

Test Report for FCC

FCC ID : ZKE-ICAMM300

Report Number		ESTRFC1810-003		
Applicant	Company name	Iris ID, Inc.		
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	Contact person	Mr Dae-Sung Noh		
Product	Product name	Portable Data Collection Terminal		
	Model No.	iCAM M300	Manufacturer	Iris ID, Inc.
	Serial No.	NONE	Country of origin	KOREA
Test date	2018-08-29 ~ 2018-09-27		Date of issue	16-Oct-18
Testing location	347-69, Jungbu-daero 147beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do 467-811, R. O. Korea			
Standard	FCC PART 15 Subpart C (15.247), ANSI C 63.10(2013)			
Measurement facility registration number		659627		
Tested by	Senior Engineer I.K. Hong		(Signature)	
Reviewed by	Engineering Manager K.B. Lee		(Signature)	
Abbreviation	OK, Pass = Passed, Fail = Failed, N/A = not applicable			
<p>* Note</p> <ul style="list-style-type: none"> - This test report is not permitted to copy partly without our permission - This test result is dependent on only equipment to be used - This test result based on a single evaluation of one sample of the above mentioned - Marketing Model name : RP1600 				

Contents 1

1. Laboratory Information	4
2. Description of EUT	5
3. Test Standards	6
4. Measurement condition	7
5. Carrier Frequency Separation	10
5.1 Test procedure	10
5.2 Test instruments and measurement setup	10
5.3 Measurement results	10
5.4 Trace data	12
6. Maximum Peak Output Power	16
6.1 Test procedure	16
6.2 Measurement results	16
7. Number of Hopping Frequency	18
7.1 Test procedure	18
7.2 Test instruments and measurement setup	18
7.3 Measurement results	18
7.4 Trace data	19
8. Time of Occupancy (Dwell Time)	21
8.1 Test procedure	21
8.2 Test instruments and measurement setup	21
8.3 Measurement results	22
8.4 Trace Data	23

Contents 2

9. Band-edge and Out of band emissions	26
9.1 Test procedure	26
9.2 Test instruments and measurement setup	26
9.3 Measurement results of band-edge & out of emission	26
9.4 Trace data of band-edge & out of emission	27
10. Measurement of radiated emission	35
10.1 Measurement equipment	35
10.2 Environmental conditions	35
10.3 Test data (Bluetooth Basic Rate)	36
10.4 Restricted Band Edges (Bluetooth Basic Rate)	40
10.5 Test data (Bluetooth EDR)	44
10.6 Restricted Band Edges (Bluetooth Basic EDR)	48
11. Measurement of conducted emission	52
11.1 Measurement equipment	52
11.2 Environmental conditions	52
11.3 Test data (Bluetooth Basic Rate / EDR)	53

Appendix 1. Special diagram

Appendix 2. Antenna Requirement

1. Laboratory Information

1.1 General

This EUT (Equipment Under Test) has been shown to be capable of compliance with the applicable technical standards and is tested in accordance with the measurement procedures as indicated in this report.

ESTECH Lab attests to accuracy of test data. All measurement reported herein were performed by ESTECH Co., Ltd.

ESTECH Lab assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

1.2 Test Lab.

Corporation Name : ESTECH Co., Ltd.

Head Office : Suite 1015 World Meridian III , 123 Gasan Digital 2-ro, Geumcheon-gu,
Seoul 153-759, R.O. Korea

EMC/Telecom/Safety Test Lab : 347-69, Jungbu-daero 147beon-gil, Majang-myeon, Icheon-si,
Gyeonggi-do 467-811, R. O. Korea

1.3 Official Qualification(s)

MSIP : Granted Accreditation from Ministry of Information & Communication for EMC, Safety
and Telecommunication

KOLAS : Accredited Lab By Korea Laboratory Accreditation Schema base on CENELEC
requirements

FCC : Conformity Assessment Body(CAB) with registration number 659627 under
APEC TEL MRA between the RRA and the FCC

VCCI : Granted Accreditation from Voluntary Control Council for Interference from ITE

2. Description of EUT

2.1 Summary of Equipment Under Test (Bluetooth)

Modulation Type : GFSK(FHSS) , 8DPSK
 Transfer Rate : 3 Mbps
 Number of Channel : 79 ch
 Channel Spacing : 1 MHz
 PEAK Output Power : GFSK : 1.15 mW 8DPSK : 0.48 mW
 Rating : DC 3.7 V Battery
 Receipt Date : 2-Apr-18

2.2 General descriptions of EUT

Performance Characteristics		Battery(4000mA) Performance	
CPU	Samsung CPU 1.8GHz (Octa core) Exynos5430	Standby time	220 hours
OS	Android 4.4 KitKat	Talk time	10 hours
Memory	3G SDRAM 16G ROM	User profiles	Outdoor WAN+GPS, 15min/hour voice communication, 10kB transmission every 10 min, and GPS on all time, 10.5 hours of operation.
Communication Interface	USB HOST 2.0 HIGH SPEED USB Client 2.0 HIGH SPEED		Outdoor Voice, 15 min/hour voice communication, 10.5 hours of operation and 150 hours standby time.
Physical Characteristics		User Environment	
Dimensions	139mm H X 73mm W X 21mm D	Sealing	
Weight	315 gram with 4000mAH battery	Drop Spec.	1.5M drop to concrete. 2 drops per 6 sides
Display	4.3inch. WVGA	Operating Temp.	Main -20°C ~ +60°C
Input	Touch Panel, 4 side keys, power key, Alphanumeric Keypad		Storage -25°C ~ +70°C
Battery	4000mA/h, 3.7V, Li-ion Build-in backup battery : 200mA/h, 3.7V (polymer)	AC Power	Input : AC 100 ~ 240V, 50 ~ 60Hz Output : DC +5.0V, 3.5A
Expansion Slot	High capacity micro SD Card	Relative Humidity	5% ~ 80%
Audio	Speaker / Receiver / MIC		
Wireless (WWAN)	HSPA+(Five-band) 800/850/900/1900/2100MHz Quad-band EDGE GPRS GSM 850/900/1800/1900 MHz		
Bluetooth	Class 2 (2402MHz~2480MHz) Bluetooth V4.0+HS		
Wireless LAN	2.4GHz/ 5GHz 802.11 a/b/g/n	Peripherals and Accessories	
GPS	Embedded A-GPS	Communication	USB Client 2.0 HIGH SPEED
Notification	Vibration and Charging LED	Battery Chargers:	1-slot battery charger Cradle
Scanner	1D Laser Type 2D Imager (SE-4750SR)		
Camera			
Resolution:	13 megapixel		
Illumination:	User controllable flash		
Lens:	Auto Focus		

3. Test Standards

Test Standard : FCC PART 15 Subpart C (15.247)

This Standard sets out the regulations under which an intentional, unintentional, or incidental radiator may be operated without an individual license. It also contains the technical specifications, administrative requirements and other conditions relating to the marketing of Part 15 devices.

Test Method : ANSI C 63.10 (2013)

This standard sets forth uniform methods of measurement of radio-frequency (RF) signals and noise emitted from both unintentional and intentional emitters of RF energy in the frequency range 9 kHz to 40 GHz. Methods for the measurement of radiated and AC power-line conducted radio noise are covered and may be applied to any such equipment unless otherwise specified by individual equipment requirements. These methods cover measurement of certain devices that deliberately radiate energy, such as intentional emitters, but does not cover licensed transmitters. This standard is not intended for certification/approval of avionic equipment or for industrial, scientific, and medical (ISM) equipment. These methods apply to the measurement of individual units or systems comprised of multiple units.

Summary of Test Results

Applied Standard : 47 CFR Part 15 Subpart C				remark
FCC Standard	Test Type	Result	Remark	Limit
15.207	AC Power Conducted Emission	Pass	Meet the requirement	
15.205 & 15.209	Intentional Radiated Emission	Pass	Meet the requirement	
15.247(a)(1)	Carrier Frequency Separation & 20 Bandwidth ,99% Bandwidth	Pass	Meet the requirement	>25 kHz
15.247(b)	Maximum Peak output power	Pass	Meet the requirement	30dBm(1W)
15.247(a)(1)(ii)	Number of Hopping Frequency	Pass	Meet the requirement	>75
15.247(c)	Transmitter Radiated Emission	Pass	Meet the requirement	
15.247(a)(1)(iii)	Time of Occupancy (Dwell Time)	Pass	Meet the requirement	<400ms
15.247(d)	Band Edge Measurement	Pass	Meet the requirement	

4. Measurement Condition

4.1 EUT Operation

a. Channel

Ch.	Frequency	Ch.	Frequency
0	2402 MHz	40	2442 MHz
1	2403 MHz	41	2443 MHz
2	2404 MHz	42	2444 MHz
3	2405 MHz	43	2445 MHz
4	2406 MHz
...	...	78	2480 MHz
39	2441 MHz		

b. Measurement Channel : Low (2402 MHz), Middle (2441 MHz), High (2480 MHz)

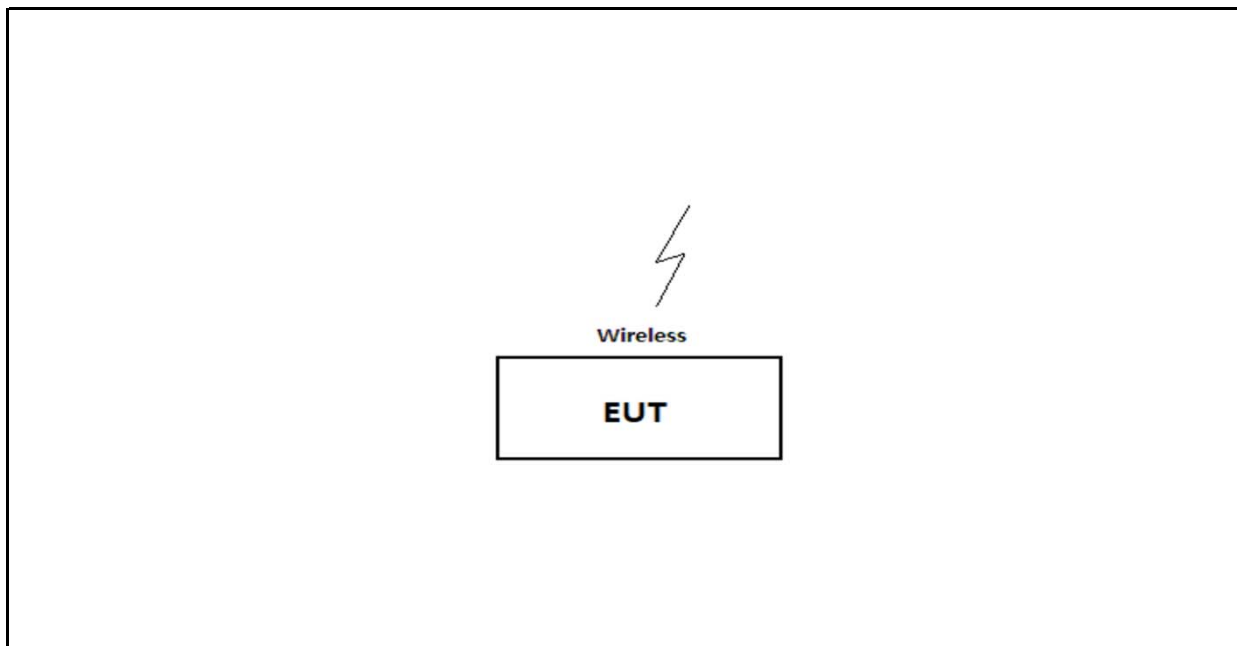
c. Test Mode : 8DPSK, GFSK (worst case)

d. Test rate : 3 Mbps

4.2 EUT Operation.

- * The EUT was in the following operation mode during all testing
- * The operational conditions of the EUT was determined by the manufacturer according to emission
- * Execute a RF test program to enable EUT under transmission/receiving condition continuously at specific channel frequency.
- * Transmit mode was each test. Each channel (low, middle, high), also set the test after
- * The EUT was measured up to tenth harmonic or 40 GHz of the highest operating frequencies.

4.3 Configuration and Peripherals



4.4 EUT and Support equipment

Equipment Name	Model Name	S/N	Manufacturer	Remark (FCC ID)
Portable Data Collection Terminal	iCAM M300	NONE	Iris ID, Inc.	EUT
Cradle	iCAM M300-CRST	NONE	Iris ID, Inc.	

4.5 Cable Connecting

Start Equipment		End Equipment		Cable Standard		Remark
Name	I/O port	Name	I/O port	Length	Shielded	
Portable Data Collection Terminal	Power	Adapter	–	2.0	Unshielded	

5. Carrier Frequency Separation

5.1 Test procedure

According to §15.247(a)(1), Frequency hopping systems shall have hopping channel carrier frequencies separated by minimum of 25kHz or the 20dB bandwidth of the hopping channel, whichever is greater.

5.2 Test instruments and measurement setup

The spectrum analyzer is set to as following.

- . RBW= 30 KHz
- . VBW= 300 KHz
- . Span= 3 MHz
- . Sweep= suitable duration based on the EUT specification.

