

*FCC PART 15, SUBPART B and C
TEST REPORT**for***SMART READER****MODEL: OPAS02**

Prepared for

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DATE: MAY 4, 2015

	REPORT BODY	APPENDICES					TOTAL
		A	B	C	D	E	
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GENERAL REPORT SUMMARY

This electromagnetic emission test report is generated by Compatible Electronics Inc., which is an independent testing and consulting firm. The test report is based on testing performed by Compatible Electronics personnel according to the measurement procedures described in the test specifications given below and in the "Test Procedures" section of this report.

The measurement data and conclusions appearing herein relate only to the sample tested and this report may not be reproduced without the written permission of Compatible Electronics, unless done so in full.

This report must not be used to claim product certification, approval or endorsement by NVLAP, NIST or any agency of the federal government.

Device Tested: Smart Reader
Model: OPAS02
S/N: N/A

Product Description: See Expository Statement.

Modifications: The EUT was not modified during the testing.

Customer: OpenPath Security, Inc.
13428 Maxella Avenue, Suite 866
Marina Del Rey, California 90292

Test Dates: April 26 and 27, 2018

Test Specifications covered by accreditation:

Emissions requirements

FCC Standard:

CFR Title 47, Part 15, Subpart B and Subpart C



Test Procedure: ANSI C63.4:2014, ANSI C63.10: 2013

Test Deviations: The test procedure was not deviated from during the testing.

SUMMARY OF TEST RESULTS

TEST	DESCRIPTION	RESULTS
1	Spurious Radiated RF Emissions, 9 kHz – 25000 MHz (Transmitter and Digital portion)	Complies with the Class A and Class B limits of CFR Title 47, Part 15 Subpart B; and the limits of CFR Title 47, Part 15, Subpart C, section 15.205, 15.209 and 15.225 Highest reading in relation to spec limit: 36.09 (QP) dBuV/m @ 80.50 MHz (*U = 4.54 dB)
2	Conducted RF Emissions, 150 kHz to 30 MHz	Complies with the Class B limits of CFR Title 47, Part 15 Subpart B; and the limits of CFR Title 47, Part 15, Subpart C, section 15.207 Highest reading in relation to spec limit: 40.21(Avg) dBuV @ 13.558 MHz (*U = 2.72 dB)

1. PURPOSE

This document is a qualification test report based on the emissions tests performed on the Smart Reader, Model: OPAS02. The emissions measurements were performed according to the measurement procedure described in ANSI C63.4 and ANSI C63.10. The tests were performed in order to determine whether the electromagnetic emissions from the equipment under test, referred to as EUT hereafter, are within the **Class A and Class B specification limits defined by CFR Title 47, Part 15, Subpart B; and Subpart C, sections 15.205, 15.207, 15.209, and 15.225.**



2. ADMINISTRATIVE DATA

2.1 Location of Testing

The emissions tests described herein were performed at the test facility of Compatible Electronics, 114 Olinda Drive, Brea, California 92823.

2.2 Traceability Statement

The calibration certificates of all test equipment used during the test are on file at the location of the test. The calibration is traceable to the National Institute of Standards and Technology (NIST).

2.3 Cognizant Personnel

OpenPath Security, Inc.

Michael Biggs Engineer

Compatible Electronics Inc.

Kyle Fujimoto Test Engineer

James Ross Test Engineer

2.4 Date Test Sample was Received

The test sample was received prior to the initial test date.

2.5 Disposition of the Test Sample

The test sample has not been returned to OpenPath Security, Inc. as of the date of this test report.

2.6 Abbreviations and Acronyms

The following abbreviations and acronyms may be used in this document.

RF	Radio Frequency
EMI	Electromagnetic Interference
EUT	Equipment Under Test
P/N	Part Number
S/N	Serial Number
HP	Hewlett Packard
ITE	Information Technology Equipment
CML	Corrected Meter Limit
LISN	Line Impedance Stabilization Network
N/A	Not Applicable
BLE	Bluetooth Low Energy
USB	Universal Serial Bus

3. APPLICABLE DOCUMENTS

The following documents are referenced or used in the preparation of this emissions Test Report.

SPEC	TITLE
FCC Title 47, Part 15 Subpart C	FCC Rules - Radio frequency devices (including digital devices) – Intentional Radiators
FCC Title 47, Part 15 Subpart B	FCC Rules - Radio frequency devices (including digital devices) – Unintentional Radiators
ANSI C63.4 2014	Methods of measurement of radio-noise emissions from low-voltage electrical and electronic equipment in the range of 9 kHz to 40 GHz
ANSI C63.10 2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
EN 50147-2 1997	Anechoic chambers, Alternative test site suitability with respect to site attenuation

4. DESCRIPTION OF TEST CONFIGURATION

4.1 Description of Test Configuration - Emissions

The Smart Reader, Model: OPAS02 (EUT) was connected to and powered via the Access Control Unit. The EUT was sending its data to the access control unit on a continuous basis.

The EUT is a **Class A** digital device since it will only be used in commercial and industrial environments and not sold to the general public.

The EUT contains a Rigado BMD-300 fully certified BLE module.

The EUT was continuously transmitting at 13.56 MHz and also transmitting BLE on a continuous basis.

The amplitude of the fundamental for both the BLE and 13.56 MHz transmitter did not change when both radios were simultaneously transmitting. Also, there were no additional emissions detected.

The Rigado firmware was used to allow the EUT to continuously transmit BLE. The EUT is stored at the company's servers.

The fundamental of the BLE was verified to determine that they were still in compliance. Appendix E will have the worst case emission.

The final radiated data for the EUT as was taken in the mode described above. Please see Appendix E for the data sheets.

4.1.1 Cable Construction and Termination

Cable 1

This is a 17.3-meter unshielded cable connecting the EUT to the Access Control Unit. The cable contained a 4-pin terminal block connector at the EUT end and was hard wired at the Access Control unit end.



5. LISTS OF EUT, ACCESSORIES AND TEST EQUIPMENT

5.1 EUT and Accessory List

EQUIPMENT	MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	FCC ID
SMART READER (EUT)	OPENPATH SECURITY, INC.	OPAS02	N/A	2AEMESSLS
ACCESS CONTROL UNIT	OPENPATH SECURITY, INC.	ETHER	N/A	N/A
FIRMWARE FOR BLE*	RIGADO	V3.3.1	N/A	N/A
BLE MODULE (INSIDE EUT)	RIGADO	BMD-300	N/A	2AA9B04

*The firmware was used to allow the EUT to continuously transmit BLE.

5.2 Emissions Test Equipment

EQUIPMENT TYPE	MANU-FACTURER	MODEL NUMBER	SERIAL NUMBER	CALIBRATION DATE	CAL. CYCLE
RADIATED AND CONDUCTED EMISSIONS TEST EQUIPMENT					
TDK TestLab	TDK RF Solutions, Inc.	9.22	700145	N/A	N/A
Computer	Hewlett Packard	p6716f	MXX1030PX0	N/A	N/A
LCD Monitor	Hewlett Packard	52031a	3CQ046N3MG	N/A	N/A
EMI Receiver	Rohde & Schwarz	ESIB40	100194	September 26, 2017	1 Year
EMI Receiver, 20 Hz – 26.5 GHz	Keysight Technologies	N9038A	MY5120150	December 6, 2017	1 Year
CombiLog Antenna	Com-Power	AC-220	61060	July 27, 2017	1 Year
System Controller	Sunol Sciences Corporation	SC110V	112213-1	N/A	N/A
Turntable	Sunol Sciences Corporation	2011VS	N/A	N/A	N/A
Antenna-Mast	Sunol Sciences Corporation	TWR95-4	112213-3	N/A	N/A
Turntable	Com-Power	TT-100	N/A	N/A	N/A
Antenna-Mast	Com-Power	AM-100	N/A	N/A	N/A
Horn Antenna	Com-Power	AH-118	071175	February 22, 2018	2 Year
Preamplifier	Com-Power	PAM-118A	551024	May 12, 2016	2 Year
Preamplifier	Com-Power	PA-840	711013	May 13, 2016	2 Year
Horn Antenna	Com-Power	AH-826	71957	N/A	N/A
Loop Antenna	Com-Power	AL-130R	121090	February 9, 2017	2 Year
FREQUENCY TOLERANCE OF CARRIER SIGNAL TEST EQUIPMENT					
Temperature Chamber	Despatch Industries, Inc.	16212A	149857	March 15, 2017	2 Year
Digital Multimeter	Fluke	115	Asset #: 4168	September 27, 2017	1 Year
Variable Autotransformer	Superior Electric Company	Type: 11560	Spec. BP142056	N/A	N/A
EMI Receiver	Rohde & Schwarz	ESIB40	100194	September 26, 2017	1 Year

6. TEST SITE DESCRIPTION

6.1 Test Facility Description

Please refer to section 2.1 of this report for emissions test location.

6.2 EUT Mounting, Bonding and Grounding

The EUT was mounted on a 1.0 by 1.5 meter non-conductive table 0.8 meters above the ground plane.

The EUT was not grounded.

7. TEST PROCEDURES

The following sections describe the test methods and the specifications for the tests. Test results are also included in this section.

7.1 RF Emissions

7.1.1 Conducted Emissions Test

The EMI Receiver was used as a measuring meter. A transient limiter was used for the protection of the EMI Receiver input stage, and the offset was adjusted accordingly to read the actual data measured. The LISN output was measured using the EMI Receiver. The output of a second LISN was terminated by a 50-ohm termination. The effective measurement bandwidth used for this test was 9 kHz.

Please see section 6.2 of this report for mounting, bonding, and grounding of the EUT. The EUT was powered through the LISN, which was bonded to the ground plane. The LISN power was filtered and the filter was bonded to the ground plane. The EUT was set up with the minimum distances from any conductive surfaces as specified in ANSI C63.4. The excess power cord was wrapped in a figure eight pattern to form a bundle not exceeding 0.4 meters in length.

The conducted emissions from the EUT were maximized for operating mode as well as cable placement. The final data was collected under program control by computer software. The final qualification data is located in Appendix E.

Test Results:

The EUT complies with the limits of CFR Title 47, Part 15, section 15.207; and the **Class B** limits of CFR Title 47, Part 15, Subpart B for conducted emissions.

7.1.2 Radiated Emissions (Spurious and Harmonics) Test – Lab A**7.1.3 Radiated Emissions Test (Spurious and Harmonics)**

The EMI Receiver was used as a measuring meter. The measurement meter was used in the peak detect mode with the "Max Hold" feature activated. In this mode, the measurement meter records the highest measured reading over all the sweeps. The following antenna and measurement bandwidths were used as specified in the following table.

