Report Number: 60.790.16.716.01



FCC - TEST REPORT

| Report Number | : 60.790.16.716.01 Date of Issue: June 2, 2016 |
|-------------------------------------|---|
| | |
| Model | : SH002 |
| Product Type | : VerveLoop+ |
| Applicant | : Binatone Electronics International Ltd. |
| Address | : Floor 23A, 9 Des Voeux Road West, Sheung Wan, Hong Kong |
| | China |
| Production Facility | : Charter Media (Dongguan) Co., Ltd. |
| Address | : Dabandi Industrial Zone, Daning District, Humen Town, |
| | Dongguan City, Guangdong Province 523930, P. R. China |
| | |
| Test Result | : ■ Positive |
| | |
| Total pages including Appendices | 49 |

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2 Details about the Test Laboratory

Details about the Test Laboratory

Test Site 1

| TÜV SÜD Hong Kong Ltd. |
|---------------------------------|
| 3/F, West Wing, Lakeside 2, |
| 10 Science Park West Avenue, |
| Science Park, Shatin, Hong Kong |
| |

Test Site 2 Company name:

mpany name: Hong Kong Productivity Council LG1, HKPC Building, 78 Tat Chee Avenue, Kowloon, Hong Kong

FCC Registration Number: 90656

IC Registration Number: 4780A



3 Description of the Equipment Under Test

| Product: | VerveLoop+ |
|-------------------------------|--|
| Model no.: | SH002 |
| Options and accessories: | Nil |
| Rating: | DC3.7V Supplied by Li-ion Rechargeable Battery DC5.0V Charged by the mini-USB port |
| RF Transmission Frequency: | 2402MHz-2480MHz |
| No. of Operated Channel: | 79 |
| Modulation: | GFSK, π/4-DQPSK, 8-DPSK |
| Antenna Type: | Chip antenna |
| Antenna Gain: | 1.6dBi |
| Description of the EUT: | The Equipment Under Test (EUT) is a Bluetooth headset operated at 2.4GHz |



4 Summary of Test Standards

| Test Standards | | | | | |
|-----------------------|--|--|--|--|--|
| FCC Part 15 Subpart C | PART 15 - RADIO FREQUENCY DEVICES | | | | |
| 10-1-2015 Edition | Subpart C - Intentional Radiators | | | | |
| RSS-247 | Digital Transmission Systems (DTSs), Frequency Hopping Systems | | | | |
| Issue 1 2015 | (FHSS) and License-Exempt Local Area Network (LE-LAN) Devices | | | | |

All the test methods were according to Public Notice DA 00-705 -Frequency Hopper Spread Spectrum Test Procedure released by FCC on March 30, 2000 and ANSI C63.10-2013.



5 Summary of Test Results

| | | Technical Requirements | | | |
|---------------------------|--|--|---------------|--------------|--------|
| FCC Part 15 Sub | part C/RSS-247 | Issue 1/RSS-Gen Issue 4 | | | |
| Test Condition | | Pages | Test Result | Test Site | |
| §15.207 | RSS-GEN 8.8 | Conducted emission AC power port | 10 | Pass | Site 2 |
| §15.247(b)(1) | RSS-247 Clause 5.4(2) | Conducted peak output power | 13 | Pass | Site 2 |
| §15.247(e) | RSS-247 Clause 5.2(2) | Power spectral density* | | N/A | |
| §15.247(a)(2) | RSS-247 Clause 5.2(1) | 6dB bandwidth | | N/A | |
| §15.247(a)(1) | RSS-247 Clause 5.1(1) | 20dB bandwidth and 99% Occupied Bandwidth | 20 | Pass | Site 2 |
| §15.247(a)(1) | RSS-247 Clause 5.1(2) | Carrier frequency separation | 27 | Pass | Site 2 |
| §15.247(a)(1)(iii) | RSS-247 Clause 5.1(4) | Number of hopping frequencies | 30 | Pass | Site 2 |
| §15.247(a)(1)(iii) | RSS-247 Clause 5.1(4) | Dwell Time | 32 | Pass | Site 2 |
| §15.247(d) | RSS-247 Clause 5.5 | Spurious RF conducted emissions | 35 | Pass | Site 2 |
| §15.247(d) | RSS-247 Clause 5.5 | Band edge | 39 | Pass | Site 2 |
| §15.247(d) & §15.209 & | RSS-247 Clause 5.5 & RSS-GEN 6.13 | Spurious radiated emissions for transmitter and receiver | 44 | Pass | Site 2 |
| §15.203 | RSS-GEN 8.3 | Antenna requirement | See note 1 | Pass | |

Note 1: N/A=Not Applicable.

Note 2: The EUT uses a Chip antenna, which gain is 1.6dBi. In accordance to §15.203, it is considered sufficiently to comply with the provisions of this section.



6 General Remarks

Remarks

This submittal(s) (test report) is intended for FCC ID: VLJ-SH002, IC: 4522A-SH002 complies with Section 15.207, 15.209, 15.247 of the FCC Part 15, Subpart C, RSS 247 and RSS-Gen rules.

SUMMARY:

All tests according to the regulations cited on page 5 were

- Performed
- □ Not Performed

The Equipment Under Test

- - Fulfills the general approval requirements.
- □ **Does not** fulfill the general approval requirements.

Sample Received Date: May 9, 2016

Testing Start Date: May 9, 2016

Testing End Date: May 28, 2016

- TÜV SÜD HONG KONG LTD. -

Reviewed by:

Fran

Phoebe Hu EMC Project Manager Prepared by:

Felis. Li

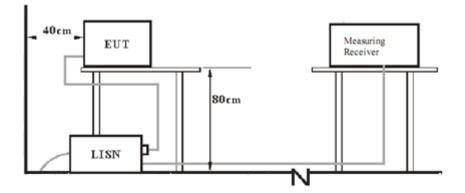
Felix Li Senior EMC Project Engineer

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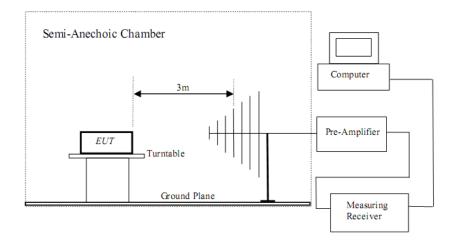


7 Test Setups

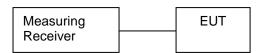
7.1 AC Power Line Conducted Emission test setups



7.2 Radiated test setups



7.3 Conducted RF test setups





8 Systems test configuration

Auxiliary Equipment Used during Test:

| DESCRIPTION | MANUFACTURER | MODEL NO. | S/N |
|-------------|--------------|-----------|-----|
| PC | lenovo | X220 | |

Test software: Blue test 3.0, which used to control the EUT in continues transmitting mode

The system was configured to hopping mode and non-hopping mode.

Hopping mode: typical working mode (normal hopping status)

Non-hopping mode: The system was configured to operate at a signal channel transmitting. The test software allows the configuration and operation at the worst-case duty and the highest transmit power



9 Technical Requirement

9.1 Conducted Emission

Test Method

- 1. The EUT was placed on a table, which is 0.8m above ground plane
- 2. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.).
- 3. Maximum procedure was performed to ensure EUT compliance
- 4. A EMI test receiver is used to test the emissions from both sides of AC line

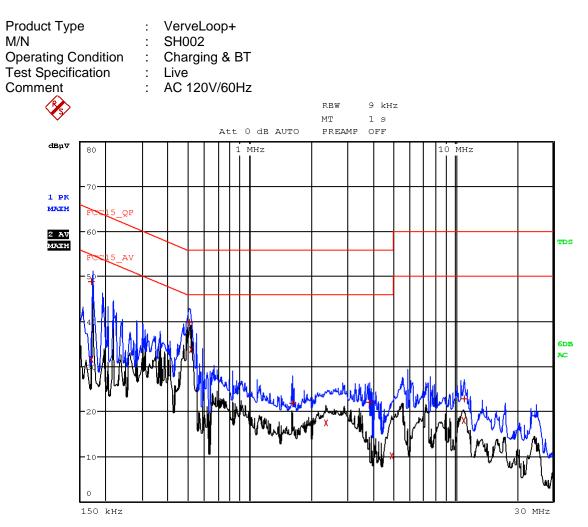
Limit

| | Frequency | QP Limit | AV Limit |
|----|------------------------|------------------------|----------|
| | MHz | dBµV | dBµV |
| | 0.150-0.500 | 66-56* | 56-46* |
| | 0.500-5 | 56 | 46 |
| | 5-30 | 60 | 50 |
| D۵ | oranging linearly with | logarithm of the frequ | uanay |

