A SIMPLE OBSERVATION ABOUT COMPACTNESS AND FAST DECAY OF FOURIER COEFFICIENTS

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ABSTRACT. Let X be a Banach space and suppose $Y \subseteq X$ is a Banach space compactly embedded into X, and (a_k) is a weakly null sequence of functionals in X^*. Then there exists a sequence $\{\varepsilon_n\} \searrow 0$ such that $|a_n(y)| \leq \varepsilon_n \|y\|_Y$ for every $n \in \mathbb{N}$ and every $y \in Y$. We prove this result and we use it for the study of fast decay of Fourier coefficients in $L^p(\mathbb{T})$ and frame coefficients in the Hilbert setting.

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