Fusion Reactors – a dream that can never come true

Jose P Koshy
josepkoshy@gmail.com

Abstract:

Nuclear fusion is primarily a process of 'system becoming dense', rather than 'fusion of two nuclei'. It is spontaneous in stars, which are light and are moving at high speeds. Earth is dense and moves at a comparatively slow speed. So on Earth, nuclear fusion is non-spontaneous – the energy input required to maintain the reaction will be greater than energy released. So it is practically impossible to produce energy from nuclear fusion reactions.

Key words: Nuclear fusion, non-metric expansion, spontaneous changes, fusion reactors

1. Introduction:

Nuclear fusion has been known to us for more than eighty years, but efforts to create fusion reactors even on experimental basis have been futile till this day. The problem is regarded as merely technical, and it is expected that one day we will be able to tackle it. So this area of research is attracting many, and much money flows into it.

The logic behind the assumed feasibility of fusion reactors is simple: fusion reaction is exothermic and happens spontaneously in stars, and it has been possible to carry out uncontrolled nuclear fusion; so producing energy from fusion reactions is just a matter of arriving at the right technology. But, before arriving at such a conclusion, two crucial questions have to be answered: What exactly is the process of nuclear fusion? Is fusion spontaneous on Earth?

We are familiar with the present-day interpretations of nuclear fusion and spontaneity. However, these interpretations are model-dependent, and will be discarded if we arrive at a better model. Here I argue that alternate and equally-logical interpretations are possible in these cases, and so the problem with nuclear fusion reactors is theoretical not technical.

2. Nuclear fusion – an alternate interpretation:

Imagine a completely isolated star containing highly energetic hydrogen and helium atoms, and moving at a very high speed. Because of the high internal energy, the atoms in it tend to escape, but the force towards its center confines these. If these two remain balanced, the star remains in a state of equilibrium, a plasma state having a certain temperature. If this equilibrium is disturbed by transferring internal energy to speed, the force towards the center overwhelms, causing fusion of hydrogen atoms. Helium is denser and requires less energy to remain at that temperature. The excess energy goes to increase the speed further, and thereby the process continues, the star remaining at the same temperature. Similarly, if the speed of the star is decreased, the energy goes to increase the kinetic energy of atoms, and consequently the reverse process, helium splitting into hydrogen, takes place. Thus nuclear fusion is a process of 'a system of atoms becoming dense', and is reversible.

The present view is that if hydrogen atoms are brought close enough, fusion happens spontaneously due to the strong interaction between the nuclei. But based on the alternate view, bringing atoms close is not enough, atoms have to be forced to collide and fuse together. The so-called *strong nuclear-force*[1] is actually gravity, and its influence is confined within the nucleus and not felt outside. The left-over nuclear force manifests as (strong) gravity between atoms, and still leftover manifests as *weak gravity* [2] towards the center of large-scale structures. In stars, it is this force towards the center that coerces the atoms to fuse together. The strength of this force *depends on the speed* [3] of the star.

During fusion, hydrogen nuclei release internal energy. As it is a forced reaction, the minimum effort required to maintain the reaction will be equivalent to the energy released. How-much energy is released? Based on Einstein's equation, energy released, $E = mc^2$. If radiations are actually particles having kinetic energy, a possibility that has been explained in a *previous paper* [4], the energy released is just half, only $mc^2/2$. Thus there is the possibility that serious errors exist in the assessment of both the energy required to maintain the reaction and energy released during reaction.

3. **Non-metric expansion of universe:**

The ΛCDM model visualizes metric-expansion of universe. But an equally logical non-metric model based on actual motion of galaxy-clusters is possible. The galaxy-clusters actually move at very high speeds, about one-third the speed of light (refer chart below).

A galaxy-cluster is a multi-level system (satellite, planet, star, galaxy and cluster) with an average increase in orbiting speed of about 20 to 25 times for each level.

For example, Earth moves nearly 30 times faster than moon, and Sun moves nearly 17 times faster than Jupiter, the central planet (orbiting speed of sun – 220Km/s).

So the orbiting speed of our galaxy will be 20 to 25 times that of sun, and the speed of our cluster again that much higher. This gives the speed of the cluster as about one-third the speed of light.