20dB Bandwidth Test Instruments

Description	Model	Serial Number	Cal. Due Date
Spectrum Analyzer	E4440A	US42041291	2018-12-27
Signal Analyzer	FSV40	100939	2018-12-27
-Spectrum Analyzer <=> EUT	Loss: 1.0dB	-	

5.3 Measurement results

EUT	Portable Data Collection Terminal	MODEL	iCAM M300
MODE	GFSK,8DPSK	ENVIRONMENTAL CONDITION	22 °C, 40 % R.H .
INPUT POWER	DC 3.7 V		

CHANNEL	Channel Frequency (MHz)	Bandwidth at 99% (kHz)	Bandwidth at 20dB below(kHz)	Channel Separation (kHz)	Limit (kHz)	PASS/FAIL
0	2402	897	973	1000	649	PASS
39	2441	895	934	1000	622	PASS
78	2480	871	932	1000	622	PASS



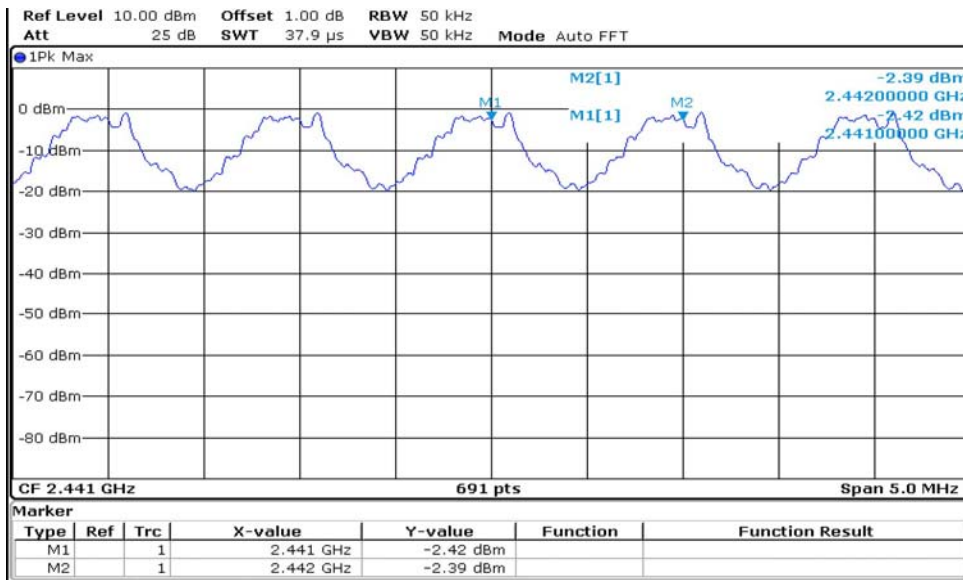
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(8DPSK)

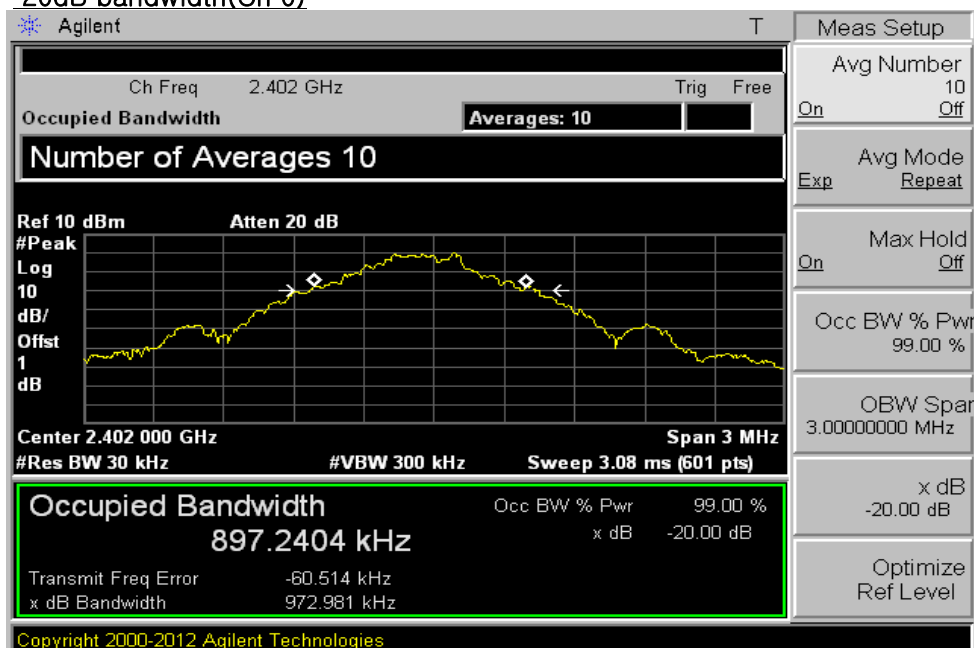
CHANNEL	Channel Frequency (MHz)	Bandwidth at 99% (MHz)	Bandwidth at 20dB below(kHz)	Channel Separation (kHz)	Limit (kHz)	PASS/FAIL
0	2402	1.214	1337	1000	891	PASS
39	2441	1.200	1296	1000	864	PASS
78	2480	1.218	1370	1000	913	PASS

5.4 Trace data (GFSK)

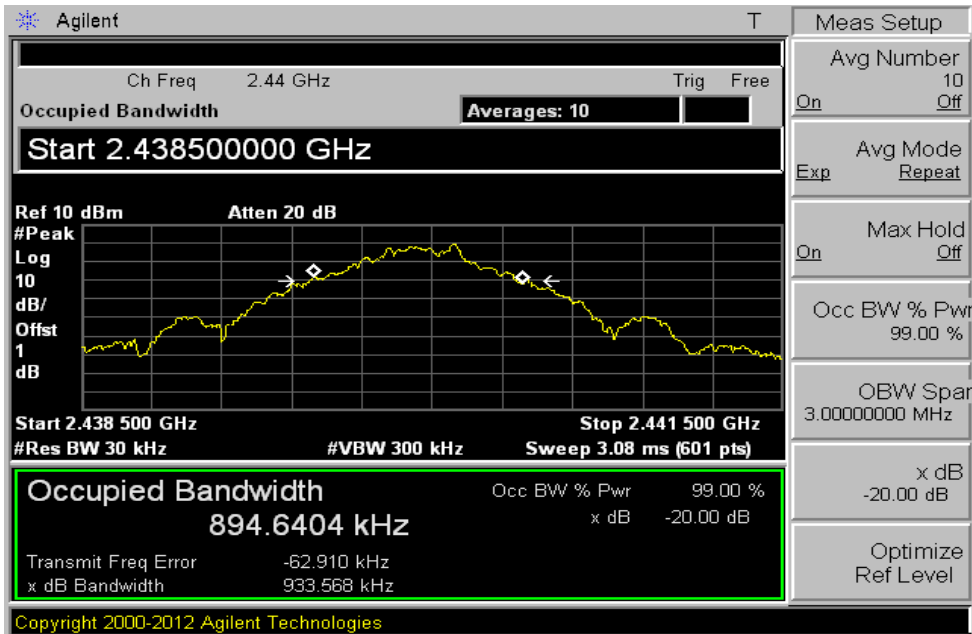
Channel Separation



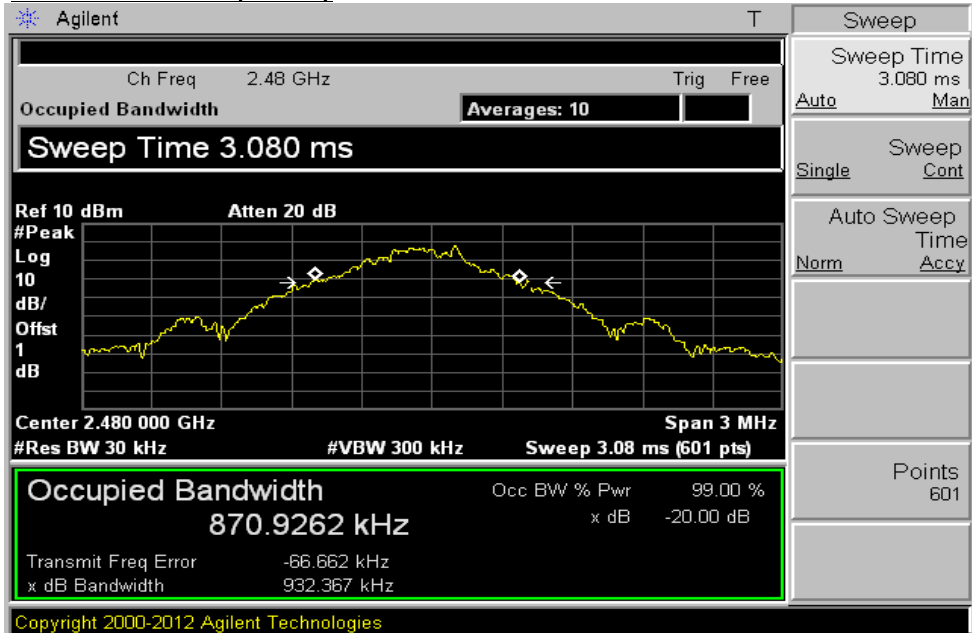
20dB bandwidth(Ch 0)



20dB bandwidth(CH 39)

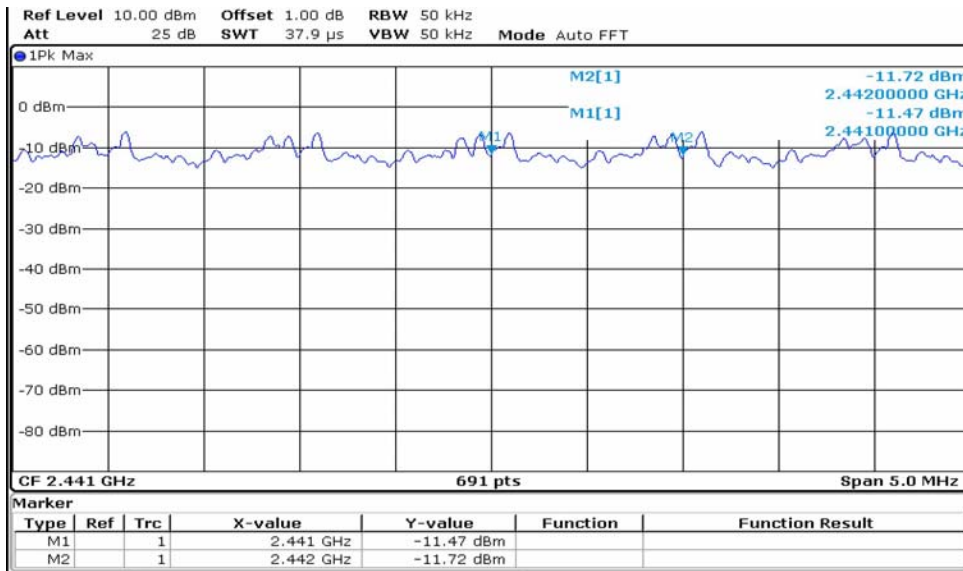


20dB bandwidth(CH 78)

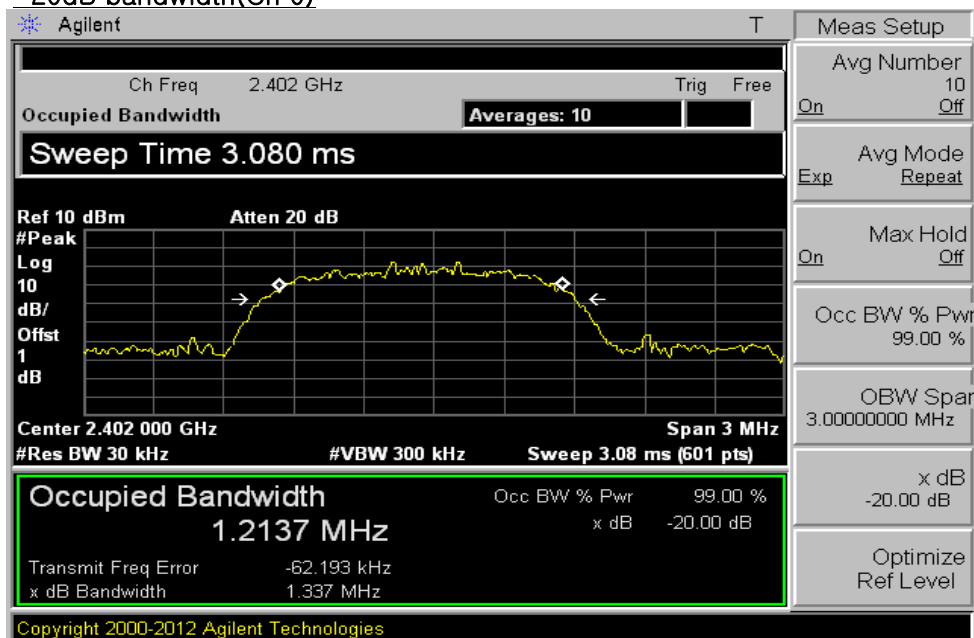


(8DPSK)

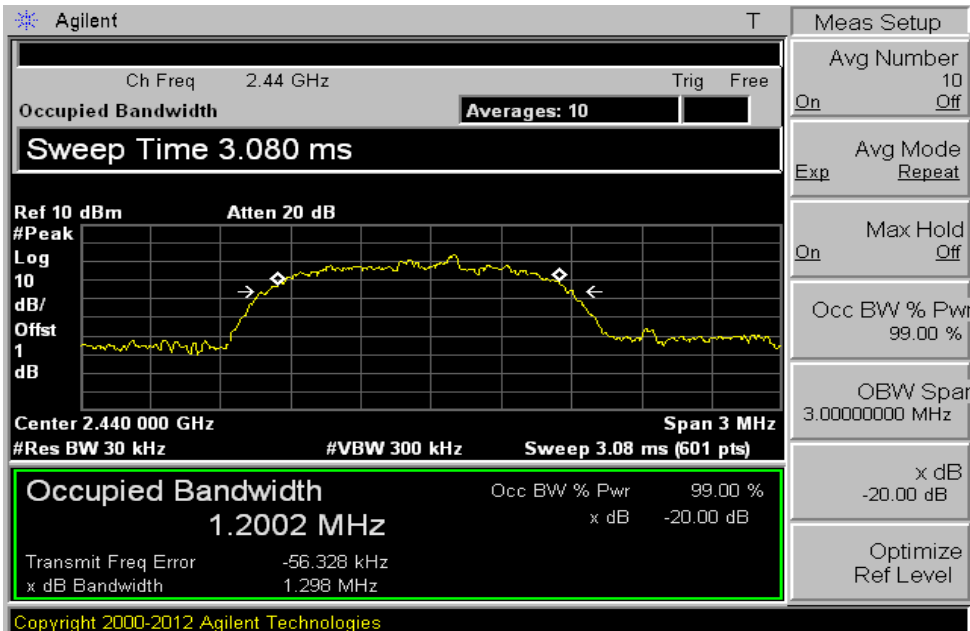
Channel Separation



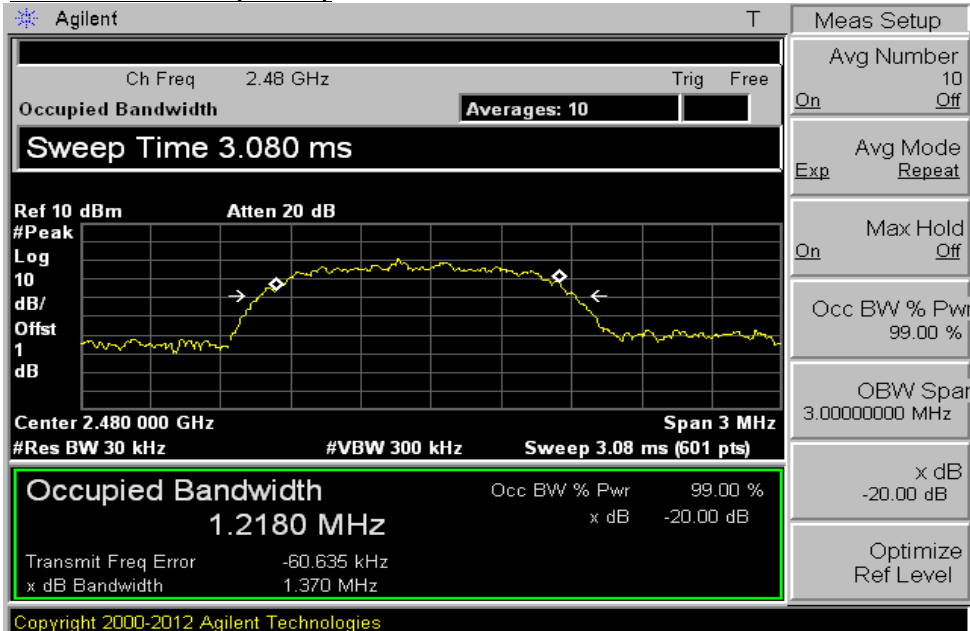
20dB bandwidth(Ch 0)



20dB bandwidth(CH 39)



20dB bandwidth(CH 78)



6. MAXIMUM PEAK OUTPUT POWER

6.1 Test procedure

The transmitter antenna terminal is connected to the input of a Power Sensor. Measurement is made while EUT is operating in transmission mode at the appropriate center frequency. The maximum peak output power measurement is 30 dBm.

