
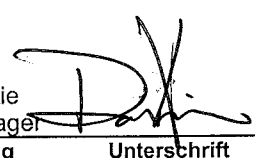


<b>Prüfbericht - Nr.:</b> 16030354 001		<b>Seite 1 von 34</b>	
<i>Test Report No.:</i>		<i>Page 1 of 34</i>	
<b>Auftraggeber:</b> <i>Client:</i>	Sam Ash Music Corporation 262 Duffy Avenue Hicksville, NY 11801 United States		
<b>Gegenstand der Prüfung:</b> <i>Test item:</i>	Wireless Microphone Transmitter		
<b>Bezeichnung:</b> <i>Identification:</i>	AL2	<b>FCC ID:</b> <i>FCC ID</i>	CCRAL2
<b>Wareneingangs-Nr.:</b> <i>Receipt No.:</i>	173059632	<b>Eingangsdatum:</b> <i>Date of receipt:</i>	01.Apr.2011
<b>Prüfört:</b> <i>Testing location:</i>	TÜV Rheinland (Guangdong) Ltd. EMC Laboratory Guangzhou Auto Market, Yuan Gang Section of Guangshan Road, Guangzhou 510650 P. R. China		Listed test laboratory according to FCC rules section 2.948 for measuring devices under Parts 74
<b>Prüfgrundlage:</b> <i>Test specification:</i>	TIA/EIA-603-C-2004 FCC "Rules and Regulations", Part 74: 01, Oct., 2008 Subpart H, Section 74.861		
<b>Prüfergebnis:</b> <i>Test Result:</i>	Der Prüfgegenstand entspricht oben genannter Prüfgrundlage(n). <i>The test item passed the test specification(s).</i>		
<b>Prüflaboratorium:</b> <i>Testing Laboratory:</i>	TÜV Rheinland (Guangdong) Ltd.		
<b>geprüft / tested by:</b>	<b>kontrolliert/ reviewed by:</b>		
13.Apr.2011	Frank Du Project Engineer		13. Apr. 2011
Datum	Name/Stellung	Unterschrift	Datum
Date	Name/Position	Signature	Date
			Liangdong Xie Project Manager
			
			Name/Stellung
			Name/Position
			Unterschrift
			Signature
<b>Sonstiges/ Other Aspects:</b>			
<b>Abkürzungen:</b> P(ass) = entspricht Prüfgrundlage F(ail) = entspricht nicht Prüfgrundlage N/A = nicht anwendbar N/T = nicht getestet			
<b>Abbreviations:</b> P(ass) = passed F(ail) = failed N/A = not applicable N/T = not tested			
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any safety mark on this or similar products.</i>			

## TEST SUMMARY

**5.1 CONDUCTED POWER OUTPUT MEASUREMENT FOR FCC PART 74 PER SECTION 74.861(E)(1)**

RESULT: N/A

**5.2 CONDUCTED SPURIOUS EMISSIONS MEASUREMENT FOR FCC PART 74 PER SECTION 74.861(E)(1)**

RESULT: N/A

**5.3 RADIATED POWER OUTPUT MEASUREMENT FOR FCC PART 74 PER SECTION 74.861(E)(1) and RF-Exposure evaluation**

RESULT: Pass

**5.4 SPURIOUS RADIATION MEASUREMENT FOR FCC PART 74 PER SECTION 74.861(E)(6)(III)**

RESULT: Pass

**5.5 MODULATION CHARACTERISTICS MEASUREMENT**

RESULT: Pass

**5.6 OCCUPIED BANDWIDTH FOR FCC PART 74 PER SECTION 74.861(E)(3), 74.861(E)(5) AND 74.861(E)(6)**

RESULT: Pass

**5.7 FREQUENCY TOLERANCE FOR FCC PART 74 PER SECTION 74.861(E)(4)**

RESULT: Pass

## Contents

<b>1</b>	<b>GENERAL REMARKS .....</b>	<b>5</b>
<b>1.1</b>	<b>COMPLEMENTARY MATERIALS.....</b>	<b>5</b>
<b>2</b>	<b>TEST SITES .....</b>	<b>5</b>
<b>2.1</b>	<b>TEST FACILITIES .....</b>	<b>5</b>
<b>2.2</b>	<b>LIST OF TEST AND MEASUREMENT INSTRUMENTS .....</b>	<b>6</b>
<b>2.3</b>	<b>TRACE ABILITY .....</b>	<b>7</b>
<b>2.4</b>	<b>CALIBRATION .....</b>	<b>7</b>
<b>2.5</b>	<b>MEASUREMENT UNCERTAINTY .....</b>	<b>7</b>
<b>2.6</b>	<b>LOCATION OF ORIGINAL DATA .....</b>	<b>7</b>
<b>2.7</b>	<b>STATUS OF FACILITY USED FOR TESTING .....</b>	<b>7</b>
<b>3</b>	<b>GENERAL PRODUCT INFORMATION.....</b>	<b>8</b>
<b>3.1</b>	<b>PRODUCT FUNCTION AND INTENDED USE.....</b>	<b>8</b>
<b>3.2</b>	<b>RATINGS AND SYSTEM DETAILS.....</b>	<b>8</b>
<b>3.3</b>	<b>INDEPENDENT OPERATION MODES .....</b>	<b>9</b>
<b>3.4</b>	<b>SUBMITTED DOCUMENTS.....</b>	<b>9</b>
<b>4</b>	<b>TEST SET-UP AND OPERATION MODE.....</b>	<b>10</b>
<b>4.1</b>	<b>PRINCIPLE OF CONFIGURATION SELECTION .....</b>	<b>10</b>
<b>4.2</b>	<b>TEST OPERATION AND TEST SOFTWARE.....</b>	<b>10</b>
<b>4.3</b>	<b>SPECIAL ACCESSORIES AND AUXILIARY EQUIPMENT .....</b>	<b>10</b>
<b>4.4</b>	<b>COUNTERMEASURES TO ACHIEVE EMC COMPLIANCE.....</b>	<b>10</b>
<b>4.5</b>	<b>TEST SET-UP.....</b>	<b>11</b>
<b>5</b>	<b>TEST RESULTS EMISSION .....</b>	<b>14</b>
<b>5.1</b>	<b>CONDUCTED POWER OUTPUT MEASUREMENT FOR FCC PART 74 PER SECTION 74.861(E)(1) 14</b>	
<b>5.2</b>	<b>CONDUCTED SPURIOUS EMISSIONS MEASUREMENT FOR FCC PART 74 PER SECTION 74.861(E)(1).....</b>	<b>15</b>
<b>5.3</b>	<b>RADIATED POWER OUTPUT MEASUREMENT FOR FCC PART 74 PER SECTION 74.861(E)(1) AND RF-EXPOSURE EVALUATION.....</b>	<b>16</b>
<b>5.4</b>	<b>SPURIOUS RADIATION MEASUREMENT FOR FCC PART 74 PER SECTION 74.861(E)(6)(III)18</b>	
<b>5.5</b>	<b>MODULATION CHARACTERISTICS MEASUREMENT .....</b>	<b>22</b>

<b>5.6</b>	<b>OCCUPIED BANDWIDTH AND EMISSION MASK FOR FCC PART 74 PER SECTION 74.861(E)(3), 74.861(E)(5) AND 74.861(E)(6)</b> .....	<b>26</b>
<b>5.7</b>	<b>FREQUENCY TOLERANCE FOR FCC PART 74 PER SECTION 74.861(E)(4)</b> .....	<b>27</b>
<b>6</b>	<b>PHOTOGRAPHS OF THE TEST SET-UP</b> .....	<b>30</b>
<b>7</b>	<b>LIST OF TABLES</b> .....	<b>34</b>
<b>8</b>	<b>LIST OF PHOTOGRAPHS</b> .....	<b>34</b>

**Prüfbericht - Nr.: 16030354 001**  
*Test Report No.:*

**Seite 5 von 34**  
*Page 5 of 34*

## **1 General Remarks**

### **1.1 Complementary Materials**

All attachments are integral parts of this test report. This applies especially to the following appendix:

Appendix 1: Test result

## **2 Test Sites**

### **2.1 Test Facilities**

**TÜV Rheinland (Guangdong) Ltd. EMC Laboratory**

Guangzhou Auto Market, Yuan Gang Section of Guangshan Road  
Guangzhou 510650

P. R. China

Prüfbericht - Nr.: **16030354 001**  
Test Report No.:

Seite 6 von 34  
Page 6 of 34

## 2.2 List of Test and Measurement Instruments

**Table 1: List of Test and Measurement Equipment**

Equipment	Manufacturer	Type	Serial No.	Calibrated until
<b>TÜV Rheinland (Guangdong) Ltd.</b>				
EMI Test Receiver	Rohde & Schwarz	ESCI-3	100216	16.Mar.2012
Spectrum Analyzer	Rohde & Schwarz	FSP30	100286	16.Mar.2012
Trilog-Broadband Antenna	SCHWARZBECK MESS- ELEKTRONIK	VULB9168	209	07.Nov.2011
Trilog-Broadband Antenna	SCHWARZBECK MESS- ELEKTRONIK	VULB9168	210	26.Jun.2011
Double-Ridged Waveguide Horn Antenna	Rohde & Schwarz	HF906	100385	18.Jul.2011
Double-Ridged Waveguide Horn Antenna	Rohde & Schwarz	HF906	100407	26.Jun.2011
Pre-amplifier	MITEQ	AFS42-00101800- 25-S-42	1101599	31.Jul.2011
Band Reject Filter	Micro-Tronics	BRM50702	023	14.Mar.2012
Precision Dipole	Schwarzbeck	VHAP	1180+1109	22.Dec.2011
Precision Dipole	Schwarzbeck	UHAP	1091+1092	26.Jun.2011
Standard Gain Horn Antenna	EMCO	3160-09	21642	26.Jun.2011
Standard Gain Horn Antenna	EMCO	3160-09	21645	N/A
Pre-amplifier	MITEQ	AFS33-18002650- 30-8P-44	1108282	16.Mar.2012
3m Anechoic Chamber	Albatross Project GmbH	N/A	N/A	16.Apr.2011
Climatic Chamber	ESPEC	EL-04 KA	6107116	16.Mar.2012
Spectrum analyzer	Agilent	E4404B	MY41440753	16.Mar.2012
Communication Analyser	Hewlett-Packard	8920A	3906A10633	03.Nov.2011

**Prüfbericht - Nr.: 16030354 001**  
*Test Report No.:*

**Seite 7 von 34**  
*Page 7 of 34*

## 2.3 Trace ability

All measurement equipment calibrations are traceable to NIST or where calibration is performed outside the United States, to equivalent nationally recognized standards organizations

## 2.4 Calibration

Equipment requiring calibration is calibrated periodically by the manufacturer or according to manufacturer's specifications. Additionally all equipment is verified for proper performance on a regular basis using in house standards or comparisons.

## 2.5 Measurement Uncertainty

Uncertainty for conducted emissions measurements is  $\pm 2.68\text{dB}$ .  
Uncertainty for radiated emissions measurements is  $\pm 4.94\text{dB}$  (30MHz-1GHz),  $\pm 4.88\text{dB}$  (>1GHz).

The reported expanded uncertainty is based on a standard uncertainty multiply by a coverage factor  $k=2$ , providing a level of confidence of approximately 95%.

## 2.6 Location of original data

The original copies of all test data taken during actual testing were attached at Appendix 1 of this report and delivered to the applicant. A copy has been retained in the TÜV Rheinland (Guangzhou) file for certification follow-up purposes.

## 2.7 Status of facility used for testing

TÜV Rheinland (Guangdong) Ltd. EMC Laboratory; Guangzhou Auto Market, Yuan Gang Section of Guangshan Road, Guangzhou 510650, P. R. China is listed on the US Federal Communications Commission list of facilities approved to perform measurements, the register no. 833845.

### 3 General Product Information

The submitted sample AL2 is wireless microphone transmitter operating within the frequency range of 642.375MHz to 645.750MHz.

#### 3.1 Product Function and Intended Use

For details, refer to technical document and the user manual.

#### 3.2 Ratings and System Details

Frequency range	:	CH1: 642.375MHz CH2: 642.875MHz CH3: 644.125MHz CH4: 644.750MHz CH5: 645.500MHz CH6: 645.750MHz
RF output power	:	10mW (e.r.p)
Channel bandwidth	:	200 kHz
Type of antenna	:	Integrated antenna
FCC ID	:	CCRAL2
Power Supply	:	DC 3.7V (powered by built-in battery)
Frequency Response	:	50Hz-15kHz
Protection Class	:	III

Refer to the technical document for further information.



