Test Report

TEST PROCEDURES AND TEST SITE DESCRIPTION

DATE: 12-04-03
FCC ID: AMWUT917
MODEL: GMR855-2
DESCRIPTION: 22CH FRS/GMRS RADIO

MEASUREMENT ITEMS	Section No.
1. DC Voltage & Current into Final Device	2.1033(C)(8)
2. RF Output Power	2.1046
3. Modulation Characteristics (Audio Roll-off)	2.1047
4. Modulation Characteristics (Audio Frequency Response)	2.1047
5. Modulation Characteristics (Modulation Limiting)	2.1047 & 95.637(a)
6. Occupied Bandwidth	2.1049(c)(1) & 95.635(b)(1)(3)(7)
7. Spurious & Harmonic Emission at Antenna Terminal	2.1051
8. Field Strength of Spurious/Harmonic Radiation	2.1053 & 95.635(b)(7)
9. Frequency Stability (Temperature)	2.1055
10. Frequency Stability (Voltage)	2.1055

NOTE: List of measurement equipment and test site description are included in this EXHIBIT.

1. DC Voltage & Current into Final Device 2.1033(C)(8)

To measure the DC Voltage and Current into Final Amplifying Device, the measuring equipment was connected to the actual P.C.Board of the transmitter.

FCC limits: Not specified

Test Results: Refer to test data

2. RF Output Power 2.1046 & 95.639

The unit was tuned-up in accordance with the alignment procedure stated in the EXHIBIT-6, and was loaded into a 50-ohm resistive termination. The unit was powered through its normally supplied power cable by a DC power supply. Power supply voltage was set to nominal voltage at the power supply terminals with the transmitter off.

The unit was operated for three consecutive test cycles of 15 minutes standby and 5 minutes in transmitting. At the end of the third 5 minutes period, the RF output power is measured. During the test, no components of the emission spectrum exceed the limit specified in the applicable rule part for occupied bandwidth or emission limitations.

FCC limits: 0.5 W ERP for FRS and 5W ERP for GMRS

Test Results: Refer to test data

3. Modulation Characteristics (Audio Roll-off) 2.1047

To measure the audio roll-off filter response, an audio frequency oscillator and AF VTVM were connected to the actual P.C.Board of the transmitter. AF VTVM and an oscilloscope monitored the output of the audio filter. An AF input level was maintained was maintained constant at least 10 dB below the saturation level at maximum response frequency. The measurement was made under the above conditions by varying the frequency between 1 kHz and 100 kHz.

FCC limits: 3 kHz - 20 kHz: $-60 \log_{10} (F/3)$ dB

Test Results: Refer to test data

4. Modulation Characteristics (Audio Frequency Response) 2.1047

The audio frequency response was measured in accordance with TIA/EIA Specification 603. Operate the unit under the standard test conditions and monitor the output with a modulation or a calibrated test receiver.
The input required to produce 30 percent modulation level was measured.

5. Modulation Characteristics (Modulation Limiting) 2.1047 & 95.637(a)

The transmitter shall be adjusted for full rated system deviation, 1000 Hz and reference it as 0dB input. With modulation frequencies of 300, 1000 and 3000 Hz respectively, vary the audio input to a level 20dB above that required at 100 Hz to produce 60% of rated system deviation. This is required for both up to and down modulation. Record the percent of full system deviation obtained as a function of input level.

FCC limits: +/-2.5 kHz deviation

Test Results: Refer to test data

6. Occupied Bandwidth 2.1049(c)(1) & 95.635(b)(1)(3)(7)

The spectrum of the modulated carrier was monitored by a panoramic method capable of 60dB amplitude range. The unit was modulated with a 2500 Hz audio signal at an input level 16dB above that required for 50% of maximum system deviation.

In case the 100Hz of CTCSS tone or 100 bps of digital coded data modulation is indicated for this transmitter, a representative measurement data for this operation is also presented.

Since the total deviation of the unit is designed as 4.7 kHz Div., the deviation of 2500Hz audio signal was set to 3.7 kHz Div., as the maximum deviation of tone or digital coded signal was continuously set to 1.0 kHz Div.

At first, tone or digital signal was disabled and set the 2500 Hz audio signal to 1.85 kHz deviation (= 50% of 3.7 kHz deviation). Then, the input level of 2500Hz audio signal was increased by 16dB.

In this condition, the tone or digital coded signal was then enabled and imposed with 2500Hz audio signal.

FCC limits: a) -25dB (50 - 100% of assigned frequency)
b) -35dB (100 - 250% of assigned frequency)
c) 43 + $10\log_{10}$ (RF output power in Watts) dB or 80dB, whichever is lesser attenuation for more than 250% of assigned frequency

Test Results: Refer to test data

7. Spurious & Harmonic Emission at Antenna Terminal 2.1051

Spurious radiation are the radio frequency voltage or power generated within the equipment and appearing at the equipment's output terminals when properly loaded with its characteristic non-radiating load.

The unit was modulated with a 2500 Hz tone at an input level 16dB greater than that required 50% modulation. The spectrum was scanned from the lowest frequency generated in the equipment to the tenth harmonic of the carrier.
FCC limits: 43 + $10\log_{10}$ (RF output power in Watts) dB

Test Results: Refer to test data.

8. Field Strength of Spurious & Harmonic Radiation 2.1053

Measurement Procedure & Test Site Description

Field strength measurements of radiated spurious emissions were made on a 3-meter range maintained by Uniden Corporation in Japan. Complete description and measurement data of this test site have been placed on file with the Commission. The equipment was scanned for radiated emissions in a scheduled enclosure prior to open field testing.

For each spurious or harmonic frequency, the antenna was raised and lowered to obtain a maximum reading on the Spectrum Analyzer with antenna horizontally polarized. Then the turntable, on which the equipment under test was placed, was rotated a minimum of 360 degree to further increase the reading on the Spectrum Analyzer. This procedure was repeated with the antenna vertically polarized.

