



## FCC Part 15.236 Test Report

<b>APPLICANT</b>	WISYCOM SRL
	VIA SPIN, 156 ROMANO D'EZZELINO (VI) 36060 ITALY
<b>FCC ID</b>	POUMTK952N-2W0
<b>MODEL NUMBER</b>	MTK952N-2W0-US_DC, CSA121T, CSI16T, CSI8T, MTK952N
<b>PRODUCT DESCRIPTION</b>	DUAL TRANSMITTER WITH/WITHOUT COMBINER
<b>DATE SAMPLE RECEIVED</b>	9/21/2018
<b>DATE TESTED</b>	9/21/2018
<b>TESTED BY</b>	Tim Royer
<b>APPROVED BY</b>	Franklin Rose
<b>TEST RESULTS</b>	<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL

Report Number	Report Version	Description	Issue Date
1511AUT18_PT 15236_TestReport	Rev1	Initial Issue	09/21/2018
1511AUT18_PT 15236_TestReport	Rev2	Updated test procedure and freq ranges	12/26/2018

**THE ATTACHED REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT THE WRITTEN APPROVAL OF TIMCO ENGINEERING, INC.**



## TABLE OF CONTENTS

<b>GENERAL REMARKS</b> .....	<b>2</b>
<b>GENERAL INFORMATION</b> .....	<b>3</b>
<b>RESULTS SUMMARY</b> .....	<b>4</b>
<b>CHANGE(S) TO EUT, SUMMARY</b> .....	<b>4</b>
<b>RF POWER OUTPUT</b> .....	<b>5</b>
TEST DATA: MEAN OUTPUT MEASUREMENT TABLE, 600 MHZ GUARD BAND & DUPLEX GAP .....	5
<b>FREQUENCY SELECTION</b> .....	<b>6</b>
<b>OCCUPIED BANDWIDTH</b> .....	<b>7</b>
<b>OCCUPIED BANDWIDTH (26 DB)</b> .....	<b>8</b>
TEST DATA: 614.075 MHZ .....	8
TEST DATA: 615.925 MHZ .....	9
TEST DATA: 658 MHZ .....	10
TEST DATA: 662.925 MHZ .....	11
<b>OCCUPIED BANDWIDTH (99%)</b> .....	<b>12</b>
TEST DATA: 614.075 MHZ .....	12
TEST DATA: 615.925 MHZ .....	13
TEST DATA: 658 MHZ .....	14
TEST DATA: 662.925 MHZ .....	15
<b>EMISSION MASK</b> .....	<b>16</b>
TEST DATA: 614.1 MHZ EMISSION MASK PLOT .....	18
TEST DATA: 615.925 MHZ EMISSION MASK PLOT .....	19
TEST DATA: 658 MHZ EMISSION MASK PLOT .....	20
TEST DATA: 662.925 MHZ EMISSION MASK PLOT .....	21
<b>FIELD STRENGTH OF SPURIOUS EMISSIONS</b> .....	<b>22</b>
<b>FREQUENCY STABILITY</b> .....	<b>27</b>
<b>STATEMENT OF MEASUREMENT UNCERTAINTY</b> .....	<b>28</b>
<b>EMC EQUIPMENT LIST</b> .....	<b>29</b>

## GENERAL REMARKS

### Summary

The device under test does:

- Fulfill the general approval requirements as identified in this test report and was selected by the customer.
- Not fulfill the general approval requirements as identified in this test report

### Attestations

This equipment has been tested in accordance with the standards identified in this test report. To the best of my knowledge and belief, these tests were performed using the measurement procedures described in this report.

All instrumentation and accessories used to test products for compliance to the indicated standards are calibrated regularly in accordance with ISO 17025 requirements.

I attest that the necessary measurements were made at:

**Timco Engineering Inc.**  
**849 NW State Road 45**  
**Newberry, FL 32669**  
**Designation #: US1070**

**Tested by:**



**Name and Title** Tim Royer, Project Manager / EMC Testing Engineer  
**Date** 09/25/2018

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**Reviewed and Approved by:**



**Name and Title** Franklin Rose, Project Manager / EMC Testing Technician  
**Date** 09/25/2018

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## GENERAL INFORMATION

<b>EUT Description</b>	DUAL TRANSMITTER WITH/WITHOUT COMBINER
<b>FCC ID</b>	POUMTK952N-2W0
<b>Model Number</b>	MTK952N-2W0-US_DC, CSA121T, CSI16T, CSI8T, MTK952N
<b>Operating Frequency</b>	Band 2: 614.075 – 615.925 MHz Band 4: 657 – 663 MHz
<b>Test Frequencies</b>	Band 2: 614.075, 615.925 MHz Band 4: 658, 662.925 MHz
<b>EUT Power Source</b>	<input checked="" type="checkbox"/> 110–120Vac/50– 60Hz
	<input type="checkbox"/> DC Power
	<input type="checkbox"/> Battery Operated Exclusively
<b>Test Item</b>	<input type="checkbox"/> Prototype
	<input type="checkbox"/> Pre-Production
	<input checked="" type="checkbox"/> Production
<b>Type of Equipment</b>	<input checked="" type="checkbox"/> Fixed
	<input type="checkbox"/> Mobile
	<input type="checkbox"/> Portable
<b>Antenna Connector</b>	BNC
<b>Test Conditions</b>	The temperature was 26°C Relative humidity of 50%.
<b>Modification to the EUT</b>	No Modification to EUT.
<b>Test Exercise</b>	The EUT was placed in continuous transmit and was operated in “Test Mode” for digital emissions tests.
<b>Applicable Standards</b>	FCC CFR 47 Part 2, & 15, KDB 206256 D01 v02, ANSI C63.10-2013, ANSI C63.26 2015
<b>Test Facility</b>	Timco Engineering Inc. at 849 NW State Road 45 Newberry, FL 32669 USA. Designation #: US1070

## RESULTS SUMMARY

FCC Rule Part	Requirement	Test Item	Result
PART 2.1046(a), 15.236(d)(2)	Conducted Power	RF Power Output	Pass
PART 15.236(g), ETSI EN 300-422-1 s. 8.3.2	Unwanted Emissions	Emission Mask	Pass

## CHANGE(S) TO EUT, SUMMARY

The changes to Part 74 H, specifically in the 600 MHz band have impact on the granted function of this device. In order to comply with the changes outlined in KDB 206256 D01 Wireless Microphones v02, this device has been tested to show compliance with the new rulings.

This device's hardware has not been altered; only the software/firmware settings have been changed in order to become compliant with the newly updated rules, as per KDB 206256, sections II and III. For more specific information, please see the updated Operational Description of the device.

This device was previously granted on the following frequency bands:

Date of Grant: 04/11/2015

470.1 – 607.9 MHz  
614.1 – 697.9 MHz

And only the software has been altered to limit operation to:

614.1 – 616 MHz  
657 – 663 MHz

**Note:** The EUT is only marketed and sold to "Professional Users" and Part 74 frequencies are also selectable in device. For more details, see companion report:

"1511AUT18\_PT 74H\_TestReport\_Rev1"

**RF POWER OUTPUT**

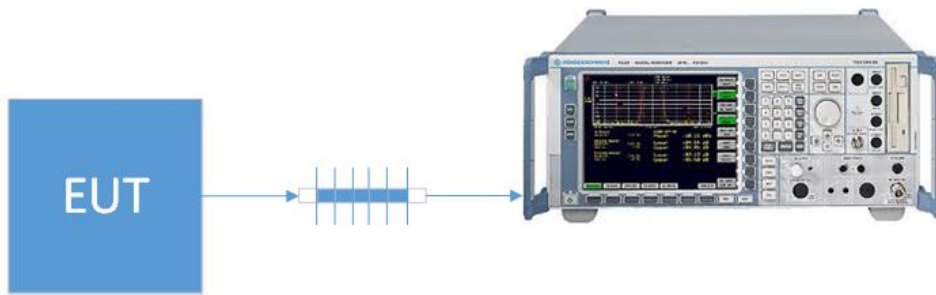
**Rule Part No.:** PART 2.1046(a), 15.236(d)(2)

**Requirement:**

§15.236 Operation of wireless microphones in the bands 54-72 MHz, 76-88 MHz, 174-216 MHz, 470-608 MHz and 614-698 MHz.

