TEST REPORT

REPORT NUMBER: I23W00008-BT RF

ON

Type of Equipment:	Multimedia Control System
Type of Designation:	IN9.0-OS
Brand Name:	HAVAL NOBO
Manufacturer:	NOBO AUTOMOTIVE TECHNOLOGIES CO., LTD.
FCC ID:	2A7V5-IN90-OS-1

ACCORDING TO

FCC Part15

Chongqing Academy of Information and Communications Technology

Month date, year
Mar 23, 2023
Signature

Xiang Luoyong
Director

Note:
The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of Chongqing Academy of Information and Communications Technology.

Revision Version

Report Number	Revision	Date	Memo
I23W00008-BT RF	00	2023-03-23	Initial creation of test report

CONTENTS

1. Test Laboratory

1.1. Testing Location

Name:	Chongqing Academy of Information and Communications Technology
FCC/IC Registration Number:	CN1239
Address:	Building C, Technology Innovation Center, No.8, Yuma Road, Chayuan New Area, Nan'an District, Chongqing, People's Republic of China
Postal Code:	401336
Telephone:	0086-23-88069965
Fax:	0086-23-88608777

1.2. Testing Environment

Normal Temperature:	15-35℃
Relative Humidity:	25-75%

1.3. Project data

Testing Start Date:	2023-01-05
Testing End Date:	2023-03-01

1.4. Signature

	2023-03-23
Dong Junxin **(Prepared this test report)**	**Date**
	2023-03-23
Li Xu **(Reviewed this test report)**	**Date**
	2023-03-23
Xiang Luoyong **Director of the laboratory** **(Approved this test report)**	**Date**

2. Client Information

2.1. Applicant Information

Company Name:	NOBO AUTOMOTIVE TECHNOLOGIES CO., LTD.
Address /Post:	No. 668, Caihong Road, Zhangjiagang Economic and Technological Development Zone, Suzhou , Jiangsu, P.R. China
City:	Jiangsu
Country:	China
Telephone:	0512-80616208
Fax:	N/A
Email:	douwenjuan@noboauto.com
Contact Person:	Wenjuan Dou

2.2. Manufacturer Information

Company Name:	NOBO AUTOMOTIVE TECHNOLOGIES CO., LTD.
Address /Post:	No. 668, Caihong Road, Zhangjiagang Economic and Technological Development Zone, Suzhou , Jiangsu, P.R. China
City:	Jiangsu
Country:	China
Telephone:	0512-80616208
Fax:	N/A
Email:	douwenjuan@noboauto.com
Contact Person:	Wenjuan Dou

3. Equipment under Test (EUT) and Ancillary Equipment (AE)

3.1. About EUT

EUT Description	Multimedia Control System
Model name	IN9.0-OS
Brand name	
GSM Frequency Band	--
WCDMA Frequency Band	--
LTE Frequency Band	--
BLUETOOTH Frequency Band	2402MHz-2480MHz
WLAN Frequency Band	Wi-Fi 2.4G:802.11b/g/n, Wi-Fi 5G U-NII-1/Wi-Fi 5G U-NII-3:802.11a/n/ac
Type of BT modulation	GFSK; π/4 DQPSK; 8DPSK
Extreme Temperature	-40-85℃
Nominal Voltage	12V
Extreme High Voltage	18V
Extreme Low Voltage	7V

Note: Photographs of EUT are shown in ANNEX A of this test report.
Note: High and low voltage values in extreme condition test are given by manufacturer.

3.2. Internal Identification of EUT used during the test

EUT ID*	SN or IMEI	HW Version	SW Version	Date of receipt
S1	NA	AA	AA	2023-03-14
S2	NA	AA	AA	2023-03-14

*EUT ID: is used to identify the test sample in the lab internally.

Technology	Band	UL Freq.(MHz)	DL Freq.(MHz)	Note
BLUETOOTH	CH0-78	2402-2480		--

3.3. Outline of Equipment under Test

3.4. Internal Identification of AE used during the test

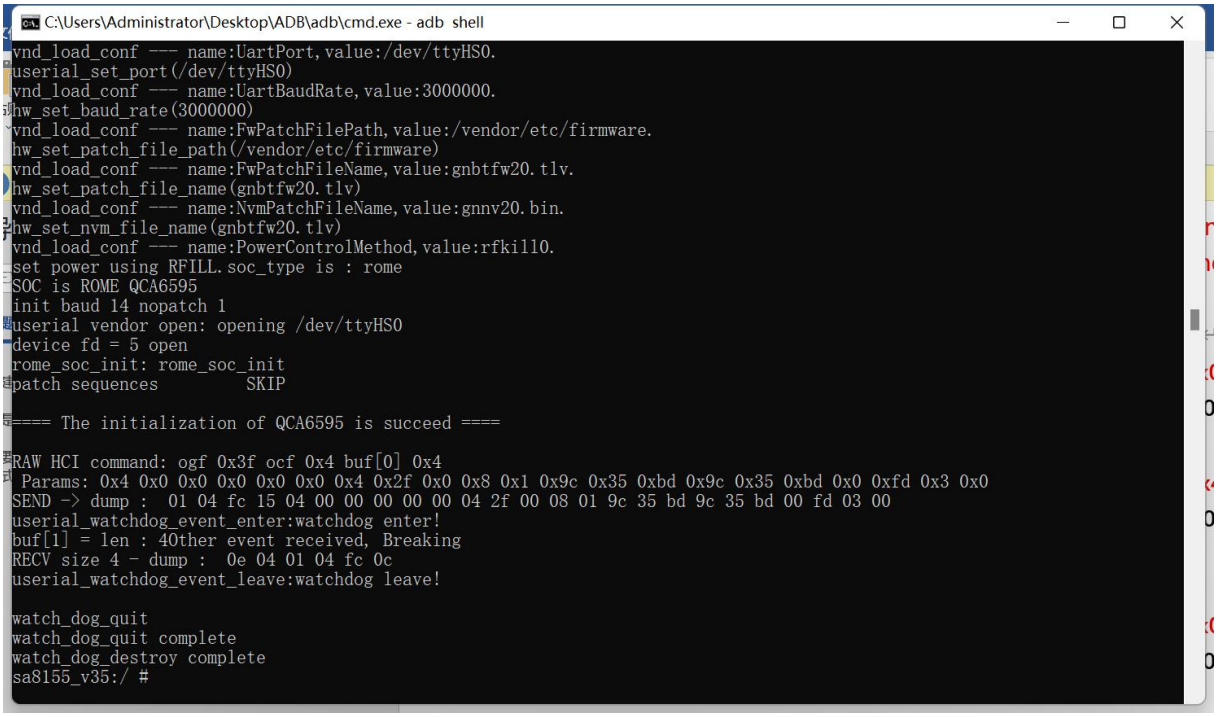
AE ID*	Description	dB*
AE1	RF cable	0.5dB

*AE ID: is used to identify the test sample in the lab internally.

dB*：is provided customer.

3.5. EUT Test RF Confagle Configuration

EUT uses adb tool to control emission measurement, Change power level, channel, rate and HT .



4. Reference Documents

4.1. Documents supplied by applicant

PICS/PIXIT, referring to Annex B for detailed information, is supplied by the client or manufacturer, which is the basis of testing.

4.2. Reference Documents for testing

The following documents listed in this section are referred for testing.

Reference	Title	Version
FCC Part15	FCC CFR 47, Part 15, Subpart C: 15.205 Restricted bands of operation; 15.209 Radiated emission limits, general requirements; 15.247 Operation within the bands 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz	2020
ANSI C63.10	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices	2013
KDB 558074	Guidance for Performing Compliance Measurements on Frequency Hopping Spread Spectrum systems (DSS) Operating Under §15.247	2019

5. Test Equipments Utilized

5.1. RF Test System

No.	Equipment	Model	SN	HW Version	SW Version	Manufacture	Cal.Due Date
1	Spectrum analyzer	FSQ 26	201137/026	--	--	R&S	2023-06-29
2	Spectrum analyzer	FSW26	104280	--	--	R&S	2023-06-29
3	DC Power Supply	3303D	801128	--	--	Topward	2023-06-29
4	Universal Radio Communication Tester	CMW500	152395	--	--	R&S	2023-06-29

5.2. RSE Test System

No.	Equipment	Model	SN	HW Version	SW Version	Manufacture	Cal.Due Date
1	EMI Test Receiver	ESU40	100307	--	--	R&S	2023-06-29
2	TRILOG Broadband Antenna	VULB9163	9163-586	--	--	Schwarzbeck	2024-10-28
3	Horn antenna	9120D	1083	--	--	Schwarzbeck	2024-12-14
4	Amplifier1	SCU-08F1	8320027	--	--	R&S	2023-06-29
5	Amplifier2	SCU-18F	180093	--	--	R&S	2023-06-29

5.3. Climate Chamber

No.	Name	Type	SN	Manufacture	Cal.Due Date
1	Climate chamber	SH-241	92010759	ESPEC	2023-06-29

5.4. Anechoic chamber Vibration table

No.	Name	Type	SN	Manufacture	Cal.Due Date
1	Fully-Anechoic Chamber	FAC5	--	TDK	2024-09-22

5.5. Test software

No.	Name	version	SN	Manufacture
1	EMI Test Software	EMC32 V9.26.01	--	R&S

6. Test Results

6.1 Summary of Test Results

A brief summary of the tests carried out is shown as following.

FCC Rules	Name of Test	Result
15.247(b)	Maximum Peak Output Power	Pass
15.247(a)	20dB Occupied Bandwidth	Pass
15.247(a)	99% Occupied Bandwidth	Pass
15.247 (d)	Band Edges Compliance	Pass
15.247(a)	Time Of Occupancy (Dwell Time)	Pass
15.247(a)	Carrier Frequency Separation	Pass
15.247(a)	Number Of Hopping Channels	Pass
15.247(d)	Transmitter Spurious Emission-Conducted	Pass
15.247,15.209,15.205	Transmitter Spurious Emission-Radiated	Pass
15.207	AC Powerline Conducted Emission	N/A
Note: The IN9.0-OS, manufactured by NOBO AUTOMOTIVE TECHNOLOGIES CO., LTD. is a new product for testing.		

6.2 Peak Output Power-Conducted

Specifications:	FCC 47 Part 15.247(b)
DUT Serial Number:	S1
Test conditions:	Ambient Temperature:15℃-35℃ Relative Humidity:30%-60% Air pressure: 86-106kPa
Test Results:	Pass

Limit Level Construction:

Standard	Limit
FCC 47 Part 15.247(b)(3)	<30dBm

Measurement Uncertainty:

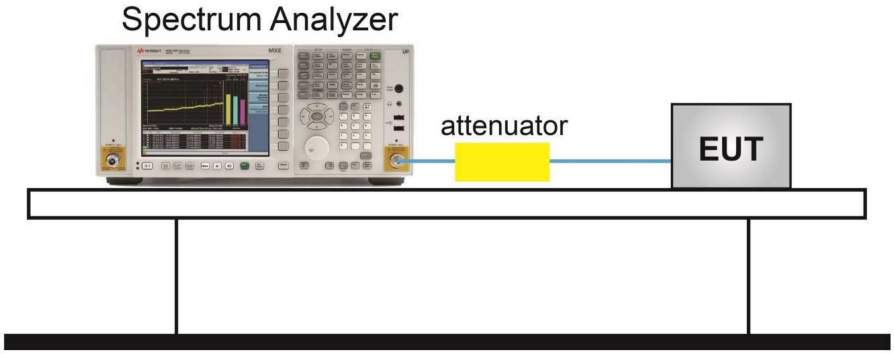
Measurement Uncertainty	±0.36dB

Test Procedure

The measurement is according to ANSI C63.10 clause 7.8.5.

1. The output power of EUT was connected to the spectrum analyzer by cable and divide. The path loss was compensated to the results for each measurement.
2. Enable EUT transmitter maximum power continuously.
3. Measure the conducted output power and record the results it

Test setup



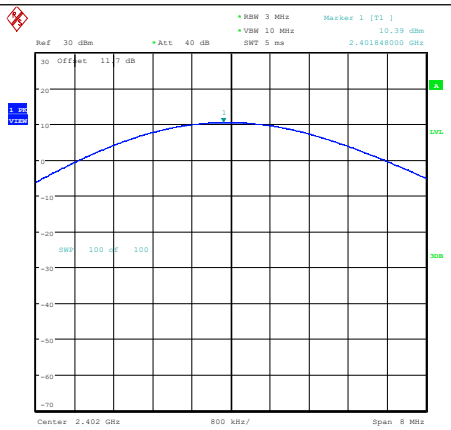
Antenna gain of EUT

No.	Item(s)	Data
1	Antenna gain of EUT	2.34 dBi
Note: The data is provided by the customer may affect the validity of the test results in this report, and the impact and consequences of this shall be undertaken by the customer.		

