

Testing Foundations of QM in High Energy Physics

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In this talk I focus on the fundamental quantum effects that can be explored with a pair of entangled neutral K-mesons produced at the accelerator facility DAPHNE. I present the first conclusive test for this particle-antiparticle system to prove the existence of correlations that are stronger than those predicted by classical physics by deriving a Bell inequality that is conclusive for decaying systems [1].

Then I report on investigations to explore the measurement problem of quantum mechanics with naturally oscillating systems, i.e. whether collapse models can be tested by neutrinos, mesons or chiral molecules [2].

[1] B.C. Hiesmayr et al., EPJ C, Vol. 72, 1856 (2012).

[2] M. Bahrani, S. Donadi, L. Feriardi, A. Bassi, C. Curceanu, A. Di Domenico, and B. C. Hiesmayr, Nature:Scientific Reports 3, 1952 (2013).