The resolution bandwidths and transducers used for this test were:

FREQUENCY RANGE	EFFECTIVE MEASUREMENT BANDWIDTH	TRANSDUCER
9 kHz to 150 kHz	200 Hz	Loop Antenna
150 kHz to 30 MHz	9 kHz	Loop Antenna

An open field, non-ground plane test site of Compatible Electronics, Inc. was used for radiated emission testing. This test site is set up according to ANSI C63.4. Please see section 6.2 of this report for mounting, bonding, and grounding of the EUT. The portable turntable supporting the EUT is remote controlled using a motor. The portable turntable permits EUT rotation of 360 degrees in order to maximize emissions. Data was collected in the worst case (highest emission) configuration of the EUT. At the transmit frequency band, the antenna height was 1 meter; the EUT was rotated 360 degrees; and the antenna was positioned in three orthogonal positions and the position with the highest emission level was recorded (for H field radiated field strength).

The presence of ambient signals was verified by turning the EUT off. In case an ambient signal was detected, the measurement bandwidth was reduced temporarily and verification was made that an additional adjacent peak did not exist. The EUT was tested at a 10-meter test distance to obtain final test data. The final qualification data is located in Appendix E.

The corrected spec limit at 10 meters is based on the following formula: $[(40) \text{ Log (spec test distance / actual test distance)}] + \text{spec limit}$. This is based on by using the square of an inverse linear distance extrapolation factor of 40 dB/decade per FCC 15.31 (f)(2).

The final qualification data sheets are located in Appendix E.

The e-field factor is derived from the magnetic field factor plus 51.5, which is the characteristic impedance of the medium. Please see Appendix D for a table of magnetic and electric field factors.

Test Results:

The EUT complies with the limits of CFR Title 47, Part 15, Subpart C, Sections 15.209 and 15.225 for radiated emissions. Please see Appendix E for the data sheets.

7.1.4 Radiated Emissions (Spurious and Harmonics) Test – Lab D

The EMI Receiver was used as the measuring meter. A built-in, internal preamplifier was used to increase the sensitivity of the instrument. The EMI Receiver was initially used with the Analyzer mode feature activated. In this mode, the EMI receiver can then record the actual frequency to be measured. This final reading is then taken accurately in the EMI Receiver mode, which takes into account the cable loss, amplifier gain and antenna factors, so that a true reading is compared to the true limit. The effective measurement bandwidth used for the radiated emissions test was according to the frequency measured (200 Hz for 9 kHz to 150 kHz, 9 kHz for 150 kHz to 30 MHz, 120 kHz for 30 MHz to 1 GHz and 1 MHz for 1 GHz to 25 GHz).

The frequencies above 1 GHz were averaged using the RMS detector function on the EMI Receiver.

The EMI test chamber of Compatible Electronics, Inc. was used for radiated emissions testing. This test site is in full compliance with ANSI C63.4. Please see section 6.2 of this report for mounting, bonding and grounding of the EUT. The turntable supporting the EUT is remote controlled using a motor. The turntable permits EUT rotation of 360 degrees in order to maximize emissions. Also, the antenna mast allows height variation of the antenna from 1 meter to 4 meters. Data was collected in the worst case (highest emission) configuration of the EUT. At each reading, the EUT was rotated 360 degrees and the antenna height was varied from 1 to 4 meters (for E field radiated field strength). The gunsight method was used when measuring with the horn antenna in order to ensure accurate results.

The EUT was tested at a 3-meter test distance. The six highest emissions are listed in Table 1.0.

The measurement bandwidths and transducers used for the radiated emissions test were:

FREQUENCY RANGE	EFFECTIVE MEASUREMENT BANDWIDTH	TRANSDUCER
9 kHz to 150 kHz	200 Hz	Loop Antenna
150 kHz to 30 MHz	9 kHz	Loop Antenna
30 MHz to 1 GHz	120 kHz	CombiLog Antenna
1 GHz to 25 GHz	1 MHz	Horn Antenna

Test Results:

The EUT complies with the **Class A** and **Class B** limits of CFR Title 47, Part 15, Subpart B; and Subpart C sections 15.205, 15.209 and 15.225 for radiated emissions.

7.1.5 RF Emissions Test ResultsTable 1.0 RADIATED EMISSION RESULTS
Smart Reader, Model: OPAS02

Frequency MHz	Corrected Reading* dBuV/m	Specification Limit dBuV/m	Delta (Cor. Reading – Spec. Limit) dB
80.50 (V)	36.09 (QP)	40.00	-3.91
79.20 (V)	34.10 (QP)	40.00	-5.90
77.70 (V)	32.84 (QP)	40.00	-7.16
81.70 (V)	32.73 (QP)	40.00	-7.27
74.50 (V)	32.05 (QP)	40.00	-7.95
81.50 (V)	31.38 (QP)	40.00	-8.62

Table 2.0 CONDUCTED EMISSION RESULTS
Smart Reader, Model: OPAS02

Frequency MHz	Corrected Reading* dBuV	Specification Limit dBuV	Delta (Cor. Reading – Spec. Limit) dB
13.558 (BL)	40.21 (Avg)	50.00	-9.79
27.122 (WL)	39.83 (Avg)	50.00	-10.17
27.122 (BL)	39.41 (Avg)	50.00	-10.59
13.558 (WL)	38.59 (Avg)	50.00	-11.41
0.174 (WL)	41.31 (Avg)	54.22	-12.91
0.178 (BL)	40.25 (Avg)	54.14	-13.89

Notes:

(H) Horizontal
(V) Vertical
(BL) Black Lead
(WL) White Lead
(QP) Quasi Peak
(Avg) Average

* The complete emissions data is given in Appendix E of this report.

7.2 Frequency Tolerance of Carrier Signal

The EUT was placed in a temperature chamber and set to +50 degrees Celsius. The EUT was exposed to this temperature for a period of 10 minutes. The temperature was subsequently decreased at 10 degree increments down to -20 degrees Celsius with a 30 minute acclimation period between each temperature. At each temperature, the EUT's fundamental emission was measured with an EMI Receiver to determine whether the carrier signal was within 0.01% of the fundamental frequency at startup, 2 minutes, 5 minutes, and 10 minutes after removal from the temperature chamber.

Also, at +20 degrees Celsius, the EUT's input voltage was varied between 85% and 115% using a variable auto transformer and the fundamental of the EUT was measured with an EMI Receiver to determine whether the carrier signal was within 0.01% of the fundamental frequency.

A data sheet of the Frequency Tolerance testing is located in Appendix E.

Test Results:

The EUT complies with the requirements of FCC Title 47, Part 15, Subpart, B, section 15.225 [e]. Please see Appendix E for the data sheets.

8. CONCLUSIONS

The Smart Reader, Model: OPAS02, as tested, meets all of the specification limits defined in FCC Title 47, Part 15, Subpart B and Subpart C, sections 15.205, 15.209, and 15.225.

APPENDIX A

LABORATORY ACCREDITATIONS AND RECOGNITIONS

LABORATORY ACCREDITATIONS AND RECOGNITIONS



NVLAP LAB CODE 200528-0

Quote from ISO-ILAC-IAF Communiqué on 17025:

"A laboratory's fulfilment of the requirements of ISO/IEC 17025:2005 means the laboratory meets both the technical competence requirements and management system requirements that are necessary for it to consistently deliver technically valid test results and calibrations. The management system requirements in ISO/IEC 17025:2005 (Section 4) are written in language relevant to laboratory operations and meet the principles of ISO 9001:2008 Quality Management Systems — Requirements."



For US, Canada, Australia/New Zealand, Japan, Taiwan, Korea, and the European Union, Compatible Electronics is currently accredited by NVLAP to ISO/IEC 17025. **For the most up-to-date version of our scopes and certificates please visit <http://celectronics.com/quality/scope/>**



APPENDIX B

MODIFICATIONS TO THE EUT

MODIFICATIONS TO THE EUT

The modifications listed below were made to the EUT to pass FCC Subpart B and FCC 15.225 specifications.

All the rework described below was implemented during the test in a method that could be reproduced in all the units by the manufacturer.

No modifications were made to the EUT during the testing.





APPENDIX C

ADDITIONAL MODELS

ADDITIONAL MODELS COVERED UNDER THIS REPORT

USED FOR THE PRIMARY TEST

Smart Reader
Model: OPAS02
S/N: N/A

ADDITIONAL MODELS COVERED UNDER THIS REPORT:

There were no additional models covered under this report.

