

Prüfbericht - Nr.: **02423370 001**
Seite 1 von 47
Test Report No.:
Page 1 of 47

Auftraggeber: Vihaan Networks Ltd.
Client: 21-B, Sector 18, Udyog Vihar
 Gurgaon, Haryana
 India-122015

Gegenstand der Prüfung: RBTS 1900 MHz R2, R2.0
Test item:

Bezeichnung: RBTS 1900 MHz R2, R2.0 **Serien-Nr.:** R2D20SE11085752
Identification: **Serial No.**

Wareneingangs-Nr.: 1403015582 **Eingangsdatum:** 24.07.2011
Receipt No.: **Date of receipt:**

Prüfort: Refer Page 4 of 47 for test facilities
Testing location:

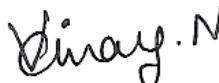
Prüfgrundlage: FCC Part 2
Test specification: FCC Part 24

Prüfergebnis: Der Prüfgegenstand entspricht oben genannter Prüfgrundlage(n).
Test Result: The tests item passed the test specification(s).

Prüflaboratorium: TÜV Rheinland (India) Pvt. Ltd.
Testing Laboratory: Alpha Tower, Sigma Soft Tech Park, # 7, Whitefield Main Road,
 Varthur Kodi, Bangalore – 560066, India

geprüft / tested by: **kontrolliert / reviewed by:**

16.08.2011 Vinay.N
 Test Engineer



17.08.2011 Varma Kalyan
 Manager



Datum Date	Name/Stellung Name/Position	Unterschrift Signature
---------------	--------------------------------	---------------------------

Datum Date	Name/Stellung Name/Position	Unterschrift Signature
---------------	--------------------------------	---------------------------

Sonstiges /Other Aspects: FCC ID : ZO7-RBTS1900R2

Abkürzungen: **P(ass)** = entspricht Prüfgrundlage
Fail) = entspricht nicht Prüfgrundlage
N/A = nicht anwendbar
N/T = nicht getestet

Abbreviations: **P(ass)** = passed
Fail) = failed
N/A = not applicable
N/T = not tested

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.

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.

www.tuv.com

Test Result Summary

Clause	Test Item	Result
2.1046 / 24.232	Maximum Channel Power	Pass
2.1047	Modulation Characteristics	Pass
2.1049	Occupied Bandwidth	Pass
2.1051 / 24.238	Band Edges Compliance	Pass
2.1051 / 24.238	Spurious Emission at Antenna Terminal	Pass
2.1053 / 24.238	Radiated Spurious Emission	Pass
2.1055 / 24.235	Frequency Stability	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 Results.....	8
Maximum Channel Power	Section 2.1046 / 24.232
Modulation Characteristics	Section 2.1047
Occupied Bandwidth	Section 2.1049
Band-edge Compliance	Section 2.1051 and 24.238
Spurious Emissions at antenna terminals	Section 2.1051 and 24.238.....
Radiated Spurious Emissions	Section 2.2051 and 24.238
Frequency Stability	Section 2.1055 and 24.235
Appendix 1: Test Setup Photos	
Appendix 2: EUT External Photos	
Appendix 3: EUT Internal Photos	
Appendix 4: Label Diagram	
Appendix 5: Block Diagram	
Appendix 6: Specification of EUT	
Appendix 7: Schematic Diagrams	
Appendix 8: Bill of Material	
Appendix 9: User Manual	
Appendix 10 : Maximum Permissible Exposure Information	

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
Digital Radio Communication Tester	Rohde & Schwarz	CMU 300	100342	07.07.2012
Spectrum Analyzer	Agilent Technologies	E4407B	US41192 772	27.01.2012

Testing Facilities

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

General Product Information

Product Function and Intended Use

A BTS provides coverage for a cell, which is usually located at the center of a cell. A BTS provide the connectivity between the network and the mobile station via the Air-interface using the RF frequencies. The VNL RBTS-1900 with TU in built in DMB card and power system corresponds to BTS/Cell-Site in 1900MHz GSM band. The RBTS-1900 shall provide wider umbrella coverage. It shall have RPA/DLNA for boosting the TX output.

Ratings and System Details

Operating Frequency	1930 – 1990 MHz
No. of channel	297
Channel Spacing	200 kHz
Transmitted Power	+40.45 dBm
Modulation	GMSK
Antenna Type	Omni Directional
Antenna Gain	~10 dBi
Supply Voltage	24V DC
Dimensions	724.1 mm X 422.3 mm X 229.3 mm
Environmental	Storage: -65 to +125degrees C Operational: -40 to +60 degrees C.

Test Conditions:

24V DC Battery Supply

Environmental conditions:

Temperature: +23 ° C

RH: 62%

Operation Descriptions

In case of RBTS-1900, TU (DMB) is present inside the BTS unit and Ethernet port is there for the connectivity to the BSC on Abis interface, then one external TU is required (That will be TU @ BSC) to convert that Ethernet to standard E1 which will go to the N2 of the BSC Simulator.

The base band system is divided in three parts: Main block, and two slaves block. The main block consists of an ARM9 based processor (Freescale i.MX27L) responsible for all common tasks in the system. The two slaves block is used to control of the TRX's (one block for each TRX). The slave blocks consists of two (Analog Devices) Blackfin BF547 processors each (total of four Blackfins). For each TRX there are two slave CPU's. The SPI interfaces used for control of the radio parts are only connected to one of these slave CPU's. The interfaces used for data transmission are connected to both slave CPU's. The received data from each TRX are connected to all four slave CPU's. There are a total of two Tx DACs in the system, one on each RTM. The DAC uses a parallel interface for data transfer. This interface is connected to each of the Blackfin CPU's controlling one TRX. There are a total of two Rx ADCs in the system, one on each RTM

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

Console 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:

- Console Computer used to set the test configuration (channel and power level)

Countermeasures to achieve EMC Compliance

- None

Table of carrier frequencies

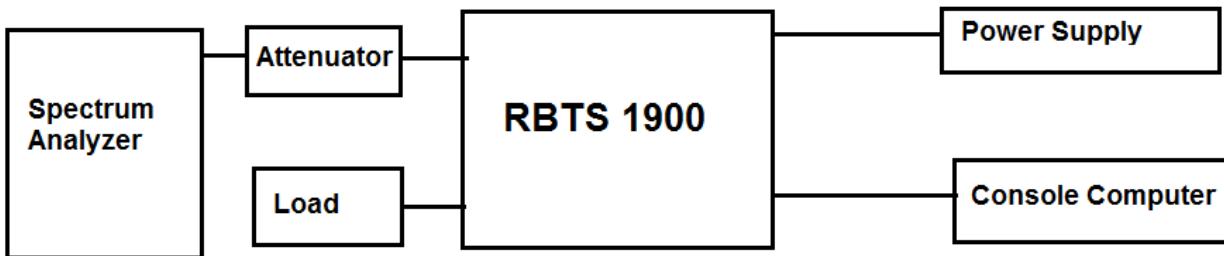
Frequency Band	Channel No.	Frequency (MHz)
1930 – 1990 MHz	513	1930.4
	514	1930.6
	.	.
	.	.
	.	.
	.	.
	.	.
	.	.
	808	1989.4
	809	1989.6

Test Results

Maximum Channel Power Result	Section 2.1046 / 24.232
	Pass
Test Specification	CFR 47 (FCC) part 2.1046 and part 24.232
Test Method	TIA-603-C:2004.
Measured at	Antenna Connector
Test Configuration	Transmitter 1 – Channel Low, Mid and High Transmitter 2 – Channel Low, Mid and High

Test Method:

The EUT was connected to the Spectrum Analyzer via the one RF connector. Other RF connectors were connected to match load. BTS was controlled to transmit Maximum power by console computer. Measure and record the Maximum Channel Power of the Base Station by the Spectrum Analyzer.



Limits:

The Maximum output power may not exceed 1640W i.e. 62 dBm (EIRP)

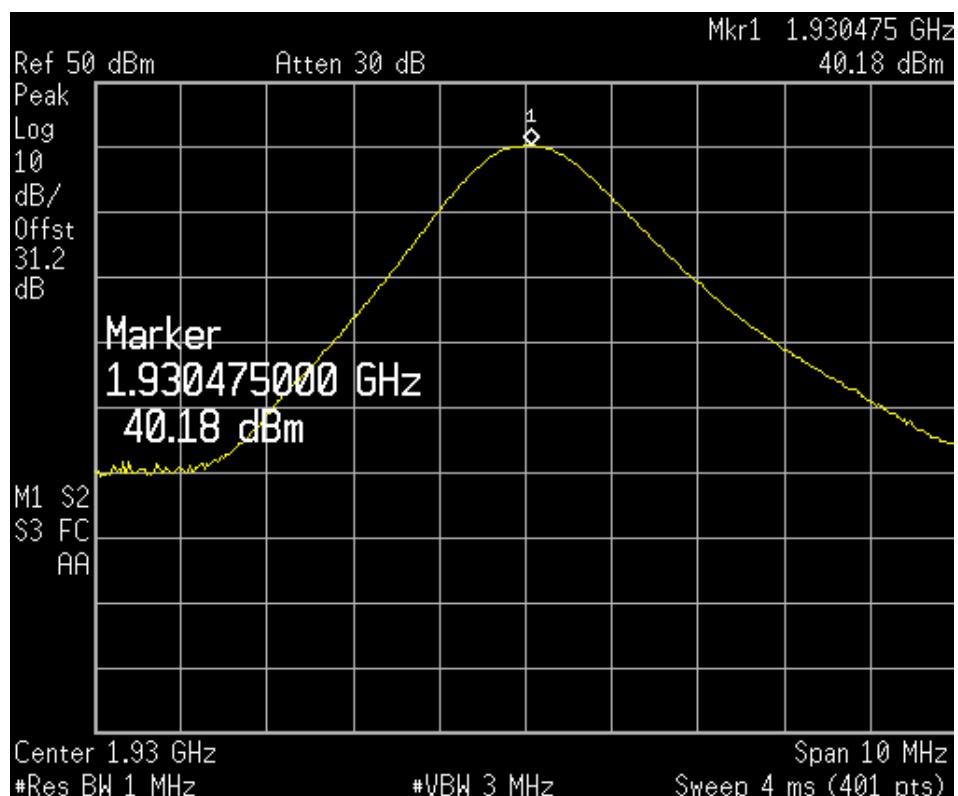
Test Conditions:

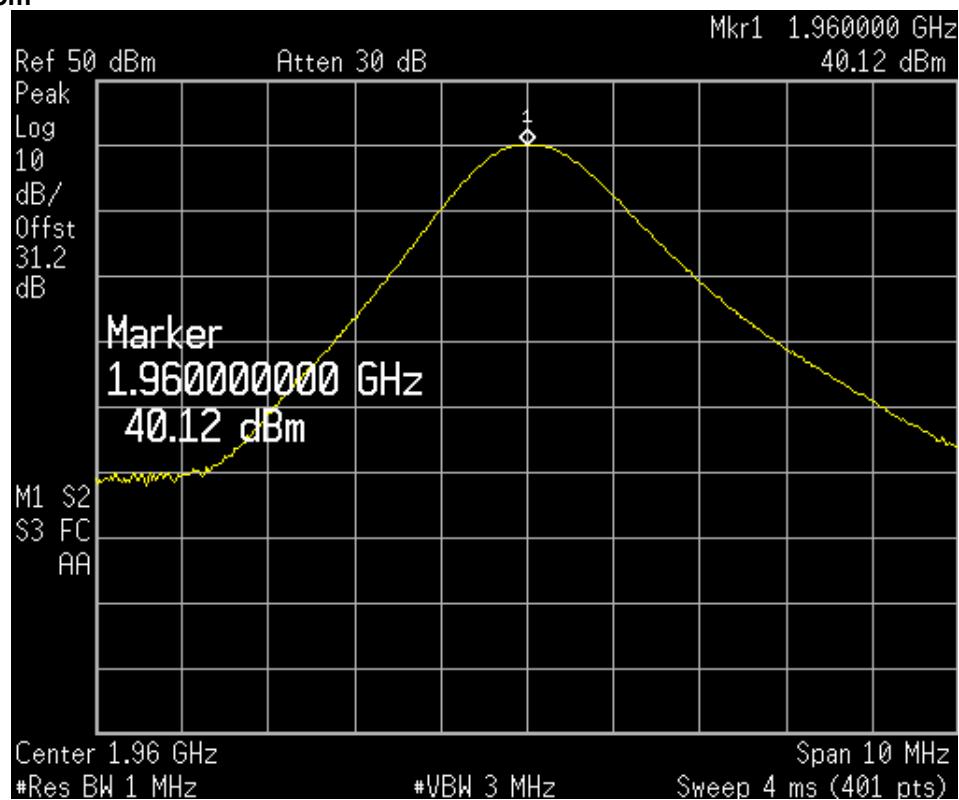
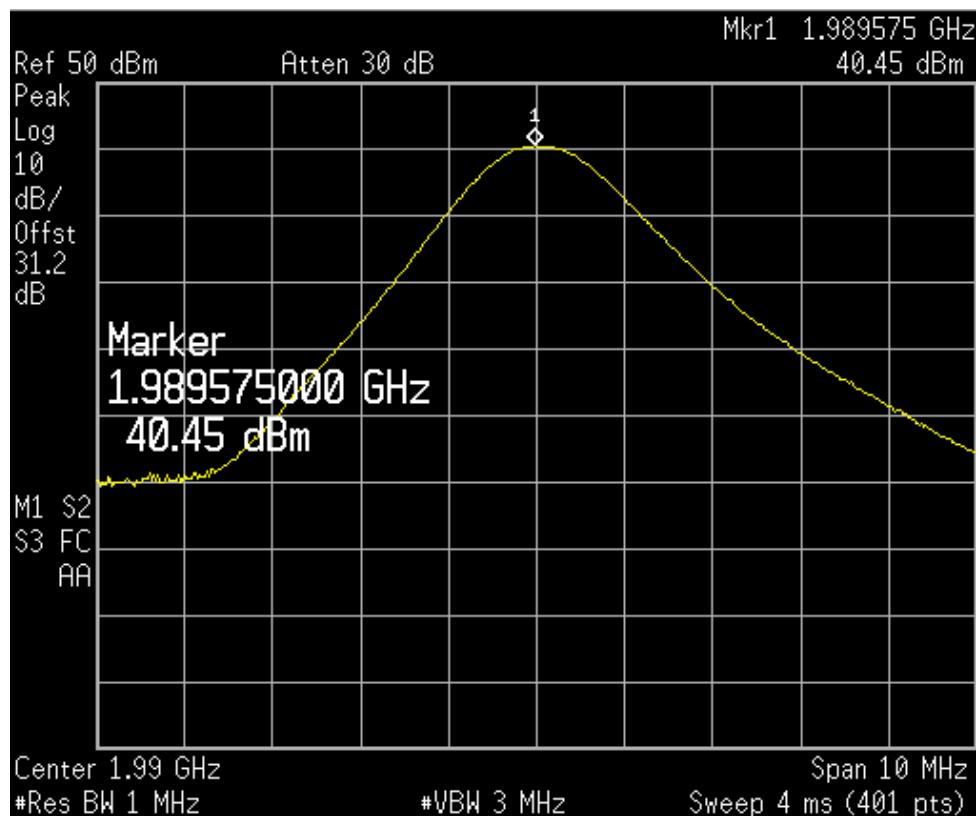
Supply Voltage: 24V DC

Temperature: 25° C

Test Results:
Transmitter 1

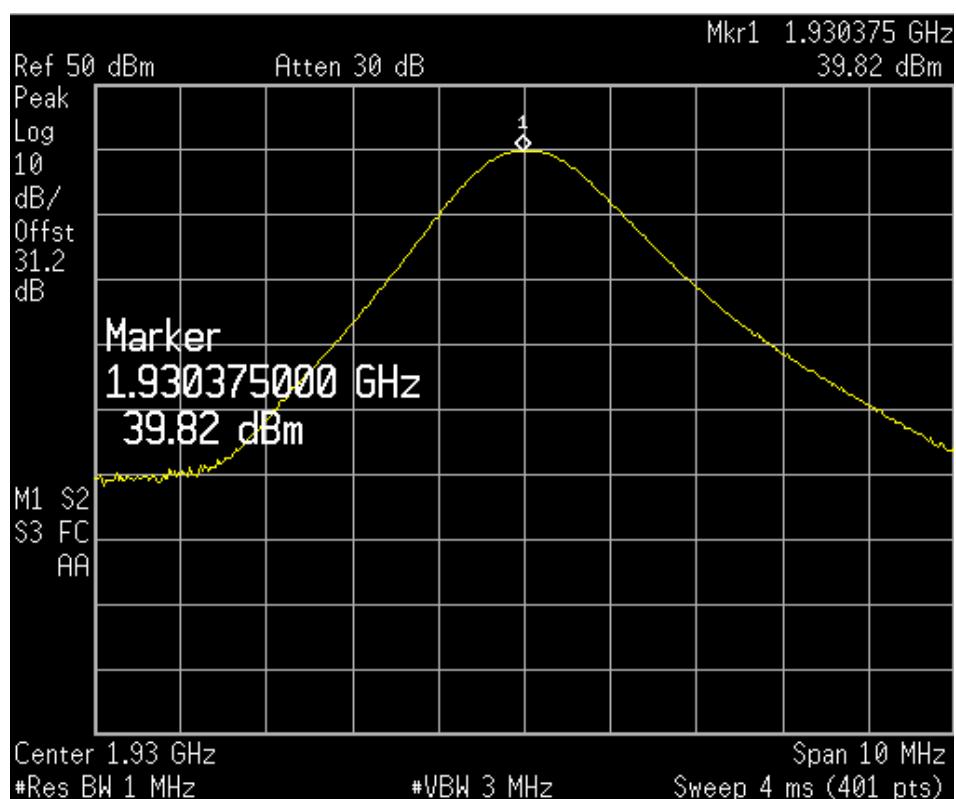
Channel Number	Channel Frequency (MHz)	Measured RF Output power (dBm)	Result
513	1930.4	40.18	Pass
661	1960.0	40.12	Pass
809	1989.6	40.45	Pass


