MEASUREMENT REPORT

FCC PART 15 Subpart C Bluetooth

FCC ID:	Q9DAPEX037457
APPLICANT:	Hewlett Packard Enterprise Company
Application Type:	Certification
Product:	ACCESS POINT
Model No.:	APEX0374, APEX0375, APEX0377
Brand Name:	aruba a Hewlett Packard Enterprise company / Hewlett Packard Enterprise
FCC Classification:	Digital Transmission System (DTS)
FCC Rule Part(s):	Part15 Subpart C (Section 15.247)
Test Procedure(s):	ANSI C63.10-2013, KDB 558074 D01v04
Test Date:	August 15 ~ November 15, 2017

Reviewed By : Paddy Chen
(Paddy Chen)

Approved By : Chenz Ker
(Chenz Ker)

Testing Laboratory 3261

The test results relate only to the samples tested.
This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in KDB 558074 D01v04. Test results reported herein relate only to the item(s) tested.

Revision History

Report No.	Version	Description	Issue Date	Note
1710TW0108-U2	Rev. 01	Initial report	11-16-2017	Valid

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§2.1033 General Information

Applicant:	Hewlett Packard Enterprise Company
Applicant Address:	3000 Hanover St. Palo Alto, CA 94304, USA
Manufacturer:	Hewlett Packard Enterprise Company
Manufacturer Address:	3000 Hanover St. Palo Alto, CA 94304, USA
Test Site:	MRT Technology (Taiwan) Co., Ltd
Test Site Address:	No. 38, Fuxing Second Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C)
MRT Registration No.:	153292
FCC Rule Part(s):	Part 15.247 Subpart C (Section 15.247)
Model No.:	APEX0374, APEX0375, APEX0377
FCC ID:	Q9DAPEX037457
Test Device Serial No.:	APEX0374 (Conducted Sample S/N: CNDNK7Z002, Radiated Sample S/N: CNDNK7Z001)
	APEX0375 (Conducted Sample S/N: CNDJK8001T, Radiated Sample S/N: CNDJK8001L)
	APEX0377 (Conducted Sample S/N: CNDJK8001J, Radiated Sample S/N: CNDNK81002)

Test Facility / Accreditations

Measurements were performed at MRT Laboratory located in Fuxing Rd., Taoyuan, Taiwan (R.O.C)

- **MRT facility is a FCC registered (Reg. No. 153292) test facility with the site description report on file and is designated by the FCC as an Accredited Test Film.**
- **MRT facility is an IC registered (MRT Reg. No. 21723-1) test laboratory with the site description on file at Industry Canada.**
- **MRT Lab is accredited to ISO 17025 by the American Association for Laboratory Accreditation (TAF) under the American Association for Laboratory Accreditation Program (TAF Cert. No. 3261) in EMC, Telecommunications and Radio testing for FCC, Industry Taiwan, EU and TELEC Rules.**

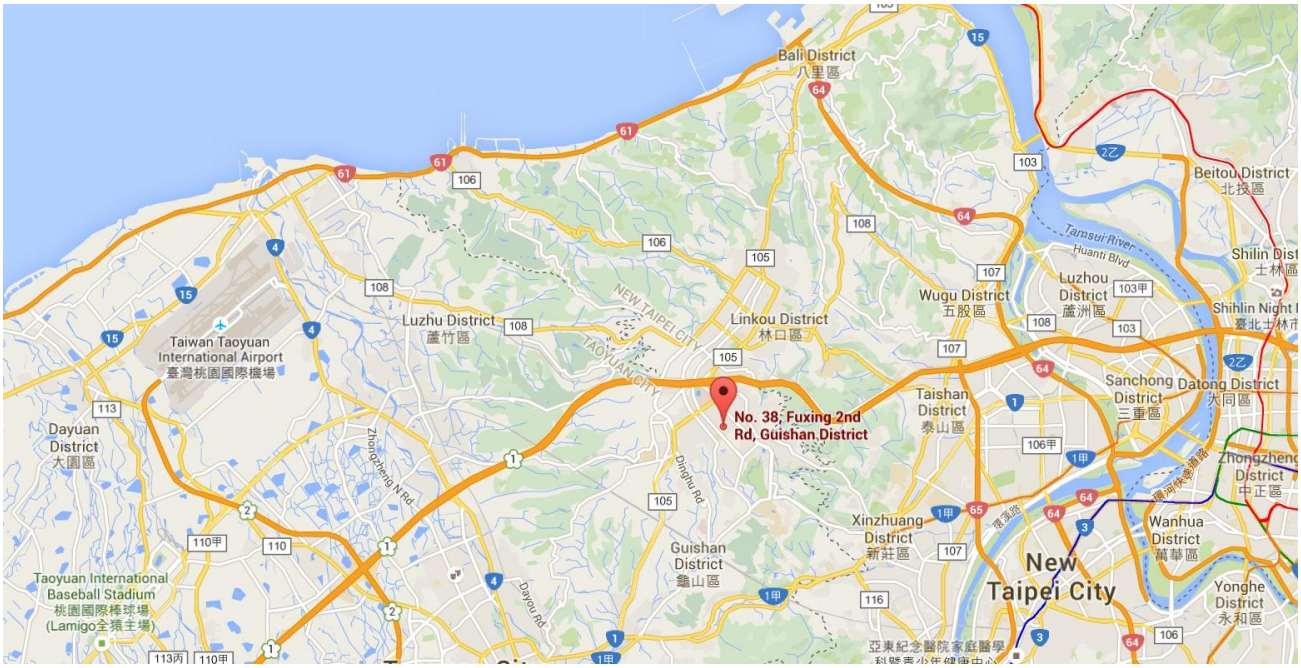
1. INTRODUCTION

1.1. Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Industry Canada Certification and Engineering Bureau.

1.2. MRT Test Location

The map below shows the location of the MRT LABORATORY, its proximity to the Taoyuan City. These measurement tests were conducted at the MRT Technology (Taiwan) Co., Ltd. Facility located at No.38, Fuxing 2nd Rd., Guishan Dist., Taoyuan City 33377, Taiwan (R.O.C).



2. PRODUCT INFORMATION

2.1. Feature of Equipment under Test

Product Name:	ACCESS POINT
Model No.:	APEX0374, APEX0375, APEX0377
Brand Name:	aruba a Hewlett Packard Enterprise company , Hewlett Packard Enterprise
Wi-Fi Specification:	802.11a/b/g/n/ac
Bluetooth Specification:	v4.0 single mode
Software Version:	R660.1.1.0.3.005
Operating Temperature:	-40 ~ 65 °C
Power Type:	POE input or AC adapter input
Operating Environment:	Outdoor Use

Note 1: The difference between three models is that the EUT use different antenna and appearance, other hardware and software are the same. Each model has its own power parameter value.

Note 2: The applicant provide one POE adapter (Manufacturer: MICROSEMI & Model: PD-9001GR/AT/AC) for approval testing, it is not for sale.

2.2. Product Specification Subjective to this Report

Bluetooth Frequency	2402~2480MHz
Bluetooth Version	v4.0
Type of modulation	FHSS
Data Rate	1Mbps(GFSK)

Note: For other features of this EUT, test report will be issued separately.

2.3. Working Frequencies for this report

Channel	Frequency	Channel	Frequency	Channel	Frequency
00	2402 MHz	01	2404 MHz	02	2406 MHz
03	2408 MHz	04	2410 MHz	05	2412 MHz
06	2414 MHz	07	2416 MHz	08	2418 MHz
09	2420 MHz	10	2422 MHz	11	2424 MHz
12	2426 MHz	13	2428 MHz	14	2430 MHz
15	2432 MHz	16	2434 MHz	17	2436 MHz
18	2438 MHz	19	2440 MHz	20	2442 MHz
21	2444 MHz	22	2446 MHz	23	2448 MHz
24	2450 MHz	25	2452 MHz	26	2454 MHz
27	2456 MHz	28	2458 MHz	29	2460 MHz
30	2462 MHz	31	2464 MHz	32	2466 MHz
33	2468 MHz	34	2470 MHz	35	2472 MHz
36	2474 MHz	37	2476 MHz	38	2478 MHz
39	2480 MHz	--	--	--	--

2.4. Test Configuration

The **ACCESS POINT** was tested per the guidance of KDB 558074 D01v04. ANSI C63.10-2013 was used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing.

