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Via del Carroccio, 4 I 20853 Biassono (Italy)

Report Reference ID:	300983-1TRFWL
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<b>Test specification:</b>	Title 47 - Telecommunication Chapter I - Federal Communications Commission Subchapter A - General Part 15 - Radio Frequency Devices Subpart C - Intentional Radiators  <b>§15.247</b> - Operation within the bands 2400–2483.5 MHz  RSS-210 Issue 8 December 2010  RSS-247 Issue 1 May 2015 Spectrum Management and Telecommunications Radio Standards Specification Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
<b>Applicant:</b>	Mares Spa Via Salita Bonsen, 4 – 16035 Rapallo (GE) – Italy
<b>Apparatus:</b>	BLE Adapter
<b>Model:</b>	bluelink universal
<b>FCC ID:</b>	Contains FCC ID: 2AIKSBLNK
<b>IC ID</b>	Contains IC: 21499-BLNK

<b>Testing laboratory:</b>	<b>Nemko Spa</b> Via del Carroccio, 4 I 20853 Biassono (Italy)  Telephone: +039 039 2201201 Facsimile: +39 039 220 1221
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	<b>Name and title</b>	<b>Date</b>
<b>Tested by:</b>	Daniele Guarnone, Wireless/EMC Specialist  	2016-06-15
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Product: bluelink universal

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## Section 1: Report summary

### 1.1 Test specification

<b>Specifications</b>	<b>FCC Part 15 Subpart C, 15.247</b> Operation within the bands 902–928 MHz, 2400–2483.5 MHz and 5725–5850 MHz.
	<b>RSS-247 Issue 1 May 2015</b> Spectrum Management and Telecommunications Radio Standards Specification Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSs) and Licence- Exempt Local Area Network (LE-LAN) Devices

### 1.2 Statement of compliance

<b>Compliance</b>	In the configuration tested the EUT was found compliant Yes <input type="checkbox"/> No <input type="checkbox"/> This report contains an assessment of apparatus against specifications based upon tests carried out on samples submitted at Nemko Canada Inc. These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15; Subpart C. and RSS-247 Issue 1 May 2015 Radiated tests were conducted in accordance with ANSI C63.10-2013
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### 1.3 Exclusions

<b>Exclusions</b>	None
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### 1.4 Registration number

<b>Test site FCC ID number</b>	481407 (10 m Semi anechoic chamber)
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### 1.5 Test report revision history

<b>Revision #</b>	Details of changes made to test report
TRF	Original report issued

### 1.6 Limits of responsibility

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

This test report has been completed in accordance with the requirements of ISO/IEC 17025. All results contained in this report are within Nemko Italy's ISO/IEC 17025 accreditation.

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## Section 2: Summary of test results

Product: bluelink universal

### Section 2: Summary of test results

#### 2.1 FCC Part 15 Subpart C – Intentional Radiators, RSS-247 test results

##### General requirements for FCC Part 15, RSS-210 Issue 8 December 2010

Part	Test description	Verdict
§15.31(e)	Variation of power source	N/A
§15.31(m)	Number of operating frequencies	Pass
§15.203	Antenna requirement	Pass
§15.207(a)	Conducted limits	N/A

##### Specific requirements for FCC Part 15 Subpart C, 15.247, RSS-247 Issue 1 May 2015

Part	Test description	Verdict
§15.247(a)(1)(i)	Frequency hopping systems operating in the 902–928 MHz band	N/A
§15.247(a)(1)(ii)	Frequency hopping systems operating in the 5725–5850 MHz band	N/A
§15.247(a)(1)(iii)	Frequency hopping systems operating in the 2400–2483.5 MHz band	N/A
§15.247(a)(2)	Minimum 6 dB bandwidth for systems using digital modulation techniques	N/A
§15.247(b)(1)	Maximum peak output power of frequency hopping systems operating in the 2400–2483.5 MHz band and 5725–5850 MHz band	Pass
§5.4(2)	Maximum peak output power of Frequency hopping systems operating in the 902–928 MHz band	N/A
§15.247(b)(2)	Maximum peak output power of systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands	N/A
§15.247(b)(3)	Maximum peak output power of systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands	N/A
§15.247(b)(4)	Maximum peak output power	N/A
§15.247(c)(1)	Fixed point-to-point operation with directional antenna gains greater than 6 dBi	N/A
§15.247(c)(2)	Transmitters operating in the 2400–2483.5 MHz band that emit multiple directional beams	N/A
§15.247(d)	Spurious emissions	Pass
§5.5		
§15.247(e)	Power spectral density for digitally modulated devices	N/A
§15.247(f)	Time of occupancy for hybrid systems	N/A

Notes: None



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**Section 3: EUT and application details** | **Product: bluelink universal**

**Section 3: Equipment under test (EUT) and application details**

**3.1 Applicant details**

<b>Applicant complete business name</b>	Name:	Mares Spa
	Federal Registration Number (FRN):	0025609975
	Grantee code	2AIKS
	Industry Canada n.	21499
<b>Mailing address</b>	Address: City: Province/State: Post code: Country:	Via Salita Bonsen, 4 – 16035 Rapallo (GE) – Italy Rapallo GE Italy

**3.2 Modular equipment**

<b>a) Single modular approval</b>	Single modular approval Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
<b>b) Limited single modular approval</b>	Limited single modular approval Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>

**3.3 Product details**

<b>FCC ID / IC ID</b>	FCC	Contains FCC ID: 2AIKSBLNK
	IC	Contains IC: 21499-BLNK
<b>Equipment class</b>	DSS Part 15 Spread Spectrum Transmitter (BLE)	
<b>Description of product as it is marketed</b>	BLE Adapter	
	Model name/number:	bluelink universal
	Variant name/number	--

**3.4 Application purpose**

<b>Type of application</b>	<input type="checkbox"/> Original certification <input type="checkbox"/> Change in identification of presently authorized equipment Original FCC ID: _____ Grant date: _____ <input checked="" type="checkbox"/> Class II permissive change or modification of presently authorized equipment
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**3.5 Composite/related equipment**

<b>a) Composite equipment</b>	The EUT is a composite device subject to an additional equipment authorization Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
<b>b) Related equipment</b>	The EUT is part of a system that operates with, or is marketed with, another device that requires an equipment authorization Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
<b>c) Related FCC ID</b>	If either of the above is "yes": <input type="checkbox"/> has been granted under the FCC ID(s) listed below: <input type="checkbox"/> is in the process of being filled under the FCC ID(s) listed below: <input type="checkbox"/> is pending with the FCC ID(s) listed below: <input type="checkbox"/> has a mix of pending and granted statuses under the FCC ID(s) listed below:

 Nemko Spa Via del Carroccio, 4 I 20853 Biassono (Italy)	<b>Section 3: EUT and application details</b>	<b>Product:</b> bluelink universal
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### 3.6 Sample information

