



|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |                                                                                                                                      |  |                                                  |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--------------------------------------------------------------------------------------------------------------------------------------|--|--------------------------------------------------|--|
| <b>Prüfbericht - Nr.:</b><br><i>Test Report No.</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  | <b>14001814 001</b>                                                                                                                  |  | Seite 1 von 18<br>Page 1 of 18                   |  |
| <b>Auftraggeber:</b><br><i>Client:</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  | Innovi Technologies Ltd.<br>Suite 501-3, 5/F.<br>Chinachem Leighton Plaza<br>29 Leighton Road<br>Causeway Bay<br>Hong Kong           |  |                                                  |  |
| <b>Gegenstand der Prüfung:</b><br><i>Test item:</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  | Bluetooth Headset                                                                                                                    |  |                                                  |  |
| <b>Bezeichnung:</b><br><i>Identification:</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  | <b>BlueTrek</b>                                                                                                                      |  | <b>Serien-Nr.:</b><br><i>Serial No.</i>          |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |                                                                                                                                      |  | Engineering sample                               |  |
| <b>Wareneingangs-Nr.:</b><br><i>Receipt No.:</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  | <b>020805048</b>                                                                                                                     |  | <b>Eingangsdatum:</b><br><i>Date of receipt:</i> |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |                                                                                                                                      |  | 05.08.2002                                       |  |
| <b>Prüfort:</b><br><i>Testing location:</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  | Refer to section 2.1                                                                                                                 |  |                                                  |  |
| <b>Prüfgrundlage:</b><br><i>Test specification:</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  | FCC Part 15, Subpart C                                                                                                               |  |                                                  |  |
| <b>Prüfergebnis:</b><br><i>Test Result</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  | Der vorstehend beschriebene Prüfgegenstand wurde geprüft und entspricht oben genannter Prüfgrundlage.<br>The a. m. test item passed. |  |                                                  |  |
| <b>geprüft / tested by:</b><br><br>Fred Wai                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  | <b>kontrolliert / reviewed by</b><br><br>Stephan Wald                                                                                |  |                                                  |  |
| <div>04.10.2002<br/>Datum<br/>Date</div> <div></div> <div>Unterschrift<br/>Signature</div>                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  | <div>04.10.2002<br/>Datum<br/>Date</div> <div></div> <div>Unterschrift<br/>Signature</div>                                           |  |                                                  |  |
| <b>Sonstiges / Other Aspects:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |                                                                                                                                      |  |                                                  |  |
| <div>Abkürzungen:    OK, Pass    = entspricht Prüfgrundlage<br/>                    Fail        = entspricht nicht Prüfgrundlage<br/>                    N/A        = nicht anwendbar</div> <div>Abbreviations:    OK, Pass    = passed<br/>                      Fail        = failed<br/>                      N/A        = not applicable</div>                                                                                                                                                                                            |  |                                                                                                                                      |  |                                                  |  |
| <p><b>Dieser Prüfbericht bezieht sich nur auf den o.g. Prüfgegenstand und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.</b><br/>This test report relates to the a. m. test item. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark on this or similar products.</p> <p><small>Authorized format 16.12.1996, R.M.</small></p> |  |                                                                                                                                      |  |                                                  |  |

