Pilot Model for Fusion Power Ignition by Federating Acceleration Method

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Abstract

Background: Amongst many suggestions toward fusion power ignition, particle acceleration related model has an advantage of reaching high temperature performance.

Objective: Suggesting a plasma enclosure model by applying particle acceleration could be tried.

Method: By given equation from unification of energy, application of heat and work transformation gives model to ignition of fusion power by accelerating fusion fuel.

Conclusion: By accelerating multiple inputs of fuel for fusion in an initiation of fusion power, higher temperature that meets requirement for nuclear fusion could be established.
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Index Terms—Fusion reactors, Particle beams

I. INTRODUCTION

REACHING high level of temperature is essential in igniting fusion power. And speaking of particle accelerator, LHC (Large Hardron Collider) has reached $5.5 \times 10^{12}$°C [1]. By federating these two methods, new model for fusion power ignition could be suggested.

Fig. 1. Fuel Accelerator Tokamak Phase 1 - Accelerating fusion fuel by part to the transformation target level between heat and work energy

Fig. 2. Fuel Accelerator Tokamak Phase 2 - Accelerated fusion fuel injected to the plasma enclosure body - for in this paper, Tokamak type

Fig. 3. Fuel Accelerator Tokamak Phase 3 - Accelerated fuel affects inner plasma enclosure body and circulations are federated to the ignition of plasma
II. PARTICLE ACCELERATOR AS AN FUEL ACCELERATOR

Previously, particle accelerator based nuclear fusion power has been tried [2]. Basically, it’s federation of both Tokamak and ICF.

- Phase 1 - Fuel acceleration causes fuel particle to acceleration in work force (strong and weak energy)
- Phase 2 - Fuel acceleration is being released into a plasma enclosure body (especially in this paper as Tokamak)
- Phase 3 - With increasing state of inner energy in a plasma enclosure body, accelerated fuel causes fusion inside plasma enclosure body to ignite itself to the target temperature level

A. Phase 1 - Fuel Acceleration

Adding movement to a particle in reality affects the mass of a particle.

\[
Assuming\ that, |E_{\text{electromagnetic}} \cdot E_{\text{Gravity}}| \leq \cos \theta \\
\Rightarrow E = E_{\text{electromagnetic}} + E_{\text{gravity}} + E_{\text{Weak}} + E_{\text{Strong}}
\]

By accelerating the fuel, total energy of fuel particles increase.

B. Phase 2 - Injection to Plasma Enclosure Body

Continuing preceding discussion [3], expansion of phase in matter to energy happens while colliding particles:

\[
Assuming\ that, |E_{\text{electromagnetic}} \cdot E_{\text{Gravity}}| \leq \cos \theta \\
\Rightarrow E = E_{\text{electromagnetic}} \cdot E_{\text{Gravity}} + E_{\text{Weak}} + E_{\text{Strong}} \\
= E_{\text{electromagnetic}} + E_{\text{Gravity}} + E_{\text{Weak}} + E_{\text{Strong}} \\
\Rightarrow \text{Electromagnetic Gravitational Field by} \\
B = \{2, -2, 2i, -2i\} \Rightarrow \langle B \rangle = \text{Group G(·)}
\]

By this relation, all the particles collided to fuel transitioning to plasma ignites to the level of temperature transformed from work to heat.

C. Phase 3 - Ignition with Fuel Collision

Difference between fuel acceleration and particle acceleration is that while particle acceleration focuses on work energy to collision, fuel acceleration focuses on generating heat energy to fusion plasma. This causes chain reaction to all states in energy of particle to a plasma:

\[
E = \frac{E_{\text{Weak}} + E_{\text{Strong}}}{E_{\text{Gravity}}} + \frac{E_{\text{Weak}} + E_{\text{Strong}}}{E_{\text{Electromagnetic}}} \\
+ 2 \cdot E_{\text{Electromagnetic}} \cdot E_{\text{Gravity}} - E_{\text{Strong}} - E_{\text{Weak}} \\
= (E_{\text{Strong}} + E_{\text{Weak}}) \cdot \left(\frac{1}{E_{\text{Gravity}}} + \frac{1}{E_{\text{Electromagnetic}}} - 1\right) \\
+ 2 \cdot E_{\text{Electromagnetic}} \cdot E_{\text{Gravity}}
\]

III. CONCLUSION

A. Limitations

1) This paper is just a partial model for a nuclear fusion to ignite plasma in a chamber.
2) Default values for ignition in this model should be studied, but as an expectation, ignition itself based on collision toward phase transitioning plasma could be a new chance.
3) This paper merely focuses on making higher ignition temperature as a pilot model, which impose a premise of heat and work transition working on plasma to be targeted in consideration. Because of this premise, not only fusion technology but particle accelerator related features should also be considered.

B. Considerations

1) Chaining ignition of plasma could give another chance of utilizing particle accelerator in fusion power.
2) By igniting plasma itself in transformation to fuse into target temperature could lead to ignition by nuclear fusion.

REFERENCES