

FCC Part 90 Measurement and Test Report

For

TIETONG Electronics(Group)

No.13 zihua Street Jiangnan Hi-tech Industrial area Licheng District

QuanZhou City Fujian Province, China

FCC ID: 2AD7HT526

| | |
|--------------------------------------|---|
| FCC Rules: | <u>FCC Part 90</u> |
| Product Description: | <u>T526</u> |
| Tested Model: | <u>Analog Radio</u> |
| Report No.: | <u>STR15088180I</u> |
| Tested Date: | <u>2015-09-15 to 2015-10-30</u> |
| Issued Date: | <u>2015-11-02</u> |
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Note: This test report is limited to the above client company and the product model only. It may not be duplicated without prior permitted by Shenzhen SEM. Test Technology Co., Ltd.

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1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

| | |
|--------------------------|---|
| Applicant: | TIETONG Electronics(Group) |
| Address of applicant: | No.13 zihua Street Jiangnan Hi-tech Industrial area Licheng District Quanzhou City Fujian Province, China |
| Manufacturer: | TIETONG Electronics(Group) |
| Address of manufacturer: | No.13 zihua Street Jiangnan Hi-tech Industrial area Licheng District Quanzhou City Fujian Province, China |

| General Description of EUT | |
|--|--|
| Product Name: | Analog Radio |
| Trade Name: | TIETONG |
| Model No.: | T526 |
| Adding Models: | T508, T506, T516, T536, T556, T566, T576, TT-517, TT-519, TT-305, TT-307, TT-308, TT-312, TT-313, TT-315 |
| Hardware Version: | T526_V12_A016R61M40 |
| Software Version: | TT-526-V50 |
| Rated Voltage: | Battery 7.4V battery |
| <i>Note: The test data is gathered from a production sample, provided by the manufacturer. The appearance of others models listed in the report is different from main-test model T526, but the circuit and the electronic construction do not change, declared by the manufacturer.</i> | |

| Technical Characteristics of EUT | |
|----------------------------------|--------------------|
| Frequency Range: | 406.1~470MHz |
| RF Output Power: | 34.21dBm (ERP) |
| Type of Modulation: | FM |
| Type of Antenna: | Detachable Antenna |
| Antenna Gain: | 2.15 dBi |
| Channel Spacing: | 12.5kHz |

1.2 Test Standards

The following report is prepared on behalf of the TIETONG Electronics(Group) in accordance with Part 90, and Part 2 of the Federal Communication Commissions rules.

The objective is to determine compliance with the Part 90, and Part 2 of the Federal Communication Commissions rules.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product, which result in lowering the emission, should be checked to ensure compliance has been maintained.

1.3 Test Methodology

Measurements contained in this report were also conducted with ANSI/TIA-603-D: 2010, Telecommunications Industry Association Land Mobile FM or PM Communications Equipment Measurement and Performance Standards and ANSI C63.4-2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

The equipment under test (EUT) was configured to measure its highest possible emission level. The test modes were adapted with Low Channel, Middle Channel and High Channel on 12.5kHz narrowband specifications since EUT is designed with 12.5kHz channel bandwidth Only. For more detail refers to the Operating Instructions.

1.4 Test Facility

- **FCC – Registration No.: 934118**

Shenzhen SEM.Test Technology Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files and the Registration is 934118.

- **Industry Canada (IC) Registration No.: 11464A**

The 3m Semi-anechoic chamber of Shenzhen SEM.Test Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 11464A.

- **CNAS Registration No.: L4062**

Shenzhen SEM.Test Technology Co., Ltd. is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L4062. All measurement facilities used to collect the measurement data are located at 1/F, Building A, Hongwei Industrial Park, Liuxian 2nd Road, Bao'an District, Shenzhen, P.R.C (518101)

1.5 EUT Setup and Test Mode

The equipment under test (EUT) was configured to measure its highest possible emission/immunity level. The test modes were adapted according to the operation manual for use, the EUT was operated in the continuous transmitting mode that was for the purpose of the measurements, more detailed description as follows:

| Test Mode List | | |
|----------------|--------------|--------------------------------------|
| Test Mode | Description | Remark |
| TM1 | Transmitting | 406.1125MHz, 438.050MHz, 469.9875MHz |

| Test Conditions | | | | | |
|------------------|--------|------|------|------|------|
| | Normal | LTLV | LTHV | HTHV | HTLV |
| Temperature (°C) | 20 | -20 | -20 | 55 | 55 |
| Voltage (V) | 7.4 | 6.29 | 7.4 | 6.29 | 7.4 |

The extreme temperature is the operating temperature range declared by the manufacture

| EUT Cable List and Details | | | |
|-----------------------------------|------------|---------------------|------------------------|
| Cable Description | Length (m) | Shielded/Unshielded | With / Without Ferrite |
| DC Power Cable | 1.2 | Unshielded | Without Ferrite |

| Special Cable List and Details | | | |
|---------------------------------------|------------|---------------------|------------------------|
| Cable Description | Length (m) | Shielded/Unshielded | With / Without Ferrite |
| / | / | / | / |

| Auxiliary Equipment List and Details | | | |
|---|-----------------|----------|---------------|
| Description | Manufacturer | Model | Serial Number |
| MEILI | Audio Generator | MFG-3005 | 200612187 |

1.7 Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Cal. Date | Due. Date |
|--------------------------|----------------------|-------------|---------------|------------|------------|
| Agilent | Spectrum Analyzer | E4402B | US41192821 | 2015-06-17 | 2016-06-16 |
| Atten | Attenuator | ATS100-4-20 | / | 2015-06-17 | 2016-06-16 |
| VICTOR | Multimeter | VC9801A | 98965350 | 2015-06-17 | 2016-06-16 |
| FLUKE | Multimeter | 15B | 91280239 | 2015-06-17 | 2016-06-16 |
| Spectrum Analyzer | R&S | FSP | 836079/035 | 2015-06-17 | 2016-06-16 |
| Positioning Controller | C&C | CC-C-1F | N/A | 2015-06-17 | 2016-06-16 |
| RF Switch | EM | EMSW18 | SW060023 | 2015-06-17 | 2016-06-16 |
| Pre-amplifier | Agilent | 8447F | 3113A06717 | 2015-06-17 | 2016-06-16 |
| Pre-amplifier | Compliance Direction | PAP-0118 | 24002 | 2015-06-17 | 2016-06-16 |
| Trilog Broadband Antenna | SCHWARZBECK | VULB9163 | 9163-333 | 2015-06-17 | 2016-06-16 |
| Horn Antenna | ETS | 3117 | 00086197 | 2015-06-17 | 2016-06-16 |
| Signal Generator | Rohde & Schwarz | SMR20 | 100047 | 2015-06-17 | 2016-06-16 |

2. SUMMARY OF TEST RESULTS

| FCC RULES | DESCRIPTION OF TEST | RESULT |
|----------------------|--|-----------|
| §2.1046 | Conducted Output Power | Compliant |
| §2.1046, §90.205 | Radiated Output Power | Compliant |
| §2.1047 §90.207 | Modulation Characteristic | Compliant |
| §2.1049, §90.209 | Occupied Bandwidth | Compliant |
| §2.1051 §90.210 | Spurious Emission at Antenna Terminal | Compliant |
| § 2.1053 § 90.210 | Spurious Radiated Emissions | Compliant |
| § 2.1055 § 90.213 | Frequency stability | Compliant |
| § 90.214 | Transient Frequency Behavior | Compliant |
| §1.1307 §2.1093 | RF Exposure | Compliant |

3. §2.1046-CONDUCTED OUTPUT POWER

3.1 Standard Applicable

According to FCC §2.1046, and §90.205, maximum ERP is dependent upon the station's antenna HAAT and required service area.

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

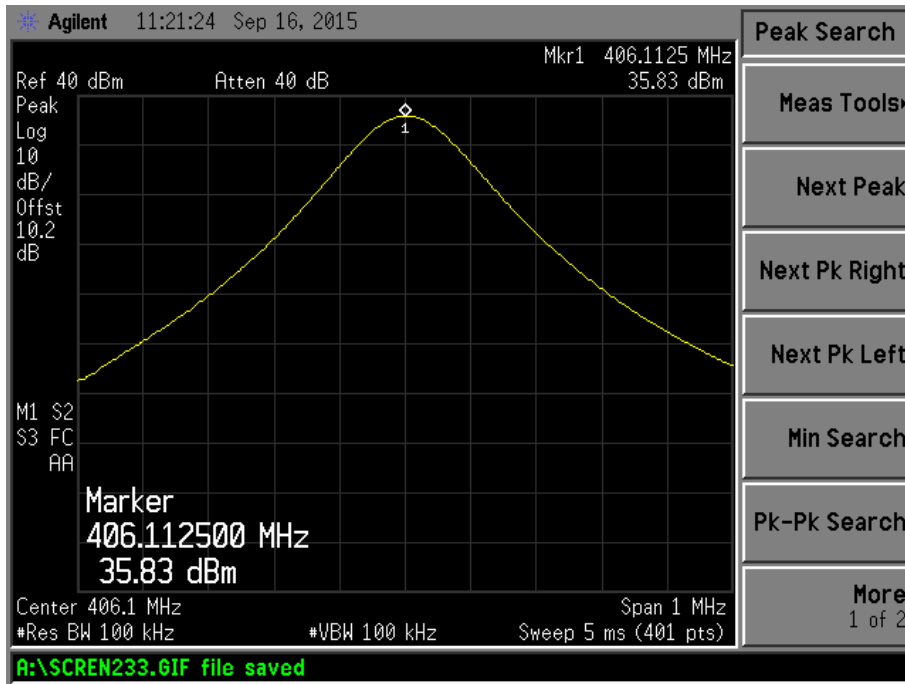
3.2 Test Procedure

1. The maximum peak output power was measured with a Spectrum Analyzer connected to the antenna terminal while EUT was operating in unmodulated situation.
2. Power was supplied to the battery input connector a power supply. The power supply was set for +7.4VDC. The Spectrum Analyzer was connected at antenna terminal to measure RF power of the carrier.
3. A Multimeter was connected in series with Q11 of FINAL AMP to measure the current of Q11, the RF amplifier device. A Multimeter was used to measure Q11 supply voltage.

