

FCC Test Report

Report No.: QBG-ESH-P20100483B-2

FCC ID: 2AXWU-13037

Product: LITTLE MARCEL SPEAKER

Test Model: 13037, 14599

YR PO number: 40c7952g01, 4007952g01, 4137952g01;
40c7953g01, 4007953g01, 4137953g01

ANAIK Product ref: PR-19-015066, PR-19-015066

ANAIK PO number: VE20-093118, VE20-093122

Received Date: Oct.22, 2020

Test Date: Oct.23 to Nov.10, 2020

Issued Date: Nov.12, 2020

Applicant: ANAIK

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Manufacturer: Bellatemps Limited

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Issued By: BUREAU VERITAS ADT (Shanghai) Corporation

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Release Control Record

Issue No.	Description	Date Issued
QBG-ESH-P20100483B-2	Original release	Nov.12, 2020



1 Certificate of Conformity

Product: LITTLE MARCEL SPEAKER

Brand: --

Model: 13037,14599

Applicant: ANAIK

Test Date: Oct.23 to Nov.10, 2020

Standards: 47 CFR FCC Part 15, Subpart C (Section 15.247)
ANSI C63.10:2013

The above equipment has been tested by **BUREAU VERITAS ADT (Shanghai) Corporation**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

Prepared by :

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, Date:

Nov.12, 2020

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Nov.12, 2020

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2 Summary of Test Results

The EUT has been tested according to the following specifications:

47 CFR FCC Part 15, Subpart C (SECTION 15.247)			
FCC Clause	Test Item	Result	Remarks
15.203	Antenna Requirement	PASS	No antenna connector is used.
15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit.
15.247(a) (1)	20dB Bandwidth	PASS	Meet the requirement of limit.
15.247(b)	Conducted Peak Output Power	PASS	Meet the requirement of limit.
15.247(a)(1)	Carrier Frequency Separation	PASS	Meet the requirement of limit.
15.247(a)(1)(iii)	Number of Hopping Frequencies	PASS	Meet the requirement of limit.
15.247(a)(1)(iii)	Dwell Time	PASS	Meet the requirement of limit.
15.247(d)	Conducted Band Edges Measurement	PASS	Meet the requirement of limit.
15.247(d)	Conducted Spurious Emissions	PASS	Meet the requirement of limit.
15.247(d)	Emissions in restricted frequency bands	PASS	Meet the requirement of limit.
15.205 / 15.209 / 15.247(d)	Radiated Emissions	PASS	Meet the requirement of limit.

Note: The data shown in the report is the worst case data when the EUT is powered by AC120V, 60Hz(Via Adaptor)

2.1 Test Instruments

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Hybrid Antenna(25MHz-1.5GHz)	Schwarzbeck	VULB9168	E1A1012	Jul.29, 20	Jul.28, 22
Horn Antenna(1GHz -18GHz)	Schwarzbeck	BBHA9120D	E1A1017	Aug.25, 20	Aug.24, 22
Double Ridge Horn Antenna(18G-40G)	COM-POWER	AH-840	E1A1040	Jul.15, 20	Jul.14, 22
Pre-Amplifier(100kHz-1.3GHz)	Agilent	8447D	E1A2001	Apr.20, 20	Apr.19, 21
Pre-Amplifier(0.5GHz-18GHz)	EMCI	EMC184045SE	E1A2009	Jul.06, 20	Jul.05, 21
Pre-Amplifier(18GHz-40GHz)	EMCI	EMC051845SE	E1A2008	Jul.06, 20	Jul.05, 21
EMI test receiver	R&S	ESR7	E1R1005	Apr.20, 20	Apr.19, 21
Spectrum Analyzer	Keysight	N9030B	E1S1003	Jul.23, 20	Jul.22, 21
Spectrum Analyzer	Keysight	N9020A	E1S1004	Mar.03, 20	Mar.02, 21
EMI test receiver	R&S	ESCS30	E1R1001	May.12, 20	May.11, 21
LISN	R&S	ENV216	E1L1011	May.12, 20	May.11, 21
Humidity&Temp Tester	Baolima	WS508	E1H1011	Apr. 03, 20	Apr. 02, 21
RF Control Unit	Toscend	JS0806-2	E1C5003	N/A	N/A
Test Software	ADT	ADT_COND_V7 .3.1	N/A	N/A	N/A
Test Software	Toscend	JS32-RE	N/A	N/A	N/A
Test Software	Toscend	JS1120	N/A	N/A	N/A
Test Software	Toscend	JS1120-3	N/A	N/A	N/A

2.2 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT:

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

Measurement	Frequency	Expanded Uncertainty ($k=2$) ($\pm$)
Conducted Emissions at mains ports	150kHz ~ 30MHz	1.83 dB
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	5.36 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	3.47 dB
	6GHz ~ 18GHz	3.75 dB
	18GHz ~ 40GHz	3.30 dB

2.3 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	LITTLE MARCEL SPEAKER
Brand	--
Test Model	13037,14599
Power Rating	Powered by USB 5Vdc or battery
Modulation Type	GFSK, $\pi/4$ -DQPSK, 8DPSK
Modulation Technology	BT-EDR, FHSS
Operating Frequency	2402MHz ~ 2480MHz
Number of Channel	79
Output Power	0.92dBm
Antenna Type	PCB Antenna
Antenna Connector	--
Antenna Gain	0dBi

Note:

1. For more details, please refer to the User's manual of the EUT.
2. All models are same as each other except model name. So all tests were performed on model 14599.

3.2 Description of Test Modes

79 channels are provided for BT-EDR mode:

Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
0	2402	20	2422	40	2442	60	2462
1	2403	21	2423	41	2443	61	2463
2	2404	22	2424	42	2444	62	2464
3	2405	23	2425	43	2445	63	2465
4	2406	24	2426	44	2446	64	2466
5	2407	25	2427	45	2447	65	2467
6	2408	26	2428	46	2448	66	2468
7	2409	27	2429	47	2449	67	2469
8	2410	28	2430	48	2450	68	2470
9	2411	29	2431	49	2451	69	2471
10	2412	30	2432	50	2452	70	2472
11	2413	31	2433	51	2453	71	2473
12	2414	32	2434	52	2454	72	2474
13	2415	33	2435	53	2455	73	2475
14	2416	34	2436	54	2456	74	2476
15	2417	35	2437	55	2457	75	2477
16	2418	36	2438	56	2458	76	2478
17	2419	37	2439	57	2459	77	2479
18	2420	38	2440	58	2460	78	2480
19	2421	39	2441	59	2461		

3.2.1 Test Mode Applicability:

EUT Configure Mode	Applicable to				Description
	RE $\geq$ 1G	RE < 1G	PLC	APCM	
-	√	√	-	√	-

Where **RE $\geq$ 1G**: Radiated Emission above 1GHz **RE $\leq$ 1G**: Radiated Emission below 1GHz
PLC: Power Line Conducted Emission **APCM**: Antenna Port Conducted Measurement

Radiated Emission Test (Above 1 GHz):

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	PACKET TYPE
-	0 to 78	0, 39, 78	FHSS	GFSK	DH5
-	0 to 78	0, 39, 78	FHSS	$\pi/4$ -DQPSK	2DH5
-	0 to 78	0, 39, 78	FHSS	8DPSK	3DH5

Radiated Emission Test (Below 1 GHz):

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	PACKET TYPE
-	0 to 78	78	FHSS	GFSK	DH5

Power Line Conducted Emission Test:

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	PACKET TYPE
-	0 to 78	78	FHSS	$\pi/4$ -DQPSK	2DH5

Antenna Port Conducted Measurement

- ☒ This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.
- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	PACKET TYPE
-	0 to 78	0, 39, 78	FHSS	GFSK	DH5
-	0 to 78	0, 39, 78	FHSS	$\pi/4$ -DQPSK	2DH5
-	0 to 78	0, 39, 78	FHSS	8DPSK	3DH5

3.2.2 Test Condition:

Applicable to	Normal Environmental Conditions	Normal Input Power
RE $\geq$ 1G	23deg. C, 58%RH	Battery
RE < 1G	23deg. C, 58%RH	Battery
PLC	22deg. C, 54%RH	Battery
APCM	25deg. C, 60%RH	Battery

3.3 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units.

