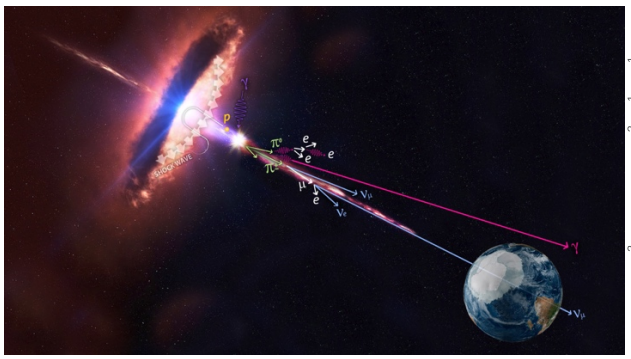
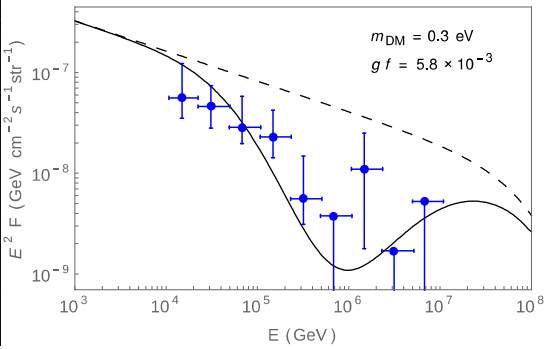
Research Highlights in Physics: Do Neutrinos hold the key to the `Dark' side of our Universe?

Observation of high energy astrophysical neutrinos by the IceCube Neutrino Observatory at Antarctica marks the dawn of neutrino astronomy. These extremely energetic (in TeV - PeV range) extragalactic neutrinos travel a very long distance (100 Mpc – several Gpc) bringing us information from the remote corners of the Universe. The observed flux of these neutrinos shows some striking features, such as an accidental dip, a sharp cut-off, a low-energy excess etc., which are rather puzzling. On the other hand, despite a massive hunt through ground-based experiments and satellites, true nature of the elusive `Dark Matter', though five times more abundant than the visible matter, are still unknown to the mankind. We have pointed out that, the special features of the observed neutrino spectrum at IceCube may be indicative of neutrino absorption in dark matter, which makes IceCube a promising probe to the dark side of our Universe. By extensively solving the neutrino propagation equations we have shown that, sub-eV scalar dark matter particles interacting with neutrinos via a new MeV-mass vector boson can explain all the aforementioned features within a single framework.



Picture courtesy: IceCube Collaboration



Neutrino absorption while passing through dark matter halo

References:

1. Interactions of Astrophysical Neutrinos with Dark Matter: A model building perspective.
   By Sujata Pandey, Siddhartha Karmakar, Subhendu Rakshit.
   arXiv:1810.04203 [hep-ph], JHEP **1901** (2019) 095.
2. Are We Looking at Neutrino Absorption Spectra at IceCube?
   By Siddhartha Karmakar, Sujata Pandey, Subhendu Rakshit.
   arXiv:1810.04192 [hep-ph].