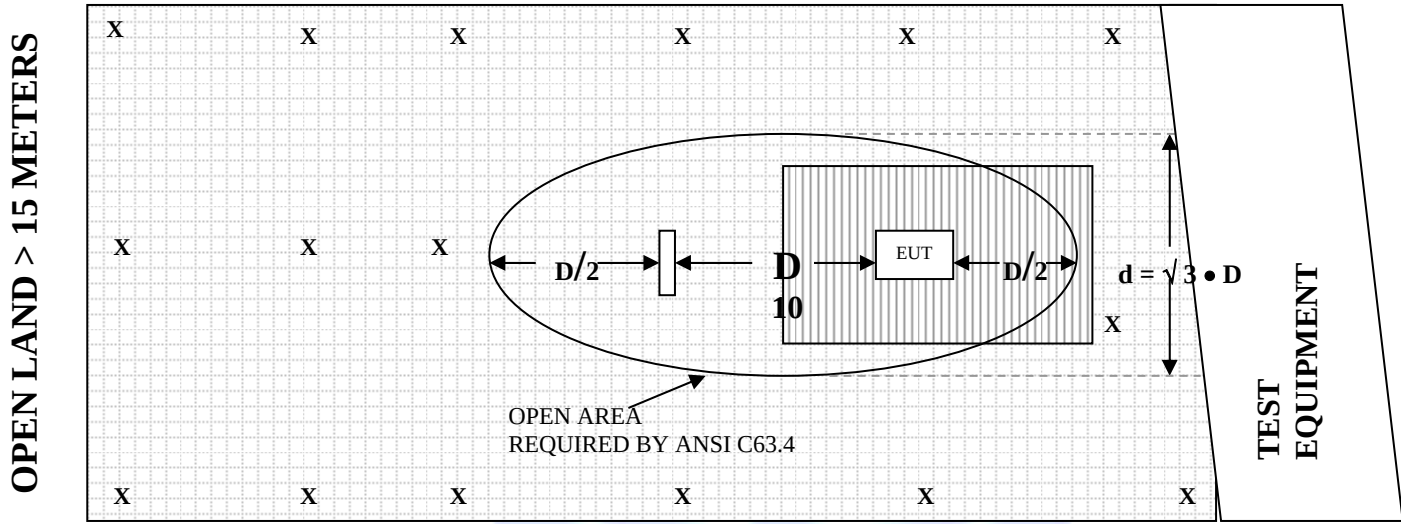


APPENDIX D

DIAGRAMS AND CHARTS

FIGURE 1: PLOT MAP AND LAYOUT OF RADIATED SITE

OPEN LAND > 15 METERS



OPEN LAND > 15 METERS

X	= GROUND RODS		= GROUND SCREEN
D	= TEST DISTANCE (meters)		= WOOD COVER

FIGURE 2: LAYOUT OF THE SEMI-ANECHOIC TEST CHAMBER

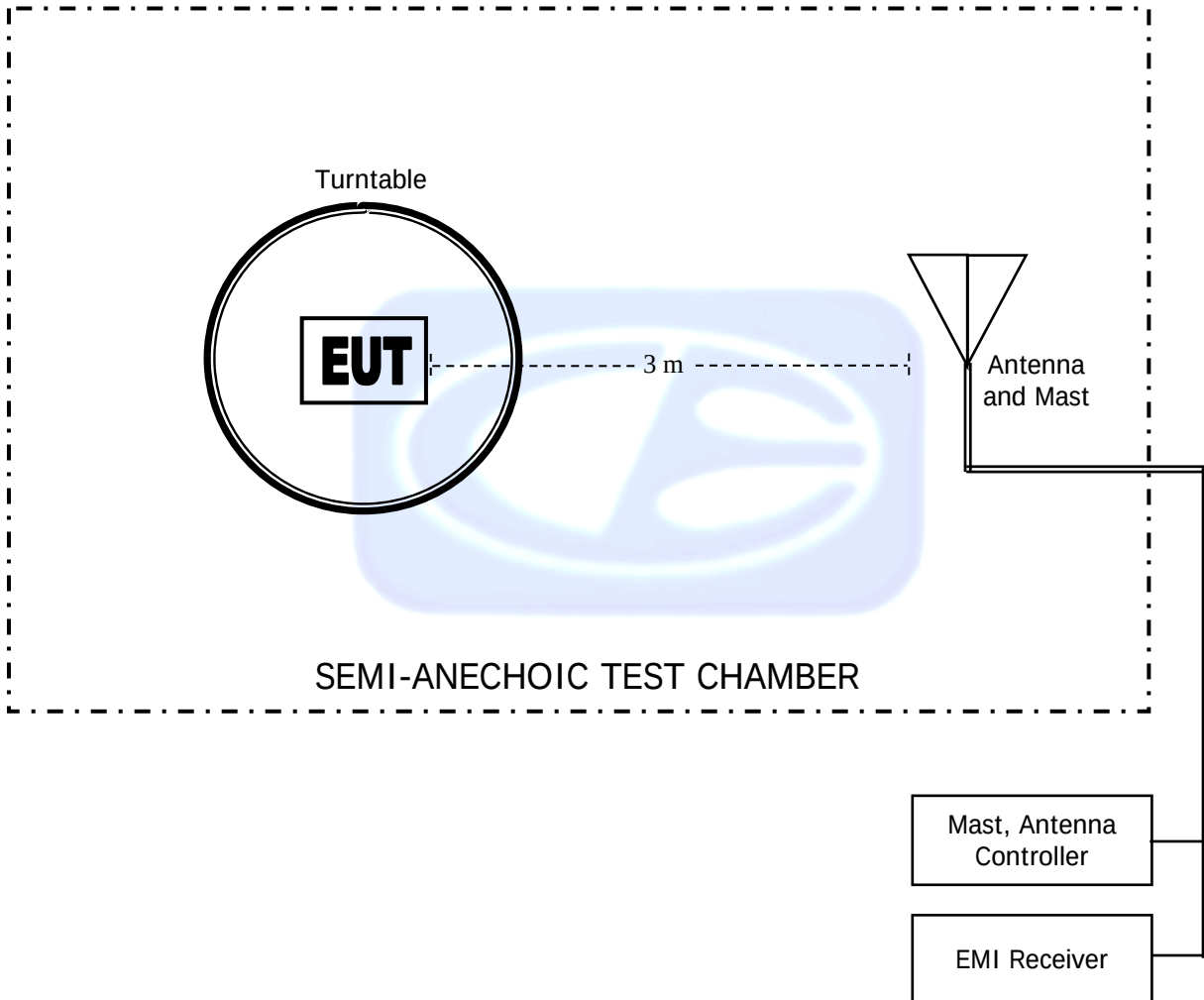
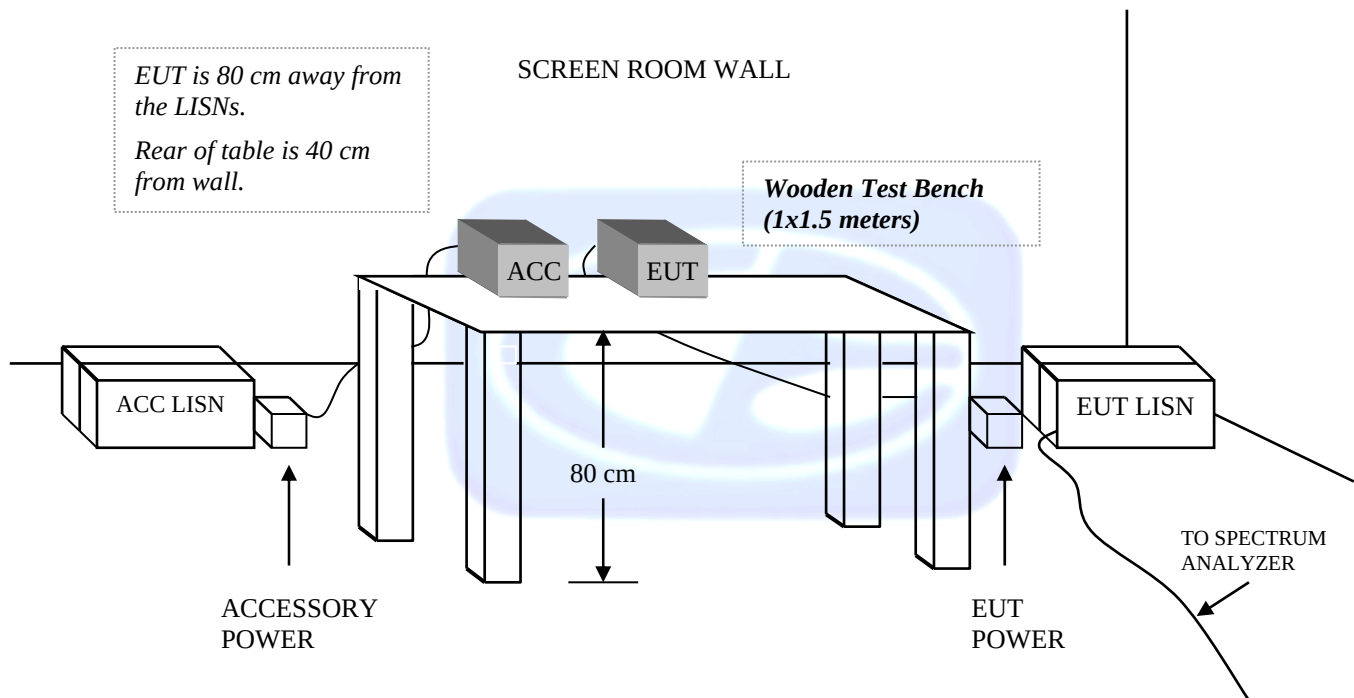


FIGURE 3: CONDUCTED EMISSIONS TEST SETUP

COM-POWER AL-130R**LOOP ANTENNA****S/N: 121090****CALIBRATION DATE: FEBRUARY 9, 2017**

FREQUENCY (MHz)	MAGNETIC (dB/m)	ELECTRIC (dB/m)
0.009	-36.17	15.33
0.01	-35.86	15.64
0.02	-37.30	14.20
0.03	-36.58	14.92
0.04	-36.99	14.51
0.05	-37.66	13.84
0.06	-37.53	13.97
0.07	-37.64	13.86
0.08	-37.52	13.98
0.09	-37.62	13.88
0.1	-37.59	13.91
0.2	-37.79	13.71
0.3	-37.80	13.70
0.4	-37.70	13.80
0.5	-37.79	13.71
0.6	-37.79	13.71
0.7	-37.69	13.81
0.8	-37.49	14.01
0.9	-37.39	14.11
1	-37.39	14.11
2	-37.09	14.41
3	-37.09	14.41
4	-37.19	14.31
5	-36.98	14.52
6	-37.17	14.33
7	-37.05	14.45
8	-36.85	14.65
9	-36.84	14.66
10	-36.75	14.75
15	-37.16	14.34
20	-36.44	15.06
25	-37.88	13.62
30	-39.14	12.36

COM-POWER AC-220**COMBILOG ANTENNA****S/N: 61060****CALIBRATION DATE: JULY 27, 2017**

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
30	23.80	200	14.10
35	24.00	250	15.30
40	24.70	300	17.70
45	22.90	350	17.70
50	22.10	400	19.00
60	17.60	450	21.30
70	12.70	500	21.00
80	11.20	550	22.30
90	13.10	600	23.40
100	14.40	650	22.90
120	15.30	700	24.60
125	15.00	750	24.50
140	12.80	800	25.40
150	16.50	850	26.40
160	12.90	900	27.20
175	14.30	950	27.80
180	14.50	1000	26.80

COM POWER AH-118**HORN ANTENNA****S/N: 071175****CALIBRATION DATE: FEBRUARY 22, 2018**

FREQUENCY (GHz)	FACTOR (dB)	FREQUENCY (GHz)	FACTOR (dB)
1.0	23.71	10.0	40.08
1.5	25.46	10.5	40.75
2.0	29.26	11.0	41.78
2.5	27.95	11.5	41.02
3.0	29.03	12.0	40.32
3.5	29.70	12.5	40.96
4.0	30.71	13.0	40.29
4.5	31.62	13.5	39.48
5.0	33.23	14.0	39.89
5.5	35.07	14.5	42.75
6.0	34.43	15.0	40.98
6.5	34.98	15.5	38.54
7.0	36.75	16.0	39.40
7.5	37.10	16.5	39.40
8.0	37.66	17.0	41.74
8.5	39.29	17.5	42.58
9.0	37.75	18.0	44.68
9.5	38.23		