Channel: 513

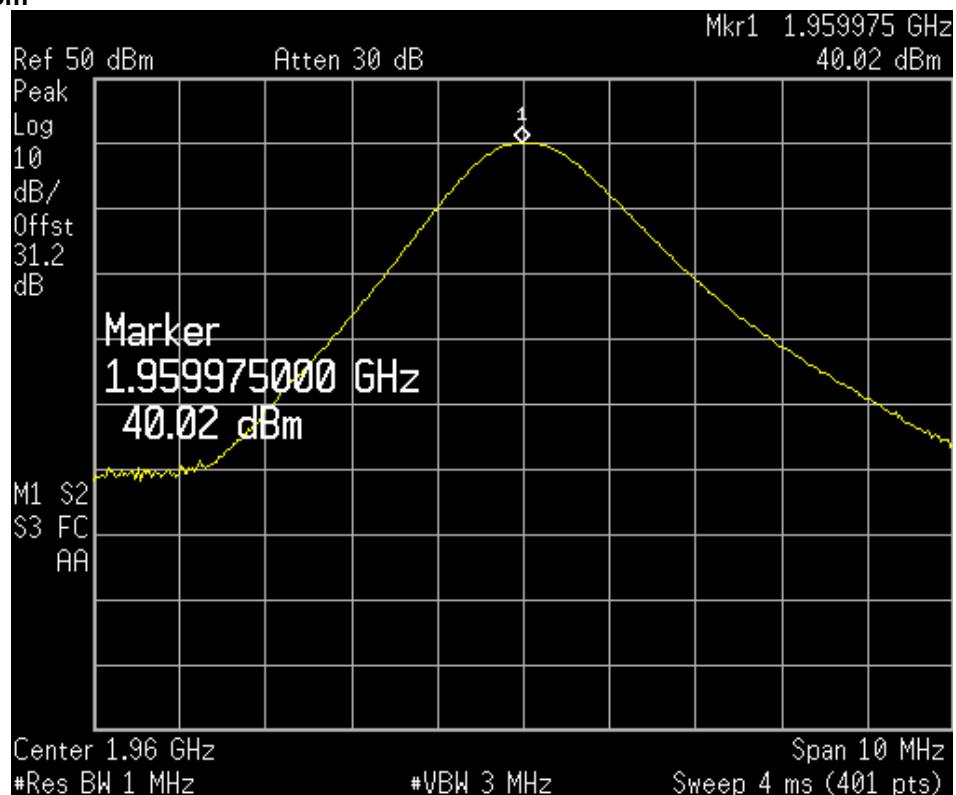
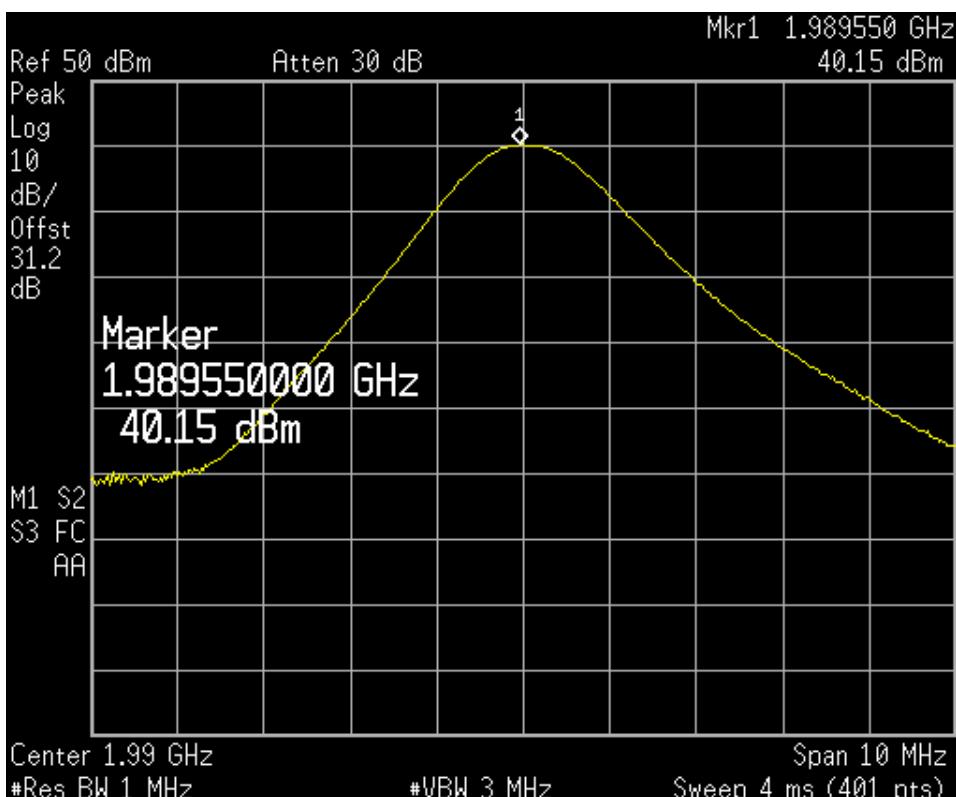

Channel: 661

Channel: 809

Transmitter 2

Channel Number	Channel Frequency (MHz)	Measured RF Output power (dBm)	Result
513	1930.4	39.82	Pass
661	1960.0	40.02	Pass
809	1989.6	40.15	Pass



Channel: 513

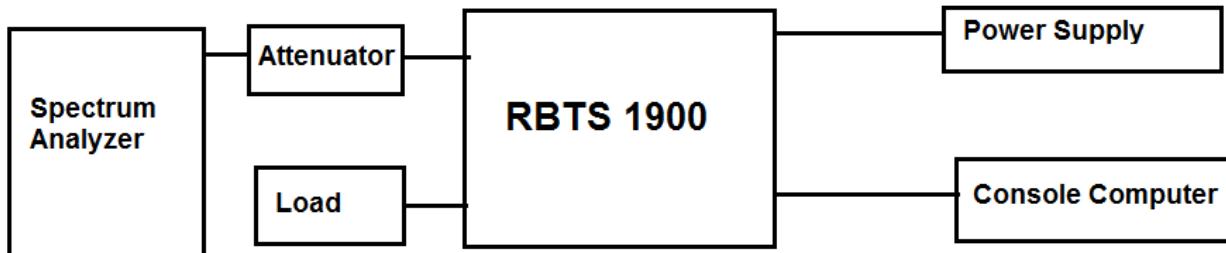

Channel: 661

Channel: 809

Modulation Characteristics
Result
Section 2.1047
Pass

Test Specification	CFR 47 (FCC) part 2.1047 and part 24
Test Method	TIA-603-C:2004.
Measured at	Antenna Connector
Test Configuration	Transmitter 1 – Channel Mid Transmitter 2 – Channel Mid

Test Method:

The EUT was connected to the Digital Radio Communication tester via the one RF connector. Other RF connectors were connected to match load. BTS was controlled to transmit Maximum power by console computer. Measure and record the Modulation Characteristics of the Base Station by the Digital Radio Communication tester.


Limits:

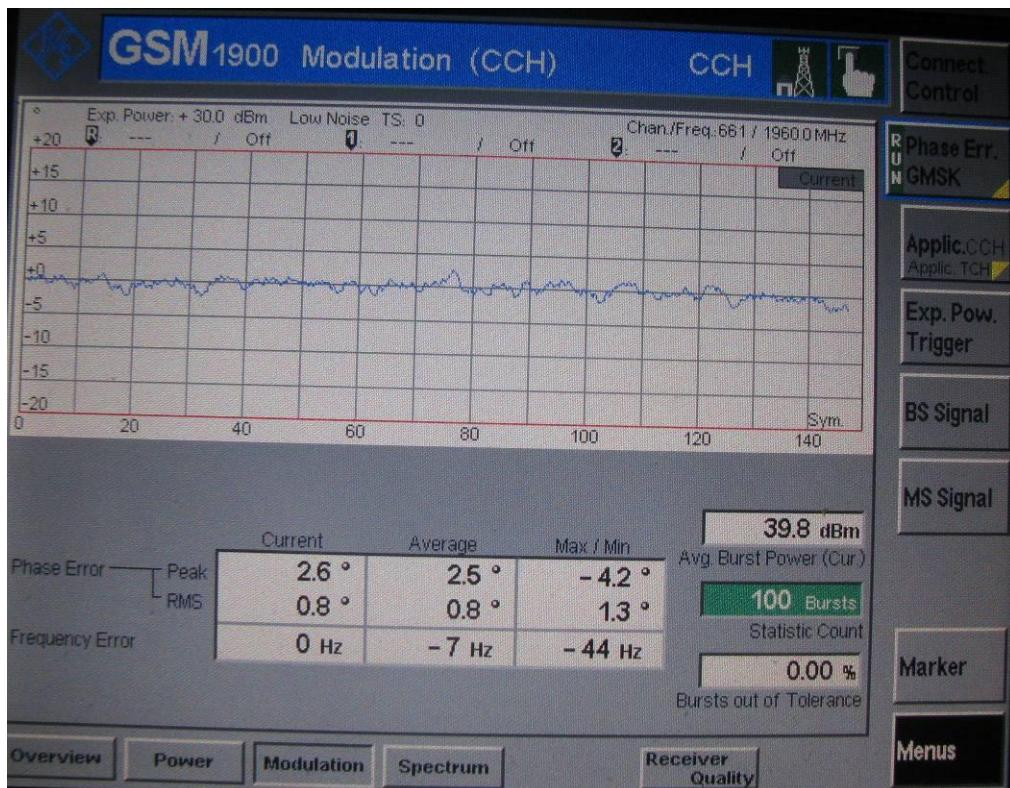
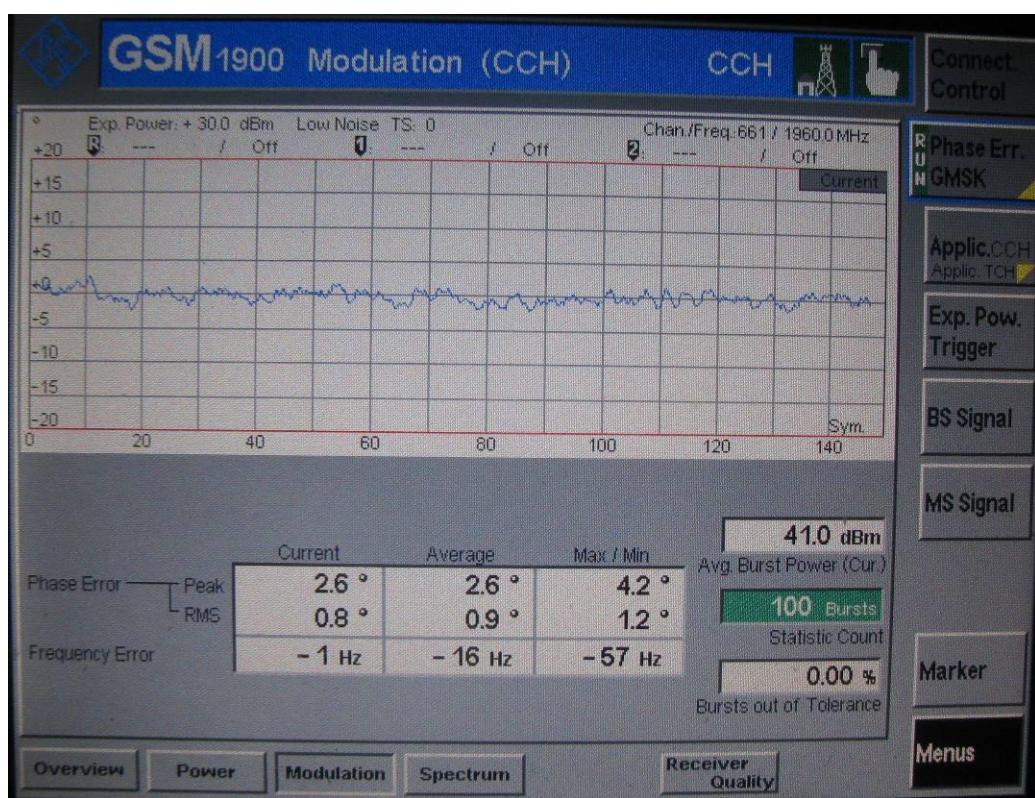
No specific modulation characteristics requirement limits in part 2.1047 and part 24 subpart E.

Limits According to 3GPP TS 11.21

Modulation: GMSK	rms phase error (°)		<5
	peak phase error (°)		<20

Test Result:

Test Conditions	Modulation GMSK			
	Measured		Limit	
	Phase Error (°)		Phase Error (°)	
	° rms	peak °	rms °	° peak
Transmitter 1 Channel 661 (1960 MHz)	1.3	-4.3	<5	<20
Transmitter 2 Channel 661 (1960 MHz)	1.2	4.2	<5	<20

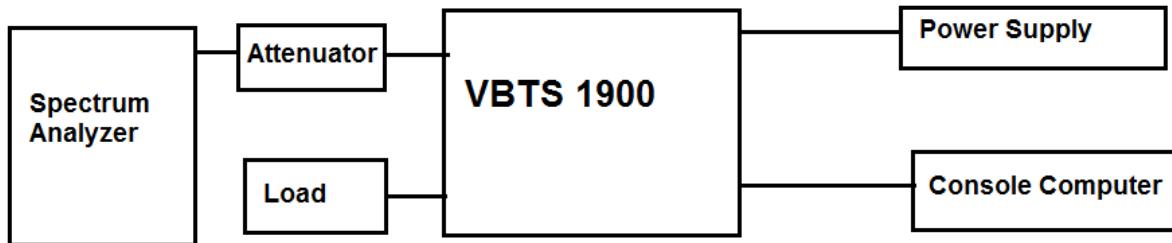

Transmitter 1: Channel 661

Transmitter 2: Channel 661

**Occupied Bandwidth
Result**
**Section 2.1049
Pass**

Test Specification	CFR 47 (FCC) part 2.1049
Test Method	TIA-603-C:2004.
Measured at	Antenna Connector
Test Configuration	Transmitter 1 – Channel Low, Mid and High Transmitter 2 – Channel Low, Mid and High

Test Method:

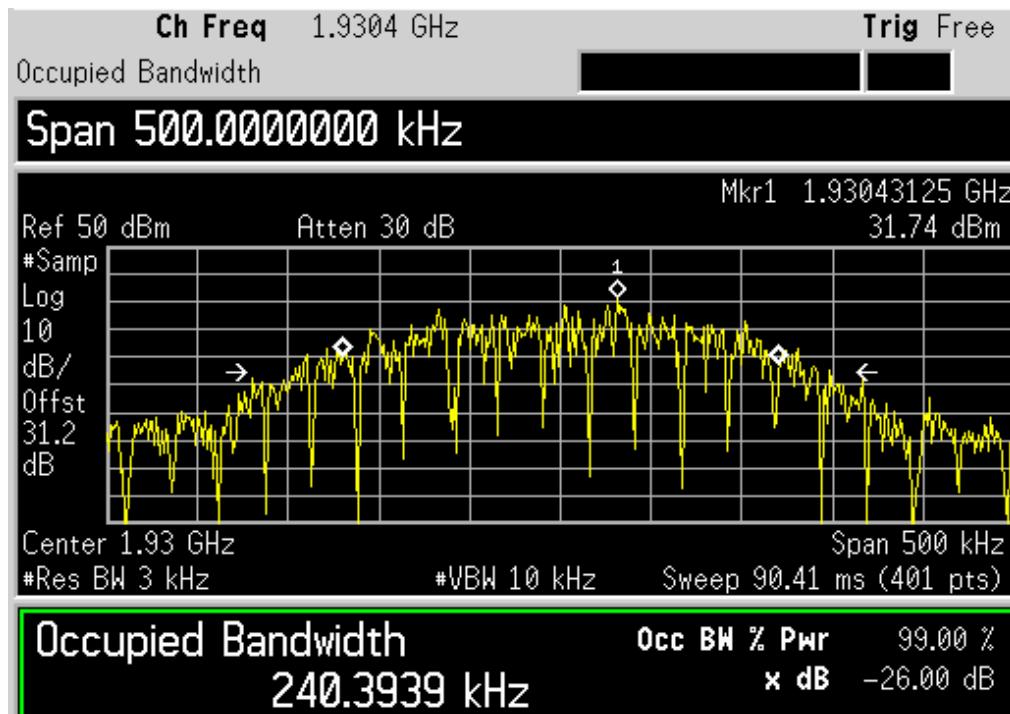
The EUT was connected to the Spectrum Analyzer via the one RF connector. Other RF connectors were connected to match load. BTS was controlled to transmit Maximum power by console computer. Measure and record the Occupied Bandwidth of the Base Station by the Spectrum Analyzer.


Limits:

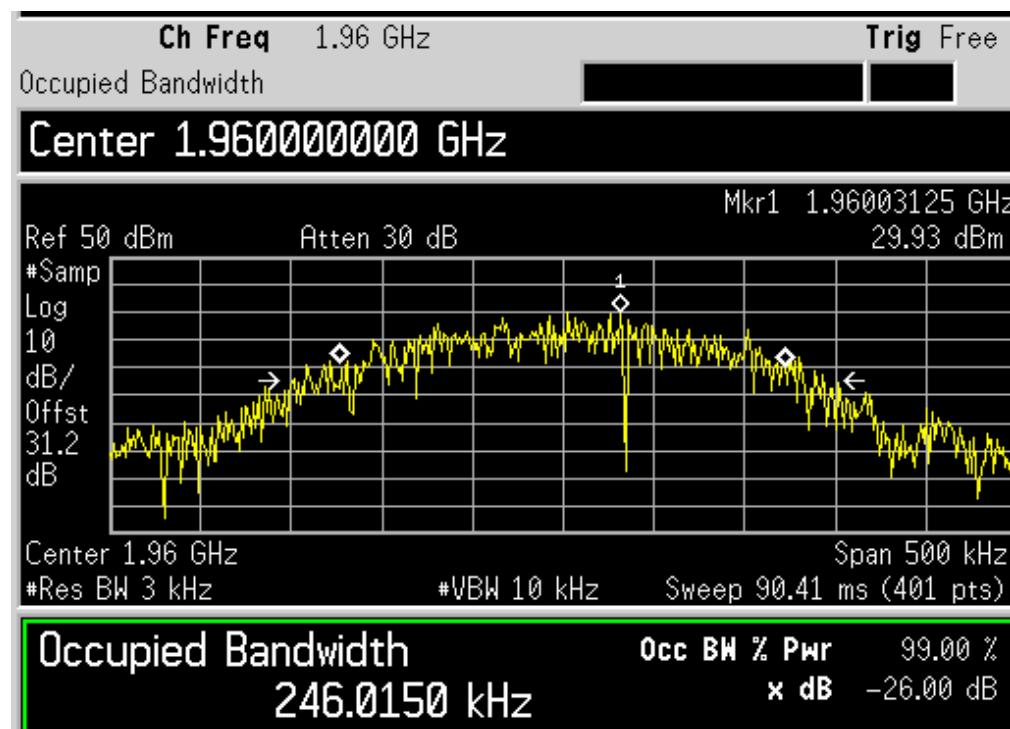
No specific occupied bandwidth requirement in FCC part 24 subpart E, but the occupied bandwidth was defined in part 2.1049: the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured.