### **3.3 Independent Operation Modes**

The basic operation modes are:

- Transmitting without modulation
- Transmitting with modulation

For further information refer to User Manual

### **3.4 Submitted Documents**

- Block Diagram
- Circuit Diagram
- Components List
- PCB layout
- FCC label
- User Manual
- Photo document

## **4 Test Set-up and Operation Mode**

### **4.1 Principle of Configuration Selection**

**Emission:** The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the instructions for use.

### **4.2 Test Operation and Test Software**

Refer to Test set-up in chapter 5.

### **4.3 Special Accessories and Auxiliary Equipment**

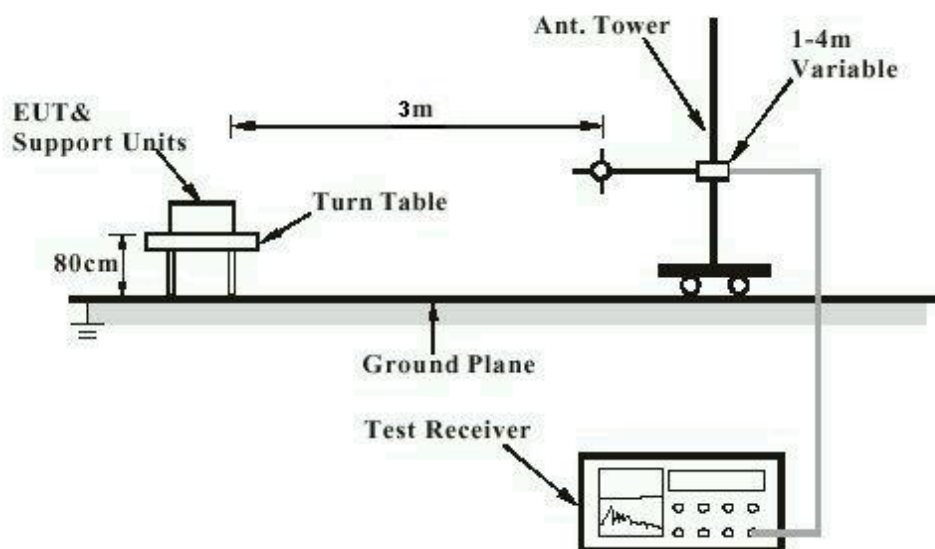
None.

### **4.4 Countermeasures to achieve EMC Compliance**

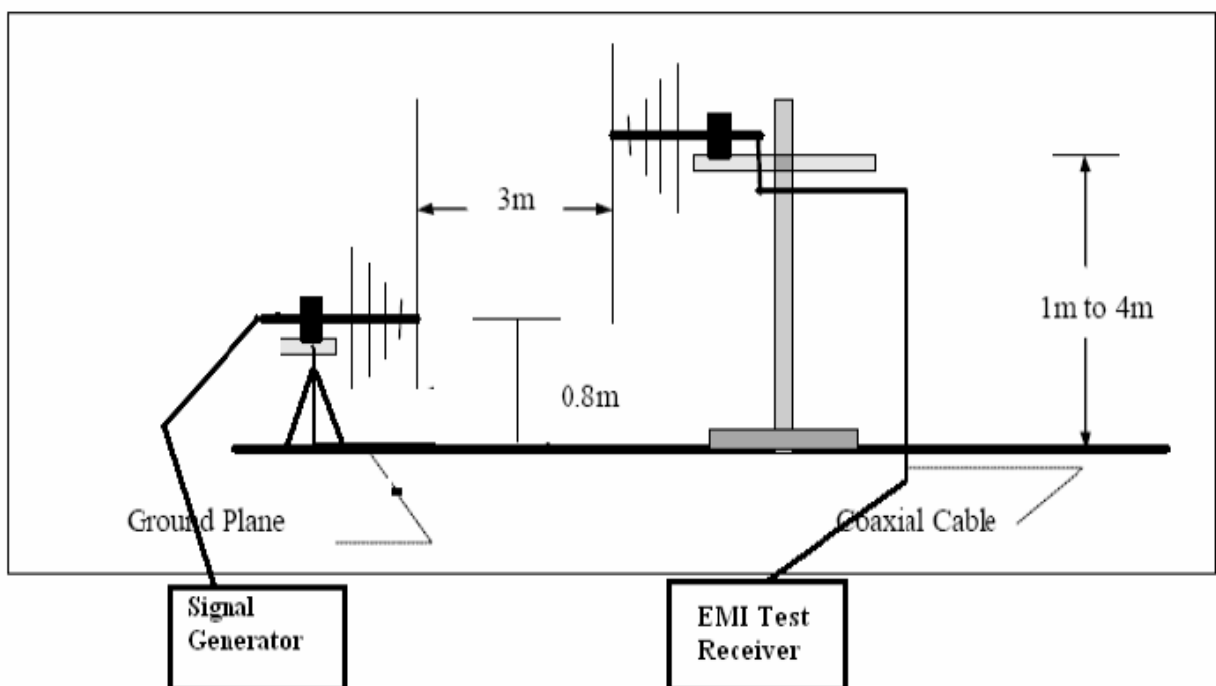
The test sample, which has been tested, contained the noise suppression parts as described in the technical document. No additional measures were employed to achieve compliance.

## 4.5 Test set-up

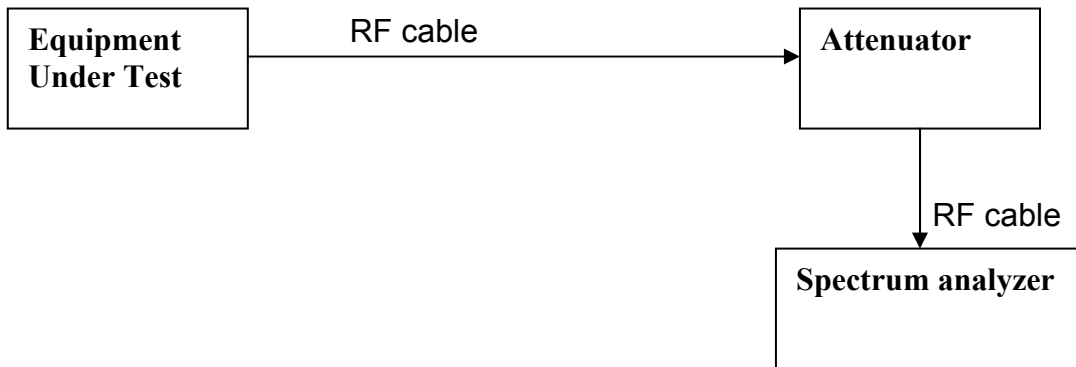
### Diagram 1 of Measurement Equipment Configuration for Testing Radiated Emission



### Diagram 2 of Measurement Equipment Configuration for Substitution Method



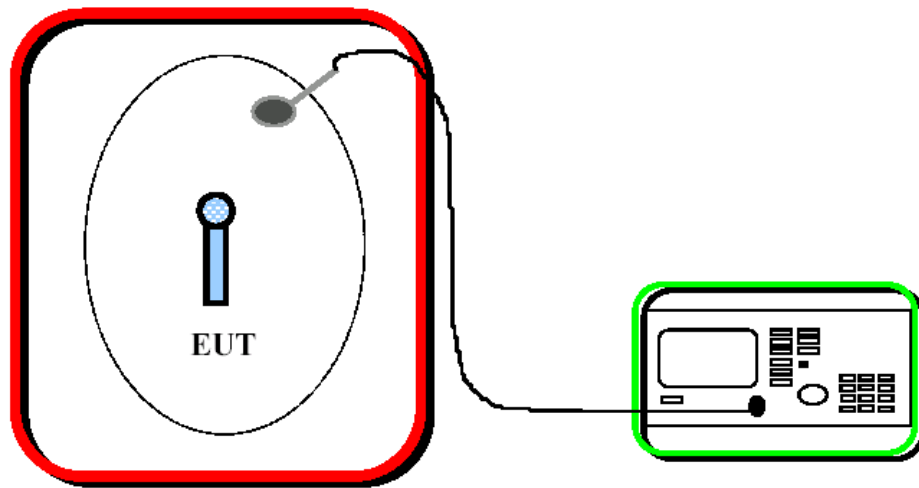
**Diagram 3 of Measurement Equipment Configuration for Conducted power output and conducted spurious emissions measurement**



**Diagram 4 of Measurement Equipment Configuration for Testing Modulation Characteristics measurement**

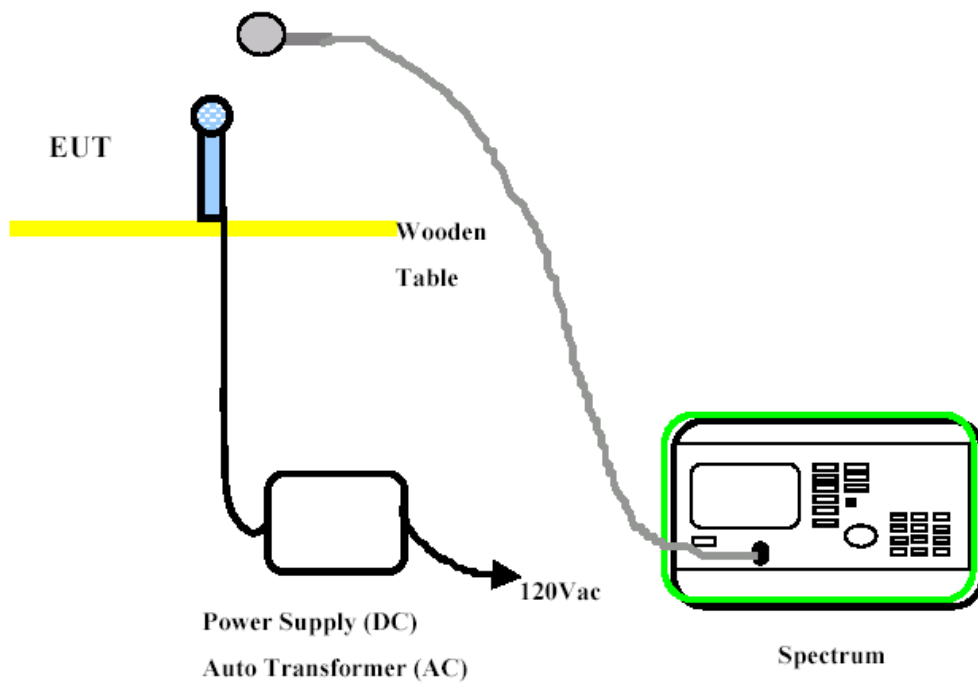


**Diagram 5 of Measurement Equipment Configuration for Testing Frequency Tolerance**



*Chamber*

*Spectrum*



*Spectrum*

**Prüfbericht - Nr.: 16030354 001**  
Test Report No.:

**Seite 14 von 34**  
Page 14 of 34

## 5 Test Results EMISSION

### 5.1 Conducted Power Output measurement for FCC part 74 Per Section 74.861(e)(1)

**RESULT:**

**N/A**

Date of testing	:	---
Test specification	:	FCC Part 2 Per Section 2.1046(a)
Guide	:	ANSI/TIA-603-C-2004, clause 2.2.1
Limits	:	FCC Part 74 Per Section 74.861(e)(1)
Kind of test site	:	3m Anechoic Chamber
Operation mode	:	Transmitting (unmodulated)
Power supply	:	DC3.7V (battery powered)
Temperature	:	22°C
Humidity	:	50%

**Measurement procedure:**

1. connected equipment as diagram 4;
2. The EUT was connected to spectrum analyzer through a resistive coaxial attenuator;
3. Correct all losses in the RF path.
4. The EUT was set to operate on unmodulation mode at low, mid and high channels;
5. Measure the EUT output power.

The EUT has no external antenna port, therefore this test is not applicable.

**Prüfbericht - Nr.: 16030354 001**  
Test Report No.:

**Seite 15 von 34**  
Page 15 of 34

## 5.2 Conducted Spurious emissions measurement for FCC part 74 Per Section 74.861(e)(1)

### RESULT:

N/A

Date of testing	:	---
Test specification	:	FCC Part 2 Per Section 2.1046(a)
Guide	:	ANSI/TIA-603-C-2004, clause 2.2.1
Limits	:	FCC Part 74 Per Section 74.861(e)(1)
Kind of test site	:	3m Anechoic Chamber
Operation mode	:	Transmitting (unmodulated)
Power supply	:	DC3.7V (battery powered)
Temperature	:	22°C
Humidity	:	50%

### Measurement procedure:

1. connected equipment as diagram 4;
2. The EUT was connected to spectrum analyzer through a resistive coaxial attenuator;
3. Correct all losses in the RF path.
4. The EUT was set to operate on unmodulation mode at low, mid and high channels;
5. Measure the EUT output power.

