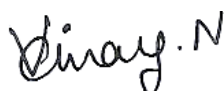



Produkte
Products

Prüfbericht - Nr.: 02423088 001		Seite 1 von 27	
<i>Test Report No.:</i>		<i>Page 1 of 27</i>	
Auftraggeber: <i>Client:</i>	Atmel Norway AS Vestre Rosten 79 7075 Tiller Norway		
Gegenstand der Prüfung: <i>Test item:</i>	ATAVRRZ600-231		
Bezeichnung: <i>Identification:</i>	ATAVRRZ600-231	Serien-Nr.: <i>Serial No.</i>	Engineering Sample
Wareneingangs-Nr.: <i>Receipt No.:</i>	1403013231	Eingangsdatum: <i>Date of receipt:</i>	20-01-2011
Prüfört: <i>Testing location:</i>	Refer Page 4 of 27 for test facilities		
Prüfgrundlage: <i>Test specification:</i>	FCC Part 15, Subpart C		
Prüfergebnis: <i>Test Result:</i>	Der Prüfgegenstand entspricht oben genannter Prüfgrundlage(n). <i>The tests item passed the test specification(s).</i>		
Prüflaboratorium: <i>Testing Laboratory:</i>	TÜV Rheinland (India) Pvt. Ltd. Alpha Tower, Sigma Soft Tech Park, # 7, Whitefield Main Road, Varthur Kodi, Bangalore – 560066, India		
geprüft / tested by:		kontrolliert / reviewed by:	
24-03-2011	Vinay.N Test Engineer	24-03-2011	Varma Kalyan Manager
			
Datum <i>Date</i>	Name/Stellung <i>Name/Position</i>	Unterschrift <i>Signature</i>	Datum <i>Date</i>
Sonstiges / Other Aspects: FCC ID : VW4A09490			
Abkürzungen:	P(ass) = entspricht Prüfgrundlage F(ail) = entspricht nicht Prüfgrundlage N/A = nicht anwendbar N/T = nicht getestet	Abbreviations:	P(ass) = passed F(ail) = failed N/A = not applicable N/T = not tested
<p>Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.</p> <p><i>This test report relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any safety mark on this or similar products.</i></p>			

Test Result Summary

Clause	Test Item	Result
15.247(b) (3)	Conducted Peak RF Output Power	Pass
15.247 (a) (2)	6dB Bandwidth	Pass
15.247 (e)	Power Spectral Density	Pass
15.247 (d)	Band-edge Compliance	Pass
15.209	Spurious Radiated Emissions	Pass

Content

List of Test and Measurement Instruments	4
General Product Information	5
Product Function and Intended Use	5
Ratings and System Details.....	5
Operation Descriptions	6
Test Set-up and Operation Mode	7
Principle of Configuration Selection	7
Test Operation and Test Software	7
Special Accessories and Auxiliary Equipment	7
Countermeasures to achieve EMC Compliance	7
Test Methodology	8
Radiated Emission Test	8
Test Results.....	9
Conducted Peak Output Power	Section 15.247(b)(3).....9
6 dB Bandwidth	Section 15.247(a)(2).....12
Power Spectral Density	Section 15.247(e)16
Band-edge Compliance	Section 15.247 (d)19
Spurious Radiated Emissions	Section 15.209.....23
Appendix 1: Test Setup Photos	
Appendix 2: EUT Photos	
Appendix 3: Label Diagram & label Location	
Appendix 4: Block Diagram	
Appendix 5: Specification of EUT	
Appendix 6: Schematic Diagrams	
Appendix 7: Bill of Material	
Appendix 8: User Manual	
Appendix 9: Maximum Permissible Exposure Information	

www.tuv.com

List of Test and Measurement Instruments

Wipro Technologies, Bangalore

List of Test and Measurements

Equipment	Manufacturer	Type	S/N	Calibration Due Date
EMI Test Receiver	Rohde & Schwarz	ESIB40	100306	24.03.2012
Hybrid Log Periodic Antenna	TDK	HLP3003C	130334	21.03.2012
Broadband Horn Antenna	Schwarzbeck Mess-Electronik	BBHA9170	9170-344	21.03.2012
Double Ridged Horn Antenna	Schwarzbeck Mess-Electronik	BBHA9120D	9120D-687	21.03.2012
Pre-Amplifier	TDK-RFSolution	PA-02	100008	15.02.2012

Testing Facilities

- 1) Wipro Technologies
Survey No. 70, 77, 78 / 8A, Dodda Kannelli,
Sarjapur Road, Bangalore – 560 035
India

www.tuv.com

General Product Information

Product Function and Intended Use

The RZ600-231 is an evaluator board for Atmel AT86RF231 Radio frequency device. These are highly acclaimed Networking device within low power personal area networks. The RZ600-231 evaluation board can be used evaluate RF4CE, IEEE802.15.4, Zigbee and 6lowPAN network capability of the AT86RF231 device, by professional users

Ratings and System Details

Operating Frequency	2405 -2480MHz
No. of channel	16
Channel Spacing	5 MHz
Transmitted Power	2.81 dBm
Modulation	DSSS [O-QPSK]
Data Rate	250kbps
Antenna Type	Whip
Number of antenna	one
Antenna Gain	0 dBi
Supply Voltage	5 V DC (from USB)
Dimensions	65.2 mm x 16 mm x 7 mm
Environmental	Operating temperature: -20°C to 70°C Humidity : Not more than 80%

Test Conditions:

5 V DC (from USB)

Environmental conditions:

Temperature: +23 ° C

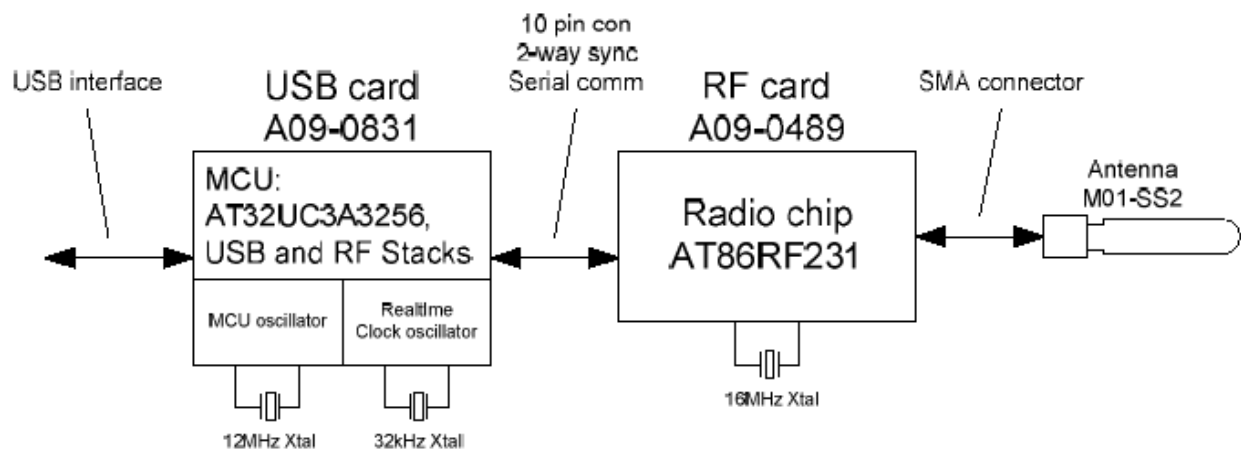
RH: 62%

www.tuv.com

Operation Descriptions

This evaluation board/kit is intended for use for FURTHER ENGINEERING, DEVELOPMENT, DEMONSTRATION, or EVALUATION PURPOSES ONLY by professional users and must not be incorporated into any other device or system. The device is not sold retail, to the general public. Standard antenna connectors are used. The equipment is sold with the antennas that have been tested in this filing. Antenna instructions are provided in the hardware manual.

Block Diagram:



www.tuv.com

Test Set-up and Operation Mode

Principle of Configuration Selection

The test was performed under continuous transmission to obtain the maximum emissions.

Test Operation and Test Software

Hyper terminal in the computer used to enable the continuous transmission and changing channels (low/mid/high) on the EUT for the tests in this report.

