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An equivariant weak expectation property and amenable actions

We introduce an equivariant version of the weak expectation property (WEP) at the level of operator modules over completely contractive Banach algebras. This yields a natural notion of group covariant WEP, related to recent work of Buss–Echterhoff–Willett, but also a dual notion of the $A(G)$ -WEP for operator modules over the Fourier algebra of a locally compact group G . These dual notions are related in the setting of C^* -dynamical systems, where we show that an action $G \curvearrowright X$ of an exact locally compact group is topologically amenable if and only if $C_0(X)$ has the $L^1(G)$ -WEP if and only if the reduced crossed product $C_0(X) \rtimes G$ has the $A(G)$ -WEP. Along the way, we answer a question of Anantharaman-Delaroche and generalize the equivalence between topological amenability and Zimmer amenability of the bidual action to the locally compact setting. This is joint work with Alex Bearden and Mehrdad Kalantar.