COM-POWER PA-118**PREAMPLIFIER****S/N: 551024****CALIBRATION DATE: MAY 12, 2016**

FREQUENCY (GHz)	FACTOR (dB)	FREQUENCY (GHz)	FACTOR (dB)
1.0	39.84	6.0	39.05
1.1	39.40	6.5	38.94
1.2	39.58	7.0	39.25
1.3	39.68	7.5	39.09
1.4	39.91	8.0	39.01
1.5	39.78	8.5	38.60
1.6	39.50	9.0	38.64
1.7	39.81	9.5	39.67
1.8	39.89	10.0	39.30
1.9	39.94	11.0	39.15
2.0	39.57	12.0	39.24
2.5	40.39	13.0	39.49
3.0	40.63	14.0	39.44
3.5	40.80	15.0	39.94
4.0	40.86	16.0	40.09
4.5	39.94	17.0	40.06
5.0	34.47	18.0	39.76
5.5	39.32		

COM-POWER AH-826**HORN ANTENNA****S/N: 71957**

FREQUENCY (GHz)	FACTOR (dB)	FREQUENCY (GHz)	FACTOR (dB)
18.0	33.5	22.5	35.5
18.5	33.5	23.0	35.9
19.0	34.0	23.5	35.7
19.5	34.0	24.0	35.6
20.0	34.3	24.5	36.0
20.5	34.9	25.0	36.2
21.0	34.7	25.5	36.1
21.5	35.0	26.0	36.2
22.0	35.0	26.5	35.7

COM-POWER PA-840**MICROWAVE PREAMPLIFIER****S/N: 711013****CALIBRATION DATE: MAY 13, 2016**

FREQUENCY (GHz)	FACTOR (dB)	FREQUENCY (GHz)	FACTOR (dB)
18.0	25.19	31.0	25.69
19.0	24.48	31.5	25.74
20.0	24.39	32.0	26.35
21.0	24.73	32.5	26.64
22.0	23.49	33.0	25.98
23.0	24.23	33.5	24.68
24.0	24.59	34.0	24.61
25.0	25.32	34.5	23.78
26.0	25.66	35.0	24.74
26.5	25.99	35.5	24.39
27.0	26.26	36.0	23.46
27.5	25.33	36.5	23.71
28.0	24.49	37.0	26.35
28.5	24.74	37.5	23.49
29.0	25.93	38.0	25.42
29.5	26.28	38.5	24.87
30.0	26.17	39.0	22.60
30.5	26.11	39.5	20.57
		40.0	19.15



