1.4.35. SMALL-SIZE BETATRON FOR THE ENERGY 2.5 MeV FOR FIELD INSPECTION

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In Research Institute of Introscopy, a new model of the smallest defectoscopic betatron for the energy 2.5 MeV was developed. For Russian customers this betatron is named MIB-2.5D, when it is exported it is called PXB-2.5D.

Its main application is field inspection. It is recommended to use it for inspection of steel thicknesses from 50 to 120 mm. In this range, the exposure time for MIB-2.5D is less than for other best models of X-ray units manufactured for the same purpose. The betatron has smaller focal spot, which enhances image quality.

Structurally, the betatron consists of five units: radiator, power converter, power supply unit, control panel and remote dosimeter. Such a packaging was aimed at the maximum possible reduction of weight of the heaviest unit, i.e. radiator.

Betatron control is fully automatized. Exposure can be set by three parameters: time, internal dose, and dose behind the cassette and film. In the latter case there is no need to take into account focal spot and absorber thickness.

A petrol-electric generating set is recommended to be used as a self-contained power source. A power factor corrector in the supply circuit allows reducing the total power consumed from the source.

The technical characteristics of the betatron are given below.

1. Peak energy of accelerated electrons – 2.5 MeV.

2. Guaranteed bremsstrahlung dose rate at 1 m distance from the target, at the peak energy – 0.7 R/min.

3. Maximum sizes of the focal spot – 0.2 × 2 mm.

4. Maximum power consumption from AC mains at 50, 60 Hz, voltage 220 V with permitted deviations from the nominal value ±10%, not more than 0.8 kW.

5. Minimum size of the work field at 1 m focal distance and darkening non-uniformity not more than 10%, 350 × 350 mm.

6. Exposure time (D7 film and lead screens, optical density 2.0, focal distance 0.7 m).

– At 50 mm of steel thickness – 2.5 min.

– At 120 mm of steel thickness – 25 min.

7. Relative radiographic sensitivity for steel at more than 50 mm thicknesses (D7 film with lead shields) 1 – 1.5%.

8. Overall dimensions of the radiator, 440 × 300 × 150 mm, weight 30 kg.