FCC Test Report

(PART 90 Subpart Y)

Report No.:	RF170731C08-4
FCC ID:	QXO-AP3917I
Test Model:	AP3917i
Series Model:	AP7662i
Received Date:	Jul. 31, 2017
Test Date:	Aug. 18 ~ Sep. 20, 2017
Issued Date:	Sep. 26, 2017
Applicant:	Extreme Networks, Inc.
Address:	6480 VIA DEL ORO SAN JOSE CA 95119 USA
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Lab Address:	No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan, R.O.C.
Test Location:	No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, Taiwan, R.O.C.

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Release Control Record

Issue No.	Description	Date Issued
RF170731C08-4	Original release.	Sep. 26, 2017

1 Certificate of Conformity

Product:	Wireless 802.11 a/ac+b/g/n Access Point
Brand:	Extreme Networks
Test Model:	AP3917i
Series Model:	AP7662i
Sample Status:	Engineering sample
Applicant:	Extreme Networks, Inc.
Test Date:	Aug. 18 ~ Sep. 20, 2017
Standards:	FCC Part 90, Subpart Y FCC Part 2

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

Prepared by : _____ , **Date:** Sep. 26, 2017

Pettie Chen / Senior Specialist

Approved by : _____ , **Date:** Sep. 26, 2017

Ken Liu / Senior Manager

2 Summary of Test Results

Applied Standard: FCC Part 90 & Part 2			
FCC Clause	Test Item	Result	Remarks
Part 2.1046 Part 90.1215(a)	Peak Output Power	Pass	Meet the requirement of limit.
Part 2.1049 Part 90.210	Emission Bandwidth	Pass	Meet the requirement of limit.
Part 2.1049 Part 90.210	Emission Mask	Pass	Meet the requirement of limit.
Part 2.1046 Part 90.1215(a)	Power Spectral Density	Pass	Meet the requirement of limit.
Part 90.1215	Peak Excursion	Pass	Meet the requirement of limit.
Part 2.1053 Part 90.210	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -1.0dB at 11720.00 & 11740.00 & 11780.00MHz.
Part 2.1055 Part 90.213	Frequency Stability	Pass	Meet the requirement of limit.

2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Radiated Emissions up to 1 GHz	30MHz ~ 200MHz	3.86 dB
	200MHz ~1000MHz	3.87 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	2.29 dB
	18GHz ~ 40GHz	2.29 dB

2.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESIB7	100187	May 02, 2017	May 01, 2018
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100041	Nov. 16, 2016	Nov. 15, 2017
BILOG Antenna SCHWARZBECK	VULB9168	9168-171	Dec. 28, 2016	Dec. 27, 2017
HORN Antenna SCHWARZBECK	9120D	209	Dec. 27, 2016	Dec. 26, 2017
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Dec. 14, 2016	Dec. 13, 2017
Preamplifier Agilent	8447D	2944A10738	Aug. 21, 2017	Aug. 20, 2018
Preamplifier Agilent	8449B	3008A02465	Apr. 05, 2017	Apr. 04, 2018
RF signal cable HUBER+SUHNER	SUCOFLEX 104	Cable-CH3-03 (223653/4)	Aug. 21, 2017	Aug. 20, 2018
RF signal cable HUBER+SUHNER& EMCI	SUCOFLEX 104&EMC104-SM-SM-8000	Cable-CH3-03 (309224+170907)	Sep.11, 2017	Sep. 10, 2018
Software BV ADT	ADT_Radiated_ V7.6.15.9.4	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	013303	NA	NA
Antenna Tower Controller BV ADT	AT100	AT93021702	NA	NA
Turn Table BV ADT	TT100	TT93021702	NA	NA
Turn Table Controller BV ADT	SC100	SC93021702	NA	NA

Note:
1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HwaYa Chamber 3.
3. The horn antenna and preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
4. The FCC Designation Number is TW0003. The number will be varied with the Lab location and scope as attached.
5. The IC Site Registration No. is IC 7450F-3.

3 General Information

3.1 General Description of EUT

Product	Wireless 802.11 a/ac+b/g/n Access Point
Brand	Extreme Networks
Test Model	AP3917i
Series Model	AP7662i
Model Difference	Refer to Note
Status of EUT	Engineering sample
Power Supply Rating	54Vdc (POE)
Modulation Type	OFDM, BPSK, QPSK, 16QAM, 64QAM
Data Rate	Channel Bandwidth 5MHz: 1.5, 2.25, 3, 4.5, 6, 9, 12, 13.5Mbps Channel Bandwidth 10MHz: 3, 4.5, 6, 9, 12, 18, 24, 27Mbps Channel Bandwidth 20MHz: 6, 9, 12, 18, 24, 36, 48, 54Mbps
Operating Frequency	Channel Bandwidth 5MHz: 4942.5MHz~4987.5MHz Channel Bandwidth 10MHz: 4945MHz~4985MHz Channel Bandwidth 20MHz: 4950MHz~4980MHz
Number of Channel	Channel Bandwidth 5MHz: 10 Channel Bandwidth 10MHz: 9 Channel Bandwidth 20MHz: 7
Conducted Output Power	Channel Bandwidth 5MHz: 20.69dBm (0.117W) Channel Bandwidth 10MHz: 21.10dBm (0.129W) Channel Bandwidth 20MHz: 21.56dBm (0.143W)
Antenna Type	Refer to Note
Accessory Device	Wall mount, 1.75m non-shielded Grounding cable without core
Data Cable Supplied	NA

Note:

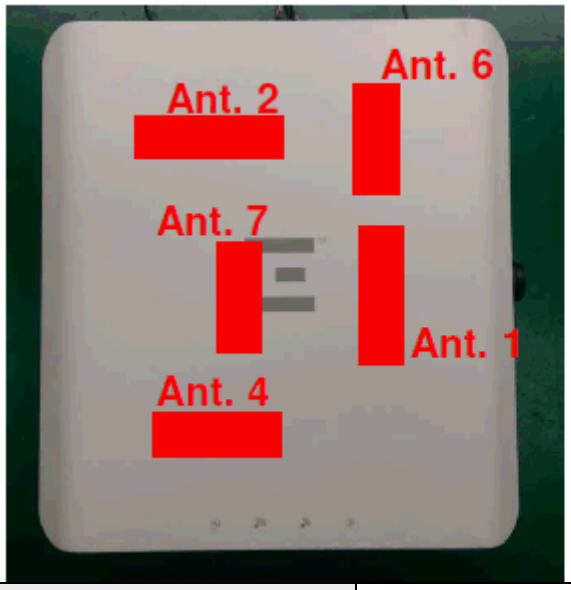
1. All models are listed as below. Model: AP3917i was chosen for final test.

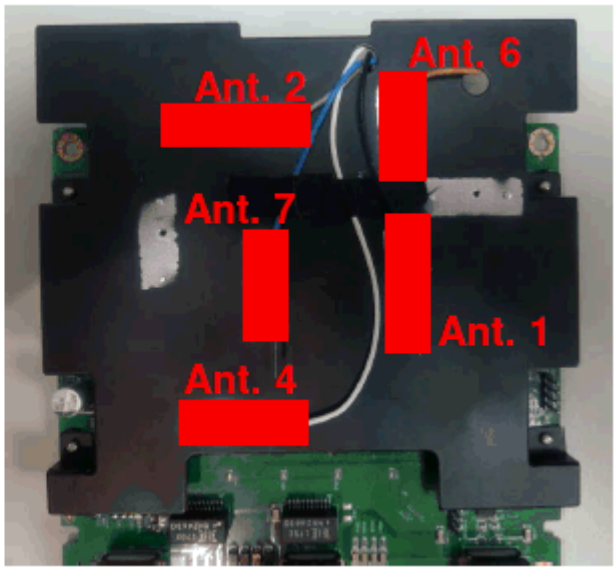
Brand	Model	Difference
Extreme Networks	AP3917i	All models are electrically identical, only the cover printing is different.
	AP7662i	

2. The EUT is 2x2 Spatial Multiplexing device, transmiter signals are correlated.
3. The EUT consumes power from the following POE. (Support unit only)

POE	
Brand	EnGenius
Model	EPA5006GP
Input Power	100-240Vac, 50-60Hz, 0.8A
Output Power	54Vdc, 0.6A Pin 4, 5: 54Vdc Pin 7, 8: Return

4. The following antennas were provided to the EUT.





Antenna Type	PIFA	Antenna Connector	IPEX
Gain (dBi)	Frequency (MHz)		
	2400-2500	4900-5850	
1	4.06	-	
2	3.94	-	
4	-	6.18	
6	-	6.00	
7 (BT LE / Zigbee)	3.53	-	

5. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.

3.2 Description of Test Modes

10 channels are for the Channel Bandwidth 5MHz bandwidth of EUT:

Channel	Frequency (MHz)
1	4942.5
2	4947.5
3	4952.5
4	4957.5
5	4962.5
6	4967.5
7	4972.5
8	4977.5
9	4982.5
10	4987.5

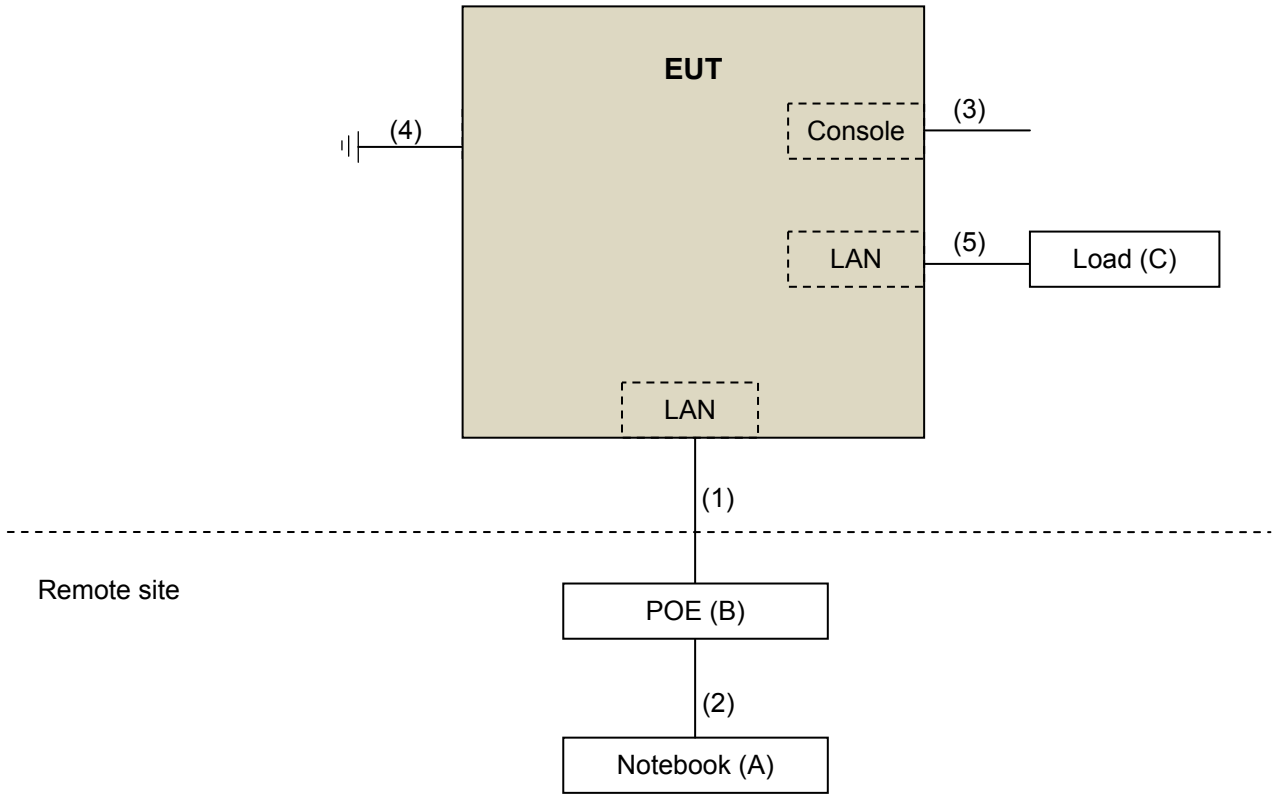
9 channels are for the Channel Bandwidth 10MHz bandwidth of EUT:

Channel	Frequency (MHz)
11	4945
12	4950
13	4955
14	4960
15	4965
16	4970
17	4975
18	4980
19	4985

7 channels are for the Channel Bandwidth 20MHz bandwidth of EUT:

Channel	Frequency (MHz)
20	4950
21	4955
22	4960
23	4965
24	4970
25	4975
26	4980

3.3 Configuration of System under Test



3.3.1 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Notebook	DELL	E5410	1HC2XM1	FCC DoC Approved	-
B.	POE	EnGenius	EPA5006GP	NA	NA	Provided by manufacturer
C.	Load	NA	NA	NA	NA	-

Note:

1. All power cords of the above support units are non-shielded (1.8m).
2. Item A acted as a communication partner to transfer data.

