

## EFFICIENCY OF MODERATELY RELATIVISTIC RESONANT S-BAND BWO

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The scheme of a resonant relativistic BWO was proposed by the Tomsk group of researchers [1, 2] for efficient generation of high-power microwave radiation in the S-band while maintaining relatively small structure length (only 2–4  $\lambda$ ). Due to the fact that this scheme implements effective conditions for the interaction of the beam with both the (-1st) spatial harmonic of the backward wave and the fundamental harmonic of the forward wave, a high generation efficiency (up to 30%) and record powers (above 5 GW) were achieved, both in simulations and experiments.

As far as can be found from publications, the scheme proposed in [1, 2] uses high-current relativistic electron beams with energies of 0.7–1.5 MeV and a strong guiding magnetic field (at least 1.5 T, typically 2–3 T). In this paper, we propose a variant of a resonant BWO that operates at more lower, moderately relativistic beam energies (400–550 keV) and at similar values of the guiding magnetic field (starting from 1.3 T). Compared to the original BWO geometry [2], in the the current investigated scheme, the length of the periodic structure is increased by 1 period (see figure 1 below). The main generation wavelength is about 8 cm.

Simulation and optimization of the proposed BWO were carried out in 2.5D particle-in-cell code XOOPIC [3]. A general view of the electrodynamic structure of the proposed BWO is shown in figure below. For optimization, the length of the insert between the cutoff-neck and the periodic structure, as well as the corrugation profiles of the slow wave structure were varied in the calculations. It is shown in the numerical simulation that for a beam energy of 500 keV and current of 6.25 kA, the average radiation power reaches 875 MW (28% efficiency). High generation efficiency is achieved in magnetic fields of 1.3 T and higher.

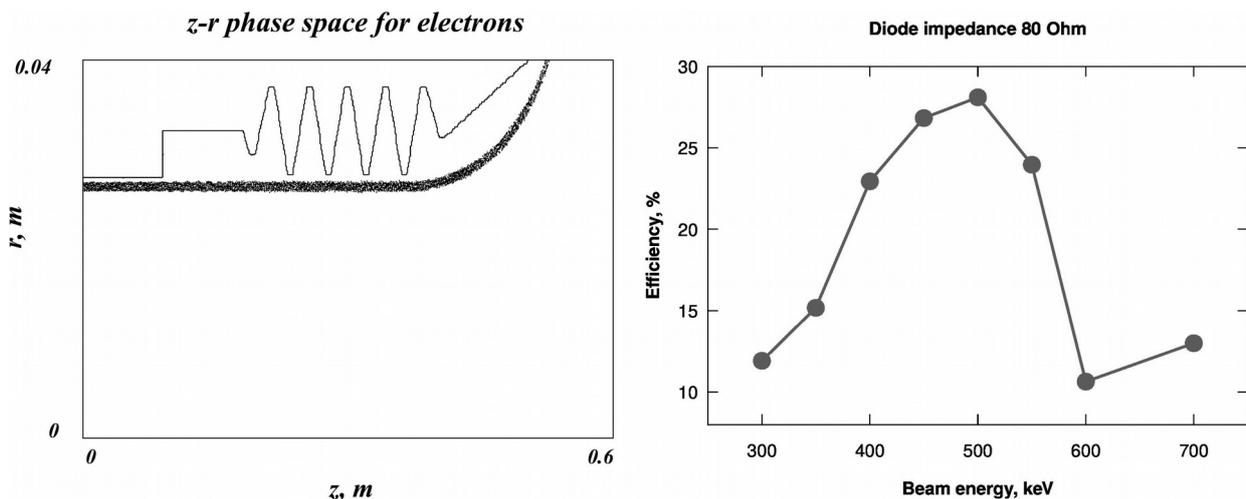


Fig.1. Geometry of the proposed resonant BWO in XOOPIC (left) and its efficiency as function of beam energy for beam impedance 80 Ohm (right).

### REFERENCES

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