

RF Exposure Lab

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CERTIFICATE OF COMPLIANCE RF EXPOSURE & NERVE STIMULATION EVALUATION

InVue
9201 Baybrook Lane
Charlotte, NC 28277

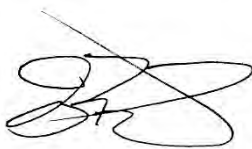
Dates of Test: January 4, 2024
Test Report Number: SAR.20240110

Lab Designation Number: US1195

FCC ID:	2AFR8-P05BRLT
Model(s):	2300-W
Serial Number:	Eng 1
Equipment Type:	Wireless Power Transfer
Classification:	WPT Transmitter
TX Frequency Range:	326.5 kHz, 1.778 MHz
Frequency Tolerance:	± 2.5 ppm
Maximum RF Output:	326.5 kHz – 36.99 dBm EIRP, 1.778 MHz – 36.99 dBm EIRP
Signal Modulation:	FSK and ASK
Antenna Type:	Internal
Application Type:	Certification
Standard(s):	KDB680106 v04
Maximum E-Field:	28.50 V/m for 326.5 kHz Transmitter, 5.58 V/m for 1.778 MHz Transmitter
Maximum H-Field:	0.103 A/m for 326.5 kHz Transmitter, 0.134 A/m for 1.778 MHz Transmitter
Distance to Probe:	0 mm

This wireless mobile device has been shown to meet the requirements for RF exposure testing for uncontrolled environment/general exposure limits specified in above listed standards. The device has also been shown to meet the simultaneous requirements of each standard as well (See test report).

I attest to the accuracy of the data. I assume full responsibility for the completeness of these calculations and vouch for the qualifications of all persons making them.



Jay M. Moulton
Vice President



Testing Certificate # 2387.01

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Comment/Revision	Date
Original Release	March 26, 2024

Note: The latest version supersedes all previous versions listed in the above table. The latest version shall be used.

1. Introduction

This report shows RF exposure evaluation of the InVue Model 2300-W Wireless Power Transfer with KDB680106 v04.

2. Radiation Sources

Radio	Description	
FSK and ASK	Frequency (MHz)	326.5 kHz
	Maximum Power (dBm)	36.99 dBm (EIRP)
	Maximum Duty Cycle (%)	100%

Radio	Description	
FSK and ASK	Frequency (MHz)	1.778 MHz
	Maximum Power (dBm)	36.99 dBm (EIRP)
	Maximum Duty Cycle (%)	100%

3. RF Exposure Classifications

Device Types	
Fixed	A fixed device is defined as a device physically secured at one fixed location and cannot be easily re-located.
Mobile	A mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons.
Portable	A portable device is defined as a transmitting device designed to be used so that the radiating structure(s) of the device is/are within 20 centimeters of the body of the user.

Exposure Categories	
Occupational / Controlled	Limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.
General population / uncontrolled	Exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure.

4. RF Exposure Limits

FCC Requirements

Table 1 to § 1.1310(e)(1)—Limits for Maximum Permissible Exposure (MPE)				
Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(i) Limits for Occupational/Controlled Exposure				
0.3–3.0	614	1.63	*(100)	≤6
3.0–30	1842/f	4.89/f	*(900/f ²)	<6
30–300	61.4	0.163	1.0	<6
300–1,500			f/300	<6
1,500–100,000			5	<6
(ii) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	<30
1.34–30	824/f	2.19/f	*(180/f ²)	<30
30–300	27.5	0.073	0.2	<30
300–1,500			f/1500	<30
1,500–100,000			1.0	<30

f = frequency in MHz. * = Plane-wave equivalent power density.

Note: For frequencies below 300 MHz, use the limits at 300 MHz.

5. General Conditions

- This report is only in reference to the item that has undergone the assessment.
- This report does not constitute or imply on its own an approval of the product by the Certification Bodies or Competent Authorities.

6. Environmental Conditions

The following limits were not exceeded during the test:

Temperature	Min. = 15 °C Max. = 35 °C
Relative Humidity	Min. = 30% Max. = 60%

7. Test Equipment

	Serial Number	Last Cal. Date	Cal. Due Date
• Wavecontrol SMP2	19SN1179	04/13/2022	04/13/2024
• WP400-3	19WP120054	04/13/2022	04/13/2024
• WPH60	19WP110048	04/13/2022	04/13/2024
• WPF6	19WP060233	04/13/2022	04/13/2024
• Positioning Apparatus used is a plastic tripod to hold the meter and probe at a specified position			

8. EUT Description

The description of the antenna is listed below

- There is one antenna in the device
- The element is a 9 turn coil antenna with an impedance of 4 μ H
- The shielding or field shaping is done with ferrite, aluminum and a copper e-shield
- The overall dimensions of the device is 26 mm diameter
- The distance from the antenna to the outside of the enclosure is 6 mm
- The position of the antenna in the device is located in the center of the device
- The enclosure over the antenna is POM – Celcon:MC90
- The two transmitters cannot operate simultaneously.
- The probes meet the requirements set forth in SPR-002 Issue 2 7.1.6.1, 7.1.6.2 and 7.1.6.3 as required by table A2

9. RF exposure Evaluation Results for 362.5 kHz

The measurements for the 2300-W was conducted at 20 mm distance from the device to the center of the probe diameter. A pre-scan of the entire side was conducted first by moving the probe across all areas of the side being tested. The movement was conducted at a very slow pace to find the peak value for each side of the device. Once the peak position was determined for each of the sides, the meter and probe were installed on the positioning apparatus for conducting the final measurements.

