

Uncertainty Principles for Fourier Multipliers

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Many questions in time-frequency analysis can be reduced to properties of a sequence of complex exponentials in certain function spaces. Specifically, we consider the integer frequency exponentials in weighted L^2 spaces on the torus, and we show that certain basis properties of the exponentials are equivalent to the weight being a bounded Fourier multiplier between certain ℓ^p spaces. We prove uncertainty principles for these Fourier multipliers, which lead to Balian-Low type theorems for the generators of Gabor systems and shift-invariant spaces.