## **1 Test Summary**

### **7.1.1 ANTENNA CONNECTOR SUBCLAUSE 15.203**

### **7.1.2 ANTENNA TYPE SUBCLAUSE 15.204**

### **7.1.3 DISTURBANCE VOLTAGE ON AC MAINS SUBCLAUSE 15.207**

*RESULT: Pass*

*Limit Subclause 15.207(a)*

### **7.1.4 CARRIER FREQUENCY SEPERATION SUBCLAUSE 15.247(A)**

*Limit Subclause 15.247(a)(1)(ii)*

### **7.1.5 DWELL TIME SUBCLAUSE 15.247(A)**

*RESULT: Pass*

*Limit Subclause 15.247(a)(1)(ii)*

### **7.1.6 20dB BANDWIDTH SUBCLAUSE 15.247(A)(1)**

*RESULT: Pass*

*Limit Subclause 15.247(a)(1)(ii)*

### **7.1.7 HOPPING SEQUENCE SUBCLAUSE 15.247(A)(1)**

### **7.1.8 RECEIVER INPUT BANDWIDTH SUBCLAUSE 15.247(A)(1)**

### **7.1.9 PEAK OUTPUT POWER SUBCLAUSE 15.247(B)(1)**

*RESULT: Pass*

*Limit Subclause 15.247(c)*

### **7.1.10 BAND EDGE COMPLIANCE SUBCLAUSE 15.247(C)**

*RESULT: Pass*

*Limit Subclause 15.247(c)*

### **7.1.11 SPURIOUS CONDUCTED SUBCLAUSE 15.247(C)**

*RESULT: Pass*

*Limit Subclause 15.247(c)*

### **7.1.12 SPURIOUS RADIATED SUBCLAUSE 15.247(C)**

*RESULT: Pass*

*Limit Subclause 15.247(c)*

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## **3 General Remarks**

### **3.1 Complementary Materials**

All attachments are integral parts of this test report. This applies especially to the following appendix:

Appendix 1: Test Result

Appendix 2: Test Setup

Appendix 3: Construction Photographs

Appendix 4: Test Result and test set-up conducted emission

## **4 Test Sites**

### **4.1 Test Facilities**

Hong Kong Productivity Council  
HKPC Building  
78 Tat Chee Avenue  
Kowloon  
Hong Kong

## 4.2 List of Test and Measurement Instruments

**Table 1: List of Test and Measurement Equipment**

|                                     | Kind of Equipment                 | Manufacturer      | Type             | S/N          |
|-------------------------------------|-----------------------------------|-------------------|------------------|--------------|
| <input type="checkbox"/>            | Test Receiver                     | Rohde & Schwarz   | ESH-3            | 890173/033   |
| <input type="checkbox"/>            | L/I/S/N                           | Rohde & Schwarz   | ESH 3-Z5         | 849876/026   |
| <input type="checkbox"/>            | Oscilloscope                      | HP                | 54713B           | US34510455   |
| <input type="checkbox"/>            | Test Receiver                     | Rohde & Schwarz   | ESVP             | 882402/033   |
| <input type="checkbox"/>            | Absorbing Clamp                   | Rohde & Schwarz   | MDS-21           | 979 3/4      |
| <input checked="" type="checkbox"/> | Test Receiver                     | Rohde & Schwarz   | ESVS30           | 842807/009   |
| <input checked="" type="checkbox"/> | Biconical Antenna                 | Rohde & Schwarz   | HK116            | 841489/015   |
| <input checked="" type="checkbox"/> | Log.-Periodic Antenna             | Rohde & Schwarz   | HL223            | 841516/017   |
| <input type="checkbox"/>            | Universal Power Analyzer          | Voltech           | PM3000A          | 9915         |
| <input type="checkbox"/>            | Reference Impedance Network       | Voltech           | IEC 555 Standard | 9946         |
| <input type="checkbox"/>            | AC Power Source                   | California Instr. | 4500L            | HK51895      |
| <input type="checkbox"/>            | Trip-Loop Antenna                 | Chase             | LLA6142          | 1019         |
| <input checked="" type="checkbox"/> | Double Ridge Horn Antenna         | EMCO              | 3115             | 9002-3351    |
| <input checked="" type="checkbox"/> | Double Ridge Horn Antenna         | EMCO              | 3116             | 9002-3347    |
| <input type="checkbox"/>            | RF Comms Test Set                 | HP                | 8920B            | US36492628   |
| <input type="checkbox"/>            | Spectrum Analyser + Tracking Gen. | HP                | 8596E            | 3639A00758   |
| <input checked="" type="checkbox"/> | Signal Generator                  | Rohde & Schwarz   | SMY 01           | 844146/024   |
| <input checked="" type="checkbox"/> | Signal Generator                  | Rohde & Schwarz   | SMY 01           | 844146/023   |
| <input type="checkbox"/>            | BiLog Antenna                     | EMCO              | 3143             | 9607-1287    |
| <input type="checkbox"/>            | Isotropic Field Probe             | Holladay          | HI-4422          | 90956        |
| <input type="checkbox"/>            | Power Amplifier                   | Kalmus            | 757-LC           | 7620-1       |
| <input type="checkbox"/>            | Power Amplifier                   | Kalmus            | 122-FC           | 7620-2       |
| <input type="checkbox"/>            | Coupling Clamp                    | Schaffner         | CDN 126          | 312          |
| <input type="checkbox"/>            | Couple Device Network             | Fischer           | CDN-M2           | 9604         |
| <input checked="" type="checkbox"/> | Spectrum Analyzer                 | Rohde & Schwarz   | FSP30            | 1093.4495K30 |
| <input checked="" type="checkbox"/> | Temperature Chamber               | Binder            | MK 240           | 9020-0028    |
| <input checked="" type="checkbox"/> | EFT,ESD,SURGE, DIPS tester        | Schaffner         | Best 96          | IN3796-011   |