2.5. EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and/or no modifications were made during testing.

2.6. Description of Available Antennas

Model No.: APEX0374

Antenna No.	Polarization	Frequency Band (GHz)	Model No.	Max Peak Gain (dBi)	30 Degree Antenna Gain (dBi)	BF Gain (dBi)	CDD Directional Gain (dBi)	
							For Power	For PSD
Wi-Fi External Antenna List (2.4GHz 2*2 MIMO, 5GHz 4*4 MIMO)								
1 (Note 3)	**Omni**	**2.4**	**ANT-2x2-2005**	**5.0**	**N/A**	**0**	**5.0**	**5.00**
2 (Note 3)	**Omni**	**5**	**ANT-2x2-5005**	**5.0**	**0**	**3.0**	**5.0**	**8.01**
3 (Note 3)	**Directional**	**2.4**	**ANT-2x2-2314**	**14.0**	**N/A**	**0**	**14.0**	**14.00**
4 (Note 3)	Directional	5	ANT-3x3-5712	11.5	1.5	3.0	11.5	14.51
5 (Note 3)	Directional	5	ANT-4x4-5314	14.0	6.0	3.0	14.0	17.01
6 (Note 3)	**Directional**	**5**	MT-484052/NVH	**16.0**	**3.0**	**3.0**	**16.0**	**19.01**
7 (Note 3)	Directional	2.4	ANT-3x3-D608	7.5	N/A	3.0	7.5	10.51
		5		7.5	4.5	3.0	7.5	10.51
8 (Note 3)	Directional	2.4	ANT-3x3-D100	5.0	N/A	3.0	5.0	8.01
		5		5.0	4.0	3.0	5.0	8.01
Bluetooth Internal Antenna								
PCB		2.4		3.0				

Model No.: APEX0377

Polarization	Frequency Band (GHz)	Max Peak Gain (dBi)	30 Degree Antenna Gain (dBi)	BF Gain (dBi)	CDD Directional Gain (dBi)	
					For Power	For PSD
Wi-Fi Internal Antenna List (2.4GHz 2*2 MIMO, 5GHz 4*4 MIMO)						
Directional (Note 3)	2.4	6.4	N/A	0.0	6.4	6.40
Directional (Note 3)	5	6.3	6.3	3.0	6.3	9.31
Bluetooth Internal Antenna						
PCB	2.4	6.7				

Model No.: APEX0375

Polarization	Frequency Band (GHz)	Max Peak Gain (dBi)	30 Degree Antenna Gain (dBi)	BF Gain (dBi)	CDD Directional Gain (dBi)	
					For Power	For PSD
Wi-Fi Internal Antenna List (2.4GHz 2*2 MIMO, 5GHz 4*4 MIMO)						
Directional (Note 3)	2.4	4.0	N/A	0.0	4.0	4.00
Directional (Note 3)	5	4.6	-4.0	3.0	4.6	7.61
Bluetooth Internal Antenna						
PCB	2.4	4.5				

Note:

1. The EUT supports Cyclic Delay Diversity (CDD) mode, and CDD signals are correlated.
   For CDD transmissions, directional gain is calculated as follows, N_{ANT} = 2, N_{SS} = 1.
   If all antennas have the same gain, G_{ANT}, Directional gain = G_{ANT} + Array Gain, where Array Gain is as follows.
   - For power spectral density (PSD) measurements on all devices,
     Array Gain = 10 log (N_{ANT}/ N_{SS}) dB = 3.01;
   - For power measurements on IEEE 802.11 devices,
     Array Gain = 0 dB for $N_{ANT} \leq 4$;
2. The EUT also supports Beam Forming mode, and the Beam Forming support 802.11n/ac, not include 802.11a/b/g.
   Directional gain = G_{ANT} + BF Gain, BF Gain was declared by the applicant.
3. These antennas have Cross-Polarized design, the detail see the antenna specification.
4. For Model No.: APEX0374 approval, we selected the max peak gain antenna of each type to perform RF testing. (Omni antenna 1# and 2#, Directional antenna 3# and 6#)

2.7. Description of Test Software

The test utility software used during testing was " SmartRF Studio", and the version was "build #23".

Model No.	Test Mode	Test Frequency (MHz)	Power Parameter Value
APEX0374	BLE	2402	4.0
		2440	4.0
		2480	4.0
APEX0375	BLE	2402	4.0
		2440	4.0
		2480	4.0
APEX0377	BLE	2402	4.0
		2440	4.0
		2480	4.0

2.8. Device Capabilities

This device contains the following capabilities:

802.11a/b/g/n/ac Wi-Fi & Bluetooth v4.0 single mode

Note: The maximum achievable duty cycles was determined based on measurements performed on a spectrum analyzer in zero-span mode with RBW = 8MHz, VBW = 50MHz. The RBW and VBW were both greater than 50/T, where T is the minimum transmission duration, and the number of sweep points across T was greater than 100. The duty cycles are as follows:

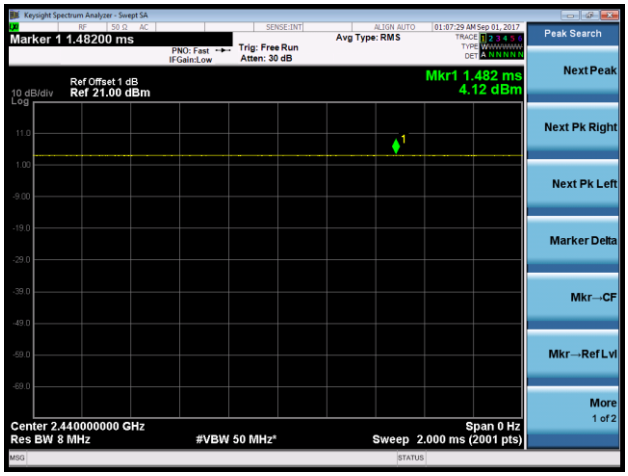
Model No.	Test Mode	Duty Cycle
APEX0374	BLE	100.00%
APEX0375	BLE	100.00%
APEX0377	BLE	100.00%

Duty Cycle

APEX0374

APEX0375

APEX0377



2.9. Description of Antenna RF Port

<table>
<tr><td colspan="7">Antenna RF Port</td></tr>
<tr><td>--</td><td colspan="2">2.4GHz RF Port</td><td colspan="4">5GHz RF Port</td></tr>
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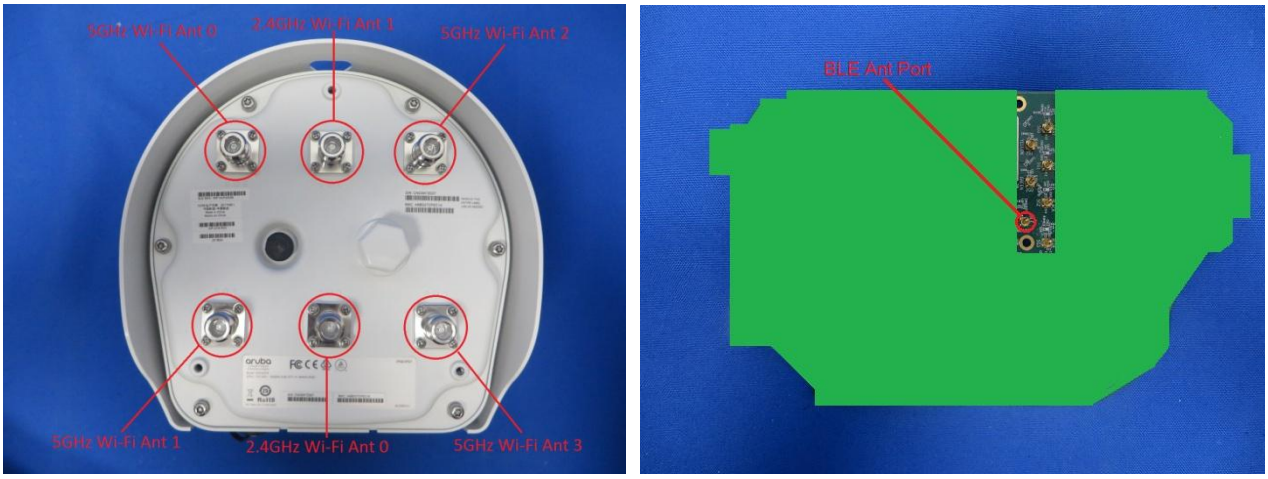
<tr><td colspan="7"> 
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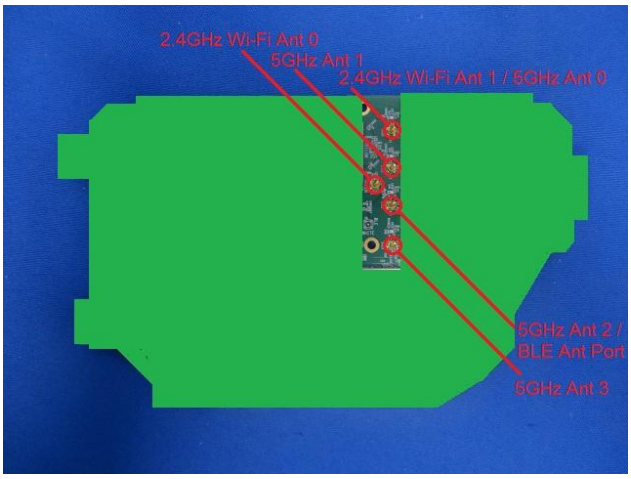
<tr><td colspan="3"> 
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</table>

2.10. Labeling Requirements

Per 2.1074 & 15.19; Docket 95-19

The label shall be permanently affixed at a conspicuous location on the device; instruction manual or pamphlet supplied to the user and be readily visible to the purchaser at the time of purchase. However, when the device is so small wherein placement of the label with specified statement is not practical, only the FCC ID must be displayed on the device per Section 15.19(a)(5). Please see attachment for FCC ID label and label location.

3. DESCRIPTION OF TEST

3.1. Evaluation Procedure

The measurement procedures described in the American National Standard for Testing Unlicensed Wireless Devices (ANSI C63.10-2013), and the guidance provided in KDB 558074 D01v04 were used in the measurement of the **ACCESS POINT.**

Deviation from measurement procedure…….....None

3.2. AC Line Conducted Emissions

The line-conducted facility is located inside an 8'x4'x4' shielded enclosure. A 1m x 2m wooden table 80cm high is placed 40cm away from the vertical wall and 80cm away from the sidewall of the shielded room. Two 10kHz-30MHz, 50Ω/50uH Line-Impedance Stabilization Networks (LISNs) are bonded to the shielded room floor. Power to the LISNs is filtered by external high-current high-insertion loss power line filters. These filters attenuate ambient signal noise from entering the measurement lines. These filters are also bonded to the shielded enclosure.

