

# The Density Variation Effect on Increasing the Acceleration Rate of the Charged Particle in the Plasma Physics

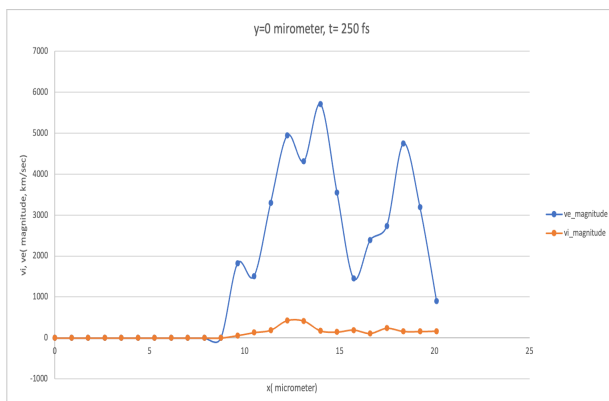
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In studying the interaction of a high-intensity laser beam with a high-density plasma regime, a remarkable acceleration of the electron beam's energy has been recorded in comparison to the ion beam within the same system. Laser Wakefield Acceleration (LWFA) has been used to govern the acceleration of charged particles within the simulation system. The two-dimensional particle in cell code has been used to demonstrate the study of the acceleration gradient of the charged particle in plasma framework by using an ultra-fast laser of wavelength 800 nm, incidence angle 0, linearly-polarized, 500 fs duration time and intensity  $10^{18}$  W/cm<sup>2</sup>- mm<sup>2</sup> in hydrogen plasma. The Acceleration gradients have been calculated in hot plasma at  $t = 50, 100, 250$  fs. Remarkable acceleration energy was recorded at  $t=250$ fs, with electron velocity equal = 5500 km/sec.



**Fig. 1.** The electron and ion velocity comparison in the  $x$ - $y$  plane at  $t = 250$  fs. The density profile shows the formation of the periodic

nanograting structure with evolution time.

## References

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