Multistage Collector Design Based on E×B Drift Concept for Gyrotron

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ABSTRACT

Single-stage depressed collectors have been successfully used in gyrotrons. With a collector efficiency of about 60 % it is possible to increase the overall electrical efficiency to above 50 %. In order to further increase the tube overall efficiency, it is necessary to use a multistage depressed collector (MDC) system. Although MDCs have been successfully used in the past in TWTs and klystrons, the design of MDC for gyrotron is not trivial due to the presence of a high magnetic field at the collector region. Several theoretical design approaches for MDC system for gyrotrons were recently published [1-5]. For the efficient sorting of the magnetic confined spent beam electrons on the electrodes is based on the E×B drift concept, which was proposed in Ref. 1. In that work, a design approach for gyrotron MDC was also presented. However, in that theoretical work an infinite number of electrodes was considered. In this work, a variety of pragmatic designs based on that approach are numerically investigated with a full three-dimensional simulation tool. MDCs with two, three and four stages were optimized for a high power gyrotron spent beam. A high efficiency is demonstrated for a variety of realistic spent beam energy distributions with a negligible reflected current. Furthermore, the possibility to use the E×B drift concept on the design of single stage depressed collector was investigated. The results of this work will be presented.

References

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