Universal scattering in photonic impurity problems: dispersion, dissipation and quantized phases YIDAN WANG, JQI, MICHAEL GULLANS, Princeton University , ALEXEY GORSHKOV, JQI, QuICS — Many synthetic quantum systems allow particles to have unusual dispersion relations, besides linear or quadratic. To understand the impact of different dispersion relations on the behavior of scattering, we study particles propagating in a 1D channel scattered by quantum impurities. We show that the scattering matrix approaches different universal limits when the group velocity vanishes at different rates. Also, the existence of generic bound states is decided by an interplay between dissipation of the impurities and dispersion relation. We present how the scattering phase is related to the number of bound states for general dispersion relations, as a generalization of Levinson's theorem beyond quadratic dispersion relation.

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