153

Accession number:20114514497106

Title:Impedance of hot-electron bolometer mixers at terahertz frequencies

Authors:Kollberg, Erik L. (1); Yngvesson, K. Sigfrid (2); Ren, Yuan (3); Zhang, Wen (4); Khosropanah, Pourya (5); Gao, Jian-Rong (3)

Author affiliation:(1) Department of Microelectronics and Nano Science, Chalmers University of Technology, Göthenburg SE-41296, Sweden; (2) Department of Electrical and Computer Engineering, University of Massachusetts, Amherst, MA 01003, United States; (3) Delft University of Technology, Kavli Institute of Nanoscience, Delft 2628 CJ, Netherlands; (4) Purple Mountain Observatory, Chinese Academy of Sciences, Nanjing, China; (5) SRON, Netherlands Institute for Space Research, Groningen, Netherlands

Corresponding author:Kollberg, E.L.(erik.kollberg@chalmers.se)

Source title: IEEE Transactions on Terahertz Science and Technology

Abbreviated source title: IEEE Trans. Terahertz Sci. Technolog.

Volume:1

Issue:2

Issue date:November 2011

Publication year:2011

Pages:383-389

Article number:6017152

Language:English

ISSN:2156342X

Document type:Journal article (JA)

Publisher:IEEE Microwave Theory and Techniques Society, 2458 East Kael Circle, Mesa, AZ 85213, United States

Abstract:This paper discusses the current distribution in thin-film devices, especially in a hot-electron bolometer (HEB) mixer at terahertz frequencies, and the consequences of different current distributions on the device impedance. We first present an approximate analytical model from which we derive a proposed rule of thumb for deciding when the film is thin enough to support a current distribution that is uniform in the transverse direction. We then verify this rule by performing electromagnetic simulations. Our conclusion is that the current distribution in thin films with a relatively high DC resistivity and small film thickness with respect to the skin depth is essentially uniform up to 8 THz. These results are crucial, e.g., for understanding radiation coupling between an HEB and an antenna and indispensable when analyzing detectors and receivers based on bolometric properties of thin films.

Number of references:16