The next-level entity has to move much faster than light, and so does not exist; so galaxy-clusters are the individual units of the universe.

Chart-1: Galaxy-clusters as individual units of the universe

Then what should be the average energy of a cluster? Since 'c' is the speed limit, we can assume that the average energy of a cluster is $mc^2/2$ and that most of this energy remains inside that a cluster never attains the speed 'c'. Then, at what ratio the energy remains divided as speed and internal energy? The only force existing between large-scale structures is gravity, and gravity alone cannot keep the speed- IE ratio static. So the only possibility is that the ratio will be changing from one extreme to the other, and at any given time, the ratio will be the same for all clusters.

When speed increases, the clusters move outwards causing expansion. Once it reaches the limit, speed starts decreasing and the clusters move inwards. A mathematically viable *pulsating model* [5] can be obtained, if we take that the clusters follow helical paths to move outwards and inwards, instead of orbiting around a common center. In this model, the universe exists for ever as a pulsating system of galaxy-clusters, and expansion is due to actual motion of galaxy-clusters, a consequence of internal energy changing into speed.

The speed of the cluster increases drawing energy from inside. The increased speed increases the force towards its center, and so the galaxies require more kinetic energy to counter it, and this is drawn from inside the galaxy, and thus the process of internal energy changing into speed spreads to lower levels. Thus in the expanding universe, the stars are subjected to a force that tries to increase their speeds, and this decides the direction of nuclear reaction in them.

4. **Spontaneous changes in the expanding universe:**
   A spontaneous change happens automatically in the given environment. The environment inside the universe depends on whether it is expanding or contracting. A process spontaneous in the expanding phase need not be spontaneous in the contracting phase. Similarly, the environment in each celestial body (planet, star, black-hole, etc.) depends on the energy possessed and elements present. That is, even in the expanding phase, a process spontaneous in one celestial body need not be spontaneous in another.

   If, as described earlier, the expansion is due to internal energy changing into speed, then at present, decrease in internal energy will be spontaneous and increase, non-spontaneous. Taking nuclear binding energy as internal energy, fusion of light nuclei and fission of dense nuclei should then be spontaneous, because the middle elements have the least binding energy. However, the universe is not a homogeneous soup of atoms; it contains bodies which are lumps of atoms. So spontaneity of nuclear fusion depends on the nature of such lumps, such as its speed, internal energy and elements present.

   Speed and internal energy depends on energy possessed, and thus energy possessed have a crucial role in deciding the spontaneity of nuclear reaction. A celestial body having low energy cannot acquire the high temperature and high speed required for nuclear fusion. So fusion reactions are non-spontaneous in such bodies; but fission will be spontaneous, because at low speeds, the force toward the center will not be enough to provide stability to the very-dense nuclei. Similarly, a celestial body having high energy can acquire the required temperature and speed for nuclear fusion, making nuclear fusion spontaneous, but fission will be non-spontaneous in it.

5. **Fusion reactions in stars:**
   Stars contain light elements, have high internal energy and move at high speeds. The high speed provides enough compression for the highly energized atoms to collide, and so fusion reactions happen spontaneously in stars. It is the expansion (and the consequent transfer of internal energy as speed) that kindles and controls the fusion reactions in stars. As explained, fusion reaction is a process of increasing density, and so the fusion reactions become non-spontaneous in stars once it attains the critical density.

   If the star was very light in the beginning, then it would have been a cloud of hydrogen moving at a slow speed that it is not compressed, and the temperature is very low. As its speed increases, it gets compressed and heated, and fusion reaction is kindled making it a star. The reaction continues until the hydrogen fuel is almost exhausted. Further increase in speed heats up helium, and the next-stage fusion is kindled. The products now formed are dense and non-compressible, and require much less energy to remain at the critical temperature. So the excess energy is very high to get adjusted in the speed of the star, and so it explodes, a supernova explosion.

