

# **TEST REPORT**

FCC/ISED DTS Test for IL7SF Certification

APPLICANT LG Electronics Inc.

REPORT NO. HCT-RF-2307-FI008-R1

DATE OF ISSUE July 31, 2023

> Tested by Jeong Ho Kim

(m)

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F-TP22-03(Rev.04)

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TEST REPORT FCC/ISED DTS Test for IL7SF	REPORT NO. HCT-RF-2307-FI008-R1 DATE OF ISSUE July 31, 2023 Additional Model -
Applicant	<b>LG Electronics Inc.</b> 222, LG-ro, Jinwi-myeon, Pyeongtaek-si, Gyeonggi-do 17709, Republic of Korea
Eut Type Model Name	Silverbox RADIO ASM-RECEIVER IL7SF
FCC ID	BEJIL7SF3
IC	2703H-IL7SF3
Modulation type	CCK/DSSS/OFDM
FCC Classification	Digital Transmission System(DTS)
FCC Rule Part(s)	Part 15.247
ISED Rule Part(s)	RSS-247 Issue 2 (February 2017) RSS-Gen Issue 5_Amendment 2 (February 2021)
	The result shown in this test report refer only to the sample(s) tested unless

otherwise stated.

This test results were applied only to the test methods required by the standard.



# **REVISION HISTORY**

The revision history for this test report is shown in table.

Revision No.	Date of Issue	Description
0	July 27, 2023	Initial Release
1	July 31, 2023	- Revised The typo (Page 28~30) - Added antenna gain measurement procedure. (Page.31)

**Engineering Statement:** 

The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of the FCC / ISED Rules under normal use and maintenance.

If this report is required to confirmation of authenticity, please contact to www.hct.co.kr



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# **1. EUT DESCRIPTION**

Model	IL7SF			
Additional Model	-			
EUT Type	Silverbox RADIO	Silverbox RADIO ASM-RECEIVER		
Power Supply	DC 12.0 V			
Frequency Range	2412 MHz – 2462	MHz		
	Peak Power	External Ant.	802.11b: 22.61 dBm 802.11g: 23.34 dBm 802.11n(HT20): 22.82 dBm	
Max. RF Output Power	Average Power	External Ant.	802.11b: 17.05 dBm 802.11g: 15.25 dBm 802.11n(HT20): 14.57 dBm	
	Radiated Output Power (EIRP)	External Ant.	802.11b: 19.34 dBm 802.11g: 17.36 dBm 802.11n(HT20): 16.51 dBm	
Modulation Type	DSSS/CCK : 802.	11b		
modulation type	OFDM : 802.11g,	802.11n(HT20)		
Number of Channels	11 Channels	11 Channels		
Antenna Peak Gain	External Antenna			
Date(s) of Tests	- Maximum Peak Gain : 3.62 dBi June 9, 2023 ~ July 26, 2023			
EUT serial numbers	Conduction : 210D83881 Radiation : 210D83901			
PMN (Product Marketing Number)	Silverbox RADIO ASM-RECEIVER			
HVIN (Hardware Version Identification Number)	IL7SF3			
FVIN (Firmware Version Identification Number)	N/A			
HMN (Host Marketing Name)	N/A			



# 2. TEST METHODOLOGY

FCC KDB 558074 D01 15.247 Meas Guidance v05r02 dated April 02, 2019 entitled "guidance for compliance measurements on digital transmission system, frequency hopping spread spectrum system, and hybrid system devices and the measurement procedure described in ANSI C63.10(Version : 2013) 'the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices'.

# **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.

# **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 its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209 and 15.247 under the FCC Rules Part 15 Subpart C. / RSS-Gen issue 5, RSS-247 issue 2.

# **GENERAL TEST PROCEDURES**

# **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 of ANSI C63.10. (Version :2013) Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

# **Radiated Emissions**

The EUT is placed on a turn table, which is 0.8 m above ground plane below 1GHz. Above 1GHz with 1.5m using absorbers between the EUT and receive antenna. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3 m away from the receiving antenna, which varied from 1 m to 4 m 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 max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes according to the requirements in Section 6.6.5 of ANSI C63.10. (Version: 2013)



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# **DESCRIPTION OF TEST MODES**

The EUT has been tested under operating condition. Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

# **3. INSTRUMENT CALIBRATION**

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

Especially, all antenna for measurement is calibrated in accordance with the requirements of C63.5 (Version : 2017).

# 4. FACILITIES AND ACCREDITATIONS

#### FACILITIES

The SAC(Semi-Anechoic Chamber) and conducted measurement facility used to collect the radi ated data are located at the 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA. The site is constructed in conformance with the requirements of A NSI C63.4. (Version :2014) and CISPR Publication 22.

Detailed description of test facility was submitted to the Commission and accepted dated Apri l 02, 2018 (Registration Number: KR0032).

For ISED, test facility was accepted dated January 26, 2021 (CAB identifier: KR0032).

#### EQUIPMENT

Radiated emissions are measured with one or more of the following types of Linearly polarized antennas: tuned dipole, bi-conical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements. Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers. Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."



# **5. ANTENNA REQUIREMENTS**

#### According to FCC 47 CFR § 15.203:

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

- (1) The antennas of this E.U.T are used a unique coupling.
- (2) The E.U.T Complies with the requirement of § 15.203

# According to RSS-GEN(Issue 5) Section 6.8:

The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.

For expediting the testing, measurements may be performed using only the antenna with highest gain of each combination of transmitter and antenna type, with the transmitter output power set at the maximum level. However, the transmitter shall comply with the applicable requirements under all operational conditions and when in combination with any type of antenna from the list provided in the test report (and in the notice to be included in the user manual, provided below).

When measurements at the antenna port are used to determine the RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna's manufacturer.

The test report shall state the RF power, output power setting and spurious emission measurements with each antenna type that is used with the transmitter being tested.





# **6. MEASUREMENT UNCERTAINTY**

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013.

All measurement uncertainty values are shown with a coverage factor of k = 2 to indicate a 95 % level of confidence.

The measurement data shown herein meets or exceeds the *U*<sub>CISPR</sub> measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

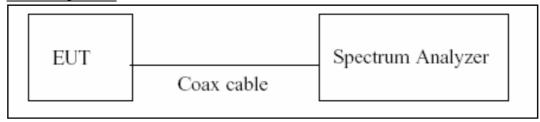
Parameter	Expanded Uncertainty (dB)
Conducted Disturbance (150 kHz ~ 30 MHz)	1.90 ( Confidence level about 95 %, <i>k</i> =2)
Radiated Disturbance (9 kHz ~ 30 MHz)	4.14 ( Confidence level about 95 %, <i>k</i> =2)
Radiated Disturbance (30 MHz ~ 1 GHz)	5.82 ( Confidence level about 95 %, <i>k</i> =2)
Radiated Disturbance (1 GHz ~ 18 GHz)	5.74 ( Confidence level about 95 %, <i>k</i> =2)
Radiated Disturbance (18 GHz ~ 40 GHz)	5.76 ( Confidence level about 95 %, <i>k</i> =2)
Radiated Disturbance (Above 40 GHz)	5.52 ( Confidence level about 95 %, <i>k</i> =2)



# 7. DESCRIPTION OF TESTS

7.1. Duty Cycle

# **Test Configuration**



# Test Procedure

The transmitter output is connected to the Spectrum Analyzer.

We tested according to the zero-span measurement method.

The largest available value of RBW is 8 MHz and VBW is 50 MHz.

The zero-span method of measuring duty cycle shall not be used if T  $\leq$  6.25 microseconds. (50/6.25 = 8)

The zero-span method was used because all measured T data are > 6.25 microseconds and both RBW and VBW are > 50/T.

- 1. RBW = 8 MHz (the largest available value)
- 2. VBW = 8 MHz ( $\geq$  RBW)
- 3. SPAN = 0 Hz
- 4. Detector = Peak
- 5. Number of points in sweep > 100
- 6. Trace mode = Clear write
- 7. Measure  $T_{total}$  and  $T_{on}$
- 8. Calculate Duty Cycle =  $T_{on}/T_{total}$  and Duty Cycle Factor = 10log(1/Duty Cycle)

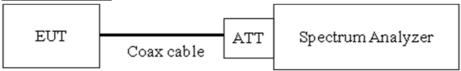


# 7.2. 6 dB Bandwidth & 99 % Bandwidth

#### Limit

The minimum permissible 6 dB bandwidth is 500 kHz.

#### **Test Configuration**



#### **Test Procedure**

The transmitter output is connected to the Spectrum Analyzer.

The Spectrum Analyzer is set to (Procedure 11.8.1 in ANSI 63.10-2013)

- 1) RBW = 100 kHz
- 2) VBW  $\geq$  3 x RBW
- 3) Detector = Peak
- 4) Trace mode = max hold
- 5) Sweep = auto couple
- 6) Allow the trace to stabilize
- 7) We tested 6 dB bandwidth using the automatic bandwidth measurement capability of a spectrum analyzer. X dB is set 6 dB.

#### Test Procedure (99 % Bandwidth for ISED)

The transmitter output is connected to the spectrum analyzer.

RBW =  $1\% \sim 5\%$  of the occupied bandwidth VBW  $\Rightarrow 3 \times$  RBW Detector = Peak Trace mode = max hold Sweep = auto couple Allow the trace to stabilize

Note : We tested OBW using the automatic bandwidth measurement capability of a spectrum analyzer.

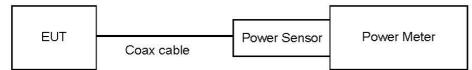


# 7.3. Output Power

#### Limit

The maximum permissible conducted output power is 1 Watt.

#### **Test Configuration**



#### **Test Procedure**

The transmitter output is connected to the Power Meter.

- Peak Power (Procedure 11.9.1.3 in ANSI 63.10-2013)
- : Measure the peak power of the transmitter.
- Average Power (Procedure 11.9.2.3 in ANSI 63.10-2013)
  - 1) Measure the duty cycle.
  - 2) Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.
  - 3) 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.

#### Sample Calculation

- Conducted Output Power(Peak) = Measured Value + ATT loss + Cable loss
- Conducted Output Power(Average) = Measured Value + ATT loss + Cable loss + Duty Cycle Factor

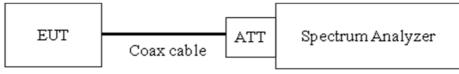


# 7.4. Power Spectral Density

# <u>Limit</u>

The transmitter power density average over 1-second interval shall not be greater than 8dBm in any 3kHz BW.

#### **Test Configuration**



#### Test Procedure

The transmitter output is connected to the Spectrum Analyzer.

We tested according to Procedure 8.4 in KDB 558074 v05r02, Procedure 11.10.2 in ANSI 63.10-2013.

The spectrum analyzer is set to :

- 1) Set analyzer center frequency to DTS channel center frequency.
- 2) Span = 1.5 times the DTS channel bandwidth.
- 3) RBW = 3 kHz  $\leq$  RBW  $\leq$  100 kHz.
- 4) VBW  $\geq$  3 x RBW.
- 5) Sweep = auto couple
- 6) Detector = peak
- 7) Trace Mode = max hold
- 8) Allow trace to fully stabilize.
- Use the peak marker function to determine the maximum amplitude level within the RBW.
   If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

#### **Sample Calculation**

Power Spectral Density = Measured Value + ATT loss + Cable loss



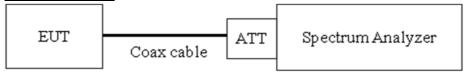
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# 7.5. Conducted Band Edge(Out of Band Emissions) & Conducted Spurious Emissions

# Limit

The maximum conducted (Peak) output power was used to demonstrate compliance, then the peak power in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz. [Conducted > 20 dBc]

# **Test Configuration**



#### **Test Procedure**

The transmitter output is connected to the spectrum analyzer.

(Procedure 11.11 in ANSI 63.10-2013)

- 1) RBW = 100 kHz
- 2) VBW  $\geq$  3 x RBW
- 3) Set span to encompass the spectrum to be examined
- 4) Detector = Peak
- 5) Trace Mode = max hold
- 6) Sweep time = auto couple
- 7) Ensure that the number of measurement points  $\geq 2 \times \text{Span/RBW}$
- 8) Allow trace to fully stabilize.
- 9) Use peak marker function to determine the maximum amplitude level.

Measurements are made over the 30 MHz to 25 GHz range with the transmitter set to the lowest, middle, and highest channels.

# Factors for frequency

Freq(MHz)	Factor(dB)
30	20.04
100	20.09
200	20.13
300	20.19
400	20.22
500	20.23
600	20.23
700	20.25
800	20.27
900	20.29
1000	20.31
2000	20.46
2400	20.52
2480	20.52
2500	20.52
3000	20.57
4000	20.67
5000	20.75
5150	20.77
5850	20.82
6000	20.82
7000	20.91
8000	20.98
9000	21.05
10000	21.12
11000	21.16
12000	21.24
13000	21.32
14000	21.30
15000	21.32
16000	21.37
17000	21.41
18000	21.47
19000	21.50
20000	21.56
21000	21.30
22000	21.77
23000	21.74
24000	21.94
25000	21.77
26000	21.80

Note : 1. 2400 ~ 2500 MHz is fundamental frequency range.

2. Factor = Attenuator loss + Cable loss





# 7.6. Radiated Test

#### Limit

# FCC

Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (m)
0.009 - 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30	30	30

# ISED

Frequency (MHz)	Field Strength ( $\mu$ A/m)	Measurement Distance (m)
0.009 - 0.490	6.37/F(kHz)	300
0.490 – 1.705	63.7/F(kHz)	30
1.705 – 30	0.08	30

# FCC&ISED

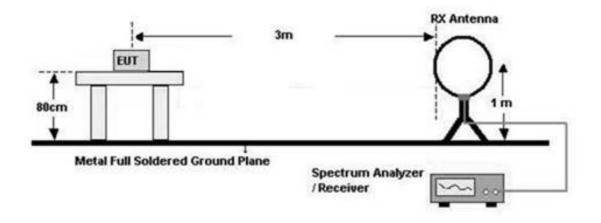
Frequency (MHz)	Field Strength ( $\mu$ V/m)	Measurement Distance (m)
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3



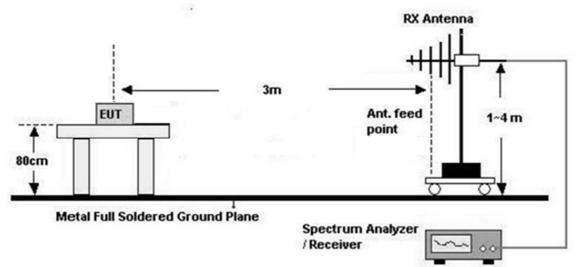
Report No. HCT-RF-2307-FI008-R1

# **Test Configuration**

Below 30 MHz

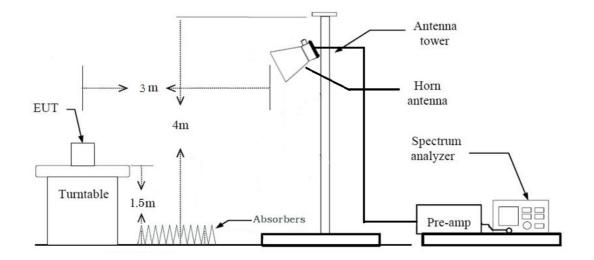


30 MHz - 1 GHz





#### Above 1 GHz



#### Test Procedure of Radiated spurious emissions (Below 30 MHz)

- 1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.
- 2. The loop antenna was placed at a location 3m from the EUT
- 3. The EUT is placed on a turntable, which is 0.8m above ground plane.
- 4. We have done x, y, z planes in EUT and horizontal and vertical polarization and Parallel to the ground plane in detecting antenna.
- 5. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
- 6. Distance Correction Factor(0.009 MHz 0.490 MHz) = 40log(3 m/300 m) = 80 dB
  - Measurement Distance : 3 m
- 7. Distance Correction Factor(0.490 MHz 30 MHz) = 40log(3 m/30 m) = 40 dB

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Measurement Distance : 3 m
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- 8. Spectrum Setting
  - Frequency Range = 9 kHz ~ 30 MHz
  - Detector = Peak
  - Trace = Maxhold
  - RBW = 9 kHz
  - VBW  $\geq$  3 x RBW
- 9. Total = Measured Value + Antenna Factor(A.F) + Cable Loss(C.L) + Distance Factor(D.F)



10. Measurement value only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.

# KDB 414788 OFS and Chamber Correlation Justification

Base on FCC 15.31 (f) (2): measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field.