Decreasing linearly with logarithm of the frequency



Conducted Emission

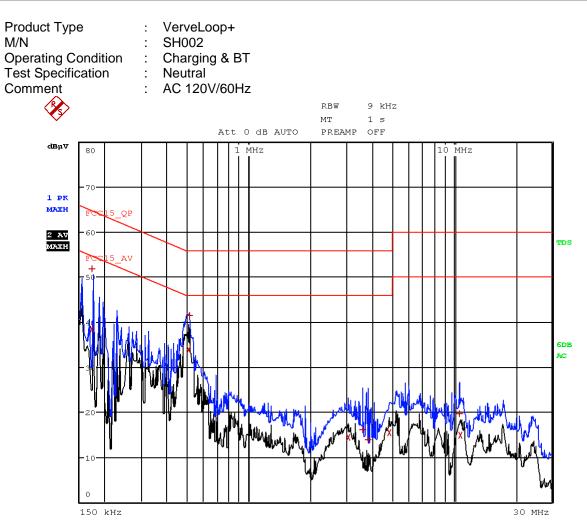


| Trace | Frequenc | y | Level (dBµV) | Detector | Delta Limit/dB |
|-------|---------------|-----|--------------|------------|----------------|
| 1 | 170.000000000 | kHz | 48.88 | Quasi Peak | -16.08 |
| 2 | 170.00000000 | kHz | 31.56 | Average | -23.40 |
| 1 | 506.00000000 | kHz | 39.75 | Quasi Peak | -16.25 |
| 2 | 514.000000000 | kHz | 33.75 | Average | -12.25 |
| 1 | 1.614000000 | MHz | 21.73 | Quasi Peak | -34.27 |
| 2 | 2.338000000 | MHz | 17.32 | Average | -28.68 |
| 1 | 3.834000000 | MHz | 21.86 | Quasi Peak | -34.14 |
| 2 | 4.914000000 | MHz | 9.98 | Average | -36.02 |
| 2 | 11.050000000 | MHz | 17.88 | Average | -32.12 |
| 1 | 11.070000000 | MHz | 22.74 | Quasi Peak | -37.26 |

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Conducted Emission



| Trace | Frequenc | ;y | Level (dBµV) | Detector | Delta Limit/dB |
|-------|---------------|-----|--------------|------------|----------------|
| 1 | 174.000000000 | kHz | 51.77 | Quasi Peak | -12.99 |
| 2 | 174.000000000 | kHz | 38.39 | Average | -16.38 |
| 2 | 506.00000000 | kHz | 33.81 | Average | -12.19 |
| 1 | 510.00000000 | kHz | 41.48 | Quasi Peak | -14.52 |
| 2 | 3.042000000 | MHz | 14.41 | Average | -31.59 |
| 1 | 3.598000000 | MHz | 15.99 | Quasi Peak | -40.01 |
| 1 | 3.806000000 | MHz | 13.83 | Quasi Peak | -42.17 |
| 2 | 4.842000000 | MHz | 15.41 | Average | -30.59 |
| 1 | 10.682000000 | MHz | 19.63 | Quasi Peak | -40.37 |
| 2 | 10.738000000 | MHz | 14.90 | Average | -35.10 |

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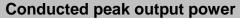
9.2 Conducted peak output power

Test Method

- Use the following spectrum analyzer settings: Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel RBW > the 20 dB bandwidth of the emission being measured, VBW≥RBW, Sweep = auto, Detector function = peak, Trace = max hold
- 2. Add a correction factor to the display.
- 3. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power

Limits

| Frequency Range | Limit | Limit |
|-----------------|-------|-------|
| MHz | W | dBm |
| 2400-2483.5 | ≤1 | ≤30 |



Bluetooth Mode GFSK modulation Test Result Conducted Peak Frequency Output Power Result

| | | - | | | | | | |
|---------------------|------------------------|-------------|----------|----------|---------|------|--------|-------------------------|
| | MHz | | | | Bm | | | |
| Low ch | annel 2 | 2402MH | Z | -1.56 | | | Pass | |
| Middle c | Middle channel 2441MHz | | Ηz | 3. | | Pass | | |
| High ch | annel 2 | 2480MH | z | 3. | .53 | | Pass | |
| Ū | | | | el 2402M | ИНz | | | |
| Spectrum | | | | | | | | |
| Ref Level 16.00 dBm | Offset 0 | .50 dB 👄 RB | W 1 MHz | | | | | (~ |
| Att 35 dB | SWT | 1 ms 👄 VE | SW 3 MHz | Mode Aut | o Sweep | | | |
| 1Pk Max | | | | | 1[1] | | | -1.56 dBn |
| 10 dBm | | | | M | 1[1] | | 2.402 | -1.36 UBA 218810 GH |
| | | | | | | | | |
| D dBm | | | | M1 | | | | |
| | | | | | | | | |
| -10 dBm | | 1 | | | | | | |
| -20 dBm | | | | | | | | |
| | ſ | | | | | | \sim | |
| -30 dBm | | | | | | | | men |
| hanger that the | | | | | | | | |
| -40 dBm | | | | | | | | |
| -50 dBm | | | | | | | | |
| -30 UBIN | | | | | | | | |
| -60 dBm | | | | | | | | |
| | | | | | | | | |
| -70 dBm | | | | | | | | |
| 00.10 | | | | | | | | |
| -80 dBm | | | | | | | | |
| CF 2.402 GHz | | | 691 | pts | | | | n 5.0 MHz 12.05.2016 |
| | | | | Mea | suring | | 1/0 | 12:24:01 |

Middle channel 2441MHz

Spectrum Offset 0.50 dB ● RBW 1 MHz SWT 1 ms ● VBW 3 MHz Ref Level 16.00 dBm Att 35 dB Mode Auto Sweep ●1Pk Max 3.35 dBn 2.44084080 GHa M1[1] 10 dBm· M1 0 dBm -10 dBm--20 dBm--30 dBm--40 dBm--50 dBm -60 dBm -70 dBm--80 dBm-Span 5.0 MHz 691 pts CF 2.441 GHz Measuring... 📲 🚺 🚧 12.05.2016 12:23:35

Date: 12.MAY.2016 12:23:36

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High channel 2480MHz Spectrum Ref Level 16.00 dBm Att 35 dB
 Offset
 0.50 dB ●
 RBW
 1 MHz

 SWT
 1 ms ●
 VBW
 3 MHz
 Mode Auto Sweep Att ●1Pk Max M1[1] 3.53 dBm 2.47983360 GHz 10 dBm· M1 0 dBm -10 dBm· -20 dBm -30 dBm--40 dBm· -50 dBm--60 dBm--70 dBm· -80 dBm-691 pts Span 5.0 MHz CF 2.48 GHz 12.05.2016 12:22:48 Measuring...

Date: 12.MAY.2016 12:22:49

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Bluetooth Mode π/4-DQPSK modulation Test Result Conducted Peak

| Frequency MHz | Output Power dBm | Result |
|------------------------|---------------------|--------|
| Low channel 2402MHz | -0.73 | Pass |
| Middle channel 2441MHz | 3.27 | Pass |
| High channel 2480MHz | 3.57 | Pass |

| | | LOW | channe | 31 Z40Z | IVIHZ | | | |
|---------------------|-----|--------------|---------|---------|----------|---|-------|------------------------|
| Spectrum | | | | | | | | |
| Ref Level 16.00 dBm | | 0.50 dB 👄 RB | | | | | | |
| Att 35 dB | SWT | 1 ms 👄 🛛 🛛 | W 3 MHz | Mode Au | to Sweep | | | |
| ●1Pk Max | | | | | | | | |
| 10 dBm | | | | N | 11[1] | | 2.402 | -0.73 dBm 16640 GHz |
| 0 dBm | | | | M1 | | | | |
| o ubiii | | | | | | | | |
| -10 dBm | | | | | | | | |
| -20 dBm | | | | | | | | |
| -30 dBm | | | | | | | | |
| -40 dBm | | | | | | | | mond |
| -40 UBIII | | | | | | | | |
| -50 dBm | | | | | | | | |
| -60 dBm | | | | | | | | |
| -70 dBm | | | | | | _ | | |
| -80 dBm | | | | | | | | |
| CF 2.402 GHz | | | 691 | pts | | | Spa | n 5.0 MHz |
| Γ. | | | | | asuring | | | 12.05.2016 12:26:04 |

Low channel 2402MHz

Date: 12.MAY.2016 12:26:04

Middle channel 2441MHz

Spectrum
 Offset
 0.50 dB ●
 RBW
 1 MHz

 SWT
 1 ms ●
 VBW
 3 MHz
 Ref Level 16.00 dBm 35 dB Mode Auto Sweep Att ⊖1Pk Max 3.27 dBm 2.44081190 GHz M1[1] 10 dBm· M1 0 dBm -10 dBm· -20 dBm--30 dBm--40 dBm--50 dBm--60 dBm--70 dBm· -80 dBm-CF 2.441 GHz 691 pts Span 5.0 MHz Measuring... 🚺 🚺 🚧 12.05.2016 12:25:42

Date: 12.MAY.2016 12:25:42

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High channel 2480MHz Spectrum Ref Level 16.00 dBm Att 35 dB
 Offset
 0.50 dB ●
 RBW
 1 MHz

 SWT
 1 ms ●
 VBW
 3 MHz
 Mode Auto Sweep Att ●1Pk Max M1[1] 3.57 dBm 2.47982630 GHz 10 dBm· M1 0 dBm -10 dBm· -20 dBm -30 dBm--40 dBm· -50 dBm--60 dBm--70 dBm· -80 dBm-691 pts Span 5.0 MHz CF 2.48 GHz 12.05.2016 12:25:20 Measuring...

