

Company: Hewlett Packard Enterprise

Test of: APIN0344 & APIN0345

To: FCC Subpart E 15.407 & ISED RSS-247

Report No.: HPEN111-U8_Master WiFi non-DFS Rev A

MASTER TEST REPORT



MASTER TEST REPORT

FROM



Test of: Hewlett Packard Enterprise APIN0344 & APIN0345

To: FCC Subpart E 15.407 & ISED RSS-247

Test Report Serial No.: HPEN111-U8_Master WiFi non-DFS 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-U8_Master WiFi (non-DFS Bands)	HPEN111-U8_Conducted WiFi
	HPEN111-U8_Radiated_Radio 1 WiFi
	HPEN111-U8_Radiated_Radio 0 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.micmlabs.com



MiCOM Labs is an ISO 17025 Accredited Testing Laboratory

Table of Contents

1. ACCREDITATION, LISTINGS & RECOGNITION	4
1.1. TESTING ACCREDITATION	4
1.2. RECOGNITION	5
1.3. PRODUCT CERTIFICATION	6
2. DOCUMENT HISTORY	7
3. TEST RESULT CERTIFICATE	8
4. REFERENCES AND MEASUREMENT UNCERTAINTY	9
4.1. Normative References	9
4.2. Test and Uncertainty Procedure	10
5. PRODUCT DETAILS AND TEST CONFIGURATIONS	11
5.1. Technical Details	11
5.2. Scope Of Test Program	12
5.3. Equipment Model(s) and Serial Number(s)	14
5.4. Antenna Details	14
5.5. Cabling and I/O Ports	14
5.6. Test Configurations	15
5.7. Equipment Modifications	15
5.8. Deviations from the Test Standard	15
6. TEST SUMMARY	16
7. TEST EQUIPMENT CONFIGURATION(S)	17
7.1. Conducted	17
7.2. Radiated Emissions - 3m Chamber	19
8. MEASUREMENT AND PRESENTATION OF TEST DATA	21

This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

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>



This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

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

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>



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

This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

2. DOCUMENT HISTORY

Draft History		
Revision	Date	Comments
Draft	10 th August 2017	Initial

Released Document History				
Master Revision/Date	Addendum Revision	Release	Date	Comments
Rev A / 22 nd Aug 2017	Conducted	Rev A	22 nd Aug 2017	Initial Release
	Radiated_Radio 0	Rev A	22 nd Aug 2017	Initial Release
	Radiated_Radio 1	Rev A	22 nd Aug 2017	Initial Release

In the above table the latest report revision will replace all earlier versions.

This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

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): 26th July – 7th August 2017

Website: www.micomlabs.com

STANDARD(S)

FCC Subpart E 15.407 & ISED RSS-247

TEST RESULTS

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.

This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

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 905462 D07 v02	22nd August 2016	Test guidance to demonstrate compliance for U-NII devices subject to DFS requirements.
III	KDB 926956 D01 v02	22nd August 2016	U-NII Device Transition Plan
IV	KDB 789033 D02 v01r04	2nd May 2017	Guidelines for compliance testing of Unlicensed National Information Infrastructure (U-NII) Devices (Part 15, Subpart E)
V	A2LA	June 2015	R105 - Requirement's When Making Reference to A2LA Accreditation Status
VI	ANSI C63.10	2013	American National Standard for Testing Unlicensed Wireless Devices
VII	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
VIII	CISPR 32	2015	Electromagnetic compatibility of multimedia equipment - Emission requirements
IX	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
X	FCC 06-96	Jun 30 2006	Memorandum Opinion and Order
XI	FCC 47 CFR Part 15.407	2016	Radio Frequency Devices; Subpart E –Unlicensed National Information Infrastructure Devices
XII	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.
XIII	M 3003	Edition 3 Nov.2012	Expression of Uncertainty and Confidence in Measurements
XIV	RSS-247 Issue 2	Feb 2017	Digital Transmission Systems (DTSS), Frequency Hopping System (FHSs) and Licence-Exempt Local Area Network (LE-LEN) Devices
XV	RSS-Gen Issue 4	November 2014	General Requirements and Information for the Certification of Radiocommunication Equipment
XVI	KDB 644545 D03 v01	August 14th 2014	Guidance for IEEE 802.11ac New Rules
XVII	KDB 905462 D02 v02	April 8 2016	Compliance Measurement Procedures for Unlicensed National Information Infrastructure devices operating in the 5250 to 5350 MHz and 5470 to 5725 MHz bands incorporating Dynamic Frequency Selection.