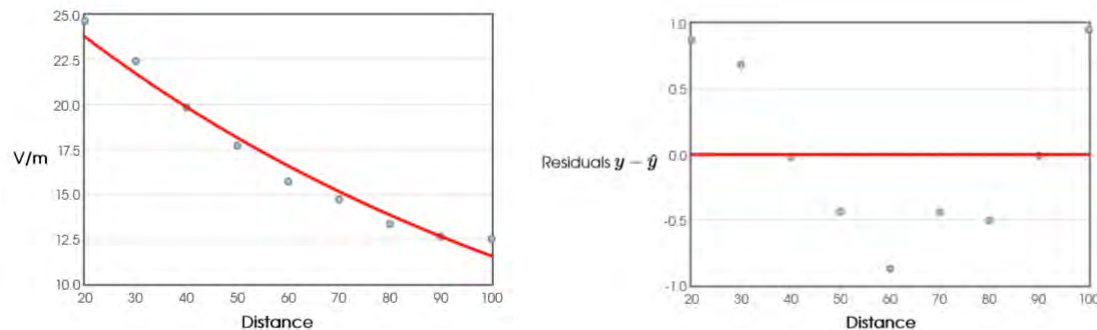
The highest value of all the sides at 20 mm was then tested every 10 mm moving away from the antenna. All the values were used to extrapolate to the 0 mm distance. The equation used to extrapolate the value to zero is $y = a * b^x$, where x is the distance and y is the measured value. Below are all the measured values for the e- and h-field.

E-Field		H-Field	
Distance	Meas. Value	Distance	Meas. Value
20 mm	24.67 V/m	20 mm	0.102 A/m
30 mm	22.43 V/m	30 mm	0.101 A/m
40 mm	19.85 V/m	40 mm	0.101 A/m
50 mm	17.72 V/m	50 mm	0.099 A/m
60 mm	15.72 V/m	60 mm	0.099 A/m
70 mm	14.72 V/m	70 mm	0.099 A/m
80 mm	13.35 V/m	80 mm	0.099 A/m
90 mm	12.65 V/m	90 mm	0.098 A/m
100 mm	12.52 V/m	100 mm	0.098 A/m

The regression equation for the E-Field calculates to be $28.4984 * 0.9910^{(mm)}$.
The correlation for the E-Field calculates to be $r = -0.9957$.
The R-square for the E-Field calculates to be $r^2 = 0.9716$.

The extrapolated value at 10 mm is 26.03 V/m.
The extrapolated value at 0 mm is 28.50 V/m.

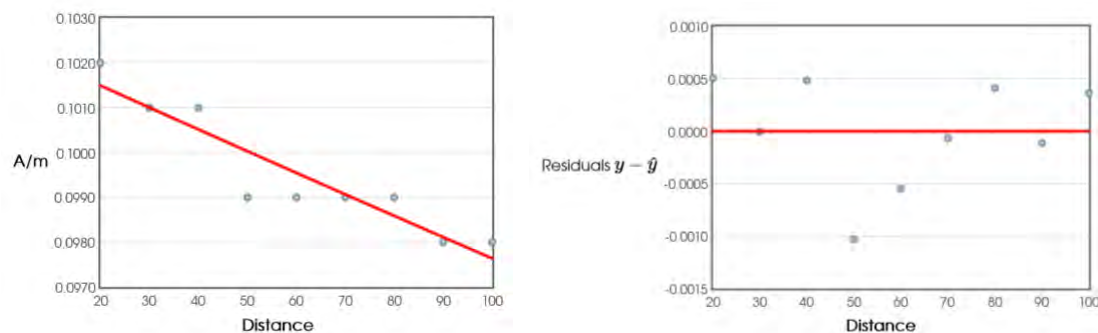
Below is the scatter plot and residual plot for the E-Field measurements.



The regression equation for the H-Field calculates to be $0.1025 * 0.9995$ (mm).
The correlation for the H-Field calculates to be $r = -0.9304$.
The R-square for the H-Field calculates to be $r^2 = 0.8656$.

The extrapolated value at 10 mm is 0.102 A/m.
The extrapolated value at 0 mm is 0.103 A/m.

Below is the scatter plot and residual plot for the H-Field measurements.



Frequency	E-Field Measurement	Limit [V/m]	% Limit	Verdict
326.5 kHz	28.50	614	4.6	Pass

Frequency	H-Field Measurement	Limit [A/m]	% Limit	Verdict
326.5 kHz	0.103	1.63	6.3	Pass

There is no simultaneous transmitters in the device. Only one of the transmitters is operating at one time. Therefore, TER was not required to be evaluated for this device.

10. RF exposure Evaluation Results for 1.778 MHz

The measurements for the 2300-W was conducted at 40 mm distance from the device to the center of the probe diameter. A pre-scan of the entire side was conducted first by moving the probe across all areas of the side being tested. The movement was conducted at a very slow pace to find the peak value for each side of the device. Once the peak position was determined for each of the sides, the meter and probe were installed on the positioning apparatus for conducting the final measurements.

The highest value of all the sides at 40 mm was then tested every 10 mm moving away from the antenna. All the values were used to extrapolate to the 0 mm distance. The equation used to extrapolate the value to zero is $y = a * b^x$, where x is the distance and y is the measured value. Below are all the measured values for the e- and h-field.