OFS and chamber correlation testing had been performed and chamber measured test result is the worst case test result.



#### Test Procedure of Radiated spurious emissions (Below 1GHz)

- 1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.
- 2. The EUT is placed on a turntable, which is 0.8m above ground plane.
- 3. The Hybrid antenna was placed at a location 3m from the EUT, which is varied from 1m to 4m to find out the highest emissions.
- 4. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

5. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.

- 6. Spectrum Setting
  - (1) Measurement Type(Peak):
    - Measured Frequency Range : 30 MHz 1 GHz
    - Detector = Peak
    - Trace = Maxhold
    - RBW = 100 kHz
    - VBW  $\geq$  3 x RBW
  - (2) Measurement Type(Quasi-peak):
    - Measured Frequency Range : 30 MHz 1 GHz
    - Detector = Quasi-Peak
    - RBW = 120 kHz
  - %In general, (1) is used mainly
- 7. Total = Measured Value + Antenna Factor(A.F) + Cable Loss(C.L)
- 8. Measurement value only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.

#### Test Procedure of Radiated spurious emissions (Above 1 GHz)

- 1. The EUT is placed on a turntable, which is 1.5 m above ground plane.
- 2. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
- 3. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
- 4. EUT is set 3 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
- 5. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 6. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- 7. Spectrum Setting (Method 8.6 in KDB 558074 v05r02, Procedure 11.12 in ANSI 63.10-2013)



- (1) Measurement Type(Peak):
  - Measured Frequency Range : 1 GHz 25 GHz
  - Detector = Peak
  - Trace = Maxhold
  - RBW = 1 MHz
  - VBW  $\geq$  3 x RBW
- (2) Measurement Type(Average): Duty cycle  $\geq$  98%
  - Measured Frequency Range : 1 GHz 25 GHz
  - Detector = RMS
  - Averaging type = power (*i.e.*, RMS)
  - RBW = 1 MHz
  - VBW  $\geq$  3 x RBW
  - Sweep time = auto.
  - Trace mode = average (at least 100 traces).
- (3) Measurement Type(Average): Duty cycle < 98%, duty cycle variations are less than  $\pm 2\%$ 
  - Measured Frequency Range : 1 GHz 25 GHz
  - Detector = RMS
  - Averaging type = power (*i.e.*, RMS)
  - RBW = 1 MHz
  - VBW  $\geq$  3 x RBW
  - Sweep time = auto.
  - Trace mode = average (at least 100 traces).
  - Correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 percent duty cycle.
  - Duty Cycle Factor (dB) : Please refer to the please refer to section 9.1.
- 8. Measurement value only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
- 9. Distance extrapolation factor = 20log (test distance / specific distance) (dB)
- 10. Total(Measurement Type : Peak)
  - = Measured Value + Antenna Factor(A.F) + Cable Loss(C.L) Amp Gain(A.G) + Distance Factor(D.F)



- Total(Measurement Type : Average, Duty cycle  $\geq$  98%)
- = Measured Value + Antenna Factor(A.F) + Cable Loss(C.L) Amp Gain(A.G) + Distance Factor(D.F)

Total(Measurement Type : Average, Duty cycle < 98%)

- = Measured Value + Antenna Factor(A.F) + Cable Loss(C.L) Amp Gain(A.G) + Distance Factor(D.F)
- + Duty Cycle Factor

#### Test Procedure of Radiated Restricted Band Edge

1. The EUT is placed on a turntable, which is 1.5 m above ground plane.

2. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

3. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.

- 4. EUT is set 3 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
- 5. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 6. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- 7. Spectrum Setting
  - (1) Measurement Type(Peak):
    - Measured Frequency Range : 2310 MHz  $\sim$  2390 MHz/ 2483.5 MHz  $\sim$  2500 MHz
    - Detector = Peak
    - Trace = Maxhold
    - RBW = 1 MHz
    - VBW  $\geq$  3 x RBW
  - (2) Measurement Type(Average): Duty cycle  $\geq$  98%,
    - Measured Frequency Range : 2310 MHz  $\sim$  2390 MHz/ 2483.5 MHz  $\sim$  2500 MHz
    - Detector = RMS
    - Averaging type = power (*i.e.*, RMS)
    - RBW = 1 MHz
    - VBW  $\geq$  3 x RBW
    - Sweep time = auto.
    - Trace mode = average (at least 100 traces).

(3) Measurement Type(Average): Duty cycle < 98%, duty cycle variations are less than  $\pm 2\%$ 



- Measured Frequency Range : 2310 MHz  $\sim$  2390 MHz/ 2483.5 MHz  $\sim$  2500 MHz
- Detector = RMS
- Averaging type = power (*i.e.*, RMS)
- RBW = 1 MHz
- VBW  $\geq$  3 x RBW
- Sweep time = auto.
- Trace mode = average (at least 100 traces).
- Correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 percent duty cycle.
- Duty Cycle Factor (dB) : Please refer to the please refer to section 9.1.
- 8. Measurement value only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
- 9. Distance extrapolation factor = 20log (test distance / specific distance) (dB)
- 10. Total(Measurement Type : Peak)
  - = Measured Value + Antenna Factor(A.F) + Cable Loss(C.L) Amp Gain(A.G) + Distance Factor(D.F)

Total(Measurement Type : Average, Duty cycle  $\geq$  98%)

= Measured Value + Antenna Factor(A.F) + Cable Loss(C.L) - Amp Gain(A.G) + Distance Factor(D.F)

Total(Measurement Type : Average, Duty cycle < 98%)

= Measured Value + Antenna Factor(A.F) + Cable Loss(C.L) - Amp Gain(A.G) + Distance Factor(D.F) + Duty Cycle Factor



# 7.8. Receiver Spurious Emissions

#### Limit

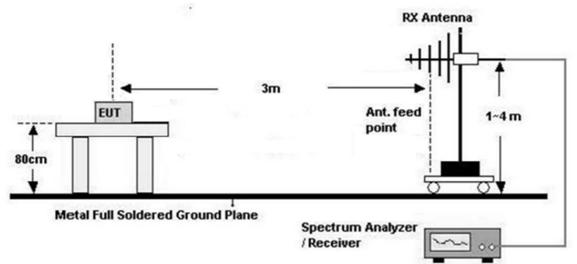
Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (m)
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

# Note:

Measurements for compliance with the limits in table may be performed at distances other than 3 metres.

# **Test Configuration**

# 30 MHz - 1 GHz





# Test Procedure of Receiver Spurious Emissions (Below 1GHz)

1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.

2. The EUT is placed on a turntable, which is 0.8m above ground plane.

3. The Hybrid antenna was placed at a location 3m from the EUT, which is varied from 1m to 4m to find out the highest emissions.

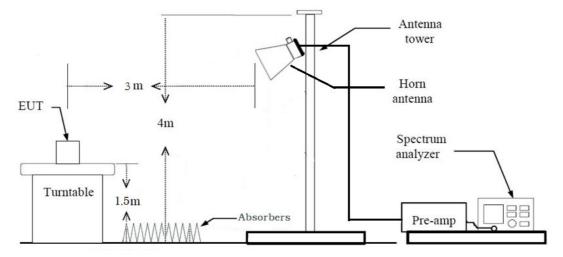
4. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

5. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.

- 6. Spectrum Setting
  - (1) Measurement Type(Peak):
    - Measured Frequency Range : 30 MHz 1 GHz
    - Detector = Peak
    - Trace = Maxhold
    - RBW = 100 kHz
    - VBW  $\geq$  3 x RBW
  - (2) Measurement Type(Quasi-peak):
    - Measured Frequency Range : 30 MHz 1 GHz
    - Detector = Quasi-Peak
    - RBW = 120 kHz
- 7. Total = Measured Value + Antenna Factor(A.F) + Cable Loss(C.L)



#### Above 1 GHz



#### Test Procedure of Radiated spurious emissions (Above 1 GHz)

1. The EUT is placed on a turntable, which is 1.5 m above ground plane.

2. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

3. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.

- 4. EUT is set 3 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
- 5. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 6. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- 7. Spectrum Setting
  - (1) Measurement Type(Peak):
    - Measured Frequency Range : 1 GHz 25 GHz
    - Detector = Peak
    - Trace = Maxhold
    - RBW = 1 MHz
    - VBW  $\geq$  3 x RBW
  - (2) Measurement Type(Average):

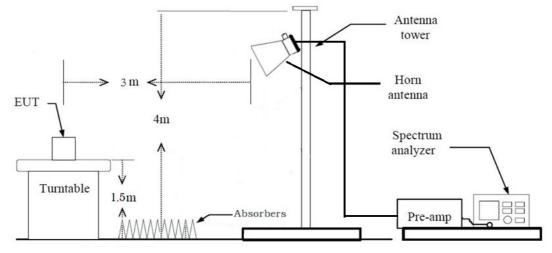


- We performed using a reduced video BW method was done with the analyzer in linear mode
- Measured Frequency Range : 1 GHz 25 GHz
- Detector = Peak
- Trace = Maxhold
- RBW = 1 MHz
- VBW  $\geq$  3 x RBW
- 8. Measurement Level only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.

9. Total = Measured Value + Antenna Factor(A.F) + Cable Loss(C.L) - Amp Gain(A.G) + Distance Factor(D.F)



# 7.8. Radiated Output Power (E.I.R.P)



Test Procedure of Radiated Output Power (E.I.R.P)

1. The EUT is placed on a turntable, which is 1.5 m above ground plane.

2. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

3. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.

- 4. EUT is set 3 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
- 5. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 6. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- 7. Spectrum Setting
  - 1) Measure the duty cycle.
  - 2) Set span to encompass the entire emission bandwidth(EBW) of the signal.
  - 3) RBW = 1 MHz.
  - 4) VBW  $\geq$  3 MHz.
  - 5) Number of points in sweep  $\geq 2 \times \text{span/RBW}$ .
  - 6) Sweep time = auto.
  - 7) Detector = RMS.
  - 8) Do not use sweep triggering. Allow the sweep to "free run".
  - 9) Trace average at least 100 traces in power averaging(RMS) mode
  - 10) Integrated bandwidth = OBW
  - 11) Add  $10\log(1/x)$ , where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times.



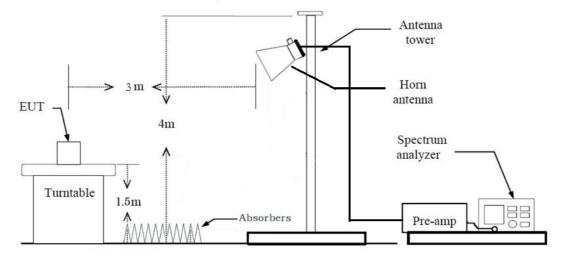
Report No. HCT-RF-2307-FI008-R1

# Note:

Field Strength (dBμV/m) = Measured Value(dBμV/m) + Antenna Factor(A.F) + Cable Loss(C.L) +DutyCycle Factor(D.F) EIRP (dBm) = Field Strength (dBμV/m) – 95.2 Max Antenna Gain = EIRP(dBm) – Conducted Output Power(dBm)



# 7.9. Radiated Power Spectral Density



# Test Procedure of Radiated Power Spectral Density

1. The EUT is placed on a turntable, which is 1.5 m above ground plane.

2. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

3. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.

- 4. EUT is set 3 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
- 5. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 6. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- 7. Spectrum Setting
- 1) Set analyzer center frequency to DTS channel center frequency.
- 2) Set span to encompass the entire emission bandwidth(EBW) of the signal.
- 3) RBW = 3 kHz  $\leq$  RBW  $\leq$  100 kHz.
- 4) VBW  $\geq$  3 x RBW.
- 5) Sweep = auto couple
- 6) Detector = peak
- 7) Trace Mode = max hold
- 8) Allow trace to fully stabilize.
- 9) Use the peak marker function to determine the maximum amplitude level within the RBW. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

# Note:

Field Strength  $(dB\mu V/m) =$  Measured Value $(dB\mu V/m) +$  Antenna Factor(A.F) + Cable Loss(C.L) +DutyCycle Factor(D.F)

PSD (dBm) = Field Strength (dB $\mu$ V/m) – 95.2



# 7.10. Antenna Gain Calculation

#### Test Procedure of Maximum Antenna Gain

- 1. Measured Radiated Ouput Power(EIRP) according to Section 7.8
- 2. Measured Conducted Ouput Power according to Section 7.3
- 3. Calculatated Antenna gain according to below equation

# [Antenna gain calculation]

Antenna Gain(dBi) = EIRP(dBm) – Conducted Output Power(dBm)

#### [Max Antenna Gain] External Antenna

Frequency	Peak Gain[dBi]
2412 MHz	2.55 dBi
2437 MHz	2.95 dBi
2462 MHz	3.62 dBi



# 7.11. Worst case configuration and mode

# **Radiated test**

1. All modes of operation were investigated and the worst case configuration results are reported.

2. All configurations of antenna were investigated and the worst case configuration results are reported.

- Mode : External Ant
- 3. EUT Axis
  - Radiated Spurious Emissions : X
  - Radiated Restricted Band Edge : X
- 4. Duty cycle factor applies only 802.11g/n (Duty cycle < 98%).
- 5. All datarate of operation were investigated and the worst case datarate results are reported
  - 802.11b : 1Mbps
  - -802.11g:6Mbps
  - 802.11n : MCS0
- 6. All position of loop antenna were investigated and the test result is a no critical peak found at all

positions.

