Erratum: Formulas for coherent synchrotron radiation microbunching in a bunch compressor chicane [Phys. Rev. ST Accel. Beams 5, 074401 (2002)]

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The coherent synchrotron radiation (CSR) impedance used in Eq. (12) is formulated assuming the head of the bunch is at the longitudinal coordinate $z > 0$ [1], to be consistent with the definition of machine impedances. In such a coordinate system, the total momentum compaction R_{56} in a bunch compressor chicane is positive (a higher energy particle moves forward with z). Wrong signs of R_{56} 's were used in Eq. (30). They are corrected here as

$$R_{56}(s_1) = -\frac{s_1^3}{6\rho_0^2}, \quad R_{56}(s_2) \approx \frac{\Delta L L_b}{\rho_0^2} s_2, \quad R_{56}(s_3) \approx \frac{2\Delta L L_b^2}{\rho_0^2} \equiv R_{56}, \quad R_{56}(s_1 \rightarrow s_2) \approx \frac{\Delta L}{\rho_0^2} (L_b - s_1) s_2,$$

$$R_{56}(s_2 \rightarrow s_3) \approx \frac{\Delta L}{\rho_0^2} (2L_b - s_2) s_3, \quad R_{56}(s_1 \rightarrow s_3) \approx \frac{2\Delta L}{\rho_0^2} [(L_b - s_1)L_b + s_1 s_3].$$

The sign of the chirp h should be changed from positive to negative consequently. The rest of the equations are not affected by this error.

FIG. 1. (Color) BC1 gain G_{f1} of density modulation as a function of modulation wavelength at the exit of BC1 as calculated from Eq. (38) with (red) and without (blue) the last term (the two-stage amplification).

FIG. 2. Energy modulation amplitude $|\Delta p_1(k_f; f)|$ (in units of initial bunching) as a function of modulation wavelength at the exit of BC1.

The sign correction results in some reduction of CSR microbunching gain. We reevaluate the gain of CSR microbunching in the Linac Coherent Light Source bunch compressors (BC1 and BC2) using Eqs. (38), (39), and (43). The numerical results are shown here in Figs. 1–5 as one-to-one replacements for the figures in the original paper. Figures 3 and 4 compare these results with the numerical solutions of the integral equation obtained using the correct

FIG. 3. (Color) BC2 gain G_{f2} of density modulation as a function of modulation wavelength at the entrance of BC2 for (1) $\sigma_\delta = 3 \times 10^{-5}$, $\gamma\epsilon_0 = 1 \mu\text{m}$ (blue); (2) $\sigma_\delta = 3 \times 10^{-5}$, $\gamma\epsilon_0 = 0 \mu\text{m}$ (red); and (3) $\sigma_\delta = 3 \times 10^{-6}$, $\gamma\epsilon_0 = 1 \mu\text{m}$ (black). Solid curves are calculated from Eq. (38), and dashed curves are numerical solutions of the integral equation obtained with the correct sign of R_{56} [2].

FIG. 4. (Color) BC2 gain G_{f2} of density modulation as a function of modulation wavelength at the entrance of BC2 for $\sigma_\delta = 3 \times 10^{-6}$, $\gamma\epsilon_0 = 0 \mu\text{m}$, as calculated from Eq. (38) (red) and the last term of Eq. (38) only (blue). The dashed curve is the numerical solution of the integral equation obtained with the correct sign of R_{56} [2].

FIG. 5. Total amplification factor G_T of BC1 and BC2 as a function of modulation wavelength at the entrance of BC2 (1) without the wiggler and (2) with the wiggler.

sign of R_{56} [2] and show excellent agreement between the two methods. Good agreements between these formulas and numerical simulations are reported in Ref. [3].

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