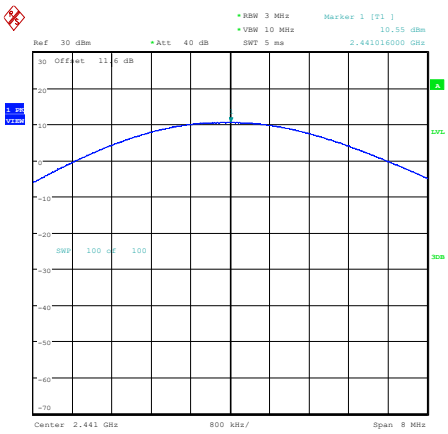
Measurement Results

Test Mode	Antenna	Frequency [MHz]	Conducted Peak Power[dBm]	Conducted Limit[dBm]	Verdict
DH5	Ant1	2402	10.39	≤30	PASS
DH5	Ant1	2441	10.55	≤30	PASS
DH5	Ant1	2480	10.93	≤30	PASS
2DH5	Ant1	2402	9.34	≤20.97	PASS
2DH5	Ant1	2441	9.32	≤20.97	PASS
2DH5	Ant1	2480	9.56	≤20.97	PASS
3DH5	Ant1	2402	9.7	≤20.97	PASS
3DH5	Ant1	2441	9.69	≤20.97	PASS
3DH5	Ant1	2480	9.89	≤20.97	PASS

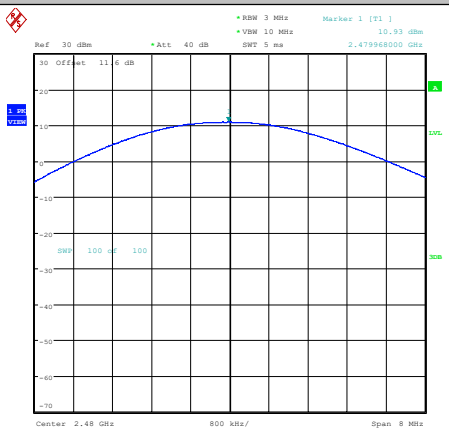
Test Graphs



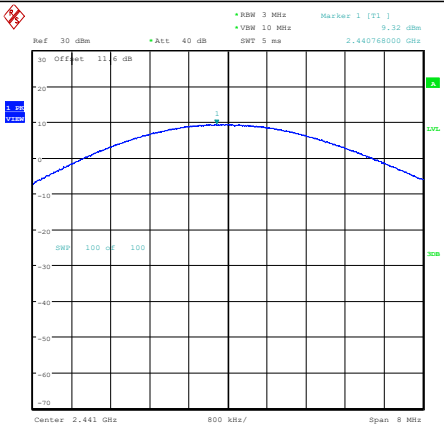
DH5-Ant1-2402



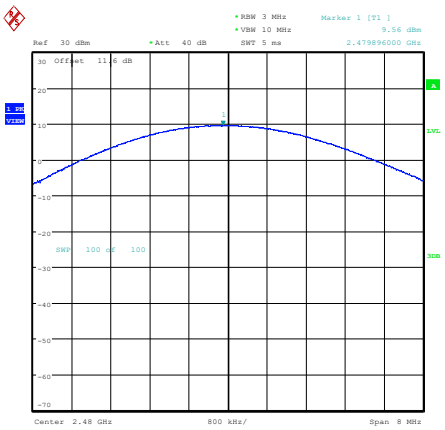
DH5-Ant1-2441



DH5-Ant1-2480



2DH5-Ant1-2441



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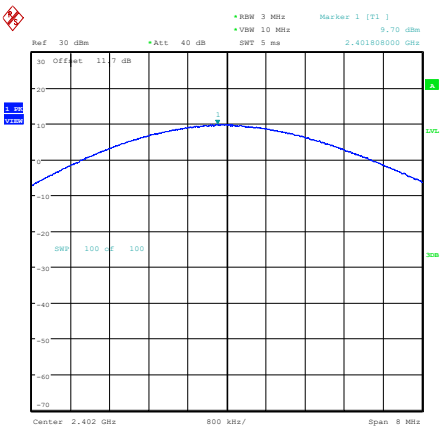
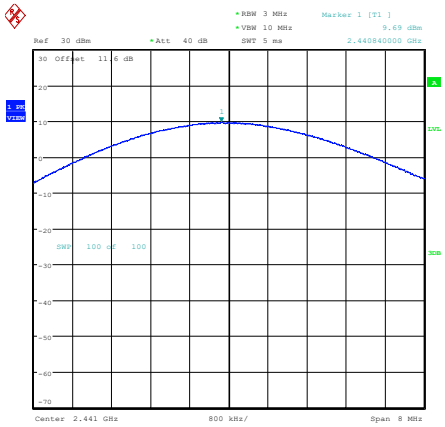


3DH5-Ant1-2402



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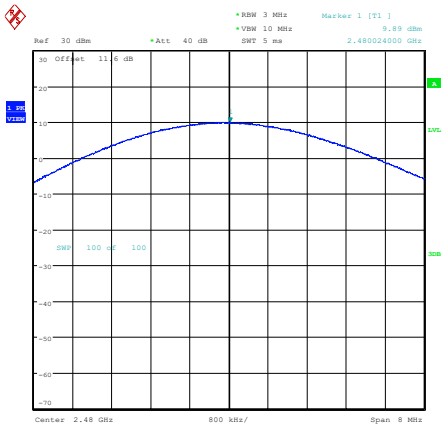


3DH5-Ant1-2480

6.3 Frequency Band Edges-Conducted

Specifications:	FCC 47 CFR Part 15.247(d)
DUT Serial Number:	S1
Test conditions:	Ambient Temperature:15℃-35℃ Relative Humidity:30%-60% Air pressure: 86-106kPa
Test Results:	Pass

Limit Level Construction:

Standard	Limit
FCC 47 CFR Part 15.247(d)	>20dBm

Measurement Uncertainty:

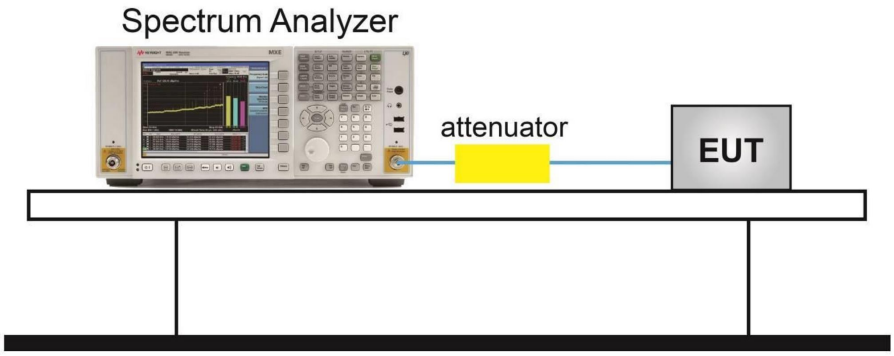
Measurement Uncertainty	±0.80dBm/KHz

Test procedures

The measurement is according to ANSI C63.10 clause 7.8.6.

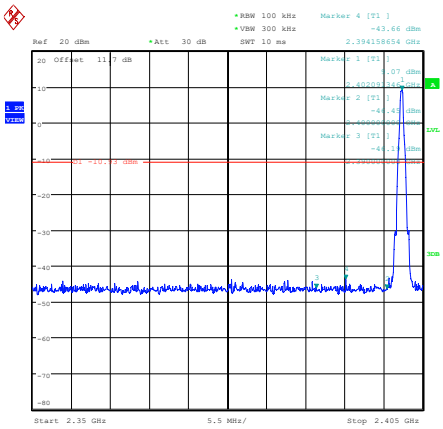
1. Connect the EUT to spectrum analyzer.
2. Set RBW=1MHz, VBW=3MHz, span more than 1.5 times channel bandwidth (2MHz).
3. Detector =peak, sweep time=auto couple, trace mode=max hold.Allow sweep to continue until the trace stabilizes.

Test setup

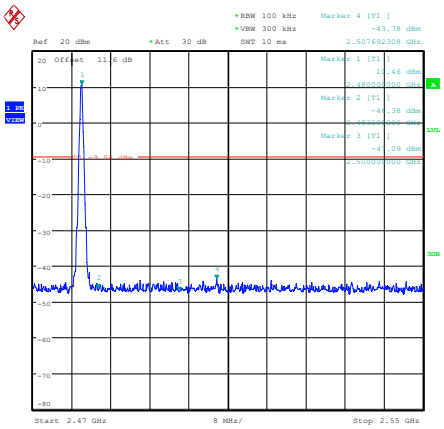


Measurement Result

TestMode	Antenna	ChName	Frequency [MHz]	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
DH5	Ant1	Low	2402	9.07	-43.66	≤-10.93	PASS
DH5	Ant1	High	2480	10.46	-43.78	≤-9.54	PASS
2DH5	Ant1	Low	2402	7.24	-43.61	≤-12.76	PASS
2DH5	Ant1	High	2480	7.24	-44.18	≤-12.76	PASS
3DH5	Ant1	Low	2402	7.14	-44.04	≤-12.86	PASS
3DH5	Ant1	High	2480	7.13	-43.76	≤-12.87	PASS
DH5	Ant1	Low	Hop_2402	9.37	-43.15	≤-10.63	PASS
DH5	Ant1	High	Hop_2480	10.04	-43.66	≤-9.96	PASS
2DH5	Ant1	Low	Hop_2402	3.83	-44.15	≤-16.17	PASS
2DH5	Ant1	High	Hop_2480	4.41	-43.69	≤-15.59	PASS
3DH5	Ant1	Low	Hop_2402	5.76	-43.82	≤-14.24	PASS
3DH5	Ant1	High	Hop_2480	6.69	-43.75	≤-13.31	PASS



DH5-Ant1-Low-2402-9.07



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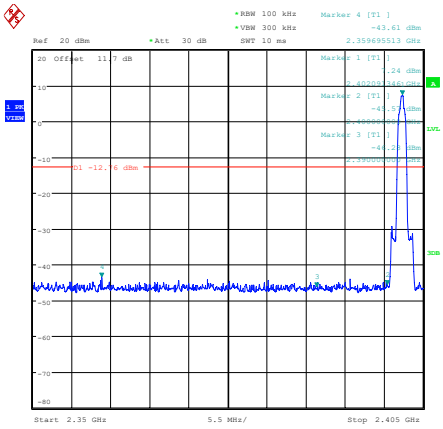

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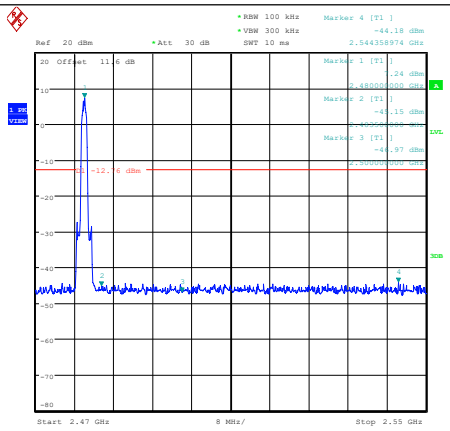

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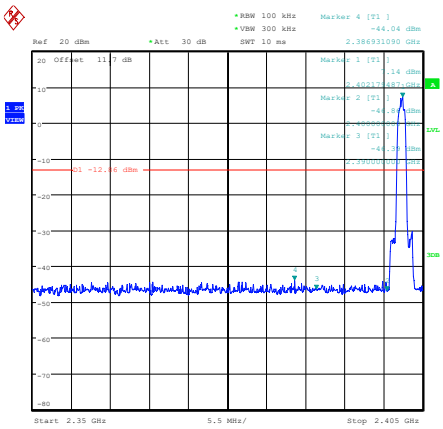

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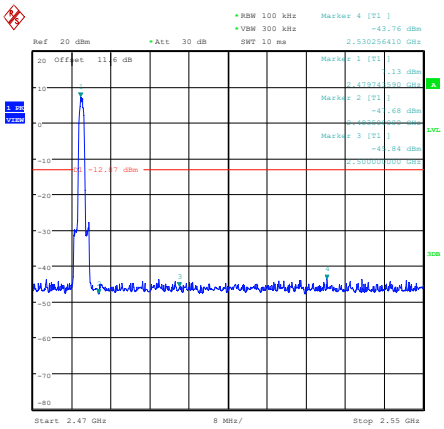

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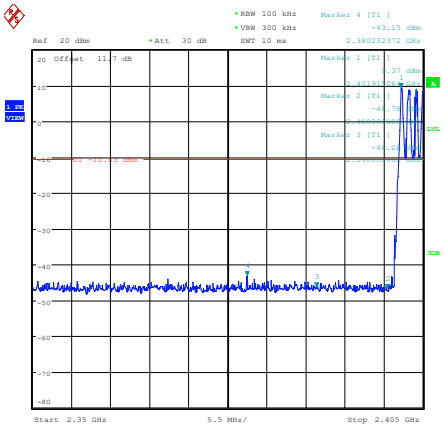

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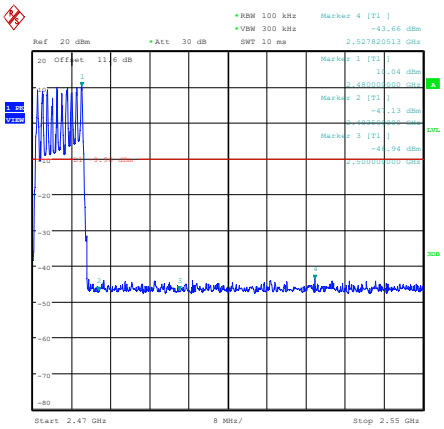

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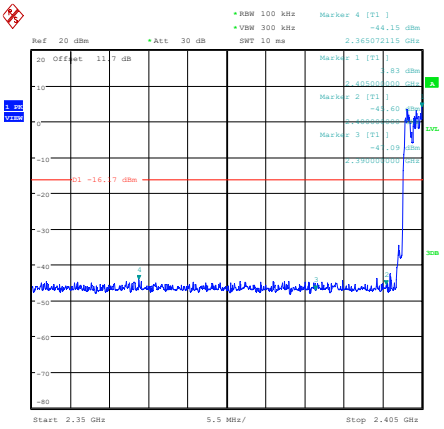

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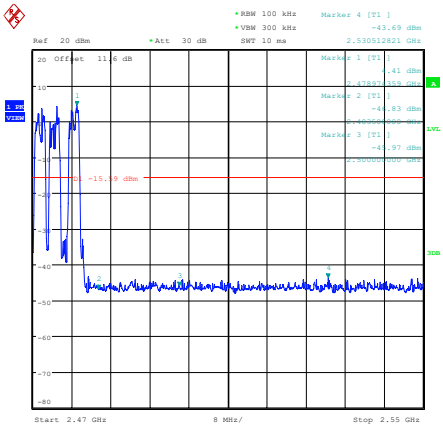

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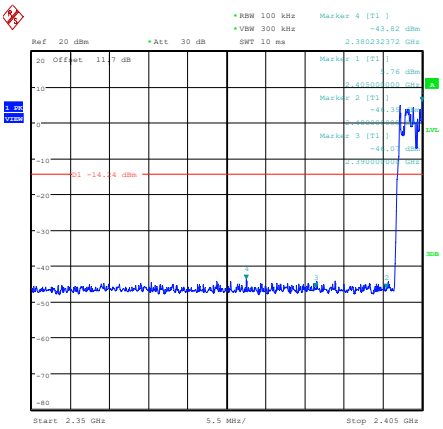