Description	Model	Serial Number	Cal. Due Date
Power Meter	N1912A	MY45100570	2018-12-26
Power Sensor	N1912A	MY45240427	2018-12-26
Power Meter <=> EUT	Loss: 1.0dB	–	

6.2 Measurement results

EUT	Portable Data Collection Terminal	MODEL	iCAM M300
MODE	GFSK,8DPSK	ENVIRONMENTAL CONDITION	23 °C, 41 % R.H.
INPUT POWER	DC 3.7 V		

GFSK

CHANNEL	Channel Frequency (MHz)	Peak Power Output(dBm)		Limit[mW]	PASS/FAIL
		(dBm)	(mW)		
0	2402	0.62	1.15	125	PASS
39	2441	-0.33	0.93	125	PASS
78	2480	-2.13	0.61	125	PASS

8DPSK

CHANNEL	Channel Frequency (MHz)	Peak Power Output(dBm)		Limit[mW]	PASS/FAIL
		(dBm)	(mW)		
0	2402	-3.55	0.44	125	PASS
39	2441	-3.21	0.48	125	PASS
78	2480	-4.45	0.36	125	PASS

Note : 8DPSK mode is max power in three different modulations.



GFSK

CHANNEL	Channel Frequency (MHz)	Average Output(dBm)			Limit[mW]	PASS/ FAIL
		(dBm)	(mW)	factor		
0	2402	-4.78	0.43	1.09	125	PASS
39	2441	-5.68	0.35	1.09	125	PASS
78	2480	-7.54	0.23	1.09	125	PASS

8DPSK

CHANNEL	Channel Frequency (MHz)	Average Power Output(dBm)			Limit[mW]	PASS/ FAIL
		(dBm)	(mW)	factor		
0	2402	-6.37	0.29	1.06	125	PASS
39	2441	-6.43	0.29	1.06	125	PASS
78	2480	-7.31	0.24	1.06	125	PASS

Note : 8DPSK mode is max power in three different modulations.

7. Number of Hopping Frequency

7.1 Test procedure

According to §15.247(a)(1)(ii), Frequency hopping systems operating in the 2 400 MHz – 2 483.5 MHz bands shall use at least 15 hopping frequencies.

7.2 Test instruments and measurement setup

The spectrum analyzer is set to as following.

- . RBW= 100 KHz
- . VBW= 100 KHz
- . Span= the frequency band of operation
- . Sweep= suitable duration based on the EUT specification.

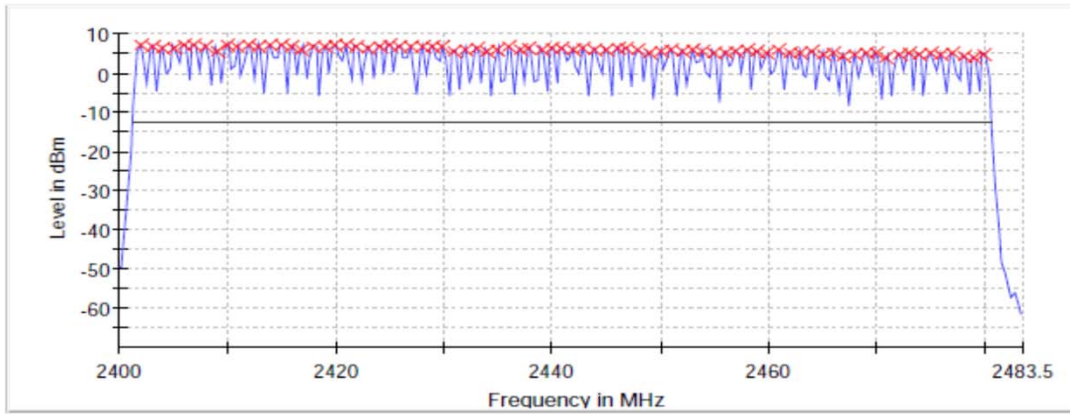
The Number of Hopping Frequency Test Instruments

Description	Model	Serial Number	Cal. Due Date
Spectrum Analyzer	E4440A	US42041291	2018-12-27
Signal Analyzer	FSV40	100939	2018-12-27
-Spectrum Analyzer <=> EUT	Loss: 1.0dB		

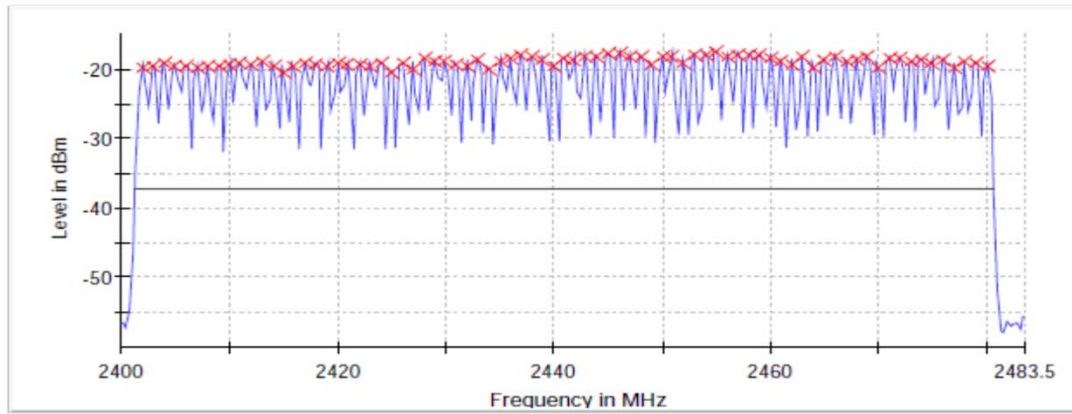
7.3 Measurement results

EUT	Portable Data Collection Terminal	MODEL	iCAM M300
MODE	GFSK,8DPSK	ENVIRONMENTAL CONDITION	23 °C, 42 % R.H.
INPUT POWER	DC 3.7 V		
Number of CH	Limit (Number of CH)	PASS/FAIL	
79	>15	PASS	

7.4 Trace data(GFSK)



7.4 Trace data(8DPSK)



8. Time of Occupancy (Dwell Time)

8.1 Test procedure

According to §15.247(a)(1)(iii), Frequency hopping systems operating in the 2 400 MHz – 2 483.5 MHz bands. The average time of occupancy on any channels shall not greater than 0.4 s within a period 0.4 s multiplied by the number of hopping channels employed.

8.2 Test instruments and measurement setup

The spectrum analyzer is set to as following.

- . RBW= 1 MHz
- . VBW= 1 MHz
- . Span= zero span, centered on a hopping channel
- . Sweep = as necessary to capture the entire dwell time per hopping channel
- . Detector function = Peak
- . Trace = Max hold

The Time of Occupancy Test Instruments

Description	Model	Serial Number	Cal. Due Date
Spectrum Analyzer	E4440A	US42041291	2018-01-04
Signal Analyzer	FSV40	100939	2018-12-27
-Spectrum Analyzer <=> EUT	Loss: 1 dB		

8.3 Measurement results

EUT	Portable Data Collection Terminal	MODEL	iCAM M300
MODE	GFSK,8DPSK	ENVIRONMENTAL CONDITION	23 °C, 43 % R.H.
INPUT POWER	DC 3.7 V		

A. DH1 Mode

One period for each particular channel : $0.402 \text{ ms} \times 320.1 = 128.68 \text{ ms}$

Channel	Pulse Time(ms)	Limit(ms)	PASS/FAIL
39	128.68	400	PASS

Calculation: The Bluetooth system hops at a rate of 1600 times per second. This means there are 1600 timeslots in one second, the DH1 data rate operates on a one-slot transmission and one-slot receiving basis. Thus there are $1600/(1+1)=800$ transmissions per second. In one period for each particular channel there are $10.13 \times 31.6 = 320.1$ times of transmissions.

B. DH3 Mode

One period for each particular channel : $1.669 \text{ ms} \times 159.9 = 266.87 \text{ ms}$

Channel	Pulse Time(ms)	Limit(ms)	PASS/FAIL
39	266.87	400	PASS

Calculation: The Bluetooth system hops at a rate of 1600 times per second. This means there are 1600 timeslots in one second, the DH3 data rate operates on a three-slot transmission and one-slot receiving basis. Thus there are $1600/(3+1)=400$ transmissions per second. In one period for each particular channel there are $5.06 \times 31.6 = 159.9$ times of transmissions.

C. DH5 Mode

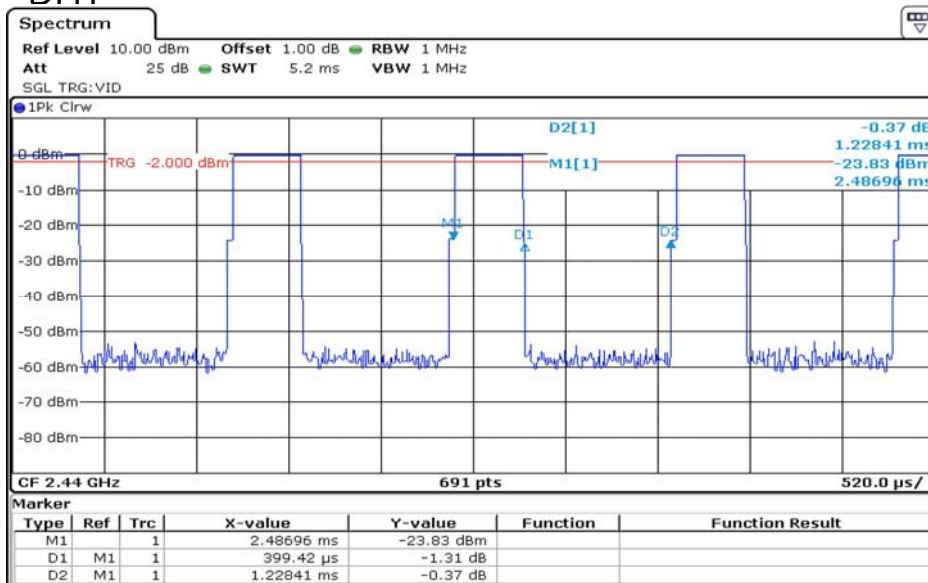
One period for each particular channel : $2.936 \text{ ms} \times 106.81 = 313.59 \text{ ms}$

Channel	Pulse Time(ms)	Limit(ms)	PASS/FAIL
39	313.59	400	PASS

Calculation: The Bluetooth system hops at a rate of 1600 times per second. This means there are 1600 timeslots in one second, the DH5 data rate operates on a five-slot transmission and one-slot receiving basis. Thus there are $1600/(5+1)=266.7$ transmissions per second. In one period for each particular channel there are $3.38 \times 31.6 = 106.81$ times of transmissions.

8.4 Trace data

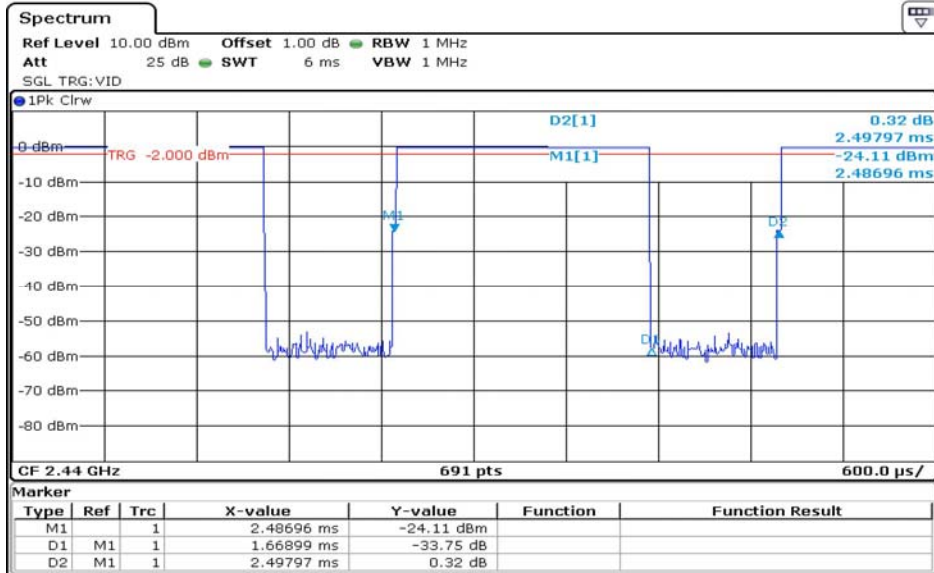
DH1



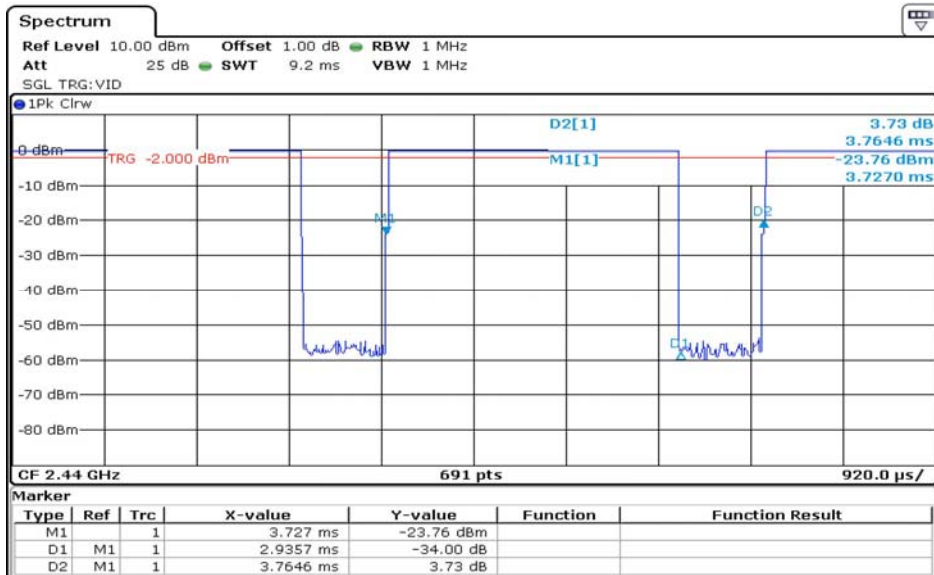


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DH3



DH5



8DPSK

A. DH1 Mode

One period for each particular channel : $0.402 \text{ ms} \times 320.1 = 128.68 \text{ ms}$

