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Experimental evidence of nonlinear standing wave effect excited by higher harmonics in very high frequency capacitive discharges[1] KAI ZHAO, YONG-XIN LIU, YOU-NIAN WANG, School of Physics and Optoelectronic Technology, Dalian University of Technology, China — Previous theory and experiment have demonstrated that the standing wave effect in very-high-frequency (VHF) capacitive discharge can cause severe plasma non-uniformity. In this work, the spatial distribution of electromagnetic field in a 100 MHz capacitively coupled argon discharge has been measured utilizing a newly designed high-frequency magnetic probe, combined with a resonance hairpin probe to determine the plasma density. Our results show that the radial profile of plasma density exhibits a center-peaked distribution at 3 Pa, suggesting a pronounced standing wave effect. Observed from the FFT spectra of the magnetic measurement results, it is found that the fundamental frequency component of magnetic field tends to be linear increased with the radial position, whereas its higher harmonic components turn out to be maximum at the positions between the reactor center and the electrode edge. Furthermore, with the increase of the harmonic order, the position corresponding to the maximum magnetic field can be clearly observed to shift toward to the reactor center. These results has demonstrated that the nonuniformity of the plasma density dominated by the standing wave effect could primarily ascribed to the higher harmonics close to the reactor center.

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