



FCC LISTED, REGISTRATION
NUMBER: 2764.01

ISED LISTED REGISTRATION
NUMBER: 23595-1

Test report No:
2427ERM.003A1

Test report

**USA FCC Part 15.247, 15.209
CANADA RSS-247, RSS-Gen**

**Radio Frequency Devices. Operation within the bands 902 - 928 MHz,
2400 -2483.5 MHz, and 5725 - 5850 MHz.
Digital Transmission Systems (DTSs), Frequency Hopping Systems
(FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices.**

Identification of item tested	High Performance Display Controller (HPDC)
Trademark	Panasonic
Model and /or type reference	HPDC
Other identification of the product	FCC ID: ACJ932A-HPDC IC: 216A-HPDC HVIN: HPDC
Features	LVDS, Ethernet, A2B, BT, Wi-Fi, USB
Manufacturer	Panasonic Automotive Systems Company of America 776 Georgia Hwy 74 Peachtree city, GA 30269
Test method requested, standard	USA FCC Part 15.247, 10-1-18 Edition: Operation within the bands 902 - 928 MHz, 2400 -2483.5 MHz, and 5725 - 5850 MHz USA FCC Part 15.209, 10-1-18 Edition: Radiated emission limits; general requirements. CANADA RSS-247 Issue 2 (February 2017). CANADA RSS-Gen Issue 5 (April 2018). Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 558074 D01 DTS Meas. Guidance v04 dated 05/04/2017. ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices.
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Domingo Galvez EMC&RF Lab Manager
Date of issue	06-11-2019
Report template No	FDT08_21

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Competences and guarantees

DEKRA Certification Inc. is a testing laboratory accredited by A2LA (The American Association for Laboratory Accreditation), to perform the tests indicated in the Certificate 2764.01

DEKRA Certification Inc. is a testing laboratory competent to carry out the tests described in this report.

In order to assure the traceability to other national and international laboratories, DEKRA Certification Inc. has a calibration and maintenance program for its measurement equipment.

DEKRA Certification Inc. guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated on the report and, it is based on the knowledge and technical facilities available at DEKRA Certification at the time of performance of the test.

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The results presented in this Test Report apply only to the particular item under test established in this document.

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General conditions

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of DEKRA Certification Inc.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA Certification Inc. and the Accreditation Bodies.

Uncertainty

Uncertainty (factor $k=2$) was calculated according to the DEKRA Certification internal document PODT000.

Frequency (MHz)	U(k=2)	Units
0,009 - 30	2.69	dB
30-180	3.82	dB
180-1000	2.61	dB
1000-18000	2.92	dB
18000-40000	2.15	dB

Data provided by the client

LVDS, Ethernet, A2B, BT, Wi-Fi, USB

DEKRA declines any responsibility with respect to the information provided by the client and that may affect the validity of results.

Usage of samples

Samples undergoing test have been selected by: The client.

Sample S/01 is composed of the following elements:

Control N°	Description	Model	Serial N°	Date of reception
2427.09	HPDC Unit	GA200FRDMMM	100092	01/24/2019

Following accessories were used with Sample S/01 to keep S/01 in testing mode

Control N°	Description	Model	Serial N°	Date of reception
2427.05	Innolux Display for HPDC Unit	DD102ZA-01C	0139	01/11/2019
2427.02	Center Molex connector to Ethernet Interface cable	-	2M20181210-1304	1/11/2019
2427.01	Power cable	-	-	1/11/2019
2427.03	Molex blue cable to Innolux Display	-	20181218-0958	1/11/2019
2427.04	Power cable for display	-	-	1/11/2019

1. Sample S/01 has undergone following test(s):
All conducted tests indicated in appendix A and B.

Sample S/02 is composed of the following elements:

Control N°	Description	Model	Serial N°	Date of reception
2427.06	HPDC Unit	GA200FRDMMM	100042	01/11/2019

Following accessories were used with Sample S/02 to keep S/02 in testing mode

Control N°	Description	Model	Serial N°	Date of reception
2427.11	Innolux Display for HPDC Unit	DD102ZA-01C	0030	01/24/2019
2427.02	Center Molex connector to Ethernet Interface cable	-	2M20181210-1304	1/11/2019
2427.01	Power cable	-	-	1/11/2019
2427.03	Molex blue cable to Innolux Display	-	20181218-0958	1/11/2019
2427.04	Power cable for display	-	-	1/11/2019

1. Sample S/02 has undergone following test(s):

All radiated tests indicated in appendix A and B.

Test sample description

Ports..... :	Port name and description	Cable					
		Specified max length [m]	Attached during test	Shielded	Coupled to patient ⁽³⁾		
	Main Harness	2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Supplementary information to the ports..... :							
Rated power supply	Voltage and Frequency		Reference poles				
			L1	L2	L3	N	PE
	<input type="checkbox"/>	AC:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	AC:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	DC: 14.4 Vdc						
Rated Power	<i>Data not provided</i>						
Clock frequencies	<i>Data not provided</i>						
Other parameters..... :	<i>Data not provided</i>						
Software version	R7						
Hardware version..... :	PV						
Dimensions in cm (W x H x D).... :	10x10x3						
Mounting position..... :	<input type="checkbox"/>	Table top equipment					
	<input type="checkbox"/>	Wall/Ceiling mounted equipment					
	<input type="checkbox"/>	Floor standing equipment					
	<input type="checkbox"/>	Hand-held equipment					
	<input checked="" type="checkbox"/>	Other: Vehicle Equipment					
Modules/parts	Module/parts of test item		Type	Manufacturer			
	CX-MG29N04D		HPDC	Panasonic			
Accessories (not part of the test item)	Description		Type	Manufacturer			
	<i>Not Provided Data</i>						
Documents as provided by the	Description		File name	Issue date			

applicant.....:	FDT30_14 Data Declaration Equipment Data		
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Identification of the client

PANASONIC AUTOMOTIVE SYSTEMS COMPANY OF AMERICA
776 GEORGIA HWY 74 PEACHTREE CITY, GA 30269

Testing period and place

Test Location	DEKRA Certification Inc.
Date (start)	12-26-2018
Date (finish)	02-19-2019

Document history

Report number	Date	Description
2427ERM.003	04-01-2019	First release
2427ERM.003A1	06-11-2019	Second release

Modifications to the reference test report

It was introduced the following modifications in respect to the test report number 2427ERM.003 related with the same samples, in the next clauses and sub-clauses:

Clauses/ Sub-Clauses	Modification	Justification
Page 31/ TOC (Dwell Time) test case	Inserted the One pulse Graph for all the modulations and packets	Requested by the reviewer

This modification test report cancels and replaces the test report 2427ERM.003

Environmental conditions

In the control chamber, the following limits were not exceeded during the test:

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 30 % Max. = 75 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar

In the semi-anechoic chamber, the following limits were not exceeded during the test.

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 30 % Max. = 75 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar

In the chamber for conducted measurements, the following limits were not exceeded during the test:

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 30 % Max. = 60 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar

Remarks and comments

The tests have been performed by the technical personnel: Divya Adusumilli, Koji Nishimoto and Poojita Bhattu.

Testing verdicts

Not applicable :	N/A
Pass :	P
Fail :	F
Not measured :	N/M

Summary

FCC PART 15 PARAGRAPH / RSS-247 (Bluetooth EDR)					
Section	15.247 Spec Clause	RSS Spec Clause	Test Description	Verdict	Remark
A.1	§ 15.247 (a) (1)	RSS-247 5.1 (b)	20dB Emission Bandwidth, Occupied Bandwidth & Carrier Frequency Separation	P	N/A
A.2	§ 15.247 (a) (1) (iii)	RSS-247 5.1 (d)	Number of hopping channels	P	N/A
A.3	§ 15.247 (a) (1) (iii)	RSS-247 5.1 (d)	Time of Occupancy (Dwell Time)	P	N/A
A.4	§ 15.247 (b) (3)	RSS-247 5.4 (b)	Maximum peak conducted output power and antenna gain	P	N/A
A.5	§ 15.247 (d)	RSS-247 5.5	Band-edge conducted emissions compliance (Transmitter)	P	N/A
--	§ 15.247 (d)	RSS-247 5.5	Emission limitations Conducted (Transmitter)	N/A	Refer 1
A.6	§ 15.247 (d)	RSS-247 5.5	Emission limitations Radiated (Transmitter)	P	N/A
<u>Supplementary information and remarks:</u>					
1) Device is incorporated with integral antenna.					

FCC PART 15 PARAGRAPH (WIFI 2.4GHz)					
Section	15.247 Spec Clause	RSS Spec Clause	Test Description	Verdict	Remark
B.1	§ 15.247 (a) (2)	RSS-247 5.2 (a)	99% Occupied Bandwidth & 6dB Bandwidth	P	N/A
B.2	§ 15.247 (b)	RSS-247 5.4 (d)	Maximum Output Power and antenna gain	P	N/A
--	§15.247(d)	RSS-247 5.5	Emission limitations Conducted (Transmitter)	N/A	Refer 1
B.3	§ 15.247 (d)	RSS-247 5.5	Band-edge conducted emissions compliance (Transmitter)	P	N/A
B.4	§ 15.247 (e)	RSS-247 5.2 (b)	Power Spectral Density	P	N/A
B.5	§15.247 (d)	RSS-247 5.5	Emission limitations Radiated (Transmitter)	P	N/A
<u>Supplementary information and remarks:</u>					
1) Device is incorporated with integral antenna.					

List of equipment used during the test

Conducted Measurements

Test system Rohde & Schwarz TS 8997:

CONTROL NUMBER	DESCRIPTION	MANUFACTURER	MODEL	LAST CALIBRATION	NEXT CALIBRATION
1039	Signal Analyzer	ROHDE & SCHWARZ	FSV40	2017/03	2019/03
1040	EMI Test Receiver	ROHDE & SCHWARZ	OSP120 / OSPB157	2017/03	2019/03
1041	RF generator	ROHDE & SCHWARZ	SMB100A	2017/04	2019/04
1042	RF generator	ROHDE & SCHWARZ	SMBV100A	2018/01	2019/01
0101	Climatic Chamber	ESPEC NA	ESL-2CA	2019/01	2020/01

Radiated Measurements

CONTROL NUMBER	DESCRIPTION	MANUFACTURER	MODEL	LAST CALIBRATION	NEXT CALIBRATION
1014	Signal Analyzer	ROHDE & SCHWARZ	FSV40	2017/03	2019/03
1012	EMI Test Receiver	ROHDE & SCHWARZ	ESR26	2018/09	2020/09
1058	Double Ridged Waveguide Horn Antenna	ETS LINDGREN	3115	2017/03	2020/03
1055	Double Ridged Waveguide Horn Antenna	ETS LINDGREN	3116C	2016/12	2019/12
1065	Biconilog Antenna	ETS LINDGREN	3142E	2017/03	2020/03
0981	Preamplifier	BONN ELEKTRONIK	BLMA 0118-2A	2017/05	2019/05
0980	Preamplifier	BONN ELEKTRONIK	BLNA 0360-01N	2017/05	2019/05
0982	Preamplifier	BONN ELEKTRONIK	BLMA1840-1M	2017/05	2019/05
1017	EMC measurement software	ROHDE & SCHWARZ	EMC32 V9.01	---	---

Appendix A: Test results (Bluetooth EDR)

Appendix A Content

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PRODUCT INFORMATION

The following information is provided by the client

Information	Description
Modulation	FHSS
Operation mode 1: Single Antenna Equipment	Equipment with only one antenna
Operating Frequency Range	2402 – 2480 MHz
Nominal Channel Bandwidth	1 MHz
RF Output Power	4 dBm
Extreme operating conditions	
Temperature range	-40 °C to +85 °C
Antenna type	Integral antenna
Antenna gain	BT: -3.5 dBi WIFI 2.4GHz: -3.5 dBi
Nominal Voltage	
Supply Voltage	14.4 Vdc
Type of power source	DC voltage from battery
Equipment type	Bluetooth EDR and WIFI
Geo-location capability	No

DESCRIPTION OF TEST CONDITIONS

TEST CONDITIONS	DESCRIPTION
TC#01	<p><u>Power supply (V):</u> $V_{\text{nominal}} = 14.4 \text{ Vdc}$</p> <p><u>Modulation:</u> GFSK</p> <p><u>Test Frequencies for Conducted / Radiated tests:</u> Lowest range: 2402 MHz Middle channel: 2441 MHz Highest range: 2480 MHz</p>
TC#02	<p><u>Power supply (V):</u> $V_{\text{nominal}} = 14.4 \text{ Vdc}$</p> <p><u>Modulation:</u> PI4DQPSK</p> <p><u>Test Frequencies for Conducted / Radiated tests:</u> Lowest range: 2402 MHz Middle channel: 2441 MHz Highest range: 2480 MHz</p>
TC#03	<p><u>Power supply (V):</u> $V_{\text{nominal}} = 14.4 \text{ Vdc}$</p> <p><u>Modulation:</u> 8DPSK</p> <p><u>Test Frequencies for Conducted / Radiated tests:</u> Lowest range: 2402 MHz Middle channel: 2441 MHz Highest range: 2480 MHz</p>

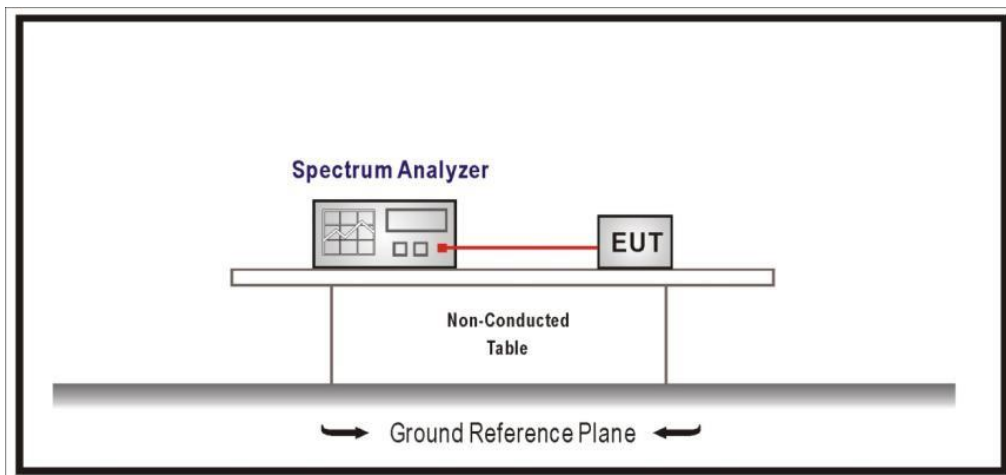
TEST A.1: 20DB EMISSION BANDWIDTH, OCCUPIED BANDWIDTH AND CARRIER FREQUENCY SEPARATION

LIMITS:	Product standard:	Part 15 Subpart C §15.247 and RSS-247
	Test standard:	Part 15 Subpart C §15.247(a) (1) and RSS-247 5.1 (b)

LIMITS

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

TEST SETUP:



TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#01
TEST RESULTS:	PASS

	Lowest frequency 2402 MHz	Middle frequency 2441 MHz	Highest frequency 2480 MHz
20dB Bandwidth (KHz)	930	930	930
Occupied bandwidth (kHz)	890	960	900
Measurement uncertainty (kHz)	<± 1.80		

