



Designer and Manufacturer  
of  
Scientific and Industrial  
Instruments

# CERTIFICATE OF CALIBRATION

**LUDLUM MEASUREMENTS, INC.**  
POST OFFICE BOX 810 PH. 325-235-5494  
501 OAK STREET FAX NO. 325-235-4672  
SWEETWATER, TEXAS 79556, U.S.A.

CUSTOMER INSTITUTE FOR PHARMA DISCOVERY

ORDER NO. 20190662/371799

Mfg. Ludlum Measurements, Inc. Model 3

Serial No. 153923

Mfg. Ludlum Measurements, Inc. Model 44-9

Serial No. PR157495

Cal. Date 20-Dec-11 Cal Due Date 20-Dec-12 Cal. Interval 1 Year Meterface 202-608

Check mark ☒ Applies to applicable instr. and/or detector IAW mfg. spec. T. 72 °F RH 28 % Alt 797.8 mm Hg

☐ New Instrument ☐ Instrument Received ☒ Within Toler. +10% ☐ 10-20% ☐ Out of Tol. ☐ Requiring Repair ☐ Other-See comments

☒ Mechanical ck. ☒ Meter Zeroed ☐ Background Subtract ☐ Input Sens. Linearity

☒ F/S Resp. ck. ☒ Reset ck. ☐ Window Operation ☒ Geotropism

☒ Audio ck. ☐ Alarm Setting ck. ☒ Batt. ck. (Min. Volt) 2.2 VDC

☐ Calibrated in accordance with LMI SOP 14.8 rev 12/05/89. ☒ Calibrated in accordance with LMI SOP 14.9 rev 02/07/97.

Instrument Volt Set 900 V Input Sens. 34 mV Det. Oper. 900 V at 34 mV Threshold = mV  
Dial Ratio =

☒ HV Readout (2 points) Ref./Inst. / V Ref./Inst. / V

## COMMENTS:

Gamma Calibration: GM detectors positioned perpendicular to source except for M 44-9 in which the front of probe faces source.

RANGE/MULTIPLIER	REFERENCE CAL. POINT	INSTRUMENT REC'D "AS FOUND READING"	INSTRUMENT METER READING*
X 100	150 mR/hr	<u>1.5</u>	<u>1.5</u>
X 100	50 mR/hr	<u>0.5</u>	<u>0.5</u>
X 10	15 mR/hr	<u>1.5</u>	<u>1.5</u>
X 10	5 mR/hr	<u>0.5</u>	<u>0.5</u>
X 1	1.5 mR/hr = <u>4930 cpm</u>	<u>1.5</u>	<u>1.5</u>
X 1	1.0 mR/hr	<u>1.0</u>	<u>1.0</u>
X 0.1	<u>493 cpm</u>	<u>1.5</u>	<u>1.5</u>
X 0.1	<u>164 cpm</u>	<u>0.5</u>	<u>0.5</u>

\*Uncertainty within ± 10% C.F. within ± 20%

X 0.1 Range(s) Calibrated Electronically

REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
Digital Readout			Log Scale		

Ludlum Measurements, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities of other International Standards Organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of calibration techniques. The calibration system conforms to the requirements of ANSI/NCISL Z540-1-1994 and ANSI N323-1978

State of Texas Calibration License No. LO-1963

### Reference Instruments and/or Sources:

Cs-137 Gamma S/N ☐ 1162 ☒ G112 ☐ M565 ☐ 5105 ☐ T1008 ☐ T879 ☐ E552 ☒ E551 ☐ 720 ☐ 734 ☐ 1616 ☐ Ra-226 S/N Y982 ☐ Neutron Am-241 Be S/N T-304

☐ Alpha S/N ☐ Beta S/N ☐ Other

☒ m 500 S/N 81084 ☐ Oscilloscope S/N ☒ Multimeter S/N 69101832

Calibrated By: Donald E. Brenner

Date 20-DEC-11

Reviewed By: Alan H.

Date 20 Dec 11

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AC Inst. ☐ Passed Dielectric (Hi-Pot) and Continuity Test  
Only ☐ Failed:



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POST OFFICE BOX 810 PH. 325-235-5494  
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SWEETWATER, TEXAS 79556, U.S.A.

ORDER NO. 20192163/372715

CUSTOMER INSTITUTE OF PHARMA DISCOVERY

Mfg. Ludlum Measurements, Inc. Model 3

Serial No. 155003

Mfg. Ludlum Measurements, Inc. Model 44-9

Serial No. PR 157465

Cal. Date 20-Jan-12 Cal Due Date 20-Jan-13

Cal. Interval 1 Year Meterface 202-608

T. 75 °F RH 20 % Alt 692.8 mm Hg

Check mark ☒ applies to applicable instr. and/or detector IAW mfg. spec.

☐ New Instrument ☐ Instrument Received ☒ Within Toler.  $\pm 10\%$  ☐ 10-20% ☐ Out of Tol. ☐ Requiring Repair ☐ Other-See comments

☒ Mechanical ck.

☒ Meter Zeroed

☐ Background Subtract

☐ Input Sens. Linearity

☒ F/S Resp. ck

☒ Reset ck.

