

Test report

324905-2TRFWL

Date of issue: August 28, 2017

Applicant:

Garmin International, Inc.

Product name:

GMA 1360 and GMA 1360D

Model:

GMN-01340

Model variants:

GMN-01627

FCC ID:

IPH-0272500

IC Registration number:

1792A-0272500

Specifications:

◆ **FCC 47 CFR Part 15 Subpart C, §15.247**

Operation in the 902–928 MHz, 2400–2483.5 MHz, 5725–5850 MHz

◆ **RSS-247, Issue 2, Feb. 2017, Section 5**

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

Test location

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Website	www.nemko.com
Site number	FCC: CA2041; IC: 2040G-5 (3 m semi anechoic chamber)

Tested by	Avul Nzenza, EMC/Wireless Specialist
Reviewed by	Tom Tidwell
Review date	September 1, 2017
Reviewer signature	

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 contain in this report are within Nemko Canada's ISO/IEC 17025 accreditation.

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Table of contents

Table of contents	3
Section 1. Report summary	4
1.1 Applicant and manufacturer	4
1.2 Test specifications	4
1.3 Test methods.....	4
1.4 Statement of compliance	4
1.5 Exclusions	4
1.6 Test report revision history	4
Section 2. Summary of test results	5
2.1 FCC Part 15 Subpart C, general requirements test results.....	5
2.2 FCC Part 15 Subpart C, intentional radiators test results.....	5
2.3 IC RSS-GEN, Issue 4, test results	5
2.4 ISED RSS-247, Issue 2, test results	6
Section 3. Equipment under test (EUT) details	7
3.1 Sample information.....	7
3.2 EUT information	7
3.3 Technical information	7
3.4 Product description and theory of operation	7
3.5 EUT exercise details.....	7
3.6 EUT setup diagram	8
Section 4. Engineering considerations	9
4.1 Modifications incorporated in the EUT.....	9
4.2 Technical judgment	9
4.3 Deviations from laboratory tests procedures	9
Section 5. Test conditions	10
5.1 Atmospheric conditions	10
5.2 Power supply range	10
Section 6. Measurement uncertainty	11
6.1 Uncertainty of measurement	11
Section 7. Test equipment	12
7.1 Test equipment list.....	12
Section 8. Testing data	13
8.1 FCC 15.247(a)(2) and RSS-247 5.2(1): 6 dB bandwidth (DTS-BLE).....	13
8.2 FCC 15.247(b) and RSS-247 5.4 (4) Transmitter output power and e.i.r.p. requirements	18
8.3 FCC 15.247(d) and RSS-247 5.5 Spurious (out-of-band) emissions	22
8.4 FCC 15.247(e) and RSS-247 5.2(2) Power spectral density for digitally modulated devices	33
Section 9. Block diagrams of test set-ups	37
9.1 Radiated emissions set-up for frequencies below 1 GHz.....	37
9.2 Radiated emissions set-up for frequencies above 1 GHz.....	37

Section 1. Report summary

1.1 Applicant and manufacturer

Company name	Garmin International, Inc.
Address	1200 E 151st Street Olathe, KS 66062USA

1.2 Test specifications

FCC 47 CFR Part 15, Subpart C, Clause 15.247	Operation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz.
RSS-247, Issue 2, Feb. 2017, Section 5	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

1.3 Test methods

558074 D01 DTS Meas Guidance v04 (April 5, 2017)	Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247
ANSI C63.10 v2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

1.4 Statement of compliance

In the configuration tested, the EUT was found compliant.

Testing was completed against all relevant requirements of the test standard. Results obtained indicate that the product under test complies in full with the requirements tested. The test results relate only to the items tested.

See “Summary of test results” for full details.

1.5 Exclusions

None

1.6 Test report revision history

Table 1.6-1: Test report revision history

Revision #	Details of changes made to test report
TRF	Original report issued

Notes: None

Section 2. Summary of test results

2.1 FCC Part 15 Subpart C, general requirements test results

Table 2.1-1: FCC part 15 Subpart C test results

Part	Test description	Verdict
§15.207(a)	Conducted limits	Not applicable ¹
§15.31(e)	Variation of power source	Pass ¹
§15.203	Antenna requirement	Pass ²

Notes: ¹ Equipment is DC powered.
² The equipment will be professionally installed.

2.2 FCC Part 15 Subpart C, intentional radiators test results

Table 2.2-1: FCC part 15 Subpart C, §15.247 test results

Part	Test description	Verdict
§15.247(a)(1)(i)	Frequency hopping systems operating in the 902–928 MHz band	Not applicable
§15.247(a)(1)(ii)	Frequency hopping systems operating in the 5725–5850 MHz band	Not applicable
§15.247(a)(1)(iii)	Frequency hopping systems operating in the 2400–2483.5 MHz band	Pass
§15.247(a)(2)	Minimum 6 dB bandwidth for systems using digital modulation techniques	Pass
§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	Not applicable
§15.247(b)(2)	Maximum peak output power of Frequency hopping systems operating in the 902–928 MHz band	Not applicable
§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	Pass
§15.247(c)(1)	Fixed point-to-point operation with directional antenna gains greater than 6 dBi	Not applicable
§15.247(c)(2)	Transmitters operating in the 2400–2483.5 MHz band that emit multiple directional beams	Not applicable
§15.247(d)	Spurious emissions	Pass
§15.247(e)	Power spectral density for digitally modulated devices	Pass
§15.247(f)	Time of occupancy for hybrid systems	Not applicable

Notes: None

2.3 IC RSS-GEN, Issue 4, test results

Table 2.3-1: RSS GEN test results

Part	Test description	Verdict
7.1.2	Receiver radiated emission limits	Not applicable ¹
7.1.3	Receiver conducted emission limits	Not applicable ¹
8.8	Power Line Conducted Emissions Limits for Licence-Exempt Radio Apparatus	Pass

Notes: ¹ According to sections 5.2 and 5.3 of RSS-Gen, Issue 4 the EUT does not have a stand-alone receiver neither scanner receiver, therefore exempt from receiver requirements.

2.4 ISED RSS-247, Issue 2, test results

Table 2.4-1: RSS 247 test results

Part	Test description	Verdict
5.1	Frequency Hopping Systems (FHSs)	
5.1 (1)	Bandwidth of a frequency hopping channel	Not applicable
5.1 (2)	Minimum channel spacing for frequency hopping systems	Not applicable
5.1 (3)	Frequency hopping systems operating in the 902–928 MHz band	Not applicable
5.1 (4)	Frequency hopping systems operating in the 2400–2483.5 MHz band	Not applicable
5.1 (5)	Frequency hopping systems operating in the 5725–5850 MHz band	Not applicable
5.2	Digital Transmission Systems (DTs)	
5.2 (1)	Minimum 6 dB bandwidth	Pass
5.2 (2)	Maximum power spectral density	Pass
5.3	Hybrid Systems	
5.3 (1)	Digital modulation turned off	Not applicable
5.3 (2)	Frequency hopping turned off	Not applicable
5.4	Transmitter output power and e.i.r.p. requirements	
5.4 (1)	Frequency hopping systems operating in the 902–928 MHz band	Not applicable
5.4 (2)	Frequency hopping systems operating in the 2400–2483.5 MHz band	Not applicable
5.4 (3)	Frequency hopping systems operating in the 5725–5850 MHz	Not applicable
5.4 (4)	Systems employing digital modulation techniques	Pass
5.4 (5)	Point-to-point systems in 2400–2483.5 MHz and 5725–5850 MHz band	Not applicable
5.4 (6)	Transmitters which operate in the 2400–2483.5 MHz band with multiple directional beams	Not applicable
5.5	Out-of-band emissions	Pass

Notes: None

Section 3. Equipment under test (EUT) details

3.1 Sample information

Receipt date	March 15, 2017
Nemko sample ID number	#1

3.2 EUT information

Product name	GMA 1360 and GMA 1360D
Model	GMN-01340
Model variants	GMN-01627
Serial number	4QF000011

3.3 Technical information

Applicant IC company number	1792A
IC UPN number	0272500
All used IC test site(s) Reg. number	2040G-5
RSS number and Issue number	RSS-247 Issue 2, Feb. 2017
Frequency band	2400–2483.5 MHz
Frequency Min (MHz)	2402
Frequency Max (MHz)	2480
RF power (W), Conducted	0.000047 (–13.25 dBm)
Field strength, Units @ distance	N/A
Measured BW (MHz) (99%)	1.121
Calculated BW (kHz), as per TRC-43	N/A
Type of modulation	EDR2, EDR3
Emission classification (F1D, G1D, D1D)	1M12F1D
Transmitter spurious, Units @ distance	39.02 dB μ V/m Peak and 27.41 dB μ V/m Average @ 3 m @ 2484 MHz
Power requirements	14/28 Vdc
Antenna information	The EUT is professionally installed. Antenna: 2.5 dBi

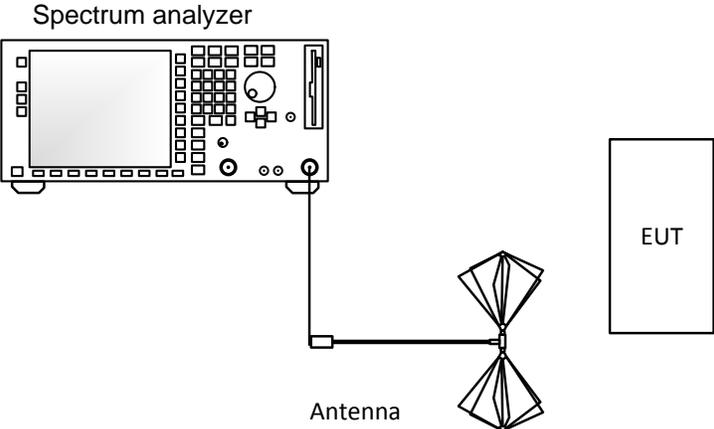
3.4 Product description and theory of operation

The GMA 1360 (Including GMA1360D and GMA 36B) is a Marker Beacon receiver and audio processor that primarily interfaces to a display unit, communications and navigation radios, headsets, and speakers.