Test Results:
Transmitter 1

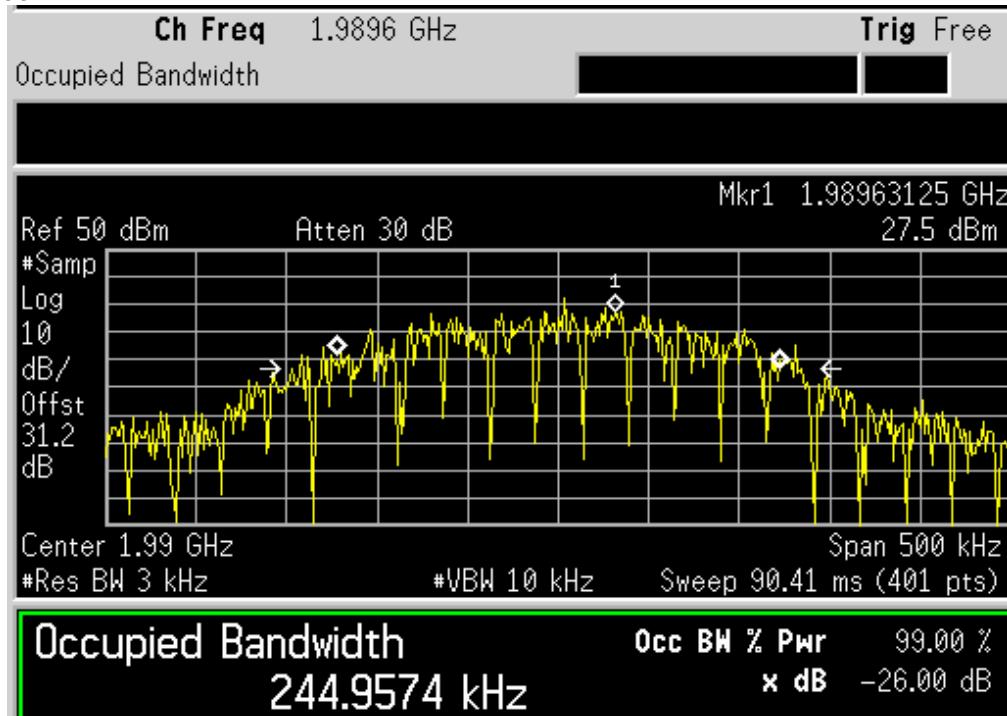
Channel	Channel Frequency (MHz)	Occupied Bandwidth (kHz)
513	1930.4	240.39
661	1960.0	246.01
809	1989.6	244.95



Channel: 513



Channel: 661

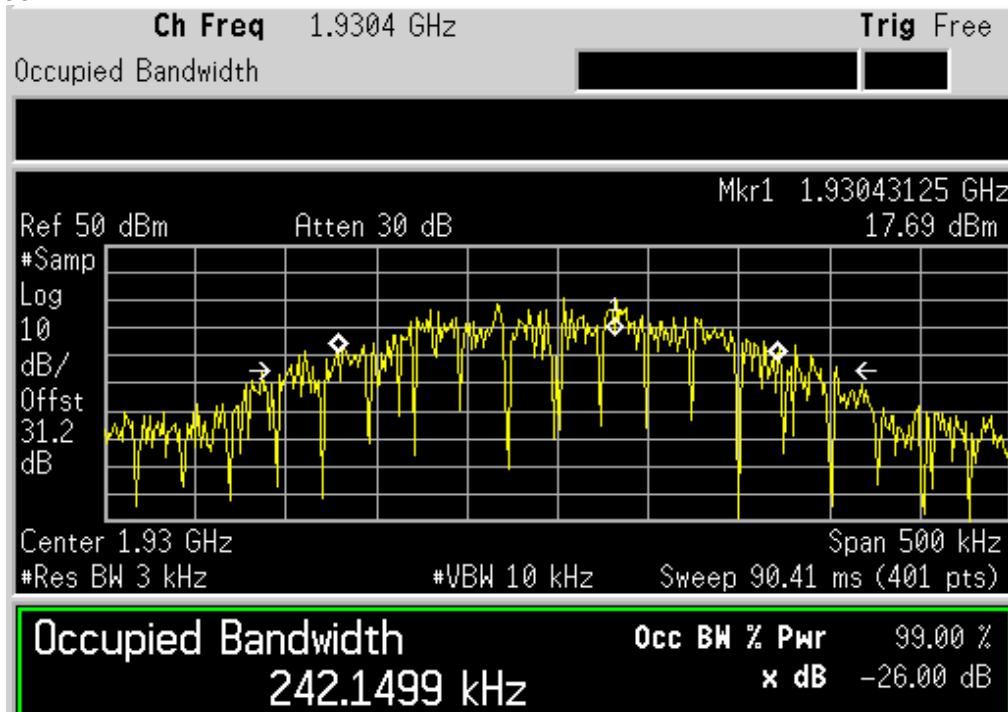
www.tuv.com


Channel: 809

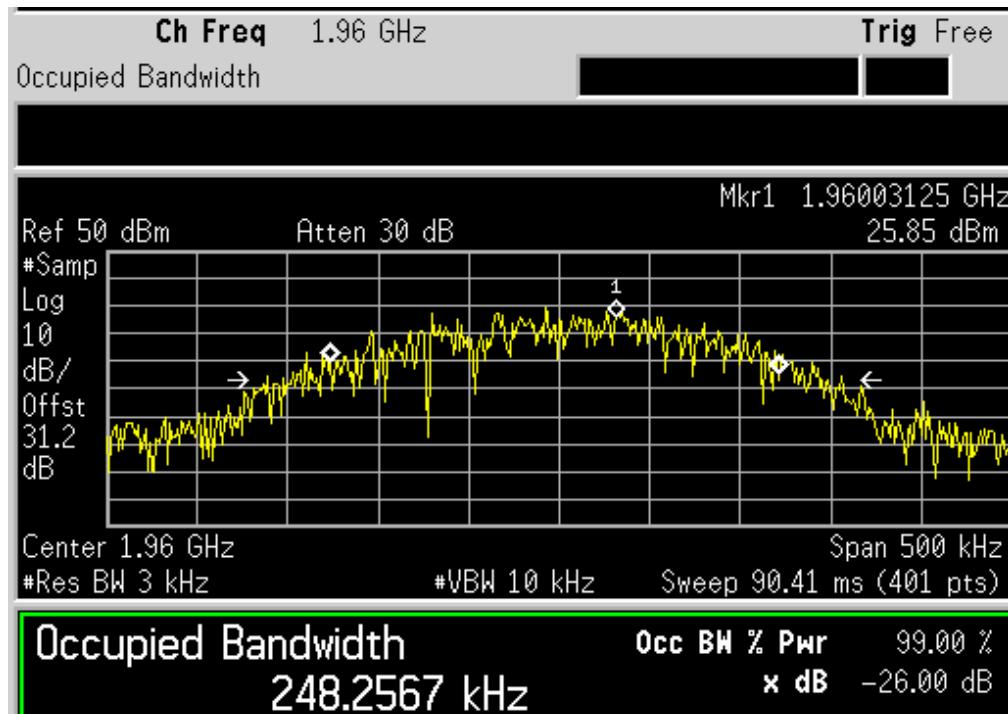
Transmitter 2

Channel	Channel Frequency (MHz)	Occupied Bandwidth (kHz)
513	1930.4	242.19
661	1960.0	248.25
809	1989.6	251.35

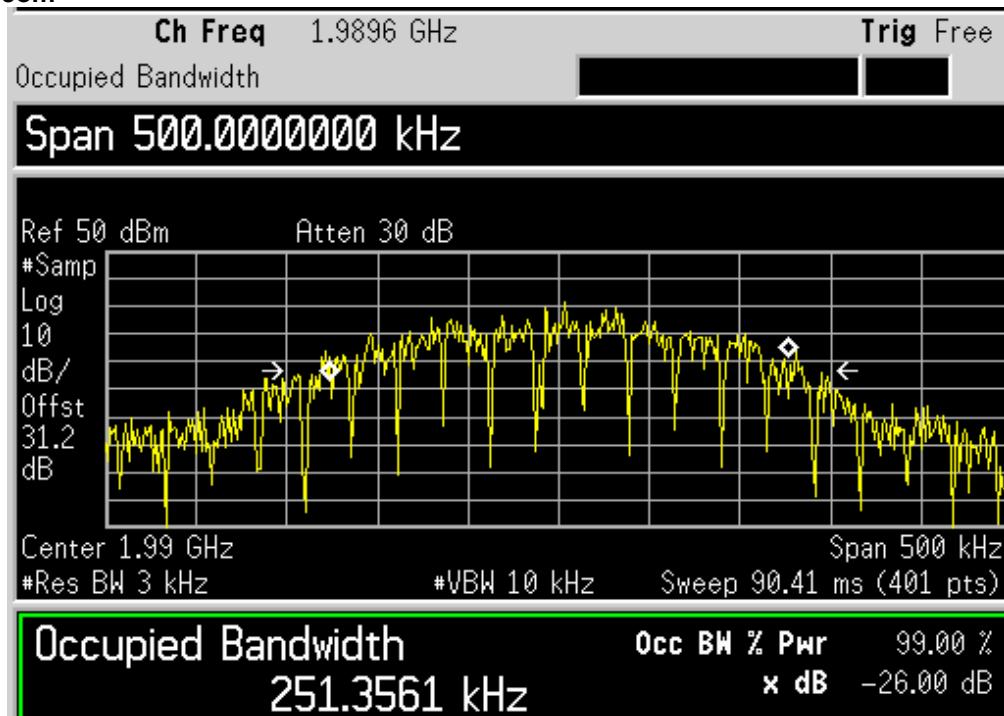
www.tuv.com



Channel: 513



Channel: 661

www.tuv.com

Channel: 809

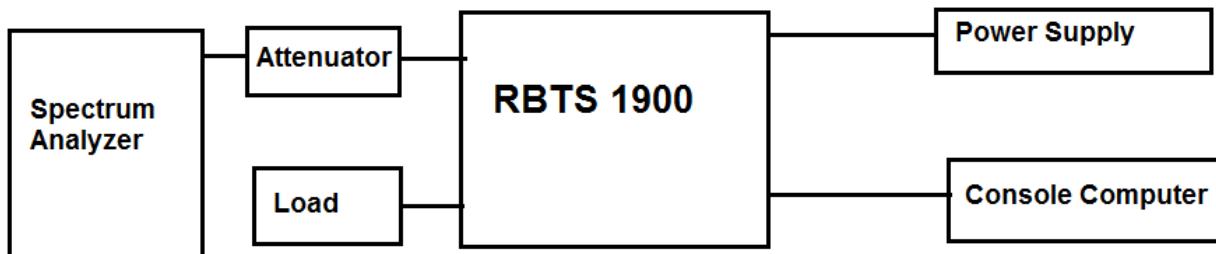
Band-edge Compliance Result

Section 2.1051 and 24.238 Pass

Test Specification	CFR 47 (FCC) part 2.1051 and Part 24.238
Test Method	TIA-603-C:2004.
Measured at	Antenna Connector
Test Configuration	Transmitter 1 – Channel Low and High Transmitter 2 – Channel Low High

Test Method:

The EUT was connected to the Spectrum Analyzer via the one RF connector. Other RF connectors were connected to match load. BTS was controlled to transmit Maximum power by console computer. Measure and record the power at band edge of the Base Station by the Spectrum Analyzer.



Limits:

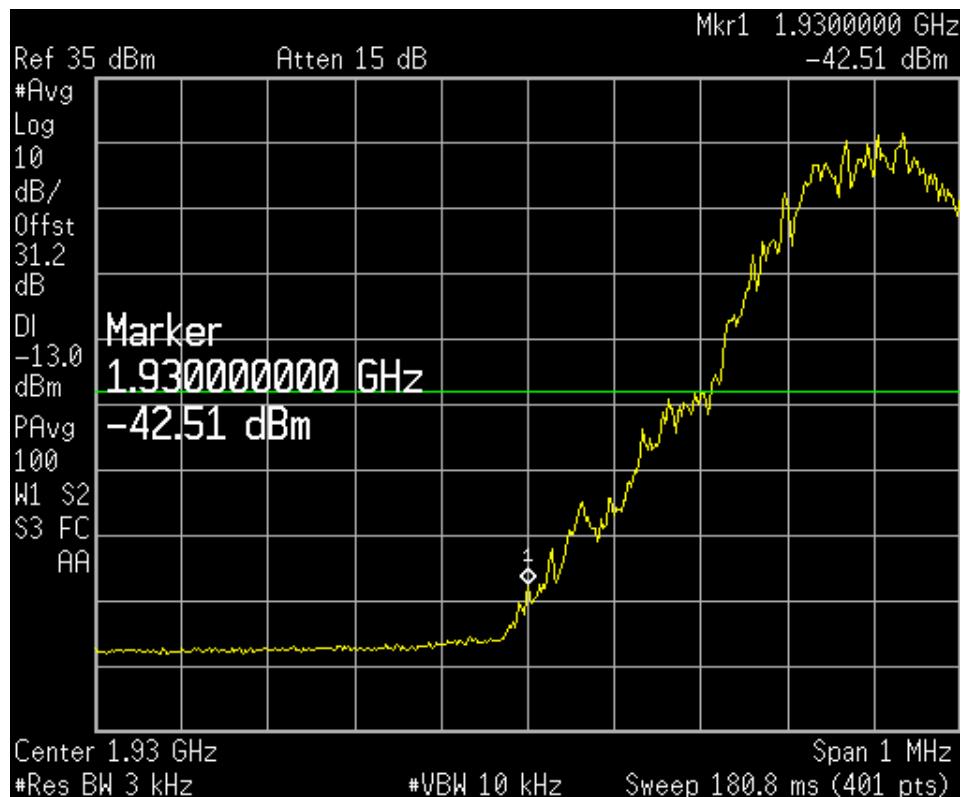
Compliance with FCC part 24.238, all spurious emission must be attenuated below the transmitter power by at least $43 + 10 \log_{10} P$. (Whereas P is the rated power of the EUT).

$$\text{Limit: } P - (43 + 10 \log_{10} P) = 10 \log_{10}(1000P) - 43 - 10 \log_{10} P = 30 - 43 = -13 \text{ dBm}$$

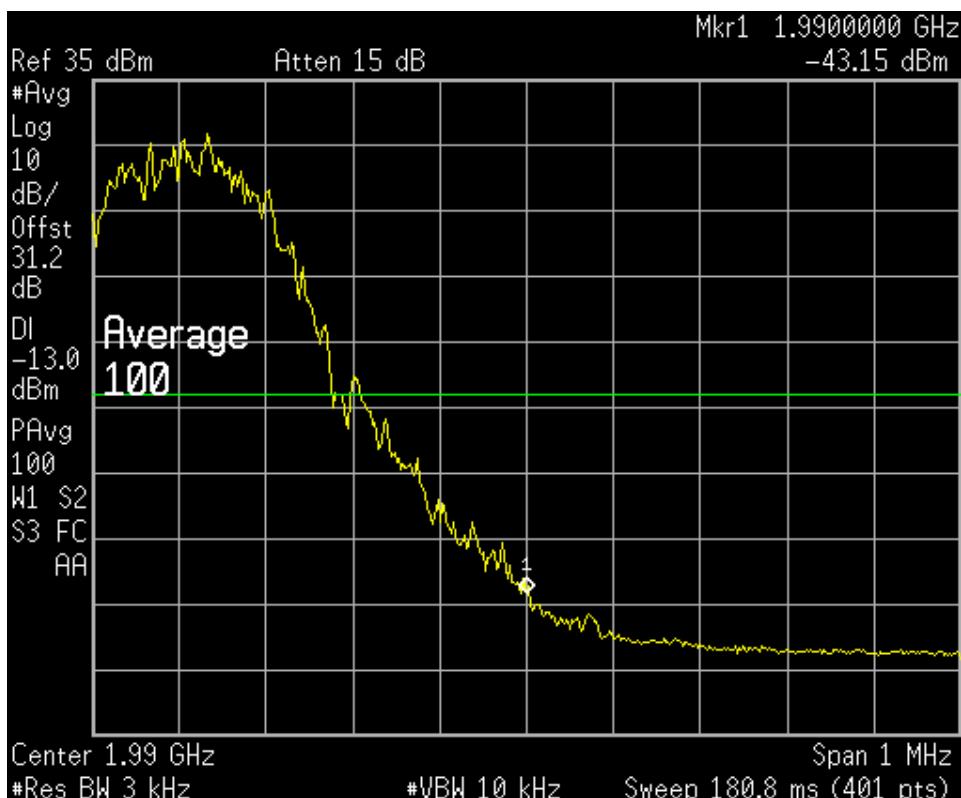
Test Result:

Transmitter 1

Channel	Fundamental Frequency (MHz)	Measured Emission (dBm)	Limit (dBm)
513	1930.4	-42.51	-13
809	1989.6	-43.15	-13



Channel 513



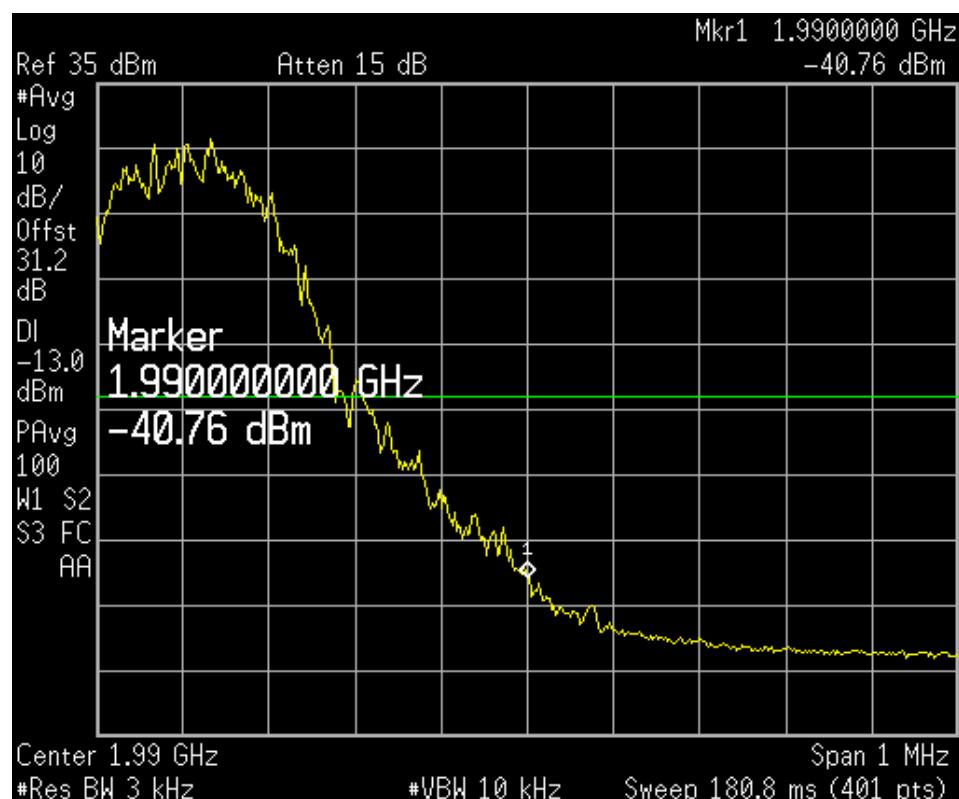
Channel 809

Transmitter 2

Channel	Fundamental Frequency (MHz)	Measured Emission (dBm)	Limit (dBm)
513	1930.4	-42.83	-13
809	1989.6	-40.76	-13



Channel 513



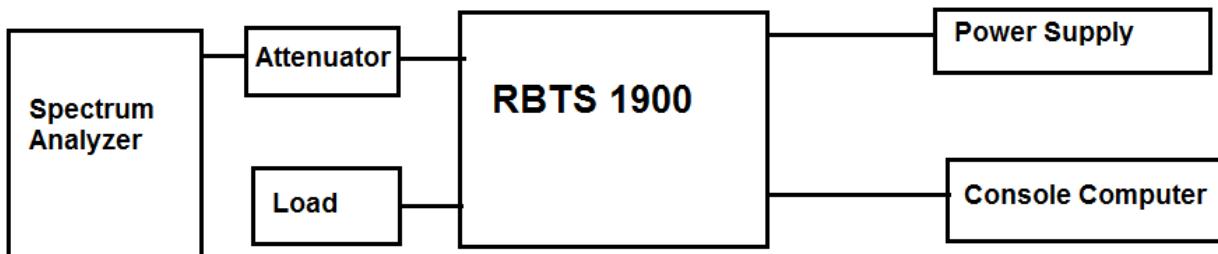
Channel 809

Spurious Emissions at antenna terminals
Result
Section 2.1051 and 24.238
Pass

Test Specification	CFR 47 (FCC) part 2.1051 and Part 24.238
Test Method	TIA-603-C:2004.
Measured at	Antenna Connector
Test Configuration	Transmitter 1 – Channel Low, Mid and High Transmitter 2 – Channel Low, Mid and High

Test Method

The EUT was connected to the Spectrum Analyzer via the one RF connector. Other RF connectors were connected to match load. BTS was controlled to transmit Maximum power by console computer. Measure and record the power at spurious emissions of the Base Station by the Spectrum Analyzer.



