# FCC TEST REPORT

# For

# AZUMI S.A

# Mobile phone

# Model No.: Speed pro 55

# Additional Model No.: Please refer to page 6

Prepared for Address	:	AZUMI S.A Avenida Aquilino de la Guardia con Calle 47, PH Ocean Plaza, Piso 16 of. 16-01, Marbella, Ciudad de Panama
Prepared by	:	Shenzhen LCS Compliance Testing Laboratory Ltd.
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Web	:	www.LCS-cert.com
Mail	:	webmaster@LCS-cert.com
Date of receipt of test sample Number of tested samples	:	March 29, 2017 1
Serial number	:	Prototype
Date of Test	:	March 29, 2017~May 26, 2017
Date of Report	:	May 26, 2017

	FCC TEST REPORT	
FCC	CFR 47 PART 15 C(15.247): 20	15
Report Reference No: :	LCS170329086AE	
Date of Issue	May 26, 2017	
Testing Laboratory Name: :	Shenzhen LCS Compliance Test	ing Laboratory Ltd.
Address : Testing Location/ Procedure	Bao'an District, Shenzhen, Guango	dong, China
resuling Location/ Procedure	Partial application of Harmonised s Other standard testing method D	
Applicant's Name :	AZUMI S.A	
Address :	Avenida Aquilino de la Guardia cor 16 of. 16-01, Marbella, Ciudad de F	
Test Specification		
Standard:	FCC CFR 47 PART 15 C(15.247):	2015
Test Report Form No :	LCSEMC-1.0	
TRF Originator:	Shenzhen LCS Compliance Testin	g Laboratory Ltd.
Master TRF :	Dated 2011-03	
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EUT Description :	Mobile phone	
Trade Mark:	AZUMI	
Model/ Type reference :	Speed pro 55	
Ratings :	DC 3.7V, 2450mAh Charging parameter: AC Input: 100 Output: DC 5V, 1.0A	0~240V, 50/60Hz, 0.2A;
Result:	Positive	
Compiled by:	Supervised by:	Approved by:

compiled by: kyle Tin

Gavin Liang/ Manager

Kyle Yin/ File administrators

Glin Lu/ Technique principal

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# FCC -- TEST REPORT

Test Report No. :	LCS170329086AE	<u>May 26, 2017</u> Date of issue		
EUT	: Mobile phone			
Type / Model	: Speed pro 55	Speed pro 55		
Applicant	: AZUMI S.A			
Address	: Avenida Aquilino de la G 16 of. 16-01, Marbella, (	Guardia con Calle 47, PH Ocean Plaza, Piso Ciudad de Panama		
Telephone				
Fax	: /	/		
Manufacturer	: AZUMI HK LTD			
Address		FLAT/RM 18 BLK 1 14/F GOLDEN INDUSTRIAL BUILDING 16-26 KWAI TAK STREET KWAI CHUNG,HK		
Telephone	: /			
Fax	: /			
Factory	: LWIN HK CO.,LIMITED	)		
Address	: Room 9C,A Zone,Shenye Tairan Hongsong building,Tairan Six Road North,CheGongMiao, FuTian District,Shenzhen,Guangdong Province,P.R.China			
Telephone	·			
Fax				

|--|

The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

## **Revision History**

Revision	Issue Date	Revisions	Revised By
00	2017-05-26	Initial Issue	Gavin Liang

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# **1. GENERAL INFORMATION**

1.1. Description of Device (EUT)

Name of EUT	Mobile phone		
Model Number	Speed pro 55		
Modulation Type	GMSK for GSM/GPRS, 8-PSK for EDGE,QPSK for UMTS, QPSK, 16QAM for LTE		
Antenna Gain0.5dBi (max.) For GSM 850; 0.5dBi (max.) For GSM 900; 0.5dBi (max.) For DCS 1800; 0.5dBi (max.) For PCS 1900; 0.5dBi (max.) For WCDMA Band II 0.5dBi (max.) For WCDMA Band V 0.5dBi (max.) For LTE FDD Band 2; 0.5dBi (max.) For LTE FDD Band 4; 0.5dBi (max.) For LTE FDD Band 7; 0.5dBi (max.) For BT and WLANHardware version/			
Software version	/		
GSM/EDGE/GPRS Operation Frequency Band	GSM850/PCS1900/GPRS850/GPRS1900/EDGE850/EDGE1900		
UMTS Operation Frequency Band	UMTS FDD Band II/V		
LTE Operation Frequency Band	LTE FDD band 2, FDD band 4, FDD band 7		
GSM/EDGE/GPRS	Supported GSM/GPRS/EDGE		
GSM Release Version	R99		
GSM/EDGE/GPRS Power Class	GSM850:Power Class 4/ PCS1900:Power Class 1		
GPRS/EDGE Multislot Class	GPRS/EDGE: Multi-slot Class 12		
GPRS operation mode	Class B		
WCDMA Release Version	R99		
HSDPA Release Version	Release 10		
HSUPA Release Version	Release 6		
DC-HSUPA Release Version	Not Supported		
LTE Release Version	R8		
LTE/UMTS Power Class	Level 3		
WLAN FCC Modulation Type	IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK) IEEE 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n HT20: OFDM (64QAM, 16QAM, QPSK,BPSK) IEEE 802.11n HT40: OFDM (64QAM, 16QAM, QPSK,BPSK)		
WLAN FCC Operation frequency	IEEE 802.11b:2412-2462MHz IEEE 802.11g:2412-2462MHz IEEE 802.11n HT20:2412-2462MHz IEEE 802.11n HT40:2412-2462MHz		
Antenna Type	Integral Antenna		
BT Modulation Type	GFSK,8DPSK,π/4DQPSK(BT V4.0)		
Extreme temp. Tolerance	-30°C to +50°C		
GPS function	Support and only RX		
NFC Function	Not Support		
Extreme vol. Limits	3.40VDC to 4.2VDC (nominal: 3.70VDC)		

# 1.2. Host System Configuration List and Details

Manufacturer	Description	Model	Serial Number	Certificate
AZUMI S.A	Power Adapter	TPA-46050150UU		FCC VoC

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# 1.3. External I/O Cable

I/O Port Description	Quantity	Cable
USB	1	N/A
Earphone	1	N/A

# 1.4. Description of Test Facility

CNAS Registration Number. is L4595. FCC Registration Number. is 899208. Industry Canada Registration Number. is 9642A-1. VCCI Registration Number. is C-4260 and R-3804. ESMD Registration Number. is ARCB0108. UL Registration Number. is 100571-492. TUV SUD Registration Number. is SCN1081. TUV RH Registration Number. is UA 50296516-001

The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.4:2014 and CISPR 16-1-4:2010 SVSWR requirement for radiated emission above 1GHz.

# 1.5. Statement of the Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. To CISPR 16 – 4 "Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements" and is documented in the LCS quality system acc. To DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

# 1.6. Measurement Uncertainty

Test Item		Frequency Range	Uncertainty	Note
Radiation Uncertainty		9KHz~30MHz	±3.10dB	(1)
	:	30MHz~200MHz	±2.96dB	(1)
		200MHz~1000MHz	±3.10dB	(1)
		1GHz~26.5GHz	±3.80dB	(1)
		26.5GHz~40GHz	±3.90dB	(1)
Conduction Uncertainty	:	150kHz~30MHz	±1.63dB	(1)
Power disturbance	:	30MHz~300MHz	±1.60dB	(1)

(1). This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

# 1.7. Description of Test Modes

The EUT has been tested under operating condition.