Date: 12.MAY.2016 12:25:20

EMC_SZ_FR_21.00FCC Release 2014-03-20 Page 17 of 49



| Bluetooth Mode 8D | PSK modulation Test | t Result |
|-------------------|---------------------|----------|
| | Conducted Peak | |
| Frequency | Output Power | Result |
| | | |

| | MHz | | dBm | | | |
|----------------------------------|---------------------------------|-----------------------------|---------------|-----------|------------|-----------------------|
| | | | ubiii | | | |
| Low ch | annel 2402MHz | 2 | -1.11 | | Pass | |
| | annel 2441MHz | | 3.20 | | Pass | |
| High ch | nannel 2480MH | 7 | 3.47 | | Pass | |
| i ligit oi | | - channel 2 [,] | | | 1 400 | |
| | LOW | | | | | Ē |
| Spectrum | off 1 o so lo - pp | | | | | |
| Ref Level 16.00 dBm Att 35 dB | Offset 0.50 dB RB SWT 1 ms VB | | de Auto Sweep | | | |
| 1Pk Max | | | | | | |
| | | | M1[1] | | | -1.11 dBm |
| 10 dBm | | | | | 2.402 | 01450 GHz |
| 0 dBm | | M1 | | | | |
| o abiii | | | | | | |
| -10 dBm | | | | | | |
| | | | | | | |
| -20 dBm | | | | | \searrow | |
| | | | | | \sim | |
| -30 dBm | | | | | | and the second |
| MANNE | | | | | | and the second |
| -40 dBm | | | | | | |
| | | | | | | |
| -50 dBm | | | | | | |
| -60 dBm | | | | | | |
| | | | | | | |
| -70 dBm | | | | | | |
| | | | | | | |
| -80 dBm | | | | | | |
| CF 2.402 GHz | | 691 pts | 1 | · · · · · | Spa | n 5.0 MHz |
| 1 I | | | Measuring | | 1/0 1 | 2.05.2016 12:27:59 |

Date: 12.MAY.2016 12:27:59

Middle channel 2441MHz

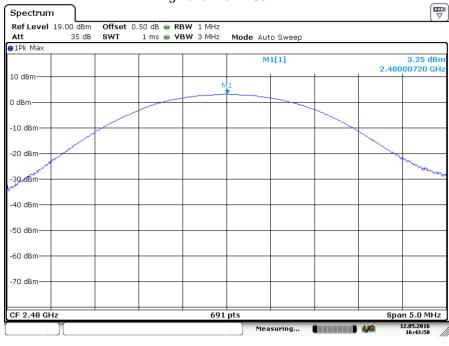
Spectrum Ref Level 16.00 dBm 35 dB Mode Auto Sweep Att ⊖1Pk Max M1[1] 3.20 dBm 2.44098550 GHz 10 dBm· Ν 0 dBm -10 dBm· -20 dBm-30 dBm--40 dBm--50 dBm--60 dBm--70 dBm· -80 dBm-CF 2.441 GHz 691 pts Span 5.0 MHz Measuring... 🚺 🚺 🚧 12.05.2016 12:27:32

Date: 12.MAY.2016 12:27:33

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High channel 2480MHz



Date: 12.MAY.2016 16:43:50

| Spectrum | | | | | | | |
|----------------------------------|-------------------|------------------------|---------|----------|----------|-----------|------------------------|
| Ref Level 16.00 dBm Att 35 dB | Offset 0.5 SWT | D dB 👄 RB L ms 👄 VB | | | | | |
| ●1Pk Max | 501 | L ms 🖶 VE | W 3 MHZ | Mode Au | to Sweep | | |
| 10 dBm | | | | <u> </u> | 11[1] | 2.480 | 3.47 dBn 00000 GHa |
| | | | M | 1 | | | |
| 0 dBm | | | | | | | |
| -10 dBm | | | | | | | |
| -20 dBm | | | | | | - w | |
| -30 dBm- | | | | | | | - manual |
| -40 dBm | | | | | | | |
| -50 dBm | | | | | | | |
| -60 dBm | | | | | | | |
| -70 dBm | | | | | | | |
| -80 dBm | | | | | | | |
| CF 2.48 GHz | | | 691 | pts | 1 | Spa | n 5.0 MHz |
| | | | | | asuring | | 12.05.2016 12:27:08 |

Date: 12.MAY.2016 12:27:08

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9.3 20 dB bandwidth and 99% Occupied Bandwidth

Test Method

- 1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- 2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
- 3. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
- 4. Repeat above procedures until all frequencies measured were complete.

Limit

Limit [kHz]

N/A



20 dB bandwidth and 99% Occupied Bandwidth

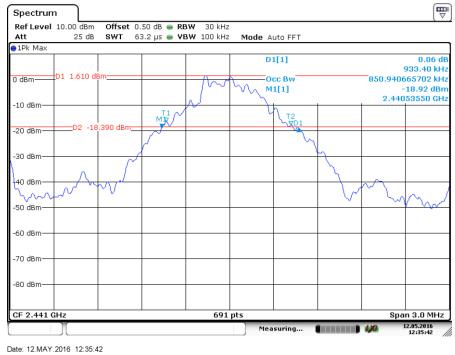
Bluetooth Mode GFSK Modulation test result

| requency | 20 dB Band | width | | ndwidth | Limit | | Result |
|--|----------------------------------|----------------------------|-------------------|---|------------------|----------|------------------------|
| MHz | kHz | | | Hz 0.94 | kHz | | Daar |
| 2402 | 929.10 | | | | | | Pass |
| 2441 | 933.40 | | | 0.94 | | | Pass |
| 2480 | 924.70 | | | 5.40 | | | Pass |
| | | | 2402N | ИНz | | | |
| Spectru | | | | | | | |
| Ref Leve Att | el 10.00 dBm Offset 25 dB SWT | 0.50 dB 👄 R 63.2 µs 👄 V | | Mode Auto FFT | | | |
| • 1Pk Max | | 03.2 µ3 🖕 🖡 | BW 100 KH2 | Mode Adto FFT | | | |
| | | | | D1[1] | | | -0.08 dB 929.10 kHz |
| 0 dBm | | | | Occ Bw | | 850.9406 | i65702 kHz |
| | D1 -3.690 dBm | | In | M1[1] | | | 23.73 dBm 54410 GHz |
| -10 dBm- | | | | × ~~~ | | | |
| -20 dBm- | | | | Lh TO | | | |
| 20 0011 | D2 -23.690 dBm | MT1/* | | ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~ | | | |
| -30 dBm- | | $- \int_{-}^{-}$ | | | | | |
| | | 1 | | | $\left[\right]$ | 0 | |
| -40 dBm- | | | | | | YM | |
| 50 dBm- | A A | | | | | | |
| ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~ | | | | | | | |
| -60 dBm- | | | | | | | |
| -70 dBm- | | | | | | | |
| -70 dBm- | | | | | | | |
| -80 dBm- | | | | | | | |
| | | | | | | | |
| CF 2.402 | 2 GHz | | 691 p | ots | | Spa | n 3.0 MHz |

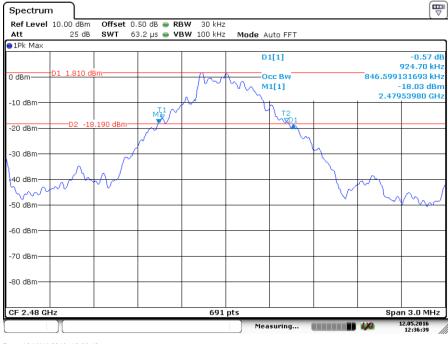
Date: 12.MAY.2016 12:34:53



2441MHz



2480MHz



Date: 12.MAY.2016 12:36:40

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20 dB bandwidth and 99% Occupied Bandwidth

Bluetooth Mode π /4-DQPSK Modulation test result

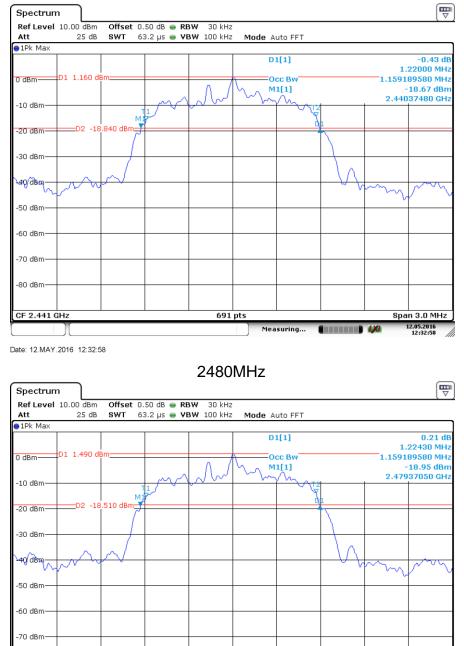
| equency MHz | 20 dB Bandwidt kHz | h 99% Bandwidth kHz | Limit kHz | Result |
|----------------|------------------------------|---------------------------------|--------------|----------------------------|
| 2402 | 1220.0 | 1163.50 | | Pass |
| 2441 | 1220.0 | 1159.19 | | Pass |
| 2480 | 1224.3 | 1159.19 | | Pass |
| | | 2402MHz | | |
| Spect | rum | 210211112 | | |
| | vel 10.00 dBm Offset 0.50 dB | | | (•) |
| Att | | s 👄 VBW 100 kHz 🛛 Mode Auto FFT | | |
| O IPK M | ax | D1[1] | | 0.06 dB |
| 0 dBm- | | Occ Bw | 1.16 | 1.22000 MHz 3531114 MHz |
| -10 dBn | D1 -3.000 dBm | MI[1] | 2.4 | -22.82 dBm 10137920 GHz |
| -20 dBn | n Mar | | | |
| -30 dBn | D2 -23.000 dBm | | | |
| -40 dBn | n | | | |
| -50 dBn | mm - | | | Mr m |
| -60 dBn | n | | | |
| -70 dBn | n | | | |
| -80 dBn | n | | | |
| CF 2.4 | 02 GHz | 691 pts | s | pan 3.0 MHz |
| | | Measuring | 4,0 | 12.05.2016 12:33:38 |

