

Tritium Targets for Research in Basic Nuclear Physics

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For about last 10 years RFNC-VNIIEF is intensively involved in performed by Joint Institute for Nuclear Research (JINR) basic nuclear research with the use of tritium.

The main goal of RFNC-VNIIEF in this field was to developed special processing equipment and tritium radiation-safe targets to be used in a wide pressure and temperature range.

This equipment and targets were used in regular research of muon catalyzed fusion (Dzhelepov Laboratory for Nuclear Problems), and to study structures of exotic light nuclei and nuclear systems near the drip-line (Flerov Laboratory for Nuclear Research).

A line of special targets composed of two modifications of tritium high - pressure targets; low-temperature tritium high- pressure targets and a cryogenic tritium target has been developed to study muon catalyzed fusion. In 1997-2003 these targets were used when measuring main characteristics of muon catalysis in liquid tritium, double D/T and triple H/D/T mixtures as a function of density, temperature and hydrogen isotopes concentration in a mixture.

A set of targets, including liquid-tritium target and two modifications of a gas tritium target, has been developed to study structures of exotic light nuclei and nuclear systems. The targets presented new possibilities in research on properties of light exotic nuclei generated in reactions with radioactive ^3H , ^6He and ^8He beams. The developed targets were used in 2000-2007 experiments when properties of the main resonance level ^4H were defined; nucleus ^5H was obtained for the first time; energy, width and quantum numbers of three resonance levels of the nucleus were determined. Since November 2006 to March 2007 a number of experiments were performed to study properties of ^{10}He nucleus and to seek a hypothetical nuclear system composed of four neutrons (the so-called tetra neutron).

The paper presents designs of the targets, their technical and operational characteristics as well as service results.