Special Accessories and Auxiliary Equipment

The EUT was tested together with the following additional accessory:

- Notebook computer used to power the device through USB cable, set the test configuration (channel and power level)

Countermeasures to achieve EMC Compliance

- None

Table of carrier frequencies

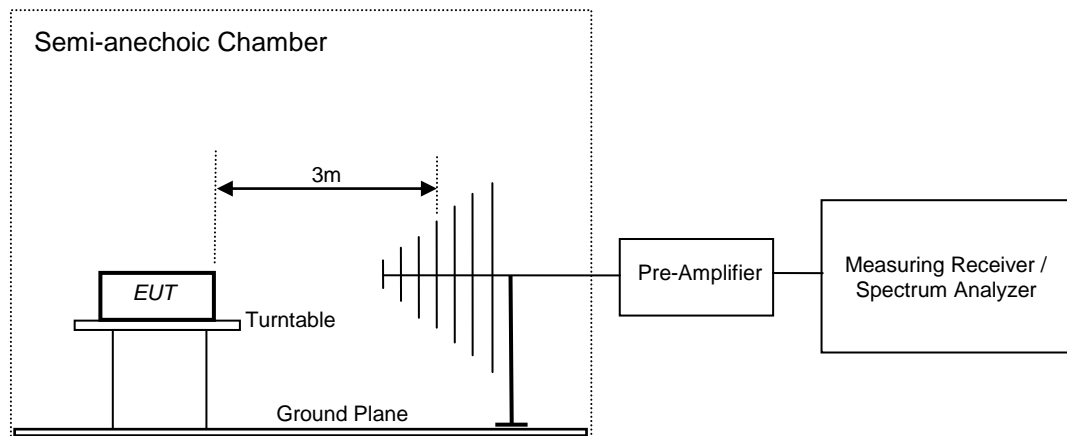
Frequency Band	Channel No.	Frequency (MHz)
2400-2483.5 MHz	11	2405
	12	2410
	13	2415
	14	2420
	15	2425
	16	2430
	17	2435
	18	2440
	19	2445
	20	2450
	21	2455
	22	2460
	23	2465
	24	2470
	25	2475
	26	2480

Test Methodology

Radiated Emission Test

The radiated emission measurement was performed according to the procedures in ANSI C63.4-2003. The equipment under test (EUT) was placed at the middle of the 80 cm high turntable, and the EUT is 3 meters far from the measuring antenna. The turntable was rotated 360° for obtaining the maximum emission. The height of the measuring antennas was scanned between 1m and 4m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations. Repeat the measurement steps until the maximum emissions were obtained. The measurement above 1000MHz was performed by horn antenna. The measurement below 30MHz was performed by loop antenna.

The EUT was rotated around the X-, Y-, and Z-Axis and the results from worst case axis are recorded.



www.tuv.com

Test Results

Conducted Peak Output Power

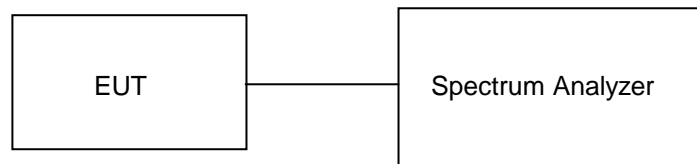
Section 15.247(b)(3)

Result

Pass

Test Specification	FCC 15.247 (b)(3)
Measurement Bandwidth (RBW)	3MHz
Detector	Peak
Requirement	<1 watt (30dBm) for Digital Transmission System

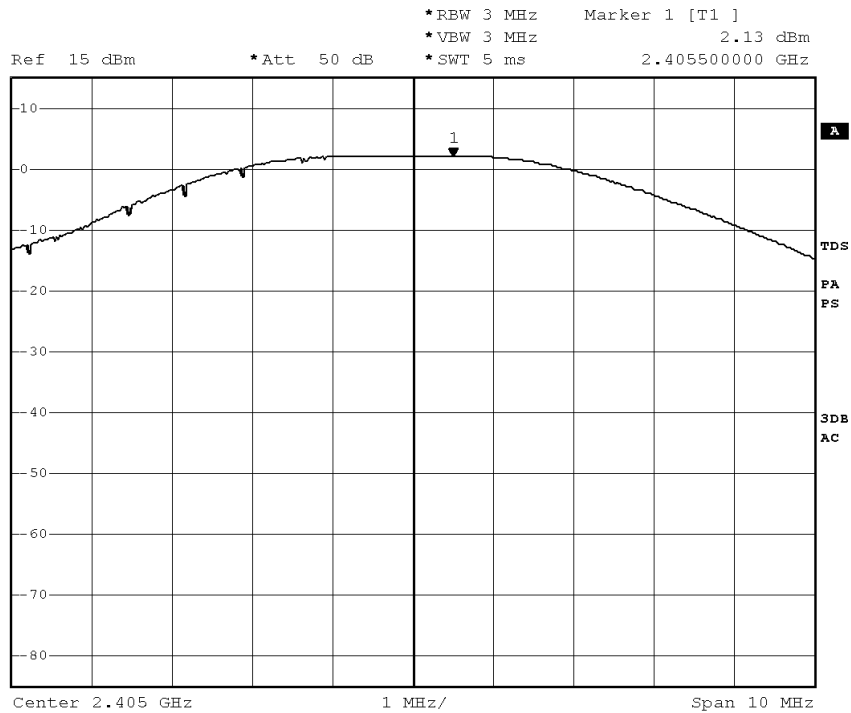
Test Method:



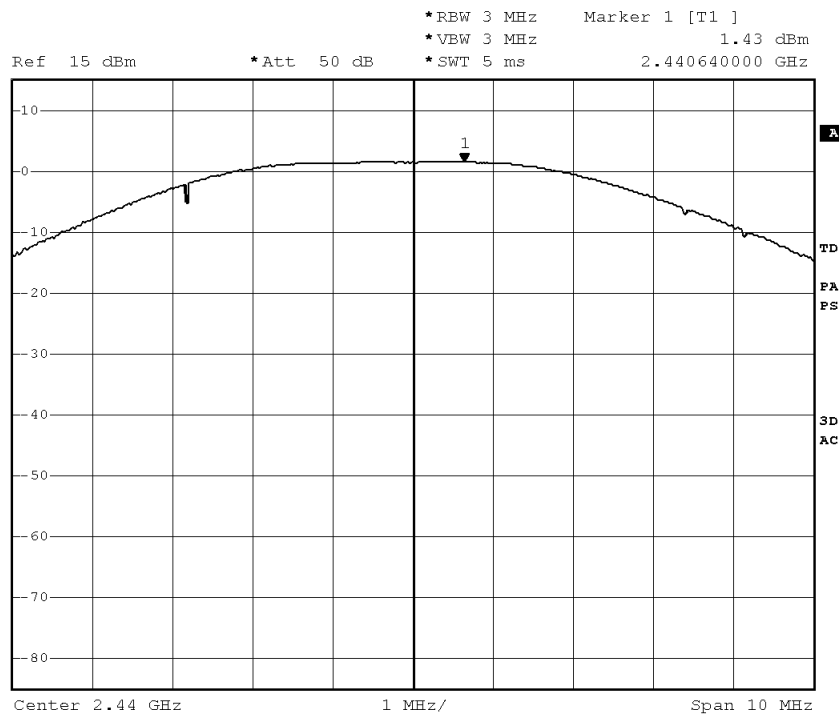
Test Results:

Cable Loss: 0.68dB

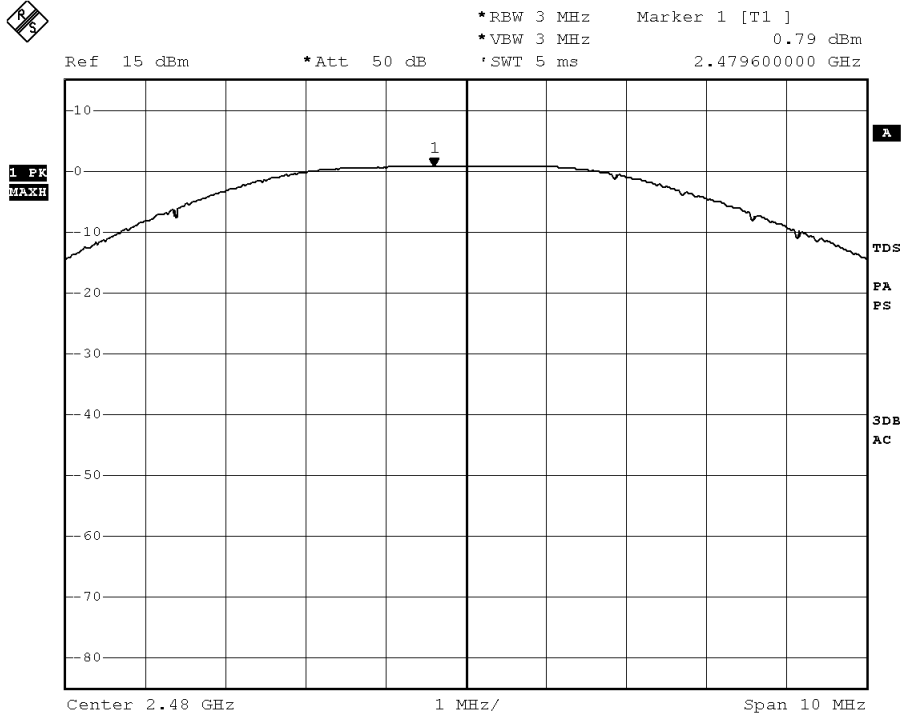
Channel Frequency (MHz)	Measured RF Output power (dBm)	Total Output power (dBm)	Limit (dBm)
2405	2.13	2.81	30
2440	1.43	2.11	30
2480	0.79	1.47	30



Channel Frequency: 2405 MHz



Channel Frequency: 2440 MHz



Channel Frequency: 2480 MHz

www.tuv.com

6 dB Bandwidth

Section 15.247(a)(2)

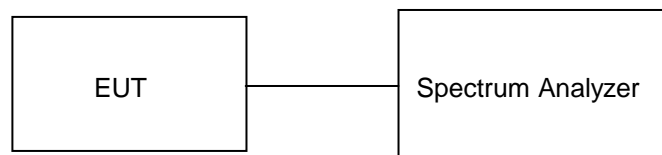
Result

Pass

Test Specification
Detector Function
Requirement

FCC Part 15 Section 15.247 (a) (2)
Peak
The minimum 6 dB bandwidth shall be at least 500 kHz.

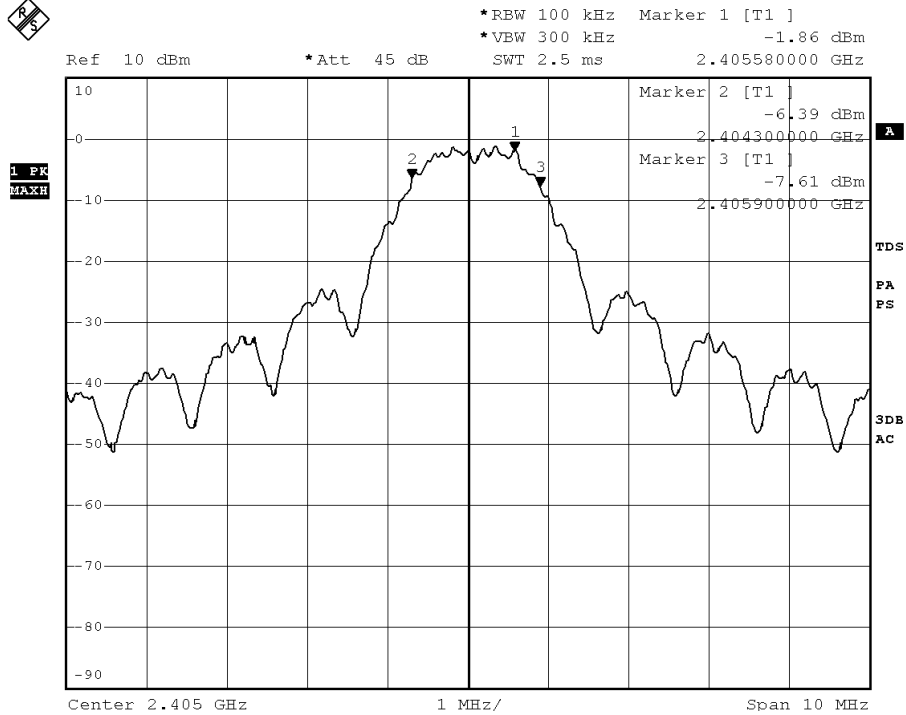
Test Method:



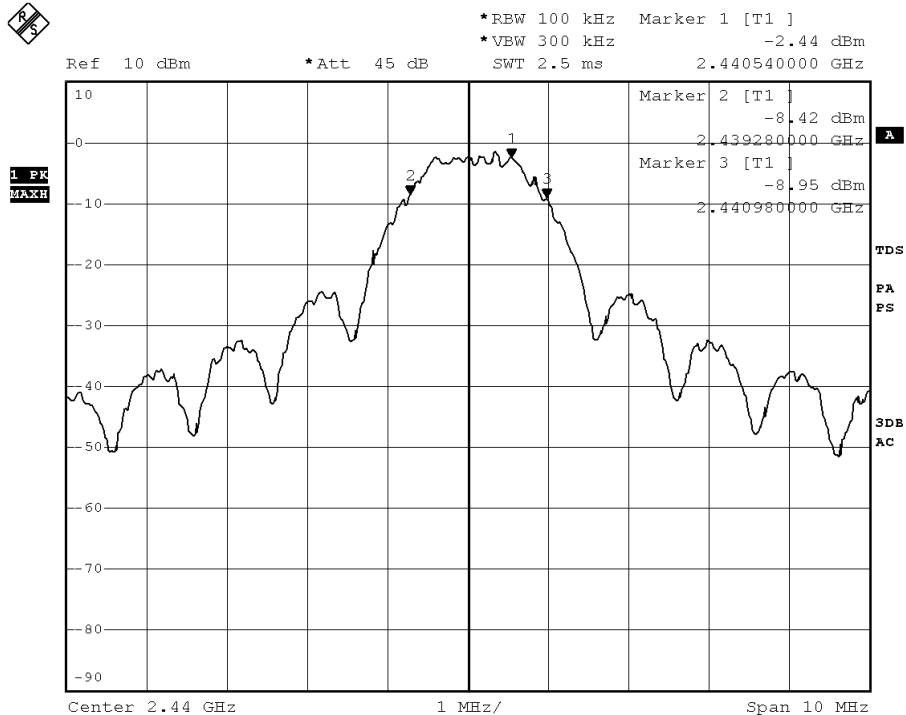
Test Result:

Cable Loss: 0.68dB

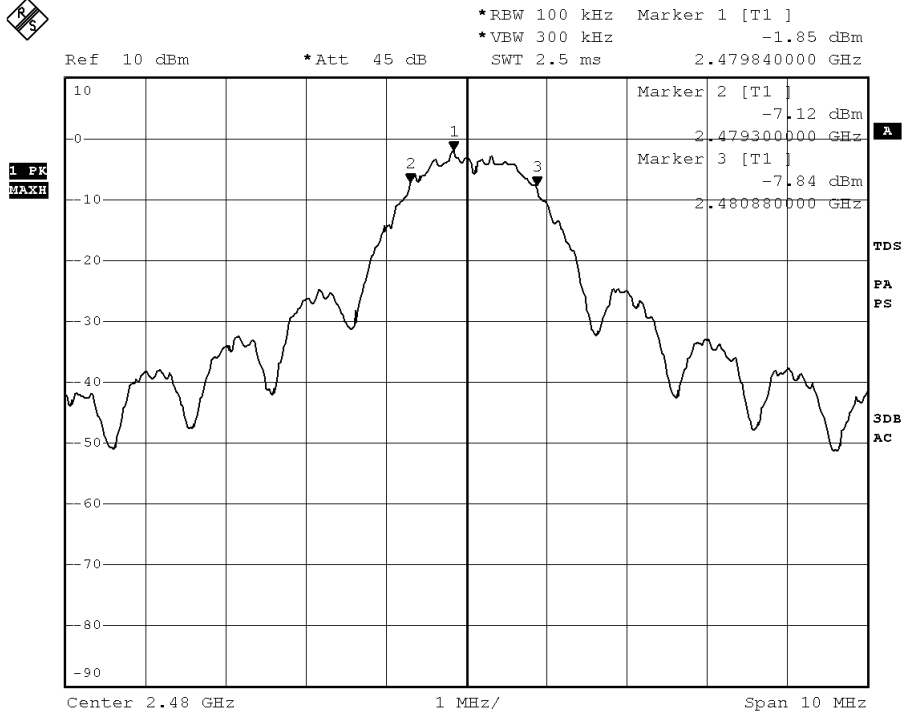
Channel Frequency (MHz)	Lower Frequency (MHz)	Upper Frequency (MHz)	6 dB Bandwidth (MHz)	99% OBW (MHz)
2405	2404.30	2405.90	1.60	2.42
2440	2439.28	2440.98	1.70	2.68
2480	2479.30	2480.88	1.58	2.86



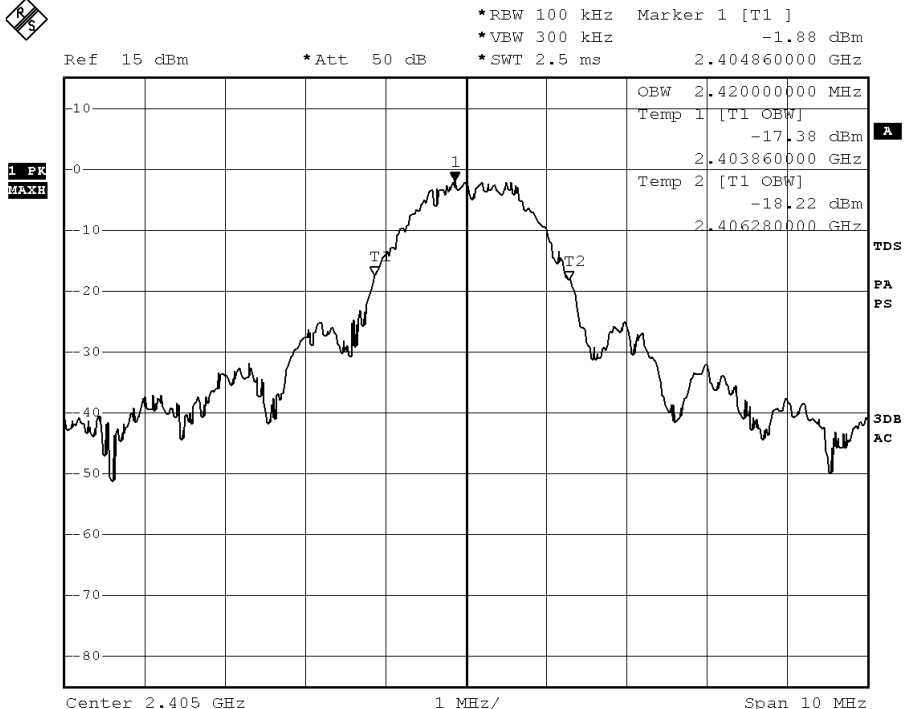
Channel Frequency 2405 MHz



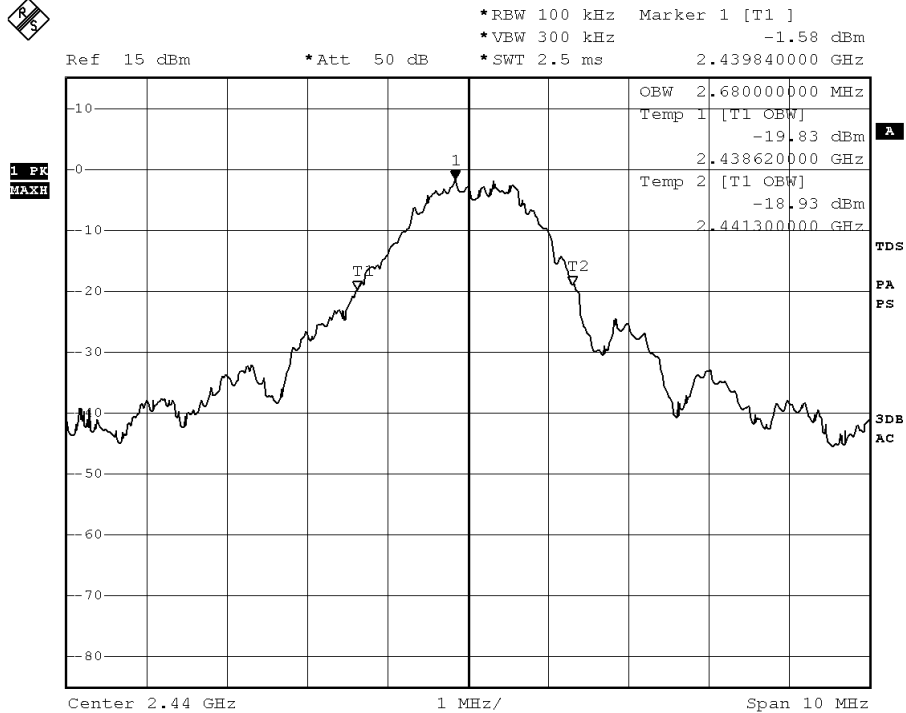
Channel Frequency 2440 MHz



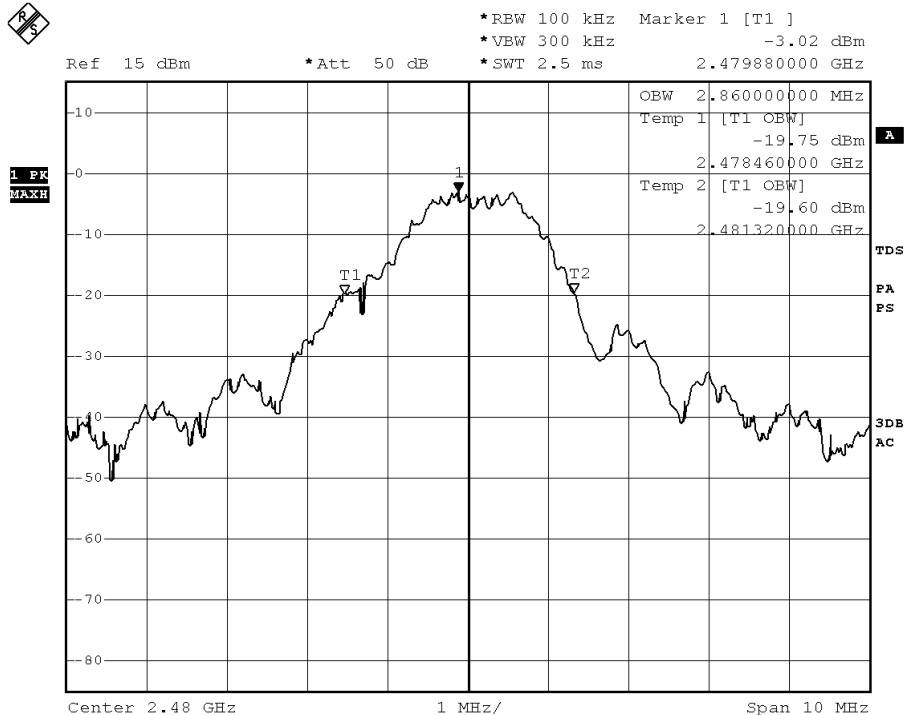
Channel Frequency 2480 MHz



99% Occupied Bandwidth: Channel Low



99% Occupied Bandwidth: Channel Mid



99% Occupied Bandwidth: Channel High

www.tuv.com

Power Spectral Density

Section 15.247(e)

Result

Pass

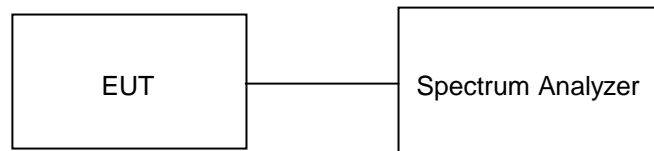
Test Specification
Detector Function
Requirement

FCC Part 15 Section 15.247 (e)

Peak

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.