Channel	Pulse Time(ms)	Limit (ms)	PASS/FAIL
39	128.68	400	PASS

B. DH3 Mode

One period for each particular channel : $1.669 \text{ ms} \times 159.9 = 266.87 \text{ ms}$

Channel	Pulse Time(ms)	Limit (ms)	PASS/FAIL
39	266.87	400	PASS

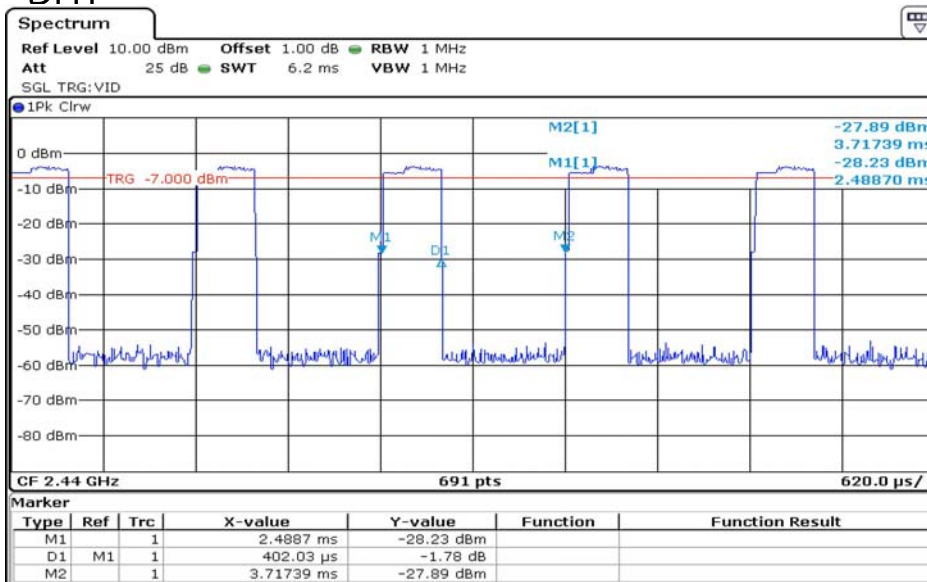
C. DH5 Mode

One period for each particular channel : $2.974 \text{ ms} \times 106.81 = 317.65 \text{ ms}$

Channel	Pulse Time(ms)	Limit (ms)	PASS/FAIL
39	317.65	400	PASS

8.5 Trace data

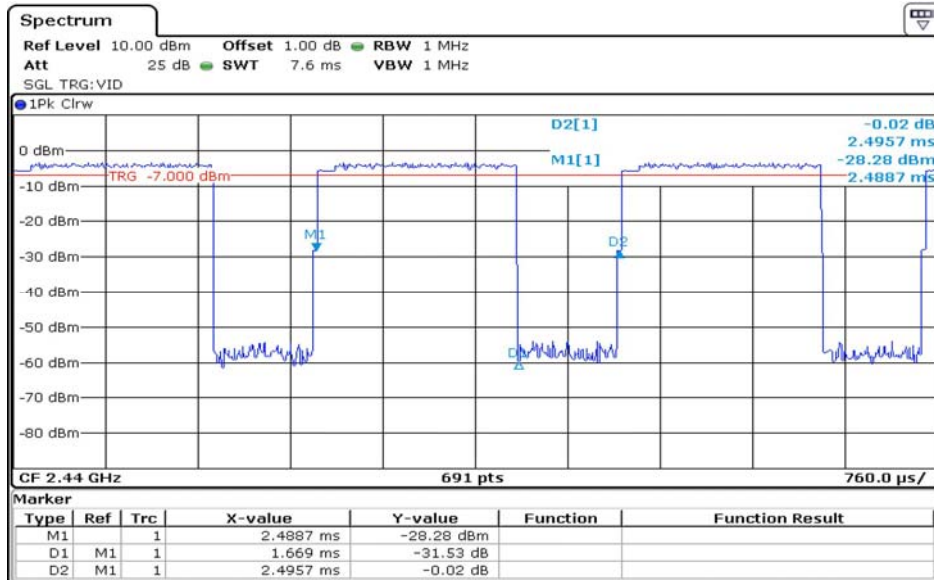
DH1



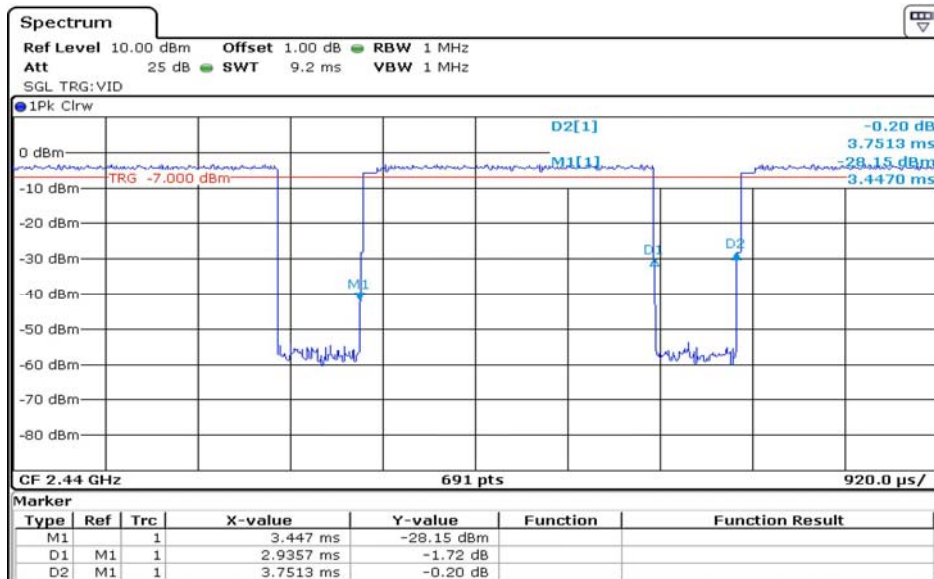


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8DPSK
DH3



DH5



9. band-edge and out of band emissions.

9.1 Test procedure

The radio frequency power at 20dB down from the highest inband power level is measured with a spectrum analyzer connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate center frequency. The band edge&out of band emission shall be at least 20dB below of the highest inband power level.

9.2 Test instruments and measurement setup

The spectrum analyzer is set to as following.

- . RBW= 100 KHz
- . VBW= >100 KHz
- . Span= suitable frequency span
- . Sweep= suitable duration based on the EUT specification.

Band Edge&Out of Emission Test Instruments

Description	Model	Serial Number	Cal. Due Date
Spectrum Analyzer	E4440A	US42041291	2018-01-04
Signal Analyzer	FSV40	100939	2018-12-27
-Spectrum Analyzer <=> EUT	Loss: 1.0dB		

9.3 Measurement results of band-edge & out of emission

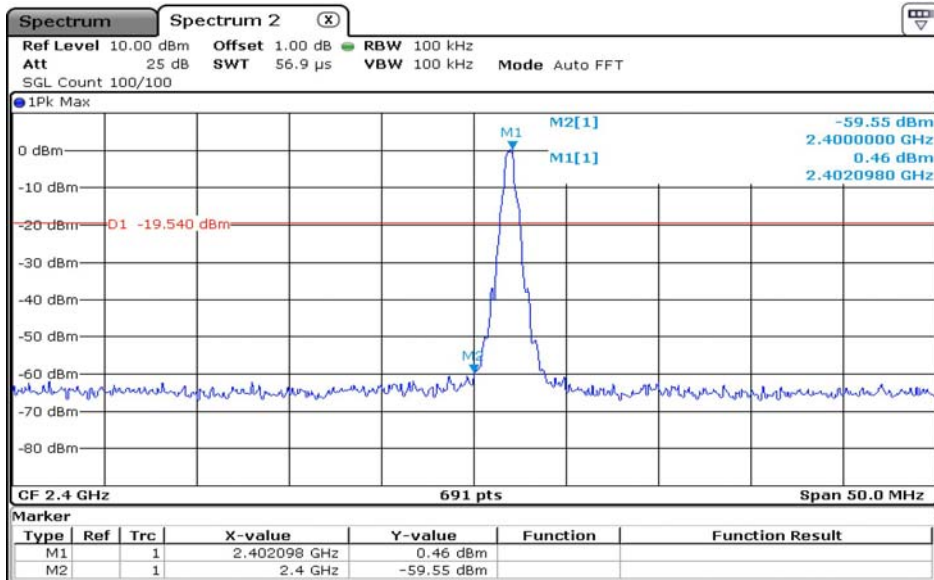
EUT	Portable Data Collection Terminal	MODEL	iCAM M300
MODE	GFSK,8DPSK	ENVIRONMENTAL CONDITION	23 °C, 42 % R.H.
INPUT POWER	DC 3.7 V		

* Refer to attach spectrum analyzer data chart.

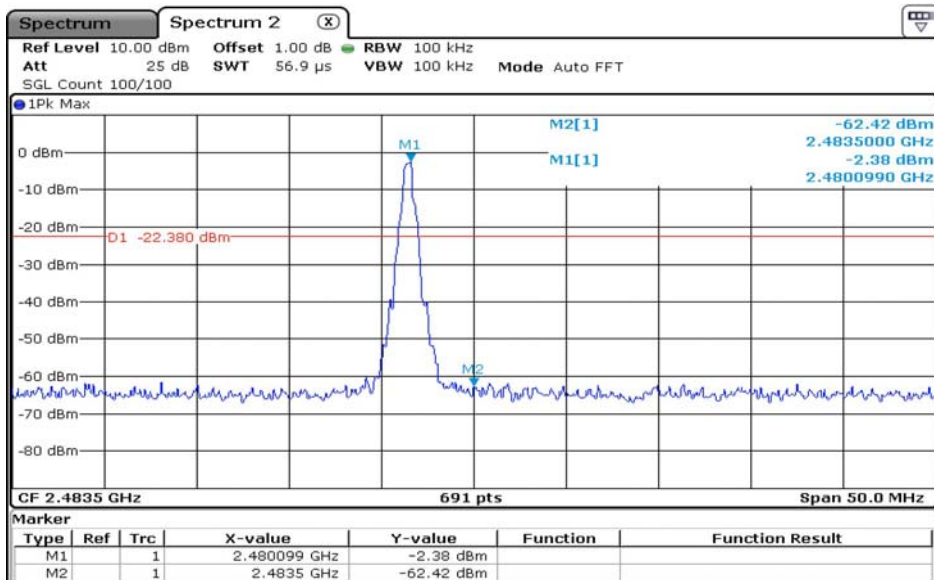


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9.4 Trace data of band-edge & Out of Emission CH0



