Lab Code: 200167-0

FCC PART 22, 24, 90, 101

TEST AND MEASUREMENT REPORT

For

Spectra Engineering Pty Ltd.

9 Trade Road,

Malaga, WA 6090, Australia

FCC ID: OKRMX800WL

Report Type: Original Report	**Product type:** 900 MHz Radio Base Station

Test Engineer:	Dennis Huang
Report Number:	R1010127
Report Date:	2010-10-27
Reviewed By:	Victor Zhang RF Lead
Prepared By: (84)	Bay Area Compliance Laboratories Corp. 1274 Anvilwood Avenue, Sunnyvale, CA 94085, U.S.A. Tel: (408) 732-9162 Fax: (408) 732 9164

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1010127	Original Report	2010-10-27

1. General Information

1.1 Product Description for Equipment under Test (EUT)

The report has been prepared on behalf of *Spectra Engineering Pty Ltd*. and their product FCC ID: OKRMX800WL, model: MX800WZL or the EUT as referred to in the rest of this report. The EUT is a conventional 2-way voice 900 MHz base station.

The EUT is a 900 MHz Radio Transceiver that operates under FCC Part 22, 24, 90, 101.

- 917-930 MHz: Part 90
- 930-935 MHz: Part 22, 24 & 101
- 935-940 MHz: Part 90
- 940-950 MHz: Part 22, 24 & 101

Specifications	
Frequency Bands	917-930 MHz, 930-935 MHz, 935-940 MHz, 940-950 MHz
Modulation Type	FM
Emission Designator	F3E, F1D, F7D, F9W
RF Output Power	5 Watts
Channel Spacing	25 kHz/12.5 kHz
Power Supply	13.8 VDC Nominal
Frequency Deviation	Peak ± 5 kHz (25 kHz Channel Spacing) Peak ± 2.5 kHz (12.5 kHz Channel Spacing)

1.2 Mechanical Description

The EUT measures approximately 485mm (L) x 330 mm (W) x 80 mm (H) and weighs 7.48kg.

The test data gathered are from production sample, serial number: 10052132 provided by the manufacturer.

1.3 Objective

This Type approval report is prepared on behalf of *Spectra Engineering Pty Ltd* in accordance with Part 22, 24, 90, 101.

1.4 Related Submittal(s)/Grant(s)

None.

1.5 Test Methodology

All tests and measurements indicated in this document were performed in accordance with the Code of federal Regulations Title 47 Part 2, Sub-part J as well as the following individual parts:

Part 22 – Public Mobile Services
Part 24 – Personal Communications Services
Part 90 – Private Land Mobile Radio Service
Part 101 – Fixed Microwave Services

Applicable Standards:TIA603-C and ANSI 63.4-2003, American National Standard for Method of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

All emissions measurement was performed by Bay Area Compliance Laboratories Corp. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

1.6 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in the field of EMC. 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 values ranging from ± 2.0 dB for Conducted Emissions tests and ±4.0 dB for Radiated Emissions tests are the most accurate estimates pertaining to uncertainty of EMC measurements at BACL Corp.

Detailed instrumentation measurement uncertainties can be found in BACL Corp. report QAP-018.

1.7 Test Facility

The test site used by BACL Corp. to collect radiated and conducted emissions measurement data is located at its facility in Sunnyvale, California, USA.

The test sites at BACL have 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, Industry Canada, and Voluntary Control Council for Interference has the reports on file and is listed under FCC registration number: 90464, IC registration number: 3062A, and VCCI Registration Number: C-2463 and R-2698. The test site has been approved by the FCC, IC, 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

2 System Test Configuration

2.1 Justification

The EUT was configured for testing according to TIA/EIA-603-C.

The EUT was tested in the normal (native) operating mode to represent *worst*-case results during the final qualification test.

2.2 Equipment Modifications

No modifications were made to the EUT.

2.3 Internal Configuration

Manufacturer	Description	Model No.	Serial No.
Spectral Engineering Pty Ltd	RF PCB Board 1	OPT T37 L489 REV. A	O037000001
Spectral Engineering Pty Ltd	RF PCB Board 2	L053-C TC-0809	00544W0191
Spectral Engineering Pty Ltd	Digital PCB Board 1	MB-STD L122	06032945
Spectral Engineering Pty Ltd	Digital PCB Board 2	NVC0 REV B	-
Spectral Engineering Pty Ltd	Digital PCB Board 3	T50	-

2.4 Local Support Equipment

Manufacturer	Description	Model No.	Serial No.
-	-	-	-

2.5 Local Support Equipment Power Supply and Line Filters

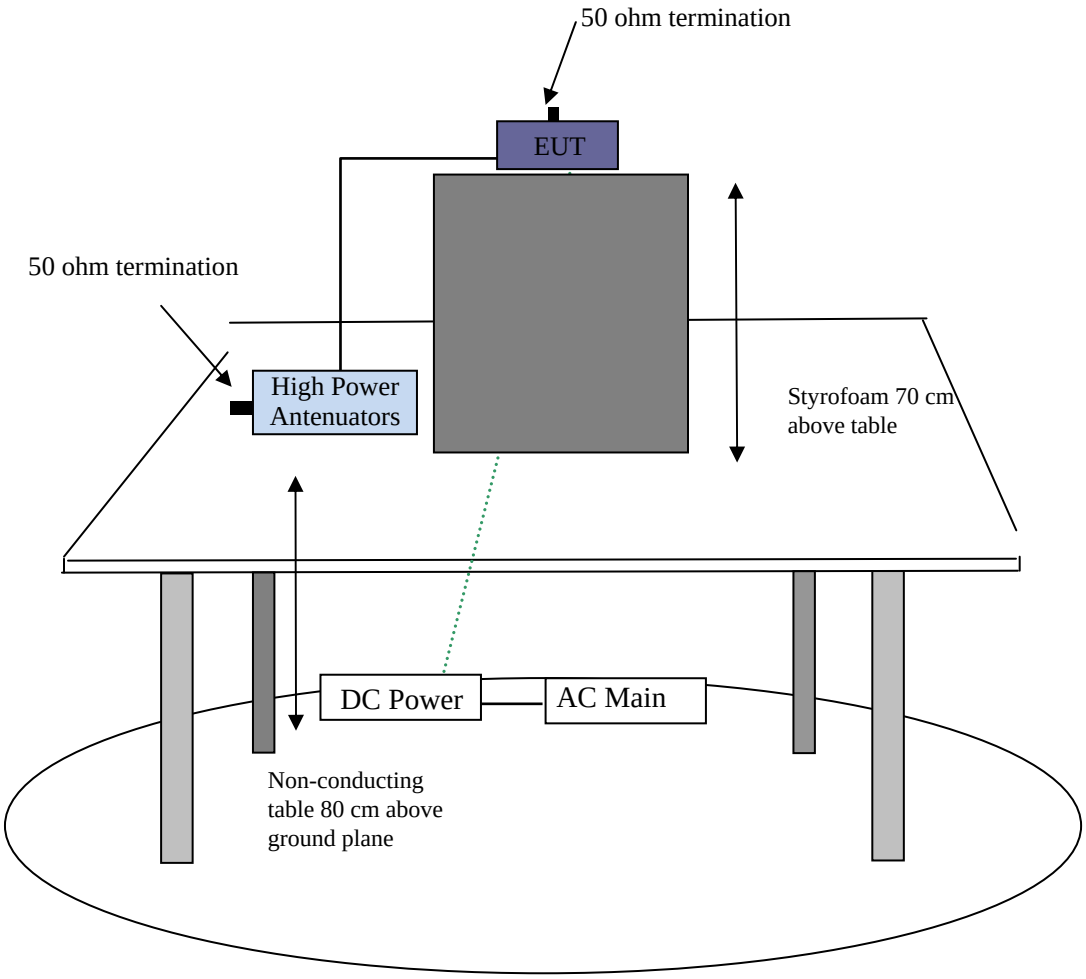
Manufacturer	Description	Model	Serial Number
Electronic Measurements Inc.	DC power supply	TCR 20S30-20V	84A-6267

2.6 Interface Ports and Cabling

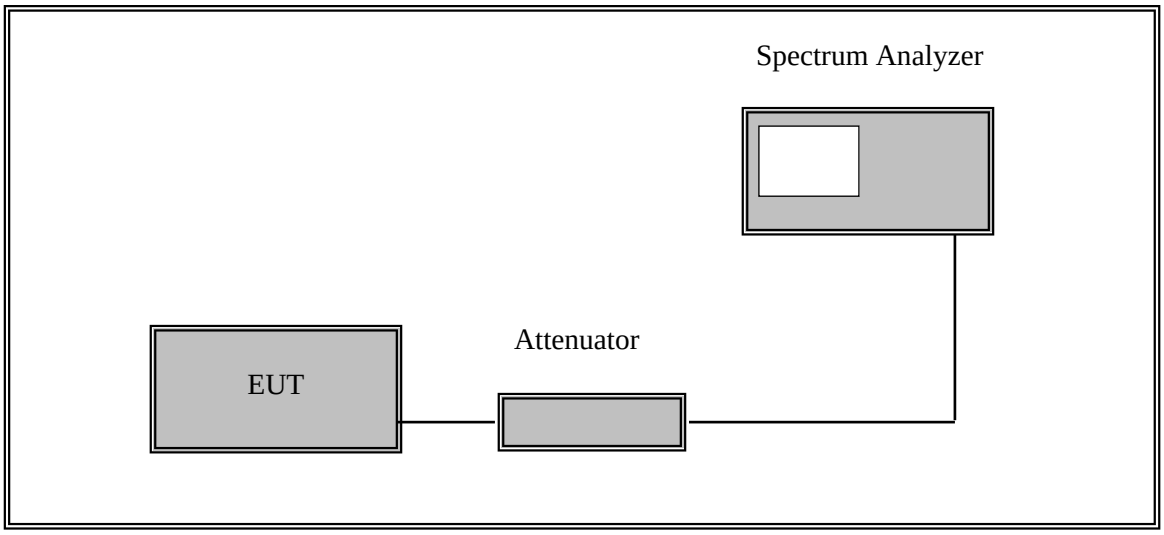
Cable Description	Length (m)	From	To
BNC Cable	< 1.0	High Power Attenuator	EUT
RF Cable	< 1.0	High Power Attenuator	PSA

2.7 Test Setup Block Diagram

Radiated Test



Conducted Test



3 Summary of Test Results

FCC Rules	Description of Test	Result
§1.1310, §2.1091	RF Exposure	N/A
§2.1046	RF Output Power	Compliant
§2.1047	Modulation Characteristics, Audio Frequency Response and Audio Filter Response	Compliant
§2.1049	Occupied Bandwidth and Emission Mask	Compliant
§2.1051, §22.359 §24.133, §90.205 §101.111	Spurious Emissions at Antenna Terminals	Compliant
§2.1055, §22.355, §24.135, §90.213, §101.101	Frequency Stability	Compliant
§2.1053, §22.359, §24.133, §24.238, §90.210, §90.543(c), §101.111	Field Strength of Spurious Radiation	Compliant

4 FCC §2.1091 - RF Exposure

4.1 Applicable Standards

FCC §2.1091

(a) Requirements of this section are a consequence of Commission responsibilities under the National Environmental Policy Act to evaluate the environmental significance of its actions. See subpart I of part 1 of this chapter, in particular §1.1307(b).

