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SUPERFAST AGN VARIABILITY

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We compare the energy requirements of different scenarios that allow addressing ultrafast gamma-ray variability recently reported by the MAGIC collaboration from two extragalactic sources, IC 310 and NGC 1275. Currently, the following three models are accepted as a feasible explanation for minute-scale variability: (i) external cloud in the jet, (ii) relativistic blob propagating through the jet material, and (iii) production of high-energy gamma rays in the magnetosphere gaps. Our
analysis shows that the first two scenarios are not constrained by the flare luminosity. On the other hand, there is a robust upper limit on the luminosity of flares generated in the black hole (BH) magnetosphere (MSph). The maximum luminosity of magnetosphere flares depends weakly on the mass of the central BH and is determined by the accretion disk magnetization, viewing angle, and the pair multiplicity. For the most favorable values of these parameters, the luminosity for 5-minute flares are limited by 2*10^43 erg/s, which excludes a BH MSph origin of the flare detected with MAGIC from IC 310, and NGC 1275. In the scopes of scenarios (i) and (ii), the jet power, which is required to explain the flares detected from these sources, exceeds the jet power estimated based on the radio data. To resolve this discrepancy in the framework of the scenario (ii), it is sufficient to assume that the relativistic blobs are not distributed isotropically in the jet reference frame. A realization of scenario (i) demands that the jet power during the flare exceeds by a large factor, 100, the power of the radio jet relevant on a timescale of 10^8 years.

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