

Company: Hewlett Packard Enterprise

Test of: APIN0344 & APIN0345

To: FCC 15.247 (DTS) & ISED RSS-247

Report No.: HPEN111-U5_Master WiFi Rev A

MASTER TEST REPORT



MASTER TEST REPORT

FROM



Test of: Hewlett Packard Enterprise APIN0344 & APIN0345

to

To: FCC 15.247 (DTS) & ISED RSS-247

Test Report Serial No.: HPEN111-U5_Master WiFi Rev A

This report supersedes: NONE

As a result of the 6 Mbyte FCC file size limitation potentially large test reports require to be split into smaller components. This document is the Master document controlling Addendum reports as listed below. This Master document combined with the Addendums demonstrate compliance with the standard

| Master Document Number | Addendum Reports |
|------------------------|---------------------------|
| HPEN111-U5_Master WiFi | HPEN111-U5_Conducted WiFi |
| | HPEN111-U5_Radiated WiFi |

Applicant: Hewlett Packard Enterprise
1344 Crossman Ave
Sunnyvale, California 94089
USA

Product Function Wireless Access Point with BLE

Issue Date: 22nd August 2017

This Test Report is Issued Under the Authority of:

MiCOM Labs, Inc.
575 Boulder Court
Pleasanton California 94566
USA
Phone: +1 (925) 462-0304
Fax: +1 (925) 462-0306
www.micomlabs.com



MiCOM Labs is an ISO 17025 Accredited Testing Laboratory



Title: Hewlett Packard Enterprise APIN0344 & APIN0345
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1. ACCREDITATION, LISTINGS & RECOGNITION

1.1. TESTING ACCREDITATION

MiCOM Labs, Inc. is an accredited Electrical testing laboratory per the international standard ISO/IEC 17025:2005. The company is accredited by the American Association for Laboratory Accreditation (A2LA) www.a2la.org test laboratory number 2381.01. MiCOM Labs test schedule is available at the following URL; <http://www.a2la.org/scopepdf/2381-01.pdf>



Accredited Laboratory

A2LA has accredited

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Pleasanton, CA

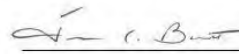
for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 General requirements for the competence of testing and calibration laboratories. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009).



Presented this 4th day of February 2016.



Senior Director of Quality & Communications
For the Accreditation Council
Certificate Number 2381.01
Valid to November 30, 2017

For the tests or types of tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

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1.2. RECOGNITION

MiCOM Labs, Inc has widely recognized wireless testing capabilities. Our international recognition includes Conformity Assessment Body designation by APEC MRA countries. MiCOM Labs test reports are accepted globally.

| Country | Recognition Body | Status | Phase | Identification No. |
|-----------|---|--------|------------|---|
| USA | Federal Communications Commission (FCC) | TCB | - | US0159 Listing #: 102167 |
| Canada | Industry Canada (IC) | FCB | APEC MRA 2 | US0159 Listing #: 4143A-2 4143A-3 |
| Japan | MIC (Ministry of Internal Affairs and Communication) | CAB | APEC MRA 2 | RCB 210 |
| | VCCI | -- | -- | A-0012 |
| Europe | European Commission | NB | EU MRA | NB 2280 |
| Australia | Australian Communications and Media Authority (ACMA) | CAB | APEC MRA 1 | US0159 |
| Hong Kong | Office of the Telecommunication Authority (OFTA) | CAB | APEC MRA 1 | |
| Korea | Ministry of Information and Communication Radio Research Laboratory (RRL) | CAB | APEC MRA 1 | |
| Singapore | Infocomm Development Authority (IDA) | CAB | APEC MRA 1 | |
| Taiwan | National Communications Commission (NCC) Bureau of Standards, Metrology and Inspection (BSMI) | CAB | APEC MRA 1 | |
| Vietnam | Ministry of Communication (MIC) | CAB | APEC MRA 1 | |

EU MRA – European Union Mutual Recognition Agreement.

NB – Notified Body

APEC MRA – Asia Pacific Economic Community Mutual Recognition Agreement. Recognition agreement under which test lab is accredited to regulatory standards of the APEC member countries.