Date: 12.MAY.2016 12:33:38

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2441MHz



Date: 12.MAY.2016 12:32:15

-80 dBm-

CF 2.48 GHz

EMC_SZ_FR_21.00FCC Release 2014-03-20 691 pts

Measuring...

4,20

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Span 3.0 MHz

12:05.2016 12:32:15



20 dB bandwidth and 99% Occupied Bandwidth

Bluetooth Mode 8DPSK Modulation test result

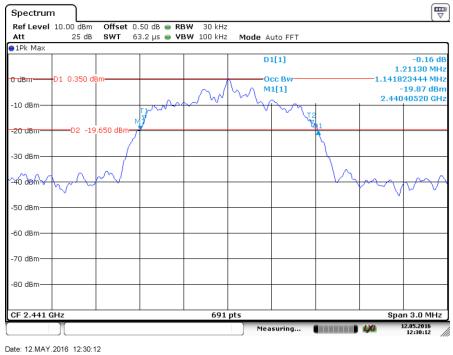
| 2441 1211.3 1141.82 Pa 2480 1211.3 1146.16 Pa 2402MHz Spectrum Ref Level 10.00 dbm Offset 0.50 dB • RBW 30 kHz Met _ 25 dB _ SWT 63.2 µs • VBW 100 kHz Mode Auto FFT • IPK Max 0 dbm 01 -3.980 dbm 01 -1.150056512 MHz -10 dbm 02 -23,980 dbm 02 -23,980 dbm 02 -24.21 dbm -30 dbm 02 -23,980 dbm 02 -23,980 dbm 02 -23,980 dbm 02 -30 | requency MHz | 20 dB Bandwi kHz | | andwidth Hz | Limit kHz | Result |
|--|-----------------|----------------------|--|--|--------------|--------------|
| 2480 1211.3 1146.16 Pa 2480 1211.3 1146.16 Pa 2402MHz Pa Spectrum | 2402 | 1211.3 | 115 | 0.51 | | Pass |
| 2480 1211.3 1146.16 Pa | 2441 | 1211.3 | 114 | 1.82 | | Pass |
| Spectrum Image: Constraint of the second secon | 2480 | 1211.3 | 114 | 6.16 | | Pass |
| Spectrum Image: Constraint of the second secon | | | 2402 | MHz | | |
| Ref Level 10.00 dBm Offset 0.50 dB RBW 30 kHz Att 25 dB SWT 63.2 µs VBW 100 kHz Mode Auto FFT ● 1Pk Max D1[1] -0.39 dB 1.21130 MHz 0 dBm Occ Bw 1.150506512 MHz 0 dBm Occ Bw 2.40140960 GHz -10 dBm 2.40140960 GHz -20 dBm D2 -23,980 dBm M -30 dBm O O -40 dBm O O O -70 dBm O O O O | Spectru | m | - | | | |
| • 1Pk Max D1[1] • 0.39 dB 1.21130 MHz 1.21130 MHz • 0cc Bw 1.150506512 MHz • 24.21 dBm • 10 dBm • 10 dBm • 0cd Bm • 10 - 24.21 dBm • 24.21 dBm • 24.21 dBm • 10 - | | | | | | (*) |
| 0 dBm 0cc Bw 1.150506512 MHz 01 -3.980 dBm M1[1] -24.21 dBm -10 dBm 2.40140960 GHz -20 dBm 0c -23.980 dBm 1 -30 dBm -02 -23.980 dBm -1 -30 dBm -0 -0 -70 dBm -0 -0 | | 25 08 5WI 63. | 2 µs 👅 VBW 100 kH2 | MODE AUTO FFT | | |
| D1 -3.980 dBm M1[1] -24.21 dBm -10 dBm 2.40140960 GHz -20 dBm 1 -20 dBm 1 -30 dBm 1 -40 dBm -40 dBm -50 dBm -50 dBm -70 dBm -70 dBm | 0 dBm | | | | 1. | 1.21130 MHz |
| -10 dBm -20 dBm -20 dBm -20 dBm -30 dBm -40 dBm -40 dBm -60 dBm -70 dBm -70 dBm | | D1 -3.980 dBm | | M1[1] | | -24.21 dBm |
| -20 dBm D2 -23,980 dBm | -10 dBm— | | · ···································· | ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~ | | |
| -30 dBm -40 dBm -50 dBm -60 dBm -70 dBm | -20 dBm— | | pro · | | 12 | |
| -40 dBm -50 dBm -60 dBm -70 dBm | 20.40- | D2 -23.980 dBm | | | Ř. – | |
| -50 dBm -60 dBm -70 dBm | -30 UBIII— | | | | | |
| -60 dBm | -40 dBm- | | | | | |
| -70 dBm | -50 dBm— | man - | | | | ver v |
| | -60 dBm— | | | | | |
| | -70 dBm— | | | | | |
| | -80 dBm— | | | | | |
| | 00 3011 | | | | | |
| CF 2.402 GHz 691 pts Span 3.0 MHz | CF 2.402 | GHz | 691 | ots | | Span 3.0 MHz |

Date: 12.MAY.2016 12:29:18

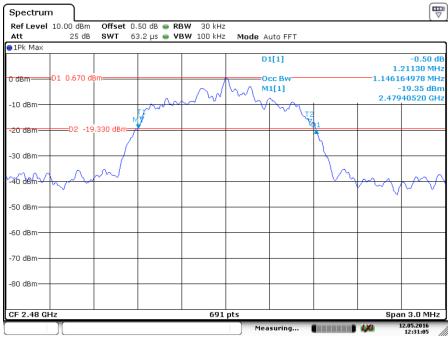
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2441MHz



2480MHz



Date: 12.MAY.2016 12:31:05

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9.4 Carrier Frequency Separation

Test Method

- Use the following spectrum analyzer settings: Span = wide enough to capture the peaks of two adjacent channels, RBW ≥ 1% of the span, VBW) ≥RBW, Sweep = auto, Detector function = peak
- 2. By using the Max-Hold function record the separation of two adjacent channels.
- 3. Measure the frequency difference of these two adjacent channels by spectrum analyzer marker function.
- 4. Repeat above procedures until all frequencies measured were complete.

Limit

Limit kHz

≥25KHz or 2/3 of the 20 dB bandwidth which is greater

GFSK Modulation Limit

| Frequency | 2/3 of 20 dB Bandwidth |
|-----------|------------------------|
| MHz | kHz |
| 2402 | 619.40 |
| 2441 | 622.27 |
| 2480 | 616.47 |





Carrier Frequency Separation

Test result: The measurement was performed with the typical configuration (normal hopping status), here GFSK modulation mode was used to show compliance.

