The special state standard for unit neutron flux density was established on the basis of a modernized neutron generator type NG-160 and it ensures the reproduction of the unit of thermal neutron flux density in the range of $10^8$-$10^{11}$ neutron/sec·cm$^2$ for diffused and $10^6$-$10^9$ neutron/sec·m$^2$ for directional neutron radiations, and of the unit of neutron flux density with the energy of 14.5 ±0.1 MeV in the range of $10^8$-$10^{11}$ neutron/sec·m$^2$ for directional neutron radiations.

This standard is a first step in providing an up-to-date set of standards for neutron measurements at nuclear-physics installations. On the basis of the recently-developed neutron sources the following sources will also be established in the near future: that of neutrons with energies of 2.5 MeV with a spectrum approaching that of fission neutrons, and delays with a spectrum which follows the law of "1/E" in the range of epithermal neutrons. With the bringing into use of the electrostatic accelerator type ~G-2M, it will be possible to provide the standard with sources of monoenergetic neutrons whose energies are in the range of 10 keV-17 MeV and to raise the power of the thermal neutron source approximately up to $10^{13}$ neutron/sec·m$^2$.

The neutron source in the special state standard is provided by the nuclear reaction $^7$Li(d, n)$^4$He established by means of an accelerator of the type of a neutron generator (NG). The task of establishing neutron sources on the basis of mass-produced NG-160 neutron generators and providing them with a sufficiently intensive and stable neutron field required their modernization and the development of a system for stabilizing the neutron flux density. The stabilization system maintains at a constant value during 2-6 h of continuous operation a preset neutron source power with a root-mean-square deviation of 0.2-0.5% from the mean value.

The thermal neutron source consists of a 500 x 500 x 600 mm assembly 1 which is made of graphite and Plexiglas and contains sources of fast neutrons (Fig. 1). The assembly is surrounded with the thermal neutron reflector 2, consisting of a 100-mm-thick Plexiglas screen. The working cavity is made in the form of a cube with a side of 50 mm. This cavity can be extended into a 50 x 50 x 600 mm longitudinal channel for the purpose of calibrating neutron transducers. The design of the source is also suitable for leading out a neutron beam from the assembly for the purpose of calibrating neutron radiometers. The neutrons are generated in the two targets 4 and 5, located inside heavy water.
the assembly and spaced longitudinally along the accelerator's ion conductor. The stabilization system regulates the position of the accelerated neutron beam with respect to the targets in such a manner that their neutron output remains the same for a constant total output of the two targets. The neutron monitors which control the operation of the stabilization system are located in the three assembly channels, two of which pass in the immediate proximity of the targets, whereas the third one is in the depth of the assembly. Figure 1 also shows the diaphragm, the graphite slug, the Plexiglas stopper, and the cadmium screen.

For regulating and controlling the operation of the monitors and the equipment used in the installation for working with the accelerator, the assembly is provided with four plutonium-alpha-beryllium neutron sources, which have a total output of $4 \times 10^6$ neutrons/sec and establish in the assembly a stable reference thermal neutron field with a flux density of about $2 \times 10^3$ neutrons/sec $\cdot$ cm$^2$.

The source of neutrons with energies of 14.5 MeV consists of the NC accelerator's target unit which provides the reaction $T(d, n)^3$He. The design of the target unit (Fig. 2) is based on the method of measuring neutron radiation, namely, the method of counting $\alpha$ particles ($^4$He) which are associated with the reaction of obtaining neutrons.

The $\alpha$ particles' detector consists of the type FEU-58 miniature photomultiplier with a CsI(Tl) crystal which is 0.3-0.4 mm thick and is covered with a sprayed aluminum layer for protection from the scattered deuteron. The target is placed perpendicularly to the direction of the $\alpha$ particles' registration. The collimator of these particles serves at the same time as the holder of the target, thus ensuring a fixed geometry for registering the associated particles. Figure 2 also shows the deuteron beam shield, the target's output diaphragm, the $\alpha$ counter's shield, and the $\alpha$ counter's input diaphragm.

The neutron beam under certification is radiated in a direction opposite to that of the $\alpha$ particles' registration. The total thickness of the target and the target unit elements in the direction of the neutron beam does not exceed 0.8 mm, thus ensuring only a small disturbance of the output neutron radiation. The target unit is cooled by means of liquid nitrogen vapor.

The neutron monitor used for controlling the stabilization system consists of an all-wave neutron counter.

The measuring equipment of the standard consists of a set of reference neutron-activation specimens of substances for determining the neutron flux density, and the instruments for measuring the specimens' induced activity and for recording $\alpha$ particles in the reaction producing neutrons with energies of 14.5 MeV.

Table 1 provides a list of specimens and some of their characteristics.

The equipment for measuring the specimens' induced activity comprises an installation for determining the activity by means of the $4\pi$-y-coincidence method, a scintillation spectrometer, and a flow-type $4\pi$ counter. The detector unit of the coincidence installation and the scintillation spectrometer are located in protected housings made of iron and lead which in turn are placed in a protective recess made of concrete with 0.5-m-thick walls.

The channel for recording the associated particles consists of a scintillation transducer, amplifier, single-channel pulse analyzer, and scaler. An output is provided to a type AI-128-2 pulse analyzer and a type BZ-15 printer, as well as to a ratemeter with a recording instrument. In operation with a thermal neutron source this channel is used for checking the stability of the thermal neutron field.

The auxiliary equipment of the standard consists of a pneumatic mail system and a calibration rule for the 14.5 MeV neutron source. The pneumatic system has two channels for rapid transportation of small specimens and their strictly determined location in fields of the 14.5 MeV and thermal neutron sources. The calibration rule provides a remote controlled linear and angular displacement in the field of neutrons of the same energy and the location in a given position of the neutron instruments under calibration. The reproducibility of placing objects in a given position amounts to $\pm 0.5$ mm.