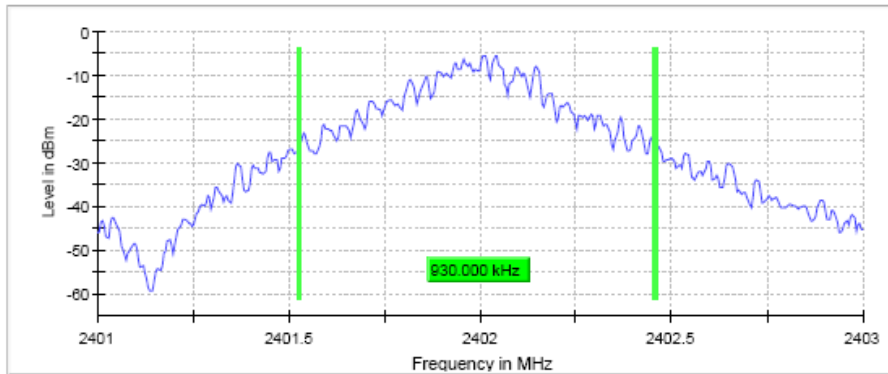
Measurement Set up

Setting	Instrument Value	Instrument Value	Instrument Value
Start Frequency	2.40100 GHz	2.44000 GHz	2.47900 GHz
Stop Frequency	2.40300 GHz	2.44200 GHz	2.48100 GHz
Span	2.000 MHz	2.000 MHz	2.000 MHz
RBW	10.000 kHz	10.000 kHz	10.000 kHz
VBW	30.000 kHz	30.000 kHz	30.000 kHz
SweepPoints	400	400	400
Sweeptime	189.648 μs	189.648 μs	189.648 μs
Reference Level	10.000 dBm	0.000 dBm	10.000 dBm
Attenuation	30.000 dB	20.000 dB	30.000 dB
Detector	MaxPeak	MaxPeak	MaxPeak
SweepCount	200	200	200
Filter	3 dB	3 dB	3 dB
Trace Mode	Max Hold	Max Hold	Max Hold
Sweeptype	FFT	FFT	FFT
Preamp	off	off	off
Stablemode	Trace	Trace	Trace
Stablevalue	0.50 dB	0.50 dB	0.50 dB
Run	10 / max. 150	7 / max. 150	9 / max. 150
Stable	5 / 5	5 / 5	5 / 5
Max Stable Difference	0.06 dB	0.10 dB	0.10 dB

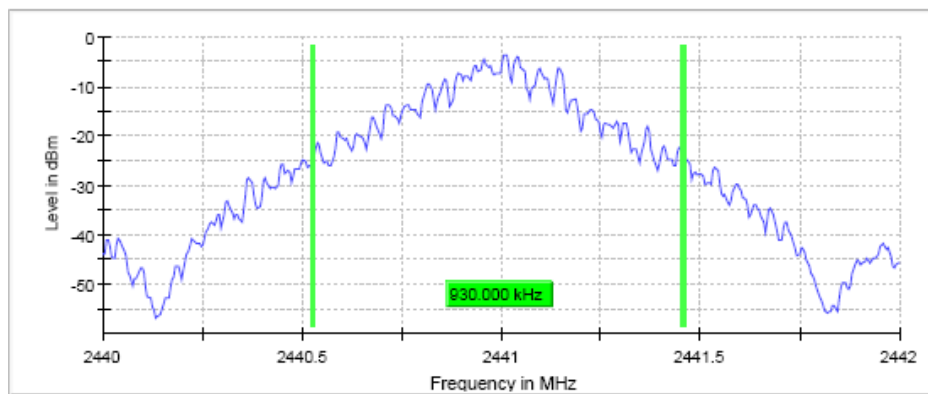
TEST RESULTS (Cont.):

20 dB BANDWIDTH

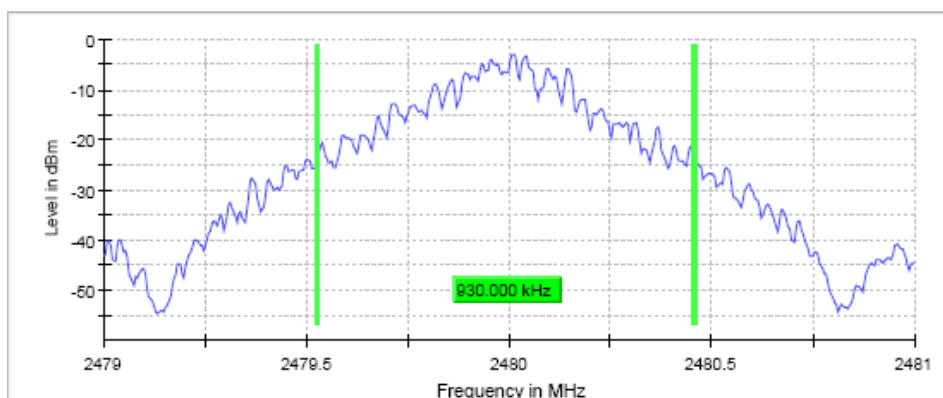
Lowest Channel



Middle Channel



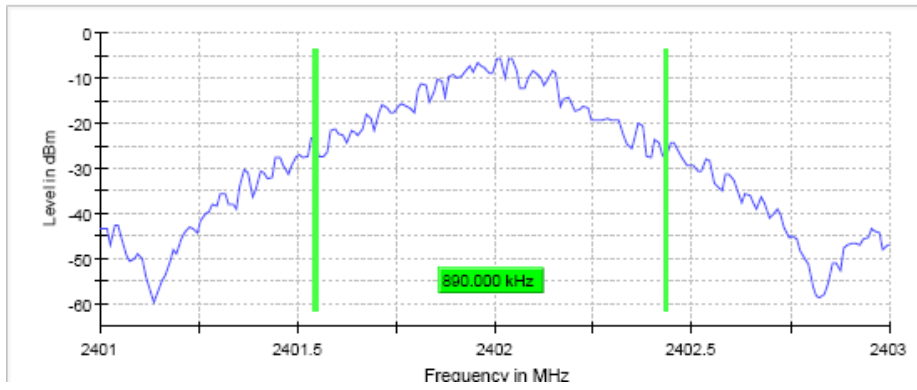
Highest Channel



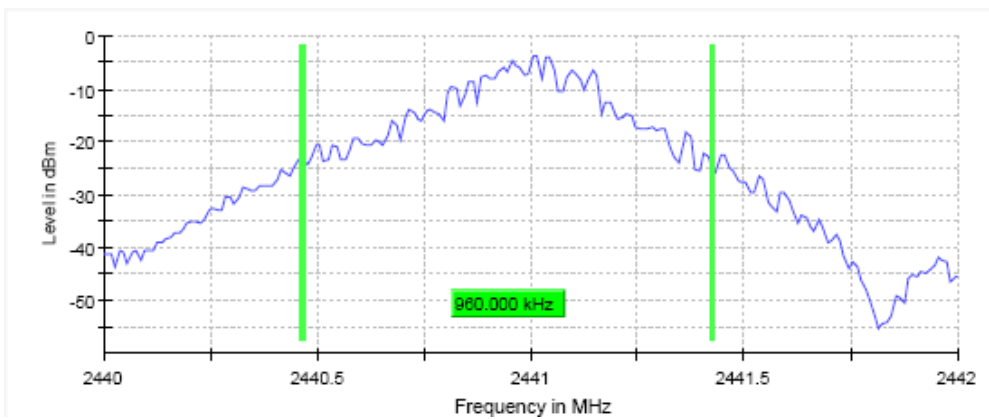
TEST RESULTS (Cont.):

OCCUPIED BANDWIDTH

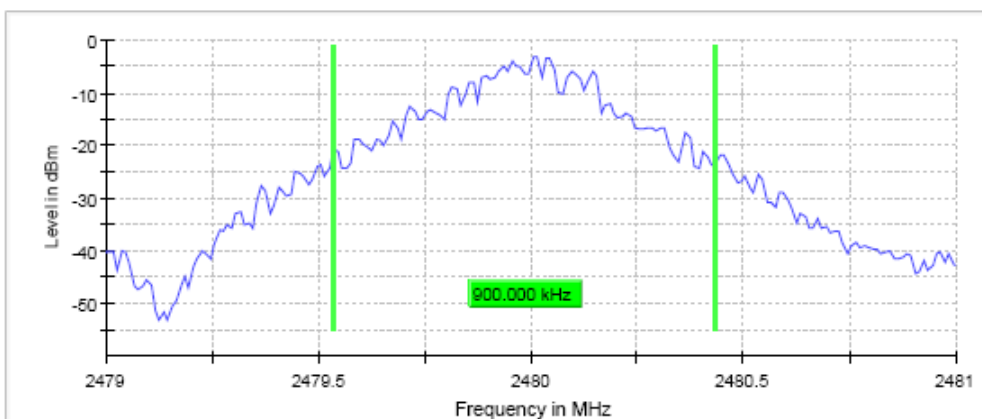
Lowest Channel



Middle Channel

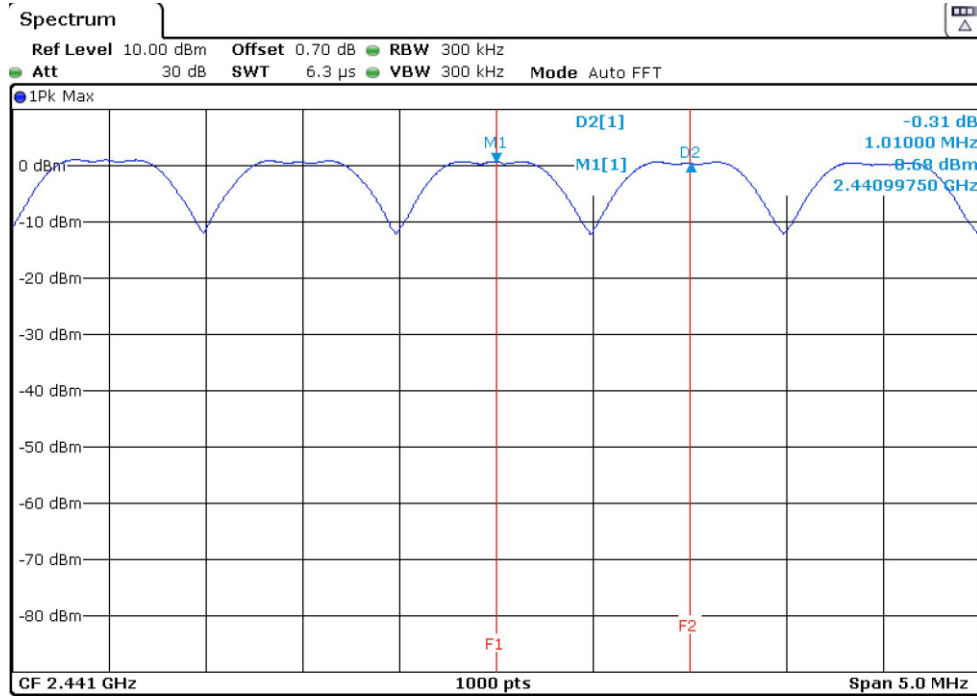


Highest Channel



TEST RESULTS (Cont.)

CARRIER FREQUENCY SEPARATION



The hopping channel carrier frequencies are separated by a minimum of the two-thirds of the 20 dB bandwidth of the hopping channel.

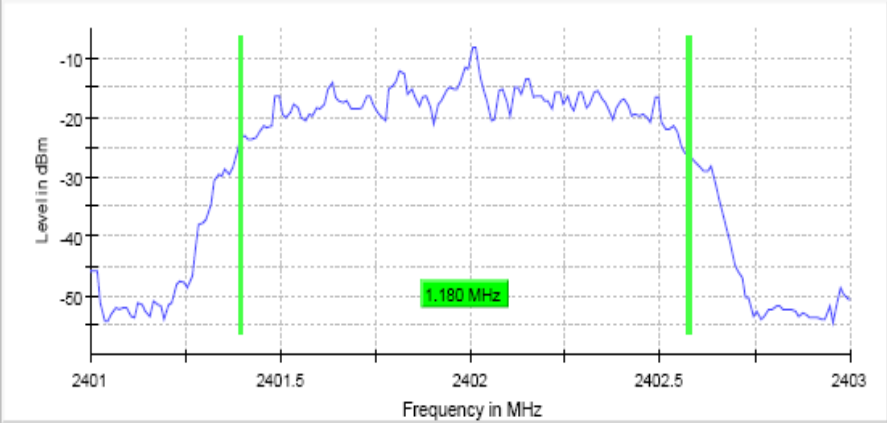
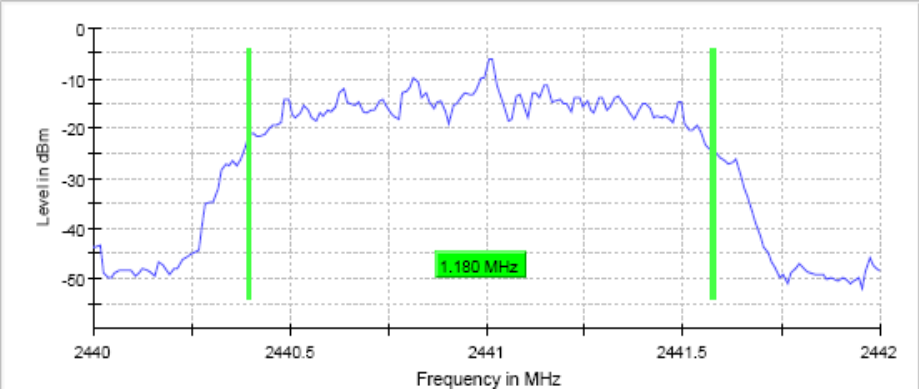
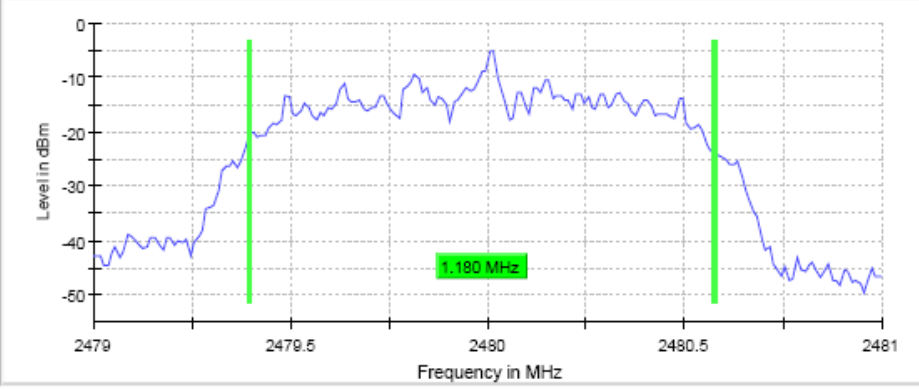
TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#02
TEST RESULTS:	PASS

	Lowest frequency 2402 MHz	Middle frequency 2441 MHz	Highest frequency 2480 MHz
20dB bandwidth (MHz)	1.225	1.225	1.225
Occupied bandwidth (MHz)	1.18	1.18	1.18
Measurement uncertainty (kHz)	<± 1.80		

