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Very fast TeV gamma-ray variability from the non-aligned AGN IC 310: Insight into Black Hole Lightnings

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Rapid flux variabilities with time scales of minutes are regularly detected in the very high energy (VHE) gamma-ray emission of blazars during violent flaring periods. Those are generally explained by the classical shock-in-jet acceleration models, assuming a very large Doppler factor, which condenses the intrinsic multi-hours-scale variations into a few minutes for the observer on Earth. This assumption, which requires a large jet Lorentz factor (>10) and very small angle between the jet and the observer (<5 deg), is conceivable for blazars. However, recent observation of rapid variabilities in the VHE gamma-ray flux from the peculiar radio galaxy IC 310 by MAGIC is very challenging for the shock-in-jet model. Indeed the jet viewing angle is estimated to lie between 10 and 20 deg, and the Doppler boost cannot play a dramatic role. The flux doubling-time measured in November 2012 is faster than 5 min and constrains the size of the emission region to be smaller than 20% of the gravitational radius of the central black hole. Here, we will present in detail the MAGIC observations and discuss possible alternative models, such as pulsar-like particle acceleration in the magnetosphere anchored to the plasma surrounding a spinning black hole.

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