The EUT has no external antenna port, therefore this test is not applicable.

**Prüfbericht - Nr.: 16030354 001**  
Test Report No.:

**Seite 16 von 34**  
Page 16 of 34

### **5.3 Radiated Power Output measurement for FCC part 74 Per Section 74.861(e)(1) and RF-Exposure evaluation**

**RESULT:**

**Pass**

Date of testing	:	10.Apr.2011
Test specification	:	FCC Part 2 Per Section 2.1046(a)
Guide	:	ANSI/TIA-603-C-2004, clause 2.2.17
Limits	:	FCC Part 74 Per Section 74.861(e)(1)
Kind of test site	:	3m Anechoic Chamber
Operation mode	:	Transmitting (unmodulated)
Power supply	:	DC3.7V (battery powered)
Temperature	:	23°C
Humidity	:	50%

#### **Measurement procedure:**

1. The EUT was placed on an 0.8 m high turntable in the anechoic chamber.
2. For radiated power output of the EUT, the measuring antenna was raised and lowered to obtain a maximum reading on the spectrum analyzer with the test antenna polarized vertically and horizontally. The turntable was rotated 360 to further searching the maximum reading on the spectrum analyzer. Then the max value on spectrum was recorded.
3. The EUT was removed and be replaced with a substitute dipole antenna. The length of the antenna was adjusted to a half-wave of transmitting frequency measured. The centre of the dipole antenna was placed approximately at the same location as the centre place of the EUT in step 1 and 2.
4. The dipole antenna was connected to a signal generator with a coaxial cable.
5. The signal generator is tuned to the transmitting frequency with the substitute antenna polarized both vertically and horizontally, the output level of the signal generator output was then adjusted to get a maximum reading in the spectrum with the same value recorded in the step 2.
6. The input RF power in the dipole antenna was calculated from the coaxial cable loss and the signal generator output level obtained in step 5. This value was regarded as final result and recorded in following table 2.



**Prüfbericht - Nr.: 16030354 001**

Test Report No.:

Seite 17 von 34

Page 17 of 34

Note:

While in Step 2, the EUT was placed in 3 orthogonal planes to find a maximum reading.

**Measurement result:**

**Table 2: Measurement result of radiated output power at low, high channel**

Channel	Freq. (MHz)	Polarization (V/H)	Reading (SG) (dBm)	Cable loss (dB)	Antenna Gain(dB)	Transmit power (dBm)	Transmit power (mW)	Limit (mW)
Low	642.375	V	-2.903	5.0	-10	-17.903	0.0162	250
		H	-2.794	5.0	-10	-17.794	0.0166	250
High	645.750	V	-3.881	5.2	-10	-19.081	0.0124	250
		H	-2.914	5.2	-10	-18.114	0.0154	250

Note:

SG means Signal Generator.

Transmit power (dBm) = Reading(SG) (dBm) - Cable loss(dB) + Antenna Gain(dB)

Transmit power (dBm) = 10Log(transmit power(mW)/1mW)

**RF-Exposure evaluation**

No SAR evaluation is required if the power is below the following threshold:

Tunable Range		Center of Tunable Band [GHz]	60/f SAR Limitation Based on Center of Band [mW]
Lowest Frequency [GHz]	Highest Frequency [GHz]		
0.6423	0.6457	0.6444	86.96

Maximum measured transmitter power:

Transmit power Pout [mW]	Maximum Antenna Gain [dBi]	Pout EIRP [mW]
0.0166	0	0.0166

The low threshold for SAR evaluation is 86.96 mW.

The maximum TX output power is 0.0166 mW EIRP.

**Conclusion:**

SAR evaluation is not required since the maximum transmitter Pout (EIRP) is below the FCC low threshold.

## 5.4 Spurious Radiation Measurement for FCC Part 74 Per Section 74.861(e)(6)(iii)

**RESULT:**

**Pass**

Date of testing	:	10.Apr.2011
Test specification	:	FCC Part 2 Per Section 2.1053(a) and 2.1057
Guide	:	ANSI/TIA-603-C-2004, clause 2.2.12
Limits	:	FCC Part 74 Per Section 74.861(e)(6)(iii)
Kind of test site	:	3m Full-Anechoic Chamber
Operation mode	:	Transmitting (unmodulated)
Power supply	:	DC3.7V (battery powered)
Temperature	:	23°C
Humidity	:	50%

**Measurement procedure:**

1. Adjust the spectrum analyzer for the following settings:

- a. RBW = 10kHz for spurious emissions below 1 GHz, and 1 MHz for spurious emissions above 1GHz.
- b. VBW = 300 kHz for spurious emissions below 1 GHz, and 3 MHz for spurious emissions above 1GHz.
- c. Sweep speed slow enough to maintain measurement calibration.
- d. Detector Mode = Positive Peak

2. The EUT was turned on and placed on the top of a rotatable table 0.8 m above the ground with 3-orthogonal XYZ direction and be kept close enough to the measurement receiving antenna (especially for the measurement frequency range above 1 GHz). The table was then rotated 360 degrees to detect the suspected emission frequency points. The position of the worst radiation case with both horizontal and vertical receiving antenna polarization was then recorded together with the suspected emission frequency points above-mentioned.

3. The EUT was then set 3 meters away from the receiving antenna, which was mounted on a variable-height antenna tower.

4. For each suspected emission frequency point recorded in step 1, the EUT was arranged to its worst case that the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to read the maximum emission.

5. The EUT was removed and be replaced with substitute antenna correspondent to the suspected frequency point mentioned in Step 3 (if necessary, characteristic frequency of the antenna is adjusted to a half-wave of the suspected frequency point). The substitute antenna was then connected to a signal generator with a coaxial cable and its center is placed approximately at the same location as the centre place of the EUT in Step 3.

**Prüfbericht - Nr.: 16030354 001**

*Test Report No.:*

**Seite 19 von 34**

*Page 19 of 34*

6. The signal generator is tuned to the suspected frequency point mentioned in Step 3 with the substitute antenna polarized both vertically and horizontally, the output level of the signal generator output was then adjusted to get a maximum reading in the spectrum with the same value recorded in the step 3.

7. For each suspected frequency point, the input RF power in the substitute antenna was calculated from the coaxial cable loss, antenna factor and the signal generator output level obtained in step 5. This value was regarded as final result and recorded in following table 3, table 4 and table 5.

The allowed emissions for transmitters operating in the 535 MHz to 564 MHz bands are found under Part 74, Section 74.861, Paragraph (e) (6) for Low Power Auxiliary Stations. This paragraph states the mean power of the emissions shall be attenuated below the mean output power of the transmitter in accordance with the following schedule:

(1) On any frequency removed from the operating frequency by more than 250 percent of the authorized bandwidth: at least  $43+10\text{Log}_{10}$  (mean output power in watts) dB.

To determine the Limit for Spurious Emissions the following method was used:

Maximum output power in watts:

Maximum output power in Watt: 0.0000166W (see table 2)

The emission must be reduced by:

$$43+10\text{Log}(0.0000166) = -4.8\text{dB}$$

Therefore, the Emission Limit equals:

$$10\text{Log}(0.0000166 \times 1000) - (-4.8\text{dB}) = -13 \text{ dBm}$$

**Prüfbericht - Nr.: 16030354 001**

*Test Report No.:*

**Seite 20 von 34**

*Page 20 of 34*

While testing, the EUT was placed in 3 orthogonal planes and the maximum reading was recorded in the following tables.

Note:

**Measurement result:**

**Table 3: Spurious Emission measured at low channel 642.375 MHz**

Freq. (MHz)	Polarization (V/H)	Reading (SG) (dBm)	Cable loss (dB)	Antenna Gain(dB)	Transmit power (dBm)	Limit (dBm)
65.340	V	-71.46	2.5	3.53	-72.49	-13
159.915	V	-76.13	3.3	3.76	-76.59	-13
1284.625	V	-46.39	8.4	6.23	-44.22	-13
2569.375	V	-57.57	9.3	7.74	-56.01	-13
3211.750	V	-57.47	10.6	8.29	-55.16	-13
60.191	H	-73.81	2.4	3.33	-74.74	-13
154.645	H	-76.97	3.2	3.56	-77.33	-13
1284.625	H	-45.48	8.7	6.26	-43.04	-13
2569.375	H	-57.67	9.9	7.89	-55.66	-13
3211.750	H	-59.39	10.8	8.45	-57.04	-13

**Table 4: Spurious Emission measured at high channel 645.750 MHz**

Freq. (MHz)	Polarization (V/H)	Reading (SG) (dBm)	Cable loss (dB)	Antenna Gain(dB)	Transmit power (dBm)	Limit (dBm)
66.803	V	-72.50	2.5	3.35	-73.35	-13
171.981	V	-74.21	3.3	3.67	-74.58	-13
1291.375	V	-46.05	8.4	6.32	-43.97	-13
2582.875	V	-61.75	9.3	7.47	-59.92	-13
3228.625	V	-50.63	10.6	8.33	-48.36	-13
61.040	H	-75.16	2.4	3.25	-76.01	-13
167.497	H	-76.51	3.2	3.65	-76.96	-13
1291.375	H	-51.34	8.7	6.52	-49.16	-13
2582.875	H	-59.50	9.9	7.58	-57.18	-13
3228.625	H	-48.67	10.8	8.36	-46.23	-13

Disturbances other than those mentioned are small or not detectable.

Note: (for above mentioned three tables)

SG means Signal Generator

Transmit power (dBm) = Reading(SG) (dBm) - Cable loss(dB) + Antenna Gain(dB)

Transmit power (dBm) = 10Log(transmit power(mW)/1mW)

## 5.5 Modulation Characteristics measurement

### RESULT:

**Pass**

Date of testing	:	12.Apr.2011
Test specification	:	FCC Part 2 Per Section 2.1047(a) and (b)
Guide	:	ANSI/TIA-603-C-2004, clause 2.2.3
Limits	:	FCC Part 2 Per Section 2.1047(a) and (b)
Operation mode	:	Transmitting
Power supply	:	DC3.7V (battery powered)
Temperature	:	22°C
Humidity	:	50%

### Audio frequency response:

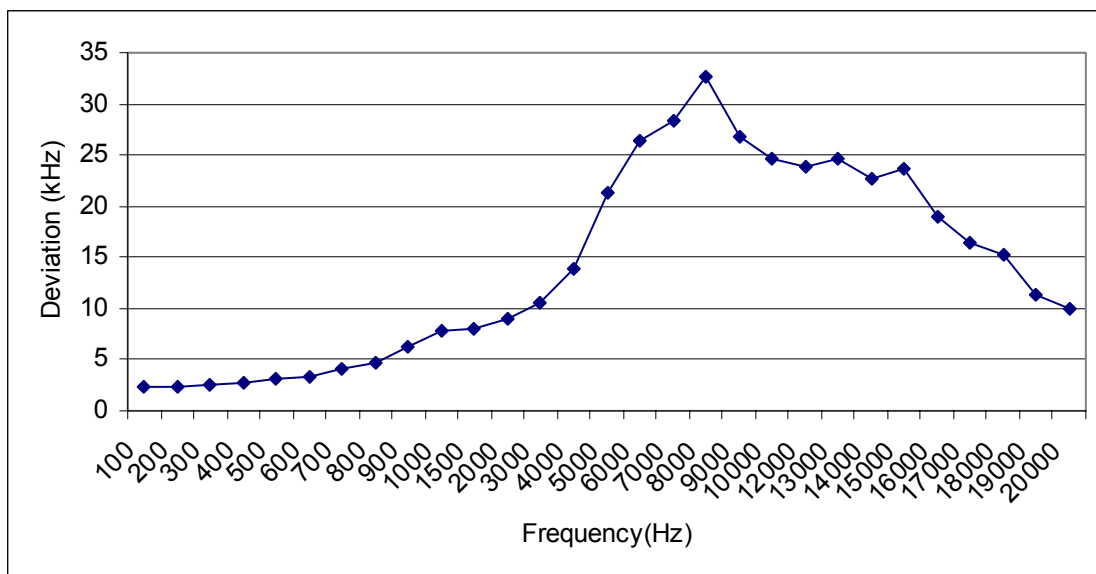
#### Measurement procedure:

- 1) Configure the EUT as shown in diagram 3.
- 2) Adjust the audio input for 20% of rated system deviation at 1 kHz using this level as a reference (0 dB).
- 3) Vary the Audio frequency from 200 Hz to 20 kHz and record the frequency deviation.