According to 47CFR part 24.238, this defined the measurement bandwidth of as following:

Measurement bandwidth (RBW) for 9 kHz up to 10th harmonic included: 1MHz;

Limit:

Compliance with FCC part 24.238, all spurious emission must be attenuated below the transmitter power by at least $43 + 10 \log_{10} P$. (Whereas P is the rated power of the EUT).

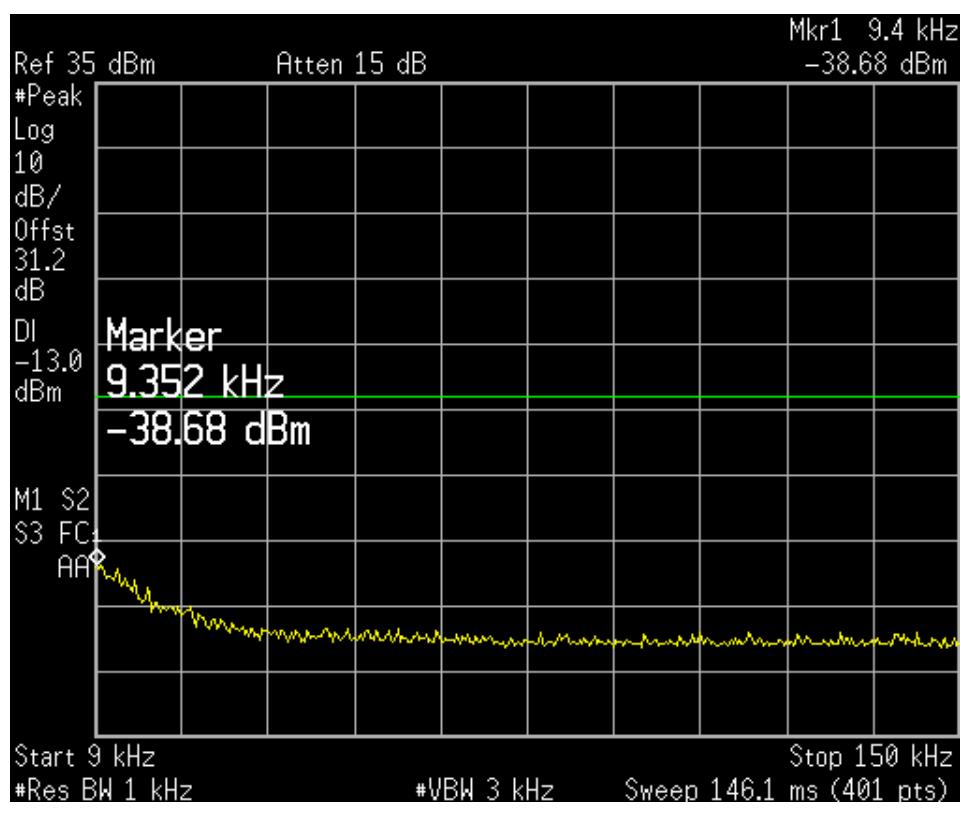
Limit	$P - (43 + 10 \log_{10} P) = 10 \log_{10}(1000P) - 43 - 10 \log_{10} P = 30 - 43 = -13 \text{ dBm}$
-------	---

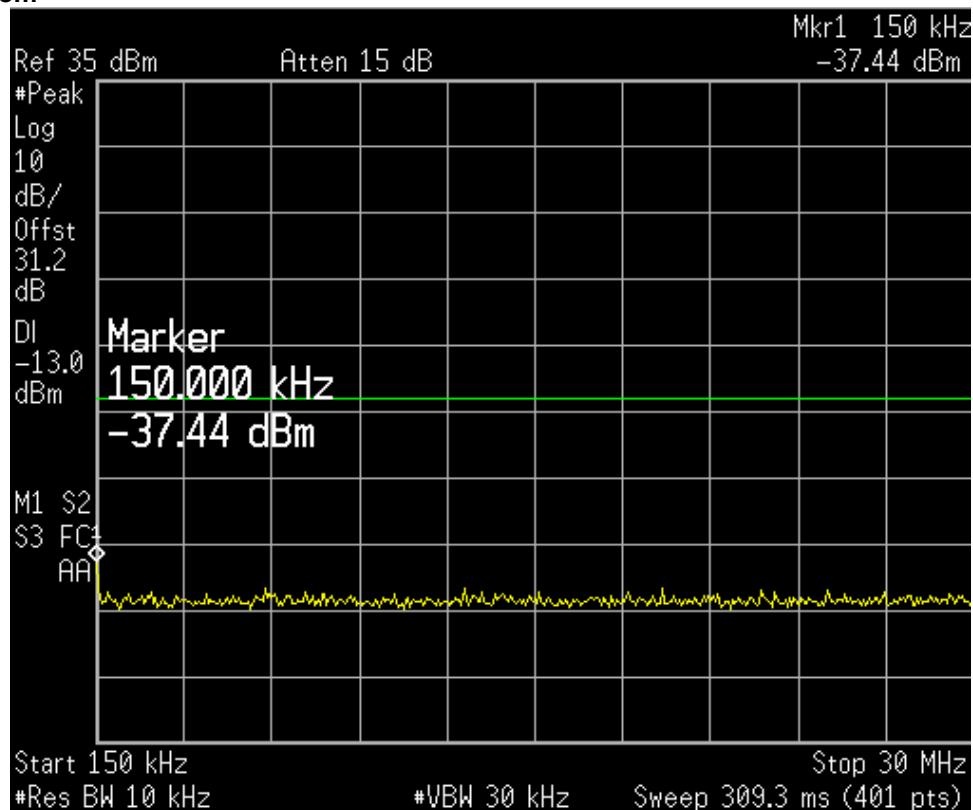
Test Results

Transmitter 1

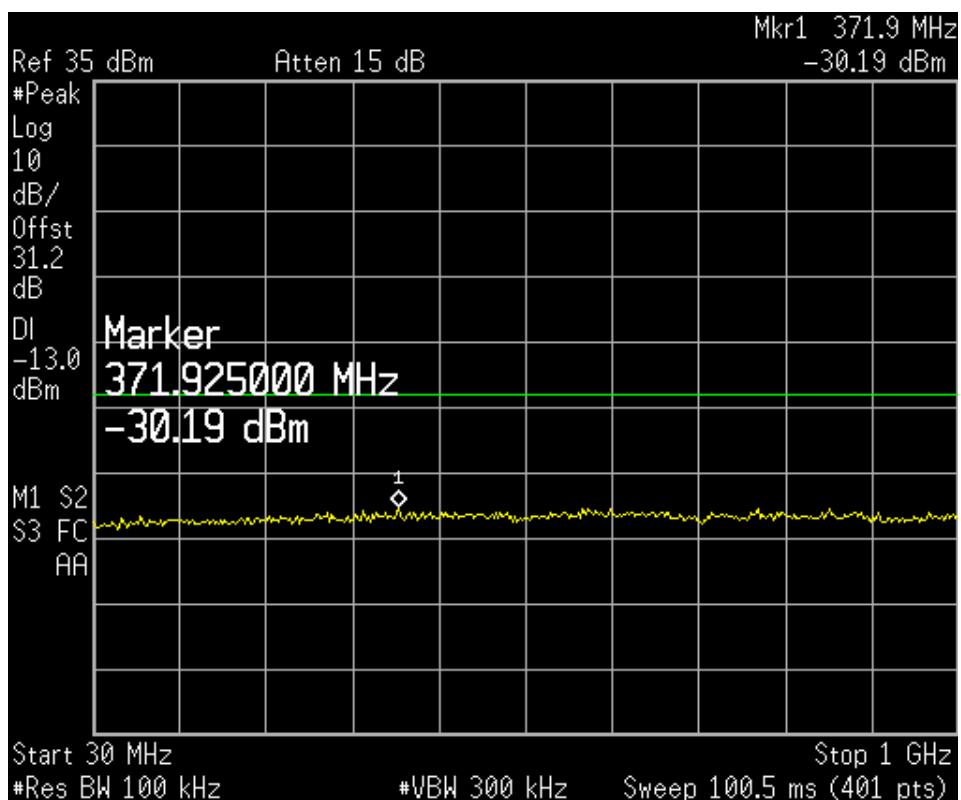
Channel	Channel Frequency (MHz)	Test Frequency	Measured Maximum Emission (dBm)	Limit (dBm)
513	1930.4	9 kHz – 20 GHz	-16.43	-13
661	1960.0	9 kHz – 20 GHz	-22.17	-13
809	1989.6	9 kHz – 20 GHz	-17.08	-13

