MEASUREMENT REPORT

FCC PART 15.407 / RSS-247 WLAN 802.11a/n

FCC ID:	OU5-MAC2000
IC:	4048B-MAC2000
APPLICANT:	GE Medical Systems Information Technologies, Inc.
Application Type:	Certification
Product:	ECG analysis system
Model No.:	MAC 2000
Brand Name:	GE
FCC Classification:	Unlicensed National Information Infrastructure (UNII)
FCC Rule Part(s):	Part15 Subpart E (Section 15.407)
IC Rule(s):	RSS-247 Issue 2, RSS-GEN Issue 4
Test Procedure(s):	ANSI C63.10-2013, KDB 789033 D02v02
Test Date:	November 16 ~ December 11, 2017

Reviewed By : Kevin Guo
(Kevin Guo)

Approved By : Marlin Chen
(Marlin Chen)

ACCREDITED
TESTING LABORATORY
CERTIFICATE #3628.01

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 789033 D02v02. Test results reported herein relate only to the item(s) tested.

Revision History

Report No.	Version	Description	Issue Date	Note
1710WSU00503	Rev. 01	Initial report	12-11-2017	Valid

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Description Page

§2.1033 General Information

Applicant:	GE Medical Systems Information Technologies, Inc.
Applicant Address:	8200W, Tower Ave, Milwaukee, WI 53223 USA
Manufacturer:	GE Medical Systems Information Technologies, Inc.
Manufacturer Address:	8200W, Tower Ave, Milwaukee, WI 53223 USA
Test Site:	MRT Technology (Suzhou) Co., Ltd
Test Site Address:	D8 Building, Youxin Industrial Park, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China
MRT FCC Registration No.:	893164
MRT IC Registration No.:	11384A-1
FCC Rule Part(s):	Part15 Subpart E (Section 15.407)
IC Rule Part(s):	RSS-247 Issue 2
Model No.:	MAC 2000
FCC ID:	OU5-MAC2000
IC:	4048B-MAC2000
Test Device Serial No.:	N/A ☐ Production ☒ Pre-Production ☐ Engineering

Test Facility / Accreditations

Measurements were performed at MRT Laboratory located in Tian'edang Rd., Suzhou, China.

- **MRT facility is a FCC registered (MRT Reg. No. 893164) test facility with the site description report on file and has met all the requirements specified in Section 2.948 of the FCC Rules.**
- **MRT facility is an IC registered (MRT Reg. No. 11384A-1) test laboratory with the site description on file at Industry Canada.**
- **MRT facility is a VCCI registered (R-4179, G-814, C-4664, T-2206) test laboratory with the site description on file at VCCI Council.**
- **MRT Lab is accredited to ISO 17025 by the American Association for Laboratory Accreditation (A2LA) under the American Association for Laboratory Accreditation Program (A2LA Cert. No. 3628.01) in EMC, Telecommunications and Radio testing for FCC, Industry Canada, EU and TELEC Rules.**

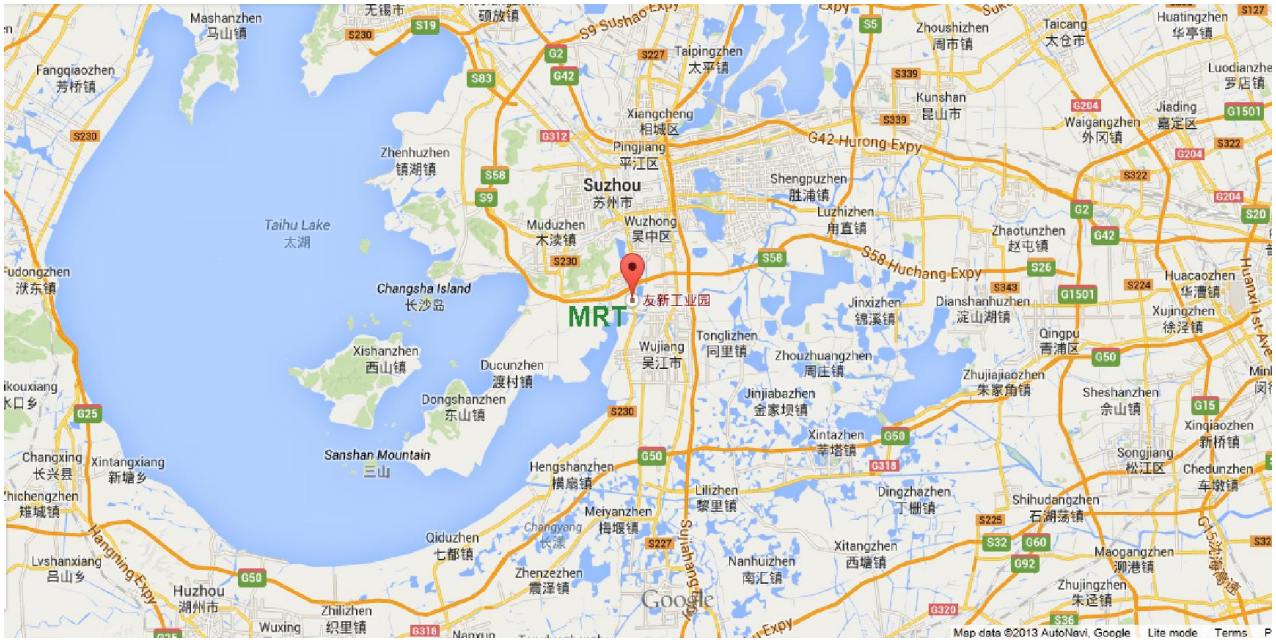
1. INTRODUCTION

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 Taihu Lake. These measurement tests were conducted at the MRT Technology (Suzhou) Co., Ltd. Facility located at D8 Building, Youxin Industrial Park, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China. The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4-2009 on September 30, 2013.



2. PRODUCT INFORMATION

2.1. Equipment Description

Product Name	ECG analysis system
Model No.	MAC 2000
Brand Name:	GE
Wi-Fi Specification	802.11a/b/g/n
Antenna Type:	Internal Antenna

2.2. Product Specification Subjective to this Report

Frequency Range	802.11a/n-HT20: 5180~5320MHz, 5500~5700MHz, 5745~5825MHz
Type of Modulation	802.11a/n: OFDM
Data Rate:	802.11a: 6/9/12/18/24/36/48/54Mbps 802.11n: up to 72.2Mbps
Maximum Average Output Power	802.11a: 16.13dBm 802.11n-HT20: 16.22dBm
Antenna Gain	3.3dBi

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

2.3. Operation Frequency / Channel list

802.11a/n-HT20

Channel	Frequency	Channel	Frequency	Channel	Frequency
36	5180 MHz	40	5200 MHz	44	5220 MHz
48	5240 MHz	52	5260 MHz	56	5280 MHz
60	5300 MHz	64	5320 MHz	100	5500 MHz
104	5520 MHz	108	5540 MHz	112	5560 MHz
116	5580 MHz	120	5600 MHz	124	5620 MHz
128	5640 MHz	132	5660 MHz	136	5680 MHz
140	5700 MHz	149	5745 MHz	153	5765 MHz
157	5785 MHz	161	5805 MHz	165	5825 MHz

Note: The device can't operate in 5600~5650 MHz band in Canada (The frequency of blue font).

2.4. Test Mode

Test Mode	Mode 1: Transmit by 802.11a
	Mode 2: Transmit by 802.11n-HT20

2.5. Description of Test Software

The test utility software used during testing was "LRU.EXE", and it was supplied by manufacturer.

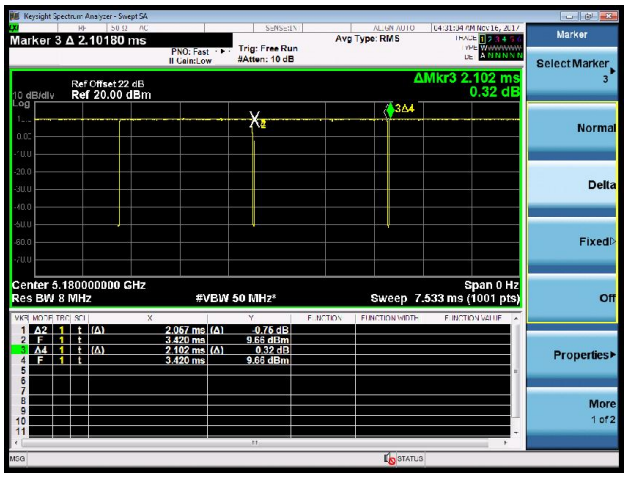
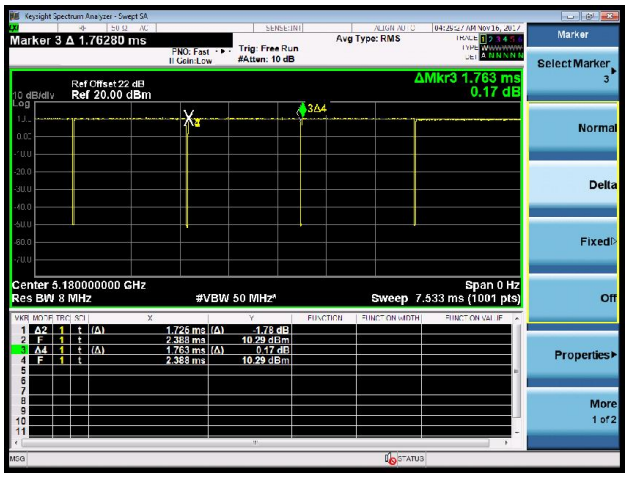
2.6. Device Capabilities

This device contains the following capabilities:

802.11a/b/g/n-HT20 Wi-Fi Device.

Note: 5GHz (NII) operation is possible in 20MHz, 40MHzand 80MHz channel bandwidths. The maximum achievable duty cycles for all modes were determined based on measurements performed on a spectrum analyzer in zero-span mode with RBW = 8MHz, VBW = 50MHz, and detector = average per the guidance of Section B)2)b) of KDB 789033 D02v02. 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:

Test Mode	Duty Cycle
802.11a	97.86%
802.11n-HT20	97.84%

802.11a (T = 2.057ms)	802.11n-HT20 (T = 1.725ms)
	

2.7. Test Configuration

The **ECG analysis system** was tested per the guidance of KDB 789033 D02v02. ANSI C63.10-2013 was used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing.

2.8. EMI Suppression Device(s)/Modifications

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

2.9. 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.

