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WEK-WS674 Accelerator M-Area Internal and External Measurement Stand

The stand is mainly used to measure leakage radiation inside and outside the accelerator head M-area. According to the method WS674, thermoluminescent dosimeters are placed in holes at different positions on the stand to measure leakage radiation dose. Measurements shall be performed in a phantom. Each side of the phantom shall be at least 5 cm larger than the radiation field; the depth of the phantom shall be at least 5 cm greater than the measurement depth. The incident surface shall be perpendicular to the reference axis and placed at the normal treatment distance.

At the maximum field size, for the given electron energies, measure the dose ratio of stray X-rays to the total absorbed dose.

Method for Relative Surface Dose Measurement during X-ray Irradiation

Measurements shall be performed in a phantom. Each side of the phantom shall be at least 5 cm larger than the radiation field; the depth of the phantom shall be at least 5 cm greater than the measurement depth. The incident surface shall be perpendicular to the reference axis. The detector shall be placed at the normal treatment distance.

Remove all beam-shaping devices that can be taken off without tools. All flattening filters shall remain in their designated positions. At the maximum field size, measure the relative surface dose for each electron energy given in Table 2.

Leakage Radiation through the Beam Limiting Device

X-rays passing through the beam limiting device

Measurement conditions:

- Completely shield the radiation exit port with X-ray absorbing material having at least two tenth-value layers. For non-collapsible beam limiting devices, measure at the minimum field size.
- Use a radiation detector with a cross-section $\leq 1\ cm^2$ to measure at the location of maximum leakage radiation.
- Measurements shall be performed at the depth of maximum absorbed dose in a phantom.

Measurement procedure:

- Set a rectangular field symmetrically to maximum (X- direction) × minimum (Y- direction).
- Measure at 24 points with the radiation detector, calculate the average, and determine the percentage relative to the maximum absorbed dose.
- Then set the field symmetrically to minimum (X- direction) × maximum (Y- direction) and repeat the measurement described in step b).
- Repeat the above measurements for all X- ray energies.
- If a multileaf collimator is used, open the adjustable or interchangeable collimator to produce a square field of about 300 cm^2 (approx. 18 cm × 18 cm). Close the multileaf collimator to the minimum consistent with that field, and measure the area shielded by the multileaf collimator using the radiation detector.

Electron beams passing through the beam limiting device

Measurement conditions:

- Use 10 mm of tissue- equivalent material as a buildup simulation. For electron beam applicators / limiting systems of all sizes, at the corresponding maximum and minimum energies, perform radiography at the normal treatment distance under the most unfavourable combination of data measured for the electron energies specified in the type test.
- Determine the point of maximum absorbed dose in the region between the line 2 cm outside the geometric field edge and the boundary of the M- area.
- Use a radiation detector with a cross- section not larger than 1 cm^2. The probe shall have adequate shielding against radiation scattered from material below the radiation detector.

Measurement procedure:

- In the M- area, along the eight dividing lines (see Figure A.2), at intervals of 2 cm, from the point 5 cm outside the geometric field edge to the inner boundary of the M- area, measure with the radiation detector.
- For each electron beam applicator / limiting system, determine the percentage value of the average radiation detector reading relative to the maximum absorbed dose at the reference axis at the normal treatment distance.

Leakage Radiation Measurement outside the M- area (neutrons excluded)

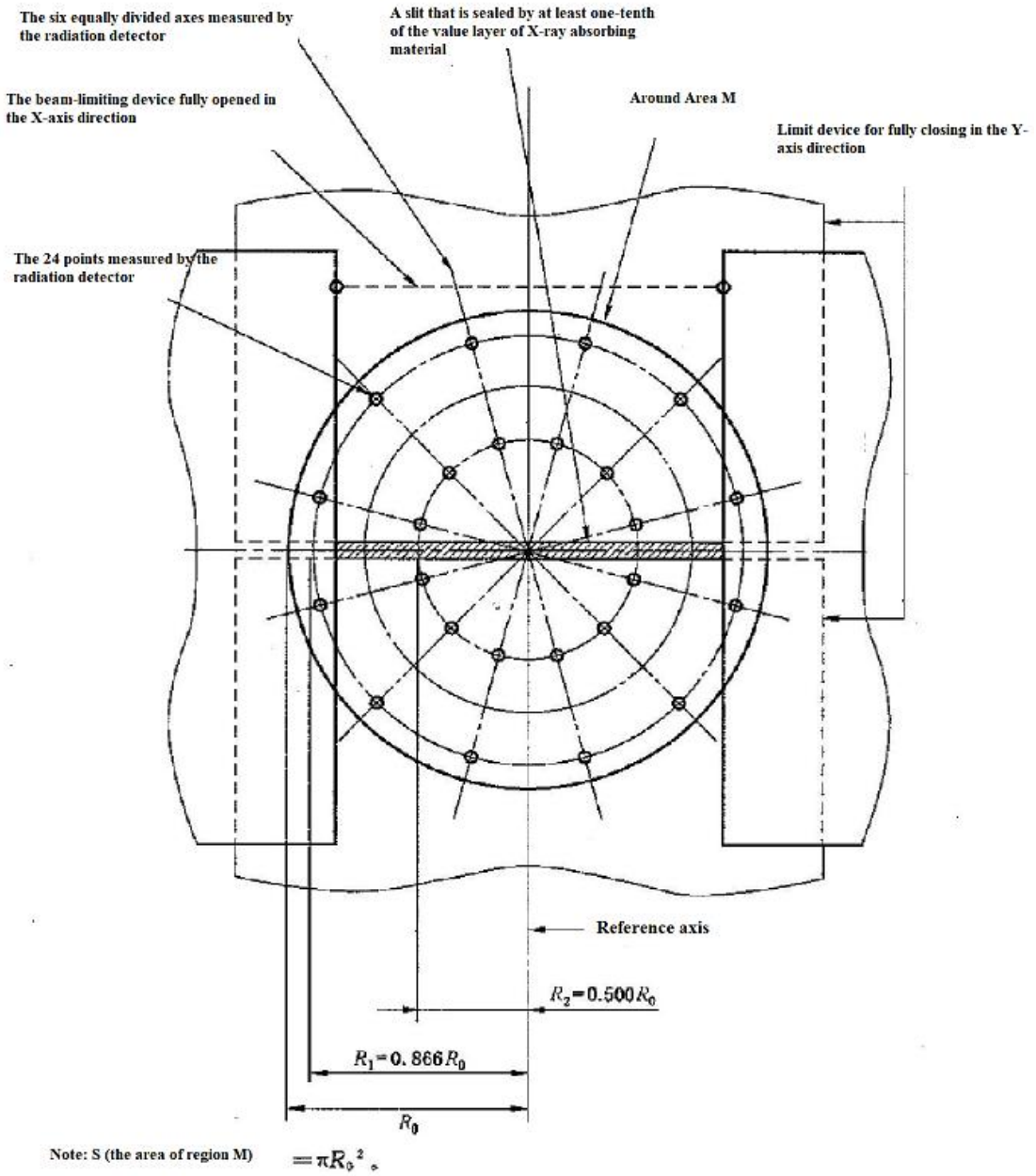
Measurement conditions:

- Based on type test results, under the combination of conditions that gives the maximum leakage radiation.

- At all X- ray energies and at the highest electron energy, determine the points of maximum leakage radiation and measure at these points with the radiation detector.

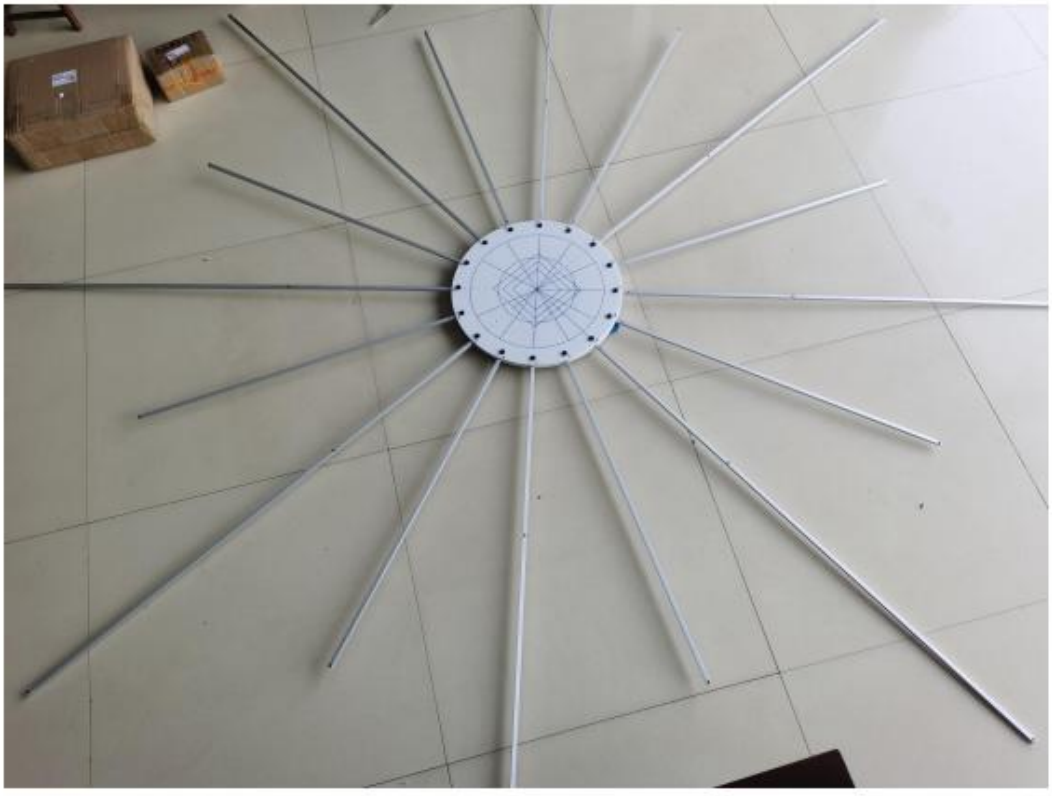
Measurement procedure:

- Measure at the 41 positions given in Figure A.3 using the radiation detector.
- Calculate the percentage value of the average absorbed dose due to leakage radiation using the average of 24 measurement values.



Configuration List

Item	Quantity	Specification and Use
Detector disc (with dose- element holes)	1 piece	41 holes for placing dosimeters, arranged at different positions on the disc
Aluminium tubes (for placing dosimeters)	32 holes	
Aluminium tube set 1	18 pieces	10 × 10 mm, length 1448 mm; tubes No. 1, 3, 5, 7, 9, 11, 13, 15 are connected to the disc with corresponding numbers
Aluminium tube set 2	8 pieces	10 × 10 mm, length 965 mm; tubes No. 2, 4, 6, 8, 10, 12, 14, 16 are connected to the disc with corresponding numbers
Positioning screws	16	M6 screws used to fix the aluminium tubes to the detector disc
Detector tray	1 piece	Used to hold the detection elements
Installation instruction manual	1 copy	



The stand can be customised according to various requirements!