Unmatter Plasma Discovered

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Abstract.

Unmmatter Plasma is a novel form of plasma, exclusively made of matter and its antimatter counterpart. It was first generated in the 2015 experiment [1, 2] based on the 2004 considerations [3].
Unmatter is formed by combinations of matter and antimatter that bound together, or by long-range mixture of matter and antimatter forming a weakly-coupled phase.
The electron-positron beam plasma was generated in the laboratory in the beginning of 2015. This experimental fact shows that unmatter, a new form of matter that is formed by matter and antimatter bind together (mathematically predicted a decade ago) really exists. That is the electron-positron plasma experiment of 2015 is the experimentum crucis verifying the mathematically predicted unmatter.

1. Introduction.

There are four fundamental states of matter: solid, liquid, gas, and plasma.

Plasma consists of positive ions and free electrons (negative particles), typically at low pressures, and it is overall almost neutral. Plasma is an ionized gas (as in fluorescent neon, in lightning, in stars, in nuclear reactors).

An ion is a positive or negative charged particle. A positive ion is called cation, while a negative ion is called anion. If the ion is an atom, then it may contain less electrons than needed for being neutrally charged (hence one has a cation), or more electrons than needed for being neutrally charged (hence one has an anion). Similarly if the ion is a molecule or a group (of atoms or molecules).

The process of forming ions is called ionization. The degree of ionization depends on the proportion of atoms that have lost or gained electrons. By applying a strong electromagnetic field to a gas, or by heating a gas, one obtains plasma.

2. Definition of Unmatter.

Unmatter [4-6] is formed by combinations of matter and antimatter that bind together, or by long-range mixture of matter and antimatter forming a weakly-coupled phase.
Binding and bound state means that the interaction is sufficiently strong to tie together the particles of a system, therefore hindering them from becoming free. For example, a usual liquid is a bound state of molecules, while a gas is an un-bounded where the molecules can move freely in successive collisions.

Weakly-coupled means that the interaction is too week to form a bound state, but it is not that week to let the particles be free. For example, the liquid molecules closer to the surface are weakly coupled and they can evaporate.

Long-range means that the interaction (either week or strong) between particles extends in space on long lengths. For example, the superconductive state in metals is based on pairs of electrons whose interactions are long-range, i.e. it is not confined into a limited spatial region.

Mixture means a collective state of particles: a combination of non-miscible particles for example.
Phase corresponds to the notion of phase of the matter.
For example, the electron-positron pair is a type of unmatter. We coined the word "unmatter" that means neither matter nor antimatter, but something in between.
Besides matter and antimatter there may exist unmatter (as a new form of matter) in accordance with the neutrosophy theory that between an entity and its opposite there exist intermediate entities.

3. Definition of Unmatter Plasma.

Unmmatter Plasma is a novel form of plasma, exclusively made of matter and its antimatter counterpart.

The 2015 experiment [1, 2] on matter-antimatter plasma (or unmatter plasma, in terms of the neutrosophic logic and statistics) was recently successful at the Astra Gemini laser facility at the Rutherford Appleton Laboratory, Oxford, United Kingdom.
The 2015 experiment has produced electron-positron plasma. The positron is the antimatter of the electron, having an opposite charge of the electron, but the other properties are the same.

4. The Neutrosophic Triplets.

The neutrosophic triplets also reflect the matter, unmatter, and antimatter. They are defined as follows [7]:

Let N be a set together with a binary operation $*$. Then N is called a neutrosophic triplet set if for any $a \in N$, there exist a neutral of "a" called $neut(a)$, different from the classical algebraic unitary element, and an opposite of "a" called $anti(a)$, with $neut(a)$ and $anti(a)$ belonging to N, such that:

$$a * neut(a) = neut(a) * a = a,$$

and

$$a * anti(a) = anti(a) * a = neut(a).$$

The elements a, $neut(a)$ and $anti(a)$ are collectively called as neutrosophic triplet and we

denote it by $(a, neut(a), anti(a))$. By $neut(a)$, we means *neutral* of a and apparently, a is just the first coordinate of a neutrosophic triplet and not a neutrosophic triplet.

For the same element *"a"* in *N*, there may be more neutrals to it *neut(a)* and more opposites of it *anti(a).*

5. Verifications of Unmatter.

"The meson is a clear example of "Unmatter" whose configuration includes a pair quark-antiquark. "Unmatter" is mostly expected to emerge in exotic states outside the boundaries of the Standard Model for particle physics (for example in the Dark Matter sector) and in the regime of high-energy astrophysical objects" [8].

6. Verification of Unmatter Plasma.

"It is definitely a jet of unmatter, because a plasma consisting of the electrons and the positrons is neither matter nor antimatter in the same time. This experiment is the truly verification of unmatter as the theoretical achievements of fuzzy logics and statistics. This experiment is a milestone of both experimental physics and pure mathematics" [9].

References

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