MEASUREMENT REPORT

FCC PART 15C / WLAN 802.11b/g/n

FCC ID:	HD5-CT40L0N
Applicant:	Honeywell International Inc Honeywell Safety and Productivity Solutions
Application Type:	Class II Permissive Change
Product:	DOLPHIN CT40
Model No.:	CT40-L0N
Brand Name:	Honeywell
FCC Classification:	Digital Transmission System (DTS)
FCC Rule Part(s):	Part 15 Subpart C (Section 15.247)
Test Procedure(s):	ANSI C63.10-2013
Test Date:	December 16 ~ 29, 2020

Reviewed By: Jame Yuan

Approved By: Robin Wu

ACCREDITED
TESTING LABORATORY
CERTIFICATE #3628.01

The test results relate only to the samples tested.
This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.10-2013. Test results reported herein relate only to the item(s) tested.
The test report shall not be reproduced except in full without the written approval of MRT Technology (Suzhou) Co., Ltd.

Revision History

Report No.	Version	Description	Issue Date	Note
2012RSU040-U1	Rev. 01	Initial Report	12-30-2020	Valid

Note: Model CT40-L0N has got FCC ID HD5-CT40L0N, now add new channel 12/13 (20M BW) and 10/11 (40M BW) by software upgrade, so we evaluated all RF testing for new channels in this report.

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1. GENERAL INFORMATION

1.1. Applicant

Honeywell International Inc
Honeywell Safety and Productivity Solutions

9680 Old Bailes Rd. Fort Mill, SC 29707 United States

1.2. Manufacturer

Honeywell International Inc
Honeywell Safety and Productivity Solutions

9680 Old Bailes Rd. Fort Mill, SC 29707 United States

1.3. Test Facility

☒	**Test Site – MRT Suzhou Laboratory**	
	Laboratory Location (Suzhou - Wuzhong)	
	D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China	
	Laboratory Location (Suzhou - SIP)	
	4b Building, Liando U Valley, No.200 Xingpu Rd., Shengpu Town, Suzhou Industrial Park, China	
	Laboratory Accreditations	
	A2LA: 3628.01	CNAS: L10551
	FCC: CN1166	ISED: CN0001
	VCCI: R-20025, G-20034, C-20020, T-20020	
☐	**Test Site – MRT Shenzhen Laboratory**	
	Laboratory Location (Shenzhen)	
	1G, Building A, Junxiangda Building, Zhongshanyuan Road West, Nanshan District, Shenzhen, China	
	Laboratory Accreditations	
	A2LA: 3628.02	CNAS: L10551
	FCC: CN1284	ISED: CN0105
☐	**Test Site – MRT Taiwan Laboratory**	
	Laboratory Location (Taiwan)	
	No. 38, Fuxing 2nd Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)	
	Laboratory Accreditations	
	TAF: L3261-190725	
	FCC: 291082, TW3261	ISED: TW3261

2. PRODUCT INFORMATION

2.1. Equipment Description

Product Name	DOLPHIN CT40
Model No.	CT40-L0N
Serial No.	19022B699A
Hardware Version	1.0
Software Version	OS.04.001
Wi-Fi Specification	802.11a/b/g/n/ac
Bluetooth Version	v5.0 dual mode
NFC	13.56MHz
Accessories	
USB Adapter	Model No.: ADS-12B-06 05010E Input Power: 100 - 240V ~ 50/60Hz, Max. 0.3A Output Power: 5VDC 2.0A
Snap-on Adapter	Model No.: CT40-SN
Battery	Model No.: CT50-BTSC Capacitance: 15.5Wh, 4090mAh Rated Voltage: 3.8V Limit Charge Voltage: 4.36V

2.2. Product Specification Subjective to this Report

Frequency Range	802.11b/g/n-HT20: 2412 ~ 2472 MHz 802.11n-HT40: 2422 ~ 2462 MHz
Channel Number	802.11b/g/n-HT20: 13 802.11n-HT40: 9
Type of Modulation	802.11b: DSSS 802.11g/n: OFDM
Data Rate	802.11b: 1/2/5.5/11Mbps 802.11g: 6/9/12/18/24/36/48/54Mbps 802.11n: up to 150Mbps
Antenna Type	FPC Antenna
Antenna Gain	2.20dBi

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

2.3. Working Frequencies for this report

802.11b/g/n-HT20

Channel	Frequency	Channel	Frequency	Channel	Frequency
01	2412 MHz	02	2417 MHz	03	2422 MHz
04	2427 MHz	05	2432 MHz	06	2437 MHz
07	2442 MHz	08	2447 MHz	09	2452 MHz
10	2457 MHz	11	2462 MHz	12	2467 MHz
13	2472 MHz	--	--	--	--

802.11n-HT40

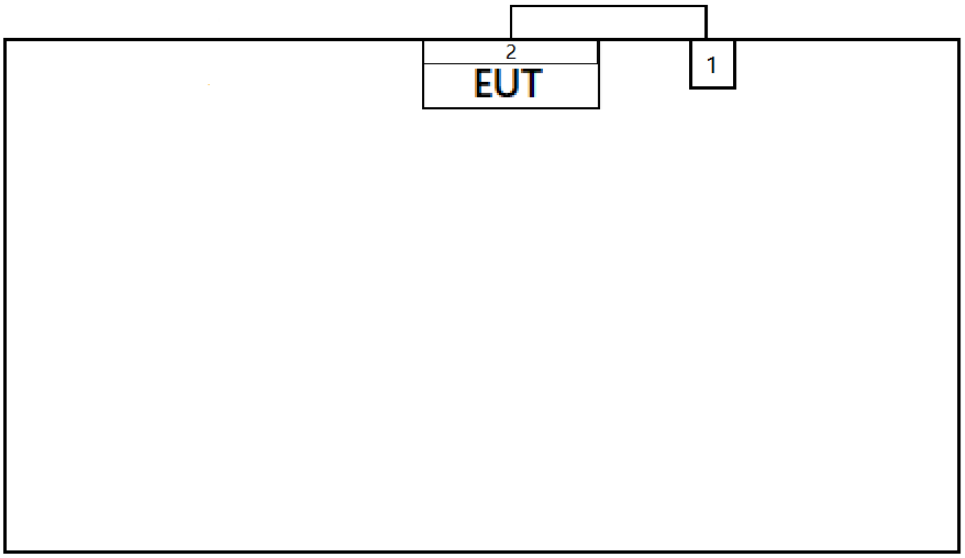
Channel	Frequency	Channel	Frequency	Channel	Frequency
03	2422 MHz	04	2427 MHz	05	2432 MHz
06	2437 MHz	07	2442 MHz	08	2447 MHz
09	2452 MHz	10	2457 MHz	11	2462 MHz

2.4. Test Mode

Test Mode	Mode 1: Transmit by 802.11b (1Mbps)
	Mode 2: Transmit by 802.11g (6Mbps)
	Mode 3: Transmit by 802.11n-HT20 (MCS0)
	Mode 4: Transmit by 802.11n-HT40 (MCS0)

2.5. Description of Test Configuration

The device was tested per the guidance ANSI C63.10: 2013 that was used to reference the appropriate EUT setup for radiated emissions and AC line conducted emission testing.



Product		Manufacturer	Model No.
1	USB Adapter	Shenzhen Honor Electronic Co., Ltd	ADS-12B-06 05010E
2	Snap-on Adapter	Honeywell	CT40-SN

Note 1: The test utility software used during testing was “QRCT”, and the version was 3.0.268.0.

Note 2: Detail power setting refer to operation description.

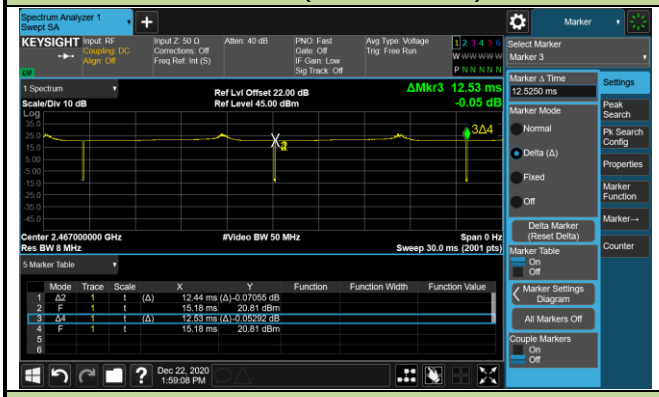
2.6. Duty Cycle

2.4GHz WLAN (DTS) operation is possible in 20MHz channel bandwidths. The maximum achievable duty cycles for all modes were determined based on measurements performed on a spectrum analyzer in zero-span mode with RBW = 8MHz, VBW = 50MHz. The RBW and VBW were both greater than 50/T, where T is the minimum transmission duration, and the number of sweep points across T was greater than 100. The duty cycles are as follows:

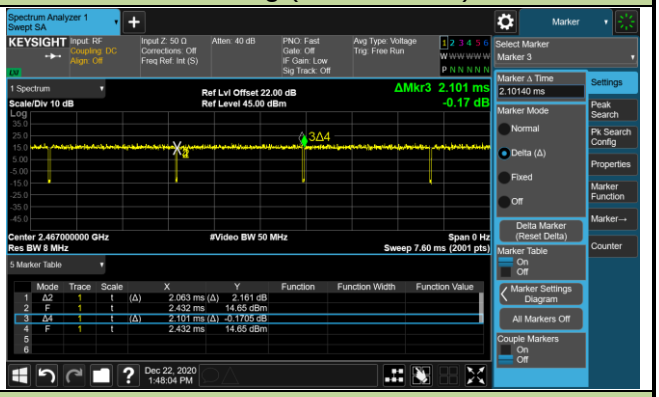
Test Mode	Duty Cycle
802.11b	99.28%
802.11g	98.19%
802.11n-HT20	98.06%
802.11n-HT40	94.52%

Duty Cycle (T = Transmission Duration)