According to §1.1310 and §2.1091 RF exposure is calculated.

Limits for Exposure

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Averaging Time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3-3.0	614	1.63	*(100)	6
3.0-30	1842/f	4.89/f	*($900/f^2$)	6
30-300	61.4	0.163	1.0	6
300-1500	/	/	f/300	6
1500-100,00	/	/	1	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	842/f	2.19/f	*($180/f^2$)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/150	30
1500-100,000	/	/	1	30

f = frequency in MHz
* = Plane-wave equivalent power density

Note 1 to Table 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

Note 2 to Table 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

4.2 Result

Conclusion

No MPE calculation needed:

The antenna(s) used for this transmitter must be fixed-mounted on outdoor permanent structures. RF exposure compliance is addressed at the time of licensing, as required by the responsible FCC Bureau(s), including antenna co-location requirements of Para. 1.1307(b)(3).

5 FCC §2.1046 – Conducted Output Power

5.1 Applicable Standard

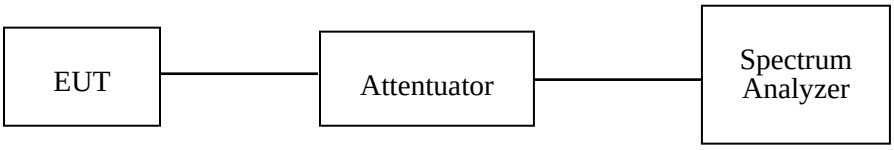
According to §90.635: The effective radiated power (ERP) and antenna height for base station transmitters must not exceed the limits in this section as per below:

Base Station Transmitters	Maximum ERP (Watts)
Operating frequency range: (764-776, 794-806, 806-824, 851-869, 896-901, 935-940MHz)	500 Watts and 152 meters (AAT) in Suburban Area 1 Kilowatts and 304 meters (304) in Urban Area

According to §90.205, maximum ERP is dependent upon the station's antenna HAAT and required service area.

5.2 Test Procedure

The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.



5.3 Test Environmental Conditions

Temperature:	24~26 °C
Relative Humidity:	48~49 %
ATM Pressure:	101.0~101.9 kPa

The testing was performed by Dennis Huang on 2010-10-11.

5.4 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date
Agilent	Spectrum Analyzer	E4440A	US45303156	2010-08-09

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

5.5 Test Result

Test Mode: Transmitting

917-930 MHz – Part 90

Frequency Spacing (kHz)	Frequency (MHz)	Output Power (dBm)	Output Power (Watt)
25 kHz	917	36.98	5.03
12.5 kHz	917	36.97	5.02

930-935 MHz – Part 22, 24 & 101

Frequency Spacing (kHz)	Frequency (MHz)	Output Power (dBm)	Output Power (Watt)
25 kHz	933.5	37.19	5.24
12.5 kHz	933.5	37.23	5.28

935-940 MHz – Part 90

Frequency Spacing (kHz)	Frequency (MHz)	Output Power (dBm)	Output Power (Watt)
25 kHz	937	37.02	5.03
12.5 kHz	937	37.01	5.02

940-950 MHz – Part 22, 24 & 101

Frequency Spacing (kHz)	Frequency (MHz)	Output Power (dBm)	Output Power (Watt)
25 kHz	950	37.22	5.27
12.5 kHz	950	37.23	5.28

6 FCC §2.1047 – Modulation Characteristic

6.1 Applicable Standard

FCC §2.1047 & §90.207:

(a) Equipment which utilizes voice modulated communication shall show the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz. for equipment which is required to have a low pass filter, the frequency response of the filter, or all of the circuitry installed between the modulation limited and the modulated stage shall be supplied.
(b) Equipment which employs modulation limiting, a curve showing the percentage of modulation versus the modulation input voltage shall be supplied.

6.2 Test Procedure

Test Method: TIA/EIA-603-C 2.2.3

6.3 Test Environmental Conditions

Temperature:	24~26 °C
Relative Humidity:	48~49 %
ATM Pressure:	101.0~101.9 kPa

The testing was performed by Dennis Huang on 2010-10-11.

6.4 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date
Agilent	Spectrum Analyzer	E4440A	US45303156	2010-08-09
Agilent	Function Arbitrary Waveform Generator	33220A	MY43004878	2010-07-29
HP	RF Communication test set	8920A	3438A05338	2010-05-18

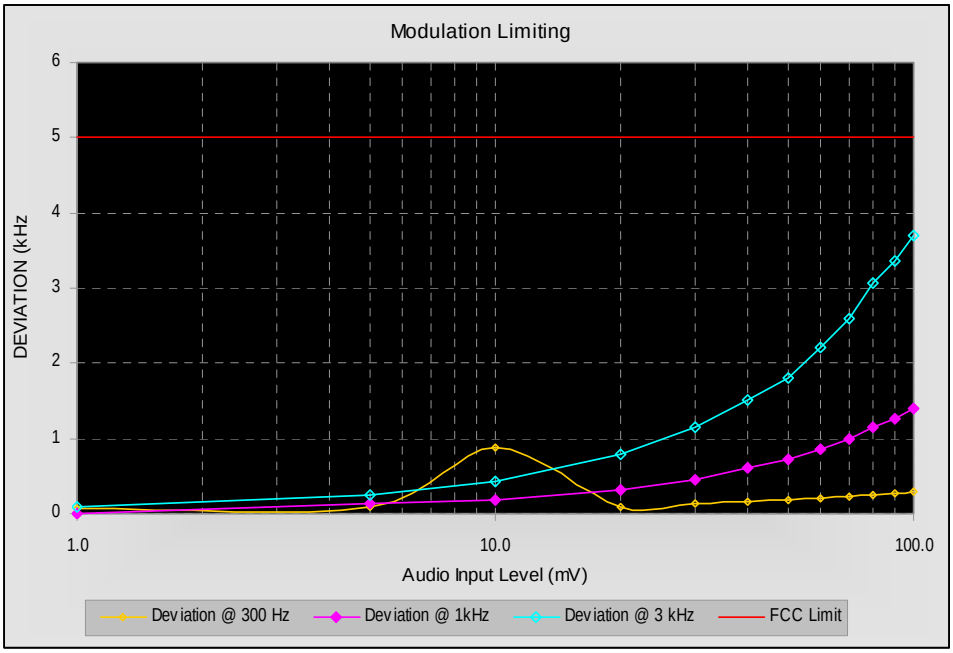
Statement of Traceability: BACL Corp. attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

6.5 Test Result

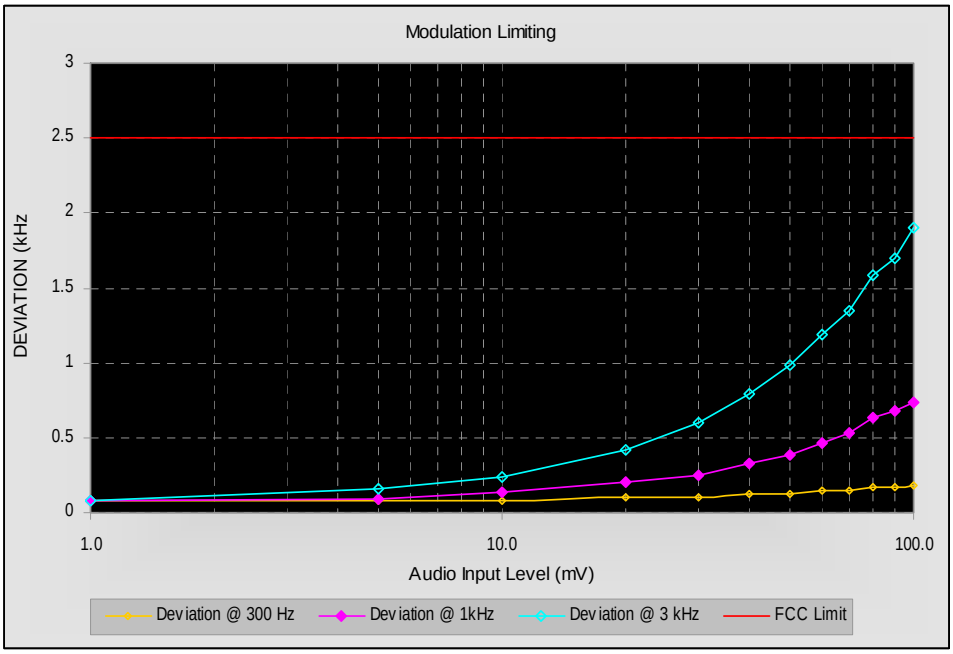
Please refer to the hereinafter plots.