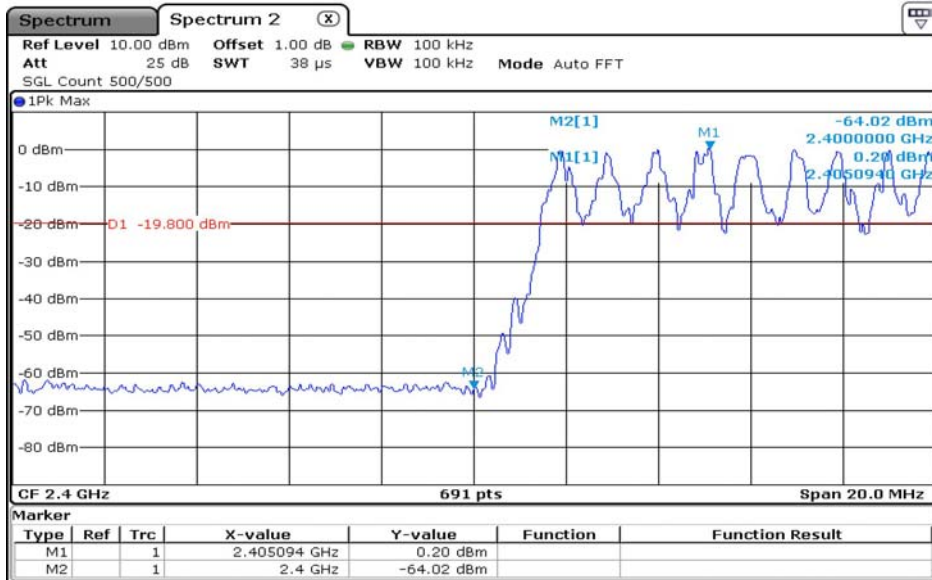
CH78



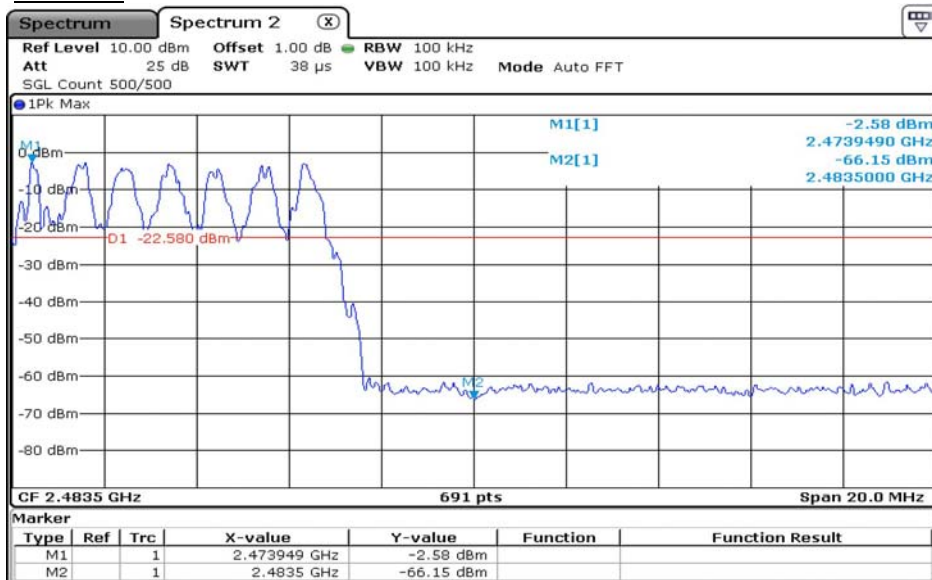


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CH0



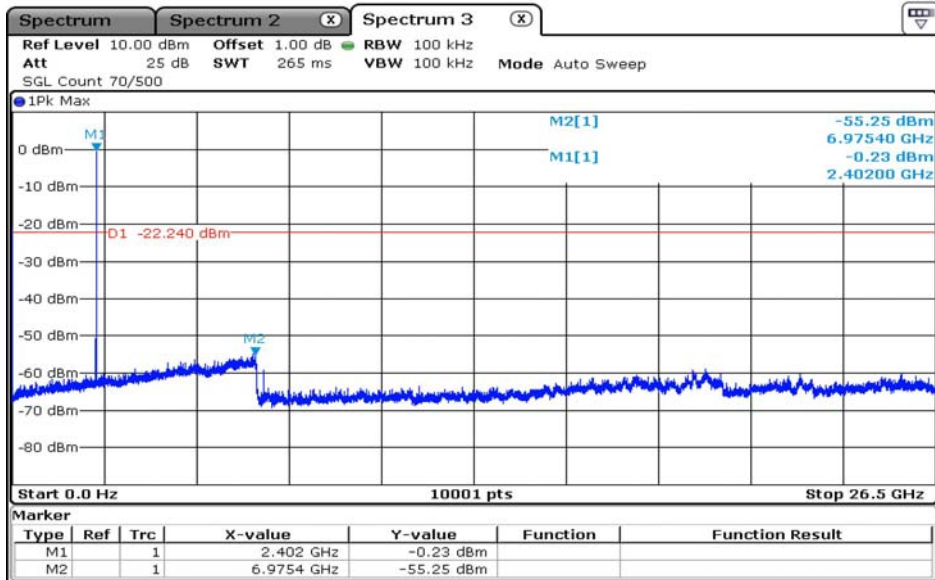
CH78



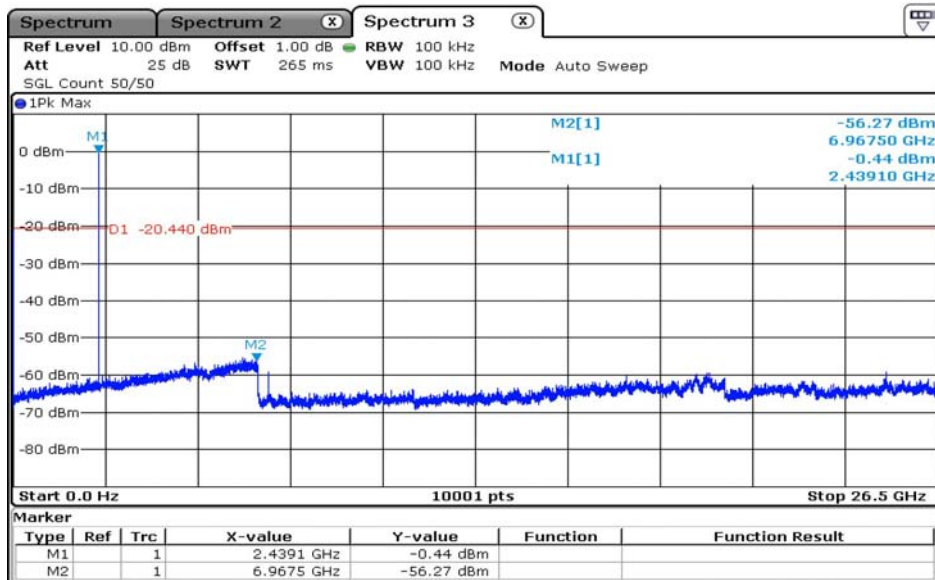


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CH0



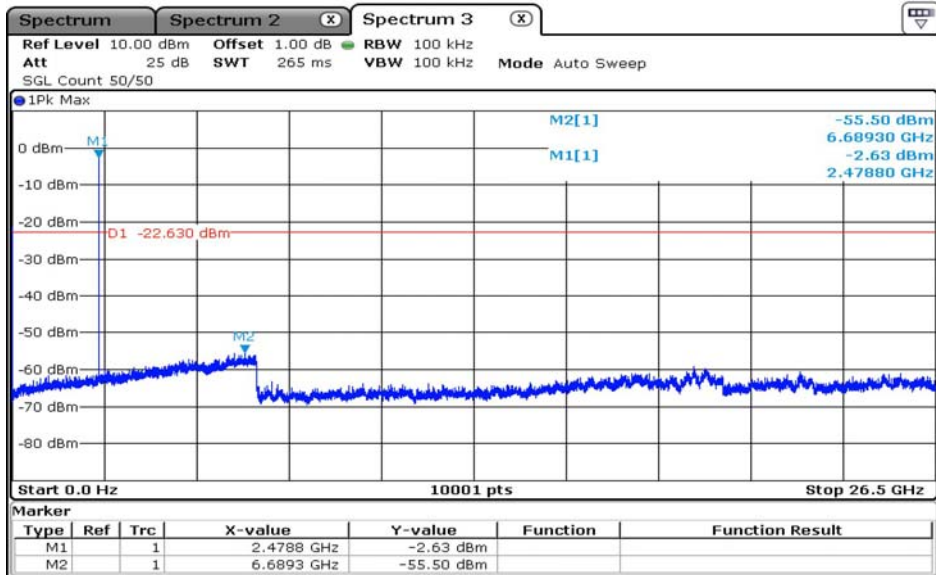
CH38





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CH79

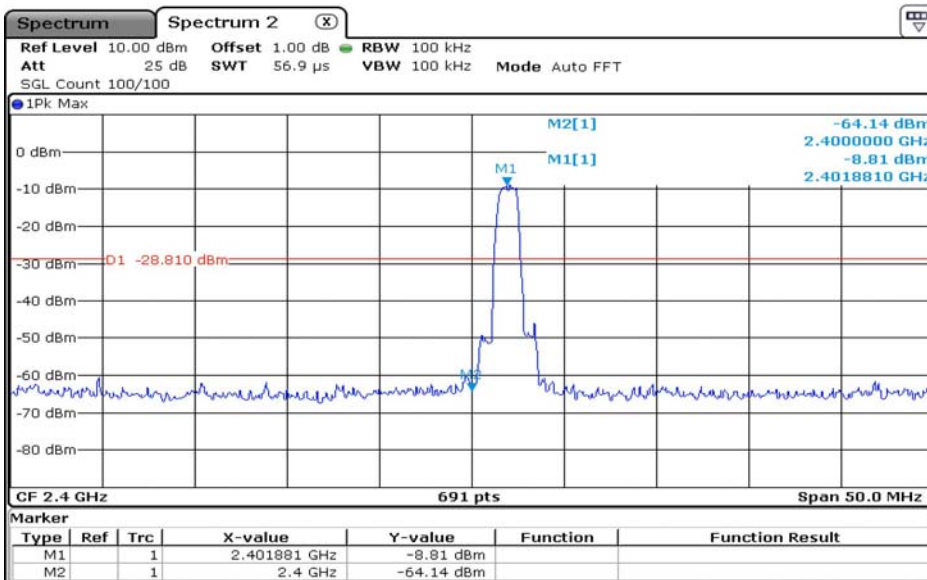




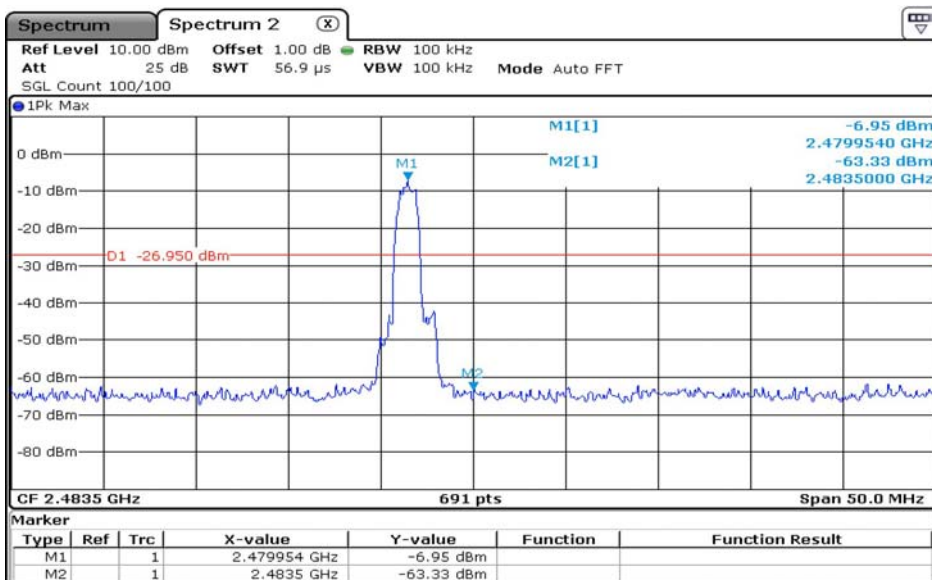
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8DPSK