Measurement Setup

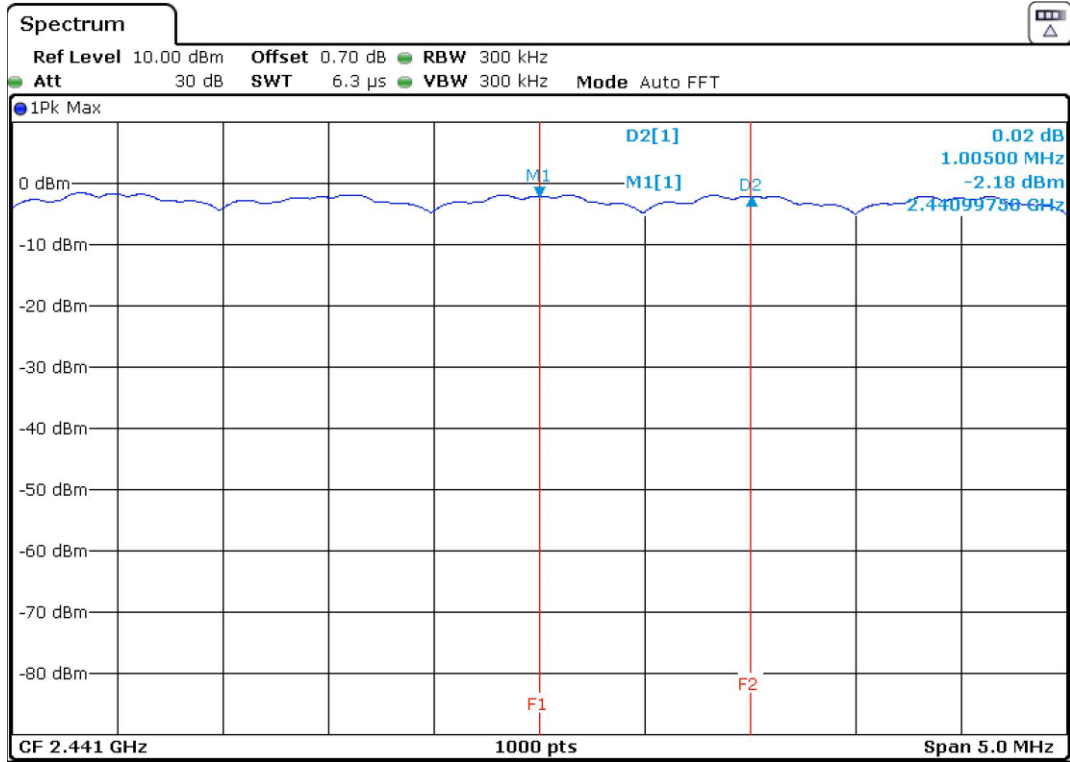
Setting	Instrument Value	Instrument Value	Instrument Value
Start Frequency	2.40100 GHz	2.44000 GHz	2.47900 GHz
Stop Frequency	2.40300 GHz	2.44200 GHz	2.48100 GHz
Span	2.00 MHz	2.00 MHz	2.00 MHz
RBW	10.000 KHz	10.000 kHz	10.000 kHz
VBW	30.000 kHz	30.000 kHz	30.000 kHz
SweepPoints	400	400	400
Sweeptime	189.648 µs	189.648 µs	189.648 µs
Reference Level	10.000 dBm	0.000 dBm	0.000 dBm
Attenuation	30.000 dB	20.000 dB	20.000 dB
Detector	MaxPeak	MaxPeak	MaxPeak
SweepCount	200	200	200
Filter	3 dB	3 dB	3 dB
Trace Mode	Max Hold	Max Hold	Max Hold
Sweeptype	FFT	FFT	FFT
Preamp	off	off	off
Stablemode	Trace	Trace	Trace
Stablevalue	0.50 dB	0.50 dB	0.50 dB
Run	7 / max. 150	8 / max. 150	9 / max. 150
Stable	5 / 5	5 / 5	5 / 5
Max Stable Difference	0.05 dB	0.07 dB	0.12 dB

TEST RESULTS (Cont.):	20 dB BANDWIDTH
Lowest Channel	
Middle Channel	
Highest Channel	

TEST RESULTS (Cont.):	OCCUPIED BANDWIDTH
<p>Lowest Channel</p> 	
<p>Middle Channel</p> 	
<p>Highest Channel</p> 	

TEST RESULTS (Cont.)

CARRIER FREQUENCY SEPARATION



The hopping channel carrier frequencies are separated by a minimum of the two-thirds of the 20 dB bandwidth of the hopping channel.

TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#03
TEST RESULTS:	PASS

	Lowest frequency 2402 MHz	Middle frequency 2441 MHz	Highest frequency 2480 MHz
20db bandwidth (MHz)	1.27	0.78	1.255
Occupied bandwidth (MHz)	1.17	0.82	1.17
Measurement uncertainty (kHz)	<± 1.80		

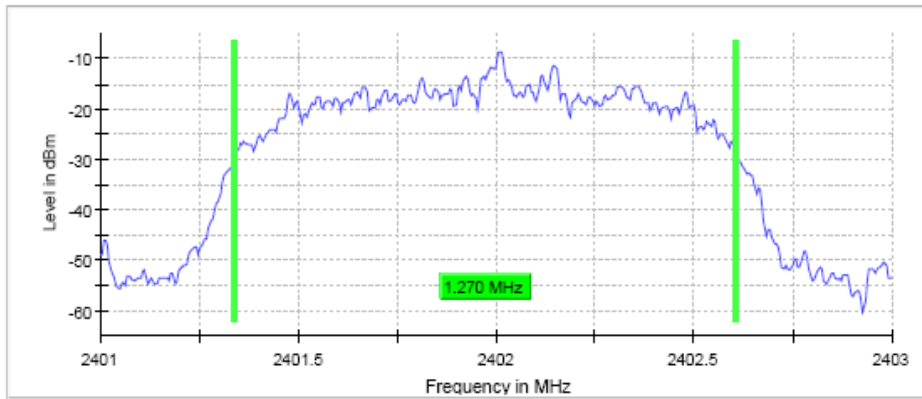
Measurement Setup

Setting	Instrument Value	Instrument Value	Instrument Value
Start Frequency	2.40100 GHz	2.44000 GHz	2.47900 GHz
Stop Frequency	2.40300 GHz	2.44200 GHz	2.48100 GHz
Span	2.00 MHz	2.00 MHz	2.00 MHz
RBW	10.000 kHz	10.000 kHz	10.000 kHz
VBW	30.000 kHz	30.000 kHz	30.000 kHz
SweepPoints	400	400	400
Sweeptime	189.648 µs	189.648 µs	189.648 µs
Reference Level	10.000 dBm	0.000 dBm	0.000 dBm
Attenuation	30.000 dB	20.000 dB	20.000 dB
Detector	MaxPeak	MaxPeak	MaxPeak
SweepCount	200	200	200
Filter	3 dB	3 dB	3 dB
Trace Mode	Max Hold	Max Hold	Max Hold
Sweeptype	FFT	FFT	FFT
Preamp	off	off	off
Stablemode	Trace	Trace	Trace
Stablevalue	0.50 dB	0.50 dB	0.50 dB
Run	13 / max. 150	6 / max. 150	12 / max. 150
Stable	5 / 5	5 / 5	5 / 5
Max Stable Difference	0.06 dB	0.08 dB	0.07 dB

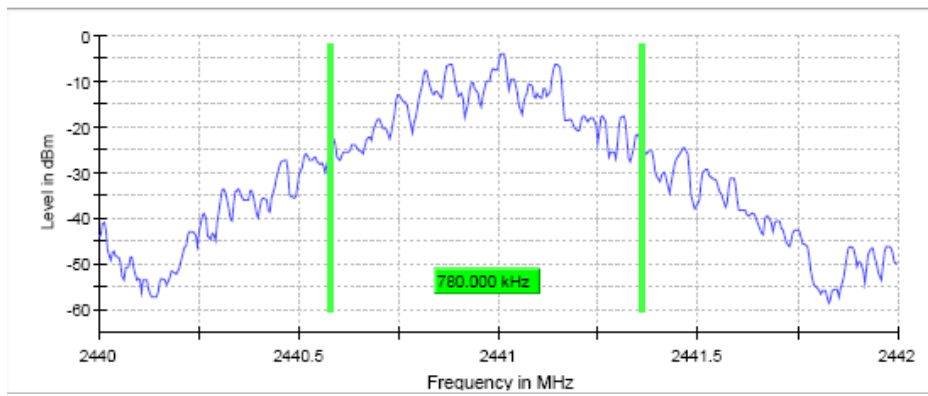
TEST RESULTS (Cont.):

20 dB BANDWIDTH

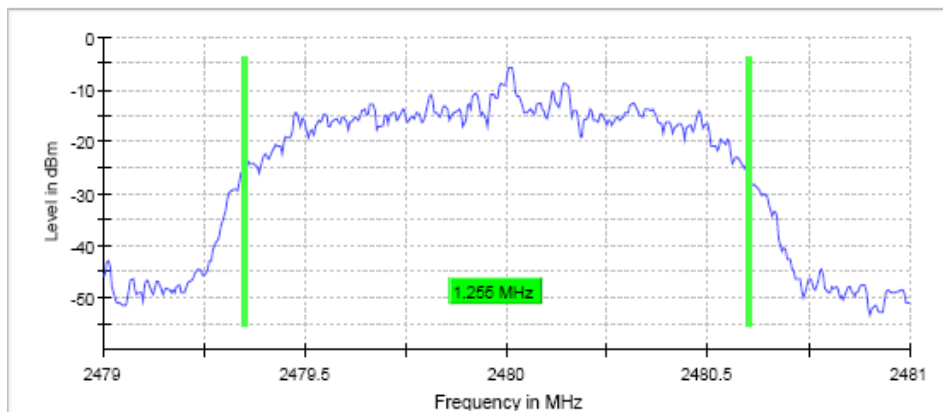
Lowest Channel



Middle Channel



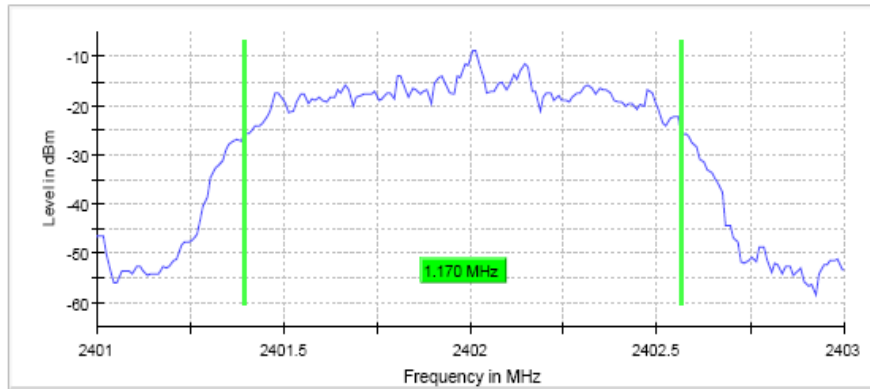
Highest Channel



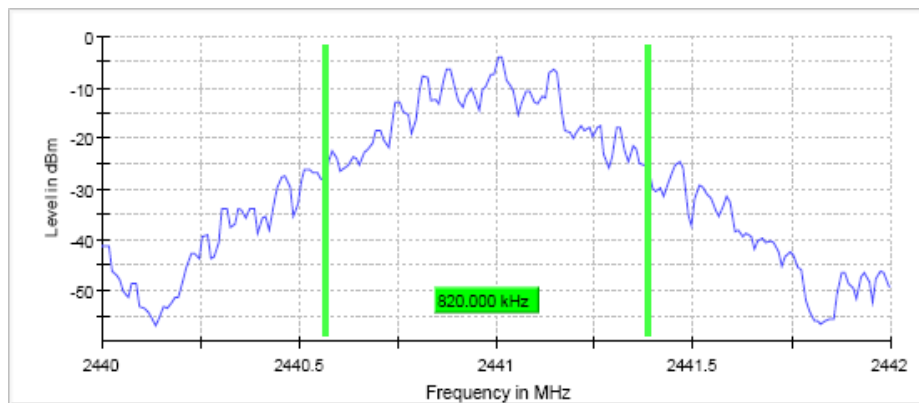
TEST RESULTS (Cont.)

OCCUPIED BANDWIDTH

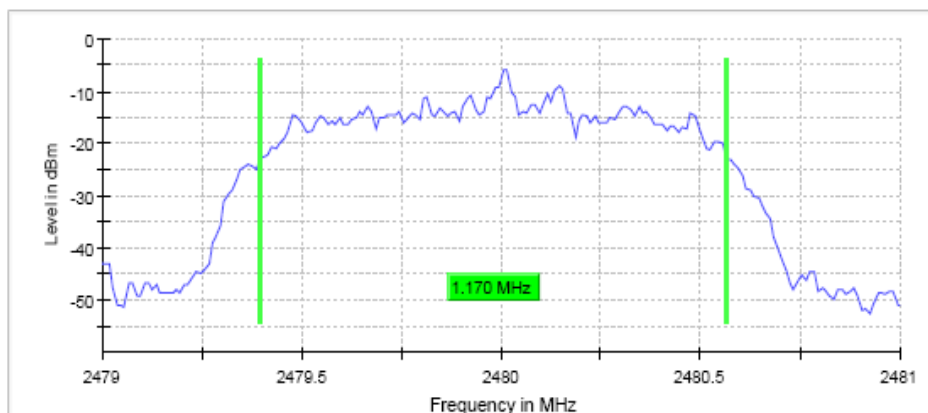
Lowest Channel



Middle Channel

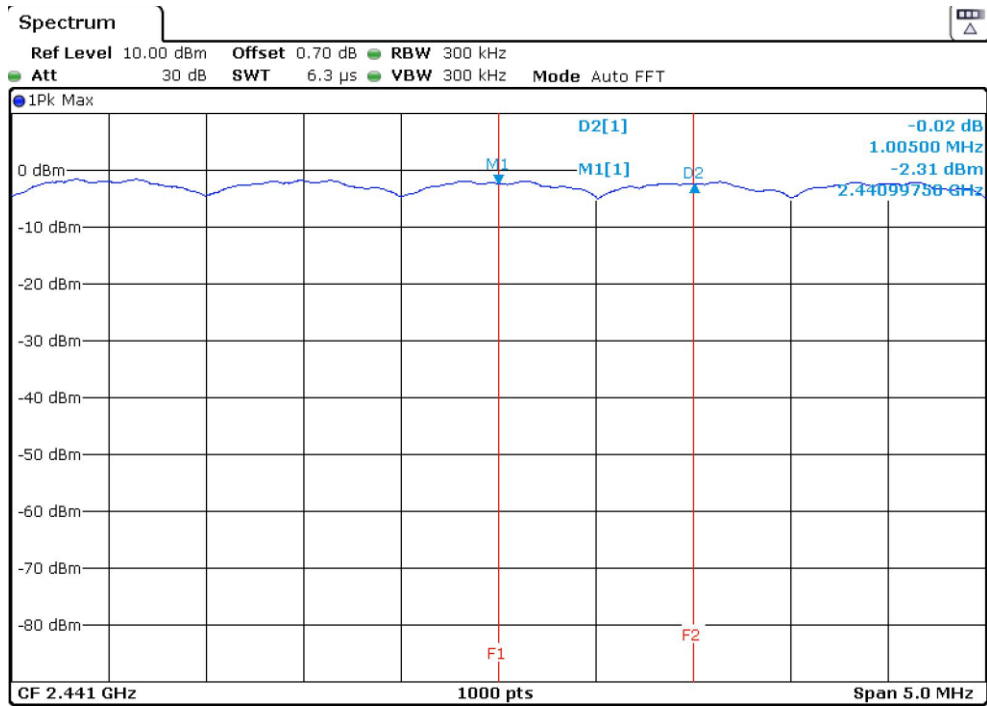


Highest Channel



TEST RESULTS (Cont.)