3.4 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standard:

FCC Part 15, Subpart C (15.247)

FCC DA 00705

ANSI C63.10:2013

All relaxed test items have been performed and recorded as per the above standard.

4 Test Procedure and Results

4.1 AC Power Conducted Emission Measurement

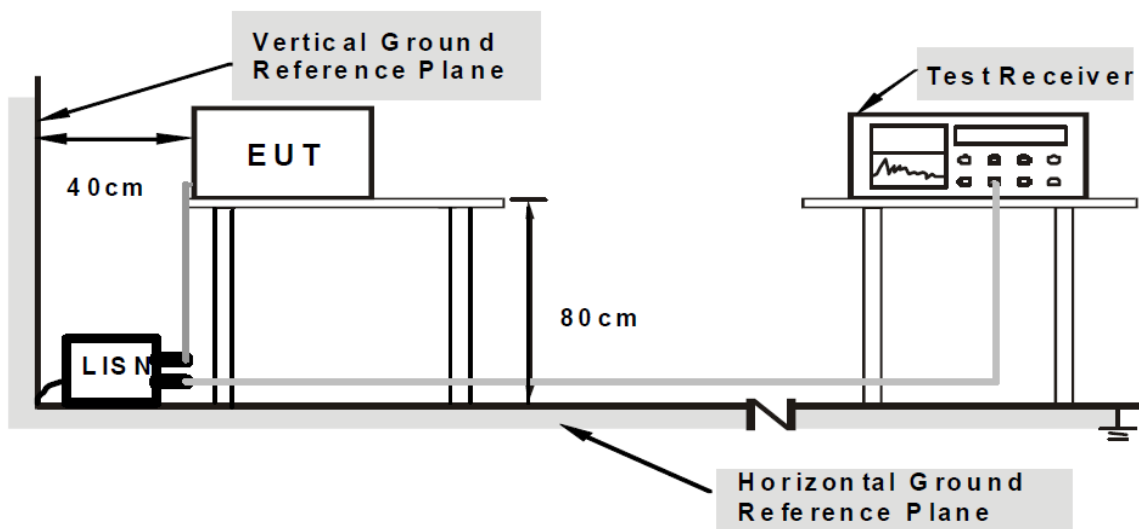
4.1.1 Limit

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

Note: 1. The lower limit shall apply at the transition frequencies.

2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

4.1.2 Test Setup



4.1.3 Test Procedures

- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

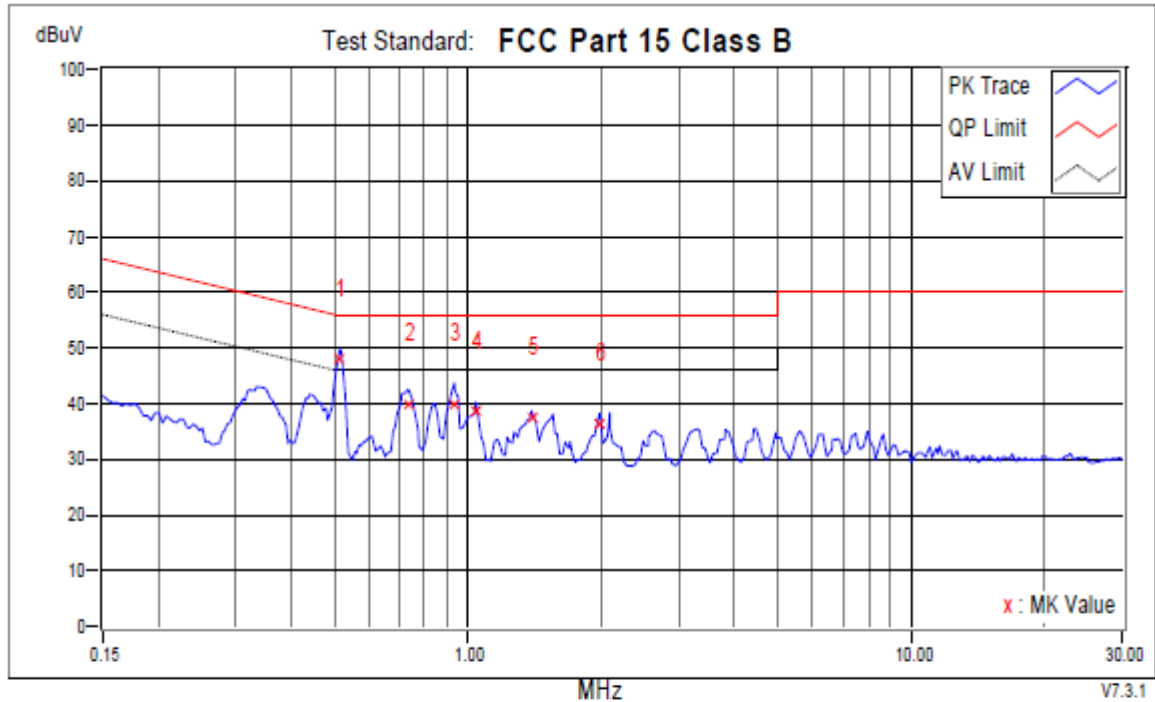
NOTE: The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.

4.1.4 Deviation of Test Standard

No deviation.

4.1.5 Test Results

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
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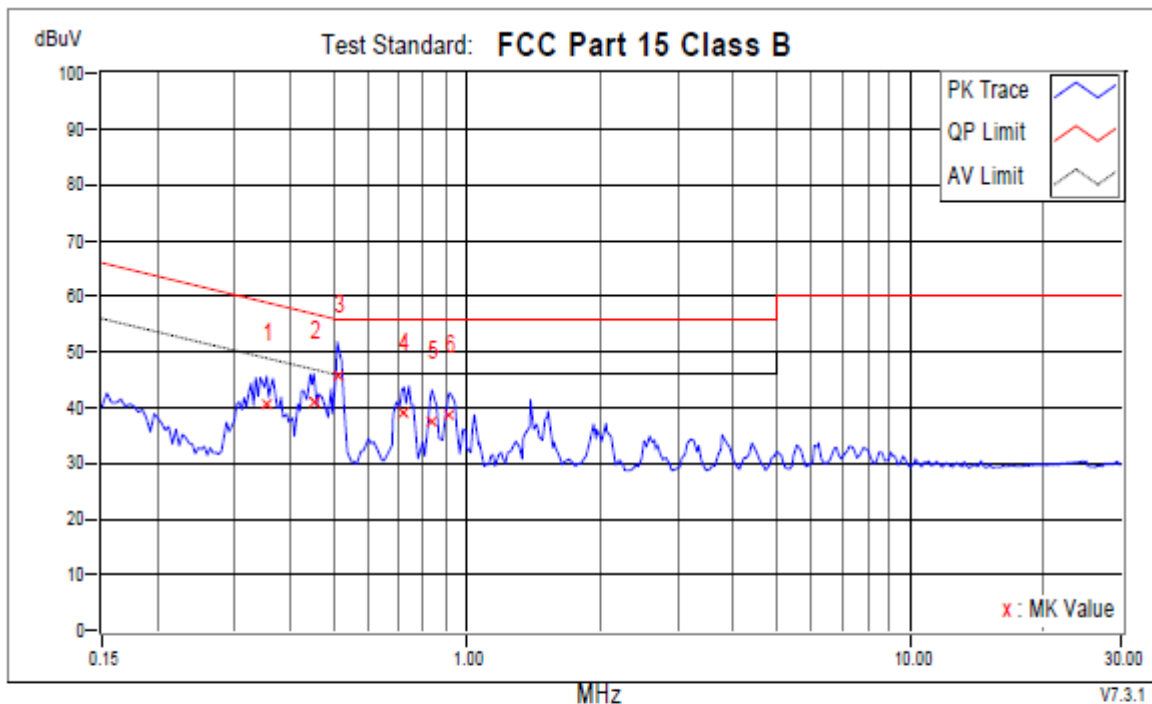


