

ISO 8769

**Reference sources for the calibration of
surface contamination monitors —
alpha-, beta- and photon-emitters**

ISO8769 – Existing standards

ISO 8769:1988

*Reference sources for the calibration of surface contamination monitors —
Beta-emitters (maximum beta energy greater than 0.15 MeV) and alpha-emitters*

ISO 8769:1996

*Reference sources for the calibration of surface contamination monitors — Part 2:
Electrons of less than 0.15 MeV and photons of energy less than 1.5 MeV*

Problems

Uniformity and its specification:

*For the purpose of specifying the uniformity of a source with respect to surface emission rate per unit area, the source shall be considered as comprising a number of portions of equal area. **The uniformity shall then be specified as the estimated standard deviation of measurements of the individual portions about the mean value for the whole surface as a percent of the mean value.** The area of the portions shall be 10 cm² or less.*

*Uniformity may be measured by inserting a masking plate between the source and the detector. The masking plate should have an aperture of appropriate size and should be thick enough to absorb particles of the maximum energy emitted (see the table). **Knowledge of uniformity will make it possible to use smaller areas of the source while maintaining traceability.***

Typical problem - 2007 UKAS LAB Comparison

Uniformity mapping of benchmark source (cps/10 cm²)

| | | | | |
|--------|--------|--------|--------|--------|
| | | | | |
| -0.40% | 0.80% | 5.70% | 1.60% | -2.50% |
| 1.20% | 3.90% | 3.50% | 4.70% | -0.30% |
| -5.60% | -3.20% | -2.60% | -2.20% | -4.50% |

SD SD = 3.45% ✓✓ Class 1 PASS

Typical problem

| | | | | |
|-------------|--------------|----------|---------------------|--------|
| -1.0% | 2.4% | 10.0% | -3.5% | -7.5% |
| -10.0% | 12.0% | 17.0% | 14.0% | -0.9% |
| -16.0% | 3.5% | 5.0% | -6.5% | -13.0% |
| SD = | 10.0% | ✓ | Class 1 PASS | |

Calibration of 20 cm² probe using central area

Emission rate/cm² in probe area ~ 14% higher than for whole source area

Assume 15% calibration uncertainty ($k=2$)

1.1 % difference from type test mean → FAIL (at 95% c.l.)

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➤ **Tighter uniformity specification**

For the purpose of specifying the uniformity of a source with respect to surface emission rate per unit area, the source shall be considered as comprising a number of portions of equal area.

The area of the portions shall be 5 cm² or less.

The uniformity shall be expressed as the relative experimental standard deviation derived from the emission rates from each individual portion of the whole source. The emission rate from each individual portion shall not be different from the mean value for the whole surface by more than the *UNIFORMITY LIMIT*.

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➤ Uniformity Limits

Class 1: 5%

Class 2: 10%

Working

Sources: preferably same as Class 2

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➤ Uniformity Measurement

Uniformity shall be determined using a masking device between the source and a detector. **The masking device shall have an aperture of appropriate size and provide sufficient shielding of the detector to ensure that the contribution from areas outside the aperture area should not contribute more than 5% of the measurement result from any individual area.** Care should be taken to always use the same portion of the detector to minimize effects due its possible non-uniform response

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➤ Reporting requirements

- a) radionuclide and its half-life [1];
- b) source identification number;
- c) surface emission rate, its uncertainty and the reference date;
- d) activity, calculated to correspond to the same reference date as in c) above, and its uncertainty;
- e) active area and dimensions of source and its uncertainty;
- f) depth of active layer from front surface;

[1] Half-life values shall be the current values provided by the Decay Data Evaluation Project (DDEP)

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➤ Reporting requirements

- g) nature, thickness, **density and dimensions** of substrate;
- h) nature, thickness, **density and dimensions of filter** (if any);
- i) uniformity and table of emission rates of all individual portions relating position and emission rate;**
- j) class of source.

Manufacturers may decide to give further information of help to the user. Markings on the source itself shall indicate the radionuclide and the source identification number.

Comments

Full text available from Mike Woods/IRMF website?

Comments formally to BSI NCE/2 (ASAP)

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