This test was performed with EUT in X, Y, Z position and the worst case was found when EUT in X position.

Worst-case mode and channel used for 150 KHz-30 MHz power line conducted emissions was the mode and channel with the highest output power that was determined to be IEEE 802.11b mode (High Channel).

AC conducted emission pre-test at both at AC 120V/60Hz and AC 240V/50Hz modes, recorded worst case;

AC conducted emission pre-test at both at power adapter and power from PC modes, recorded worst case;

Worst-case mode and channel used for 9 KHz-1000 MHz radiated emissions was the mode and channel with the highest output power that was determined to be IEEE 802.11b mode (High Channel).

Worst-Case data rates were utilized from preliminary testing of the Chipset, worst-case data rates used during the testing are as follows:

IEEE 802.11b Mode: 1 Mbps, DSSS. IEEE 802.11g Mode: 6 Mbps, OFDM. IEEE 802.11n Mode HT20: MCS0, OFDM. IEEE 802.11n Mode HT40: MCS0, OFDM. BT LE: 1Mbps, GFSK.

Channel List & Frequency

IEEE 802.11b/g/n HT20

Frequency Band	Channel No.	Frequency(MHz)	Channel No.	Frequency(MHz)
	1	2412	7	2442
	2	2417	8	2447
2412~2462MHz	3	2422	9	2452
2412~240210172	4	2427	10	2457
	5	2432	11	2462
	6	2437		

IEEE 802.11b/g/n HT40

Frequency Band	Channel No.	Frequency(MHz)	Channel No.	Frequency(MHz)
2422~2452MHz	3	2422	9	2452
	4	2427		
	5	2432		
	6	2437		
	7	2442		
	8	2447		

# 2. TEST METHODOLOGY

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

The radiated testing was performed at an antenna-to-EUT distance of 3 meters. All radiated and conducted emissions measurement was performed at Shenzhen LCS Compliance Testing Laboratory Ltd.

# 2.1. EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

## 2.2. EUT Exercise

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

According to FCC's request, Test Procedure KDB558074 D01 DTS Meas. Guidance v03r05 and KDB 6622911 are required to be used for this kind of FCC 15.247 digital modulation device.

According to its specifications, the EUT must comply with the requirements of the Section 15.203, 15.205, 15.207, 15.209 and 15.247 under the FCC Rules Part 15 Subpart C.

# 2.3. General Test Procedures

#### 2.3.1 Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 6.2.1 of ANSI C63.10-2013 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using Quasi-peak and average detector modes.

#### 2.3.2 Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 6.3 of ANSI C63.10-2013

# **3. SYSTEM TEST CONFIGURATION**

# 3.1. Justification

The system was configured for testing in a continuous transmits condition.

# 3.2. EUT Exercise Software

The sample will control by special test software (RF Test Tool) to control sample change channel, modulation provided by application;

# 3.3. Special Accessories

Ν	lo.	Equipment	Manufacturer	Model No.	Serial No.	Length	shielded/ unshielded	Notes
	1	PC	Lenovo	Ideapad	A131101550	/	/	DOC
	2	Power adapter	Lenovo	CPA-A090	36200414	1.00m	unshielded	DOC

# 3.4. Block Diagram/Schematics

Please refer to the related document

# 3.5. Equipment Modifications

Shenzhen LCS Compliance Testing Laboratory Ltd. has not done any modification on the EUT.

# 3.6. Test Setup

Please refer to the test setup photo.

# 4. SUMMARY OF TEST RESULTS

A	Applied Standard: FCC Part 15 Subpart C							
FCC Rules	FCC Rules Description of Test							
§15.247(b)	Maximum Conducted Output Power	Compliant						
§15.247(e)	Power Spectral Density	Compliant						
§15.247(a)(2)	6dB Bandwidth	Compliant						
§15.247(a)	Occupied Bandwidth	Compliant						
§15.209, §15.247(d)	Radiated and Conducted Spurious Emissions	Compliant						
§15.205	Emissions at Restricted Band	Compliant						
§15.207(a)	Conducted Emissions	Compliant						
§15.203	Antenna Requirements	Compliant						
§15.247(i)§2.1093	RF Exposure	Compliant						

# 5. TEST RESULT

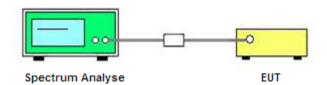
- 5.1. On Time and Duty Cycle
- 5.1.1. Standard Applicable

None; for reporting purpose only.

5.1.2. Measuring Instruments and Setting

Please refer to section 6 of equipment list in this report. The following table is the setting of the spectrum analyzer.

- 5.1.3. Test Procedures
- 1. Set the centre frequency of the spectrum analyzer to the transmitting frequency;
- 2. Set the span=0MHz, RBW=8MHz, VBW=50MHz, Sweep time=5ms;
- 3. Detector = peak;
- 4. Trace mode = Single hold.
- 5.1.4. Test Setup Layout



5.1.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

## 5.1.6. Test result

Mode	On Time B (ms)	Period (ms)	Duty Cycle x (Linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW(KHz)
IEEE 802.11b	5	5	1	100	0	0.010
IEEE 802.11g	5	5	1	100	0	0.010
IEEE 802.11n HT20	5	5	1	100	0	0.010
IEEE 802.11n HT40	5	5	1	100	0	0.010
BTLE	0.3754	0.6242	1	60.14	2.208	2.664