- Position : Horizontal, Vertical, Parallel to the ground plane

#### Radiated test(RSDB)

- 1. All modes of operation were investigated and the worst case configuration results are reported.
  - Mode : Stand alone
  - Worstcase : Stand alone
- 2. EUT Axis
  - Radiated Spurious Emissions : X
- 3. All of RSDB Scenario were investigated and the worst case configuration results are reported.

RSDB Scenario	2.4 GHz WiFi	5 GHz WiFi	Bluetooth
2.4 GHz WiFi + 5 GHz WiFi	on	on	
2.4 GHz WiFi + Bluetooth	on		on



4. The following tables show the worst case configurations determined during testing.

(Worst case: The lowest margin condition the channels and modes were selected for test.)

Description	<b>Bluetooth Emission</b>	2.4 GHz Emission	
Antenna	WIFI/BT	WIFI	
Channel	78	6	
Data Rate	1 Mbps	1Mbps	
Mode	π/4DQPSK: 2-DH5	802.11b	
Description	2.4 GHz Emission	5 GHz Emission	
<b>Description</b> Antenna	2.4 GHz Emission WIFI	5 GHz Emission WIFI/BT	
-			
Antenna	WIFI	WIFI/BT	

Note : WLAN 5 GHz, Bluetooth RSDB Data refer to [UNII, BT] Test Report.

# AC Power line Conducted Emissions

1. We don't perform powerline conducted emission test. Because this EUT is used with vehicle.

# Conducted test

1. The EUT was configured with data rate of highest power.

# 8. SUMMARY TEST OF RESULTS

# FCC Part

Test Description	FCC Part Section(s)	Test Limit	Test Condition	Test Result
6 dB Bandwidth	§ 15.247(a)(2)	> 500 kHz		PASS
Conducted Maximum Output Power	§ 15.247(b)(3)	< 1 Watt	-	PASS
Power Spectral Density	§ 15.247(e)	< 8 dBm / 3 kHz Band	Conducted	PASS
Band Edge (Out of Band Emissions)	§ 15.247(d)	Conducted > 20 dBc		PASS
AC Power line Conducted Emissions	§ 15.207	cf. Section 7.7		N/A (#Note)
Radiated Spurious Emissions	§ 15.247(d), 15.205, 15.209	cf. Section 7.6		PASS
Radiated Restricted Band Edge	§ 15.247(d), 15.205, 15.209	cf. Section 7.6	Radiated	PASS
Radiated Output Power (E.I.R.P)	-	-	nutited	-
Radiated Power Spectral Density	-	-		-

#Note: Not Tested.

Report No. HCT-RF-2307-FI008-R1



# ISED Part

Test Description	ISED Part Section(s)	Test Limit	Test Condition	Test Result
6 dB Bandwidth	RSS-247, 5.2	> 500 kHz		PASS
99% Bandwidth	RSS-GEN, 6.7	N/A		PASS
Conducted Maximum Peak Output Power And e.i.r.p.	RSS-247, 5.4.	<1 Watt <4 Watt(e.i.r.p.)	Conducted	PASS
Power Spectral Density	RSS-247, 5.2	< 8 dBm / 3 kHz Band		PASS
Band Edge(Out of Band Emissions)	RSS-247, 5.5	Conducted > 20 dBc		PASS
AC Power line Conducted Emissions	RSS-GEN, 8.8	cf. Section 7.7		N/A (#Note)
Radiated Spurious Emissions	RSS-GEN, 8.9	cf. Section 7.6		PASS
Receiver Spurious Emissions	RSS-GEN, 7	cf. Section 7.8		PASS
Radiated Restricted Band Edge	RSS-GEN, 8.10	cf. Section 7.6	Radiated	PASS
Radiated Output Power (E.I.R.P)	-	-		-
Radiated Power Spectral Density	-	-		-

#Note: Not Tested.



# 9. TEST RESULT

#### 9.1 DUTY CYCLE

Mode	Data Rate (Mbps)	T <sub>on</sub> (ms)	T <sub>total</sub> (ms)	Duty Cycle	Duty Cycle Factor (dB)
	1	8.626	8.635	0.999	0.005
002 116	2	4.410	4.420	0.998	0.010
802.11b	5.5	1.723	1.736	0.993	0.033
	11	0.959	0.970	0.988	0.051
	6	1.432	1.450	0.988	0.054
	9	0.961	0.978	0.983	0.074
	12	0.729	0.746	0.976	0.104
002.11~	18	0.492	0.509	0.965	0.153
802.11g	24	0.376	0.394	0.956	0.198
	36	0.256	0.273	0.937	0.284
	48	0.200	0.217	0.920	0.361
	54	0.180	0.198	0.912	0.398
	6.5 (MCS0)	1.339	1.356	0.987	0.055
	13 (MCS1)	0.689	0.706	0.975	0.108
	19.5 (MCS2)	0.472	0.490	0.963	0.163
802.11n	26 (MCS3)	0.364	0.381	0.954	0.203
(HT20)	39 (MCS4)	0.256	0.273	0.937	0.282
	52 (MCS5)	0.200	0.217	0.921	0.356
	58.5 (MCS6)	0.184	0.201	0.915	0.386
	65 (MCS7)	0.168	0.185	0.908	0.420

# Note :

Duty Cycle Factor =  $10\log(1/Duty Cycle)$ . where, Duty Cycle = T<sub>on</sub> / T<sub>total</sub>



# Test Plots

Agilent Spectr	um Analyzer - Swept SA RF 50 Ω AC		SENSE:II	NT I	ALIGN AUTO	12:48:40 PM Jun 27, 2023	_
Center Fi	req 2.412000000	GHz PNO: Fast ↔ IFGain:Low		#Avg	Type: RMS	TRACE 123456 TYPE WANNAME DET PPPPP	Frequency
10 dB/div	Ref Offset 22.42 dB Ref 40.00 dBm				Δ	Mkr3 8.635 ms -0.01 dB	Auto Tune
20.0		X <u>a</u>		<b>→</b> 3∆	4		Center Free 2.412000000 GH:
0.00 -10.0 -20.0							Start Free 2.412000000 GH
-30.0							<b>Stop Fre</b> 2.412000000 GH
Center 2.4 Res BW 8		#VBV	V 8.0 MHz	FUNCTION	Sweep 30	Span 0 Hz .66 ms (10000 pts)	<b>CF Ste</b> 8.000000 MH <u>Auto</u> Ma
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	t (Δ) t t (Δ) t	8.626 ms (Δ) 10.20 ms 8.635 ms (Δ) 10.20 ms	24.03 dBm				Freq Offse 0 H
6 7 8 9 10 11							
sg			Ш		STATUS		

Duty cycle plot (802.11b(1 Mbps))

# Duty cycle plot (802.11g(6 Mbps))

gilent Spectr	rum Analyzer - S	wept SA								
enter Fi	RF 50 req 2.4120	Ω AC			INSE:INT	#Avg	ALIGN AUTO Type: RMS	TRACI	Jun 27, 2023	Frequency
	Ref Offset 2	22.42 dB	PNO: Fast IFGain:Low	Atten: 2			Δ	DE Mkr3 1.4	450 ms	Auto Tun
0 dB/div .og 25.0	Ref 35.00	) dBm	aliya da ya a fanas	┉╷┈╲	441-1410-1410-14	3∆4 Philippi			).11 dB	Center Fre
5.00										2.412000000 GF
15.0 25.0 35.0										2.412000000 Gł
45.0 55.0										<b>Stop Fr</b> 2.412000000 Gi
enter 2.4 es BW 8		GHz	#VE	3W 8.0 MHz		INCTION	Sweep 7	S  731 ms (4. FUNCTIO		CF Ste 8.000000 M <u>Auto</u> M
1 Δ2 1 2 F 1 3 Δ4 1 4 F 1	t (∆) t t (∆)		1.432 ms(, 3.207 ms 1.450 ms(, 3.207 ms	23.28 d	dB IBm dB					Freq Offs
5 6 7 8 9										
				Ш					~	
a 🤑 Align	ment Comple	eted					STATUS			



Agilent Spectrum Analyzer - Swept SA		
X RL RF 50 Ω AC Center Freq 2.41200000		ALIGNAUTO 02:31:26 PM Jun 27, 2023 #Avg Type: RMS TRACE 22:34 55 Type
Ref Offset 22.42 d 10 dB/div Ref 35.00 dBm	IFGain:Low Atten: 24 dB	ΔMkr3 1.356 ms 0.56 dB
Log 25.0 15.0 5.00	i terefinista han piri kan dan para minakap dara Kapata kan a	3∆4 Center Fred 2.412000000 GH
-5.00		Start Free 2.412000000 GH
-35.0		<b>Stop Free</b> 2.412000000 GH
Center 2.412000000 GHz Res BW 8 MHz	#VBW 8.0 MHz	Span 0 Hz Sweep 5.332 ms (5000 pts) INCTION FUNCTION VIETH FUNCTION VALUE ALLON MAI
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	1.339 ms         (Δ)         -2.08 dB           2.686 ms         22.78 dBm           1.356 ms         (Δ)         0.56 dB           2.686 ms         22.78 dBm	Freq Offse 0 H
7 8 9 10 11		
K NSG	10	STATUS

## Duty cycle plot (802.11n(HT20)(MCS0))

# Note:

In order to simplify the report, attached plots were only the lowest data rate.



# 9.2 6 dB BANDWIDTH & 99 % BANDWIDTH

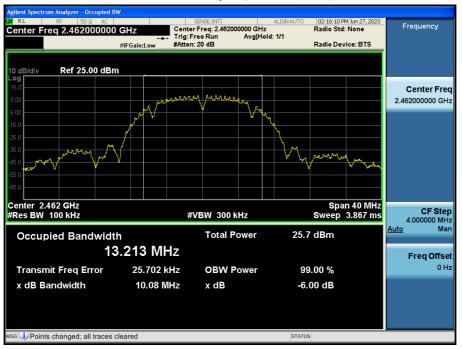
802.11b Mode Frequency [MHz] Channel No.		6 dB Bandwidth [MHz]	Minimum Bandwidth [MHz	
2412	1	10.11	> 0.5	
2437	6	10.09	> 0.5	
2462	11	10.08	> 0.5	
802.11g	Mode	6 dB Bandwidth [MHz]	Minimum Bandwidth [MHz	
Frequency [MHz]	Channel No.	o db bandwiddii [iii12]		
2412	1	16.40	> 0.5	
2417	2	16.40	> 0.5	
2437	6	16.40	> 0.5	
2457	10	16.39	> 0.5	
2462 11		16.41	> 0.5	
802.11n(HT	T20) Mode			
		6 dB Bandwidth [MHz]	Minimum Bandwidth [MHz]	

002.11II(H	120) Mode	C dB Bandwidth [MU]	Minimum Bandwidth [MHz]	
Frequency [MHz]	Channel No.	6 dB Bandwidth [MHz]		
2412	1	17.59	> 0.5	
2417	2	17.57	> 0.5	
2437	6	17.58	> 0.5	
2457	10	17.58	> 0.5	
2462	11	17.59	> 0.5	

# FCC



## Test Plots



#### 6 dB Bandwidth plot (802.11b-CH 11)

#### 6 dB Bandwidth plot (802.11g-CH 10)

Agilent Spectrum Analyzer - Occupied BV	N				
02 RL RF 50Ω AC Center Freq 2.457000000	Trig:	SENSE:INT er Freq: 2.457000000 GHz Free Run Avg Hol n: 20 dB	Radio Sto		Frequency
10 dB/div Ref 25.00 dBm	1				
15.0 5.00 -5.00	mhanhanhanhan	how prolondendandor	1nn -		Center Freq 2.457000000 GHz
-15.0	کمر		Anna Anna Anna Anna		
-25.0 WMWW/N-10-00-04/WMM/N/160			han lander hills	Holanda Control	
-65.0					
Center 2.457 GHz #Res BW 100 kHz	3	≇VBW 300 kHz		an 40 MHz 3.867 ms	CF Step 4.000000 MHz
Occupied Bandwidt	<sup>h</sup> 6.477 MHz	Total Power	23.0 dBm		<u>Auto</u> Man
Transmit Freq Error	21.182 kHz	OBW Power	99.00 %		Freq Offset 0 Hz
x dB Bandwidth	16.39 MHz	x dB	-6.00 dB		
мsg iPoints changed; all traces c	cleared		STATUS		



Agilent Spectrum Analyzer - Occupied B	N				
XI RL RF 50Ω AC Center Freq 2.417000000	Trig:1	SENSE:INT er Freq: 2.417000000 GHz Free Run Avg Hol n: 20 dB	Radio Sto		Frequency
10 dB/div Ref 20.00 dBm					
10.0	- Jour Sungle - Jour Sound and	bon for And marker show			Center Fre 2.417000000 GH
-20.0 -30.0			- L.	hand and the state of the state	
-40.0					
70.0 Center 2.417 GHz #Res BW 100 kHz	#	*VBW 300 kHz		un 40 MHz 3.867 ms	CF Ste 4.000000 MH
Occupied Bandwidt		Total Power	22.3 dBm		Auto Ma
٦ <i>٢</i> Transmit Freq Error	20.356 kHz	OBW Power	99.00 %		FreqOffse 0 ⊦
x dB Bandwidth	17.57 MHz	x dB	-6.00 dB		
ss ↓Points changed; all traces o	leared		STATUS		

# 6 dB Bandwidth plot (802.11n\_HT20-CH 2)

# Note:

In order to simplify the report, attached plots were only the narrowest 6 dB BW channel.