RSP-100 Issue 11 Section 3

The manufacturer, importer or distributor shall meet the labelling requirements set out in this section for every unit:

(i) prior to marketing in Canada, for products manufactured in Canada

(ii) prior to importation into Canada, for imported products

For information regarding the e-labelling option, see Notice 2014–DRS1003. The label for the certified product represents the manufacturer's or importer's compliance with Innovation, Science and Economic Development Canada's (ISED) regulatory requirements.

Please see attachment for IC 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 789033 D02v02 were used in the measurement of the **ECG analysis system.**

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 are 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 7.10.

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 **ECG analysis system** is **permanently attached.**
- There are no provisions for connection to an external antenna.

Conclusion:

The **ECG analysis system** unit complies with the requirement of §15.203.

5. TEST EQUIPMENT CALIBRATION DATE

Conducted Emissions - SR2

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR7	MRTSUE06001	1 year	2018/06/20
Two-Line V-Network	R&S	ENV216	MRTSUE06002	1 year	2018/06/20
Two-Line V-Network	R&S	ENV216	MRTSUE06003	1 year	2018/06/20
Temperature/Humidity Meter	Yuhuaze	HTC-2	MRTSUE06181	1 year	2018/12/20
Shielding Anechoic Chamber	Mikebang	Chamber-SR2	MRTSUE06214	1 year	2018/05/10

Radiated Emission – AC1

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
MXE EMI Receiver	Agilent	N9038A	MRTSUE06125	1 year	2018/08/18
Loop Antenna	Schwarzbeck	FMZB1519	MRTSUE06025	1 year	2018/11/20
Bilog Period Antenna	Schwarzbeck	VULB 9168	MRTSUE06172	1 year	2018/11/18
Horn Antenna	Schwarzbeck	BBHA9120D	MRTSUE06023	1 year	2018/10/21
Broadband Coaxial Preamplifier	Schwarzbeck	BBV 9718	MRTSUE06176	1 year	2018/11/18
Broadband Horn Antenna	Schwarzbeck	BBHA9170	MRTSUE06024	1 year	2017/12/30
Temperature/Humidity Meter	Yuhuaze	HTC-2	MRTSUE06183	1 year	2017/12/22
Anechoic Chamber	TDK	Chamber-AC1	MRTSUE06212	1 year	2018/05/10

Conducted Test Equipment - TR3

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Spectrum Analyzer	Agilent	N9020A	MRTSUE06106	1 year	2018/04/25
Power Meter	Agilent	U2021XA	MRTSUE06030	1 year	2018/12/06
Temperature/Humidity Meter	Yuhuaze	HTC-2	MRTSUE06180	1 year	2017/12/22

Software	Version	Function
e3	V8.3.5	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
Frequency Stability - TR3
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 0.78dB
Output Power, Transmit Power Control - TR3
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 1.13dB
Power Spectrum Density - TR3
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 1.15dB
Occupied Bandwidth - TR3
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 0.28%

7. TEST RESULT

7.1. Summary

Company Name: **GE Medical Systems Information Technologies, Inc.**
FCC ID: **OU5-MAC2000**
IC: **4048B-MAC2000**
FCC Classification: **Unlicensed National Information Infrastructure (UNII)**
Data Rate(s) Tested: **6Mbps ~ 54Mbps (a); MCS0 ~ MCS7 (n-HT20).**

FCC Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
15.407(a)	26dB Bandwidth	N/A	Conducted	Pass	Section 7.2
15.407(e)	6dB Bandwidth	≥ 500kHz		Pass	Section 7.3
15.407(a)(1)(iv), (2), (3)	Maximum Conducted Output Power	Refer to Section 7.4		Pass	Section 7.4
15.407(h)(1)	Transmit Power Control	≤ 24 dBm		Pass	Section 7.5
15.407(a)(1)(iv), (2), (3), (5)	Peak Power Spectral Density	Refer to Section 7.6		Pass	Section 7.6
15.407(g)	Frequency Stability	N/A		Pass	Section 7.7
15.407(b)(1), (2), (3), (4)(i)	Undesirable Emissions	≤ -27dBm/MHz EIRP Detail see section 7.8	Radiated	Pass	Section 7.8 & 7.9
15.205, 15.209 15.407(b)(5), (6), (7)	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in 15.209		Pass	
15.207	AC Conducted Emissions 150kHz - 30MHz	< FCC 15.207 limits	Line Conducted	Pass	Section 7.10

RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
RSS-247 §6.2	99% Bandwidth	N/A	Conducted	Pass	Section 7.2
RSS-247 §6.2.4	6dB Bandwidth	>500kHz		Pass	Section 7.3
RSS-247 §6.2.1, §6.2.2, §6.2.3, §6.2.4	Max Conducted Output Power	Refer to Section 7.4		Pass	Section 7.4
	Maximum E.I.R.P				
RSS-247 §6.2.2, §6.2.3	Transmit Power Control	≤ 24 dBm		Pass	Section 7.5
RSS-247 §6.2.1, §6.2.2, §6.2.3, §6.2.4	Peak Power Spectral Density	Refer to Section 7.6		Pass	Section 7.6
RSS-Gen [8.11]	Frequency Stability	N/A		Pass	Section 7.7
RSS-247 §6.2.1, §6.2.2, §6.2.3, §6.2.4	Out-of-Band Emissions	≤ -27dBm/MHz EIRP	Radiated	Pass	Section 7.8 & 7.9
RSS-247 §6.2.1, §6.2.2, §6.2.3, §6.2.4	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in RSS-Gen [8.9]		Pass	
RSS-Gen [8.8]	AC Conducted Emissions 150kHz - 30MHz	< RSS-Gen [8.8] limits	Line Conducted	Pass	Section 7.10

Notes:

1) All channels, modes, and modulations/data rates were investigated among all UNII bands. For radiated emission test, every axis (X, Y, Z) was also verified. The test results shown in the following sections represent the worst case emissions.
2) 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. 26dB Bandwidth Measurement

7.2.1.Test Limit

N/A

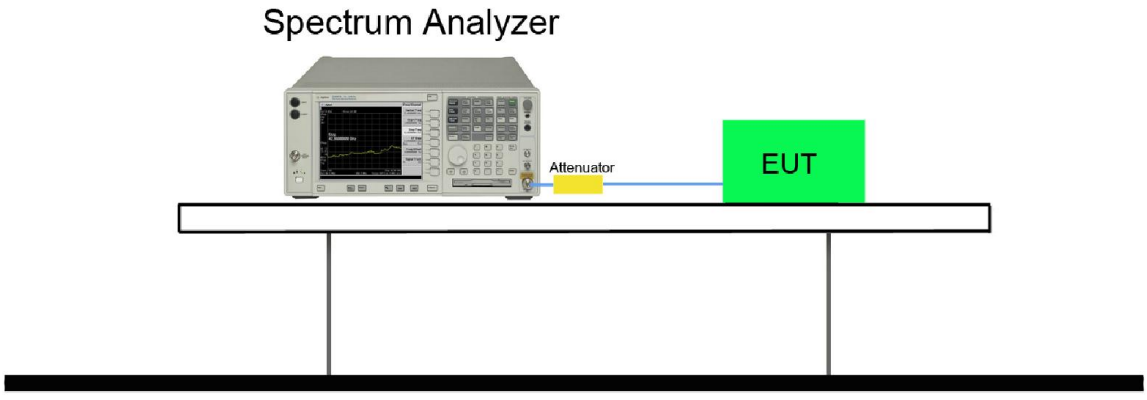
7.2.2.Test Procedure used

KDB 789033 D02v02 – Section C.1

7.2.3.Test Setting

1. The analyzers' automatic bandwidth measurement capability was used to perform the 26dB bandwidth measurement. The "X" dB bandwidth parameter was set to X = 26. The automatic bandwidth measurement function also has the capability of simultaneously measuring the 99% occupied bandwidth. The bandwidth measurement was not influenced by any intermediated power nulls in the fundamental emission.
2. RBW = approximately 1% of the emission bandwidth.
3. VBW ≥ 3 × RBW.
4. Detector = Peak.
5. Trace mode = max hold.

7.2.4.Test Setup



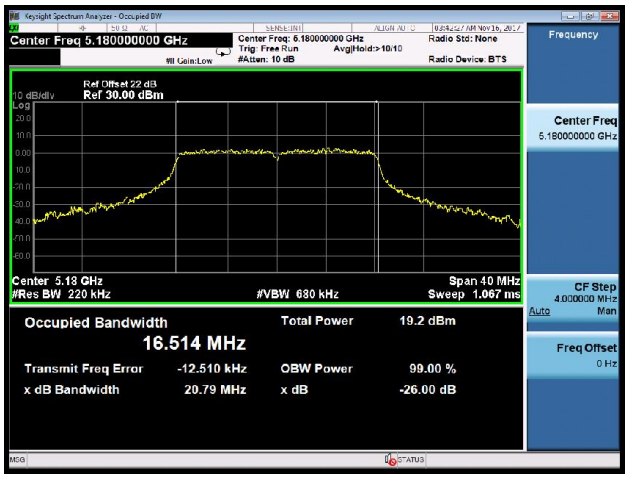
7.2.5.Test Result

Product	ECG analysis system	Temperature	24°C
Test Engineer	Dandy Li	Relative Humidity	53%
Test Site	TR3	Test Date	2017/11/16
Test Item	26dB Bandwidth		