Channel low

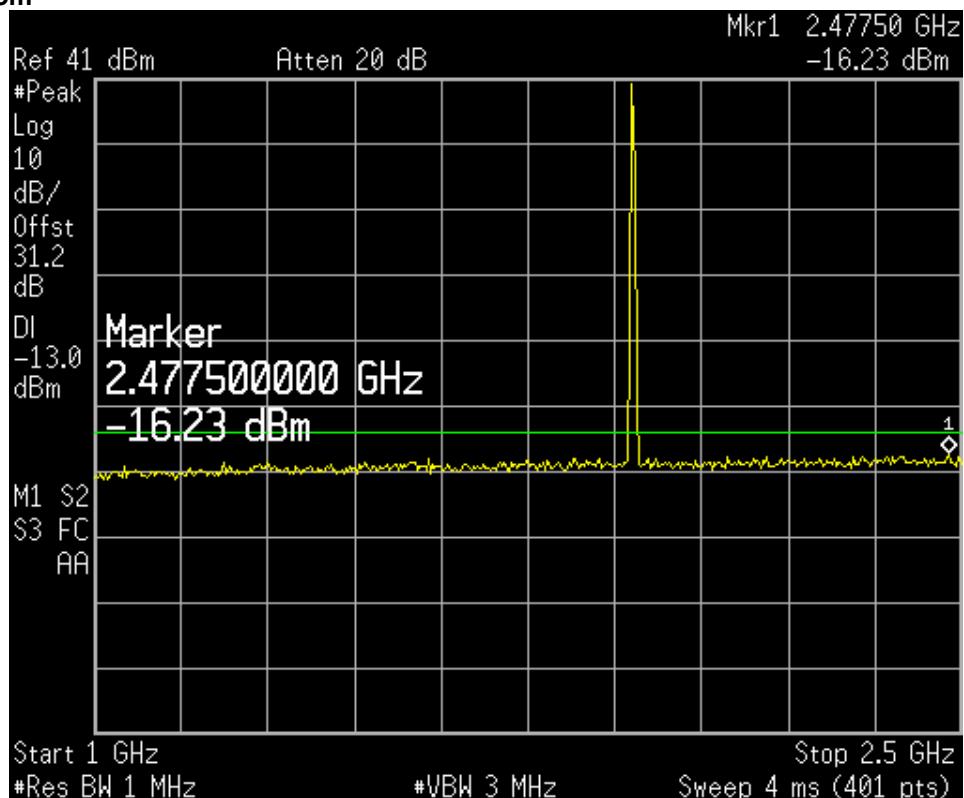




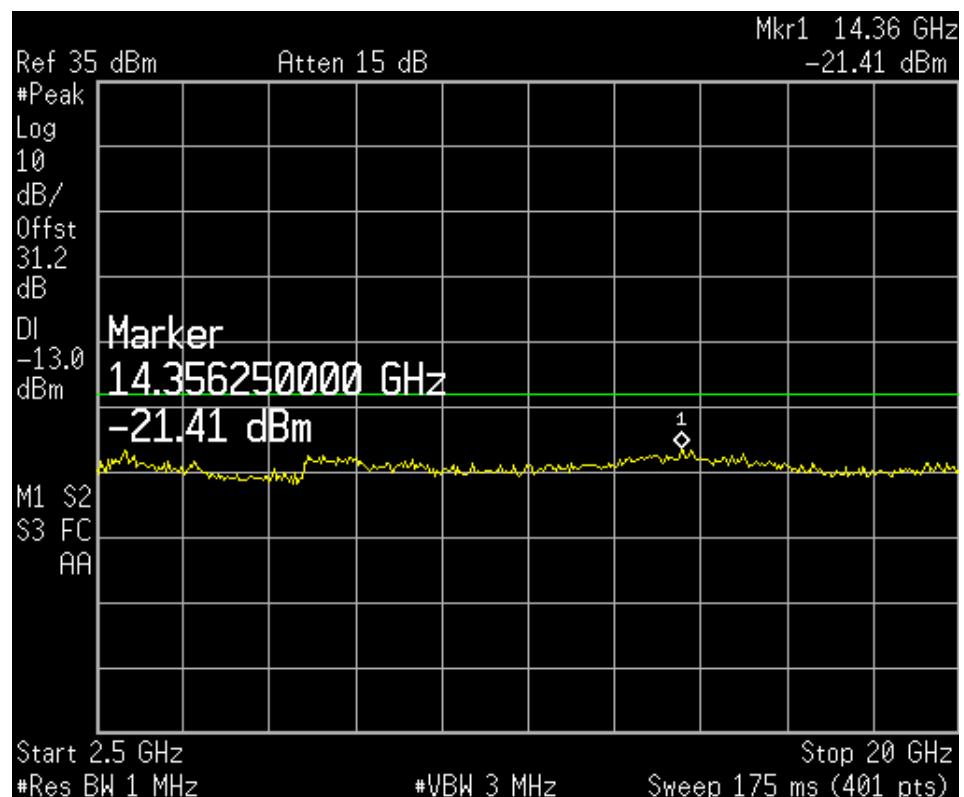
150 kHz to 30 MHz



30 MHz to 1 GHz

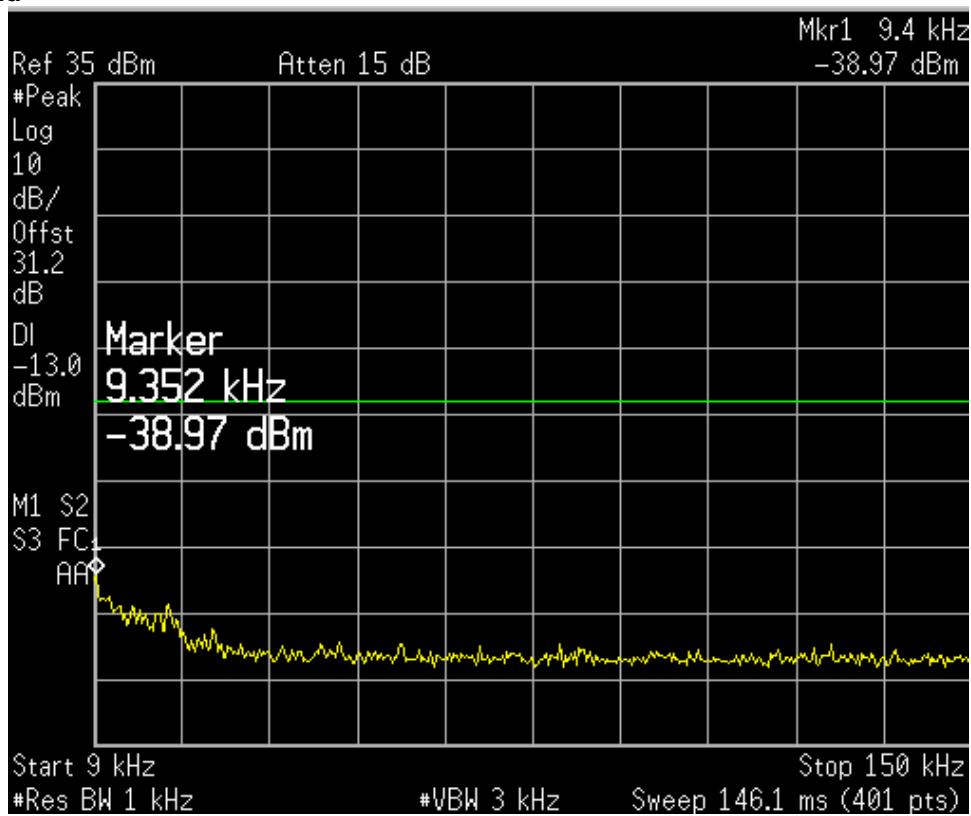


1GHz to 2.5 GHz

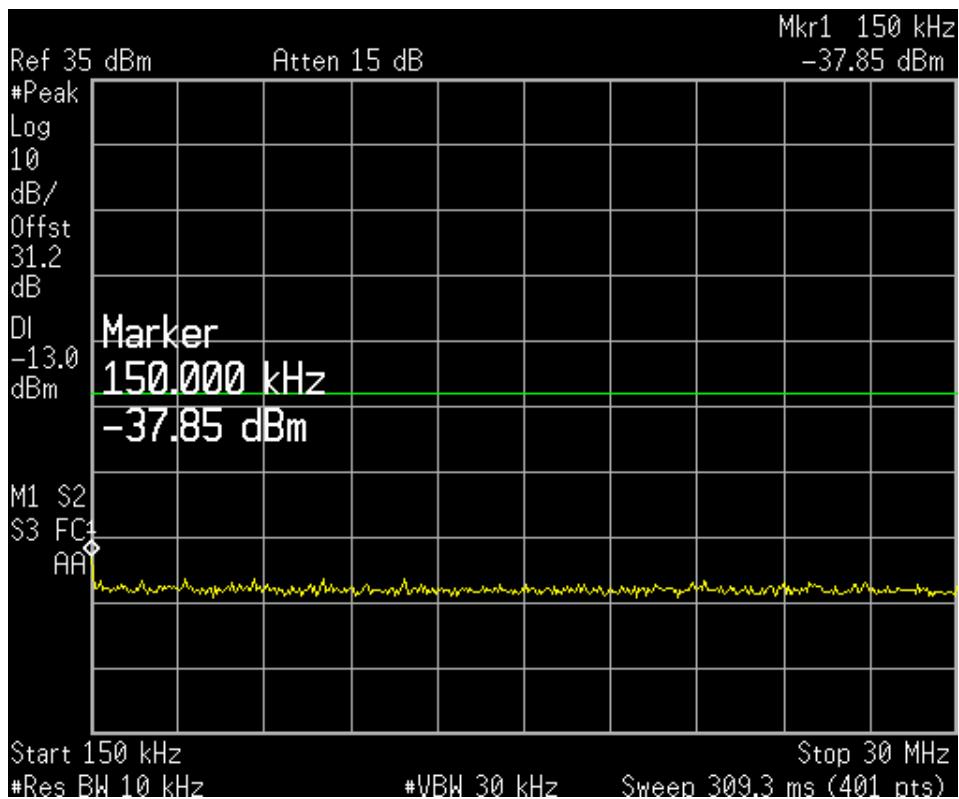


2.5 GHz to 20 GHz

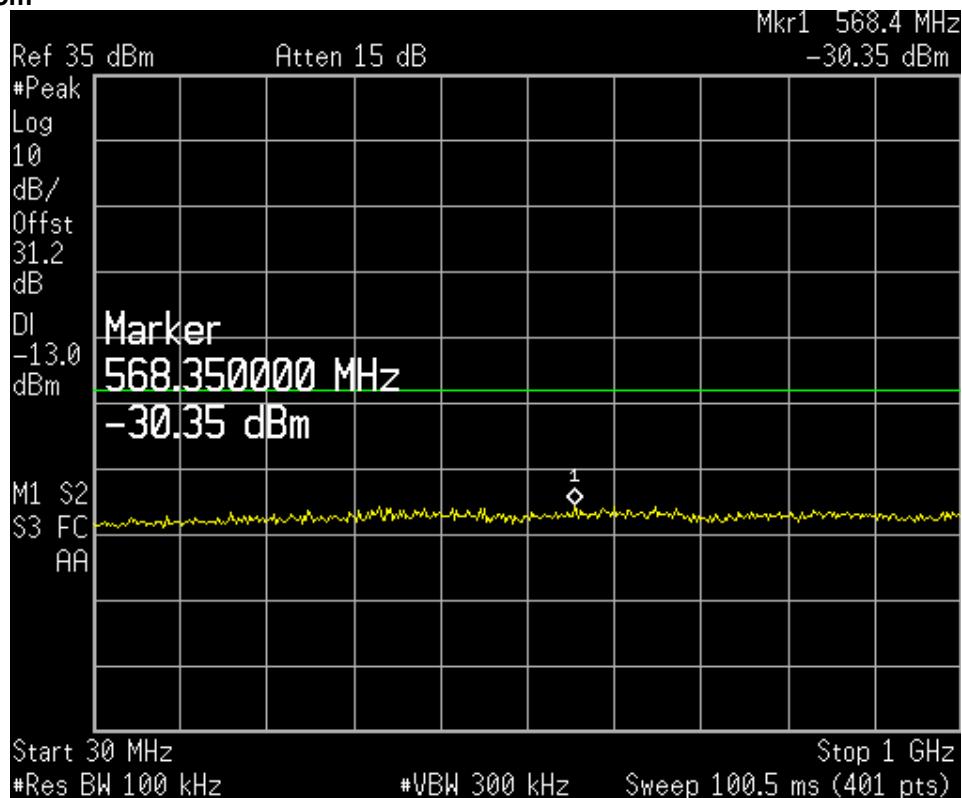
www.tuv.com
Channel Mid



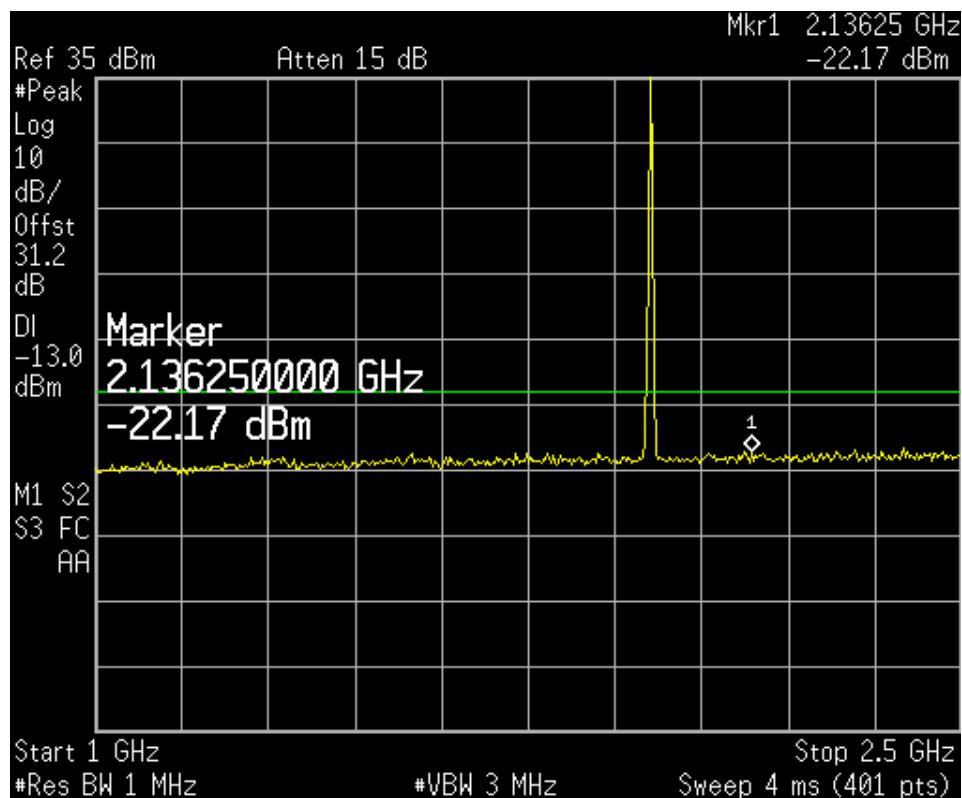
9 kHz to 150 kHz



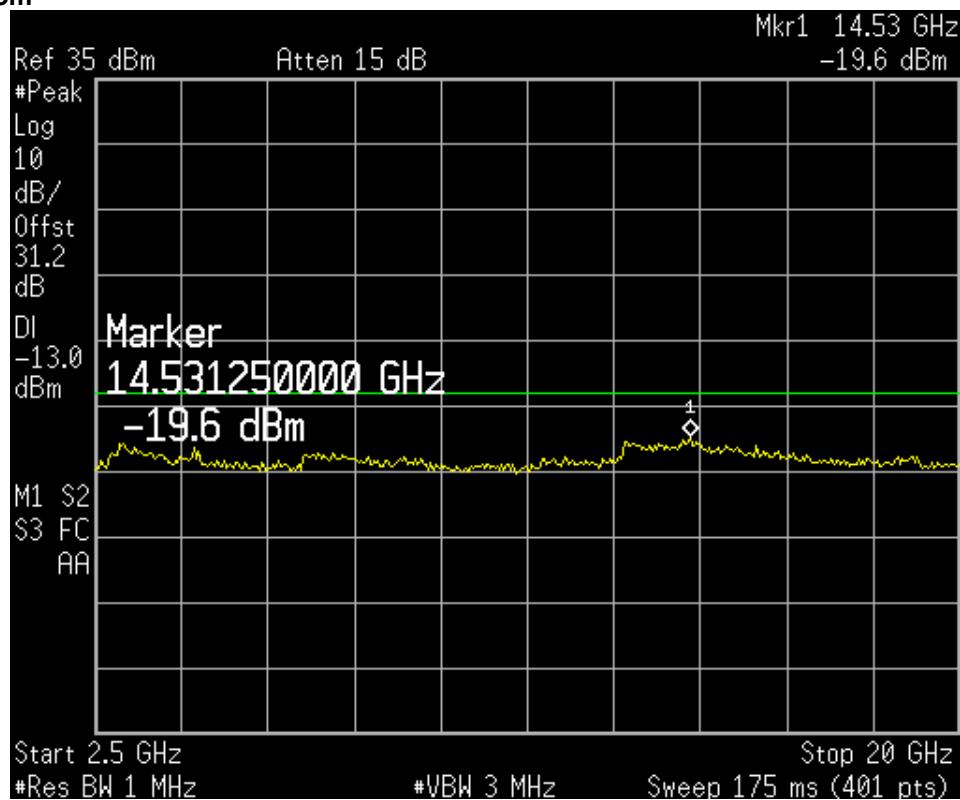
150 kHz to 30 MHz



30 MHz to 1 GHz

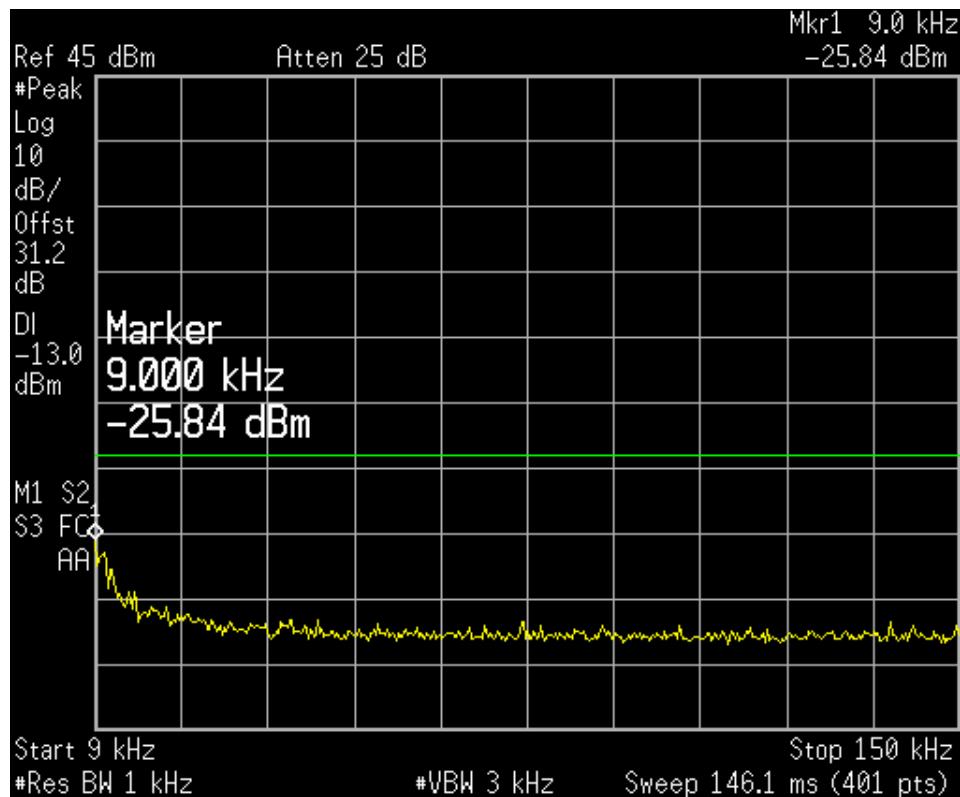


1GHz to 2.5 GHz

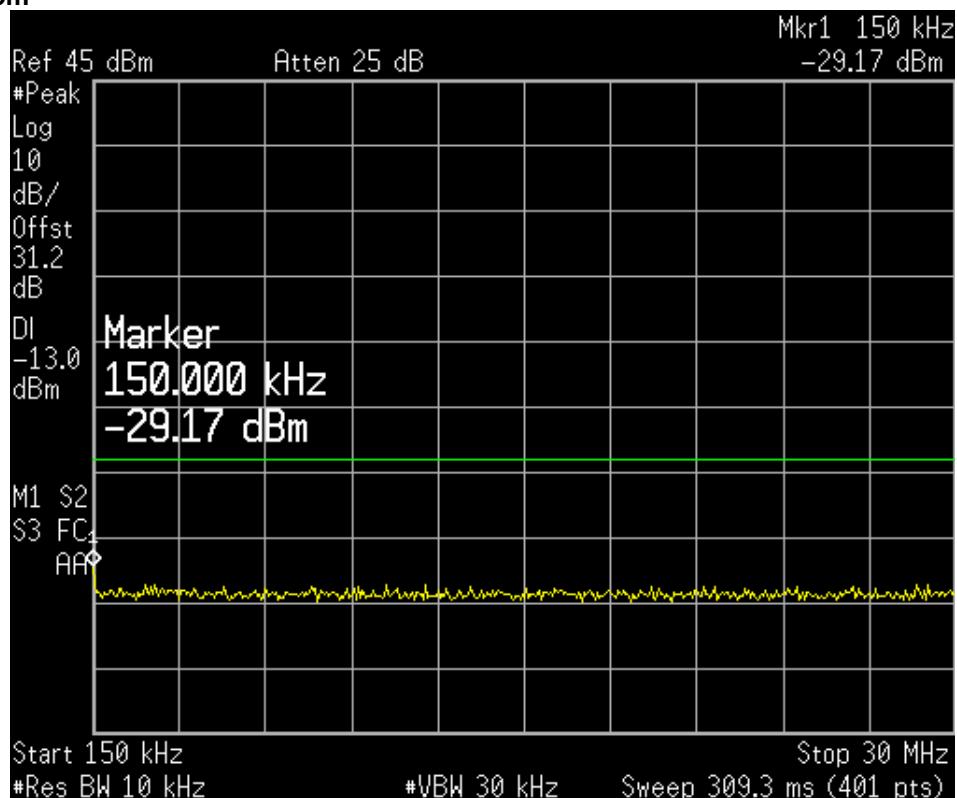


2.5 GHz to 20 GHz

