# FCC TEST REPORT

# For

# Shenzhen Geniatech Inc., Ltd.

# eyetv

# Model No.: Netstream Air

# Additional Model No.: Netstream Duo, Netstream 4S, Netstream 4A, Netstream 4T,

Netstream A, Eyetv Netstream, eyetv T2, U6

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Date of receipt of test sample	:	April 21, 2017
Number of tested samples	:	1
Serial number	:	Prototype
Date of Test	:	April 21, 2017~May 04, 2017

May 04, 2017

:

Date of Report

 SHENZHEN LCS COMPLIANCE TESTING LABORATORY LTD.
 FCC ID: ZJU-IE7D4N

Report No.: LCS170421078AE

F	FCC TEST REPORT CC CFR 47 PART 15 E(15.407): 2016	6
Report Reference No	.: LCS170421078AE	
Date of Issue	.: May 04, 2017	
Address	<ul> <li>Shenzhen LCS Compliance Testi</li> <li>1F., Xingyuan Industrial Park, Tong District, Shenzhen, Guangdong, Cl</li> <li>Full application of Harmonised star Partial application of Harmonised s</li> </ul>	gda Road, Bao'an Blvd., Bao'an nina ndards ∎
Applicant's Name	. : Shenzhen Geniatech Inc., Ltd.	
Address	. : 18F, GDC Building, No 9th, Gaoxir Shenzhen, China	n Middle 3rd Road, Nanshan,
Test Specification		
Standard	. : FCC CFR 47 PART 15 E(15.407):	2016
Test Report Form No	.: LCSEMC-1.0	
TRF Originator	. : Shenzhen LCS Compliance Testing	g Laboratory Ltd.
Master TRF	.: Dated 2011-03	
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EUT Description.	.: eyetv	
Trade Mark	. : N/A	
Madal/ Type reference	.: Netstream Air	
Model/ Type reference		
Ratings	.: DC 5.0V/2A by AC Adapter	
Ratings		
		Approved by:
Result	. : Positive	Approved by: Graving Liang

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	SHENZHEN LCS	COMPLIANCE	E TESTING LABORATORY LTD.	
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FCC ID: ZJU-1E7D4N Report No.: LCS170421078AE

# **FCC -- TEST REPORT**

Test Report No. : LCS170421078AE May 04, 2017 Date of issue

EUT	:	eyetv
Type / Model	:	Netstream Air
Applicant	:	Shenzhen Geniatech Inc., Ltd.
Address	:	18F, GDC Building, No 9th, Gaoxin Middle 3rd Road, Nanshan,
		Shenzhen, China
Telephone	:	1
Fax	:	1
Manufacturer	:	Shenzhen Geniatech Inc., Ltd.
Address	:	18F, GDC Building, No 9th, Gaoxin Middle 3rd Road, Nanshan,
		Shenzhen, China
Telephone	:	/
Fax	:	/
Factory	:	Shenzhen Geniatech Inc., Ltd.
Address	:	18F, GDC Building, No 9th, Gaoxin Middle 3rd Road, Nanshan,
		Shenzhen, China
Telephone	:	/
Fax	:	/

Test Result:	Positive

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.

SHENZHEN LCS COMPLIANCE TESTING LABORATORY LTD. FCC II	SHENZHEN	LCS COMPL	IANCE TESTIN	G LABORATOR	Y LTD. H	FCC ID.
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: ZJU-1E7D4N Report No.: LCS170421078AE

# **Revision History**

Revision	Issue Date	Revisions	Revised By
00	May 04, 2017	Initial Issue	Gavin Liang

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# **1. GENERAL INFORMATION**

# 1.1. Description of Device (EUT)

EUT	
Model Number	: eyetv
	: Netstream Air, Netstream Duo, Netstream 4S, Netstream 4A,
Model Declaration	Netstream 4T, Netstream A, Eyetv Netstream, eyetv T2, U6
	: PCB board, structure and internal of these model(s) are the same, So no additional models were tested
Test Model	: Netstream Air
Power Supply	: DC 5.0V/2A by AC Adapter
Frequency Range	: IEEE 802.11b:2412-2462MHz
	IEEE 802.11g:2412-2462MHz
	IEEE 802.11n HT20:2412-2462MHz/5180-5240MHz/5745-5825MHz
	IEEE 802.11n HT40:2422-2452MHz/5190-5230MHz/5755-5795MHz
	IEEE 802.11a:5180-5240MHz/5745-5825MHz
	IEEE 802.11ac:5180-5240MHz/5745-5825MHz
	IEEE 802.11ac VHT40: 5190-5230MHz/5755-5795MHz
<b>a</b>	IEEE 802.11ac VHT80: 5210MHz/5775MHz
Channel Number	: 11 Channels for WIFI 20MHz Bandwidth(802.11b/g/n-HT20)
	7 Channels for WIFI 40MHz Bandwidth(802.11n-HT40)
	4 Channels for 5180.00-5240.00MHz(802.11a/ac/n-HT20)
	2 Channels for 5190.00-5230.00MHz(802.11ac/n-HT40)
	1 Channels for 5210.00MHz(802.11ac-HT80)
	5 Channels for 5745.00-5825.00MHz(802.11a/ac/n-HT20)
	2 Channels for 5755.00-5795.00MHz(802.11ac/n-HT40)
	1 Channels for 5775.00MHz(802.11ac-HT80)
Modulation Technology	: IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK)
	IEEE 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK)
	IEEE 802.11n: OFDM (64QAM, 16QAM,QPSK,BPSK)
	IEEE 802.11a: OFDM (64QAM, 16QAM,QPSK,BPSK)
	IEEE 802.11ac: OFDM (256QAM, 64QAM, 16QAM,QPSK,BPSK)
Data Rates	: IEEE 802.11b: 1-11Mbps
	IEEE 802.11g: 6-54Mbps
	IEEE 802.11n: MCS0-MCS15
	IEEE 802.11a: 6-54Mbps
	IEEE 802.11ac: MCS0-MCS15
Antenna Type And Gain	: PIFA antenna, 2.0dBi (Max.) for 2.4G, 5.2G and 5.8G WLAN

# 1.2. Host System Configuration List and Details

Manufacturer	Description	Model	Serial Number	Certificate
TRANSIN	Adapter	TS-A010-050020ADH		VoC

# 1.3. External I/O Port

I/O Port Description	Quantity	Cable
DC Power Port	1	N/A
ATSC Antenna Port	1	N/A

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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.

Test Item		Frequency Range	Uncertainty	Note
		9KHz~30MHz	3.10dB	(1)
		30MHz~200MHz	2.96dB	(1)
Radiation Uncertainty	:	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)

# 1.6. Measurement Uncertainty

(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 802.11a mode (High Channel).

Worst-case mode and channel used for 9kHz-1000 MHz radiated emissions was the mode and channel with the highest output power, that was determined to be IEEE 802.11a 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 802.11a Mode : 6 Mbps, OFDM.

IEEE 802.11ac VHT20 Mode: MCS0

IEEE 802.11n HT20 Mode: MCS0, OFDM.

IEEE 802.11ac VHT40 Mode: MCS0, OFDM.

IEEE 802.11n HT40 Mode: MCS0, OFDM.

IEEE 802.11ac VHT80 Mode: MCS0, OFDM.

