ETSI EN 300 086-1 V1.2.1: 2001-03
ETSI EN 300 086-2 V1.1.1: 2001-03
TEST REPORT

For

Vehicle Radio

Model Number: 5188, 588, TWR MR-150U (400-490MHz)

Trade Name: N/A

Report No.: QZAGC013080602E2

Date of Issue: Jun.22, 2008

Prepared For

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Prepared By

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TABLE OF CONTENTS

1. TEST RESULT CERTIFICATION

Applicant	Qixiang Electron Science & Technology Co., Ltd. Qixiang Building, Tangxi Industrial Zone, Luojiang District, Quanzhou 362011, Fujian Province, China
Equipment Under Test	Vehicle Radio
Trade Name	--
Model Name	5188, 588, TWR MR-150U (400-490MHz)
Date of Test	Jun.12 to Jun.22, 2008

APPLICABLE STANDARDS	
STANDARD	**TEST RESULT**
ETSI EN 300 086-1 V1.2.1: 2001-03 ETSI EN 300 086-2 V1.1.1: 2001-03	No non-compliance noted

The above equipment was tested by Shenzhen Attestation of Global Compliance Science & Technology Co., Ltd. for compliance with the requirements set forth in the European Standard ETSI EN 300 086. 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.

Prepared By: Tony Tian — Tony Tian Jun.22, 2008

Checked By: Randy He — Randy He Jun.22, 2008

Authorized By: King Zhang — King Zhang Jun.22, 2008

2. EUT DESCRIPTION

Product	Vehicle Radio
Trade Name	--
Model Number	5188, 588, TWR MR-150U (400-490MHz)
Difference between Models	Same PCB Layout, Parts list, difference with it's external appearance
Operation Frequency	400 MHz-490MHz
Operation Mode	Push-to-Talk
Channel Separation	25.0 KHz, 12.5KHz
Output Power	40 W, 10W, 5W
Model Difference	N/A
Power Supply	DC 13.8 V

Note: for more details, refer to the user's manual of the EUT.

3. TEST METHODOLOGY

3.1 GENERAL DESCRIPTION OF APPLIED STANDARDS

According to its specifications, the EUT must comply with the requirements of the following standards:

ETSI EN 300 086-2 – Electromagnetic compatibility and Radio spectrum Matters (ERM); Land Mobile Service; Radio equipment with an internal or external RF Connector intended primarily for analogue speech; Part 2: Harmonized EN covering essential requirements under article 3.2 of the R&TTE Directive.

3.2 DESCRIPTION OF TEST MODES

The EUT has been tested under typical operating condition. No software used to control the EUT for staying in transmitting and receiving mode for testing.

4. FACILITIES AND ACCREDITATIONS

4.1 TEST FACILITIES

All measurement facilities used to collect the measurement data are located at

1-2/F, Dachong Keji Building, No.28 of Tonggu Road, Nanshan District,
World Standardization Certification & Testing Co., Ltd.

FCC Registration Number: 989301

4.2 EQUIPMENT

Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, biconical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with preselectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers.

Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, “Radio Interference Measuring Apparatus and Measurement Methods.”

5. SETUP OF EQUIPMENT UNDER TEST

5.1 SETUP CONFIGURATION OF EUT

See test photographs attached in Appendix 1 for the actual connections between EUT and support equipment.

5.2 SUPPORT EQUIPMENT

No.	Device Type	Brand	Model	Series No.	Data Cable	Power Cord
1	--	--	--	--	--	--

Notes:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

6. ETSI EN 300 086-1/-2 REQUIREMENTS

6.1 FREQUENCY ERROR

TEST LIMIT

ETSI EN 300 086-1 (V.1.2.1) Sub-clause 5.1.1

The frequency error, as defined in EN 300 086-1 sub-clause 8.1.1, shall not exceed the limits in EN 300 086-1 sub-clause 5.1.1 table 1.

Channel separation (kHz)	Frequency error limit (kHz)				
	below 47 MHz	47 MHz to 137 MHz	above 137 MHz to 300 MHz	above 300 MHz to 500 MHz	above 500 MHz to 1 000 MHz
20 & 25	±0,60	±1,35	±2,00	±2,00	±2,50 (a)
12,5	±0,60	±1,00	±1,00 (B) ±1,50 (M)	±1,00 (B) ±1,50 (a) (M)	No value specified

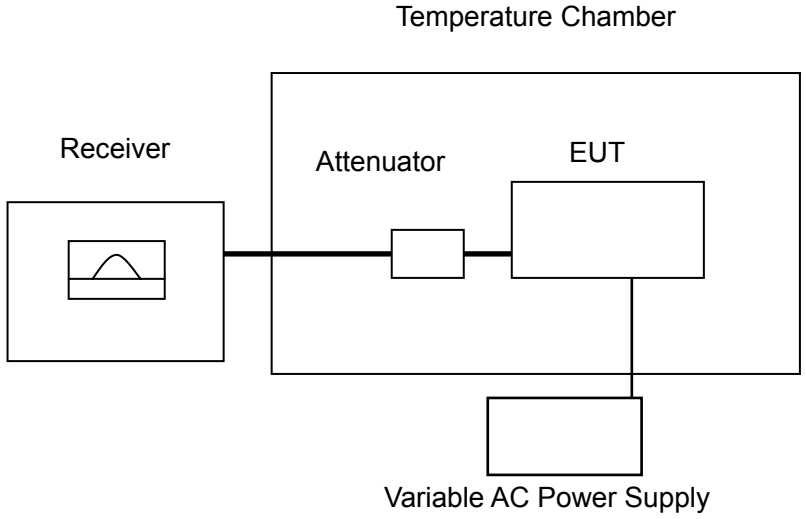
NOTE:
- B = base station.
- M = mobile or hand portable station.
- (a) = for hand portable stations having integral power supplies, the frequency error shall not be exceeded over a temperature range of 0°C to +30°C.
  Under extreme temperature conditions (clause 6.4.1), the frequency error shall not exceed ±2,50 kHz for a channel separation of 12,5 kHz between 300 MHz and 500 MHz, and ±3,00 kHz for channel separations of 20 kHz and 25 kHz between 500 MHz and 1 000 MHz.

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMI Test Receiver	R&S	ESCS30	100343	2009-04-16
Tem. & Hum. Chamber	TEPCHY	MHG-8000NF	E21104	2009-06-13

Remark: *Each piece of equipment is scheduled for calibration once a year.*

TEST CONFIGURATION



TEST PROCEDURE

1. Please refer to ETSI EN 300 086-1 (V.1.2.1) Sub-clause 6.3 and Sub-clause 6.4 for the test conditions.
2. Please refer to ETSI EN 300 086-1 (V1.2.1) Sub-clause 8.1.2 for the measurement method.

TEST RESULTS

The Top Channel of 25.0 KHz Channel Separation

Test Condition		Frequency Measured	Frequency Error
Temperature (℃)	Voltage (V)	(MHz)	(KHz)
T Nor (25℃)	DC 13.8 V	399.999790	-0.21
T min (-20℃)	DC 12.4 V	399.999934	-0.07
	DC 17.9 V	399.999942	-0.06
T Max (+55℃)	DC 12.4 V	399.999637	-0.36
	DC 17.9 V	399.999641	-0.36
Limit		±2.0 KHz	
Result		Pass	

The Middle Channel of 25.0 KHz Channel Separation

Test Condition		Frequency Measured	Frequency Error
Temperature (℃)	Voltage (V)	(MHz)	(KHz)
T Nor (25℃)	DC 13.8 V	444.999792	-0.21
T min (-20℃)	DC 12.4 V	444.999948	-0.05
	DC 17.9 V	444.999945	-0.05
T Max (+55℃)	DC 12.4 V	444.999638	-0.36
	DC 17.9 V	444.999635	-0.36
Limit		±2.0 KHz	
Result		Pass	

The Bottom Channel of 25.0 KHz Channel Separation

Test Condition		Frequency Measured	Frequency Error
Temperature (℃)	Voltage (V)	(MHz)	(KHz)
T Nor (25℃)	DC 13.8 V	489.999779	-0.22
T min (-20℃)	DC 12.4 V	489.999838	-0.16
	DC 17.9 V	489.999841	-0.16
T Max (+55℃)	DC 12.4 V	489.999627	-0.37
	DC 17.9 V	489.999632	-0.37
Limit		±2.0 KHz	
Result		Pass	

The Top Channel of 12.5 KHz Channel Separation

Test Condition		Frequency Measured (MHz)	Frequency Error (KHz)
Temperature (℃)	Voltage (V)		
T Nor (25℃)	DC 13.8 V	399.999798	-0.20
T min (-20℃)	DC 12.4 V	399.999941	-0.06
	DC 17.9 V	399.999949	-0.05
T Max (+55℃)	DC 12.4 V	399.999642	-0.36
	DC 17.9 V	399.999649	-0.35
Limit		±1.5 KHz	
Result		Pass	

The Middle Channel of 12.5 KHz Channel Separation

Test Condition		Frequency Measured (MHz)	Frequency Error (KHz)
Temperature (℃)	Voltage (V)		
T Nor (25℃)	DC 13.8 V	444.999801	-0.20
T min (-20℃)	DC 12.4 V	444.999956	-0.04
	DC 17.9 V	444.999954	-0.05
T Max (+55℃)	DC 12.4 V	444.999644	-0.36
	DC 17.9 V	444.999641	-0.36
Limit		±1.5 KHz	
Result		Pass	

The Bottom Channel of 12.5 KHz Channel Separation

Test Condition		Frequency Measured (MHz)	Frequency Error (KHz)
Temperature (℃)	Voltage (V)		
T Nor (25℃)	DC 13.8 V	489.999783	-0.22
T min (-20℃)	DC 12.4 V	489.999842	-0.16
	DC 17.9 V	489.999846	-0.15
T Max (+55℃)	DC 12.4 V	489.999633	-0.37
	DC 17.9 V	489.999639	-0.36
Limit		±1.5 KHz	
Result		Pass	

6.2 CARRIER POWER (CONDUCTED)

TEST LIMIT

ETSI EN 300 086-1 (V.1.2.1) Sub-clause 5.1.2

The carrier output power (conducted) as defined in ETSI EN 300 086-1 Sub-clause 8.2.1 under normal test conditions shall be within ± 1.5 dB of the rated output power. Furthermore, the carrier output power (conducted) shall not exceed the maximum value allowed by the Administrations.

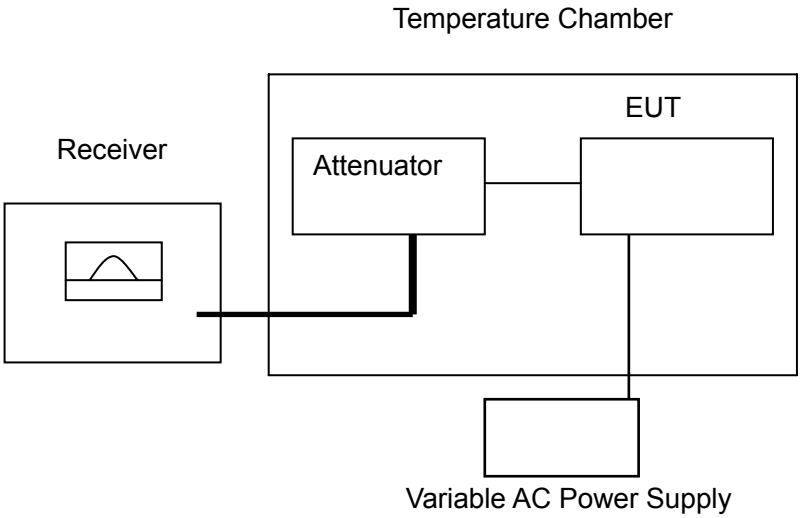
The carrier output power(conducted)under extreme test conditions shall be within +2.0dB and -3.0dB of the rated output power.

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMI Test Receiver	R&S	ESCS30	100343	2009-04-16
Tem. & Hum. Chamber	TEPCHY	MHG-8000NF	E21104	2009-06-13

Remark: Each piece of equipment is scheduled for calibration once a year.

TEST CONFIGURATION



TEST PROCEDURE

1. Please refer to ETSI EN 300 086-1 (V.1.2.1) Sub-clause 6.3 for the test conditions.
2. Please refer to ETSI EN 300 086-1 (V1.2.1) Sub-clause 8.2.2 for the measurement method.

TEST RESULTS FOR OUTPUT POWER 40 W

The Top Channel of 25.0 KHz Channel Separation

Test Condition		Power Measured (dBm)	Power Error (dB)
Temperature (℃)	Voltage (V)		
T Nor (25℃)	DC 13.8 V	45.83	-0.17
T min (-20℃)	DC 12.4 V	45.81	-0.19
	DC 17.9 V	45.82	-0.18
T Max (+55℃)	DC 12.4 V	45.79	-0.21
	DC 17.9 V	45.80	-0.20
Nominal Power= 46.99 dBm; Limit n=±1.5 dB and Limit e=2 dB & -3 dB			
Result		Pass	

The Middle Channel of 25.0 KHz Channel Separation

Test Condition		Power Measured (dBm)	Power Error (dB)
Temperature (℃)	Voltage (V)		
T Nor (25℃)	DC 13.8 V	45.89	-0.11
T min (-20℃)	DC 12.4 V	45.89	-0.11
	DC 17.9 V	45.95	-0.05
T Max (+55℃)	DC 12.4 V	45.86	-0.14
	DC 17.9 V	45.91	-0.09
Nominal Power= 46.99 dBm; Limit n=±1.5 dB and Limit e=2 dB & -3 dB			
Result		Pass	

The Bottom Channel of 25.0 KHz Channel Separation

Test Condition		Power Measured (dBm)	Power Error (dB)
Temperature (℃)	Voltage (V)		
T Nor (25℃)	DC 13.8 V	45.88	-0.12
T min (-20℃)	DC 12.4 V	45.98	-0.02
	DC 17.9 V	45.99	-0.01
T Max (+55℃)	DC 12.4 V	45.95	-0.05
	DC 17.9 V	45.96	-0.04
Nominal Power= 46.99 dBm; Limit n=±1.5 dB and Limit e=2 dB & -3 dB			
Result		Pass	

The Top Channel of 12.5 KHz Channel Separation

Test Condition		Power Measured (dBm)	Power Error (dB)
Temperature (℃)	Voltage (V)		
T Nor (25℃)	DC 13.8 V	45.83	-0.17
T min (-20℃)	DC 12.4 V	45.80	-0.20
	DC 17.9 V	45.81	-0.19
T Max (+55℃)	DC 12.4 V	45.79	-0.21
	DC 17.9 V	45.79	-0.21
Nominal Power= 46.99 dBm; Limit n=±1.5 dB and Limit e=2 dB & -3 dB			
Result		Pass	

The Middle Channel of 12.5 KHz Channel Separation

Test Condition		Power Measured (dBm)	Power Error (dB)
Temperature (℃)	Voltage (V)		
T Nor (25℃)	DC 13.8 V	45.88	-0.12
T min (-20℃)	DC 12.4 V	45.89	-0.11
	DC 17.9 V	45.94	-0.06
T Max (+55℃)	DC 12.4 V	45.85	-0.15
	DC 17.9 V	45.90	-0.10
Nominal Power= 46.99 dBm; Limit n=±1.5 dB and Limit e=2 dB & -3 dB			
Result		Pass	

The Bottom Channel of 12.5 KHz Channel Separation

Test Condition		Power Measured (dBm)	Power Error (dB)
Temperature (℃)	Voltage (V)		
T Nor (25℃)	DC 13.8 V	45.89	-0.11
T min (-20℃)	DC 12.4 V	45.98	-0.02
	DC 17.9 V	45.98	-0.02
T Max (+55℃)	DC 12.4 V	45.94	-0.06
	DC 17.9 V	45.96	-0.04
Nominal Power= 46.99 dBm; Limit n=±1.5 dB and Limit e=2 dB & -3 dB			
Result		Pass	

TEST RESULTS FOR OUTPUT POWER 10 W

The Top Channel of 25.0 KHz Channel Separation

Test Condition		Power Measured	Power Error
Temperature (℃)	Voltage (V)	(dBm)	(dB)
T Nor (25℃)	DC 13.8 V	39.84	-0.16
T min (-20℃)	DC 12.4 V	39.83	-0.17
	DC 17.9 V	39.82	-0.18
T Max (+55℃)	DC 12.4 V	39.80	-0.20
	DC 17.9 V	39.79	-0.21
Nominal Power= 43.98 dBm; Limit n=±1.5 dB and Limit e=2 dB & -3 dB			
Result		Pass	

The Middle Channel of 25.0 KHz Channel Separation

Test Condition		Power Measured	Power Error
Temperature (℃)	Voltage (V)	(dBm)	(dB)
T Nor (25℃)	DC 13.8 V	39.90	-0.10
T min (-20℃)	DC 12.4 V	39.91	-0.09
	DC 17.9 V	39.95	-0.05
T Max (+55℃)	DC 12.4 V	39.87	-0.13
	DC 17.9 V	39.90	-0.10
Nominal Power= 43.98 dBm; Limit n=±1.5 dB and Limit e=2 dB & -3 dB			
Result		Pass	

The Bottom Channel of 25.0 KHz Channel Separation

Test Condition		Power Measured	Power Error
Temperature (℃)	Voltage (V)	(dBm)	(dB)
T Nor (25℃)	DC 13.8 V	39.81	-0.19
T min (-20℃)	DC 12.4 V	39.81	-0.19
	DC 17.9 V	39.86	-0.14
T Max (+55℃)	DC 12.4 V	39.77	-0.23
	DC 17.9 V	39.82	-0.18
Nominal Power= 43.98 dBm; Limit n=±1.5 dB and Limit e=2 dB & -3 dB			
Result		Pass	

The Top Channel of 12.5 KHz Channel Separation

Test Condition		Power Measured (dBm)	Power Error (dB)
Temperature (℃)	Voltage (V)		
T Nor (25℃)	DC 13.8 V	39.85	-0.15
T min (-20℃)	DC 12.4 V	39.83	-0.17
	DC 17.9 V	39.81	-0.19
T Max (+55℃)	DC 12.4 V	39.81	-0.19
	DC 17.9 V	39.79	-0.21
Nominal Power= 43.98 dBm; Limit n=±1.5 dB and Limit e=2 dB & -3 dB			
Result		Pass	

The Middle Channel of 12.5 KHz Channel Separation

Test Condition		Power Measured (dBm)	Power Error (dB)
Temperature (℃)	Voltage (V)		
T Nor (25℃)	DC 13.8 V	39.91	-0.09
T min (-20℃)	DC 12.4 V	39.92	-0.08
	DC 17.9 V	39.95	-0.05
T Max (+55℃)	DC 12.4 V	39.88	-0.12
	DC 17.9 V	39.91	-0.09
Nominal Power= 43.98 dBm; Limit n=±1.5 dB and Limit e=2 dB & -3 dB			
Result		Pass	

The Bottom Channel of 12.5 KHz Channel Separation

Test Condition		Power Measured (dBm)	Power Error (dB)
Temperature (℃)	Voltage (V)		
T Nor (25℃)	DC 13.8 V	39.82	-0.18
T min (-20℃)	DC 12.4 V	39.81	-0.19
	DC 17.9 V	39.87	-0.13
T Max (+55℃)	DC 12.4 V	39.78	-0.22
	DC 17.9 V	39.83	-0.17
Nominal Power= 43.98 dBm; Limit n=±1.5 dB and Limit e=2 dB & -3 dB			
Result		Pass	

TEST RESULTS FOR OUTPUT POWER 5 W

The Top Channel of 25.0 KHz Channel Separation

Test Condition		Power Measured	Power Error
Temperature (℃)	Voltage (V)	(dBm)	(dB)
T Nor (25℃)	DC 13.8 V	36.65	-0.35
T min (-20℃)	DC 12.4 V	36.64	-0.36
	DC 17.9 V	36.65	-0.35
T Max (+55℃)	DC 12.4 V	36.60	-0.40
	DC 17.9 V	36.61	-0.39
Nominal Power= 36.99 dBm; Limit n=±1.5 dB and Limit e=2 dB & -3 dB			
Result		Pass	

The Middle Channel of 25.0 KHz Channel Separation

Test Condition		Power Measured	Power Error
Temperature (℃)	Voltage (V)	(dBm)	(dB)
T Nor (25℃)	DC 13.8 V	36.72	-0.28
T min (-20℃)	DC 12.4 V	36.73	-0.27
	DC 17.9 V	36.79	-0.21
T Max (+55℃)	DC 12.4 V	36.68	-0.32
	DC 17.9 V	36.74	-0.26
Nominal Power= 36.99 dBm; Limit n=±1.5 dB and Limit e=2 dB & -3 dB			
Result		Pass	

The Bottom Channel of 25.0 KHz Channel Separation

Test Condition		Power Measured	Power Error
Temperature (℃)	Voltage (V)	(dBm)	(dB)
T Nor (25℃)	DC 13.8 V	36.61	-0.39
T min (-20℃)	DC 12.4 V	36.59	-0.41
	DC 17.9 V	36.66	-0.34
T Max (+55℃)	DC 12.4 V	36.53	-0.47
	DC 17.9 V	36.60	-0.40
Nominal Power= 36.99 dBm; Limit n=±1.5 dB and Limit e=2 dB & -3 dB			
Result		Pass	

The Top Channel of 12.5 KHz Channel Separation

Test Condition		Power Measured (dBm)	Power Error (dB)
Temperature (℃)	Voltage (V)		
T Nor (25℃)	DC 13.8 V	36.64	-0.36
T min (-20℃)	DC 12.4 V	36.64	-0.36
	DC 17.9 V	36.63	-0.37
T Max (+55℃)	DC 12.4 V	36.61	-0.39
	DC 17.9 V	36.61	-0.39
Nominal Power= 36.99 dBm; Limit n=±1.5 dB and Limit e=2 dB & -3 dB			
Result		Pass	

The Middle Channel of 12.5 KHz Channel Separation

Test Condition		Power Measured (dBm)	Power Error (dB)
Temperature (℃)	Voltage (V)		
T Nor (25℃)	DC 13.8 V	36.73	-0.27
T min (-20℃)	DC 12.4 V	36.71	-0.29
	DC 17.9 V	36.77	-0.23
T Max (+55℃)	DC 12.4 V	36.68	-0.32
	DC 17.9 V	36.73	-0.27
Nominal Power= 36.99 dBm; Limit n=±1.5 dB and Limit e=2 dB & -3 dB			
Result		Pass	

The Bottom Channel of 12.5 KHz Channel Separation

Test Condition		Power Measured (dBm)	Power Error (dB)
Temperature (℃)	Voltage (V)		
T Nor (25℃)	DC 13.8 V	36.60	-0.40
T min (-20℃)	DC 12.4 V	36.59	-0.41
	DC 17.9 V	36.65	-0.35
T Max (+55℃)	DC 12.4 V	36.52	-0.48
	DC 17.9 V	36.60	-0.40
Nominal Power= 36.99 dBm; Limit n=±1.5 dB and Limit e=2 dB & -3 dB			
Result		Pass	

6.3 EFFECTIVE RADIATED POWER (FIELD STRENGTH) (NOT APPLICABLE TO DEVICE WITH EXTERNAL RF PORT)

LIMIT

ETSI EN 300 086-1 (V.1.2.1) Sub-clause 5.1.3
The effective radiated power (field strength) as defined in ETSI EN 300 086-1 Sub-clause 8.3.1 under normal test conditions shall be within ±7.5dB of the rated effective radiated power. Furthermore, the effective radiated power shall not exceed the maximum value allowed by the Administrations.

MEASUREMENT EQUIPMENT USED

N/A

TEST PROCEDURE

N/A

TEST CONFIGURATION

N/A

TEST RESULTS

N/A

6.4 FREQUENCY DEVIATION

TEST LIMIT

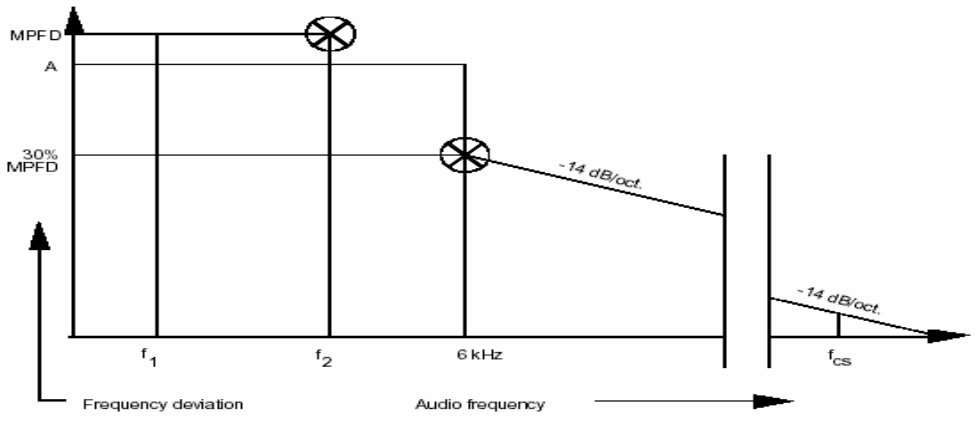
ETSI EN 300 086-1 (V.1.2.1) Sub-clause 5.1.4.1
The maximum permissible frequency deviation as defined in Sub-clause 8.4.1 for modulation frequencies from the lowest frequency transmitted (f1) by the equipment (as declared by the manufacturer) up to (f2) shall be as given in table 2.

Table 2

Channel separation (KHz)	Maximum permissible frequency deviation (kHz)
12.5 kHz	±2.5 kHz
20 kHz	±4 kHz
25 kHz	±5 kHz

ETSI EN 300 086-1 (V.1.2.1) Sub-clause 5.1.4.2
The response of transmitter to modulation frequency as defined in ETSI EN 300 086-1 Sub-clause 8.4.2, the frequency deviation at modulation frequencies between 3.0 KHz
(for equipment operating with 20 KHz or 25 KHz channel separations) and 2.55 KHz
(for equipment operating with 12.5 KHz channel separation) and 6.0 KHz shall not exceed
the frequency deviation at a modulation frequency of 3.0 KHz/2.55 KHz. At 6.0KHz the deviation shall be not more than 30% of the maximum permissible frequency deviation.

The frequency deviation at modulation frequencies between 6.0 KHz and a frequency equal
to the channel separation for which the equipment is intended shall not exceed that given by
a linear representation of the frequency deviation (dB) relative to the modulation frequency, starting at the 6.0 KHz limit and having a slope of -14.0 dB per octave. These limits are illustrated in figure 1.



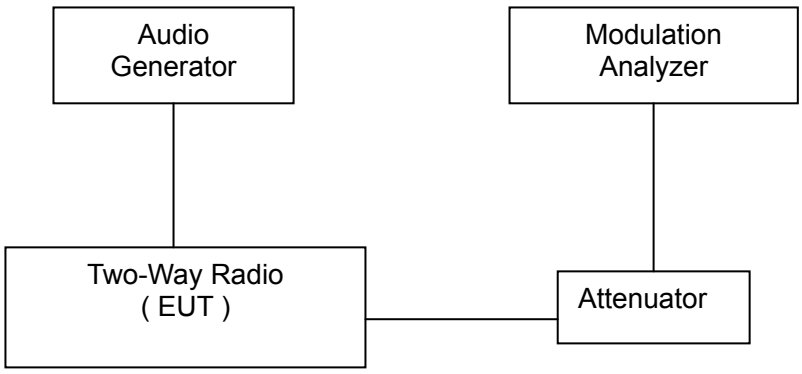
NOTE:
Abbreviations:

f1	lowest appropriate frequency
f2	3,0 kHz (for 20 kHz or 25 kHz channel separation), or 2,55 kHz (for 12,5 kHz channel separation)
MPFD	maximum permissible frequency deviation, clause 5.1.4.1
A	measured frequency deviation at f2
fcs	frequency equal to channel separation

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Telecommunication Test Set	HP	8920B	3104A03367	2009-04-16

TEST CONFIGURATION

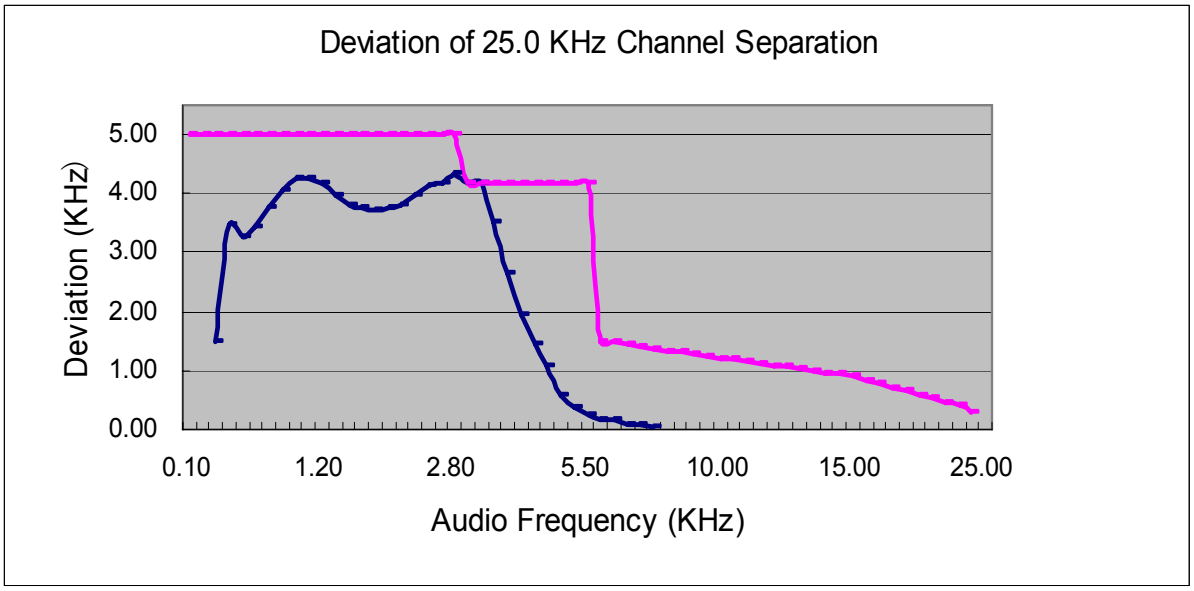


TEST PROCEDURE

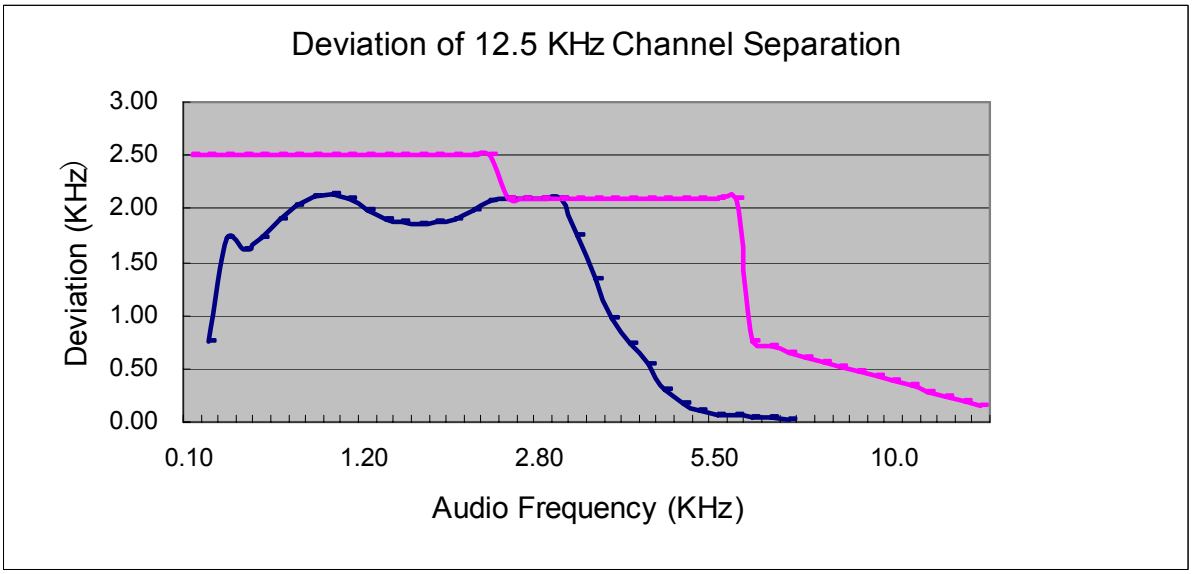
1. Please refer to ETSI EN 300 086-1 (V.1.2.1) Sub-clause 6.3 for the test conditions.
2. Please refer to ETSI EN 300 086-1 (V1.2.1) Sub-clause 8.4.1 and 8.4.1.2 for the measurement method.

TEST RESULTS

The Worst Case Middle Channel @25.0 KHz Channel Separation



The Worst Case Middle Channel @12.5 KHz Channel Separation



6.5 ADJACENT CHANNEL POWER

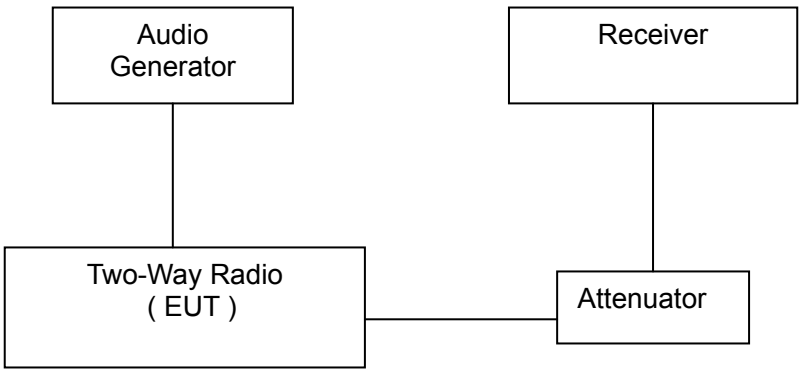
LIMIT

ETSI EN 300 086-1 (V.1.2.1) Sub-clause 5.1.5
The adjacent channel power as defined in ETSI EN 300 086-1 Sub-clause 8.5.1, for channel separations of 20 KHz and 25 KHz, the adjacent channel power shall not exceed a value of 70.0 dB below the carrier power of the transmitter without the need to be below 0.2 uW. For channel separations of 12.5 KHz, the adjacent channel power shall not exceed a value of 60 dB below the transmitter carrier power without the need to be below 0.20 uW

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMI Test Receiver	R&S	ESCS30	100343	2009-04-16
Telecommunication Test Set	HP	8920B	3104A03367	2009-04-16

TEST CONFIGURATION



TEST PROCEDURE
1. Please refer to ETSI EN 300 086-1 (V.1.2.1) Sub-clause 6.3 for the test conditions.
2. Please refer to ETSI EN 300 086-1 (V1.2.1) Sub-clause 8.5.2 for the measurement method.

TEST RESULTS

The Top Channel @25 KHz Channel Separation

Test Condition		Measurement Offset	Adjacent Channel Power (dBc)
Temperature (℃)	Voltage (V)		
T Nor (25℃)	DC 13.8V	+17 KHz	73.5
		-17 KHz	72.4
Applicable Limit		60 dBc	
Result		Pass	

The Middle Channel @ 25 KHz Channel Separation

Test Condition		Measurement Offset	Adjacent Channel Power (dBc)
Temperature (℃)	Voltage (V)		
T Nor (25℃)	DC 13.8V	+17 KHz	72.5
		-17 KHz	72.3
Applicable Limit		60 dBc	
Result		Pass	

The Bottom Channel @ 25 KHz Channel Separation

Test Condition		Measurement Offset	Adjacent Channel Power (dBc)
Temperature (℃)	Voltage (V)		
T Nor (25℃)	DC 13.8V	+17 KHz	73.5
		-17 KHz	73.4
Applicable Limit		60 dBc	
Result		Pass	

The Top Channel @12.5 KHz Channel Separation

Test Condition		Measurement Offset	Adjacent Channel Power (dBc)
Temperature (℃)	Voltage (V)		
T Nor (25℃)	DC 13.8V	+8.25 KHz	65.4
		+8.25 KHz	64.3
Applicable Limit		60 dBc	
Result		Pass	

The Middle Channel @ 12.5 KHz Channel Separation

Test Condition		Measurement Offset	Adjacent Channel Power (dBc)
Temperature (℃)	Voltage (V)		
T Nor (25℃)	DC 13.8V	+8.25 KHz	64.8
		+8.25 KHz	64.5
Applicable Limit		60 dBc	
Result		Pass	

The Bottom Channel @ 12.5 KHz Channel Separation

Test Condition		Measurement Offset	Adjacent Channel Power (dBc)
Temperature (℃)	Voltage (V)		
T Nor (25℃)	DC 13.8V	+8.25 KHz	63.7
		+8.25 KHz	64.6
Applicable Limit		60 dBc	
Result		Pass	

6.6 SPURIOUS EMISSIONS

LIMIT

ETSI EN 300 086-1 (V.1.2.1) Sub-clause 5.1.6
Spurious emission as defined in ETSI EN 300 086-1 Sub-clause 8.6.1, the power of any spurious emission shall not exceed the values given in table 3 and table 4

Table 3: Conducted emissions

Frequency Range	9 KHz to 1GHz	Above 1GHz to 4GHz, or above 1GHz to 12.75GHz
TX Operating	0.25μW (-36 dBm)	1.00μW (-30 dBm)
TX Standby	2.0nW (-57 dBm)	20.00nW (-47.0 dBm)

Table 4: Radiated emissions

Frequency Range	30 MHz to 1GHz	Above 1GHz to 4GHz
TX Operating	0.25μW (-36 dBm)	1.00μW (-30 dBm)
TX Standby	2.0nW (-57 dBm)	20.00nW (-47.0 dBm)

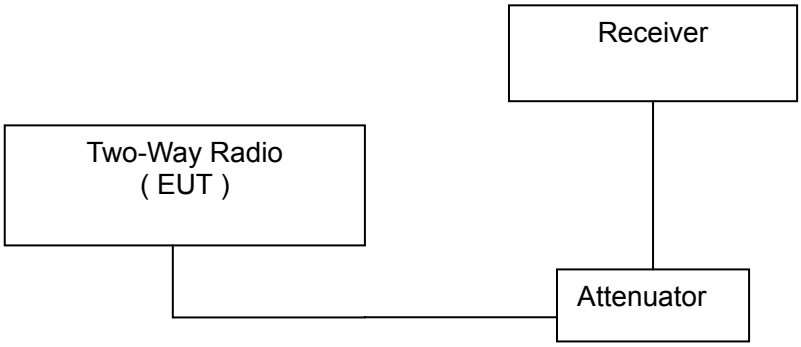
MEASUREMENT EQUIPMENT USED

Radiated Emission Test Site # 4				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Attenuator	--	--	--	2009-04-16
EMI Test Receiver	R&S	ESCS30	100343	2009-04-16
AMPLIFIER	HP	HP8447E	2945A02715	2009-04-16
ANTENNA	Sunol Sciences Corp.	JB3	A021907	2009-04-16

Remark: Each piece of equipment is scheduled for calibration once a year.

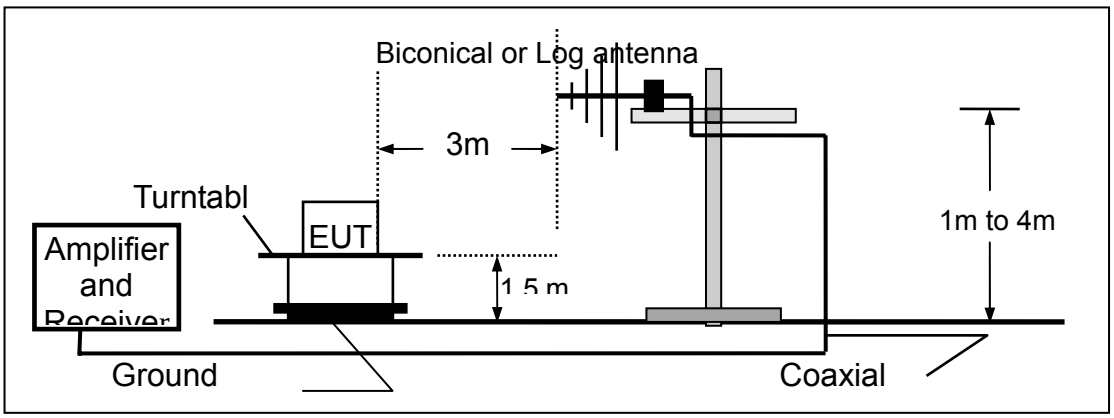
TEST CONFIGURATION

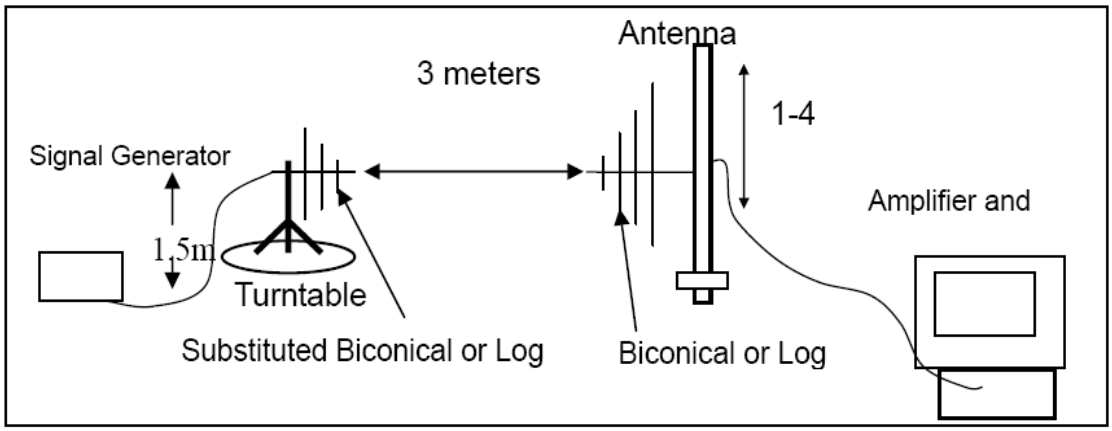
Conducted Measurement (9 KHz to 4 GHz)



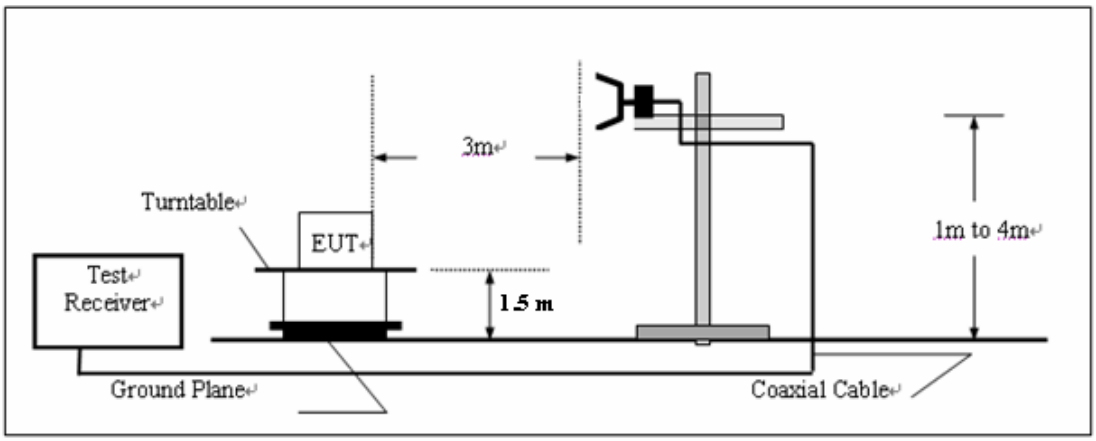
Effective Radiated Power measurement (30 MHz to 4 GHz)

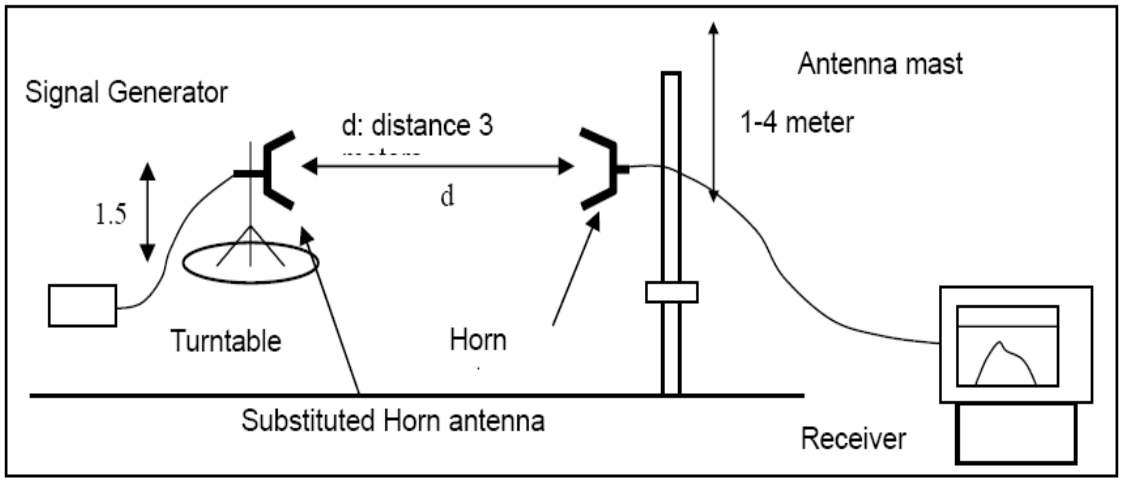
Below 1GHz





Above 1GHz


3m
Turntable
EUT
Test
Receiver
1.5 m
1m to 4m
Ground Plane
Coaxial Cable


Signal Generator
d: distance 3
d
Antenna mast
1-4 meter
1.5
Turntable
Horn
Substituted Horn antenna
Receiver

TEST PROCEDURE

1. Please refer to ETSI EN 300 086-1 (V.1.2.1) Sub-clause 6.3 for the test conditions.
2. Please refer to ETSI EN 300 086-1 (V1.2.1) Sub-clause 8.6.2 and 8.6.3 for the measurement method.

TEST RESULTS

Conducted Measurement (9 KHz to 5 GHz)

The Worst Case of Conducted Spurious Emission for 40 W

Test Condition		Frequency (MHz)	Conducted Power (dBm)
Temperature (℃)	Voltage (V)		
T Nor (25℃)	DC 13.8 V	890.12	-39.19
		1235.77	-40.11
		--	--
Applicable Limit		0.25 uW (-36 dBm)	
Result		Pass	

The Worst Case of Conducted Spurious Emissions for 10 W

Test Condition		Frequency (MHz)	Conducted Power (dBm)
Temperature (℃)	Voltage (V)		
T Nor (25℃)	DC 13.8 V	890.12	-43.21
		1235.77	-45.61
		--	--
Applicable Limit		0.25 uW (-36 dBm)	
Result		Pass	

The Worst Case of Conducted Spurious Emissions for 5 W

Test Condition		Frequency (MHz)	Conducted Power (dBm)
Temperature (℃)	Voltage (V)		
T Nor (25℃)	DC 13.8 V	890.12	-45.11
		1235.77	-47.29
		--	--
Applicable Limit		0.25 uW (-36 dBm)	
Result		Pass	

The Worst Case of Conducted Spurious Emissions – Standby Mode

Test Condition		Frequency (MHz)	Conducted Power (dBm)
Temperature (℃)	Voltage (V)		
T Nor (25℃)	DC 7.4V	9 KHz to 12.75GHz	At Least 20 dB down than the limits
Applicable Limit		0.25 uW (-36 dBm)	
Result		Pass	

Effective Radiated Power measurement (30 MHz to 4 GHz)---PASS

The Worst Case of Radiated Spurious Emissions for all output power - Transmitting

Frequency (MHz)	Reading level (dBuV)	Antenna Polarization	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dB)	Emission level (dBm)	Limit (dBm)	Margin (dB)
Below 1 GHz	--	V	--	--	--	--	--	**At least 20 dB down than the limit**
Above 1 GHz	--	V	--	--	--	--	--	
Below 1 GHz	--	H	--	--	--	--	--	
Above 1 GHz	--	H	--	--	--	--	--	

Remark:

(1) Emission Level(dBm) = SG O/P-Cable + Ant Gain
(2) Measuring frequencies from 30 MHz to the 4GHz.
(3) Data of measurement within this frequency range shown "--" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

The Worst Case of Radiated Spurious Emissions for all output power - Standby Mode

Frequency (MHz)	Reading level (dBuV)	Antenna Polarization	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dB)	Emission level (dBm)	Limit (dBm)	Margin (dB)
Below 1 GHz	--	V	--					At least 20 dB down than the limit
Above 1 GHz	--	V	--					
Below 1 GHz	--	H	--					
Above 1 GHz	--	H	--					

Remark:

(1) Emission Level (dBm) = SG O/P-Cable + Ant Gain
(2) Measuring frequencies from 30 MHz to the 4GHz.
(3) Data of measurement within this frequency range shown "--" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

6.7 TRANSIENT FREQUENCY BEHAVIOUR OF TRANSMITTER

LIMIT

ETSI EN 300 086-1 (V 1.2.1) Sub-clause 5.1.8
The transient frequency behaviour of transmitter as defined in ETSI EN 300 086-1 Sub-clause 8.8.1, the transient periods are given in table 5

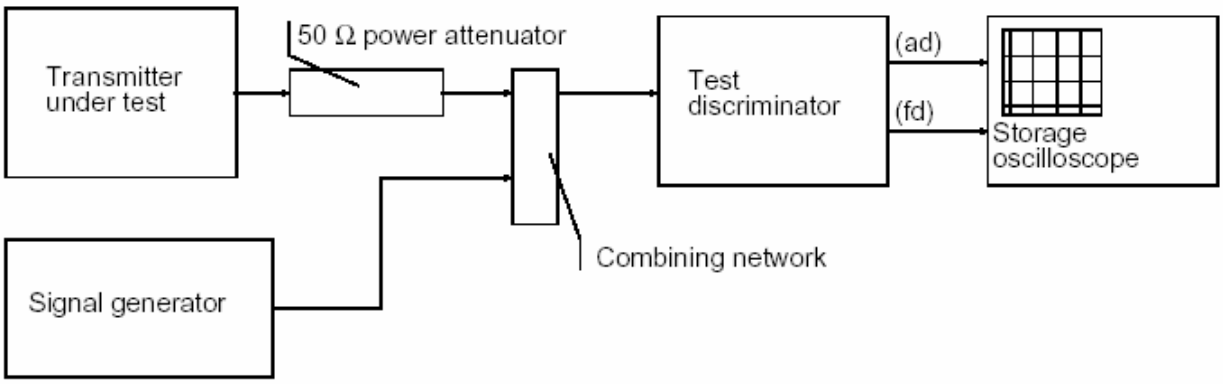
Table 5

Range	30 MHz to 300 MHz	Above 300 MHz to 500 MHz	Above 500 MHz to 1000 MHz
T1 (ms)	5	10	20
T2 (ms)	20	25	50
T3 (ms)	5	10	10

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Signal Generator	IFA	2023B	202477/229	2007-04-16
Storage Oscilloscope	Tektronix	TDS3052	B017447	2007-04-16

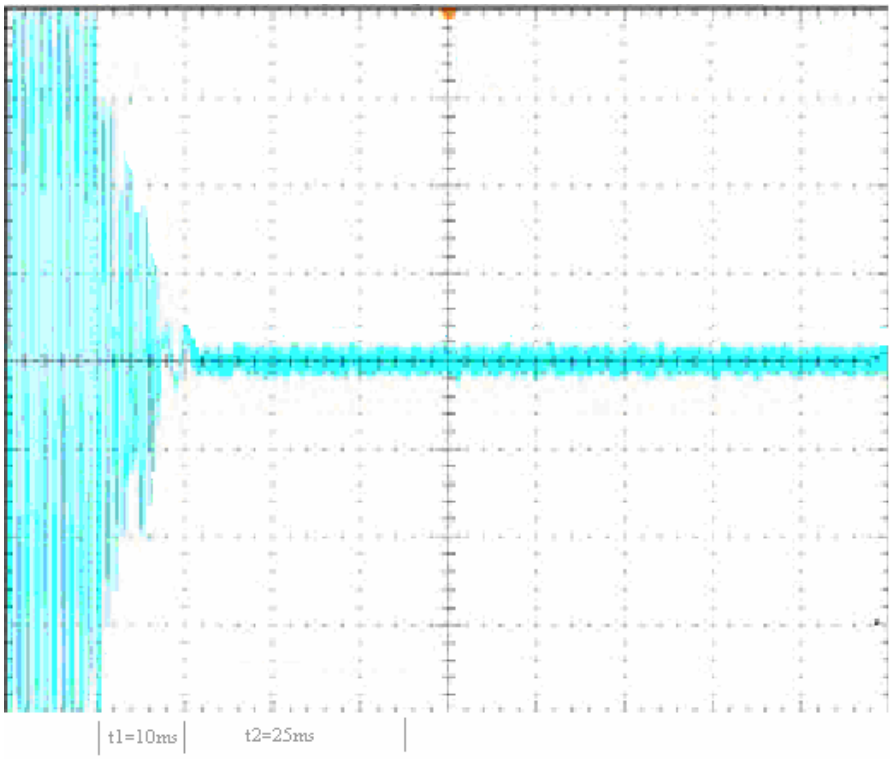
TEST CONFIGURATION



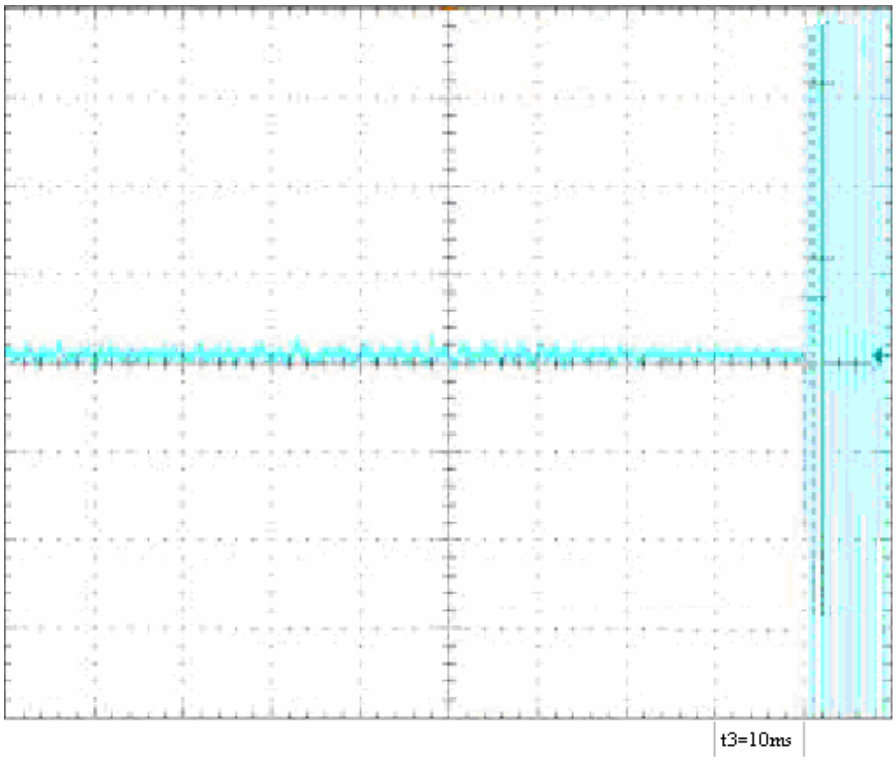
TEST PROCEDURE
1. Please refer to ETSI EN 300 086-1 (V.1.2.1) Sub-clause 6.3 for the test conditions.
2. Please refer to ETSI EN 300 086-1 (V1.2.1) Sub-clause 8.8.2 for the measurement method.

TEST RESULTS

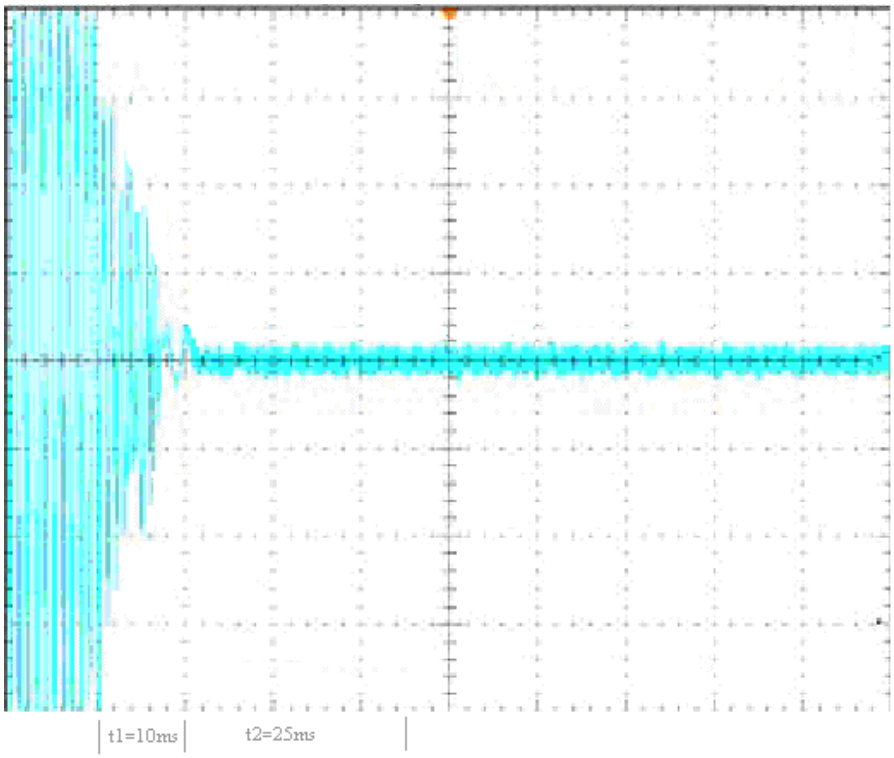
Transmitter Frequency Behavior @ 25KHz Channel Separation------Off to On



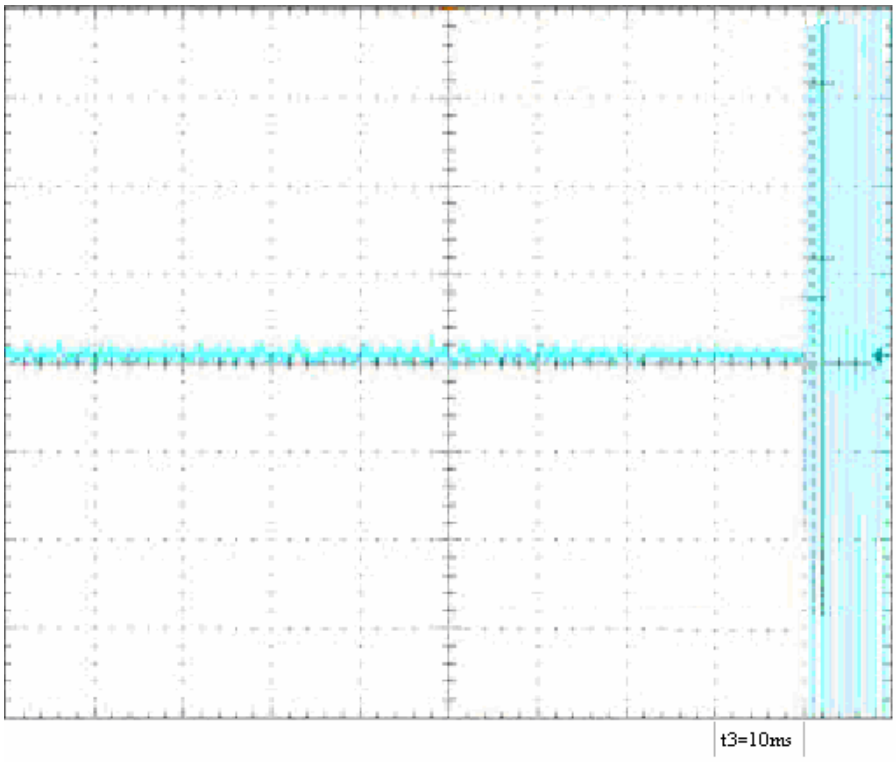
Transmitter Frequency Behaviour @ 25 KHz Channel Separation------On to Off



Transmitter Frequency Behaviour @ 12.5 KHz Channel Separation------Off to On



Transmitter Frequency Behaviour @ 12.5 KHz Channel Separation------On to Off



7. RECEIVER PARAMETERS

7.1 MAXIMUM USABLE SENSITIVITY (CONDUCTED)

LIMIT

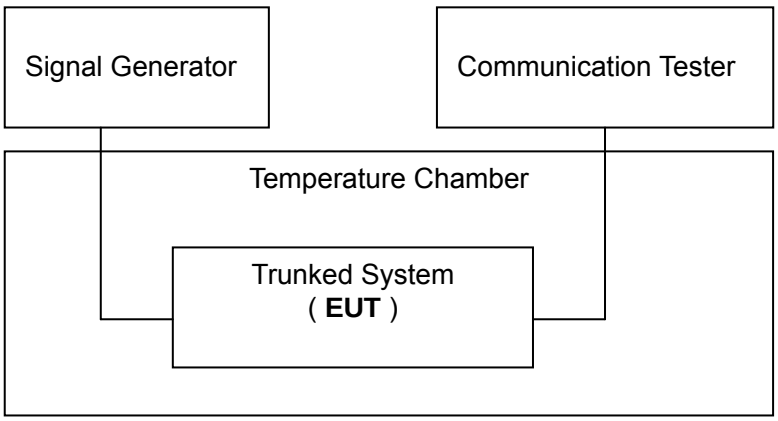
ETSI EN 300 086-1(V 1.2.1) Sub-clause 5.2.1
The maximum usable sensitivity (conducted) of the receiver as defined as in ETSI EN 300 086-1 Sub-clause 9.1.1 shall produce

a) An audio frequency output power of at least 50% of the rated power output, and
b) A SND/ND ratio of 20 dB, measured at the receiver output.

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Telecommunication Test Set	HP	8920B	3104A03367	2009-04-16
Signal Generator	IFA	2023B	202477/229	2009-04-16
Tem. & Hum. Chamber	TEPCHY	MHG-8000NF	E21104	2009-06-13

TEST CONFIGURATION



TEST PROCEDURE
1. Please refer to ETSI EN 300 086-1 (V.1.2.1) Sub-clause 6.3 and 6.4 for the test conditions.
2. Please refer to ETSI EN 300 086-1 (V1.2.1) Sub-clause 9.1.2 for the measurement method.

TEST RESULTS

Test Result of 25 KHz Channel Separation			
Test Condition		Result Measured (dBuV)	Limit (dBuV)
Temperature (℃)	Voltage (V)		
T Nor (25℃)	DC 13.8 V	0.31	6.0
T min (-20℃)	DC 12.4 V	0.45	12
	DC 17.9 V	0.41	12
T Max (+55℃)	DC 12.4 V	0.43	12
	DC 17.9 V	0.40	12
Result		Pass	

Test Result of 12.5 KHz Channel Separation			
Test Condition		Result Measured (dBuV)	Limit (dBuV)
Temperature (℃)	Voltage (V)		
T Nor (25℃)	DC 13.8 V	0.39	6.0
T min (-20℃)	DC 12.4 V	0.51	12
	DC 17.9 V	0.49	12
T Max (+55℃)	DC 12.4 V	0.54	12
	DC 17.9 V	0.52	12
Result		Pass	

7.2 MAXIMUM USABLE SENSITIVITY (FIELD STRENGTH) (NOT APPLICABLE TO DEVICE WITH EXTERNAL RF PORT)

LIMIT

ETSI EN 300 086-1(V 1.2.1) Sub-clause 5.2.2
The maximum usable sensitivity (field strength) of the receiver as defined as in ETSI EN 300 086-1 Sub-clause 9.2.1 shall produce

a) An audio frequency output power of at least 50% of the rated power output, and
b) A SND/ND ratio of 20 dB, measured at the receiver output.

MEASUREMENT EQUIPMENT USED

N/A

TEST CONFIGURATION

N/A

TEST PROCEDURE

N/A

TEST RESULTS

N/A

7.3 AMPLITUDE CHARACTERISTIC OF RECEIVER

LIMIT

ETSI EN 300 086-1(V 1.2.1) Sub-clause 5.2.3
The amplitude characteristic of the receiver as defined as in ETSI EN 300 086-1 Sub-clause 9.3.1, within the specified change in radio frequency input signal level, the change of the audio output level shall not exceed 3.0 dB.

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Telecommunication Test Set	HP	8920B	3104A03367	2009-04-16
Signal Generator	IFA	2023B	202477/229	2009-04-16

TEST CONFIGURATION

The same as described in section 7.1

TEST PROCEDURE

1. Please refer to ETSI EN 300 086-1 (V.1.2.1) Sub-clause 6.3 for the test conditions.
2. Please refer to ETSI EN 300 086-1 (V1.2.1) Sub-clause 9.3.2 for the measurement method.

TEST RESULTS

Test Result of 25 KHz Channel Separation	
Test Result (dB)	Limit (dB)
2.86	3
Result	PASS

Test Result of 12.5 KHz Channel Separation	
Test Result (dB)	Limit (dB)
2.89	3
Result	PASS

7.4 CO-CHANNEL REJECTION

LIMIT

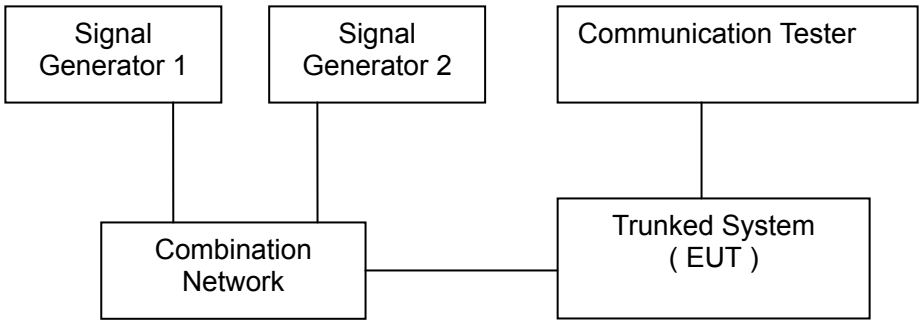
ETSI EN 300 086-1(V 1.2.1) Sub-clause 5.2.4
The co-channel rejection of the receiver as defined as in ETSI EN 300 086-1 Sub-clause 9.4.1, at any frequency of the unwanted signal within the specified range, shall be between:

c) -8.0 dB and 0 dB for channel separation of 20 KHz and 25 KHz;
d) -12.0 dB and 0 dB for channel separation of 12.5 KHz.

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Telecommunication Test Set	HP	8920B	3104A03367	2009-04-16
Signal Generator	IFA	2023B	202477/229	2009-04-16
Signal Generator	IFA	2023B	202301/878	2009-04-16

TEST CONFIGURATION



TEST PROCEDURE

1. Please refer to ETSI EN 300 086-1 (V.1.2.1) Sub-clause 6.3 for the test conditions.
2. Please refer to ETSI EN 300 086-1 (V1.2.1) Sub-clause 9.4.2 for the measurement method.

TEST RESULTS

Test Result of 25 KHz Channel Separation	
Test Result (dB)	Limit (dB)
-7.71	Between -8 dB and 0 dB
Result	PASS

Test Result of 12.5 KHz Channel Separation	
Test Result (dB)	Limit (dB)
-8.42	Between -12 dB and 0 dB
Result	PASS

7.5 ADJACENT CHANNEL SELECTIVITY

LIMIT

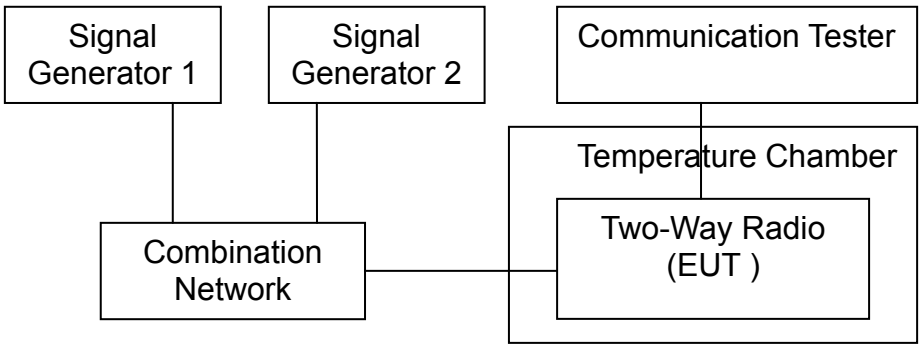
ETSI EN 300 086-1(V 1.2.1) Sub-clause 5.2.5
The adjacent channel selectivity of the receiver as defined as in ETSI EN 300 086-1 Sub-clause 9.5.1,

For channel separations of 20 KHz and 25 KHz, the adjacent channel selectivity shall not be less than 70.0 dB under normal test conditions and not less than 60.0 dB under extreme test conditions.
For channel separations of 12.5 KHz, the adjacent channel selectivity shall not be less than 60.0 dB under normal test conditions and not less than 50.0 dB under extreme test conditions.

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Telecommunication Test Set	HP	8920B	3104A03367	2009-04-16
Signal Generator	IFA	2023B	202477/229	2009-04-16
Signal Generator	IFA	2023B	202301/878	2009-04-16
Tem. & Hum. Chamber	TEPCHY	MHG-8000NF	E21104	2009-06-13

TEST CONFIGURATION



TEST PROCEDURE

1. Please refer to ETSI EN 300 086-1 (V.1.2.1) Sub-clause 6.3 and 6.4 for the test conditions.
2. Please refer to ETSI EN 300 086-1 (V1.2.1) Sub-clause 9.5.2 for the measurement method.

TEST RESULTS

Test Result of 25 KHz Channel Separation			
Test Condition		Result Measured (dB)	Limit (dB)
Temperature (℃)	Voltage (V)		
T Nor (25℃)	DC 13.8 V	73.8	70
T min (-20℃)	DC 12.4 V	71.6	60
	DC 17.9 V	72.3	60
T Max (+55℃)	DC 12.4 V	69.8	60
	DC 17.9 V	70.5	60
Result		Pass	

Test Result of 12.5 KHz Channel Separation			
Test Condition		Result Measured (dB)	Limit (dB)
Temperature (℃)	Voltage (V)		
T Nor (25℃)	DC 13.8 V	68.7	60
T min (-20℃)	DC 12.4 V	65.8	50
	DC 17.9 V	66.4	50
T Max (+55℃)	DC 12.4 V	65.1	50
	DC 17.9 V	65.8	50
Result		Pass	

7.6 SPURIOUS RESPONSE REJECTION

LIMIT

ETSI EN 300 086-1(V 1.2.1) Sub-clause 5.2.6
The spurious response rejection of the receiver as defined as in ETSI EN 300 086-1 Sub-clause 9.6.1, at any frequency separated from the nominal frequency of the receiver by more than one channel, the spurious response rejection ratio shall not be less than 70.0 dB.

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Telecommunication Test Set	HP	8920B	3104A03367	2009-04-16
Signal Generator	IFA	2023B	202477/229	2009-04-16
Signal Generator	IFA	2023B	202301/878	2009-04-16

TEST CONFIGURATION

The same as described in section 7.4

TEST PROCEDURE

1. Please refer to ETSI EN 300 086-1 (V.1.2.1) Sub-clause 6.3 for the test conditions.
2. Please refer to ETSI EN 300 086-1 (V1.2.1) Sub-clause 9.6.2 for the measurement method.

TEST RESULTS

Test Result of 25 KHz Channel Separation	
Test Result (dB)	Limit (dB)
74.3	At least 70
Result	PASS

Test Result of 12.5 KHz Channel Separation	
Test Result (dB)	Limit (dB)
73.1	At least 70
Result	PASS

7.7 INTER MODULATION RESPONSE REJECTION

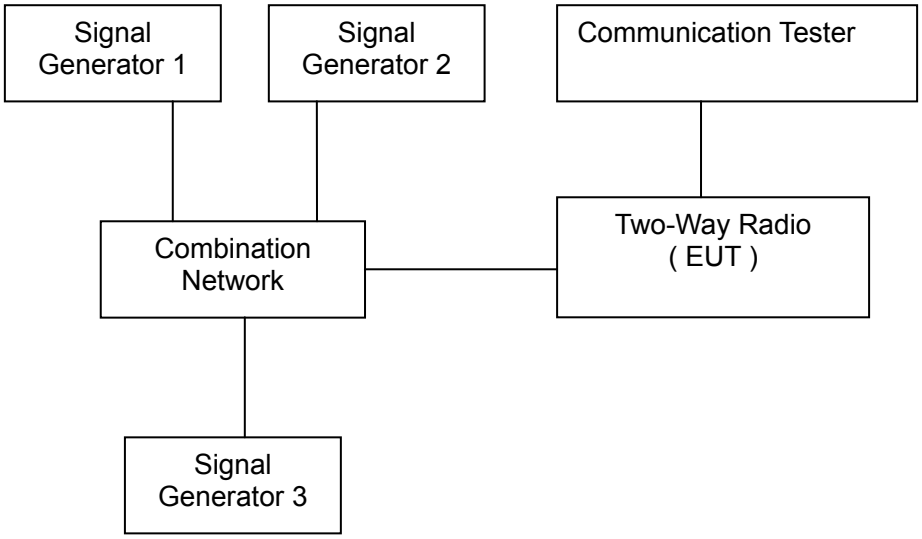
LIMIT

ETSI EN 300 086-1(V 1.2.1) Sub-clause 5.2.7
The inter modulation response rejection of the receiver as defined as in ETSI EN 300 086-1 Sub-clause 9.7.1, shall not be less than the ratio of 70.0 dB for base stations and 65.0 dB for mobile and hand portable stations.

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Telecommunication Test Set	HP	8920B	3104A03367	2009-04-16
Signal Generator	IFA	2023B	202477/229	2009-04-16
Signal Generator	IFA	2023B	202301/878	2009-04-16

TEST CONFIGURATION



TEST PROCEDURE

1. Please refer to ETSI EN 300 086-1 (V.1.2.1) Sub-clause 6.3 for the test conditions.
2. Please refer to ETSI EN 300 086-1 (V1.2.1) Sub-clause 9.7.2 for the measurement method.

TEST RESULTS

Test Result of 25 KHz Channel Separation	
Test Result (dB)	Limit (dB)
68.7	At least 65
Result	PASS

Test Result of 12.5 KHz Channel Separation	
Test Result (dB)	Limit (dB)
66.5	At least 65
Result	PASS

7.8 BLOCKING OR DESENSITIZATION

LIMIT

ETSI EN 300 086-1(V 1.2.1) Sub-clause 5.2.8
The blocking or desensitization of the receiver as defined in ETSI EN 300 086-1 Sub-clause 9.8.1, for any frequency within the specified range, shall not be less than 84.0 dB, except at frequencies on which spurious response are found

MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Telecommunication Test Set	HP	8920B	3104A03367	2009-04-16
Signal Generator	IFA	2023B	202477/229	2009-04-16
Signal Generator	IFA	2023B	202301/878	2009-04-16
Signal Generator	IFA	2023B	203002/100	2009-04-16

TEST CONFIGURATION

The same as described in section 7.4

TEST PROCEDURE

1. Please refer to ETSI EN 300 086-1 (V.1.2.1) Sub-clause 6.3 for the test conditions.
2. Please refer to ETSI EN 300 086-1 (V1.2.1) Sub-clause 9.8.2 for the measurement method.

TEST RESULTS

Test Result of 25 KHz Channel Separation	
Test Result (dB)	Limit (dB)
86.8	At least 84
Result	PASS

Test Result of 12.5 KHz Channel Separation	
Test Result (dB)	Limit (dB)
85.9	At least 84
Result	PASS

7.9 SPURIOUS RADIATION

LIMIT

ETSI EN 300 086-1(V 1.2.1) Sub-clause 5.2.9
The spurious radiation of the receiver as defined in ETSI EN 300 086-1 Sub-clause 9.9.1, shall not exceed the values given in tables 7 and 8

Table 7: Conducted emissions

Frequency Range	9 KHz to 1GHz	Above 1GHz to 4GHz, or above 1GHz to 12.75GHz
Limit	2.0 nW (-57 dBm)	20 nW (-47 dBm)

Table 8: Radiated emissions

Frequency Range	30 MHz to 1GHz	Above 1GHz to 4GHz
Limit	2.0 nW (-57 dBm)	20 nW (-47 dBm)

MEASUREMENT EQUIPMENT USED

Radiated Emission Test Site # 4				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Attenuator	--	--	--	2009-04-16
EMI Test Receiver	R&S	ESCS30	100343	2009-04-16
AMPLIFIER	HP	HP8447E	2945A02715	2009-04-16
ANTENNA	Sunol Sciences Corp.	JB3	A021907	2009-04-16

Remark: Each piece of equipment is scheduled for calibration once a year.

TEST CONFIGURATION

The same as described in section 6.6

TEST PROCEDURE

1. Please refer to ETSI EN 300 086-1 (V.1.2.1) Sub-clause 6.3 for the test conditions.
2. Please refer to ETSI EN 300 086-1 (V1.2.1) Sub-clause 9.9.2 for the measurement method.

TEST RESULTS

The Radiated Measurement are performed to the three channels (the top channel, the middle channel and the top channel) at each channel separation (25 KHz, 12.5 KHz), the datum recorded below is the worst case for each channel separation.

The Bottom Channel is the worst case for 25 KHz Channel Separation

Frequency (MHz)	Reading level (dBuV)	Antenna Polarization	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dB)	Emission level (dBm)	Limit (dBm)	Margin (dB)
Below 1 GHz	--	V	--					**At least 20 dB down than the limit**
Above 1 GHz	--	V	--					
Below 1 GHz	--	H	--					
Above 1 GHz	--	H	--					

Remark:

(1) Emission Level (dBm) = SG O/P-Cable + Ant Gain
(2) Measuring frequencies from 30 MHz to the 4GHz.
(3) Data of measurement within this frequency range shown " -- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

The Bottom Channel is the worst case for 12.5 KHz Channel Separation

Frequency (MHz)	Reading level (dBuV)	Antenna Polarization	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dB)	Emission level (dBm)	Limit (dBm)	Margin (dB)
Below 1 GHz	--	V	--					**At least 20 dB down than the limit**
Above 1 GHz	--	V	--					
Below 1 GHz	--	H	--					
Above 1 GHz	--	H	--					

Remark:

(1) Emission Level (dBm) = SG O/P-Cable + Ant Gain
(2) Measuring frequencies from 30 MHz to the 4GHz.
(3) Data of measurement within this frequency range shown " -- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

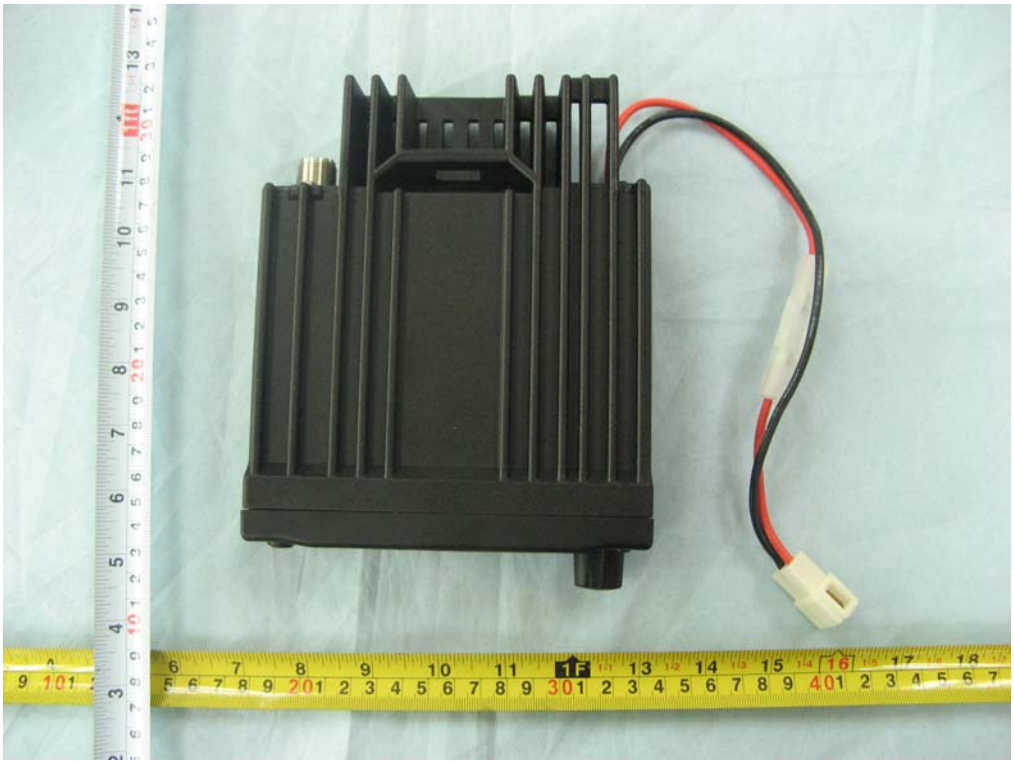
APPENDIX 1

PHOTOGRPHS OF TEST SETUP

RADIATED EMISSIONS TEST SETUP

APPENDIX 2
PHOTOGRPHS OF EUT

TOP VIEW OF SAMPLE



BOTTOM VIEW OF SAMPLE

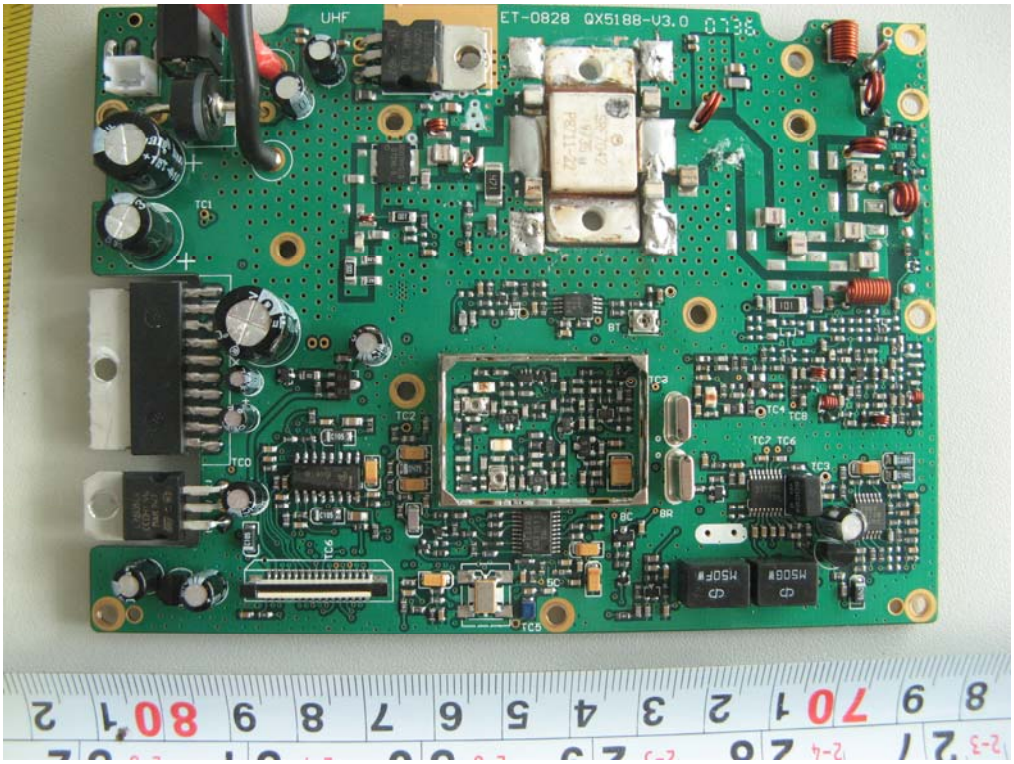
LEFT VIEW OF SAMPLE

RIGHT VIEW OF SAMPLE

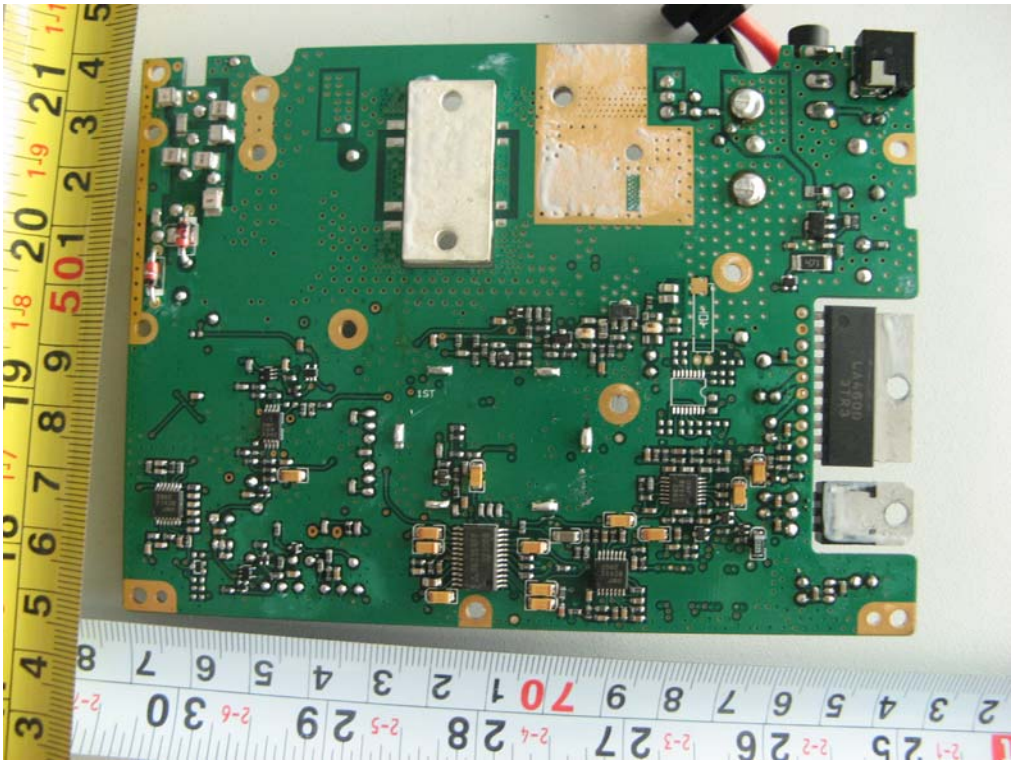
FRONT VIEW OF SAMPLE

BACK VIEW OF SAMPLE

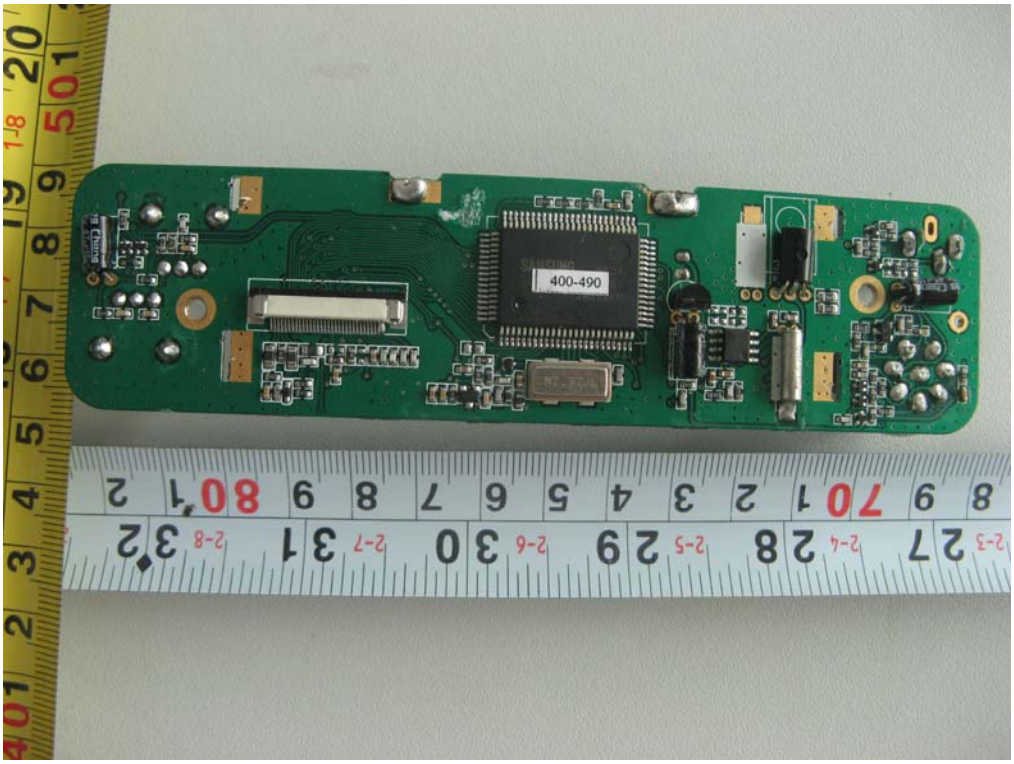
INTERNAL VIEW OF SAMPLE -1



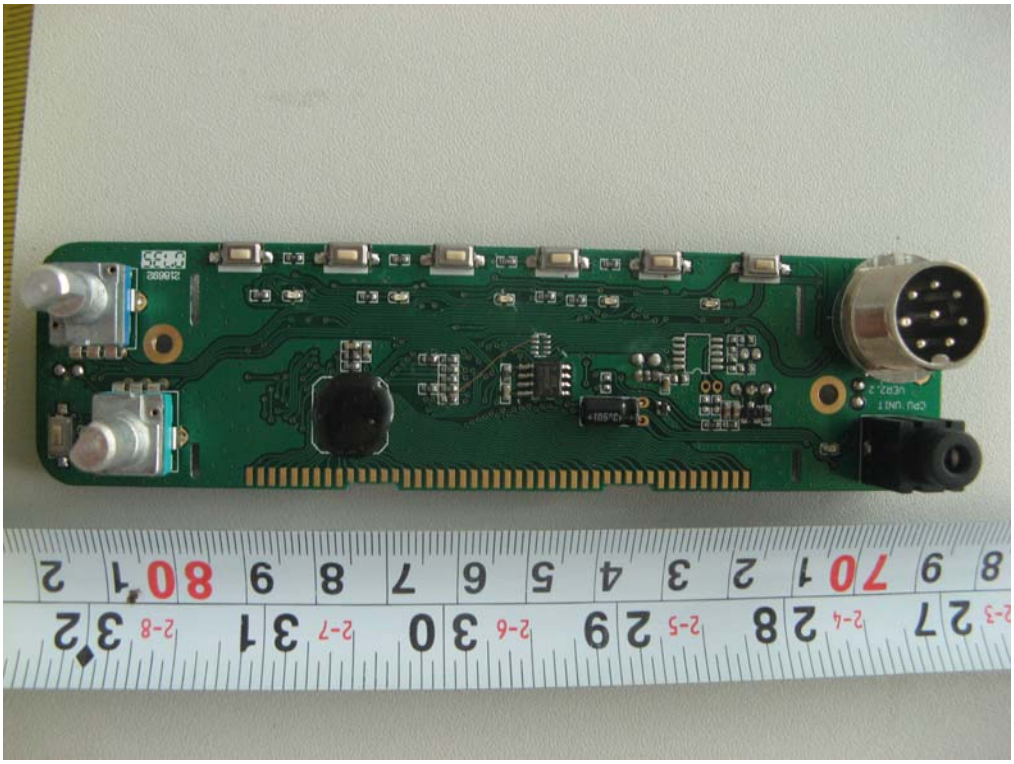
INTERNAL VIEW OF SAMPLE -2



INTERNAL VIEW OF SAMPLE – 3



INTERNAL VIEW OF SAMPLE – 4



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