## 5 General Product Information

### 5.1 Product Function and Intended Use

The submitted sample is Bluetooth Headset for use with a device providing the Bluetooth audio gateway functionality.

Bluetooth is a short-range radio link intended to be a cable replacement between portable and/or fixed electronic devices.

Bluetooth operates in the unlicensed ISM Band at 2.4 GHz. In the US a band of 83.5 MHz width is available. In this band, 79 RF channels spaced 1MHz apart are defined.

The channel is represented by a pseudo-random hopping sequence through the 79 channels. The channel is divided into time slots, with a nominal slot length of 625µs, where each slot corresponds to different RF hop frequencies. The nominal hop rate is 1600 hops/s. The symbol rate on the channel is 1 Ms/s.

### 5.2 Ratings and System Details

|                    | Receiver                | Transmitter           |
|--------------------|-------------------------|-----------------------|
| Frequency range    | : 2402 - 2480MHz        | 2402 - 2480MHz        |
| Number of channels | : 79                    | 79                    |
| Channel separation | : 1MHz                  | 1MHz                  |
| Type of antenna    | : Integral antenna      | Integral antenna      |
| Power supply       | : Battery operated 3,6V | Battery operated 3,6V |

### 5.3 Independent Operation Modes

- a) Inquiry scan
- b) Page scan
- c) Connection state:
  - ACL link
  - SCO link

## **5.4 Submitted Documents**

Circuit Diagram  
PCB Layout  
Bill of material  
User manual

# **6 Test Set-up and Operation Mode**

## **6.1 Principle of Configuration Selection**

**Emission:** The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the instructions for use.

## **6.2 Test Operation and Test Software**

Refer to Test set-up in chapter 7.

## **6.3 Special Accessories and Auxiliary Equipment**

Battery charger for Bluetrek Headset

|        |   |                           |
|--------|---|---------------------------|
| Input  | : | AC 100-240V, 15A, 50-60Hz |
| Output | : | DC 6.2V, 190mA            |

## **7 Test Results**

### **7.1.1 Antenna connector**

#### **Subclause 15.203**

The EUT has no antenna connector. The antenna is printed on the circuit board.

### **7.1.2 Antenna type**

#### **Subclause 15.204**

The EUT has an integral antenna printed on the circuit board. The antenna gain is 2dBi.