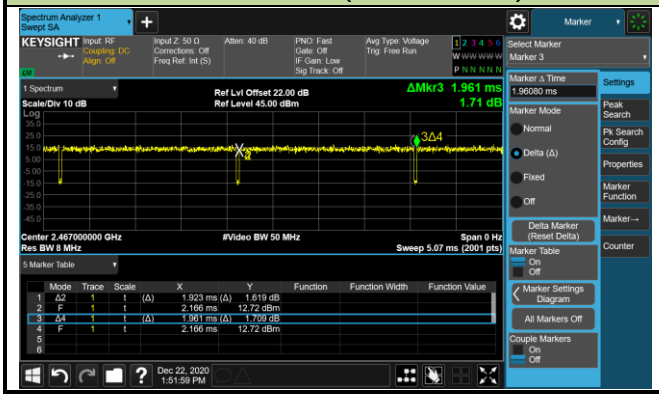
802.11b (T = 12.44ms)



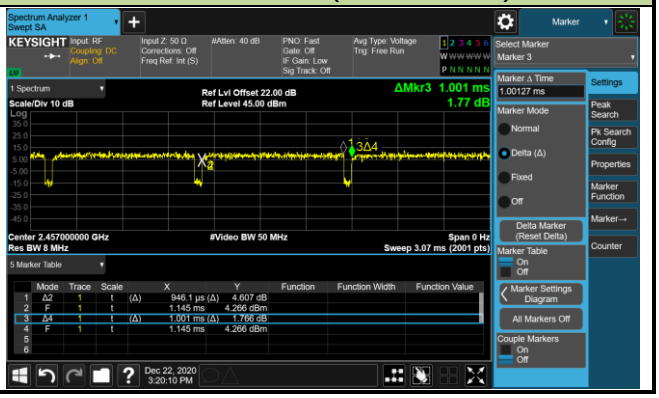
802.11g (T = 2.063ms)



802.11n-HT20 (T = 1.923ms)



802.11n-HT40 (T = 946.1 us)



2.7. EMI Suppression Device(s)/Modifications

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

2.8. Test Environment Condition

Ambient Temperature	15°C ~ 35°C
Relative Humidity	20%RH ~ 75%RH

3. TEST EQUIPMENT CALIBRATION DATE

Conducted Emission (WZ-SR2)

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR3	MRTSUE06185	1 year	2021/01/18
Two-Line V-Network	R&S	ENV216	MRTSUE06002	1 year	2021/09/09
Thermal Hygrometer	testo	608-H1	MRTSUE06404	1 year	2021/07/26
Shielding Room	MIX-BEP	Chamber-SR2	MRTSUE06215	N/A	N/A

Conducted Emission (SIP-SR2)

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR3	MRTSUE06613	1 year	2021/07/02
Two-Line V-Network	R&S	ENV216	MRTSUE06003	1 year	2021/09/09
Thermal Hygrometer	testo	608-H1	MRTSUE06621	1 year	2021/12/03

Radiated Emission (WZ-AC1)

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR7	MRTSUE06001	1 year	2021/01/18
PXA Signal Analyzer	Keysight	N9030B	MRTSUE06395	1 year	2021/08/30
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2021/11/08
Bilog Period Antenna	Schwarzbeck	VULB 9168	MRTSUE06172	1 year	2021/08/08
Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06023	1 year	2021/09/27
Horn Antenna	Schwarzbeck	BBHA9170	MRTSUE06597	1 year	2021/12/14
Microwave System Amplifier	Agilent	83017A	MRTSUE06076	1 year	2021/11/14
Preamplifier	Schwarzbeck	BBV 9721	MRTSUE06121	1 year	2021/06/11
Thermal Hygrometer	testo	608-H1	MRTSUE06403	1 year	2021/07/26
Anechoic Chamber	TDK	Chamber-AC1	MRTSUE06212	1 year	2021/04/30

Radiated Emission (WZ-AC2)

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
MXE EMI Receiver	Keysight	N9038A	MRTSUE06125	1 year	2021/07/02
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2021/11/08
Bilog Period Antenna	Schwarzbeck	VULB 9162	MRTSUE06022	1 year	2021/05/26
Broad-Band Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06171	1 year	2021/10/25
Horn Antenna	Schwarzbeck	BBHA9170	MRTSUE06597	1 year	2021/12/14
Broadband Coaxial Preamplifier	Schwarzbeck	BBV 9718	MRTSUE06176	1 year	2021/11/14
Preamplifier	Schwarzbeck	BBV 9721	MRTSUE06121	1 year	2021/06/11
Thermal Hygrometer	Minggao	ETH529	MRTSUE06170	1 year	2021/12/08
Anechoic Chamber	RIKEN	Chamber-WZ-AC2	MRTSUE06213	1 year	2021/04/30

Radiated Emission (SIP-AC1)

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR3	MRTSUE06612	1 year	2021/07/02
EXA Signal Analyzer	Keysight	N9010B	MRTSUE06559	1 year	2021/07/23
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2021/11/08
Bilog Period Antenna	Schwarzbeck	VULB9168	MRTSUE06645	1 year	2021/08/30
Double Ridged Horn Antenna	R&S	HF907	MRTSUE06610	1 year	2021/08/30
Preamplifier	EMCI	EMC051845SE	MRTSUE06600	1 year	2021/11/09
Thermal Hygrometer	testo	608-H1	MRTSUE06620	1 year	2021/12/03
Anechoic Chamber	RIKEN	SIP-AC1	MRTSUE06554	1 year	2021/12/24

Radiated Emission (SIP-AC2)

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR3	MRTSUE06613	1 year	2021/07/02
MXA Signal Analyzer	Keysight	N9020B	MRTSUE06604	1 year	2021/09/26
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2021/11/08
Bilog Period Antenna	Schwarzbeck	VULB9168	MRTSUE06646	1 year	2021/08/30
Horn Antenna	Schwarzbeck	BBHA9120D	MRTSUE06648	1 year	2021/11/26
Horn Antenna	Schwarzbeck	BBHA9170	MRTSUE06599	1 year	2021/11/26
Preamplifier	EMCI	EMC051845SE	MRTSUE06644	1 year	2021/11/09
Preamplifier	EMCI	EMC184045SE	MRTSUE06602	1 year	2021/10/21
Thermal Hygrometer	testo	608-H1	MRTSUE06624	1 year	2021/12/03
Anechoic Chamber	RIKEN	SIP-AC2	MRTSUE06781	1 year	2021/12/24

Radiated Emission (SIP-AC3)

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR3	MRTSUE06612	1 year	2021/07/02
EXA Signal Analyzer	Keysight	N9010B	MRTSUE06559	1 year	2021/07/23
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2021/11/08
Bilog Period Antenna	Schwarzbeck	VULB9168	MRTSUE06647	1 year	2021/08/08
Double Ridged Horn Antenna	R&S	HF907	MRTSUE06611	1 year	2021/09/13
Horn Antenna	Schwarzbeck	BBHA9170	MRTSUE06598	1 year	2021/11/26
Preamplifier	EMCI	EMC012645SE	MRTSUE06642	1 year	2021/01/16
Preamplifier	EMCI	EMC184045SE	MRTSUE06641	1 year	2021/01/16
Thermal Hygrometer	testo	608-H1	MRTSUE06622	1 year	2021/12/03
Anechoic Chamber	RIKEN	SIP-AC3	MRTSUE06782	1 year	2021/12/24

Conducted Test Equipment (WZ-TR3)

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EXA Signal Analyzer	Agilent	N9020A	MRTSUE06106	1 year	2021/04/14
EXA Signal Analyzer	Keysight	N9010B	MRTSUE06607	1 year	2021/01/08
Signal Analyzer	R&S	FSV40	MRTSUE06218	1 year	2021/04/14
Power Meter	Agilent	U2021XA	MRTSUE06030	1 year	2021/10/22
USB wideband power sensor	Keysight	U2021XA	MRTSUE06446	1 year	2021/08/30
USB wideband power sensor	Keysight	U2021XA	MRTSUE06447	1 year	2021/08/08
Bluetooth Test Set	Anritsu	MT8852B-042	MRTSUE06389	1 year	2021/06/11
Audio Analyzer	Agilent	U8903B	MRTSUE06143	1 year	2021/06/11
Modulation Analyzer	HP	HP8901A	MRTSUE06098	1 year	2021/09/26
Attenuator	MVE	20dB	MRTSUE06547	1 year	2021/05/20
Attenuator	MVE	6dB	MRTSUE06532	1 year	2021/05/20
Attenuator	MVE	10dB	MRTSUE06540	1 year	2021/05/20
Wideband Radio Communication Tester	R&S	CMW 500	MRTSUE06243	1 year	2021/10/20
DC Power Supply	GWINSTEK	DPS-3303C	MRTSUE06064	N/A	N/A
Temperature & Humidity Chamber	BAOYT	BYH-150CL	MRTSUE06051	1 year	2021/10/21
Thermal Hygrometer	testo	608-H1	MRTSUE06401	1 year	2021/07/26

Conducted Test Equipment (SIP-SR5)

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Signal Analyzer	R&S	FSV40	MRTSUE06218	1 year	2021/04/14
PXA Signal Analyzer	Keysight	N9030B	MRTSUE06395	1 year	2021/08/30
USB wideband power sensor	Agilent	U2021XA	MRTSUE06595	1 year	2021/09/26
USB wideband power sensor	Agilent	U2021XA	MRTSUE06596	1 year	2021/09/26
Attenuator	MVE	20dB	MRTSUE06547	1 year	2021/05/20
Attenuator	MVE	6dB	MRTSUE06532	1 year	2021/05/20
Attenuator	MVE	10dB	MRTSUE06540	1 year	2021/05/20
Wideband Radio Communication Tester	R&S	CMW 500	MRTSUE06243	1 year	2021/10/20
Bluetooth Test Set	Anritsu	MT8852B-042	MRTSUE06389	1 year	2021/06/11
Temperature Chamber	BAOYT	BYG-408CS	MRTSUE06847	1 year	2021/03/31
Thermal Hygrometer	testo	622	MRTSUE06629	1 year	2021/11/25

Software	Version	Function
EMI Software	V3	EMI Test Software

4. MEASUREMENT UNCERTAINTY

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

AC Conducted Emission Measurement
Measurement Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 9kHz~150kHz: 3.74dB 150kHz~30MHz: 3.44dB
Radiated Disturbance
Measurement Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): Horizontal: 30MHz~300MHz: 5.04dB 300MHz~1GHz: 4.95dB 1GHz~40GHz: 6.40dB Vertical: 30MHz~300MHz: 5.24dB 300MHz~1GHz: 6.03dB 1GHz~40GHz: 6.40dB
Spurious Emissions, Conducted
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 0.78dB
Output Power
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 1.13dB
Power Spectrum Density
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 1.15dB
Occupied Bandwidth
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 0.28%

5. TEST RESULT

5.1. Summary

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
15.247(a)(2)	6dB Bandwidth	≥ 500kHz	Conducted	Pass	Section 5.2
15.247(b)(3)	Output Power	≤ 1Watt		Pass	Section 5.3
15.247(e)	Power Spectral Density	≤ 8dBm / 3kHz		Pass	Section 5.4
15.247(d)	Band Edge / Out-of-Band Emissions	≥ 20dBc (Peak)		Pass	Section 5.5
15.205 15.209	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in 15.209	Radiated	Pass	Section 5.6 & 5.7
15.207	AC Conducted Emissions 150kHz - 30MHz	< FCC 15.207 limits	Line Conducted	Pass	Section 5.8

Notes:

1) The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.
2) All modes of operation and data rates were investigated. For radiated emission test, every axis (X, Y, Z) was also verified. The test results shown in the following sections represent the worst case emissions.