FCC limits: 43 + $10\log_{10}$ (RF output power in Watts) dB

Test Results: Refer to test data

9. Frequency Stability (Temperature) 2.1055(a)(2)

Frequency measurement was performed at the extremes of throughout the range -20 °C to +50 °C and at intervals of not more than 10 degrees C throughout the range. A period of time sufficient to stabilize all of the components in the equipment was allowed prior to frequency measurement.

The frequency of the unit was measured by extracting a sample of the carrier and measuring its center frequency by equipment having a degree accuracy at least 10 times that of the minimum to be measured.

FCC limits: 0.00025%, 2.5 ppm

Test Results: Refer to test data

10. Frequency Stability (Voltage) 2.1055(a)(2)

Frequency measurement was performed at the extremes of throughout the range 85% and 115% of the nominal voltage. Extracting a sample of the carrier and measuring its center frequency by equipment having degree accuracy at least 10 times that of the minimum to be measured measured the frequency of the unit.

FCC limits: 0.00025%, 2.5 ppm

Test Results: Refer to test data

1. RF Output Power & DC Voltage and Current into Final Amplifying Device 2.1033(C)(8)

		TX FINAL TRANSISTOR	
MEASURED FREQUENCY (MHz)	OUTPUT POWER (50Ω TERMINATED) (Watts)	COLLECTOR VOLTAGE (V)	COLLECTOR CURRENT (A)
462.5625	0.98	5.98	0.365
462.5625 (BOOST)	1.60	5.96	0.550
467.5625	0.69	5.99	0.290

2. RF Output Power 2.1046

MEASURED FREQUENCY (MHz)	OUTPUT POWER (50Ω TERMINATED) (Watts)	OUTPUT POWER (ERP) (Watts)
462.5625	0.98	0.55
462.5625 (BOOST)	1.60	0.74
467.5625	0.69	0.39

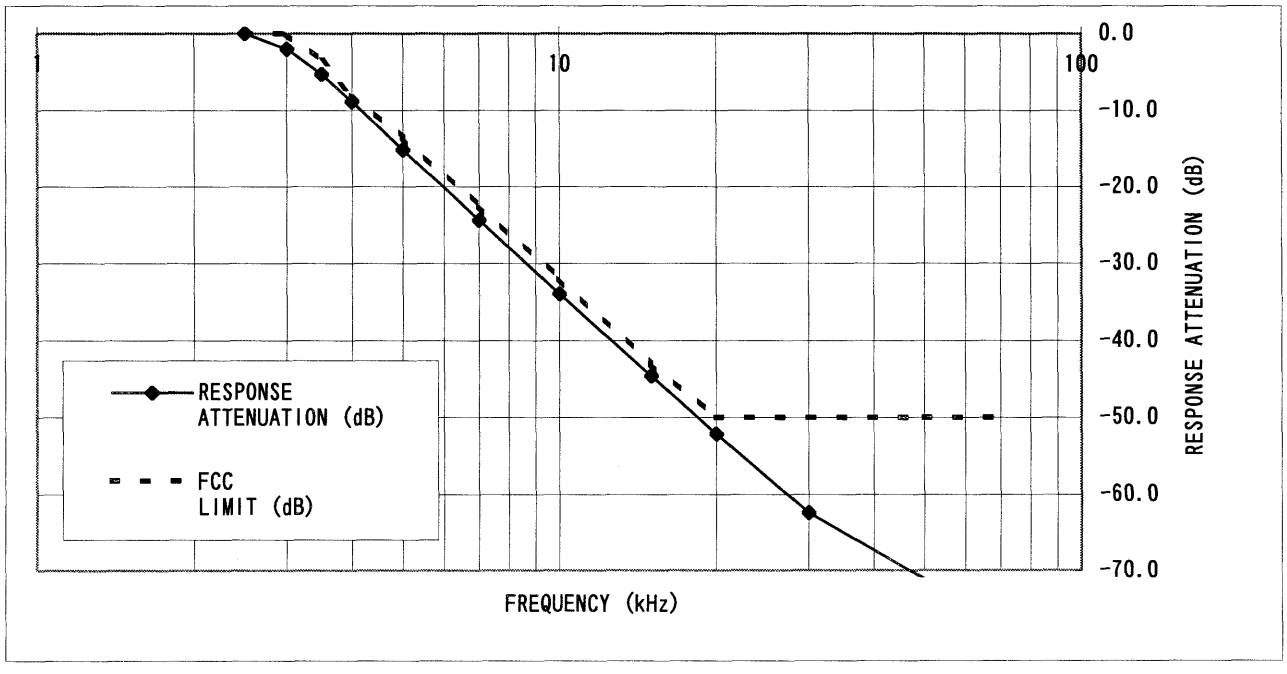
Note:

a) OUTPUT POWER (50Ω TERMINATED) was measured by opening the enclosure.

b) ERP was measured based on substitution method using with standard dipole antenna.

3. MODULATION CHARACTERISTICS (AUDIO ROLL-OFF RESPONSE) 2.1047

AUDIO FREQUENCY (kHz)	RESPONSE ATTENUATION (dB)	FCC LIMIT (dB)
2.5	0.0	--
3	-2.0	0.0
3.5	-5.3	-3.5
4	-8.9	-8.0
5	-15.1	-13.5
7	-24.4	-22.5
10	-34.0	-32.0
15	-44.6	-43.0
20	-52.2	-50.0
30	-62.4	-50.0
50	-71.1	-50.0
70	-72.0	-50.0

