

TEST REPORT

Report No.: 21031057HKG-004

Infinite Uptime India Pvt Ltd.

Japan RF Law Type Approval- 2.4GHz Band Wideband Low-power Data Communication System (WWA)

Prepared and Checked by:

Approved by:

Signed On File
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Assistant Manager
Date: 6 Aug 2021

TEST REPORT

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TEST REPORT

1.0 GENERAL INFORMATION

Report No.:	21031057HKG-004
Applicant:	Infinite Uptime India Pvt Ltd. 5B, Vasundhara space, nagras road, Aundh- 411007 Pune, Maharastra
Equipment Under Test (EUT):	
Product Description:	SKF Smart Edge Sensor
Model:	SKF Smart Edge Sensor
Manufacturer:	Arete Manufacturing Service Pvt Ltd.
Brand Name:	SKF Smart Edge Sensor
Samples No:	1/1
Sample Receipt Date:	1 Jul 2021
Test Conducted Date:	15 Jul 2021 to 20 Jul 2021
Issue Date:	6 Aug 2021
Test Site Location:	Workshop No. 3, G/F., World-Wide Industrial Centre, 43-47 Shan Mei Street, Fo Tan, Sha Tin, N.T., Hong Kong SAR, China.
Classification Of Specified Radio Equipment:	Article 2 Clause 1 Item 19
Type Of Emissions, Frequency and Declaration Output Power to Be Tested:	G1D 2412-2472MHz (5MHz interval 13 channels) 0.004W/MHz D1D G1D 2412-2472MHz (5MHz interval 13 channels) 0.002W/MHz D1D G1D 2422-2462MHz (5MHz interval 9 channels) 0.0009W/MHz
Modulation Method:	DSSS and OFDM
Environmental Conditions:	Temperature: +5 to +35°C Humidity: 45 to 85%
Testing Conditions:	Temperature: +21°C Humidity: 58%
Test Category:	2.4GHZ Band Wideband Low-Power Data Communication System
Antenna Gain:	-1.5dBi
Test Requirement:	MIC Test Procedure #43
Test Result:	Pass

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2.0 TEST RESULTS SUMMARY FOR JAPANESE CERTIFICATION

Infinite Uptime India Pvt Ltd.
Model: SKF Smart Edge Sensor
(Mode: B 1Mbps)

Test Item				limit	unit		24 V	Judge
Frequency				NA	MHz	2412.0	2442.0	2472.0
Frequency Error				50	ppm	-12.94	-13.27	-13.11
Occupied Bandwidth				26	MHz	13.14	13.14	13.20
Spreading Bandwidth				>500	kHz	9.60	9.60	9.60
Spreading factor				>5	-	9.60	9.60	9.60
								-
Spurious	30	~	1000	MHz	-26	dBm/MHz	-51.74	-51.42
								-51.18
								ok
	1000	~	2387	MHz	-26	dBm/MHz	806.00	815.70
								823.46
								ok
								-57.51
								-59.37
								-59.06
	2387	~	2400	MHz	-16	dBm/MHz	2387.00	2384.23
								2387.00
								ok
								-51.84
								-50.77
								-56.02
	2483.5	~	2496.5	MHz	-16	dBm/MHz	2399.56	2400.00
								2398.47
								ok
								-55.53
								-55.09
								-51.12
	2496.5	~	4000	MHz	-26	dBm/MHz	2484.15	2487.01
								2483.50
								ok
								-44.83
								-45.99
								-47.05
	4000	~	12500	MHz	-26	dBm/MHz	3215.17	3257.27
								3296.36
								ok
								-27.31
								-27.68
								-28.53
								ok
								4816.00
								4884.00
								4935.00
								-
Rated Power				4	mW/MHz			
								ok
Antenna Power				10	mW/MHz	2.86	2.67	2.42
								ok
				-80	%	-28.50	-33.18	-39.50
								ok
Antenna Gain:	-1.5	dBi		12.14	dBm/MHz	3.06	2.77	2.34
								ok
								-
Collateral emission	30	~	1000	MHz	-54	dBm/MHz	-62.05	-63.95
								-56.95
								ok
								916.58
								953.44
								916.58
	1000	~	3000	MHz	-47	dBm/MHz	-67.71	-70.19
								-69.31
								ok
								1728.00
								2484.00
								2444.00
	3000	~	6000	MHz	-47	dBm/MHz	-52.28	-52.57
								-52.80
								ok
								3216.00
								3252.00
								3294.00
	6000	~	12500	MHz	-47	dBm/MHz	-56.95	-56.76
								-56.60
								ok
								10953.00
								8054.00
								9016.00
								-
								-
System:ID				yes		Complies		
								ok
System:Carrier Sense				na				
								-
System:DFS				na				
								-

Note:

Measurement was conducted by the following test method:

MIC TEST PROCEDURE #43 or the test method more than equivalent.

Test is performed only at 24VDC because the voltage variation to EUT is less than 1% (see details in Item 3.9).

The data rate to be measured was selected by finding the maximum power at 3.10

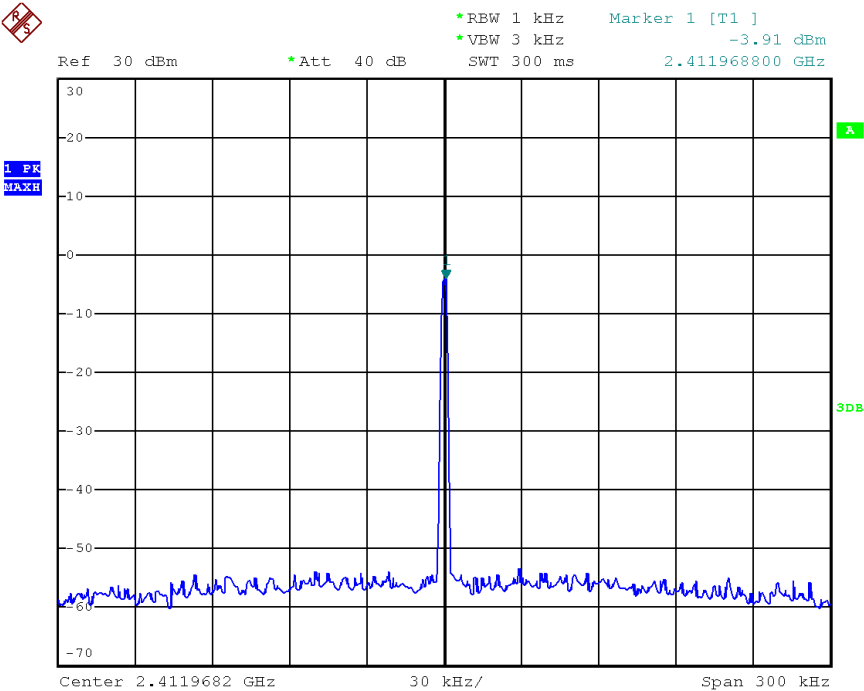
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3.0 MEASUREMENT RESULTS