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	RJ45, Cat5e	1	3	N	0	-
2.	RJ45, Cat5e	1	1.8	N	0	-
3.	Console cable	1	1	N	0	Provided by manufacturer
4.	Ground cable	1	1.75	N	0	Accessory Device
5.	RJ45, Cat5e	1	1.8	N	0	-

3.4 Test Mode Applicability and Tested Channel Detail

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis and antenna ports.
The worst case was found when positioned on Z-plane. Following channel(s) was (were) selected for the final test as listed below:

EUT Configure Mode	Test Item	Channel Bandwidth (MHz)	Tested Channel
-	Peak Output Power	5	1, 5, 10
		10	11, 15, 19
		20	20, 23, 26
-	Emission Bandwidth	5	1, 5, 10
		10	11, 15, 19
		20	20, 23, 26
-	Emission Mask	5	1, 5, 10
		10	11, 15, 19
		20	20, 23, 26
-	Peak Excursion	5	1, 5, 10
		10	11, 15, 19
		20	20, 23, 26
-	Radiated Spurious Emissions (Frequency range below 1GHz)	5	1, 5, 10
		10	11, 15, 19
		20	20, 23, 26
-	Radiated Spurious Emissions (Frequency range above 1GHz)	5	1, 5, 10
		10	11, 15, 19
		20	20, 23, 26
-	Frequency Stability	5	1, 5, 10
		10	11, 15, 19
		20	20, 23, 26

Test Condition:

Test Item	Environmental Conditions	Input Power	Tested By
Peak Output Power	25 deg. C, 65% RH	120Vac	James Yang
Emission Bandwidth	25 deg. C, 65% RH	120Vac	James Yang
Emission Mask	26 deg. C, 74% RH	120Vac	Match Tsui
Peak Excursion	25 deg. C, 65% RH	120Vac	James Yang
Radiated Spurious Emission	25 deg. C, 65% RH	120Vac	James Yang
Frequency Stability	25 deg. C, 65% RH	120Vac	James Yang

3.5 EUT Operating Conditions

The EUT makes a call to the communication simulator. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency.

3.6 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC 47 CFR Part 2

FCC 47 CFR Part 90

KDB 971168 D01 Power Meas License Digital Systems v02r02

ANSI/TIA/EIA-603-D 2010

NOTE: All test items have been performed and recorded as per the above standards.

Note: The EUT has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (DoC). The test report has been issued separately.

4 Test Types and Results

4.1 Peak Output Power Measurement

4.1.1 Limits of Peak Output Power Measurement

Per FCC §90.1215, the transmitting power of stations operating in the 4940-4990 MHz band must not exceed the maximum limits in this section.

The maximum conducted output power should not exceed:

Channel Bandwidth (MHz)	Low Power Maximum conducted output power (dBm)	High Power Maximum conducted output power (dBm)
1	7	20
5	14	27
10	17	30
15	18.8	31.8
20	20	33

If transmitting antennas of directional gain greater than 9 dBi are used, both the maximum conducted output power and the peak power spectral density should be reduced by the amount in decibels that the directional gain of the antenna exceeds 9 dBi. However, high power point-to-point and point-to-multipoint operations (both fixed and temporary-fixed rapid deployment) may employ transmitting antennas with directional gain up to 26 dBi without any corresponding reduction in the maximum conducted output power or spectral density.
Corresponding reduction in the maximum conducted output power and peak power spectral density should be the amount in decibels that the directional gain of the antenna exceeds 26 dBi

4.1.2 Test Procedures

a) Set span to at least 1.5 times the OBW
b) Set RBW = 1-5 % of the OBW, not to exceed 1MHz
c) Set VBW ≥ 3 MHz
d) Detector = RMS
e) Sweep time = auto couple.
f) Trace mode = max hold.

4.1.3 Test Setup

CONDUCTED POWER MEASUREMENT:

For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.1.4 Test Results

Conducted Output Power
Channel Bandwidth 5MHz

Channel	Frequency (MHz)	Conducted Output Power (dBm)		
		Chain 0	Chain 1	Total
1	4942.5	18.11	16.95	20.58
5	4962.5	18.16	17.02	20.64
10	4987.5	18.21	17.08	20.69

Channel Bandwidth 10MHz

Channel	Frequency (MHz)	Conducted Output Power (dBm)		
		Chain 0	Chain 1	Total
11	4945	18.51	17.34	20.97
15	4965	18.58	17.41	21.04
19	4985	18.62	17.48	21.10

Channel Bandwidth 20MHz

Channel	Frequency (MHz)	Conducted Output Power (dBm)		
		Chain 0	Chain 1	Total
20	4950	18.97	17.56	21.33
23	4965	19.08	17.80	21.50
26	4980	19.19	17.81	21.56

4.2 Emission Bandwidth Measurement

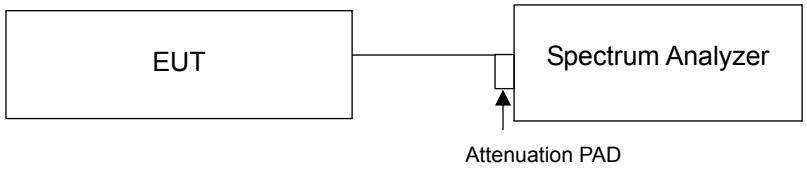
4.2.1 Limits of Emission Bandwidth Measurement

The width of a frequency band such that, below the lower and above the upper frequency limits, the signal power at the 99% channel power of occupied bandwidth when resolution bandwidth should be approximately 1 % to 5 % of the occupied bandwidth (OBW)

4.2.2 Test Procedure

The EUT makes a call to the communication simulator. All measurements were done at low, middle and high operational frequency range. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency. Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth.

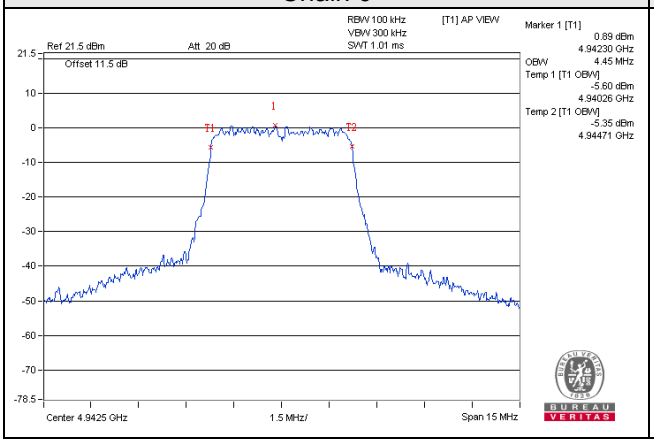
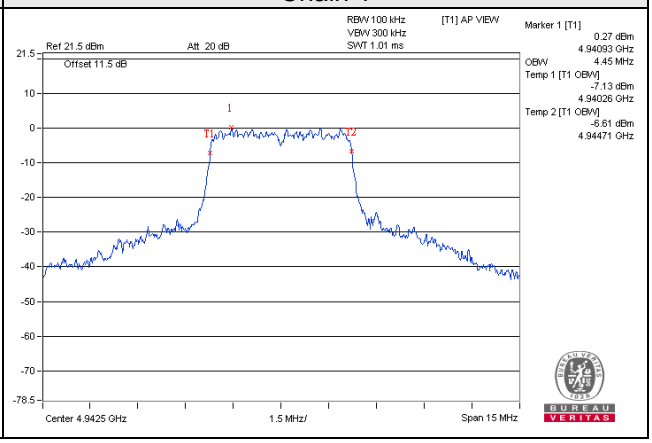
4.2.3 Test Setup



4.2.4 Test Result

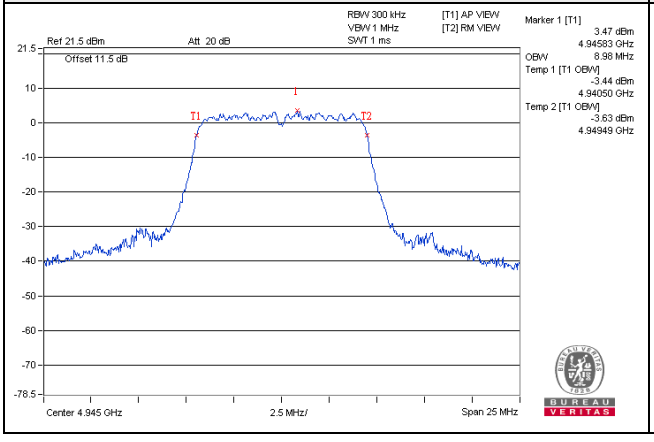
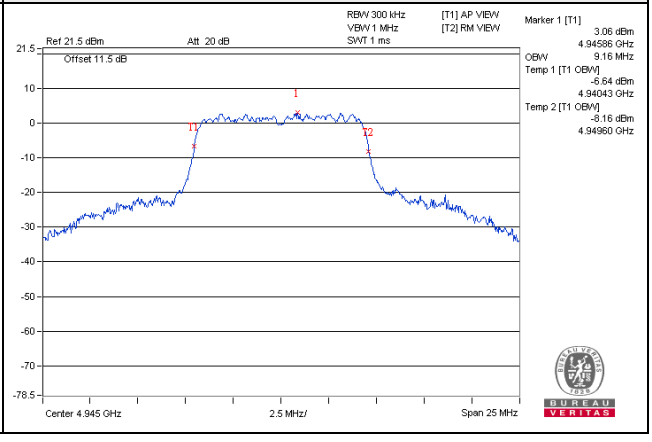
Channel Bandwidth 5MHz

Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	
		Chain 0	Chain 1
1	4942.5	4.45	4.45
5	4962.5	4.45	4.45
10	4987.5	4.45	4.45