CARRIER FREQUENCY SEPARATION



The hopping channel carrier frequencies are separated by a minimum of the two-thirds of the 20 dB bandwidth of the hopping channel.

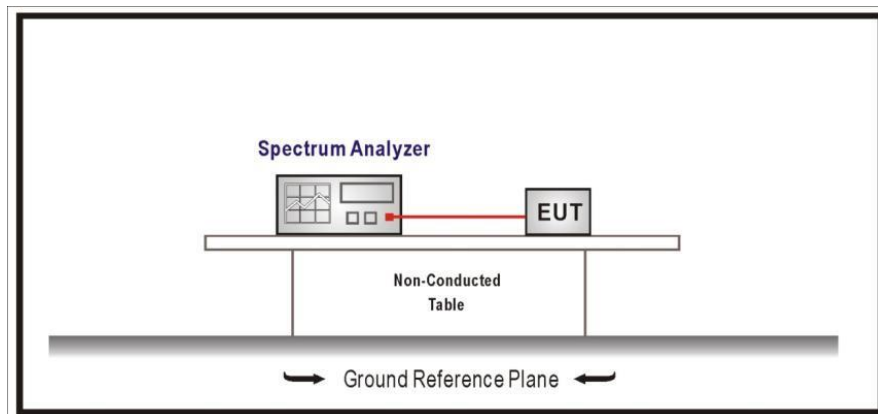
TEST A.2: NUMBER OF HOPPING CHANNELS

LIMITS:	Product standard:	Part 15 Subpart C §15.247 and RSS-247
	Test standard:	Part 15 Subpart C §15.247(a) (1) (iii) and RSS-247 5.1 (d)

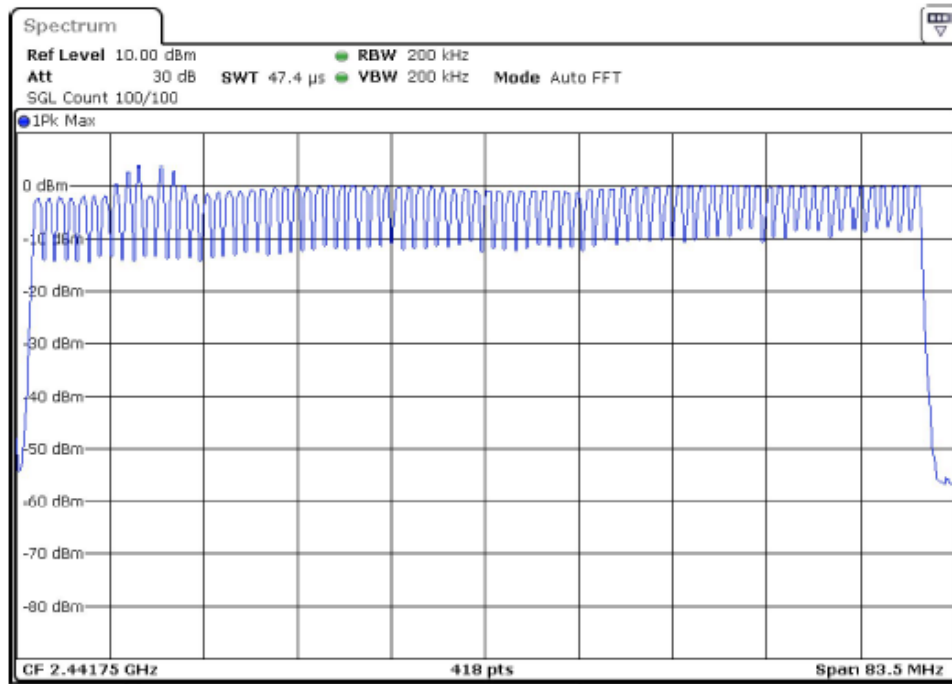
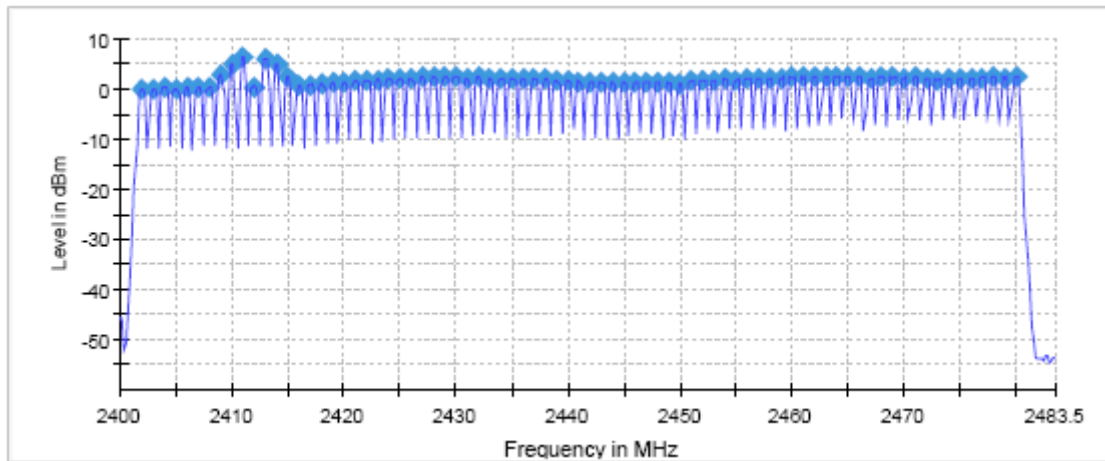
LIMITS

Frequency hopping system in the 2400-2483.5 MHz band shall use at least 15 channels.

TEST SETUP:

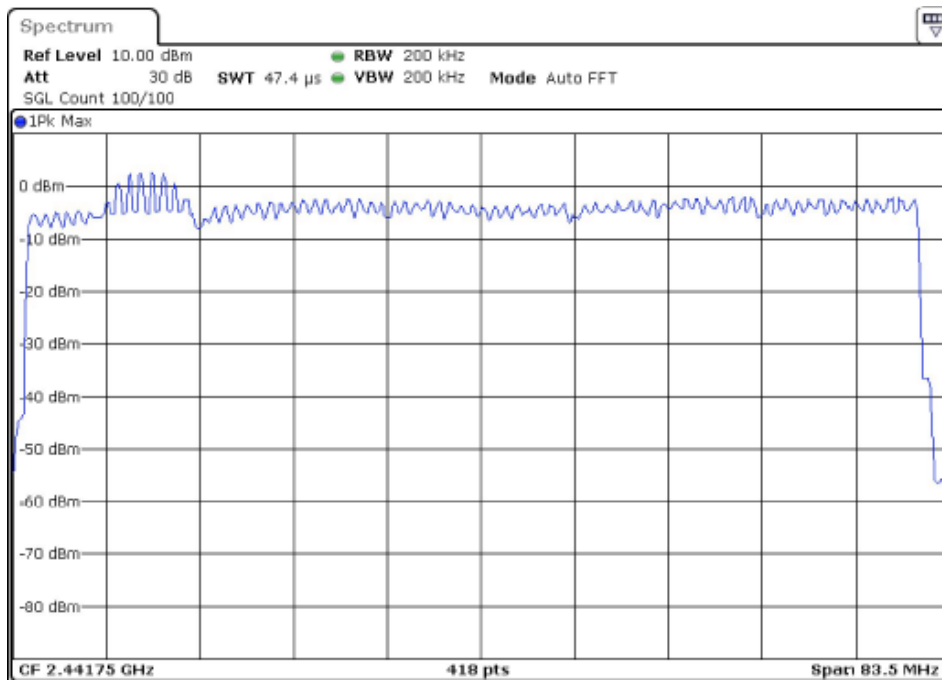
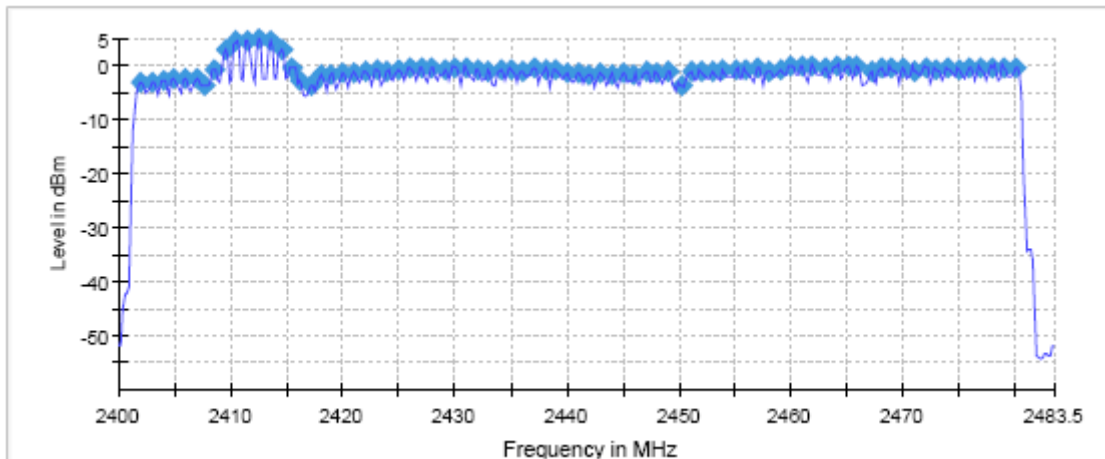


TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#01
TEST RESULTS:	PASS



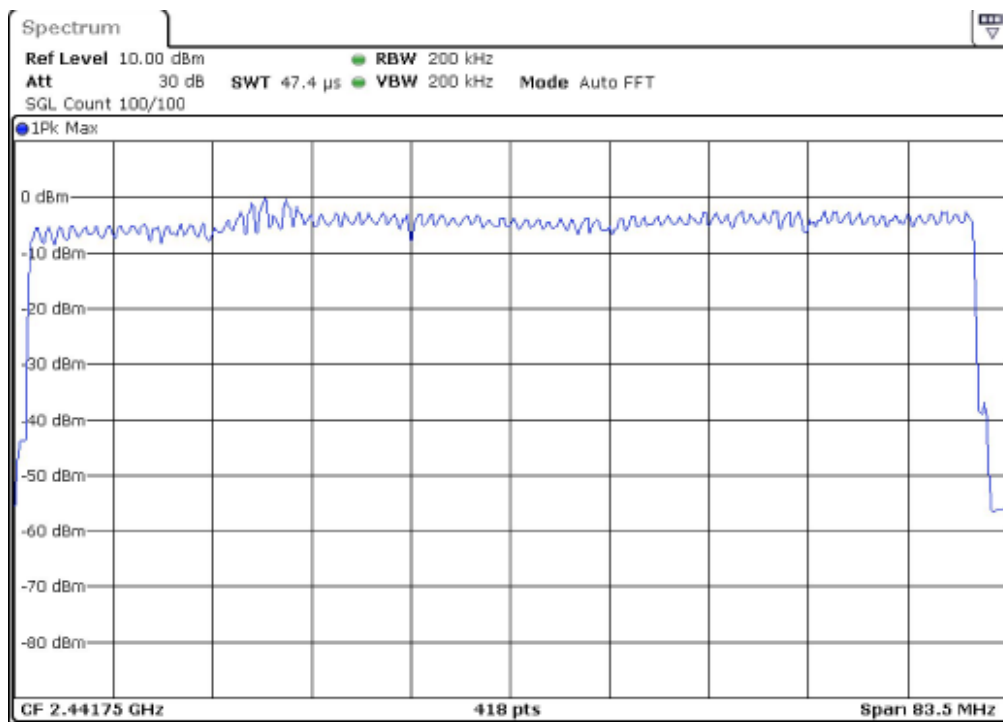
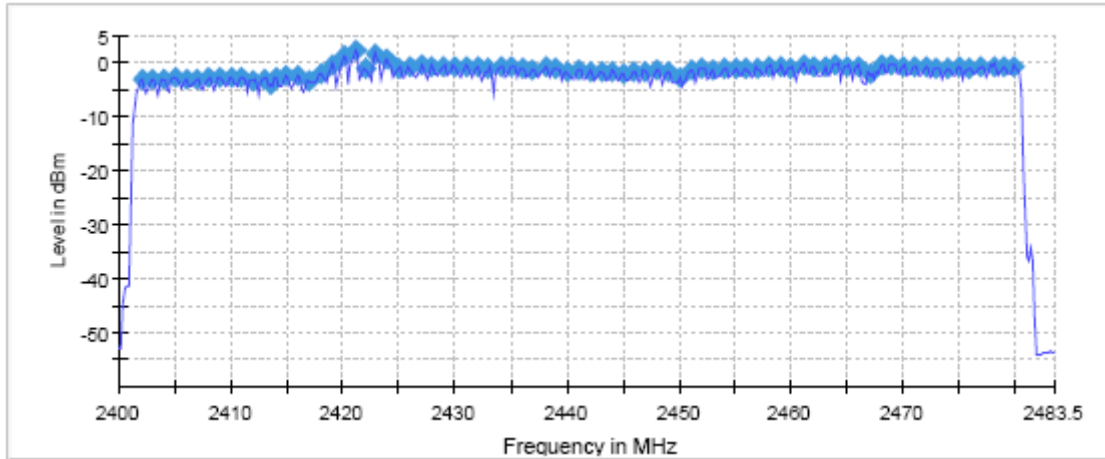
Number of Hopping Frequencies: 79

TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#02
TEST RESULTS:	PASS



Number of Hopping Frequencies: 79

TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#03
TEST RESULTS:	PASS



Number of Hopping Frequencies: 79

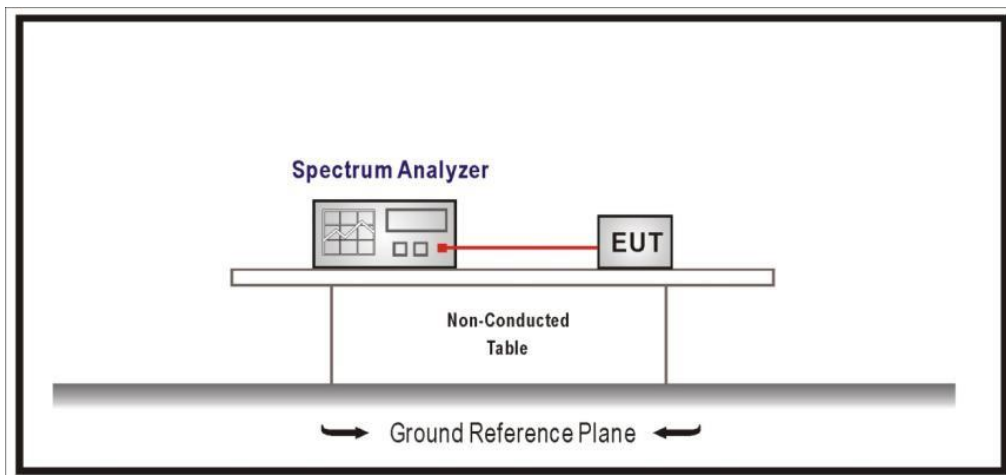
TEST A.3: TIME OF OCCUPANCY (DWELL TIME)