FRONT VIEW

OPENPATH SECURITY, INC.
SMART READER
MODEL: OPAS02

FCC SUBPART B AND C – RADIATED EMISSIONS – BELOW 30 MHz

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION
FOR MAXIMUM EMISSIONS**

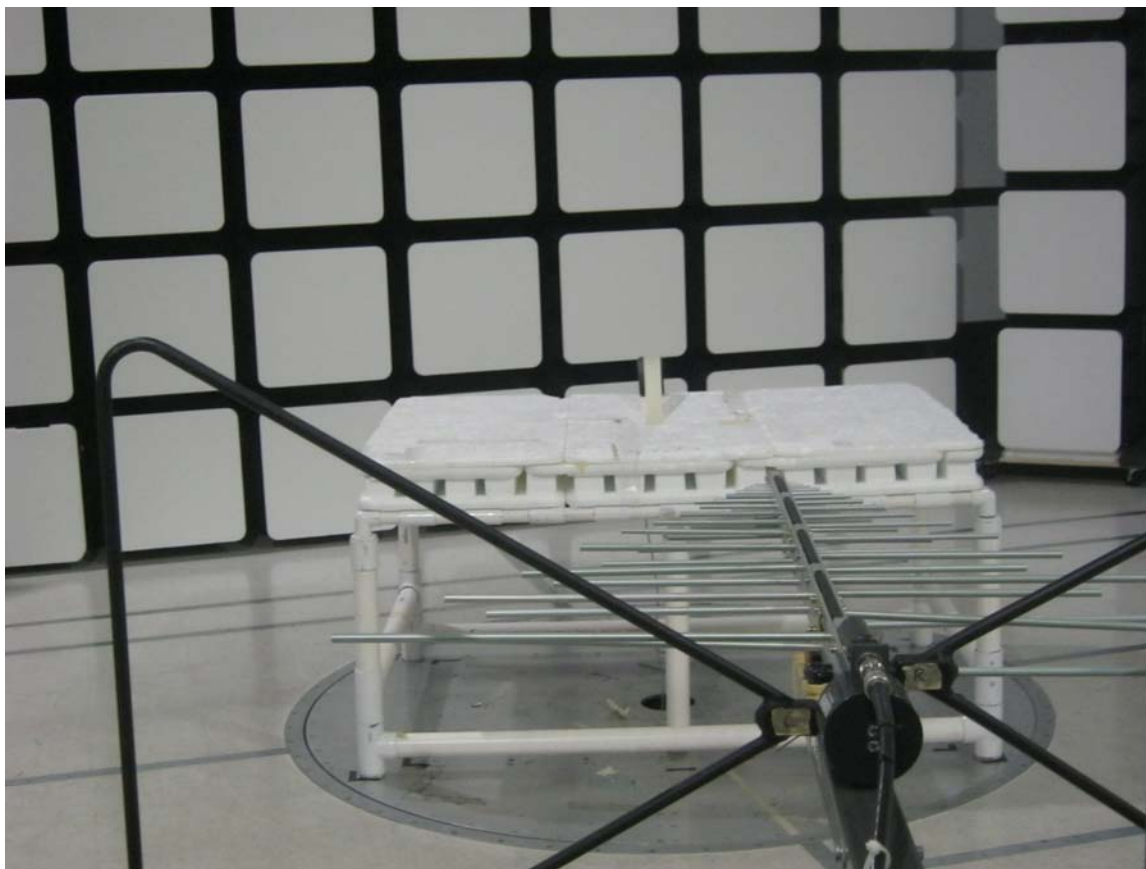


REAR VIEW

OPENPATH SECURITY, INC.
SMART READER
MODEL: OPAS02

FCC SUBPART B AND C – RADIATED EMISSIONS – BELOW 30 MHz

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION
FOR MAXIMUM EMISSIONS**

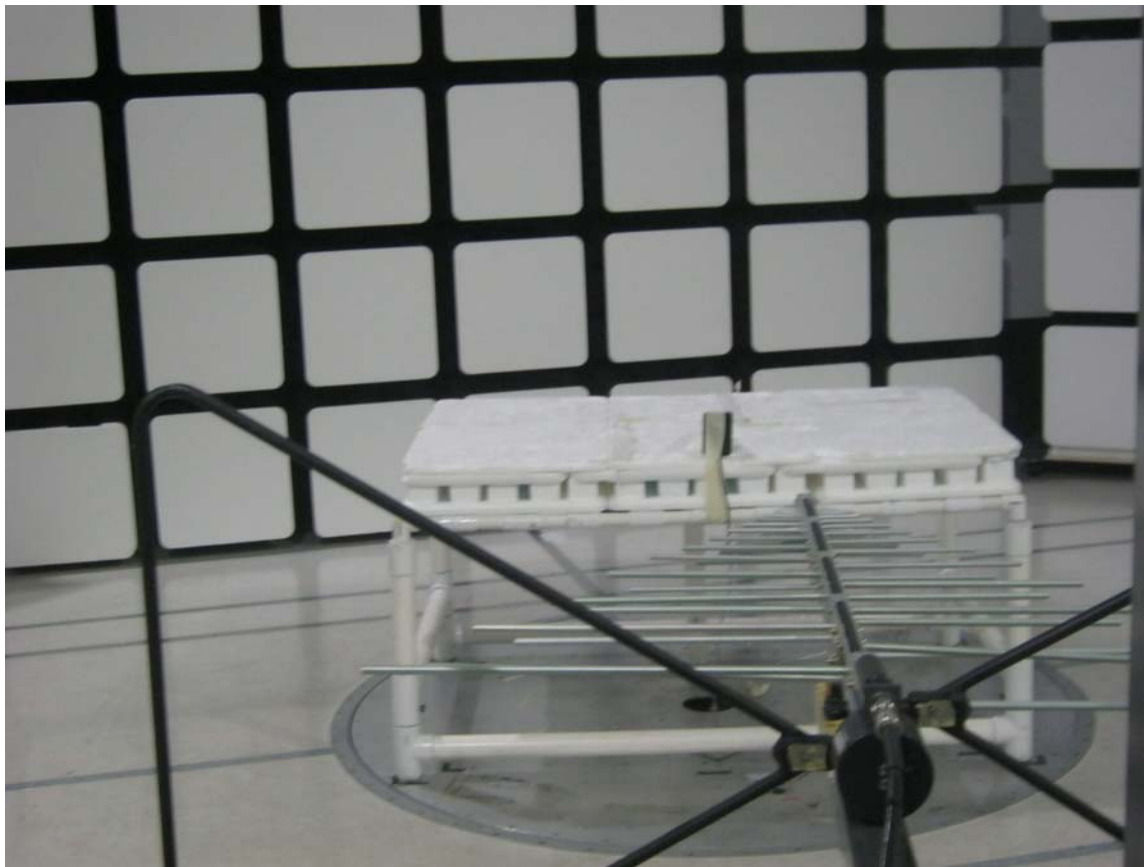


FRONT VIEW

OPENPATH SECURITY, INC.
SMART READER
MODEL: OPAS02

FCC SUBPART B AND C – RADIATED EMISSIONS – ABOVE 30 MHz

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION
FOR MAXIMUM EMISSIONS**

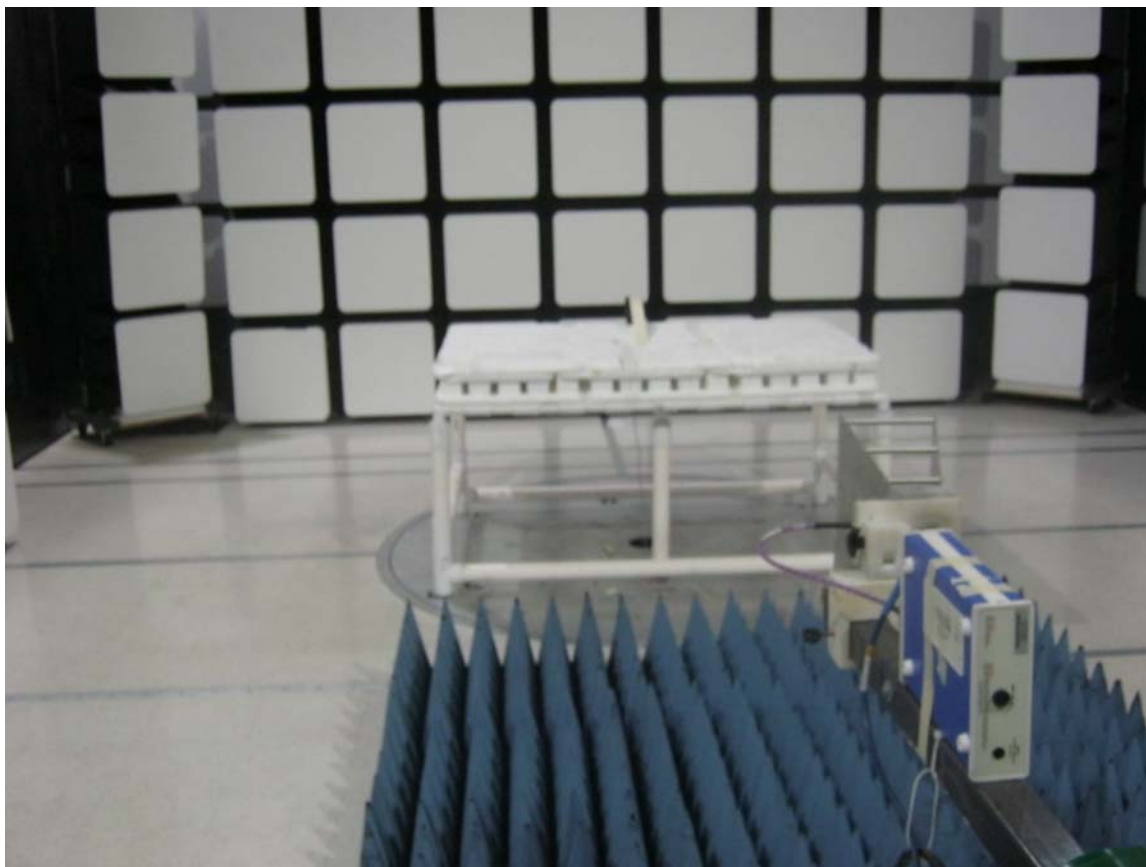


REAR VIEW

OPENPATH SECURITY, INC.
SMART READER
MODEL: OPAS02

FCC SUBPART B AND C – RADIATED EMISSIONS – ABOVE 30 MHz

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION
FOR MAXIMUM EMISSIONS**

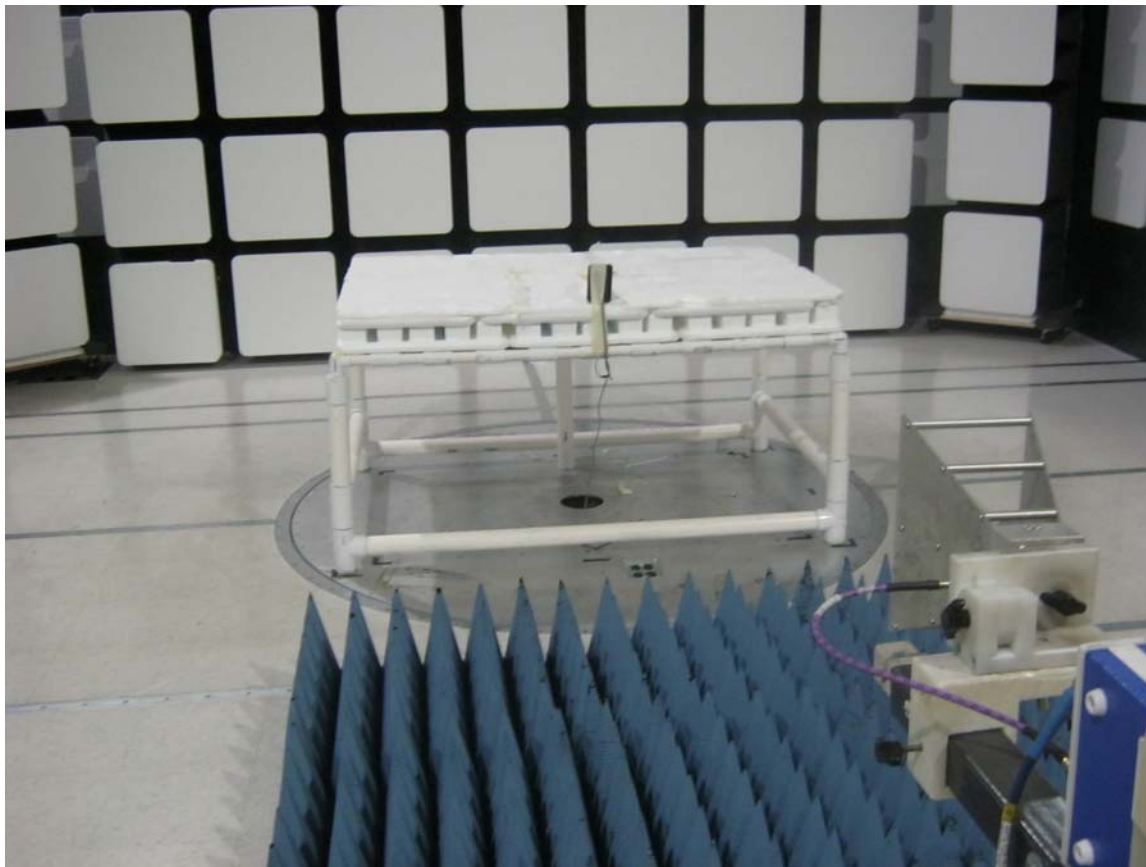


FRONT VIEW

OPENPATH SECURITY, INC.
SMART READER
MODEL: OPAS02

FCC SUBPART B AND C – RADIATED EMISSIONS – ABOVE 1 GHz

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION
FOR MAXIMUM EMISSIONS**

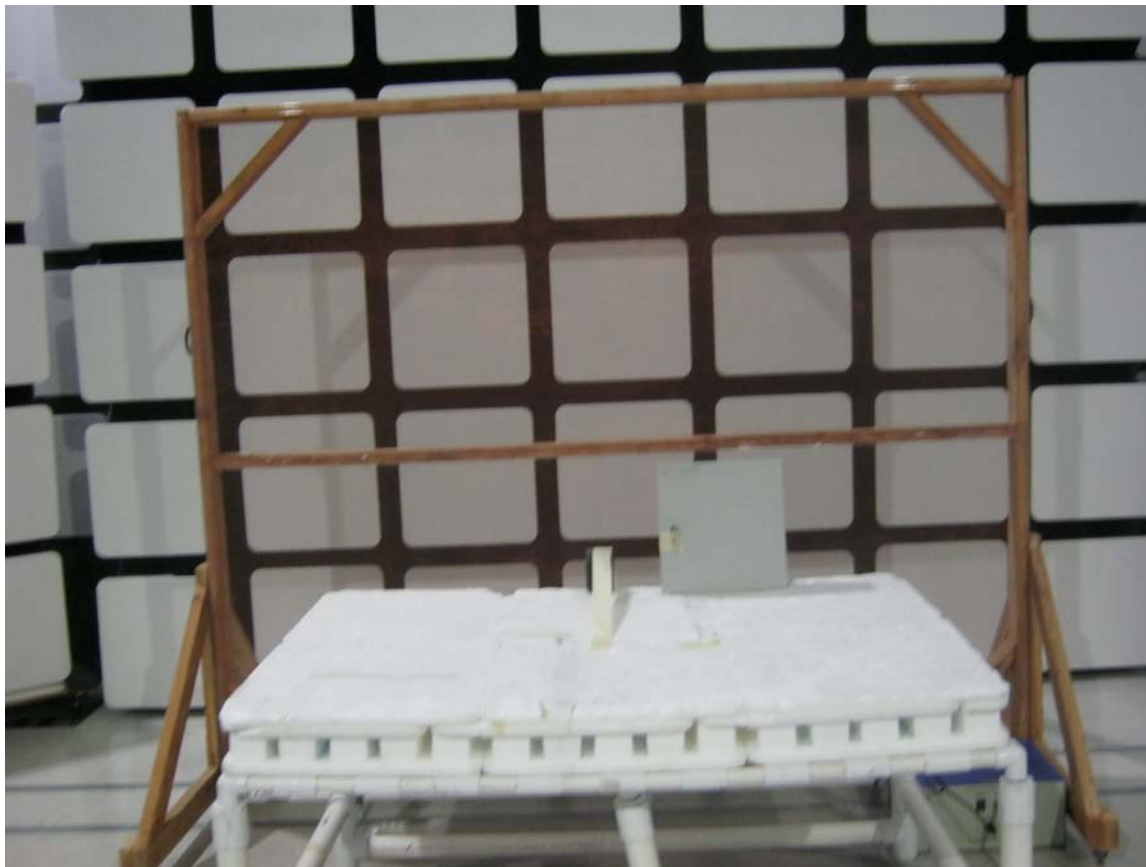


REAR VIEW

OPENPATH SECURITY, INC.
SMART READER
MODEL: OPAS02

FCC SUBPART B AND C – RADIATED EMISSIONS – ABOVE 1 GHz

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION
FOR MAXIMUM EMISSIONS**



FRONT VIEW

OPENPATH SECURITY, INC.
SMART READER
MODEL: OPAS02
FCC SUBPART B – CONDUCTED EMISSIONS

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION
FOR MAXIMUM EMISSIONS**



REAR VIEW

OPENPATH SECURITY, INC.
SMART READER
MODEL: OPAS02
FCC SUBPART B AND C – CONDUCTED EMISSIONS

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION
FOR MAXIMUM EMISSIONS**

APPENDIX E
DATA SHEETS

RADIATED EMISSIONS

DATA SHEETS

FCC 15.225OpenPath Security, Inc.
Smart Reader
Model: TBDDate: 04/26/2018
Lab: A
Tested By: Kyle Fujimoto**Transmit Mode - 9 kHz to 30 MHz****Test Distance: 10 Meters****The EUT is Wall Mounted, thus Y-Axis Only**

Corrected Spec Limit at 10 Meters = [40 Log (spec test dist./actual test dist.)] + spec limit

Freq. (MHz)	Level (dBuV/m)	Ant. Axis	Spec Limit (at 10 m)	Margin	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
13.56	51.99	X	103.08	-51.094	Peak	1	90	Y-Axis
13.553	40.32	X	69.56	-29.24	Peak	1	90	FCC 15.255 (b) Y-Axis Worst Case
13.567	40.61	X	69.56	-28.95	Peak	1	90	FCC 15.255 (b) Y-Axis Worst Case
13.41	29.46	X	59.59	-30.131	Peak	1	90	FCC 15.255 [c] Y-Axis Worst Case
13.71	29.1	X	59.59	-30.491	Peak	1	90	FCC 15.225 [c] Y-Axis Worst Case
27.118	29.88	X	48.63	-18.747	Peak	1	90	Y-Axis

Note #1: The EUT was checked with the BLE also continuous transmitting at the same time.