Spectrum Plot of Worst Value	
Chain 0	Chain 1
	

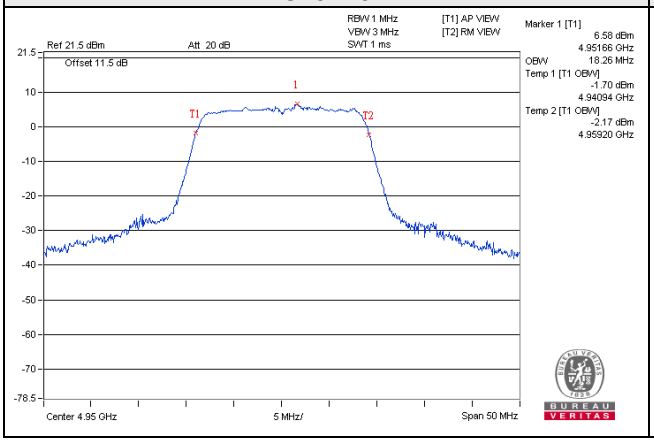
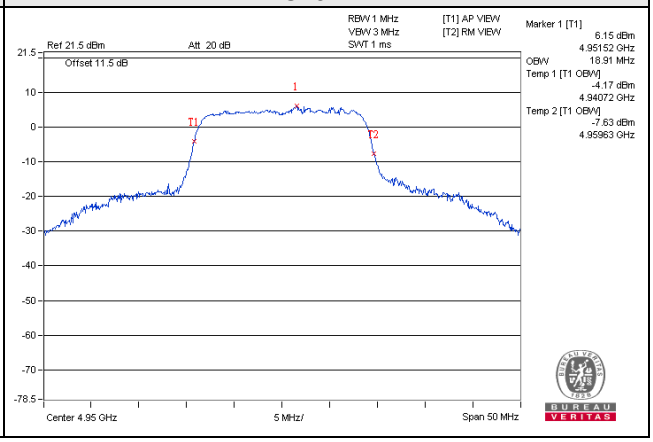
Channel Bandwidth 10MHz

Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	
		Chain 0	Chain 1
11	4945	8.98	9.16
15	4965	8.98	9.09
19	4985	8.98	9.05

Spectrum Plot of Worst Value	
Chain 0	Chain 1
	

Channel Bandwidth 20MHz

Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	
		Chain 0	Chain 1
20	4950	18.26	18.91
23	4965	18.26	18.69
26	4980	18.18	18.55

Spectrum Plot of Worst Value	
Chain 0	Chain 1
	

4.3 Emission Mask Measurement

4.3.1 Limits of Emission Mask Measurement

For low power transmitters (20 dBm or less) and high power transmitters (greater than 20 dBm operating in the 4940-4990 MHz frequency band, the power spectral density of the emissions must be attenuated below the output power of the transmitter as follows:

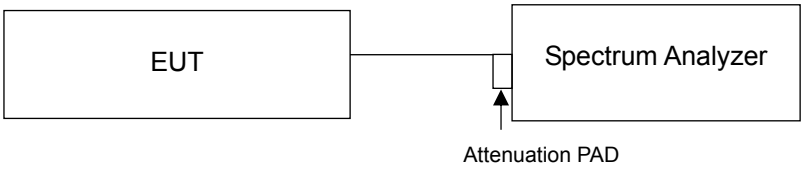
Frequency Offset fd	Minimum Attenuation	
	Low Power Transmitter	High Power Transmitter
0 < fd ≤ 45	0	0
45 < fd ≤ 50	219 log(fd/45)	568 log(fd/45)
50 < fd ≤ 55	10 + 242 log(fd/50)	26 + 145 log(fd/50)
55 < fd ≤ 100	20 + 31 log(fd/55)	32 + 31 log(fd/55)
100 < fd ≤ 150	28 + 68 log(fd/100)	40 + 57 log(fd/100)
fd > 150	40	50 dB or 55 + 10 log (P) dB, whichever is the lesser attenuation.

f_d is the percentage of the equipment's channel bandwidth.

4.3.2 Test Procedures

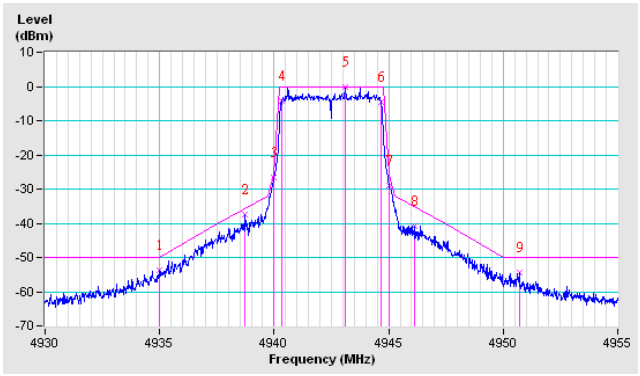
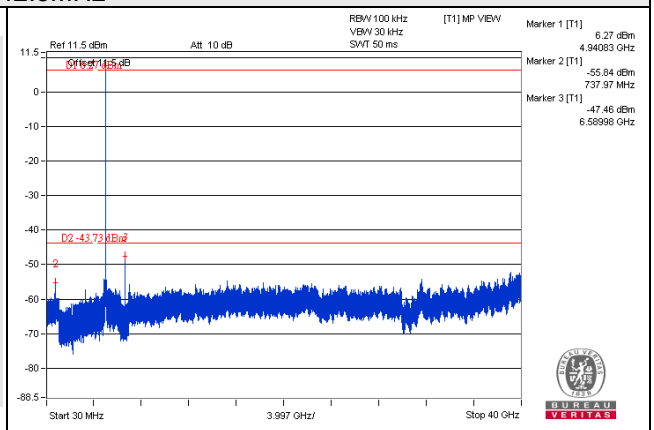
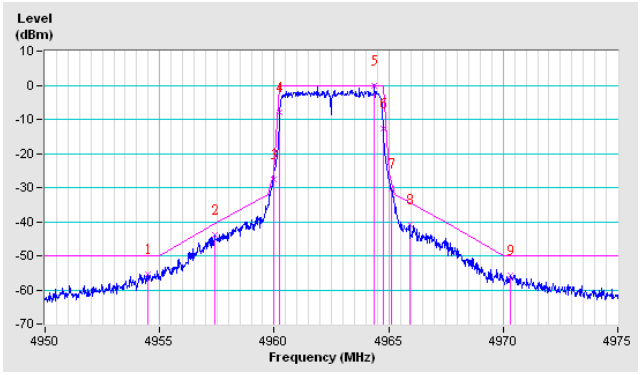
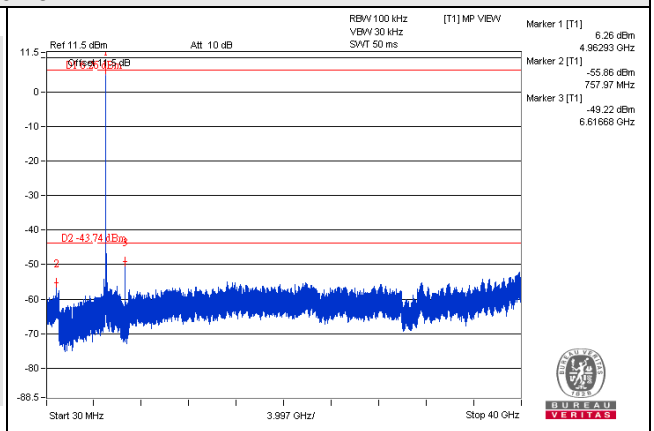
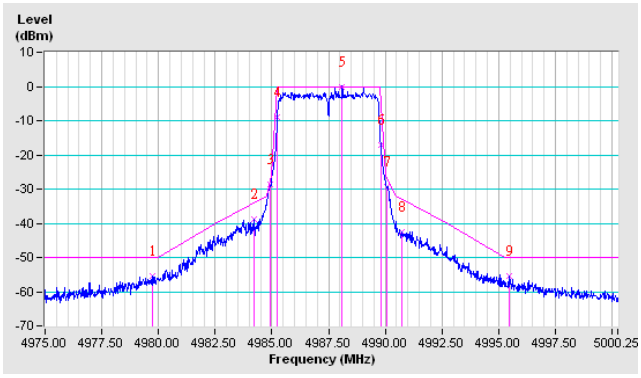
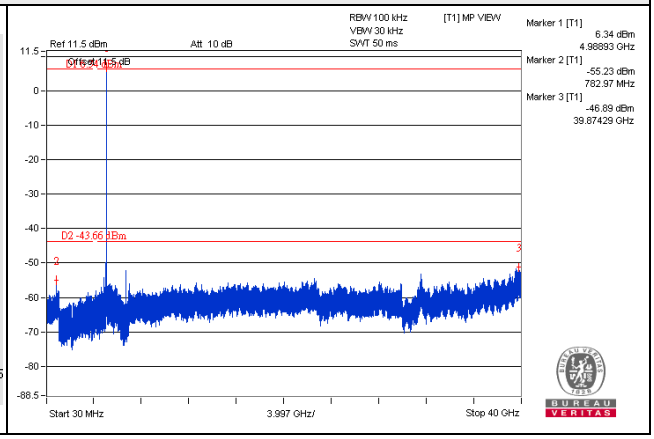
The zero dB reference is measured relative to the highest average power of the fundamental emission measured across the designated channel bandwidth using a resolution bandwidth of at least one percent of the occupied bandwidth of the fundamental emission and a video bandwidth of 30 kHz.

4.3.3 Test Setup

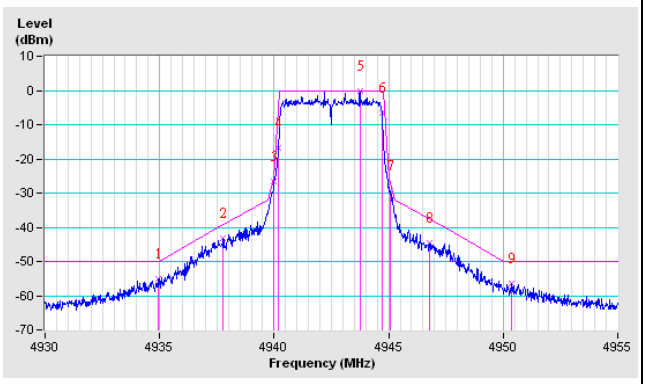
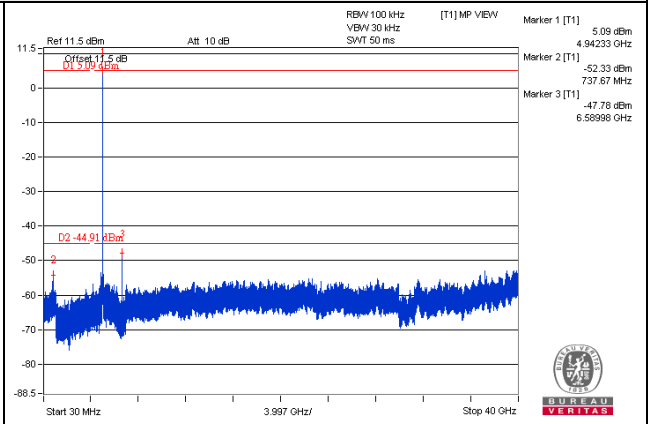
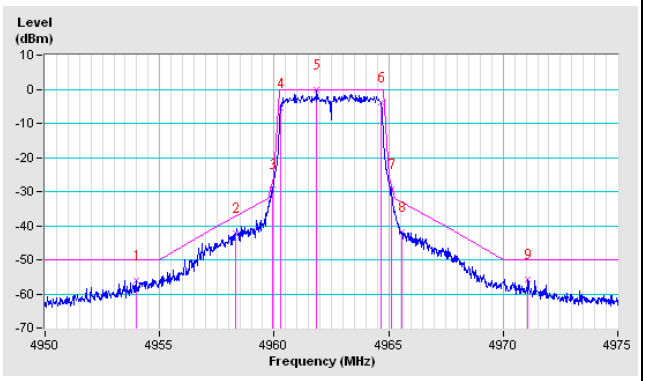
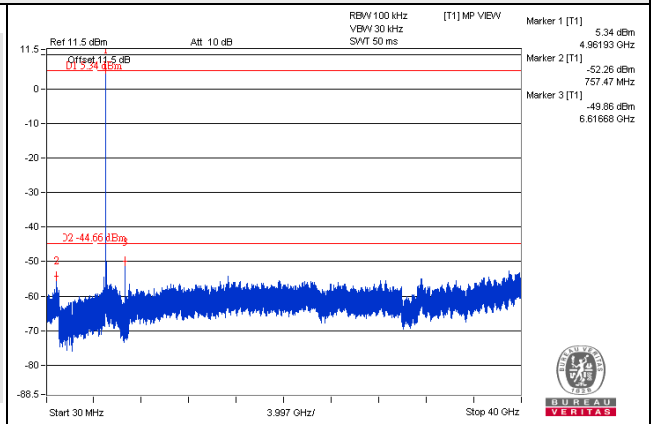
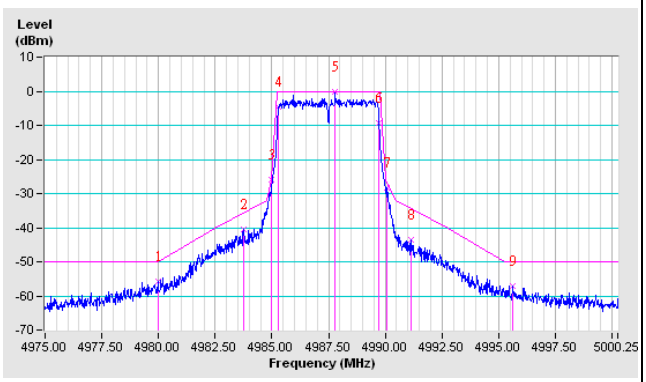
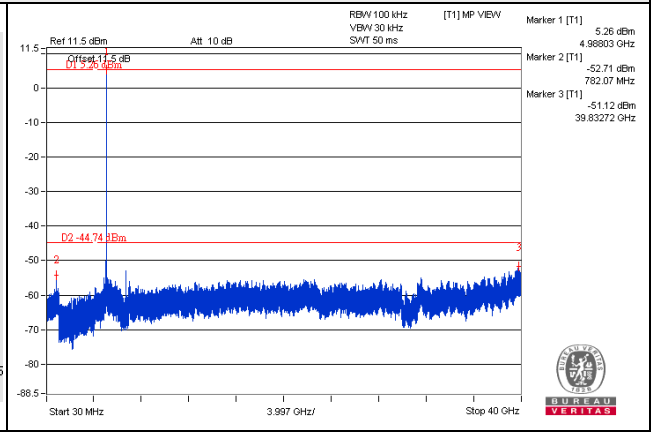


