



FCC CO-LOCATION RADIO TEST REPORT

FCC ID : A4RGD1YQ
Equipment : Phone
Model Name : GD1YQ
Applicant : Google LLC
1600 Amphitheatre Parkway,
Mountain View, California, 94043 USA
Standard : FCC Part 15 Subpart E §15.407

The product was received on Apr. 22, 2020 and testing was started from May 22, 2020 and completed on Jun. 29, 2020. We, SPORTON INTERNATIONAL INC., EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

Louis Wu

Approved by: Louis Wu

SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory
No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)



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History of this test report

Report No.	Version	Description	Issued Date
FR011718-01G	01	Initial issue of report	Jul. 07, 2020

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	15.407(b)	Unwanted Emissions	Pass	Under limit 1.74 dB at 5150.000 MHz
3.2	15.203 & 15.407 (a)	Antenna Requirement	Pass	-

Declaration of Conformity:

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

Comments and Explanations:

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

Reviewed by: Wii Chang

Report Producer: Yimin Ho

1 General Description

1.1 Product Feature of Equipment Under Test

Product Feature	
Equipment	Phone
Model Name	GD1YQ
FCC ID	A4RGD1YQ
EUT supports Radios application	CDMA/EV-DO/GSM/EGPRS/WCDM/HSPA/LTE/5G NR /NFC/GNSS/WPC/WPT WLAN 11b/g/n HT20 WLAN 11a/n HT20/HT40 WLAN 11ac VHT20/VHT40/VHT80 Bluetooth BR/EDR/LE

Remark: The above EUT's information was declared by manufacturer.

EUT Information List	
S/N	Performed Test Item
03281FDD4000BB	Radiated Spurious Emission

1.2 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx/Rx Channel Frequency Range	2400 MHz ~ 2483.5 MHz 5180 MHz ~ 5240 MHz 5500 MHz ~ 5720 MHz
Antenna Type / Gain	<Bluetooth> ILA Antenna type with gain -2.20 dBi <2400 MHz ~ 2483.5 MHz> <Ant. 4>: ILA Antenna type with gain -2.20 dBi <Ant. 3>: Loop Antenna type with gain -2.40 dBi <5180 MHz ~ 5240 MHz> <Ant. 4>: ILA Antenna type with gain -2.30 dBi <Ant. 3>: Loop Antenna type with gain -3.40 dBi <5500 MHz ~ 5720 MHz > <Ant. 4>: ILA Antenna type with gain -1.90 dBi <Ant. 3>: Loop Antenna type with gain -5.80 dBi
Type of Modulation	Bluetooth EDR (3Mbps) : 8-DPSK Bluetooth LE : GFSK 802.11a/n : OFDM (BPSK / QPSK / 16QAM / 64QAM)

1.3 Modification of EUT

No modifications are made to the EUT during all test items.

1.4 Testing Location

Test Site	SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory
Test Site Location	No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855
Test Site No.	Sporton Site No.
	03CH11-HY

Note: The test site complies with ANSI C63.4 2014 requirement.

FCC designation No.: TW0007

1.5 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ♦ FCC Part 15 Subpart E
- ♦ FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v05r02
- ♦ FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
- ♦ FCC KDB 414788 D01 Radiated Test Site v01r01.
- ♦ FCC KDB 662911 D01 Multiple Transmitter Output v02r01.
- ♦ ANSI C63.10-2013

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. The TAF code is not including all the FCC KDB listed without accreditation.
3. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

2 Test Configuration of Equipment Under Test

The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z and Accessory (Adapter or Earphone). The worst cases (Z plane with Adapter) were recorded in this report.

2.1 Carrier Frequency and Channel

2400-2483.5 MHz Bluetooth EDR		2400-2483.5 MHz Bluetooth - LE		2400-2483.5 MHz 802.11n HT20	
Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
78	2480	39	2480	13	2472

5150-5250 MHz 802.11a		5470-5725 MHz 802.11a	
Channel	Freq. (MHz)	Channel	Freq. (MHz)
36	5180	100	5500

2.2 Test Mode

Final test modes are considering the modulation and worse data rates as below table.

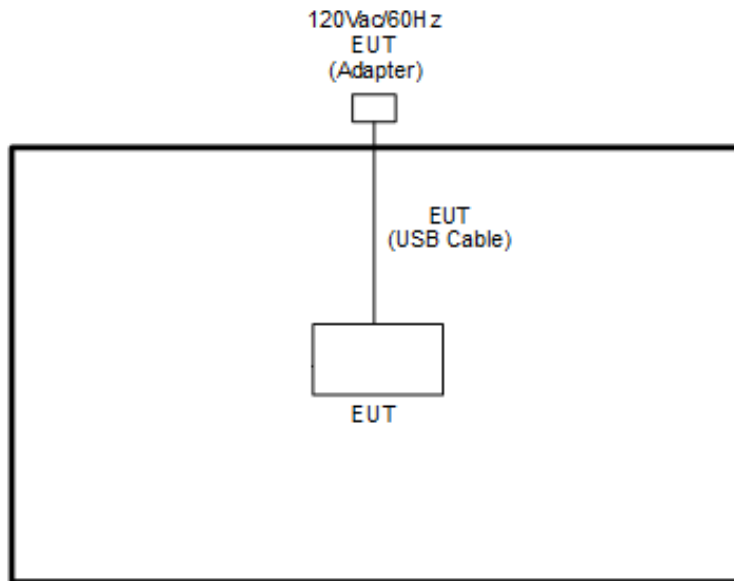
<Co-Location>

Modulation	Data Rate
Bluetooth EDR Ant. 4 + WLAN 5GHz 802.11a for MIMO <Ant. 4 + 3>	3Mbps + 6Mbps
Bluetooth LE Ant. 4 + WLAN 5GHz 802.11a for MIMO <Ant. 4 + 3>	1Mbps + 6Mbps
WLAN 2.4GHz 802.11n HT20 Ant. 4 + WLAN 5GHz 802.11a for Ant. 3	MCS0 + 6Mbps

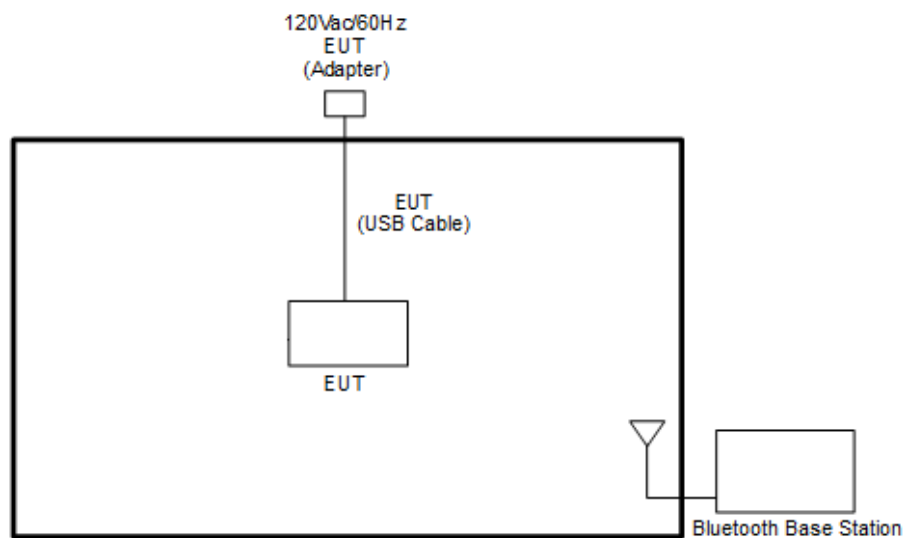
Remark: For Radiated Test Cases, the tests were performed with Adapter 2.

2.3 Connection Diagram of Test System

<Co-Location Tx Mode>



<Co-Location with Bluetooth Tx Mode>





2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	Bluetooth Base Station	R&S	CBT32	N/A	N/A	Unshielded, 1.8 m

2.5 EUT Operation Test Setup

For Bluetooth test items, utility “QRCT 4.0.00153.0” was installed in Notebook which was programmed in order to make the EUT get into the engineering modes to contact with base station to provide channel selection, power level, data rate and the application type and for continuous transmitting signals.

For Bluetooth - LE and WLAN test items, utility “QRCT 4.0.00153.0” was installed in Notebook which was programmed in order to make the EUT get into the engineering modes to provide channel selection, power level, data rate and the application type and for continuous transmitting signals.

3 Test Result

3.1 Unwanted Emissions Measurement

This section is to measure unwanted emissions through radiated measurement for band edge spurious emissions and out of band emissions measurement.

3.1.1 Limit of Unwanted Emissions

- (1) Unwanted spurious emissions fallen in restricted bands shall comply with the general field strength limits as below table,

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

Note: The following formula is used to convert the EIRP to field strength.

$$E = \frac{1000000\sqrt{30P}}{3} \text{ } \mu\text{V/m, where P is the eirp (Watts)}$$

EIRP (dBm)	Field Strength at 3m (dBμV/m)
- 27	68.3

- (2) KDB789033 D02 v02r01 G)2)c)

- (i) Sections 15.407(b)(1-3) specifies the unwanted emissions limit for the U-NII-1 and U-NII-2 bands. As specified, emissions above 1000 MHz that are outside of the restricted bands are subject to a peak emission limit of -27 dBm/MHz.
- (ii) Section 15.407(b)(4) specifies the unwanted emissions limit for the U-NII-3 band. A band emissions mask is specified in Section 15.407(b)(4)(i). The emission limits are based on the use of a peak detector.