LIMITS:	Product standard:	Part 15 Subpart C §15.247 and RSS-247
	Test standard:	Part 15 Subpart C §15.247(a)(1)(iii) and RSS-247 5.1(d)

LIMITS

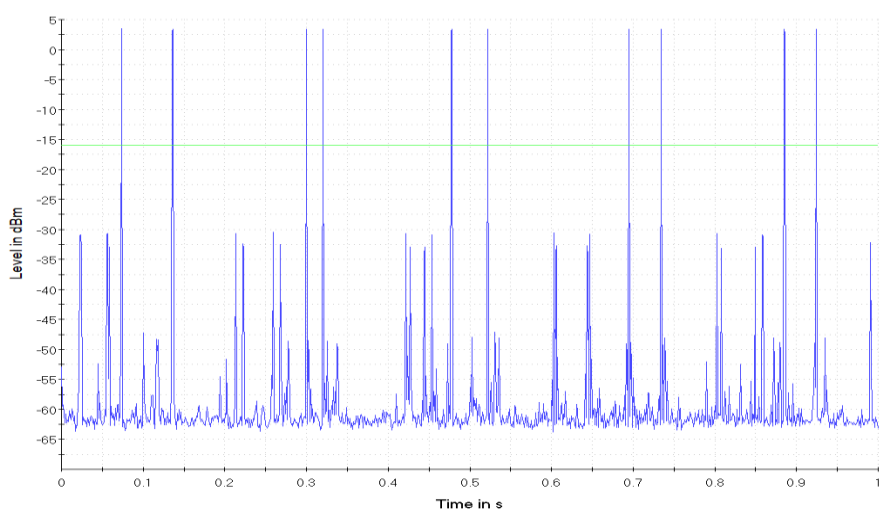
The average time of occupancy on any channel shall not be greater than 0.4 seconds (400 ms) within a period of 0.4 seconds multiplied by the number of hopping channels employed = $0.4 \times 79 = 31.6$ seconds.

TEST SETUP:



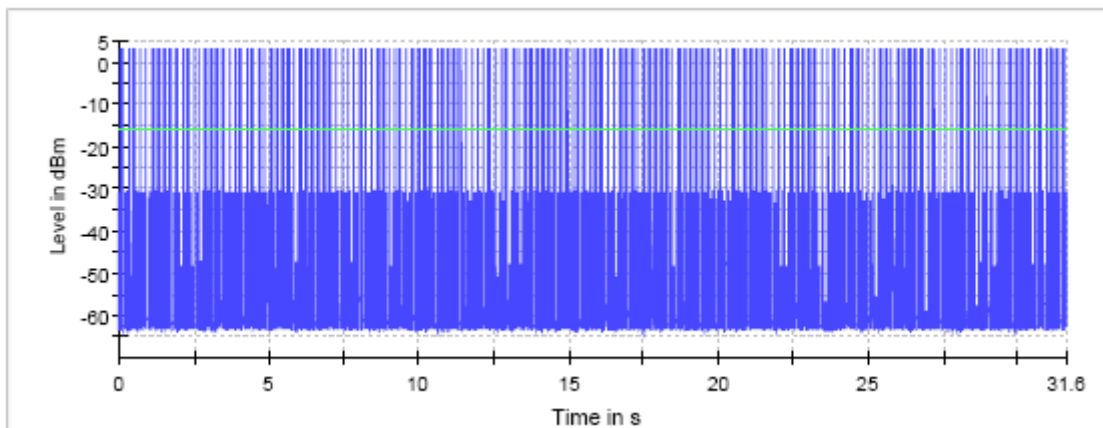
TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#01 (GFSK)
TEST RESULTS:	PASS
TEST RESULTS (Cont.)	PACKET TYPE DH1

Number of hops over a period of 1 second = 10 (See next plot)
 Number of hops in the period specified in the requirements = (10 hops) * (31.6/1s) = 316 hops.



Average Time of Occupancy Per 31.6s = 122.710 ms. (See below table)

DUT Frequency (MHz)	Time (ms)	Limit Max (ms)	Limit Min (ms)	Threshold (dBm)
2441.000000	122.710	400.000	0.000	-16.0



Tx Time per hop = 122.710ms / 316 = 388 μs.

Measurement uncertainty (%)	<±0.12
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TEST RESULTS (Cont.)

Measurement Setup

Setting	Instrument Value
Center Frequency	2.44100 GHz
Span	Zero span
RBW	500.000 kHz
VBW	1.000 MHz
SweepPoints	30001
SweepTime	31.600 s
Reference Level	10.000 dBm
Attenuation	20.000 dB
Detector	MaxPeak
SweepCount	1
Filter	Channel
Trace Mode	Clear write
Sweeptype	Sweep
Preamp	off
Trigger	External
Trigger Offset	0.00 ms

OSP Measurement

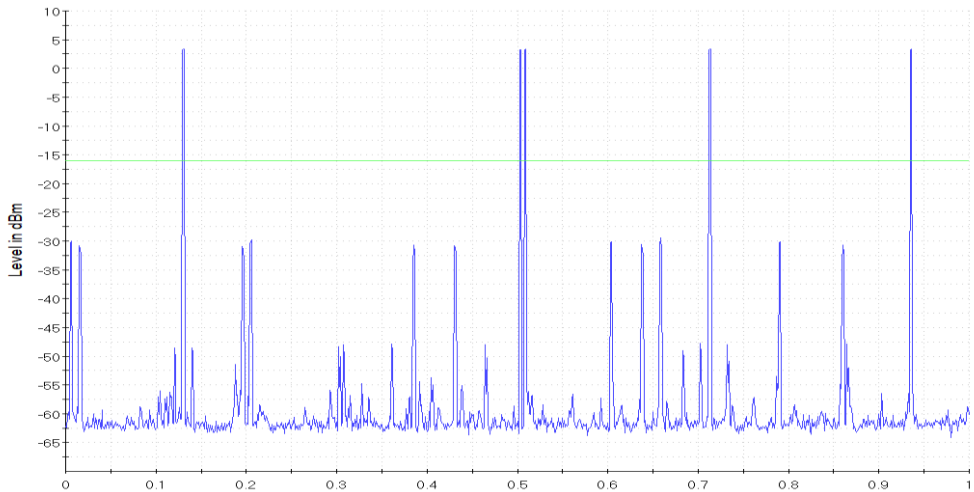
Setting	Instrument Value
Measurement Time	31.600 s
Trace Points	3160000
Time resolution	10.000 μ s
Detector	RMS

TEST RESULTS (Cont.)

PACKET TYPE DH3

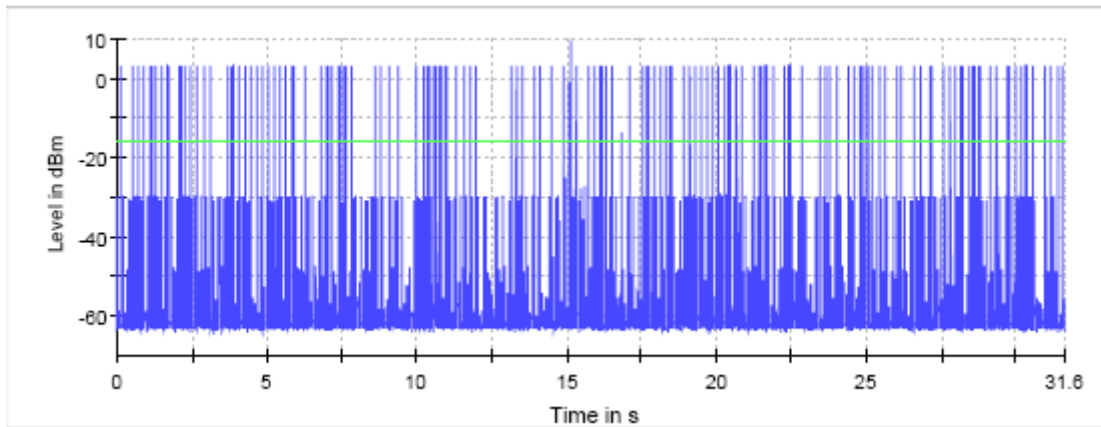
Number of hops over a period of 1 second =5 (See next plot)

Number of hops in the period specified in the requirements = (5 hops) * (31.6/1s) = 158 hops.



Average Time of Occupancy Per 31.6s = 272.340 ms. (See below table)

DUT Frequency (MHz)	Time (ms)	Limit Max (ms)	Limit Min (ms)	Threshold (dBm)
2441.000000	272.340	400.000	0.000	-16.0



Tx Time per hop = 272.340ms / 158 = 1.723 ms.

Measurement uncertainty (%)	<±0.12
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TEST RESULTS (Cont.)

Measurement Setup

Setting	Instrument Value
Center Frequency	2.44100 GHz
Span	Zero span
RBW	500.000 kHz
VBW	1.000 MHz
SweepPoints	30001
SweepTime	31.600 s
Reference Level	10.000 dBm
Attenuation	20.000 dB
Detector	MaxPeak
SweepCount	1
Filter	Channel
Trace Mode	Clear write
Sweeptype	Sweep
Preamp	off
Trigger	External
Trigger Offset	0.00 ms

OSP Measurement

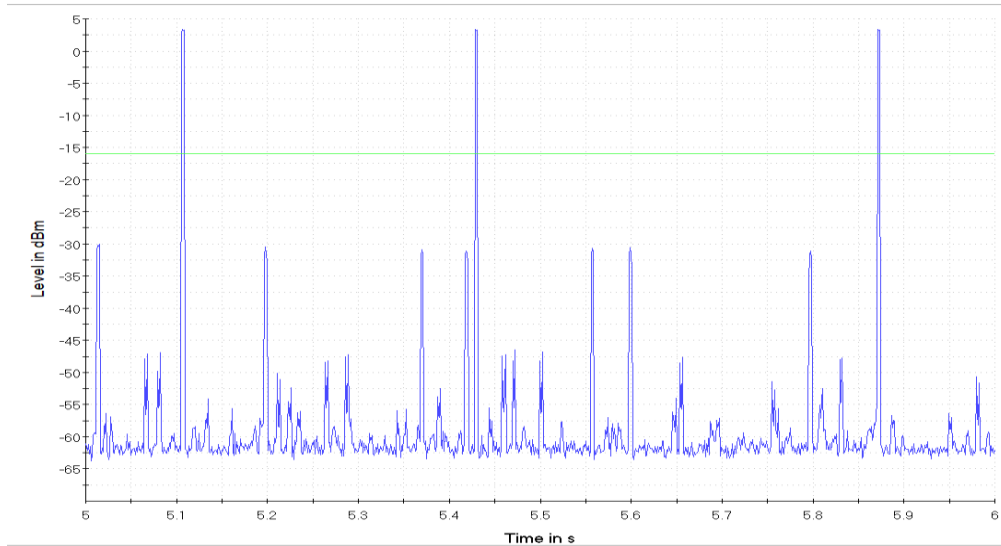
Setting	Instrument Value
Measurement Time	31.600 s
Trace Points	3160000
Time resolution	10.000 μ s
Detector	RMS

TEST RESULTS (Cont.)

PACKET TYPE DH5

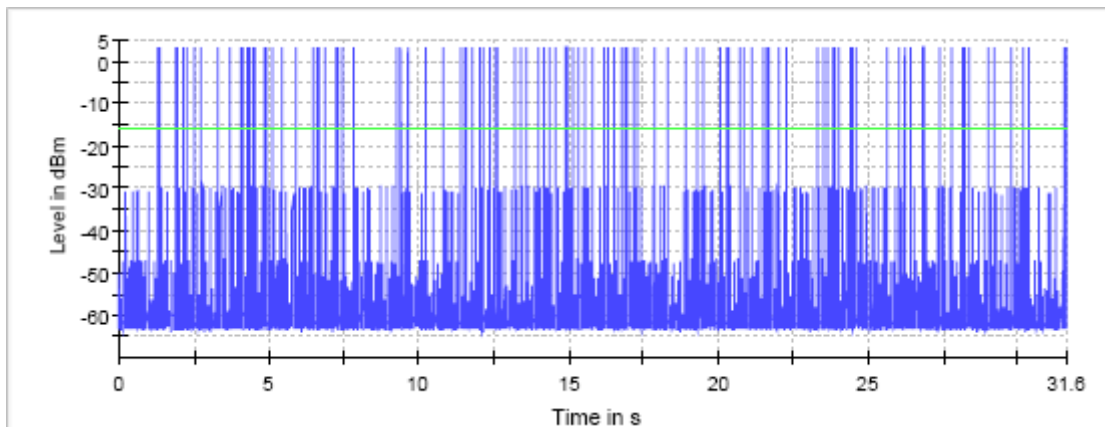
Number of hops over a period of 1 second = 3 (See next plot)

Number of hops in the period specified in the requirements = (3 hops) * (31.6/1s) = 94.8 hops.



Average Time of Occupancy Per 31.6s = 311.900 ms. (See below table)

DUT Frequency (MHz)	Time (ms)	Limit Max (ms)	Limit Min (ms)	Threshold (dBm)
2441.000000	311.900	400.000	0.000	-16.0



Tx Time per hop = 311.900ms / 94.8 = 3.29ms.

Measurement uncertainty (%)	<±0.12
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TEST RESULTS (Cont.)

