2.911

TECHNICAL REPORT

NAME AND ADDRESS OF MANUFACTURER

APPLICANT

NAME OF VENDOR

ICOM AMERICA, INC.
2380 116TH Ave NE
Bellevue, WA 98004

TRADE NAME

ICOM

FCC ID:

AFJIC-T2H

PHOTOGRAPHS

See List of Exhibits

15.31 MEASURE STANDARD AND PROCEDURE

JAPAN QUALITY ASSURANCE ORGANIZATION
KITA-KANSAI TESTING CENTER
7-7 Ishimaru 1-Chome, Minoh-shi, Osaka 562 Japan. Phone: +81-727-29-2243/Facsimile: +81-727-28-6848

EMC EMISSION - TEST REPORT

JQA APPLICATION No. : KL8080108

Model/Type No. : IC-T2H

Name of Product : Receiver portion of VHF Transceiver

FCC ID : AFJ IC-T2H

Applicant : ICOM INCORPORATED

Address : 1-6-19, Kami-Kuratsukuri, Hirano-ku 547-0004 , JAPAN

Manufacturer : ICOM INCORPORATED

Address : 1-6-19, Kami-Kuratsukuri, Hirano-ku 547-0004 , JAPAN

Final Judgement : Passed

TEST RESULTS IN THIS REPORT are obtained in use of equipment that is traceable to Electro-technical Lab. of MITI Japan and Comminications Research Lab. of PTT Japan.

THE TEST RESULTS only responds to the test sample. This test report shall not be reproduced except in full.

DIRECTORY

TEST REGULATION

FCC Rules and Regulations Part 15 Subpart A and B (April 17, 1997)

● - Superheterodyne Receiver

Test procedure:

Conducted and radiated emission test were performed according to the procedures in ANSI C63.4-1992.

GENERAL INFORMATION

Test facility:

1) Test Facility located at Kita-Kansai : 1st and 2nd Open Sites (3 m Site)
Test Facility located at Kameoka Open Site (3, 10 and 30 m, on common plane))
FCC filing No. : 31040/SIT 1300F2

2) KITA-KANSAI TESTING CENTER is recognized under the National Voluntary Lavoratory Accreditation Program for satisfactory compliance established in Title 15, Part 285 Code of Federal Regurations.
NAVLAP Lab Code: 200191-0

3) Average Measurement Method
FCC filing No. : 950523A 1300F2

Description of the Equipment Under Test (EUT):

1) Name	:	Receiver portion of VHF Transceiver
2) Model/Type No.	:	IC-T2H
3) Product Type	:	Pre-Production(S/N 00001)
4) Category	:	Doule-Superheterodyne Receiver
5) EUT Authorization	:	○ - Verification ● - Notification ○ - Certification
6) Highest frequency used/generated	:	143.150 MHz
4) Tunig Freqency	:	136.000 MHz - 174.000 MHz(Refer to page 9)
4) Accessories	:	Helical Antenna
7) Power Rating	:	AC120V60Hz (DC9.6V,Ni-Cd Battery 1.2Vx8) AC Adapter : BC-110A

Definitions for symbols used in this test report:

● - Black box indicates that the listed condition, standard or equipment is applicable for this Report.
○ - Blank box indicates that the listed condition, standard or equipment is not applicable for this Report.

TEST CONDITIONS

The measurement of the Conducted Emission (Disturbance Voltage)

was performed in the following test site.

Test location:

KITA-KANSAI Testing Center
7-7, Ishimaru 1-Chome, Minoh-Shi, Osaka 562-0027 Japan
● - Shielded room
KAMEOKA EMC Branch
9-1, Ozaki, Inukanno, Nishibetsuin-Cho, Kameoka-Shi, Kyoto 621-0126 Japan
○ - Shielded room
○ - On metal plane of open site

Used test instruments and sites:

Model No.	Device I.D No.	Last Cal. Date	Cal. Interval
○ - ESH 3	A - 1		
● - ESH 2	A - 2	December, 1997	1 Year
○ - ESH 2	A - 3		
● - KNW-407	D - 6	February, 1998	1 Year
○ - KNW-242	D - 7		
○ - KNW-408	D - 14		
○ - KNW-341C	D - 13		
○ - IEEE	D - 1		
○ - ESH2-Z5	D - 10		
○ - ESH3-Z5	D - 12		
○ - ESH2-Z3	D - 17		
○ - 8568B	A - 10		
○ - 8566B	A - 13		
○ - 8593A	A - 15		
○ - Cable	H - 5		
● - Cable	H - 8	February, 1998	1 Year

Environmental conditions:

Temperature: 21 ℃ Humidity: 53 %

The measurement of the Radiated Emission (Electric Field)

was performed in horizontal and vertical polarization, in the frequency range of 30 MHz - 1000 MHz, in the following test site.

