

CFR 47 Part 2 and 22 Test Report

Terminal device

FCC ID: HHV20021106

Device Name: Emergency Portable Cellular Telephone

Model Number: ECG2111

Date of Report: 22, November, 2002

Rev. 1.1

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1. GENERAL INFORMATION**1.1. List of General Information Required for Certification**

1.1.1. Sub-Part 2.1033(c)(1)

Name and Address of Applicant: Matsushita Electric Works, Ltd
1048, Kadoma, Kadoma-shi, Osaka, 571-8686, Japan

Manufacturer: Matsushita Electric Works, Ltd
or
Shintom Co., Ltd.
4-5-14 Tarumachi, Kohoku-Ku
Yokohama 222-0001, Japan

1.1.2. Sub-Part 2.1033(c)(2)

FCC ID: HHV20021106

1.1.3. Sub-Part 2.1033(c)(3)

Instruction Manual(s): Refer to attached Exhibits.

1.1.4. Sub-Part 2.1033(c)(4)

Type of Emission: 40K0F8W and 40K0F1D

1.1.5. Sub-Part 2.1033(c)(5)

Frequency Range: 824.04 to 848.97 MHz

1.1.6. Sub-Part 2.1033(c)(6)

Power Rating, Watts, Rated:
Variable
Conducted: 0.449 W (26.5 dBm)
Radiated: Refer to attached Exhibits.

1.1.7. Sub-Part 2.1033(c)(7)

Maximum Power Rating: Refer to attached Exhibits.

1.1.8. Sub-Part 2.1033(c)(8)

DC Voltage and Current to the Final Amplifier Module:

Supply Voltage: 6.00 V DC
Drain Voltage: 5.92 V DC
Drain Current: 0.254 to 0.042 A

1.1.9. Sub-Part 2.1033(c)(9)

Tune-Up Procedure: Refer to attached Exhibits.

1.1.10. Sub-Part 2.1033(c)(10)

Circuit Diagrams/Circuit Description:

Including description of circuitry & devices provided for determining and stabilizing frequency, for suppression of spurious radiation, for limiting power.

Refer to Exhibits (Schematics, Block Diagrams, and Operational Description).

1.1.11. Sub-Part 2.1033(c)(11)

Equipment Identification: Refer to attached Exhibits.

1.1.12. Sub-Part 2.1033(c)(12)

Photographs: Refer to attached Exhibits.

1.1.13. Sub-Part 2.1033(c)(13)

Digital Modulation Description: Not applicable.

1.1.14. Sub-Part 2.1033(c)(14)

Test and Measurement Data: Refer to Section 2 onwards of this report.

1.1.15. Sub-Part 2.1091

Radiofrequency radiation exposure evaluation: Refer to attached Exhibits.

1.1.16. Sub-Part 22.919(a)(b)(c)

Description of Electronic Serial Number: Refer to attached Exhibits.

1.2. Test Summary

Test Performed	Reference	Section of Report	Complies/ Does not comply
RF Power Output (Conducted)	FCC Part 2.1046 (a), (c)	4	Complies
Modulation Requirements: Transmitter Audio Frequency Response	FCC Part 2.1047(a), 22.915(d)(1)	5	Complies
Modulation Requirements: Modulation Limiting	FCC Part 2.1047(b), 22.915(b)(1), (c)	6	Complies
Occupied Bandwidth	FCC Part 2.1049(c)(1), 22.917	7	Complies
Spurious Emissions as Antenna Terminals	FCC Part 2.1051 / 22.917	8	Complies
Emissions in Receive Band	FCC Part 2.1051 / 22.917(f)	9	Complies
Frequency Stability (Temperature Variation)	FCC Part 2.1055(a)(1)	10	Complies
Frequency Stability (Voltage Variation)	FCC Part 2.1055(d)	11	Complies

The following test results were not included in this test report.
Refer to attached Exhibits.

Test Performed	Reference	Complies/ Does not comply
RF Power Output (Radiated)	FCC Part 22.913(a)	Complies
Radiated Spurious Emissions	FCC Part 2.1053 / 22.917(e)	Complies

2. Standard Test Conditions

The following conditions and procedures were followed during testing of this transmitter:

Room temperature: 23 - 27 Degrees Celsius
 Room Humidity: 30 - 50 %
 Supply Voltage: 6.0 V DC

Prior to testing, the unit was tuned-up according to the manufacturer's alignment procedure.
 Test procedures were according to EIA specification IS19B.

3. Test Equipment List

The following instruments were used for testing.

Test/Section of Report	Test Equipment	Manufacturer	Model No.
4	Power Meter	Hewlett Packard	437B
4	Power Sensor	Hewlett Packard	8481A
5, 6	Modulation Analyzer	Hewlett Packard	8901B
5, 6, 7, 8, 9	Audio Analyzer	Hewlett Packard	8903A
7, 8, 9	Spectrum Analyzer	Hewlett Packard	8566B
10,11	RF Signal Generator	Hewlett Packard	8642A
10,11	Frequency Counter	Hewlett Packard	53132A
10,11	Cellular Interface	Hewlett Packard	8958A
4, 5, 6, 7, 8, 9,10,11	Power Supply	Hewlett Packard	E3610A
11	Multi Meter	Hewlett Packard	34401A
9	Branching Filter	TDK	CF6121612D
4, 7, 8	Attenuator (10dB)	Anritsu	MP721C
9	Terminator	Anritsu	MP752A

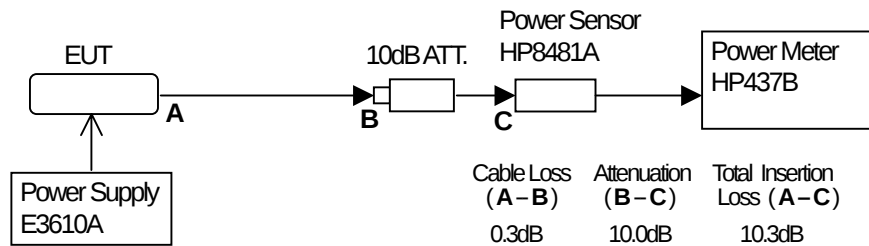
4. RF POWER OUTPUT (CONDUCTED)

Specification: FCC Part 2.1046(a)(c)

4.1. Setup and Procedure

The test set-up is as per the following figure.

The EUT was connected to a coaxial attenuator having a 50ohm Impedance through a RF coaxial cable.

**4.2. Pass/Fail Criteria**

Not Applicable

4.3. Test Results

RF Power					
Channel	Nominal Frequency (MHz)	Max (mW)	Max (dBm)	Min (mW)	Min (dBm)
991	824.04	427	26.30	5.61	7.49
383	836.49	449	26.52	5.90	7.71
799	848.97	400	26.02	5.58	7.47

Note: Channel capacity = 832

5. TRANSMITTER AUDIO FREQUENCY RESPONSE

Specification: FCC Part 2.1047(a), 22.915(d)(1)

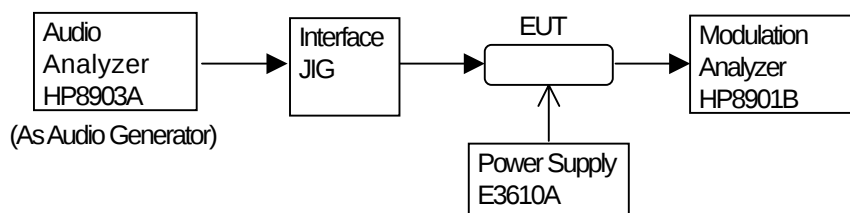
5.1. Setup and Procedure

The test set-up is as per the following figure.