3.5 EUT exercise details

EUT was set to transmit continuously

3.6 EUT setup diagram



Section 4. Engineering considerations

4.1 Modifications incorporated in the EUT

There were no modifications performed to the EUT during this assessment.

4.2 Technical judgment

None

4.3 Deviations from laboratory tests procedures

No deviations were made from laboratory procedures.

Section 5. Test conditions

5.1 Atmospheric conditions

Temperature	15–30 °C
Relative humidity	20–75 %
Air pressure	860–1060 mbar

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.

5.2 Power supply range

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 $\pm 5\%$, for which the equipment was designed.

Section 6. Measurement uncertainty

6.1 Uncertainty of measurement

Measurement uncertainty budgets for the tests are detailed below. Measurement uncertainty calculations assume a coverage factor of $K = 2$ with 95% certainty.

Test name	Measurement uncertainty, dB
All antenna port measurements	0.55
Conducted spurious emissions	1.13
Radiated spurious emissions	3.78

Section 7. Test equipment

7.1 Test equipment list

Table 7.1-1: Equipment list

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
3 m EMI test chamber	TDK	SAC-3	FA002532	2 year	June 5/19
Flush mount turntable	Sunol	FM2022	FA002550	—	NCR
Controller	Sunol	SC104V	FA002551	—	NCR
Antenna mast	Sunol	TLT2	FA002552	—	NCR
Receiver/spectrum analyzer	Rohde & Schwarz	ESU 40	FA002071	1 year	May 3/18
Bilog antenna (20–2000 MHz)	Sunol	JB1	FA002517	1 year	Oct. 5/17
Horn antenna (1–18 GHz)	EMCO	3115	FA001452	1 year	Oct. 26/17
Pre-amplifier (0.5–18 GHz)	COM-POWER	PAM-118A	FA002561	1 year	May 8/18
Signal generator	Rohde & Schwarz	SMC100A	FA002483	1 year	Oct. 19/17
50 Ω coax cable	C.C.A.	None	FA002603	—	VOU
50 Ω coax cable	C.C.A.	None	FA002605	—	VOU
50 Ω coax cable	C.C.A.	None	FA002607	—	VOU
Pre-amplifier (18–40 GHz)	COM-POWER	PAM-840	FA002508	1 year	May 8/18
2400-2483 MHz Notch Filter	Microwave Circuits	N0324413	FA002693	—	VOU

Notes: VOU - verify on use

Table 7.1-2: test software

Test description	Manufacturer of Software	Details
Radiated emissions – Ottawa	Rhode & Schwarz	EMC32, Software for EMC Measurements, Version 9.26.01

Notes: None

Section 8. Testing data

8.1 FCC 15.247(a)(2) and RSS-247 5.2(1): 6 dB bandwidth (DTS-BLE)

8.1.1 Definitions and limits

FCC §15.247 (a)(2):

- (a) Operation under the provisions of this Section is limited to frequency hopping and digitally modulated intentional radiators that comply with the following provisions:
- (2) Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

RSS-247, Clause 5.2 (1):

The minimum 6 dB bandwidth shall be 500 kHz.

8.1.2 Test summary

Verdict	Pass				
Test date	April 20, 2017	Test engineer	Avul Nzenza		
Temperature	24 °C	Relative humidity	34 %	Air pressure	1015 mbar

8.1.3 Notes

Measurements were performed as per 558074 D01 DTS Meas Guidance v04 (The test was performed using method described in Section 8.1)

8.1.4 Setup details

Spectrum analyser settings: for 6 dB bandwidth test:

Resolution bandwidth	100 kHz
Video bandwidth	≥3 × RBW
Frequency span	2 MHz
Detector mode	Peak
Trace mode	Max Hold

8.1.5 Test data

Table 8.1-1: 6 dB bandwidth results

Frequency, MHz	6 dB bandwidth, kHz	Minimum limit, kHz	Margin, kHz
EDR2 Modulation			
2402	1099	500.0	599
2441	1096	500.0	596
2480	1121	500.0	621
EDR3 Modulation			
2402	1102	500.0	602
2441	1096	500.0	596
2480	1099	500.0	599