3.1.2 Measuring Instruments

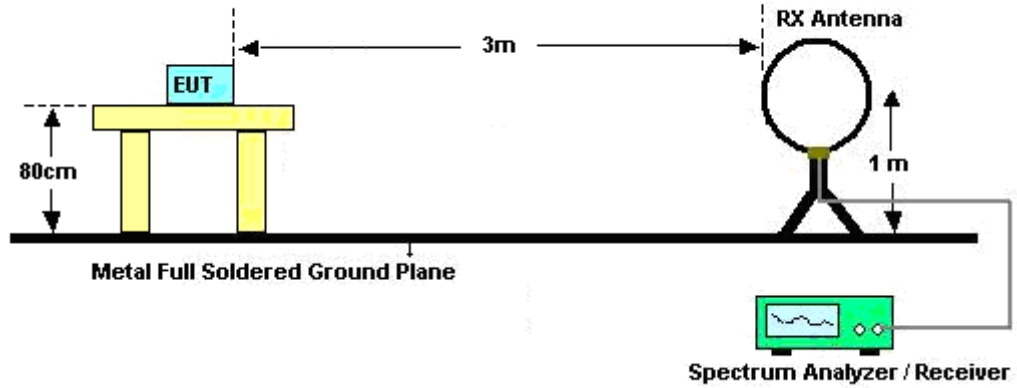
See list of measuring equipment of this test report.

3.1.3 Test Procedures

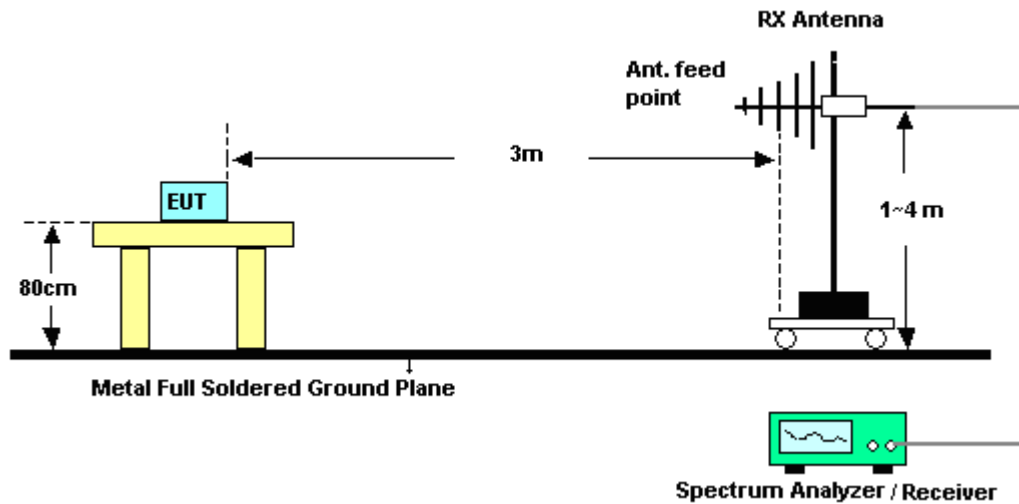
1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01. Section G) Unwanted emissions measurement.
 - (1) Procedure for Unwanted Emissions Measurements Below 1000MHz
 - RBW = 120 kHz
 - VBW = 300 kHz
 - Detector = Peak
 - Trace mode = max hold
 - (2) Procedure for Peak Unwanted Emissions Measurements Above 1000 MHz
 - RBW = 1 MHz
 - VBW $\geq$ 3 MHz
 - Detector = Peak
 - Sweep time = auto
 - Trace mode = max hold
 - (3) Procedures for Average Unwanted Emissions Measurements Above 1000MHz
 - RBW = 1 MHz
 - VBW = 10 Hz, when duty cycle is no less than 98 percent.
 - VBW $\geq$ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.
2. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
3. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
4. The antenna is a broadband antenna and its height is adjusted between one meter and four meters above ground to find the maximum value of the field strength for both horizontal polarization and vertical polarization of the antenna.
5. For each suspected emission, the EUT was arranged to its worst case and then adjust the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading.
6. For testing below 1GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.
7. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

3.1.4 Test Setup

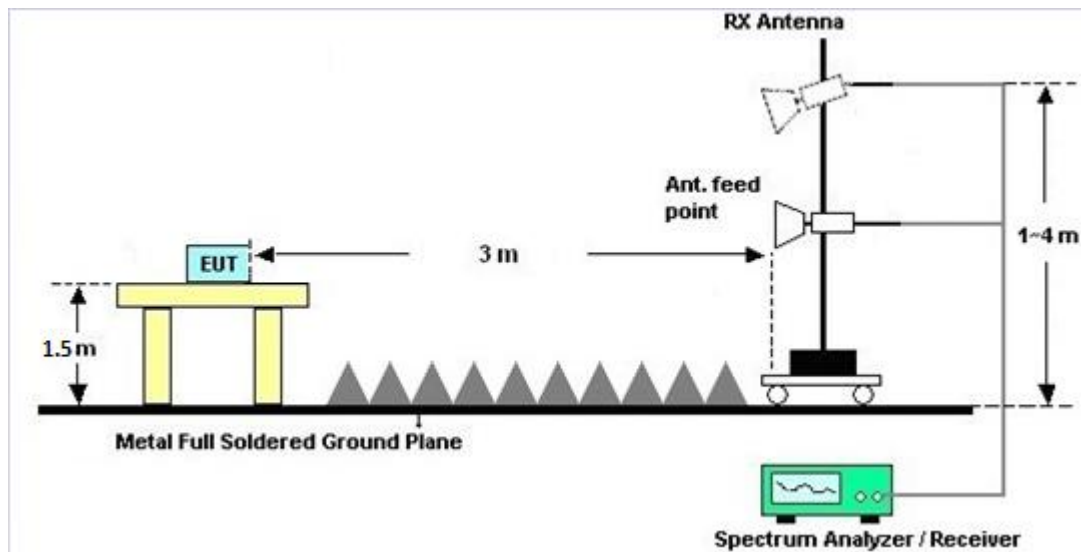
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



3.1.5 Test Results of Radiated Emissions (9 kHz ~ 30 MHz)

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

There is a comparison data of both open-field test site and alternative test site - semi-Anechoic chamber according to 414788 D01 Radiated Test Site v01r01, and the result came out very similar.

3.1.6 Test Result of Radiated Band Edges

Please refer to Appendix A and B.

3.1.7 Duty Cycle

Please refer to Appendix C.

3.1.8 Test Result of Unwanted Radiated Emission (30MHz ~ 10th Harmonic)

Please refer to Appendix A and B.



3.2 Antenna Requirements

3.2.1 Standard Applicable

If transmitting antenna directional gain is greater than 6 dBi, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

3.2.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.2.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.



4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Preamplifier	EMCE	EM18G40G	060715	18GHz ~ 40GHz	Dec. 13, 2019	May 22, 2020~ Jun. 29, 2020	Dec. 12, 2020	Radiation (03CH11-HY)
Amplifier	SONOMA	310N	187312	9kHz~1GHz	Dec. 03, 2019	May 22, 2020~ Jun. 29, 2020	Dec. 02, 2020	Radiation (03CH11-HY)
Bilog Antenna	TESEQ	CBL 6111D & N-6-06	35414 & AT-N0602	30MHz~1GHz	Oct. 12, 2019	May 22, 2020~ Jun. 29, 2020	Oct. 11, 2020	Radiation (03CH11-HY)
Horn Antenna	SCHWARZBE CK	BBHA 9120 D	9120D-1326	1GHz ~ 18GHz	Nov. 04, 2019	May 22, 2020~ Jun. 29, 2020	Nov. 03, 2020	Radiation (03CH11-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100315	9 kHz~30 MHz	Dec. 26, 2019	May 22, 2020~ Jun. 29, 2020	Dec. 25, 2020	Radiation (03CH11-HY)
Preamplifier	Keysight	83017A	MY5327008 0	1GHz~26.5GHz	Nov. 13, 2019	May 22, 2020~ Jun. 29, 2020	Nov. 12, 2020	Radiation (03CH11-HY)
Spectrum Analyzer	Keysight	N9010A	MY5420048 6	10Hz ~ 44GHz	Oct. 28, 2019	May 22, 2020~ Jun. 29, 2020	Oct. 27, 2020	Radiation (03CH11-HY)
Controller	EMEC	EM 1000	N/A	Control Turn table & Ant Mast	N/A	May 22, 2020~ Jun. 29, 2020	N/A	Radiation (03CH11-HY)
Antenna Mast	EMEC	AM-BS-4500- B	N/A	1~4m	N/A	May 22, 2020~ Jun. 29, 2020	N/A	Radiation (03CH11-HY)
Turn Table	EMEC	TT 2000	N/A	0~360 Degree	N/A	May 22, 2020~ Jun. 29, 2020	N/A	Radiation (03CH11-HY)
Preamplifier	Jet-Power	JPA0118-55-3 03K	1710001800 054002	1GHz~18GHz	Aug. 06, 2019	May 22, 2020~ Jun. 29, 2020	Aug. 05, 2020	Radiation (03CH11-HY)
SHF-EHF Horn Antenna	SCHWARZBE CK	BBHA 9170	BBHA91705 76	18GHz- 40GHz	May 22, 2020	May 22, 2020~ Jun. 29, 2020	May 21, 2021	Radiation (03CH11-HY)
Spectrum Analyzer	Keysight	N9010A	MY5420048 6	10Hz~44GHz	Oct. 28, 2019	May 22, 2020~ Jun. 29, 2020	Oct. 27, 2020	Radiation (03CH11-HY)
Software	Audix	E3 6.2009-8-24	RK-001053	N/A	N/A	May 22, 2020~ Jun. 29, 2020	N/A	Radiation (03CH11-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY9837/4P E	9kHz-30MHz	Mar. 12, 2020	May 22, 2020~ Jun. 29, 2020	Mar. 11, 2021	Radiation (03CH11-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	MY2859/2	30MHz-40GHz	Mar. 12, 2020	May 22, 2020~ Jun. 29, 2020	Mar. 11, 2021	Radiation (03CH11-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY9837/4P E	30M-18G	Mar. 12, 2020	May 22, 2020~ Jun. 29, 2020	Mar. 11, 2021	Radiation (03CH11-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	MY4274/2	30MHz-40GHz	Mar. 12, 2020	May 22, 2020~ Jun. 29, 2020	Mar. 11, 2021	Radiation (03CH11-HY)
Filter	Wainwright	WLK4-1000-1 530-8000-40 SS	SN11	1.53G Low Pass	Sep. 15, 2019	May 22, 2020~ Jun. 29, 2020	Sep. 14, 2020	Radiation (03CH11-HY)
Filter	Wainwright	WHKX12-270 0-3000-18000 -60SS	SN3	3GHz High Pass Filter	Sep. 15, 2019	May 22, 2020~ Jun. 29, 2020	Sep. 14, 2020	Radiation (03CH11-HY)
Filter	Wainwright	WHKX8-5872 .5-6750-1800 0-40SS	SN3	6.75GHz High Pass Filter	Sep. 16, 2019	May 22, 2020~ Jun. 29, 2020	Sep. 15, 2020	Radiation (03CH11-HY)
Hygrometer	TECPEL	DTN-303B	TP140325	N/A	Nov. 07, 2019	May 22, 2020~ Jun. 29, 2020	Nov. 06, 2020	Radiation (03CH11-HY)