On Tin	ne and	d Duty Cycle
Agilent Spectrum Analyzer - Swept SA		Agilent Spectrum Analyzer - Swept SA
M         M         L100 (CF         1006/03 Arc (1 + 2017)           Sweep Time 5.000 ms         Sexes:NrT         Avg Type: Log-Pwr         T#xdf [+ 23 + 6 + 707]           PN0: Fast →- IFGalincLow         Frig: Free Run Atten: 36 dB         Avg Type: Log-Pwr         T#xdf [+ 23 + 6 + 707]	Trace/Detecto	BF         50.0         AC         SRSE.BIT         AudistorF         1004-131 Aut 1, 2027         TraceIDetecto           Sweep Time 5.000 ms         Trig: Free Run IFGaint.ew         Trig: Free Run Atten: 36 dB         TraceIDetecto         TraceIDetecto         TraceIDetecto
Ref Offset 0.5 dB 10 dB/div Ref 25.00 dBm 10 dB/div Ref 25.00 dBm 150		Ref Offset 0.5 dB 10 dB/div Ref 25.00 dBm 100 100 de attentione tentione
5.00	Clear W	
350	Trace Aven	350         Trace Avera           450
-5.0 -55.0 	Max H	45.0 Max H
Center 2.437000000 GHz         Span 0 Hz           Res BW 8 MHz         #VBW 50 MHz         Sweep 5.000 ms (40001 pts)           MRR MODE TRC SCL         X         Y         Function         Function value	Min H	Center 2.437000000 GHz         Span 0 Hz           Res BW 8 MHz         #VBW 50 MHz         Sweep 5.000 ms (40001 pts)           MRR MORE TRC SCL         X         Y         Function         Function worth         Function worth
	View Blar Trace 0	1 2 3 4 5 5 7 7 7 7 7 7 7 7 7 7
7 9 9 10 11	<b>M</b> 1	7 8 9 10 11 11 11 11 11 11 11 11 11 11 11 11
IEEE 802.11b		IEEE 802.11g
Adlent Spectrum Audyzer - Swopt SA Sweep Time 5.000 ms PN0: Fast →- IFGainLow FGGinLow Atten: 36 dB PN0: Fast →- Trig: Free Run Cerl N1NNH - 14,2017 Avg Type: Log-Pwr Trig: Free Run Cerl N1NH - 14,2017 Avg Type: Log-Pwr Trig: Free Run Cerl N1NH - 14,2017 Trig: Free Run Cerl N1NH - 14,2017 Trig: Free Run Cerl N1NH - 14,2017 Trig: Free Run	Trace/Detecto	Adjent Spectram Analyzer - Swept SA ■ F5 50.0 Ac SelectIT Analyzer - Swept SA Sweep Time 5.000 ms PN0:Fast → Trig:Free Run IFGalic.Uw Atten: 36 dB cell N1 N1 N1 Select Trac
Ref Offset 0.5 dB 10 dB/div Ref 25.00 dBm Log	Select Tra	IF Gainstow Attent 36 dB Select Trad
	ClearW	
	Trace Aven	-150 - 197 197 197 197 197 197 197 197 197 197
450 450 450	Max H	450
Center 2.437000000 GHz         Span 0 Hz           Res BW 8 MHz         #VBW 50 MHz         Sweep 5.000 ms (40001 pts)           MRR MODE TRC SCL         X         Y         Function         Function value	Min H	Center 2.437000000 GHz         Span 0 Hz           Res BW 8 MHz         #VBW 50 MHz         Sweep 5.000 ms (40001 pts)           MRR MORE TRC SCL         X         Y         Function         Function worth         Function worth
	View Blar Trace 0	1 View Blar 2 3 4 4 5 5 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7
	<b>M</b> 1	б 7 8 9 9 10 11
KE STATUS		STATUS
IEEE 802.11n-HT20           Aglent Spectrum Analyzer - Sweyt SA         Sweyt SA           16         50.0         AC         SPEEINT         AcLIDI OFF         (02:17:31 PMAgr 14, 2017)		IEEE 802.11n-HT40
Marker 3 Δ 624.250 μs PNO: Fast → Trig: Free Run If Gaint.tow Atten: 20 dB Avg Type: Log-Pwr Trig: Pree Run	Trace/Detecto	
Ref Offset 0.5 dB         ΔMkr3 624.2 μs           10 dB/div         Ref 10.00 dBm         -0.32 dB           0.00         -0.32 dB         -0.32 dB	ClearW	
	Trace Aven	
	Max H	
-800 (1) (1) (1) (1) (1) (1) (1) (1) (1) (1)	Min H	
New moder time         Professional         Office         Office <thoffice< th="">         Office         <thoffice< th=""></thoffice<></thoffice<>	View Blar	
4 F t 3.321 ms 2.50 dBm 6 F 7 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	Trace 0	
9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	1	
BT LE		

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# 5.2. Maximum Conducted Output Power Measurement

### 5.2.1. Standard Applicable

According to §15.247(b): For systems using digital modulation in the 2400-2483.5 MHz and 5725-5850 MHz band, the limit for maximum peak conducted output power is 30dBm. The limited has to be reduced by the amount in dB that the gain of the antenna exceeds 6dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

Systems operating in the 5725-5850 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi without any corresponding reduction in transmitter peak output power.

#### 5.2.2. Measuring Instruments and Setting

Please refer to section 6 of equipment list in this report. The following table is the setting of the power meter.

### 5.2.3. Test Procedures

According to KDB558074 D01 DTS Measurement Guidance Section 9.1 Maximum peak conducted output power, 9.1.2 the maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector.

According to KDB558074 D01 DTS Measurement Guidance Section 9.2 Maximum average conducted output power, 9.2.3.1 Method AVGPM (Measurement using an RF average power meter)

(a) As an alternative to spectrum analyzer or EMI receiver measurements, measurements may be performed using a wideband RF power meter with a thermocouple detector or equivalent if all of the conditions listed below are satisfied.

1) The EUT is configured to transmit continuously, or to transmit with a constant duty factor.

2) At all times when the EUT is transmitting, it shall be transmitting at its maximum power control level.

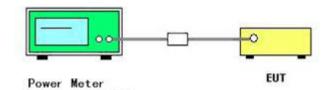
3) The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five.

(b) If the transmitter does not transmit continuously, measure the duty cycle (x) of the transmitter output signal as described in Section 6.0.

(c) Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.

(d) Adjust the measurement in dBm by adding 10log (1/x), where x is the duty cycle to the measurement result.

5.2.4. Test Setup Layout



5.2.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

This report shall not be reproduced except in full, without the written approval of Shenzhen LCS Compliance Testing Laboratory Ltd. Page 14 of 63 5.2.6. Test Result of Maximum Conducted Output Power

Temperature	<b>25</b> ℃	Humidity	60%
Test Engineer	Kyle.Yin	Configurations	IEEE 802.11b/g/n & BT LE

Test Mode	Channel	Frequency (MHz)	Measured Peak Output Power (dBm)	Measured Average Output Power (dBm)	Limits (dBm)	Verdict
	1	2412	18.26	15.16		
IEEE 802.11b	6	2437	18.28	14.98	30	PASS
	11	2462	18.20	15.05		
	1	2412	16.21	12.52		
IEEE 802.11g	6	2437	16.27	12.80	30	PASS
	11	2462	16.20	12.56		
IEEE 802.11n	1	2412	16.16	12.35		
HT20	6	2437	16.18	12.35	30	PASS
11120	11	2462	16.31	12.33		
IEEE 802.11n	3	2422	14.25	10.61		
HT40	6	2437	14.47	10.67	30	PASS
11140	9	2452	14.93	10.61		
	0	2402	1.86	-2.17		
BT – LE	19	2440	2.81	0.42	30	PASS
	39	2480	0.87	-3.24		

Remark:

1. Measured output power at difference data rate for each mode and recorded worst case for each mode.

2. Test results including cable loss;

3. Worst case data at 1Mbps at IEEE 802.11b; 6Mbps at IEEE 802.11g; 6.5Mbps at IEEE 802.11n HT20 13.5Mbps at IEEE 802.11n HT40;

4. Average power is for report only;

## 5.3. Power Spectral Density Measurement

### 5.3.1. Standard Applicable

According to §15.247(e): For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

#### 5.3.2. Measuring Instruments and Setting

Please refer to section 6 of equipment list in this report. The following table is the setting of Spectrum Analyzer.

#### 5.3.3. Test Procedures

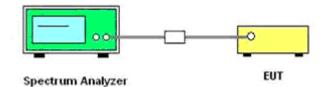
1. The transmitter was connected directly to a Spectrum Analyzer.

2. The power was monitored at the coupler port with a Spectrum Analyzer. The power level was set to the maximum level.

- 3. Set the RBW = 3 KHz $\sim$ 100 KHz.
- 4. Set the VBW  $\geq$  3\*RBW
- 5. Set the span to 1.5 times the DTS channel bandwidth.
- 6. Detector = peak.
- 7. Sweep time = auto couple.
- 8. Trace mode = max hold.
- 9. Allow trace to fully stabilize.

10. Use the peak marker function to determine the maximum power level in any 3 kHz band segment within the fundamental EBW.