- (d) The maximum radiated power shall not exceed the following values:
- (2) In the 600 MHz guard band and the 600 MHz duplex gap: 20 mW EIRP.

**Setup Diagram:**



**Test Data: Mean Output Measurement Table, 600 MHz Guard Band & Duplex Gap**

Tuned Frequency (MHz)	Mean Power Output				
	Level (dBm)	Ant. Gain (dBi)	Cable Loss (dB)	Level (mW)	Margin (mW)
614.1	16.76	0.00	3.80	19.8	0.2
615.925	16.79	0.00	3.80	19.9	0.1
658.000	16.60	0.00	3.80	19.1	0.9
662.925	16.82	0.00	3.80	20.0	0.0

## Frequency Selection

**Rule Part No.:** 15.236 (f) (1)

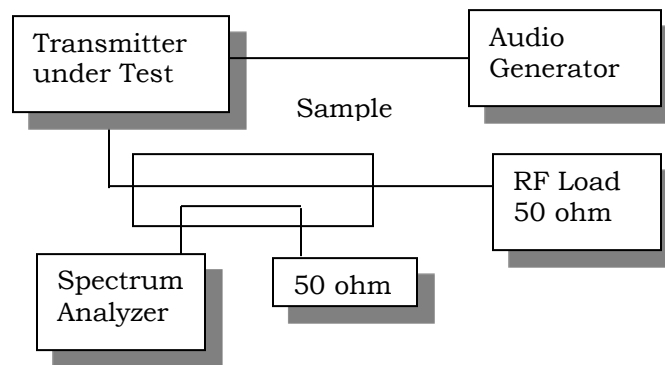
### Test Requirements:

(1) The frequency selection shall be offset from the upper or lower band limits by 25 kHz or an integral multiple thereof.

there of 614.075-615.925 MHz and 657.00-663.00 MHz

**Method of Measurement:** For a device that has a permanently attached antenna, RF power is measured radiated. With a nominal battery voltage, and the transmitter properly adjusted, the ,RF output measures:

### Test Setup Diagram:



### Test Data:

Frequency Range

Low Frequency	614.075	MHz
High Frequency	662.925	MHz

**Result: Meets Requirements**

## OCCUPIED BANDWIDTH

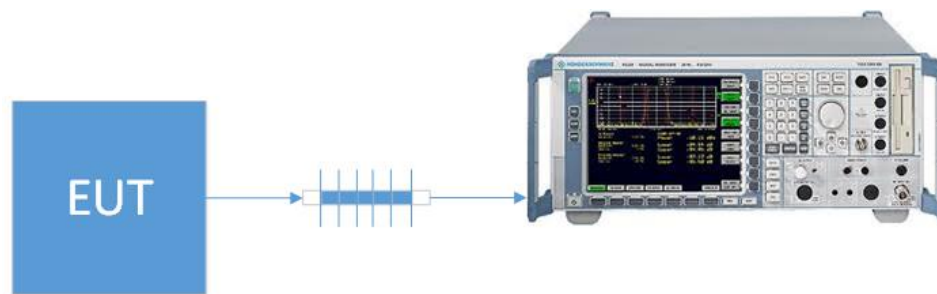
**Rules Part No.:** FCC Part 15.236 (f) (2)

### Requirements:

(2) One or more adjacent 25 kHz segments within the assignable frequencies may be combined to form a channel whose maximum bandwidth shall not exceed 200 kHz. The operating bandwidth shall not exceed 200 kHz.

**Measurement Procedure:** ANSI C63.26 sec. 5.4.3

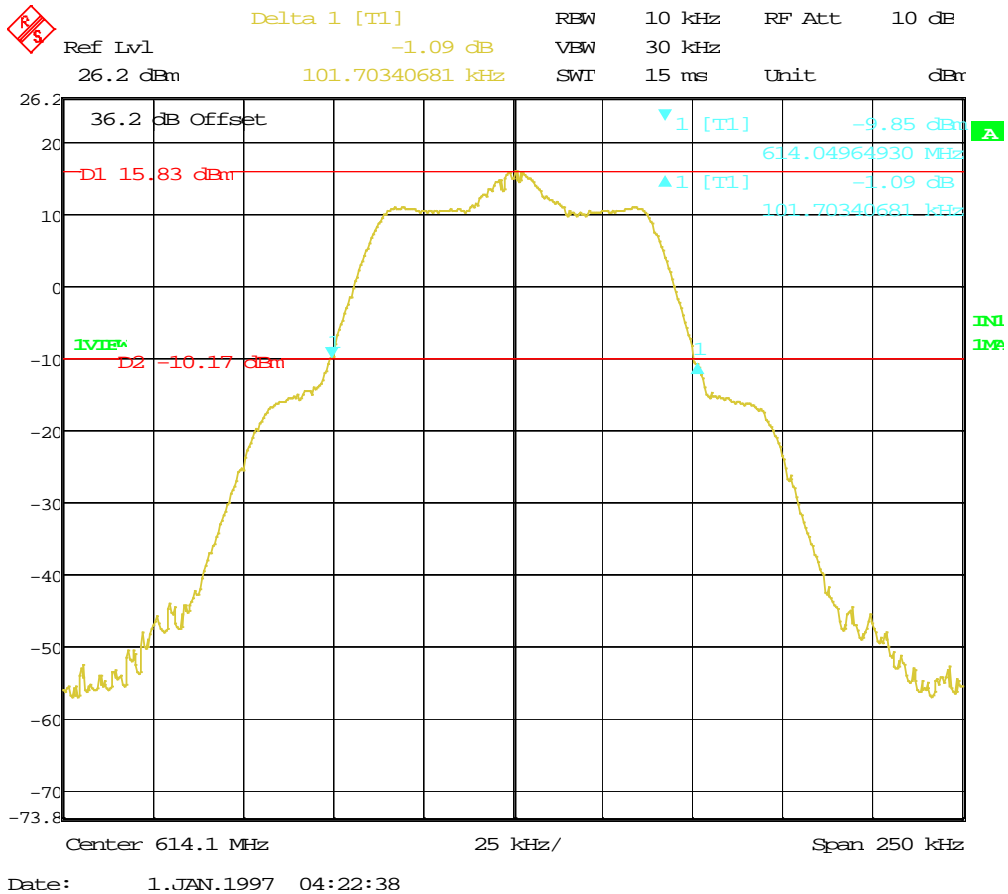
### Test Setup Diagram:





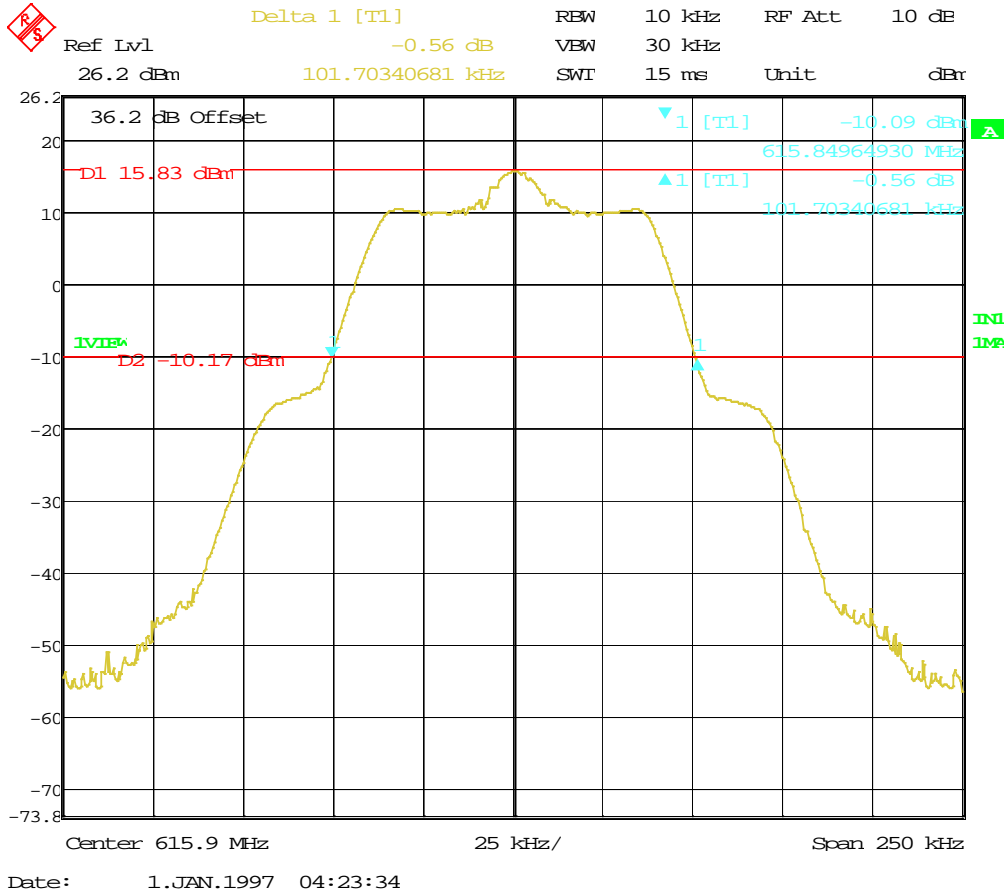
# OCCUPIED BANDWIDTH (26 dB)

