



BUREAU VERITAS

Test Report No.: RF131121N042-1

TEST REPORT



| | |
|-----------|--|
| Applicant | SEIKAKU TECHNICAL GROUP LIMITED |
| Address | Offshore Chambers, P.O. Box 217, Apia, Samoa |

| | |
|-------------------------------------|--|
| Manufacturer or Supplier | SEIKAKU TECHNICAL GROUP LIMITED |
| Address | Offshore Chambers, P.O. Box 217, Apia, Samoa |
| Product | wireless microphone |
| Brand Name | SHOW |
| Model | U-899H |
| Additional Model & Model Difference | N/A |
| Date of tests | Nov. 21 ~ Dec. 05, 2013 |

The tests have been carried out according to the requirements of the following standards:

FCC Part 74, Subpart H (Section 74.861e)

CONCLUSION: The submitted sample was found to COMPLY with the test requirement

| | |
|---|--|
| Tested by Venless Long Project Engineer / EMC Department | Approved by Glyn He Supervisor / EMC Department |
|  |  Date: Dec. 05, 2013 |

This report is for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence, provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents. Unless specific mention, the uncertainty of measurement has been explicitly taken into account to declare the compliance or non-compliance to the specification



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RELEASE CONTROL RECORD

| ISSUE NO. | REASON FOR CHANGE | DATE ISSUED |
|----------------|-------------------|---------------|
| RF131121N042-1 | Original release | Dec. 05, 2013 |

1. SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

| APPLIED STANDARD: FCC PART 74, SUBPART H (SECTION 74.861e) | | | |
|--|--|--------|-----------|
| STANDARD SECTION | TEST TYPE AND LIMIT | RESULT | REMARK |
| §74.861(e)(1) | Power Output Measurement | PASS | Compliant |
| §74.861 (e)(6) (III) | Spurious Radiated Emission | PASS | Compliant |
| §74.861 (e)(6) (III) | Conducted Spurious Measurement | PASS | Compliant |
| §74.861(e)(3,5,6) | Occupied Bandwidth | PASS | Compliant |
| §74.861(e)(4) | Frequency Tolerance | PASS | Compliant |
| §2.1047(a)(b) | Modulation Characteristics Measurement | PASS | Compliant |

2. 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 | UNCERTAINTY |
|---------------------|-----------------|-------------|
| Conducted emissions | 9kHz~30MHz | 2.44dB |
| Radiated emissions | 9kHz~30MHz | 2.74dB |
| | 30MHz ~ 200MHz | 3.19dB |
| | 200MHz ~1000MHz | 3.21dB |
| | 1GHz ~ 18GHz | 2.26dB |
| | 18GHz ~ 40GHz | 1.94dB |

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k = 2$.

3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

| | |
|-------------------------------|--|
| PRODUCT | wireless microphone |
| MODEL NO. | U-899H |
| FCC ID | H38U-899H |
| NOMINAL VOLTAGE | DC 3.0V From Battery(Two AA) |
| MODULATION TYPE | FM |
| OPERATING FREQUENCY | 542.125 - 564.400MHz 638.125 - 660.400MHz |
| ANTENNA TYPE | Internal Spring Antenna, 0dBi gain |
| CONDUCTED OUTPUT POWER | 11.68dBm |
| I/O PORTS | Refer to user's manual |
| CABLE SUPPLIED | N/A |

NOTE:

1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.
2. For the test results, the EUT had been tested with all conditions. But only the worst case was showed in test report.

3.2 DESCRIPTION OF TEST MODES

| CHANNEL | FREQUENCY |
|---------|------------|
| Low | 542.125MHz |
| Middle | 552.475MHz |
| High | 564.400MHz |

| CHANNEL | FREQUENCY |
|---------|------------|
| Low | 638.125MHz |
| Middle | 648.475MHz |
| High | 660.400MHz |

For a more detailed channel list, please refer to the manufacturer's specifications or the User's Manual.

3.3 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 Part 74, Subpart H (74.861e)
TIA-603-C-2009

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

3.4 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.

| NO. | PRODUCT | BRAND | MODEL NO. | SERIAL NO. | FCC ID |
|-----|-----------------|--------|-----------|------------|--------|
| 1 | DC Power Supply | LWDQGS | PS-6403D | 010970922 | N/A |
| | | | | | |

| NO. | SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS |
|-----|---|
| 1 | AC Cable---Unshielded----1.5M |
| | |

4. TEST TYPES AND RESULTS

4.1 CONDUCTED POWER OUTPUT MEASUREMENT

4.1.1 LIMITS OF CONDUCTED POWER OUTPUT MEASUREMENT

According to FCC Part 74 Section 74.861(e) (1): The power of the measured unmodulated carrier power at the output of the transmitter power amplifier may not exceed 250mW

4.1.2 TEST INSTRUMENTS

| DESCRIPTION & MANUFACTURER | MODEL NO. | SERIAL NO. | DATE OF CALIBRATION | DUE DATE OF CALIBRATION |
|-----------------------------|-----------|------------|---------------------|-------------------------|
| Digital Multimeter FLUKE | 15B | A1220010DG | Oct. 30,13 | Oct. 29,14 |
| Power Meter Anritsu | ML2495A | 1139001 | Nov. 04,13 | Nov. 03,14 |

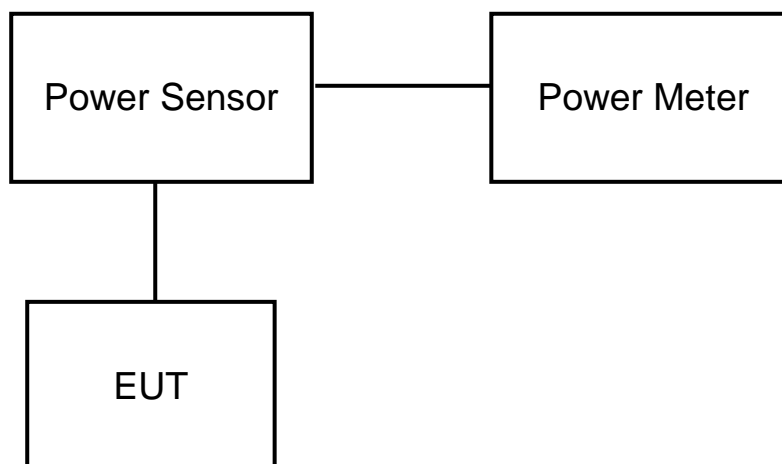
- NOTE:**
1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA and NIM/CHINA.
 2. The test was performed in Oven Room.

4.1.3 TEST PROCEDURES

According to the clause 2.2.1.2 of TIA – 603 – C

- a) Connect the equipment as illustrated.
- b) Measure the transmitter output power during the defined duty cycle (see 1.3.2). Correct for all losses in the RF path (The duty cycle is 100% for this product, Correction Factor is 0).
- c) The value recorded in step b) is the conducted carrier output power rating.

4.1.4 TEST SETUP



4.1.5 EUT OPERATING CONDITIONS

- a. Placed the EUT on the testing table.
- b. Trun on the EUT power by battery,
- c. Enable EUT under transmission condition continuously at specific channel frequency.

4.1.6 TEST RESULTS

| FREQUENCY (MHz) | Output Power dBm | Output Power mW | Limit mW |
|-----------------|------------------|-----------------|----------|
| 542.125 | 11.46 | 14.0 | 250 |
| 552.475 | 10.62 | 11.53 | 250 |
| 564.400 | 9.42 | 8.75 | 250 |
| 638.125 | 11.68 | 14.72 | 250 |
| 648.475 | 10.66 | 11.64 | 250 |
| 660.400 | 9.43 | 8.77 | 250 |

4.2 SPURIOUS RADIATION MEASUREMENT

4.2.1 LIMITS OF SPURIOUS RADIATION MEASUREMENT

According to FCC 74.861(e)(6)(iii), On any frequency removed from the operating frequency by more than 250 percent of the authorized bandwidth: at least $43+10\text{Log}_{10}$ (mean output power in watts) dB..

4.2.2 TEST INSTRUMENTS

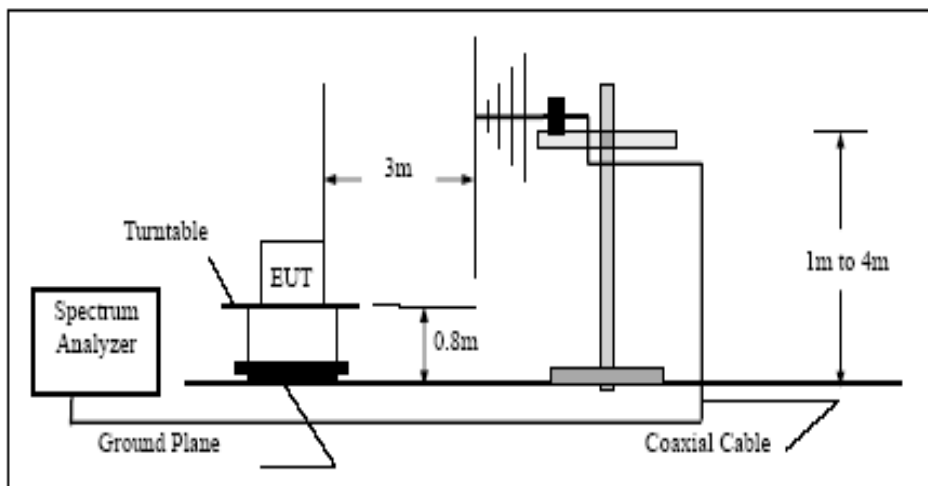
| Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Next Cal. |
|-----------------------------------|----------------|--------------------------|----------------|-------------|-------------|
| Spectrum Analyzer | Agilent | E4446A | MY46180622 | Apr. 24,13 | Apr. 23,14 |
| EMI Test Receiver | Rohde& Schwarz | ESVD | 847398/003 | May 14,13 | May 13,14 |
| Bilog Antenna | Teseq | CBL 6111D | 27089 | Jul. 27, 13 | Jul. 26, 14 |
| Horn Antenna (1GHz -18GHz) | ETS -Lindgren | 3117 | 00062558 | Oct. 18, 13 | Oct. 17, 14 |
| Pre-Amplifier (9kHz~1GHz) | SONOMA | 310D | 186955 | Mar. 06,13 | Mar. 05,14 |
| Pre-Amplifier (100MHz-26.5GHz) | Agilent | 8449B | 3008A00409 | May 14,13 | May 13,14 |
| 10m Semi-anechoic Chamber | CHANGLING | 21.4m*12.1m*8 .8m | NSEMC006 | Mar. 24,13 | Mar. 23,14 |
| Power Meter | Anritsu | ML2495A | 1139001 | Nov. 04,13 | Nov. 03,14 |
| Digital Multimeter | FLUKE | 15B | A1220010D G | Oct. 30, 13 | Oct. 29, 14 |
| Signal Analyzer | Rohde& Schwarz | FSV7 | 102331 | Nov. 26,13 | Nov. 25,14 |
| Test Software | ADT | ADT_Radiated _V7.6.15 | N/A | N/A | N/A |

- NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA and NIM/CHINA.
2. The test was performed in Dongguan Chamber 10m.
3. The horn antenna are used only for the measurement of emission frequency above 1GHz if tested.

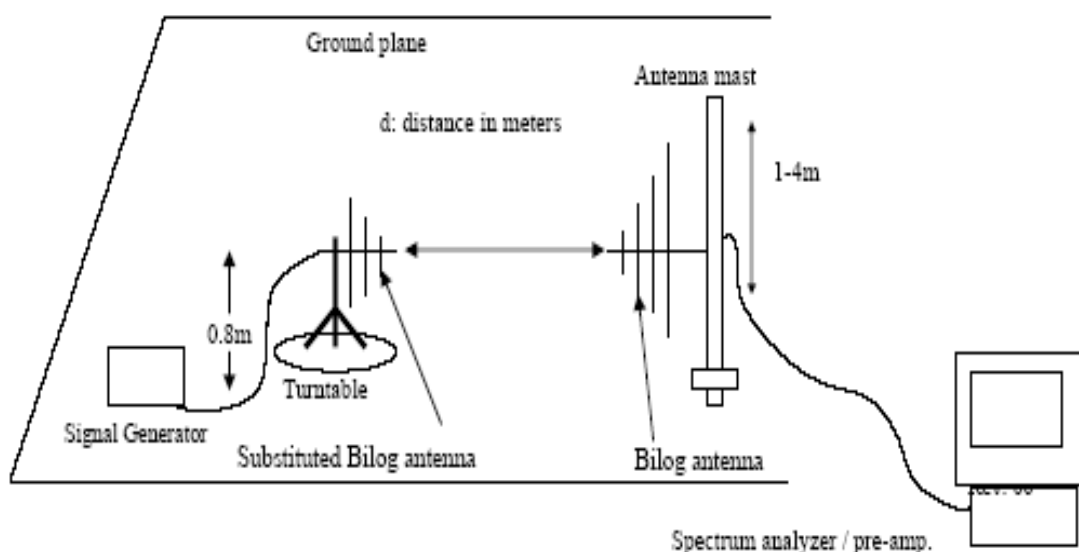
4.2.3 TEST PROCEDURE

1. On a test site, the EUT shall be placed on a turntable, and in the position closest to the normal use as declared by the user.
2. The test antenna shall be oriented initially for vertical polarization located 3m from the EUT to correspond to the transmitter.
3. The output of the antenna shall be connected to the measuring receiver and either a peak or quasi-peak detector was used for the measurement as indicated on the report. The detector selection is based on how close the emission level was approaching the limit.
4. The transmitter shall be switched on; if possible, without the modulation and the measurement receiver shall be tuned to the frequency of the transmitter under test.
5. The test antenna shall be raised and lowered through the specified range of height until the measuring receiver detects a maximum signal level.
6. The transmitter shall than be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
7. The test antenna shall be raised and lowered again through the specified range of height until the measuring receiver detects a maximum signal level.
8. The maximum signal level detected by the measuring receiver shall be noted.
9. Replace the antenna with a proper Antenna (substitution antenna).
10. The substitution antenna shall be oriented for vertical polarization and, if necessary, the length of the substitution antenna shall be adjusted to correspond to the frequency of transmitting.
11. The substitution antenna shall be connected to a calibrated signal generator.
12. If necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
13. The test antenna shall be raised and lowered through the specified range of the height to ensure that the maximum signal is received.
14. The input signal to substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, that is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuation setting of the measuring receiver.
15. The input level to the substitution antenna shall be recorded as power level in dBm, corrected for any change of input attenuator setting of the measuring receiver.
16. The measurement shall be repeated with the test antenna and the substitution antenna oriented for horizontal polarization.
17. The measure of the effective radiated power is the larger of the two levels recorded, at the input to the substitution antenna, corrected for the gain of the substitution antenna if necessary.

