SUPERCONDUCTING HTS CONDUCTORS AND MAGNETS FOR FUSION – PROBLEMS AND SOLUTIONS IN RUSSIA AND IN THE WORLD [[1]](#footnote-1)\*)

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Vysotsky V.S.

JSC VNIIKP. Moscow, Russia

At present, in Russia and in the world, projects of new thermonuclear fusion devices using high-temperature superconductors (HTS) of electromagnetic systems (EMS) are being actively considered and developed. The use of high-temperature superconductors makes it possible to obtain magnetic fields in EMC windings of the order of 20 T and higher, which makes it possible to reduce the dimensions of tokamaks and increase the efficiency of the device. However, to create EMC, special combined conductors with operating currents about tenths of kiloamperes are required and with current density up to hundreds of A/mm2, made on the basis of standard HTS tapes produced by the industry.

In the paper the possible projects of fusion devices with HTS EMS in the world and in Russia are considered. Variants of possible conductors based on HTS tapes and approaches to manufacturing EMC windings based on them are discussed. The approach to the manufacture of a toroidal winding by Commonwealth Fusion Science (USA) and the results of its tests are discussed, when a magnetic field of 20 T at a temperature of 20 K was obtained first in the world. The results of recent research and testing of conductors for the FFHR helicoid fusion reactor in Japan are presented. Russian approaches to the development of conductors for EMC of fusion devices are considered. The major problems and scientific directions of research and research in the development of HTS EMS for fusion devices are formulated.

1. \*) [abstracts of this report in Russian](http://www.fpl.gpi.ru/Zvenigorod/L/E/ru/IO-Vysotskiy.docx) [↑](#footnote-ref-1)