5.2. 6dB Bandwidth Measurement

5.2.1.Test Limit

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

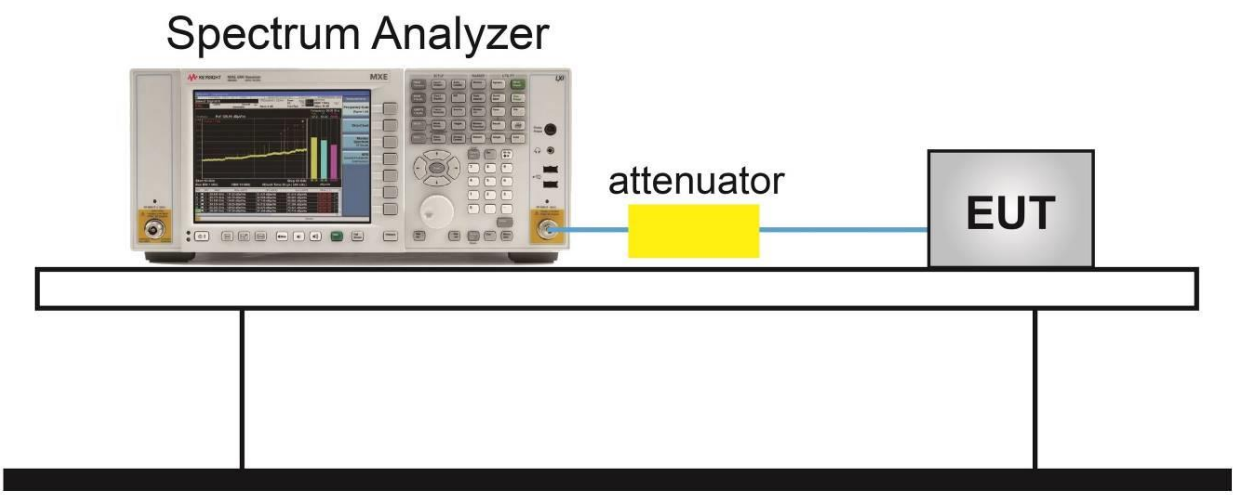
5.2.2.Test Procedure used

ANSI C63.10-2013 - Section 11.8

5.2.3.Test Setting

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

5.2.4.Test Setup



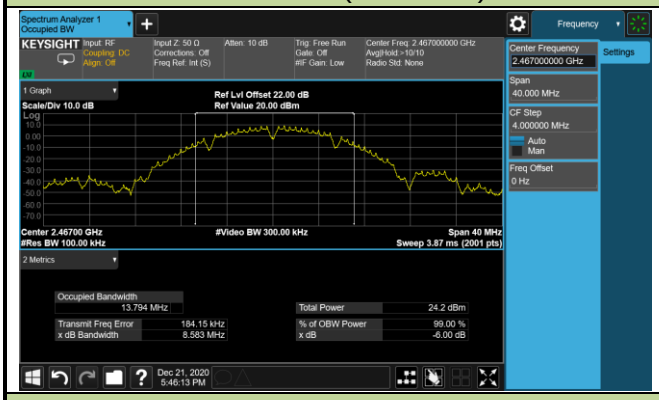
5.2.5.Test Result

Product	DOLPHIN CT40	Test Engineer	Amy Zhang
Test Site	WZ-TR3	Test Date	2020/12/21 ~ 2020/12/22

Test Mode	Data Rate / MCS	Channel No.	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)	Result
802.11b	1Mbps	12	2467	8.58	≥ 0.5	Pass
802.11b	1Mbps	13	2472	7.16	≥ 0.5	Pass
802.11g	6Mbps	12	2467	15.71	≥ 0.5	Pass
802.11g	6Mbps	13	2472	15.73	≥ 0.5	Pass
802.11n-HT20	MCS0	12	2467	16.29	≥ 0.5	Pass
802.11n-HT20	MCS0	13	2472	15.96	≥ 0.5	Pass
802.11n-HT40	MCS0	10	2457	35.96	≥ 0.5	Pass
802.11n-HT40	MCS0	11	2462	35.53	≥ 0.5	Pass

802.11b

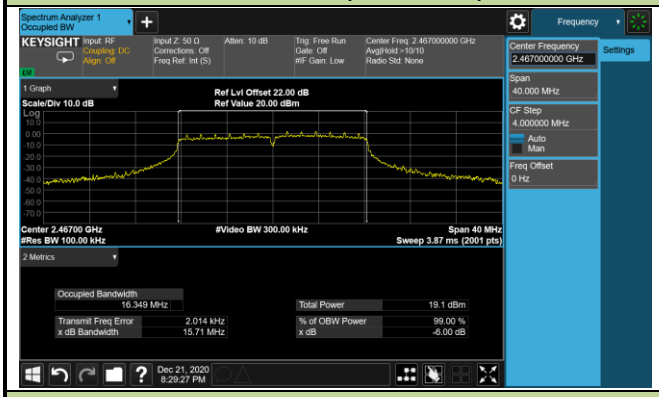
Channel 12 (2467MHz)



Channel 13 (2472MHz)

802.11g

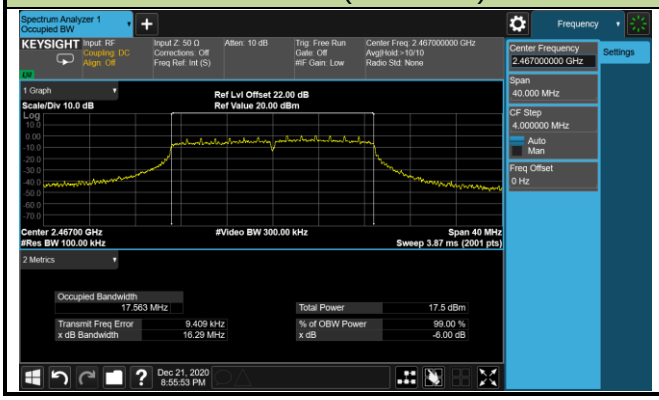
Channel 12 (2467MHz)



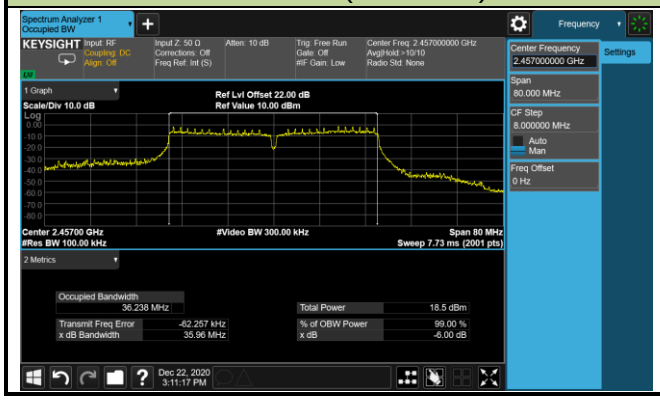
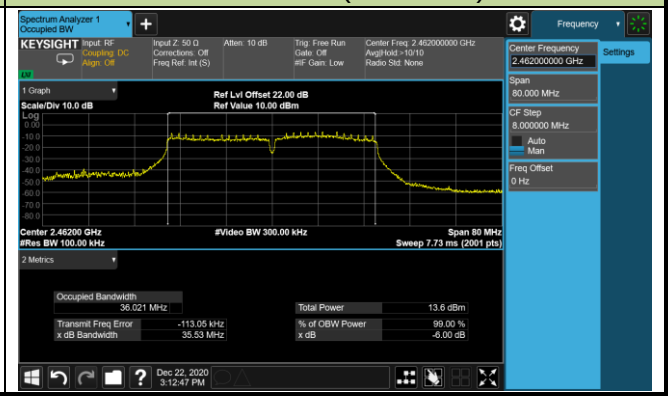
Channel 13 (2472MHz)

802.11n-HT20

Channel 12 (2467MHz)



Channel 13 (2472MHz)

802.11n-HT40	
Channel 10 (2457MHz)	Channel 11 (2462MHz)
	

5.3. Output Power Measurement

5.3.1.Test Limit

The maximum peak output power shall not exceed 1 Watt (30dBm).

5.3.2.Test Procedure Used

ANSI C63.10-2013 Section 11.9.1.3 & ANSI C63.10-2013 Section 11.9.2.3

5.3.3.Test Setting

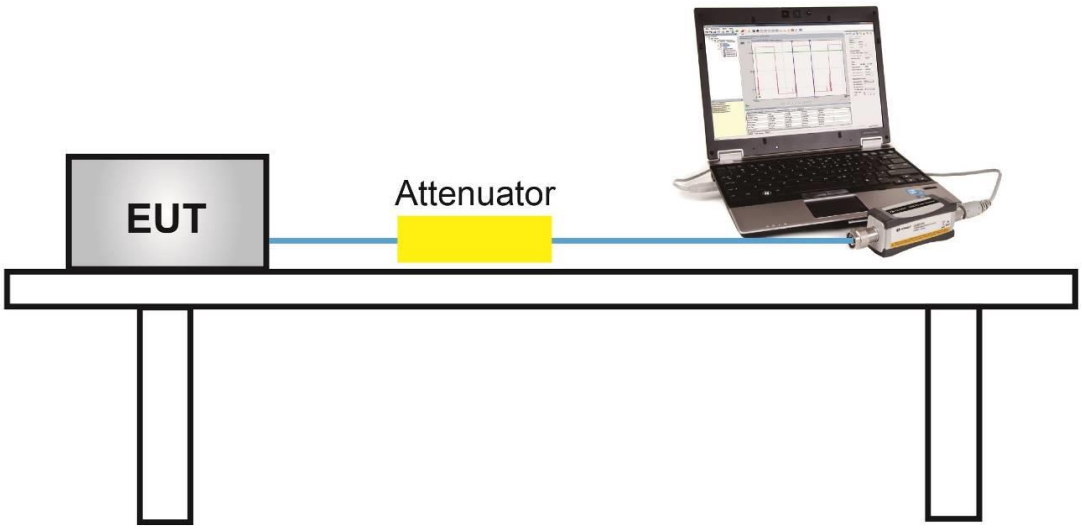
Method PKPM1 (Peak Power Measurement)

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

Method AVGPM-G (Measurement using a gated RF average-reading power meter)

Measurements may be performed using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since this measurement is made only during the ON time of the transmitter, no duty cycle correction is required.