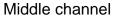
GFSK Modulation test result

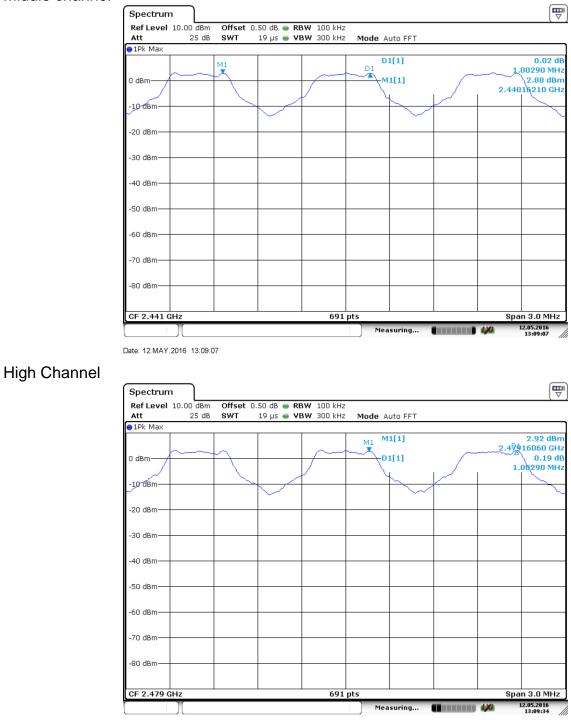
| | Frequency MHz | Carrier Frequency Separation kHz | Result |
|-------------|----------------------------------|---|----------------------------|
| | 2402 | 1000.0 | Pass |
| | 2441 | 1000.0 | Pass |
| | 2480 | 1000.0 | Pass |
| Low Channel | | | |
| | Spectrum | | |
| | Ref Level 10.00 dBm Att 25 dB | Offset 0.50 dB ● RBW 100 kHz SWT 19 µs ● VBW 300 kHz Mode Auto FFT | |
| | Att 25 dB | SWT 19 µs 👄 VBW 300 kHz Mode Auto FFT |] |
| | | D1[1] | 2.21 dB 999.30 kHz |
| | 0 dBm | M1 D1 M1[1] | 1.85 dBm |
| | -10 dBm | | 2.402)7080 GHz |
| | -10 dBm7 | | |
| | -20 dBm | | |
| | -30 dBm | | |
| | | | |
| | -40 dBm | | |
| | -50 dBm | | |
| | -60 dBm | | |
| | -70 dBm | | |
| | -80 dBm | | |
| | | | |
| | CF 2.403 GHz | 691 pts | Span 3.0 MHz 12.05.2016 |
| | | Measuring | 12.05.2016 |

Date: 12.MAY.2016 13:08:01

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Date: 12.MAY.2016 13:09:34

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9.5 Number of hopping frequencies

Test Method

- Use the following spectrum analyzer settings: Span = wide enough to capture the peaks of two adjacent channels, RBW ≥ 1% of the span, VBW) ≥RBW, Sweep = auto, Detector function = peak
- 2. Set the spectrum analyzer on Max-Hold Mode, and then keep the EUT in hopping mode.
- 3. Record all the signals from each channel until each one has been recorded.
- 4. Repeat above procedures until all frequencies measured were complete.

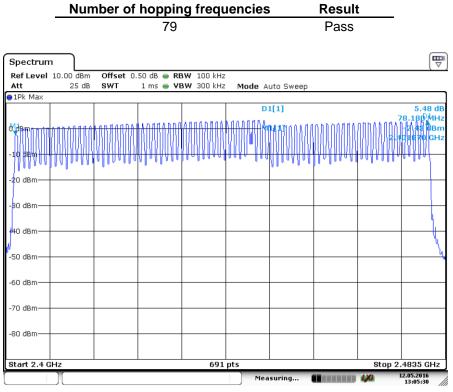
Limit

Limit number ≥ 15



Number of hopping frequencies

Test result: The measurement was performed with the typical configuration (normal hopping status), and the total hopping channels is constant for the all modulation mode according with the Bluetooth Core Specification. Here GFSK modulation mode was used to show compliance.



Date: 12.MAY.2016 13:05:30



9.6 Dwell Time

Test Method

- 1. Connect EUT antenna terminal to the spectrum analyzer with a low loss cable. Equipment mode: Spectrum analyzer
- 2. RBW: 1MHz; VBW: 1MHz; SPAN: Zero Span
- 3. Adjust the center frequency of spectrum analyzer on any frequency be measured.
- 4. Measure the Dwell Time by spectrum analyzer Marker function.
- 5. Repeat above procedures until all frequencies measured were complete.

Limit

The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.



Dwell Time

Dwell time

The maximum dwell time shall be 0.4 s.

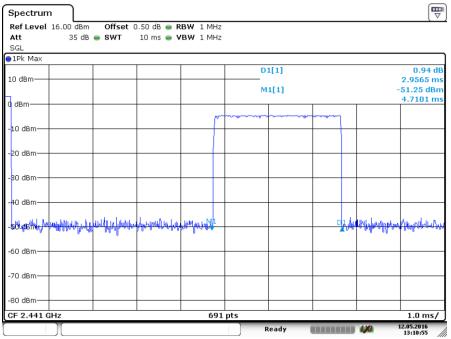
According to the Bluetooth Core Specification, the worse result (DH5 mode) was reported to show compliance.

The Dwell Time = Burst Width * Total Hops. The detailed calculations are showed as follows: The duration for dwell time calculation: 0.4 [s] * hopping number = 0.4 [s] * 79 [ch] = 31.6 [s*ch];The burst width, which is directly measured, refers to the duration on one channel hop. The maximum number of hopping channels in 31.6s for DH5=1600 / 6 / 79 *31.6=106.67

Test Result

Modulation **Test Result** Reading Limit **Total Hops** Mode Result (ms) (ms) (ms) GFSK DH5 106.67 2956.5 315.37 < 400 Pass π/4-DQPSK 2DH5 2985.5 106.67 318.46 < 400 Pass 8-DPSK 3DH5 106.67 315.37 2956.5 < 400 Pass

GFSK Modulation



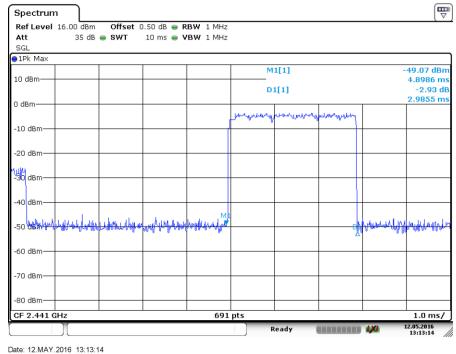
Date: 12.MAY.2016 13:10:56

DH5

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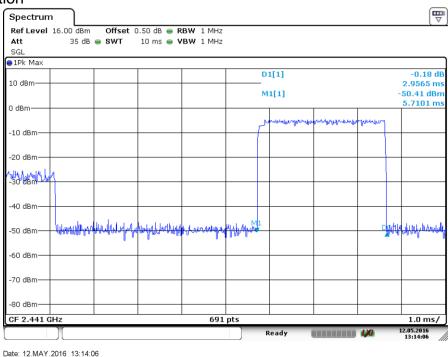


π/4-DQPSK Modulation



2DH5

8-DPSK Modulation



3DH5

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9.7 Spurious RF conducted emissions

Test Method

- 1. Use the following spectrum analyzer settings:
- Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span. RBW = 100 kHz, VBW≥RBW, Sweep = auto, Detector function = peak, Trace = max hold
- 2. Allow the trace to stabilize. Set the marker on the peak of any spurious emission recorded.
- 3. The level displayed must comply with the limit specified in this Section. Submit these plots.
- 4. Repeat above procedures until all frequencies measured were complete.

Limit

| Frequency Range MHz | Limit (dBc) |
|------------------------|-------------|
| 30-25000 | -20 |



Spurious RF conducted emissions

Only the worst case (which is subject to the maximum EIRP, $\pi/4$ -DQPSK mode) test result is listed in the report.