The EUT is powered from one LISN and the support equipment is powered from the second LISN. All interconnecting cables more than 1 meter were shortened to a 1 meter length by non-inductive bundling (serpentine fashion) and draped over the back edge of the test table. All cables were at least 40cm above the horizontal reference ground-plane. Power cables for support equipment were routed down to the second LISN while ensuring that that cables were not draped over the second LISN.

Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the receiver and exploratory measurements were made to determine the frequencies producing the maximum emission from the EUT. The receiver was scanned from 150kHz to 30MHz. The detector function was set to peak mode for exploratory measurements while the bandwidth of the analyzer was set to 9kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Each emission was also maximized by varying: power lines, the mode of operation or data exchange speed, or support equipment whichever determined the worst-case emission. Once the worst case emissions have been identified, the one EUT cable configuration/arrangement and mode of operation that produced these emissions were used for final measurements on the same test site. The analyzer is set to CISPR quasi-peak and average detectors with a 9kHz resolution bandwidth for final measurements.

An extension cord was used to connect to a single LISN which powered by EUT. The extension cord was calibrated with LISN, the impedance and insertion loss are compliance with the requirements as stated in ANSI C63.10-2013.

Line conducted emissions test results are shown in Section 7.8.

3.3. Radiated Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. For measurements above 1GHz absorbers are arranged on the floor between the turn table and the Antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1GHz, the absorbers are removed. A MF Model 210SS turntable is used for radiated measurement. It is a continuously rotatable, remote controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. An 80cm high PVC support structure is placed on top of the turntable. For all measurements, the spectrum was scanned through all EUT azimuths and from 1 to 4 meter receive Antenna height using a broadband Antenna from 30MHz up to the upper frequency shown in 15.33(b)(1) depending on the highest frequency generated or used in the device or on which the device operates or tunes. For frequencies above 1GHz, linearly polarized double ridge horn Antennas were used. For frequencies below 30MHz, a calibrated loop Antenna was used. When exploratory measurements were necessary, they were performed at 1 meter test distance inside the semi-anechoic chamber using broadband Antennas, broadband amplifiers, and spectrum analyzers to determine the frequencies and modes producing the maximum emissions. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The test set-up for frequencies below 1GHz was placed on top of the 0.8 meter high, 1 x 1.5 meter table; and test set-up for frequencies 1-40GHz was placed on top of the 1.5 meter high, 1 x 1.5 meter table. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Appropriate precaution was taken to ensure that all emissions from the EUT were maximized and investigated. The system configuration, clock speed, mode of operation or video resolution, if applicable, turntable azimuth, and receive Antenna height was noted for each frequency found.

Final measurements were made in the semi-anechoic chamber using calibrated, linearly polarized broadband and horn Antennas. The test setup was configured to the setup that produced the worst case emissions. The spectrum analyzer was set to investigate all frequencies required for testing to compare the highest radiated disturbances with respect to the specified limits. The turntable containing the EUT was rotated through 360 degrees and the height of the receive Antenna was varied 1 to 4 meters and stopped at the azimuth and height producing the maximum emission. Each emission was maximized by changing the orientation of the EUT through three orthogonal planes and changing the polarity of the receive Antenna, whichever produced the worst-case emissions. According to 3dB Beam-Width of horn Antenna, the horn Antenna should be always directed to the EUT when rising height.

4. ANTENNA REQUIREMENTS

Excerpt from §15.203 of the FCC Rules/Regulations:

"An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section."

- The antenna of the **ACCESS POINT** is **permanently attached.**
- There are no provisions for connection to an external antenna.

Conclusion:

The **ACCESS POINT** unit complies with the requirement of §15.203.

5. TEST EQUIPMENT CALIBRATION DATE

Conducted Emissions

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR3	MRTTWA00045	1 year	2018/03/17
Two-Line V-Network	R&S	ENV216	MRTTWA00019	1 year	2018/03/23
Two-Line V-Network	R&S	ENV216	MRTTWA00020	1 year	2018/03/23
Temperature/Humidity Meter	TFA	35.1078.10.IT	MRTTWA00033	1 year	2018/06/08

Radiated Emissions

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Signal Analyzer	R&S	FSV40	MRTTWA00007	1 year	2018/03/02
EMI Test Receiver	R&S	ESR3	MRTTWA00009	1 year	2018/03/16
Broadband Preamplifier	SCHWARZBECK	BBV 9718	MRTTWA00005	1 year	2018/04/06
Broadband Amplifier	SCHWARZBECK	BBV 9721	MRTTWA00006	1 year	2018/04/06
Acitve Loop Antenna	SCHWARZBECK	FMZB 1519B	MRTTWA00002	1 year	2018/04/06
Broadband TRILOG Antenna	SCHWARZBECK	VULB 9162	MRTTWA00001	1 year	2018/04/06
Broadband Hornantenna	SCHWARZBECK	BBHA 9120D	MRTTWA00003	1 year	2018/04/06
Breitband Hornantenna	SCHWARZBECK	BBHA 9170	MRTTWA00004	1 year	2018/04/06
Temperature/Humidity Meter	TFA	35.1078.10.IT	MRTTWA00033	1 year	2018/06/08

Conducted Test Equipment

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EXA Signal Analyzer	KEYSIGHT	N9010A	MRTTWA00012	1 year	2018/07/10
PSA Series Spectrum Analyzer	Agilent	E4447A	MRTTWA00060	1 year	2017/12/11
X-Series USB Peak and Average Power Sensor	KEYSIGHT	U2021XA	MRTTWA00014	1 year	2018/03/18
X-Series USB Peak and Average Power Sensor	KEYSIGHT	U2021XA	MRTTWA00015	1 year	2018/03/18
Programmable Temperature & Humidity Chamber	TEN BILLION	TTH-B3UP	MRTTWA00036	1 year	2018/05/10
Temperature/Humidity Meter	TFA	35.1078.10.IT	MRTTWA00033	1 year	2018/06/08

Software	**Version**	**Function**
e3	V 8.3.5	EMI Test Software

6. MEASUREMENT UNCERTAINTY

Where relevant, the following test uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k = 2.

AC Conducted Emission Measurement - SR2
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 150kHz~30MHz: 3.46dB
Radiated Emission Measurement - AC1
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 9kHz ~ 1GHz: 4.18dB 1GHz ~ 25GHz: 4.76dB
Spurious Emissions, Conducted - SR1
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 0.78dB
Output Power - SR1
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 1.13dB
Power Spectrum Density - SR1
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 1.15dB
Occupied Bandwidth - SR1
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 0.28%

7. TEST RESULT

7.1. Summary

Product Name: **ACCESS POINT**
FCC ID: **Q9DAPEX037457**
FCC Classification: **Digital Transmission System (DTS)**
Data Rate(s) Tested: **1Mbps(GFSK)**

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
15.247(a)(2)	6dB Bandwidth	≥ 500kHz	Conducted	Pass	Section 7.2
15.247(b)(3)	Output Power	≤ 1Watt		Pass	Section 7.3
15.247(e)	Power Spectral Density	≤ 8dBm / 3kHz		Pass	Section 7.4
15.247(d)	Band Edge / Out-of-Band Emissions	≥ 20dBc(Peak)		Pass	Section 7.5
15.205 15.209	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in 15.209	Radiated	Pass	Section 7.6 & 7.7
15.207	AC Conducted Emissions 150kHz - 30MHz	< FCC 15.207 limits	Line Conducted	Pass	Section 7.8

Note: The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.

7.2. 6dB Bandwidth Measurement

7.2.1.Test Limit

The minimum 6dB bandwidth shall be at least 500 kHz.

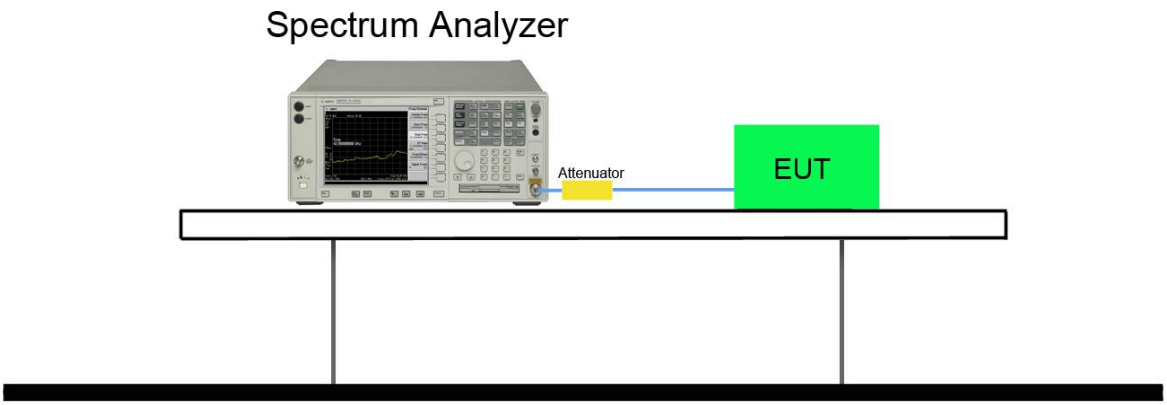
7.2.2.Test Procedure used

KDB 558074 D01v04 - Section 8.2 Option 2

7.2.3.Test Setting

1. The Spectrum's automatic bandwidth measurement capability was used to perform the 6dB bandwidth measurement. The "X" dB bandwidth parameter was set to X = 6. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. Set RBW = 100 kHz
3. VBW ≥ 3 × RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. Allow the trace was allowed to stabilize

