Tests of Lorentz Invariance and intrinsic time lags in active galactic nuclei with H.E.S.S./CTA

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Some of the quantum gravity theories, aiming at unifying gravitation with other fundamental forces, predict that the speed of light in vacuum could be energy-dependent. This would translate into a Lorentz invariance violation (LIV), and take the form of a delay between the arrival times of gamma-ray photons emitted with different energies. LIV studies use the light emitted by specific astrophysical sources, namely flaring blazars which are the most energetic objects in the universe, as distant high energy photon sources, observed by Imaging Atmospheric Cherenkov Telescopes.
This project handles two different aspects of time delay studies. On the one hand, it has been shown that there exists intrinsic delays between the time of emission of photons with different energies in blazars. There is hence a need to understand in more details their emission mechanisms in order to be able to predict the delays induced by these sources. On the other hand, despite the previous argument, only one significant delay has been observed so far. A consortium between H.E.S.S. and two other similar experiments, namely MAGIC and VERITAS, has been created in order to better constrain the LIV models by combining multiple observations. Furthermore, this work aims at providing a transition between H.E.S.S. and the future CTA observatory, an array of telescopes more sensitive than the ones used for LIV studies so far.