CH 0



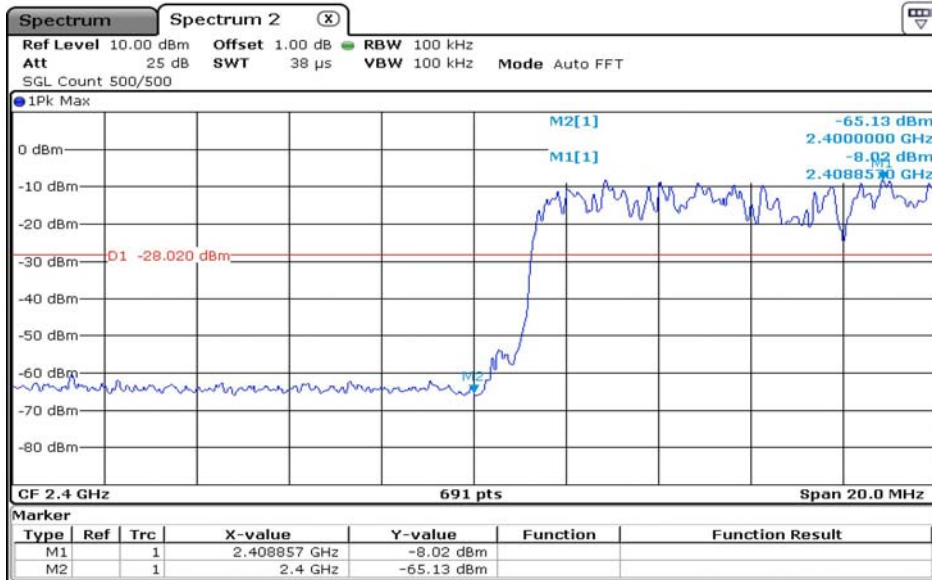
CH78



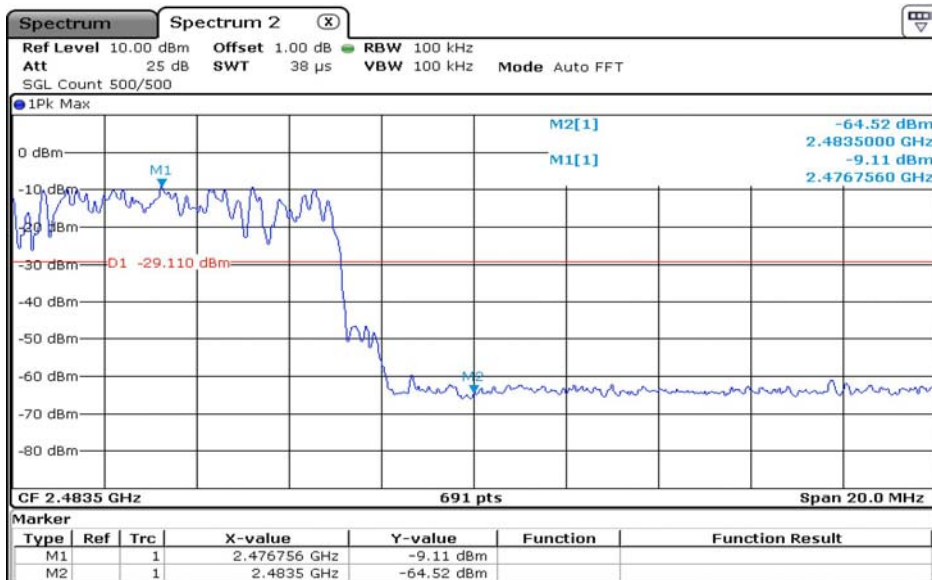


Estech
your best partner

CH 0



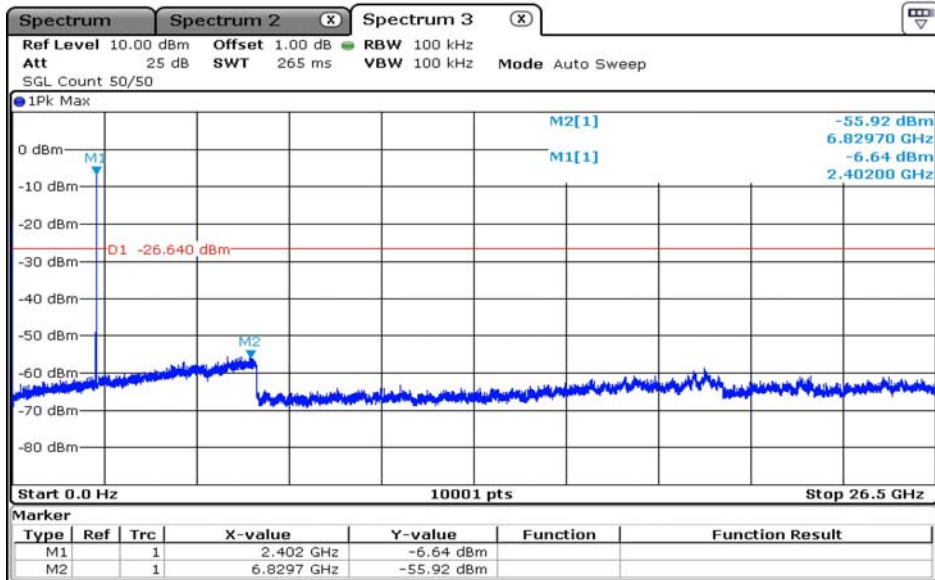
CH78



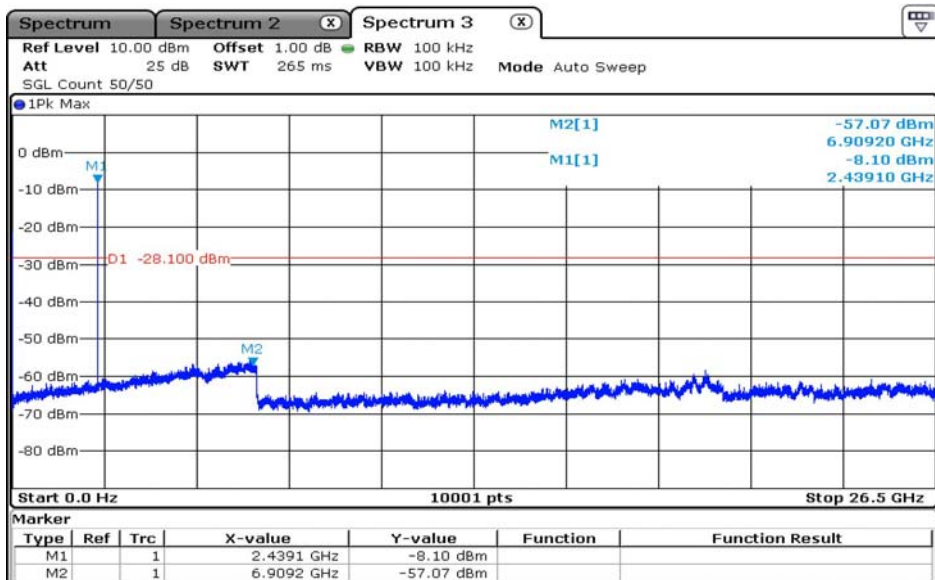


Estech
your best partner

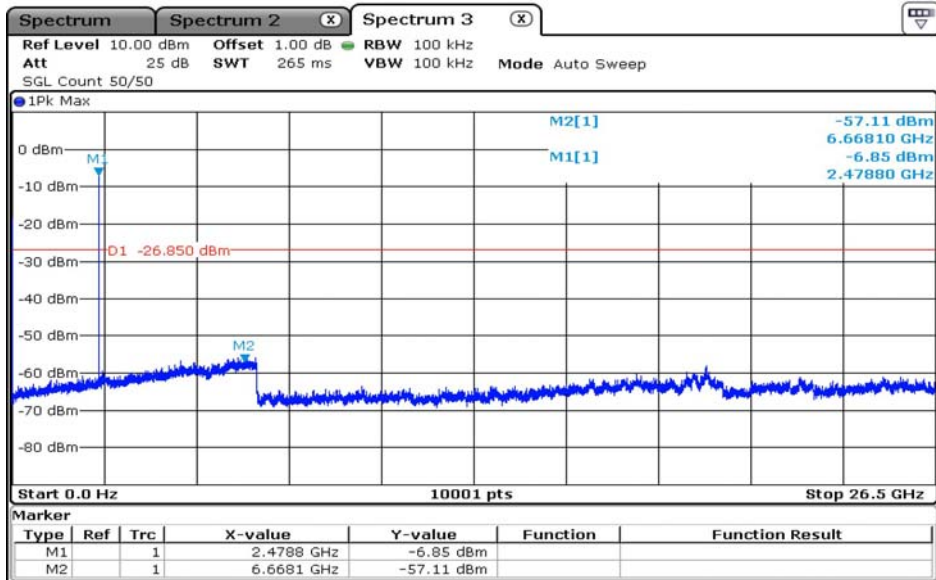
CH 0



CH38



CH79



10. Measurement of radiated disturbance

Above 30 MHz Electric Field strength was measured in accordance with FCC PART 15.205, 15.209. The test setup was made according to ANSI C 63.10 (2013) Semi-anechoic chamber, which allows a 3 m distance measurement. The EUT was placed in the center of styrofoam turntable. The height of this table was 0.8 m. The measurement was conducted with both horizontal and vertical antenna polarization. The turntable has fully rotated. For further description of the configuration refer to the picture of the test setup.

10.1 Measurement equipments

Equipment Name	Type	Manufacturer	Serial No.	Next Calibration date
TEST Receiver	ESCi7	ROHDE & SCHWARZ	100916	31-Oct-18
Logbicon Antenna	VULB 9168	SCHWARZBECK	193	12-Oct-18
Turn Table	DT3000-2t	Innco System GmbH	N/A	-
Antenna Mast	MA4000-EP	Innco System GmbH	N/A	-
PREAMPLIFIER	8449B	AGILENT	3008A00581	31-Oct-18
Horn Antenna	BBHA9120D	SCHWARZBECK	469	25-Aug-18
Test Receiver	ESPi7	ROHDE & SCHWARZ	100185	31-Oct-18
Spectrum Analyzer	R3273	ADVANTEST	121200664	10-Oct-18
Turn Table	DT1500-S	Innco System GmbH	N/A	-
Antenna Mast	MA4000-EP	Innco System GmbH	N/A	-
Pyramidal Horn Antenna	3160-09-01	EST-LINDGREN	102642	25-Aug-18
Antenna Master & Turn table controller	C02000-P	Innco System GmbH	CO2000/642 /28051111/L	-

10.2 Environmental Condition

Below 1 GHz –Test Place : 10 m Semi-anechoic chamber

BT Basic Rate Mode

Temperature (°C) : 22.4 °C
Humidity (% R.H.) : 43.5 % R.H.

BT EDR Mode

Temperature (°C) : 22.4 °C
Humidity (% R.H.) : 47.0 % R.H.

Above 1 GHz–Test Place : 3 m Semi-anechoic chamber

BT Basic Rate Mode

Temperature (°C) : 20.1 °C
Humidity (% R.H.) : 53.0 % R.H.

BT EDR Mode

Temperature (°C) : 20.4 °C
Humidity (% R.H.) : 51.5 % R.H.

10.3 Test Data for Bluetooth (Basic Rate)

Test Date : 5-Sep-18

Measurement Distance : 3 m

Frequency (MHz)	Reading (dB μ W)	Position (V/H)	Height (m)	Correction Factor		Result Value		
				Ant Factor (dB)	Cable (dB)	Limit (dB μ W/m)	Result (dB μ W/m)	Margin (dB)
40.80	17.39	H	1.0	13.16	0.95	40.00	31.49	8.51
115.70	21.79	H	1.0	10.57	1.62	43.50	33.97	9.53
334.80	17.20	V	1.0	14.25	2.86	46.00	34.31	11.69
480.00	6.05	V	1.0	17.40	3.45	46.00	26.90	19.10
Remark	H : Horizontal, V : Vertical Bluetooth (Basic Rate , 39 CH , 2 441 MHz) *CL = Cable Loss (In case of below 1 000 MHz) *The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection at frequency below 1 GHz. *Result Value = Reading + Ant Factor + Cable loss *Margin = Limit - Result							

10.3-1 Test Data for Bluetooth(Basic Rate)

Test Date : 5-Sep-18

Measurement Distance : 3 m

Frequency (MHz)	Reading (dB μ V)	Position (V/H)	Height (m)	Correction Factor		Duty Cycle Correction (dB)	Result Value		
				Ant Factor (dB)	Cable (dB)		Limit (dB μ V/m)	Result (dB μ V/m)	Margin (dB)
PEAK(RBW:1 MHz VBW:3 MHz)									
2355.60	51.30	H	1.5	27.68	-29.99	0.00	74.00	48.99	25.01
2349.20	50.41	V	1.3	27.70	-30.00	0.00	74.00	48.11	25.89
4804.00	54.39	H	1.2	31.60	-27.16	0.00	74.00	54.39	19.61
4804.00	53.35	V	1.5	31.60	-27.16	0.00	74.00	52.35	21.65
Average (RBW:1 MHz VBW:1 kHz)									
2390.00	38.66	H	1.5	27.71	-30.01	1.09	54.00	37.46	16.54
2390.00	38.57	V	1.5	27.65	-29.98	1.09	54.00	37.34	16.66
4804.00	35.16	H	1.5	31.60	-27.17	1.09	54.00	40.68	13.32
4804.00	26.11	V	1.5	13.40	1.02	1.09	54.00	41.62	12.38
Remark	H : Horizontal, V : Vertical TEST MODE : Bluetooth Basic Rate-CH0 (2 402 MHz)								
	*The TX signal wasn't detected from 3th harmonics.								
	*Result Value = Reading + Ant Factor + Cable loss - Amplifier Gain + Duty Cycle Correction Factor								
	*Margin = Limit - Result								

10.3-2 Test Data for Bluetooth(Basic Rate)

Test Date : 5-Sep-18

Measurement Distance : 3 m

Frequency (MHz)	Reading (dB μ V)	Position (V/H)	Height (m)	Correction Factor		Duty Cycle Correction (dB)	Result Value		
				Ant Factor (dB)	Cable (dB)		Limit (dB μ V/m)	Result (dB μ V/m)	Margin (dB)
PEAK(RBW:1 MHz VBW:3 MHz)									
4882.00	54.39	H	1.5	31.60	-27.23	0.00	74.00	55.22	18.78
4882.00	53.35	V	1.6	31.60	-27.23	0.00	74.00	53.66	20.34
Average (RBW:1 MHz VBW:1 kHz)									
4882.00	35.53	H	1.6	31.60	-27.23	1.09	54.00	40.99	13.01
4882.00	35.42	V	1.7	31.60	-27.23	1.09	54.00	40.88	13.12
Remark	H : Horizontal, V : Vertical TEST MODE : Bluetooth Basic Rate-CH0 (2 441 MHz)								
	*The TX signal wasn't detected from 3th harmonics.								
	*Result Value = Reading + Ant Factor + Cable loss - Amplifier Gain + Duty Cycle Correction Factor								
	*Margin = Limit - Result								

10.3-3 Test Data for Bluetooth(Basic Rate)

Test Date : 5-Sep-18

Measurement Distance : 3 m

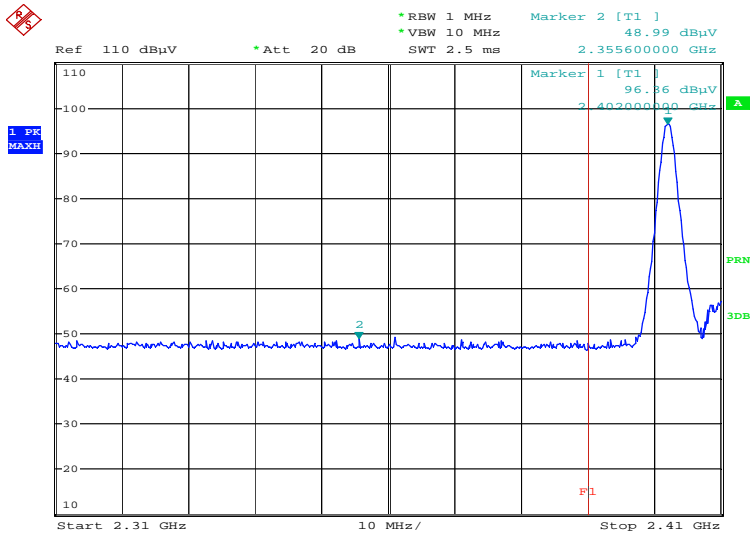
Frequency (MHz)	Reading (dBμV)	Position (V/H)	Height (m)	Correction Factor		Duty Cycle Correction (dB)	Result Value		
				Ant Factor (dB)	Cable (dB)		Limit (dBμV/m)	Result (dBμV/m)	Margin (dB)
PEAK(RBW:1 MHz VBW:3 MHz)									
2483.50	61.36	H	1.6	27.58	-29.77	0.00	74.00	59.18	14.82
2483.50	61.52	V	1.8	27.58	-29.77	0.00	74.00	59.34	14.66
4960.00	54.39	H	1.5	31.66	-27.09	0.00	74.00	55.22	18.78
4960.00	53.35	V	1.7	31.66	-27.09	0.00	74.00	53.39	20.61
Average (RBW:1 MHz VBW:1 kHz)									
2483.50	44.44	H	1.5	27.58	-29.77	1.09	54.00	43.35	10.65
2483.50	42.39	V	1.6	27.58	-29.77	1.09	54.00	41.30	12.70
4960.00	39.10	H	1.6	31.66	-27.09	1.09	54.00	44.76	9.24
4960.00	35.62	V	1.7	31.66	-27.09	1.09	54.00	41.28	12.72
Remark	H : Horizontal, V : Vertical TEST MODE : Bluetooth Basic Rate-CH0 (2 480 MHz)								
	*The TX signal wasn't detected from 3th harmonics.								
	*Result Value = Reading + Ant Factor + Cable loss - Amplifier Gain + Duty Cycle Correction Factor								
	*Margin = Limit - Result								

10.4 Restricted Band Edges for BT(Basic Rate)

Band Edges(CH Low)

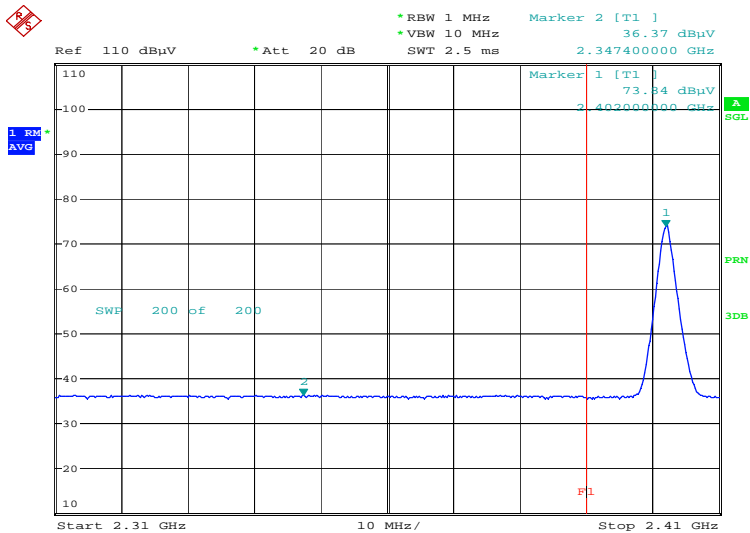
Detector mode:Peak

Polarity:Horizontal



Detector mode:Average

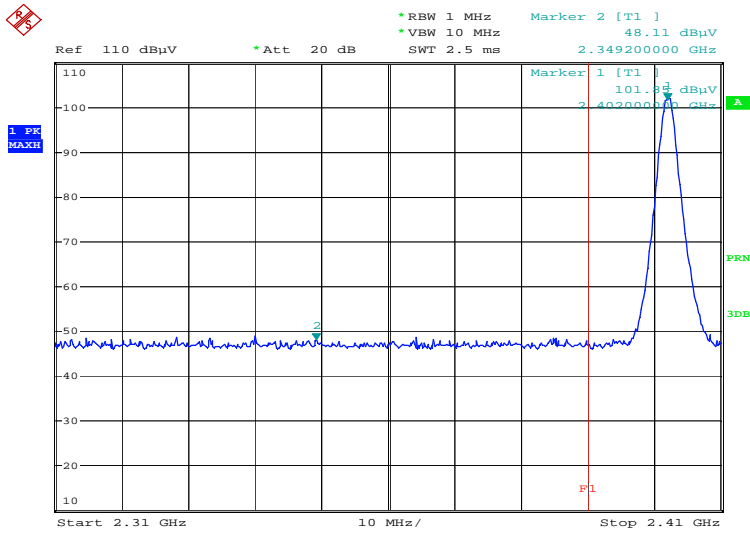
Polarity:Horizontal



Band Edges(CH Low)

