Lab Code: 200167-0

FCC PART 22, 24, 90, 101

TEST AND MEASUREMENT REPORT

For

TPL Communications Inc.

3370 San Fernando Road, Unit 206

Los Angeles, CA 90065, USA

FCC ID: BBDPA9096-350

Report Type: Original Report	**Product Type:** RF Power Amplifier
Test Engineer:	Kevin Li
Report Number:	R1105201
Report Date:	2011-09-22
Reviewed By:	Victor Zhang EMC/RF Lead
Prepared By: (84)	Bay Area Compliance Laboratories Corp. 1274 Anvilwood Avenue, Sunnyvale, CA 94089, USA 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	R1105201	Original Report	2011-09-22

1 GENERAL INFORMATION

1.1 Product Description for Equipment under Test (EUT)

This test and measurement report was prepared on behalf of *TPL Communications, Inc*., and their product, FCC ID: BBDPA9096-350, model: PA9096-350, which will henceforth be referred to as the EUT "Equipment Under Test". The EUT is designed to increase the power output of a repeater transmitter used in the Private Land Mobile and Public Mobile Services for commercial and public safety communications.

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

- 920-930 MHz: Part 90
- 930-935 MHz: Part 22, 24 & 101
- 935-940 MHz: Part 90

Specifications	
Frequency Bands	920-930 MHz, 930-935 MHz, 935-940 MHz
Modulation Type	FM
RF Output Power	350 Watts
Channel Spacing	25 kHz/12.5 kHz
Power Supply	120V/60Hz

1.2 Mechanical Description of EUT

The EUT dimension is approximately 381mm (L) x 483 mm (W) x 290 mm (H) and weighs approximately 21.8 kg.

The test data gathered are from typical production sample, serial number: 1000, provided by the Manufacturer.

1.3 Objective

This type approval report is prepared on behalf of *TPL Communications, Inc.,* accordance with Part 22, 24, 90, 101.

1.4 Related Submittal(s)/Grant(s)

No Related Submittals

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 EUT Exercise Software

Signal was sent through EUT using a signal generator.

2.3 Equipment Modifications

No modification was made to the EUT

2.4 Special Equipment

No special equipment was used during testing

2.5 Local Support Equipment

Manufacturers	Descriptions	Models	Serial Numbers
Rohde & Schwarz	Signal Generator	SMIQ03	849192/0085

2.6 EUT Internal Configuration Details

Manufacturer	Description	Model	Serial Number
TPL	Controller Board	101298	-
TPL	Current Sensor	102645	-
TPL	Display Board	102424	-
TPL	Directional Coupler	102181A	-
TPL	Voltage Regulator	-	-
TPL	RF Input Sensor	102677	-

2.7 External I/O Cabling List and Details

Cable Descriptions	Length (m)	From	To
RF Cable	< 3	Signal Generator	EUT Input
RF Cable	< 3	EUT Output	Spectrum Analyzer

3 SUMMARY OF TEST RESULTS

FCC Rules	Description of Tests	Results
§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	N/A **
§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	N/A***
§2.1053, §22.359, §24.133, §24.238, §90.210, §90.543(c), §101.111	Field Strength of Spurious Radiation	Compliant

Note: N/A - RF exposure compliance will be addressed at the time of licensing.*
*N/A** - Not applicable due to the EUT is a power amplifier and has no mix circuitry to modulate the RF signal.*
*N/A*** - The EUT is the amplifier and does not contain modulation circuitry or frequency generation.*

4 FCC §2.1046 – RF OUTPUT POWER

4.1 Applicable Standards

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

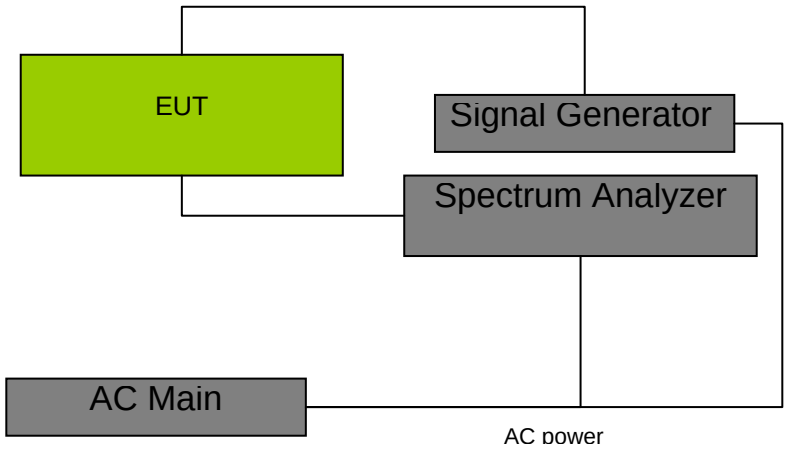
According to §90.205, maximum ERP is dependent upon the station's antenna HAAT and required service area.

4.2 Test Procedure

Conducted:

The RF output of the transmitter was connected to the signal generator and the spectrum analyzer through sufficient attenuation.

4.3 Test Setup Block Diagram



4.4 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates
Agilent	PSA Spectrum Analyzer	E4440A	US45303156	2011-05-10
Rhode & Schwarz	Signal Generator	SMIQ 03	849192/0085	2011-03-31

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

4.5 Test Environmental Conditions

Temperature:	22-24°C
Relative Humidity:	50-55 %
ATM Pressure:	101-102kPa

The testing was performed by Victor Zhang on 2011-05-31 in 5 meter chamber 2.

4.6 Test Results

Input power: 36.5 dBm:

Frequency Range (Rule Part)	Frequency (MHz)	Conducted Output Power (dBm)	Conducted Output Power (Watt)
920-930 MHz (Part 90)	920.1	55.39	345.94
930-935 MHz (Part 22, 24, 101)	930.1	55.46	351.56
930-940 MHz (Part 90)	939.9	55.43	349.14

5 FCC §2.1047 - MODULATION CHARACTERISTIC

5.1 Applicable Standard

According to FCC §2.1047(d) and Part 90, the EUT is an amplifier and there is no modulating/or limiting circuit, therefore modulation characteristic is not presented.

5.2 Test Result

N/A- Not applicable due to the EUT is a power amplifier and has no mix circuitry to modulate the RF signal.

6 FCC §2.1049 – OCCUPIED BANDWIDTH & EMISSION MASK

6.1 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.

6.2 Test Procedure

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

According to the FCC 2-11-04/EAB/RF, Input and output signals were compared to verify that there was no any degradation to the signal due to amplification and conversion from the repeater using an RBW of 300 Hz or 1% of the emission bandwidth. Then the 20 dB & 99% bandwidth was recorded.

6.3 Test Environmental Conditions

Temperature:	22-24°C
Relative Humidity:	50-55 %
ATM Pressure:	101-102kPa

The testing was performed by Victor Zhang on 2011-05-31 in 5 meter chamber 2.

6.4 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates
Agilent	PSA Series Spectrum Analyzer	E4440A	US45303156	2011-05-10
Rhode & Schwarz	Signal Generator	SMIQ 03	849192/0085	2011-03-31

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

6.5 Test Results

Frequency Range: 920-930 MHz under FCC Part 90, Test Frequency: 920.1 MHz

Channel Spacing (kHz)	Modulation	Output Signal 26 dB Emission Bandwidth (kHz)
12.5	FM Voice	9.55
25	FM Voice	18.62

Frequency Range: 930-935MHz under FCC Part 22, 24 & 101, Test Frequency: 930.1 MHz

Channel Spacing (kHz)	Modulation	Output Signal 26 dB Emission Bandwidth (kHz)
12.5	FM Voice	9.54
25	FM Voice	18.61

