



An IIA Company

FCC C2PC Test Report

APPLICANT	RADIO ACTIVITY S.R.L
FCC ID	Y9M-KA080
MODEL NUMBER	KA-080
PRODUCT DESCRIPTION	VHF REPEATER
DATE SAMPLE RECEIVED	03/03/2020
FINAL TEST DATE	04/08/2020
REPORT NUMBER	412AUT20_C2PC TestReport_

**AMERICAN ASSOCIATION FOR LABORATORY ACCREDITATION
UNDER ISO/IEC 17025, AND ISO/IEC 17065**





TABLE OF CONTENTS

SIGNATURE PAGE3

TEST LABORATORY INFORMATION4

TEST INFORMATION5

EUT INFORMATION.....6

2.1041 MEASUREMENT PROCEDURE.....7

2.1046 – 2.1055 TECHNICAL REQUIREMENTS7

2.1057 FREQUENCY SPECTRUM TO BE INVESTIGATED.....8

2.1033 MODULATION CHARACTERISTICS9

2.1049 OCCUPIED BANDWIDTH 10

90.209 OCCUPIED BANDWIDTH 12

90.210 EMISSION MASKS 16

2.1051 CONDUCTED SPURIOUS EMISSIONS AT ANTENNA TERMINALS 19

2.1053 FIELD STRENGTH OF SPURIOUS EMISSIONS 21

STATEMENT OF MEASUREMENT UNCERTAINTY 28

EMC EQUIPMENT LIST 29

ANNEX I – MANUFACTURER-PROVIDED INFORMATION 30

ANNEX II – MEASUREMENT DATA..... 31

SIGNATURE PAGE

Timco Engineering, Inc. attests that:

<input checked="" type="checkbox"/>	The EUT tested herein fulfills all approval requirements and/or the customer requirements as identified in this test report.
<input type="checkbox"/>	The EUT tested herein does not fulfill all approval requirements and/or the customer requirements as identified in this test report.

This report relates only to the Equipment Under Test (EUT) sample(s) tested.

This report shall not be reproduced except in full without the written approval of Timco Engineering, Inc.

To the best of my knowledge and belief, this device has been tested in accordance with the standards identified in this test report, and 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 measurements were made at:

Timco Engineering Inc.
849 NW State Road 45
Newberry, FL 32669



Name and Title Franklin Rose, Project Manager / EMC Specialist



Name and Title Tim Royer, Project Manager / EMC Engineer

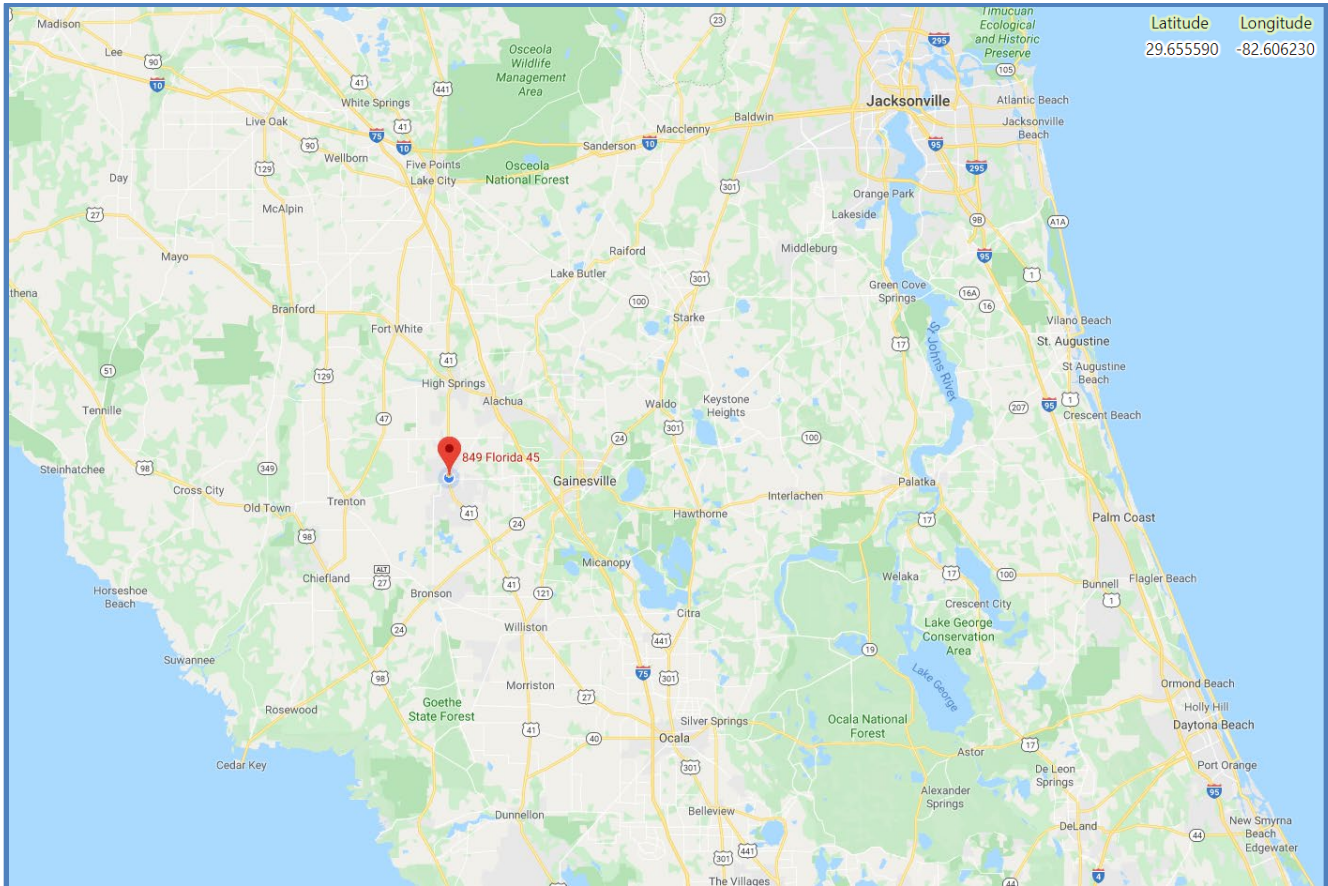


Name and Title Sharon Hoffman, Senior Marketing Director / Operations

Date 04/8/2020

TEST LABORATORY INFORMATION

**Timco Engineering Inc.
849 NW State Road 45
Newberry, FL 32669, USA**



United States	FCC Accredited and Recognized Test Lab & TCB # US1070
	DHS Recognized P25 CAP Test Facility # P25CAPTIMCO081016
Australia / New Zealand	U.S. CABs Recognized by Australia ACMA Under MRA
Canada	U.S. Lab & CB Recognized by Canada ISED, Designation # US0111, Test Site # 2056A
Chinese Taipei	U.S. CABs Recognized by Chinese Taipei BSMI/NCC Under MRA
European Union	U.S. EMC & RE Directive NB's, Designation # US0111, Notified Body # 1177
Hong Kong	U.S. Labs & CBs Recognized by Hong Kong OFCA Under MRA
Israel	U.S. CABs Recognized by Israel MOE/MOC Under MRA
Japan	U.S. RCBs Recognized by Japan MIC
Korea	U.S. CABs Recognized by Korea RRA Under MRA
Mexico	U.S. CABs Recognized by Mexico IFT Under MRA
Singapore	U.S. Labs & CBs Recognized by Singapore IMDA Under MRA
Vietnam	U.S. CABs Recognized by Vietnam MIC Under MRA

TEST INFORMATION

Report Version	Description	Issue Date
Rev1	Initial Issue	04/08/2020
Rev2		
Rev3		
Rev4		
Rev5		
Rev6		

Test Conditions	Temperature during testing: 26°C, Humidity during testing: 50%
Test Exercise	The EUT was operated in accordance with the service manual using software supplied by the manufacturer.
Applicable Standards	ANSI/TIA 603-E, March 2016 ANSI C63.26, December 11, 2015 FCC CFR 47 Part 2, December 5, 2019 FCC CFR 47 Part 90, November 25, 2019
Test Facility	Timco Engineering Inc. at 849 NW State Road 45 Newberry, FL 32669 USA

EUT INFORMATION

EUT Description	VHF REPEATER		
Model Number	KA-080		
Modified for Testing	<input type="checkbox"/>		
Modification	n/a		
Antenna Connector	<input type="checkbox"/> UHF	<input type="checkbox"/> BNC	<input type="checkbox"/> N
	<input type="checkbox"/> TNC	<input checked="" type="checkbox"/> SMA	<input type="checkbox"/> Other
EUT Power Source	<input type="checkbox"/> AC Power (110-120 V)	<input checked="" type="checkbox"/> DC Power (13.8 V)	<input type="checkbox"/> DC Battery (7.4 V)
Test Item	<input type="checkbox"/> Engineering Prototype	<input checked="" type="checkbox"/> Pre-Production	<input type="checkbox"/> Post-Production
Type of Equipment	<input checked="" type="checkbox"/> Fixed	<input type="checkbox"/> Mobile	<input type="checkbox"/> Portable

NOTE: Nature of the change causing need for Class 2 Permissive Change: Adding Emission Designators

2.1041 MEASUREMENT PROCEDURE

§2.1041 Measurement procedure.

(a) For equipment operating under parts 15 and 18, the measurement procedures are specified in the rules governing the particular device for which certification is requested.

(b) For equipment operating in the authorized radio services, measurements are required as specified in §§2.1046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055 and 2.1057. The measurement procedures in ANSI C63.26-2015 (incorporated by reference, see §2.910) are acceptable for performing compliance measurements for equipment types covered by the measurement standard. See also §2.947 for acceptable measurement procedures.

2.1046 – 2.1055 TECHNICAL REQUIREMENTS

General Requirement (FCC PT 2)	Specific Requirement (FCC PT 90)	Requirement	Complies	N/A
2.1033(c)(4)		Modulation Characteristics	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2.1046	90.205	RF Power Output	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2.1047		Audio Frequency Response	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2.1047	90.242	Audio Low Pass Filter Response	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2.1047		Modulation Limiting	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2.1049	90.209	Occupied Bandwidth (99%)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	90.210	Emission Masks	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2.1051	90.210	Conducted Spurious Emissions at Antenna Terminals	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2.1053	90.210	Radiated Field Strength of Spurious Emissions	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2.1055	90.213	Frequency Stability	<input type="checkbox"/>	<input checked="" type="checkbox"/>

NOTE: Nature of the change causing need for Class 2 Permissive Change: Adding Emission Designators

2.1057 FREQUENCY SPECTRUM TO BE INVESTIGATED

Requirements: 2.1057, ANSI C63.26 S 5.1.2

52.1057 Frequency spectrum to be investigated.

(a) In all of the measurements set forth in §§2.1051 and 2.1053, the spectrum shall be investigated from the lowest radio frequency signal generated in the equipment, without going below 9 kHz, up to at least the frequency shown below:

(1) If the equipment operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

(2) If the equipment operates at or above 10 GHz and below 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 100 GHz, whichever is lower.

(3) If the equipment operates at or above 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 200 GHz, whichever is lower.

(b) Particular attention should be paid to harmonics and subharmonics of the carrier frequency as well as to those frequencies removed from the carrier by multiples of the oscillator frequency. Radiation at the frequencies of multiplier stages should also be checked.

(c) The amplitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be reported.

(d) Unless otherwise specified, measurements above 40 GHz shall be performed using a minimum resolution bandwidth of 1 MHz.

5.1.2 Number of fundamental frequencies to be tested in EUT transmit band

5.1.2.1 General requirement

Measurements of transmitters shall be performed and, if required, reported for each frequency band in which the EUT can be operated with the device transmitting at the number of frequencies in each band specified in Table 2.

Table 2—Number of frequencies to be tested

Frequency range over which EUT operates	Number of frequencies	Location in frequency range of operation
1 MHz or less	1	Middle
1 MHz to 10 MHz	2	1 near top and 1 near bottom
More than 10 MHz	3	1 near top, 1 near middle, and 1 near bottom

5.1.2.2 Test channels and test modes (streamlined test requirements)²⁵

Measurement of all modes and all channels is not always necessary to demonstrate compliance. Regardless of the test reduction methods selected, a device must comply with all the applicable rule parts under all modes of operation. A detailed technical rationale must be provided as justification for the selection of a subset of operational modes as being representative of “worst case” conditions.