5.3.4. Test Setup Layout



5.3.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

## 5.3.6. Test Result of Power Spectral Density

Temperature	<b>25</b> ℃	Humidity	60%
Test Engineer	Kyle Yin	Configurations	IEEE 802.11b/g/n & BT LE

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Test Mode	Channel	Frequency (MHz)	Measured Peak Power Spectral Density (dBm/100KHz)	Limits (dBm/3KHz)	Verdict
IEEE 802.11b	1 6	2412 2437	3.059 4.122	8	PASS
	11	2462	4.403	0	1 700
	1	2412	-2.502	2	5100
IEEE 802.11g	6 11	2437 2462	-2.177 -2.167	8	PASS
	1	2402	-2.167 -1.940		
IEEE 802.11n HT20	6	2437	-2.644	8	PASS
	11	2462	-2.526		
	3	2422	-5.862		
IEEE 802.11n HT40	6	2437	-5.953	8	PASS
	9	2452	-5.753		
	0	2402	0.953	•	5400
BT LE	19	2440	1.762	8	PASS
	39	2480	-0.044		

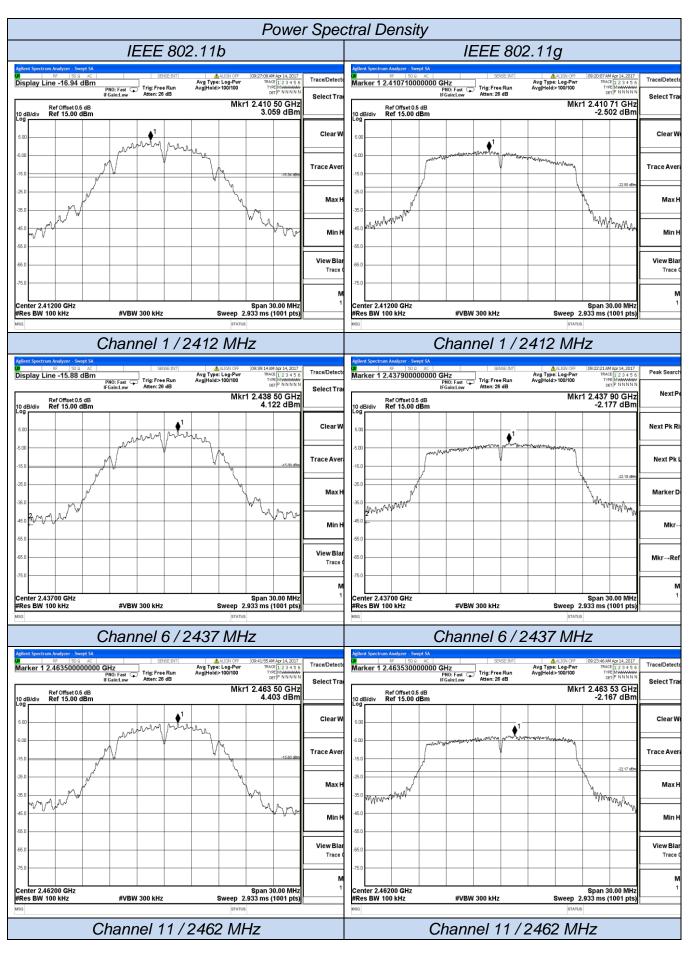
Remark:

1. Measured peak power spectrum density at difference data rate for each mode and recorded worst case for each mode.

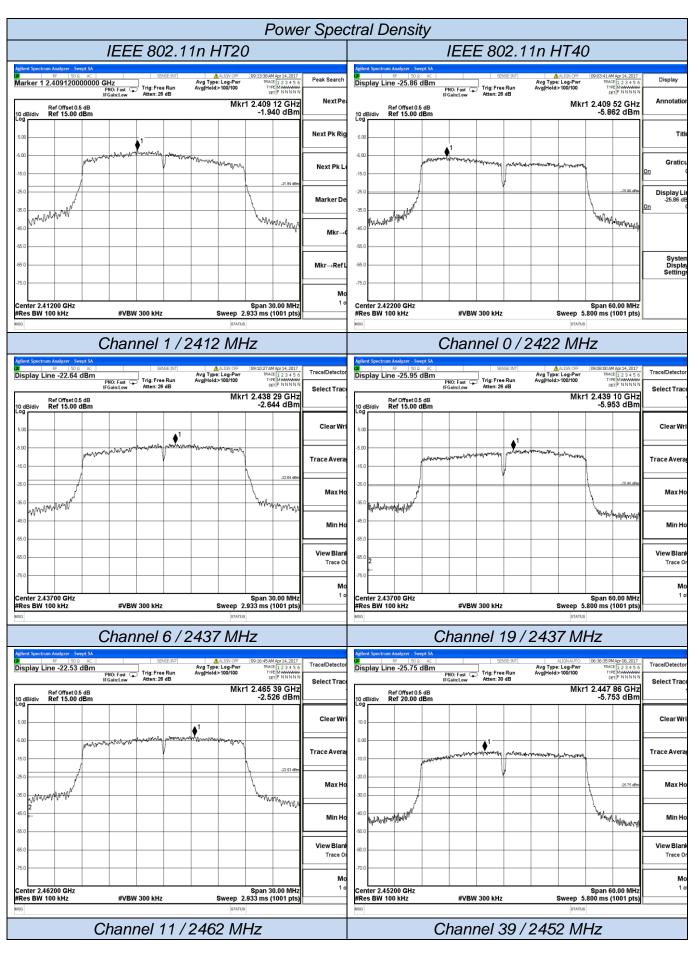
2. Test results including cable loss;

3. Worst case data at BT LE; 1Mbps at IEEE 802.11b; 6Mbps at IEEE 802.11g; 6.5Mbps at IEEE 802.11n HT20 13.5Mbps at IEEE 802.11n HT40;