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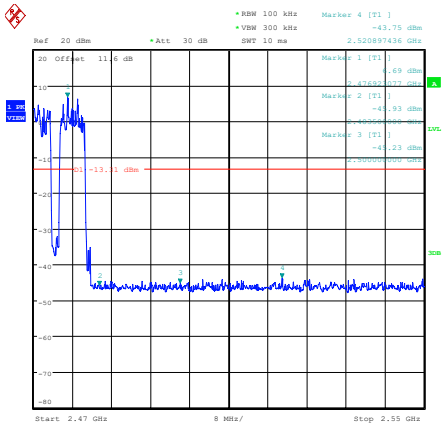


3DH5-Ant1-High-Hop_2480-6.69

6.4 Conducted Emission

Specifications:	FCC 47 CFR Part 15.247(d)
DUT Serial Number:	S1
Test conditions:	Ambient Temperature:15℃-35℃ Relative Humidity:30%-60% Air pressure: 86-106kPa
Test Results:	Pass

Limit Level Construction:

Standard	Limit
FCC 47 CFR Part 15.247(d)	20dB below peak output power in 100KHz

Measurement Uncertainty:

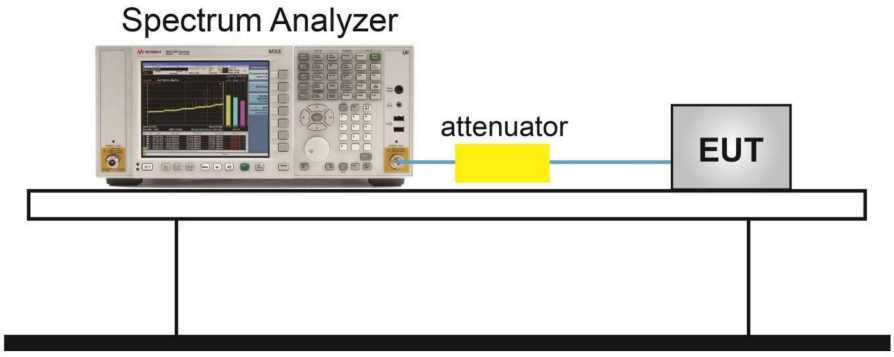
Measurement Uncertainty	±0.80dBm/100KHz

Test procedures

The measurement is according to ANSI C63.10 clause 7.8.8.

1. Connect the EUT to spectrum analyzer.
2. Set RBW=100kHz, VBW=300kHz.
3. Detector =peak, sweep time=auto couple, trace mode=max hold

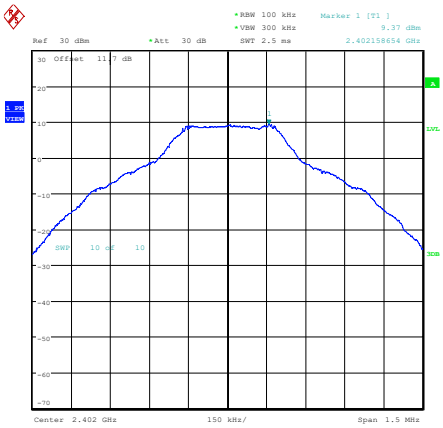
Test Setup



Measurement Results

TestMode	Antenna	Frequency[MHz]	FreqRange [MHz]	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
DH5	Ant1	2402	0~Reference	9.37	9.37	---	PASS
DH5	Ant1	2402	30~1000	9.37	-54.96	≤-10.63	PASS
DH5	Ant1	2402	1000~26500	9.37	-52.05	≤-10.63	PASS
DH5	Ant1	2441	0~Reference	9.42	9.42	---	PASS
DH5	Ant1	2441	30~1000	9.42	-53.59	≤-10.58	PASS
DH5	Ant1	2441	1000~26500	9.42	-52.24	≤-10.58	PASS
DH5	Ant1	2480	0~Reference	10.71	10.71	---	PASS
DH5	Ant1	2480	30~1000	10.71	-51.85	≤-9.29	PASS
DH5	Ant1	2480	1000~26500	10.71	-52.66	≤-9.29	PASS
2DH5	Ant1	2402	0~Reference	7.34	7.34	---	PASS
2DH5	Ant1	2402	30~1000	7.34	-54.82	≤-12.66	PASS
2DH5	Ant1	2402	1000~26500	7.34	-51.95	≤-12.66	PASS
2DH5	Ant1	2441	0~Reference	7.36	7.36	---	PASS
2DH5	Ant1	2441	30~1000	7.36	-55	≤-12.64	PASS
2DH5	Ant1	2441	1000~26500	7.36	-48.84	≤-12.64	PASS
2DH5	Ant1	2480	0~Reference	7.70	7.70	---	PASS
2DH5	Ant1	2480	30~1000	7.70	-55.43	≤-12.3	PASS
2DH5	Ant1	2480	1000~26500	7.70	-52.41	≤-12.3	PASS
3DH5	Ant1	2402	0~Reference	7.23	7.23	---	PASS
3DH5	Ant1	2402	30~1000	7.23	-55.02	≤-12.77	PASS
3DH5	Ant1	2402	1000~26500	7.23	-52.52	≤-12.77	PASS
3DH5	Ant1	2441	0~Reference	7.24	7.24	---	PASS
3DH5	Ant1	2441	30~1000	7.24	-55.58	≤-12.76	PASS
3DH5	Ant1	2441	1000~26500	7.24	-51.78	≤-12.76	PASS
3DH5	Ant1	2480	0~Reference	7.66	7.66	---	PASS
3DH5	Ant1	2480	30~1000	7.66	-54.99	≤-12.34	PASS
3DH5	Ant1	2480	1000~26500	7.66	-51.91	≤-12.34	PASS

Test Graphs



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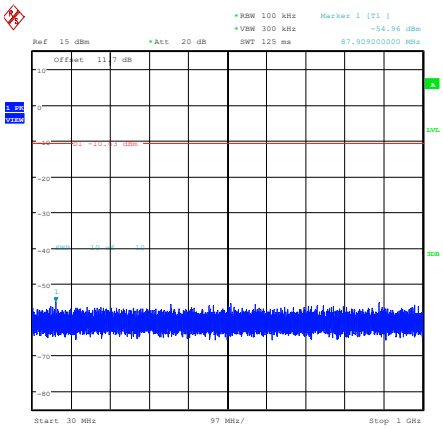
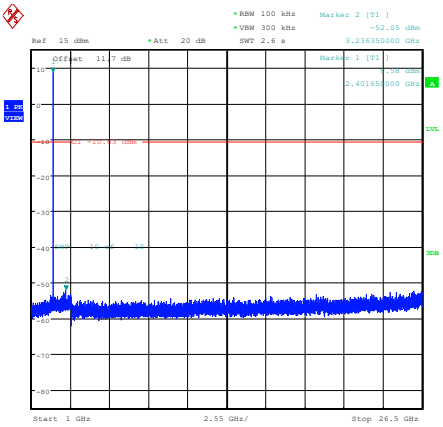
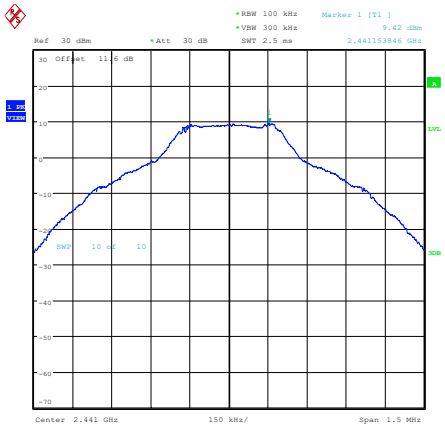


DH5-Ant1-2402-30~1000-9.37



DH5-Ant1-2402-1000~26500-9.37



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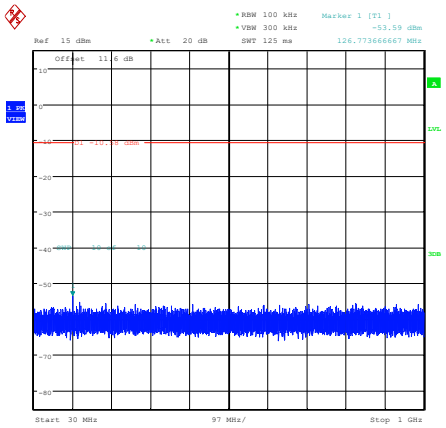

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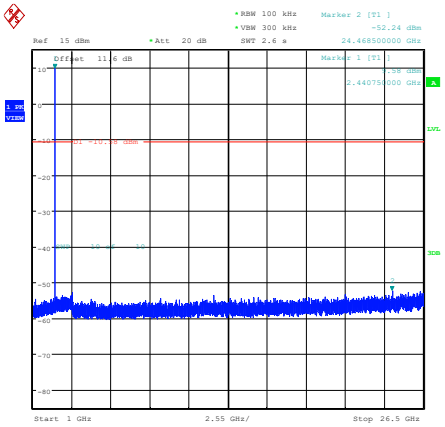

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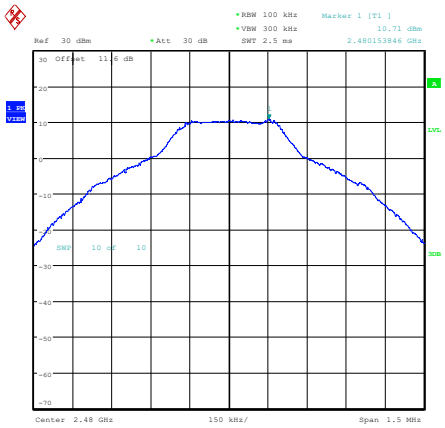

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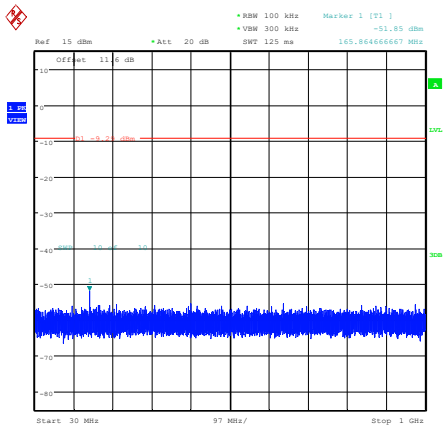

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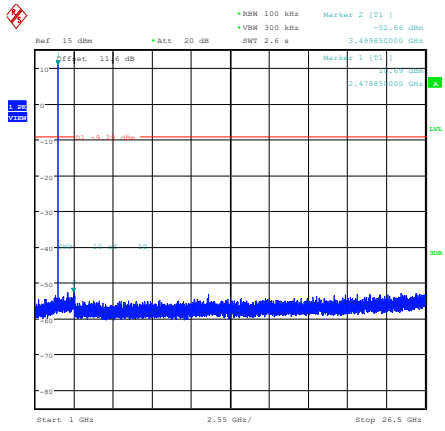
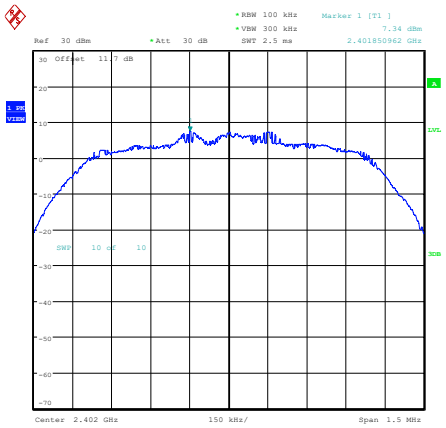
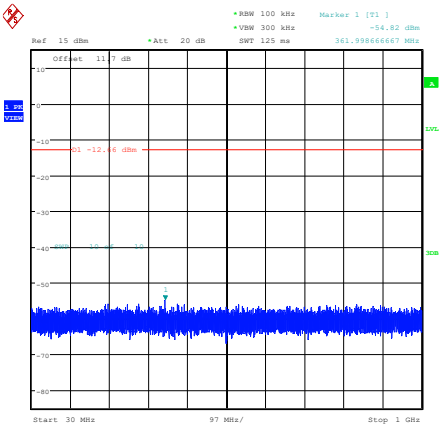


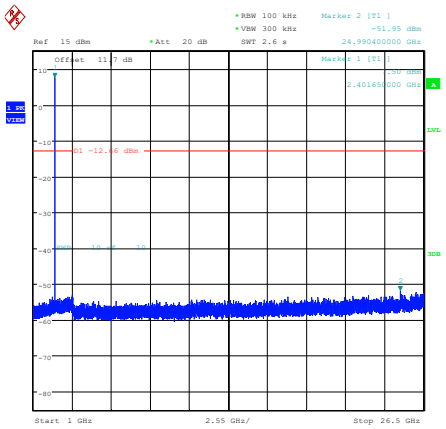
DH5-Ant1-2480-1000~26500-10.71



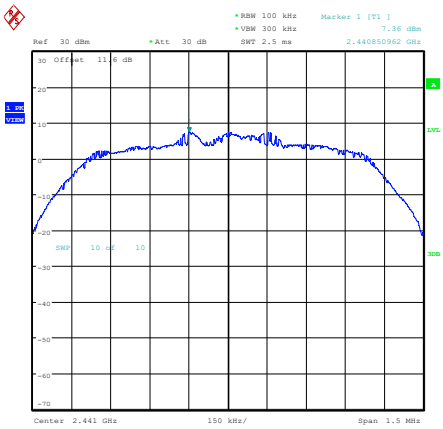
2DH5-Ant1-2402-0~Reference-7.34



2DH5-Ant1-2402-30~1000-7.34



2DH5-Ant1-2402-1000~26500-7.34



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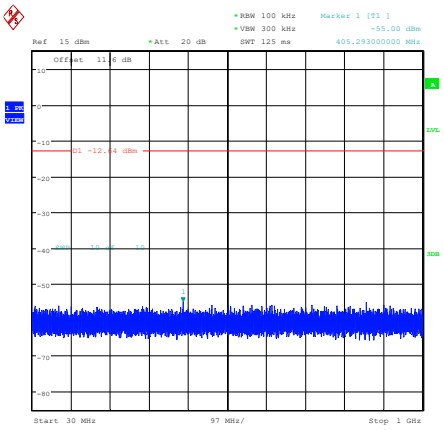
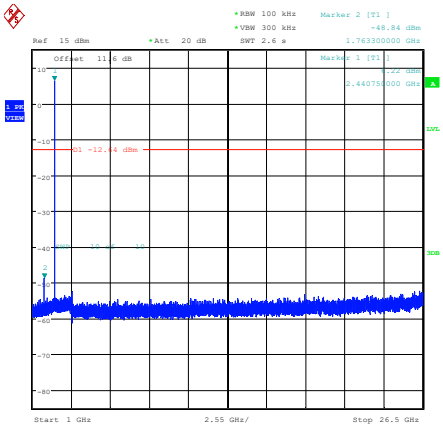
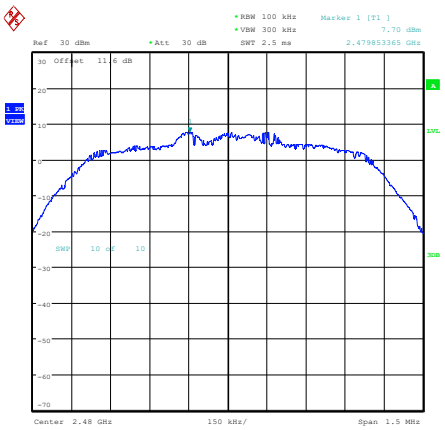