Notes: None

EDR2 Modulation

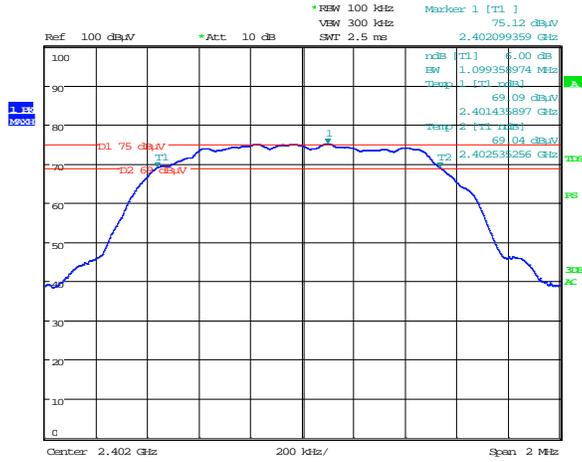


Figure 8.1-1: 6 dB bandwidth on low channel



Figure 8.1-2: 6 dB bandwidth on mid channel

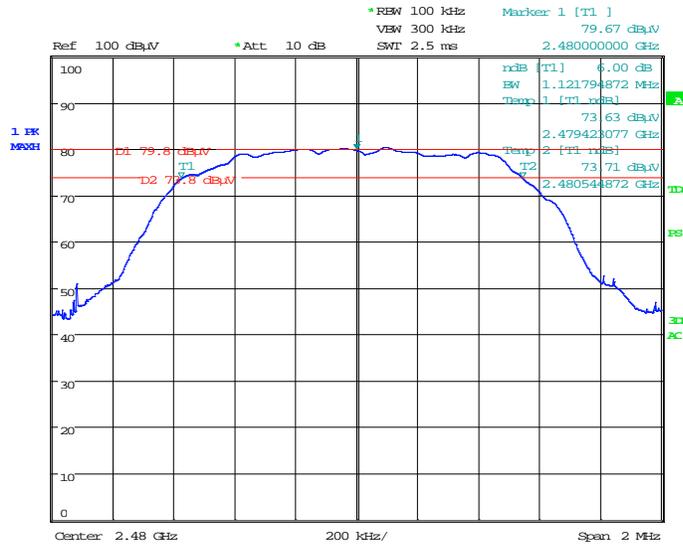


Figure 8.1-3: 6 dB bandwidth on high channel

EDR2 Modulation

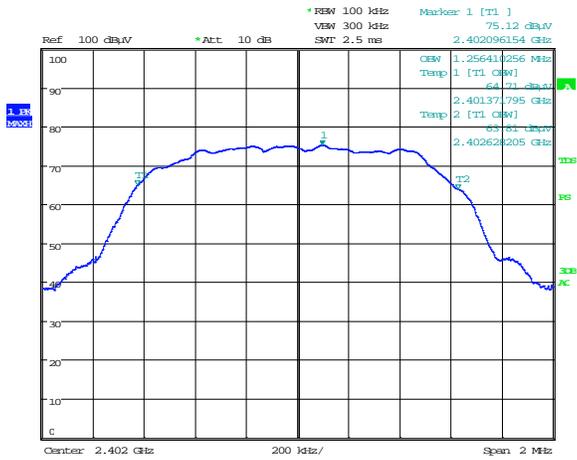


Figure 8.1-4: 99% bandwidth on low channel

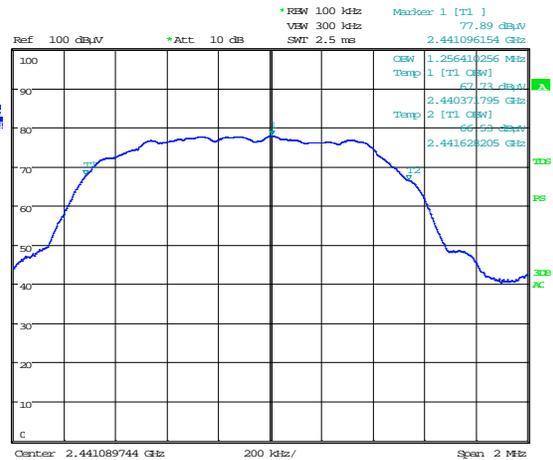


Figure 8.1-5: 99% bandwidth on mid channel

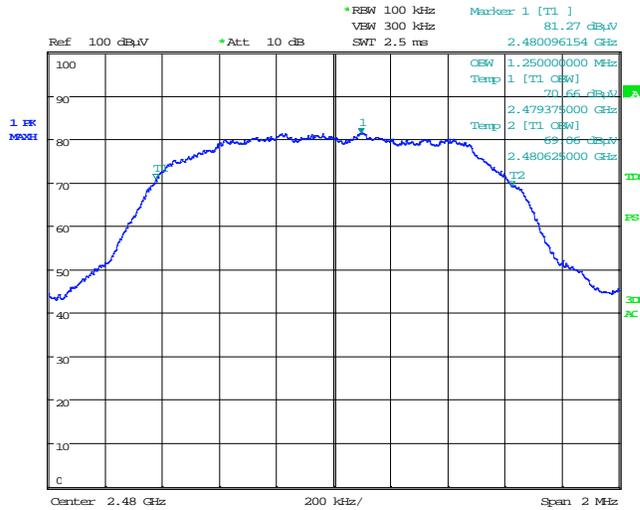


Figure 8.1-6: 99% bandwidth on high channel

EDR3 Modulation

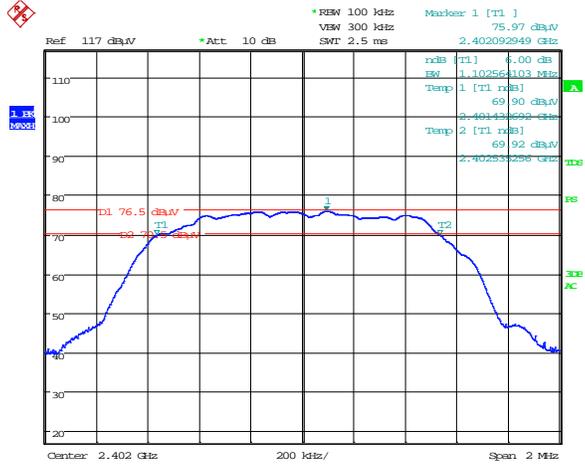


Figure 8.1-7: 6 dB bandwidth on low channel

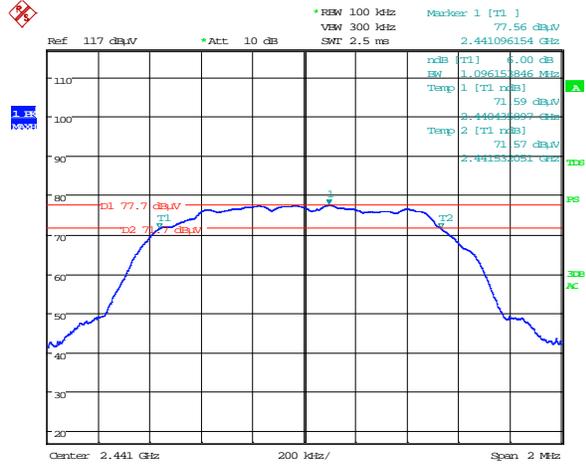


Figure 8.1-8: 6 dB bandwidth on mid channel

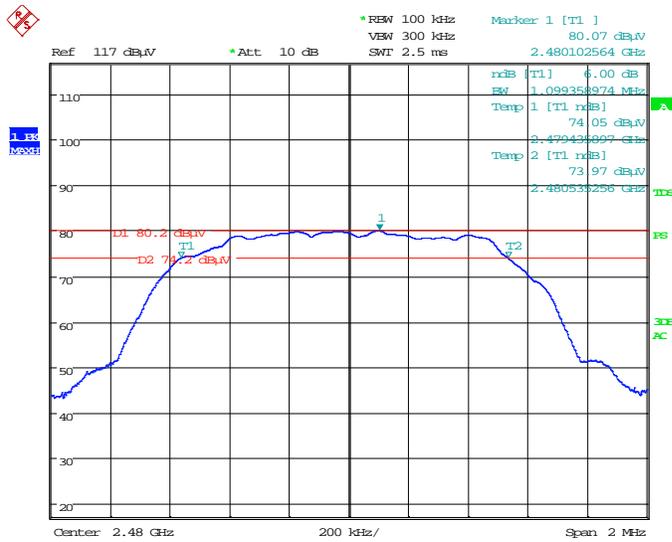


Figure 8.1-9: 6 dB bandwidth on high channel

EDR3 Modulation

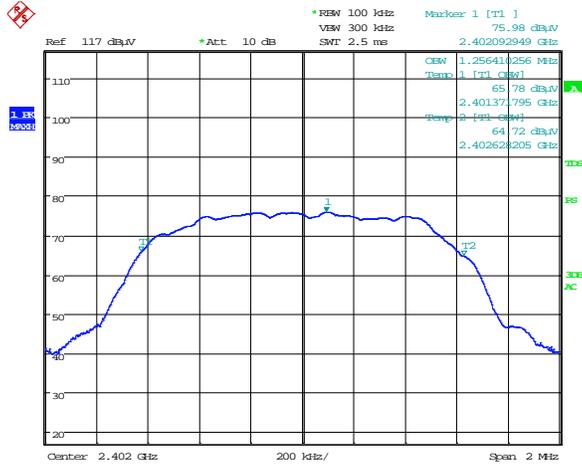


Figure 8.1-10: 99% bandwidth on low channel

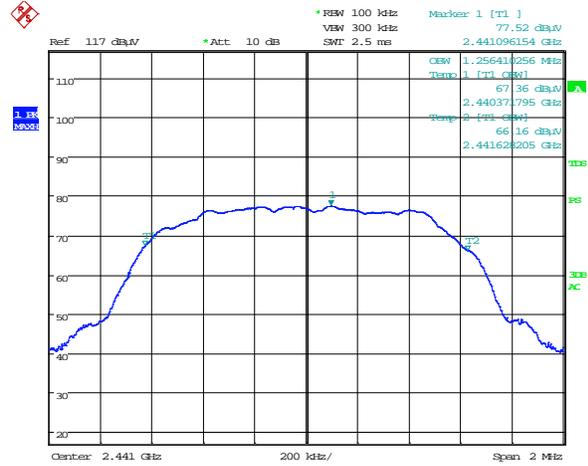


Figure 8.1-11: 99% bandwidth on mid channel

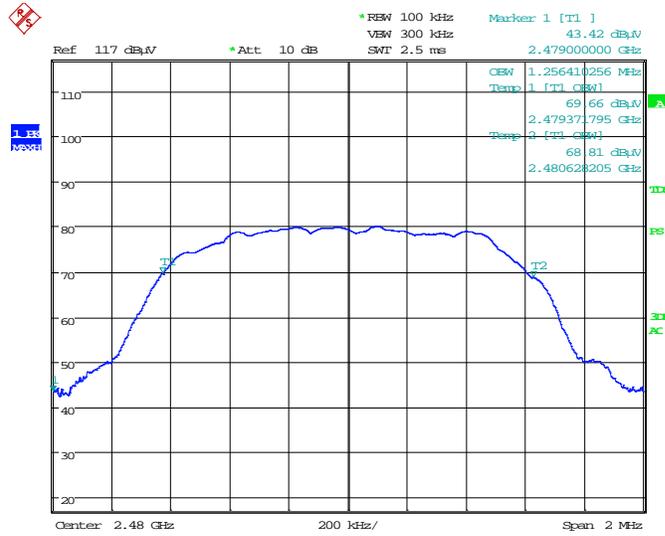


Figure 8.1-12: 99% bandwidth on high channel

8.2 FCC 15.247(b) and RSS-247 5.4 (4) Transmitter output power and e.i.r.p. requirements

8.2.1 Definitions and limits

FCC §15.247 (b)(3,4):

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

- (3) For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 W (30 dBm). 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.

RSS-247, Clause 5.4 (4):

For DTSs employing digital modulation techniques operating in the bands 902–928 MHz and 2400–2483.5 MHz, the maximum peak conducted output power shall not exceed 1W. Except as provided in Section 5.4(5), the e.i.r.p. shall not exceed 4 W. Fixed point-to-point systems in the bands 2400-2483.5 MHz and 5725-5850 MHz are permitted to have an e.i.r.p. higher than 4 W provided that the higher e.i.r.p. is achieved by employing higher gain directional antennas and not higher transmitter output powers. Point-to-multipoint systems, omnidirectional applications and multiple co-located transmitters transmitting the same information are prohibited from exceeding an e.i.r.p. of 4 W.

8.2.2 Test summary

Verdict	Pass				
Test date	April 20, 2017	Test engineer	Avul Nzenza		
Temperature	24 °C	Relative humidity	34 %	Air pressure	1015 mbar

8.2.3 Notes

The test was performed according to 558074 D01 DTS Meas Guidance v04 (The test was performed using method described in Section 9.1.1 Method Peak Power Measurements.

8.2.4 Setup details

Spectrum analyser settings:

Resolution bandwidth	1 MHz
Video bandwidth	3 MHz
Frequency span	5 MHz
Detector mode	Peak
Trace mode	Max Hold

8.2.5 Test data

Table 8.2-1: Output power measurements results

Frequency, MHz	Radiated output power, dBμV/m	dBμV/m to dBm factor, dB	EIRP, dBm	EIRP limit, dBm	EIRP margin, dB
EDR2 Modulation					
2402	79.54	95.23	-15.69	36	51.69
2441	81.84	95.23	-13.39	36	49.39
2480	84.48	95.23	-10.75	36	46.75
EDR3 Modulation					
2402	80.49	95.23	-14.74	36	50.74
2441	81.98	95.23	-13.25	36	49.25
2480	84.47	95.23	-10.76	36	46.76

Note: dBμV/m to dBm factor of 95.23 dB was used.