4. Please refer to following plots;



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				Powe	-	tral De LE	nsity						
					Ы	_							
gilent Spectrum Analyzer - Swept SA RF SD Ω AC		SENSE:INT	ALIGN OFF	02:13:11 PM Apr 14, 2017		- DC	alyzer - Swept SA 50 Ω AC		SENSE:INT	🔥 ALIG	N OFF 02:11:49	MApr 14, 2017	
Display Line -19.05 dBm	PNO: Wide	Free Run Av	vg Type:Log-Pwr vg Hold:>100/100	02:13:11 PM Apr 14, 2017 TRACE 1 2 3 4 5 6 TYPE MWWWWW	Trace/Detector	Display Line	-18.24 dBm	PNO: Wide	rig: Free Run	Avg Type: Log Avg Hold>100	g-Pwr TRJ 1/100 T	MApr 14, 2017 ICE 1 2 3 4 5 6 IPE MWWWWW	Trace/Detec
	IFGain:Low Atter	n: 20 dB			Select Trace			PNO: Wide 🖵 T IFGain:Low A	tten: 20 dB		Mkr1 2.439		Select Tr
Ref Offset 0.5 dB 0 dB/div Ref 10.00 dBm			IVIKE	2.402 249 GHz 0.953 dBm		10 dB/div Ref	Offset 0.5 dB 10.00 dBm			ľ	VIKET 2.439 1.7	62 dBm	
.og		A1				Log			1				
0.00					Clear Wri	0.00				$\rightarrow$			Clear
10.0						-10.0				$\left \right\rangle$			
10.0					Trace Avera	-10.0						-18.24 dBm	Trace Av
20.0		+		-19.05 dBm	These Avera	-20.0				+		-10.24 dBm	THECHN
30.0						-30.0					1		
	~				Max Ho	- 0.0	$\square$						Max
40.0				$\vdash \lor \sim$		-40.0 2	/					$\sim$	
50.0				<u> </u>		-50.0						~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	
					Min Ho								Min
60.0						-60.0							
70.0					View Blank	-70.0							View Bl
					Trace Or								Trace
80.0						-80.0							
					<b>Mo</b> 1 o	Center 2.4400							
Center 2.402000 GHz	#VBW 300 k			Span 3.000 MHz			00 GHz			_		3.000 MHz	
Res BW 100 kHz		nz .	Sweep 1	1.000 ms (1001 pts)		#Res BW 100	kHz	#VBW 30	0 kHz	Swe	eep 1.000 ms	(1001 pts)	
sg		ΠZ	Sweep 1 statu:	1.000 ms (1001 pts) s			kHz	#VBW 30	0 kHz	Swe	ep 1.000 ms	(1001 pts)	
			STATU	S		#Res BW 100					STATUS	(1001 pts)	
	Channe		STATU	S		#Res BW 100		<sup>#VBW 30</sup>			STATUS	(1001 pts)	
	Channe	10/24	statu 102 MH	-Iz		#Res BW 100					STATUS	(1001 pts)	
so gilent Spectrum Analyzer - Swept SA RF 50 Q AC	Channe	10/24	5141U 402 MF	s -1Z 102:09:41 PMAcr 14, 2017	Trace/Detector	#Res BW 100					STATUS	(1001 pts)	
so gilent Spectrum Analyzer - Swept SA RF 50 Q AC		10/24	ALIGN OFF Wg Type: Log-Pwr vgHeid>100/100	S 12 102:09:41 PMApr 14, 2017 TRACE [1 2 3 4 5 6 TYPE MWWWWW	Trace/Detector Select Trace	#Res BW 100					STATUS	(1001 pts)	
so glent Spectrum Analyzer _ Swept SA RF _ ISO Q _ AC Display Line -20.05 dBm Ref Offset 0.5 dB	Channe PNO: Wide Trig: IFGainLow Trig:	10/24	ALIGN OFF Wg Type: Log-Pwr vgHeid>100/100	s 12 02:09:41 PMApr 14, 2017 TRACE [1 2 3 4 5 6 TYPE [M INN N 02:19 MINN N 2.479 994 GHz		#Res BW 100					STATUS	(1001 pts)	
so silent Spectrum Analyzer - Swept SA bisplay Line -20.05 dBm	Channe PNO: Wide Trig: IFGainLow Trig:	10/24	ALIGN OFF Wg Type: Log-Pwr vgHeid>100/100	S 12 102:09:41 PMApr 14, 2017 TRACE [1 2 3 4 5 6 TYPE MWWWWW		#Res BW 100					STATUS	(1001 pts)	
so so so so so so so so so so	Channe PNO: Wide Trig: IFGainLow Trig:	10/24	ALIGN OFF Wg Type: Log-Pwr vgHeid>100/100	s 12 02:09:41 PMApr 14, 2017 TRACE [1 2 3 4 5 6 TYPE [M INN N 02:19 MINN N 2.479 994 GHz		#Res BW 100					STATUS	(1001 pts)	
signet Spectrum Analyzer Swept SA Ref 2010 AC Display Line -20.05 dBm Ref Offset 0.5 dB 0 dB/div Ref 10.00 dBm 00	Channe PNO: Wide Trig: IFGainLow Trig:	10/24	ALIGN OFF Wg Type: Log-Pwr vgHeid>100/100	s 12 02:09:41 PMApr 14, 2017 TRACE [1 2 3 4 5 6 TYPE [M INN N 02:19 MINN N 2.479 994 GHz	Select Trace	#Res BW 100					STATUS	(1001 pts)	
so so so so so so so so so so	Channe PNO: Wide Trig: IFGainLow Trig:	10/24	ALIGN OFF Wg Type: Log-Pwr vgHeid>100/100	s 12 02:09:41 PMApr 14, 2017 TRACE [1 2 3 4 5 6 TYPE [M INN N 02:19 MINN N 2.479 994 GHz	Select Trace	#Res BW 100					STATUS	(1001 pts)	
signet Spectrum Analyzer Swept SA Ref 2010 AC Display Line -20.05 dBm Ref Offset 0.5 dB 0 dB/div Ref 10.00 dBm 00	Channe PNO: Wide Trig: IFGainLow Trig:	10/24	ALIGN OFF Wg Type: Log-Pwr vgHeid>100/100	s 12 02:09:41 PMApr 14, 2017 TRACE [1 2 3 4 5 6 TYPE [M INN N 02:19 MINN N 2.479 994 GHz	Select Trace	#Res BW 100					STATUS	(1001 pts)	
80         Ref offset 0.5 dB           80         80 × 0.05 dB           90 dB/div         Ref offset 0.5 dB           0.00         0.00 dB/div           0.00         0.00 dB/div	Channe PNO: Wide Trig: IFGainLow Trig:	10/24	ALIGN OFF Wg Type: Log-Pwr vgHeid>100/100	s 1020941PMatr 14,2017 THACE [1,2:3:4:5 THACE [1,2:4:5] THACE [1,2	Select Trace	#Res BW 100					STATUS	(1001 pts)	
80         Ref offset 0.5 dB           80         80 × 0.05 dB           90 dB/div         Ref offset 0.5 dB           0.00         0.00 dB/div           0.00         0.00 dB/div	Channe PNO: Wide Trig: IFGainLow Trig:	10/24	ALIGN OFF Wg Type: Log-Pwr vgHeid>100/100	s 1020941PMatr 14,2017 THACE [1,2:3:4:5 THACE [1,2:4:5] THACE [1,2	Select Trace	#Res BW 100					STATUS	(1001 pts)	
80         80           81         80         500         20           100         80         500         20           100         80         500         20           100         80         100         20           100         80         10.00         dBm           100         90         90         10.00         10.00	Channe PNO: Wide Trig: IFGainLow Trig:	10/24	ALIGN OFF Wg Type: Log-Pwr vgHeid>100/100	s 1020941PMatr 14,2017 THACE [1,2:3:4:5 THACE [1,2:4:5] THACE [1,2	Select Trace	#Res BW 100					STATUS	(1001 pts)	
so effort Synchrum Analyzer _ Swept SA isplay Line -20.05 dBm o dB/div Ref 10.00 dBm o dB/div Ref 10.00 dBm o d200 000 000 000 000 000 000 000	Channe PNO: Wide Trig: IFGainLow Trig:	10/24	ALIGN OFF Wg Type: Log-Pwr vgHeid>100/100	s 1020941PMatr 14,2017 THACE [1,2:3:4:5 THACE [1,2:4:5] THACE [1,2	Select Trace	#Res BW 100					STATUS	(1001 pts)	
so client Spectrum Audyzer - Swept Sh isplay Line -20.05 dBr 0 dB/div Ref Offset 0.5 dB 0 dB/div Ref 10.00 dBm 0 dB/div 300	Channe PNO: Wide Trig: IFGainLow Trig:	10/24	ALIGN OFF Wg Type: Log-Pwr vgHeids 100/100	s 1020941PMatr 14,2017 THACE [1,2:3:4:5 THACE [1,2:4:5] THACE [1,2	Select Trace	#Res BW 100					STATUS		
so effort Synchrum Analyzer _ Swept SA isplay Line -20.05 dBm o dB/div Ref 10.00 dBm o dB/div Ref 10.00 dBm o d200 000 000 000 000 000 000 000	Channe PNO: Wide Trig: IFGainLow Trig:	10/24	ALIGN OFF Wg Type: Log-Pwr vgHeids 100/100	s 1020941PMatr 14,2017 THACE [1,2:3:4:5 THACE [1,2:4:5] THACE [1,2	Select Trace	#Res BW 100					STATUS		
ss ss ss ss ss ss ss ss ss ss	Channe PNO: Wide Trig: IFGainLow Trig:	10/24	ALIGN OFF Wg Type: Log-Pwr vgHeids 100/100	s 1020941PMatr 14,2017 THACE [1,2:3:4:5 THACE [1,2:4:5] THACE [1,2	Select Trace	#Res BW 100					STATUS		
so effort Spectrum Analyzer - Swept SA bisplay Line -20.05 dBr 0 dBidiv Ref 0ffset 0.5 dB 0 00 0 00 0 00 0 00 0 00 0 00 0 00 0 00 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Channe PNO: Wide Trig: IFGainLow Trig:	10/24	ALIGN OFF Wg Type: Log-Pwr vgHeids 100/100	s 1020941PMatr 14,2017 THACE [1,2:3:4:5 THACE [1,2:4:4:5 THACE [1,2:4:4:5] THACE [1,2:4:4:5 THACE [1,2:4:4:5] THACE [1,2:4:5] THACE [1,	Select Trace	#Res BW 100					STATUS		
ss ss ss ss ss ss ss ss ss ss	Channe PNO: Wide Trig: IFGainLow Trig:	10/24	ALIGN OFF Wg Type: Log-Pwr vgHeids 100/100	s 1020941PMatr 14,2017 THACE [1,2:3:4:5 THACE [1,2:4:4:5 THACE [1,2:4:4:5] THACE [1,2:4:4:5 THACE [1,2:4:4:5] THACE [1,2:4:5] THACE [1,	Select Trace Clear Wri Trace Avera Max Ho Min Ho View Blani	#Res BW 100					STATUS		
so so isplay Line -20.05 dBm so dB/div Ref 10.00 dBm so so so so so so so so so so	Channe PNO: Wide Trig: IFGainLow Trig:	10/24	ALIGN OFF Wg Type: Log-Pwr vgHeids 100/100	s 1020941PMatr 14,2017 THACE [1,2:3:4:5 THACE [1,2:4:4:5 THACE [1,2:4:4:5] THACE [1,2:4:4:5 THACE [1,2:4:4:5] THACE [1,2:4:5] THACE [1,	Select Trace	#Res BW 100					STATUS		
80         80           81         80         80         80           100         80         90         40           0         Blddy         Ref Offset 0.5 dB         80           0         Blddy         Ref 10.00 dBm         90           000         90         90         90         90           000         90	Channe	SPREIMT Free Run 1 20 dB	ALOO OF VIG Type: Log-Pur Vig Type: Log-Pur Wig Type: Log-Pur Mkr1	Span 3.000 MHz	Select Trace	#Res BW 100					STATUS		
so so isplay Line -20.05 dBm so dB/div Ref 10.00 dBm so action of the solution of the sol	Channe PNO: Wide Trig: IFGainLow Trig:	SPREIMT Free Run 1 20 dB	ALDON OFF Wg Type: Leg-Pwr ygHeid>100/100 Mkr1	s 1/Z 10200941PMAcr 14, 2017 THRACE [12 3 4 5 6 TYPE [12 3 4 5	Select Trace	#Res BW 100					STATUS		
Bill         Image: Second and Sec	Channe	IO/24	ALOO OF VIG Type: Log-Pur Vig Type: Log-Pur Mkr1	S 1/Z 1020041PMAcr 14,2017 THACE [12 3 4 5 0 THE [12 3 4 5 0 THE PARTY IN THIN 2.479 94 GHz -0.044 dBm -0.044 dBm	Select Trace	#Res BW 100					STATUS		

