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At the center of certain elliptic galaxies, also known as blazars, are super massive black holes that eject jets of ionized material that travel close to the speed of light. Relativistic jets from blazars that have hard spectra in the TeV band are suggested to interact with the proposed extragalactic magnetic fields to produce halo-like extended cascade emission. In this study we analyzed high energy gamma rays based on the data from the Fermi Large Area Telescope (LAT) and attempted to detect the speculated halo-like extended emission around TeV blazars. We extracted and filtered events from the Fermi LAT database and performed maximum likelihood analysis against the null hypothesis that such halos are absent. Although still inconclusive, the results we obtained showed that seven out of ten sources we analyzed exhibit relatively strong patterns that could be interpreted as halo-like extended emission. This interpretation, if verified, would imply the existence of extragalactic magnetic field with a moderate field strength. A further validation of the detection significance of the halos is needed, which, if performed successfully, could establish a preliminary ground for future studies in the origins of extragalactic magnetic field and reveal more information about the very high energy blazars.