

# Wide Area Reference Sources

Twenty-Seventh IRMF Meeting, NPL  
26th May 2003

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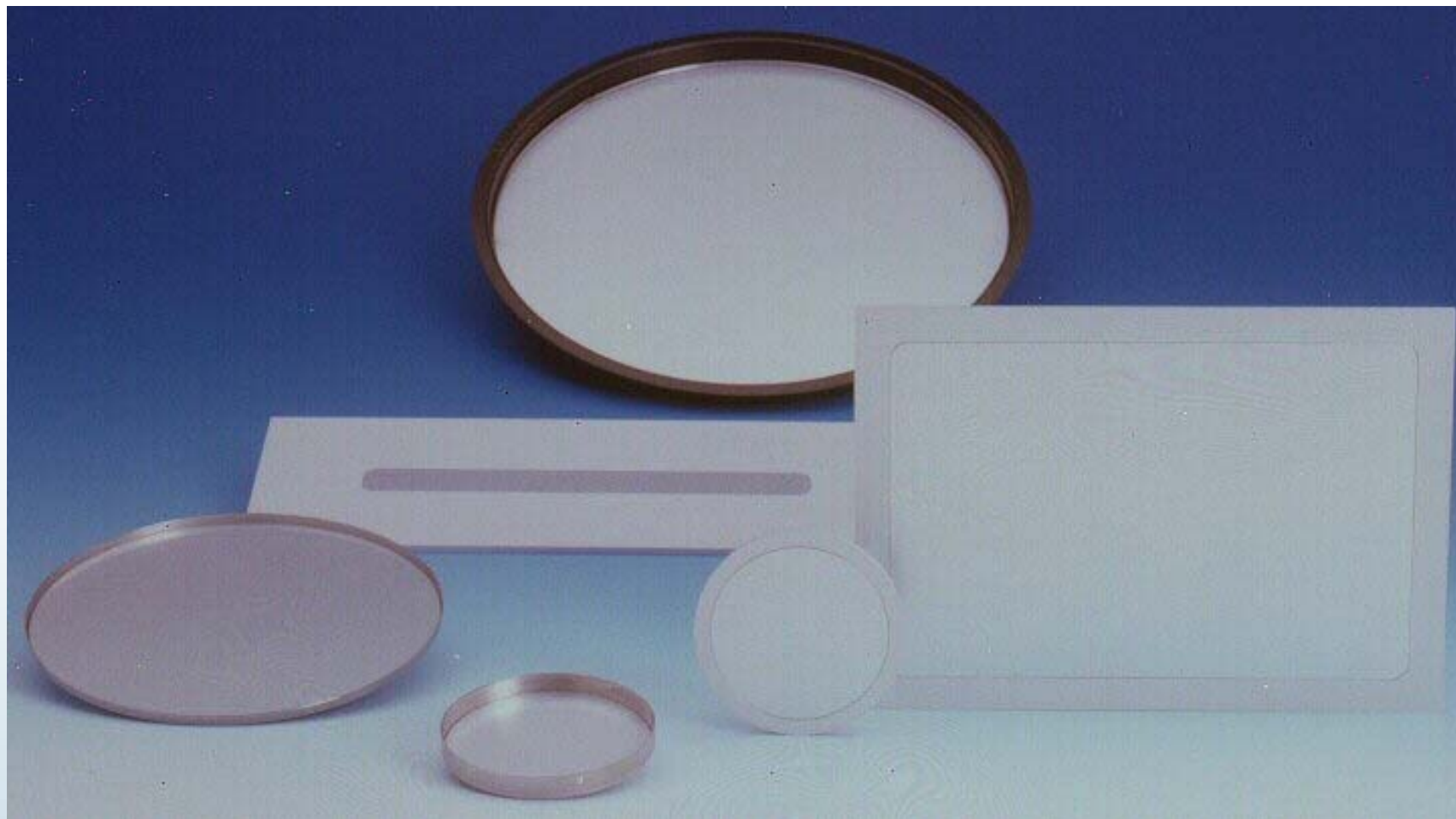
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# WARS according to ISO 8769



- Specification
- Production
- Measurement
- Discussion of NRPB complaint

# WARS for different applications



## Classification of WARS according to ISO 8769 (Reference Sources for the calibration of surface contamination monitors)

- Class 1 sources:
  - calibrated by National Standards Laboratory  
(NPL, NIST, etc.)
- Class 2 sources:
  - calibrated by an accredited laboratory  
(accredited by UKAS, DKD, etc.)
- Working sources:
  - traceable to national standards

Important specifications of Class 1 and 2 sources according to ISO 8769 :