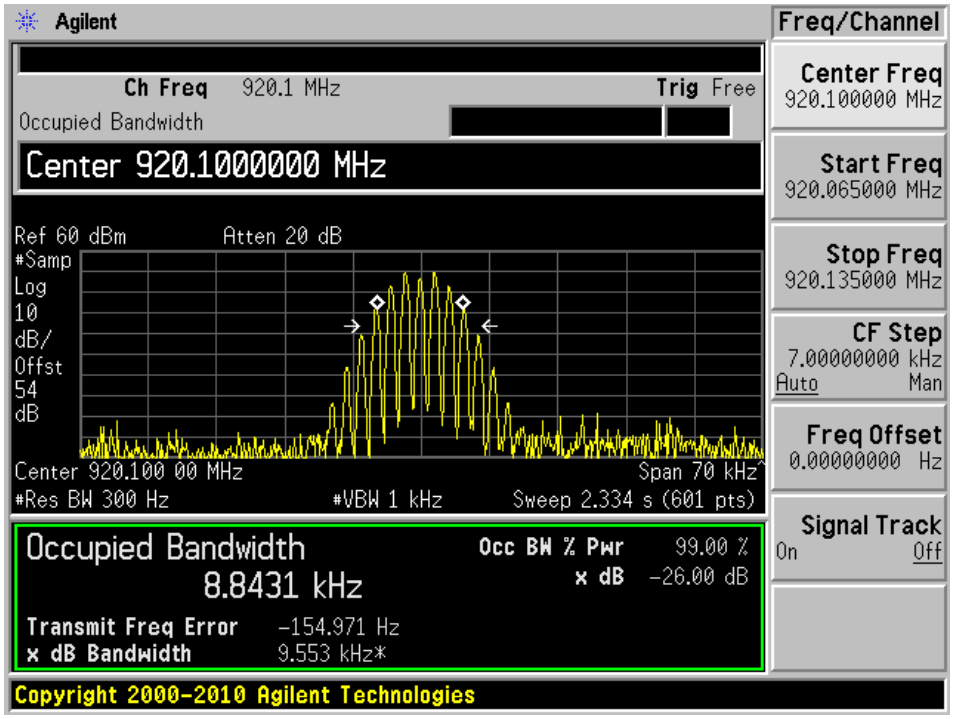
Frequency Range: 935-940MHz under FCC part 90, Test Frequency: 939.9 MHz

Channel Spacing (kHz)	Modulation	Output Signal 26 dB Emission Bandwidth (kHz)
12.5	FM Voice	8.84
25	FM Voice	9.54

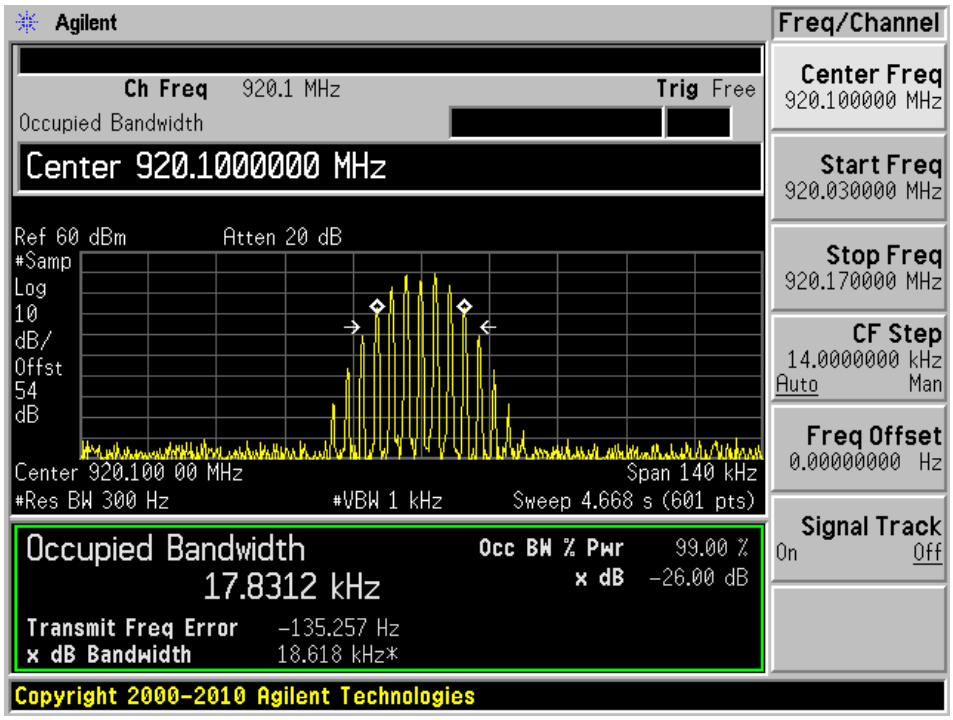
Please refer to the following plots:

920.1 MHz (920-930 MHz under FCC part 90)

12.5 kHz channel Spacing with FM Voice signal

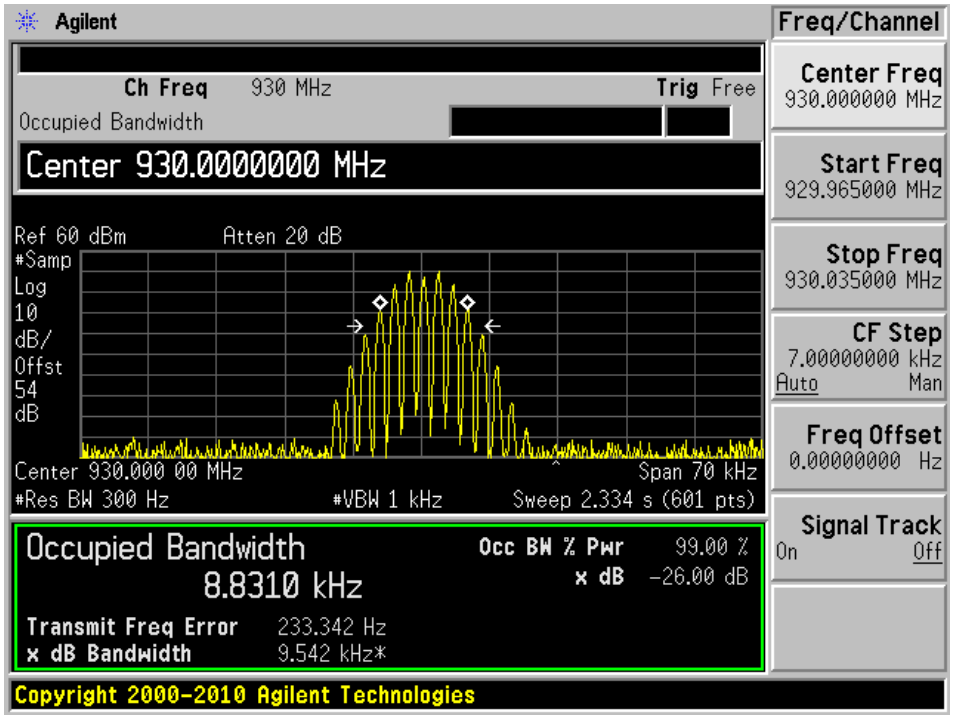


25 kHz channel Spacing with FM modulation FM Voice signal

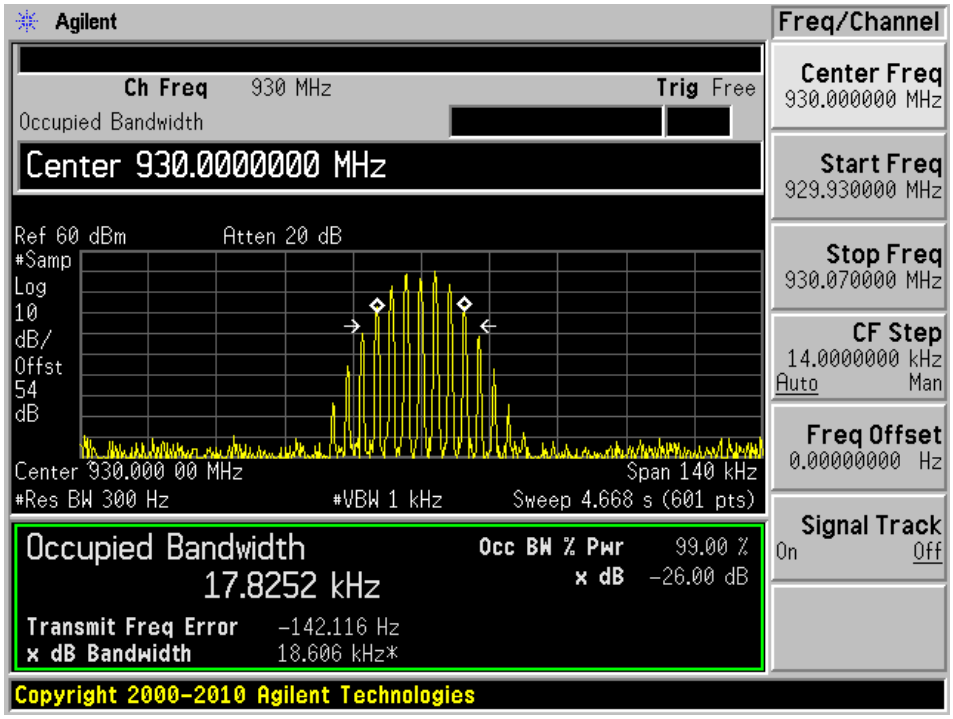


930.1 MHz (930-935 MHz under FCC part 22, 24 & 101)

12.5 kHz channel Spacing with FM Voice signal

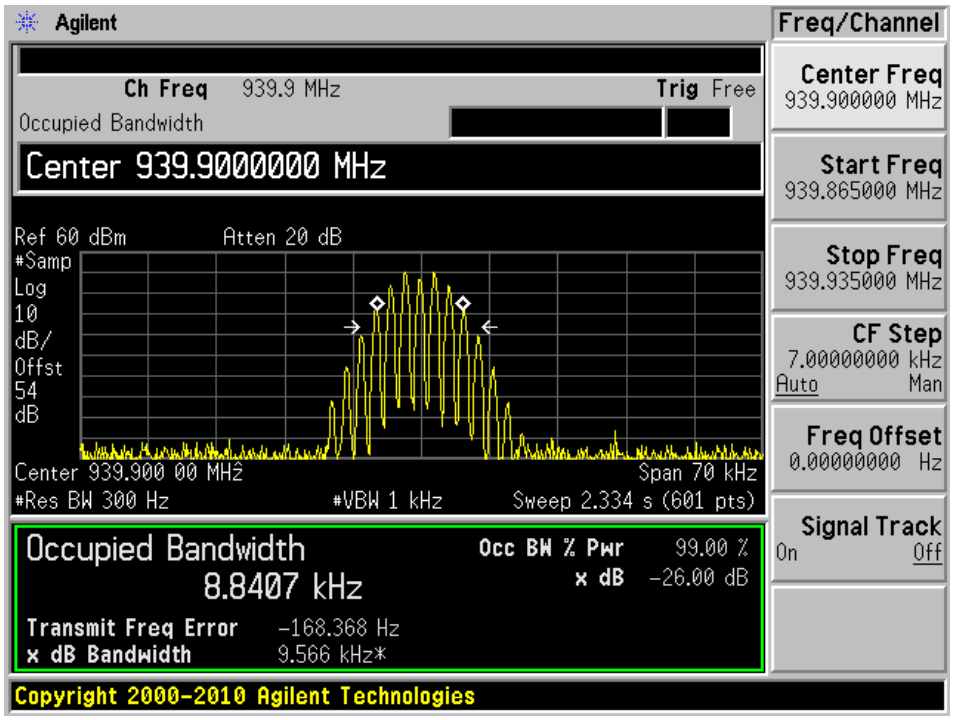


25 kHz channel Spacing with FM modulation FM Voice signal

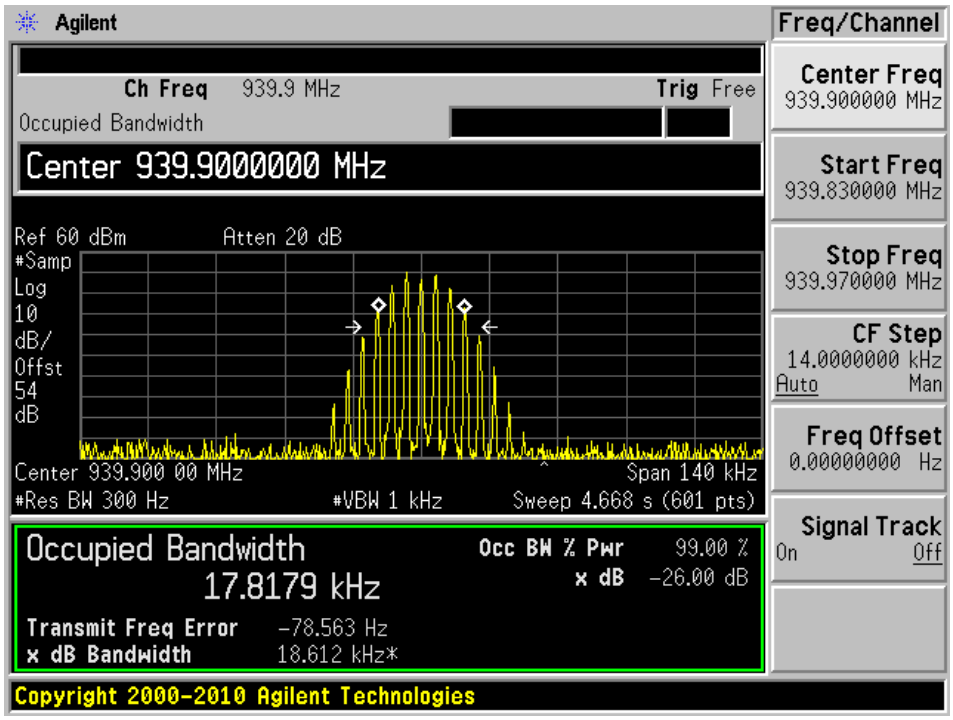


939.9 MHz (935-940 MHz under FCC part 90)

12.5 kHz channel Spacing with FM Voice signal



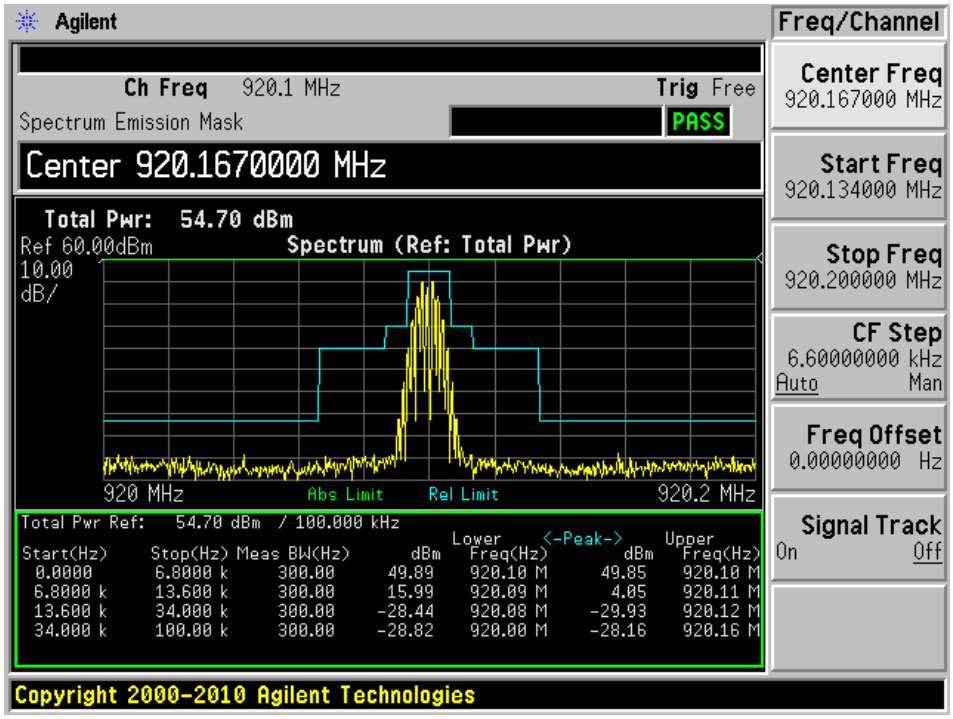
25 kHz channel Spacing with FM modulation FM Voice signal