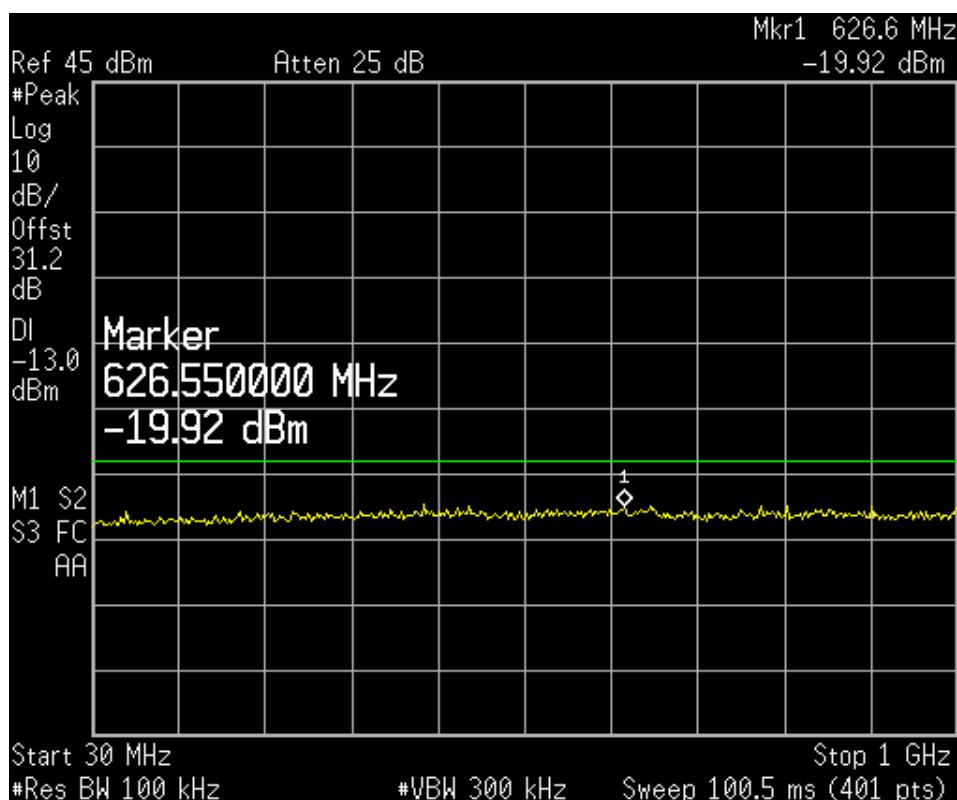
Channel High



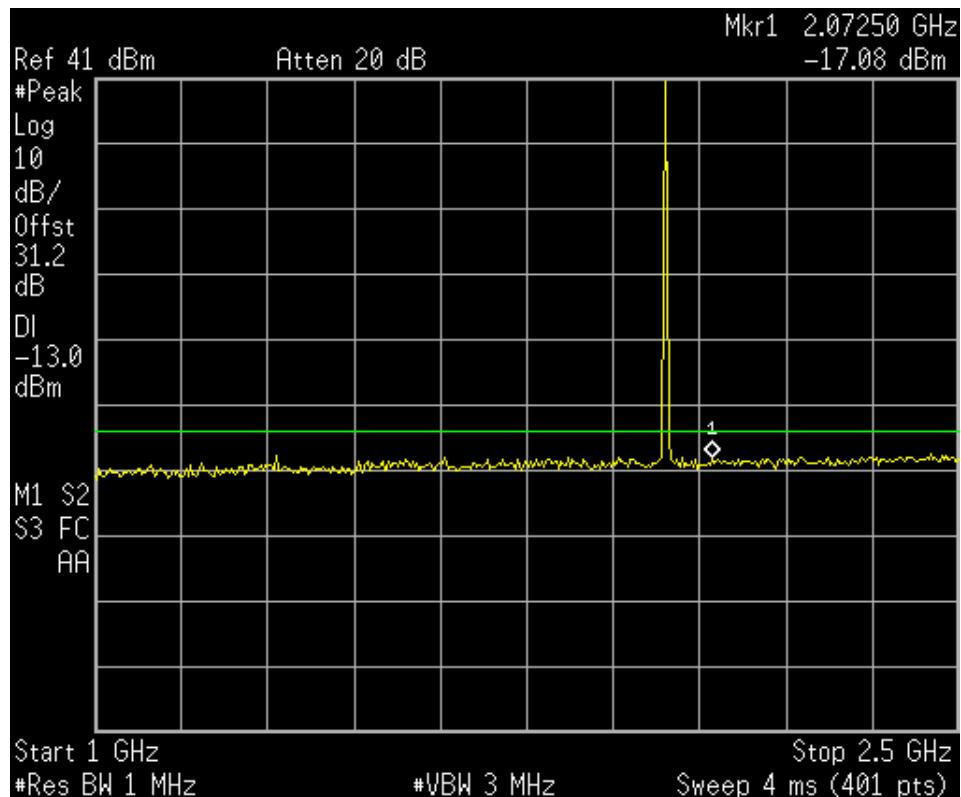
9 kHz to 150 kHz



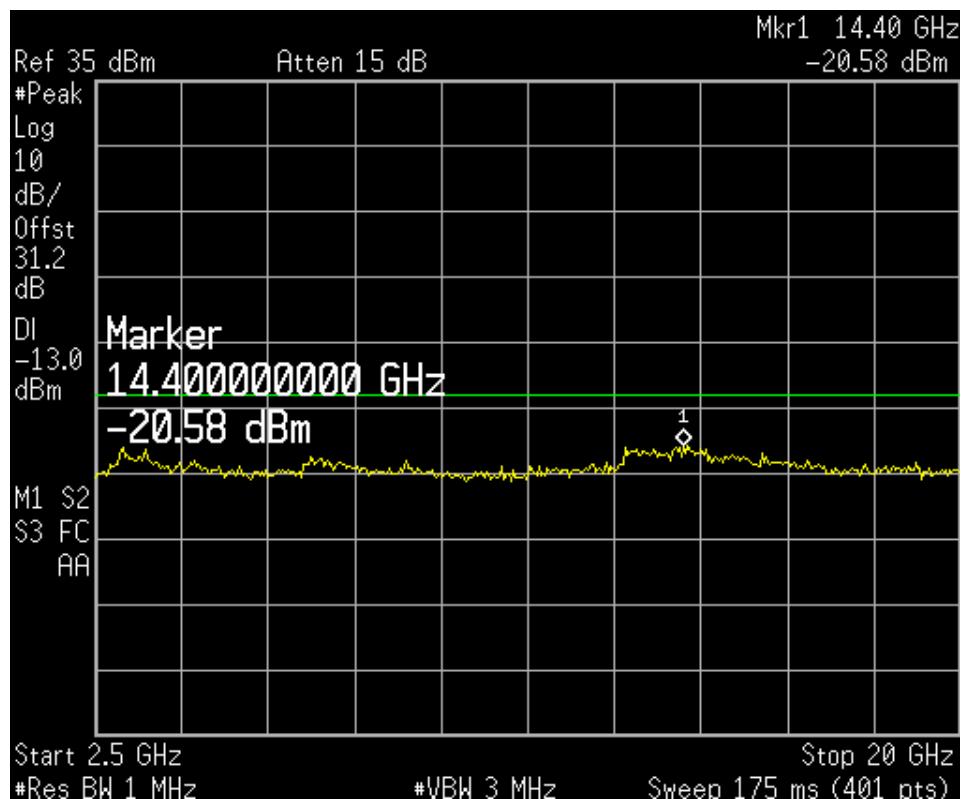
150 kHz to 30 MHz



30 MHz to 1 GHz



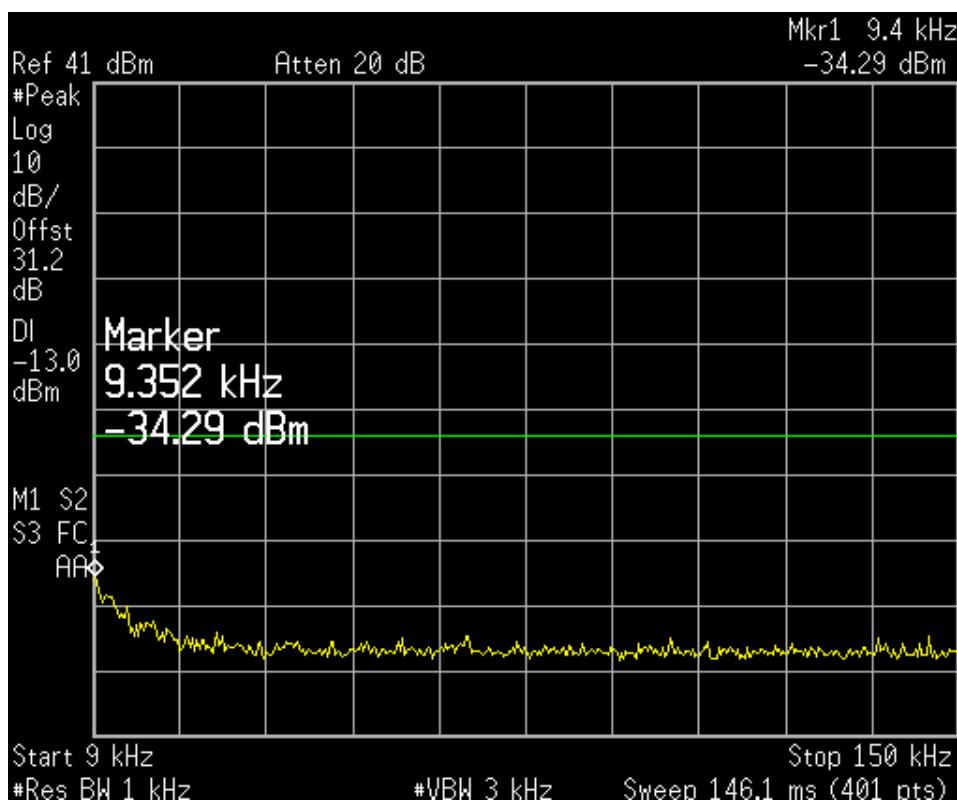
1GHz to 2.5 GHz



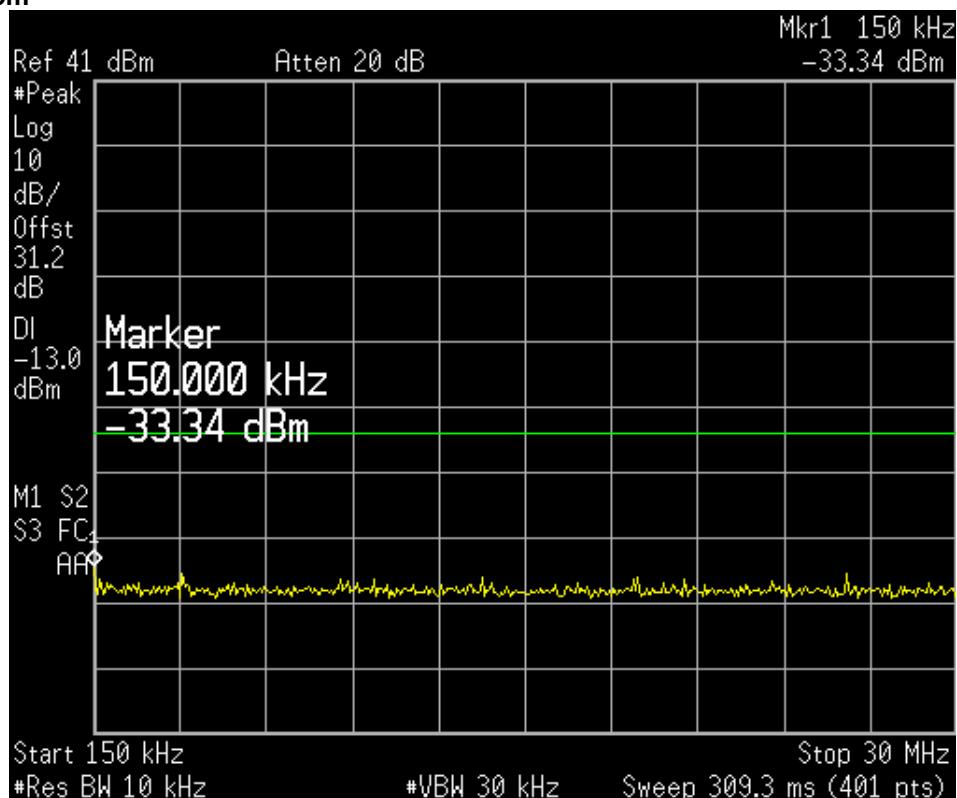
2.5 GHz to 20 GHz

Transmitter 2:

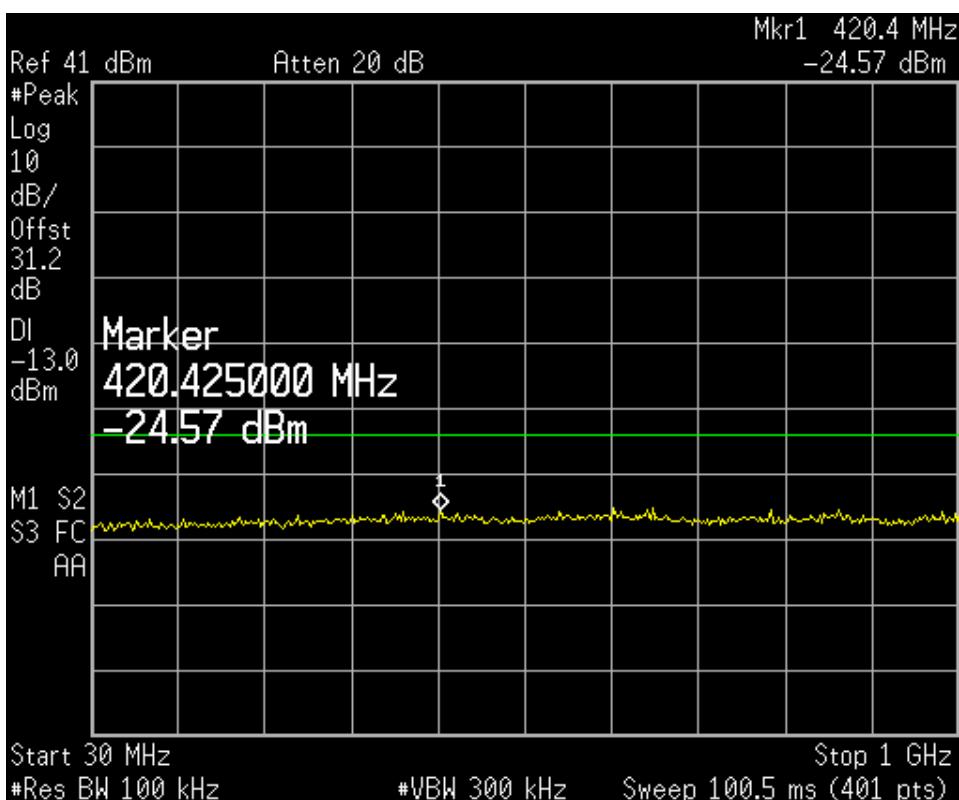
Channel	Channel Frequency (MHz)	Test Frequency	Measured Maximum Emission (dBm)	Limit (dBm)
513	1930.4	9 kHz – 20 GHz	-16.40	-13
661	1960.0	9 kHz – 20 GHz	-15.98	-13
809	1989.6	9 kHz – 20 GHz	-16.42	-13