No.	Frequency MHz	Corr. Factor dB	Reading dBuV		Emission dBuV		Limit dBuV		Margins dB		Notes
			QP	AV	QP	AV	QP	AV	QP	AV	
+1	0.51363	9.73	38.49	30.26	48.22	39.99	56.00	46.00	-7.78	-6.01	
2	0.73259	9.61	30.17	22.49	39.78	32.10	56.00	46.00	-16.22	-13.90	
3	0.93200	9.61	30.31	19.32	39.92	28.93	56.00	46.00	-16.08	-17.07	
4	1.04301	9.62	29.17	18.73	38.79	28.35	56.00	46.00	-17.21	-17.65	
5	1.39100	9.67	27.65	19.53	37.32	29.20	56.00	46.00	-18.68	-16.80	
6	1.98141	9.77	26.61	15.13	36.38	24.90	56.00	46.00	-19.62	-21.10	

REMARKS:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value.

Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
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No.	Frequency MHz	Corr. Factor dB	Reading dBuV		Emission dBuV		Limit dBuV		Margins dB		Notes
			QP	AV	QP	AV	QP	AV	QP	AV	
1	0.35332	9.88	30.75	18.85	40.63	28.73	58.88	48.88	-18.25	-20.15	
2	0.45107	9.87	31.13	19.78	41.00	29.65	56.86	46.86	-15.86	-17.21	
+3	0.50972	9.86	35.65	24.86	45.51	34.72	56.00	46.00	-10.49	-11.28	
4	0.72086	9.84	29.07	17.85	38.91	27.69	56.00	46.00	-17.09	-18.31	
5	0.83425	9.90	27.45	16.08	37.35	25.98	56.00	46.00	-18.65	-20.02	
6	0.91245	9.91	28.59	15.70	38.50	25.61	56.00	46.00	-17.50	-20.39	

REMARKS:

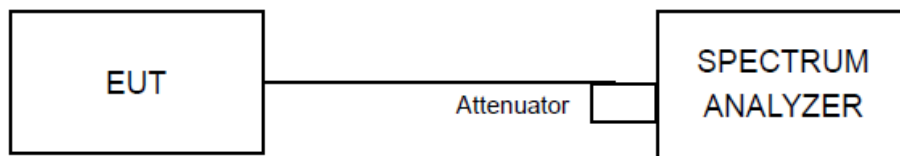
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value.

4.2 20dB Bandwidth

4.2.1 Limit

For frequency hopping system operating in the 2400-2483.5MHz, If the 20dB bandwidth of hopping channel is greater than 25kHz, two-thirds 20dB bandwidth of hopping channel shall be a minimum limit for the hopping channel separation.

4.2.2 Test Setup



4.2.3 Test Procedures

- Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
- Measure the frequency difference of two frequencies that were attenuated 20dB from the reference level. Record the frequency difference as the emission bandwidth.
- Repeat above procedures until all frequencies measured were complete.

4.2.4 Deviation of Test Standard

No deviation.

4.2.5 EUT Operating Condition

The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

4.2.6 Test Results

Test Mode	Antenna	Channel [MHz]	20dB EBW [MHz]	FL [MHz]	FH [MHz]	Limit [MHz]	Verdict
DH5	Ant1	2402	0.954	2401.568	2402.522	---	PASS
		2441	0.957	2440.565	2441.522	---	PASS
		2480	1.026	2479.505	2480.531	---	PASS
2DH5	Ant1	2402	1.362	2401.358	2402.720	---	PASS
		2441	1.353	2440.364	2441.717	---	PASS
		2480	1.365	2479.361	2480.726	---	PASS
3DH5	Ant1	2402	1.350	2401.358	2402.708	---	PASS
		2441	1.362	2440.346	2441.708	---	PASS
		2480	1.353	2479.355	2480.708	---	PASS