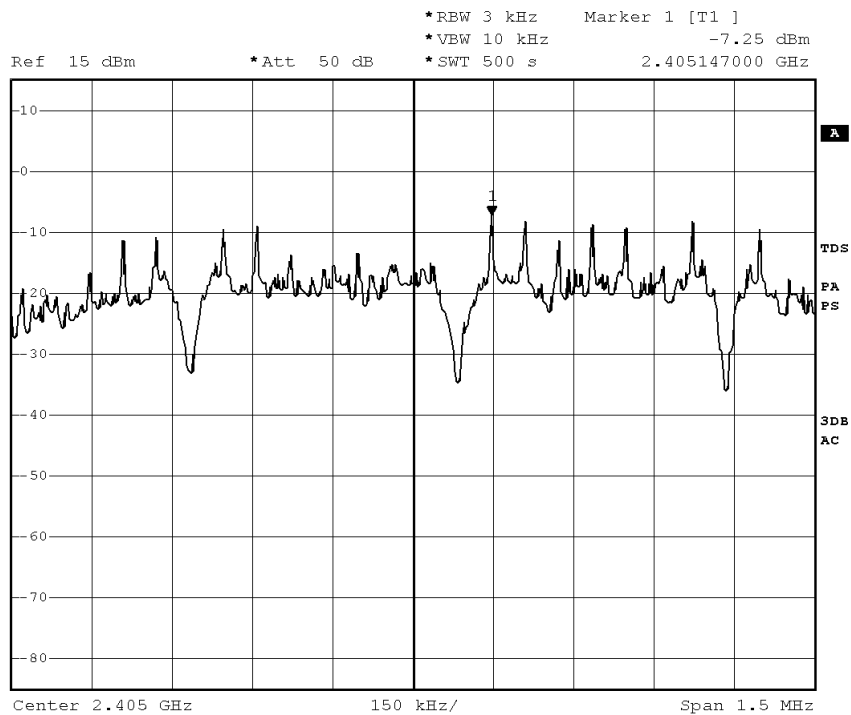
Test Method:



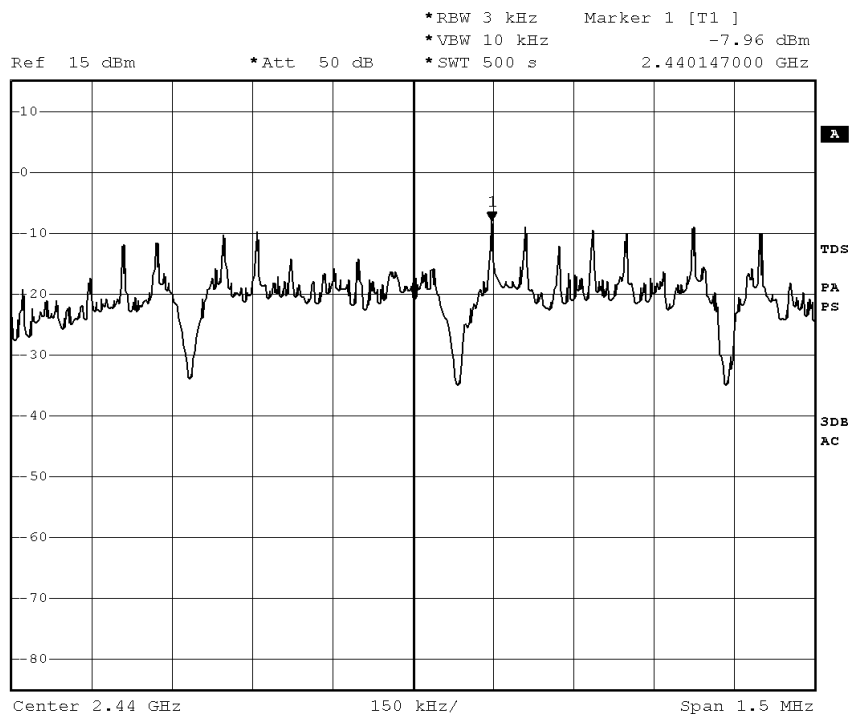
Test Results:

Cable Loss: 0.68dB

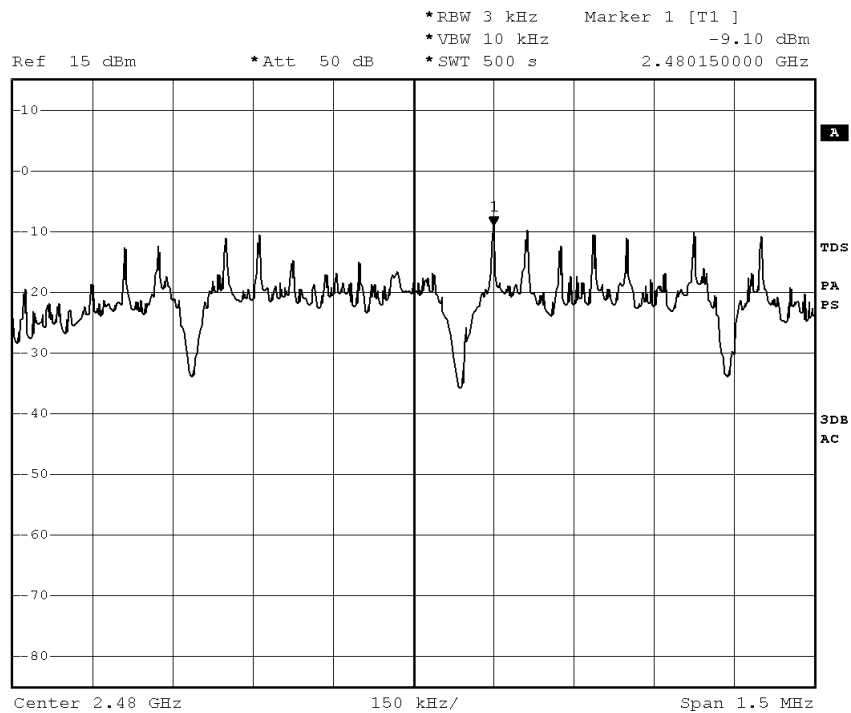
Channel Frequency (MHz)	Measured Power Spectral Density (dBm)	Measured PSD + Cable Loss (dBm)	Limit (dBm)
2405	-7.25	-6.57	08.00
2440	-7.96	-7.28	08.00
2480	-9.10	-8.42	08.00



Channel Frequency 2405 MHz



Channel Frequency 2440 MHz



Channel Frequency 2480 MHz

www.tuv.com

Band-edge Compliance

Section 15.247 (d)

Result

Pass

Test Specification
Detector Function
Requirement

FCC Part 15, Subpart C
Peak

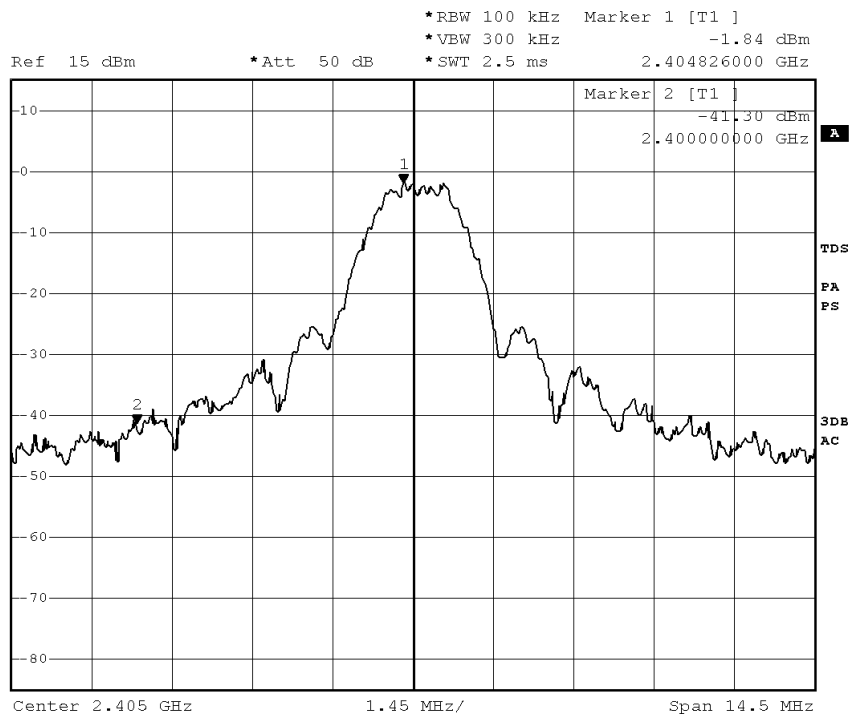
In any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the 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.