7.2.4.Test Setup



7.2.5.Test Result

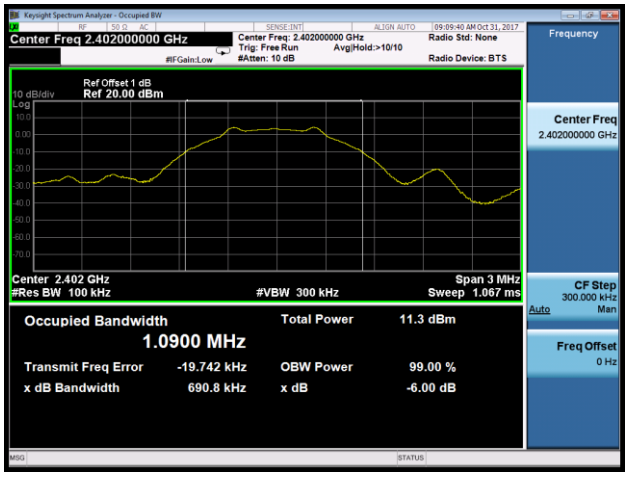
Model No.: APEX0374

Product	ACCESS POINT	Temperature	25°C
Test Engineer	Kevin Ker	Relative Humidity	60%
Test Site	SR2	Test Date	2017/10/31
Test Item	6dB Bandwidth		

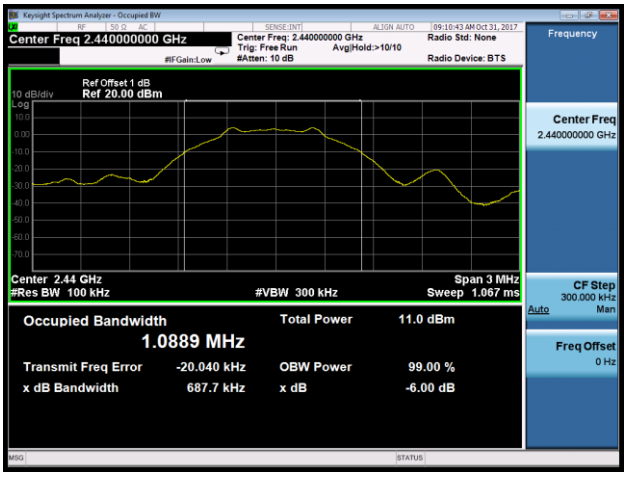
Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)	Result
BLE	1	00	2402	0.69	≥ 0.5	Pass
BLE	1	19	2440	0.69	≥ 0.5	Pass
BLE	1	39	2480	0.69	≥ 0.5	Pass

BLE 6dB Bandwidth

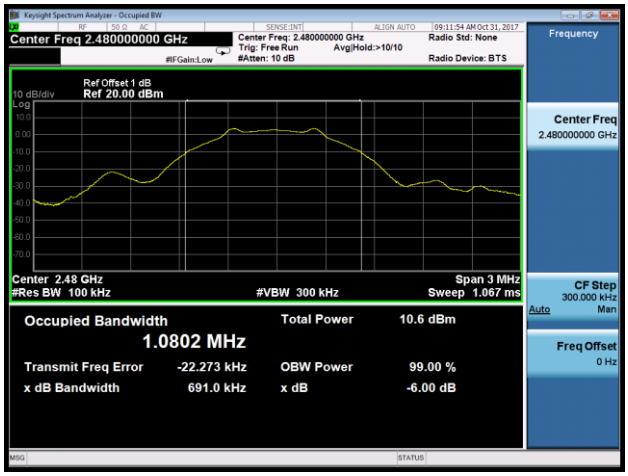
Channel 00 (2402MHz)



Channel 19 (2440MHz)



Channel 39 (2480MHz)



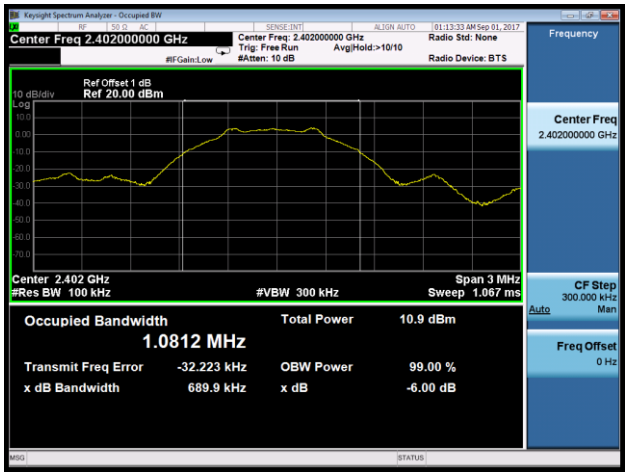
Model No.: APEX0375

Product	ACCESS POINT	Temperature	25°C
Test Engineer	Kevin Ker	Relative Humidity	58%
Test Site	SR2	Test Date	2017/09/01
Test Item	6dB Bandwidth		

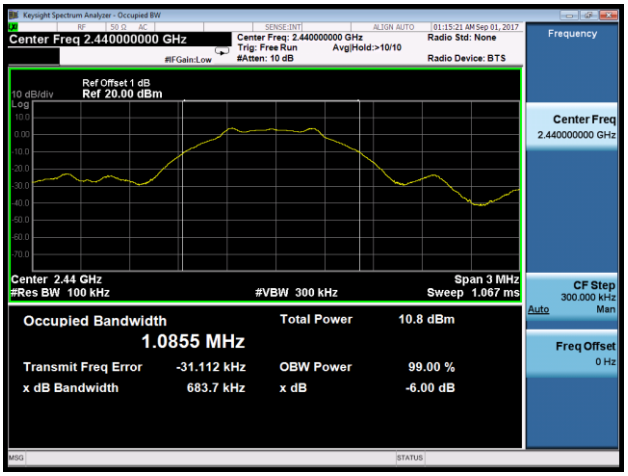
Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)	Result
BLE	1	00	2402	0.69	≥ 0.5	Pass
BLE	1	19	2440	0.68	≥ 0.5	Pass
BLE	1	39	2480	0.68	≥ 0.5	Pass

BLE 6dB Bandwidth

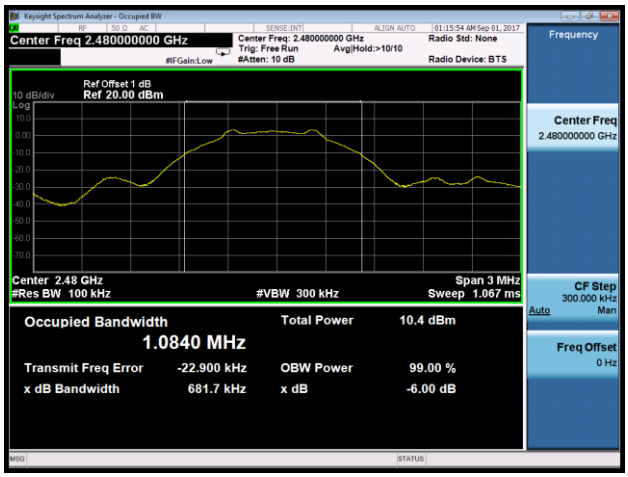
Channel 00 (2402MHz)



Channel 19 (2440MHz)



Channel 39 (2480MHz)



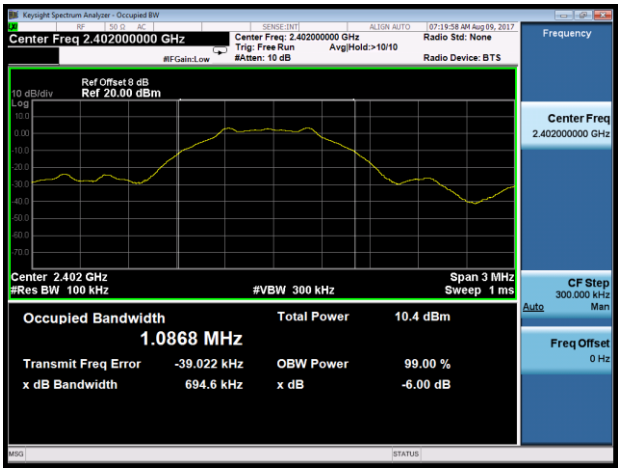
Model No.: APEX0377

Product	ACCESS POINT	Temperature	27°C
Test Engineer	Kevin Ker	Relative Humidity	65%
Test Site	SR2	Test Date	2017/08/09
Test Item	6dB Bandwidth		

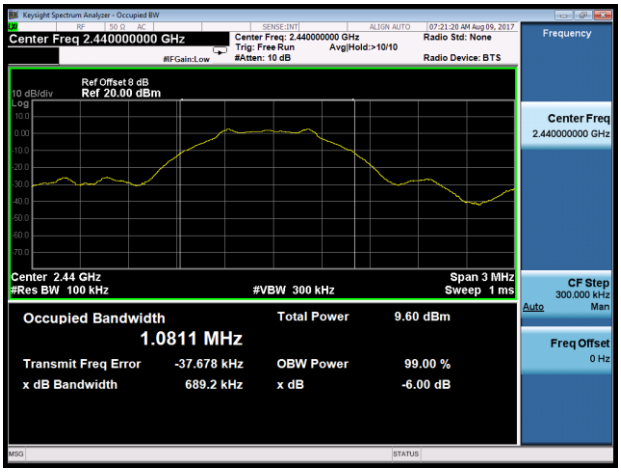
Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)	Result
BLE	1	00	2402	0.69	≥ 0.5	Pass
BLE	1	19	2440	0.69	≥ 0.5	Pass
BLE	1	39	2480	0.69	≥ 0.5	Pass

BLE 6dB Bandwidth

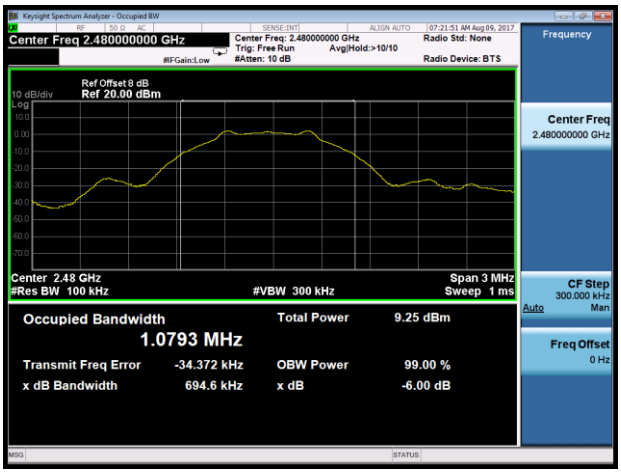
Channel 00 (2402MHz)



Channel 19 (2440MHz)



Channel 39 (2480MHz)



7.3. Output Power Measurement

7.3.1.Test Limit

The maximum out power shall be less 1 Watt (30dBm).

