TIME- OF- FLIGHT SPECTROMETER OF CORPUSCULAR PULSED FLOWS BASED ON DIAMOND DETECTOR FOR LASER THERMONUCLEAR SYNTHESIS [[1]](#footnote-1)\*)

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Currently one of the promising directions in the development of controlled thermonuclear fusion (CNF) is the implementation of a controlled thermonuclear reaction in a plasma initiated by high-power pulsed laser radiation [1]. In a compressed fuel heated up to thermonuclear temperatures, the synthesis reactions of hydrogen isotopes occur. In this case, the emitted products provide information about the state of the compressed target nuclei and it is an effective tool for diagnostics of compressed plasma. This work is devoted to the development of a time-of-flight spectrometer of pulsed neutron and corpuscular flows based on a diamond detector for the study of physical processes in laser thermonuclear fusion (LTF).

The diamond detector is radiation resistant to all types of radiation, operates at high temperatures (up to 300 ° C), it has a high energy resolution and the fast response no worse than 1.0 ns. The detector registers a wide range of ionizing radiation: photons, neutrons, alpha particles, atoms and ions. The detector will measure the fluxes of fusion reaction products in the conditions of accompanying photon background radiation

Due to the different emission velocity of particles and neutrons from a thermonuclear "flash", a diamond detector installed at a certain distance from a thermonuclear target irradiated with high-power laser radiation will work as a time-of-flight spectrometer of corpuscular pulsed fluxes of with the given length of flight base (~ 10 m). This will make it possible to study the temporal dynamics of a thermonuclear plasma, initiated by pulsed laser radiation, and to analyze the structure of a thermonuclear source of an LTF.

It is proposed to use a diamond homoepitaxial structure as a detector for time-of-flight spectrometry [2]. This is a boron-doped HPHT substrate coated with the thin CVD film of type IIa diamond 40-50 µm thick. The small thickness of the CVD film will make it possible to record a signal with a duration comparable to the characteristic time of thermonuclear combustion in LTF.

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References

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1. \*) [abstracts of this report in Russian](http://www.fpl.gpi.ru/Zvenigorod/XLVIII/It/ru/DV-Krasilnikov.docx) [↑](#footnote-ref-1)