Test Data: 614.075 MHz



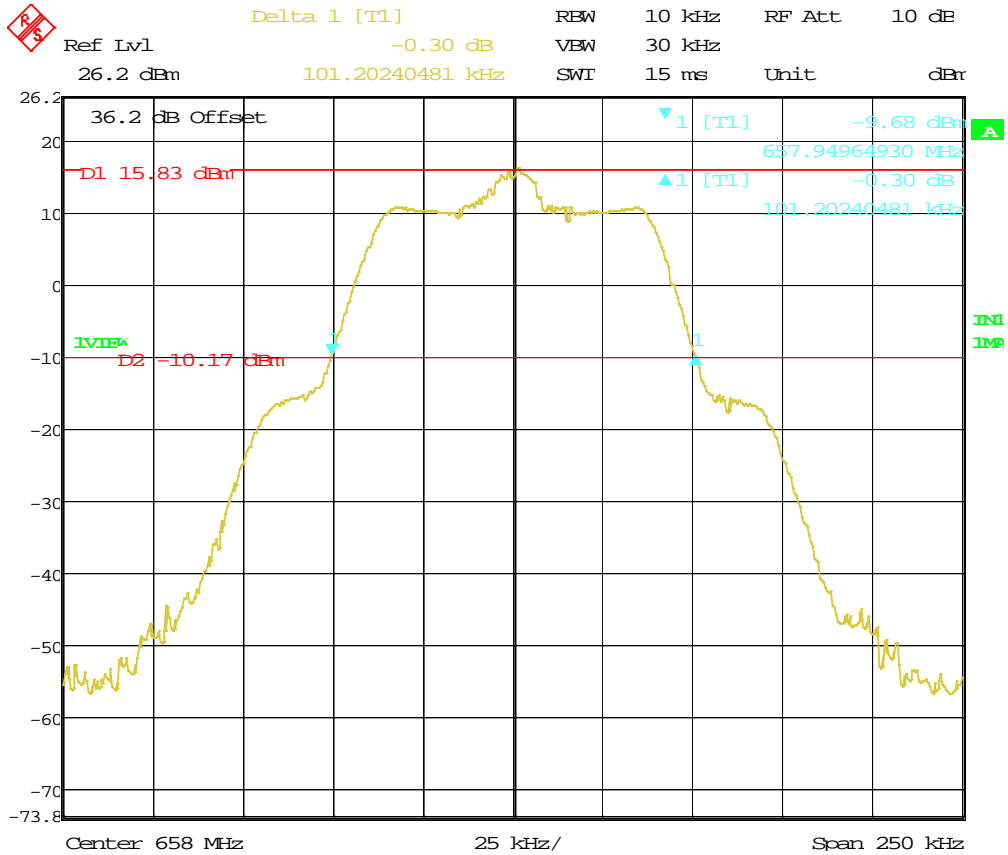
# OCCUPIED BANDWIDTH PLOT (26 dB)

