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Electron Acceleration by Self Focused q-Gaussian Laser Pulse in Plasma

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A scheme for electron acceleration by self focused -Gaussian laser pulses in under dense plasma has been presented. The relativistic increase in the mass of plasma electrons gives nonlinear response of plasma to the incident laser pulse resulting in its self focusing. Under the combined effects of saturation nature of relativistic nonlinearity of plasma, self focusing and diffraction broadening of the laser pulse, the beam width of the laser pulse evolves in an oscillatory manner. An electron initially on pulse axis and at the front of the self focused pulse, gains energy from it until the peak of the pulse reaches. When the electron reaches at the tail of the pulse, the pulse begins to diverge. Thus, the deacceleration of the electron from the trailing part of pulse is less compared to the acceleration provided by the ascending part of the pulse. Hence, the electron leaves the pulse with net energy gain. The differential equations for the motion of electron have been solved numerically by incorporating the effect of self focusing of the laser pulse.

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Footnotes

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