Channel low


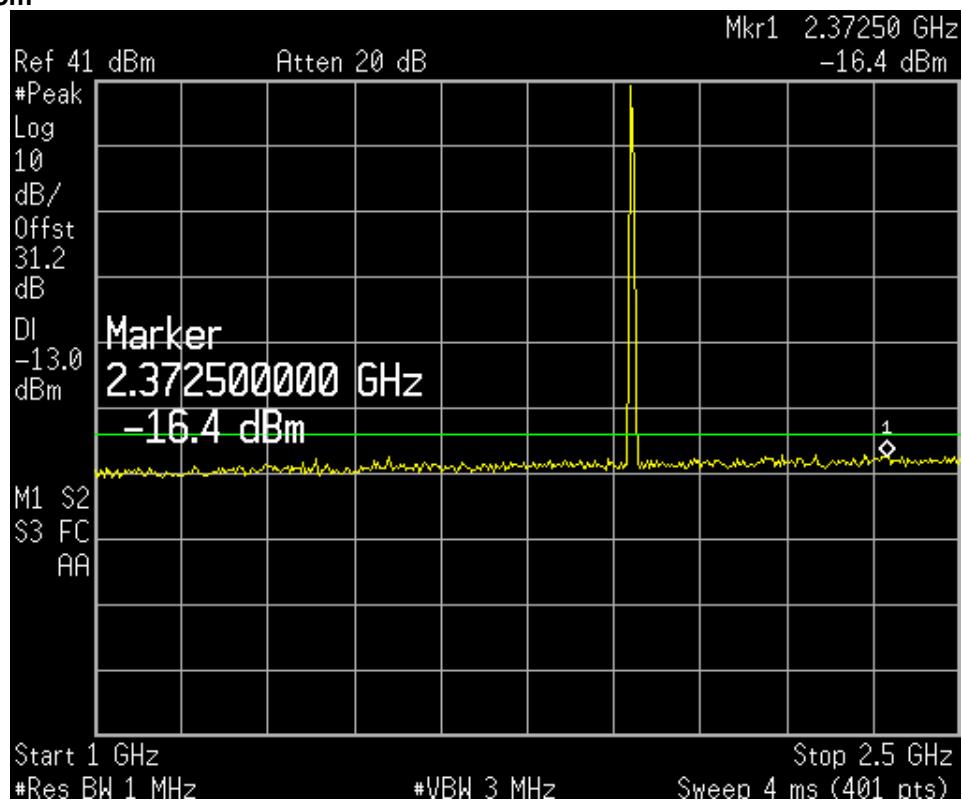
9 kHz to 150 kHz



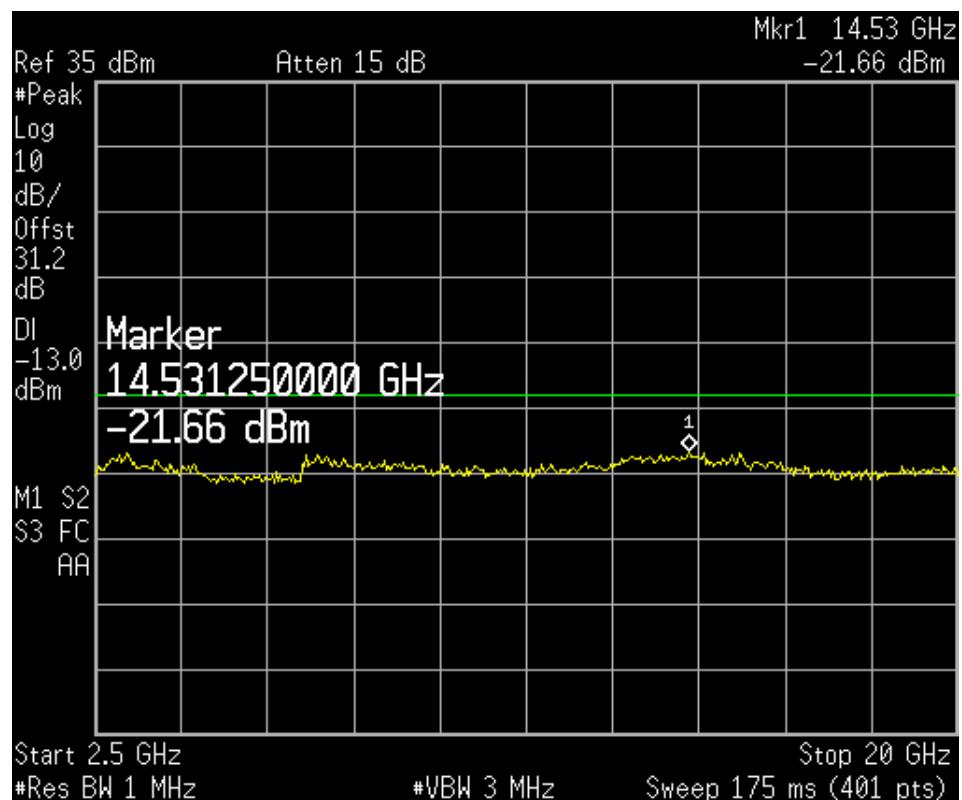
150 kHz to 30 MHz



30 MHz to 1 GHz



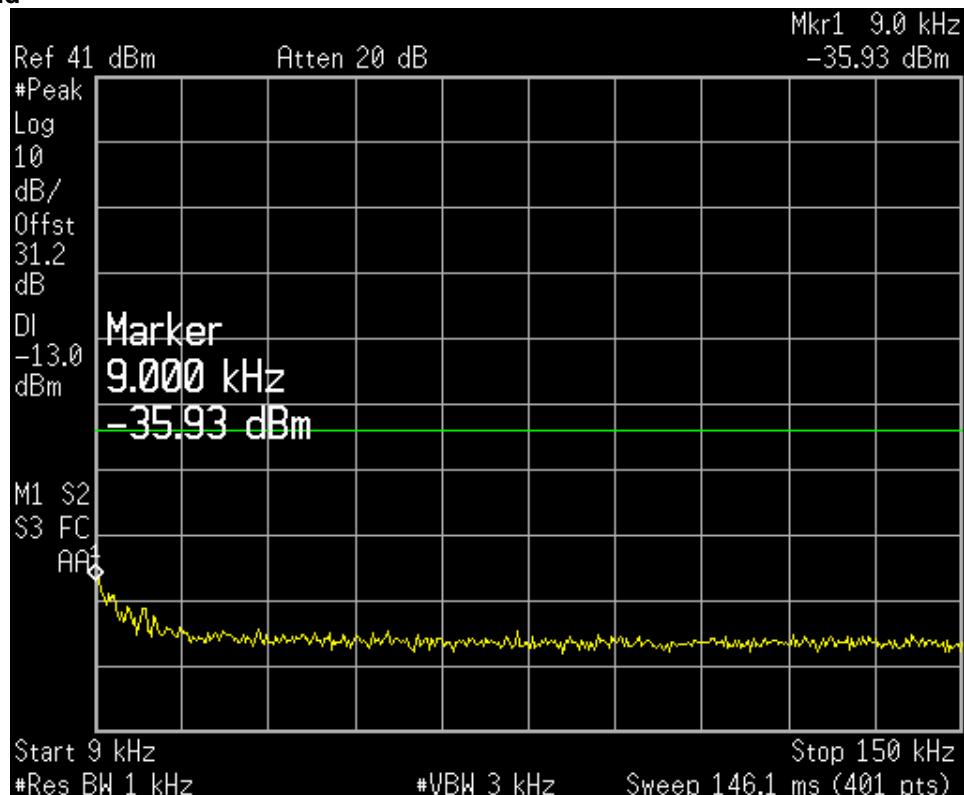
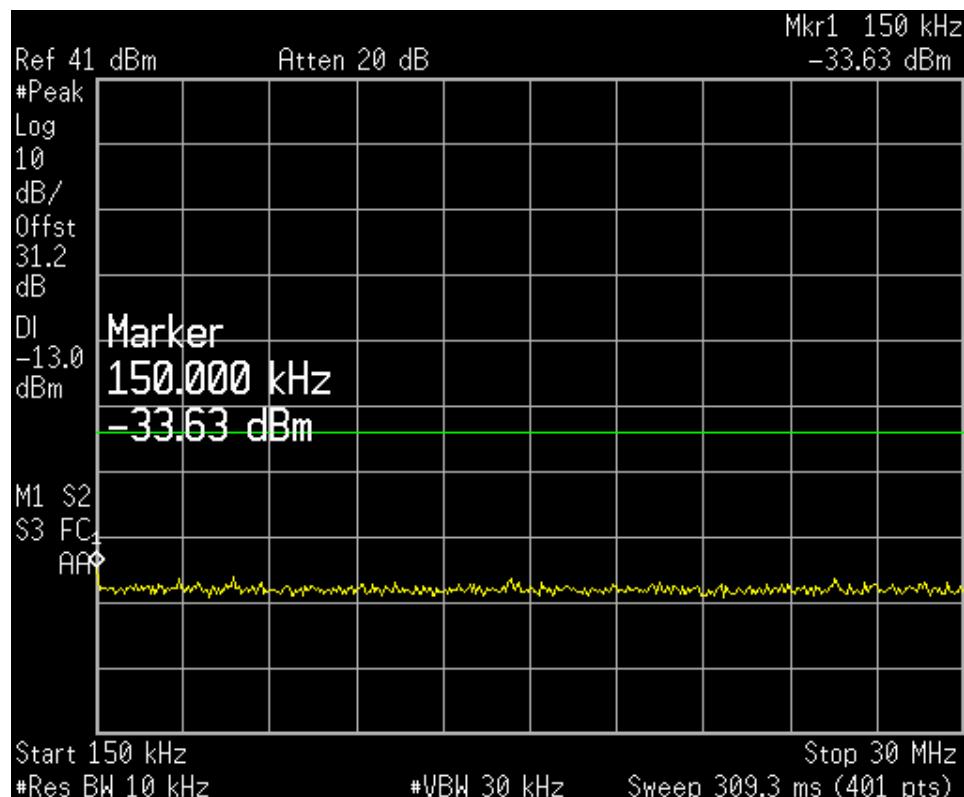
1GHz to 2.5 GHz

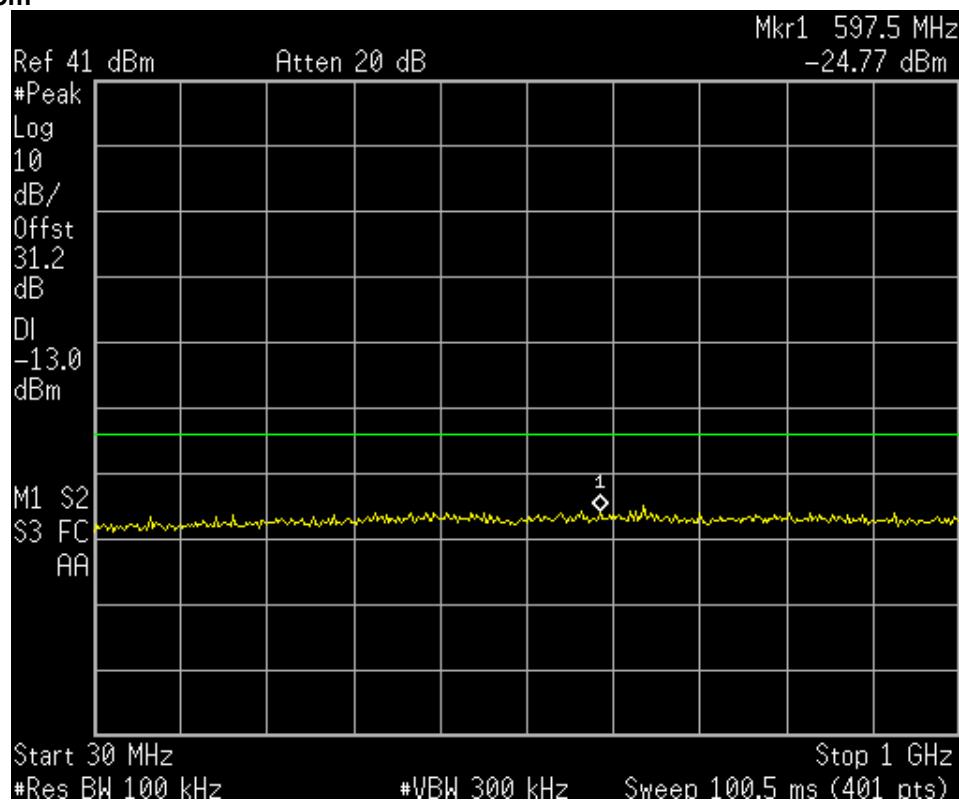
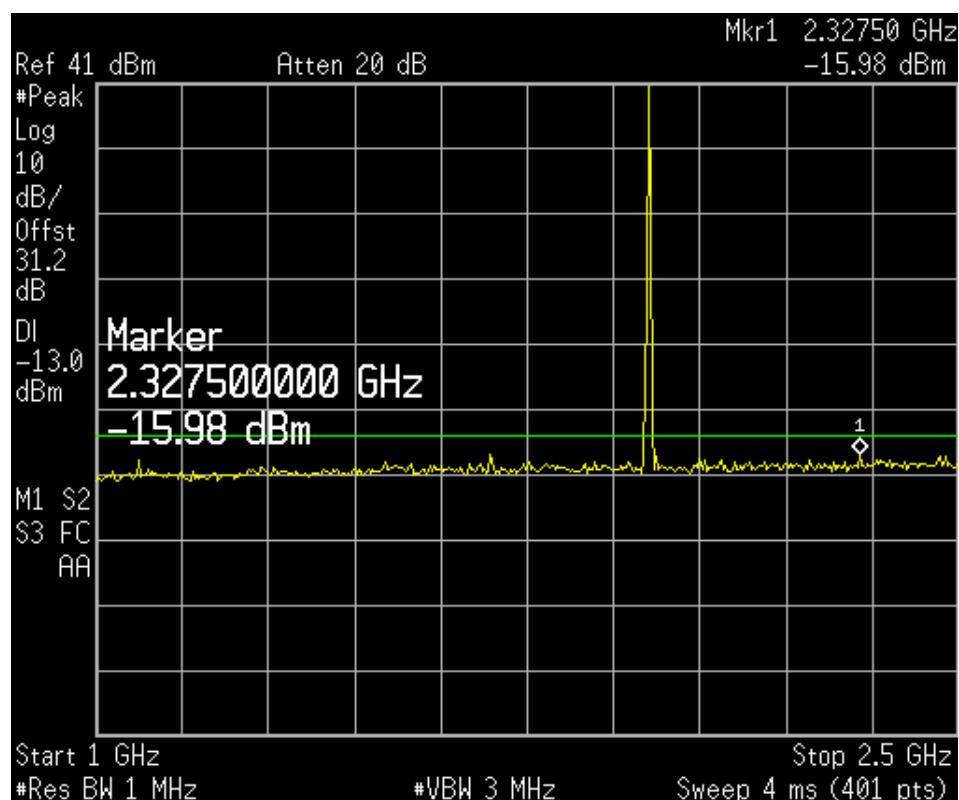