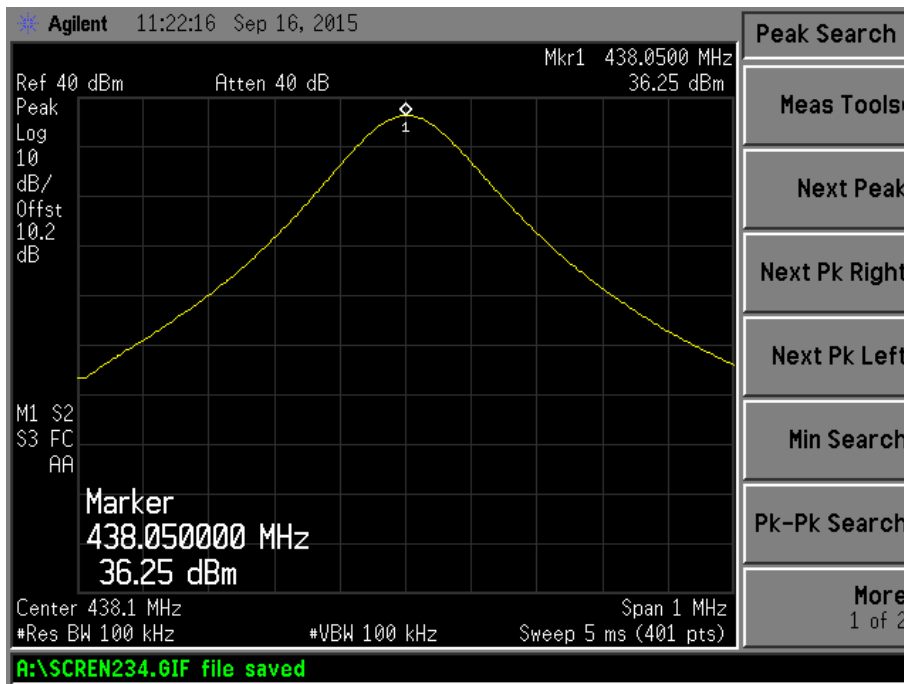
3.3 Test Result/Plots

| Type | Channel | Frequency (MHz) | Collected Voltage (VDC) | Collected Current (A) | Output Power (dBm) | Output Power (W) |
|------------|-----------|-----------------|-------------------------|-----------------------|--------------------|------------------|
| UHF | | | | | | |
| Narrowband | Low CH | 406.1125 | 7.4 | 0.610 | 35.83 | 3.83 |
| | Middle CH | 438.0500 | 7.4 | 0.605 | 36.25 | 4.24 |
| | High CH | 469.9875 | 7.4 | 0.606 | 35.70 | 3.73 |

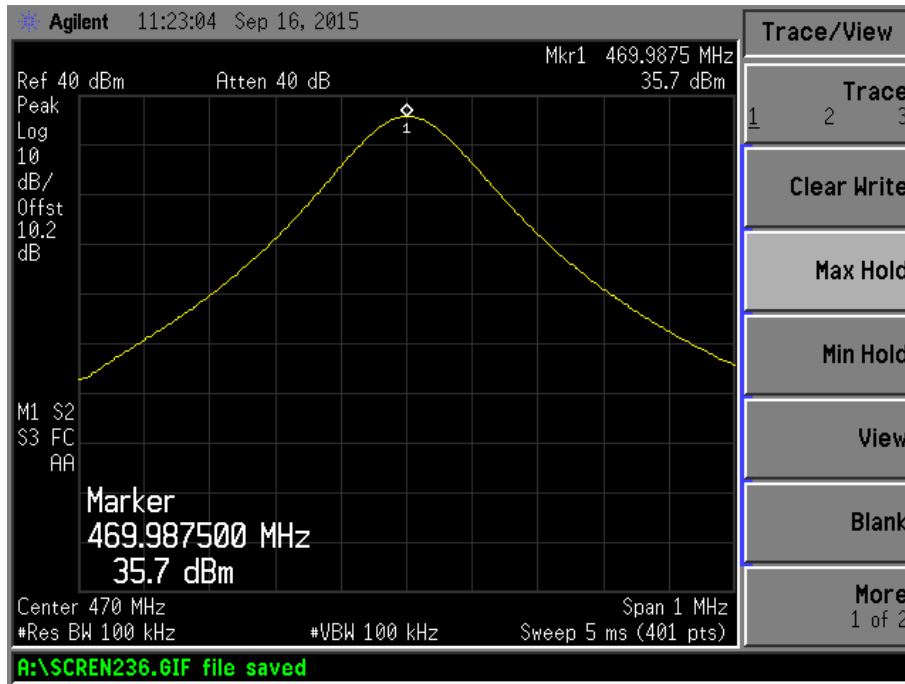
Narrowband-Low Channel:



Narrowband-Middle Channel:



Narrowband-High Channel:



4. §2.1046, and §90.205-RADIATED OUTPUT POWER (E.R.P.)

4.1 Standard Applicable

According to FCC §2.1046, and §90.205, maximum ERP is dependent upon the station's antenna HAAT and required service area.

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

4.2 Test Procedure

1. The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load, which was also placed on the turntable.
2. The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT .The test was performed by placing the EUT on 3-orthogonal axis.
3. Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the ERP were measured by the substitution.
4. Absolute level = substituted level + Antenna gain – Cable Loss

4.3 Test Result

| Frequency | SG Reading | Height | Table | Polar | Cable loss | Antenna Gain | Corrected Ampl. | FCC Part 90 |
|---------------------------|------------|--------|--------|-------|------------|--------------|-----------------|-------------|
| MHz | dBm | Meter | Degree | H / V | dB | dB | dBm | W |
| Narrowband-Low Channel | | | | | | | | |
| 406.125 | 32.25 | 1.5 | 133 | H | 1.8 | 0 | 30.45 | 1.11 |
| 406.125 | 35.92 | 1.5 | 126 | V | 1.8 | 0 | 34.12 | 2.58 |
| Narrowband-Middle Channel | | | | | | | | |
| 459.025 | 32.66 | 1.5 | 272 | H | 1.9 | 0 | 30.76 | 1.19 |
| 459.025 | 36.11 | 1.5 | 268 | V | 1.9 | 0 | 34.21 | 2.64 |
| Narrowband-High Channel | | | | | | | | |
| 511.975 | 32.19 | 1.5 | 178 | H | 2.0 | 0 | 30.19 | 1.04 |
| 511.975 | 36.14 | 1.5 | 180 | V | 2.0 | 0 | 34.14 | 2.59 |

5. §2.1047, and §90.207-MODULATION CHARACTERISTICS

5.1 Standard Applicable

According to FCC §2.1047 & §90.207:

- (a) Equipment which utilizes voice modulated communication shall show the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz. for equipment which is required to have a low pass filter, the frequency response of the filter, or all of the circuitry installed between the modulation limited and the modulated stage shall be supplied.
- (b) Equipment which employs modulation limiting, a curve showing the percentage of modulation versus the modulation input voltage shall be supplied.

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

5.2 Test Procedure

Test is carried out under the procedure of TIA/EIA-603-D §2.2.3.

Audio Low Pass Filter Response test procedure please refer to TIA/EIA-603-D §2.2.15.

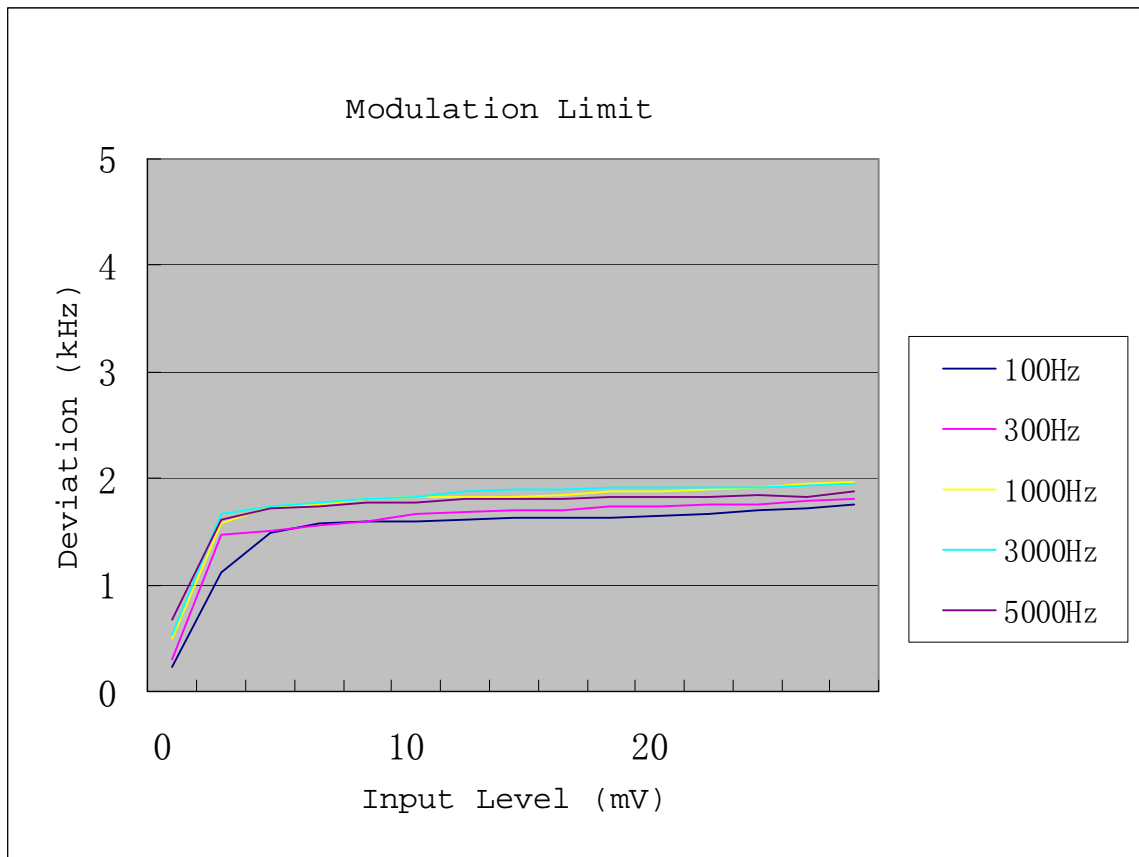
5.3 Environmental Conditions

| | |
|--------------------|----------|
| Temperature: | 25 °C |
| Relative Humidity: | 50 % |
| ATM Pressure: | 1005mbar |