The audio signal generator was connected to the audio input circuit of the EUT through the Interface JIG.

Operate the EUT with the compressor disabled, and monitor the output using the HP8901B modulation analyzer without standard 750-microsecond de-emphasis, with expander disabled. Apply the sine wave audio signal to the audio input of the EUT, vary the modulating frequency from 300 to 3000 Hz, and observe the input levels necessary to maintain a constant ± 2.9 KHz system deviation.

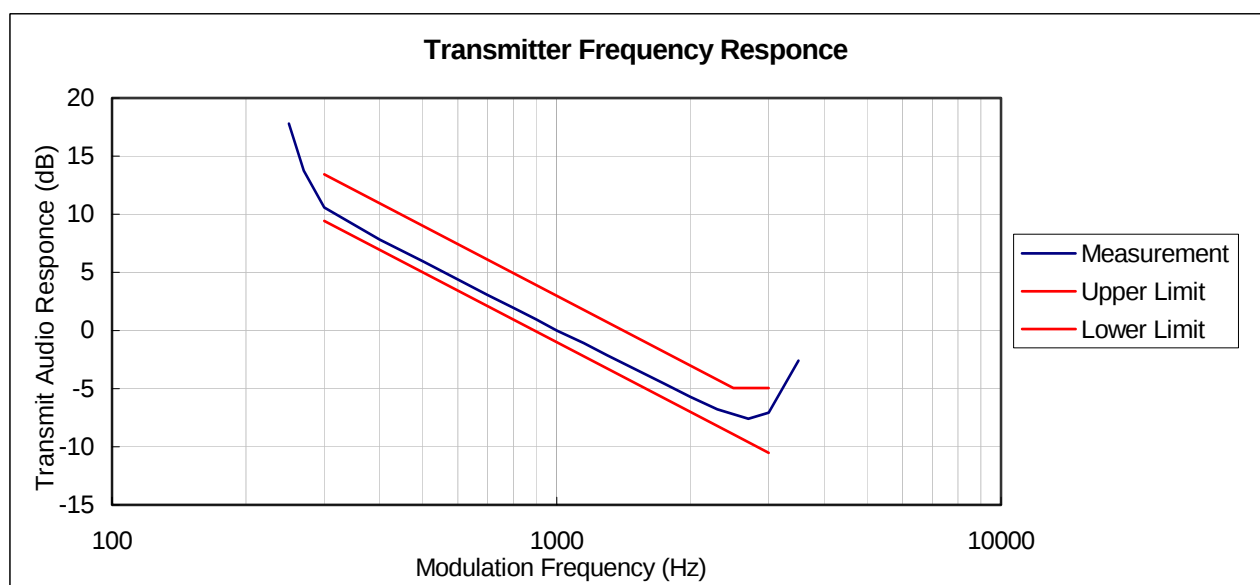
Adjust the audio input frequency to 1000 Hz, and adjust the input level to 20 dB greater than that required to produce ± 8 KHz deviation. Note the output level on the HP8901B modulation analyzer. Using this output level as reference (0dB), Vary the modulating frequency from 3000 Hz to 30,000 Hz, and observe the change in output while maintaining a constant audio input level.

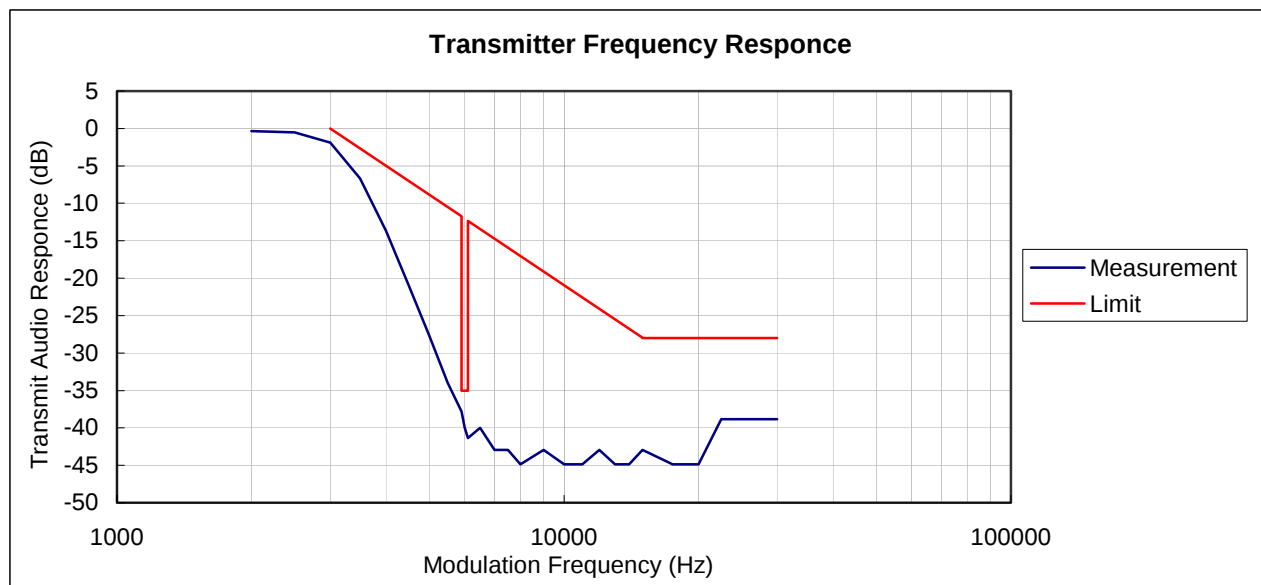


5.2. Pass/Fail Criteria

Emissions mask.

5.3. Test Results





6. MODULATION LIMITING

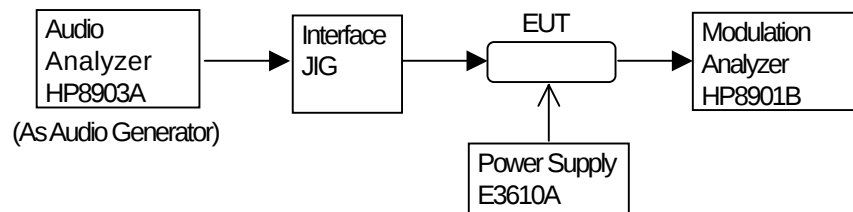
Specification: FCC Part 2.1047(b), 22.915(b)(1),(c)

6.1. Setup and Procedure

The test set-up is as per the following figure.

The deviation is to be observed by varying the audio input voltage.

