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Electromagnetic field distributions of perfect and imperfect cloaks TAI HANG FUNG, LAI LAI LEUNG, KIN WAH YU, Chinese University of Hong Kong, Shatin, NT, Hong Kong — In this work, based on the ideal cloaking model proposed by Pendry et al. [1], we calculate, by first-principles approach, the electric field distributions of ideal cloaks (both spherical and cylindrical) subject to different external electric field sources. The results show that the external electric field of an ideal cloak remains unperturbed and the field inside the cloaking region vanishes, thus verifying that Pendry et al.'s model is indeed perfect. We then extend the investigation to imperfect cloaks, whose permittivity tensors can be perturbed due to dispersion or loss, by solving the appropriate boundary-value problems [2]. The resultant electric field distributions can become nonzero inside the cloaking regions as expected. We further evaluate the visibility of the imperfect cloak against the perturbation. We find small visibility under appropriate conditions.
[1] J. B. Pendry, D. Schurig, and D. R. Smith, Science 312, 1780 (2006).
[2] L. Dong, J. P. Huang, K. W. Yu and G. Q. Gu, Eur. Phys. J. B 48, 439 (2005).

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