This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

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.

5. PRODUCT DETAILS AND TEST CONFIGURATIONS

5.1. Technical Details

Details	Description
Purpose:	Test of the Hewlett Packard Enterprise APIN0344 & APIN0345 to FCC Subpart E 15.407 & IC RSS-247.
Applicant:	Hewlett Packard Enterprise 1344 Crossman Ave Sunnyvale California 94089 USA
Manufacturer:	Hewlett Packard Enterprise Company
Laboratory performing the tests:	MiCOM Labs, Inc. 575 Boulder Court Pleasanton California 94566 USA
Test report reference number:	HPEN111-U8 Draft
Date EUT received:	26 th July 2017
Standard(s) applied:	FCC Subpart E 15.407 & 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):	5150 - 5250 MHz; 5725 - 5850 MHz;
Type of Modulation:	APIN0344 & APIN0345
EUT Modes of Operation:	802.11a; 802.11n HT-20; 802.11n HT-40; 802.11ac80; 802.11ac80+80
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:	802.11a: 43M1D1D 802.11n HT-20: 29M3D1D 802.11n HT-40: 97M7D1D 802.11ac-80: 156M2D1D 802.11ac-80+80: 156M2D1D
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

This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

5.2. Scope Of Test Program

Hewlett Packard Enterprise AP-344 & AP-345

The scope of the test program was to test the Hewlett Packard Enterprise AP-344 & AP-345, APIN0344 & APIN0345 configurations in the frequency ranges 5150 - 5250 MHz and 5725 - 5850 MHz; for compliance against the following specification:

FCC Subpart E 15.407

Radio Frequency Devices; Subpart E –Unlicensed National Information Infrastructure Devices

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



This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

Hewlett Packard Enterprise APIN0345



This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

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

Type	Description	Manu.	Model	Serial no.	Delivery Date
EUT	Wireless Access Point	Hewlett Packard Enterprise	APIN0344	CNDJK5001W	26 th July 2017
EUT	Wireless Access Point	Hewlett Packard Enterprise	APIN0344	CNDJK5004S	26 th July 2017
EUT	Wireless Access Point	Hewlett Packard Enterprise	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	4.0	6.0	360	-	5150 – 5250 5725 - 5850
external	Aruba	AP-ANT-19	10	6.0	6.0	360	-	5150 – 5250 5725 - 5850
external	Aruba	AP-ANT-1W	10	5.8	6.0	360	-	5150 – 5250 5725 - 5850
external	Aruba	AP-ANT-20W	10	2.0	6.0	360	-	5150 – 5250 5725 - 5850
external	Aruba	AP-ANT-40	6	5.0	3.0	360	-	5150 – 5250 5725 - 5850
external	Aruba	AP-ANT-45	6	5.5	3.0	360	-	5150 – 5250 5725 - 5850
external	Aruba	AP-ANT-48	6	8.5	3.0	360	-	5150 – 5250 5725 - 5850
integral	Aruba	Metal Sheet	9	2.7	6.0	360	-	5150 – 5250 5725 - 5850

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

This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

5.6. Test Configurations

Results for the following configurations are provided in this report:

Operational Mode(s)	Data Rate with Highest Power MBit/s	Channel Frequency (MHz)		
		Low	Mid	High
5150 - 5250 MHz				
802.11a	6.00	5180.00	5200.00	5240.00
802.11ac-80+80	29.30	5210.00	--	--
802.11ac-80	29.30	5210.00	--	--
802.11n HT-20	6.50	5180.00	5200.00	5240.00
802.11n HT-40	13.50	5190.00	--	5230.00
5725 - 5850 MHz				
802.11a	6.00	5745.00	5785.00	5825.00
802.11ac-80	29.30	5775.00	--	5775.00
802.11n HT-20	6.50	5745.00	5785.00	5825.00
802.11n HT-40	13.50	5755.00	--	5795.00