#### Measurement result:

Frequency (Hz)	Deviation (kHz)
100	2.3
200	2.4
300	2.5
400	2.8
500	3.1
600	3.3
700	4.1
800	4.7
900	6.3
1000	7.9
1500	8.1
2000	8.9
3000	10.6

4000	13.8
5000	21.4
6000	26.3
7000	28.3
8000	32.7
9000	26.7
10000	24.6
12000	23.8
13000	24.7
14000	22.6
15000	23.7
16000	18.9
17000	16.5
18000	15.2
19000	11.3
20000	9.9



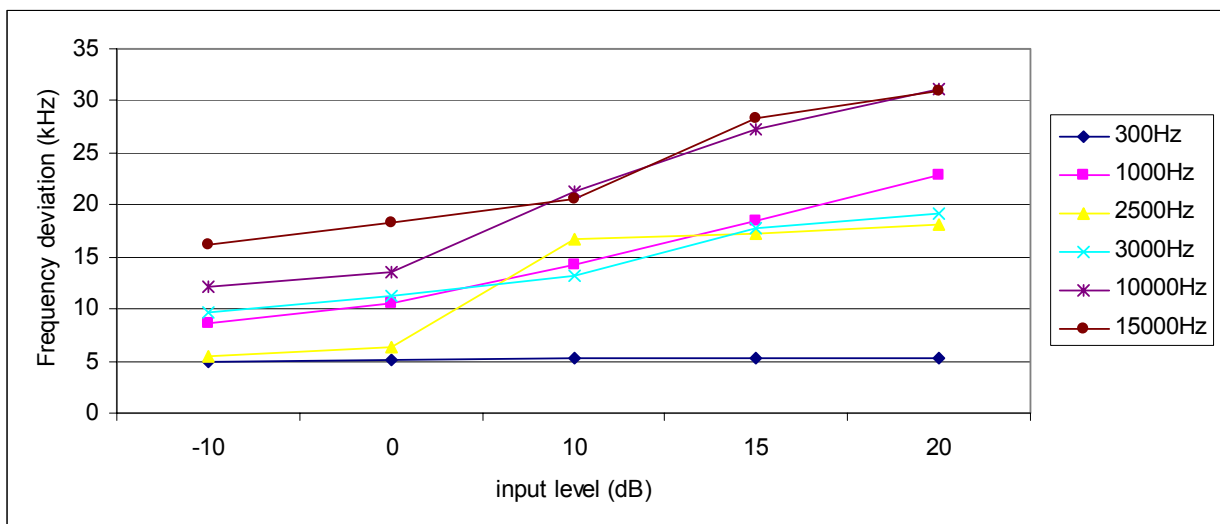
**Modulation limit and Necessary Bandwidth (Bn):**

**Measurement procedure:**

- 1). Configure the EUT as shown in diagram 4, adjust the audio input to produce 50 percent modulation at 2500Hz, this level is as a reference (0dB)
- 2). Vary the input level to at least 20dB higher than the saturation point;
- 2). Repeat step 1 with input frequency changing to 300Hz, 1kHz, 2.5kHz, 3kHz, 10kHz and 15kHz in sequence.

**Measurement result for modulation limit:**

Modulation (dB)		-10	0	10	15	20
300Hz	kHz	5.0	5.1	5.2	5.3	5.2
1kHz	kHz	8.7	10.5	14.3	18.4	22.9
2.5kHz	kHz	5.4	6.3	16.7	17.3	18.2
3kHz	kHz	9.7	11.3	13.2	17.8	19.2
10kHz	kHz	12.1	13.6	21.3	27.2	31.1
15kHz	kHz	16.1	18.3	20.5	28.3	30.9





**Prüfbericht - Nr.: 16030354 001**  
Test Report No.:

**Seite 25 von 34**  
Page 25 of 34

**Measurement result for Maximum Deviation and Necessary Bandwidth:**

According to modulation limit of Modulation Characteristics, the Maximum Deviation and Necessary Bandwidth are list in the following table 5 and 6, the rule for Necessary bandwidth is according to part 2.202(g).

**Table 5: Maximum Deviation**

Reading:	31.1kHz
Limit:	± 75kHz

**Table 6: Necessary Bandwidth (Bn)**

Parameter:	M	D
Reading	15kHz	30.9kHz
Bn:	91.8kHz	
Limit:	200kHz	
Emission Designator:	91K8F3E	
Bn=2M+2D*K Bn: operation bandwidth M: Max. Modulation Frequency D: Peak Frequency Deviation K=1		

**Prüfbericht - Nr.: 16030354 001**  
Test Report No.:

Seite 26 von 34  
Page 26 of 34

## 5.6 Occupied Bandwidth and Emission Mask for FCC Part 74 Per Section 74.861(e)(3), 74.861(e)(5) and 74.861(e)(6)

### RESULT:

Pass

Date of testing	:	10.Apr.2011
Test specification	:	FCC Part 2 Per Section 2.1049(c)1
Guide	:	ANSI/TIA-603-C-2004, clause 2.2.11
Limits	:	FCC Part 74 Per Section 74.861(e)(3), 74.861(e)(5) and 74.861(e)(6)
Operation mode	:	Transmitting (modulated)
Power supply	:	DC3.7V (battery powered)
Temperature	:	23°C
Humidity	:	50%

### Measurement procedure:

1. Connect the EUT as diagram 4 in Section 4.5.
2. Plot the unmodulated chart shows on spectrum.
3. Set to 2500 Hz tone at an input level to produce the 50 percent modulation.
4. Set the input level 16 dB greater than that necessary to produce 50 percent modulation at 2500Hz, Emission Mask was measured with the spectrum analyzer controls set as shown on the test result;
5. Keep on the input level, Emission Mask were measured on frequencies 300Hz, 1 kHz, 2.5 kHz, 5 kHz and 15 kHz,
6. The 99% emitted energy Occupied Bandwidth were measured at frequencies 2.5 kHz, 5 kHz and 15 kHz.

### Measurement result:

Please refer to appendix 1 of this report for result.

## **5.7 Frequency Tolerance for FCC Part 74 Per Section 74.861(e)(4)**

**RESULT:**

**Pass**

Date of testing	:	10.Apr.2011
Test specification	:	FCC Part 2 Per Section 2.1055
Guide	:	ANSI/TIA-603-C-2004, clause 2.2.2
Limits	:	FCC Part 74 Per Section 74.861(e)(4)
Operation mode	:	Transmitting (unmodulated)
Power supply	:	DC3.7V (battery powered)
Temperature	:	-30°C to 50°C
Humidity	:	50%

Measurement procedure:

A. Frequency stability versus environmental temperature

1. Setup the configuration as diagram 4 in section 4.5 for frequency measured inside an environment chamber and install new battery in the EUT.
2. Turn on EUT and set spectrum analyzer center frequency to the EUT operating frequency. Set spectrum analyzer Resolution Bandwidth to 1 kHz and Video Resolution Bandwidth to 1 kHz and Frequency Span to 50kHz. Record this frequency as reference frequency.
3. Set the temperature of chamber to 50°C. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize. While maintaining a constant temperature inside the chamber, turn the EUT on and measure the EUT operating frequency.
4. Repeat step 2 with a 10°C decreased per stage until the lowest temperature -30°C is measured, record all measured frequencies on each temperature step.

B. Frequency stability versus input voltage

1. Setup the configuration as diagram 4 for frequencies measurement at temperature range from 15 °C to 25°C. Otherwise, an environment chamber set for a temperature of 20°C shall be used.
2. Set spectrum analyzer center frequency to the EUT operating frequency. Set spectrum analyzer Resolution Bandwidth to 1 kHz and Video Resolution Bandwidth to 1 kHz. Record this frequency as reference frequency.
3. Set the supply voltage to the nominal voltage of the EUT.
4. Turn the EUT on and measure the EUT operating frequency
5. Repeat step 4 with decreased supply voltage, record all measured frequencies on each voltage step.
6. Stop the test until the lowest voltage specified by the manufacturer is reached or the EUT case to emission radio signal.

**Prüfbericht - Nr.: 16030354 001**

Test Report No.:

Seite 28 von 34

Page 28 of 34

**Table 7: the measurement of Frequency Tolerance (temperature)**

Test condition	Power supply	Low Frequency (MHz) (642.375 )	High Frequency (MHz) (645.750 )
-30°C	DC3.7V	642.355500	645.727076
-20°C	DC3.7V	642.360750	645.733075
-10°C	DC3.7V	642.374625	645.747700
0°C	DC3.7V	642.378750	645.753825
10°C	DC3.7V	642.378375	645.753950
20°C	DC3.7V	642.376000	645.752700
30°C	DC3.7V	642.375250	645.751200
40°C	DC3.7V	642.374875	645.751075
50°C	DC3.7V	642.375125	645.750825
Frequency Error:		0.019500	0.022924
Frequency tolerance:		0.00303%	0.00355%
Frequency Tolerance Limit:		0.005%	

**Prüfbericht - Nr.: 16030354 001**  
*Test Report No.:*

**Seite 29 von 34**  
*Page 29 of 34*

**Table 8: The measurement of Frequency Tolerance (supply voltage)**

Temperature (°C)	Power supply	Low Frequency (MHz) ( 642.375 )	High Frequency (MHz) (645.750 )
20	DC3.7V	642.377500	645.732500
20	DC3.3V	642.377625	645.733750
20	DC3.1V	642.377650	645.733500
20	DC4.1V	642.377500	645.733750
20	DC4.3V	642.377550	645.733700
Frequency Error:		0.002625	0.017500
Frequency tolerance:		0.0004%	0.0027%
Frequency Tolerance Limit:		0.005%	

## 6 Photographs of the Test Set-Up

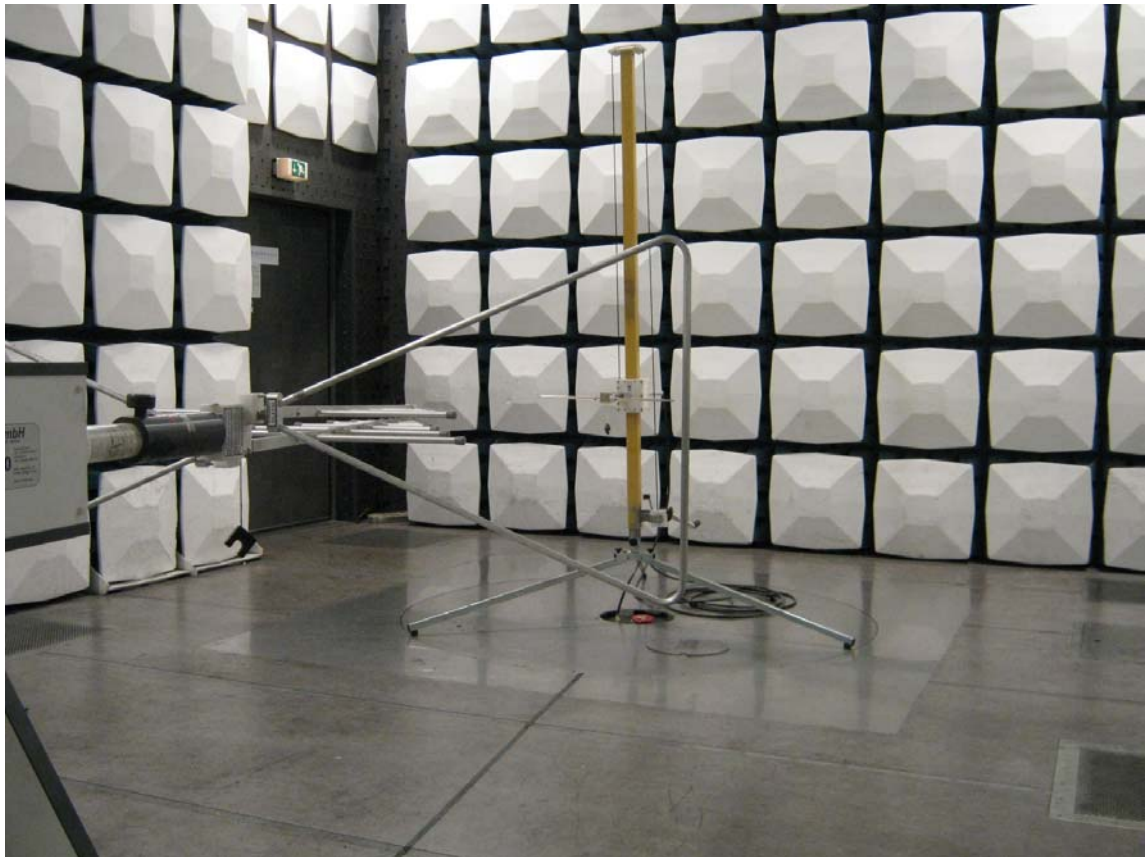
**Photograph 1: Set-up for Radiation Measurement below 1GHz**



**Prüfbericht - Nr.: 16030354 001**  
*Test Report No.:*

**Seite 31 von 34**  
*Page 31 of 34*

**Substitute antenna**



**Photograph 2: Set-up for Radiation Measurement above 1GHz**





**Prüfbericht - Nr.: 16030354 001**  
*Test Report No.:*

**Seite 33 von 34**  
*Page 33 of 34*

**Substitute antenna**



## 7 List of Tables

Table 1: List of Test and Measurement Equipment.....	6
Table 2: Measurement result of radiated output power at low, high channel .....	17
Table 3: Spurious Emission measured at low channel 642.375 MHz .....	20
Table 4: Spurious Emission measured at high channel 645.750 MHz.....	21
Table 5: Maximum Deviation.....	25
Table 6: Necessary Bandwidth (Bn) .....	25
Table 7: the measurement of Frequency Tolerance (temperature) .....	28
Table 8: The measurement of Frequency Tolerance (supply voltage).....	29

## 8 List of Photographs

Photograph 1: Set-up for Radiation Measurement below 1GHz .....	30
Photograph 2: Set-up for Radiation Measurement above 1GHz.....	32

**Prüfbericht - Nr.:**

**16030354 001**

Seite 1 von 18

Test Report No.