This does not cause an increase to any of the emissions

Note #2: The X-Axis for the antenna axis is the worst case.

Limit in uV/m = 2400/F (kHz) at 300 Meters from 9 kHz to 490 kHz

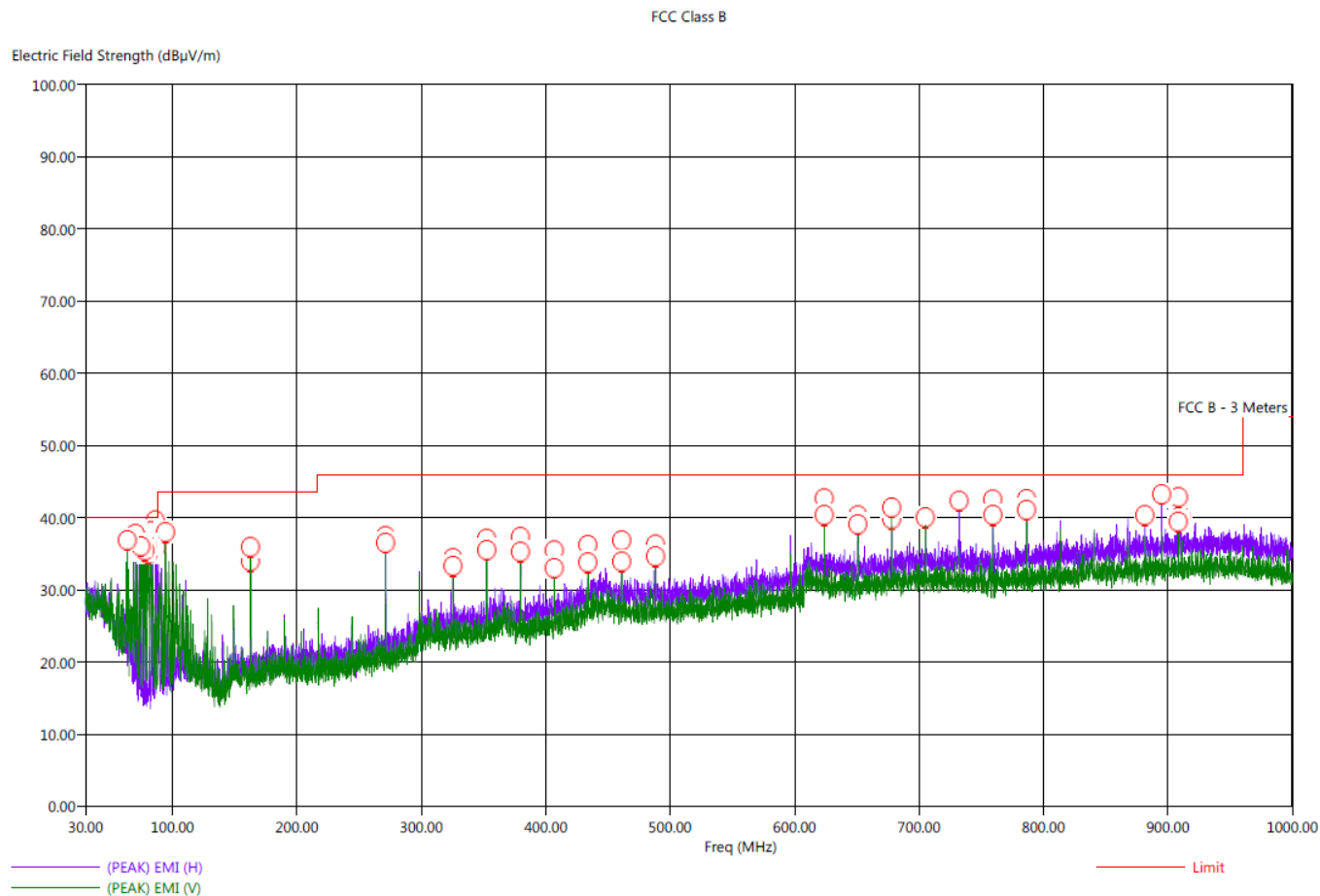
Limit in uV/m = 24000/F (kHz) at 30 Meters from 490 kHz to 1705 kHz

Limit in uV/m = 30 at 30 Meters from 1705 kHz to 30 MHz

dBuV/m = 20 Log (uV/m)

Title: Radiated Emissions - FCC Class B
File: Agilent - Pre-Scan - FCC Class B - Card Reader - 30 MHz to 1000 MHz - 04-26-2018.set Operator: Kyle Fujimoto
EUT Type: Reader
EUT Condition: The EUT is continuously transmitting at 13.56 MHz and transmitting BLE
Company: OpenPath Security, Inc.
Model: OPAS02
S/N: N/A

4/26/2018 10:19:36 AM
Sequence: Preliminary Scan



Note: A manual scan was performed from 1 GHz to 25 GHz and no emissions were detected except for the fundamental of the BLE.

Title: Radiated Emissions - FCC Class B
File: Agilent - Final Scan - FCC Class B - Card Reader - 30 MHz to 1000 MHz - 04-26-2018.set
Operator: Kyle Fujimoto
EUT Type: Reader
EUT Condition: The EUT is continuously transmitting at 13.56 MHz and transmitting BLE
Company: OpenPath Security, Inc.
Model: OPAS02
S/N: N/A

4/26/2018 10:33:30 AM
Sequence: Final Measurements

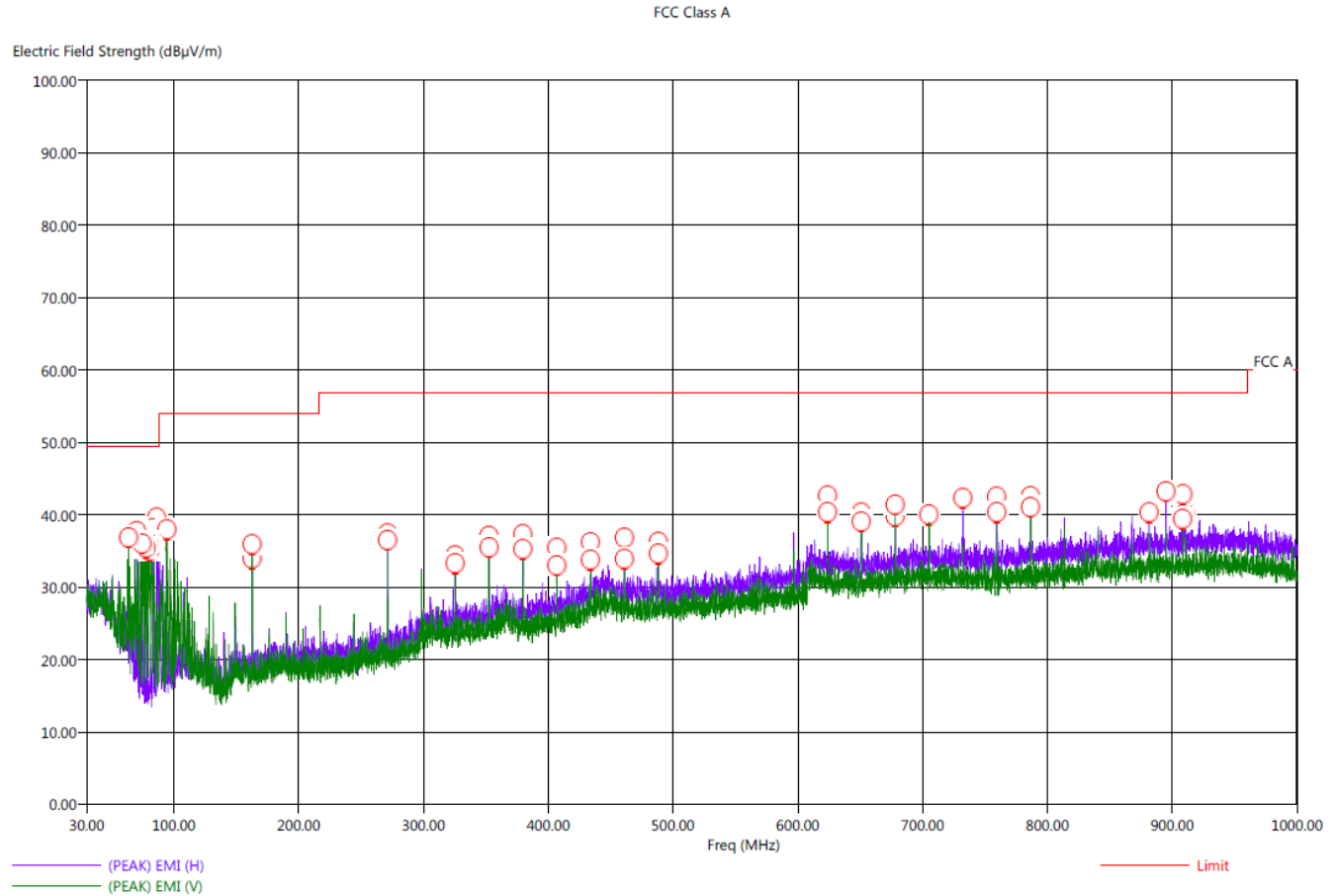
FCC Class B										
Freq (MHz)	Pol	(PEAK) EMI (dBµV/m)	(QP) EMI (dBµV/m)	(PEAK) Margin (dB)	(QP) Margin (dB)	Limit (dBµV/m)	Transducer (dB)	Cable (dB)	Ttbl Agl (deg)	Twr Ht (cm)
63.60	V	26.39	19.16	-13.61	-20.84	40.00	15.64	0.94	323.75	254.91
70.10	H	26.48	20.83	-13.52	-19.17	40.00	12.68	1.00	276.75	318.61
73.10	H	26.76	20.38	-13.24	-19.62	40.00	12.24	1.03	301.75	334.25
74.50	V	40.20	32.05	0.20	-7.95	40.00	12.03	1.04	0.00	127.32
77.70	V	38.37	32.84	-1.63	-7.16	40.00	11.52	1.08	284.50	223.08
79.20	V	39.63	34.10	-0.37	-5.90	40.00	11.32	1.09	294.50	175.08
80.50	V	41.85	36.09	1.85	-3.91	40.00	11.31	1.10	304.75	127.38
81.50	V	39.45	31.38	-0.55	-8.62	40.00	11.43	1.10	26.25	159.08
81.70	V	39.97	32.73	-0.03	-7.27	40.00	11.58	1.10	352.75	223.14
83.00	H	24.48	18.12	-15.52	-21.88	40.00	11.80	1.10	270.75	318.31
83.70	H	29.22	19.41	-10.78	-20.59	40.00	11.98	1.10	307.75	302.61
86.10	H	27.45	20.37	-12.55	-19.63	40.00	12.42	1.10	116.25	159.14
87.00	H	26.94	18.96	-13.06	-21.04	40.00	12.54	1.10	69.50	366.97
87.50	H	24.85	18.37	-15.15	-21.63	40.00	12.69	1.10	103.00	334.49
87.90	H	26.37	19.72	-13.63	-20.28	40.00	12.71	1.10	81.00	143.32
94.40	V	41.06	35.20	-2.44	-8.30	43.50	13.69	1.10	67.75	127.20

