Part 95 Family Radio Face Held Transmitter

RF MEASUREMENT REPORT

VERIFICATION OF COMPLIANCE

PRODUCT	:	**GMRS/FRS Combination**
MODEL/TYPE NO	:	**Dico XA1500**
FCC ID	:	**RQSDICOXA1500**
TRADE NAME	:	**SayU**
APPLICANT	:	**SayU Co., Ltd. #305 chungnam Technopark, 244-19 Songkok-ri, Yeomchi-uep, Asan, Chungcheongnam-do, Korea**
FCC RULE PART(S)	:	**FCC Part 95 & Part 2**
FCC PROCEDURE	:	**Certification**
FCC CLASSIFICATION	:	**Part 95 Family Radio Face Held Transmitter(FRF)**
EMISSION DESIGNATOR	:	**F3E**
FREQUENCY RANGE	:	**FRS + GMRS : 462.5625 MHz ~ 462.7125 MHz (1~7 Ch.) FRS Only : 467.5625 MHz ~ 467.7125 MHz (8~14 Ch.) GMRS Only : 462.5500 MHz ~ 462.7250 MHz (15~22 Ch.)**
RF OUTPUT POWER	:	**FRS : 0.5W GMRS : 0.5W ~1W**
DATES OF TEST	:	**April 20~30, 2004**
DATES OF ISSUE	:	**May 07, 2004**
TEST REPORT No.	:	**BWS-04-RF-012**
TEST LAB.		**BWS Tech., Inc. (Registration No. : 553281)**

This **GMRS/FRS Combination** Model **DICO XA-1500** has been tested in accordance with the measurement procedures specified CFR 47 Part 2.947 and ANSI C63.4-2000 at the BWS TECH/RF Test Laboratory and has been shown to be complied with the FCC Technical Specification described above.
I attest to the accuracy of data. All measurement herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them. The results of testing in this report apply to the product/system which was tested only. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

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Chief of Laboratory Division
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RF TEST REPORT

Scope – *Measurement and determination of radio frequency devices including intentional radiators and/or unintentional radiators for compliance with the technical rules and regulations of relevant international standard*

1. General Information

Applicant Information

Company Name	:	SayU Co., Ltd.
Company Address	:	#305 chungnam Technopark, 244-19 Songkok-ri, Yeomchi-uep, Asan, Chungcheongnam-do, Korea
Phone/Fax	:	Phone : +82-2-2108-1111 Fax : +82-2-2108-1660

Other Information

● **EUT Type**	:	GMRS/FRS Combination
● **Model Name**	:	Dico XA1500
● **FCC Identifier**	:	RQSDICOXA1500
● **Brand Name**	:	SayU
● **S/N**	:	Prototype
● **Freq. Range**	:	FRS + GMRS : 462.5625 MHz ~ 462.7125 MHz (1~7 Ch.) FRS Only : 467.5625 MHz ~ 467.7125 MHz (8~14 Ch.) GMRS Only : 462.5500 MHz ~ 462.7250 MHz (15~22 Ch.)
● **Max. Power Output**	:	FRS : 0.5W GMRS : 0.5W ~1W
● **Emission Designator**	:	F3E
● **FCC Classification**	:	Part 95 Family Radio Face Held Transmitter(FRF)
● **Rule Part(s)**	:	FCC Part 95A,B & Part 2
● **Test Procedure**	:	Certification
● **Dates of Tests**	:	April 20~30, 2004
● **Place of Tests**	:	BWS TECH Inc. 294-9, Jungdae-Dong, Kwangju-Si, Kyunggi-Do 464-080, Korea EMC Testing Laboratory (FCC Registration Number : 553281) TEL: +82 31 762 0124 FAX: +82 31 762 0126
● **Test Report No.**	:	BWS-04-RF-012

2. DESCRIPTION OF ATTACHMENTS

Appendix 1. FCC ID Label and Location
-. Sample FCC ID Label and location information is shown

Appendix 2. Test Setup Photos
-. Radiated Emission Test setup photos are shown

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-. Explanation of operational instruction for circuit is shown.

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-. The part lists are shown.

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-. The alignment procedure are shown.

Appendix 10. RF Exposure statement
-. The user operating manual is shown.

3. INTRODUCTION

The measurement tests were conducted at the open area test site of BWS TECH Inc. facility located at 294-9, Jungdae-Dong, Kwangju-Si, Kyunggi-Do, Korea. The measurement facilities were constructed in conformance with the requirements of the ANSI C63.4-2000 and CISPR Publication 16. The BWS has site descriptions on file with the FCC for 3 and 10 meter site configurations. Detailed description of test facility was found to be in compliance with the requirements of Section 2.948 FCC Rules according to the ANSI C63.4-2000 and registered to the Federal Communications Commission(Registration Number : 553281).

All measurements contained in this application were conducted in accordance with FCC Rules and regulations CFR 47and American National Standard Method of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz (ANSI C.63.4-2000).

Measurement Procedure

The radiated and spurious measurements were made outdoors at a 3-meter test range (see Figure2).
The equipment under testing was placed on a wooden turntable, 3-meters from the receive antenna. The receive antenna height and turntable rotations was adjusted for the highest reading on the receive spectrum analyzer. A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. This level was recorded.
For readings above 1 GHZ, the above procedure would be repeated using horn antennas and the difference between the gain of the horn and an isotropic antenna are taken into consideration.

4. PRODUCT INFORMATION

4.1 Equipment Description

The following certification data are submitted in connection with this request for type certification of the Dico XA1500 transceiver in accordance with Section 2, of FCC Rules.
The Dico XA1500 is a hand-held, battery operated, UHF, frequency modulated, transceiver intended for voice communications applications under Part 95 GMRS (channels 1-7 or 15-22)* or Part 95 FRS (channels 8-14)*.

*See Appendix A for frequency assignment.
1. The unit’s antenna meets 95.647, (i.e. is integral to the transmitter).
2. Except for power, the technical parameters for operating on all the channels (both FRS and GMRS) are the same as those for FRS, (i.e. 12.5 kHz bandwidth, 2.5 ppm frequency tolerance, maximum 2.5 kHz deviation, etc).
3. A notice is included in the user instructions that clearly informs the consumer (buyer/owner) when the radio is transmitting on GMRS frequencies, that operation on GMRS frequencies requires an FCC license and such operation is subject to additional rules specified in 47 CFR Part 95.

4.2 Technical Specification

- Chassis Type	Plastic enclosure
- Frequency Range	FRS + GMRS : 462.5625 MHz ~ 462.7125 MHz (1~7 Ch.) FRS Only : 467.5625 MHz ~ 467.7125 MHz (8~14 Ch.) GMRS Only : 462.5500 MHz ~ 462.7250 MHz (15~22 Ch.)
- Channel Spacing	12.5KHz
- RF Output Power	FRS : 0.5W GMRS : Low power 0.5W ~ High power 1W
- FREQUENCY CONTROL	PLL SYNTHESIZER
- Display	B/W LCD screen
- Weight	65g (without battery)
- Operating Temperature	-20 – 60 ℃
- Dimension	54 * 75 * 22 (W*H*T)
- Power	DC 3.7V 600mAH Li-ion

4.3 Additional information related to Testing

☑ **Note.**

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☑ **Note.**

Please refer to the duties and responsibilities of the Responsible Party attached.

5. DESCRIPTION OF TESTS

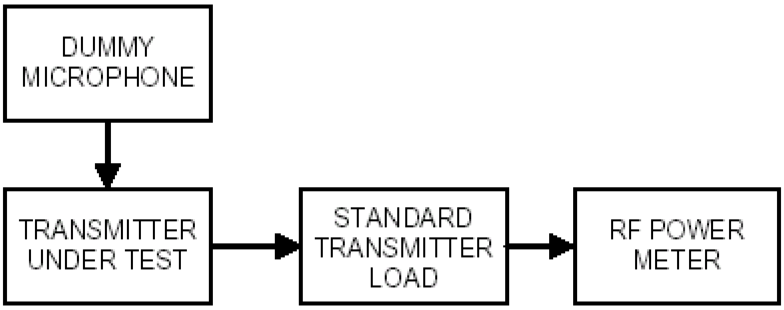
5.1 RF Power Output - Conducted Power Output - §2.1046

Test Procedure : ANSI/TIA/EIA-603-B-2002, section 2.2.1

Definition :

The conducted carrier power output rating for a transmitter is the power available at the output terminals of the transmitter when the output terminals are connected to the standard transmitter load.

Method of Measurement:



a) Connect the equipment as illustrated.
b) Measure the transmitter output power during the defined duty cycle. Correct for all losses in the RF path.
c) The value recorded in step b) is the conducted carrier output power rating.

5.2 RF Power Output - Radiated Power Output – §95.639(d)

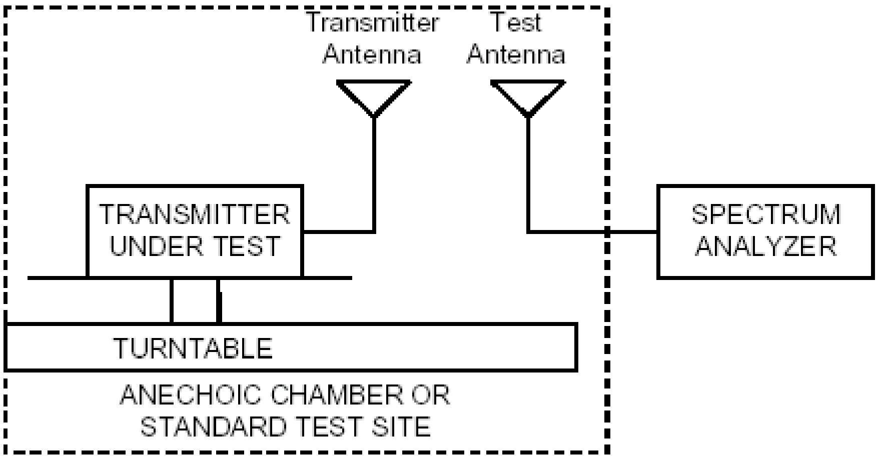
Test Procedure : ANSI/TIA/EIA-603-B-2002, section 2.2.17

Definition :

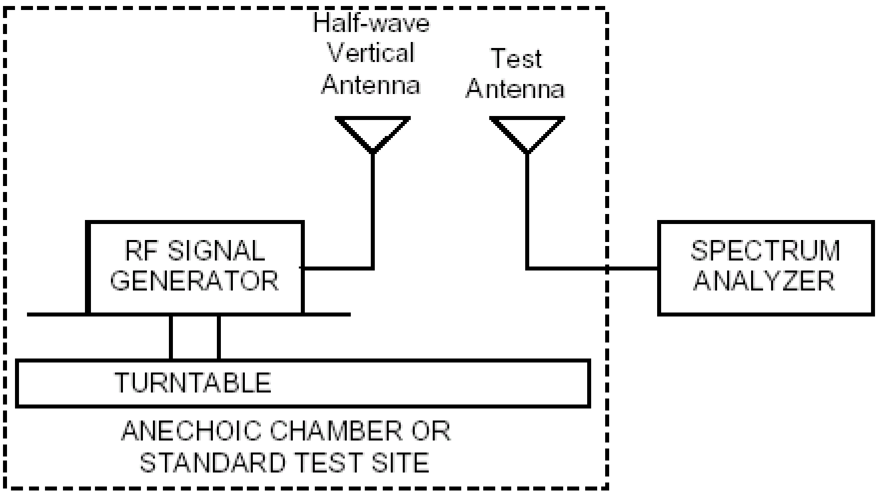
The Effective Radiated Power is defined as the product of the power applied to an antenna and its gain relative to an ideal half wave dipole in a given direction.
Maximum ERP is the maximum ERP in any direction.
For equipment using an antenna with known radiation characteristics ERP is a characteristic that can be calculated as well as measured, (Note: Effective Isotropic Radiated Power (EIRP) can be computed using the following:

EIRP (dBm) = *ERP* (dBm) + 2.15 (dB.)

Method of Measurement:



a) Connect the equipment as illustrated. Mount the equipment with the manufacturer specified antenna in a vertical orientation on a manufacturer specified mounting surface located on a non-conducting rotating platform of a RF anechoic chamber (preferred) or a standard radiation site.
b) Key the transmitter, then rotate the EUT 360o azimuthally and record spectrum analyzer power level (LVL) measurements at angular increments that are sufficiently small to permit resolution of all peaks. If a standard radiation test site is used, raise and lower the test antenna to obtain a maximum reading at each angular increment. (Note: several batteries may be needed to offset the effect of battery voltage droop, which should not exceed 5% of the manufactured specified battery voltage during transmission).



c) Replace the transmitter under test with a vertically polarized half-wave dipole (or an antenna whose gain is known relative to an ideal half-wave dipole). The center of the antenna should be at the same location as the center of the antenna under test.

d) Connect the antenna to a signal generator with a known output power and record the path loss (in dB) as *LOSS*. If a standard radiation test site is used, raise and lower the test antenna to obtain a maximum reading.

***LOSS* = *Generator Output Power* (dBm) – *Analyzer reading* (dBm)**

e) Determine the effective radiated output power at each angular position from the readings in steps b) and d) using the following equation:

***ERP* (dBm) = *LVL* (dBm) + *LOSS* (dB)**

f) The maximum ERP is the maximum value determined in the preceding step.

Method of Calculation

When calculating ERP, in addition to knowing the antenna radiation and matching characteristics, it is necessary to know the loss values of all elements (e.g. transmission line attenuation, mismatches, filters, combiners) interposed between the point where transmitter output power is measured, and the point where power is applied to the antenna. ERP can then be calculated as follows:

***ERP* (dBm) = *Output Power* (dBm) - *Losses* (dB) + *Antenna Gain* (dBd)**

where:
dBd refers to gain relative to an ideal dipole.

