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**First Principles Derivation of Fading Models from Wave Chaos Theory** JEN-HAO YEH, University of Maryland — Wave chaos is the study of solutions to linear wave equations in situations where the ray dynamics recovered in the classical limit is chaotic. Fading is the observation of variations in signal strength measured at a receiver due to time-dependent variations in the propagation or multi-path scattering and interference. A quantitative statistical theory of wave chaos - random matrix theory (RMT) - can be applied to predict statistical properties of many quantities, such as the scattering matrix, of a wave chaotic system. Here we started from the statistical model of the scattering matrix [1] to establish a general fading model that includes Rayleigh fading and then combine the RMT fading model with our random coupling model that takes account system-specific features [2-4] to build a more general fading model that includes Rician fading. In the high loss limit, our model agrees with the Rayleigh/Rice models, however, it shows deviation in the limit of low loss. We have performed experiments [3,4] to verify the RMT fading model.
[1] http://publish.aps.org/search/field/author/Brouwer_P_W (P. W. Brouwer) and http://publish.aps.org/search/field/author/Beenakker_C_W_J (C. W. J. Beenakker), Phys. Rev. B 55, 4695 (1997). [2] James A. Hart, *et al.*, Phys. Rev. E 80, 041109 (2009). [3] Jen-Hao Yeh, *et al.*, Phys. Rev. E 81, 025201(R) (2010). [4] Jen-Hao Yeh, *et al.*, Phys. Rev. E 82, 041114 (2010).

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