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

6. TEST SUMMARY

List of Measurements

Test Header	Result	Comments
Conducted Testing		See Report HPEN111-U8_Conducted
(a) Peak Transmit Power	Complies	
(a) 26 dB & 99% Bandwidth	Complies	
(a)(5) Power Spectral Density	Complies	
Radiated Testing		See Test Report(s) HPEN111-U8_Radiated Radio 0 and Radio 1
(b)(2) Radiated Spurious & Band-Edge Emissions	Complies	
AP-ANT-13B	Complies	
AP-ANT-19	Complies	
AP-ANT-1W	Complies	
AP-ANT-20W	Complies	
AP-ANT-40	Complies	
AP-ANT-45	Complies	
AP-ANT-48	Complies	
Metal Sheet	Complies	

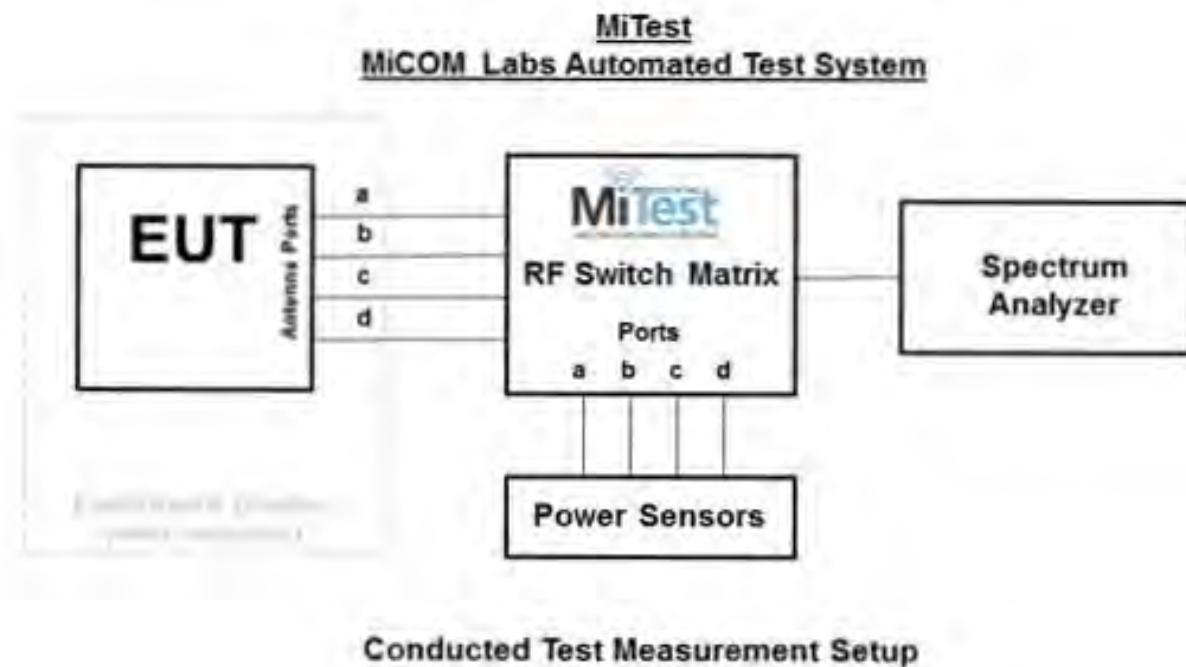
This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

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. Peak Transmit Power
2. 26 dB & 99% Bandwidth
3. Power Spectral Density



This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.