Test Data: 615.925 MHz



# OCCUPIED BANDWIDTH PLOT (26 dB)

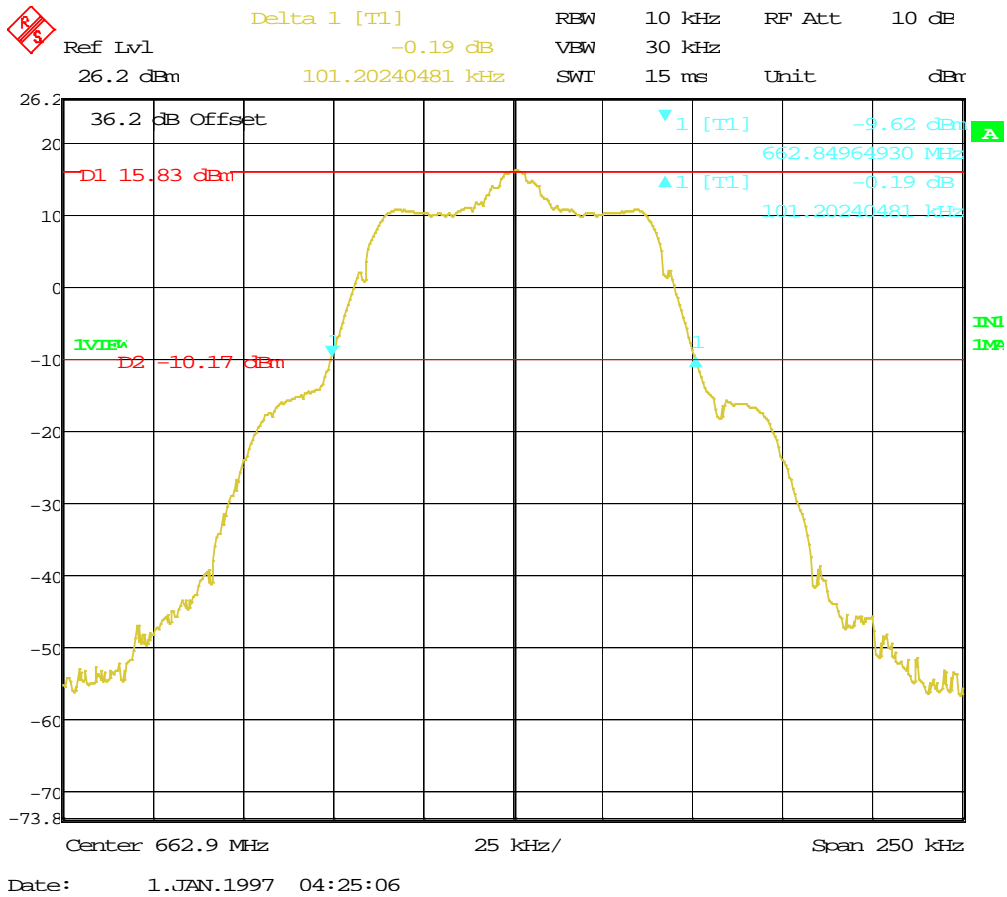
Test Data: 658 MHz



Date: 1.JAN.1997 04:24:18

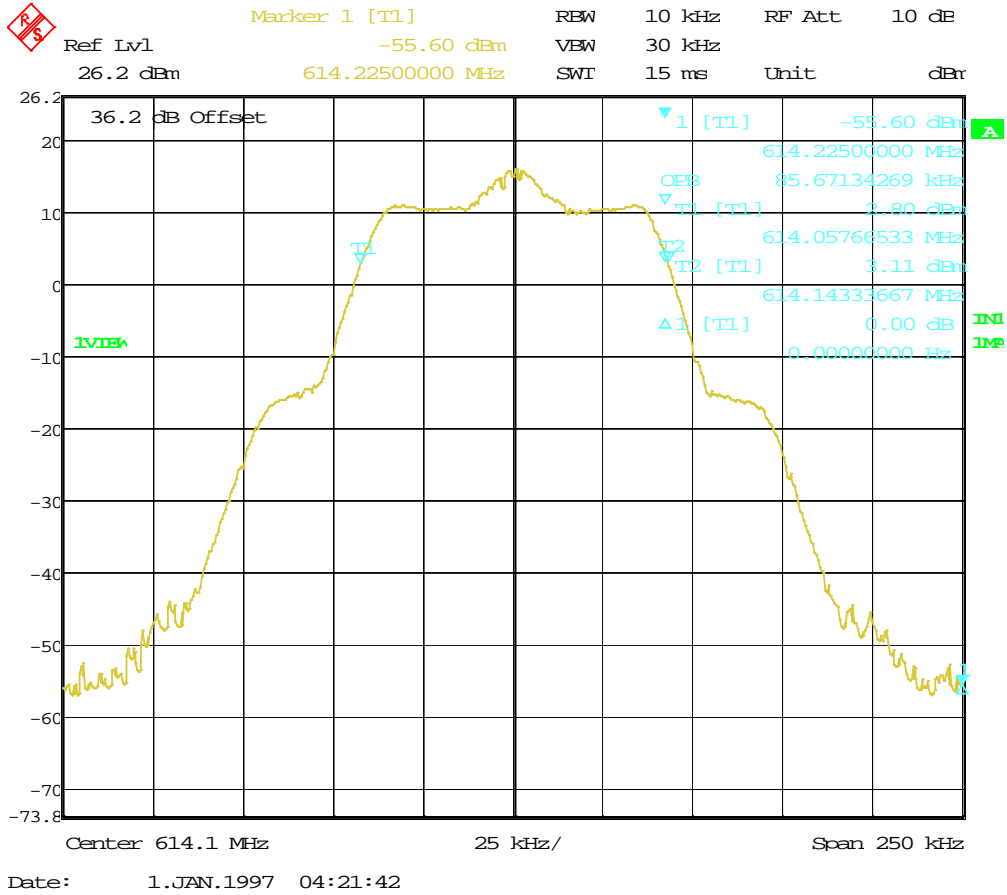
# OCCUPIED BANDWIDTH PLOT (26 dB)

Test Data: 662.925 MHz



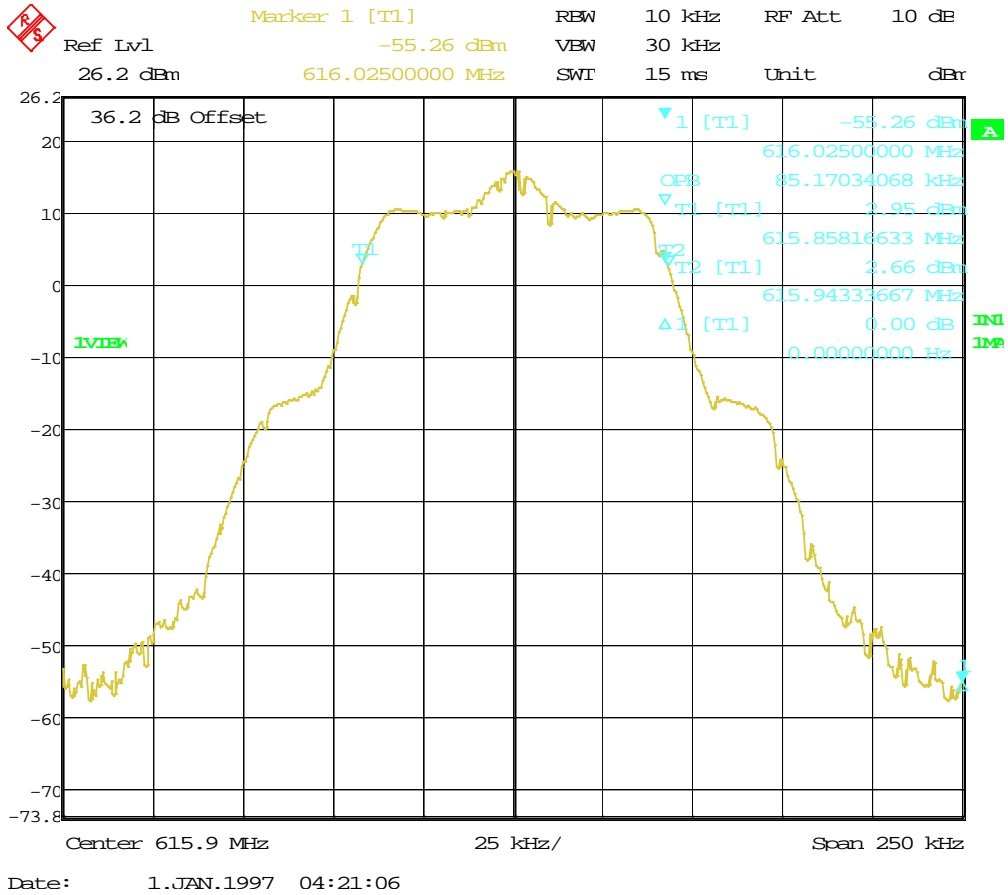
# OCCUPIED BANDWIDTH (99%)

Test Data: 614.075 MHz



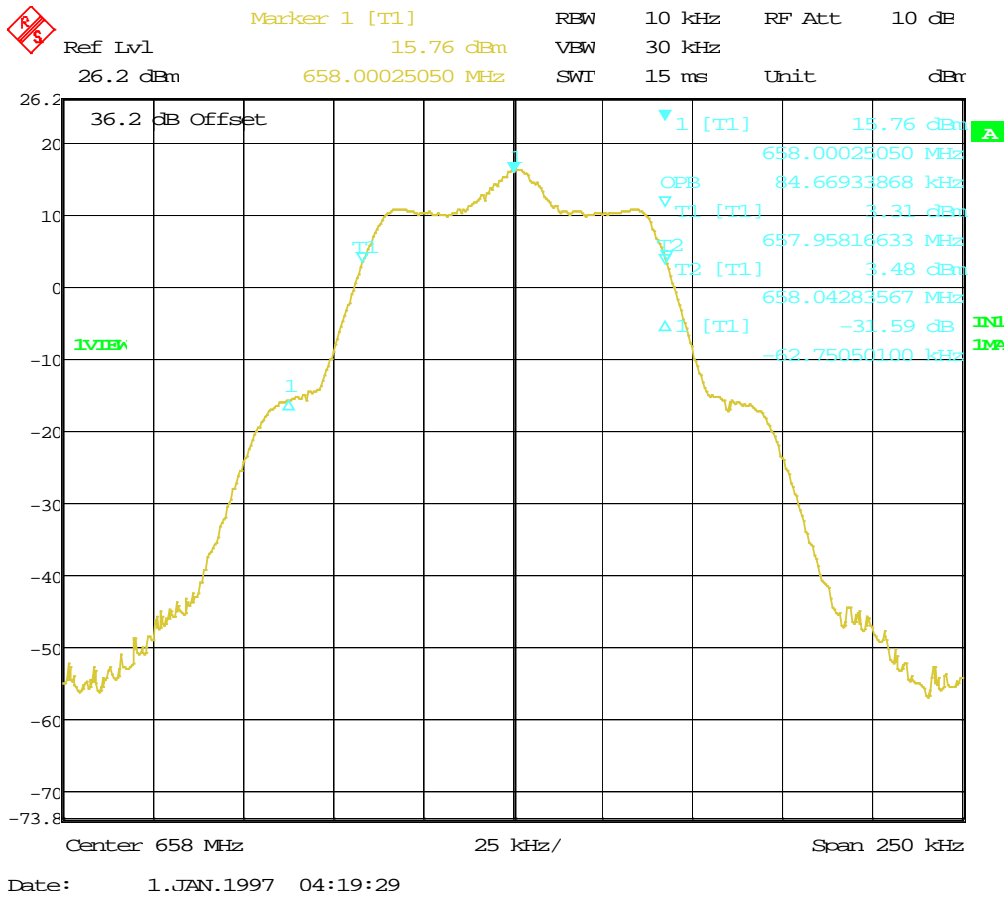
# OCCUPIED BANDWIDTH PLOT (99%)