E-Field		H-Field	
Distance	Meas. Value	Distance	Meas. Value
40 mm	2.80 V/m	40 mm	0.079 A/m
50 mm	2.46 V/m	50 mm	0.067 A/m
60 mm	2.10 V/m	60 mm	0.061 A/m
70 mm	1.69 V/m	70 mm	0.053 A/m
80 mm	1.32 V/m	80 mm	0.049 A/m
90 mm	1.03 V/m	90 mm	0.044 A/m
100 mm	0.88 V/m	100 mm	0.037 A/m
110 mm	0.77 V/m	110 mm	0.032 A/m
120 mm	0.65 V/m	120 mm	0.029 A/m
130 mm	0.59 V/m	130 mm	0.025 A/m
140 mm	0.56 V/m	140 mm	0.022 A/m
		150 mm	0.018 A/m

The regression equation for the E-Field calculates to be $5.5769 * 0.9826^{(mm)}$.
The correlation for the E-Field calculates to be $r = -0.9908$.
The R-square for the E-Field calculates to be $r^2 = 0.9817$.

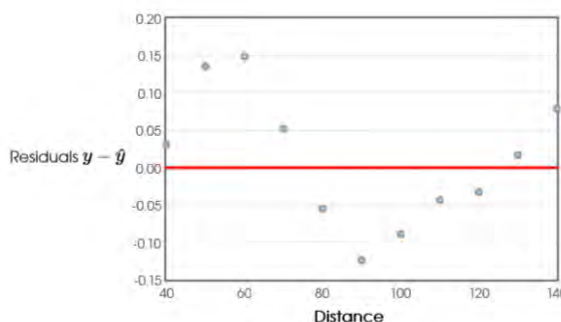
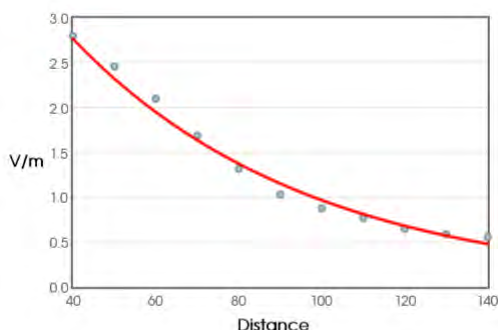
The extrapolated value at 30 mm is 3.29 V/m.

The extrapolated value at 20 mm is 3.93 V/m.

The extrapolated value at 10 mm is 4.68 V/m.

The extrapolated value at 0 mm is 5.58 V/m.

Below is the scatter plot and residual plot for the E-Field measurements.



The regression equation for the H-Field calculates to be $0.1335 * 0.9871^{(mm)}$.

The correlation for the H-Field calculates to be $r = -0.9977$.

The R-square for the H-Field calculates to be $r^2 = 0.9954$.

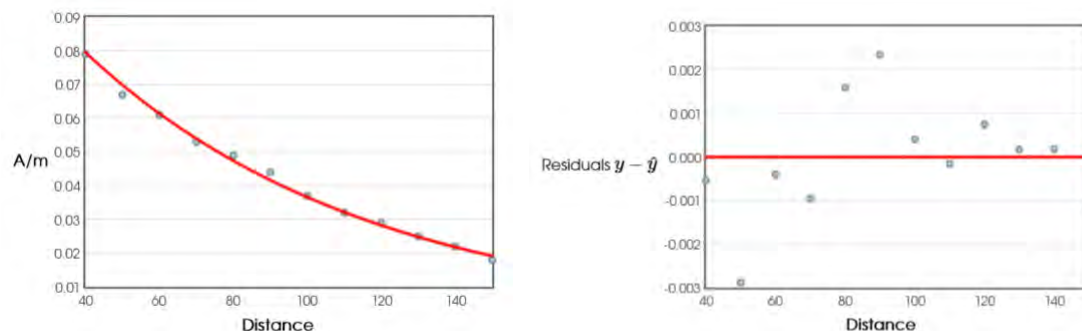
The extrapolated value at 30 mm is 0.090 A/m.

The extrapolated value at 20 mm is 0.103 A/m.

The extrapolated value at 10 mm is 0.117 A/m.

The extrapolated value at 0 mm is 0.134 A/m.

Below is the scatter plot and residual plot for the H-Field measurements.



Frequency	E-Field Measurement	Limit [V/m]	% Limit	Verdict
1.778 MHz	5.58	614	0.9	Pass

Frequency	H-Field Measurement	Limit [A/m]	% Limit	Verdict
1.778 MHz	0.134	1.63	8.2	Pass

There are no other transmitters in the device. Therefore, TER was not required to be evaluated for this device.

Appendix A – Calibration Certificates



Certificate of Calibration

ISO/IEC 17025:2017 and ANSI/NCSL Z540.1-1994

Certificate Number 220411-085519-f52052



Model Number WP400-3; SMP2
Manufacturer Wavecontrol
Description Field Probe
Serial Number 19WP120054; 19SN1179
Customer Asset No. N/A

Customer
RF Exposure Lab, LLC
802 N. Twin Oaks Valley Rd
Suite 105
San Marcos, CA 92069
USA

Date of Calibration 04/13/2022
Temperature 23°C
Humidity 48% RH

Location of Calibration
Keysight Technologies Inc.
1346 Yellowwood Road
Kimballton, IA 51543
United States

This certifies that the equipment has been calibrated using applicable Keysight Technologies procedures and in compliance with ISO/IEC 17025:2017 and ANSI/NCSL Z540.1-1994 (R2002). The quality management system is registered to ISO 9001:2015.

