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Accession number:20123515384473

Title:Frequency shifts in two-level ultra-deep reactive ion etched slow-wave structures for 0.1 THz backward-wave oscillations

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Source title:Applied Physics Letters

Abbreviated source title:Appl Phys Lett

Volume:101

Issue:7

Issue date:August 13, 2012

Publication year:2012

Article number:073508

Language:English

ISSN:00036951

CODEN:APPLAB

Document type:Journal article (JA)

Publisher:American Institute of Physics, 2 Huntington Quadrangle, Suite N101, Melville, NY 11747-4502, United States

Abstract:We present microfabricated slow-wave structures for millimeter- or terahertz-wave vacuum electronic sources. A two-level ultra-deep reactive ion etching (u-DRIE) on highly doped silicon wafers has been employed and allowed for complicated 3-dimensional structures with high aspect ratio. The measured spectra of return loss, however, show 1.2 and 6.8 upshifts in both cutoff and resonant frequencies, respectively. We found the suppression of two-level u-DRIE at the narrow channel between resonant cavities has caused the change of aspect ratios, i.e., saddle-shaped bottom surfaces, which is proved to be associated with the difference in frequency shifts as well as RF attenuation by comparison with theoretical prediction. © 2012 American Institute of Physics.

Number of references:15

Main heading:Slow wave structures

Controlled terms:Aspect ratio - Frequency shift keying - Natural frequencies - Silicon wafers - Terahertz waves

Uncontrolled terms:3-dimensional structures - Backward-wave oscillations - Bottom surfaces - Frequency shift - High aspect ratio - Microfabricated - Narrow channel - Reactive ion - Return loss - Slow wave - Theoretical prediction - Vacuum electronics

Classification code:718 Telephone Systems and Related Technologies; Line Communications - 717 Optical Communication - 716 Telecommunication; Radar, Radio and Television - 943 Mechanical and Miscellaneous Measuring Instruments - 714.3 Waveguides - 711.1 Electromagnetic Waves in Different Media - 711 Electromagnetic Waves - 714.2 Semiconductor

Devices and Integrated Circuits

DOI:10.1063/1.4745774

Database:Compendex

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