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FEDERAL COMMUNICATIONS COMMISSION

Registration number: 282399

Report No.: GZEM101200325901

Page: 1 of 60

FCC ID: BOU-DS7700V37

TEST REPORT

| | |
|------------------------------------|------------------------------------|
| Application No.: | GZEM1012003259AV |
| Applicant: | Philips Consumer Lifestyle |
| Manufacturer: | Philips Electronics Hong Kong Ltd. |
| Factory: | Arts Electronics Co., Ltd. |
| Equipment Under Test (EUT): | |
| Product Name: | Docking Speaker |
| Model No.: | DS7700/37 |
| Trade Mark: | PHILIPS |
| FCC ID: | BOU-DS7700V37 |
| Standards: | FCC PART 15 Subpart C: 2009 |
| Date of Receipt: | 2010-12-09 |
| Date of Test: | 2010-12-14 to 2010-12-28 |
| Date of Issue: | 2011-01-25 |
| Test Result : | Pass* |

* In the configuration tested, the EUT detailed in this report complied with the standards specified above. Please refer to section 3 of this report for further detail.

Authorized Signature:

2011 Jan.

Strong Yao
Manager

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government. All test results in this report can be traceable to National or International Standards.

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2 Version

| Revision Record | | | | |
|-----------------|---------|------------|----------|----------|
| Version | Chapter | Date | Modifier | Remark |
| 00 | | 2011-01-25 | | Original |
| | | | | |
| | | | | |
| | | | | |

| | | | |
|--------------------------|---|--|--------------------------|
| Authorized for issue by: | | | |
| Tested By |  | | 2010-12-14 to 2010-12-28 |
| | (Daniel He) /Signature | | Date |
| Prepared By |  | | 2010-12-29 |
| | (Daniel He) /Signature | | Date |
| Checked By |  | | 2011-01-25 |
| | (Strong Yao) /Reviewer | | Date |



3 Test Summary

| Test | Test Requirement | Standard Paragraph | Result |
|--|-------------------|----------------------------|--------|
| Antenna Requirement | FCC PART 15 :2009 | Section 15.247 (c) | PASS |
| Occupied Bandwidth | FCC PART 15 :2009 | Section 15.247 (a1) | PASS |
| Carrier Frequencies Separated | FCC PART 15 :2009 | Section 15.247(a)(1) | PASS |
| Hopping Channel Number | FCC PART 15 :2009 | Section 15.247(a)(1)(iii) | PASS |
| Dwell Time | FCC PART 15 :2009 | Section 15.247(a)(1)(iii) | PASS |
| Pseudorandom Frequency Hopping Sequence | FCC PART 15 :2009 | Section 15.247(a)(1) | PASS |
| Maximum Peak Output Power | FCC PART 15 :2009 | Section 15.247(b)(1) | PASS |
| Conducted Spurious Emission (30MHz to 25GHz) | FCC PART 15 :2009 | Section 15.209 &15.247(d) | PASS |
| Radiated Spurious Emission (30MHz to 25GHz) | FCC PART 15 :2009 | Section 15.209 &15.247(d) | PASS |
| Band Edges Measurement | FCC PART 15 :2009 | Section 15.247 (d) &15.205 | PASS |
| Conducted Emissions at Mains Terminals | FCC PART 15 :2009 | Section 15.207 | PASS |



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5 General Information

5.1 Client Information

Applicant: Philips Consumer Lifestyle
Address of Applicant: 3029E. Governor John Sevier Hwy. Knoxville, TN 37914
Manufacturer: Philips Electronics Hong Kong Ltd.
Address of Manufacturer: 5/F., Philips Electronics Building, 5 Science Park East Avenue, Hong Kong Science Park, Shatin N.T., Hong Kong
Factory: Arts Electronics Co., Ltd.
Address of Factory: No. 1, SHANGXING LU, SHANGJIAO COMMUNITY, CHANGAN TOWN, DONGGUAN CITY, GUANGDONG PROVINCE, CHINA

5.2 General Description of E.U.T.

Product Name: Docking Speaker
Model No.: DS7700/37
Trade Mark: PHILIPS
Number of Channels: 79 Channels
Channel Separation: 1 MHz
Type of Modulation: GFSK, ($\pi/4$)QPSK, 8DPSK
Dwell time: Per channel is less than 0.4s.
Antenna Type: PCB layout
Antenna gain: 0dBi
Specialty: Bluetooth V2.1+EDR
Radio Function: Bluetooth
Power Supply: AC 100-240V 50/60Hz or
DC 7.4V 1000mAh (Internal AP SHIDA Battery SDL-553055)
Adapter: Model 1: OH-1048E1003500U
Model 2: OH-1048B1003500U-U
Input: 100-240V 50/60Hz 1.5A
Output: 10V 3.5A

Remark: Two adaptors are total the same except for plug portion: OH-1048E1003500U is changeable plug adaptor and OH-1048B1003500U-U is fixed plug adaptor.

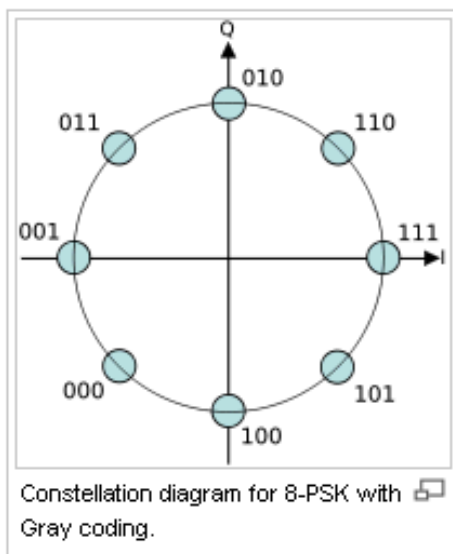
5.3 Modulation configure

| Modulation | Packet | Packet Type | Packet Size |
|----------------|--------|-------------|-------------|
| GFSK | DH1 | 4 | 24 |
| | DH3 | 11 | 183 |
| | DH5 | 15 | 339 |
| $(\pi/4)$ QPSK | 2DH1 | 20 | 54 |
| | 2DH3 | 26 | 367 |
| | 2DH5 | 30 | 379 |
| 8DPSK | 3DH1 | 24 | 83 |
| | 3DH3 | 27 | 552 |
| | 3DH5 | 31 | 1021 |

Remark:

Modulation 8-DPSK

The modulation 8 PSK works with 8 phases between 0 and 2π (0 and 360 degrees), it can be seeing bellow in the circle.



Normal mode: the Bluetooth has been tested on the Modulation of GFSK;

EDR mode: the Bluetooth has been tested on the Modulation of $(\pi/4)$ QPSK and 8DPSK, compliance test and record the worst case on 8DPSK.

5.4 Description of Support Units

The EUT has been tested as an independent unit for fixed frequency by testing lab.

5.5 Standards Applicable for Testing

The customer requested FCC tests for the EUT.

The standard used was FCC PART 15 Subpart C: 2009. ANSI C63.4:2003. DA 00-705.



5.6 Test Facility

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

- **NVLAP – Lab Code: 200611-0**

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou EMC Laboratory is recognized under the National Voluntary Laboratory Accreditation Program (NVLAP/NIST). NVLAP Code: 200611-0.

- **FCC – Registration No.: 282399**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 282399, May 31, 2002.

5.7 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou EMC Laboratory,
198 Kezhu Road, Sciencetech Park, Guangzhou Economic & Technology Development District,
Guangzhou, China 510663

Tel: +86 20 82155555 Fax: +86 20 82075059

No tests were sub-contracted.

5.8 Deviation from Standards

Biconical and log periodic antennas were used instead of dipole antennas.

5.9 Abnormalities from Standard Conditions

None.

5.10 Monitoring of EUT for All Immunity Test

None.



6 Equipment Used during Test

| RE in Chamber | | | | | |
|---------------|-------------------------------|-------------------|-----------|------------|--------------|
| No. | Test Equipment | Manufacturer | Model No. | Serial No. | Cal.Due date |
| | | | | | (YYYY-MM-DD) |
| EMC0525 | Compact Semi-Anechoic Chamber | ChangZhou ZhongYu | N/A | N/A | 2011-09-06 |
| EMC0522 | EMI Test Receiver | Rohde & Schwarz | ESIB26 | 100283 | 2011-01-25 |
| EMC0056 | EMI Test Receiver | Rohde & Schwarz | ESCI | 10036 | 2011-06-02 |
| N/A | EMI Test Software | Audix | E3 | N/A | N/A |
| EMC0514 | Coaxial cable | SGS | N/A | N/A | 2011-12-08 |
| EMC0524 | Bi-log Type Antenna | Schaffner -Chase | CBL6112B | 2966 | 2011-12-20 |
| EMC0519 | Bilog Type Antenna | Schaffner -Chase | CBL6143 | 5070 | 2011-12-20 |
| EMC0518 | Horn Antenna | Rohde & Schwarz | HF906 | 100096 | 2011-09-11 |
| EMC0521 | 1-26.5 GHz Pre-Amplifier | Agilent | 8449B | 3008A01649 | 2011-01-25 |
| EMC0049 | Amplifier | Agilent | 8447D | 2944A10862 | 2011-04-21 |
| EMC0075 | 310N Amplifier | Sonoma | 310N | 272683 | 2011-10-25 |
| EMC0523 | Active Loop Antenna | EMCO | 6502 | 42963 | 2011-11-17 |
| EMC0530 | 10m Semi- Anechoic Chamber | ETS | N/A | N/A | 2011-05-17 |

| Conducted Emission | | | | | |
|--------------------|-------------------|------------------------------------|----------------------------|------------|--------------|
| No. | Test Equipment | Manufacturer | Model No. | Serial No. | Cal.Due date |
| | | | | | (YYYY-MM-DD) |
| EMC0306 | Shielding Room | Zhong Yu | 8 x 3 x 3.8 m ³ | N/A | N/A |
| EMC0118 | Two-line v-netwok | R&S | ENV216 | 100359 | 2011-09-25 |
| EMC0506 | EMI Test Receiver | Rohde & Schwarz | ESCS30 | 100085 | 2011-11-24 |
| EMC0107 | Coaxial Cable | SGS | 2m | N/A | 2011-07-18 |
| EMC0106 | Voltage Probe | SGS | N/A | N/A | N/A |
| EMC0120 | 8 Line ISN | Fischer Custom Communications Inc. | FCC-TLISN-T8-02 | 20550 | 2011-01-25 |
| EMC0121 | 4 Line ISN | Fischer Custom Communications Inc. | FCC-TLISN-T4-02 | 20549 | 2011-01-25 |
| EMC0122 | 2 Line ISN | Fischer Custom Communications Inc. | FCC-TLISN-T2-02 | 20548 | 2011-01-25 |

| General used equipment | | | | | |
|------------------------|----------------|--------------|-----------|------------|--------------|
| No. | Test Equipment | Manufacturer | Model No. | Serial No. | Cal.Due date |
| | | | | | (YYYY-MM-DD) |
| EMC0006 | DMM | Fluke | 73 | 70681569 | 2011-12-16 |
| EMC0007 | DMM | Fluke | 73 | 70671122 | 2011-12-16 |



7 Test Results

7.1 E.U.T. test conditions

Power supply: AC 120V
Temperature: 20.0 -25.0 °C
Humidity: 38-50 % RH
Atmospheric Pressure: 1000 -1010 mbar
Test frequencies: According to the 15.31(m) Measurements on intentional radiators or receivers, other than TV broadcast receivers, shall be performed and, if required, reported for each band in which the device can be operated with the device operating at the number of frequencies in each band specified in the following table:

| Frequency range over which device operates | Number of frequencies | Location in the range of operation |
|--|-----------------------|---|
| 1 MHz or less | 1 | Middle |
| 1 to 10 MHz | 2 | 1 near top and 1 near bottom |
| More than 10 MHz | 3 | 1 near top, 1 near middle and 1 near bottom |

EUT channels and frequencies list:



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

Test frequency is the lowest channel: 0 channel(2402MHz), middle channel: 39 channel(2441MHz) and highest channel: 78 channel(2480MHz)



7.2 Antenna Requirement

7.2.1 Standard requirement

15.203 requirement:

For intentional device. According to 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.

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

(i) Systems operating in the 2400-2483.5 MHz bands that are used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi 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 6 dBi.

7.2.2 EUT Antenna

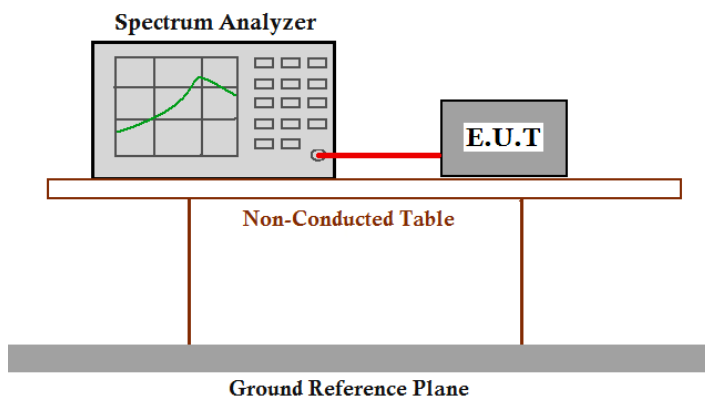
The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 0dBi.

Test result: The unit does meet the FCC requirements.

7.3 Occupied Bandwidth

Test Requirement: FCC Part 15 C
Test Method: Based on FCC Part15 C Section 15.247 & DA 00-705
Test Status: Test in continuous transmitting mode at lowest, middle and highest channel.

Test Configuration:



Test Procedure:

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: Span = approximately 2 to 3 times the 20dB bandwidth, centring on a hopping channel;
3. Set the spectrum analyzer: RBW \geq 1% of the 20dB bandwidth VBW \geq RBW. Sweep = auto; Detector Function = Peak. Trace = Max Hold.
4. Mark the peak frequency and -20dB points bandwidth.

Test result:

Normal mode:

| Test Channel | Bandwidth(MHz) | 2/3 bandwidth(MHz) |
|--------------|----------------|--------------------|
| Lowest | 1.132 | 0.755 |
| Middle | 1.142 | 0.761 |
| Highest | 1.132 | 0.755 |

EDR mode:

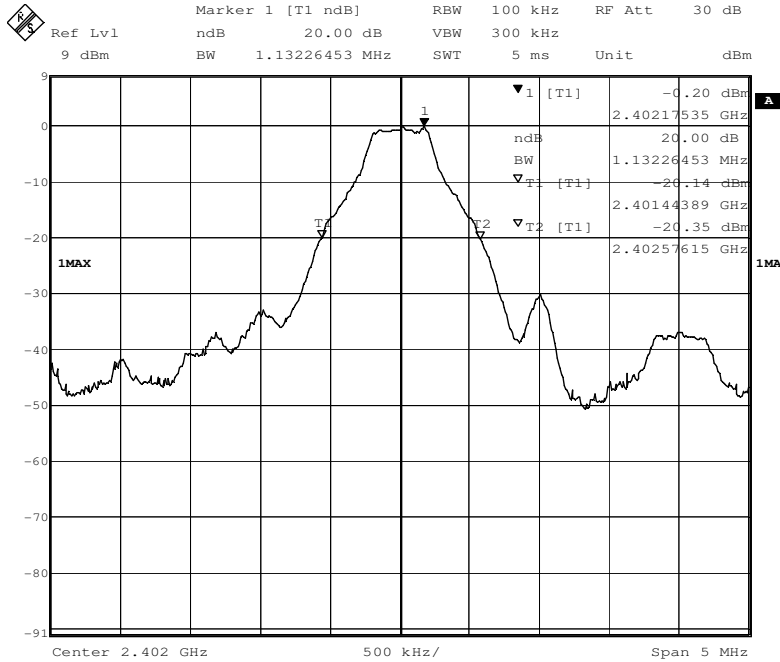
| Test Channel | bandwidth | 2/3 bandwidth |
|--------------|-----------|---------------|
| Lowest | 1.403 | 0.935 |
| Middle | 1.413 | 0.942 |
| Highest | 1.403 | 0.935 |



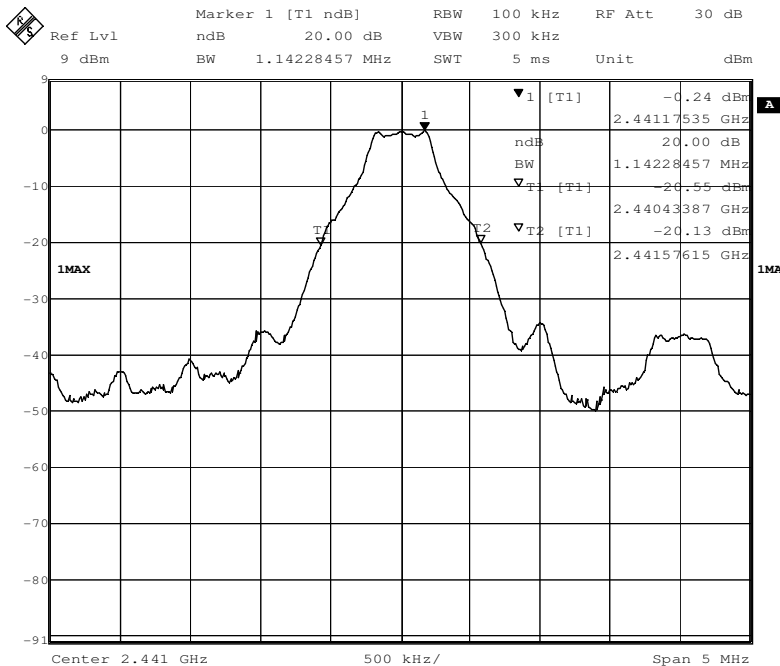
Result plot as follows:

DH5:

Lowest Channel:

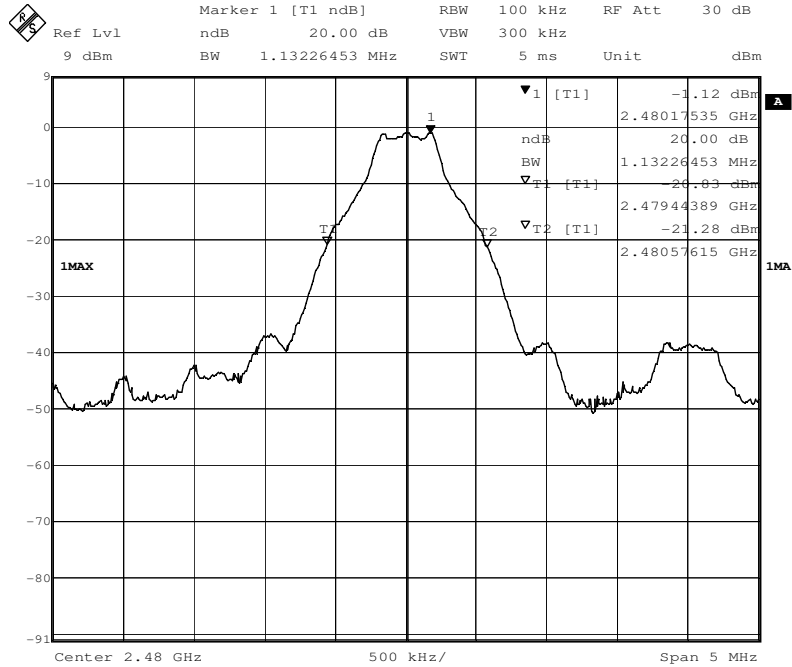


Middle Channel:

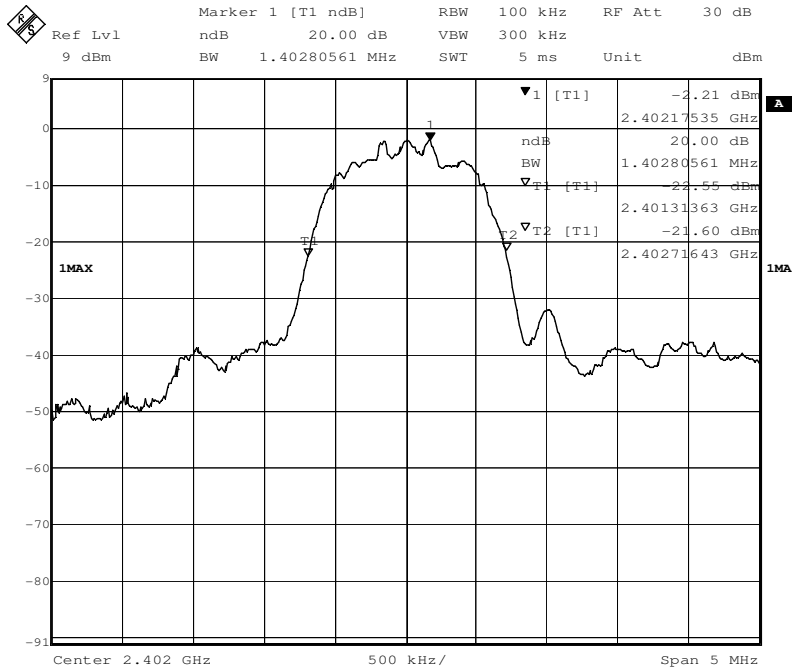




Highest Channel:

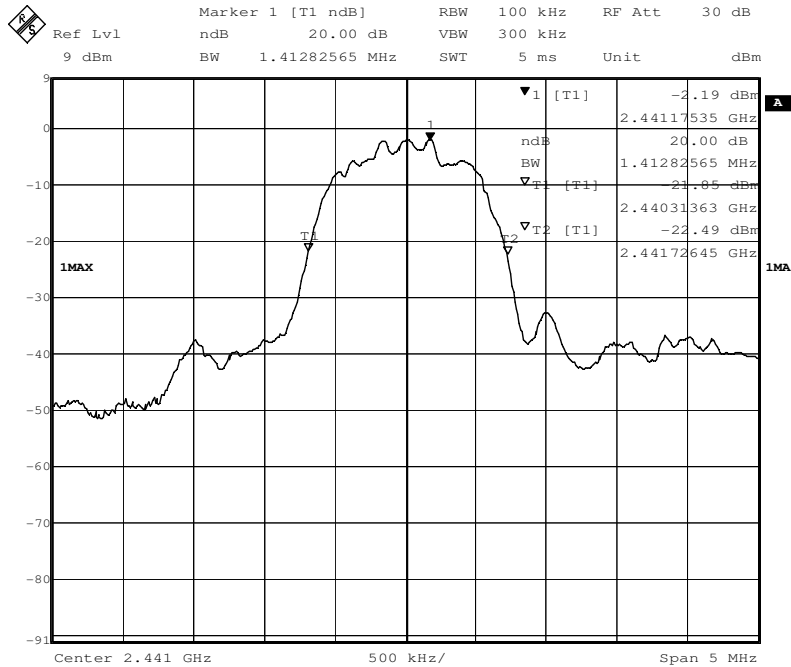


3DH5:
Lowest channel:

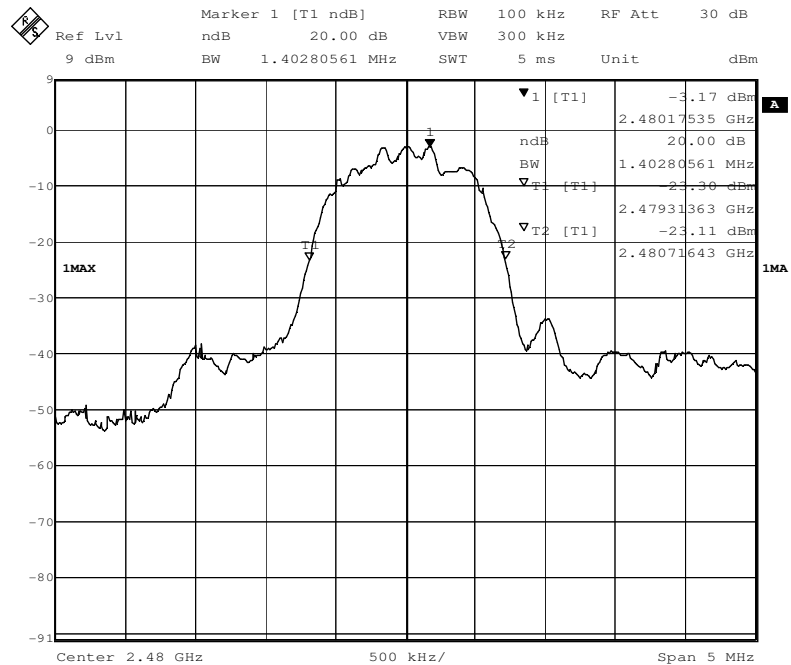




Middle channel:



Highest channel:



7.4 Carrier Frequencies Separated

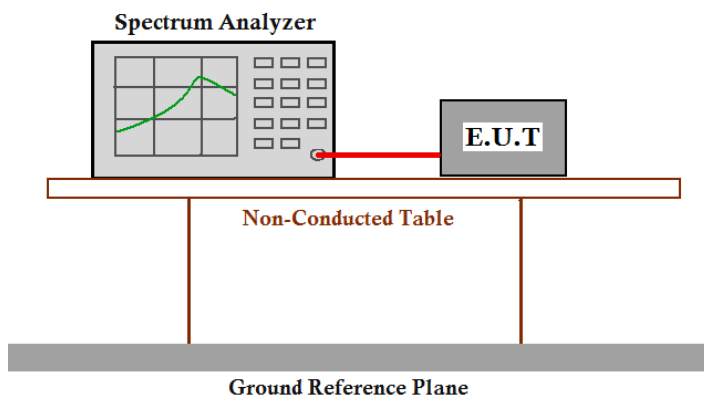
Test Requirement: FCC Part 15 C

Test Method: Based on FCC Part15 C Section 15.247 & DA 00-705

Test requirements: Regulation 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.

Test Status: Test in hopping transmitting operating mode.

Test Configuration:



Test Procedure:

1. Remove the antenna from the EUT and then connect a low attenuation RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW \geq 1% of the span, VBW \geq RBW,. Sweep = auto; Detector Function = Peak. Trace = Max, hold.
3. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section. Submit this plot.



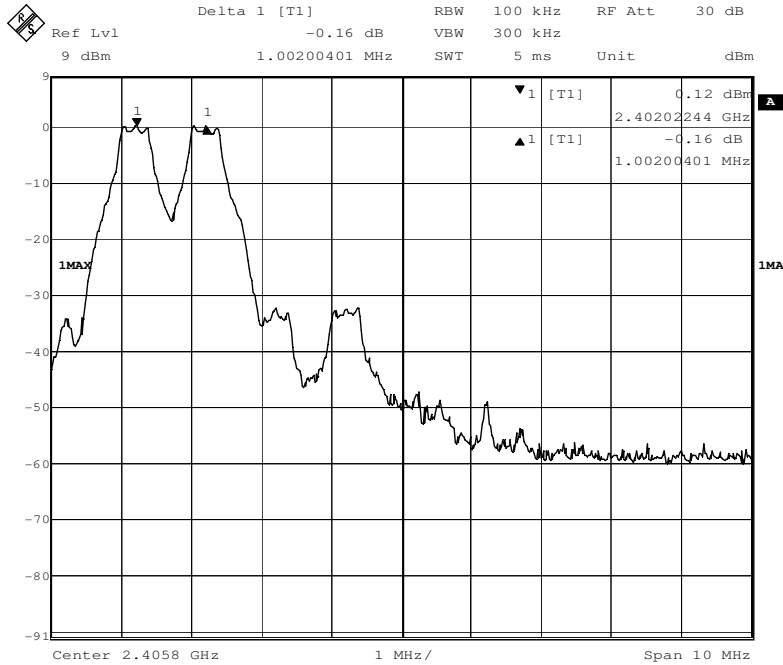
Test result:

| Test Channel | Carrier Frequencies Separated | Pass/Fail |
|--|-------------------------------|-----------|
| Lower Channels (channel 0 and channel 1) | 1.002MHz | Pass |
| Middle Channels (channel 39 and channel 40) | 1.022MHz | Pass |
| Upper Channels (channel 77 and channel 78) | 1.022MHz | Pass |

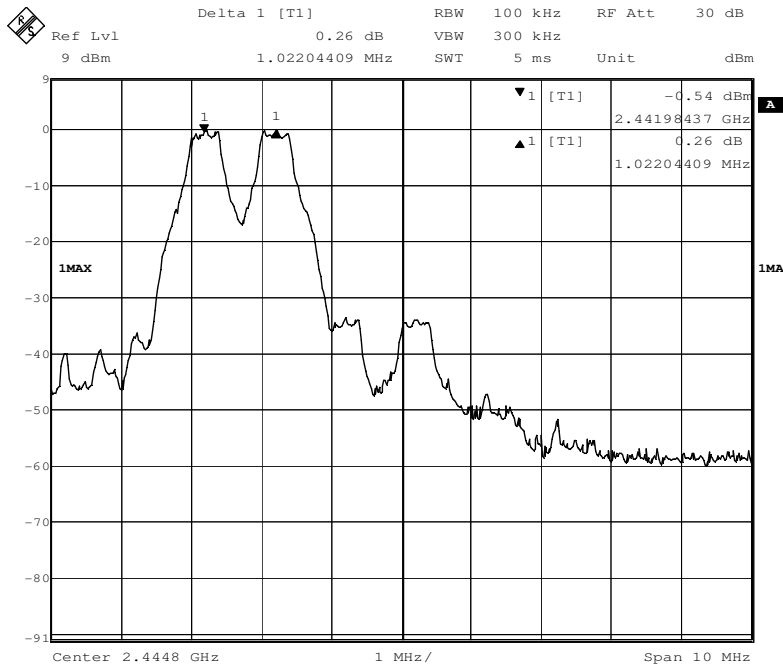
Remark:
The limit is maximum two-thirds of the 20 dB bandwidth: 942KHz.



1. Lowest Channels: Carrier Frequencies Separated

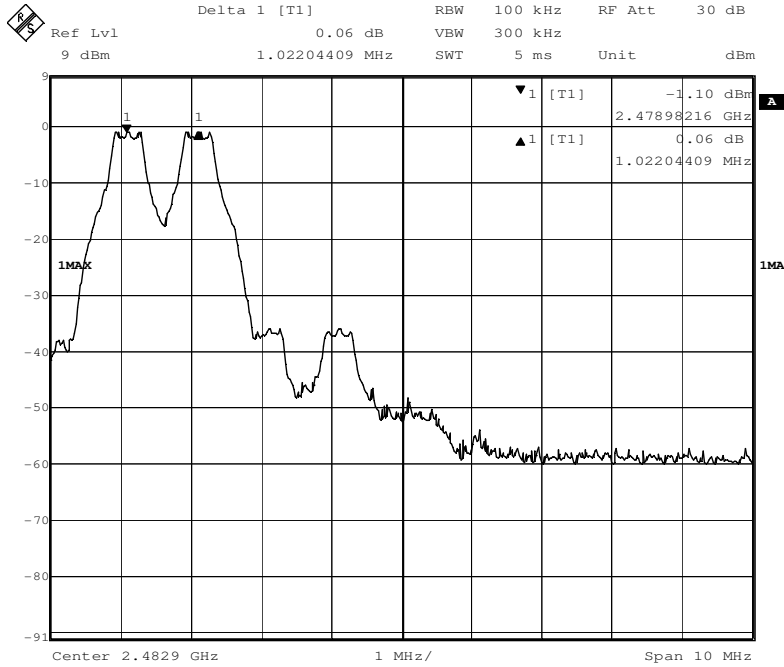


2. Middle Channels: Carrier Frequencies Separated





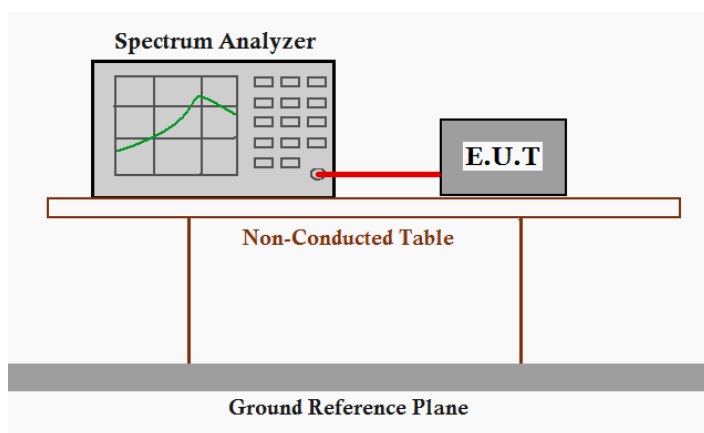
3. Highest Channels: **Carrier Frequencies Separated**



Test result: The unit does meet the FCC requirements.

7.5 Hopping Channel Number

- Test Requirement:** FCC Part15 C
- Test Method:** Based on FCC Part15 C Section 15.247 & DA 00-705
- Requirements:** Regulation 15.247 (a) (1)(iii) Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.
- Test Status:** Test the EUT in hopping on mode.
- Test Configuration:**

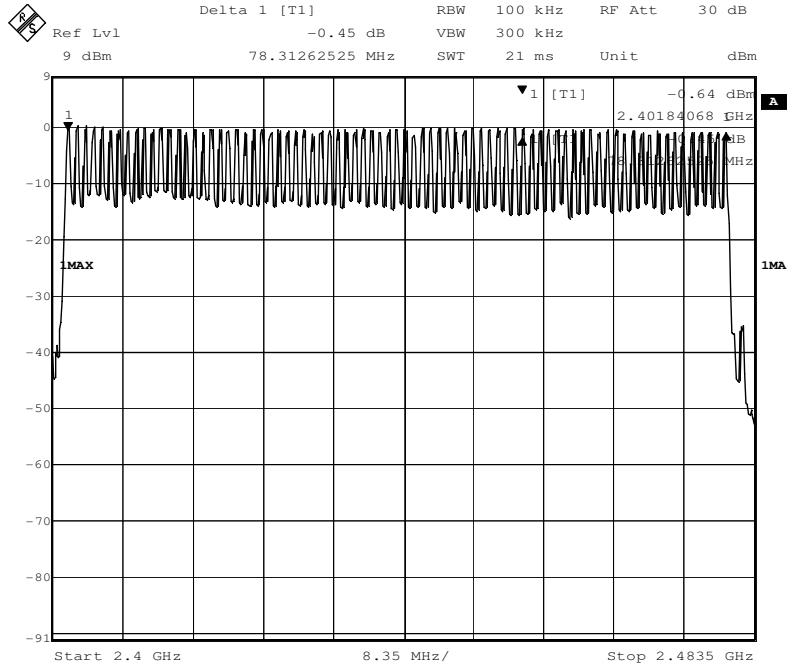


Test Procedure:

1. Remove the antenna from the EUT and then connect a low attenuation RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 100 kHz. VBW = 100 kHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.
3. Allow the trace to stabilize. It may prove necessary to break the span up to sections. in order to clearly show all of the hopping frequencies. The limit is specified in one of the subparagraphs of this Section.
4. Set the spectrum analyzer: start frequency = 2400MHz. stop frequency = 2483.5MHz. Submit the test result graph.



Test result: Total channels are 79 channels.



Test result: The unit does meet the FCC requirements.

7.6 Dwell Time

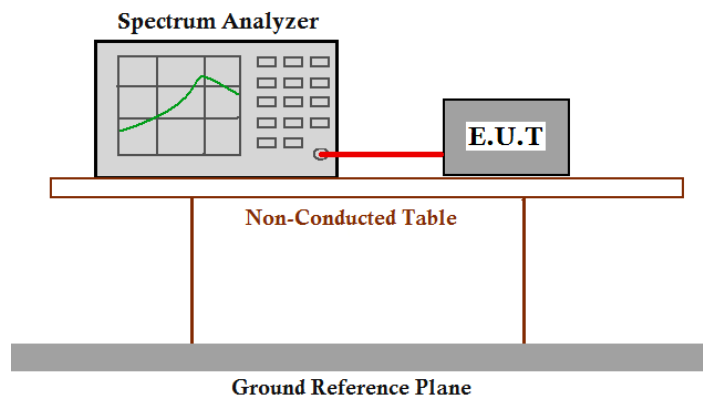
Test Requirement: FCC Part 15 C

Test Method: Based on FCC Part15 C Section 15.247 & DA 00-705

Test requirements: Regulation 15.247(a)(1)(iii) Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

Test Status: Test the EUT in continuous transmitting mode at the lowest (2402MHz), middle (2441MHz) and highest (2480MHz) channel with different packages, find the worst case is 8DPSK mode.

Test Configuration:



Test Procedure:

1. Remove the antenna from the EUT and then connect a low attenuation RF cable from the antenna port to the spectrum.
 2. Set spectrum analyzer span = 0. centered on a hopping channel;
 3. Set RBW = 1MHz and VBW = 1MHz. Sweep = as necessary to capture the entire dwell time per hopping channel. Detector Function = Peak. Trace = Max hold;
 4. Use the marker-delta function to determine the dwell time. If this value varies with different modes of operation (e.g.. data rate. modulation format. etc.). Repeat this test for each variation.
- The limit is specified in one of the subparagraphs of this Section. Submit this plot(s). An oscilloscope may be used instead of a spectrum analyzer.



Test Result:

The test period: $T = 0.4 \text{ Second/Channel} \times 79 \text{ Channel} = 31.6 \text{ s}$

1. Channel 0: 2.402GHz

3DH1 time slot = $0.421 \text{ (ms)} \times (1600/(2 \times 79)) \times 31.6 = 134.720\text{ms}$

3DH3 time slot = $1.683 \text{ (ms)} \times (1600/(4 \times 79)) \times 31.6 = 269.280\text{ms}$

3DH5 time slot = $2.685 \text{ (ms)} \times (1600/(6 \times 79)) \times 31.6 = 286.400\text{ms}$

2. Channel 39: 2.441GHz

3DH1 time slot = $0.421 \text{ (ms)} \times (1600/(2 \times 79)) \times 31.6 = 134.720\text{ms}$

3DH3 time slot = $1.683 \text{ (ms)} \times (1600/(4 \times 79)) \times 31.6 = 269.280\text{ms}$

3DH5 time slot = $2.926 \text{ (ms)} \times (1600/(6 \times 79)) \times 31.6 = 312.107\text{ms}$

3. Channel 78: 2.480GHz

3DH1 time slot = $0.411 \text{ (ms)} \times (1600/(2 \times 79)) \times 31.6 = 131.520\text{ms}$

3DH3 time slot = $1.683 \text{ (ms)} \times (1600/(4 \times 79)) \times 31.6 = 269.280\text{ms}$

3DH5 time slot = $2.936 \text{ (ms)} \times (1600/(6 \times 79)) \times 31.6 = 313.173\text{ms}$

The results are not greater than 0.4 seconds.

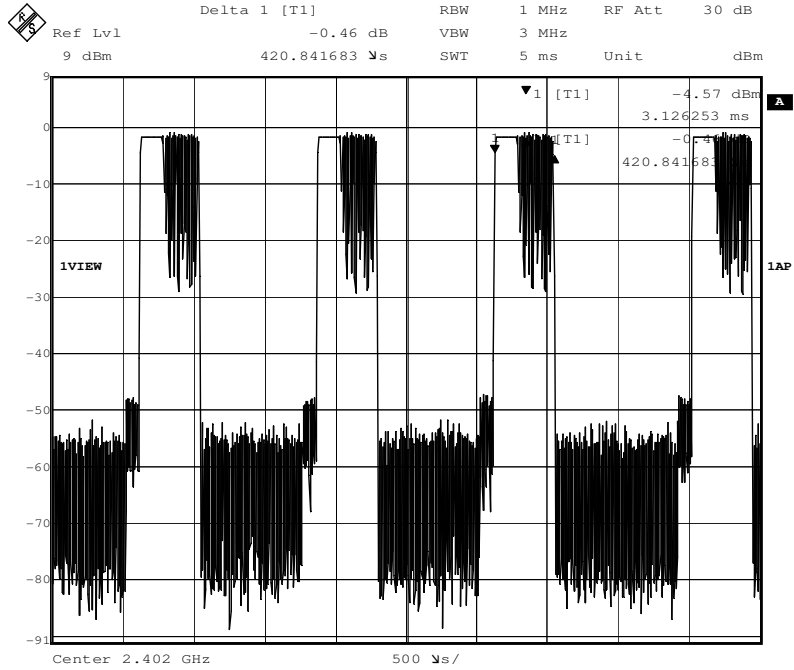
The unit does meet the FCC requirements.



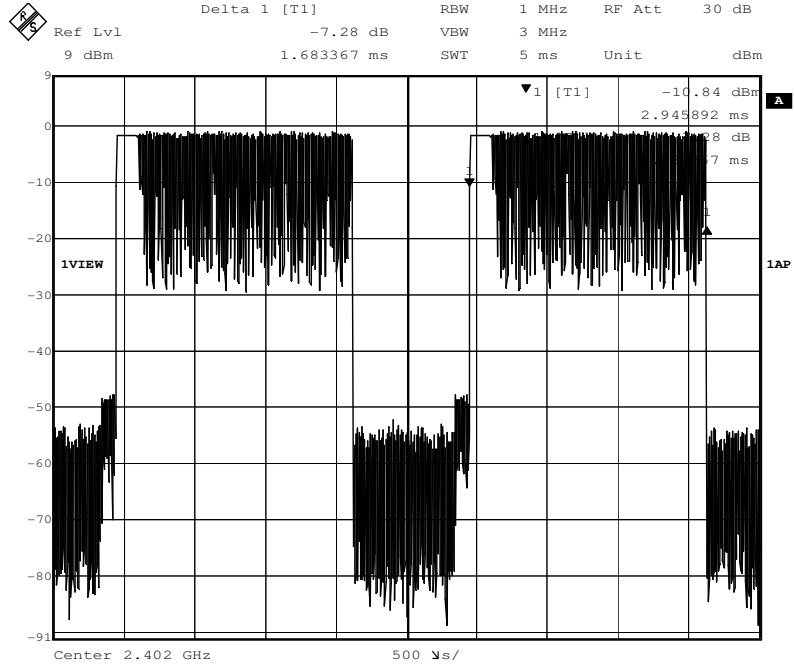
Please refer the graph as below:

1. Lowest channel (2.402 GHz):

(1). 3DH1

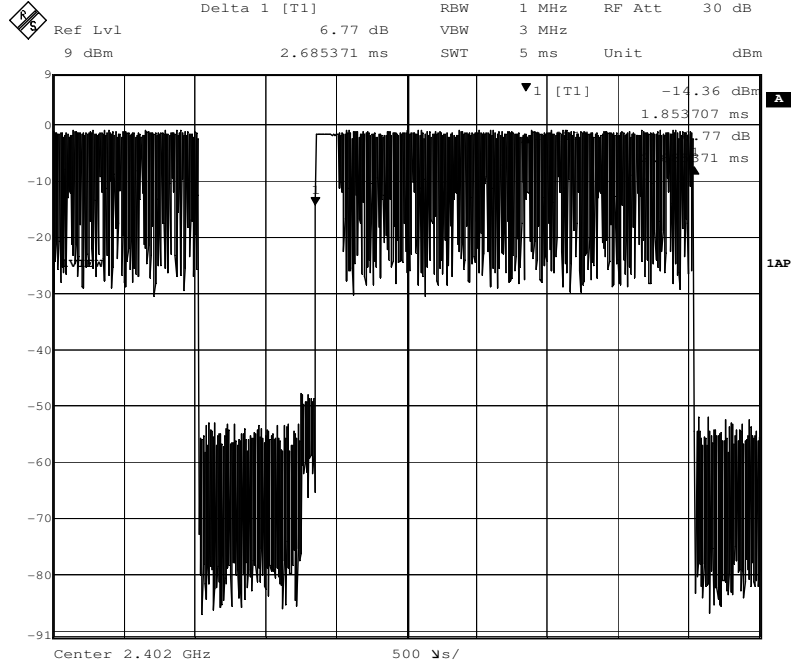


(2) 3DH3



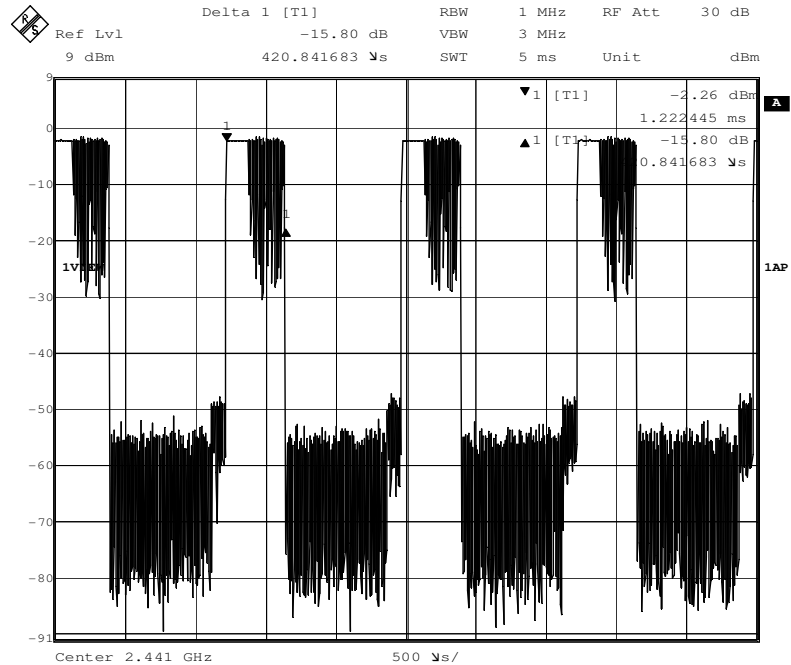


(3) 3DH5



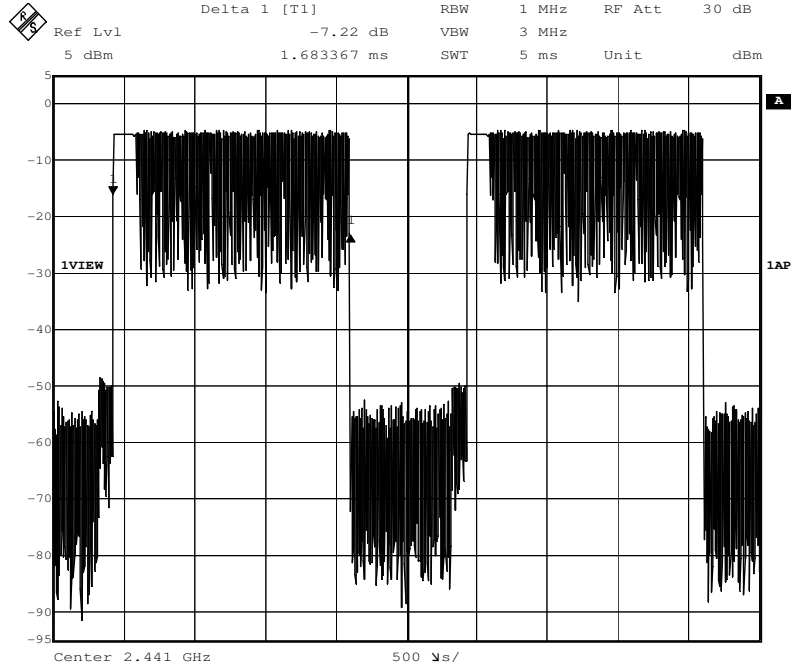
2. Middle Channel (2.441GHz)

(1). 3DH1

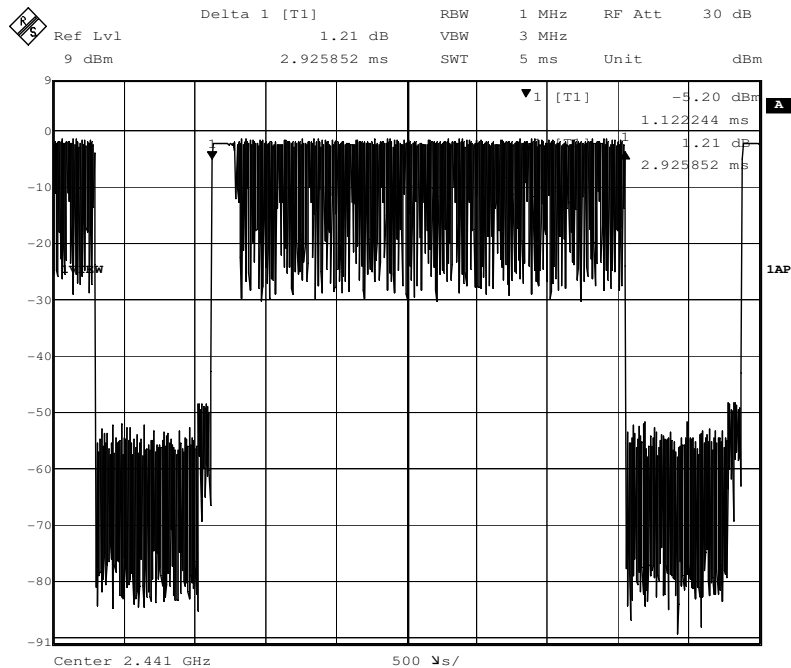




(2) 3DH3



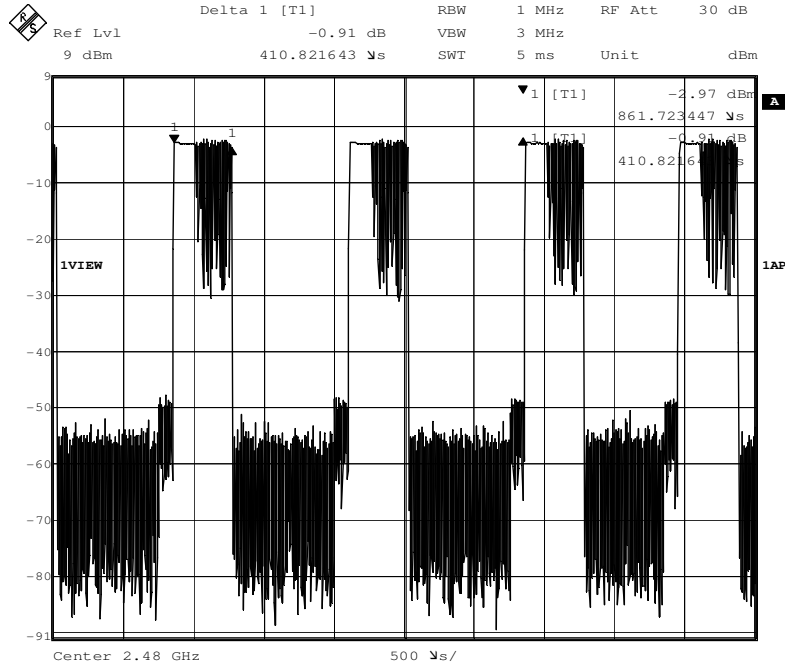
(3) 3DH5



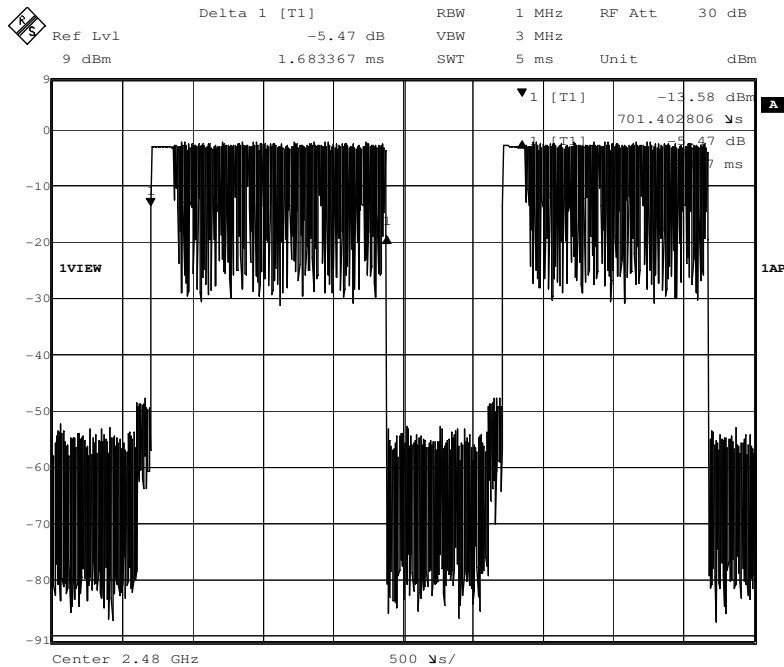


3. Highest Channel (2.480GHz)

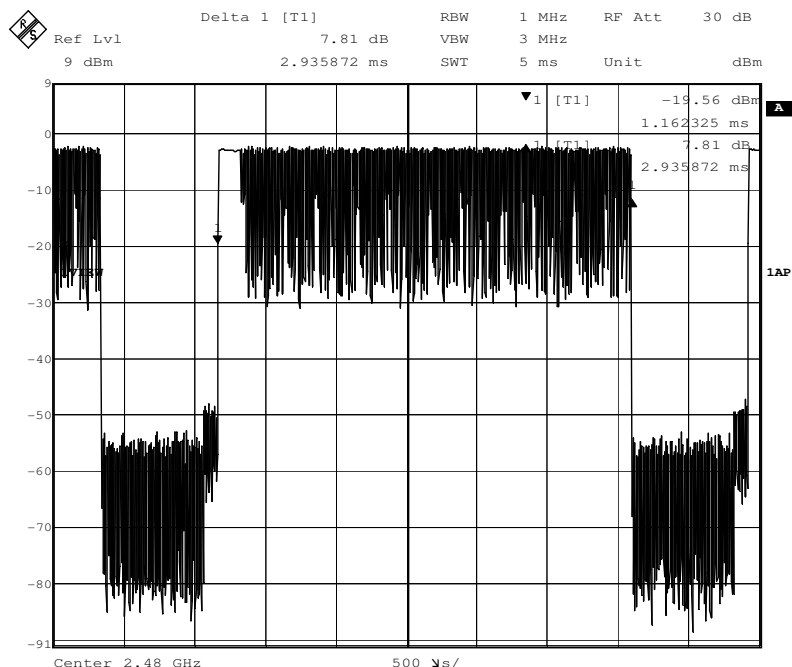
(1). 3DH1



(2) 3DH3



(3) 3DH5



Remark:

In communication data link mode (expect inquiry or page mode) the hopping rate is 1600 per second, the 79 channels will be randomly selected for RF channel, and each channel have equal probability to be selected. The hop selection scheme is defined in Clause 2.6 of Part B of Volume 2 of core specification of Bluetooth.

The Dwell time must be calculated via following formula:

$$\text{Dwell time} = \text{Pulse wide} \times (\text{Hopping rate} / \text{Number of channels}) \times \text{Period}$$

$$\text{Period} = 0.4 \text{ (seconds/ channel)} \times 79 \text{ (channel)} = 31.6 \text{ seconds}$$

So

$$\text{Dwell time DH1} = \text{slot time} \times (1600/2/79) \times 31.6$$

$$\text{Dwell time DH3} = \text{slot time} \times (1600/4/79) \times 31.6$$

$$\text{Dwell time DH5} = \text{slot time} \times (1600/6/79) \times 31.6$$

The RF channel will remain fixed for duration of a packet, that means for DH3 packet the RF frequency will remain unchanged during 3 slots (1slot=1/1600=625us), and for DH5 packet the RF frequency will remain unchanged during 5 slots, illustrated the principle as below:

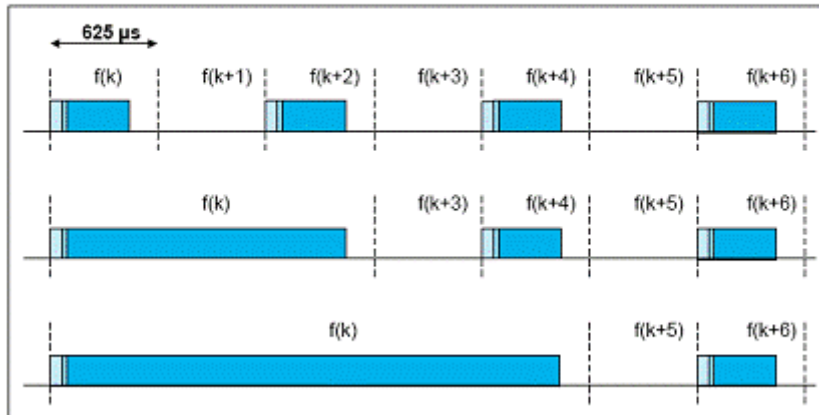


Figure 2.14: Single- and multi-slot packets.

Therefore, in a certain period for different packet types, the quantities of hops (not hopping rate 1600) are different, accurately, the quantity of hops for DH1 is double of DH3's and triple of DH5's.

“for DH1 packet, 1 hop in 1 slot; for DH3 packet, 1/2 hop in 1 slot; for DH5 packet, 1/3 hop in 1 slot.”, explained as below:

From the illustrated hopping scheme:

For DH1, in two slots, there are two hops, i.e. $f(k)$ in Slot(k), $f(k+1)$ in Slot($k+1$), means DH1 1 hop in 1 slot;

For DH3, in four slots, there are two hops, i.e. $f(k)$ in Slot(k) & Slot($k+1$) & Slot($k+2$), $f(k+3)$ in Slot($k+3$), means DH3 2 hops in four slots -> 1/2 hop in 1 slot;

For DH5, in six slots, there are two hops, i.e. $f(k)$ in Slot(k) & Slot($k+1$) & Slot($k+2$) & Slot($k+3$) & Slot($k+4$), $f(k+5)$ in Slot($k+5$), means DH3 2 hops in six slots -> 1/3 hop in 1 slot.

The Hopping rate in the formula should not be fixed value, for DH1, it is 1600/2; for DH3, it is 1600/4; for DH5, it is 1600/6.



To calculate Dwell time of data transmission of Bluetooth system, the worst case is for Bluetooth PICONET that contains two devices only (although Bluetooth PICONET can support up to eight devices), and for Bluetooth data transmission, after device A sending a packet to device B, device A must get response packet from device B to continue data transmission;

For DH1 packet: assume device A is EUT, the worst case is after device A sending a DH1 packet to device B, device A gets a DH1 response packet from device B, that means device A needs 1 time slot for transmitting and 1 time slot for receiving, therefore, the actual hopping rate of device A is half of 1600, i.e. 800 hops per second for EUT;

For DH3 packet: assume device A is EUT, the worst case is after device A sending a DH3 packet to device B, device A gets a DH1 response packet from device B, that means device A needs 3 time slots for transmitting and 1 time slot for receiving, therefore, the actual hopping rate of device A is quarter of 1600, i.e. 400 hops per second for EUT;

For DH5 packet: assume device A is EUT, the worst case is after device A sending a DH5 packet to device B, device A gets a DH1 response packet from device B, that means device A needs 5 time slots for transmitting and 1 time slot for receiving, therefore, the actual hopping rate of device A is sixth of 1600, i.e. $1600/6=266.7$ hops per second for EUT;



7.7 Pseudorandom Frequency Hopping Sequence

7.7.1 Standard requirement

15.247(a)(1) requirement:

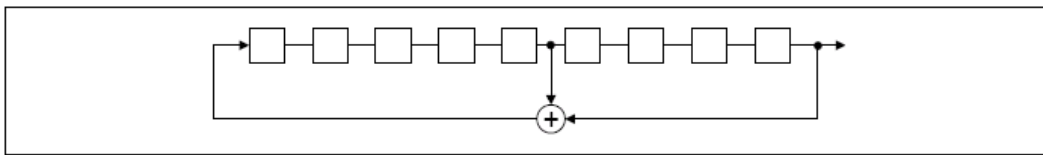
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

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.

7.7.2 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:



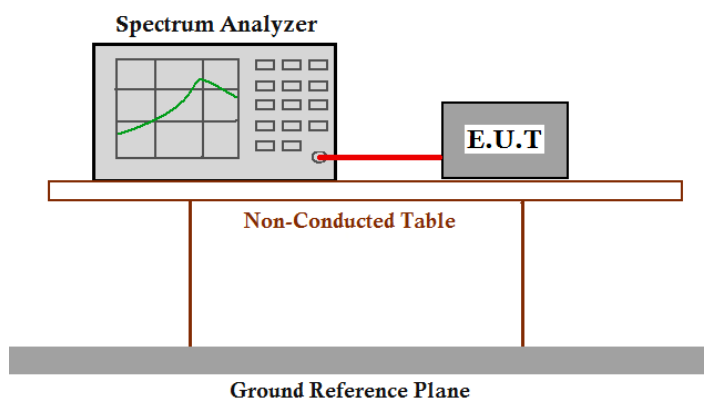
Each frequency used equally on the average by each transmitter.

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.

7.8 Maximum Peak Output Power

- Test Requirement:** FCC Part 15.247 & DA 00-705
- Test Method:** Base on ANSI C63.4:2003.
- Test Limit:** Regulation 15.247 (b)(1) For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.
Refer to the result "Hopping channel number" of this document. The 1 watt (30.0dBm) limit applies.
- Test mode:** Pre-test the EUT in transmitting mode in different modulation types with different data packages reported the worst case.

Test Configuration:



Test Procedure:

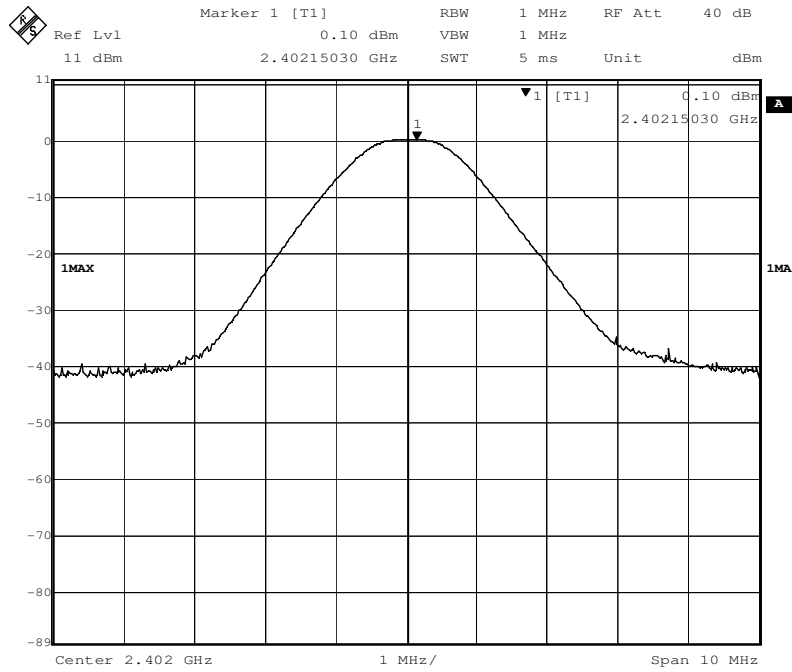
1. Remove the antenna from the EUT and then connect a low attenuation RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 2 MHz. VBW = 2 MHz. Sweep = auto; Detector Function = Peak.
3. Keep the EUT in transmitting at lowest, medium and highest channel individually. Record the max value.



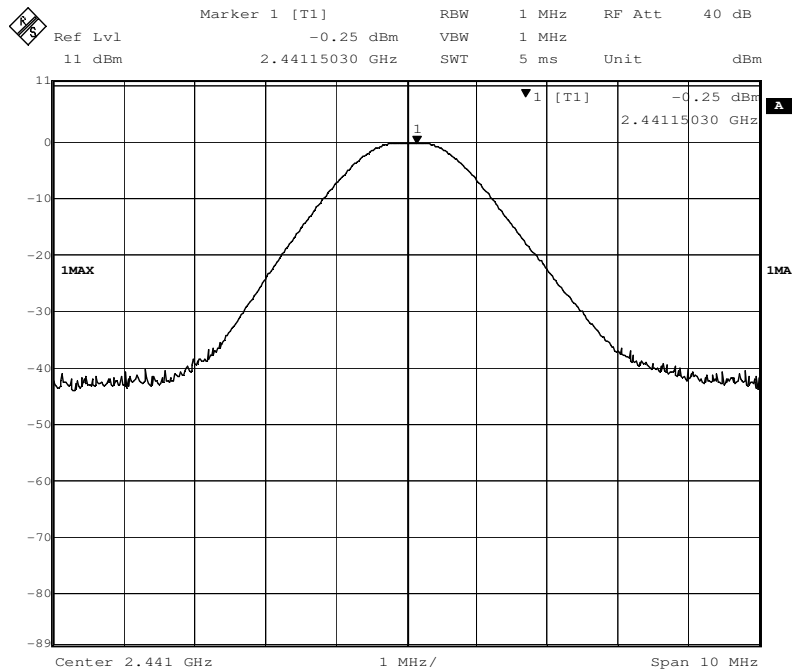
| Test Result: | | | | |
|--|-----------------------------|--------------------|-------------|--------|
| Normal mode: | | | | |
| Test Channel | Fundamental Frequency (MHz) | Output Power (dBm) | Limit (dBm) | Result |
| Lowest | 2.402 | 1.10 | 30.0 | Pass |
| Middle | 2.441 | 0.75 | 30.0 | Pass |
| Highest | 2.480 | 0.07 | 30.0 | Pass |
| EDR mode: | | | | |
| Test Channel | Fundamental Frequency (MHz) | Output Power (dBm) | Limit (dBm) | Result |
| Lowest | 2.402 | 0.74 | 30.0 | Pass |
| Middle | 2.441 | -0.67 | 30.0 | Pass |
| Highest | 2.480 | -1.37 | 30.0 | Pass |
| Remark: cable lose=1.0dB | | | | |
| Test result: The unit does meet the FCC requirements. | | | | |
| Test result plot as follows: | | | | |



Normal mode:
Lowest Channel:

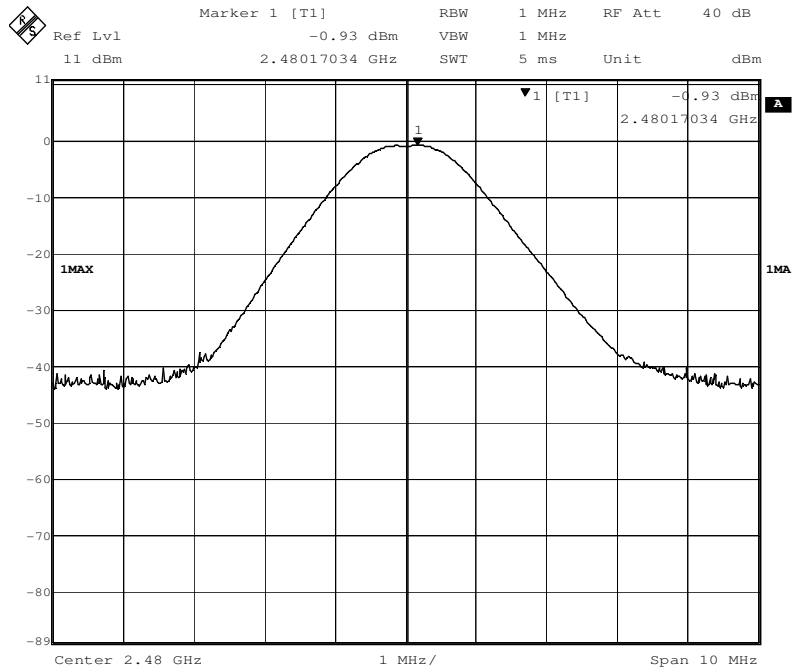


Middle Channel:

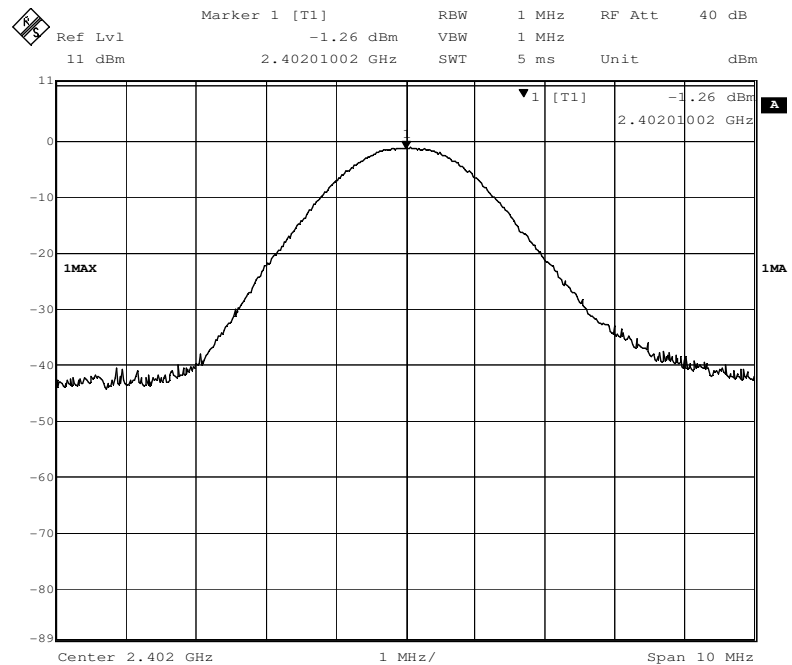




Highest Channel:

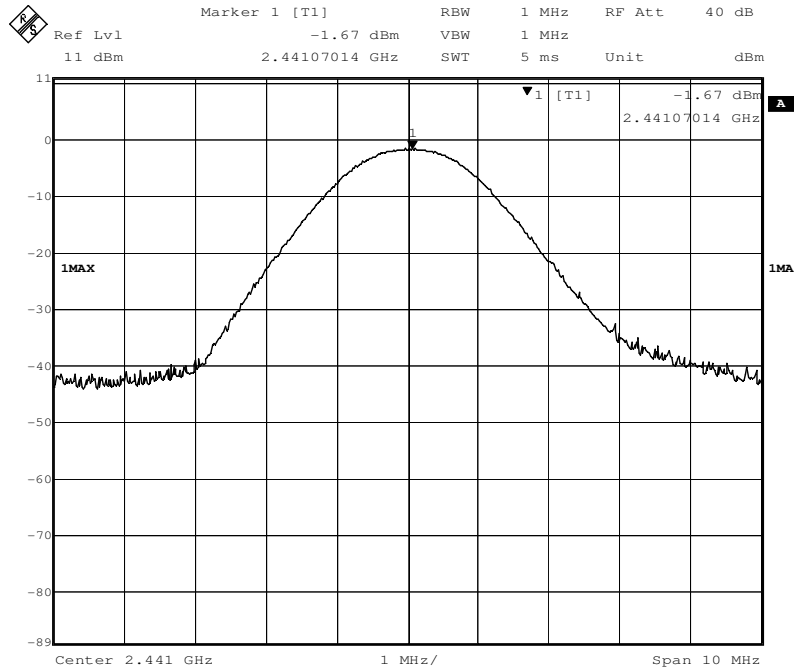


**8DPSK mode:
Lowest Channel:**

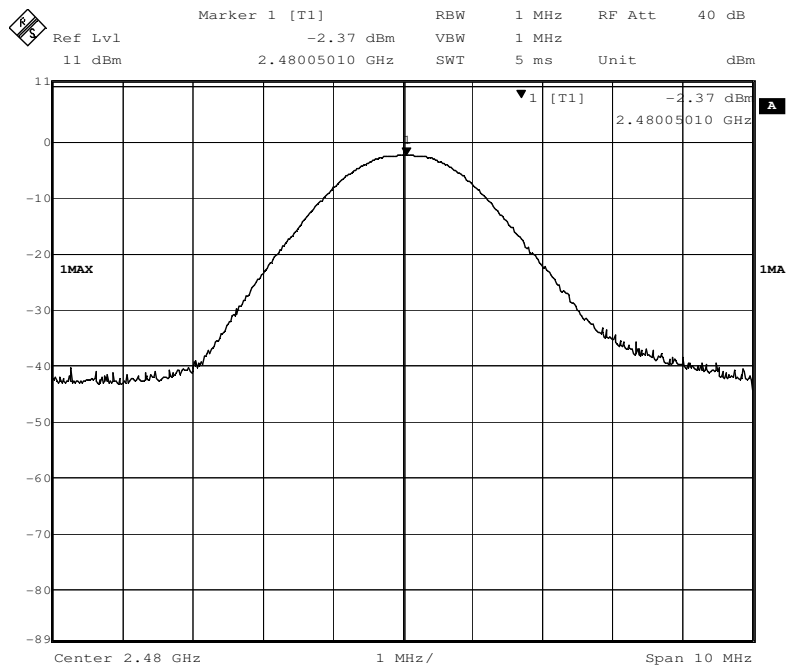




Middle channel:



Highest channel:



7.9 Conducted Spurious Emissions

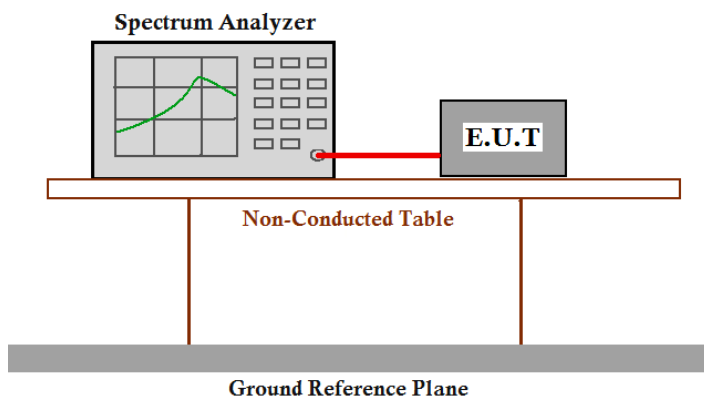
Test Requirement: FCC Part 15.247 & DA 00-705

Test Method: Based on FCC Part15 C Section 15.247&15.209

Test requirements: (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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. Provided the transmitter demonstrates compliance with the peak conducted power limits.

Test Status: Test the EUT in continuous transmitting mode at lowest. Middle, highest channel.

Test Configuration:



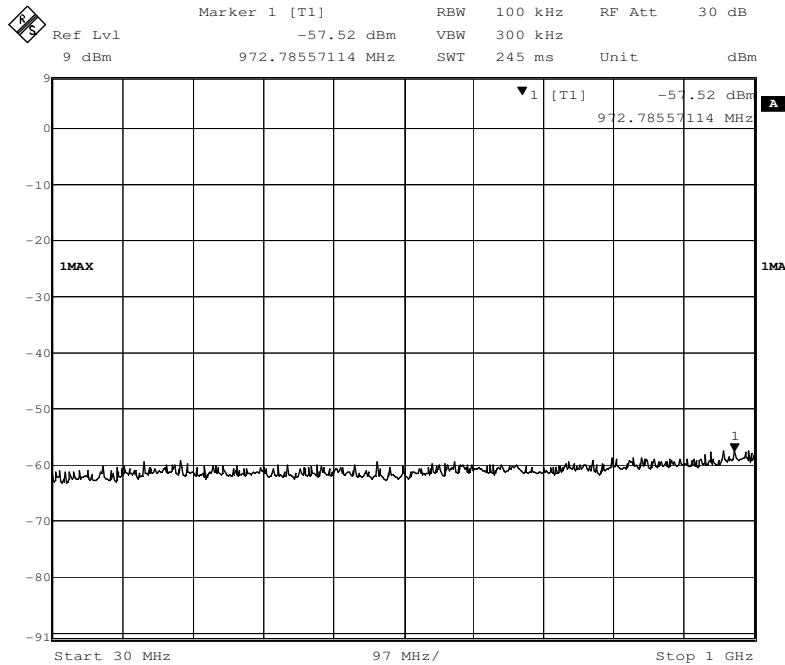
Test Procedure:

1. Remove the antenna from the EUT and then connect a low attenuation RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 100KHz. VBW \geq RBW. Sweep = auto; Detector Function = Peak (Max. hold).

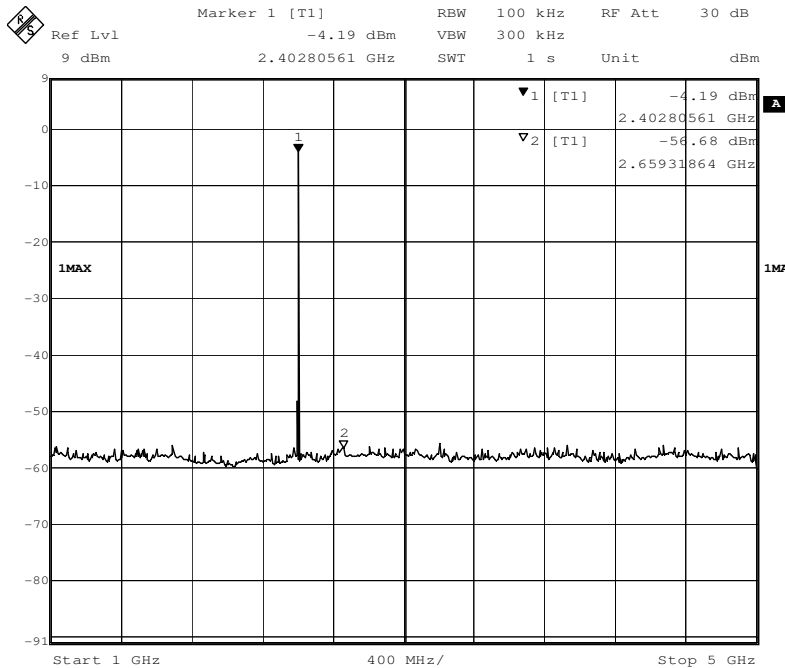
Test result plot as follows:



Lowest Channel: 30M to 1GHz

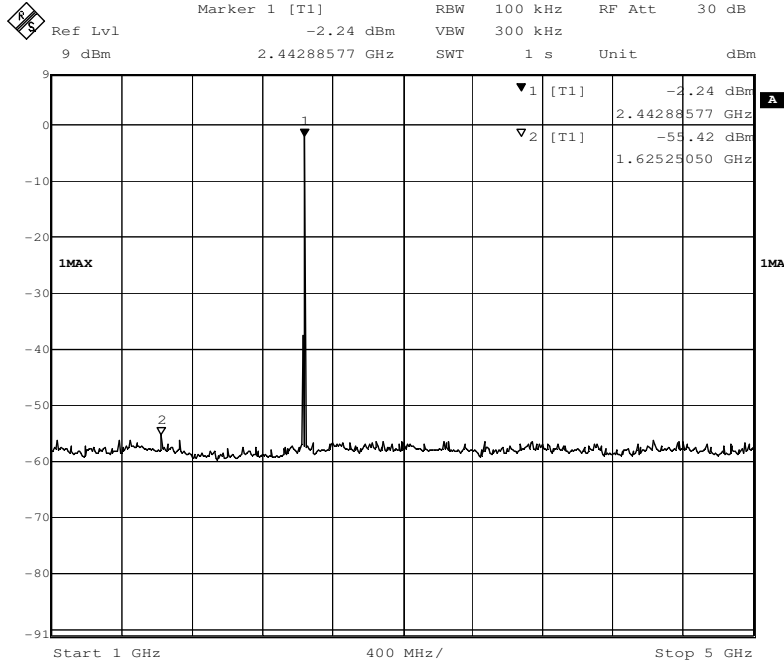


1G to 5GHz

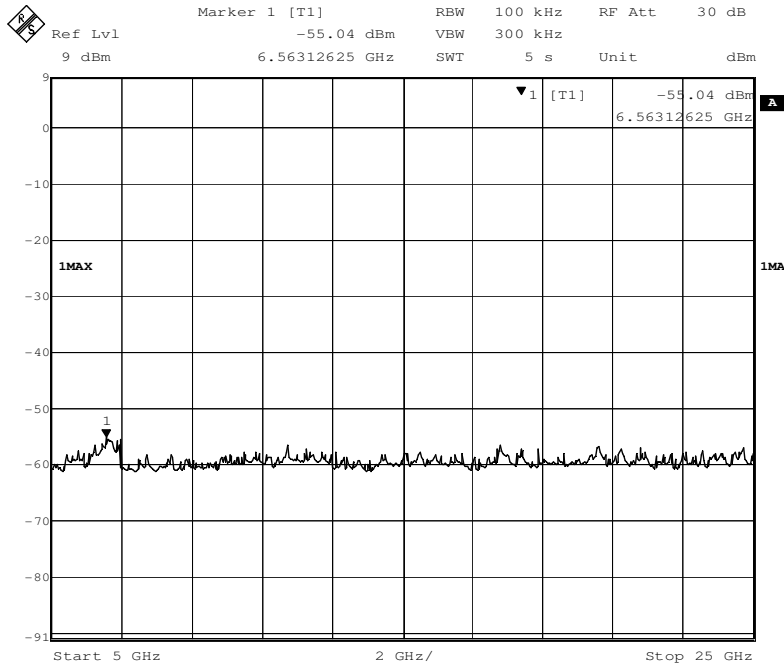




1G to 5GHz

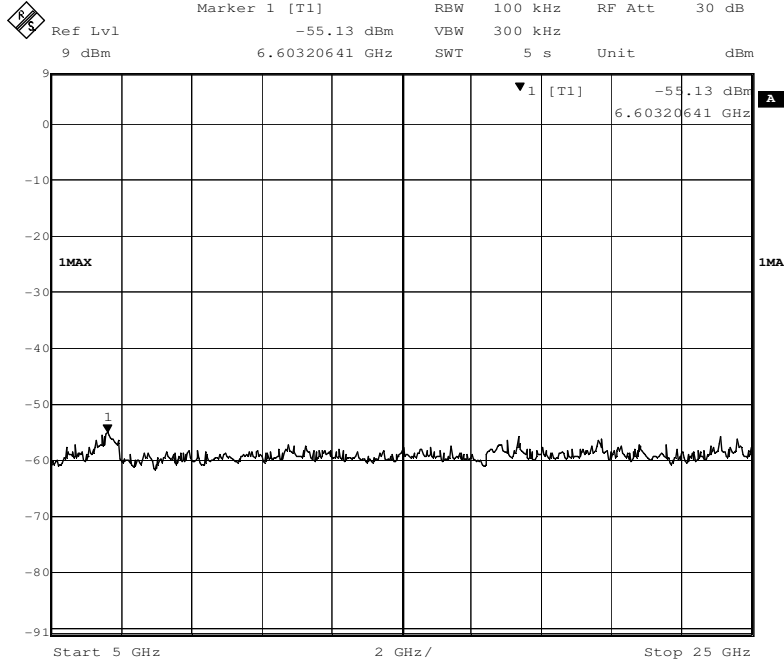


5G to 25GHz





5G to 25GHz



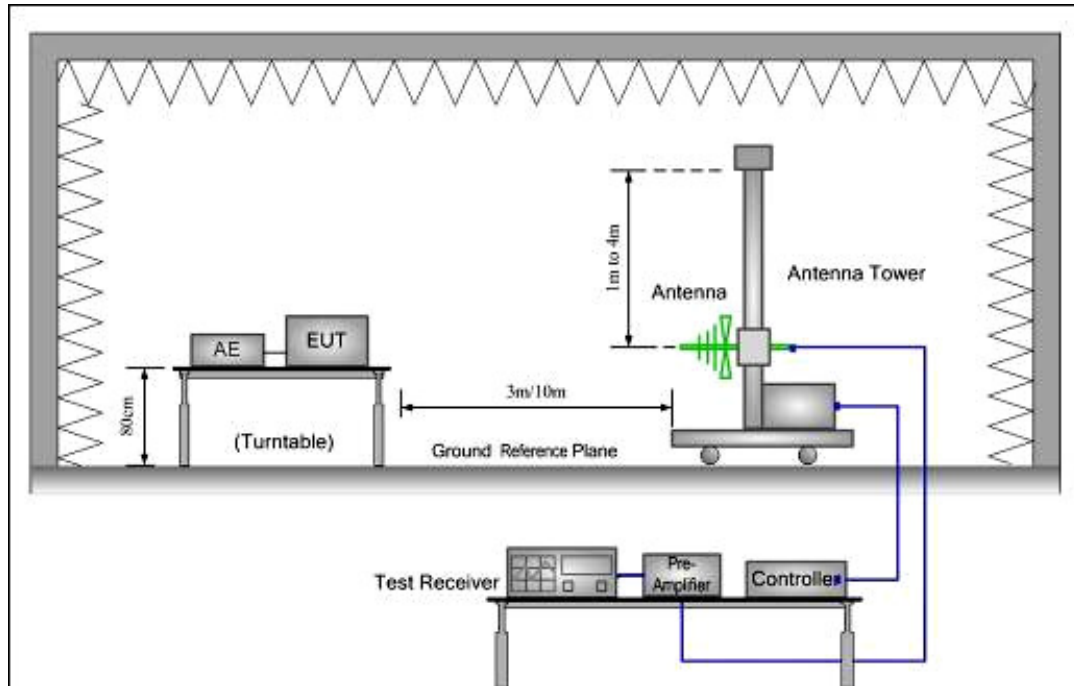


7.10 Radiated Spurious Emissions

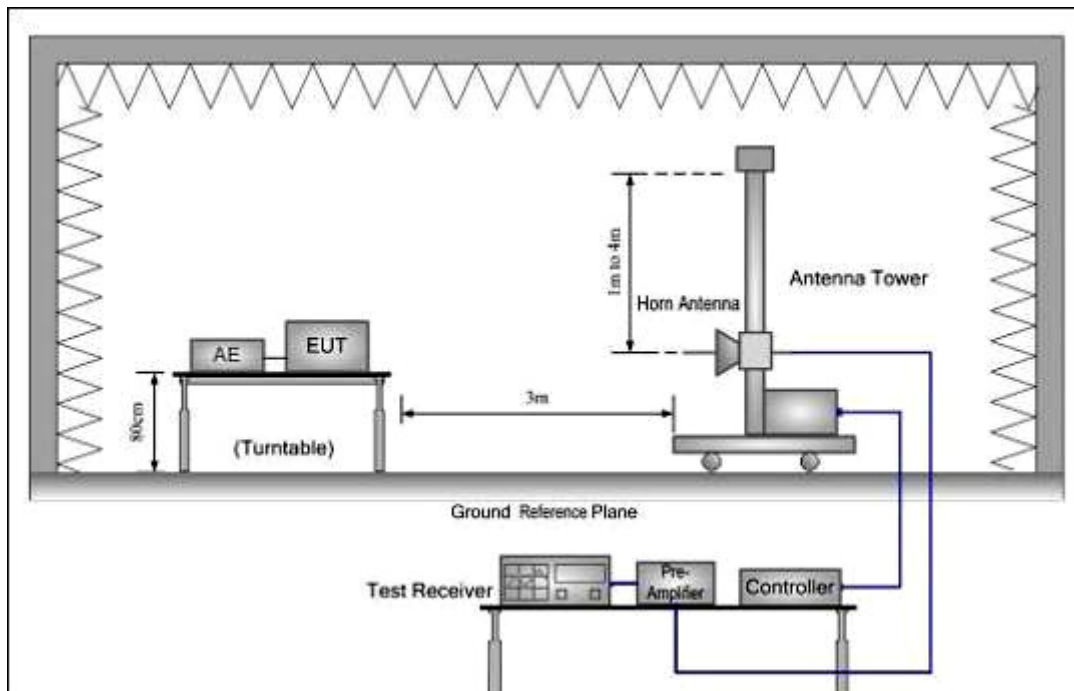
| | |
|--------------------------|---|
| Test Requirement: | FCC 15.247(d) & 15.209 |
| Test Method: | ANSI C63.4:2003 section 8 & 13 |
| Test Status: | Test the EUT in continuous transmitting mode at lowest channel, Middle, highest channel. |
| Detector: | For PK value: RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz VBW \geq RBW Sweep = auto Detector function = peak Trace = max hold For AV value: RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz VBW = 10Hz Sweep = auto Detector function = peak Trace = max hold |
| 15.209 Limit: | 40.0 dB μ V/m between 30MHz & 88MHz 43.5 dB μ V/m between 88MHz & 216MHz 46.0 dB μ V/m between 216MHz & 960MHz 54.0 dB μ V/m above 960MHz |
| 15.247(d) limit: | (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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, and provided the transmitter demonstrates compliance with the peak conducted power limits. |

Test Configuration:

- 1) 30MHz to 1GHz emissions:



- 2) 1GHz to 40GHz emissions:





Test Procedure: The procedure used was ANSI Standard C63.4:2003. The receiver was scanned from 30MHz to 25GHz. When an emission was found, the table was rotated to produce the maximum signal strength. An initial pre-scan was performed for in peak detection mode using the receiver. The EUT was measured for both the Horizontal and Vertical polarities and performed a pre-test three orthogonal planes. For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. The worst case emissions were reported.

Now set the VBW to 10 Hz, while maintaining all of the other instrument settings. This peak level, once corrected, must comply with the limit specified in Section 15.209. If the dwell time per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a "duty cycle correction factor", derived from $20\log(\text{dwell time}/100 \text{ ms})$, in an effort to demonstrate compliance with the 15.209 limit.

Submit this data.



7.10.1 Harmonic and other spurious emissions

7.10.1.1 Test at low Channel in transmitting status

30MHz~1GHz Spurious Emissions .Quasi-Peak Measurement

| Frequency (MHz) | Reading Level (dBμV) | Antenna factors (dB/m) | Cable loss (dB) | Preamp factor (dB) | Emission Level (dBμV/m) | Limit (dBμV/m) | Antenna polarization |
|-----------------|----------------------|------------------------|-----------------|--------------------|-------------------------|----------------|----------------------|
| 159.980 | 45.61 | 10.70 | 1.10 | 27.38 | 30.03 | 43.50 | Vertical |
| 416.060 | 46.39 | 14.80 | 1.80 | 27.82 | 35.17 | 46.00 | V |
| 447.100 | 44.07 | 15.12 | 1.80 | 27.90 | 33.09 | 46.00 | V |
| 159.980 | 52.66 | 10.70 | 1.10 | 27.38 | 37.08 | 43.50 | Horizontal |
| 341.330 | 48.14 | 13.36 | 1.60 | 27.38 | 35.72 | 46.00 | H |
| 510.150 | 36.62 | 15.79 | 2.00 | 28.08 | 26.34 | 46.00 | H |

1~25 GHz Harmonics & Spurious Emissions. Peak & Average Measurement

Peak Measurement:

| Frequency (MHz) | Antenna factors (dB/m) | Cable loss (dB) | Preamp factor (dB) | Reading Level (dBμV) | Emission Level (dBμV/m) | Limit (dBμV/m) | Antenna polarization |
|-----------------|------------------------|-----------------|--------------------|----------------------|-------------------------|----------------|----------------------|
| 4804.000 | 31.53 | 6.20 | 33.48 | 50.95 | 55.20 | 74.00 | V |
| 7206.000 | 36.47 | 7.20 | 32.76 | 46.29 | 57.20 | 74.00 | V |
| 9608.000 | 38.08 | 8.56 | 34.08 | 47.64 | 60.20 | 74.00 | V |
| 4804.000 | 31.53 | 6.20 | 33.48 | 45.43 | 49.68 | 74.00 | H |
| 7206.000 | 36.47 | 7.20 | 32.76 | 45.77 | 56.68 | 74.00 | H |
| 9608.000 | 38.08 | 8.56 | 34.08 | 46.11 | 58.68 | 74.00 | H |

Average Measurement:

| Frequency (MHz) | Antenna factors (dB/m) | Cable loss (dB) | Preamp factor (dB) | Reading Level (dBμV) | Emission Level (dBμV/m) | Limit (dBμV/m) | Antenna polarization |
|-----------------|------------------------|-----------------|--------------------|----------------------|-------------------------|----------------|----------------------|
| 4804.000 | 31.53 | 6.20 | 33.48 | 36.95 | 41.20 | 54.00 | V |
| 7206.000 | 36.47 | 7.20 | 32.76 | 37.05 | 47.96 | 54.00 | V |
| 9608.000 | 38.08 | 8.56 | 34.08 | 37.29 | 49.86 | 54.00 | V |
| 4804.000 | 31.53 | 6.20 | 33.48 | 36.58 | 43.66 | 54.00 | H |
| 7206.000 | 36.47 | 7.20 | 32.76 | 38.90 | 43.15 | 54.00 | H |
| 9608.000 | 38.08 | 8.56 | 34.08 | 37.65 | 50.21 | 54.00 | H |



7.10.1.2 Test at middle Channel in transmitting status

30MHz~1GHz Spurious Emissions .Quasi-Peak Measurement

| Frequency (MHz) | Antenna factors (dB/m) | Cable loss (dB) | Preamp factor (dB) | Reading Level (dBμV) | Emission Level (dBμV/m) | Limit (dBμV/m) | Antenna polarization |
|-----------------|------------------------|-----------------|--------------------|----------------------|-------------------------|----------------|----------------------|
| 159.980 | 10.70 | 1.10 | 27.38 | 45.61 | 30.03 | 43.50 | Vertical |
| 245.340 | 11.16 | 1.40 | 27.15 | 42.91 | 28.32 | 46.00 | V |
| 416.060 | 14.80 | 1.80 | 27.82 | 46.39 | 35.17 | 46.00 | V |
| 168.710 | 9.88 | 1.20 | 27.35 | 53.75 | 37.48 | 43.50 | Horizontal |
| 339.430 | 13.34 | 1.60 | 27.37 | 52.15 | 39.72 | 46.00 | H |
| 458.740 | 15.16 | 1.90 | 27.94 | 39.09 | 28.22 | 46.00 | H |

1~25 GHz Harmonics & Spurious Emissions. Peak & Average Measurement

Peak Measurement:

| Frequency (MHz) | Antenna factors (dB/m) | Cable loss (dB) | Preamp factor (dB) | Reading Level (dBμV) | Emission Level (dBμV/m) | Limit (dBμV/m) | Antenna polarization |
|-----------------|------------------------|-----------------|--------------------|----------------------|-------------------------|----------------|----------------------|
| 4882.000 | 31.57 | 6.27 | 33.15 | 55.21 | 59.90 | 74.00 | V |
| 7323.000 | 36.50 | 7.68 | 32.61 | 45.82 | 57.39 | 74.00 | V |
| 9764.000 | 38.51 | 8.66 | 34.17 | 46.39 | 59.39 | 74.00 | V |
| 4882.000 | 31.57 | 6.27 | 33.15 | 45.80 | 50.49 | 74.00 | H |
| 7323.000 | 36.50 | 7.68 | 32.61 | 45.61 | 57.18 | 74.00 | H |
| 9764.000 | 38.51 | 8.66 | 34.17 | 46.02 | 59.02 | 74.00 | H |

Average Measurement:

| Frequency (MHz) | Antenna factors (dB/m) | Cable loss (dB) | Preamp factor (dB) | Reading Level (dBμV) | Emission Level (dBμV/m) | Limit (dBμV/m) | Antenna polarization |
|-----------------|------------------------|-----------------|--------------------|----------------------|-------------------------|----------------|----------------------|
| 4882.000 | 31.57 | 6.27 | 33.15 | 39.60 | 44.29 | 54.00 | V |
| 7323.000 | 36.50 | 7.68 | 32.61 | 38.26 | 49.83 | 54.00 | V |
| 9764.000 | 38.51 | 8.66 | 34.17 | 37.26 | 50.26 | 54.00 | V |
| 4882.000 | 31.57 | 6.27 | 33.15 | 36.36 | 41.05 | 54.00 | H |
| 7323.000 | 36.50 | 7.68 | 32.61 | 37.26 | 48.83 | 54.00 | H |
| 9764.000 | 38.51 | 8.66 | 34.17 | 37.29 | 50.29 | 54.00 | H |



7.10.1.3 Test at high Channel in transmitting status

30MHz~1GHz Spurious Emissions .Quasi-Peak Measurement

| Frequency (MHz) | Antenna factors (dB/m) | Cable loss (dB) | Preamp factor (dB) | Reading Level (dBμV) | Emission Level (dBμV/m) | Limit (dBμV/m) | Antenna polarization |
|-----------------|------------------------|-----------------|--------------------|----------------------|-------------------------|----------------|----------------------|
| 159.980 | 10.70 | 1.00 | 27.38 | 45.61 | 30.03 | 43.50 | Vertical |
| 245.340 | 11.16 | 1.40 | 27.15 | 42.91 | 28.32 | 46.00 | V |
| 424.790 | 14.91 | 1.80 | 27.84 | 45.55 | 34.42 | 46.00 | V |
| 159.980 | 10.70 | 1.10 | 27.38 | 52.99 | 37.41 | 43.50 | Horizontal |
| 339.430 | 13.34 | 1.60 | 27.37 | 55.15 | 42.72 | 46.00 | H |
| 458.740 | 15.16 | 1.90 | 27.94 | 39.09 | 28.22 | 46.00 | H |

1~25 GHz Harmonics & Spurious Emissions. Peak & Average Measurement

Peak Measurement:

| Frequency (MHz) | Antenna factors (dB/m) | Cable loss (dB) | Preamp factor (dB) | Reading Level (dBμV) | Emission Level (dBμV/m) | Limit (dBμV/m) | Antenna polarization |
|-----------------|------------------------|-----------------|--------------------|----------------------|-------------------------|----------------|----------------------|
| 4960.000 | 31.70 | 6.20 | 32.82 | 55.26 | 60.34 | 74.00 | V |
| 7440.000 | 36.60 | 7.47 | 32.46 | 46.03 | 57.63 | 74.00 | V |
| 9920.000 | 38.68 | 8.75 | 34.26 | 46.10 | 59.27 | 74.00 | V |
| 4960.000 | 31.70 | 6.20 | 32.82 | 49.44 | 54.53 | 74.00 | H |
| 7440.000 | 36.60 | 7.47 | 32.46 | 45.30 | 56.91 | 74.00 | H |
| 9920.000 | 38.68 | 8.75 | 34.26 | 37.26 | 50.43 | 74.00 | H |

Average Measurement:

| Frequency (MHz) | Antenna factors (dB/m) | Cable loss (dB) | Preamp factor (dB) | Reading Level (dBμV) | Emission Level (dBμV/m) | Limit (dBμV/m) | Antenna polarization |
|-----------------|------------------------|-----------------|--------------------|----------------------|-------------------------|----------------|----------------------|
| 4960.000 | 31.70 | 6.20 | 32.82 | 35.26 | 40.34 | 54.00 | V |
| 7440.000 | 36.60 | 7.47 | 32.46 | 37.26 | 48.86 | 54.00 | V |
| 9920.000 | 38.68 | 8.75 | 34.26 | 37.20 | 50.37 | 54.00 | V |
| 4960.000 | 31.70 | 6.20 | 32.82 | 40.26 | 45.34 | 54.00 | H |
| 7440.000 | 36.60 | 7.47 | 32.46 | 37.26 | 48.86 | 54.00 | H |
| 9920.000 | 38.68 | 8.75 | 34.26 | 37.26 | 50.43 | 54.00 | H |



Remark:

1). The field strength is calculated by adding the Antenna Factor. Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level =Receiver Reading + Antenna Factor + Cable Factor –Preamplifier Factor.

2). As shown in Section, for frequencies above 1000 MHz. the above field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

3). The test only perform the EUT in transmitting status since the test frequencies were over 1GHz only required transmitting status.

Test result: The unit does meet the FCC requirements.



7.10.2 Radiated Emissions which fall in the restricted bands

| | |
|------------------------------|---|
| Test Requirement: | Section 15.247(d) In addition, radiated emissions which fall in the restricted bands. as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)). |
| Test Method: | Base on ANSI C63.4:2003 |
| Test Status: | Test the EUT in continuous transmitting mode at lowest channel, Middle, highest channel. |
| Measurement Distance: | 3m (Semi-Anechoic Chamber) |
| Limit: | 40.0 dB μ V/m between 30MHz & 88MHz; 43.5 dB μ V/m between 88MHz & 216MHz; 46.0 dB μ V/m between 216MHz & 960MHz; 54.0 dB μ V/m above 960MHz. |
| Detector: | For PK value: RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz VBW \geq RBW Sweep = auto Detector function = peak Trace = max hold For AV value: RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz VBW =10Hz Sweep = auto Detector function = peak Trace = max hold |



Test Result:

1. Low Channel

| Frequency (MHz) | Antenna factors (dB/m) | Cable loss(dB) | Preamp factor(dB) | Peak Reading Level (dBμV) | Average Reading Level (dBμV) | Peak Emission Level (dBμV/m) | Average Emission Level (dBμV/m) |
|-----------------|------------------------|----------------|-------------------|---------------------------|------------------------------|------------------------------|---------------------------------|
| 2310.000 | 27.93 | 4.23 | 35.60 | 48.02 | 37.11 | 44.58 | 33.67 |
| 2390.000 | 27.61 | 4.30 | 35.60 | 72.77 | 54.26 | 69.08 | 50.57 |
| 2500.000 | 27.55 | 4.40 | 35.60 | 47.33 | 35.26 | 43.68 | 31.61 |
| 2483.500 | 27.55 | 4.40 | 35.60 | 46.32 | 35.79 | 42.68 | 32.14 |

2. Middle Channel

| Frequency (MHz) | Antenna factors (dB/m) | Cable loss(dB) | Preamp factor(dB) | Peak Reading Level (dBμV) | Average Reading Level (dBμV) | Peak Emission Level (dBμV/m) | Average Emission Level (dBμV/m) |
|-----------------|------------------------|----------------|-------------------|---------------------------|------------------------------|------------------------------|---------------------------------|
| 2310.000 | 27.93 | 4.23 | 35.60 | 48.38 | 38.16 | 44.94 | 34.72 |
| 2390.000 | 27.61 | 4.30 | 35.60 | 49.31 | 36.26 | 45.61 | 32.57 |
| 2500.000 | 27.55 | 4.40 | 35.60 | 48.86 | 38.11 | 45.21 | 34.46 |
| 2483.500 | 27.55 | 4.40 | 35.60 | 49.31 | 37.77 | 45.66 | 34.12 |

3. High Channel

| Frequency (MHz) | Antenna factors (dB/m) | Cable loss(dB) | Preamp factor(dB) | Peak Reading Level (dBμV) | Average Reading Level (dBμV) | Peak Emission Level (dBμV/m) | Average Emission Level (dBμV/m) |
|-----------------|------------------------|----------------|-------------------|---------------------------|------------------------------|------------------------------|---------------------------------|
| 2310.000 | 27.93 | 4.23 | 35.60 | 47.59 | 35.26 | 44.15 | 31.82 |
| 2390.000 | 27.61 | 4.30 | 35.60 | 47.85 | 35.55 | 44.15 | 31.82 |
| 2500.000 | 27.55 | 4.40 | 35.60 | 49.80 | 35.95 | 46.15 | 32.30 |
| 2483.500 | 27.55 | 4.40 | 35.60 | 67.26 | 53.80 | 63.61 | 50.15 |

Remark: No any other emission which falls in restricted bands can be detected and be reported.

Test result: The unit does meet the FCC requirements.



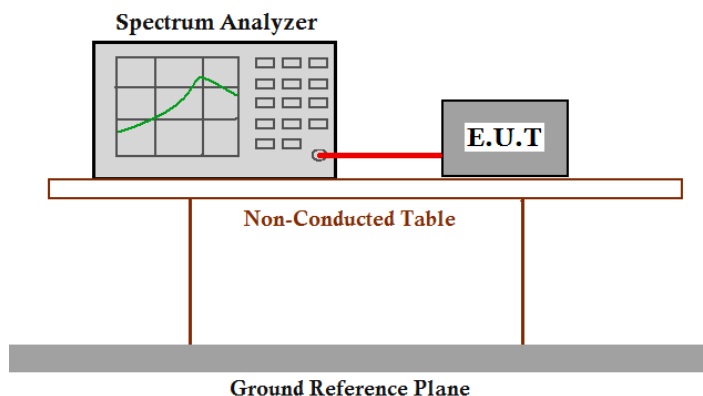
Section 15.205 Restricted bands of operation.

(a) Except as shown in paragraph (d) of this section. only spurious emissions are permitted in any of the frequency bands listed below:

| MHz | MHz | MHz | GHz |
|----------------------------|---------------------|-----------------|---------------|
| 0.090 - 0.110 | 16.42 - 16.423 | 399.9 - 410 | 4.5 - 5.15 |
| ¹ 0.495 - 0.505 | 16.69475 - 16.69525 | 608 - 614 | 5.35 - 5.46 |
| 2.1735 - 2.1905 | 16.80425 - 16.80475 | 960 - 1240 | 7.25 - 7.75 |
| 4.125 - 4.128 | 25.5 - 25.67 | 1300 - 1427 | 8.025 - 8.5 |
| 4.17725 - 4.17775 | 37.5 - 38.25 | 1435 - 1626.5 | 9.0 - 9.2 |
| 4.20725 - 4.20775 | 73 - 74.6 | 1645.5 - 1646.5 | 9.3 - 9.5 |
| 6.215 - 6.218 | 74.8 - 75.2 | 1660 - 1710 | 10.6 - 12.7 |
| 6.26775 - 6.26825 | 108 - 121.94 | 1718.8 - 1722.2 | 13.25 - 13.4 |
| 6.31175 - 6.31225 | 123 - 138 | 2200 - 2300 | 14.47 - 14.5 |
| 8.291 - 8.294 | 149.9 - 150.05 | 2310 - 2390 | 15.35 - 16.2 |
| 8.362 - 8.366 | 156.52475 - | 2483.5 - 2500 | 17.7 - 21.4 |
| 8.37625 - 8.38675 | 156.52525 | 2655 - 2900 | 22.01 - 23.12 |
| 8.41425 - 8.41475 | 156.7 - 156.9 | 3260 - 3267 | 23.6 - 24.0 |
| 12.29 - 12.293 | 162.0125 - 167.17 | 3332 - 3339 | 31.2 - 31.8 |
| 12.51975 - 12.52025 | 167.72 - 173.2 | 3345.8 - 3358 | 36.43 - 36.5 |
| 12.57675 - 12.57725 | 240 - 285 | 3600 - 4400 | |
| 13.36 - 13.41 | 322 - 335.4 | | |

7.11 Band Edges Requirement

| | |
|----------------------------|---|
| Test Requirement: | FCC Part 15 C |
| Test Method: | Based on ANSI C63.4:2003 Operation within the band 2400 – 2483.5 MHz |
| Test Status: | Test the EUT in normal mode and EDR mode, found the worst case is in normal mode and report it. |
| Test Configuration: | |



Test Procedure: Set RBW of spectrum analyzer to 100 kHz and VBW of spectrum analyzer to 100 kHz with suitable frequency span including 100 kHz bandwidth from band edge.

Pretest the EUT in hopping on and hopping off; found the worse case was the hopping off. The band edge was measured and recorded the worse case.

Requirements: Section 15.247 (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

The band edges was measured and recorded Result:

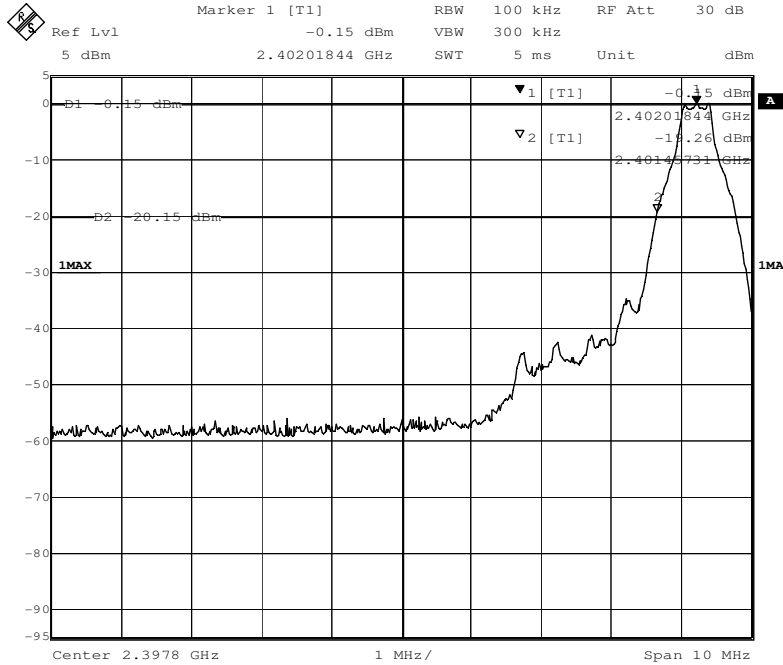
The Lower Edges attenuated more than 20dB.

The Upper Edges attenuated more than 20dB.

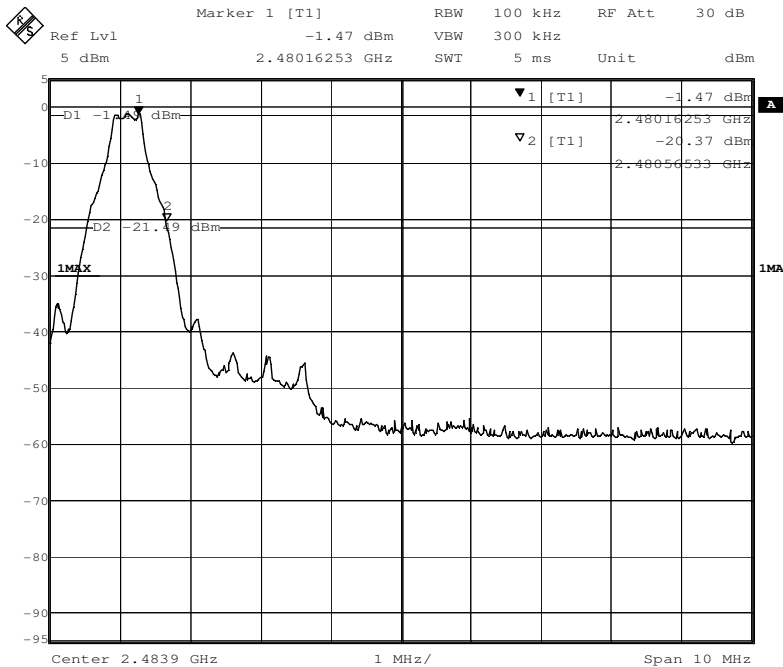
The graph as below. Represents the emissions take for this device.



DH5:
Low channel:

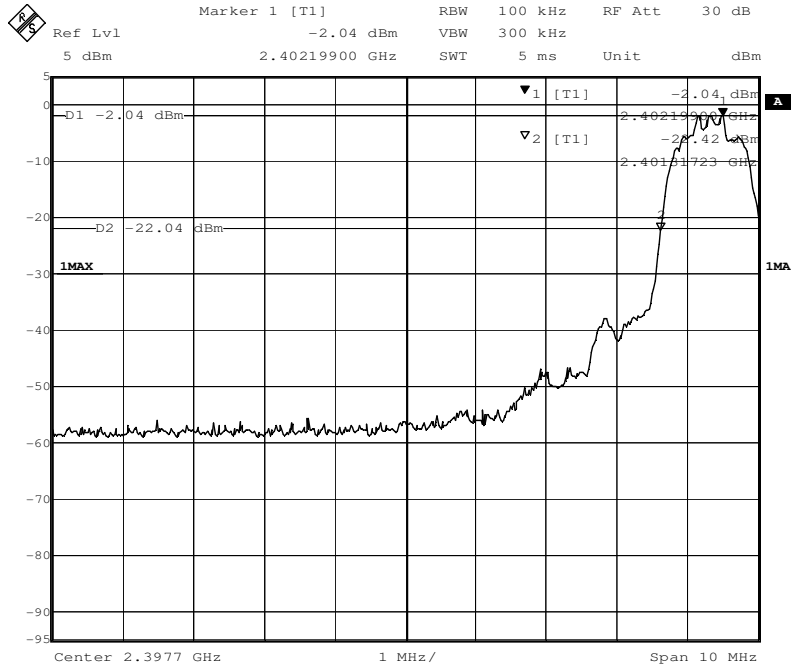


Highest Channel:

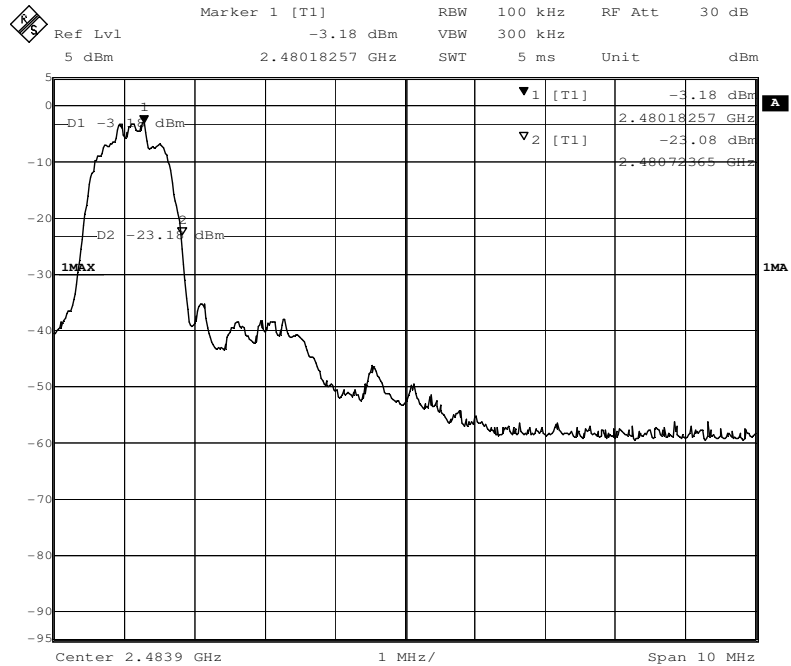




3DH5:
Low channel:



Highest Channel:



Test result: The unit does meet the FCC requirements.



7.12 Conducted Emissions at Mains Terminals 150 kHz to 30MHz

Test Requirement: FCC Part 15.207
Test Method: ANSI C63.4:2003
Frequency Range: 150KHz to 30MHz
Detector: Peak for pre-scan (9kHz Resolution Bandwidth)
Test Limit

Limits for conducted disturbance at the mains ports of class B

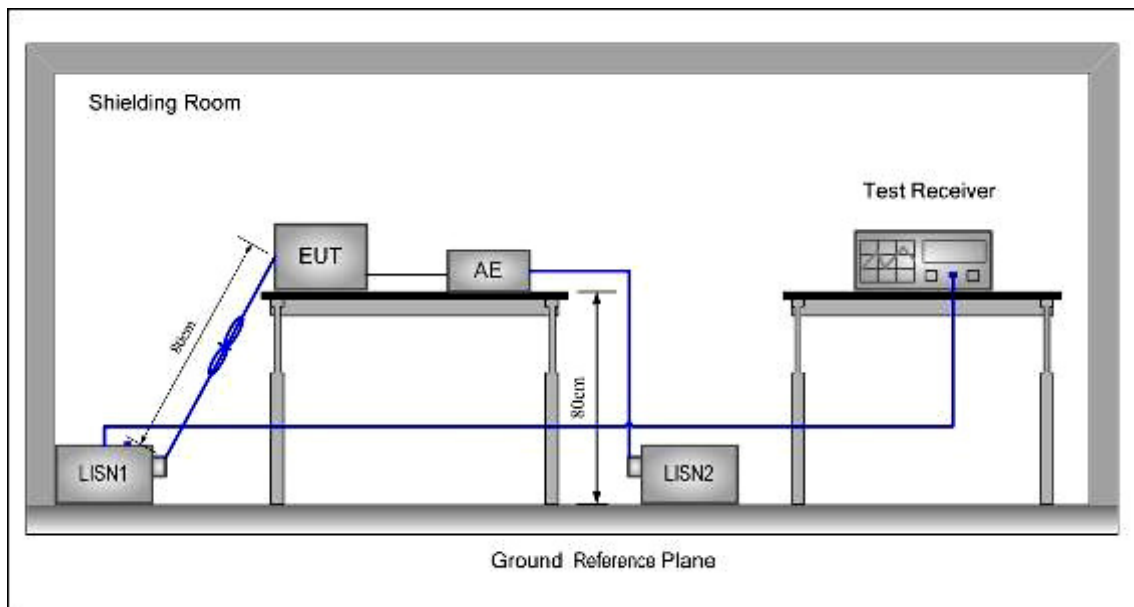
| Frequency Range (MHz) | Class B Limit (dBuV) | |
|--------------------------|----------------------|----------|
| | Quasi-peak | Average |
| 0.15 to 0.50 | 66 to 56 | 56 to 46 |
| 0.50 to 5 | 56 | 46 |
| 5 to 30 | 60 | 50 |

NOTE 1 The limit decreases linearly with the logarithm of the frequency in the range 0,15 MHz to 0,50 MHz.

EUT Operation: Test in normal mode. For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage.

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

Test Configuration:



Test procedure:

1. The mains terminal disturbance voltage test was conducted in a shielded room.
2. The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a $50\Omega/50\mu\text{H} + 5\Omega$ linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.
3. The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane, but separated from metallic contact with the ground reference plane by 0.1m of insulation.
4. The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0,4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0,8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0,8 m from the LISN 2.



7.12.1 Measurement Data

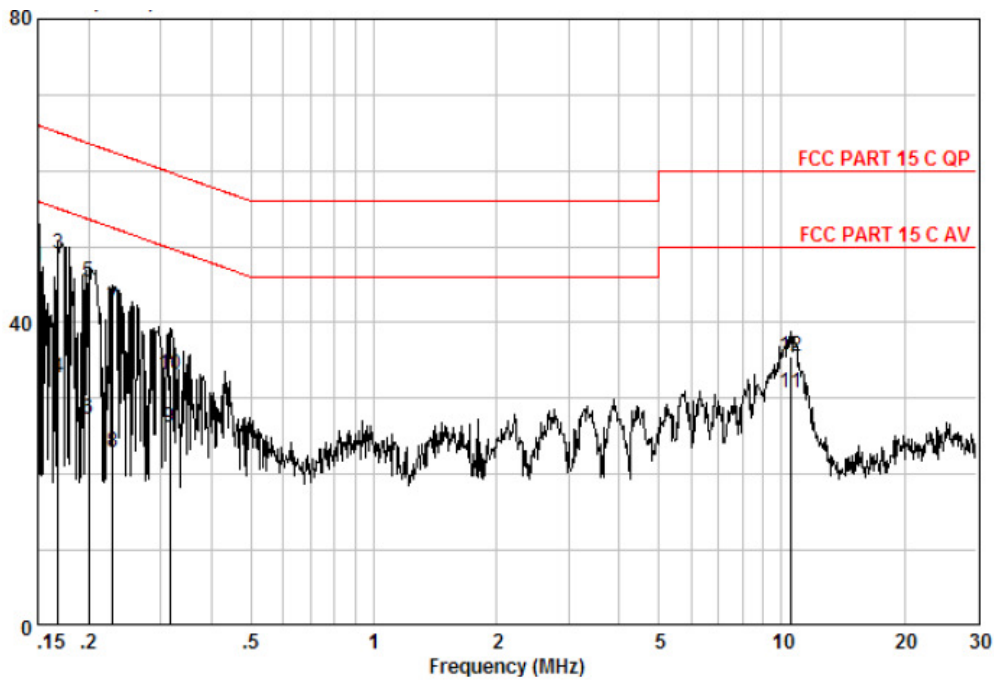
An initial pre-scan was performed on the live and neutral lines with peak detector.

Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected. For EUT the communicating was worst case mode.

The following Quasi-Peak and Average measurements were performed on the EUT:

Neutral Line

Level(dB μ V)

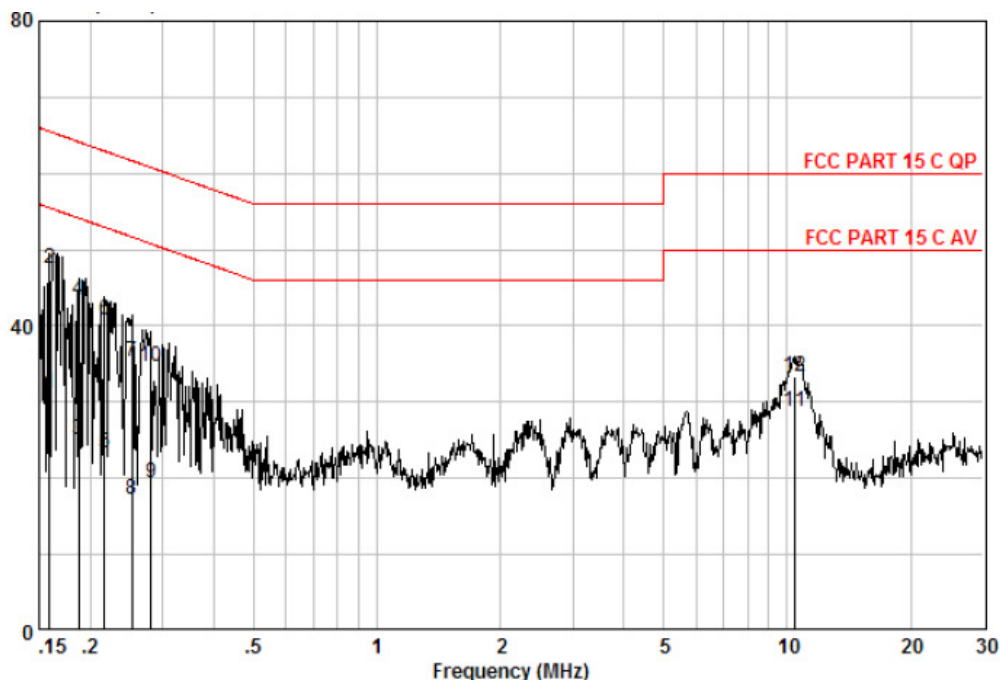


Measure data:

| Freq MHz | Read Level dBuV | Cable Loss dB | LISN Factor dB | Level dBuV | Limit Line dBuV | Over Limit dB | Remark |
|-------------|-----------------------|---------------------|----------------------|---------------|-----------------------|---------------------|---------|
| 0.150 | 37.54 | 0.06 | 9.64 | 47.24 | 66.00 | -18.76 | QP |
| 0.150 | 17.20 | 0.06 | 9.64 | 26.90 | 56.00 | -29.10 | AVERAGE |
| 0.169 | 39.42 | 0.09 | 9.63 | 49.14 | 65.03 | -15.89 | QP |
| 0.169 | 22.99 | 0.09 | 9.63 | 32.71 | 55.03 | -22.32 | AVERAGE |
| 0.200 | 35.62 | 0.13 | 9.62 | 45.37 | 63.62 | -18.25 | QP |
| 0.200 | 17.58 | 0.13 | 9.62 | 27.33 | 53.62 | -26.29 | AVERAGE |
| 0.229 | 32.06 | 0.11 | 9.62 | 41.79 | 62.48 | -20.68 | QP |
| 0.229 | 13.18 | 0.11 | 9.62 | 22.91 | 52.48 | -29.56 | AVERAGE |
| 0.317 | 16.56 | 0.07 | 9.63 | 26.26 | 49.80 | -23.54 | AVERAGE |
| 0.317 | 23.38 | 0.07 | 9.63 | 33.08 | 59.80 | -26.72 | QP |
| 10.564 | 20.88 | 0.17 | 9.78 | 30.84 | 50.00 | -19.16 | AVERAGE |
| 10.564 | 25.68 | 0.17 | 9.78 | 35.64 | 60.00 | -24.36 | QP |



Live Line
Level(dBuV)



Measure result:

| Freq | Read Level | Cable Loss | LISN Factor | Level | Limit Line | Over Limit | Remark |
|--------|------------|------------|-------------|-------|------------|------------|---------|
| MHz | dBuV | dB | dB | dBuV | dBuV | dB | |
| 0.159 | 21.52 | 0.07 | 9.62 | 31.21 | 55.52 | -24.30 | AVERAGE |
| 0.159 | 37.82 | 0.07 | 9.62 | 47.51 | 65.52 | -18.00 | QP |
| 0.187 | 15.35 | 0.11 | 9.62 | 25.08 | 54.15 | -29.07 | AVERAGE |
| 0.187 | 33.72 | 0.11 | 9.62 | 43.45 | 64.15 | -20.70 | QP |
| 0.216 | 13.61 | 0.12 | 9.62 | 23.35 | 52.96 | -29.61 | AVERAGE |
| 0.216 | 30.94 | 0.12 | 9.62 | 40.68 | 62.96 | -22.28 | QP |
| 0.252 | 25.60 | 0.10 | 9.62 | 35.32 | 61.69 | -26.37 | QP |
| 0.252 | 7.47 | 0.10 | 9.62 | 17.19 | 51.69 | -34.50 | AVERAGE |
| 0.282 | 9.71 | 0.09 | 9.62 | 19.41 | 50.76 | -31.35 | AVERAGE |
| 0.282 | 24.88 | 0.09 | 9.62 | 34.58 | 60.76 | -26.18 | QP |
| 10.397 | 18.76 | 0.17 | 9.75 | 28.68 | 50.00 | -21.32 | AVERAGE |
| 10.397 | 23.54 | 0.17 | 9.75 | 33.46 | 60.00 | -26.54 | QP |

--End of Report--