4.2.4 TEST SETUP



SUBSTITUTION METHOD:



Adjust the spectrum analyzer for the following settings:

- 1) Resolution Bandwidth = 100 kHz for spurious emissions below 1 GHz, and 1 MHz for spurious emissions above 1GHz.
- 2) Video Bandwidth = 300 kHz for spurious emissions below 1 GHz, and 3 MHz for spurious emissions above 1 GHz.
- 3) Sweep Speed slow enough to maintain measurement calibration.
- 4) Detector Mode = Positive Peak.

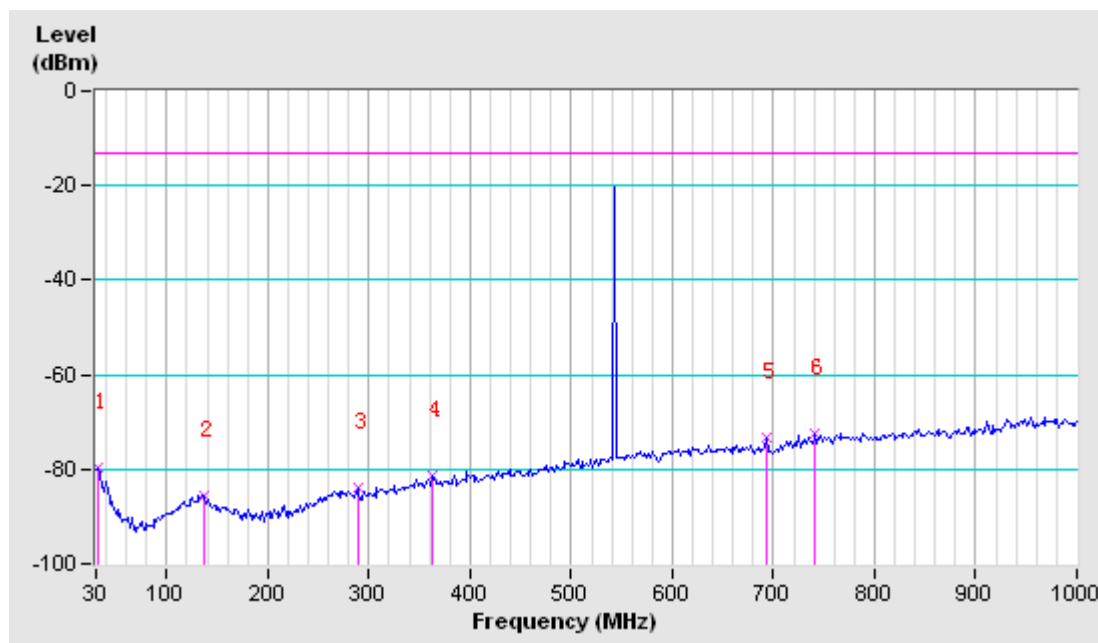
4.2.5 TEST RESULTS

BELOW 1GHz WORST-CASE DATA : 542.125MHz

| | | | |
|--|--------------|--------------------------|------|
| SPURIOUS EMISSION FREQUENCY RANGE | 30MHz ~ 1GHz | OPERATING CHANNEL | CH 0 |
|--|--------------|--------------------------|------|

| SPURIOUS EMISSION LEVEL | | | | |
|-------------------------|----------------------|-------------|-------------|-------------|
| Frequency (MHz) | Antenna Polarization | Level (dBm) | Limit (dBm) | Margin (dB) |
| 31.62 | H | -79.48 | -13 | -66.48 |
| 136.7 | H | -85.7 | -13 | -72.7 |
| 288.67 | H | -83.94 | -13 | -70.94 |
| 363.03 | H | -81.17 | -13 | -68.17 |
| 692.83 | H | -73.23 | -13 | -60.23 |
| 741.33 | H | -72.44 | -13 | -59.44 |

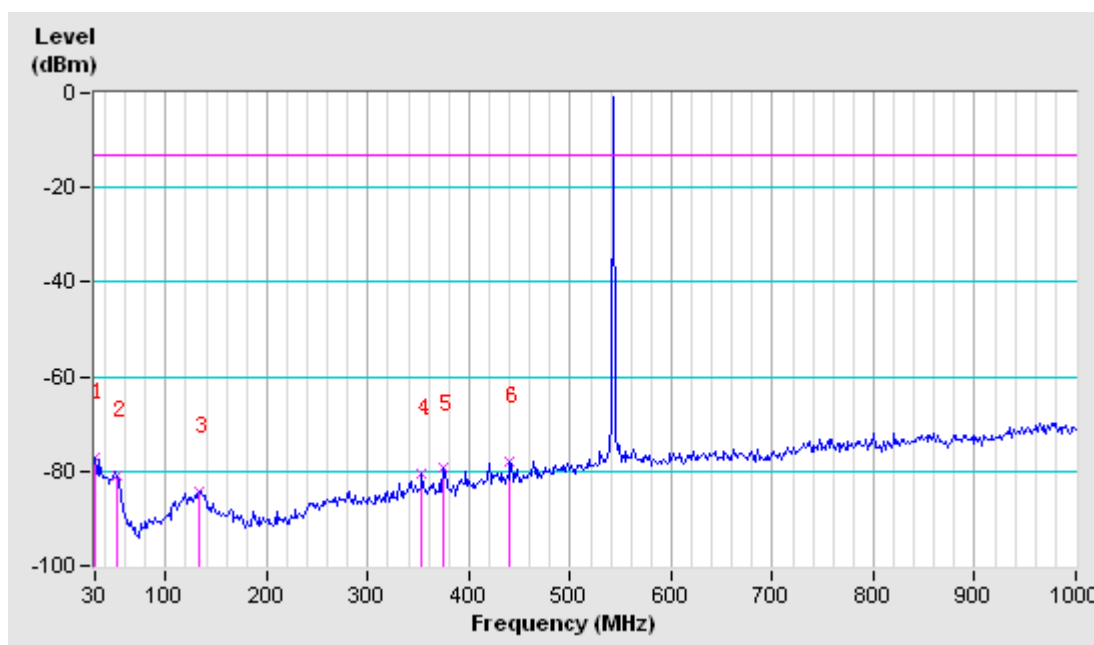
NOTE: The emission behavior belongs to narrowband spurious emission.



| | | | |
|--|--------------|------------------------------|------|
| SPURIOUS EMISSION FREQUENCY RANGE | 30MHz ~ 1GHz | OPERATING CHANNEL | CH 0 |
|--|--------------|------------------------------|------|

| SPURIOUS EMISSION LEVEL | | | | |
|-------------------------|-------------------------|----------------|----------------|----------------|
| Frequency (MHz) | Antenna Polarization | Level (dBm) | Limit (dBm) | Margin (dB) |
| 30 | V | -77.11 | -13 | -64.11 |
| 52.63 | V | -80.72 | -13 | -67.72 |
| 133.47 | V | -84.18 | -13 | -71.18 |
| 353.33 | V | -80.58 | -13 | -67.58 |
| 374.35 | V | -79.42 | -13 | -66.42 |
| 440.63 | V | -77.8 | -13 | -64.8 |

NOTE: The emission behavior belongs to narrowband spurious emission.

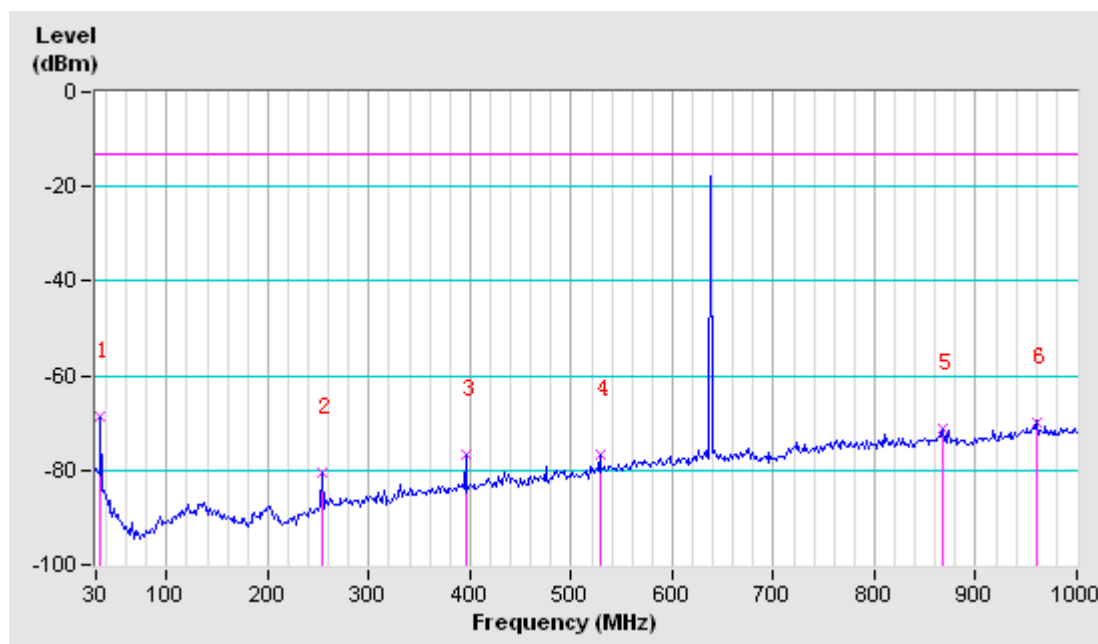


BELOW 1GHz WORST-CASE DATA : 638.125MHz

| | | | |
|--|--------------|--------------------------|------|
| SPURIOUS EMISSION FREQUENCY RANGE | 30MHz ~ 1GHz | OPERATING CHANNEL | CH 0 |
|--|--------------|--------------------------|------|

| SPURIOUS EMISSION LEVEL | | | | |
|-------------------------|----------------------|-------------|-------------|-------------|
| Frequency (MHz) | Antenna Polarization | Level (dBm) | Limit (dBm) | Margin (dB) |
| 34.85 | H | -68.64 | -13 | -55.64 |
| 253.1 | H | -80.36 | -13 | -67.36 |
| 395.37 | H | -76.63 | -13 | -63.63 |
| 527.93 | H | -76.54 | -13 | -63.54 |
| 867.43 | H | -71.28 | -13 | -58.28 |
| 961.2 | H | -69.85 | -13 | -56.85 |

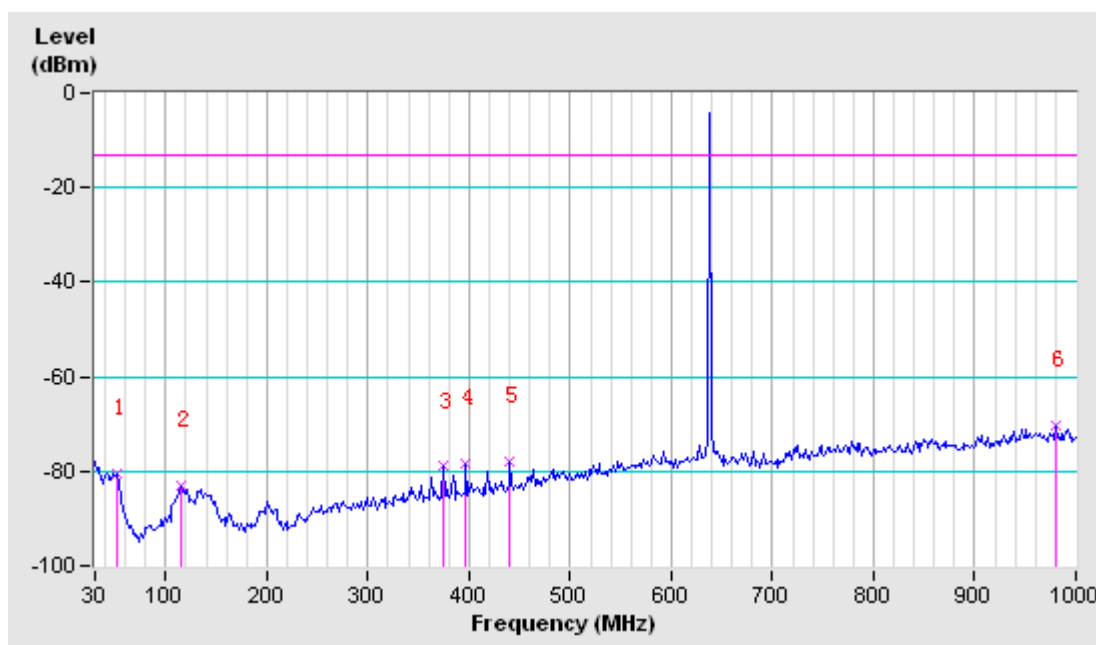
NOTE: The emission behavior belongs to narrowband spurious emission.



| | | | |
|--|--------------|------------------------------|------|
| SPURIOUS EMISSION FREQUENCY RANGE | 30MHz ~ 1GHz | OPERATING CHANNEL | CH 0 |
|--|--------------|------------------------------|------|

| SPURIOUS EMISSION LEVEL | | | | |
|-------------------------|-------------------------|----------------|----------------|----------------|
| Frequency (MHz) | Antenna Polarization | Level (dBm) | Limit (dBm) | Margin (dB) |
| 51.02 | V | -80.56 | -13 | -67.56 |
| 115.68 | V | -83.03 | -13 | -70.03 |
| 374.35 | V | -79.01 | -13 | -66.01 |
| 396.98 | V | -78.42 | -13 | -65.42 |
| 440.63 | V | -77.95 | -13 | -64.95 |
| 980.6 | V | -70.2 | -13 | -57.2 |

NOTE: The emission behavior belongs to narrowband spurious emission.



