2.4 GHZ RELATIVISTIC TRAVELING WAVE OSCILLATOR WITH SHORT TRANSIENT TIME BASED ON A CIRCULAR CORRUGATED WAVEGUIDE

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Reducing the transient time (TT) of high power microwave oscillators based on relativistic electron beams (REBs) widens the microwave pulse [*Totmeniniov E.M., Klimov A.I., Konev V.Yu., et al.//Tech. Phys. Lett. – 2014.–Vol. 40. –No 2. – P. 152.*,*Totmeninov E.M., Klimov A.I. // Tech. Phys. – 2016. – Vol. 61. – No 6. – P. 950.*]. This can be done by increasing the coupling impedance (CI) between the operating wave and REB. In a low-frequency (1 GHz) RBWO [*Totmeniniov E.M., Klimov A.I., Konev V.Yu., et al.//Tech. Phys. Lett. – 2014.–Vol. 40. –No 2. – P. 152.*], coaxial design of the slow wave structure (SWS) and interaction of REB with (–1) harmonics of TEM wave enable significant reduction of TT.

At higher frequencies, in an oscillator using no external magnetic field, based on conventional hollow SWS and interaction with (0) harmonics of TM01 wave, CI as high as 10 Ohm is achievable [*Totmeninov E.M., Klimov A.I. // Tech. Phys. – 2016. – Vol. 61. – No 6. – P. 950.*].

We present PiC modeling (using 2.5D and 3D versions of KARAT code [*Tarakanov V.P. User's Manual for Code Karat. – Berkley: Springfield, 1992.*] and a simple 1D model) of 2.4 GHz traveling wave oscillator in which the key role plays the Cherenkov interaction of 420 keV, 3 kA REB guided by magnetic field with (0) harmonic of TM01 wave slowed down to speed of light. The CI is 9 Ohm. The simulated TT is as short as 15 ns and the microwave power is 320 MW (25 % efficiency) in both strong (0.6 T) and weak (0.2 T) magnetic fields.

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