

ENGINEERING REPORT

IC-M510BB

FAX : (06) 6793-0021

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GENERAL INFORMATION

Receivers

Frequency Range : 156.050 to 163.275 MHz

Number of Channels : 183ch + WX 10ch + programable 70ch

Intermediate Frequency : 1st 21.7 MHz (Audio Receiver)
2nd 450kHz

1st 30.875 MHz (DSC Receiver)
2nd 450kHz

Input Impedance (RF) : 50 ohms

Output Impedance (SP) : 4 ohms

Audio Output Power (Resistive Load) : 15 W (4 ohms)

Transmitters

Frequency Range : 156.025 to 157.425 MHz

Maximum Power Rating: 25 / 1 W

Number of Channels : 173ch + programable 70ch

Input Impedance (MIC) : 2000 ohms

Output Impedance (RF) : 50 ohms nominal

Voltage Requirements : 13.8 V DC nominal value

Model name : IC-M510BB

Serial No. : 00000002

Manufacturer : ICOM INCORPORATED

This Report was prepared by ICOM INCORPORATED.

Test performed by Kazunori Sugimoto

TRANSMITTER

NAME OF TEST : RF POWER OUTPUT

MANUFACTURERS RATING : HIGH 25W
LOW 1W

TEST RESULT : MEETS MINIMUM STANDARD

TEST CONDITIONS : AS SPECIFIED IN PARAGRAPH

TEST ARRANGEMENT : SEE BLOCK DIAGRAM ON PAGE 24

MEASUREMENT DATA TEST FREQUENCY 156.050 MHz
Nominal Voltage 13.8 V

HIGH POWER 25 WATTS NOMINAL TRANSMIT POWER
(CH01) 22.54 WATTS ACTUAL TRANSMIT POWER
60.67 WATTS INPUT POWER
37.15 % EFFICIENCY

Limit
normal test conditions between 20W and 25W

LOW POWER 1 WATTS NOMINAL TRANSMIT POWER
(CH01) 0.76 WATTS ACTUAL TRANSMIT POWER
14.30 WATTS INPUT POWER
5.34 % EFFICIENCY

Limit
normal test conditions between 0.5W and 1.0W

NAME OF TEST : RF POWER OUTPUT

MANUFACTURERS RATING : HIGH 25W
 LOW 1W

TEST RESULT : MEETS MINIMUM STANDARD

TEST CONDITIONS : AS SPECIFIED IN PARAGRAPH

TEST ARRANGEMENT : SEE BLOCK DIAGRAM ON PAGE 24

MEASUREMENT DATA TEST FREQUENCY 156.800 MHz
 Nominal Voltage 13.8 V

HIGH POWER 25 WATTS NOMINAL TRANSMIT POWER
 (CH16) 22.53 WATTS ACTUAL TRANSMIT POWER
 59.63 WATTS INPUT POWER
 37.78 % EFFICIENCY

Limit
 normal test conditions between 20W and 25W

LOW POWER 1 WATTS NOMINAL TRANSMIT POWER
 (CH16) 0.77 WATTS ACTUAL TRANSMIT POWER
 14.30 WATTS INPUT POWER
 5.38 % EFFICIENCY

Limit
 normal test conditions between 0.5W and 1.0W

NAME OF TEST : RF POWER OUTPUT
MANUFACTURERS RATING : HIGH 25W
LOW 1W
TEST RESULT : MEETS MINIMUM STANDARD
TEST CONDITIONS : AS SPECIFIED IN PARAGRAPH
TEST ARRANGEMENT : SEE BLOCK DIAGRAM ON PAGE 24

MEASUREMENT DATA TEST FREQUENCY 157.425 MHz
Nominal Voltage 13.8 V

HIGH POWER 25 WATTS NOMINAL TRANSMIT POWER
(CH88) 22.62 WATTS ACTUAL TRANSMIT POWER
58.85 WATTS INPUT POWER
38.44 % EFFICIENCY

Limit
normal test conditions between 20W and 25W

LOW POWER 1 WATTS NOMINAL TRANSMIT POWER
(CH88) 0.78 WATTS ACTUAL TRANSMIT POWER
14.04 WATTS INPUT POWER
5.56 % EFFICIENCY

Limit
normal test conditions between 0.5W and 1.0W

PARAGRAPH : 2.1055

DATE : 2023/2/28

NAME OF TEST : FREQUENCY STABILITY
MINIMUM STANDARD : AS SPECIFIED IN PARAGRAPH
TEST RESULT : MEETS MINIMUM STANDARD
TEST CONDITIONS : AS SPECIFIED IN PARAGRAPH
TEST ARRANGEMENT : SEE BLOCK DIAGRAM ON PAGE 24

MEASUREMENT DATA

SEE DATA ON PAGE 8/24 ~ 10/24

NAME OF TEST : FREQUENCY STABILITY

MEASUREMENT DATA

TEST FREQUENCY 156.050 MHz CH01
 Nominal Voltage 13.8 V

TEMP.	Voltage	High Power	Low Power	Frequency Stability	
				Carrier Freq.	error
-20 deg.C	11.73 V	22.71 W	0.75 W	156.050146 MHz	0.15 kHz
	13.80 V	22.83 W	0.76 W	156.050145 MHz	0.14 kHz
	15.87 V	22.86 W	0.76 W	156.050142 MHz	0.14 kHz
0 deg.C	11.73 V	22.81 W	0.71 W	156.050055 MHz	0.06 kHz
	13.80 V	22.94 W	0.71 W	156.050054 MHz	0.05 kHz
	15.87 V	22.99 W	0.72 W	156.050053 MHz	0.05 kHz
25 deg.C	11.73 V	22.33 W	0.76 W	156.049992 MHz	-0.01 kHz
	13.80 V	22.54 W	0.76 W	156.049992 MHz	-0.01 kHz
	15.87 V	22.63 W	0.77 W	156.049991 MHz	-0.01 kHz
40 deg.C	11.73 V	22.66 W	0.77 W	156.050000 MHz	0.00 kHz
	13.80 V	22.86 W	0.77 W	156.049999 MHz	0.00 kHz
	15.87 V	22.90 W	0.77 W	156.049999 MHz	0.00 kHz
60 deg.C	11.73 V	22.51 W	0.78 W	156.049988 MHz	-0.01 kHz
	13.80 V	22.76 W	0.79 W	156.049986 MHz	-0.01 kHz
	15.87 V	22.82 W	0.80 W	156.049983 MHz	-0.02 kHz