# 99% Bandwidth Measurements(ISED)

802.11b Mode		OBW	Limit
Frequency [MHz]	Channel No.	Bandwidth [MHz]	[MHz]
2412	1	13.295	N/A
2437	6	13.320	N/A
2462	11	13.276	N/A
802.11g Mode		OBW	Limit
Frequency [MHz]	Channel No.	Bandwidth [MHz]	[MHz]
2412	1	17.006	N/A
2417	2	17.095	N/A
2437	6	17.277	N/A
2457	10	17.016	N/A
2462	11	16.970	N/A
802.11n(HT20) Mo	ode	OBW	Limit
Frequency [MHz]	Channel No.	Bandwidth [MHz]	[MHz]
2412	1	17.854	N/A
2417	2	17.888	N/A
2437	6	18.021	N/A
2457	10	17.891	N/A
2462	11	17.829	N/A

HCT

## Test Plots



#### 99% Bandwidth plot (802.11b-CH 6)

#### 99% Bandwidth plot (802.11g-CH 6)

Agilent Spectrum Analyzer - Occupied B	N				
M         RL         RF         50 Ω         AC         AC           Center Freq 2.437000000         Δ </td <td>Tri</td> <td>SENSE:INT nter Freq: 2.437000000 g: Free Run Av tten: 20 dB</td> <td>ALIGN AUTO GHz g Hold: 1/1</td> <td>02:37:59 PMJun 27, 202 Radio Std: None Radio Device: BTS</td> <td>Frequency</td>	Tri	SENSE:INT nter Freq: 2.437000000 g: Free Run Av tten: 20 dB	ALIGN AUTO GHz g Hold: 1/1	02:37:59 PMJun 27, 202 Radio Std: None Radio Device: BTS	Frequency
10 dB/div Ref 25.00 dBm					
15.0 5.00 -5.00			~~~		Center Freq 2.437000000 GHz
-15.0 -25.0 -35.0				an an ya an	4
-45.0					
Center 2.437 GHz #Res BW 390 kHz		#VBW 1.2 MHz		Span 40 MH Sweep 1 m	CF Step
Occupied Bandwidt		Total Powe	r 24.:	2 dBm	4.000000 MHz <u>Auto</u> Man
۲ <i>۲</i> Transmit Freq Error	72.680 kHz	OBW Powe	er 9!	9.00 %	Freq Offset 0 Hz
x dB Bandwidth	16.51 MHz	x dB	-6	.00 dB	
мѕд			STATU	S	



Agilent Spectrum Analyzer - Occupied	BW						
M RL RF 500 AC Center Freq 2.43700000	0 GHz #IFGain:Low	SENSE:INT Center Freq: 2.43 Trig: Free Run #Atten: 20 dB		ALIGNAUTO	Radio Std		Frequency
10 dB/div Ref 20.00 dB	m						
0.00	forman	and a strange of the	manna an ann an an an an an an an an an a				Center Freq 2.437000000 GHz
-10.0 -20.0 <mark></mark>					-lylu-unawo-	Malymontheapyle	
-40.0							
-70.0 Center 2.437 GHz					Sna	n 40 MHz	
#Res BW 390 kHz		#VBW 1.2	MHz			n 40 MHz ep 1 ms	CF Step 4.000000 MHz
Occupied Bandwid			Power	23.4	4 dBm		<u>Auto</u> Man
Transmit Freg Error	60.882		Power	99	9.00 %		Freq Offset 0 Hz
x dB Bandwidth	17.73 N	ЛHz xdB		-6.	00 dB		
MSG				STATU	s		

## 99% Bandwidth plot (802.11n\_HT20-CH 6)

# Note:

In order to simplify the report, attached plots were only the widest 99% Bandwidth channel.



## 9.3 OUTPUT POWER

# Peak Power

802.11b Mode			Measured	Limit
Frequency[MHz]	Channel No.	Rate (Mbps)	Power(dBm)	(dBm)
		1	19.01	30.00
2412	1	2	19.35	30.00
2412	1	5.5	20.74	30.00
		11	22.22	30.00
	6	1	19.61	30.00
2427		2	19.86	30.00
2437		5.5	21.22	30.00
		11	22.61	30.00
		1	18.91	30.00
2462	11	2	19.11	30.00
2462	11	5.5	20.43	30.00
		11	22.01	30.00



802.11g Mode		Data (Mhac)	Measured	Limit
Frequency[MHz]	Channel No.	Rate (Mbps)	Power(dBm)	(dBm)
riequency[MHz]		6	20.33	30.00
		9	20.55	30.00
		12	20.48	30.00
2412		18	20.47	30.00
2412	1	24	21.00	30.00
	Ī	36	21.02	30.00
		48	20.89	30.00
		54	21.07	30.00
		6	21.57	30.00
		9	21.74	30.00
		12	21.57	30.00
2417	2	18	21.52	30.00
2417	2	24	22.02	30.00
		36	22.00	30.00
		48	22.01	30.00
		54	22.19	30.00
		6	22.87	30.00
		9	22.89	30.00
		12	22.74	30.00
2427	6	18	22.74	30.00
2437		24	23.28	30.00
		36	23.28	30.00
		48	23.25	30.00
		54	23.34	30.00
	_	6	21.61	30.00
		9	21.68	30.00
		12	21.48	30.00
2457	10	18	21.57	30.00
2457	10	24	22.10	30.00
		36	22.08	30.00
		48	22.07	30.00
		54	22.12	30.00
		6	20.61	30.00
		9	20.61	30.00
		12	20.48	30.00
2462	11	18	20.50	30.00
2402	11	24	21.05	30.00
		36	21.05	30.00
	İ	48	20.98	30.00
		54	21.16	30.00



802.11n(HT		MCS Index	Measured	Limit
Frequency[MHz]	Channel No.	MCS MUCK	Power(dBm)	(dBm)
		0	19.95	30.00
		1	19.96	30.00
		2	20.03	30.00
2412	1	3	20.49	30.00
2412	T	4	20.38	30.00
		5	20.55	30.00
		6	20.51	30.00
		7	20.42	30.00
		0	20.93	30.00
		1	20.90	30.00
		2	20.94	30.00
2417	2	3	21.63	30.00
2417	Z	4	21.42	30.00
		5	21.53	30.00
		6	21.43	30.00
		7	21.40	30.00
		0	22.17	30.00
		1	22.11	30.00
		2	22.28	30.00
2427	6	3	22.82	30.00
2437	0	4	22.61	30.00
		5	22.72	30.00
		6	22.79	30.00
		7	22.76	30.00
		0	20.79	30.00
		1	20.78	30.00
		2	20.83	30.00
2457	10	3	21.48	30.00
2457	10	4	21.27	30.00
		5	21.42	30.00
		6	21.40	30.00
		7	21.29	30.00
		0	19.83	30.00
		1	19.83	30.00
		2	19.78	30.00
2462	11	3	20.47	30.00
2462	11	4	20.17	30.00
		5	20.28	30.00
		6	20.33	30.00
		7	20.41	30.00





# Average Power

802.11b	Mode		Measured		Measured	
Frequency [MHz]	Channel No.	Rate (Mbps)	Power (dBm)	Duty Cycle Factor	Power(dBm) + Duty Cycle Factor	Limit (dBm)
		1	16.36	0.005	16.37	30.00
2412	2412 1	2	16.49	0.010	16.50	30.00
2412		5.5	16.45	0.033	16.49	30.00
		11	16.40	0.051	16.45	30.00
		1	17.04	0.005	17.05	30.00
2437	6	2	17.02	0.010	17.03	30.00
2437	0	5.5	16.92	0.033	16.95	30.00
		11	16.81	0.051	16.86	30.00
		1	16.35	0.005	16.35	30.00
2462	11	2	16.29	0.010	16.30	30.00
2462	11	5.5	16.08	0.033	16.12	30.00
		11	16.23	0.051	16.28	30.00



802.11g			Measured	Duty Cycle	Total Power	Limit
Frequency	Channel	Rate (Mbps)	Power	Factor	(dBm)	(dBm)
[MHz]	No.		(dBm)	(dB)	(abiii)	
	_	6	12.54	0.054	12.60	30.00
		9	12.70	0.074	12.78	30.00
		12	12.70	0.104	12.80	30.00
2412	1	18	12.73	0.153	12.88	30.00
2412	1	24	12.63	0.198	12.83	30.00
		36	12.54	0.284	12.83	30.00
		48	12.50	0.361	12.86	30.00
		54	12.42	0.398	12.82	30.00
		6	13.77	0.054	13.83	30.00
		9	13.92	0.074	13.99	30.00
		12	13.89	0.104	13.99	30.00
2417	2	18	13.78	0.153	13.94	30.00
2417	Z	24	13.76	0.198	13.96	30.00
		36	13.66	0.284	13.95	30.00
		48	13.62	0.361	13.99	30.00
		54	13.60	0.398	14.00	30.00
		6	15.08	0.054	15.14	30.00
		9	15.09	0.074	15.16	30.00
		12	15.07	0.104	15.17	30.00
2437	6	18	14.99	0.153	15.14	30.00
2437	0	24	15.01	0.198	15.20	30.00
		36	14.92	0.284	15.21	30.00
		48	14.89	0.361	15.25	30.00
		54	14.81	0.398	15.20	30.00
		6	13.81	0.054	13.86	30.00
		9	13.84	0.074	13.91	30.00
		12	13.74	0.104	13.84	30.00
2457	10	18	13.80	0.153	13.95	30.00
2457	10	24	13.78	0.198	13.98	30.00
		36	13.66	0.284	13.95	30.00
		48	13.62	0.361	13.98	30.00
		54	13.54	0.398	13.94	30.00
		6	12.82	0.054	12.88	30.00
		9	12.77	0.074	12.84	30.00
	[	12	12.76	0.104	12.86	30.00
2462	11	18	12.72	0.153	12.88	30.00
2462	11 -	24	12.69	0.198	12.89	30.00
	[	36	12.59	0.284	12.87	30.00
		48	12.55	0.361	12.91	30.00
		54	12.51	0.398	12.91	30.00



802.11n(HT			Measured	Duty Cycle	Total Power	Limit
Frequency	Channel	MCS Index	Power	Factor	(dBm)	(dBm
[MHz]	No.		(dBm)	(dB)	10.14	
	-	0	12.09	0.055	12.14	30.00
	_	1	12.10	0.108	12.21	30.00
	-	2	12.07	0.163	12.23	30.00
2412	1 -	3	11.97	0.203	12.17	30.00
	_	4	11.91	0.282	12.20	30.00
	_	5	11.91	0.356	12.26	30.00
	_	6	11.88	0.386	12.26	30.00
		7	11.85	0.420	12.28	30.00
	_	0	13.07	0.055	13.13	30.00
		1	13.04	0.108	13.15	30.00
	_	2	13.03	0.163	13.19	30.00
2417	2 -	3	13.03	0.203	13.23	30.00
2417	2	4	12.91	0.282	13.20	30.00
		5	12.91	0.356	13.27	30.00
		6	12.83	0.386	13.22	30.00
		7	12.78	0.420	13.20	30.00
		0	14.31	0.055	14.37	30.00
		1	14.36	0.108	14.47	30.00
		2	14.38	0.163	14.54	30.00
2427		3	14.31	0.203	14.52	30.00
2437	6	4	14.18	0.282	14.47	30.00
		5	14.11	0.356	14.46	30.00
		6	14.18	0.386	14.57	30.00
		7	14.13	0.420	14.55	30.00
		0	12.94	0.055	12.99	30.00
		1	12.93	0.108	13.04	30.00
		2	12.91	0.163	13.07	30.00
2457	10	3	12.87	0.203	13.07	30.00
2457	10	4	12.80	0.282	13.08	30.00
		5	12.75	0.356	13.11	30.00
	-	6	12.73	0.386	13.12	30.00
		7	12.68	0.420	13.10	30.00
		0	11.96	0.055	12.01	30.00
		1	11.92	0.108	12.03	30.00
		2	11.85	0.163	12.01	30.00
A 1 4 -		3	11.86	0.203	12.06	30.00
2462	11 -	4	11.70	0.282	11.98	30.00
	-	5	11.60	0.356	11.96	30.00
	-	6	11.63	0.386	12.02	30.00
		7	11.76	0.420	12.18	30.00





## 9.4 POWER SPECTRAL DENSITY

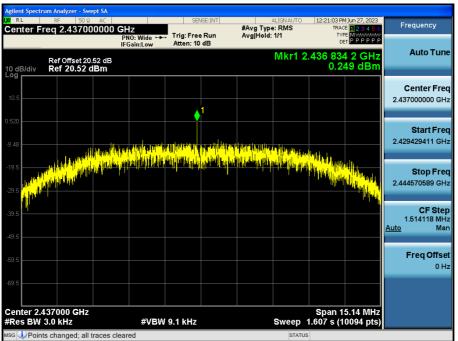
	Frequency		Test	t Result	
Mode	(MHz)	Channel No.	Max. PSD	Limit (dBm/3 kHz)	
	2412	1	0.196		
802.11b	2437	6	0.249		
	2462	11	-0.445		
	2412	1	-12.021		
	2417	2	-11.167		
802.11g	2437	6	-9.371		
	2457	10	-11.191	8	
	2462	11	-12.067		
	2412	1	-12.813		
	2417	2	-12.042		
802.11n(HT20)	2437	6	-10.683		
	2457	10	-11.290		
	2462	11	-12.818		

## Note :

1. The measured PSD results in plot is already including the actual values of loss for the attenuator and cable combination.

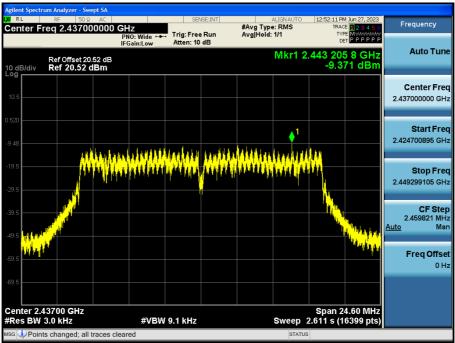


## Test Plots



#### Power Spectral Density (802.11b-CH 6)

## Power Spectral Density (802.11g-CH 6)







#### Power Spectral Density (802.11n\_HT20 -CH 6)

#### Note :

In order to simplify the report, attached plots were only the worstcase PSD channel.

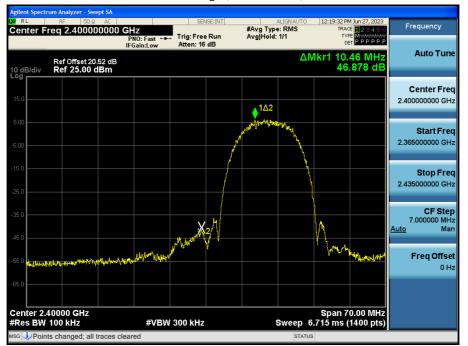


# 9.5 BAND EDGE/ CONDUCTED SPURIOUS EMISSIONS

## Note :

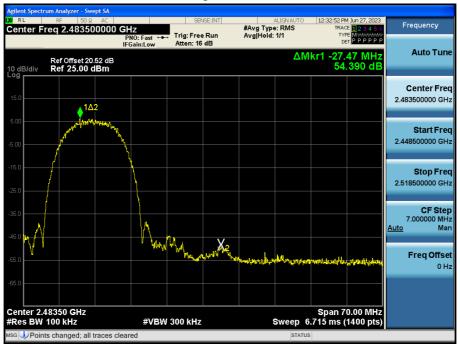
In order to simplify the report, attached plots were only the worst case channel and data rate.