4.3.4 Test Results

Channel Bandwidth 5MHz

Chain 0	
CH1 4942.5MHz	
	
CH5 4962.5MHz	
	
CH10 4987.5MHz	
	

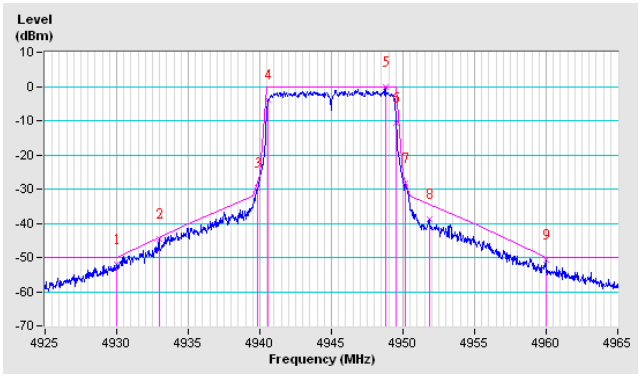
Channel Bandwidth 5MHz

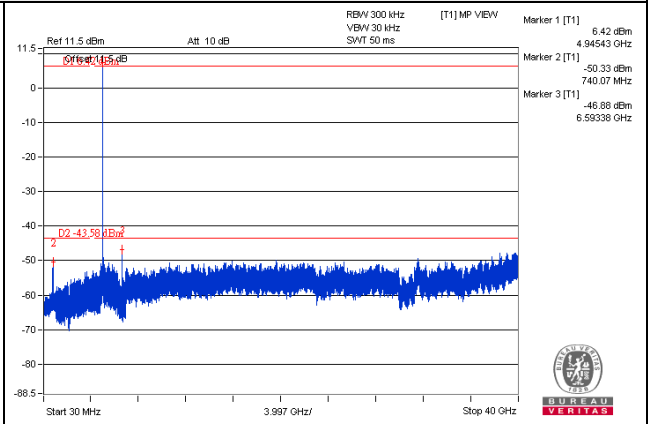
Chain 1	
CH1 4942.5MHz	
	
CH5 4962.5MHz	
	
CH10 4987.5MHz	
	

Channel Bandwidth 10MHz

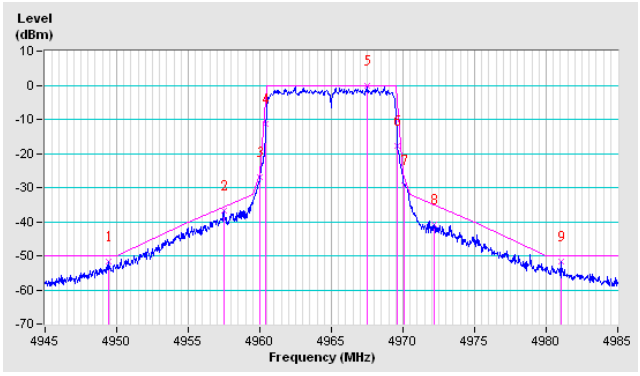
Chain 0

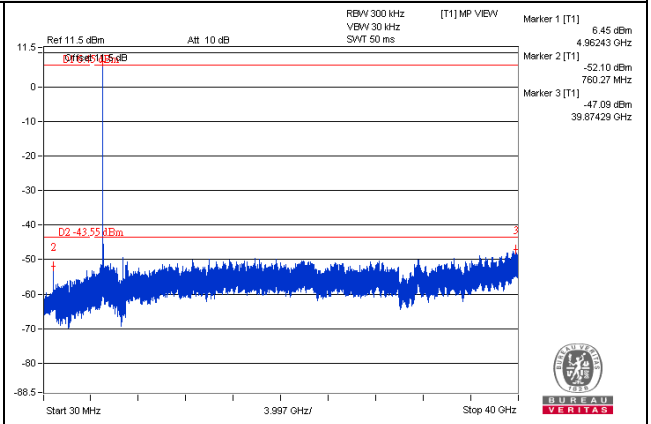
CH11 4945MHz



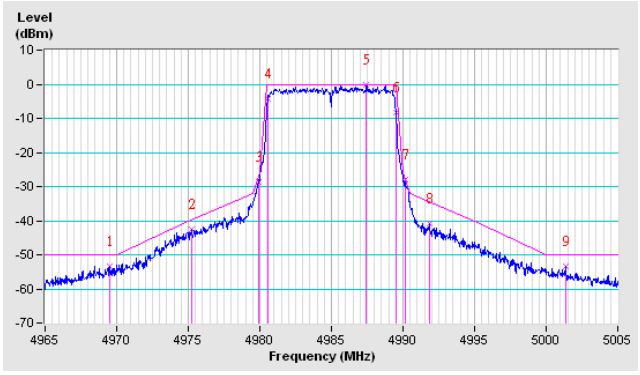


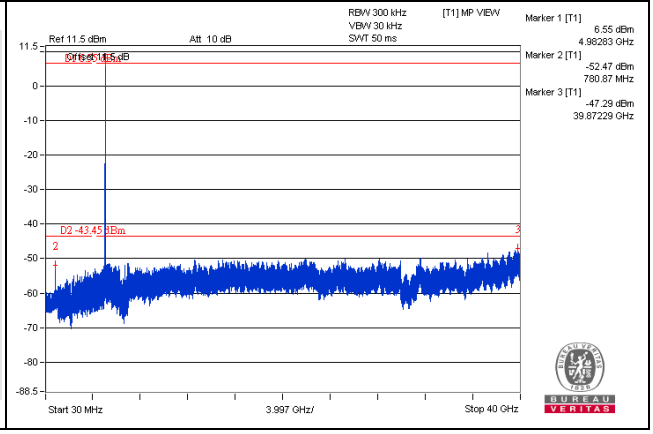
CH15 4965MHz





CH19 4985MHz

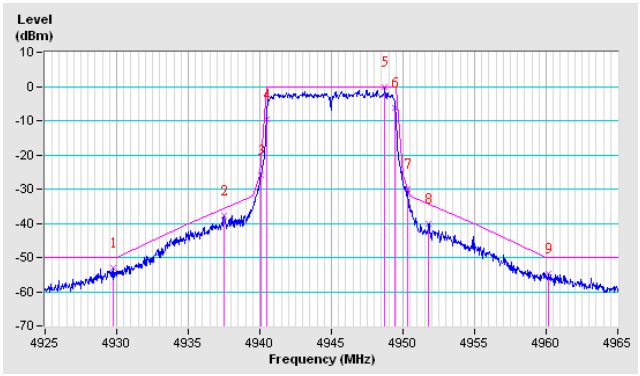


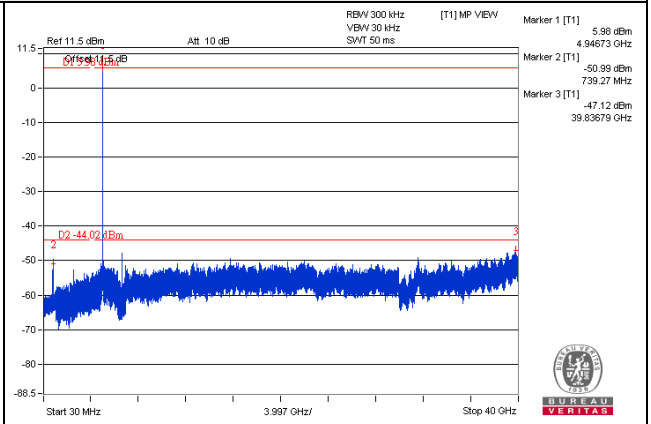


Channel Bandwidth 10MHz

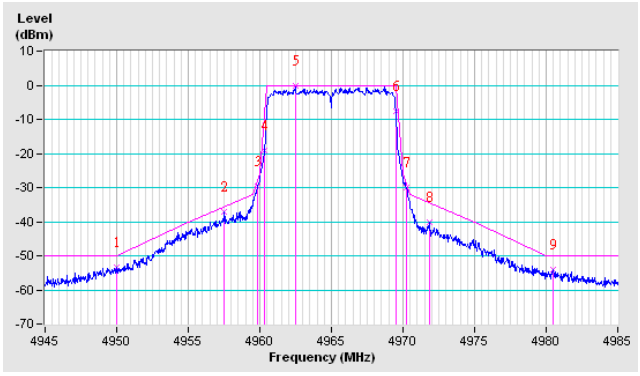
Chain 1

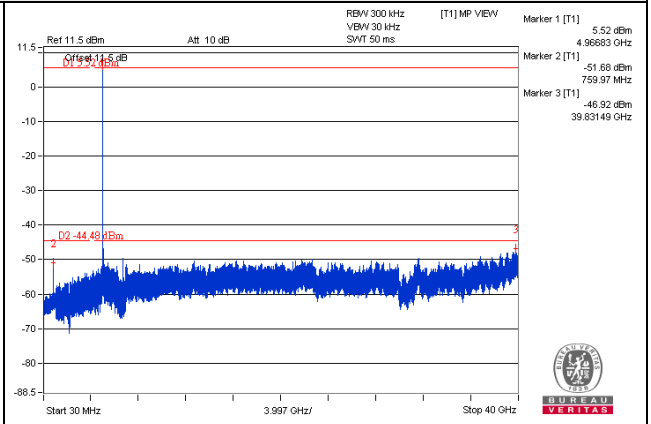
CH11 4945MHz



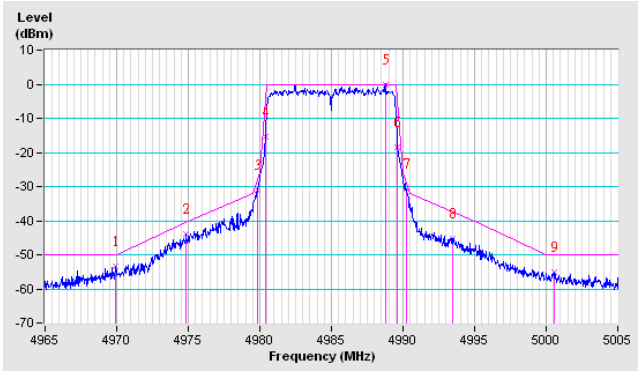


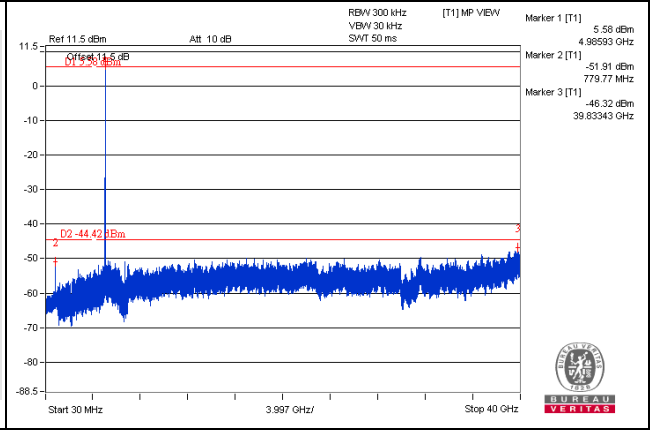
CH15 4965MHz





CH19 4985MHz

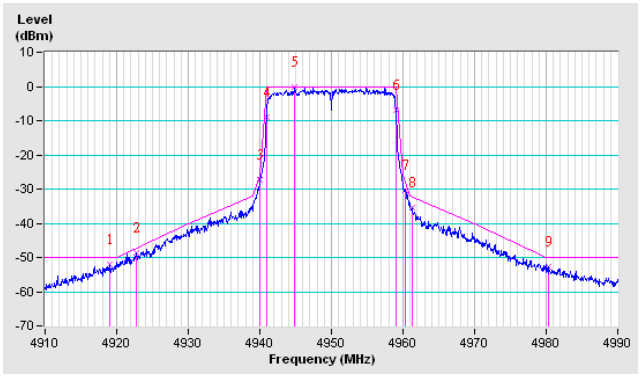