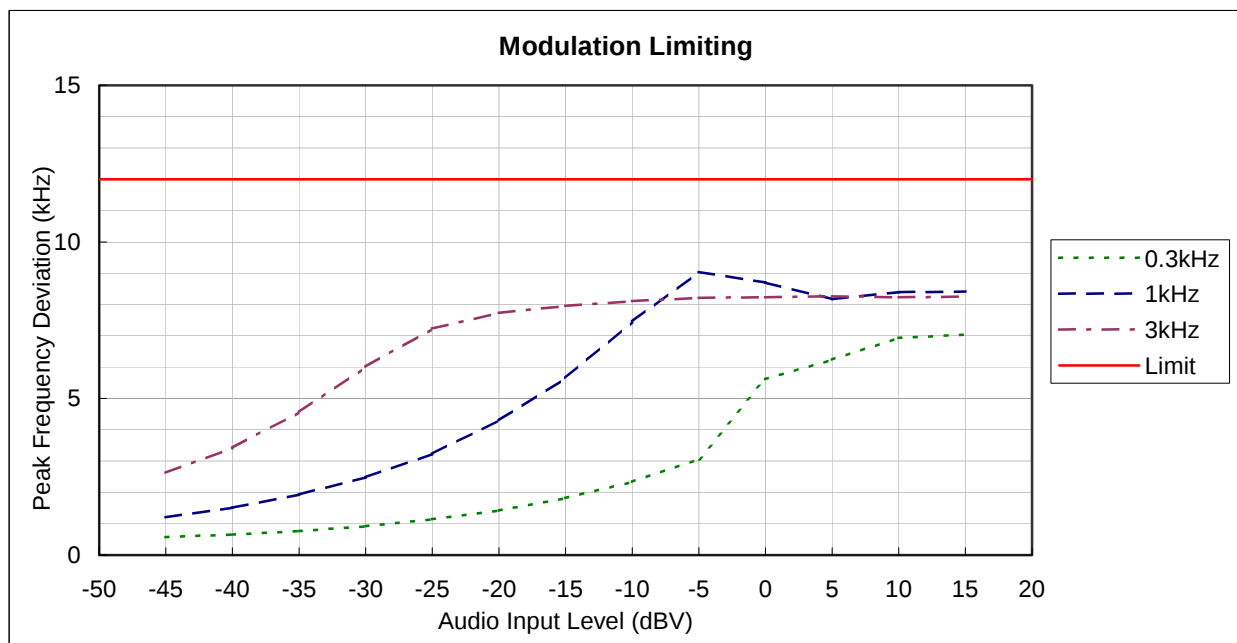
Test has been performed for three different modulation frequencies.



6.2. Pass/Fail Criteria

Less than ± 12 kHz deviation.

6.3. Test Results



7. OCCUPIED BANDWIDTH

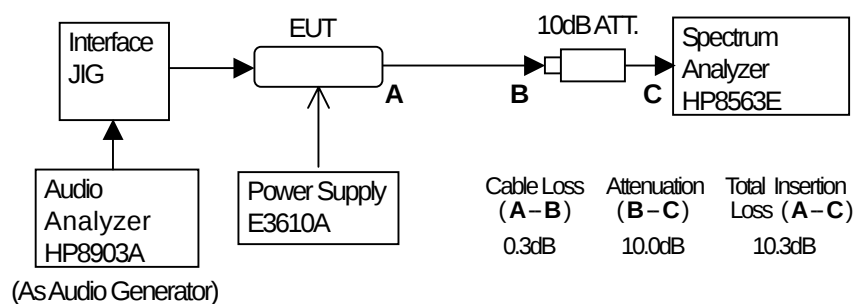
Specification: FCC Part 2.1049(c)(1), 22.917

7.1 Setup and Procedure

The test set-up is as per the following figure.

The Audio Signal Generator was adjusted to the frequency of 1 KHz. The output level was set to ± 6 KHz deviation. With level constant, the frequency was set to 2,500 Hz. Then the audio signal level was increased by 16 dB.

In addition, occupied bandwidth data was obtained for the SAT (Supervisory Audio Tone), ST (Signaling Tone), WBD (Wideband Data), and DTMF (Dual Tone Multi Frequencies).

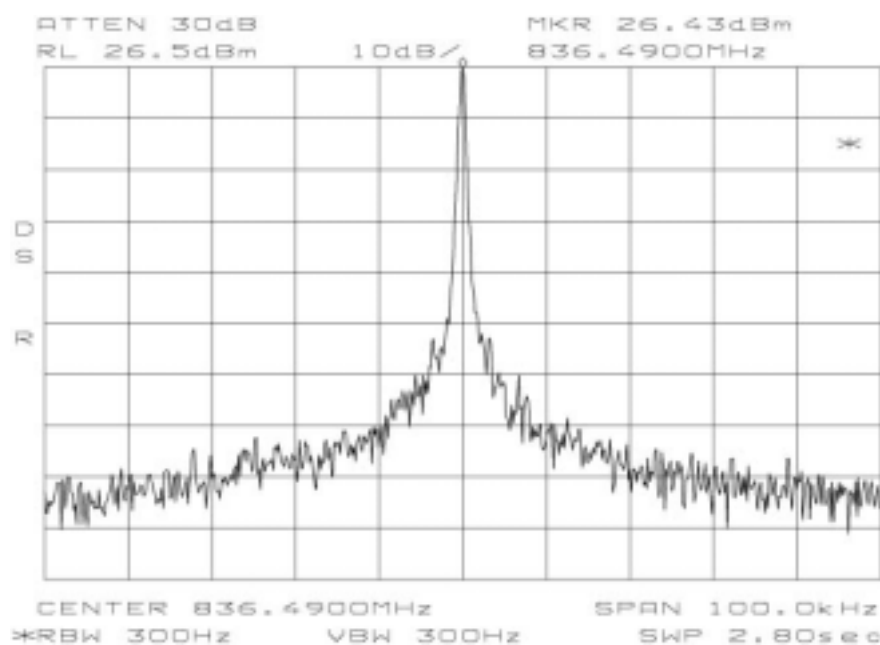


7.2 Pass/Fail Criteria

Emissions mask.