## Test Plots(BandEdge)



Band Edge (802.11b-CH1)

#### Band Edge (802.11b-CH11)

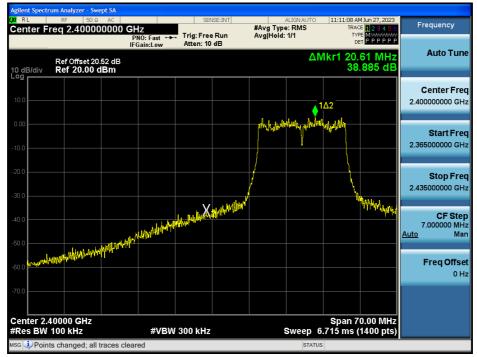




Agilent Spectr	rum Analyzer - Swe									
	RF 50 Ω req 2.40000					#Avg Typ Avg Hold:		TRAC	1 Jun 27, 2023 E 1 2 3 4 5 6 E M 4444444	Frequency
10 dB/div	Ref Offset 20.4 Ref 20.00 d	IFC	NO: Fast 🔸 Gain:Low	Atten: 10		Avginoia		₀₀ 1kr1 15.	T P P P P P P	Auto Tune
10.0							1∆2			<b>Center Fred</b> 2.400000000 GH;
-10.0					- And	der horhvillan, edf	doub ndy that n			<b>Start Free</b> 2.365000000 GH
-20.0										<b>Stop Fre</b> 2.435000000 GH
-40.0	and have been and the second	the state of the s	hlinnyn an ar	urthing the				"huykkay kay	Williel Linding	CF Stej 7.000000 MH <u>Auto</u> Ma
	un hunner un along 4.147	1147 V								Freq Offse 0 H
-70.0 Center 2.4 #Res BW	40000 GHz 100 kHz		#VBW	300 kHz			Sweep 6		0.00 MHz 1400 pts)	
	ts changed; all tr	races clear		0001112			STATUS	`	1100 pt3)	

Band Edge (802.11g\_Ch.1)

#### Band Edge (802.11g\_Ch.2)



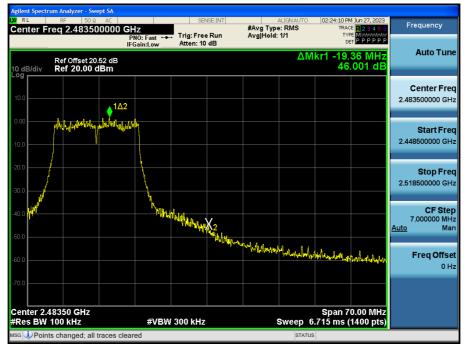




enter Freq 2.483500		SENSE:INT Trig: Free Run Atten: 10 dB	#Avg Type Avg Hold:		TRAC	1 Jun 27, 2023 E 1 2 3 4 5 6 E M M M M M M T P P P P P P P	Frequency
Ref Offset 20.5 0 dB/div Ref 20.00 dl	52 dB	Atten: IO 4D		ΔM		02 MHz 626 dB	Auto Tu
.og 10.0 ↓1∆2							<b>Center Fr</b> 2.483500000 G
0.00 platentalin with hilps	holin						<b>Start Fr</b> 2.448500000 G
20.0							<b>Stop Fr</b> 2.518500000 G
40.0	her for the the second produced on the second	mundan data data data data data data data					CF St 7.000000 M <u>Auto</u> M
50.0			Mathewshipp	Winning	wathin	ndlithermondus	Freq Offs 0
70.0						0.00 MHz	
Res BW 100 kHz	#VBW	300 kHz	\$	Sweep 6		1400 pts)	

Band Edge (802.11g\_Ch.10)

Band Edge (802.11g\_Ch.11)



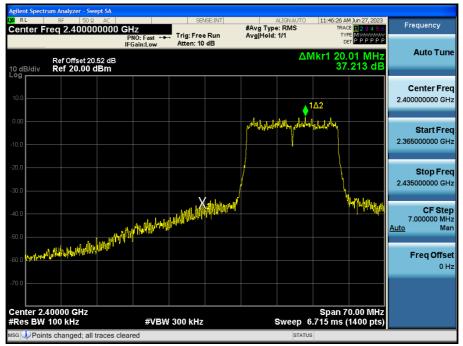




RL RF 50Ω AC Center Freq 2.400000000	PNO: Fast Trig:		ALIGN AUTO #Avg Type: RMS Avg Hold: 1/1	02:39:39 PM Jun 27, 2023 TRACE 1 2 3 4 5 TYPE M WANNAN PET P P P P P	Frequency
Ref Offset 20.52 dB 0 dB/div Ref 20.00 dBm	IFGain:Low Atte	n: 10 dB	Δ	Mkr1 15.81 MH: 37.849 dE	Auto Tun
10.0			162		Center Fre 2.400000000 GH
0.00		M <sup>pla</sup> John	nimitation point both look of a	9	<b>Start Fr</b> 2.365000000 G
20.0					<b>Stop Fr</b> 2.435000000 G
40.0	Al mark state and a state of the state of th	K -		"May daway and the stand of the	CF St 7.000000 M <u>Auto</u> M
60.0 And Andrew Manual March 1994					Freq Offs 0
70.0					
Center 2.40000 GHz Res BW 100 kHz	#VBW 3001	kH7	Sween f	Span 70.00 MH: 5.715 ms (1400 pts	

#### Band Edge (802.11n\_HT20\_Ch.1)

Band Edge (802.11n\_HT20\_Ch.2)



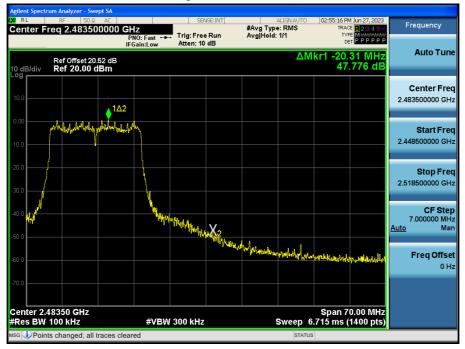




Agilent Spectrum Analyzer - Swept SA								
X RL RF 50Ω AC Center Freq 2.483500000	GH7	SENSE	INT	#Avg Type	ALIGN AUTO	TRAC	4 Jun 27, 2023 E 1 2 3 4 5 6	Frequency
Ref Offset 20.52 dB 10 dB/div Ref 20.00 dBm	PNO: Fast +++ IFGain:Low	Trig: Free R Atten: 10 dl		Avg[Hold:		tyr De kr1 -27.	EMWWWWW PPPPPP	Auto Tune
10.0								Center Freq 2.483500000 GHz
0.00 what we have the standing of the standing								<b>Start Freq</b> 2.448500000 GHz
-20.0								<b>Stop Freq</b> 2.518500000 GHz
-40.0	handfallithing	-Udu <sub>NUpperwitzen</sub>	<b>.</b>					CF Step 7.000000 MHz <u>Auto</u> Man
-60.0				Woorn Hould	nlounad	phhananantationag	where in the first of the second s	<b>Freq Offset</b> 0 Hz
-70.0 Center 2.48350 GHz #Res BW 100 kHz	41)/BM	300 kHz			Swoon 6		0.00 MHz 1400 pts)	
MSG DO TOU KHZ		300 KH2			sweep o		1400 pts)	

# Band Edge (802.11n\_HT20\_Ch.10)

Band Edge (802.11n\_HT20\_Ch.11)

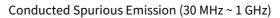


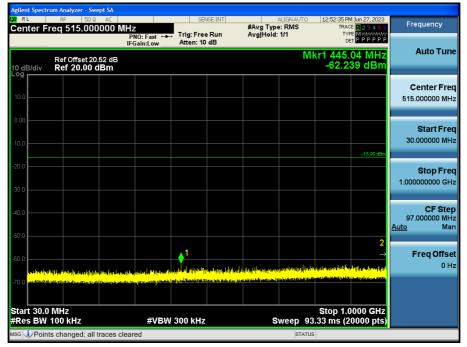


# Test Plots(Conducted Spurious Emission)

Worst case : 802.11g\_Ch.6\_54 Mbps

Limit : -15.95 dBm





## Conducted Spurious Emission (1 GHz ~ 3 GHz)

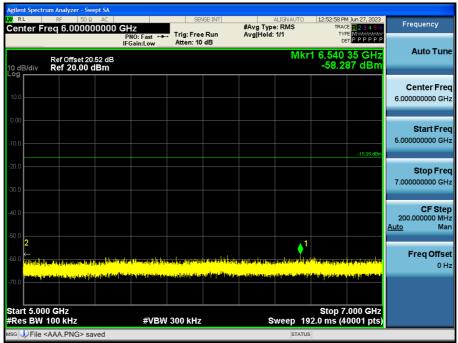
	um Analyzer - Swept					
Center Fi	RF   50 ຊ req 2.000000	000 GHz	SENSE:INT	ALIGN AUTO #Avg Type: RMS	12:52:24 PM Jun 27, 2023 TRACE 1 2 3 4 5 6 TYPE MWWWWW	Frequency
		PNO: Fast + IFGain:Low	<ul> <li>Trig: Free Run Atten: 10 dB</li> </ul>	Avg Hold: 1/1	DET PPPPP	
10 dB/div	Ref Offset 20.52 Ref 20.00 dB			Mkr	2 2.531 65 GHz -57.977 dBm	Auto Tune
Log 10.0 0.00				 	-15 95 dBm	Center Freq 2.000000000 GHz
-20.0 -30.0 -40.0					-15.95 upri	Start Freq 1.000000000 GHz
-50.0 -60.0 -70.0 <mark>- 10.0 - 10</mark>	a poste de la seconda de la constante de la seconda de	en i fan en	eren zeret gang i berget perset gin stand internet. Eren eren stande internet inter		n na se de la seguin partie de seguine des la seguine des la seguines de la seguine de la seguine de la seguine La séguine la seguine de la	<b>Stop Freq</b> 3.000000000 GHz
Start 1.00 #Res BW		#VB	W 300 kHz	Sweep 19	Stop 3.000 GHz 2.0 ms (40001 pts)	CF Step 200.000000 MHz
MKR MODE TH	RC SCL	× 2.439 50 GHz	۲ 4.050 dBm	FUNCTION FUNCTION WIDTH	FUNCTION VALUE	<u>Auto</u> Man
2 N 1 3 4 5 5	f	2.531 65 GHz	-57.977 dBm			<b>Freq Offset</b> 0 Hz
6 7 8 9 10						
11					×	
мsg 🗼 Point	ts changed; all tra	ces cleared		STATUS		



gilent Spectrum Analyzer - Swept SA				
RL RF 50 Q AC	SENSE:IM	ALIGNAUTO #Avg Type: RMS	12:52:46 PM Jun 27, 2023 TRACE 1 2 3 4 5 6	Frequency
center Freq 4.000000000	PNO: East +++ Trig: Free Rui			
	IFGain:Low Atten: 10 dB			Auto Tur
Ref Offset 20.52 dB		Mkr	1 3.631 30 GHz	Auto Tune
0 dB/div Ref 20.00 dBm			-57.801 dBm	
.og				
				Center Free
10.0				4.00000000 GH
0.00				
				Start Free
10.0				3.00000000 GH:
			-15.95 dBm	
20.0				Stop Free
				5.000000000 GH
30.0				3.00000000 811.
40.0				CF Step
				200.000000 MH Auto Mar
50.0				Addo Mai
2	▲ <sup>1</sup>			
60.0				Freq Offse
60.0 Wethers have a first of the second second		in here the desired at the band weather with		ОН
70.0	ing painting the second se	and a state of the second s	الاأرائي متراهدهما فريراه الأأمل المتعريبا ماتا	
Start 3.000 GHz			Stop 5.000 GHz	
Res BW 100 kHz	#VBW 300 kHz	Sweep 19	2.0 ms (40001 pts)	
sg 🗼 Points changed; all traces	cleared	STATUS	5	

#### Conducted Spurious Emission (3 GHz ~ 5 GHz)

#### Conducted Spurious Emission (5 GHz ~ 7 GHz)

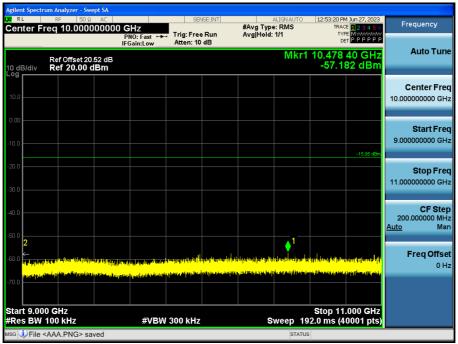




Agilent Spectrum Analyzer - Swept SA					
X RL RF 50Ω AC Center Freq 8.000000000	GHz	SENSE:INT	ALIGN AUTO #Avg Type: RMS	12:53:09 PM Jun 27, 2023 TRACE 1 2 3 4 5 6	Frequency
Ref Offset 20.52 dB 10 dB/div Ref 20.00 dBm	PNO: Fast IFGain:Low	Trig: Free Run Atten: 10 dB	Avg Hold: 1/1 Mkr	түре рет Р Р Р Р Р Р Р 1 7.487 00 GHz -58.325 dBm	Auto Tune
10.0					<b>Center Fred</b> 8.000000000 GH;
-10.0				-15.95 dBm	<b>Start Free</b> 7.000000000 GH
30.0					<b>Stop Fre</b> 9.000000000 GH
40.0					<b>CF Ste</b> 200.000000 MH <u>Auto</u> Ma
2 -60.0 21-1944 1944 1944 1947 1947 1947 1947 1947					<b>Freq Offse</b> 0 H
Start 7.000 GHz				Stop 9.000 GHz	
#Res BW 100 kHz	#vBW	300 kHz	Sweep 19	2.0 ms (40001 pts)	

## Conducted Spurious Emission (7 GHz ~ 9 GHz)

#### Conducted Spurious Emission (9 GHz ~ 11 GHz)

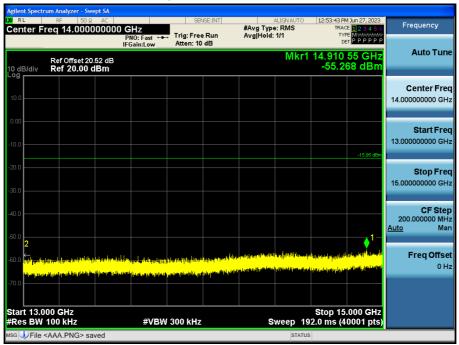




Agilent Spectrum Analyzer - Swept SA				
X RL RF 50Ω AC Center Freq 12.00000000	0 GHz	ALIGNAUTO #Avg Type: RMS	12:53:32 PM Jun 27, 2023 TRACE 1 2 3 4 5 6	Frequency
Ref Offset 20.52 dB 10 dB/div Ref 20.00 dBm	PNO: Fast Trig: Free Run IFGain:Low Atten: 10 dB	AvgjHold: 1/1 Mkr1	12.481 90 GHz -57.657 dBm	Auto Tune
10.0				Center Fred 12.000000000 GH;
-10.0			-15.95 dBm	<b>Start Fred</b> 11.000000000 GH
-20.0				<b>Stop Free</b> 13.000000000 GH
-40.0				CF Ste 200.000000 MH <u>Auto</u> Ma
-60.0 The reproduct of the structure of the second str	anterporter dependent i de la la fait de la companie print Gran y conten (e. 2014 de la contentia de la co		alar siyar walar jada dalar ina) Deriyaan walar jaja parteriya	<b>Freq Offse</b> 0 H
-70.0 Start 11.000 GHz			Stop 13.000 GHz	
#Res BW 100 kHz	#VBW 300 kHz	Sweep 1	92.0 ms (40001 pts)	