Test Method:

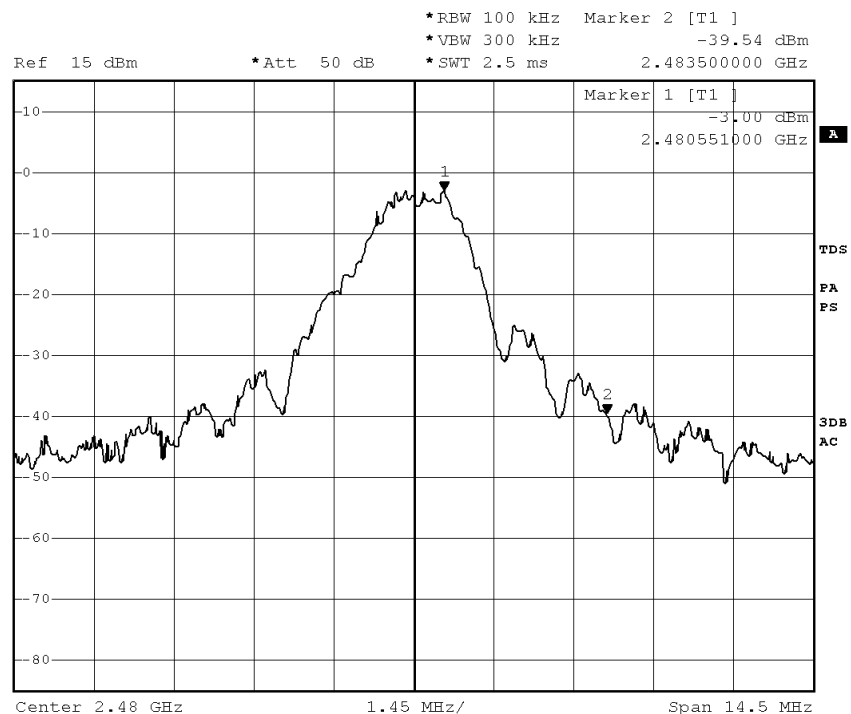


Test Result:

Fundamental Frequency (MHz)	Value at Band Edge		Limit (dB)
	Frequency (MHz)	Value (dB)	
2405	2400.00	-41.30	-20
2480	2483.50	-39.54	-20