Frequency Stability limit
 normal test conditions ±0.5kHz
 extreme test conditions ±1.5kHz

Output Power (High) limit
 normal test conditions between 20W and 25W
 extreme test conditions between 12.5W and 25W

Output Power (Low) limit
 normal test conditions between 0.5W and 1.0W
 extreme test conditions between 0.5W and 1.0W

NAME OF TEST : FREQUENCY STABILITY

MEASUREMENT DATA

TEST FREQUENCY 156.800 MHz CH16
 Nominal Voltage 13.8 V

TEMP.	Voltage	High Power	Low Power	Frequency Stability	
				Carrier Freq.	error
-20 deg.C	11.73 V	22.92 W	0.74 W	156.800075 MHz	0.08 kHz
	13.80 V	23.06 W	0.74 W	156.800075 MHz	0.07 kHz
	15.87 V	23.11 W	0.74 W	156.800074 MHz	0.07 kHz
0 deg.C	11.73 V	22.37 W	0.72 W	156.800004 MHz	0.00 kHz
	13.80 V	22.55 W	0.73 W	156.800005 MHz	0.00 kHz
	15.87 V	22.60 W	0.73 W	156.800004 MHz	0.00 kHz
25 deg.C	11.73 V	22.33 W	0.77 W	156.799986 MHz	-0.01 kHz
	13.80 V	22.53 W	0.77 W	156.799985 MHz	-0.01 kHz
	15.87 V	22.58 W	0.77 W	156.799985 MHz	-0.02 kHz
40 deg.C	11.73 V	22.14 W	0.78 W	156.799990 MHz	-0.01 kHz
	13.80 V	22.38 W	0.78 W	156.799990 MHz	-0.01 kHz
	15.87 V	22.44 W	0.79 W	156.799990 MHz	-0.01 kHz
60 deg.C	11.73 V	22.16 W	0.81 W	156.799936 MHz	-0.06 kHz
	13.80 V	22.44 W	0.82 W	156.799936 MHz	-0.06 kHz
	15.87 V	22.51 W	0.82 W	156.799935 MHz	-0.06 kHz

Frequency Stability limit
 normal test conditions ±0.5kHz
 extreme test conditions ±1.5kHz

Output Power (High) limit
 normal test conditions between 20W and 25W
 extreme test conditions between 12.5W and 25W

Output Power (Low) limit
 normal test conditions between 0.5W and 1.0W
 extreme test conditions between 0.5W and 1.0W

NAME OF TEST : FREQUENCY STABILITY

MEASUREMENT DATA

TEST FREQUENCY 157.425 MHz CH88
 Nominal Voltage 13.8 V

TEMP.	Voltage	High Power	Low Power	Frequency Stability	
				Carrier Freq.	error
-20 deg.C	11.73 V	22.78 W	0.74 W	157.425060 MHz	0.06 kHz
	13.80 V	22.95 W	0.74 W	157.425060 MHz	0.06 kHz
	15.87 V	23.01 W	0.75 W	157.425059 MHz	0.06 kHz
0 deg.C	11.73 V	22.77 W	0.74 W	157.425021 MHz	0.02 kHz
	13.80 V	23.00 W	0.74 W	157.425021 MHz	0.02 kHz
	15.87 V	23.06 W	0.75 W	157.425021 MHz	0.02 kHz
25 deg.C	11.73 V	22.41 W	0.78 W	157.424993 MHz	-0.01 kHz
	13.80 V	22.62 W	0.78 W	157.424993 MHz	-0.01 kHz
	15.87 V	22.67 W	0.78 W	157.424992 MHz	-0.01 kHz
40 deg.C	11.73 V	22.14 W	0.79 W	157.424998 MHz	0.00 kHz
	13.80 V	22.40 W	0.80 W	157.424998 MHz	0.00 kHz
	15.87 V	22.47 W	0.80 W	157.424997 MHz	0.00 kHz
60 deg.C	11.73 V	22.03 W	0.83 W	157.424924 MHz	-0.08 kHz
	13.80 V	22.34 W	0.83 W	157.424924 MHz	-0.08 kHz
	15.87 V	22.40 W	0.83 W	157.424923 MHz	-0.08 kHz

Frequency Stability limit
 normal test conditions ±0.5kHz
 extreme test conditions ±1.5kHz

Output Power (High) limit
 normal test conditions between 20W and 25W
 extreme test conditions between 12.5W and 25W

Output Power (Low) limit
 normal test conditions between 0.5W and 1.0W
 extreme test conditions between 0.5W and 1.0W

PARAGRAPH : 2.1047(a)