BT3.0 π/4-DQPSK Modulation: 2402MHz

| Spectrun | n | | | | | | | | (v |
|---|--|---------------|----------|-------------------------|--------------------|------------|-------|---------------|---------------------------------------|
| | 10.00 dBm | | | • RBW 100 k | | | | | |
| Att 1Pk Max | 25 dB | SWT | 9.7 ms 🧉 | • VBW 300 k | Hz Mode A | uto Sweep | | | |
| ar k man | | | | | N | 11[1] | | | -61.99 dBn |
| | | | | | | 1 | | | 960.00 MH |
|) dBm | | | | | | | | | |
| 10 40 | | | | | | | | | |
| 10 dBm | | | | | | | | | |
| 20 dBm | | | | | | | | | |
| 20 00111 | D1 -22.560 |) dBm | | | | | | | |
| 30 dBm | | | | | | | | | |
| | | | | | | | | | |
| 40 dBm— | | | | | | | | | |
| | | | | | | | | | |
| 50 dBm— | | + | | | | | + | | |
| | | | | | | | | | M1 |
| 60 dBm— | | | | | | | | ale di setter | _ |
| way way with | manghare | านแปล | mounder | undelunsteronist | hallowershimmlight | alifuber | ununu | por male with | annar ar |
| -70 dBm | | | | | | | | | |
| 80 dBm | | | | | | | | | |
| 00 0011 | | | | | | | | | |
| | | | | | | | | | |
| tart 30.0 | I MHZ | | | 60 | 91 pts | | | | op 1.0 GHz |
| | n | 04 | | | | asuring | | 4,40 | 12:05.2016 12:47:04 |
| Spectrun Ref Level | n 10.00 dBm | Offset | | • RBW 100 k | Hz | | | 4,40 | 12:47:04 |
| Spectrun Ref Level Att | n | Offset | | | Hz | asuring | | 490 | 12:47:04 |
| Spectrun Ref Level Att | n 10.00 dBm | Offset | | • RBW 100 k | Hz Hz Mode A | | | | 12:47:04 |
| Spectrun Ref Level Att) 1Pk Max | n 10.00 dBm | Offset | | • RBW 100 k | Hz Hz Mode A | Auto Sweep | | | 12:47:04 |
| Spectrun Ref Level Att 1Pk Max | n 10.00 dBm | Offset | | • RBW 100 k | Hz Hz Mode A | Auto Sweep | | | 12:47:04 ∠ ⊽ -2.56 dBn |
| Spectrun Ref Level Att 1Pk Max | n 10.00 dBm | Offset | | • RBW 100 k | Hz Hz Mode A | Auto Sweep | | | 12:47:04 ∠ ⊽ -2.56 dBn |
| Spectrun Ref Level Att 1Pk Max | n 10.00 dBm | Offset | | • RBW 100 k | Hz Hz Mode A | Auto Sweep | | | 12:47:04 ∠ ⊽ -2.56 dBn |
| Spectrun Ref Level Att 1Pk Max 0 dBmU 10 dBm | n 10.00 dBm 25 dB | Offset SWT | | • RBW 100 k | Hz Hz Mode A | Auto Sweep | | | 12:47:04 ∠ ⊽ -2.56 dBn |
| Spectrun Ref Level Att 1Pk Max 0 dBmU 10 dBm | n 10.00 dBm | Offset SWT | | • RBW 100 k | Hz Hz Mode A | Auto Sweep | | | 12:47:04 ∠ ⊽ -2.56 dBn |
| Spectrun Ref Level Att 11Pk Max 0 dBMU 10 dBm 20 dBm | n 10.00 dBm 25 dB | Offset SWT | | • RBW 100 k | Hz Hz Mode A | Auto Sweep | | | 12:47:04 ∠ ⊽ -2.56 dBn |
| Spectrun Ref Level Att 11Pk Max 0 dBMU 10 dBm 20 dBm 30 dBm 30 dBm | n 10.00 dBm 25 dB | Offset SWT | | • RBW 100 k | Hz Hz Mode A | Auto Sweep | | | 12:47:04 ∠ ⊽ -2.56 dBn |
| Spectrun Ref Level Att 11Pk Max 0 dBMU 10 dBm 20 dBm 30 dBm 30 dBm | n 10.00 dBm 25 dB | Offset SWT | | • RBW 100 k | Hz Hz Mode A | Auto Sweep | | | 12:47:04 ∠ ⊽ -2.56 dBn |
| Spectrun Ref Level Att 11 Pk Max 10 dBm 10 dBm 20 dBm 30 dBm 40 dBm | n 10.00 dBm 25 dB | Offset SWT | | • RBW 100 k | Hz Hz Mode A | Auto Sweep | | | 12:47:04 ∠ ⊽ -2.56 dBn |
| Spectrun Ref Level Att 11 Pk Max 10 dBm 10 dBm 20 dBm 30 dBm 40 dBm | n 10.00 dBm 25 dB | Offset SWT | | • RBW 100 k | Hz Hz Mode A | Auto Sweep | | | 12:47:04 ∠ ⊽ -2.56 dBn |
| Spectrum Ref Level Att 1Pk Max 0 dBm/// 10 dBm/// 20 dBm/// 30 dBm/// 40 dBm/// 50 dBm/// | n 10.00 dBm 25 dB | Offset SWT | | RBW 100 k VBW 300 k | Hz Mode A | Auto Sweep | | | 12:47:04 √ -2.56 dBn 2.4070 GH: |
| Spectrun Ref Level Att 11Pk Max 0 dBm 20 dBm 20 dBm 30 dBm 40 dBm 50 dBm | n 10.00 dBm 25 dB | Offset SWT | | RBW 100 k VBW 300 k | Hz Mode A | Auto Sweep | | | 12:47:04 ∠ ⊽ -2.56 dBn |
| Spectrum Ref Level Att 11Pk Max 0 dBm 20 dBm 20 dBm 30 dBm 40 dBm 50 dBm 50 dBm | n 10.00 dBm 25 dB | Offset SWT | 240 ms (| RBW 100 k VBW 300 k | Hz Mode A | Auto Sweep | | | 12:47:04 √ -2.56 dBn 2.4070 GH: |
| Spectrun Ref Level Att | n 10.00 dBm 25 dB | Offset SWT | 240 ms (| RBW 100 k VBW 300 k | Hz Mode A | Auto Sweep | | | 12:47:04 √ |
| Spectrum Ref Level Att 11Pk Max 0 dBm 20 dBm 20 dBm 30 dBm 40 dBm 50 dBm 50 dBm | n 10.00 dBm 25 dB | Offset SWT | 240 ms (| RBW 100 k VBW 300 k | Hz Mode A | Auto Sweep | | | 12:47:04 √ |
| Spectrum Ref Level Att 1Pk Max 0 dBm/// 10 dBm/// 20 dBm/// 30 dBm/// 30 dBm/// 50 dBm/// 60 dBm/// 70 dBm/// | n 10.00 dBm 25 dB | Offset SWT | 240 ms (| RBW 100 k VBW 300 k | Hz Mode A | Auto Sweep | | | 12:47:04 √ |
| Spectrum Ref Level Att 1Pk Max 0 dBm/// 10 dBm/// 20 dBm/// 30 dBm/// 30 dBm/// 50 dBm/// 60 dBm/// 70 dBm/// | n 10.00 dBm 25 dB - - - - - - - - - - - - - | Offset SWT | 240 ms (| RBW 100 k VBW 300 k | Hz Mode A | Auto Sweep | | | 12:47:04 √ |

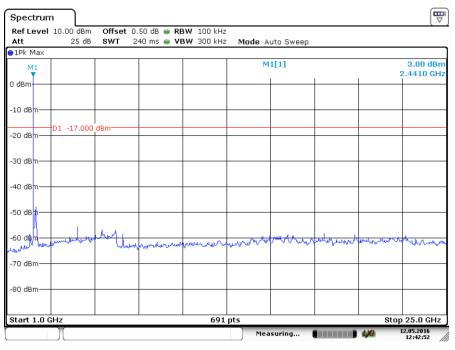
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Report Number: 60.790.16.716.01

2441MHz

| Att | 10.00 dBm 25 dB | Offset SWT | 0.50 dB 👄 RI 9.7 ms 👄 V | | | to Sweep | | | |
|------------|--------------------|---------------|----------------------------|-----------|---------|-----------------|-------------------|-----------------|-----------------------|
| ∋1Pk Max | | | | | | | | | |
| | | | | | M1 | [1] | | | 62.60 dBn 18.50 MH |
| 0 dBm | | | | | | | | | |
| -10 dBm— | | | | | | | | | |
| -20 dBm— | D1 -17.000 | dBm | | | | | | | |
| -30 dBm— | | | | | | | | | |
| -40 dBm— | | | | | | | | | |
| -50 dBm— | | | | | | | | | |
| -60 dBm— | | | | | | | 41 | | |
| -70 dBm | adamodelloru | Muruhnhu | whenthere b | murhallow | whenter | njindellandarka | dr.furrateron das | and an world by | hinner |
| -80 dBm | | | _ | | | | | | |
| | | | | | | | | | |
| Start 30.0 | | | | 691 | | | | | p 1.0 GHz |

Date: 12.MAY.2016 12:43:18



Date: 12.MAY.2016 12:42:52

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Report Number: 60.790.16.716.01

2480MHz

| Ref Level | 10.00 dBm | Offset | 0.50 dB 👄 R | | | | | | |
|------------------------|------------|-----------|-------------------|-------------------|--------------|----------------|-------------|-------------|------------------------|
| Att | 25 dB | SWT | 9.7 ms 👄 V | BW 300 kHz | Mode A | uto Sweep | | | |
| ∋1Pk Max | | | | | | | | | |
| | | | | | м | 1[1] | 1 | | 62.55 dBi 356.10 MH |
| 0 dBm | | | | | | | | | |
| -10 dBm— | | | | | | | | | |
| -20 dBm | D1 -16.940 | dBm | | | | | | | |
| -30 dBm | | | | | | | | | |
| -40 dBm | | | | | | | | | |
| -50 dBm | | | | | | | | | |
| -60 dBm | | | | | | | | M.1 | |
| ակերություն -70 dBm | hubbelling | whitehour | ullinennennen | ander | when merthin | hif-yund haven | montalities | unulihimiti | hunna |
| | | | | | | | | | |
| -80 dBm— | | | | | | | | | |
| Start 30.0 | MHz | | | 691 | pts | | | Sto | p 1.0 GHz |

Date: 12.MAY.2016 12:41:10

| Spectrum | | | | |
|---------------------------------|-------------------------|-----------------|--|---|
| RefLevel 10.00 dBm Att 25 dB | | | Auto Sweep | |
| 1Pk Max | 341 240 m3 - 4 | BW 300 KH2 MOUE | Adto Sweep | |
| | | | M1[1] | 3.06 dBn 2.4760 GH |
| 10 dBm | | | | |
| 20 dBm |) dBm | | | |
| 30 dBm | | | | |
| 40 dBm | | | | |
| 50 dBm | | | | |
| 60 dem when here | how when the store when | www.www.du | when when a start of the second secon | wert way all the to be a supported the seather thanks and a seather the seather that the seather that the seather |
| -70 dBm | | | | |
| Start 1.0 GHz | | 691 pts | | Stop 25.0 GHz |
| | | par hrz | | Stop 25.0 GHz |

Date: 12.MAY.2016 12:40:50

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9.8 Band edge testing

Test Method

1 Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious RBW = 100 kHz, VBW \ge RBW, Sweep = auto, Detector function = peak, Trace = max hold

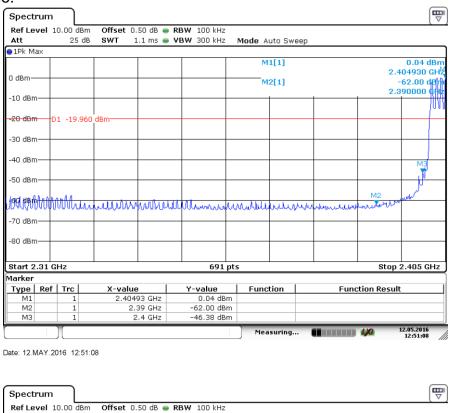
- 2 Allow the trace to stabilize, use the peak and delta measurement to record the result.
- 3 The level displayed must comply with the limit specified in this Section. .
- 4 Repeat the test at the hopping off and hopping on mode, submit all the plots.