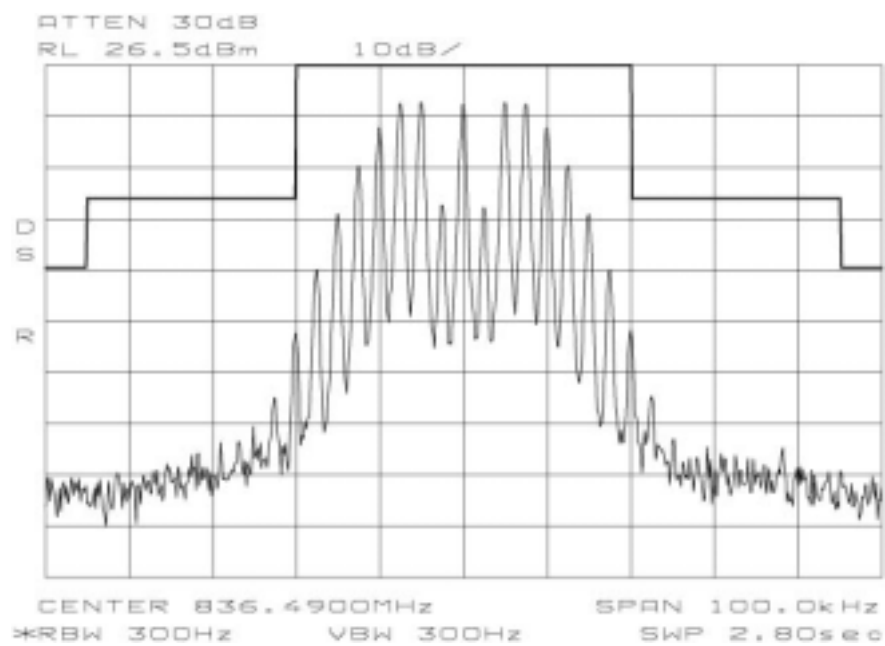
7.3 Test Results

No Modulation; 836.49 MHz



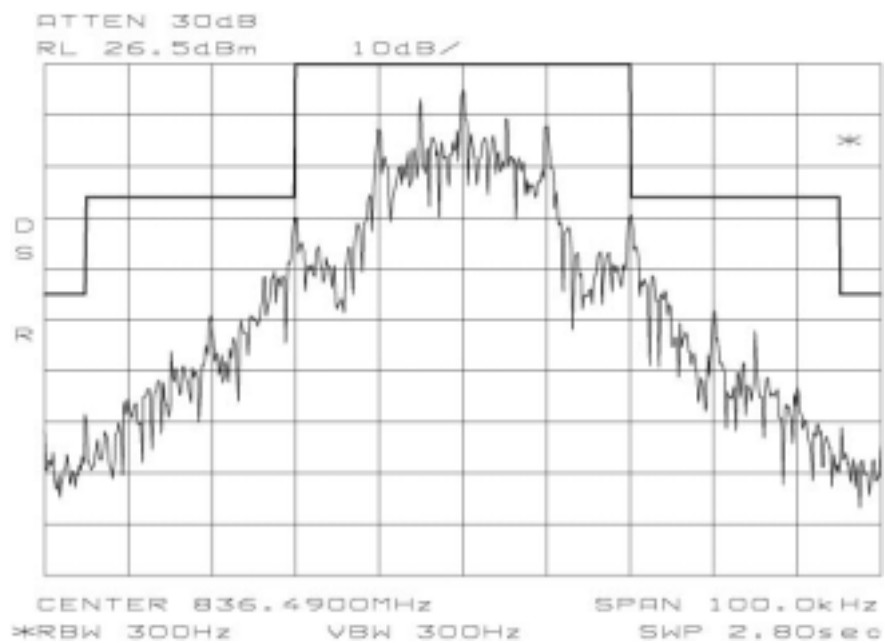
Voice; 836.49 MHz

100kHz Span, 300Hz RBW/VBW, Ref to power level



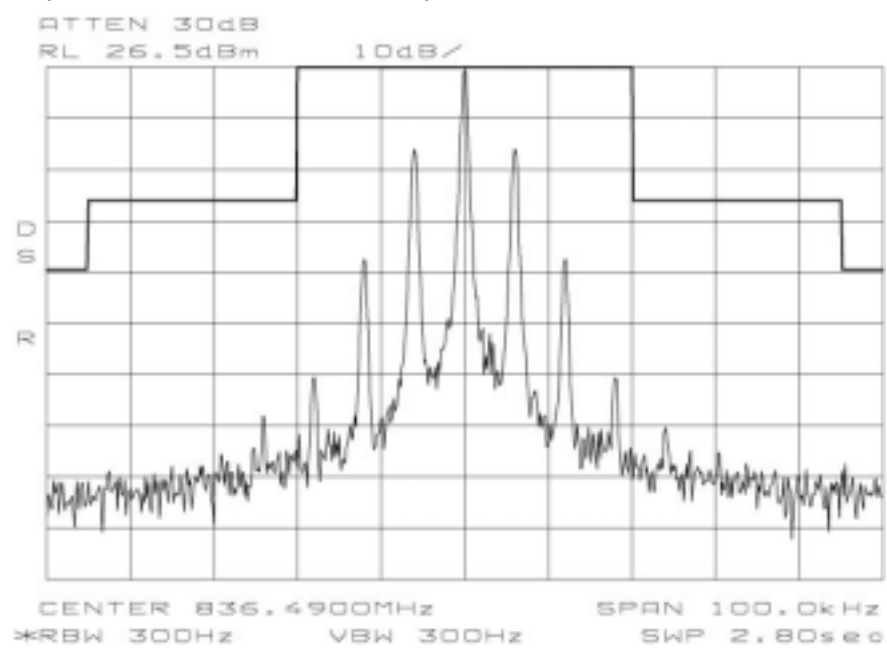
Wideband Data; 836.49 MHz

100kHz Span, 300Hz RBW/VBW, Ref to power level



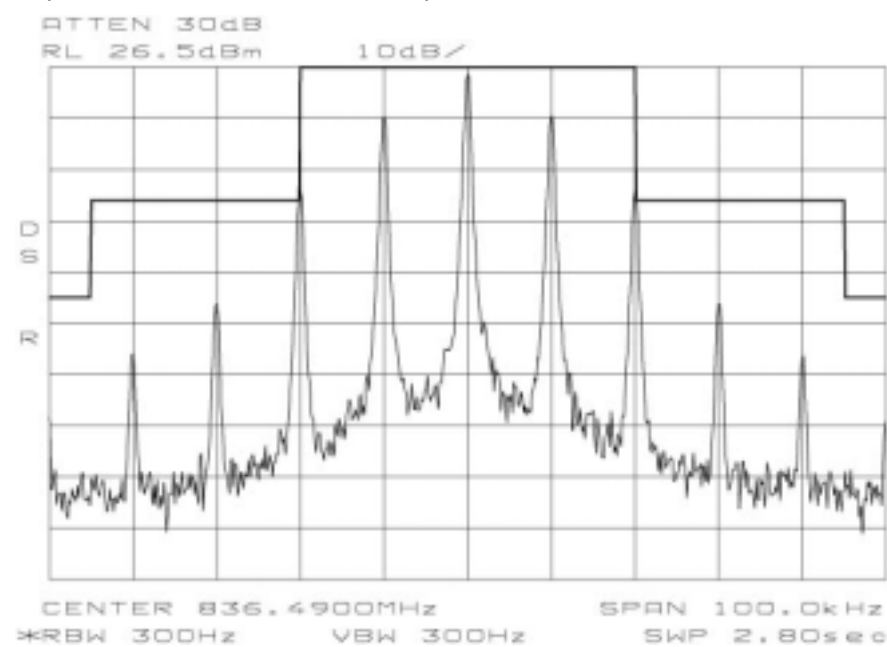
SAT; 836.49 MHz

100kHz Span, 300Hz RBW/VBW, Ref to power level



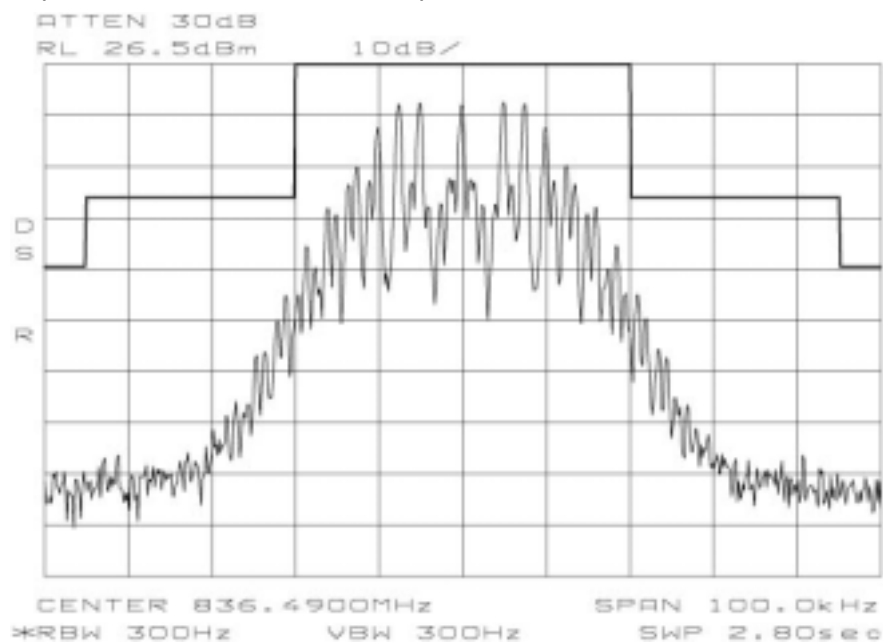
ST; 836.49 MHz

100kHz Span, 300Hz RBW/VBW, Ref to power level



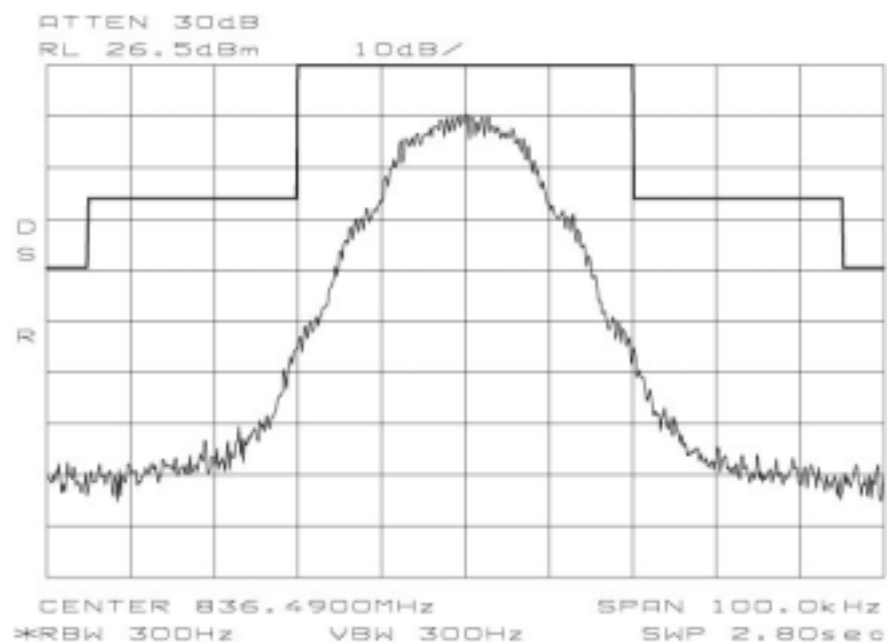
SAT + Voice; 836.49 MHz

100kHz Span, 300Hz RBW/VBW, Ref to power level



SAT + DTMF; 836.49 MHz

100kHz Span, 300Hz RBW/VBW, Ref to power level



8. SPURIOUS EMISSIONS AT ANTENNA TERMINAL

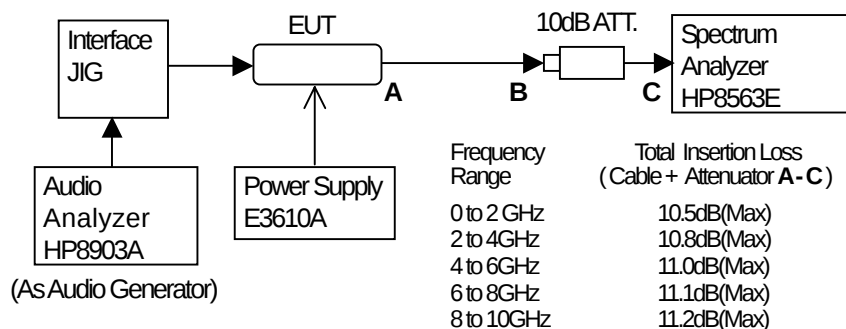
Specification: FCC Part 2.1051, 22.917

8.1. Setup and Procedure

The test set-up is as per the following figure.