<b>Receipt date:</b>	2016-06-13
<b>Nemko sample ID number:</b>	--

### 3.7 EUT technical specifications

<b>Operating band:</b>	Frequency Band 2.400 GHz ~ 2483.5 GHz Number of Channels 38 channels Modulation GFSK
<b>Operating frequency:</b>	2402MHz to 2480 MHz
<b>Modulation type:</b>	GFSK
<b>Occupied bandwidth:</b>	2MHz
<b>Channel spacing:</b>	2 MHz
<b>Emission designator:</b>	F1D, G7D
<b>Antenna type:</b>	Integral, -1.5 dBi
<b>Power source:</b>	max.100m A / 3 V DC Battery CR123A

### 3.8 Operation of the EUT during testing

<b>Details:</b>	Tx at lower, middle and higher frequency with GFSK modulation
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### 3.9 EUT setup diagram

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**Section 4: Engineering considerations** **Product:** bluelink universal

## Section 4: Engineering considerations

### 4.1 Modifications incorporated in the EUT

<b>Modifications</b>	Modifications performed to the EUT during this assessment None <input type="checkbox"/> Yes <input type="checkbox"/> , performed by Client <input type="checkbox"/> or Nemko <input type="checkbox"/> Details:
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### 4.2 Deviations from laboratory tests procedures

<b>Deviations</b>	Deviations from laboratory test procedures None <input type="checkbox"/> Yes <input type="checkbox"/> - details are listed below:
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### 4.3 Technical judgment

<b>Judgment</b>	None
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 Nemko Spa Via del Carroccio, 4 I 20853 Biassono (Italy)	<b>Section 5: Test conditions</b>	<b>Product:</b> bluelink universal
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## Section 5: Test conditions

5.1 Power source and ambient temperatures	
<b>Normal temperature, humidity and air pressure test conditions</b>	Temperature: 15–30 °C Relative humidity: 20–75 % Air pressure: 86–106 kPa  When it is impracticable to carry out tests under these conditions, a note to this effect stating the ambient temperature and relative humidity during the tests shall be recorded and stated.
<b>Power supply range:</b>	The normal test voltage for equipment to be connected to the mains shall be the nominal mains voltage. For the purpose of the present document, the nominal voltage shall be the declared voltage, or any of the declared voltages ±5 %, for which the equipment was designed.



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## Section 6: Measurement uncertainty

**Product:** bluelink universal

### Section 6: Measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report according Nemko Spa Technical Procedure WML0078. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device. Hereafter the best measurement capability for Nemko Spa laboratory is reported:

EUT	Type	Test	Range and Setup features	Measurement Uncertainty	Notes
Transmitter	Conducted	Frequency error	0.001MHz ÷ 18 GHz	0.08 ppm	(1)
		Carrier power RF Output Power	1MHz ÷ 18 GHz With power meter	1.6 dB	(1)
			1MHz ÷ 18 GHz With spectrum/receiver	3.0 dB	(1)
		Adjacent channel power	1MHz ÷ 18 GHz	1.6 dB	(1)
		Conducted spurious emissions	1MHz ÷ 18 GHz	4.2 dB	(1)
		Intermodulation attenuation	1MHz ÷ 18 GHz	2.2 dB	(1)
		Attack time – frequency behaviour	1MHz ÷ 18 GHz	2.0 ms	(1)
		Attack time – power behaviour	1MHz ÷ 18 GHz	2.5 ms	(1)
		Release time – frequency behaviour	1MHz ÷ 18 GHz	2.0 ms	(1)
		Release time – power behaviour	1MHz ÷ 18 GHz	2.5 ms	(1)
		Transient behaviour of the transmitter– Transient frequency behaviour	1MHz ÷ 18 GHz	0.2 kHz	(1)
		Transient behaviour of the transmitter – Power level slope	1MHz ÷ 18 GHz	9%	(1)
		Frequency deviation - Maximum permissible frequency deviation	0.001MHz ÷ 18 GHz	1.3%	(1)
		Frequency deviation - Response of the transmitter to modulation frequencies above 3 kHz	0.001MHz ÷ 18 GHz	0.5 dB	(1)
		Dwell time	-	3%	(1)
	Radiated	Hopping Frequency Separation	0.01MHz ÷ 18 GHz	1%	(1)
		Occupied Channel Bandwidth	0.01MHz ÷ 18 GHz	2%	(1)
		Modulation Bandwidth	0.01MHz ÷ 18 GHz	2%	(1)
	Radiated	Radiated spurious emissions	30MHz ÷ 18 GHz	6.0 dB	(1)
		Effective radiated power transmitter	30MHz ÷ 18 GHz	6.0 dB	(1)
Receiver	Radiated	Radiated spurious emissions	30MHz ÷ 18 GHz	6.0 dB	(1)
		Sensitivity measurement	1MHz ÷ 18 GHz	6.0 dB	(1)
	Conducted	Conducted spurious emissions	1MHz ÷ 18 GHz	4.2 dB	(1)

#### NOTES:

(1) The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k = 2$  which has been derived from the assumed normal probability distribution with infinite degrees of freedom and for a coverage probability of 95 %.



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**Section 7: Test equipment****Product: bluelink universal****Section 7: Test equipment****7.1 Test equipment list**

Equipment	Manufacturer	Model No.	Asset/Serial No.	Next cal.
Spectrum Analyzer 9 KHz ÷ 40 GHz	R&S	FSEK	848255/005	09/2016
Broadband preamplifier	Schwarzbeck	BBV 9718	9718-137	12/2016
Trilog Broadband Antenna	Schwarzbeck	VULB 9162	9162-025	2018/07
Semi-anechoic chamber	Nemko	10m semi-anechoic chamber	530	2016/09
Antenna mast	R&S	HCM	836 529/05	NCR
Controller	R&S	HCC	836 620/7	NCR
EMI receiver 9 kHz ÷ 3 GHz	R&S	ESCI	100888	2016/09
LISN 9 kHz ÷ 30 MHz	R&S	ESH2-Z5	872 460/041	2016/11
Climatic Chamber	ESPEC	ARS 1100	4100000067	2016/12
Loop antenna	R&S	HFH2-Z2	831247/011	2017/02
EMI receiver 20 Hz ÷ 8 GHz	R&S	ESU8	100202	2016/09
Bilog antenna 1 ÷ 18 GHz	Schwarzbeck	STLP 9148-123	123	09/2018
Double Ridged Waveguide Horn	RF SPIN	DRH40	061106a40	08/2016
Wide band Amplifier 18 GHz ÷ 40 GHz	MITEQ	AMF-5F-18004000-37-8P	128061	12/2016
High pass filter	Wainwright Instruments	WHNX6-2555-3500-26500-60CC	01	11/2016

Note: N/A = Not applicable, NCR = No cal required, COU = Cal on use

 Nemko Spa Via del Carroccio, 4 I 20853 Biassono (Italy)	<b>Section 8: Testing data</b>	<b>Product</b> bluelink universal
	<b>Specification:</b> FCC Part 15 Subpart A	

## Section 8: Testing data

### 8.1 Clause 15.31(e) Variation of power source

#### § 15.31 Measurement standards.

(e) For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85 % and 115 % of the nominal rated supply voltage. For battery-operated equipment, the equipment tests shall be performed using a new battery.