Phase I - recognition for product testing

Phase II – recognition for both product testing and certification

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1.3. PRODUCT CERTIFICATION

MiCOM Labs, Inc. is an accredited Product Certification Body per the international standard ISO/IEC 17065:2012. The company is accredited by the American Association for Laboratory Accreditation (A2LA) www.a2la.org test laboratory number 2381.02. MiCOM Labs test schedule is available at the following URL; <http://www.a2la.org/scopepdf/2381-02.pdf>



Accredited Product Certification Body

A2LA has accredited

MICOM LABS

Pleasanton, CA

This product certification body is accredited in accordance with the recognized International Standard ISO/IEC 17065:2012 *Requirements for bodies certifying products, processes and services*. This accreditation demonstrates technical competence for a defined scope and the operation of a management system.



Presented this 4th day of February 2016.

Senior Director of Quality & Communications
For the Accreditation Council
Certificate Number 2381.02
Valid to November 30, 2017

For the product certification schemes to which this accreditation applies, please refer to the organization's Product Certification Scope of Accreditation.

United States of America – Telecommunication Certification Body (TCB)
Industry Canada – Certification Body, CAB Identifier – US0159
Europe – Notified Body (NB), NB Identifier - 2280
Japan – Recognized Certification Body (RCB), RCB Identifier - 210

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2. DOCUMENT HISTORY

| Document History | | |
|------------------|------------------------------|----------|
| Revision | Date | Comments |
| Draft | 10 th August 2017 | |
| | | |
| | | |

| Released Document History | | | | |
|-----------------------------------|-------------------|---------|------------------------------|-----------------|
| Master Revision/Date | Addendum Revision | Release | Date | Comments |
| 22 nd Aug 2017 / Rev A | Conducted | Rev A | 22 nd August 2017 | Initial Release |
| | Radiated_Radio 0 | Rev A | 22 nd August 2017 | Initial Release |
| | Radiated_Radio 1 | Rev A | 22 nd August 2017 | Initial Release |
| | | | | |
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In the above table, the latest report revision will replace all earlier versions.

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3. TEST RESULT CERTIFICATE

| | |
|---|---|
| Manufacturer: Hewlett Packard Enterprise 1344 Crossman Ave Sunnyvale California 94089 USA | Tested By: MiCOM Labs, Inc. 575 Boulder Court Pleasanton California 94566 USA |
| Model: APIN0344 & APIN0345 | Telephone: +1 925 462 0304 Fax: +1 925 462 0306 |
| Type Of Equipment: Wireless Access Point with BLE | |
| S/N's: Conducted CNDJK5001W (APIN0344) Radiated CNDJK5004S (APIN0344) Radiated CNDBK51073 (APIN0345) | |
| Test Date(s): 26 th July – 7 th August 2017 | Website: www.micomlabs.com |

| STANDARD(S) | TEST RESULTS |
|-------------------------------|--------------------|
| FCC 15.247 DTS & ISED RSS-247 | EQUIPMENT COMPLIES |

MiCOM Labs, Inc. tested the equipment mentioned in accordance with the requirements set forth in the above standards. Test results indicate that the equipment tested is capable of demonstrating compliance with the requirements as documented within this report.

Notes:

1. This document reports conditions under which testing was conducted and the results of testing performed.
2. Details of test methods used have been recorded and kept on file by the laboratory.
3. Test results apply only to the item(s) tested.

Approved & Released for MiCOM Labs, Inc. by:



Graeme Grieve
Quality Manager MiCOM Labs, Inc.

Gordon Hurst
President & CEO MiCOM Labs, Inc.

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4. REFERENCES AND MEASUREMENT UNCERTAINTY