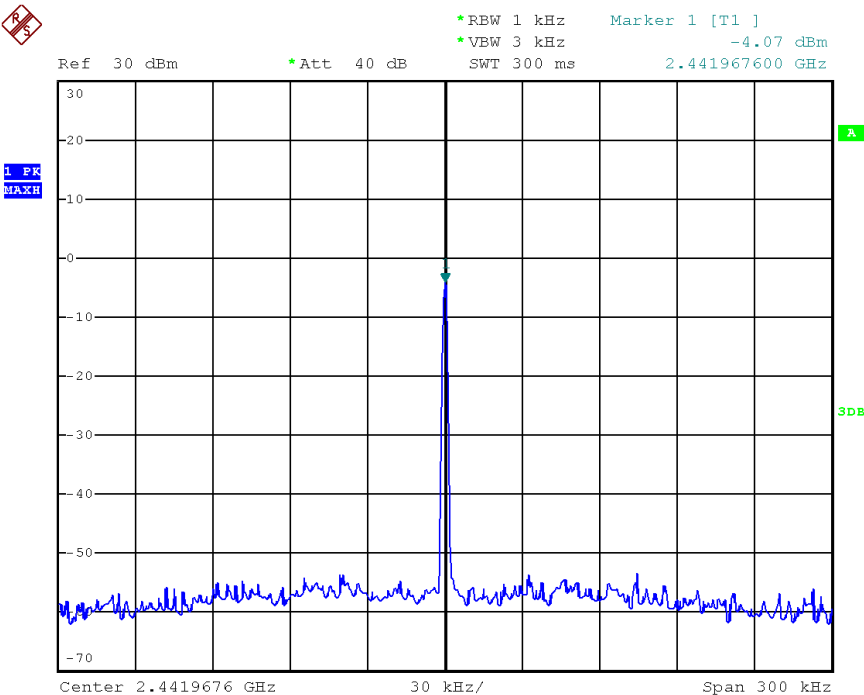
3.1 Frequency Tolerance

3.1.1 Modulation Type: b, g, n(20) un-modulation

2412MHz



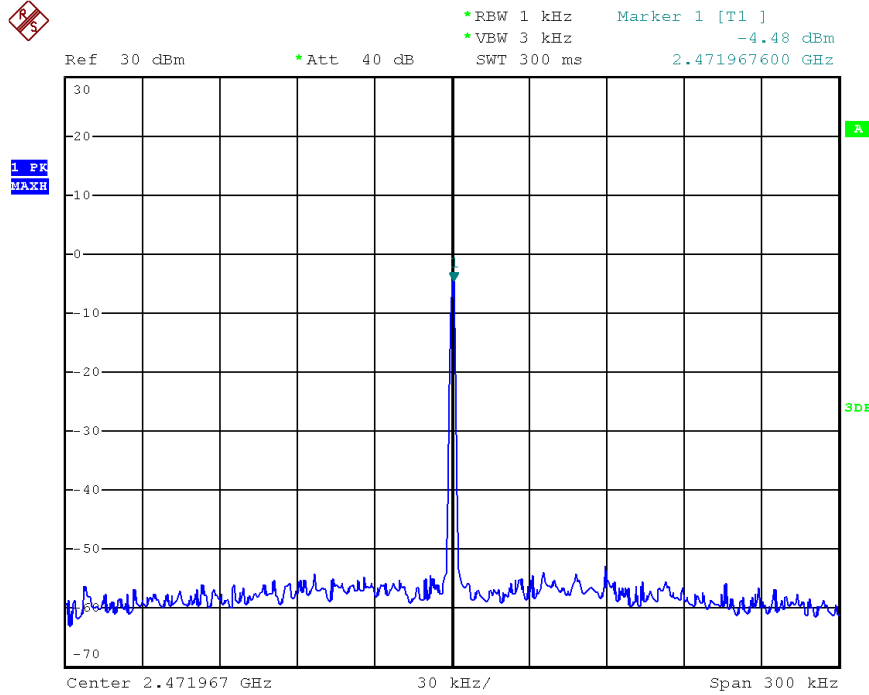
2442MHz



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3.1.1 Modulation Type: b, g, n(20) un-modulation

2472MHz



Note: Conducted measurement was preformed for this test.

Japanese Regulation:

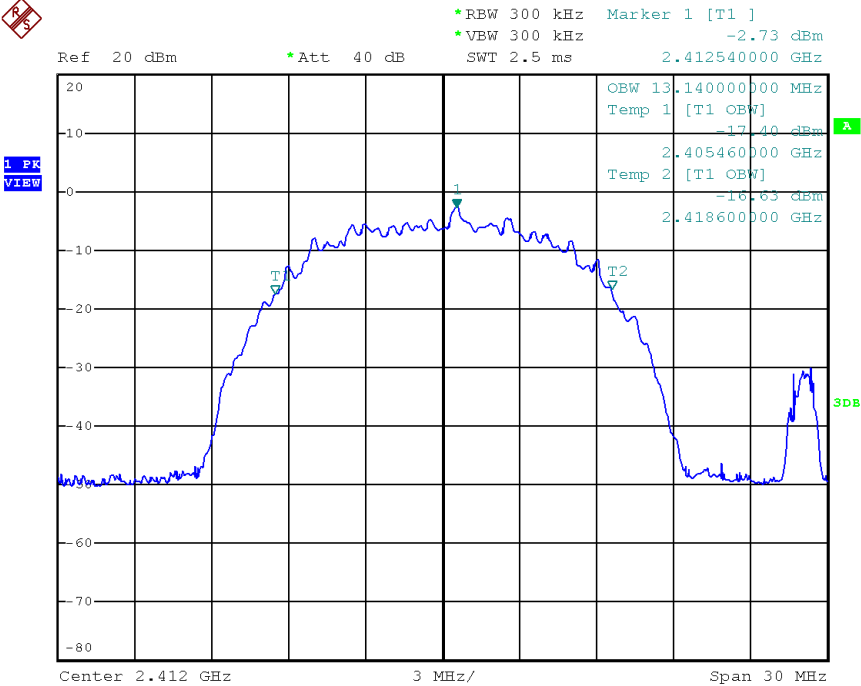
Frequency Tolerance shall be within +/-50ppm.

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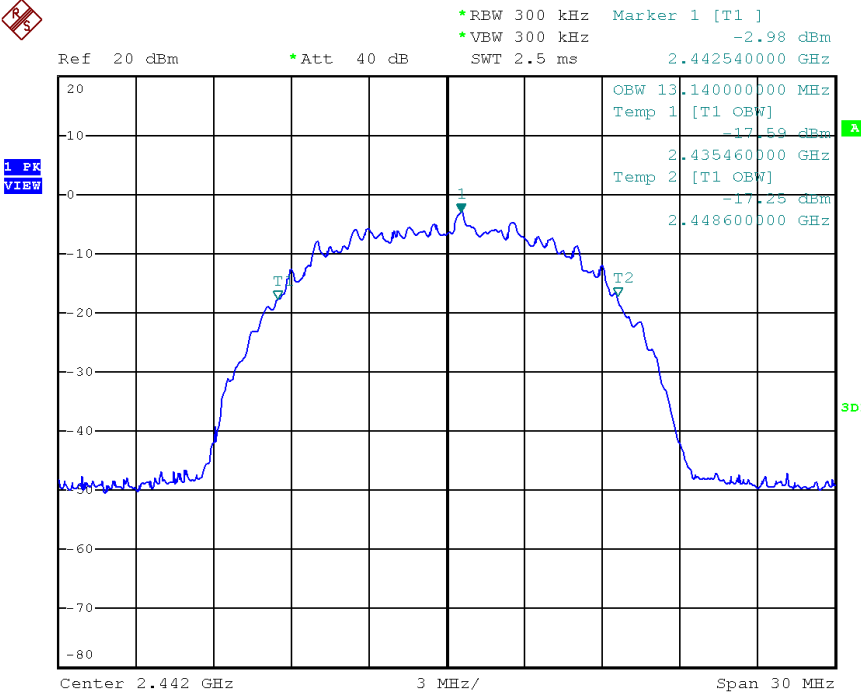
3.2 Occupied Bandwidth

3.2.1 Modulation Type: b Mode

2412MHz



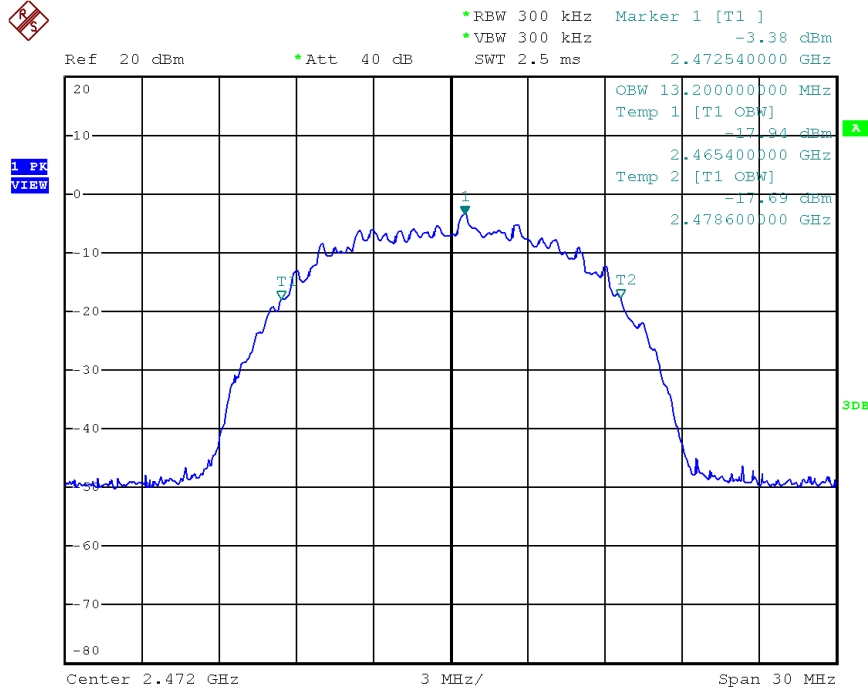
2442MHz



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3.2.1 Modulation Type: b Mode

2472MHz



Note: Conducted measurement was preformed for this test.

