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Type: **Lecture**

## Laser driven proton acceleration using resonant nanorod antenna

*Tuesday, July 18, 2023 4:00 PM (30 minutes)*

A novel idea was proposed not long ago to help out laser-induced fusion with simultaneous volume ignition, a spin-off from heavy ion collisions, which uses implanted nano antennas to regulate and amplify light absorption in a fusion target [1,2]. Recent studies have analyzed the resilience of these nano antennas in a vacuum [3] and in a UDMA-TEGDMA medium[4]. While the lifetime of the plasmonic effect was found to be longer in the medium, less energy was observed due to the smaller resonant size of gold nanoantennas. Here we present new findings on how the plasmonic effect behaves in an environment surrounded by hydrogen atoms close to liquid densities. We conducted numerical simulations treating the electrons of gold in the conduction band as strongly coupled plasma. The results show that the protons close to the nanorod's surface follow the collectively moving electrons rather than the incoming electric field of the light. Additionally, this "screening" effect is found to be dependent on the laser intensity.

[1] L.P. Csernai and D.D. Strottman,  
Volume ignition via time-like detonation in pellet fusion,  
Laser and Particle Beams, 33, 279-282 (2015).

[2] L.P. Csernai, N. Kroo, and I. Papp,  
Radiation dominated implosion with nano-plasmonics,  
Laser and Particle Beams, 36 (2), 171-178 (2018).

[3] I. Papp, L. Bravina, M. Csete, A. Kumari, I.N. Mishustin, D. Molnár, A. Motornenko, P. Rácz, L. M. Satarov, H. Stöcker, D. D. Strottman, A. Szenes, D. Vass, T. S. Biró, L. P. Csernai, and N. Kroó, (NAPLIFE Collaboration), Kinetic Model Evaluation of the Resilience of Plasmonic Nanoantennas for Laser-Induced Fusion, PRX Energy, 1, 023001 (2022).

[4] I. Papp, L. Bravina, M. Csete, A. Kumari, I.N. Mishustin, A. Motornenko, P. Rácz, L. M. Satarov, H. Stöcker, D. D. Strottman, A. Szenes, D. Vass, Á. Szokol, J. Kámán, A. Bonyár, T. S. Biró, L. P. Csernai, and N. Kroó, (NAPLIFE Collaboration), Kinetic model of resonant nanoantennas in polymer for laser induced fusion, Frontiers in Physics, 11, 1116023 (2023).

### Is this abstract from experiment?

No

### Name of experiment and experimental site

NAPLIFE collaboration

### Is the speaker for that presentation defined?

Yes

### Details

N/A

## Internet talk

No

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