Modulation Limit

Channel Spacing 25 kHz

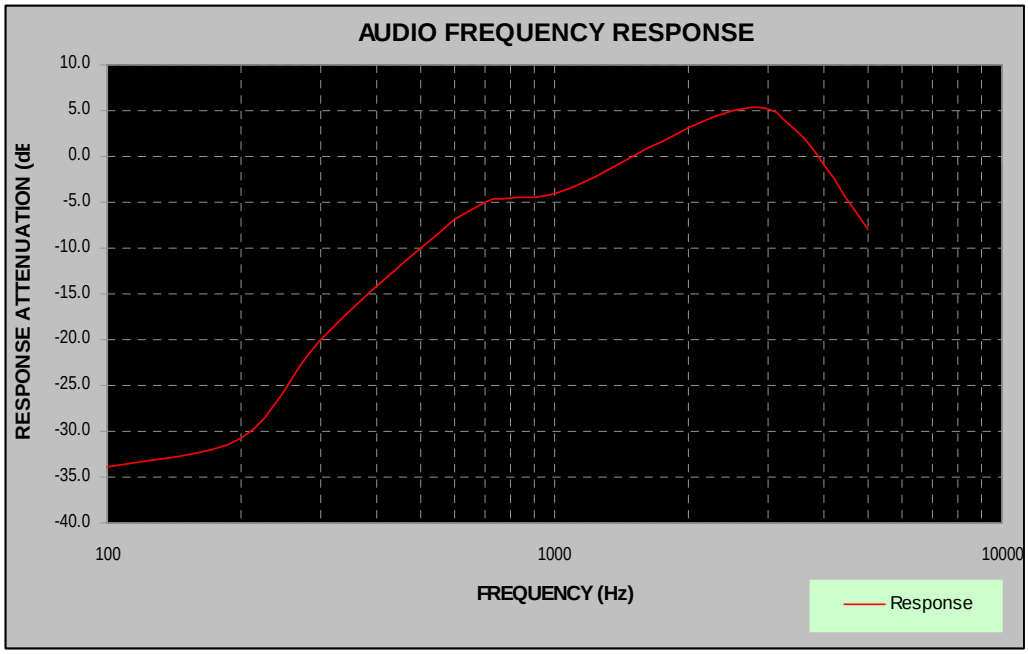


Channel Spacing 12.5 kHz

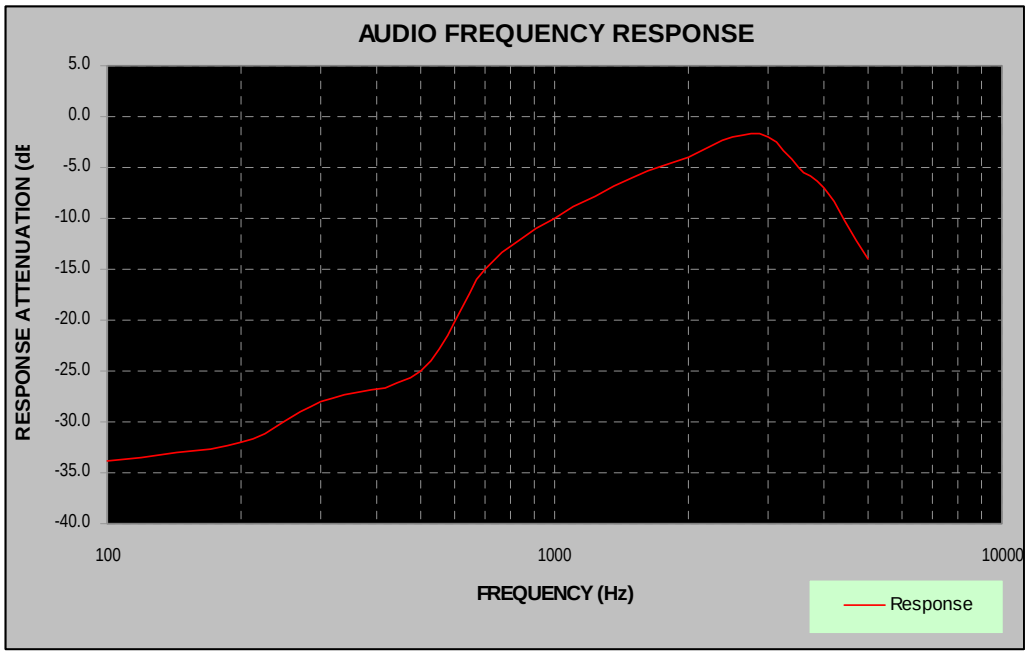


Audio Frequency Response

Channel Spacing 25 kHz

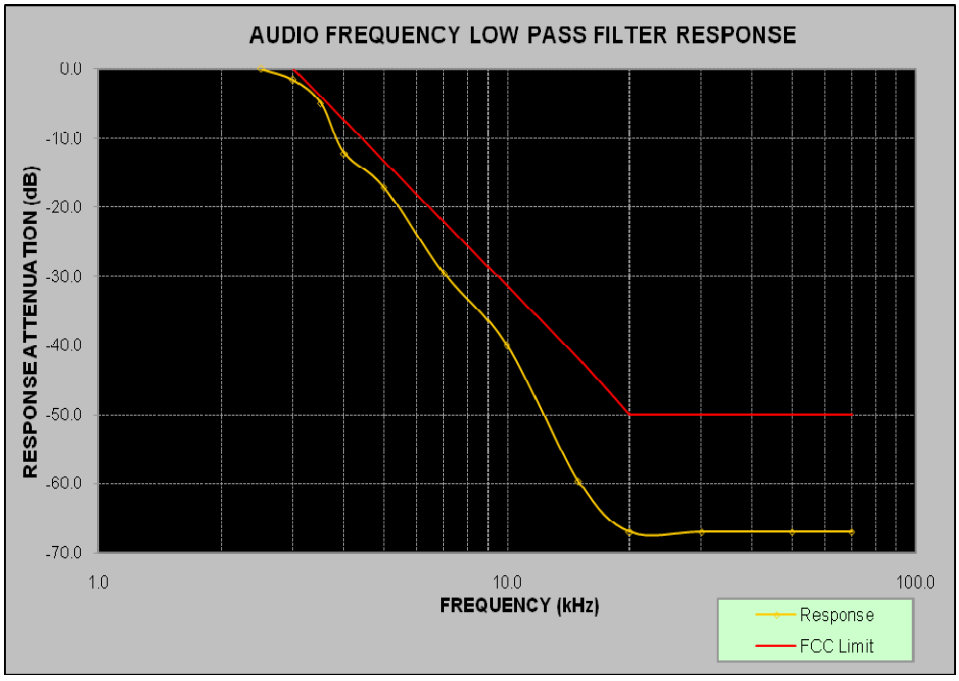


Channel Spacing 12.5 kHz

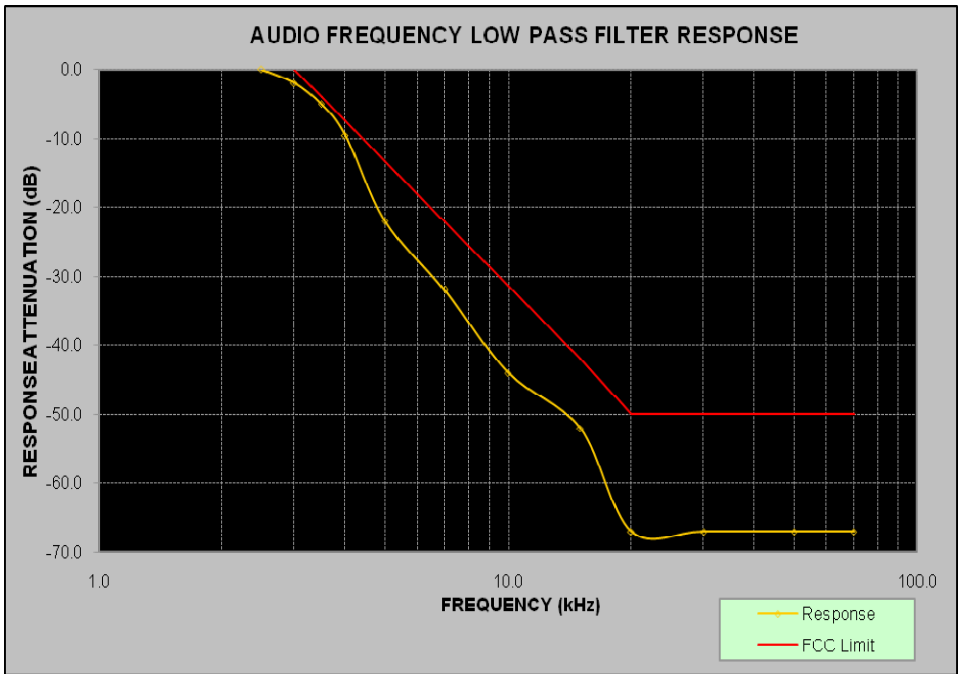


Audio Filter Response

Channel Spacing 25 kHz



Channel Spacing 12.5 kHz



7 FCC §2.1049 – Occupied Bandwidth & Emission Mask

7.1 Applicable Standard

FCC §90.209

Operations using equipment using a 25 kHz bandwidth will be authorized a 20 kHz bandwidth. Operations using equipment designed to operate with a 12.5 kHz channel bandwidth will be authorized an 11.25 kHz bandwidth.

FCC §2.1049, §90.210

Emission Mask B. For transmitters that are equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows:

1) On any frequency removed from the assigned frequency by more than 50 percent, but not 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 not 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 + log (P) dB.

The resolution bandwidth was 100Hz or greater for measuring up to 250kHz from the edge of the authorized frequency segment, and 30kHz or greater for measuring more than 250kHz from the authorized frequency segment.

7.2 Test Procedure

The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.

The resolution bandwidth of the spectrum analyzer was set at 300 Hz and the spectrum was recorded in the frequency band ±50 kHz from the carrier frequency.

7.3 Test Environmental Conditions

Temperature:	24~26 °C
Relative Humidity:	48~49 %
ATM Pressure:	101.0~101.9 kPa

The testing was performed by Dennis Huang on 2010-10-11.