2DH5-Ant1-2441-30~1000-7.36



2DH5-Ant1-2441-1000~26500-7.36



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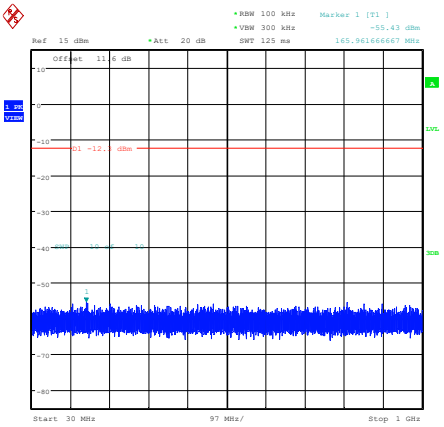

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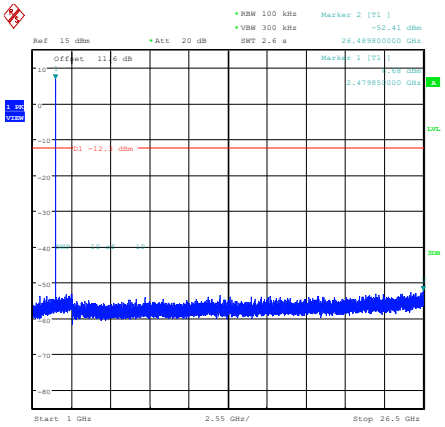

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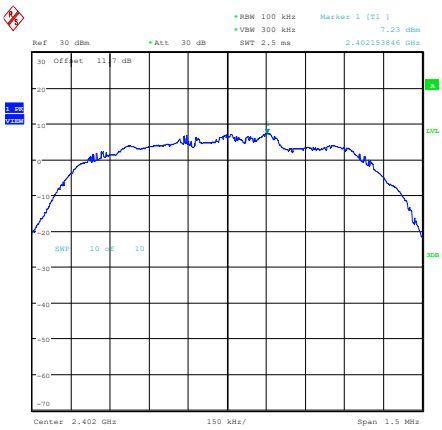

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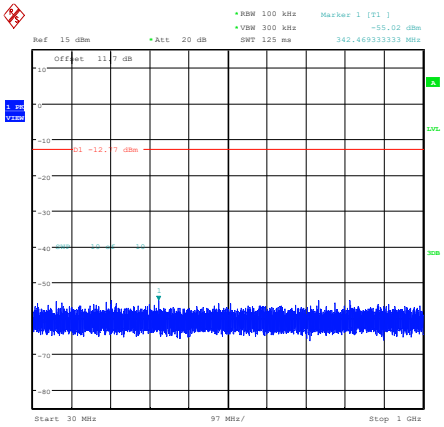

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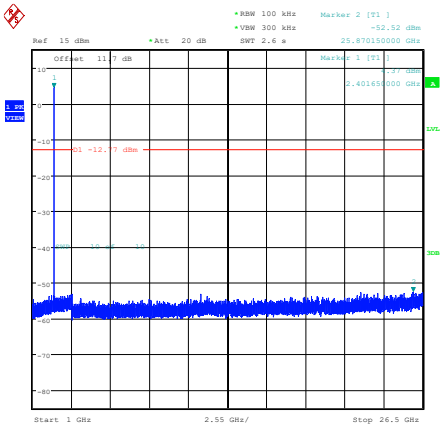

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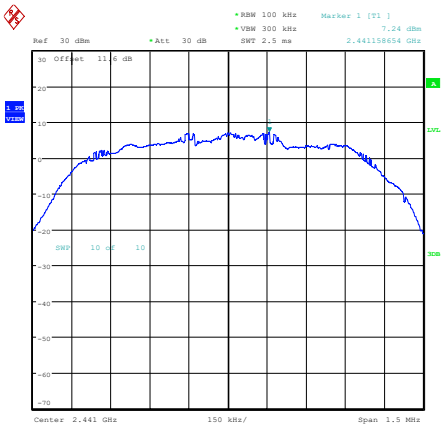

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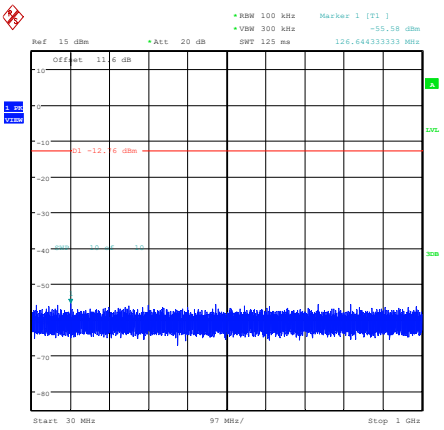
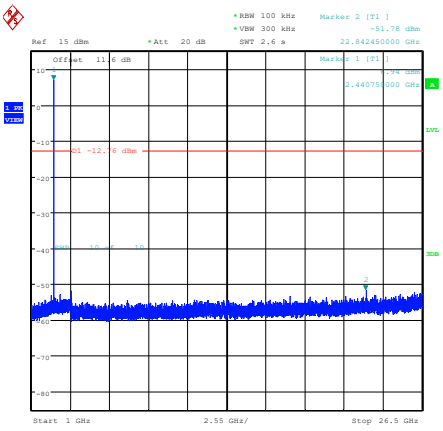


3DH5-Ant1-2441-30~1000-7.24



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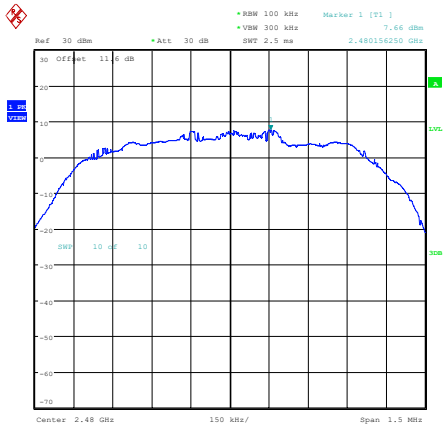
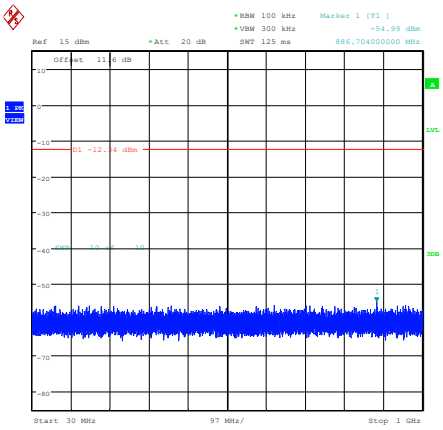
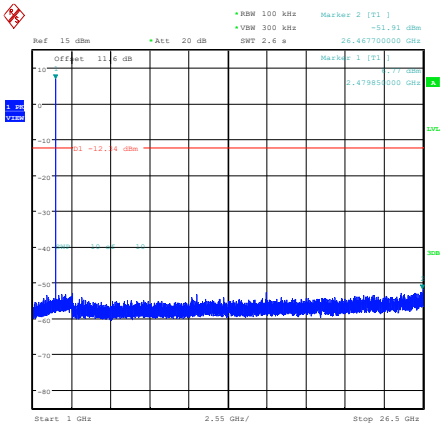


3DH5-Ant1-2480-0~Reference-7.66



3DH5-Ant1-2480-30~1000-7.66



3DH5-Ant1-2480-1000~26500-7.66

6.5 Radiated Emission

Specifications:	FCC 47 CFR Part 15.247, 15.205, 15.209
DUT Serial Number:	S2
Test conditions:	Ambient Temperature:15℃-35℃ Relative Humidity:30%-60% Air pressure: 86-106kPa
Test Results:	Pass

Limit Level Construction:

Standard	Limit
FCC 47 CFR Part 15.247, 15.205, 15.209	20dB below peak output power

Measurement Uncertainty:

Measurement Uncertainty	30MHz-1000MHz: 4.09 dB(MAX) (k=2). 1000MHz-6000MHz : 4.84 dB (k=2). 6000MHz-18000MHz : 4.52 dB (k=2).

In addition, radiated emissions which fall in the restricted bands, as defined in 15.205(a), must also comply with the radiated emission limits specified in 15.209(a) (see 15.205(c)).

Limit in restricted band

Frequency of emission (MHz)	Field strength (mV/m)	Field strength (dBuV/m)
0.009~0.49	2400/F (kHz)	129-94
0.49~1.705	24000/F (kHz)	74-63
1.705~30	30	70
30~88	100	40
88~216	150	43.5
216~960	200	46
Above 960	500	54

Test Method

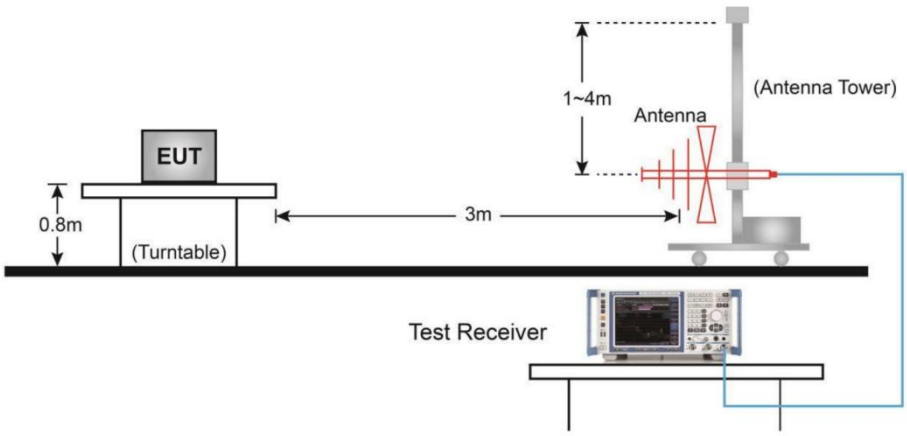
Portable, small, lightweight, or modular devices that may be handheld, worn on the body, or placed on a table during operation shall be positioned on a non-conducting platform, the top of which is 80 cm above the reference ground plane. The preferred area occupied by the EUT arrangement is 1 m by 1.5 m, For emissions testing at or below 1 GHz, the table height shall be 80 cm above the reference ground plane. For emission measurements above 1 GHz, the table height shall be 1.5 m. but it may be larger or smaller to accommodate various sized EUTs. For testing purposes, ceiling- and wall-mounted devices also shall be positioned on a tabletop (see also ANSI C63.10-2013 section 6.3.4 and 6.3.5). In making any tests involving handheld, body-worn, or ceiling-mounted equipment, it is essential to recognize that the measured levels may be dependent on the orientation (attitude) of the three orthogonal axes of the EUT. Thus, exploratory tests as specified in 8.3.1 shall be carried out for various axes orientations to determine the attitude having maximum or near-maximum emission level.

The EUT was placed on a non-conductive table. The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and the EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. This maximization process was repeated with the EUT positioned in each of its three orthogonal orientations.

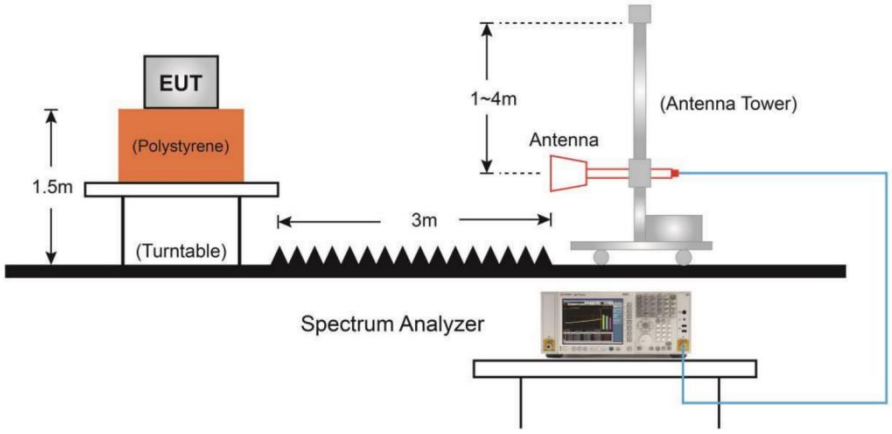
Frequency of emission	RBW/VBW	Sweep Time (s)
0.009~30	9KHz/30KHz	Auto
30~1000	100KHz/300KHz	5
1000~4000	1MHz/3MHz	15
4000~18000	1MHz/3MHz	40
18000~26500	1MHz/3MHz	20

Test Setup

Below 1GHz Test Setup



Above 1GHz Test Setup


EUT
(Polystyrene)
1.5m
(Turntable)
3m
1~4m
Antenna
(Antenna Tower)
Spectrum Analyzer

Measurement Results

A “reference path loss” is established and ARpi is the attenuation of “reference path loss”, and including the gain of receive antenna, the gain of the preamplifier, the cable loss.

