Session 17. Millimeter-wave TWTs-II

April 30 (Tuesday) / 16:30 ~ 17:50 / Room 2

Session Chair: John Booske (University of Wisconsin, USA)

16:30 ~ 16:50

17.1 / Design and Experiment of An E-band Folded Waveguide Traveling Wave Tube

Rujing Ji (University of Electronic Science and Technology of China, China), Zhixin Yang (University of Electronic Science and Technology of China, China), Zugen Guo (University of Electronic Science and Technology of China, China), Qi Wang (University of Electronic Science and Technology of China, China), Ping Han (University of Electronic Science and Technology of China, China), Huarong Gong (University of Electronic Science and Technology of China, China)

An E-band folded waveguide traveling wave tube (FWGTWT) was designed, fabricated and tested. Experimental result shows that the prototype tube covers the bandwidth of 83-86GHz with the output power of above 30W, meanwhile, the peak power is 35W in 85.5GHz. The maximum electron efficiency is up to 3.3%. The tube is tested when the electron gun voltage is 17kV and the beam current is 62mA.

16:50 ~ 17:10

17.2 / Investigation on W-Band 100W Three-section Ridge-Loaded Folded Waveguide TWT

Fei Li (IECAS, China), Liu Xiao (IECAS, China), Jiandong Zhao (IECAS, China), Yuhui Sun (IECAS, China), Tianjun Ma (IECAS, China), Linlin Cao (IECAS, China), Jian Wang (IECAS, China), Hongxia Yi (IECAS, China), Xinwen Shang (IECAS, China), Mingguang Huang (IECAS, China)

A W-band 100W three-section folded waveguide traveling wave tube (TWT) is investigated by numerical simulation and fabrication experiments. The results show that the ridge-loaded folded waveguide circuit achieves higher coupling impedance than conventional folded waveguide circuit with dispersion characteristics almost unchanged. Three-section structure can not only increase gain and gain flatness of TWT, but also save cost by removing attenuator and improve machining straightness of each section ridge-loaded folded waveguide assembly by shortening length of it.

17:10 ~ 17:30

17.3 / Simulations of a W-Band Circular TWT

K. Nusrat Islam (University of New Mexico, USA), Edl Schamiloglu (University of New Mexico, USA), Andrey D. Andreev (University of New Mexico, USA), Frank Krawczyk (Los Alamos National Laboratory, USA), Bruce Carlsten (Los Alamos National Laboratory, USA)

We are exploring the amplification of W-band electromagnetic radiation using a dielectric-loaded traveling wave tube (TWT) by employing several particle-in-cell (PIC) codes. We are seeking to replicate recent results obtained by a Naval Research Laboratory's (NRL's) dielectric-loaded TWT design [1] consisting of a solid circular electron beam (26 kV, 100mA and 0.185 mm beam radius) surrounded with dielectric material, ε_r=13.5, and coupled to a TM_{01} electromagnetic wave at a frequency of 94 GHz. NRL used a finite-difference-time domain (FDTD) formulation in a 2-D cylindrical coordinate system to perform the dielectric-loaded TWT simulations. In our work, we have opted for PIC simulations comparing three different software tools-a 3-D Cartesian coordinate system 'FDTD-PIC method-based MAGIC', 'CST Electromagnetic and Multiphysics Simulation Studio Suite', and 'Improved Concurrent Electromagnetic Particle-In-Cell (ICEPIC)'. This paper summarizes our results from these studies.

17:30 ~ 17:50

17.4 / Investigation of a Sheet Beam RF Structure with Bragg Reflector for W band Amplifier

Richards Joe Stanislaus (CSIR-Central Electronics Engineering Research Institute, India), Anirban Bera (CSIR-Central Electronics Engineering Research Institute, India), Rajendra Kumar Sharma (CSIR-Central Electronics Engineering Research Institute, India)

A W Band staggered double vane (SDV) loaded traveling wave tube amplifier (TWTA) with two sections separated by a lossy dielectric loaded rectangular wave guide is studied in this paper. The dispersion characteristics and transient analysis of the slow wave structure are analyzed in Computer Simulation Technology Microwave studio (CST MWS) and High Frequency Software Simulator (HFSS). In this amplifier, we propose to use Bragg reflectors on both sides of the slow wave structure (SWS), at the windows for the sheet beam at the electron gun and collector ends; this increases the impedance bandwidth of the RF structure. The attenuator section is comprised of a rectangular waveguide loaded on either side with single lossy dielectric material spanning over 5.5 pitches. The loss profile of the attenuator and loss magnitude is optimized to provide a 20dB loss in separating the input and output sections. A bandwidth of 15GHz ranging from 90-105GHz is obtained through the analysis. In the PIC simulations, a sheet beam of 50mA current is fed with an operating voltage of 18.3kV. The TWTA yields 20dB gain in the 90-105GHz range.