7.4 Test Equipment List and Details

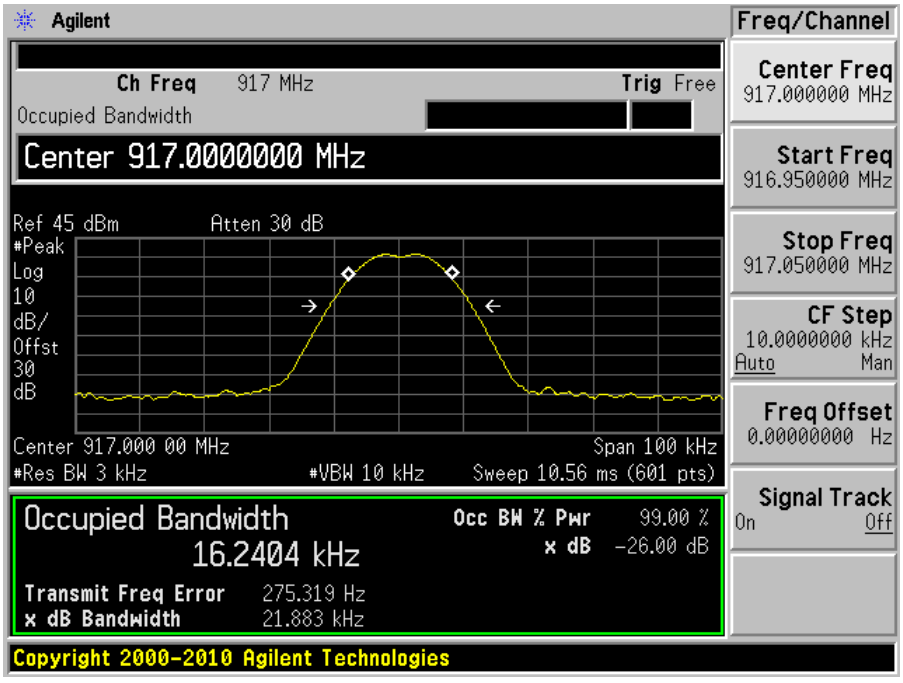
Manufacturer	Description	Model	Serial Number	Calibration Date
Agilent	Spectrum Analyzer	E4440A	US45303156	2010-08-09
Agilent	Function Arbitrary Waveform Generator	33220A	MY43004878	2010-07-29
HP	RF Communication test set	8920A	3438A05338	2010-05-18