Test location:

KITA-KANSAI Testing Center
7-7, Ishimaru 1-Chome, Minoh-Shi, Osaka 562-0027 Japan
● - 1st site (3 meters)
○ - 2nd site (3 meters)
KAMEOKA EMC Branch
9-1, Ozaki, Inukanno, Nishibetsuin-Cho, Kameoka-Shi, Kyoto 621-0126 Japan
○ - 3 meters
○ - 10 meters

Validation of Site Attenuation:

1) Last Confirmed Date: November 21, 1997
2) Interval : 1 Year

Used test instruments:

	Model No.	Device I.D No.	Last Cal. Date	Cal. Interval
○	ESV/ESV-Z3	A - 7 / A - 17		
○	ESV/ESV-Z3	A - 6 / A - 18		
●	ESV/ESV-Z3	A - 5 / A - 16	December, 1997	1 Year
○	ESV/ESV-Z3	A - 4 / A - 20		
○	ESV/ESV-Z3	A - 8 / A - 19		
●	KBA-511A	C - 12	December, 1997	1 Year
●	KBA-611	C - 22	December, 1997	1 Year
●	Cable	H - 5	November, 1997	1 Year
○				

Environmental conditions:

Temperature: 25 °C Humidity: 60 %

The measurement of the Radiated Emission (Electric Field) was performed in horizontal and vertical polarization, in the frequency range of 1 GHz - 2.2 GHz, in the following test site.

Test location:

KITA-KANSAI Testing Center
7-7, Ishimaru 1-Chome, Minoh-Shi, Osaka 562-0027 Japan
○ - 1st site (3 meters)
○ - 2nd site (3 meters)
KAMEOKA EMC Branch
9-1, Ozaki, Inukanno, Nishibetsuin-Cho, Kameoka-Shi, Kyoto 621-0126 Japan
○ - 3 meters
○ - 10 meters

Used test instruments:

	Model No.	Device I.D No.	Last Cal. Date	Cal. Interval
○	8566B	A - 13		
○	8593A	A - 15		
○	4T-10	D - 73		
○	4T-10	D - 74		
○	WJ-6611-513	A - 23		
○	WJ-6882-824	A - 21		
○	91888-2	C - 41-1		
○	91889-2	C - 40		
○	94613-1	C - 40		
○	Cable	H - 9		
○	Cable	H - 10		
○				

Setting of the spectrum analyzer:

RES B.W : 1 MHz Video B.W : 1 MHz
SCALE : LIN Sweep Time: 20 msec.

Environmental conditions: Temperature: ____ ℃ Humidity: ____ %

The measurement of the Antenna-Conducted Power

was performed in the following test site.

Test location:

KITA-KANSAI Testing Center
7-7, Ishimaru 1-Chome, Minoh-Shi, Osaka 562-0027 Japan
● - Shielded room
○ - Anechoic Chamber
KAMEOKA EMC Branch
9-1, Ozaki, Inukanno, Nishibetsuin-Cho, Kameoka-Shi, Kyoto 621-0126 Japan
○ - Shielded room

Used test instruments:

Model No.	Device I.D No.	Last Cal. Date	Cal. Interval
● - ESV/ESV-Z3	A - 7 / A - 17	December, 1997	1 Year
○ - ESV/ESV-Z3	A - 6 / A - 18		
○ - ESV/ESV-Z3	A - 5 / A - 16		
○ - ESV/ESV-Z3	A - 4 / A - 20		
○ - ESV/ESV-Z3	A - 8 / A - 19		
○ - 8566B	A - 13		
● - 2-10	D - 40	June , 1998	1 Year

Environmental conditions:

Temperature: 21 °C Humidity: 53 %

CONFIGURATION OF EUT

The Equipment Under Test (EUT) consists of:

Description	Applicant (Manufacturer)	Model No. (Serial No.)	FCC ID
VHF/UHF FM Transceiver	ICOM INCORPORATED (ICOM INCORPORATE)	IC-T2H (00001)	AFJ IC-T2H
Speaker Microphone	ICOM INCORPORATED (ICOM INCORPORATED)	HM-75A (---)	N/A
Battery Case	ICOM INCORPORATED (ICOM INCORPORATED)	BP-194 (---)	N/A
AC Adapter	ICOM INCORPORATED (ICOM INCORPORATED)	BC-110A (---)	N/A

The measurement was carried out with the following equipment connected:

None

Type of Interference Cable(s) and the AC Power Cord used with the EUT:

No.	Cable	Shielded	Ferrite Core	Length
1	EUT"MIC/SP"/Speaker Microphone	NO	NO	0.5m
2	EUT"CHARGER"/AC Adapter(DC Power Cord with 2-pin plug)	NO	NO	1.9m

Detailed receiver portion:

1) Frequency bands tuned by the receiver and Intermediate Frequency

No.	Receiving Frequency Band [MHz]	1st Local Frequency [MHz]	2nd Local Frequency [MHz]
1	136.000 - 174.000	105.150 - 143.150	30.400

1st IF : 30.850 MHz
2nd IF : 0.45 MHz

2) The highest generated frequency : 143.150 MHz

4) Type of Antenna :

External 50 Ω(Unbalanced)

5) The used(generated) frequencies used the EUT :

CPU : 6.800 MHz
PLL : 15.200 MHz
Local frequency : 105.150 - 143.150 MHz, 30.400 MHz

EUT Modification

● - No modifications were conducted by JQA to achive compliance to the applied limits.

○ - To achieve compliance to the applied limits, the following change(s) were made by JQA during the compliance test.

The modification(s) will be implemented in all production models of this equipment.

Applicant : _____ Date :

Typed Name : Position :

Responsible Party

Responsible Party of Test Item(Product)

Responsibe party :

Contact Person :

_____
Signatory

TEST RESULTS

Conducted Emission 450 kHz - 30 MHz

The requirements are ● - KEPT ○ - NOT KEPT

Min. limit margin 35.5 dB at 8.50 MHz

Max. limit exceeding _____ dB at _____ MHz

Uncertainty of measurement results +2.1 dB(2σ) -2.1 dB(2σ)

Remarks: _____

Radiated Emission (Electric Field) 30 MHz - 1.0 GHz

The requirements are ● - KEPT ○ - NOT KEPT

Min. limit margin More than 9.6 dB at 946.35 MHz

Max. limit exceeding _____ dB at _____ MHz

Uncertainty of measurement results +4.1 dB(2σ) -4.2 dB(2σ)

Remarks: _____

Antenna-Conducted Power 30 MHz - 1.0 GHz

The requirements are ● - KEPT ○ - NOT KEPT

Min. limit margin 21.0 dB at 143.15 MHz

Max. limit exceeding _____ dB at _____ MHz

Uncertainty of measurement results +2.3 dB(2σ) -2.3 dB(2σ)

Remarks: _____

SUMMARY

GENERAL REMARKS :

The EUT was tested according to the requirements of FCC Rules and Regulations Part 15 Subpart A and B (April 17, 1997) under the test configuration, as shown in page 13.
The conclusion for the test items of which are required by the applied regulation is indicated under the final judgement.

FINAL JUDGEMENT :

The "as received" sample;

● - fulfill the test requirements of the regulation mentioned on page 3.

○ - fulfill the test requirements of the regulation mentioned on page 3, but with certain qualifications.

○ - doesn't fulfill the test regulation mentioned on page 3.

