A POSSIBLE CANDIDATE FOR DARK MATTER

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Abstract. On the basis of a new quantum field theory without divergence presented by us we identify W-matter with dark matter and guess that the two new stars RXJ1865 and 3C58 and quasi-stellar objects are the compounds of a F-celestial body with a W-celestial body with massive enough mass, and some earthquakes, some tsunamis and some disasters in some areas like Bermuda are caused by W-objects.

1. Introduction

According to present understanding, more than ninety per cent of cosmic matter is dark matter, dark matter has only gravitational effects and can hardly be detected unless by gravitation. Many suppositions for dark matter have presented. Some theories consider that the so-called dark matter may possibly be composed of yet undetected particles. A common character of the suppositions is that dark matter are not absolutely dark, i.e., it can be detected by some way besides gravitation in essence.

In contrast with the suppositions, on the basis a new quantum field theory without divergence we identify dark matter with the W-particles which cannot be detected except gravitation. By the new quantum field theory we have obtained possible answers to the following problems[1].

1. The issue of the cosmological constant.
2. The problem of divergence of Feynman integrals with loop diagrams.
3. The problem of the origin of asymmetry in the electroweak unified theory.

The Lagrangian density of the quantum field theory without divergence is

\[ \mathcal{L} = \mathcal{L}_F + \mathcal{L}_W, \]

\( \mathcal{L}_F \) describes the F-particles which are correspondent to the particles in the conventional quantum field theory, \( \mathcal{L}_W \) describes the W-particles which are new particles. \( \mathcal{L}_F \) and \( \mathcal{L}_W \) are symmetric. Thus the F-particles and the W-particles are fully symmetric. \( \mathcal{L}_F \) and \( \mathcal{L}_W \) are independent of each other before quantization unless the gravitation or repulsion is considered. After quantization \( \mathcal{L}_F \) and \( \mathcal{L}_W \) are dependent on each other. Thus, there is no interaction between the W-particles and the F-particles by quantizable fields, only the gravitation or repulsion may possibly be the interaction between the W-particles and the F-particles, and a real F-particle cannot transform into a real W-particle unless by a gravitation field or a repulsion field, and vice versa (but the two sorts of virtual particles can transform from one into another). The W-particles form the W-world, and the F-particles form the F-world. Thus we existing in the F-world cannot detect the W-particles by

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another methods except gravitation or repulsion in essence. Both energies of the
W-particles and energies of the F-particles are positive. In present paper we discuss
only this possibility that there is gravitation between W-particles and F-particles.

In the second section the conjecture that W-matter is identified with dark matter
is presented. In the third section the properties and predictable astronomical
observation of the sort of dark matter are discussed. Section four is conclusion.

2. W-MATTER IS IDENTIFIED WITH DARK MATTER

Because there are the two sorts of particles corresponding to $\mathcal{L}_W$ and
$\mathcal{L}_F$ according to the new quantum field theory\cite{1}, the energy-momentum tensor
$\mathcal{T}_{\mu\nu}$ should be written as

$$\mathcal{T}_{\mu\nu} = \mathcal{T}_{F \mu\nu} + \mathcal{T}_{W \mu\nu}. \tag{1}$$

Correspondingly, the Einstein’s equation should also be written as

$$R_{\mu\nu} - \frac{1}{2} g_{\mu\nu} R + \lambda g_{\mu\nu} = -8\pi G (\mathcal{T}_{F \mu\nu} + \mathcal{T}_{W \mu\nu}). \tag{2}$$

Because there is no other interaction between the F-particles and the W-particles
except the gravitation, we existing in F-world cannot detect the W-particles by
other methods except the gravitation. Thus, if W-particles exist, they must be the
dark matter for the F-world. Because the F-world and the W-world are symmetric,
it is possible that the W-matter is 50 per cent of all matter in the cosmos. Other
components of dark matter for the F-world may possibly be other undetected F-
matter.

In Ref.\cite{1} we obtain naturally a new $SU(2) \times U(1)$ electroweak unified model
whose $\mathcal{L} = \mathcal{L}_F + \mathcal{L}_W$, here $\mathcal{L}$ is left-right symmetric and $\mathcal{L}_W$ and
$\mathcal{L}_F$ are both left-right asymmetric. Thus the world is left-right symmetric in principle, but the part
observed by us is asymmetric because $\mathcal{L}_F$ is asymmetric. This model does not
contain any unknown particle with a massive mass. The world in which we exist,
i.e., the F-world, is left-hand world, then the W-world is the right-hand world.
Thus the right-hand world is the dark matter world for the left-hand world, and
vice versa.

