On the Electromagnetic Wave Reflection at the Subluminal, Luminal, and Superluminal Mirrors

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As predicted by A Einstein [1] the electromagnetic wave reflected from a mirror moving at relativistic velocity undergoes the frequency upshifting and intensification as high as the mirror velocity is close to the speed of light in vacuum. Using the light reflection at the relativistic flying mirror has been proposed as a way towards reaching extremely intense coherent electromagnetic radiation. On the other hand, the higher the wave frequency, the more transparent the medium becomes, and the reflection coefficient tends to zero. To resolve this paradox, we analyze the electromagnetic wave propagation in the medium, where the modulations of the refraction index move with the velocity below, above and equal to the speed of light in vacuum. As we show, although the wave reflection at the luminal mirror vanishes, *i.e.* the electromagnetic pulse cannot cutch up and overtake the mirror; it propagates through the mirror and its frequency spectrum changes.

References

[1] A Einstein, Ann. Phys. **17**, 891 (1905)