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Accession number:20114314446982

Title:Superheterodyne amplification of electromagnetic waves of optical and terahertz bands in gallium nitride films

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Source title:Radioelectronics and Communications Systems

Abbreviated source title:Radioelectron. Commun. Syst.

Volume:54

Issue:8

Issue date:August 2011

Publication year:2011

Pages:401-410

Language:English

ISSN:07352727

Document type:Journal article (JA)

Publisher:Allerton Press Inc., 250 West 57th Street, New York, NY 10007, United States

Abstract:Superheterodyne amplification of electromagnetic waves of optical and terahertz bands in the case of three-wave interaction in n-GaN films with the space charge wave of millimeter band amplified due to negative differential resistance is studied. It is shown that amplification of the space charge wave in n-GaN films may be achieved on higher frequencies  $f \leq 500$  GHz than when using GaAs. The case of three-wave resonant interaction of two counter-propagating waves with the space charge wave is considered for the waveguide on based on GaN film on dielectric substrate. It is shown that gain of electromagnetic waves of optical band may reach 20-40 dB on the waveguide lengths of up to 100  $\mu\text{m}$ .

Number of references:19