Contribution ID: **33** Type: **Oral report (20min)**

Finding pulsar TeV halos among LHAASO sources

TeV halos, as a new type of Very-High-Energy (VHE) sources recently identified from VHE observations and intensively followed with theoretical studies, are extended gamma-ray emissions around middle-aged pulsars. They are suggested as a common phenomenon associated with middle-aged pulsars, while only several of them have been identified and studied. The full operation of LHAASO WCDA and KM2A and significant detections of Galactic sources turn out to have offered a great opportunity for finding this new type of sources. Here we report our very recent published results that show the identification of three candidate TeV halos among the first LHAASO catalog of gamma-ray sources. Detailed multi-energy-band properties for these three sources and their associated pulsars will be presented. Combining the previously well-studied TeV halo cases with our findings, a possible correlation between VHE luminosities (at 50 TeV) of the TeV halos and spin-down rates of the corresponding pulsars is found. In addition, the energy conversion efficiencies of the pulsars' spin-down energies to their TeV halos appear as a constant, no sign of showing the dependence on the properties of the pulsars such as their ages. On the basis of these study results, we speculate that more candidate TeV halos remain to be found among the LHAASO sources.

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