Calibration Standard(s)
IEEE Std 1309-2013

Calibration Method(s)
Substitution

Calibration Procedure(s)
909579

Calibration Software
Probe Comparison 1.4.1

As Received Conditions
The measured values of the equipment were observed in specification at the points tested.

Action Taken
No action was taken.

As Completed Conditions
The measured values of the equipment were observed in specification at the points tested.

Calibration Due
Based on the customer's request, the next calibration is due on 13 Apr 2024

Remarks or Special Requirements

This calibration report shall not be reproduced, except in full. The documented results relate to the equipment calibrated only.

The test limits stated in the report correspond to the published specifications of the equipment, at the points tested.

Keysight Technologies, Inc.
1346 Yellowwood Road
Kimballton, IA 51543
United States

Brandt Langer Iowa Service Center Manager



Certificate of Calibration

ISO/IEC 17025:2017 and ANSI/NCSL Z540.1-1994

Certificate Number 220411-085519-f52052



Traceability Information

Technician Name Dave Grabill

Measurements are traceable to the International System of Units (SI) via national metrology institutes (www.keysight.com/find/NMI) that are signatories to the CIPM Mutual Recognition Arrangement.

Calibration Equipment Used

Manufacturer	Model Number	Model Description	Equipment ID	Cal Due Date	Certificate Number
Agilent Technologies, Inc.	33250A	Function/Arbitrary Waveform Generator	11101	06/03/2022	210602-130008-794ded
AR	350AH1	Amp	11453	NA	NA
Crown	5002VZ	Amp	11069	NA	NA
EMCO	5101	TEM Cell	10420	NA	2003121920
Hewlett-Packard	8564E	Spectrum Analyzer	10029	06/02/2022	210527-143459-612042
Combinova	FD1	Field Detector	10348	01/31/2023	220104-091355-ad0560
Combinova	FD2	Field Detector	10347	02/28/2023	220201-110452-66d607
Schwarzbeck Mess-Elektronik	FESP 5133-7/41	Loop	11285	10/31/2022	211018-135220-351697
Schwarzbeck Mess-Elektronik	HHS 5204-12	Helmholtz Coil	11091	NA	NA
Holaday	HI-3624	ELF Magnetic Field Meter	10569	09/30/2022	210901-094617-c4f116
Holaday	HI-3627	ELF Magnetic Field Meter	10570	03/31/2023	220309-140426-5aaae9

Compliance with Specification

Unless otherwise noted, the calibration results are reported without factoring in the effect of uncertainty on the assessment of compliance/specification.

In Specification/Out of Specification Explanation

The standard criteria to determine the "In Specification/Out of Specification" status is based on one or more of the following conditions, as requested by the client:

1. If the manufacturer has a specified specification for the item being calibrated, then the calibration values are compared to this specification, and the values must fall within the manufacturer's specification. The specification may be obtained from the manufacturer's web site, data sheets, equipment manuals, etc.
2. Where specifications are called out in a published standard, the calibration results are compared to this specification, and the measured values must fall within the standard's specification.
3. In cases where the manufacturer, standard, or client does not identify any relevant specifications, applicable calibration results are compared to historical data with a +/- 3 dB specification.

Uncertainty of Measurement

The uncertainty evaluation has been performed in accordance with ISO/IEC Guide 98-3:2008(GUM). The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k such that the coverage probability corresponds to approximately 95%. This probability corresponds to a coverage factor of k=2 for a normal distribution.

Parameter	Range	MU (+/-)
Magnetic Field Strength Meters - AC	0.20 mG to 20 G	0.33% + 1.2 mG

Customer Name: RF Exposure Lab, LLC

Probe Manufacturer: Wavecontrol

Probe Model: WP400-3; SMP2

Probe Serial No.: 19WP120054; 19SN1179

Notes:

CAL CERT #: 220411-085519-f52052

Electric Field

E Field (V/m)	Linearity - 50Hz						Mean CF
	X axis CF	X axis dB	Y axis CF	Y axis dB	Z axis CF	Z axis dB	
800	1.05	0.41	1.04	0.34	1.04	0.35	1.04
750	1.04	0.32	1.04	0.33	1.03	0.27	1.04
500	1.04	0.30	1.03	0.22	1.02	0.18	1.03
250	1.04	0.32	1.04	0.35	1.04	0.32	1.04
100	1.01	0.09	1.03	0.29	0.99	-0.05	1.01
50	1.03	0.22	1.03	0.30	1.03	0.23	1.03
20	1.01	0.05	1.04	0.32	1.04	0.31	1.03