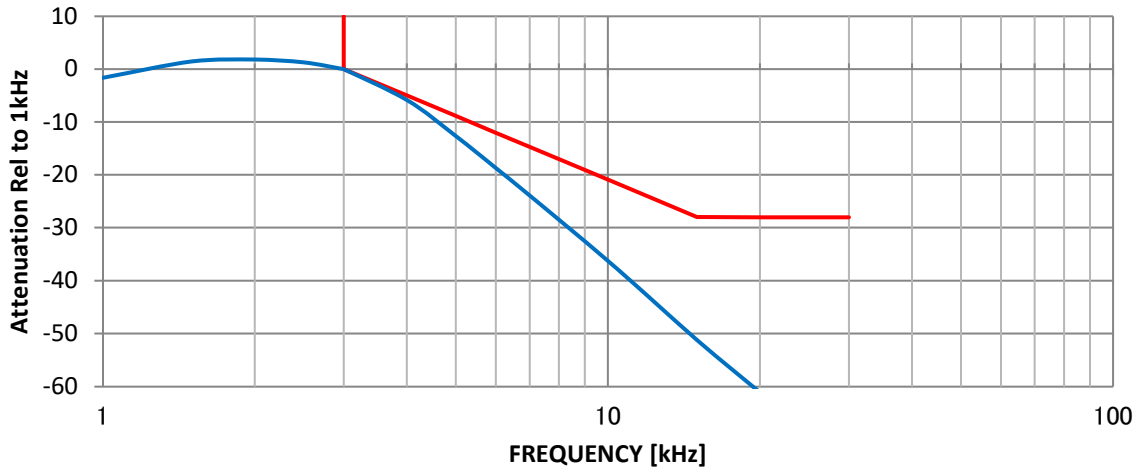
DATE : 2023/2/28

NAME OF TEST : AUDIO FREQUENCY RESPONSE
MINIMUM STANDARD : AS SPECIFIED IN PARAGRAPH
TEST RESULT : MEETS MINIMUM STANDARD
TEST CONDITIONS : AS SPECIFIED IN PARAGRAPH
TEST ARRANGEMENT : SEE BLOCK DIAGRAM ON PAGE 24

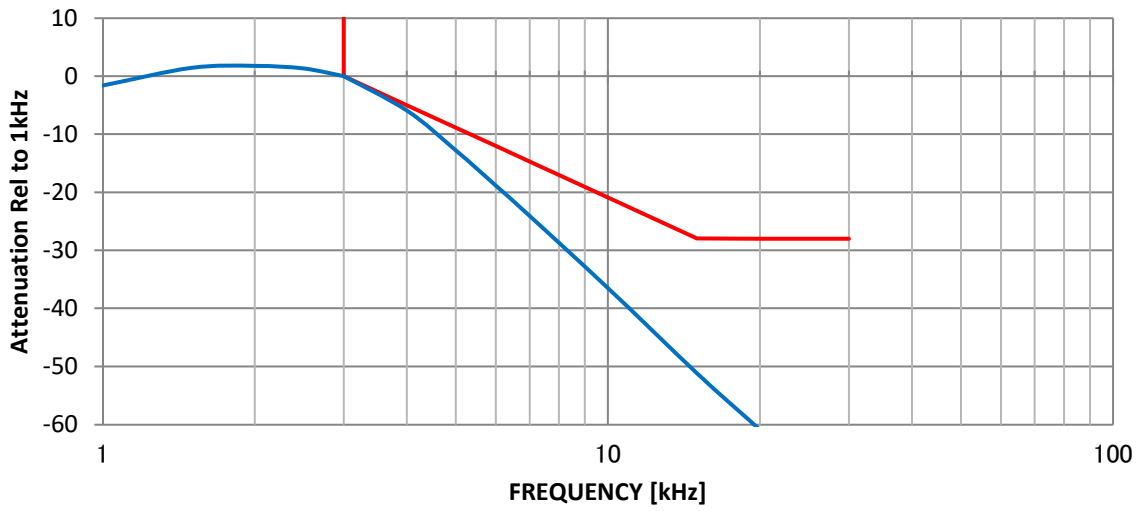
MEASUREMENT DATA

SEE PAGE ON PAGE 12/24

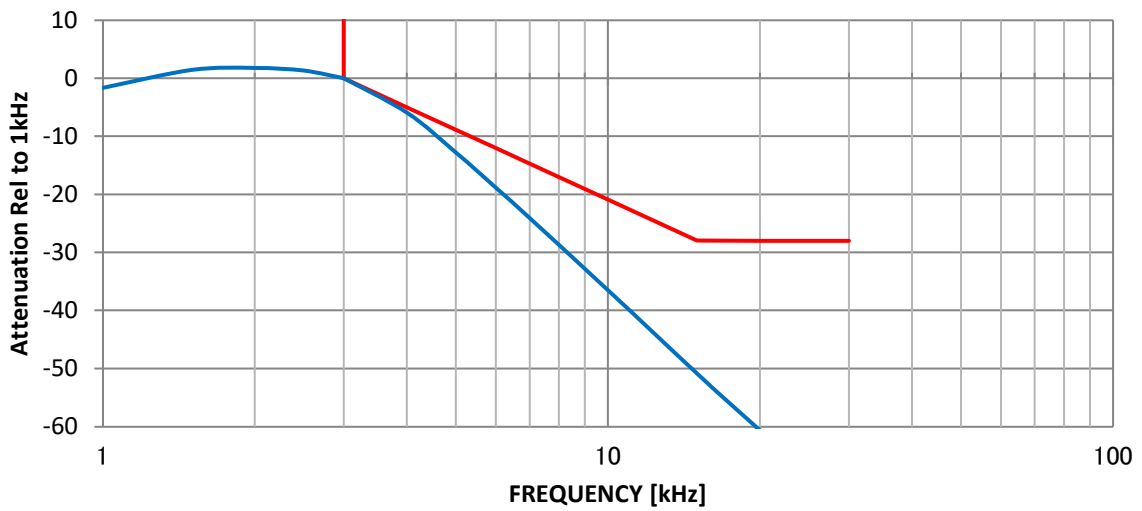
TEST FREQUENCY : 156.050MHz (CH01)



TEST FREQUENCY : 156.800MHz (CH16)



TEST FREQUENCY : 157.425MHz (CH88)



PARAGRAPH : 2.1047(b)