#### Special notes

None

#### Test data

- Transmit output power was measured with battery full charge



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**Section 8: Testing data****Product: bluelink universal**

Specification: FCC Part 15 Subpart A

**8.2 Clause 15.31(m) Number of operating frequencies****§ 15.31 Measurement standards.**

(m) Measurements on intentional radiators or receivers, other than TV broadcast receivers, shall be performed and, if required, reported for each band in which the device can be operated with the device operating at the number of frequencies in each band specified in the following table:

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

**Special notes**

None

**Test data**

The frequency band is 2400 ÷ 2483.5 MHz therefore number of operating frequencies is 3.

Low frequency / channel	2402 MHz
Mid frequency / channel	2440 MHz
High frequency / channel	2480 MHz

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<b>Specification:</b> FCC Part 15 Subpart C		

### 8.3 Clause 15.203 Antenna requirement

#### § 15.203 Antenna requirement.

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

#### Special notes

None

#### Test data

- The EUT uses a unique antenna non-detachable antenna to the intentional radiator.

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	<b>Specification:</b> FCC Part 15.247, RSS-247	

## 8.4 Clause 15.247(b) Maximum peak conducted output power

### § 15.247 Operation within the bands 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz.

(b) The maximum peak conducted output power of the intentional radiator shall not exceed the following:

- (1) For frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725–5850 MHz band: 1 watt. **For all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 watts.**
- (2) For frequency hopping systems operating in the 902–928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this section.
- (3) For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.
- (4) The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.
  - (i) Systems operating in the 2400–2483.5 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.
  - (ii) Systems operating in the 5725–5850 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter peak output power.
  - (iii) Fixed, point-to-point operation, as used in paragraphs (b)(3)(i) and (b)(3)(ii) of this section, excludes the use of point-to-multipoint systems, omnidirectional applications, and multiple co-located intentional radiators transmitting the same information. The operator of the spread spectrum intentional radiator or, if the equipment is professionally installed, the installer is responsible for ensuring that the system is used exclusively for fixed, point-to-point operations. The instruction manual furnished with the intentional radiator shall contain language in the installation instructions informing the operator and the installer of this responsibility.

### RSS-247 Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

5.4(2) For FHSs operating in the band 2400–2483.5 MHz, the maximum peak conducted output power shall not exceed 1.0 W and the e.i.r.p. shall not exceed 4 W if the hopset uses 75 or more hopping channels; the maximum peak conducted output power shall not exceed 0.125 W and the e.i.r.p. shall not exceed 0.5 W if the hopset uses less than 75 hopping channels (see Section 5.4(5) for exceptions).

### Special notes

None



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## Section 8: Testing data

Product: bluelink universal

Specification: FCC Part 15.247, RSS-247

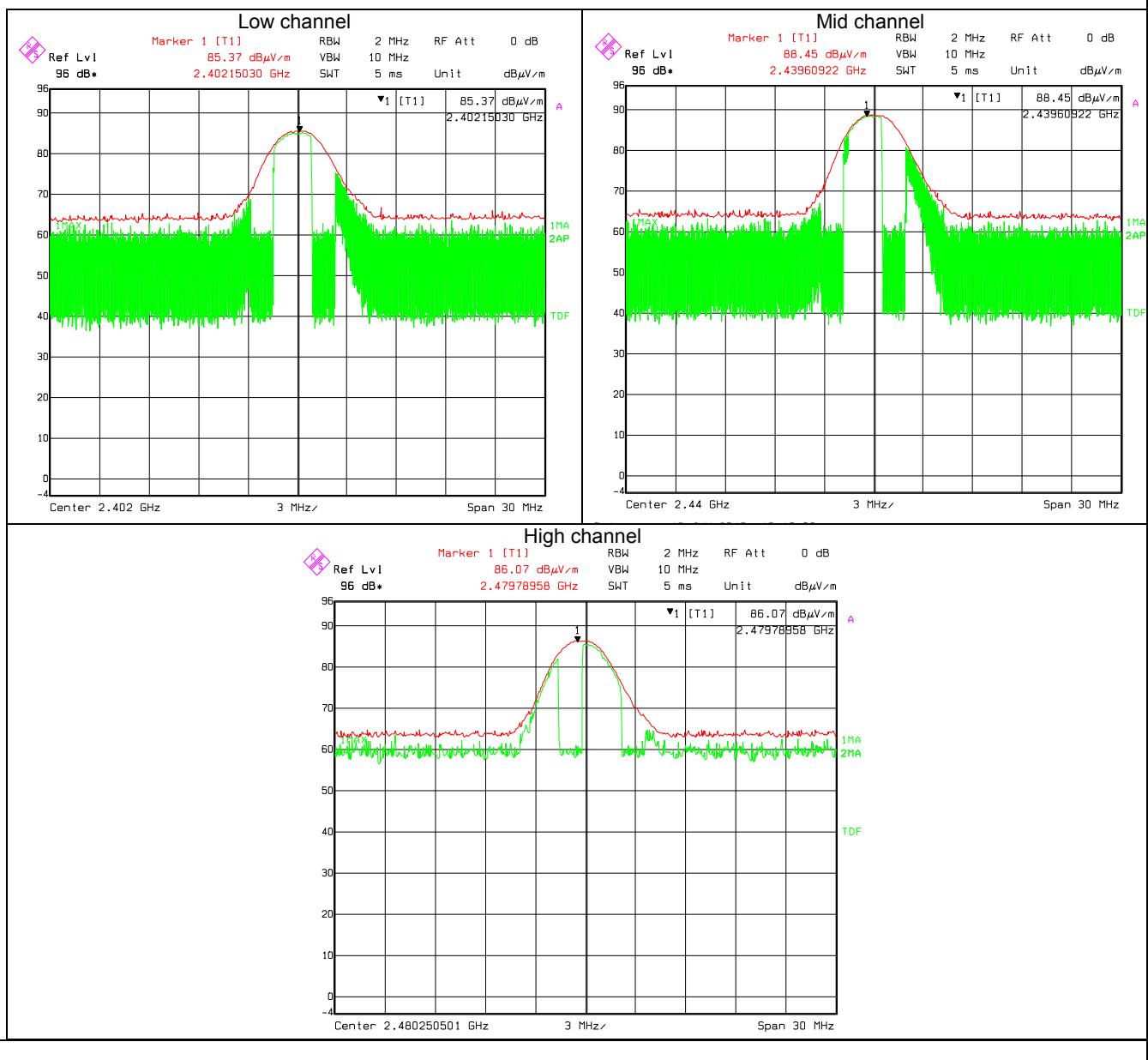
### Test data, continued

#### Section (3) Results, continued

### Radiated measurements

Radiated measurements were performed:

- All measurements were performed at a distance of 3 m.
- test method ANSI C63.10-2013
- Vertical polarization, GFSK modulation





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**Section 8: Testing data**

**Product:** bluelink universal

**Specification:** FCC Part 15.247, RSS-247

Frequency (MHz)	Field strength (dB $\mu$ V/m)	Output power (dBm)	Limit (dBm)	Margin (dBm)
2402	85.37	-8.36	20.9	-29.26
2440	88.45	-5.28	20.9	-26.18
2480	86.07	-7.66	20.9	-28.56

**Note:**

Theoretical conversion from Field Strength measured at 3 m to power conducted from the intentional radiator to the antenna:

$$P (W) = \frac{E^2 R^2}{30G}$$

*E* = Measured field strength value (V/m)

*R* = Measurement distance (m)

*G* = Antenna Gain (numeric)

Therefore dBW = dB $\mu$ V/m + 20Log(3) - 10Log(30) - 10Log(G)

From which we obtain

$$\begin{aligned} \text{dBmW} &= \text{dB $\mu$ V/m} - 120 + 20\text{Log}(3) - 10\text{Log}(30) - 10\text{Log}(G) + 30 \\ &= \text{dB $\mu$ V/m} - 95.23 - 10\text{Log}(G) \end{aligned}$$

Output power [dBm] = Field Strength [dB $\mu$ V/m] - 95.23 [dB] - Antenna gain [dBi] (-1.5 dBi)

Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dBm)
2402	-9.86	26.9	-36.76
2440	-6.78	26.9	-33.68
2480	-9.16	26.9	-36.06

EIRP [dBm] = Output power [dBm] + Antenna gain [dBi] (-1.5 dBi)



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#### Section 8: Testing data

Product: bluelink universal

Specification: FCC Part 15.247, RSS-247

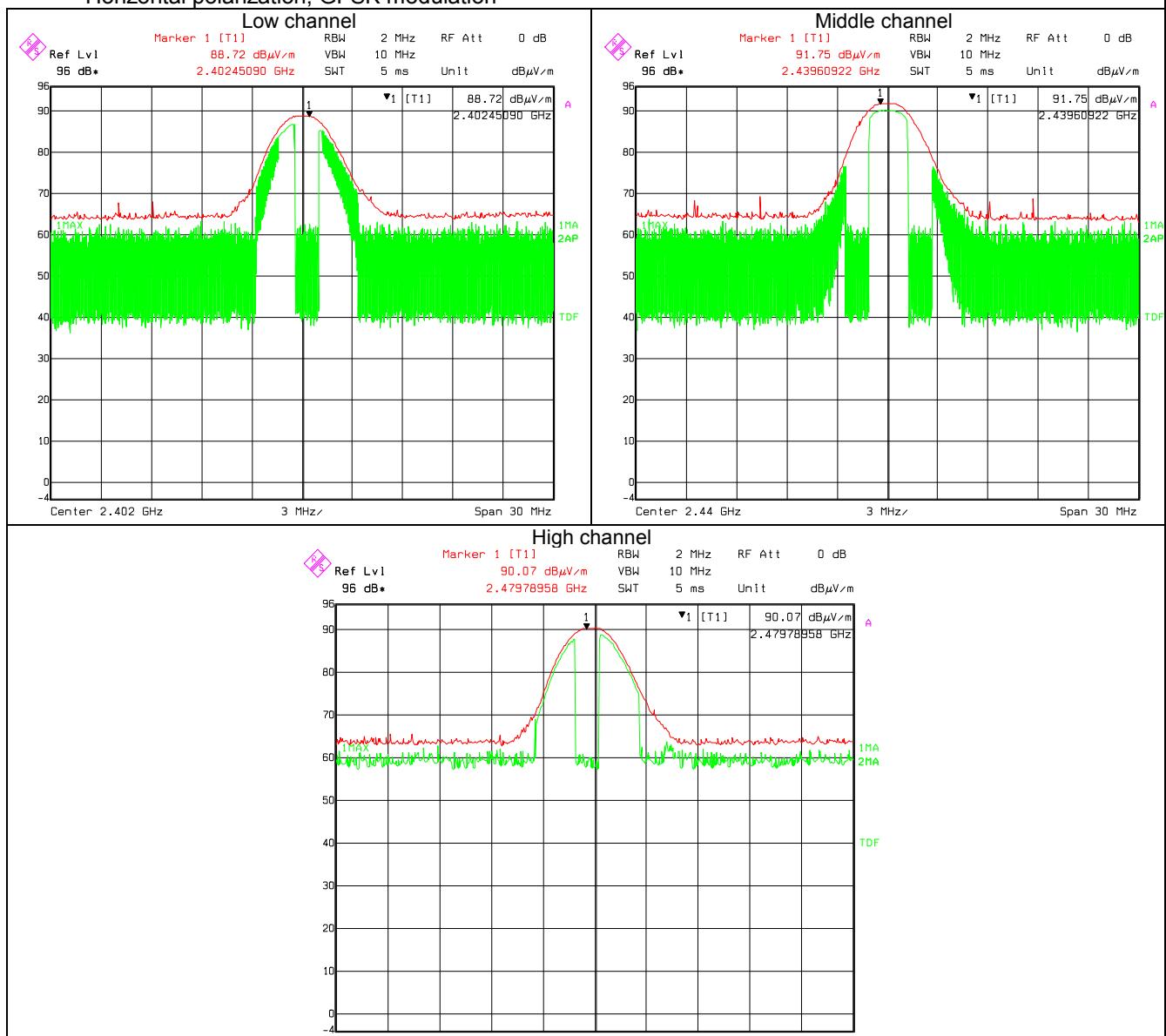
#### Test data, continued

##### Section (3) Results, continued

#### Radiated measurements

Radiated measurements were performed:

- All measurements were performed at a distance of 3 m.
- test method ANSI C63.10-2013
- 
- Horizontal polarization, GFSK modulation





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**Section 8: Testing data**

**Product:** bluelink universal

**Specification:** FCC Part 15.247, RSS-247

Frequency (MHz)	Field strength (dB $\mu$ V/m)	Output power (dBm)	Limit (dBm)	Margin (dBm)
2402	88.72	-5.01	20.9	-25.91
2440	91.75	-1.98	20.9	-22.88
2480	90.07	-3.66	20.9	-24.56