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

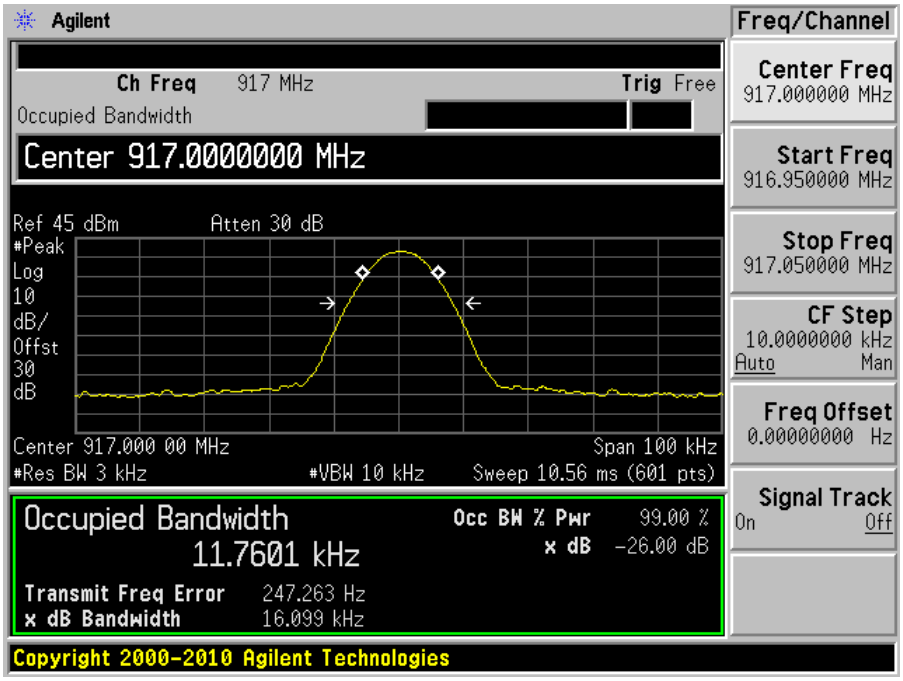
7.5 Test Result

Occupied Bandwidth

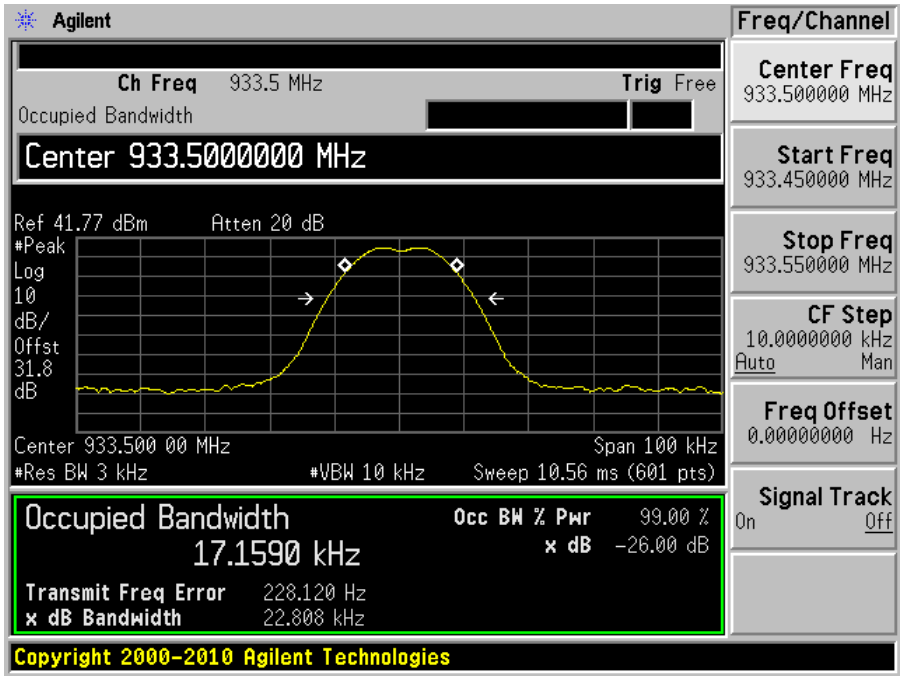
25 kHz Channel Space, 917 MHz



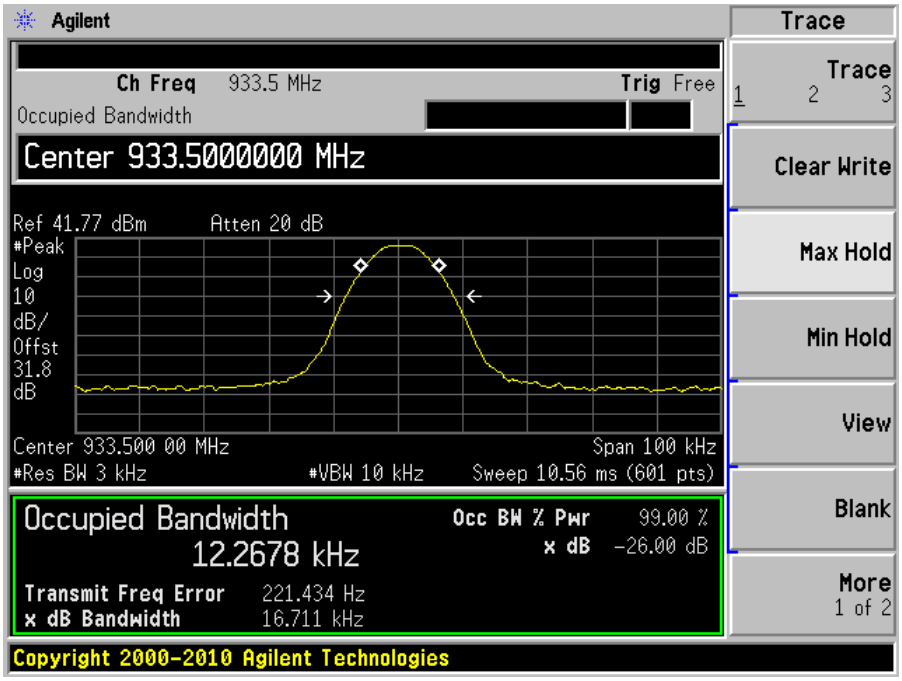
12.5 kHz Channel Space, 917 MHz



25 kHz Channel Space, 933.5 MHz



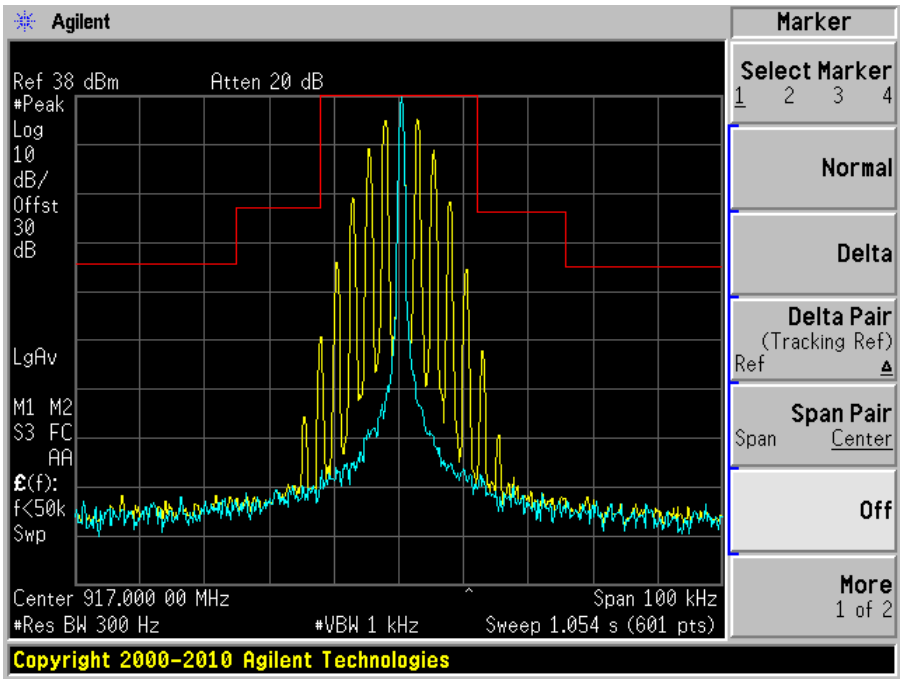
12.5 kHz Channel Space, 933.5 MHz



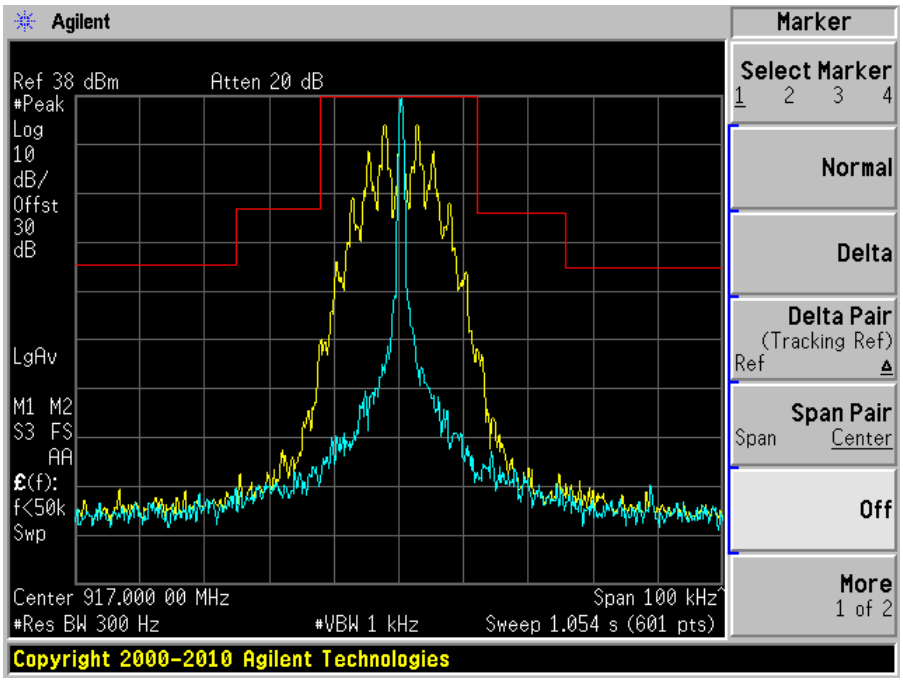
Emission Mask

25 kHz Channel Space, 917 MHz

F1D/F7D



F3E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Marker
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Atten 20 dB
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Log
10
dB/
Offst
30
dB
LgAv
M1 M2
S3 FS
AA
£(f):
f<50k
Swp
Center 917.000 00 MHz
#Res BW 300 Hz
#VBW 1 kHz
Span 100 kHz
Sweep 1.054 s (601 pts)
Select Marker
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Delta Pair
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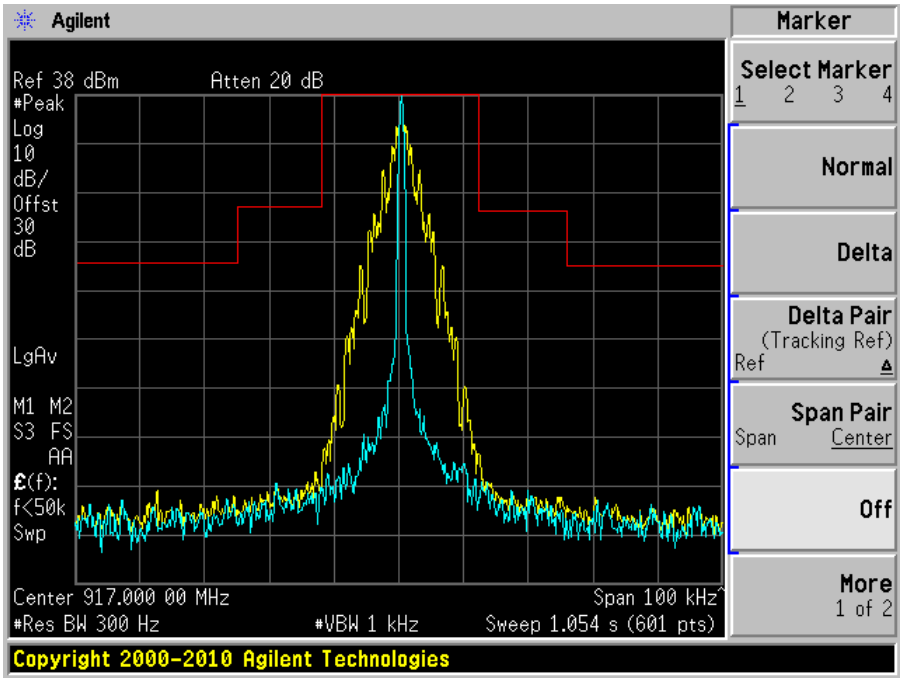
Ref
Span Pair
Span Center
Off
More
1 of 2
Copyright 2000-2010 Agilent Technologies

F9W


Agilent
Marker
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Atten 20 dB
#Peak
Log
10
dB/
Offst
30
dB
LgAv
M1 M2
S3 FS
AA
£(f):
f<50k
Swp
Center 917.000 00 MHz
#Res BW 300 Hz
#VBW 1 kHz
Span 100 kHz
Sweep 1.054 s (601 pts)
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2
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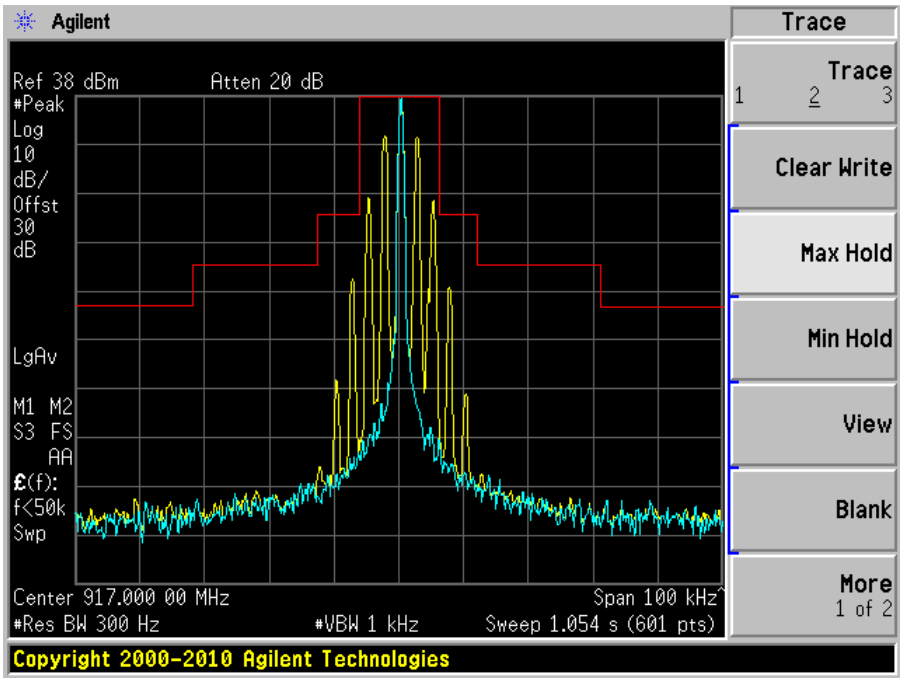
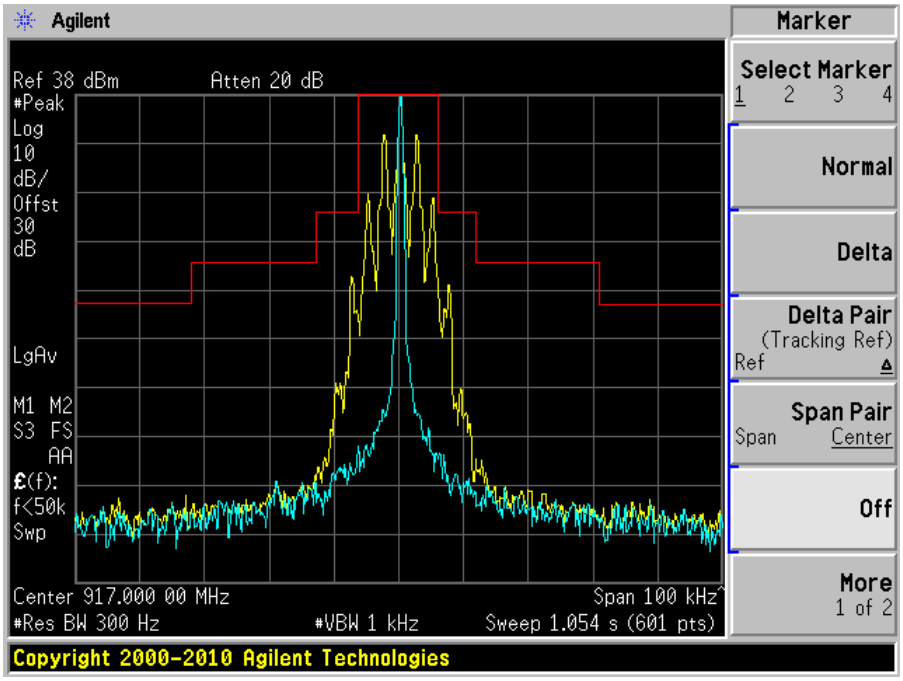
12.5 kHz Channel Space, 917 MHz