Table 8.2-2: Conducted Output power measurements results

Frequency, MHz	EIRP, dBm	Antenna gain, dBi	Conducted output, dBm	limit, dBm	Margin, dB
EDR2 Modulation					
2405	-15.69	2.5	-18.19	30	48.19
2440	-13.39	2.5	-15.89	30	45.89
2480	-10.75	2.5	-13.25	30	43.25
EDR3 Modulation					
2405	-14.74	2.5	-17.24	30	47.24
2440	-13.25	2.5	-15.75	30	45.75
2480	-10.76	2.5	-13.26	30	43.26

EDR2 Modulation

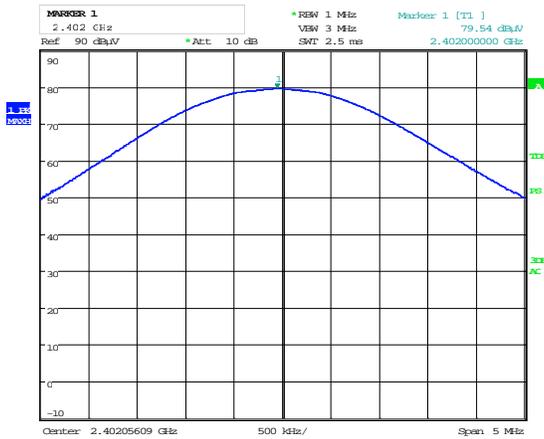


Figure 8.2-1: Output power on low channel

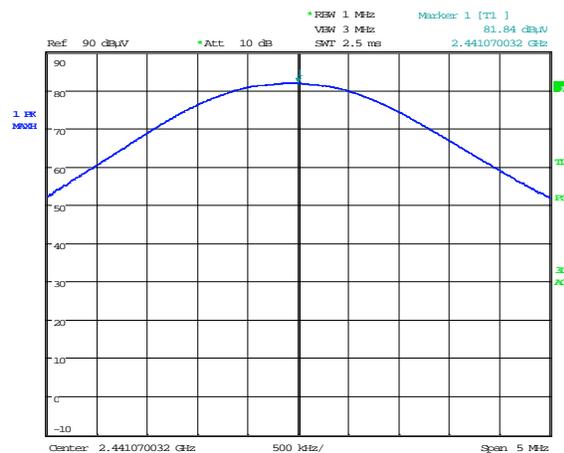


Figure 8.2-2: Output power on mid channel

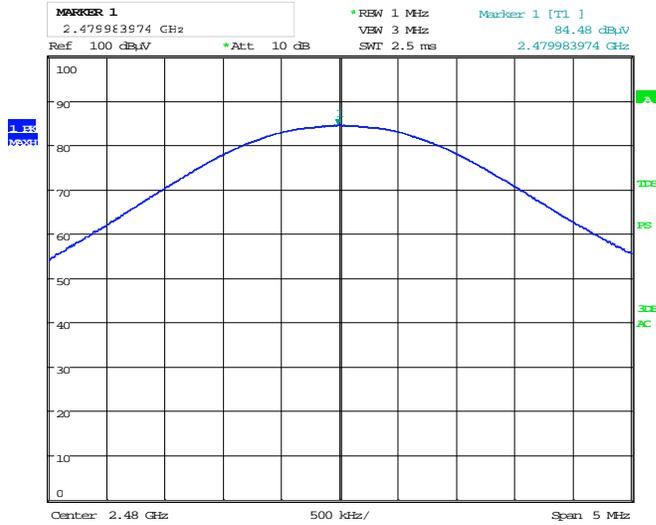


Figure 8.2-3: Output power on high channel

EDR3 Modulation

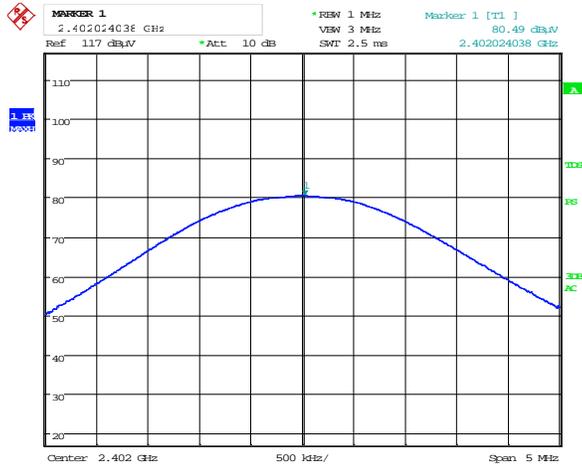


Figure 8.2-4: Output power on low channel

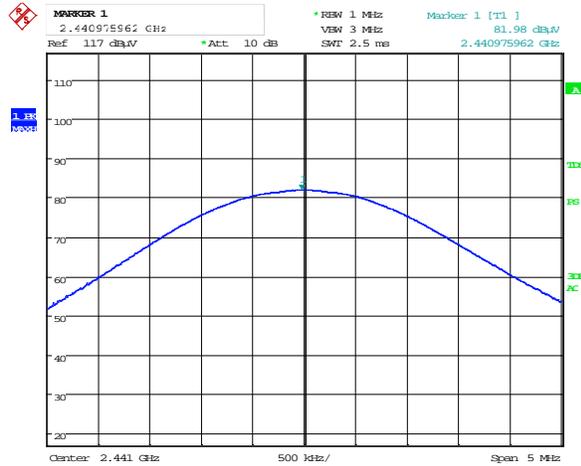


Figure 8.2-5: Output power on mid channel

Section 8
Test name
Specification

Testing data
FCC 15.247(b) and RSS-247 5.4 (4) Transmitter output power and e.i.r.p. requirements
FCC Part 15 Subpart C and RSS-247, Issue 2

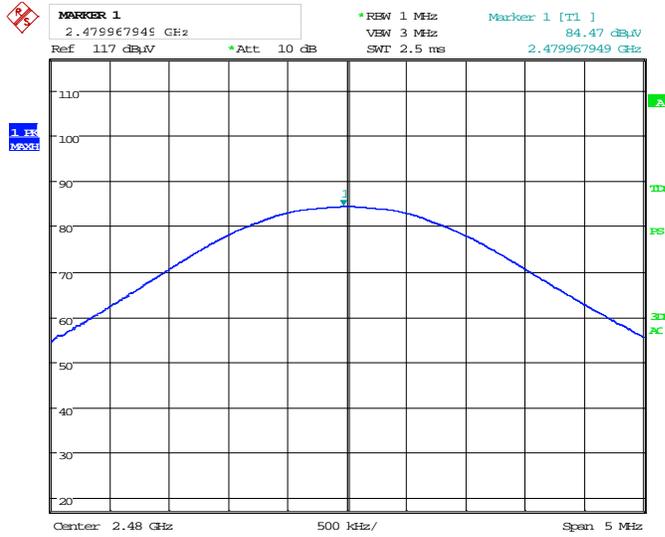


Figure 8.2-6: Output power on high channel

8.3 FCC 15.247(d) and RSS-247 5.5 Spurious (out-of-band) emissions

8.3.1 Definitions and limits

FCC §15.247 (d):

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §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, Clause 5.5:

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.

Table 8.3-1: FCC §15.209 and RSS-Gen – Radiated emission limits

Frequency, MHz	Field strength of emissions		Measurement distance, m
	µV/m	dBµV/m	
0.009–0.490	2400/F	$67.6 - 20 \times \log_{10}(F)$	300
0.490–1.705	24000/F	$87.6 - 20 \times \log_{10}(F)$	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: 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

Table 8.3-2: IC restricted frequency bands

MHz	MHz	MHz	GHz
0.090–0.110	12.51975–12.52025	399.9–410	5.35–5.46
2.1735–2.1905	12.57675–12.57725	608–614	7.25–7.75
3.020–3.026	13.36–13.41	960–1427	8.025–8.5
4.125–4.128	16.42–16.423	1435–1626.5	9.0–9.2
4.17725–4.17775	16.69475–16.69525	1645.5–1646.5	9.3–9.5
4.20725–4.20775	16.80425–16.80475	1660–1710	10.6–12.7
5.677–5.683	25.5–25.67	1718.8–1722.2	13.25–13.4
6.215–6.218	37.5–38.25	2200–2300	14.47–14.5
6.26775–6.26825	73–74.6	2310–2390	15.35–16.2
6.31175–6.31225	74.8–75.2	2655–2900	17.7–21.4
8.291–8.294	108–138	3260–3267	22.01–23.12
8.362–8.366	156.52475–156.52525	3332–3339	23.6–24.0
8.37625–8.38675	156.7–156.9	3345.8–3358	31.2–31.8
8.41425–8.41475	240–285	3500–4400	36.43–36.5
12.29–12.293	322–335.4	4500–5150	Above 38.6

Notes: Certain frequency bands listed in this table and above 38.6 GHz are designated for low-power licence-exempt applications. These frequency bands and the requirements that apply to the devices are set out in this Standard

Table 8.3-3: FCC restricted frequency bands

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	2200–2300	14.47–14.5
8.291–8.294	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366	156.52475–156.52525	2483.5–2500	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			

8.3.2 Test summary

Verdict	Pass		
Test date	February 16, 2017	Test engineer	Avul Nzenza
Temperature	24 °C	Relative humidity	36.2 %
		Air pressure	1012 mbar

8.3.3 Notes

- The spectrum was searched from 30 MHz to the 10th harmonic.
- Since fundamental power was tested using Peak method, the spurious emissions limit is –20 dBc/100 kHz

8.3.4 Setup details

Spectrum analyser settings for conducted measurements:

Resolution bandwidth:	100 kHz
Video bandwidth:	300 kHz
Detector mode:	Peak
Trace mode:	Max Hold

Spectrum analyser settings for radiated measurements within restricted bands below 1 GHz:

Resolution bandwidth:	100 kHz
Video bandwidth:	300 kHz
Detector mode:	Peak
Trace mode:	Max Hold

Spectrum analyser settings for peak radiated measurements within restricted bands above 1 GHz:

Resolution bandwidth:	1 MHz
Video bandwidth:	3 MHz
Detector mode:	Peak
Trace mode:	Max Hold

8.3.5 Test data

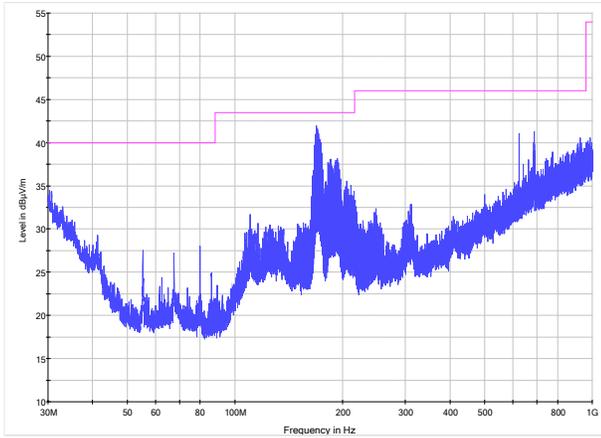


Figure 8.3-1: Radiated spurious (out-of-band) emissions, low channel, 30 to 1000 MHz

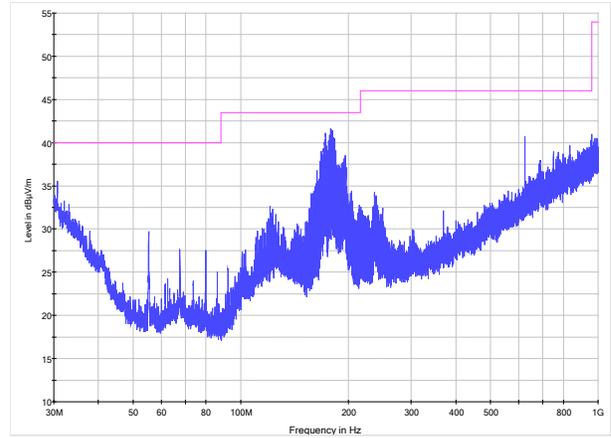


Figure 8.3-2: Radiated spurious (out-of-band) emissions, mid channel, 30 to 1000 MHz

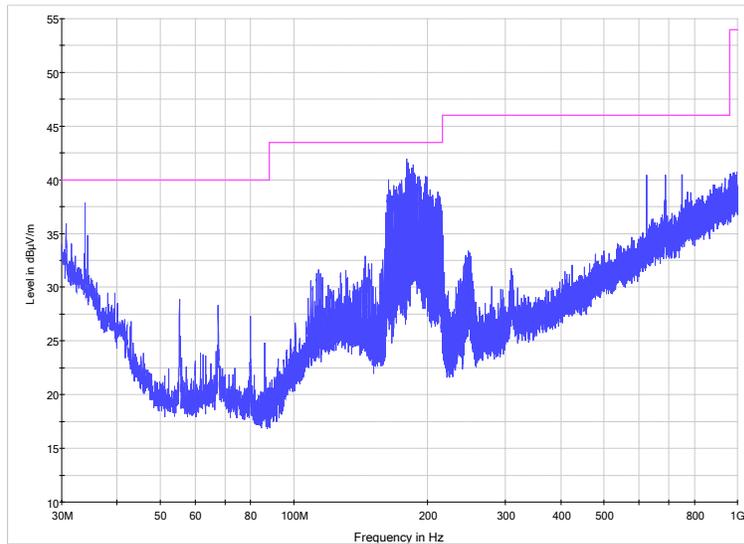


Figure 8.3-3: Radiated spurious (out-of-band) emissions, high channel, 30 to 1000 MHz

8.3.5 Test data, continued

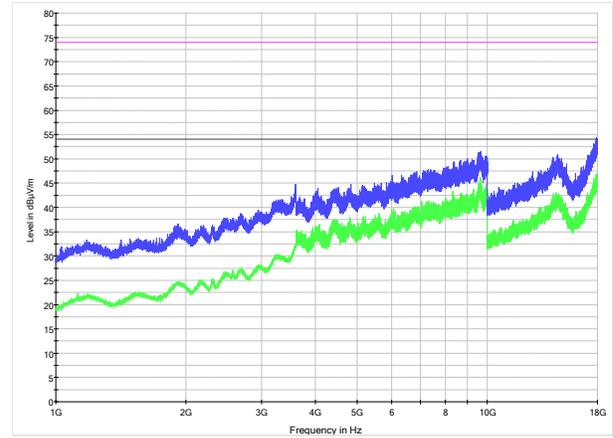
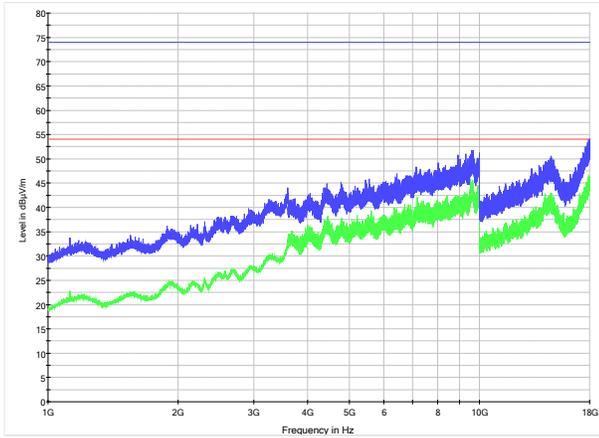


Figure 8.3-4: Radiated spurious emissions for BT, low channel – 1 to 18 GHz

Figure 8.3-5: Radiated spurious emissions for BT, mid channel – 1 to 18 GHz

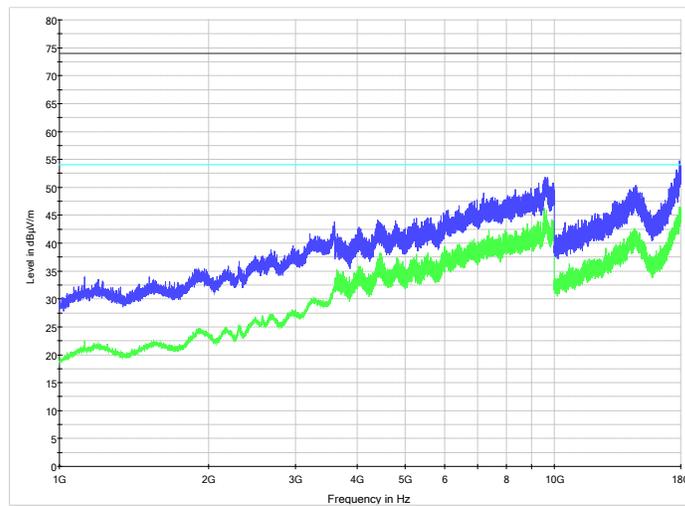
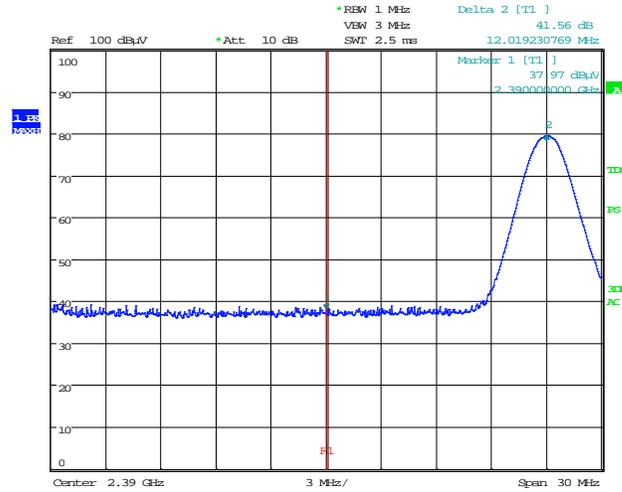


Figure 8.3-6: Radiated spurious emissions for BT, high channel – 1 to 18 GHz

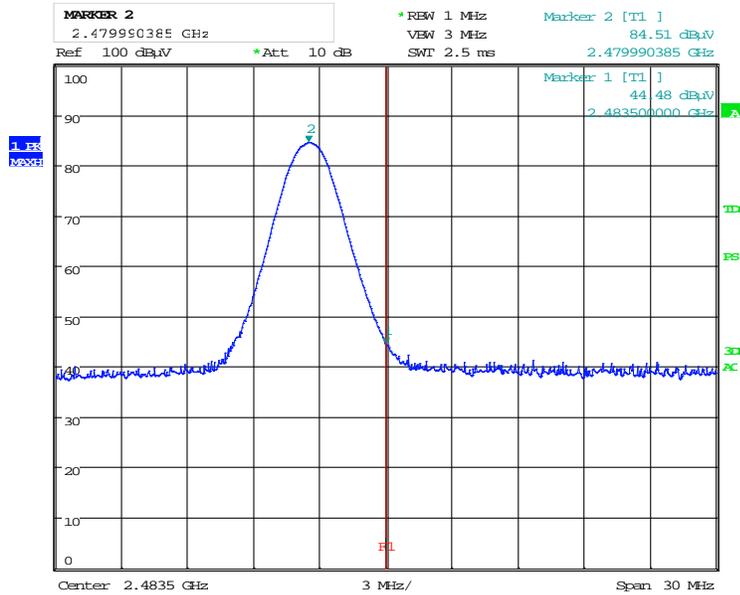
EDR2 Modulation

8.3.5 Test data, continued



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Figure 8.3-7: Conducted spurious (out-of-band) emissions Lower band, low channel