**Note:**

Theoretical conversion from Field Strength measured at 3 m to power conducted from the intentional radiator to the antenna:

$$P (W) = \frac{E^2 R^2}{30G}$$

*E* = Measured field strength value (V/m)

*R* = Measurement distance (m)

*G* = Antenna Gain (numeric)

Therefore dBW = dB $\mu$ V/m + 20Log(3) - 10Log(30) - 10Log(G)

From which we obtain

$$\begin{aligned} \text{dBmW} &= \text{dB $\mu$ V/m} - 120 + 20\text{Log}(3) - 10\text{Log}(30) - 10\text{Log}(G) + 30 \\ &= \text{dB $\mu$ V/m} - 95.23 - 10\text{Log}(G) \end{aligned}$$

Output power [dBm] = Field Strength [dB $\mu$ V/m] - 95.23 [dB] - Antenna gain [dBi] (-1.5 dBi)

Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dBm)
2402	-6.51	26.9	-33.41
2440	-3.48	26.9	-30.38
2480	-5.16	26.9	-32.06

EIRP [dBm] = Output power [dBm] + Antenna gain [dBi] (-1.5 dBi)

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	<b>Specification:</b> FCC Part 15.247, RSS-247	

## 8.5 Clause 15.247(d) Spurious emissions

### § 15.247 Operation within the bands 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz.

(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

### RSS-247 Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

#### 5.5 Unwanted Emissions

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 the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.



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**Section 8: Testing data**

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**Special notes**

**§15.209 – Radiated emission limits**

Frequency (MHz)	Field strength		Measurement distance (m)
	( $\mu$ V/m)	(dB $\mu$ V/m)	
0.009–0.490	2400/F	67.6–20log(F)	300
0.490–1.705	24000/F	87.6–20log(F)	30
1.705–30.0	30	29.5	30
30–88	100	40.0	3
88–216	150	43.5	3
216–960	200	46.0	3
above 960	500	54.0	3

**Notes:**

- F = fundamental frequency in kHz
- In the emission table above, the tighter limit applies at the band edges.
- For frequencies above 1 GHz the limit on peak RF emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test.

**§15.205 – Restricted bands of operation**

MHz	MHz	MHz	GHz
0.090–0.110	16.42–16.423	399.9–410	4.5–5.15
0.495–0.505	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225	123–138	<b>2200–2300</b>	14.47–14.5
8.291–8.294	149.9–150.05	<b>2310–2390</b>	15.35–16.2
8.362–8.366	156.52475–156.52525	<b>2483.5–2500</b>	17.7–21.4
8.37625–8.38675	156.7–156.9	2690–2900	22.01–23.12
8.41425–8.41475	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025	240–285	3345.8–3358	36.43–36.5
12.57675–12.57725	322–335.4	3600–4400	Above 38.6
13.36–13.41			

- The spectrum was searched from 30 MHz to the 10<sup>th</sup> harmonic.
- The EUT was measured on three orthogonal axis.
- All measurements were performed at a distance of 3 m.
- All measurements were performed:
  - within 30–1000 MHz range: using a quasi-peak detector with 120 kHz/300 kHz RBW/VBW,
  - within 30–1000 MHz range: using a peak detector with 100 kHz/300 kHz RBW/VBW,
  - above 1 GHz: using peak detector with 1 MHz/3 MHz RBW/VBW for peak results
    - or using average detector with 1 MHz/3 MHz RBW/VBW for average results



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#### Section 8: Testing data

Product: bluelink universal

Specification: FCC Part 15.247, RSS-247

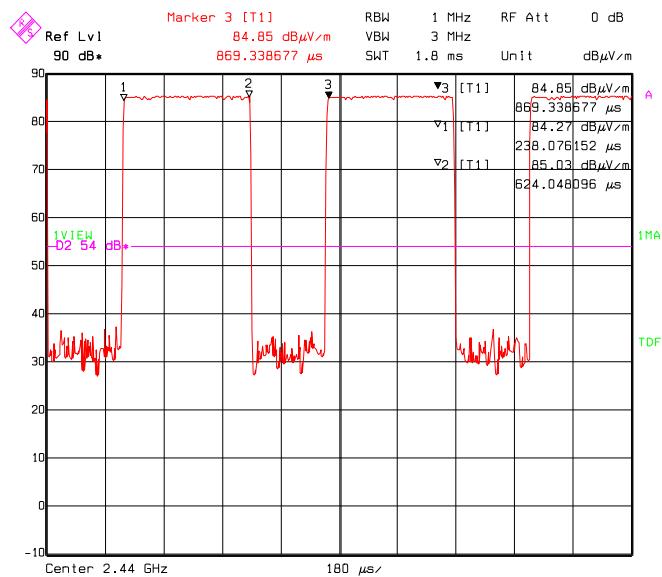
#### Test data

##### Duty cycle/average factor calculations

§15.35(c) When the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds.

##### Duty cycle/average factor calculations:

$$\text{Duty cycle / average factor} = 20 \times \log_{10} \left( \frac{T_{x_{100ms}}}{100ms} \right) = -4.3$$



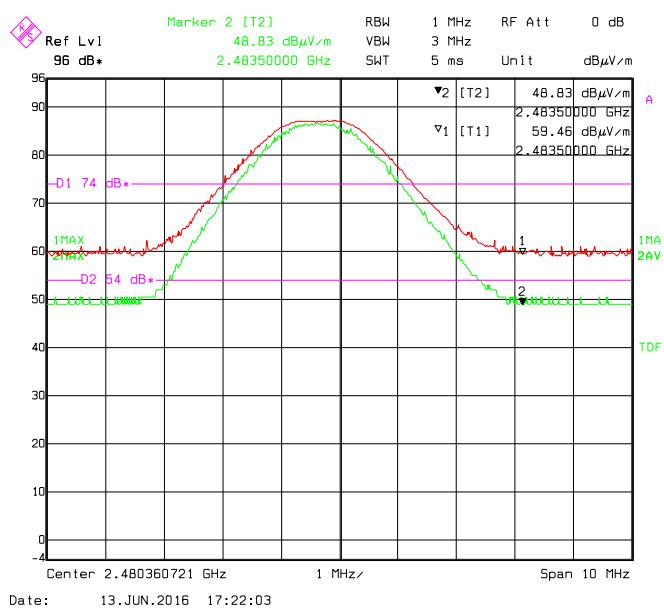
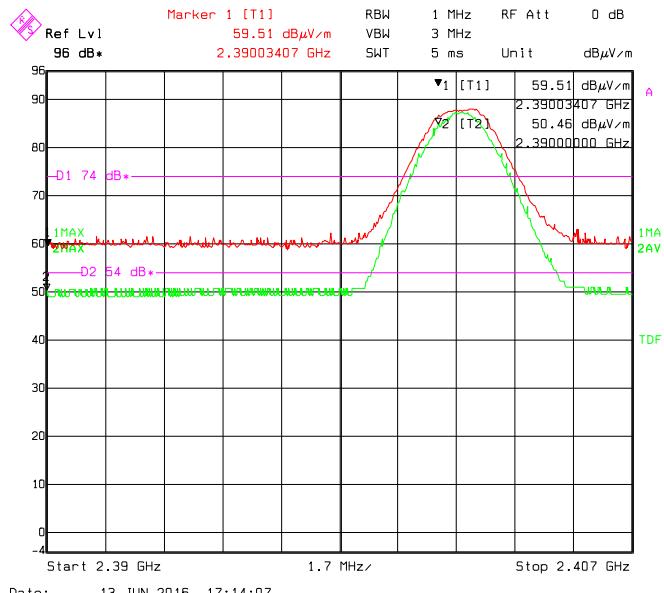
$$\begin{aligned} t_1 &= 238.076152 \mu\text{s} \\ t_2 &= 624.048096 \mu\text{s} \\ t_3 &= 868.338677 \mu\text{s} \end{aligned}$$

