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Title:Generation of high power sub-terahertz radiation from a gyrotron with second harmonic oscillation

Authors:Saito, Teruo (1); Yamada, Naoki (1); Ikeuti, Shinji (1); Ogasawara, Shinya (2); Tatematsu, Yoshinori (1); Ikeda, Ryosuke (1); Ogawa, Isamu (1); Idehara, Toshitaka (1); Manuilov, Vladimir N. (3); Shimozuma, Takashi (4); Kubo, Shin (4); Nishiura, Masaki (4); Tanaka, Kenji (4); Kawahata, Kazuo (4)

Author affiliation:(1) Research Center for Development of Far-Infrared Region, University of Fukui, 3-9-1 Bunkyo, Fukui 910-8507, Japan; (2) Department of Energy Engineering and Science, Nagoya University, Nagoya 464-8463, Japan; (3) Nizhny Novgorod State University, Nizhny Novgorod 603600, Russia; (4) National Institute for Fusion Science, 322-6 Oroshi-cho, Toki 509-5292, Japan

Corresponding author:Saito, T.

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Abstract:New power records of second harmonic gyrotron oscillation have been demonstrated in the sub-THz band. The first step gyrotron of demountable type had succeeded in oscillation with power more than 50 kW at 350 GHz and nearly 40 kW at 390 GHz [T. Notake, Phys. Rev. Lett. 103, 225002 (2009)]. Then, the second step gyrotron of sealed-off type was manufactured. A cavity mode was carefully selected to avoid mode competition with a neighboring fundamental harmonic mode. Matching of the selected mode with the electron gun was also circumspectly considered. The second step gyrotron has attained higher power radiation than the first gyrotron. The maximum single mode power was 62 kW at 388 GHz. Then, the electron gun was modified for use of a different cavity mode with a higher coupling coefficient than that for the 62 kW mode. The new mode proved single mode oscillation power of 83 kW at about 389 GHz. These results are new second-harmonic-oscillation power records for sub-THz gyrotrons. The present study constitutes foundations of development of high power second harmonic sub-THz gyrotron for application to collective Thomson scattering measurement on fusion plasmas, especially on high-density plasmas such as those produced in LHD [N. Ohya, Phys. Rev. Lett. 97, 055002 (2006)]. This paper reports the design consideration to realize high power single mode gyrotron oscillation at second harmonic and the examination of oscillation characteristics of the gyrotron. ©2012 American Institute of Physics.

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