Erratum: Planar and axial coherent bremsstrahlung of type *A* from a 17-MeV electron beam in a diamond crystal [Phys. Rev. B 64, 014304 (2001)]

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We found a mistake in the second part of Eq. (6). In the derivation of Eq. (6), the forward direction was mistakenly taken as the axis direction instead of the electron beam direction, therefore the values of the photons transverse energies [Eq. (8)] and therefore the emission angles are different from the ones previously published. The constants $A_{g_{n,m}}$ as well as the photons total energies remain unchanged since they are determined by the many-beam calculations.

The forward direction is taken as the direction of the electron beam, and the direction of the emitted quanta is given by $\mathbf{u}_\gamma$, and $\mathbf{u}_\gamma^\parallel$ and $\mathbf{u}_\gamma^\perp$ are the photon unit vectors parallel and perpendicular to the electron beam direction, respectively [Fig. 8(a)]. Using the energy and momentum conservation equation, the photon energy E_γ is given by

$$E_\gamma \approx \frac{2\gamma(\hbar c)^2}{m_e c^2}[\mathbf{k}\cdot\mathbf{g}_n - g_n^2/2] - \frac{2\gamma\hbar c}{m_e c^2}E_\gamma^\perp \mathbf{u}_\gamma^\perp\cdot\mathbf{g}_n. \quad (6)$$

In the equation above, we have assumed that the photon transverse energy $E_\gamma^\perp$ is small compared to its longitudinal one. $\mathbf{g}_n$ is the momentum transfer and $\mathbf{k}$ is the electron momentum. $\mathbf{k}\cdot\mathbf{g}_n = \mathbf{k}_\perp\cdot\mathbf{g}_n$, where $k_\perp \approx k\theta$ is the electron transverse momentum and θ the tilt angle [Fig. 8(b)]. For photons emitted in the forward direction, the energy of the photon is

$$E_\gamma = \frac{\gamma(\hbar c)^2}{m_e c^2}[2\mathbf{k}_\perp\cdot\mathbf{g}_n - g_n^2], \quad (7)$$

Equation (6) and Fig. 4 enable us to determine the photon emission angles. From Fig. 4(c) it is clear that the second term in Eq. (6) is a constant independent of the tilt angle $A_{g_{n,m}}$, and which can be determined from the many-beam data points. From Eq. (6), the transverse energy is therefore for the momentum transfer vectors:

$$E_\gamma^\perp = -\frac{m_e c^2}{2\gamma\hbar c}\frac{A_{g_{n,m}}}{\mathbf{u}_\gamma^\perp\cdot\mathbf{g}_{n,m}} \geqslant 0. \quad (8)$$

This condition requires that $\mathbf{u}_\gamma^\perp\cdot\mathbf{g}_{n,m}$ be negative. For a scan along the $(01\overline{1})$ plane and because $\mathbf{y}_c$ is parallel to the electron transverse direction [Fig. 8(b)], one can write, since $\cos(\theta)\approx 1$,

$$\begin{aligned}\mathbf{u}_\gamma^\perp\cdot\mathbf{g}_{n,m} &= \frac{2\pi}{\sqrt{2}\mathbf{a}_p}\{n[\sin(\psi)\cos(\theta)-\cos(\psi)] \\ &\quad + m[\sin(\psi)\cos(\theta)+\cos(\psi)]\}<0 \\ &\approx \frac{2\pi}{\sqrt{2}\mathbf{a}_p}\{n[\sin(\psi)-\cos(\psi)] \\ &\quad + m[\sin(\psi)+\cos(\psi)]\}<0. \quad (9)\end{aligned}$$

Equation (9) sets additional conditions on the components or choice of the momentum transfer vectors. It is, however, still difficult to determine the photon emission angles without knowing the value of ψ. For $\psi=0$, we must have $n-m>0$. We took the same examples as in the article, the first order (1a) and second order (2a) peaks in Fig. 3, corresponding to the momentum transfer vectors $\mathbf{g}_{6,-2}=6\mathbf{g}_{0,1,0}-2\mathbf{g}_{0,0,1}$ and $\mathbf{g}_{8,0}=8\mathbf{g}_{0,1,0}$, respectively. Using Eq. (6) and the data points from the many-beam formalism for the momentum transfer vectors $\mathbf{g}_{6,-2}$ and $\mathbf{g}_{8,0}$, we find that the val-