$$\text{duty cycle} = 20 \times \log [(t_2-t_1)/t_3-t_1)]$$

$$\text{duty cycle} = -4.3 \text{dB}$$



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**Section 8: Testing data****Product: bluelink universal****Specification: FCC Part 15.247, RSS-247****Test data, continued****Radiated measurement , GFSK modulation, Horizontal polarization**



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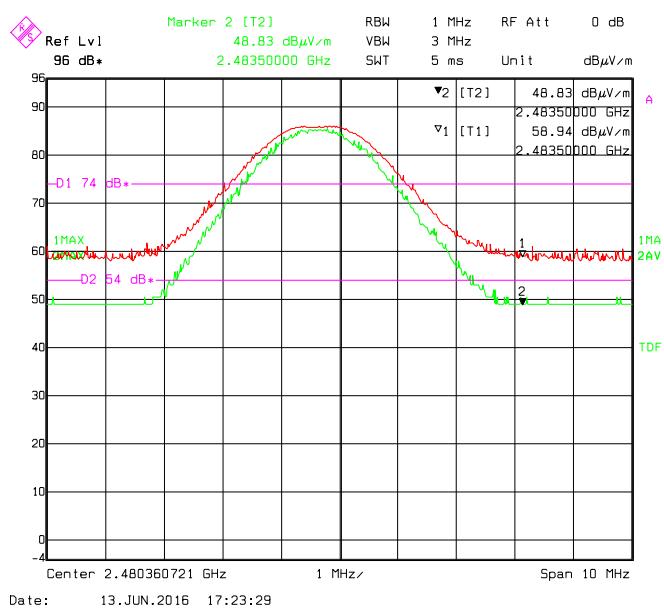
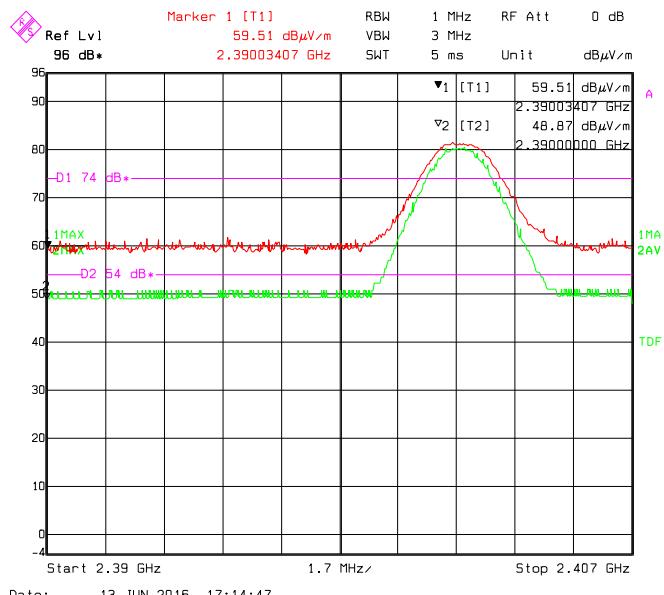
#### Section 8: Testing data

Product: bluelink universal

Specification: FCC Part 15.247, RSS-247

#### Test data, continued

Radiated measurement, GFSK modulation, vertical polarization





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### Section 8: Testing data

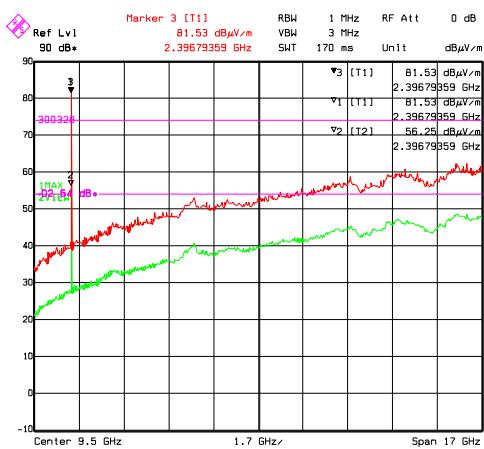
Product: bluelink universal

Specification: FCC Part 15.247, RSS-247

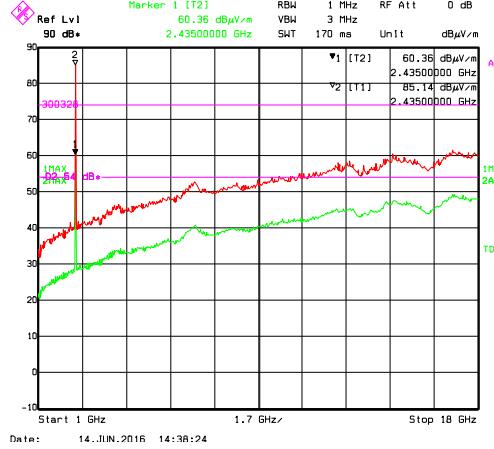
### Test data, continued

#### Radiated measurement GFSK modulation, vertical polarization

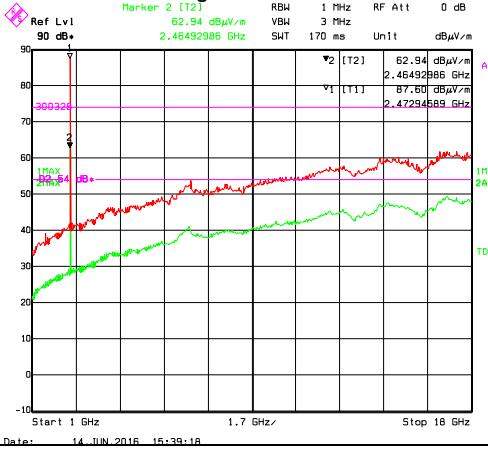
##### Low channel



##### Mid channel



##### High channel



Freq. (MHz)	P. I. V/H	Peak field strength (dBµV/m)	Correction (dB)	Peak limit (dBµV/m)	Peak margin (dB)	Duty cycle corr. (dB)	Avg field strength (dBµV/m)	Avg limit (dBµV/m)	Avg margin (dB)
--	h	--	--	--	--	--	--	--	--

