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FCC PART 90 TEST REPORT

FCC PART 90

Report Reference No......: **VITE090303001FC**

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Date of issue.....: Mar 18, 2009

Testing Laboratory Name: **Shenzhen VITE Technology Co., Ltd**

Address.....: Room 1702, Building 1A, Xi'an Guandi, 87 District Xin'an, Bao'an District, Shenzhen 518101, P.R. China

Applicant's name.....: **Shenzhen Friendcom Technology Development Co., Ltd.**

Address.....: 6/F,17 Building, Guangqian Industrial Park, Longzhu Road,Xili Town, Nanshan, Shenzhen

Test specification:

Standard: **FCC Part 90: PRIVATE LAND MOBILE RADIO SERVICES**

TRF Originator.....: Shenzhen VITE Technology Co., Ltd

Master TRF.....: Dated 2009-03

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Test item description : RF Link Module

FCC ID.....: UU3FC301DV1

Trade Mark: Friendcom

Model/Type reference.....: FC-301/D

Listed Models: /

Modulation.....: FSK

Power Supply.....: DC 12.5 V

Maximum Transmitter Power.....: 5W

Operating Frequency Range.....: 136 MHz~174 MHz

Result.....: **Positive**

T E S T R E P O R T

Test Report No. :	VITE090303001FC	Mar 18, 2009
		Date of issue

Equipment under Test : RF Link Module

Model /Type : FC-301/D

Listed Models : /

Applicant : Shenzhen Friendcom Technology Development Co., Ltd.

Address : 6/F,17 Building, Guangqian Industrial Park, Longzhu Road,Xili Town, Nanshan, Shenzhen

Test Result according to the standards on page 4:	Positive
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The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

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1. TEST STANDARDS

The tests were performed according to following standards:

[FCC Part 90: PRIVATE LAND MOBILE RADIO SERVICES](#)

2.6. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: **UU3FC301DV1** filing to comply with the FCC Part 90 Rules.

2.7. Modifications

No modifications were implemented to meet testing criteria.

3. TEST ENVIRONMENT

3.1. Address of the test laboratory

Shenzhen Huatongwei International Inspection Co., Ltd
Keji Nan No.12 Road, Hi-tech Park, Shenzhen, China
Phone: 86-755-26715686 Fax: 86-755-26748089

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 (2003) and CISPR Publication 22.

3.2. Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

CNAS-Lab Code: L1225

Shenzhen Huatongwei International Inspection Co., Ltd has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC 17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories, Date of Registration: August 02, 2007. Valid time is until March 04, 2009.

A2LA-Lab Cert. No. 2243.01

Shenzhen Huatongwei International Inspection Co., Ltd, EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing. Valid time is from Aug 24, 2005 to Sept 30, 2009.

FCC-Registration No.: 662850

Shenzhen Huatongwei International Inspection Co., Ltd, EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files. Registration 662850, Renewal date September, 2009.

IC-Registration No.: 5377

The 3m Alternate Test Site of Shenzhen Huatongwei International Inspection Co., Ltd has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Renewal No. 5377A on Feb 13, 2009.

ACA

Shenzhen Huatongwei International Inspection Co., Ltd, EMC Laboratory can also perform testing for the Australian C-Tick mark as a result of our A2LA accreditation.

NEMKO-Aut. No.: ELA125

Shenzhen Huatongwei International Inspection Co., Ltd has been assessed the quality assurance system, the testing facilities, qualifications and testing practices of the relevant parts of the organization. The quality assurance system of the Laboratory has been validated against ISO/IEC 17025:2005 or equivalent. The laboratory also fulfils the conditions described in Nemko Document NLA-10, the Authorization is valid through April 25, 2009.

VCCI

The 3m Semi-anechoic chamber (12.2m×7.95m×6.7m) and Shielded Room (8m×4m×3m) of Shenzhen Huatongwei International Inspection Co., Ltd has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-2484. Date of Registration: December 20, 2006. Valid time is until December 19, 2009.

Main Ports Conducted Interference Measurement of Shenzhen Huatongwei International Inspection Co., Ltd has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: C-2726. Date of Registration: December 20, 2006. Valid time is until December 19, 2009.

3.3. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature: 15-35 ° C

Humidity: 30-60 %

Atmospheric pressure: 950-1050mbar

3.4. Configuration of Tested System

Fig. 2-1 Configuration of Tested System

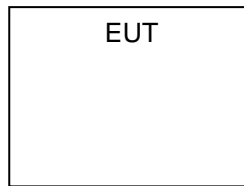


Table 2-1 Equipment Used in Tested System

No.	Product	Manufacturer	Model No.	Serial No.	

3.5. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the Shenzhen Huatongwei International Inspection Co., Ltd quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Shenzhen Huatongwei laboratory is reported:

Test	Range	Measurement Uncertainty	Notes
Radiated Emission	30~1000MHz	4.22dB	(1)
Radiated Emission	1~12.75GHz	4.35dB	(1)
Conducted Disturbance	0.15~30MHz	3.29dB	(1)

- (1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

3.6. Equipments Used during the Test

AC Power Conducted Emission					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESCI	100106	2008/11
2	ARTIFICIAL MAINS	ROHDE & SCHWARZ	ESH2-Z5	100028	2008/11
3	PULSE LIMITER	ROHDE & SCHWARZ	ESHSZ2	100044	2008/11
4	EMI TEST SOFTWARE	ROHDE & SCHWARZ	ES-K1 1.71	N/A	2008/11

Radiated Emissions					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	ULTRA-BROADBAND ANTENNA	ROHDE & SCHWARZ	HL562	100015	2008/11
2	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESI 26	100009	2008/11
3	RF TEST PANEL	ROHDE & SCHWARZ	TS / RSP	335015/ 0017	2008/11
4	TURNTABLE	ETS	2088	2149	2008/11
5	ANTENNA MAST	ETS	2075	2346	2008/11
6	EMI TEST SOFTWARE	ROHDE & SCHWARZ	ESK1	N/A	2008/11

3.7. General Technical Requirements and Summary of Test Results

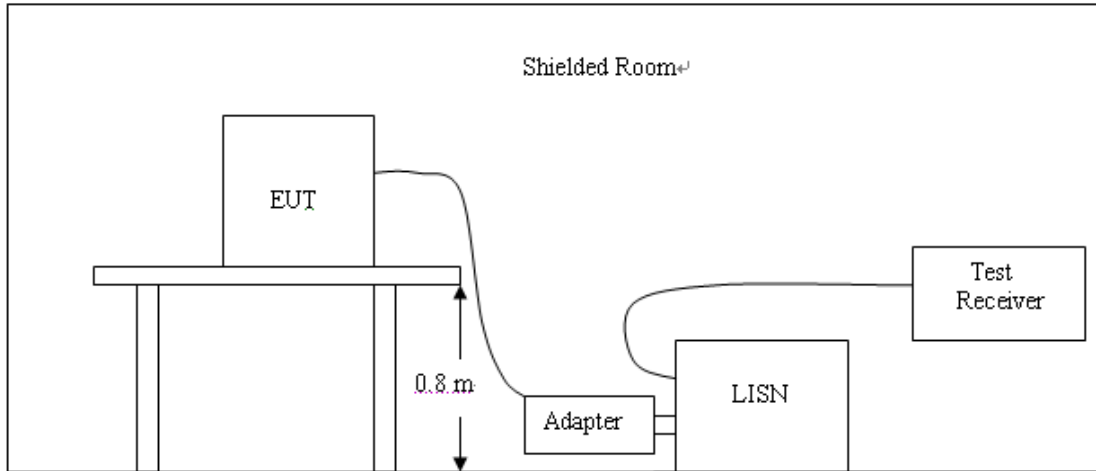
The EUT has been tested according to the following specifications:

Standard	Test Type	Result	Notes
FCC Part 15, Paragraph 15.107	AC Line Conducted Emission	N/A	Owing to the DC operation of EUT, this test item is not performed.
FCC 2.1046 & 90.205(h)	RF Output Power	PASS	Complies
FCC 2.1047 & 90.207 & 90.210(b)	Modulation Characteristics	PASS	Complies
FCC 2.1049 & 90.209(b)(5) & 90.210(b)	Occupied Bandwidth	PASS	Complies
FCC 2.1053 & 90.210(b)	Radiated Spurious Emission	PASS	Complies.
FCC 2.1051 & 90.210(b)	Spurious Emission on Antenna Port	PASS	Complies.
FCC 2.1055 & 90.213	Frequency Stability Vs. Temperature Vs. Voltage	PASS	Complies.
FCC Section 90.214	Transient Frequency Behavior	PASS	Complies.

4. TEST CONDITIONS AND RESULTS

4.1. Conducted Emissions Test

TEST CONFIGURATION



TEST PROCEDURE

- 1 The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.4.
- 2 Support equipment, if needed, was placed as per ANSI C63.4.
- 3 All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4.
- 4 The EUT received DC8V power from the adapter, the adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
- 5 All support equipments received AC power from a second LISN, if any.
- 6 The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
- 7 Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
- 8 During the above scans, the emissions were maximized by cable manipulation.

Conducted Power Line Emission Limit

For unintentional device, according to § 15.107(a) Line Conducted Emission Limits is as following :

Frequency (MHz)	Maximum RF Line Voltage (dBµV)			
	CLASS A		CLASS B	
	Q.P.	Ave.	Q.P.	Ave.
0.15 - 0.50	79	66	66-56*	56-46*
0.50 - 5.00	73	60	56	46
5.00 - 30.0	73	60	60	50

* Decreasing linearly with the logarithm of the frequency

For intentional device, according to §15.207(a) Line Conducted Emission Limit is same as above table.

TEST RESULTS

Owing to the DC operation of EUT, this test item is not performed.

4.2. OCCUPIED BANDWIDTH

PROVISIONS APPLICABLE

According to FCC Part 90 Section 90.209: The authorized bandwidth shall be 11.25 KHz for 12.5 KHz and 20 KHz for 25 KHz.

For any frequency removed from the center of the authorized bandwidth f_0 to 5.625 kHz removed from f_0 , 0dB.

On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 5.626 kHz but no more than 12.5 kHz, at least 7.27 (f_d 2.88 kHz) dB.

On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 12.5 kHz at least:

$$50+10\log P=50+10\log(4.842)=56.85\text{ dB}$$

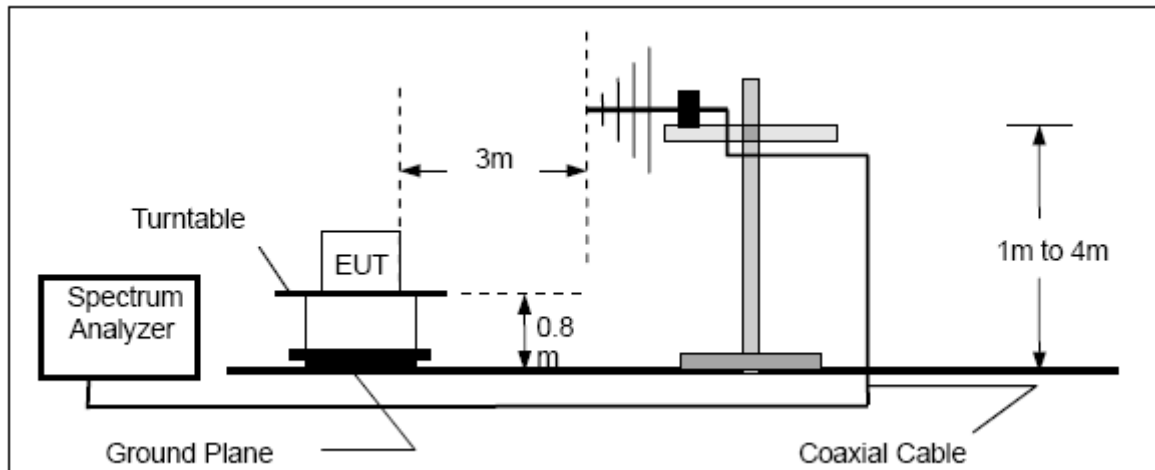
For 25 KHz:

$$43+10\log(4.808)=49.82\text{ dB}$$

MEASUREMENT PROCEDURE

- 1). The EUT was placed on a turn table which is 0.8m above ground plane.
- 2). Set EUT as normal operation
- 3). Set SPA Center Frequency = fundamental frequency, RBW=300Hz, VBW= 3 KHz, span =100 KHz.

TEST SETUP BLOCK DIAGRAM



TEST RESULTS:

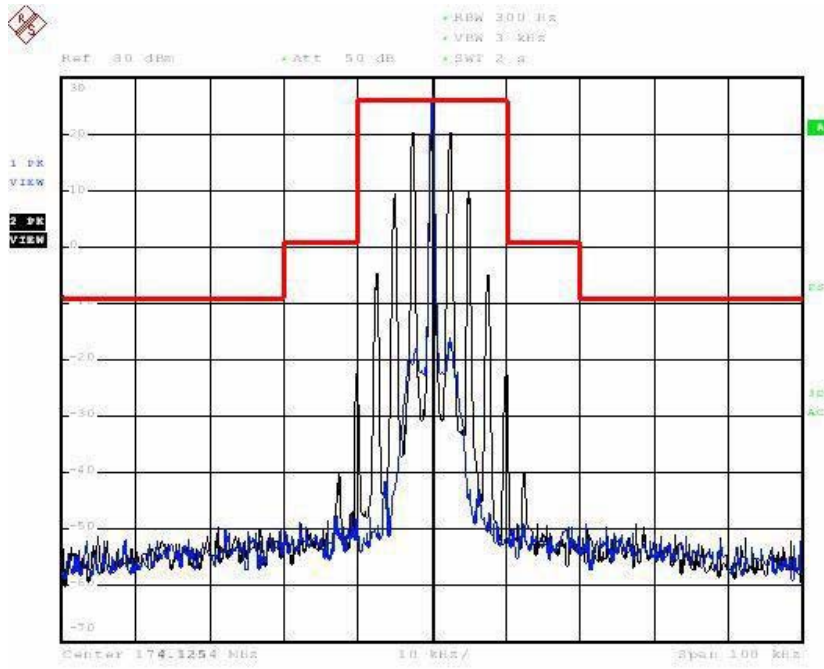
Referred as the attached plot hereinafter

Note: The blue curve represents unmodulated signal.

The black curve represents modulated signal.

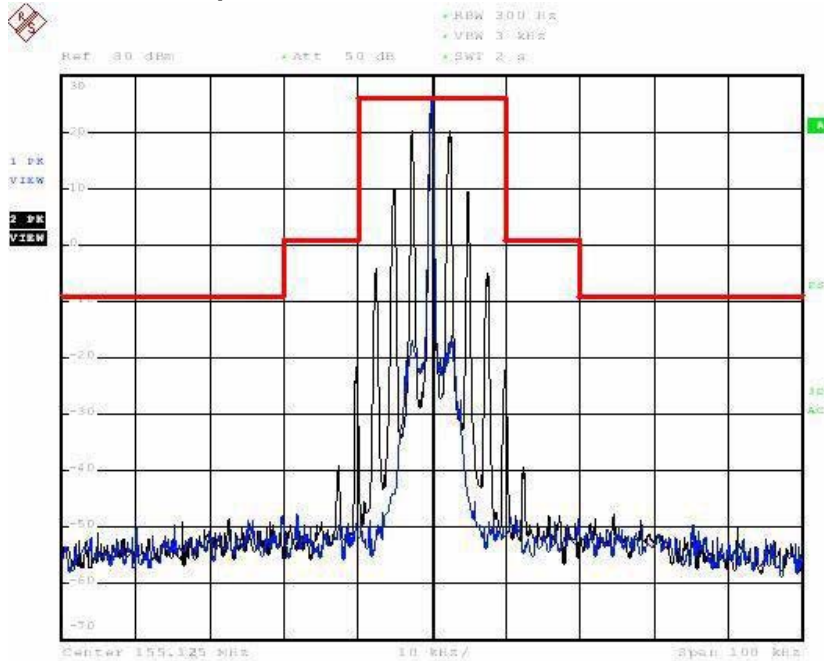
For 25 KHz:

Occupied Bandwidth of Top Channel



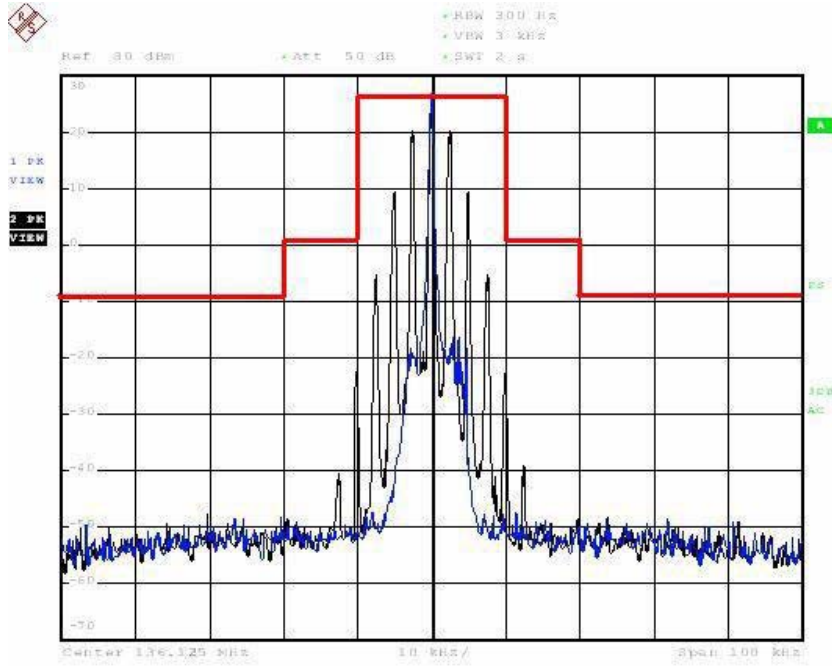
25 kHz Channel Spacing, 174MHz, 2500 Hz Audio Modulation Only

Occupied Bandwidth of Middle Channel



25 kHz Channel Spacing, 155 MHz, 2500 Hz Audio Modulation Only

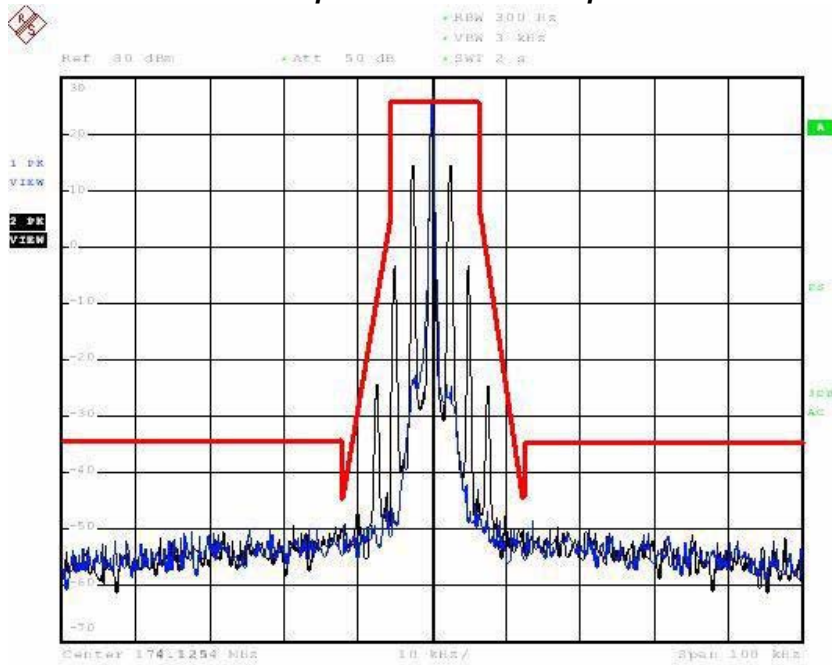
Occupied Bandwidth of Bottom Channel



25 kHz Channel Spacing, 136 MHz, 2500 Hz Audio Modulation Only

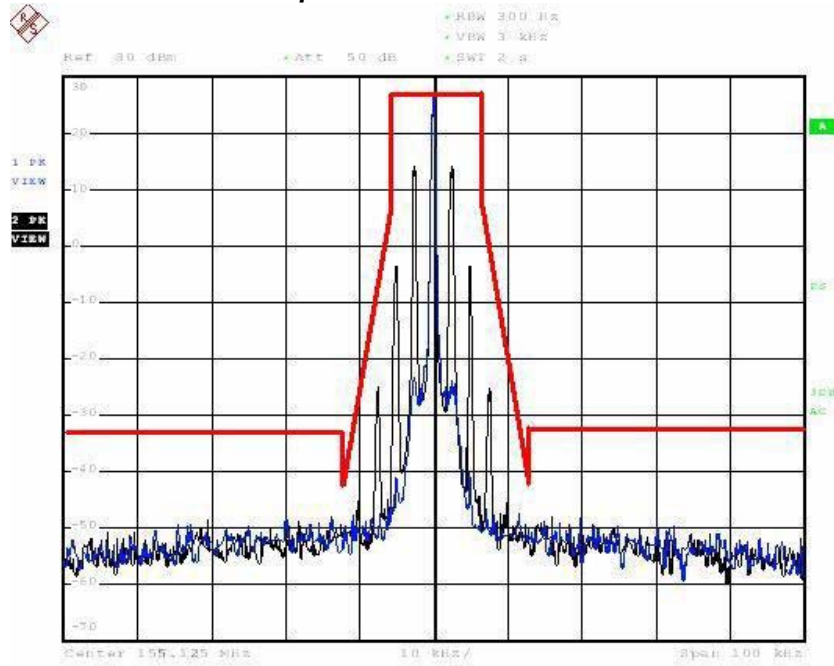
For 12.5 KHz

Occupied Bandwidth of Top Channel



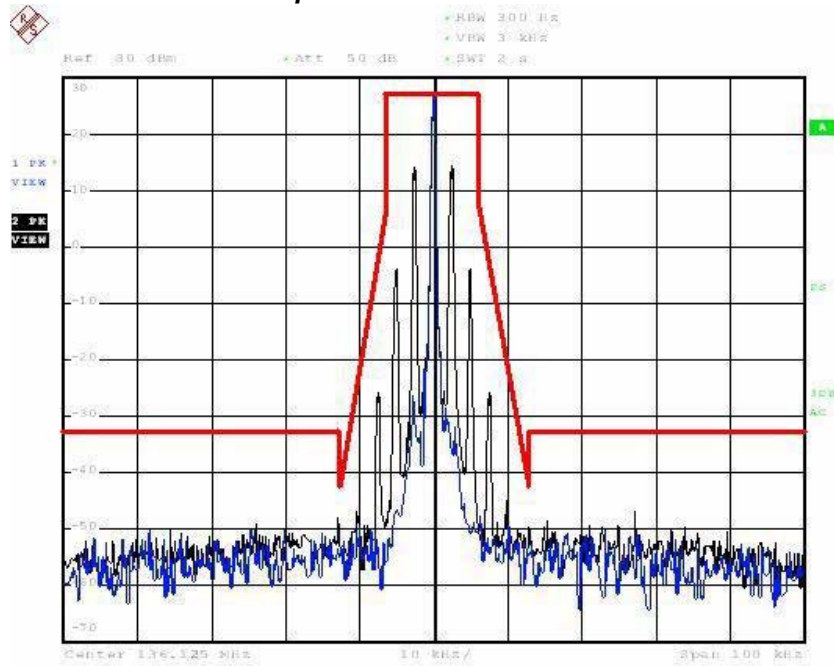
12.5 kHz Channel Spacing, 174 MHz, 2500 Hz Audio Modulation Only

Occupied Bandwidth of Middle Channel



12.5 kHz Channel Spacing, 155 MHz, 2500 Hz Audio Modulation Only

Occupied Bandwidth of Bottom Channel



12.5 kHz Channel Spacing, 136 MHz, 2500 Hz Audio Modulation Only

4.3. Radiated Spurious Emission Test

PROVISIONS APPLICABLE

According to Section 90.210,, the power of each unwanted emission shall be less than Transmitted Power as specified below for transmitters designed to operate with 12.5 KHz channel bandwidth:

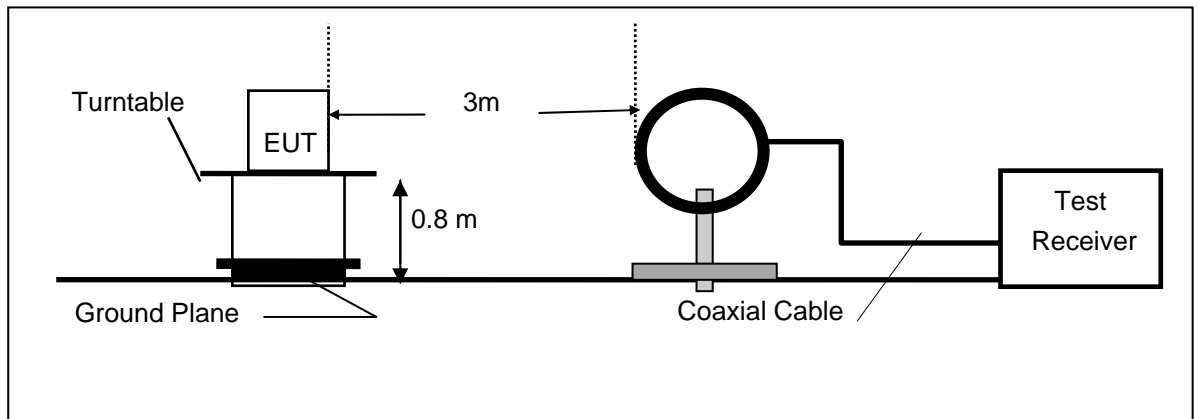
- 1). On any frequency removed from the center of the authorized bandwidth f_0 to 5.625 KHz removed from f_0 : Zero dB
- 2). On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in KHz) f_0 of more than 5.625 KHz but no more than 12.5 KHz: At least 7.27dB
- 3). On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in KHz) f_0 of more than 12.5 KHz: At least $50+10 \log (P)$ dB or 70 dB, which ever is lesser attenuation.

For transmitters designed to transmit with 25 KHz channel separation and equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as following:

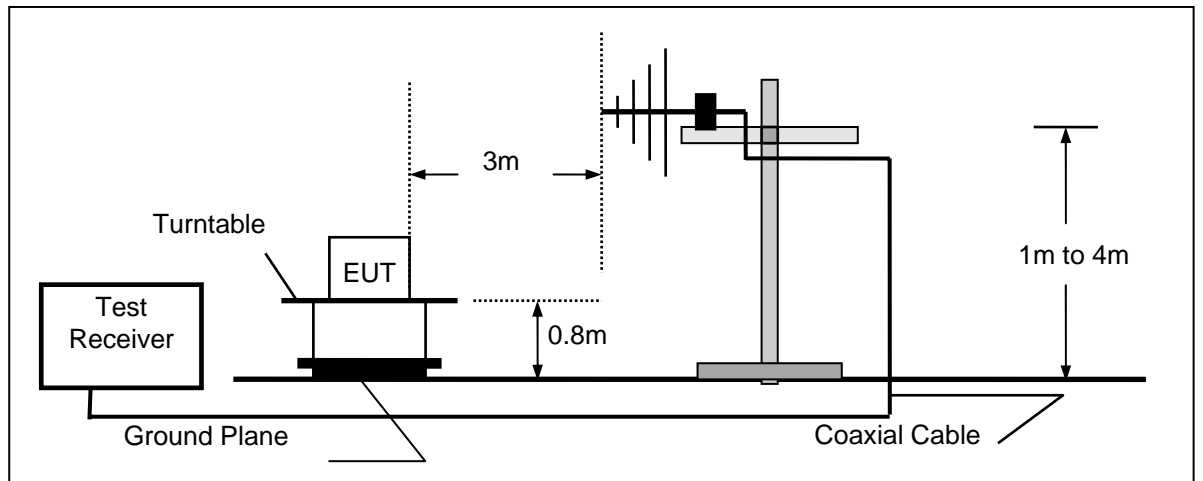
- 1). On any frequency removed from the assigned frequency by more than 50 percent, but no more than 100 percent of the authorized bandwidth: At least 25 dB.
- 2). On any frequency removed from the assigned frequency by more than 100 percent, but no more than 250 percent of the authorized bandwidth: At least 35 dB.
- 3). On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least $43+10\text{Log} (P)$ dB.

TEST CONFIGURATION

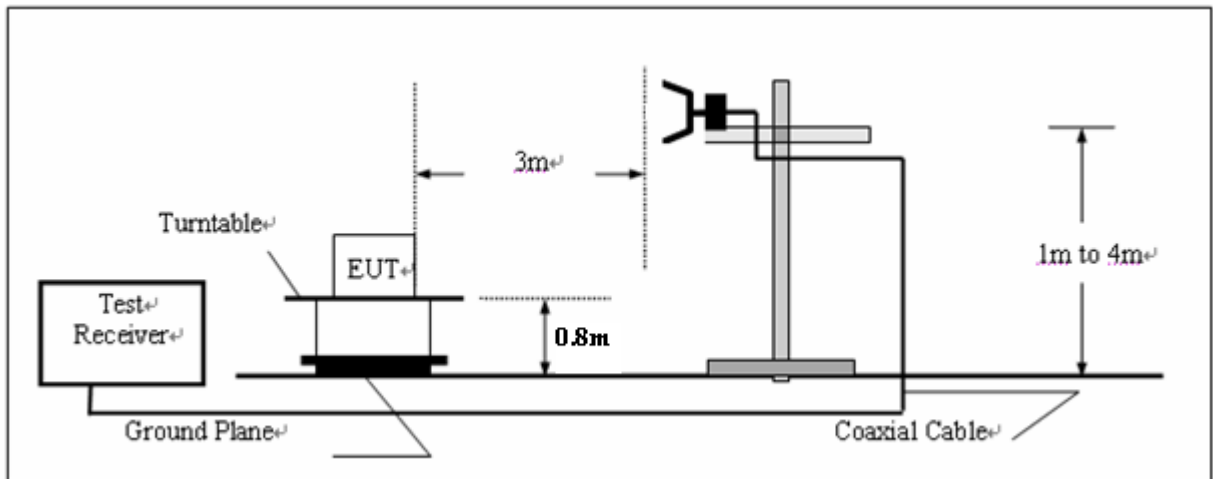
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



(B) Radiated Emission Test Set-Up, Frequency below 1000MHz



(C) Radiated Emission Test Set-Up, Frequency above 1000MHz



TEST PROCEDURE

- 1). On a test site, the EUT shall be placed on a turntable, and in the position closest to the normal use as declared by the user.
- 2). The test antenna shall be oriented initially for vertical polarization located 3m from the EUT to correspond to the transmitter.
- 3). The output of the antenna shall be connected to the measuring receiver and either a peak or quasi-peak detector was used for the measurement as indicated on the report. The detector selection is based on how close the emission level was approaching the limit.
- 4). The transmitter shall be switched on; if possible, without the modulation and the measurement receiver shall be tuned to the frequency of the transmitter under test.
- 5). The test antenna shall be raised and lowered through the specified range of height until the measuring receiver detects a maximum signal level.
- 6). The transmitter shall then be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
- 7). The test antenna shall be raised and lowered again through the specified range of height until the measuring receiver detects a maximum signal level.
- 8). The maximum signal level detected by the measuring receiver shall be noted.
- 9). The measurement shall be repeated with the test antenna set to horizontal polarization.
- 10). Replace the antenna with a proper Antenna (substitution antenna).
- 11). The substitution antenna shall be oriented for vertical polarization and, if necessary, the length of the substitution antenna shall be adjusted to correspond to the frequency of transmitting.
- 12). The substitution antenna shall be connected to a calibrated signal generator.
- 13). If necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
- 14). The test antenna shall be raised and lowered through the specified range of the height to ensure that the maximum signal is received.
- 15). The input signal to substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, that is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuation setting of the measuring receiver.

16). The input level to the substitution antenna shall be recorded as power level in dBm, corrected for any change of input attenuator setting of the measuring receiver.

17). The measurement shall be repeated with the test antenna and the substitution antenna oriented for horizontal polarization

TEST RESULTS

FCC Part 22.359, 74.462, 80.211 and 90.210 (25 kHz bandwidth only):

On any frequency removed from the center of the assigned channel by more than 250 percent at least:

Low: $43 + 10 \log (P_{\text{watts}}) = 43 + 10 \log (3.945) = 48.96 \text{ dB}$

High: $43 + 10 \log (P_{\text{watts}}) = 43 + 10 \log (4.808) = 49.82 \text{ dB}$

FCC Part 90.210 (12.5 kHz Bandwidth only):

On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f d in kHz) of more than 12.5 kHz at least:

Low: $50 + 10 \log (P_{\text{watts}}) = 50 + 10 \log (4.046) = 56.07 \text{ dB}$

High: $50 + 10 \log (P_{\text{watts}}) = 50 + 10 \log (4.955) = 56.95 \text{ dB}$

Note: In general, the worse case attenuation requirement shown above was applied.

For 25 KHz

Calculation: $\text{Limit (dBm)} = \text{EL} - 43 - 10 \log_{10} (\text{TP})$

Notes: EL is the emission level of the Output Power expressed in dBm,

In this application, the EL is 36.82 dBm.

$\text{Limit (dBm)} = 36.82 - 43 - 10 \log_{10} (4.808) = -13 \text{ dBm}$

The Bottom Channel

Frequency (MHz)	Reading level (dBm)	Antenna Polarization	Transd (dB)	Emission level (dBm)	Limit (dBm)	Margin (dB)
272.25	***	H	13.7	--	-13	
***	--	H			-13	
272.25	***	V	13.7	--	-13	
***	--	V			-13	

The Middle Channel

Frequency (MHz)	Reading level (dBm)	Antenna Polarization	Transd (dB)	Emission level (dBm)	Limit (dBm)	Margin (dB)
310.50	***	H	15.3	--	-13	
***	--	H			-13	
310.50	***	V	15.3	--	-13	
***	--	V			-13	

The Top Channel

Frequency (MHz)	Reading level (dBm)	Antenna Polarization	Transd (dB)	Emission level (dBm)	Limit (dBm)	Margin (dB)
348.50	***	H	17.1	--	-13	
***	--	H			-13	
348.50	***	V	17.1	--	-13	
***	--	V			-13	

***Note:**

*** means that the emission level is too low to be measured or at least 20 dB down than the limit.

For 12.5 KHz

Calculation: Limit (dBm) =EL-50-10log10 (TP)

Notes: EL is the emission level of the Output Power expressed in dBm,
In this application, the EL is 36.95dBm.

Limit (dBm) =36.95-50-10log10 (4.955) = -20 dBm

The Bottom Channel

Frequency (MHz)	Reading level (dBm)	Antenna Polarization	Transd (dB)	Emission level (dBm)	Limit (dBm)	Margin (dB)
272.25	***	H	13.7	--	-20	
***	--	H			-20	
272.25	***	V	13.7	--	-20	
***	--	V			-20	

The Middle Channel

Frequency (MHz)	Reading level (dBm)	Antenna Polarization	Transd (dB)	Emission level (dBm)	Limit (dBm)	Margin (dB)
310.50	***	H	15.3	--	-20	
***	--	H			-20	
310.50	***	V	15.3	--	-20	
***	--	V			-20	

The Top Channel

Frequency (MHz)	Reading level (dBm)	Antenna Polarization	Transd (dB)	Emission level (dBm)	Limit (dBm)	Margin (dB)
348.50	***	H	17.1	--	-20	
***	--	H			-20	
348.50	***	V	17.1	--	-20	
***	--	V			-20	

***Note:**

*** means that the emission level is too low to be measured or at least 20 dB down than the limit.

For Receiver Spurious radiation

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

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

Frequency (MHz)	Reading level (dBm)	Antenna Polarization	Transd (dB)	Emission level (dBm)	Limit (dBm)	Margin (dB)
Below 1GHz	--	V				At least 20 dB down than the limit
Above 1GHz	--	V				
Below 1GHz	--	H				
Above 1GHz	--	H				

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

Frequency (MHz)	Reading level (dBm)	Antenna Polarization	Transd (dB)	Emission level (dBm)	Limit (dBm)	Margin (dB)
Below 1GHz	--	V				At least 20 dB down than the limit
Above 1GHz	--	V				
Below 1GHz	--	H				
Above 1GHz	--	H				

Remark:

- (1) Corrected Power (dBm) = SG O/P-Cable + Ant Gain
- (2) Measuring frequencies from 30 MHz to the 2GHz.
- (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.

4.4. SPURIOUS EMISSION ON ANTENNA PORT

PROVISIONS APPLICABLE

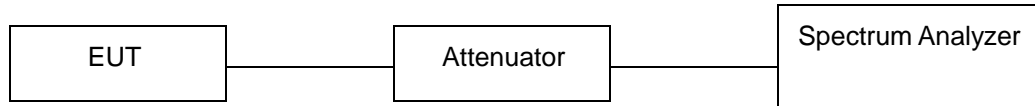
The same as Section 6.1.

MEASUREMENT PROCEDURE

The RF output of the EUT was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set to 100 kHz. Sufficient scans were taken to show any out of band emission up to 10th. Harmonic for the lower and the highest frequency range. RBW 100 kHz, VBW 300 kHz,

The audio input was set to 0 to get the unmodulated carrier, the resulting picture is print out for each channel separation.

TEST SETUP BLOCK DIAGRAM



The EUT was directly connected to a RF Communication Test Set by a 20 dB attenuator

TEST RESULTS:

FCC Part 22.359, 74.462, 80.211, 90.210 and RSS Gen, RSS 119 Issue 8 section 5.8.1 (25 kHz bandwidth only):

On any frequency removed from the center of the assigned channel by more than 250 percent at least:

Low: $43 + 10 \log (\text{Pwatts}) = 43 + 10 \log (3.945) = 48.96 \text{ dB}$

High: $43 + 10 \log (\text{Pwatts}) = 43 + 10 \log (4.808) = 49.82 \text{ dB}$

FCC Part 90.210 (12.5 kHz Bandwidth only):

On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 12.5 kHz at least:

Low: $50 + 10 \log (\text{Pwatts}) = 50 + 10 \log (4.046) = 56.07 \text{ dB}$

High: $50 + 10 \log (\text{Pwatts}) = 50 + 10 \log (4.955) = 56.95 \text{ dB}$

Note: In general, the worse case attenuation requirement shown above was applied.

For 12.5 KHz

Product : RF Link Module

Test Mode: 174 MHz

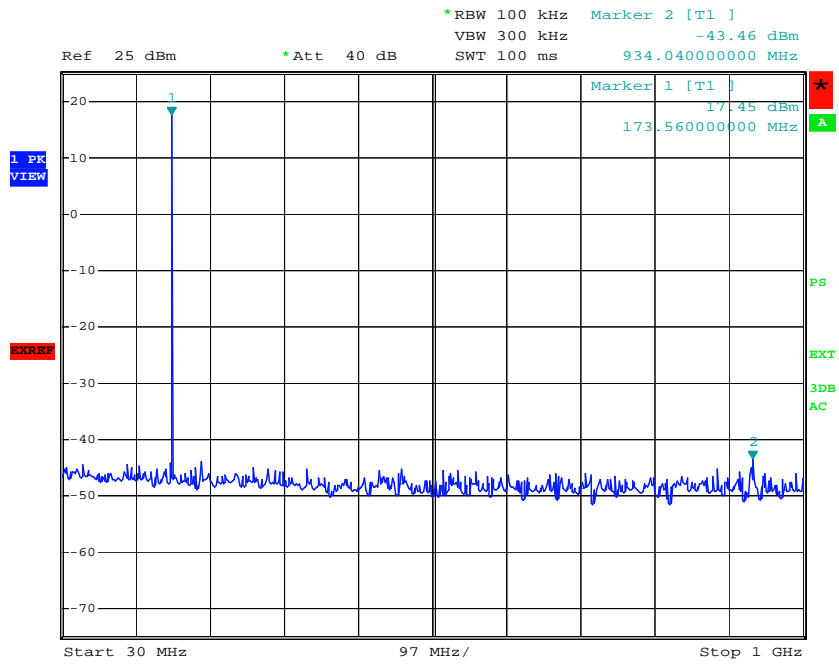
Test Item : Spurious Emission on Antenna Port

Temperatu: 25 °C

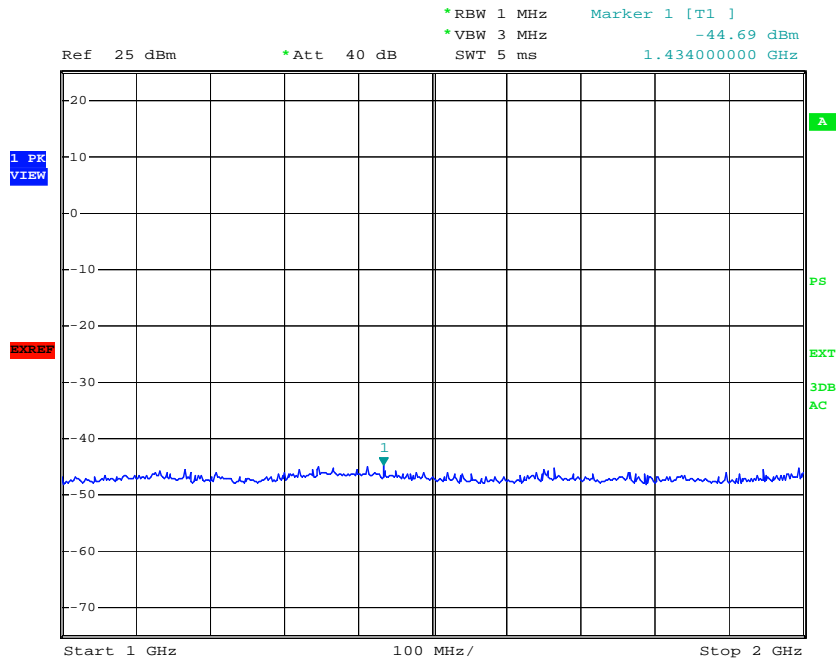
Test Voltaç: DC 12.5V (External Power Supply)

Humidity : 56%RH

Test Resul: **PASS**



Date: 11.MAR.2009 20:29:14



Date: 11.MAR.2009 20:31:17

Product : RF Link Module

Test Mode : 155 MHz

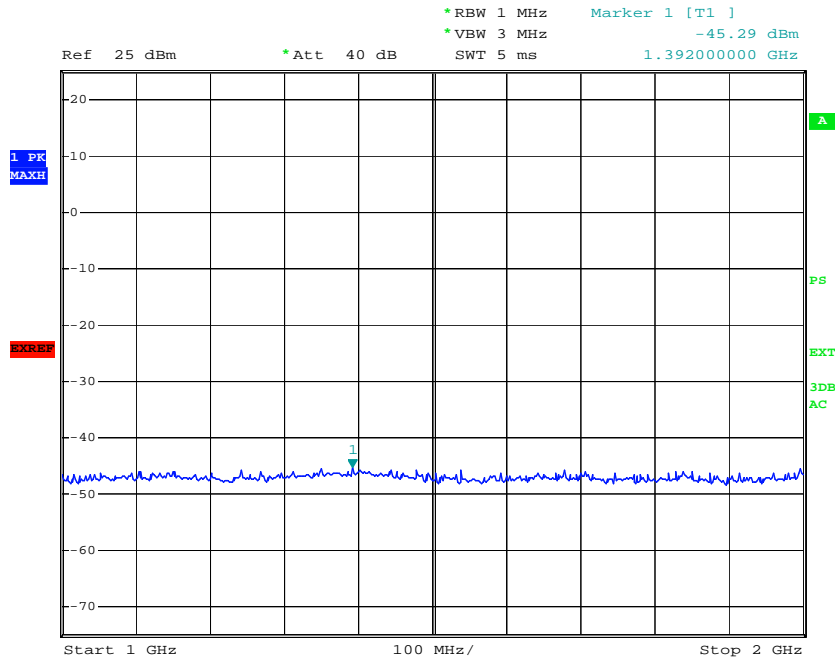
Test Item : Spurious Emission on Antenna Port

Temperatu: 25 °C

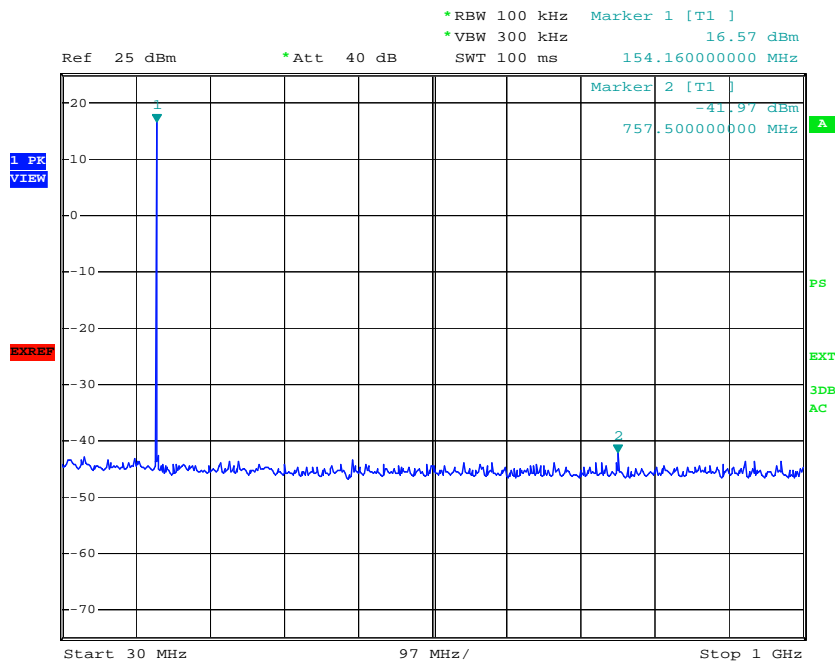
Test Voltaç: DC 12.5V (External Power Supply)

Humidity : 56%RH

Test Resul: **PASS**



Date: 11.MAR.2009 20:31:48



Date: 11.MAR.2009 20:32:44

Product : RF Link Module

Test Mode : 136 MHz

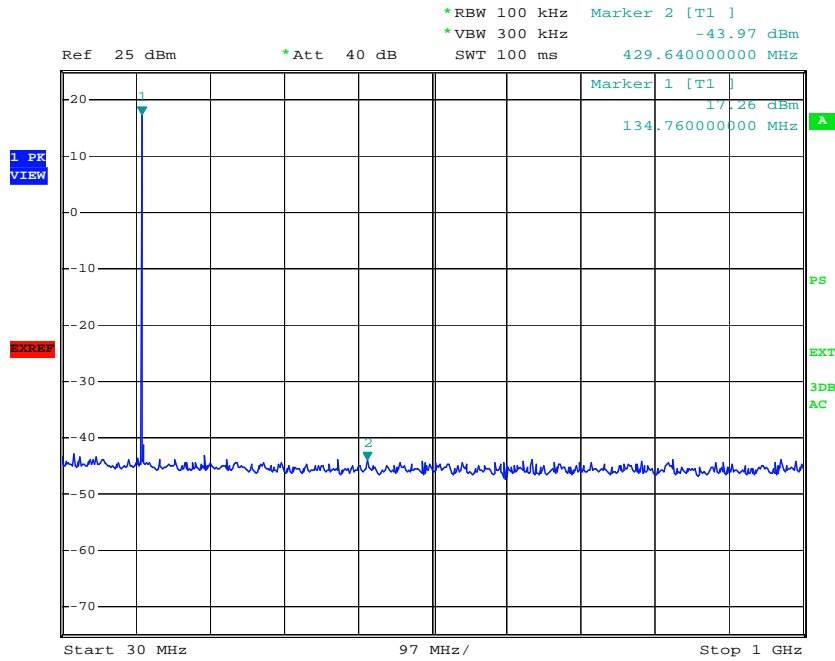
Test Item : Spurious Emission on Antenna Port

Temperatu: 25 °C

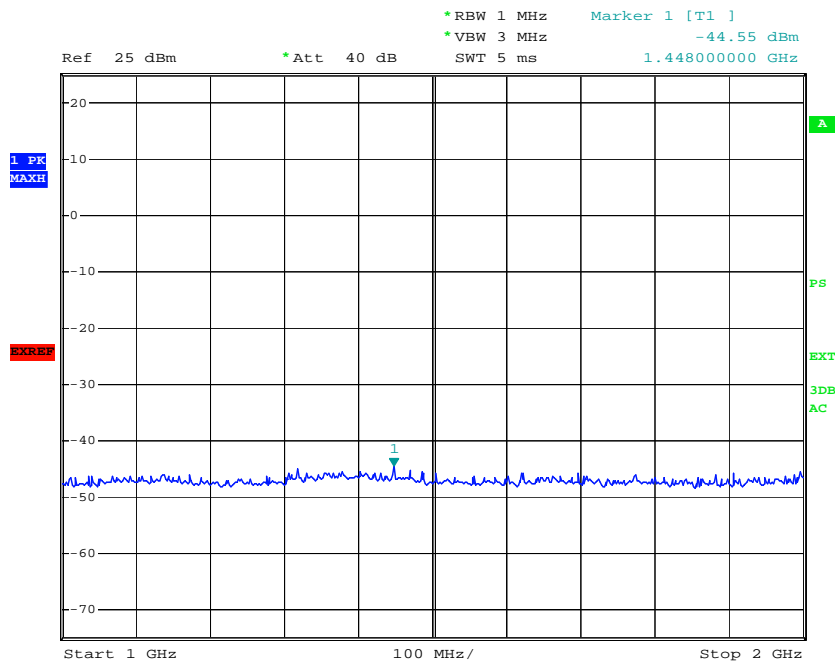
Test Voltaç: DC 12.5V (External Power Supply)

Humidity : 56%RH

Test Resul: **PASS**



Date: 11.MAR.2009 20:33:25



Date: 11.MAR.2009 20:33:55

For 25 KHz

Product : RF Link Module

Test Mode: 136 MHz

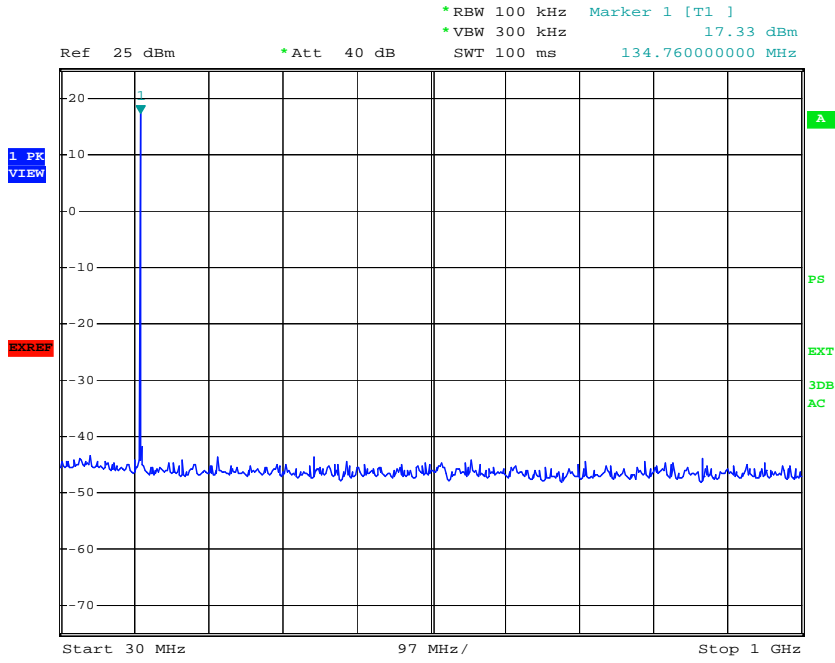
Test Item : Spurious Emission on Antenna Port

Temperatu: 25 °C

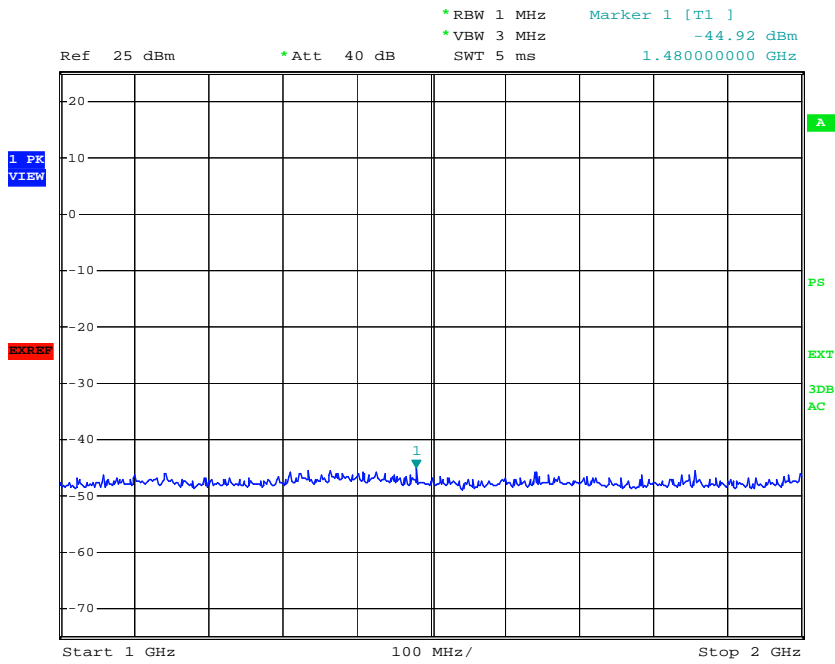
Test Voltaç: DC 12.5V (External Power Supply)

Humidity : 56%RH

Test Resul: **PASS**



Date: 11.MAR.2009 20:48:30



Date: 11.MAR.2009 20:49:05

Product : RF Link Module

Test Mode: 155 MHz

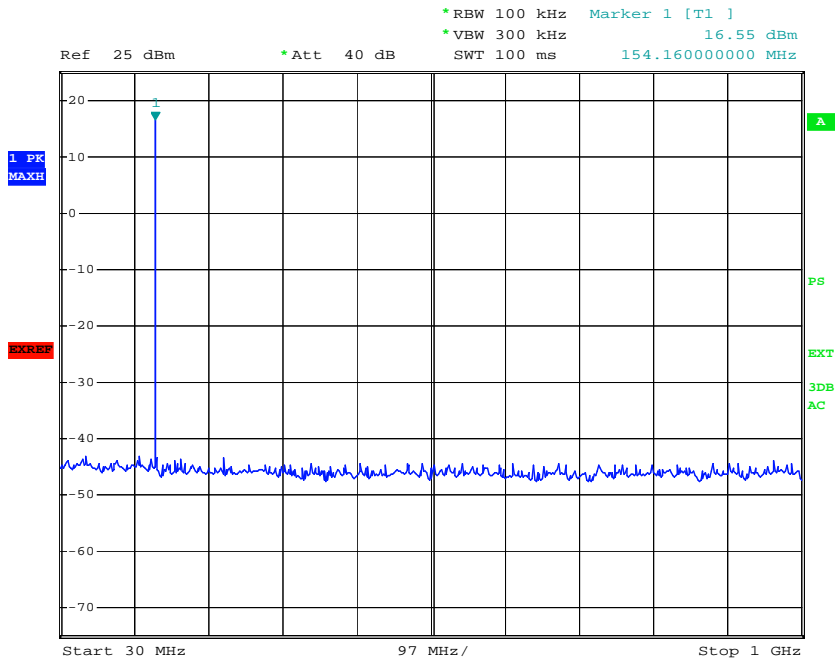
Test Item : Spurious Emission on Antenna Port

Temperatu: 25 °C

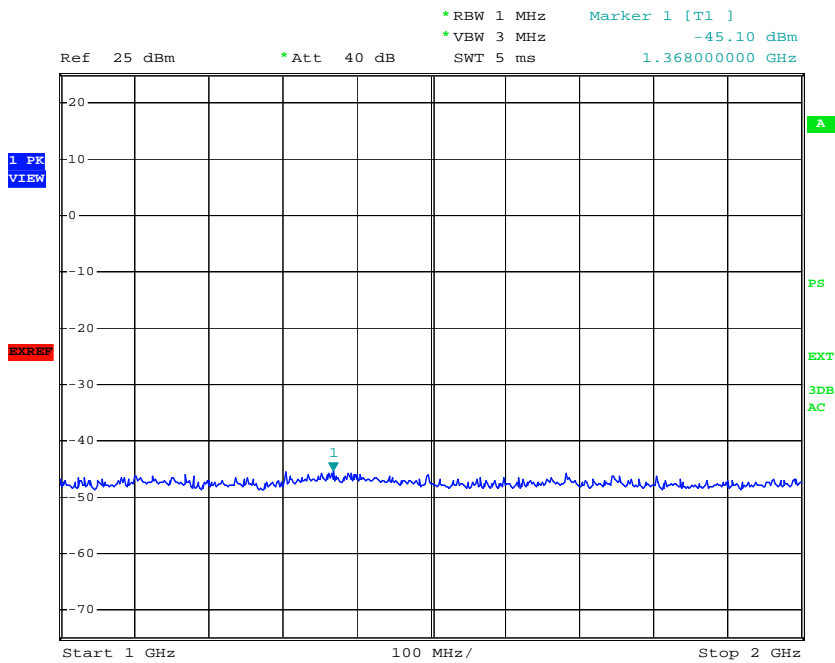
Test Voltaç: DC 12.5V (External Power Supply)

Humidity : 56%RH

Test Resul: **PASS**



Date: 11.MAR.2009 20:50:27



Date: 11.MAR.2009 20:49:37

Product : RF Link Module

Test Mode: 174 MHz

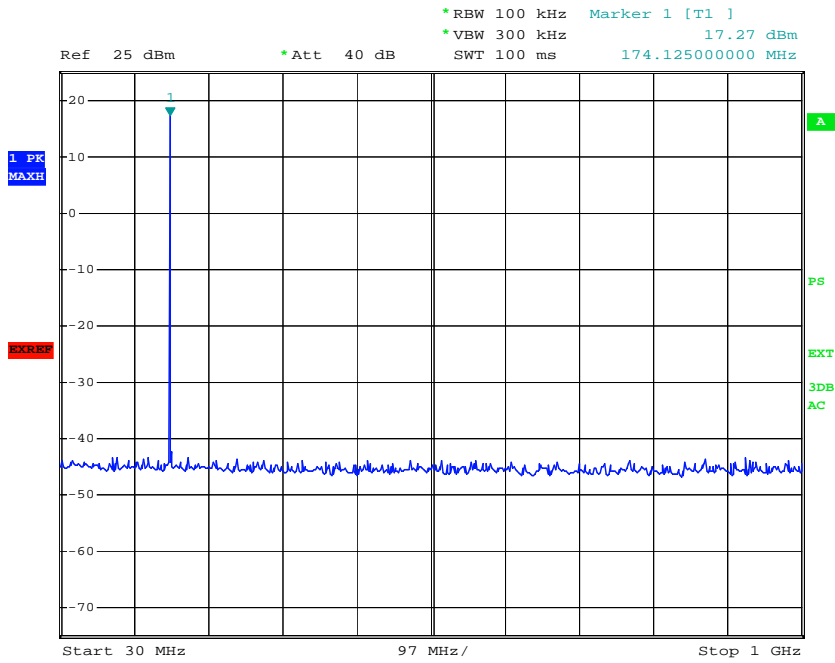
Test Item : Spurious Emission on Antenna Port

Temperatu: 25 °C

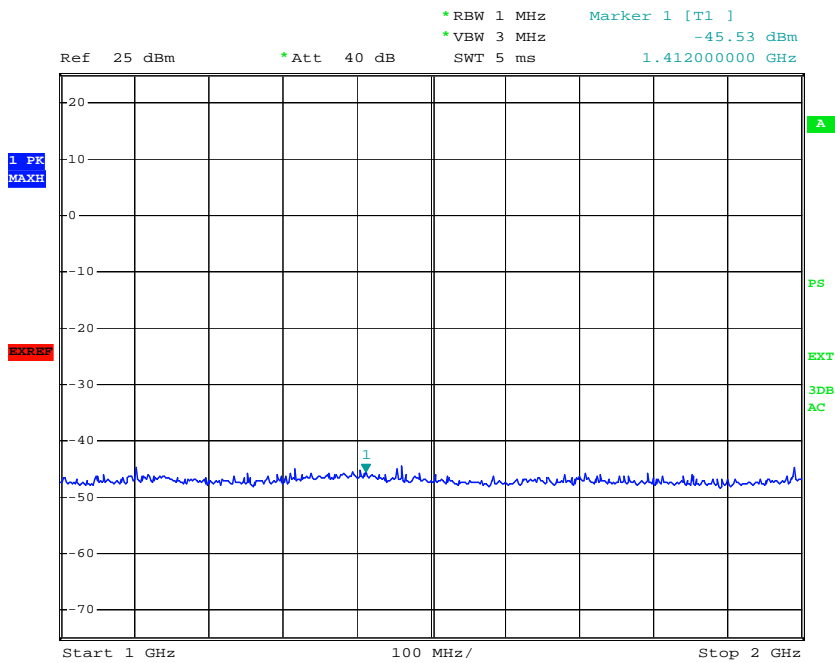
Test Voltaç: DC 12.5V (External Power Supply)

Humidity : 56%RH

Test Resul: **PASS**



Date: 11.MAR.2009 20:52:22



Date: 11.MAR.2009 20:53:06

4.5. MODULATION CHARACTERISTICS

PROVISIONS APPLICABLE

According to CFR47 section 2.1047(a), for Voice Modulation Communication Equipment, the frequency response of the audio modulation circuit over a range of 100 to 5000Hz shall be measured.

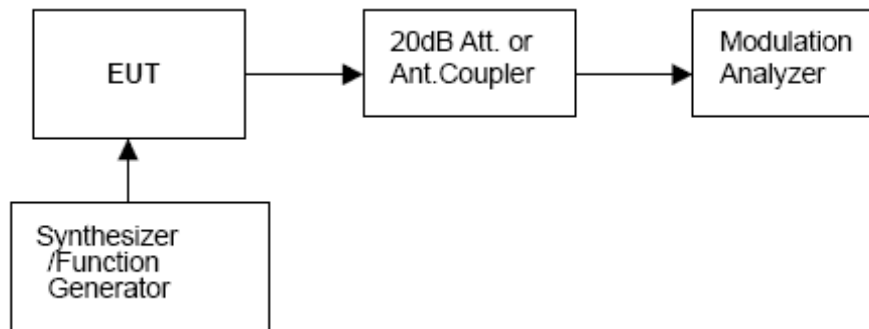
MEASUREMENT METHOD

Modulation Limit

- 1). Configure the EUT as shown in figure 1, adjust the audio input for 60% of rated system deviation at 1KHz using this level as a reference (0dB) and vary the input level from -20 to +20dB. Record the frequency deviation obtained as a function of the input level.
- 2). Repeat step 1 with input frequency changing to 300, 1004, and 2500Hz in sequence.

Audio Frequency Response

- 1). Configure the EUT as shown in figure 1.
- 2). Adjust the audio input for 20% of rated system deviation at 1 KHz using this level as a reference (0dB).
- 3). Vary the Audio frequency from 100 Hz to 10 KHz and record the frequency deviation.
- 4) Audio Frequency Response = $20 \log_{10} (\text{Deviation of test frequency} / \text{Deviation of 1 KHz reference})$.

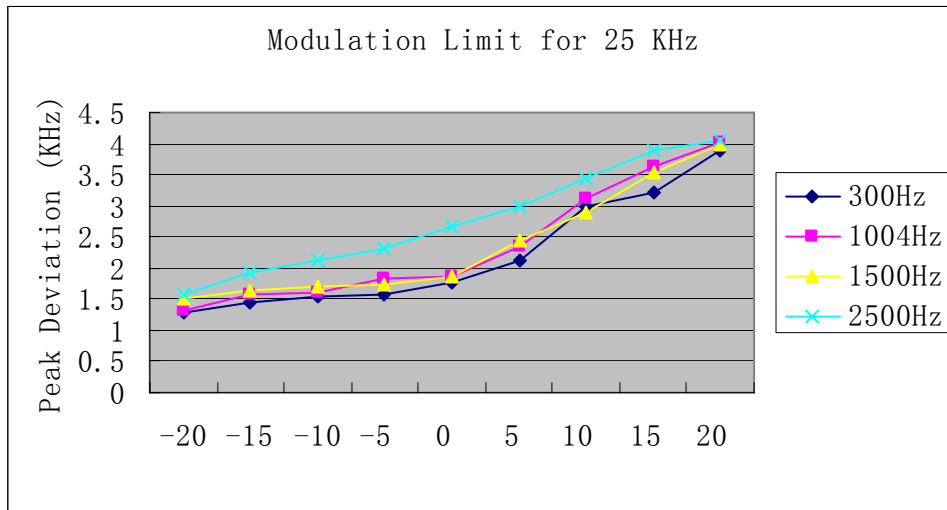


TEST RESULTS:

a). Modulation Limit:

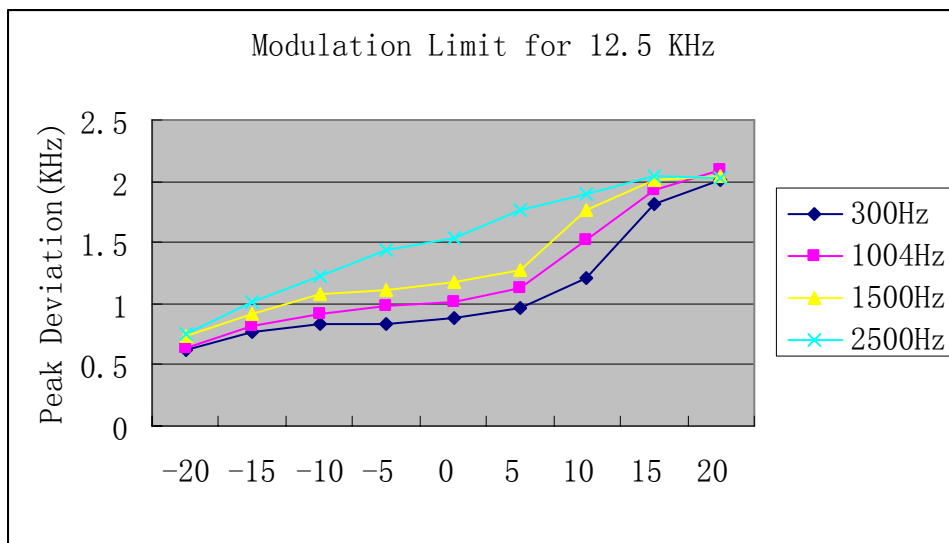
25 KHz Channel Separation

Modulation Level (dB)	Peak Freq. Deviation At 300 Hz (KHz)	Peak Freq. Deviation At 1004 Hz (KHz)	Peak Freq. Deviation At 1500 Hz (KHz)	Peak Freq. Deviation At 2500 Hz (KHz)
-20	1.28	1.31	1.51	1.57
-15	1.45	1.58	1.64	1.94
-10	1.53	1.61	1.71	2.11
-5	1.58	1.82	1.74	2.32
0	1.78	1.85	1.86	2.68
+5	2.12	2.35	2.44	2.99
+10	2.98	3.12	2.89	3.45
+15	3.23	3.64	3.54	3.88
+20	3.88	4.01	3.97	4.05



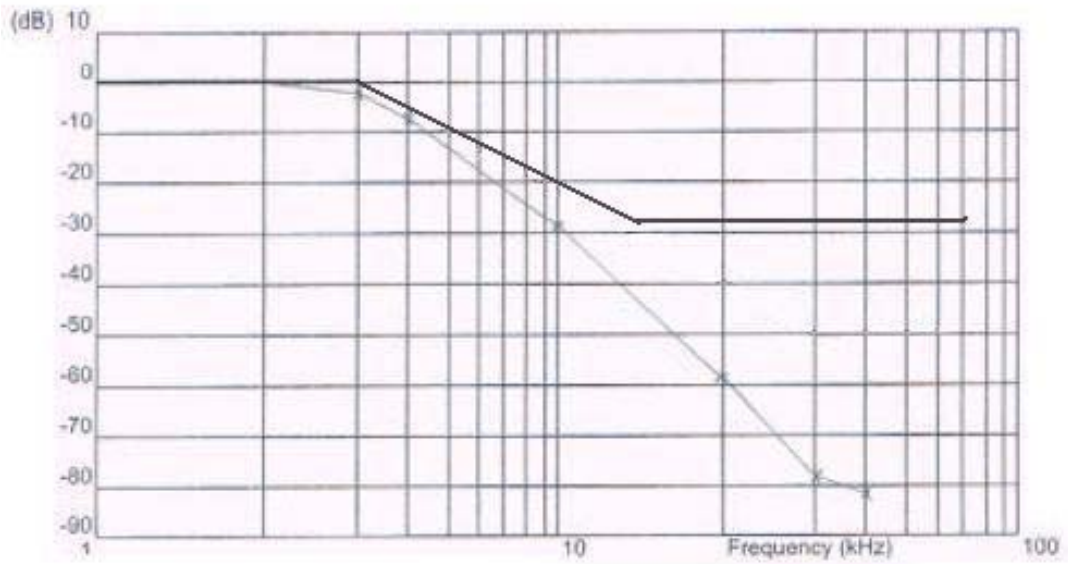
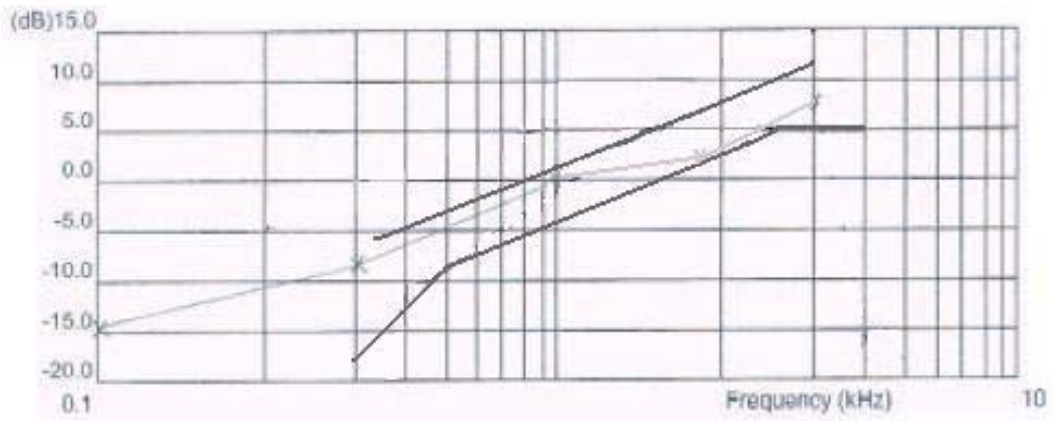
12.5 KHz Channel Separation

Modulation Level (dB)	Peak Freq. Deviation At 300 Hz (KHz)	Peak Freq. Deviation At 1004 Hz (KHz)	Peak Freq. Deviation At 1500 Hz (KHz)	Peak Freq. Deviation At 2500 Hz (KHz)
-20	0.62	0.64	0.73	0.75
-15	0.77	0.81	0.91	1.01
-10	0.83	0.92	1.08	1.22
-5	0.84	0.98	1.11	1.44
0	0.88	1.01	1.17	1.54
+5	0.96	1.12	1.28	1.76
+10	1.21	1.52	1.77	1.89
+15	1.82	1.93	2.01	2.04
+20	2.01	2.09	2.04	2.03



b). Audio Frequency Response:

Note: The Audio Frequency Response is identical for 12.5 KHz and 25 KHz channel separation



4.6. FREQUENCY STABILITY MEASUREMENT

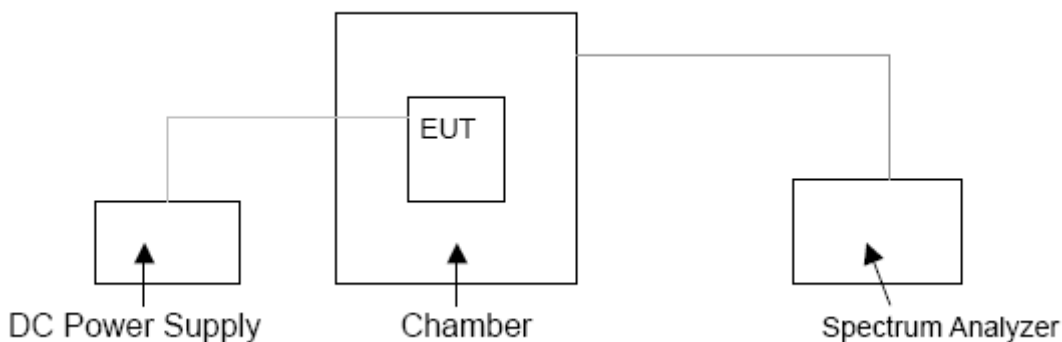
PROVISIONS APPLICABLE

- a). According to FCC Part 2 Section 2.1055 (a)(1), the frequency stability shall be measured with variation of ambient temperature from -30°C to +60°C centigrade.
- b). According to FCC Part 2 Section 2.1055 (a)(2), for battery powered equipment, the frequency stability shall be measured with reducing primary supply voltage to the battery operating end point, which is specified by the manufacture.
- c). According to §90.213, the frequency stability limit is 2.5 ppm for 12.5KHz channel separation and 5 ppm for 25KHz channel separation.

MEASUREMENT PROCEDURE

The EUT was set in the climate chamber and connected to an external DC power supply. The RF output was directly connected to Spectrum Analyzer ESI 26. The coupling loss of the additional cables was recorded and taken in account for all the measurements. After temperature stabilization (approx. 20 min for each stage), the frequency for the lower, the middle and the highest frequency range was recorded. For Frequency stability Vs. Voltage the EUT was connected to an DC power supply and the voltage was adjusted in the required ranges. The result was recorded.

TEST SETUP BLOCK DIAGRAM



TEST RESULTS:

a. Frequency stability versus input voltage (battery operation end point voltage is 8.6 V)

For 25 KHz:

Channel	Reference Frequency (MHz)	Frequency Measured at end point	Frequency Deviation (%)	Limit (%)
01	136.12500	136.12551	0.00038	0.0005
02	155.12500	155.12550	0.00032	0.0005
03	174.12500	174.12548	0.00028	0.0005

For 12.5 KHz:

Channel	Reference Frequency (MHz)	Frequency Measured at end point	Frequency Deviation (%)	Limit (%)
04	136.12500	136.12530	0.00022	0.00025
05	155.12500	155.12531	0.00020	0.00025
06	174.12500	174.12532	0.00018	0.00025

b. Frequency stability versus ambient temperature

For 25 KHz:

The Bottom Channel

Reference Frequency: 136.12500 MHz		Limit: 0.0005%	
Environment Temperature (°C)	Power Supply (DC)	Frequency deviation measured with time Elapse (10 minutes)	
		(MHz)	%
50	12.5 V	136.12540	0.00029
40	12.5 V	136.12528	0.00021
30	12.5 V	136.12520	0.00015
20	12.5 V	136.12500	0.00000
10	12.5 V	136.12520	0.00015
0	12.5 V	136.12530	0.00022
-10	12.5 V	136.12540	0.00029
-20	12.5 V	136.12547	0.00025
-30	12.5 V	136.12547	0.00035

The Middle Channel

Reference Frequency: 155.12500 MHz		Limit: 0.0005%	
Environment Temperature (°C)	Power Supply (DC)	Frequency deviation measured with time Elapse (10 minutes)	
		(MHz)	%
50	12.5 V	155.12540	0.00026
40	12.5 V	155.12525	0.00016
30	12.5 V	155.12515	0.00010
20	12.5 V	155.12500	0.00000
10	12.5 V	155.12510	0.00006
0	12.5 V	155.12520	0.00013
-10	12.5 V	155.12531	0.00020
-20	12.5 V	155.12543	0.00028
-30	12.5 V	155.12543	0.00028

The Top Channel

Reference Frequency: 174.12500 MHz		Limit: 0.0005%	
Environment Temperature (°C)	Power Supply (DC)	Frequency deviation measured with time	
		Elapse (10 minutes)	
		(MHz)	%
50	12.5 V	174.12536	0.00021
40	12.5 V	174.12525	0.00014
30	12.5 V	174.12517	0.00010
20	12.5 V	174.12500	0.00000
10	12.5 V	174.12510	0.00006
0	12.5 V	174.12520	0.00012
-10	12.5 V	174.12530	0.00017
-20	12.5 V	174.12530	0.00017
-30	12.5 V	174.12540	0.00023

For 12.5 KHz:

The Bottom Channel

Reference Frequency:136.12500 MHz		Limit: 0.00025%	
Environment Temperature (°C)	Power Supply (DC)	Frequency deviation measured with time	
		Elapse (10 minutes)	
		(MHz)	%
50	12.5 V	136.12525	0.00018
40	12.5 V	136.12522	0.00016
30	12.5 V	136.12520	0.00015
20	12.5 V	136.12500	0.00000
10	12.5 V	136.12510	0.00007
0	12.5 V	136.12515	0.00011
-10	12.5 V	136.12520	0.00015
-20	12.5 V	136.12525	0.00018
-30	12.5 V	136.12528	0.00021

The Middle Channel

Reference Frequency: 155.12500 MHz		Limit: 0.00025%	
Environment Temperature (°C)	Power Supply (DC)	Frequency deviation measured with time	
		Elapse (10 minutes)	
		(MHz)	%
50	12.5 V	155.12523	0.00015
40	12.5 V	155.12521	0.00014
30	12.5 V	155.12520	0.00013
20	12.5 V	155.12500	0.00000
10	12.5 V	155.12511	0.00007
0	12.5 V	155.12512	0.00008
-10	12.5 V	155.12515	0.00010
-20	12.5 V	155.12520	0.00013
-30	12.5 V	155.12525	0.00016

The Top Channel

Reference Frequency: 174.12500 MHz		Limit: 0.00025%	
Environment Temperature (°C)	Power Supply (DC)	Frequency deviation measured with time	
		Elapse (10 minutes)	
		(MHz)	%
50	12.5 V	174.12521	0.00012
40	12.5 V	174.12521	0.00012
30	12.5 V	174.12515	0.00009
20	12.5 V	174.12500	0.00000
10	12.5 V	174.12508	0.00005
0	12.5 V	174.12510	0.00006
-10	12.5 V	174.12514	0.00008
-20	12.5 V	174.12520	0.00012
-30	12.5 V	174.12523	0.00013

4.7. CONDUCTED OUTPUT POWER

PROVISIONS APPLICABLE

Per FCC <<2.1046 and <<90.205: Maximum ERP is dependent upon the station's antenna HAAT and required service area.

TEST PROCEDURE

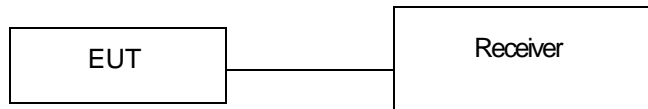
Measurements shall be made to establish the radio frequency power delivered by the transmitter the standard output termination. The power output shall be monitored and recorded and no adjustment shall be made to the transmitter after the test has begun, except as noted below:

If the power output is adjustable, measurements shall be made for the highest and lowest power levels.

The EUT connect to the Receiver through 20 dB attenuator.

Measurement with Spectrum Analyzer ESI 26 conducted, external power supply with 13.6V stabilized supply voltage.

TEST SETUP BLOCK DIAGRAM

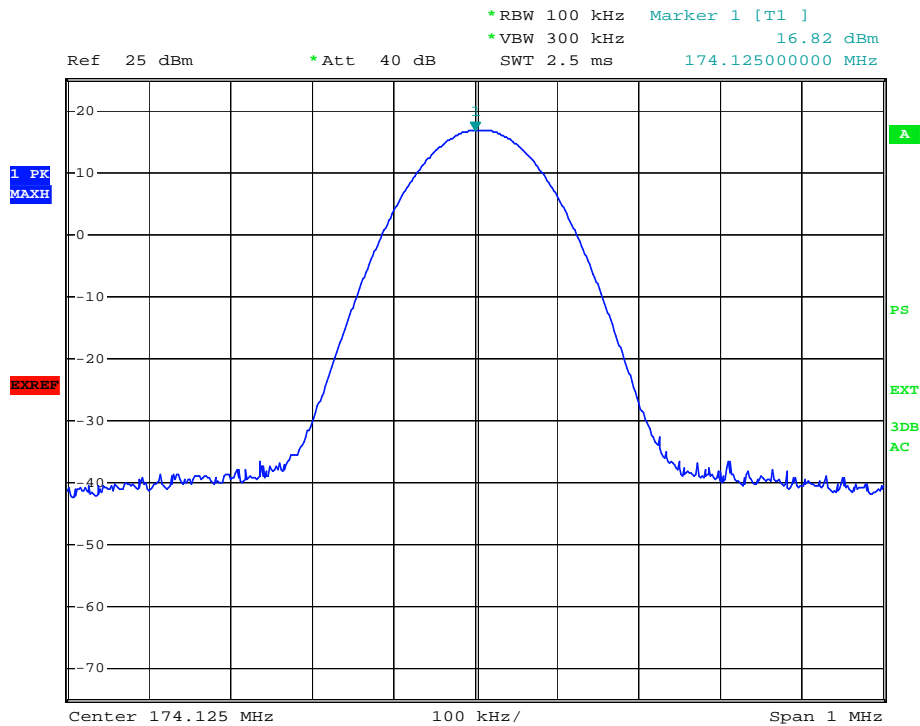


The EUT was directly connected to a RF Communication Test Set by a 20 dB attenuator

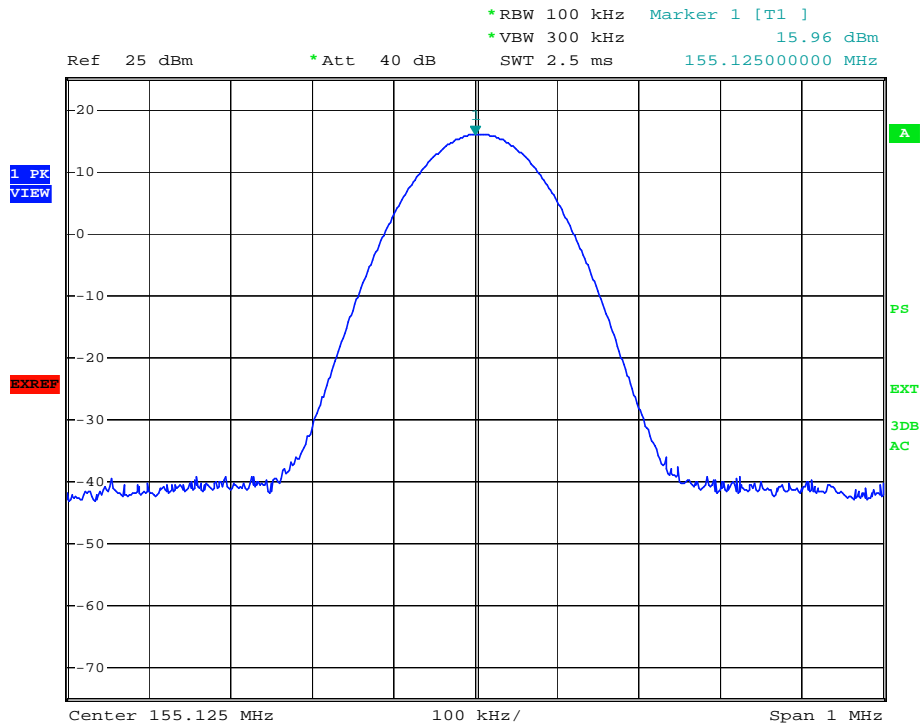
TEST RESULTS:

For 25 KHz

Freq.(MHz)	Measurement (dBm)	FCC Limit
174.125	36.82	Varies

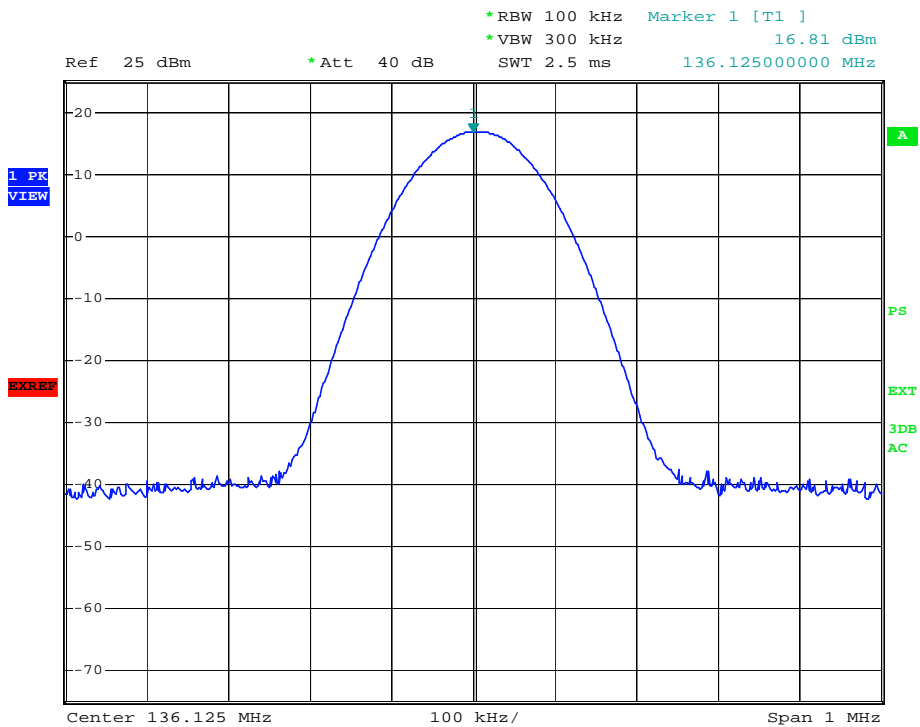


Freq. (MHz)	Measurement (dBm)	FCC Limit
155.125	35.96	Varies



Date: 11.MAR.2009 20:51:24

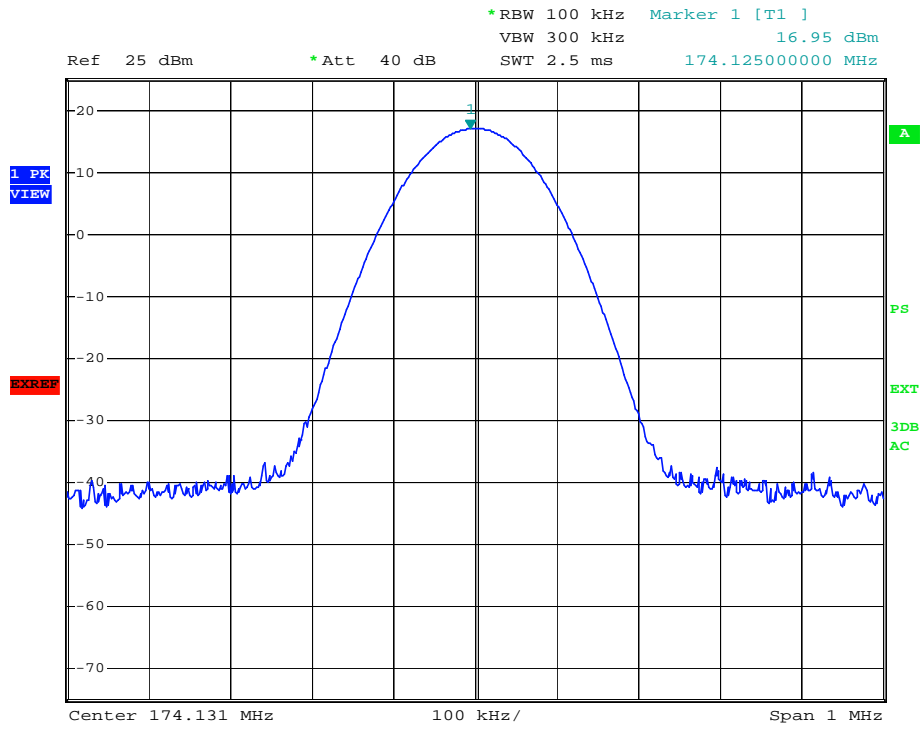
Freq. (MHz)	Measurement (dBm)	FCC Limit
136.125	36.81	Varies



Date: 11.MAR.2009 20:46:37

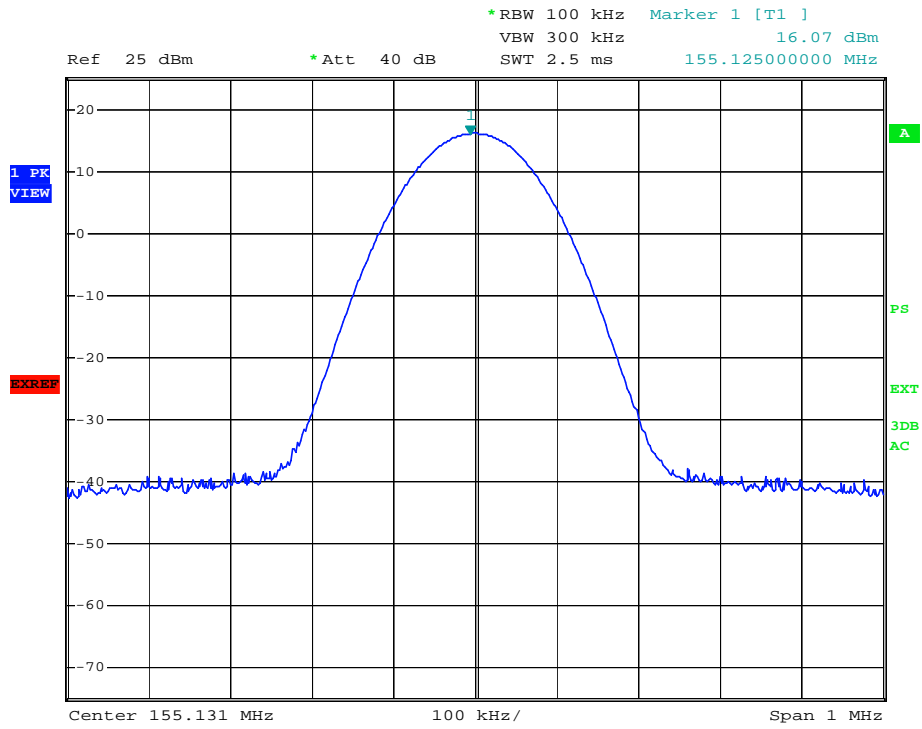
For 12.5 KHz

Freq. (MHz)	Measurement (dBm)	FCC Limit
174.125	36.95	Varies



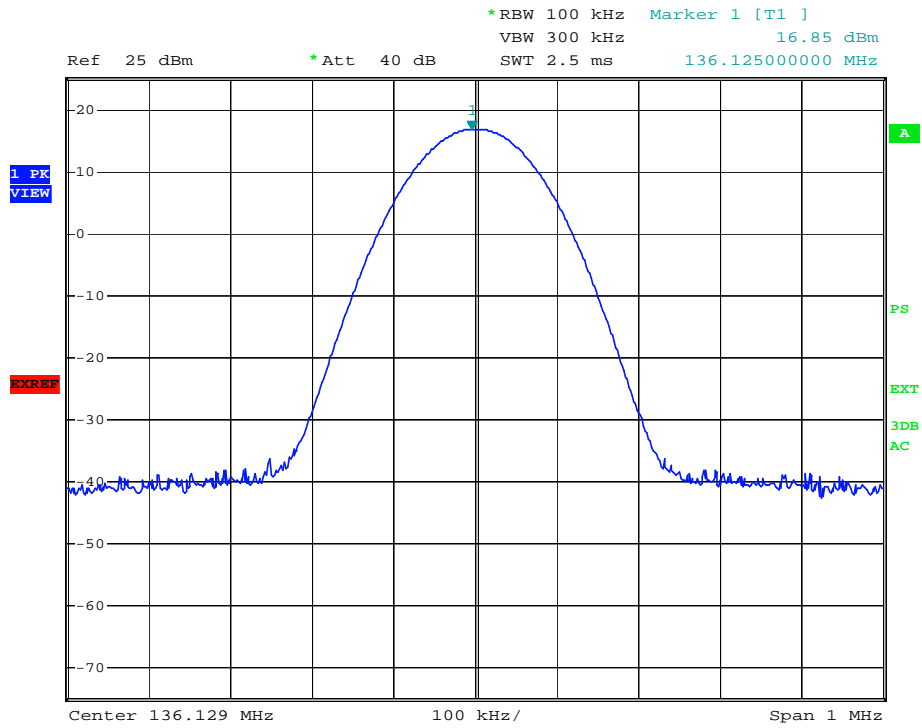
Date: 11.MAR.2009 20:27:21

Freq. (MHz)	Measurement (dBm)	FCC Limit
155.125	36.07	Varies



Date: 11.MAR.2009 20:26:08

Freq. (MHz)	Measurement (dBm)	FCC Limit
136.125	36.85	Varies



Date: 11.MAR.2009 20:24:24

4.8. TRANSMITTER FREQUENCY BEHAVIOR

PROVISIONS APPLICABLE

Section 90.214

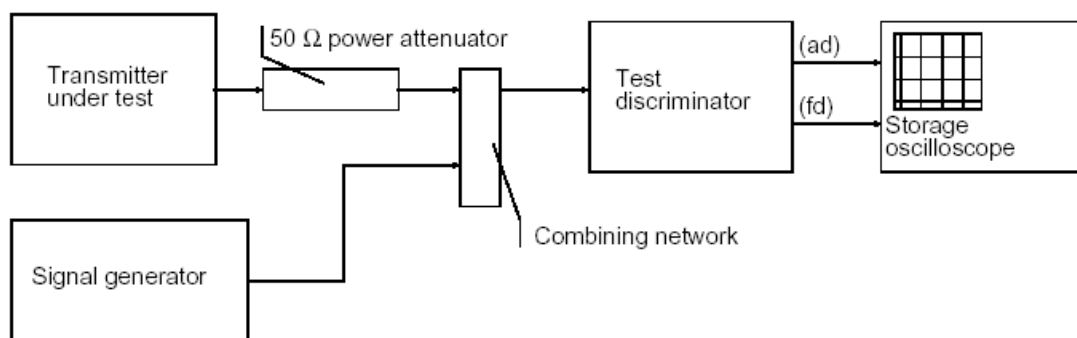
The transient periods are given in following table:

Frequency Range	30 MHz to 300 MHz	Above 300 MHz to 500 MHz	Above 500 MHz to 1000MHz
t ₁ (ms)	5.0	10.0	20.0
t ₂ (ms)	20.0	25.0	50.0
t ₃ (ms)	5.0	10.0	10.0

TEST METHOD

TIA/EIA-603 2.2.19

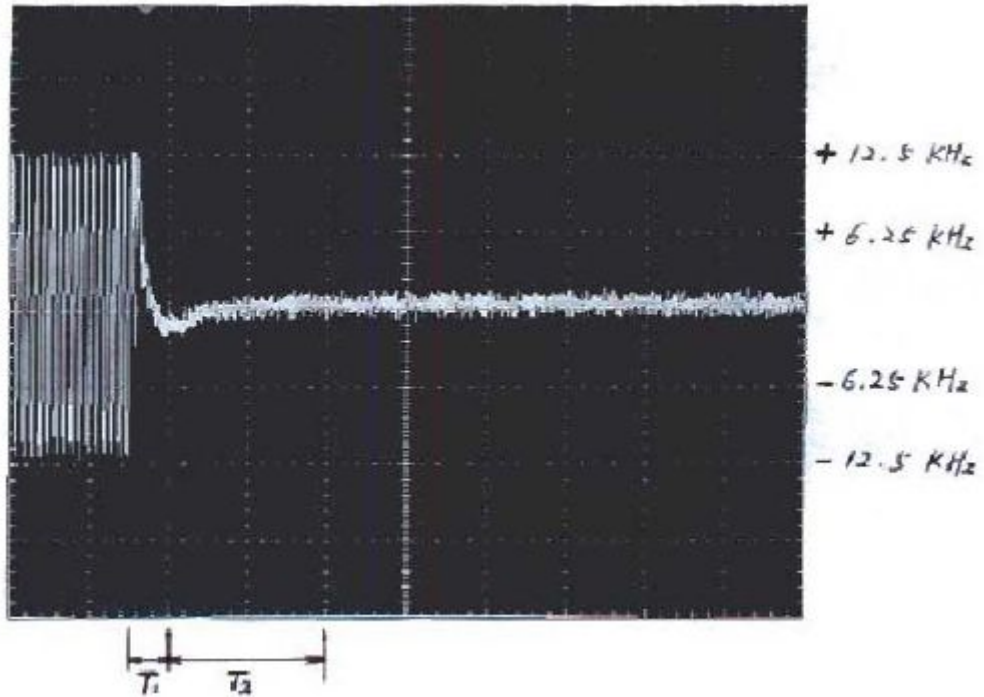
TEST SETUP BLOCK DIAGRAM



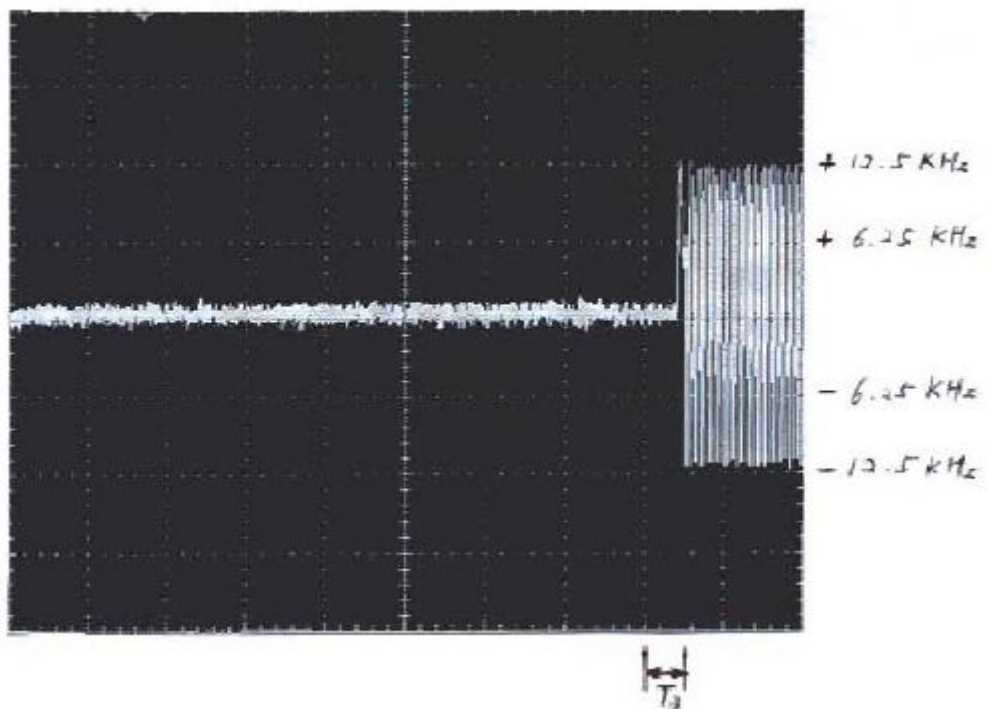
TEST RESULTS:

Please refer to the following plots.

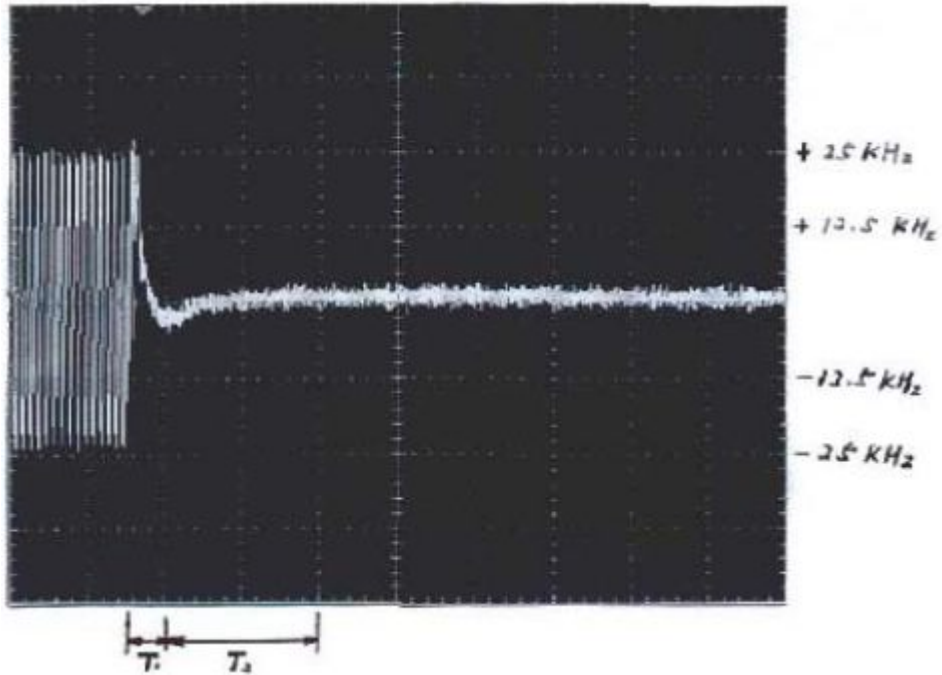
Transmitter Frequency Behaviour @ 12.5 KHz Channel Separation-----Off – On



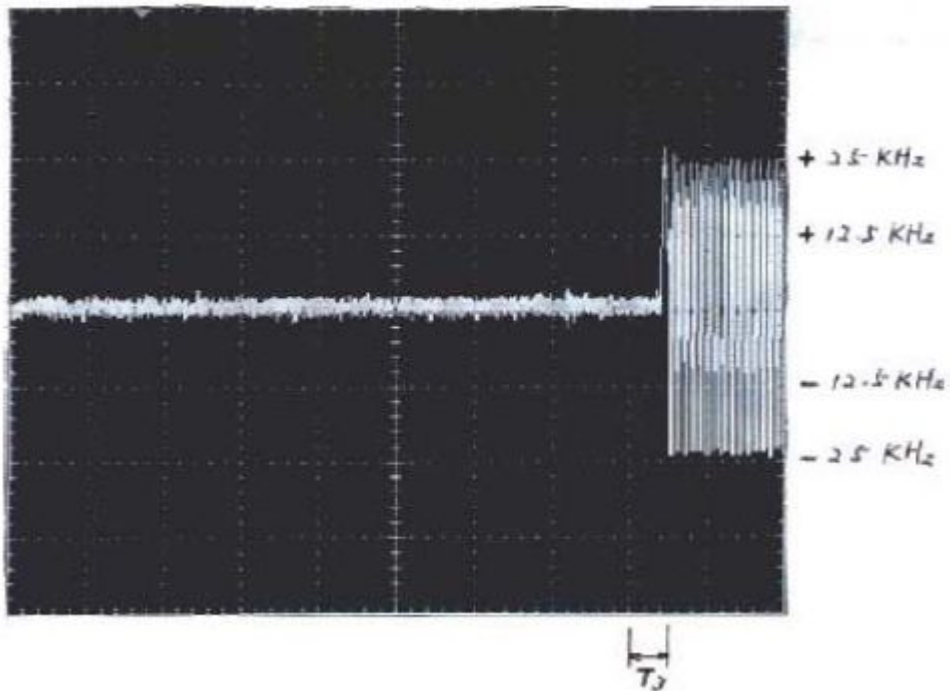
Transmitter Frequency Behaviour @ 12.5 KHz Channel Separation-----On - Off



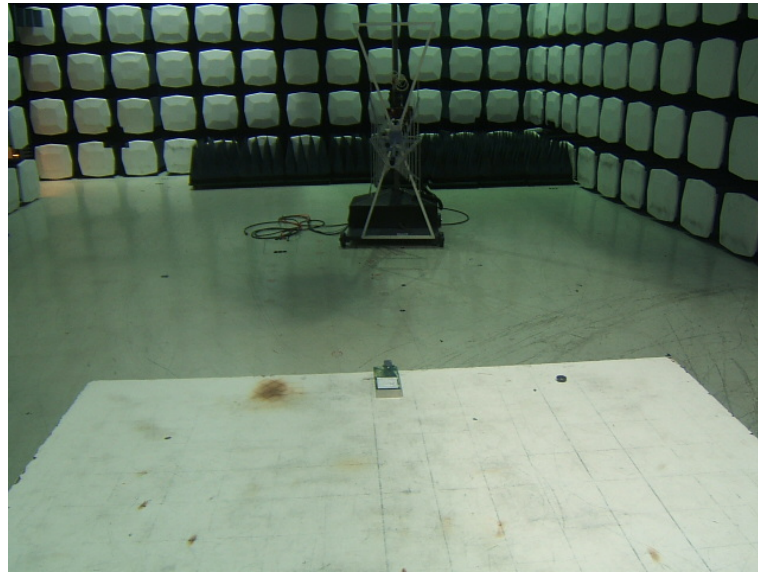
Transmitter Frequency Behaviour @ 25 KHz Channel Separation-----Off – On



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

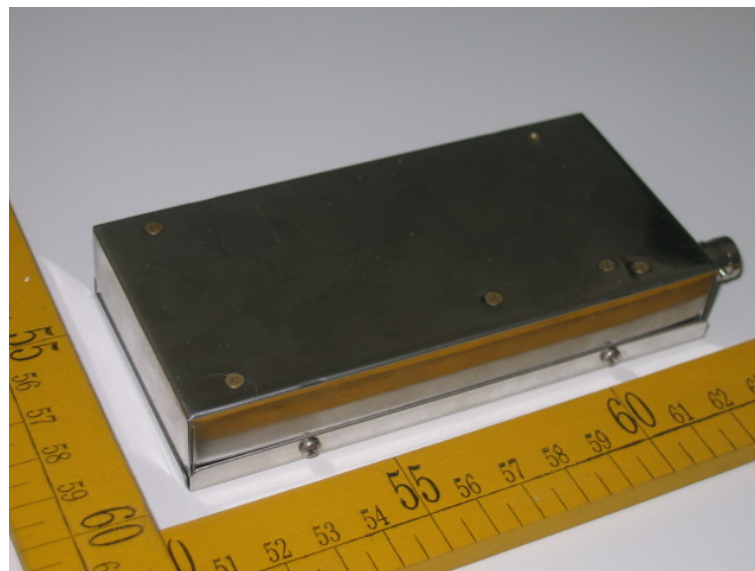
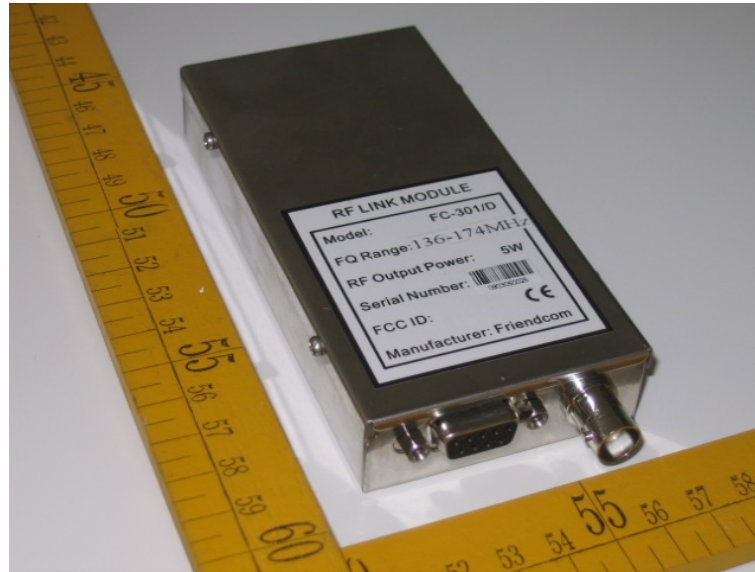


5. Test Setup Photos of the EUT

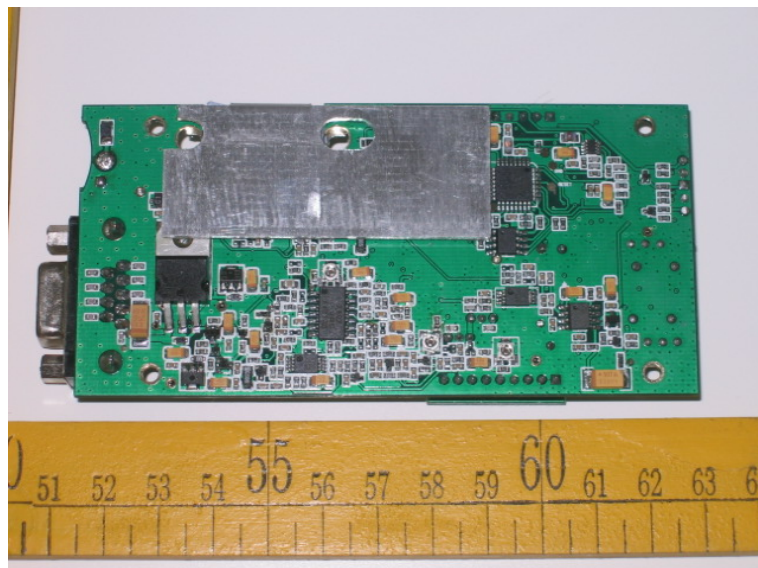
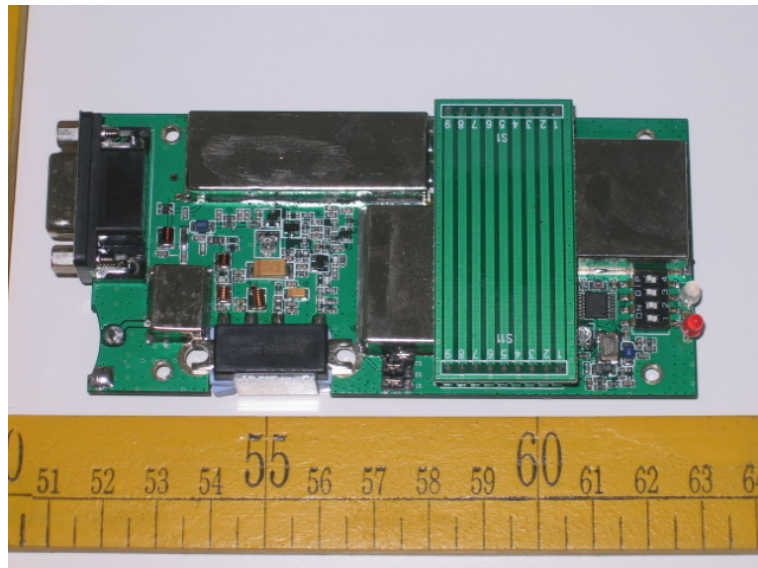
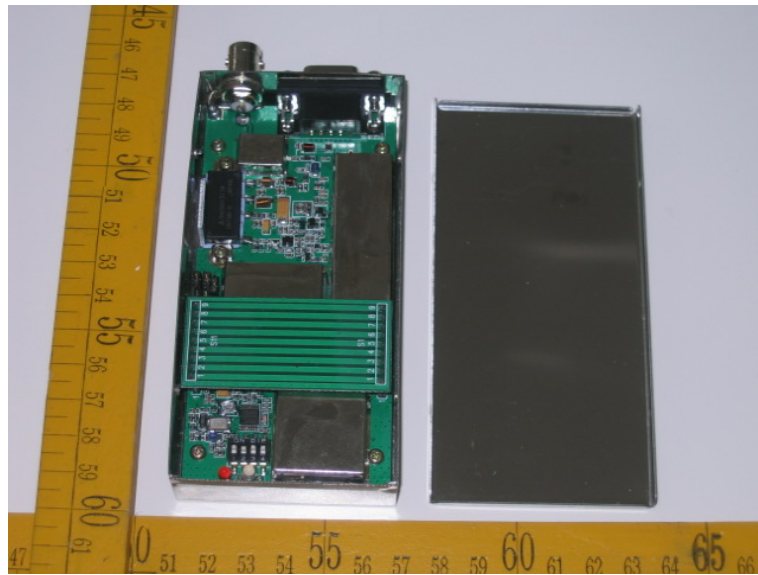


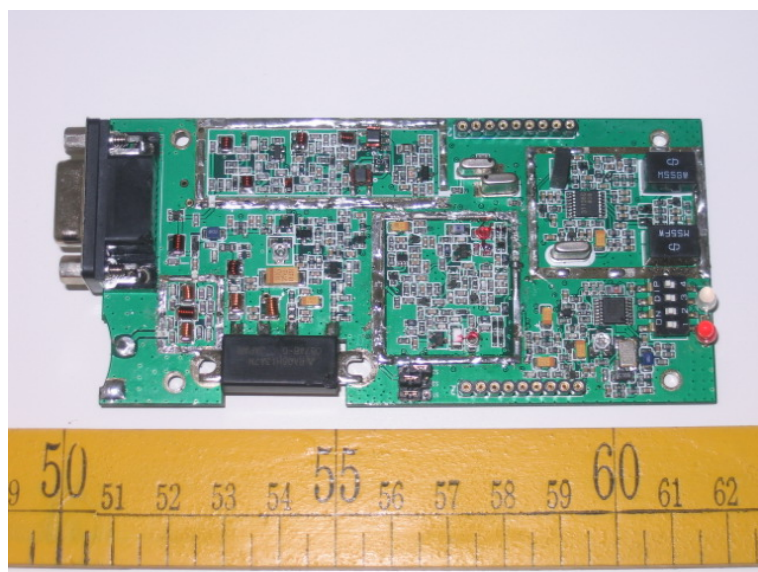
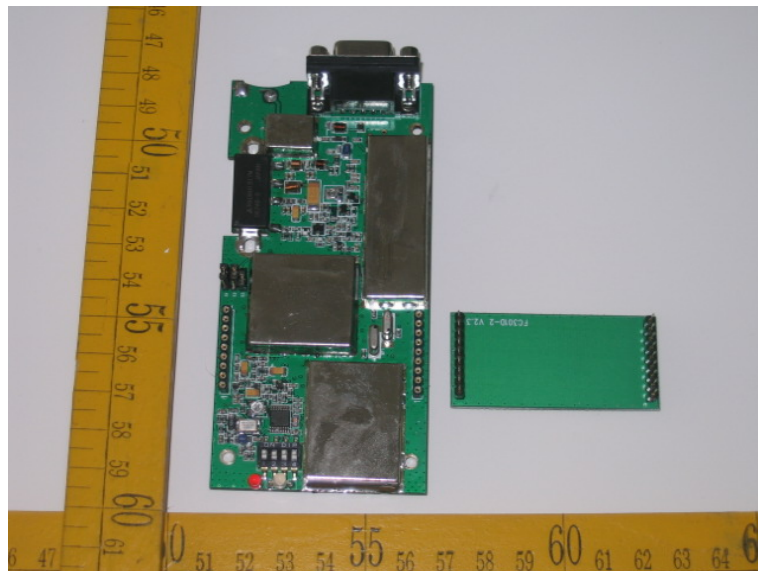
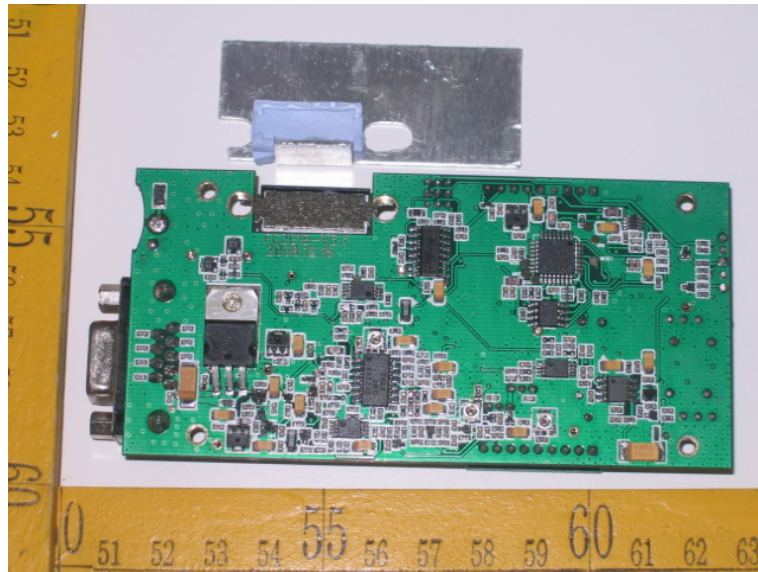
6. External and Internal Photos of the EUT

External Photos



Internal Photos





.....End of Report.....