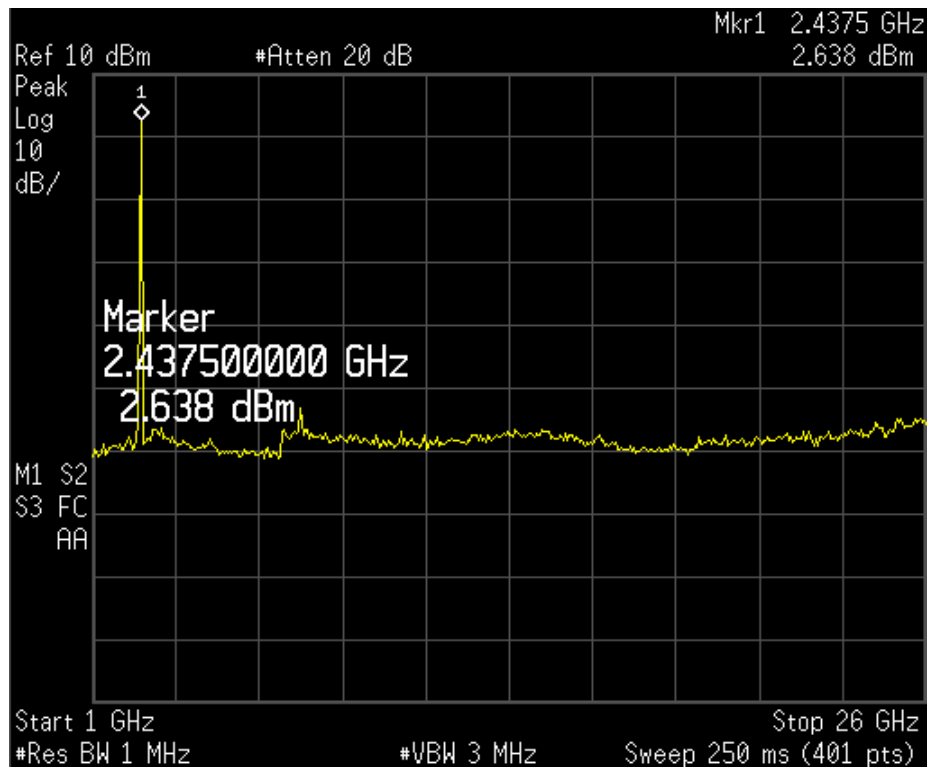


Channel Frequency 2405 MHz

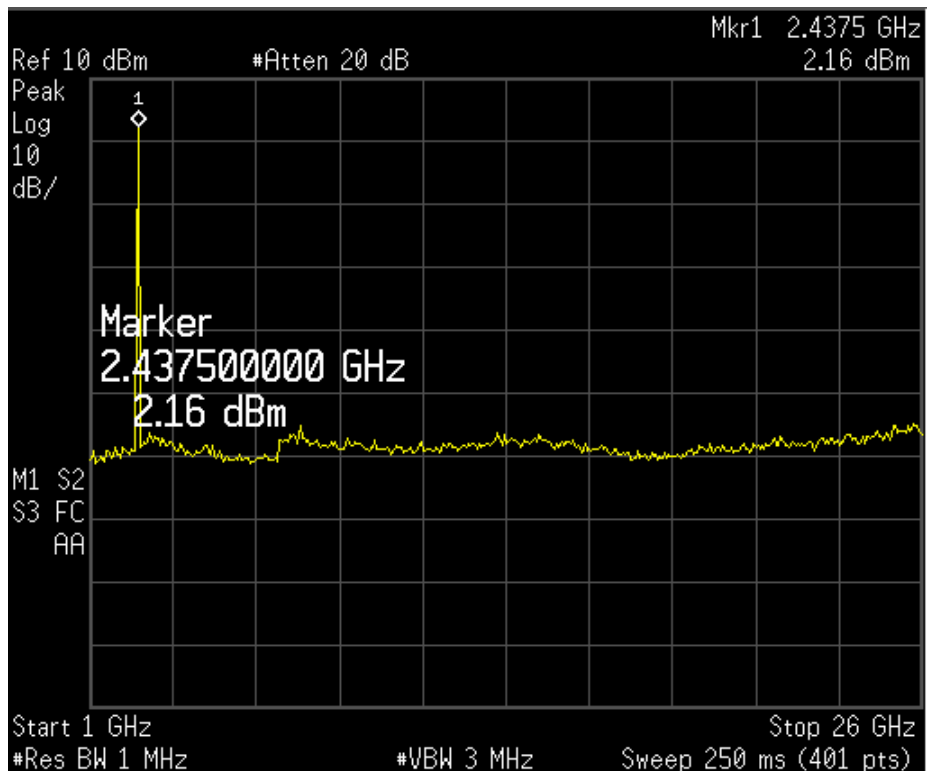


Channel Frequency 2480 MHz

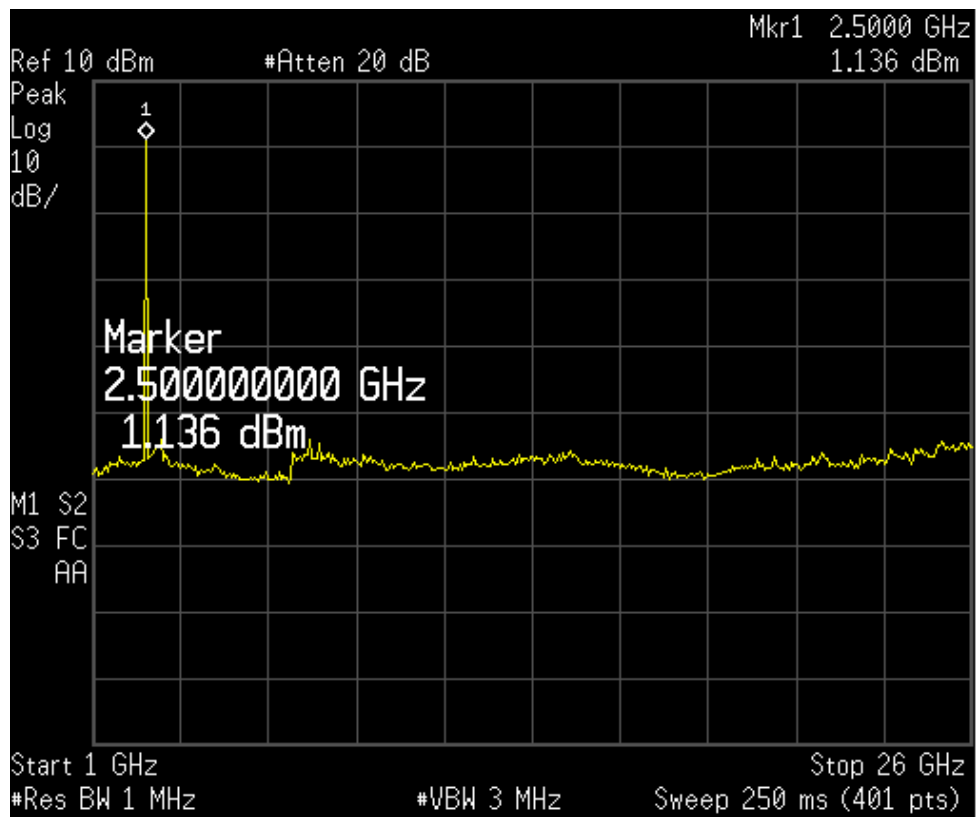
www.tuv.com
Conducted Spurious Emission



Channel Frequency Low



Channel Frequency Mid



Channel Frequency High

Spurious Radiated Emissions
Section 15.209
Result
Pass

Test Specification	FCC 15.207
Test Method	ANSI C63.4-2003
Measurement Location	Semi Anechoic Chamber
Supply Voltage	5V DC (USB Supply)
Measuring Frequency Range	9kHz to 26.5GHz(Up to 10 th harmonic of the highest fundamental frequency)
Measuring Distance	3m
Detection	QP for frequency below 1GHz, Average for frequency above 1GHz
Requirement	As per the limits mentioned in the bellow table

Limit for Radiated Emission of Section 15.209:

Frequency (MHz)	Field strength (μV/m)	Field strength (dBμV/m)	Distance of Measurement (m)
0.009 – 0.490	2400/F(kHz)	48.50 – 13.80	300*
0.490 – 1.705	24000/F(kHz)	33.80 – 23.00	30*
1.705 -30	30	29.54	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

Remark: * the limit shows in the table above of frequency range 0.009 – 0.490, 0.490 – 1.705 MHz and 1.705-30MHz are at 300 meter, 30 meter and 30 meter range respectively, which corresponds to 88,50 – 53.80, 53.80 – 43.00 and 49.5dBμV/m at 3m range by extrapolation calculation and The measurement of loop antenna.

The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz Radiated emission limits in these three bands are based on measurements employing an average detector.

Channel	Antenna Polarization	Spurious Emission (MHz)	Field strength (dBµV/m)	Limit (dBm)	Margin (dbm)
Low	H	64.85	30.21	40.00	-09.79
		129.85	31.56	43.50	-11.94
		254.35	25.65	46.00	-20.35
		2405.50 (P)	84.08	*	-
		2405.50 (Av)	70.04	*	-
		4810.00 (P)	49.26	74.00	-24.74
		4810.00 (Av)	32.63	54.00	-21.37
	V	91.50	30.20	43.50	-13.30
		254.85	20.65	46.00	-25.35
		560.21	28.65	46.00	-17.35
		2405.00(P)	91.16	*	-
		2405.00 (Av)	79.20	*	-
		4810.00 (P)	52.36	74.00	-21.64
		4810.00 (Av)	35.50	54.00	-18.50
Mid	H	64.85	28.56	40.00	-11.44
		129.85	30.65	43.50	-12.85
		2440.00 (P)	82.88	*	-
		2440.00 (Av)	70.01	*	-
		4880.00 (P)	50.68	74.00	-23.32
		4880.00 (Av)	31.74	54.00	-22.26
	V	91.50	30.20	43.50	-13.3
		254.85	20.65	46.00	-25.35
		2440.00 (P)	88.59	*	-
		2440.00 (Av)	76.70	*	-
		4880.00 (P)	49.64	74.00	-24.36
		4880.00 (A)	31.29	54.00	-22.71
High	H	91.50	24.35	43.50	
		2480.00 (P)	81.28	*	-
		2480.00 (Av)	66.98	*	-
		4960.00 (P)	49.24	74.00	-24.76
		4960.00 (Av)	30.70	54.00	-23.30
	V	89.26	23.87	43.50	-19.63
		254.55	22.36	43.50	-21.14
		370.25	25.69	46.00	-20.31
		2480.00 (P)	80.65	*	-
		2480.00 (Av)	78.22	*	-
		4960.00 (P)	50.97	74.00	-23.03
		4960.00 (Av)	31.65	54.00	-22.35

P--> Peak Detector

Av--> Average Detector

* - Fundamental frequency

www.tuv.com

Restricted Bands of Operation

Channel Low (2405MHz)

