

# Interpreting the activity of blazar PKS 0735+178 with particle interactions in the jet

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In December 2021, the Fermi-LAT observed the brightest-ever gamma-ray flare from blazar PKS 0735+178. It was also accompanied by activity in optical, ultraviolet and X-rays. Moreover, the IceCube South Pole Neutrino Observatory and Baikal-GVD, a deep underwater neutrino telescope located in Lake Baikal, have both detected neutrinos that were temporally and spatially coincident with PKS 0735+178. This makes this event the first multi-wavelength flare with associated real-time detections by different neutrino observatories. We explain the observed photon and neutrino fluxes in a multi-messenger context with leptohadronic models where radiation originates from high-energy protons and electrons interacting in the jet. We explore the time-dependent evolution based on the observed multi-wavelength spectra. We develop a new approach to explore the parameter space of the models and find multiple solutions with different physical parameters. We discuss the model results and how they improve our understanding of this blazar as a multi-messenger source.

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