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**R&D in Energy Engineering**

**A Nano Relativistic Motor: Preliminary Analysis**

**המנוע הננו יחסותי - תוצאות ראשונות**

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(1) Background: In a recent paper discussing Newton’s third law in the framework of special relativity for charged bodies, it was suggested that one can construct a practical relativistic motor provided high enough charge and current densities are available. As on the macroscopic scale charge density is limited by the phenomena of dielectric breakdown, it was suggested to take advantage of the high charge densities which are available on the microscopic scale.

(2) Results: We show that a hydrogen atom either in the ground state or excited state will not produce a relativistic engine effect, but by breaking the symmetry or putting the electron in a wave packet state may produce relativistic motor effect.

(3) Conclusions: A highly localized wave packet will produce a strong relativistic motor effect. The preliminary analysis of the current paper suggests new promising directions of research both theoretical and experimental.

References:

1. M. Tuval and A. Yahalom, “Newton’s Third Law in the Framework of Special Relativity,” Eur. Phys. J. Plus, vol. 129 (11), pp. 240, November 2014.

2. A. Yahalom, “Retardation in Special Relativity and the Design of a Relativistic Motor,” Acta Physica Polonica A, Vol. 131, No. 5, (2017).

3. M. Tuval and A. Yahalom, “Momentum Conservation in a Relativistic Engine,” Eur. Phys. J. Plus, vol. 131, no. 10, pp. 374, October 2016.

4. A. Yahalom, “Preliminary Energy Considerations in a Relativistic Engine,” In Proceedings of the Israeli-Russian Bi-National Workshop, Ariel, Israel, pp. 203-213, August 28-31, 2017.

5. S. Rajput and A. Yahalom, “Preliminary Magnetic Energy Considerations in a Relativistic Engine: Mutual Inductance vs. Kinetic Terms,” In Proceedings the IEEE ICSEE, Eilat, Israel, pp. 1-5, December 12-14, 2018.

6. S. Rajput, and A. Yahalom, “Material Engineering and Design of a Relativistic Engine: How to Avoid Radiation Losses,” Advanced Engineering Forum, 36 (2020), pp 126-131.

7. Shailendra Rajput, Asher Yahalom & Hong Qin "Lorentz Symmetry Group, Retardation and Energy Transformations ‎in a Relativistic Engine" Symmetry 2021, 13, 420. https://doi.org/10.3390/sym13030420.S.

8. Rajput, Shailendra, and Asher Yahalom. 2021. "Newton’s Third Law in the Framework of Special Relativity for Charged Bodies" Symmetry 13, no. 7: 1250. https://doi.org/10.3390/sym13071250

9. Yahalom, Asher. 2022. "Newton’s Third Law in the Framework of Special Relativity for Charged Bodies Part 2: Preliminary Analysis of a Nano Relativistic Motor" Symmetry 14, no. 1: 94. https://doi.org/10.3390/sym14010094



Asher Yahalom is a Full Professor and former Vice Dean in the Faculty of Engineering at Ariel University and the Academic director of the free electron laser user center which is located within the University Center campus.

He was born in Israel on November 15, 1968, received the B.Sc., M.Sc. and Ph.D. degrees in mathematics and physics from the Hebrew University in Jerusalem, Israel in 1990, 1991 and 1996 respectively.

 Asher Yahalom was a postdoctoral fellow (1998) in the department of electrical engineering of Tel-Aviv University, Israel. And a Visiting Professor at the University of Cambridge, UK during the years 2005-2006, 2008, 2012. He was a visiting Professor at Princeton University, USA during the years 2019-2020.

From 1994 to 1998 Asher Yahalom worked with Direx Medical System on the development of a novel MRI machine as a head of the magneto-static team.

In the years 1998-1999 Asher Yahalom joined the Israeli Free Electron Laser Group both as postdoctoral fellow and as a project manager, he is a member of the group ever since.

As part of his duties he established the FEL user center of which he now directs, the aim of the FEL user center is to establish applications for FEL radiation including

medical applications.

Currently much of his efforts are directed toward the study of the implication of retardation phenomena in general and relativistic engines in particular, both theoretically and experimentally.