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Figure 8.3-8: Conducted spurious (out-of-band) emissions upper band, high channel

8.3.6 Test data, continued

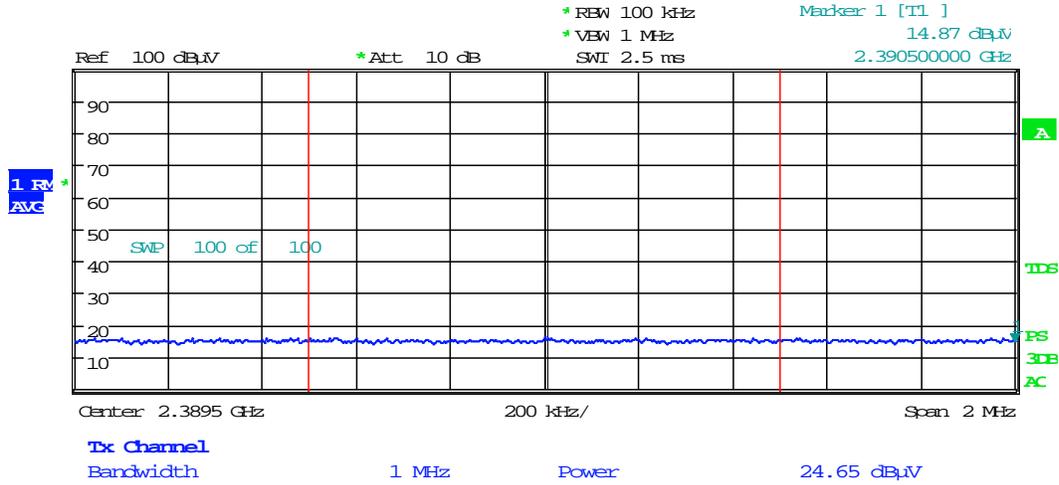


Figure 8.3-9: Radiated spurious (out-of-band) emissions Lower band edge emission, low channel_Avg

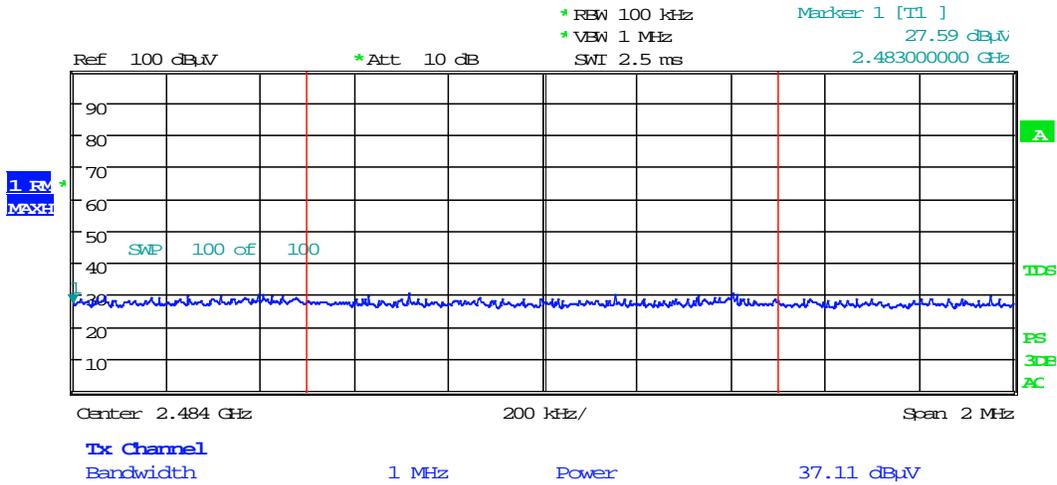


Figure 8.3-10: Radiated spurious (out-of-band) emissions Upper band edge emission -Avg

8.3.5 Test data, continued

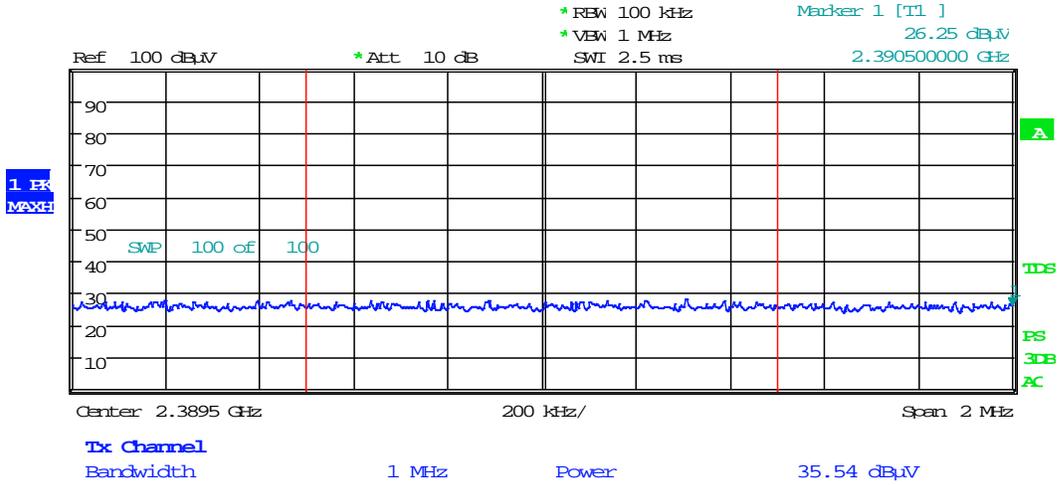


Figure 8.3-11: Radiated spurious (out-of-band) emissions lower band edge emission, low channel_Peak

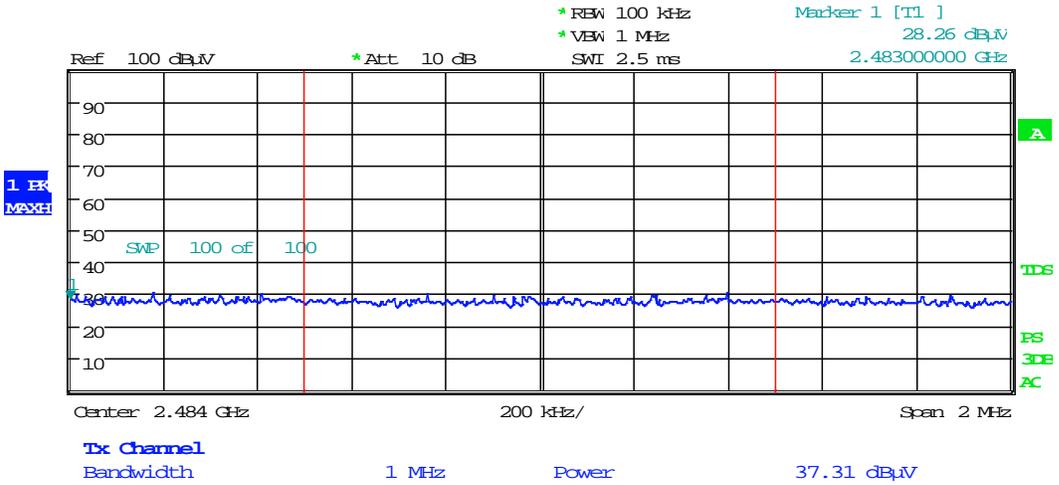


Figure 8.3-12: Radiated spurious (out-of-band) emissions upper band edge emission -Peak

EDR3 Modulation

8.3.5 Test data, continued

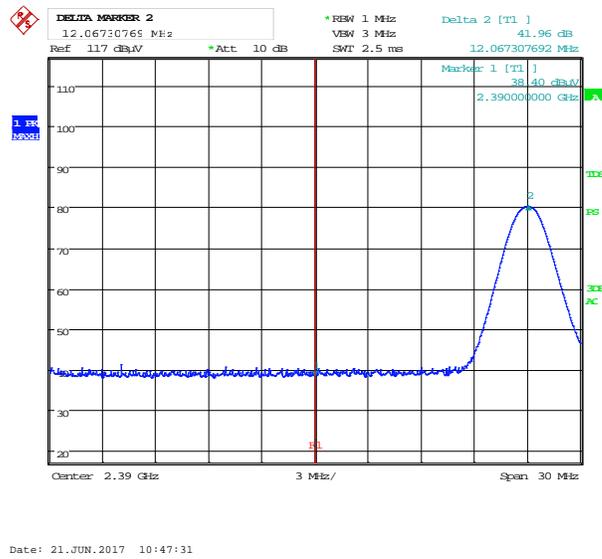


Figure 8.3-13: Conducted spurious (out-of-band) emissions Lower band, low channel)

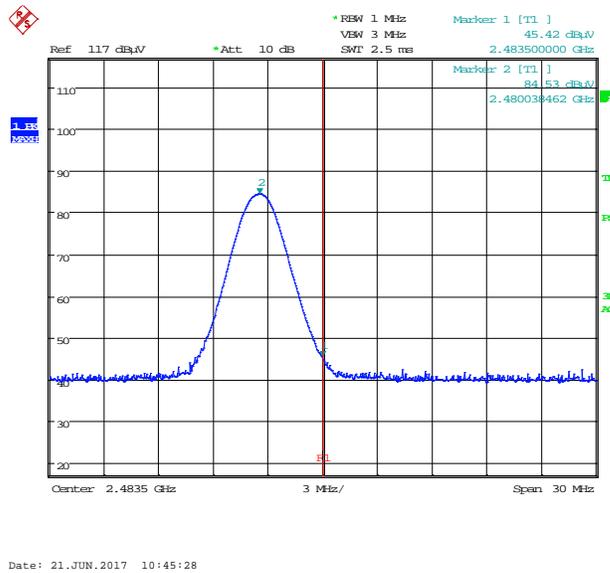


Figure 8.3-14: Conducted spurious (out-of-band) emissions upper band, high channel)