5.3 Transmitter Audio Frequency Response - §2.1047(a)

Test Procedure : ANSI/TIA/EIA-603-B-2002, section 2.2.6

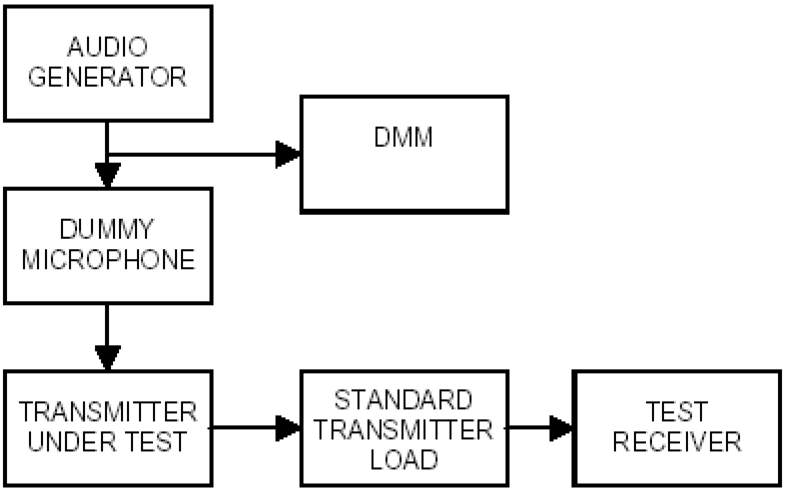
Definition

The audio frequency response is the degree of closeness to which the frequency deviation of the transmitter follows a prescribed characteristic.

Method of Measurement

Below are two test methods that will yield similar results for testing from 300 Hz to 3000 Hz, either method may be used. The first method is a constant deviation approach. The second method is a constant input approach.

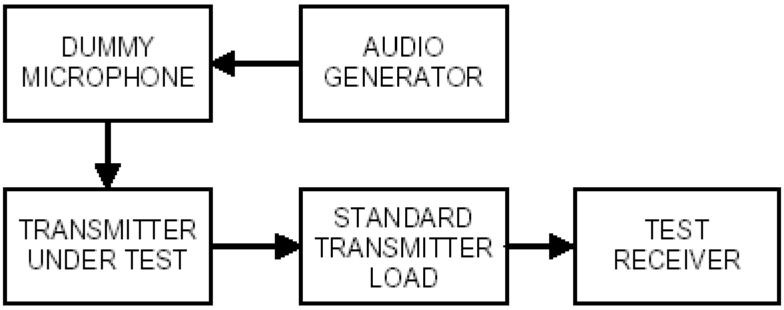
Constant deviation test method (300 Hz to 3000 Hz)



a) Connect the equipment as illustrated.
b) Set the test receiver to measure peak positive deviation. Set the audio bandwidth for ≤50 Hz to ≥15,000 Hz. Turn the de-emphasis function off.
c) Set the DMM to measure rms voltage.
d) Adjust the transmitter per the manufacturer's procedure for full rated system deviation.
e) Apply a 1000 Hz tone and adjust the audio frequency generator to produce 20% of the rated system deviation.
f) Set the test receiver to measure rms deviation and record the deviation reading.
g) Record the DMM reading as *VREF* .
h) Set the audio frequency generator to the desired test frequency between 300 Hz and 3000 Hz.
i) Vary the audio frequency generator output level until the deviation reading that was recorded in step f) is obtained.
j) Record the DMM reading as *VFREQ* .
k) Calculate the audio frequency response at the present frequency as:

$$\text{audio frequency response} = 20\ \log_{10}\left(\frac{V_{FREQ}}{V_{REF}}\right)$$

Constant Input Test Method (300 Hz to 3000 Hz)



a) Connect the equipment as illustrated.
b) Set the test receiver to measure peak positive deviation. Set the audio bandwidth for ≤50 Hz to ≥15,000 Hz. Turn the de-emphasis function off.
c) Adjust the transmitter per the manufacturer's procedure for full rated system deviation.
d) Apply a 1000 Hz tone and adjust the audio frequency generator to produce 20% of the rated system deviation.
e) Set the test receiver to measure rms deviation and record the deviation reading as *DEVREF* .
f) Set the audio frequency generator to the desired test frequency between 300 Hz and 3000 Hz.
g) Record the test receiver deviation reading as *DEVFREQ* .
h) Calculate the audio frequency response at the present frequency as:

$$audio\ frequency\ response = 20\ \log_{10}\left(\frac{DEV_{FREQ}}{DEV_{REF}}\right)$$

i) Repeat steps f) through h) for all the desired test frequencies.

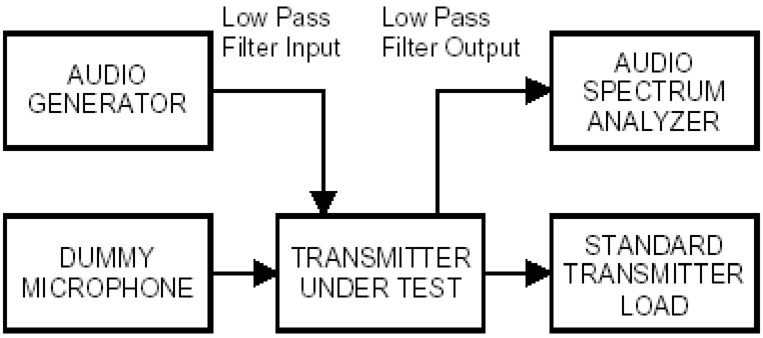
5.4 Audio Low Pass Filter Response - §2.1047(a) & §95.637(b)

Test Procedure : ANSI/TIA/EIA-603-1992, section 2.2.15

Definition

The audio low pass filter response is the frequency response of the post limiter low pass filter circuit above 3000 Hz.

Method of Measurement:



a) Connect the equipment as illustrated.
b) Connect the audio frequency generator as close as possible the input of the post limiter low pass filter within the transmitter under test.
c) Connect the audio spectrum analyzer to the output of the post limiter low pass filter within the transmitter under test.
d) Apply a 1000 Hz tone from the audio frequency generator and adjust the level per manufacturer's specifications.
e) Record the dB level of the 1000 Hz spectral line on the audio spectrum analyzer as *LEVREF* .
f) Set the audio frequency generator to the desired test frequency between 3000 Hz and the upper low pass filter limit.
g) Record audio spectrum analyzer levels, at the test frequency in step f).
h) Record the dB level on the audio spectrum analyzer as *LEVFREQ* .
i) Calculate the audio frequency response at the test frequency as:
low pass frequency response = LEVFREQ - LEVREF
j) Repeat steps f) through i) for all the desired test frequencies.

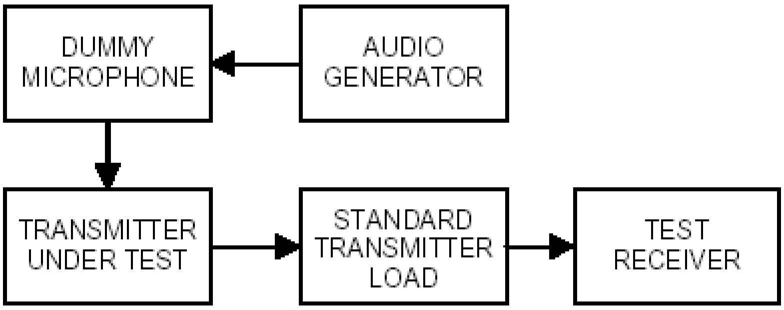
5.5 Modulation Limiting - §2.1047(b)

Test Procedure : ANSI/TIA/EIA-603-2002, Section 2.2.3

Definition:

Modulation limiting is the transmitter circuit's ability to limit the transmitter from producing deviations in excess of a rated system deviation.

Method of Measurement:



a) Connect the equipment as illustrated.
b) Adjust the transmitter per the manufacturer's procedure for full rated system deviation.
c) Set the test receiver to measure peak positive deviation. Set the audio bandwidth for ≤0.25 Hz to ≥15,000 Hz. Turn the de-emphasis function off.
d) 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.
e) Increase the level from the audio frequency generator by 20 dB in one step (rise time between the 10% and 90% points shall be 0.1 second maximum).
f) Measure both the instantaneous and steady-state deviation at and after the time of increasing the audio input level.
g) 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.
h) Set the test receiver to measure peak negative deviation and repeat steps d) through g).
i) The values recorded in steps g) and h) are the modulation limiting.

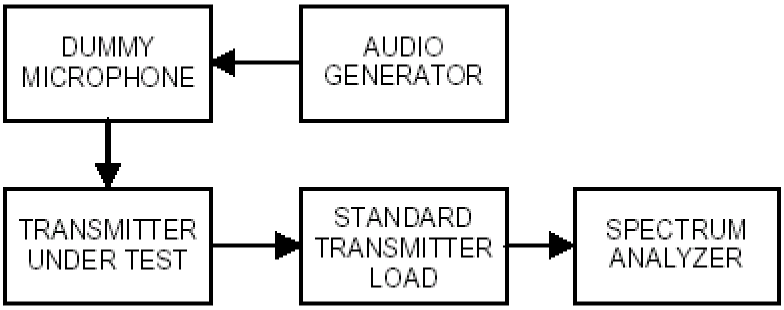
5.6 Occupied Bandwidth : §2.1049 & § 95.635(b)(1)(3)(7)

Test Procedure : ANSI/TIA/EIA-603-2002, Section 2.2.11

Definition:

The transmitter sideband spectrum denotes the sideband power produced at a discrete frequency separation from the carrier up to the test bandwidth due to all sources of unwanted noise within the transmitter in a modulated condition.

Method of Measurement:



a) Connect the equipment as illustrated. Use the table 16 to determine the spectrum analyzer resolution bandwidth:
b) Adjust the spectrum analyzer for the following settings:
 1) Resolution Bandwidth per the above table.
 2) Video Bandwidth at least 10 times the resolution bandwidth.
 3) Sweep Speed slow enough to maintain measurement calibration.
 4) Detector Mode = Positive Peak.
 5) Span that will allow proper viewing of the test bandwidth (see 1.3.4.4).
c) Set the center frequency of the spectrum analyzer to the assigned transmitter frequency. Key the transmitter, and set the level of the unmodulated carrier to a full scale reference line. This is the 0 dB reference for the measurement.
d) Modulate the transmitter with a 2500 Hz sine wave at an input level 16 dB greater than that necessary to produce 50% of rated system deviation. The input level shall be established at the frequency of maximum response of the audio modulating circuit. Transmitters employing digital modulation techniques that bypass the limiter and the audio low-pass filter shall be modulated as specified by the manufacturer.
e) Record the resulting spectrum analyzer presentation of the emission level with an on-line recording device or in a photograph. It is recommended that the emission limit (as given in 3.2.11) be drawn on the plotted graph or photograph. The spectrum analyzer presentation is the sideband spectrum attenuation.

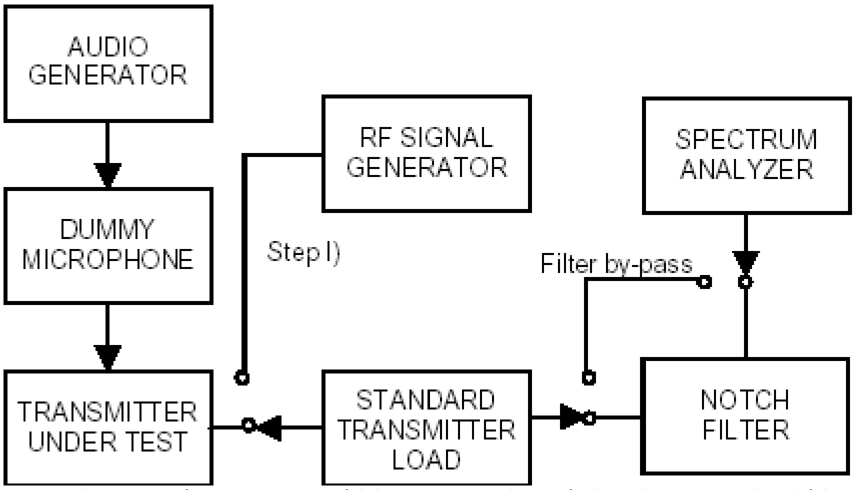
5.7 Spurious and Harmonic Emissions at Antenna Terminal : §2.1051

Test Procedure : ANSI/TIA/EIA-603-2002, Section 2.2.13

Definition:

Conducted spurious emissions are emissions at the antenna terminals on a frequency or frequencies that are outside a band sufficient to ensure transmission of information of required quality for the class of communication desired.