Test Data: 615.925 MHz



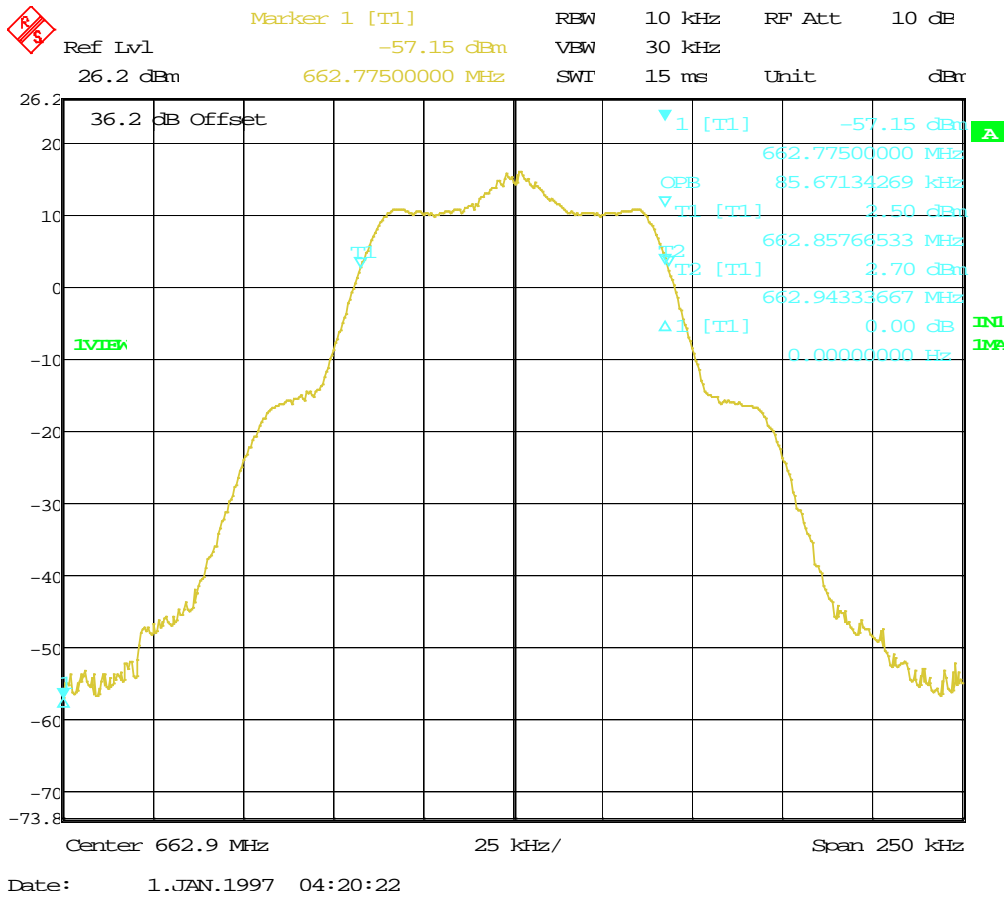
# OCCUPIED BANDWIDTH PLOT (99%)

Test Data: 658 MHz



# OCCUPIED BANDWIDTH PLOT (99%)

Test Data: 662.925 MHz





## EMISSION MASK

**Rule Part No.:** FCC CFR 47 PART 15.236(g)

(g) Emissions within the band from one megahertz below to one megahertz above the carrier frequency shall comply with the emission mask in §8.3 of ETSI EN 300 422-1 V1.4.2 (2011-08), *Electromagnetic compatibility and Radio spectrum Matters (ERM); Wireless microphones in the 25 MHz to 3 GHz frequency range; Part 1: Technical characteristics and methods of measurement*. Emissions outside of this band shall comply with the limits specified in section 8.4 of ETSI EN 300 422-1 V1.4.2 (2011-08).

**Requirement:** ETSI EN 300 422-1 Section 8.3.2

- (c) Compliance for emission mask and spurious emission requirements shall be demonstrated using the applicable measurement procedures of ETSI EN 300 422-1. Compliance with the emission limits shall be demonstrated using a RMS Average detector. Emissions shall be investigated up to the 10<sup>th</sup> harmonic of the fundamental. All other technical requirements shall be demonstrated utilizing the procedures specified in ANSI C63.26,<sup>4</sup> as applicable.

## EMISSION MASK

### 8.3.2.2 Limits

The transmitter output spectrum shall be within the mask defined in figure 4. This mask may also be used for analogue.

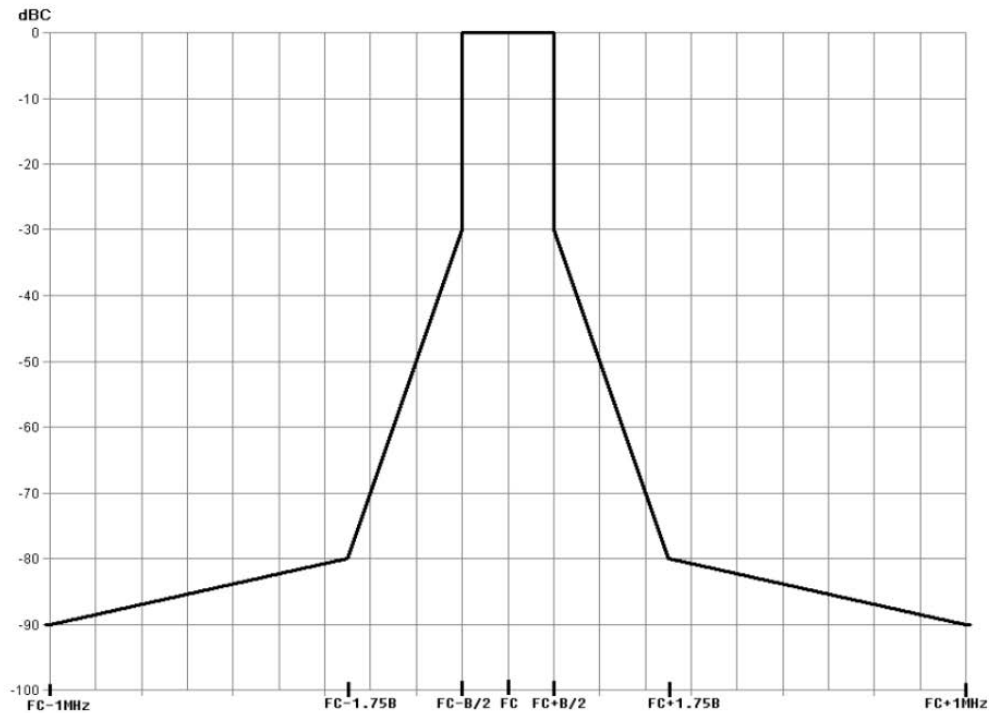
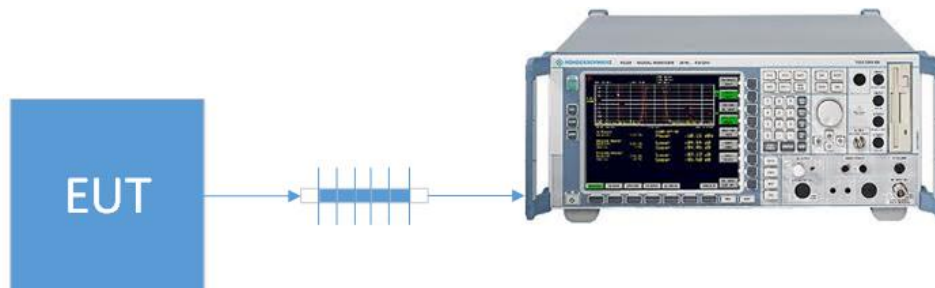


Figure 4: Spectrum mask for digital systems below 1 GHz

**Procedure:** ETSI EN 300 422-1 s. 8.3.2  
 KDB 971168 D01 Spurious Emissions at antenna term section 6  
 ANSI C63.26, 5.4.4 (using Test Setup from TIA 603-E 2.2.11, below)