8.3.5 Test data, continued

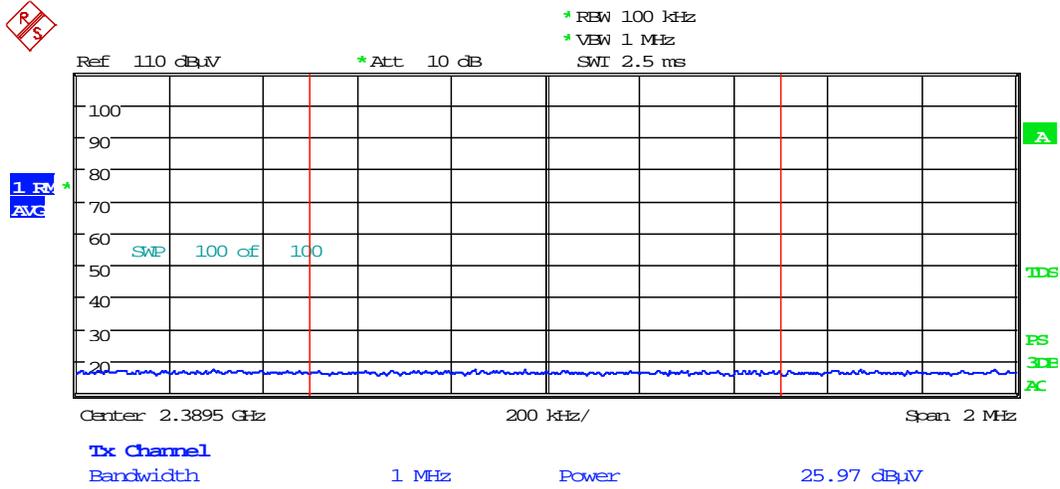


Figure 8.3-15: Radiated spurious (out-of-band) emissions Lower band edge emission, low channel_Avg

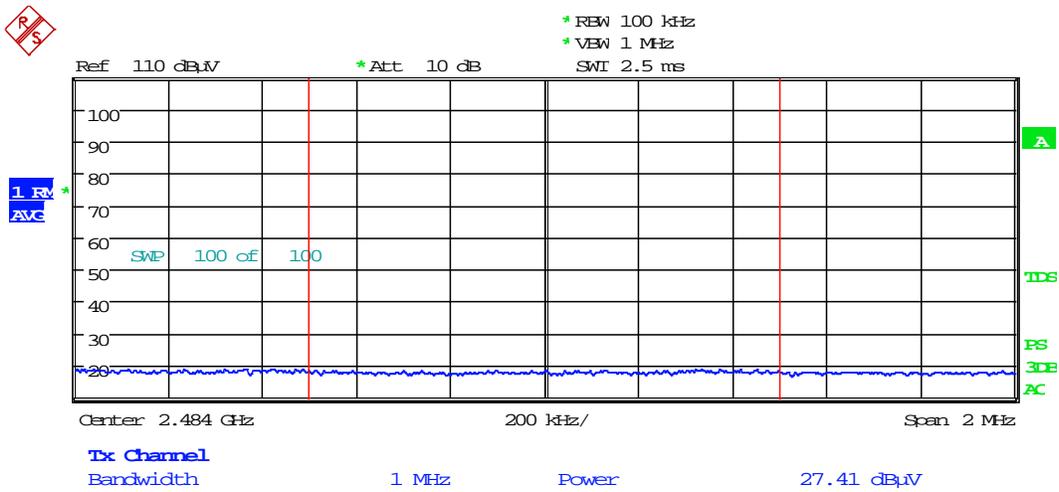


Figure 8.3-16: Radiated spurious (out-of-band) emissions Upper band edge emission -Avg

8.3.5 Test data, continued

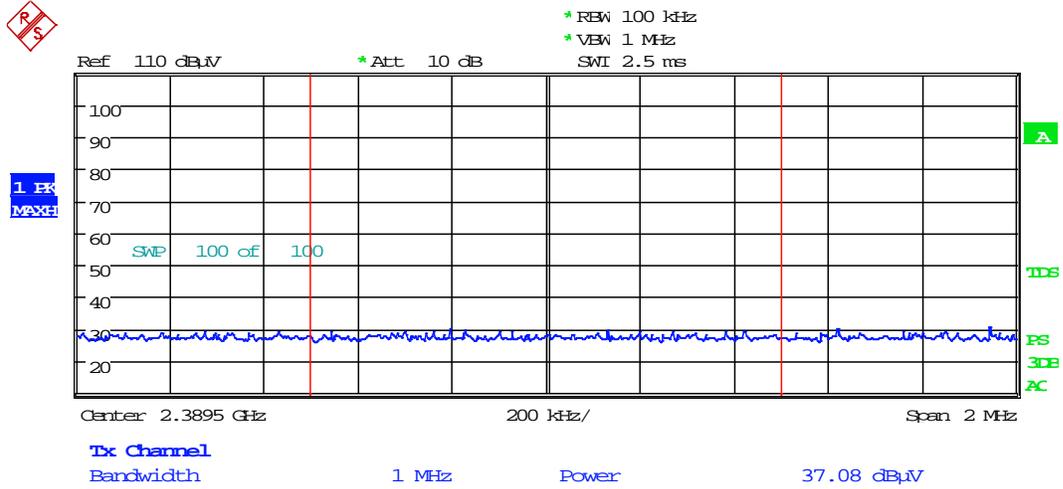


Figure 8.3-17: Radiated spurious (out-of-band) emissions lower band edge emission, low channel_Peak

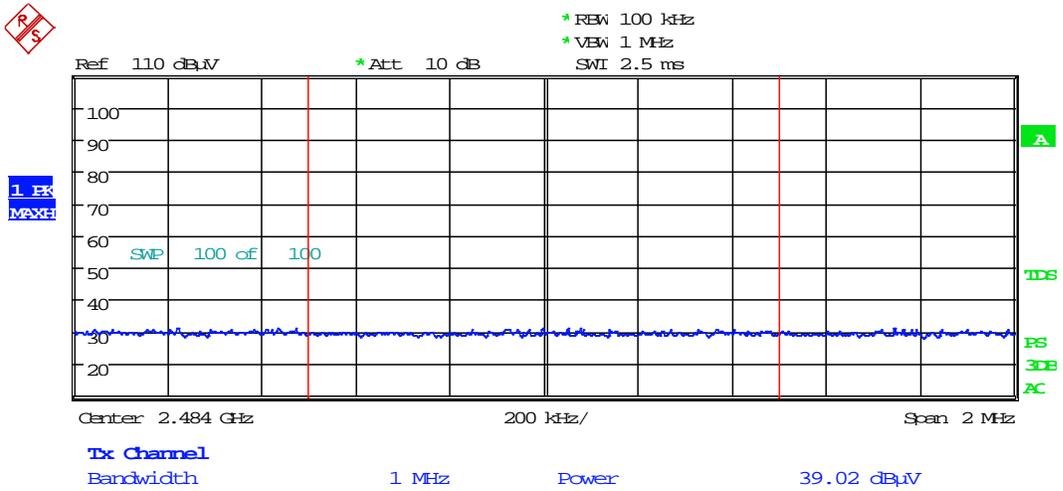


Figure 8.3-18: Radiated spurious (out-of-band) emissions upper band edge emission -Peak



8.3.5 Test data, continued

Table 8.3-4: Radiated field strength measurement results

Channel	Frequency, MHz	Peak Field strength, dB μ V/m		Peak margin, dB	Average Field strength, dB μ V/m		Margin, dB
		Measured	Limit		Measured	Limit	
EDR2 Modulation							
High	2483.5	37.31	74	36.69	37.11	54	16.89
Low	2390.0	35.54	74	38.46	24.65	54	29.35
EDR3 Modulation							
High	2483.5	39.02	74	34.98	27.41	54	26.59
Low	2390.0	37.08	74	36.92	25.97	54	28.03

Notes: Field strength (dB μ V/m) = Spectrum analyzer value (dB μ V) + transducer factors (dB)
 Transducer factors (i.e. antenna factors, cable loss, amplifier gains, and attenuators).
 All other emissions were greater than 20 dB from limit.

8.4 FCC 15.247(e) and RSS-247 5.2(2) Power spectral density for digitally modulated devices

8.4.1 Definitions and limits

FCC §15.247 (e):

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

RSS-247, Clause 5.2 (2):

The transmitter power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of Section 5.4(4), (i.e. the power spectral density shall be determined using the same method as is used to determine the conducted output power).