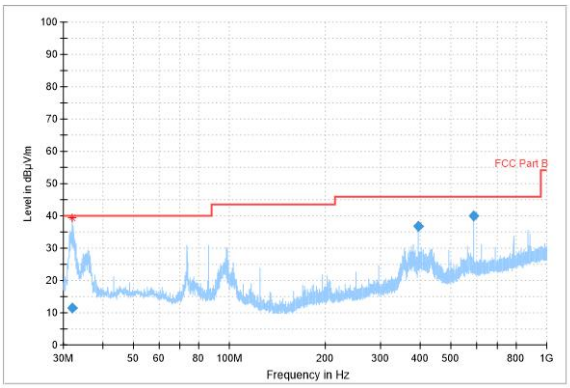
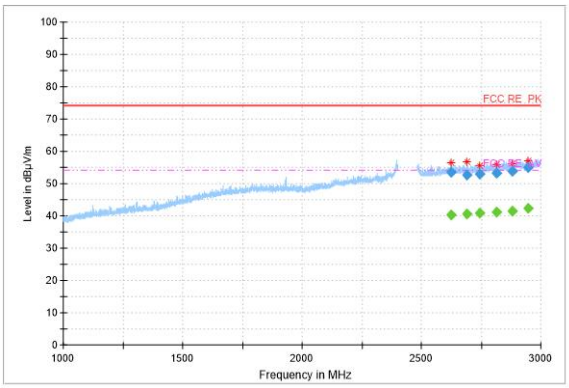
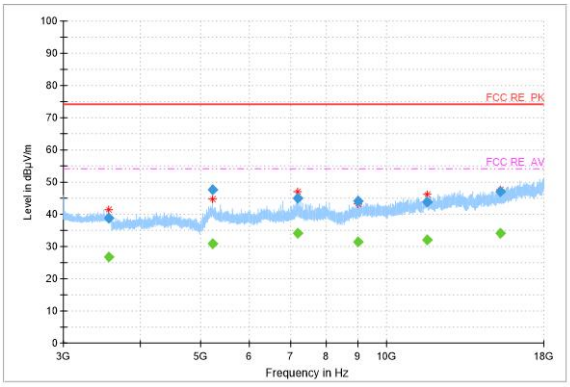
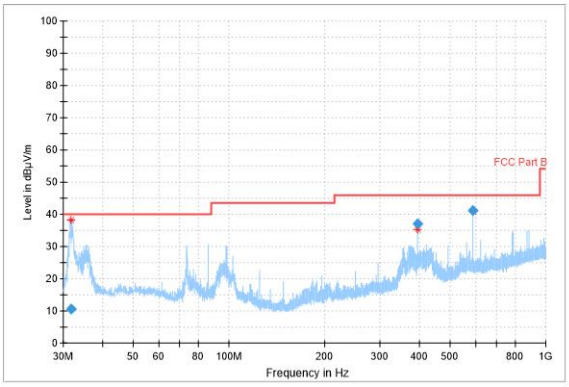
The measurement results are obtained as described below:

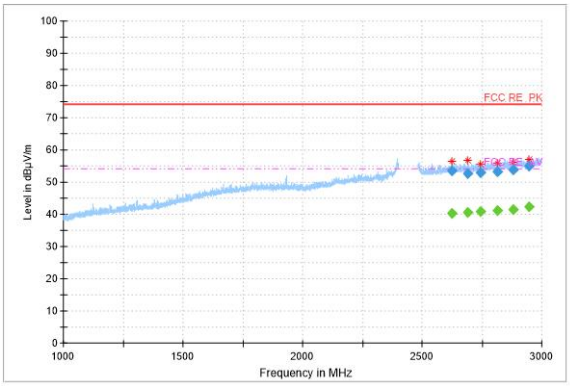
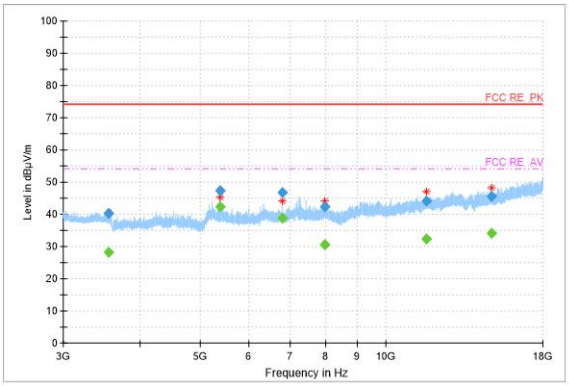
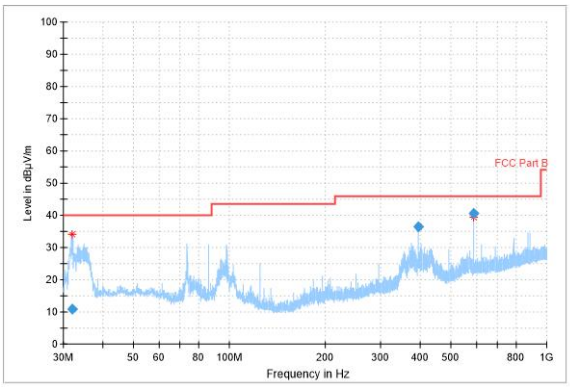
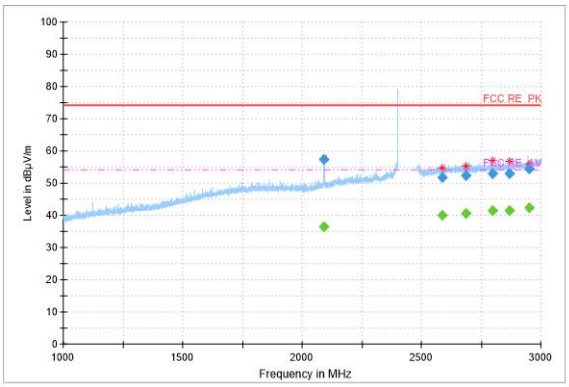
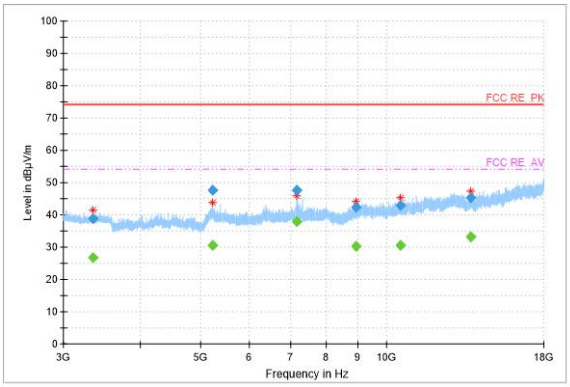
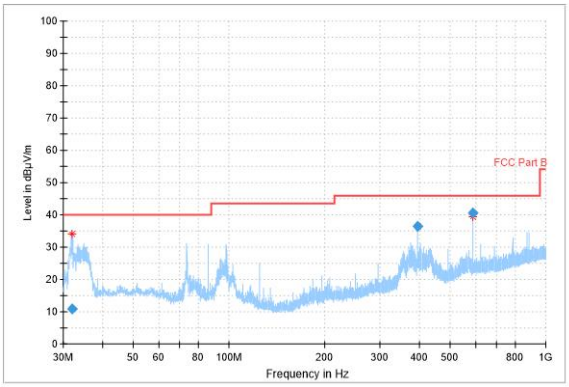
ARpi = Cable loss + Antenna Factor-Preamplifier gain

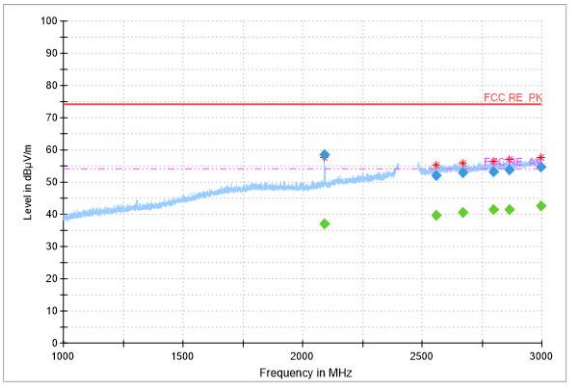
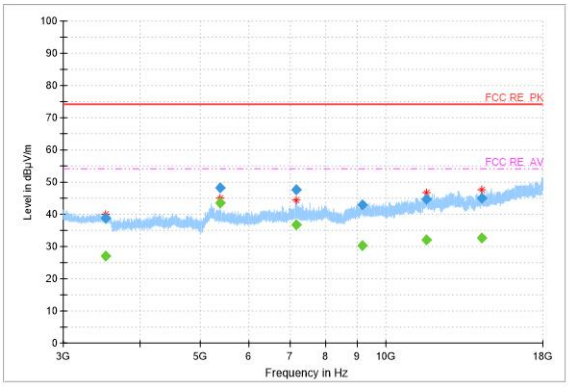
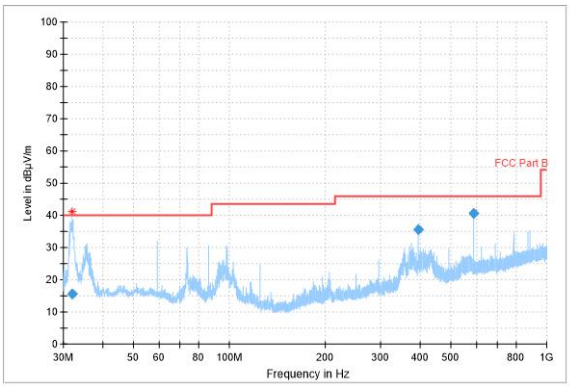
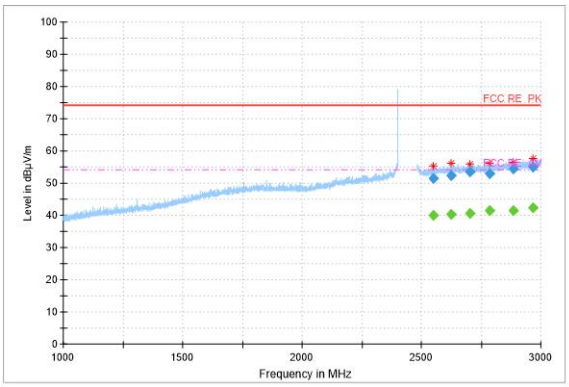
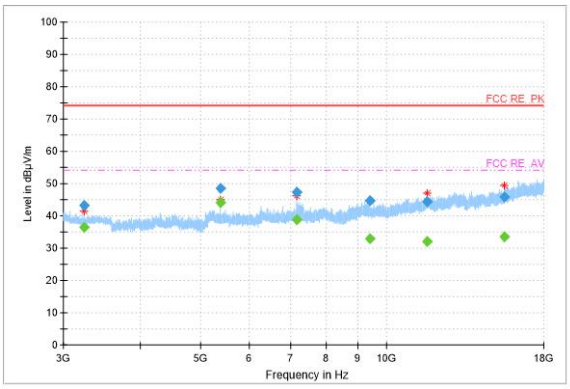
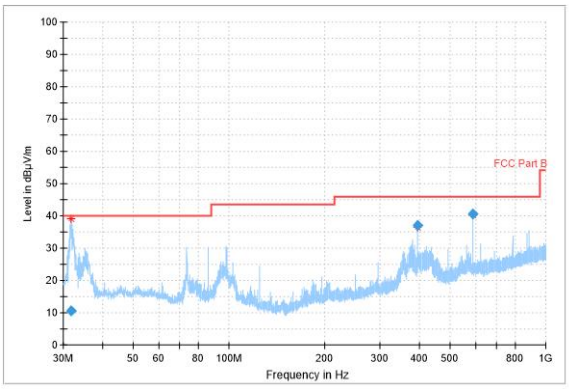
Result=PMea + ARpi

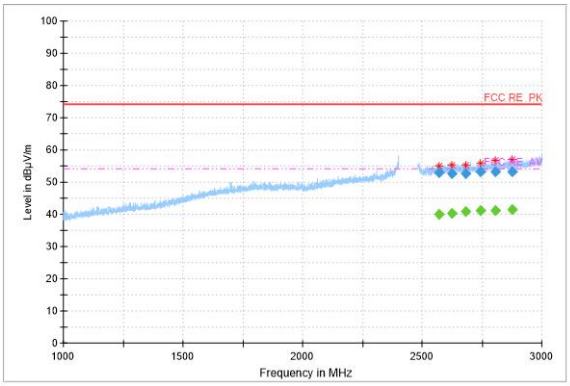
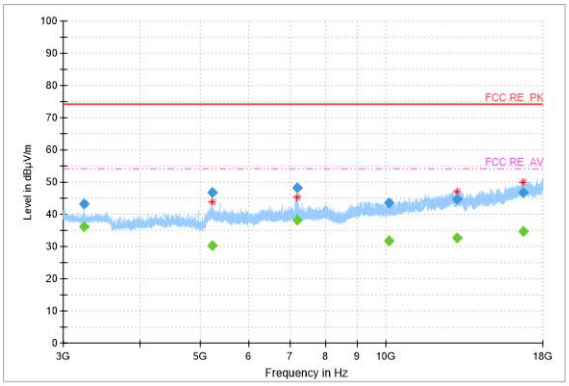
The test data below 30MHz is more than 20dB lower than the limit value, so it is not provided in the report.