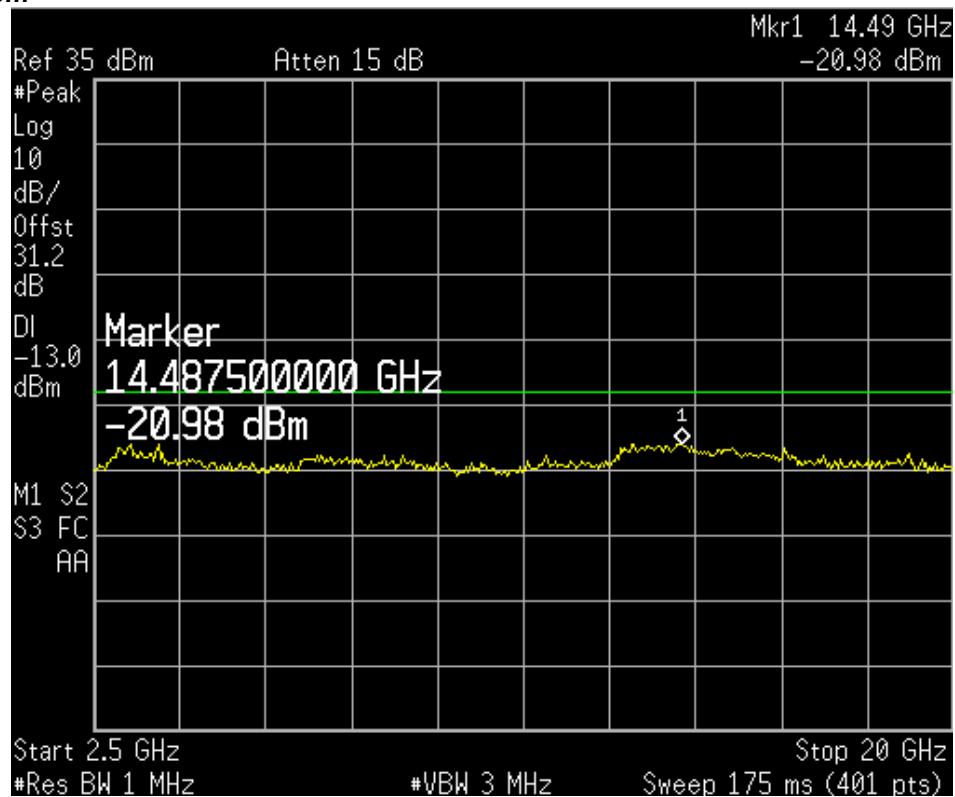
2.5 GHz to 20 GHz

www.tuv.com

Channel Mid

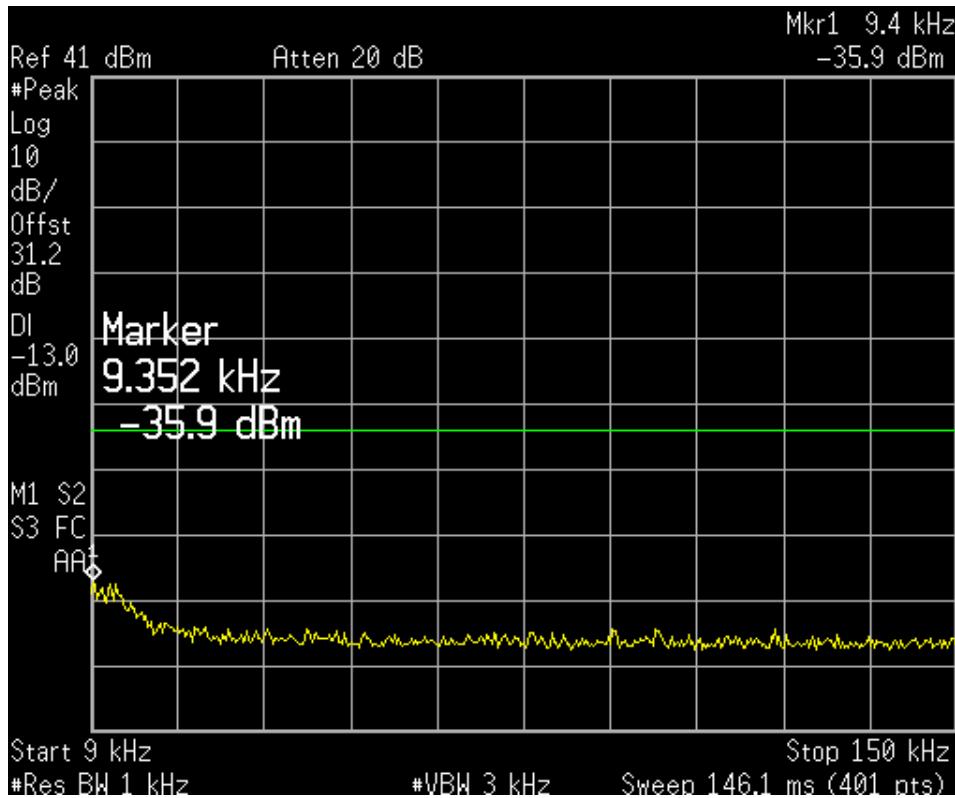

9 kHz to 150 kHz

150 kHz to 30 MHz


30 MHz to 1 GHz

1GHz to 2.5 GHz

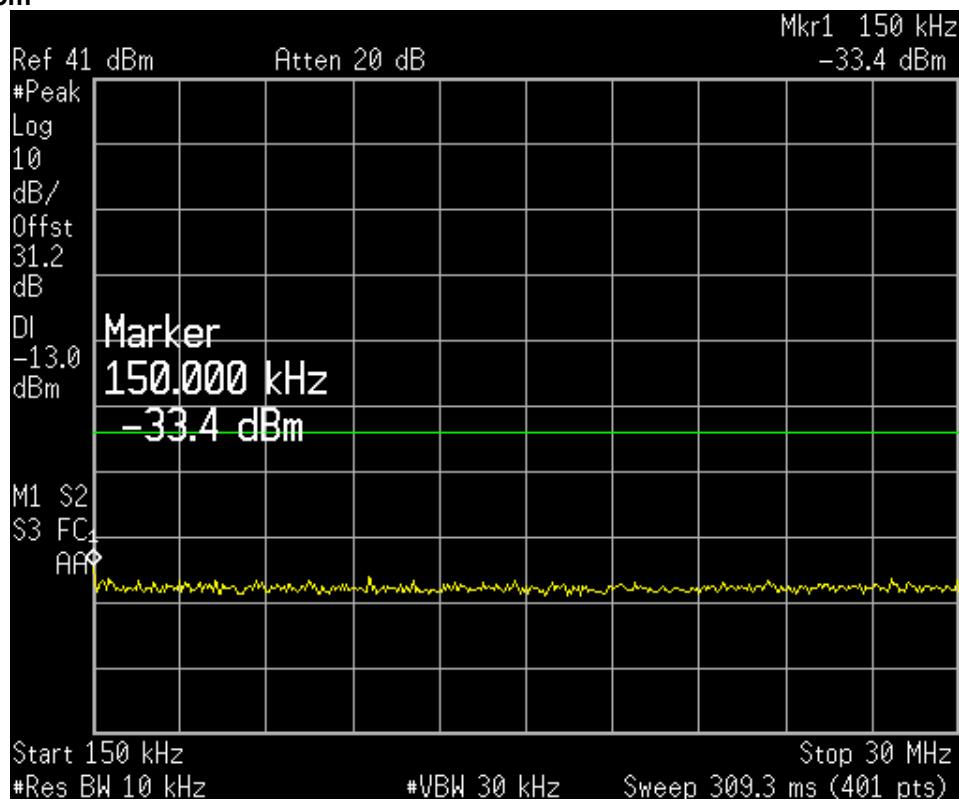


2.5 GHz to 20 GHz

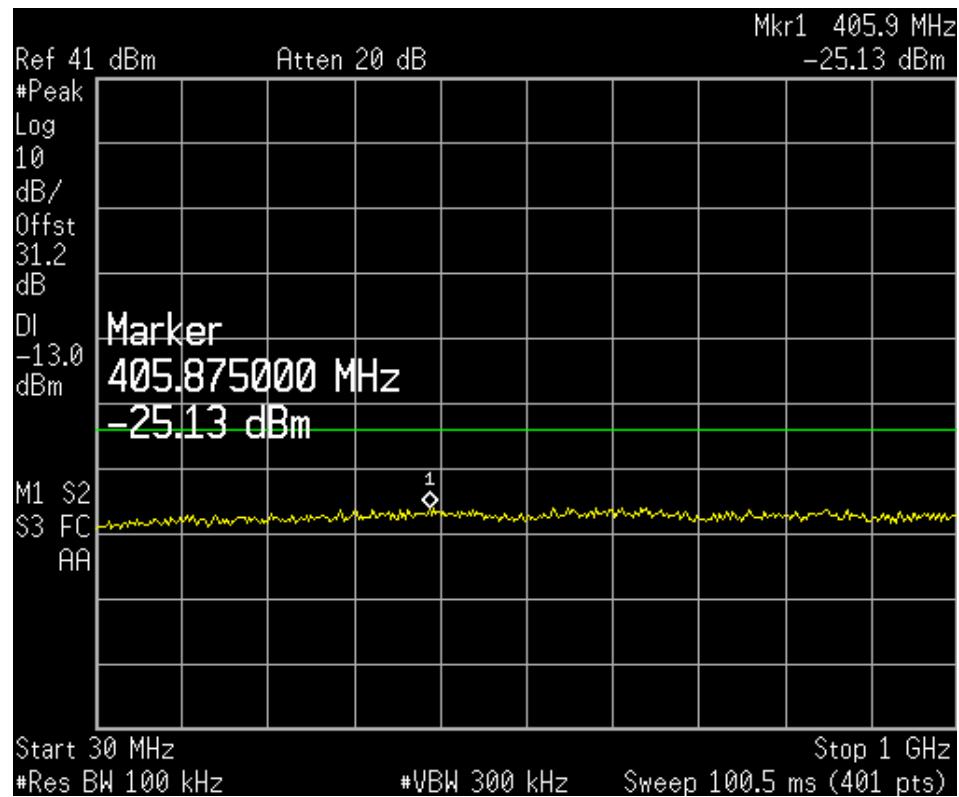
Channel High



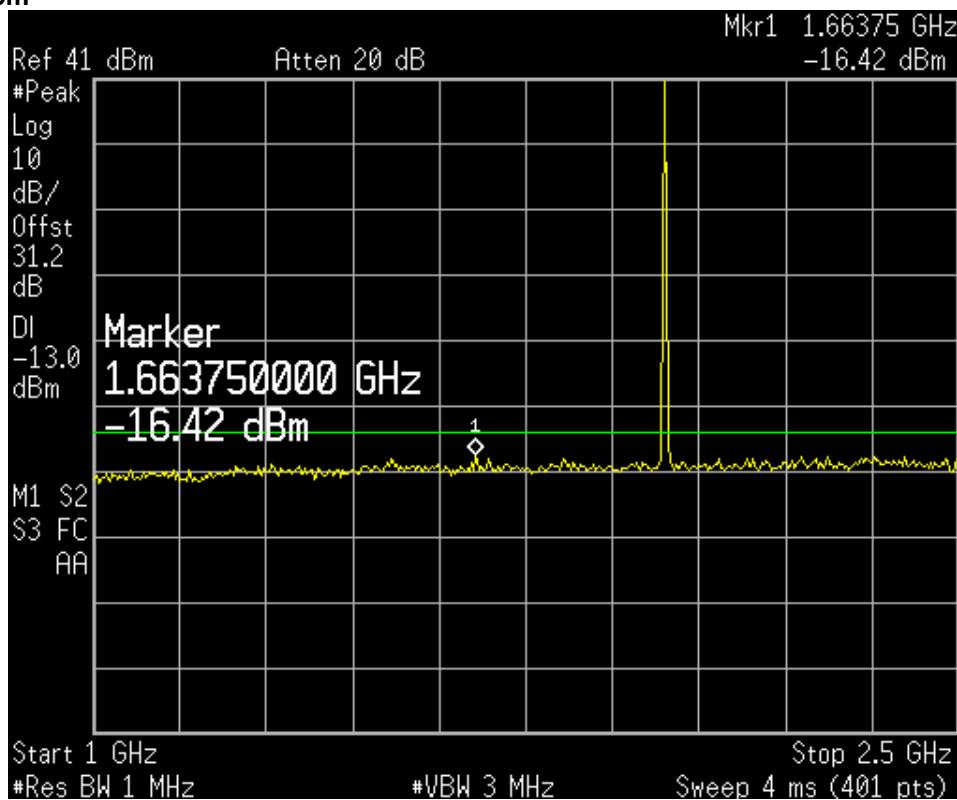
9 kHz to 150 kHz



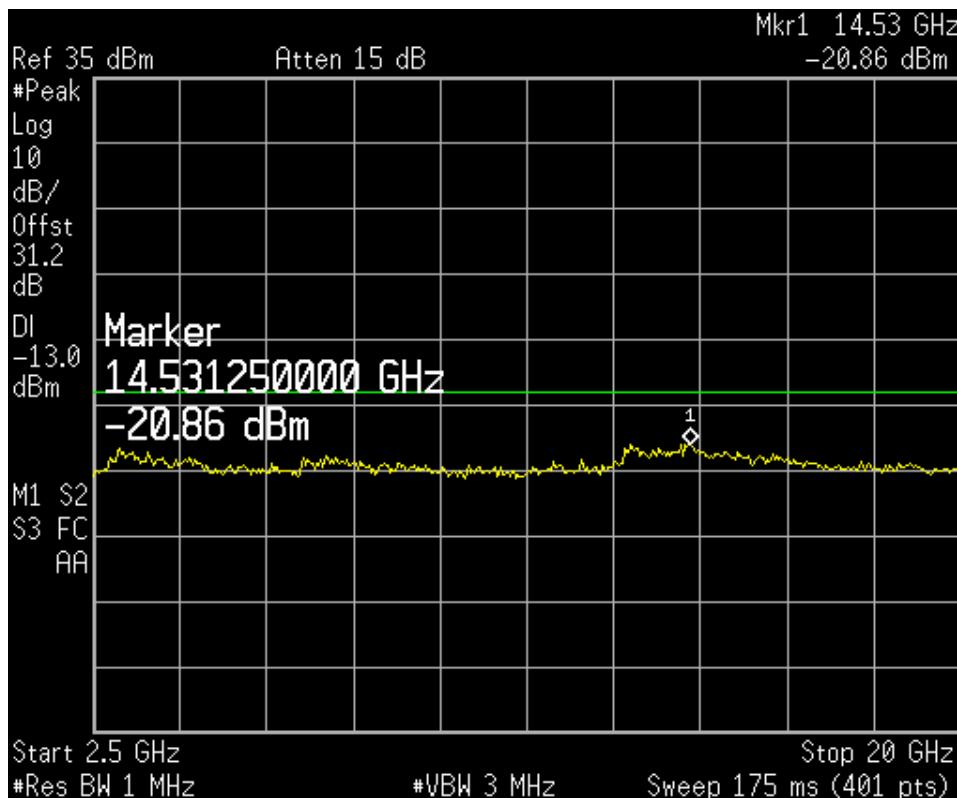
150 kHz to 30 MHz



30 MHz to 1 GHz



1GHz to 2.5 GHz



2.5 GHz to 20 GHz

**Radiated Spurious Emissions
Result****Section 2.2051 and 24.238
Pass**

Test Specification	CFR 47 (FCC) part 2.1051 and Part 24.238
Test Method	TIA-603-C:2004.
Measured at	Enclosure
Test Configuration	Channel Low, Mid and High

Test Method:

BTS is connected to match loads. The console computer controls the EUT to transmitter the maximum power which defined in specification of product. The EUT operates on a typical channel.

The test procedure:

(a) For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, E.R.P. shall be measured when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in FCC 2.1033(c)(8). The EUT was connected to ancillary in order to simulate normal operating conditions with reference to the guidance given in the standard for this type of equipment.

(b) Test the radiated maximum output power by the R&S test receiver ESMI received from test antenna.

(c) Use substitution method to verify the Maximum output power. The EUT is substituted by a dipole antenna. The dipole is connected to a signal generator. And then adjust the output level of the signal generator to get the same received power recorded in step (b) on ESMI, and record the power level of Signal Generator. Of course, the cable loss at the test frequency should be compensated.

According to 47CFR part 22.917, this defined the measurement bandwidth of as following:

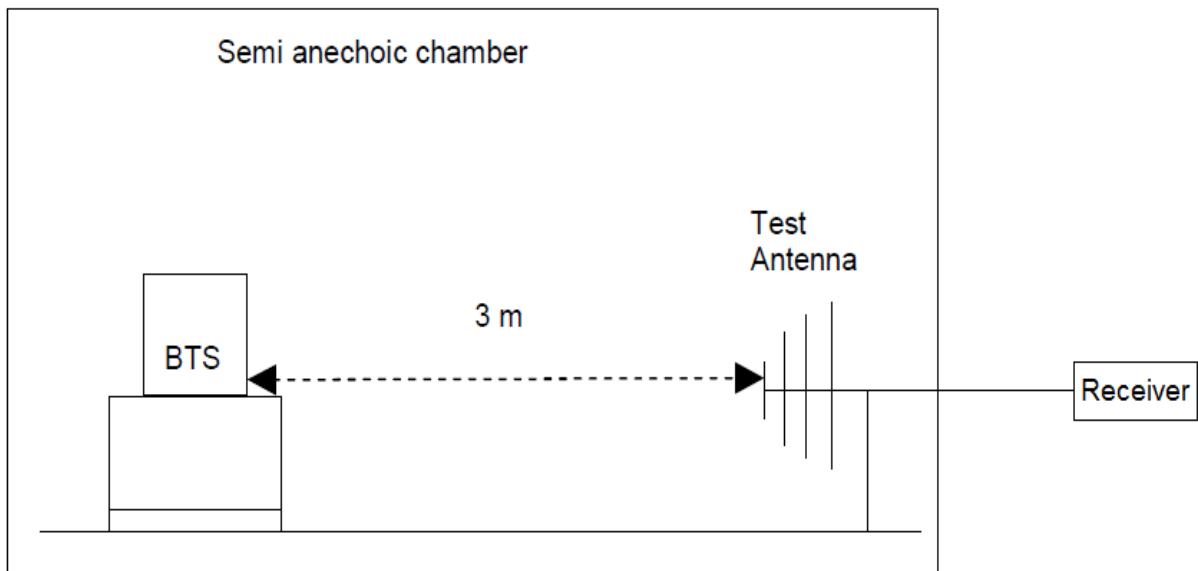
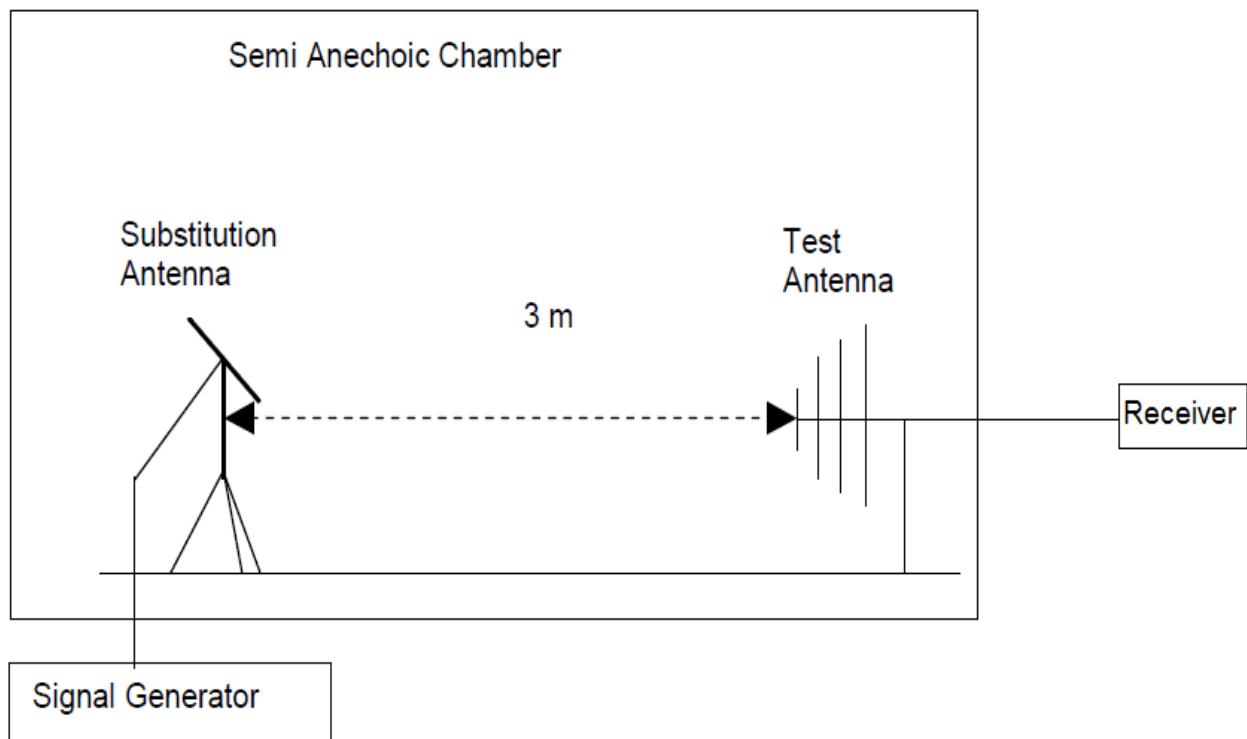
Measurement bandwidth (RBW) for 9 kHz up to 10th harmonic included: 100kHz;

According to IC RSS-133 clause 6.5, this defined the measurement bandwidth of as following:

Measurement bandwidth (RBW): 1MHz;

The product was pre-tested with vertical placement also, but worst test results were found with EUT Horizontal placement. Hence the final test was done EUT Horizontal placement.

Also, The final test was made with EUT on table of 80cm high.

Pre test:**Substitution test:**

Test Results

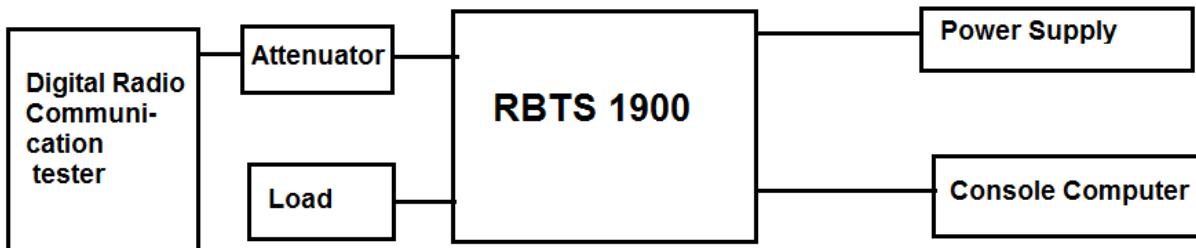
Channel	Polarization	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)
513 1930.40 MHz	V	57.21	-75.58	-13.00	-62.58
		3860.38	-54.30	-13.00	-41.30
	H	57.21	-68.58	-13.00	-55.58
		39.71	-67.84	-13.00	-54.84
		3860.38	-39.30	-13.00	-26.30
661 1960.00 MHz	V	59.15	-76.58	-13.00	-63.58
		94.14	-76.08	-13.00	-63.08
		3920.00	-52.26	-13.00	-39.26
	H	37.77	-68.84	-13.00	-55.84
		57.21	-68.58	-13.00	-55.58
		3920.00	-57.26	-13.00	-44.26
809 1989.60 MHz	V	57.21	-76.58	-13.00	-63.58
		3979.40	-57.20	-13.00	-44.20
	H	37.77	-67.84	-13.00	-54.84
		57.21	-68.58	-13.00	-55.58
		3979.40	-58.20	-13.00	-45.20

**Frequency Stability
Result**
**Section 2.1055 and 24.235
Pass**

Test Specification	CFR 47 (FCC) part 2.1055 and part 24.235
Test Method	TIA-603-C:2004.
Measured at	Antenna Connector
Test Configuration	Transmitter 1 – Channel Low, Mid and High Transmitter 2 – Channel Low, Mid and High

Test Method

The EUT was connected to the Radio Communication Tester via the one RF connector. Other RF connectors were connected to match load. BTS was controlled to transmit Maximum power by console computer. Measure and record the Frequency drift of the Base Station by the Radio Communication Tester.



The frequency stability shall be measured with variation of ambient temperature as follows:

- (1) From -30° to $+50^{\circ}$ centigrade for all equipment except that specified in subparagraphs (2) and (3) of FCC paragraph 2.1055
- (b) Frequency measurements shall be made at the extremes of the specified temperature range and at intervals of not more than 10° centigrade through the range. A period of time sufficient to stabilize all of the components of the oscillator circuit at each temperature level shall be allowed prior to frequency measurement. The short-term transient effects on the frequency of the transmitter due to keying (except for broadcast transmitters) and any heating element cycling normally occurring at each ambient temperature level also shall be shown. Only the portion or portions of the transmitter containing the frequency determining and stabilizing circuitry need be subjected to the temperature variation test.
- (d) The frequency stability shall be measured with variation of primary supply voltage as follows:
 - (1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.
 - (2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating end point, which shall be specified by the manufacturer.
 - (3) The supply voltage shall be measured at the input to the cable normally provided with the equipment, or at the power supply terminals if cables are not normally provided. Effects on

www.tuv.com

frequency of transmitter keying (except for broadcast transmitters) and any heating element cycling at the nominal supply voltage and at each extreme also shall be shown.

(e) When deemed necessary, the Commission may require tests of frequency stability under conditions in addition to those specifically set out in paragraphs (a), (b), (c) and (d) of this section. (For example, measurements showing the effect of proximity to large metal objects, or of various types of antennas, may be required for portable equipment.)

Limit:

No specific frequency stability requirement in FCC part 2.1055 and part 24.235.

According to IC RSS-133 clause 6.3, the carrier frequency shall not depart from the reference frequency in excess of ± 1.0 ppm for base stations.

Test Results

Transmitter 1

Channel	Temperature (°C)	Measured Frequency Error (Hz)	Error (ppm)	Limit
513 (1930.4 MHz)	-30	-43	-0.022	± 1
	-20	-59	-0.031	± 1
	-10	-43	-0.022	± 1
	0	-54	-0.028	± 1
	10	-55	-0.028	± 1
	20	-66	-0.034	± 1
	30	-62	-0.032	± 1
	40	-69	-0.036	± 1
	50	-79	-0.041	± 1
661 (1960.0 MHz)	-30	-41	-0.021	± 1
	-20	-50	-0.026	± 1
	-10	-49	-0.025	± 1
	0	-60	-0.031	± 1
	10	-59	-0.030	± 1
	20	-44	-0.022	± 1
	30	-60	-0.031	± 1
	40	-66	-0.034	± 1
	50	-58	-0.030	± 1
809 (1989.6 MHz)	-30	-37	-0.019	± 1
	-20	-51	-0.026	± 1
	-10	-49	-0.025	± 1
	0	-75	-0.038	± 1
	10	-49	-0.025	± 1
	20	-55	-0.028	± 1
	30	-77	-0.039	± 1
	40	-73	-0.037	± 1
	50	-67	-0.034	± 1

Transmitter 2

Channel	Temperature (°C)	Measured Frequency Error (Hz)	Error (ppm)	Limit
513 (1930.4 MHz)	-30	-43	-0.022	±1
	-20	-40	-0.021	±1
	-10	-45	-0.023	±1
	0	-51	-0.026	±1
	10	-49	-0.025	±1
	20	-57	-0.030	±1
	30	-76	-0.039	±1
	40	-54	-0.028	±1
	50	-53	-0.027	±1
661 (1960.0 MHz)	-30	-42	-0.021	±1
	-20	-50	-0.026	±1
	-10	-64	-0.033	±1
	0	-52	-0.027	±1
	10	-53	-0.027	±1
	20	-57	-0.029	±1
	30	-73	-0.037	±1
	40	-77	-0.039	±1
	50	-76	-0.039	±1
809 (1989.6 MHz)	-30	-40	-0.020	±1
	-20	-46	-0.023	±1
	-10	-68	-0.034	±1
	0	-54	-0.027	±1
	10	-52	-0.026	±1
	20	-66	-0.033	±1
	30	-69	-0.035	±1
	40	-70	-0.035	±1
	50	-73	-0.037	±1

www.tuv.com
Frequency Error vs. Voltage

Transmitter	Voltage	Channel	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
Transmitter 1	85% Vnorm (20.4V DC)	512 (1930.4 MHz)	-63	-0.033	±1
		661 (1960.0 MHz)	-63	-0.032	±1
		810 (1989.6 MHz)	-62	-0.031	±1
	115% Vnorm (27.6 V DC)	512 (1930.4 MHz)	-58	-0.030	±1
		661 (1960.0 MHz)	-59	-0.030	±1
		810 (1989.6 MHz)	-62	-0.031	±1
Transmitter 2	85% Vnorm (20.4V DC)	512 (1930.4 MHz)	-73	-0.038	±1
		661 (1960.0 MHz)	-60	-0.031	±1
		810 (1989.6 MHz)	-81	-0.041	±1
	115% Vnorm (27.6 V DC)	512 (1930.4 MHz)	-57	-0.030	±1
		661 (1960.0 MHz)	-58	-0.030	±1
		810 (1989.6 MHz)	-62	-0.031	±1