5.3.4.Test Setup



5.3.5.Test Result

Product	DOLPHIN CT40	Test Engineer	Yuri Li
Test Site	WZ-TR3	Test Date	2020/12/21~2020/12/29

Test Result of Peak Output Power

Test Mode	Data Rate / MCS	Channel No.	Freq. (MHz)	Peak Power (dBm)	Limit (dBm)	Result
11b	1Mbps	12	2467	15.57	≤ 30.00	Pass
11b	1Mbps	13	2472	15.43	≤ 30.00	Pass
11g	6Mbps	12	2467	21.45	≤ 30.00	Pass
11g	6Mbps	13	2472	18.59	≤ 30.00	Pass
11n-HT20	MCS0	12	2467	20.22	≤ 30.00	Pass
11n-HT20	MCS0	13	2472	13.05	≤ 30.00	Pass
11n-HT40	MCS0	10	2457	20.09	≤ 30.00	Pass
11n-HT40	MCS0	11	2462	16.22	≤ 30.00	Pass

Test Result of Average Output Power (Reporting Only)

Test Mode	Data Rate / MCS	Channel No.	Freq. (MHz)	Average Power (dBm)	Limit (dBm)	Result
11b	1Mbps	12	2467	12.98	≤ 30.00	Pass
11b	1Mbps	13	2472	12.97	≤ 30.00	Pass
11g	6Mbps	12	2467	12.14	≤ 30.00	Pass
11g	6Mbps	13	2472	8.26	≤ 30.00	Pass
11n-HT20	MCS0	12	2467	11.05	≤ 30.00	Pass
11n-HT20	MCS0	13	2472	3.97	≤ 30.00	Pass
11n-HT40	MCS0	10	2457	10.96	≤ 30.00	Pass
11n-HT40	MCS0	11	2462	6.46	≤ 30.00	Pass

5.4. Power Spectral Density Measurement

5.4.1.Test Limit

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

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

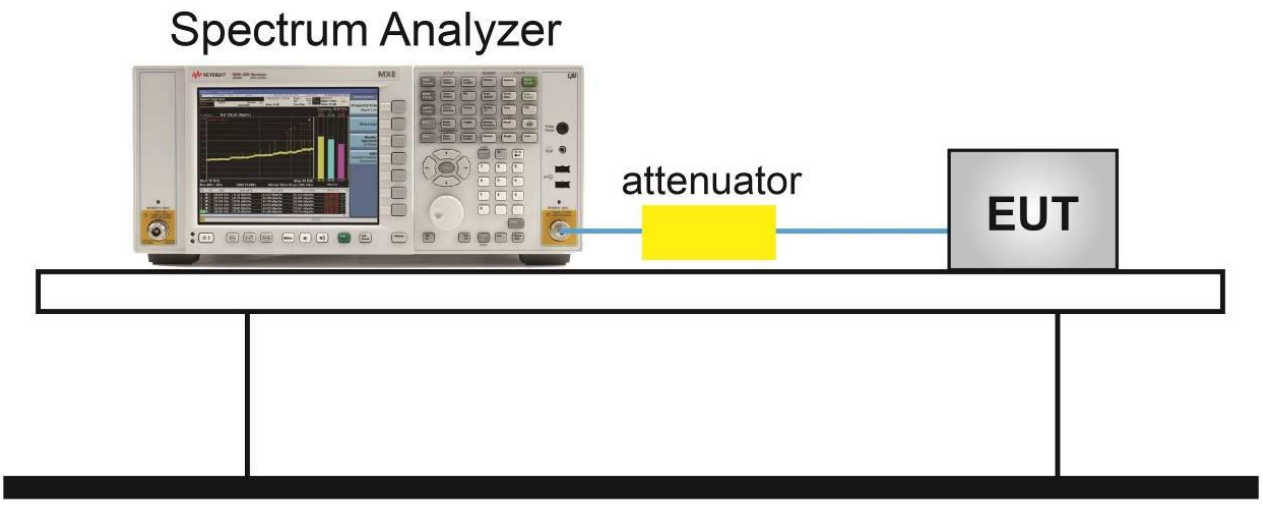
5.4.2.Test Procedure Used

ANSI C63.10-2013 - Section 11.10.2

5.4.3.Test Setting

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

5.4.4.Test Setup

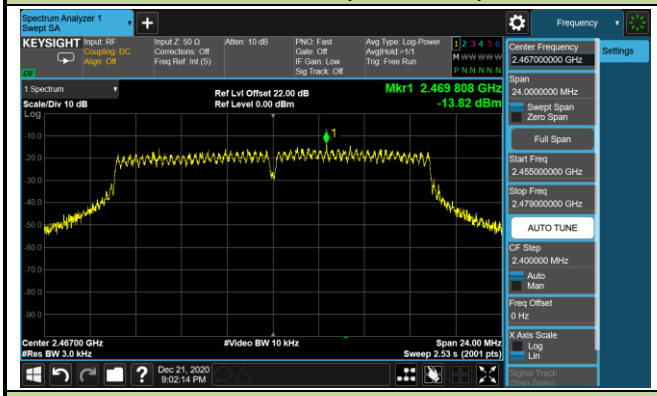
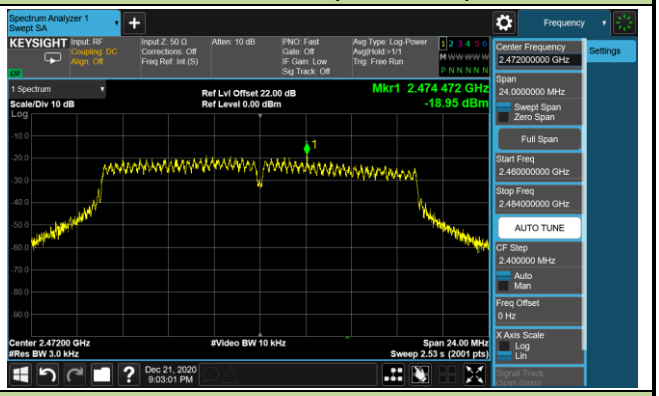
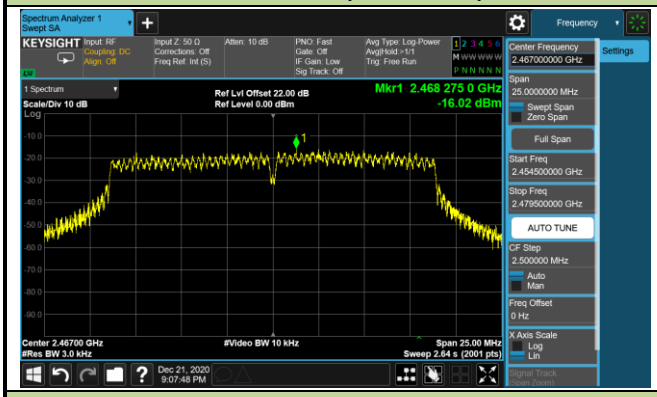
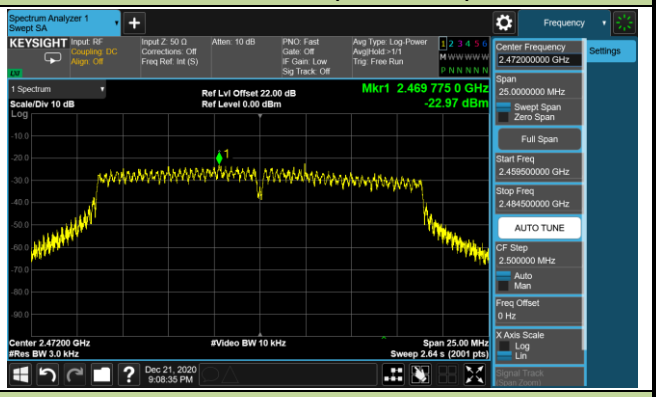
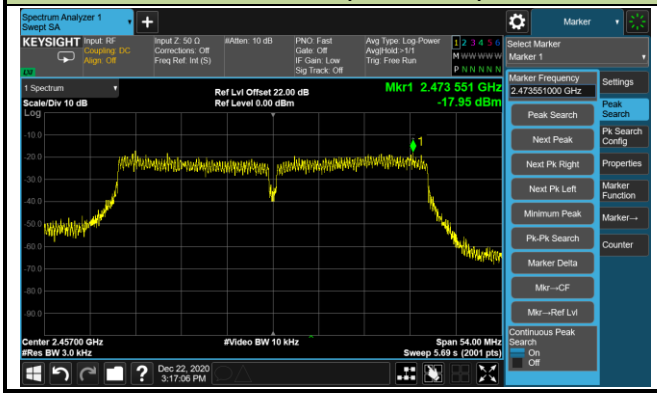
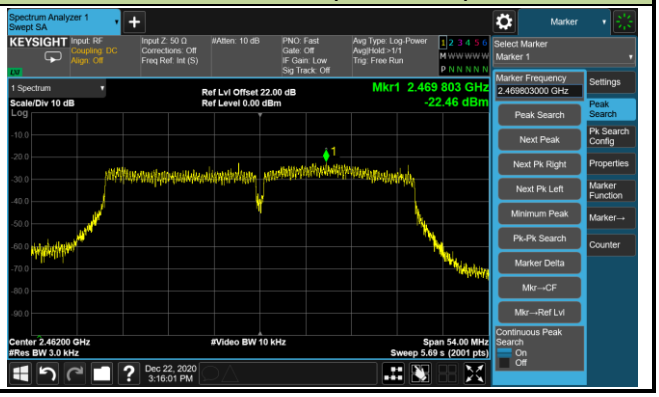