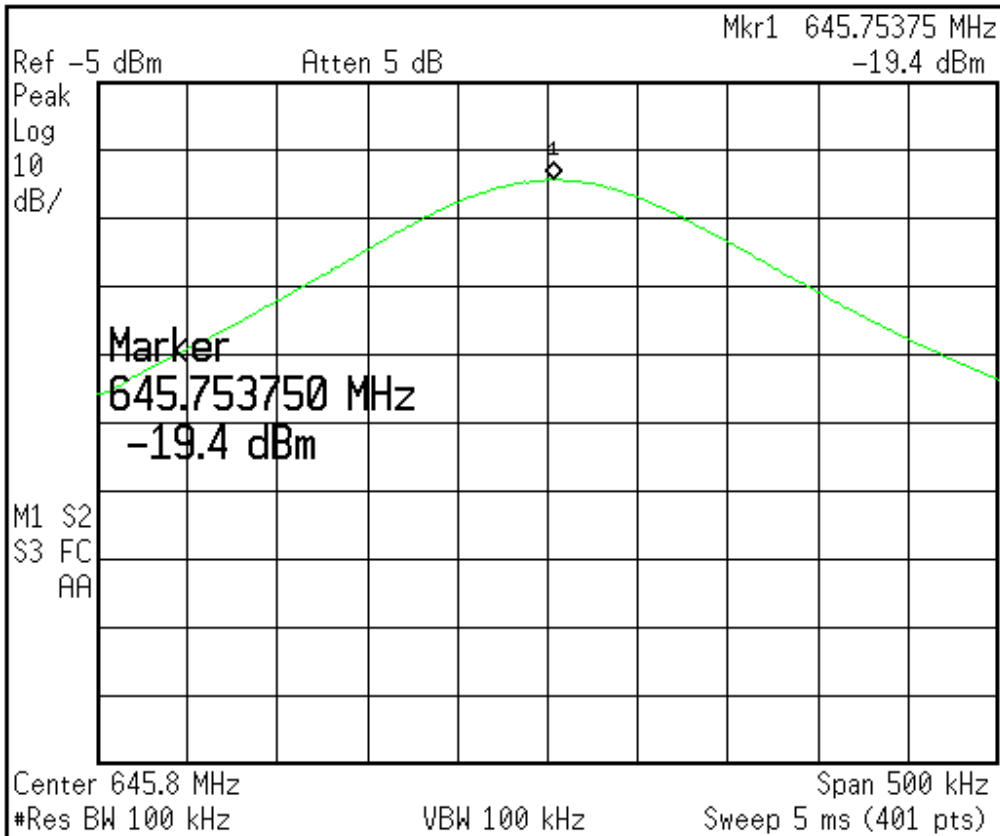
Page 1 of 18

**Emission Mask:**

**High frequency**

**Unmodulated RF carrier**

 Agilent

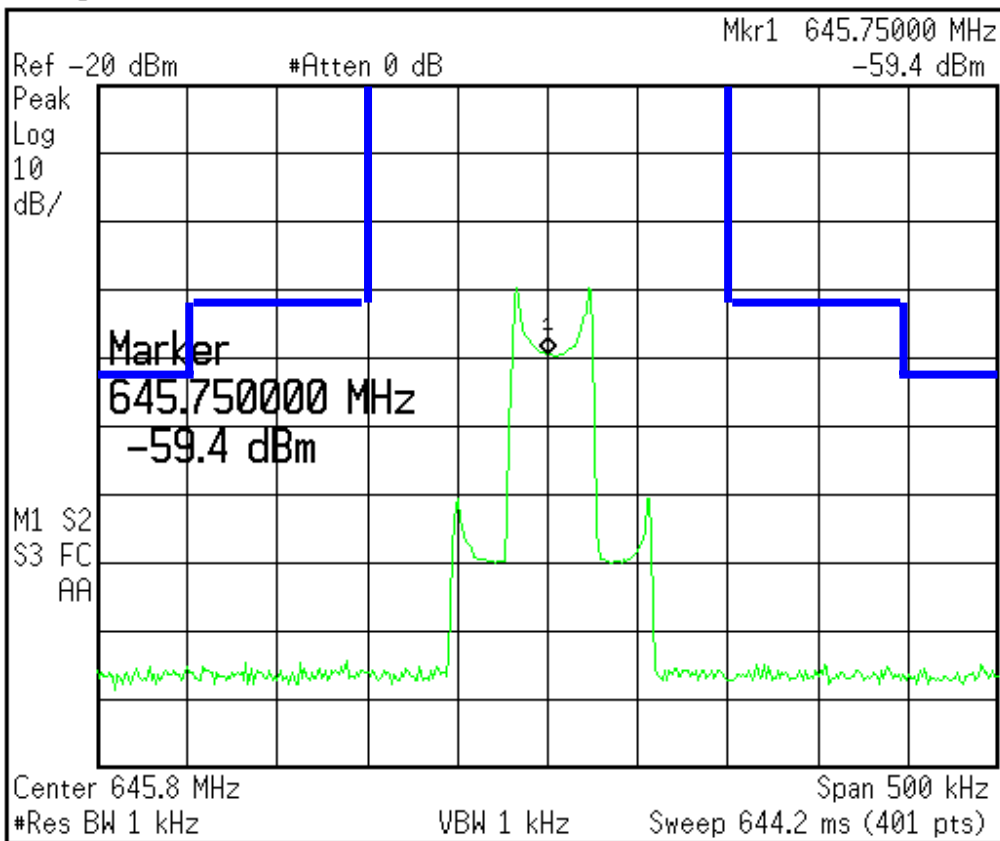


- Peak Search
- Meas Tools▶
- Next Peak
- Next Pk Right
- Next Pk Left
- Min Search
- Pk-Pk Search
- More  
1 of 2

C:\STATE037.STA file saved

Input Audio signal: 300Hz

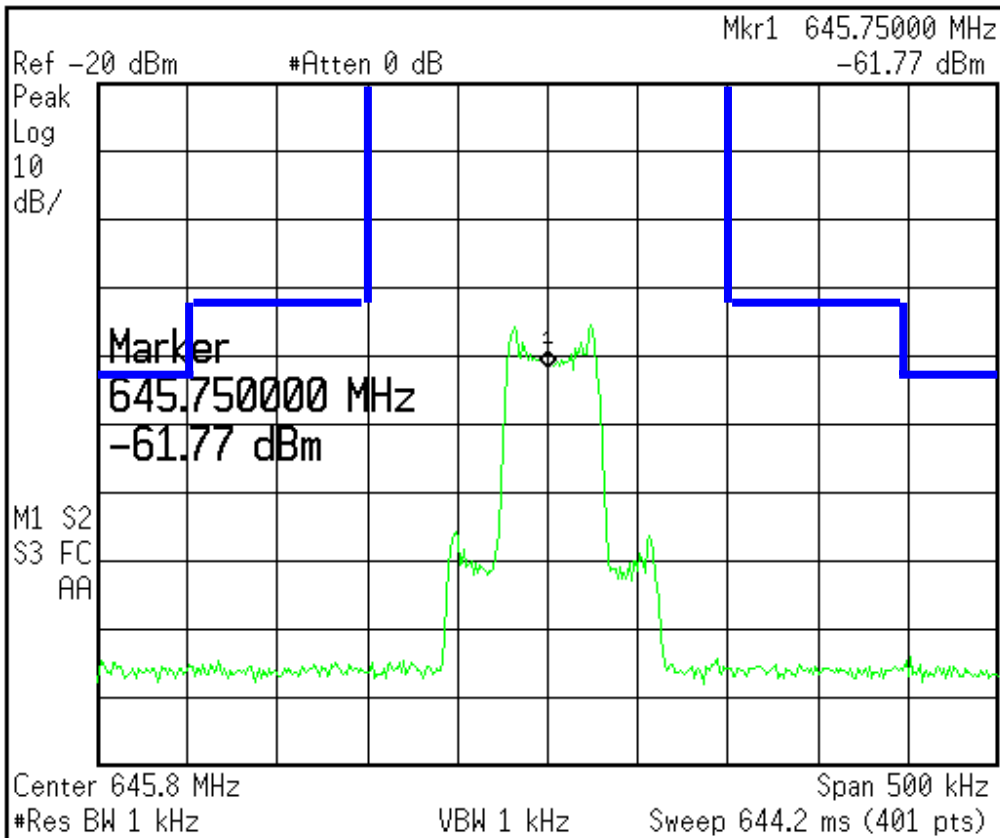
Agilent



<b>Marker</b>
Select Marker 1 2 3 4
Normal
Delta
Delta Pair (Tracking Ref) Ref Delta
Span Pair Span Center
Off
More 1 of 2

Input Audio signal: 1 kHz

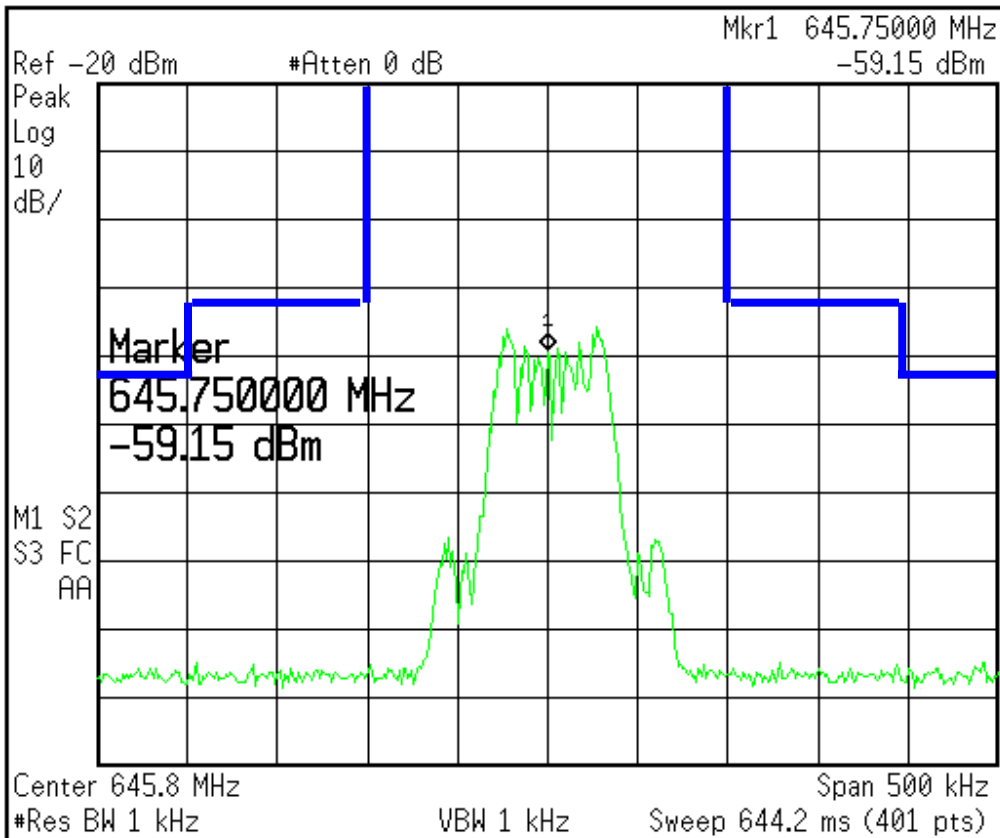
Agilent



Trace/View		
Trace	1	2 3
Clear Write		
Max Hold		
Min Hold		
View		
Blank		
More	1 of 2	