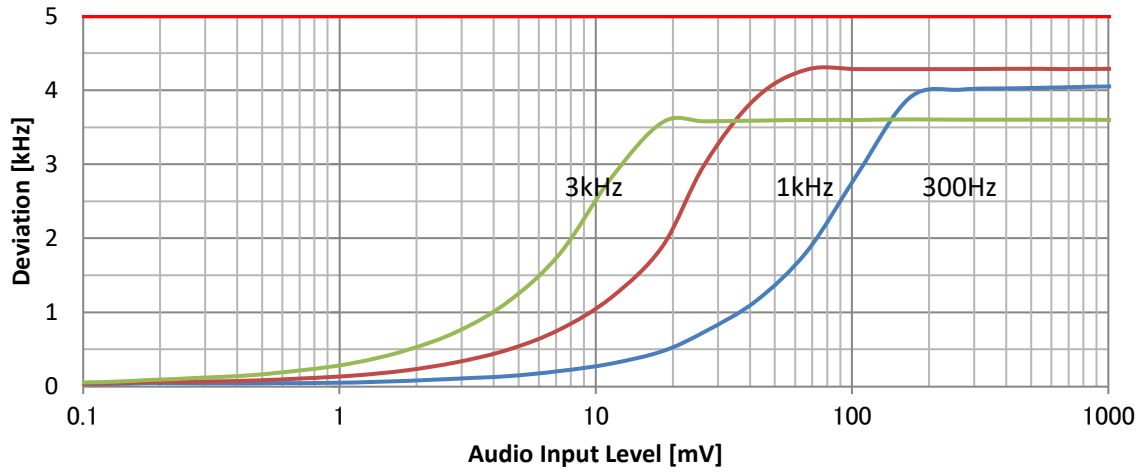
DATE : 2023/2/28

NAME OF TEST : MODULATION LIMITING
MINIMUM STANDARD : AS SPECIFIED IN PARAGRAPH
TEST RESULT : MEETS MINIMUM STANDARD
TEST CONDITIONS : AS SPECIFIED IN PARAGRAPH
TEST ARRANGEMENT : SEE BLOCK DIAGRAM ON PAGE 24

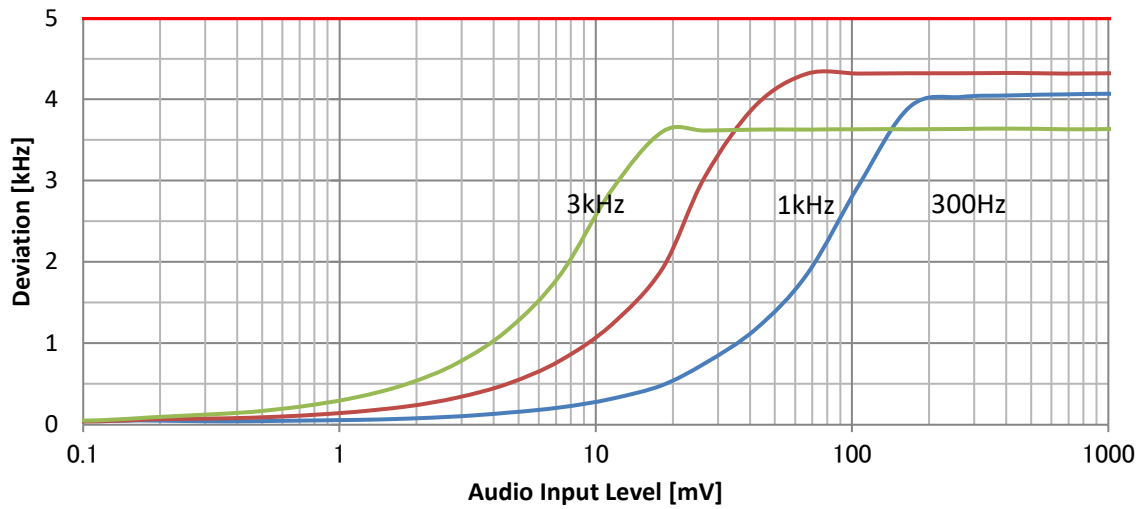
MEASUREMENT DATA

SEE PAGE ON PAGE 14/24

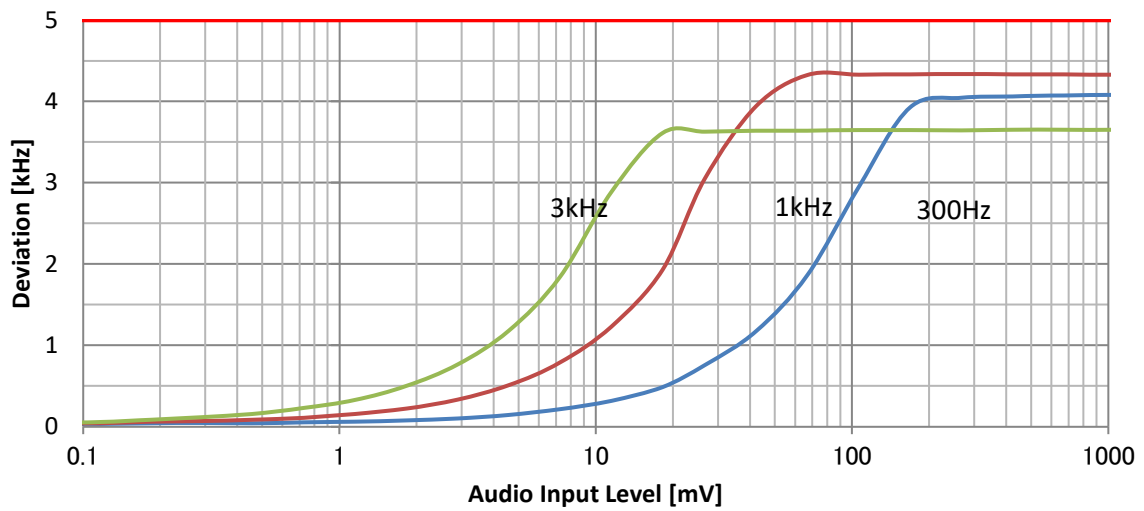
TEST FREQUENCY : 156.050MHz (CH01)



TEST FREQUENCY : 156.800MHz (CH16)



TEST FREQUENCY : 157.425MHz (CH88)



PARAGRAPH : 2.1049

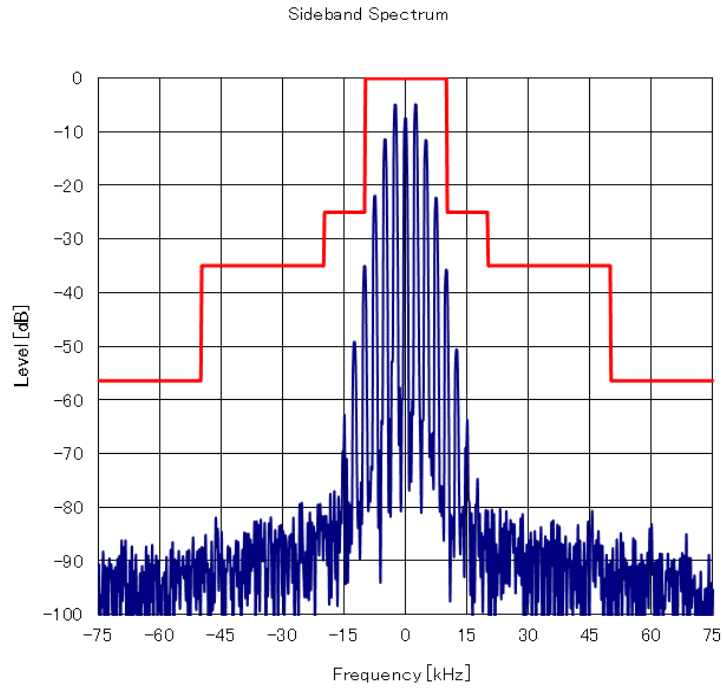
DATE : 2023/2/28

NAME OF TEST : OCCUPIED BANDWIDTH
MINIMUM STANDARD : AS SPECIFIED IN PARAGRAPH
TEST RESULT : MEETS MINIMUM STANDARD
TEST CONDITIONS : AS SPECIFIED IN PARAGRAPH
TEST ARRANGEMENT : SEE BLOCK DIAGRAM ON PAGE 24

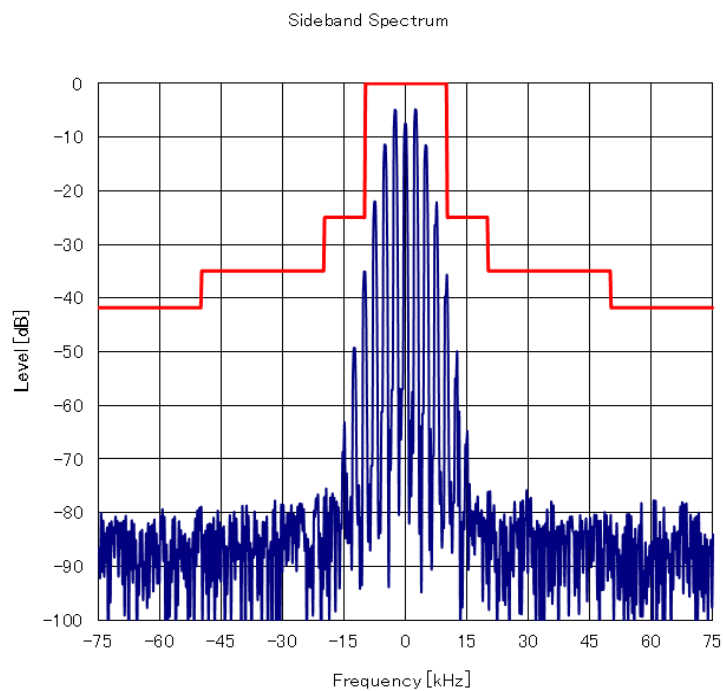
MEASUREMENT DATA

SEE DATA ON PAGE 16/24 ~ 20/24

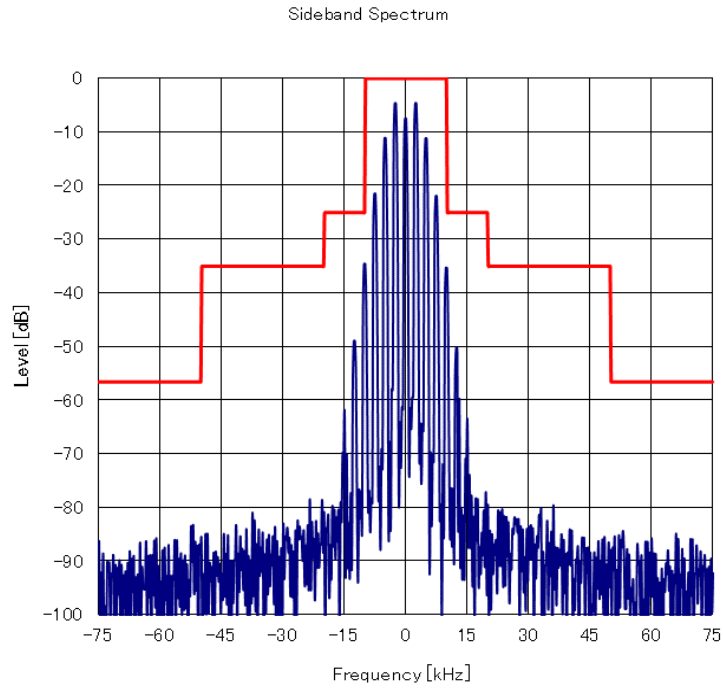
TEST FREQUENCY 156.050MHz (CH01)
Carrier output power 25W
MOD Frequency 2500Hz
0dB with reference to level of unmodulated carrier



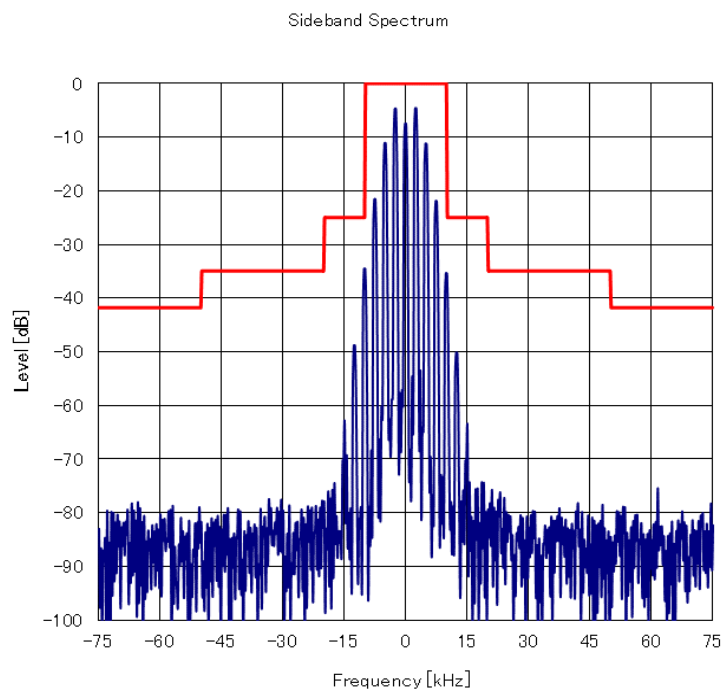
TEST FREQUENCY 156.050MHz (CH01)
Carrier output power 1W
MOD Frequency 2500Hz
0dB with reference to level of unmodulated carrier



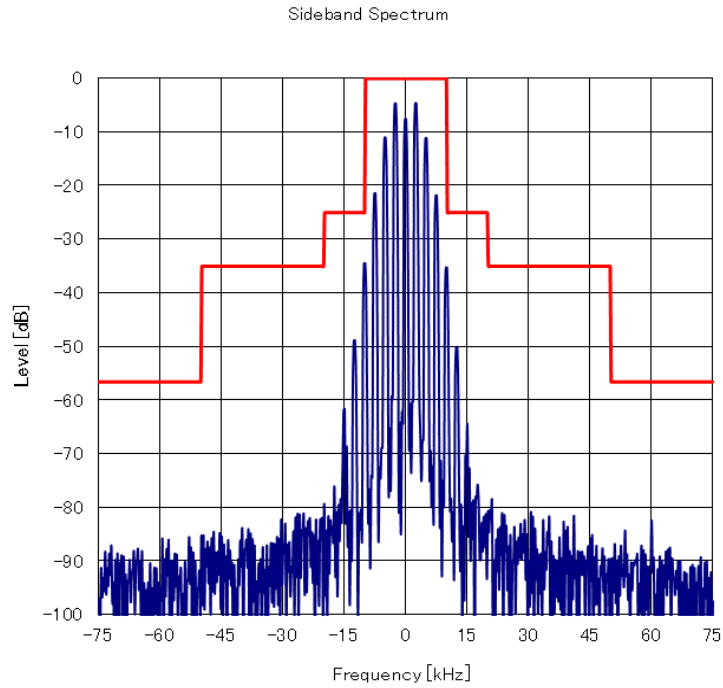
TEST FREQUENCY 156.800MHz (CH16)
Carrier output power 25W
MOD Frequency 2500Hz
0dB with reference to level of unmodulated carrier



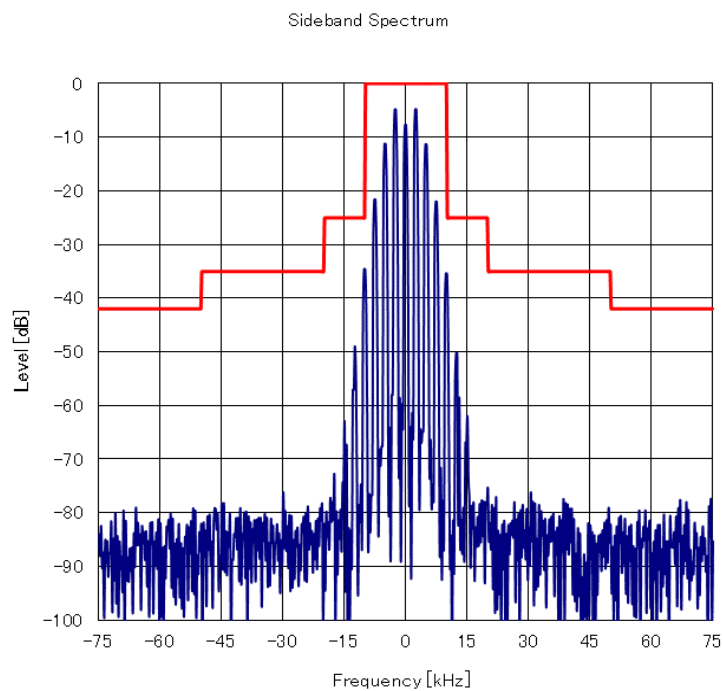
TEST FREQUENCY 156.800MHz (CH16)
Carrier output power 1W
MOD Frequency 2500Hz
0dB with reference to level of unmodulated carrier



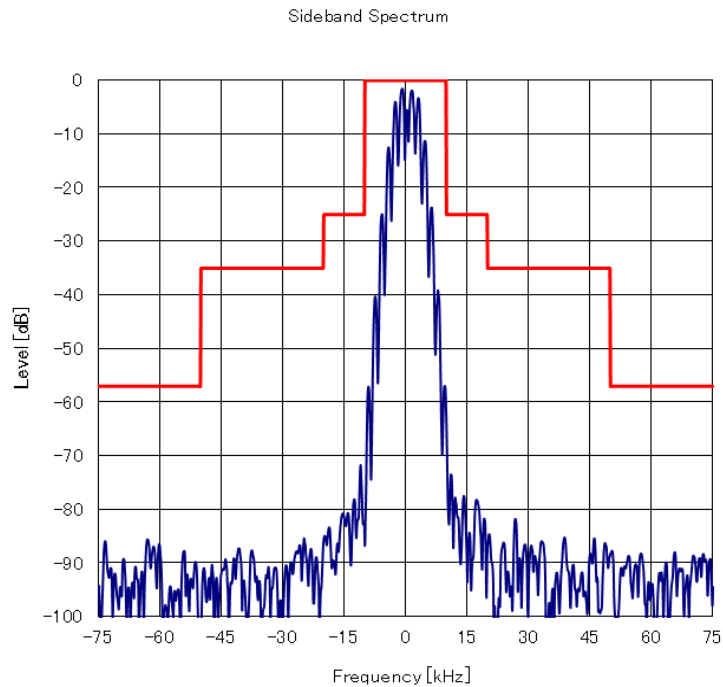
TEST FREQUENCY 157.425MHz (CH88)
Carrier output power 25W
MOD Frequency 2500Hz
0dB with reference to level of unmodulated carrier



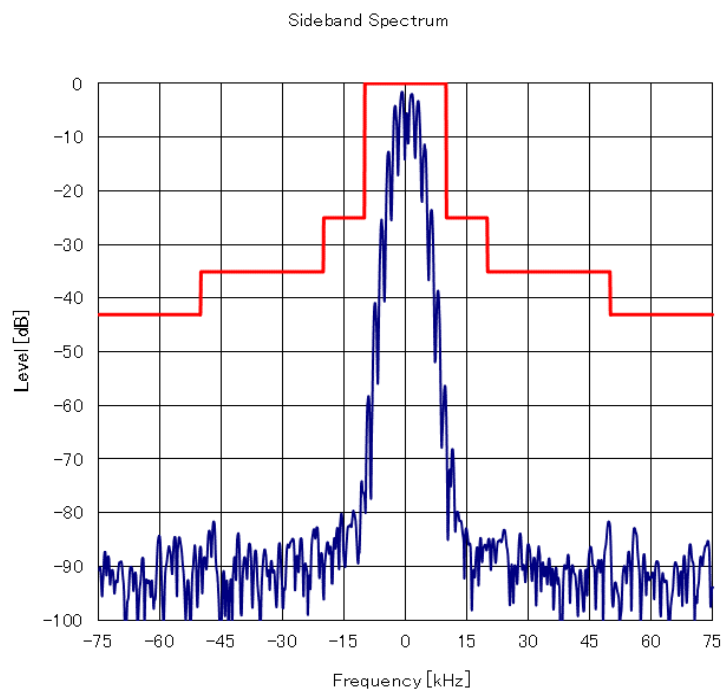
TEST FREQUENCY 161.975MHz (CH2087)
Carrier output power 1W
MOD Frequency 2500Hz
0dB with reference to level of unmodulated carrier



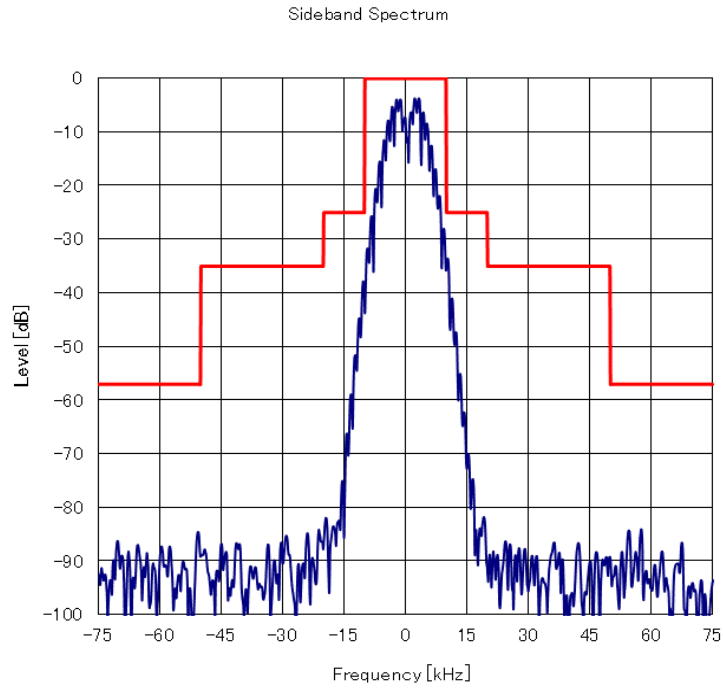
TEST FREQUENCY 156.525MHz (CH70)
Carrier output power 25W
MOD Frequency DSC 1300Hz
0dB with reference to level of unmodulated carrier



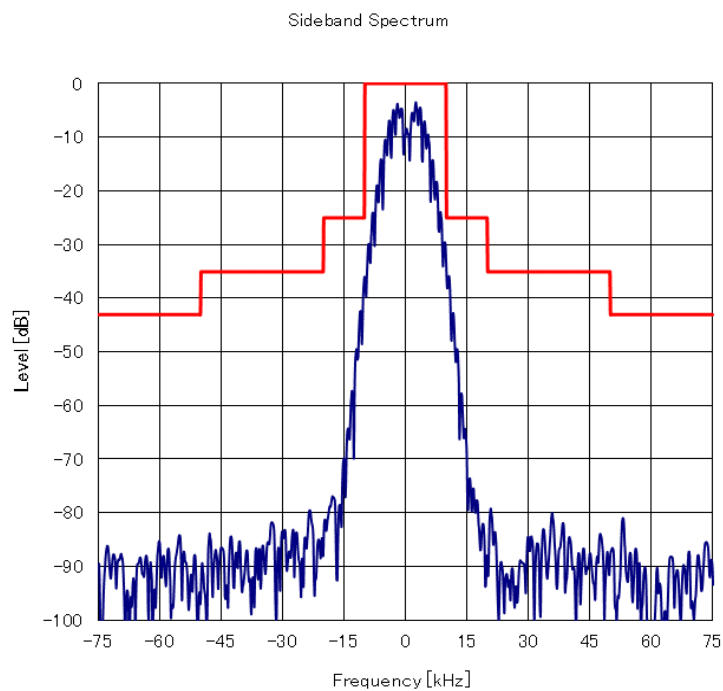
TEST FREQUENCY 156.525MHz (CH70)
Carrier output power 1W
MOD Frequency DSC 1300Hz
0dB with reference to level of unmodulated carrier



TEST FREQUENCY 156.525MHz (CH70)
Carrier output power 25W
MOD Frequency DSC 2100Hz
0dB with reference to level of unmodulated carrier



TEST FREQUENCY 156.525MHz (CH70)
Carrier output power 1W
MOD Frequency DSC 2100Hz
0dB with reference to level of unmodulated carrier



NAME OF TEST : SPURIOUS EMISSIONS AT ANTENNA TERMINALS
 MINIMUM STANDARD : AS SPECIFIED IN PARAGRAPH
 TEST RESULT : MEETS MINIMUM STANDARD
 TEST CONDITIONS : AS SPECIFIED IN PARAGRAPH
 TEST ARRANGEMENT : SEE BLOCK DIAGRAM ON PAGE 24

MEASUREMENT DATA

High Power

Harmonics	Frequency	Below Carrier	Output power
1Fo	156.050 MHz	0.0 dB	23.5 W (CH01)
2Fo	312.100 MHz	90.2 dB	
3Fo	468.150 MHz	88.9 dB	
4Fo	624.200 MHz	88.5 dB	
5Fo	780.250 MHz	88.4 dB	
6Fo	936.300 MHz	87.4 dB	
7Fo	1092.350 MHz	87.5 dB	
8Fo	1248.400 MHz	86.5 dB	
9Fo	1404.450 MHz	87.3 dB	
10Fo	1560.500 MHz	86.2 dB	
Limit		70dB <	

Low Power

Harmonics	Frequency	Below Carrier	Output power
1Fo	156.050 MHz	0.0 dB	0.84 W (CH01)
2Fo	312.100 MHz	85.4 dB	
3Fo	468.150 MHz	84.4 dB	
4Fo	624.200 MHz	84.0 dB	
5Fo	780.250 MHz	82.4 dB	
6Fo	936.300 MHz	83.0 dB	
7Fo	1092.350 MHz	82.3 dB	
8Fo	1248.400 MHz	82.2 dB	
9Fo	1404.450 MHz	82.2 dB	
10Fo	1560.500 MHz	80.5 dB	
Limit		56dB <	

NAME OF TEST : SPURIOUS EMISSIONS AT ANTENNA TERMINALS
 MINIMUM STANDARD : AS SPECIFIED IN PARAGRAPH
 TEST RESULT : MEETS MINIMUM STANDARD
 TEST CONDITIONS : AS SPECIFIED IN PARAGRAPH
 TEST ARRANGEMENT : SEE BLOCK DIAGRAM ON PAGE 24

MEASUREMENT DATA

High Power

Harmonics	Frequency	Below Carrier	Output power
1Fo	156.800 MHz	0.0 dB	23.2 W (CH16)
2Fo	313.600 MHz	89.4 dB	
3Fo	470.400 MHz	88.6 dB	
4Fo	627.200 MHz	88.9 dB	
5Fo	784.000 MHz	88.5 dB	
6Fo	940.800 MHz	87.8 dB	
7Fo	1097.600 MHz	87.5 dB	
8Fo	1254.400 MHz	87.6 dB	
9Fo	1411.200 MHz	86.8 dB	
10Fo	1568.000 MHz	86.3 dB	
Limit		70dB <	

Low Power

Harmonics	Frequency	Below Carrier	Output power
1Fo	156.800 MHz	0.0 dB	0.83 W (CH16)
2Fo	313.600 MHz	84.7 dB	
3Fo	470.400 MHz	84.7 dB	
4Fo	627.200 MHz	83.8 dB	
5Fo	784.000 MHz	83.8 dB	
6Fo	940.800 MHz	82.1 dB	
7Fo	1097.600 MHz	82.8 dB	
8Fo	1254.400 MHz	81.7 dB	
9Fo	1411.200 MHz	81.5 dB	
10Fo	1568.000 MHz	81.5 dB	
Limit		56dB <	

NAME OF TEST : SPURIOUS EMISSIONS AT ANTENNA TERMINALS
 MINIMUM STANDARD : AS SPECIFIED IN PARAGRAPH
 TEST RESULT : MEETS MINIMUM STANDARD
 TEST CONDITIONS : AS SPECIFIED IN PARAGRAPH
 TEST ARRANGEMENT : SEE BLOCK DIAGRAM ON PAGE 24

MEASUREMENT DATA

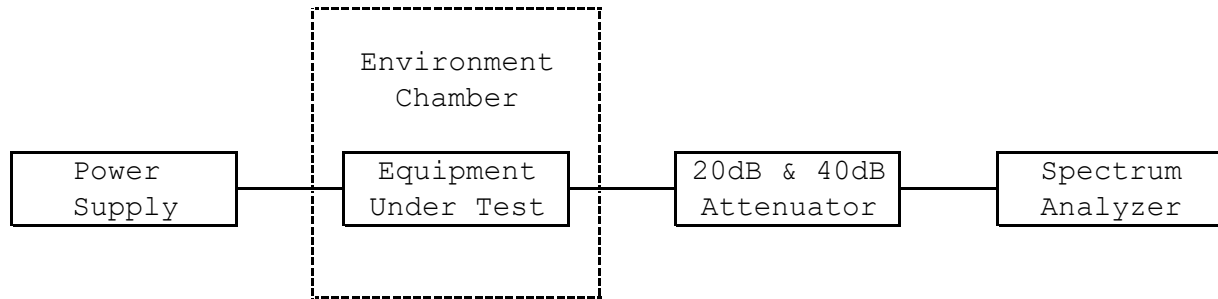
High Power

Harmonics	Frequency	Below Carrier	Output power
1Fo	157.425 MHz	0.0 dB	23.1 W (CH88)
2Fo	314.850 MHz	89.6 dB	
3Fo	472.275 MHz	89.0 dB	
4Fo	629.700 MHz	89.2 dB	
5Fo	787.125 MHz	87.9 dB	
6Fo	944.550 MHz	88.3 dB	
7Fo	1101.975 MHz	87.0 dB	
8Fo	1259.400 MHz	86.9 dB	
9Fo	1416.825 MHz	86.4 dB	
10Fo	1574.250 MHz	86.2 dB	
Limit		70dB <	

Low Power

Harmonics	Frequency	Below Carrier	Output power
1Fo	157.425 MHz	0.0 dB	0.82 W (CH88)
2Fo	314.850 MHz	86.2 dB	
3Fo	472.275 MHz	85.0 dB	
4Fo	629.700 MHz	84.6 dB	
5Fo	787.125 MHz	84.0 dB	
6Fo	944.550 MHz	83.3 dB	
7Fo	1101.975 MHz	82.6 dB	
8Fo	1259.400 MHz	82.0 dB	
9Fo	1416.825 MHz	82.0 dB	
10Fo	1574.250 MHz	81.0 dB	
Limit		56dB <	

Test Arrangement



Test Equipment

Spectrum Analyzer	Agilent Technologies	E4440A
Attenuator	Agilent Technologies	8495B
Attenuator	Weinschel Engineering	57-20-33
DC Power Supply	Agilent Technologies	6653A
Environment Chamber	ESPEC	PL-1KT