Contribution ID: **136** Type: **Oral**

A mixed origin of neutrinos from TXS 0506+056

Monday 2 December 2019 17:30 (15 minutes)

The blazar TXS 0506+056 was recently identified as a tentative source of very high energy neutrinos. In 2017, the IceCube Observatory recorded a track-like event initiated by a neutrino with the primary energy E between 200 TeV and 7.5 PeV (90 % CL) accompanied with a bright "flare"across the electromagnetic (EM) spectrum, in particular, in the high energy (HE, E>100 MeV) domain [1]. Additionally, in 2014-2015 the same instrument detected a "cluster"of track-like events from the same source; most of these are compatible with ~100 TeV neutrinos with a ~E^{-2} power-law spectrum [2]. The 2014-2015 neutrino events were not accompanied by a bright EM flare, but the HE gamma-ray spectrum during the "neutrino cluster"episode was probably harder than during the "gamma-ray flare"[3].
Given the different behaviours of neutrino and photon emissions recorded during the above-mentioned two episodes, it is natural and tempting to presume the different emission mechanisms during the "flare"and "cluster"episodes. In the present work, profiting by the recent re-classification of TXS 0506+056 as a flat-spectrum radio quasar (FSRQ) [4] (that probably has a broad line region (BLR), narrow line region (NLR), and a dusty torus), we propose a model where the "flare"is explained by the photohadronic (proton-gamma or nucleus-gamma) mechanism, while the "neutrino cluster"and the associated EM emission are due to hadronuclear (proton-proton or nucleus-nucleus) interactions with subsequent development of EM cascade in the dusty torus/NLR photon field.
We show that such a "mixed"model reasonably well describes the observations. This model predicts an "ankle" in the diffuse neutrino spectrum, where the low-energy neutrinos are predominantly due to the hadronuclear mechanism, while the high-energy neutrinos are mostly of the photohadronic origin. We discuss the signatures in the high energy and very high energy (E>100 GeV) gamma-ray ranges that could be used to test our model.

References

1. IceCube Collaboration et al., Science, 361, eaat1378 (2018)
2. IceCube Collaboration et al., Science, 361, 147 (2018)
3. P. Padovani et al., MNRAS, 480, 192 (2018)
4. P. Padovani et al., MNRAS, 484, L104 (2019)

Authors: DZHATDOEV, Timur; Mr PODLESNYI, Egor (Moscow State University)

Presenters: DZHATDOEV, Timur; Mr PODLESNYI, Egor (Moscow State University)

Session Classification: Parallel

Track Classification: Neutrinos