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Experimental investigation of relativistic backward-wave oscillators operating in phase-induced regime

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In the report we present new approach where radiation phase of Ka-band BWO is controlled by an external rf signal which is ultra-short. Thus, such excitation is not an amplification regime. Particle-in-cell simulation demonstrated that phase-induced BWO excitation is feasible for a seed power minimized to -38 dB with respect to the driven BWO.
In experiments, two synchronized accelerators RADAN were used. We have a master source of a seed signal (superradiance BWO) and driven oscillators of two types. The first represents a similar, 0.5-GW superradiance oscillator. Alternatively, quasi-stationary, nanosecond-pulse BWO (>100 MW) was used. Driven HPM devices demonstrated phase-induced operation with a seed signal power minimized to –35 dB. Besides, phase-induced operation was confirmed when ˜ 5 % frequency detuning between oscillators. Suggested method of phase control is less sensitive to the beam's front stepeness and stability of the accelerating voltage. Thus, numerous parallel HPM generators could operate in coherent mode.
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