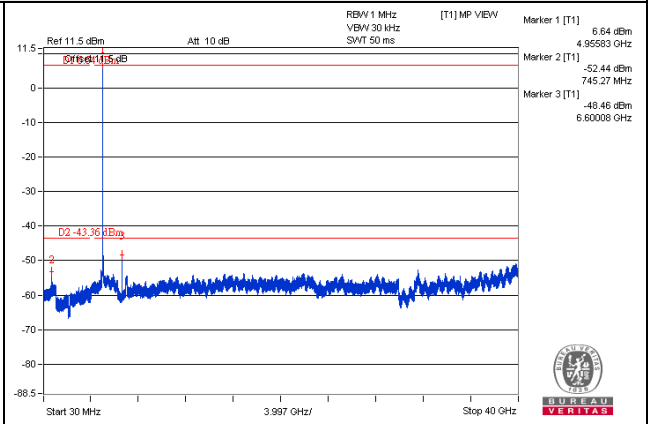


Channel Bandwidth 20MHz

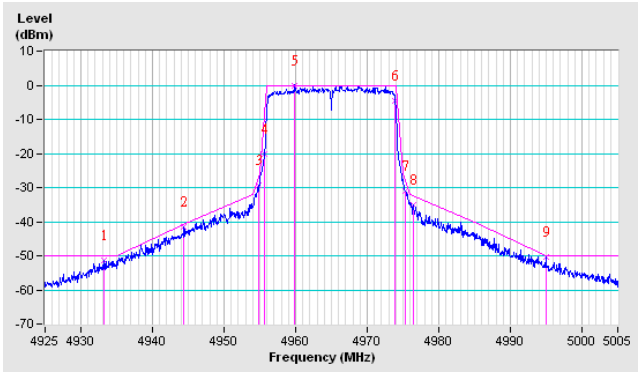
Chain 0

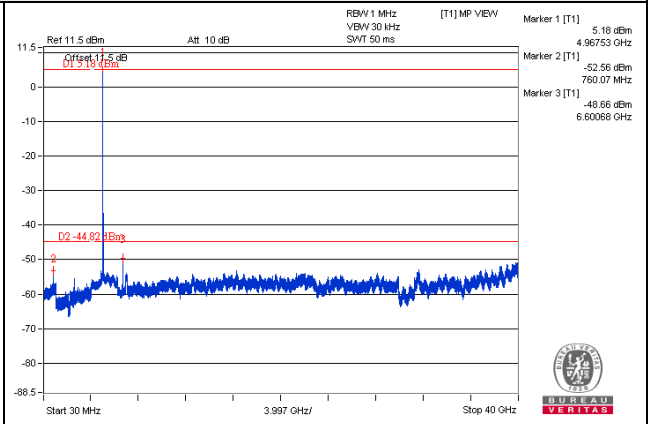
CH20 4950MHz



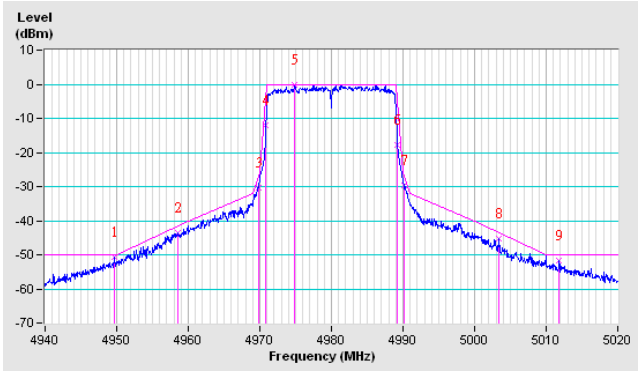


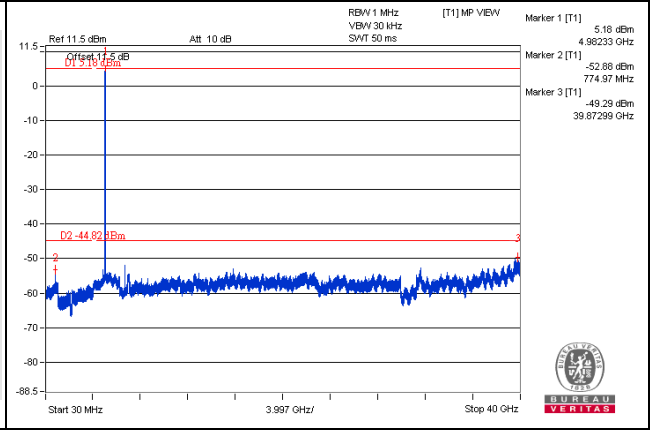
CH23 4965MHz





CH26 4980MHz

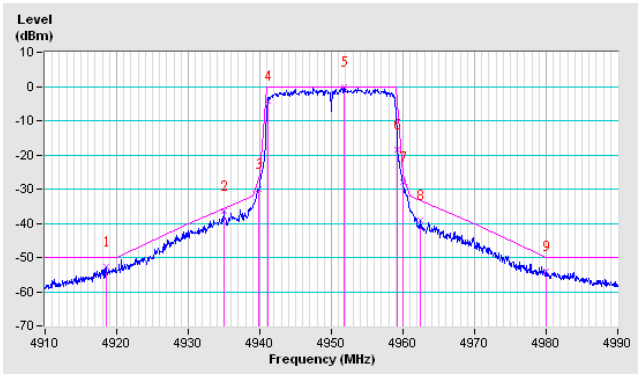


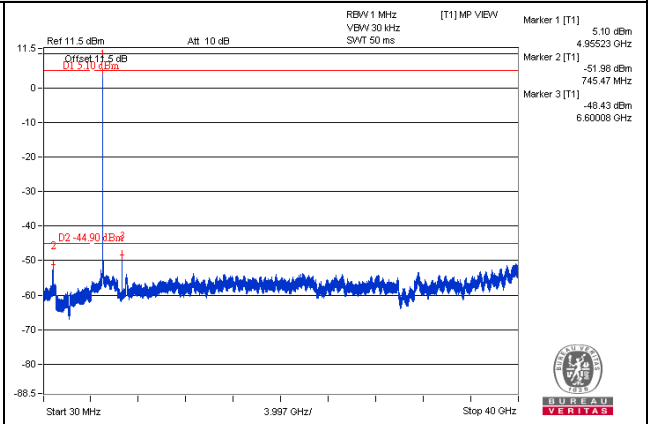


Channel Bandwidth 20MHz

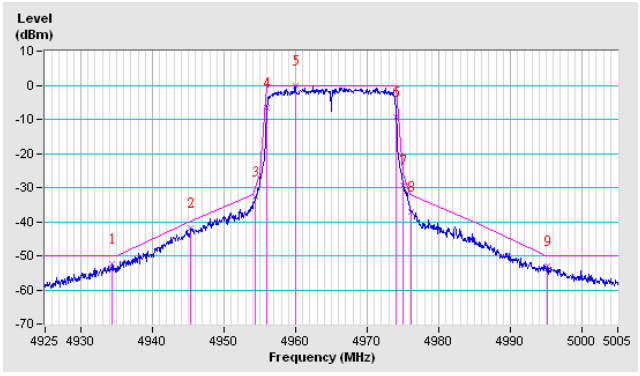
Chain 1

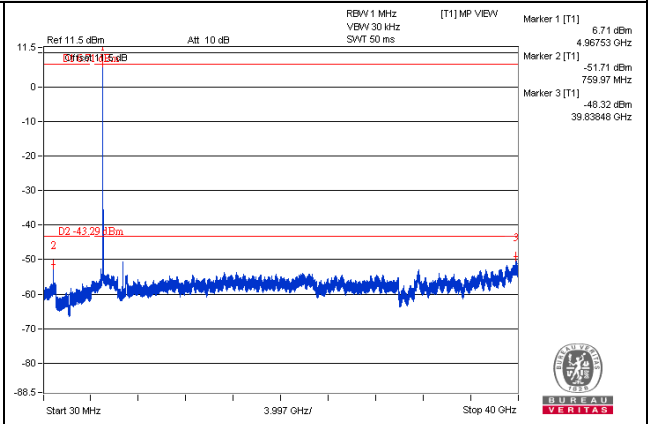
CH20 4950MHz



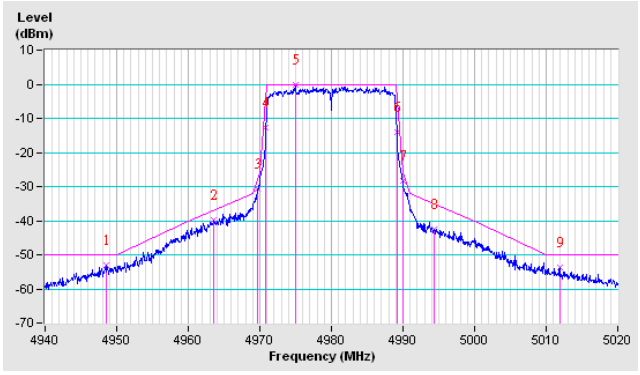


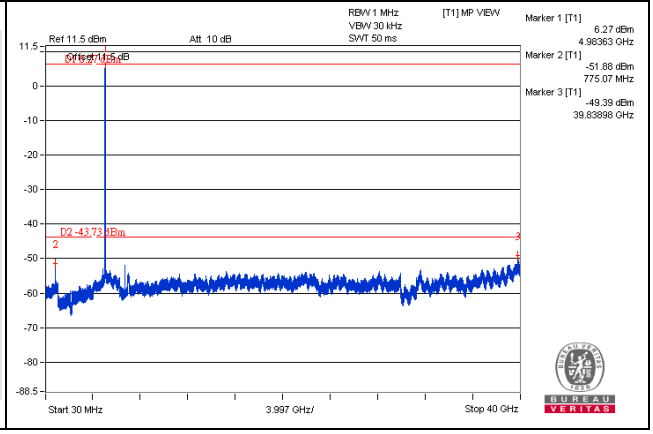
CH23 4965MHz





CH26 4980MHz





4.4 Peak Excursion Measurement

4.4.1 Limits of Peak Excursion Measurement

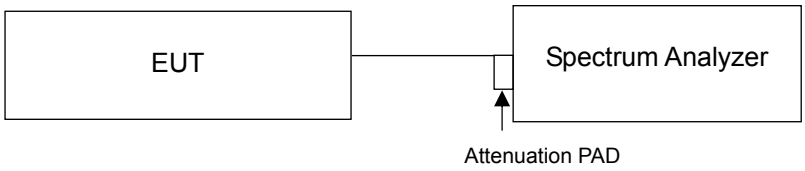
The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the maximum conducted output power shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