5 Uncertainty of Evaluation

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.2
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Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.2
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Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.3
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Appendix A. Radiated Spurious Emission

Test Engineer :	Cookie Ku, Fu Chen and Troye Hsieh	Temperature :	19.1~26.3°C
		Relative Humidity :	50.2~69.1%

2.4GHz 2400~2483.5MHz + Band 3 - 5470~5725MHz

Ant 4_BT_Tx_Ch78 + Ant 4+3_11a_Tx_Ch100_Co-location (Band Edge @ 3m)

Simultaneously	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BT CH78 2480MHz	*	2480	103.82	-	-	102.96	27.28	6.79	33.21	345	52	P	H
	*	2480	79.03	-	-	-	-	-	-	-	-	A	H
		2483.6	50.7	-23.3	74	49.85	27.27	6.79	33.21	345	52	P	H
		2483.6	25.91	-28.09	54	-	-	-	-	-	-	A	H
													H
	*	2480	107.12	-	-	106.26	27.28	6.79	33.21	107	110	P	V
	*	2480	82.33	-	-	-	-	-	-	-	-	A	V
		2483.52	52.55	-21.45	74	51.7	27.27	6.79	33.21	107	110	P	V
		2483.52	27.76	-26.24	54	-	-	-	-	-	-	A	V
													V
802.11a CH 100 5500MHz		5459.92	55.15	-18.85	74	45.8	31.74	10.23	32.62	103	64	P	H
		5470	65.69	-2.51	68.2	56.28	31.78	10.24	32.61	103	64	A	H
		5460	44.85	-9.15	54	35.5	31.74	10.23	32.62	103	64	A	H
	*	5500	112.69	-	-	103.12	31.9	10.26	32.59	103	64	P	H
	*	5500	105.52	-	-	95.95	31.9	10.26	32.59	103	64	A	H
												A	H
		5459.28	54.54	-19.46	74	45.19	31.74	10.23	32.62	113	83	P	V
		5467.92	63.61	-4.59	68.2	54.21	31.77	10.24	32.61	113	83	P	V
		5458.8	45.05	-8.95	54	35.7	31.74	10.23	32.62	113	83	A	V
	*	5500	111.95	-	-	102.38	31.9	10.26	32.59	113	83	P	V
	*	5500	104.22	-	-	94.65	31.9	10.26	32.59	113	83	A	V
												A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Ant 4_BT_Tx_Ch78 + Ant 4+3_11a_Tx_Ch100_Co-location (Harmonic @ 3m)

Simultaneously	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
Co-location		4960	55.85	-18.15	74	47.84	31.14	9.74	32.87	100	0	P	H
		4960	31.06	-22.94	54	-	-	-	-	-	-	A	H
		7440	45.72	-28.28	74	54.76	36.38	13.62	59.04	100	0	P	H
		7440	20.93	-33.07	54	-	-	-	-	-	-	A	H
		11000	48.82	-25.18	74	53.94	40	17.48	62.6	100	0	P	H
		16500	47.96	-20.24	68.2	46.75	38.4	22.01	59.2	100	0	P	H
													H
													H
		4960	55.9	-18.1	74	47.89	31.14	9.74	32.87	100	0	P	V
		4960	31.11	-22.89	54	-	-	-	-	-	-	A	V
		7440	44.7	-29.3	74	53.74	36.38	13.62	59.04	100	0	P	V
		7440	19.91	-34.09	54	-	-	-	-	-	-	A	V
		11000	48.77	-25.23	74	53.89	40	17.48	62.6	100	0	P	V
		16500	48.01	-20.19	68.2	46.8	38.4	22.01	59.2	100	0	P	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Emission below 1GHz

Ant 4_BT_Tx_Ch78 + Ant 4+3_11a_Tx_Ch100_Co-location (LF @ 3m)

Simultaneously	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
Co-location		30	24.76	-15.24	40	32.27	24.15	0.76	32.42	-	-	P	H
		80.44	23.88	-16.12	40	41.82	13.2	1.3	32.44	-	-	P	H
		160.95	26.54	-16.96	43.5	41.01	16.16	1.88	32.51	-	-	P	H
		919.49	30.01	-15.99	46	28.16	28.97	4.35	31.47	-	-	P	H
		941.8	30.35	-15.65	46	27.48	29.63	4.42	31.18	-	-	P	H
		953.44	31.28	-14.72	46	27.6	30.26	4.44	31.02	100	0	P	H
													H
													H
													H
													H
													H
													H
													H
		39.7	33.4	-6.6	40	45.57	19.4	0.91	32.48	100	0	P	V
		52.31	28.38	-11.62	40	46.88	12.99	1.04	32.53	-	-	P	V
		212.36	25.22	-18.28	43.5	40.7	14.93	2.13	32.54	-	-	P	V
		872.93	29.04	-16.96	46	27.58	29.06	4.25	31.85	-	-	P	V
		937.92	29.58	-16.42	46	26.96	29.45	4.4	31.23	-	-	P	V
		951.5	30.37	-15.63	46	26.83	30.15	4.44	31.05	-	-	P	V
													V
													V
													V
													V
													V
													V
	Remark	1. No other spurious found. 2. All results are PASS against limit line.											



2.4GHz 2400~2483.5MHz + Band 1 - 5150~5250MHz

Ant 4_BLE_Tx_Ch39 + Ant 4+3_11a_Tx_Ch36_Co-location (Band Edge @ 3m)

Simultaneously	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BLE CH39 2480MHz	*	2480	96.3	-	-	85.51	27.28	16.72	33.21	341	142	P	H
	*	2480	95.36	-	-	84.57	27.28	16.72	33.21	341	142	A	H
		2484.68	53.2	-20.8	74	42.43	27.26	16.72	33.21	341	142	P	H
		2496.04	43.07	-10.93	54	32.32	27.22	16.74	33.21	341	142	A	H
												P	H
												A	H
	*	2480	99	-	-	88.21	27.28	16.72	33.21	170	305	P	V
	*	2480	98.24	-	-	87.45	27.28	16.72	33.21	170	305	A	V
		2484	52.37	-21.63	74	41.6	27.26	16.72	33.21	170	305	P	V
		2484	43.91	-10.09	54	33.14	27.26	16.72	33.21	170	305	A	V
												P	V
												A	V
802.11a CH 36 5180MHz		5149.76	61.61	-12.39	74	52.65	31.8	9.97	32.81	100	121	P	H
		5150	52.26	-1.74	54	43.3	31.8	9.97	32.81	100	121	A	H
	*	5180	110.86	-	-	102.02	31.62	10.01	32.79	100	121	P	H
	*	5180	103.71	-	-	94.87	31.62	10.01	32.79	100	121	A	H
												P	H
												A	H
		5149.24	59.82	-14.18	74	50.86	31.8	9.97	32.81	100	105	P	V
		5148.72	47.99	-6.01	54	39.03	31.8	9.97	32.81	100	105	A	V
	*	5180	108.81	-	-	99.97	31.62	10.01	32.79	100	105	P	V
	*	5180	100.91	-	-	92.07	31.62	10.01	32.79	100	105	A	V
												P	V
												A	V
Remark	1. No other spurious found.												
	2. All results are PASS against Peak and Average limit line.												