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### **7.1.3 Disturbance voltage on AC mains**

### **Subclause 15.207**

#### **RESULT:**

**Pass**

Test Specification : ANSI C63.4-1992  
Mode of operation : Tx mode (hopping on)  
Port of testing : AC power port of charger  
Supply voltage: AC 110V  
Temperature : 20°C  
Humidity : 52%

For test results refer to Appendix 4

#### **Limit**

**Subclause 15.207(a)**

#### **7.1.4 Carrier frequency separation**

#### **Subclause 15.247(a)**

Mode of operation : Tx mode (hopping on), DH1 packet  
Port of testing : Temporary antenna port  
Supply voltage: DC 3,6V  
Temperature : 22°C  
Humidity : 51%

For test results refer to Appendix 1, page 15

#### **Limit**

#### **Subclause 15.247(a)(1)(ii)**

Frequency hopping systems operating in the 2400-2483.5 MHz and 5725-5850 MHz bands shall use at least 75 hopping frequencies. The maximum 20 dB bandwidth of the hopping channel is 1 MHz.

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### **7.1.5 Dwell time**

### **Subclause 15.247(a)**

#### **RESULT:**

**Pass**

|                   |   |                               |
|-------------------|---|-------------------------------|
| Mode of operation | : | Tx mode (2441MHz), DH5 packet |
| Port of testing   | : | Temporary antenna port        |
| Supply voltage:   |   | DC 3,6V                       |
| Temperature       | : | 20°C                          |
| Humidity          | : | 55%                           |

The screenshot in annex 1 shows the occurrence of a channel in a 30s time period. The frequency was used 62 times. The dwell time for the longest supported packet type is about 3ms. As a result the average time of occupancy will not be greater than 400ms.

For test results refer to Appendix 1, page 13 – 14.

#### **Limit**

#### **Subclause 15.247(a)(1)(ii)**

The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 30 second period.

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### 7.1.6 20dB bandwidth

### Subclause 15.247(a)(1)

#### RESULT:

**Pass**

Mode of operation : Tx mode (2402MHz, 2441MHz, 2480MHz), DH1 packet  
Port of testing : Temporary antenna port  
Supply voltage: DC 3,6V  
Temperature : 20°C  
Humidity : 55%

| 20dB bandwidth (MHz) |       |       |
|----------------------|-------|-------|
| 2402                 | 2441  | 2480  |
| 0.749                | 0.794 | 0.794 |

For test results refer to Appendix 1, page 01 – 03.

#### Limit

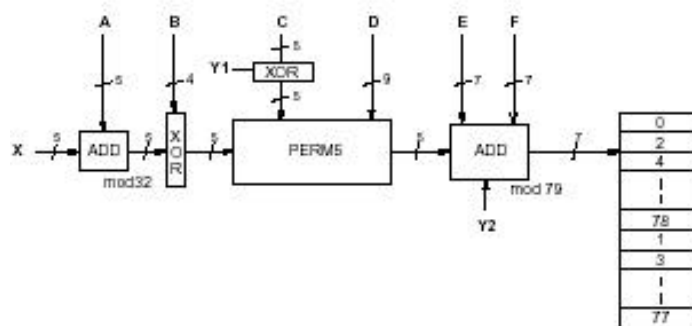
#### Subclause 15.247(a)(1)(ii)

The occupied bandwidth shall not exceed 1000kHz

## 7.1.7 Hopping sequence

## Subclause 15.247(a)(1)

The channel is represented by a pseudo-random hopping sequence hopping through the 79 RF channels. The hopping sequence is unique for the piconet and is determined by the Bluetooth device address of the master. The X input determines the phase in the 32-hop segment, whereas Y1 and Y2 selects between master-to-slave and slave-to-master transmission. The inputs A to D determine the ordering within the segment, the inputs E and F determine the mapping onto the hop frequencies.



