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Boundary Effects in Transmission through Random Media XIAOJUN CHENG, Queens College of CUNY and The Graduate Center of CUNY, New York, CHUSHUN TIAN, Institute for Advanced Study, Tsinghua University, Beijing, AZRIEL GENACK, Queens College of CUNY and The Graduate Center of CUNY, New York — Recent measurements of the transmission matrix in disordered quasi-1D samples found the average of the logarithms of the transmission eigenvalues to be uniformly spaced. This corresponds to a single peak in the distribution of transmission eigenvalues at low values of transmission, which differs from the bimodal distribution with peaks at both high and low values. One of the reasons may be the reflectivity at the boundaries. The photon diffusion model suggests that internal reflection can be treated as extrapolation length and the average transmission behaves the same way as we change the sample length or the extrapolation length at the output, but it does not predict the impact of internal reflection on the distribution of the transmission eigenvalues. We have conducted microwave experiments and first-principles analytic calculations using the supersymmetry method to explore the role of boundary effects upon the transmission eigenchannels. Our results, however, show that the statistics of the transmission eigenchannels can be changed by reflectivity at the boundaries. The universality of the bimodal distribution breaks down in that channels with transmission close to unity are greatly suppressed when the extrapolation length is comparable to the sample length.

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