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High repetition-rate K-alpha x-ray source from a low-density gas target

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Potential applications for laser-driven x-ray sources benefit from operation at high repetition-rate. Here, 15 mJ CPA pulses are generated at 480 Hz repetition-rate and tightly focused onto a gas target for the generation of K_{α} x-rays from a number of noble gases. The continuously-flowing nature of the gas jet meant that the target density was below the threshold for clustering and ensured an easier-to-implement target design. A robust experimental analysis of this debris-free x-ray source is presented including measurements of its performance while varying a number of parameters and how the source's output scales under different experimental conditions. Calculations that suggest the x-ray pulse duration being on the fs time-scale in the forward direction are shown. Investigation of potential applications of the source and future improvements are discussed as well.

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