Title: Hewlett Packard Enterprise APIN0344 & APIN0345
To: FCC Subpart E 15.407 & ISED RSS-247
Serial #: HPEN111-U8_Master WiFi non-DFS Rev A
Issue Date: 22nd August 2017
Page: 18 of 22

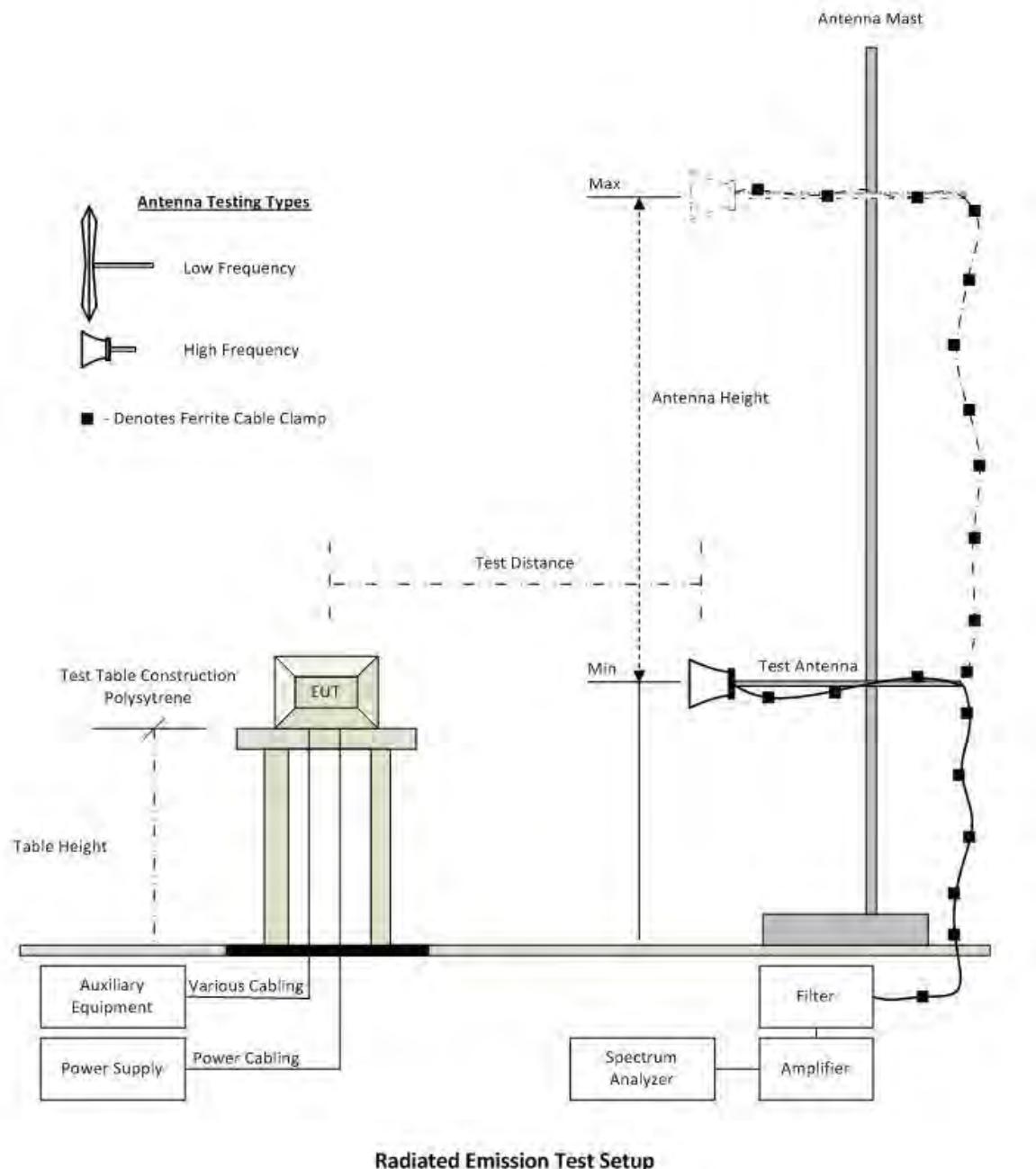
A full system calibration was performed on the test station and any resulting system losses (or gains) were taken into account in the production of all final measurement data.

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

This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

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.



This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

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

This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

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)

This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.



575 Boulder Court
Pleasanton, California 94566, USA
Tel: +1 (925) 462 0304
Fax: +1 (925) 462 0306
www.micomlabs.com