Consequences of the Production of Very Massive Magnetically Charged Leptons Early in the Universe and Their Decays to a New Set of Extremely Massive Neutrinos

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We examine the production and decay of extremely heavy magnetically charged leptons, ($\tau_g$ and $\mu_g$), to their own very heavy $\rho_g$ and $\epsilon_g$ plus their own new species of neutrinos, $\nu_g$ and $\bar{\nu}_g$, at some time early in the universe which could be present in space and, attracted gravitationally towards and passing through astronomical objects, annihilated with each other to produce large numbers of photons. Further, we describe the possibility of presently detecting the bursts of such photons, of three different total energies, in the seas or oceans on earth.

This will result in the creation of a new set of magnetic neutrinos much heavier than the neutrinos from ordinary tau and mu decays which we now know to have extremely small masses, not equal to zero. The ordinary (electric origin) neutrinos that have been measured till now are often called “massive neutrinos” and a complete review of their properties can be found in reference [5]. Perhaps, to stress the distinction, they should be called light neutrinos.

We now turn to the interesting properties of the new neutrinos that are involved in the decays of magnetically charged tau’s and mu’s:

1. They do not interact at all with the protons, neutrons and electrons that make up our universe. Only ordinary neutrinos can do so. (This would not be the case in a universe made up of anti-matter.)

2. They have mass so they are attracted to massive bodies like the earth, but they simply pass on through, making no interactions with anything.

3. However, there are occasions when a magnetic neutrino comes within range of a magnetic antineutrino. The result would be a burst of photons with three different energies depending on whether the neutrinos are associated with the different mass magnetic leptons, tau, mu, or e.

4. It is perhaps worth noting that the same Feynman diagram used to describe the annihilation of ordinary neutrinos and their antineutrinos into photons would be used but with a new magnetically charged $W$ as the intermediate state.

The bursts of photons coming from the magnetic origin proposed neutrino annihilations should be examined by astrophysicists since they should have affected the expansion of the universe.

We next examine the possibility of an experiment on earth that might possibly actually measure the photons from the annihilations of magnetic origin neutrinos. Experiments in mines have the property that the neutrinos...
would be attracted into the mine walls and, if they an-
nihilate within, the photons would be absorbed and not
enter the detectors. However experiments in seas and
oceans would not have this problem. In particular there
is the experiment called NESTOR that has its labora-
tory on the shores of the Ionian Sea at Pylos. Having a
large number of layers of detectors in large rings that go
miles deep into the Sea, and not surrounded by walls, it
would be a place to search for the photon bursts since it
is designed, among other things, to detect photons [6].

Searches for monopoles and massive exotic particles
have been of great interest and the reader might want
to browse the reports of various collaborations: The
MACRO collaboration, “Search for GUT Monopoles and
massive Exotic Particles”; Antares Collaboration, “Neu-
trino Telescopes as Magnetic Monopole Detectors”; Inst.
For Nuclear Research of RAS, Moscow, “Detection of
Relativistic Magnetic Monopoles”.

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[1] J. Thomson, *Elements of Mathematical Theory of Electric-
ity and Magnetism* (Cambridge University Press, 1904).
[2] P. Dirac, Proc. R. Soc. A. 133, 60 (1931).
[3] S. Frankel, Am. J. Phys. 44, 683 (1976).
[4] CDF Collaboration, Phys. Rev. Lett. 96, 201801 (2006).
[5] S. Habib, Los Alamos Science 25, 180 (1997).
[6] Leonidas Resvanis is Professor of Physics at the Univer-
sity of Athens and director of the NESTOR Institute for
Astroparticle Physics of the National Athens Observatory.