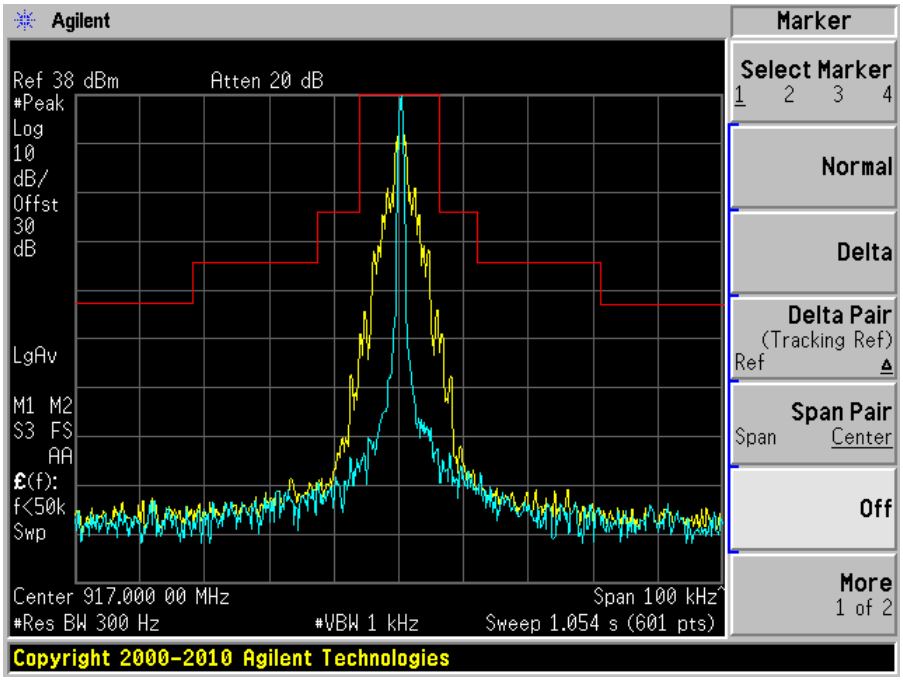
F1D/F7D



F3E



F9W


Agilent
Marker
Ref 38 dBm
Atten 20 dB
#Peak
Log
10
dB/
Offst
30
dB
LgAv
M1 M2
S3 FS
AA
£(f):
f<50k
Swp
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2
Center 917.000 00 MHz
Span 100 kHz
#Res BW 300 Hz
#VBW 1 kHz
Sweep 1.054 s (601 pts)
Copyright 2000-2010 Agilent Technologies

8 FCC §2.1051, §22.359, §24.133, §90.210 & §101.111 - Spurious Emissions at Antenna Terminals

8.1 Applicable Standard

The most stringent limit of 43+10*log(P in Watts) dBc is applied for worst case.

8.2 Test Procedure

The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 100 kHz. Sufficient scans were taken to show any out of band emissions up to 10th harmonic.

8.3 Test Environmental Conditions

Temperature:	24~26 °C
Relative Humidity:	48~49 %
ATM Pressure:	101.0~101.9 kPa

The testing was performed by Dennis Huang on 2010-10-11.

8.4 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date
Agilent	Spectrum Analyzer	E4440A	US45303156	2010-08-09

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

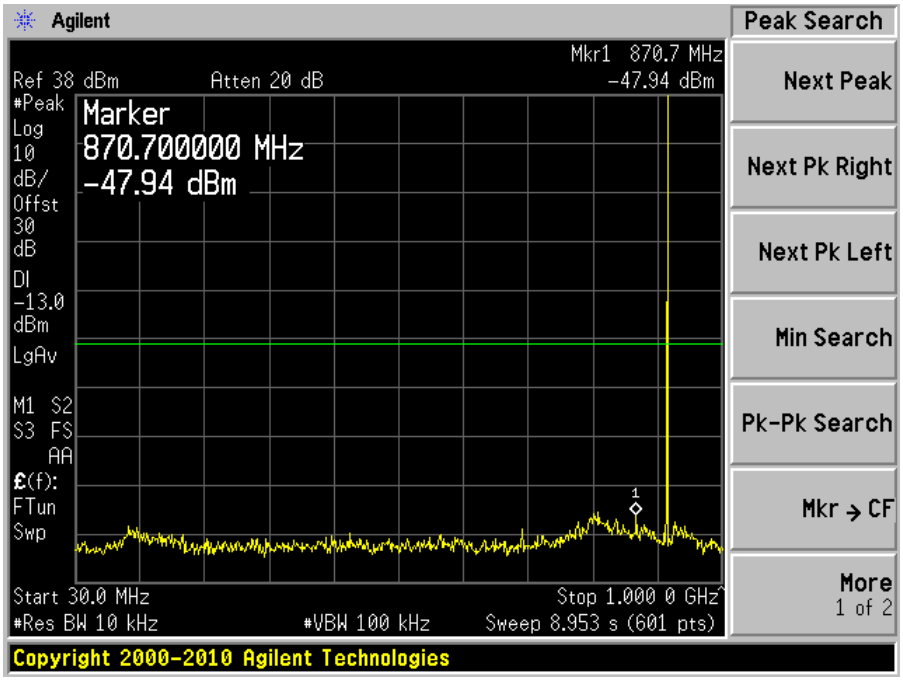
8.5 Test Results

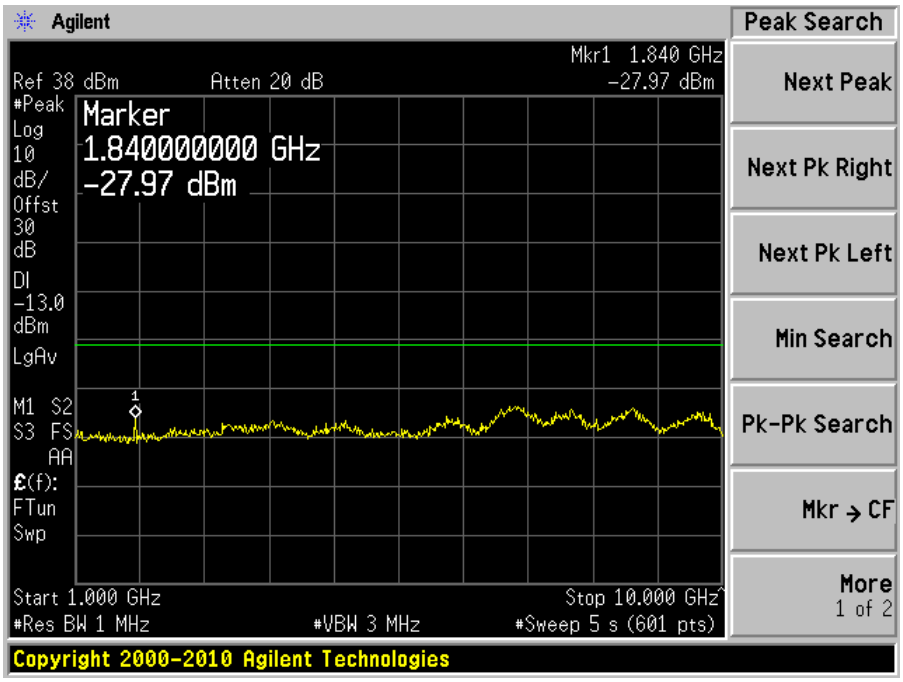
Please refer to the hereinafter plots.

FCC Part 90 (917-930 MHz, 935-940 MHz)