Measurement Setup

Setting	Instrument Value
Center Frequency	2.44100 GHz
Span	Zero span
RBW	500.000 kHz
VBW	1.000 MHz
SweepPoints	30001
SweepTime	31.600 s
Reference Level	10.000 dBm
Attenuation	20.000 dB
Detector	MaxPeak
SweepCount	1
Filter	Channel
Trace Mode	Clear write
Sweeptype	Sweep
Preamp	off
Trigger	External
Trigger Offset	0.00 ms

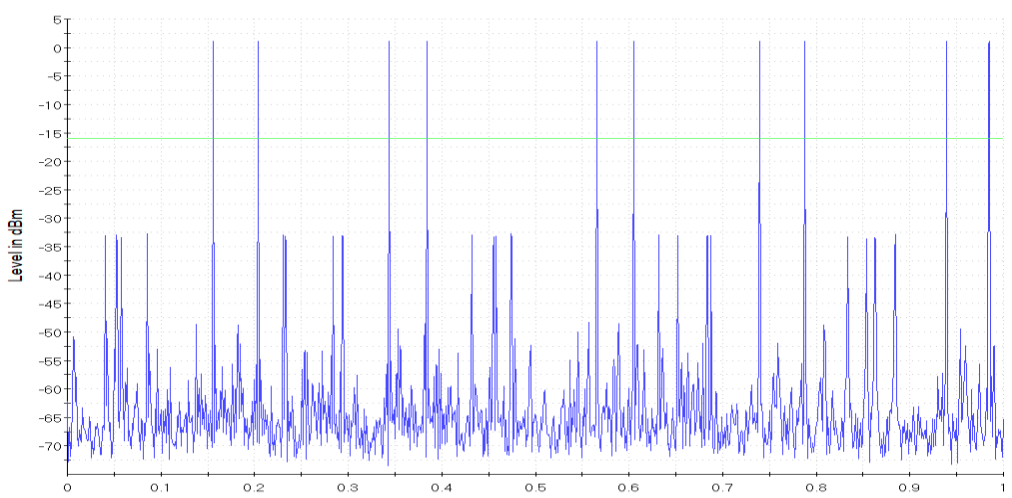
OSP Measurement

Setting	Instrument Value
Measurement Time	31.600 s
Trace Points	3160000
Time resolution	10.000 μ s
Detector	RMS

TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#02 (PI4DQPSK)
TEST RESULTS:	PASS
TEST RESULTS (Cont.)	PACKET TYPE 2DH1

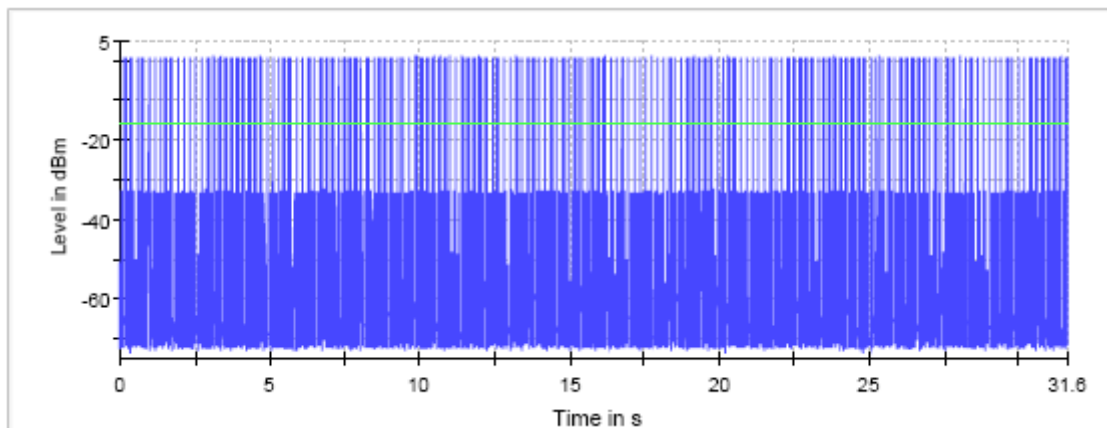
Number of hops over a period of 1 second = 10 (See next plot)

Number of hops in the period specified in the requirements = (10 hops) * (31.6/1s) = 316 hops.



Average Time of Occupancy Per 31.6s = 117.820 ms. (See below table)

DUT Frequency (MHz)	Time (ms)	Limit Max (ms)	Limit Min (ms)	Threshold (dBm)
2441.000000	117.820	400.000	0.000	-16.0



Tx Time per hop = 117.820ms / 316 = 372 μs.

Measurement uncertainty (%)	<±0.12
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TEST RESULTS (Cont.)

Measurement Setup

Setting	Instrument Value
Center Frequency	2.44100 GHz
Span	Zero span
RBW	500.000 kHz
VBW	1.000 MHz
SweepPoints	30001
SweepTime	31.600 s
Reference Level	0.000 dBm
Attenuation	10.000 dB
Detector	MaxPeak
SweepCount	1
Filter	Channel
Trace Mode	Clear write
Sweeptype	Sweep
Preamp	off
Trigger	External
Trigger Offset	0.00 ms

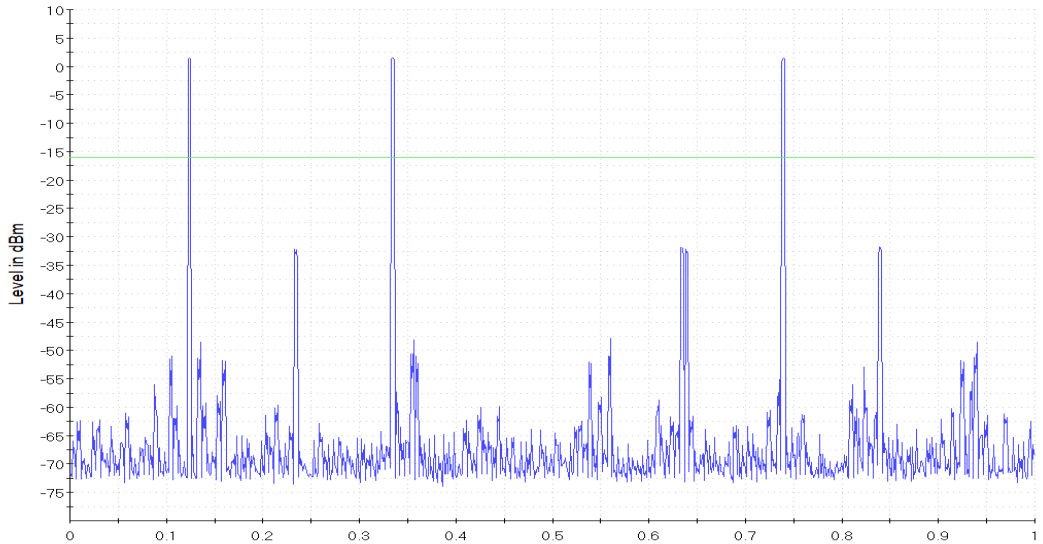
OSP Measurement

Setting	Instrument Value
Measurement Time	31.600 s
Trace Points	3160000
Time resolution	10.000 μ s
Detector	RMS

PACKET TYPE 2DH3

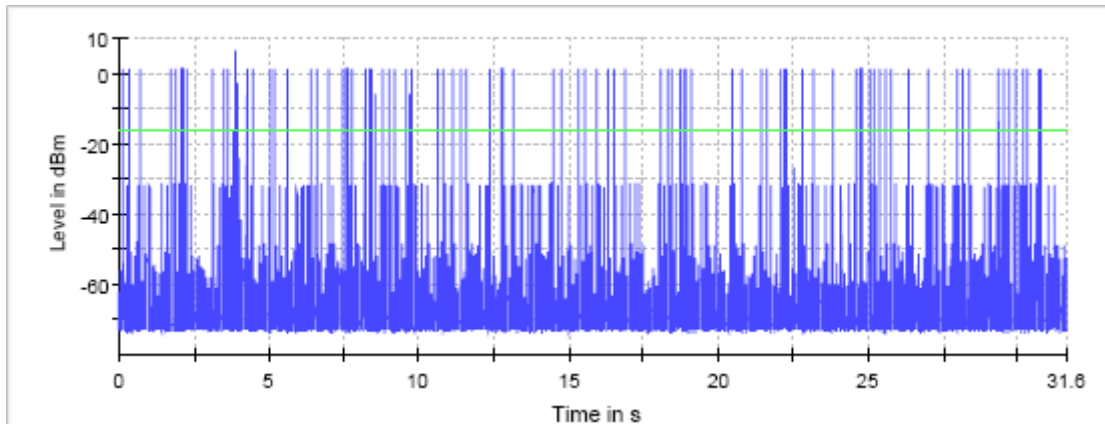
Number of hops over a period of 1 second =3 (See next plot)

Number of hops in the period specified in the requirements = (3 hops) * (31.6/1s) = 94.8 hops.



Average Time of Occupancy Per 31.6s = 257.670ms. (See below table)

DUT Frequency (MHz)	Time (ms)	Limit Max (ms)	Limit Min (ms)	Threshold (dBm)
2441.000000	257.670	400.000	0.000	-16.0



Tx Time per hop = 257.670ms / 94.8 = 2.71ms.

Measurement uncertainty (%)	<±0.12
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TEST RESULTS (Cont.)

Measurement Setup

Setting	Instrument Value
Center Frequency	2.44100 GHz
Span	Zero span
RBW	500.000 kHz
VBW	1.000 MHz
SweepPoints	30001
SweepTime	31.600 s
Reference Level	0.000 dBm
Attenuation	10.000 dB
Detector	MaxPeak
SweepCount	1
Filter	Channel
Trace Mode	Clear write
Sweeptype	Sweep
Preamp	off
Trigger	External
Trigger Offset	0.00 ms

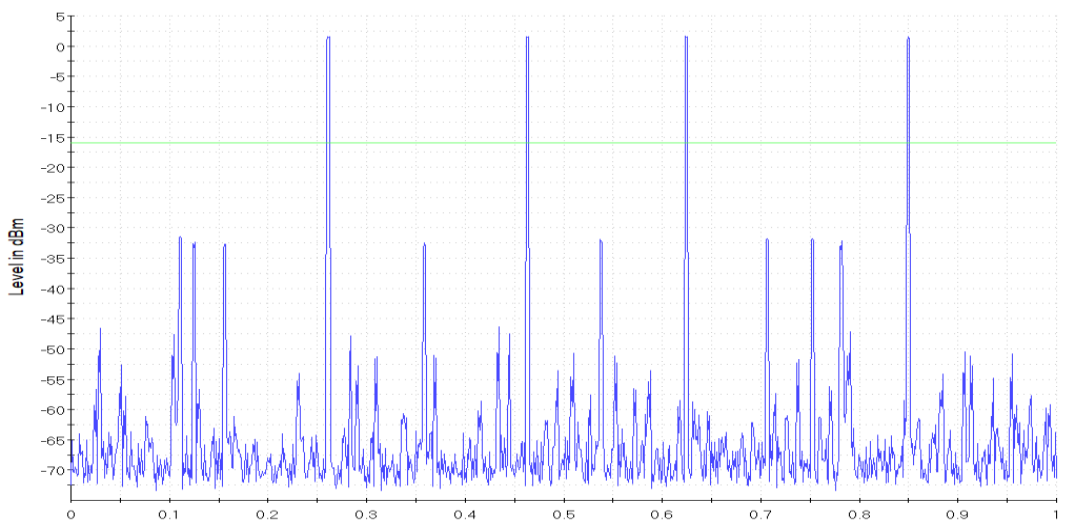
OSP Measurement

Setting	Instrument Value
Measurement Time	31.600 s
Trace Points	3160000
Time resolution	10.000 μ s
Detector	RMS

PACKET TYPE 2DH5

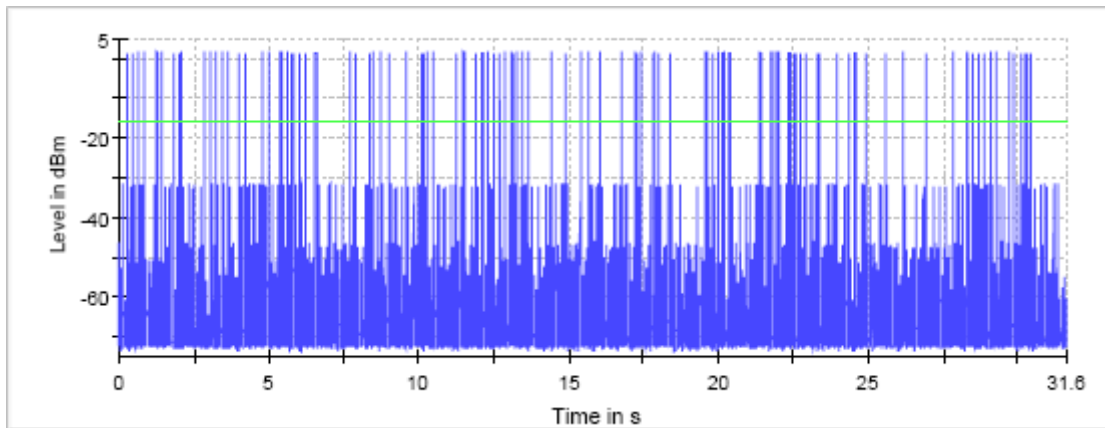
Number of hops over a period of 1 second = 4 (See next plot)

Number of hops in the period specified in the requirements = (4 hops) * (31.6/1s) = 126.4 hops.



Average Time of Occupancy Per 31.6s = 243.660ms. (See below table)

DUT Frequency (MHz)	Time (ms)	Limit Max (ms)	Limit Min (ms)	Threshold (dBm)
2441.000000	243.660	400.000	0.000	-16.0



Tx Time per hop = 243.660ms / 126.4 = 1.92ms.

Measurement uncertainty (%)	<±0.12
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TEST RESULTS (Cont.)

Measurement Setup

Setting	Instrument Value
Center Frequency	2.44100 GHz
Span	Zero span
RBW	500.000 kHz
VBW	1.000 MHz
SweepPoints	30001
SweepTime	31.600 s
Reference Level	0.000 dBm
Attenuation	10.000 dB
Detector	MaxPeak
SweepCount	1
Filter	Channel
Trace Mode	Clear write
Sweeptype	Sweep
Preamp	off
Trigger	External
Trigger Offset	0.00 ms

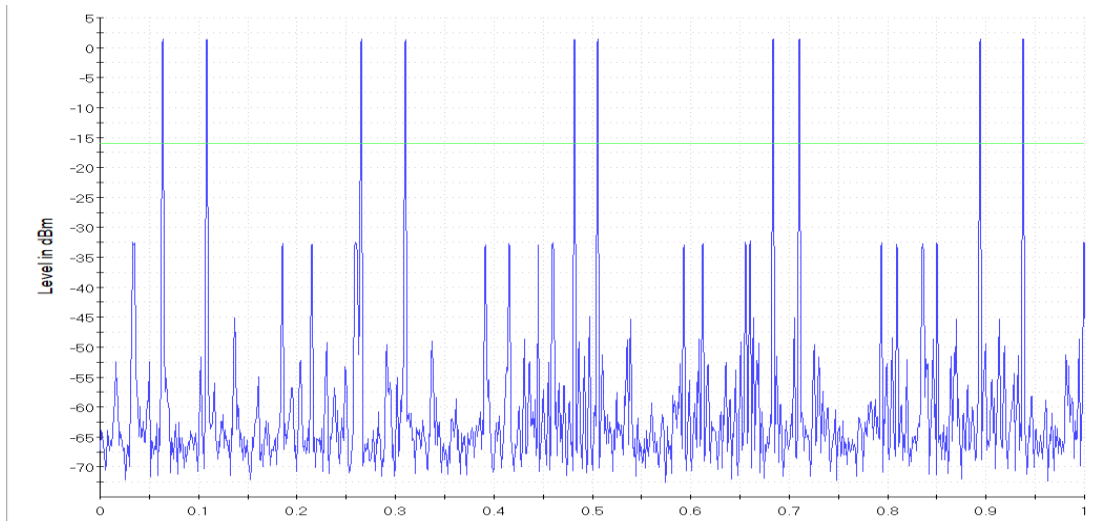
OSP Measurement

Setting	Instrument Value
Measurement Time	31.600 s
Trace Points	3160000
Time resolution	10.000 μ s
Detector	RMS

TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#03 (8DPSK)
TEST RESULTS:	PASS
TEST RESULTS (Cont.)	PACKET TYPE 3DH1

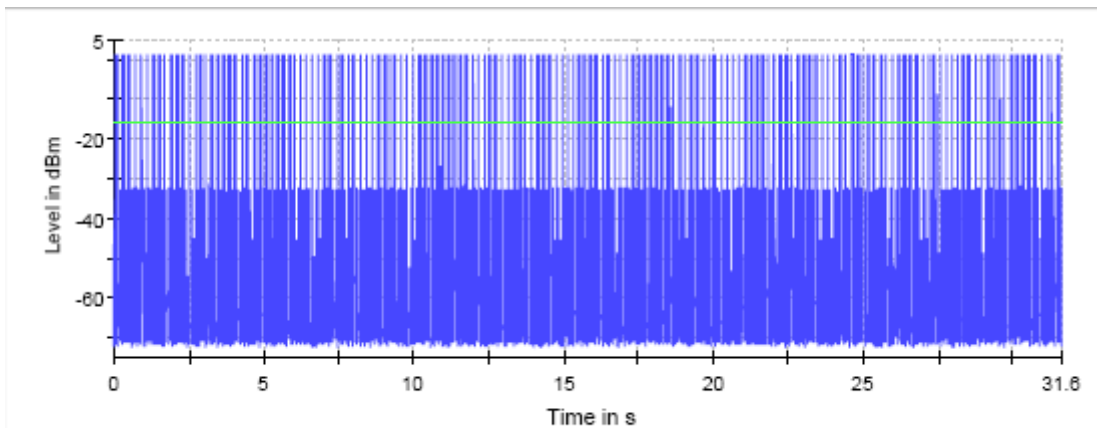
Number of hops over a period of 1 second = 10 (See next plot)

Number of hops in the period specified in the requirements = (10 hops) * (31.6/1s) = 316 hops.



