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Spectral Triples in Particle Physics

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The classical description of the Standard Model of Particle Physics is rather complicated and it is not so easy to see hidden fundamental structures behind such description. On the other hand we know that theories like the General Relativity can be simply described using geometrical objects. It is a natural question if it is possible to find some purely geometric description of other gauge-like theories, especially the Standard Model. It turns out that it is possible, but instead of classical notion of geometry we need to extend it to the case of so-called Noncommutative Geometries. This generalization, based on the ideas of Gelfand and Naimark, leads to the notion of Connes' spectral triples as basic objects which are used to define the geometry. The main ideas how to apply it to the description of the Standard Model will be presented. Moreover, the problems within this approach and open questions will be formulated. Possible applications to find physical restrictions of minimal extensions of the Standard Model will be presented.

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