The conducted output power limit specified in paragraph FCC Part 15.247(b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs FCC Part 15.247(b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

7.3.2.Test Procedure Used

KDB 558074 D01v04 - Section 9.1.2 PKPM1 - Peak Power Method

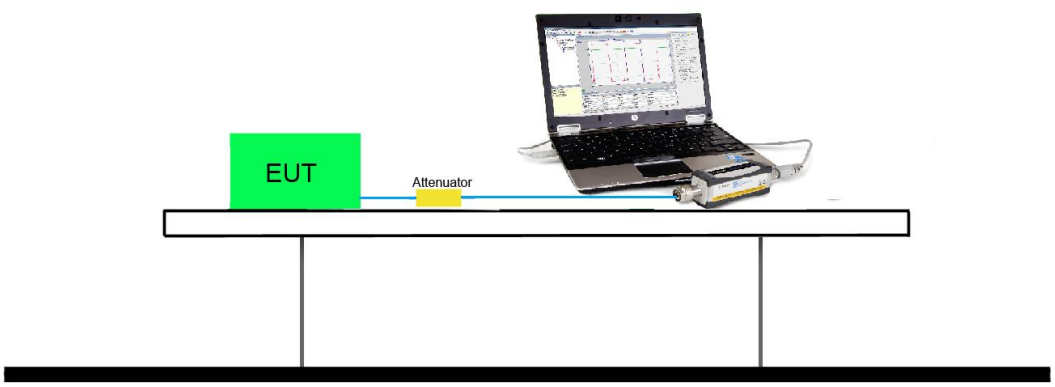
KDB 558074 D01v04 - Section 9.2.3.2 AVGPM-G Average Power Method

7.3.3.Test Setting

Method PKPM1 (Peak Power Measurement of Signals with DTS BW ≤ 50MHz)

Peak power measurements were performed only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor. The pulse sensor employs a VBW = 50MHz so this method was only used for signals whose DTS bandwidth was less than or equal to 50MHz.

7.3.4.Test Setup



7.3.5.Test Result of Output Power

Model No.: APEX0374

Product	ACCESS POINT	Temperature	25°C
Test Engineer	Kevin Ker	Relative Humidity	60%
Test Site	SR2	Test Date	2017/10/31
Test Item	Output Power		

Test Result of Peak Output Power

Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Result
BLE	1	00	2402	4.98	≤ 30.0	Pass
BLE	1	19	2440	4.71	≤ 30.0	Pass
BLE	1	39	2480	4.33	≤ 30.0	Pass

Test Result of Average Output Power (Reporting Only)

Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	Average Power (dBm)	Limit (dBm)	Result
BLE	1	00	2402	4.65	≤ 30.0	Pass
BLE	1	19	2440	4.38	≤ 30.0	Pass
BLE	1	39	2480	3.99	≤ 30.0	Pass

Model No.: APEX0377

Product	ACCESS POINT	Temperature	25°C
Test Engineer	Kevin Ker	Relative Humidity	60%
Test Site	SR2	Test Date	2017/10/31
Test Item	Output Power		

Test Result of Peak Output Power

Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Result
BLE	1	00	2402	5.22	≤ 29.3	Pass
BLE	1	19	2440	5.06	≤ 29.3	Pass
BLE	1	39	2480	4.78	≤ 29.3	Pass

Test Result of Average Output Power (Reporting Only)

Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	Average Power (dBm)	Limit (dBm)	Result
BLE	1	00	2402	5.05	≤ 29.3	Pass
BLE	1	19	2440	4.85	≤ 29.3	Pass
BLE	1	39	2480	4.56	≤ 29.3	Pass

Note: Limit (dBm) = 30dBm - (6.7 dBi - 6.0 dBi) = 29.3 dBm, Antenna Gain = 6.7dBi.

Model No.: APEX0375

Product	ACCESS POINT	Temperature	27°C
Test Engineer	Kevin Ker	Relative Humidity	65%
Test Site	SR2	Test Date	2017/08/09
Test Item	Output Power		

Test Result of Peak Output Power

Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Result
BLE	1	00	2402	5.01	≤ 30.0	Pass
BLE	1	19	2440	4.48	≤ 30.0	Pass
BLE	1	39	2480	4.42	≤ 30.0	Pass

Test Result of Average Output Power (Reporting Only)

Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	Average Power (dBm)	Limit (dBm)	Result
BLE	1	00	2402	4.71	≤ 30.0	Pass
BLE	1	19	2440	4.45	≤ 30.0	Pass
BLE	1	39	2480	3.99	≤ 30.0	Pass

7.4. Power Spectral Density Measurement

7.4.1.Test Limit

The maximum permissible power spectral density is 8dBm in any 3 kHz band.

The same method of determining the conducted output power shall be used to determine the power spectral density.

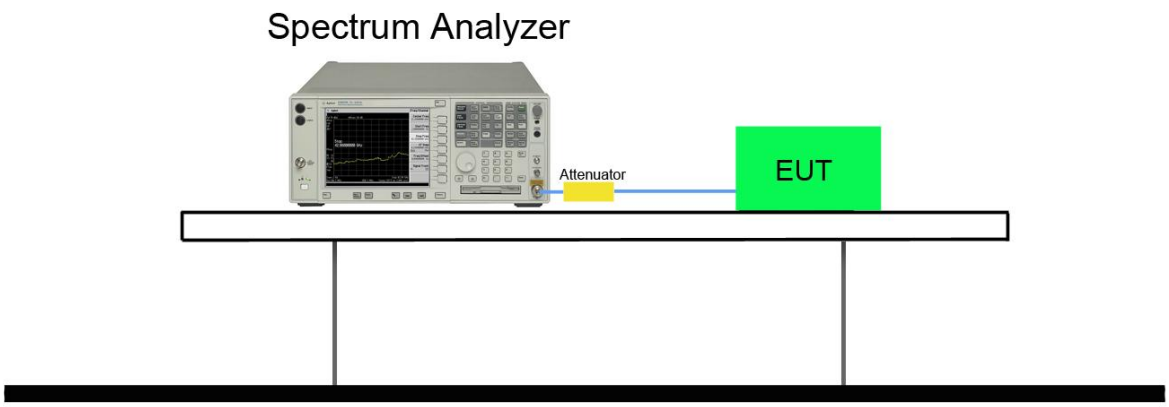
7.4.2.Test Procedure Used

KDB 558074 D01v04 - Section 10.2 Method PKPSD

7.4.3.Test Setting

1. Analyzer was set to the center frequency of the DTS channel under investigation
2. Span = 1.5 times the DTS channel bandwidth
3. RBW = 3kHz
4. VBW = 10kHz
5. Detector = peak
6. Sweep time = auto couple
7. Trace mode = max hold
8. Trace was allowed to stabilize

7.4.4.Test Setup



7.4.5.Test Result

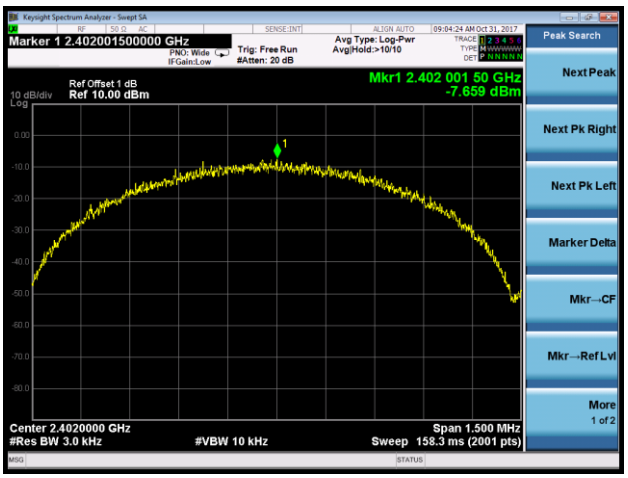
Model No.: APEX0374

Product	ACCESS POINT	Temperature	25°C
Test Engineer	Kevin Ker	Relative Humidity	60%
Test Site	SR2	Test Date	2017/10/31
Test Item	Power Spectral Density		