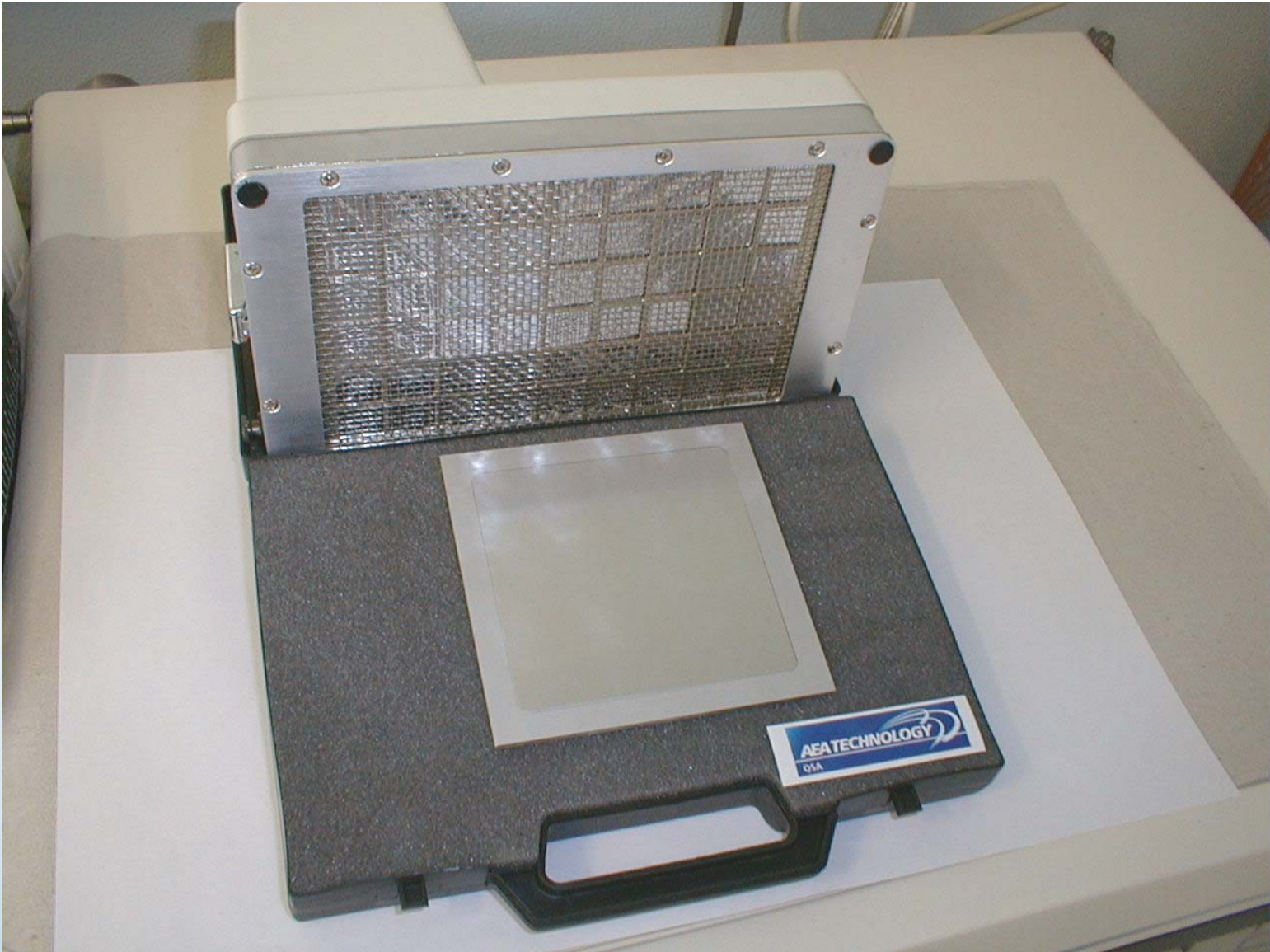
- Activity and particle surface emission rate have to be calibrated
- Surface emission rate R:  
$$2.000 \text{ s}^{-1} > R < 10.000 \text{ s}^{-1}$$
- Active area of source:  $\geq 150 \text{ cm}^2$
- Uniformity:  $< 10 \%$

# Uniformity

...the source shall be considered as comprising 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 cm<sup>2</sup> or less.

- AEAT WARS are manufactured by anodizing aluminium foils of 0.3mm thickness.
- During this process the activity is incorporated within the top layer of the source with approx. 5 to 6  $\mu\text{m}$  thickness.
- The microscopic holes in the source are covered by another chemical process called „Sealing“.
- Finally the foil is mounted in a holder, which is normally a 3mm thick aluminium backing.

