J. opt. Soc. Am.* A **16**, 2583.