4.1. Normative References

| REF. | PUBLICATION | YEAR | TITLE |
|------|------------------------|--|---|
| I | KDB 662911 D01 & D02 | Oct 31 2013 | Guidance for measurement of output emission of devices that employ single transmitter with multiple outputs or systems with multiple transmitters operating simultaneously in the same frequency band |
| II | KDB 558074 D01 v04 | 5th April 2017 | Guidance for performing compliance measurements on Digital Transmission Systems (DTS) operating under section 15.247. |
| III | A2LA | June 2015 | R105 - Requirement's When Making Reference to A2LA Accreditation Status |
| IV | ANSI C63.10 | 2013 | American National Standard for Testing Unlicensed Wireless Devices |
| V | ANSI C63.4 | 2014 | American National Standards for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz |
| VI | CISPR 32 | 2015 | Electromagnetic compatibility of multimedia equipment - Emission requirements |
| VII | ETSI TR 100 028 | 2001-12 | Parts 1 and 2 Electromagnetic compatibility and Radio Spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics |
| VIII | FCC 47 CFR Part 15.247 | 2016 | Radio Frequency Devices; Subpart C – Intentional Radiators |
| IX | ICES-003 | Issue 6 Jan 2016 Updated April 2017 | Spectrum Management and Telecommunications; Interference-Causing Equipment Standard. Information Technology Equipment (Including Digital Apparatus) – Limits and methods of measurement. |
| X | M 3003 | Edition 3 Nov.2012 | Expression of Uncertainty and Confidence in Measurements |
| XI | RSS-247 Issue 2 | Feb 2017 | Digital Transmission Systems (DTSs), Frequency Hopping System (FHSs) and Licence-Exempt Local Area Network (LE-LEN) Devices |
| XII | RSS-Gen Issue 4 | November 2014 | General Requirements and Information for the Certification of Radiocommunication Equipment |
| XIII | KDB 644545 D03 v01 | August 14th 2014 | Guidance for IEEE 802.11ac New Rules |
| XIV | FCC 47 CFR Part 2.1033 | 2016 | FCC requirements and rules regarding photographs and test setup diagrams. |

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4.2. Test and Uncertainty Procedure

Conducted and radiated emission measurements were conducted in accordance with American National Standards Institute ANSI C63.4, listed in the Normative References section of this report.

Measurement uncertainty figures are calculated in accordance with ETSI TR 100 028 Parts 1 and 2.

Measurement uncertainties stated are based on a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95 % in accordance with UKAS document M 3003 listed in the Normative References section of this report.

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5. PRODUCT DETAILS AND TEST CONFIGURATIONS

5.1. Technical Details

| Details | Description |
|-----------------------------------|--|
| Purpose: | Test of the Hewlett Packard Enterprise APIN0344 & APIN0345 to FCC 15.247 DTS & ISED RSS-247. |
| Applicant: | Hewlett Packard Enterprise 1344 Crossman Ave Sunnyvale California 94089 USA |
| Manufacturer: | Hewlett Packard Enterprise |
| Laboratory performing the tests: | MiCOM Labs, Inc. 575 Boulder Court Pleasanton California 94566 USA |
| Test report reference number: | HPEN111-U5_Master Draft |
| Date EUT received: | 26 th July 2017 |
| Standard(s) applied: | FCC 15.247 DTS & IC RSS-247 |
| Dates of test (from - to): | 26 th July - 07 August 2017 |
| No of Units Tested: | 3 |
| Product Family Name: | Wireless Access Point with Bluetooth BLE |
| Model(s): | APIN0344 & APIN0345 |
| Location for use: | Indoors |
| Declared Frequency Range(s): | 2400 - 2483.5 MHz; 5725 - 5850 MHz; |
| Type of Modulation: | APIN0344 & APIN0345 |
| EUT Modes of Operation: | 802.11b; 802.11g; 802.11n HT-20; 802.11n HT-40; |
| Declared Nominal Output Power: | +25 dBm |
| Number of Transmit/Receive Ports: | 4 |
| Rated Input Voltage and Current: | AC/ DC adaptor 48Vdc POE 57Vdc |
| Operating Temperature Range: | Declared Range 0°C to 50°C |
| ITU Emission Designator: | 802.11b 30M7G1D 802.11g 35M9D1D 802.11n HT-20 36M8D1D 802.11n HT-40 71M5D1D |
| Equipment Dimensions: | 344: 245 x 224 x 52 mm 345: 225 x 224x 52 mm |
| Weight: | 344: 1088g (1.088kg) 345: 1046g (1.046kg) |
| Hardware Rev: | 1 |
| Software Rev: | arm64rd.ari.abeaudin-rd-masterson |

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5.2. Scope Of Test Program

Hewlett Packard Enterprise APIN0344 & APIN0345

The scope of the test program was to test the Hewlett Packard Enterprise APIN0344 & APIN0345, APIN0344 & APIN0345 configurations in the frequency ranges 2400 - 2483.5 MHz for compliance against the following specification(s):

FCC Subpart C 15.247 (DTS)

Radio Frequency Devices; Subpart C – Intentional Radiators

ISED RSS-247

Radio Standards Specification RSS-247, Issue 2, Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

Hewlett Packard Enterprise APIN0344



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Hewlett Packard Enterprise APIN0345