Begin of testing : May 29, 1998

End of testing : June 1, 1998

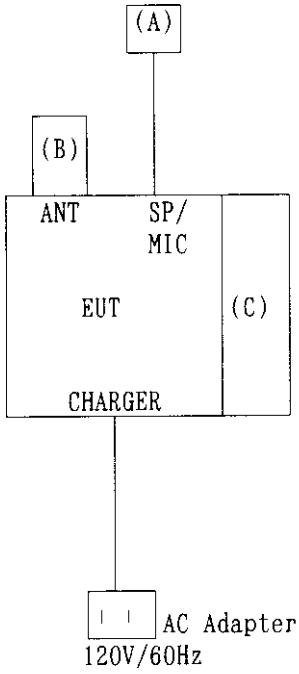
- JAPAN QUALITY ASSURANCE ORGANIZATION -

Takashi Yamanaka
Manager
EMC Div.
JQA KITA-KANSAI Testing Center

Approved Signatory :

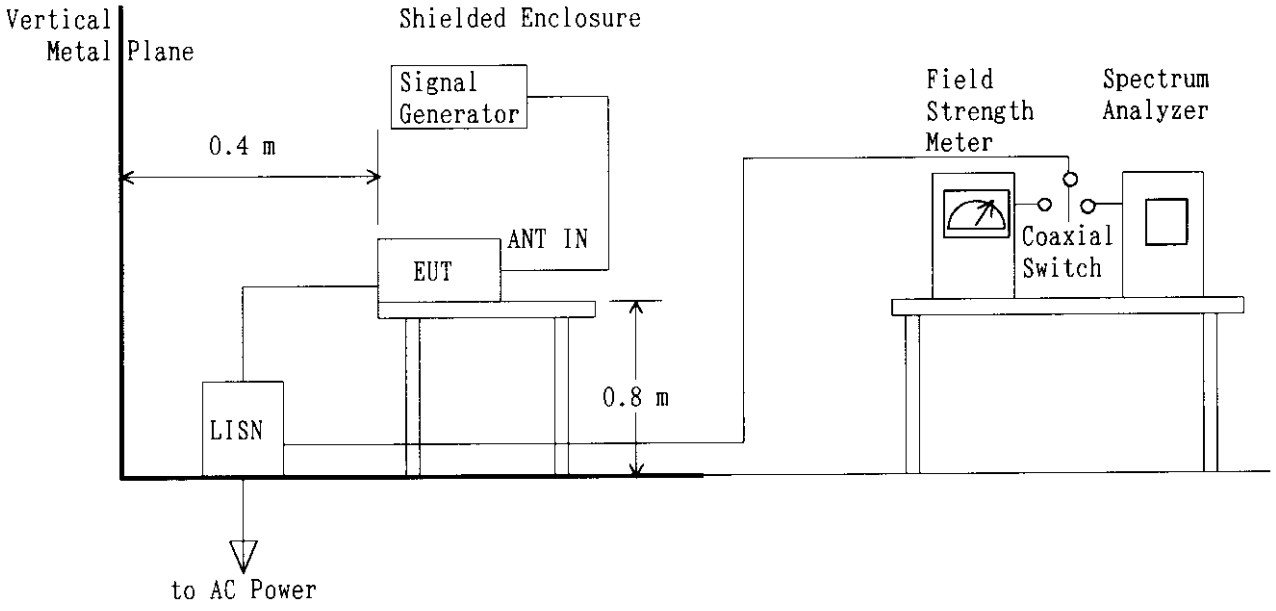
Akio Hosoda
Project Manager
EMC Div.
JQA KITA-KANSAI Testing Center

Test System-Arrangement (Drawings)