The level of the carrier and the various conducted spurious and harmonic frequencies were measured by means of a calibrated Spectrum Analyzer.

The spectrum was scanned from the lowest frequency generated in the equipment to 10 GHz.



Note:

Modulation Condition: Audio Plus SAT

Audio:

Frequency: 2,500 Hz

Input Level: 16 dB greater than the level to Produce <6KHz deviation.

SAT:

Frequency: 6,000 Hz

Deviation: ± 2 KHz

8.2. Pass/Fail Criteria

Below -13dBm.

8.3. Test Results

The level of emissions were below -40 dBm.

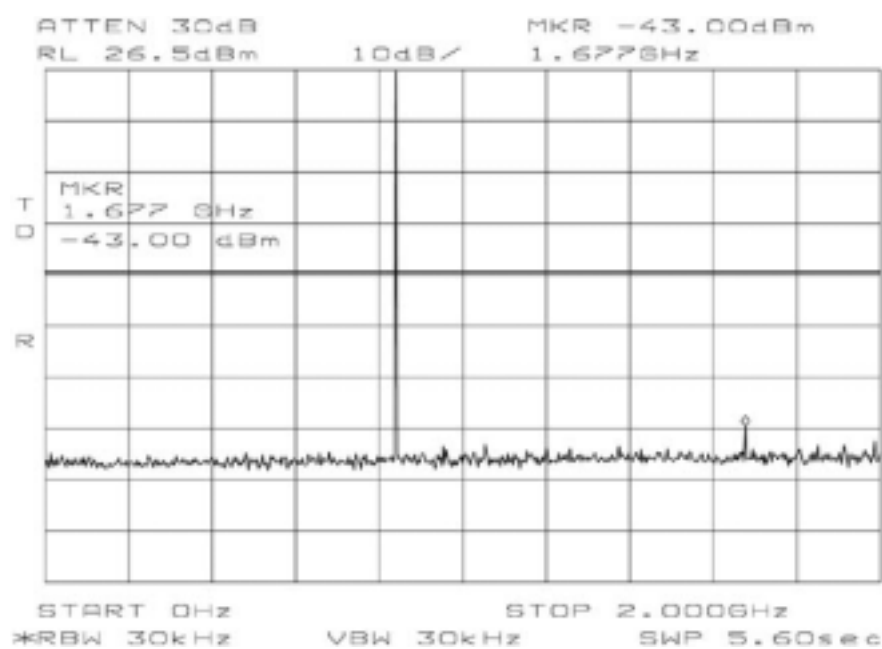
Spurious Level				
Harmonics	Frequency Range	Carrier frequency		
		824.04 MHz	836.49 MHz	848.97 MHz
2nd	0 to 2 GHz	< -40 dBm	< -40 dBm	< -40 dBm
3rd, 4th	2 to 4 GHz	< -45 dBm	< -45 dBm	< -45 dBm
5th to 7th	4 to 6 GHz	< -45 dBm	< -45 dBm	< -45 dBm
8th, 9th	6 to 8 GHz	< -45 dBm	< -45 dBm	< -45 dBm
10th, 11th	8 to 10 GHz	< -45 dBm	< -45 dBm	< -45 dBm

