## Session 2. THz sources

April 29 (Monday) / 10:20 ~ 11:40 / Room 2

Session Chair: Joong Kim (Office of Naval Research, USA)

10:20 ~ 10:40

**2.1 / Multi-Color Coherent Terahertz Smith-Purcell Radiation Based on Compound Grating**

Juan-Feng Zhu (Peking University, Beijing), Chao-Hai Du (Peking University, Beijing), Lu-Yao Bao (Peking University, Beijing), Shi Pan (Peking University, Beijing), Hui-QI Bian (Peking University, Beijing), Fan-Hong Li (Peking University, Beijing), Pu-Kun Liu (Peking University, Beijing)

A multi-color coherent terahertz (THz) Smith-Purcell radiation based on compound grating is introduced in this paper. The periodically modulated depth in the compound grating is beneficial to decreasing the coupling strength of adjacent grooves and constructing a series of spoof surface plasmon (SPP) cavities. Owing to the weak coupling between two adjacent cavities, the multi-color coherent Smith-Purcell radiation in specific directions is induced by the excitation of free electron beam. This kind of Smith-Purcell radiation is promising for the development of THz radiation sources and THz communication.

10:40 ~ 11:00

**2.2 / [Keynote] A 850GHz Folded Waveguide Based on Thin Dielectric**

Lu Wang (Southeast University, China), Wenchen Xiang (Southeast University, China), Ningfeng Bai (Southeast University, China), Changsheng Shen (Southeast University, China), Xiaohan Sun (Southeast University, China), Pan Pan (Beijing Vacuum Electronics Institution, China), Jun Cai (Beijing Vacuum Electronics Institution, China), Jinjun Feng (Beijing Vacuum Electronics Institution, China)

We presents a folded waveguide based on thin dielectric (FWG-TD) for Terahertz traveling wave tube (TWT). Thin Dielectric layer helps to decrease phase velocity and improve the power capacity. The simulation results show that this FWG-TD has lower phase velocity compare to conventional folded waveguide, which decreases 15% at center frequency. Coupling structure of FWG-TD and grating filters are designed and simulated, which shows a good transmittance around 850GHz. Finally, PIC simulation show that the output power of this FWG-TD is 605mW, where the power gain is 20.8dB at 850GHz.

11:00 ~ 11:20

**2.3 / Slow Wave Structure based on Defect Photonic Crystal Waveguide**

Yang Xie (Nanjing University of Science and Technology, China), Wei Hong (Nanjing University of Science and Technology, China), Ningfeng Bai (Southeast University, China), Changsheng Shen

(Southeast University, China), Xiaohan Sun (Southeast University, China), Pan Pan (Beijing Vacuum Electronics Institution, China), Jun Cai (Beijing Vacuum Electronics Institution, China), Jinjun Feng (Beijing Vacuum Electronics Institution, China)

We present a defect photonic crystal waveguide (DPCW) as slow wave structure (SWS) for Terahertz (THz) TWT in this paper. The SWS is consists of photonic crystal waveguide and a defect unit in center. Due to strong confinement effect of electromagnetic, metallic PCW only needs four periods in transverse direction, which help to decrease the transverse size of SWS. The simulation results show that it has low phase velocity, 0.182c, and high pierce impedance, 47Ω, at 850GHz, which show the capability of DPCW as terahertz SWS with sufficient confinement and efficient interaction.

11:20 ~11:40

**2.4 / Parallel multi-beam and its application in THz band**

Kaichun Zhang (University of Electronic Science and Technology, China), QIan Xu (University of Electronic Science and Technology, China), Neng Xiong (University of Electronic Science and Technology, China), Wangju Xu (University of Electronic Science and Technology, China)

A conception of parallel multi-beam is proposed for vacuum devices in THz band. This multi-beam, combined with the planar geometry of parallel pins circuit, can be applied in 300GHz-500GHz band. We have identified stable multi-beam formation and transport as the key enabling technology for this type of device. The convergence and control of this multi-beam is investigated by an elliptical solenoidal magnetic field. The dispersion of the slow-wave structure (SWS) is studied and compared with that of conventional corrugated waveguide SWS. Also, the interaction impedance in beam tunnel is calculated. The result shows that the structure has high interaction impedance suitable for this type of parallel multiple beams. To demonstrate these characteristics, two types of BWO at the central frequency of 340 GHz and 520GHz with 4-beam and the circuit of 3-row pins are studied by 3-D particle-in-cell simulation. Results indicate that this multi-beam combined with the planar geometry can lead to high-peak power output with low operation current of each beam and greater allowable total beam current.