Antenna & Bandwidth

Antenna	Single (Port.1)			Two (Port.1 + Port.2)		
Bandwidth Mode	20MHz	40MHz	80MHz	20MHz	40MHz	80MHz
IEEE 802.11a				$\mathbf{\overline{A}}$		
IEEE 802.11n				$\mathbf{\overline{A}}$	$\square$	
IEEE 802.11ac				$\mathbf{\overline{\mathbf{A}}}$		

### 1.8. Frequency of Channels

IEEE 802.11a/n-HT20/ac-VHT20

Frequency Band	Channel No.	Frequency(MHz)	Channel No.	Frequency(MHz)
5180~5240MHz	36	5180	44	5220
5160~5240IMITZ	40	5200	48	5240

# IEEE 802.11n-HT40/ac-VHT40

Frequency Band	Channel No.	Frequency(MHz)	Channel No.	Frequency(MHz)
5190~5230MHz	38	5190	46	5230

### IEEE 802.11ac-VHT80

Frequency Band	Channel No.	Frequency(MHz)	Channel No.	Frequency(MHz)
5210MHz	42	5210		

The test configuration of the test software shows as below:

Test mode	Channel No.	Frequency(MHz)	Software setting value
	36	5180	14
IEEE 802.11a	44	5220	14
	48	5240	14
	36	5180	12
IEEE 802.11n-HT20	44	5220	12
002.1111-1120	48	5240	12
	36	5180	11
	44	5220	11
802.11ac-VHT20	48	5240	11
IEEE	38	5190	12
802.11n-HT40	46	5230	12
IEEE	38	5190	11
802.11ac-VHT40	46	5230	11
IEEE 802.11ac-VHT80	42	5210	11

# 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 KDB 789033 D02 General UNII Test Procedures New Rules v01r04 and KDB 662911 are required to be used for this kind of FCC 15.407 UII device.

According to its specifications, the EUT must comply with the requirements of the Section 15.203, 15.205, 15.207, 15.209 and 15.407 under the FCC Rules Part 15 Subpart E

# 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

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# 3. SYSTEM TEST CONFIGURATION

# 3.1. Justification

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

# 3.2. EUT Exercise Software

The system was configured for testing in a continuous transmits condition and change test channels by software (realtek\_8812AU) provided by application.

# 3.3. Special Accessories

N/A

# 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 E							
FCC Rules	Description of Test	Result						
§15.407(a)	Maximum Conducted Output Power	Compliant						
§15.407(a)	Power Spectral Density	Compliant						
§15.407(a)	26dB Bandwidth	Compliant						
§15.407(a)	99% Occupied Bandwidth	Compliant						
§15.407(b)	Radiated Emissions	Compliant						
§15.407(b)	Band edge Emissions	Compliant						
§15.205	Emissions at Restricted Band	Compliant						
§15.407(g)	Frequency Stability	N/A						
§15.207(a)	Line Conducted Emissions	Compliant						
§15.203	Antenna Requirements	Compliant						
§2.1091	RF Exposure	Compliant						

Note: The customer declared frequency stability is better than 20ppm which ensures that the signal remains in the allocated bands under all operational conditions stated in the user manual.

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# **5. TEST RESULT**

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

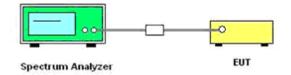
None; for reporting purpose only.

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 802.11a	5.0	5.0	1	100	0	0.01
IEEE 802.11n HT20	5.0	5.0	1	100	0	0.01
IEEE 802.11ac HT20	5.0	5.0	1	100	0	0.01
IEEE 802.11n HT40	5.0	5.0	1	100	0	0.01
IEEE 802.11ac HT40	5.0	5.0	1	100	0	0.01
IEEE 802.11ac HT80	5.0	5.0	1	100	0	0.01

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# 5.2. Maximum Conducted Output Power Measurement

### 5.2.1. Standard Applicable

### (1) For the band 5.15-5.25 GHz.

(i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

(ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1dB reduction in maximum conducted output power is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(iv) 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 250 mW provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

#### 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

The transmitter output (antenna port) was connected to the power meter.

According to KDB 789033 D02 Section 3 (a) Method PM (Measurement using an RF average power meter):

- (i) 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.
- The EUT is configured to transmit continuously or to transmit with a constant duty cycle.
- At all times when the EUT is transmitting, it must be transmitting at its maximum power control level.
- The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five.
- (ii) If the transmitter does not transmit continuously, measure the duty cycle, x, of the transmitter output signal as described in section II.B.
- (iii)Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.
- Adjust the measurement in dBm by adding 10 log (1/x) where x is the duty cycle (e.g., 10 log (iv) (1/0.25) if the duty cycle is 25%).

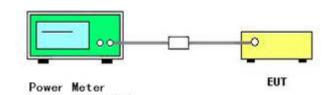
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5.2.4. Test Setup Layout



5.1.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.2.6. Test Result of Maximum Conducted Output Power

Temperature	<b>25</b> ℃	Humidity	60%
Test Engineer	Aking Jin	Configurations	IEEE 802.11a/n/ac

Test	Channel	Frequency	Measured ConductedDutyReportAverage Power (dBm)CycleAverage Power (dBm)						Limits	Verdict	
Mode	Channel	(MHz)	Antenna 0	Antenna 1	Sum	factor (dB)	Antenna 0	Antenna 1	Sum	(dBm)	Verdict
	36	5180	12.63	12.78	/	0.000	12.63	12.78	/		
IEEE 802.11a	44	5220	12.56	12.87	/	0.000	12.56	12.87	/	30.00	PASS
002.11a	48	5240	12.85	12.54	/	0.000	12.85	12.54	/		
IEEE	36	5180	11.87	11.90	14.90	0.000	11.87	11.90	14.90		
802.11n	44	5220	11.79	11.69	14.75	0.000	11.79	11.69	14.75	30.00	PASS
HT20	48	5240	11.86	11.78	14.83	0.000	11.86	11.78	14.83		
IEEE	36	5180	10.68	10.85	13.78	0.000	10.68	10.85	13.78		
802.11ac	44	5220	10.82	10.87	13.86	0.000	10.82	10.87	13.86	30.00	PASS
VHT20	48	5240	10.91	10.65	13.79	0.000	10.91	10.65	13.79		
IEEE	38	5190	10.84	10.54	13.70	0.000	10.84	10.54	13.70		
802.11n HT40	46	5230	10.65	10.84	13.76	0.000	10.65	10.84	13.76	30.00	PASS
IEEE	38	5190	10.48	10.54	13.52	0.000	10.48	10.54	13.52		
802.11ac VHT40	46	5230	10.54	10.54	13.55	0.000	10.54	10.54	13.55	30.00	PASS
IEEE 802.11ac VHT80	42	5210	10.62	10.54	13.59	0.000	10.62	10.54	13.59	30.00	PASS

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 6Mbps at IEEE 802.11a; MCS0 at IEEE 802.11n HT20, IEEE 802.11n HT40, IEEE 802.11a VHT20, IEEE 802.11ac VHT40 and IEEE 802.11ac VHT80;
- 4. For MIMO with CCD technology device, The Directional Gain= Gain of individual transmit antennas (dBi) + Array gain;
  - Array gain = 10 log ( $N_{ant}$ ), where  $N_{ant}$  is the number of transmit antennas.
- 5. Directional Gain =  $2.00 + 10\log(2) = 5.01 \text{ dBi} < 6dBi$ ; no need reduce power limit;
- 6. Report conducted power = Measured conducted average power + Duty Cycle factor;

# 5.3. Power Spectral Density Measurement

### 5.3.1. Standard Applicable

# For 5150~5250MHz

- (i) For an outdoor access point operating in the band 5.15 5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 MHz band.note1
- (ii) For an indoor access point operating in the band 5.15 5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 MHz band.note1
- (iii) For fixed point-to-point access points operating in the band 5.15 5.25 GHz, transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi.
- (iv) For mobile and portable client devices in the 5.15 5.25 GHz band, the maximum power spectral density shall not exceed 11 dBm in any 1 MHz band. note1
- Note1: If transmitting antennas of directional gain greater than 6 dBi are used, the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### 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