All other Spurious were the same as those shown previously.

The results measured by the spectrum analyzer are shown in the following charts.

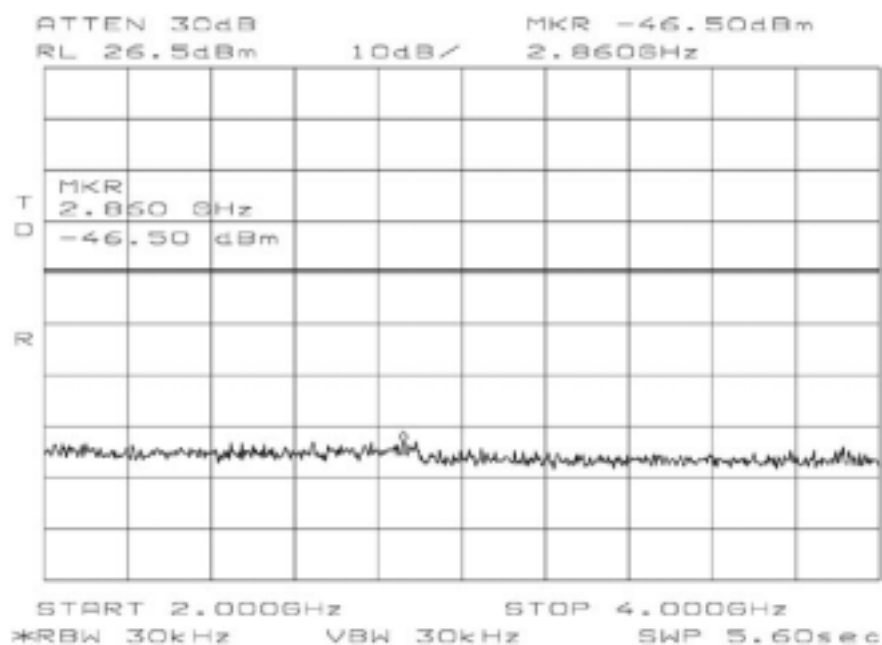
Carrier frequency: 836.49 MHz, Max Power Level

Frequency Range: 0Hz to 2GHz, 30kHz RBW/VBW, Ref to power level



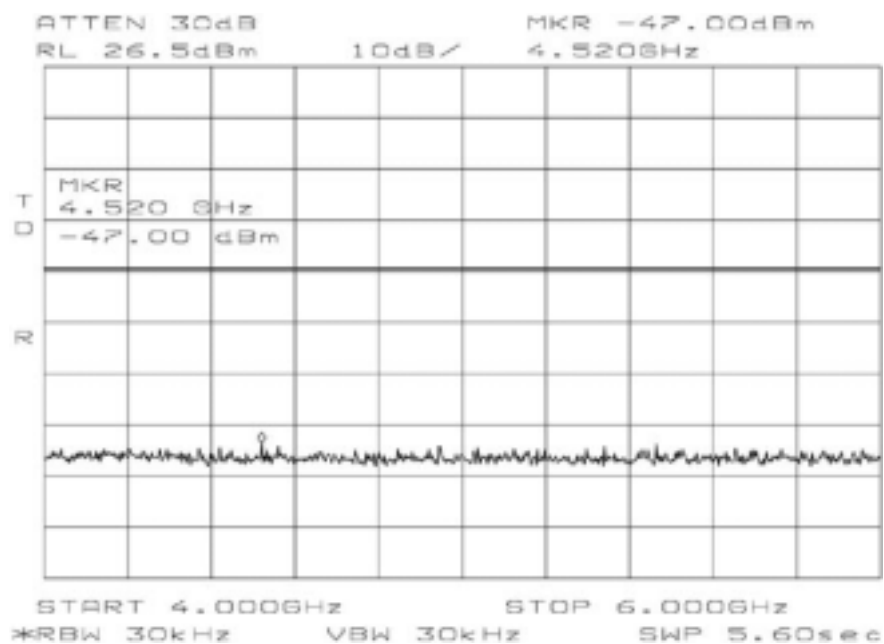
Carrier frequency: 836.49 MHz, Max Power Level

Frequency Range: 2GHz to 4GHz, 30kHz RBW/VBW, Ref to power level



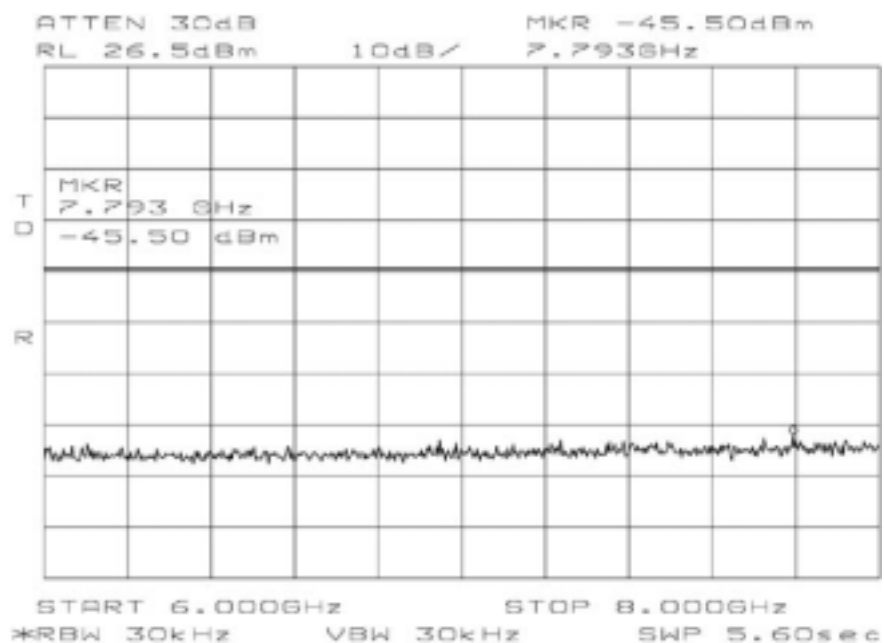
Carrier frequency: 836.49 MHz, Max Power Level

