

## **The first results of the HCN interferometer measuring atmospheric pressure air plasmas**

J.B. Zhang<sup>1</sup>, H.Q. Liu<sup>1\*</sup>, L.Q. Hu<sup>1</sup>, Y.X. Jie<sup>1</sup>, X.C. Wei<sup>1</sup>, Y Zhang<sup>1</sup>, J.X. Xie<sup>1,2</sup>, S.X. Wang<sup>1</sup> and H. Lian<sup>1,3</sup>

*1) Institute of Plasma Physics, Chinese Academy of Sciences, Hefei 230031, China*

*\*E-mail : hqliu@ipp.ac.cn*

*2) University of Science and Technology of China, Hefei, Anhui 230026, China*

*3) University of California, Los Angeles, California 90095, USA*

A HCN heterodyne interferometer has been designed for measuring electron densities of Experimental Research Apparatus for Electromagnetic Science (ERAES) for hypersonic vehicle plasma in near space [1], whose density is from  $1 \times 10^{15}$  to  $3 \times 10^{19}/\text{m}^3$  and the pressure is from 50Pa to 1500Pa. The light source is hydrogen cyanide (HCN) laser with wavelength of  $337\mu\text{m}$ , which has high spatial resolution compared with microwave interferometer. The interferometer is configured as a Mach-Zehnder interferometer, which intermediate frequency (IF) is generated by the Doppler shift with a rotating grating. The spatial and temporal resolution of the HCN interferometry is reach to about 14mm and  $100\mu\text{s}$  respectively. The antenna-coupled ALGaN/GaN-HEMT have been used as detectors which have more high sensitivity— typical RF responsivity is around 900 V/W — than VDI planar-diode Integrated Conical Horn Fundamental Mixers in the HCN interferometry. The first results of the HCN interferometer designed for ERAES have been obtained in the recent experimental campaign, with phase resolution up to  $0.5^\circ$ .

### **References**

- [1] Zhang J B , Liu H Q , Jie Y X , et al. The conceptual design of high temporal resolution HCN interferometry for atmospheric pressure air plasmas[J]. Journal of Instrumentation, 2018, 13(01):T01004-T01004.