The Missing Sources of Ultra High Energy Neutrinos and a New Idea!

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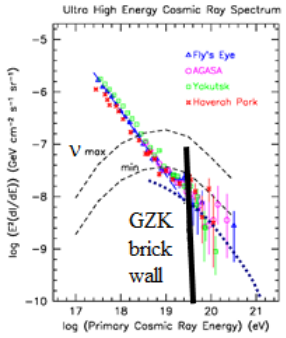
Introduction
GZK neutrinos are a "guaranteed" source

- Ultra-high energy cosmic rays:
  - From where??! And How??
- Standard Model:
  - Ordinary charged particles accelerated by distant sources: AGN, GRBs…
- If so: GZK neutrinos are the signature
  - Probably necessary and sufficient to confirm standard GZK model



AMANDA Search for Neutrino Point Sources

- According to the study of (Erick A.S, 2009), where a search of neutrinos from 85 GRBs in the northern sky using AMANDA II detector. The result was there are no evidence for neutrinos from these GRBs.
- Also, by using the Ice-Cube detector for neutrino search from determined 41 GRBs, but there are no such neutrinos.
- The total events detected by the detector AMANDA II during 3.8 years of searching between 2000 and 2006 were 6595 events (*James R.B, 2009*) and also there are no known extragalactic source for neutrinos.
- After completion of Ice-Cube detector in 2010, they looked in 300 known GRBs and there are no neutrinos again.

Ice-Cube Search for Neutrino Point Sources

- After the first detection of a diffuse flux of high-energy astrophysical neutrinos (*Aartsen et al. 2013*), the most pressing question in the field of neutrino astronomy is the astrophysical origin of the particles.

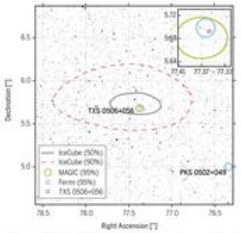
No significant cluster in space or time has been found in untriggered searches of neutrino data yet (*Aartsen et al. 2017a*).

- Multi-wavelength observations are the key to identify neutrino sources through the detection of an electromagnetic counterpart.
- The IceCube Neutrino Observatory at the South Pole has recently reported the detection of a number of high-energy astrophysical neutrinos (*Aartsen et al. 2013; IceCube Collaboration 2013, 2014, 2015a*). These include 82 high-energy starting events collected over six years (*IceCube Collaboration 2017b*), which are inconsistent with a purely atmospheric origin with a significance greater than 6.5 σ.

The origin of the IceCube neutrinos is presently unknown (see, e.g. *Ahlers & Halzen 2015*, and references therein, for a comprehensive discussion).

Ice-Cube Search for Neutrino Point Sources

- Recently, the high-energy 290 TeV neutrino event IceCube-170922A has been associated with a flare in the blazar TXS 0506+056 at 3σ significance (*Aartsen et al. 2018a,b*). But with big uncertainty in position.



- The only other identified extragalactic source of neutrinos is the core-collapse supernova 1987A. Undisputed detection of 20 neutrinos were made by two experiments in the energy range of 7.5 to 40 MeV (*Hirata et al. 1987; Bionta et al. 1987*). With about 3 hours neutrinos earlier than photons.

Theory: The New Idea!

- The new idea focusing on the effect of elementary particles approaching the Planck Length ($l_p = 1.6 \times 10^{-33}$ cm). This effect concerning the time dilation as a quantum gravity probing to Planck scale.

$$\frac{v - c_0}{c_0} = \left[1 - \left(\frac{(\alpha+1)^2 m_0 c_0^2}{E}\right)^2\right]^{\frac{1}{2}} (\alpha+1) - 1 \quad \text{Where} \quad \alpha = \frac{1}{\sqrt{1 - \frac{2l_p}{r+2l_p}}} - 1$$

- This idea can explain many unsolved and mysterious problems in cosmology and astroparticle physics such as: MINOS experiment, Fermilab1979, AMANDA and Ice-Cube results, SN1987A, Gamma Ray Bursts (GRBs) as the neutrinos arrive to earth (detector) before the photons, so we cannot observe the two at the same time. And the time difference could be a years.

Conclusion:

- This idea has implications on black holes and the Big Bang theory:
  - The radius of a black hole will be smaller by a half or between $r_c/[1 - 2]$. And this is the results were founded by **Event Horizon Telescope in early 2019** without an explanation. They said that the size of black hole found to be a half on the picture they processed (This idea can remove the conflicts in results naturally!). (*The Astrophysical Journal, 859:60 (11pp), 2018 May 20; arXiv:1903.02401v2; arXiv:1810.10713v1*).
  - For a very small particle ≈ 10^{-33} eV which have a Planck energy ≈ 10^{28} eV, the speed of this particle will be in the **order of 10^{39} m/s** ! (it is the same inflation speed of space-time in the big bang theory !!!).
  - This particle with mass ≈ 10^{-33} eV suppose to be a selected particle filling the universe as one theory predicts.