4.4.2 Test Procedures

The EUT was set to transmit continuously;
The following setting were set on the spectrum analyzer:
Trace 1:
- RBW = 1MHz
- VBW = 3 x RBW
- Span = 40MHz
- Detector = Peak
- Trace = Maxhold

Trace 2:
- RBW = 1MHz
- VBW = 3 x RBW
- Span = 40MHz
- Detector = Average (RMS)
- Trace = 100 Trace average

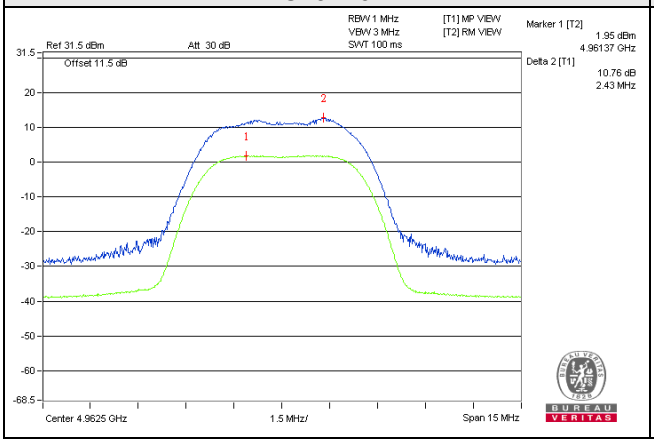
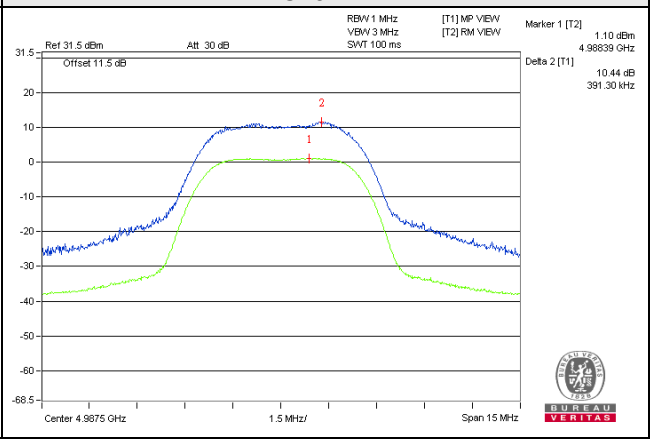
4.4.3 Test Setup



4.4.4 Test Results

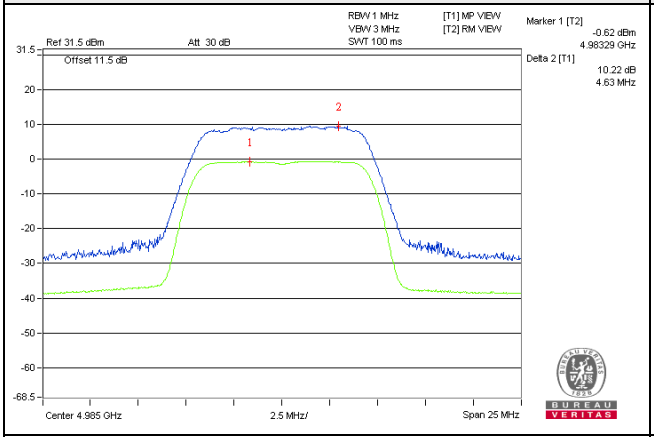
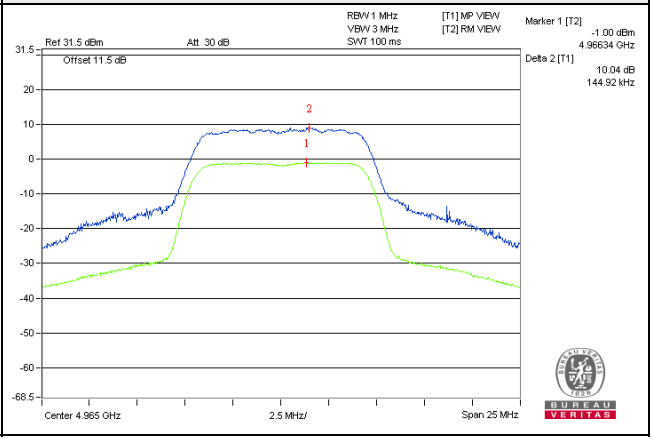
Channel Bandwidth 5MHz

Channel	Frequency (MHz)	Peak Excursion (dB)		Limit (dB)	Result
		Chain 0	Chain 1		
1	4942.5	10.72	10.11	13.00	Pass
5	4962.5	10.76	10.14	13.00	Pass
10	4987.5	10.59	10.44	13.00	Pass

Spectrum Plot of Worst Value	
Chain 0	Chain 1
	

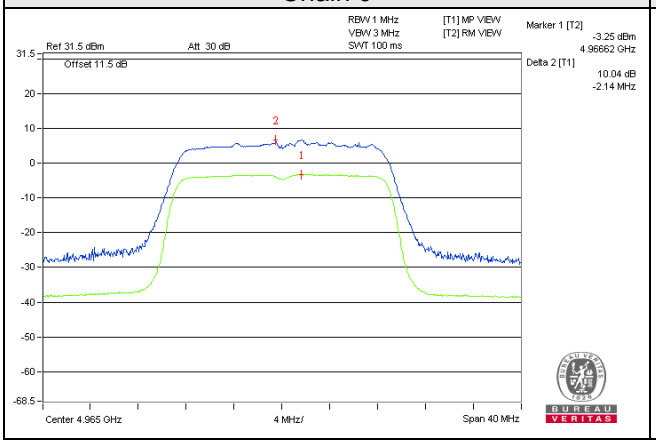
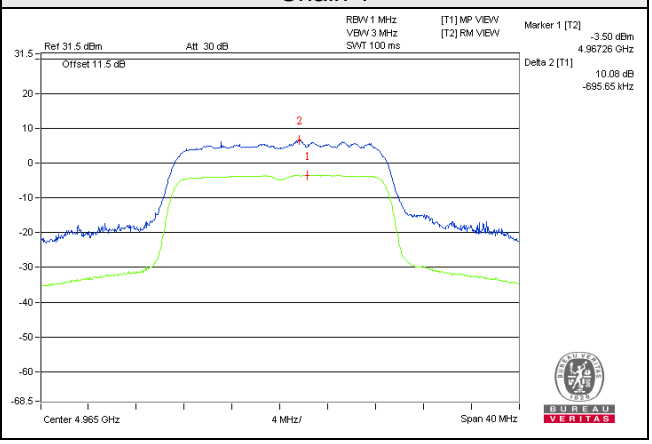
Channel Bandwidth 10MHz

Channel	Frequency (MHz)	Peak Excursion (dB)		Limit (dB)	Result
		Chain 0	Chain 1		
11	4945	10.02	9.92	13.00	Pass
15	4965	10.04	10.04	13.00	Pass
19	4985	10.22	9.96	13.00	Pass

Spectrum Plot of Worst Value	
Chain 0	Chain 1
	

Channel Bandwidth 20MHz

Channel	Frequency (MHz)	Peak Excursion (dB)		Limit (dB)	Result
		Chain 0	Chain 1		
20	4950	9.90	9.80	13.00	Pass
23	4965	10.04	10.08	13.00	Pass
26	4980	9.91	10.04	13.00	Pass

Spectrum Plot of Worst Value	
Chain 0	Chain 1
	

4.5 Power Spectral Density Measurement

4.5.1 Limits of Power Spectral Density Measurement

High power devices are also limited to a peak power spectral density of 21 dBm per one MHz. If transmitting antennas of directional gain greater than 9 dBi are used, the peak power spectral density should be reduced by the amount in decibels that the directional gain of the antenna exceeds 9 dBi.

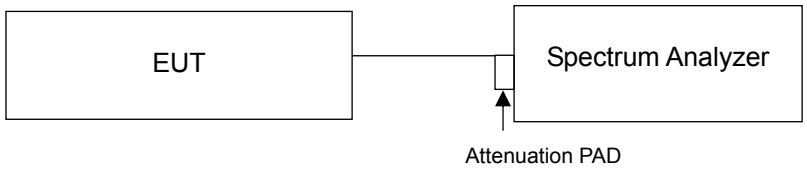
Low power devices are also limited to a peak power spectral density of 8 dBm per one MHz. Low power devices using channel bandwidths other than those listed above are permitted; however, they are limited to a peak power spectral density of 8 dBm/MHz. If transmitting antennas of directional gain greater than 9 dBi are used, the peak power spectral density should be reduced by the amount in decibels that the directional gain of the antenna exceeds 9 dBi.

However, high power point-to-point and point-to-multipoint operations (both fixed and temporary-fixed rapid deployment) may employ transmitting antennas with directional gain up to 26 dBi without any corresponding reduction in the maximum conducted output power or spectral density. Corresponding reduction in the maximum conducted output power and peak power spectral density should be the amount in decibels that the directional gain of the antenna exceeds 26 dBi

4.5.2 Test Procedures

- Set span to minimum of 1.5 times the OBW
- Set RBW = 1 MHz
- Set VBW ≥ 3 MHz
- Detector = RMS
- Sweep time = auto couple.
- Trace mode = max hold.
- Use the peak marker function to determine the maximum amplitude level within the RBW.

