Lefebvre, Malka, and Miquel Reply: In a recent paper, we reported on the acceleration to relativistic energies of free electrons interacting with an ultra-short and intense laser pulse in vacuum [1]. Our results were interpreted with the help of a code that computes the trajectories of test electrons in the pulse. The two preceding Comments [2,3] suggest improvements to our model.

The electron trajectories in our paper are computed on the laser period time scale [1]. The fact that a (relativistic) ponderomotive formalism [4] can lead to the same average trajectories [3] is an interesting result. Mora and Quesnel also considered the effect on the electron orbits of the first-order longitudinal electric and magnetic fields [5], and found that they lead to a nearly isotropic scattering of the particles. This property of the ponderomotive force, namely, that it is polarization independent, has been extensively discussed, e.g., by Cicchitelli *et al.* [6]. Its observation has been claimed in experiments at much lower laser intensity and electron energy than ours [7]. Our calculations were performed in the plane defined by the laser propagation and polarization directions. B_x cancels in this plane, so that particles initially in this plane are not scattered out of it, as in our model. One could anticipate that the inclusion of the E_x field might strongly limit the electron acceleration [2]. Our calculations were performed again with the first-order correction, and no such effect was observed, in agreement with [3]. Instead, the trend is rather toward a slightly larger acceleration. The angle between the laser propagation direction and the electron trajectory is also slightly affected by this first-order correction, so that Eq. (2) in our paper no longer exactly holds. However, this does not alter our conclusions, since the maximum electron energies predicted by the code in the two directions of observation are hardly changed.

Our experimental results do not support isotropic scattering. This was checked by rotating the laser polarization direction by 90°, without changing the position of the spectrometer [1]. No significant signal was detected in this configuration, contrary to what is expected if the driving force is purely isotrope.

As our model, Mora and Quesnel's resort to the paraxial approximation (zero or first-order) for the fields, and are then subject to McDonald's criticism [2]. We performed some calculations with higher electron initial velocities (up to $0.95c$) and still observed a large acceleration by the pulse. The Lawson-Woodward theorem [2] predicts zero acceleration provided the particle is not driven by any nonlinear forces. For our parameters, the $\mathbf{v} \times \mathbf{B}$ force clearly prevents using this theorem, and it may require ultrarelativistic particles before the $\mathbf{v} \times \mathbf{B}$ force is effectively linear.

In conclusion, out of the laser polarization plane, the first-order paraxial model predicts an isotrope electron scattering which was not observed in our experiments. Yet as far as electron trajectories in the polarization plane are concerned, calculations with the first-order fields are only marginally different from our results. This altogether supports that the electrons we observed were indeed free electrons accelerated by the laser pulse, even though the models we used might not be suited at larger laser irradiance and/or larger initial electron energy.

E. L. acknowledges an interesting discussion with Brice Quesnel.

E. Lefebvre, G. Malka, and J.-L. Miquel
Commissariat à l'Energie Atomique, Limeil-Valenton
94195 Villeneuve Saint-Georges, France

Received 18 November 1997 [S0031-9007(97)05194-6]
PACS numbers: 41.75.Lx, 52.40.Nk, 52.75.Di

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