Freq Hz	Frequency Response 25Hz-100kHz: 750V/m / 10Hz, 200-400kHz: 300V/m						Mean CF
	X axis CF	X axis dB	Y axis CF	Y axis dB	Z axis CF	Z axis dB	
10	1.31	2.37	1.30	2.31	1.31	2.37	1.31
25	1.14	1.16	1.16	1.26	1.15	1.23	1.15
50	1.06	0.54	1.07	0.56	1.07	0.61	1.07
100	1.09	0.77	1.09	0.77	1.10	0.83	1.10
500	1.10	0.82	1.09	0.72	1.10	0.81	1.09
1000	1.10	0.82	1.09	0.71	1.10	0.83	1.10
2000	1.18	1.44	1.17	1.33	1.17	1.39	1.17
10000	1.07	0.57	1.05	0.45	1.07	0.57	1.06
100000	1.07	0.56	1.06	0.50	1.06	0.48	1.06
200000	1.00	0.04	1.00	0.03	1.00	0.02	1.00
300000	1.05	0.44	1.05	0.46	1.05	0.43	1.05
400000	1.06	0.51	1.03	0.27	1.06	0.48	1.05

Customer Name: RF Exposure Lab, LLC

Probe Manufacturer: Wavecontrol

Probe Model: WP400-3; SMP2

Probe Serial No.: 19WP120054; 19SN1179

Notes:

CAL CERT #: 220411-085519-f52052

Magnetic Field

B Field (uT)	Linearity - 50Hz						Mean CF
	X axis CF	X axis dB	Y axis CF	Y axis dB	Z axis CF	Z axis dB	
2000	1.00	0.02	1.00	0.00	1.00	0.00	1.00
1500	0.97	-0.26	0.96	-0.33	0.96	-0.36	0.96
1000	0.97	-0.26	0.97	-0.23	0.97	-0.28	0.97
750	0.96	-0.37	0.96	-0.35	0.95	-0.40	0.96
500	0.96	-0.35	0.96	-0.32	0.96	-0.37	0.96
250	0.97	-0.30	0.97	-0.24	0.97	-0.29	0.97
100	0.95	-0.41	0.96	-0.35	0.95	-0.41	0.96
50	0.97	-0.30	0.97	-0.23	0.97	-0.28	0.97
10	0.97	-0.25	0.98	-0.18	0.98	-0.22	0.98
5	0.98	-0.20	0.98	-0.15	0.98	-0.19	0.98

Freq Hz	Frequency Response 10Hz-2kHz: 100uT / 10-200kHz: 25uT						Mean CF
	X axis CF	X axis dB	Y axis CF	Y axis dB	Z axis CF	Z axis dB	
10	0.93	-0.67	0.93	-0.65	0.93	-0.63	0.93
30	1.02	0.15	1.02	0.17	1.02	0.19	1.02
50	0.95	-0.46	0.95	-0.44	0.95	-0.43	0.95
100	0.98	-0.17	0.98	-0.15	0.98	-0.14	0.98
500	1.01	0.08	1.01	0.12	1.02	0.13	1.01
1000	0.95	-0.43	0.96	-0.38	0.96	-0.38	0.96
2000	0.94	-0.52	0.95	-0.49	0.95	-0.49	0.94
10000	0.88	-1.09	0.88	-1.14	0.88	-1.12	0.88
100000	0.87	-1.16	0.87	-1.25	0.87	-1.26	0.87
200000	0.88	-1.16	0.86	-1.30	0.86	-1.28	0.87



Certificate of Calibration

ISO/IEC 17025:2017 and ANSI/NCSL Z540.1-1994

Certificate Number 220411-083319-8bcdde



Model Number WPF6; SMP2
Manufacturer Wavecontrol
Description Field Probe
Serial Number 19WP060233; 19SN1179
Customer Asset No. N/A

Customer
RF Exposure Lab, LLC
802 N. Twin Oaks Valley Rd
Suite 105
San Marcos, CA 92069
USA

Date of Calibration 04/13/2022
Temperature 23°C
Humidity 48% RH

Location of Calibration
Keysight Technologies Inc.
1346 Yellowwood Road
Kimballton, IA 51543
United States

This certifies that the equipment has been calibrated using applicable Keysight Technologies procedures and in compliance with ISO/IEC 17025:2017 and ANSI/NCSL Z540.1-1994 (R2002). The quality management system is registered to ISO 9001:2015.

Calibration Standard(s)
IEEE Std 1309-2013 Section 4.1
IEEE Std 1309-2013 Section 5
IEEE Std 1309-2013 Section 8.2
IEEE Std 1309-2013 Section Annex A
IEEE Std 1309-2013 Section A.3

Calibration Method(s)
Substitution

Calibration Procedure(s)
287330

Calibration Software
Isotropy 1.0
Probe Comparison 1.4.1

As Received Conditions
The measured values of the equipment were observed in specification at the points tested.

Action Taken
No action was taken.

As Completed Conditions
The measured values of the equipment were observed in specification at the points tested.

Calibration Due
Based on the customer's request, the next calibration is due on 13 Apr 2024

Remarks or Special Requirements
A probe position document is included with this certificate. This calibration is valid only for the alignment/mounting position specified in this report. Calibrated with Keysight Technologies' monitor and fiberoptic cable.

Keysight Technologies, Inc.
1346 Yellowwood Road
Kimballton, IA 51543
United States


Brandt Langer Iowa Service Center Manager



Certificate of Calibration

ISO/IEC 17025:2017 and ANSI/NCSL Z540.1-1994

Certificate Number 220411-083319-8bcdde



This calibration report shall not be reproduced, except in full. The documented results relate to the equipment calibrated only.

The test limits stated in the report correspond to the published specifications of the equipment, at the points tested.

Traceability Information

Technician Name Dave Grabill

Measurements are traceable to the International System of Units (SI) via national metrology institutes (www.keysight.com/find/NMI) that are signatories to the CIPM Mutual Recognition Arrangement.