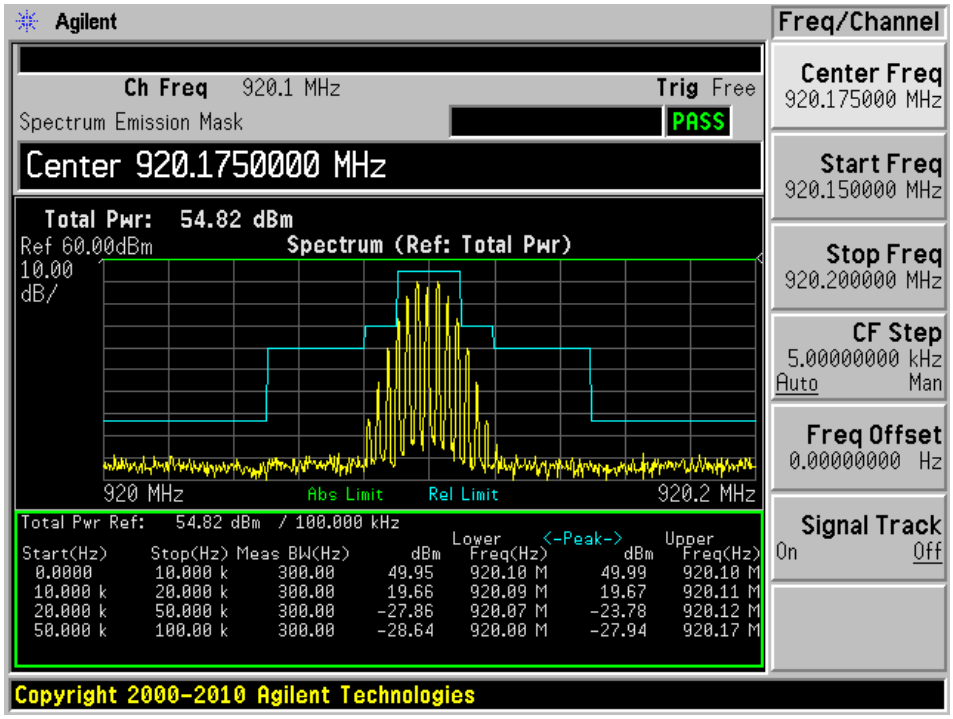
Emission Mask B:

920.1 MHz (920-930 MHz under FCC part 90)

12.5 kHz channel Spacing with FM Voice signal

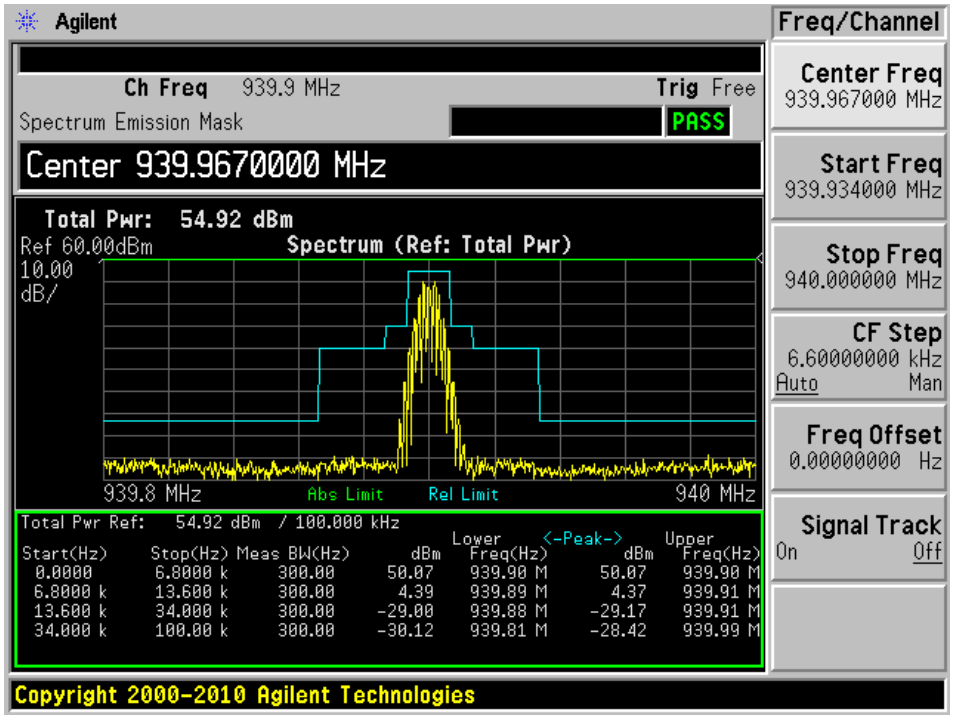


25 kHz channel Spacing with FM Voice signal

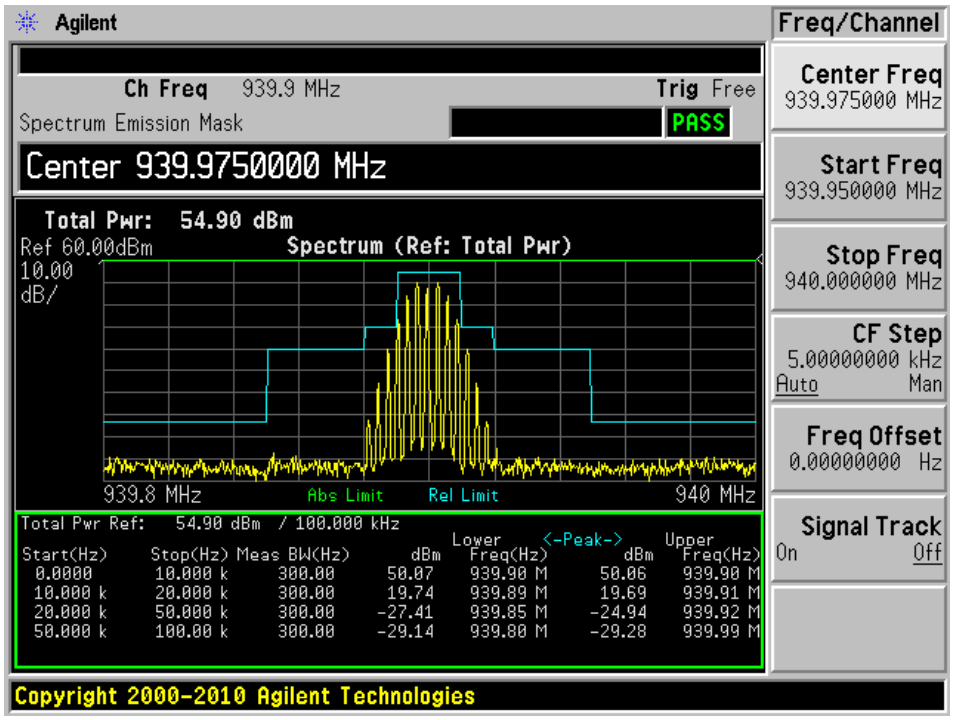


939.9 MHz (935-940 MHz under FCC part 90)

12.5 kHz channel Spacing with FM Voice signal



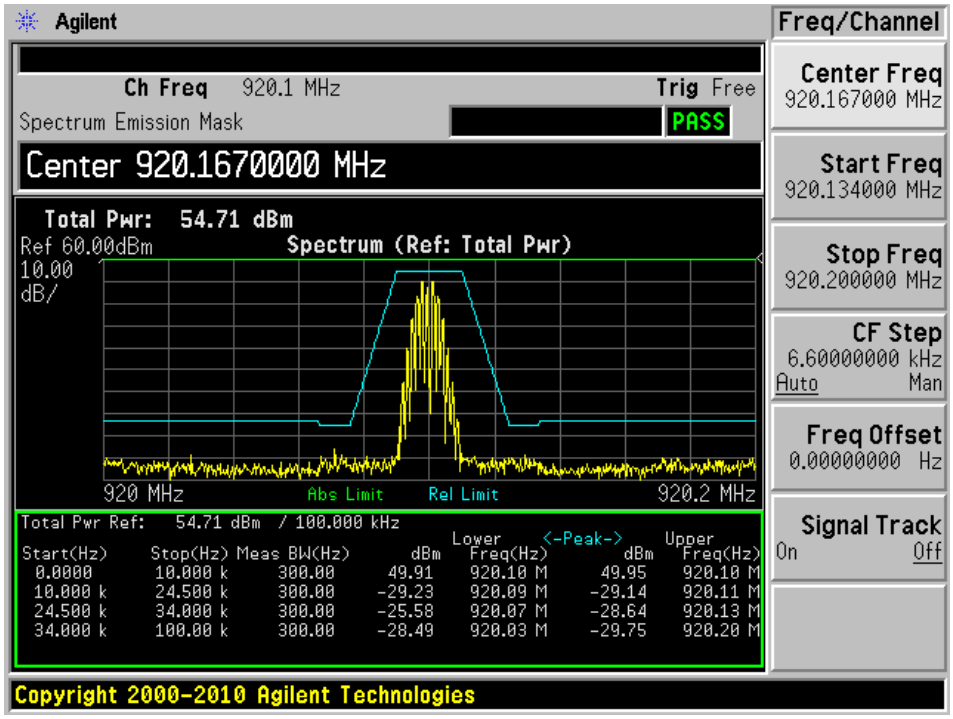
25 kHz channel Spacing with FM Voice signal