Note: The frequencies shown are all below the tenth harmonic of the fundamental frequency of 13.56 MHz and thus were tested to the limits of FCC 15.209 and FCC 15.109 Class B

Per FCC 15.209 (f) – Measurements above the tenth harmonic shall comply with the general radiated emission limits applicable to the incorporated digital device, as shown in FCC 15.109 and as based on the frequency of the emission being measured, or, except for emissions contained in the restricted bands shows in FCC 15.205, the limit on spurious emissions specified for the intentional radiator, whichever is the higher limit. Emissions which must be measured above the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator and which fall within the restricted bands shall comply with the general radiated emissions in 15.109 that are applicable to the incorporated digital device.

Title: Radiated Emissions - FCC Class A
File: 1 - Agilent - Pre-Scan - FCC Class A - Card Reader - 30 MHz to 1000 MHz - 04-26-2018.set
Operator: Kyle Fujimoto
EUT Type: Smart Reader
EUT Condition: The EUT is continuously transmitting at 13.56 MHz and transmitting BLE
Comments: OpenPath Security, Inc.
Model: OPAS02
S/N: N/A

4/26/2018 10:19:36 AM
Sequence: Preliminary Scan



Note: A manual scan was performed from 1 GHz to 25 GHz and no emissions were detected except for the fundamental of the BLE.

Title: Radiated Emissions - FCC Class A

File: Agilent - Final Scan - FCC Class A - Card Reader - 30 MHz to 1000 MHz - 04-26-2018.set

Operator: Kyle Fujimoto

EUT Type: Smart Reader

EUT Condition: The EUT is continuously transmitting at 13.56 MHz and transmitting BLE

Company: OpenPath Security, Inc.

Model: OPAS02

S/N: N/A

4/26/2018 11:15:45 AM

Sequence: Final Measurements

FCC Class A

Freq (MHz)	Pol	(PEAK) EMI (dBμV/m)	(QP) EMI (dBμV/m)	(PEAK) Margin (dB)	(QP) Margin (dB)	Limit (dBμV/m)	Transducer (dB)	Cable (dB)	Ttbl Agl (deg)	Twr Ht (cm)
162.70	H	30.06	28.15	-23.91	-25.82	53.97	13.16	1.30	106.75	206.85
162.70	V	39.50	38.64	-17.39	-18.25	56.89	13.16	1.30	199.50	111.38
271.20	H	37.82	36.55	-19.07	-20.34	56.89	16.37	1.64	82.00	111.44
271.20	V	38.68	37.60	-18.21	-19.29	56.89	16.37	1.64	168.25	111.44
325.50	H	36.80	35.11	-20.09	-21.78	56.89	17.70	1.81	247.25	111.32
325.50	V	37.14	35.87	-19.75	-21.02	56.89	17.70	1.81	182.25	127.32
352.50	H	39.86	38.45	-17.03	-18.44	56.89	17.77	1.91	122.50	111.44
352.50	V	40.23	37.27	-16.66	-19.62	56.89	17.77	1.91	1.50	111.38
379.70	H	35.39	32.58	-21.50	-24.31	56.89	18.49	2.02	264.00	127.20
379.70	V	40.46	39.07	-16.43	-17.82	56.89	18.49	2.02	357.50	111.50
406.80	H	33.52	30.49	-23.37	-26.40	56.89	19.33	2.11	121.25	159.08
406.80	V	38.70	35.73	-18.19	-21.16	56.89	19.33	2.11	0.00	111.38
433.90	H	38.12	34.85	-18.77	-22.04	56.89	20.59	2.17	100.25	238.85
433.90	V	39.03	37.11	-17.86	-19.78	56.89	20.59	2.17	351.75	127.32
461.00	H	37.88	35.45	-19.01	-21.44	56.89	21.23	2.20	252.25	191.08
461.00	V	38.80	36.83	-18.09	-20.06	56.89	21.23	2.20	44.25	111.44
488.20	H	35.57	32.43	-21.32	-24.46	56.89	21.07	2.20	234.75	238.91
488.20	V	38.54	35.21	-18.35	-21.68	56.89	21.07	2.20	51.25	111.44
623.80	H	45.69	44.30	-11.20	-12.59	56.89	23.16	2.50	260.00	127.32
623.80	V	44.58	42.67	-12.31	-14.22	56.89	23.16	2.50	345.25	111.32
650.90	H	42.00	39.50	-14.89	-17.39	56.89	22.93	2.50	54.50	110.91
650.90	V	40.84	37.26	-16.05	-19.63	56.89	22.93	2.50	270.75	190.85
678.00	H	42.35	40.13	-14.54	-16.76	56.89	23.87	2.50	315.00	111.44
678.00	V	44.37	42.69	-12.52	-14.20	56.89	23.87	2.50	266.50	111.44
705.10	H	40.44	37.44	-16.45	-19.45	56.89	24.59	2.52	41.50	175.20
732.30	H	44.45	42.02	-12.44	-14.87	56.89	24.53	2.63	72.75	111.50
759.30	H	43.12	41.01	-13.77	-15.88	56.89	24.67	2.72	68.75	175.20
759.40	V	46.98	45.57	-9.91	-11.32	56.89	24.67	2.72	8.25	111.38
786.50	H	42.72	40.60	-14.17	-16.29	56.89	25.16	2.77	68.75	159.14
786.50	V	47.86	46.47	-9.03	-10.42	56.89	25.16	2.77	357.75	111.50
881.50	H	40.09	35.98	-16.80	-20.91	56.89	26.91	2.93	223.00	238.91
895.00	H	42.58	37.35	-14.31	-19.54	56.89	27.12	2.98	145.25	302.55
908.50	V	43.68	41.22	-13.21	-15.67	56.89	27.30	3.02	1.00	111.38
908.60	H	41.33	36.32	-15.56	-20.57	56.89	27.30	3.02	123.50	382.61
910.30	H	38.74	33.56	-18.15	-23.33	56.89	27.33	3.02	185.50	159.08

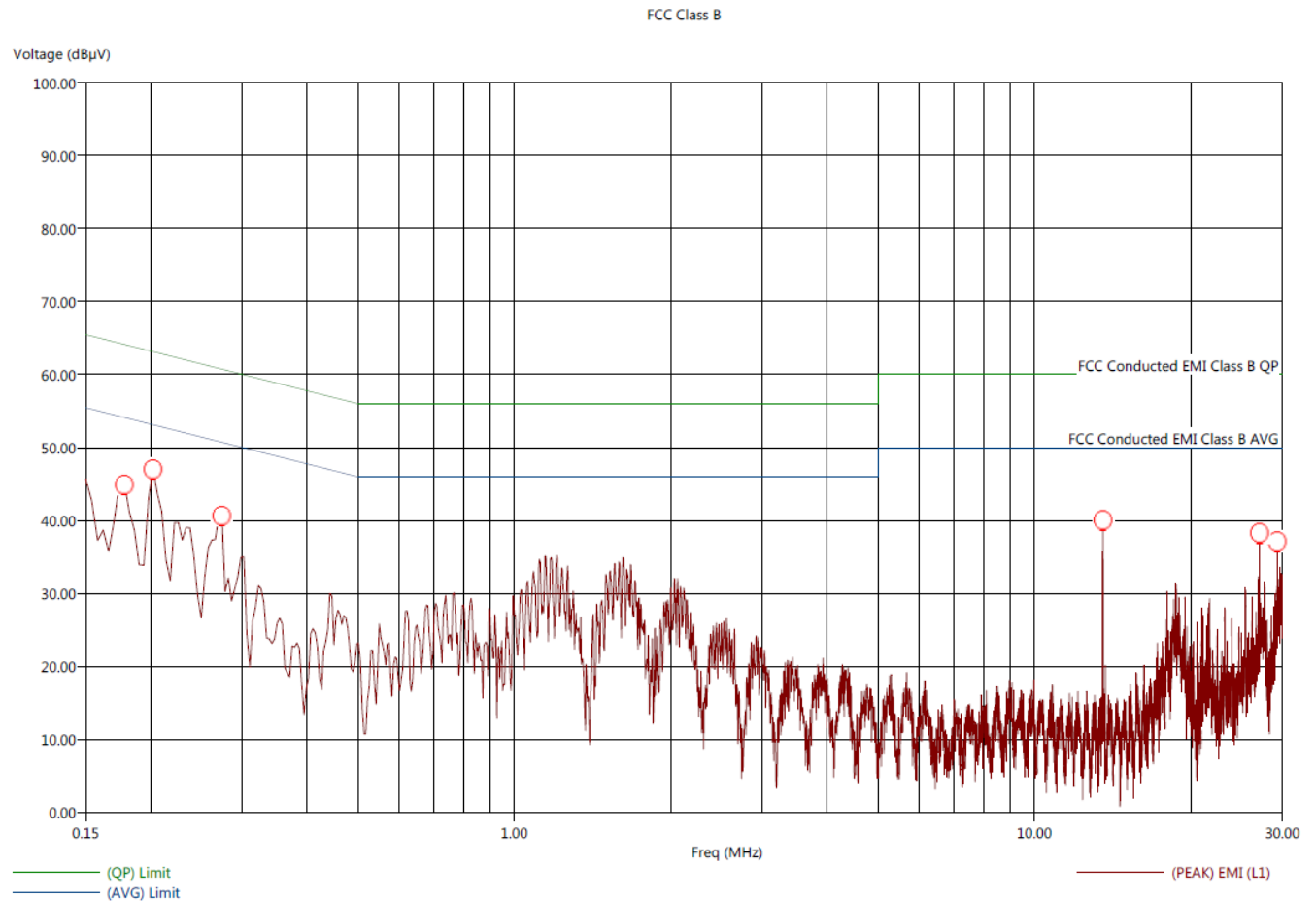
Note: The frequencies shown are all above the tenth harmonic of the fundamental frequency of 13.56 MHz

Per FCC 15.209 (f) – Measurements above the tenth harmonic shall comply with the general radiated emission limits applicable to the incorporated digital device, as shown in FCC 15.109 and as based on the frequency of the emission being measured, or, except for emissions contained in the restricted bands shown in FCC 15.205, the limit on spurious emissions specified for the intentional radiator, whichever is the higher limit. Emissions which must be measured above the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator and which fall within the restricted bands shall comply with the general radiated emissions in 15.109 that are applicable to the incorporated digital device.