²⁵ Use of the procedures in 5.1.2.2 is subject to the discretion of the regulatory authority.

2.1033 MODULATION CHARACTERISTICS

Requirements: 2.1033(c)(4), 2.1033(c)(13)

Referencing: 2.202(g)

Digital Signals

Emission Designator	Description	Modulation Type	M (modulation Freq., kHz)	R (rate, baud)	D (deviation, kHz)	K (numeric constant)	S (symbols)	Bandwidth Calculation	Bn (necessary bandwidth, kHz)
7K60FXE	DMR Voice	4FSK	-	9600	1.8	0.778	4	$B_n = (R/\log_2 S) + 2DK$	7.60
7K60FXD	DMR Data	4FSK	-	9600	1.8	0.778	4		7.60
8K10F1E	P25 Phase I C4FM Voice	4FSK	-	9600	1.8	0.916	4	$B_n = (R/\log_2 S) + 2DK$	8.10
8K10F1D	P25 Phase I C4FM Data	4FSK	-	9600	1.8	0.916	4		8.10
8K10F1W	P25 Phase II H-CPM Voice/Data	4FSK	-	9600	1.8	0.916	4		8.10

2.1049 OCCUPIED BANDWIDTH

§2.1049 Measurements required: Occupied bandwidth.

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured under the following conditions as applicable:

- (a) Radiotelegraph transmitters for manual operation when keyed at 16 dots per second.
- (b) Other keyed transmitters—when keyed at the maximum machine speed.
- (c) Radiotelephone transmitters equipped with a device to limit modulation or peak envelope power shall be modulated as follows. For single sideband and independent sideband transmitters, the input level of the modulating signal shall be 10 dB greater than that necessary to produce rated peak envelope power.
 - (1) Other than single sideband or independent sideband transmitters—when modulated by a 2500 Hz tone at an input level 16 dB greater than that necessary to produce 50 percent modulation. The input level shall be established at the frequency of maximum response of the audio modulating circuit.
 - (2) Single sideband transmitters in A3A or A3J emission modes—when modulated by two tones at frequencies of 400 Hz and 1800 Hz (for 3.0 kHz authorized bandwidth), or 500 Hz and 2100 Hz (for 3.5 kHz authorized bandwidth), or 500 Hz and 2400 Hz (for 4.0 kHz authorized bandwidth), applied simultaneously. The input levels of the tones shall be so adjusted that the two principal frequency components of the radio frequency signal produced are equal in magnitude.
 - (3) Single sideband transmitters in the A3H emission mode—when modulated by one tone at a frequency of 1500 Hz (for 3.0 kHz authorized bandwidth), or 1700 Hz (for 3.5 kHz authorized bandwidth), or 1900 Hz (for 4.0 kHz authorized bandwidth), the level of which is adjusted to produce a radio frequency signal component equal in magnitude to the magnitude of the carrier in this mode.
 - (4) As an alternative to paragraphs (c) (2) and (3) of this section, other tones besides those specified may be used as modulating frequencies, upon a sufficient showing of need. However, any tones so chosen must not be harmonically related, the third and fifth order intermodulation products which occur must fall within the -25 dB step of the emission bandwidth limitation curve, the seventh and ninth order products must fall within the -35 dB step of the referenced curve and the eleventh and all higher order products must fall beyond the -35 dB step of the referenced curve.
 - (5) Independent sideband transmitters having two channels—when modulated by 1700 Hz tones applied simultaneously to both channels. The input levels of the tones shall be so adjusted that the two principal frequency components of the radio frequency signal produced are equal in magnitude.
 - (d) Radiotelephone transmitters without a device to limit modulation or peak envelope power shall be modulated as follows. For single sideband and independent sideband transmitters, the input level of the modulating signal should be that necessary to produce rated peak envelope power.
 - (1) Other than single sideband or independent sideband transmitters—when modulated by a 2500 Hz tone of sufficient level to produce at least 85 percent modulation. If 85 percent modulation is unattainable, the highest percentage modulation shall be used.

OCCUPIED BANDWIDTH



(f) Transmitters for which peak frequency deviation (D) is determined in accordance with §2.202(f), and in which the modulating baseband comprises more than 3 independent speech channels—when modulated by a test signal determined in accordance with the following:

(1) A modulation reference level is established for the characteristic baseband frequency. (Modulation reference level is defined as the average power level of a sinusoidal test signal delivered to the modulator input which provides the specified value of per-channel deviation.)

(2) Modulation reference level being established, the total rms deviation of the transmitter is measured when a test signal consisting of a band of random noise extending from below 20 kHz to the highest frequency in the baseband, is applied to the modulator input through any preemphasis networks used in normal service. The average power level of the test signal shall exceed the modulation reference level by the number of decibels determined using the appropriate formula in the following table:

Number of message circuits that modulate the transmitter	Number of dB by which the average power (P_{avg}) level test signal shall exceed the modulation reference level	Limits of P_{avg} (dBm0)
More than 3, but less than 12	To be specified by the equipment manufacturer subject to FCC approval	
At least 12, but less than 60	$X + 2 \log_{10} N_c$	X: -2 to +2.6
At least 60, but less than 240	$X + 4 \log_{10} N_c$	X: -5.6 to -1.0
240 or more	$X + 10 \log_{10} N_c$	X: -19.6 to -15.0

Where X represents the average power in a message circuit in dBm0; N_c is the number of circuits in the multiplexed message load. P_{avg} shall be selected by the transmitter manufacturer and included with the technical data submitted with the application for type acceptance. (See §2.202(e) in this chapter.)



(g) Transmitters in which the modulating baseband comprises not more than three independent channels—when modulated by the full complement of signals for which the transmitter is rated. The level of modulation for each channel should be set to that prescribed in rule parts applicable to the services for which the transmitter is intended. If specific modulation levels are not set forth in the rules, the tests should provide the manufacturer's maximum rated condition.



(h) Transmitters employing digital modulation techniques—when modulated by an input signal such that its amplitude and symbol rate represent the maximum rated conditions under which the equipment will be operated. The signal shall be applied through any filter networks, pseudo-random generators or other devices required in normal service. Additionally, the occupied bandwidth shall be shown for operation with any devices used for modifying the spectrum when such devices are optional at the discretion of the user.