ABOVE 1GHz WORST-CASE DATA : 542.125MHz - 564.400M

| | | | |
|--|-------------|------------------------------|-----------|
| SPURIOUS EMISSION FREQUENCY RANGE | 1GHz ~ 6GHz | OPERATING CHANNEL | 0, 46, 49 |
|--|-------------|------------------------------|-----------|

| SPURIOUS EMISSION LEVEL | | | | | |
|--------------------------------|----------------------------|---------------------------------|------------------------|------------------------|------------------------|
| Channel | Frequency (MHz) | Antenna Polarization | Level (dBm) | Limit (dBm) | Margin (dB) |
| 0 | 1084.25 | H | -45.25 | -13.00 | -32.25 |
| | 1084.25 | V | -42.58 | -13.00 | -29.58 |
| | 1626.37 | H | -47.63 | -13.00 | -34.63 |
| | 1626.37 | V | -44.36 | -13.00 | -31.36 |
| | 2168.50 | H | -50.85 | -13.00 | -37.85 |
| | 2168.50 | V | -48.74 | -13.00 | -35.74 |
| 46 | 1104.95 | H | -45.36 | -13.00 | -32.36 |
| | 1104.95 | V | -43.57 | -13.00 | -30.57 |
| | 1657.42 | H | -46.55 | -13.00 | -33.55 |
| | 1657.42 | V | -44.16 | -13.00 | -31.16 |
| | 2209.90 | H | -49.82 | -13.00 | -36.82 |
| | 2209.90 | V | -47.19 | -13.00 | -34.19 |
| 49 | 1128.85 | H | -44.25 | -13.00 | -31.25 |
| | 1128.85 | V | -41.58 | -13.00 | -28.58 |
| | 1693.28 | H | -46.87 | -13.00 | -33.87 |
| | 1693.28 | V | -43.70 | -13.00 | -30.70 |
| | 2257.70 | H | -49.70 | -13.00 | -36.70 |
| | 2257.70 | V | -47.51 | -13.00 | -34.51 |

ABOVE 1GHz WORST-CASE DATA : 638.125MHz - 660.400M

| | | | |
|--|-------------|------------------------------|-----------|
| SPURIOUS EMISSION FREQUENCY RANGE | 1GHz ~ 7GHz | OPERATING CHANNEL | 0, 46, 49 |
|--|-------------|------------------------------|-----------|

| SPURIOUS EMISSION LEVEL | | | | | |
|--------------------------------|----------------------------|---------------------------------|------------------------|------------------------|------------------------|
| Channel | Frequency (MHz) | Antenna Polarization | Level (dBm) | Limit (dBm) | Margin (dB) |
| 0 | 1276.25 | H | -44.52 | -13.00 | -31.52 |
| | 1276.25 | V | -41.74 | -13.00 | -28.74 |
| | 1914.37 | H | -45.87 | -13.00 | -32.87 |
| | 1914.37 | V | -43.89 | -13.00 | -30.89 |
| | 2552.50 | H | -48.59 | -13.00 | -35.59 |
| | 2552.50 | V | -46.85 | -13.00 | -33.85 |
| 46 | 1296.95 | H | -47.51 | -13.00 | -34.51 |
| | 1296.95 | V | -42.51 | -13.00 | -29.51 |
| | 1945.42 | H | -48.62 | -13.00 | -35.62 |
| | 1945.42 | V | -44.35 | -13.00 | -31.35 |
| | 2593.90 | H | -50.12 | -13.00 | -37.12 |
| | 2593.90 | V | -46.26 | -13.00 | -33.26 |
| 49 | 1320.85 | H | -44.57 | -13.00 | -31.57 |
| | 1320.85 | V | -42.12 | -13.00 | -29.12 |
| | 1981.28 | H | -46.95 | -13.00 | -33.95 |
| | 1981.28 | V | -43.58 | -13.00 | -30.58 |
| | 2641.70 | H | -48.25 | -13.00 | -35.25 |
| | 2641.70 | V | -44.85 | -13.00 | -31.85 |

4.3 CONDUCTED SPURIOUS MEASUREMENT

4.3.1 LIMITS OF CONDUCTED SPURIOUS MEASUREMENT

According to FCC 74.861(e)(6)(iii), On any frequency removed from the operating frequency by more than 250 percent of the authorized bandwidth: at least $43+10\text{Log}_{10}$ (mean output power in watts) dB..

4.3.2 TEST INSTRUMENTS

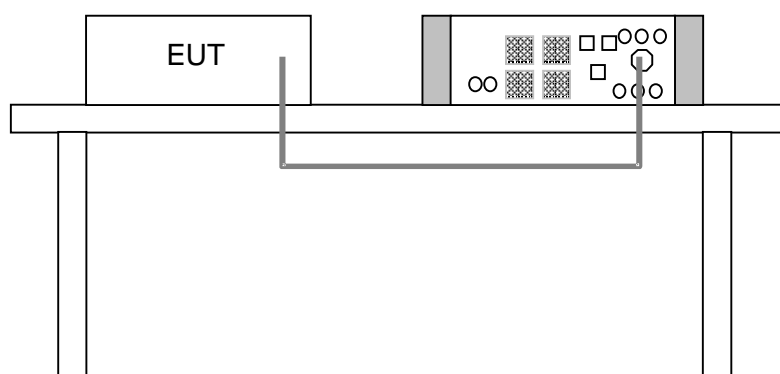
| DESCRIPTION & MANUFACTURER | MODEL NO. | SERIAL NO. | DATE OF CALIBRATION | DUE DATE OF CALIBRATION |
|------------------------------------|-----------|------------|---------------------|-------------------------|
| Signal Analyzer Rohde & Schwarz | FSV7 | 102331 | Nov. 25,13 | Nov. 24,14 |

- NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA and NIM/CHINA.
2. The test was performed in Dongguan Chamber RF.

