

AS/NZS 4378:1996
IEC 789:1995

Australian/New Zealand Standard[®]

**Characteristics and test conditions
of radionuclide imaging devices—
Anger type gamma cameras**

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This Joint Australian/New Zealand Standard was prepared by Joint Technical Committee HT/23, Medical Diagnostic Imaging Equipment. It was approved on behalf of the Council of Standards Australia on 6 February 1996 and on behalf of the Council of Standards New Zealand on 14 February 1996. It was published on 5 May 1996.

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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee HT/23 on Medical Diagnostic Imaging Equipment, as a Joint Standard.

This Standard is identical with and has been reproduced from IEC 789:1992, *Characteristics and test conditions of radionuclide imaging devices; Anger type gamma cameras*.

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<i>Reference to International Standard or other publication</i>	<i>Australian/New Zealand Standard</i>
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NU1 Performance measurements for scintillation cameras	

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AUSTRALIAN/NEW ZEALAND STANDARD

1 Scope and object

The object of this Standard is to specify terminology and test methods for declaring the characteristics of Anger type GAMMA CAMERAS. These consist of a COLLIMATOR, a DETECTOR SHIELD, and a RADIATION DETECTOR ASSEMBLY, together with recording and display devices.

2 Terminology and definitions

For the purposes of this Standard, the definitions given in IEC 788 apply, together with the supplementary definitions given in annex A.

Defined terms are printed in small capitals.

3 Test methods

All measurements shall be performed with the PULSE AMPLITUDE ANALYSER WINDOW settings specified in table 1.

Additional measurements with other settings, as specified by the manufacturer, can be performed. Before the measurements are performed the camera shall be adjusted by the procedure normally used by the manufacturer for an installed unit and shall not be adjusted specially for the measurement of specific parameters.

Unless otherwise specified, measurements shall be carried out at count rates not exceeding 20 000 counts per second.

3.1 *Measurements of SYSTEM SENSITIVITY*

The measurement shall be carried out using the cylindrical phantom of polymethylmethacrylate as specified in figure 2. The plane source shown in figure 1 shall be placed in the cylindrical hole with the dimensions shown in figure 2, the remainder of the hole shall then be filled by a cylindrical part the dimensions of which are also shown in figure 2. The phantom, including the source, shall be placed on the COLLIMATOR (distance $d = 0$) and centered on the COLLIMATOR AXIS.

The measured value shall be expressed in counts $s^{-1} \cdot Bq^{-1}$.

NOTE - Measurements of SYSTEM SENSITIVITY without scatter, using the source cuvette of figure 1 placed directly on the COLLIMATOR FRONT FACE, may be carried out.

3.2 LINE SPREAD FUNCTION, FWHM, FWTM and EW

3.2.1 Measurement of the LINE SPREAD FUNCTION with COLLIMATOR

A solution containing a selected radionuclide shall be placed in a tube with an inner diameter of 1 mm and length approximately equal to the width of the FIELD OF VIEW. This tube shall be placed with its axes perpendicular to the COLLIMATOR AXIS and aligned parallel to one of the electronic axes at the depth of measurement in water or water-equivalent material covering the whole FIELD OF VIEW. The air gap between the COLLIMATOR FRONT FACE and the surface of the scattering medium shall be less than 5 mm. The depth of the scattering medium along the COLLIMATOR AXIS shall be 200 mm.

The measured quantity $L(x)$, for example the number of counts, shall be integrated within sets of areas with length not more than 30 mm and parallel to the line source and width equal to or less than 10 % of the FULL WIDTH AT HALF MAXIMUM (FWHM) at the depth of measurement. The areas shall abut each other.

The measured quantity shall be expressed as a percentage of the maximum value. The lateral extension of the set of areas shall be to a point where the measured quantity is 1 % of its maximum value, or up to the border of the DETECTOR FIELD OF VIEW. The measured number of counts at the maximum of the LINE SPREAD FUNCTION shall be at least 10 000 at each distance from the COLLIMATOR. If some other quantity is measured, provision shall be made to obtain the same statistical accuracy. The measurement shall be carried out in three parallel planes with the center of the sources at 50, 100 and 150 mm from the COLLIMATOR FRONT FACE and the source aligned parallel to the X- and Y-electronic axes. A radionuclide appropriate to the COLLIMATOR in use shall be chosen from table 1.

3.2.2 Measurement of the INTRINSIC LINE SPREAD FUNCTION

A multiple slit transmission phantom shall be used as shown in figure 4.

NOTE - This phantom is only suitable for energies equal to or less than 140 keV.

The slit transmission phantom covering the entire FIELD OF VIEW shall be placed at the centre of the detector face (COLLIMATOR removed) and the area outside the FIELD OF VIEW shall be shielded with lead.

An uncollimated shielded source shall be positioned vertically above the centre of the phantom at a distance of at least five times the maximum linear dimension of the circular FIELD OF VIEW (2 m for a 40 cm circular FIELD OF VIEW camera, figure 5). The orientation of the phantom shall be adjusted until its slit axis is aligned parallel to the X- or Y-electronic axis. Digital data shall be acquired with a pixel size equal to or less than 10 % of the intrinsic FWHM. The peak pixel number of counts shall be greater than 1 000. Profiles of width $30 \text{ mm} \pm 5 \text{ mm}$ shall be obtained at right angles to the slit axis.

3.2.3 Evaluation of the measurement of the LINE SPREAD FUNCTION

From the measured LINE SPREAD FUNCTIONS (3.2.1 and 3.2.2) the following data shall be obtained:

- a) The calculated MODULATION TRANSFER FUNCTION (MTF) from the measurements described in 3.2.1, presented as a set of graphs with linear scaling;