5.4 Test Results/Plots

For Narrowband Channel Separation 12.5kHz

| Audio Input (mV) | 100Hz Deviation (kHz) | 300Hz Deviation (kHz) | 1kHz Deviation (kHz) | 3kHz Deviation (kHz) | 5kHz Deviation (kHz) |
|------------------|-----------------------|-----------------------|----------------------|----------------------|----------------------|
| 0 | 0.24 | 0.31 | 0.5 | 0.53 | 0.67 |
| 2 | 1.12 | 1.47 | 1.58 | 1.66 | 1.61 |
| 4 | 1.49 | 1.51 | 1.74 | 1.74 | 1.72 |
| 6 | 1.57 | 1.56 | 1.76 | 1.78 | 1.74 |
| 8 | 1.59 | 1.59 | 1.8 | 1.81 | 1.77 |
| 10 | 1.6 | 1.67 | 1.82 | 1.83 | 1.77 |
| 12 | 1.61 | 1.68 | 1.83 | 1.88 | 1.81 |
| 14 | 1.63 | 1.7 | 1.83 | 1.89 | 1.81 |
| 16 | 1.63 | 1.71 | 1.85 | 1.9 | 1.81 |
| 18 | 1.64 | 1.73 | 1.87 | 1.91 | 1.82 |
| 20 | 1.65 | 1.73 | 1.88 | 1.91 | 1.83 |
| 24 | 1.66 | 1.75 | 1.89 | 1.92 | 1.83 |
| 28 | 1.70 | 1.76 | 1.92 | 1.92 | 1.85 |
| 32 | 1.72 | 1.79 | 1.94 | 1.93 | 1.83 |
| 36 | 1.76 | 1.81 | 1.96 | 1.95 | 1.87 |



6. §2.1049 and §90.209 - OCCUPIED BANDWIDTH OF EMISSION

6.1 Standard Applicable

According to FCC §2.1049, §90.209 and §90.210, the necessary attenuation requirements need to meet as the following:

Emission Mask D For 12.5kHz bandwidth:

On any frequency from the center of the authorized bandwidth f_0 to 5.625 kHz removed from f_0 : Zero dB.

On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 5.625 kHz but no more than 12.5 kHz: At least $7.27(f_d - 2.88 \text{ kHz})$ dB.

On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 12.5 kHz: At least $50 + 10 \log(P)$ dB or 70 dB, whichever is the lesser attenuation.

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

6.2 Test Procedure

1. The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.
2. The signal is modulated with 2.5kHz audio signal as necessary levels.
3. The resolution bandwidth of the spectrum analyzer was set at 100 Hz and video bandwidth was set to 1kHz. Then the mask plots was reported.

6.3 Test Results/Masks

The occupied Bandwidth Emission of all fall in the Mask, full fit the requirements of the standards.

For Narrowband Channel Separation 12.5kHz:

$K=1$

$M=3\text{kHz}$

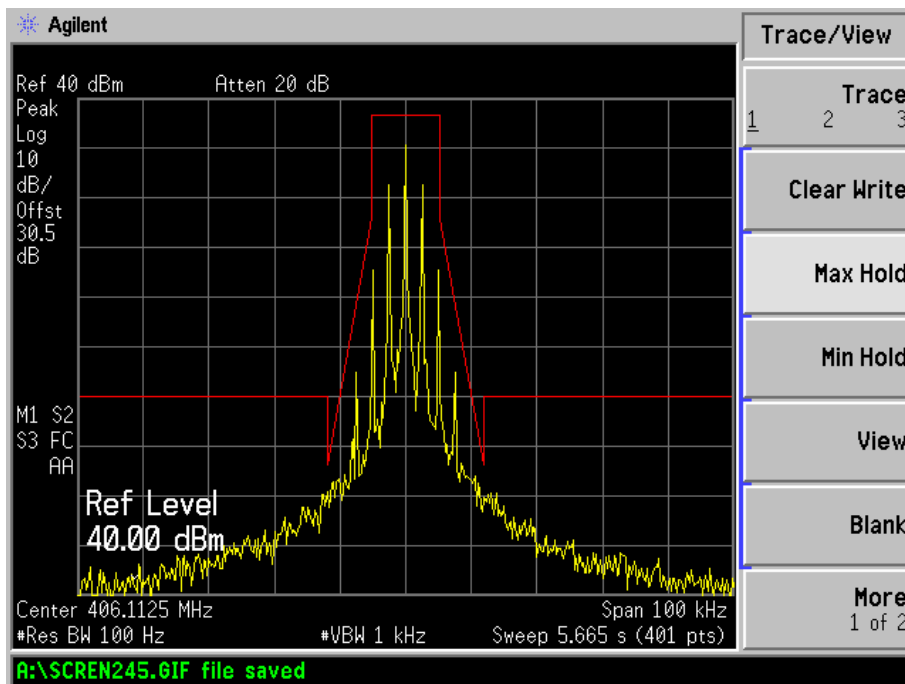
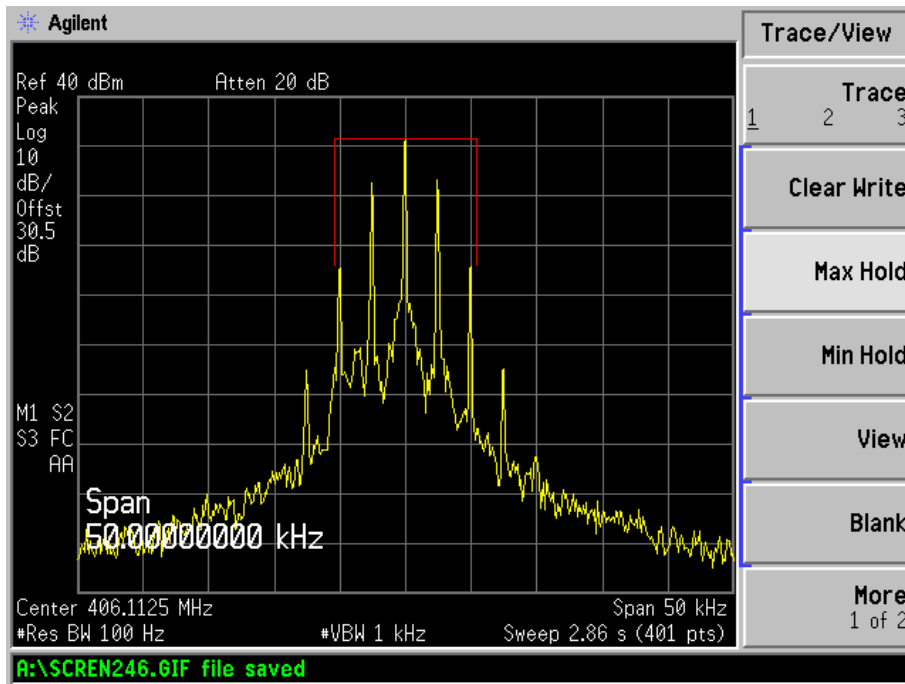
$D=2.5\text{kHz}$

$B_n=2M+2DK=2*3+2*2.5*1=11\text{kHz}$

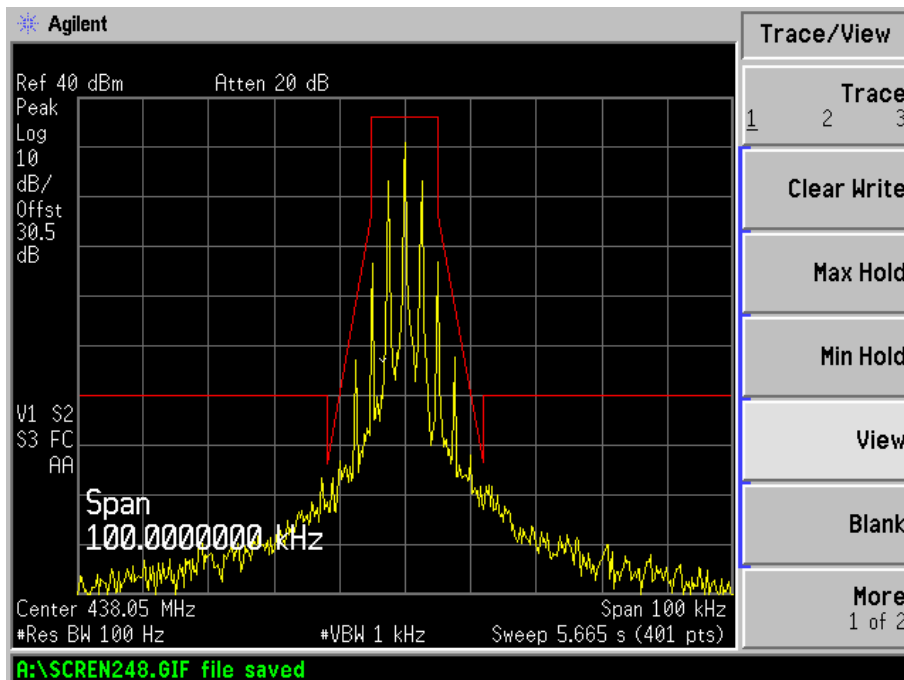
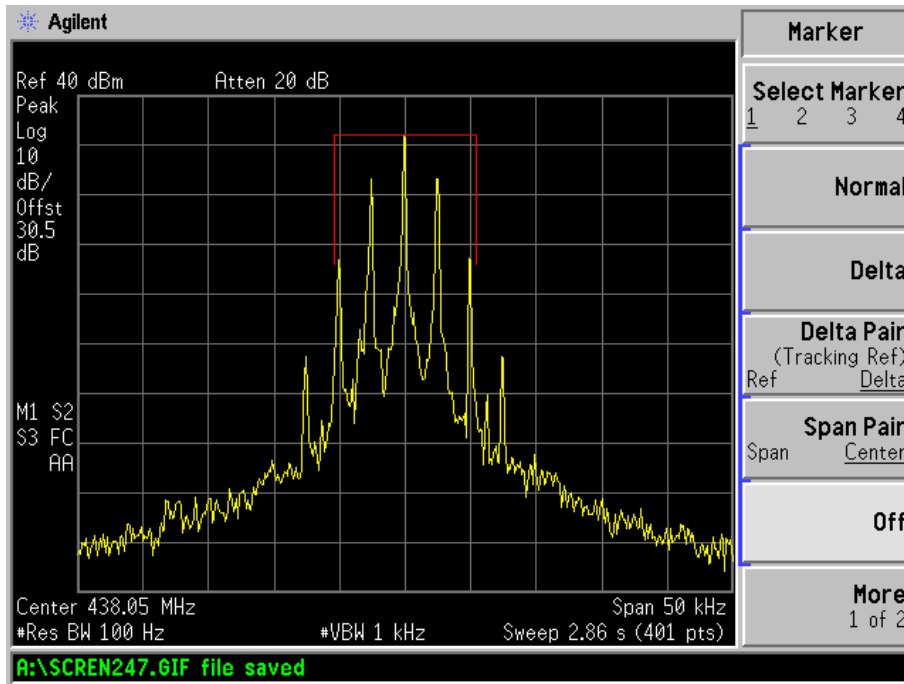
Emission Designation=11K0F3E

Refer to the attached plots.