***CONDUCTED EMISSIONS
DATA SHEETS***

Title: FCC Class B - Black Lead
File: Agilent - Conducted Pre-Scan Line - 0.15-30 MHz - FCC-B - 04-10-2018.set
Operator: Kyle Fujimoto
EUT Type: Smart Reader
EUT Condition: The EUT is continuously transmitting at 13.56 MHz and transmitting BLE
Customer: OpenPath Security, Inc.
Model: OPAS02
S/N: N/A

4/26/2018 2:58:02 PM
Sequence: Preliminary Scan



Title: FCC Class B - Black Lead
File: Agilent - Conducted Final Scan Line - 0.15-30 MHz - FCC-B - 04-10-2018.set
Operator: Kyle Fujimoto
EUT Type: Smart Reader
EUT Condition: The EUT is continuously transmitting at 13.56 MHz and transmitting BLE
Company: OpenPath Security, Inc.
Model: OPAS02
S/N: N/A

4/26/2018 3:01:21 PM
Sequence: Final Measurements

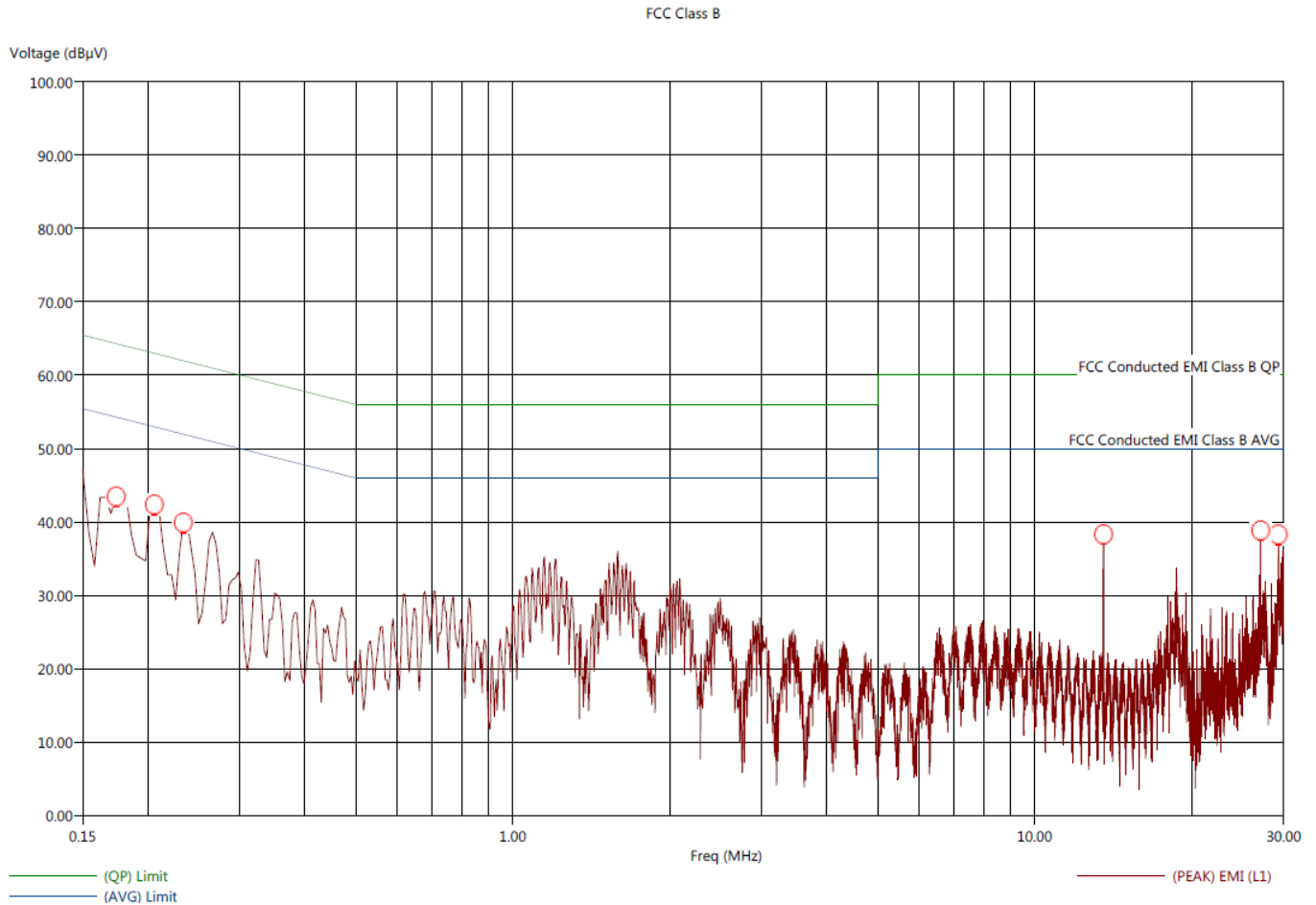
Black Lead

Freq (MHz)	(PEAK) EMI (dBμV)	(AVG) EMI (dBμV)	(PEAK) Margin (dB)	(AVG) Margin (dB)	(AVG) Limit (dBμV)	Cable (dB)	Transducer (dB)	Filter (dB)
0.178	52.60	40.25	-1.54	-13.89	54.14	0.00	0.35	9.80
0.202	49.93	38.31	-3.08	-14.70	53.00	0.00	0.28	9.80
0.274	43.50	32.51	-7.39	-18.38	50.90	0.03	0.16	9.80
13.558	40.68	40.21	-9.32	-9.79	50.00	0.34	0.02	10.15
27.122	41.99	39.41	-8.01	-10.59	50.00	1.30	0.04	10.64
29.330	40.82	26.63	-9.18	-23.37	50.00	1.53	0.06	10.69



Title: FCC Class B - White Lead
File: Agilent - Conducted Pre-Scan Neutral - 0.15-30 MHz - FCC-B - 04-10-2018.set
Operator: Kyle Fujimoto
EUT Type: Smart Reader
EUT Condition: The EUT is continuously transmitting at 13.56 MHz and transmitting BLE
Customer: OpenPath Security, Inc.
Model: OPAS02
S/N: N/A

4/26/2018 3:08:04 PM
Sequence: Preliminary Scan



Title: FCC Class B - White Lead
File: Agilent - Conducted Final Scan Neutral - 0.15-30 MHz - FCC-B - 04-10-2018.set
Operator: Kyle Fujimoto
EUT Type: Smart Reader
EUT Condition: The EUT is continuously transmitting at 13.56 MHz and transmitting BLE
Company: OpenPath Security, Inc.
Model: OPAS02
S/N: N/A

4/26/2018 3:10:14 PM
Sequence: Final Measurements

White Lead								
Freq (MHz)	(PEAK) EMI (dBµV)	(AVG) EMI (dBµV)	(PEAK) Margin (dB)	(AVG) Margin (dB)	(AVG) Limit (dBµV)	Cable (dB)	Transducer (dB)	Filter (dB)
0.174	48.19	41.31	-6.03	-12.91	54.22	0.00	0.34	9.80
0.206	45.65	38.94	-7.28	-13.99	52.92	0.00	0.26	9.80
0.234	43.20	36.04	-8.67	-15.83	51.87	0.02	0.20	9.80
13.558	39.55	38.59	-10.45	-11.41	50.00	0.34	0.07	10.15
27.122	42.34	39.83	-7.66	-10.17	50.00	1.30	0.13	10.64
29.318	40.90	27.02	-9.10	-22.98	50.00	1.53	0.15	10.69



FCC 15.225 [e] Testing

COMPANY:	OPENPATH SECURITY, INC.	DATE:	04/27/2018
EUT:	SMART READER	ENGINEER:	KYLE FUJIMOTO
MODEL:	OPAS02	S/N:	N/A

TEMPERATURE (CELSIUS)	FREQUENCY (MHz) at 0 MINUTES	FREQUENCY (MHz) at 2 MINUTES	FREQUENCY (MHz) at 5 MINUTES	FREQUENCY (MHz) at 10 MINUTES
-20	13.55980461	13.55979459	13.55980461	13.55984061
-10	13.55978457	13.55978457	13.55976453	13.55978457
0	13.55976453	13.55976453	13.55976453	13.55976453
10	13.55974449	13.55975451	13.55972445	13.55971443
20 @ 100% Nominal VAC	13.55976453	13.55976453	13.55976453	13.55976453
20 @ 85% Nominal VAC	13.55976453	13.55976453	13.55976453	13.55976453
20 @ 115% Nominal VAC	13.55976453	13.55976453	13.55976453	13.55976453
30	13.55975451	13.55975451	13.55974449	13.55976453
40	13.55976453	13.55974449	13.55976453	13.55947451
50	13.55976453	13.55976453	13.55976453	13.55978457

Baseline = 13.55976453 MHz 20 Degrees Celsius at 100%

Low Limit = 13.558409 MHz Fundamental -0.01%
High Limit = 13.5611205 MHz Fundamental +0.01%

85% at 20 Degrees Celsius = 13.55976453 MHz

115% at 20 Degrees Celsius = 13.55924449 MHz