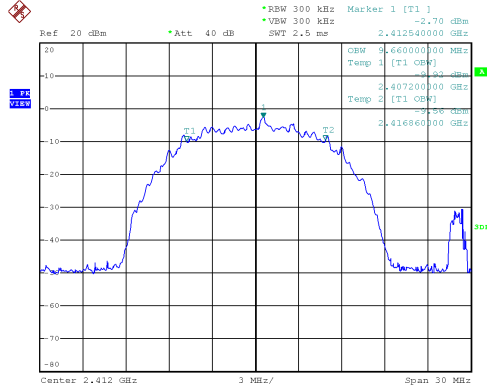
Japanese Regulation:

Occupied Bandwidth shall be 26 MHz or below.

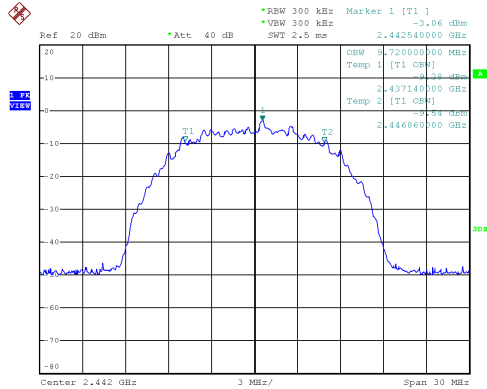
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3.3 Spreading Bandwidth

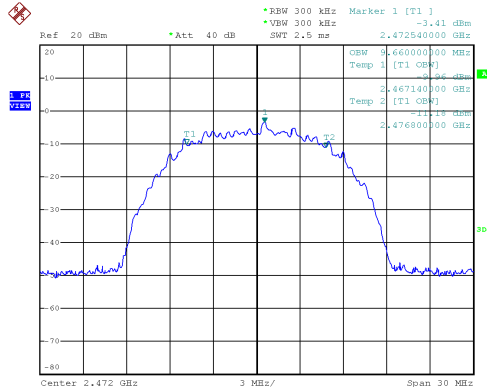
2412



2442



2472



Measurement Value			
Channel	(MHz)	Limit	Result
2412	9.6	≥500kHz	Pass
2442	9.6	≥500kHz	Pass
2472	9.6	≥500kHz	Pass

Note: Conducted measurement was performed for this test.

Japanese Regulation:

Spreading Bandwidth shall be greater than 500kHz.

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3.4 Spreading Rate Calculation

Measurement Value			
Channel	(MHz)	Limit	Result
2412	9.6	≥5	Pass
2442	9.6	≥5	Pass
2472	9.6	≥5	Pass

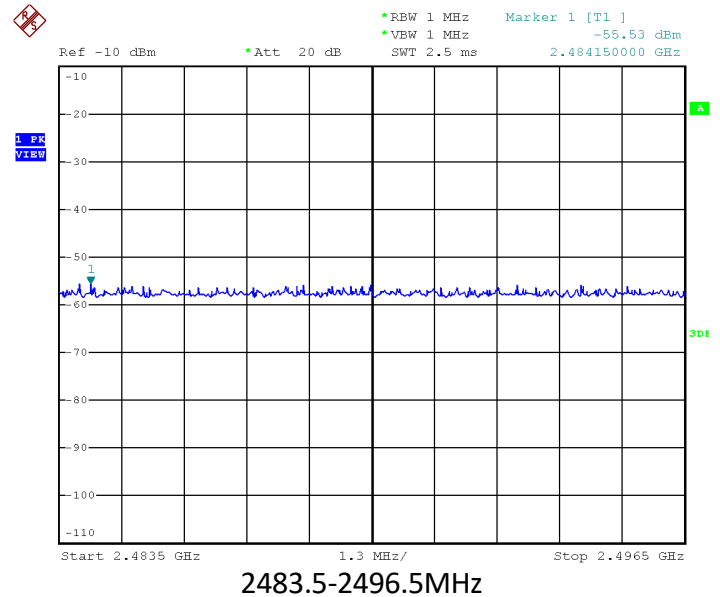
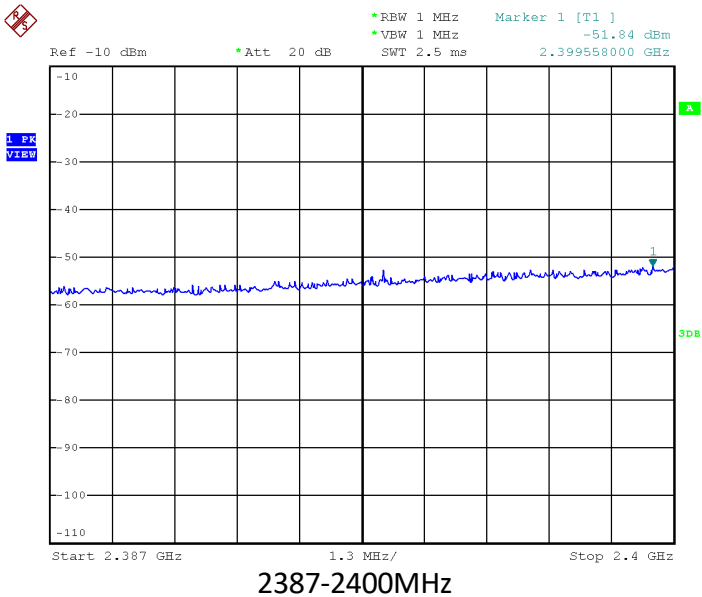
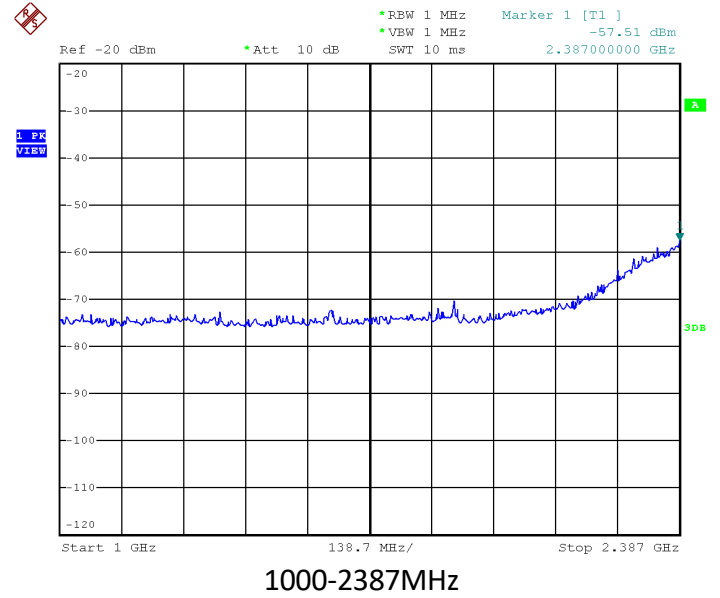
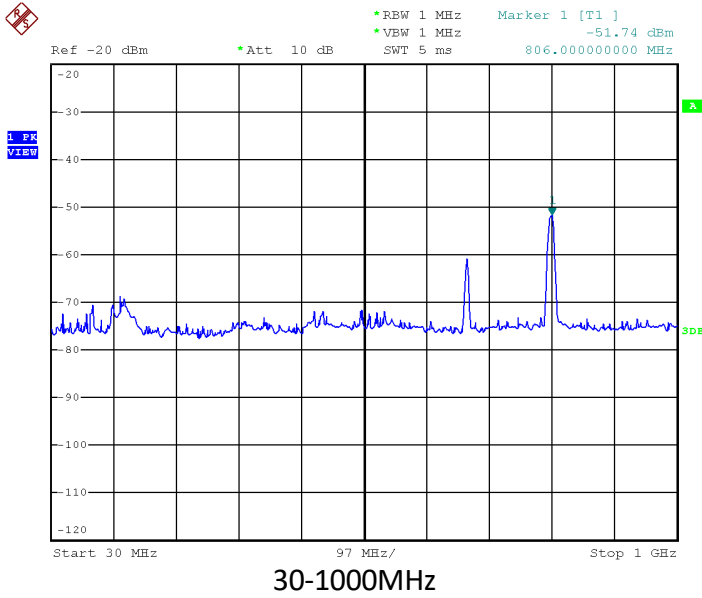
Japanese Regulation:

Spreading rate shall be greater than 5.