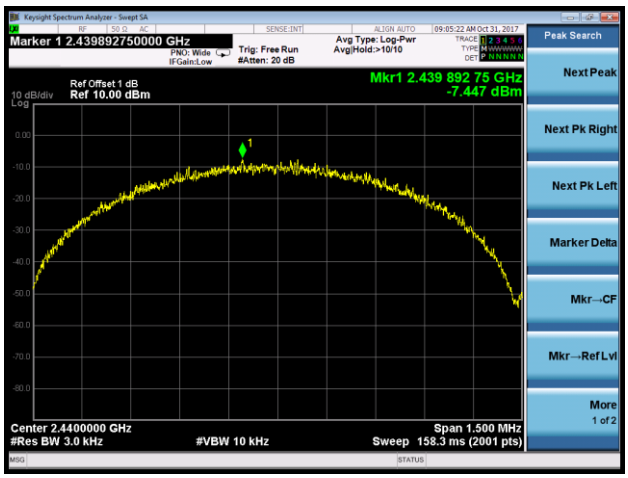
Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	PSD Result (dBm / 3kHz)	Limit (dBm / 3kHz)	Result
BLE	1	00	2402	-7.66	≤ 8.0	Pass
BLE	1	19	2440	-7.45	≤ 8.0	Pass
BLE	1	39	2480	-7.88	≤ 8.0	Pass

BLE PSD

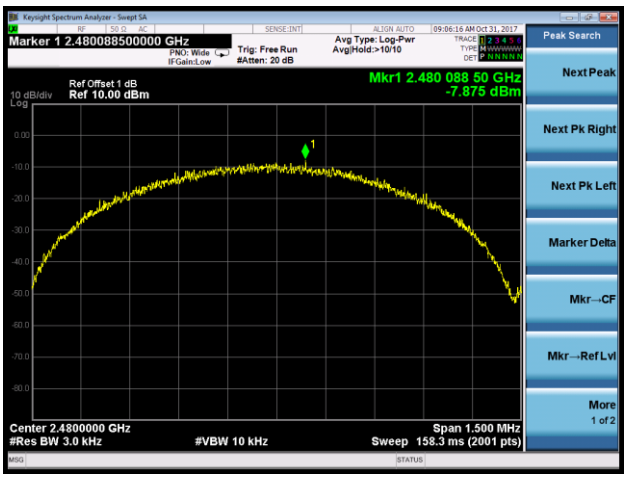
Channel 00 (2402MHz)



Channel 19 (2440MHz)



Channel 39 (2480MHz)



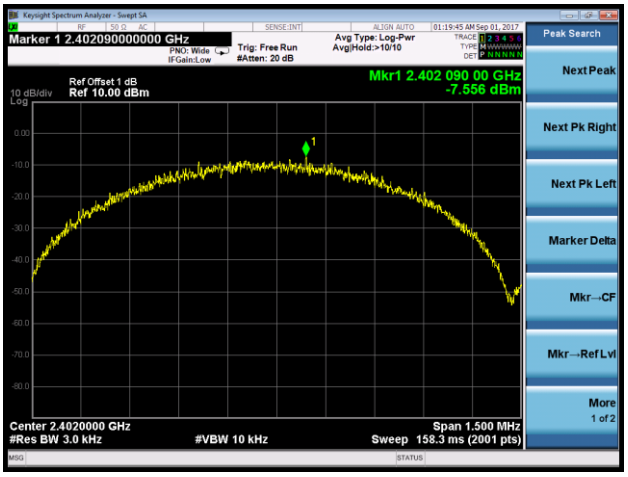
Model No.: APEX0375

Product	ACCESS POINT	Temperature	25°C
Test Engineer	Kevin Ker	Relative Humidity	58%
Test Site	SR2	Test Date	2017/09/01
Test Item	Power Spectral Density		

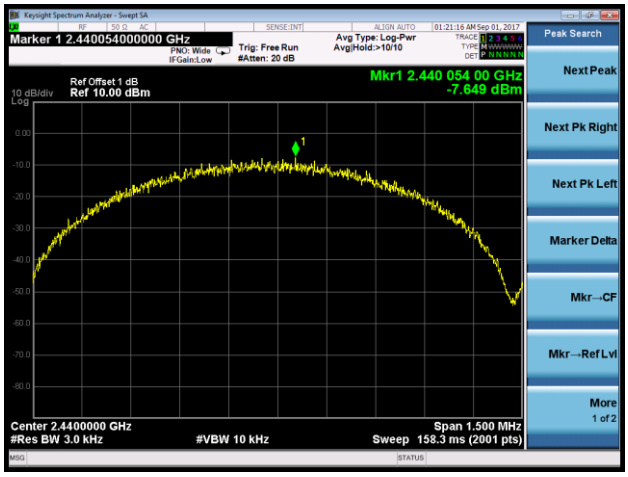
Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	PSD Result (dBm / 3kHz)	Limit (dBm / 3kHz)	Result
BLE	1	00	2402	-7.56	≤ 8.0	Pass
BLE	1	19	2440	-7.65	≤ 8.0	Pass
BLE	1	39	2480	-7.37	≤ 8.0	Pass

BLE PSD

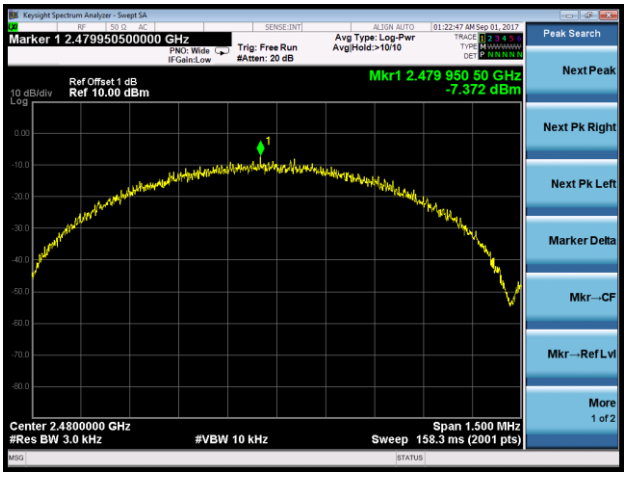
Channel 00 (2402MHz)



Channel 19 (2440MHz)



Channel 39 (2480MHz)



Model No.: APEX0377

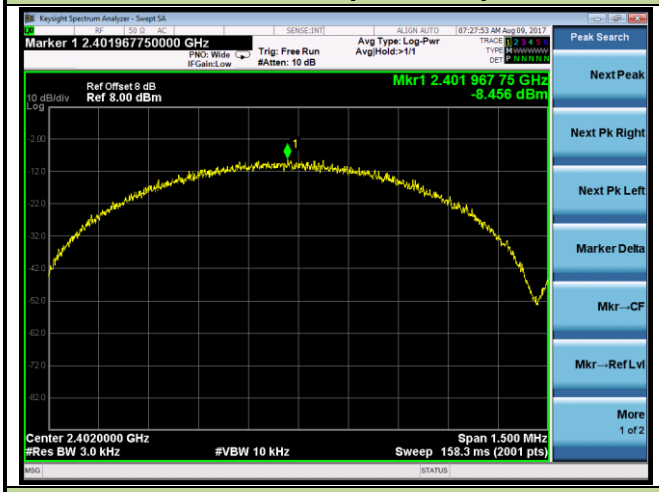
Product	ACCESS POINT	Temperature	27°C
Test Engineer	Kevin Ker	Relative Humidity	65%
Test Site	SR2	Test Date	2017/08/09
Test Item	Power Spectral Density		

Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	PSD Result (dBm / 3kHz)	Limit (dBm / 3kHz)	Result
BLE	1	00	2402	-8.46	≤ 7.3	Pass
BLE	1	19	2440	-8.55	≤ 7.3	Pass
BLE	1	39	2480	-10.77	≤ 7.3	Pass

Note: PSD Limit (dBm/3kHz) = 8dBm/3kHz - (6.7dBi – 6.0dBi) = 7.3dBm/3kHz.

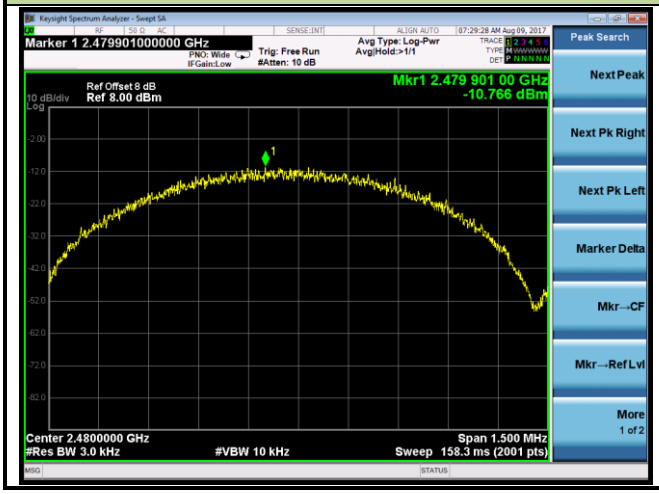
BLE PSD

Channel 00 (2402MHz)



Channel 19 (2440MHz)

Channel 39 (2480MHz)



7.5. Conducted Band Edge and Out-of-Band Emissions

7.5.1.Test Limit

The limit for out-of-band spurious emissions at the band edge is 20dB below the fundamental emission level, as determined from the in-band power measurement of the DTS channel performed in a 100kHz bandwidth per the PSD procedure.