(i) Transmitters designed for other types of modulation—when modulated by an appropriate signal of sufficient amplitude to be representative of the type of service in which used. A description of the input signal should be supplied.

90.209 OCCUPIED BANDWIDTH

§90.209 Bandwidth limitations.

(a) Each authorization issued to a station licensed under this part will show an emission designator representing the class of emission authorized. The designator will be prefixed by a specified necessary bandwidth. This number does not necessarily indicate the bandwidth occupied by the emission at any instant. In those cases where §2.202 of this chapter does not provide a formula for the computation of necessary bandwidth, the occupied bandwidth, as defined in part 2 of this chapter, may be used in lieu of the necessary bandwidth.

(b) The maximum authorized single channel bandwidth of emission corresponding to the type of emission specified in §90.207 is as follows:

(1) For A1A or A1B emissions, the maximum authorized bandwidth is 0.25 kHz. The maximum authorized bandwidth for type A3E emission is 8 kHz.

(3) For all other types of emissions, the maximum authorized bandwidth shall not be more than that normally authorized for voice operations.

(4) Where a frequency is assigned exclusively to a single licensee, more than a single emission may be used within the authorized bandwidth. In such cases, the frequency stability requirements of §90.213 must be met for each emission.

(5) Unless specified elsewhere, channel spacings and bandwidths that will be authorized in the following frequency bands are given in the following table.

Standard Channel Spacing/Bandwidth

Applies to EUT	Frequency band (MHz)	Channel spacing (kHz)	Authorized bandwidth (kHz)
<input type="checkbox"/>	Below 25 ²		
<input type="checkbox"/>	25 – 50	20	20
<input checked="" type="checkbox"/>	72 – 76	20	20
<input type="checkbox"/>	40.66 – 40.70 Buoy & Tracking	n/a	1.0
<input type="checkbox"/>	90.250 Meteor Burst	fixed	20

²Bandwidths for radiolocation stations in the 420-450 MHz band and for stations operating in bands subject to this footnote will be reviewed and authorized on a case-by-case basis.

OCCUPIED BANDWIDTH **§90.248 Wildlife and ocean buoy tracking.**

(a) The frequency bands 40.66-40.70 MHz and 216-220 MHz may be used for the tracking of, and the telemetry of scientific data from, ocean buoys and animal wildlife.

(b) Transmitters operating under the provisions of this section are not subject to the technical standards contained in §§90.205-90.217. In lieu thereof, the transmitters shall comply with the provisions in this section.

(d) The authorized bandwidth shall not exceed 1 kHz.

 §90.250 Meteor burst communications.

Meteor burst communications may be authorized for the use of private radio stations subject to the following provisions:

(b) The frequency 44.20 MHz may be used for base station operation and 45.90 MHz for remote station operation on a primary basis. The frequencies 42.40 and 44.10 MHz may be used by base and remote stations, respectively, on a secondary basis to common carrier stations utilizing meteor burst communications. Users shall cooperate among themselves to the extent practicable to promote compatible operation.

(f) The maximum authorized bandwidth is 20 kHz.

 §90.257 Assignment and use of frequencies in the band 72-76 MHz.

(b) The following criteria governs the authorization and use of frequencies in the 72-76 MHz band by mobile stations in the Industrial/Business Pool.

(2) The maximum transmitter output power that will be authorized is 1 watt; and each station authorized will be classified and licensed as a mobile station. Any units of such a station, however, may be used to provide the operational functions of a base or fixed station. The antennas of transmitters operating on these frequencies must be directly mounted or installed upon the transmitting unit: Except that when permanently installed aboard a vehicle, antenna and transmitter may be separated as required for convenience in mounting. Horizontal polarization will not be allowed; and the gain of antennas employed shall not exceed that of a halfwave dipole. The maximum bandwidth that will be authorized is 20 kHz. Tone control transmissions are permitted.

OCCUPIED BANDWIDTH

Test Procedure: ANSI C63.26 S 5.4

5.4 Occupied bandwidth

The following procedures shall be used for measuring the OBW of the fundamental frequencies of certain transmitters, when required.

5.4.1 General OBW requirements

A spectrum analyzer or other instrument providing a spectral display is recommended for these measurements. The VBW shall be set to a value at least three times greater than the resolution/measurement bandwidth, to avoid the introduction of amplitude smoothing. Video filtering or averaging shall not be used when performing OBW tests.

The applicable regulatory requirements should be consulted to determine which measurement method should be employed. There can be a need to utilize more than one measurement method.

5.4.2 Typical modulation configurations

The OBW shall be measured using the modulation conditions specified in the applicable regulatory requirements.

Voice modulated devices will require the use of a signal/audio generator to produce the required modulation levels.

A modulation analyzer can also be required to measure the modulation characteristics at the output of the EUT to determine if the correct modulation stimulus has been applied.

Digitally modulated devices should be stimulated with a pseudo-random bit sequence.

The OBW shall be measured for all operating modes that will result in transmission in a different OBW (e.g., different channel bandwidth settings).

OCCUPIED BANDWIDTH

5.4.4 Occupied bandwidth—Power bandwidth (99%) measurement procedure³⁰

The OBW is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission.

The following procedure shall be used for measuring (99%) power bandwidth:³¹

- a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be set wide enough to capture all modulation products including the emission skirts (typically a span of $1.5 \times \text{OBW}$ is sufficient).
- b) The nominal IF filter 3 dB bandwidth (RBW) shall be in the range of 1% to 5% of the anticipated OBW, and the VBW shall be set $\geq 3 \times \text{RBW}$.
- c) Set the reference level of the instrument as required to prevent the signal amplitude from exceeding the maximum spectrum analyzer input mixer level for linear operation. See guidance provided in 4.2.3.

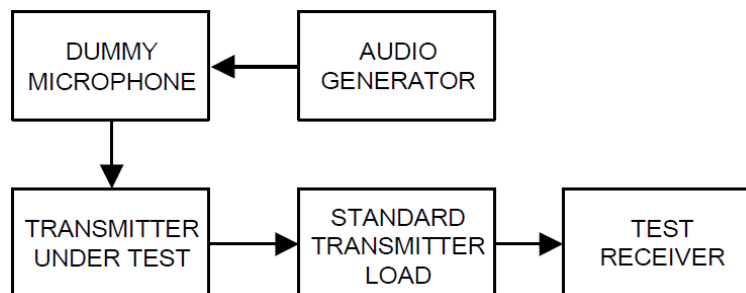
NOTE—Step a), step b), and step c) may require iteration to adjust within the specified tolerances.

