Session 8. Millimeter-wave TWTs-I

April 29 (Monday) / 16:30 ~ 17:50 / Room 2

Session Chair: Zhaoyun Duan (University of Electronic Science and Technology of China, China)

16:30 ~ 16:50

8.1 / Fabrication and measurements of a planar slow wave structure operating in V-band

Giacomo Ulisse (Goethe University Frankfurt, Germany), Viktor Krozer (Goethe University Frankfurt, Germany), Nikita Ryskin (Institute of Radio Engineering and Electronics RAS / Saratov State University, Russia), Andrey Starodubov (Institute of Radio Engineering and Electronics RAS / Saratov State University, Russia), Alexey Serdobintsev (Saratov State University, Russia), Viktor Galushka (Saratov State University, Russia), Mikhail Samarskiy (Institute of Radio Engineering and Electronics RAS, Russia), Anton Pavlov (Saratov State University, Russia)

A traveling wave tube amplifier (TWTa) operating in V-band (62-65 GHz) was designed considering a planar slow wave structure (SWS). Particle in cell simulations were performed to calculate the gain and the output power of the TWT. The simulated TWT showed a maximum gain of 36 dB at 64 GHz and an output power of 16 W. The planar SWS was then fabricated with a laser machining technique. Sparameters measurements of the SWS showed excellent matching and low losses in the operating frequency band.

16:50 ~ 17:10

8.2 / 71 – 76 GHz Folded Waveguide TWT for Satellite Communications

C.W. Robertson (University of Strathclyde, UK), A.W. Cross (University of Strathclyde, UK), C. Gilmour (TMD Technologies LTD, UK), D. Dyson (TMD Technologies LTD, UK), P. G. Huggard (STFC Rutherford Appleton Laboratory, UK), F. Cahill (STFC Rutherford Appleton Laboratory, UK), M. Beardsley (STFC Rutherford Appleton Laboratory, UK), R. Dionisio (ESA ESTEC, NL), Kevin Ronald (University of Strathclyde, UK)

A high frequency folded waveguide travelling wave tube (TWT) has been designed to test this delay line technology. Envisaged applications of the technology are in satellite communications. PIC simulations predict an output power ~100 W over the frequency range of 71 – 76 GHz can be achieved for an input power of ~9 mW (40dB gain) using such a folded waveguide. Simulations of the return loss of the vacuum windows yield values lower than -30 dB cross the frequency band of interest.

17:10 ~ 17:30

8.3 / 80 to 100 Watts TWT in Q-band for Space Downlink Communication

Frédéric André (Thales AVS / MIS, France), Justin Demory (Thales AVS / MIS, France), Jean

Gastaud (Thales AVS / MIS, France), Wolfgang Dürr (Thales Germany / MIS, Germany), Dawid Kupidura (Thales Germany / MIS, Germany), Natanael Ayllon (ESA, The Netherlands), Roberto Dionisio (ESA, The Netherlands), Jérôme Puech (CNES, France)

The first breadboard results for the development of a new TWT in Q-band with 80 to 100W of saturated power are presented. Two technologies for the delay have been tested at TWT level. They have successfully reached the targetted performances in terms of power, efficiency and oscillation margins. More than 100W of saturated power has been reached with both technologies in broadband operation covering the full band of 5 GHz allocated around 40 GHz. These results give strong confidence on the feasibility of this commercial product.

17:30 ~ 17:50

8.4 / A Novel Beam Forming Electrode for Sheet Beam Electron Gun

Shaomeng Wang (Nanyang Technological University, Singapore), Sheel Aditya (Nanyang Technological University, Singapore), Yuanjin Zheng (Nanyang Technological University, Singapore)

A novel beam focusing electrode (BFE) is proposed for an electron gun to form a sheet electron beam. The proposed BFE is in the shape of an elliptical ring and is defined by the parameters of height and the lengths of the major and minor axis. The BFE is suitable for microfabrication and can be designed to form a sheet electron beam from either a rectangular cathode or circular cathode. A thermionic electron gun with a circular-cylindrical cathode is then designed based on the proposed BFE. CST particle studio is used to determine the electron beam trajectory and to achieve a sheet electron beam with beam current of 20 mA, voltage of 4000 V, and cross-section size of 0.75 mm×0.15 mm. The fabrication and assembly of the thermionic electron gun are also briefly described.