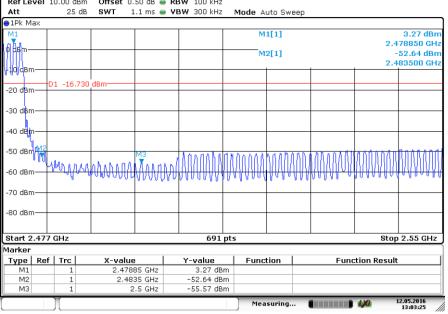
Limit:

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the100 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 that the transmitter demonstrates compliance with the peak conducted power limits.

Band edge testing

BT3.0 GFSK Modulation Test Result: Hopping on mode:





Date: 12.MAY.2016 13:03:25

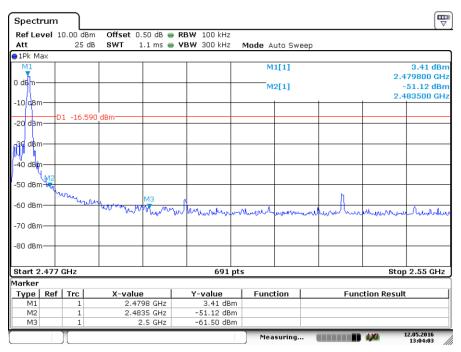




Hopping off mode:

| • | ո լ | In | | PPUL KOOLU | | | | | |
|-----------------|--------|----------------------|---------------------|----------------------------|---------|----------|---------------------|------------|-------------------------|
| Ref Leve Att | | dBm Offse 5dB SWT | | RBW 100 kHz VBW 300 kHz | Mode to | ta C | | | |
| ALL 1Pk Max | 23 | 5 UB 5WI | 1.1 ms 👅 | VBW 300 KHZ | Mode Au | to Swee | р | | |
| JIPK Max | | | | | M3 | C 4 1 | | | -46.38 dB |
| | | | | | Ma | [1] | | | -40.38 uB 400000 i@t |
| 0 dBm | - | | | | M1 | [1] | | 2. | -2.28 d |
| | | | | | | | | 2. | 402180 CH |
| -10 dBm— | | | | | | | | 1 | |
| 00 dp | | | | | | | | | 1 = N |
| -20 dBm— | D1 -22 | .280 dBm | | | | | | | |
| -30 dBm— | | | | | | | | | |
| -30 ubiii- | | | | | | | | | |
| -40 dBm— | | | | _ | | | | | |
| io abiii | | | | | | | | | MB |
| -50 dBm— | | | _ | _ | | | _ | | <u> </u> |
| | | | | | | | | | 1.1 |
| -60 dBm— | | | | | | | - | M2 | week - |
| | ounder | wheneverwheeter | manderderments | unertuburrent | withing | knukhnuk | well and the second | | |
| -70 dBm— | | | | | | | _ | | + |
| 00 10- | | | | | | | | | |
| -80 dBm— | | | | | | | | | |
| | | | | | | | | | |
| Start 2.3 | 1 GHz | | | 691 p | ts | | | Stop | 2.405 GH |
| Marker | | | | | | | | | |
| | ef Trc | | | Y-value | Functi | ion | Fun | ction Resu | it |
| M1 | 1 | 2. | 40218 GHz | -2.28 dBm | | | | | |
| M2 M3 | 1 | | 2.39 GHz 2.4 GHz | -62.57 dBm -46.38 dBm | | | | | |
| 1413 | 1 | | 217 002 | 40.30 Ubiii | | | | | 12.05.2016 |

Date: 12.MAY.2016 12:49:34



Date: 12.MAY.2016 13:04:03



BT3.0 8-DPSK Modulation Test Result: Hopping on mode:

T Spectrum Ref Level 10.00 dBm Offset 0.50 dB 👄 RBW 100 kHz Att 25 dB SWT 1.1 ms 😑 **VBW** 300 kHz Mode Auto Sweep 🔵 1 Pk Max -1.56 dBn 2.403970 GM M1[1] -63.78 dBr 2.390000 GM 0 dBm M2[1] -10 dBm--30 dBm -40 dBm--50 dBm-59 PM With and an area of the way of the second and the second se herroral indu Untrol цц -70 dBm -80 dBm-691 pts Start 2.31 GHz Stop 2.405 GHz Marker X-value 2.40397 GHz 2.39 GHz 2.4 GHz Y-value -1.56 dBm -63.78 dBm -56.70 dBm Function Type Ref Trc Function Result M1 M2 MЗ 12.05.2016 12:57:25 Measuring...

Date: 12.MAY.2016 12:57:25

| Spect | rum | | | | | | | | | | | | | |
|---------|----------|---------|-----|-----------------|----------|------|------------------|-----|---------|---------|-------|-------------|--------------|------------------------|
| | evel | 10.00 d | | Offset (| | | | | | | | | | |
| Att | | 25 | dB | SWT | 1.1 ms 🧉 | VB | W 300 kHz | N | 1ode A | uto Sw | еер | | | |
| ⊖1Pk M | lax | | | | | | | | | | | | | |
| M1 | | | | | | | | | M | 1[1] | | | | 1.56 dBm |
| 0 dBm- | | | | | | | | | | | | | | 179800 GHz |
| 11101 | | | | | | | | | M | 2[1] | | | | -57.30 dBm |
| -10 dBr | n_ | | | | | | | | | | | | 2.4 | 183500 GHz |
| 10 0.01 | " | | | | | | | | | | | | | |
| -20 dBr | n— | D1 -18. | 440 | dBm | + | | | | | | | | | |
| | | | | | | | | | | | | | | |
| -30 dBr | n | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| -40 dBr | n— | | | | | | | | | | | | | |
| -50 dBr | M | | | | | | | | | | | | | |
| -J0 ubi | M2 | | | | МЗ | | ******* | 111 | UT DA N | 106.80 | 11.01 | ከ ለ ለ በ ላ አ | ለለሴስስአ | ከለለሲሲሲ |
| -60 dBr | <u> </u> | 88.080 | 111 | nachalt | 1000 | المه | NAMAN | ſVЧ | MANA? | የትልለ | 100 | and Aman | WWW | AAAAAAAAAAA |
| -00 UBI | " | 19000 | 221 | ABAAAA | Angel | 144 | | | | | | | | |
| -70 dBr | | | | | | | | | | | | | | |
| -70 ubi | " | | | | | | | | | | | | | |
| -80 dBr | - | | | | | | | | | | | | | |
| -00 001 | " | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| Start 2 | | 7 GHz | | | | | 691 | pts | | | | | Stop | o 2.55 GHz |
| Marker | | | | | | | | | | | | | | |
| Туре | Ref | | | X-valu | | | Y-value | | Func | tion | | Fun | ction Result | t |
| M1 | | 1 | | | 798 GHz | | 1.56 dB | | | | | | | |
| M2 | | 1 | | | 335 GHz | | -57.30 dB | | | | | | | |
| МЗ | | 1 | | | 2.5 GHz | | -57.73 dB | m | | | | | | |
| [| | Л | | | | | | | Mea | suring. | (| | L)O | 12.05.2016 12:59:11 |