- d) Set the detection mode to peak, and the trace mode to max-hold.
- e) If the instrument does not have a 99% OBW function, recover the trace data points and sum directly in linear power terms. Place the recovered amplitude data points, beginning at the lowest frequency, in a running sum until 0.5% of the total is reached. Record that frequency as the lower OBW frequency. Repeat the process until 99.5% of the total is reached and record that frequency as the upper OBW frequency. The 99% power OBW can be determined by computing the difference these two frequencies.
- f) The OBW shall be reported and plot(s) of the measuring instrument display shall be provided with the test report. The frequency and amplitude axis and scale shall be clearly labeled. Tabular data can be reported in addition to the plot(s).

³⁰ Measurement method to satisfy 47 CFR 2.1049 and IC RSS-Gen [B60].

³¹ See FCC/KDB-971168 D01 [B31].

Test Setup Block Diagram:



90.210 EMISSION MASKS

§90.210 Emission masks.

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 (o) 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 under this part.

Applies to EUT	Frequency band (MHz)	Mask for equipment with audio low pass filter	Mask for equipment without audio low pass filter
<input type="checkbox"/>	Below 25 ¹	A or B	A or C
<input type="checkbox"/>	25 – 50	B	C
<input checked="" type="checkbox"/>	72 – 76	B	C
<input type="checkbox"/>	All other bands	B	C
<input type="checkbox"/>	40.66 – 40.70 Buoy & Tracking	Outside Authorized BW, > 26 dBc	

¹Equipment using single sideband J3E emission must meet the requirements of Emission Mask A. Equipment using other emissions must meet the requirements of Emission Mask B or C, as applicable.

§90.248 Wildlife and ocean buoy tracking.

(a) The frequency bands 40.66-40.70 MHz and 216-220 MHz may be used for the tracking of, and the telemetry of scientific data from, ocean buoys and animal wildlife.

(b) Transmitters operating under the provisions of this section are not subject to the technical standards contained in §§90.205-90.217. In lieu thereof, the transmitters shall comply with the provisions in this section.

(g) Emissions appearing outside of the authorized bandwidth shall be attenuated below the carrier power by at least 26 dB, following the procedures specified in §90.210(m).

EMISSION MASKS

MASK B

(b) *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 $43 + 10 \log (P)$ dB.

(n) *Other frequency bands.* Transmitters designed for operation under this part on frequencies other than listed in this section must meet the emission mask requirements of Emission Mask B. Equipment operating under this part on frequencies allocated to but shared with the Federal Government, must meet the applicable Federal Government technical standards.

MASK C

(c) *Emission Mask C.* For transmitters that are not equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier output power (P) as follows:

(1) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 5 kHz, but not more than 10 kHz: At least $83 \log (f_d/5)$ dB;

(2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 10 kHz, but not more than 250 percent of the authorized bandwidth: At least $29 \log (f_d^2/11)$ dB or 50 dB, whichever is the lesser attenuation;

(3) On any frequency removed from the center of the authorized bandwidth by more than 250 percent of the authorized bandwidth: At least $43 + 10 \log (P)$ dB.

(4) In the 1427-1432 MHz band, licensees are encouraged to take all reasonable steps to ensure that unwanted emissions power does not exceed the following levels in the 1400-1427 MHz band:

(i) For stations of point-to-point systems in the fixed service: -45 dBW/27 MHz.

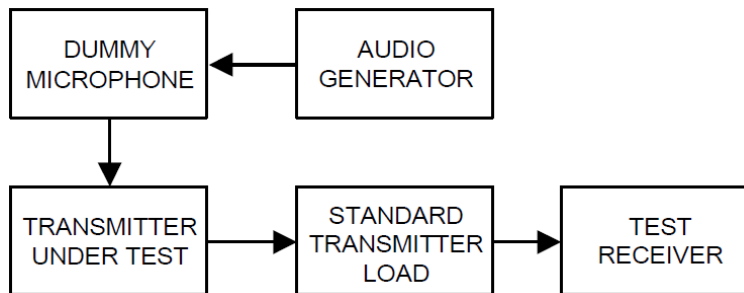
(ii) For stations in the mobile service: -60 dBW/27 MHz.

EMISSION MASKS

Test Procedure:

(o) *Instrumentation.* The reference level for showing compliance with the emission mask shall be established, except as indicated in §§90.210 (d), (e), and (k), using standard engineering practices for the modulation characteristic used by the equipment under test. When measuring emissions in the 150-174 MHz and 421-512 MHz bands the following procedures will apply. A sufficient number of sweeps must be measured to insure that the emission profile is developed. If video filtering is used, its bandwidth must not be less than the instrument resolution bandwidth. For frequencies more than 50 kHz removed from the edge of the authorized bandwidth a resolution of at least 100 kHz must be used for frequencies below 1000 MHz. Above 1000 MHz the resolution bandwidth of the instrumentation must be at least 1 MHz. If it can be shown that use of the above instrumentation settings do not accurately represent the true interference potential of the equipment under test, then an alternate procedure may be used provided prior Commission approval is obtained.

Test Setup Block Diagram:



2.1051 CONDUCTED SPURIOUS EMISSIONS AT ANTENNA TERMINALS

52.1051 Measurements required: Spurious emissions at antenna terminals.

The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in §2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

5.2 RF output power measurement procedures

This subclause provides guidance for performing the power measurements necessary to demonstrate compliance to the RF output power limits imposed by regulatory authorities on transmitters. In addition, these procedures can also be utilized to collect the data necessary to demonstrate compliance to regulatory limits placed on unwanted (out-of-band and spurious) emissions.

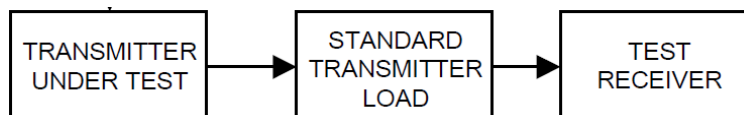
Test Procedure: ANSI C63.26 S 5.2.3.3

5.2.3.3 Measurement of peak power in a narrowband signal with a spectrum/signal analyzer or EMI receiver

This procedure can be used to measure the peak power in either a CW-like or noise-like narrowband RF signal. The measurement instrument must have a RBW that is greater than or equal to the OBW of the signal to be measured and a VBW $\geq 3 \times$ RBW.