#### Conducted Spurious Emission (11 GHz ~ 13 GHz)

#### Conducted Spurious Emission (13 GHz ~ 15 GHz)

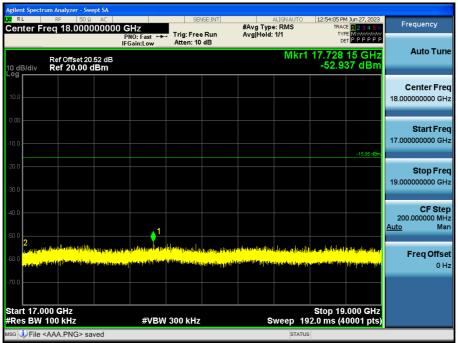




Agilent Spectrum Ar									
Center Fred	50 Q AC	0 GHz		ISE:INT	#Avg Type		TRAC	4 Jun 27, 2023 E 1 2 3 4 5 6	Frequency
Rei	f Offset 20.52 dB	PNO: Fast ↔ IFGain:Low	Atten: 10		Avg Hold:		15.189	20 GHz 84 dBm	Auto Tune
10 dB/div Re	f 20.00 dBm						-00.74	64 UBIII	
10.0									Center Freq 16.00000000 GHz
0.00									
-10.0									Start Freq 15.00000000 GHz
10.0								-15.95 dBm	
-20.0									Stop Freq
-30.0									17.000000000 GHz
-40.0									CF Step
-50.0	1								200.000000 MHz <u>Auto</u> Man
-50.0 2	and all states in some states of the	the Horal Wilden have					oto na l		Ener: Offeret
-60.0	al deschip of the large					in an	half and a second		Freq Offset 0 Hz
-70.0				110.000		and the			
Start 15.000 C #Res BW 100		#VBW	/ 300 kHz		s	weep <u>19</u>	Stop 17 2.0 ms (4	.000 GHz 0001 pts)	
мsg 🧼File <aaa< td=""><td>PNG&gt; saved</td><td></td><td></td><td></td><td></td><td>STATUS</td><td></td><td></td><td></td></aaa<>	PNG> saved					STATUS			

## Conducted Spurious Emission (15 GHz ~ 17 GHz)

#### Conducted Spurious Emission (17 GHz ~ 19 GHz)

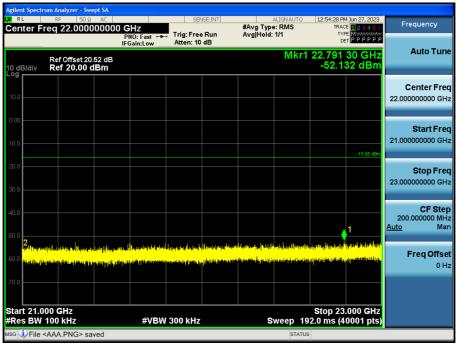




Agilent Spectrum Analyzer - Swept SA				
X RL RF 50Ω AC Center Freg 20.00000000		ALIG #Avg Type: R	INAUTO 12:54:17 PM Jun 27, 2023 MS TRACE 123456	Frequency
	PNO: Fast +++ Trig: Free IFGain:Low Atten: 10	Run Avg Hold: 1/1	TYPE M WWWWWW DET P P P P P	
Ref Offset 20.52 dB 10 dB/div Ref 20.00 dBm			Mkr1 20.836 85 GHz -52.640 dBm	Auto Tune
10.0				<b>Center Free</b> 20.000000000 GH
10.0			-15.95 dBm	<b>Start Fre</b> 19.000000000 GH
30.0				<b>Stop Fre</b> 21.000000000 GH
40.0			<b>1</b>	CF Ste 200.000000 MH <u>Auto</u> Ma
				Freq Offse 0 H
-70.0 Start 19.000 GHz #Res BW 100 kHz	#VBW 300 kHz	Swe	Stop 21.000 GHz ep 192.0 ms (40001 pts)	
ISG 🕕 File <aaa.png> saved</aaa.png>			STATUS	

## Conducted Spurious Emission (19 GHz ~ 21 GHz)

#### Conducted Spurious Emission (21 GHz ~ 23 GHz)





Agilent Spectrum Analyzer - Swept SA					
Center Freq 24.00000000	) GHz		ALIGN AUTO /g Type: RMS g Hold: 1/1	12:54:39 PM Jun 27, 2023 TRACE 1 2 3 4 5 6 TYPE M WWWWW	Frequency
Ref Offset 20.52 dB 10 dB/div Ref 20.00 dBm	PNO: Fast Trig: Free IFGain:Low Atten: 10			24.936 00 GHz -46.943 dBm	Auto Tune
10.0					Center Freq 24.00000000 GHz
-10.0				-15.95 dBm	<b>Start Freq</b> 23.000000000 GHz
-20.0					<b>Stop Freq</b> 25.000000000 GHz
-40.0 -60.0 <mark>Rolang Lands of solid high district and the states of the solid solid solid solid solid solid solid solid solid</mark>	I. I		17	1	CF Step 200.000000 MHz <u>Auto</u> Man
-60.0 Republication of the states of the sta	ynn fylog ann far far fan de fan d	<mark>A season ta shi shi shi shi shi shi shi shi shi shi</mark>	a ang dan ang kanalang kanalan Kanalang kanalang kana	<mark>in the support the department of the second stated on the support of the second stated on the second stated stated on the second stated state</mark>	<b>Freq Offset</b> 0 Hz
Start 23.000 GHz			0	Stop 25.000 GHz	
#Res BW 100 kHz	#VBW 300 kHz		Sweep 1	92.0 ms (40001 pts) s	

# Conducted Spurious Emission (23 GHz ~ 25 GHz)



## 9.6 RADIATED SPURIOUS EMISSIONS

#### Frequency Range : 9 kHz – 30 MHz

Frequency         Measured Value         A.F+C.L+D.F         Ant. POL         Total         Limit         M							
[MHz]	[dBµV]	[dB/m]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	
No Critical peaks found							

#### Note:

1. The Measured value of emissions are attenuated more than 20 dB below the permissible limits or the field strength is too small to be measured.

- 2. Distance extrapolation factor = 40log (specific distance / test distance) (dB)
- 3. Limit line = specific Limits (dBµV) + Distance extrapolation factor

#### Frequency Range : Below 1 GHz

Frequency	Measured Value	A.F+C.L	Ant. POL	Total	Limit	Margin	
[MHz]	[dBµV]	[dB/m]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	
No Critical peaks found							

#### Note:

1. Radiated emissions measured in frequency range from 30 MHz to 1000 MHz were made

with an instrument using Quasi peak detector mode.



Frequency Range : Above 1 GHz	Frequenc	y Range	: Above	1 GHz
-------------------------------	----------	---------	---------	-------

Operation Mode: 802.11b							
Transfer Ra	Transfer Rate: 1 Mbps						
Operating	Operating Frequency 2 412 MHz						
Channel No. 01 Ch			1 Ch				
Frequency	Measured Value	A.F+C.L-A.G+D.F	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[dB/m]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	туре
4824	43.61	4.02	V	47.63	73.98	26.35	PK
4824	32.51	4.02	V	36.53	53.98	17.45	AV
7236	40.79	11.57	V	52.36	73.98	21.62	PK
7236	28.92	11.57	V	40.49	53.98	13.49	AV
4824	43.48	4.02	Н	47.50	73.98	26.48	PK
4824	32.12	4.02	Н	36.14	53.98	17.84	AV
7236	40.55	11.57	Н	52.12	73.98	21.86	PK
7236	28.62	11.57	Н	40.19	53.98	13.79	AV

Operation	Operation Mode: 802.11b						
Transfer Ra	Transfer Rate: 1 Mbps				_		
Operating Frequency 2			437 MHz				
Channel No.			6 Ch				
Frequency	Measured Value	A.F+C.L-A.G+D.F	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[dB/m]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	туре
4874	43.15	4.25	V	47.40	73.98	26.58	PK
4874	31.74	4.25	V	35.99	53.98	17.99	AV
7311	40.45	12.01	V	52.46	73.98	21.52	PK
7311	29.13	12.01	V	41.14	53.98	12.84	AV
4874	42.95	4.25	Н	47.20	73.98	26.78	PK
4874	31.48	4.25	Н	35.73	53.98	18.25	AV
7311	40.33	12.01	Н	52.34	73.98	21.64	PK
7311	29.02	12.01	Н	41.03	53.98	12.95	AV



Operation Mode:	802.11b			
Transfer MCS Index:	1 Mbps			
Operating Frequency	2 462 MHz			
Channel No.	11 Ch			

Frequency	Measured Value	A.F+C.L-A.G+D.F	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[dB/m]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	туре
4924	42.61	4.41	V	47.02	73.98	26.96	PK
4924	31.25	4.41	V	35.66	53.98	18.32	AV
7386	39.51	11.96	V	51.47	73.98	22.51	PK
7386	28.22	11.96	V	40.18	53.98	13.80	AV
4924	42.48	4.41	Н	46.89	73.98	27.09	PK
4924	31.02	4.41	Н	35.43	53.98	18.55	AV
7386	39.42	11.96	Н	51.38	73.98	22.60	PK
7386	28.09	11.96	Н	40.05	53.98	13.93	AV

0	Operation Mode:									
Т	ransfer Rate:	:	6 Mbps	6 Mbps						
Operating Frequency			2 412 MHz							
Channel No.			01 Ch							
	Measured	Duty Cycle			Tatal	1 :	Mausia			
Frequency	Value	Factor	A.F+C.L-A.G+D.F	ANT. POL	Total	Limit	Margin	Measurement		
[MHz]	[dBµV]	[dB]	[dB/m]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	Туре		
4824	42.41	0.000	4.02	V	46.43	73.98	27.55	PK		
4824	29.69	0.054	4.02	V	33.76	53.98	20.22	AV		
7236	39.21	0.000	11.57	V	50.78	73.98	23.20	PK		
7236	26.71	0.054	11.57	V	38.33	53.98	15.65	AV		
4824	42.21	0.000	4.02	Н	46.23	73.98	27.75	PK		
4824	26.44	0.054	4.02	Н	30.51	53.98	23.47	AV		
7236	39.02	0.000	11.57	Н	50.59	73.98	23.39	PK		
7236	26.51	0.054	11.57	Н	38.13	53.98	15.85	AV		



Operation Mode:			802.11g	802.11g						
Т	Transfer Rate:			6 Mbps						
C	perating Fre	quency	2 437 MHz	2 437 MHz						
С	hannel No.		06 Ch							
Frequency	Measured	Duty Cycle	A.F+C.L-A.G+D.F	ANT. POL	Total	Limit	Margin			
riequency	Value	Factor	A.F 'C.L-A.G 'D.F	ANT. FUL	TOLAL			Measurement Type		
[MHz]	[dBµV]	[dB]	[dB/m]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	туре		
4874	41.97	0.000	4.25	V	46.22	73.98	27.76	PK		
4874	29.53	0.054	4.25	V	33.83	53.98	20.15	AV		
7311	40.44	0.000	12.01	V	52.45	73.98	21.53	PK		
7311	27.35	0.054	12.01	V	39.41	53.98	14.57	AV		
4874	41.55	0.000	4.25	Н	45.80	73.98	28.18	PK		
4874	29.12	0.054	4.25	Н	33.42	53.98	20.56	AV		
7311	40.39	0.000	12.01	Н	52.40	73.98	21.58	PK		
7311	27.12	0.054	12.01	Н	39.18	53.98	14.80	AV		

Operation Mode:			802.11g	802.11g					
Т	Transfer Rate: Operating Frequency			6 Mbps					
C				2 462 MHz					
С	hannel No.		11 Ch						
Frequency	Measured Value	Duty Cycle Factor	A.F+C.L-A.G+D.F	ANT. POL	Total	Limit	Margin	Measurement	
[MHz]	[dBµV]	[dB]	[dB/m]	[H/V] [dBµV/	[dBµV/m]	[dBµV/m]	[dB]	Туре	
4924	41.76	0.000	4.41	V	46.17	73.98	27.81	PK	
4924	29.73	0.054	4.41	V	34.19	53.98	19.79	AV	
7386	39.87	0.000	11.96	V	51.83	73.98	22.15	PK	
7386	26.99	0.054	11.96	V	39.00	53.98	14.98	AV	
4924	41.52	0.000	4.41	Н	45.93	73.98	28.05	PK	
4924	29.62	0.054	4.41	Н	34.08	53.98	19.90	AV	
7386	39.69	0.000	11.96	Н	51.65	73.98	22.33	PK	
7386	26.81	0.054	11.96	Н	38.82	53.98	15.16	AV	



Operation Mode:			802.11n_H	802.11n_HT20					
MCS Index:			0	0					
C	perating Fre	quency	2 412 MHz	2 412 MHz					
С	hannel No.		01 Ch						
Frequency	Measured Value	Duty Cycle Factor	A.F+C.L-A.G+D.F	ANT. POL	Total	Limit	Margin	Measurement	
[MHz]	[dBµV]	[dB]	[dB/m]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	Туре	
4824	42.39	0.000	4.02	V	46.41	73.98	27.57	PK	
4824	29.65	0.055	4.02	V	33.73	53.98	20.26	AV	
7236	39.18	0.000	11.57	V	50.75	73.98	23.23	PK	
7236	26.62	0.055	11.57	V	38.25	53.98	15.74	AV	
4824	42.22	0.000	4.02	Н	46.24	73.98	27.74	PK	
4824	26.45	0.055	4.02	Н	30.53	53.98	23.46	AV	
7236	39.05	0.000	11.57	Н	50.62	73.98	23.36	PK	
7236	26.48	0.055	11.57	Н	38.11	53.98	15.88	AV	

Operation Mode:			802.11n_H	802.11n_HT20				
MCS Index:			0					
0	perating Fre	quency	2 437 MHz					
C	hannel No.		06 Ch					
	Measured	Duty Cycle			Tatal	1 :	Mausia	Measurement
Frequency	Value	Factor	A.F+C.L-A.G+D.F	ANT. POL	Total	Limit	Margin	
[MHz]	[dBµV]	[dB]	[dB/m]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	Туре
4874	41.93	0.000	4.25	V	46.18	73.98	27.80	PK
4874	29.45	0.055	4.25	V	33.76	53.98	20.23	AV
7311	39.64	0.000	12.01	V	51.65	73.98	22.33	PK
7311	27.12	0.055	12.01	V	39.19	53.98	14.80	AV
4874	41.78	0.000	4.25	Н	46.03	73.98	27.95	PK
4874	29.32	0.055	4.25	Н	33.63	53.98	20.36	AV
7311	39.54	0.000	12.01	Н	51.55	73.98	22.43	PK
7311	26.95	0.055	12.01	Н	39.02	53.98	14.97	AV



Operation Mode:			802.11n_⊦	802.11n_HT20						
Μ	MCS Index:									
C	perating Fre	quency	2 462 MHz	2 462 MHz						
C	hannel No.		11 Ch							
Frequency	Measured Value	Duty Cycle Factor	A.F+C.L-A.G+D.F	ANT. POL	Total	Limit	Margin	Measurement		
[MHz]	[dBµV]	[dB]	[dB/m]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	Туре		
4924	42.16	0.000	4.41	V	46.57	73.98	27.41	PK		
4924	29.69	0.055	4.41	V	34.16	53.98	19.83	AV		
7386	39.67	0.000	11.96	V	51.63	73.98	22.35	PK		
7386	26.95	0.055	11.96	V	38.97	53.98	15.02	AV		
4924	42.02	0.000	4.41	Н	46.43	73.98	27.55	PK		
4924	26.51	0.055	4.41	Н	30.98	53.98	23.01	AV		
7386	39.55	0.000	11.96	Н	51.51	73.98	22.47	PK		
7386	26.88	0.055	11.96	Н	38.90	53.98	15.09	AV		



[RSDB]
DTS 802.11b 1 Mbps Ch.6 + BT 2-DH5 Ch.78

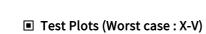
Frequency	Measured Value	A.F+C.L-A.G+D.F	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[dB/m]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	туре
4874	41.73	4.25	V	45.98	73.98	28.00	PK
4874	29.52	4.25	V	33.77	53.98	20.21	AV
7311	38.92	12.01	V	50.93	73.98	23.05	PK
7311	26.62	12.01	V	38.63	53.98	15.35	AV
4874	41.55	4.25	Н	45.80	73.98	28.18	PK
4874	29.32	4.25	Н	33.57	53.98	20.41	AV
7311	38.88	12.01	Н	50.89	73.98	23.09	PK
7311	26.52	12.01	Н	38.53	53.98	15.45	AV

Note : Bluetooth RSDB Data refer to [BT] Test Report.