Note: Correction factor includes antenna, cable loss, amplifier, and attenuators.  
Only worst results were reported (horizontal polarization)

#### Radiated Measurements

- All measurements were performed at a distance of 3 m.
- All measurements performed:
  - within 30–1000 MHz range: using a quasi-peak detector with 120 kHz/300 kHz RBW/VBW,
  - above 1 GHz: using peak detector with 1 MHz/3 MHz RBW/VBW for peak results
  - and using average detector with 1 MHz/3 MHz RBW/VBW for average results



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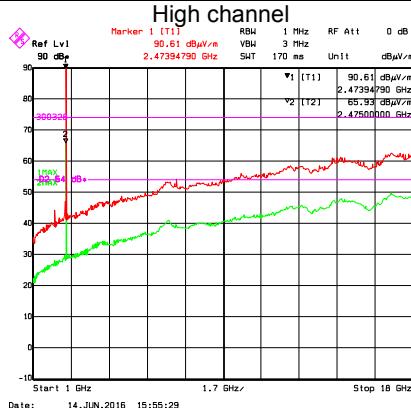
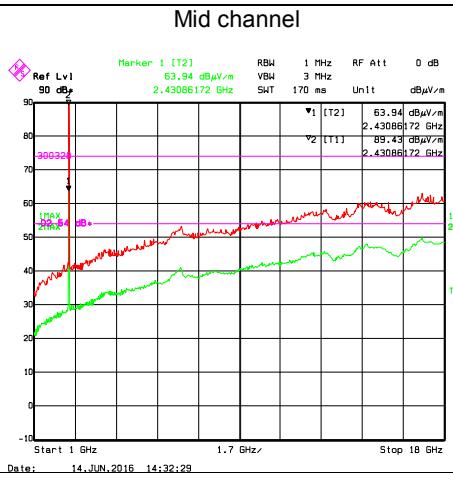
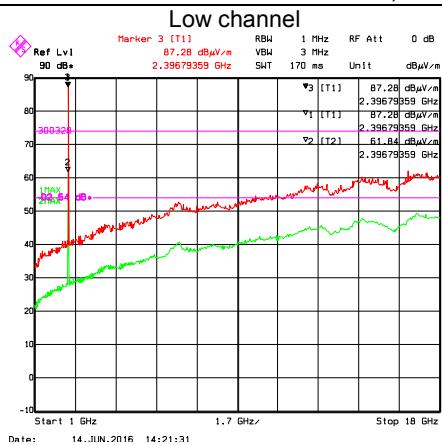
### Section 8: Testing data

Product: bluelink universal

Specification: FCC Part 15.247, RSS-247

#### Test data, continued

##### Radiated measurement GFSK modulation, horizontal polarization



Freq. (MHz)	P . I . V/H	Peak field strength (dBμV/m)	Correction (dB)	Peak limit (dBμV/m)	Peak margin (dB)	Duty cycle corr. (dB)	Avg field strength (dBμV/m)	Avg limit (dBμV/m)	Avg margin (dB)
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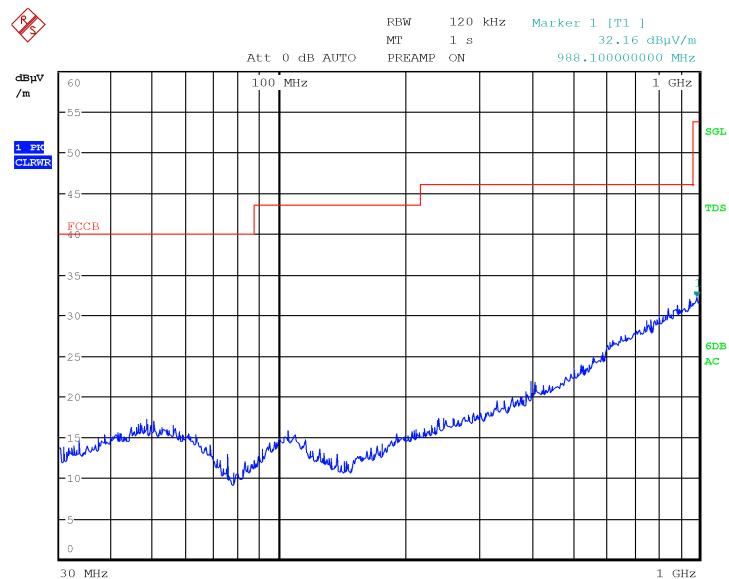
Note: Correction factor includes antenna, cable loss, amplifier, and attenuators.  
Only worst results were reported (horizontal polarization)

#### Radiated Measurements

- All measurements were performed at a distance of 3 m.
- All measurements performed:
  - within 30–1000 MHz range: using a quasi-peak detector with 120 kHz/300 kHz RBW/VBW,
  - above 1 GHz: using peak detector with 1 MHz/3 MHz RBW/VBW for peak results
  - and using average detector with 1 MHz/3 MHz RBW/VBW for average results



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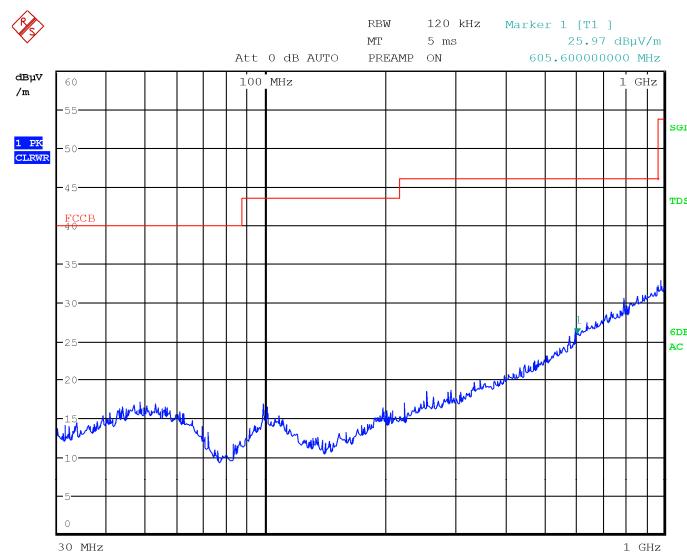
**Section 8: Testing data****Product: bluelink universal****Specification: FCC Part 15.247, RSS-247****Test data, continued****Radiated measurement Horizontal polarization, middle channel**

Freq. (MHz)	Pol. V/H	Quasi Peak field strength (dB $\mu$ V/m)	Correction (dB)	Quasi Peak limit (dB $\mu$ V/m)	Quasi Peak margin (dB)	Duty cycle corr. (dB)	Avg field strength (dB $\mu$ V/m)	Avg limit (dB $\mu$ V/m)	Avg margin (dB)
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Note: Correction factor includes antenna, cable loss, amplifier, and attenuators.