## 5.4. 6 dB Spectrum Bandwidth Measurement

### 5.4.1. Standard Applicable

According to §15.247(a) (2): For digital modulation systems, the minimum 6 dB bandwidth shall be at least 500 KHz.

### 5.4.2. Measuring Instruments and Setting

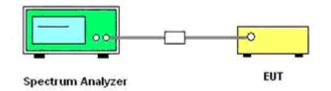
Please refer to section 6 of equipment's list in this report. The following table is the setting of the Spectrum Analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	> RBW
Detector	Peak
Trace	Max Hold
Sweep Time	100ms

### 5.4.3. Test Procedures

- 1. The transmitter output (antenna port) was connected to the spectrum analyzer in peak hold mode.
- 2. The resolution bandwidth and the video bandwidth were set according to KDB558074.
- 3. Measured the spectrum width with power higher than 6dB below carrier.

### 5.4.4. Test Setup Layout



#### 5.4.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

## 5.4.6. Test Result of 6dB Spectrum Bandwidth

Temperature	<b>25</b> ℃	Humidity	60%
Test Engineer	Kyle.Yin	Configurations	IEEE 802.11b/g/n & BT LE

Test Mode	Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Limits (MHz)	Verdict
	1	2412	8.27		
IEEE 802.11b	6	2437	9.27	0.500	PASS
	11	2462	9.53		
	1	2412	14.15		
IEEE 802.11g	6	2437	16.24	0.500	PASS
	11	2462	16.43		
	1	2412	15.19		
IEEE 802.11n HT20	6	2437	17.47	0.500	PASS
	11	2462	17.63		
	3	2422	36.14		
IEEE 802.11n HT40	6	2437	36.00	0.500	PASS
	9	2452	30.75		
	0	2402	0.7033		
BT - LE	19	2440	0.6985	0.500	PASS
	39	2480	0.7071		

Remark:

1. Measured 6dB Bandwidth at difference data rate for each mode and recorded worst case for each mode.

2. Test results including cable loss;

3. Worst case data at BT LE; 1Mbps at IEEE 802.11b; 6Mbps at IEEE 802.11g; 6.5Mbps at IEEE 802.11n HT20 13.5Mbps at IEEE 802.11n HT40;