Example data:

Hop sequence {k} for CONNECTION STATE:

CLK start: 0x0000010

ULAP: 0x00000000

#ticks: 00 02 | 04 06 | 08 0a | 0c 0e | 10 12 | 14 16 | 18 1a | 1c 1e |

|            |       |       |       |       |       |       |       |       |
|------------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0x0000010: | 08 66 | 10 70 | 12 19 | 14 23 | 16 01 | 18 05 | 20 33 | 22 37 |
| 0x0000030: | 24 03 | 26 07 | 28 35 | 30 39 | 32 72 | 34 76 | 36 25 | 38 29 |
| 0x0000050: | 40 74 | 42 78 | 44 27 | 46 31 | 48 09 | 50 13 | 52 41 | 54 45 |
| 0x0000070: | 56 11 | 58 15 | 60 43 | 62 47 | 32 17 | 36 19 | 34 49 | 38 51 |
| 0x0000090: | 40 21 | 44 23 | 42 53 | 46 55 | 48 33 | 52 35 | 50 65 | 54 67 |
| 0x00000b0: | 56 37 | 60 39 | 58 69 | 62 71 | 64 25 | 68 27 | 66 57 | 70 59 |
| 0x00000d0: | 72 29 | 76 31 | 74 61 | 78 63 | 01 41 | 05 43 | 03 73 | 07 75 |
| 0x00000f0: | 09 45 | 13 47 | 11 77 | 15 00 | 64 49 | 66 53 | 68 02 | 70 06 |
| 0x0000110: | 01 51 | 03 55 | 05 04 | 07 08 | 72 57 | 74 61 | 76 10 | 78 14 |
| 0x0000130: | 09 59 | 09 59 | 11 63 | 13 12 | 15 16 | 17 65 | 19 69 | 21 22 |
| 0x0000150: | 33 67 | 35 71 | 37 20 | 39 24 | 25 73 | 27 77 | 29 26 | 31 30 |
| 0x0000170: | 41 75 | 43 00 | 45 28 | 47 32 | 17 02 | 21 04 | 19 34 | 23 36 |
| 0x0000190: | 33 06 | 37 08 | 35 38 | 39 40 | 25 10 | 29 12 | 27 42 | 31 44 |
| 0x00001b0: | 41 14 | 45 16 | 43 46 | 47 48 | 49 18 | 53 20 | 51 50 | 55 52 |
| 0x00001d0: | 65 22 | 69 24 | 67 54 | 71 56 | 57 26 | 61 28 | 59 58 | 63 60 |
| 0x00001f0: | 73 30 | 77 32 | 75 62 | 00 64 | 49 34 | 51 42 | 57 66 | 59 74 |
| 0x0000210: | 53 36 | 55 44 | 61 68 | 63 76 | 65 50 | 67 58 | 73 03 | 75 11 |
| 0x0000230: | 69 52 | 71 60 | 77 05 | 00 13 | 02 38 | 04 46 | 10 70 | 12 78 |
| 0x0000250: | 06 40 | 08 48 | 14 72 | 16 01 | 18 54 | 20 62 | 26 07 | 28 15 |
| 0x0000270: | 22 56 | 24 64 | 30 09 | 32 17 | 02 66 | 06 74 | 10 19 | 14 27 |
| 0x0000290: | 04 70 | 08 78 | 12 23 | 16 31 | 18 03 | 22 11 | 26 35 | 30 43 |
| 0x00002b0: | 20 07 | 24 15 | 28 39 | 32 47 | 34 68 | 38 76 | 42 21 | 46 29 |
| 0x00002d0: | 36 72 | 40 01 | 44 25 | 48 33 | 50 05 | 54 13 | 58 37 | 62 45 |
| 0x00002f0: | 52 09 | 56 17 | 60 41 | 64 49 | 34 19 | 36 35 | 50 51 | 52 67 |
| 0x0000310: | 38 21 | 40 37 | 54 53 | 56 69 | 42 27 | 44 43 | 58 59 | 60 75 |
| 0x0000330: | 46 29 | 48 45 | 62 61 | 64 77 | 66 23 | 68 39 | 03 55 | 05 71 |
| 0x0000350: | 70 25 | 72 41 | 07 57 | 09 73 | 74 31 | 76 47 | 11 63 | 13 00 |
| 0x0000370: | 78 33 | 01 49 | 15 65 | 17 02 | 66 51 | 70 67 | 03 04 | 07 20 |
| 0x0000390: | 68 55 | 72 71 | 05 08 | 09 24 | 74 59 | 78 75 | 11 12 | 15 28 |
| 0x00003b0: | 76 63 | 01 00 | 13 16 | 17 32 | 19 53 | 23 69 | 35 06 | 39 22 |
| 0x00003d0: | 21 57 | 25 73 | 37 10 | 41 26 | 27 61 | 31 77 | 43 14 | 47 30 |
| 0x00003f0: | 29 65 | 33 02 | 45 18 | 49 34 | 19 04 | 21 08 | 23 20 | 25 24 |