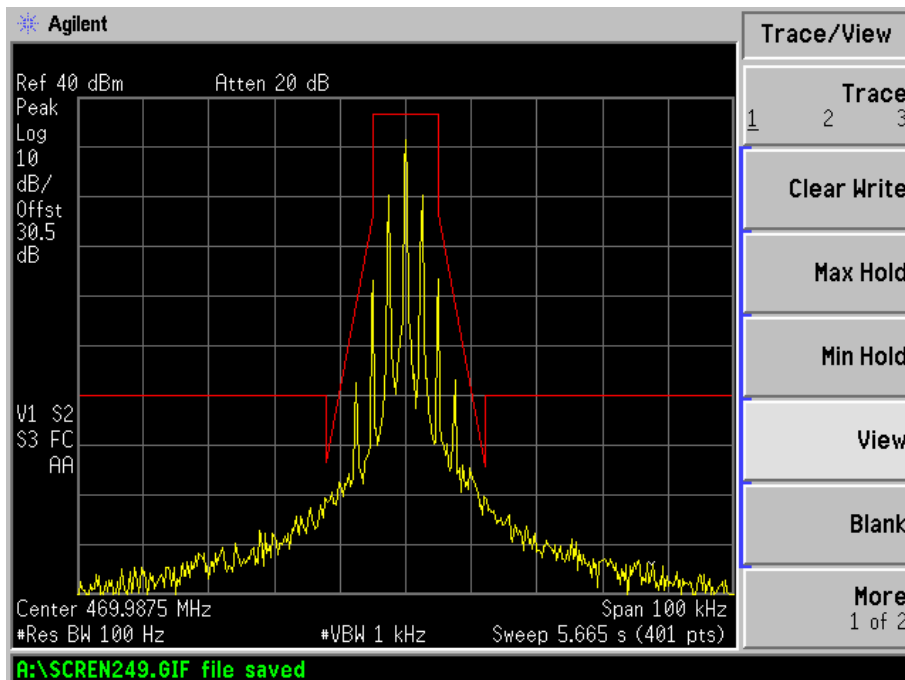
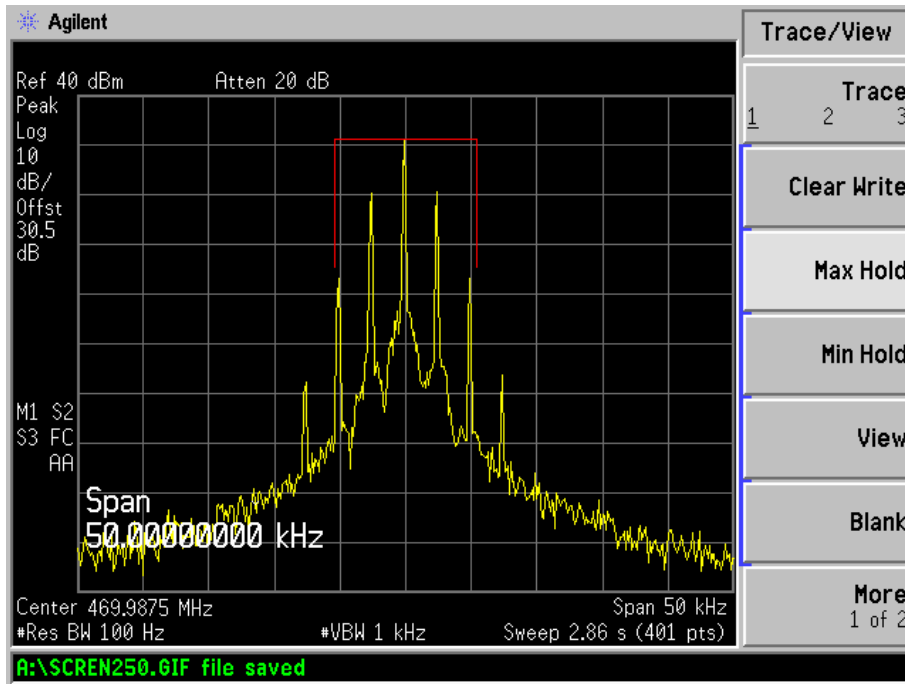
For UHF band
Narrowband-Low Channel:



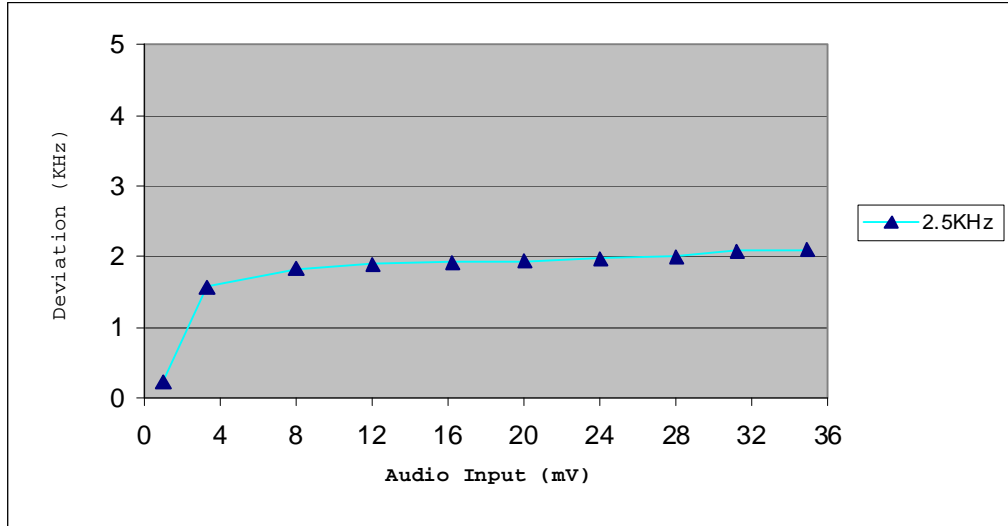
Narrowband-Middle Channel:



Narrowband-High Channel:



Deviation Vs Audio Level with the wore case (Narrowband-High Channel)



7. §2.1053 and §90.210- RADIATED SPURIOUS EMISSION

7.1 Measurement Uncertainty

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement is ± 5.10 dB.

7.2 Standard Applicable

According to FCC §2.1053, measurements shall be made to detect spurious emission that may be radiated directly from the cabinet, control circuits, power leads, or intermediated circuit elements under normal condition of installation and operation. Information submitted shall include the relative radiated power of spurious emission with reference to the rated power output of the transmitter, assuming all emissions are radiated from a halfwave dipole antenna.

According to FCC §90.210, the necessary attenuation requirements need to meet as the following:

Emission Mask D For 12.5 kHz bandwidth:

On any frequency from the center of the authorized bandwidth f_0 to 5.625 kHz removed from f_0 : Zero dB.

On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 5.625 kHz but no more than 12.5 kHz: At least $7.27(f_d - 2.88 \text{ kHz})$ dB.

On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 12.5 kHz: At least $50 + 10 \log(P)$ dB or 70 dB, whichever is the lesser attenuation.

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

7.3 Test Procedure

The setup of EUT is according with per TIA/EIA Standard 603 and ANSI C63.4-2014 measurement procedure.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.

The frequency range up to tenth harmonic of the fundamental frequency was investigated.

Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

7.4 Environmental Conditions

| | |
|--------------------|-----------|
| Temperature: | 22 °C |
| Relative Humidity: | 53% |
| ATM Pressure: | 1014 mbar |

7.5 Summary of Test Results/Plots

According to the data below, the FCC Part 90 standards, and had the worst margin of:

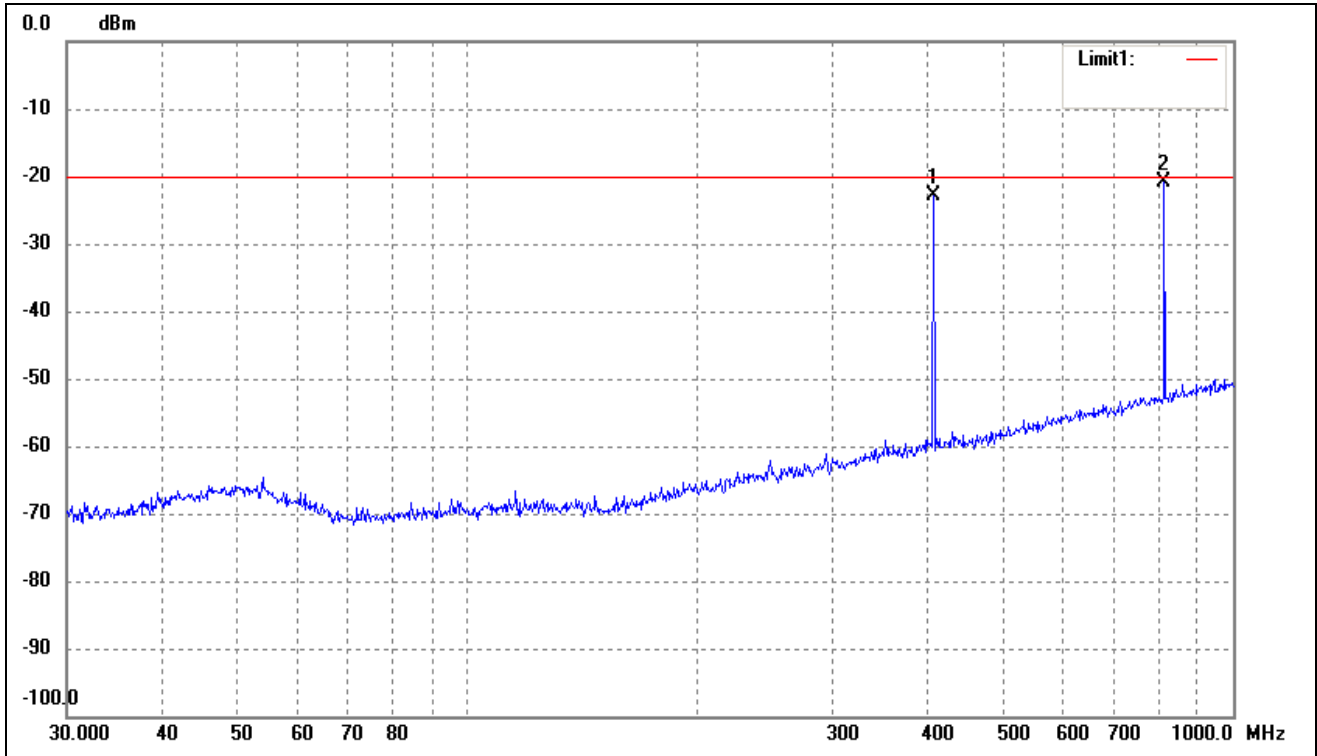
-0.76 dB at 813.1115 MHz in the **Horizontal polarization, Low Channel, 30 MHz to 5 GHz, 3Meters.**

For UHF band

Plots of the spurious emission for below 1GHz:

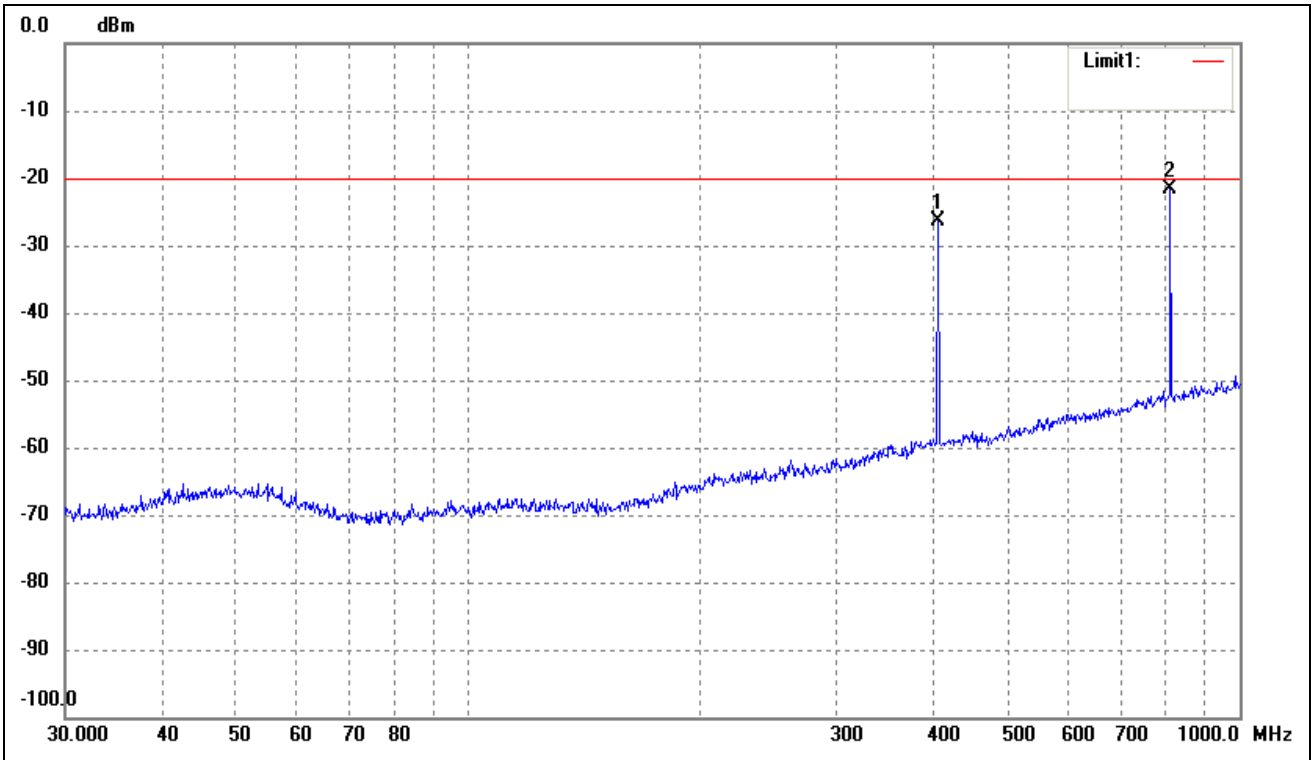
Narrowband Low Channel:

Horizontal:



| No. | Frequency (MHz) | Reading (dBm) | Correct (dB) | Result (dBm) | Limit (dBm) | Margin (dB) | Remark |
|-----|-----------------|---------------|--------------|--------------|-------------|-------------|-------------|
| 1 | 406.1125 | -32.60 | 9.68 | -22.92 | / | / | Fundamental |
| 2 | 813.1115 | -36.96 | 16.20 | -20.76 | -20.00 | -0.76 | ERP |

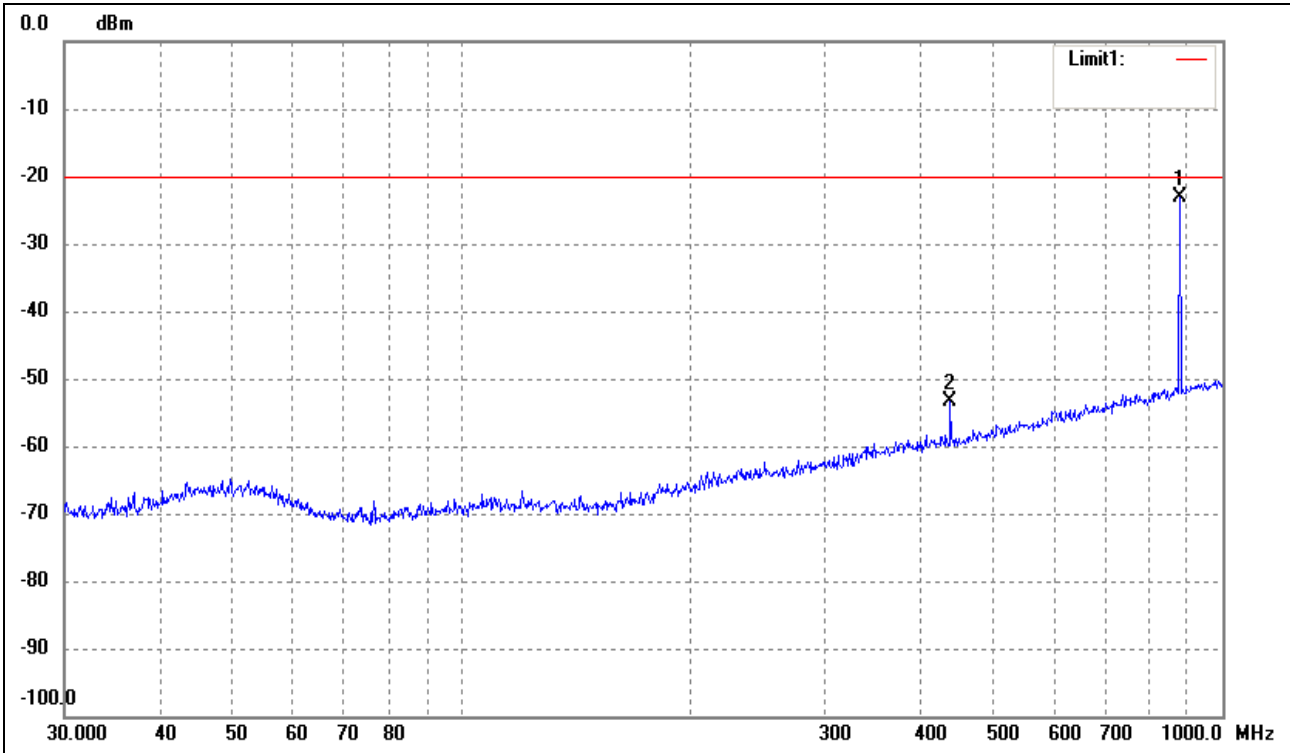
Vertical:



| No. | Frequency (MHz) | Reading (dBm) | Correct (dB) | Result (dBm) | Limit (dBm) | Margin (dB) | Remark |
|-----|-----------------|---------------|--------------|--------------|-------------|-------------|-------------|
| 1 | 406.1125 | -35.98 | 9.68 | -26.30 | / | / | Fundamental |
| 2 | 813.1115 | -37.94 | 16.20 | -21.74 | -20.00 | -1.74 | ERP |

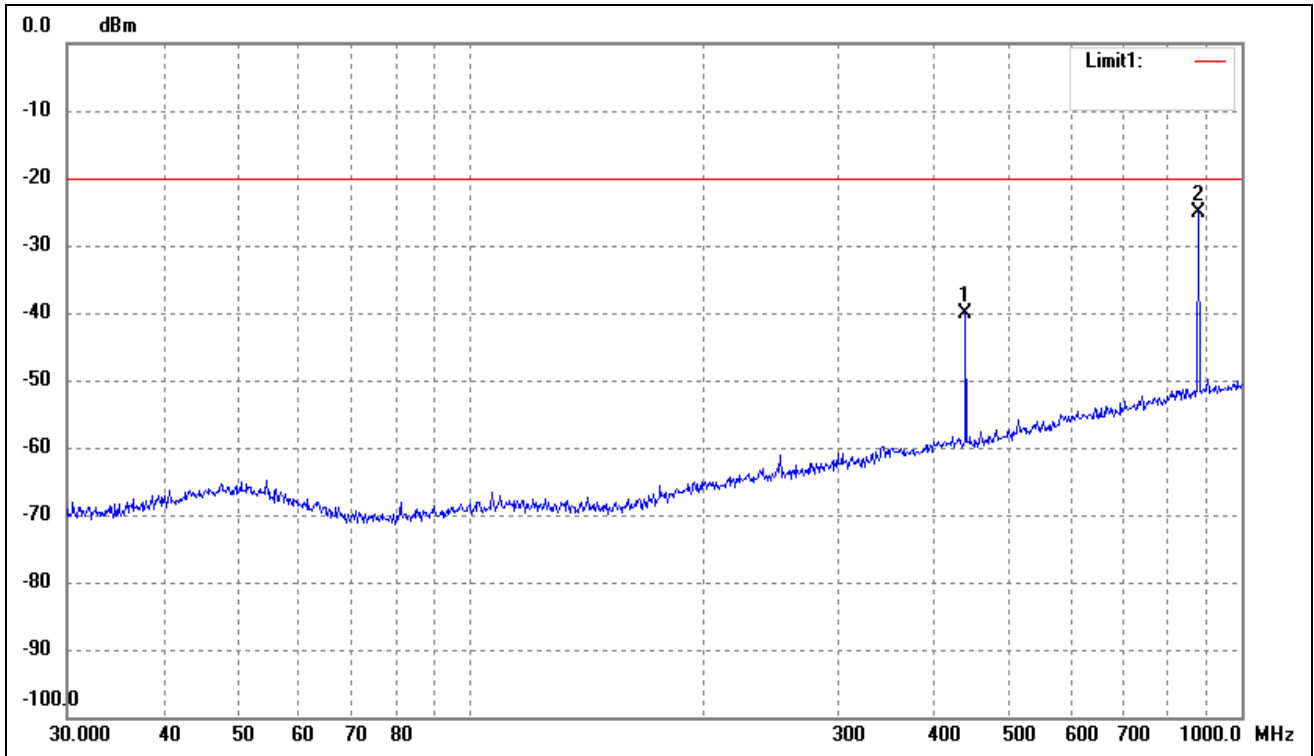
Narrowband Middle Channel:

Horizontal:



| No. | Frequency (MHz) | Reading (dBm) | Correct (dB) | Result (dBm) | Limit (dBm) | Margin (dB) | Remark |
|-----|-----------------|---------------|--------------|--------------|-------------|-------------|-------------|
| 1 | 878.3214 | -40.32 | 17.20 | -23.12 | -20.00 | -3.12 | ERP |
| 2 | 438.0500 | -63.50 | 10.15 | -53.35 | / | / | Fundamental |

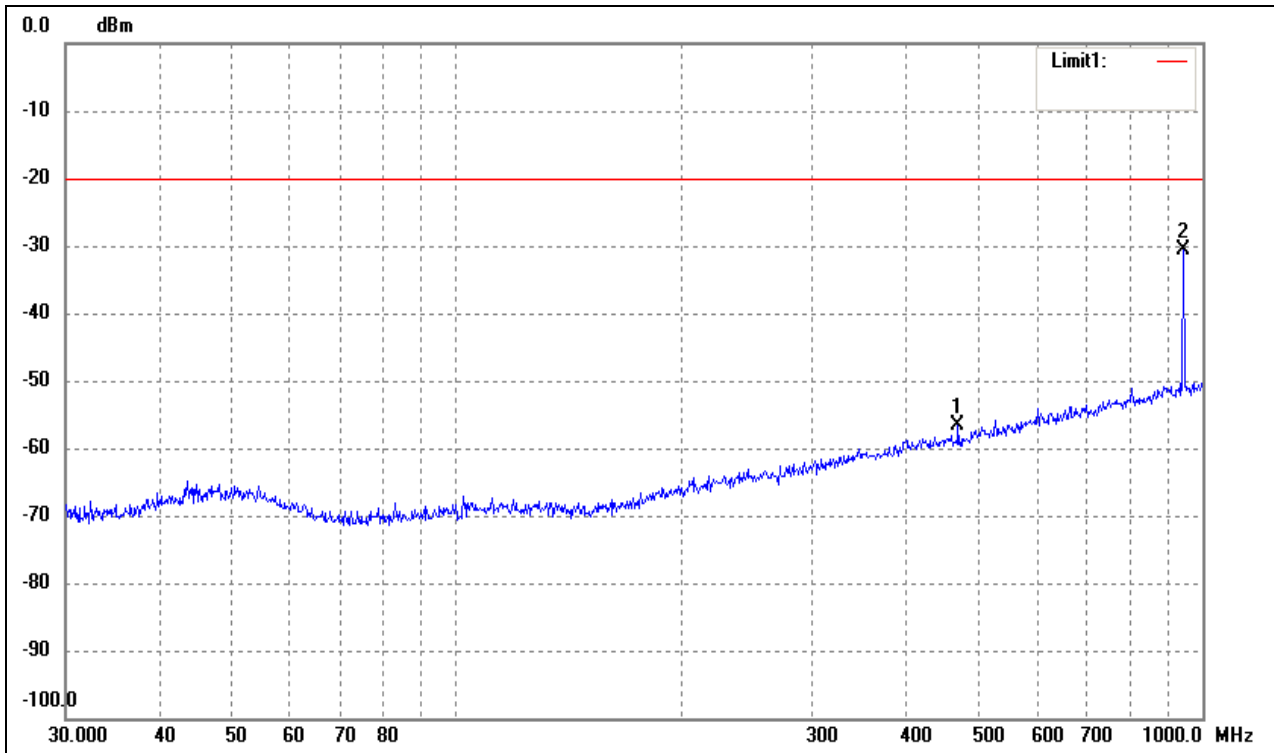
Vertical:



| No. | Frequency (MHz) | Reading (dBm) | Correct dB | Result (dBm) | Limit (dBm) | Margin (dB) | Remark |
|-----|--------------------|------------------|---------------|-----------------|----------------|----------------|-------------|
| 1 | 438.0500 | -50.16 | 10.15 | -40.01 | / | / | Fundamental |
| 2 | 878.3214 | -42.20 | 17.20 | -25.00 | -20.00 | -5.00 | ERP |

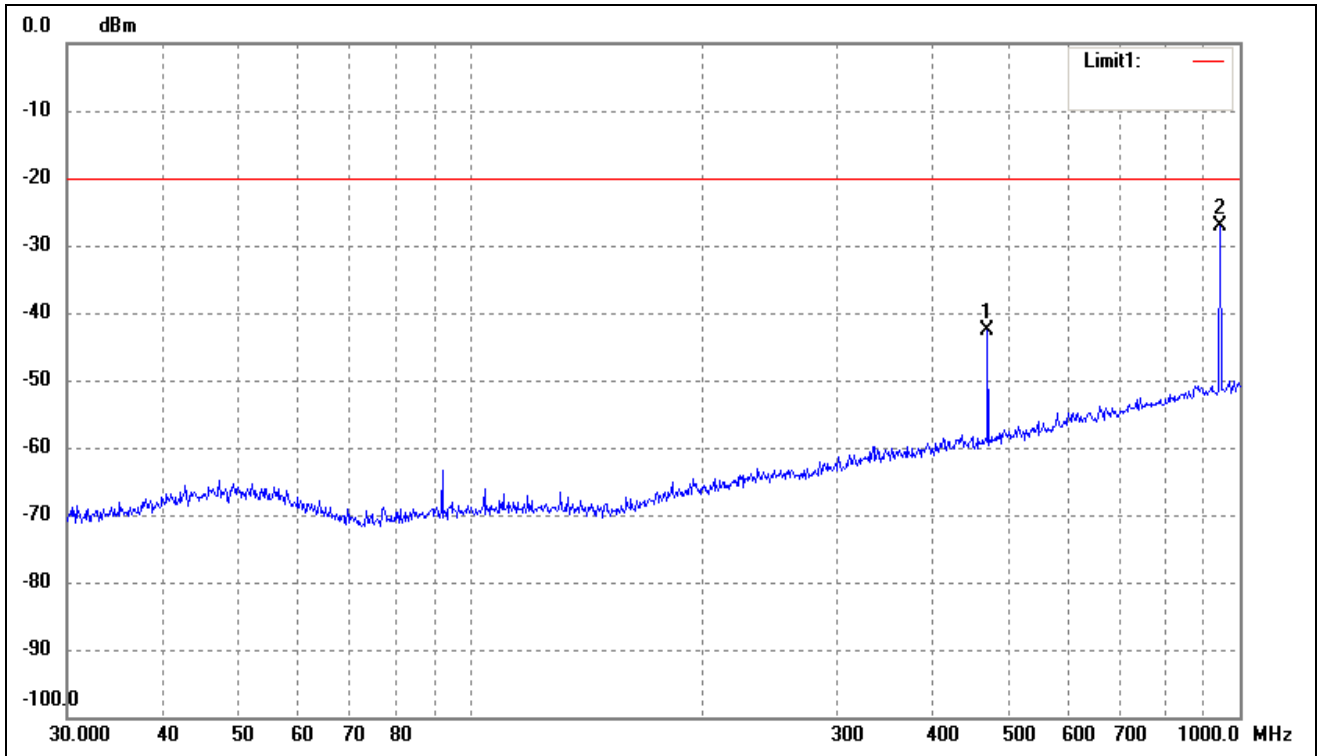
Narrowband High Channel:

Horizontal:



| No. | Frequency (MHz) | Reading (dBm) | Correct (dB) | Result (dBm) | Limit (dBm) | Margin (dB) | Remark |
|-----|-----------------|---------------|--------------|--------------|-------------|-------------|-------------|
| 1 | 469.7985 | -67.13 | 10.57 | -56.56 | / | / | Fundamental |
| 2 | 942.1305 | -48.18 | 17.67 | -30.51 | -20.00 | -10.51 | ERP |

Vertical:



| No. | Frequency (MHz) | Reading (dBm) | Correct dB | Result (dBm) | Limit (dBm) | Margin (dB) | Remark |
|-----|--------------------|------------------|---------------|-----------------|----------------|----------------|-------------|
| 1 | 469.9875 | -53.12 | 10.57 | -42.55 | / | / | Fundamental |
| 2 | 942.1305 | -44.89 | 17.67 | -27.22 | -20.00 | -7.22 | ERP |

| Frequency (MHz) | Reading (dBm) | Correct dB | Result (dBm) | Limit (dBm) | Margin (dB) | Polar H/V |
|---------------------|------------------|---------------|-----------------|----------------|----------------|--------------|
| Channel 406.1125MHz | | | | | | |
| 1218 | -49.21 | 3.45 | -39.27 | -20 | -15.76 | H |
| 1624 | -60.43 | 5.70 | -40.88 | -20 | -24.73 | H |
| 1338 | -46.43 | 3.45 | -38.34 | -20 | -12.98 | V |
| 1784 | -62.15 | 5.70 | -45.43 | -20 | -26.45 | V |
| Channel 438.0500MHz | | | | | | |
| 1314 | -43.84 | 3.52 | -40.32 | -20 | -43.84 | H |
| 1572 | -53.59 | 5.83 | -47.76 | -20 | -53.59 | H |
| 1314 | -42.53 | 3.55 | -38.98 | -20 | -42.53 | V |
| 1572 | -52.05 | 5.83 | -46.22 | -20 | -52.05 | V |
| Channel 469.9675MHz | | | | | | |
| 1338 | -44.76 | 3.55 | -41.21 | -20 | -21.21 | H |
| 1784 | -54.18 | 5.90 | -48.28 | -20 | -28.28 | H |
| 1338 | -41.87 | 3.55 | -38.32 | -20 | -18.32 | V |
| 1784 | -52.46 | 5.90 | -46.56 | -20 | -26.56 | V |

Tests is carry to 10th spurious, which emission above 4th spurious and below 30MHz is attention 20dB than the limit are not list above

8. §2.1051 and §90.210-SPURIOUS EMISSIONS AT ANTENNA TERMINALS

8.1 Standard Applicable

According to §2.1051 and §90.210

For 12.5kHz bandwidth

On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 12.5 kHz: At least $50 + 10 \log(P)$ dB or 70 dB, whichever is the lesser attenuation.

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

8.2 Test Procedure

Connect a suitable artificial antenna properly, set the Low, Middle and High Transmitting Channel, observed the spurious emissions from antenna port, and then mark the higher-level emission for comparing with the rules.

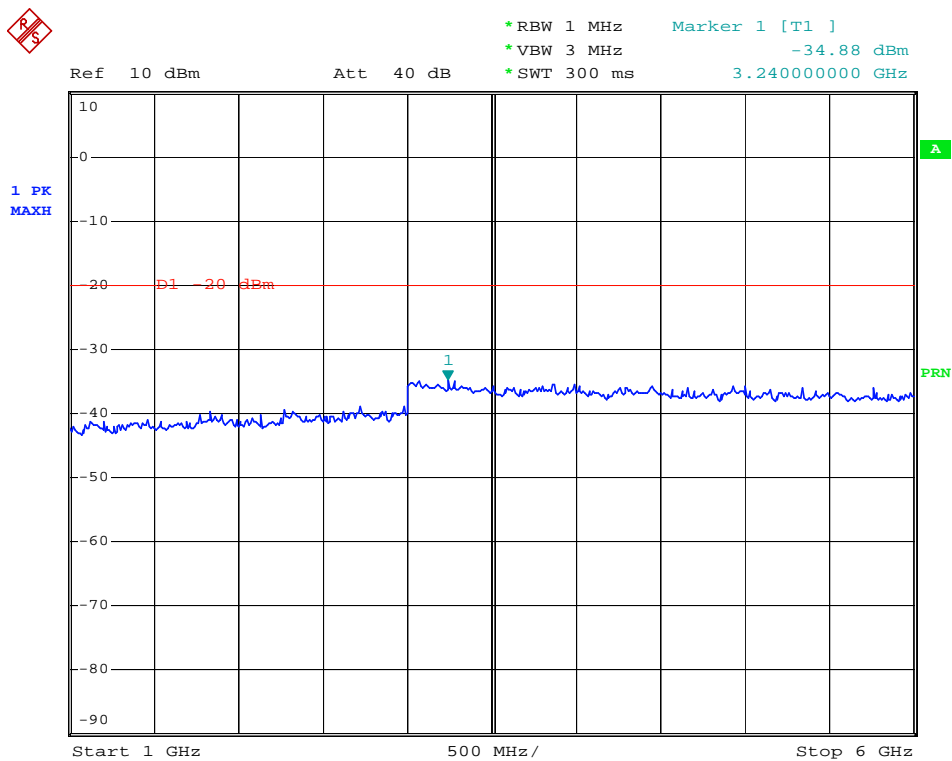
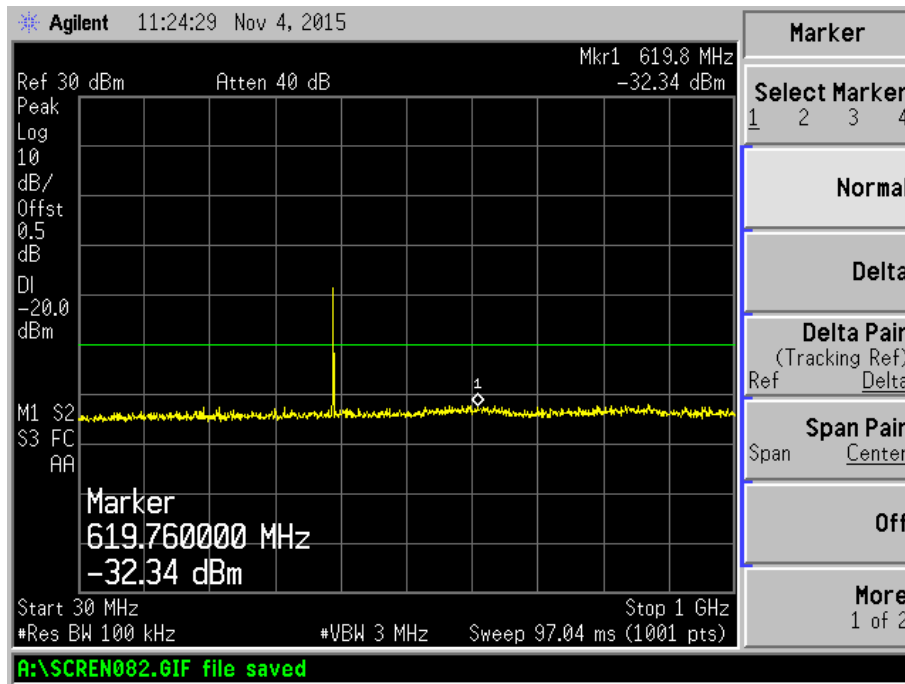
8.3 Summary of Test Results/Plots

Refer to the attached plots.

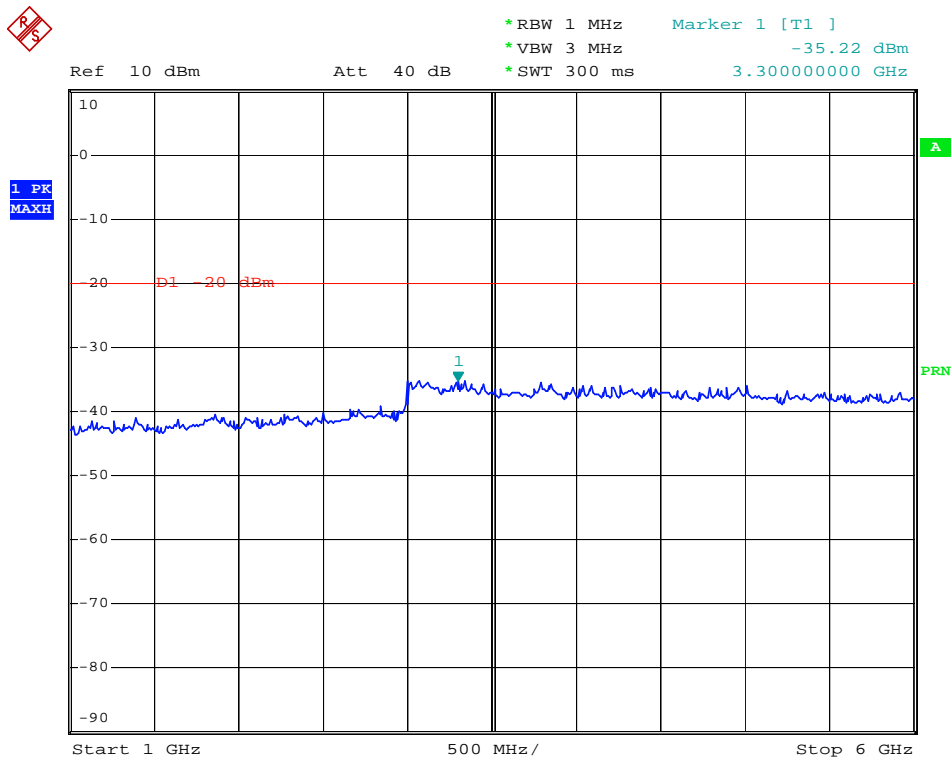
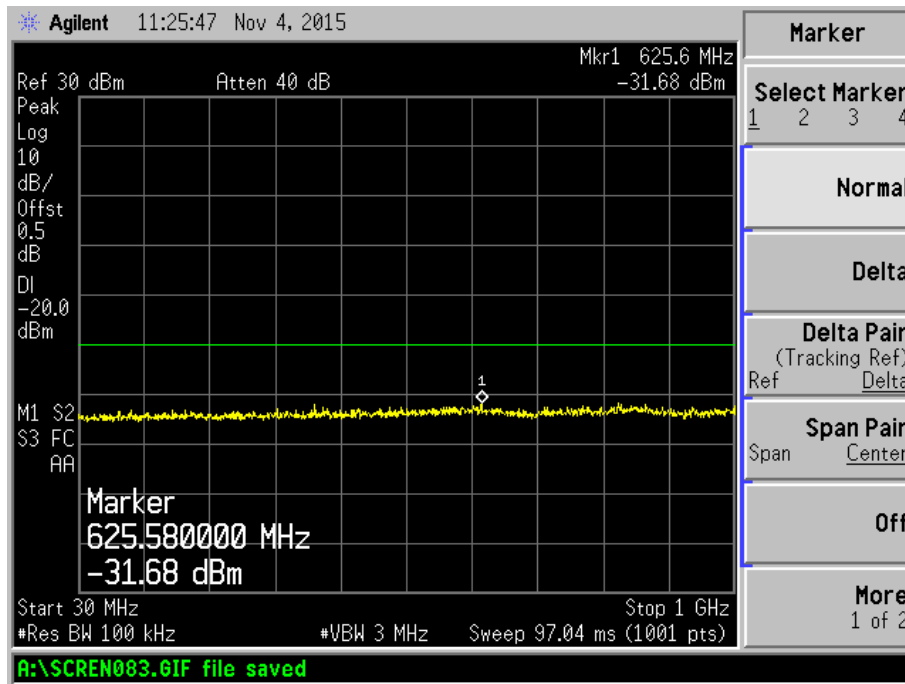
With filter

Narrowband-Low Channel:

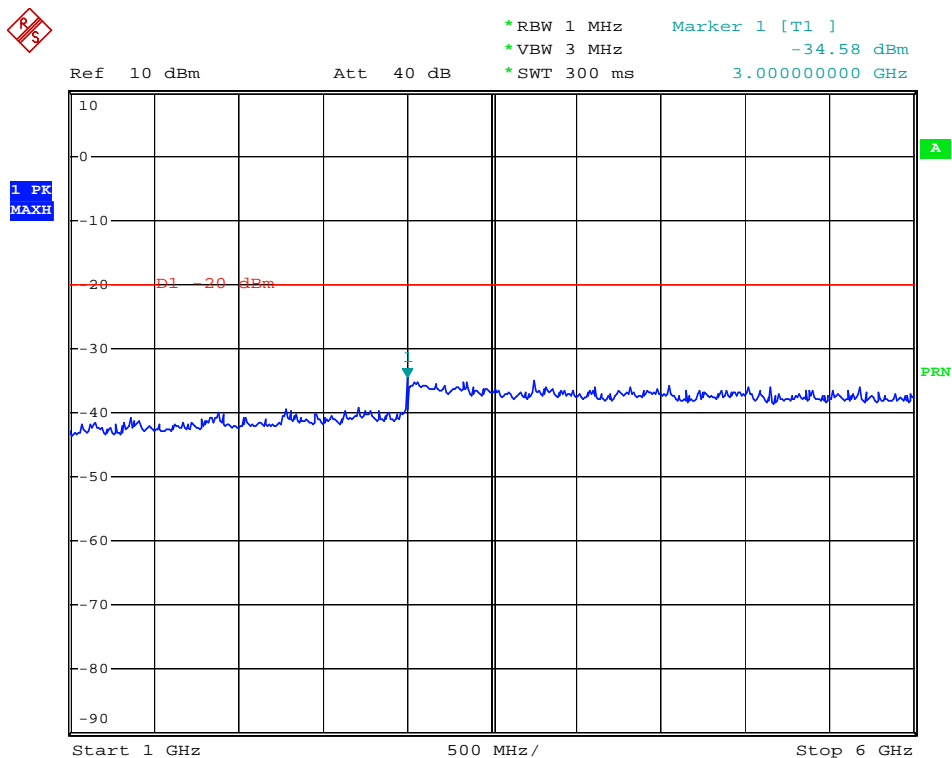
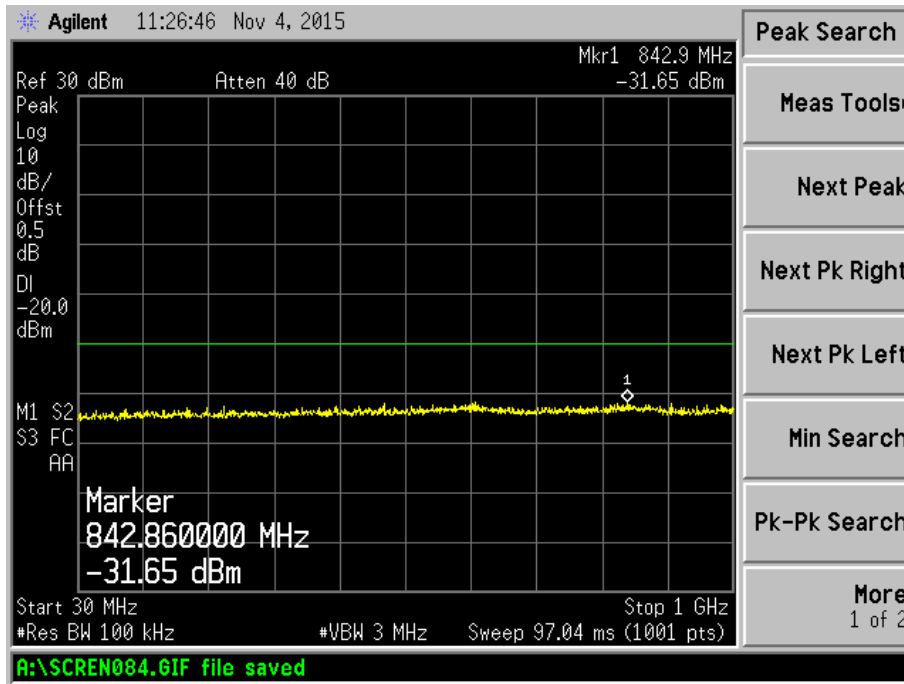
Emission above limit is fundamental



Narrowband-Middle Channel:



Narrowband-High Channel:



Note: Emissions up to 5th harmonics is close to the base noise, checking through radiated strength fields. There is no peak detected when EUT is operating in Standby mode.

9. §2.1055 (d) and §90.213- FREQUENCY STABILITY

9.1 Standard Applicable

According to FCC §2.1055 (d) and §90.213.

For output power over 2 watts, the limit is 5ppm, and in the 421–512 MHz band, mobile stations designed to operate with a 12.5 kHz channel bandwidth must have a frequency stability of 2.5 ppm.

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

9.2 Test Procedure

1. Setup the configuration of the ambient temperature form -30°C to 50°C with sufficient time. And measure the different power of the EUT with an artificial power from highest to end point voltage.
2. Active the Analyzer frequency counter option, center frequency to the right frequency needs to be measured.

9.3 Test Results/Plots

| Limit: +/-5ppm | | | | |
|------------------------------|----------------------|-----------------------|-------------------------|-----------------------|
| Environment Temperature (°C) | Power Supplied (VDC) | Frequency Error (ppm) | | |
| | | Low CH (406.1125MHz) | Middle CH (438.0500MHz) | High CH (469.9875MHz) |
| 50 | 7.4 | -0.12 | -0.14 | -0.12 |
| 40 | 7.4 | -0.89 | -0.76 | -0.95 |
| 30 | 7.4 | -0.76 | -0.64 | -0.76 |
| 20 | 7.4 | -0.82 | -0.48 | -0.69 |
| 10 | 7.4 | -0.43 | -0.55 | -0.55 |
| 0 | 7.4 | 0.18 | 0.19 | -0.17 |
| -10 | 7.4 | 0.26 | 0.22 | 0.12 |
| -20 | 7.4 | 0.33 | 0.29 | 0.17 |
| -30 | 7.4 | 0.45 | 0.35 | 0.33 |

So, Frequency Stability Versus Input Voltage is:

| Limit: +/-5ppm | | | |
|----------------------|-----------------------|-------------------------|-----------------------|
| Power Supplied (VDC) | Frequency Error (ppm) | | |
| | Low CH (406.1125MHz) | Middle CH (438.0500MHz) | High CH (469.9875MHz) |
| 6.29 (85% Rated) | 0.28 | 0.50 | 0.21 |
| 8.51 (115% Rated) | 0.34 | 0.44 | 0.25 |

10. §90.214-TRANSIENT FREQUENCY BEHAVIOR

10.1 Standard Applicable

According to FCC §90.214, Transmitters designed to operate in the 150-174 MHz frequency bands must maintain transient frequencies within the maximum frequency difference limits during the time intervals indicated:

| Time Intervals | Maximum frequency difference | All equipment | |
|---|------------------------------|---------------|------------|
| | | 150-174MHz | 421-512MHz |
| Transient Frequency Behavior for Equipment Designed to Operate on 12.5 kHz Channels | | | |
| t1 | ± 12.5kHz | 5.0 ms | 10.0 ms |
| t2 | ± 6.25kHz | 20.0 ms | 25.0 ms |
| t3 | ± 12.5kHz | 5.0 ms | 10.0 ms |

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

10.2 Test Procedure

Test is carried under TIA/EIA-603 §2.2.19

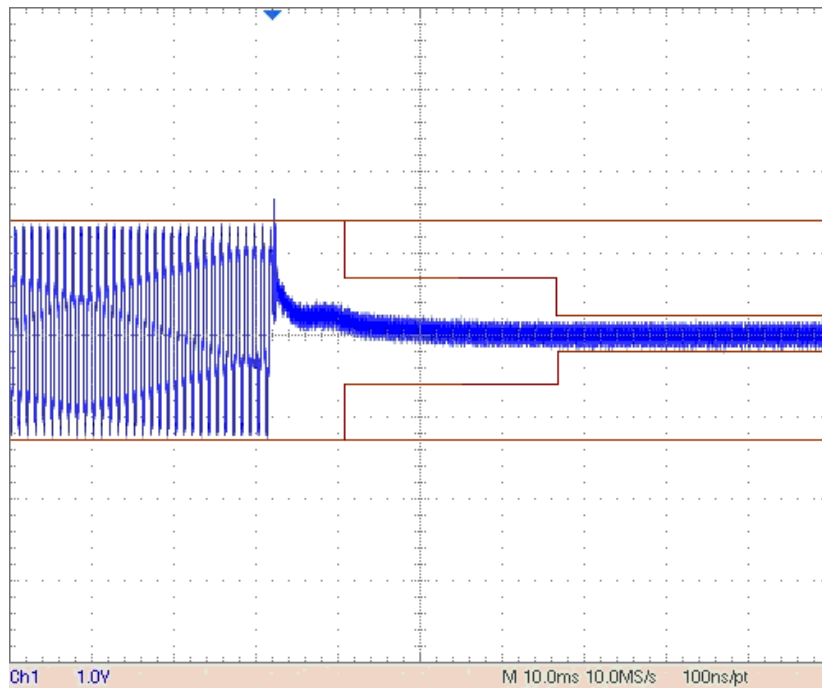
10.3 Test Results/Plots

For UHF Narrowband channel separation=12.5KHz. Worse case as below.

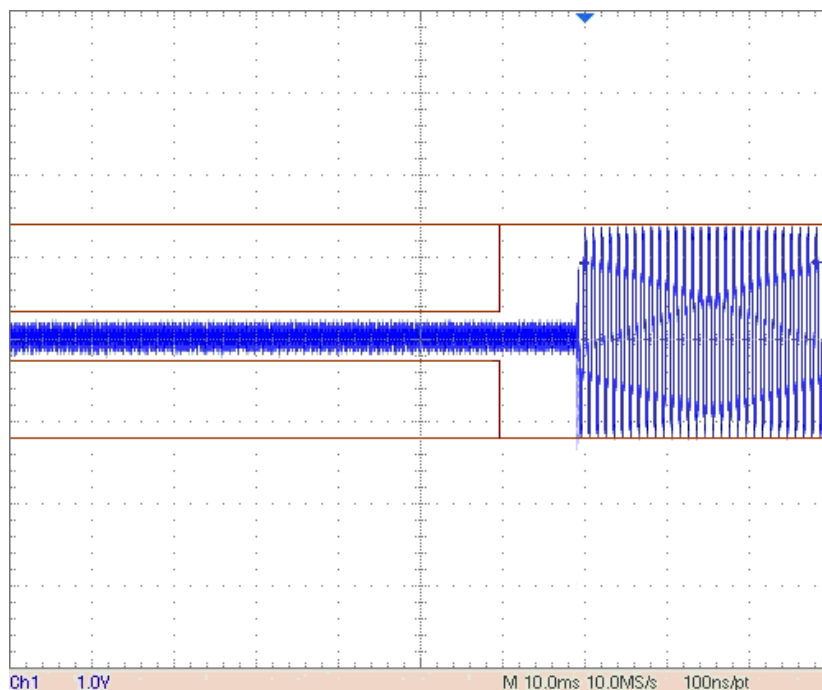
| Operation Frequency (MHz) | Channel Separation (kHz) | Transient Period (ms) | Transient Frequency |
|---------------------------|--------------------------|-----------------------|---------------------|
| 469.9875 | 12.5 | <10 | +/-12.5 kHz |
| | | <25 | +/-6.25 kHz |
| | | <10 | +/-12.5kHz |

For Narrowband-UHF

TRANSIENT FREQUENCY BEHAVIOR-On



TRANSIENT FREQUENCY BEHAVIOR-Off



***** END OF REPORT *****