If the star has a significant amount of dense core, the first stage nuclear fusion proceeds as described, but before attaining the critical temperature for the second-stage fusion, it crosses the critical density, and so the second-stage fusion does not happen. It will remain as a white dwarf or a nova, depending on the size of the core. A slightly larger core allows the first-stage nuclear fusion, but it soon crosses the critical density, and the fusion reaction stops even before the hydrogen fuel is exhausted. These will appear as red giants. If it has a sufficiently large dense core, it will be very hot and above the critical density at the beginning itself that fusion reaction is not kindled in it.

Once the star attains the critical density, fusion reactions are no more kindled in it. Further increase in speed cools it, eventually leading to a cold-state, a state similar but symmetrically opposite to that of a hot-state – like positive and negative charges in the case of particles – that instead of emitting thermal radiations, it absorbs all thermal radiations, making it literally black; or it becomes a *black hole* [6].

6. **Nuclear reactions on earth:**

Earth resembles burnt-out stars which have crossed the critical density. It has a dense core of iron. Compared to hydrogen, only less energy is required to heat up iron to high temperatures. Thus internal energy of Earth is low. Its speed is also low. That is, fusion reactions are non-spontaneous on Earth. At the same time, the low speed and low internal energy of Earth do not provide stability to very-dense nuclei, making nuclear fission of these spontaneous.

7. **Energy production and fusion reactors:**

Energy releasing reactions can be either spontaneous or non-spontaneous. In the former, the energy input required to maintain the reaction will be less, and in the latter, greater, than the energy released. In cases where the input energy is natural, as in the case of solar cells, we can use non-spontaneous reactions for tapping the available energy. However, if the input energy is contributed by us, we have to depend on spontaneous reactions for energy production. Nuclear fusion reactions, as explained, are non-spontaneous on Earth and in fusion reactors, we have to provide the required energy to maintain the reaction; so it can be concluded that energy production based on nuclear fusion reactions is impossible.

The present fusion-power expectations are based on two assumptions: (i). Bringing atoms close enough will result in fusion (ii). Energy released is mc^2. The ITER, the world's *largest experimental fusion-device* [7] to be commissioned, is being designed to produce 500 Megawatts of power with an input of 50 Megawatts. They expect that sufficient number of atoms can be brought close enough for fusion that the energy released is 10 times the in-put. But based on the alternate interpretations, the atoms have to collide, if fusion is to happen. Out of the expected number of atoms that come close enough, how many will lead to collision? If it is one-fifth, then energy released will be only one-fifth, and if the energy released is calculated using $E=mc^2/2$, then the actual amount of energy released will be only one-tenth, that is equal to the input. This is the maximum out-put that can be expected from a non-spontaneous process; that is, if the proposed ITER device is 100% efficient, the output will be just equal to the input, there will be no net energy produced.

8. Conclusion:

Based on alternate interpretations, it has been concluded in this paper that fusion reactions are non-spontaneous on Earth, and so the energy in-put required to maintain the reaction will be greater than the energy released. So contrary to the existing belief, it is impossible to produce energy from nuclear fusion reactions; fusion reactors will remain a dream that can never come true.

The alternate interpretations (based on which the above conclusion was arrived at) do not go against any observational evidences; this can be verified from my previous papers. So there is a strong possibility that the above conclusion is right. As fusion-research involves much money and manpower, it would be justifiable to be more cautious, and so it would be wise to make sure that the present interpretations are fool-proof, by disproving alternate interpretations as and when those arise.

Reference:

[1]. Jose P Koshy, *Unification of Forces: a Complete Model with Theoretical Proof,* http://vixra.org/abs/1402.0103

[2]. Jose P Koshy, *Theoretical Deduction of Universal Gravitational Constant,* http://vixra.org/abs/1510.0155

[3]. Jose P Koshy, *The Inherent Relation Between Motion and Force (Motion Creates the Forces of Nature),* http://vixra.org/abs/1312.0176

[4]. Jose P Koshy, N*ewton was right: Light is particles,* http://vixra.org/abs/1505.0042

[5]. Jose P Koshy, *Synchronized-motion of Galaxy-clusters – a Pulsating model of Universe,* http://vixra.org/abs/1602.0069

[6]. Jose P Koshy, *Black holes have 'Cold Energy'* http://vixra.org/abs/1312.0092

[7]. ITER – the way to new energy https://www.iter.org/