Method of Measurement:



a) Connect the equipment as illustrated, with the notch filter by-passed.
b) Set the center frequency of the spectrum analyzer to the assigned transmitter frequency, key the transmitter, and set the level of the carrier to the full scale reference line.
c) Modulate the transmitter with a 2500 Hz sine wave at an input level 16 dB greater than that necessary to produce 50% of rated system deviation. The input level shall be established at the frequency of maximum response of the audio modulating circuit.
d) Adjust the spectrum analyzer for the following settings:
  1) Resolution Bandwidth = 10 kHz for spurious emissions below 1 GHz, and 1 MHz for spurious emissions above 1 GHz.
  2) Video Bandwidth ≥ 3 times the resolution bandwidth.
  3) Sweep Speed ≤ 2000 Hz per second.
  4) Detector Mode = mean or average power.
e) Adjust the center frequency of the spectrum analyzer for incremental coverage of the range from:
  1) The lowest radio frequency generated in the equipment to the carrier frequency minus the test bandwidth (see 1.3.4.4).
  2) The carrier frequency plus the test bandwidth to a frequency less than 2 times the carrier frequency.
f) Record the frequencies and levels of spurious emissions from step e).
g) Unkey the transmitter. Replace the transmitter under test with the signal generator and adjust the signal level to reproduce the frequencies and levels of every spurious emission recorded in step f). Record the signal generator levels in dBm.
h) Insert the notch filter.
i) Adjust the spectrum analyzer for the following settings:
  1) Resolution Bandwidth = 10 kHz for spurious emissions below 1 GHz, and 1 MHz for spurious emissions above 1 GHz.
  2) Video Bandwidth ≥ 3 times the resolution bandwidth.
  3) Sweep Speed ≤ 2000 Hz per second.
  4) Detector Mode = mean or average power.
j) Key the transmitter. Adjust the center frequency of the spectrum analyzer for incremental coverage of the range from a frequency equal to 2 times the carrier frequency and to the tenth harmonic of the carrier frequency.
k) Record the frequencies and levels of spurious emissions from step j).

l) Unkey the transmitter. Replace the transmitter under test with the signal generator and adjust the signal level to reproduce the frequencies and levels of every spurious emission recorded in step k). Record the signal generator levels in dBm.

m) The levels recorded in steps g) and l) are the absolute levels of conducted spurious emissions in dBm. The conducted spurious attenuation can be calculated by the following:

Spurious attenuation (dB) = $10\ \log_{10}\left(\frac{TX\ power\ in\ watts}{0.001}\right) - the\ levels\ in\ steps\ g)\ and\ l)$

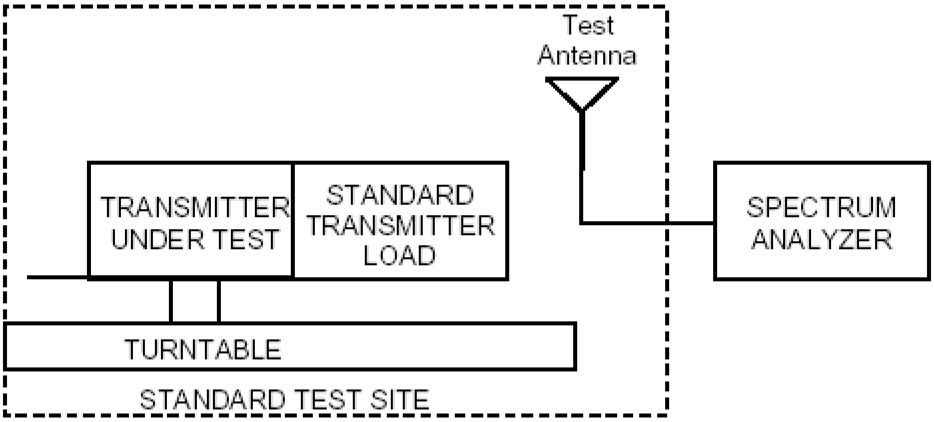
5.8 Radiated Spurious and Harmonic Emissions : §2.1053

Test Procedure : ANSI/TIA/EIA-603-2002, Section 2.2.12

Definition:

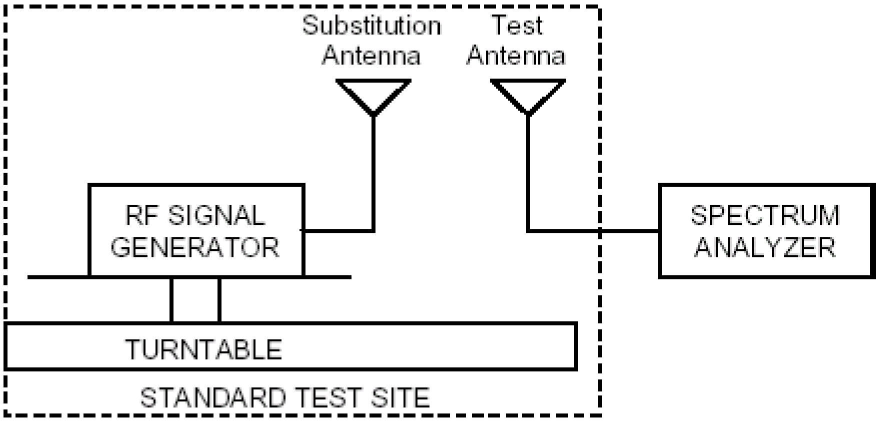
Radiated spurious emissions are emissions from the equipment when transmitting into a nonradiating load on a frequency or frequencies that are outside an occupied band sufficient to ensure transmission of information of required quality for the class of communications desired.

Method of Measurement: (Non-Radiating Load)



a) Connect the equipment as illustrated.
b) Adjust the spectrum analyzer for the following settings:
  1) Resolution Bandwidth = 10 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.
c) Place the transmitter to be tested on the turntable in the standard test site, or an FCC listed site compliant with ANSI C63.4-2001 clause 5.4. The transmitter is transmitting into a nonradiating load that is placed on the turntable. The RF cable to this load should be of minimum length. For transmitters with integral antennas, the tests are to be run with the unit operating into the integral antenna.
d) For each spurious measurement the test antenna should be adjusted to the correct length for the frequency involved. This length may be determined from a calibration ruler supplied with the equipment. Measurements shall be made from the lowest radio frequency generated in the equipment to the tenth harmonic of the carrier, except for the region close to the carrier equal to ± the test bandwidth (see 1.3.4.4).
e) Key the transmitter.
f) For each spurious frequency, raise and lower the test antenna from 1 m to 4 m to obtain a maximum reading on the spectrum analyzer with the test antenna at horizontal polarity. Then the turntable should be rotated 360° to determine the maximum reading. Repeat this procedure to obtain the highest possible reading. Record this maximum reading.

g) Repeat step f) for each spurious frequency with the test antenna polarized vertically.



h) Reconnect the equipment as illustrated.
i) Keep the spectrum analyzer adjusted as in step b).
j) Remove the transmitter and replace it with a substitution antenna (the antenna should be half-wavelength for each frequency involved). The center of the substitution antenna should be approximately at the same location as the center of the transmitter. At the lower frequencies, where the substitution antenna is very long, this will be impossible to achieve when the antenna is polarized vertically. In such case the lower end of the antenna should be 0.3 m above the ground.
k) Feed the substitution antenna at the transmitter end with a signal generator connected to the antenna by means of a nonradiating cable. With the antennas at both ends horizontally polarized, and with the signal generator tuned to a particular spurious frequency, raise and lower the test antenna to obtain a maximum reading at the spectrum analyzer. Adjust the level of the signal generator output until the previously recorded maximum reading for this set of conditions is obtained. This should be done carefully repeating the adjustment of the test antenna and generator output.
l) Repeat step k) with both antennas vertically polarized for each spurious frequency.
m) Calculate power in dBm into a reference ideal half-wave dipole antenna by reducing the readings obtained in steps k) and l) by the power loss in the cable between the generator and the antenna, and further corrected for the gain of the substitution antenna used relative to an ideal half-wave dipole antenna by the following formula:

_Pd_(dBm) = _Pg_(dBm) – _cable loss_ (dB) + _antenna gain_ (dB)

where:
_Pd_ is the dipole equivalent power and
_Pg_ is the generator output power into the substitution antenna.

n) The _Pd_ levels record in step m) are the absolute levels of radiated spurious emissions in dBm. The radiated spurious emissions in dB can be calculated by the following:

Radiated spurious emissions (dB) = $10\log_{10}\left(\frac{TX\ power\ in\ watts}{0.001}\right) - the\ levels\ in\ step\ m)$

NOTE: It is permissible to use other antennas provided they can be referenced to a dipole.

5.9 Frequency Stability / Temperature Variation - §2.1055(a)(b)

The carrier frequency stability is the ability of the transmitter to maintain an assigned carrier frequency.

The frequency stability of the transmitter is measured by:

a) **Temperature:** The temperature is varied from -30°C to +50°C using an environmental chamber.

b) **Primary Supply Voltage:** The primary supply voltage is varied from 85% to 115% of the voltage normally at the input to the device or at the power supply terminals if cables are not normally supplied.

Specification **-** The minimum frequency stability shall be +/- 1.5ppm for base station or Fixed station at any time during normal operation.

Time Period and Procedure:

1. The carrier frequency of the transmitter and the individual oscillators is measured at room temperature (25°C to 27°C to provide a reference).
2. The equipment is subjected to an overnight "soak" at -30˜°C without any power applied.
3. After the overnight "soak" at -30˜°C (usually 14-16 hours), the equipment is turned on in a "standby" condition for one minute before applying power to the transmitter. Measurement of the carrier frequency of the transmitter and the individual oscillators is made within a three minute interval after applying power to the transmitter.
4. Frequency measurements is made at 1˜°C interval up to room temperature. At least a period of one and one half hour is provided to allow stabilization of the equipment at each temperature level.
5. Again the transmitter carrier frequency and the individual oscillators is measured at room temperature to begin measurement of the upper temperature levels.
6. Frequency were made at 10 intervals starting at -30˜°C up to +50˜°C allowing at least two hours at each temperature for stabilization. In all measurements the frequency is measured within three minutes after applying power to the transmitter.
7. The artificial load is mounted external to the temperature chamber.

Note: The EUT is tested down to the battery endpoint for battery operated equipment.

6. TEST RESULTS

6.1 Summary of Test Results

The measurement results were obtained with the EUT tested in the conditions described in this
report. Detailed measurement data and plots showing the maximum emission of the EUT are reported.

FCC Rules Section	Description	Test Result
Part 2.1046	RF Power Output - Conducted Power Output	☒ Pass ☐ Fail
Part 95.639(d)	RF Power Output - Radiated Power Output	☒ Pass ☐ Fail
Part 2.1047(a)	Transmitter Audio Frequency Response	☒ Pass ☐ Fail
Part 2.1047(a), 95.637(b)	Audio Low Pass Filter Response	☒ Pass ☐ Fail
Part 2.1047(b)	Modulation Limiting	☒ Pass ☐ Fail
Part 2.1049	Occupied Bandwidth	☒ Pass ☐ Fail
Part 2.1051	Spurious Emission at Antenna Terminal	☒ Pass ☐ Fail
Part 2.1053	Field Strength of Spurious Emission	☒ Pass ☐ Fail
Part 2.1055(a)(b)	Frequency Stability	☒ Pass ☐ Fail

The data collected shows that the **SayU Co., Ltd. GMRS/FRS Combination , Dico XA1500** complies with technical requirements of the FCC Rule Part 2.947 and Part 95 related technical specification.

6.2 Modification to EUT

The device tested is not modified anything, mechanical or circuits to improve EMI status during a measurement. No EMI suppression device(s) was added and/or modified during testing.

7. TEST DATA

7.1 RF Power Output – Conducted Power Output Measurement

7.1.1 Test Condition

Test Standard	: FCC Part 2.1046
Operating Frequency(MHz)	: All
Channel	: Channel 01 ~ Channel 22
RF Power Output (Watts)	: 0.5 Watt, 1 Watt
Temperature/Humidity	: 25.2°C , 60%
Test By	: Choi, Chang-Young

7.1.2 Test Result

Channel	Cross Reference	Frequency (MHz)	Low Power (mW)	High Power (mW)
1	GMRS & FRS 1	462.5625	489.8	736.2
2	GMRS & FRS 2	462.5875	489.8	736.2
3	GMRS & FRS 3	462.6125	481.9	707.9
4	GMRS & FRS 4	462.6375	481.9	707.9
5	GMRS & FRS 5	462.6625	481.9	707.9
6	GMRS & FRS 6	462.6875	481.9	707.9
7	GMRS & FRS 7	462.7125	481.9	707.9
8	FRS 8	467.5625	446.7	-
9	FRS 9	467.5875	446.7	-
10	FRS 10	467.6125	446.7	-
11	FRS 11	467.6375	446.7	-
12	FRS 12	467.6625	446.7	-
13	FRS 13	467.6875	446.7	-
14	FRS 14	467.7125	446.7	-
15	GMRS 11	462.5500	489.8	736.2
16	GMRS 8	462.5750	489.8	736.2
17	GMRS 12	462.6000	489.8	736.2
18	GMRS 9	462.6250	489.8	736.2
19	GMRS 13	462.6500	489.8	736.2
20	GMRS 10	462.6750	489.8	736.2
21	GMRS 14	462.7000	489.8	736.2
22	GMRS 15	462.7250	489.8	736.2

7.2 RF Power Output – Radiated Power Output Measurement

7.2.1 Test Condition

Test Standard	:	FCC Part 2.1046 & 95.639(a)1,(d)
Operating Frequency(MHz)	:	Channel 7 / 462.7125 MHz / 30 dBm
		Channel 14 / 467.7125 MHz / 27 dBm
		Channel 15 / 462.5500 MHz / 30 dBm
Temperature/Humidity	:	25.2˚C , 60%
Test By	:	Choi, Chang-Young

7.2.2 Test Result

Test Condition	Measured Output Power (dBm)	
	Low Power	High Power
462.7125 MHz	26.7	28.3
467.7125 MHz	26.6	-
462.5500 MHz	26.9	28.5

7.2.3 Limit

Method	Measured Output Power (W)
FRS	0.5
GMRS	50

7.3 Transmitter Audio Frequency Response Measurement

7.3.1 Test Condition

Test Standard	: FCC Part 2.1047(a)
Operating Frequency(MHz)	: Channel 7 / 462.7125 MHz / 1 Watt Channel 14 / 467.7125 MHz / 0.5 Watt Channel 15 / 462.5500 MHz / 1 Watt
Temperature/Humidity	: 25.2˚C , 60%
Test By	: Choi, Chang-Young