5.4.5.Test Result

Product	DOLPHIN CT40	Test Engineer	Yuri Li
Test Site	WZ-TR3	Test Date	2020/12/21 ~ 2020/12/28

Test Mode	Data Rate/ MCS	Channel No.	Freq. (MHz)	PKPSD (dBm / 3kHz)	Limit (dBm / 3kHz)	Result
11b	1Mbps	12	2467	4.93	≤ 8.00	Pass
11b	1Mbps	13	2472	3.34	≤ 8.00	Pass
11g	6Mbps	12	2467	-13.82	≤ 8.00	Pass
11g	6Mbps	13	2472	-18.95	≤ 8.00	Pass
11n-HT20	MCS0	12	2467	-16.02	≤ 8.00	Pass
11n-HT20	MCS0	13	2472	-22.97	≤ 8.00	Pass
11n-HT40	MCS0	10	2457	-17.95	≤ 8.00	Pass
11n-HT40	MCS0	11	2462	-22.46	≤ 8.00	Pass

802.11b	
Channel 12 (2467MHz)	Channel 13 (2472MHz)

802.11g	
Channel 12 (2467MHz)	Channel 13 (2472MHz)
	
802.11n-HT20	
Channel 12 (2467MHz)	Channel 13 (2472MHz)
	
802.11n-HT40	
Channel 10 (2457MHz)	Channel 11 (2462MHz)
	

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

5.5.1.Test Limit

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

5.5.2.Test Procedure Used

ANSI C63.10-2013 - Section 11.11

5.5.3.Test Settitng

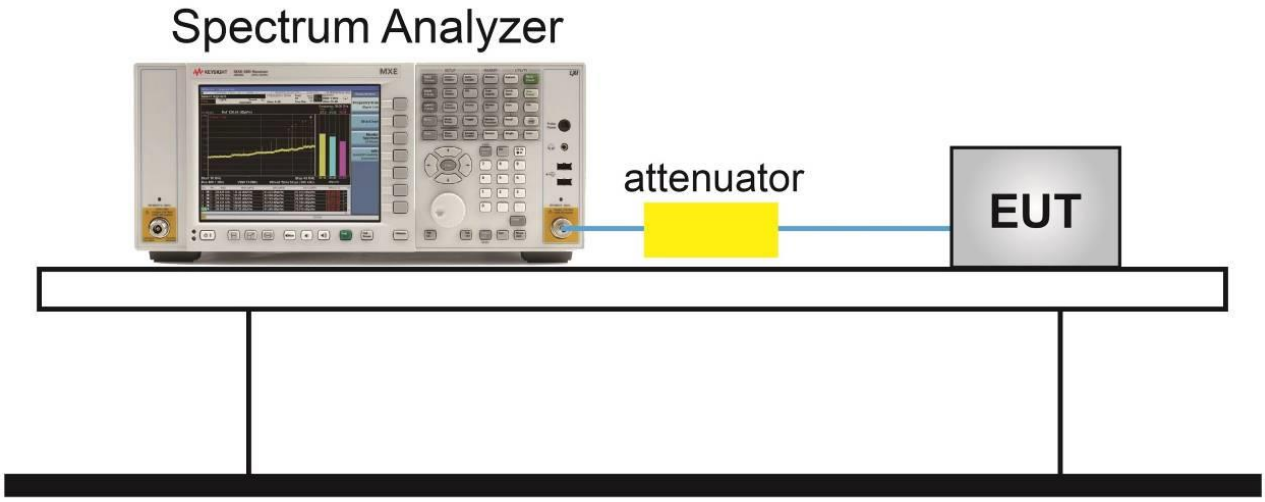
Reference level measurement

1. Set instrument center frequency to DTS channel center frequency
2. Set the span to ≥ 1.5 times the DTS bandwidth
3. Set the RBW = 100 kHz
4. Set the VBW ≥ 3 x RBW
5. Detector = peak
6. Sweep time = auto couple
7. Trace mode = max hold
8. Allow trace to fully stabilize

Emission level measurement

1. Set the center frequency and span to encompass frequency range to be measured
2. RBW = 100kHz
3. VBW = 300kHz
4. Detector = Peak
5. Trace mode = max hold
6. Sweep time = auto couple
7. The trace was allowed to stabilize

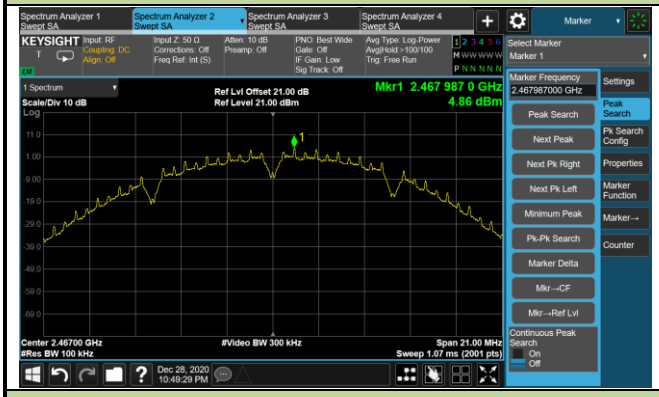
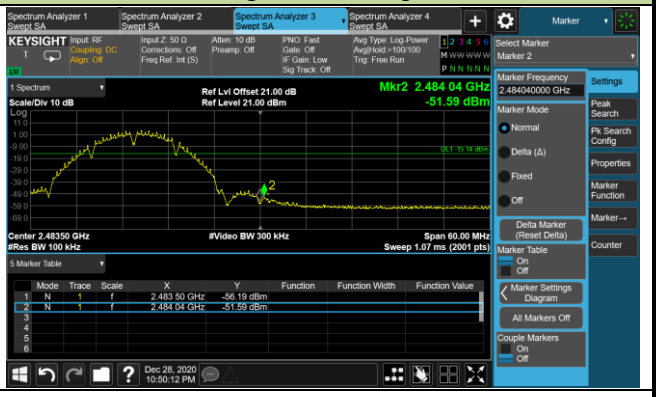
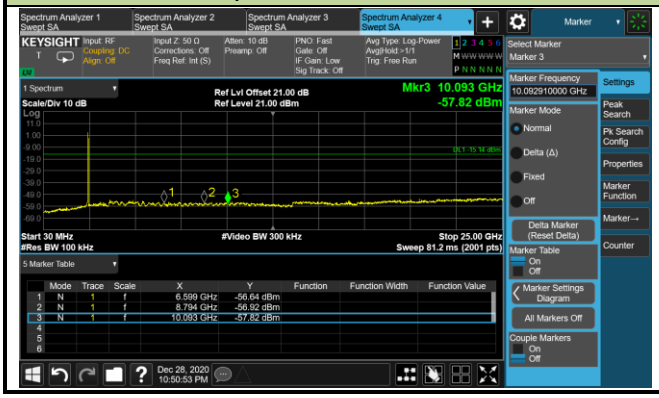
5.5.4.Test Setup

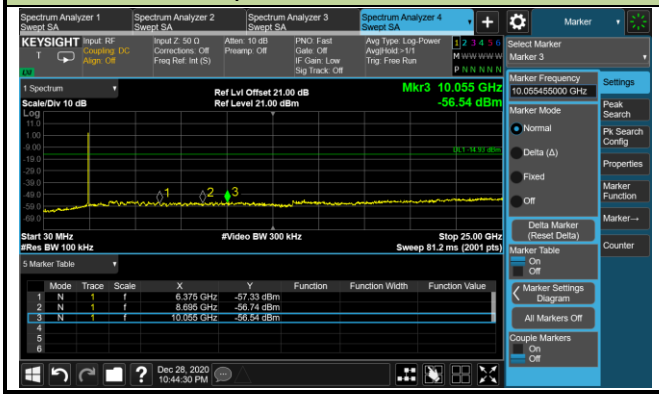


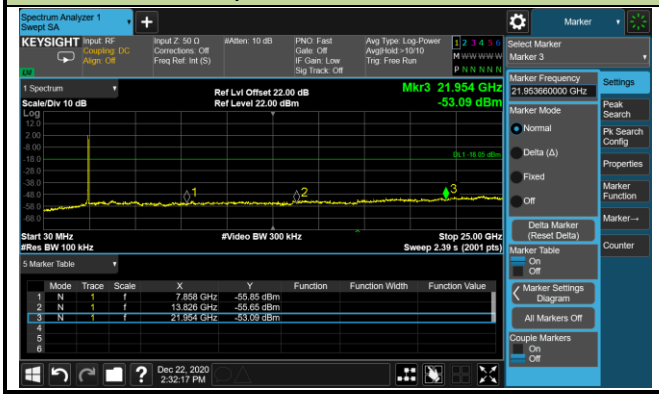
5.5.5.Test Result

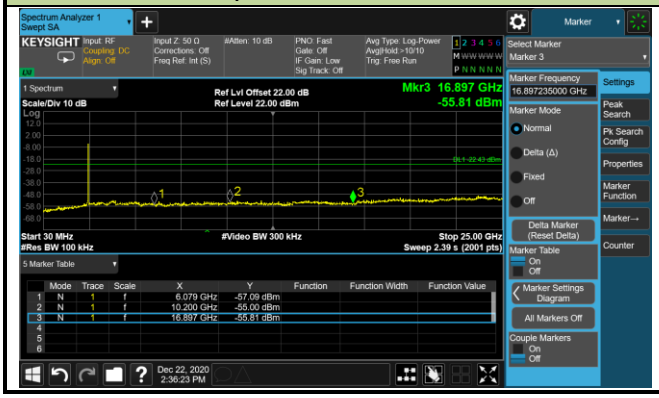
Product	DOLPHIN CT40	Test Engineer	Amy Zhang
Test Site	WZ-TR3	Test Date	2020/12/22 ~ 2020/12/28

