Creation of plasma column with various density gradients to generate THz-radiation in beam-plasma interaction [[1]](#footnote-1)\*)

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Since 2010 in BINP SB RAS research of high power THz radiation generation based on beam-plasma interaction has been carried out. First experimental results were obtained at GOL-3 facility [1]. Then, the GOL-PET facility was created in order to study in detail the processes of terahertz radiation generation. Two mechanisms of generation were discovered and described during the research [2,3]. In both cases relativistic electron beam (REB) excites and pumps upper-hybrid plasma waves. According to the first mechanism upper-hybrid plasma waves are reflected by plasma density gradients to transform in electromagnetic waves with the same frequency [2]. According to the second mechanism upper-hybrid plasma waves merge to create electromagnetic wave with the doubled frequency [3]. The studies performed at the GOL-PET facility are currently aimed at generation of radiation by transformation of upper hybrid waves in electromagnetic ones. It requires creation of plasma column with various density distribution. On the one hand, in order to obtain the effective relaxation of REB in a plasma and following excitation of upper-hybrid the plasma column with an relatively uniform density distribution along the axis of the solenoid is required. On the other hand, the conversion of upper-hybrid plasma waves into electromagnetic ones requires the creation of radial density gradients. Therefore, plasma discharge system that allows us create plasma column with predefined plasma density distribution is an important part of the facility for caring out experiments of the generation of powerful terahertz radiation.

Considering those circumstances improvements of plasma discharge system at GOL-PET facility were made. Improvements were aimed at creation of plasma column with different density distribution along solenoid length and diameter. Also, diagnostic systems of high voltage discharge and plasma parameters was improved. In current report improved system of high voltage discharge will be described and results of experiments with creation of plasma column with various density gradients will be presented.

References

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1. \*) [abstracts of this report in Russian](http://www.fpl.gpi.ru/Zvenigorod/XLVII/Pt/ru/GK-Samtsov.docx) [↑](#footnote-ref-1)