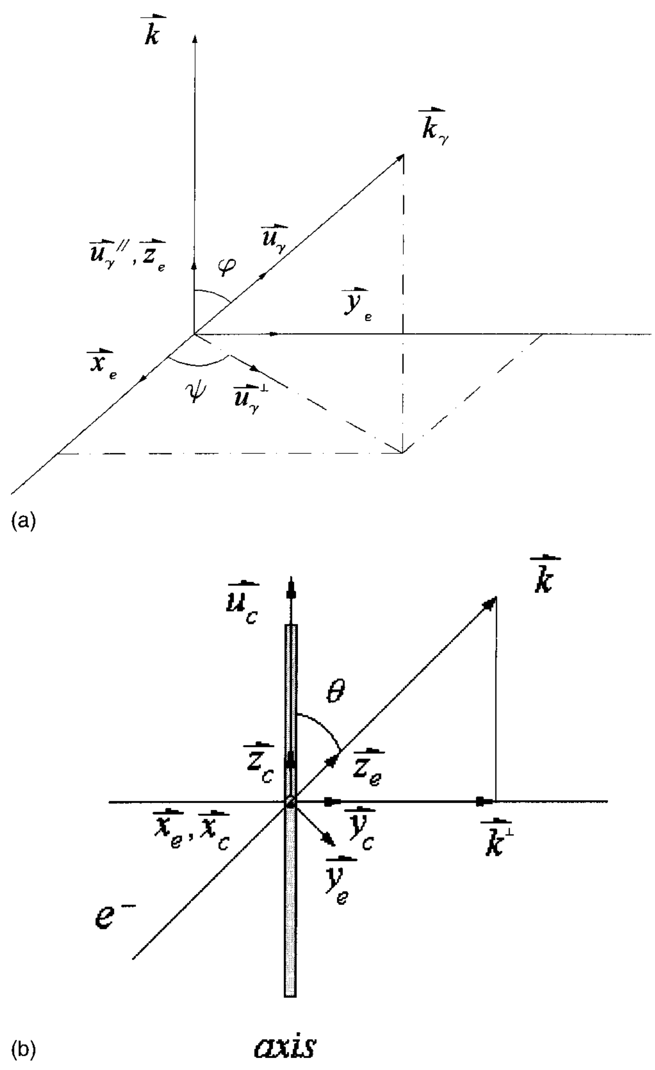

FIG. 8. (a) Photon direction with respect to electron beam. (b) Electron direction with respect to axis.

ues of the constants $A_{\mathbf{g}_{n,m}}$ are $A_{\mathbf{g}_{6,-2}}=3.06$ keV and $A_{\mathbf{g}_{8,0}}=3.22$ keV. Using Eq. (8), we find that $E_\gamma^\perp=2.31$ keV and $E_\gamma^\perp=1.21$ keV, respectively. From Eq. (6) and for a tilt angle $\theta=8$ mrad we conclude that the emission angles φ are equal to 14.85 mrad and 3.8 mrad, respectively.

For the second scan direction, scan along the (001) plane (Fig. 6), assuming that $\cos(\theta)\approx 1$, one should write

$$\mathbf{u}_\gamma^\perp \cdot \mathbf{g}_{n,m} \approx \frac{2\pi}{a_p}[n \sin(\psi)+m\cos(\psi)] = \frac{2\pi\cos(\psi)}{a_p}[n\tan(\psi)+m]<0. \tag{10}$$

Using a similar example as previously, for a tilt angle $\theta=8$ mrad, for a first CBA order (peak $1'$) (Fig. 6), and for $\psi=0$, one must have $m<0$. Using the value of the constant $A_{\mathbf{g}_{2,-2}}=2.77$ keV from Fig. 6(b), we find that $E_\gamma^\perp=2.965$ keV and the photon emission angle φ with respect to the forward direction is equal 22.92 mrad.

Equation (6) and therefore Eq. (8) determine the emission angle when the photon is not emitted in the forward direction or when the momentum transfer is not parallel to the electron transverse momentum. It is, however, impossible to determine the value of the emission angle φ without first knowing the value of ψ.

The conclusion of this study remains unchanged by the new expressions of Eq. (6) and Eq. (8). Axial CB is emitted in the forward direction only when the momentum transfer is parallel to the electron transverse momentum as can be seen from Eq. (7) and Figs. 4, 6, and 7.

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