

HS436 Reliability Testing Procedure for Ionising Radiation Detectors

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| Policy Hierarchy link | Radiation Control Act 1990 Radiation Control Regulation 2003 Work Health and Safety Policy | | |
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| Associated Documents | HS601 Ionising Radiation Procedure | | |
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1. Purpose and Scope

This procedure describes the requirements for testing ionising radiation detectors, used with unsealed sources, to ensure they are capable of carrying out the function for which they were designed (fitness for purpose). This procedure is used to establish that each detector has the same response to a given level of ionising radiation when tested again under the same geometrical conditions used for that detector.

This procedure does not constitute “calibration” of detectors but is a substitute method of testing which is more appropriate for the type of equipment used to detect low levels of ionising radiation. Rationale

This procedure applies to testing of ionising radiation detectors which provide count rates (eg counts per second or counts per minute) from sources emitting gamma , medium and high energy beta radiation. Typically this involves equipment of the mini monitor range of detection equipment used with P32, C14, S35, I125, Se75, Fe59. These detectors are the Geiger-Mueller or scintillation detector or proportional counter rate meter type.

The scope also includes X-ray detection equipment used to detect leakage from X-ray producing equipment.

This procedure does NOT cover:

- 1) Fixed or portable survey monitoring equipment measuring in $\mu\text{Sv/hr}$. That type of equipment requires annual calibration traceable to a national standard.
- 2) Neutron detection equipment.

Ionising radiation detectors measuring in counts per second or counts per minute are used only to identify presence or absence of radiation. It is therefore only important that they are able to detect ionising radiation on a visual screen and audibly at levels greater than background. This procedure describes the requirements to ensure that radiation detectors operate satisfactorily.

Detectors can be Geiger-Mueller (GM), scintillation detectors or proportional counters. This procedure describes the testing of detectors using gas mantles containing thorium

232 as a test source, though any radioactive source providing suitable visual response could be used.

2. Definitions

This section sets out definitions for key terms and acronyms referred to in this Procedure. Definitions must be consistent with other UNSW documents, particularly the associated Policy.

3. Procedure

3.1 Test Source

Use a test source of ionising radiation which is proven to give a significant and stable reading at the surface of the detection probe (or at a measurable fixed distance). A thorium 232 type gas mantle provides sufficient radiation to produce a suitable mid range response (100-300 cps). The activity of the thorium in these gas mantles is typically 740 Bq (0.02 μ Ci).



3.2 Labelling The source should be labelled with:

- a unique identification and
- the response from a calibrated contamination monitor

This source can now be considered to be a standard for detector testing if it has a suitably long half life.

(eg thorium 232, $\frac{1}{2}$ life is 1.41×10^{10} years).



3.3 Response

The response from a detector should be recorded against the response of the test source by a calibrated detector. If the meter reading varies by more than 10% of the test reading, the detector should be considered not fit for purpose and should be quarantined prior to repair/maintenance.

It is recommended that all detectors are checked immediately prior to use with a known source to ensure there is a satisfactory response. The radiation detector should be labeled after inspection with a radiation inspection label.



Appendix A: History

| Version | Authorised by | Approval Date | Effective Date | Sections modified |
|---------|---------------|-----------------|------------------|--|
| 1 | HR Director | 1 December 2006 | 21 December 2006 | New Document |
| 2 | HR Director | 1 June 2008 | 1 July 2009 | Section 2 |
| 3 | HR Director | 21 March 2010 | 21 March 2010 | All- Formatting 3.3 Response Links and procedure name change. |
| 3.1 | HR Director | 22/04/2013 | 22/04/2013 | Updated Branding Logo in accordance with UNSW Branding Guidelines. Modified the document identifier from OHS to HS in |

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| | | | | accordance with WHS legislation review |
| 3.2 | Director, UNSW Safety and Sustainability | 30 April 2014 | 30 April 2014 | Reviewed for administrative updates |