Ant 4_BLE_Tx_Ch39 + Ant 4+3_11a_Tx_Ch36_Co-location (Harmonic @ 3m)

Simultaneously	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
Co-location		4960	58.18	-15.82	74	48.53	31.14	11.38	32.87	100	120	P	H
		4960	51.38	-2.62	54	41.73	31.14	11.38	32.87	100	120	A	H
		7440	45.49	-28.51	74	54.53	36.38	13.62	59.04	100	0	P	H
		10360	48.79	-19.41	68.2	53.7	39.8	17.44	62.15	100	0	P	H
		15540	47.79	-26.21	74	48.97	37.84	21.62	60.64	100	0	P	H
													H
													H
													H
		4960	57.25	-16.75	74	47.6	31.14	11.38	32.87	100	102	P	V
		4960	50.71	-3.29	54	41.06	31.14	11.38	32.87	100	102	A	V
		7440	44.18	-29.82	74	53.22	36.38	13.62	59.04	100	0	P	V
		10360	48.77	-19.43	68.2	53.68	39.8	17.44	62.15	100	0	P	V
		15540	47.81	-26.19	74	48.99	37.84	21.62	60.64	100	0	P	V
													V
													V
													V
Remark	1. No other spurious found.												
	2. All results are PASS against Peak and Average limit line.												



Emission below 1GHz

Ant 4_BLE_Tx_Ch39 + Ant 4+3_11a_Tx_Ch36_Co-location (LF @ 3m)

Simultaneously	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
		(MHz)	(dBμV/m)	Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
Co-location		97.9	22.53	-20.97	43.5	37.93	15.55	1.44	32.39	-	-	P	H
		159.98	29.76	-13.74	43.5	44.12	16.27	1.88	32.51	-	-	P	H
		205.57	31.05	-12.45	43.5	46.72	14.81	2.09	32.57	100	0	P	H
		841.89	29.16	-16.84	46	28.5	28.46	4.18	31.98	-	-	P	H
		898.15	30.02	-15.98	46	28.54	28.92	4.3	31.74	-	-	P	H
		957.32	30.56	-15.44	46	26.57	30.51	4.45	30.97	-	-	P	H
													H
													H
													H
													H
													H
													H
		42.61	31.42	-8.58	40	45.06	17.91	0.94	32.49	100	0	P	V
		134.76	26.67	-16.83	43.5	40.26	17.2	1.66	32.45	-	-	P	V
		204.6	30.93	-12.57	43.5	46.64	14.78	2.08	32.57	-	-	P	V
		857.41	29.9	-16.1	46	28.64	28.95	4.22	31.91	-	-	P	V
		891.36	30.23	-15.77	46	28.71	29.01	4.28	31.77	-	-	P	V
		958.29	30.6	-15.4	46	26.54	30.57	4.45	30.96	-	-	P	V
													V
													V
													V
													V
													V
													V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												



2.4GHz 2400~2483.5MHz + Band 3 - 5470~5725MHz

Ant 4_11n HT20_Tx_Ch13 + Ant 3_11a_Tx_Ch100_Co-location (Band Edge @ 3m)

Simultaneous	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11n HT20 CH 13 2472MHz	*	2472	87	-	-	76.2	27.31	16.71	33.22	100	275	P	H
	*	2472	79.38	-	-	68.58	27.31	16.71	33.22	100	275	A	H
		2483.75	60.42	-13.58	74	49.64	27.27	16.72	33.21	100	275	P	H
		2483.55	50.57	-3.43	54	39.79	27.27	16.72	33.21	100	275	A	H
													H
													H
	*	2472	85.86	-	-	75.06	27.31	16.71	33.22	383	47	P	V
	*	2472	78.03	-	-	67.23	27.31	16.71	33.22	383	47	A	V
		2483.55	59.97	-14.03	74	49.19	27.27	16.72	33.21	383	47	P	V
		2483.5	48.82	-5.18	54	38.04	27.27	16.72	33.21	383	47	A	V
													V
													V
802.11a CH 100 5500MHz		5459.44	54.48	-19.52	74	45.13	31.74	10.23	32.62	100	61	P	H
		5462.8	55.67	-12.53	68.2	46.29	31.75	10.24	32.61	100	61	P	H
		5459.6	44.62	-9.38	54	35.27	31.74	10.23	32.62	100	61	A	H
	*	5500	109.1	-	-	99.53	31.9	10.26	32.59	100	61	P	H
	*	5500	101.79	-	-	92.22	31.9	10.26	32.59	100	61	A	H
												A	H
		5451.44	50.89	-23.11	74	41.57	31.71	10.23	32.62	394	104	P	V
		5469.52	51.05	-17.15	68.2	41.64	31.78	10.24	32.61	394	104	P	V
		5457.68	41.92	-12.08	54	32.58	31.73	10.23	32.62	394	104	A	V
	*	5500	103.89	-	-	94.32	31.9	10.26	32.59	394	104	P	V
	*	5500	96.1	-	-	86.53	31.9	10.26	32.59	394	104	A	V
												A	V
Remark	1. No other spurious found.												
	2. All results are PASS against Peak and Average limit line.												



Ant 4_11n HT20_Tx_Ch13 + Ant 3_11a_Tx_Ch100_Co-location (Harmonic @ 3m)

Simultaneously	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
Co-location		4944	51.24	-22.76	74	43.28	31.09	9.73	32.86	100	0	P	H
		7416	44.51	-29.49	74	53.62	36.33	13.61	59.05	100	0	P	H
		11000	49.15	-24.85	74	54.27	40	17.48	62.6	100	0	P	H
		16500	48.96	-19.24	68.2	47.75	38.4	22.01	59.2	100	0	P	H
													H
													H
													H
													H
		4944	51.07	-22.93	74	43.11	31.09	9.73	32.86	100	0	P	V
		7416	44.67	-29.33	74	53.78	36.33	13.61	59.05	100	0	P	V
		11000	48.32	-25.68	74	53.44	40	17.48	62.6	100	0	P	V
		16500	47.91	-20.29	68.2	46.7	38.4	22.01	59.2	100	0	P	V
													V
													V
													V
													V
Remark	1. No other spurious found.												
	2. All results are PASS against Peak and Average limit line.												



Emission below 1GHz

Ant 4 _11n HT20_ Tx_ Ch13 + Ant 3 _11a_ Tx_ Ch100_ Co-location (LF@ 3m)

Simultaneously	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
		(MHz)	(dBμV/m)	Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
				(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
Co-location		30	24.98	-15.02	40	32.49	24.15	0.76	32.42	-	-	P	H
		80.44	23.69	-16.31	40	41.63	13.2	1.3	32.44	-	-	P	H
		116.33	32.78	-10.72	43.5	46.59	17.07	1.53	32.41	100	0	P	H
		866.14	29.25	-16.75	46	27.86	29.03	4.24	31.88	-	-	P	H
		936.95	30.07	-15.93	46	27.49	29.42	4.4	31.24	-	-	P	H
		959.26	31.91	-14.09	46	27.76	30.64	4.46	30.95	-	-	P	H
													H
													H
													H
													H
													H
													H
		36.79	33.65	-6.35	40	44.49	20.76	0.86	32.46	100	0	P	V
		42.61	29.47	-10.53	40	43.11	17.91	0.94	32.49	-	-	P	V
		134.76	36.93	-6.57	43.5	50.52	17.2	1.66	32.45	-	-	P	V
		925.31	30.09	-15.91	46	28.07	29.04	4.38	31.4	-	-	P	V
		938.89	30.33	-15.67	46	27.66	29.48	4.41	31.22	-	-	P	V
		960	30.76	-15.24	46	26.55	30.69	4.46	30.94	-	-	P	V
													V
													V
													V
													V
													V
													V
													V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												



Note symbol

*	Fundamental Frequency which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
!	Test result is over limit line.
P/A	Peak or Average
H/V	Horizontal or Vertical



A calculation example for radiated spurious emission is shown as below:

BLE	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BLE CH 00 2402MHz		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	A	H

1. Path Loss(dB) = Cable loss(dB) + Filter loss(dB) + Attenuator loss(dB)
2. Level(dBμV/m) =
Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)
3. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

For Peak Limit @ 2390MHz:

1. Level(dBμV/m)
= Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)
= 32.22(dB/m) + 4.58(dB) + 54.51(dBμV) – 35.86 (dB)
= 55.45 (dBμV/m)
2. Over Limit(dB)
= Level(dBμV/m) – Limit Line(dBμV/m)
= 55.45(dBμV/m) – 74(dBμV/m)
= -18.55(dB)

For Average Limit @ 2390MHz:

1. Level(dBμV/m)
= Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)
= 32.22(dB/m) + 4.58(dB) + 42.6(dBμV) – 35.86 (dB)
= 43.54 (dBμV/m)
2. Over Limit(dB)
= Level(dBμV/m) – Limit Line(dBμV/m)
= 43.54(dBμV/m) – 54(dBμV/m)
= -10.46(dB)

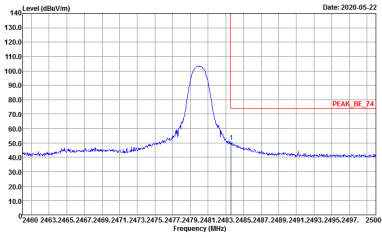
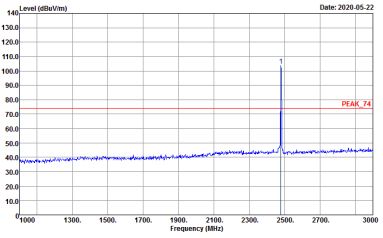
Both peak and average measured complies with the limit line, so test result is “PASS”.



