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Certificate of Calibration

Determination of the shielding properties of Lead vinyl samples

FOR: Kemmetech Ltd
Unit 4 Arnold Business Park
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DESCRIPTION: Determination of Lead equivalence of Lead vinyl samples in accordance with BS EN 61331-1:2014 using the inverse broad beam geometry.

DATE OF MEASUREMENTS: 27 April 2015 – 05 May 2015

Reference: 2015050150_3

Date of Issue: 22 May 2015

Checked by:

Signed:

Name: G A Bass

(Authorised signatory)
for Managing Director

CONDITIONS:

Distance from x-ray tube to target sample: 0.8m
Ionisation chamber used: Radcal 10x5-60E s/n 9088

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

Table I
61331-1:2014 X-ray beam qualities

X-ray Tube Voltage kV	**Total filtration mmAl***
50	2.5
70	2.5
90	2.5
110	2.5
120	2.5
150	2.5

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

RESULTS:
Attenuation = 1 – attenuated/un-attenuated x 100

Table II
Lightweight Lead vinyl sheet, 0.125mm nominal Lead equivalent

kV	Equivalent Lead thickness mm	Attenuation %	PASS/FAIL
50	0.1243	93.0	PASS
70	0.1331	85.0	PASS
90	0.1370	78.6	PASS
110	0.1425	74.0	PASS
120	0.1420	72.0	PASS
150	0.1427	67.3	PASS

Table III
Lightweight Lead vinyl sheet, 0.167mm nominal Lead equivalent

kV	Equivalent Lead thickness mm	Attenuation %	PASS/FAIL
50	0.1627	96.3	PASS
70	0.1746	90.0	PASS
90	0.1784	84.4	PASS
110	0.1848	80.3	PASS
120	0.1843	78.6	PASS
150	0.1849	74.2	PASS

Table IV
Lightweight Lead vinyl sheet, 0.175mm nominal Lead equivalent

kV	Equivalent Lead thickness mm	Attenuation %	PASS/FAIL
50	0.1712	96.8	PASS
70	0.1838	90.9	PASS
90	0.1879	85.4	PASS
110	0.1921	81.2	PASS
120	0.1916	79.5	PASS
150	0.1927	75.3	PASS

UNCERTAINTIES

The uncertainty in the Lead equivalence is ±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 δ_{IB} is the Lead equivalence of the material under test, the condition can be written as:

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