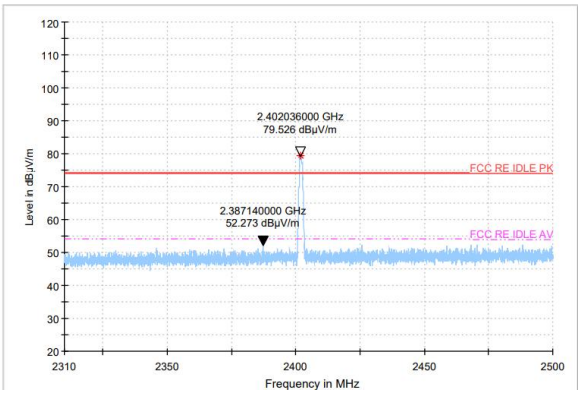
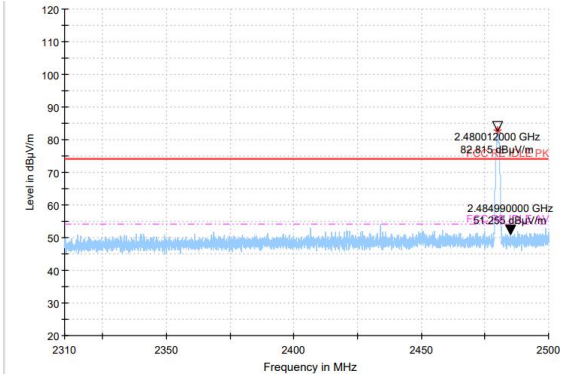
Main Supply

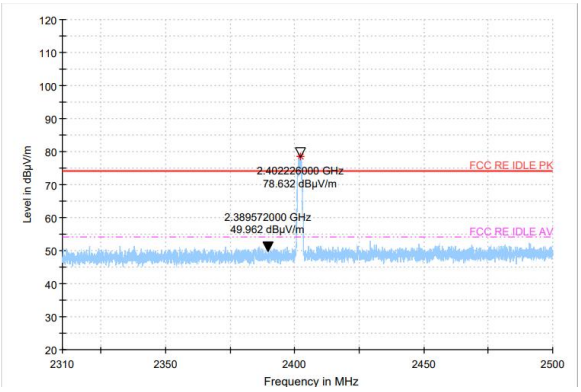
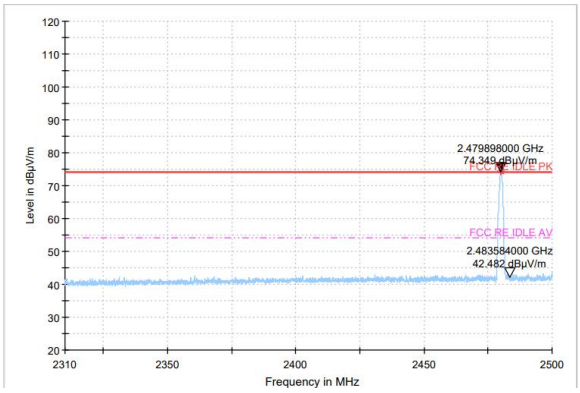
Radiated emission: GFSK, Ch0, 30MHz~1GHz	Radiated emission: GFSK, Ch0, 1GHz~3GHz
	
Radiated emission: GFSK, Ch0, 3GHz~18GHz	**Radiated emission: GFSK, Ch78, 30MHz~1GHz**
	

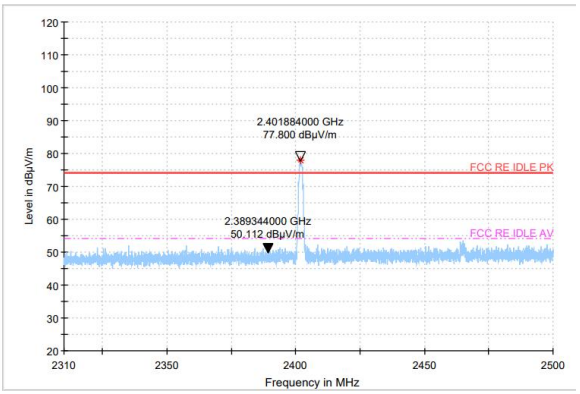
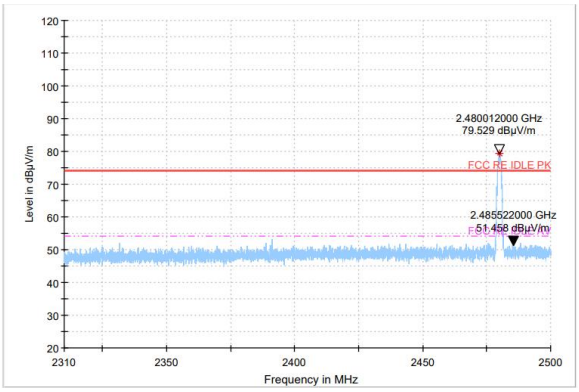
Radiated emission: GFSK, Ch78, 1GHz~3GHz	Radiated emission: GFSK, Ch78, 3GHz~18GHz
	
Radiated emission: π/4 DQPSK, Ch0, 30MHz~1GHz	Radiated emission: π/4 DQPSK, Ch0, 1GHz~3GHz
	
Radiated emission: π/4 DQPSK, Ch0, 3GHz~18GHz	Radiated emission: π/4 DQPSK, Ch78, 30MHz~1GHz
	

Radiated emission: π/4 DQPSK, Ch78, 1GHz~3GHz	Radiated emission: π/4 DQPSK, Ch78, 3GHz~18GHz
	
Radiated emission: 8DPSK, Ch0, 30MHz~1GHz	Radiated emission: 8DPSK, Ch0, 1GHz~3GHz
	
Radiated emission: 8DPSK, Ch0, 3GHz~18GHz	Radiated emission: 8DPSK, Ch78, 30MHz~1GHz
	

Radiated emission: 8DPSK, Ch78, 1GHz~3GHz	Radiated emission: 8DPSK, Ch78, 3GHz~18GHz
	

Bandedge (Low): GFSK, low channel	Bandedge (High): GFSK, high channel
	

Bandedge (Low): π/4 DQPSK, low channel	Bandedge (High): π/4 DQPSK, high channel
	

Bandedge (Low): 8DPSK, low channel	Bandedge (High): 8DPSK, high channel
	

Note1: The out-of- limit signal in the picture is the main frequency signal.

Note2: Sweep the whole frequency band through the range from 30MHz to the 5th harmonic of the carrier, the Emissions in the frequency band 18GHz-40GHz is more than 20dB below the limit are not report.

GFSK Ch0 30MHz-1GHz

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
32.1	11.42	-14.3	25.72	H
393.2	36.69	-8.2	44.89	V
589.8	39.98	-3.7	43.68	V

GFSK Ch0 1GHz-3GHz

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
2635.1	52.79	16	36.79	V
2685.5	53.08	16.1	36.98	V
2742.7	53.27	16.4	36.87	H
2796.8	53.44	16.8	36.64	V
2862.5	53.1	17.2	35.9	V
2950.7	53.89	17.8	36.09	V

GFSK Ch0 3GHz-18GHz

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
3549.2	38.95	-7	45.95	V
5230.0	47.79	-0.8	48.59	V
7190.0	44.92	-2.1	47.02	H
8997.9	44.01	-0.5	44.51	H
11645.3	43.95	2.6	41.35	H
15302.2	47.04	6.6	40.44	H

GFSK Ch78 30MHz-1GHz

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
31.7	10.7	-14.4	25.1	H
393.2	36.96	-8.2	45.16	V
589.8	41.11	-3.7	44.81	V

GFSK Ch78 1GHz-3GHz

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
2622.2	53.59	15.9	37.69	H

2690.7	52.67	16.1	36.57	H
2744.1	53.03	16.4	36.63	H
2812.5	53.09	16.9	36.19	V
2881.8	53.76	17.3	36.46	H
2946.6	55.11	17.7	37.41	V

GFSK Ch78 3GHz-18GHz

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
3548.0	40.25	-7	47.25	V
5400.0	47.39	-2.8	50.19	V
6812.8	46.67	-2.8	49.47	V
7972.9	42.37	-0.9	43.27	H
11635.4	44.23	2.6	41.63	V
14848.5	45.69	6	39.69	H

π/4 DQPSK -CH0-30M-1G

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
32.1	11.02	-14.3	25.32	H
393.2	36.55	-8.2	44.75	V
589.8	40.6	-3.7	44.3	V

π/4 DQPSK -CH0-1G-3G

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
2090.6	57.23	11.2	46.03	V
2587.6	51.84	15.6	36.24	H
2687.7	52.44	16.1	36.34	V
2798.0	53.05	16.8	36.25	V
2868.5	52.83	17.2	35.63	H
2948.6	54.41	17.8	36.61	V

π/4 DQPSK -CH0-3G-18G

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity

3350.0	38.96	-6.8	45.76	H
5229.5	47.52	-0.8	48.32	V
7151.9	47.6	-2.4	50	V
8923.4	42.45	-1	43.45	V
10529.7	42.91	1	41.91	H
13715.0	45.24	4	41.24	V

π/4 DQPSK -CH78-30M-1G

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
31.8	12.46	-14.4	26.86	H
393.2	36.93	-8.2	45.13	V
589.8	39.6	-3.7	43.3	V

π/4 DQPSK -CH78-1G-3G

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
2092.7	58.6	11.2	47.4	H
2559.2	52.2	15.5	36.7	H
2670.6	52.96	16.1	36.86	H
2796.4	53.33	16.8	36.53	V
2862.9	53.74	17.2	36.54	H
2996.4	54.64	18.5	36.14	V

π/4 DQPSK -CH78-1G-3G (Average)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
2092.7	36.96	11.2	25.76	H
2996.4	42.65	18.5	24.15	V

π/4 DQPSK -CH78-3G-18G

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
3509.7	38.86	-6.8	45.66	V
5400.0	48.28	-2.8	51.08	V
7152.1	47.58	-2.4	49.98	V

9152.8	42.91	-0.4	43.31	H
11631.7	44.71	2.6	42.11	V
14327.5	45.1	5.3	39.8	H

8DPSK -CH0-30M-1G

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
32.0	15.67	-14.3	29.97	H
393.2	35.61	-8.2	43.81	V
589.8	40.66	-3.7	44.36	V

8DPSK -CH0-1G-3G

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
2549.6	51.4	15.4	36	H
2624.9	52.45	15.9	36.55	H
2700.8	53.58	16.1	37.48	H
2784.7	53.01	16.7	36.31	H
2882.8	54.39	17.3	37.09	V
2965.4	54.92	18	36.92	H

8DPSK -CH0-1G-3G (Average)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
2882.8	41.47	17.3	24.17	V
2965.4	42.26	18	24.26	H

8DPSK -CH0-3G-18G

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
3239.2	43.14	-6.8	49.94	V
5400.0	48.57	-2.8	51.37	V
7151.7	47.37	-2.4	49.77	V
9418.6	44.81	-0.2	45.01	H
11664.0	44.27	2.5	41.77	H
15554.6	45.76	6.7	39.06	H

8DPSK -CH78-30M-1G

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
31.7	10.58	-14.4	24.98	H
393.2	36.92	-8.2	45.12	V
589.8	40.68	-3.7	44.38	V

8DPSK -CH78-1G-3G

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
2568.5	52.91	15.5	37.41	H
2623.8	52.68	15.9	36.78	V
2680.6	52.59	16.1	36.49	H
2742.5	53.33	16.4	36.93	V
2804.5	53.18	16.8	36.38	V
2875.2	53.34	17.3	36.04	H

8DPSK -CH78-3G-18G

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
3239.4	43.25	-6.8	50.05	V
5227.0	46.62	-0.8	47.42	V
7189.5	48.3	-2.1	50.4	V
10139.4	43.47	-0.1	43.57	H
13066.4	44.6	4.1	40.5	H
16706.6	46.91	9.2	37.71	V

6.6 Time Of Occupancy (Dwell Time)

Specifications:	FCC 47 Part 15.247 (a)
DUT Serial Number:	S1
Test conditions:	Ambient Temperature:15℃-35℃ Relative Humidity:30%-60% Air pressure: 86-106kPa
Test Results:	Pass

Limit Level Construction:

Standard	Limit
FCC 47 Part 15.247 (a) (1) (iii)	<400ms

Measurement Uncertainty:

Measurement Uncertainty	0.52ms

Test procedures

The measurement is according to ANSI C63.10 clause 7.8.4

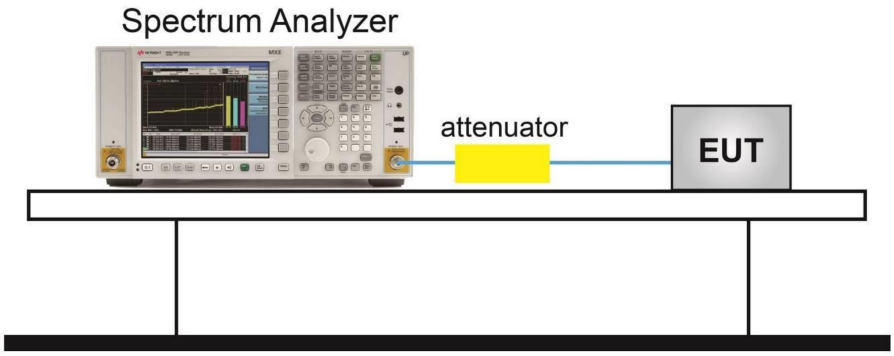
1. Connect the EUT through cable and divide with CMW 270 and spectrum analyzer.
2. Enable the EUT transmit maximum power.
3. Set the spectrum analyzer as step 4 to step 8.
4. Span: Zero span, centered on a hopping channel.
5. RBW shall be ≤ channel spacing and where possible RBW should be set >> 1 / T, where T is the expected dwell time per channel.
6. Sweep: As necessary to capture the entire dwell time per hopping channel; where possible use a video trigger and trigger delay so that the transmitted signal starts a little to the right of the start of the plot. The trigger level might need slight adjustment to prevent triggering when the system hops on an adjacent channel; a second plot might be needed with a longer sweep time to showtwo successive hops on a channel.
7. Detector function: Peak.
8. Trace: Max hold.
9. Use the marker-delta function, and record it.

Note： For AFH mode, Test Period = 0.4 (second/ channel) x 20 Channel = 8 sec,

For FHSS mode, Test Period = 0.4 (second/ channel) x 79 Channel = 31.6 sec,

So the Time of Occupancy (Dwell Time) of AFH mode= Time of Occupancy (Dwell Time) of FHSS mode / 79 Channel x 20 Channel.