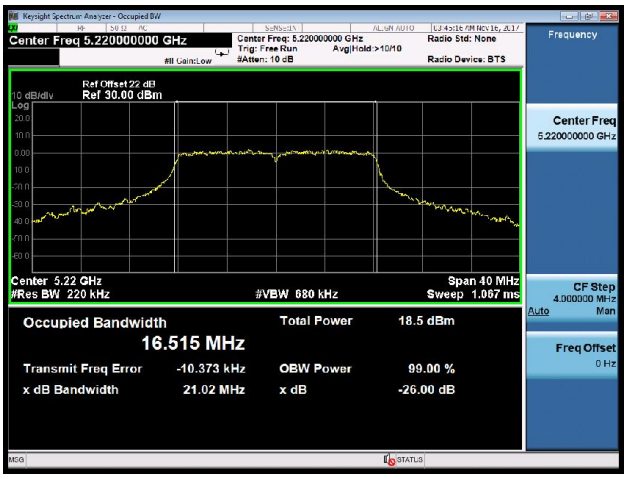
Test Mode	Data Rate / MCS	Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)	Result
802.11a	6Mbps	36	5180	20.79	16.51	Pass
802.11a	6Mbps	44	5220	21.02	16.52	Pass
802.11a	6Mbps	48	5240	21.21	16.52	Pass
802.11a	6Mbps	52	5260	23.65	16.62	Pass
802.11a	6Mbps	60	5300	23.04	16.61	Pass
802.11a	6Mbps	64	5320	20.99	16.52	Pass
802.11a	6Mbps	100	5500	20.87	16.52	Pass
802.11a	6Mbps	116	5580	21.25	16.52	Pass
802.11a	6Mbps	120	5600	21.26	16.52	Pass
802.11a	6Mbps	140	5700	21.26	16.54	Pass
802.11a	6Mbps	149	5745	21.54	16.59	Pass
802.11a	6Mbps	157	5785	23.60	16.61	Pass
802.11a	6Mbps	165	5825	23.59	16.64	Pass
802.11n-HT20	MCS0	36	5180	22.20	17.71	Pass
802.11n-HT20	MCS0	44	5220	23.98	17.81	Pass
802.11n-HT20	MCS0	48	5240	23.12	17.75	Pass
802.11n-HT20	MCS0	52	5260	24.05	17.78	Pass
802.11n-HT20	MCS0	60	5300	22.95	17.74	Pass
802.11n-HT20	MCS0	64	5320	22.51	17.70	Pass
802.11n-HT20	MCS0	100	5500	22.31	17.71	Pass
802.11n-HT20	MCS0	116	5580	22.23	17.71	Pass
802.11n-HT20	MCS0	120	5600	22.30	17.71	Pass
802.11n-HT20	MCS0	140	5700	22.20	17.72	Pass
802.11n-HT20	MCS0	149	5745	23.61	17.73	Pass
802.11n-HT20	MCS0	157	5785	23.60	17.73	Pass
802.11n-HT20	MCS0	165	5825	22.45	17.73	Pass

802.11a 26dB Bandwidth & 99% Bandwidth

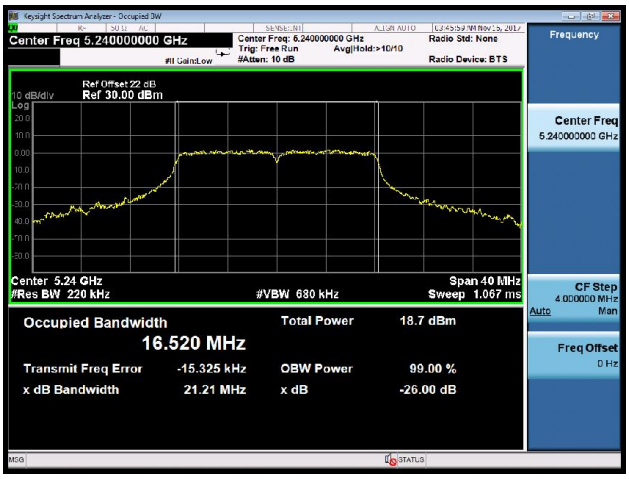
Channel 36 (5180MHz)



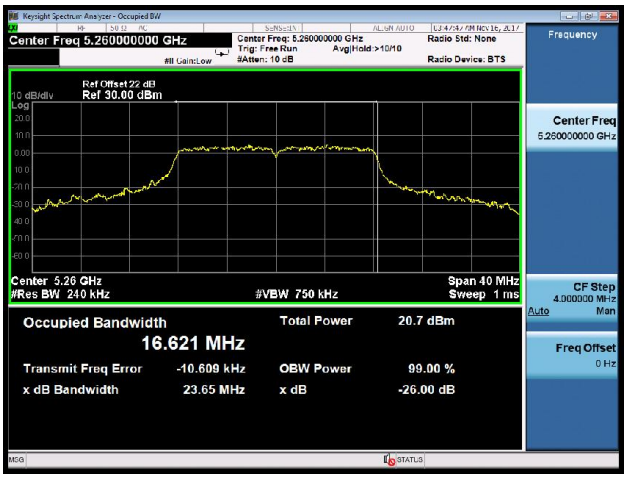
Channel 44 (5220MHz)



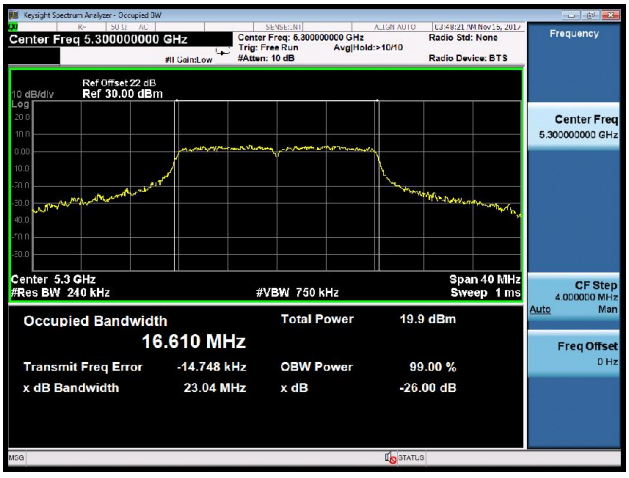
Channel 48 (5240MHz)



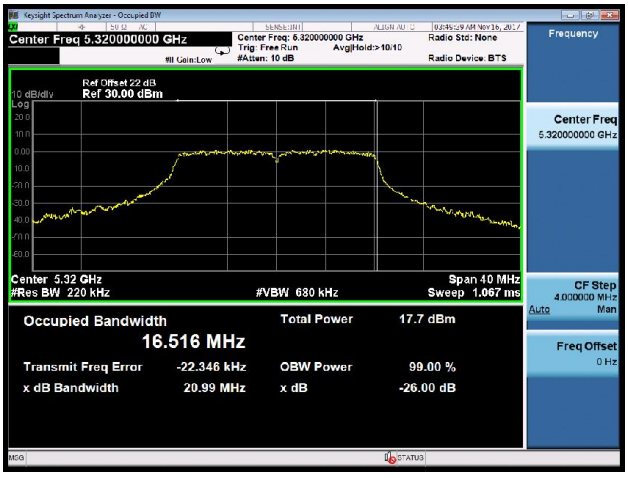
Channel 52 (5260MHz)



Channel 60 (5300MHz)

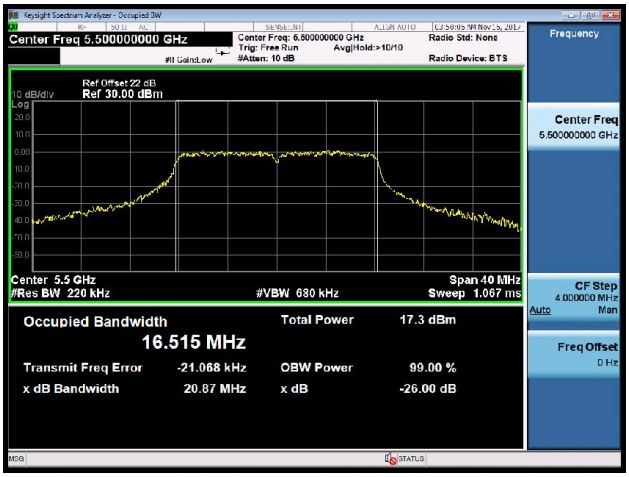


Channel 64 (5320MHz)

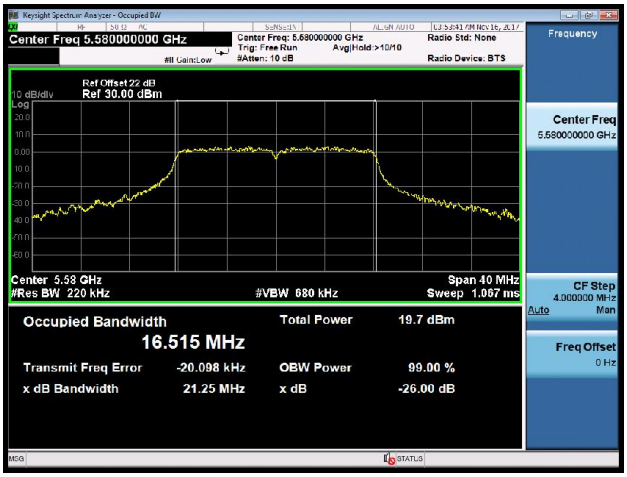


802.11a 26dB Bandwidth & 99% Bandwidth

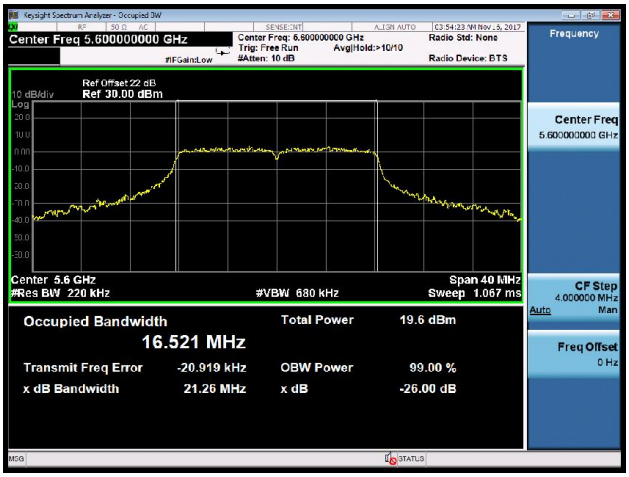
Channel 100 (5500MHz)



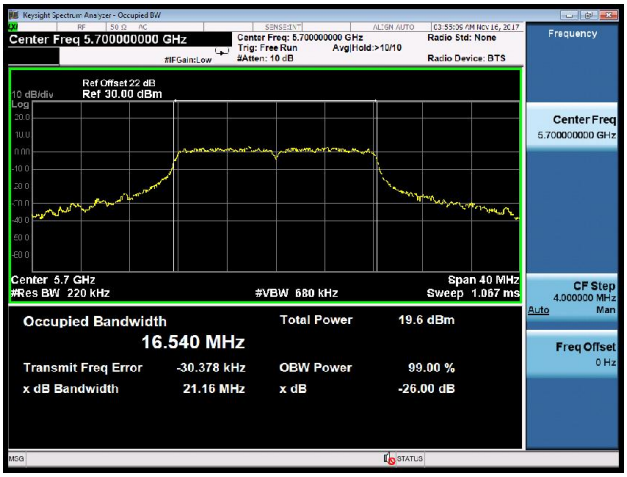
Channel 116 (5580MHz)



