FCC Report

Bluetooth 2.1+EDR

Product Description: MID

Trade Mark: QUO

Model No.: QD3Gme-710-SL, QD3Gme-710-GD

FCC ID: 2AAPW-QD3GME-710-SL

Applicant: KBX GROUP

Address: AVENIDA 1ERA. CALLE B Y C MANZANA 58, FRANCE FIELD COLON PANAMA

Applicable standards:	FCC CFR Title 47 Part 15 Subpart C Section 15.247:2014
Test Date:	08 ~ 26 May, 2015
Issued Date:	26 May, 2015
Test Result:	Complied

James Wu

James Wu
Laboratory Manager

The test result in this test report relate only to the tested samples in this report .

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2 Version

Version No.	*Date*	*Description*
00	*26 May, 2015*	*Original*

Prepared By:	***Young Li*** ***Project Engineer***	***Date:***	*26 May, 2015*
Check By:	***Dixon Hao*** ***Reviewer***	***Date:***	*26 May, 2015*

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4 Test Summary

Test Item	Test Method	Result
Antenna Requirement	15.203/15.247 (c)	Complied
Conducted Emission	15.207	Complied
Conducted Peak Output Power	15.247 (b)(1)	Complied
20dB Occupied Bandwidth	15.247 (a)(1)	Complied
Carrier Frequencies Separation	15.247 (a)(1)	Complied
Hopping Channel Number	15.247 (a)(1)	Complied
Dwell Time	15.247 (a)(1)	Complied
Pseudorandom Frequency Hopping Sequence	15.247(b)(4)&TCB Exclusion List	Complied
Radiated Emission	15.205/15.209	Complied

Complied: The EUT has complied with the essential requirements in the standard.

5 General Information

5.1 Client Information

Applicant:	KBX GROUP
Address:	AVENIDA 1ERA. CALLE B Y C MANZANA 58, FRANCE FIELD COLON PANAMA
Manufacturer:	KBX GROUP
Address:	AVENIDA 1ERA. CALLE B Y C MANZANA 58, FRANCE FIELD COLON PANAMA

5.2 General Description of EUT

Product Name:	MID
Brand Mark:	QUO
Model No.:	QD3Gme-710-SL, QD3Gme-710-GD
Test model No.:	QD3Gme-710-SL
Software Version:	V1.0
Hardware Version:	V1.0
Bluetooth	
Bluetooth Version:	V2.1+EDR
Operation Frequency:	2402MHz~2480MHz
Channel numbers:	79
Channel separation:	1MHz
Modulation type:	Frequency Hopping Spread Spectrum (FHSS)
Modulation technology:	GFSK, Pi/4QPSK, 8DPSK
Antenna Type:	Integral Antenna
Antenna Gain:	1.00dBi (declare by Applicant)
AC Adapter:	Model: JHD-AP012U-050200AB Input: AC 100~240V 50/60Hz 0.35A Output: DC 5.0V 2.0A
Power supply:	lithium-ion charge battery 3.7V

Operation Frequency each of channel							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2402MHz	21	2422MHz	41	2442MHz	61	2462MHz
2	2403MHz	22	2423MHz	42	2443MHz	62	2463MHz
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
18	2419MHz	38	2439MHz	58	2459MHz	78	2479MHz
19	2420MHz	39	2440MHz	59	2460MHz	79	2480MHz
20	2421MHz	40	2441MHz	60	2461MHz		

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Test channel	Frequency (MHz)
Lowest channel	2402
Middle channel	2441
Highest channel	2480

5.3 Test Mode

Bluetooth mode	Keep the EUT in communicating mode with Bluetooth device.
Non-hopping mode	Keep the EUT in continuously transmitting mode of modulation with the fix frequency.
Hopping mode	Keep the EUT in continuously transmitting mode of modulation with hopping.

5.4 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **CNAS —Registration No.: CNAS L5775**

  CNAS has accredited Global United Technology Services Co., Ltd. to ISO/IEC 17025 General Requirements for the competence of testing and calibration laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

- **FCC —Registration No.: 600491**

  Global United Technology Services Co., Ltd., Shenzhen EMC Laboratory has been registered and fuly described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in files. Registration 600491

- **Industry Canada (IC) —Registration No.: 9079A-2**

  The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 9079A-2.

5.5 Test Location

All tests were performed at:

Global United Technology Services Co., Ltd.

Address: 2nd Floor, Block No.2, Laodong Industrial Zone, Xixiang Road Baoan District, Shenzhen, China

6 Test Instruments list

Instrument	Manufacturer	Model No.	Inventory No.	Next Cal. Date
3m Semi- Anechoic Chamber	ZhongYu Electron	9.2(L)*6.2(W)* 6.4(H)	GTS250	Mar. 27 2016
Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A
EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	Jun. 30 2015
BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	Feb. 22 2016
Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	9120D-829	GTS208	June 26 2015
Horn Antenna	ETS-LINDGREN	3160	GTS217	Mar. 27 2016
EMI Test Software	AUDIX	E3	N/A	N/A
Coaxial Cable	GTS	N/A	GTS213	Mar. 27 2016
Coaxial Cable	GTS	N/A	GTS211	Mar. 27 2016
Coaxial cable	GTS	N/A	GTS210	Mar. 27 2016
Coaxial Cable	GTS	N/A	GTS212	Mar. 27 2016
Amplifier(100kHz-3GHz)	HP	8347A	GTS204	Jun. 30 2015
Amplifier(2GHz-20GHz)	HP	8349B	GTS206	Jun. 30 2015
Pre-amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June 26 2015
Band filter	Amindeon	82346	GTS219	Mar. 27 2016
Universal radio communication tester	Rohde & Schwarz	CMU200	GTS235	Mar. 27 2016
Signal Generator	Rohde & Schwarz	SML03	GTS236	Mar. 27 2016
Temp. Humidity/ Barometer	Oregon Scientific	BA-888	GTS248	Mar. 27 2016
D.C. Power Supply	Instek	PS-3030	GTS232	NA
Splitter	Agilent	11636B	GTS237	Mar. 27 2016

Conducted Emission

Instrument	Manufacturer	Model No.	Inventory No.	Next Cal. Date
Shielding Room	ZhongYu Electron	7.0(L)x3.0(W)x3.0(H)	GTS264	Sep. 06 2015
EMI Test Receiver	Rohde & Schwarz	ESCS30	GTS223	Jun. 30 2015
10dB Pulse Limita	Rohde & Schwarz	N/A	GTS224	Jun. 30 2015
Coaxial Switch	ANRITSU CORP	MP59B	GTS225	Jun. 30 2015
LISN	SCHWARZBECK MESS-ELEKTRONIK	NSLK 8127	GTS226	Jun. 30 2015
Coaxial Cable	GTS	N/A	GTS227	Jun. 30 2015
EMI Test Software	AUDIX	E3	N/A	N/A

7 Measurement Data and Test Results

7.1 Antenna requirement

☞ **Standard requirement**

According to Standard: FCC Part15 C Section 15.203 /247(c)

15.203 requirement:

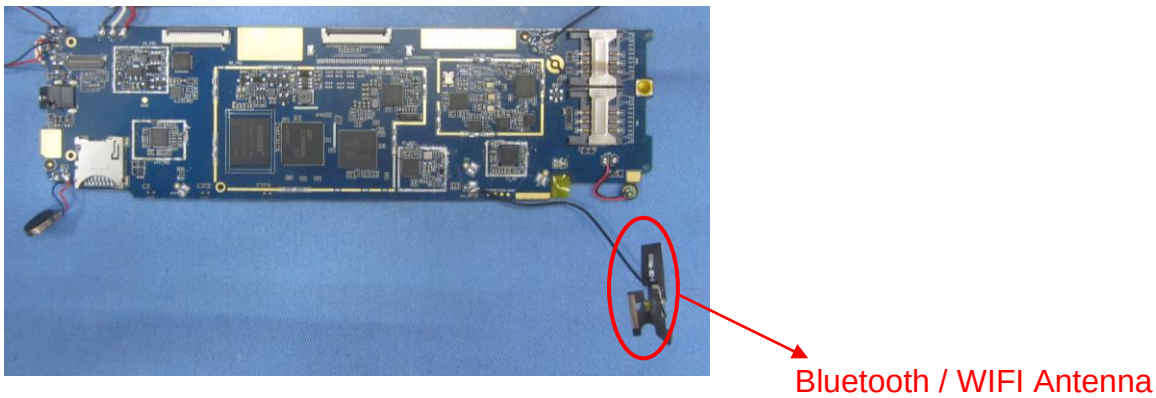
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

15.247(c) (1)(i) requirement:

(i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

☞ **EUT Antenna:**

The antenna is unique integral Antenna, the typical gain of the antenna is 1dBi.



7.2 Conducted Emissions

Standard requirement

FCC Part15 C Section 15.207

Test method

ANSI C63.4:2009

Receiver set

RBW=9KHz, VBW=30KHz, Sweep time=auto

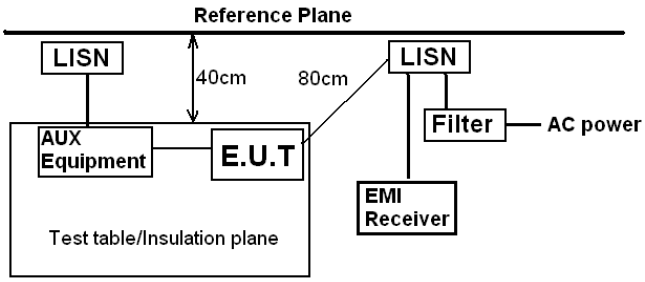
Limit

Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

Test mode

Refer to section 5.3 for details

Test setup



Remark:
E.U.T: Equipment Under Test
LISN: Line Impedence Stabilization Network
Test table height=0.8m

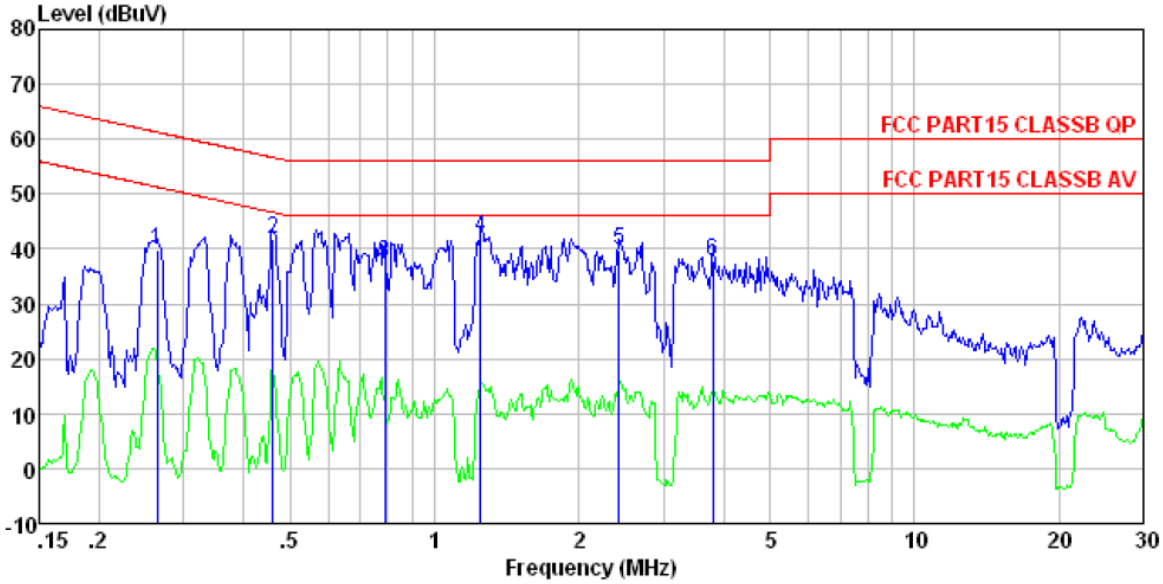
Test mode

1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment.
2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs).
3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4: 2009 on conducted measurement.