### **7.1.8 Receiver input bandwidth**

### **Subclause 15.247(a)(1)**

The receiver bandwidth is equal to the receiver bandwidth in the 79 hopping channel mode, which is 1 MHz. The receiver bandwidth is indirectly verified during Bluetooth RF conformance testing.

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### 7.1.9 Peak output power

### Subclause 15.247(b)(1)

**RESULT:**

**Pass**

Mode of operation : Tx mode (2402MHz, 2441MHz, 2480MHz), DH1 packet  
 Port of testing : Temporary antenna port  
 Supply voltage: DC 3,6V  
 Temperature : 20°C  
 Humidity : 55%

| Maximum peak output power (dBm) |       |       |
|---------------------------------|-------|-------|
| 2402                            | 2441  | 2480  |
| -0.77                           | -1.67 | -0.72 |

For test results refer to Appendix 1, page 04 - 06

**Limit**

**Subclause 15.247(c)**

|                  |                 |
|------------------|-----------------|
| Frequency range  | RF output power |
| 2.400-2.483,5MHz | 1,0W (30dBm)    |

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### **7.1.10 Band edge compliance**

### **Subclause 15.247(c)**

#### **RESULT:**

**Pass**

|                   |   |                                                 |
|-------------------|---|-------------------------------------------------|
| Mode of operation | : | Tx mode (2402MHz, 2441MHz, 2480MHz), DH1 packet |
| Port of testing   | : | Temporary antenna port                          |
| Supply voltage:   |   | DC 3,6V                                         |
| Temperature       | : | 20°C                                            |
| Humidity          | : | 55%                                             |

For test results refer to Appendix 1, page 10 - 13

#### **Limit**

#### **Subclause 15.247(c)**

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.

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### **7.1.11 Spurious conducted**

### **Subclause 15.247(c)**

#### **RESULT:**

**Pass**

Mode of operation : Tx mode (2402MHz, 2441MHz, 2480MHz), DH1 packet  
Port of testing : Temporary antenna port  
Supply voltage: DC 3,6V  
Temperature : 20°C  
Humidity : 55%

For test results refer to Appendix 1, page 07 - 10

#### **Limit**

#### **Subclause 15.247(c)**

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.

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## 7.1.12 Spurious radiated

## Subclause 15.247(c)

**RESULT:**

**Pass**

| Tx Frequency (MHz)    |                       |                      |                       |                       |                      |                       |                       |                      |
|-----------------------|-----------------------|----------------------|-----------------------|-----------------------|----------------------|-----------------------|-----------------------|----------------------|
| 2402                  |                       |                      | 2441                  |                       |                      | 2480                  |                       |                      |
| Restricted band (MHz) | Level (dB $\mu$ V/m)  | Limit (dB $\mu$ V/m) | Restricted band (MHz) | Level (dB $\mu$ V/m)  | Limit (dB $\mu$ V/m) | Restricted band (MHz) | Level (dB $\mu$ V/m)  | Limit (dB $\mu$ V/m) |
|                       | <b>No peaks found</b> |                      |                       | <b>No peaks found</b> |                      |                       | <b>No peaks found</b> |                      |
|                       |                       |                      |                       |                       |                      |                       |                       |                      |

## Limit

## Subclause 15.247(c)

In addition to the limits stated for conducted emissions, 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).