Frequency Range: 4GHz to 6GHz, 30kHz RBW/VBW, Ref to power level



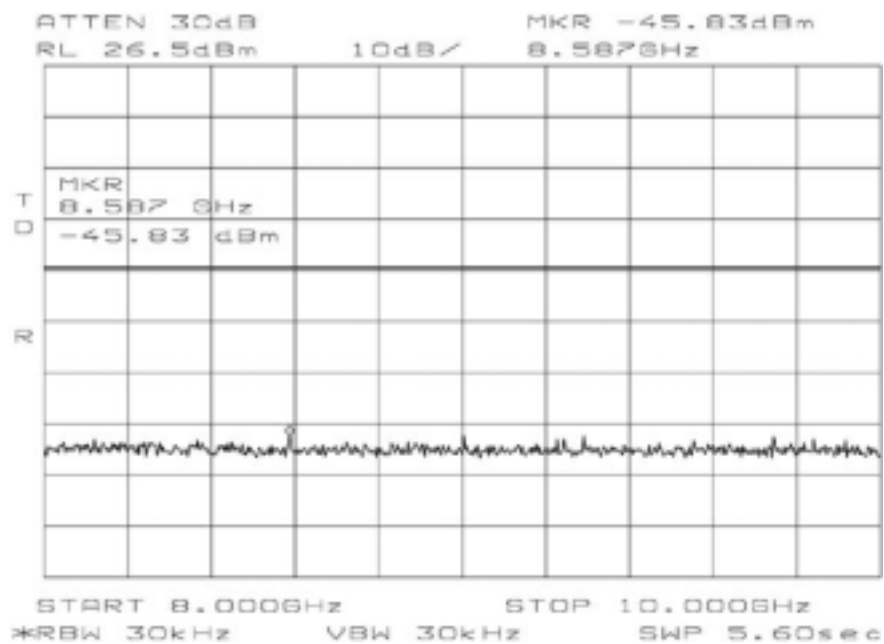
Carrier frequency: 836.49 MHz, Max Power Level

Frequency Range: 6GHz to 8GHz, 30kHz RBW/VBW, Ref to power level



Carrier frequency: 836.49 MHz, Max Power Level

Frequency Range: 8GHz to 10GHz, 30kHz RBW/VBW, Ref to power level



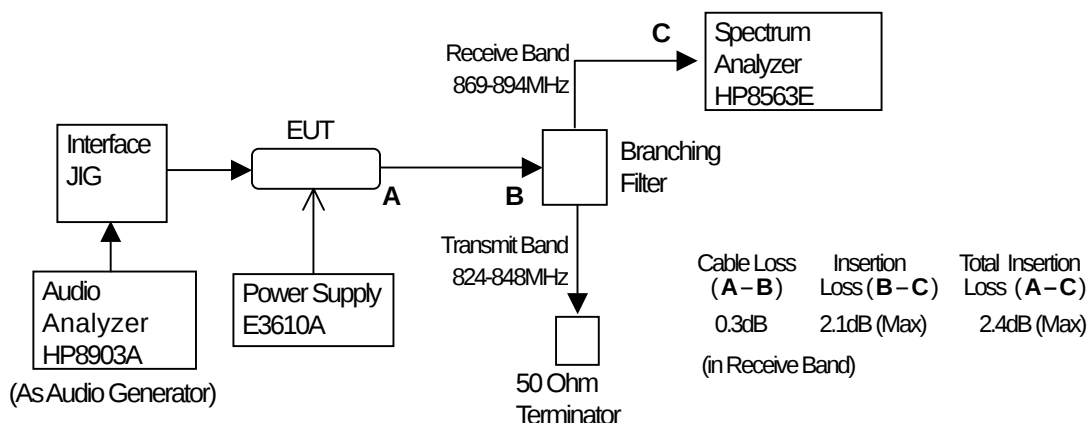
9. EMISSIONS IN RECEIVE BAND

Specification: FCC Part 2.1051, 22.917(f)

9.1. Setup and Procedure

The test set-up is as per the following figure.

The mean power of any emissions appearing in the base station frequency range (869 - 894 MHz) from the EUT were measured by means of a calibrated spectrum analyzer.



9.2. Pass/Fail Criteria

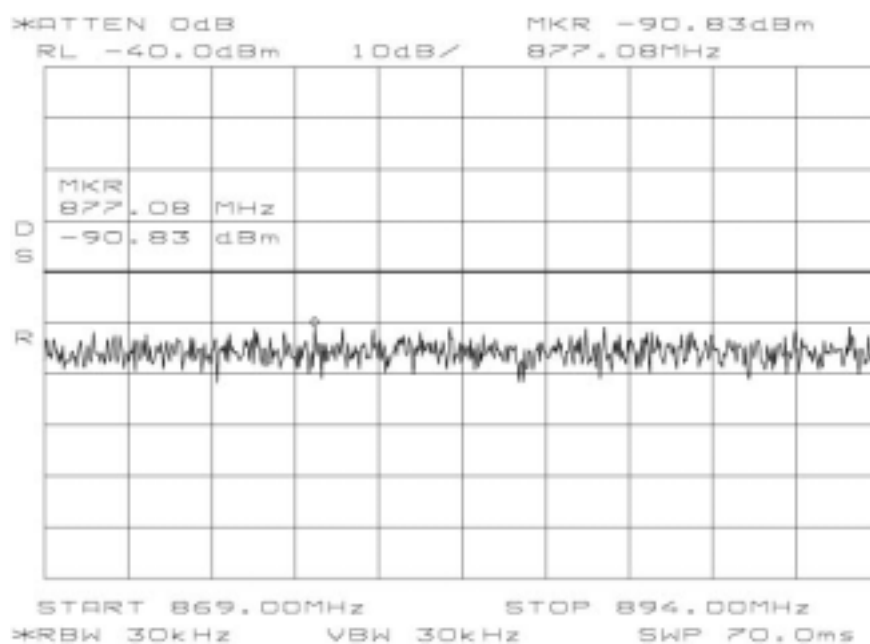
Below -80 dBm.

9.3. Test Results

The level of emissions were below -90 dBm.

Carrier frequency of 824.04, 836.49, 848.97 MHz and Max, Min Power Level were measured, and the results were the same as those shown previously. The result measured by the spectrum analyzer is shown in the following chart.

