Erratum for Relativistic Optics: The Frontier of Ultrashort X-ray Pulse Generation

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November 20, 2024

This erratum aims to correct some of the typos and mistakes found within the doctoral thesis after its defense, small misprints and grammatical errors are not discussed here. However, for those interested, the most recent and fully corrected version of the thesis is available upon reasonable request from the following e-mail: marcel.lamac@eli-beams.eu. *None of the changes affect the results or conclusions of the doctoral thesis.*

1 Nonlinear inverse Compton scattering

In Section 2.1, Eq. 116 describing nonlinear inverse Compton scattering contains a mistake in the form of quadratic scaling with particle energy in the denominator, the correct version reads for linear polarization

$$\omega_n = \frac{4\gamma^2 n\omega_0}{1 + 4\gamma n \frac{\hbar\omega_0}{m_e c^2} + \frac{a_0^2}{2}}. \tag{1}$$

We also note a more general version for arbitrary scattering angle for linear polarization

$$\omega_n \approx \frac{4\gamma^2 n\omega_0}{1 + \left(2n\frac{\gamma\hbar\omega_0}{m_e c^2} + \frac{a_0^2}{4}\right)(1 - \cos\theta)}. \tag{2}$$

2 Stimulated Raman scattering and nonlinear laser depletion

2.1

On page 46, the equation within the sentence „*The characteristic rise time of the laser pulse modulation is of the order* $\tau_{\theta=0} = 1/(\tau_p\gamma_{SFRS}^2)$*"* should read $\tau_{\theta=0} = 1/(\tau_p\Gamma_{SFRS}^2)$, as the instability growth rate is designated with capital gamma in preceding text.

2.2

Eq. 165 describing the pump depletion length has the nominator and denominator swapped, which is clear from the derivation given within the text, as well as the limits discussed, the correct version reads

$$l_{pd} = l_p\left(\frac{\omega_0}{\omega_{pe}}\right)^2 \frac{1 + a^2}{a^2}.$$

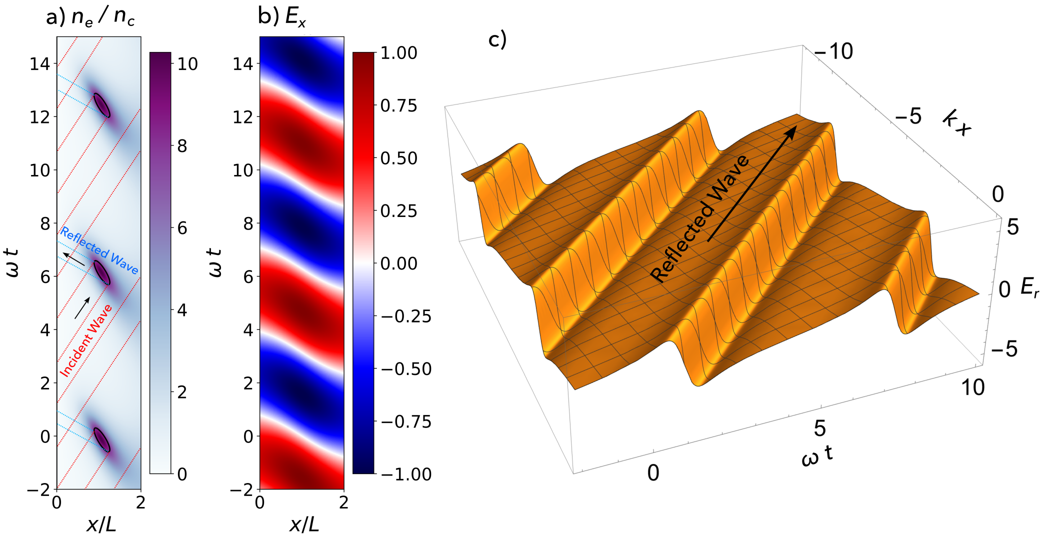

Figure 1: High harmonic generation from the resonant relativistic oscillating mirror. (a) The electron plasma density evolution, given by Eq. (270). The black contour line indicates a threshold, beyond which $n_e > n_c$. In the interior of this boundary, radiation can be reflected into the vacuum, as indicated by the colored dotted lines. (b) Longitudinal electric field of the saturated plasma resonance (Eq. 257). (c) Spatiotemporal evolution of reflected radiation, calculated using the model of a narrow resonance given by Eq. (274).

3 Resonance saturation

Eq. 257 has a mistake within the sign of the wave phase, which gives incorrect direction of time. The correct version reads

$$E_x(x,t) = \mathcal{R}\left[\frac{E_d \exp(i\omega t)}{1-(\omega_{pe}/\omega)^2 - is}\right].$$

This also changes the direction of time in Eqs. 268, 289 and 270. The correct time-reversed versions read

$$\xi = r_e \frac{(1-x/L)\cos(\omega t) - s\sin(\omega t)}{(1-x/L)^2 + s^2}, \tag{3}$$

$$\dot{\xi} = -\frac{r_e s \omega}{(1-x/L)^2 + s^2}\cos(\omega t). \tag{4}$$

$$\frac{n_e}{n_0} = \left[1 - \frac{r_e}{L}\frac{\cos(\omega t)}{s^2 + (1-x/L)^2} + \frac{2r_e(1-x/L)}{L}\frac{(1-x/L)\cos(\omega t) - s\sin(\omega t)}{\left(s^2+(1-x/L)^2\right)^2}\right]^{-1}. \tag{5}$$

This also changes the direction of time in Figs. 22a and 22b, which plot these equations. The correct visualization is shown here in Fig. 1.

4 Accidentally pasted text

On page 87, the text contains a sentence accidentally pasted from a different section „*Based on our exposition of and to the topics, both concepts currently offer much potential to the* *scientific community at large, with significant promise for future research and applications. o presented through oral contributions at the SPIE Optics + Photonics international conference in Prague, Czech Republic (2023)"*, the correct version reads *„Based on our exposition of and to the topics, both concepts currently offer much potential to the scientific community at large, with significant promise for future research and applications."*