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5.3. Equipment Model(s) and Serial Number(s)

| Type | Description | Manufacturer | Model | Serial no. | Delivery Date |
|------|-----------------------|--------------|----------|------------|----------------------------|
| EUT | Wireless Access Point | HPE | APIN0344 | CNDJK5001W | 26 th July 2017 |
| EUT | Wireless Access Point | HPE | APIN0344 | CNDJK5004S | 26 th July 2017 |
| EUT | Wireless Access Point | HPE | APIN0345 | CNDBK51073 | 26 th July 2017 |

5.4. Antenna Details

| Type | Manufacturer | Model | Family | Gain (dBi) | BF Gain | Dir BW | X-Pol | Frequency Band (MHz) |
|----------|--------------|-------------|--------|------------|---------|--------|-------|----------------------|
| external | Aruba | AP-ANT-13B | 10 | 2.3 | 6.0 | 360 | - | 2400 - 2483.5 |
| external | Aruba | AP-ANT-19 | 10 | 3.0 | 6.0 | 360 | - | 2400 - 2483.5 |
| external | Aruba | AP-ANT-1W | 10 | 3.8 | 6.0 | 360 | - | 2400 - 2483.5 |
| external | Aruba | AP-ANT-20W | 10 | 2.0 | 6.0 | 360 | - | 2400 - 2483.5 |
| external | Aruba | AP-ANT-40 | 6 | 4.0 | 3.0 | 360 | - | 2400 - 2483.5 |
| external | Aruba | AP-ANT-45 | 6 | 4.5 | 3.0 | 360 | - | 2400 - 2483.5 |
| external | Aruba | AP-ANT-48 | 6 | 8.5 | 3.0 | 360 | - | 2400 - 2483.5 |
| integral | Aruba | Metal Sheet | 9 | 3.1 | 6.0 | 360 | - | 2400 - 2483.5 |

BF Gain - Beamforming Gain
Dir BW - Directional BeamWidth
X-Pol - Cross Polarization

5.5. Cabling and I/O Ports

| Port Type | Max Cable Length | # of Ports | Screened | Conn Type | Data Type | Bit Rate (Mbit/s) |
|-----------|------------------|------------|----------|-----------|-----------|-------------------|
| Ethernet | 50ft | 1 | No | RJ45 | Packet | 10/100/1000 |
| Ethernet | 50ft | 1 | No | RJ45 | Packet | 100/1000/2500 |

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5.6. Test Configurations

Results for the following configurations are provided in this report:

| Operational Mode(s) | Data Rate Tested MBit/s | Channel Frequency (MHz) | | |
|--------------------------|-------------------------|-------------------------|----------|----------|
| | | Low | Mid | High |
| 2400 - 2483.5 MHz | | | | |
| 802.11b | 1.00 | 2,412.00 | 2,437.00 | 2,462.00 |
| 802.11g | 6.00 | 2,412.00 | 2,437.00 | 2,462.00 |
| 802.11n HT-20 | 6.50 | 2,412.00 | 2,437.00 | 2,462.00 |
| 802.11n HT-40 | 13.50 | 2,422.00 | 2,437.00 | 2,452.00 |

5.7. Equipment Modifications

The following modifications were required to bring the equipment into compliance:

1. NONE

5.8. Deviations from the Test Standard

The following deviations from the test standard were required in order to complete the test program:

1. NONE

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6. TEST SUMMARY

List of Measurements

| Test Header | Result | Data Link |
|--|--------------------------------------|-----------|
| Conducted Results | See Test Report HPEN111-U5_Conducted | |
| 15.247(a)(2) 6 dB & 99% Bandwidth | Complies | |
| 15.247(b), 15.31(e) Conducted Output Power | Complies | |
| 15.247(d) Emissions | Complies | |
| (1) Conducted Emissions | Complies | |
| (i) Conducted Spurious Emissions | Complies | |
| (ii) Conducted Band-Edge Emissions | Complies | |
| 15.247(e) Power Spectral Density | Complies | |
| Radiated Emissions | See Test Report HPEN111-U5_Radiated | |
| (i) 15.205 Restricted Band Emissions | Complies | |
| (ii) 15.205 Restricted Band-Edge Emissions | Complies | |

