Test Report

TEST PROCEDURES AND TEST SITE DESCRIPTION

FCC ID: AMWUT910
UNI-NO.: UT-910Z
MODEL: OCEANUS DSC
Description: VHF MOBILE TYPE MARINE 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 & 80.213
4. Modulation Characteristics (Audio Frequency Response)	2.1047
5. Modulation Characteristics (Modulation Limiting)	2.1047
6. Occupied Bandwidth	2.1049(c)(1) & 80.211
7. Spurious & Harmonic Emission at Antenna Terminal	2.1051
8. Field Strength of Spurious & Harmonic Radiation	2.1053
9. Frequency Stability (Temperature)	2.1055 & 80.209
10. Frequency Stability (Voltage)	2.1055 & 80.209
11. Receiver radiated spurious emissions	80.217(b)

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

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: Not specified

Test Results: Refer to test data

3. Modulation Characteristics (Audio Roll-off) 2.1047 & 80.213

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 - 15 kHz: $-40 \log_{10} (F/3)$ dB
Above 20kHz : At least -28 dB

Test Results: Refer to test data

4. Modulation Characteristics (Audio Frequency Response) 2.1047

Operate the unit under the standard test conditions and monitor the output with a modulation or a calibrated test receiver. With a 1000 Hz sine wave (applied through a dummy microphone circuit) used as a 0 dB reference, vary the modulating frequency from 300 to 3000 Hz and observe the level necessary to maintain a constant 30% modulation.

FCC limits: 300 - 3000 Hz: 6dB/octave roll-off (+1/-3 dB)

Test Results: Refer to test data

5. Modulation Characteristics (Modulation Limiting) 2.1047

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: +/-5 kHz deviation

Test Results: Refer to test data

6. Occupied Bandwidth 2.1049(c)(1) & 80.211

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 & 80.209

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: +/-0.0005%

Test Results: Refer to test data

10. Frequency Stability (Voltage) 2.1055 & 80.209

Frequency measurement was performed at the extremes of throughout the range 85% and 115% of the nominal voltage. 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: +/-0.0005%

Test Results: Refer to test data

11. Receiver radiated spurious emissions 80.217(b)

Regarding the electromagnetic field strength at a distance of over sea water of one nautical mile, the value of field strength in the range of visible distance, which will be emitted from $1/2\lambda$ dipole antenna, results from the combination of the direct field component (free space field) and the ground reflected filed component.

Therefore, assuming that the ground is a flat perfect conductor, the maximum value of field strength in cases of varying the antenna high at the test point should be extrapolated to indicate two as large as the value in free space field.

At the actual test site in the range of 10 feet of distance, the

following formula can be considered to make up on an average, though it may include a little bit error. And, this fact is surely confirmed at our test site.

Accordingly, the value of field strength measured at the distance of 10 feet (3-meters) away shall be formulated as follows;

$$E_3 = 2 \times E_0 = 2 \times 7 \times / P \times 1/r \text{ (V/m)} \text{ ---------- (1)}$$

where: E_3: Field strength at the distance of 3 m (V/m)
E_0: Field strength in free space field (V/m)
P : Power into 1/2λ dipole antenna (Watts)
r : Distance from test point to dipole antenna (m)

Also, in the surface over seawater, since it can be supposed that the sea surface rather keeps better conductor condition, the above (1).

Therefore, the value of field strength at the distance of one nautical mile (1852 m) E_{1852} shall be calculated as below;

$$E_{1852} = E_3 \times 14 \times / P / 1852$$
$$= E_3 \times 3 / 1852$$
$$= E_3 / 620 \text{ ---------- (2)}$$

Test Results: Refer to test data

TEST DATA

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

FULL POWER MODE		TX FINAL TRANSISTOR	
MEASURED FREQUENCY (MHz)	OUTPUT POWER (Watts)	COLLECTOR VOLTAGE (V)	COLLECTOR CURRENT(A)
156.05	25.7	13.2	5.6
156.8	25.3	13.2	5.5
157.425	24.9	13.2	5.4

REDUCED POWER MODE		TX FINAL TRANSISTOR	
MEASURED FREQUENCY (MHz)	OUTPUT POWER (Watts)	COLLECTOR VOLTAGE (V)	COLLECTOR CURRENT(A)
156.05	1.25	13.6	1.6
156.8	1.21	13.6	1.6
157.425	1.19	13.6	1.6

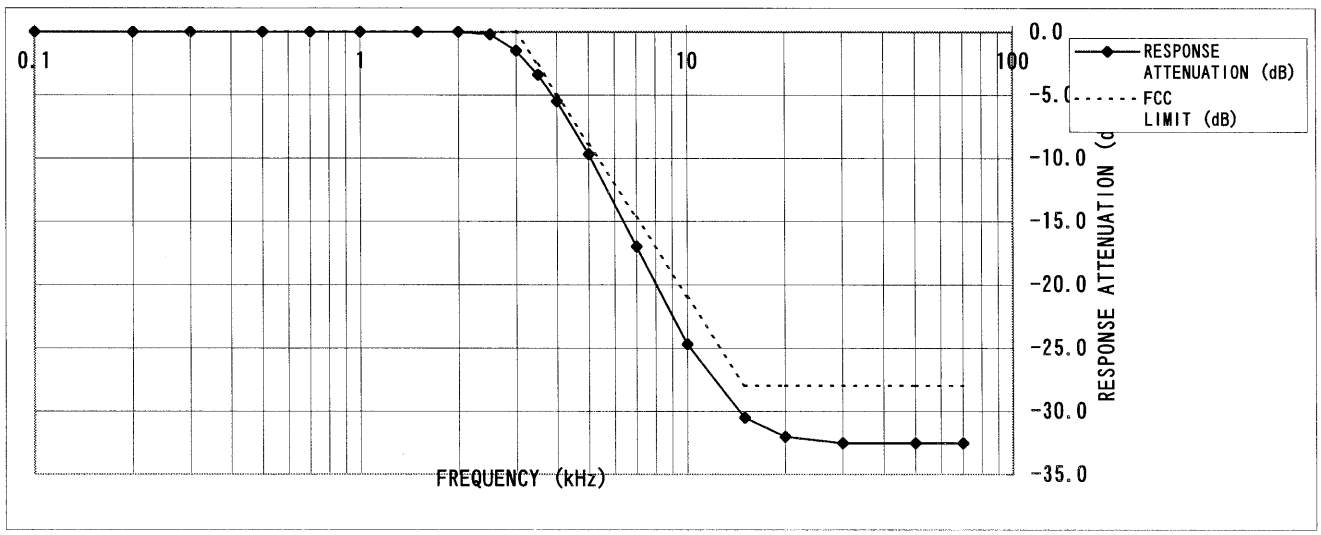
2. CARRIER POWER 2.1046

MEASURED FREQUENCY (MHz)	FULL POWER (Watts)	REDUCED POWER (Watts)
156.05	25.7	1.25
156.8	25.3	1.21
157.425	24.9	1.19

3. MODULATION CHARACTERISTICS (AUDIO ROLL-OFF RESPONSE) 2.1047 & 80.213

CARRIER FREQUENCY: 156.80 MHz
OUTPUT POWER: 24.7 WATTS

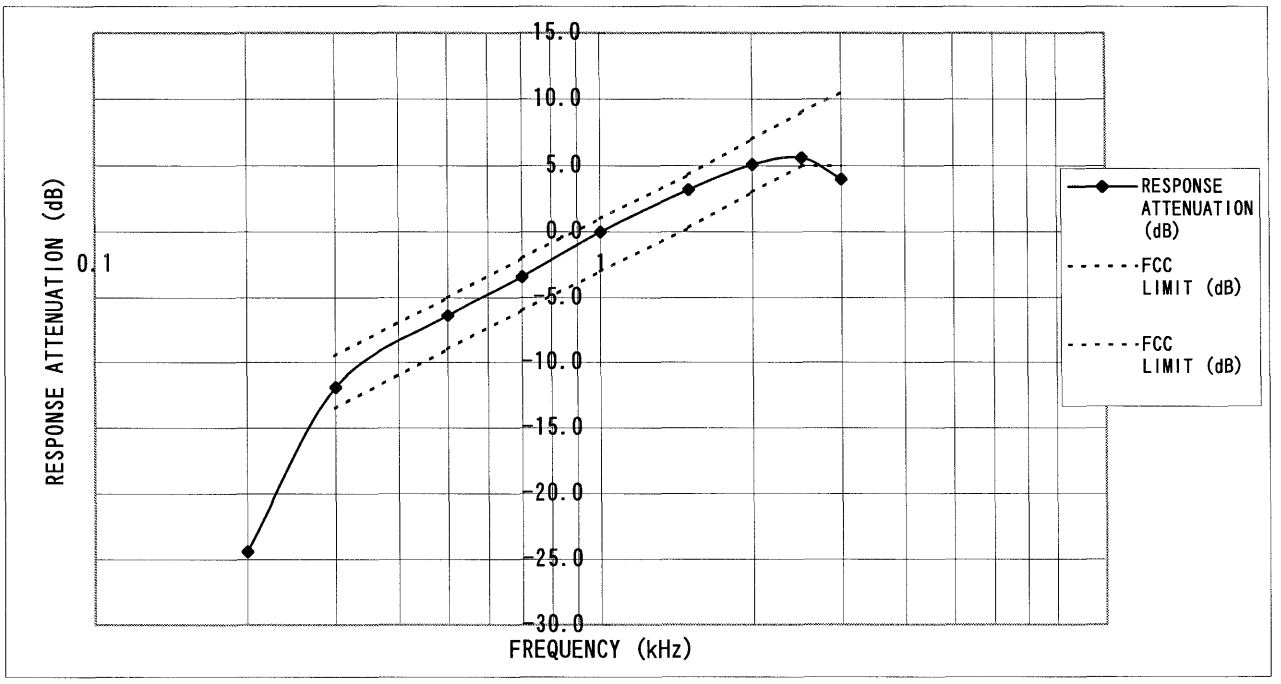
AUDIO FREQUENCY (kHz)	RESPONSE ATTENUATION (dB)	FCC LIMIT (dB)
0.1	0.0	--
0.2	0.0	--
0.3	0.0	--
0.5	0.0	--
0.7	0.0	--
1	0.0	--
1.5	0.0	--
2	0.0	--
2.5	-0.2	--
3	-1.5	0.0
3.5	-3.4	-2.6
4	-5.5	-5.0
5	-9.7	-8.9
7	-17.0	-14.7
10	-24.7	-21.0
15	-30.5	-28.0
20	-32.0	-28.0
30	-32.5	-28.0
50	-32.5	-28.0
70	-32.5	-28.0



4. MODULATION CHARACTERISTICS (AUDIO FREQUENCY RESPONSE) 2.1047

CARRIER FREQUENCY: 156.80 MHz
OUTPUT POWER: 24.7 WATTS

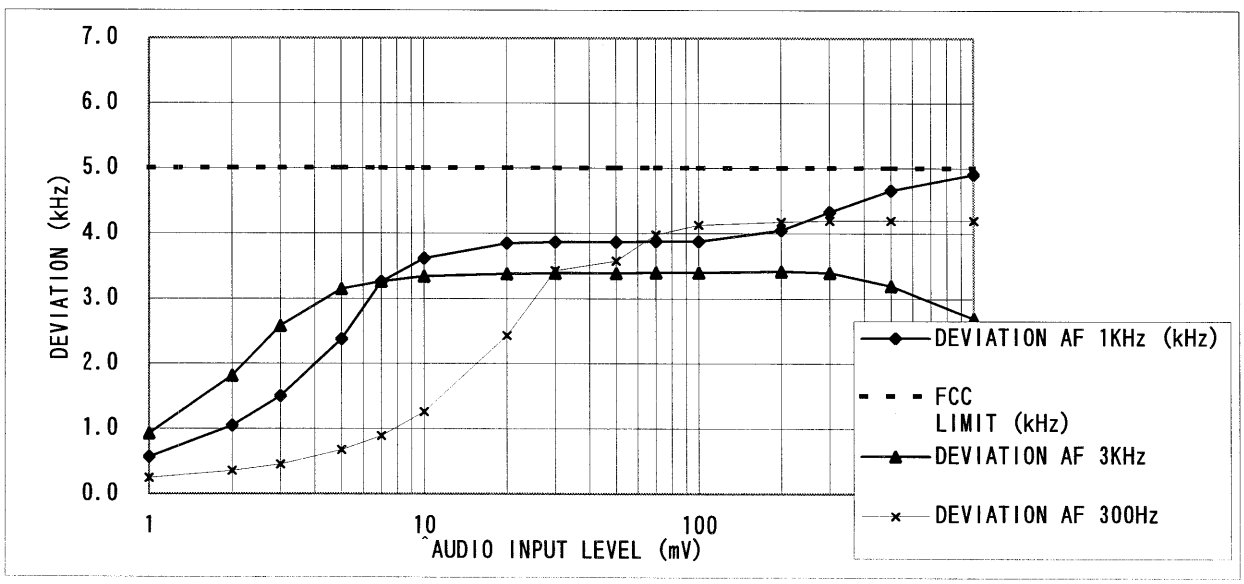
AUDIO FREQUENCY	RESPONSE ATTENUATION	FCC LIMIT	
(kHz)	(dB)	(dB)	
0.2	-24.4		
0.3	-11.9	-9.5	-13.5
0.5	-6.4	-5.0	-9
0.7	-3.4	-2.0	-6
1	0.0	1.0	-3
1.5	3.2	4.3	0.3
2	5.1	7.0	3
2.5	5.6	9.0	5
3	4.0	10.5	5



5. MODULATION CHARACTERISTICS (MODULATION LIMITING) 2.1047

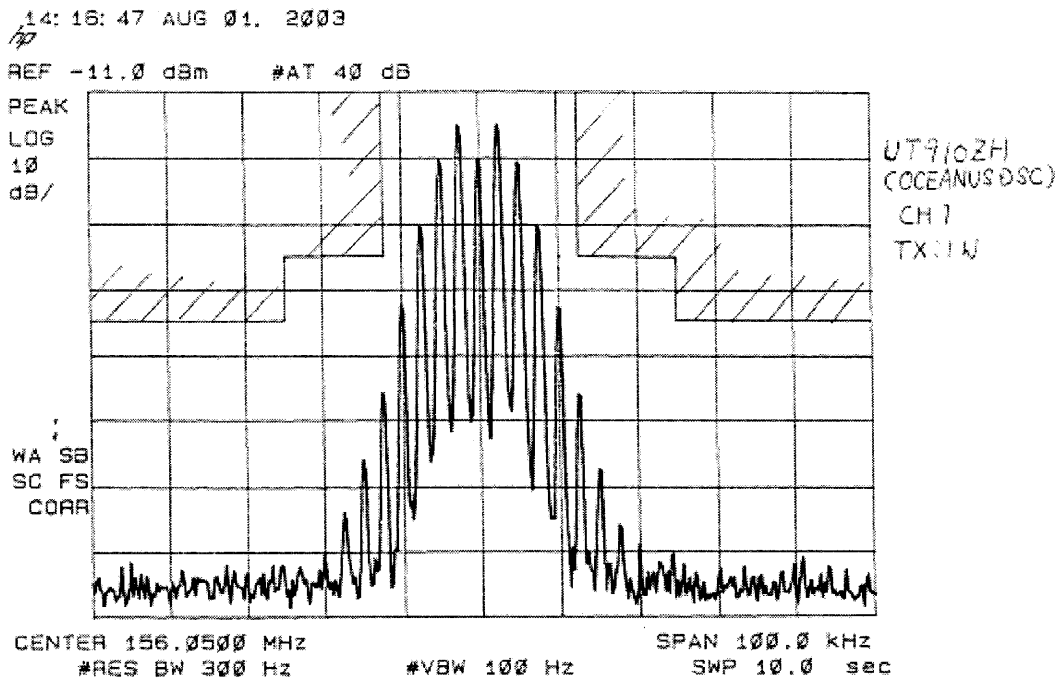
CARRIER FREQUENCY: 156.80 MHz
OUTPUT POWER: 24.7 WATTS
1KHz 3KHz 300Hz

AUDIO INPUT LEVEL	DEVIATION			FCC LIMIT
	AF 1KHz	AF 3KHz	AF 300Hz	
(mV)	(kHz)			(kHz)
1	0.6	0.9	0.3	5.0
2	1.1	1.8	0.4	5.0
3	1.5	2.6	0.5	5.0
5	2.4	3.2	0.7	5.0
7	3.3	3.3	0.9	5.0
10	3.6	3.3	1.3	5.0
20	3.9	3.4	2.4	5.0
30	3.9	3.4	3.4	5.0
50	3.9	3.4	3.6	5.0
70	3.9	3.4	4.0	5.0
100	3.9	3.4	4.1	5.0
200	4.1	3.4	4.2	5.0
300	4.3	3.4	4.2	5.0
500	4.7	3.2	4.2	5.0
1000	4.9	2.7	4.2	5.0

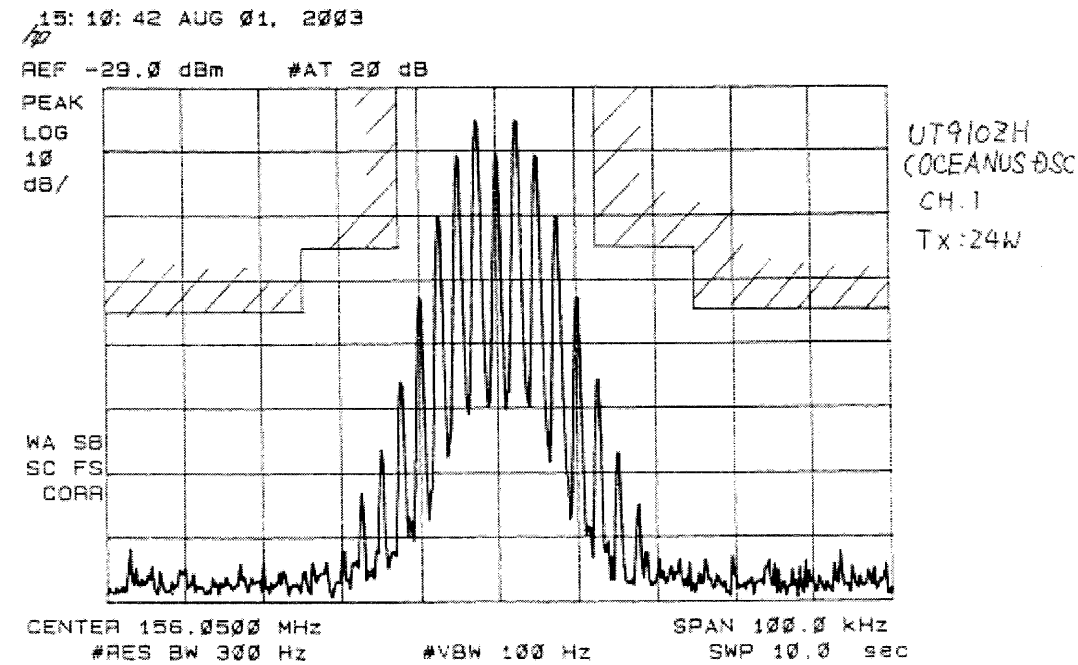


6-1. OCCUPIED BANDWIDTH 2.1049(c)(1) & 80.211

CH1 1W UT910ZH (OCEANUX DSC)



CH1 24W UT910ZH (OCEANUX DSC)



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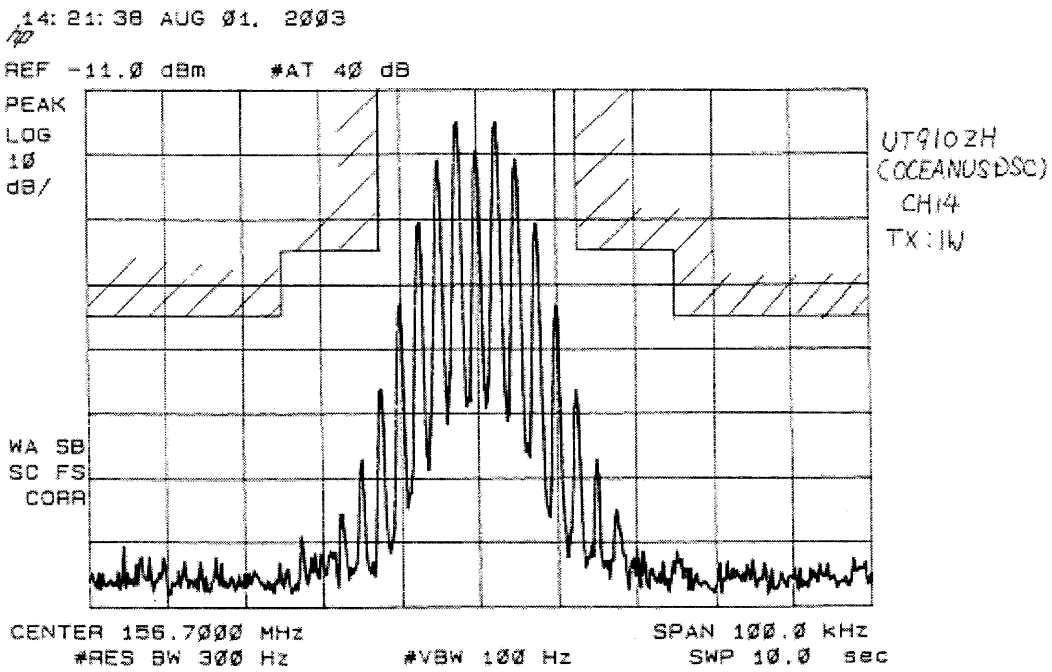
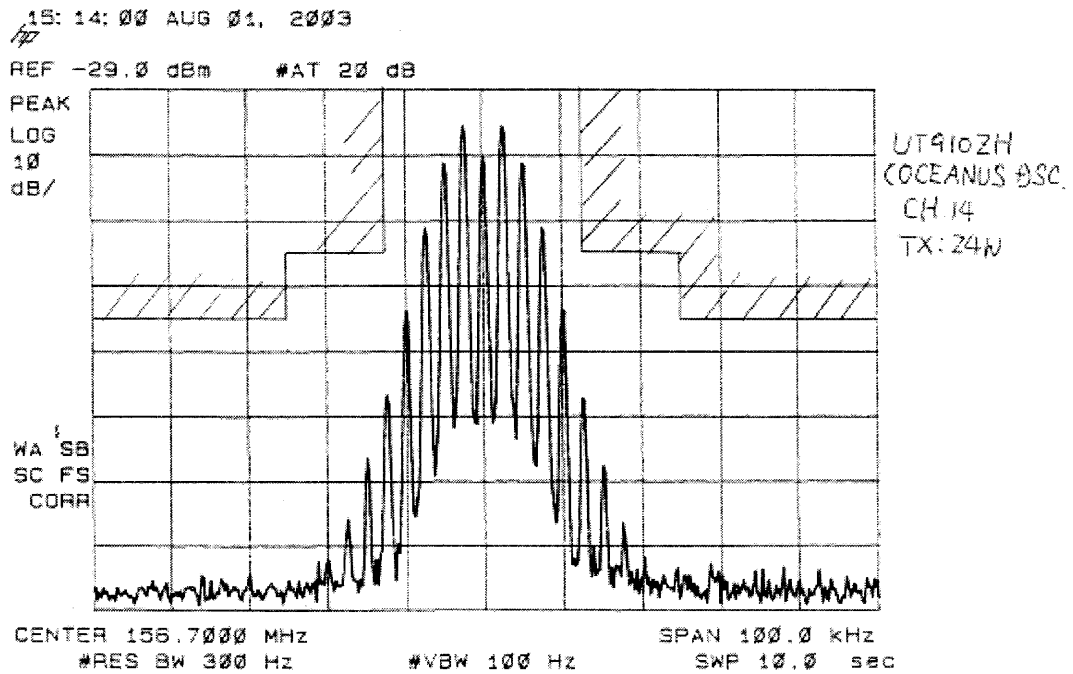
6-2. OCCUPIED BANDWIDTH

CH14 1W UT910ZH (OCEANUX DSC)

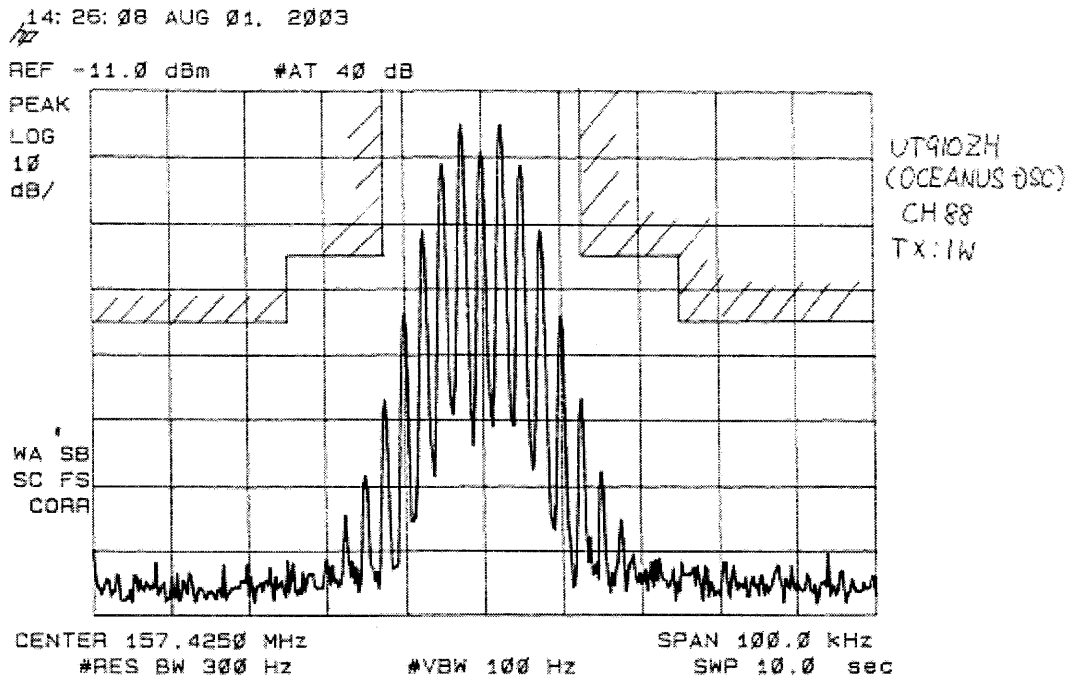


CH14 24W UT910ZH (OCEANUX DSC)

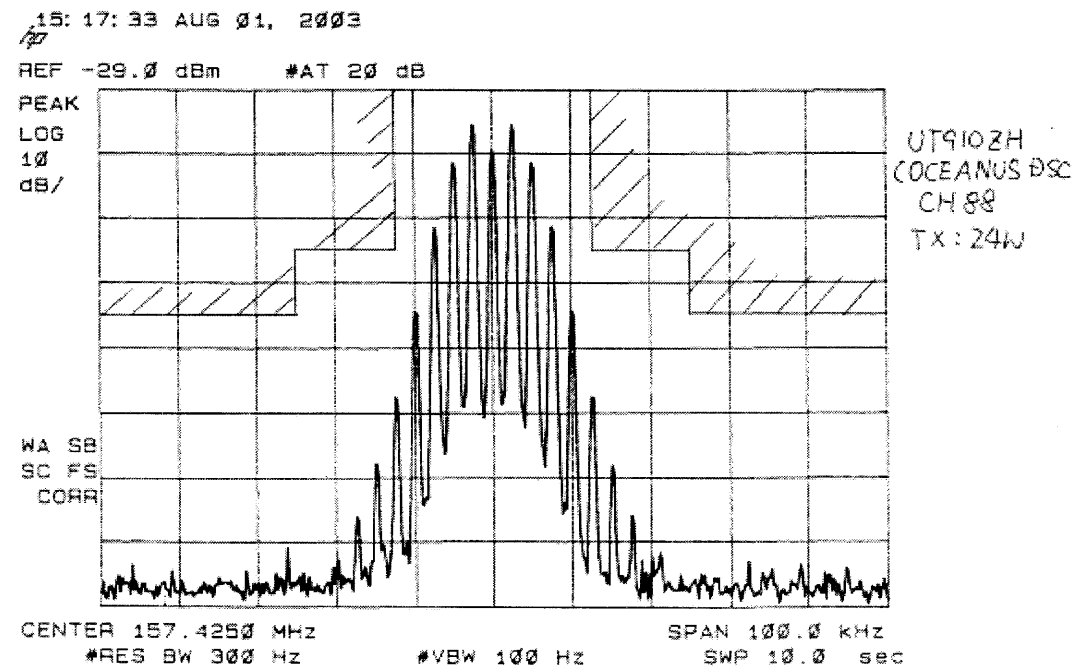


6-3. OCCUPIED BANDWIDTH

CH88 1W UT910ZH (OCEANUX DSC)



CH88 24W UT910ZH (OCEANUX DSC)



7. SPURIOUS & HARMONICS EMISSION AT ANTENNA TERMINAL 2.1051

TX

Full Power

Harmonics of Carrier	156.05MHz [dBc]	156.8MHz [dBc]	157.425MHz [dBc]
1	-	-	-
2	-70.7	-70.2	-69.2
3	-69.9	-65.0	-64.7
4	lesst than -90	lesst than -90	lesst than -90
5	lesst than -90	lesst than -90	lesst than -90
6	lesst than -90	lesst than -90	lesst than -90
7	lesst than -90	lesst than -90	lesst than -90
8	lesst than -90	lesst than -90	lesst than -90
9	lesst than -90	lesst than -90	lesst than -90
10	lesst than -90	lesst than -90	lesst than -90

Reduced Power

Harmonics of Carrier	156.05MHz [dBc]	156.8MHz [dBc]	157.425MHz [dBc]
1	-	-	-
2	-45.5	-46.0	-46.0
3	-72.0	-71.0	-71.0
4	lesst than -90	lesst than -90	lesst than -90
5	lesst than -90	lesst than -90	lesst than -90
6	lesst than -90	lesst than -90	lesst than -90
7	lesst than -90	lesst than -90	lesst than -90
8	lesst than -90	lesst than -90	lesst than -90
9	lesst than -90	lesst than -90	lesst than -90
10	lesst than -90	lesst than -90	lesst than -90

8. FIELD STRENGTH OF SPURIOUS & HARMONICS RADIATION

2.1053

1) Frequency at which tuned: 156.05 MHz

EMISSIONS (MHz)	DUT, PLACED V/H	ANT, POLARITY V/H	ATTENUATION (dBc)	FCC LIMIT (dBc)	MARGIN (dB)
FULL POWER: 24 WATTS					
312.100	H	H	-52.5	-47	5.5
468.150	H	V	-64.2	-47	17.2
624.200	H	H	-65.5	-47	18.5
780.250	-	-	-	-47	>20
936.300	-	-	-	-47	>20
1092.350	-	-	-	-47	>20
1248.400	-	-	-	-47	>20
1404.450	-	-	-	-47	>20

EMISSIONS (MHz)	DUT, PLACED V/H	ANT, POLARITY V/H	ATTENUATION (dBc)	FCC LIMIT (dBc)	MARGIN (dB)
REDUCED POWER: 1 WATT					
312.100	H	H	-45.6	-43	2.6
468.150	H	V	-61.7	-43	18.7
624.200	-	-	-	-43	>20
780.250	-	-	-	-43	>20
936.300	-	-	-	-43	>20
1092.350	-	-	-	-43	>20
1248.400	-	-	-	-43	>20
1404.450	-	-	-	-43	>20

2) Frequency at which tuned: 156.80 MHz

EMISSIONS (MHz)	DUT, PLACED V/H	ANT, POLARITY V/H	ATTENUATION (dBc)	FCC LIMIT (dBc)	MARGIN (dB)
FULL POWER: 24 WATTS					
313.600	H	H	-53.0	-47	6.0
470.400	H	V	-65.5	-47	18.5
627.200	H	V	-66.1	-47	19.1
784.000	-	-	-	-47	>20
940.800	-	-	-	-47	>20
1097.600	-	-	-	-47	>20
1248.400	-	-	-	-47	>20
1404.450	-	-	-	-47	>20

EMISSIONS (MHz)	DUT, PLACED V/H	ANT, POLARITY V/H	ATTENUATION (dBc)	FCC LIMIT (dBc)	MARGIN (dB)
REDUCED POWER: 1 WATT					
313.600	H	H	-46.8	-43	3.8
470.400	H	V	-61.4	-43	18.4
627.200	-	-	-	-43	>20
784.000	-	-	-	-43	>20
940.800	-	-	-	-43	>20
1097.600	-	-	-	-43	>20
1248.400	-	-	-	-43	>20
1404.450	-	-	-	-43	>20

3) Frequency at which tuned: 157.43 MHz

EMISSIONS (MHz)	DUT, PLACED V/H	ANT, POLARITY V/H	ATTENUATION (dBc)	FCC LIMIT (dBc)	MARGIN (dB)
FULL POWER: 24 WATTS					
314.850	H	H	-53.5	-47	6.5
472.275	H	V	-62.3	-47	15.3
629.700	-	-	-	-47	>20
787.125	-	-	-	-47	>20
944.550	-	-	-	-47	>20
1101.975	-	-	-	-47	>20
1248.400	-	-	-	-47	>20
1404.450	-	-	-	-47	>20

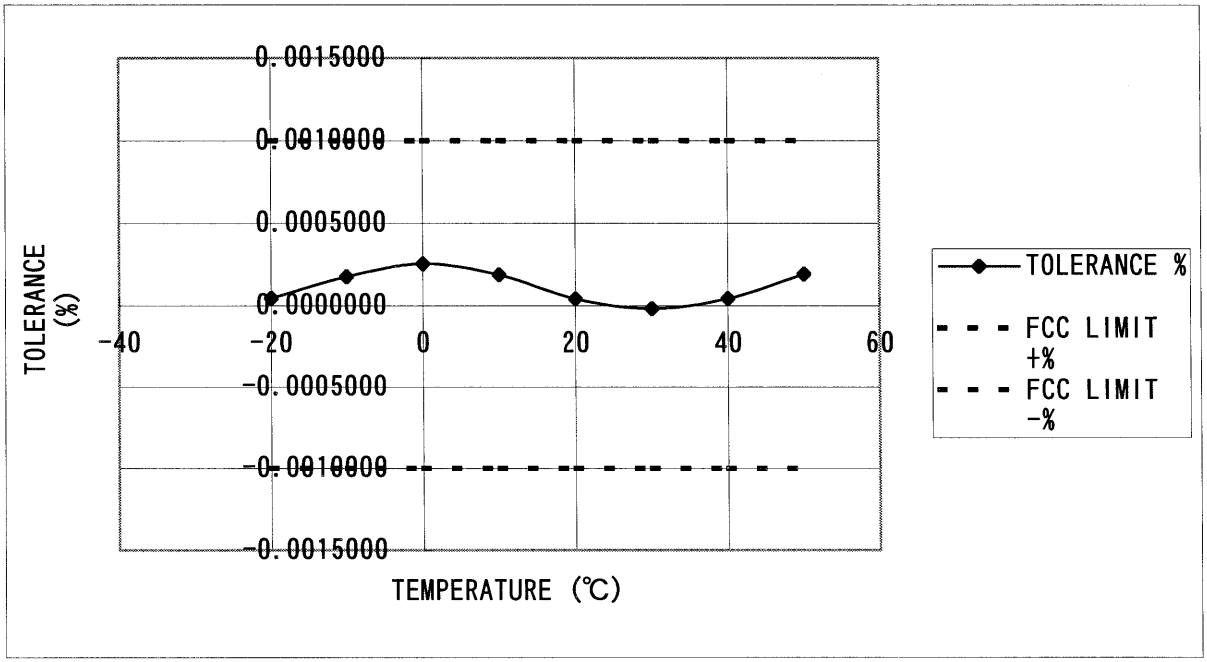
EMISSIONS (MHz)	DUT, PLACED V/H	ANT, POLARITY V/H	ATTENUATION (dBc)	FCC LIMIT (dBc)	MARGIN (dB)
REDUCED POWER: 1 WATT					
314.850	H	H	-47.2	-43	4.2
472.275	H	H	-60.8	-43	17.8
629.700	-	-	-	-43	>20
787.125	-	-	-	-43	>20
944.550	-	-	-	-43	>20
1101.975	-	-	-	-43	>20
1248.400	-	-	-	-43	>20
1404.450	-	-	-	-43	>20

Note: All spurious emissions note reported were attenuated by at least 20 dB below the FCC limit.

9. FREQUENCY STABILITY (TEMPERATURE RANGE) 2.1055 & 80.209

CENTER FREQUENCY : 156.800 MHz

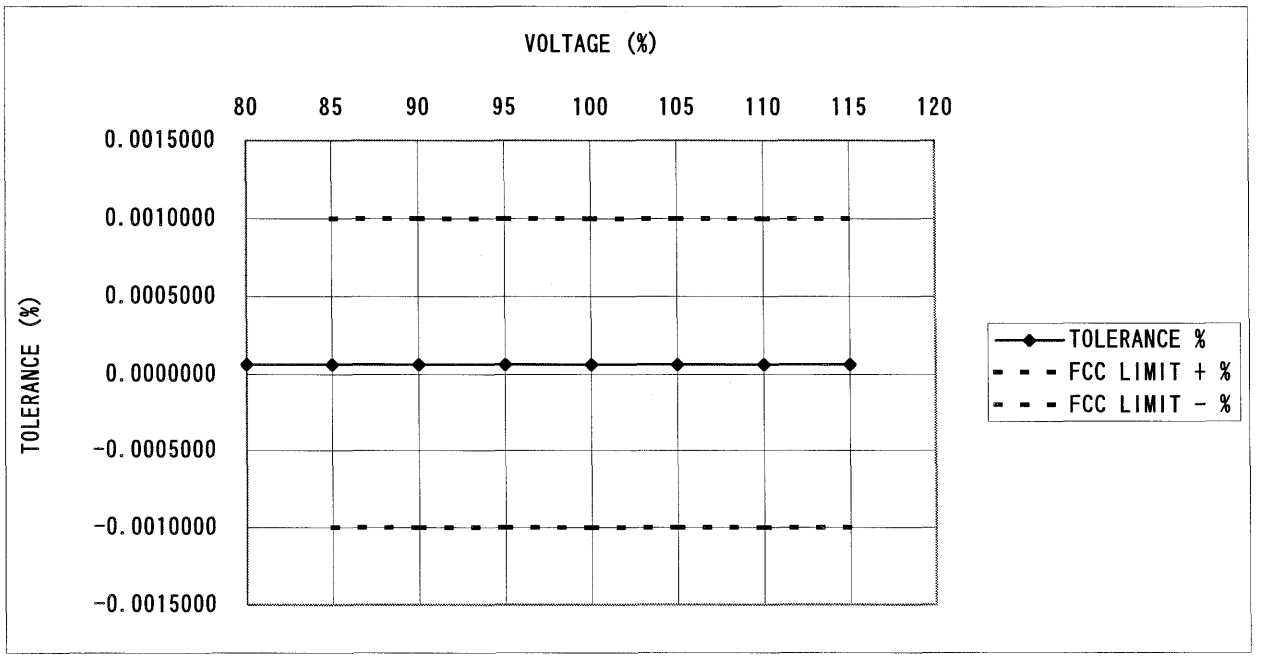
TEMPERATURE	FREQ.	TOLERANCE		FCC LIMIT	
℃	MHz	Hz	%	+%	-%
-20	156.800070	70	0.0000446	0.001	-0.001
-10	156.800277	277	0.0001767	0.001	-0.001
0	156.800400	400	0.0002551	0.001	-0.001
10	156.800295	295	0.0001881	0.001	-0.001
20	156.800063	63	0.0000402	0.001	-0.001
30	156.799973	-27	-0.0000172	0.001	-0.001
40	156.800067	67	0.0000427	0.001	-0.001
50	156.800302	302	0.0001926	0.001	-0.001



10. FREQUENCY STABILITY (VOLTAGE RANGE) 2.1055 & 80.209

CENTER FREQUENCY : 156.800 MHz

VOLTAGE		FREQ.	TOLERANCE		FCC LIMIT	
(V)	(%)	MHz	Hz	%	+ %	- %
11.04	80	156.8001	100	0.0000638		
11.73	85	156.8001	100	0.0000638	0.001	-0.001
12.42	90	156.8001	100	0.0000638	0.001	-0.001
13.11	95	156.8001	100	0.0000638	0.001	-0.001
13.80	100	156.8001	100	0.0000638	0.001	-0.001
14.49	105	156.8001	100	0.0000638	0.001	-0.001
15.18	110	156.8001	100	0.0000638	0.001	-0.001
15.87	115	156.8001	100	0.0000638	0.001	-0.001



NOTE: BATTERY ENDPOINT --- 11.0V

11. FIELD STRENGTH OF SPURIOUS & HARMONICS RADIATION 80.217(b)

1) Frequency at which tuned: 156.05 MHz

EMISSIONS (MHz)	DUT, PLACED V/H	ANT, POLARITY V/H	FIELD STRENGTH at 3m point (dBuV/m)	CONVERSION FACTOR (dB)	FIELD STRENGTH at 1 marine mile (1852m) (dBuV/m)	FCC LIMIT (dBuV/m)	MARGIN (dB)
70.000	H	V	22.8	-55.8	-33.0	-10	23.0
133.425	H	V	29.3	-55.8	-26.5	0	26.5

2) Frequency at which tuned: 156.80 MHz

EMISSIONS (MHz)	DUT, PLACED V/H	ANT, POLARITY V/H	FIELD STRENGTH at 3m point (dBuV/m)	CONVERSION FACTOR (dB)	FIELD STRENGTH at 1 marine mile (1852m)	FCC LIMIT (dBuV/m)	MARGIN (dB)
74.300	H	V	27.3	-55.8	-28.5	-10	18.5
133.425	H	V	29.5	-55.8	-26.3	0	26.3

3) Frequency at which tuned: 157.43 MHz

EMISSIONS (MHz)	DUT, PLACED V/H	ANT, POLARITY V/H	FIELD STRENGTH at 3m point (dBuV/m)	CONVERSION FACTOR (dB)	FIELD STRENGTH at 1 marine mile (1852m) (dBuV/m)	FCC LIMIT (dBuV/m)	MARGIN (dB)
49.700	H	V	32.4	-55.8	-23.4	-10	13.4
69.400	H	V	26.1	-55.8	-29.7	-10	19.7
98.950	H	H	23.3	-55.8	-32.5	-10	22.5
138.400	H	V	29.3	-55.8	-26.5	0	26.5

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