Input Audio signal: 2.5 kHz

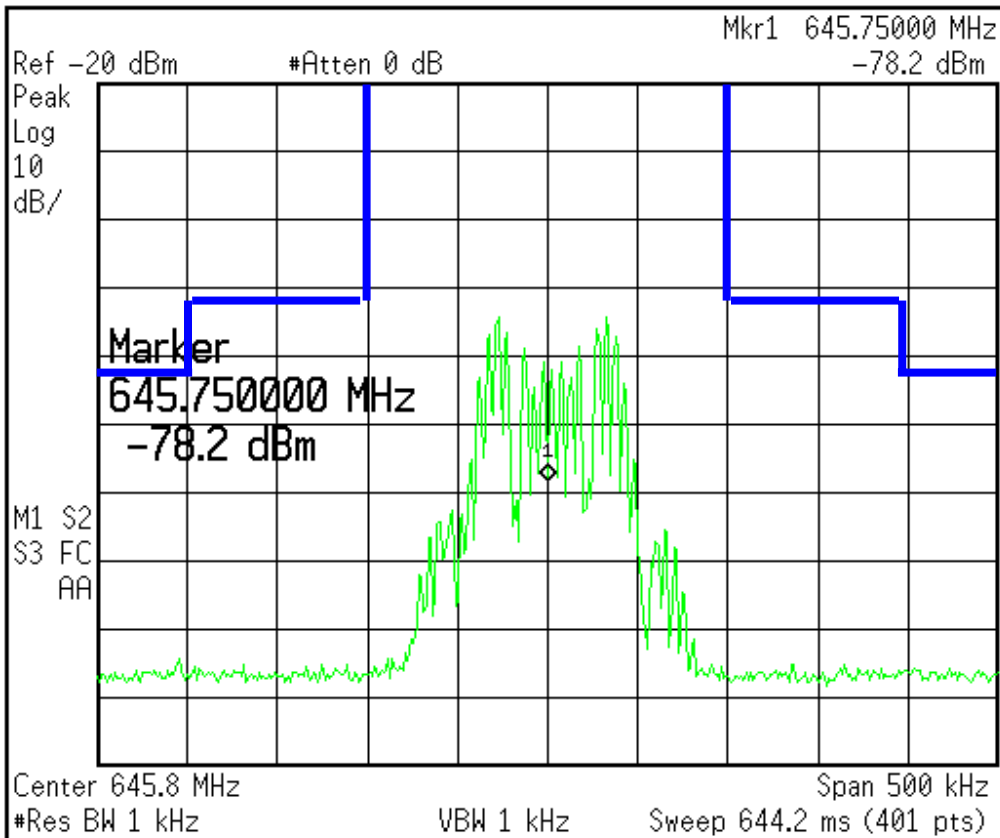
Agilent



Trace/View		
Trace	1	2 3
Clear Write		
Max Hold		
Min Hold		
View		
Blank		
More		1 of 2

Input Audio signal: 5 kHz

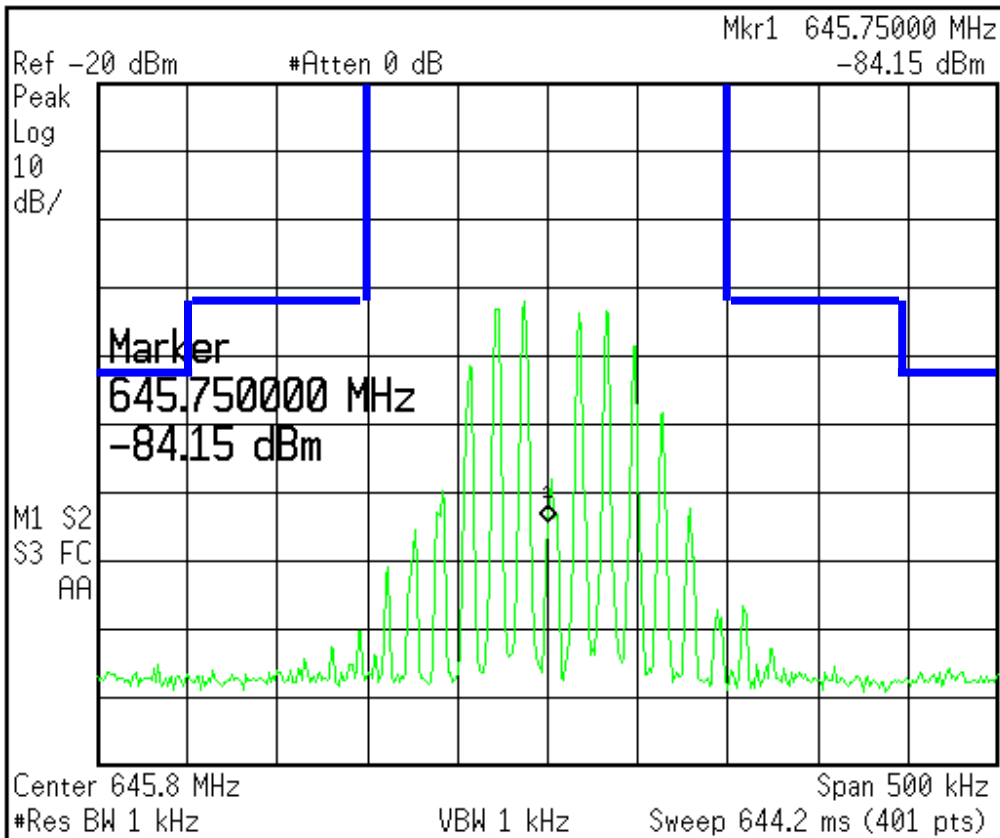
Agilent



Trace/View		
Trace	1	2 3
Clear Write		
Max Hold		
Min Hold		
View		
Blank		
More		1 of 2

Input Audio signal: 15 kHz

Agilent



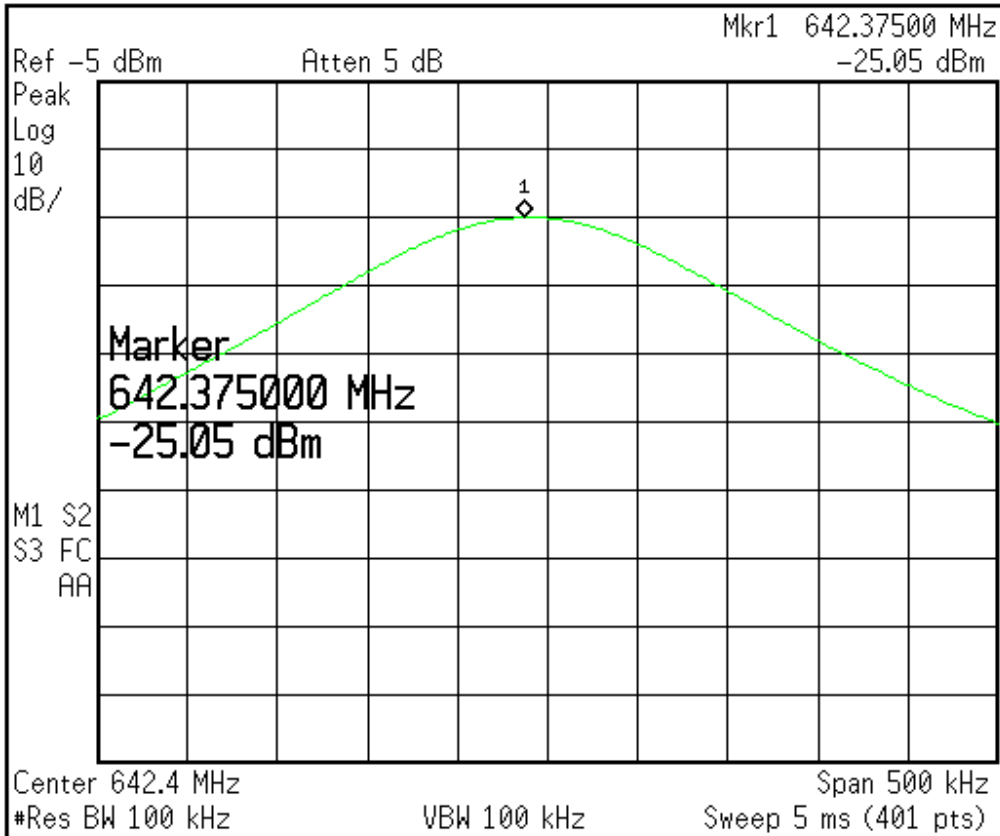
Trace/View		
Trace	1	2 3
Clear Write		
Max Hold		
Min Hold		
View		
Blank		
More		1 of 2



**Low frequency**

**Unmodulated RF carrier**

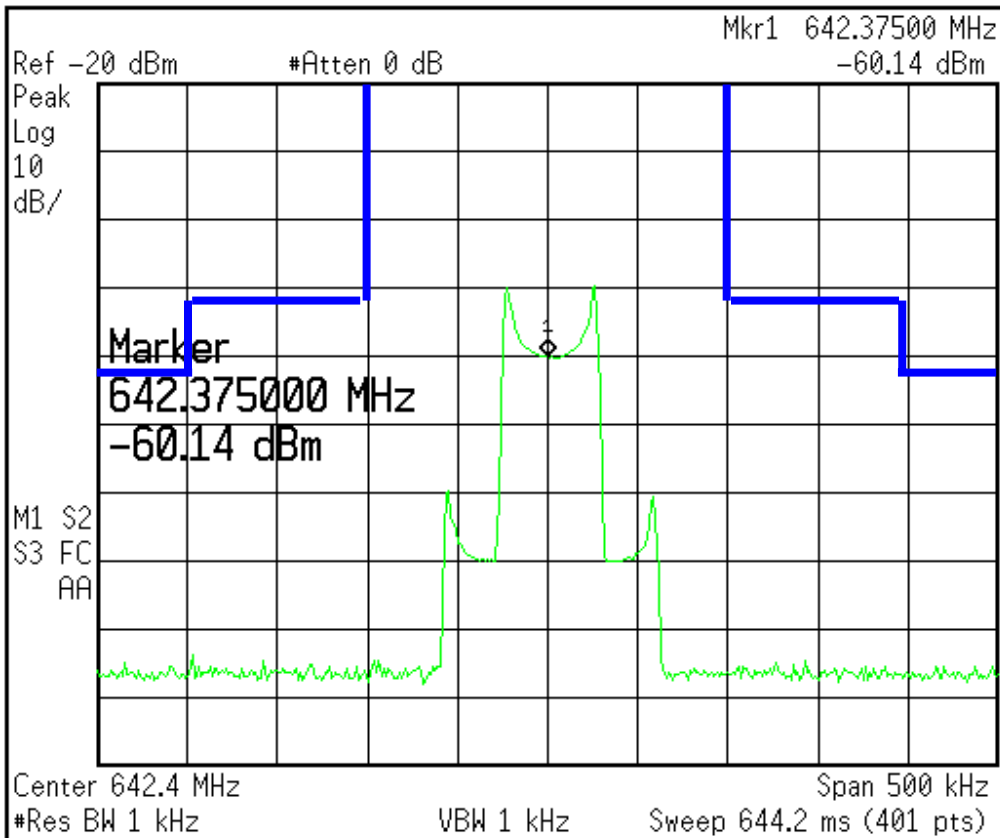
Agilent



- Peak Search
- Meas Tools
- Next Peak
- Next Pk Right
- Next Pk Left
- Min Search
- Pk-Pk Search
- More  
1 of 2