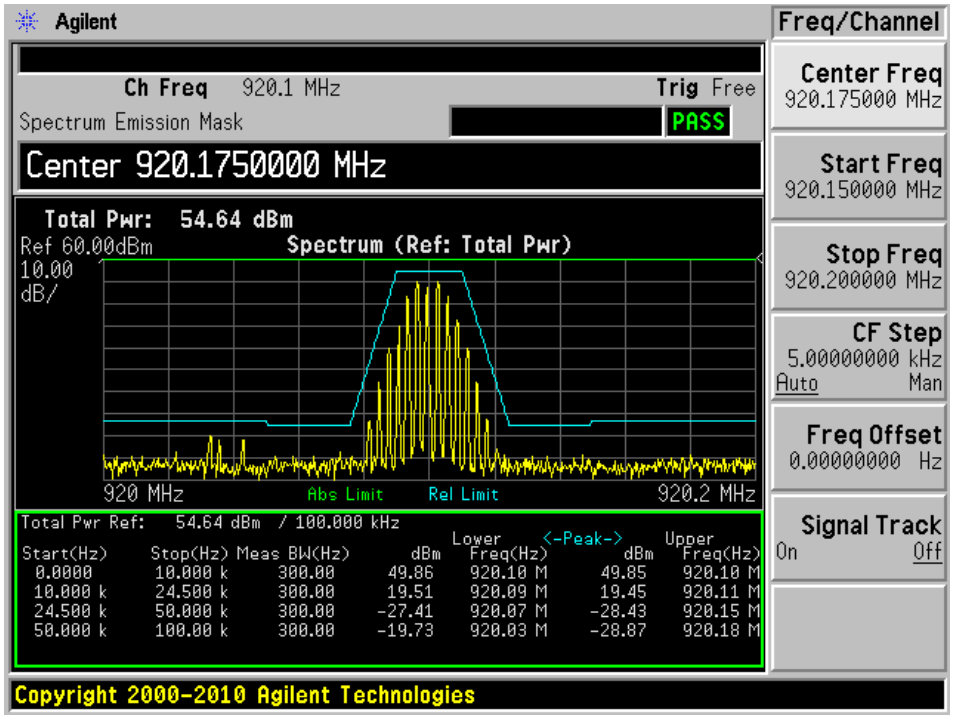
Emission Mask G:

920.1 MHz (920-930 MHz under FCC part 90)

12.5 kHz channel Spacing with FM Voice signal

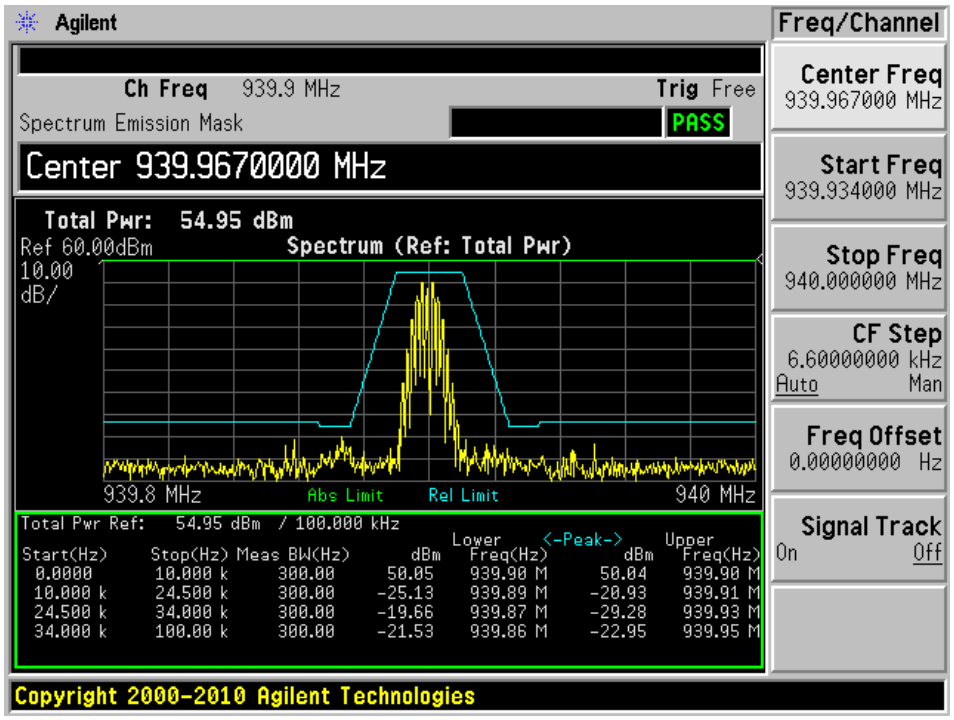


25 kHz channel Spacing with FM Voice signal

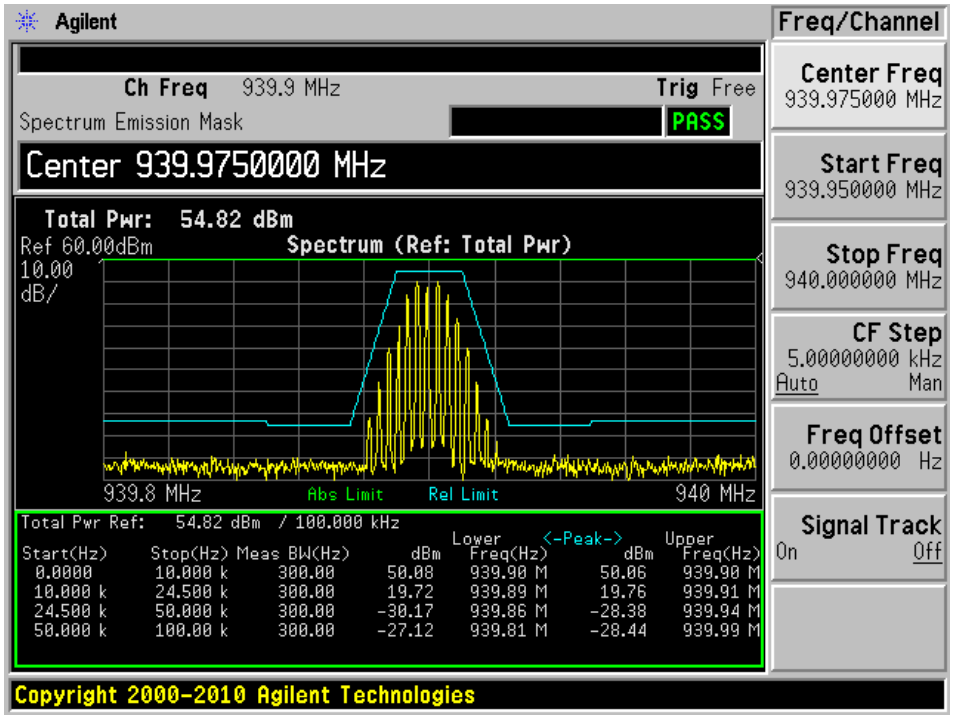


939.9 MHz (935-940 MHz under FCC part 90)

12.5 kHz channel Spacing with FM Voice signal



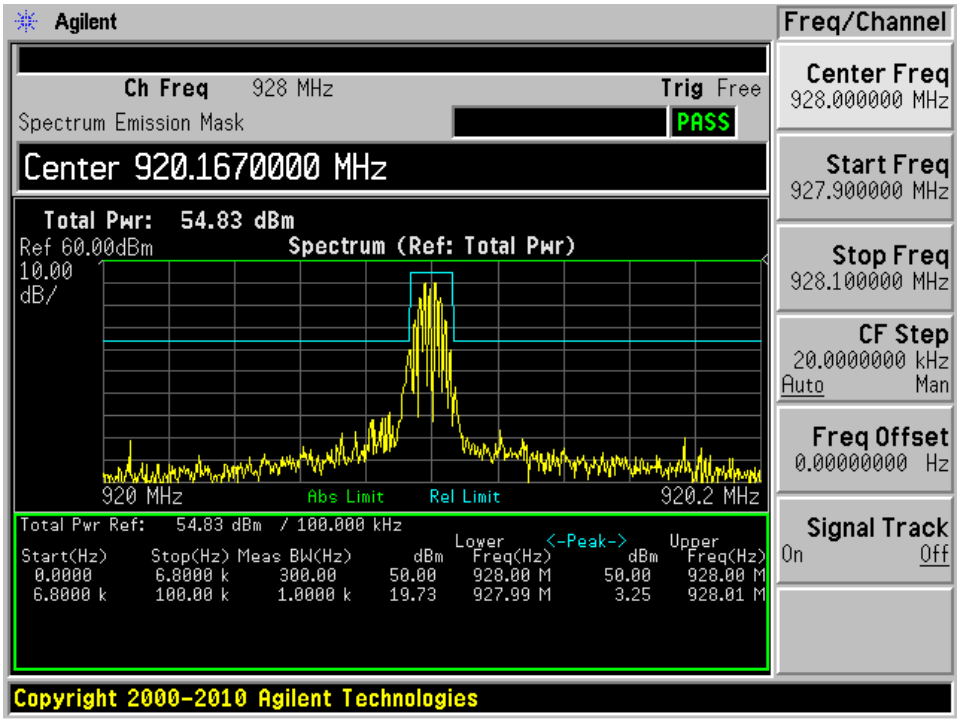
25 kHz channel Spacing with FM Voice signal



