Chamseddine, Ali H.; Connes, Alain
Conceptual explanation for the algebra in the noncommutative approach to the standard model. (English) Zbl 1228.81190

Summary: The purpose of this letter is to remove the arbitrariness of the ad hoc choice of the algebra and its representation in the noncommutative approach to the standard model, which was begging for a conceptual explanation. We assume as before that space-time is the product of a four-dimensional manifold by a finite noncommutative space $F$. The spectral action is the pure gravitational action for the product space. To remove the above arbitrariness, we classify the irreducible geometries $F$ consistent with imposing reality and chiral conditions on spinors, to avoid the fermion doubling problem, which amounts to have total dimension 10 (in the $K$-theoretic sense). It gives, almost uniquely, the standard model with all its details, predicting the number of fermions per generation to be 16, their representations and the Higgs breaking mechanism, with very little input.

MSC:
81R60 Noncommutative geometry in quantum theory
58B34 Noncommutative geometry (à la Connes)
81T75 Noncommutative geometry methods in quantum field theory
81V22 Unified quantum theories

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References:

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