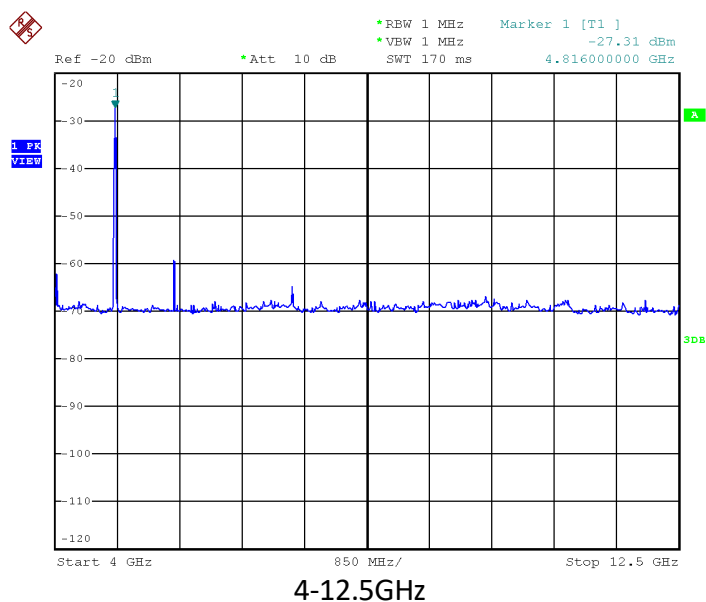
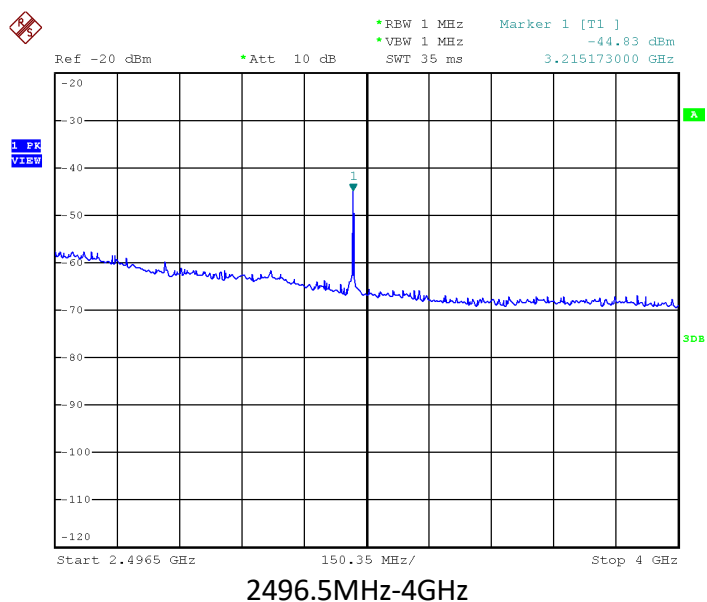
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3.5 Spurious Strength

3.5.1 Modulation Type: b Mode Channel: 2412MHz



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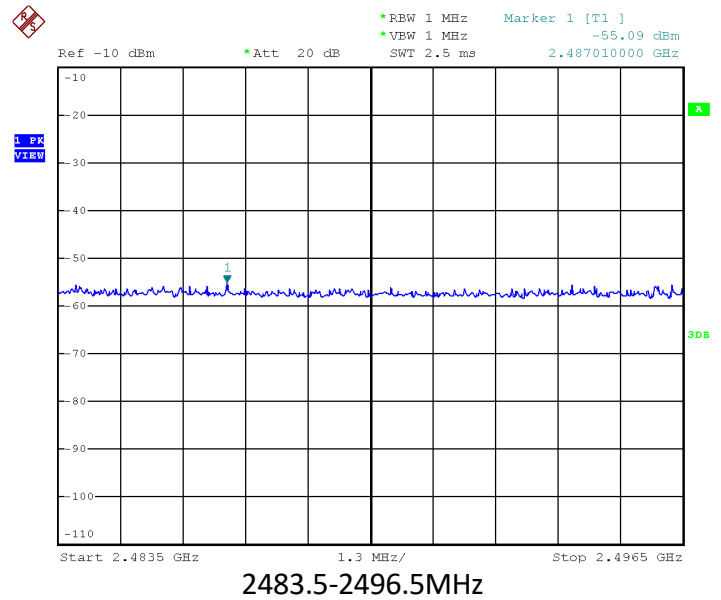
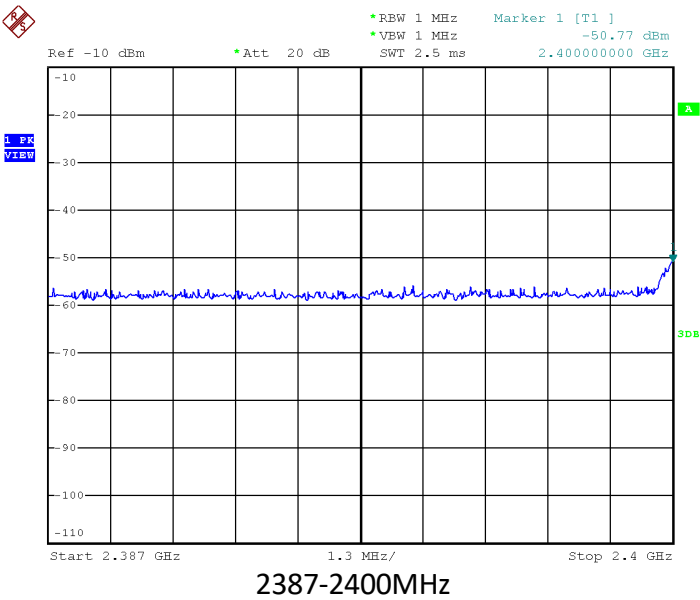
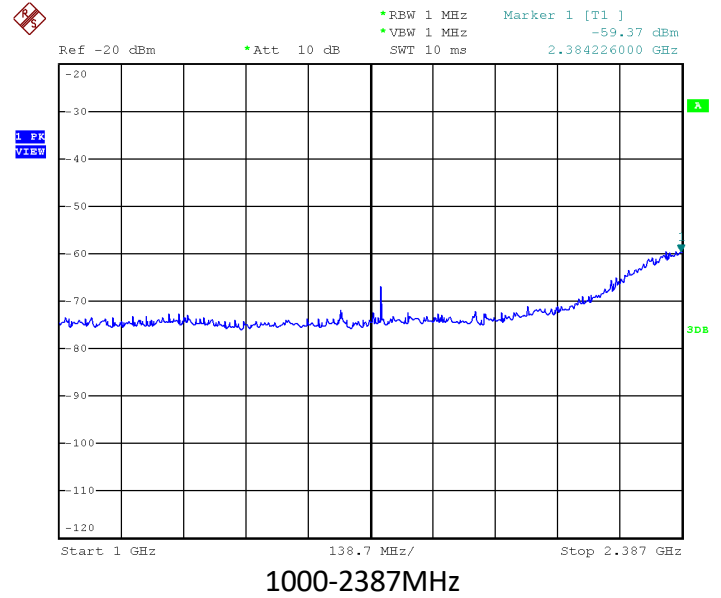
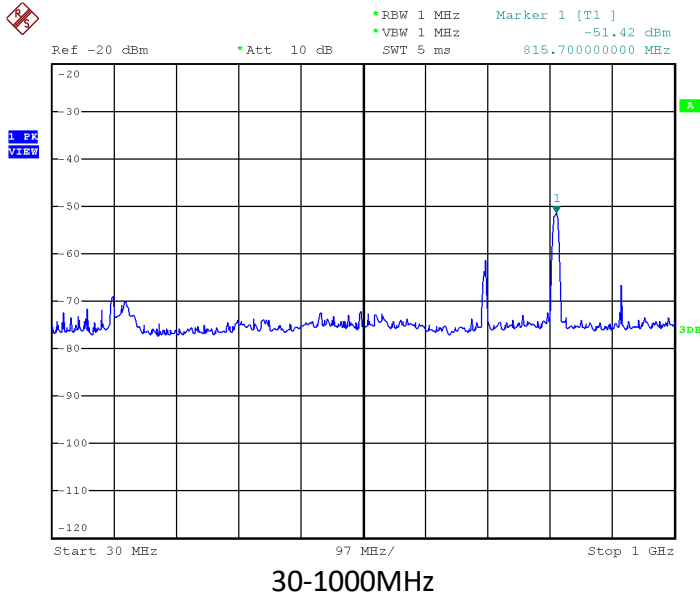


Note:

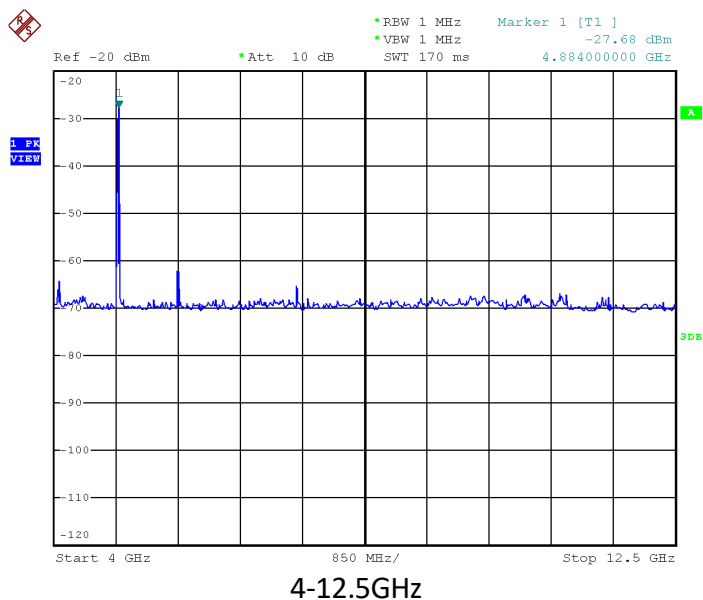
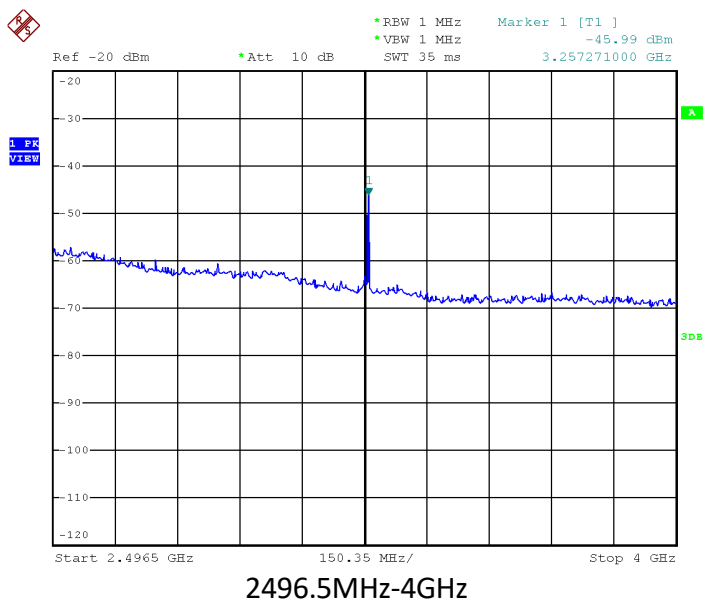
1. Negative sign (-) in the margin column signify levels below the limit.
2. Other emissions found were at least 10 dB below the limit at the measurement range.
3. -16.0dBm corresponds to 25uW.
4. -26.0dBm corresponds to 2.5uW.
5. Measurement uncertainty is ± 5.3 dB at a level of confidence of 95%.
6. Radiated measurement was performed for this test.

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3.5.2 Modulation Type: b Mode Channel: 2442MHz



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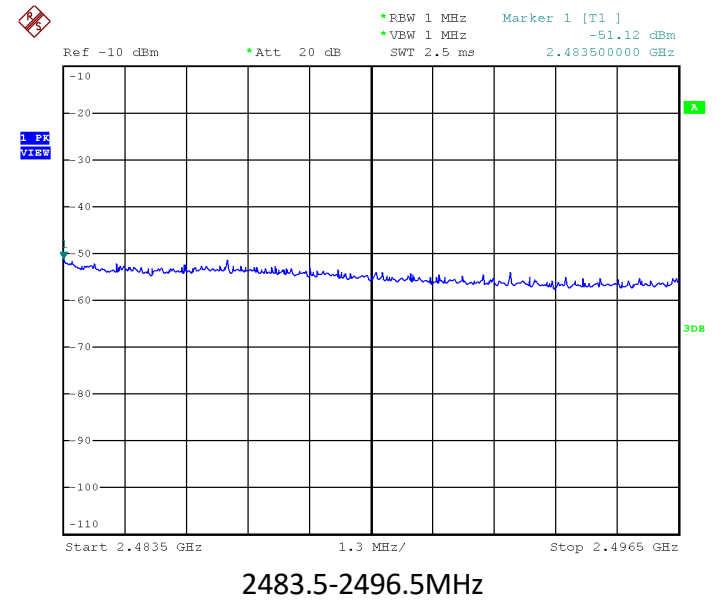
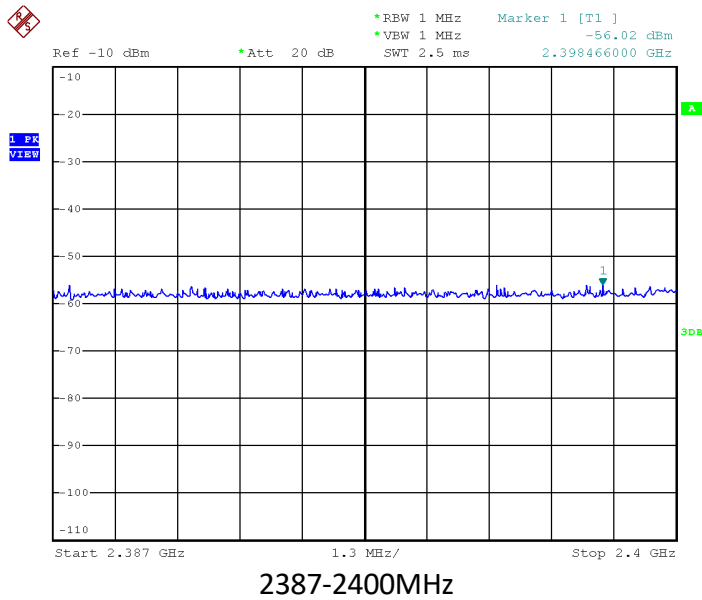
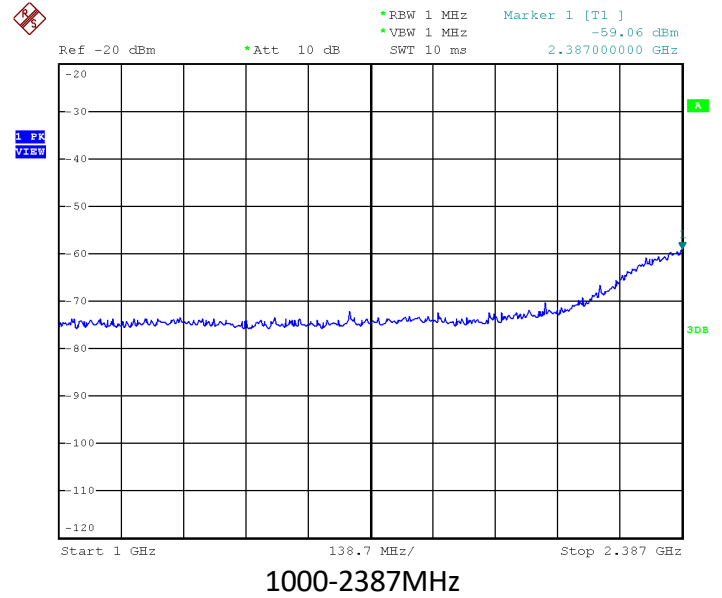
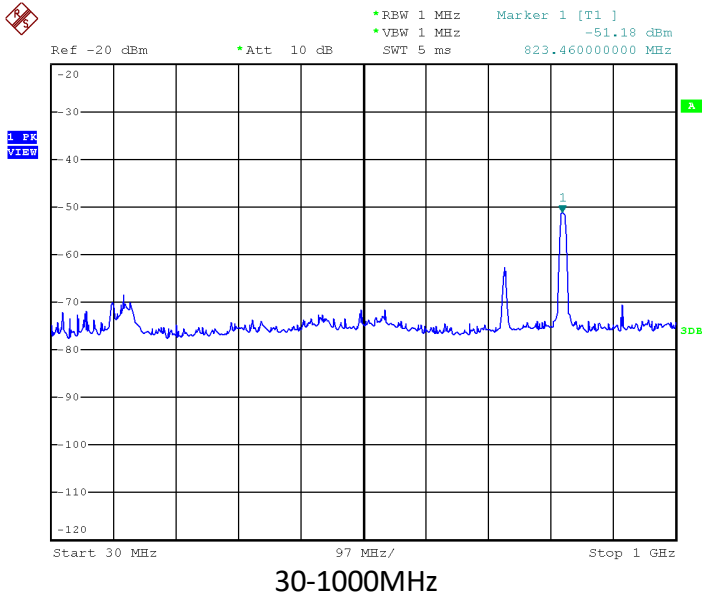


Note:

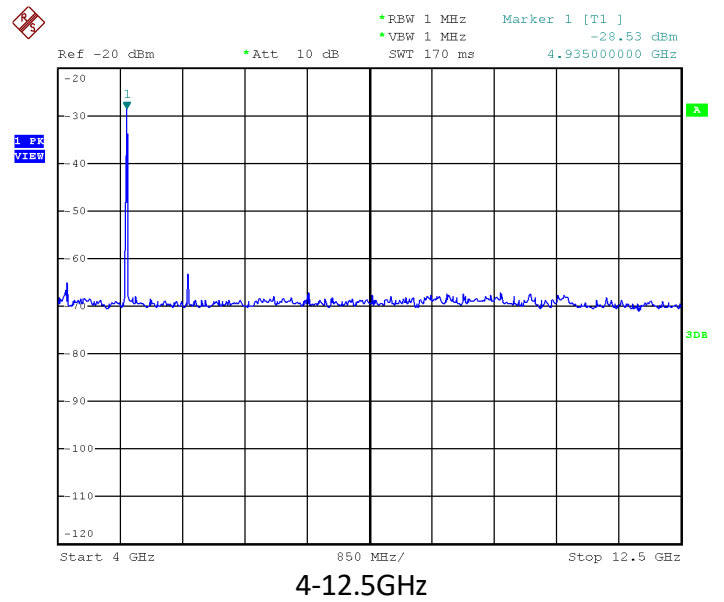
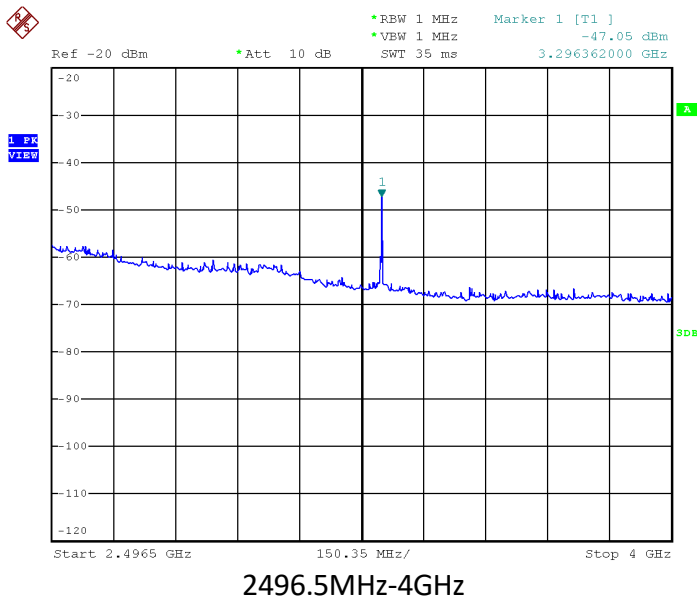
1. Negative sign (-) in the margin column signify levels below the limit.
2. Other emissions found were at least 10 dB below the limit at the measurement range.
3. -16.0dBm corresponds to 25uW.
4. -26.0dBm corresponds to 2.5uW.
5. Measurement uncertainty is ± 5.3 dB at a level of confidence of 95%.
6. Radiated measurement was performed for this test.

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3.5.3 Modulation Type: b Mode Channel: 2472 MHz



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Note:

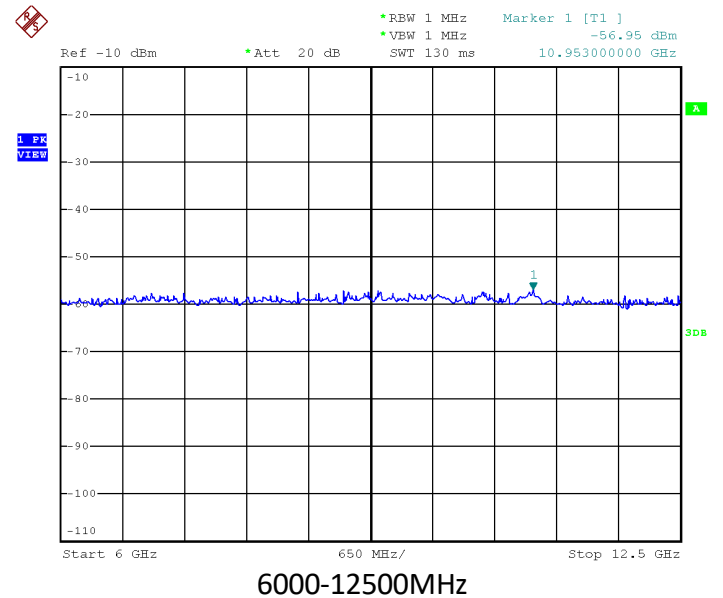
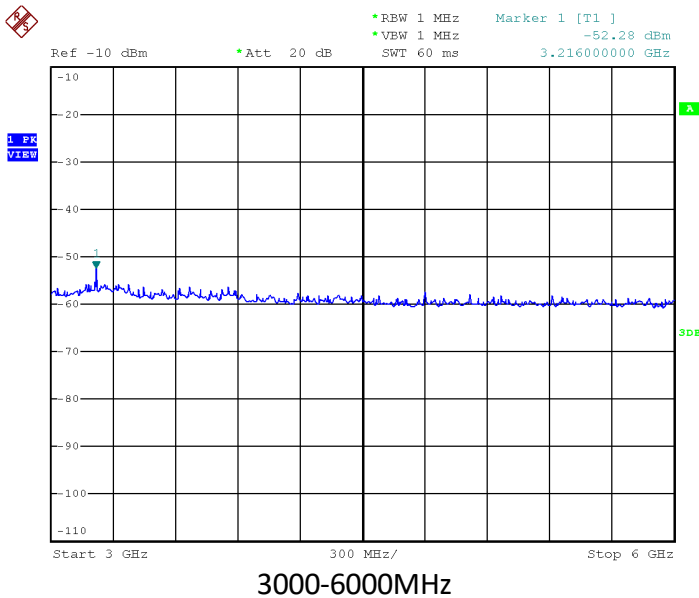
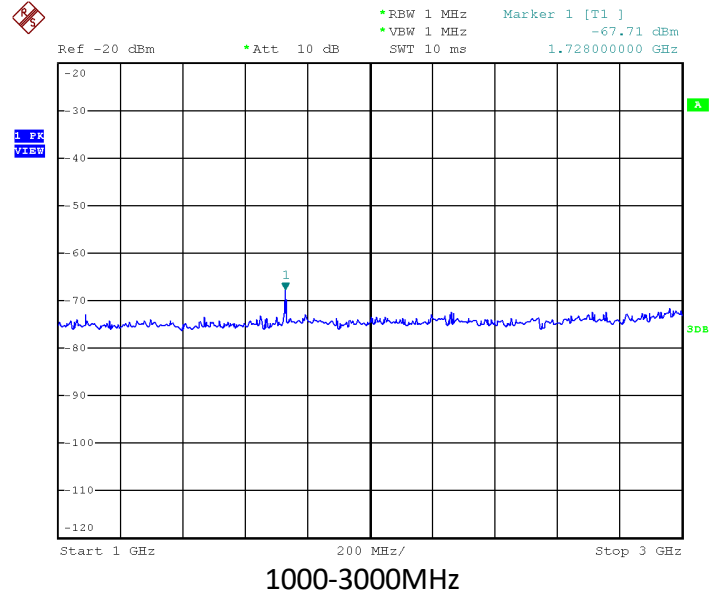
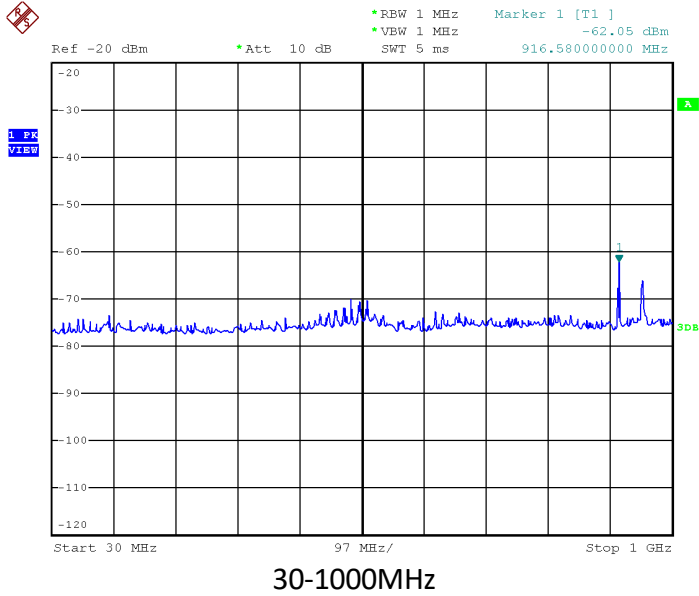
1. Negative sign (-) in the margin column signify levels below the limit.
2. Other emissions found were at least 10 dB below the limit at the measurement range.
3. -16.0dBm corresponds to 25uW.
4. -26.0dBm corresponds to 2.5uW.
5. Measurement uncertainty is ± 5.3 dB at a level of confidence of 95%.
6. Radiated measurement was performed for this test.