- a) Set the RBW \geq OBW.
- b) Set VBW $\geq 3 \times$ RBW.
- c) Set span $\geq 2 \times$ OBW.
- d) Sweep time $\geq 10 \times$ (number of points in sweep) \times (transmission symbol period).
- e) Detector = peak.
- f) Trace mode = max hold.
- g) Allow trace to fully stabilize.
- h) Use the peak marker function to determine the peak amplitude level.

Test Setup Block Diagram:



CONDUCTED SPURIOUS EMISSIONS

MASK B

(3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least $43 + 10 \log (P)$ dB.

(n) *Other frequency bands.* Transmitters designed for operation under this part on frequencies other than listed in this section must meet the emission mask requirements of Emission Mask B. Equipment operating under this part on frequencies allocated to but shared with the Federal Government, must meet the applicable Federal Government technical standards.

MASK C

(3) On any frequency removed from the center of the authorized bandwidth by more than 250 percent of the authorized bandwidth: At least $43 + 10 \log (P)$ dB.

2.1053 FIELD STRENGTH OF SPURIOUS EMISSIONS

§2.1053 Measurements required: Field strength of spurious radiation.

(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. For equipment operating on frequencies below 890 MHz, an open field test is normally required, with the measuring instrument antenna located in the far-field at all test frequencies. In the event it is either impractical or impossible to make open field measurements (e.g. a broadcast transmitter installed in a building) measurements will be accepted of the equipment as installed. Such measurements must be accompanied by a description of the site where the measurements were made showing the location of any possible source of reflections which might distort the field strength measurements. Information submitted shall include the relative radiated power of each spurious emission with reference to the rated power output of the transmitter, assuming all emissions are radiated from halfwave dipole antennas.

(b) The measurements specified in paragraph (a) of this section shall be made for the following equipment:

- (1) Those in which the spurious emissions are required to be 60 dB or more below the mean power of the transmitter.
- (2) All equipment operating on frequencies higher than 25 MHz.
- (3) All equipment where the antenna is an integral part of, and attached directly to the transmitter.
- (4) Other types of equipment as required, when deemed necessary by the Commission.

5.5.2 Common requirements

5.5.2.1 General

This subclause details the common requirements applicable to all radiated measurements, except for performing radiated output power measurements per 5.2.7. When conducted measurements cannot be performed (e.g., the EUT utilizes an integrated antenna), then a radiated test configuration must be used to measure the compliance-related technical parameters. Such radiated measurements shall use substitution methods unless a test site validated to ANSI C63.4 requirements is utilized, in which case, radiated fundamental and/or unwanted emissions can be measured using the direct radiated field strength method.

When performing radiated measurements, regardless of whether substitution or direct field strength methods are utilized, the EUT shall be rotated through three axes and the receive (measurement) antenna shall be oriented in both horizontal and vertical polarization. When the direct field strength method is used, then the equations provided in 5.2.7 can be used to determine the radiated output power from either a field strength or received power measurement. Detailed guidance with respect to performing band-edge compliance testing is provided in 5.7.3.

Pre-scan measurements are often performed to identify unwanted emission frequencies and to isolate the associated test variables (e.g., measurement antenna height and polarization, axis orientation, etc.) as discussed in 5.5.2.5. Final compliance tests are performed subsequently using the specified detector(s) at the frequencies and EUT and measurement antenna orientations identified in the pre-scan.

FIELD STRENGTH OF SPURIOUS EMISSIONS

5.5.2.2 Instrumentation

5.5.2.2.1 General considerations

In addition to the following considerations, the instrumentation and associated guidance provided in Clause 4 shall be applied when performing radiated emissions measurements.

The RF sensitivity of the complete measurement system, relative to the applicable regulatory limit, shall be adequate to permit the anticipated signals (and their related power levels) to be detected and measured. For such purposes, a system noise floor established at 10 dB or more below the relevant power or emission limit is typically adequate. Low-noise preamplifiers, high gain antennas, or reduced test distances (while still maintaining measurement antenna beamwidth coverage of the EUT and a far-field measurement distance relationship) may be required to improve the noise floor-to-limit ratio. These specifics regarding the measurement conditions shall be thoroughly explained in the test report. The use of external band-pass, band-stop, low-pass, and/or high pass filters may be required to provide adequate protection of the measurement instrumentation from overload (see 4.2.3). The insertion losses associated with these external peripherals, to include connecting cables, shall be accounted for in the final measurement data.

5.5.2.2.2 Measurement antenna

Radiated measurements shall be made using antenna(s) as specified in 4.4. The measurement antenna shall be positioned at a suitable test distance from the periphery of the EUT such that the measurement is performed in the far field of the transmitting (EUT) antenna. A practical limitation on test distance can also be set by the available antenna calibration data. The main “beam” or main lobe of the pattern for any antenna used shall be large enough to encompass the physical size of the EUT, or system arrangement, when located at the measurement distance. If the 3 dB beamwidth of the antenna at the specified measurement distance is not large enough to encompass the physical size of the EUT or system arrangement, then multiple radiated scans with the 3 dB beamwidth of the antenna focused on different portions of the EUT or system arrangement will be necessary to ensure that the entirety of the EUT or system arrangement has been measured.

5.5.2.2.3 Test site

The test site shall satisfy the applicable requirements specified in 4.6.

FIELD STRENGTH OF SPURIOUS EMISSIONS

5.5.2.3 Test arrangement for EUT and antenna positioning

5.5.2.3.1 Test arrangements for tabletop EUTs

For radiated emissions measurements performed at frequencies less than or equal to 1 GHz, the EUT shall be placed on a RF-transparent table or support at a nominal height of 80 cm above the reference ground plane. Radiated measurements shall be made with the measurement antenna positioned in both horizontal and vertical polarization. The measurement antenna shall be varied from 1 m to 4 m in height above the reference ground in a search for the relative positioning that produces the maximum radiated signal level (i.e., field strength or received power). When orienting the measurement antenna in vertical polarization, the minimum height of the lowest element of the antenna shall clear the site reference ground plane by at least 25 cm.