Input Audio signal: 300Hz

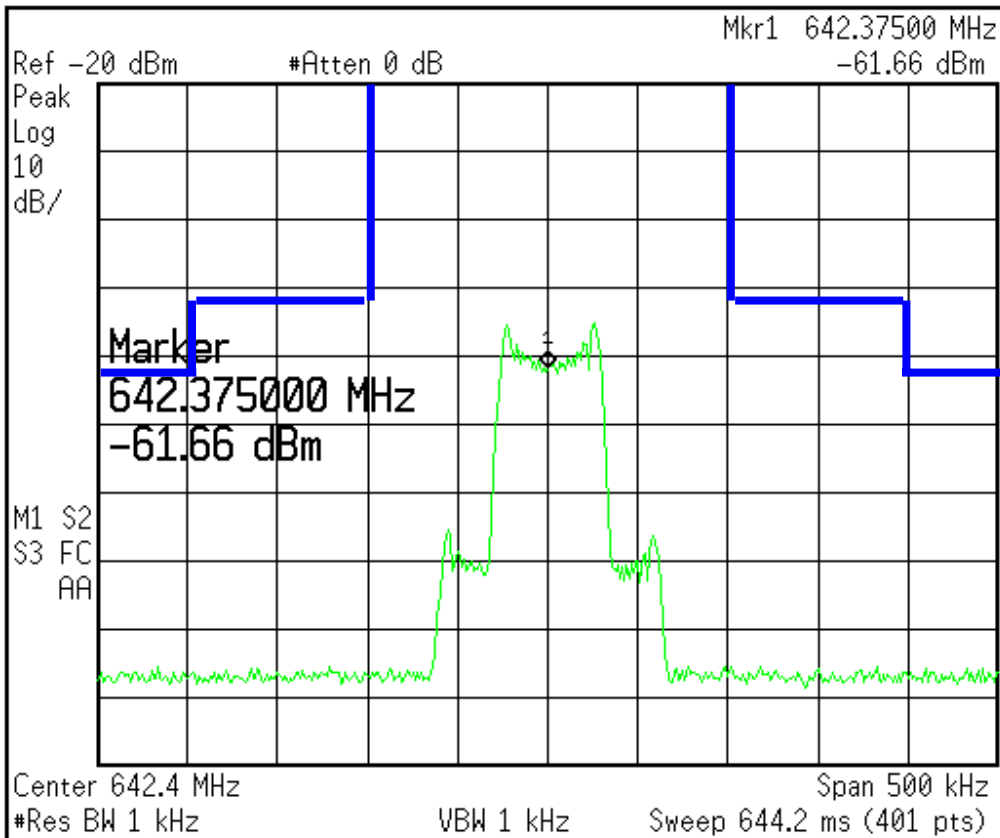
Agilent



Trace/View		
Trace	1	2 3
Clear Write		
Max Hold		
Min Hold		
View		
Blank		
More		1 of 2

Input Audio signal: 1 kHz

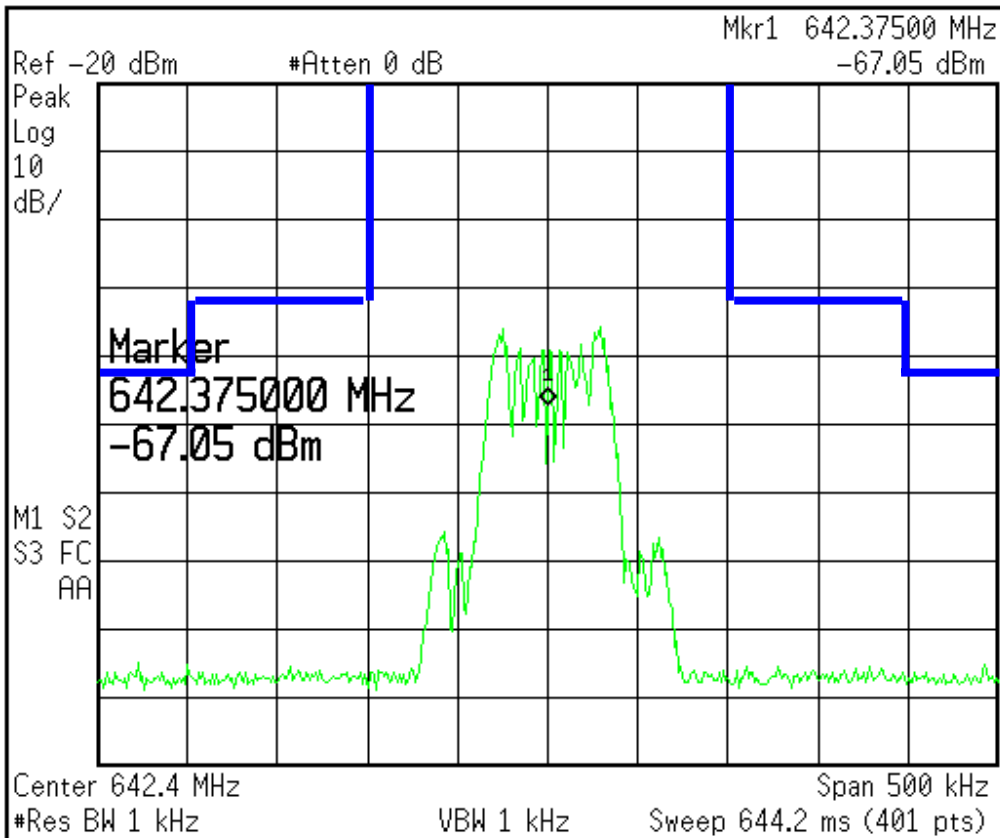
Agilent



Trace/View		
Trace	1	2 3
Clear Write		
Max Hold		
Min Hold		
View		
Blank		
More		1 of 2

Input Audio signal: 2.5 kHz

 Agilent



Trace/View		
Trace	1	2 3
Clear Write		
Max Hold		
Min Hold		
View		
Blank		
More	1 of 2	

**Prüfbericht - Nr.:**

**16030354 001**

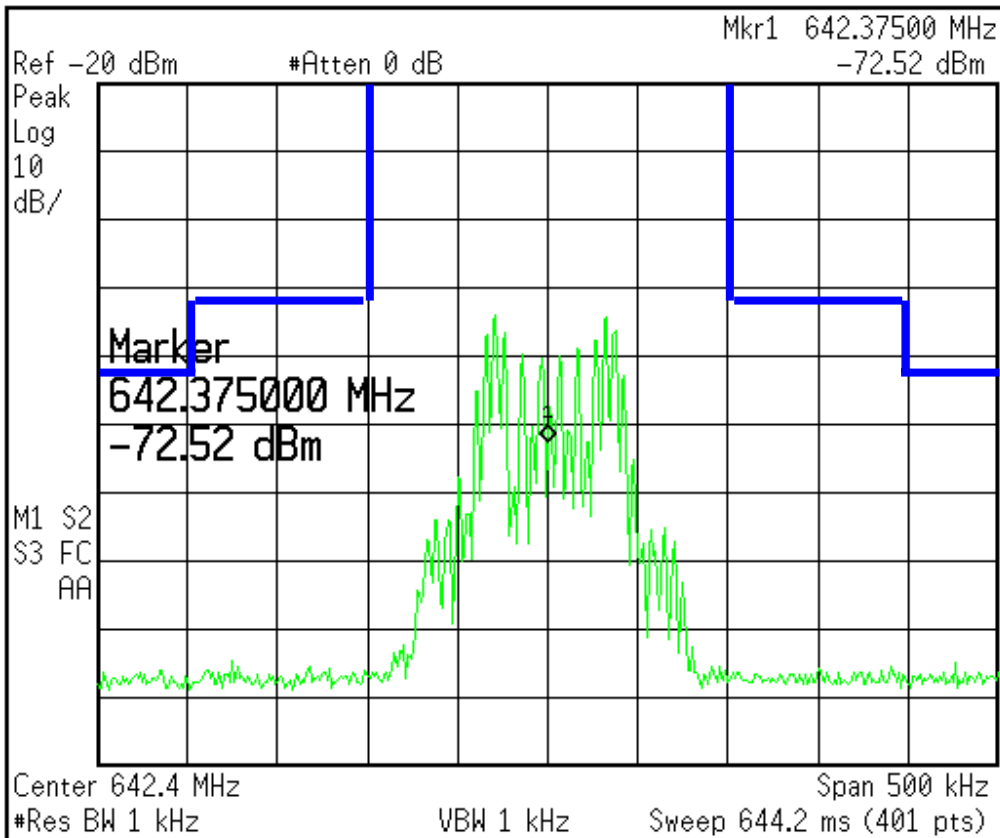
Seite 11 von 18

Test Report No.

Page 11 of 18

Input Audio signal: 5 kHz

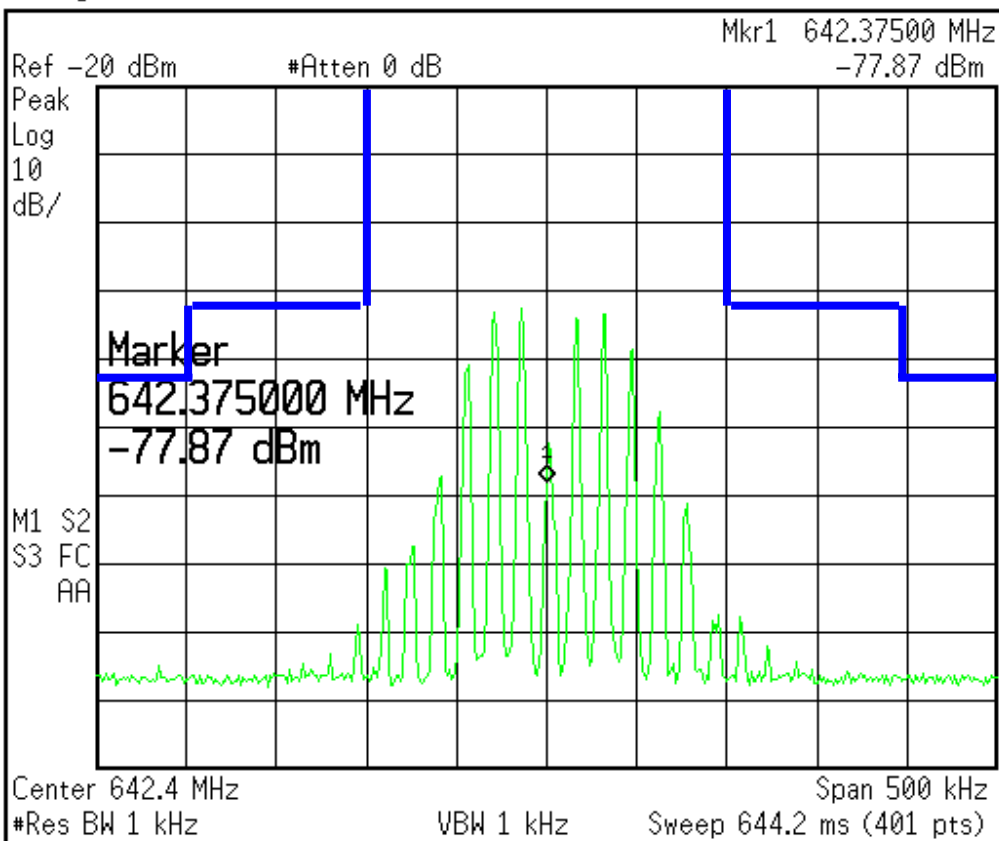
Agilent



Trace/View		
Trace	1	2 3
Clear Write		
Max Hold		
Min Hold		
View		
Blank		
More		1 of 2

Input Audio signal: 15 kHz

Agilent



<b>Marker</b>			
<b>Select Marker</b>			
<u>1</u>	2	3	4
<b>Normal</b>			
<b>Delta</b>			
<b>Delta Pair</b> (Tracking Ref)			
Ref	Delta		
<b>Span Pair</b>			
Span	Center		
<b>Off</b>			
<b>More</b> 1 of 2			

**Prüfbericht - Nr.:**

**16030354 001**

Seite 13 von 18

Test Report No.