3. THE PROPERTIES AND PREDICTABLE ASTRONOMICAL OBSERVATION OF THE
SORT OF DARK MATTER.

Because F-particles and W-particles are symmetric, we may suppose that in some
phase after large explosion of the cosmos, the W-elementary particles and the F-
elementary particles, e.g. the W-leptons and W-quarks and the F-leptons and F-
quarks, are equal in quantity and mix uniformly. When the F-elementary particles
go together, they can form F-nucleons, F-atoms, F-molecules, F-matter, F-celestial
bodies and the F-world by the strong interaction and electroweak interaction. Identically, when the W-elementary particles go together, they can form W-nucleons,
W-atoms, W-molecules, W-matter, W-celestial bodies and the W-world. But when
W-elementary particles and F-elementary particles go together, they cannot form
any new particles, since there is no interaction except the gravitation between them.
Thus, we see that the dark matter for the F-world, i.e., the W-matter, has the fol-
lowing properties:

1. Dark matter and matter are no longer uniformly mixing.
2. Dark matter can also form a dumpling as matter does.
3. Dark matter is absolutely dark, and cannot be detected except by its gravitation effects.

4. Dark matter or a W-celestial body is transparent for any F-particle, e.g., a F-photon or a F-electron, can pass through a W-celestial body without any resistance. Of course, because of gravitation effects, when F-photons go towards a W-celestial body, they will have a movement to violet. When F-photons go away from a W-celestial body, they will have a movement to red. When F-particles, e.g. F-photons, go by a W-celestial body, their orbits will be winding, i.e., the W-celestial body has lens effect for the F-particles.

5. Because there is no force offsetting the gravitation between a F-celestial body and a W-celestial body, a F-body can easily go into the interior of a W-body, and vice versa, and a W-celestial body is a gravitation potential well for a F-particle or a F-body. Thus, in contrast with impact of two F-celestial bodies, when a F-celestial body impacts a W-celestial body (dark matter), the F-celestial body and the W-celestial body will pass through each other without any friction or dissipative force. Of course, because of the powerful gravitation of the W-celestial body, some phenomena analogous to earthquake will occur for the F-celestial body. For example, when a W-celestial body with a very large mass passes through the earth, the entrance of the W-celestial body will form a sea and the exit will form land or a high mountain because of powerful gravitation effects. When the velocity of a F-celestial body relative to a W-celestial body is not large, the F-celestial body and the W-celestial body will form a vibration system because of the gravitation between them. Obviously, a F-celestial body can also rotate around a W-celestial body.

From this We guess it is possible that the reason for drift of the land on the earth is effect of impact of a W-celestial body with a massive mass to the earth, and the North Pole and the South Pole are respectively the entrance and the exit of the W-celestial body.

When a W-celestial body with a small mass impacts the earth, it will cause some earthquakes or tsunamis. The characters of such events are as follows.

A. Gravitation in some areas will be abnormal for a time.
B. All such events will be abrupt since we cannot detect motion of a W-object.
C. All such events will be accompanied by gathering of seawater and atmosphere and charges caused by friction, consequently powerful windstorm, thunder and lightning, abnormal magnetic field will appear.

From this we guess that some earthquakes, some tsunamis and some disasters in areas like Bermuda, are caused by some W-celestial bodies.

6. A F-celestial body can coincide with a W-celestial body when their relative velocity is equal to zero (It is easily proven that according to quantum mechanics in this case the gravitation potential energy is not infinite). We call such a celestial body a W-F-celestial body or a W-F-star. The characters of a W-F-celestial body are as follows.

A. Because the gravitation mass of a W-F-celestial body is a sum of the W-celestial body and the F-celestial body contained in it and the W-celestial body is absolutely dark, the mass density of a W-F-celestial body will be very large, hence the photons radiated by them will have larger movement to red.
B. Their temperature is not higher since the mass and density of the F-celestial body contained in it are not still very large.
It is possible that two new stars $RXJ1865$ and $3C58$ have been found. The radius and temperature of $RXJ1865$ are respectively $11.3km$ and $7 \times 10^5 ^\circ C$, and the density and temperature of $3C58$ are respectively 5 times of a neutron-star and $1 \times 10^8 ^\circ C$. We guess that the new stars $RXJ1865$ and $3C58$ are such two W-F-stars, and are not so-called quark-stars. The density and temperature of a W-F-star may is arbitrary since a W-F-star can be composed of a F-celestial body and a W-celestial body with an arbitearly large mass. But the density and temperature of a quark-star should be determinate, and no proof show how much the density and temperature of a quark-star are respectively. Hence $RXJ1865$ and $3C58$ may possibly be the two W-F-stars. In fact, if the gravitation mass of a celestial body is abnormally large, the celestial body is possibly a W-F-celestial body.

Quasi-stellar objects have very large movement to red and radiate very powerful energy. We guess that quasi-stellar objects are possibly the W-F-stars. Thus it is possible that their very large movement to red originates from the very powerful gravitation of the W-celestial body contained in quasi-stellar objects, the distances from the earth to quasi-stellar objects are not very long, and the energy emmitted by a quasi-stellar object is not very powerful.

We will discuss the problems in detail in the following paper.

4. Conclusions

On the basis of a new quantum field theory without divergence, we identify W-matter with dark matter and guess that the two new stars $RXJ1865$ and $3C58$ and quasi-stellar objects are the compounds of a F-celestial body with a W-celestial body with massive enough mass, and some earthquakes, some tsunamis and some disasters in some areas like Bermuda are caused by W-objects.

References

[1] Shi-Hao Chen, Quantum Field Theory Without Divergence, hep-th/0203220.