Date: 12.MAY.2016 12:59:11



Hopping off mode:

| Spectru | | | | | | | | | | | | | | |
|-----------------|--------|----------|--------|-------------|------|-----------------------|----------|-------|---------|----------|------|-----------|-------------------|-----|
| Ref Leve Att | | | | | | 100 kHz 300 kHz | | odo A | uto Sw | een | | | | |
| 1Pk Max | - | 5 45 . | | 1.1 115 | 101 | 500 KH2 | 141 | oue A | 410 510 | eep | | | | |
| 0 dBm | | | | | | | | м | 3[1] | | | 2 | -46.38 .400000 | ιGΗ |
| U aBm— | | | | | | | | M | 1[1] | | | _ | -2.28 | |
| -10 dBm— | + | | | | | | - | | | | | 2 | .402180 | |
| -20 dBm— | 0.1 0 | 2.280 de | | | | | | | | | | | | 4 |
| -30 dBm— | -21 | 2.280 08 | m | | | | | | | | | | | Π |
| -30 ubiii- | | | | | | | | | | | | | | Д |
| -40 dBm— | - | | | | | | - | | | | | | мэ | Ц |
| -50 dBm— | | | | | | | | | | | | | |) |
| -60 dBm— | | | | | | | | | | | | M2 | and the | |
| -ou abm— | mura | morener | mound | unter | huma | huburre | war | windy | whenthe | unoputer | m | -unitor | | |
| -70 dBm— | | | | | | | <u> </u> | | | | | | | |
| -80 dBm— | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| Start 2.3 | 1 GHz | | | | | 691 | pts | | | | | Stop | 0 2.405 (| GHz |
| Marker | | | | | | | | | | | | | | |
| Type R M1 | ef Trc | | X-valu | e 18 GHz | Y | -value -2.28 dB | - | Func | tion | | Fund | tion Resu | lt | |
| M1 M2 | | | | 39 GHz | | -2.28 dB -62.57 dB | | | | | | | | |
| M3 | | | | 2.4 GHz | | -46.38 dB | | | | | | | | |
| |][| | | | | | | Mea | suring. | | | 490 | 12.05.2010 | |

Date: 12.MAY.2016 12:49:34

| Spect | rum | | | | | | | | | | | |
|---------------|-------|------------------|------------|--------|------------------|--------------------|--------|---------|-------|-------|-----------|------------------------|
| Ref Le Att | vel 1 | .0.00 dB 25 (| | | RBW 10 VBW 30 | | Mode A | uto Sw | еер | | | , |
| ●1Pk Ma | ax . | | | | | | | | | | | |
| M1 | | | | | | | м | 1[1] | | | 2 | 1.65 dBm 479800 GHz |
| 0 dBm- | - | | | | | | M | 2[1] | | | | -57.14 dBm |
| -10 dBm | | | | | | | | | | | 2. | 483500 GHz |
| -10 050 | - | | | | | | | | | | | |
| -20 dBm | | 1 -18.3 | 50 dBm | | | _ | | | | | | |
| | | | | | | | | | | | | |
| -30 dBm | -+- | | | | | | | | | | | |
| 40 dBm | | | | | | | | | | | | |
| 10 00. | | | | | | | | | | | | |
| -50 dBm | | | | | | | | | | | | |
| | 5 | | | мз | | | | | | л | | |
| -60 dBm | י ע | milio | where have | whene | in hime | under | mun | unter | mound | hulos | whenty | monum |
| -70 dBm | - | | | | | | | | | | | |
| | | | | | | | | | | | | |
| -80 dBm | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| Start 2 | .477 | GHz | | | | 691 p | ts | | | | Sto | p 2.55 GHz |
| Marker | | | | | | | | | | | | |
| Type M1 | Ref | Trc 1 | X-value | 98 GHz | <u>Y-va</u> | alue .65 dBm | Func | tion | | Fund | tion Resu | t |
| M1 M2 | | 1 | | 35 GHZ | | .65 dBm .14 dBm | | | | | | |
| M3 | | 1 | | 5 GHz | | .39 dBm | | | | | | |
| | |)[| | | | | Mea | suring. | | | 4/0 | 12.05.2016 12:59:59 |

Date: 12.MAY.2016 13:00:00



9.9 Spurious radiated emissions for transmitter

Test Method

1: The EUT was place on a turn table which is 1.5m above ground plane for above 1GHz and 0.8m above ground for below 1GHz at 3 meter chamber room for test. 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 height of antenna 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 rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

5: Use the following spectrum analyzer settings According to C63.10:

For Above 1GHz

Span = wide enough to capture the peak level of the in-band emission and all spurious RBW = 1MHz, VBW ≥ RBW for peak measurement and VBW = 10Hz for average measurement, Sweep = auto, Detector function = peak, Trace = max hold.
For Below 1GHz

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious RBW = 100 KHz, VBW \geq RBW for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.

Note:

1: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 KHz for Quasi-peak detection (QP) at frequency below 1GHz.

2: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for peak detection (PK) at frequency above 1GHz.

3: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for RMS Average ((duty cycle < 98%) for Average detection (AV) at frequency above 1GHz, then the measurement results was added to a correction factor (20log(1/duty cycle)).

4: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz (duty cycle > 98%) for Average detection (AV) at frequency above 1GHz.



Limit

The radio emission outside the operating frequency band 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. Radiated emissions which fall in the restricted bands, as defined in section15.205, must comply with the radiated emission limits specified in section 15.209.

| Frequency | Field Strength | Field Strength | Detector |
|------------|----------------|----------------|----------|
| MHz | uV/m | dBµV/m | |
| 30-88 | 100 | 40 | QP |
| 88-216 | 150 | 43.5 | QP |
| 216-960 | 200 | 46 | QP |
| 960-1000 | 500 | 54 | QP |
| Above 1000 | 500 | 54 | AV |
| Above 1000 | 5000 | 74 | PK |



Spurious radiated emissions for transmitter

According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit.

The only worst case (which is subject to the maximum EIRP, π /4-DQPSK mode) test result is listed in the report.

Transmitting spurious emission test result as below:

| BT3.0 GFSK Modulation | 2402MHz Test Result |
|-----------------------|---------------------|
|-----------------------|---------------------|

| Frequency Band | Frequency | Emission Level | Polarization | Limit | Detector | Margin | Result |
|-------------------|-----------|-------------------|--------------|--------|----------|--------|--------|
| Danu | MHz | dBuV/m | | dBµV/m | | dBuV/m | |
| | *4804 | 46.88 | Н | 74 | PK | 27.12 | Pass |
| 1000- | | | Н | 74 | PK | | Pass |
| 25000MHz | *4804 | 39.92 | V | 74 | PK | 34.08 | Pass |
| | | | V | 74 | PK | | Pass |

BT3.0 GFSK Modulation 2441MHz Test Result

| Frequency Band | Frequency | Emission Level | Polarization | Limit | Detector | Margin | Result |
|-------------------|-----------|-------------------|--------------|--------|----------|--------|--------|
| Dallu | MHz | dBuV/m | | dBµV/m | | dBuV/m | |
| 30- | | | Н | 46 | QP | | Pass |
| 1000MHz | | | Н | 46 | QP | | Pass |
| | *4882 | 47.62 | Н | 74 | PK | 26.38 | Pass |
| 1000- | | | Н | 74 | PK | | Pass |
| 25000MHz | *4882 | 46.08 | V | 74 | PK | 27.92 | Pass |
| | | | V | 74 | PK | | Pass |



BT3.0 GFSK Modulation 2480MHz Test Result

| Frequency Band | Frequency | Emission Level | Polarization | Limit | Detector | Margin | Result |
|-------------------|-----------|-------------------|--------------|--------|----------|--------|--------|
| Danu | MHz | dBuV/m | | dBµV/m | | dBuV/m | |
| | *4960 | 44.58 | Н | 74 | PK | 29.42 | Pass |
| 1000- | | | Н | 74 | PK | | Pass |
| 25000MHz | *4960 | 44.23 | V | 74 | PK | 29.77 | Pass |
| | | | V | 74 | PK | | Pass |

Remark:

(1) "*" means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205.



10 Test Equipment List

Site 2:

| DESCRIPTION | MANUFACTURER | MODEL NO. | SERIAL NO. | CAL. DUE DATE |
|---|--------------|------------------------|----------------------|---------------|
| Test Receiver | R&S | ESU26 | 100050 | 12-Feb-2017 |
| Bi-conical Antenna | R&S | HK116 | 100242 | 07-Dec-2016 |
| Log Periodic Antenna | R & S | HL223 | 841516/020 | 01-Sep-2017 |
| Coaxial cable (50ohm) | Rosenberger | RTK081-05S- 05S-10m | LA2-001-10M / 001 | 01-Sep-2017 |
| Microwave amplifier (0.5-26.5GHz, 25dB gain) | НР | 83017A | 3123A00437 | 10-Jun-2016 |
| High Pass Filter (cutoff freq. =1000MHz) | Trilithic | 23042 | 9829213 | 17-Jul-2016 |
| Horn Antenna | EMCO | 3115 | 9002-3351 | 28-Oct-2017 |
| Active Loop Antenna | EMCO | 6502 | 9107-2651 | 26-Aug-2017 |
| RF Voltage Probe | Schwarzbeck | TK9416 | None | 10-Feb-2017 |
| LISN | R&S | ESH3-Z5 | 849876/027 | 15-Jun-2016 |
| Double Shield Cable | Radiall | RG142 | Nil | 14-Sep-2017 |
| Pulse Limiter | R&S | ESH3-Z2 | Nil | 04-Jun-2016 |

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11 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

| System Measurement Uncertainty | | | | | |
|--------------------------------|---|----------------------------------|--|--|--|
| Items | Extended Uncertainty | | | | |
| Radiated Emissions | Level accuracy 30 to 200 MHz 200 to 1000 MHz 1000 to 25000 MHz | ±4.68 dB ±5.73 dB ±5.57 dB | | | |
| Conducted Emissions | Level accuracy 9 kHz to 30 MHz | ±3.16 dB | | | |
| Conducted RF Test | ≤ 1 dB | | | | |