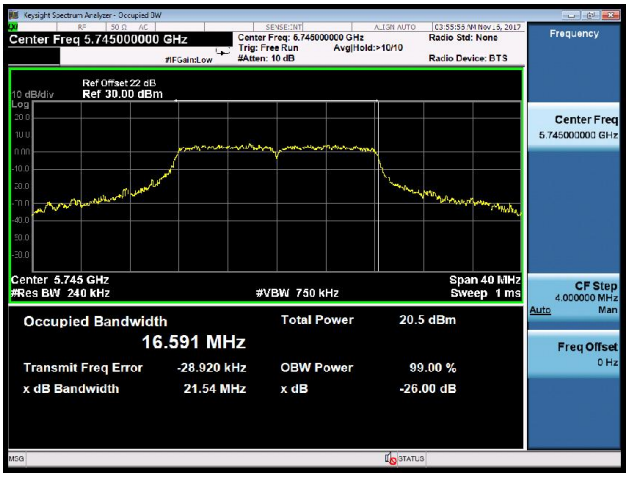
Channel 120 (5600MHz)



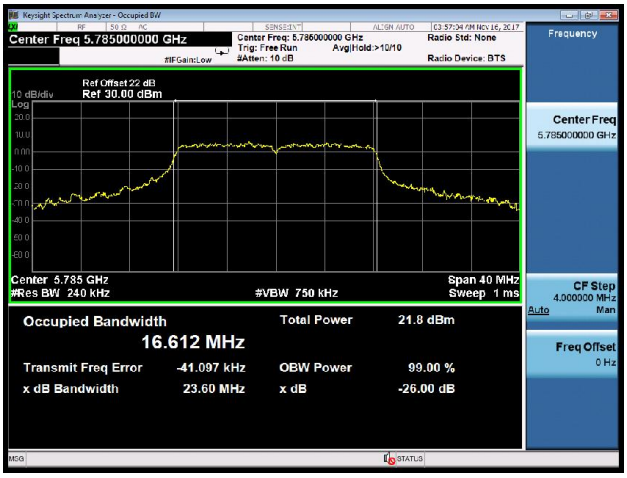
Channel 140 (5700MHz)

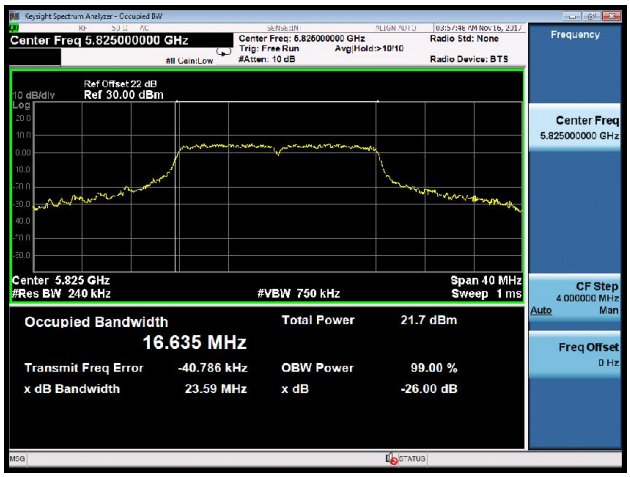


Channel 149 (5745MHz)



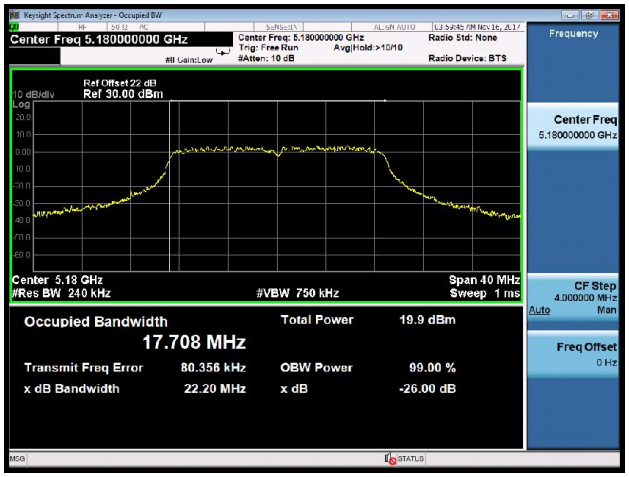
Channel 157 (5785MHz)



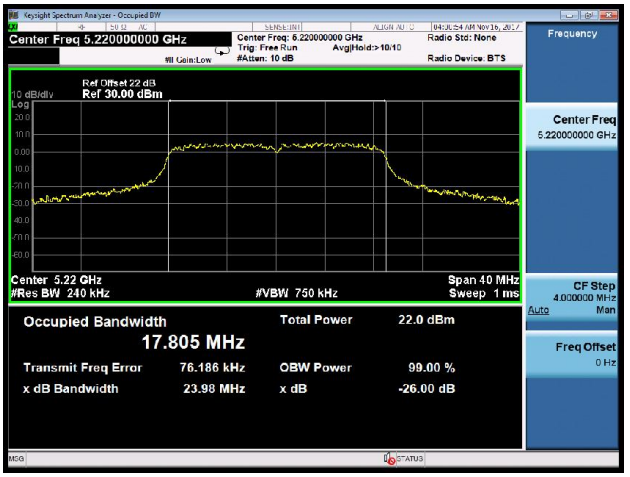
802.11a 26dB Bandwidth & 99% Bandwidth	
Channel 165 (5825MHz)	
	

802.11n-HT20 26dB Bandwidth & 99% Bandwidth

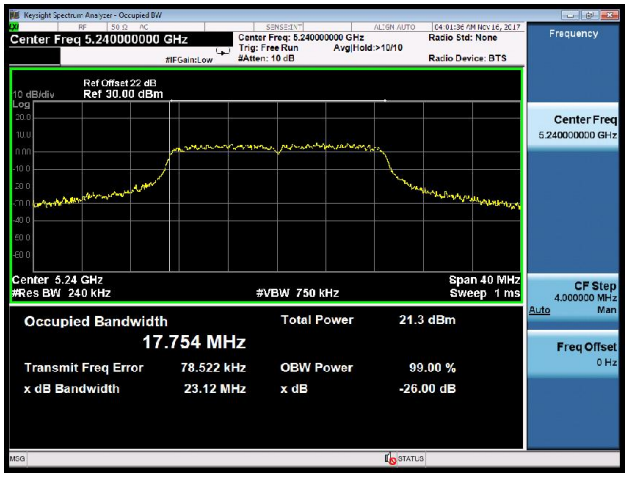
Channel 36 (5180MHz)



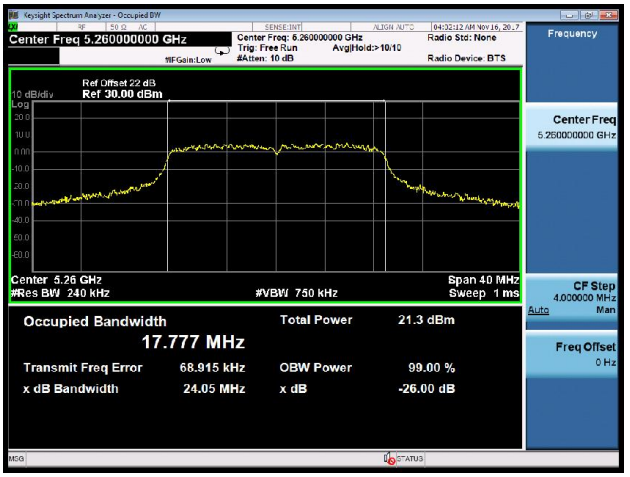
Channel 44 (5220MHz)



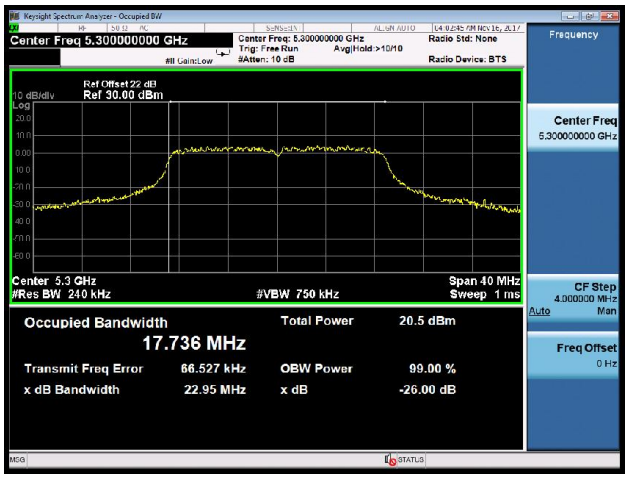
Channel 48 (5240MHz)



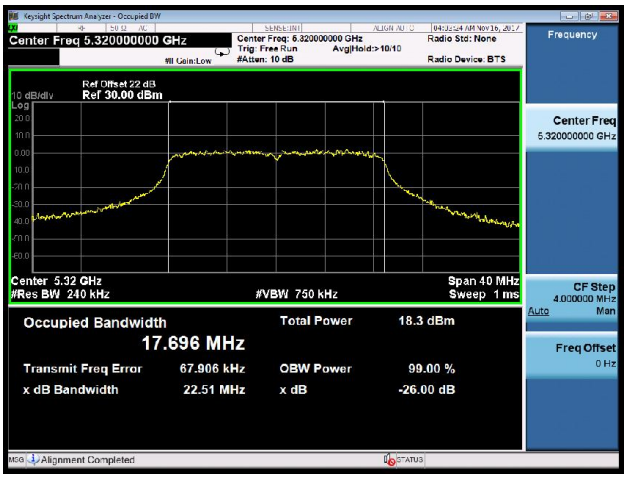
Channel 52 (5260MHz)



Channel 60 (5300MHz)

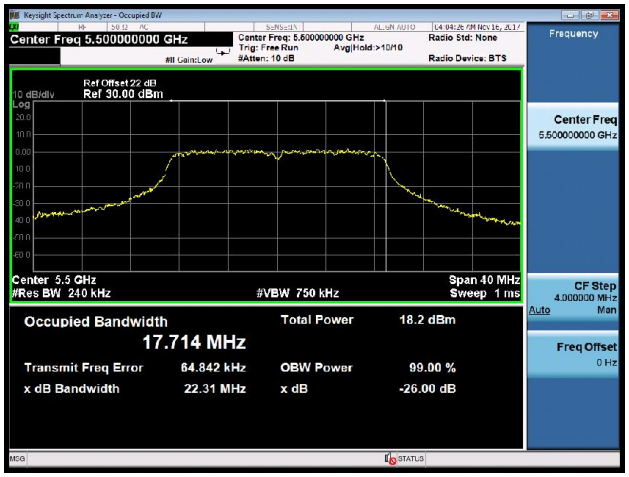


Channel 64 (5320MHz)