4. Please refer to following plots;

6 dB Bandwidth		
IEEE 802.11b		IEEE 802.11g
Agilent Spectrum Analyzer - Occupied BW		Aglient Spectrum Analyzer - Occupied EW
M         NF         ISO 8         AC         SPECENTI         ALIXAUTO         D062901PM apro8.2017           Center Freq 2.41200000 GHz         Center Freq 2.41200000 GHz         Center Freq 2.41200000 GHz         Radio Std: None           #IFGalinLow         Free Run         Avg[Hold>-10/10         Radio Device: BTS           10 dB/div         Ref 20.00 dBm         Ref 20.00 dBm         Ref 20.00 dBm	Trace/Detecto	BF         500         AC         SPREENT         AUDAUTO         De23811 PMAP 08 2017           Center Freq 2.412000000 GHz         Center Freq 2.41200000 GHz         Trigs Free Run         Avg Hold>10/10         Radio Std: None           #FFGaint.tww         #FFGaint.tww         #Atten: 30 dB         Radio Device: BTS           10 dB/div         Ref 20.00 dBm         Ref 20.00 dBm         Ref 20.00 dBm
	ClearWi	Log
	Avera	Average
800 700 Center 2.412 GHz Span 30 MHz	Max H	60.0
#Res BW 100 kHz #VBW 300 kHz Sweep 2.933 ms Occupied Bandwidth Total Power 19.9 dBm 12.390 MHz	Min H	#Res BW 100 kHz #VBW 300 kHz Sweep 2.933 ms Occupied Bandwidth Total Power 16.3 dBm 16.246 MHz Detect
Transmit Freq Error -202.15 kHz OBW Power 99.00 % x dB Bandwidth 8.269 MHz x dB -6.00 dB	Detec Per Auto <u>I</u>	16.246 IMHZ     Detect       Peat       Transmit Freq Error     -71.737 kHz       Value     Max       x dB Bandwidth     14.15 MHz     x dB       -6.00 dB
Channel 1 / 2412 MHz		Channel 1 / 2412 MHz
Agtent: Spectrum Analyzer - Decupied BW         SPREINT         ALISNAUTO         [06:29:21 PMApr:08,2017]           20         NF         150 0.8.4C         SPREINT         ALISNAUTO         [06:29:21 PMApr:08,2017]           20         NF         150 0.8.4C         Center Freq; 2:437000000 GHz         Radio Std: None           Trig: Free Run #Atten: 30 dB         Avg Hold>10/10         Radio Device: BTS	Trace/Detecto	Agient Spectrum Analyzer - Occupied BW         SENSE: INTI         ALIONAUTO         IO6:28:25 PM Apr 08: 2017           B         M         S0 a         AC         SENSE: INTI         ALIONAUTO         IO6:28:25 PM Apr 08: 2017           Center Freq 2.4370000000 GHz         Center Freq: 2.437000000 GHz         Trig: Free Run         Avg Hold>10/10         Radio Std: None         Trace/Detector
10 dB/div Ref 20.00 dBm	ClearWi	10 dB/div Ref 20.00 dBm
	Avera	200 Average Av
600 -700 Center 2.437 GHz Span 30 MHz	Max H	600         Max Ho           700         Center 2.437 GHz
#Res BW 100 kHz #VBW 300 kHz Sweep 2.933 ms	Min H	#Res BW 100 kHz #VBW 300 kHz Sweep 2.933 ms Min Ho
Occupied Bandwidth Total Power 20.1 dBm 12.571 MHz Transmit Freq Error 169.45 kHz OBW Power 99.00 %	Detec Pe Auto 1	Occupied Bandwidth Total Power 17.2 dBm 16.393 MHz Detect Transmit Freg Error 47.556 kHz OBW Power 99.00 % Auto M
x dB Bandwidth 9.273 MHz x dB -6.00 dB		x dB Bandwidth 16.24 MHz x dB -6.00 dB
MSG STATUS		
Channel 6 / 2437 MHz		Channel 6 / 2437 MHz
Adlent Spectrum Analyzer - Docupied BW         597 651 00 000         AllowAur 08 2017           Version - Document - Do	Trace/Detecto	Agint Spectrum Analyzer         Occupied BW           B         50         8C         SENSE B/IT         ALIONAUTO         [06:28:39 FM Arr 08:2017]           Center Freq 2.462000000 GHz         C         Free Freq 2.462000000 GHz         Trig: Free Run         Avg Hold>10/10
10 dB/div Ref 20.00 dBm	ClearWi	10 dBdiv Ref 20.00 dBm
	Avera	
500 600 700	Max H	500 600 600 600 600 600 600 600 600 600
Center 2.462 GHz Span 30 MHz #Res BW 100 kHz #VBW 300 kHz Sweep 2.933 ms	Min H	Center 2.462 GHz Span 30 MHz #Res BW 100 kHz #VBW 300 kHz Sweep 2.933 ms Min Ho
Occupied Bandwidth Total Power 21.0 dBm 12.710 MHz	Detec	Occupied Bandwidth Total Power 18.0 dBm 16.432 MHz Detect
Transmit Freq Error 96.355 kHz OBW Power 99.00 % x dB Bandwidth 9.534 MHz x dB -6.00 dB	Pe Auto <u>1</u>	Transmit Freq Error     11.372 kHz     OBW Power     99.00 %     Auto     Muto     Muto     Muto       x dB     andwidth     16.43 MHz     x dB     -6.00 dB
MSG STATUS		MSG
Channel 11 / 2462 MHz		Channel 11 / 2462 MHz

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6 dB Bandwidth		
IEEE 802.11n HT20 IEEE 802.11n HT40		
Agilent Spectrum Analyzer - Occupied BW         Agilent Spectrum Analyzer - Occupied BW           Di         IF         SS A.C.         SSREERT          ALISHAUTO         06:27:16 PM Arr 08, 2017           Center Free: 2.412000000 GHz         Center Free: 2.412000000 GHz         Radie Std: None         SSREERT          ALISHAUTO         06:30:49 PM Arr 08, 2017	Trace/Detector	
Center Freq 2.41200000 GHz Center Freq: 2.41200000 GHz Radio Std: None #/FGain:Lew Atten: 30 dB Radio Std: None		
10 dB/div Ref 20.00 dBm		
	Clear Write	
	Average	
	Maxiald	
	Max Hold	
Center 2.412 GHz Span 30 MHz #Res BW 100 kHz #VBW 300 kHz Sweep 2.933 ms Min Ho #Res BW 100 kHz #VBW 300 kHz Sweep 5.8 ms	Min Hold	
Occupied Bandwidth Total Power 16.5 dBm Occupied Bandwidth Total Power 16.1 dBm 17.391 MHz Detect 35.998 MHz	Detrotor	
Transmit Freq Error         -56.911 kHz         OBW Power         99.00 %         Auto         M         Transmit Freq Error         -42.586 kHz         OBW Power         99.00 %	Detector Peak► Auto <u>Man</u>	
x dB Bandwidth 15.19 MHz x dB -6.00 dB x dB Bandwidth 36.14 MHz x dB -6.00 dB		
And		
Channel 1 / 2412 MHz Channel 3 / 2422 MHz		
Agilent Spectrum Analyzer - Occupied EW         Agilent Spectrum Analyzer - Occupied EW           Image: Application Analyzer - Occupied EW         Agilent Spectrum Analyzer - Occupied EW           Image: Application Analyzer - Occupied EW         Agilent Spectrum Analyzer - Occupied EW           Image: Application Analyzer - Occupied EW         Agilent Spectrum Analyzer - Occupied EW           Image: Application Analyzer - Occupied EW         Agilent Spectrum Analyzer - Occupied EW           Image: Application Analyzer - Occupied EW         Agilent Spectrum Analyzer - Occupied EW           Image: Application Analyzer - Occupied EW         Enter Freq 2.437000000 GHz           Center Freq 2.437000000 GHz         Center Freq 2.437000000 GHz           Center Freq 2.437000000 GHz         Radio Std: None	Trace/Detector	
Bit Realing.ow     Fig: Free Run     AvgiHeid>10/10       #IFGaint.ow     #Atten: 30 dB     Radio Device: BTS		
10 dB/div Ref 20.00 dBm		
	Clear Write	
	Average	
	Max Hold	
700         70.0		
#Res BW 100 kHz #VBW 300 kHz Sweep 2.933 ms Min Ho #Res BW 100 kHz #VBW 300 kHz Sweep 5.8 ms	Min Hold	
Occupied Bandwidth Total Power 17.1 dBm Occupied Bandwidth Total Power 17.3 dBm 17.556 MHz Detect 35.909 MHz	Detector	
Transmit Freq Error 53.766 kHz OBW Power 99.00 %	Peak▶ Auto <u>Man</u>	
x dB Bandwidth 17.47 MHz x dB -6.00 dB x dB Bandwidth 36.00 MHz x dB -6.00 dB		
Channel 6 / 2437 MHz         Channel 6 / 2437 MHz           Addred Spectrum Analyzer - Occupied BW         Addred Spectrum Analyzer - Occupied BW		
MF         SD 0:         AC         SDREENT         ALISHANTO         (e4:29:48 PM Jun 05, 2017)           x dB -6.00 dB         Center Freq: 2.46200000 GHz         Radio Std: None         Trace/Detector         Center Freq: 2.45200000 GHz         Center Freq: 2.45200000 GHz         Radio Std: None           Trace/Detector         Trig: Free Num         Avg/Hold>/10/10         Trace/Detector         Trace/Detector         Trace/Detector	Trace/Detector	
#IFGain:Low #Atten: 40 dB Radio Device: BTS #IFGain:Low #Atten: 30 dB Radio Device: BTS		
10 dB/div Ref 20.00 dBm		
	Clear Write	
	Average	
80 707	Max Hold	
Center 2.462 GHz Span 30 MHz Center 2.452 GHz Span 30 MHz Sweep 2.933 ms Min Ho Res BW 100 kHz #VBW 300 kHz Sweep 5.8 ms		
Min Ho         Min Ho         Min Ho         Min Ho         Min Ho         Cocupied Bandwidth         Total Power         19.5 dBm         Occupied Bandwidth         Total Power         21.6 dBm	Min Hold	
17.578 MHz Detect 35.830 MHz	Detector Peak▶	
Transmit Freq Error         20.723 kHz         OBW Power         99.00 %         Auto         M         Transmit Freq Error         150.02 kHz         OBW Power         99.00 %           x dB Bandwidth         17.63 MHz         x dB         -6.00 dB         x dB Bandwidth         30.75 MHz         x dB         -6.00 dB	Auto <u>Man</u>	
M50 STATUS STATUS		
Channel 44 / 2402 MUL		
Channel 11 / 2462 MHz Channel 9 / 2452 MHz		
Channel 11 / 2462 MHZ Channel 9 / 2452 MHZ		