Figure 4 shows a typical EUT configuration with a wireless device placed on a tabletop on an appropriate radiated test site. The measurement antenna shall be placed at the specified distance from the closest point of the EUT. Tabletop devices shall be placed on a RF transparent platform with nominal top surface dimensions of 1 m by 1.5 m. Any necessary support equipment shall be placed far enough away from the EUT, such that changes in relative position of the EUT and support equipment do not influence the measured values. If the EUT requires a connection to a server or computer, via control/data cable(s), to exercise the product, then the controlling server or computer may be placed outside of the test area.

For radiated measurements performed at frequencies above 1 GHz, the EUT shall be placed on an RF transparent table or support at a nominal height of 1.5 m above the ground plane. Radiated measurements shall be made with the measurement antenna positioned in both horizontal and vertical polarization. The height scan of the measurement antenna shall be varied from 1 m to 4 m in a search for the relative positioning that produces the maximum radiated signal level (i.e., field strength or received power). When using the direct field strength method and the EUT is manipulated through three different orientations, then the scan height range of the measurement antenna is limited to 2.5 m, or 0.5 m above the top of the EUT, whichever is higher.

NOTE—The use of waveguide and/or flexible waveguide may be necessary when performing measurements at frequencies above 10 GHz to achieve usable signal-to-noise ratios at acceptable measurement distances. If so, it may be necessary to restrict the height search of the antenna, or conversely to raise or lower the EUT relative to the elevation of the measurement antenna, including its relative angle with respect to the ground plane. In any case, special care should be exercised to ensure that the maximum emissions are identified and measured.

FIELD STRENGTH OF SPURIOUS EMISSIONS

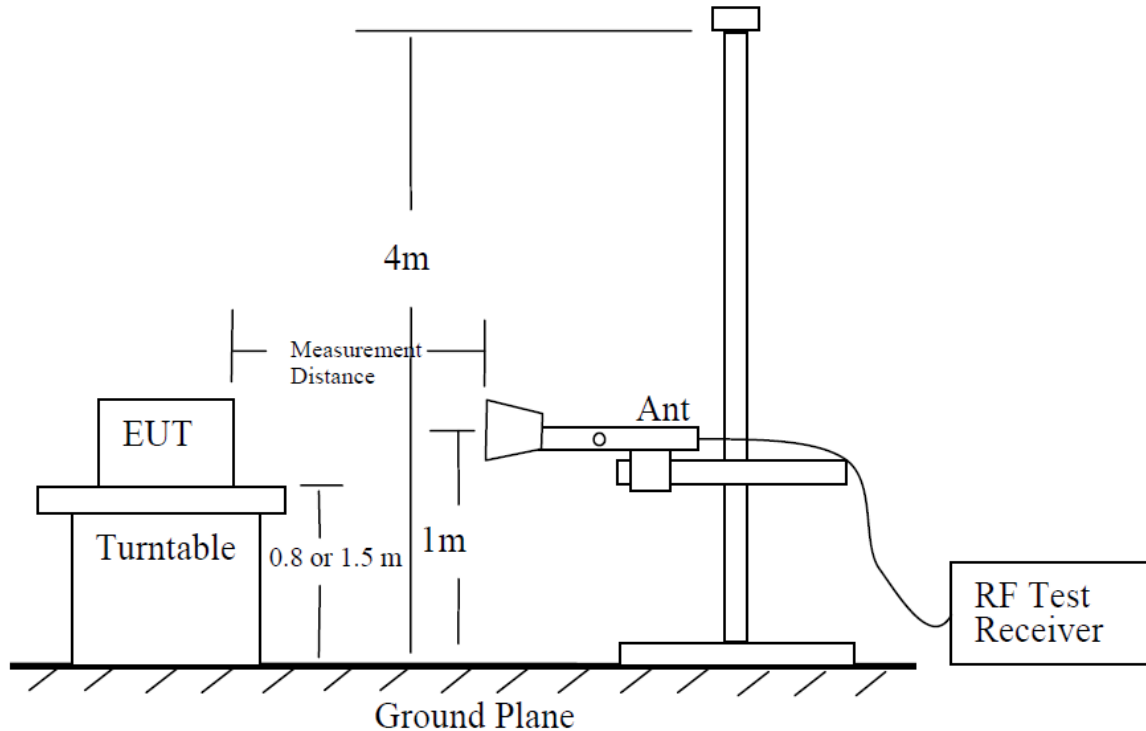


Figure 4—Test set-up for radiated spurious measurements

Radiated unwanted emissions measurements shall be made over the frequency range specified in 5.1, dependent upon the relevant operational frequency band. These radiated measurements shall be made around the EUT (or alternatively, with the EUT rotated on a turntable), while varying the measurement antenna height and examining both horizontal and vertical polarization of the measurement antenna, as described above. Ordinarily, this will require the use of a turntable and an antenna positioner.

The EUT shall be set up in its typical configuration and arrangement and operated in its various modes of operation. Unless the EUT uses an integral antenna, the EUT shall be terminated with a non-radiating transmitter load. In cases where the EUT uses an adjustable antenna, the antenna shall be adjusted through typical positions and lengths to maximize emissions levels. EUTs with integral antennas shall be evaluated in their normal orientation. Where EUTs are designed to be installed in one of two distinct orientations, they shall be tested in both of their possible orientations. EUTs that can be operated in one of multiple orientations (e.g., handheld, portable, or modular devices) shall be tested in a minimum of three orientations. See Figure 5. When large antennas (e.g., high gain) or antennas not structurally supported by the EUT are utilized, a RF transparent supporting structure shall be used to facilitate the compliance testing. In all cases, the EUT, including the transmit antenna, shall be orientated such that the measurement of the emission is maximized.

FIELD STRENGTH OF SPURIOUS EMISSIONS

Cables or wires inclusive to the EUT shall be configured so as to maximize the measured emission levels. The EUT controls shall also be adjusted to maximize the emission according to the manufacturer's specifications. The modulation applied shall be based on the guidance provided in the manufacturer's specifications. When necessary, field strength measurements shall be converted to ERP or EIRP for comparison to the applicable regulatory limits. See 5.2.7 for additional guidance.

