# Search for Lorentz Invariance Violation effects with PKS 2155-304 flaring period in 2006 by H.E.S.S.

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***Abstract.*** **Highly energetic, variable and distant sources such as Active Galactic Nuclei provide a good opportunity to evaluate effects due to the emission and the propagation of high energy photons. In particular, energy-dependant time-lags could sign a Lorentz Symmetry breaking as predicted in some Quantum Gravity models. It is assumed that the velocity of light could vary linearly with $E/\mathrm{E_P}$, where $E$ is the energy of the photons and $\mathrm{E_P} = 1.22 \times 10^{19}\ \mathrm{GeV}$ is the Planck energy. The goal of time of flight studies is then to compare arrival times of photons with different energies, assuming they are emitted at the same time. For this, two kind of distant and variable sources are commonly used: Gamma-Ray Bursts (GRBs) and Active Galactic Nuclei (AGNs).**

**This poster describes an analysis of a flare of the blazar PKS 2155-304 that was detected by H.E.S.S. in July 2006, in order to look for energy-dependant time-lags. The high flux (10 000 photons recorded in 1.5 hours) and the high variability (rise and fall times of $\sim$200 s) during the flare gave a good opportunity to search for propagation effects. Two methods were used to measure the time-lags between photons in different energy bands: a Cross-Correlation Function (CCF) and a Continuous Wavelet Transform (CWT). A toy Monte-Carlo simulation was developped in addition to calibrate the errors and evaluate systematic uncertainties.**

**The final results on the quantum gravity energy scale were $E_{\mathrm{QG}} > 7.2 \times 10^{17}\ \mathrm{GeV}$ with the CCF and $5.2 \times 10^{17}\ \mathrm{GeV}$ with the CWT. The difference between these results come from the fact that the energy bands were chosen differently for the CCF and the CWT. These results are more constraining than those obtained by other experiments with Mkn 421 and Mkn 501, due to the fact that PKS 2155-304 is almost four times more distant and the statistics are higher by a factor of ten.**

**Further observations of a high number of AGN flares will be necessary to give robust conclusions on possible propagation effects. Present and future experiments such as CTA or AGIS will greatly improve our capabilities in this area.**

***Keywords*: H.E.S.S., Quantum Gravity, Active Galactic Nuclei, Lorentz Invariance Violation**

This proceeding consists only of an extended abstract. For more details, see [1].

## REFERENCES

[1] F. Aharonian *et al.* (HESS Collaboration), *PRL*, 101, 170402 (2008); arXiv:0810.3475.