7.5.2.Test Procedure Used

KDB 558074 D01v04 - Section 11.2 & Section 11.3

7.5.3.Test Settitng

1. Reference level measurement

(a) Set instrument center frequency to DTS channel center frequency

(b) Set the span to ≥ 1.5 times the DTS bandwidth

(c) Set the RBW = 100 kHz

(d) Set the VBW ≥ 3 x RBW

(e) Detector = peak

(f) Sweep time = auto couple

(g) Trace mode = max hold

(h) Allow trace to fully stabilize

2. Emission level measurement

(a) Set the center frequency and span to encompass frequency range to be measured

(b) RBW = 100kHz

(c) VBW = 300kHz

(d) Detector = Peak

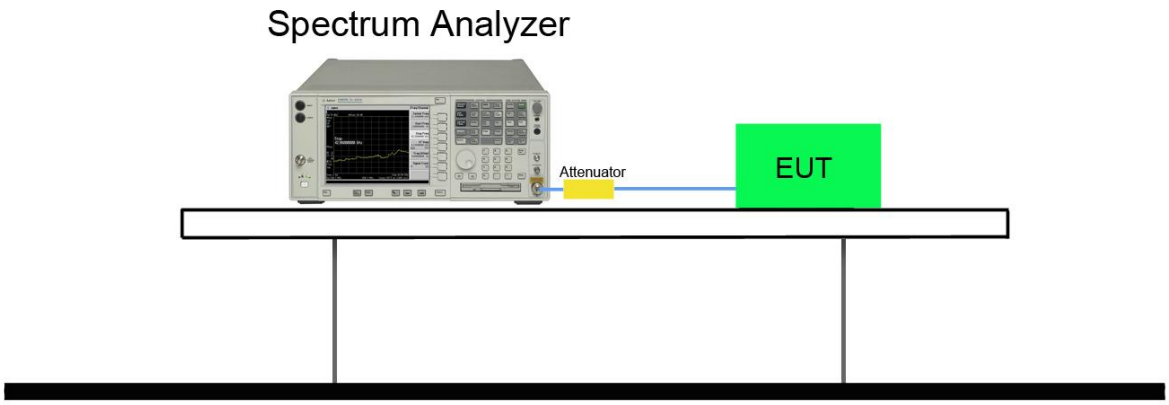
(e) Number of sweep points ≥ 2 x Span/RBW

(f) Trace mode = max hold

(g) Sweep time = auto couple

(h) The trace was allowed to stabilize

7.5.4.Test Setup



7.5.5.Test Result

Model No.: APEX0374

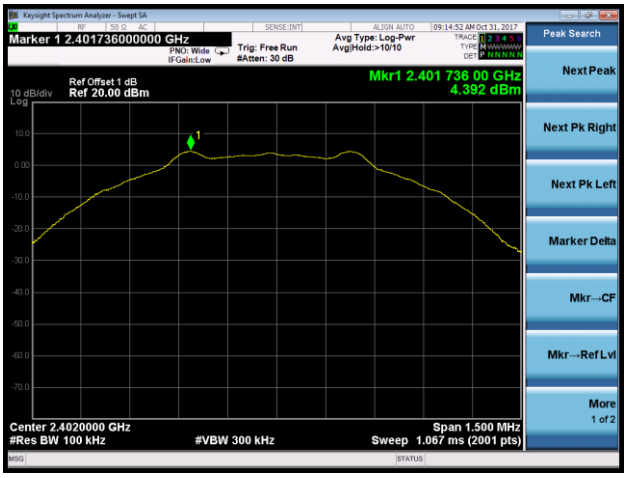
Product	ACCESS POINT	Temperature	25°C
Test Engineer	Kevin Ker	Relative Humidity	60%
Test Site	SR2	Test Date	2017/10/31
Test Item	Conducted Band Edge and Out-of-Band Emissions		

Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	Limit	Result
BLE	1	00	2402	20dBc	Pass
BLE	1	19	2440	20dBc	Pass
BLE	1	39	2480	20dBc	Pass

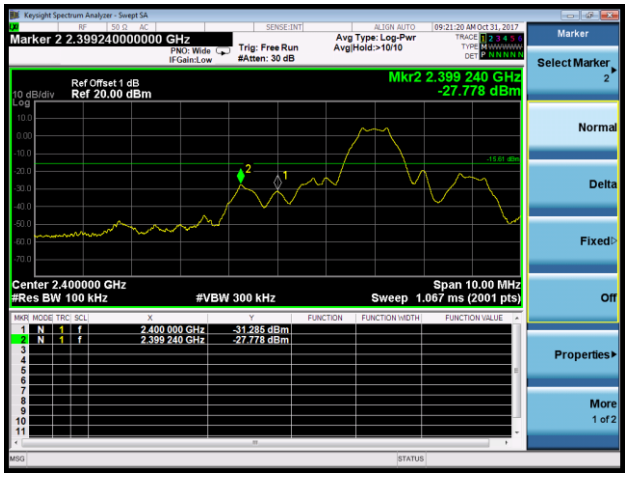
BLE Out-of-Band Emissions

Channel 00 (2402MHz)

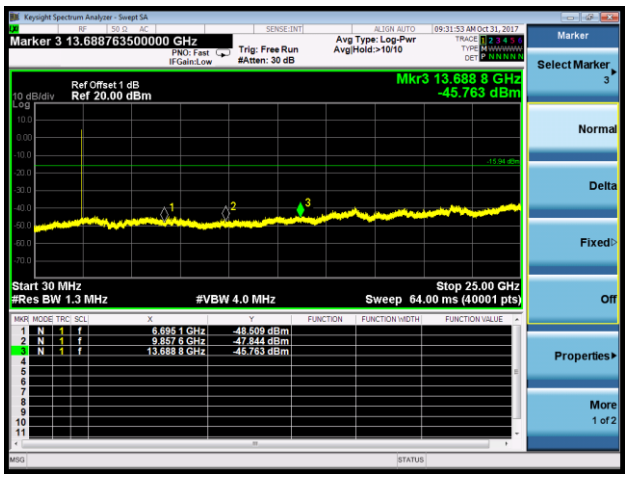
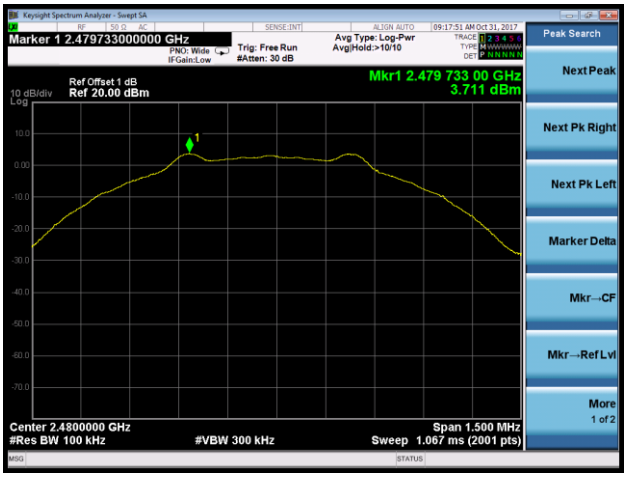
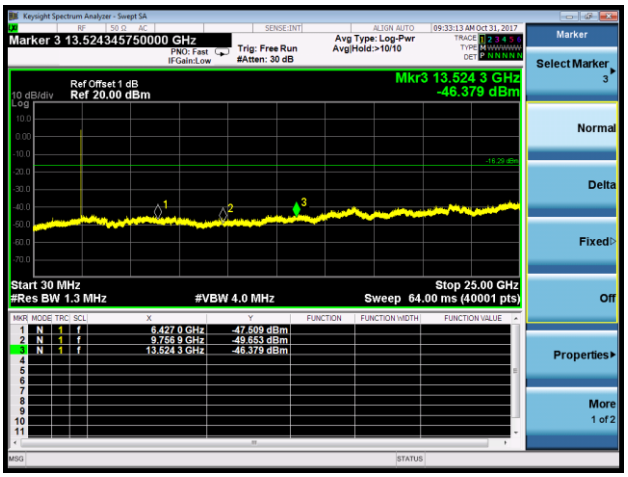
100kHz PSD reference Level



Low Band Edge



Spurious Emission 30MHz ~ 25GHz

Channel 19 (2440MHz)	
100kHz PSD reference Level	Spurious Emission 30MHz ~ 25GHz
	
Channel 39 (2480MHz)	
100kHz PSD reference Level	**High Band Edge**
	
Spurious Emission 30MHz ~ 25GHz	
	

Model No.: APEX0375

Product	ACCESS POINT	Temperature	25°C
Test Engineer	Kevin Ker	Relative Humidity	58%
Test Site	SR2	Test Date	2017/09/01
Test Item	Conducted Band Edge and Out-of-Band Emissions		

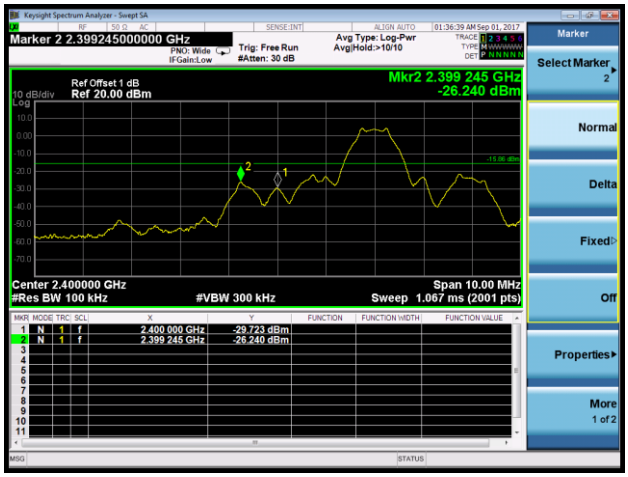
Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	Limit	Result
BLE	1	00	2402	20dBc	Pass
BLE	1	19	2440	20dBc	Pass
BLE	1	39	2480	20dBc	Pass