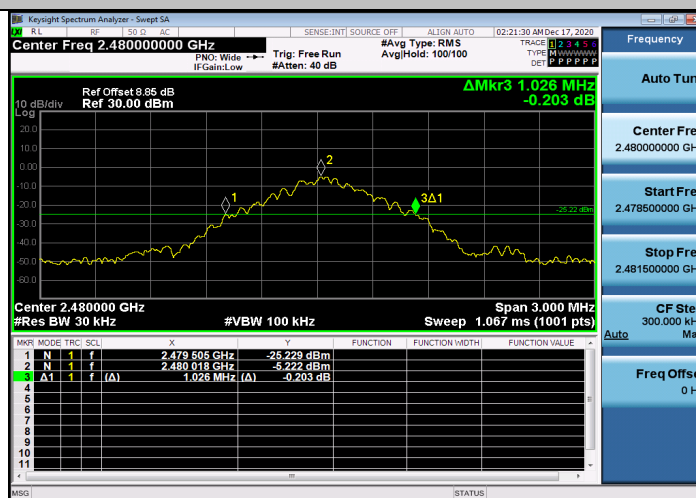
DH5_Ant1_2402



DH5_Ant1_2441



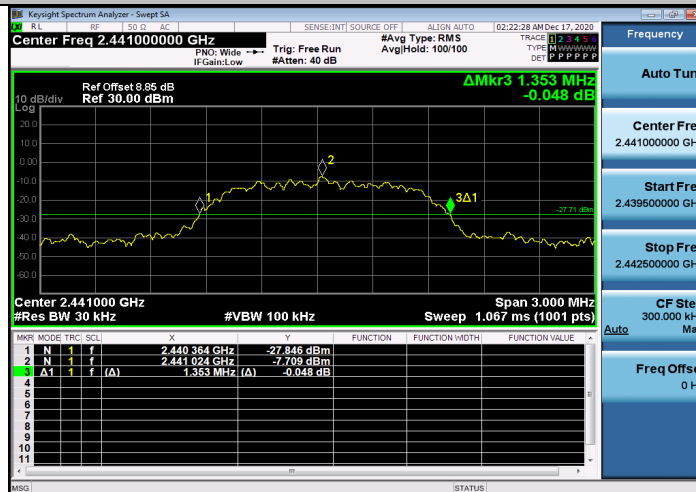
DH5_Ant1_2480



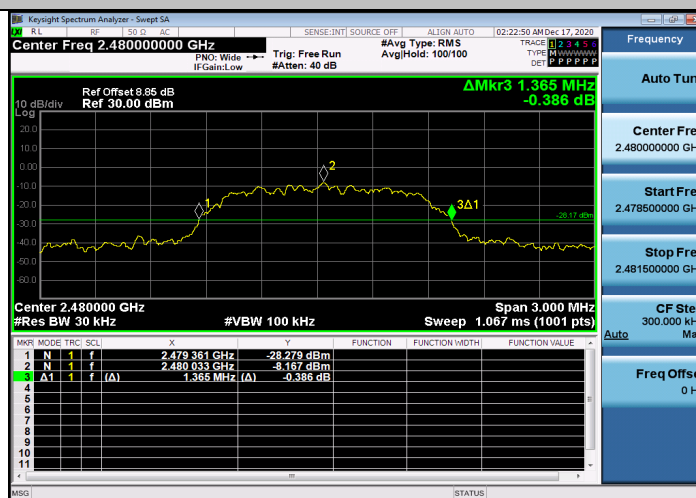
2DH5_Ant1_2402



2DH5_Ant1_2441



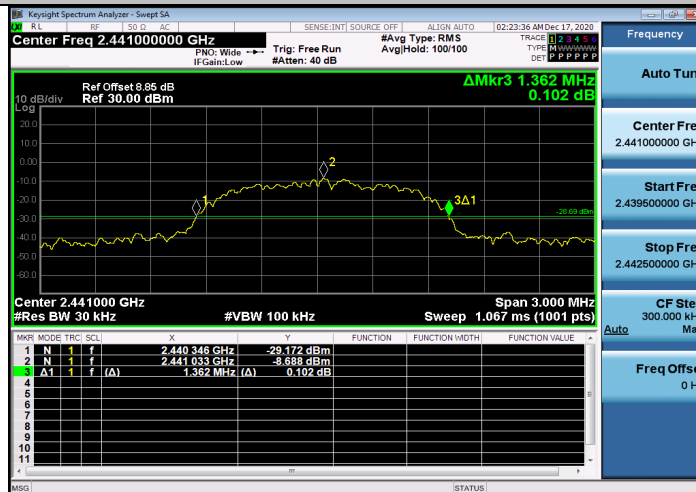
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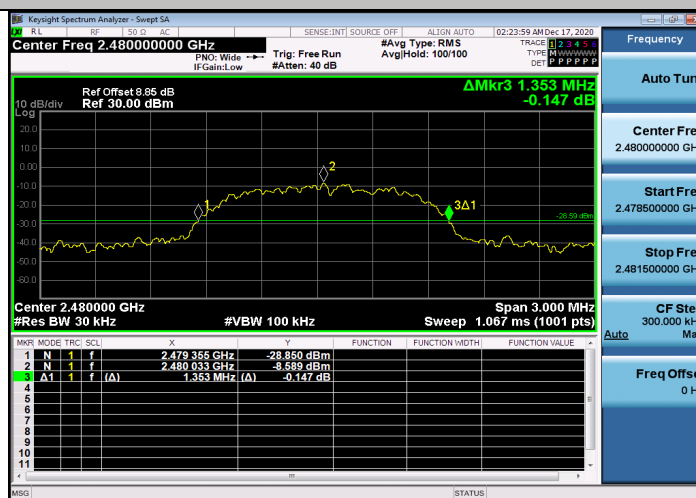
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3DH5_Ant1_2441



3DH5_Ant1_2480

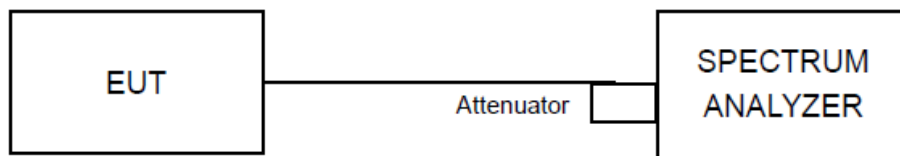


4.3 Conducted Peak Output Power

4.3.1 Limit

The Maximum Output Power Measurement is 125mW(21dBm).

4.3.2 Test Setup



4.3.3 Test Procedures

- 1) Span: Approximately five times the 20 dB bandwidth, centered on a hopping channel.
- 2) RBW > 20 dB bandwidth of the emission being measured.
- 3) VBW $\geq$ RBW.
- 4) Sweep: Auto.
- 5) Detector function: Peak.
- 6) Trace: Max hold.
- b) Allow trace to stabilize.
- c) Use the marker-to-peak function to set the marker to the peak of the emission.
- d) The indicated level is the peak output power, after any corrections for external attenuators and cables.
- e) A plot of the test results and setup description shall be included in the test report.

4.3.4 Deviation of Test Standard

No deviation.

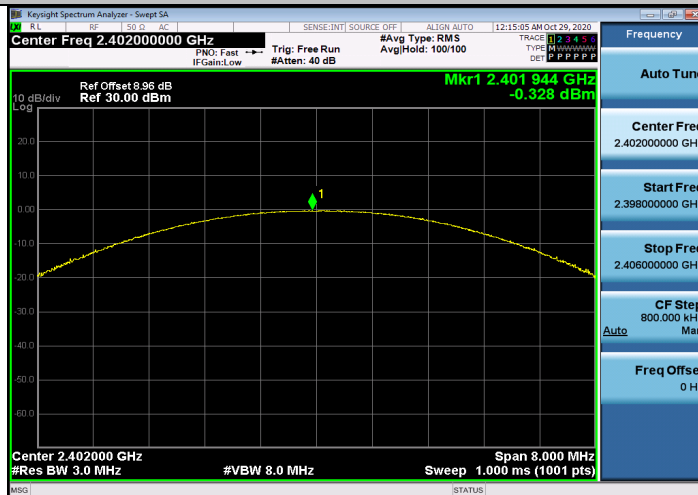
4.3.5 EUT Operating Condition

The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

4.3.6 Test Results

Test Mode	Antenna	Channel [MHz]	Power [dBm]	Limit [dBm]	Verdict
DH5	Ant1	2402	-0.33	≤ 20.97	PASS
		2441	-1.32	≤ 20.97	PASS
		2480	-1.37	≤ 20.97	PASS
2DH5	Ant1	2402	0.61	≤ 20.97	PASS
		2441	-0.56	≤ 20.97	PASS
		2480	-0.52	≤ 20.97	PASS
3DH5	Ant1	2402	0.92	≤ 20.97	PASS
		2441	-0.25	≤ 20.97	PASS
		2480	-0.2	≤ 20.97	PASS

