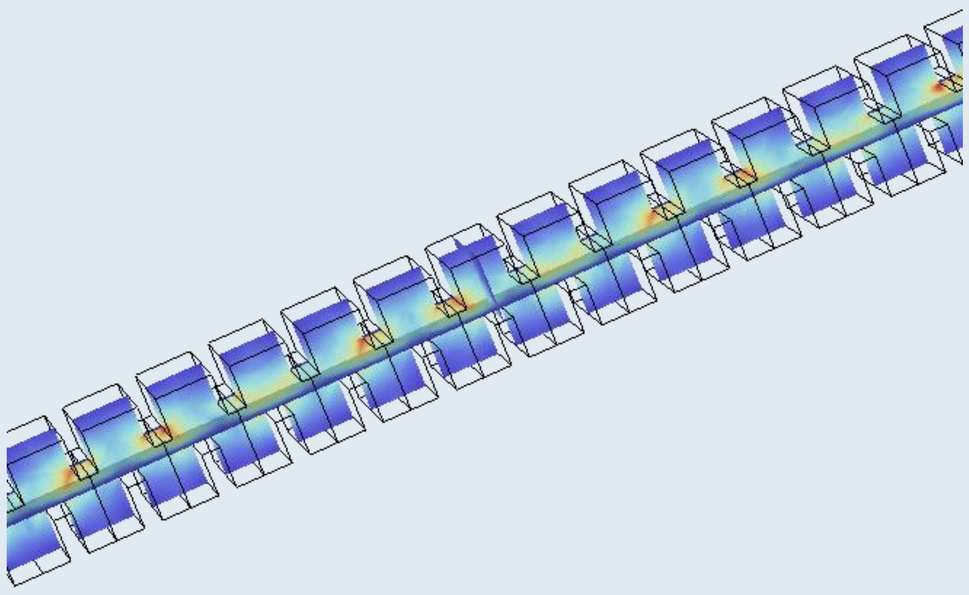

Design Of 0.2 THz Staggered Double Vane Beam-Wave Interaction Structure Using COMSOL Multiphysics

S-parameter characteristics and E-field pattern analysis of staggered double vane beam-wave interaction structure

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Introduction and Goals

- THz covers the frequency range from 0.1-10 THz.
- THz can be strongly utilized in the field of spectroscopy, communication, biomedical imaging, non-destructive evaluation (NDE), food industry and many more fields [1].
- To achieve the high output power along with broader bandwidth the backward wave oscillator (BWO) is a promising solution.
- In BWO, the beam-wave interaction structure is one of a core component [1-2].
- The staggered double vane interaction structure (SDVIS) possesses a planar and robust metallic geometry.
- In this content, the design of a 0.2 THz SDVIS structure has been presented and its S-parameter characteristics, and E-field pattern in the structure have been analyzed.

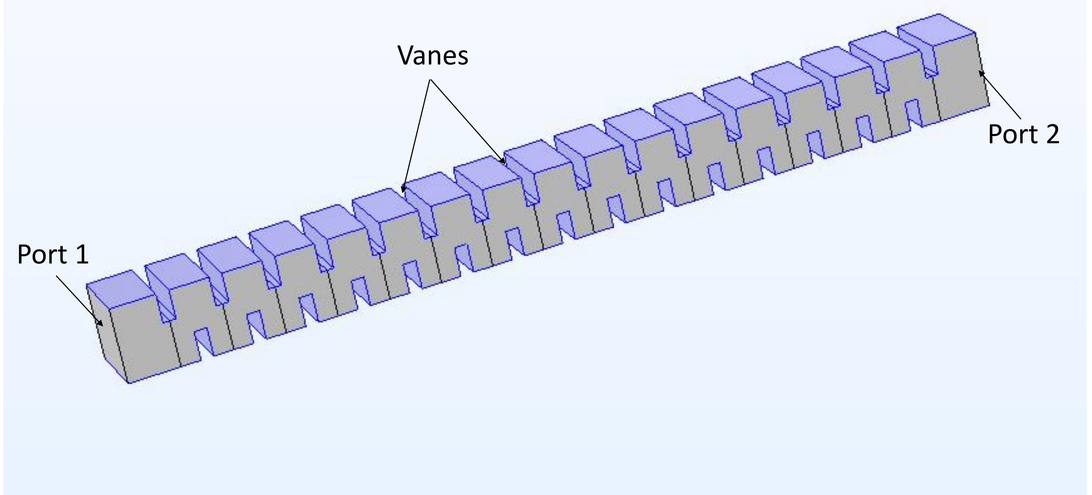

FIGURE 1: 3-D modelling of SDVIS

Methodology

- The design has been carried out through the RF module of COMSOL Multiphysics.
- The electromagnetic waves, frequency domain (emw) physics has been chosen for further analysis.
- The frequency domain general study has been utilized to analyze the S-parameter plots as well as the E-field pattern.
- The structure has been simulated for the frequency range 199-290 GHz to obtain the S-parameter characteristics.
- FIGURE 1 shows the 3-D view of SDVIS.

Results

- E-field distribution is shown in FIGURE 2(a).
- S-parameter characteristics are shown in FIGURE 2(b).
- The return-loss (S_{11}) is approximately below -30dB.
- Transmission (S_{21}) is approximately near in between 0 to -5 dB.
- This structure provides a broader bandwidth up to 91GHz.

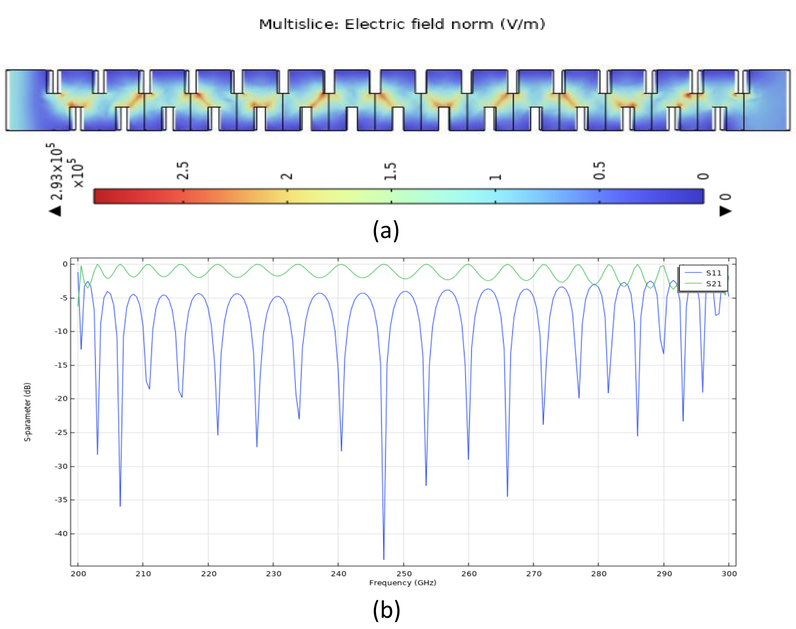

FIGURE 2: (a) E-field distribution, (b) S-parameter characteristics of SDVIS

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