### Setup Diagram:

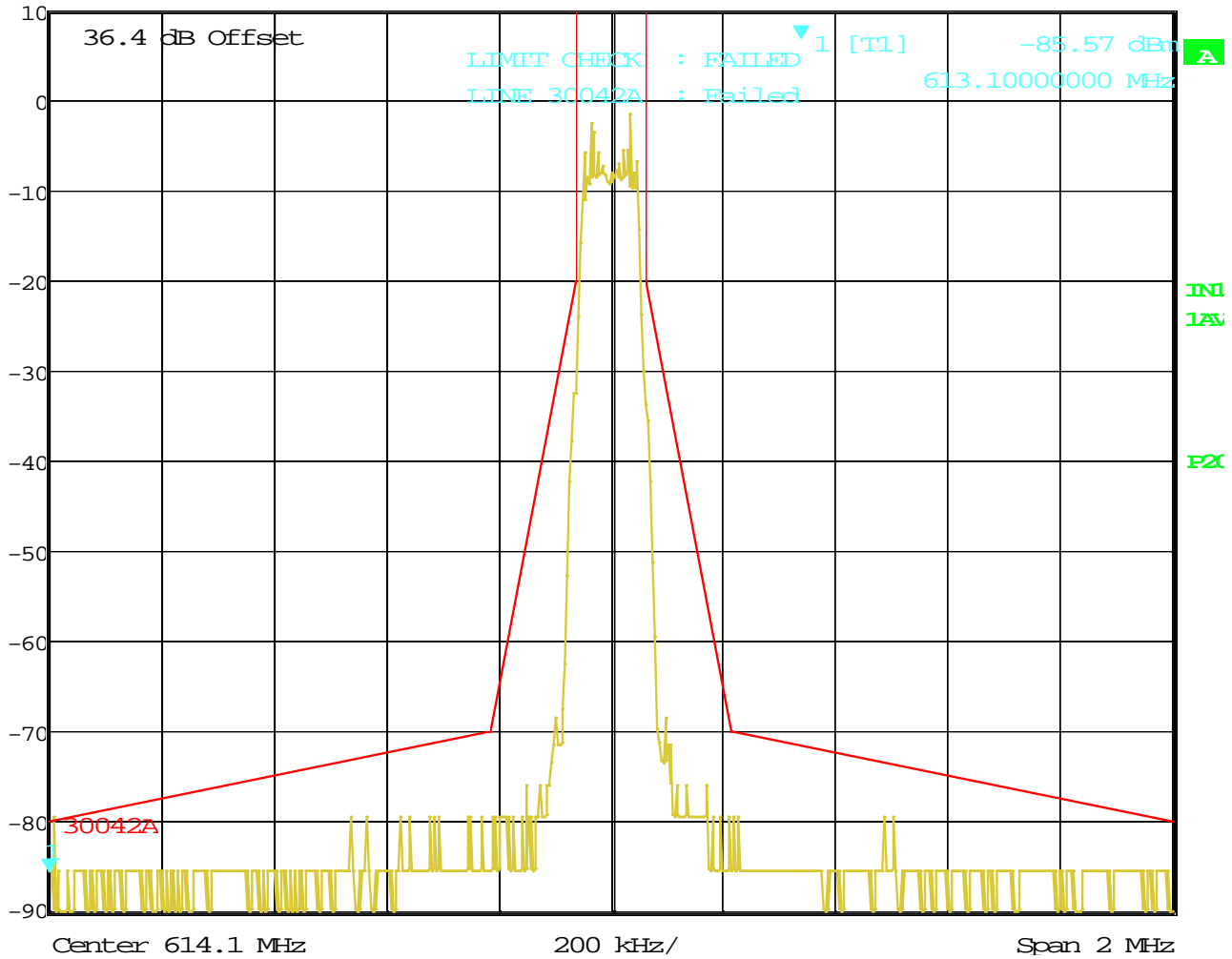


# EMISSION MASK

## Test Data: 614.1 MHz Emission Mask Plot



Ref Lvl	10 dBm	Marker 1 [T1]	-85.57 dBm	RBW	1 kHz	RF Att	20 dB
			613.1000000 MHz	VBW	1 kHz	Unit	dBm
				SWT	5 s		

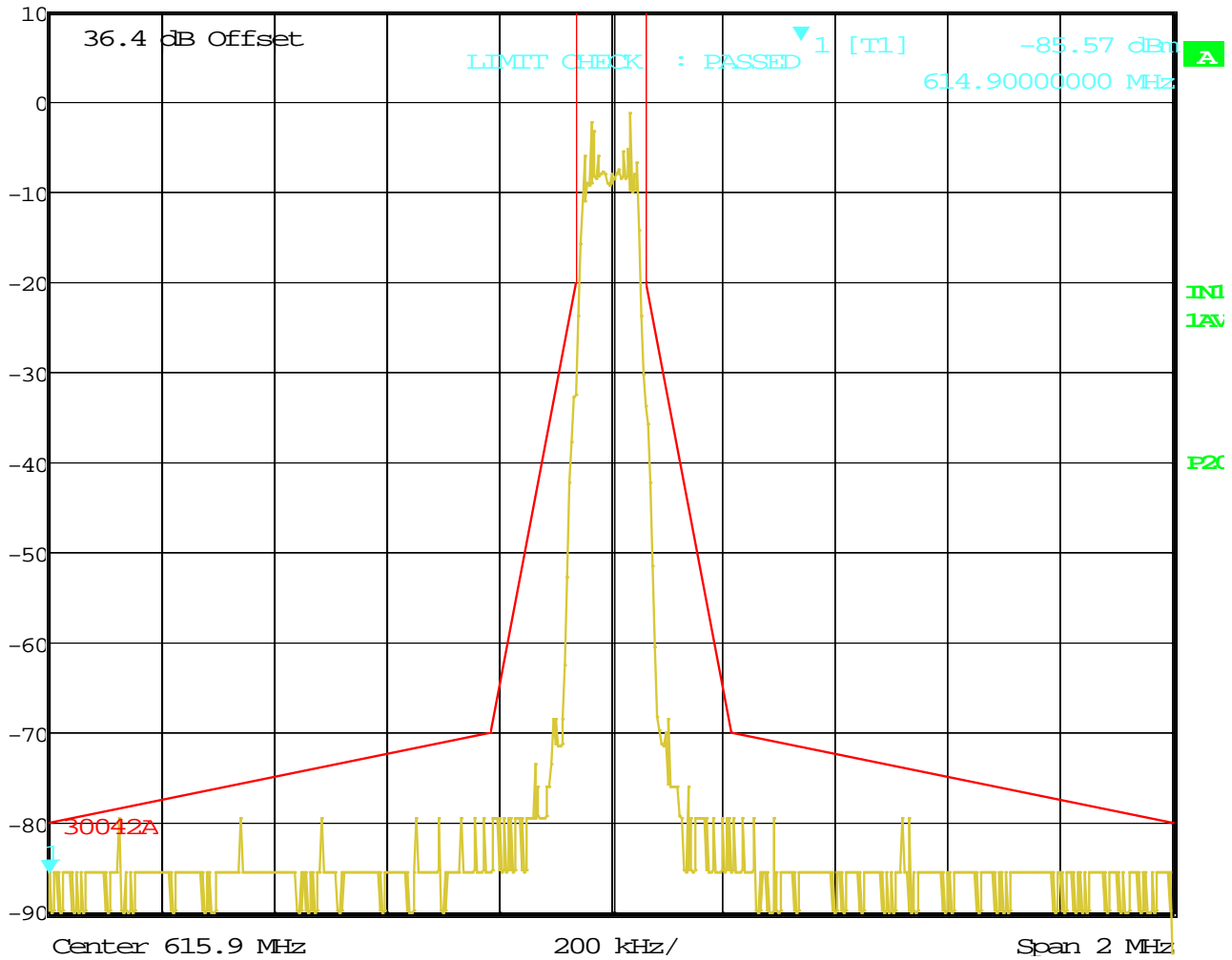


Date: 1.JAN.1997 03:43:31

# EMISSION MASK

## Test Data: 615.925 MHz Emission Mask Plot

	Ref Lvl	10 dBm	36.4 dB Offset	Marker 1 [T1]	-85.57 dBm	614.9000000 MHz	RBW	1 kHz	RF Att	20 dB
							VBW	1 kHz		
							SWT	5 s	Unit	dBm