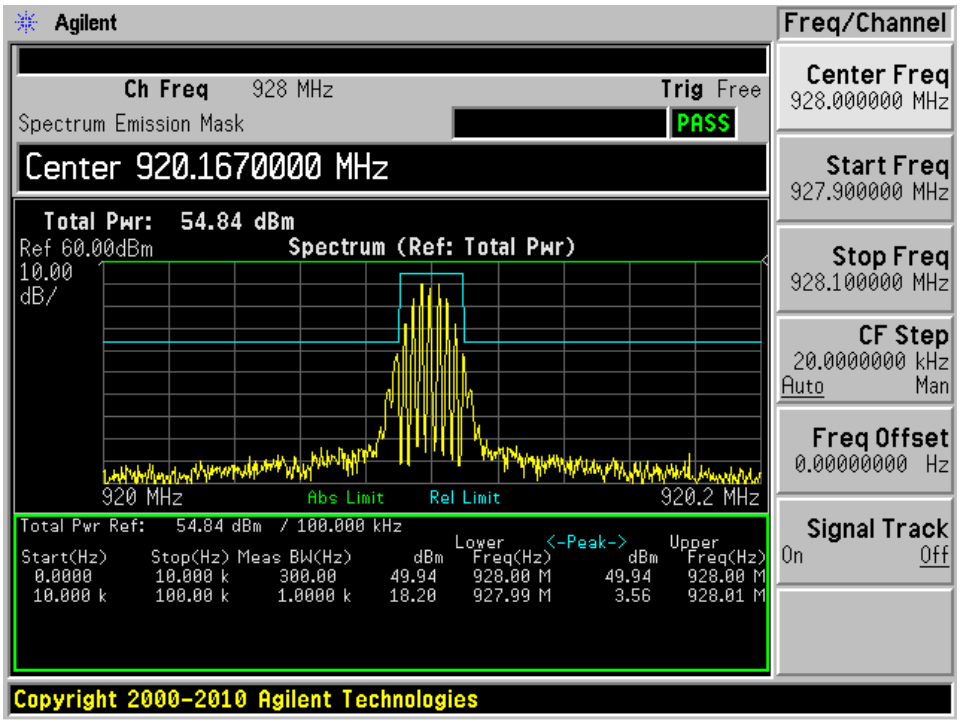
Emission Mask K:

920.1 MHz (920-930 MHz under FCC part 90)

12.5 kHz channel Spacing with FM Voice signal

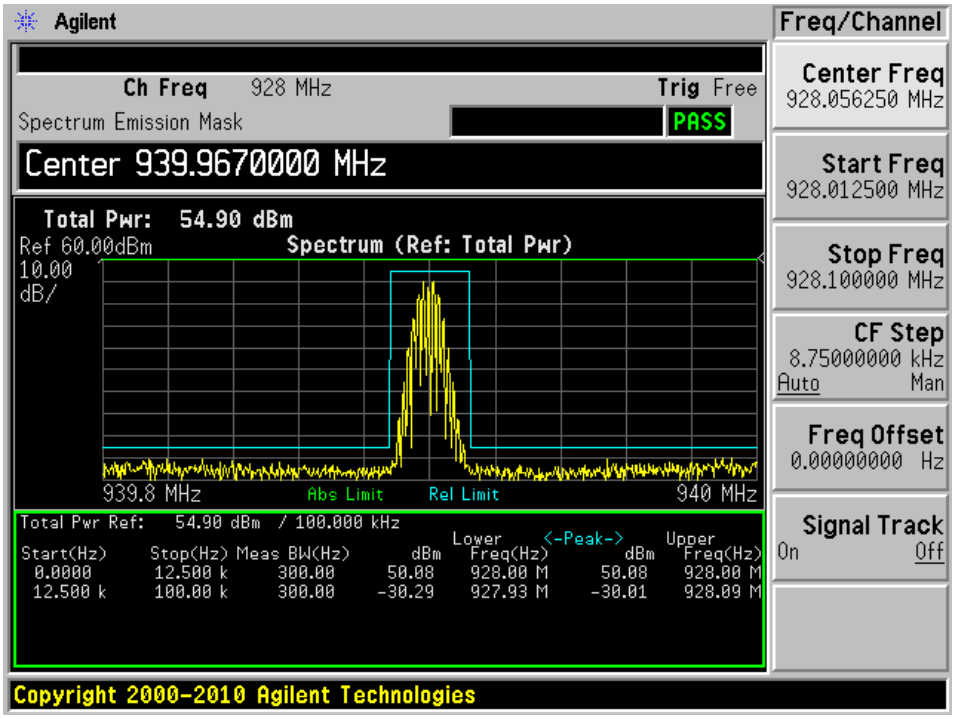


25 kHz channel Spacing with FM Voice signal

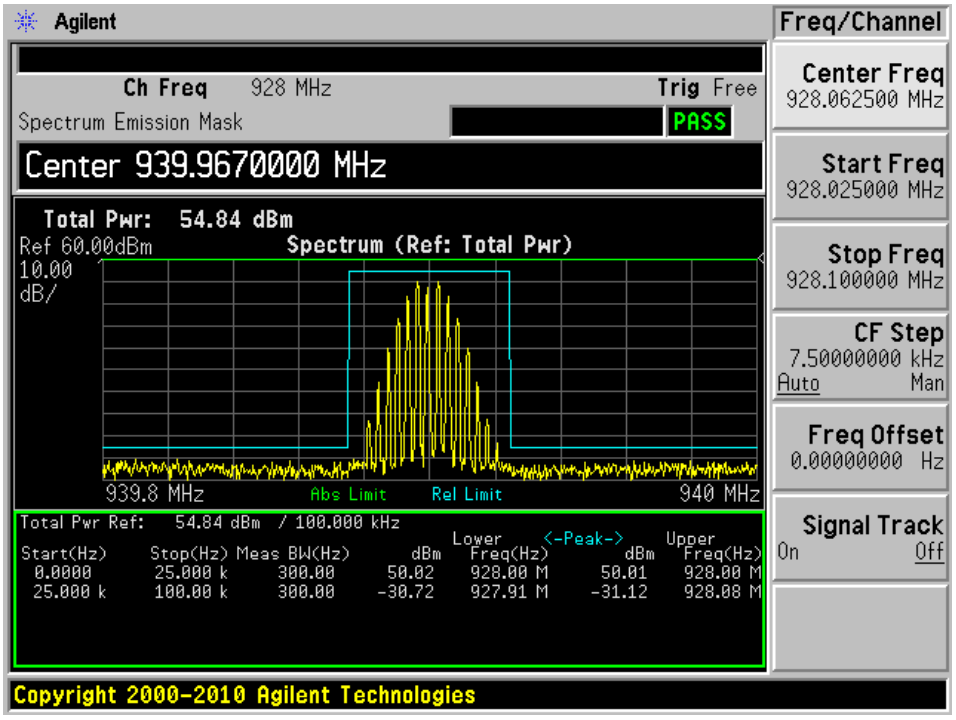


939.9 MHz (935-940 MHz under FCC part 90)

12.5 kHz channel Spacing with FM Voice signal



25 kHz channel Spacing with FM Voice signal



7 FCC §2.1051 - SPURIOUS EMISSIONS AT ANTENNA TERMINALS

7.1 Applicable Standard

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

7.2 Test Procedure

The RF output of the transceiver was connected to a spectrum analyzer and simulator 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.

7.3 Test Environmental Conditions

Temperature:	22-24°C
Relative Humidity:	50-55 %
ATM Pressure:	101-102kPa

The testing was performed by Victor Zhang on 2011-05-31 in 5 meter chamber 2.