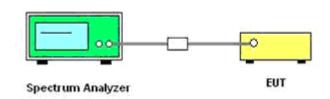
- 1. The transmitter was connected directly to a Spectrum Analyzer through a directional couple.
- 2. The power was monitored at the coupler port with a Spectrum Analyzer. The power level was set to the maximum level.
- 3. Set the RBW = 1MHz.
- 4. Set the VBW  $\geq$  3MHz
- 5. Span=Encompass the entire emissions bandwidth (EBW) of the signal (or, alternatively, the entire 99% occupied bandwidth) of the signal.
- 6. Number of points in sweep ≥ 2 × span / RBW. (This ensures that bin-to-bin spacing is ≤ RBW/2, so that narrowband signals are not lost between frequency bins.)
- 7. Manually set sweep time ≥ 10 × (number of points in sweep) × (total on/off period of the transmitted signal).
- 8. Set detector = power averaging (rms).
- 9. Sweep time = auto couple.
- 10. Trace mode = max hold.
- 11. Allow trace to fully stabilize.
- 12. Compute power by integrating the spectrum across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal using the instrument's band power measurement function with band limits set equal to the EBW (or occupied bandwidth) band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at 1 MHz intervals extending across the EBW (or, alternatively, levels (in power units) at 1 MHz intervals extending across the EBW (or, alternatively,
- 13. 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%.
- 14. Use the peak marker function to determine the maximum power level in any 1MHz band segment within the fundamental EBW.

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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	Aking Jin	Configurations	IEEE 802.11a/n/ac

To at Maria	e Channel Frequency PSD (dBm)		Frequency PSD (dBm)		Array	Duty Cycle	Repo	rt Conducted (dBm)	PSD	PSD	Mandiat	
Test Mode	Channel	(MHz)	Antenna 0	Antenna 1	Sum	Gain (dB)	factor (dB)	Antenna 0	Antenna 1	Sum	Limits (dBm)	Verdict
IEEE	36	5180	4.768	5.212	/	0	0	4.768	5.212	/		
802.11a	44	5220	4.938	5.214	/	0	0	4.938	5.214	/	17.00	PASS
002.11a	48	5240	5.278	5.323	/	0	0	5.278	5.323	/		
IEEE	36	5180	3.542	3.800	6.68	3.010	0	3.542	3.800	6.68		
802.11n	44	5220	3.720	3.849	6.80	3.010	0	3.720	3.849	6.80	17.00	PASS
HT20	48	5240	3.823	3.910	6.88	3.010	0	3.823	3.910	6.88		
IEEE	36	5180	2.718	2.852	5.80	3.010	0	2.718	2.852	5.80		
802.11ac	44	5220	2.695	2.762	5.74	3.010	0	2.695	2.762	5.74	17.00	PASS
VHT20	48	5240	2.980	2.971	5.99	3.010	0	2.980	2.971	5.99		
IEEE	38	5190	0.781	1.324	4.07	3.010	0	0.781	1.324	4.07		
802.11n HT40	46	5230	1.028	1.297	4.17	3.010	0	1.028	1.297	4.17	17.00	PASS
IEEE	38	5190	-0.131	-0.179	2.86	3.010	0	-0.131	-0.179	2.86		
802.11ac VHT40	46	5230	-0.331	0.062	2.88	3.010	0	-0.331	0.062	2.88	17.00	PASS
IEEE 802.11ac VHT80	42	5210	-1.641	-1.745	1.32	3.010	0	-1.641	-1.745	1.32	17.00	PASS

# Remark:

- 1. Measured 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 6Mbps at IEEE 802.11a; MCS0 at IEEE 802.11n HT20, IEEE 802.11n HT40, IEEE 802.11a VHT20, IEEE 802.11ac VHT40 and IEEE 802.11ac VHT80;
- 4. For MIMO with CCD technology device, The Directional Gain= Gain of individual transmit antennas (dBi) + Array gain;

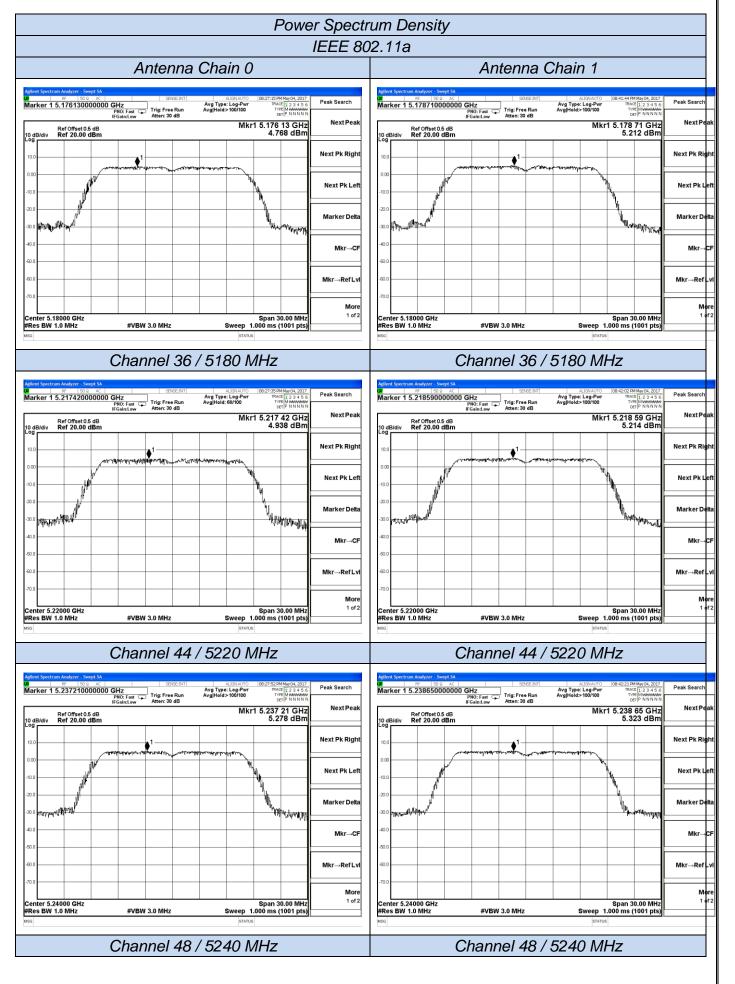
Array gain = 10 log ( $N_{ant}$ ), where  $N_{ant}$  is the number of transmit antennas.

- 5. Directional Gain = 2.00 + 10log (2) = 5.01 dBi < 6dBi; no need reduce power spectrum density limit;
- 6. Report conducted PSD = Measured conducted average power + Duty Cycle factor;
- 7. Please refer to following test plots;