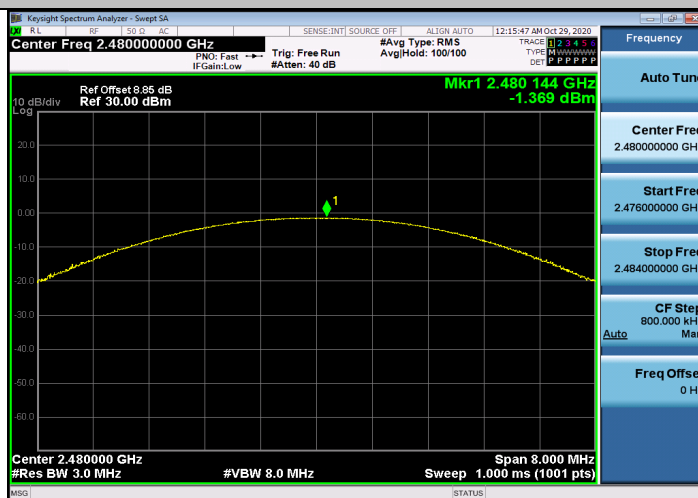
DH5_Ant1_2402



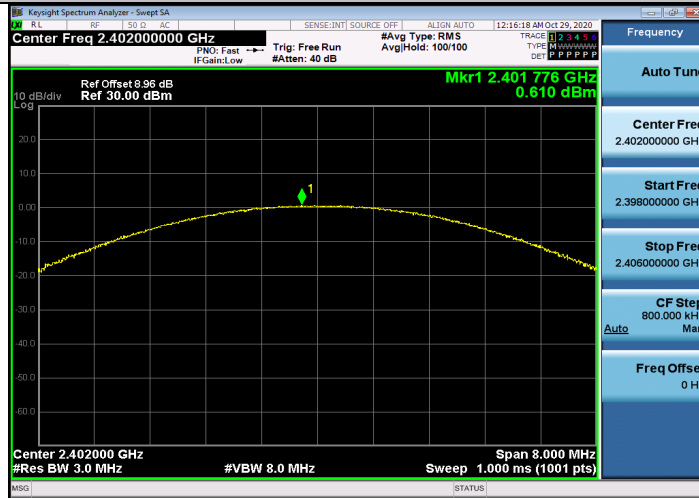
DH5_Ant1_2441



DH5_Ant1_2480



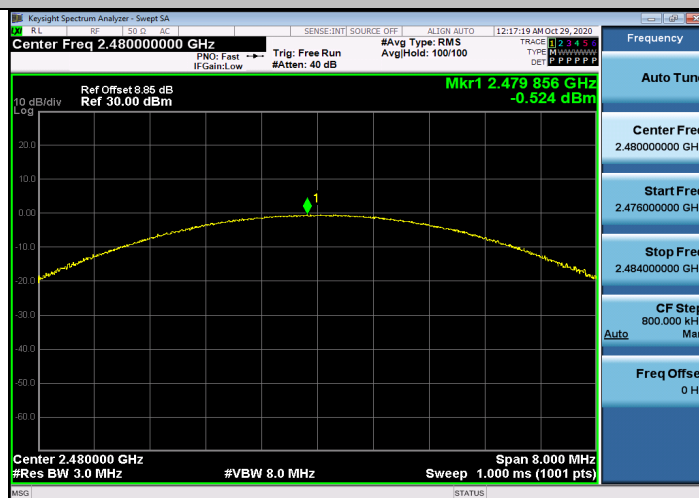
2DH5_Ant1_2402



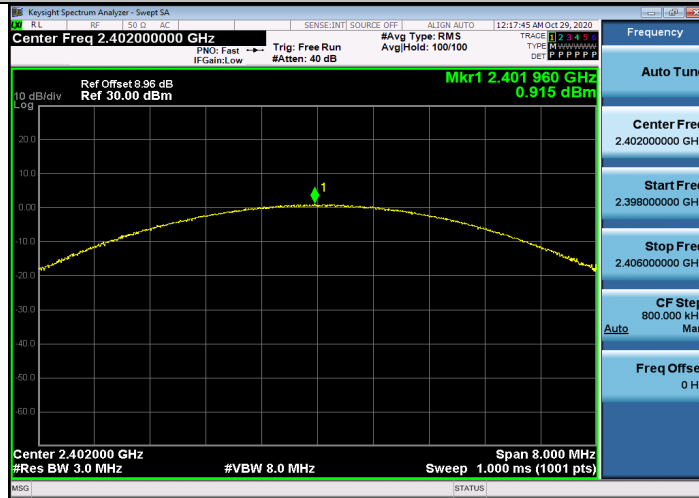
2DH5_Ant1_2441



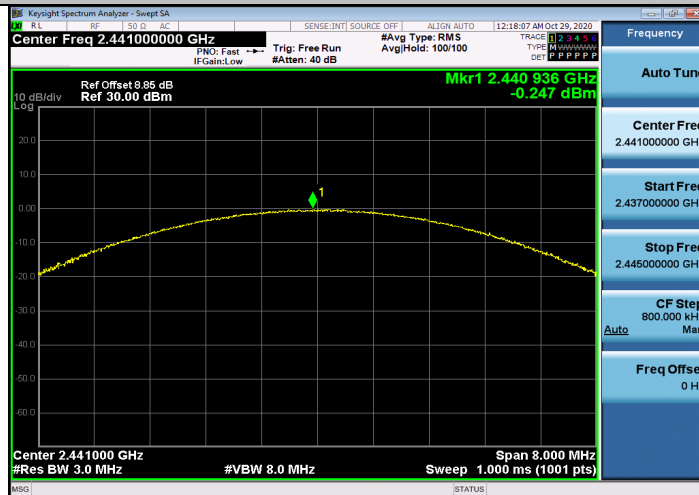
2DH5_Ant1_2480



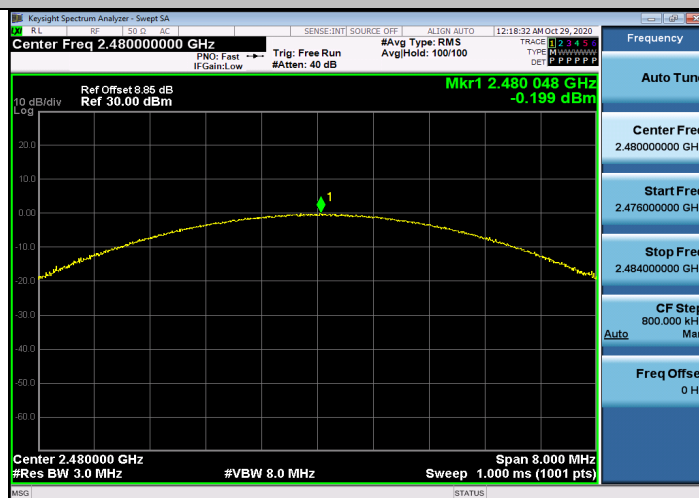
3DH5_Ant1_2402



3DH5_Ant1_2441



3DH5_Ant1_2480

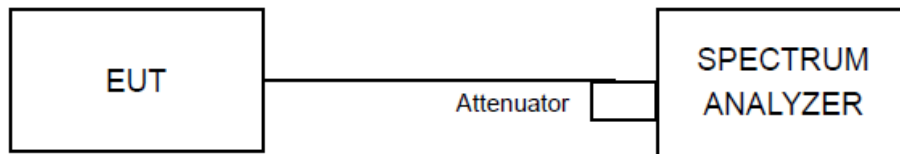


4.4 Carrier Frequency Separation

4.4.1 Limit

At least 25kHz or two-third of 20dB hopping channel bandwidth (whichever is greater)

4.4.2 Test Setup



4.4.3 Test Procedures

Measurement Procedure REF

- Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range.
- By using the MaxHold function record the separation of two adjacent channels.
- Measure the frequency difference of these two adjacent channels by SA MARK function. And then plot the result on SA screen.
- Repeat above procedures until all frequencies measured were complete.

4.4.4 Deviation of Test Standard

No deviation.

4.4.5 Test Results

Test Mode	Antenna	Channel [MHz]	Result [MHz]	Limit [MHz]	Verdict
DH5	Ant1	Hop	1.024	≥ 0.730	PASS
2DH5	Ant1	Hop	0.998	≥ 0.940	PASS
3DH5	Ant1	Hop	1.026	≥ 0.944	PASS

DH5_Ant1_Hop



2DH5_Ant1_Hop



3DH5_Ant1_Hop

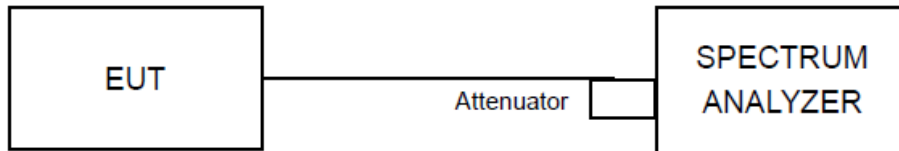


4.5 Number of Hopping Frequencies

4.5.1 Limit

At least 15 channels frequencies, and should be equally spaced.

4.5.2 Test Setup



4.5.3 Test Procedures

- Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
- Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
- Set the SA on MaxHold Mode, and then keep the EUT in hopping mode. Record all the signals from each channel until each one has been recorded.
- Set the SA on View mode and then plot the result on SA screen.
- Repeat above procedures until all frequencies measured were complete.

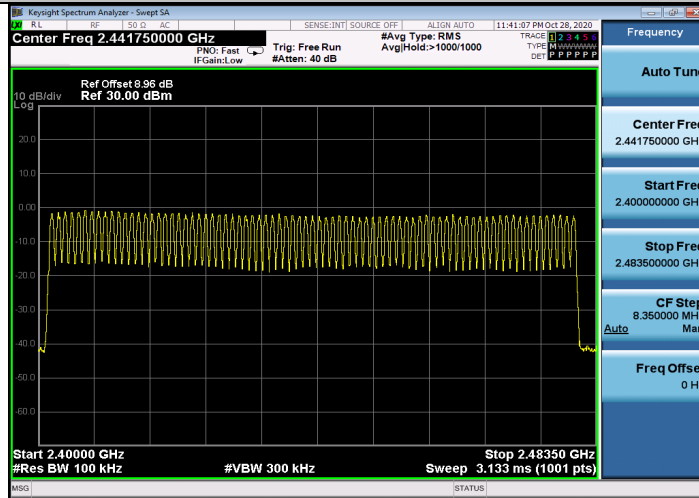
4.5.4 Deviation of Test Standard

No deviation.