# WARS with contamination monitor



# Measurement of Class 2 sources

## 1. Measurement of **uniformity**:

windowed position sensitive proportional counter  
(Instant Imager, Packard Comp. )

## 2. determination of **activity** :

- pure alpha/beta emitting nuclides:  
windowless proportional counter ;
- gamma emitting nuclides (Cs-137, Co-60)  
NaI with Multichannel Gamma-spectrometer

# Measurement of Class 2 sources

After mounting on backing foil follows

3. Measurement:

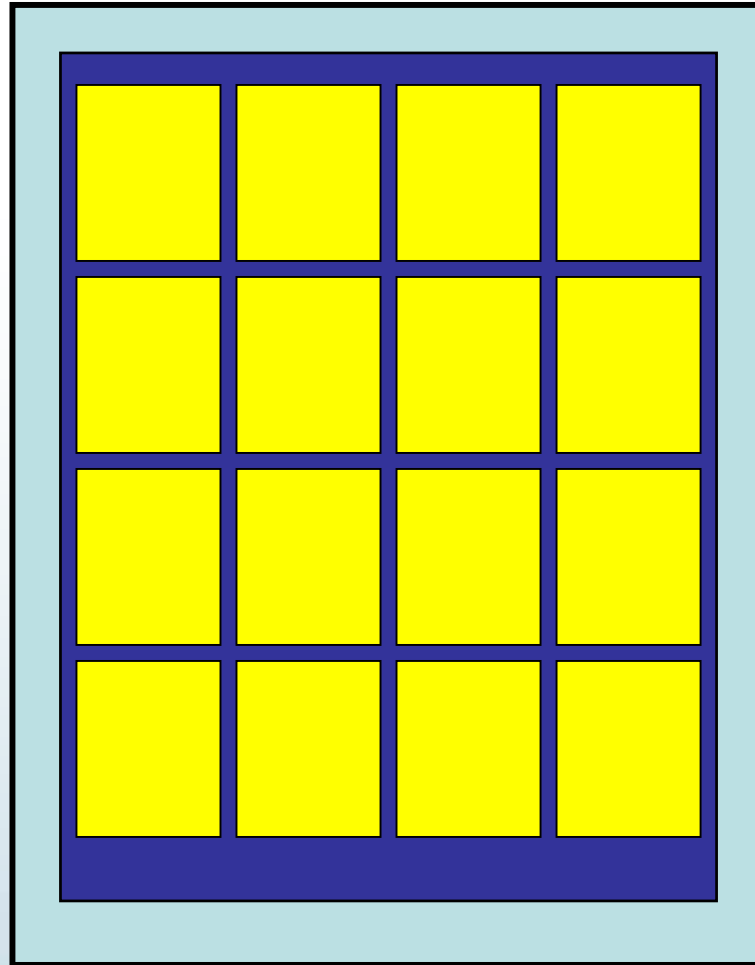
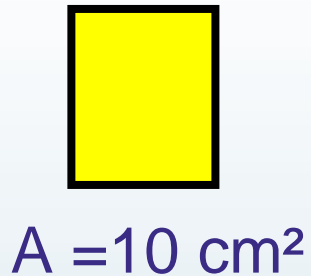
determination of **surface emission rate** at  
windowless proportional counter

# Packard Instant Imager



# Measurement of Uniformity

n individual portions of equal area A



Each position has been calibrated using a reference source

# Complaint of NRPB

## Wide Area Reference Sources for NRPB

Nuclide	VZ	Activ Area (cm <sup>2</sup> )	Activity Bq	Source No	NRPB Out of Spec	AEAT Homogeneity %
Am-241	626	100	185	MF 157		8,43
Am-241	626	100	185	MF 158		8,08
Am-241	626	100	185	MF 159	x	6,76
Am-241	628	150	1000	MF 160	x	6,26
Am-241	628	150	1000	MF 161	x	7,36
Am-241	628	150	1000	MF 162	x	6,29
Am-241	628	150	3000	<b>MF 163</b>	x	<b>6,24</b>
Am-241	628	150	3000	MF 164	x	8,62
Sr-90	628	150	185	MF 165		3,3
Sr-90	628	150	185	MF 166		3,8
Sr-90	628	150	185	MF 167	x	4,9
Sr-90	628	150	1000	MF 168	x	7,95
Sr-90	628	150	1000	MF 169		4,25
Sr-90	628	150	1000	MF 170	x	4,06
Sr-90	628	150	3000	MF 171		4,1
Sr-90	628	150	3000	MF 172		3,9
Sr-90	628	150	3000	MF 173		7,7

# Complaint (2)

<b>Results of NRPB</b>			
<b>MF 163</b>			
	counts	% Deviation from mean	
Pos.1	12991	19,00	
Pos.2	12345	13,60	
Pos.3	10742	-1,18	
Pos.4	10928	0,53	
Pos.5	10649	-1,62	
Pos.6	10128	-6,83	
Pos.7	9370	-13,80	
Pos.8	9759	-10,20	
mean	10864		
STD	1240,8		
STD (%)	11,4		

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