# DTS 802.11b 1 Mbps Ch.6 + UNII 802.11a 6 Mbps Ch.165

Frequency	Measured Value	A.F+C.L-A.G+D.F	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[dB/m]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	туре
4874	43.18	4.25	V	47.43	73.98	26.55	PK
4874	33.56	4.25	V	37.81	53.98	16.17	AV
7311	39.74	12.01	V	51.75	73.98	22.23	PK
7311	27.50	12.01	V	39.51	53.98	14.47	AV
4874	42.85	4.25	Н	47.10	73.98	26.88	PK
4874	32.62	4.25	Н	36.87	53.98	17.11	AV
7311	39.51	12.01	Н	51.52	73.98	22.46	PK
7311	27.22	12.01	Н	39.23	53.98	14.75	AV

Note : WLAN 5 GHz Data refer to [UNII] Test Report.



HCT

Radiated Spurious Emissions plot – Average Measured Value (802.11b, Ch.6 3rd Harmonic)

		Spectrum 4	4 X						
Ref Level         97.00 dB           Att         0           Count         100/100		BW 1 MHz s VBW 3 MHz	Mode Swee	вр					
1Rm AvgPwr●2Pk Clr	w								
90 dвµV			MI	[1]			29.13 dBµV 7.3123750 GHz		
30 dBµV									
70 dBµV									
ю dBµV									
i0 dBµV									
ю авру-			المرامي						
ю авµv_ porthhufpinykrinykrihufy lo авµv	within Martalia	her with the second		n hlenden ver	houtently for	yuunturturuu	, White have a second		
0 dBµV									
0 dBµV									
) dBµV									

Radiated Spurious Emissions plot - Peak Measured Value (802.11b, Ch.6 3rd Harmonic)

Spectrum	Spe	ectrum 3	X Sp	ectrum 4	X				
RefLevel 9 Att			<ul> <li>RB</li> <li>0 ms</li> <li>VB</li> </ul>	W 1 MHz	Mode Swe	100			
Count 100/10		5 <b>- 5</b> WI 2	u ms 🖝 🕶	W 310HZ	Moue Swe	ieh			
●1Pk Max●2P	'k Clrw								
					M	1[1]			ŧ0.45 dBμV
90 dBµV						I	I	7.30	70930 GHz
80 dBµV									
70 dBµV									
60 dBuV									
60 UBHV									
50 dBµV									
co app:				М1					
40 dBµV				_	Actual				
40 dBµV	and marked	www.www.www.	مىسىرىيىتىن يىسى 14.14 مىلىدى	Mount	ANNING MARINE	Manure	webber	Month and a line	مرينين ميلين معرد الما الحيين
30 dBµV	MMMMINN	hornshirab	Ranchhadlena	14	. 0.64	a ann that	horaldalanoo	NHANAAAANINING	WMM.M.M.M.M.M.M.M.M.M.M.M.M.M.M.M.
20 dBµV									
10 dBµV									
0 dBµV								_	
CF 7.311 GH:	z			691	pts			Span	50.0 MHz

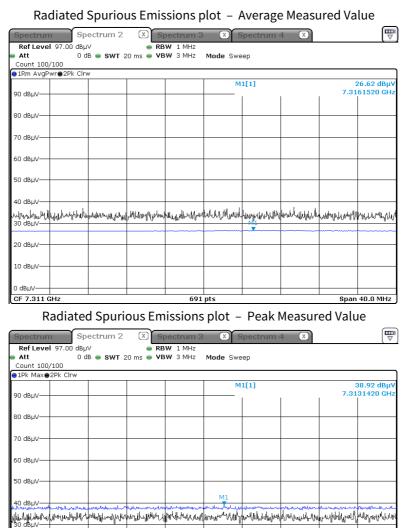
# Note:

Plot of worst case are only reported.



#### [RSDB] DTS 802.11b 1 Mbps Ch.6 + BT 2-DH5 Ch.78

#### Test Plots (Worst case : X-V)



691 pts

Span 40.0 MHz

#### Note:

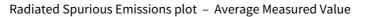
Plot of worst case are only reported.

20 dBµV 10 dBµV 0 dBµV CF 7.311 GHz



## [RSDB] DTS 802.11b 1 Mbps Ch.6 + UNII 802.11a 6 Mbps Ch.165

# Test Plots (Worst case : X-V)



Spectrum	Sp	ectrum 2	× SI	pectrum 3	XS	pectrum -	4 X		
Ref Level			-	W 1 MHz					
Att Count 100/1		B 👄 SWT 2	20 ms 👄 🛛 🗷	W 3 MHz	Mode Swe	ep			
1Rm AvgPw		W							
90 dBµV	M1[1]							27.50 dBµV 02040 GHz	
50 00p1									
80 dBµV									
70 dBµV									
60 dBµV									
50 dBµV									
40 dBµV									
hand a stand and the second stand and the second stand sta	4u/phanet	hill worth you	hirthornalith	had a stall have a	MMMMM	humphonphip	ruhaldylan	polinipartullipad	hlunhurun
30 dBµV									
20 dBµV									
10 dBµV									
0 dBµV									
CF 7.311 G	Ηz			691	pts			Span	50.0 MHz

Radiated Spurious Emissions plot – Peak Measured Value

Material
Count 100/100
90 dBµV
90 dBµV 7.3301750 GH
80 dBµV
80 dBµV
70 dBµV
60 dBµV
50 dBµV
M1
40 dB by
40 dBW here was a second of the second of t
20 dBµV
10 dBµV
0 dBµV
CF 7.311 GHz 691 pts Span 50.0 MHz

### Note:

Plot of worst case are only reported.



### 9.7 RADIATED RESTRICTED BAND EDGES

Operation	Mode:		802.11b				
Transfer Ra	ate:	-	1 Mbps				
Operating	Frequency	-	2 412 MHz, 2	462 MHz			
Channel No.			01 Ch, 11 Ch				
Frequency	Measured Value	A.F+C.L-A.G+ ATT+D.F	ANT. POL	Total	Limit	Margin	Measurement
[MHz]	[dBµV]	[dB/m]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	Туре
2390.0	20.893	37.05	Н	57.94	73.98	16.04	PK
2390.0	11.985	37.05	Н	49.04	53.98	4.95	AV
2390.0	21.004	37.05	V	58.05	73.98	15.93	PK
2390.0	12.108	37.05	V	49.16	53.98	4.82	AV
2483.5	20.952	37.03	Н	57.98	73.98	16.00	PK
2483.5	11.485	37.03	Н	48.52	53.98	5.47	AV
2483.5	21.094	37.03	V	58.12	73.98	15.86	PK
2483.5	11.647	37.03	V	48.68	53.98	5.30	AV

Operation Mode:	802.11g
Transfer Rate:	6 Mbps
Operating Frequency	2412 MHz
Channel No.	01 Ch

Frequency	Measured Value	Duty Cycle Factor	A.F+C.L-A.G+ ATT+D.F	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[dB]	[dB/m]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	
# 2389.5	26.896	0.000	37.05	Н	63.95	73.98	10.03	PK
# 2388.5	25.025	0.000	37.05	Н	62.08	73.98	11.91	PK
2388.0	32.852	0.000	37.05	Н	69.90	73.98	4.08	PK
2390.0	11.485	0.054	37.05	Н	48.59	53.98	5.39	AV
# 2389.5	27.070	0.000	37.05	V	64.12	73.98	9.86	PK
# 2388.5	25.130	0.000	37.05	V	62.18	73.98	11.80	PK
2388.0	33.157	0.000	37.05	V	70.21	73.98	3.77	PK
2390.0	11.656	0.054	37.05	V	48.76	53.98	5.22	AV



Operation Mode:	802.11g
Transfer Rate:	6 Mbps
Operating Frequency	2417 MHz
Channel No.	02 Ch
	· · · · · · · · · · · · · · · · · · ·

Frequency	Measured Value	Duty Cycle Factor	A.F+C.L-A.G+ ATT+D.F	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[dB]	[dB/m]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	
2389.5	33.025	0.000	37.05	Н	70.08	73.98	3.91	PK
2390.0	11.850	0.054	37.05	Н	48.95	53.98	5.03	AV
2388.0	33.372	0.000	37.05	V	70.42	73.98	3.56	PK
2390.0	12.076	0.054	37.05	V	49.18	53.98	4.80	AV

Operation Mode:
Transfer Rate:
Operating Frequency
Channel No.

802.11g	
6 Mbps	
2457 MHz	
10 Ch	

Frequency	Measured Value	Duty Cycle Factor	A.F+C.L-A.G+ ATT+D.F	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[dB]	[dB/m]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	
2483.5	33.125	0.000	37.03	н	70.16	73.98	3.83	PK
# 2484	13.025	0.054	37.03	Н	50.11	53.98	3.87	AV
# 2485	12.512	0.054	37.03	Н	49.60	53.98	4.38	AV
2485.5	13.025	0.054	37.03	Н	50.11	53.98	3.87	AV
2483.5	33.495	0.000	37.03	V	70.53	73.98	3.46	PK
# 2484	13.370	0.054	37.03	V	50.45	53.98	3.53	AV
# 2485	12.820	0.054	37.03	V	49.90	53.98	4.08	AV
2485.5	13.434	0.054	37.03	V	50.52	53.98	3.46	AV



Operation Mode:	802.11g
Transfer Rate:	6 Mbps
Operating Frequency	2462 MHz
Channel No.	11 Ch

Frequency	Measured Value	Duty Cycle Factor	A.F+C.L-A.G+ ATT+D.F	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[dB]	[dB/m]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	
# 2484	25.621	0.000	37.03	н	62.65	73.98	11.33	PK
# 2484	12.856	0.054	37.03	Н	49.94	53.98	4.04	AV
2484.5	33.025	0.000	37.03	Н	70.06	73.98	3.93	PK
2484.5	13.125	0.054	37.03	Н	50.21	53.98	3.77	AV
# 2484	25.870	0.000	37.03	V	62.90	73.98	11.08	PK
# 2484	13.050	0.054	37.03	V	50.13	53.98	3.85	AV
2484.5	33.351	0.000	37.03	V	70.38	73.98	3.60	PK
2484.5	13.561	0.054	37.03	V	50.65	53.98	3.33	AV

Operation Mode:	802.11n (HT20)
Transfer Rate:	MCS0
Operating Frequency	2412 MHz
Channel No.	01 Ch

Frequency	Measured Value	Duty Cycle Factor	A.F+C.L-A.G+ ATT+D.F	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[dB]	[dB/m]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	
2390.0	32.785	0.000	37.05	Н	69.84	73.98	4.15	PK
2390.0	10.125	0.055	37.05	Н	47.23	53.98	6.75	AV
2390.0	32.977	0.000	37.05	V	70.03	73.98	3.95	PK
2390.0	10.401	0.055	37.05	V	47.51	53.98	6.47	AV



Operation Mode:	802.11n (HT20)
Transfer Rate:	MCS0
Operating Frequency	2417 MHz
Channel No.	02 Ch

Frequency	Measured Value	Duty Cycle Factor	A.F+C.L-A.G+ ATT+D.F	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[dB]	[dB/m]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	
2390.0	33.296	0.000	37.05	Н	70.35	73.98	3.63	PK
2390.0	10.839	0.055	37.05	Н	47.94	53.98	6.04	AV
2390.0	33.025	0.000	37.05	V	70.08	73.98	3.91	PK
2390.0	10.621	0.055	37.05	V	47.73	53.98	6.25	AV

Operation Mode:
Transfer Rate:
Operating Frequency
Channel No.

802.11n (HT20)	
MCS0	
2457 MHz	
10 Ch	

Frequency	Measured Value	Duty Cycle Factor	A.F+C.L-A.G+ ATT+D.F	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[dB]	[dB/m]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	
2483.5	33.025	0.000	37.03	V	70.06	73.98	3.93	PK
# 2484	13.009	0.055	37.03	V	50.09	53.98	3.89	AV
# 2485	12.482	0.055	37.03	V	49.57	53.98	4.41	AV
2485.5	13.125	0.055	37.03	V	50.21	53.98	3.77	AV
2483.5	33.495	0.000	37.03	V	70.53	73.98	3.46	PK
# 2484	13.370	0.055	37.03	V	50.46	53.98	3.53	AV
# 2485	12.820	0.055	37.03	V	49.91	53.98	4.08	AV
2485.5	13.434	0.055	37.03	V	50.52	53.98	3.46	AV



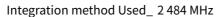
Operation Mode:	802.11n (HT20)
Transfer Rate:	MCS0
Operating Frequency	2462 MHz
Channel No.	11 Ch

Frequency	Measured Value	Duty Cycle Factor	A.F+C.L-A.G+ ATT+D.F	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[dB]	[dB/m]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	
# 2484	25.485	0.000	37.03	Н	62.52	73.98	11.47	PK
# 2484	12.695	0.055	37.03	Н	49.78	53.98	4.20	AV
2484.5	31.511	0.000	37.03	Н	68.54	73.98	5.44	PK
2484.5	13.222	0.055	37.03	Н	50.31	53.98	3.67	AV
# 2484	25.880	0.000	37.03	V	62.91	73.98	11.07	PK
# 2484	12.990	0.055	37.03	V	50.08	53.98	3.90	AV
2484.5	31.827	0.000	37.03	V	68.86	73.98	5.12	PK
2484.5	13.417	0.055	37.03	V	50.50	53.98	3.48	AV



## Test Plots

Radiated Restricted Band Edges plot - Average Measured Value (802.11g, Ch.11, X-V)





Radiated Restricted Band Edges plot – Peak Measured Value (802.11g, Ch.11, X-V) Integration method Used\_ 2 484 MHz





# Radiated Restricted Band Edges plot – Average Measured Value (802.11g, Ch.11, X-V) Standard method Used\_ 2 484.5 MHz



Radiated Restricted Band Edges plot - Peak Measured Value (802.11g, Ch.11, X-V)

Standard method Used\_ 2 484.5 MHz



#### Note:

Plot of worst case are only reported



## 9.8 RECEIVER SPURIOUS EMISSIONS

## Frequency Range : Below 1 GHz

Frequency	Measured Value	A.F + C.L	Ant. POL	Total	Limit	Margin		
[MHz]	[dBµV]	[dB/m]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]		
No Critical peaks found								

## Note:

1. Radiated emissions measured in frequency range from 30 MHz to 1000 MHz were made with an instrument using Quasi peak detector mode.