Appendix B. Radiated Spurious Emission Plots

Test Engineer :	Cookie Ku, Fu Chen and Troye Hsieh	Temperature :	19.1~26.3°C
		Relative Humidity :	50.2~69.1%

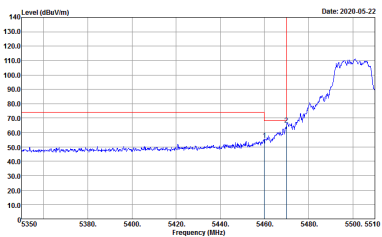
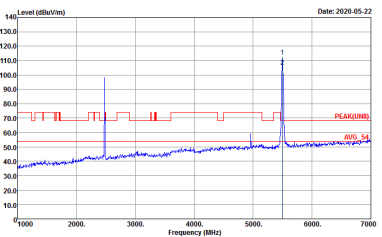
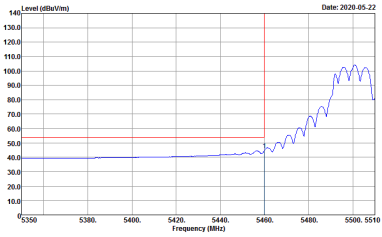
2.4GHz 2400~2483.5MHz**BT (Band Edge @ 3m)**

BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BT CH78 2480MHz	
4	Horizontal	Fundamental
Peak	 Site : 03CH11-HY Condition : PEAK_BE_74 3m HORN 91200-MF HORIZONTAL Detector : SSW-1000.000KHz VSW-3000.000KHz SWT:Auto	 Site : 03CH11-HY Condition : PEAK_74 3m HORN 91200-MF HORIZONTAL Detector : SSW-1000.000KHz VSW-3000.000KHz SWT:Auto

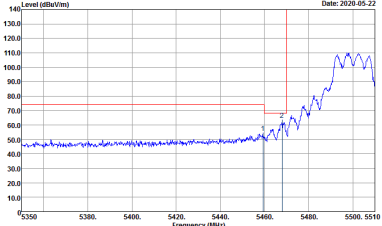
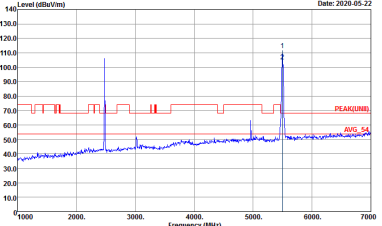
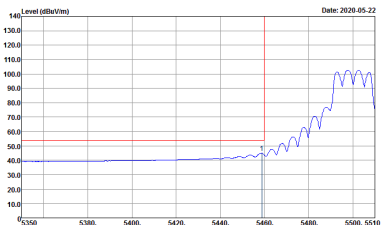


BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BT CH78 2480MHz	
4	Vertical	Fundamental
Peak	Site : 03CH11-HY Condition : PEAK_BE_74 3m HORN 9120D-HF VERTICAL RBW:1000.000kHz VBW:3000.000kHz SWT:Auto Detector : Peak	Site : 03CH11-HY Condition : PEAK_74 3m HORN 9120D-HF VERTICAL RBW:1000.000kHz VBW:3000.000kHz SWT:Auto Detector : Peak

Band 3 - 5470~5725MHz
WIFI 802.11a (Band Edge @ 3m)

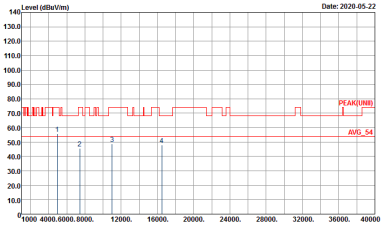
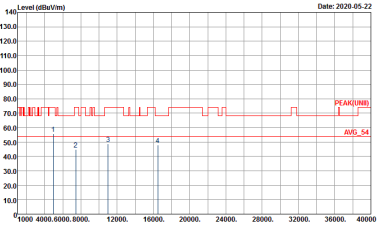
WIFI	Band 3 5470~5725MHz Band Edge @ 3m	
ANT	802.11a CH100 5500MHz	
4+3	Horizontal	Fundamental
Peak	 Site : 03CH11-HV Condition : PEAK_BE(UNIT)_B3 3m HORN 91200-HF HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak	 Site : 03CH11-HV Condition : PEAK(UNIT) 3m HORN 91200-HF HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak
	 Site : 03CH11-HV Condition : AVG_BE(UNIT)_B3 3m HORN 91200-HF HORIZONTAL RBW:1000.000KHz VBW:0.010KHz SWT:Auto Detector : Peak	
Avg.		



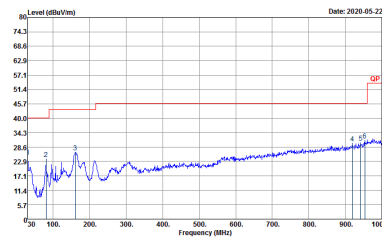
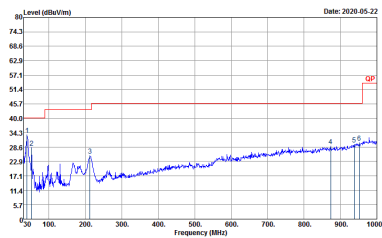
WIFI	Band 3 5470~5725MHz Band Edge @ 3m	
ANT	802.11a CH100 5500MHz	
4+3	Vertical	Fundamental
Peak	 Site : 03CH11-HY Condition : PEAK_BE(UNIT)_B3 3m HORN 91200-HF VERTICAL Detector : Peak	 Site : 03CH11-HY Condition : PEAK(UNIT) 3m HORN 91200-HF VERTICAL Detector : Peak
Avg.	 Site : 03CH11-HY Condition : AVG_BE(UNIT)_B3 3m HORN 91200-HF VERTICAL Detector : Peak	



Ant 4_BT_Tx_Ch78 + Ant 4+3_11a_Tx_Ch100_Co-location (Harmonic @ 3m)

ANT	Ant 4_BT_Tx_Ch78 + Ant 4+3_11a_Tx_Ch100_Co-location	
Simultaneously	Horizontal	Vertical
Peak Avg.	 Site : 03CH11-HY Condition : PEAK(UNIT) 3m HORN 91200-HF HORIZONTAL Detector : Peak	 Site : 03CH11-HY Condition : PEAK(UNIT) 3m HORN 91200-HF VERTICAL Detector : Peak

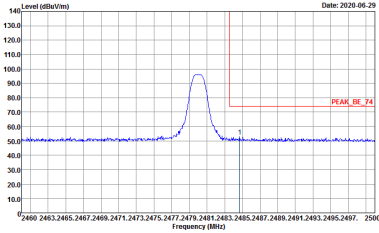
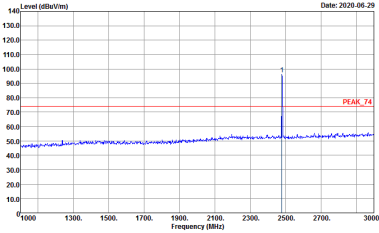
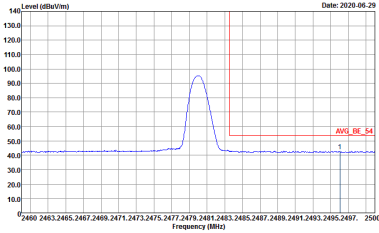
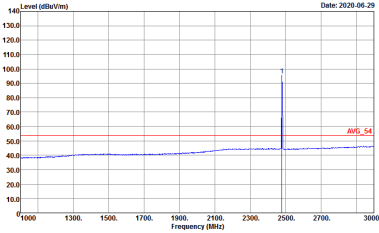
Emission below 1GHz
Ant 4_BT_Tx_Ch78 + Ant 4+3_11a_Tx_Ch100_Co-location (LF)

Simultaneously	Ant 4_BT_Tx_Ch78 + Ant 4+3_11a_Tx_Ch100_Co-location	
	Horizontal	Vertical
QP / Peak	 Site : 03CH11-HY Condition : QP 3m BE-LO6 6111D-LF_ETC HORIZONTAL Detector : Peak	 Site : 03CH11-HY Condition : QP 3m BE-LO6 6111D-LF_ETC VERTICAL Detector : Peak

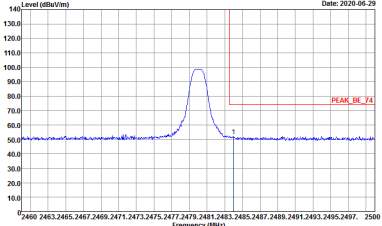
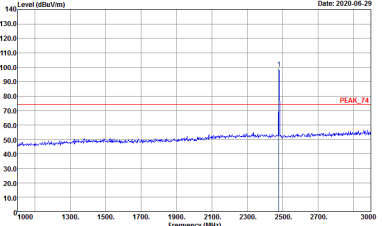
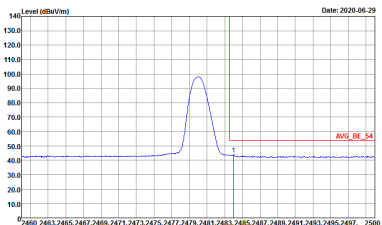
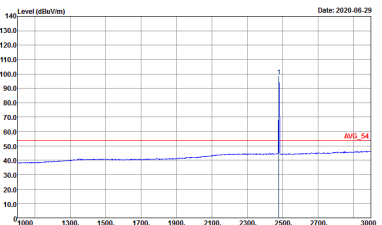


