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Urysohn metric space and Kirchberg approximation property

The Urysohn universal metric space $\mathbb{U}$ is a remarkable object, which can be described (Vershik) as the completion of the integers equipped with a random (or: generic) metric. In many regards, it is similar to the unit sphere $\mathbb{S}^\infty$ of a separable Hilbert space ℓ^2. There are however some properties long since established for the unit sphere (*e.g.* the distortion property) that remain open for the Urysohn space, and vice versa. We will discuss an example of the latter: Connes' Embedding Conjecture, whose analogue for the Urysohn space has been recently settled.

As a consequence of Kirchberg's work, Connes' Conjecture can be reformulated as follows: every pair of commuting subgroups of the unitary group $U(\ell^2)$ can be approximated with pairs of commuting compact subgroups. In this form, the property (which we call Kirchberg property) makes sense for every topological group admitting a chain of compact subgroups with dense union. Even if such groups are very common among "infinite-dimensional" groups (the infinite symmetric group, the groups of measure and measure class preserving automorphisms, *etc.*), it seems the Kirchberg property has never been verified for *any* concrete example. In a recent joint work with V. V. Uspenskij, we have established the Kirchberg property for the group of isometries of the universal Urysohn metric space $\mathbb{U}$.