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Theoretical and experimental challenges in quantum gravity phenomenology

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The experimental search of non-conventional effects predicted by bottom-up approaches and theoretical models of quantum gravity is a quite recent field of research. Generically, it requires to consider probes of very high-energy and amplification mechanisms, conditions which are fulfilled by the propagation of the cosmic messengers. Advances in multi-messenger astronomy during the last decade has driven progress in the field, but a number of theoretical and experimental challenges still lie ahead. We will review them, making emphasis in two complementary lines of research: the study of time delays and the modification of interactions which appear in quantum-gravity motivated extensions of special relativity.

Primary author: CARMONA, Jose Manuel (Universidad de Zaragoza / CAPA)
Presenter: CARMONA, Jose Manuel (Universidad de Zaragoza / CAPA)
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