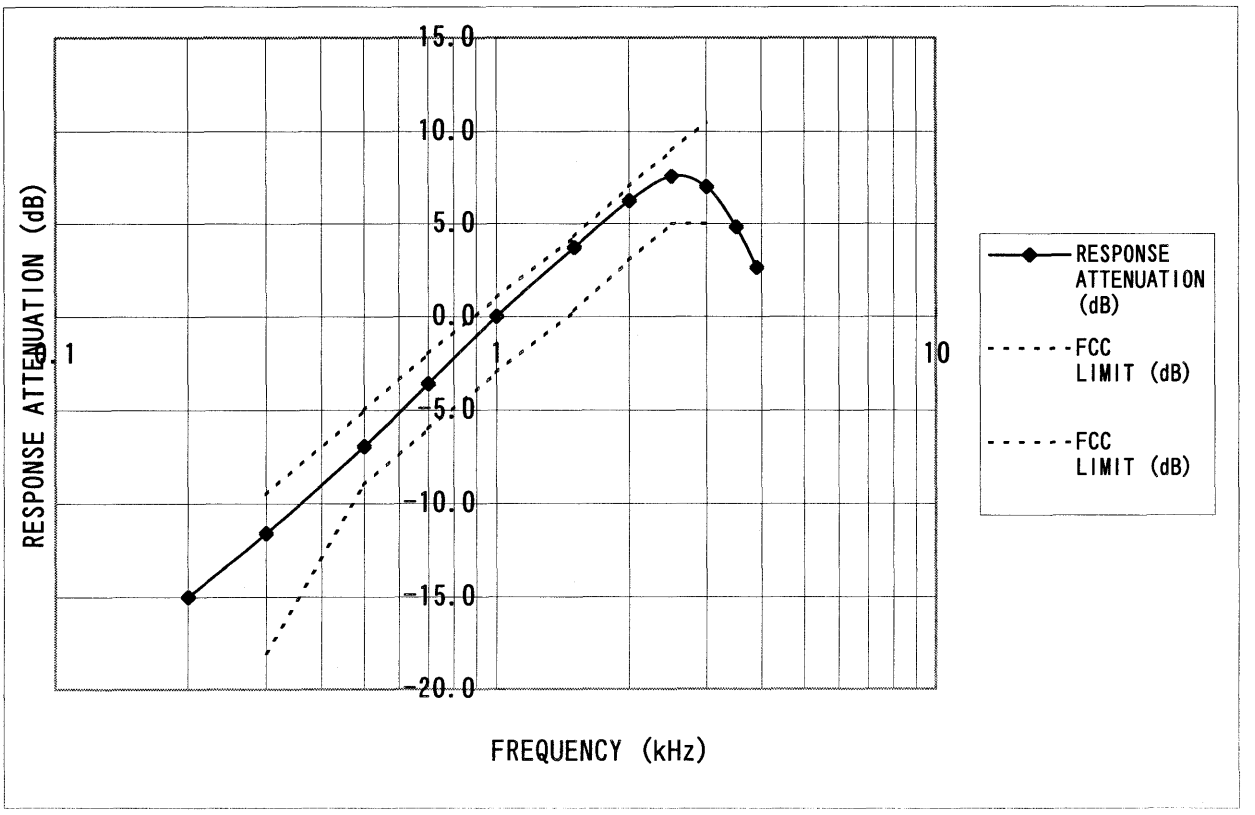


4-1. MODULATION CHARACTERISTICS (AUDIO FREQUENCY RESPONSE) 2.1047

GMRS MODE

CARRIER FREQUENCY: 462.5625 MHz
OUTPUT POWER (50Ω TERMINATED): 0.98 WATTS

AUDIO FREQUENCY	RESPONSE ATTENUATION	FCC LIMIT	
(kHz)	(dB)	(dB)	
0.1			
0.2	-15.0		
0.3	-11.6	-9.5	-18
0.5	-7.0	-5.0	-9
0.7	-3.6	-2.0	-6
1	0.0	1.0	-3
1.5	3.7	4.3	0.3
2	6.2	7.0	3
2.5	7.5	9.0	5
3	7.0	10.5	5
3.5	4.8		
3.9	2.6		

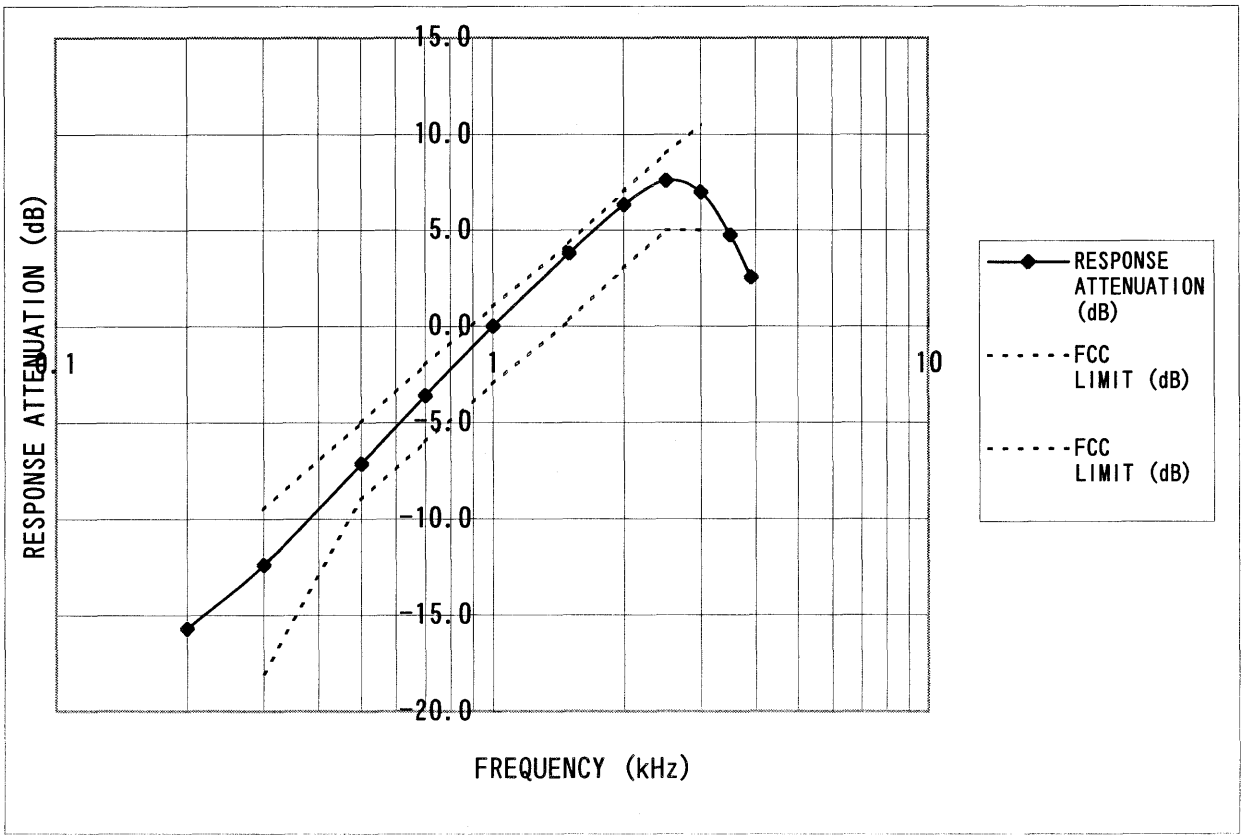


4-2. MODULATION CHARACTERISTICS (AUDIO FREQUENCY RESPONSE) 2.1047

FRS MODE

CARRIER FREQUENCY: 467.5625 MHz
OUTPUT POWER (50Ω TERMINATED): 0.69 WATTS

AUDIO FREQUENCY	RESPONSE ATTENUATION	FCC LIMIT	
(kHz)	(dB)	(dB)	
0.1			
0.2	-15.7		
0.3	-12.4	-9.5	-18
0.5	-7.2	-5.0	-9
0.7	-3.6	-2.0	-6
1	0.0	1.0	-3
1.5	3.8	4.3	0.3
2	6.3	7.0	3
2.5	7.6	9.0	5
3	7.0	10.5	5
3.5	4.7		
3.9	2.5		

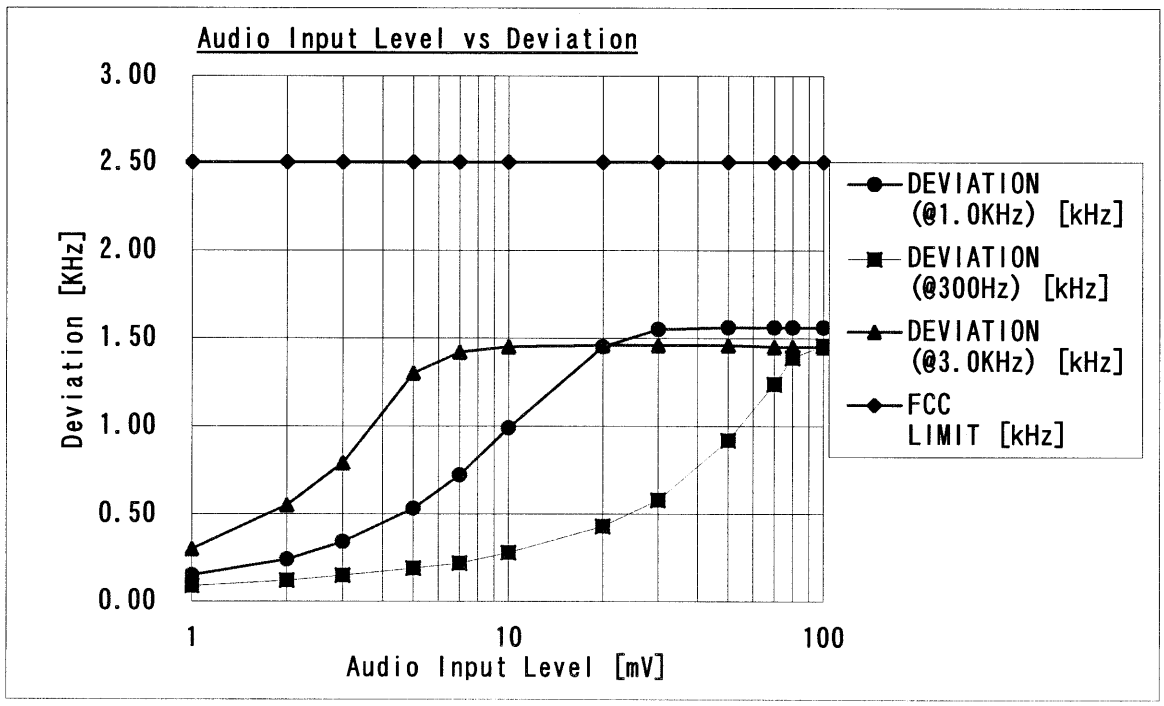


5-1. MODULATION CHARACTERISTICS (MODULATION LIMITING) 2.1047 & 95.637(a)

GMRS MODE

CARRIER FREQUENCY: 462.5625 MHz
OUTPUT POWER (50Ω TERMINATED): 0.98 WATTS

AUDIO INPUT LEVEL [mV]	DEVIATION (@1.0KHz) [kHz]	DEVIATION (@300Hz) [kHz]	DEVIATION (@3.0KHz) [kHz]	FCC LIMIT [kHz]
1	0.15	0.09	0.30	2.5
2	0.24	0.12	0.55	2.5
3	0.34	0.15	0.79	2.5
5	0.53	0.19	1.30	2.5
7	0.72	0.22	1.42	2.5
10	0.99	0.28	1.45	2.5
20	1.45	0.43	1.46	2.5
30	1.55	0.58	1.46	2.5
50	1.56	0.92	1.46	2.5
70	1.56	1.24	1.45	2.5
80	1.56	1.39	1.45	2.5
100	1.56	1.46	1.45	2.5

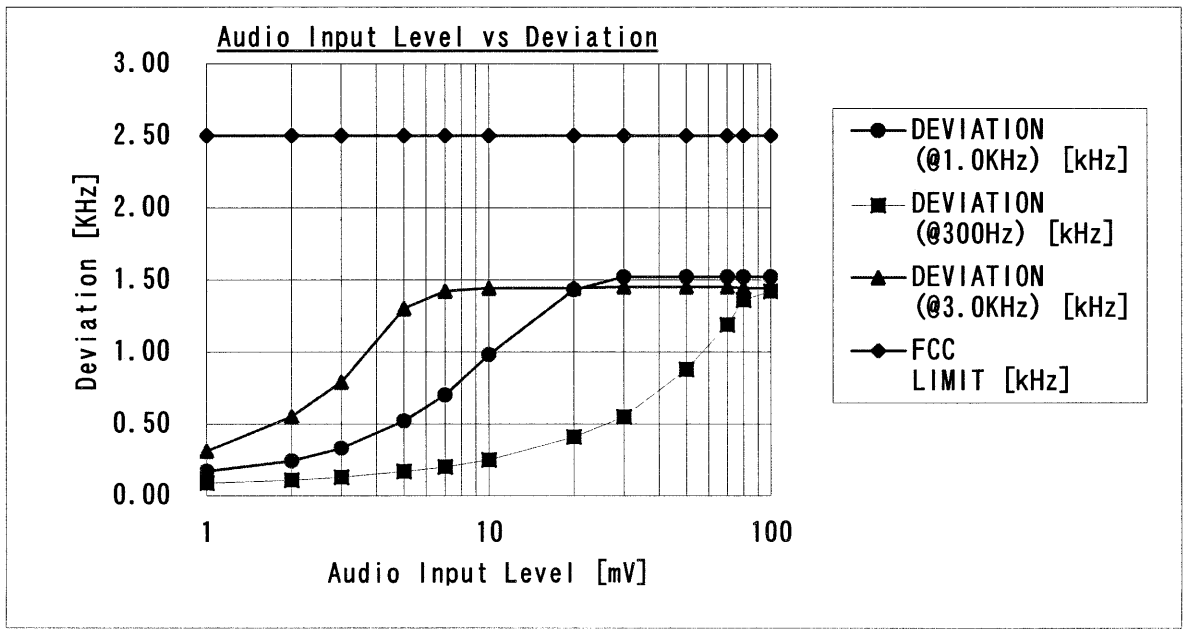


5-2. MODULATION CHARACTERISTICS (MODULATION LIMITING) 2.1047 & 95.637(a)

FRS MODE

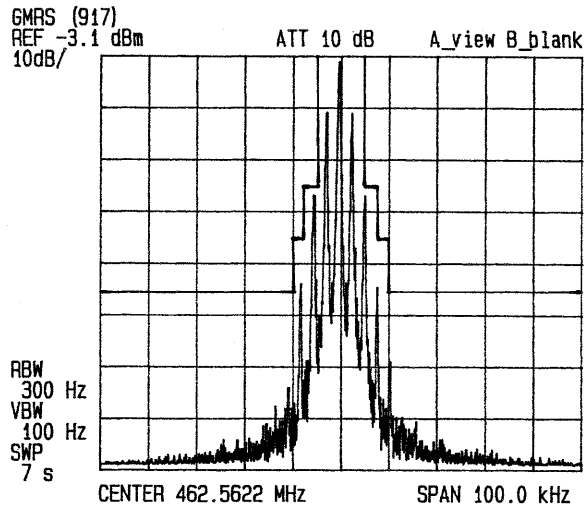
CARRIER FREQUENCY: 467.5625 MHz
OUTPUT POWER (50Ω TERMINATED): 0.69 WATTS

AUDIO INPUT LEVEL [mV]	DEVIATION (@1.0KHz) [kHz]	DEVIATION (@300Hz) [kHz]	DEVIATION (@3.0KHz) [kHz]	FCC LIMIT [kHz]
1	0.17	0.09	0.31	2.5
2	0.24	0.11	0.55	2.5
3	0.33	0.13	0.79	2.5
5	0.52	0.17	1.30	2.5
7	0.70	0.20	1.42	2.5
10	0.98	0.25	1.44	2.5
20	1.43	0.41	1.44	2.5
30	1.52	0.55	1.45	2.5
50	1.52	0.88	1.45	2.5
70	1.52	1.19	1.45	2.5
80	1.52	1.36	1.44	2.5
100	1.52	1.42	1.44	2.5

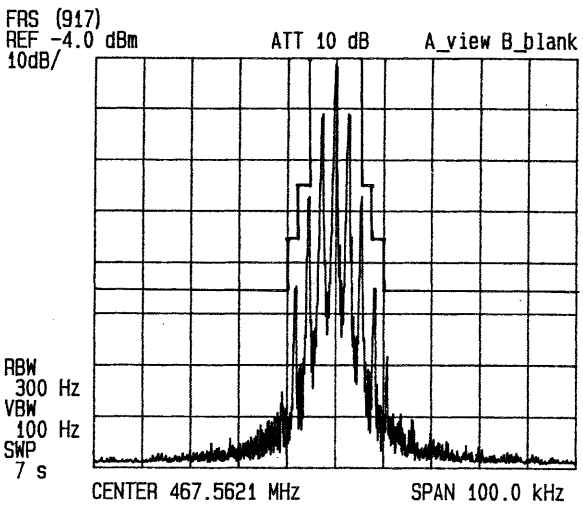


6. OCCUPIED BANDWIDTH 2.1049(c)(1) & 95.635(b)(1)(3)(7)

GMRS



FRS



7. SPURIOUS & HARMONICS EMISSION AT ANTENNA TERMINAL 2.1051

Harmonics of Carrier	462.5625MHz GMRS [dBc]	467.5625MHz FRS [dBc]
1	-	-
2	-59.3	-55.0
3	-90.8	-86.5
4	-86.8	-82.5
5	-91.5	-87.2
6	-79.8	-75.5
7	-88.7	-84.4
8	-86.8	-82.5

NOTE: The measurement was performed by opening the enclosure.

8-1-a. FIELD STRENGTH OF SPURIOUS & HARMONICS RADIATION

2.1053 & 95.635(b)(7)

GMRS

TX: 462.5625 MHz

EMISSIONS (MHz)	EUT, PLACED V/H	ANT, POLARITY V/H	FCC LIMIT (dB)	MARGIN (dB)
462.5625	V	V	-	-
462.5625	V	H	-	-
462.5625	H	V	-	-
462.5625	H	H	-	-
925.1250	V	V	33.9	7.0
925.1250	V	H	33.9	20.8
925.1250	H	V	33.9	13.3
925.1250	H	H	33.9	7.9
1387.6875	V	V	33.9	19.9
1387.6875	V	H	33.9	24.4
1387.6875	H	V	33.9	22.1
1387.6875	H	H	33.9	20.8
1850.2500	V	V	33.9	13.3
1850.2500	V	H	33.9	19.5
1850.2500	H	V	33.9	14.0
1850.2500	H	H	33.9	14.2

8-1-b. FIELD STRENGTH OF SPURIOUS & HARMONICS RADIATION

2.1053 & 95.635(b)(7)

GMRS (Boost)

TX: 462.5625 MHz

EMISSIONS (MHz)	EUT, PLACED V/H	ANT, POLARITY V/H	FCC LIMIT (dB)	MARGIN (dB)
462.5625	V	V	-	-
462.5625	V	H	-	-
462.5625	H	V	-	-
462.5625	H	H	-	-
925.1250	V	V	33.9	6.5
925.1250	V	H	33.9	22.6
925.1250	H	V	33.9	6.2
925.1250	H	H	33.9	21.2
1387.6875	V	V	33.9	16.8
1387.6875	V	H	33.9	24.4
1387.6875	H	V	33.9	17.1
1387.6875	H	H	33.9	24.2
1850.2500	V	V	33.9	8.6
1850.2500	V	H	33.9	17.1
1850.2500	H	V	33.9	8.3
1850.2500	H	H	33.9	16.8

8-2. FIELD STRENGTH OF SPURIOUS & HARMONICS RADIATION

2.1053 & 95.635(b)(7)

FRS

TX: 467.5625 MHz

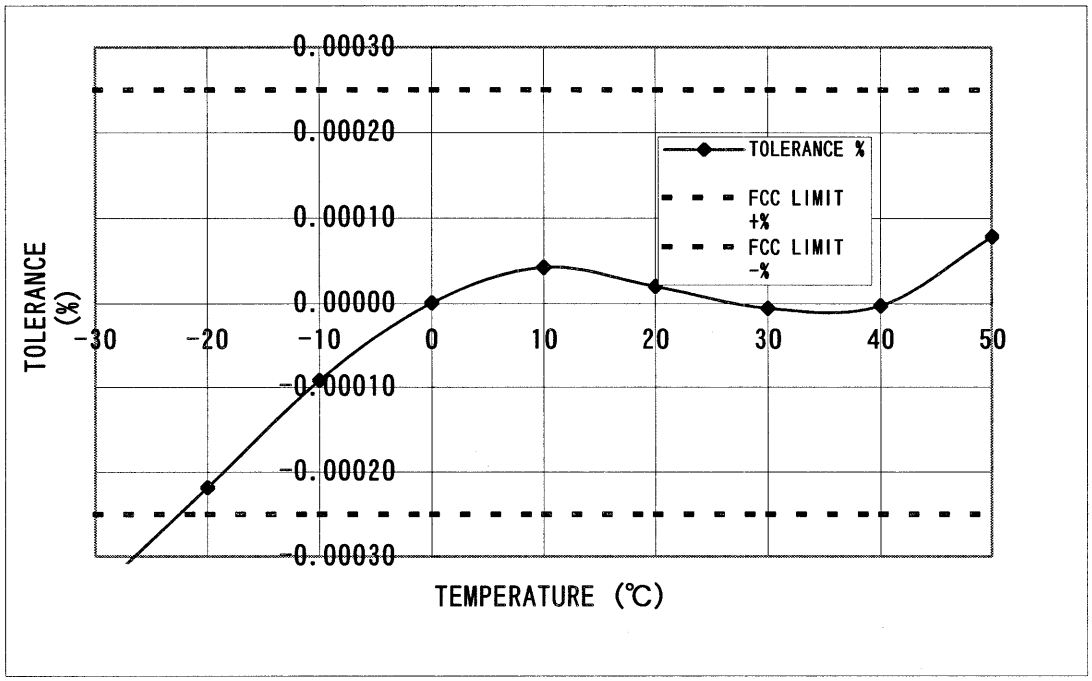
EMISSIONS (MHz)	EUT, PLACED V/H	ANT, POLARITY V/H	FCC LIMIT (dB)	MARGIN (dB)
467.5625	V	V	-	-
467.5625	V	H	-	-
467.5625	H	V	-	-
467.5625	H	H	-	-
935.1250	V	V	33.9	7.2
935.1250	V	H	33.9	20.1
935.1250	H	V	33.9	12.7
935.1250	H	H	33.9	8.2
1402.6875	V	V	33.9	22.0
1402.6875	V	H	33.9	24.1
1402.6875	H	V	33.9	23.6
1402.6875	H	H	33.9	21.5
1870.2500	V	V	33.9	15.3
1870.2500	V	H	33.9	20.5
1870.2500	H	V	33.9	17.3
1870.2500	H	H	33.9	18.2

9-1. FREQUENCY STABILITY (TEMPERATURE RANGE) 2.1055

GMRS MODE

MEASURED FREQUENCY : 462.5625 MHz

TEMPERATURE	FREQ.	TOLERANCE		FCC LIMIT	
℃	MHz	Hz	%	+%	-%
-30	462.560913	-1587	-0.0003431	0.00025	-0.00025
-20	462.561489	-1011	-0.0002186	0.00025	-0.00025
-10	462.562075	-425	-0.0000919	0.00025	-0.00025
0	462.562504	4	0.0000009	0.00025	-0.00025
10	462.562696	196	0.0000424	0.00025	-0.00025
20	462.562592	92	0.0000199	0.00025	-0.00025
30	462.562474	-26	-0.0000056	0.00025	-0.00025
40	462.562488	-12	-0.0000026	0.00025	-0.00025
50	462.562863	363	0.0000785	0.00025	-0.00025

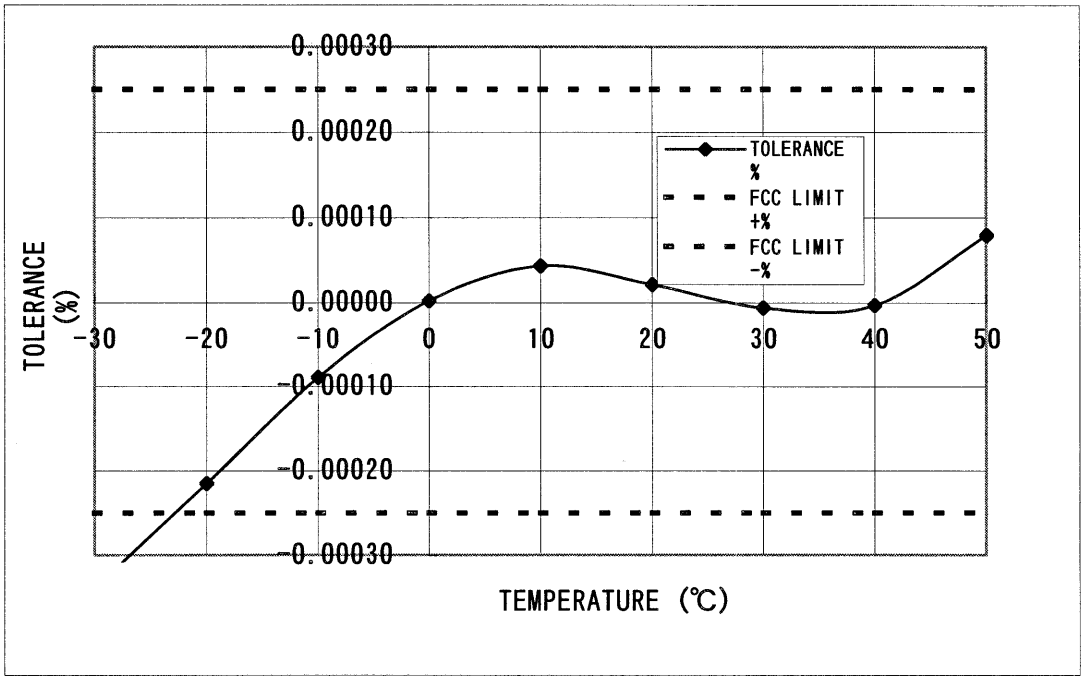


9-2. FREQUENCY STABILITY (TEMPERATURE RANGE) 2.1055

FRS MODE

MEASURED FREQUENCY : 467.5625 MHz

TEMPERATURE	FREQ.	TOLERANCE		FCC LIMIT	
℃	MHz	Hz	%	+%	-%
-30	467.560917	-1583	-0.0003386	0.00025	-0.00025
-20	467.561493	-1007	-0.0002154	0.00025	-0.00025
-10	467.562081	-419	-0.0000896	0.00025	-0.00025
0	467.562510	10	0.0000021	0.00025	-0.00025
10	467.562703	203	0.0000434	0.00025	-0.00025
20	467.562600	100	0.0000214	0.00025	-0.00025
30	467.562470	-30	-0.0000064	0.00025	-0.00025
40	467.562485	-15	-0.0000032	0.00025	-0.00025
50	467.562871	371	0.0000793	0.00025	-0.00025

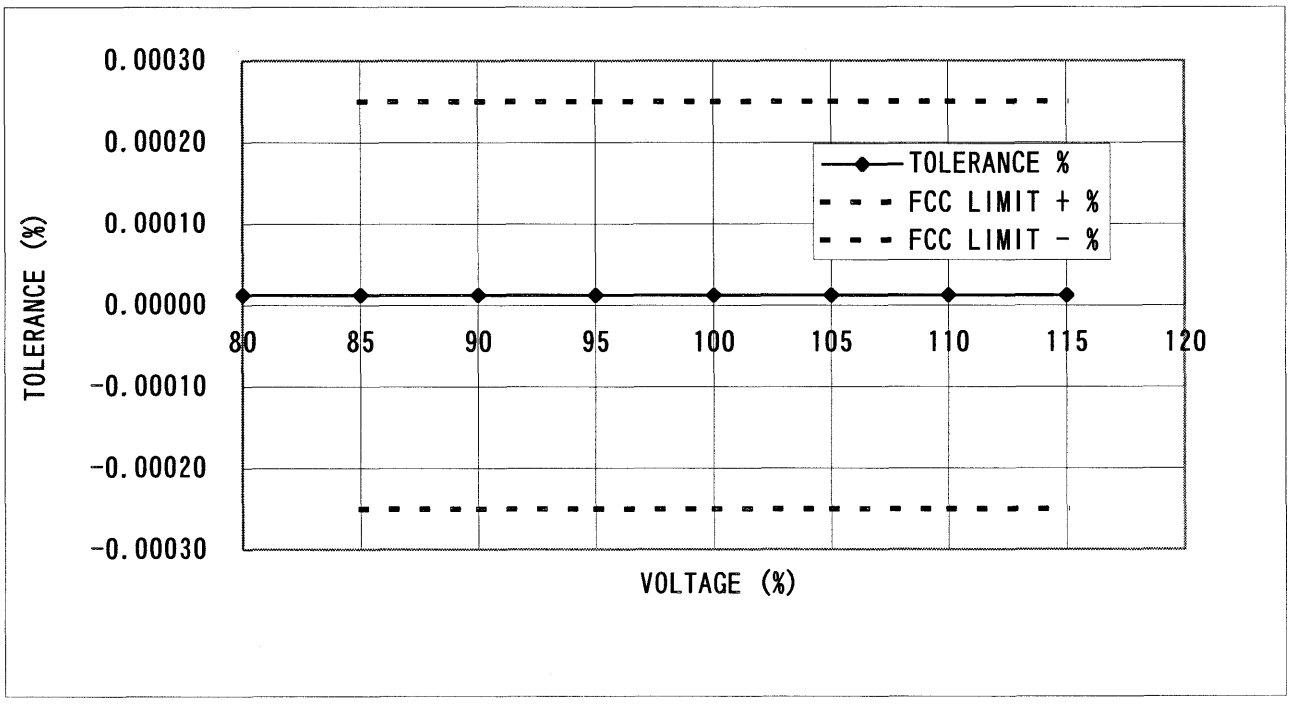


10-1. FREQUENCY STABILITY (VOLTAGE RANGE) 2.1055

GMRS MODE

MEASURED FREQUENCY : 462.5625 MHz

VOLTAGE		FREQ.	TOLERANCE		FCC LIMIT	
(V)	(%)	MHz	Hz	%	+ %	- %
4.80	80	462.562555	55	0.0000119		
5.10	85	462.562555	55	0.0000119	0.00025	-0.00025
5.40	90	462.562555	55	0.0000119	0.00025	-0.00025
5.70	95	462.562555	55	0.0000119	0.00025	-0.00025
6.00	100	462.562555	55	0.0000119	0.00025	-0.00025
6.30	105	462.562555	55	0.0000119	0.00025	-0.00025
6.60	110	462.562555	55	0.0000119	0.00025	-0.00025
6.90	115	462.562555	55	0.0000119	0.00025	-0.00025



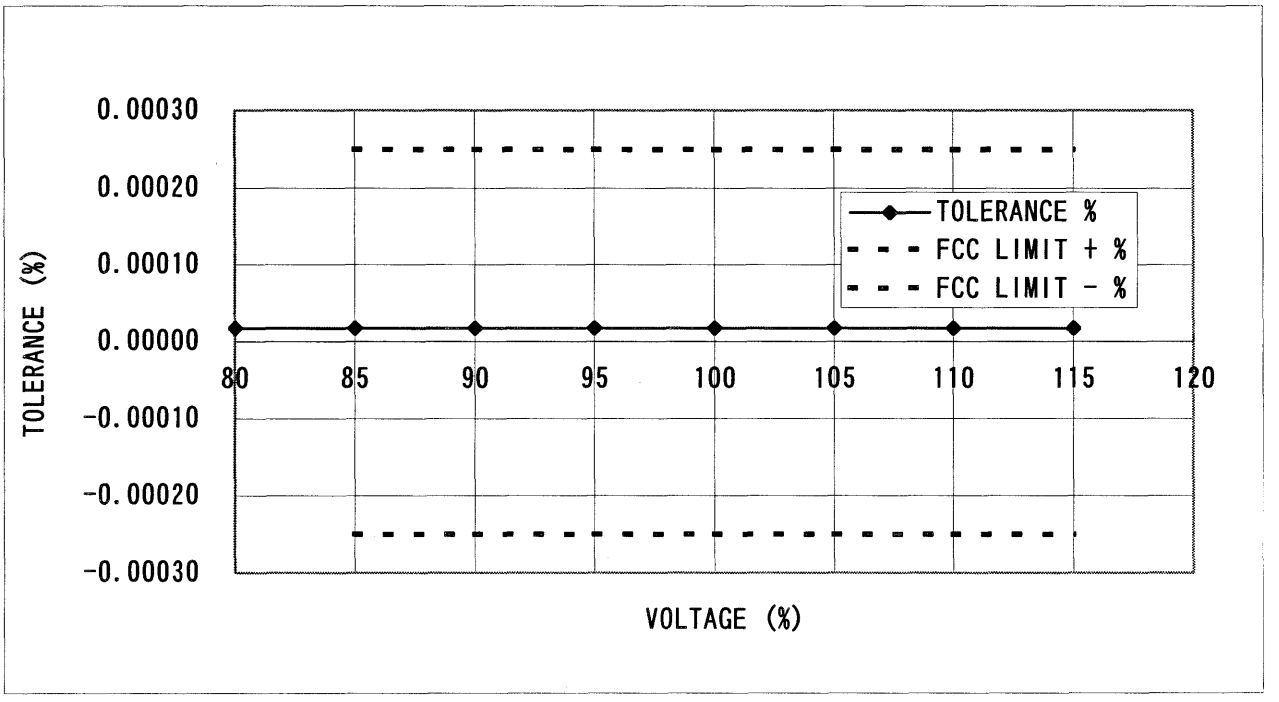
NOTE: BATTERY ENDPOINT --- 3.25V

10-2. FREQUENCY STABILITY (VOLTAGE RANGE) 2.1055

FRS MODE

MEASURED FREQUENCY : 467.5625 MHz

VOLTAGE		FREQ.	TOLERANCE		FCC LIMIT	
(V)	(%)	MHz	Hz	%	+ %	- %
4.80	80	467.562581	81	0.0000173		
5.10	85	467.562581	81	0.0000173	0.00025	-0.00025
5.40	90	467.562581	81	0.0000173	0.00025	-0.00025
5.70	95	467.562581	81	0.0000173	0.00025	-0.00025
6.00	100	467.562581	81	0.0000173	0.00025	-0.00025
6.30	105	467.562581	81	0.0000173	0.00025	-0.00025
6.60	110	467.562581	81	0.0000173	0.00025	-0.00025
6.90	115	467.562581	81	0.0000173	0.00025	-0.00025



NOTE: BATTERY ENDPOINT --- 3.25V

LIST OF MEASUREMENT EQUIPMENTS

ENG-NO	TEST EQUIPMENT	TYPE	MFR	SERIAL NO.	Last Calibrtation
1287	AMPLIFIER	AFS30010040020	MITEQ	138315	N/A
2022	MICROWAVE PREAMPLIFIER	8349B	ADVANTEST	3205A04450	N/A
1294	ANTENNA(BILOG)	CBL6112A	CHASE	2350	N/A
1602	ANTENNA(DIPOLE)	3120-B1	EMCO	0075	11-Jul-03
1603	ANTENNA(DIPOLE)	3120-B2	EMCO	0076	11-Jul-03
1604	ANTENNA(DIPOLE)	3120-B3	EMCO	0076	11-Jul-03
1560	ANTENNA(HORN) (18GHz)	3115	EMCO	2167	N/A
N/A	ANTENNA(HORN) (24GHz)	94287.24	NIPPON KOSYUHA	60.1	N/A
1388	LISN	KNW407	KYOURITSU	8-833-21	N/A
0682	POWER SUPPLY	AA300	TAKASAGO	31783013	N/A
0857	SPECTRUM ANALYZER (13GHz)	E7400A	AGILENT	US40240145	18-Apr-03
0205	SPECTRUM ANALYZER (8.4GHz)	R3265	ADVANTEST	25060158	N/A
1008	SPECTRUM ANALYZER (40GHz)	8564E	ADVANTEST	3425A00182	Apr-03