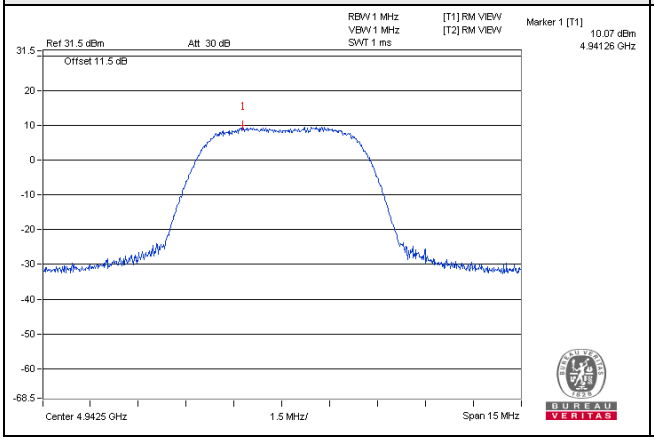
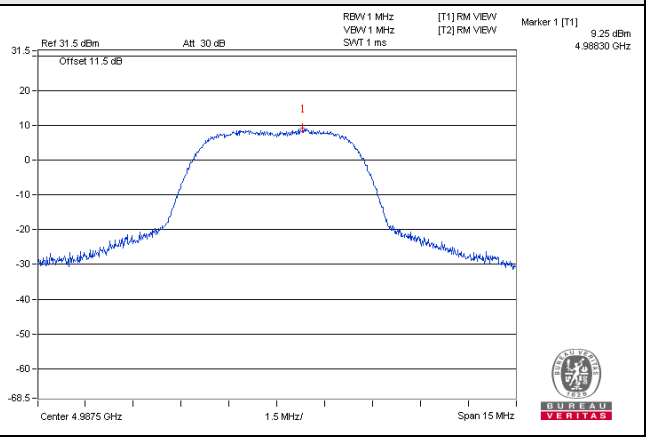
4.5.3 Test Setup



4.5.4 Test Results

Channel Bandwidth 5MHz

Channel	Frequency (MHz)	Power Spectral Density (dBm/MHz)		Limit (dBm/MHz)	Result
		Chain 0	Chain 1		
1	4942.5	10.07	8.77	21.00	Pass
5	4962.5	9.57	8.57	21.00	Pass
10	4987.5	9.77	9.25	21.00	Pass

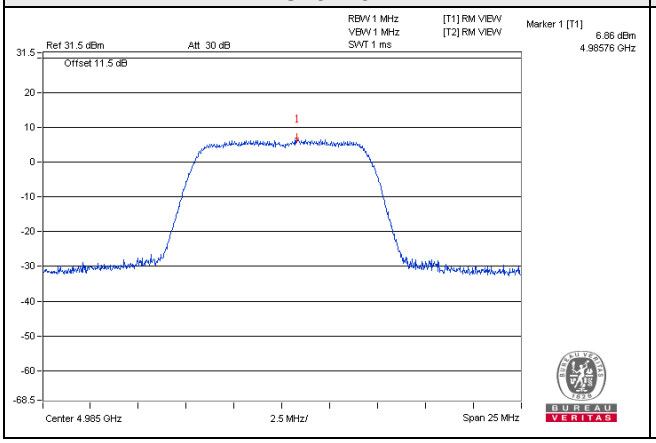
Spectrum Plot of Worst Value	
Chain 0	Chain 1
	

Channel Bandwidth 10MHz

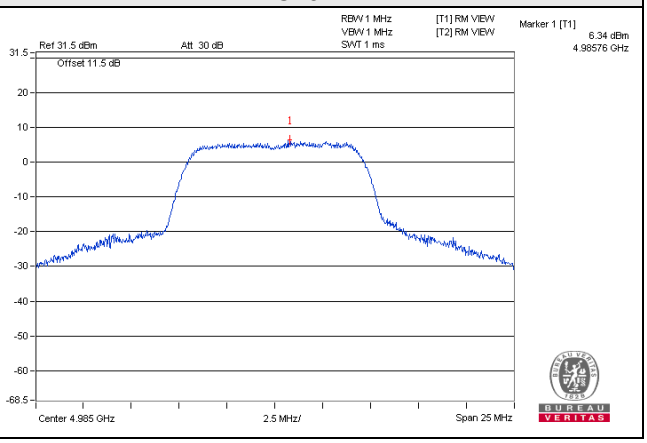
Channel	Frequency (MHz)	Power Spectral Density (dBm/MHz)		Limit (dBm/MHz)	Result
		Chain 0	Chain 1		
11	4945	6.51	6.05	21.00	Pass
15	4965	6.36	5.90	21.00	Pass
19	4985	6.86	6.34	21.00	Pass

Spectrum Plot of Worst Value

Chain 0



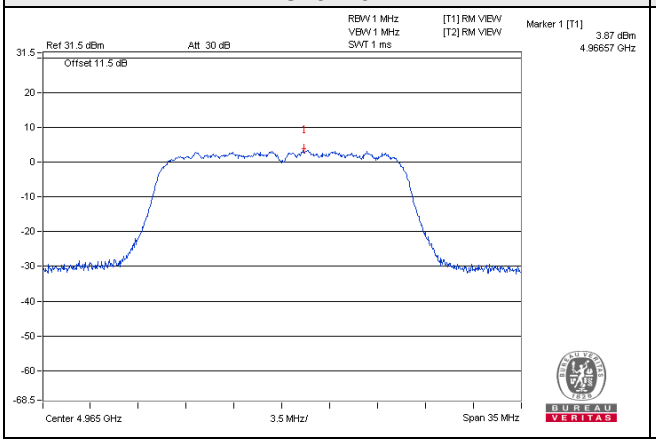
Chain 1

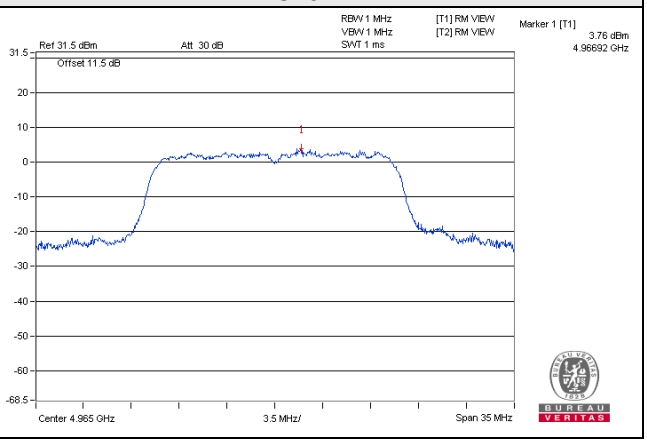


Channel Bandwidth 20MHz

Channel	Frequency (MHz)	Power Spectral Density (dBm/MHz)		Limit (dBm/MHz)	Result
		Chain 0	Chain 1		
20	4950	3.42	3.39	21.00	Pass
23	4965	3.87	3.76	21.00	Pass
26	4980	3.82	3.55	21.00	Pass

Spectrum Plot of Worst Value	
Chain 0	Chain 1





4.6 Radiated Emission Measurement

4.6.1 Limits of Radiated Emission Measurement

For low power transmitters (20 dBm or less) and high power transmitters (greater than 20 dBm operating in the 4940-4990 MHz frequency band, the power spectral density of the emissions must be attenuated below the output power of the transmitter as follows:

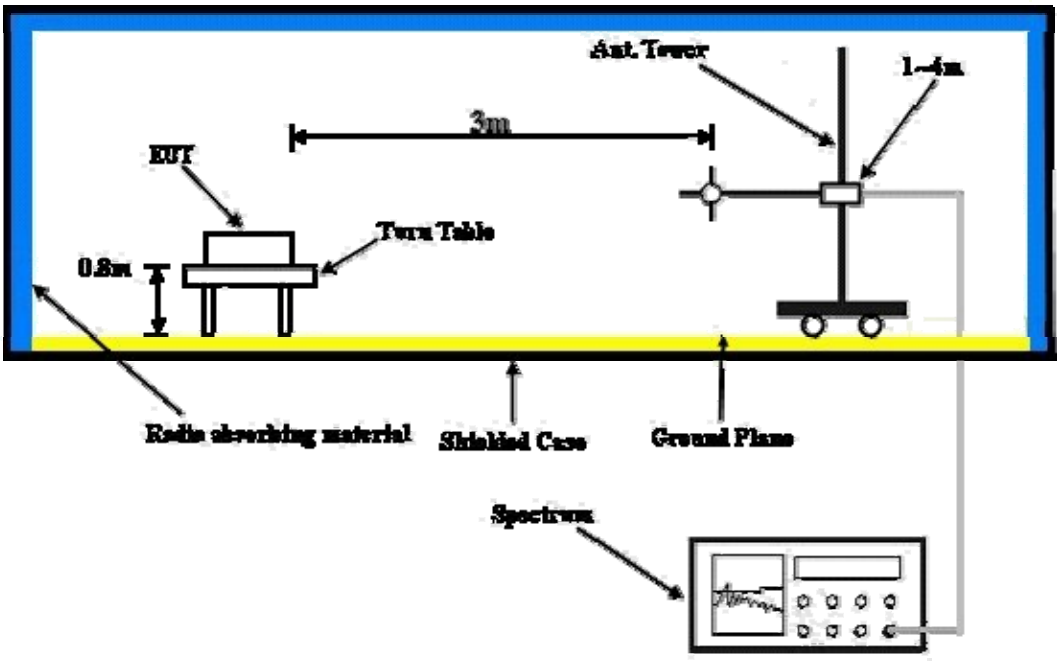
4.6.2 Test Procedure

1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. The test was carried out at the selected frequency points obtained from the EUT characterisation. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner:
   a. Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen.
   b. The EUT was then rotated to the direction that gave the maximum emission.
   c. Finally, the antenna height was adjusted to the height that gave the maximum emission.
3. Remove the transmitter and replace it with a substitution antenna (the antenna should be half-wavelength for each frequency involved). The center of the substitution antenna should be approximately at the same location as the center of the transmitter.
4. Feed the substitution antenna at the transmitter end with a signal generator connected to the antenna by means of a nonradiating cable. With the antennas at both ends horizontally polarized, and with the signal generator tuned to a particular spurious frequency, raise and lower the test antenna to obtain a maximum reading at the spectrum analyzer. Adjust the level of the signal generator output until the previously recorded maximum reading for this set of conditions is obtained.
5. Steps 4 were repeated for the next frequency point, until all selected frequency points were measured.

4.6.3 Deviation from Test Standard

No deviation.

4.6.4 Test Setup



For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.6.5 Test Results

Below 1GHz
Channel Bandwidth 5MHz

Mode	TX channel 10	Frequency Range	Below 1000 MHz

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	31.94	-47.8	-28.2	-18.3	-46.5	-25.0	-21.5
2	83.35	-52.2	-60.6	0.5	-60.1	-25.0	-35.1
3	142.52	-56.7	-61.0	-3.1	-64.1	-25.0	-39.1
4	532.46	-63.0	-68.7	3.9	-64.8	-25.0	-39.8
5	698.33	-62.9	-65.7	3.4	-62.3	-25.0	-37.3
6	938.89	-67.4	-64.9	3.7	-61.2	-25.0	-36.2
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	31.94	-33.2	-27.6	-18.3	-45.9	-25.0	-20.9
2	51.34	-43.4	-45.4	-7.3	-52.7	-25.0	-27.7
3	84.32	-47.8	-55.3	0.4	-54.9	-25.0	-29.9
4	141.55	-54.4	-55.9	-3.0	-58.9	-25.0	-33.9
5	203.63	-56.2	-58.0	-2.1	-60.1	-25.0	-35.1
6	547.01	-57.8	-62.2	3.9	-58.3	-25.0	-33.3

Remarks:
1. Output Power (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

Channel Bandwidth 10MHz,

Mode	TX channel 19	Frequency Range	Below 1000 MHz

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	30.97	-40.8	-20.5	-18.8	-39.3	-25.0	-14.3
2	83.35	-52.6	-61.0	0.5	-60.5	-25.0	-35.5
3	142.52	-56.0	-60.3	-3.1	-63.4	-25.0	-38.4
4	529.55	-63.1	-68.9	3.9	-65.0	-25.0	-40.0
5	697.36	-61.9	-64.7	3.3	-61.4	-25.0	-36.4
6	938.89	-68.5	-66.0	3.7	-62.3	-25.0	-37.3
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	48.43	-42.4	-43.6	-8.7	-52.3	-25.0	-27.3
2	84.32	-49.2	-56.8	0.4	-56.4	-25.0	-31.4
3	203.63	-56.4	-58.2	-2.1	-60.3	-25.0	-35.3
4	281.23	-62.2	-59.7	-1.7	-61.4	-25.0	-36.4
5	546.04	-58.2	-62.8	3.9	-58.9	-25.0	-33.9
6	937.92	-67.6	-64.6	3.8	-60.8	-25.0	-35.8