## Frequency Range : Above 1 GHz

Frequency	Measured Value	A.F + C.L – A.G + D.F	Ant. POL	Total	Limit	Margin
[MHz]	[dBµV]	[dB/m]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]
No Critical peaks found						



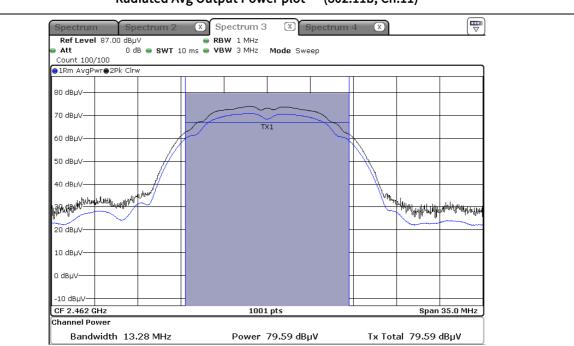
# 9.9 RADIATED OUTPUT POWER (E.I.R.P)

Operation Mode:			802.11b				
Transfer Rate:		 1	1 Mbps				
Operating Frequency			2412 MHz, 2437 MHz, 2462 MHz				
Channel No.		(	01 Ch, 06Ch, 11Ch				
	Measured			Field Chroneth			
Frequency	Value	A.F+C.L+D.F	ANT. POL	Field Strength	EIRP		
[MHz]	[dBµV/m]	[dB/m]	[H/V]	[dBµV/m]	[dBm]		
2412	78.77	34.70	Н	113.47	18.27		
2437	79.48	34.76	Н	114.24	19.04		
2462	79.59	34.95	Н	114.54	19.34		
Operation Mod	le:	8	802.11g				
Transfer Rate:		6	6 Mbps				
Operating Freq	luency	_2	2412 MHz, 2437 MHz, 2462 MHz				
Channel No.		(	01 Ch, 06Ch, 11Ch				
Frequency	Measured		ANT. POL	Field Strength	EIDD		
Frequency	Value	A.F+C.L+D.F			EIRP		
[MHz]	[dBµV/m]	[dB/m]	[H/V]	[dBµV/m]	[dBm]		
2412	75.11	34.70	Н	109.81	14.61		
2437	77.80	34.76	Н	112.56	17.36		
2462	76.26	34.95	Н	111.21	16.01		
Operation Mode:			802.11n_HT20				
MCS Index:		(	C				
Operating Frequency			2412 MHz, 2437 MHz, 2462 MHz				
Channel No.			01 Ch, 06Ch, 11Ch				
Frequency	Measured	A.F+C.L+D.F	ANT. POL	Field Strength	EIRP		
riequency	Value	A.F+C.L+D.F	ANT. PUL		LIKF		
[MHz]	[dBµV/m]	[dB/m]	[H/V]	[dBµV/m]	[dBm]		
				100.40	12.20		
2412	73.76	34.70	Н	108.46	13.26		
	73.76 76.95	34.70 34.76	H H	108.46	13.26		



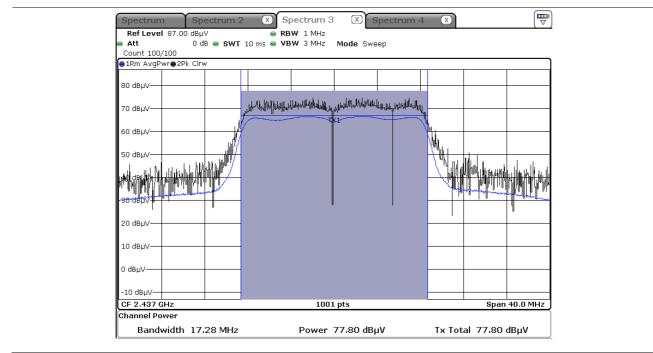


#### Test Plots (Worst case : Y-H)

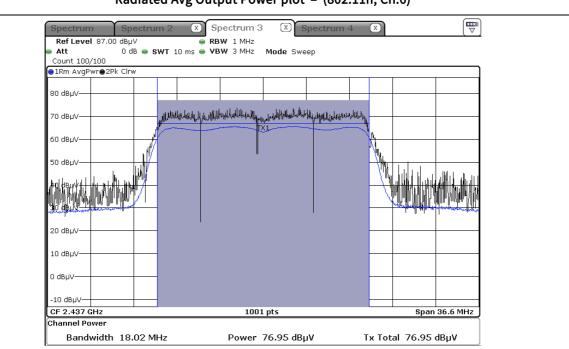


# Radiated Avg Output Power plot - (802.11b, Ch.11)

#### Radiated Avg Output Power plot - (802.11g Ch.6)







## Radiated Avg Output Power plot – (802.11n, Ch.6)

#### Note:

Worst-case test plot is included in the report.



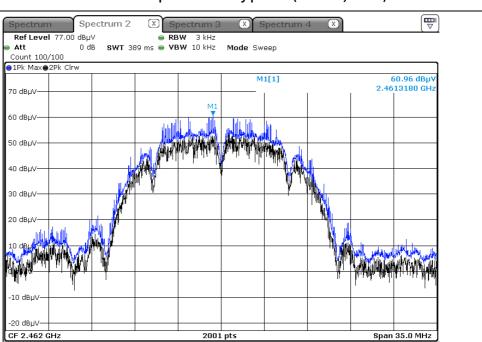
# 9.10 RADIATED POWER SPECTRAL DENSITY

Operation Mo	de:		802.11b				
Transfer Rate:			1 Mbps				
Operating Frequency			2412 MHz, 2437 M	IHz, 2462 MHz			
Channel No.			01 Ch, 06Ch, 11Ch				
Frequency	Measured Value	A.F+C.L+D.F	ANT. POL	Field Strength	PSD		
[MHz]	[dBµV]	[dB/m]	[H/V]	[dBµV/m]	[dBm]		
2412	60.14	34.70	Н	94.84	-0.36		
2437	60.91	34.76	Н	95.67	0.47		
2462	60.96	34.95	Н	95.91	0.71		
	Operation Mode: Transfer Rate:			802.11g 6 Mbps			
Operating Fre	quency		2412 MHz, 2437 MHz, 2462 MHz				
Channel No.			01 Ch, 06Ch, 11Ch				
Frequency	Measured Value	A.F+C.L+D.F	ANT. POL	Field Strength	PSD		
[MHz]	[dBµV]	[dB/m]	[H/V]	[dBµV/m]	[dBm]		
2412	49.85	34.70	Н	84.55	-10.65		
2437	52.39	34.76	Н	87.15	-8.05		
2462	50.91	34.95	Н	85.86	-9.34		
Operation Mode: MCS Index:			802.11n_HT20 0				
Operating Frequency			2412 MHz, 2437 MHz, 2462 MHz				
Channel No.		01 Ch, 06Ch, 11Ch					
Frequency	Measured	A.F+C.L+D.F	ANT. POL	Field Strength	PSD		
	Value						
[MHz]	[dBµV]	[dB/m]	[H/V]	[dBµV/m]	[dBm]		
2412	48.77	34.70	Н	83.47	-11.73		
2437	52.63	34.76	Н	87.39	-7.81		
2462	50.69	34.95	Н	85.64	-9.56		



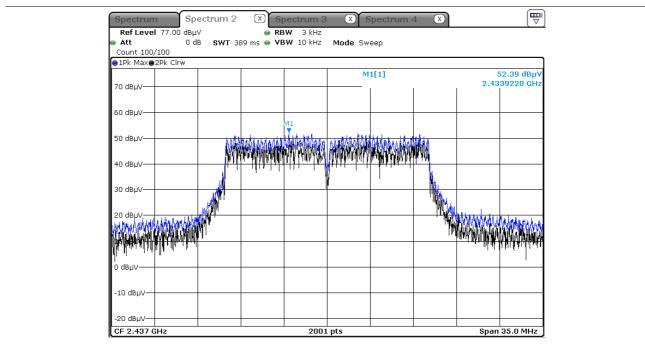


#### Test Plots (Worst case : Y-H)



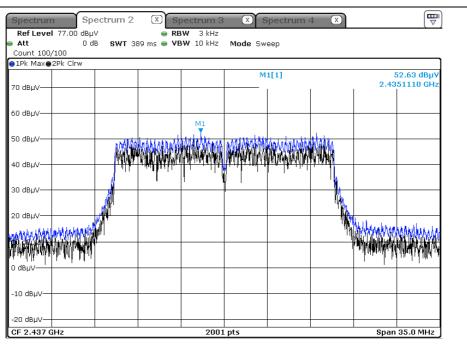
## Radiated Power Spectral Density plot - (802.11b, Ch.11)





HCT

Report No. HCT-RF-2307-FI008-R1



# Radiated Power Spectral Density plot – (802.11n, Ch.6)

# Note:

Worst-case test plot is included in the report.



# **10. LIST OF TEST EQUIPMENT**

#### Conducted Test

Equipment	Model	Manufacturer	Serial No.	Due to Calibration	Calibration Interval	
LISN	ENV216	Rohde & Schwarz	102245	08/22/2023	Annual	
EMI Test Receiver	ESR	Rohde & Schwarz	101910	06/07/2023	Annual	
Temperature Chamber	SU-642	ESPEC	0093008124	03/04/2023	Annual	
Signal Analyzer	N9030A	Agilent	MY49432108	03/08/2023	Annual	
Power Measurement Set	OSP 120	Rohde & Schwarz	101231	06/14/2023	Annual	
Power Meter	N1911A	Agilent	MY45100523	03/24/2023	Annual	
Power Sensor	N1921A	Agilent	MY57820067	03/24/2023	Annual	
Directional Coupler	87300B	Agilent	3116A03621	11/02/2023	Annual	
Power Splitter	11667B	Hewlett Packard	10545	02/06/2024	Annual	
DC Power Supply	E3632A	HP	KR75303243	04/25/2023	Annual	
Attenuator(10 dB)(DC-26.5 GHz)	8493C	НР	08285	06/21/2023	Annual	
Attenuator(20 dB)	18N-20dB	Rohde & Schwarz	8	03/07/2023	Annual	
Software	EMC32	Rohde & Schwarz	N/A	N/A	N/A	
FCC WLAN&BT&BLE Conducted Test Software v3.0	N/A	HCT CO., LTD.	N/A	N/A	N/A	
Bluetooth Tester	СВТ	Rohde & Schwarz	100808	02/22/2023	Annual	

#### Note:

1. Equipment listed above that calibrated during the testing period was set for test after the

calibration.

2. Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.



Equipment	Model	Manufacturer	Serial No.	Due to Calibration	Calibration Interval
Controller(Antenna mast)	CO3000	Innco system	CO3000-4p	N/A	N/A
Antenna Position Tower	MA4640/800-XP-EP	Innco system	N/A	N/A	N/A
EM1000 / Controller	EM1000	Audix	060520	N/A	N/A
Turn Table	N/A	Audix	N/A	N/A	N/A
Amp &Filter Bank Switch Controller	FBSM-01B	TNM system	TM19050002	N/A	N/A
Loop Antenna	FMZB 1513	Rohde & Schwarz	1513-333	03/17/2024	Biennial
Hybrid Antenna	VULB 9168	Schwarzbeck	9168-0895	08/16/2024	Biennial
Horn Antenna	BBHA 9120D	Schwarzbeck	9120D-1300	01/18/2024	Biennial
Horn Antenna(15 GHz ~ 40 GHz)	BBHA9170	Schwarzbeck	BBHA9170124	04/12/2023	Biennial
Spectrum Analyzer	FSV(10 Hz ~ 40 GHz)	Rohde & Schwarz	101055	05/16/2023	Annual
Band Reject Filter	WRCJV2400/2483.5- 2370/2520-60/12SS	Wainwright Instruments	2	01/05/2024	Annual
Band Reject Filter	WRCJV12-4900-5100- 5900-6100-50SS	Wainwright Instruments	5	06/13/2023	Annual
Band Reject Filter	WRCJV12-4900-5100- 5900-6100-50SS	Wainwright Instruments	6	06/13/2023	Annual
High Pass Filter(7 GHz ~ 18 GHz)	WHKX10-7150-8000- 18000-50SS	Wainwright Instruments	1	03/11/2023	Annual
Power Amplifier	CBL18265035	CERNEX	22966	12/01/2023	Annual
Power Amplifier	CBL26405040	CERNEX	25956	03/11/2023	Annual
Bluetooth Tester	TC-3000C	TESCOM	3000C000175	04/05/2023	Annual
HPF(3~18GHz)+LNA1(1~18GHz)	FMSR-05B	TNM system	F6	01/17/2024	Annual
ATT(10dB) + LNA1(1~18GHz)	FMSR -05B	TNM system	None	01/17/2024	Annual
ATT(3dB) + LNA1(1~18GHz)	FMSR -05B	TNM system	None	01/17/2024	Annual
LNA1(1~18GHz)	FMSR -05B	TNM system	25540	01/17/2024	Annual
HPF(7~18GHz)+LNA2(6~18GHz)	FMSR -05B	TNM system	28550	01/17/2024	Annual
Thru(30MHz ~ 18GHz)	FMSR -05B	TNM system	None	01/17/2024	Annual

#### Note:

1. Equipment listed above that calibrated during the testing period was set for test after the calibration.

2. Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.

3. Especially, all antenna for measurement is calibrated in accordance with the requirements of C63.5(Version : 2017).



# **11. ANNEX A\_ TEST SETUP PHOTO**

Please refer to test setup photo file no. as follows;

No.	Description
1	HCT-RF-2307-FI008-P