

COMPARATOR UNITS FOR METROLOGICAL CERTIFICATION OF WEAK X-RAY AND GAMMA RADIATION FIELDS BY DOSE RATE

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Comparator units based on commercially available detection units can be used to certify parameters of weak standard fields of X and gamma radiation by method of comparison.

Comparator unit consists of BDKG-05M spectrometric detection unit for gamma radiation, BDKR-01M spectrometric detection unit for X radiation, and a PC with dedicated application software.

Spectrometric dosimetry method based on the principle of conversion of measured instrument spectrum is used to build comparator units from BDKR-01M and BDKM-05M detection units. This method of dose rate calculation by "spectrum-dose" transformation operator allows finding the full dose rate value by applying the function $G(E)$ without conversion of spectrum from measured amplitude distribution map of photon radiation [1].

In order to find the conversion function $G(E)$ we calculated instrument functions of detection unit response to parallel monoenergetic gamma radiation flux in 50 keV – 350 keV energy range for BDKR-01M and in 20 keV - 3000 keV for BDKG-05M, as well as other parameters. The calculation was carried out by Monte Carlo method on SNEGMONT software [2].

The results are used as a baseline to assess energy dependence of scintillation detectors' dose sensitivity and determine "spectrum-dose" transformation operators to measure air kerma dose rate, ambient equivalent dose rate and exposure dose rate.

Specially selected detectors with high measuring path stability and low resolution, and application of the above approach allow using detection units in photon radiation metrology to calibrate standard and working measuring instruments with maximum error 3% – 6% by applying weak X and gamma radiation fields in the energy range from 5 keV to 3000 keV.

ATOMTEX Scientific and Production enterprise (Minsk, Belarus) and Federal State Unitary Enterprise "D.I.Mendeleyev Institute For Metrology" (St. Petersburg, Russia) are planning to use these comparator units in parallel for metrological purposes.

1. S.Mariuchi. A New Method of Dose Evaluation by Spectrum Dose Conversion Operator and Determination of the Operator, JAERI 1209, 1971.

2. G.Fokov, G.Shulgovich. 14-th Annual Seminar Digest "Spectrometric Analysis. Instruments and Ways of Processing Data Using Personal Computers". Obninsk: SEI "CICE&T", 2008. P.145.