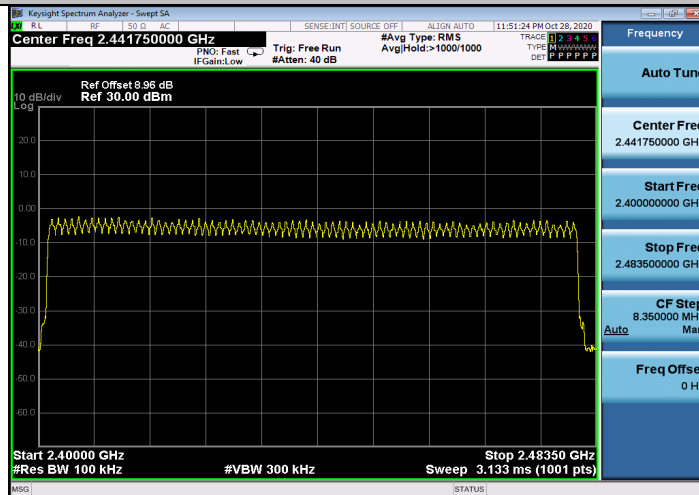
4.5.5 Test Results

Test Mode	Antenna	Number of Hopping Frequencies [N]	Limit	Verdict
DH5	Ant1	79	≥ 15	PASS
2DH5	Ant1	79	≥ 15	PASS
3DH5	Ant1	79	≥ 15	PASS

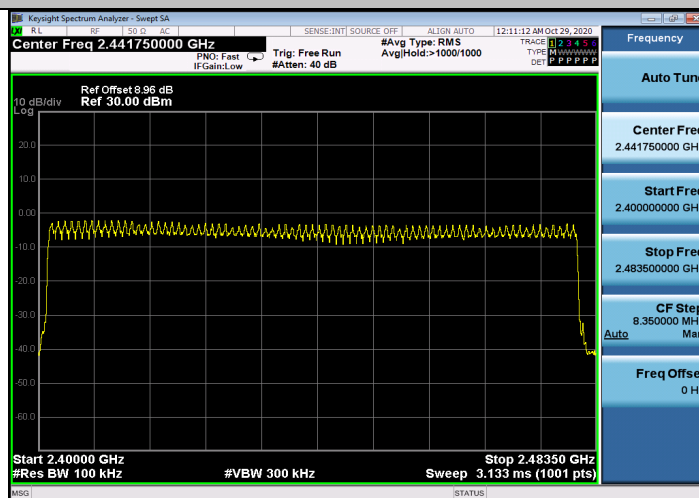
DH5_Ant1_Hop



2DH5_Ant1_Hop



3DH5_Ant1_Hop

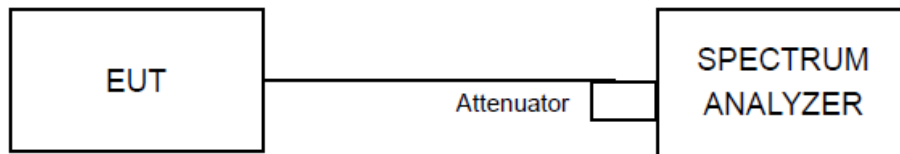


4.6 Dwell Time

4.6.1 Limit

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

4.6.2 Test Setup



4.6.3 Test Procedures

- Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
- Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
- Adjust the center frequency of SA on any frequency be measured and set SA to zero span mode. And then, set RBW and VBW of spectrum analyzer to proper value.
- Measure the time duration of one transmission on the measured frequency. And then plot the result with time difference of this time duration.
- Repeat above procedures until all different time-slot modes have been completed.

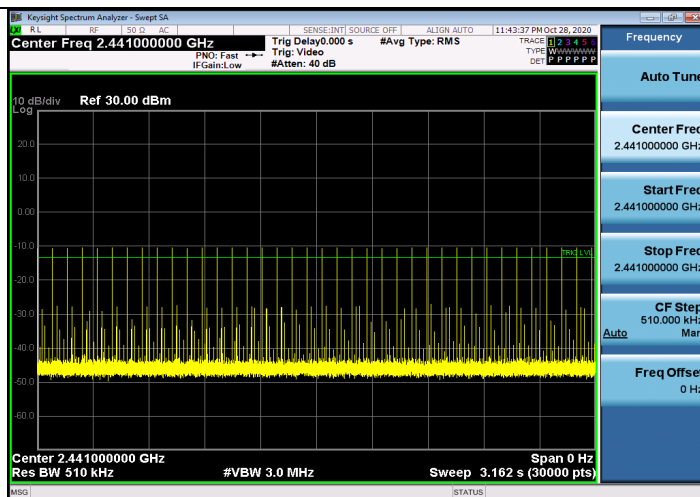
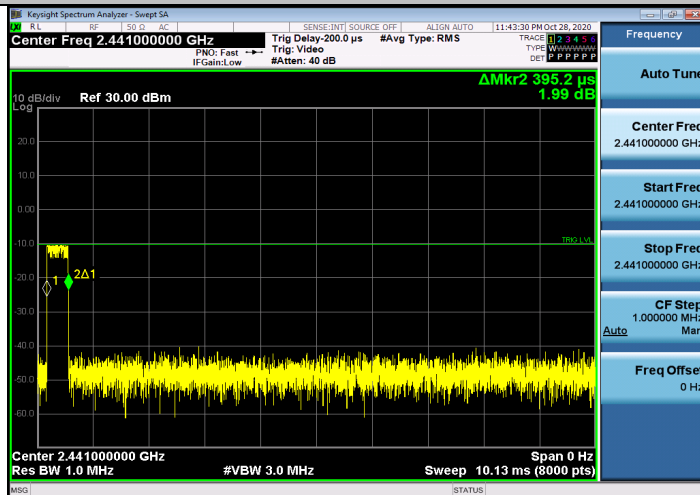
4.6.4 Deviation of Test Standard

No deviation.