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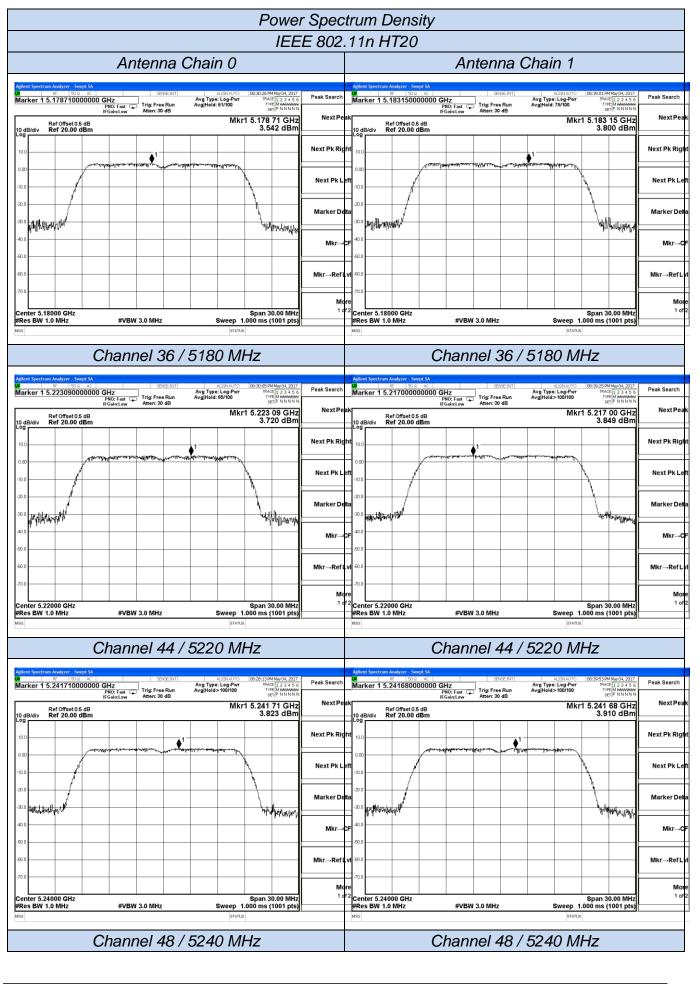
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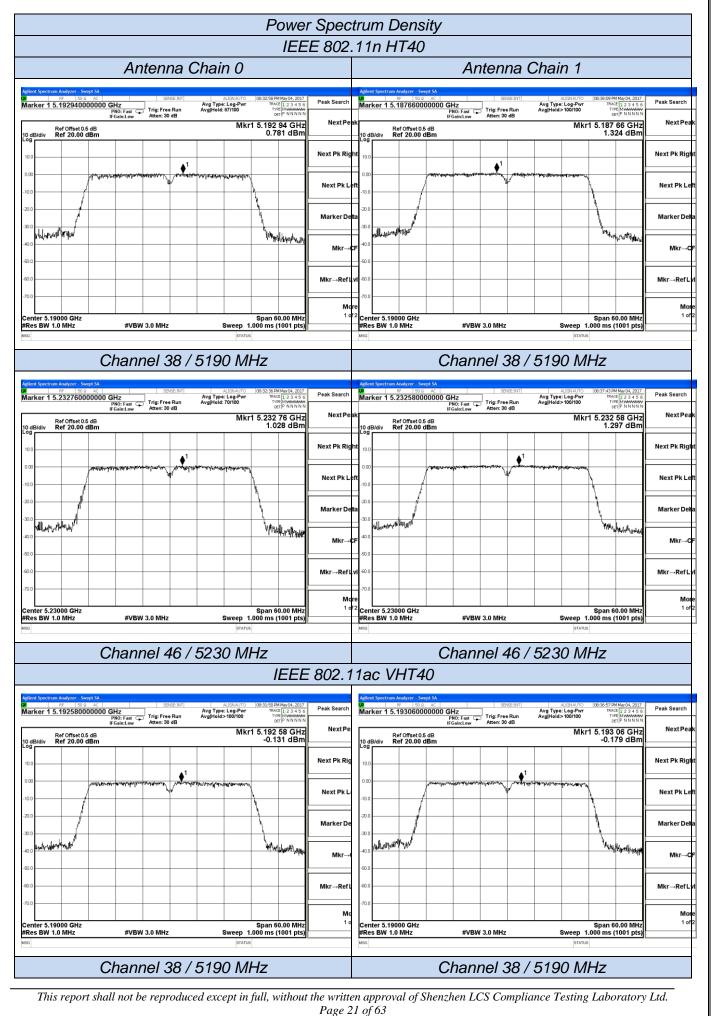
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		rum Density	
IEEE Antenna Chain 0	: 802.1	1ac VHT20 Antenna Chain 1	
Aglient Spectrum Analyzer - Swept SA		Affert Spectrum Analyzer Swept SA	
RF         190         AC         SERSEINT         AUSIAUTO         068304/98 Mondy, 2017           Marker 1 5.176790000000 GHz PRI0: Fast IFGaint.low         Avg Type: Log-Pwr Avglirioid: 88/100         Trig: Free Run Avglirioid: 88/100         Avg Type: Log-Pwr Trig: Free Run Atten: 30 dB         Avg Type: Log-Pwr Trig: Free Run Avglirioid: 88/100         Trig: Free Run Trig: Free Run	Peak Search Next Pea	Marker 1 5. 17 620000000 GHZ         Trig: Free Run         Avgihid>100/100         Trig: Kee Run           PR00: Fast         Trig: Free Run         Avgihid>100/100         Trig: Kee Run           IFGaint.ow         Atten: 30 dB         0EI P NNNN	Peak Search Next Peal
Ref Offset 0.5 dB Mkr1 5.176 79 GHz 10 dB/div Ref 20.00 dBm 2.718 dBm 2.718 dBm		10 dB/div Ref 20.00 dBm 2.852 dBm	
	Next Pk Rig		Next Pk Righ
	Next Pk Le		Next Pk Lei
	Marker De		Marker Delt
400	Mkr→C	-40.0	Mkr→Ci
60.0	Mkr→RefL	<b>n</b> 600	Mkr→Refl.v
Center 5,18000 GHz Span 30.00 MHz	<b>Mo</b> 1 of	e 2 Center 5.18000 GHz Span 30.00 MHz	Mon 1 df:
#Res BW 1.0 MHz #VBW 3.0 MHz Sweep 1.000 ms (1001 pts)	L	#Res BW 1.0 MHz #VBW 3.0 MHz Sweep 1.000 ms (1001 pts)	
Channel 36 / 5180 MHz		Channel 36 / 5180 MHz	
Agilent Spectrum Analyzer         Swigt SA           8         RF         SD g         Ac         SPREEINT         ALISHAUTO         063106 PM Mg/4, 2017           Marker 1 5.224110000000 GHz PN0: Fast         Trig: Free Run         Avg Type: Log-Pwr AvgHold>100100         TPAE PPIC: Fast         Trig: Free Run         Avg Hold>100100         TPAE PPIC: Fast         Trig: Free Run         AvgHold>100100         TPAE PPIC: Fast         TPAE	Peak Search	PIO: Fast Trig: Free Run AvgHold>100/100 TYPE	Peak Search
Ref Offset 0.5 dB Mkr1 5.224 11 GHz 10 dB/div Ref 20.00 dBm 2.695 dBm	NextPea	IFGain:Low Atten: 30 dB DETPENNINN	NextPea
	Next Pk Rig		Next Pk Righ
	Next Pk Le		Next Pk Lei
	Marker De		Marker Delt
000 uspermetality	Mkr→C		Mkr→C
60.0	Mkr→RefL	400	Mkr→RefL
70.0	Ma	e	Mon
Center 5.22000 GHz Span 30.00 MHz Sweep 1.000 ms (1001 pts) #Res BW 1.0 MHz #VBW 3.0 MHz Sweep 1.000 ms (1001 pts) Mag	1 0	2         Center 5.22000 GHz         Span 30.00 MHz           #Res BW 1.0 MHz         #VBW 3.0 MHz         Sweep 1.000 ms (1001 pts)           wso         strung	1 df:
Channel 44 / 5220 MHz		Channel 44 / 5220 MHz	
Aglient Spectrum Analyzer - Sweyt SA BE 1910 - Ar 1920 - Stratt Bill Spectrum - Bill Stratter (1921) - Stratter - St Stratter - Stratter - Stra		Applerd Spectrum Analyzer - Swept SA	
Marker 1 5.23832000000 GHz PRO: Fost IFGelincLow	Peak Search Next Pea	Marker 1 5.23694000000 GHz PH0: Factor Trig: Free Run PGsint.ow Free Run Aten: 30 dB	Peak Search Next Peal
Ref offset 0.5 dB         MKr1 5.238 32 GHZ           10 dBidiv         Ref 20.00 dBm         2.980 dBm		10 dB/div Ref 20.00 dBm 2.971 dBm	
	Next Pk Rig		Next Pk Righ
-10.0	Next Pk Le		Next Pk Lei
	Marker De		Marker Delt
400	Mkr→C		Mkr→Cl
600	Mkr→RefL	1                   <del> </del> -	Mkr→Refl.v
-70.0 Center 5.24000 GHz Span 30.00 MHz	<b>Mo</b> 1 of	P 2 Center 5.24000 GHz Span 30.00 MHz	Mon 1 cf:
#Res BW 1.0 MHz         #VBW 3.0 MHz         Sweep 1.000 ms (1001 pts)           Miso         prants         prants		#Res BW 1.0 MHz         #VBW 3.0 MHz         Sweep 1.000 ms (1001 pts)           #so         status	
Channel 48 / 5240 MHz		Channel 48 / 5240 MHz	