2.4GHz 2400~2483.5MHz

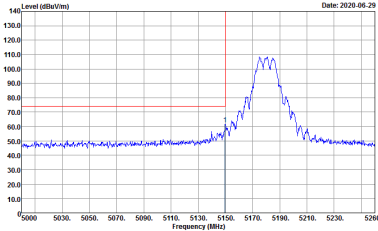
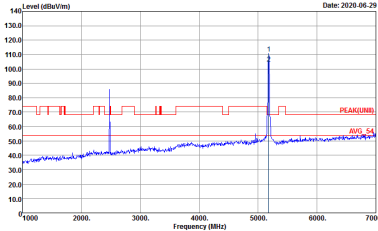
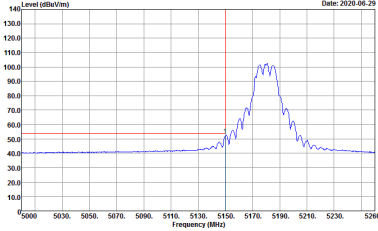
BLE (Band Edge @ 3m)

BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH39 2480MHz	
4	Horizontal	Fundamental
Peak	 Level (dBuV/m) Frequency (MHz) Date: 2020-06-29 PEAK_BE_74 Site : 03CH11-HY Condition : PEAK_BE_74 3m HORN 9120D-HF HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak	 Level (dBuV/m) Frequency (MHz) Date: 2020-06-29 PEAK_74 Site : 03CH11-HY Condition : PEAK_74 3m HORN 9120D-HF HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak
	 Level (dBuV/m) Frequency (MHz) Date: 2020-06-29 AVG_BE_54 Site : 03CH11-HY Condition : AVG_BE_54 3m HORN 9120D-HF HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak	 Level (dBuV/m) Frequency (MHz) Date: 2020-06-29 AVG_54 Site : 03CH11-HY Condition : AVG_54 3m HORN 9120D-HF HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak
Avg.		

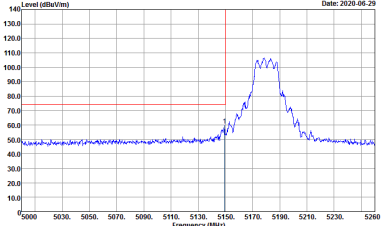
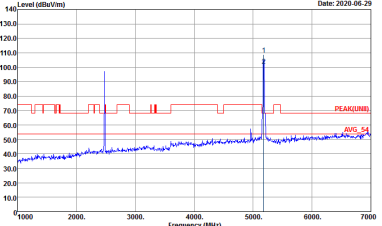
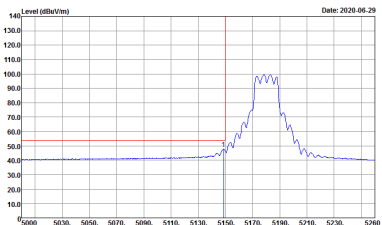


BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH39 2480MHz	
4	Vertical	Fundamental
Peak	 Site : 03CH11-HY Condition : PEAK_BE_74 3m HORN 9120D-HF VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak	 Site : 03CH11-HY Condition : PEAK_74 3m HORN 9120D-HF VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak
	 Site : 03CH11-HY Condition : AVG_BE_54 3m HORN 9120D-HF VERTICAL RBW:1000.000KHz VBW:3.000KHz SWT:Auto Detector : Peak	 Site : 03CH11-HY Condition : AVG_54 3m HORN 9120D-HF VERTICAL RBW:1000.000KHz VBW:3.000KHz SWT:Auto Detector : Peak
Avg.		

Band 1 5150~5250MHz
WIFI 802.11a (Band Edge @ 3m)

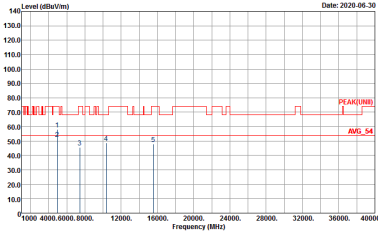
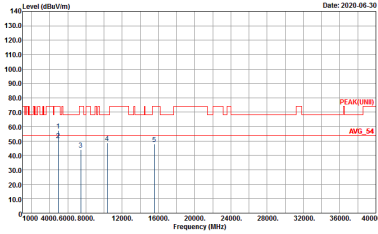
WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11a CH36 5180MHz	
4+3	Horizontal	Fundamental
Peak	 Site : 03CH11-HV Condition : PEAK_BE_74 3m HORN 91200-HF HORIZONTAL Detector : Peak	 Site : 03CH11-HV Condition : PEAK(UNIT) 3m HORN 91200-HF HORIZONTAL Detector : Peak
	 Site : 03CH11-HV Condition : AVG_BE_54 3m HORN 91200-HF HORIZONTAL Detector : Peak	Left blank



WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11a CH36 5180MHz	
4+3	Vertical	Fundamental
Peak	 Site : 03CH11-HY Condition : PEAK_BE_74 3m HORN 91200-HF VERTICAL Detector : Peak	 Site : 03CH11-HY Condition : PEAK(UNIT) 3m HORN 91200-HF VERTICAL Detector : Peak
Avg.	 Site : 03CH11-HY Condition : AVG_BE_54 3m HORN 91200-HF VERTICAL Detector : Peak	Left blank



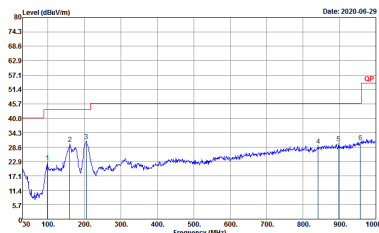
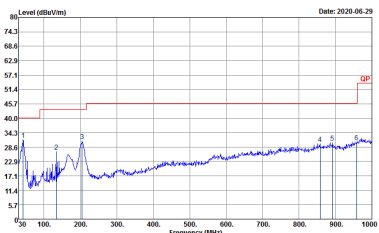
Ant 4_BLE_Tx_Ch39+ Ant 4+3_11a_Tx_Ch36_Co-location (Harmonic @ 3m)

ANT	Ant 4_BLE_Tx_Ch39+ Ant 4+3_11a_Tx_Ch36_Co-location	
Simultaneously	Horizontal	Vertical
Peak Avg.	 Site : 03CH11-HY Condition : PEAK(UNIT) 3m HORN 91200-HF HORIZONTAL Detector : Peak	 Site : 03CH11-HY Condition : PEAK(UNIT) 3m HORN 91200-HF VERTICAL Detector : Peak

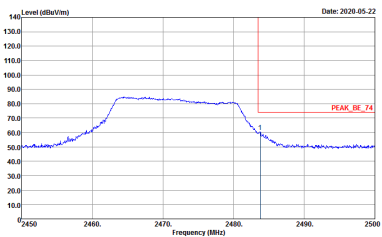
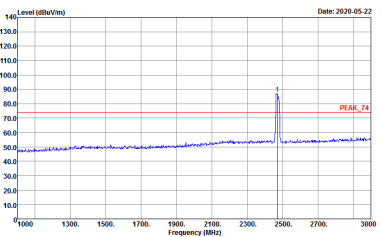
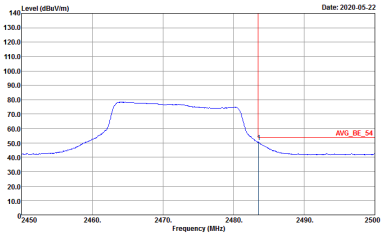


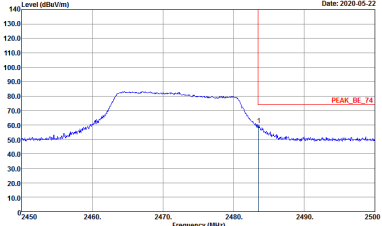
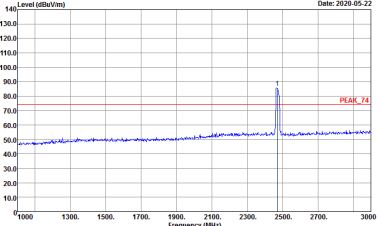
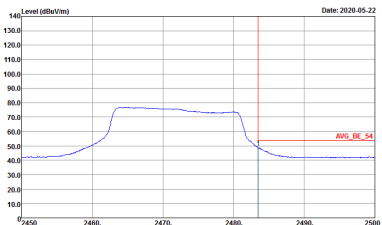
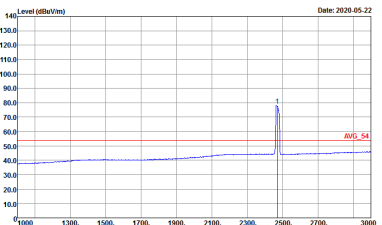
Emission below 1GHz

Ant 4_BLE_Tx_Ch39+ Ant 4+3_11a_Tx_Ch36_Co-location (LF)

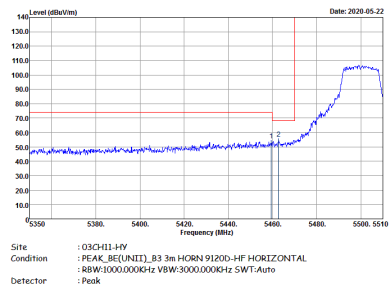
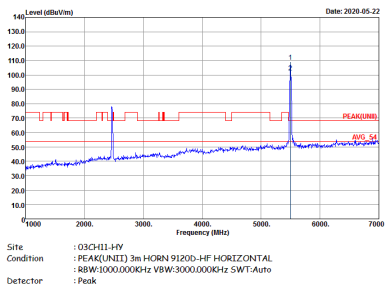
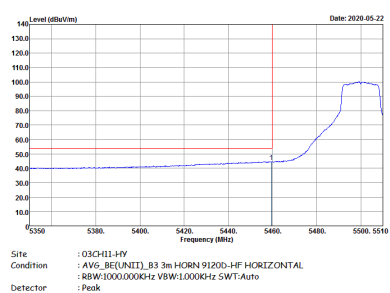
Simultaneously	Ant 4_BLE_Tx_Ch39+ Ant 4+3_11a_Tx_Ch36_Co-location	
	Horizontal	Vertical
QP / Peak	 Site : 03CH11-HY Condition : QP 3m BE-LO6 6111D-LF_ETC HORIZONTAL Detector : Peak	 Site : 03CH11-HY Condition : QP 3m BE-LO6 6111D-LF_ETC VERTICAL Detector : Peak