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3.6 Collateral Emission Strength

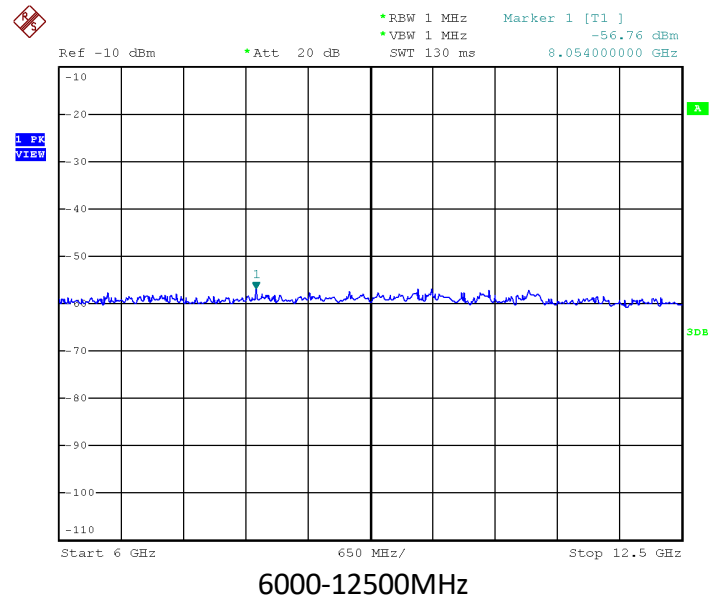
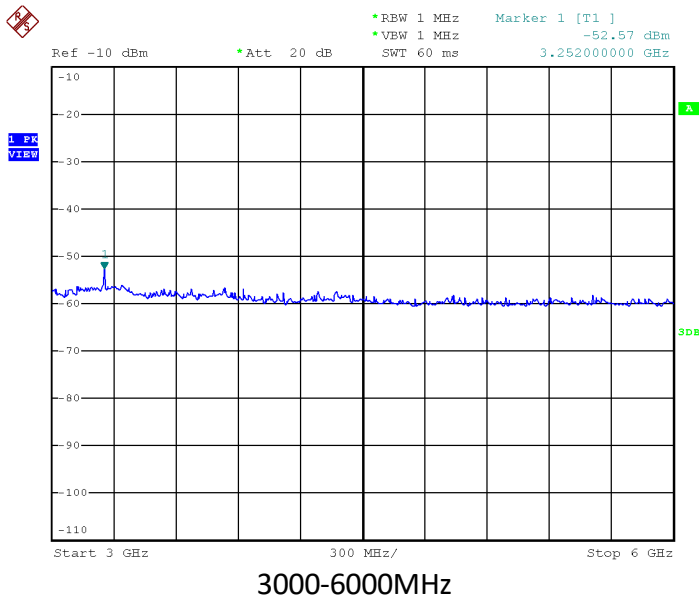
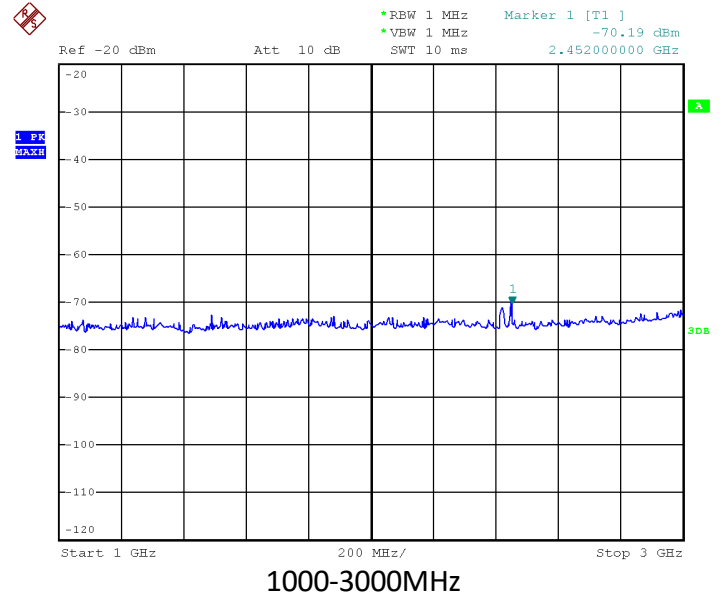
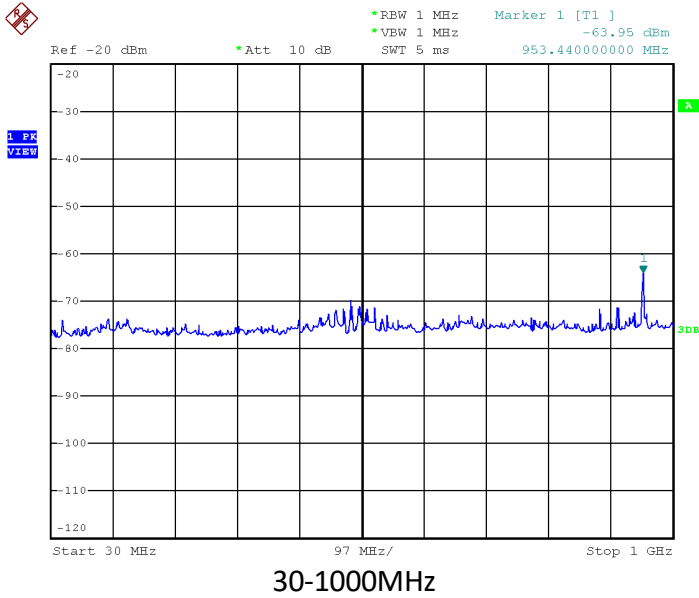
3.6.1 Modulation Type: b Mode