Calibration Equipment Used

Manufacturer	Model Number	Model Description	Equipment ID	Cal Due Date	Certificate Number
AR	15T4G18	Amp	10888	NA	NA
Amplifier Research	250W1000A	Amp	11327	NA	NA
AR	500A100A	Amp	10982	NA	NA
EMCO	5405	GTEM	10437	07/14/2022	200710-081647-4c6186
AR	75A220	Amp	11547	05/04/2022	210504-101836-230650
AR	80S1G4	Amp	11728	NA	
Hewlett-Packard	83640L	Signal Generator	10039	11/30/2022	211109-082156-7fd7e6
Agilent Technologies, Inc.	8648D	Signal Generator	11028	01/31/2023	220104-092226-e520b9
Schwarzbeck Mess-Elektronik	BBHA 9120D	Horn	10194	11/17/2022	201111-115541-0b3b6c
AR	DC3510A	Dual Directional Coupler	10460	04/30/2023	220329-080254-362ae1
AR	FI7000	Interface	11015	NA	700516
AR	FL7006	Isotropic Probe	10946	12/08/2022	2021050080-1
Mike Howard	MH-1	TEM Cell	10479	NA	NA

Compliance with Specification

Unless otherwise noted, the calibration results are reported without factoring in the effect of uncertainty on the assessment of compliance/specification.

In Specification/Out of Specification Explanation

The standard criteria to determine the "In Specification/Out of Specification" status is based on one or more of the following conditions, as requested by the client:

1. If the manufacturer has a specified specification for the item being calibrated, then the calibration values are compared to this specification, and the values must fall within the manufacturer's specification. The specification may be obtained from the manufacturer's web site, data sheets, equipment manuals, etc.
2. Where specifications are called out in a published standard, the calibration results are compared to this specification, and the measured values must fall within the standard's specification.
3. In cases where the manufacturer, standard, or client does not identify any relevant specifications, applicable calibration results are compared to historical data with a +/- 3 dB specification.



Certificate of Calibration

ISO/IEC 17025:2017 and ANSI/NCSL Z540.1-1994

Certificate Number 220411-083319-8bcdde



Uncertainty of Measurement

The uncertainty evaluation has been performed in accordance with ISO/IEC Guide 98-3:2008(GUM). The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k such that the coverage probability corresponds to approximately 95%. This probability corresponds to a coverage factor of k=2 for a normal distribution.

Parameter	Range	MU (+/-)
RF Laser E-Field Probes - GTEM Cell - Frequency Response	10 kHz to 1000 MHz	0.81 dB
RF Isotropic E-Field Probes - TEM Cell - Frequency Response	5 kHz to 800 MHz	0.91 dB
RF Isotropic E-Field Probes - Anechoic Chamber - Frequency Response	(450 to 18,000) MHz	1.1 dB
RF Isotropic E-Field Probes - TEM Cell - Linearity	5 kHz to 800 MHz	0.91 dB

Customer Name: RF Exposure Lab, LLC

Probe Manufacturer: Wavecontrol

Probe Model: WPF6; SMP2

Probe Serial No.: 19WP060233; 19SN1179

Notes:

CAL CERT #: 220411-083319-8bcddc

Correction Factors

10V/m Actual Field

Freq in MHz	X Axis		Y Axis		Z Axis	
	Mult	dB	Mult	dB	Mult	dB
0.1	1.92	5.69	1.72	4.70	1.71	4.66
0.3	1.20	1.58	1.23	1.83	1.23	1.81
0.5	1.04	0.31	1.06	0.54	1.05	0.40
1	1.02	0.20	1.04	0.37	1.02	0.14
10	1.06	0.47	1.07	0.59	1.03	0.29
30	1.05	0.44	1.07	0.56	1.03	0.26
100	1.04	0.32	1.05	0.42	1.01	0.12
200	1.14	1.10	1.18	1.46	1.20	1.58
400	1.04	0.32	1.02	0.19	1.03	0.24
600	0.87	-1.22	0.84	-1.50	0.81	-1.82
700	1.05	0.40	1.07	0.61	1.12	1.02
800	1.07	0.59	1.07	0.56	1.11	0.89
1000	1.03	0.22	1.00	-0.03	1.05	0.40
1200	0.97	-0.25	1.01	0.07	1.00	-0.04
1400	0.99	-0.07	0.97	-0.28	0.93	-0.63
1600	0.93	-0.66	0.90	-0.93	0.84	-1.55
1800	0.94	-0.54	0.97	-0.27	0.95	-0.45
2000	0.99	-0.08	1.01	0.06	0.95	-0.42
2200	1.02	0.21	1.00	0.02	0.92	-0.73
2400	0.96	-0.34	1.02	0.18	0.96	-0.38
2600	0.98	-0.18	1.06	0.50	0.98	-0.17
2800	0.89	-0.99	0.86	-1.36	0.80	-1.98
3000	0.86	-1.26	0.88	-1.16	0.83	-1.60
3200	0.88	-1.09	0.87	-1.20	0.83	-1.60
3400	0.83	-1.67	0.77	-2.22	0.73	-2.74
3600	0.81	-1.88	0.75	-2.53	0.72	-2.84
3800	0.77	-2.30	0.78	-2.14	0.77	-2.32
4000	0.99	-0.09	0.93	-0.67	0.91	-0.81
4250	0.95	-0.48	1.09	0.77	1.00	-0.01
4500	1.14	1.10	1.12	1.00	1.11	0.88
4750	0.85	-1.46	0.79	-2.07	0.79	-2.09
5000	1.14	1.12	0.96	-0.35	0.93	-0.59