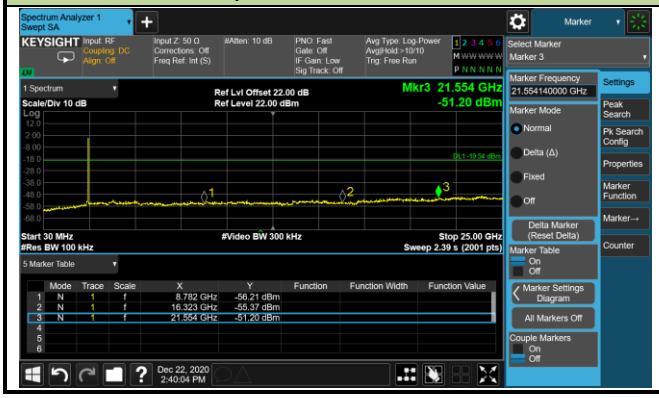
Test Mode	Data Rate / MCS	Channel No.	Frequency (MHz)	Limit	Result
802.11b	1Mbps	12	2467	20dBc	Pass
802.11b	1Mbps	13	2472	20dBc	Pass
802.11g	6Mbps	12	2467	20dBc	Pass
802.11g	6Mbps	13	2472	20dBc	Pass
802.11n-HT20	MCS0	12	2467	20dBc	Pass
802.11n-HT20	MCS0	13	2472	20dBc	Pass
802.11n-HT40	MCS0	10	2457	20dBc	Pass
802.11n-HT40	MCS0	11	2462	20dBc	Pass

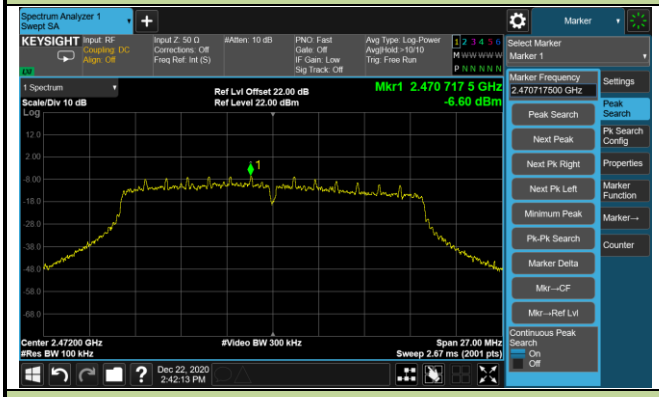
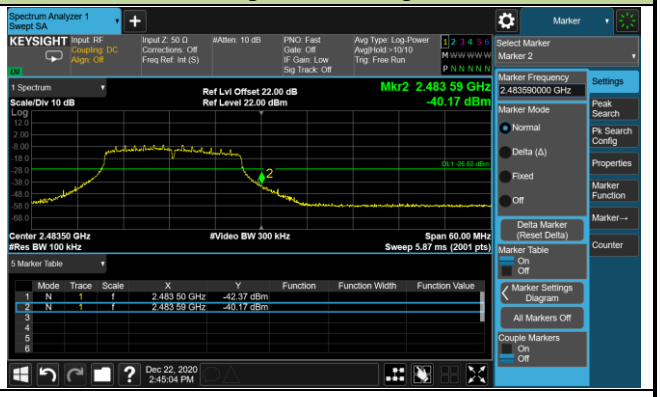
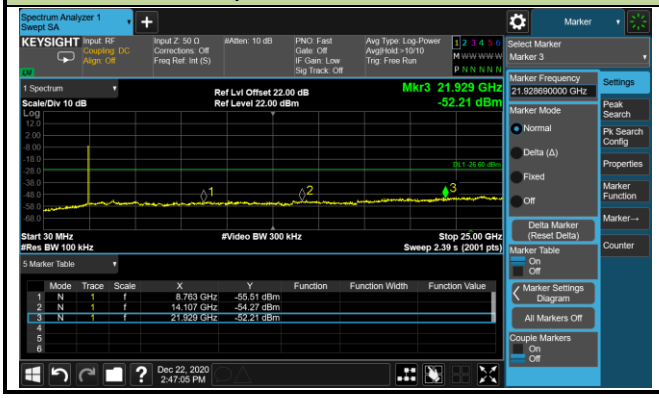
802.11b Out-of-Band Emissions	
Channel 12 (2467MHz)	
100kHz PSD Reference Level	High Band Edge
	
Spurious Emission	
	

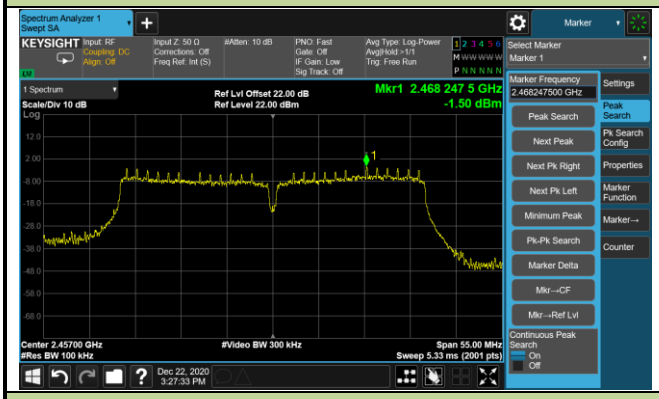
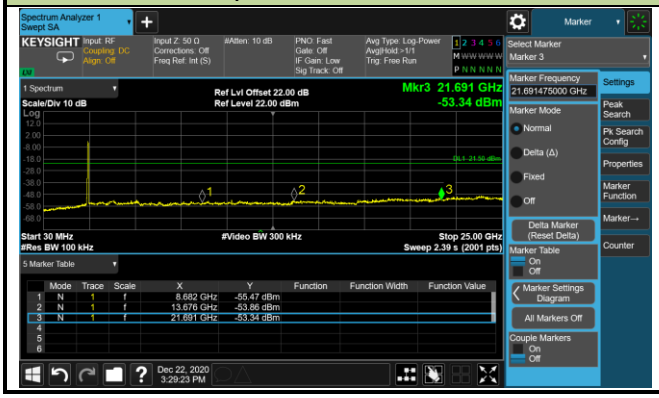
802.11b Out-of-Band Emissions	
Channel 13 (2472MHz)	
100kHz PSD Reference Level	High Band Edge
Spurious Emission	
	

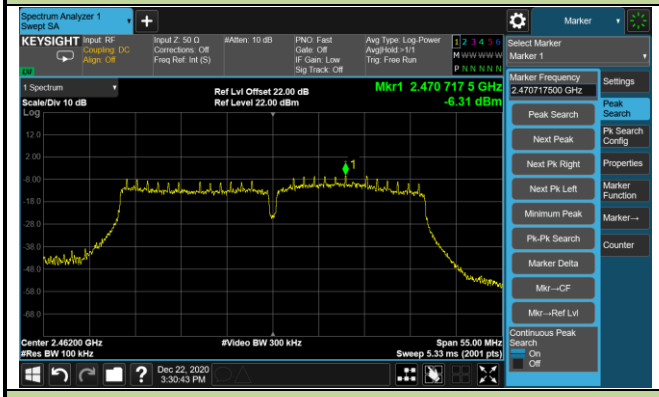
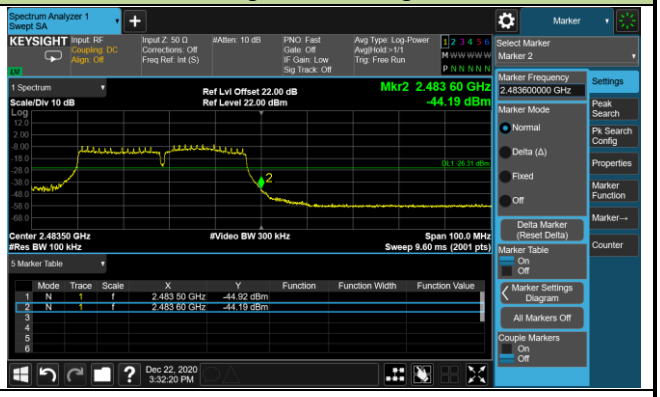
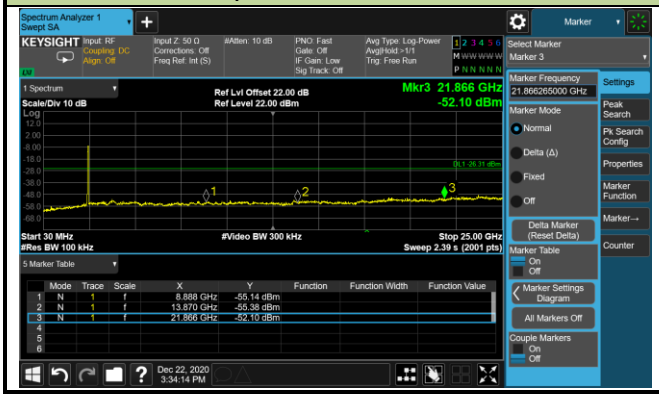
802.11g Out-of-Band Emissions	
Channel 12 (2467MHz)	
100kHz PSD Reference Level	High Band Edge
Spurious Emission	
	

802.11g Out-of-Band Emissions	
Channel 13 (2472MHz)	
100kHz PSD Reference Level	High Band Edge
Spurious Emission	
	

802.11n-HT20 Out-of-Band Emissions	
Channel 12 (2467MHz)	
100kHz PSD Reference Level	High Band Edge
Spurious Emission	
	

802.11n-HT20 Out-of-Band Emissions	
Channel 13 (2472MHz)	
100kHz PSD Reference Level	High Band Edge
	
Spurious Emission	
	

802.11n-HT40 Out-of-Band Emissions	
Channel 10 (2457MHz)	
100kHz PSD Reference Level	High Band Edge
	
Spurious Emission	
	

802.11n-HT40 Out-of-Band Emissions	
Channel 11 (2462MHz)	
100kHz PSD Reference Level	High Band Edge
	
Spurious Emission	
	

5.6. Radiated Spurious Emission Measurement

5.6.1.Test Limit

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

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

5.6.2.Test Procedure Used

ANSI C63.10-2013 Section 6.3 & 6.4 & 6.5 & 6.6

5.6.3.Test Setting

Table 1 - RBW as a function of frequency

Frequency	RBW
9 ~ 150 kHz	200 ~ 300 Hz
0.15 ~ 30 MHz	9 ~ 10 kHz
30 ~ 1000 MHz	100 ~ 120 kHz
> 1000MHz	1MHz

Quasi-Peak Measurements below 1GHz

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest

2. Span was set greater than 1MHz

3. RBW = as specified in Table 1

4. Detector = CISPR quasi-peak

5. Sweep time = auto couple

6. Trace was allowed to stabilize

Peak Measurements above 1GHz

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest

2. RBW = 1MHz

3. VBW = 3MHz

4. Detector = peak

5. Sweep time = auto couple

6. Trace mode = max hold

7. Trace was allowed to stabilize

Average Measurements above 1GHz (Method VB)

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest

2. RBW = 1MHz

3. VBW; If the EUT is configured to transmit with duty cycle ≥ 98%, set VBW = 10 Hz.

If the EUT duty cycle is < 98%, set VBW ≥ 1/T. T is the minimum transmission duration.