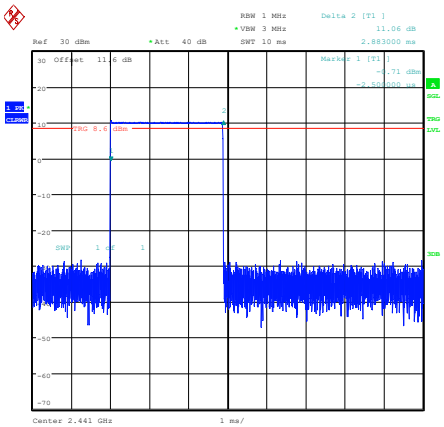
Test Setup



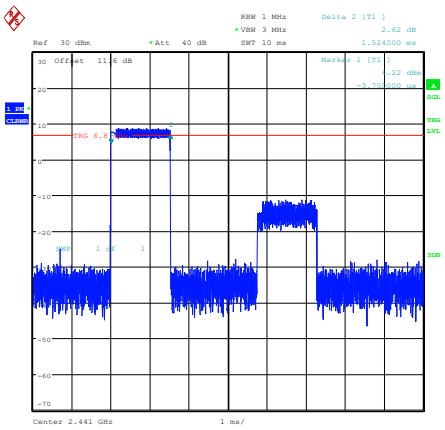
Measurement Result

TestMode	Antenna	Frequency[MHz]	BurstWidth [ms]	TotalHops [Num]	Result[s]	Limit[s]	Verdict
DH5	Ant1	Hop	2.883	106.67	0.308	≤0.4	PASS
2DH5	Ant1	Hop	1.524	106.67	0.163	≤0.4	PASS
3DH5	Ant1	Hop	2.886	106.67	0.308	≤0.4	PASS

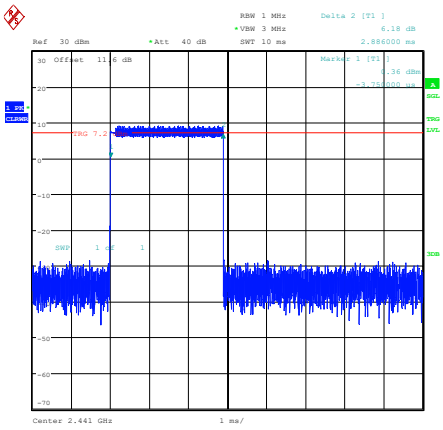
Test Graphs



DH5-Ant1-Hop-2.883-106.67



2DH5-Ant1-Hop-1.524-106.67



3DH5-Ant1-Hop-2.886-106.67

6.7 20dB Bandwidth

Specifications:	FCC 47 Part 15.247(d)
DUT Serial Number:	S1
Test conditions:	Ambient Temperature:15℃-35℃ Relative Humidity:30%-60% Air pressure: 86-106kPa
Test Results:	Pass

Limit Level Construction:

Standard	Limit
FCC 47 Part 15.247(d)	20dB below peak output power in 100KHz bandwidth

Measurement Uncertainty:

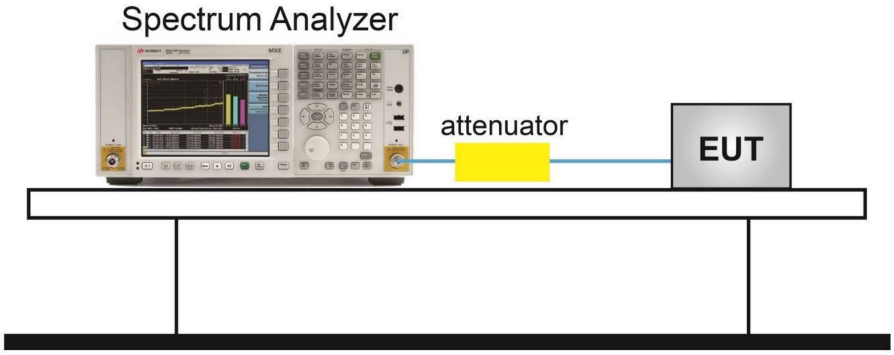
Measurement Uncertainty	±1.06KHz

Test procedures

The measurement is according to ANSI C63.10 clause 7.8.7

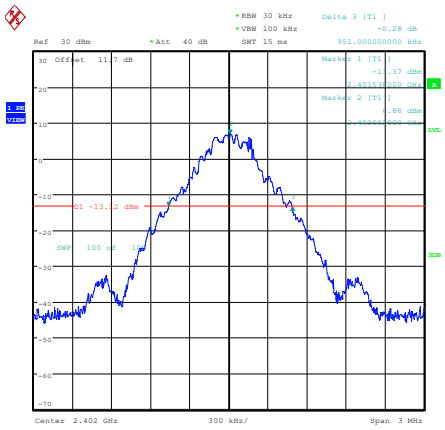
1. Connect the EUT through cable and divide with CMW 270 and spectrum analyzer.
2. Enable the EUT transmit maximum power.
3. Set the spectrum analyzer as step 4 to step 7.
4. Span: two or five times of OBW
5. RBW= 1% to 5% of the OBW; VBW is approximately three times of RBW; Max Hold.
6. Select the max peak, and N DB DOWN=20dB.
7. Record the results.

Test Setup

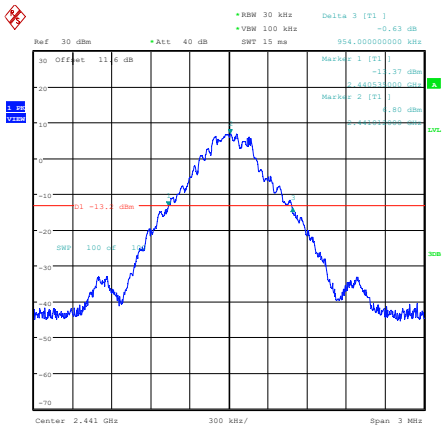


Measurement Result

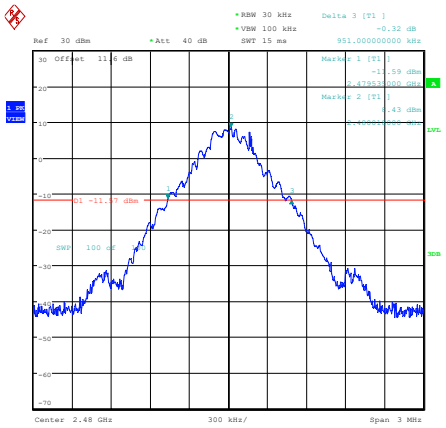
TestMode	Antenna	Frequency[MHz]	20db EBW[MHz]	FL[MHz]	FH[MHz]
DH5	Ant1	2402	0.95	2401.54	2402.49
DH5	Ant1	2441	0.95	2440.54	2441.49
DH5	Ant1	2480	0.95	2479.54	2480.49
2DH5	Ant1	2402	1.34	2401.33	2402.67
2DH5	Ant1	2441	1.31	2440.34	2441.65
2DH5	Ant1	2480	1.32	2479.34	2480.66
3DH5	Ant1	2402	1.31	2401.34	2402.65
3DH5	Ant1	2441	1.33	2440.33	2441.66
3DH5	Ant1	2480	1.31	2479.35	2480.65



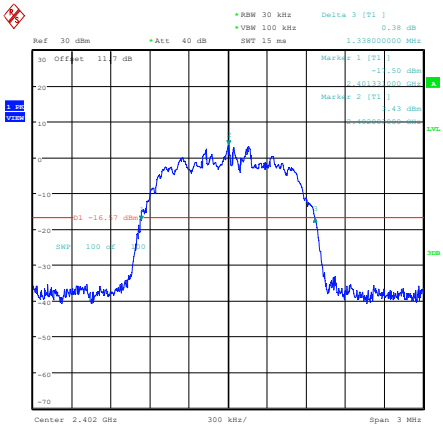
DH5-Ant1-2402



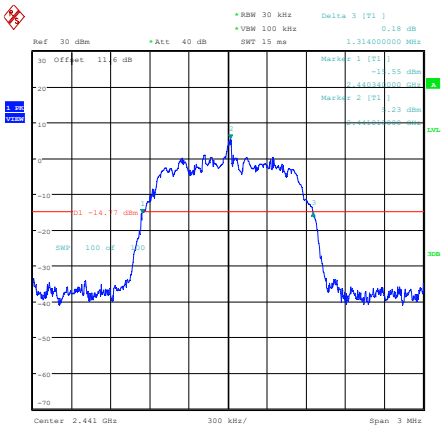
DH5-Ant1-2441



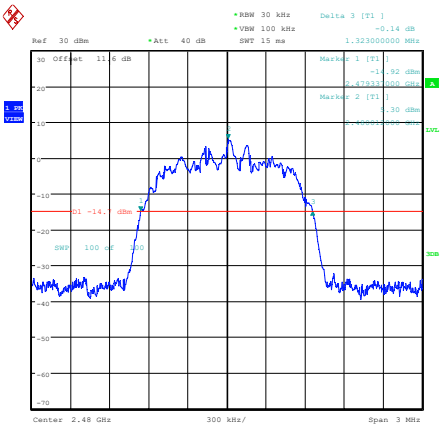
DH5-Ant1-2480



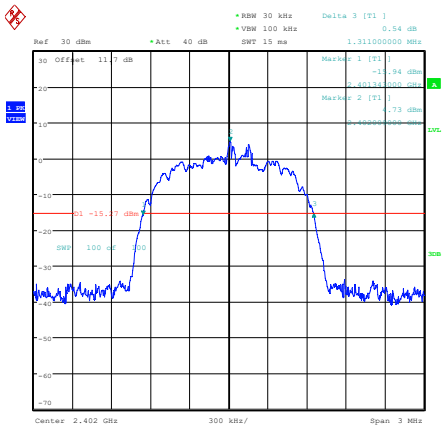
2DH5-Ant1-2402



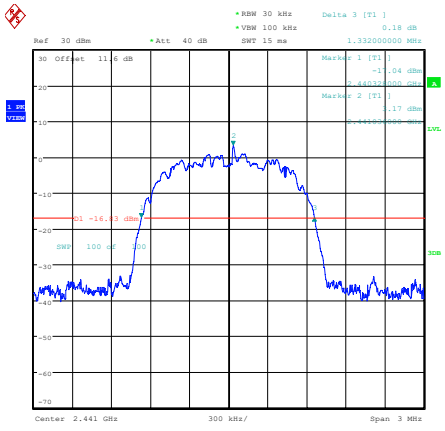
2DH5-Ant1-2441



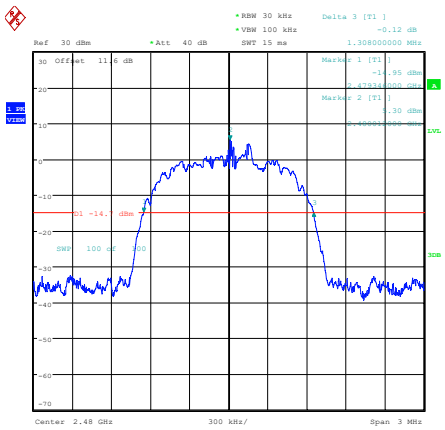
2DH5-Ant1-2480



3DH5-Ant1-2402



3DH5-Ant1-2441



3DH5-Ant1-2480

6.8 99% Occupied Bandwidth

Specifications:	FCC 47 Part 15.247(a)
DUT Serial Number:	S1
Test conditions:	Ambient Temperature:15℃-35℃ Relative Humidity:30%-60% Air pressure: 86-106kPa
Test Results:	Pass

Limit Level Construction:

Standard	Limit
FCC 47 Part 15.247(a)	N/A

Measurement Uncertainty:

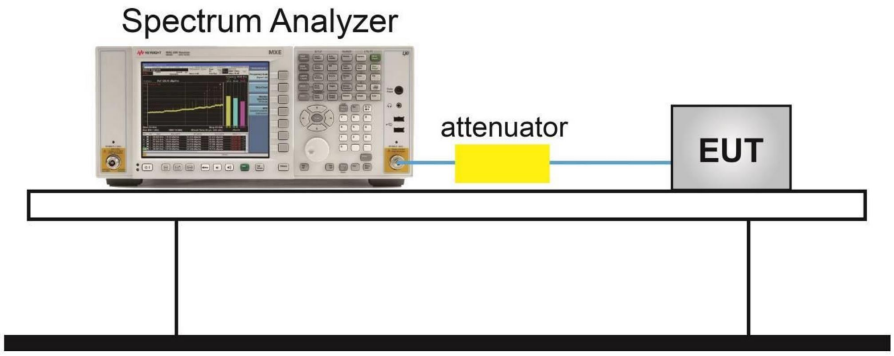
Measurement Uncertainty	±1.06KHz

Test procedures

The measurement is according to ANSI C63.10 clause 6.9.3.

1. The output power of EUT was connected to the spectrum analyzer. The path loss was compensated to the results for each measurement.
2. Enable EUT transmitter maximum power continuously.
3. Set RBW shall be in the range of 1% to 5% of the OBW.
4. Set the VBW ≥ [3 × RBW].
5. Detector = peak.
6. Trace mode = max hold.
7. Sweep = auto couple.
8. Allow the trace to stabilize.
9. The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission.