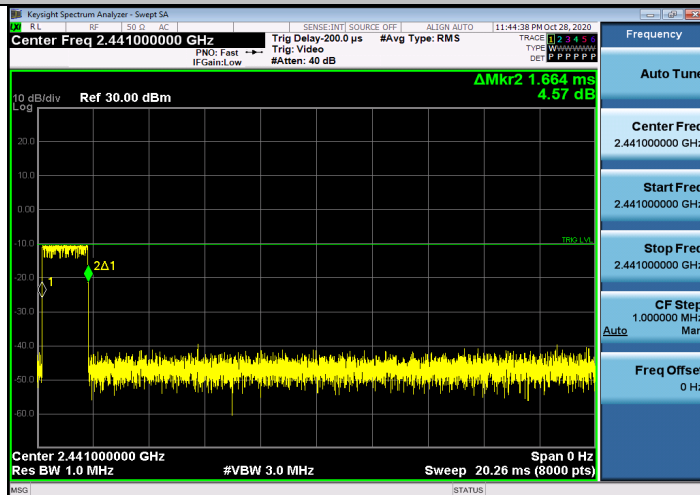
4.6.5 Test Results

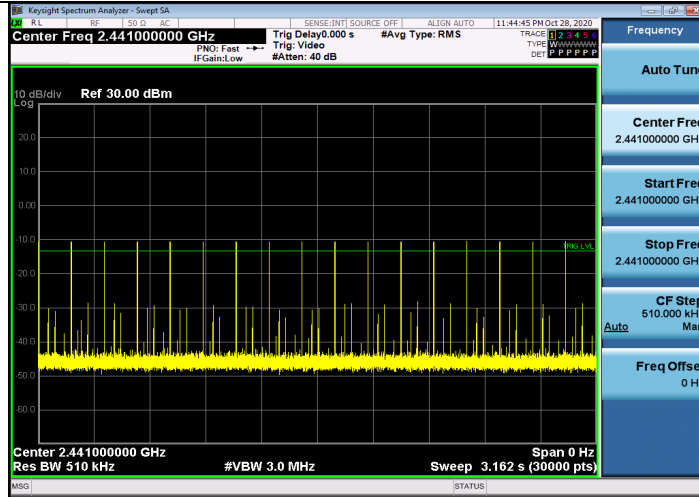
Test Mode	Antenna	Channel [MHz]	BurstWidth [ms/hop/ch]	TotalHops [hop*ch]	Dwell Time [s]	Limit [s]	Verdict
DH1	Ant1	Hop	0.40	380	0.15	<=0.4	PASS
DH3	Ant1	Hop	1.66	170	0.283	<=0.4	PASS
DH5	Ant1	Hop	2.95	110	0.324	<=0.4	PASS
2DH1	Ant1	Hop	0.41	380	0.156	<=0.4	PASS
2DH3	Ant1	Hop	1.67	170	0.283	<=0.4	PASS
2DH5	Ant1	Hop	2.93	110	0.323	<=0.4	PASS
3DH1	Ant1	Hop	0.41	380	0.156	<=0.4	PASS
3DH3	Ant1	Hop	1.66	170	0.282	<=0.4	PASS
3DH5	Ant1	Hop	2.94	110	0.324	<=0.4	PASS

DH1_Ant1_Hop

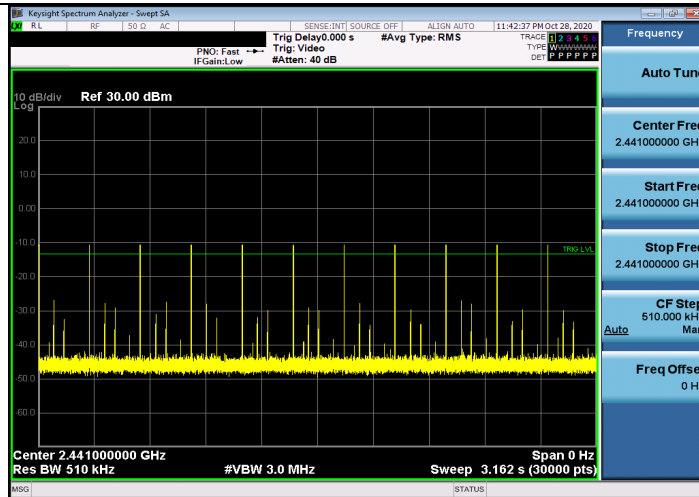
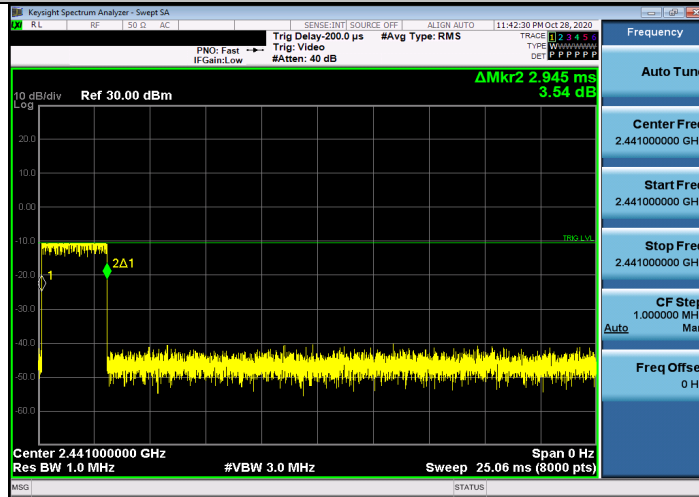


DH3_Ant1_Hop

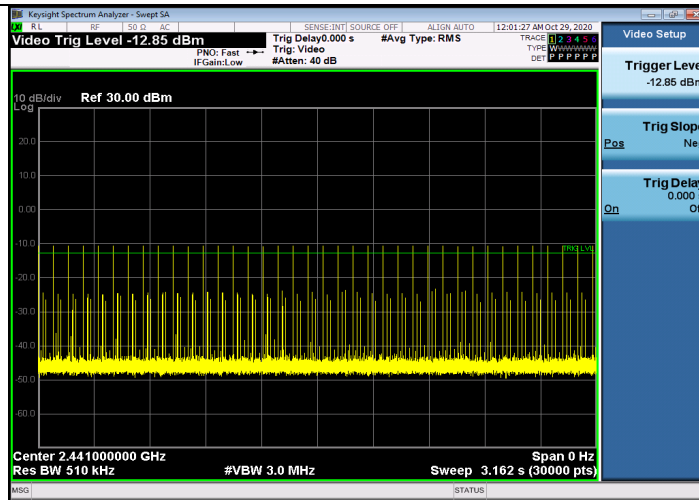
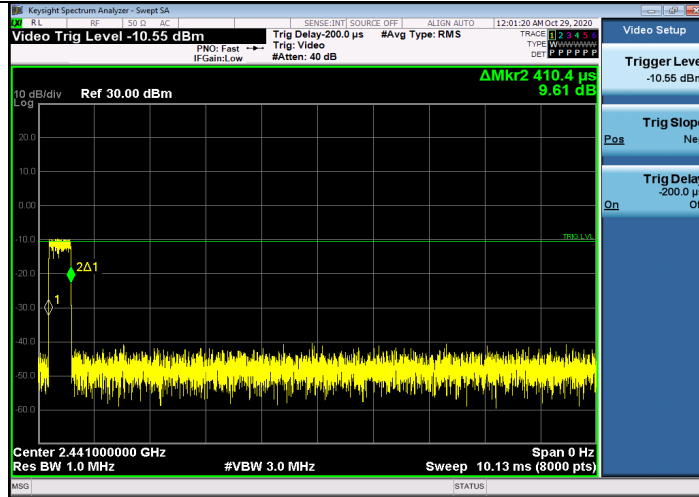