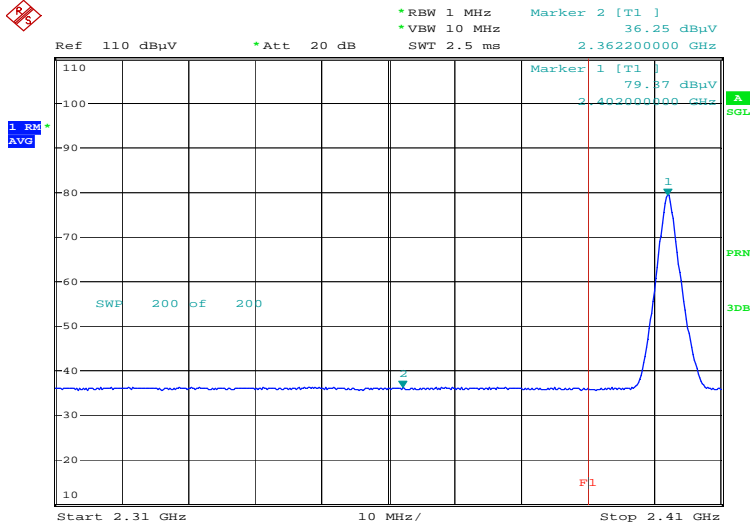
Detector mode:Peak

Polarity:Vertical



Detector mode:Average

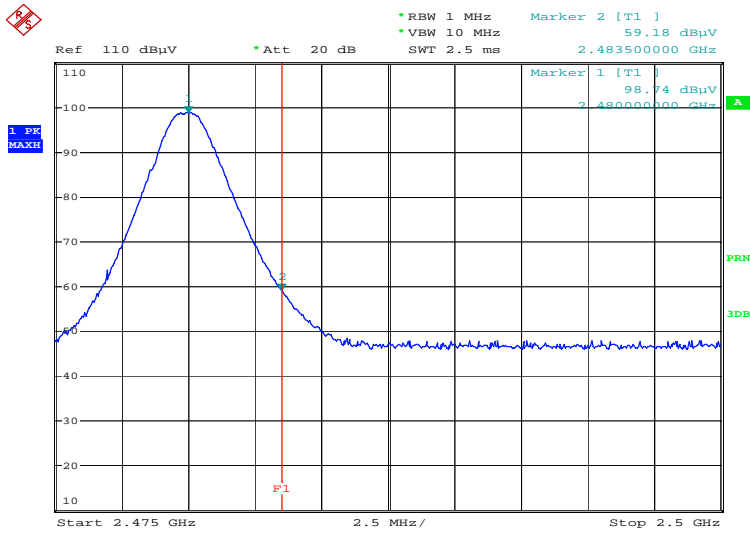
Polarity:Vertical



Band Edges(CH High)

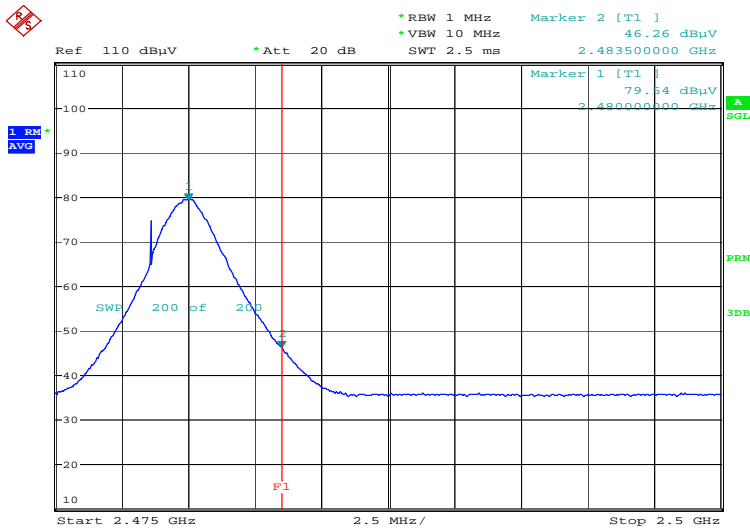
Detector mode:Peak

Polarity:Horizontal



Detector mode:Average

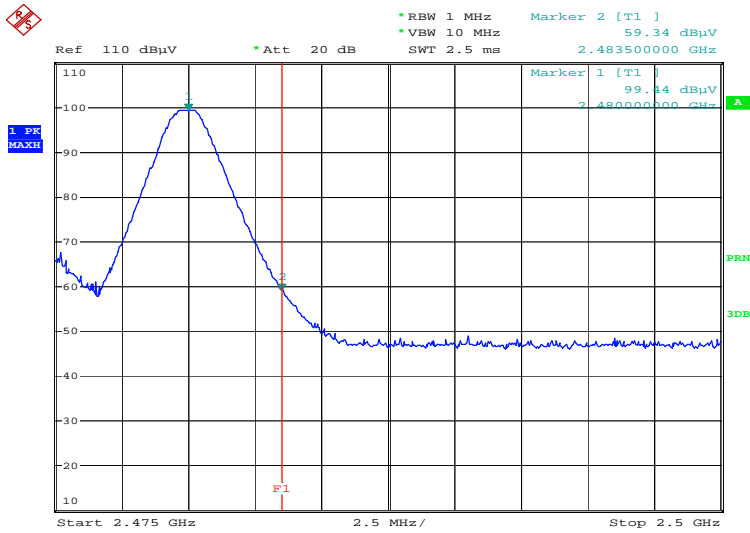
Polarity:Horizontal



Band Edges(CH High)

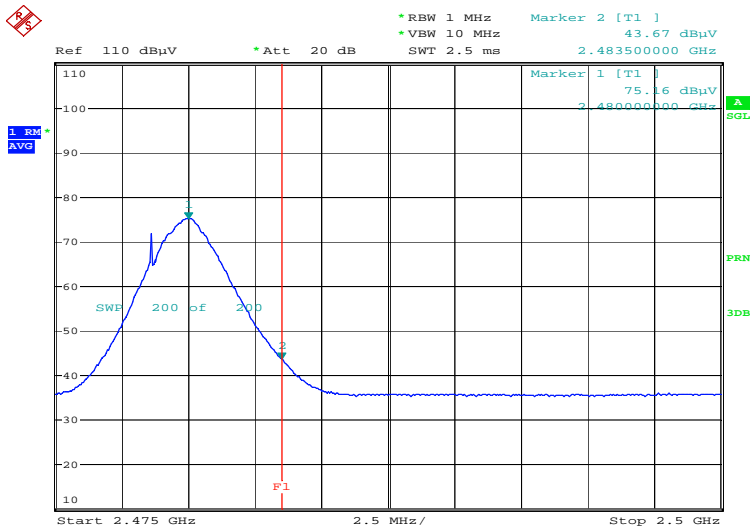
Detector mode:Peak

Polarity:Vertical



Detector mode:Average

Polarity:Vertical



10.5 Test Data for Bluetooth (EDR)

Test Date : 5-Sep-18

Measurement Distance : 3 m

Frequency (MHz)	Reading (dB μ V)	Position (V/H)	Height (m)	Correction Factor		Result Value		
				Ant Factor (dB)	Cable (dB)	Limit (dB μ V/m)	Result (dB μ V/m)	Margin (dB)
41.30	15.58	V	1.0	13.20	0.95	40.00	29.74	10.26
345.80	7.86	H	1.2	14.60	2.91	46.00	25.37	20.63
350.10	12.97	V	1.2	14.78	2.93	46.00	30.68	15.32
480.00	13.41	H	1.4	17.40	3.45	46.00	34.26	11.74
Remark	<p>H : Horizontal, V : Vertical Bluetooth (EDR , 39 CH , 2 441 MHz)</p> <p>*CL = Cable Loss(In case of below 1 000 MHz)</p> <p>*The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection at frequency below 1 GHz.</p> <p>*Result Value = Reading + Ant Factor + Cable loss</p> <p>*Margin = Limit - Result</p>							

10.5-1 Test Data for Bluetooth(EDR)

Test Date : 5-Sep-18

Measurement Distance : 3 m

Frequency (MHz)	Reading (dBμV)	Position (V/H)	Height (m)	Correction Factor		Duty Cycle Correction (dB)	Result Value		
				Ant Factor (dB)	Cable (dB)		Limit (dBμV/m)	Result (dBμV/m)	Margin (dB)
PEAK(RBW:1 MHz VBW:3 MHz)									
2351.60	50.47	H	1.5	27.69	-30.00	0.00	74.00	48.17	25.83
2347.20	50.58	V	1.4	27.71	-30.01	0.00	74.00	48.29	25.71
4804.00	54.39	H	1.5	31.60	-27.16	0.00	74.00	54.76	19.24
4804.00	53.35	V	1.6	31.60	-27.16	0.00	74.00	53.17	20.83
Average (RBW:1 MHz VBW:1 kHz)									
2356.20	38.35	H	1.5	27.68	-29.99	1.09	54.00	37.13	16.87
2358.40	38.57	V	1.7	27.67	-29.98	1.09	54.00	37.34	16.66
4804.00	35.15	H	1.5	31.60	-27.16	1.09	54.00	40.68	13.32
4804.00	35.14	V	1.7	31.60	-27.16	1.09	54.00	40.67	13.33
Remark	H : Horizontal, V : Vertical TEST MODE : Bluetooth EDR-CH0 (2 402 MHz)								
	*The TX signal wasn't detected from 3th harmonics.								
	*Result Value = Reading + Ant Factor + Cable loss - Amplifier Gain + Duty Cycle Correction Factor								
	*Margin = Limit - Result								

10.5-2 Test Data for Bluetooth(EDR)

Test Date : 5-Sep-18

Measurement Distance : 3 m

Frequency (MHz)	Reading (dB μ V)	Position (V/H)	Height (m)	Correction Factor		Duty Cycle Correction (dB)	Result Value		
				Ant Factor (dB)	Cable (dB)		Limit (dB μ V/m)	Result (dB μ V/m)	Margin (dB)
PEAK(RBW:1 MHz VBW:3 MHz)									
4882.00	55.22	H	1.6	31.60	-27.23	0.00	74.00	59.59	14.41
4882.00	52.90	V	1.7	31.60	-27.23	0.00	74.00	57.27	16.73
Average(RBW:1 MHz VBW:1 kHz)									
4882.00	35.42	H	1.5	31.60	-27.23	1.09	54.00	40.88	13.12
4882.00	35.41	V	1.7	31.60	-27.23	1.09	54.00	40.87	13.13
Remark	<div>H : Horizontal, V : Vertical TEST MODE : Bluetooth EDR-CH0 (2 441 MHz)</div> <div>*The TX signal wasn't detected from 3th harmonics. *Result Value = Reading + Ant Factor + Cable loss - Amplifier Gain + Duty Cycle Correction Factor *Margin = Limit - Result</div>								

10.5-3 Test Data for Bluetooth(EDR)

Test Date : 5-Sep-18

Measurement Distance : 3 m

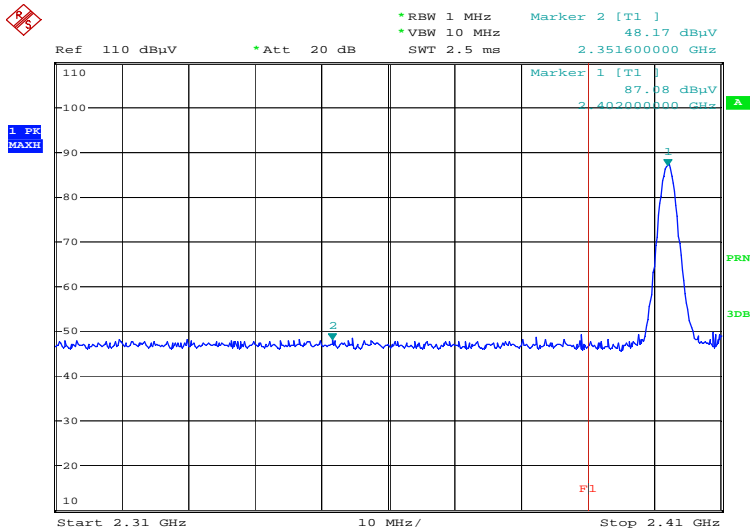
Frequency (MHz)	Reading (dBμV)	Position (V/H)	Height (m)	Correction Factor		Duty Cycle Correction (dB)	Result Value		
				Ant Factor (dB)	Cable (dB)		Limit (dBμV/m)	Result (dBμV/m)	Margin (dB)
PEAK(RBW:1 MHz VBW:3 MHz)									
2483.50	58.25	H	1.5	27.58	-29.77	0.00	74.00	56.07	17.93
2483.50	58.19	V	1.6	27.58	-29.77	0.00	74.00	56.01	17.99
4960.00	54.39	H	1.6	31.66	-27.09	0.00	74.00	53.20	20.80
4960.00	53.35	V	1.6	31.66	-27.09	0.00	74.00	53.23	20.77
Average (RBW:1 MHz VBW:1 kHz)									
2483.50	40.14	H	1.5	27.58	-29.77	1.09	54.00	39.05	14.95
2483.50	49.51	V	1.6	27.58	-29.77	1.09	54.00	48.42	5.58
4960.00	35.63	H	1.6	31.66	-27.09	1.09	54.00	41.29	12.71
4960.00	35.62	V	1.7	31.66	-27.09	1.09	54.00	41.28	12.72
Remark	<div>H : Horizontal, V : Vertical TEST MODE : Bluetooth EDR-CH0 (2 480 MHz)</div> <div>*The TX signal wasn't detected from 3th harmonics.</div> <div>*Result Value = Reading + Ant Factor + Cable loss - Amplifier Gain + Duty Cycle Correction Factor</div> <div>*Margin = Limit - Result</div>								

10.6 Restricted Band Edges for BT(EDR)

Band Edges(CH Low)

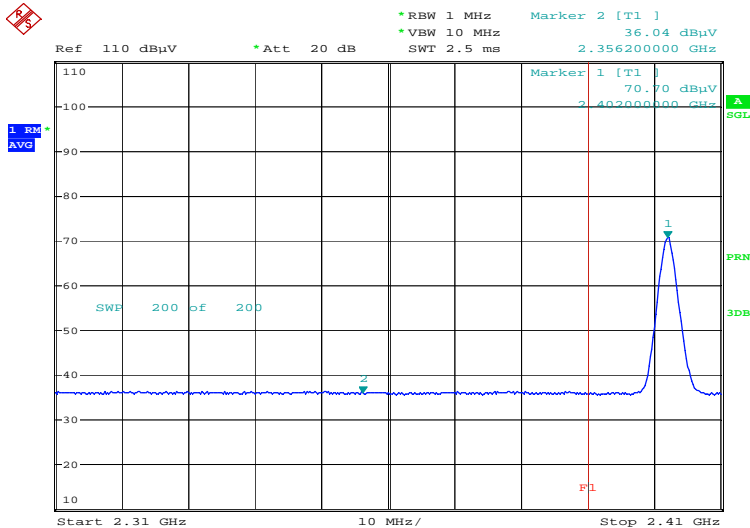
Detector mode:Peak

Polarity:Horizontal



Detector mode:Average

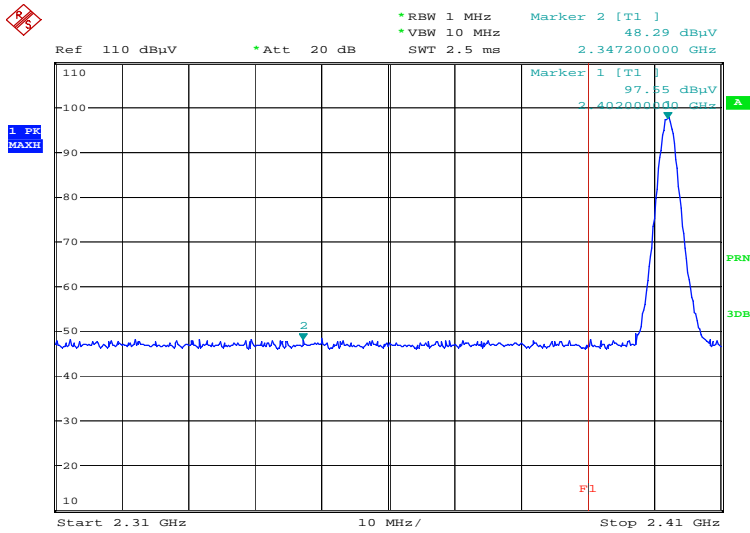
Polarity:Horizontal



Band Edges(CH Low)

