ON-CHIP DETECTION OF RADIATION POWER FROM FLUX-FLOW OSCILLATORS WITH EPITAXIAL AND HIGH-J_C NbN/AlN/NbN JUNCTIONS

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For submillimeter-wave astronomy and global monitoring of atmosphere pollution, flux-flow-type Josephson oscillators (FFOs) are suitable for a tunable, compact, and low-power consuming local oscillator (LO) on a same chip with a SIS mixer. Recently, Nb-based FFOs were successfully tested as an integrated receiver's LO below 0.6THz. With the aim of the development of an efficient FFOs-based LO operating above 0.6THz, we have investigated the radiation power P of NbN-based FFOs. The designed and fabricated chip incorporates FFOs, SIS power detectors (DETs), and their coupling circuits. Both FFOs and DETs consist of epitaxial NbN/AlN/NbN junctions with high critical current density J_C (J_C >10kA/cm^2). The most part of the coupling circuit consists of NbN/SiO_2/Al microstrip lines whose *rf* loss is taken into account in its design. It has been found P>200nW, enough for the optimum pumping of a SIS mixer with *rf* resistance of 50Ω, is coupled to DETs in the frequency range of 0.5-0.8THz. The coupling bandwidth is larger than 20% of its central frequency. In the band, the radiation frequency is continuously tuned by the control current through the FFO in the range of 20-60mA. The peak power of 1.2μW is detected at 0.78THz, i.e. above the gap frequency of Nb. In addition, the dissipated power in a FFO is smaller than hundreds of μW that prevents the external heating on an integrated SIS mixer. These experimental results indicate that FFOs with high-J_C NbN/AlN/NbN junctions are applicable for an on-chip local oscillator above 0.6THz.