8.4.2 Test summary

Verdict	Pass				
Test date	April 20, 2017	Test engineer	Avul Nzenza		
Temperature	24 °C	Relative humidity	36.2 %	Air pressure	1012 mbar

8.4.3 Notes

Measurements were performed as per 58074 D01 DTS Meas Guidance v04 (The test was performed using method described in section 10.2 Method (Peak PSD))

8.4.4 Setup details

Spectrum analyser settings:

Resolution bandwidth:	3 kHz
Video bandwidth:	10 kHz
Frequency span:	2 MHz
Detector mode:	Peak
Trace mode:	Max Hold

8.4.5 Test data

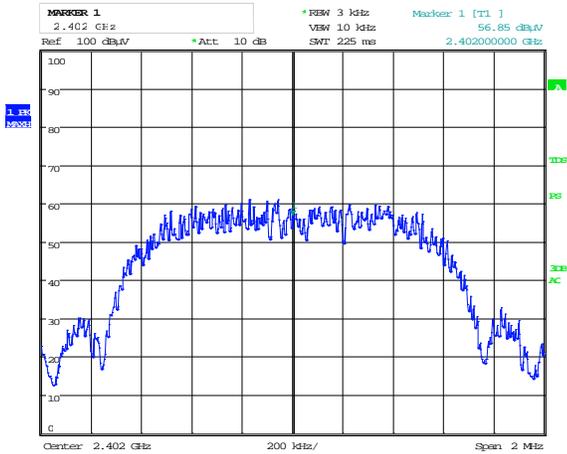
Table 8.4-1: EIRP PSD measurement results

Frequency, MHz	Radiated PSD, dB μ V/m	dB μ V/m to dBm factor, dB	EIRP, dBm
EDR2 Modulation			
2402	56.85	95.23	-38.38
2440	63.84	95.23	-31.39
2480	66.53	95.23	-28.70
EDR3 Modulation			
2402	61.97	95.23	-33.26
2440	63.37	95.23	-31.86
2480	66.06	95.23	-29.17

Table 8.4-2: Output power measurements results- PR1024

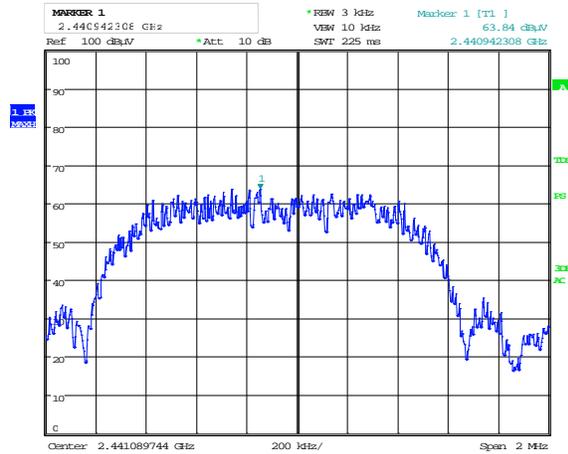
Frequency, MHz	PSD, dBm/3 kHz	Antenna gain, dBi	PSD limit, dBm/3 kHz	EIRP PSD limit, dBm/MHz	EIRP margin, dB
EDR2 Modulation					
2402	-38.38	2.5	-40.88	8.00	48.88
2440	-31.39	2.5	-33.89	8.00	41.89
2480	-28.70	2.5	-31.20	8.00	39.20
EDR3 Modulation					
2402	-33.26	2.5	-35.76	8.00	43.76
2440	-31.86	2.5	-34.36	8.00	42.36
2480	-29.17	2.5	-31.67	8.00	39.67

EDR2 Modulation



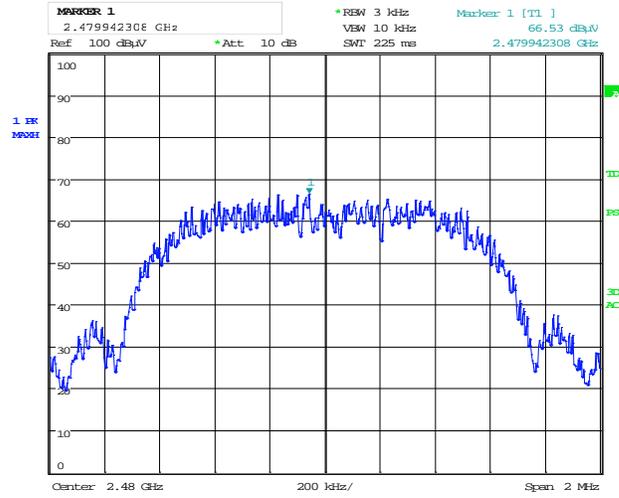
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Figure 8.4-1: PSD sample plot on low channel



Date: 20.APR.2017 12:25:13

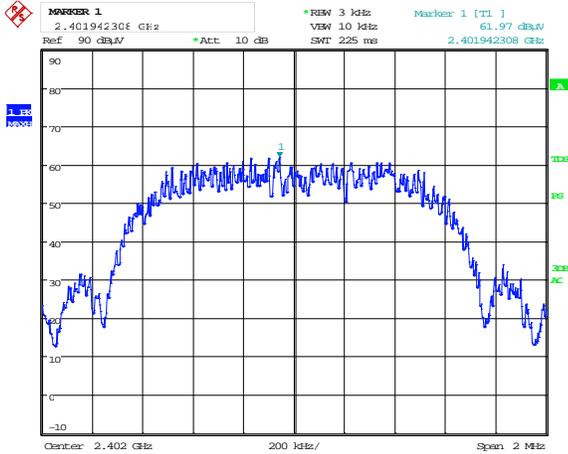
Figure 8.4-2: PSD sample plot on mid channel



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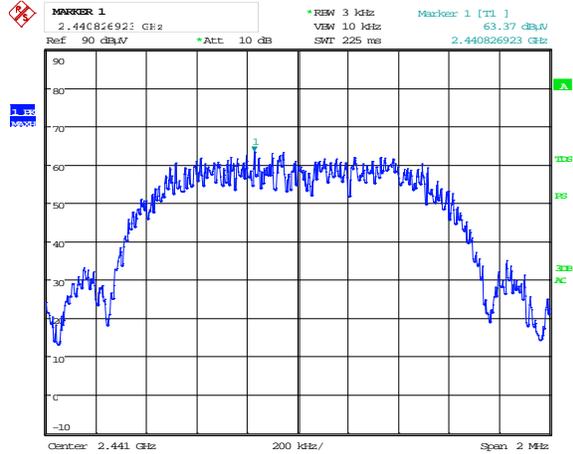
Figure 8.4-3: PSD sample plot on high channel

EDR3 Modulation



Date: 21. JUN. 2017 10:27:12

Figure 8.4-4: PSD sample plot on low channel

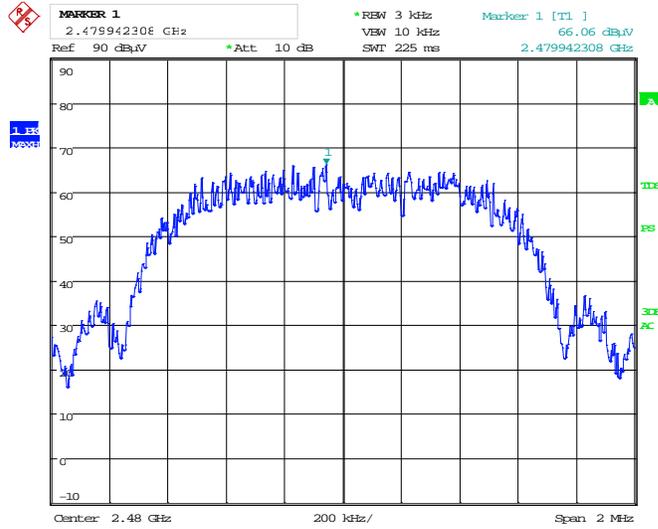


Date: 21. JUN. 2017 10:27:38

Figure 8.4-5: PSD sample plot on mid channel

Section 8
Test name
Specification

Testing data
FCC Clause 15.247(e) and RSS-247 5.2(2) Power spectral density for digitally modulated devices
FCC Part 15 Subpart C and RSS-247, Issue 2

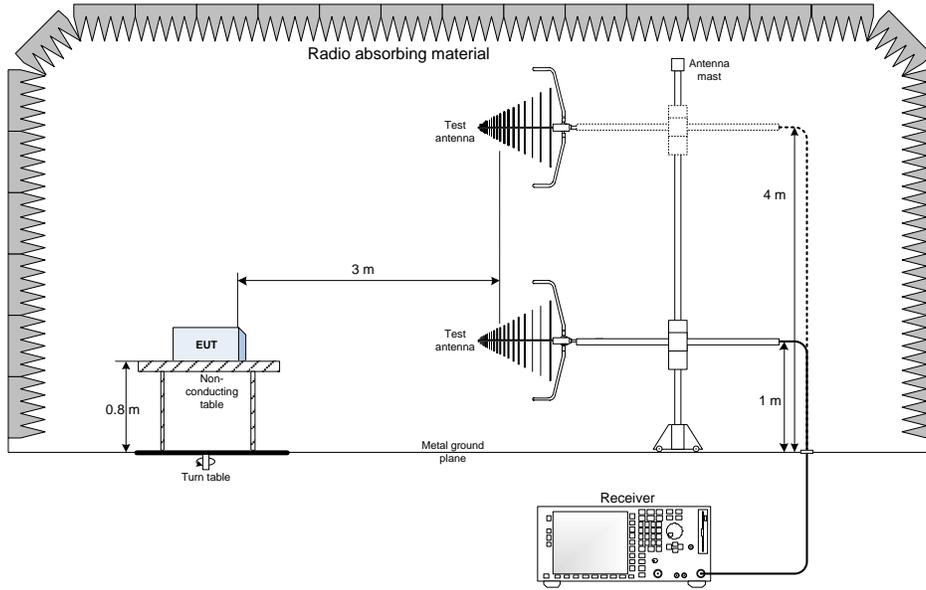


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Figure 8.4-6: PSD sample plot on high channel

Section 9. Block diagrams of test set-ups

9.1 Radiated emissions set-up for frequencies below 1 GHz



9.2 Radiated emissions set-up for frequencies above 1 GHz