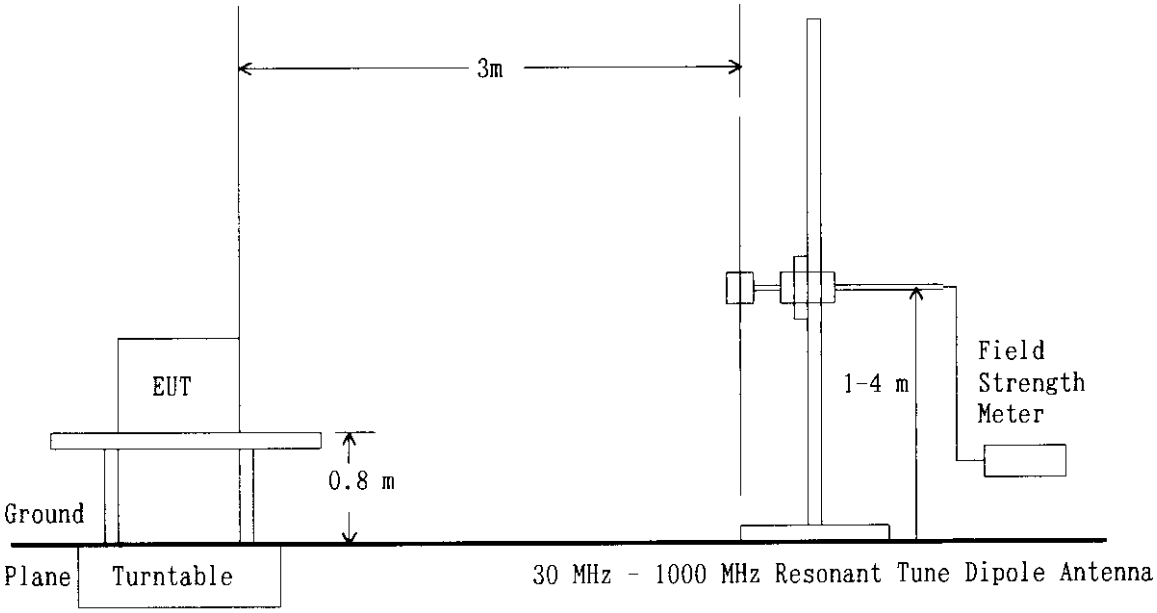


(A) Speaker/Microphone
(B) 50Ω terminator at an antenna terminal(BNC-type/50Ω unbalanced)
(C) Battery Case(Ni-Cd Battery 1.2V700mAh x8, KRO.7AAR)

Test-setup(Drawings)

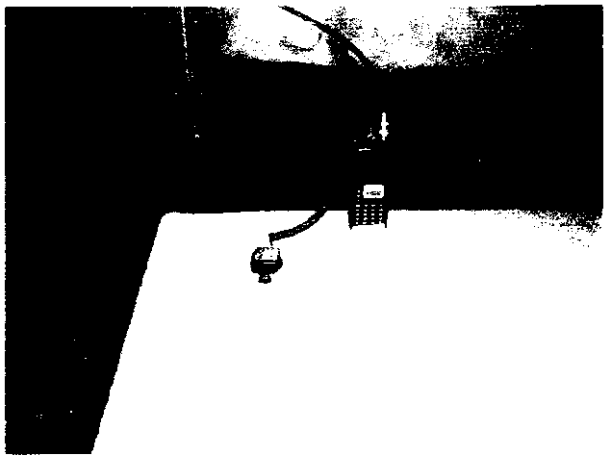


Radiated Emission (Electric Field) 30 MHz - 1000 MHz:



Test-Setup (Photographs) at worst case

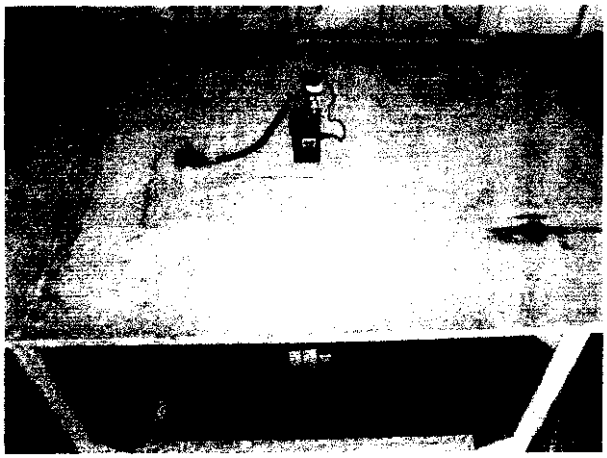
Conducted Emission 450kHz - 30MHz:

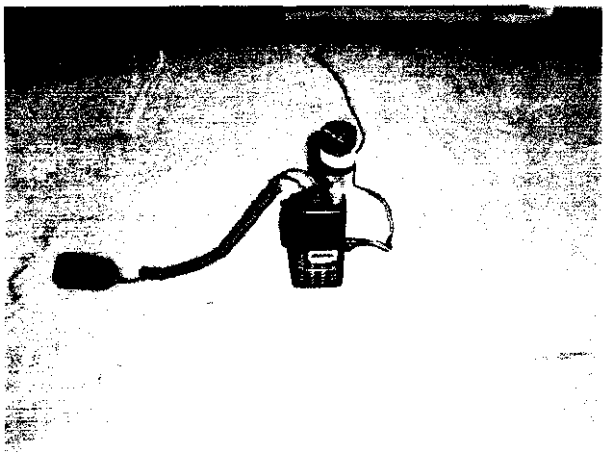


Front View

Side View

Radiated Emission 30MHz - 1000MHz:





Close-up of EUT

Mains terminal Disturbance Measurement

Test Date: June 1, 1998
Temp.: 21°C; Hum.: 53%

Frequency to which tuned : 155.00 MHz
Operating Condition : Receiving and Charging

Frequency [MHz]	Correction Factor [dB]	Meter Readings dB(uV) VA-QP	VA-AV	VB-QP	VB-AV	Limits dB(uV)	Results dB(uV) QP	AV	Remarks (Note 2)
0.45	0.1	<10.0	-	<10.0	-	48.0	<10.1	-	A
1.00	0.1	<10.0	-	<10.0	-	48.0	<10.1	-	A
1.40	0.2	<10.0	-	<10.0	-	48.0	<10.2	-	A
2.00	0.2	<10.0	-	<10.0	-	48.0	<10.2	-	A
5.10	0.4	<10.0	-	<10.0	-	48.0	<10.4	-	A
6.80	0.4	<10.0	-	<10.0	-	48.0	<10.4	-	A
8.50	0.5	11.0	-	12.0	-	48.0	12.5	-	A
12.00	0.6	<10.0	-	<10.0	-	48.0	<10.6	-	A
20.00	0.8	<10.0	-	<10.0	-	48.0	<10.8	-	A
30.00	0.9	<10.0	-	<10.0	-	48.0	<10.9	-	A

Sample of calculated result at 8.50 MHz, as the Minimum Margin point:

Cable Loss	=	0.5 dB
+)Meter Reading	=	12.0 dB(uV)
Result	=	12.5 dB(uV)

Minimum Margin : 48.0 - 12.5 = 35.5(dB)
The point shown on "____ " is the Minimum Margin Point.

Note 1:
1.The correction factors includes the LISN insertion loss and the cable loss.

Remarks:

Note 2	Detector Function	IF Bandwidth
A	CISPR QP	9KHz
B	Average	10KHz

Tester Signature : A. Hosoda

Type Name : Akio Hosoda

Electromagnetic Radiation Disturbance Measurement

Test Date: May 29, 1998
Temp.: 25°C; Hum.: 60%

Tuning Range : 136.000 MHz - 174.000 MHz

Frequency tuned [MHz]	Frequency emmision [MHz]	Meter readings at 3m dB(uV)	Polarization	Correction Factor dB(1/m)	Limits dB(uV/m)	Field Strength at 3m dB(uV/m)	Remarks (Note2)
1st Local Oscillator Frequency							
136.000	105.150	8.0	V	11.2	43.5	19.2	A
	210.300	< 0.0	-	18.3	43.5	<18.3	A
	315.450	< 0.0	-	22.6	46.0	<22.6	A
	420.600	< 0.0	-	25.9	46.0	<25.9	A
	525.750	< 0.0	-	28.7	46.0	<28.7	A
	630.900	< 0.0	-	30.9	46.0	<30.9	A
	736.050	< 0.0	-	32.9	46.0	<32.9	A
	841.200	< 0.0	-	34.6	46.0	<34.6	A
	946.350	< 0.0	-	36.4	46.0	<36.4	A
155.000	124.150	12.0	V	12.9	43.5	24.9	A
	248.300	< 0.0	-	20.0	46.0	<20.0	A
	372.450	4.0	V	24.5	46.0	28.5	A
	496.600	< 0.0	-	27.9	46.0	<27.9	A
	620.750	< 0.0	-	30.6	46.0	<30.6	A
	744.900	< 0.0	-	33.0	46.0	<33.0	A
	869.050	< 0.0	-	35.1	46.0	<35.1	A
	993.200	< 0.0	-	37.1	54.0	<37.1	A
174.000	143.150	11.0	H	14.3	43.5	25.3	A
	286.300	< 0.0	-	21.5	46.0	<21.5	A
	429.450	6.0	V	26.1	46.0	32.1	A
	572.600	< 0.0	-	29.7	46.0	<29.7	A
	715.750	< 0.0	-	32.5	46.0	<32.5	A
	859.900	< 0.0	-	34.9	46.0	<34.9	A
2nd Local Oscillator Frequency							
155.000	30.400	< 0.0	-	0.6	40.0	< 0.6	A
	45.600	< 0.0	-	3.4	40.0	< 3.4	A
	60.800	< 0.0	-	6.1	40.0	< 6.1	A