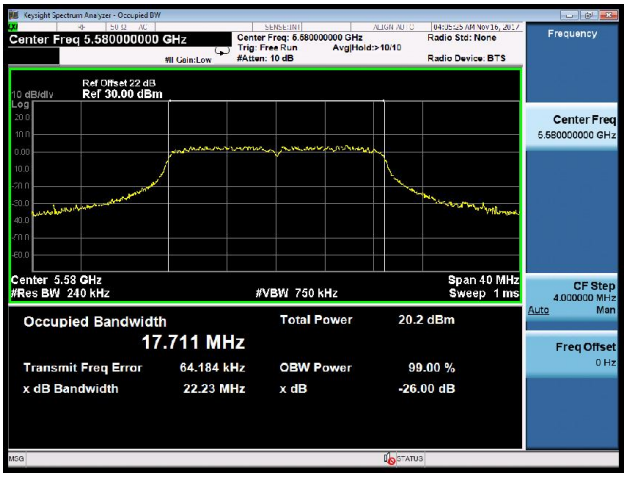


802.11n-HT20 26dB Bandwidth & 99% Bandwidth

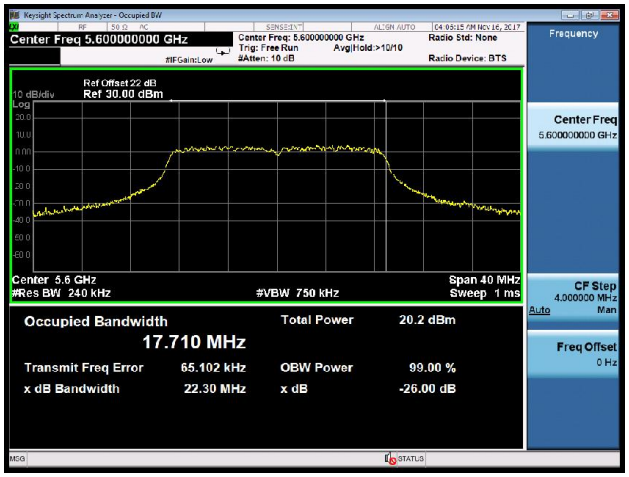
Channel 100 (5500MHz)



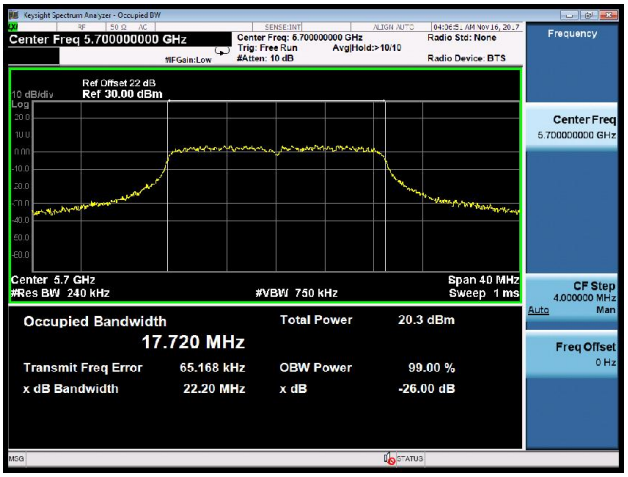
Channel 116 (5580MHz)



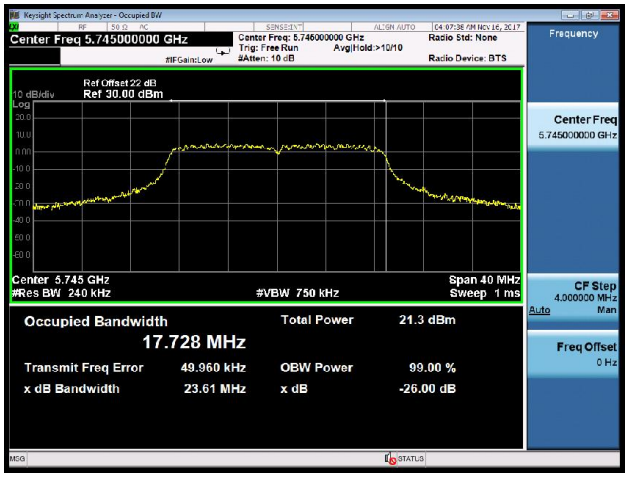
Channel 120 (5600MHz)



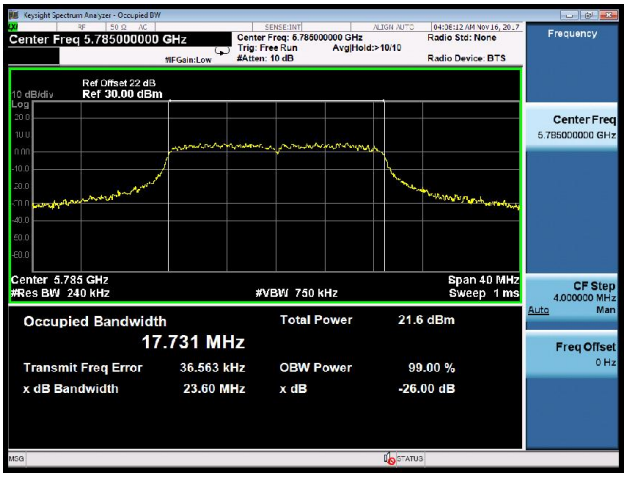
Channel 140 (5700MHz)

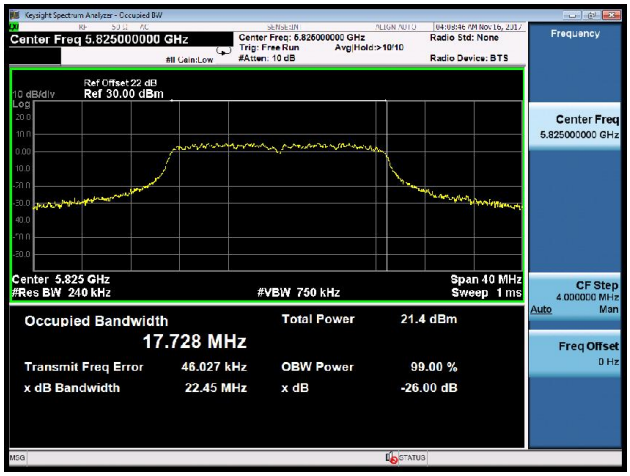


Channel 149 (5745MHz)



Channel 157 (5785MHz)



802.11n-HT20 26dB Bandwidth & 99% Bandwidth	
Channel 165 (5825MHz)	
	

7.3. 6dB Bandwidth Measurement

7.3.1.Test Limit

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

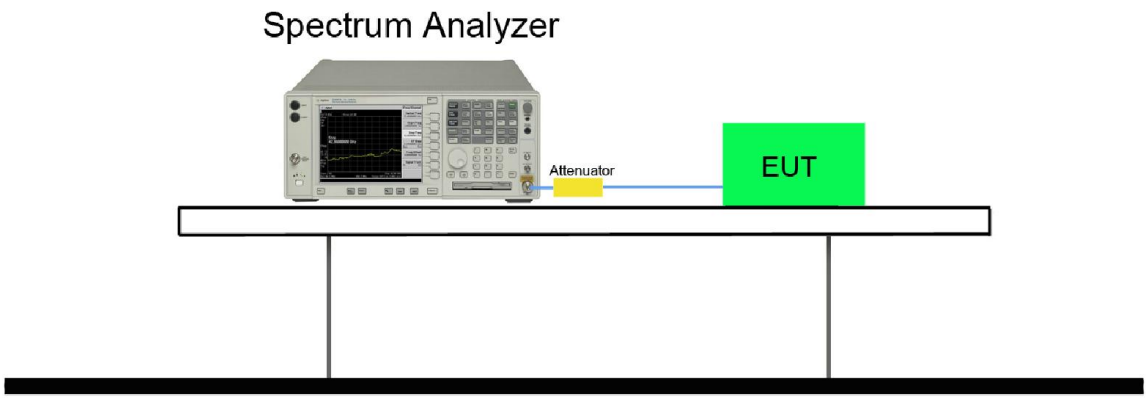
7.3.2.Test Procedure used

KDB 789033 D02v02 – Section C.2

7.3.3.Test Setting

1. Set center frequency to the nominal EUT channel center frequency.
2. RBW = 100 kHz.
3. VBW ≧ 3 × RBW.
4. Detector = Peak.
5. Trace mode = max hold.
6. Sweep = auto couple.
7. Allow the trace to stabilize.
8. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

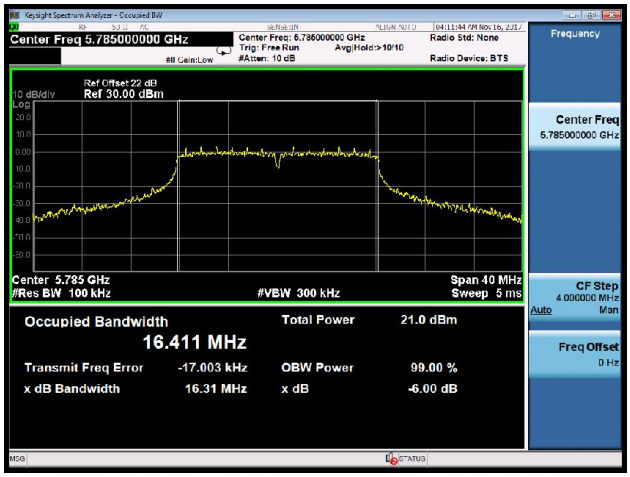
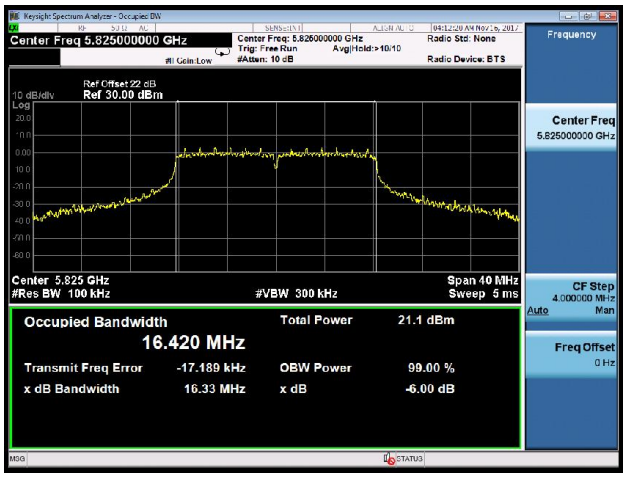
7.3.4.Test Setup

