Kuwahara *et al.* Reply: We appreciate the helpful Comment [1] to our Letter [2] and acknowledge that the descriptions in the Letter were unclear.

The Comment [1] suggests that the emission rate error contributed to variations in the coincidence counts and that the coincidence rate decreased when the electrons were spin polarized. In our experiments, the emission rate error was very low, although the Letter [2] did not give enough information to exclude such effects.

In the Letter [2], the power of the laser used to irradiate the cathode was controlled so as to carefully maintain constant spin-polarized and nonpolarized electron emissions. The high-voltage system employed to operate the cold field emission gun in the transmission electron microscope (TEM) was extremely stable, with a variation of less than $5 \times 10^{-4}\%$ [3]. This system provided a narrow electron beam energy range and an emission current with a high dynamic range (5 orders of magnitude).

In the experiments, the emission current was controlled using the laser power control and feedback system; the emission current variation was less than $10^{-2}\%$. During coincidence counting, the total amount of charge associated with the emitted current was measured and electron emission was automatically stopped at a total emission charge of 9 mC for each counting series. This was done because, as noted in the Comment [1], the total emission charge is significant for coincidence counts and is thus a source of error. During monitoring, the current data were acquired at a frequency of 10 Hz, which resulted in a total charge error of approximately 0.125 μC, equivalent to $1.4 \times 10^{-3}\%$ of the total charge amount. The current measurement system had a precision of 0.01 nA in the full range of 10 μA. The standard deviation of the measured current was 0.04 nA, which was $3 \times 10^{-3}\%$ of the emission current (1.25 μA). The variation when electron emission was stopped during each polarization was approximately $7 \times 10^{-3}\%$ (5.9 s out of 7.92×10^4 s). Consequently, the variation in the emission rate during the experiment period was less than $10^{-2}\%$.

The Comment [1] also mentions spatial variation. In this experiment, the detection area of the electron beam was $6 \times 10^{-4}\%$ of the source size, which was realized by the magnifying power of the TEM system. Furthermore, the contributed size on the photocathode to the detection area in these electron optics is estimated to be about 5 nm. An atomic-scale observation of a cross section of the photocathode microstructure over a 50-nm field of view using a TEM revealed no dislocations or patch effects [4,5]. Therefore, the quantum efficiency within a 5-nm region of the photocathode was uniform. It should also be noted that the electron gun used in our Letter [2] was able to select the emission area, as described in Ref. [3], meaning that it was possible to select an area with uniform quantum efficiency to obtain clear TEM images and interference fringes, as described in Ref. [6]. The variations in brightness reported in Ref. [6] originated from the error in the convergence angle measurements and in the electron beam spot size resulting from the finite pixel size of the electron imaging sensor. Furthermore, the beam current in Ref. [6] was monitored at the phosphor plate position where the beam current was reduced to the order of picoamperes due to the magnification power. References [3] and [7] provide TEM images of a vacuum area acquired using the same level of photoemission. Typically, the parallelism values in TEM imaging are approximately 10^{-3} to 10^{-4} rad. The spatial coherence length at the specimen position was estimated to be in the range of 1 to 10 nm. Uniform TEM images can thus be obtained by using a short spatial coherence length.

It is important to note that the emission position of an electron wave cannot be identified within a coherent emission area due to the uncertainly principle. Furthermore, the polarization conditions do not affect the degree of nonuniformity resulting from the presence of defects or patch effects. On this basis, we believe that the nonuniformity of quantum efficiency is not a significant issue for the coincidence counting rate. The reported coincidence counts were the average counting rates because they represent accumulated counts per coincident time window. In contrast, the antibunching function is not changed by the counting rate and so the counting fluctuation is reduced by the accumulated number of counts that contribute to the statistical error. Consequently, if nonuniformity decreases the emission rate and produces an asymmetric counting rate between the two detectors, this will simply reduce the coincidence counting rate.

Makoto Kuwahara, Yuya Yoshida, Wataru Nagata,
Kojiro Nakakura, Masato Furui, Takafumi Ishida,
Koh Saitoh, Toru Ujihara and Nobuo Tanaka

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