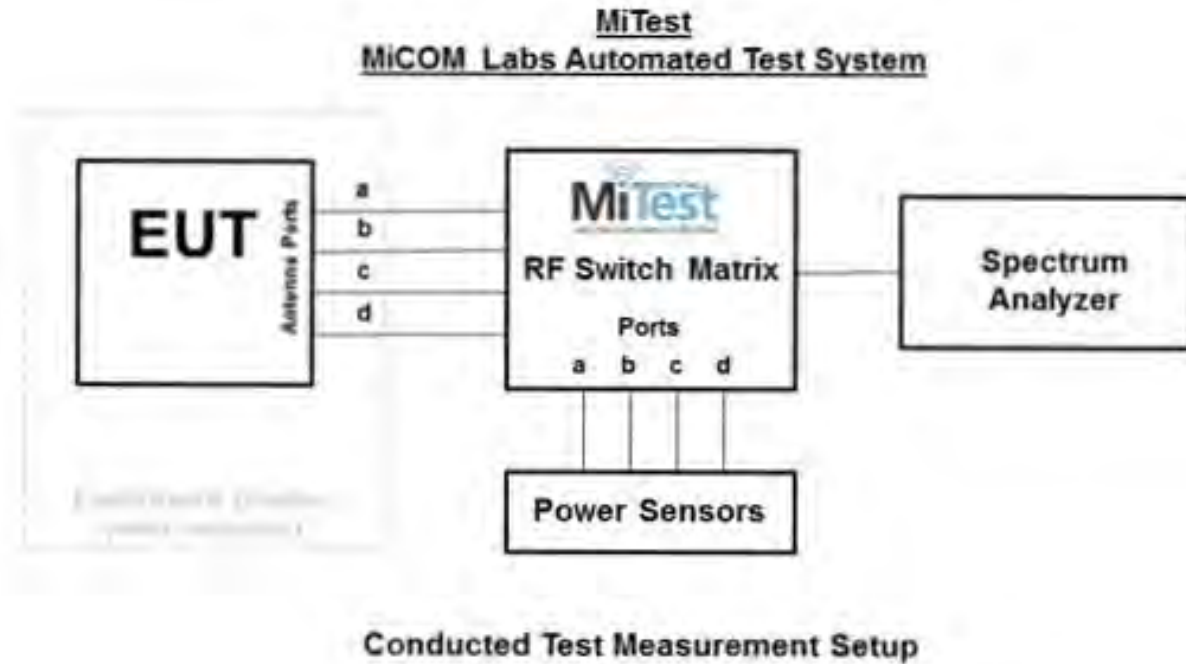
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7. TEST EQUIPMENT CONFIGURATION(S)

7.1. Conducted

Conducted RF Emission Test Set-up(s) The following tests were performed using the conducted test set-up shown in the diagram below.

1. 6 dB & 99% Bandwidth
2. Output Power
3. Power Spectral Density
4. Spurious Emissions
5. Band-Edge Emissions