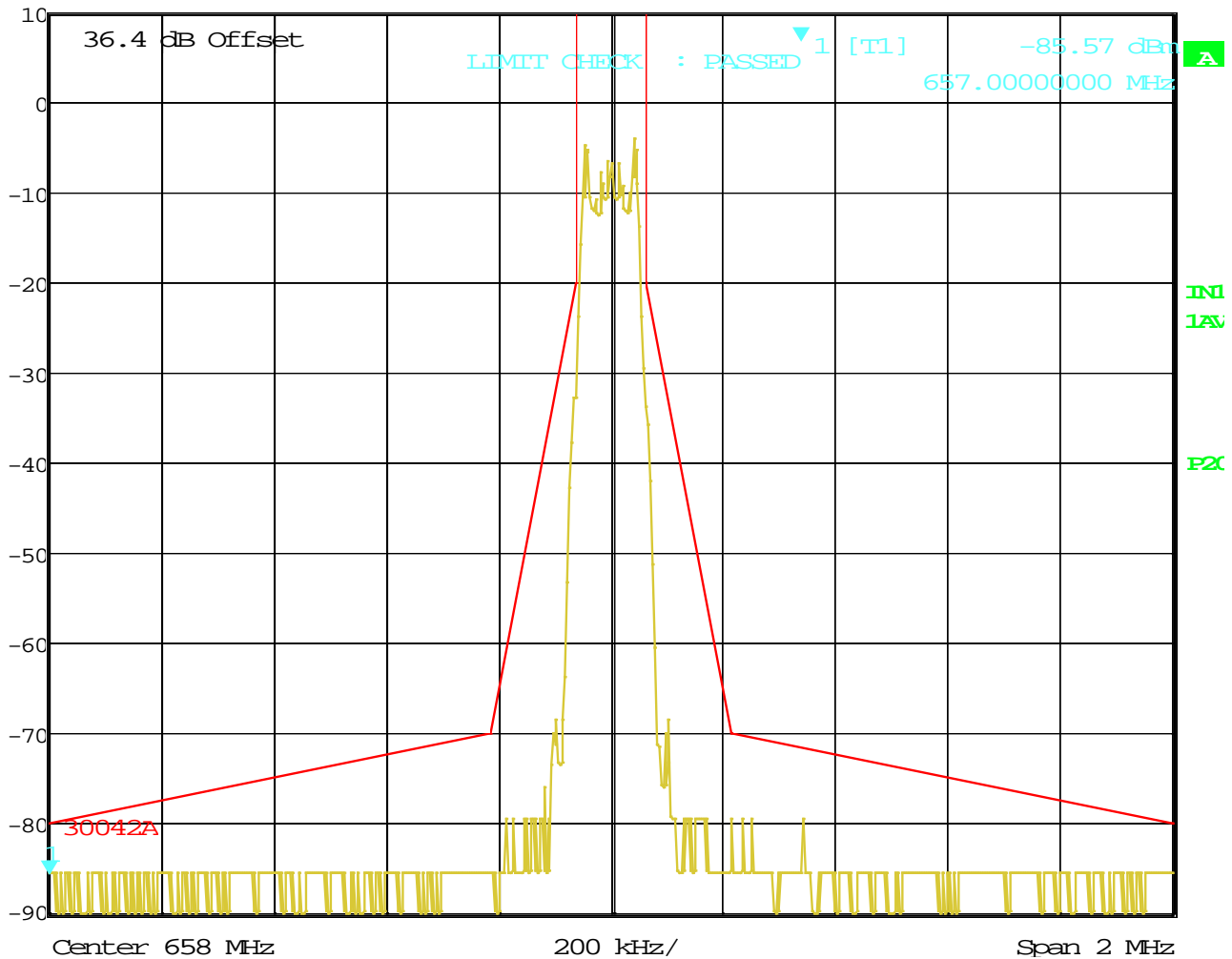
Date: 1.JAN.1997 03:44:50

# EMISSION MASK

## Test Data: 658 MHz Emission Mask Plot



Ref Lvl	Marker 1 [T1]	RBW	1 kHz	RF Att	20 dB
10 dBm	-85.57 dBm	VBW	1 kHz		
	657.00000000 MHz	SWT	5 s	Unit	dBm



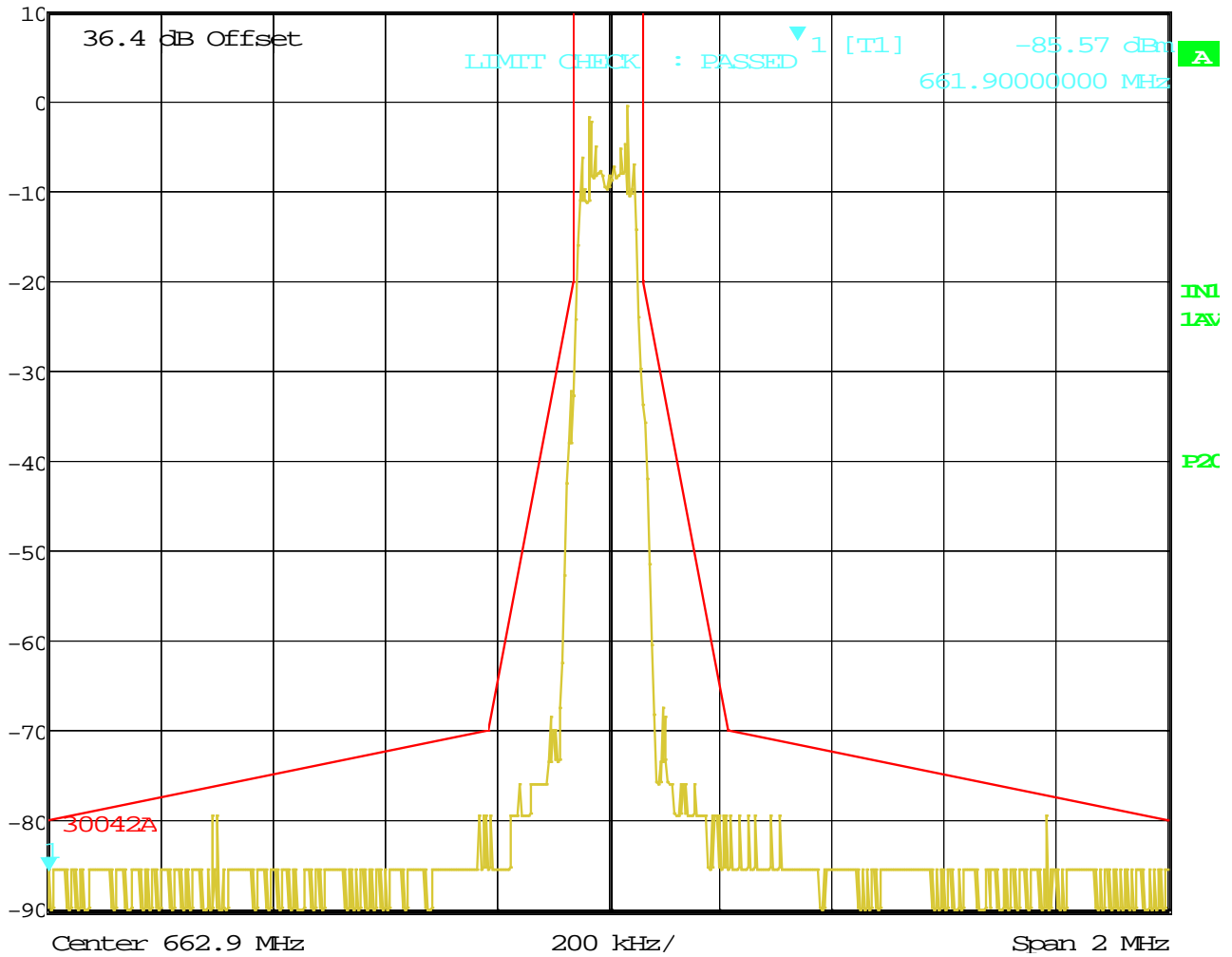
Date: 1.JAN.1997 03:46:30

# EMISSION MASK

## Test Data: 662.925 MHz Emission Mask Plot



Ref Lvl	Marker 1 [T1]	RBW	1 kHz	RF Att	20 dB
10 dBm	-85.57 dBm	VBW	1 kHz		
	661.9000000 MHz	SWT	5 s	Unit	dBm



Date: 1.JAN.1997 03:47:19

## FIELD STRENGTH OF SPURIOUS EMISSIONS

Rules Part No.: FCC Part 15.236 (g)

### Requirements:

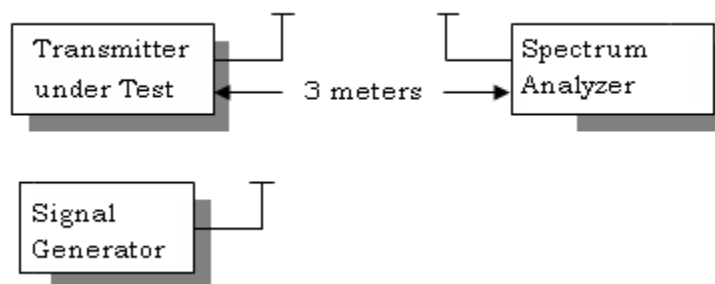
(g) Emissions within the band from one megahertz below to one megahertz above the carrier frequency shall comply with the emission mask in §8.3 of ETSI EN 300 422-1 V1.4.2 (2011-08), *Electromagnetic compatibility and Radio spectrum Matters (ERM); Wireless microphones in the 25 MHz to 3 GHz frequency range; Part 1: Technical characteristics and methods of measurement*. Emissions outside of this band shall comply with the limits specified in section 8.4 of ETSI EN 300 422-1 V1.4.2 (2011-08).