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Power Spectrum Density					
IEE	E 802.1	11ac VHT40			
Antenna Chain 0			Antenna (	Chain 1	
Agllent Spectrum Analyzer - Swept SA		Agilent Spectrum Analyzer - Swept SA			
Marker 15.2267000000000 GHz         Trig: Free Run         Auguntor         Bit Ruce Rug           PN0: Fast         PN0: Fast         Trig: Free Run         AvgtHold>100/100         Tric: Ruce Rug           Ficialit.cov         Atten: 30 B         B         Cert PN1         Cert PN1	Peak Search	Marker 1 5.232760000000	GHz PNO: Fast C Trig: Free Run IFGain:Low Atten: 30 dB	ALIGNAUTO 06:37:20 PM May 04, 2017 Avg Type: Log-Pwr TRACE 12 3 4 5 6 Avg[Hold: 96/100 TYPE IM WAWAWAWAWAWAWAWAWAWAWAWAWAWAWAWAWAWAWA	Peak Search
Ref Offset0.5 dB Mkr1 5.226 70 G 10 dB/div Ref 20.00 dBm -0.331 dE	Hz NextPe 3m	Ref Offset 0.5 dB 10 dB/div Ref 20.00 dBm	in Gain. Cow	Mkr1 5.232 76 GHz 0.062 dBm	NextPeak
	Next Pk Rig	Log			Next Pk Right
			and the second s	Kandaling and a strength and a stren	
	Next Pk L	eft	The last starts of the start		Next Pk Left
-20.0	Marker De	-20.0			Marker Della
		-30.0			
-0.0 philosocial and	Mir→	CF		man dispersion	Mkr→CF
80.0		-50.0			
	Mkr⊸Ref	-70.0			Mkr→RefLv
Center 5.23000 GHz Span 60.00 N	Mc 1 c	re <sup># 2</sup> Center 5.23000 GHz		Span 60.00 MHz	More 1 of 2
Bit Res BW 1.0 MHz         #VBW 3.0 MHz         Sweep 1.000 ms (1001 j status)		#Res BW 1.0 MHz	#VBW 3.0 MHz	Sweep 1.000 ms (1001 pts)	
Channel 46 / 5230 MHz			Channel 46 /	5000 M/L I-	
	- F 000	_	Jnannei 40 /	5230 MITZ	
	E 802.1	1ac VHT80			
Aglent Spectrum Analyzer - Swrgt SA         RF         SD 62         RE         SD 62         SD 62 <t< td=""><td>Peak Search</td><td>Agilent Spectrum Analyzer - Swept SA           Ø         RF         50.0.2.AC           Marker 1 5.227640000000</td><td>GHz SENSE:INT</td><td>ALIGNAUTO 08:36:24 PM May04, 2017 Avg Type: Log-Pwr TRACE 12 3 4 5 6 Avg Hold&gt;100/100 TYPE Huwwww</td><td>Peak Search</td></t<>	Peak Search	Agilent Spectrum Analyzer - Swept SA           Ø         RF         50.0.2.AC           Marker 1 5.227640000000	GHz SENSE:INT	ALIGNAUTO 08:36:24 PM May04, 2017 Avg Type: Log-Pwr TRACE 12 3 4 5 6 Avg Hold>100/100 TYPE Huwwww	Peak Search
PN0: Fast Trig: Free Run Avg Hold>100/100 Intellivity IFGain:Low Atten: 30 dB		ak	PNO: Fast Trig: Free Run IFGain:Low Atten: 30 dB	Avg Type: Log-Pwr Avg Hold>100/100 Mkr1 5.227 64 GHz	NextPeak
Ref Offset 05 dB WIKF1 5.252 92 G 10 dB/div Ref 20.00 dBm -1.641 dE -09	3m	Ref Offset 0.5 dB 10 dB/div Ref 20.00 dBm		-1.745 dBm	
10.0	Next Pk Rig	ht 10.0			Next Pk Right
0.00 Andrew and a second marked and a second and a second and a second a se	Next Pk L	0.00	menunutration line and bardeness	prover and a state of the second state of the	Next Pk Left
-10.0		-10.0			
	Marker De	-20.0			Marker Della
		-30.0			
100 milesterile	Mkr→	CF -40.0		Repairston	Mkr→C
60.0	Mkr→Ref	vi -60.0			Mkr→RefLv
70.0		-70.0			
Center 5.21000 GHz Span 120.0 N	IHz 1 d	<sup>2</sup> Center 5.21000 GHz		Span 120.0 MHz	More 1 of 2
#Res BW 1.0 MHz         #VBW 3.0 MHz         Sweep 1.000 ms (1001 ms)           Msc         [status]		#Res BW 1.0 MHz	#VBW 3.0 MHz	Sweep 1.000 ms (1001 pts)	
Channel 48 / 5210 MHz Channel 48 / 5210 MHz					

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# 5.4. 99% and 26dB Occupied Bandwidth Measurement

# 5.4.1. Standard Applicable

No restriction limits. But resolution bandwidth within band edge measurement is 1% of the 99% occupied bandwidth.

# 5.4.2. Measuring Instruments and Setting

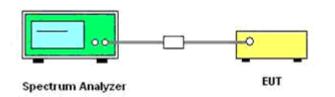
Please refer to section 6 of equipment list in this report. The following table is the setting of the Spectrum Analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span	> 26dB Bandwidth
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 of 300 KHz and the video bandwidth of 1000 KHz were used.
- 3. Measured the spectrum width with power higher than 26dB 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 99% and 26dB Occupied Bandwidth

Temperature	<b>25</b> ℃	Humidity	60%
Test Engineer	Aking Jin	Configurations	IEEE 802.11a/n/ac

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Test Mode	Channel	Frequency	26dB Bandwidth (MHz)		99% Bandwidth (MHz)	Limits	Verdict	
		(MHz)	Antenna 0	Antenna 1	Antenna 0	Antenna 1	(MHz)	
	36	5180	19.95	19.80	16.950	16.950		
IEEE 802.11a	44	5220	19.76	19.96	16.944	16.949	No Limit	PASS
	48	5240	20.04	19.86	16.859	16.952		
IEEE 802.11n	36	5180	19.87	19.99	17.799	17.788		
HT20	44	5220	19.95	19.93	17.812	17.813	No Limit	PASS
11120	48	5240	20.04	19.99	17.801	17.808		
IEEE 802.11ac	36	5180	20.07	19.94	17.805	17.803		
VHT20	44	5220	19.98	19.95	17.808	17.771	No Limit	PASS
VIIIZO	48	5240	19.97	19.82	17.783	17.811		
IEEE 802.11n	38	5190	39.97	39.59	36.171	36.230	No Limit	PASS
HT40	46	5230	40.18	39.90	36.193	36.211		FA33
IEEE 802.11ac	38	5190	39.96	40.27	36.206	36.215	No Limit	PASS
VHT40	46	5230	40.17	39.92	36.171	36.194	No Limit	FA33
IEEE 802.11ac VHT80	42	5210	89.70	81.02	75.752	75.796	No Limit	PASS

Remark:

