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## Spectral and scattering properties of quantum walks on homogenous trees of odd degree

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**Abstract:** For unitary operators  $U_0, U$  in Hilbert spaces  $\mathcal{H}_0, \mathcal{H}$  and identification operator  $J : \mathcal{H}_0 \rightarrow \mathcal{H}$ , we present results on the derivation of a Mourre estimate for  $U$  starting from a Mourre estimate for  $U_0$  and on the existence and completeness of the wave operators for the triple  $(U, U_0, J)$ . As an application, we determine spectral and scattering properties of a class of anisotropic quantum walks on homogenous trees of odd degree with evolution operator  $U$ . In particular, we establish a Mourre estimate for  $U$ , obtain a class of locally  $U$ -smooth operators, and prove that the spectrum of  $U$  covers the whole unit circle and is purely absolutely continuous, outside possibly a finite set where  $U$  may have eigenvalues of finite multiplicity. We also show that (at least) three different choices of free evolution operators  $U_0$  are possible for the proof of the existence and completeness of the wave operators.