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Cyclicity in the harmonic Dirichlet space

The harmonic Dirichlet space $\mathcal{D}(\mathbb{T})$ is the Hilbert space of functions $f \in L^2(\mathbb{T})$ such that

$$\|f\|^2_{\mathcal{D}(\mathbb{T})} := \sum_{n\in\mathbb{Z}} (1+|n|)|\hat{f}(n)|^2 < \infty.$$

We give sufficient conditions for f to be cyclic in $\mathcal{D}(\mathbb{T})$, in other words, for $\{\zeta^n f(\zeta) : \ n \geq 0\}$ to span a dense subspace of $\mathcal{D}(\mathbb{T})$. (Joint work with E. Abakumov, O. El-Fallah and K. Kellay.)