Test Result

Complied

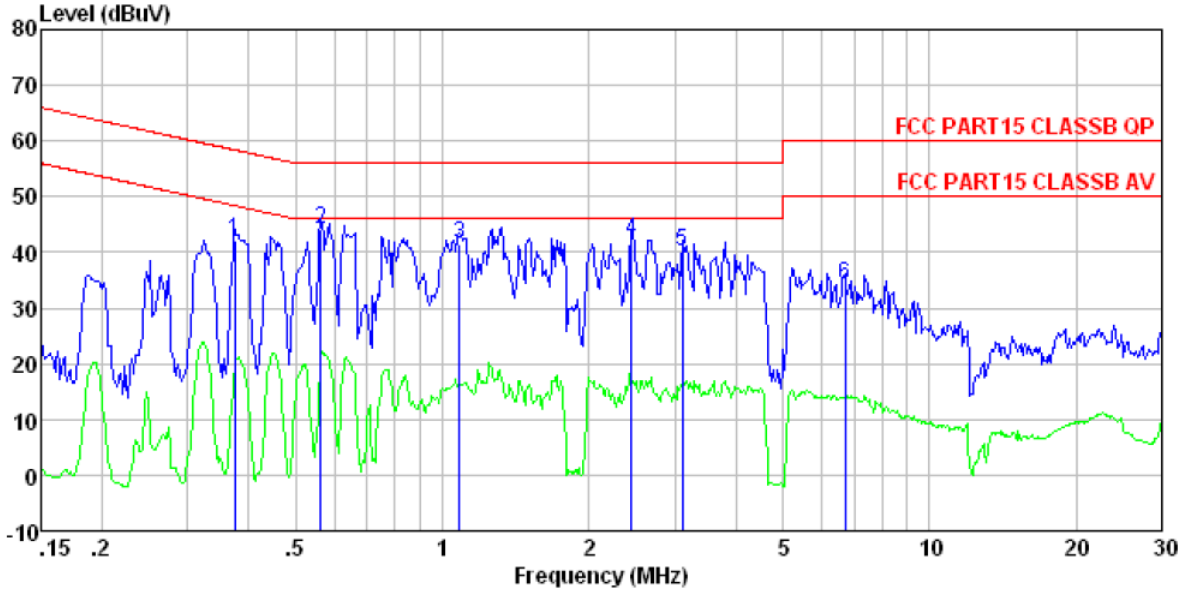
Test mode:	Bluetooth mode	Temperature:	24~26℃
Phase Polarity:	Line	Relative Humidity:	50~53%



Condition: FCC PART15 CLASSB QP LISN-2013 LINE
Test mode: Bluetooth mode

	Freq	Read Level	LISN Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	0.264	39.52	0.11	0.11	39.74	61.29	-21.55	QP
2	0.461	41.45	0.12	0.11	41.68	56.67	-14.99	QP
3	0.788	37.22	0.14	0.13	37.49	56.00	-18.51	QP
4	1.249	41.89	0.13	0.13	42.15	56.00	-13.85	QP
5	2.422	39.45	0.13	0.15	39.73	56.00	-16.27	QP
6	3.799	37.46	0.19	0.15	37.80	56.00	-18.20	QP

Test mode:	Bluetooth mode	Temperature:	24~26℃
Phase Polarity:	Nertral	Relative Humidity:	50~53%



Condition: FCC PART15 CLASSB QP LISN-2013 NEUTRAL
Test mode: Bluetooth mode

	Freq	Read Level	LISN Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	0.375	42.03	0.06	0.10	42.19	58.39	-16.20	QP
2	0.564	43.91	0.07	0.12	44.10	56.00	-11.90	QP
3	1.082	41.25	0.08	0.13	41.46	56.00	-14.54	QP
4	2.448	41.78	0.10	0.15	42.03	56.00	-13.97	QP
5	3.107	39.76	0.12	0.15	40.03	56.00	-15.97	QP
6	6.698	33.82	0.18	0.16	34.16	60.00	-25.84	QP

Notes:

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level =Receiver Read level + LISN Factor + Cable Loss

7.3 Conducted Peak Output Power

- **Standard requirement**

  FCC Part15 C Section 15.247 (b)(3)

- **Test method**

  ANSI C63.4:2009 and KDB DA00-705

- **Receiver set**

  RBW=1MHz, VBW=1MHz, Detector=Peak

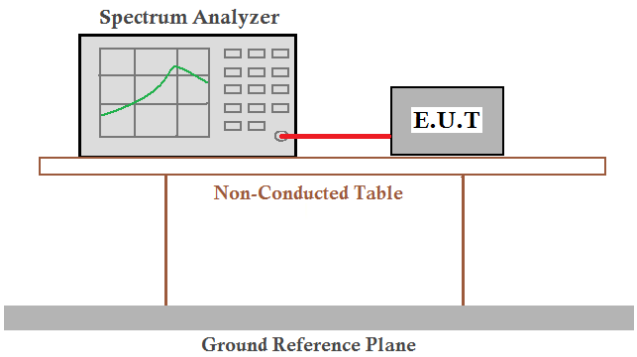
- **Limit**

  30dBm

- **Test mode**

  Refer to section 5.3 for details

- **Test setup**



- **Test Result** **Complied**

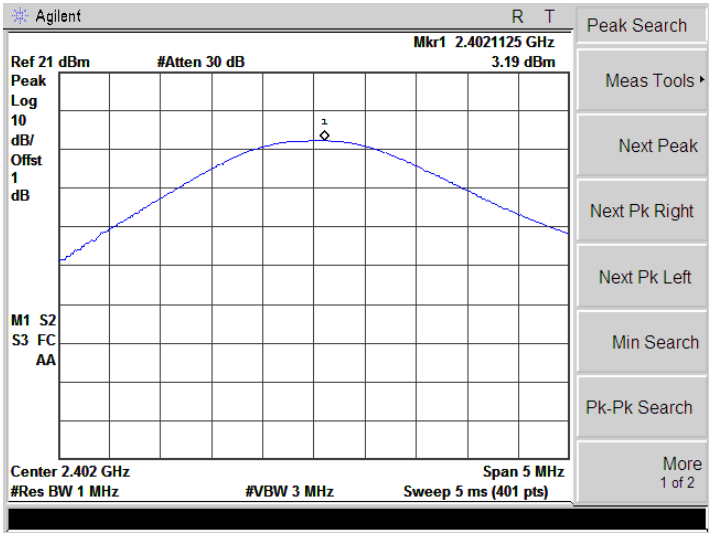
Measurement Data

GFSK mode			
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	3.19	30.00	Pass
Middle	3.33	30.00	Pass
Highest	3.35	30.00	Pass
Pi/4QPSK mode			
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	2.29	30.00	Pass
Middle	2.46	30.00	Pass
Highest	2.54	30.00	Pass
8DPSK mode			
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	2.30	30.00	Pass
Middle	2.31	30.00	Pass
Highest	2.42	30.00	Pass

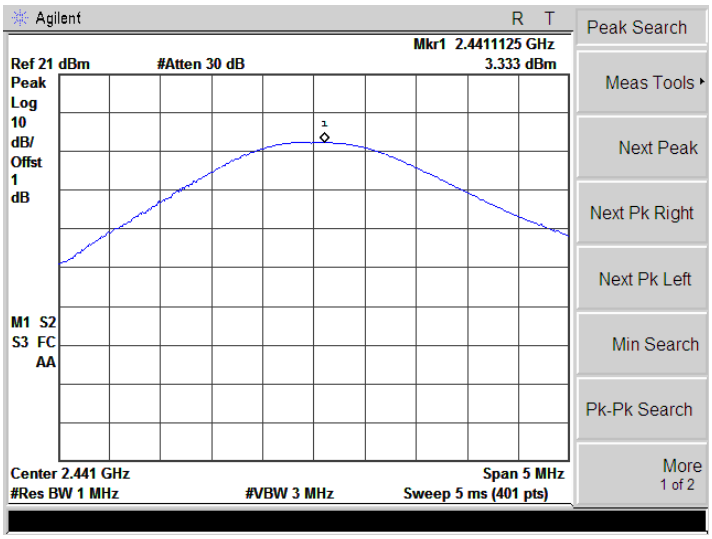
GFSK mode			
Test channel	Avearge Output Power (dBm)	Limit (dBm)	Result
Lowest	0.38	N/A	N/A
Middle	0.82	N/A	N/A
Highest	1.27	N/A	N/A
Pi/4QPSK mode			
Test channel	Avearge Output Power (dBm)	Limit (dBm)	Result
Lowest	-0.76	N/A	N/A
Middle	-0.45	N/A	N/A
Highest	0.51	N/A	N/A
8DPSK mode			
Test channel	Avearge Output Power (dBm)	Limit (dBm)	Result
Lowest	-1.61	N/A	N/A
Middle	-0.83	N/A	N/A
Highest	-0.13	N/A	N/A

Modulation	GFSK

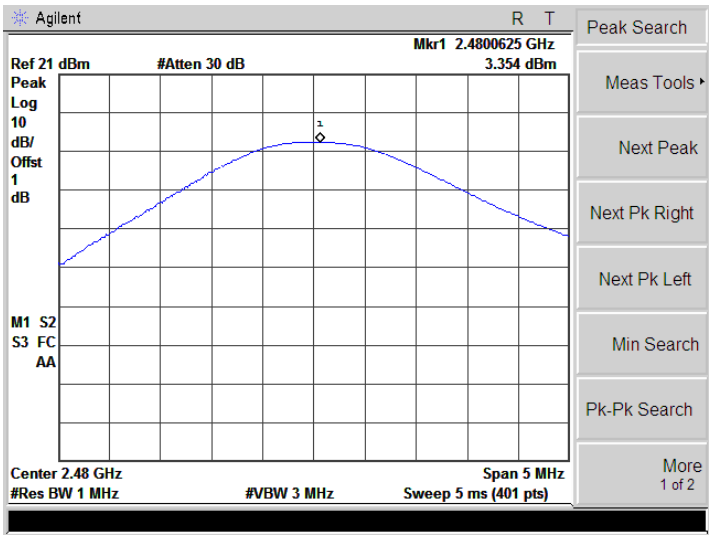
Lowest channel:



Middle channel:

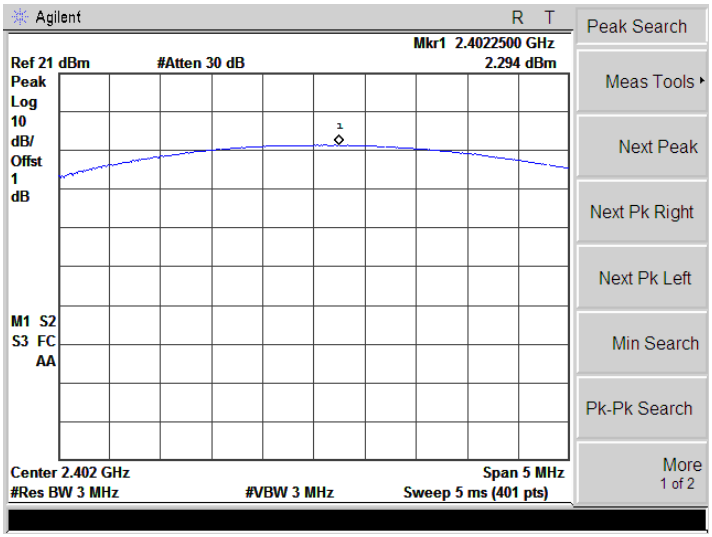


Highest channel:

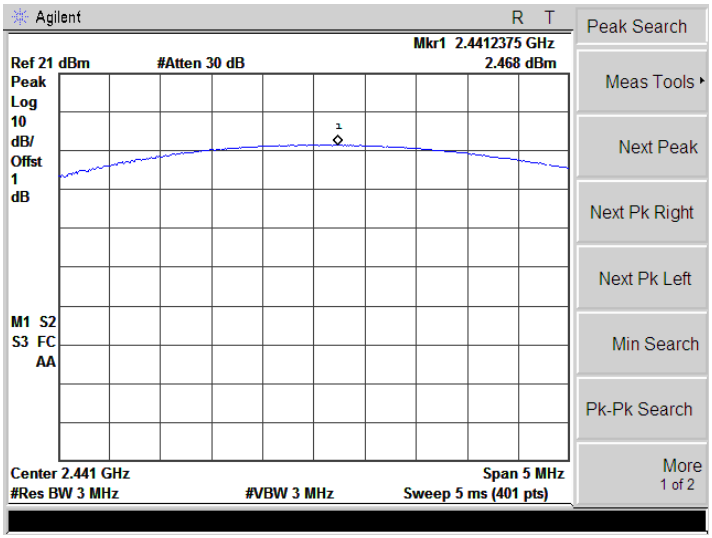


Modulation	Pi/4QPSK

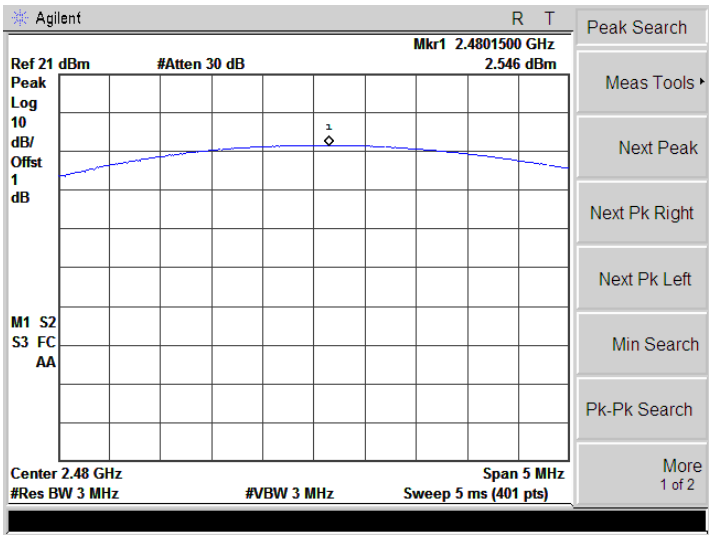
Lowest channel:



Middle channel:

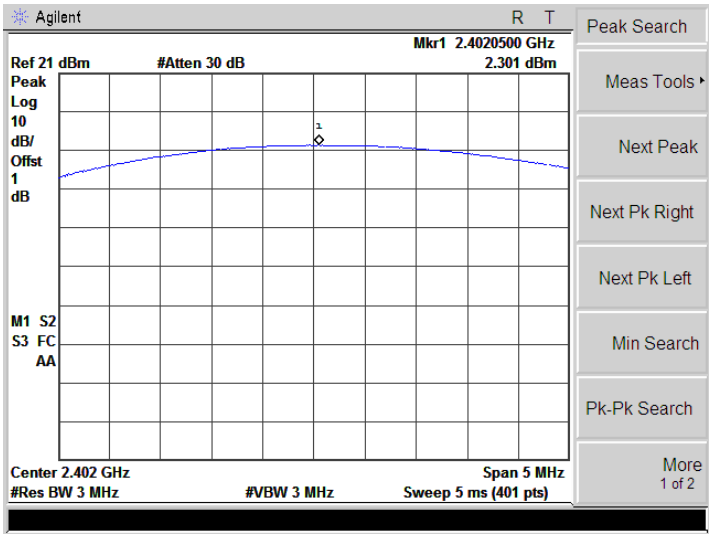


Highest channel:

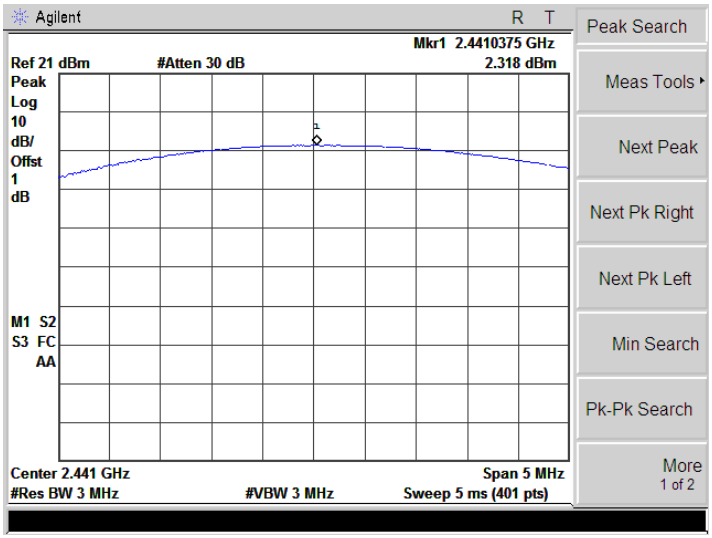


Modulation	8DPSK

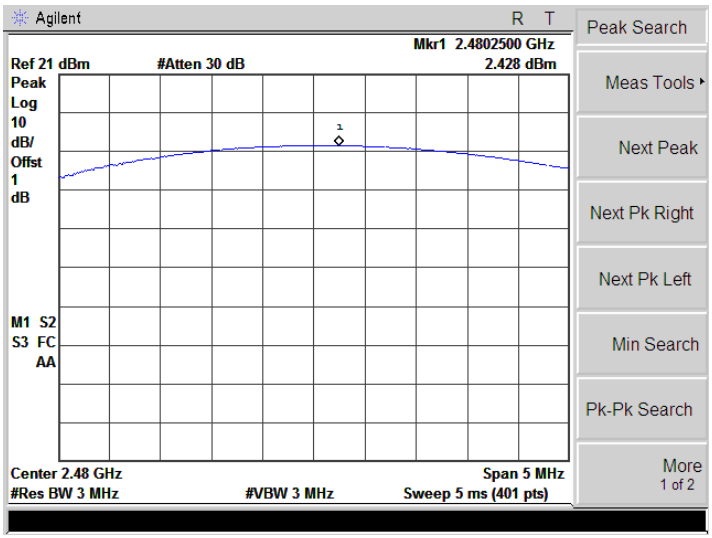
Lowest channel:



Middle channel:



Highest channel:



7.4 20dB Occupy Bandwidth

☞ **Standard requirement**

FCC Part15 C Section 15.247 (a)(1)

☞ **Test method**

ANSI C63.4:2009 and KDB DA00-705

☞ **Receiver set**

RBW=100KHz, VBW=300KHz,detector=Peak

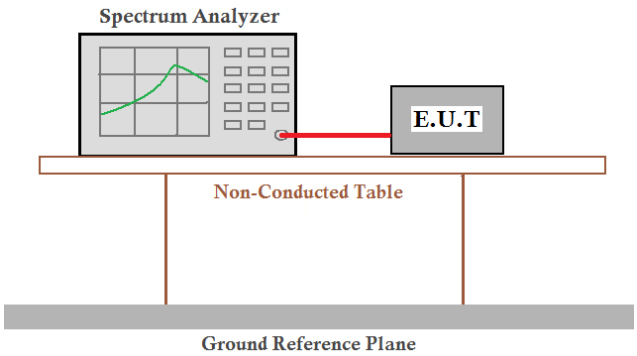
☞ **Limit**

NA

☞ **Test mode**

Refer to section 5.3 for details

☞ **Test setup**



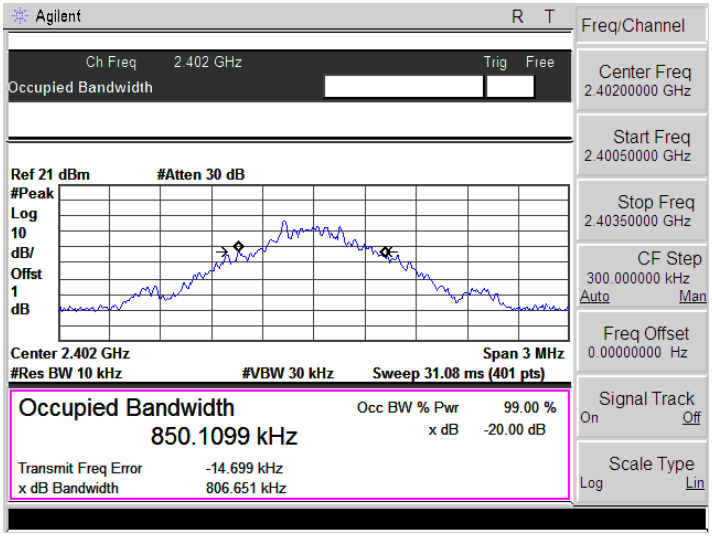
☞ **Test Result** **Complied**

Measurement Data

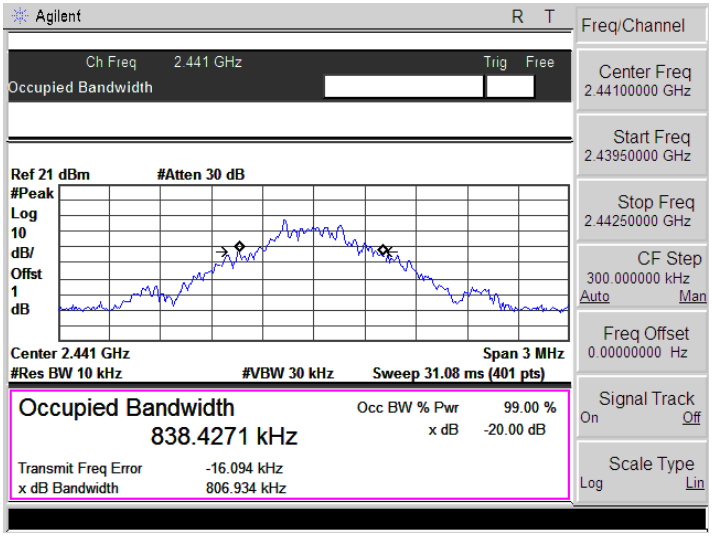
Test channel	20dB Occupy Bandwidth (MHz)		
	GFSK	Pi/4QPSK	8DPSK
Lowest	0.806	1.129	1.158
Middle	0.806	1.139	1.159
Highest	0.805	1.131	1.164

Modulation	GFSK

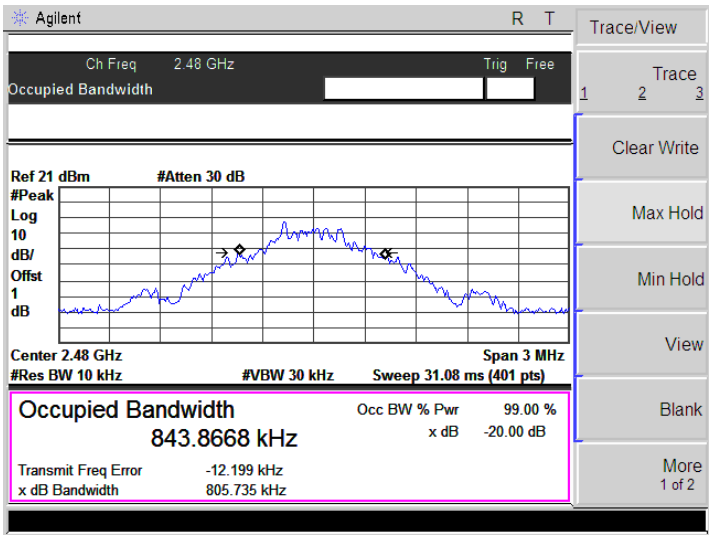
Lowest channel:



Middle channel:

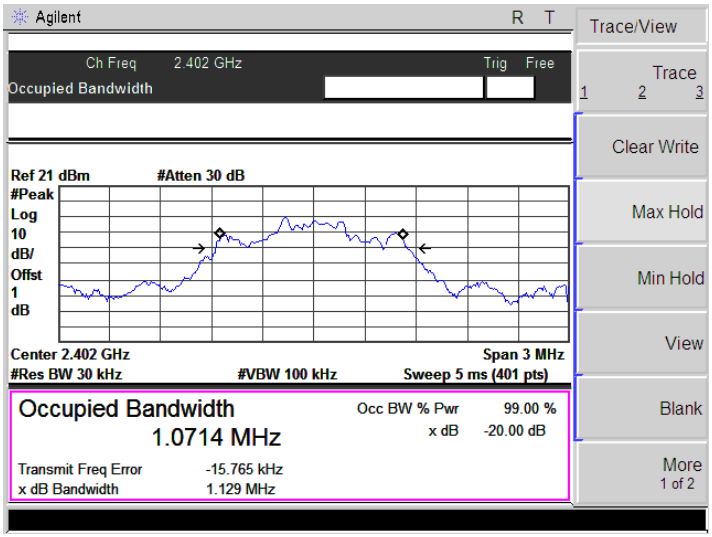


Highest channel:

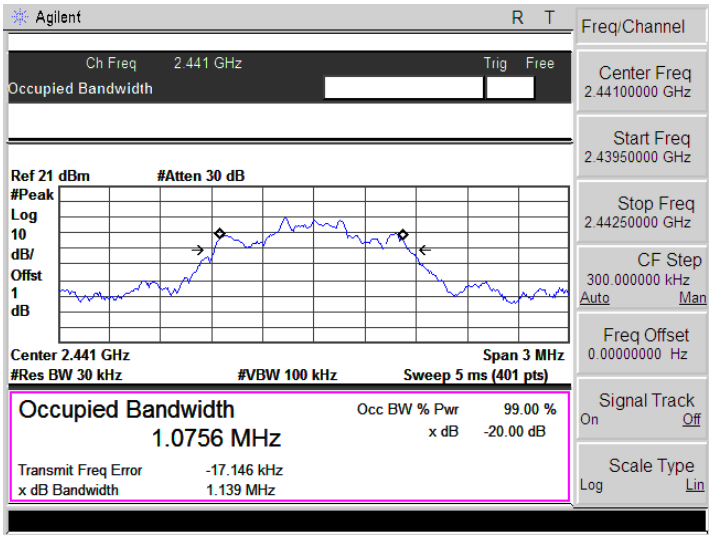


Modulation	Pi/4QPSK

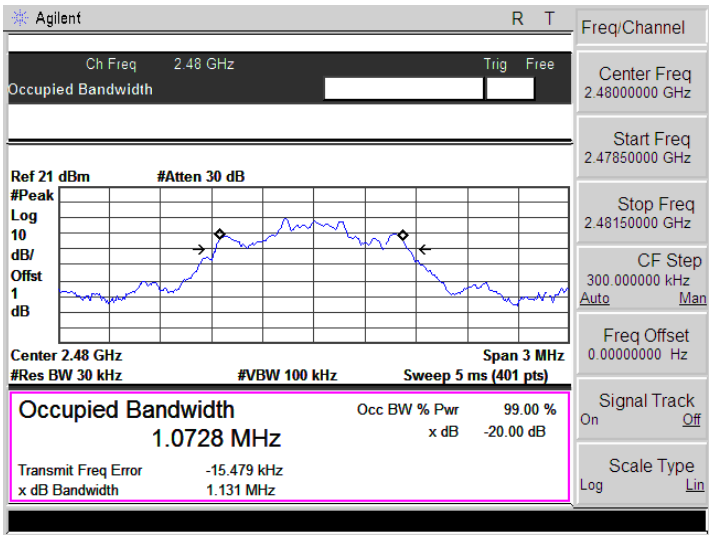
Lowest channel:



Middle channel:

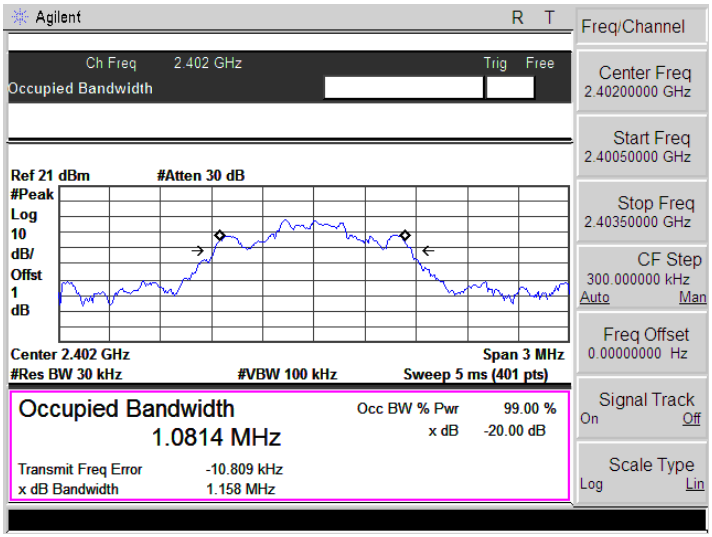


Highest channel:

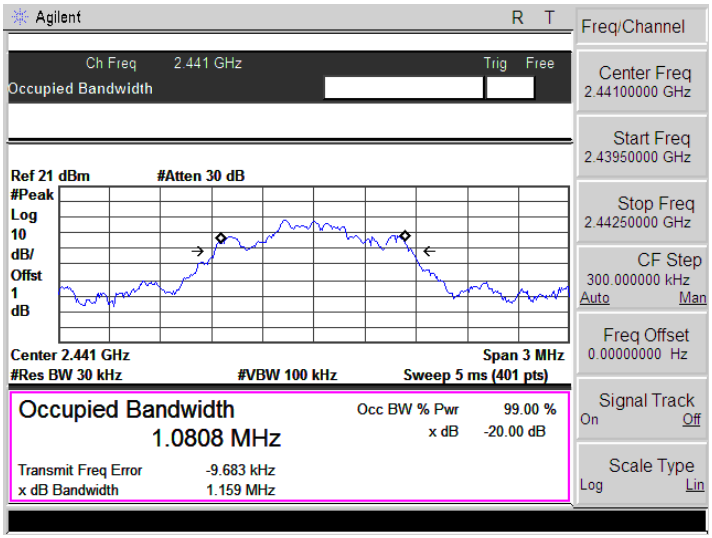


Modulation	8DPSK

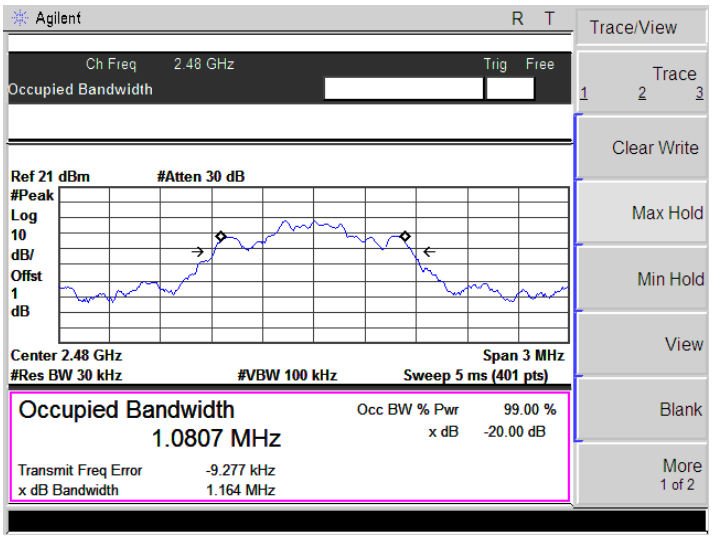
Lowest channel:



Middle channel:



Highest channel:



7.5 Carrier Frequencies Separation

☞ **Standard requirement**

FCC Part15 C Section 15.247 (a)(1)

☞ **Test method**

ANSI C63.4:2009 and KDB DA00-705

☞ **Receiver set**

RBW=100KHz, VBW=300KHz, detector=Peak

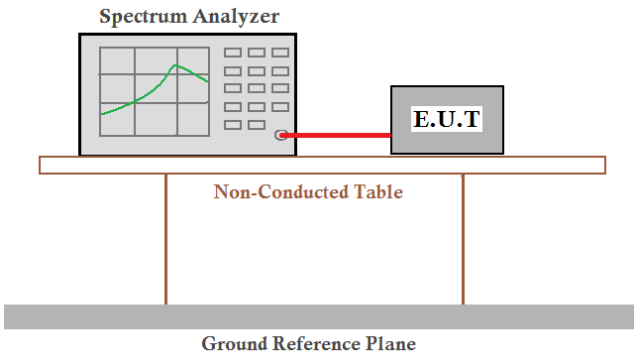
☞ **Limit**

0.025MHz or 2/3 of the 20dB bandwidth (whichever is greater)

☞ **Test mode**

Refer to section 5.3 for details

☞ **Test setup**

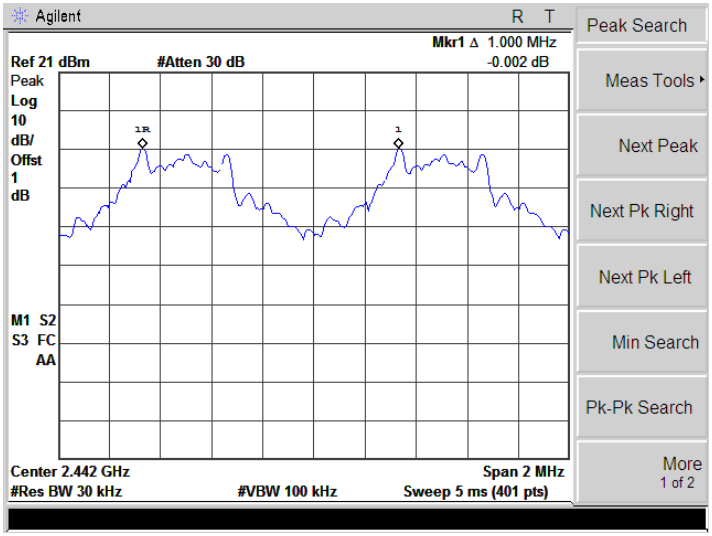


☞ **Test Result** **Complied**

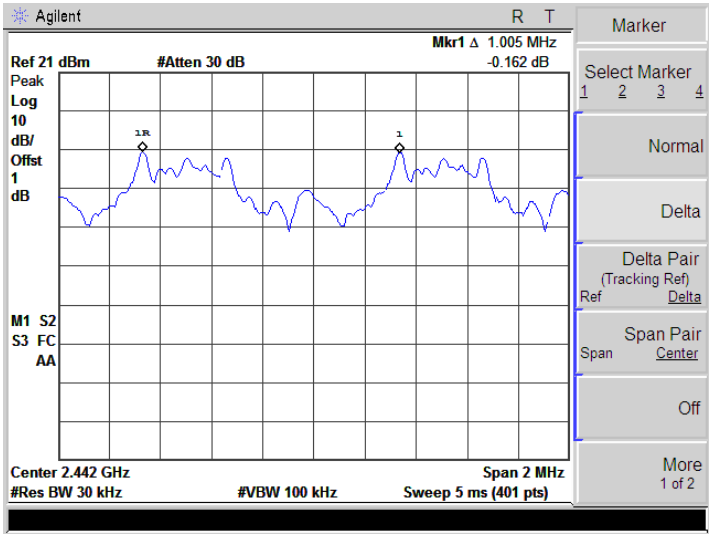
Measurement Data

Modulation type	*Channel*	*Carrier Frequencies Separation (MHz)*	*Limit (MHz)*	*Result*
GFSK	*39*	*1.000*	*0.806*	*Pass*
π/4DQPSK	*39*	*1.005*	*0.759*	*Pass*
8DPSK	*39*	*1.000*	*0.776*	*Pass*

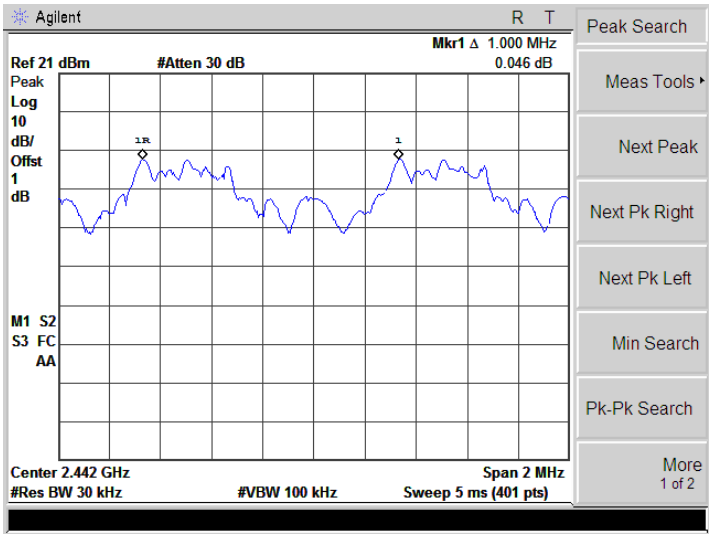
GFSK:



π/4DQPSK:



8DPSK:



7.6 Hopping Channel Number

☞ **Standard requirement**

FCC Part15 C Section 15.247 (a)(1)

☞ **Test method**

ANSI C63.4:2009 and KDB DA00-705

☞ **Receiver set**

RBW=100KHz, VBW=300KHz, detector=Peak

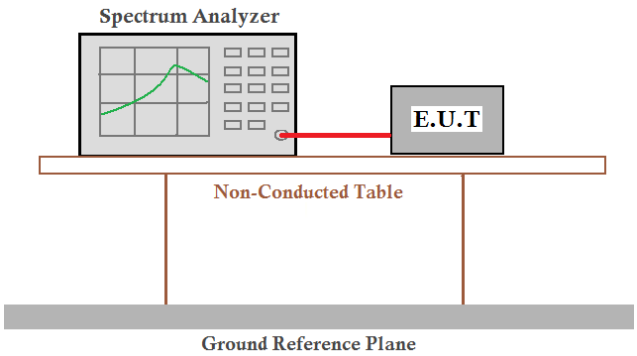
☞ **Limit**

15channels

☞ **Test mode**

Refer to section 5.3 for details

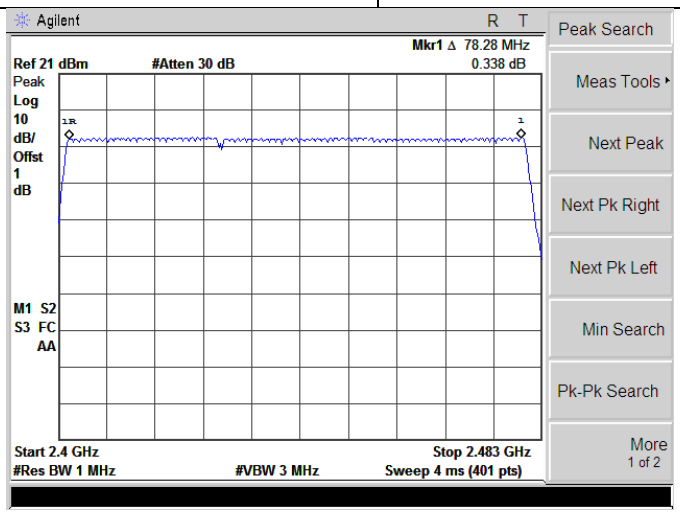
☞ **Test setup**



☞ **Test Result** **Complied**

Measurement Data

Mode	Hopping channel numbers	Limit	Result
GFSK Pi/4QPSK 8DPSK	79	15	Pass



7.7 Dwell time

☞ **Standard requirement**

FCC Part15 C Section 15.247 (a)(1)

☞ **Test method**

ANSI C63.4:2009 and KDB DA00-705

☞ **Receiver set**

RBW=1MHz, VBW=1MHz, Span=0Hz, Detector=Peak

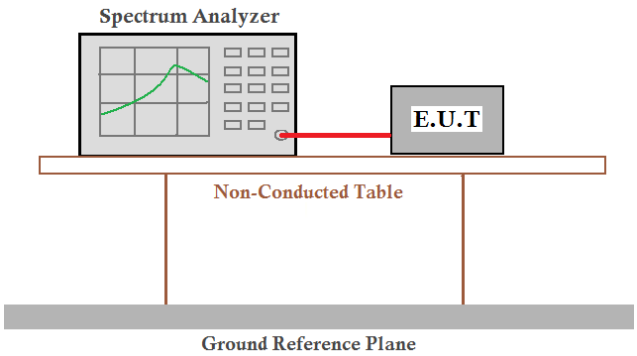
☞ **Limit**

0.4 Second

☞ **Test mode**

Refer to section 5.3 for details

☞ **Test setup**



☞ **Test Result** **Complied**

Measurement Data

Mode	Packet	Dwell time (Second)	Limit (Second)	Result
GFSK	DH1/2-DH1/3-DH1	0.128	0.40	Pass
Pi/4QPSK	DH3/2-DH3/3-DH3	0.260	0.40	Pass
8DPSK	DH5/2-DH5/3-DH5	0.310	0.40	Pass

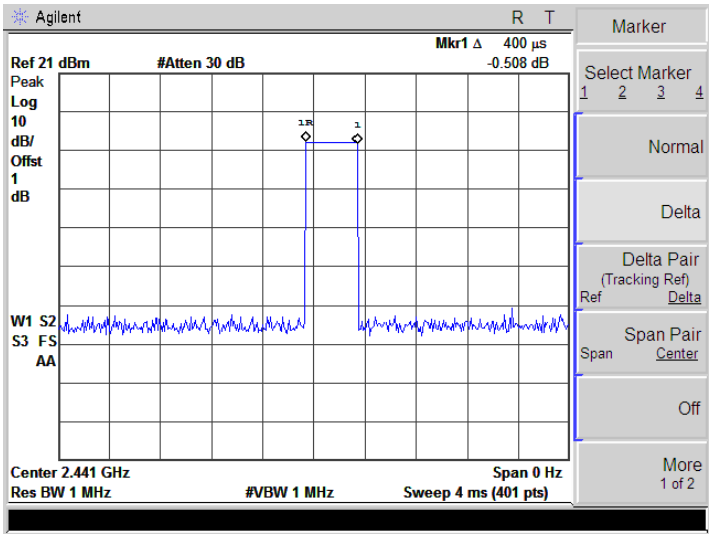
Dwell time

DH1/2-DH1/3-DH1 time slot=0.400(ms)*(1600/ (2*79))*31.6=0.128s

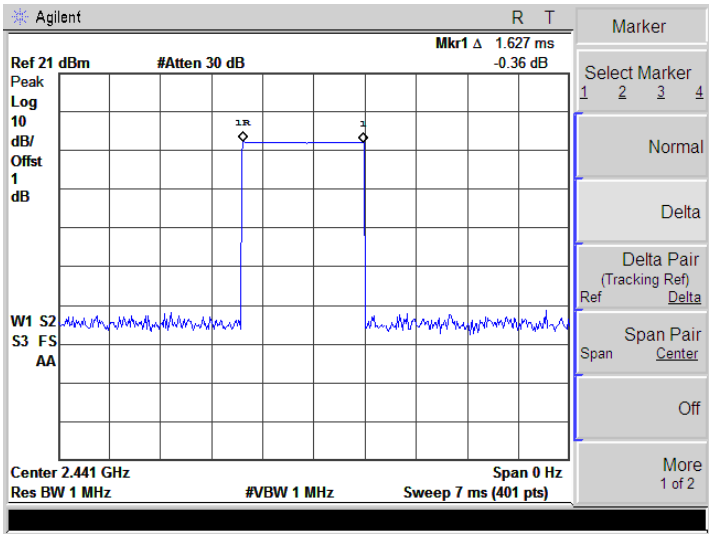
DH3/2-DH3/3-DH3 time slot=1.627(ms)*(1600/ (4*79))*31.6=0.260s

DH5/2-DH5/3-DH5 time slot=2.905 (ms)*(1600/ (6*79))*31.6=0.310s

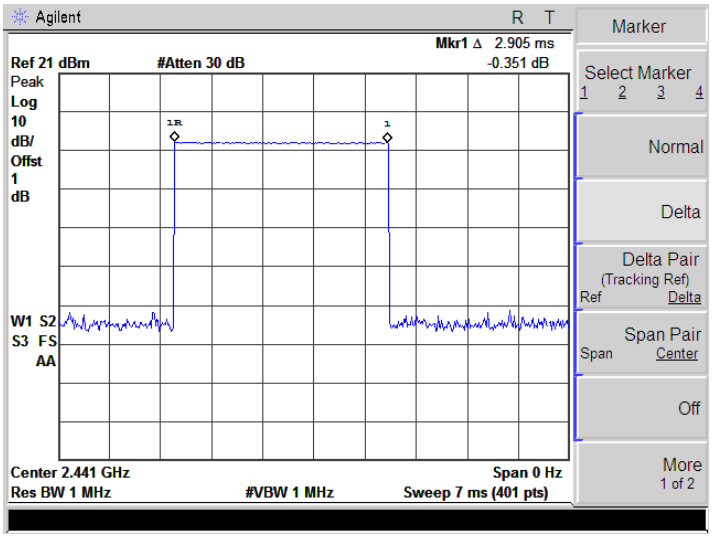
DH1/2-DH1/3-DH1:



DH3/2-DH3/3-DH3:



DH5/2-DH5/3-DH5:



7.8 Pseudorandom Frequency Hopping Sequence

☞ Standard requirement

FCC Part15 C Section 15.247 (a)(1)

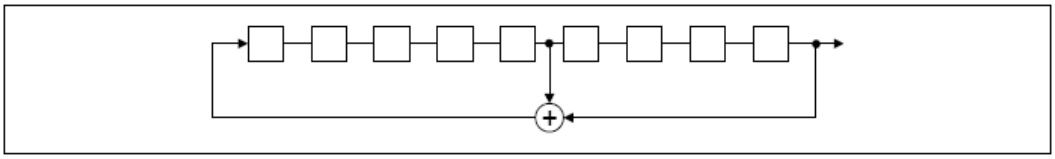
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

Alternatively. Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a Pseudorandom ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

☞ EUT Pseudorandom Frequency Hopping Sequence

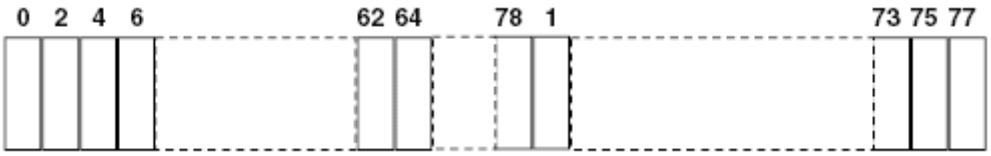
The pseudorandom sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first ONE of 9 consecutive ONEs; i.e. the shift register is initialized with nine ones.

- *Number of shift register stages: 9*
- *Length of pseudo-random sequence: 2^9 -1 = 511 bits*
- *Longest sequence of zeros: 8 (non-inverted signal)*



Linear Feedback Shift Register for Generation of the PRBS sequence

An example of Pseudorandom Frequency Hopping Sequence as follow:



Each frequency used equally on the average by each transmitter.

The system receivers have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shift frequencies in synchronization with the transmitted signals.

7.9 Band Edge

7.9.1 Conducted Emission Method

☞ **Test method**

FCC Part15 C Section 15.247 (d)

☞ **Test method**

ANSI C63.4:2009 and KDB DA00-705

☞ **Receiver set**

RBW=100kHz, VBW=300kHz, Detector=Peak

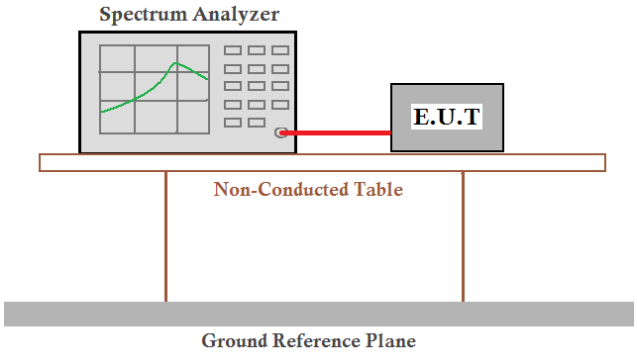
☞ **Limit**

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

☞ **Test mode**

Refer to section 5.3 for details

☞ **Test setup**

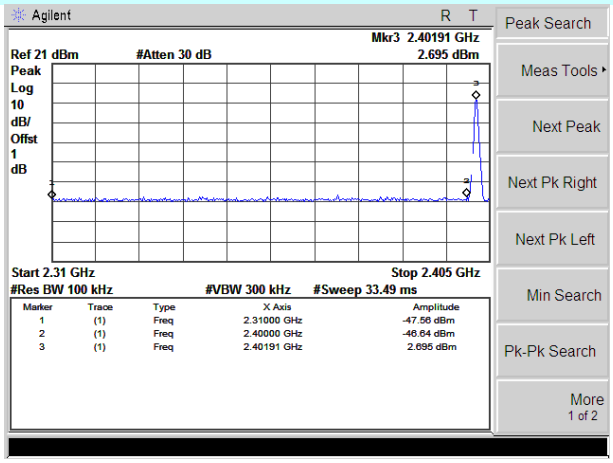


☞ **Test Result** **Complied**

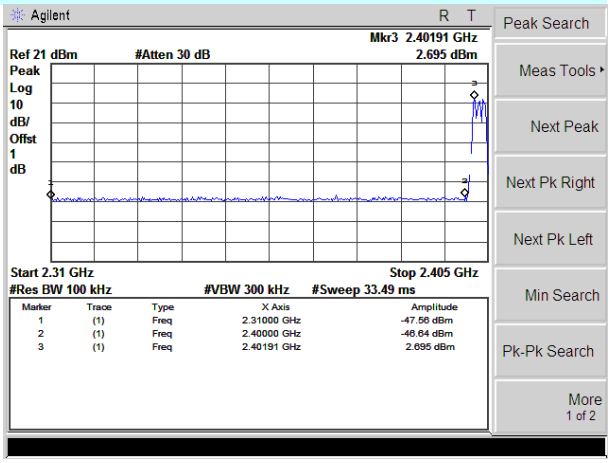
Remark:

During the test, pre-scan the GFSK, Pi/4QPSK, 8DPSK modulation, and found the GFSK modulation which it is worse case, so only show the test data of worse case modulation on the test report.

Test channel: Lowest channel

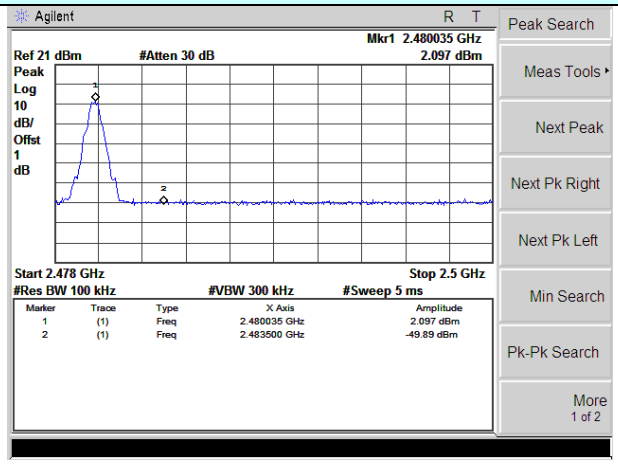


No-hopping mode

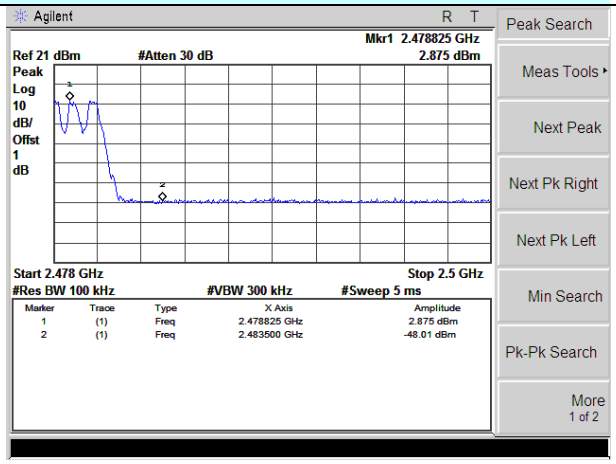


Hopping mode

Test channel: Highest channel



No-hopping mode



Hopping mode

7.9.2 Radiated Emission Method

☞ **Test method**

FCC Part15 C Section 15.209 and 15.205

☞ **Test method**

ANSI C63.4:2009

☞ **Receiver set**

Frequency	Detector	RBW	VBW	Remark
Above 1GHz	Peak	1MHz	3MHz	Peak Value
	Peak	1MHz	10Hz	Average Value

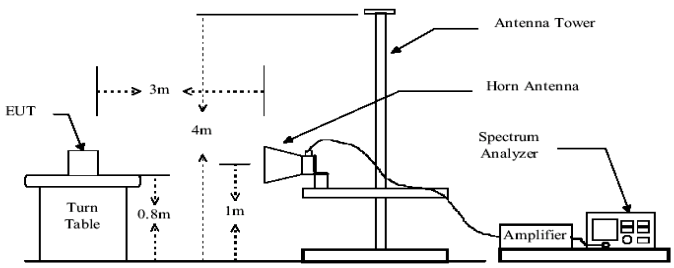
☞ **Limit**

Frequency	Limit (dBuV/m @3m)	Remark
Above 1GHz	54.00	Average Value
	74.00	Peak Value

☞ **Test mode**

Refer to section 5.3 for details

☞ **Test setup**



☞ **Test Procedure**

1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

☞ **Test Result** **Complied**

Remark:

During the test, pre-scan the GFSK, Pi/4QPSK, 8DPSK modulation, and found the GFSK modulation which it is worse case, so only show the test data of worse case modulation on the test report.

Test channel:	Lowest

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2310.00	46.65	27.59	5.38	30.18	49.44	74.00	-24.56	Vertical
2390.00	55.18	27.58	5.39	30.18	57.97	74.00	-16.03	Vertical
2310.00	47.18	27.59	5.38	30.18	49.97	74.00	-24.04	Horizontal
2390.00	57.62	27.58	5.39	30.18	60.41	74.00	-13.59	Horizontal

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2310.00	36.37	27.59	5.38	30.18	39.16	54.00	-14.84	Vertical
2390.00	41.32	27.58	5.39	30.18	44.11	54.00	-9.89	Vertical
2310.00	36.25	27.59	5.38	30.18	39.04	54.00	-14.96	Horizontal
2390.00	43.25	27.58	5.39	30.18	46.04	54.00	-7.96	Horizontal

Test channel:	Highest

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2483.50	50.21	27.53	5.47	29.93	53.28	74.00	-20.72	Vertical
2500.00	45.28	27.55	5.49	29.93	48.39	74.00	-25.61	Vertical
2483.50	51.00	27.53	5.47	29.93	54.07	74.00	-19.93	Horizontal
2500.00	46.24	27.55	5.49	29.93	49.35	74.00	-24.65	Horizontal

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2483.50	40.57	27.53	5.47	29.93	43.64	54.00	-10.36	Vertical
2500.00	35.19	27.55	5.49	29.93	38.30	54.00	-15.70	Vertical
2483.50	41.87	27.53	5.47	29.93	44.94	54.00	-9.06	Horizontal
2500.00	35.05	27.55	5.49	29.93	38.16	54.00	-15.84	Horizontal

Remark:

1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *The emission levels of other frequencies are very lower than the limit and not show in test report.*

7.10 Spurious Emission

7.10.1 Conducted Emission Method

☞ **Test method**

FCC Part15 C Section 15.247 (d)

☞ **Test method**

ANSI C63.4:2009 and KDB DA00-705

☞ **Receiver set**

RBW=100kHz, VBW=300kHz, Detector=Peak

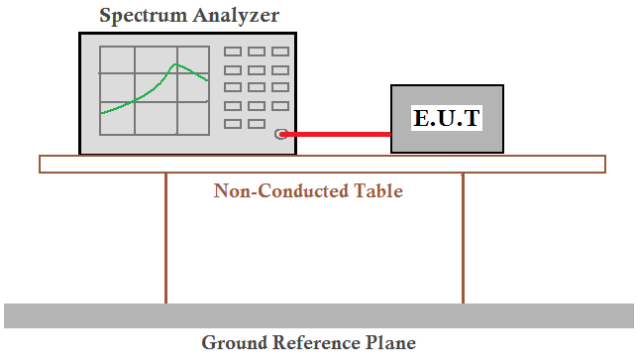
☞ **Limit**

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

☞ **Test mode**

Refer to section 5.3 for details

☞ **Test setup**

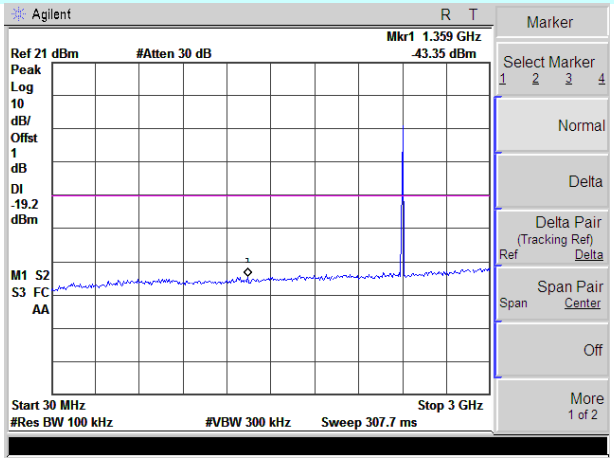


☞ **Test Result** **Complied**

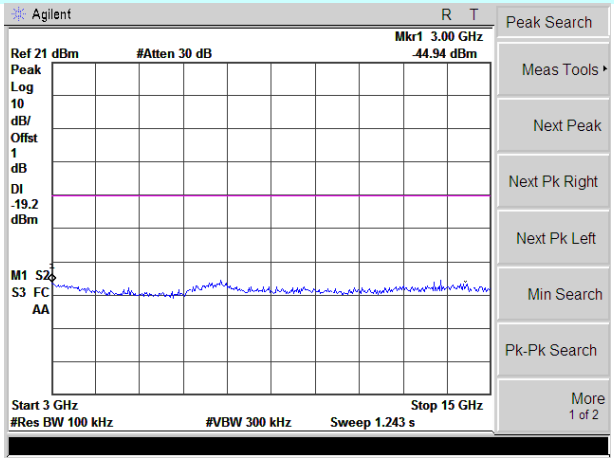
Remark:

During the test, pre-scan the GFSK, Pi/4QPSK, 8DPSK modulation, and found the GFSK modulation which it is worse case, so only show the test data of worse case modulation on the test report.

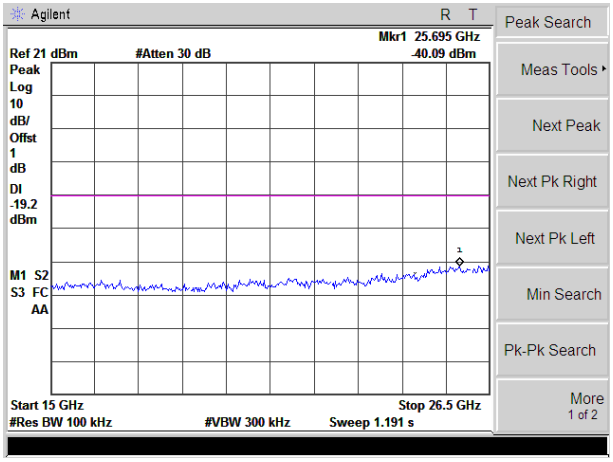
Test channel: Lowest channel



30MHz~3GHz

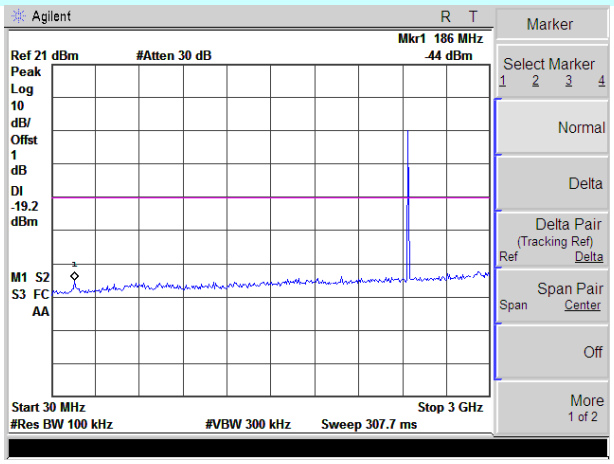


3GHz~15GHz

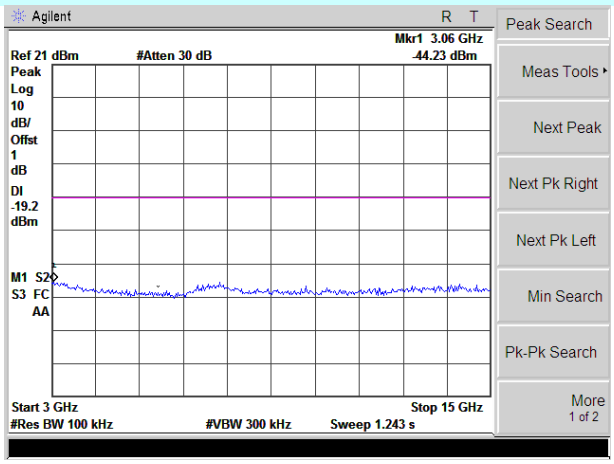


15GHz~25GHz

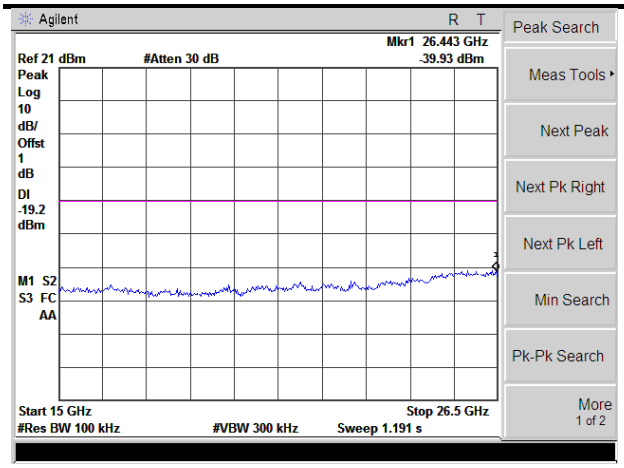
Test channel: Middle channel



30MHz~3GHz

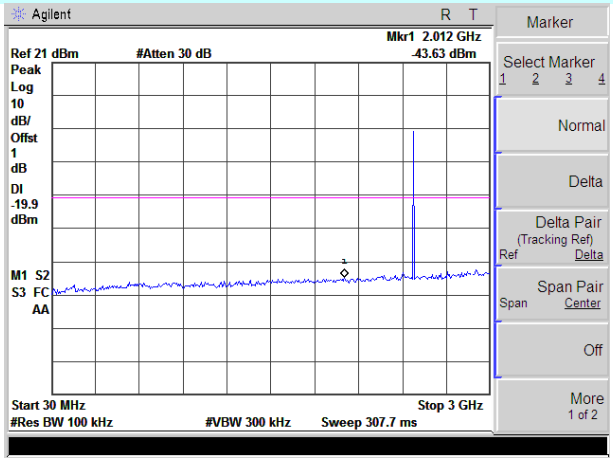


3GHz~15GHz



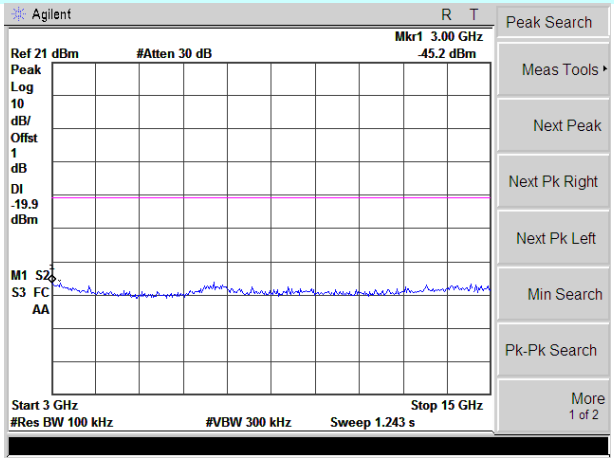
15GHz~25GHz

Test channel:

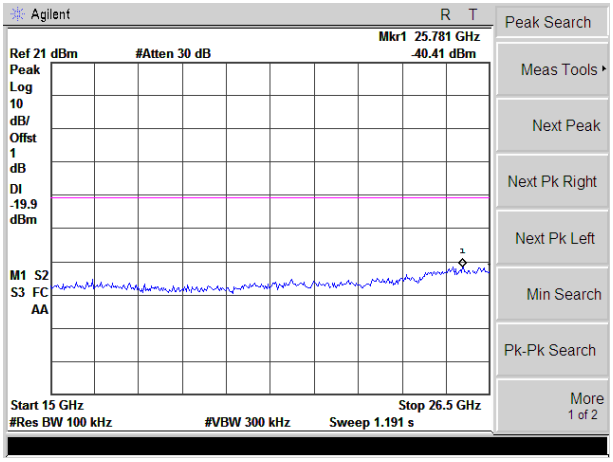


30MHz~3GHz

Highest channel



3GHz~15GHz



15GHz~25GHz

7.10.2 Radiated Emission Method

☞ **Test method**

FCC Part15 C Section 15.209 and 15.205

☞ **Test method**

ANSI C63.4:2009

☞ **Receiver set**

Frequency	Detector	RBW	VBW	Remark
30MHz-1GHz	Quasi-peak	100KHz	300KHz	Quasi-peak Value
Above 1GHz	Peak	1MHz	3MHz	Peak Value
	Peak	1MHz	10Hz	Average Value

☞ **Limit**

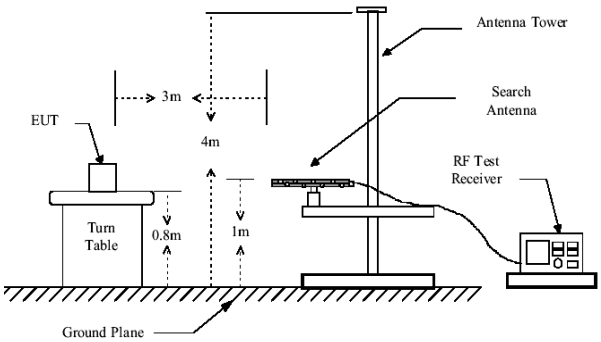
Frequency	Limit (dBuV/m @3m)	Remark
30MHz-88MHz	40.00	Quasi-peak Value
88MHz-216MHz	43.50	Quasi-peak Value
216MHz-960MHz	46.00	Quasi-peak Value
960MHz-1GHz	54.00	Quasi-peak Value
Above 1GHz	54.00	Average Value
	74.00	Peak Value

☞ **Test mode**

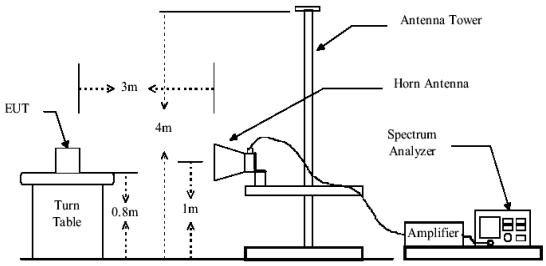
Refer to section 5.3 for details

☞ **Test setup**

Below 1GHz



Above 1GHz



☞ Test Procedure

6. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.
7. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
8. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
9. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.
10. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

☞ Test Result **Complied**

Remark:

During the test, pre-scan the GFSK, Pi/4QPSK, 8DPSK modulation, and found the GFSK modulation which it is worse case, so only show the test data of worse case modulation on the test report.

Measurement data:

■ **Below 1GHz**

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
30.32	46.26	14.33	0.55	32.06	29.08	40.00	-10.92	Vertical
40.99	40.54	15.57	0.67	32.05	24.73	40.00	-15.27	Vertical
53.32	41.30	15.10	0.80	31.95	25.25	40.00	-14.75	Vertical
67.91	44.45	11.47	0.92	31.89	24.95	40.00	-15.05	Vertical
95.76	39.52	14.90	1.16	31.74	23.84	43.50	-19.66	Vertical
155.91	44.75	10.51	1.60	32.00	24.86	43.50	-18.64	Vertical
39.85	37.77	15.53	0.66	32.06	21.90	40.00	-18.10	Horizontal
52.58	37.33	15.14	0.79	31.95	21.31	40.00	-18.69	Horizontal
87.11	39.86	13.03	1.09	31.73	22.25	40.00	-17.75	Horizontal
107.51	37.23	14.49	1.26	31.80	21.18	43.50	-22.32	Horizontal
191.07	37.46	12.56	1.80	32.11	19.71	43.50	-23.79	Horizontal
324.46	37.87	15.53	2.49	32.10	23.79	46.00	-22.21	Horizontal

■ **Above 1GHz**

Test channel:	Lowest

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4804.00	47.60	31.78	8.60	39.56	48.42	74.00	-25.58	Horizontal
7206.00	38.54	38.07	11.65	36.32	51.94	74.00	-22.06	Horizontal
9608.00	39.73	37.50	14.14	37.21	54.16	74.00	-19.84	Horizontal
12010.00	*					74.00		Horizontal
14412.00	*					74.00		Horizontal
4804.00	44.94	31.78	8.60	39.56	45.76	74.00	-28.24	Vertical
7206.00	37.22	38.07	11.65	36.32	50.62	74.00	-23.38	Vertical
9608.00	36.96	37.50	14.14	37.21	51.39	74.00	-22.61	Vertical
12010.00	*					74.00		Vertical
14412.00	*					74.00		Vertical

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4804.00	35.61	31.78	8.60	39.56	36.43	54.00	-17.57	Horizontal
7206.00	25.22	38.07	11.65	36.32	38.62	54.00	-15.38	Horizontal
9608.00	27.43	37.50	14.14	37.21	41.86	54.00	-12.14	Horizontal
12010.00	*					54.00		Horizontal
14412.00	*					54.00		Horizontal
4804.00	32.23	31.78	8.60	39.56	33.05	54.00	-20.95	Vertical
7206.00	23.54	38.07	11.65	36.32	36.94	54.00	-17.06	Vertical
9608.00	23.91	37.50	14.14	37.21	38.34	54.00	-15.66	Vertical
12010.00	*					54.00		Vertical
14412.00	*					54.00		Vertical

Remark:

1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *"*", means this data is the too weak instrument of signal is unable to test.*
3. *The emission levels of other frequencies are very lower than the limit and not show in test report.*

Test channel:	Middle

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4882.00	46.18	31.75	8.66	39.54	47.05	74.00	-26.95	Horizontal
7323.00	36.83	38.16	11.72	36.21	50.50	74.00	-23.50	Horizontal
9764.00	38.19	37.34	14.25	37.44	52.34	74.00	-21.66	Horizontal
12205.00	*					74.00		Horizontal
14646.00	*					74.00		Horizontal
4882.00	43.38	31.75	8.66	39.54	44.25	74.00	-29.75	Vertical
7323.00	35.44	38.16	11.72	36.21	49.11	74.00	-24.89	Vertical
9764.00	35.28	37.34	14.25	37.44	49.43	74.00	-24.57	Vertical
12205.00	*					74.00		Vertical
14480.00	*					74.00		Vertical

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4882.00	33.82	31.75	8.66	39.54	34.69	54.00	-19.31	Horizontal
7323.00	23.88	38.16	11.72	36.21	37.55	54.00	-16.45	Horizontal
9764.00	26.00	37.34	14.25	37.44	40.15	54.00	-13.85	Horizontal
12205.00	*					54.00		Horizontal
14646.00	*					54.00		Horizontal
4882.00	30.58	31.75	8.66	39.54	31.45	54.00	-22.55	Vertical
7323.00	22.26	38.16	11.72	36.21	35.93	54.00	-18.07	Vertical
9764.00	22.62	37.34	14.25	37.44	36.77	54.00	-17.23	Vertical
12205.00	*					54.00		Vertical
14480.00	*					54.00		Vertical

Remark:

1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *"*", means this data is the too weak instrument of signal is unable to test.*
3. *The emission levels of other frequencies are very lower than the limit and not show in test report.*

Test channel:	Highest

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4960.00	44.75	31.71	8.73	39.51	45.68	74.00	-28.32	Horizontal
7440.00	35.61	38.26	11.79	36.10	49.56	74.00	-24.44	Horizontal
9920.00	36.95	37.17	14.38	37.70	50.80	74.00	-23.20	Horizontal
12400.00	*					74.00		Horizontal
14880.00	*					74.00		Horizontal
4960.00	42.00	31.71	8.73	39.51	42.93	74.00	-31.07	Vertical
7440.00	34.24	38.26	11.79	36.10	48.19	74.00	-25.81	Vertical
9920.00	34.10	37.17	14.38	37.70	47.95	74.00	-26.05	Vertical
12400.00	*					74.00		Vertical
14646.00	*					74.00		Vertical

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4960.00	33.82	31.71	8.73	39.51	34.75	54.00	-19.25	Horizontal
7440.00	23.09	38.26	11.79	36.10	37.04	54.00	-16.96	Horizontal
9920.00	25.50	37.17	14.38	37.70	39.35	54.00	-14.65	Horizontal
12400.00	*					54.00		Horizontal
14880.00	*					54.00		Horizontal
4960.00	30.28	31.71	8.73	39.51	31.21	54.00	-22.79	Vertical
7440.00	21.32	38.26	11.79	36.10	35.27	54.00	-18.73	Vertical
9920.00	21.80	37.17	14.38	37.70	35.65	54.00	-18.35	Vertical
12400.00	*					54.00		Vertical
14646.00	*					54.00		Vertical

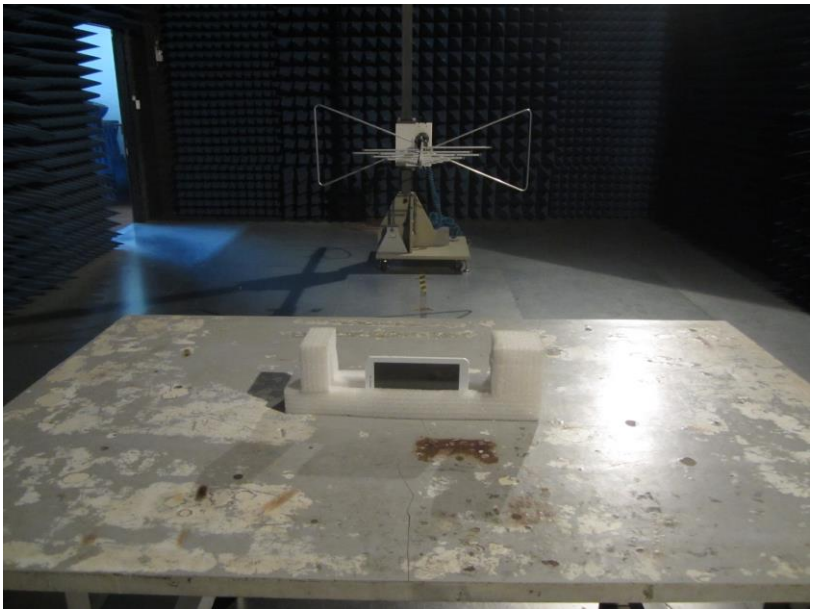
Remark:

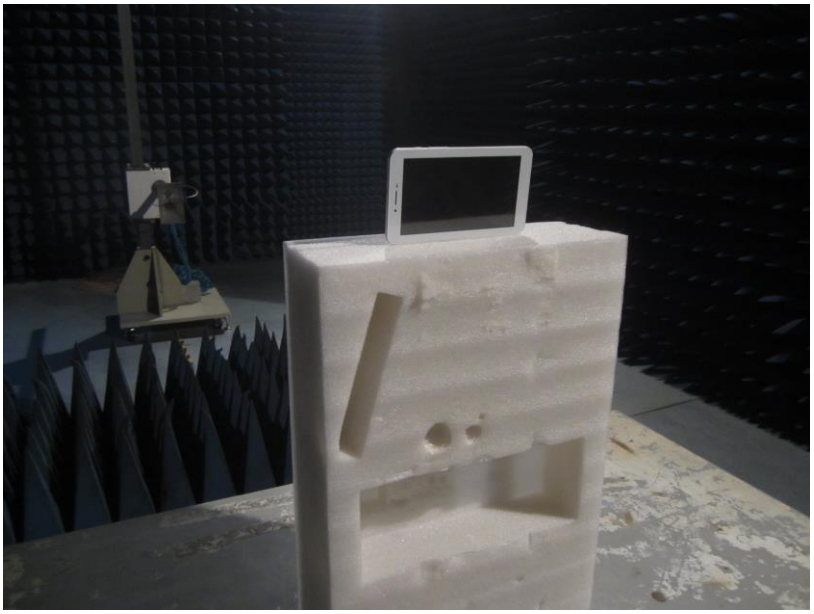
1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *"*", means this data is the too weak instrument of signal is unable to test.*
3. *The emission levels of other frequencies are very lower than the limit and not show in test report.*

8 Test Setup Photo

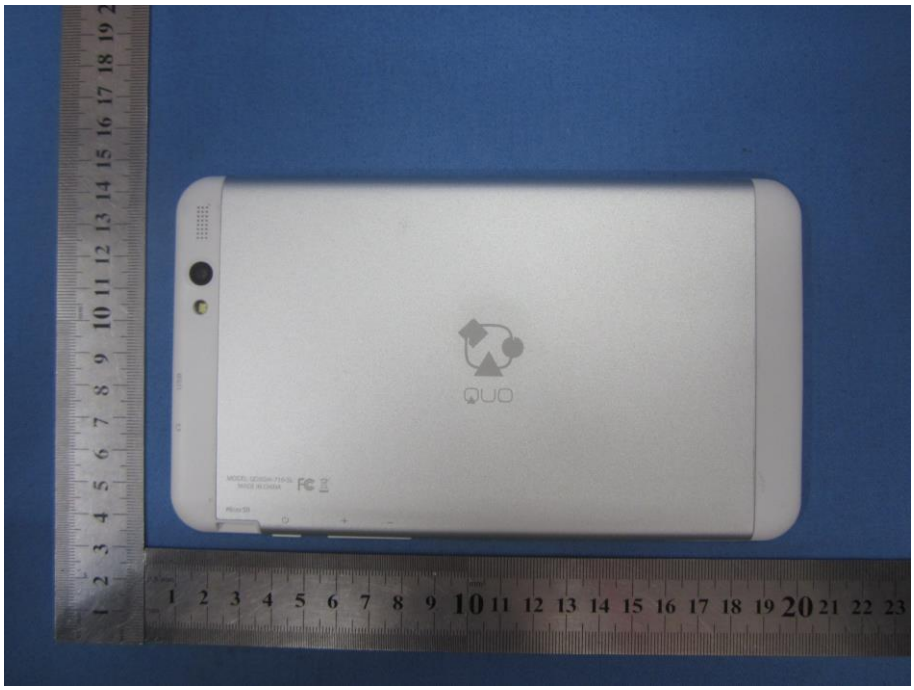
Conducted emissions:

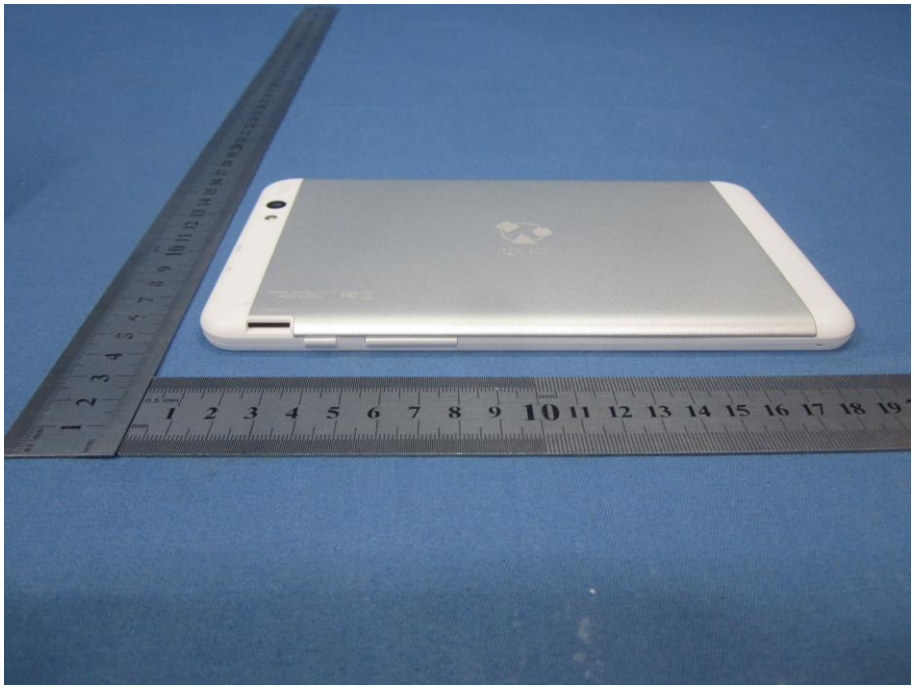
Radiated emissions:





9 EUT Constructional Details





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