Sample of calculated result at 946.35 MHz, as the Minimum Margin point:

Corretion Factor	=	36.4 dB(1/m)
+)Meter Reading	=	< 0.0 dB(uV)
Result	=	<36.4 dB(uV/m)

Minimum Margin : 46.0 - <36.4 = >9.6(dB)
The point shown on "___ " is the Minimum Margin Point.

Note 1:
1)The highest frequency generated or used in the EUT: 143.15 MHz
2)The upper frequency of measurement range : 1.0 GHz
3)The spectrum was scanned 30 MHz to 1.0 GHz and all emissions not reported were more than 20dB below the applied limits.

Remarks:

Note 2	Detector Function	IF Bandwidth
A	CISPR QP	120 KHz

Note 2	Detector Function	RES. B.W	V.B.W	Sweep Time	Span
B	Peak (SP)	1MHz	3MHz	20 msec	0 Hz
* C	Average(ESV)	1MHz(3 MHz)	3MHz	20 msec	0 Hz

( ):Setting of spectrum analyzer
*)For the avarage measurement method, it is made measurement using a test receiver, a step attenuator and a spectrum analyzer.

Tester Signature : A. Hosoda

Type Name : Akio Hosoda

Antenna-Conducted Power Measurement

Test Date: June 1, 1998
Temp.: 21°C; Hum.: 53%

Tuning Range : 136.000 MHz - 174.000 MHz

Frequency tuned [MHz]	Frequency emmision [MHz]	Meter readings dB(uV)	Correction Factor dB	Limits dB(uV)	Results dB(uV)	Remarks (Note2)
1st Local Oscillator Frequency						
136.000	105.150	13.0	10.0	50.0	23.0	A
	210.300	<10.0	10.0	50.0	<20.0	A
	315.450	14.0	10.0	50.0	24.0	A
	420.600	<10.0	10.0	50.0	<20.0	A
	525.750	11.0	10.0	50.0	21.0	A
	630.900	<10.0	10.0	50.0	<20.0	A
	736.050	<10.0	10.0	50.0	<20.0	A
	841.200	<10.0	10.0	50.0	<20.0	A
	946.350	<10.0	10.0	50.0	<20.0	A
155.000	124.150	18.0	10.0	50.0	28.0	A
	248.300	<10.0	10.0	50.0	<20.0	A
	372.450	18.0	10.0	50.0	28.0	A
	496.600	<10.0	10.0	50.0	<20.0	A
	620.750	13.0	10.0	50.0	23.0	A
	744.900	<10.0	10.0	50.0	<20.0	A
	869.050	<10.0	10.0	50.0	<20.0	A
	993.200	<10.0	10.0	50.0	<20.0	A
174.000	143.150	19.0	10.0	50.0	29.0	A
	286.300	<10.0	10.0	50.0	<20.0	A
	429.450	27.0	10.0	50.0	27.0	A
	572.600	12.0	10.0	50.0	22.0	A
	715.750	15.0	10.0	50.0	25.0	A
	858.900	<10.0	10.0	50.0	<20.0	A
2nd Local Oscillator Frequency						
155.000	30.400	<10.0	10.0	50.0	<20.0	A
	45.600	<10.0	10.0	50.0	<20.0	A
	60.800	<10.0	10.0	50.0	<20.0	A

Sample of calculated result at 143.150 MHz, as the Minimum Margin point:

Correction Factor	=	10.0 dB
+)Meter Reading	=	19.0 dB(uV)
Result	=	29.0 dB(uV)

Minimum Margin : 50.0 - 29.0 =21.0(dB)
The point shown on "____ " is the Minimum Margin Point.

Note 1:
1)The highest frequency generated or used in the EUT: 143.15 MHz
2)The upper frequency of measurement range : 1.0 GHz
3)The spectrum was scanned 30 MHz to 1.0 GHz and all emissions not reported were more than 20dB below the applied limits.

Remarks:

Note 2	Detector Function	IF Bandwidth
A	CISPR QP	120 KHz

Note 2	Detector Function	RES. B.W	V.B.W	Sweep Time	Span
B	Peak (SP)	100kHz	300kHz	20 msec	1MHz
* C	Average(ESV)	1MHz(3 MHz)	3MHz	20 msec	0 Hz

( ):Setting of spectrum analyzer
*)For the avarage measurement method, it is made measurement using a test receiver, a step attenuator and a spectrum analyzer.

Tester Signature : A. Hosoda

Type Name : Akio Hosoda

LIST OF EXHIBITS

APPLICANT: ICOM INCORPORATED

EQUIPMENT: FCC ID: AFJIC-T2H

BY APPLICANT:

EXHIBIT NO.:

1. IDENTIFICATION LABEL DRAWINGS
2. PHOTOGRAPHS
3. BLOCK DIAGRAMS
4. CIRCUIT DESCRIPTION
5. ALIGNMENT PROCEDURE
6. MANUAL

ADJUSTMENT PROCEDURES for IC-T2H

1.PLL ADJUSTMENT

ADJUSTMENT		ADJUSTMENT CONDTIONS	MEASURMENT		VALUE	ADJUSTMENT	
			UNIT	LOCATION		UNIT	ADJUST
PLL LOCK VOLTAGE	1	・Operating freq. :146.0000 MHz ・Receiving	MAIN	Connect avolt meter to the check point "LV".	1.4 V	MAIN	L11
REFERENCE FREQUENCY	1	・Operating freq. :146.0000 MHz ・Transmitting	Top panel	Loosely couple a frequency counter to the antenna connector.	146.0000 MHz	MAIN	C68

2.TRANSMITTER ADJUSTMENT

ADJUSTMENT		ADJUSTMENT CONDTIONS	MEASURMENT		VALUE	ADJUSTMENT	
			UNIT	LOCATION		UNIT	ADJUST
OUTPUT POWER	1	・Operating freq. :146.0000 MHz ・HIGH/LOW switch :HIGH ・Connect the "JIG" to the [SP] jack. ・Transmitting	Top panel	Connect an RF power mater to the antenna Connector.	5.5 W	Front panel	Push [UP] or [DOWN] swith while transmit-ting.
	2	・HIGH/LOW switch :LOW ・Transmitting			1.0 W		
FM DEVIATION	1	・Operating freq. :146.0000 MHz ・HIGH/LOW switch :HIGH ・Apply an audio generator to the [MIC] jack and set as : 1 KHz/120 mV ・Set an FM deniation meter as : HPF :OFF LPF :20 KHz De-emphasis :OFF Detector :(P-P)/2 ・Transmitting	Top panel	Connect an FM deviation meter to the antenna connector through an attenuator.	±4.5 KHz	MAIN	R119

3.RECEIVER ADJUSTMENT

ADJUSTMENT		ADJUSTMENT CONDTIONS	MEASURMENT		VALUE	ADJUSTMENT	
			UNIT	LOCATION		UNIT	ADJUST
SENSITIVITY	1	・Operating freq. :146.0000 MHz ・Connect an SSG to the antenna connector and set as : Frequency :146.0000 MHz Level :1uV*(-107 dBm) Modulation :1 KHz Deviation :±3.5 KHz ・Receiving	MAIN	Connect a digital voltmeter to the check point "S".	Maximum level level	MAIN	Adjust in sequence L18,L19
S-METER	1	・Operating freq. :146.0000 MHz ・Connect the "JIG" to the [SP] jack. ・Connect an SSG to the antenna connector and set as : Frequency :146.0000 MHz Level :0.5uV*(-113 dBm) Modulation :OFF ・Receiving	Front panel	LCD		Push and hold [SP-Marke]switch.	
	2	・Set an SSG output level for the S-meter to S3 (s dots).	SSG	Output level	0.89 to 0.28 uV (-106 to -118 dBm)	Verify	
SQUELCH	1	・Operating freq. :146.0000 MHz ・Connect an SSG to the antenna connector and set as : Frequency :146.0000 MHz Level :0.11uV*(-126 dBm) Modulation :1 KHz Deviation :±3.5 KHz ・Receiving	Spea ker		At the point where the AF signals just disappears.	MAIN	R92