1. Measured 99% and 26dB 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 6Mbps at IEEE 802.11a; MCS0 at IEEE 802.11n HT20, IEEE 802.11n HT40, IEEE 802.11a VHT20, IEEE 802.11ac VHT40 and IEEE 802.11ac VHT80;
- 4. Please refer to following test plots;

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 FCC ID: ZJU-IE7D4N

Report No.: LCS170421078AE

99% and 26dB Occupied Bandwidth				
IEEE 802.11a				
Antenna Chain 0		Antenna Chain 1		
Agilent Spectrum Analyzer - Occupied BW         SPICE INT         ALISINAUTO         D06:05:49 PM May(04, 2002)           DB         BF         50:9.2         AC         SPICE INT         ALISINAUTO         D06:05:49 PM May(04, 2002)           Center Freeg 5.1800000000 GHz         Center Freeg 5.1800000000 GHz         Radio Stdt. None	Trace/Detector	Adjent Spectrum Analyzer - Occupied BW         Stress Intl         AUGNAUTO         (0621) IDPM May 94, 2017         Trac           Center Freeg 5.1800000000 GHz         Center Freeg 5.1800000000 GHz         Radio Std: None         Trac	ace/Detector	
Trig: Free Run Avg(Hold>10/10 #/FGainLow #Atten: 30 dB Radio Device: BTS		Internet Freq 5. 10000000 GHZ Tig: Free Run Avg Hold>10/10 #/FGaint.ew #Atten: 30 dB Radio Device: BTS		
10 dB/div Ref 20.00 dBm		10 dB/div Ref 20.00 dBm		
	Clear Wri	e 0.00 10.0 // // /////////////////////////////	Clear Write	
	Avera	1 a	Average	
400 000	Max Ho		Maxidalid	
-70.0 Center 5.18 GHz Span 30 MHz	Max Hu	Center 5.18 GHz Span 30 MHz	Max Hold	
#Res BW 300 kHz #VBW 1 MHz Sweep 1 ms Occupied Bandwidth	Min Hd	#Pac BW 300 kHz #VBW 1 MHz Swaap 1 mc	Min Hold	
16.950 MHz	Detect	16.950 MHz	Detector Peak▶	
Transmit Freq Error 46.725 kHz OBW Power 99.00 % x dB Bandwidth 19.95 MHz x dB -26.00 dB	Auto <u>M</u>	Im         Transmit Freq Error         -36.593 kHz         OBW Power         99.00 %         Auto           x dB Bandwidth         19.80 MHz         x dB         -26.00 dB         Image: Compare Science S	<u>Man</u>	
NSG STATUS		MSO STATUS		
Channel 36 / 5180 MHz		Channel 36 / 5180 MHz		
Addent Spectrum Analyzer - Occupied BW         SPREEINT         RUSHNUTO         092-430PMMar(H, 2022           Center Freq: 5.22000000 GHz         Center Freq: 5.22000000 GHz         Radio Std: None	Trace/Detector	Adjust Spectrum Analyzer - Occupied BW         Stress Infl         AUDIA/TO         IOS24114 PM Mar(9, 2012)           Center Free 5.220000000 GHz         Center Free 5.220000000 GHz         Trac         Trac	ace/Detector	
Center Freq 5.22000000 GHz Center Freq 5.22000000 GHz Radio Std: None //Fig-Freq Knun Avg Hold>10/10 //FGaint.ew Adden: 30 dB Radio Device: BTS		Center Freq 5.220000000 GHz Center Freq: 5.22000000 GHz Radio Std: None #IFCain:Lew #Atten: 30 dB Radio Lovice: BTS		
10 dB/div Ref 20.00 dBm		10 dB/div Ref 20.00 dBm		
100 material and a second and a second and a second a sec	Clear Wri		Clear Write	
	Avera	1	Average	
200 http://www.thp.ac.n.th 400 http://www.thp.ac.n.th 500				
-70.0	Max Ho		Max Hold	
#ResBW 300 kHz #VBW 1 MHz Sweep 1 ms	Min Hd	d <sup>#Res BW 300 kHz #VBW 1 MHz Sweep 1 ms</sup>	Min Hold	
Occupied Bandwidth 16.944 MHz	Detect	Occupied Bandwidth	Detector Peak▶	
Transmit Freq Error -32.416 kHz OBW Power 99.00 % x dB Bandwidth 19.76 MHz x dB -26.00 dB	Auto <u>M</u>	Transmit Freq Error         -30.982 kHz         OBW Power         99.00 %         Auto           x dB Bandwidth         19.96 MHz         x dB         -26.00 dB         -	Man	
MSG STATUS		450 STATUS		
Channel 44 / 5220 MHz		Channel 44 / 5220 MHz		
Agilent Spectrum Analyzer - Occupied BW           Agilent Spectrum Analyzer - Occupied BW           BF         50.0         AC         SENSE.UNT         ALISIAUTO         D8:06:37 PM Mar(04, 2017)	Tracing	Agtient Spectrum Analyzer - Occupied BW ■ RF 50 2 AC SENSE.INT ALIGNAUTO (062031PM MayO4,2017	Detroit	
Center Freq 5.240000000 GHz Center Freq 5.24000000 GHz Radio Std: None Trig Freq Run Avg Hold>10/10 #Atten: 30 dB Radio Device: BTS	Trace/Detector	Center Freq 5.240000000 GHz Center Freq 5.2400000 GHz Radio Std: None ///FGain:Lew #Atten: 30 dB Radio Lovice: BTS	ace/Detector	
10 dB/div Ref 20.00 dBm Log		10 dB/div Ref 20.00 dBm		
100	Clear Wri		Clear Write	
	Avera		Average	
60.0	Max Ho		Max Hold	
Center 5.24 GHz Span 30 MHz #Res BW 300 kHz #VBW 1 MHz Sweep 1 ms	Min Hd		Min Hold	
Occupied Bandwidth 16.859 MHz	Detect	Occupied Bandwidth 16.952 MHz	Detector	
Transmit Freq Error 22.989 kHz OBW Power 99.00 % x dB Bandwidth 20.04 MHz x dB -26.00 dB	Peak Auto <u>Ma</u>		Peak≯ <u>Man</u>	
MSG STATUS		MSG STATUS		
Channel 48 / 5240 MHz		Channel 48 / 5240 MHz		

