

# The project of a complex of electron beam technologies IPCE RAS

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## The radiation-technological center for rendering services on electron beam technologies

The purpose - introduction of electron beam technologies by development of powerful power devices: ultrafast diodes dice, IGBT transistors, tiristory



Fig. Silicon semi-conductor plates with preparations of devices after electron beam processing

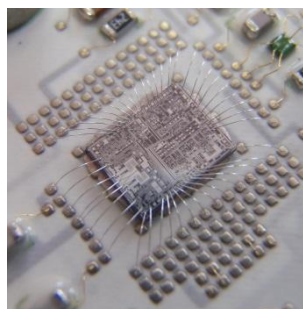


Fig. Semi-conductor devices made of the radiation-modified semi-conductor plates

№№	№ Parties	Time up to an irradiation , ns	Doze κGy	Time after an irradiation , ns
<b>2Д641В-5</b>				
1	177	350-550	400	46-52
2	192	400-540	400	48-54
3	196	400-570	400	46-53
<b>2Д640В-5</b>				
5	178	520-540	400	46-51
5	190	510-550	400	52-54
6	198	510-600	400	52-54
<b>2Д663А-5</b>				
7	211	520-580	400	46-50

The table. Time of return restoration before and after an electronic irradiation

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## Radiating modifying of polymers

Manufacture of cable armature is based on technology cross-section - tailored polymers with plastic memory of the form. In comparison with usual polymers these polymers possess the improved mechanical properties, chemical and thermal stability

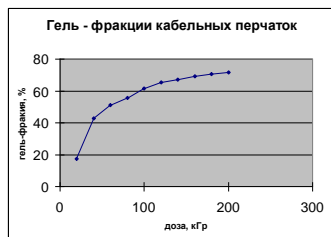


Fig. Dependence of gel - fraction heatshrinkable products from a dose

Fig. Trailer heatshrinkable cuffs external and internal installation are intended for terminal three and four-core power cables on a voltage up to 10 Kv. Are established on open air and in a room, including as mast. A range of allowable ambient temperatures from -50 ° up to +50°C, and also at relative humidity up to 98 % and temperature up to 35°C

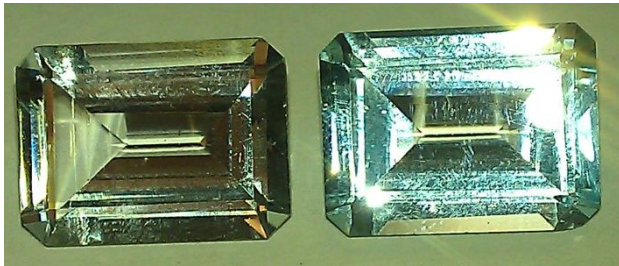


Fig. Installation heatshrinkable cuffs, casings and insulating cuffs on electric cables.



Compoundings of polymeric compositions are developed, optimum doses and circuits of an irradiation which allow to stretch (drag out) preparations heatshrinkable elements of complete sets of cable armature in 5,5-5,7 times are picked up. These details can have a complex (difficult) configuration (cable gloves) and variable thickness of walls from 1 up to 7mm, however, the developed technology allows to receive necessary uniformity lacing on volume of a detail. The total absorbed doses change in a range from 80 up to 200 kGy.

# Technology of updating of precious and semiprecious stones and minerals



Technology of updating of precious and semiprecious stones and minerals

Beam accelerated electron allows to change their physical and chemical properties At fluence up to  $10^{18}$  e/sm<sup>2</sup> various stones, including a topaz, a greenstone, wardite, scapolite agate, tourmaline, quartz, beryl, zircon, diamond were exposed to electron beam processing

Electron beam processing technical, impact diamonds at fluence  $5 \cdot 10^{16}$  e/sm<sup>2</sup> with the subsequent отжигом leads to to increase of durability of diamonds. The special mode annealing diamonds was carried out at temperature equivalent annealing diamonds in the chisel tool.

Completely black the greenstone becomes at fluence  $2 \cdot 10^{17}$  e/sm<sup>2</sup>.

Painting in blue color at a topaz is reached at fluence  $1,2 \cdot 10^{16}$  e/sm<sup>2</sup>, and density of intensity of painting depends on concrete size of a doze, technology of an irradiation and structure of impurity. On the basis of serial marks of polymers due to electron beam updating and additives to create materials for heatshrinkable products with the raised sensitivity an irradiation for acceleration and regulations of process spatial lacing polymer, thus to provide protection of polymer within 30 years under operating conditions (atmospheric influences, damp priming coat, solar radiation, course of an electric current with heatin genvironments up to 80 degrees, etc.) for all climatic zones of the CIS and Europe.

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During last 10 years IPCE RAS the Russian Academy of Science renders services to 40 enterprises.

Therefore there is an objective necessity for expansion of this center on the new modern equipment. The part of the equipment can be modernized with the help of the Russian manufacturers (Efremov NIEFA, Budker Institute of Nuclear Physics), and also representatives of company - world leaders in the field of radiating technologies - Siemens, Varian, Phillips.

Operational experience IPCE RAS the Russian Academy of Science, Joint-Stock Company JSC "VSP-MICRON", Open Company JSC "ERG" and the colleagues connected to us on business in the field of electron beam technologies has shown perspectivity and the importance of the received results, their importance and a financial recoupment. Our creative collective, developing joint projects, searches for financial sponsors for mutually advantageous private - state partnership in business of introduction of innovative electron beam technologies in an economic complex of Russia.



The projected radiation-technological center settles down on the area of 3500 sq. m. from which 2500 sq. m. already are in operation, On the working areas entered into operation three radiation-technological installations, one of which new and two a stage of modernization operate. On the entered areas it is planned to involve two powerful accelerators in the specified cooperation



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# Project team

**IPCE RAS the Russian Academy of Science**



**Joint-Stock Company JSC "VSP-MICRON"**



**Open Company JSC "ERG"**



**Efremov NII EFA**



**Budker Institute of Nuclear Physics**



**FSUE "RPE TORIY"**



**GSPI Rosatom**



**GIPRONII RAS**



**SIEMENS**

**ASML**

**PHILIPS**

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