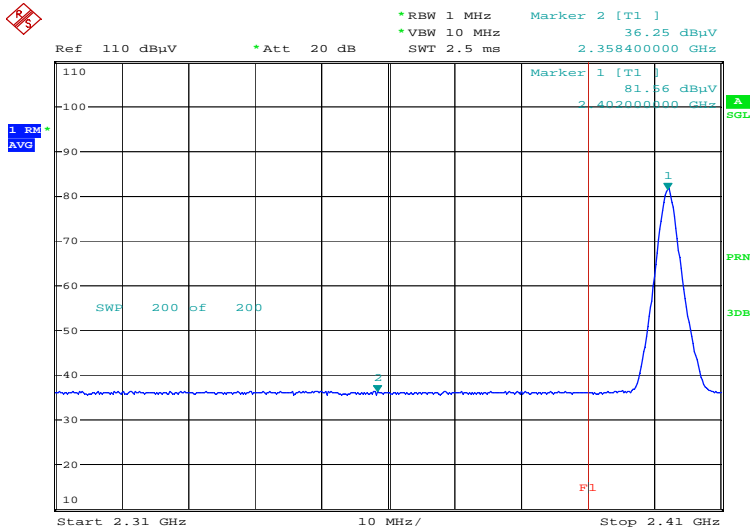
Detector mode:Peak

Polarity:Vertical



Detector mode:Average

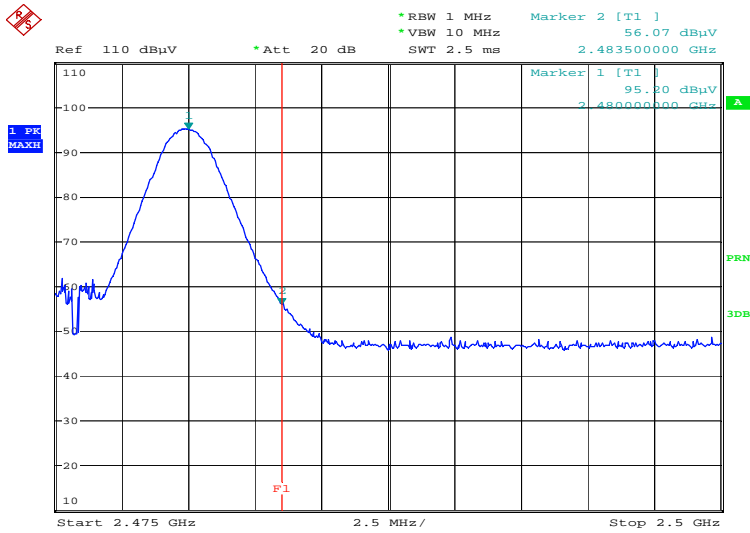
Polarity:Vertical



Band Edges(CH High)

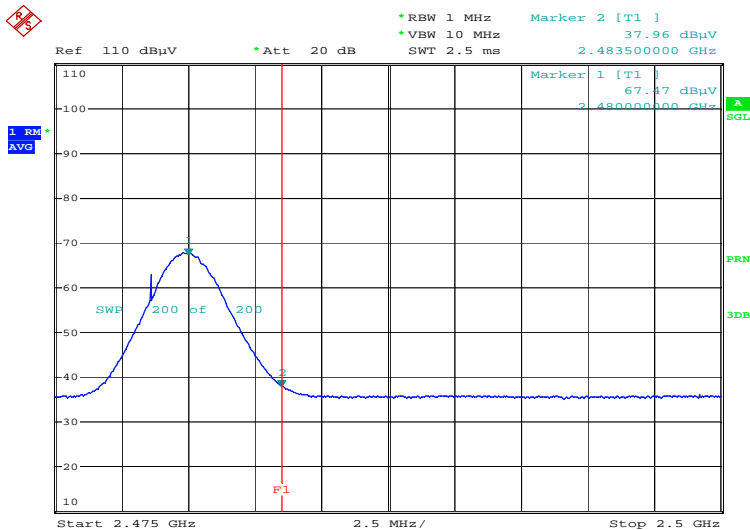
Detector mode:Peak

Polarity:Horizontal



Detector mode:Average

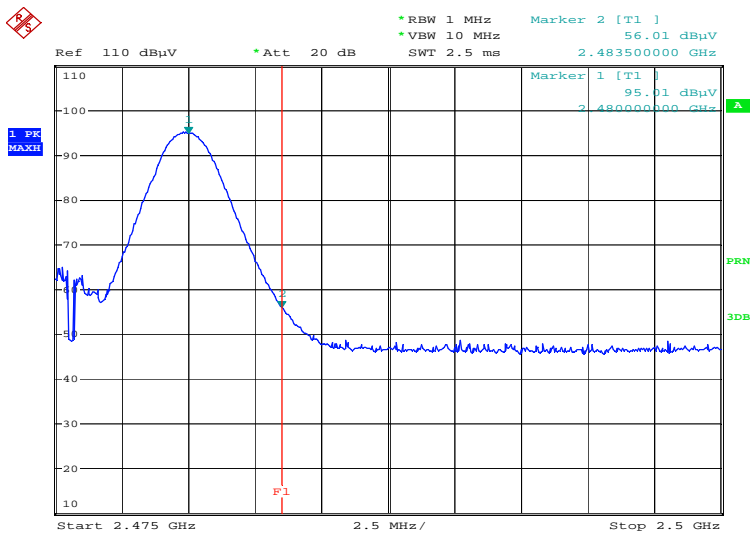
Polarity:Horizontal



Band Edges(CH High)

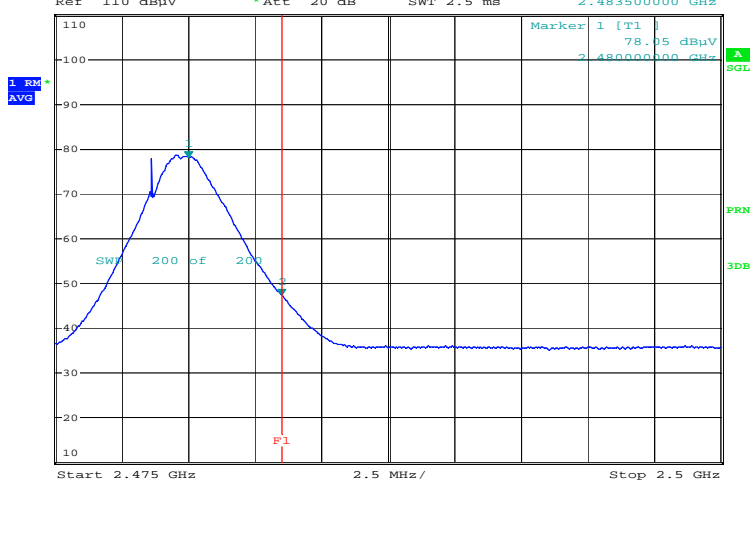
Detector mode:Peak

Polarity:Vertical



Detector mode:Average

Polarity:Vertical



11. Measurement of conducted disturbance

The continuous disturbance voltage of AC Mains in the frequency from 0.15 MHz to 30 MHz was measured in accordance to FCC PART 15.207. The test setup was made according to ANSI C 63.4 (2009) in a shielded room. The EUT was placed on a non-conductive table at least 0.8 m above the ground plan. A grounded vertical reference plane was positioned in a distance of 0.4 m from the EUT. The distance from the EUT to other metal surfaces was at least 0.8 m. The EUT was only earthen by its power cord through the line impedance stabilizing network. The power cord has been bundled to a length of 1.0 m. The test receiver with Quasi Peak detector complies with CISPR 16.

11.1 Measurement equipments

Equipment Name	Type	Manufacturer	Serial No.	Next Calibration date
TEST RECEIVER	ESPI	Rohde & Schwarz	100005	31-Oct-18
LISN	ESH3-Z5	Rohde & Schwarz	836679/025	31-Oct-18
Pulse Limiter	ESH3Z2	Rohde & Schwarz	NONE	31-Oct-18

11.2 Environmental Condition

Test Place : Shielded Room

BT Basic Mode

Temperature (°C) : 22.5 °C

Humidity (% R.H.) : 43.6 % R.H.

BT EDR Mode

Temperature (°C) : 22.3 °C

Humidity (% R.H.) : 47.1 % R.H.

11.3-1 Test Data for Bluetooth

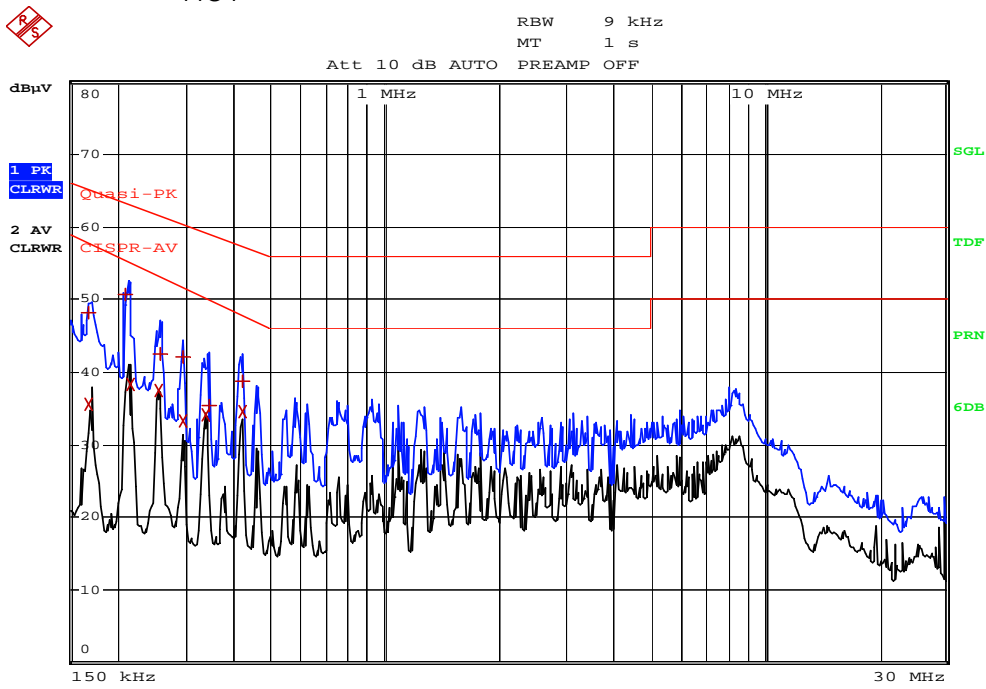
Test Date : 6-Sep-18

Frequency (MHz)	Correction Factor		Line (H/N)	Quasi-peak Value			Average Value		
	Lisn (dB)	Cable (dB)		Limit (dB μ V)	Reading (dB μ V)	Result (dB μ V)	Limit (dB μ V)	Reading (dB μ V)	Result (dB)
0.17	0.15	0.19	H	65.06	48.24	48.58	55.06	35.61	35.95
0.21	0.15	0.19	N	63.09	47.12	47.46	53.09	39.53	39.87
0.34	0.16	0.20	H	59.30	35.29	35.65	49.30	34.21	34.57
0.42	0.16	0.21	H	57.45	36.23	36.61	47.45	27.27	27.65
Remark	H : Hot Line, N : Neutral Line TEST MODE : Bluetooth Basic Rate CH39 (2 441 MHz) *Correction Factor = Lisn + Cable *Result = Correction Factor + Reading								

Appendix 1. Special diagram for Bluetooth

Bluetooth

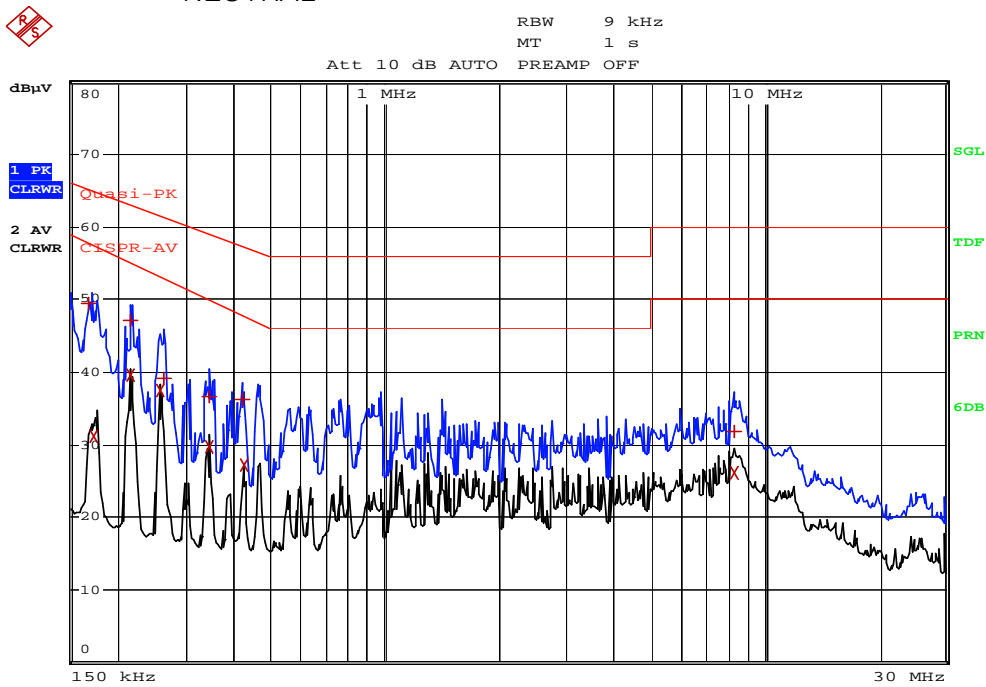
*HOT



Special diagram for Bluetooth

Bluetooth

*NEUTRAL



Appendix 2. Antenna Requirement

1. Antenna Requirement

1.1 Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.24

1.2 Antenna Connected Construction

The antenna types used in this product are Intergrated Carrier antenna .
The maximum Gain of this antenna is -2 dBi.