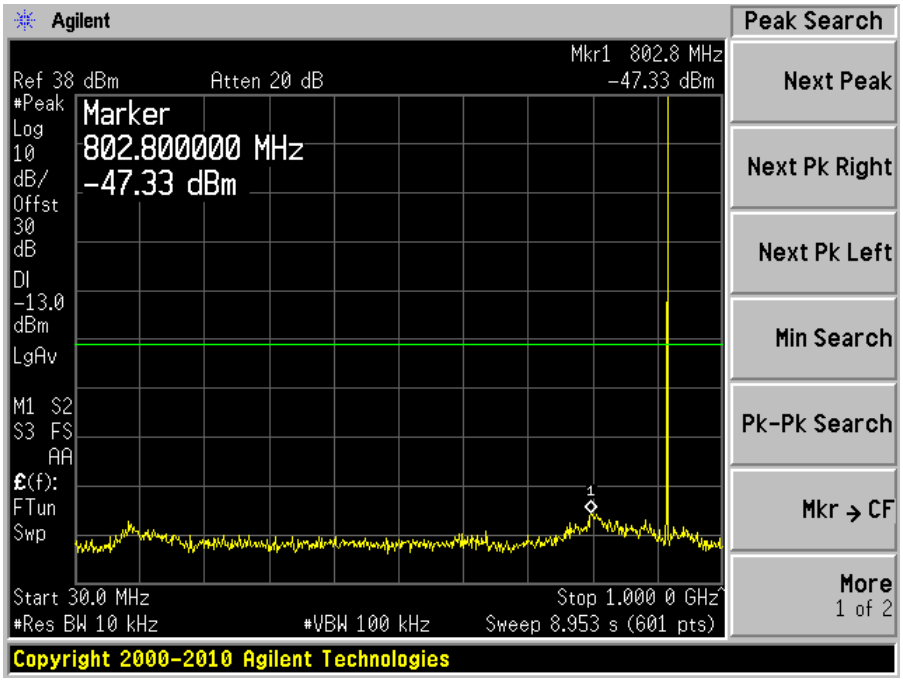
Worst Frequency: 917 MHz

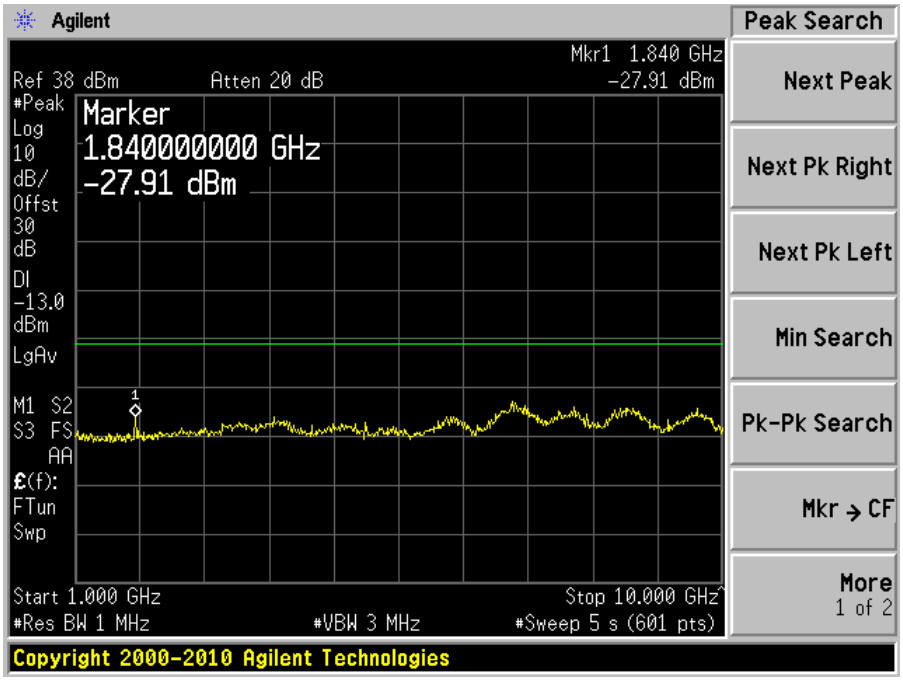
25 kHz Channel Space, 917 MHz





12.5 kHz Channel Space, 917 MHz

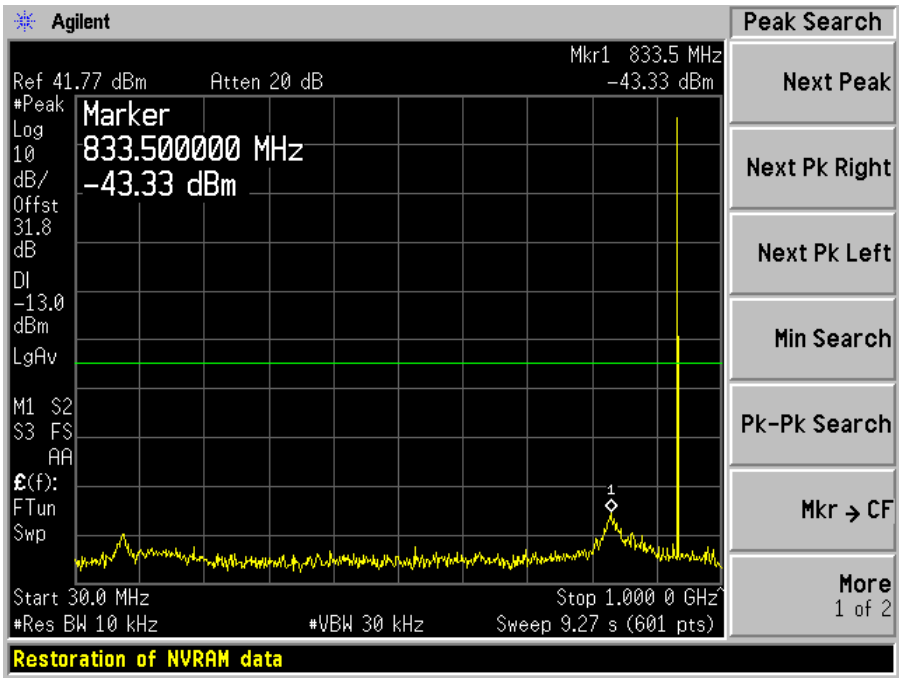


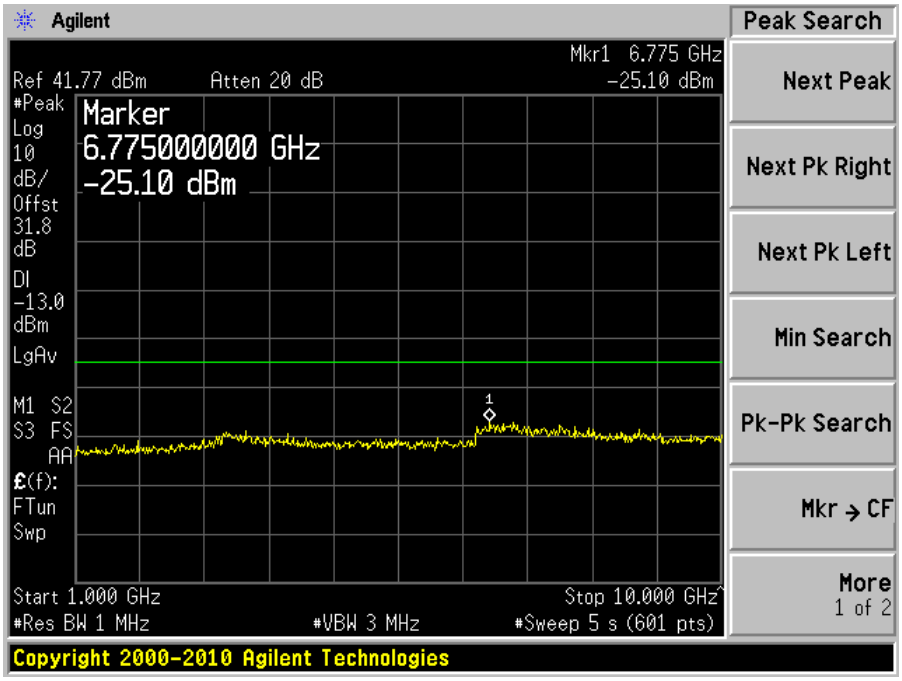


FCC Part 22, 24 & 101 (930-935 MHz, 940-950 MHz)

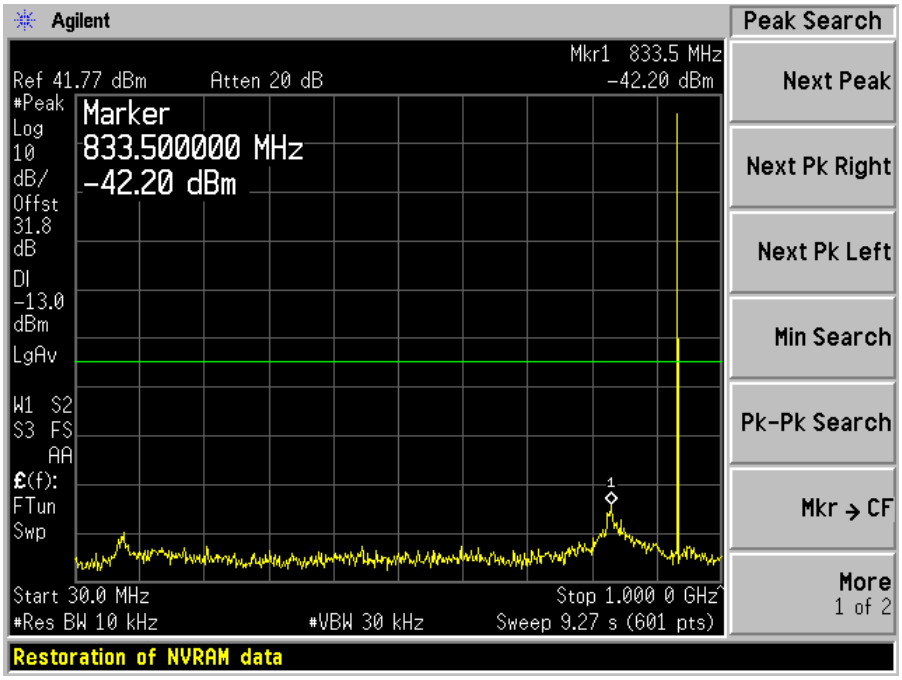
Worst Frequency: 933.5 MHz

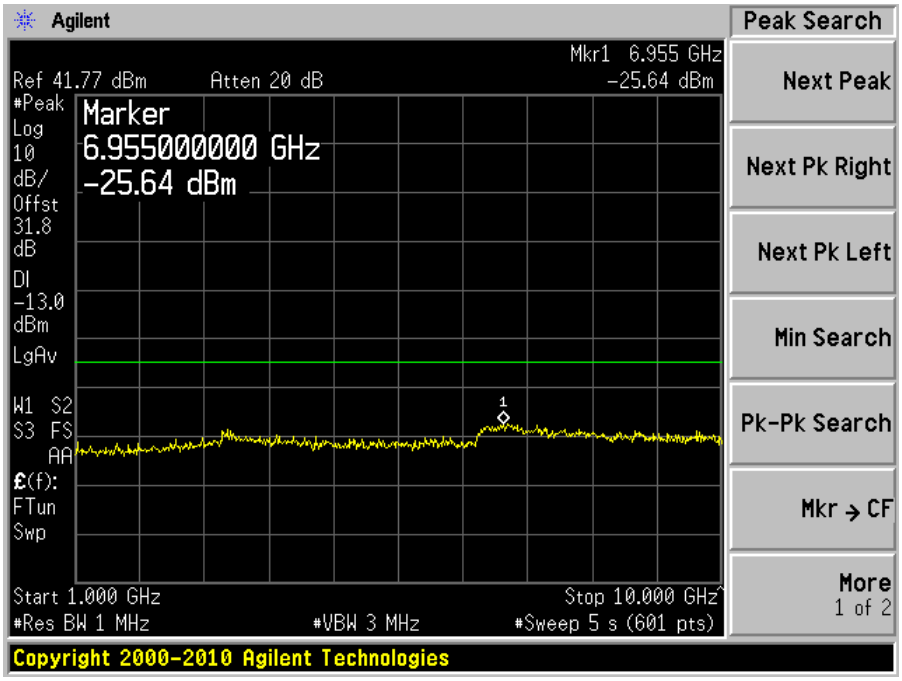
25 kHz Channel Space, 933.5 MHz





12.5 kHz Channel Space, 933.5 MHz





9 FCC §2.1055 (d), §22.355, §24.135, §90.213 & §101.101 - Frequency Stability

9.1 Applicable Standard

The limit is ±1.0 ppm.

9.2 Test Procedure

Frequency Stability vs. Temperature: The equipment under test was connected to an external DC power supply and the RF output was connected to the Spectrum Analyzer via feed-through attenuators. The EUT was placed inside the temperature chamber. The DC leads and RF output cable exited the chamber through an opening made for the purpose.