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99% and 260	dB Occupied Bandwidth	
IEEE	E 802.11n HT20	
Antenna Chain 0	Antenna Chain 1	
Incentre ried 3, 10000000 GHZ Tigs Free Run Avg Hold>10/10 #IFGain:Lew #Atten: 30 dB Radio Device: BTS	Ific Free Ran AvgiHeid>10/10 Radio Device: BTS	ce/Detector
10 dBaiw Ref 20.00 dBm	Average 300	Clear Write Average
7:00 Center 5,18 GHz Span 30 MHz	MaxHclid <sup>420</sup> / <sub>700</sub> Center 5.18 GHz Span 30 MHz	Max Hold
Center 3, 18 GH2         Spar 30 Imm2           #Res BW 300 kHz         #VBW 1 MHz         Sweep 1 ms           Occupied Bandwidth	Center 3, ro Graz         #VBW 1 MHz         Span 30 timz           Min Hold         #Res BW 300 kHz         #VBW 1 MHz         Sweep 1 ms           Occupied Bandwidth	Min Hold
17.799 MHz	Detector Pearl Nuto Min x dB Bandwidth 19.99 MHz x dB -26.00 dB	Detector Peak Man
Channel 36 / 5180 MHz	Channel 36 / 5180 MHz	
Addent Seetram Analyzer - Occarded BW		
Agentini Anazyer Occupied by/         Street-Intil         ALIGNATIC         (08:24:59 FPM MinyO4, 2017)           Center Freq 5.220000000 GHz         Center Freq 5.22000000 GHz         Center Freq 5.22000000 GHz         Radio Std: None           #IF 500 #AD         #IFGaint.ew         #Atten: 30 dB         Augitidiz>1010         Radio Device: BTS           10 dB/div         Ref 20.00 dBm         Fig. Free Aug.         Augitidiz>100         Radio Device: BTS	Agentin Analyzer Uncupied BW         State PM         ALIGNAUTO         Des23-44 PM Mar(94, 2017)         Trace/           Trace/Detecto         Image: Signame Comparison of	ce/Detector
Log 100 100 100 100 100 100 100 10	Log 10.0	Clear Write Average Max Hold Min Hold
17.812 MHz         Power         99.00 %         A           Transmit Freq Error         26.734 kHz         OBW Power         99.00 %         A           x dB Bandwidth         19.95 MHz         x dB         -26.00 dB         A	Detector Peak+ Main Transmit Freq Error 25.857 kHz OBW Power 99.00 % x dB Bandwidth 19.93 MHz x dB -26.00 dB	Detector Peak≯ Man
Channel 44 / 5220 MHz	Channel 44 / 5220 MHz	
Trig: Free Run AvgiHold>10/10 Red Device: BTS 10 dB/div Ref 20.00 dBm	Trig: Free Run Avg[Hold>10/10 Radio Device: BTS	ce/Detector
Log 100 100 100 100 100 100 100 10		Clear Write Average Max Hold Min Hold
Occupied Bandwidth 17.801 MHz	Occupied Bandwidth	Detector
Transmit Freq Error 23.481 kHz OBW Power 99.00 % x dB Bandwidth 20.04 MHz x dB -26.00 dB	Peek         Man         Transmit Freq Error         18.022 kHz         OBW Power         99.00 %         Auto           x dB Bandwidth         19.99 MHz         x dB         -26.00 dB <td>Peak Peak</td>	Peak Peak
MSG STATUS	M6G STATUS	
Channel 48 / 5240 MHz	Channel 48 / 5240 MHz	

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99% and 26dB Occupied Bandwidth				
IEEE	802.1	1ac VHT20		
Antenna Chain 0		Antenna Chain 1		
Aglient Spectrum Analyzer - Occupied BW RF 50 9 AC SPECINT ALIGNAUTO (08:07:59 PM May04, 2017	Trace/Detector	Addrest Sysectrum Analyzer - Occupied BW         Street Fail         ALIGNAUTO         Dis2245 PM Mar(04, 2017)         Trace/Detecto           M         FF         50.9         AC         Street Failer         ALIGNAUTO         Dis2245 PM Mar(04, 2017)         Trace/Detecto		
Center Free 5.180000000 GHz         Center Free 5.18000000 GHz         Radio Std: None           Trig: Free Runn         AvgiHold>10/10           #IFGaint.ew           10 dB/div         Ref 20.00 dBm	Tacobetector	Center Freq 5.180000000 GHz Center Freq 5.18000000 GHz Radio Std: None Info: Center Freq 5.18000000 GHz Radio Device: BTS		
	Clear Wri	Log Clear Wr		
	Avera			
www.me	Max Ho	400 0000000000000000000000000000000000		
-70.0 Center 5.18 GHz #Res BW 300 kHz #VBW 1 MHz Sweep 1 ms		-700 Center 5.18 GHz Span 30 MHz		
Occupied Bandwidth	Min Ho	Occupied Bandwidth		
17.805 MHz Transmit Freq Error 17.997 kHz OBW Power 99.00 % x dB Bandwidth 20.07 MHz x dB -26.00 dB	Detect Pea Auto <u>M</u>	Pea		
M50 STATUS		MSO STATUS		
Channel 36 / 5180 MHz		Channel 36 / 5180 MHz		
Aglent Spectrum Analyzer         Occupied BW           B         PF         SD g         AC         SSREEDIT         ALIGNAUTO         08:2513 PM Mar04, 2017           Center Freq 5.22000000 GHz         Center Freq 5.22000000 GHz         Trig: Free Run         Auglicid: 101/0         Radio Std: None	Trace/Detector	Applent Spectrum Analyzer         Decopied BW           B         PF         SD 2         AC         SERVED TI         ALIGNAUTO         (09:2204 FM May04, 2017)           Center Freq 5.22000000 GHz         Center Freq 5.22000000 GHz         Center Freq 5.22000000 GHz         Trace/Detecto           Trig: Free Run         AvgII/Idd>         AvgII/Idd>         1010         Std: None		
#FGaint.ew #Atten: 30 dB Radio Device: BTS		#IFGaint.ew #Atten: 30 dB Radio Device: BTS		
0g 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Clear Wri	Log Clear Wr		
	Avera			
		400 Carlor and a		
600 700 Center 5.22 GHz Span 30 MHz	Max Ho	Id 600 MaxH		
#Res BW 300 kHz #VBW 1 MHz Sweep 1 ms Occupied Bandwidth	Min Ho	#Dec BW 300 kHz #VBW 1 MHz Sween 1 ms		
17.808 MHz Transmit Freq Error 18.581 kHz OBW Power 99.00 %	Detect Pea Auto M	or 17.771 MHz Detec		
x dB Bandwidth 19.98 MHz x dB -26.00 dB		x dB Bandwidth 19.95 MHz x dB -26.00 dB		
M60 STATUS		M6G STATUS		
Channel 44 / 5220 MHz		Channel 44 / 5220 MHz		
Agient Spectrum Analyzer - Occupied BW         SENEEINT         ALUSIAUTO         06:11:27 PM Mgr04; 2017           IF         55 0.0         A.C         SENEEINT         ALUSIAUTO         06:11:27 PM Mgr04; 2017		Aglend Spectrum Analyzer - Occupied BW		
Center Freq 5.240000000 GHz #IFGeint.cw Center Freq: 5.240000000 GHz Radio Std: None Trig: Free Run Avg Hold>10/10 Radio Std: None #IFGeint.cw Run Avg Hold>10/10 Radio Std: None	Trace/Detector	Center Freq 5.240000000 GHz #IFGainLow Trig: Free Run Avg Hold>10/10 Radio Device: BTS		
10 dB/div Ref 20.00 dBm		10 dB/div Ref 20.00 dBm		
	Clear Wri	Clear Wr           0.00		
	Avera			
100 D V V V V V V V V V V V V V V V V V V	Max Ho	500		
Center 5.24 GHz Span 30 MHz		700 Center 5.24 GHz Span 30 MHz		
#Res BW 300 kHz #VBW 1 MHz Sweep 1 ms Occupied Bandwidth	Min Ho	Occupied Bandwidth		
17.783 MHz Transmit Freq Error 20.616 kHz OBW Power 99.00 %	Detect Pea Auto <u>M</u>	Pea Pea		
x dB Bandwidth 19.97 MHz x dB -26.00 dB		x dB Bandwidth 19.82 MHz x dB -26.00 dB		
MSO		MSG		
Channel 48 / 5240 MHz		Channel 48 / 5240 MHz		

