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Test of a metamaterial structure for structure-based wakefield acceleration

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Metamaterial accelerators driven by nanosecond-long RF pulses show promise to mitigate RF breakdown. Recent high-power tests at the Argonne Wakefield Accelerator (AWA) with an X-band metamaterial structure have demonstrated to achieve a gradient of 190 MV/m, while we also observed a new acceleration regime, the breakdown-insensitive acceleration regime (BIAR), where the RF breakdown may not interrupt acceleration of a main beam. Statistical analysis between different breakdown types reveals that the characteristics of the BIAR breakdown are beneficial to high-gradient acceleration at short pulse lengths.

Footnotes

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