Bound states and perfect transmission scattering states in $\mathcal{PT}$-symmetric open quantum systems $^1$ SAVANNAH GARMON, University of Tokyo, MARIAGIOVANNA GIANFREDA, Università del Salento, NAOMICHI HATANO, University of Tokyo — We study the point spectrum and transmission scattering spectrum in $\mathcal{PT}$-symmetric open quantum systems containing balanced regions of energy amplification and attenuation, using tight-binding chains with matching sink and source sites as prototype models. For a given system geometry, we write the boundary conditions that permit scattering state and bound state solutions with wave functions that likewise satisfy $\mathcal{PT}$ symmetry; we further demonstrate the $\mathcal{PT}$-symmetric scattering states give rise to perfect transmission through the scattering region. We also discuss bound states in continuum and other spectral effects that may be discovered in $\mathcal{PT}$-symmetric open quantum systems. Finally we discuss the potential for experimental realization of our models in systems containing whispering gallery mode resonators with balanced loss and gain.

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