Channel: 2412MHz



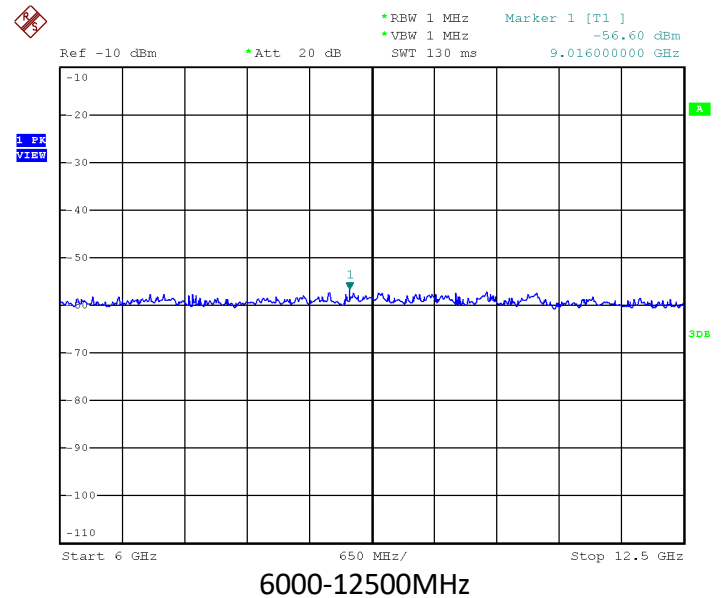
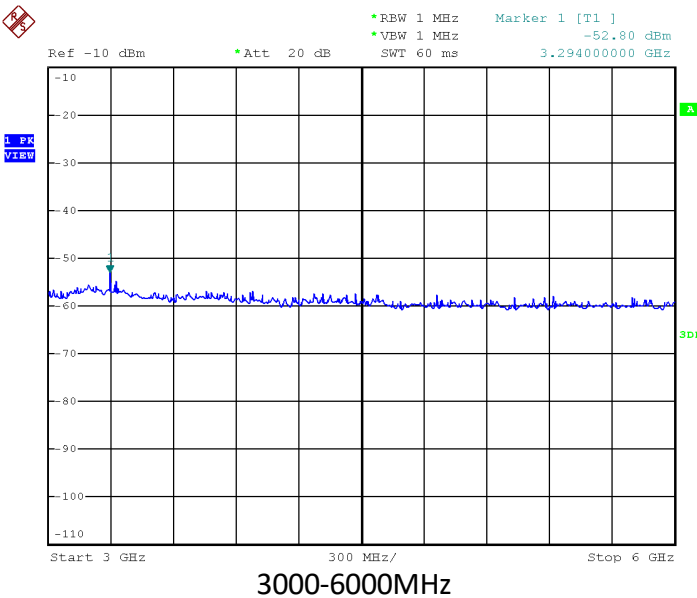
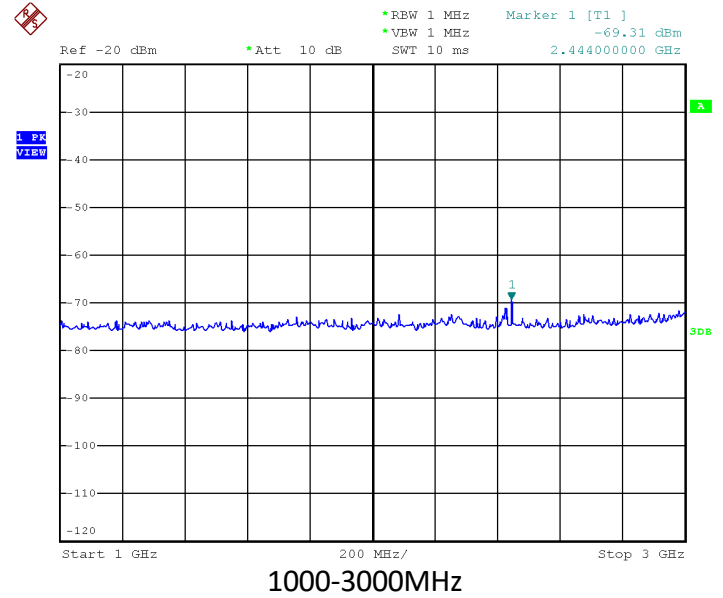
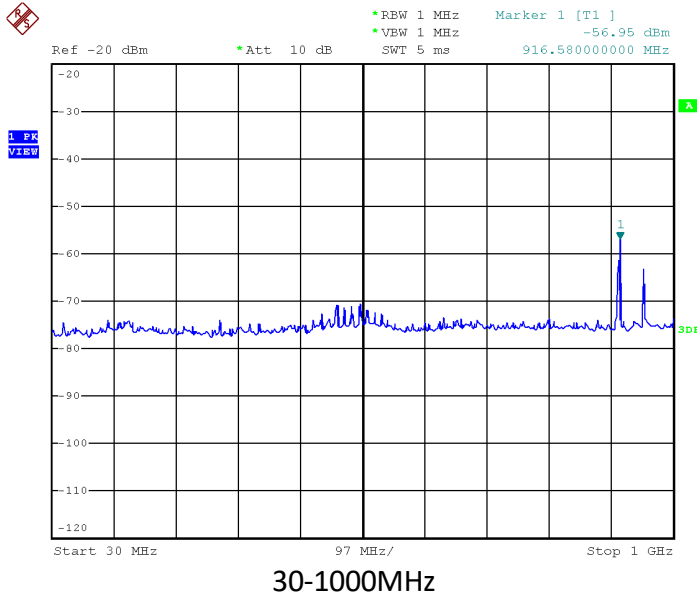
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3.6.2 Modulation Type: b Mode Channel: 2442MHz



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3.6.3 Modulation Type: b Mode Channel: 2472MHz



Note:

1. Negative sign (-) in the margin column signify levels below the limit.
2. Other emissions found were at least 10 dB below the limit at the measurement range.
3. -54.0dBm corresponds to 4nW.
4. -47.0dBm corresponds to 20nW.
5. Measurement uncertainty is ± 5.3 dB at a level of confidence of 95%.
6. Radiated measurement was performed for this test.

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3.7 Dwell Time

NA

Note: Conducted measurement was preformed for this test.

Japanese Regulation:

Dwell time shall be smaller or equal to 0.4 second.

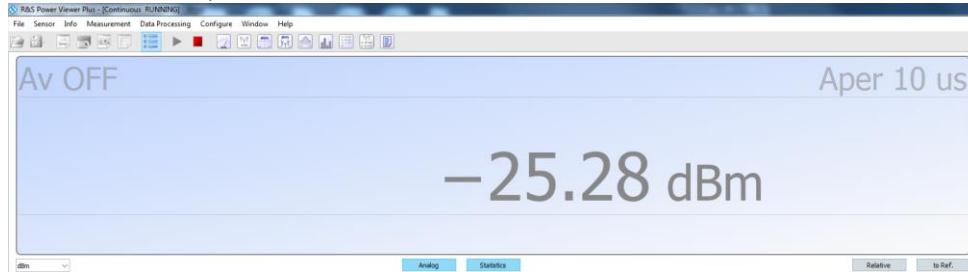
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3.8 RF Power

b Mode

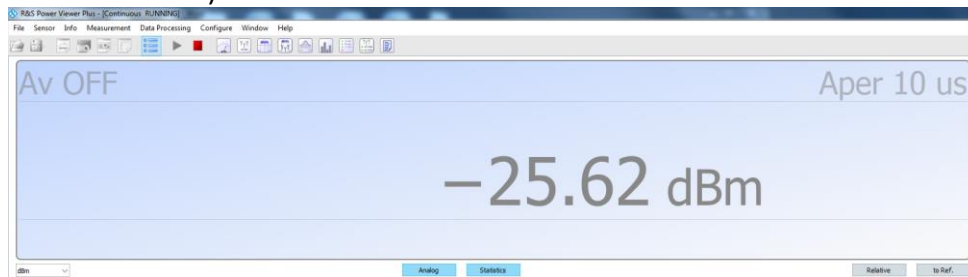
2412MHz

(f-2.4130130GHz RF power = 2.96mW = -25.29dBm+20dB(Att at input port) + 9.84dB(RF to IF conversion loss))



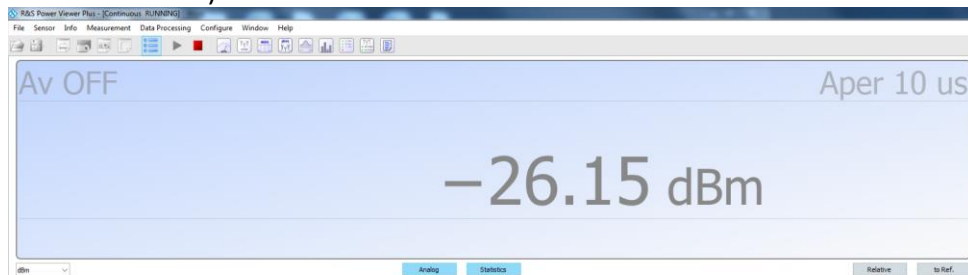
2442MHz

(f-2.4429250GHz RF power = 2.67mW = -25.61dBm+20dB (Att at input port) + 9.88dB (RF to IF conversion loss))



2472MHz

(f-2.4723470GHz RF power = 2.39mW = -26.21dBm+20dB (Att at input port) + 9.99dB (RF to IF conversion loss))



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3.9 Voltage measurement data for RF IC

Measured the voltage to EUT when the 24VDC to EUT is changed by +/- 10%.

Aims: Confirm the power of the EUT in the wireless circuit changes within $\pm 1\%$ while the external input voltage of the EUT changes of 10%

Nominal voltage input: to EUT: 24VDC

Nominal voltage DC voltage to RFIC: 3.3VDC

Testing voltage input (VDC)	Voltage output (VDC)	Voltage different (%)	Result
21.6	3.3	0.0%	Pass
24.0	3.3	0.0%	Pass
26.4	3.3	0.0%	Pass

Conclusion: It has been confirmed the change of the DC voltage to EUT is less than 1% when the nominal input voltage to EUT is changed by +/- 10%. The MIC test procedure allows to test only at the nominal voltage only when this requirement is met.

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3.10 Conducted Output Power of Different Data Rate

802.11b	
Data Rate(Mbps)	mW/MHz
1	2.85
2	2.62
5.5	2.53
11	2.51

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4.0 EQUIPMENT LIST

Equipment	Signal Generator	Spectrum Analyzer	Wideband Power Sensor (50MHz - 18GHz)
Registration No.	EW-3087	EW-2466	EW-3367
Manufacturer	ROHDESCHWARZ	ROHDESCHWARZ	ROHDESCHWARZ
Model No.	SMB100A	FSP30	NRP6A
Serial number	177894	101076	101774
Calibration Date	13 Jan 2021	05 Sep 2020	16 Oct 2020
Calibration Due Date	13 Jan 2022	05 Sep 2021	16 Oct 2021
Calibration Authority	R&S Germany	R&S Germany	R&S Germany

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5.0 EQUIPMENT PHOTOGRAPHS