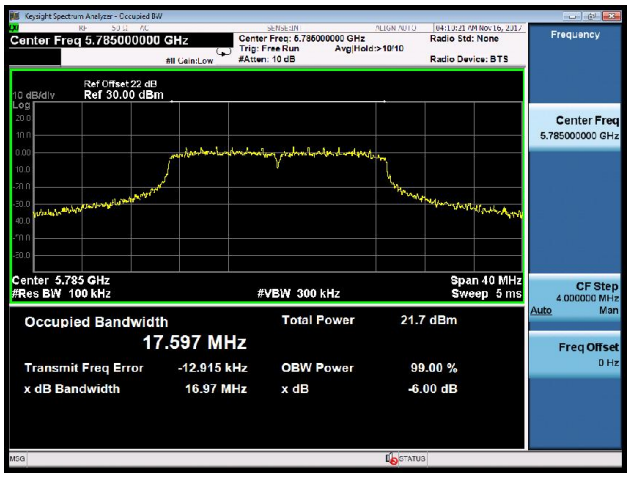


7.3.5.Test Result

Product	ECG analysis system	Temperature	24°C
Test Engineer	Dandy Li	Relative Humidity	53%
Test Site	TR3	Test Date	2017/11/16
Test Item	6dB Bandwidth		

Test Mode	Data Rate / MCS	Channel No.	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)	Result
802.11a	6Mbps	149	5745	16.37	≥ 0.5	Pass
802.11a	6Mbps	157	5785	16.31	≥ 0.5	Pass
802.11a	6Mbps	165	5825	16.33	≥ 0.5	Pass
802.11n-HT20	MCS0	149	5745	17.25	≥ 0.5	Pass
802.11n-HT20	MCS0	157	5785	16.97	≥ 0.5	Pass
802.11n-HT20	MCS0	165	5825	17.13	≥ 0.5	Pass

802.11a 6dB Bandwidth	
Channel 149 (5745MHz)	**Channel 157 (5785MHz)**
	
Channel 165 (5825MHz)	
	

802.11n-HT20 6dB Bandwidth	
Channel 149 (5745MHz)	**Channel 157 (5785MHz)**
	
Channel 165 (5825MHz)	
	

7.4. Output Power Measurement

7.4.1.Test Limit

For FCC

For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250mW provided the maximum antenna gain does not exceed 6dBi.

For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250mW or 11dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz.

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W (30dBm). If transmitting antennas of directional gain greater than 6dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

Additional Requirement for IC

For the band 5.15-5.25 GHz, the maximum e.i.r.p. shall not exceed 200mW (23.01dBm) or 10 + 10 $\log_{10}$ B, dBm, whichever power is less. B is the 99% emission bandwidth in MHz.

For the 5.25 - 5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power shall not exceed 250 mW (23.98dBm) or 11 + 10 $\log_{10}$ B, dBm, whichever power is less. The maximum e.i.r.p. shall not exceed 1.0 W (30dBm) or 17 + 10 $\log_{10}$ B, dBm, whichever power is less. B is the 99% emission bandwidth in MHz.

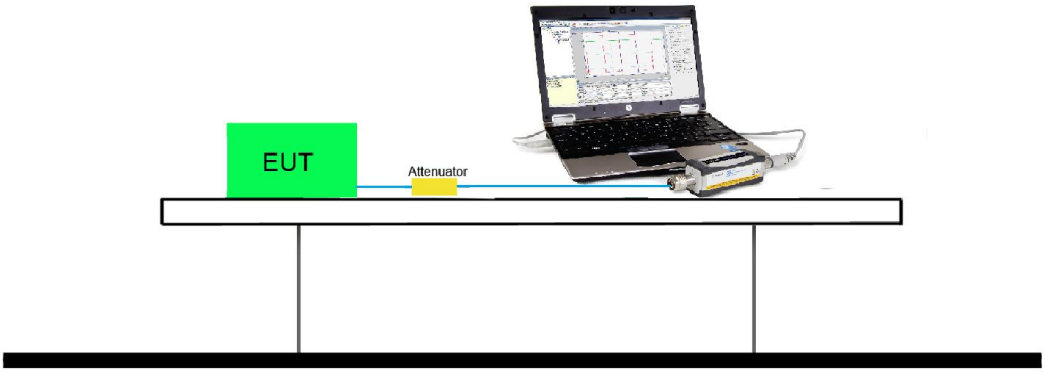
7.4.2.Test Procedure Used

KDB 789033 D02v02 - Section E) 3) b) Method PM-G

7.4.3.Test Setting

Average power measurements were perform only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor. The power meter implemented triggering and gating capabilities which were set up such that power measurements were recorded only during the ON time of the transmitter. The trace was averaged over 100 traces to obtain the final measured average power.

7.4.4.Test Setup



7.4.5.Test Result

Power output test was verified over all data rates of each mode shown as below, and then choose the maximum power output (Gray Marker) for final test of each channel.

Test Mode	Bandwidth	Channel	Frequency (MHz)	Data Rate / MCS	Average Power (dBm)
802.11a	20	36	5180	6Mbps	14.22
				24Mbps	14.02
				54Mbps	13.87
802.11n	20	36	5180	MCS0	14.09
				MCS4	13.83
				MCS7	13.71

Product	ECG analysis system	Temperature	23°C
Test Engineer	Dandy Li	Relative Humidity	54%
Test Site	TR3	Test Date	2017/11/16
Test Item	Output Power		

Test Mode	Data Rate / MCS	Channel No.	Freq. (MHz)	Average Power (dBm)	Power Limit (dBm)	Max EIRP (dBm)	EIRP Limit (dBm)	Result
11a	6Mbps	36	5180	14.22	≤ 23.98	17.52	≤ 22.18	Pass
11a	6Mbps	44	5220	14.13	≤ 23.98	17.43	≤ 22.18	Pass
11a	6Mbps	48	5240	14.04	≤ 23.98	17.34	≤ 22.18	Pass
11a	6Mbps	52	5260	16.13	≤ 23.18	19.43	≤ 29.18	Pass
11a	6Mbps	60	5300	15.33	≤ 23.18	18.63	≤ 29.18	Pass
11a	6Mbps	64	5320	12.57	≤ 23.18	15.87	≤ 29.18	Pass
11a	6Mbps	100	5500	12.11	≤ 23.18	15.41	≤ 29.18	Pass
11a	6Mbps	116	5580	14.63	≤ 23.18	17.93	≤ 29.18	Pass
11a	6Mbps	120	5600	14.71	≤ 23.18	18.01	≤ 29.18	Pass
11a	6Mbps	140	5700	15.03	≤ 23.18	18.33	≤ 29.18	Pass
11a	6Mbps	149	5745	15.69	≤ 30.00	--	--	Pass
11a	6Mbps	157	5785	15.91	≤ 30.00	--	--	Pass
11a	6Mbps	165	5825	15.89	≤ 30.00	--	--	Pass
11n-HT20	MCS0	36	5180	14.09	≤ 23.98	17.39	≤ 22.48	Pass
11n-HT20	MCS0	44	5220	16.22	≤ 23.98	19.52	≤ 22.48	Pass
11n-HT20	MCS0	48	5240	15.84	≤ 23.98	19.14	≤ 22.48	Pass
11n-HT20	MCS0	52	5260	15.75	≤ 23.48	19.05	≤ 29.48	Pass
11n-HT20	MCS0	60	5300	15.02	≤ 23.48	18.32	≤ 29.48	Pass
11n-HT20	MCS0	64	5320	12.64	≤ 23.48	15.94	≤ 29.48	Pass
11n-HT20	MCS0	100	5500	12.06	≤ 23.48	15.36	≤ 29.48	Pass
11n-HT20	MCS0	116	5580	14.66	≤ 23.48	17.96	≤ 29.48	Pass
11n-HT20	MCS0	120	5600	14.82	≤ 23.48	18.12	≤ 29.48	Pass
11n-HT20	MCS0	140	5700	15.02	≤ 23.48	18.32	≤ 29.48	Pass
11n-HT20	MCS0	149	5745	15.73	≤ 30.00	--	--	Pass
11n-HT20	MCS0	157	5785	15.95	≤ 30.00	--	--	Pass
11n-HT20	MCS0	165	5825	15.92	≤ 30.00	--	--	Pass

Note 1: Max EIRP (dBm) = Average Power (dBm) + Ant Gain (dBi), Ant Gain (dBi) = 3.3dBi.

Note 2: EIRP Limit Calculation as below:

For 5150-5250MHz

802.11a: 10 + 10 $\log_{10}$ (16.51MHz) = **22.18dBm** < 23.01dBm;

802.11n-HT20: 10 + 10 log10 (17.71MHz) = **22.48dBm** < 23.01dBm;

For 5250-5350MHz, 5470-5725MHz

802.11a: 17 + 10 log10 (16.52MHz) = **29.18dBm** < 30dBm;

802.11n-HT20: 17 + 10 log10 (17.70MHz) = **29.48dBm** < 30dBm;

Note 3: Max Conducted Output Power Limit Calculation as below:

For 5150-5250MHz: Limit (dBm) = 23.98dBm

For 5250-5350MHz, 5470-5725MHz

802.11a: 11 + 10 log10 (16.52MHz) = **23.18dBm** < 23.98dBm;

802.11n-HT20: 11 + 10 log10 (17.70MHz) = **23.48dBm** < 23.98dBm;

For 5725-5850MHz: Limit (dBm) = 30.00dBm

7.5. Transmit Power Control

7.5.1.Test Limit

The U-NII device is required to have the capability to operate at least 6 dB below the mean EIRP value of 30dBm.