Carrier frequency; 836.49 MHz
Max Power Level



10. FREQUENCY STABILITY (TEMPERATURE VARIATION)

Specification: FCC Part 2.1055(a)(1)

10.1. Setup and Procedure

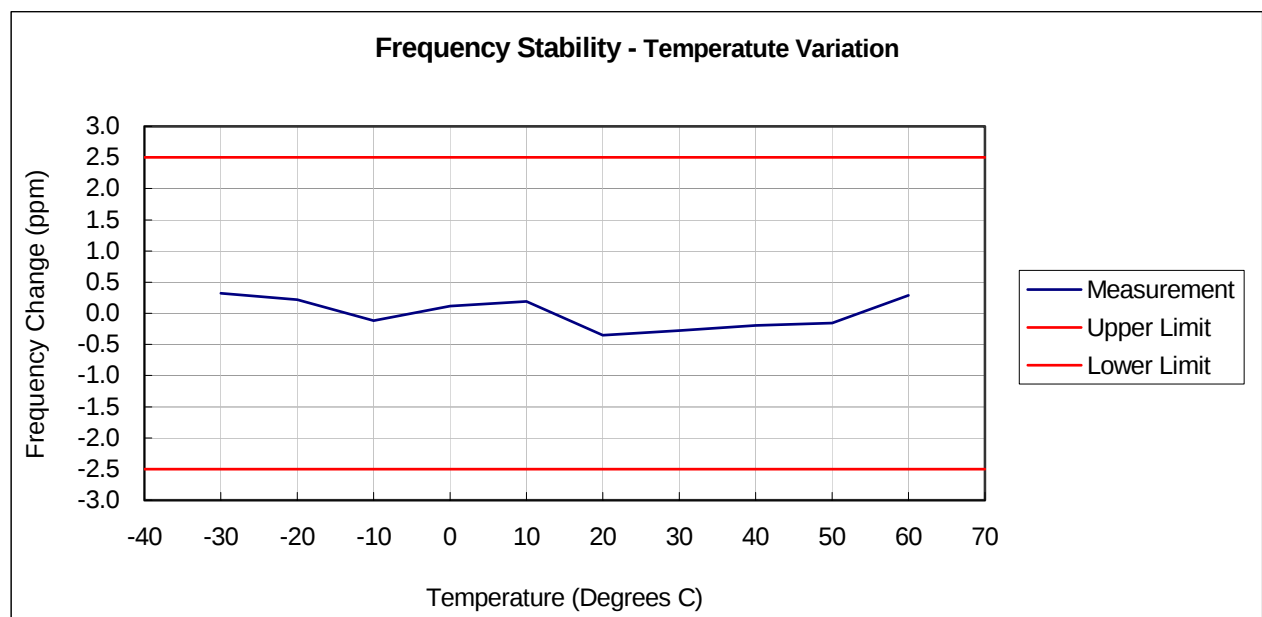
The EUT was placed in a temperature chamber, decreased to -30°C, and permitted to stabilize for one hour. Power was applied and maximum frequency change within one minute was measured.

With the power OFF, temperature was raised in 10°C steps. The next step was permitted to stabilize for one half hour. Power was applied and frequency was measured.

10.2. Pass/Fail CriteriaLess than ± 2.5 ppm (= ± 2091 Hz).**10.3. Test Results**

Carrier frequency: 836.49 MHz

Temp.(deg. C)	Frequency (MHz)	Change (Hz)	Chang (ppm)
-30	836.490270	270	0.323
-20	836.490181	181	0.216
-10	836.489901	-99	-0.118
0	836.490097	97	0.116
10	836.490161	161	0.192
20	836.489705	-295	-0.353
30	836.489767	-233	-0.279
40	836.489837	-163	-0.195
50	836.489869	-131	-0.157
60	836.490242	242	0.289



11. FREQUENCY STABILITY (VOLTAGE VARIATION)

Specification: FCC Part 2.1055(d)

11.1. Setup and Procedure

With power OFF, the sample was permitted to stabilize at $+25\pm 2^{\circ}\text{C}$. Power was then applied at 64, 75, 85, 90, 95, 100, 105, 110 and 113% of the standard test voltage (STV). The frequency change within one minute was recorded.

Note: Battery Nominal Supply Voltage = 6.0V (= STV)
 Battery Primary Supply Voltage = 6.8V (113% of STV)
 Battery operating End Point = 3.8V (64% of STV)

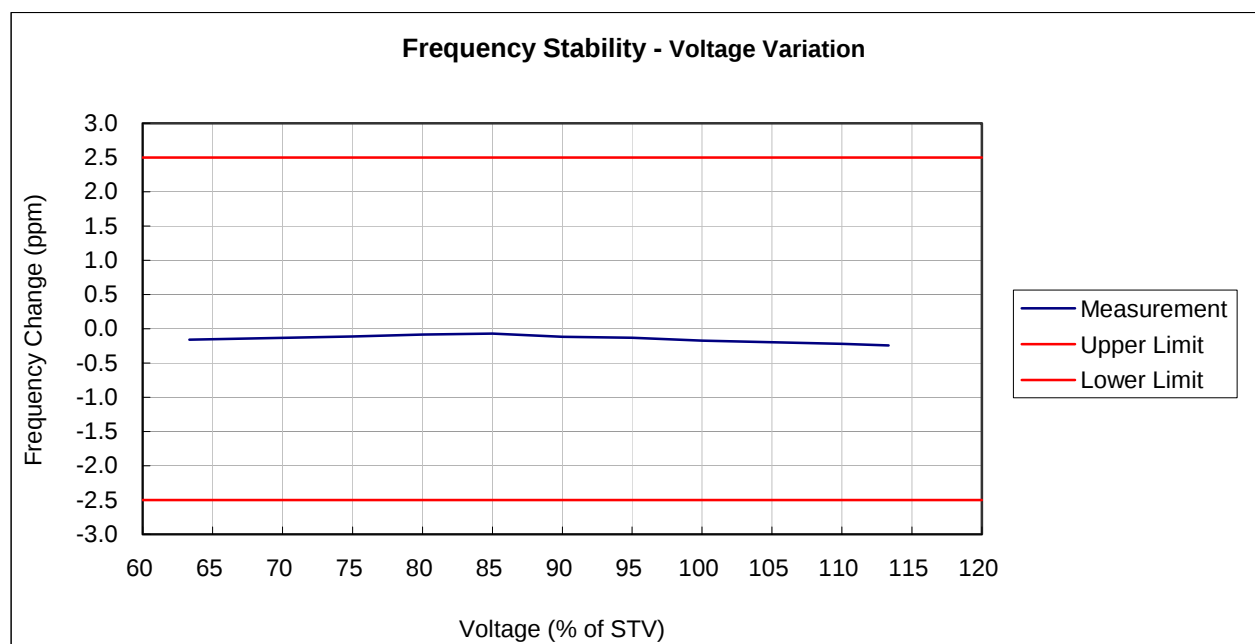
11.2 Pass/Fail Criteria

Less than $\pm 2.5\text{ppm}$ (= $\pm 2091\text{ Hz}$).

11.3. Test Results

Carrier Frequency: 836.49 MHz

% of STV	Voltage (V)	Frequency (MHz)	Change (Hz)	Chang (ppm)
64	3.8	836.489867	-133	-0.159
75	4.5	836.489906	-94	-0.112
80	4.8	836.489931	-69	-0.082
85	5.1	836.489941	-59	-0.071
90	5.4	836.489901	-99	-0.118
95	5.7	836.489892	-108	-0.129
100	6.0	836.489854	-146	-0.175
105	6.3	836.489835	-165	-0.197
110	6.6	836.489818	-182	-0.218
113	6.8	836.489797	-203	-0.243

End of Test Report