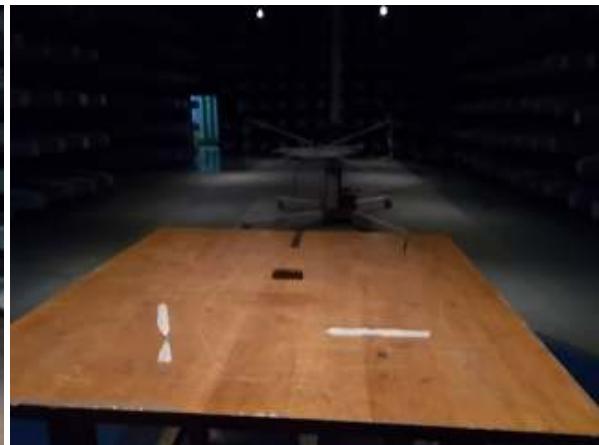
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**Section 8: Testing data****Product: bluelink universal****Specification: FCC Part 15.247, RSS-247****Test data, continued****Radiated measurement Vertical polarization, middle channel**

Freq. (MHz)	Pol. V/H	Quasi Peak field strength (dB $\mu$ V/m)	Correction (dB)	Quasi Peak limit (dB $\mu$ V/m)	Quasi Peak margin (dB)	Duty cycle corr. (dB)	Avg field strength (dB $\mu$ V/m)	Avg limit (dB $\mu$ V/m)	Avg margin (dB)
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<b>Note:</b> Correction factor includes antenna, cable loss, amplifier, and attenuators.									

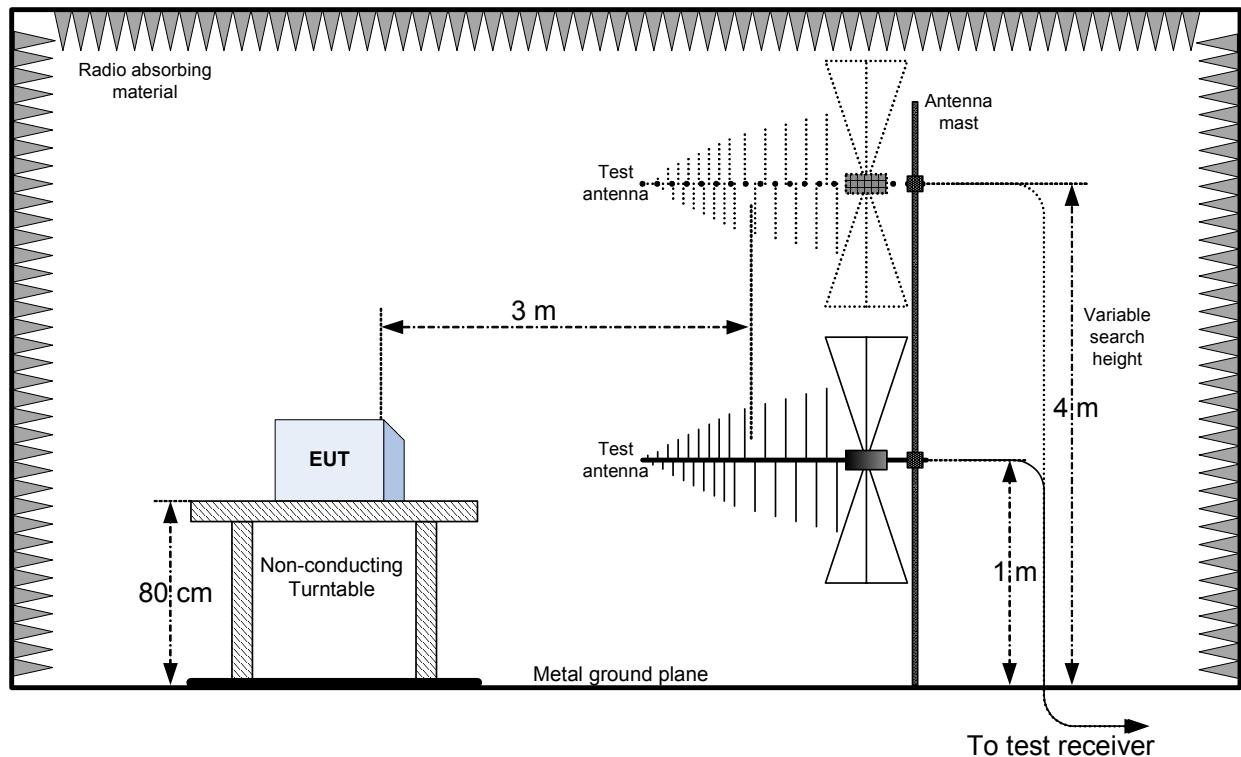


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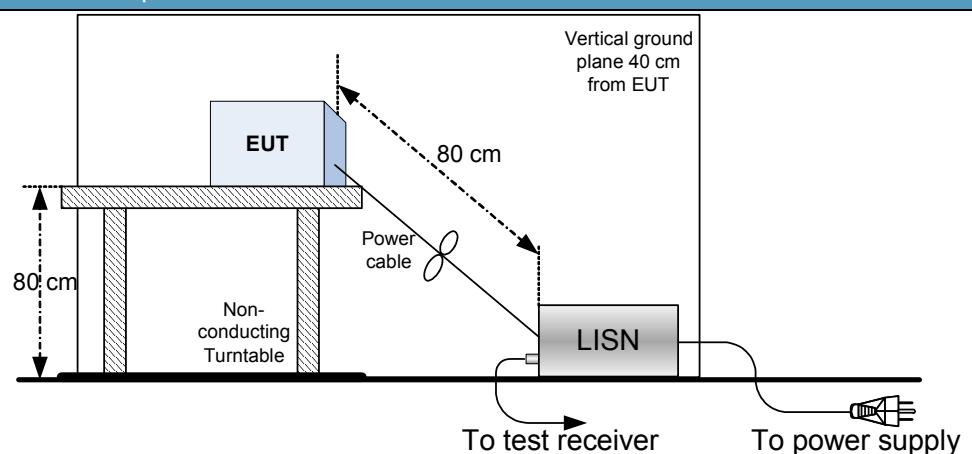
**Section 8: Testing data****Product:** bluelink universal**Specification:** FCC Part 15.247, RSS-247**Setup photos**

## Section 8: Block diagrams of test set-ups

### Radiated emissions set-up



### Conducted emissions set-up





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**Section 9: EUT photos**

**Product: bluelink universal**

**Section 9: EUT photos**