BLE Out-of-Band Emissions

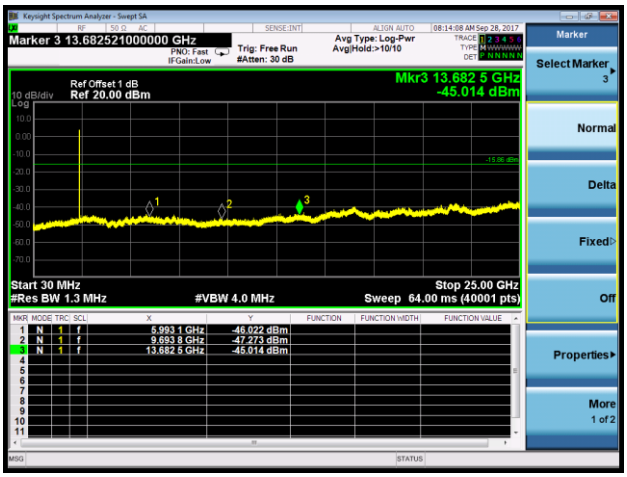
Channel 00 (2402MHz)

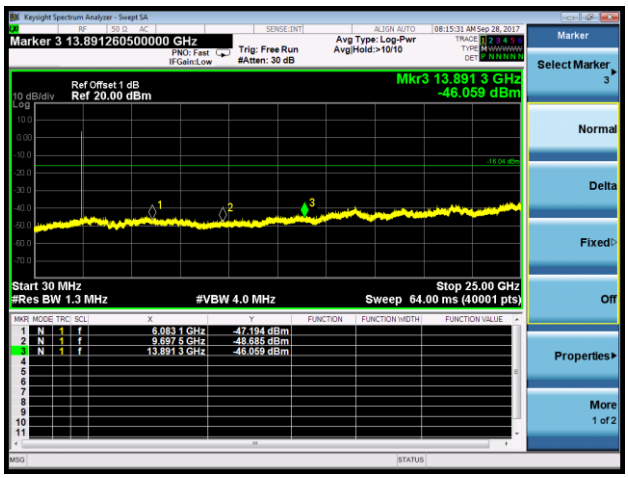
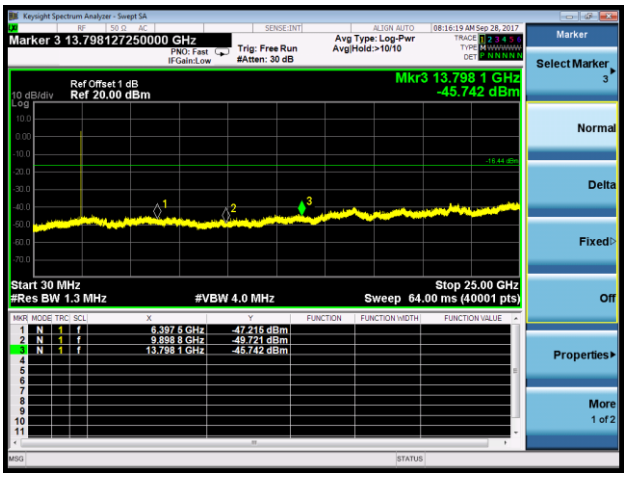
100kHz PSD reference Level

Low Band Edge



Spurious Emission 30MHz ~ 25GHz



Channel 19 (2440MHz)	
100kHz PSD reference Level	Spurious Emission 30MHz ~ 25GHz
	
Channel 39 (2480MHz)	
100kHz PSD reference Level	**High Band Edge**
	
Spurious Emission 30MHz ~ 25GHz	
	

Model No.: APEX0377

Product	ACCESS POINT	Temperature	27°C
Test Engineer	Kevin Ker	Relative Humidity	65%
Test Site	SR2	Test Date	2017/08/09
Test Item	Conducted Band Edge and Out-of-Band Emissions		

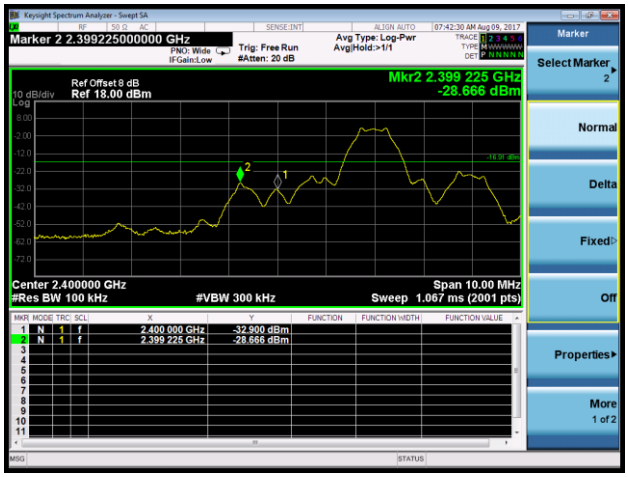
Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	Limit	Result
BLE	1	00	2402	20dBc	Pass
BLE	1	19	2440	20dBc	Pass
BLE	1	39	2480	20dBc	Pass

BLE Out-of-Band Emissions

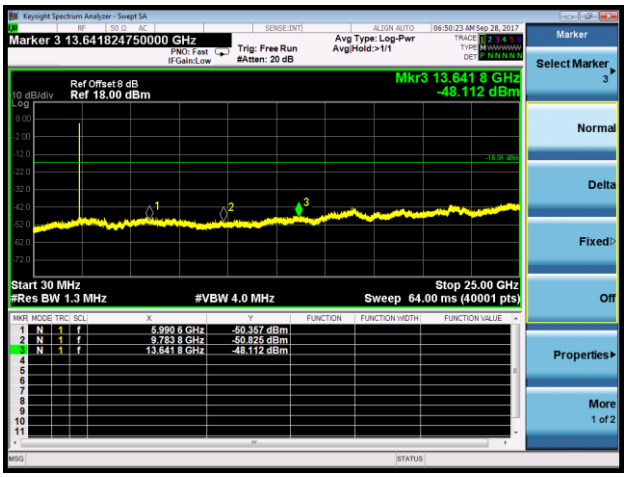
Channel 00 (2402MHz)

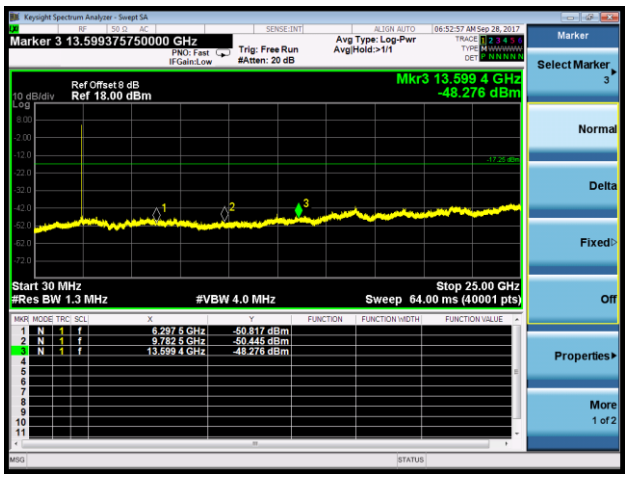
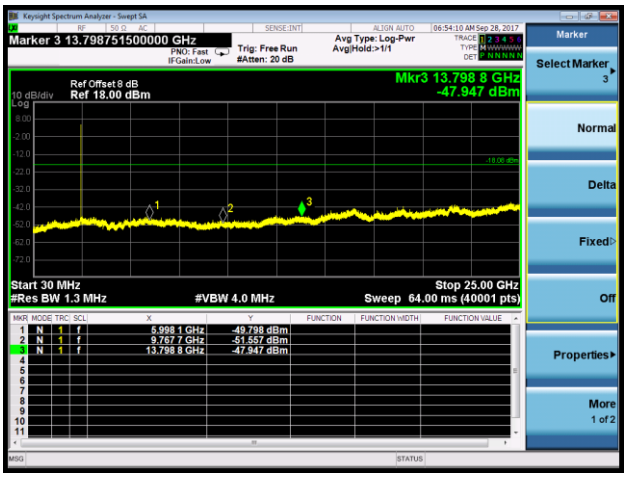
100kHz PSD reference Level

Low Band Edge



Spurious Emission 30MHz ~ 25GHz



Channel 19 (2440MHz)	
100kHz PSD reference Level	Spurious Emission 30MHz ~ 25GHz
	
Channel 39 (2480MHz)	
100kHz PSD reference Level	High Band Edge
	
Spurious Emission 30MHz ~ 25GHz	
	

7.6. Radiated Spurious Emission Measurement

7.6.1.Test Limit

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR must not exceed the limits shown in Table per Section 15.209.

FCC Part 15 Subpart C Paragraph 15.209		
Frequency [MHz]	Field Strength [uV/m]	Measured Distance [Meters]
0.009 - 0.490	2400/F (kHz)	300
0.490 - 1.705	24000/F (kHz)	30
1.705 - 30	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

7.6.2.Test Procedure Used

KDB 558074 D01v04 - Section 12.2.3 (quasi-peak measurements)

KDB 558074 D01v04 - Section 12.2.4 (peak power measurements)

KDB 558074 D01v04 - Section 12.2.5 (average power measurements)

7.6.3.Test Setting

Peak Field Strength Measurements per Section 12.2.4 of KDB 558074 D01v04

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = as specified in Table 1
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple