

| Test Mode: | 8DF | PSK Mo | ode | | | | | | | |
|----------------------|---------------------------------|----------------|--|------------|------------------------|---|---------------------------------------|---------|--------------------------|--------|
| Channel freque (MHz) | annel frequency (MHz) | | OCB [MHz |] | FL[MHz] | | | FH[MHz] | | Verdic |
| 2402 | | | 1.229 | | 2401 | .236 | | 240 | 02.465 | PASS |
| 2441 | | | 1.217 | | 2440 | .239 | | 244 | 41.456 | PASS |
| 2480 | | | 1.214 | | 2479 | .239 | | 248 | 30.453 | PASS |
| | | | - | 8DPS | K Mod | е | - | | | 1 |
| | | | | 2402 | MHz | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | Spectrur | | | | | | | | ▽ | |
| | | el 30.00 dBm | | | | | | | . | |
| | Att Count 100 | 40 dB 0/100 | SWT 94.8 µs ● | ARM TOO KE | 12 Mode A | uto FFT | | | | |
| | ●1Pk View | | | | | | | | | |
| | | | | | M: | 1[1] | | | -12.06 dBm 179920 GHz | |
| | 20 dBm | + | | | Occ Bw 1.228771229 MHz | | | | | |
| | 20 dBm - Occ Bw 1.228771229 MHz | | | | | | | | | |
| | 1 | | I | | | | | | I I | |
| | 10 dBm | +-+ | | | | | | | | |
| | | | | | | | | | | |
| | 10 dBm | | | | | | | | | |
| | | | | M1 | | | | | | |
| | 0 dBm | | | M1 | May M | | | | | |
| | 0 dBm | | TI MANA | M1 | mm | √√15 -√ | | | | |
| | 0 dBm | | | M1 | mm | ~\rho_12 | | | | |
| | 0 dBm | | Amma Amma | M1 | May | V15 | | | | |
| | 0 dBm | | - Amm | M1 | Many | V15 | | | | |
| | 0 dBm | war. | W mmm | M1 | mmm | Mrs. | · · · · · · · · · · · · · · · · · · · | ~~~~~ | Mu | |
| | 0 dBm | vw. | The same of the sa | MI | mmm | ~\n\2 | ~~~~ | , | Man | |
| | -10 dBm | | | MI | MmM | ~ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ | www. | w~~w | Many | |
| | 0 dBm | ~~~~ | | M1 | My | ~ C12 | www | | May | |
| | -10 dBm | | | | | ~ C122 | www | | San C | |
| | -10 dBm | | Nama Nama | | May M. | ~ C122 | www. | Spa | 10 3.0 MHz | |





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3.5. Carrier Frequencies Separation

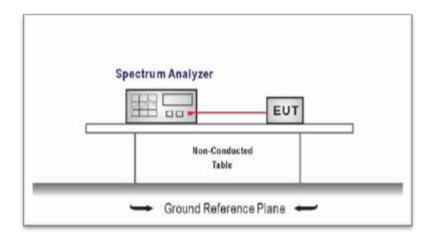
LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (a)(1):

frequency hopping systems shall have hopping channel carrier frequencies separated by minimum of 25kHz or the 2/3*20dB bandwidth of the hopping channel, whichever is greater.

| Test Item | Limit | Frequency Range(MHz) |
|--------------------|---|----------------------|
| Channel Separation | >25KHz or >two-thirds of the 20 dB bandwidth Which is greater | 2400~2483.5 |

Test Configuration



Test Procedure

- 1. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- 2. Spectrum Setting:
 - (1) Set RBW = 100 kHz.
 - (2) Set the video bandwidth (VBW) ≥ 3 RBW.
 - (3) Detector = Peak.
 - (4) Trace mode = Max hold.
 - (5) Sweep = Auto couple.

NOTE: The EUT was set to continuously transmitting in each mode and low, Middle and high channel for the test.

Test Mode

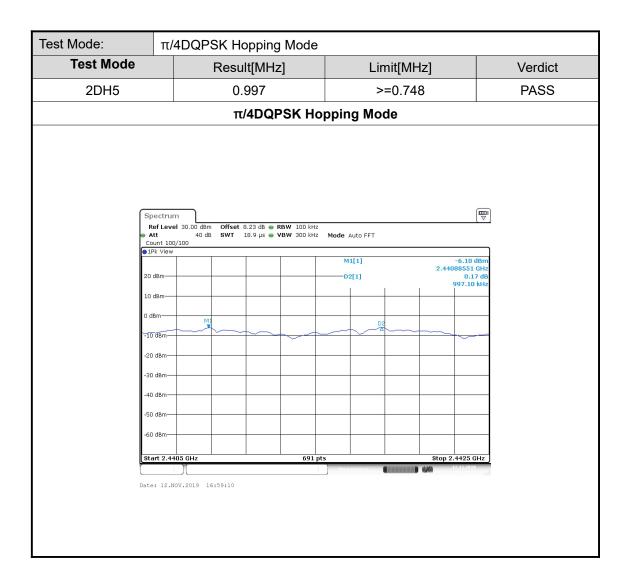
Please refer to the clause 2.3.

Test Results



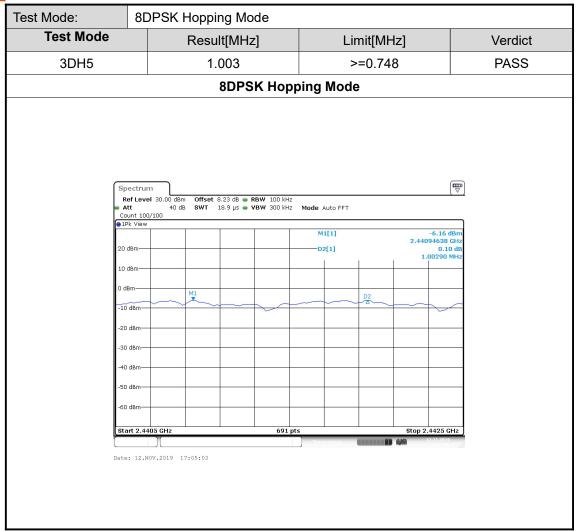
| | GFSI | K Hopping Mode | Э | | | | |
|---------------------------------|------------------------|---------------------------------------|------------|---------------|----------------|---------------------|--|
| Test Mode | | Result[MHz] |] | Limit[MHz] | | Verdict | |
| DH5 | | 0.997 | | >=(| 0.748 | PASS | |
| | , | GFSK | (Hoppi | ng Mode | | 1 | |
| | | | | | | | |
| | | | | | | | |
| _ | | | | | | | |
| R | ectrum ef Level 30. | | | | | $\overline{\nabla}$ | |
| | unt 100/100 Pk View | 40 dB SWT 18.9 μs 🖷 V I | BW 300 KHZ | Mode Auto FFT | | \neg | |
| | | | | M1[1] | dBm GHz | | |
| 20 | dBm- | | | | -0.0 997.10 | | |
| 10 | dBm | | | | | | |
| | . | | | | | | |
| 0 d | Bm - | M1 | | D2 | | | |
| | dBm | M1 | نسر | D2 | | _ | |
| -10 | | M1 | | D2 A | | | |
| -10 | dBm | M1 | | D2 A | | | |
| -10 -20 | dBm dBm | MI | | D2 | | | |
| -10 -20 -30 | dBm- | MI | | D2 | | | |
| -10 -20 -30 -40 | dBm dBm dBm dBm dBm | M1 | | D2 | | | |
| -10 -20 -30 -40 -50 | dBm dBm dBm | | | D2 | Stop 2,4425 (| | |











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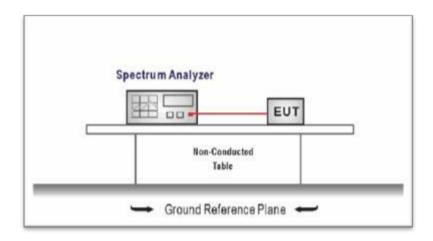
3.6. Number of Hopping Channel

<u>Limit</u>

| Section | Test Item | Limit |
|---------|---------------------------|-------|
| 15.247 | Number of Hopping Channel | >15 |

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Test Configuration



Test Procedure

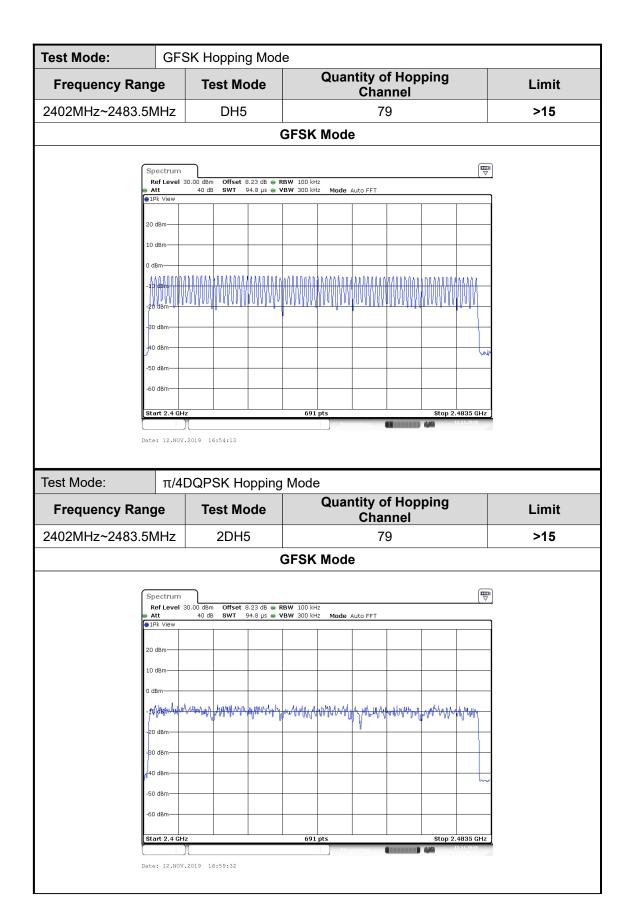
- 1. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- 2. Spectrum Setting:
 - (1) Peak Detector: RBW=100 kHz, VBW≥RBW, Sweep time= Auto.

Test Mode

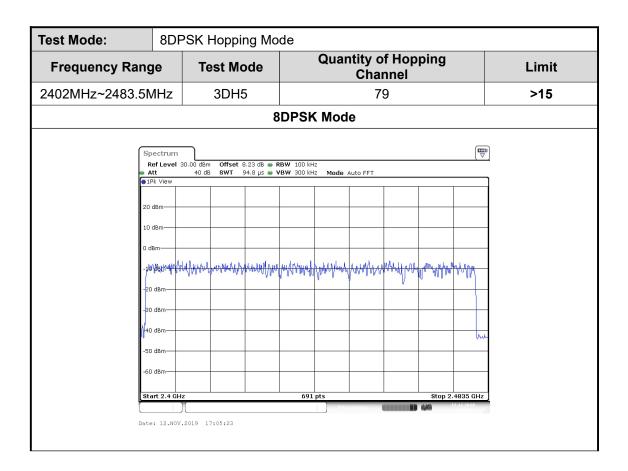
Please refer to the clause 2.3.

Test Result











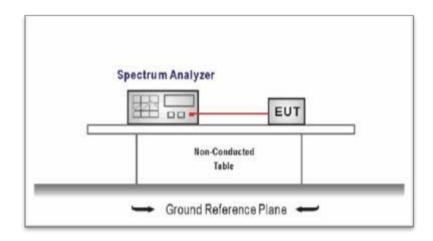
3.7. Dwell Time

<u>Limit</u>

| Section | Test Item | Limit |
|--------------|------------------------------|---------|
| 15.247(a)(1) | Average Time of Occupancy | 0.4 sec |

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Test Configuration



Test Procedure

- 1. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- 2. Spectrum Setting:
 - (1) Spectrum Setting: RBW=1MHz, VBW≥RBW.
 - (2) Use video trigger with the trigger level set to enable triggering only on full pulses.
 - (3) Sweep Time is more than once pulse time.
 - (4) Set the center frequency on any frequency would be measure and set the frequency span to zero.
 - (5) Measure the maximum time duration of one single pulse.
 - (6) Set the EUT for packet transmitting.

Test Mode

Please refer to the clause 2.3

Test Result

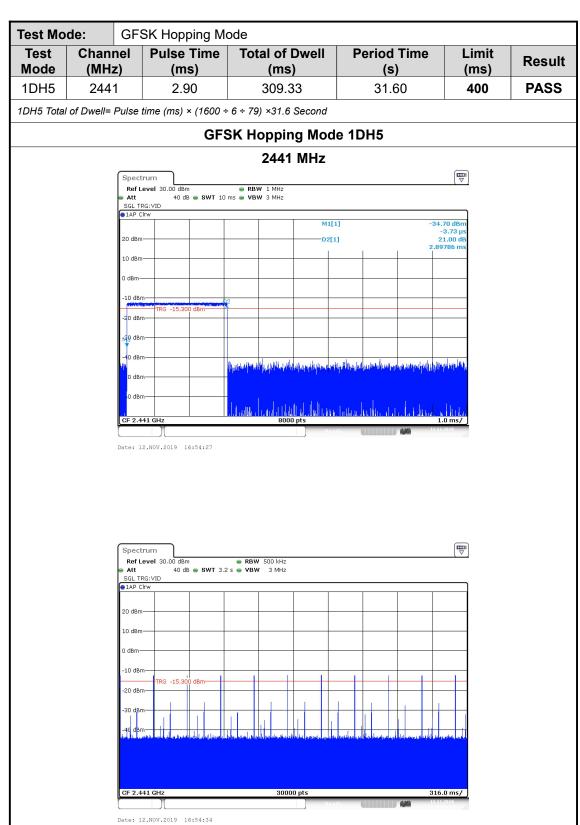
Note:

- 1.We have tested all mode at high, middle and low channel, and recoreded worst case at low channel.
- 2.Dwell time=Pulse time (ms) × (1600 ÷ 2 ÷ 79) ×31.6 Second for DH1, 2DH1, 3DH1

Dwell time=Pulse time (ms) × $(1600 \div 4 \div 79) \times 31.6$ Second for DH3, 2DH3, 3DH3

Dwell time=Pulse time (ms) × $(1600 \div 6 \div 79) \times 31.6$ Second for DH5, 2DH5, 3DH5







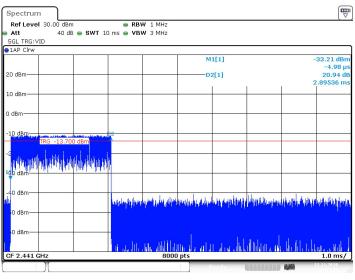


| Test Mo | de: | π/4DQPSK Hopping Mode | | | | | | |
|--------------|---------------|-----------------------|--------------------|---------------------|--------------------|---------------|--------|--|
| Test Mode | Chanr (MHz | | Pulse Time (ms) | Total of Dwell (ms) | Period Time (s) | Limit (ms) | Result | |
| 2DH5 | 2441 | 1 | 2.90 | 309.33 | 31.60 | 400 | PASS | |

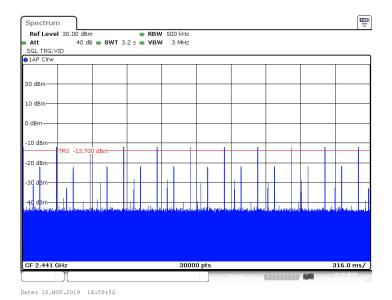
2DH5 Total of Dwell= Pulse time (ms) \times (1600 \div 6 \div 79) \times 31.6 Second

π /4DQPSK Hopping Mode 2DH5

2441 MHz



Date: 12.NOV.2019 16:59:45





| Test Mo | de: | 8DF | SK Hopping N | Лode | | | |
|--------------|--------------|---|--|---|--------------------|--|-------|
| Test Mode | Chan (MH: | | Pulse Time (ms) | Total of Dwell (ms) | Period Time (s) | Limit (ms) | Resul |
| 3DH5 | 244 | 1 | 2.90 | 309.33 | 31.60 | 400 | PASS |
| 3DH5 Total | of Dwell= | Pulse t | ime (ms) × (1600 ÷ | - 6 ÷ 79) ×31.6 Second | | | |
| | | | 8DP | SK Hopping Mod | le 3DH5 | | |
| | | Spectra Ref Let Att SGL TF GlAP CI 20 dBm: 0 dBm: -10 dBm: -40 dBm: 0 dBm: -40 dBm: | evel 30.00 dBm 40 dB • SWT 10 G:VID | 2441 MHz RBW 1 MHz M1[3] PBW 3 MHz M1[4] D2[1] 8000 pts | 1 -25. 1 1 2.89 | 05 dBm 3.73 µs 2.59 dB 536 ms | |
| | | Specti | evel 30.00 dBm 40 dB • SWT 3.2 G:VID | ● RBW 500 kHz 2 s ● VBW 3 MHz | | ₩ > | |

Date: 12.NOV.2019 17:05:43



3.8. Band Edge Emissions(Radiated)

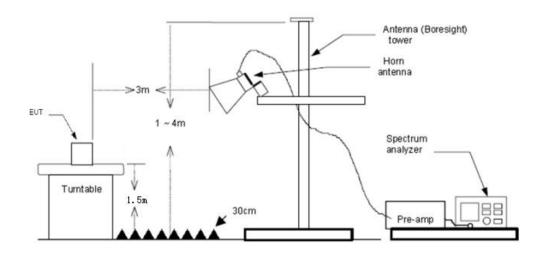
Limit

| Restricted Frequency Band | (dBuV/m)(at 3m) | | | | |
|---------------------------|-----------------|---------|--|--|--|
| (MHz) | Peak | Average | | | |
| 2310 ~2390 | 74 | 54 | | | |
| 2483.5 ~2500 | 74 | 54 | | | |

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Note: All restriction bands have been tested, only the worst case is reported.

Test Configuration



Test Procedure

- 1. The EUT was setup and tested according to ANSI C63.10:2013 requirements.
- 2. The EUT is placed on a turn table which is 1.5 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
- 3. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.
- 4. The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10:2013 on radiated measurement.
- 5. The receiver set as follow:

RBW=1MHz, VBW=3MHz PEAK detector for Peak value.

RBW=1MHz, VBW=10Hz with Average Detector for Average Value.

Test Mode

Please refer to the clause 2.3.

Test Results

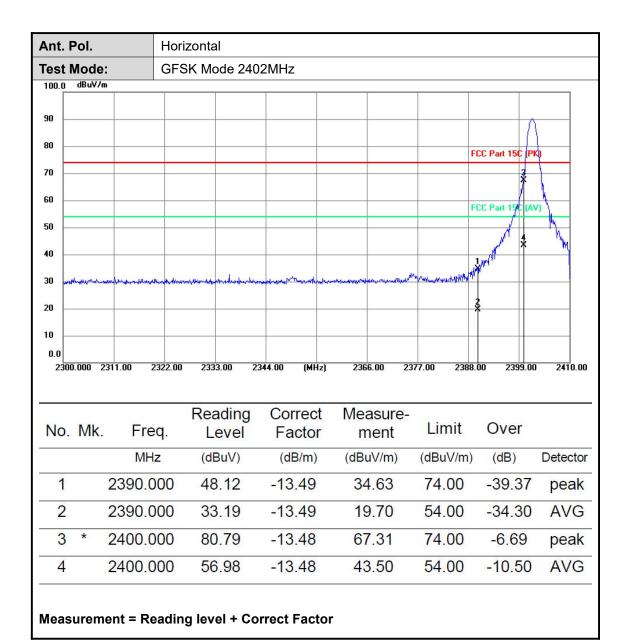
Note:

1.Measurement = Reading level + Correct Factor

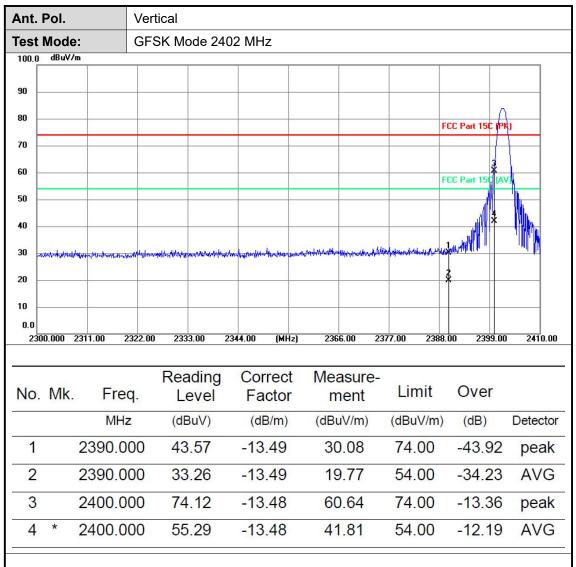
Correct Factor=Antenna Factor + Cable Loss - Preamplifier Factor

2.Pre-scan GFSK, π /4QPSK and 8DPSK modulation, and found the GFSK modulation which it is worse case, so only show the test data for worse case.

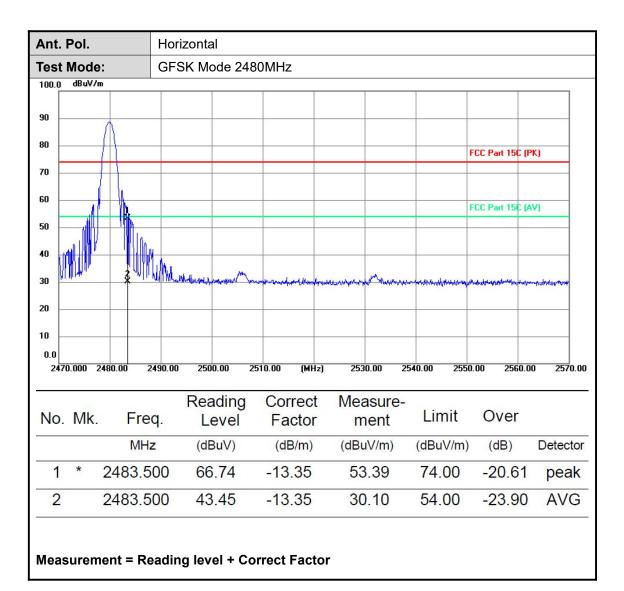




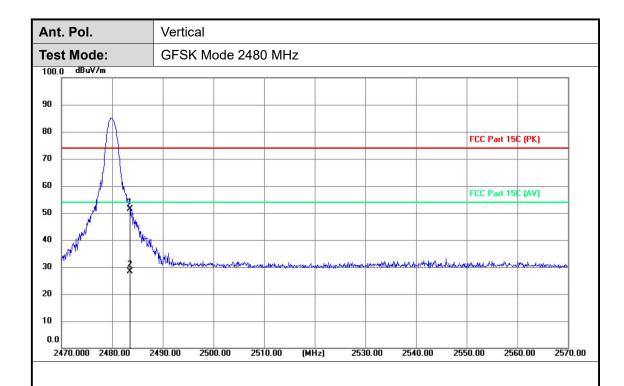












| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure- ment | Limit | Over | |
|-----|-----|----------|------------------|-------------------|------------------|----------|--------|----------|
| | | MHz | (dBuV) | (dB/m) | (dBuV/m) | (dBuV/m) | (dB) | Detector |
| 1 | * | 2483.500 | 64.62 | -13.35 | 51.27 | 74.00 | -22.73 | peak |
| 2 | | 2483.500 | 41.81 | -13.35 | 28.46 | 54.00 | -25.54 | AVG |

Measurement = Reading level + Correct Factor

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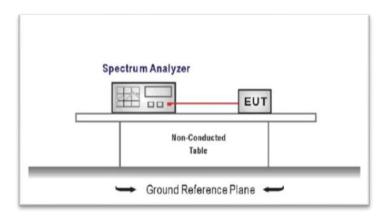
3.9. Band Edge and Spurious Emission (conducted)

LIMIT

FCC CFR Title 47 Part 15 Subpart C Section15.247 (d):

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 CONFIGURATION



TEST PROCEDURE

- 1.The transmitter output was connected to the spectrum analyzer through an attenuator, the pathloss was compensated to the results for each measurement.
- 2.Set to the maximum power setting and enable the EUT transmit continuously
- 3.Use the following spectrum analyzer settings:

RBW= 100 KHz, VBW≥RBW

Sweep = auto, Detector function = peak, Trace = max hold

4. Measure and record the results in the test report.

TEST MODE:

Please refer to the clause 2.3.

TEST RESULTS