4. Detector = Peak

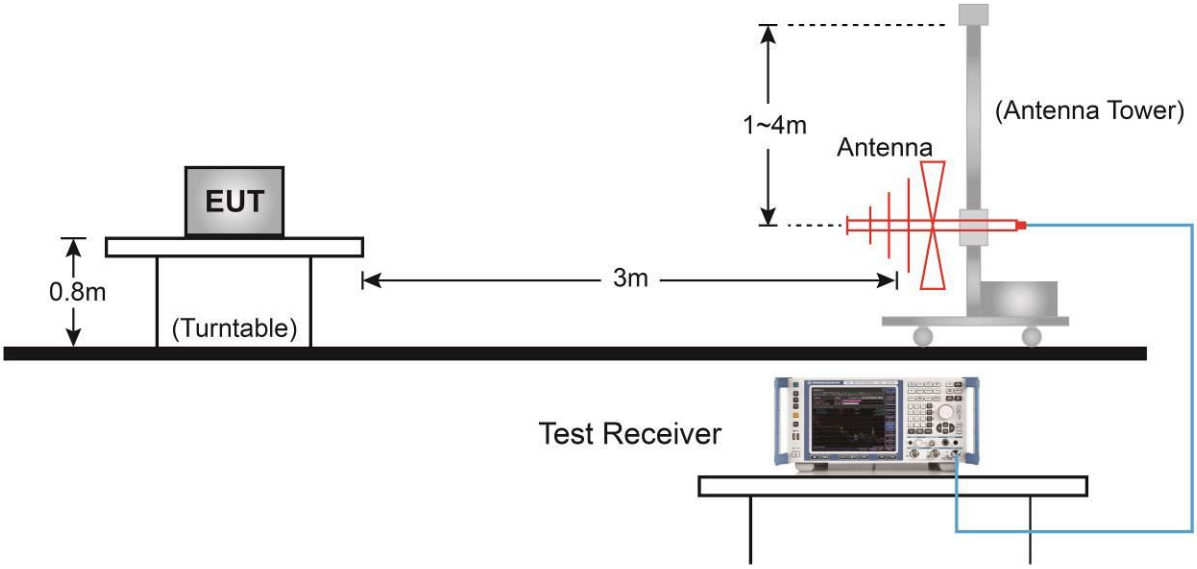
5. Sweep time = auto

6. Trace mode = max hold

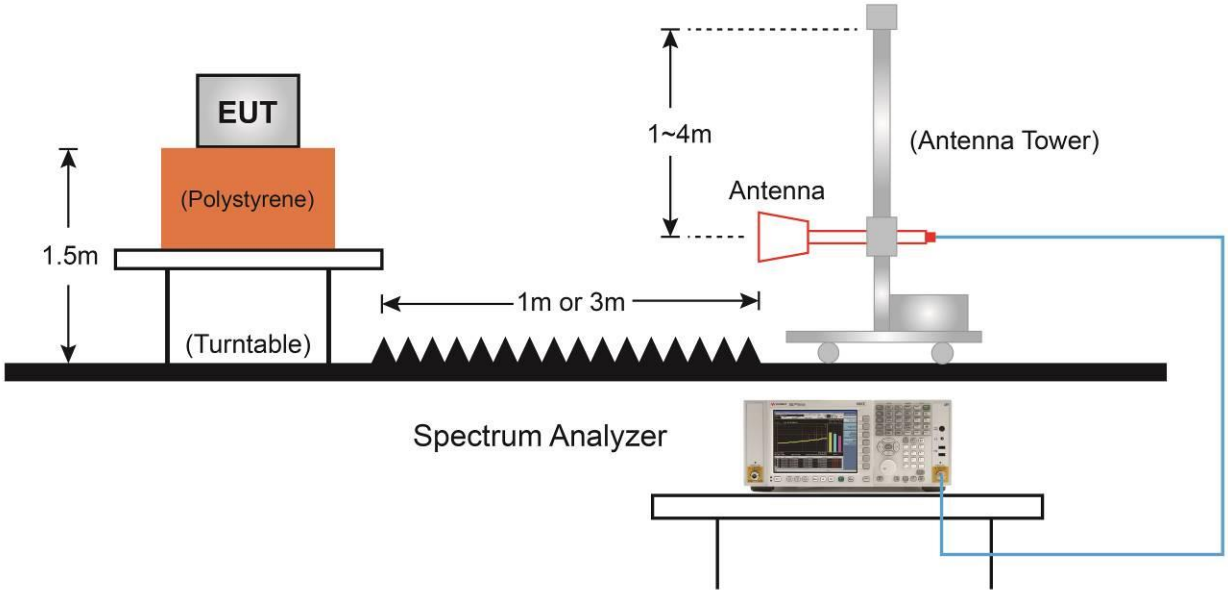
7. Trace was allowed to stabilize

5.6.4.Test Setup

Below 1GHz Test Setup:



Above 1GHz Test Setup:



5.6.5.Test Result

Product	DOLPHIN CT40	Test Engineer	Hyde Yu
Test Site	WZ-AC2	Test Date	2020/12/20
Test Mode:	802.11b	Test Channel:	13
Remark:	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

Mark	Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
	4094.0	36.8	1.8	38.6	74.0	-35.4	Peak	Horizontal
	4842.0	36.8	4.1	40.9	74.0	-33.1	Peak	Horizontal
*	5921.5	35.3	6.5	41.8	74.0	-32.2	Peak	Horizontal
*	6975.5	34.0	10.6	44.6	74.0	-29.4	Peak	Horizontal
	4170.5	37.3	2.3	39.6	74.0	-34.4	Peak	Vertical
	4825.0	37.1	4.3	41.4	74.0	-32.6	Peak	Vertical
*	6295.5	35.6	7.4	43.0	74.0	-31.0	Peak	Vertical
*	6975.5	34.0	10.6	44.6	74.0	-29.4	Peak	Vertical

Note 1: “*” means test frequency didn't fall into restricted band.

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

Product	DOLPHIN CT40	Test Engineer	Hyde Yu
Test Site	WZ-AC2	Test Date	2020/12/20
Test Mode:	802.11g	Test Channel:	13
Remark:	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

Mark	Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
	4085.5	36.6	1.8	38.4	74.0	-35.6	Peak	Horizontal
	4825.0	36.5	4.3	40.8	74.0	-33.2	Peak	Horizontal
*	6287.0	35.0	7.3	42.3	74.0	-31.7	Peak	Horizontal
*	6992.5	33.7	10.7	44.4	74.0	-29.6	Peak	Horizontal
	4085.5	37.4	1.8	39.2	74.0	-34.8	Peak	Vertical
	4825.0	35.5	4.3	39.8	74.0	-34.2	Peak	Vertical
*	5760.0	37.4	5.7	43.1	74.0	-30.9	Peak	Vertical
*	6414.5	34.3	8.2	42.5	74.0	-31.5	Peak	Vertical

Note 1: “*” means test frequency didn't fall into restricted band.

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

Product	DOLPHIN CT40	Test Engineer	Hyde Yu
Test Site	WZ-AC2	Test Date	2020/12/20
Test Mode:	802.11n-HT20	Test Channel:	13
Remark:	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

Mark	Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
	4162.0	37.2	2.2	39.4	74.0	-34.6	Peak	Horizontal
	4816.5	36.0	4.2	40.2	74.0	-33.8	Peak	Horizontal
*	5998.0	35.1	6.9	42.0	74.0	-32.0	Peak	Horizontal
*	6967.0	34.1	10.7	44.8	74.0	-29.2	Peak	Horizontal
	3958.0	36.3	1.4	37.7	74.0	-36.3	Peak	Vertical
	4842.0	37.1	4.1	41.2	74.0	-32.8	Peak	Vertical
*	5964.0	35.0	6.3	41.3	74.0	-32.7	Peak	Vertical
*	7179.5	33.4	11.9	45.3	74.0	-28.7	Peak	Vertical

Note 1: “*” means test frequency didn't fall into restricted band.

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

Product	DOLPHIN CT40	Test Engineer	Hyde Yu
Test Site	WZ-AC2	Test Date	2020/12/20
Test Mode:	802.11n-HT40	Test Channel:	11
Remark:	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

Mark	Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
	4068.5	36.4	1.8	38.2	74.0	-35.8	Peak	Horizontal
	4816.5	36.1	4.2	40.3	74.0	-33.7	Peak	Horizontal
*	5921.5	35.8	6.5	42.3	74.0	-31.7	Peak	Horizontal
*	6865.0	34.2	10.0	44.2	74.0	-29.8	Peak	Horizontal
	3822.0	37.0	0.9	37.9	74.0	-36.1	Peak	Vertical
	4697.5	35.6	4.2	39.8	74.0	-34.2	Peak	Vertical
*	5760.0	36.1	5.7	41.8	74.0	-32.2	Peak	Vertical
*	6797.0	32.6	9.6	42.2	74.0	-31.8	Peak	Vertical