7.3.2 Test Result (Channel 7)

Audio Frequency (Hz)	Attenuation (dB)	Audio Frequency (Hz)	Attenuation (dB)	Audio Frequency (Hz)	Attenuation (dB)
100	-24.5	1800	4.6	3500	1.7
200	-17	1900	4.8	3600	1.1
300	-10.4	2000	4.9	3700	-0.1
400	-8.3	2100	5.0	3700	-0.7
500	-6.1	2200	5.1	3900	-1.5
600	-4.5	2300	5.2	4000	-2.2
700	-2.8	2400	5.3	4100	-2.5
800	-1.9	2500	5.5	4200	-3.0
900	-0.6	2600	5.5	4300	-3.6
1000	0	2700	5.4	4400	-4.1
1100	1.2	2800	5.2	4500	-4.6
1200	1.9	2900	5.2	4600	-5.0
1300	2.5	3000	5.1	4700	-5.5
1400	3.1	3100	4.8	4800	-6.1
1500	3.6	3200	4.0	4900	-6.6
1600	4.0	3300	3.4	5000	-7.0
1700	4.3	3400	2.5		

7.3.3 Test Result (Channel 14)

Audio Frequency (Hz)	Attenuation (dB)	Audio Frequency (Hz)	Attenuation (dB)	Audio Frequency (Hz)	Attenuation (dB)
100	-24.8	1800	4.3	3500	1.3
200	-19.6	1900	4.4	3600	0.1
300	-12.6	2000	4.6	3700	-1.0
400	-9.4	2100	4.8	3700	-1.9
500	-7.2	2200	5.0	3900	-2.8
600	-4.8	2300	5.3	4000	-3.5
700	-3.4	2400	5.4	4100	-4.1
800	-2.3	2500	5.5	4200	-4.9
900	-1.1	2600	5.4	4300	-5.6
1000	0	2700	5.3	4400	-6.3
1100	0.7	2800	5.3	4500	-7.0
1200	1.4	2900	5.2	4600	-7.8
1300	2.1	3000	5.2	4700	-8.5
1400	2.7	3100	4.6	4800	-7.4
1500	3.3	3200	4.0	4900	-10.0
1600	3.6	3300	3.2	5000	-10.6
1700	4.1	3400	2.3		

7.3.4 Test Result (Channel 15)

Audio Frequency (Hz)	Attenuation (dB)	Audio Frequency (Hz)	Attenuation (dB)	Audio Frequency (Hz)	Attenuation (dB)
100	-24.3	1800	4.2	3500	0.8
200	-20.0	1900	4.5	3600	-0.3
300	-11.4	2000	4.7	3700	-1.2
400	-8.9	2100	4.9	3700	-1.8
500	-6.8	2200	5.1	3900	-2.4
600	-4.5	2300	5.3	4000	-2.9
700	-3.8	2400	5.5	4100	-3.3
800	-2.0	2500	5.7	4200	-3.8
900	-0.8	2600	5.6	4300	-4.3
1000	0	2700	5.4	4400	-4.8
1100	0.4	2800	5.4	4500	-5.3
1200	1.0	2900	5.3	4600	-6.0
1300	1.9	3000	5.3	4700	-6.8
1400	2.5	3100	5.0	4800	-7.5
1500	2.8	3200	3.9	4900	-8.1
1600	3.6	3300	2.5	5000	-9.1
1700	4.0	3400	1.7		

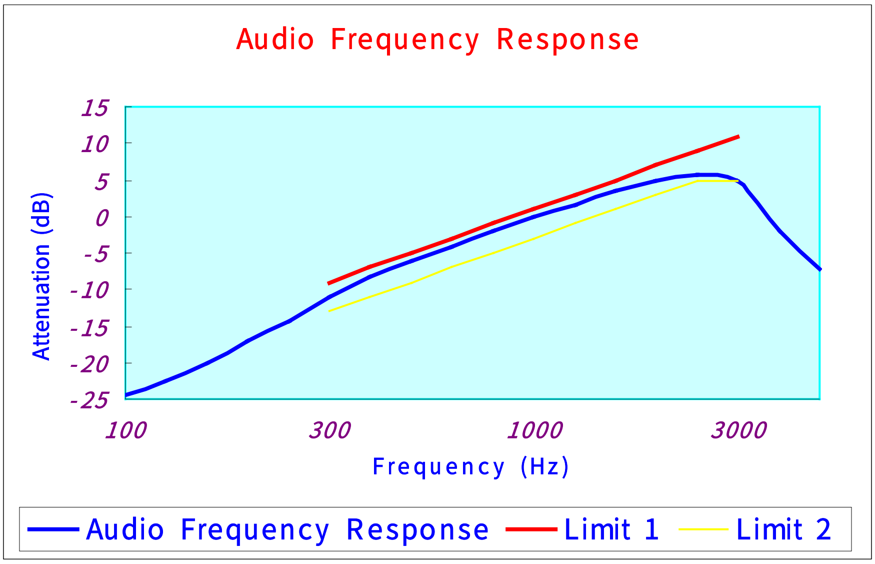
7.3.5 Graph

Audio Frequency Response Graph

Channel 7

462.7125 MHz

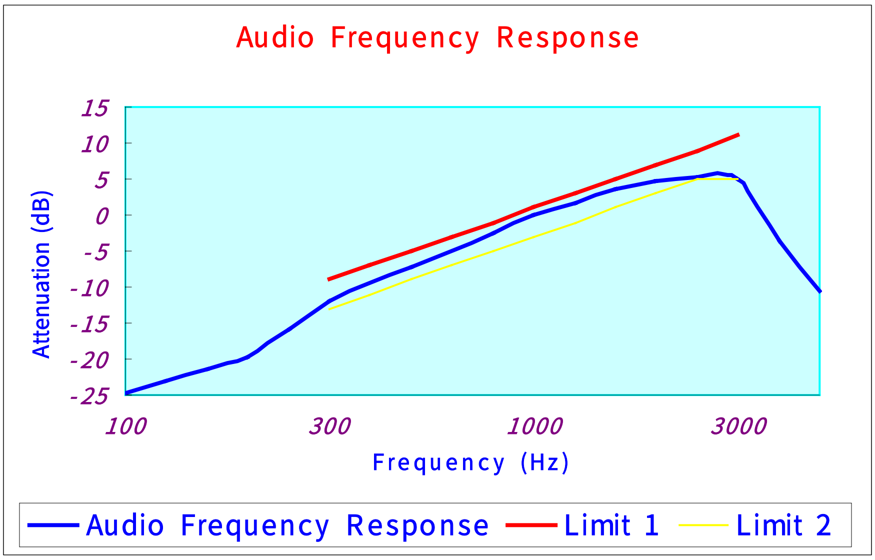
1 Watt



Channel 14

467.7125 MHz

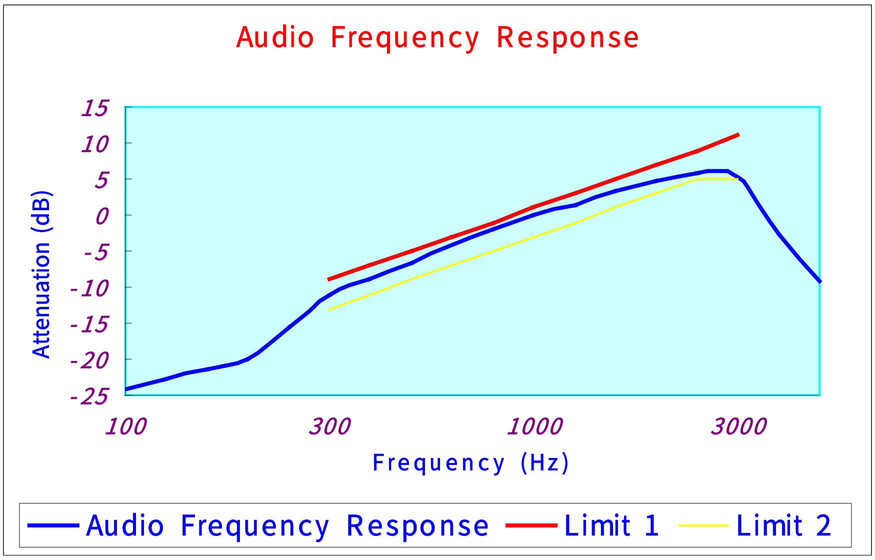
0.5 Watt



Channel 15

462.5500 MHz

1 Watt



7.4 Audio Low Pass Filter Response Measurement

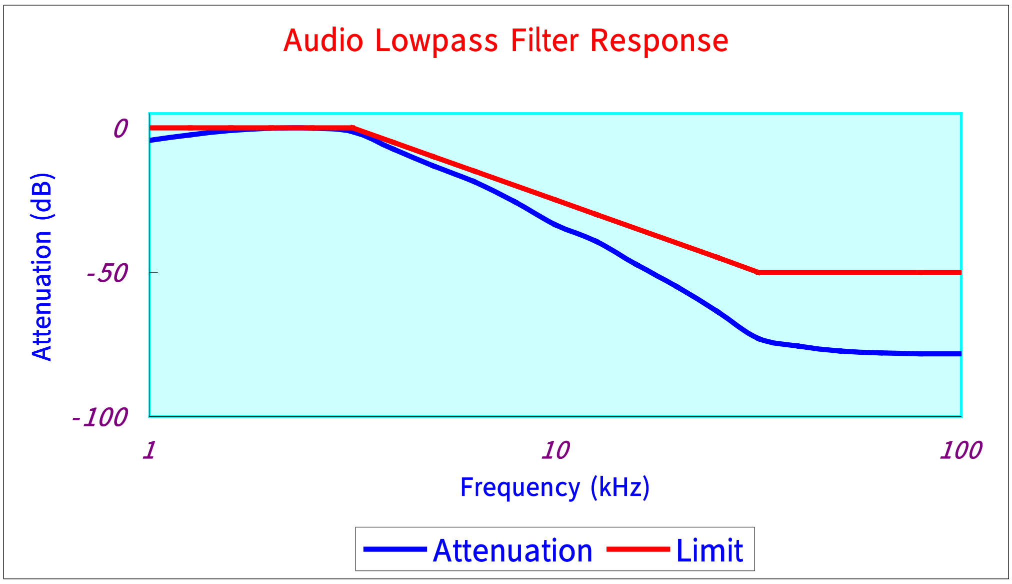
7.4.1 Test Condition

Test Standard	: FCC Part 2.1047(a) & 95.637(b)
Temperature/Humidity	: 25.2˚C , 60%
Test By	: Choi, Chang-Young

7.4.2 Test Result

Audio Frequency (Hz)	Attenuation (dB)	Audio Frequency (Hz)	Attenuation (dB)	Audio Frequency (Hz)	Attenuation (dB)
1000	-4.3	2700	-0.4	20000	-55.1
1100	-3.6	2800	-0.5	25000	-63.5
1200	-2.8	2900	-0.6	30000	-71.8
1300	-2.1	3000	-0.8	35000	-75.0
1400	-1.6	3100	-1.1	40000	-75.6
1500	-1.1	3200	-1.3	45000	-76.8
1600	-0.6	3300	-1.7	50000	-77.2
1700	-0.5	3400	-2.2	55000	-77.4
1800	-0.3	3500	-2.9	60000	-77.8
1900	-0.1	4000	-7.4	65000	-77.9
2000	-0.1	5000	-13.1	70000	-78.0
2100	0	6000	-17.4	75000	-78.1
2200	0	7000	-21.4	80000	-78.2
2300	0	8000	-25.4	85000	-78.2
2400	0	9000	-30.9	90000	-78.2
2500	-0.1	10000	-33.6	95000	-78.2
2600	-0.1	15000	-47.0	100000	-78.3

7.4.3 Plot



7.5 Modulation Limiting Measurement

7.5.1 Test Condition

Test Standard	:	FCC Part 2.1047(b)
Operating Frequency(MHz)	:	Channel 7 / 462.7125 MHz / 1 Watt Channel 14 / 467.7125 MHz / 0.5 Watt Channel 15 / 462.5500 MHz / 1 Watt
Temperature/Humidity	:	25.2˚C , 60%
Test By	:	Choi, Chang-Young

7.5.2 Test Result (Channel 7)

Audio Input Level(dBmV)	Positive Peak Deviation (kHz)			Negative Peak Deviation (kHz)		
	300 Hz	1 kHz	3 kHz	300 Hz	1 kHz	3 kHz
-60	0.32	0.35	0.54	0.31	0.34	0.49
-55	0.33	0.42	0.76	0.31	0.46	0.63
-50	0.33	0.60	0.98	0.33	0.66	0.76
-45	0.34	0.80	1.11	0.33	0.98	0.81
-40	0.41	0.91	1.27	0.38	1.28	0.89
-35	0.54	1.10	1.42	0.48	1.58	0.96
-30	0.86	1.40	1.57	0.66	1.87	0.99
-25	1.03	1.64	1.64	0.89	2.05	1.03
-20	1.20	1.71	1.65	1.28	2.16	1.12
-15	1.76	1.74	1.71	1.58	2.27	1.24
-10	2.00	1.78	1.74	1.59	2.41	1.39
-5	2.17	1.86	1.64	1.44	2.46	1.41
0	2.22	1.95	1.41	1.22	1.65	1.49
5	2.31	2.08	1.63	1.01	1.73	1.68
10	2.46	2.26	1.73	1.10	2.10	1.86
15	2.48	2.34	1.80	1.32	2.28	1.88
17	2.44	2.32	1.73	1.15	2.25	1.89

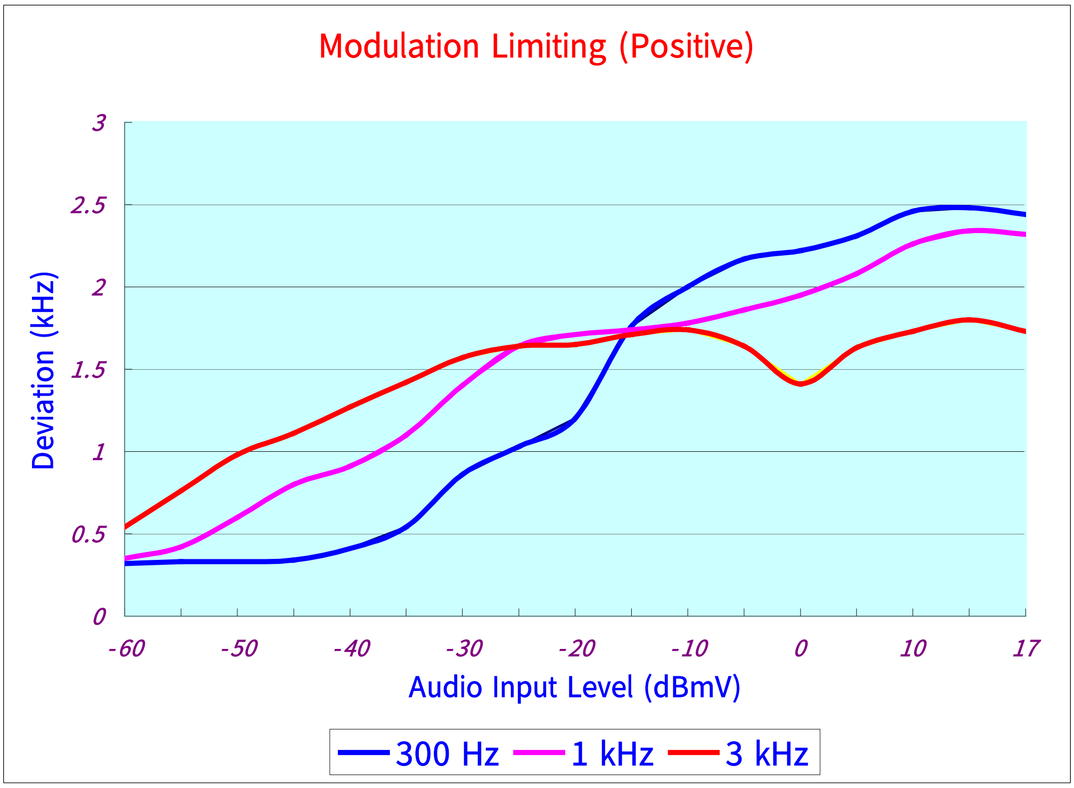
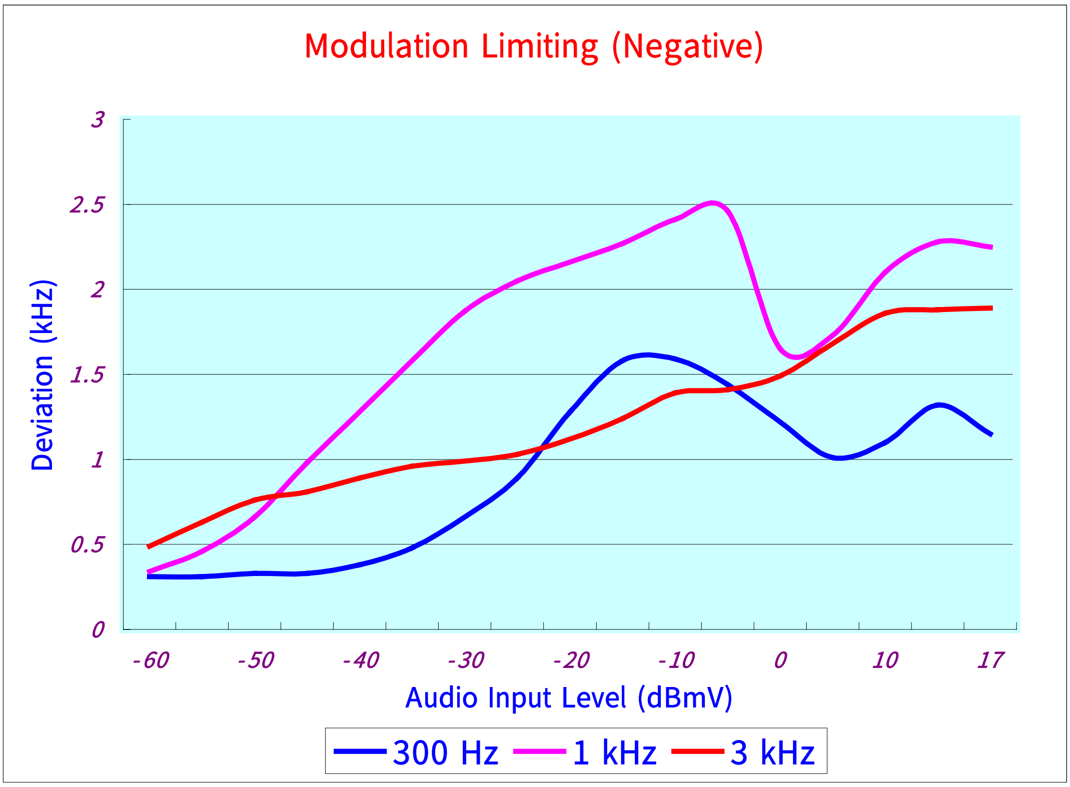
7.5.3 Test Result (Channel 14)

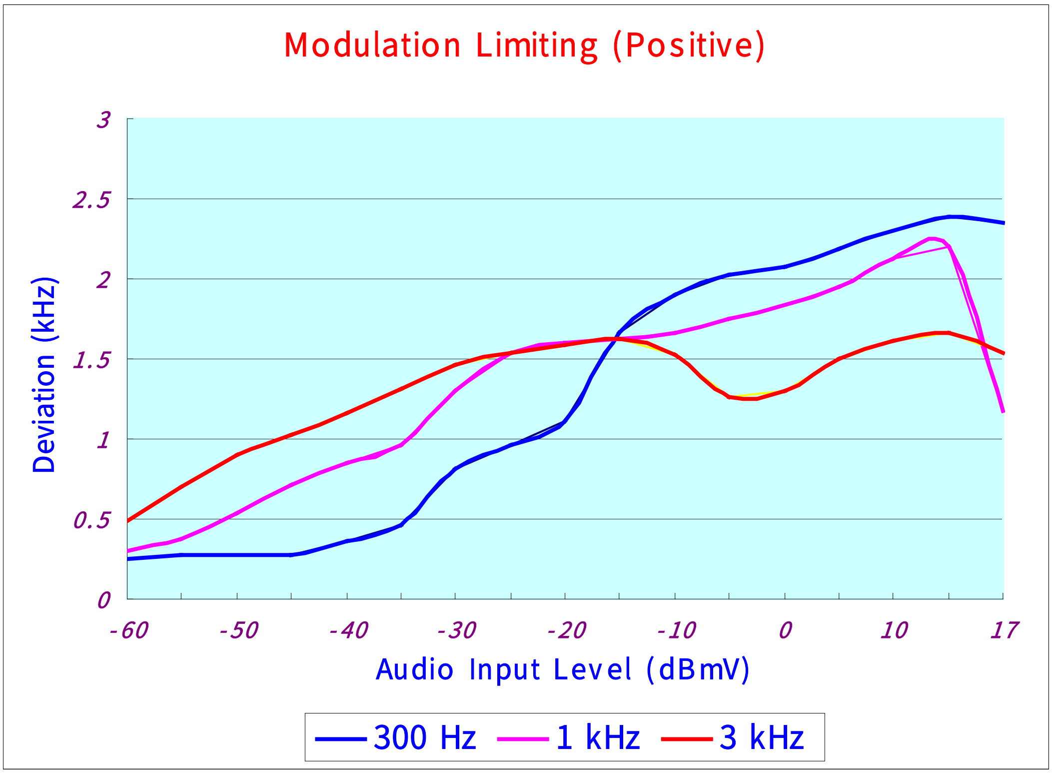
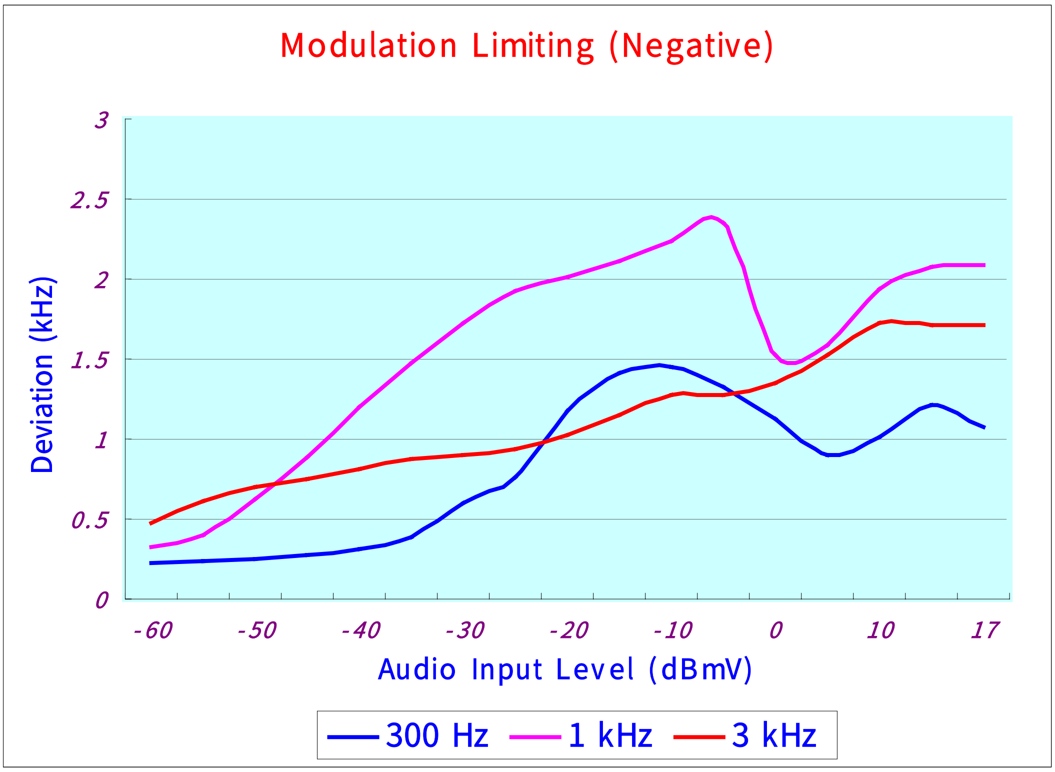
Audio Input Level (dBmV)	Positive Peak Deviation (kHz)			Negative Peak Deviation (kHz)		
	300 Hz	1 kHz	3 kHz	300 Hz	1 kHz	3 kHz
-60	0.25	0.30	0.49	0.23	0.33	0.47
-55	0.27	0.38	0.70	0.24	0.40	0.61
-50	0.27	0.54	0.90	0.25	0.62	0.70
-45	0.28	0.71	1.03	0.27	0.89	0.75
-40	0.36	0.85	1.16	0.31	1.20	0.81
-35	0.46	0.96	1.31	0.39	1.48	0.87
-30	0.81	1.30	1.46	0.60	1.73	0.90
-25	0.96	1.54	1.54	0.76	1.92	0.94
-20	1.11	1.60	1.59	1.18	2.01	1.03
-15	1.66	1.62	1.62	1.41	2.11	1.15
-10	1.90	1.66	1.52	1.45	2.24	1.27
-5	2.03	1.75	1.26	1.33	2.35	1.27
0	2.08	1.84	1.30	1.12	1.53	1.35
5	2.19	1.95	1.50	0.90	1.59	1.53
10	2.30	2.12	1.61	1.01	1.94	1.72
15	2.39	2.20	1.66	1.21	2.08	1.71
17	2.35	1.18	1.54	1.07	2.09	1.71

7.5.4 Test Result (Channel 15)

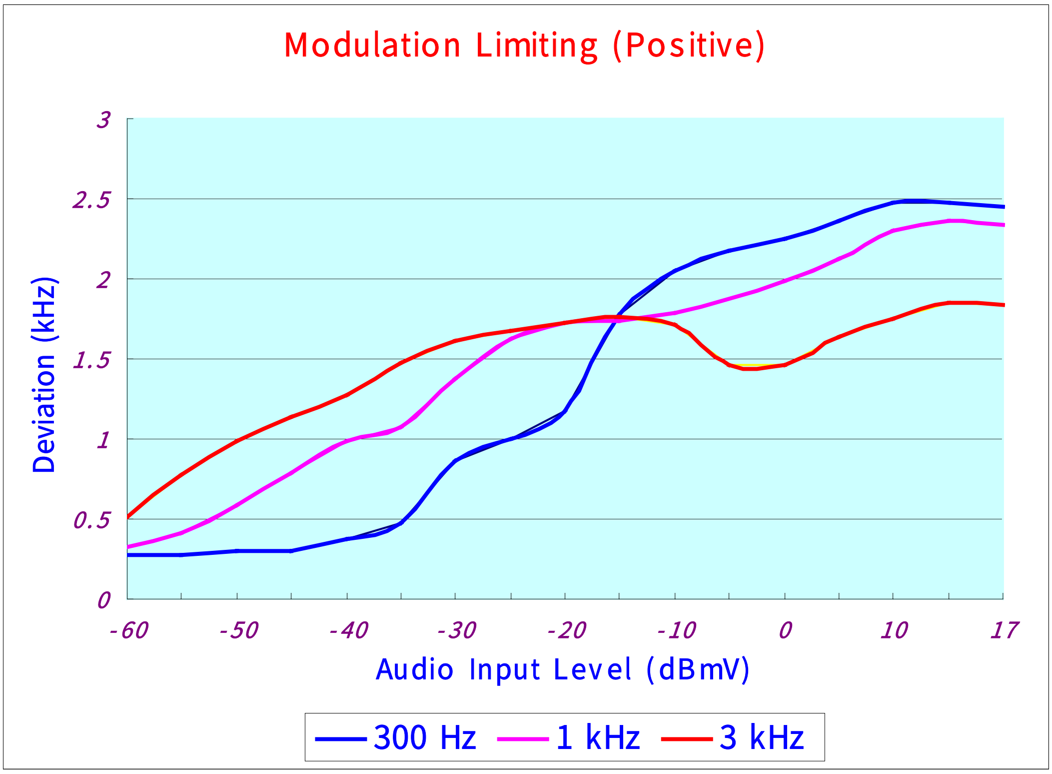
Audio Input Level (dBmV)	Positive Peak Deviation (kHz)			Negative Peak Deviation (kHz)		
	300 Hz	1 kHz	3 kHz	300 Hz	1 kHz	3 kHz
-60	0.27	0.33	0.51	0.25	0.32	0.50
-55	0.28	0.41	0.77	0.26	0.45	0.66
-50	0.30	0.59	0.99	0.27	0.65	0.77
-45	0.30	0.79	1.14	0.30	0.96	0.85
-40	0.38	0.99	1.28	0.32	1.31	0.90
-35	0.47	1.07	1.47	0.45	1.62	0.97
-30	0.86	1.38	1.61	0.67	1.92	1.00
-25	1.00	1.63	1.68	0.84	2.14	1.05
-20	1.18	1.72	1.72	1.31	2.23	1.16
-15	1.77	1.74	1.76	1.54	2.34	1.27
-10	2.05	1.79	1.71	1.56	2.46	1.41
-5	2.17	1.87	1.46	1.42	2.46	1.46
0	2.25	1.99	1.46	1.23	1.84	1.53
5	2.36	2.13	1.64	1.20	1.84	1.73
10	2.48	2.30	1.75	1.08	2.13	1.87
15	2.48	2.36	1.85	1.32	2.28	1.92
17	2.45	2.34	1.84	1.18	2.29	1.95

7.5.5 Graph

Channel 7 / 462.7125 MHz / 1 Watt	
Positive	
Negative	

Channel 14 / 467.7125 MHz / 0.5 Watt	
Positive	
Negative	

fBWS TECH Inc .
294-9 Jungdae-Dong,
Kwanggu-Si,Kyunggi-Do,
464-800, Korea

<table>
<tr><th colspan="2">Channel 15 / 462.5500 MHz / 1 Watt</th></tr>
<tr><td>Positive</td><td>
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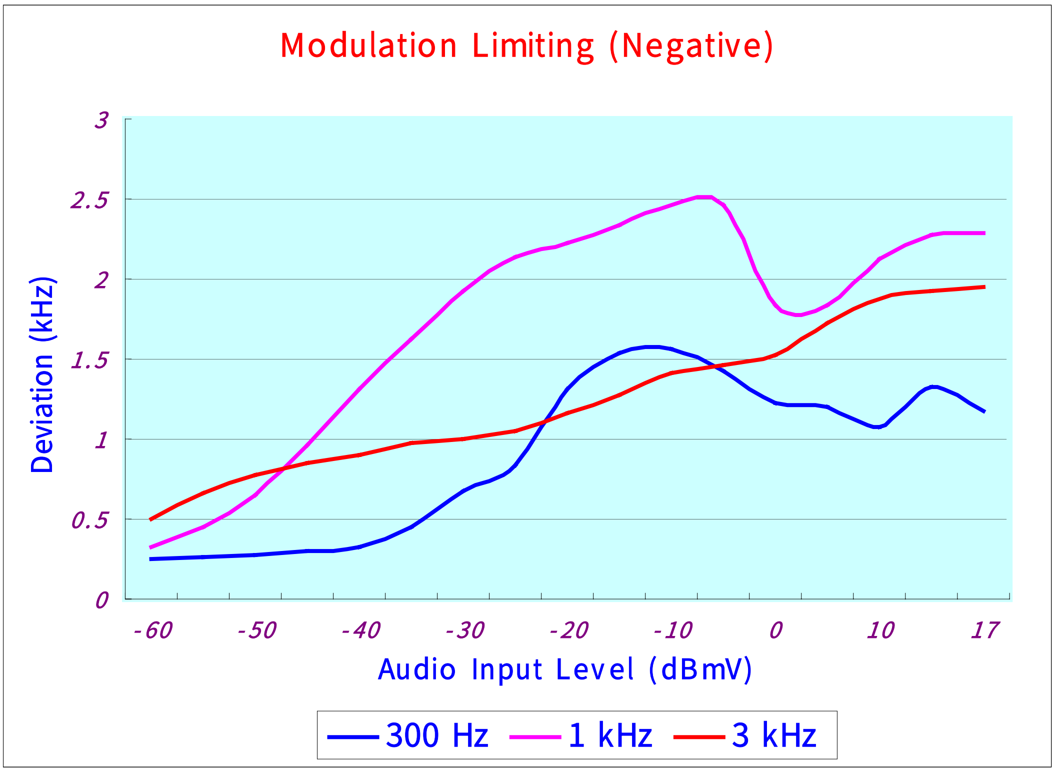
<tr><td>Negative</td><td>
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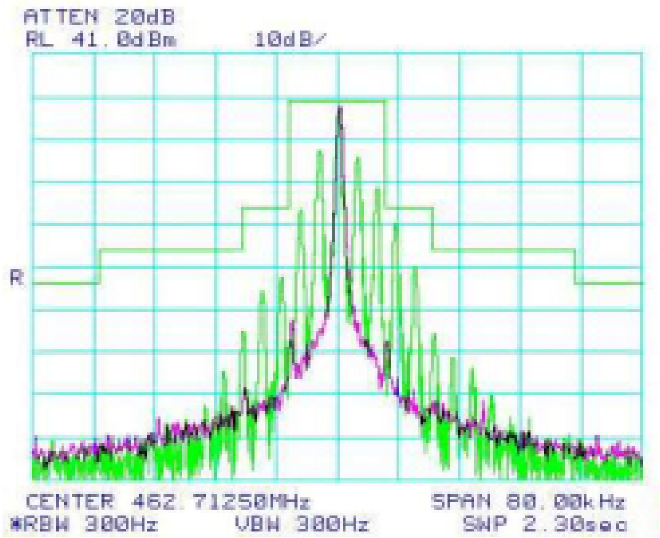
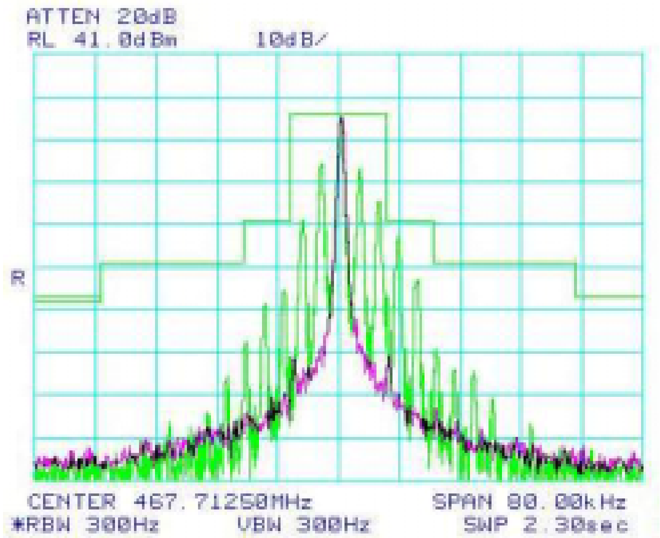
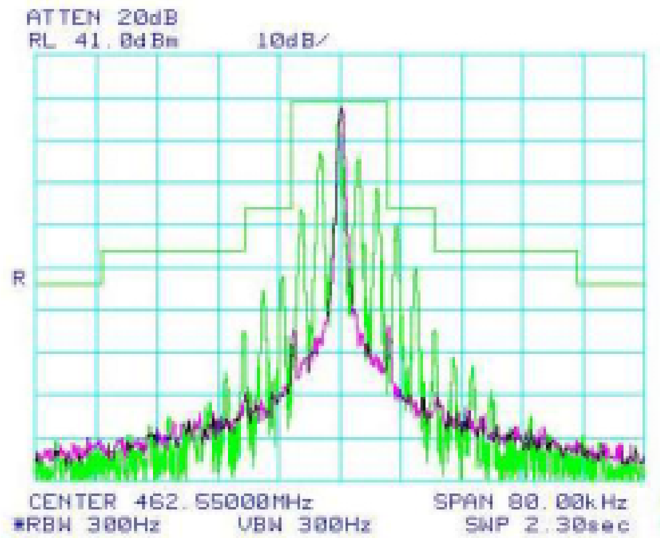
7.6 Occupied Bandwidth Measurement

7.6.1 Test Condition

Test Standard	:	FCC Part 2.1049 & 95.633(a),(c)
Operating Frequency(MHz)	:	Channel 7 / 462.7125 MHz / 1 Watt
		Channel 14 / 467.7125 MHz / 0.5 Watt
		Channel 15 / 462.5500 MHz / 1 Watt
Temperature/Humidity	:	25.2˚C , 60%
Test By	:	Choi, Chang-Young

7.6.2 Test Plot

- Next Page -

Occupied Bandwidth Plot	
Channel 7 **462.7125 MHz** **1 Watt**	
Channel 14 **467.7125 MHz** **0.5 Watt**	
Channel 15 **462.5500 MHz** **1 Watt**	

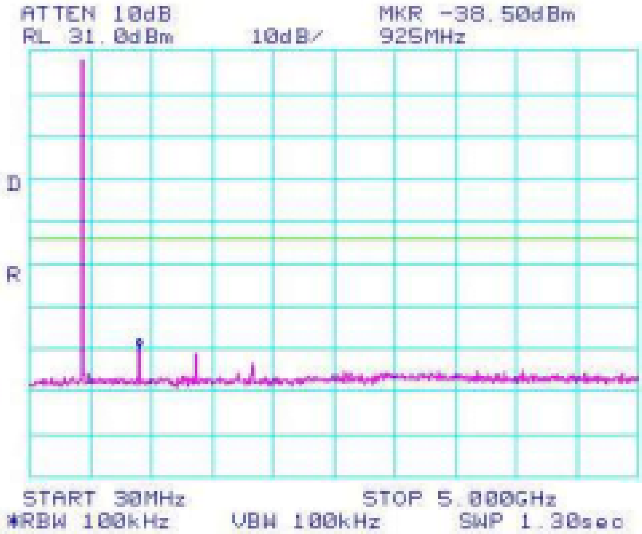
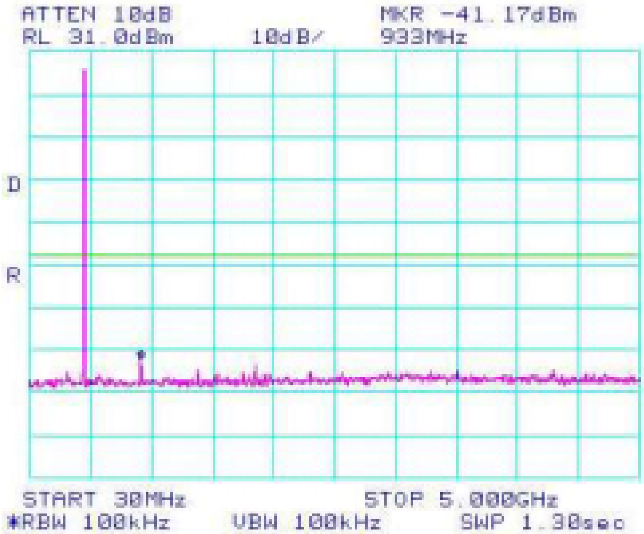
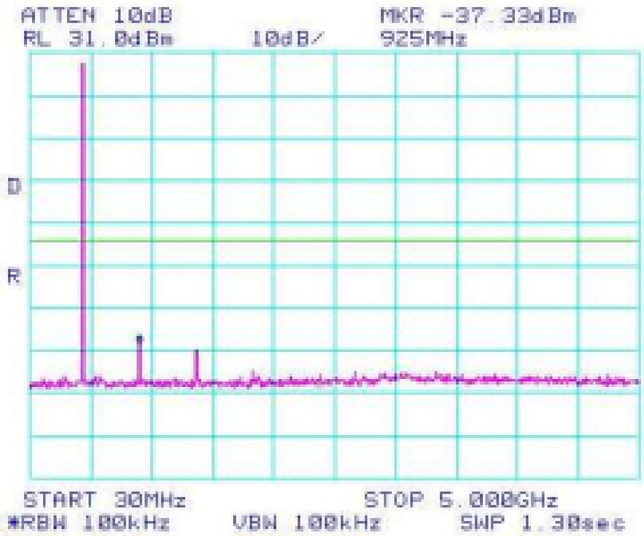
7.7 Spurious Emission at Antenna Terminal

7.7.1 Test Condition

Test Standard	:	FCC Part 2.1051 & 95.635(b)(1),(3),(7)
Operating Frequency(MHz)	:	Channel 7 / 462.7125 MHz / 1 Watt Channel 14 / 467.7125 MHz / 0.5 Watt Channel 15 / 462.5500 MHz / 1 Watt
Temperature/Humidity	:	25.2˚C , 60%
Test By	:	Choi, Chang-Young

7.7.2 Test Plot

- Next Page -

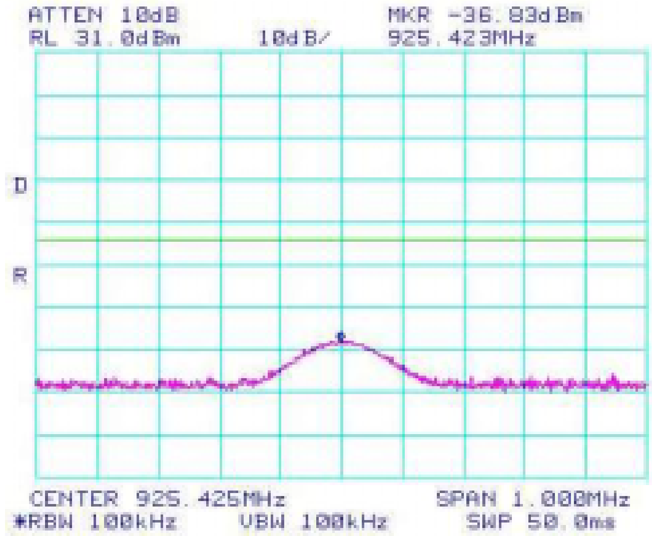
Spurious Emission / Full Scan	
Channel 7 462.7125 MHz 1 Watt	
Channel 14 467.7125 MHz 0.5 Watt	
Channel 15 462.5500 MHz 1 Watt	

Spurious Emission / Channel 7 / 462.7125 MHz

2nd Harmonic

925.4250 MHz

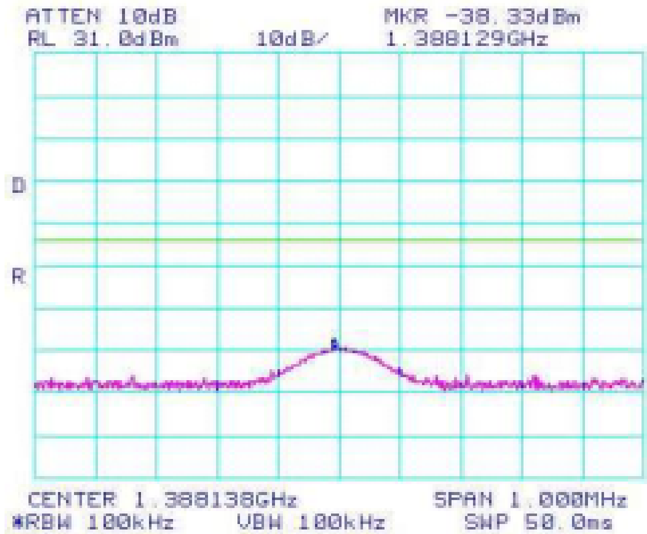
-36.83 dBm



3rd Harmonic

1388.1375 MHz

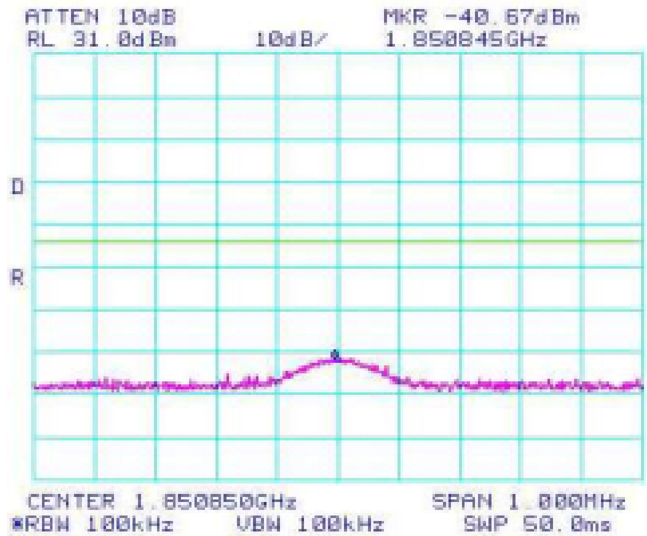
-38.33 dBm



4th Harmonic

1850.8500 MHz

-40.67 dBm



<table>
<tr><th colspan="2">Spurious Emission / Channel 14 / 467.7125 MHz</th></tr>
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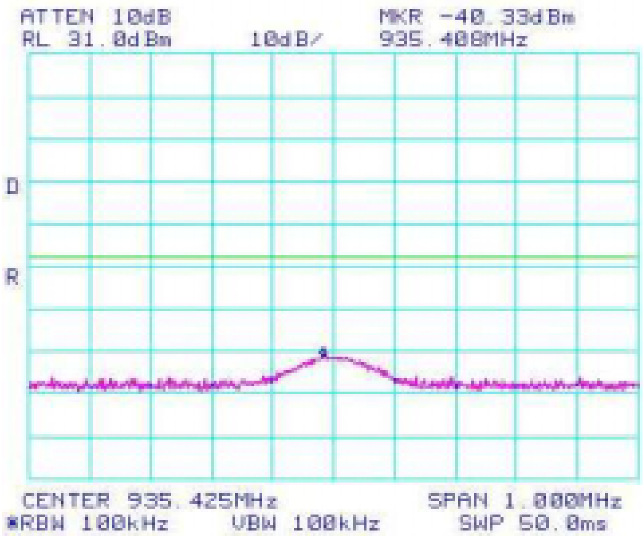
935.4250 MHz
-40.33 dBm</td><td>
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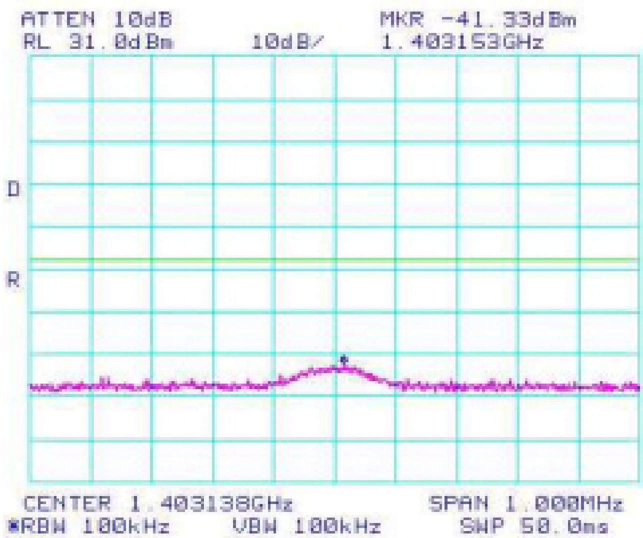
<tr><td>3rd Harmonic
1403.1375 MHz
-41.33 dBm</td><td>
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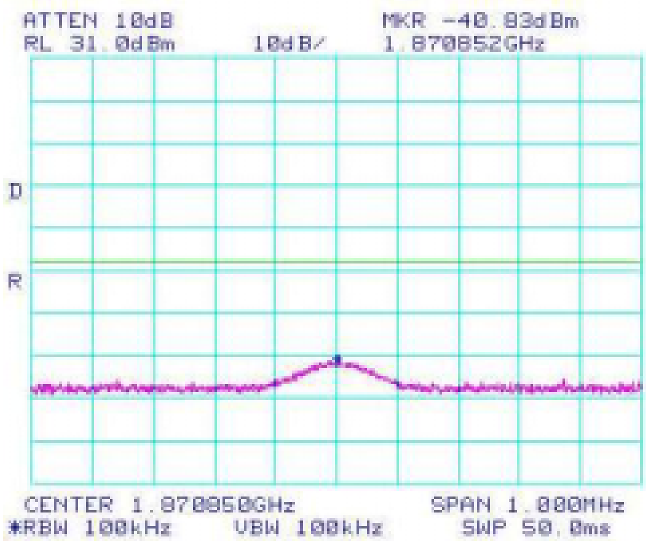
<tr><td>4th Harmonic
1870.8500 MHz
-40.83 dBm</td><td>
</td></tr>
</table>

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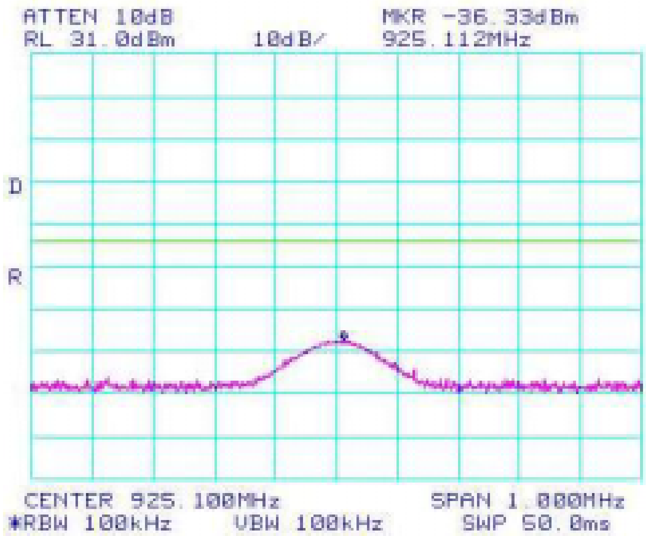
Spurious Emission / Channel 15

2nd Harmonic

925.1000 MHz

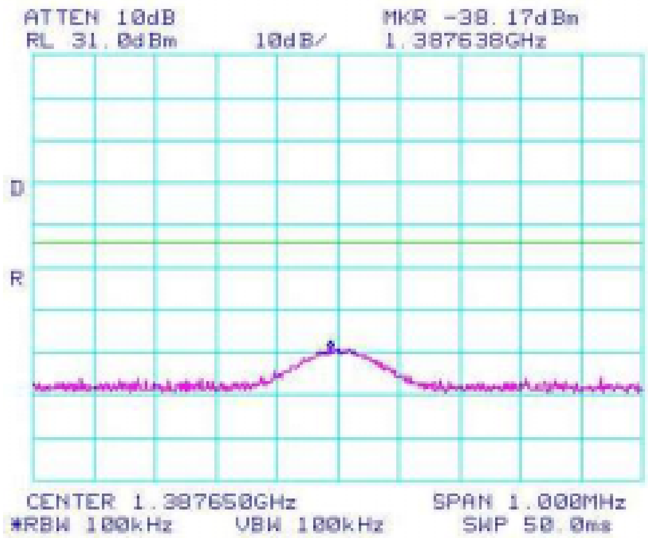
-36.33 dBm



3rd Harmonic

1387.6500 MHz

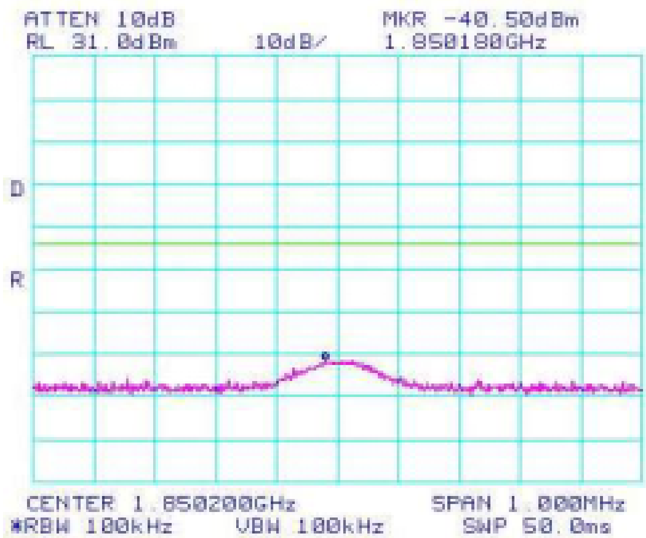
-38.17 dBm



4th Harmonic

1850.2000 MHz

-40.50 dBm



7.8 Field Strength of Spurious Radiation

7.8.1 Test Condition

Test Standard	:	FCC Part 2.1053 & 15.109(a) & 95.635(b)(7)
Operating Frequency(MHz)	:	Channel 7 / 462.7125 MHz / 1 Watt
		Channel 14 / 467.7125 MHz / 0.5 Watt
		Channel 15 / 462.5500 MHz / 1 Watt
Temperature/Humidity	:	25.2˚C , 60%
Test By	:	Choi, Chang-Young

7.8.2 Test Result (Channel 7)

Frequency Tuned (MHz)	Antenna Polarization (V/H)	ERP (dBm)	Limit (dBm)	Margin (dB)
462.7125	H	28.3	-	-
925.4250	H	-37.4	-13.0	-24.5
1388.1375	H	-38.9	-13.0	-25.9
1850.8500	H	-41.9	-13.0	-28.9
2313.5625	-	-	-13.0	-
2776.2750	-	-	-13.0	-
3238.9875	-	-	-13.0	-
3701.7000	-	-	-13.0	-
4164.4125	-	-	-13.0	-
4627.1250	-	-	-13.0	-

7.8.3 Test Result (Channel 14)

Frequency Tuned (MHz)	Antenna Polarization (V/H)	ERP (dBm)	Limit (dBm)	Margin (dB)
467.7125	H	26.6	-	-
935.4250	H	-41.0	-13.0	-28.0
1403.1375	H	-41.7	-13.0	-28.7
1870.8500	H	-41.3	-13.0	-28.3
2338.5625	-	-	-13.0	-
2806.2750	-	-	-13.0	-
3273.9875	-	-	-13.0	-
3741.7000	-	-	-13.0	-
4209.4125	-	-	-13.0	-
4677.1250	-	-	-13.0	-

7.8.4 Test Result (Channel 15)

Frequency Tuned (MHz)	Antenna Polarization (V/H)	ERP (dBm)	Limit (dBm)	Margin (dB)
462.5500	H	28.5	-	-
925.1000	H	-36.5	-13.0	-23.5
1378.6500	H	-39.7	-13.0	-26.7
1850.2000	H	-41.6	-13.0	-28.6
2312.7500	-	-	-13.0	-
2775.3000	-	-	-13.0	-
3237.8500	-	-	-13.0	-
3700.4000	-	-	-13.0	-
4162.9500	-	-	-13.0	-
4652.5000	-	-	-13.0	-

7.9 Frequency Stability

7.9.1 Test Condition

Test Standard	: FCC Part 2.1055 & 95.621 & 95.627
Operating Frequency(MHz)	: Channel 7 / 462.7125 MHz / 1 Watt Channel 14 / 467.7125 MHz / 0.5 Watt Channel 15 / 462.5500 MHz / 1 Watt
Temperature/Humidity	: 25.2˚C , 60%
Test By	: Choi, Chang-Young

7.9.2 Test Result (Channel 7 / 462.7125 MHz)

Voltage (%)	Power Supply (Vdc)	Temperature (°C)	Frequency (Hz)	Deviation (ppm)
100 %	3.700	-30	462711639	-1.86
100 %	3.700	-20	462711647	-1.84
100 %	3.700	-10	462711645	-1.85
100 %	3.700	0	462711633	-1.87
100 %	3.700	+10	462711650	-1.84
100 %	3.700	+20	462711642	-1.85
100 %	3.700	+30	462711644	-1.85
100 %	3.700	+40	462711648	-1.84
100 %	3.700	+50	462711649	-1.84
85 %	3.145	+20	462711632	-1.88
115 %	4.255	+20	462711636	-1.87

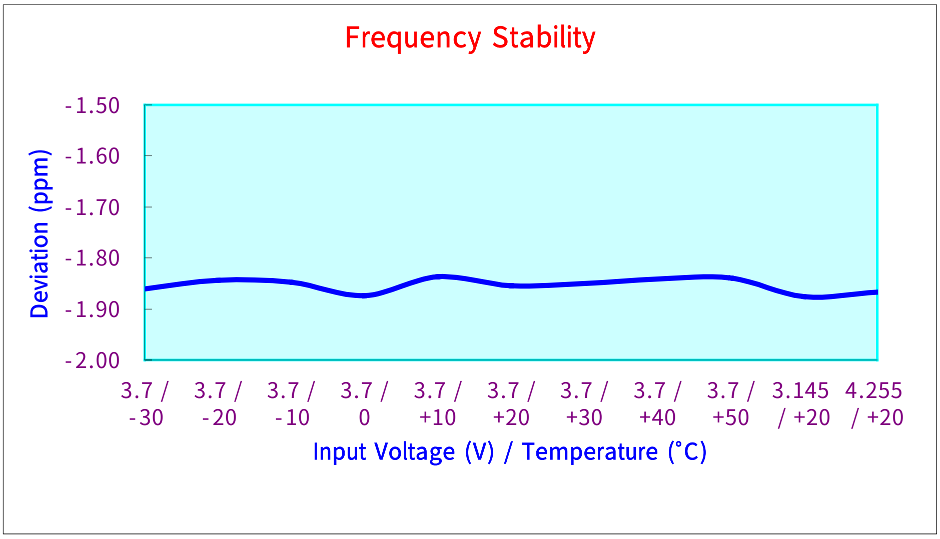
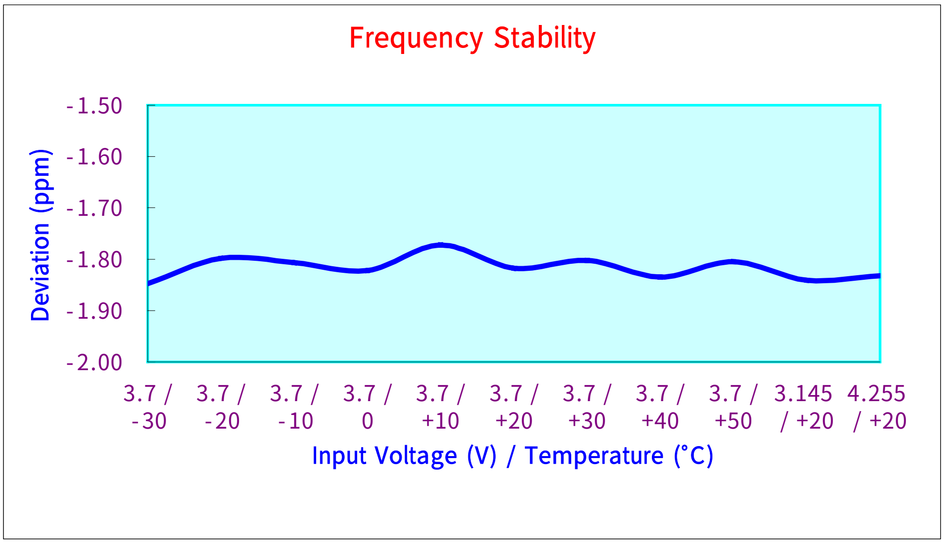
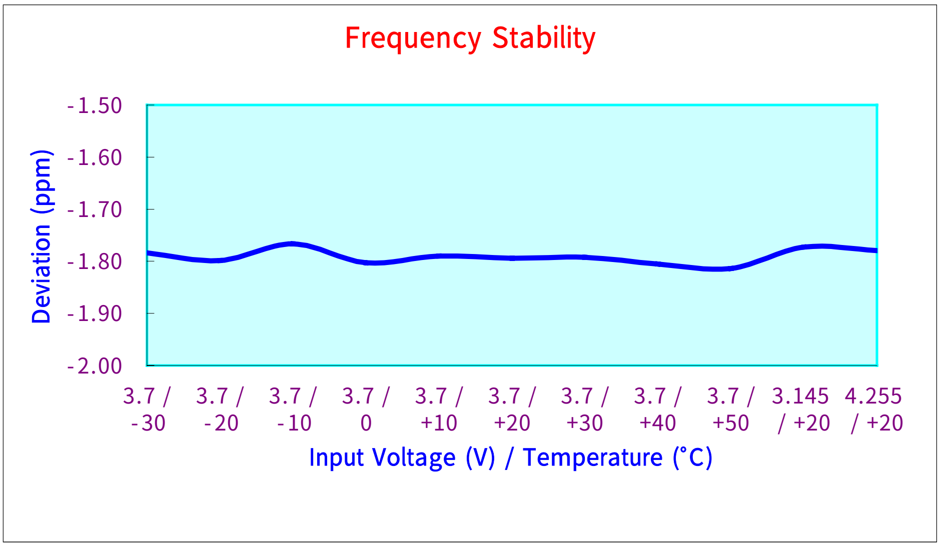
7.9.3 Test Result (Channel 14 / 467.7125 MHz)

Voltage (%)	Power Supply (Vdc)	Temperature (°C)	Frequency (Hz)	Deviation (ppm)
100 %	3.700	-30	467711636	-1.85
100 %	3.700	-20	467711659	-1.80
100 %	3.700	-10	467711655	-1.81
100 %	3.700	0	467711648	-1.82
100 %	3.700	+10	467711671	-1.77
100 %	3.700	+20	467711650	-1.82
100 %	3.700	+30	467711657	-1.80
100 %	3.700	+40	467711642	-1.83
100 %	3.700	+50	467711656	-1.80
85 %	3.145	+20	467711639	-1.84
115 %	4.255	+20	467711643	-1.83

7.9.4 Test Result (Channel 15 / 462.5500 MHz)

Voltage (%)	Power Supply (Vdc)	Temperature (°C)	Frequency (Hz)	Deviation (ppm)
100 %	3.700	-30	462549175	-1.78
100 %	3.700	-20	462549168	-1.80
100 %	3.700	-10	462549183	-1.77
100 %	3.700	0	462549166	-1.80
100 %	3.700	+10	462549172	-1.79
100 %	3.700	+20	462549170	-1.79
100 %	3.700	+30	462549171	-1.79
100 %	3.700	+40	462549165	-1.81
100 %	3.700	+50	462549161	-1.81
85 %	3.145	+20	462549180	-1.77
115 %	4.255	+20	462549177	-1.78

7.9.5 Graph˚

Frequency Stability Graph	
Channel 7 462.7125 MHz 1 Watt	
Channel 14 467.7125 MHz 0.5 Watt	
Channel 15 462.5500 MHz 1 Watt	

7.10 RF Exposure Requirments : FCC Rules Part 1 §1.1310, §2.1091

7.10.1 Method of Measurement

Personal radio services operating under section Part95 are categorically from routine environmental evaluation to demonstrating RF exposure compliance with respect to MPE and/or SAR limits. These devices are not exempted from compliance does not exceed the Commission's RF exposure guidelines. Unless a device operates at substantially low power levels, with a low gain antenna(s), supporting information is generally needed to establish the various potential operating configurations and exposure conditions of a transmitter and its antenna(s) in order to determine compliance with the RF exposure guidelines.

In order to demonstrate compliance with MPE requirements (see Section 2.1091), the following information is typically needed:

Calculation that estimates the minimum separation distance (20 cm or more) between an antenna and persons required to satisfy power density limits defined for free space.

Antenna installation and device operating instructions for installers (professional/unskilled users), and the parties responsible for ensuring compliance with the RF exposure requirement Any caution statements and/or warning labels that are necessary in order to comply with the exposure limits Any other RF exposure related issues that may affect MPE compliance.

7.10.2 Limits

FCC 1.1310 : The criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in 1.1307(b).

LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm2)	Average Time (minutes)
(A) Limits for Occupational/Control Exposures				
30-300	61.4	0.163	1.0	6
(B) Limits for General Population/Uncontrolled Exposure				
30-300	**27.5**	**0.073**	**0.2**	**30**

7.10.3 Test Result

Frequency (MHz)	Measured ERP Power (dBm)	Antenna Gain (dBi)	Calculated EIRP (mWatt)	Duty cycle (%)	The time averaged power over 30 minutes (mWatt)	Laboratory's Recommended Minimum RF Safety Distance r (meters)
462.7125	28.3	0	676.08	50	338.04	0.12
467.7125	26.6	0	457.09	50	227.05	0.10
462.5500	28.5	0	707.95	50	353.98	0.12

Calculation Method of RF Safety Distance:

$$S = \frac{PG}{4\pi r^2} = \frac{EIRP}{4\pi r^2}$$

P : power input to the antenna in mW
EIRP : Equivalent (effective) isotropic radiated power.
S : power density mW/cm2
G : numeric gain of antenna relative to isotropic radiator
R : distance to centre of radiation in cm

FCC radio frequency exposure limits may be exceeded at distances closer than r cm from the antenna of this device

$$r = \sqrt{\frac{PG}{4\pi S}} = \sqrt{\frac{EIRP}{4\pi S}}$$

Note :

1. S = 0.2 mW/cm^2 for Limits for General Population/Uncontrolled Exposures.
2. This Equipment assume a typical transceiver duty cycle with 50% transmit time.
3. The time averaged power over 30 minutes will be calculated from 15 minutes TX on time and 15 minutes TX off time .
4. Minimum calculated separation distance between antenna and persons required : 0.12m

8. TEST EQUIPMENT LIST

List of Test Equipments Used for Measurements

Test Equipment	Model	Mfg.	Serial No.	Cal. Due Date
Spectrum Analyzer	8563E	H.P.	3611A05046	05-04-28
Spectrum Analyzer	8594E	H.P.	3911A08040	05-04-24
Spectrum Analyzer	E7403A	ADVANTEST	61720002	04-08-22
Receiver	ESH3	R & S	892580/014	04-05-21
Signal Generator	E4432B	H.P.	US40053157	05-04-29
Signal Generator	SGT9000	GIGATRONICS	9604010	05-04-29
Power Meter	E4418A	H.P.	GB38272621	05-03-17
Power Sensor	8481A	H.P.	3318A92101	05-03-29
Audio Analyzer	8903B	H.P.	3011A09344	05-05-07
Modulation Analyzer	8901B	H.P.	3028A03124	05-04-29
Synthesized Function Generator	SG-4111	IWATSU	35559	04-05-26
Broadband Power Amplifier	100W 10000M 11	Amplifier Research	18649	05-03-19
Broadband Power Amplifier	75A220	Amplifier Research	15326	04-12-16
Preamplifier	8447E	H.P.	2945A02712	04-08-19
Horn Antenna	BBHA 9120 D	Schwarz Beck	234	04-06-20
Horn Antenna	BBHA 9170	Schwarz Beck	157	04-06-20
Dipole Antenna	VDA6106A / UHA9105	Schaffner-chase	1277	04-09-12
Biconical Antenna	VHA9103	Schwarzbeck	-	04-09-13
Log Periodic Antenna	UPA6109	SCHAFFNER	1076	04-09-13
Attenuator	8325	BIRD	4572	04-04-28
Attenuator	RFA500NMF30	RFA500NMF30	9522	05-01-07
Termination	8173	BIRD	2501	-
Dual directional coupler	772D	H.P.	2839A00395	05-01-07
Dual directional coupler	778D	H.P.	1144A08477	04-10-14
LISN	L3-25	PMM	1110KT0403	04-10-02
LISN	KNW-242C	PMM	8-920-20	04-08-30
Digital Oscilloscope	TDS3032	Tektronix	B081558	04-05-27
Turn-Table	JAC-2	JAEMC	-	-
Antenna Master	JAC-1	Daeil EMC	-	-
Plotter	7550A	H.P	2725A 75529	-
EMC Anechoic Chamber	-	SEMITECH	000815	
Temp/Humidity Chamber	-	Seo jin	-	04-09-01
Thermo Hygrograph	PC-5000TRH-II	SATO	-	04-10-27
BaroMeter	KEIRYOKI	SATO	564021	04-07-18
Slidacs	DeaKyong Slidacs	DeaKyong	-	-