2.4GHz 2400~2483.5MHz
WIFI 802.11n HT20 (Band Edge @ 3m)

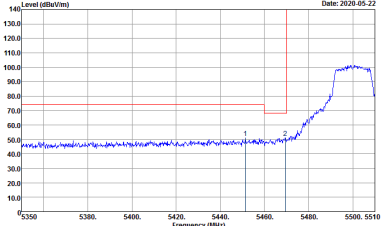
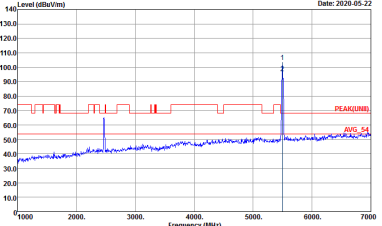
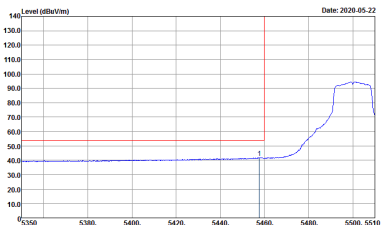
WIFI	2.4GHz 2400~2483.5MHz (Band Edge @ 3m)	
ANT	WIFI 802.11n HT20 Ch13	
4	Horizontal	Fundamental
Peak	 Site : 03CH11-HV Condition : PEAK_BE_74 3m HORN 9120D-HF HORIZONTAL Detector : Peak	 Site : 03CH11-HV Condition : PEAK_74 3m HORN 9120D-HF HORIZONTAL Detector : Peak
	 Site : 03CH11-HV Condition : AVG_BE_54 3m HORN 9120D-HF HORIZONTAL Detector : Peak	Left blank

WIFI	2.4GHz 2400~2483.5MHz (Band Edge @ 3m)	
ANT	WIFI 802.11n HT20 Ch13	
4	Vertical	Fundamental
Peak	 Date: 2020-05-22 Site : 03CH11-HY Condition : PEAK_BE_74 3m HORN 9120D-HF VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak	 Date: 2020-05-22 Site : 03CH11-HY Condition : PEAK_74 3m HORN 9120D-HF VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak
	 Date: 2020-05-22 Site : 03CH11-HY Condition : AVG_BE_54 3m HORN 9120D-HF VERTICAL RBW:1000.000KHz VBW:1000KHz SWT:Auto Detector : Peak	 Date: 2020-05-22 Site : 03CH11-HY Condition : AVG_54 3m HORN 9120D-HF VERTICAL RBW:1000.000KHz VBW:1000KHz SWT:Auto Detector : Peak
Avg.		

Band 3 - 5470~5725MHz
WIFI 802.11a (Band Edge @ 3m)

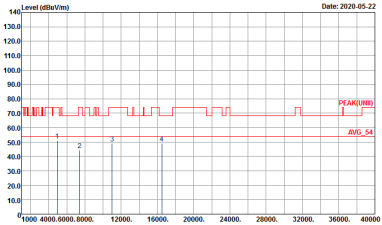
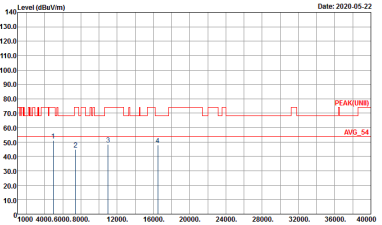
WIFI	Band 3 5470~5725MHz Band Edge @ 3m	
ANT	WIFI 802.a Ch100	
3	Horizontal	Fundamental
Peak		
Avg.		



WIFI	Band 3 5470~5725MHz Band Edge @ 3m	
ANT	WIFI 802.a Ch100	
3	Vertical	Fundamental
Peak	 Site : 03CH11-HY Condition : PEAK_BE(UNIT)_B3 3m HORN 91200-HF VERTICAL Detector : Peak	 Site : 03CH11-HY Condition : PEAK(UNIT) 3m HORN 91200-HF VERTICAL Detector : Peak
Avg.	 Site : 03CH11-HY Condition : AVG_BE(UNIT)_B3 3m HORN 91200-HF VERTICAL Detector : Peak	



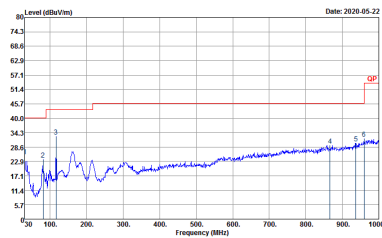
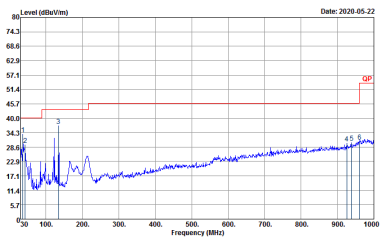
Ant 4_11n HT20_Tx_Ch13 + Ant 3_11a_Tx_Ch100_Co-location (Harmonic @ 3m)

ANT	Ant 4_11n HT20_Tx_Ch13 + Ant 3_11a_Tx_Ch100_Co-location	
Simultaneously	Horizontal	Vertical
Peak Avg.	 Site : 03CH11-HY Condition : PEAK(UNIT) 3m HORN 91200-HF HORIZONTAL Detector : Peak	 Site : 03CH11-HY Condition : PEAK(UNIT) 3m HORN 91200-HF VERTICAL Detector : Peak



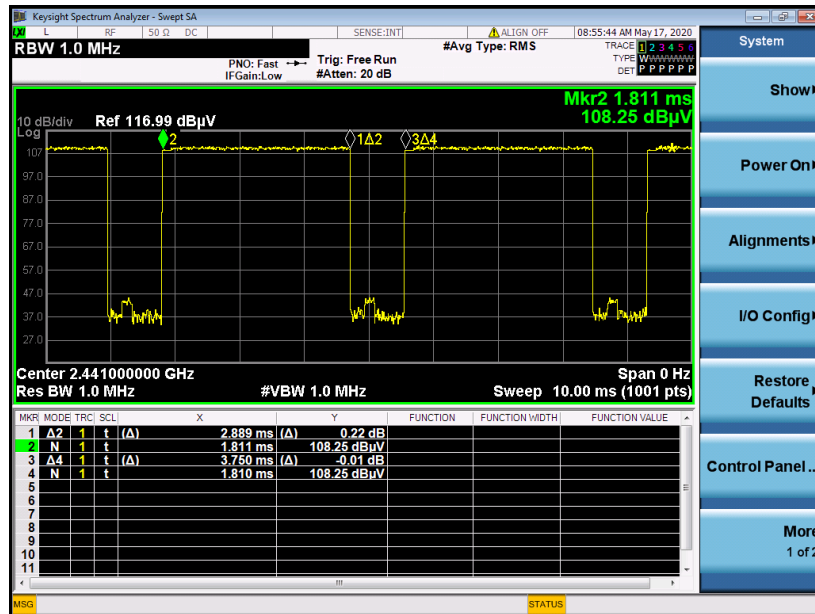
Emission below 1GHz

Ant 4 _11n HT20 _Tx _Ch13 + Ant 3 _11a _Tx _Ch100 _Co-location (LF)

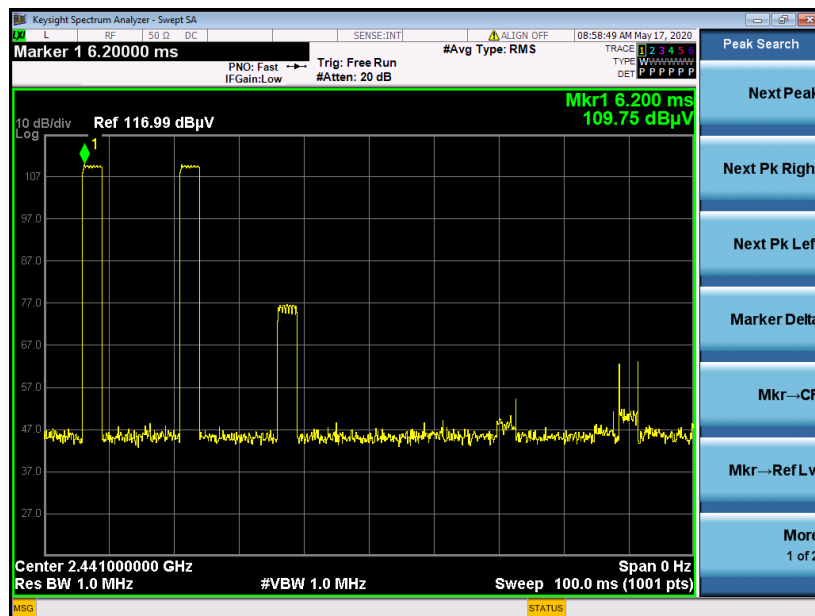
Simultaneously	Ant 4 _11n HT20 _Tx _Ch13 + Ant 3 _11a _Tx _Ch100 _Co-location	
	Horizontal	Vertical
QP / Peak	 Site : 03CH11-HY Condition : QP 3m BE-LOG 6111D-LF_ETC HORIZONTAL Detector : Peak	 Site : 03CH11-HY Condition : QP 3m BE-LOG 6111D-LF_ETC VERTICAL Detector : Peak

Appendix C. Duty Cycle Plots

3DH5 on time (One Pulse) Plot on Channel 39



on time (Count Pulses) Plot on Channel 39



Note:

1. Worst case Duty cycle = on time/100 milliseconds = $2 * 2.89 / 100 = 5.78 \%$
2. Worst case Duty cycle correction factor = $20 * \log(\text{Duty cycle}) = -24.76 \text{ dB}$
3. 3DH5 has the highest duty cycle worst case and is reported.