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6 dB Bandwidth			
	BT	LE	
Adlent Synctrum Analyzer - Occupied BW         EREF         Condition of the conditis and the condition of the condition of the conditi	7 Trace/Detector	Activit Svectrum Analyzer - Occupied IW Series 1900 - AC I SPREEINT ALUSI OF (02004-2194Apr 14, 2017) Center Freq 2.4400000000 GHz Fig Free Run Avg Hold>10/10 Fig Free Run Avg Hold>10/10 Radio Device: BTS	
10 dB/div Ref 10.00 dBm	Clear Wri	10 dB/div Ref 10.00 dBm	
	Avera	400 Avera	
700         0		700     Max Ho       800     Span 3 MHz       Center 2.44 GHz     \$Span 3 MHz       #Res BW 100 kHz     #VBW 300 kHz	
Occupied Bandwidth Total Power 8.24 dBm 1.0488 MHz	Detect	Occupied Bandwidth Total Power 9.06 dBm	
Transmit Freq Error 6.272 kHz OBW Power 99.00 % x dB Bandwidth 703.3 kHz x dB -6.00 dB	Peal Auto <u>M</u>	Transmit Freq Error 4.354 kHz OBW Power 99.00 % Auto M x dB Bandwidth 698.5 kHz x dB -6.00 dB	
M60 STATUS		MBG STATUS	
Channel 0 / 2402 MHz		Channel 19 / 2440 MHz	
Agent Spectran Analyzer         Occupied BW         Specta PM         Agent Specta         Agent	7 Trace/Detector		
10 dB/div Ref 10.00 dBm	Clear Wri		
	Avera		
600 700 600 Center 2.48 GHz Span 3 MH	Max Ho		
#Res BW 100 kHz #VBW 300 kHz Sweep 1 m Occupied Bandwidth Total Power 7.28 dBm			
Transmit Freq Error         2.047 kHz         OBW Power         99.00 %           x dB Bandwidth         707.1 kHz         x dB         -6.00 dB	Detect Peal Auto <u>M</u>		
MSG STATUS			
Channel 39 / 2480 MHz			

## 5.5. Radiated Emissions Measurement

#### 5.5.1. Standard Applicable

15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
\1\ 0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293.	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(\2\)
13.36-13.41			

\1\ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

#### \2\ Above 38.6

According to §15.247 (d): 20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

#### 5.5.2. Measuring Instruments and Setting

Please refer to section 6 of equipment list in this report. The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10 <sup>™</sup> carrier harmonic
RB / VB (Emission in restricted band)	1MHz / 1MHz for Peak, 1 MHz / 1/B kHz for Average
RB / VB (Emission in non-restricted band)	1MHz / 1MHz for Peak, 1 MHz / 1/B kHz for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB/VB 200Hz/1KHz for QP/AVG
Start ~ Stop Frequency	150kHz~30MHz / RB/VB 9kHz/30KHz for QP/AVG
Start ~ Stop Frequency	30MHz~1000MHz / RB/VB 120kHz/1MHz for QP

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#### 5.5.3. Test Procedures

#### 1) Sequence of testing 9 kHz to 30 MHz

#### Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

- --- If the EUT is a tabletop system, a rotatable table with 0.8 m height is used.
- --- If the EUT is a floor standing device, it is placed on the ground.
- --- Auxiliary equipment and cables were positioned to simulate normal operation conditions.
- --- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- --- The measurement distance is 3 meter.
- --- The EUT was set into operation.

#### **Premeasurement:**

- --- The turntable rotates from 0° to 315° using 45° steps.
- --- The antenna height is 0.8 meter.

--- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions

### **Final measurement:**

--- Identified emissions during the premeasurement the software maximizes by rotating the turntable position (0° to 360°) and by rotating the elevation axes (0° to 360°).

--- The final measurement will be done in the position (turntable and elevation) causing the highest emissions with QPK detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

## 2) Sequence of testing 30 MHz to 1 GHz

### Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

- --- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.
- --- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- --- Auxiliary equipment and cables were positioned to simulate normal operation conditions
- --- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- --- The measurement distance is 3 meter.
- --- The EUT was set into operation.

#### **Premeasurement:**

- --- The turntable rotates from 0° to 315° using 45° steps.
- --- The antenna is polarized vertical and horizontal.
- --- The antenna height changes from 1 to 3 meter.

--- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

#### **Final measurement:**

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position ( $\pm$  45°) and antenna movement between 1 and 4 meter.

--- The final measurement will be done with QP detector with an EMI receiver.

--- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

## 3) Sequence of testing 1 GHz to 18 GHz

#### Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

- --- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.
- --- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- --- Auxiliary equipment and cables were positioned to simulate normal operation conditions
- --- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- --- The measurement distance is 3 meter.
- --- The EUT was set into operation.

#### **Premeasurement:**

- --- The turntable rotates from 0° to 315° using 45° steps.
- --- The antenna is polarized vertical and horizontal.
- --- The antenna height scan range is 1 meter to 2.5 meter.

--- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions.

#### **Final measurement:**

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position ( $\pm$  45°) and antenna movement between 1 and 4 meter. This procedure is repeated for both antenna polarizations.

--- The final measurement will be done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and Average detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

#### 4) Sequence of testing above 18 GHz

#### Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

- --- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.
- --- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- --- Auxiliary equipment and cables were positioned to simulate normal operation conditions
- --- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- --- The measurement distance is 1 meter.
- --- The EUT was set into operation.

#### **Premeasurement:**

--- The antenna is moved spherical over the EUT in different polarizations of the antenna.

#### **Final measurement:**

--- The final measurement will be performed at the position and antenna orientation for all detected emissions that were found during the premeasurements with Peak and Average detector.

--- The final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.