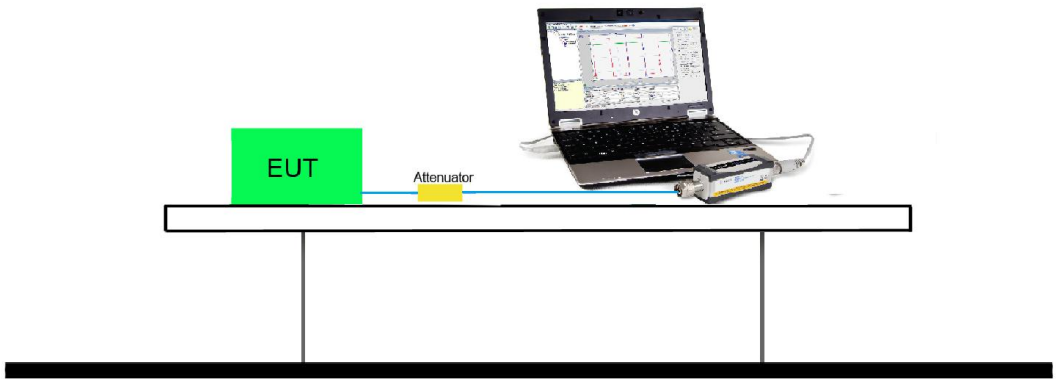
7.5.2.Test Procedure Used

KDB 789033 D02v01- Section E)3)b) Method PM-G

7.5.3.Test Setting

Average power measurements were perform only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor. The power meter implemented triggering and gating capabilities which were set up such that power measurements were recorded only during the ON time of the transmitter. The trace was averaged over 100 traces to obtain the final measured average power.

7.5.4.Test Setup



7.5.5.Test Result

A TPC mechanism is not required for systems with an e.i.r.p. of less than 500mW.

7.6. Power Spectral Density Measurement

7.6.1.Test Limit

For FCC

For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum power spectral density shall not exceed 11dBm in any 1 megahertz band.

For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum power spectral density shall not exceed 11dBm in any 1 megahertz band.

For the band 5.725-5.85 GHz, the maximum power spectral density shall not exceed 30dBm in any 500-kHz band.

If transmitting antennas of directional gain greater than 6dBi are used, the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

Additional Requirement for IC

For the band 5.15-5.25 GHz, the e.i.r.p. spectral density shall not exceed 10dBm in any 1.0 MHz band.

7.6.2.Test Procedure Used

KDB 789033 D02v02 - Section F

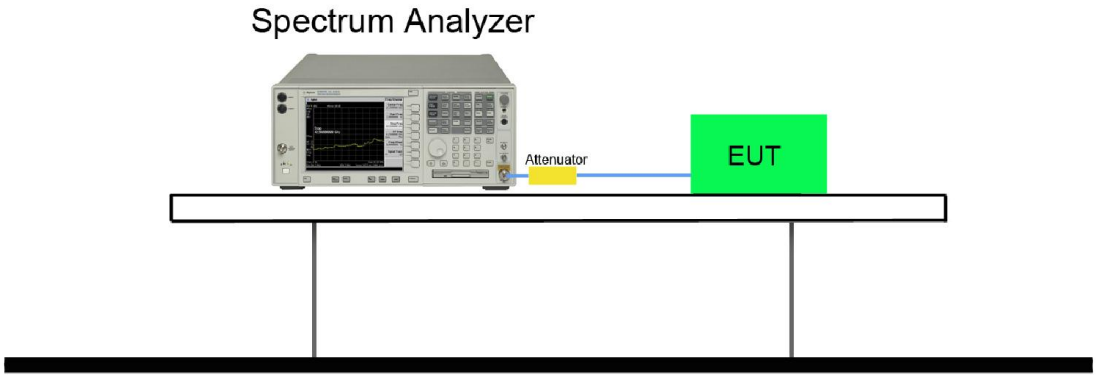
7.6.3.Test Setting

1. Analyzer was set to the center frequency of the UNII channel under investigation
2. Span was set to encompass the entire 26dB OBW of the signal.
3. RBW = 1MHz, if measurement bandwidth of Maximum PSD is specified in 500 kHz,
4. RBW = 100 kHz
5. VBW = 3MHz
6. Number of sweep points ≥ 2 × (span / RBW)
7. Detector = power averaging (RMS)
8. Sweep time = auto
9. Trigger = free run
10. Use the peak search function on the instrument to find the peak of the spectrum and record its value.
11. Add 10*log(1/x), where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times (because the measurement represents an

average over both the on and off times of the transmission). For example, add 10*log(1/0.25) = 6 dB if the duty cycle is 25 percent.

12. When the measurement bandwidth of Maximum PSD is specified in 500 kHz, add a constant factor 10*log(500kHz/100kHz) = 6.99 dB to the measured result

7.6.4.Test Setup



7.6.5.Test Result

Product	ECG analysis system	Temperature	23°C
Test Engineer	Hunk Li	Relative Humidity	54%
Test Site	TR3	Test Date	2017/11/16
Test Item	Power Spectral Density (UNII-Band 1 & UNII-2A & UNII-2C)		

Test Mode	Data Rate / MCS	Channel No.	Freq. (MHz)	PSD (dBm/ MHz)	Duty Cycle (%)	Total PSD (dBm/ MHz)	PSD Limit (dBm/ MHz)	EIRP PSD (dBm/ MHz)	EIRP PSD Limit (dBm/MHz)	Result
11a	6Mbps	36	5180	2.73	97.85	2.82	≤ 11.00	6.12	≤ 10.00	Pass
11a	6Mbps	44	5220	2.09	97.85	2.19	≤ 11.00	5.49	≤ 10.00	Pass
11a	6Mbps	48	5240	1.86	97.85	1.95	≤ 11.00	5.25	≤ 10.00	Pass
11a	6Mbps	52	5260	4.23	97.85	4.33	≤ 11.00	--	--	Pass
11a	6Mbps	60	5300	3.90	97.85	3.99	≤ 11.00	--	--	Pass
11a	6Mbps	64	5320	1.40	97.85	1.50	≤ 11.00	--	--	Pass
11a	6Mbps	100	5500	1.04	97.85	1.14	≤ 11.00	--	--	Pass
11a	6Mbps	116	5580	3.23	97.85	3.33	≤ 11.00	--	--	Pass
11a	6Mbps	120	5600	3.36	97.85	3.45	≤ 11.00	--	--	Pass
11a	6Mbps	140	5700	3.91	97.85	4.01	≤ 11.00	--	--	Pass
11n-HT20	MCS0	36	5180	2.79	97.84	2.88	≤ 11.00	6.18	≤ 10.00	Pass
11n-HT20	MCS0	44	5220	4.64	97.84	4.74	≤ 11.00	8.04	≤ 10.00	Pass
11n-HT20	MCS0	48	5240	4.53	97.84	4.62	≤ 11.00	7.92	≤ 10.00	Pass
11n-HT20	MCS0	52	5260	4.14	97.84	4.24	≤ 11.00	--	--	Pass
11n-HT20	MCS0	60	5300	3.55	97.84	3.64	≤ 11.00	--	--	Pass
11n-HT20	MCS0	64	5320	1.66	97.84	1.75	≤ 11.00	--	--	Pass
11n-HT20	MCS0	100	5500	1.21	97.84	1.31	≤ 11.00	--	--	Pass
11n-HT20	MCS0	116	5580	3.39	97.84	3.48	≤ 11.00	--	--	Pass
11n-HT20	MCS0	120	5600	3.27	97.84	3.36	≤ 11.00	--	--	Pass
11n-HT20	MCS0	140	5700	3.49	97.84	3.59	≤ 11.00	--	--	Pass

Note 1: When EUT duty cycle ≥ 98%, the Total PSD (dBm/MHz) = PSD (dBm/MHz).

Note 2: When EUT duty cycle < 98%, the Total PSD (dBm/MHz) = PSD (dBm/MHz) + 10*log (1/Duty Cycle).

Note 3: EIRP PSD (dBm /MHz) = Total PSD (dBm/MHz) + Ant Gain (dBi), Ant Gain (dBi) =3.3dBi.

Product	ECG analysis system	Temperature	23°C
Test Engineer	Dandy Li	Relative Humidity	54%
Test Site	TR3	Test Date	2017/11/16
Test Item	Power Spectral Density (UNII-Band 3)		

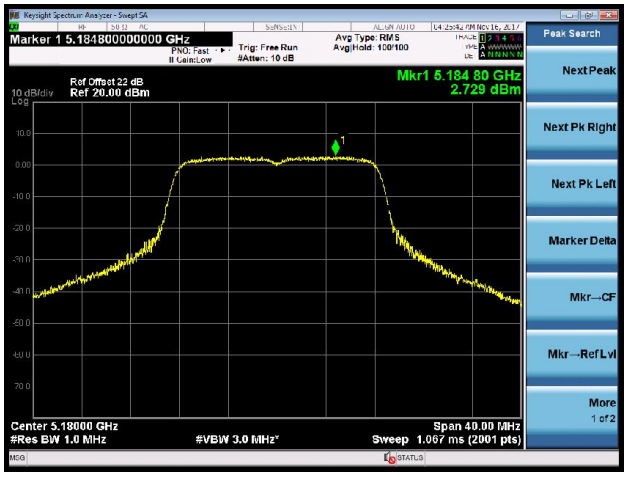
Test Mode	Data Rate / MCS	Channel No.	Freq. (MHz)	PSD (dBm/ 100kHz)	Duty Cycle (%)	Constant Factor	Total PSD (dBm/ 500kHz)	Limit (dBm/ 500kHz)	Result
11a	6Mbps	149	5745	-4.57	97.85	6.99	2.51	≤ 30.00	Pass
11a	6Mbps	157	5785	-4.02	97.85	6.99	3.06	≤ 30.00	Pass
11a	6Mbps	165	5825	-4.13	97.85	6.99	2.95	≤ 30.00	Pass
11n-HT20	MCS0	149	5745	-4.91	97.84	6.99	2.17	≤ 30.00	Pass
11n-HT20	MCS0	157	5785	-4.49	97.84	6.99	2.60	≤ 30.00	Pass
11n-HT20	MCS0	165	5825	-4.80	97.84	6.99	2.29	≤ 30.00	Pass

Note 1: When EUT duty cycle ≥ 98%, Total PSD (dBm/500kHz) = PSD (dBm/100kHz) + Constant Factor.