Duty Cycle Correction Factor Consideration for AFH mode:

Bluetooth normal hopping rate is 1600Hz and reduced to 800Hz in AFH mode; due to the reduced number of hopping frequencies, with the same packet configuration the dwell time in each channel frequency within 100msec period is longer in AFH mode than normal mode.

In AFH mode, the minimum hopping frequencies are 20, to get the longest dwell time DH5 packet is observed; the period to have DH5 packet completing one hopping sequence is

$$2.89 \text{ ms} \times 20 \text{ channels} = 57.8 \text{ ms}$$

There cannot be 2 complete hopping sequences within 100ms period, considering the random hopping behavior, maximum 2 hops can be possibly observed within the period. $[100 \text{ ms} / 57.8 \text{ ms}] = 2 \text{ hops}$

Thus, the maximum possible ON time:

$$2.89 \text{ ms} \times 2 = 5.78 \text{ ms}$$

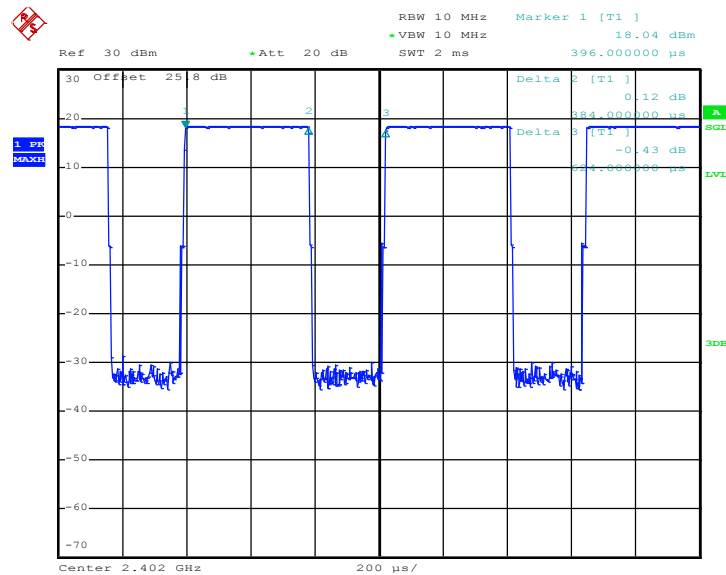
Worst case Duty Cycle Correction factor, which is derived from the maximum possible ON time,

$$20 \times \log(5.78 \text{ ms}/100 \text{ ms}) = -24.76 \text{ dB}$$

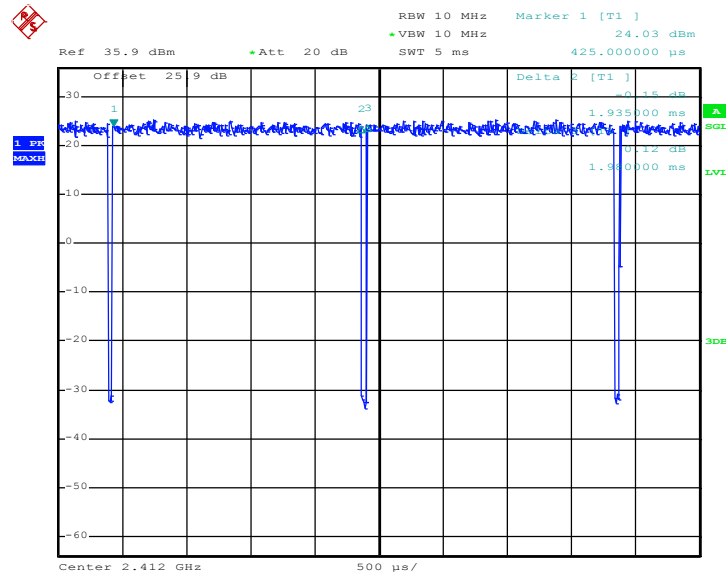
Antenna	Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting	Duty Factor(dB)
4	Bluetooth – LE for 1Mbps	61.54	384	2.60	3kHz	2.11
4	2.4GHz 802.11n HT20	97.73	1935	0.52	1kHz	0.10
3	802.11a	97.39	2055	0.49	1kHz	0.11
4+3	802.11a for Ant. 4	97.87	2070	0.48	1kHz	0.09
4+3	802.11a for Ant. 3	98.11	-	-	10Hz	0.08

<Ant .4>

Bluetooth – LE for 1Mbps

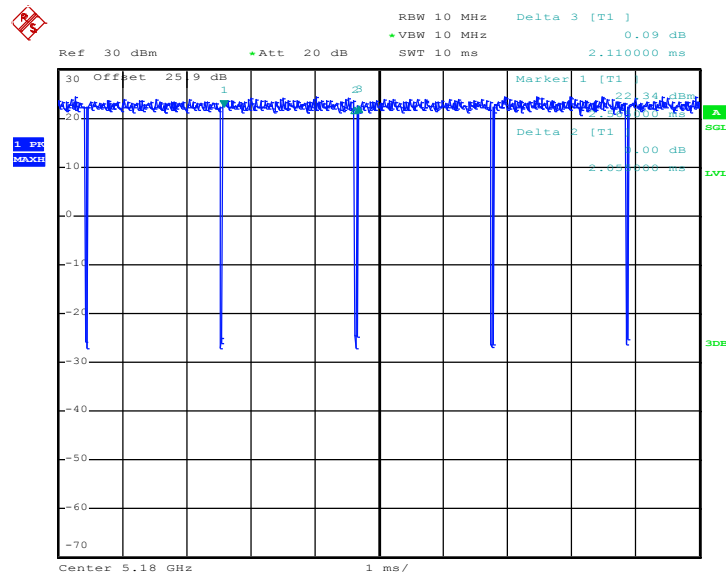


Date: 28.APR.2020 22:52:23

802.11n HT20


Date: 5.MAY.2020 01:38:52

<Ant. 3>

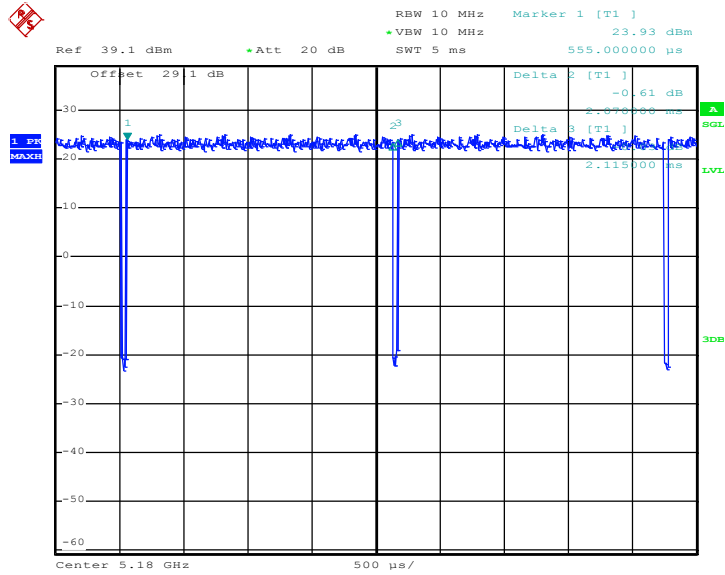
802.11a


Date: 27.APR.2020 22:47:11



MIMO <Ant. 4>

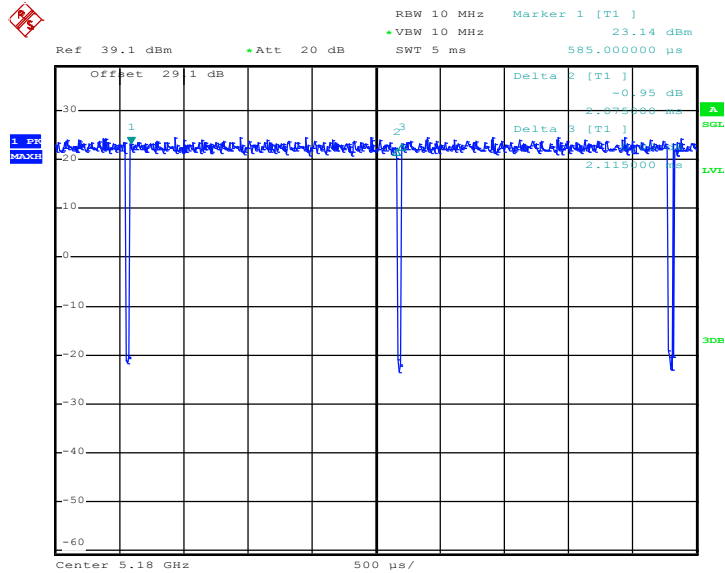
802.11a



Date: 24.APR.2020 21:16:24

MIMO<Ant. 3>

802.11a



Date: 24.APR.2020 21:18:29

—THE END—