Average Time of Occupancy Per 31.6s = 352.470ms. (See below table)

DUT Frequency (MHz)	Time (ms)	Limit Max (ms)	Limit Min (ms)	Threshold (dBm)
2441.000000	352.470	400.000	0.000	-16.0



Trace Threshold

Tx Time per hop = 352.470ms / 316 = 1.11ms

Measurement uncertainty (%)	<±0.12
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TEST RESULTS (Cont.)

Measurement Setup

Setting	Instrument Value
Center Frequency	2.44100 GHz
Span	Zero span
RBW	500.000 kHz
VBW	1.000 MHz
SweepPoints	30001
SweepTime	31.600 s
Reference Level	0.000 dBm
Attenuation	10.000 dB
Detector	MaxPeak
SweepCount	1
Filter	Channel
Trace Mode	Clear write
SweepType	Sweep
Preamp	off
Trigger	External
Trigger Offset	0.00 ms

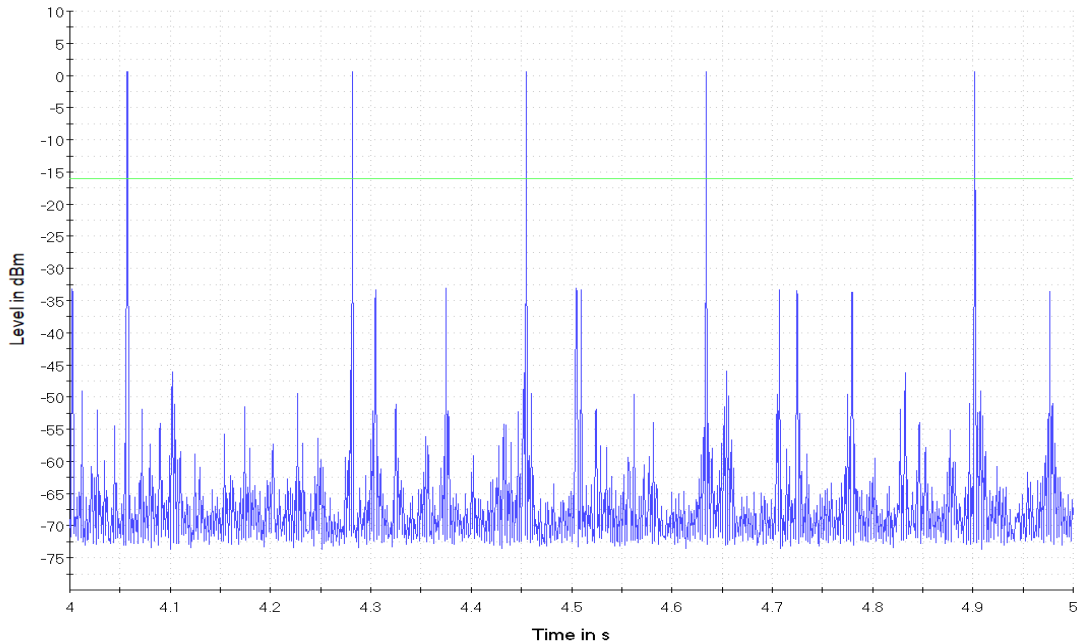
OSP Measurement

Setting	Instrument Value
Measurement Time	31.600 s
Trace Points	3160000
Time resolution	10.000 μ s
Detector	RMS

PACKET TYPE 3DH3

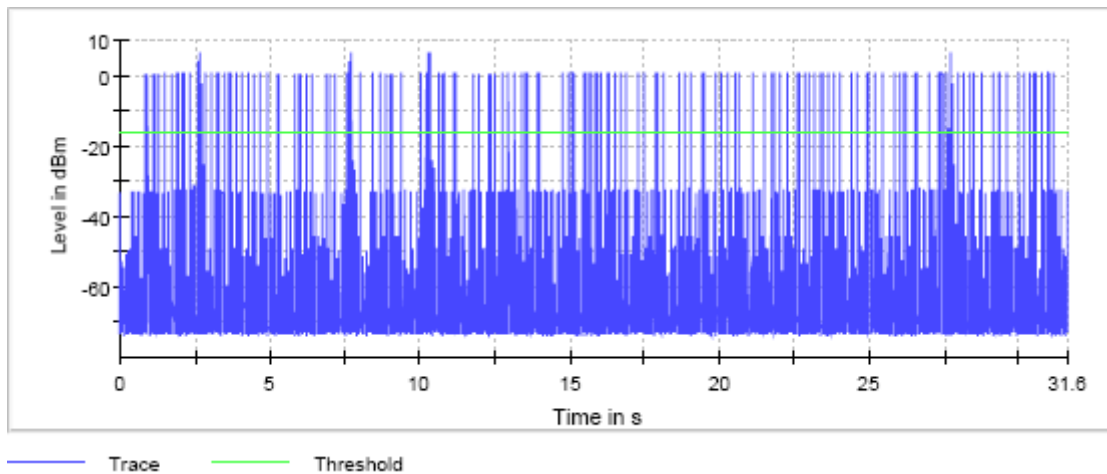
Number of hops over a period of 1 second = 5 (See next plot)

Number of hops in the period specified in the requirements = (5 hops) * (31.6/1s) = 158 hops.



Average Time of Occupancy Per 31.6s = 87.760ms. (See below table)

DUT Frequency (MHz)	Time (ms)	Limit Max (ms)	Limit Min (ms)	Threshold (dBm)
2441.000000	87.760	400.000	0.000	-16.0



Tx Time per hop = 87.760ms / 158 = 555 μ s.

Measurement uncertainty (%)	< \pm 0.12
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TEST RESULTS (Cont.)

Measurement Setup

Setting	Instrument Value
Center Frequency	2.44100 GHz
Span	Zero span
RBW	500.000 kHz
VBW	1.000 MHz
SweepPoints	30001
SweepTime	31.600 s
Reference Level	0.000 dBm
Attenuation	10.000 dB
Detector	MaxPeak
SweepCount	1
Filter	Channel
Trace Mode	Clear write
SweepType	Sweep
Preamp	off
Trigger	External
Trigger Offset	0.00 ms

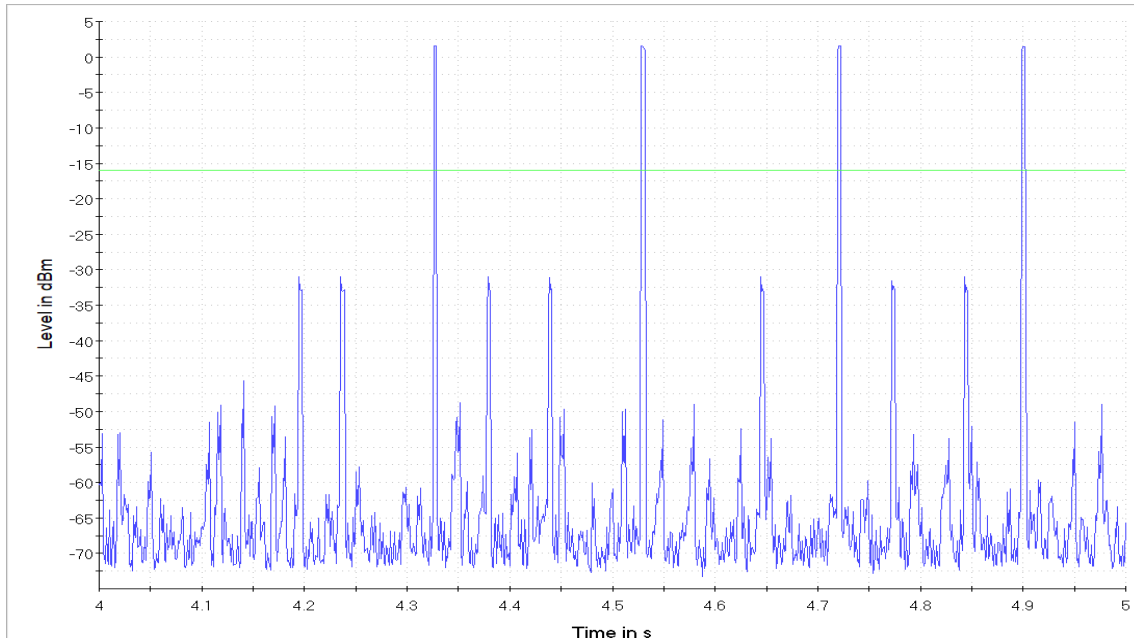
OSP Measurement

Setting	Instrument Value
Measurement Time	31.600 s
Trace Points	3160000
Time resolution	10.000 μ s
Detector	RMS

PACKET TYPE 3DH5

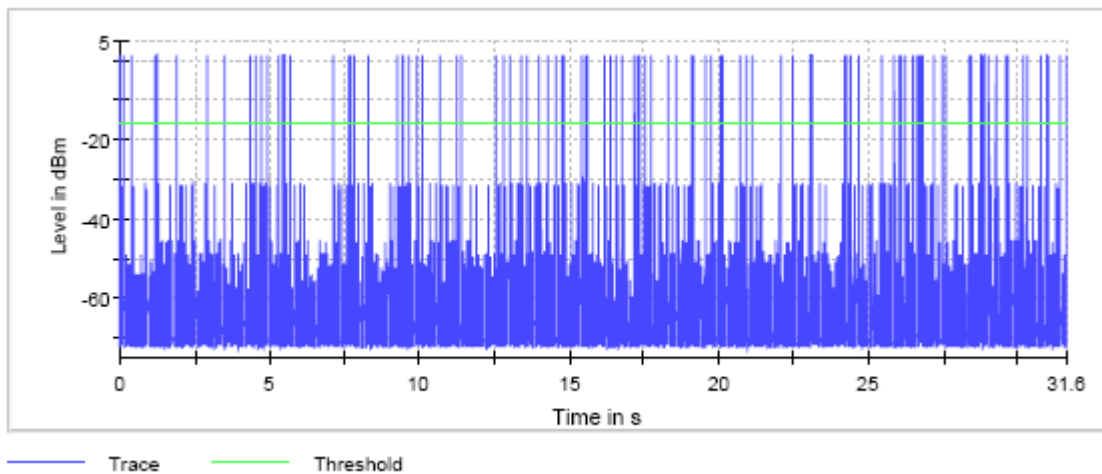
Number of hops over a period of 1 second = 4 (See next plot)

Number of hops in the period specified in the requirements = (4 hops) * (31.6/1s) = 126.4 hops.



Average Time of Occupancy Per 31.6s = 285.590ms. (See below table)

DUT Frequency (MHz)	Time (ms)	Limit Max (ms)	Limit Min (ms)	Threshold (dBm)
2441.000000	285.590	400.000	0.000	-16.0



Tx Time per hop = 285.590ms / 126.4 = 2.26ms.

Measurement uncertainty (%)	<±0.12
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TEST RESULTS (Cont.)

Measurement Setup

Setting	Instrument Value
Center Frequency	2.44100 GHz
Span	Zero span
RBW	500.000 kHz
VBW	1.000 MHz
SweepPoints	30001
SweepTime	31.600 s
Reference Level	0.000 dBm
Attenuation	10.000 dB
Detector	MaxPeak
SweepCount	1
Filter	Channel
Trace Mode	Clear write
SweepType	Sweep
Preamp	off
Trigger	External
Trigger Offset	0.00 ms

OSP Measurement

Setting	Instrument Value
Measurement Time	31.600 s
Trace Points	3160000
Time resolution	10.000 μ s
Detector	RMS

TEST A.4: MAXIMUM PEAK CONDUCTED OUTPUT POWER AND ANTENNA GAIN

LIMITS:	Product standard:	Part 15 Subpart C §15.247 and RSS-247
	Test standard:	Part 15 Subpart C §15.247(b) (3) and RSS-247 5.4(b)

LIMITS

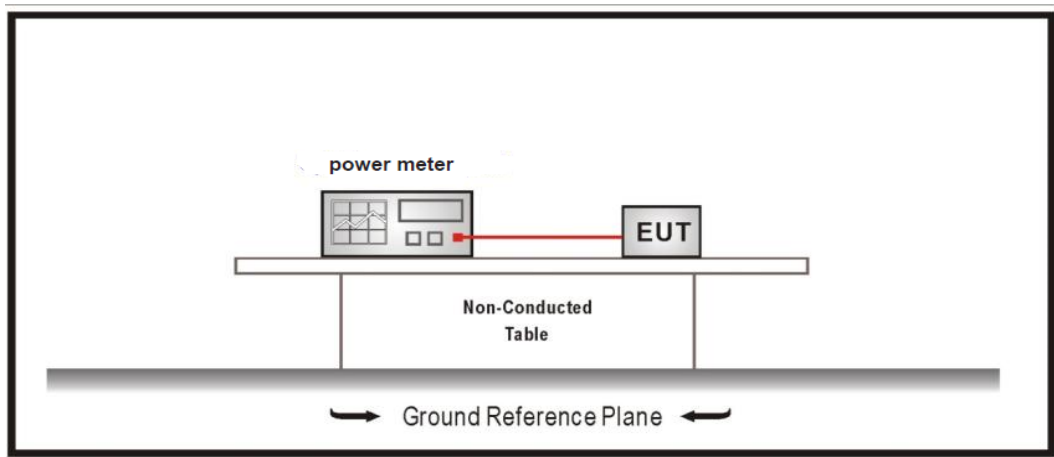
For Frequency Hopping systems operating in the 2400 – 2483.5 MHz band employing at least 75 hopping channels: 1 watt (30 dBm). (Part 15 Subpart C §15.247).