			2022	Frequency	Response	XYZ.txt
5250	0.98	-0.21	0.92	-0.73	0.91	-0.78
5500	0.92	-0.75	1.02	0.15	0.93	-0.66
5750	1.03	0.29	1.07	0.58	1.10	0.85
6000	0.84	-1.47	0.83	-1.59	0.83	-1.64

Customer Name: RF Exposure Lab, LLC
 Probe Manufacturer: Wavecontrol
 Probe Model: WPF6; SMP2
 Probe Serial No.: 19WP060233; 19SN1179
 Notes:
 CAL CERT #: 220411-083319-8bcddc

Linearity

Freq MHz	Applied Field V/m	X Axis		Y Axis		Z Axis	
		Mult	dB	Mult	dB	Mult	dB
100	1.0	1.10	0.81	1.07	0.55	1.10	0.79
100	2.5	1.07	0.59	1.07	0.59	1.03	0.23
100	5.0	1.05	0.39	1.05	0.46	1.01	0.11
100	10.0	1.05	0.39	1.06	0.48	1.02	0.18
100	20.0	1.05	0.44	1.06	0.52	1.05	0.46
100	30.0	1.08	0.70	1.10	0.79	1.09	0.73
100	40.0	1.07	0.61	1.09	0.71	1.08	0.64
100	50.0	1.08	0.66	1.09	0.73	1.08	0.68
100	60.0	1.09	0.77	1.10	0.86	1.10	0.80
100	80.0	1.10	0.84	1.11	0.93	1.11	0.87
100	100.0	1.09	0.78	1.11	0.88	1.10	0.81

Probe Alignment/Mounting Position

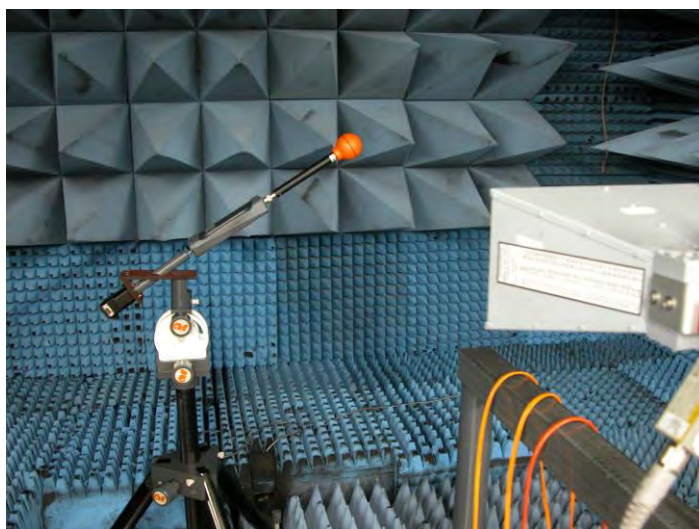
TEM Cell & GTEM Cell

Probe was calibrated at the Critical Angle (35.3°) position



Chamber

Probe was calibrated at the Critical Angle (35.3°) position,
Parallel to Source, 1meter separation distance.





Certificate of Calibration

ISO/IEC 17025:2017 and ANSI/NC SL Z540.1-1994

Certificate Number 220411-090352-04e850



Model Number WPH60; SMP2
Manufacturer Wavecontrol
Description Field Probe
Serial Number 19WP110048; 19SN1179
Customer Asset No. N/A

Customer
RF Exposure Lab, LLC
802 N. Twin Oaks Valley Rd
Suite 105
San Marcos, CA 92069
USA

Date of Calibration 04/13/2022
Temperature 23°C
Humidity 48% RH

Location of Calibration
Keysight Technologies Inc.
1346 Yellowwood Road
Kimballton, IA 51543
United States

This certifies that the equipment has been calibrated using applicable Keysight Technologies procedures and in compliance with ISO/IEC 17025:2017 and ANSI/NC SL Z540.1-1994 (R2002). The quality management system is registered to ISO 9001:2015.

Calibration Standard(s)
IEEE Std 1309-2013 Section 4.1
IEEE Std 1309-2013 Section 5
IEEE Std 1309-2013 Section 8.2
IEEE Std 1309-2013 Section Annex A
IEEE Std 1309-2013 Section A.3

Calibration Method(s)
Substitution

Calibration Procedure(s)
287330

Calibration Software
Isotropy 1.0
Probe Comparison 1.4.1

As Received Conditions
The measured values of the equipment were observed in specification at the points tested.

Action Taken
No action was taken.

As Completed Conditions
The measured values of the equipment were observed in specification at the points tested.

Calibration Due
Based on the customer's request, the next calibration is due on 13 Apr 2024

Remarks or Special Requirements
A probe position document is included with this certificate. This calibration is valid only for the alignment/mounting position specified in this report. Calibrated with Keysight Technologies' monitor and fiberoptic cable.

Keysight Technologies, Inc.
1346 Yellowwood Road
Kimballton, IA 51543
United States


Brandt Langer Iowa Service Center Manager



Certificate of Calibration

ISO/IEC 17025:2017 and ANSI/NCSL Z540.1-1994

Certificate Number 220411-090352-04e850



This calibration report shall not be reproduced, except in full. The documented results relate to the equipment calibrated only.