4.3.3 TEST PROCEDURE

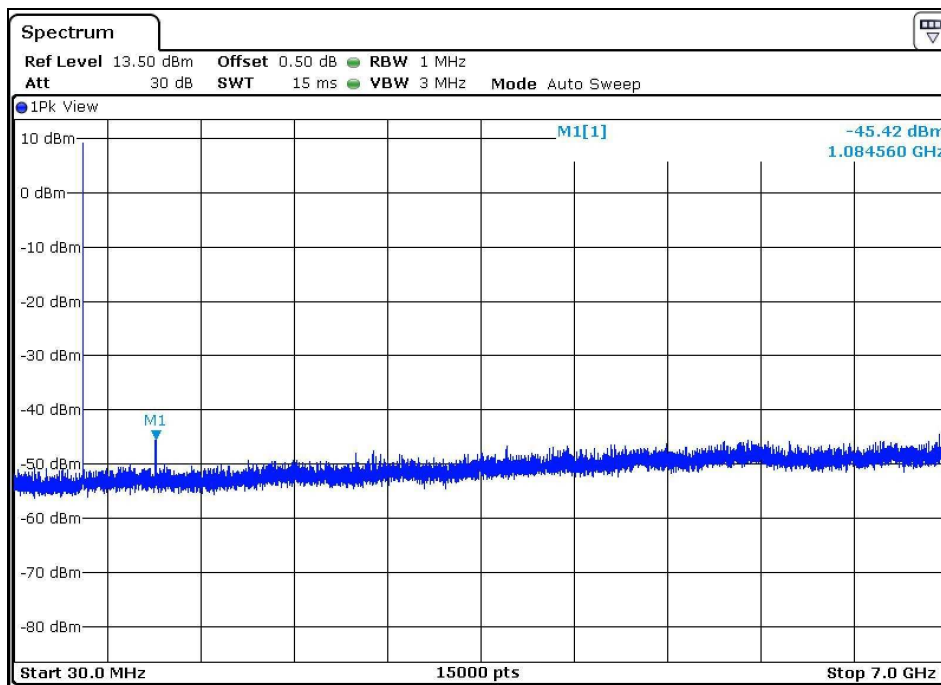
Reference to chapter FCC 2.1051

4.3.4 TEST SETUP

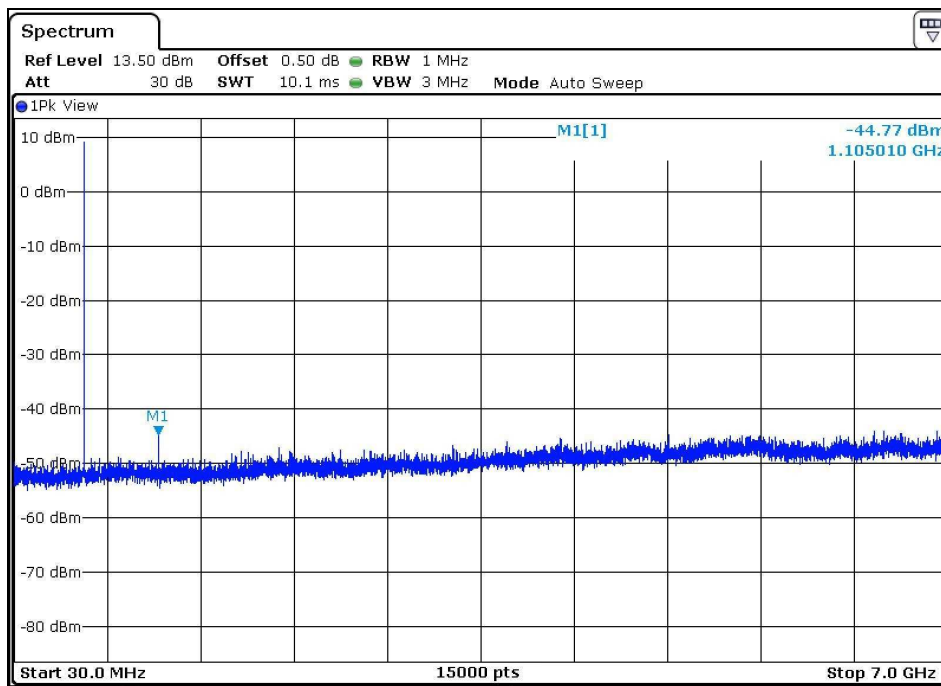


4.3.5 TEST RESULTS

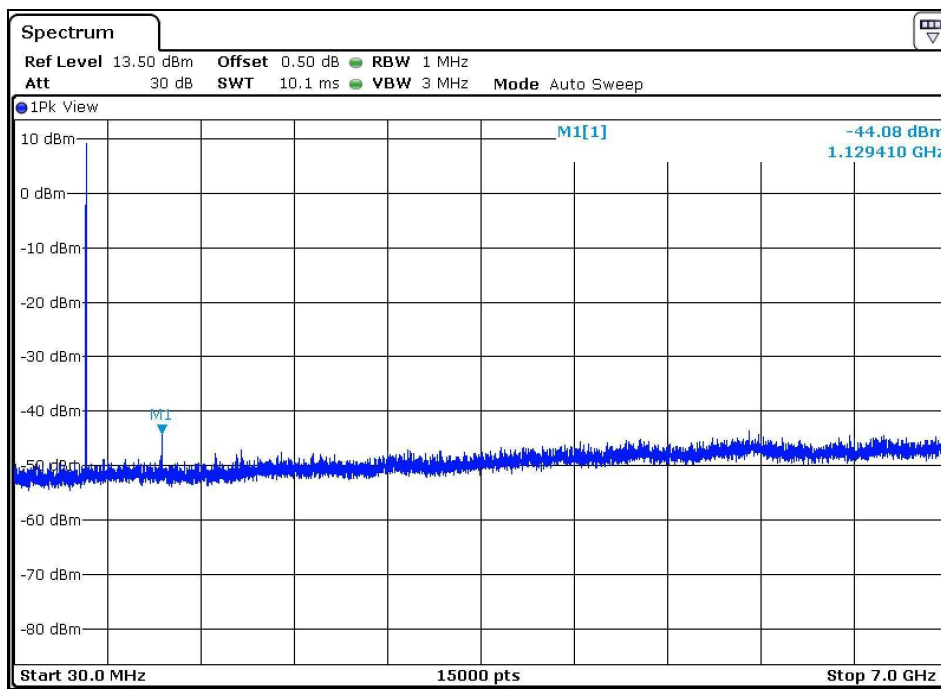
CH 0-542.125MHz



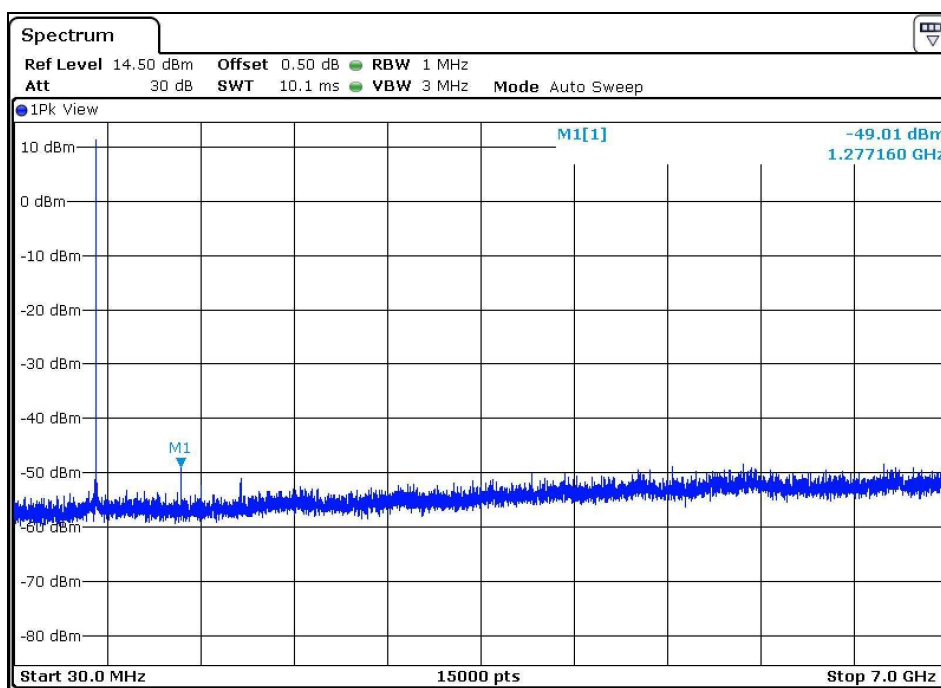
CH 46-552.475MHz



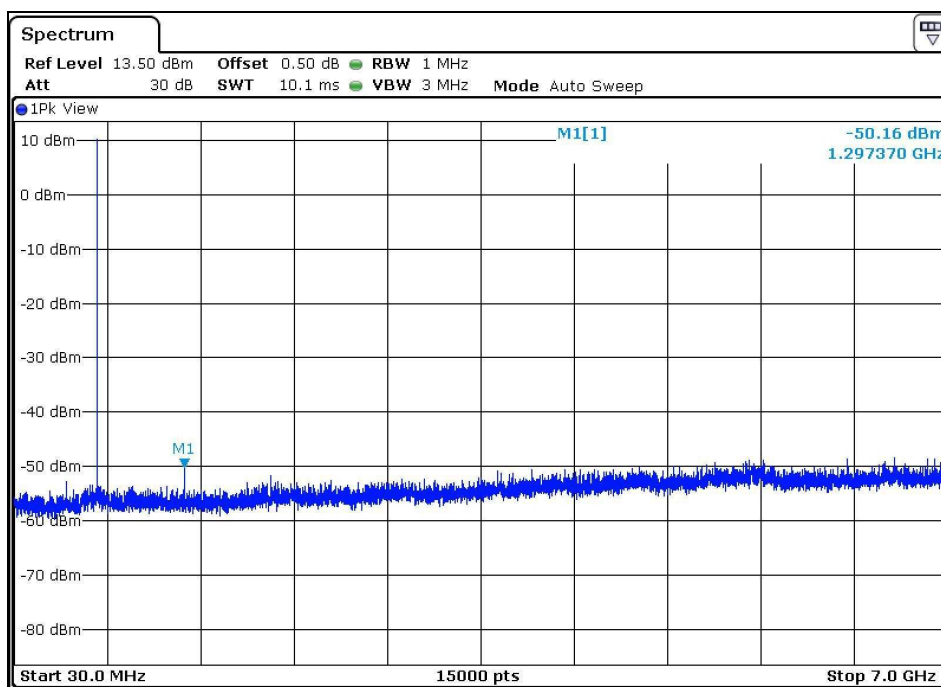
CH 49-564.400MHz



CH 0-638.125MHz



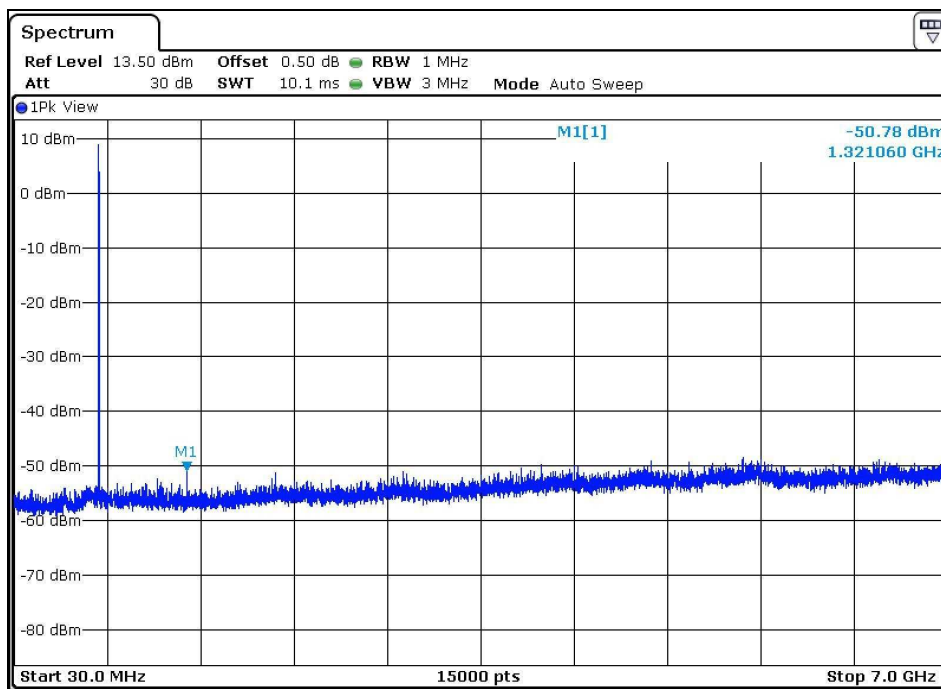
CH 46-648.475MHz





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CH 49-660.400MHz





4.4 OCCUPIED BANDWIDTH

4.4.1 STANDARD APPLICABLE

According to FCC 74.861(e)(3) Any form of modulation may be used. A maximum deviation of ±75 kHz is permitted when frequency modulation is employed.

- (5) The operating bandwidth shall not exceed 200 kHz.
- (6) The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the following schedule:
 - (i) On any frequency removed from the operating frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: at least 25 dB;
 - (ii) On any frequency removed from the operating frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: at least 35 dB;

4.4.2 TEST EQUIPMENT LIST AND DETAILS

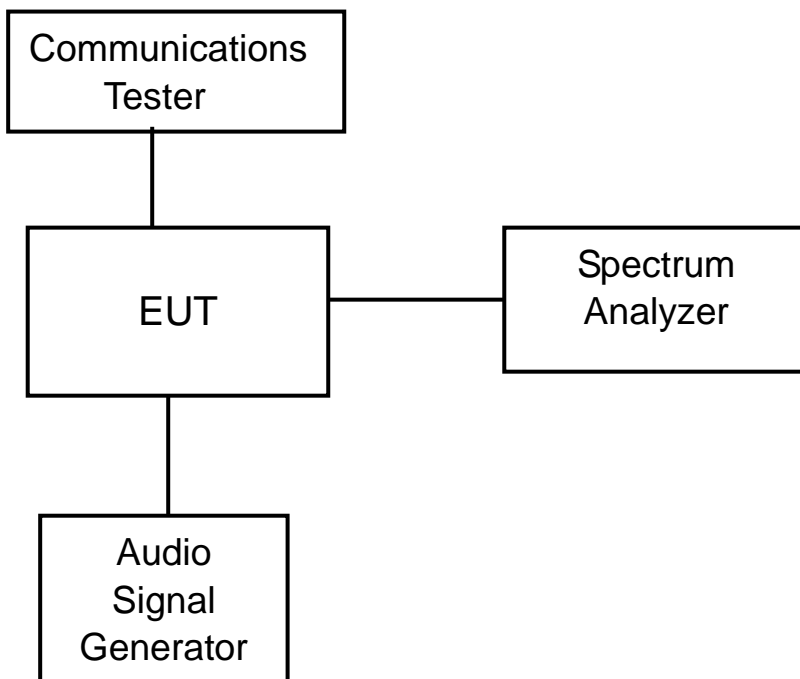
| DESCRIPTION & MANUFACTURER | MODEL NO. | SERIAL NO. | DATE OF CALIBRATION | DUE DATE OF CALIBRATION |
|------------------------------------|-----------|------------------|---------------------|-------------------------|
| Signal Analyzer Rohde & Schwarz | FSV7 | 102331 | Nov. 25,13 | Nov. 24,14 |
| Audio Test System BOSCH | ATS-1 | 0000300054270000 | Nov. 01, 13 | Oct. 30, 14 |
| Communications Tester JUNG JIN | MM-2500 | N/A | Nov. 01, 13 | Oct. 30, 14 |

Statement of Traceability: All calibrations have been performed per the NVLAP requirements traceable to the NIST.

4.4.3 TEST PROCEDURE

According to FCC 2.1049(c)(1) Other than single sideband or independent sideband transmitters—when modulated by a 2500 Hz tone at an input level 16 dB greater than that necessary to produce 50 percent modulation. The input level shall be established at the frequency of maximum response of the audio modulating circuit.

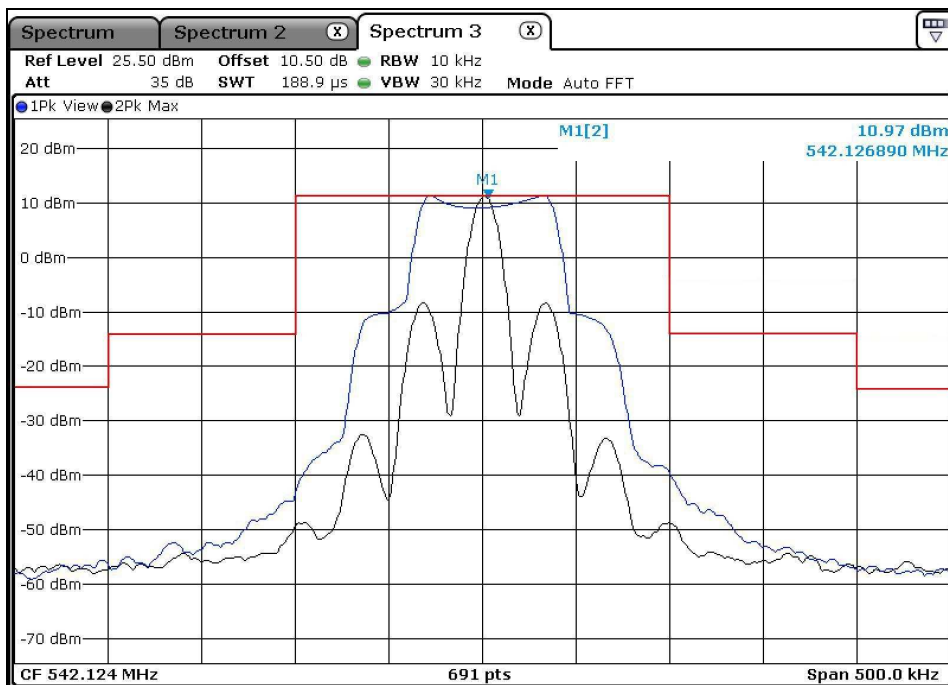
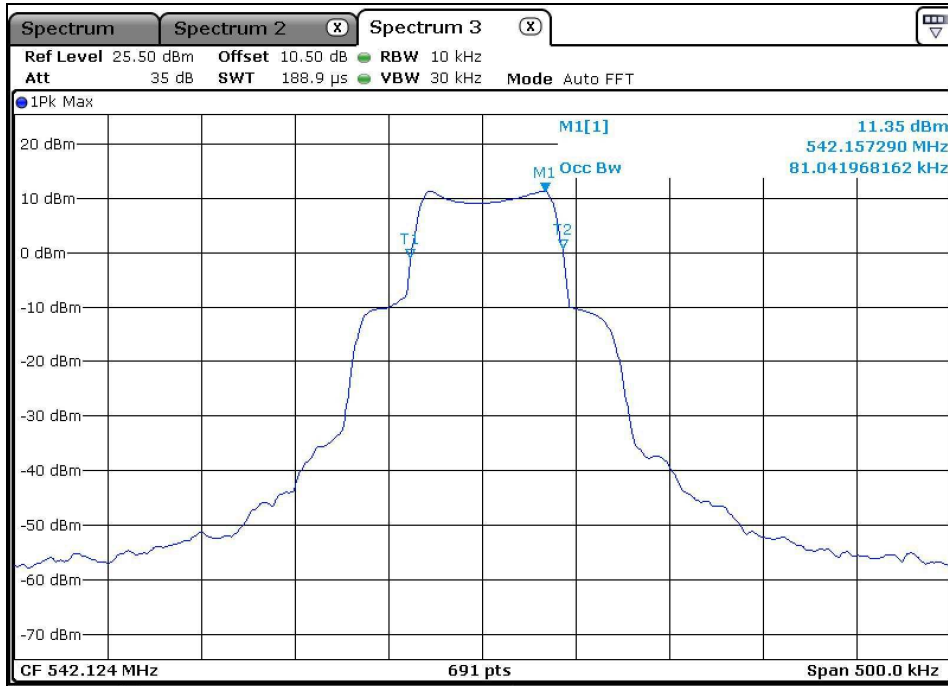
4.4.4 TEST SETUP



