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Predicting QED Photon Jets from Plasma Experiments with Present-Day Lasers[1] S. V. LUEDTKE, Los Alamos National Laboratory, University of Texas at Austin, L. YIN, Los Alamos National Laboratory, L. A. LABUN, O. Z. LABUN, University of Texas at Austin, B. J. ALBRIGHT, D. J. STARK, R. F. BIRD, W. D. NYSTROM, Los Alamos National Laboratory, B. M. HEGELICH, University of Texas at Austin — Discovery of quantum radiation dynamics in high-intensity laser-plasma interactions and engineering new laser-driven high-energy particle sources require accurate and robust predictions. Using QED-particle-in-cell simulations, we investigate a characteristic dipole pattern of high-energy photon emission that results when the laser pulse bores through the target, forming a channel that enhances the laser field. We observe significant stochasticity in macroscopically identical simulations and show that the stochasticity is physical in nature and expected to be present in experiments. The non-deterministic nature of the channeling phenomenon has important implications for designing an experimental campaign to detect QED photons and validate quantum radiation models, namely, experiments must produce a distribution of results to compare with predictions. We explore several ways that experiments differ from most simulations. Based on historical shot data from a petawatt-class laser, we run several simulations and predict the results and variability expected in experiments.

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