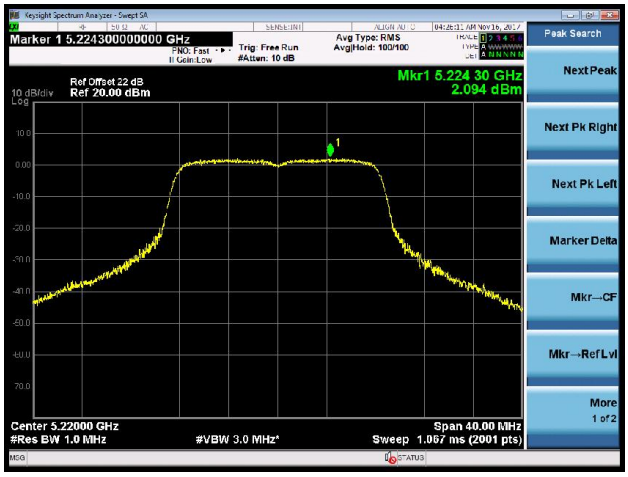
Note 2: When EUT duty cycle < 98%, Total PSD (dBm/500kHz) = PSD (dBm/100kHz) + 10*log (1/Duty Cycle) + Constant Factor.

802.11a Power Spectral Density

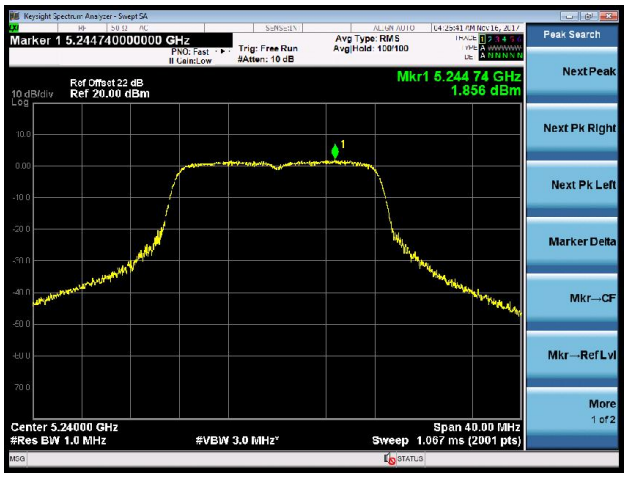
Channel 36 (5180MHz)



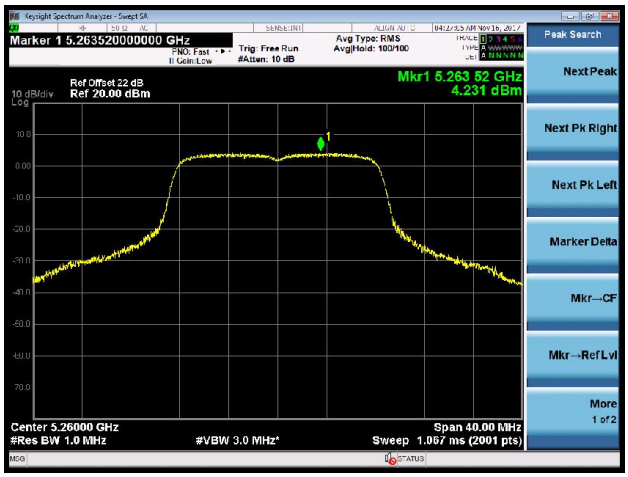
Channel 44 (5220MHz)



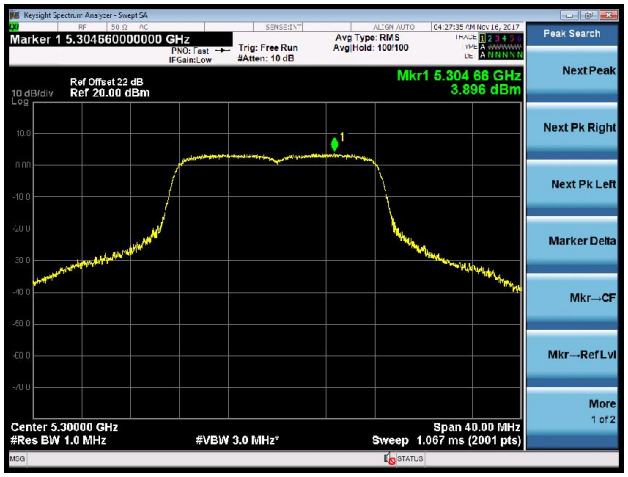
Channel 48 (5240MHz)



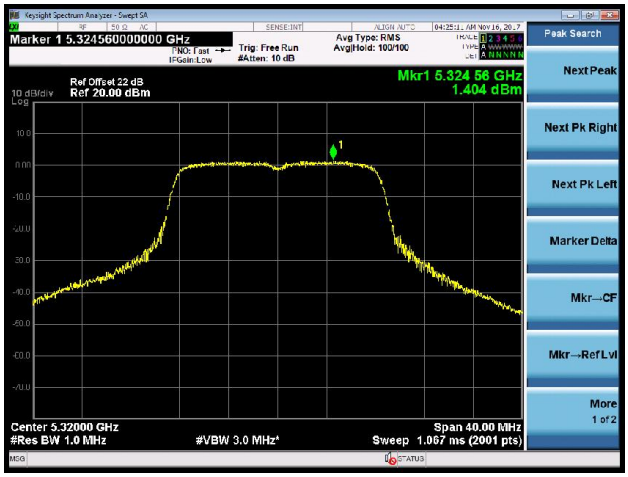
Channel 52 (5260MHz)



Channel 60 (5300MHz)

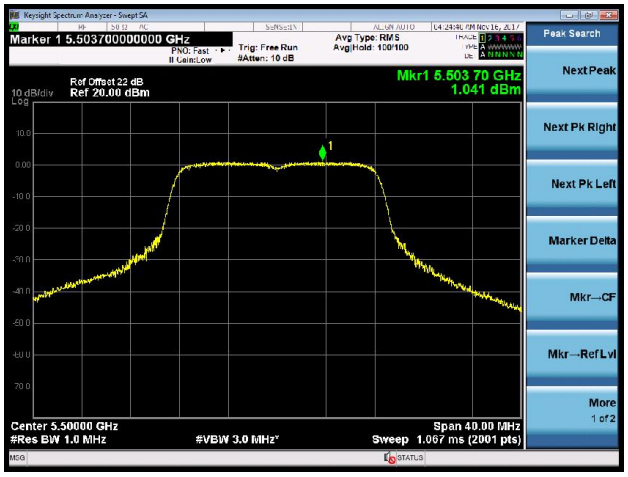


Channel 64 (5320MHz)

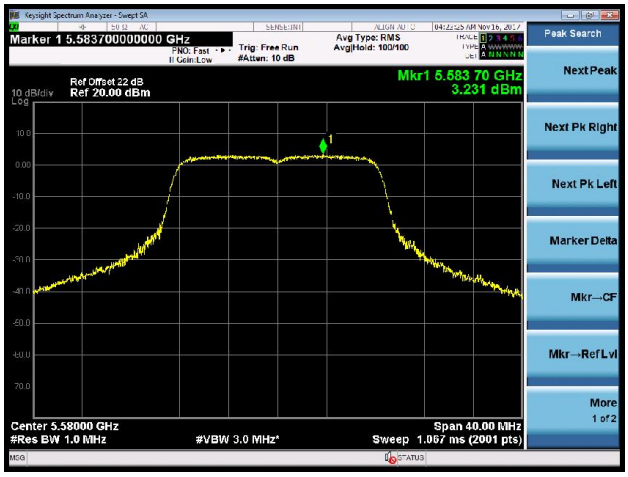


802.11a Power Spectral Density

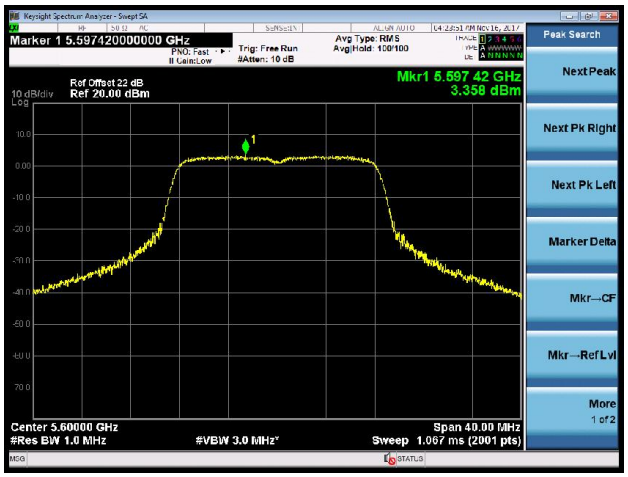
Channel 100 (5500MHz)



Channel 116 (5580MHz)

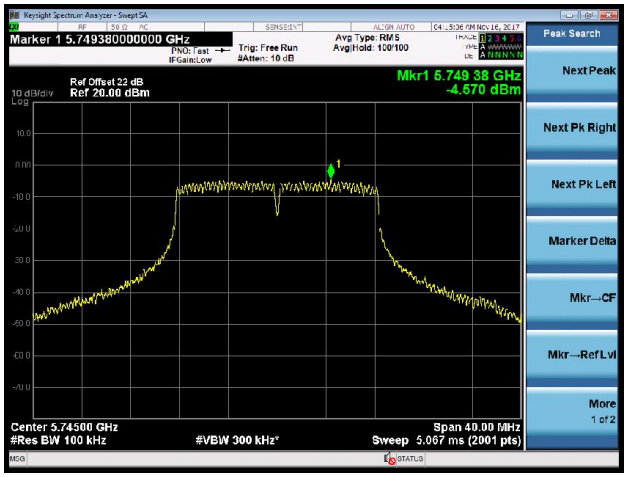


Channel 120 (5600MHz)

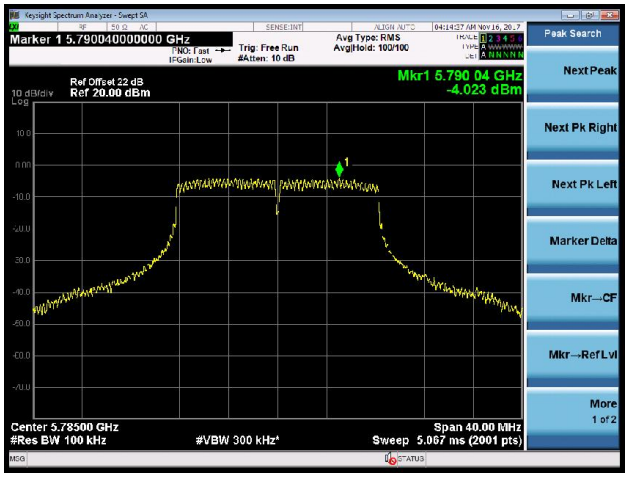


Channel 140 (5700MHz)

Channel 149 (5745MHz)



Channel 157 (5785MHz)



802.11a Power Spectral Density	
Channel 165 (5825MHz)