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Measurement of high-quality electron beams from Laser Wakefield Acceleration in a tailored plasma inside a gas cell.

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A key challenge in Laser Wakefield Acceleration (LWFA) is to achieve electron beams having high spectral brightness, particularly with high charge and low energy spread. We address this challenge by tailoring density gradients in a gas cell. This provides a way to tune with a high precision the laser interaction with the plasma and enhance electron beam quality.

During experiments using the Helmholtz-Zentrum Dresden-Rossendorf DRACO laser facility, using LWFA and ionization injection in a tailored plasma in a gas cell, we have consistently produced electron beams with high energy-divergence spectral brightness peaks of 8pC/MeV/mrad and divergence of 0.5 mrad. PIC simulations confirmed the effects resulting from the optimization of the plasma density profile.

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