☐ Window Operation

☒ Geotropism

☒ Audio ck.

☐ Alarm Setting ck.

☒ Batt. ck. (Min. Volt) 2.2 VDC

☐ Calibrated in accordance with LMI SOP 14.8 rev 12/05/89.

☒ Calibrated in accordance with LMI SOP 14.9 rev 02/07/97.

Instrument Volt Set 900 V Input Sens. 34 mV Def. Oper. 900 V at 34 mV Threshold Dial Ratio = mV

☐ HV Readout (2 points)

Ref./Inst. / V

Ref./Inst. / V

## COMMENTS:

Gamma Calibration: GM detectors positioned perpendicular to source except for M 44-9 in which the front of probe faces source.

RANGE/MULTIPLIER	REFERENCE CAL. POINT	INSTRUMENT REC'D "AS FOUND READING"	INSTRUMENT METER READING*
X 100	150 mR/hr	1.5	1.5
X 100	50 mR/hr	0.5	0.5
X 10	15 mR/hr	1.5	1.5
X 10	5 mR/hr	0.5	0.5
X 1	1.5 mR/hr = 4680 cpm	1.5	1.5
X 1	1.0 mR/hr	1.0	1.0
X 0.1	468 cpm	1.5	1.5
X 0.1	156 cpm	0.5	0.5

\*Uncertainty within  $\pm 10\%$  C.F. within  $\pm 20\%$

X 0.1 Range(s) Calibrated Electronically

REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
Digital Readout			Log Scale		

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**Reference Instruments and/or Sources:** ☐ 73410 ☐ 1131 ☐ 781 ☐ 059 ☐ 280 ☐ 60646 ☐ 70897 ☐ Ra-226 S/N Y982  
Cs-137 Gamma S/N ☐ 1162 ☒ G112 ☐ M565 ☐ 5105 ☐ T1008 ☐ T879 ☐ E552 ☒ E551 ☐ 720 ☐ 734 ☐ 1616 ☐ Neutron Am-241 Be S/N T-304  
☐ Alpha S/N ☐ Beta S/N ☐ Other ☒ m 500 S/N 189506 ☐ Oscilloscope S/N ☒ Multimeter S/N 94000441

Calibrated By: William Tinsley

Date 20-January-2012

Reviewed By: [Signature]

Date 20 Jan 12





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SWEETWATER, TEXAS 79556, U.S.A.

CUSTOMER INSTITUTE FOR BIOANALYTICS

ORDER NO. 20189779/371291

Mfg. Ludlum Measurements, Inc. Model 3

Serial No. 154510

Mfg. Ludlum Measurements, Inc. Model 44-9

Serial No. PR157474

Cal. Date 6-Dec-11 Cal Due Date 6-Dec-12 Cal. Interval 1 Year Meterface 202-608

T. 72 °F RH 20 % Alt 706.8 mm Hg

Check mark ☒ applies to applicable instr. and/or detector IAW mfg. spec.

☐ New Instrument ☐ Instrument Received ☒ Within Toler.  $\pm 10\%$  ☐ 10-20% ☐ Out of Tol. ☐ Requiring Repair ☐ Other-See comments

☒ Mechanical ck. ☒ Meter Zeroed ☐ Background Subtract ☐ Input Sens. Linearity

☒ F/S Resp. ck. ☒ Reset ck. ☐ Window Operation ☒ Geotropism

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X 100	50 mR/hr	<u>0.5</u>	<u>0.5</u>
X 10	15 mR/hr	<u>1.5</u>	<u>1.5</u>
X 10	5 mR/hr	<u>0.5</u>	<u>0.5</u>
X 1	1.5 mR/hr = <u>5000</u> cpm	<u>1.5</u>	<u>1.5</u>
X 1	1.0 mR/hr	<u>1.0</u>	<u>1.0</u>
X 0.1	<u>500</u> cpm	<u>1.5</u>	<u>1.5</u>
X 0.1	<u>167</u> cpm	<u>0.5</u>	<u>0.5</u>

\*Uncertainty within  $\pm 10\%$  C.F. within  $\pm 20\%$

X 0.1 Range(s) Calibrated Electronically

REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*	Log Scale	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
Digital Readout						

Ludlum Measurements, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities of other International Standards Organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of calibration techniques.

The calibration system conforms to the requirements of ANSI/NCSS Z540-1-1994 and ANSI N323-1978

State of Texas Calibration License No. LO-1963

**Reference Instruments and/or Sources:** ☐ 73410 ☐ 1131 ☐ 781 ☐ 059 ☐ 280 ☐ 60646 ☐ 70897 ☐ Ra-226 S/N Y982  
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☐ Alpha S/N ☐ Beta S/N ☐ Other ☒ m 500 S/N 81084 ☐ Oscilloscope S/N ☒ Multimeter S/N 69101832

Calibrated By: Donald E. Brennan

Date 6-DEC-11

Reviewed By: Robert H.

Date 6 Dec 11

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AC Inst. ☐ Passed Dielectric (Hi-Pot) and Continuity Test  
Only ☐ Failed: