

FCC PART 15.231

EMI MEASUREMENT AND TEST REPORT

For

Cape Fear Systems, LLC

215 South water Street, suite 103,
Wilmington, North Carolina 28401

FCC ID: S2Q911

This Report Concerns: <input checked="" type="checkbox"/> Original Report	Equipment Type: DTMF Decoder - TX
Test Engineer: Snell Leong / <u>Snell</u>	
Report No.: R0502091	
Report Date: 2005-03-01	
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GENERAL INFORMATION

Product Description for Equipment Under Test (EUT)

The *Cape Fear Systems, LLC* product, Model: 911, or the "EUT" as referred to this report is a DTMF decoder, which measures approximately 100mm L x 38mmW x 138mmH with 0.5LB.

**The test data gathered are from production sample, serial number:911-01, provided by the manufacturer.*

Objective

This report is prepared on behalf of *Philips Electronics Singapore Pte Ltd-Remote Control Systems* in accordance with Part 2, Subpart J, and Part 15, Subparts B and C of the Federal Communication Commissions rules.

The objective of the manufacturer is to determine compliance with FCC rules, Part 15, Sec 231 for conducted emission, radiated emission, 20dB Bandwidth, and Deactivation.

Related Submittal(s)/Grant(s)

No Related Submittals

Test Methodology

All measurements contained in this report were conducted with ANSI C63.4 –2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz. All radiated and conducted emissions measurement was performed at BACL.

Test Facility

The Open Area Test site used by BACL to collect radiated and conducted emission measurement data is located in the back parking lot of the building at 230 Commercial Street, Sunnyvale, California, USA.

Test site at BACL has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports has been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997 and Article 8 of the VCCI regulations on December 25, 1997. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2003.

The Federal Communications Commission and Voluntary Control Council for Interference has the reports on file and is listed under FCC file 31040/SIT 1300F2 and VCCI Registration No.: C-1298 and R-1234. The test site has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (Lab Code 200167-0). The current scope of accreditations can be found at <http://ts.nist.gov/ts/htdocs/210/214/scopes/2001670.htm>

SYSTEM TEST CONFIGURATION

Justification

The EUT was tested in accordance with ANSI C63.4-2003.

EUT Exercise Software

The EUT exercising software program was designed to exercise the various installed components in accordance with ANSI C63.4-2003.

Special Accessories

The unit was tested with the normally supplied cabling and accessories provided by the supporting equipment and no special accessories were used.

Schematics / Block Diagram

Exhibit A contains a copy of the EUT's schematics diagram as reference.

Equipment Modifications

No modifications were made to the EUT.

Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number	FCC ID
Southern Telecom	Telephone	None	None	None
Teltone Corp	Simulator	TLS-3B-01	80071	None

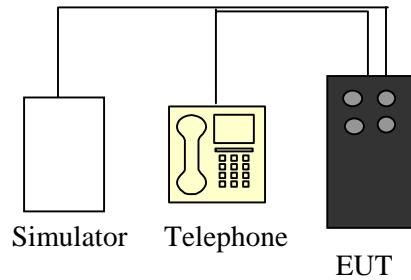
Interface Ports and Cabling List and Details

Manufacturer	Description	From	TO
None-Shielded RJ-11 Cable	1.5	Line Port/EUT	Simulator RJ11Port
None-Shielded RJ-11 Cable	1.5	Tel Port / EUT	Southern Telephone

Power Supply Information

Manufacturer	Description	Model	Serial Number	FCC ID
Class 2 Power Supply	AC Adaptor	U90020D12	E1249463H20	None

Configuration of Test System



SUMMARY OF TEST RESULTS

Results reported relate only to the product tested, serial number: 911-01.

FCC Rules	REQUIREMENTS	RESULT
FCC 15.203	Antenna Requirement	Pass
FCC 15.205, 15.209, 15.231(b)	Restricted Bands of Operation and Spurious Radiated Emissions	Pass
FCC 15.207 (a)	Conducted Emissions	Pass
FCC 15.231(a)(1)	Deactivation	Pass
FCC 15.231(b)(2)	Pulse desensitization or derating was not required because peak measurements were employed	N/A
FCC 15.231(c)	20dB Bandwidth	Pass

§15.203 - ANTENNA REQUIREMENT

Standard Applicable

According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

Refer to statement below for compliance.

“The antenna for this device is an integral antenna that the end user cannot access”.

Antenna Connected Construction

The antenna connector is designed with permanent attachment and no consideration of replacement.

§15.209, §15.205, §15.231 - RADIATED EMISSION

Measurement Uncertainty

All measurements involve certain levels of uncertainties. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at BACL is ± 4.0 dB.

EUT Setup

The radiated emission tests were performed in the open area 3-meter test site, using the setup accordance with the ANSI C63.4 - 2003. The specification used was the FCC Subpart C limits.

The spacing between the peripherals was 10 centimeters.

The external I/O cables were draped along the test table and bundled as required.

The EUT was connected to a telephone and a simulator.

Spectrum Analyzer Setup

According to FCC CFR 47, Section 15.33, the EUT was tested to 3.15GHz.

During the radiated emission test, the CISPR quasi-peak detection was employed:

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal Date
EMCO	Antenna, Biconical	3110B	9603-2315	2004-12-14
HP	Amplifier, Pre	8447D	2944A10198	2004-08-20
Electro Metrics	Antenna, Log-Periodic	3148	4-1155	2004-12-14
Agilent	Analyzer, Spectrum	E4446A	US44300386	2004-11-10

*** Statement of Traceability:** BACL attests that all calibrations have been performed per the NVLAP requirements, traceable to NIST.

Test Procedure

Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance is with all installation combinations.

According to §15.231, Intentional radiators operating under the provisions of this section shall demonstrate compliance with the limits on the field strength of emission, based on the average value of the measured emissions. As an alternative, compliance with the limits may be based on the use of measurement instrumentation with a CISPR quasi-peak detector.

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Antenna Factor} + \text{Cable Factor} - \text{Amplifier Gain}$$

The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the maximum limit for Class B. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{FCC Limit}$$

Summary of Test Results

According to the data in the following table, the EUT complied with the FCC 15.231 standards and these test results is deemed satisfactory evidence of compliance with ICES-003 of the Canadian Interference-Causing Equipment Regulations, and had the worst margin of:

- 18.0 dB at 945.00 MHz in the Vertical polarization

Radiated Emissions Test Data, 3 meters

Environmental Conditions

Temperature:	18 ° C
Relative Humidity:	56%
ATM Pressure:	1016mbar

The testing was performed by Snell Leong on 2005-02-17.

Radiated Emissions Test Data, 3 meters

INDICATED			TABLE		ANTEN NA Antenna Loss	CORRECTION FACTOR		CORRECTED AMPLITUDE Corr. Ampl. dB μ V/m (QP)	FCC 15.231	
Frequen cy MHz	QP dB μ V	Direction Degree	Height Meter	Polar H/ V		dB	dB		Limit dB μ V/m	Margin dB
945.00	38.19	350	3.0	V	23.4	4.2	28.2	37.6	55.6	-18.0
315.00	66.49	345	1.7	H	15.1	2.3	27.9	56.1	75.6	-19.5
315.00	65.85	350	2.6	V	15.1	2.3	27.9	55.4	75.6	-20.2
945.00	34.59	350	3.0	H	23.4	4.2	28.2	34.0	55.6	-21.6
630.00	32.89	350	3.0	H	20.0	3.0	28.9	27.0	55.6	-28.6
630.00	32.19	350	3.0	V	20.0	3.0	28.9	26.3	55.6	-29.3

§15.207 – CONDUCTED EMISSION DATA

Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, and LISN.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement at BACL is ± 2.4 dB.

EUT Setup

The measurement was performed in the shielded room, using the same setup per ANSI C63.4-2003 measurement procedure. The specification used was FCC 15 Class B limits.

The spacing between the peripherals was 10 cm.

The external I/O cables were draped along the test table and bundled as required.

The EUT was connected to a telephone and a simulator.

Receiver Setup

The receiver was set to investigate the spectrum from 150 kHz to 30MHz.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
Rohde & Schwarz	LISN	ESH2-Z5	871884/039	2004-08-16
Rohde & Schwarz	EMI Test Receiver	ESCS30	100176	2004-09-15

* **Statement of Traceability:** BACL Corp. attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

Test Procedure

During the conducted emission test, the EUT was connected to the mains outlet of the LISN-1.

Maximizing procedure were performed on the six (6) highest emissions of the EUT.

All data was recorded in the peak detection mode, quasi-peak and average. Average readings are distinguished with an “Ave”.

Test Results Summary

According to the recorded data, the EUT complies with the FCC Conducted limits for a Class B device, with the worst margin reading of:

-28.8 dB at 17.9 MHz on the **Line** conductor mode.

Conducted Emissions Test Data

Environmental Conditions

Temperature:	18° C
Relative Humidity:	56%
ATM Pressure:	1016mbar

Testing was performed by Snell Leong on 2005-02-15.

LINE CONDUCTED EMISSIONS				FCC15 CLASS B	
Frequency MHz	Amplitude dB μ V	Detector Qp/Ave/Peak	Phase Line/Neutral	Limit dB μ V	Margin dB
17.900	21.2	Ave	LINE	50.00	-28.8
17.900	21.1	Ave	Neutral	50.00	-28.9
13.300	18.2	Ave	LINE	50.00	-31.8
13.300	16.3	Ave	Neutral	50.00	-33.7
16.000	15.0	Ave	LINE	50.00	-35.0
0.515	20.4	QP	Neutral	56.00	-35.6
17.900	20.4	QP	LINE	60.00	-39.6
17.900	20.2	QP	Neutral	60.00	-39.8
13.300	19.5	QP	LINE	60.00	-40.5
0.515	4.6	Ave	Neutral	46.00	-41.4
13.300	18.3	QP	Neutral	60.00	-41.7
16.000	18.1	QP	LINE	60.00	-41.9

Plots of Conducted Emission

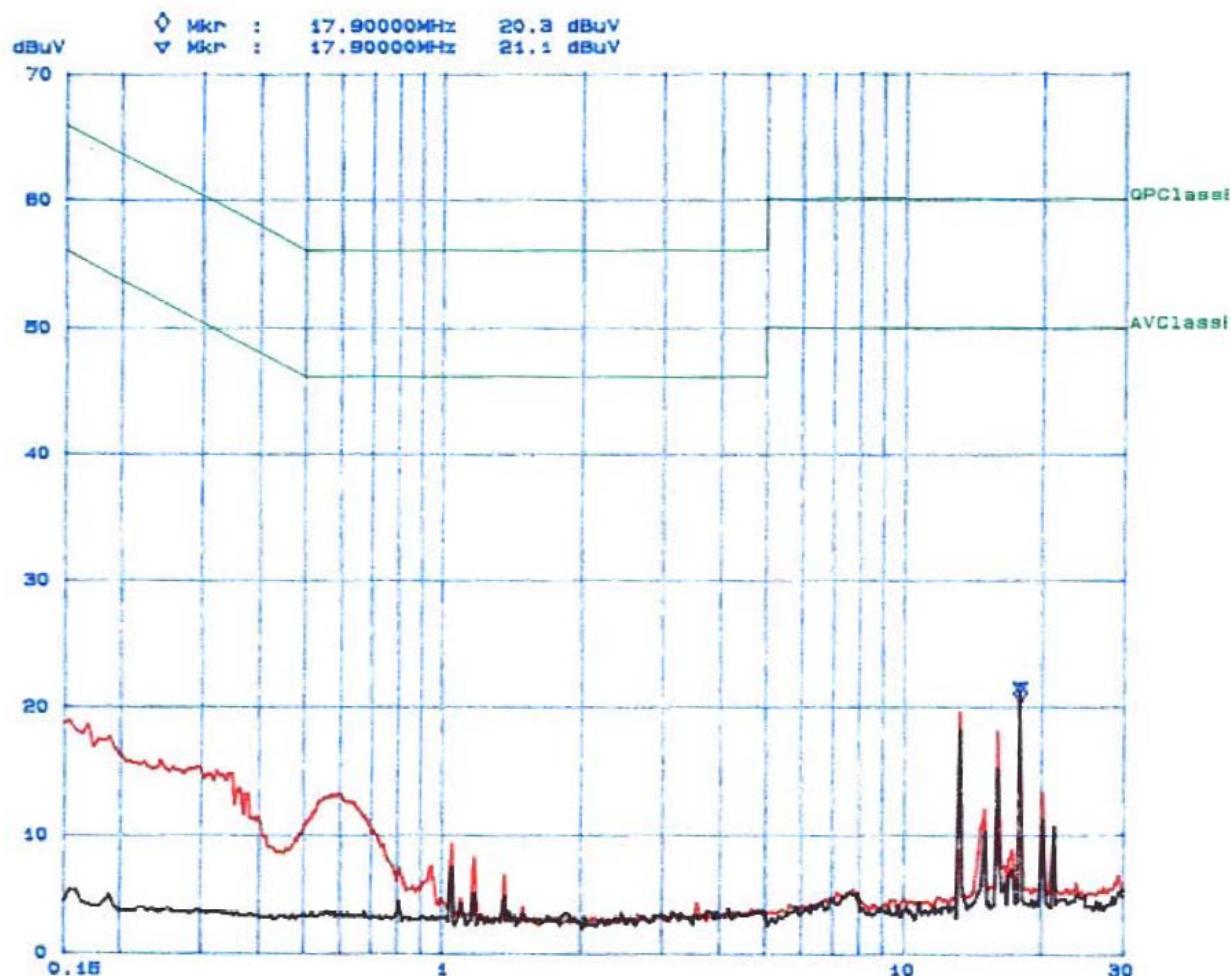
The plots of conducted emission are presented hereinafter as reference.

Bay Area Compliance Laboratory Corp
Class B

15. Feb 08 14:11

EUT: SII Flash TX
Manuf: CapeFear System
Op Cond: Normal
Operator: Snell
Comment: L
File name:

Scan Settings (3 Ranges)			Receiver Settings					
Frequencies			IF BW	Detector	M-Time	Atten	Preamp	
Start	Stop	Step	9K	QP+AV	20ms	15dBBLN	OFF	
150K	1M	5K	9K		20ms		15dBBLN	
1M	5M	10K	9K		1ms		15dBBLN	
5M	30M	100K	9K		1ms		15dBBLN	

15/Feb/08
Snell

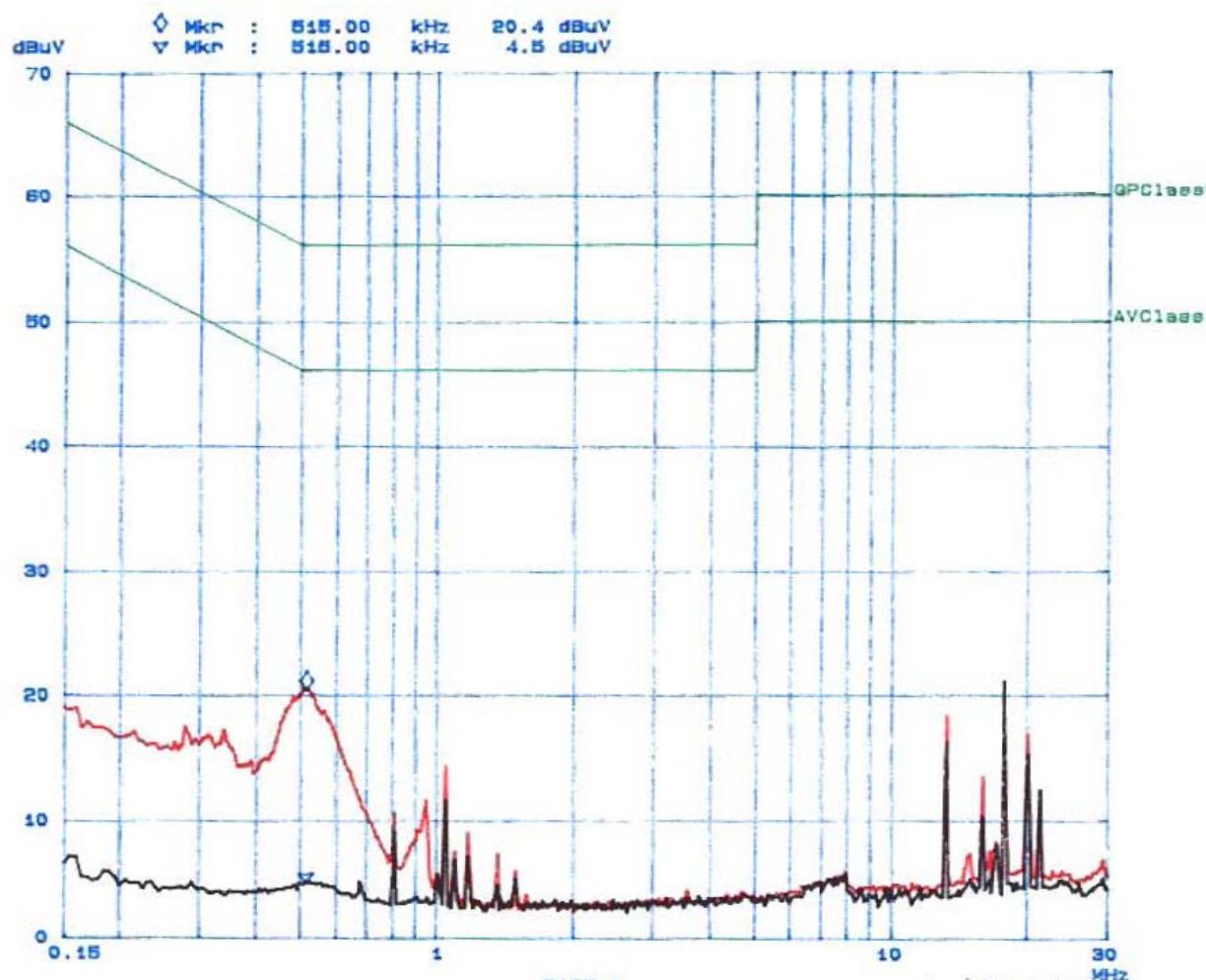
Bay Area Compliance Laboratory Corp
Class B

15. Feb 05 13:43

EUT: Bill Flash TX
Manuf: CapeFear System
Op Cond: Normal
Operator: Shell
Comment: N
File name:

Scan Settings (3 Ranges)

Frequencies			Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp
150k	1M	5k	8k	QP+AV	20ms	16dBBLN	OFF
1M	5M	10k	8k	QP+AV	1ms	16dBBLN	OFF
5M	30M	100k	8k	QP+AV	1ms	16dBBLN	OFF



§15.231(a)(2) - DEACTIVATION

Requirement

Per 15.231(a)(2), a transmitter activated automatically shall cease transmission within 5 seconds after activation.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
HP	Spectrum Analyzer	8565EC	3946A00131	2004-08-06
HP	Plotter	7470A	N/A	N/A

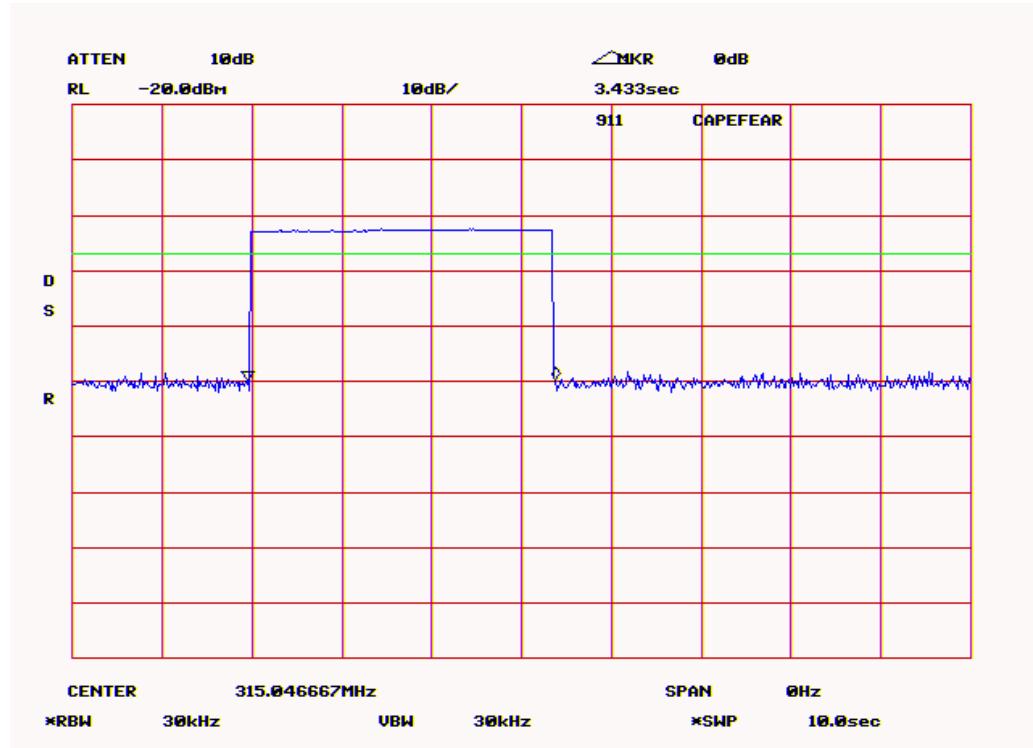
* **Statement of Traceability:** BACL Corp. attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

Test Result

Temperature:	18° C
Relative Humidity:	56%
ATM Pressure:	1016mbar

Testing was performed by Snell Leong on 2005-02-15.

Please see the following plot:



§15.231(c) – 20dB BANDWIDTH

Requirement

Per 15.231(c), the bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70MHz and below 900MHz. For devices operating above 900MHz, the emission shall be no wider than 0.5% of the center frequency bandwidth is determined at the points 20 dB down from the modulated carrier.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
Agilent	Spectrum Analyzer	E4446A	US44300386	2004-11-10
HP	Plotter	7470A	N/A	N/A

* **Statement of Traceability:** BACL Corp. attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

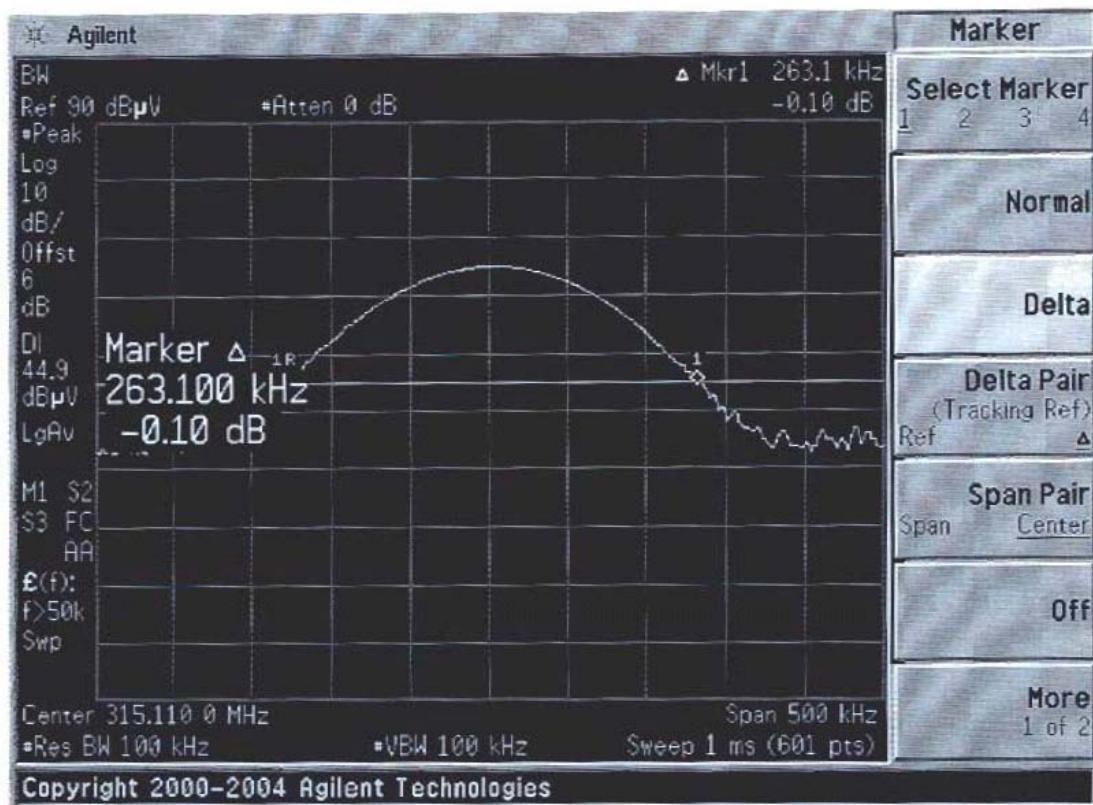
Test Result

Temperature:	21° C
Relative Humidity:	37%
ATM Pressure:	1032mbar

The testing was performed by Snell Leong on 2005-02-17.

Fund. Frequency (MHz)	20dB Bandwidth Emission (KHz)	Limit (KHz)	Result
315	263.1	787.5	Compliance

Please refer to the following plot.



8wv
02/17/05
~~02/17/05~~
17/Feb/05