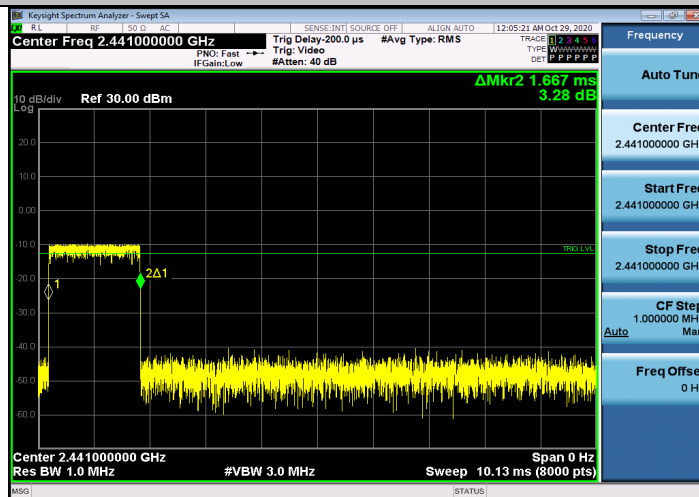
DH5_Ant1_Hop

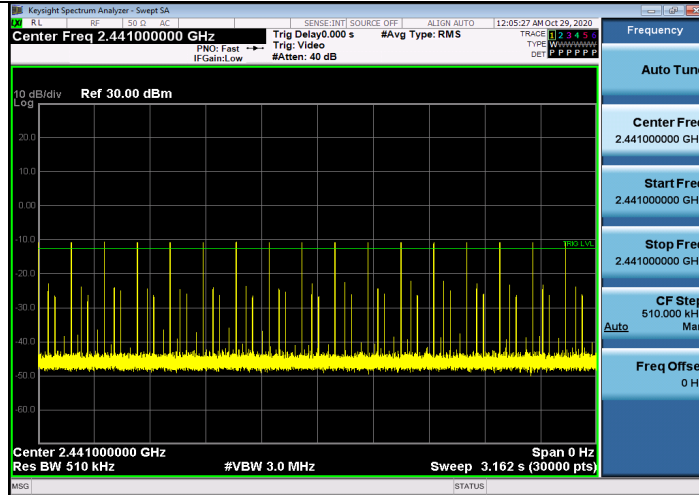


2DH1_Ant1_Hop

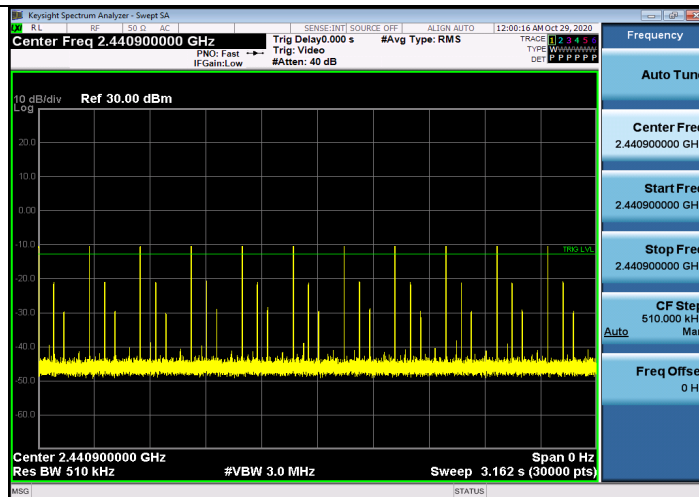
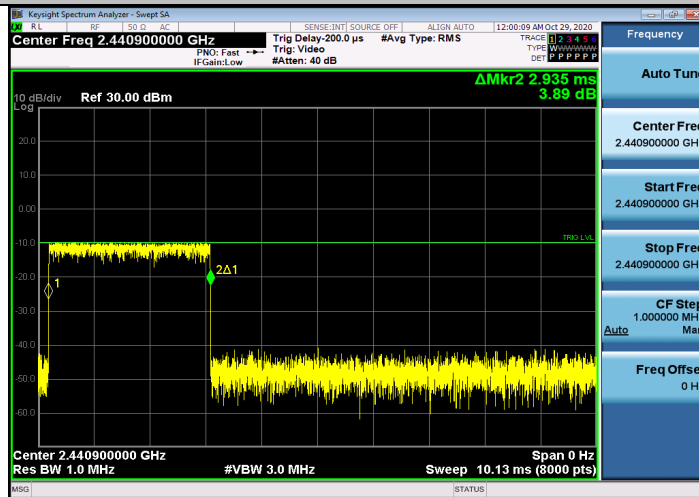


2DH3_Ant1_Hop

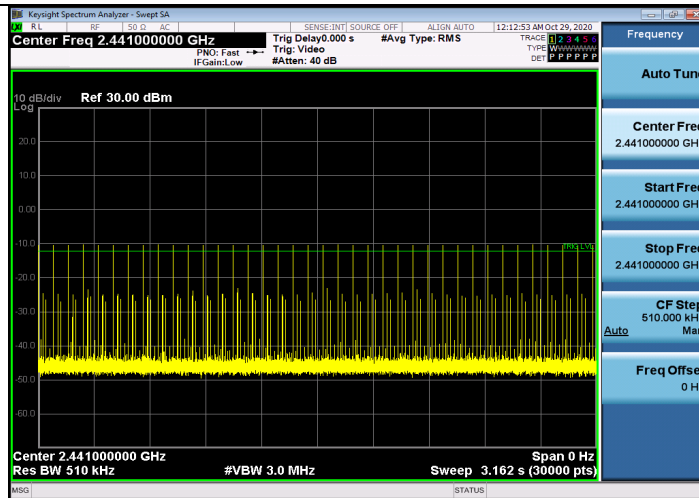
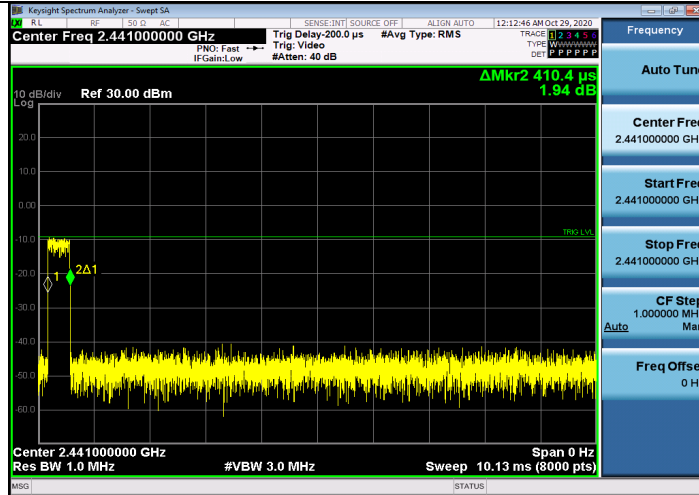




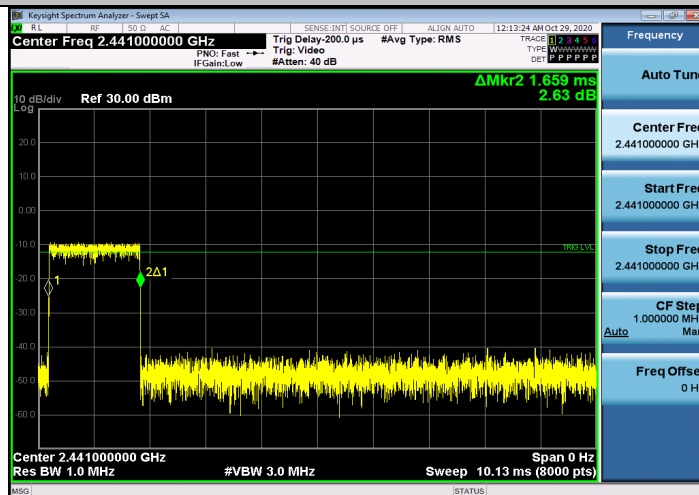
2D41_Ant1_Hop

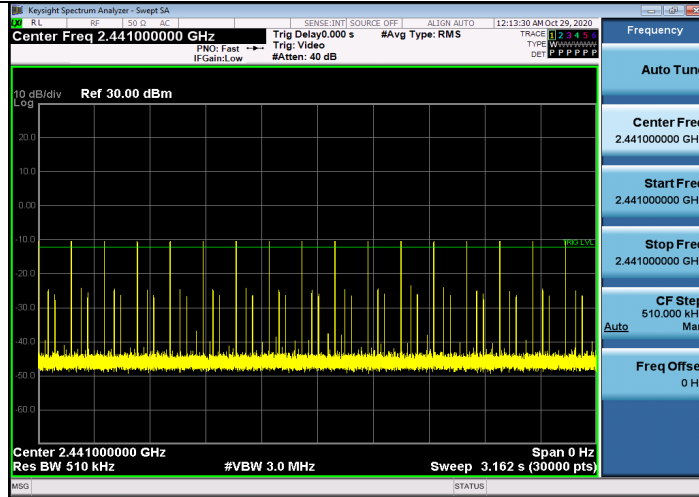


3D41_Ant1_Hop



3DH3_Ant1_Hop





3DH5_Ant1_Hop