The e.i.r.p. shall not exceed 4 W (RSS-247).

TEST SETUP

Measured according to ANSI C63.10, Section 11.9.2.3.2 Method AVGPM-G

The EIRP power (dBm) is calculated by adding the declared maximum antenna gain to the measured conducted power



TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#01
TEST RESULTS:	PASS

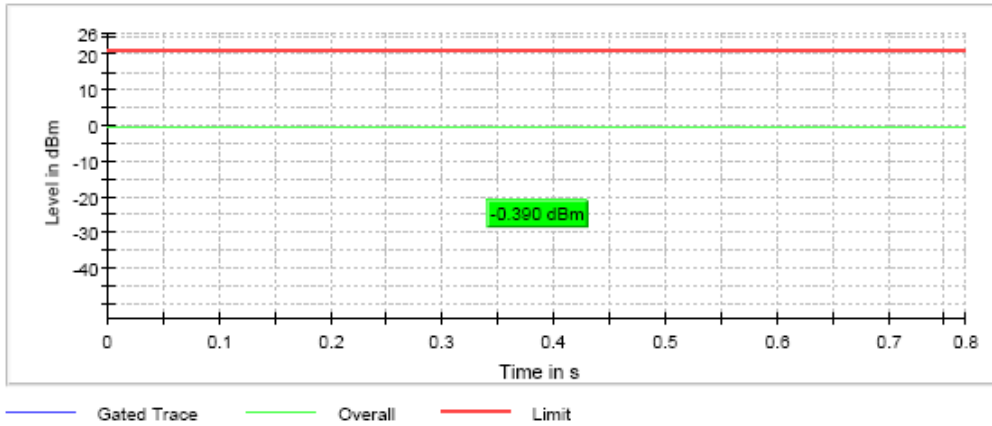
Maximum declared antenna gain: -3.5 dBi

	Lowest frequency 2402 MHz	Middle frequency 2441 MHz	Highest frequency 2480 MHz
Maximum conducted power (dBm)	-0.4	1.5	2.4
Maximum EIRP power (dBm)	-3.9	-2.0	-1.1
Measurement uncertainty (dB)	<±0.78		

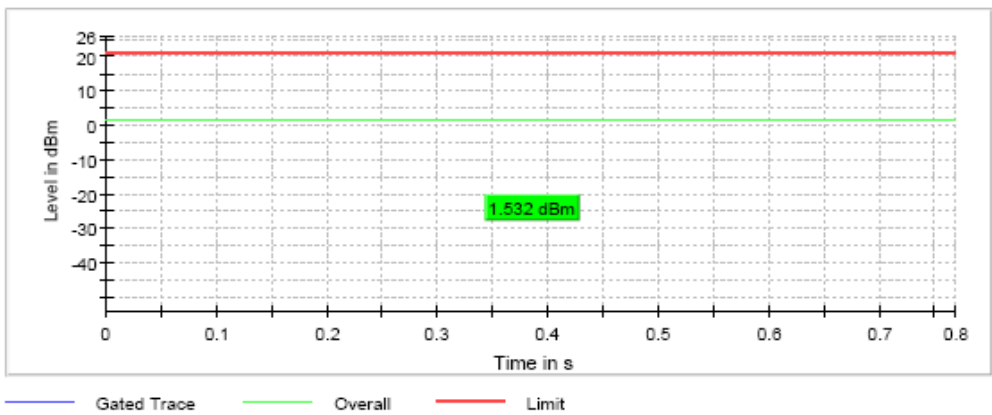
The maximum directional gain of the antenna is less than 6 dBi and therefore the maximum output power is not required to be reduced from the stated values.

TEST RESULTS (Cont.):	CONDUCTED OUTPUT POWER
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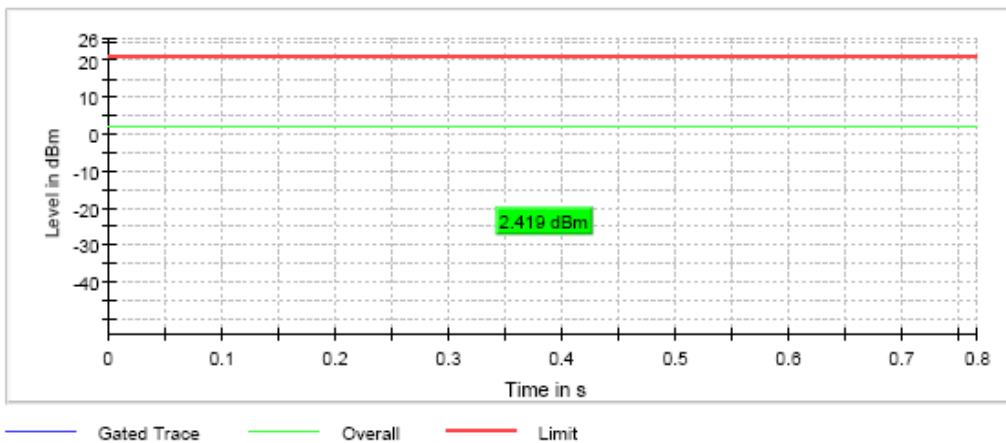
Lowest Channel



Middle Channel



Highest Channel



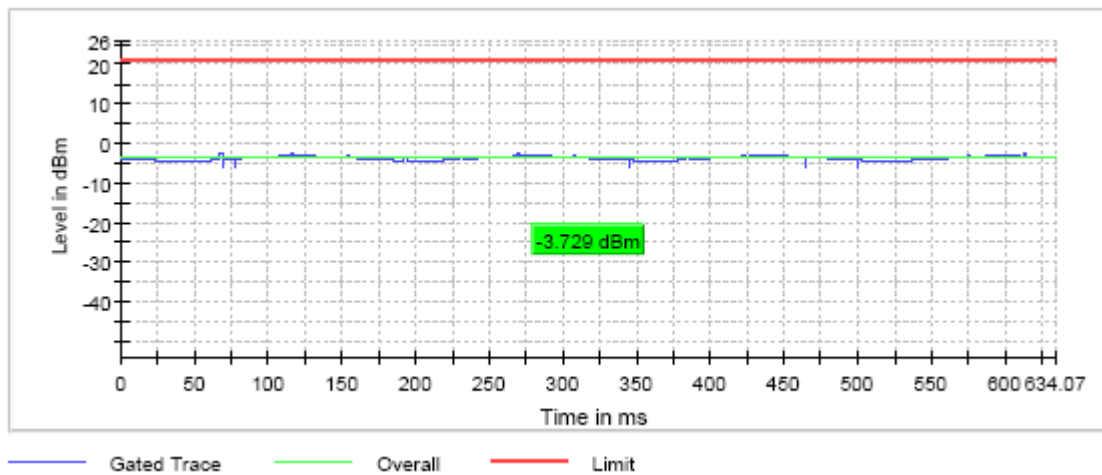
TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#02
TEST RESULTS:	PASS

Maximum declared antenna gain: -3.5 dBi

	Lowest frequency 2402 MHz	Middle frequency 2441 MHz	Highest frequency 2480 MHz
Maximum conducted power (dBm)	-3.7	-1.5	-0.4
Maximum EIRP power (dBm)	-7.2	-5.0	-3.9
Measurement uncertainty (dB)	<±0.78		

The maximum directional gain of the antenna is less than 6 dBi and therefore the maximum output power is not required to be reduced from the stated values.

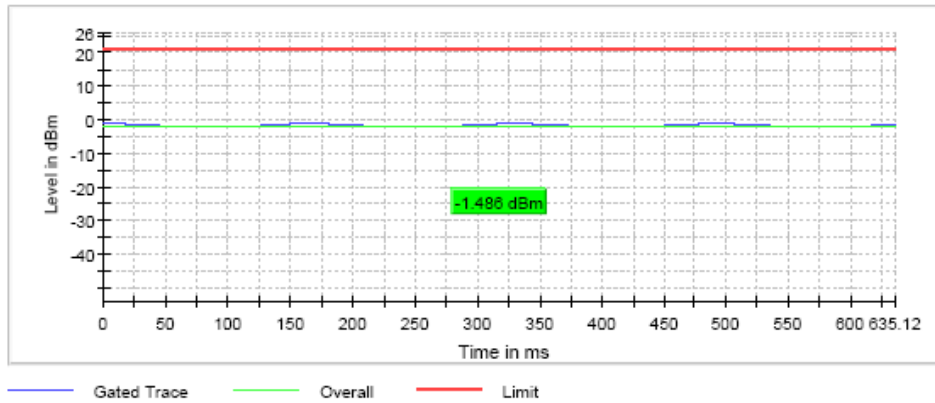
Lowest Channel



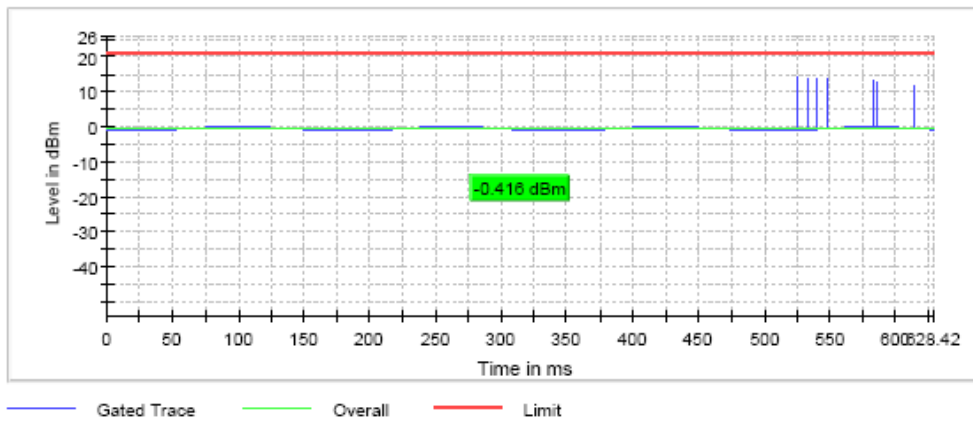
TEST RESULTS (Cont.)

CONDUCTED OUTPUT POWER

Middle Channel



Highest Channel



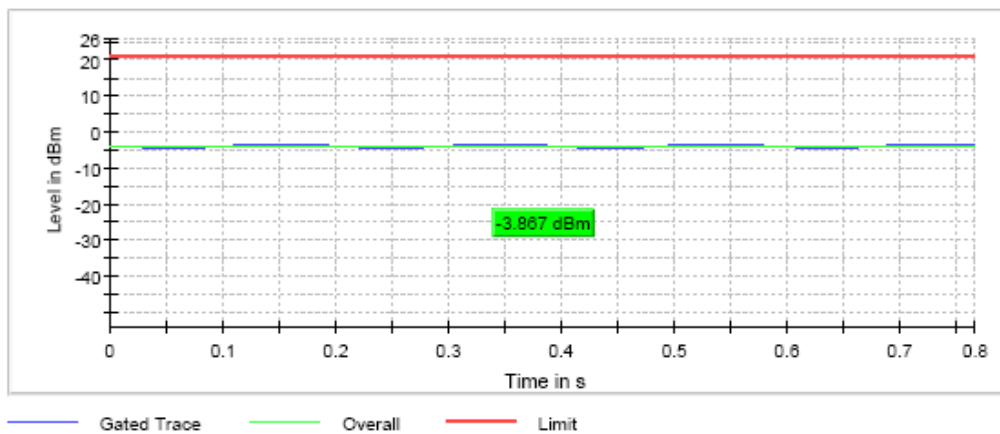
TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#03
TEST RESULTS:	PASS

Maximum declared antenna gain: -3.5 dBi

	Lowest frequency 2402 MHz	Middle frequency 2440 MHz	Highest frequency 2480 MHz
Maximum conducted power (dBm)	-3.9	0.2	-0.8
Maximum EIRP power (dBm)	-7.4	-3.7	-4.3
Measurement uncertainty (dB)	<±0.78		

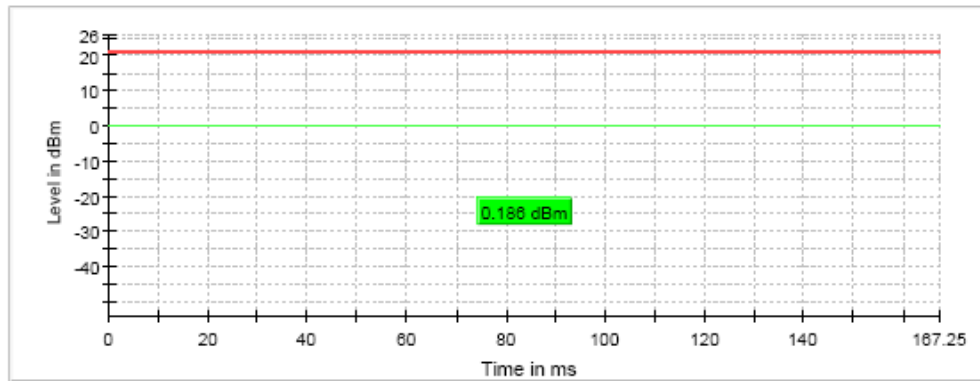
The maximum directional gain of the antenna is less than 6 dBi and therefore the maximum output power is not required to be reduced from the stated values.

Lowest Channel



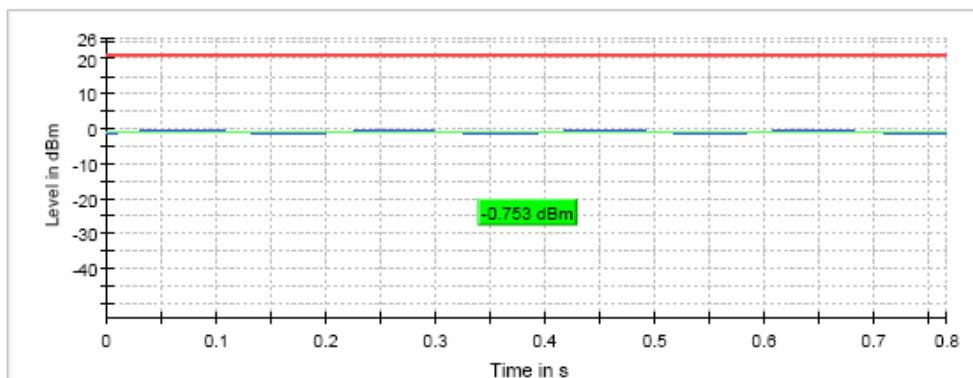
TEST RESULTS (Cont.)

Middle Channel



— Gated Trace — Overall — Limit

Highest Channel



— Gated Trace — Overall — Limit

TEST A.5: BAND-EDGE EMISSIONS COMPLIANCE (TRANSMITTER)

LIMITS:	Product standard:	Part 15 Subpart C §15.247 and RSS-247
	Test standard:	Part 15 Subpart C §15.247(d) and RSS-247 5.5

LIMITS

Emissions outside the frequency band in which the intentional radiator is operating shall be at least 20dB below the highest level of the desired power.

TEST SETUP