Remarks:
1. Output Power (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

Channel Bandwidth 20MHz,

Mode	TX channel 26	Frequency Range	Below 1000 MHz

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	83.35	-51.5	-59.9	0.5	-59.4	-25.0	-34.4
2	142.52	-56.4	-60.7	-3.1	-63.8	-25.0	-38.8
3	212.36	-57.3	-65.8	-2.1	-67.9	-25.0	-42.9
4	308.39	-61.2	-71.5	3.9	-67.6	-25.0	-42.6
5	699.30	-62.0	-64.8	3.4	-61.4	-25.0	-36.4
6	938.89	-68.8	-66.3	3.7	-62.6	-25.0	-37.6
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	30.00	-33.5	-26.2	-19.4	-45.6	-25.0	-20.6
2	48.43	-42.6	-43.8	-8.7	-52.5	-25.0	-27.5
3	202.66	-56.8	-58.3	-2.1	-60.4	-25.0	-35.4
4	286.08	-61.6	-60.0	-1.7	-61.7	-25.0	-36.7
5	541.19	-57.9	-62.6	3.9	-58.7	-25.0	-33.7
6	934.04	-67.3	-64.3	3.7	-60.6	-25.0	-35.6

Remarks:
1. Output Power (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

Above 1GHz
Channel Bandwidth 5MHz

Mode	TX channel 1	Frequency Range	Above 1000MHz

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	9885.00	-61.5	-37.9	0.3	-37.6	-25.0	-12.6
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	9885.00	-60.8	-37.5	0.3	-37.2	-25.0	-12.2

Remarks:
1. Output Power (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

Mode	TX channel 5	Frequency Range	Above 1000MHz

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	9925.00	-60.8	-37.1	0.3	-36.8	-25.0	-11.8
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	9925.00	-61.4	-38.3	0.3	-38.0	-25.0	-13.0

Remarks:
1. Output Power (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

Mode	TX channel 10	Frequency Range	Above 1000MHz

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	9975.00	-61.8	-38.1	0.4	-37.7	-25.0	-12.7
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	9975.00	-62.2	-39.5	0.4	-39.1	-25.0	-14.1

Remarks:
1. Output Power (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

Channel Bandwidth 10MHz

Mode	TX channel 11	Frequency Range	Above 1000MHz

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	9890.00	-61.2	-37.6	0.3	-37.3	-25.0	-12.3
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	9890.00	-60.9	-37.6	0.3	-37.3	-25.0	-12.3

Remarks:
1. Output Power (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

Mode	TX channel 15	Frequency Range	Above 1000MHz

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	9930.00	-60.5	-36.8	0.3	-36.5	-25.0	-11.5
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	9930.00	-60.6	-37.5	0.3	-37.2	-25.0	-12.2

Remarks:
1. Output Power (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

Mode	TX channel 19	Frequency Range	Above 1000MHz

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	9970.00	-61.4	-37.7	0.4	-37.3	-25.0	-12.3
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	9970.00	-61.3	-38.6	0.4	-38.2	-25.0	-13.2

Remarks:
1. Output Power (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

Channel Bandwidth 20MHz

Mode	TX channel 20	Frequency Range	Above 1000MHz

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	9900.00	-61.4	-37.8	0.3	-37.5	-25.0	-12.5
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	9900.00	-60.2	-36.9	0.3	-36.6	-25.0	-11.6

Remarks:
1. Output Power (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

Mode	TX channel 23	Frequency Range	Above 1000MHz

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	9930.00	-61.0	-37.3	0.3	-37.0	-25.0	-12.0
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	9930.00	-61.1	-38.0	0.3	-37.7	-25.0	-12.7

Remarks:
1. Output Power (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

Mode	TX channel 26	Frequency Range	Above 1000MHz

Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	9960.00	-61.2	-37.5	0.4	-37.1	-25.0	-12.1
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	9960.00	-61.4	-38.6	0.4	-38.2	-25.0	-13.2

Remarks:
1. Output Power (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

4.7 Frequency Stability Measurement

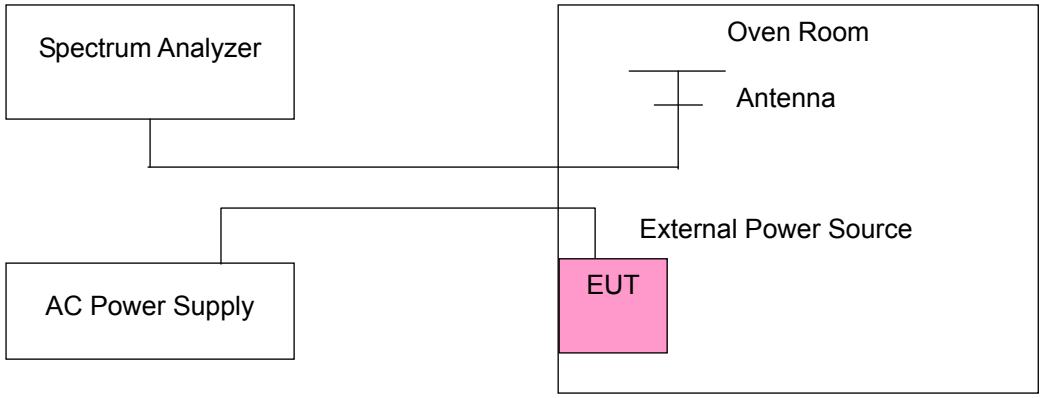
4.7.1 Limits of Frequency Stability Measurement

The test shall be performed at normal and extreme test conditions. From -30°C to +50°C and vary the primary supply voltage from 85% to 115% of the nominal value.

4.7.2 Test Procedure

- The EUT was switched on and allowed to warm up to its normal operating condition.
- The EUT output was connected to a spectrum analyser and the frequency stability was measured.
- Measurements were taken after a thermal balance was obtained.
- Normal and extreme test conditions were measured

4.7.3 Test Setup



4.7.4 Test Results

Channel Bandwidth 5MHz

Frequency Stability Versus Temp.									
Operating Frequency: 4942.5MHz									
Temp. (℃)	Power Supply (Vac)	0 Minute		2 Minute		5 Minute		10 Minute	
		Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)
50	120	4942.4964	-0.00007	4942.4991	-0.00002	4942.4988	-0.00002	4942.4993	-0.00001
40	120	4942.5029	0.00006	4942.5062	0.00013	4942.5062	0.00013	4942.5053	0.00011
30	120	4942.5186	0.00038	4942.5220	0.00045	4942.5219	0.00044	4942.5228	0.00046
20	120	4942.4986	-0.00003	4942.4988	-0.00002	4942.4992	-0.00002	4942.4973	-0.00005
10	120	4942.4970	-0.00006	4942.4969	-0.00006	4942.4930	-0.00014	4942.4960	-0.00008
0	120	4942.4835	-0.00033	4942.4852	-0.00030	4942.4822	-0.00036	4942.4843	-0.00032
-10	120	4942.5158	0.00032	4942.5159	0.00032	4942.5177	0.00036	4942.5166	0.00034
-20	120	4942.5090	0.00018	4942.5115	0.00023	4942.5084	0.00017	4942.5119	0.00024
-30	120	4942.4742	-0.00052	4942.4742	-0.00052	4942.4749	-0.00051	4942.4744	-0.00052

Frequency Stability Versus Voltage									
Operating Frequency: 4942.5MHz									
Temp. (℃)	Power Supply (Vac)	0 Minute		2 Minute		5 Minute		10 Minute	
		Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)
20	138	4942.4984	-0.00003	4942.4996	-0.00001	4942.4998	0.00000	4942.4980	-0.00004
	120	4942.4986	-0.00003	4942.4988	-0.00002	4942.4992	-0.00002	4942.4973	-0.00005
	102	4942.4993	-0.00001	4942.4997	-0.00001	4942.4994	-0.00001	4942.4983	-0.00003

Channel Bandwidth 10MHz

Frequency Stability Versus Temp.									
Operating Frequency: 4945MHz									
Temp. (℃)	Power Supply (Vac)	0 Minute		2 Minute		5 Minute		10 Minute	
		Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)
50	120	4944.9925	-0.00015	4944.9932	-0.00014	4944.9924	-0.00015	4944.9938	-0.00013
40	120	4944.9792	-0.00042	4944.9834	-0.00034	4944.9804	-0.00040	4944.9795	-0.00041
30	120	4945.0230	0.00047	4945.0216	0.00044	4945.0218	0.00044	4945.0239	0.00048
20	120	4944.9873	-0.00026	4944.9857	-0.00029	4944.9837	-0.00033	4944.9874	-0.00025
10	120	4945.0173	0.00035	4945.0178	0.00036	4945.0155	0.00031	4945.0135	0.00027
0	120	4945.0103	0.00021	4945.0089	0.00018	4945.0100	0.00020	4945.0058	0.00012
-10	120	4944.9900	-0.00020	4944.9892	-0.00022	4944.9897	-0.00021	4944.9896	-0.00021
-20	120	4944.9748	-0.00051	4944.9772	-0.00046	4944.9766	-0.00047	4944.9761	-0.00048
-30	120	4944.9778	-0.00045	4944.9769	-0.00047	4944.9786	-0.00043	4944.9797	-0.00041

Frequency Stability Versus Voltage									
Operating Frequency: 4945MHz									
Temp. (℃)	Power Supply (Vac)	0 Minute		2 Minute		5 Minute		10 Minute	
		Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)
20	138	4944.9866	-0.00027	4944.9856	-0.00029	4944.9837	-0.00033	4944.9882	-0.00024
	120	4944.9873	-0.00026	4944.9857	-0.00029	4944.9837	-0.00033	4944.9874	-0.00025
	102	4944.9874	-0.00025	4944.9848	-0.00031	4944.9845	-0.00031	4944.9878	-0.00025

Channel Bandwidth 20MHz

Frequency Stability Versus Temp.									
Operating Frequency: 4950MHz									
Temp. (℃)	Power Supply (Vac)	0 Minute		2 Minute		5 Minute		10 Minute	
		Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)
50	120	4949.9872	-0.00026	4949.9903	-0.00020	4949.9863	-0.00028	4949.9903	-0.00020
40	120	4949.9884	-0.00023	4949.9900	-0.00020	4949.9880	-0.00024	4949.9906	-0.00019
30	120	4949.9879	-0.00024	4949.9882	-0.00024	4949.9850	-0.00030	4949.9876	-0.00025
20	120	4950.0138	0.00028	4950.0112	0.00023	4950.0124	0.00025	4950.0154	0.00031
10	120	4950.0152	0.00031	4950.0145	0.00029	4950.0148	0.00030	4950.0176	0.00036
0	120	4950.0169	0.00034	4950.0142	0.00029	4950.0172	0.00035	4950.0137	0.00028
-10	120	4949.9823	-0.00036	4949.9793	-0.00042	4949.9782	-0.00044	4949.9784	-0.00044
-20	120	4949.9938	-0.00013	4949.9930	-0.00014	4949.9923	-0.00016	4949.9961	-0.00008
-30	120	4949.9907	-0.00019	4949.9885	-0.00023	4949.9883	-0.00024	4949.9881	-0.00024

Frequency Stability Versus Voltage									
Operating Frequency: 4950MHz									
Temp. (℃)	Power Supply (Vac)	0 Minute		2 Minute		5 Minute		10 Minute	
		Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)
20	138	4950.0129	0.00026	4950.0103	0.00021	4950.0134	0.00027	4950.0160	0.00032
	120	4950.0138	0.00028	4950.0112	0.00023	4950.0124	0.00025	4950.0154	0.00031
	102	4950.0128	0.00026	4950.0118	0.00024	4950.0117	0.00024	4950.0148	0.00030

5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

Appendix – Information on the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

Linko EMC/RF Lab
Tel: 886-2-26052180
Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab
Tel: 886-3-6668565
Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety Lab
Tel: 886-3-3183232
Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com
Web Site: www.bureauveritas-adt.com

The address and road map of all our labs can be found in our web site also.

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