SCHEDULE 1

Regulations 3(2) and (3), 5(3)(b)(ii) and Schedule 2 Part 1 paragraphs 1 and 2

METHOD OF MEASUREMENT OF IRRADIATION

*(This Schedule sets out (with a correction in paragraph 1(5)(**1**)) the provisions of Annex III to Directive 1999/2/EC of the European Parliament and of the Council on the approximation of the laws of the Member States concerning foods and food ingredients treated with ionising radiation(**2**))*

PART 1

Dosimetry

Overall average absorbed dose

1.—(1) It can be assumed for the purpose of the determination of the wholesomeness of foodstuffs treated with an overall average dose of 10 kGy or less, that all radiation chemical effects in that particular dose range are proportional to that dose.

(2) The overall average dose, $\overline{D}$, is defined by the following integral over the total volume of the goods:

$$\overline{D} = \frac{1}{M} \int p(x,y,z)\, d(x,y,z)\, dV$$

where	M	=	the total mass of the treated sample
	p	=	the local density at the point (x,y,z)
	d	=	the local absorbed dose at the point (x,y,z)
	dV	=	dx dy dz, the infinitesimal volume element which in real cases is represented by the volume fractions.

(3) The overall average absorbed dose can be determined directly for homogeneous products or for bulk goods of homogeneous apparent density by distributing an adequate number of dosimeters strategically and at random throughout the volume of the goods. From the dose distribution determined in this manner an average can be calculated which is the overall average absorbed dose.

(4) If the shape of the dose distribution curve throughout the product is well determined, the positions of minimum and maximum dose are known. Measurements of the distribution of dose in these two positions in a series of samples of the product can be used to give an estimate of the overall average dose.

(5) In some cases, the mean value of the average values of the minimum dose ($\overline{D}$min) and maximum dose ($\overline{D}$max) will be a good estimate of the overall average dose: i.e., in these cases:

(**1**) The Directive omits the word “average” after “overall”.
(**2**) O.J. No. L 66, 13.3.1999, p.16.

$$\text{overall average dose} \approx \frac{\overline{D}\,\text{max} + \overline{D}\,\text{min}}{2}$$

The ratio of $\frac{\overline{D}\,\text{max}}{\overline{D}\,\text{min}}$ should not exceed 3.

PART 2

Procedures

2.—(1) Before routine irradiation of a given category of foodstuffs begins at a radiation facility, the locations of the minimum and maximum doses are determined by making dose measurements throughout the product volume. These validation measurements must be carried out a suitable number of times (e.g. 3-5) in order to make allowance for variations in product density or geometry.

(2) Measurements must be repeated whenever the product, its geometry or the irradiation conditions are changed.

(3) During the process, routine dose measurements are carried out in order to ensure that the dose limits are not exceeded. Measurements should be carried out by placing dosimeters at the positions of the maximum or minimum dose, or at a reference position. The dose at the reference position must be quantitatively linked to the maximum and minimum dose. The reference position should be located at a convenient point in or on the product, where dose variations are low.

(4) Routine dose measurements must be carried out on each batch and at regular intervals during production.

(5) In cases where flowing, non-packaged goods are irradiated, the locations of the minimum and maximum doses cannot be determined. In such a case it is preferable to use random dosimeter sampling to ascertain the values of these dose extremes.

(6) Dose measurements should be carried out by using recognised dosimetry systems, and the measurements should be traceable to primary standards.

(7) During irradiation, certain facility parameters must be controlled and continuously recorded. For radionuclide facilities the parameters include product transport speed or time spent in the radiation zone and positive indication for correct position of the source. For accelerator facilities, the parameters include product transport speed and energy level, electron current and scanner width of the facility.