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## **Experimental progress towards an energy-efficient, high-quality, high-repetition-rate plasma-wakefield accelerator**

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High-gradient plasma-wakefield acceleration represents an exciting route towards both boosting the energy and reducing the footprint of future particle colliders and free-electron lasers. At such facilities thousands or even millions of high-charge particle bunches with low energy spread and low emittance will need to be accelerated in an energy-efficient manner in order to outperform current machines in luminosity and brightness. In this contribution the latest results towards achieving this goal from the beam-driven plasma-acceleration experiment FLASHForward (DESY, Hamburg) will be presented. Highlights will include record values of the energy-transfer efficiency from drive beam to wake and from wake to the accelerating bunch; preservation of incoming bunch properties including charge, energy spread, and emittance; and first results in the direction of operating plasma accelerators at the repetition rates required for future high-energy-physics and photon-science applications.

### **Acknowledgments**

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