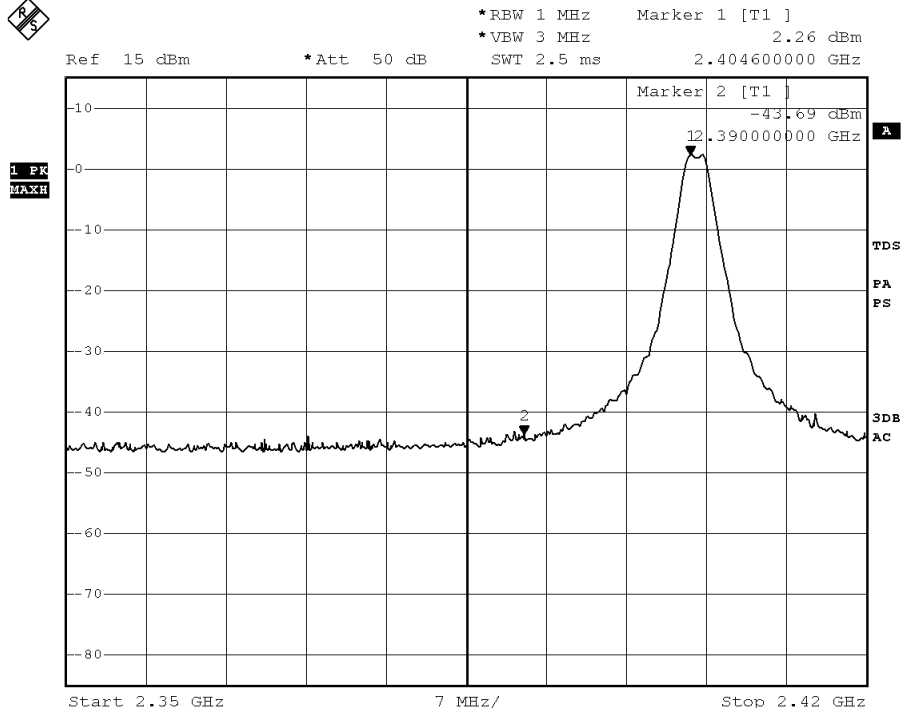
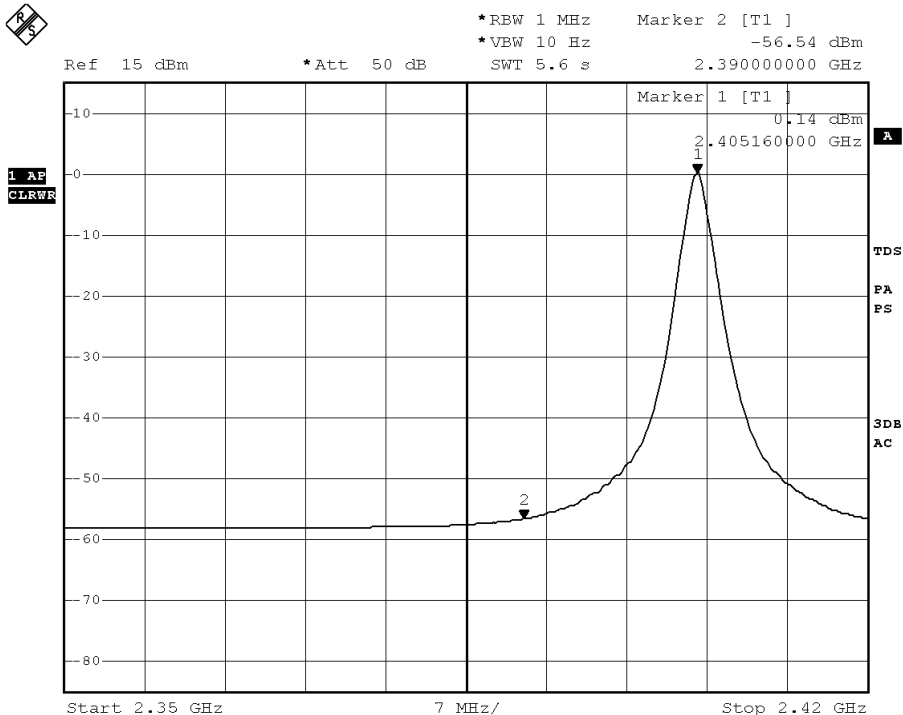
The band edge emission plot (Plot 1) shows 45.95 dBc between carrier maximum power and the local maximum emission in the restricted band. The emission of the carrier strength list in the test result of channel Low is 91.16 dBuV/m, so the maximum field strength in the restricted band is $91.16 - 45.95 = 45.21$ dBuV/m which is under 74 dBuV/m limit.

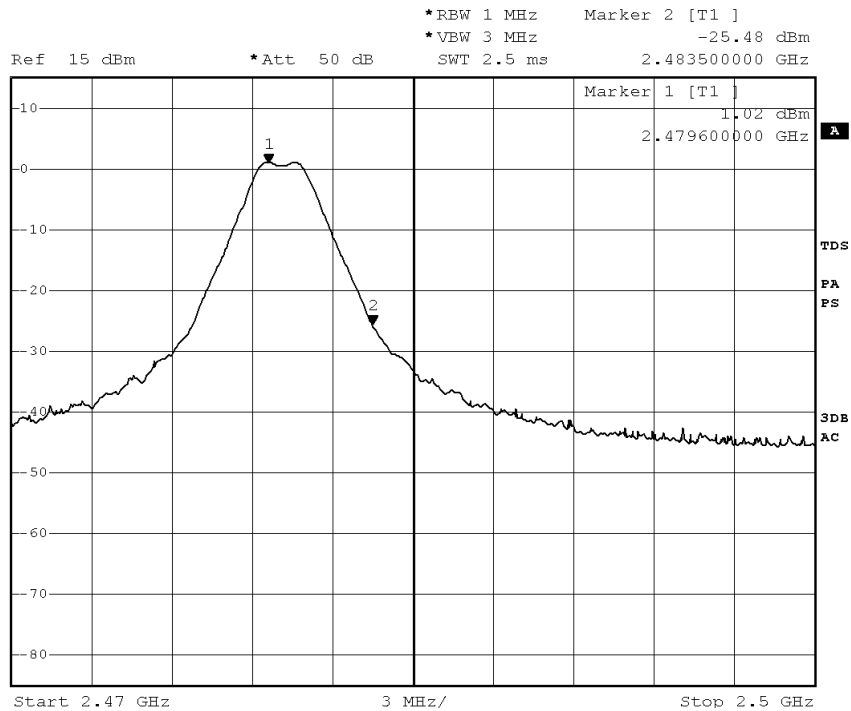
The band edge emission plot (Plot 2) shows 56.68 dBc between carrier maximum power and the local maximum emission in the restricted band. The emission of the carrier strength list in the test result of channel Low is 79.20 dBuV/m, so the maximum field strength in the restricted band is $79.20 - 56.68 = 22.52$ dBuV/m which is under 54 dBuV/m limit.

Channel High (2480MHz)

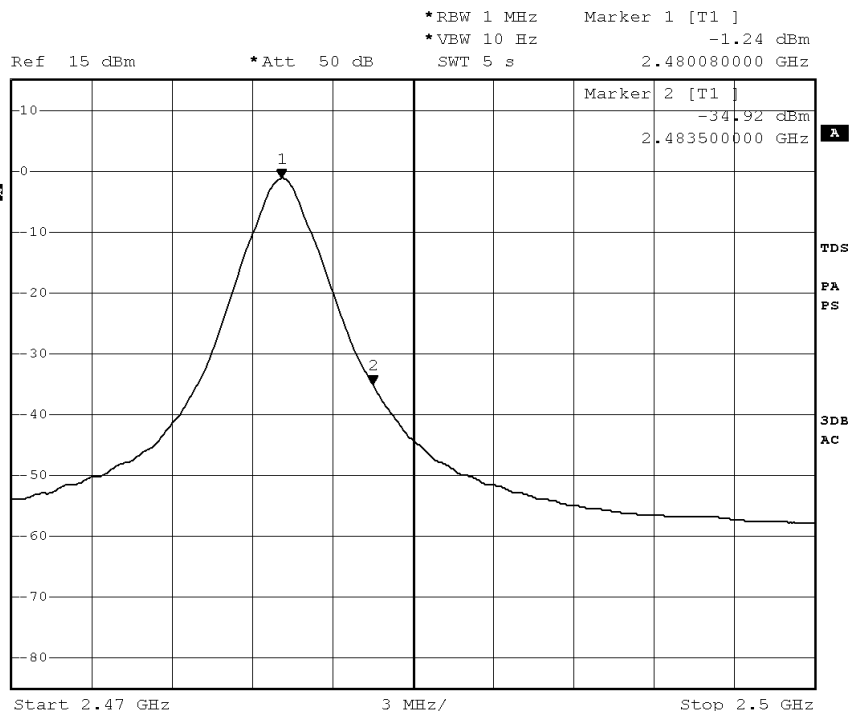
The band edge emission plot (Plot 3) shows 26.50 dBc between carrier maximum power and the local maximum emission in the restricted band. The emission of the carrier strength list in the test result of channel High is 81.28 (Peak), so the maximum field strength in the restricted band is $81.28 - 26.50 = 54.78$ dBuV/m which is under 74 dBuV/m limit

The band edge emission plot (Plot 4) shows 33.68 dBc between carrier maximum power and the local maximum emission in the restricted band. The emission of the carrier strength list in the test result of channel High is 78.22 (average), so the maximum field strength in the restricted band is $78.22 - 33.68 = 44.54$ dBuV/m which is under 54 dBuV/m limit


Plot 1 Channel Low: Peak

Plot 2 Channel Low: Average



Plot 3 Channel High: Peak



Plot 4 Channel High: Average