After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from the Spectrum Analyzer.

Frequency Stability vs. Voltage: An external variable DC power supply Source. The voltage was set to 110% of the nominal value and was then decreased until the transmitter light no longer illuminated; i.e., the end point. The output frequency was recorded for each voltage.

9.3 Test Environmental Conditions

Temperature:	24~26 °C
Relative Humidity:	48~49 %
ATM Pressure:	101.0~101.9 kPa

The testing was performed by Dennis Huang on 2010-10-11.

9.4 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date
Agilent	Spectrum Analyzer	E4440A	US45303156	2010-08-09
Electronic Measurements Inc.	DC power supply	TCR 20S30-20V	84A-6267	N/A
ESPEC	Oven, Temperature	ESL-4CA	18010	N/A

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

9.5 Test Result

FCC Part 90 (917-930 MHz, 935-940 MHz)

25 kHz Channel Space

Frequency vs. Temperature

Test Condition		Reference Frequency (MHz)	Measured Frequency (MHz)	Frequency Error (PPM)	Limit (PPM)
Voltage (Vdc)	Temperature (°C)				
13.8	60	917	916.9992	-0.82914	± 1.0
13.8	50	917	916.9991	-0.92555	± 1.0
13.8	40	917	916.9992	-0.8827	± 1.0
13.8	30	917	917.0004	0.374933	± 1.0
13.8	20	917	917.0006	0.685592	± 1.0
13.8	10	917	917.0006	0.589181	± 1.0
13.8	0	917	917.0005	0.484199	± 1.0
13.8	-10	917	917.0002	0.160686	± 1.0
13.8	-20	917	916.9999	-0.14997	± 1.0
13.8	-30	917	916.9991	-0.93626	± 1.0

Frequency vs. Voltage

Test Condition		Reference Frequency (MHz)	Measured Frequency (MHz)	Frequency Error (PPM)	Limit (PPM)
Voltage (Vdc)	Temperature (°C)				
15.18	20	917	917.0008	0.87241	± 1.0
12.42	20	917	917.0009	0.948746	± 1.0

12.5 kHz Channel Space

Frequency vs. Temperature

Test Condition		Reference Frequency (MHz)	Measured Frequency (MHz)	Frequency Error (PPM)	Limit (PPM)
Voltage (Vdc)	Temperature (°C)				
13.8	60	917	916.9993	-0.75027	± 1.0
13.8	50	917	916.9992	-0.84951	± 1.0
13.8	40	917	916.9991	-0.93348	± 1.0
13.8	30	917	917.0003	0.363141	± 1.0
13.8	20	917	917.0008	0.916031	± 1.0
13.8	10	917	917.0008	0.832061	± 1.0
13.8	0	917	917.0007	0.717557	± 1.0
13.8	-10	917	917.0004	0.390403	± 1.0
13.8	-20	917	916.9996	-0.38495	± 1.0
13.8	-30	917	916.9991	-0.95638	± 1.0

Frequency vs. Voltage

Test Condition		Reference Frequency (MHz)	Measured Frequency (MHz)	Frequency Error (PPM)	Limit (PPM)
Voltage (Vdc)	Temperature (°C)				
15.18	20	917	917.0009	0.943293	± 1.0
12.42	20	917	917.0009	0.931298	± 1.0

FCC Part 22, 24 & 101 (930-935 MHz, 940-950 MHz)

25 kHz Channel Space

Frequency vs. Temperature

Test Condition		Reference Frequency (MHz)	Measured Frequency (MHz)	Frequency Error (PPM)	Limit (PPM)
Voltage (Vdc)	Temperature (°C)				
13.8	60	933.5	933.49986	-0.14997	± 1.0
13.8	50	933.5	933.499742	-0.27638	± 1.0
13.8	40	933.5	933.499804	-0.20996	± 1.0
13.8	30	933.5	933.500225	0.241028	± 1.0
13.8	20	933.5	933.500468	0.501339	± 1.0
13.8	10	933.5	933.500607	0.650241	± 1.0
13.8	0	933.5	933.500589	0.630959	± 1.0
13.8	-10	933.5	933.500266	0.284949	± 1.0
13.8	-20	933.5	933.499663	-0.36101	± 1.0
13.8	-30	933.5	933.499406	-0.63631	± 1.0

Frequency vs. Voltage

Test Condition		Reference Frequency (MHz)	Measured Frequency (MHz)	Frequency Error (PPM)	Limit (PPM)
Voltage (Vdc)	Temperature (°C)				
15.18	20	933.5	933.499368	-0.67702	± 1.0
12.42	20	933.5	933.499339	-0.70809	± 1.0

12.5 kHz Channel Space

Frequency vs. Temperature

Test Condition		Reference Frequency (MHz)	Measured Frequency (MHz)	Frequency Error (PPM)	Limit (PPM)
Voltage (Vdc)	Temperature (°C)				
13.8	60	933.5	933.499733	-0.28602	± 1.0
13.8	50	933.5	933.499647	-0.37815	± 1.0
13.8	40	933.5	933.4997	-0.32137	± 1.0
13.8	30	933.5	933.500151	0.161757	± 1.0
13.8	20	933.5	933.500389	0.416711	± 1.0
13.8	10	933.5	933.500538	0.576326	± 1.0
13.8	0	933.5	933.500529	0.566685	± 1.0
13.8	-10	933.5	933.500227	0.243171	± 1.0
13.8	-20	933.5	933.499565	-0.46599	± 1.0
13.8	-30	933.5	933.499411	-0.63096	± 1.0

Frequency vs. Voltage

Test Condition		Reference Frequency (MHz)	Measured Frequency (MHz)	Frequency Error (PPM)	Limit (PPM)
Voltage (Vdc)	Temperature (°C)				
15.18	20	933.5	933.499384	-0.65988	± 1.0
12.42	20	933.5	933.499364	-0.68131	± 1.0

10 FCC §2.1053, §22.359, §24.133, §90.210 & §101.111 – Field Strength of Spurious Radiation

10.1 Applicable Standard

FCC §2.1053 (a) Measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data shall be supplied showing the magnitude of each harmonic and other spurious emission. For this test, single sideband, independent sideband, and controlled carrier transmitters shall be modulated under the conditions specified in paragraph (c) of §2.1049, as appropriate. and §90.210(b),(d): Except as indicated elsewhere in this part, transmitters used in the radio services governed by this part must comply with the emission masks outlined in this section. Unless otherwise stated, per paragraphs (d)(4), (e)(4), and (m) of this section, measurements of emission power can be expressed in either peak or average values provided that emission powers are expressed with the same parameters used to specify the unmodulated transmitter carrier power. For transmitters that do not produce a full power unmodulated carrier, reference to the unmodulated transmitter carrier power refers to the total power contained in the channel bandwidth. Unless indicated elsewhere in this part, the table in this section specifies the emission masks for equipment operating in the frequency bands governed under this part.

10.2 Test Procedure

The transmitter was placed on a Styrofoam with wooden turntable, and it was normal transmitting with 50ohm termination which was also placed on the turntable.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.

The frequency range up to tenth harmonic of the fundamental frequency was investigated.

Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

Spurious emissions in dB = 10 lg (TXpwr in Watts/0.001) – the absolute level

10.3 Test Environmental Conditions

Temperature:	22~25°C
Relative Humidity:	48~49 %
ATM Pressure:	101~101.9 kPa

The testing was performed by Dennis Huang 2010-10-13 in 5 meter chamber #3.

10.4 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100337	2010-03-24
Agilent	Spectrum Analyzer	E4440A	US45303156	2010-08-09
Sunol Science Corp	System Controller	SC99V	122303-1	N/R
Sunol Science Corp	Combination Antenna	JB3	A0020106-3	2010-06-16
Hewlett Packard	Pre amplifier	8447D	2944A06639	2010-06-18
A.R.A Inc	Horn antenna	DRG-1181A	1132	2009-10-27
Mini-Circuits	Pre Amplifier	ZVA-183-S	570400946	2010-05-0

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

10.5 Test Result

Worst Margin: -7.71 dB at 3734 MHz in the Vertical polarization.

25 kHz Channel Space, 933.5 MHz

Indicated		Turntable Azimuth Degrees	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Freq. (MHz)	Amp. (dBuV)		Height (m)	Polar (H/V)	Freq. (MHz)	Level (dBm)	Antenna Cord. (dBi)	Cable Loss (dB)	Absolute Level (dBm)		
1867	71.28	179	1.18	V	1867	-29.54	9.6	1.34	-21.28	-13	-8.28
1867	66.46	133	1.00	H	1867	-34.36	9.6	1.34	-26.1	-13	-13.1
2800	62.88	166	1.27	V	2800	-36.81	9.7	1.68	-28.79	-13	-15.79
2800	56.78	194	1.51	H	2800	-42.91	9.7	1.68	-34.89	-13	-21.89
3734	64.71	199	1.73	V	3734	-30.65	10.5	1.68	-21.83	-13	-8.83
3734	57.05	102	1.00	H	3734	-38.31	10.5	1.68	-29.49	-13	-16.49

12.5 kHz Channel Space, Middle Channel – 933.5 MHz

Indicated		Turntable Azimuth Degrees	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Freq. (MHz)	Amp. (dBuV)		Height (m)	Polar (H/V)	Freq. (MHz)	Level (dBm)	Antenna Cord. (dBi)	Cable Loss (dB)	Absolute Level (dBm)		
1867	71.48	180	1.18	V	1867	-29.34	9.6	1.34	-21.08	-13	-8.08
1867	66.76	133	1.00	H	1867	-34.06	9.6	1.34	-25.8	-13	-12.8
2800	63.1	168	1.26	V	2800	-36.59	9.7	1.68	-28.57	-13	-15.57
2800	56.8	193	1.51	H	2800	-42.89	9.7	1.68	-34.87	-13	-21.87
3734	65.83	197	1.73	V	3734	-29.53	10.5	1.68	-20.71	-13	-7.71
3734	56.14	102	1.00	H	3734	-39.22	10.5	1.68	-30.4	-13	-17.4