4.4.5 TEST RESULTS

The 100% deviation is 70 KHz; 50% deviation is 35KHz

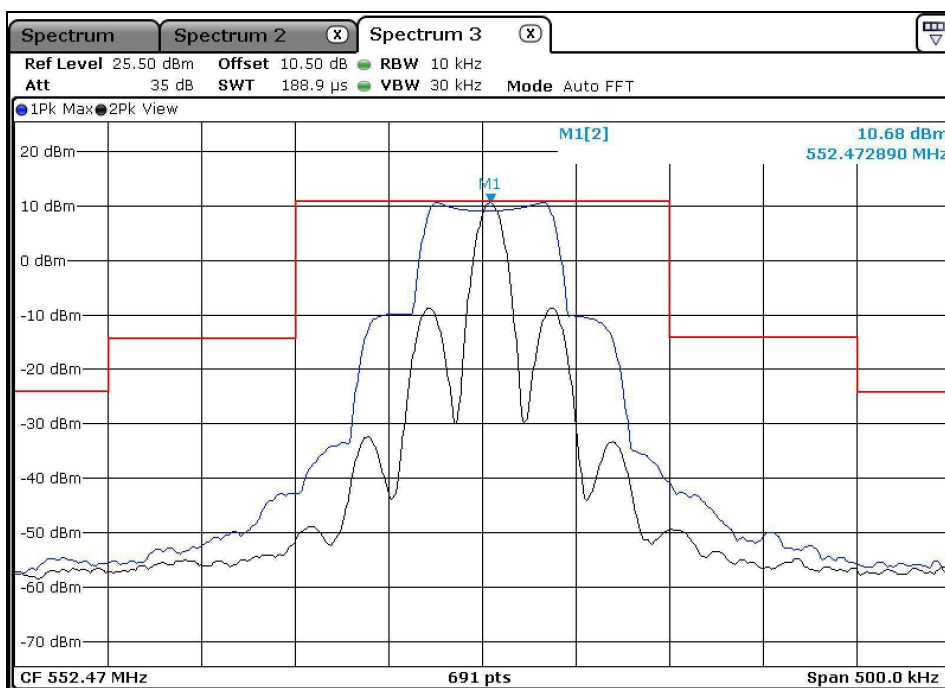
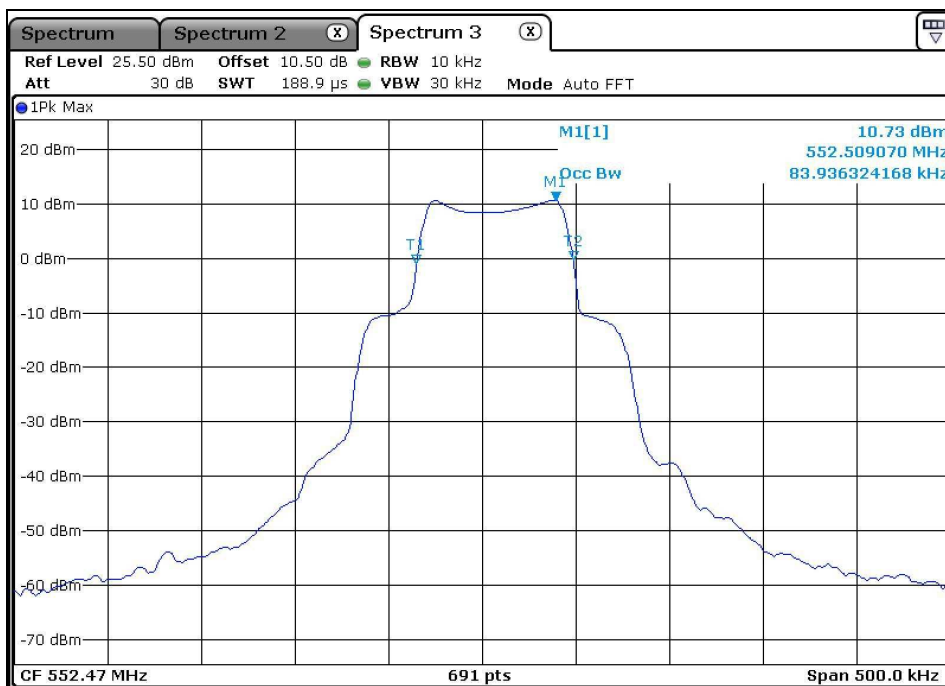
CH 0: 542.125 MHz

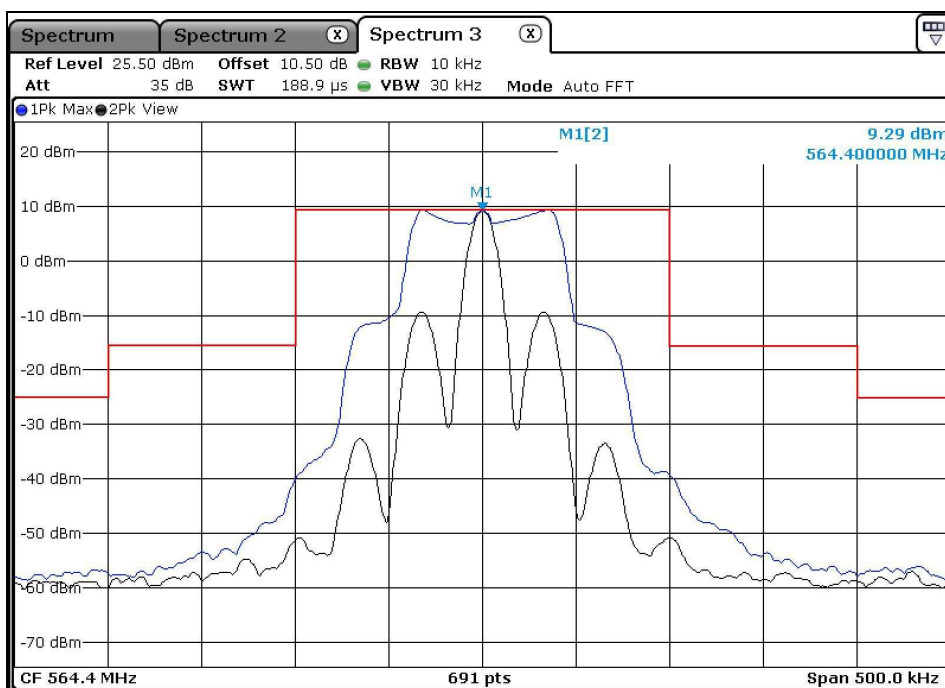
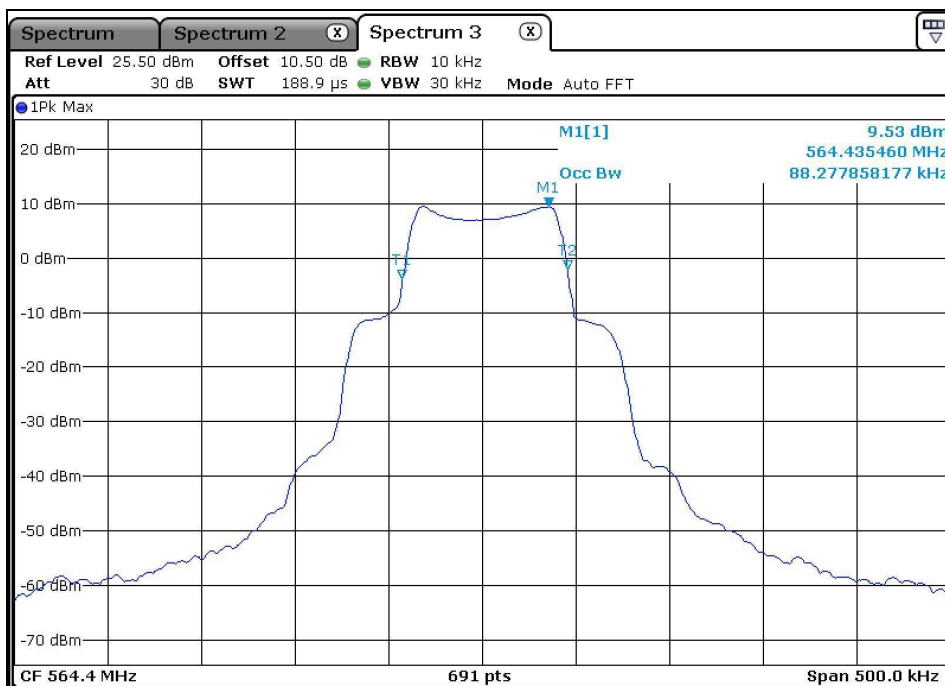




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CH 46: 552.475 MHz

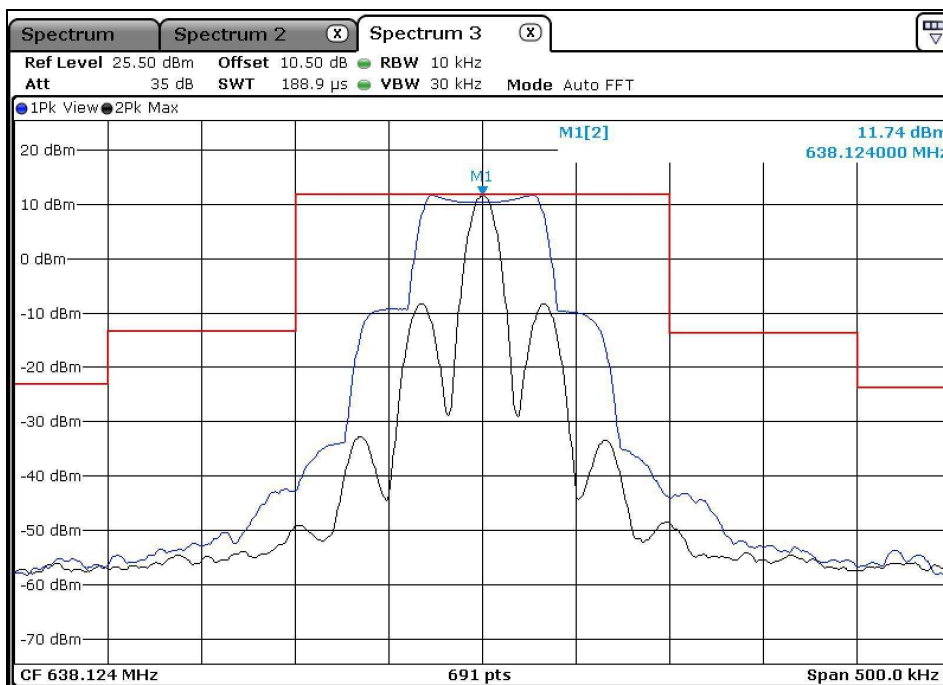
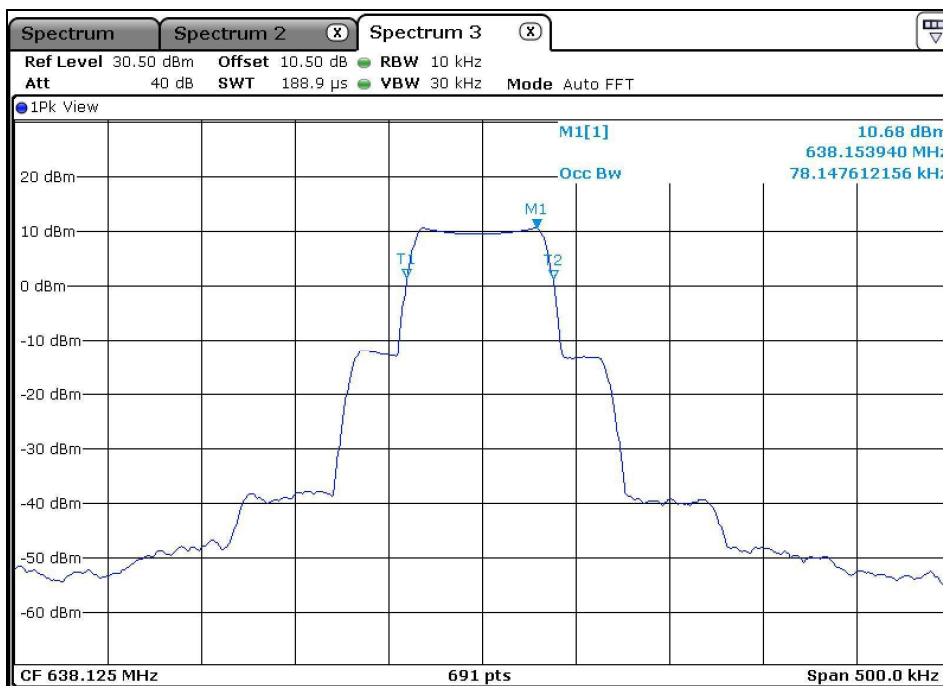




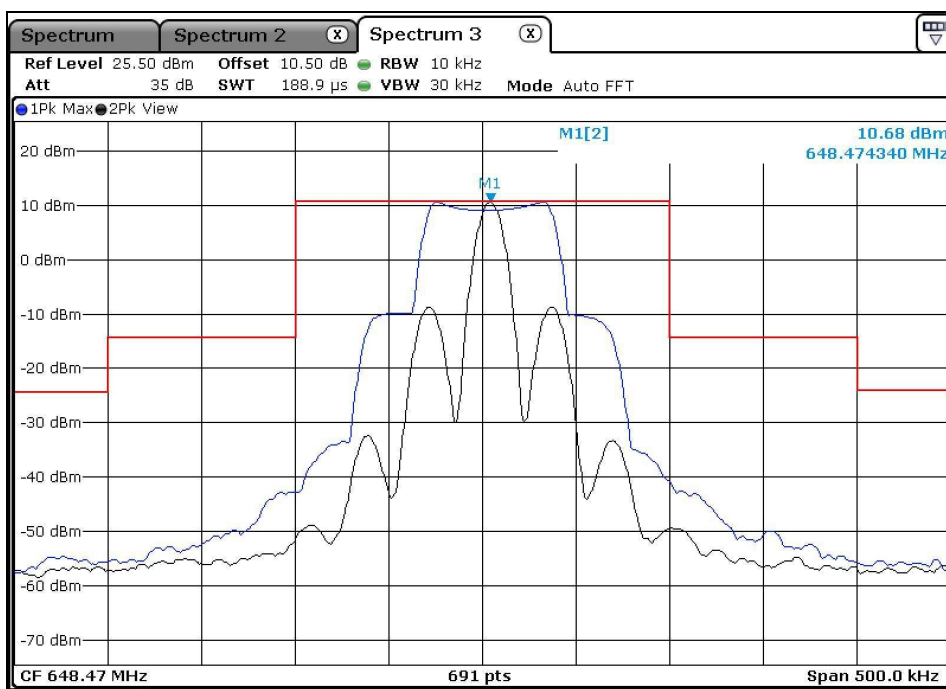
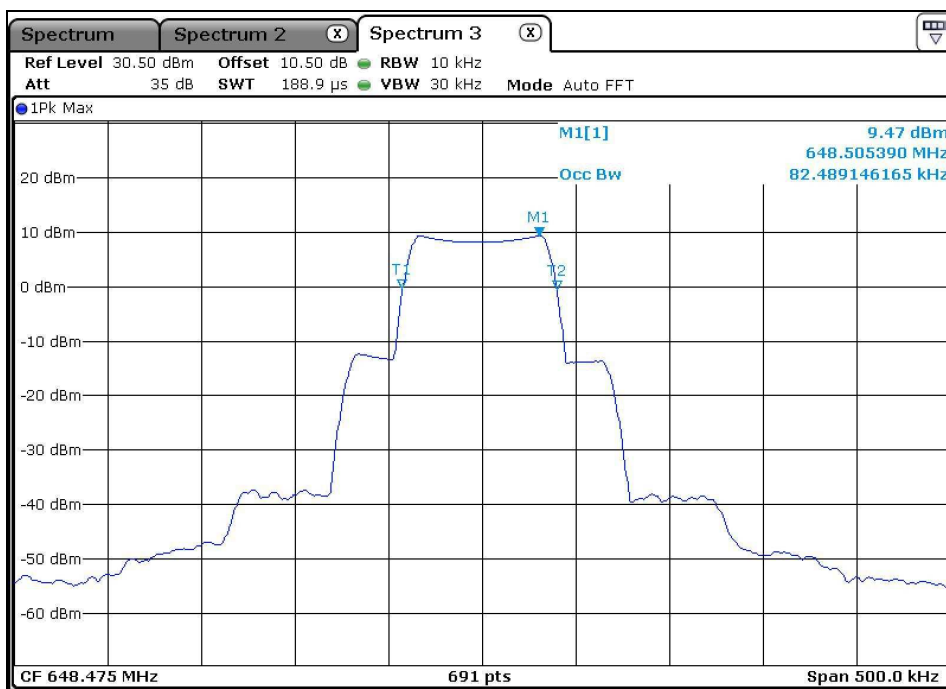


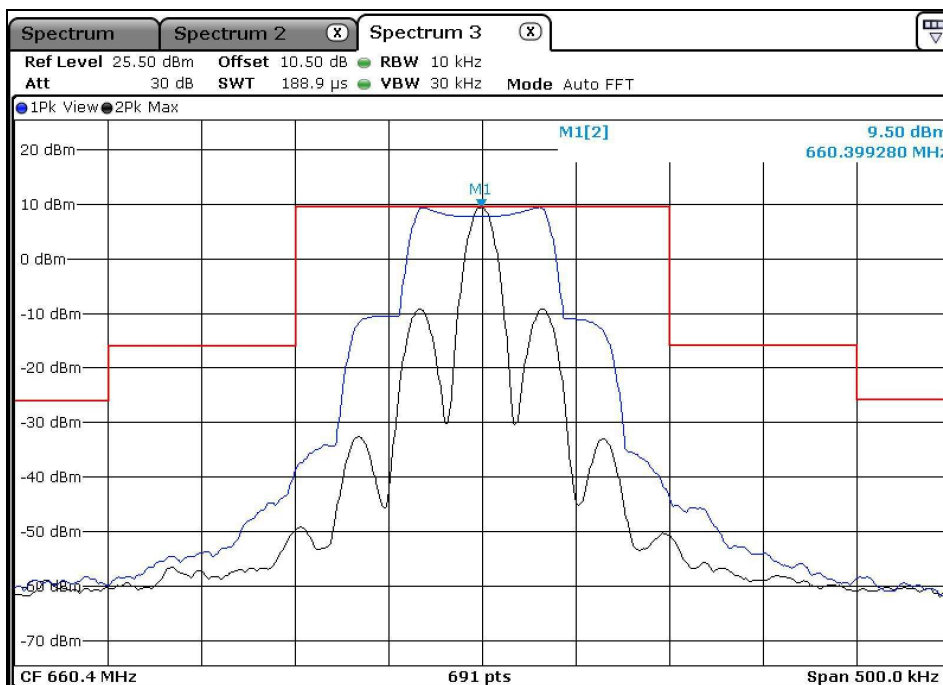
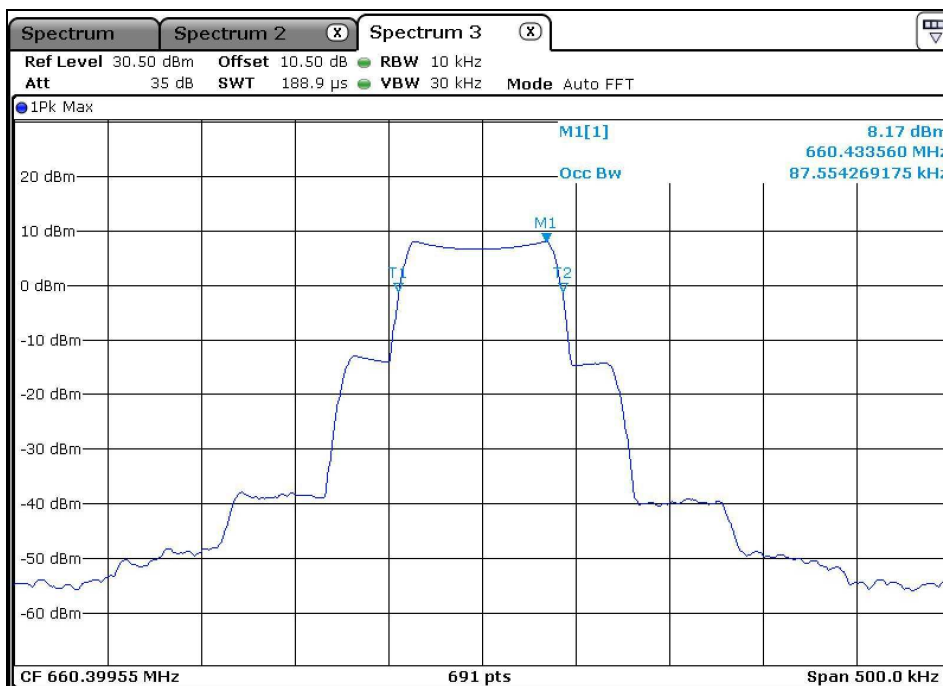
Test Report No.: RF131121N042-1

CH 0: 638.125 MHz



CH 46: 648.475 MHz







Test Report No.: RF131121N042-1

4.5 FREQUENCY TOLERANCE MEASUREMENT

4.5.1 STANDARD APPLICABLE

According to FCC Part 74 Section 74.861(e)(4), the frequency tolerance must be maintained within 0.005%.

4.5.2 TEST EQUIPMENT LIST AND DETAILS

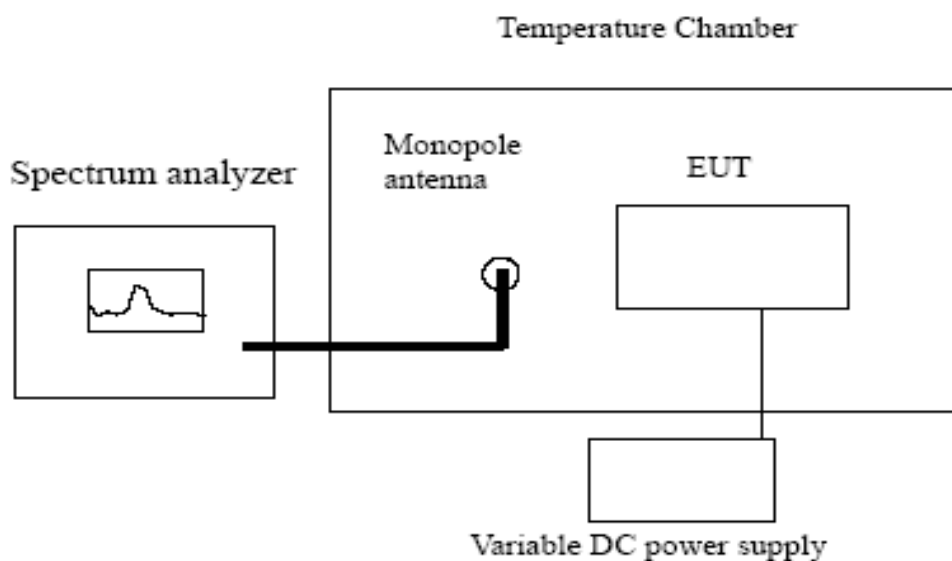
| DESCRIPTION & MANUFACTURER | MODEL NO. | SERIAL NO. | DATE OF CALIBRATION | DUE DATE OF CALIBRATION |
|------------------------------------|-----------|------------|---------------------|-------------------------|
| Signal Analyzer Rohde & Schwarz | FSV7 | 102331 | Nov. 25,13 | Nov. 24,14 |

Statement of Traceability: All calibrations have been performed per the NVLAP requirements traceable to the NIST.

4.5.3 TEST PROCEDURE

1. Turn on EUT and set spectrum analyzer center frequency to the EUT operating frequency. Set spectrum analyzer Resolution Bandwidth to 1 kHz and Video Resolution Bandwidth to 1 kHz and Frequency Span to 50kHz. Record this frequency as reference frequency.
2. Set the temperature of chamber to 50 °C. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize. While maintaining a constant temperature inside the chamber, turn the EUT on and measure the EUT operating frequency.
3. Repeat step 2 with a 10°C decreased per stage until the lowest temperature -30°C is measured, record all measured frequencies on each temperature step.
4. Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

4.5.4 TEST SETUP



4.5.5 TEST RESULTS

Test Data: 542.125MHz-564.400MHz

A, measurement of Frequency Tolerance (temperature)

| Test condition | Power supply | Low Frequency (542.125 MHz) | Middle Frequency (552.475 MHz) | High Frequency (564.400MHz) |
|---------------------------|--------------|-----------------------------|---------------------------------|------------------------------|
| -30 | 3V | 542.1231 | 552.477 | 564.3989 |
| -20 | 3V | 542.1232 | 552.4761 | 564.3989 |
| -10 | 3V | 542.1252 | 552.4759 | 564.4005 |
| 0 | 3V | 542.1251 | 552.4759 | 564.4004 |
| 10 | 3V | 542.1249 | 552.4744 | 564.3992 |
| 20 | 3V | 542.1252 | 552.4749 | 564.3996 |
| 30 | 3V | 542.1254 | 552.4744 | 564.3997 |
| 40 | 3V | 542.1245 | 552.4763 | 564.4013 |
| 50 | 3V | 542.1245 | 552.4764 | 564.4012 |
| Frequency Error | | +1.9 KHz | +2.0 KHz | -1.3 KHz |
| Frequency tolerance | | 0.00035% | 0.00036% | 0.00023% |
| Frequency Tolerance Limit | | 0.005% | | |

B, The measurement of Frequency Tolerance (supply voltage)

| Test condition | Power supply | Low Frequency (542.125 MHz) | Middle Frequency (552.475 MHz) | High Frequency (564.400MHz) |
|---------------------------|--------------|-----------------------------|---------------------------------|------------------------------|
| 20 | 2.55V | 542.1254 | 552.4752 | 564.4002 |
| 20 | 3.45V | 542.1252 | 552.4746 | 564.3998 |
| Frequency Error | | +0.4 KHz | -0.4 KHz | +0.2 KHz |
| Frequency tolerance | | 0.000074% | 0.000072% | 0.000035% |
| Frequency Tolerance Limit | | 0.005% | | |

Test Data: 638.125MHz-660.400MHz

A, measurement of Frequency Tolerance (temperature)

| Test condition | Power supply | Low Frequency (638.125 MHz) | Middle Frequency (648.475 MHz) | High Frequency (660.400MHz) |
|---------------------------|--------------|-----------------------------|---------------------------------|------------------------------|
| -30 | 3V | 638.1233 | 648.4769 | 660.3979 |
| -20 | 3V | 638.1239 | 648.4756 | 660.4017 |
| -10 | 3V | 638.1238 | 648.4758 | 660.4015 |
| 0 | 3V | 638.1261 | 648.4756 | 660.4002 |
| 10 | 3V | 638.1264 | 648.4755 | 660.3993 |
| 20 | 3V | 638.1255 | 648.4752 | 660.3999 |
| 30 | 3V | 638.1258 | 648.4761 | 660.3983 |
| 40 | 3V | 638.1231 | 648.4765 | 660.4022 |
| 50 | 3V | 638.1229 | 648.4777 | 660.4021 |
| Frequency Error | | -2.1 KHz | +2.7 KHz | +2.2 KHz |
| Frequency tolerance | | 0.00033% | 0.00042% | 0.00033% |
| Frequency Tolerance Limit | | 0.005% | | |

B, The measurement of Frequency Tolerance (supply voltage)

| Test condition | Power supply | Low Frequency (638.125 MHz) | Middle Frequency (648.475 MHz) | High Frequency (660.400MHz) |
|---------------------------|--------------|-----------------------------|---------------------------------|------------------------------|
| 20 | 2.55V | 638.1253 | 648.4754 | 660.4006 |
| 20 | 3.45V | 638.1252 | 648.4752 | 660.4005 |
| Frequency Error | | +0.3 KHz | +0.4 KHz | +0.6 KHz |
| Frequency tolerance | | 0.000047% | 0.000062% | 0.00009% |
| Frequency Tolerance Limit | | 0.005% | | |

4.6 MODULATION CHARACTERISTICS MEASUREMENT

4.6.1 STANDARD APPLICABLE

According to FCC Part 2.1047(a) (b)

4.6.2 TEST EQUIPMENT LIST AND DETAILS

| DESCRIPTION & MANUFACTURER | MODEL NO. | SERIAL NO. | DATE OF CALIBRATION | DUE DATE OF CALIBRATION |
|-----------------------------------|-----------|------------------|---------------------|-------------------------|
| Audio Test System BOSCH | ATS-1 | 0000300054270000 | Nov. 01, 13 | Oct. 30, 14 |
| Communications Tester JUNG JIN | MM-2500 | N/A | Nov. 01, 13 | Oct. 30, 14 |

Statement of Traceability: All calibrations have been performed per the NVLAP requirements traceable to the NIST.

4.6.3 TEST PROCEDURE

Audio Frequency Response:

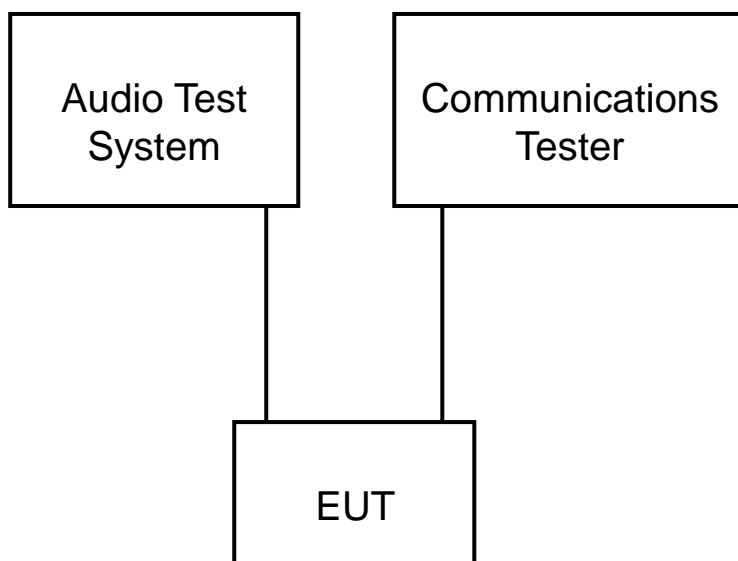
- 1) Apply a 1000 Hz tone and adjust the audio frequency generator to produce 20% of the rated system deviation.
- 2) Set the test receiver to measure rms deviation and record the deviation reading.
- 3) Record the DMM reading as V_{REF} .
- 4) Set the audio frequency generator to the desired test frequency between 100Hz and 5000Hz.
- 5) Vary the audio frequency generator output level until the deviation reading that was recorded in step f) is obtained.
- 6) Record the DMM reading as V_{FREQ} .
- 7) Calculate the audio frequency response at the present frequency as:

$$\text{audio frequency response} = 20 \log (V_{FREQ} / V_{REF})$$
- 8) Repeat steps 4) through 7) for all the desired test frequencies.

Modulation Limiting:

- 1) Apply a 1000 Hz modulating signal to the transmitter from the audio frequency generator, and adjust the level to obtain 60% of full rated system deviation.
- 2) Measure both the instantaneous and steady-state deviation at and after the time of increasing the audio input level.
- 3) With the level from the audio frequency generator held constant at the level obtained in step e), slowly vary the audio frequency from 300 Hz to 3000 Hz and observe the steady-state deviation. Record the maximum deviation.
- 4) Set the test receiver to measure peak negative deviation and repeat steps 1) through 3).
- 5) The values recorded in steps 3) and 4) are the modulation limiting.

4.6.4 TEST SETUP



4.6.5 TEST RESULTS

Audio Frequency Response

542.125 MHz

| Modulation Frequency(Hz) | Input Level(mV) | Audio Frequency Response(dB) |
|--------------------------|-----------------|------------------------------|
| 100 | 25.23 | 1.241 |
| 300 | 24.58 | 1.015 |
| 500 | 22.96 | 0.422 |
| 700 | 22.14 | 0.107 |
| 1000 | 21.87 | 0 |
| 1500 | 20.43 | -0.592 |
| 2000 | 18.25 | -1.572 |
| 2500 | 16.72 | -2.332 |
| 3500 | 14.22 | -3.739 |
| 5000 | 11.07 | -5.914 |

552.475 MHz

| Modulation Frequency(Hz) | Input Level(mV) | Audio Frequency Response(dB) |
|--------------------------|-----------------|------------------------------|
| 100 | 26.33 | 1.513 |
| 300 | 25.17 | 1.122 |
| 500 | 24.36 | 0.838 |
| 700 | 22.45 | 0.129 |
| 1000 | 22.12 | 0 |
| 1500 | 20.18 | -0.797 |
| 2000 | 18.44 | -1.580 |
| 2500 | 15.39 | -3.151 |
| 3500 | 13.89 | -4.042 |
| 5000 | 10.25 | -6.681 |

564.400 MHz

| Modulation Frequency(Hz) | Input Level(mV) | Audio Frequency Response(dB) |
|--------------------------|-----------------|------------------------------|
| 100 | 25.57 | 1.486 |
| 300 | 24.48 | 1.107 |
| 500 | 23.19 | 0.637 |
| 700 | 22.35 | 0.317 |
| 1000 | 21.55 | 0 |
| 1500 | 19.32 | -0.949 |
| 2000 | 17.46 | -1.828 |
| 2500 | 15.25 | -3.004 |
| 3500 | 13.20 | -4.257 |
| 5000 | 10.83 | -5.976 |

638.125 MHz

| Modulation Frequency(Hz) | Input Level(mV) | Audio Frequency Response(dB) |
|--------------------------|-----------------|------------------------------|
| 100 | 24.28 | 1.878 |
| 300 | 23.56 | 1.616 |
| 500 | 21.34 | 0.757 |
| 700 | 20.40 | 0.365 |
| 1000 | 19.56 | 0 |
| 1500 | 17.45 | -0.991 |
| 2000 | 15.16 | -2.213 |
| 2500 | 13.23 | -3.396 |
| 3500 | 11.22 | -4.828 |
| 5000 | 9.87 | -5.941 |

648.475 MHz

| Modulation Frequency(Hz) | Input Level(mV) | Audio Frequency Response(dB) |
|--------------------------|-----------------|------------------------------|
| 100 | 23.77 | 1.787 |
| 300 | 22.35 | 1.252 |
| 500 | 21.30 | 0.834 |
| 700 | 20.83 | 0.640 |
| 1000 | 19.35 | 0 |
| 1500 | 18.04 | -0.609 |
| 2000 | 16.71 | -1.274 |
| 2500 | 14.25 | -2.657 |
| 3500 | 12.98 | -3.468 |
| 5000 | 10.45 | -5.351 |

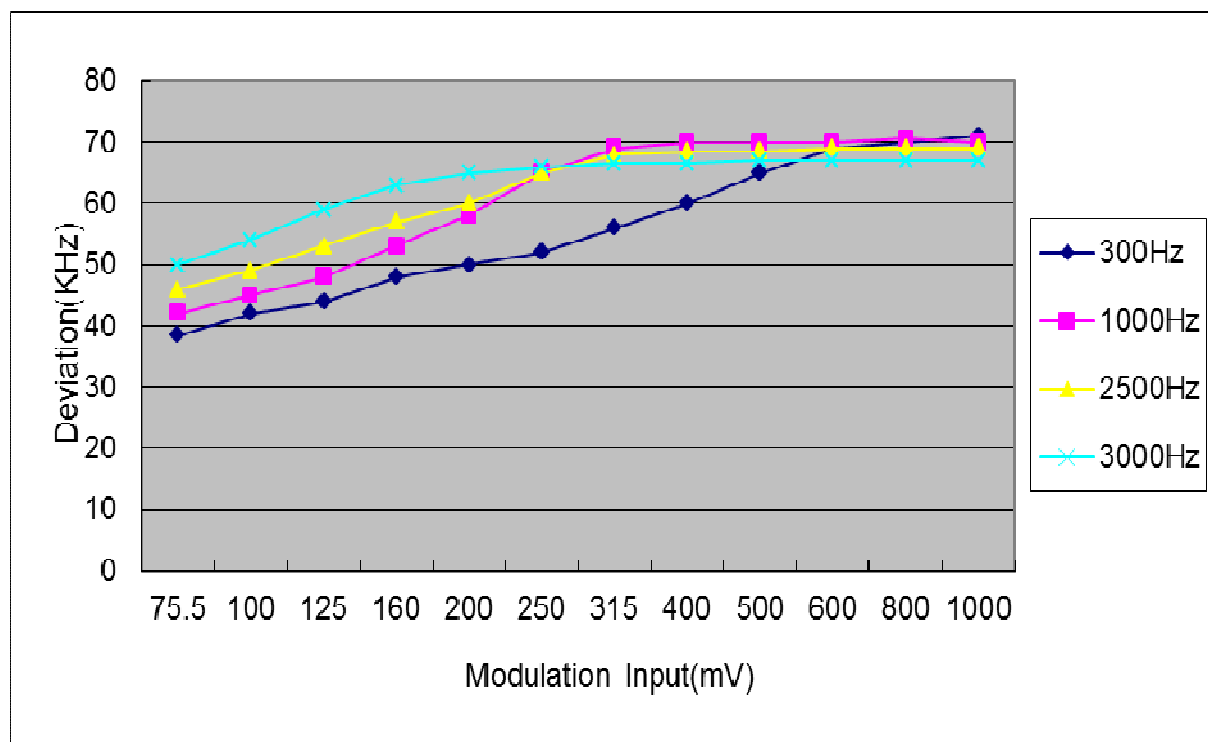
660.400 MHz

| Modulation Frequency(Hz) | Input Level(mV) | Audio Frequency Response(dB) |
|--------------------------|-----------------|------------------------------|
| 100 | 24.15 | 1.289 |
| 300 | 23.57 | 1.078 |
| 500 | 23.31 | 0.981 |
| 700 | 22.47 | 0.662 |
| 1000 | 20.82 | 0 |
| 1500 | 18.18 | -1.178 |
| 2000 | 16.46 | -2.041 |
| 2500 | 14.99 | -2.854 |
| 3500 | 12.33 | -4.550 |
| 5000 | 10.73 | -5.758 |

Modulation Limiting

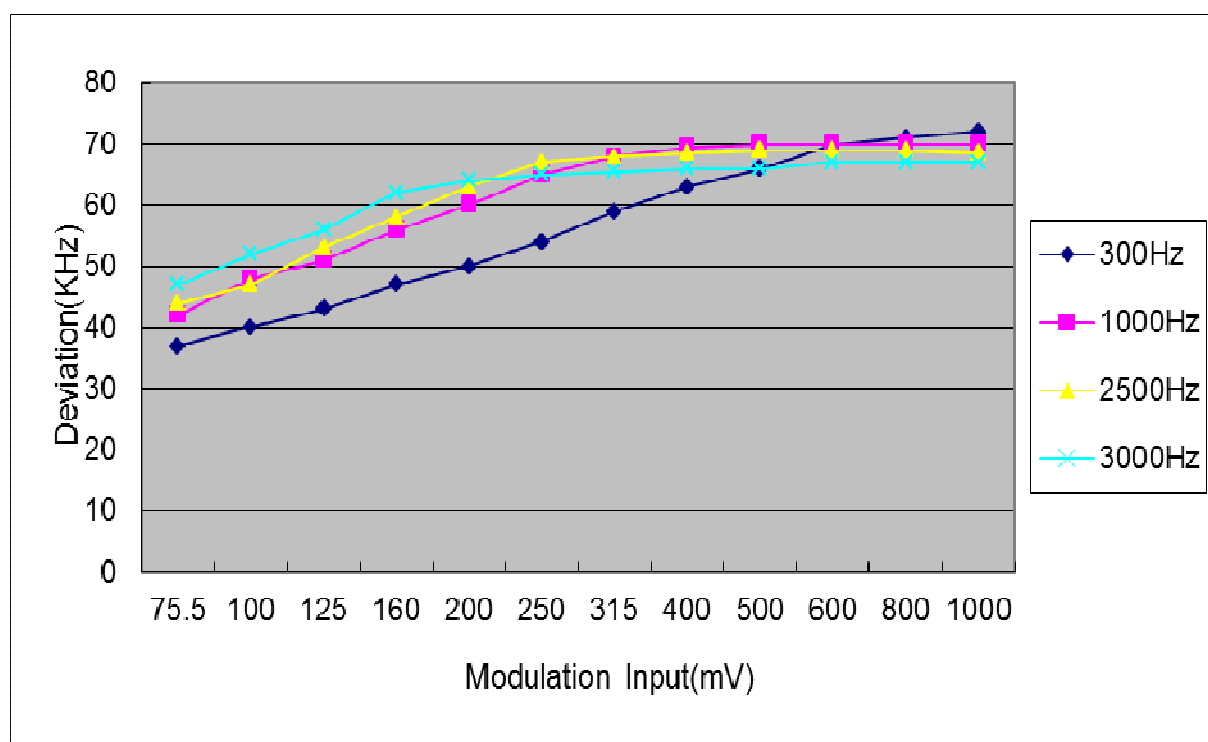
542.125 MHz

| Modulation Input(mV) | Peak Frequency Deviation(KHz) | | | |
|----------------------|-------------------------------|--------|--------|--------|
| | 300Hz | 1000Hz | 2500Hz | 3000Hz |
| 75.5 | 38.5 | 42 | 46 | 50 |
| 100 | 42 | 45 | 49 | 54 |
| 125 | 44 | 48 | 53 | 59 |
| 160 | 48 | 53 | 57 | 63 |
| 200 | 50 | 58 | 60 | 65 |
| 250 | 52 | 65 | 65 | 66 |
| 315 | 56 | 69 | 68 | 66.5 |
| 400 | 60 | 70 | 68.5 | 66.5 |
| 500 | 65 | 70 | 68.5 | 67 |
| 600 | 69 | 70 | 69 | 67 |
| 800 | 70 | 70.5 | 69 | 67 |
| 1000 | 71 | 70 | 69 | 67 |



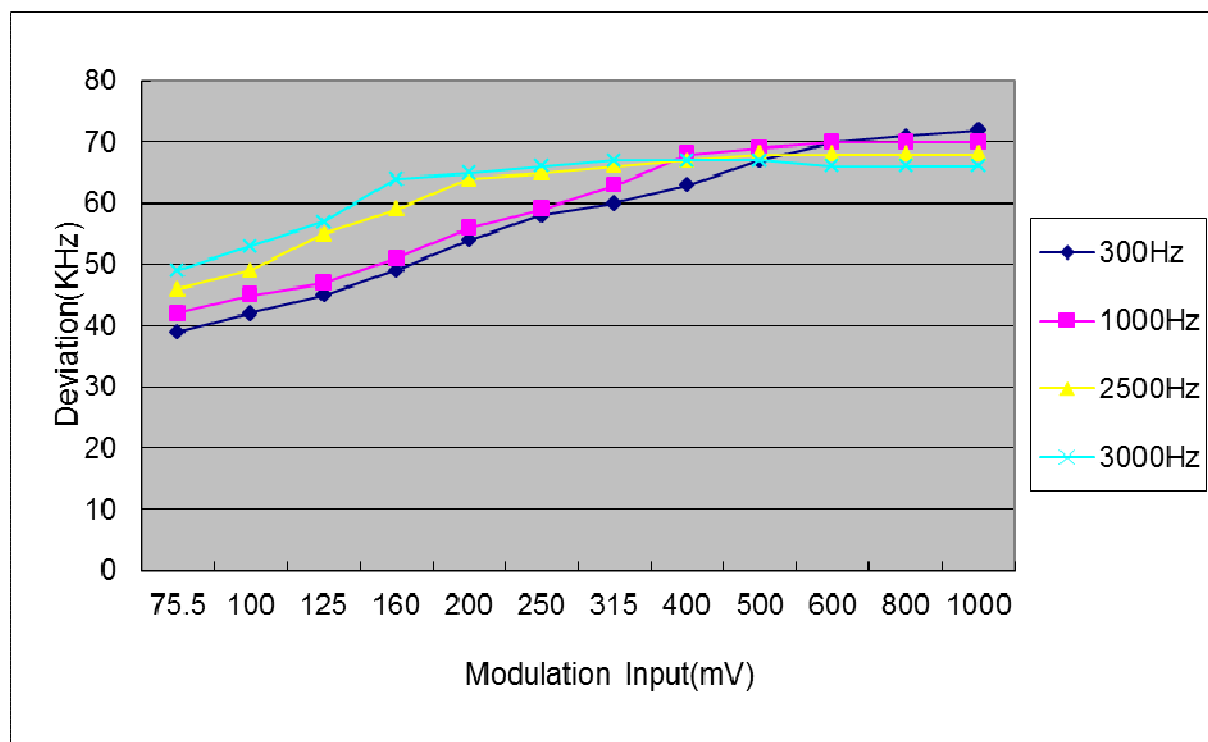
552.475 MHz

| Modulation Input(mV) | Peak Frequency Deviation(KHz) | | | |
|----------------------|-------------------------------|--------|--------|--------|
| | 300Hz | 1000Hz | 2500Hz | 3000Hz |
| 74.7 | 37 | 42 | 44 | 47 |
| 100 | 40 | 48 | 47 | 52 |
| 125 | 43 | 51 | 53 | 56 |
| 160 | 47 | 56 | 58 | 62 |
| 200 | 50 | 60 | 63 | 64 |
| 250 | 54 | 65 | 67 | 65 |
| 315 | 59 | 68 | 68 | 65.5 |
| 400 | 63 | 69.5 | 68.5 | 66 |
| 500 | 66 | 70 | 69 | 66 |
| 600 | 70 | 70 | 69 | 67 |
| 800 | 71 | 70 | 69 | 67 |
| 1000 | 72 | 70 | 68.5 | 67 |



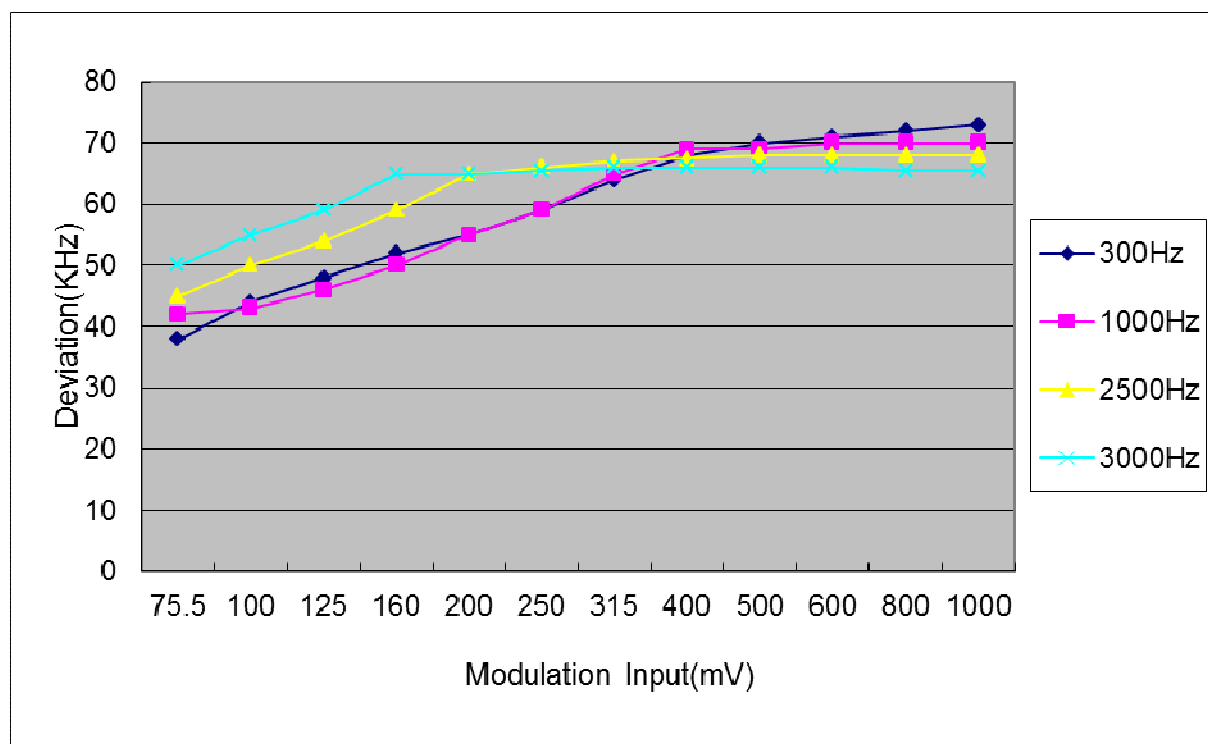
564.400 MHz

| Modulation Input(mV) | Peak Frequency Deviation(KHz) | | | |
|----------------------|-------------------------------|--------|--------|--------|
| | 300Hz | 1000Hz | 2500Hz | 3000Hz |
| 78.3 | 39 | 42 | 46 | 49 |
| 100 | 42 | 45 | 49 | 53 |
| 125 | 45 | 47 | 55 | 57 |
| 160 | 49 | 51 | 59 | 64 |
| 200 | 54 | 56 | 64 | 65 |
| 250 | 58 | 59 | 65 | 66 |
| 315 | 60 | 63 | 66 | 67 |
| 400 | 63 | 68 | 67 | 67 |
| 500 | 67 | 69 | 68 | 67 |
| 600 | 70 | 70 | 68 | 66 |
| 800 | 71 | 70 | 68 | 66 |
| 1000 | 72 | 70 | 68 | 66 |



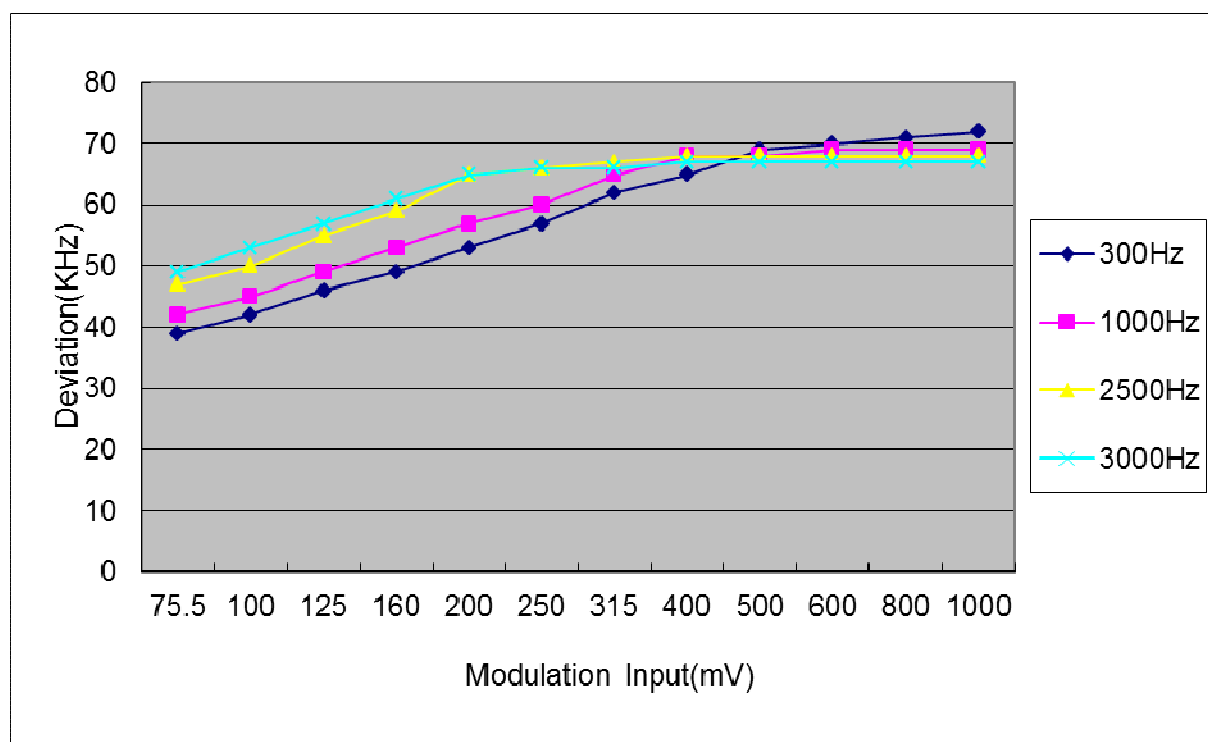
638.125 MHz

| Modulation Input(mV) | Peak Frequency Deviation(KHz) | | | |
|----------------------|-------------------------------|--------|--------|--------|
| | 300Hz | 1000Hz | 2500Hz | 3000Hz |
| 83.5 | 38 | 42 | 45 | 50 |
| 100 | 44 | 43 | 50 | 55 |
| 125 | 48 | 46 | 54 | 59 |
| 160 | 52 | 50 | 59 | 65 |
| 200 | 55 | 55 | 65 | 65 |
| 250 | 59 | 59 | 66 | 65.5 |
| 315 | 64 | 65 | 67 | 66 |
| 400 | 68 | 69 | 67.5 | 66 |
| 500 | 70 | 69 | 68 | 66 |
| 600 | 71 | 70 | 68 | 66 |
| 800 | 72 | 70 | 68 | 65.5 |
| 1000 | 73 | 70 | 68 | 65.5 |



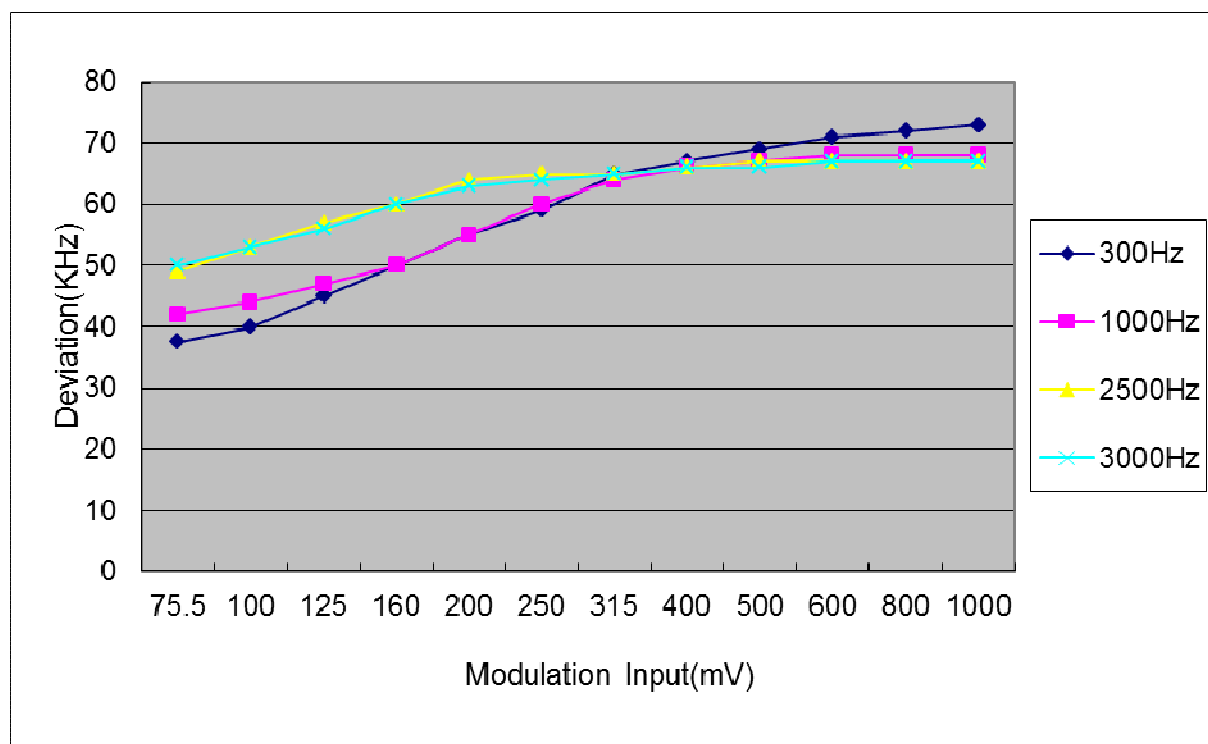
648.475 MHz

| Modulation Input(mV) | Peak Frequency Deviation(KHz) | | | |
|----------------------|-------------------------------|--------|--------|--------|
| | 300Hz | 1000Hz | 2500Hz | 3000Hz |
| 84.2 | 39 | 42 | 47 | 49 |
| 100 | 42 | 45 | 50 | 53 |
| 125 | 46 | 49 | 55 | 57 |
| 160 | 49 | 53 | 59 | 61 |
| 200 | 53 | 57 | 65 | 65 |
| 250 | 57 | 60 | 66 | 66 |
| 315 | 62 | 65 | 67 | 66 |
| 400 | 65 | 68 | 68 | 67 |
| 500 | 69 | 68 | 68 | 67 |
| 600 | 70 | 69 | 68 | 67 |
| 800 | 71 | 69 | 68 | 67 |
| 1000 | 72 | 69 | 68 | 67 |



660.400 MHz

| Modulation Input(mV) | Peak Frequency Deviation(KHz) | | | |
|----------------------|-------------------------------|--------|--------|--------|
| | 300Hz | 1000Hz | 2500Hz | 3000Hz |
| 83.8 | 37.5 | 42 | 49 | 50 |
| 100 | 40 | 44 | 53 | 53 |
| 125 | 45 | 47 | 57 | 56 |
| 160 | 50 | 50 | 60 | 60 |
| 200 | 55 | 55 | 64 | 63 |
| 250 | 59 | 60 | 65 | 64 |
| 315 | 65 | 64 | 65 | 65 |
| 400 | 67 | 66 | 66 | 66 |
| 500 | 69 | 67 | 67 | 66 |
| 600 | 71 | 68 | 67 | 67 |
| 800 | 72 | 68 | 67 | 67 |
| 1000 | 73 | 68 | 67 | 67 |





Test Report No.: RF131121N042-1

5 PHOTOGRAPHS OF THE TEST CONFIGURATION

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



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6 APPENDIX A - MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No any modifications are made to the EUT by the lab during the test.

---END---