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99% and 26dB Occupied Bandwidth				
	E 802.	11n HT40		
Antenna Chain 0		Antenna Chain 1		
Aglent Spectrum Analyzer Docugled BW S902 AC Sector Analyzer Docugled BW S902 AC Sector Analyzer Docugled BW S902 AC Sector Freq 5.190000000 GHz Radio Std: None Avg Hold>10/10 Radio Std: None Radio Std: None Radio Device: BTS	Trace/Detector	Aglent Spectrum Analyzer - Occupied BW A BF 50 a AC State Freq 5.190000000 GHz Center Freq 5.190000000 GHz IffGain:Low #Atten: 30 dB Radio Device: BTS Center Freq 5.190000000 GHz Radio Device: BTS	ace/Detector	
10 dBdiv Ref 20.00 dBm	Clear Wr	10 dB/div Ref 20.00 dBm	ClearWrite	
	Avera Max Ho	10 000	Average Max Hold	
Center 5.19 GHz Span 60 MHz #Res BW 430 KHz #VBW 1.5 MHz Sweep 1 ms	Min Ho	Center 5.19 GHz Span 60 MHz Inf#Res BW 430 KHz #VBW 1.5 MHz Sweep 1 ms	Min Hold	
Occupied Bandwidth 36.171 MHz Transmit Freq Error 23.014 kHz OBW Power 99.00 % x dB Bandwidth 39.97 MHz x dB -26.00 dB	Detect Pea Auto M	Occupied Bandwidth 36.230 MHz	Detecto Peako <u>Ma</u> r	
MSG STATUS		M5G STATUS		
Channel 38 / 5190 MHz		Channel 38 / 5190 MHz		
Aglent Spectrum Analyzer         Occupied BW         SDREED(1)         ALSPLAUTO         06:13-40 PM MaryH, 2017           0         P         50 0:::::::::::::::::::::::::::::::::::	Trace/Detector	Aglient Spectram Analyzer - Occupied BW         Strees: Diff         ALISIAUTO         Deside WinerOdy, 2002         Train           W         RF         50.9         AC         Strees: Diff         ALISIAUTO         Deside VM Mar(Ody, 2002)         Train           Center Freq. 5.230000000 GHz         Radio Std: None         Train         Train         Train         Radio Std: None         Radio Device: BTS         Train	ace/Detector	
10 dB/div Ref 20.00 dBm Log 100 000 000 000 000	Clear Wr	10 dB/div Ref 20.00 dBm	ClearWrite	
	Avera		Averag	
600         700         Span 60 MHz           701         Span 60 MHz         Span 60 MHz           #Res BW 430 kHz         #VBW 1.5 MHz         Sweep 1 ms	Max Ho	70.0 Center 5.23 GHz Span 60 MHz WDW 15 MHz Swarp 1 mp	Max Hold	
Occupied Bandwidth 36.193 MHz Transmit Freq Error 59.417 kHz OBW Power 99.00 % x dB Bandwidth 40.18 MHz x dB -26.00 dB	Min Ho Detect Pea Auto M	Occupied Bandwidth	Min Hol Detecto Peaki <u>Ma</u>	
MSO STATUS		ма		
Channel 46 / 5230 MHz		Channel 46 / 5230 MHz		
IEEE	802.1	1ac VHT40		
Addrett Syectrum Analyzer         Occupied BW         State         State         LUSAUTO         Oct 12:25 SM Mer/04, 2017           Center Freq 5, 190000000 GHz         Center Freq: 5, 190000000 GHz         Radio Std: None           #IF Gain:Lew         Freq: S, 190000000 GHz         Radio Device: BTS	Trace/Detecto	Addrent Spectrum Analyzer - Occupied BW         SENSE INT         ALISIAUTO         DEal12PM May04, 2017         Train State           Center Freq 5, 190000000 GHz         Center Freq; 5,19000000 GHz         Center Freq; 5,19000000 GHz         Train State         Radio Std: None         Train State         Radio Std: None         Train State         Radio Std: None         Radio Std: None         Radio Std: None         Radio Device: BTS         Rad	ace/Detector	
10 dB/div Ref 20.00 dBm	Clear Wr	100 - Marken marker and marker and a start	Clear Write	
	Avera	200 300 400 adjuter Theorem	Averag	
60.0 70.0 Center 5.19 GHz #VBW 1.5 MHz Span 60 MHz #Res BW 430 kHz #VBW 1.5 MHz Sweep 1 ms	Max Ho	60.0 70.0 Center 5.19 GHz #Res BW 430 kHz #VBW 1.5 MHz Sweep 1 ms	Max Hol	
#Res BW 430 kHz #VBW 1.5 MHz Sweep 1 ms Occupied Bandwidth 36.206 MHz	Min Ho Detect Pea	#Res BW 430 kHz #VBW 1.5 MHz Sweep 1 ms Occupied Bandwidth 36.215 MHz	Min Hol Detecto Peak	
Transmit Freq Error 34.070 kHz OBW Power 99.00 % x dB Bandwidth 39.96 MHz x dB -26.00 dB	Pea Auto <u>M</u>	Transmit Freq Error     40.000 kHz     OBW Power     99.00 %       x dB Bandwidth     40.27 MHz     x dB     -26.00 dB	Peako <u>Mar</u>	
Channel 38 / 5190 MHz	Channel 38 / 5190 MHz Channel 38 / 5190 MHz			
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99% and 26dB Occupied Bandwidth					
IEEE 802.11ac VHT40					
Antenna Chain 0		Antenna Chain 1			
Center Preq 3.23000000 GHZ     Trig: Free Run Avgiteid>10/10     #IFGainLow #Atten: 30 dB Radio Device: BTS	Frace/Detector	Addind Spectrum Audyrat. Dessyled BW PP 192 26 26 Center Freq 5.230000000 GHz Bil Gaint. Dw Freq 5.2	Trace/Detector		
10 dBdiv Ref 20.00 dBm	Clear Write Average	10 dB/div Ref 20.00 dBm	Clear Write Average		
400 programment	Max Hold	40.0 Million 17 Ford	Max Hold		
Center 5.23 GHz         Span 60 MHz           #Res BW 430 kHz         #VBW 1.5 MHz         Sweep 1 ms		700			
WRES BW 4-30 KHZ SWEEP THIS Occupied Bandwidth	Min Hold	Occupied Bandwidth	Min Hold		
36.171 MHz Transmit Freq Error 57.199 kHz OBW Power 99.00 % Aut x dB Bandwidth 40.17 MHz x dB -26.00 dB	Detector Peak≯ to <u>Man</u>	36.194 MHz Transmit Freq Error 49.309 kHz OBW Power 99.00 % x dB Bandwidth 39.92 MHz x dB -26.00 dB	Detector Peak≯ Auto <u>Man</u>		
MSG STATUS		NSG STATUS			
Channel 46 / 5230 MHz		Channel 46 / 5230 MHz			
IEEE	802.1	1ac VHT80			
Trig: Free Run Avg Hold>10/10 #IFGainLew #Atten: 30 dB Radio Device: BTS 10 dB/div Ref 20.00 dBm	Frace/Detector	Aglent Spectrum Analyzer - Decugied BW         SPECE INT         ALIGNAUTO         081706 FM Mar/01, 2017           VBW 3,0000 MHz         Center Free; 5210000000 GHz         Radio Stel: None         Trig: Free Run Avg Hold>10/10           III Feaint.uw         III Feaint.uw         Free; 5310000000 GHz         Radio Device: BTS           10 dB/div         Ref 20.00 dBm         Free; 51000000000000000000000000000000000000	Trace/Detector		
	Clear Write Average	Log 100 000 200 200 400 400 400 400 4	Clear Write		
	Max Hold	500 600 700	Max Hold		
Center 5.21 GHz Span 120 MHz #Res BW 1 MHz #VBW 3 MHz Sweep 1 ms	Min Hold	Center 5.21 GHz Span 120 MHz #Res BW 1 MHz #VBW 3 MHz Sweep 1 ms	Min Hold		
Occupied Bandwidth 75.752 MHz Transmit Freq Error 30.609 kHz OBW Power 99.00 % x dB Bandwidth 89.70 MHz x dB -26.00 dB	Detector Peak► to <u>Man</u>	x dB Bandwidth 81.02 MHz x dB -26.00 dB	Detector Peak≯ Auto <u>Man</u>		
MSG STATUS					
Channel 42 / 5210 MHz		Channel 42 / 5210 MHz			

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# 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

For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz (68.2dBuV/m at 3m).

In addition, 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>th</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 1.5 meter.
- --- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions

- --- 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.

- --- 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 (± 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.

- --- 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 (± 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.

- --- 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.