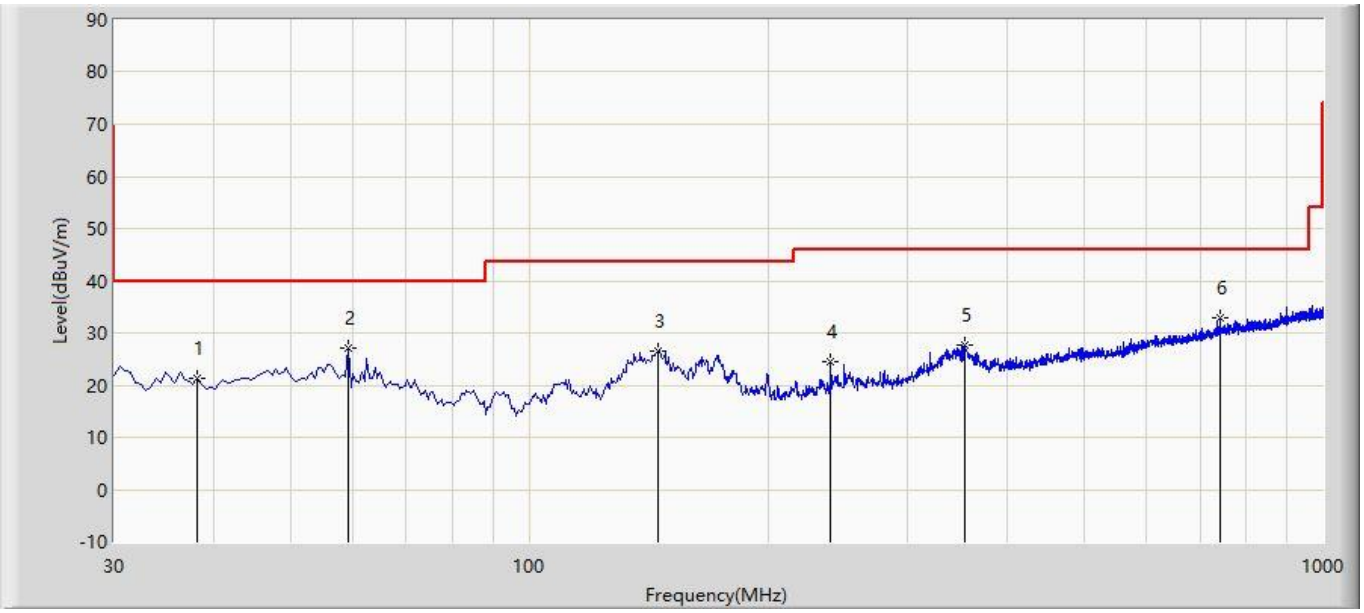
Note 1: “*” means test frequency didn't fall into restricted band.

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

The Result of Radiated Emission below 1GHz:

Site: WZ-AC1	Time: 2020/12/24 - 21:44
Limit: FCC_Part15.209_RE(3m)	Engineer: Antony Yang
Probe: WZ-AC1_VULB 9168 _30-1000MHz	Polarity: Horizontal
EUT: DOLPHIN CT40	Power: AC 120V/60Hz
Worst Case Mode: Transmit by 802.11n-HT40 at channel 2462MHz	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor	Type
1			38.245	21.355	4.100	-18.645	40.000	17.255	PK
2		*	59.100	27.113	9.449	-12.887	40.000	17.664	PK
3			145.430	26.510	8.458	-16.990	43.500	18.052	PK
4			240.005	24.601	8.003	-21.399	46.000	16.598	PK
5			354.465	27.745	7.840	-18.255	46.000	19.905	PK
6			742.465	32.899	4.583	-13.101	46.000	28.316	PK

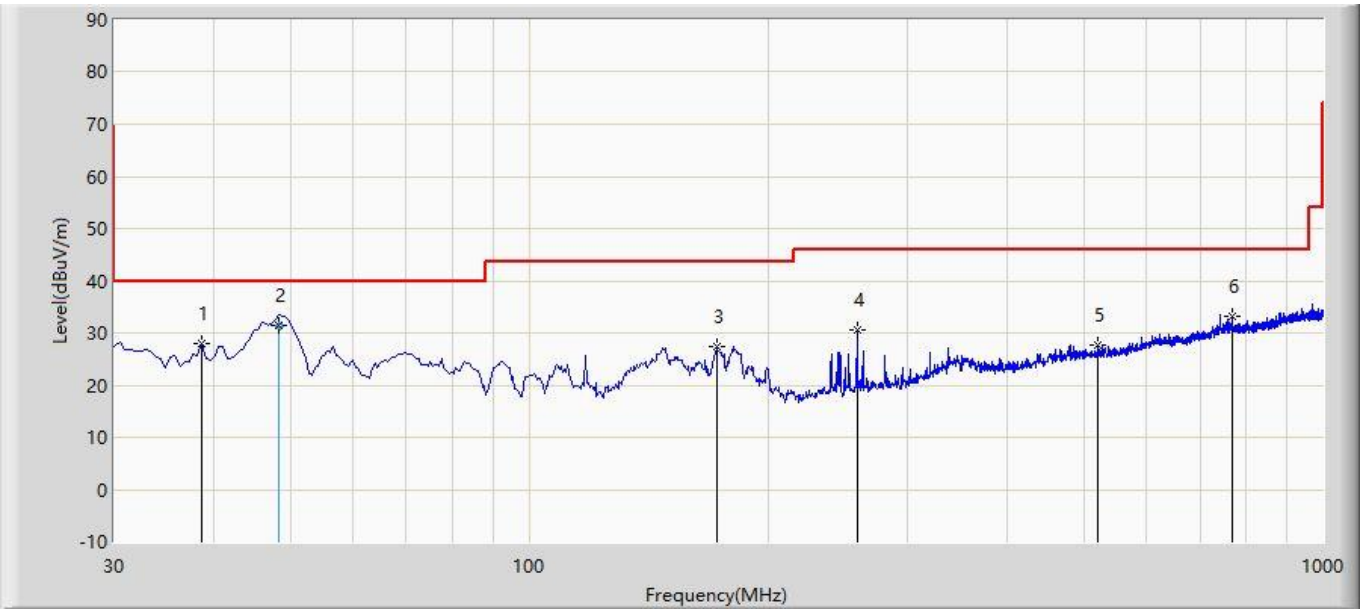
Note 1: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Note 2: QP measurement was not performed when peak measure level was lower than the QP limit by more than 10dB.

Note 3: The amplitude of radiated emissions (frequency range from 9kHz to 30MHz and 18GHz to 25GHz) is that proximity to ambient noise, which also are attenuated more than 20 dB below the permissible value. Therefore, the data is not presented in the report.

Site: WZ-AC1	Time: 2020/12/24 - 21:44
Limit: FCC_Part15.209_RE(3m)	Engineer: Antony Yang
Probe: WZ-AC1_VULB 9168 _30-1000MHz	Polarity: Vertical
EUT: DOLPHIN CT40	Power: AC 120V/60Hz
Worst Case Mode: Transmit by 802.11n-HT40 at channel 2462MHz	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor	Type
1			38.730	27.918	10.602	-12.082	40.000	17.316	PK
2		*	48.430	31.500	13.460	-8.500	40.000	18.040	QP
3			172.105	27.275	9.827	-16.225	43.500	17.448	PK
4			258.920	30.533	13.435	-15.467	46.000	17.098	PK
5			521.305	27.778	3.796	-18.222	46.000	23.981	PK
6			769.625	33.116	4.521	-12.884	46.000	28.595	PK

Note 1: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Note 2: QP measurement was not performed when peak measure level was lower than the QP limit by more than 10dB.

Note 3: The amplitude of radiated emissions (frequency range from 9kHz to 30MHz and 18GHz to 25GHz) is that proximity to ambient noise, which also are attenuated more than 20 dB below the permissible value. Therefore, the data is not presented in the report.

5.7. Radiated Restricted Band Edge Measurement

5.7.1.Test Limit

For 15.205 requirement:

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a) of FCC part 15, must also comply with the radiated emission limits specified in Section 15.209(a).

Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (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	--	--	--

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

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

5.7.2.Test Procedure Used

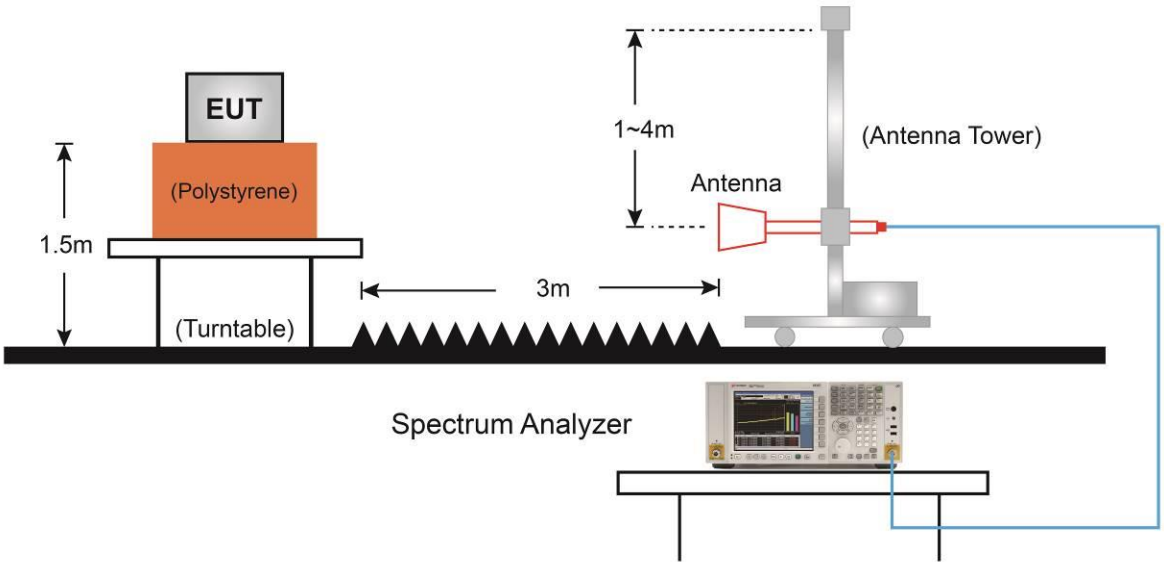
ANSI C63.10-2013 Section 6.3 & 6.6 & 11.13

5.7.3.Test Setting

Peak Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

Average Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW ≥ 1/T
4. As an alternative, the instrument may be set to linear detector mode. Ensure that video filtering is applied in linear voltage domain (rather than in a log or dB domain). Some instruments require linear display mode in order to accomplish this. Others have a setting for Average-VBW Type, which can be set to “Voltage” regardless of the display mode
5. Detector = Peak
6. Sweep time = auto
7. Trace mode = max hold
8. Allow max hold to run for at least 50 times (1/duty cycle) traces

5.7.4.Test Setup