7.4 Test Equipment List and Details

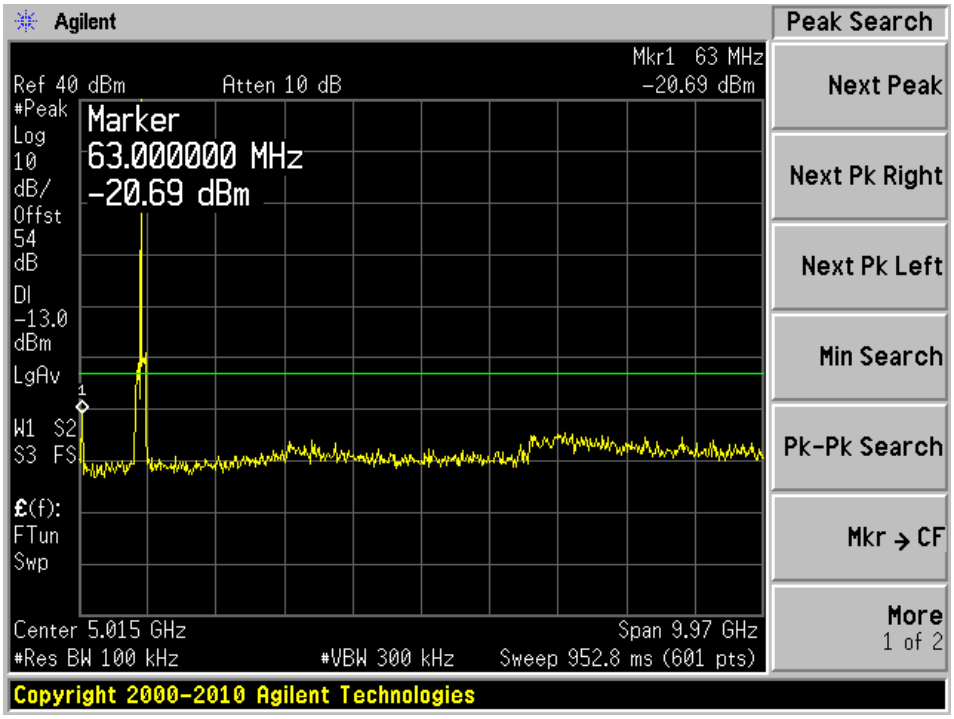
Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates
Agilent	PSA Series Spectrum Analyzer	E4440A	US45303156	2011-05-10
Rhode & Schwarz	Signal Generator	SMIQ 03	849192/0085	2011-03-31

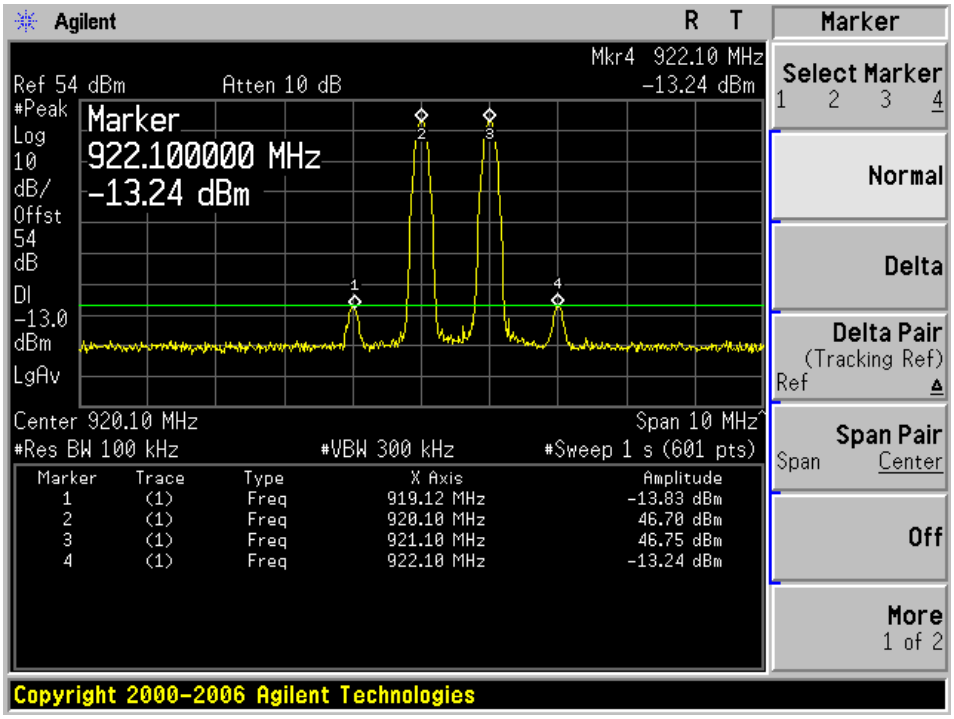
Statement of Traceability: **BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

7.5 Test Results

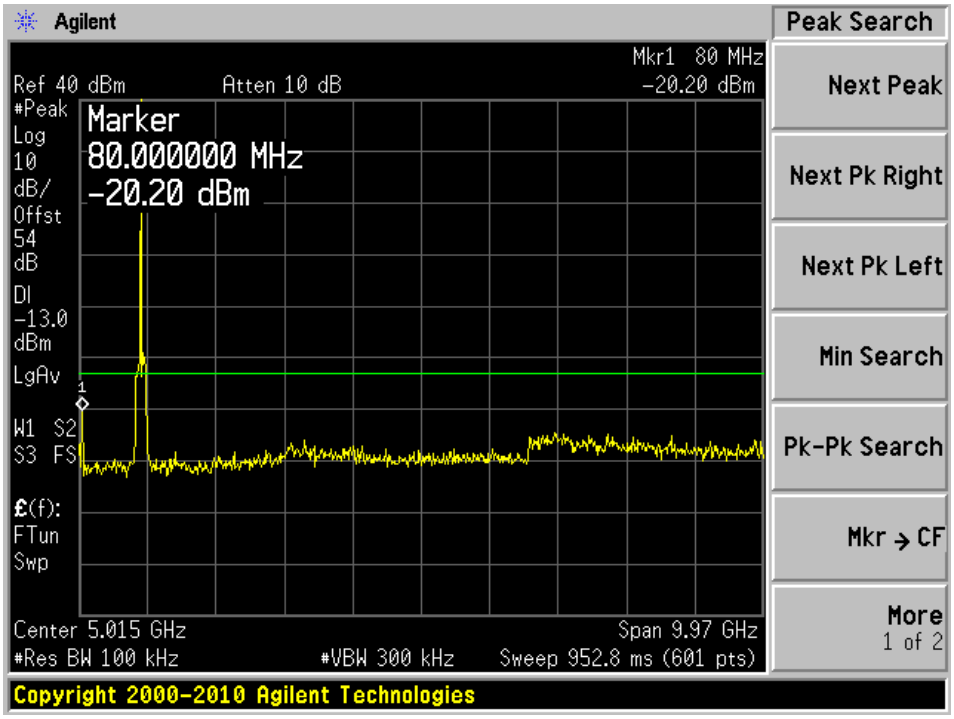
Please refer to the plot hereinafter.

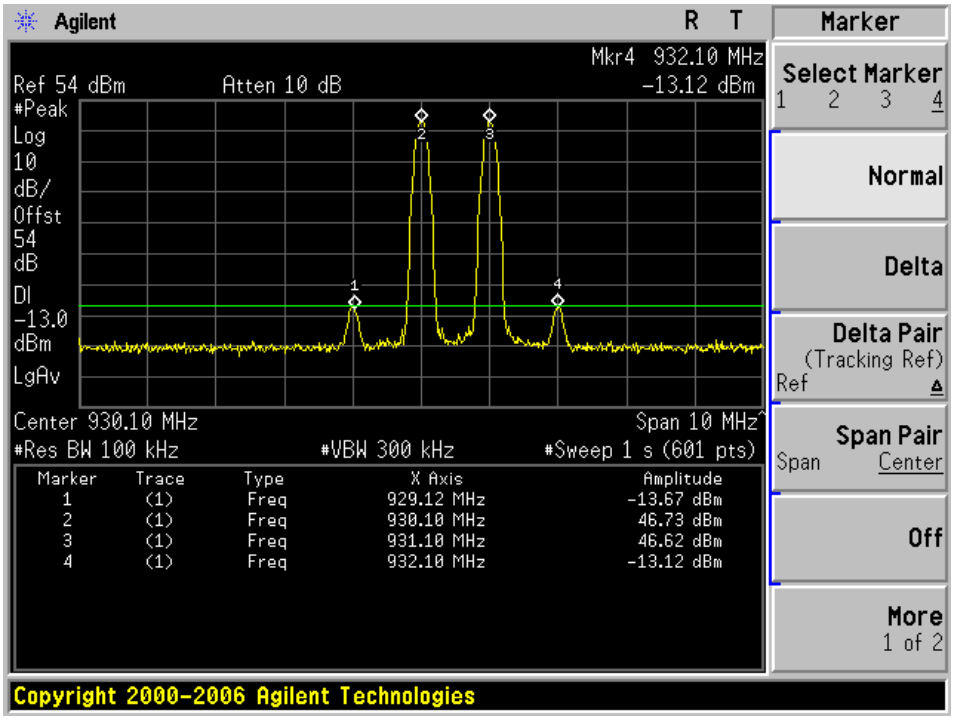
920.1 MHz (920-930 MHz under FCC part 90)