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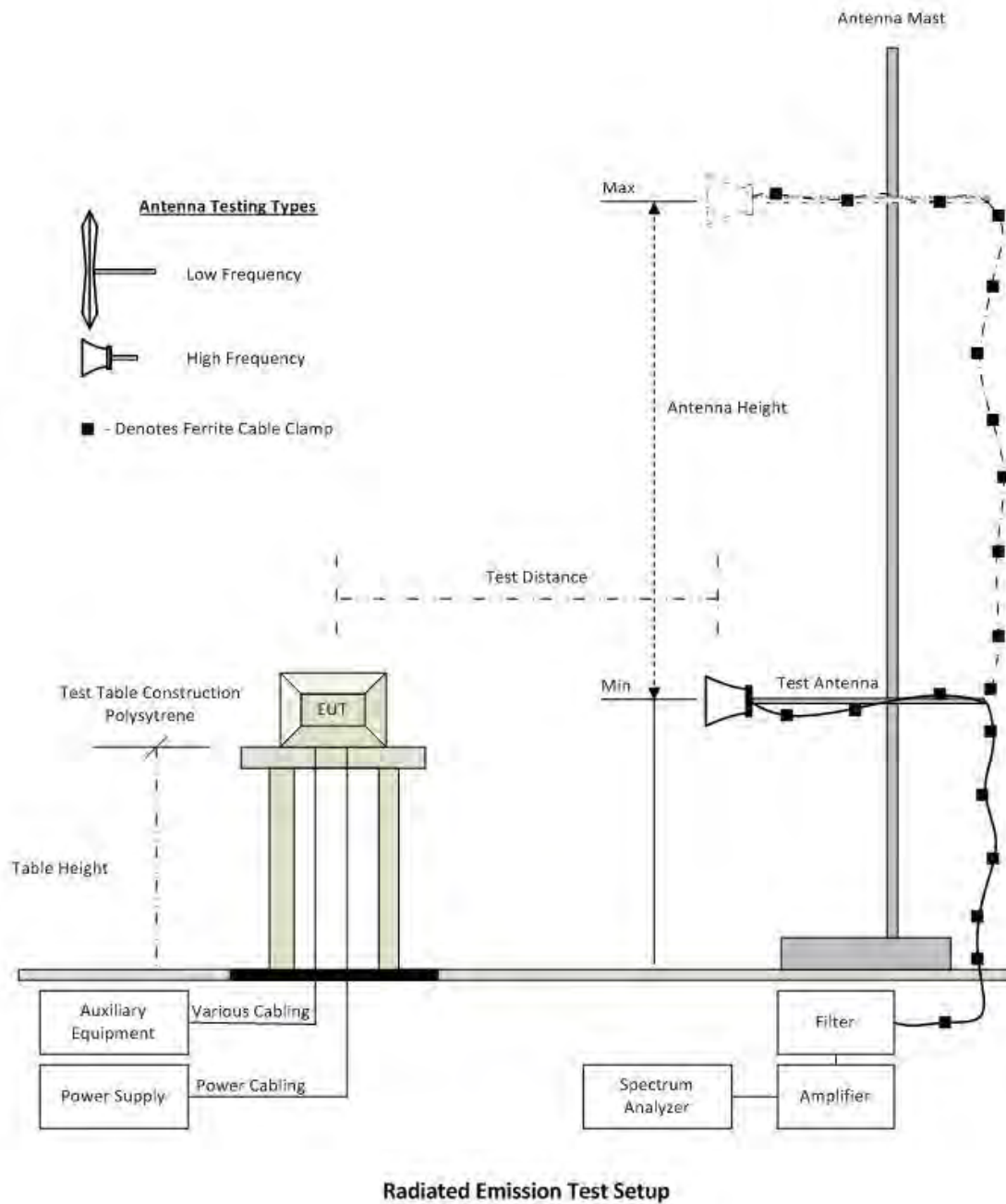
A full system calibration was performed on the test station and any resulting system losses (or gains) were taken into account in the production of all final measurement data.

| Asset# | Description | Manufacturer | Model# | Serial# | Calibration Due Date |
|-------------|-----------------------------------|----------------------|----------------------|---------------|----------------------|
| 127 | Power Supply | HP | 6674A | US36370530 | Cal when used |
| 158 | Barometer/Thermometer | Control Company | 4196 | E2846 | 30 Nov 2017 |
| 287 | Rohde & Schwarz 40 GHz Receiver | Rhode & Schwarz | ESIB40 | 100201 | 2 May 2018 |
| 381 | 4x4 RF Switch Box | MiCOM Labs | MiTest RF Switch Box | MIC002 | 2 Oct 2017 |
| 398 | MiTest RF Conducted Test Software | MiCOM | MiTest ATS | Version 4.1 | Not Required |
| 419 | Laptop with Labview Software | Lenova | W520 | TS02 | Not Required |
| 420 | USB to GPIB Interface | National Instruments | GPIB-USB HS | 1346738 | Not Required |
| 440 | USB Wideband Power Sensor | Boonton | 55006 | 9178 | 25 Sep 2017 |
| 442 | USB Wideband Power Sensor | Boonton | 55006 | 9181 | 6 Oct 2017 |
| 445 | PoE Injector | D-Link | DPE-101GL | QTAH1E2000625 | Not Required |
| 493 | USB Wideband Power Sensor | Boonton | 55006 | 9634 | 10 Mar 2018 |
| 494 | USB Wideband Power Sensor | Boonton | 55006 | 9726 | 10 Mar 2018 |
| 74 | Environmental Chamber Chamber 3 | Tenney | TTC | 12808-1 | 29 Sep 2017 |
| RF#2 GPIB#1 | GPIB cable to Power Supply | HP | GPIB | None | Not Required |
| RF#2 SMA#1 | EUT to Mitest box port 1 | Flexco | SMA Cable port1 | None | 2 Oct 2017 |
| RF#2 SMA#2 | EUT to Mitest box port 2 | Flexco | SMA Cable port2 | None | 2 Oct 2017 |
| RF#2 SMA#3 | EUT to Mitest box port 3 | Flexco | SMA Cable port3 | None | 2 Oct 2017 |
| RF#2 SMA#4 | EUT to Mitest box port 4 | Flexco | SMA Cable port4 | None | 2 Oct 2017 |
| RF#2 SMA#SA | Mitest box to SA | Flexco | SMA Cable SA | None | 2 Oct 2017 |
| RF#2 USB#1 | USB Cable to Mitest Box | Dynex | USB Cable | None | Not Required |