Page 13 of 18

**99% emitted energy Occupied Bandwidth:**

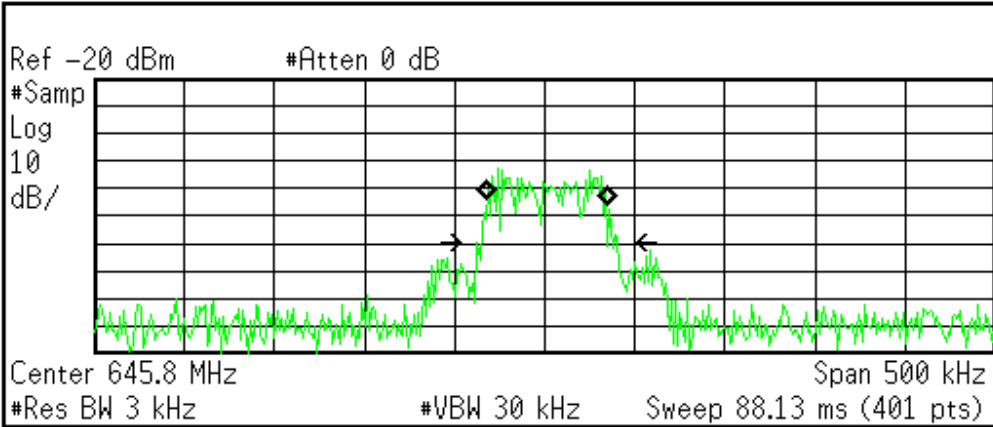
High frequency

2.5kHz

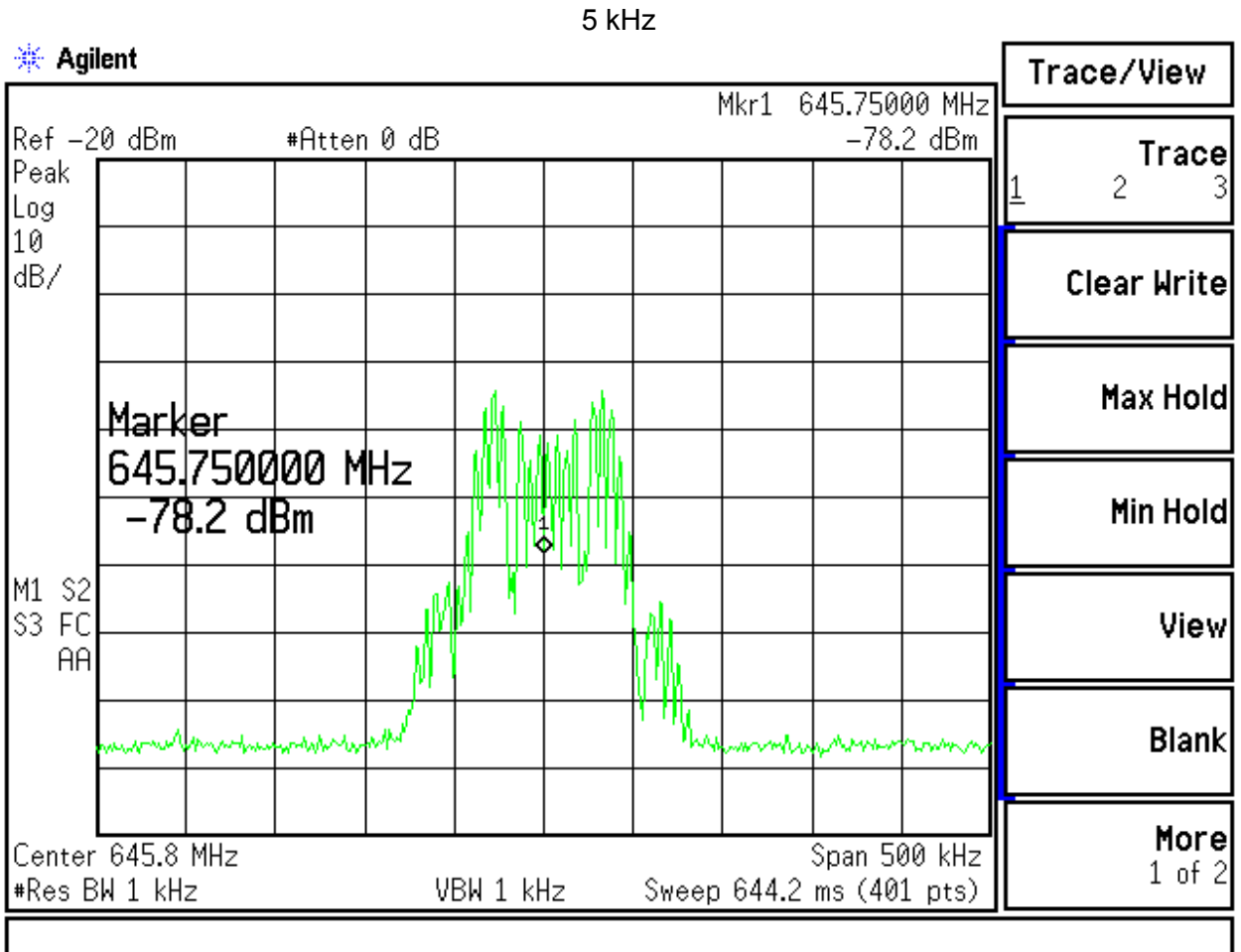
Agilent

Ch Freq 645.75 MHz Trig Free  
Occupied Bandwidth

- Measure
- Meas Off
- Channel Power
- Occupied BW
- ACP
- Multi Carrier Power
- Power Stat CCDF
- More  
1 of 2



<b>Occupied Bandwidth</b>	<b>Occ BW % Pwr</b>	99.00 %
67.4848 kHz	<b>x dB</b>	-26.00 dB
<b>Transmit Freq Error</b>	1.063 kHz	
<b>x dB Bandwidth</b>	75.997 kHz*	





**Prüfbericht - Nr.:**

**16030354 001**

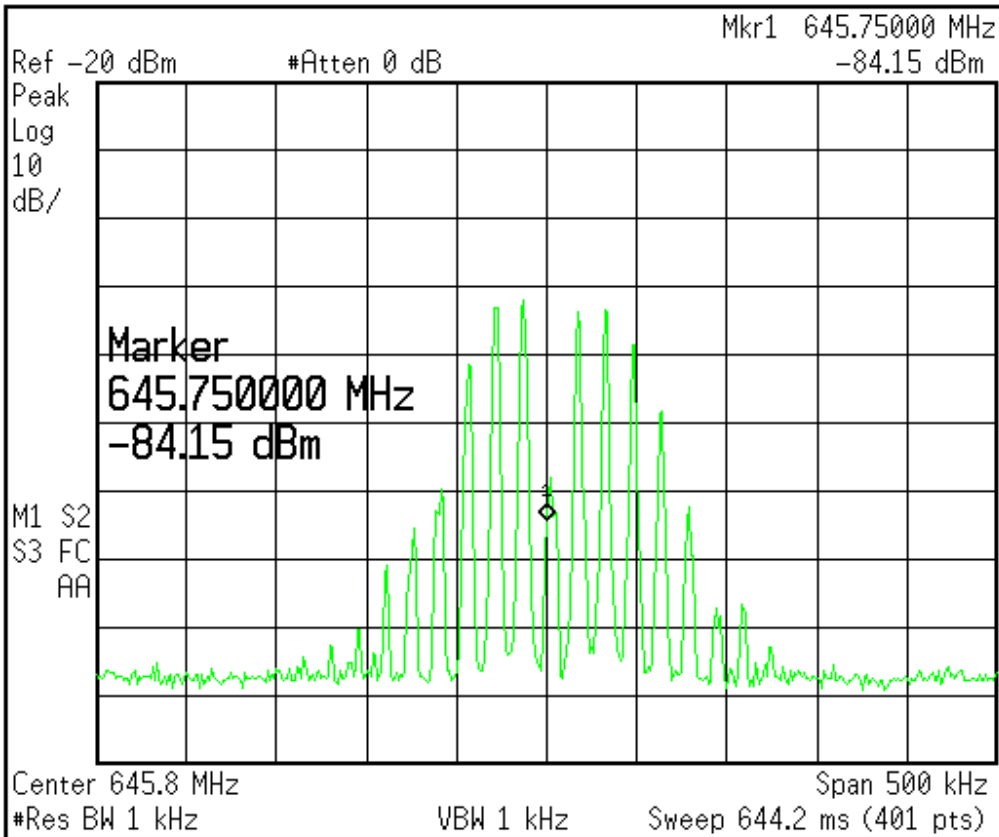
Seite 15 von 18

Test Report No.

Page 15 of 18

15 kHz

Agilent



Trace/View		
Trace	1	2 3
Clear Write		
Max Hold		
Min Hold		
View		
Blank		
More	1 of 2	

**Prüfbericht - Nr.:**

**16030354 001**

Seite 16 von 18

Test Report No.

Page 16 of 18

Low frequency

2.5 kHz

Agilent

Ch Freq 642.375 MHz Trig Free  
Occupied Bandwidth

Freq/Channel

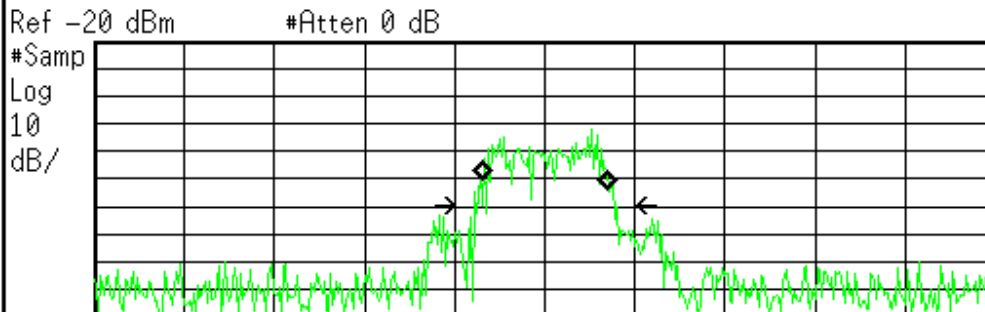
Center Freq  
642.375000 MHz

Start Freq  
642.125000 MHz

Stop Freq  
642.625000 MHz

CF Step  
50.0000000 kHz  
Auto Man

Freq Offset  
0.00000000 Hz



Signal Track  
On Off

**Occupied Bandwidth** 68.9903 kHz  
Occ BW % Pwr 99.00 %  
x dB -26.00 dB  
Transmit Freq Error 39.823 Hz  
x dB Bandwidth 78.296 kHz\*

Scale Type  
Log Lin

**Prüfbericht - Nr.:**

**16030354 001**

Seite 17 von 18

Test Report No.

Page 17 of 18

5 kHz

Agilent

Ch Freq 642.375 MHz Trig Free  
Occupied Bandwidth

Freq/Channel

Center Freq  
642.375000 MHz

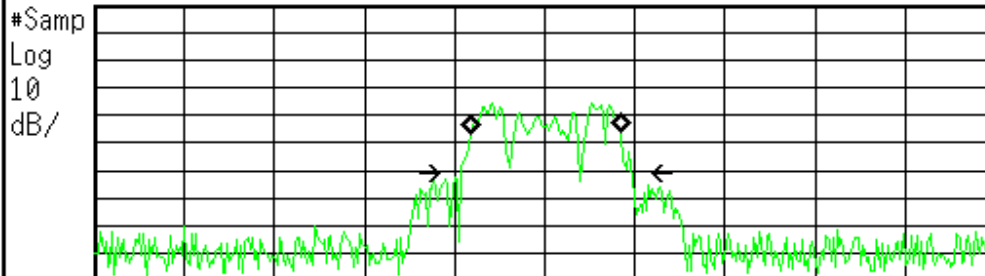
Start Freq  
642.125000 MHz

Stop Freq  
642.625000 MHz

CF Step  
50.0000000 kHz  
Auto Man

Freq Offset  
0.00000000 Hz

Ref -20 dBm #Atten 0 dB



Center 642.4 MHz Span 500 kHz  
#Res BW 3 kHz #VBW 30 kHz Sweep 88.13 ms (401 pts)

Signal Track  
On Off

**Occupied Bandwidth** Occ BW % Pwr 99.00 %  
**83.3965 kHz** x dB -26.00 dB  
Transmit Freq Error 341.065 Hz  
x dB Bandwidth 95.510 kHz\*

Scale Type  
Log Lin

**Prüfbericht - Nr.:**

**16030354 001**

Seite 18 von 18

Test Report No.

Page 18 of 18

15 kHz

 Agilent

**Ch Freq** 642.375 MHz **Trig** Free  
Occupied Bandwidth

**Freq/Channel**

**Center Freq**  
642.375000 MHz

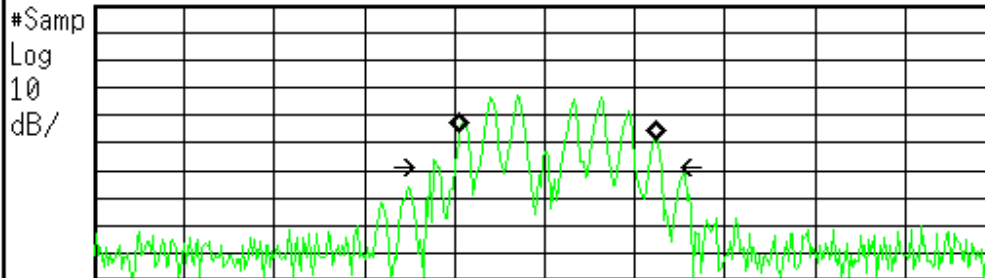
**Start Freq**  
642.125000 MHz

**Stop Freq**  
642.625000 MHz

**CF Step**  
50.0000000 kHz  
Auto Man

**Freq Offset**  
0.00000000 Hz

Ref -20 dBm #Atten 0 dB



Center 642.4 MHz Span 500 kHz  
#Res BW 3 kHz #VBW 30 kHz Sweep 88.13 ms (401 pts)

**Signal Track**  
On Off

**Scale Type**  
Log Lin

**Occupied Bandwidth** **Occ BW % Pwr** 99.00 %  
**107.9561 kHz** **x dB** -26.00 dB  
**Transmit Freq Error** 6.937 kHz  
**x dB Bandwidth** 126.752 kHz\*