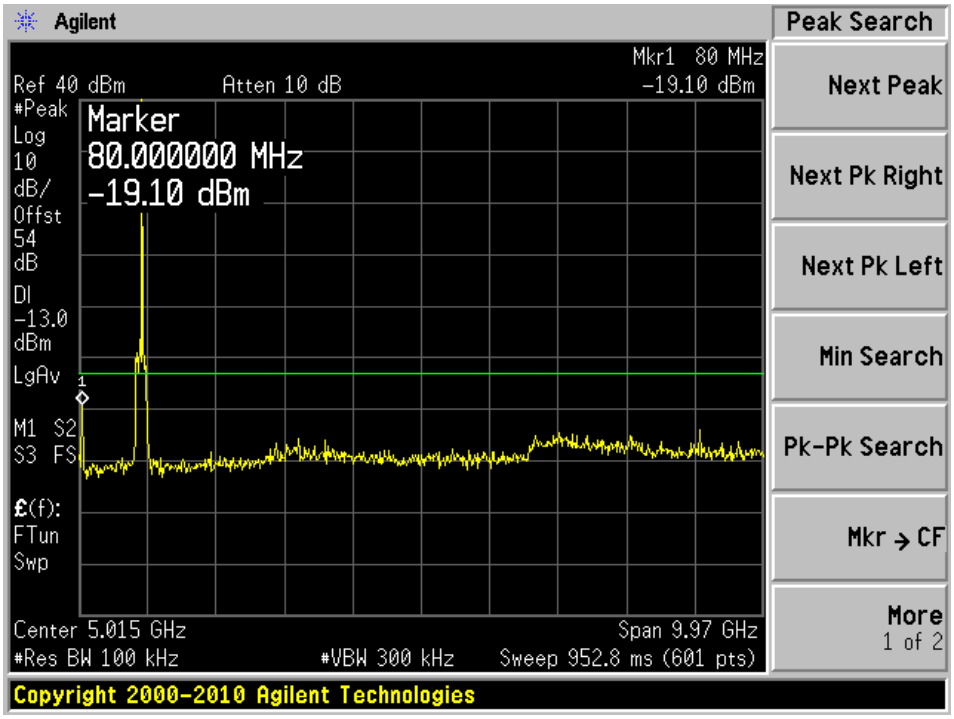


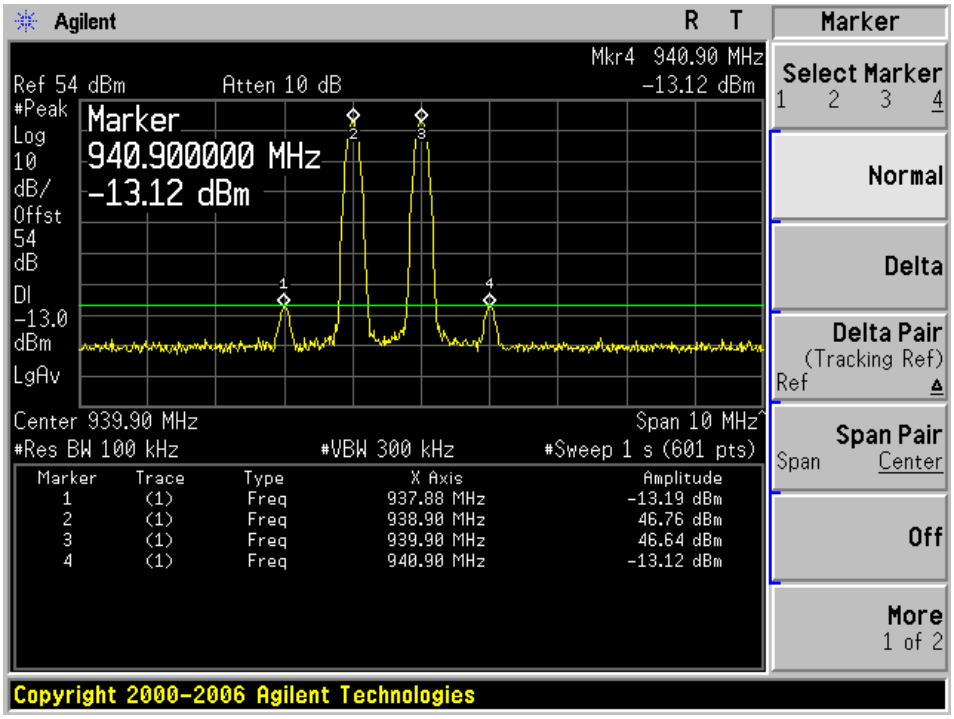
930.1 MHz (930-935 MHz under FCC part 22, 24 & 101)





939.9 MHz (935-940 MHz under FCC part 90)





8 FCC §2.1053 – FIELD STRENGTH OF SPURIOUS RADIATIONS

8.1 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.

8.2 Test Procedure

The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load 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 log (TX Power in Watts/0.001) – the absolute level
Spurious attenuation limit in dB = 43 + 10 Log10 (power out in Watts)

8.3 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date
Agilent	PSA Series Spectrum Analyzer	E4440A	US45303156	2011-05-10
Rhode & Schwarz	Signal Generator	SMIQ 03	849192/0085	2011-03-31
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100337	2011-03-24
Sunol Science Corp	System Controller	SC99V	122303-1	N/R
Sunol Science Corp	Combination Antenna	JB3	A0020106-3	2011-06-29
Hewlett Packard	Pre amplifier	8447D	2944A06639	2011-03-08
A.R.A Inc	Horn antenna	DRG-1181A	1132	2010-11-29
Mini-Circuits	Pre Amplifier	ZVA-183-S	570400946	2011-05-09

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

8.4 Test Environmental Conditions

Temperature:	22-24°C
Relative Humidity:	50-55 %
ATM Pressure:	101-102kPa

The testing was performed by Kevin Li 2011-05-23 in 5 meter Chamber 2.

8.5 Test Results

Worst Frequency Compare to the three different frequency ranges (920-930 MHz, 930-935 MHz and 935-940 MHz) is 930.1 MHz (930-935MHz)

CW Signal Input:

Indicated		Turntable Azimuth (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBuV)		Height (cm)	Polarity (H/V)	Frequency (MHz)	Level (dBm)	Ant. Cord. (dB)	Cable Loss (dB)	Absolute Level (dBm)		
4650	63.45	158	157	V	4650	-40.27	11.6	1.2	-29.87	-13	-16.87
4650	61.88	117	120	H	4650	-39.71	11.6	1.2	-29.31	-13	-16.31
1860	72.36	159	119	V	1860	-32.72	9.46	0.8	-24.06	-13	-11.06
1860	70.19	188	209	H	1860	-35.92	9.46	0.8	-27.26	-13	-14.26
2790	68.86	115	206	V	2790	-34.86	9.73	1	-26.13	-13	-13.13
2790	62.49	185	208	H	2790	-39.1	9.73	1	-30.37	-13	-17.37
3720	70.72	171	145	V	3720	-34.36	10.62	1.1	-24.84	-13	-11.84
3720	64.19	144	130	H	3720	-41.92	10.62	1.1	-32.4	-13	-19.4
165	68.25	161	125	V	165	-36.83	0	0.5	-37.33	-13	-24.33
165	66.54	125	131	H	165	-39.57	0	0.5	-40.07	-13	-27.07

9 FCC §2.1055 – FREQUENCY STABILITY

9.1 Applicable Standard

FCC §2.1055

9.2 Test Result

N/A- Not applicable due to the EUT is the amplifier and does not contain modulation circuitry or frequency generation.