Sarri *et al.* Reply: The Comment [1] reports on independent numerical simulations of the experimental results in Ref. [2]. Positron yields and spectra similar to those in Ref. [2] are numerically obtained, but with a larger divergence. A larger positron source size at the rear of the converter is hence inferred, resulting in a smaller positron density. Since the publication of the Letter, comprehensive Monte Carlo simulations of the characteristics of such positron beams have already been published by members of our collaboration [3]. The simulations discussed in the Comment are only a specific subset of this more extensive work, and largely agree with it on the divergence.

However, Fig. 1(b) in the Letter, which depicts raw data after the magnetic spectrometer, provides clear experimental evidence of a smaller divergence (∼3 mrad) for high-energy positrons. This discrepancy could be related to the fact that Monte Carlo codes generally do not capture all the physics at play in these complex environments since, for instance, they do not include collective effects, such as the generation of strong electromagnetic fields during the propagation of kA-scale short electron beams through the converter. We are aware of this, and we are further investigating it.

We do still maintain, however, that the positrons source size with energy exceeding 1 MeV is, in these experimental conditions, of the order of 150 μm. Contrary to what is stated in the Comment, we did not use a divergence of 3 mrad to estimate the overall positron density. This is apparent, if we consider that a divergence of 3 mrad and a target thickness of 4.2 mm would correspond to a source size of 12.6 μm and, thus, an exceedingly high density of 3.4×10^{16} cm^{-3}. Instead, we used a source size of 150 μm, as estimated from Monte Carlo simulations.

A source size of approximately 150 μm has since been confirmed by a series of experimental measurements recently reported by part of our collaboration [4]. In similar conditions, a positron source size of (230 ± 100) μm was experimentally observed [Fig. 5(b) in Ref. [4]], also in line with the numerical results in Ref. [3]. For further confirmation, we have performed additional FLUKA [5] simulations of our experiment. The simulated phase space of the positrons with energy > 1 MeV escaping the converter target is shown in Fig. 1. A source size of 180 μm is obtained, in line with the experimental results in Ref. [4], the estimate in Ref. [2], and the numerical simulations in [3]. Such source size implies a positron density of 1.5×10^{14} cm^{-3} whereas the experimental value of (230 ± 100) μm implies a positron density of $(1.0 \pm 0.8) \times 10^{14}$ cm^{-3}. Both values are consistent with the density estimated in the Letter (2×10^{14} cm^{-3}). We then confirm the density and source size reported in the Letter as valid estimates.

Finally, the Comment questions the usability of LWFA-driven positron sources for applications. We disagree with this statement. The applicability of LWFA-driven positrons

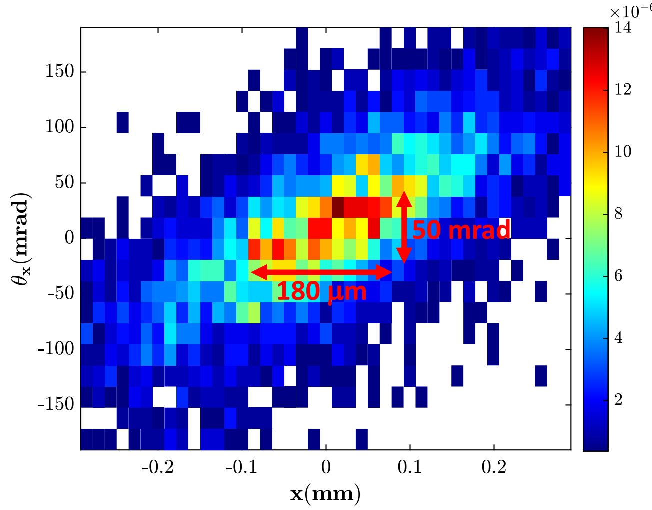

FIG. 1. Simulated phase space of positrons with energy exceeding 1 MeV escaping the rear surface of a 4.2 mm thick Ta target irradiated with an electron beam as in Ref. [2]. The x axis represents the transverse spatial coordinate and the y axis the divergence (cylindrically symmetric). The color scale is in arbitrary units, proportional to the number of electrons in the primary beam.

to advanced accelerator concepts is currently subject of investigation, and our recent work [3,4,6], together with that of independent groups [7,8], confirms that there is significant potential in this area. We have also confirmed that such positron beams can be used for some specific studies in laboratory astrophysics, and we have already experimentally measured plasmalike behavior of LWFA-driven electron-positron beams [9–12].

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