State	Frequency		
	47 MHz to 74 MHz 87,5 MHz to 137 MHz 174 MHz to 230 MHz 470 MHz to 862 MHz	Other Frequencies below 1 000 MHz	Frequencies above 1 000 MHz
Operation	4 nW	250 nW	1 $\mu$ W
Standby	2 nW	2 nW	20 nW

**METHOD OF MEASUREMENTS:** The measuring receiver, as defined in table 4, shall be tuned over the frequency range 25 MHz to 4 GHz for equipment operating on frequencies below 1 GHz or in the frequency range of 25 MHz to 12,75 GHz for equipment operating on frequencies above 1 GHz.

Measurements were made at the test site of **Timco Engineering, Inc. located at 849 NW State Road 45, Newberry, FL 32669.**

### Test Setup Diagram:



## FIELD STRENGTH OF SPURIOUS EMISSIONS

Test Data: 614.00 MHz

Tuned Freq MHz	Emission Frequency MHz	Antenna Polarity	ERP (dBm)	Margin (dB)
614.00	59.42	H	<b>-78.98</b>	12.98
614.00	59.42	V	<b>-69.09</b>	3.09
614.00	96.75	V	<b>-76.26</b>	10.26
614.00	145.78	H	<b>-71.35</b>	5.35
614.00	146.50	V	<b>-72.52</b>	6.52
614.00	214.10	V	<b>-76.20</b>	10.20
614.00	379.48	V	<b>-74.33</b>	8.33
614.00	1225.90	H	<b>-63.33</b>	3.33
614.00	1225.90	H	<b>-61.51</b>	1.51

**Result: Meets Requirements**



## FIELD STRENGTH OF SPURIOUS EMISSIONS

Test Data: 615.925 MHz

Tuned Freq MHz	Emission Frequency MHz	Antenna Polarity	ERP (dBm)	Margin (dB)
615.00	59.69	V	<b>-67.59</b>	1.59
615.00	59.69	V	<b>-79.02</b>	13.02
615.00	145.78	V	<b>-70.25</b>	4.25
615.00	146.00	V	<b>-72.37</b>	6.37
615.00	214.10	H	<b>-77.24</b>	11.24
615.00	214.10	H	<b>-77.96</b>	11.96
615.00	379.48	V	<b>-74.03</b>	8.03
615.00	1230.70	H	<b>-61.26</b>	1.26
615.00	1230.70	H	<b>-65.01</b>	5.01

**Result: Meets Requirements**

## FIELD STRENGTH OF SPURIOUS EMISSIONS

Test Data: 658.000

Tuned Freq MHz	Emission Frequency MHz	Antenna Polarity	ERP (dBm)	Margin (dB)
658.00	59.69	H	<b>-78.62</b>	12.62
658.00	59.69	V	<b>-69.62</b>	3.62
658.00	94.83	V	<b>-76.23</b>	10.23
658.00	146.00	H	<b>-67.38</b>	1.38
658.00	146.00	V	<b>-71.64</b>	5.64
658.00	165.40	H	<b>-71.38</b>	5.38
658.00	214.10	H	<b>-77.33</b>	11.33
658.00	379.48	V	<b>-69.69</b>	3.69
658.00	934.61	V	<b>-58.97</b>	-7.03
658.00	1971.10	H	<b>-61.37</b>	1.37
658.00	1971.10	V	<b>-65.96</b>	5.96

**Result: Meets Requirements**

**FIELD STRENGTH OF SPURIOUS EMISSIONS**

**Test Data: 662.925 MHz**

<b>Tuned Freq MHz</b>	<b>Emission Frequency MHz</b>	<b>Antenna Polarity</b>	<b>ERP (dBm)</b>	<b>Margin (dB)</b>
662.00	59.65	V	<b>-67.51</b>	1.51
662.00	59.96	H	<b>-79.32</b>	13.32
662.00	97.00	V	<b>-73.82</b>	7.82
662.00	146.00	H	<b>-66.87</b>	0.87
662.00	165.40	H	<b>-70.59</b>	4.59
662.92	214.10	H	<b>-76.52</b>	10.52
662.92	214.10	V	<b>-78.97</b>	12.97
662.92	262.82	H	<b>-77.33</b>	11.33
662.00	1322.11	V	<b>-67.30</b>	7.30
662.00	1985.50	H	<b>-62.33</b>	2.33

**Result: Meets Requirements**

## FREQUENCY STABILITY

**Rule Parts. No.:** Part 2.1055, Part 74.861

**Requirements:** Temperature and voltage tests were performed to verify that the frequency remains within the .0050%,(50 ppm)

**Method of Measurements:** ANSI/TIA 603-C: 2004.

**The test was conducted as follows:** The transmitter was placed in the temperature chamber at 25 °C and allowed to stabilize for one hour. The transmitter was keyed ON for one minute during which four frequency readings were recorded at 15-second intervals. The worst case number used in the table below. The assigned channel frequency was considered to be the reference frequency. The temperature was then reduced to -20 °C after which the transmitter was again allowed to stabilize for one hour. The transmitter was keyed ON for one minute, and again frequency readings were noted at 15-second intervals. The worst-case number was again used in the table below. This procedure was repeated in 10-degree increments up to + 50 °C.

### Test Data:

Temperature	Frequency MHz	Hz	PPM
25°C (reference)	662.90035		
-30°C	662.90041	60	0.091
-20°C	662.90039	40	0.060
-10°C	662.90037	20	0.030
0°C	662.90036	10	0.015
10°C	662.90036	10	0.015
20°C	662.90035	0	0.000
30°C	662.90035	0	0.000
40°C	662.90033	-20	-0.030
50°C	662.90031	-40	-0.060

**Result: Meets Requirements**

## STATEMENT OF MEASUREMENT UNCERTAINTY

The data and results referenced in this document are true and accurate. The measurement uncertainty was calculated for all measurements listed in this test report according To CISPR 16-4 or ENTR 100-028 Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: “Uncertainty in EMC Measurements” and is documented in the Timco Engineering, Inc. quality system according to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Timco Engineering, Inc. is reported:

Test Items	Measurement Uncertainty	Notes
RF Frequency Accuracy	± 49.5 Hz	(1)
RF Conducted Power	±0.93dB	(1)
Conducted spurious emission of transmitter valid up to 40GHz	±1.86dB	
Occupied Bandwidth	±2.65%	
Audio Frequency Response	±1.86dB	
Modulation limiting	±1.88%	
Radiated RF Power	±1.4dB	
Maximum frequency deviation: Within 300 Hz and 6kHz of audio freq.	±1.88%	
Within 6kHz and 25kHz of audio Freq.	±2.04%	
Rad Emissions Sub Meth up to 26.5GHz	±2.14dB	
Adjacent channel power	±1.47dB	(1)
Transient Frequency Response	±1.88%	
Temperature	±1.0°C	(1)
Humidity	±5.0%	

Notes: (1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.

## EMC EQUIPMENT LIST

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
Sweep/Signal Generator	Anritsu	68369B	985112	11/08/17	11/08/19
EMI Test Receiver R & S ESIB 40 Screen Room	Rohde & Schwarz	ESIB 40	100274	08/16/16	08/16/19
Antenna: Biconical 1096	Eaton	94455-1	1096	08/01/17	08/01/19
Antenna: Log-Periodic 1122	Electro-Metrics	LPA-25	1122	07/26/17	07/26/19
Temperature Chamber LARGE	Tenney Engineering	TTRC	11717-7	N/A	N/A
Frequency Counter Small Chamber	HP	5385A	3242A07460	08/22/17	08/22/19
CHAMBER	Panashield	3M	N/A	12/31/17	12/31/19
Antenna: Double-Ridged Horn/ETS Horn 2	ETS-Lindgren	3117	00041534	03/01/17	03/01/19
Type K J Thermometer	Martel	303	080504494	11/02/17	11/02/19
Software: Field Strength Program	Timco	N/A	Version 4.10.7.0	N/A	N/A

### \*EMI RECEIVER SOFTWARE VERSION

The receiver firmware used was version 4.43 Service Pack 3

## END OF TEST REPORT