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7.2. Radiated Emissions - 3m Chamber

The following tests were performed using the radiated test set-up shown in the diagram below. Radiated emissions below 1GHz. Radiated Emissions above 1GHz.



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A full system calibration was performed on the test station and any resulting system losses (or gains) were taken into account in the production of all final measurement data.

| Asset# | Description | Manufacturer | Model# | Serial# | Calibration Due Date |
|--------|---|----------------------|---------------------------|-----------|----------------------|
| 158 | Barometer/Thermometer | Control Company | 4196 | E2846 | 30 Nov 2017 |
| 170 | Video System Controller for Semi Anechoic Chamber | Panasonic | WV-CU101 | 04R08507 | Not Required |
| 287 | Rohde & Schwarz 40 GHz Receiver | Rhode & Schwarz | ESIB40 | 100201 | 2 May 2018 |
| 338 | Sunol 30 to 3000 MHz Antenna | Sunol | JB3 | A052907 | 15 Aug 2017 |
| 342 | 2.4 GHz Notch Filter | EWT | EWT-14-0203 | H1 | 16 Aug 2017 |
| 397 | Amp 10 - 2500MHz | MiCOM Labs | Amp 10 - 2500 MHz | NA | 9 Oct 2017 |
| 399 | ETS 1-18 GHz Horn Antenna | ETS | 3117 | 00154575 | 10 Oct 2017 |
| 406 | Amplifier for Radiated Emissions | MiCOM Labs | 40dB 1 to 18GHz Amp | 0406 | 9 Oct 2017 |
| 410 | Desktop Computer | Dell | Inspiron 620 | WS38 | Not Required |
| 411 | Mast/Turntable Controller | Sunol Sciences | SC98V | 060199-1D | Not Required |
| 412 | USB to GPIB Interface | National Instruments | GPIB-USB HS | 11B8DC2 | Not Required |
| 413 | Mast Controller | Sunol Science | TWR95-4 | 030801-3 | Not Required |
| 415 | Turntable Controller | Sunol Sciences | Turntable Controller | None | Not Required |
| 416 | Gigabit ethernet filter | ETS-Lingren | Gigafoil 260366 | None | Not Required |
| 447 | MiTest Rad Emissions Test Software | MiCOM | Test Software Version 1.0 | 447 | Not Required |
| 462 | Schwarzbeck cable from Antenna to Amplifier. | Schwarzbeck | AK 9513 | 462 | 16 Aug 2017 |
| 463 | Schwarzbeck cable from Amplifier to Bulkhead. | Schwarzbeck | AK 9513 | 463 | 16 Aug 2017 |
| 464 | Schwarzbeck cable from Bulkhead to Receiver | Schwarzbeck | AK 9513 | 464 | 16 Aug 2017 |
| 480 | Cable - Bulkhead to Amp | SRC Haverhill | 157-3050360 | 480 | 16 Aug 2017 |
| 481 | Cable - Bulkhead to Receiver | SRC Haverhill | 151-3050787 | 481 | 16 Aug 2017 |
| 482 | Cable - Amp to Antenna | SRC Haverhill | 157-3051574 | 482 | 16 Aug 2017 |

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8. MEASUREMENT AND PRESENTATION OF TEST DATA

The measurement and graphical data presented in this test report was generated automatically using state-of-the-art technology creating an easy to read report structure. Numerical measurement data is separated from supporting graphical data (plots) through hyperlinks. Numerical measurement data can be reviewed without scrolling through numerous graphical pages to arrive at the next data matrix.

Plots have been relegated into the Appendix 'Graphical Data'.

Test and report automation was performed by [MiTest](#). [MiTest](#) is an automated test system developed by MiCOM Labs. [MiTest](#) is the first cloud based modular test system enabling end-to-end automation of regulatory compliance testing for conducted RF testing.



The MiCOM Labs "[MiTest](#)" Automated Test System" (Patent Pending)

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