The test limits stated in the report correspond to the published specifications of the equipment, at the points tested.

Traceability Information

Technician Name Dave Grabill

Measurements are traceable to the International System of Units (SI) via national metrology institutes (www.keysight.com/find/NMI) that are signatories to the CIPM Mutual Recognition Arrangement.

Calibration Equipment Used

Manufacturer	Model Number	Model Description	Equipment ID	Cal Due Date	Certificate Number
AR	600A400	Amplifier, 10KHz-400 MHz, 600W	624658	NA	
Agilent Technologies, Inc.	8648D	Signal Generator	11028	01/31/2023	220104-092226-e520b9
AR	DC3510A	Dual Directional Coupler	10460	04/30/2023	220329-080254-362ae1
AR	FI7000	Interface	11015	NA	700516
AR	FL7006	Isotropic Probe	10946	12/08/2022	2021050080-1
Mike Howard	MH-1	TEM Cell	10479	NA	NA

Compliance with Specification

Unless otherwise noted, the calibration results are reported without factoring in the effect of uncertainty on the assessment of compliance/specification.

In Specification/Out of Specification Explanation

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1. If the manufacturer has a specified specification for the item being calibrated, then the calibration values are compared to this specification, and the values must fall within the manufacturer's specification. The specification may be obtained from the manufacturer's web site, data sheets, equipment manuals, etc.
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3. In cases where the manufacturer, standard, or client does not identify any relevant specifications, applicable calibration results are compared to historical data with a +/- 3 dB specification.

Uncertainty of Measurement

The uncertainty evaluation has been performed in accordance with ISO/IEC Guide 98-3:2008(GUM). The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k such that the coverage probability corresponds to approximately 95%. This probability corresponds to a coverage factor of k=2 for a normal distribution.

Parameter	Range	MU (+/-)
RF Isotropic E-Field Probes - TEM Cell - Frequency Response	5 kHz to 800 MHz	0.91 dB
RF Isotropic E-Field Probes - TEM Cell - Linearity	5 kHz to 800 MHz	0.91 dB

Customer Name: RF Exposure Lab, LLC

Probe Manufacturer: Wavecontrol

Probe Model: WPH60; SMP2

Probe Serial No.: 19WP110048; 19SN1179

Notes:

CAL CERT #: 220411-090352-04e850

Linearity

Freq	H field	X Axis		Y Axis		Z Axis		Mean
MHz	A/m	Mult	dB	Mult	dB	Mult	dB	CF
2	0.03	0.98	-0.16	0.94	-0.54	0.98	-0.19	0.97
2	0.05	1.00	0.01	0.95	-0.43	1.01	0.05	0.99
2	0.10	1.02	0.14	0.96	-0.32	1.02	0.17	1.00
2	0.20	1.02	0.21	0.97	-0.23	1.03	0.24	1.01
2	0.30	1.05	0.42	1.00	-0.03	1.05	0.45	1.03
2	0.40	1.08	0.65	1.02	0.20	1.08	0.67	1.06
2	0.50	1.08	0.64	1.03	0.23	1.08	0.67	1.06
2	0.70	1.09	0.75	1.04	0.30	1.09	0.79	1.07
2	1.00	1.03	0.30	0.94	-0.53	1.04	0.34	1.01

Probe Alignment/Mounting Position

TEM Cell

Probe was calibrated at the Critical Angle (35.3°) position



Customer Name: RF Exposure Lab, LLC

Probe Manufacturer: Wavecontrol

Probe Model: WPH60; SMP2

Probe Serial No.: 19WP110048; 19SN1179

Notes:

CAL CERT #: 220411-090352-04e850

Frequency Response - 0.265 A/m

Freq	X Axis		Y Axis		Z Axis		Mean
in MHz	Mult	dB	Mult	dB	Mult	dB	CF
0.3	1.43	3.10	1.36	2.68	1.44	3.16	1.41
0.4	1.17	1.36	1.12	0.96	1.18	1.46	1.16
0.5	1.07	0.59	1.02	0.17	1.08	0.67	1.06
0.6	1.04	0.35	0.99	-0.06	1.05	0.42	1.03
0.7	1.04	0.30	0.99	-0.12	1.04	0.31	1.02
0.8	1.03	0.22	0.98	-0.19	1.03	0.24	1.01
1	1.03	0.29	0.98	-0.14	1.04	0.31	1.02
2	1.05	0.42	1.00	-0.03	1.05	0.45	1.03
5	1.06	0.49	1.01	0.05	1.06	0.52	1.04
10	1.05	0.46	1.00	0.04	1.06	0.49	1.04
15	1.07	0.62	1.02	0.16	1.08	0.68	1.06
20	1.10	0.79	1.05	0.46	1.10	0.83	1.08
23	1.11	0.91	1.06	0.51	1.12	0.95	1.10
25	1.12	0.97	1.07	0.56	1.12	1.02	1.10
28	1.14	1.10	1.09	0.78	1.14	1.12	1.12
30	1.14	1.17	1.10	0.86	1.15	1.20	1.13
35	1.17	1.37	1.12	0.98	1.17	1.38	1.15
40	1.20	1.60	1.17	1.35	1.20	1.61	1.19
50	1.24	1.90	1.19	1.54	1.23	1.81	1.22
60	1.26	2.02	1.19	1.53	1.23	1.77	1.23