Tunable Negative Group Delay of Rectangular Waveguide Based on Corrugated Tantalum Nitride Slow Wave Structure

Zheng Liu[1], Jian Zhang[2], Xue Lei[3], Tianpeng Li[3], Jun Gao[3], and Zhijian Xu[3]

[1]PLA Strategic Support Information Engineering Universit
[2]Information Engineering University
[3]PLA Strategic Support Information Engineering University

August 16, 2022

Abstract

In this letter, a rectangular waveguide with tunable negative group delay (NGD) is proposed. Corrugated tantalum nitride (TaN) slow wave structure is used to generate the NGD response. The NGD value and NGD center frequency can be adjusted continuously by the corrugation width and height. The simulation results show that the NGD values of up to -0.7 ns are potentially available. A prototype of the proposed structure is fabricated and measured. The measured results show the fabricated structure is capable of generating up to -0.115 ns group delay at 19.4 to 19.8 GHz which is consistent with simulation predictions. To our best knowledge, this is the first time that the negative time delay has been realized at Ka-band in rectangular waveguide.

Hosted file

`maintext.docx` available at https://authorea.com/users/501454/articles/581922-tunable-negative-group-delay-of-rectangular-waveguide-based-on-corrugated-tantalum-nitride-slow-wave-structure