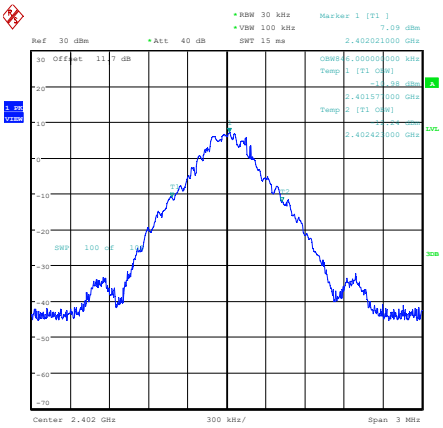
Test setup



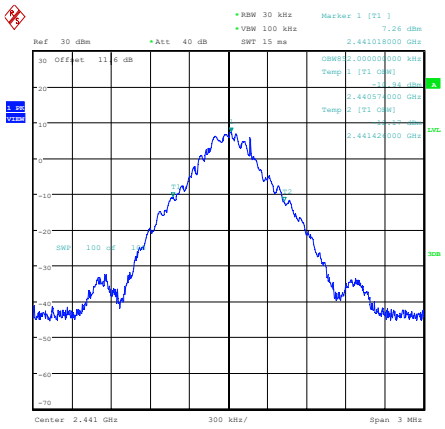
Measurement Result

TestMode	Antenna	Frequency[MHz]	OCB [MHz]	FL[MHz]	FH[MHz]
DH5	Ant1	2402	0.846	2401.5770	2402.4230
DH5	Ant1	2441	0.852	2440.5740	2441.4260
DH5	Ant1	2480	0.852	2479.5740	2480.4260
2DH5	Ant1	2402	1.185	2401.4060	2402.5910
2DH5	Ant1	2441	1.182	2440.4060	2441.5880
2DH5	Ant1	2480	1.185	2479.4030	2480.5880
3DH5	Ant1	2402	1.188	2401.4060	2402.5940
3DH5	Ant1	2441	1.191	2440.4030	2441.5940
3DH5	Ant1	2480	1.191	2479.4030	2480.5940

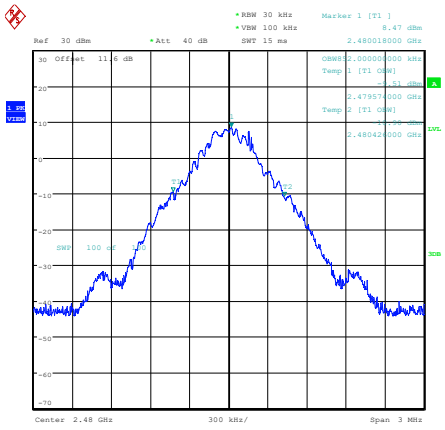
Test graphs as below



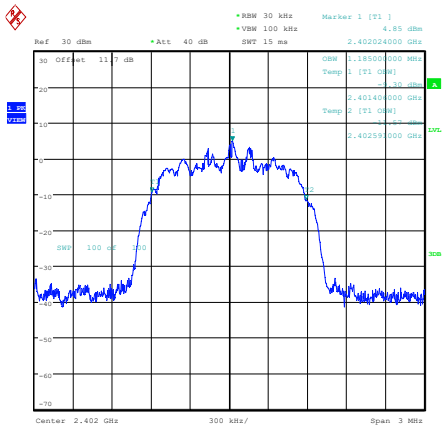
DH5-Ant1-2402



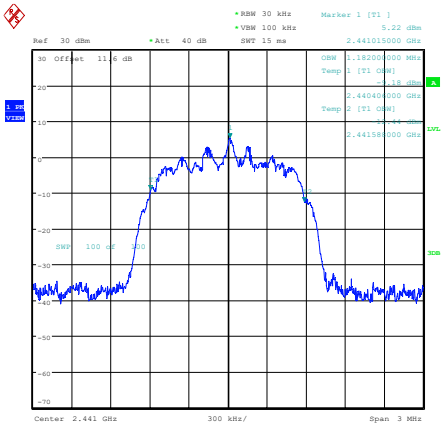
DH5-Ant1-2441



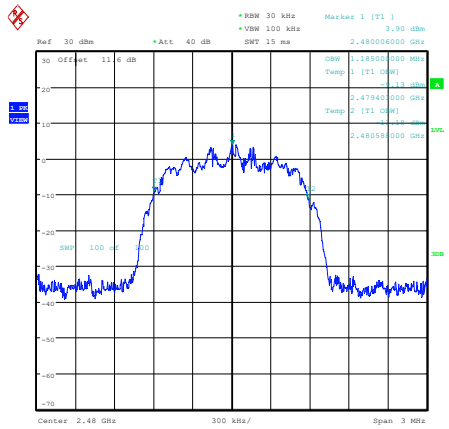
DH5-Ant1-2480



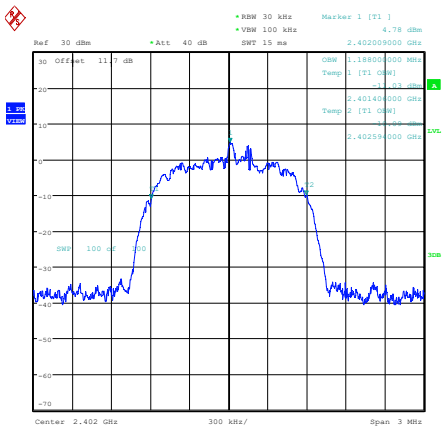
2DH5-Ant1-2402



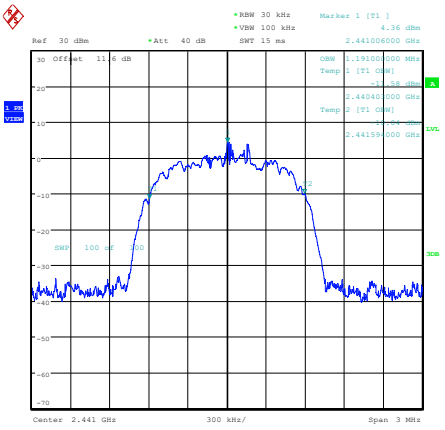
2DH5-Ant1-2441



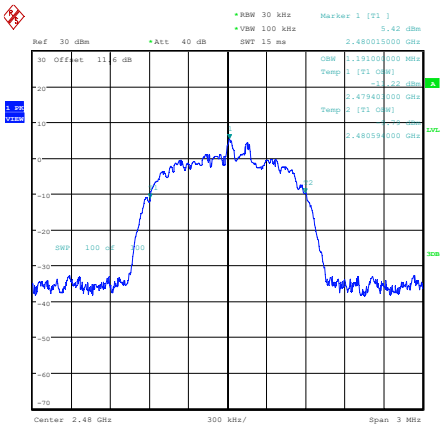
2DH5-Ant1-2480



3DH5-Ant1-2402



3DH5-Ant1-2441



3DH5-Ant1-2480

6.9 Carrier Frequency Separation

Specifications:	FCC 47 Part 15.247 (a)
DUT Serial Number:	S1
Test conditions:	Ambient Temperature:15℃-35℃ Relative Humidity:30%-60% Air pressure: 86-106kPa
Test Results:	Pass

Limit Level Construction:

Standard	Limit
FCC 47 Part 15.247 (a) (1)	Over 25KHz or (2/3)*20dB bandwidth

Measurement Uncertainty:

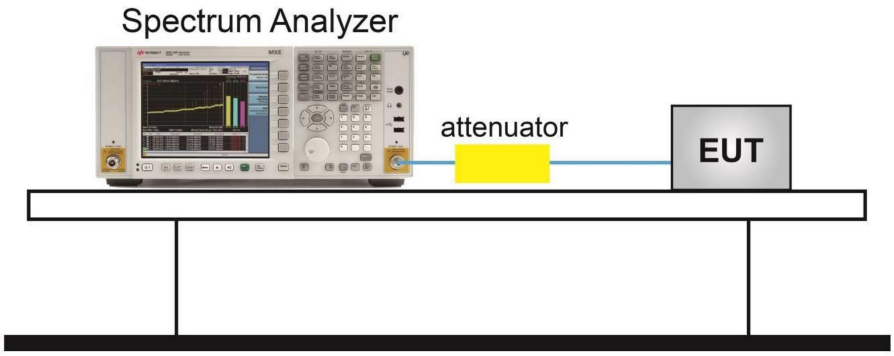
Measurement Uncertainty	4kHz

Test procedures

The measurement is according to ANSI C63.10 clause 7.8.2.

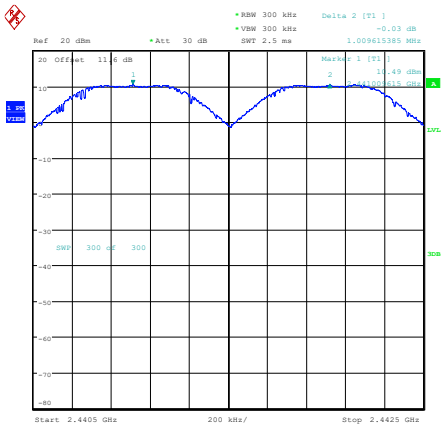
1. Connect the EUT through cable and divide with CBT32 and spectrum analyzer.
2. Enable the EUT transmit in hopping mode.
3. Span: Wide enough to capture the peaks of two adjacent channels.
4. RBW: Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel.
5. Video (or average) bandwidth (VBW) ≥ RBW.
6. Sweep: Auto.
7. Detector function: Peak.
8. Trace: Max hold.
9. Allow the trace to stabilize.S

Test Setup

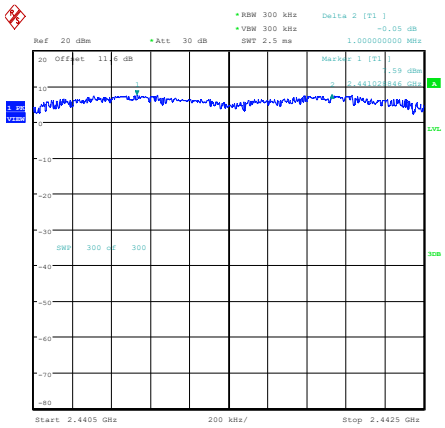


Measurement Result

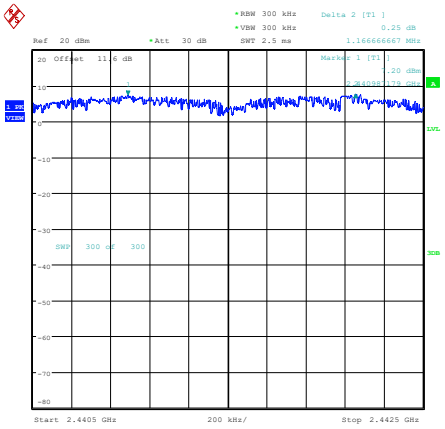
TestMode	Antenna	Frequency[MHz]	Result[MHz]	Limit[MHz]	Verdict
DH5	Ant1	Hop	1.01	≥0.950	PASS
2DH5	Ant1	Hop	1	≥0.893	PASS
3DH5	Ant1	Hop	1.167	≥0.887	PASS



DH5-Ant1-Hop



2DH5-Ant1-Hop



3DH5-Ant1-Hop

6.10 Number Of Hopping Channels

Specifications:	FCC 47 CFR Part 15.247 (a)
DUT Serial Number:	S1
Test conditions:	Ambient Temperature:15℃-35℃ Relative Humidity:30%-60% Air pressure: 86-106kPa
Test Results:	Pass

Limit Level Construction:

Standard	Limit
FCC 47 CFR Part 15.247 (a)(1)(iii)	At least 15 non-overlapping channels

Measurement Uncertainty:

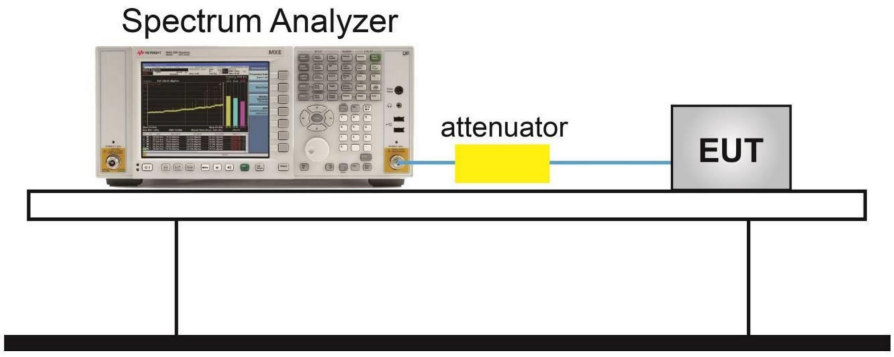
Measurement Uncertainty	±0.34dB

Test procedure

The measurement is according to ANSI C63.10 clause 7.8.3.

1. Connect the EUT through cable and divide with CMW 270 and spectrum analyzer.
2. Enable the EUT transmit in hopping mode.
3. Span: The frequency band of operation. Depending on the number of channels the device supports, it may be necessary to divide the frequency range of operation across multiple spans, to allow the individual channels to be clearly seen.
4. RBW: To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.
5. VBW ≥ RBW.
6. Sweep: Auto.
7. Detector function: Peak.
8. Trace: Max hold.
9. Allow the trace to stabilize.
10. Record the test results.

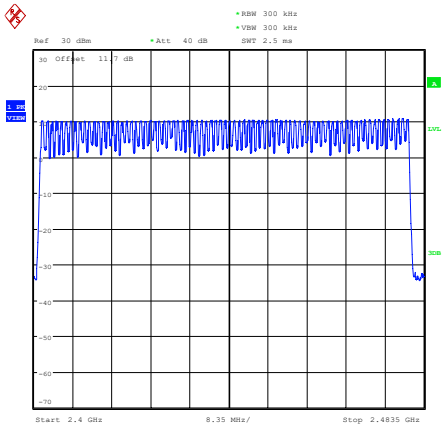
Test Setup



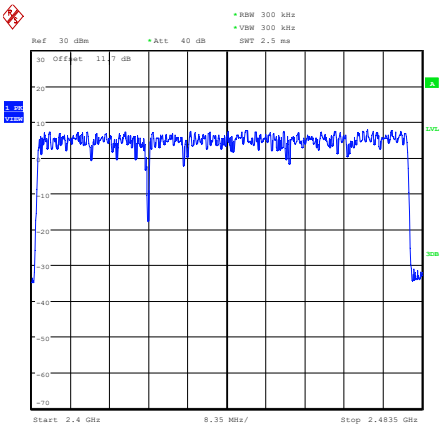
Measurement Result

TestMode	Antenna	Frequency[MHz]	Result[Num]	Limit[Num]	Verdict

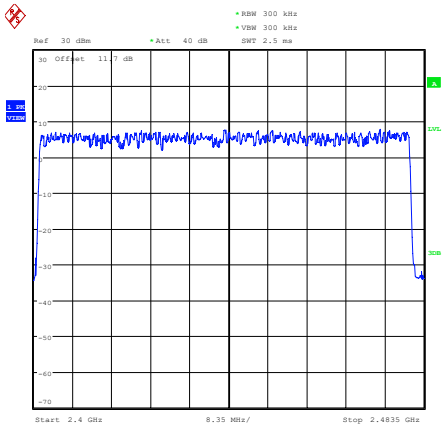
DH5	Ant1	Hop	79	≥15	PASS
2DH5	Ant1	Hop	79	≥15	PASS
3DH5	Ant1	Hop	79	≥15	PASS



DH5-Ant1-Hop



2DH5-Ant1-Hop



3DH5-Ant1-Hop

6.11 AC Powerline Conducted Emission

In accordance with the requirements of standard FCC Part 15.207, conducted emission is not applicable.

Annex A EUT Photos

See the document"I23W00008-External Photos".
See the document" I23W00008-Internal Photos ".

Annex B Deviations from Prescribed Test Methods

No deviation from Prescribed Test Methods.

*****END OF REPORT*****