

NATIONAL PHYSICAL LABORATORY

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# Certificate of Calibration Determination of the shielding properties of Lead-free vinyl samples

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FOR:

Barrier Technologies, LLC 7060 W. State Road 84 Suite 8 Davie, Florida USA 33317-7365

**DESCRIPTION:** 

Determination of Lead equivalence of Lead-free vinyl samples according to BS EN 61331-1:2014 using the inverse broad beam geometry.

DATE OF MEASUREMENTS: 09 March 2016

**Reference:** 2015090276 **Date of Issue:** 13 April 2016

Checked by: Mulls

NPLC01-09/13

Signed:

Page 1 of 3 (Authorised signatory) for Managing Director

Name: G A Bass

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**Continuation Sheet** 

### **CONDITIONS:**

Distance from x-ray tube to target sample: Ionisation chamber used:

0.8m PTW TW34060-2.5 s/n 000259

All equipment associated with the measurements performed in this report has direct traceability to UK national standards or UKAS accredited calibration facilities.

01551-1.2014 A-lay beam quanties		
<u>X-ray Tube Voltage</u> kV	<u>Total filtration</u> mmAl*	
50	2.5	
70	2.5	
90	2.5	
110	2.5	
120	2.5	
150	25	

 Table I

 61331-1:2014 X-ray beam qualities

\*The inherent filtration of the x-ray tube was determined to be 0.3mmAl equivalent

Reference: Checked by: 2015090276 Lilley

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**Continuation Sheet** 

#### **RESULTS:**

Attenuation = 1 -attenuated/un-attenuated x 100

Table II			
Lead-free vinyl sheet, 0.25mm nominal Lead equivalent			
<u>kV</u>	Equivalent Lead thickness	<b>Attenuation</b>	PASS/FAIL
	mm	%	
50	0.2404	98.8	PASS
70	0.2659	95.8	PASS
90	0.2723	91.3	PASS
110	0.2647	87.1	PASS
120	0.2601	85.2	PASS
150	0.2506	79.8	PASS

**Table III** 

Lead-free vinyl sheet	0.35mm nominal	Lead equivalent
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<u>kV</u>	<b>Equivalent Lead thickness</b>	<b>Attenuation</b>	PASS/FAIL
	mm	%	
50	0.3462	99.7	PASS
70	0.3640	98.0	PASS
90	0.3647	94.8	PASS
110	0.3510	91.7	PASS
120	0.3428	90.2	PASS
150	0.3256	85.6	PASS

Table IV

Lead-free vinyl sheet, 0.50mm nominal Lead equivalent

<u>kV</u>	Equivalent Lead thickness	Attenuation	PASS/FAIL
	mm	%	
50	*	>99.9	-
70	0.5576	99.3	PASS
90	0.5591	97.6	PASS
110	0.5185	95.7	PASS
120	0.5004	94.7	PASS
150	0.4656	91.6	PASS

\*The ionisation current from the chamber was too low to be measured accurately.

### **UNCERTAINTIES**

The uncertainty in the Lead equivalence is  $\pm 5\%$ . The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95%.

Clause 5.5.3 of IEC 61331-1:2014 states that a relative standard uncertainty of 7% be taken into account in the decision of conformity in assigning the class of the Lead equivalent thickness to the material under test. If  $t_{Pb}$  is the standard Lead equivalent thickness class (0.25mm, 0.35mm, 0.5mm or 1mm) and  $\delta_{IB}$  is the Lead equivalence of the material under test, the condition can be written as:

 $\delta_{IB} \ge 0.93 t_{Pb}$ 

Reference: 2015090276 Checked by: Mildly

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