5.5.2.3.2 Test arrangements for floor-standing EUTs

The floor standing EUT should be installed and tested as described in the manufactures instruction manual. If the installation methods are described for indoor and outdoor installations, one of the more typically used installation methods shall be tested. If the installation method provided in the manufacturer's instruction is not practical for testing, then EUT installation method provided in the latest edition of ANSI C63.4 may be used. The grounding of EUT must be achieved in accordance with manufacturer's instructions. However, if grounding studs are provided only at the top of EUT, grounding(s) of EUT may be achieved within 20 cm from the bottom of the EUT cabinet. Grounding of the EUT arbitrarily at middle of the cabinet is not allowed. The grounding material and size should be in accordance with manufacturer's instructions. Electromagnetically shielded ground wires shall not be used. If installation requires use of metal conduits for data, RF, and power cables, then typical or equivalent conduits may be used during the tests. The conduits should be elevated at least 1 cm above the ground plane and can be grounded only at the end of the conduit. All exposed cables shall be routed in accordance with latest edition of ANSI C63.4. The body of the loads connected to the RF ports should be electrically isolated from the cabinet or ground-plane. RF loads can be located outside the measurement area. Leakage radiation from the loads shall not overload the measurement receiver/analyzer.

5.5.2.4 Operational configurations

The EUT shall be tested while operating on the frequency per manufacturer specification. For EUTs that can operate on more than one frequency, unless otherwise specified, measurements shall be performed with the EUT transmitting on a frequency or frequencies as specified in 5.1 for each frequency band of operation.

- a) Set the transmitter to operate in continuous transmit mode. For transmitters unable to be configured for $\geq 98\%$ duty cycle even in a test mode, configure the system to transmit at the maximum duty cycle supported.
- b) Compliance testing shall be performed with the minimum number of channels specified in 5.1 for each supported frequency band. A compliance test shall be performed on all channel sets supported by the EUT and permitted under the applicable regulatory requirements.
- c) Compliance testing shall be performed for each supported frequency/channel using every available modulation supported by the transmitter, and at minimum and maximum data rate, in an effort to examine all possible combinations with the potential for producing the maximum emission amplitude. The test report shall clearly indicate how the various combinations were examined and a technical justification for any applied streamlining of test requirements. See 5.1.2.2 for guidance with regards to potential streamlined test requirement guidance.

FIELD STRENGTH OF SPURIOUS EMISSIONS

5.5.2.5 Pre-scan testing

Exploratory radiated measurements (pre-scans) may be performed to determine the general EUT radiated emissions characteristics and, when necessary, the EUT-to-measurement antenna orientation that produces the maximum emission amplitude. Pre-scans shall only be used to determine the emission frequencies (i.e., not amplitude levels). The information garnered from a pre-scan can then be used to perform final compliance measurements using either the substitution or direct field strength method.

Pre-scan tests shall be performed following the test procedures provided in 5.5.2.3 and 5.5.2.4. When maximizing the emissions from the EUT for measurement, the EUT and its transmitting antenna(s) shall be rotated through 360°. For each mode of operation to be tested, the frequency spectrum (based on findings from exploratory measurements) shall be monitored.

5.5.4 Radiated measurement using the field strength method

5.5.4.1 General

Using the test configuration shown in Figure 6, measure the radiated emissions directly from the EUT and convert the measured field strength or received power to ERP or EIRP, as required, for comparison to the applicable limits. As stated in 5.5.1, the field strength measurement method using a test site validated to the requirements of ANSI C63.4 is an alternative to the substitution measurement method described in 5.5.3.

The test site shall satisfy the requirements in 4.6.3. The measurements shall be performed using the instrumentation specified in Clause 4, and using the common procedures in 5.5.2.

5.5.4.2 Radiated measurements for acquiring final compliance data

Final compliance data (i.e., data to be reported to the regulatory agency in support of an application for an equipment authorization) shall be collected in accordance with the procedures provided in 5.5.2, with the EUT transmitting for each frequency specified in 5.1.2. The emission characteristics of the EUT can be identified from the pre-scan measurement information obtained as specified in 5.5.2.5. Final measurements shall be performed for the worst case combination(s) of variable technical parameters that result in the maximum measured emission amplitude as per the guidelines provided in 5.1.2. For each mode selected, record the frequency and amplitude of the highest fundamental emission (if applicable), and the frequency and amplitude data for the six highest-amplitude spurious emissions.

When reduced measurement distances or higher gain antennas are used in the measurement, a far-field measurement distance relationship and measurement antenna beamwidth coverage of the EUT must be maintained. When preamplifiers are used to improve the measurement system noise floor, overload protection shall be ensured (see guidance in 4.2). Any deviations from the specific measurement conditions or requirements shall be fully described in the test report.

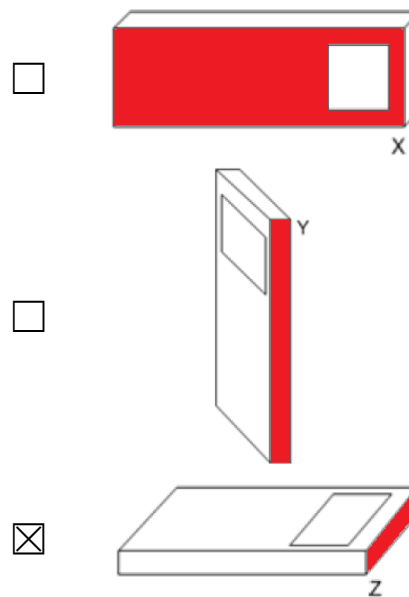
See 5.5.2.5 and/or Annex C for guidance on converting measured field strength or received power data to ERP or EIRP, as applicable, for comparison with the applicable regulatory limits.

FIELD STRENGTH OF SPURIOUS EMISSIONS

5.5.5 Recording test results

A minimum of six data points representing the highest identified unwanted emission amplitude levels relevant to the limit and associated frequencies must be included in the test report. This information shall be reported in a combination of both plots and tabular data as necessary to demonstrate compliance to the applicable technical requirement(s). When multiple operating modes are evaluated, only the “worst case” plots for each mode in each operating band need to be provided in the test report, along with an explanation and technical rationale supporting the identification of the “worst case.” Test set-up photos shall be included and shall be of a sufficient quantity and detail as to allow for replication of the tests (i.e., a single photograph made from several meters away from the EUT is typically not sufficient). Data content and format shall conform to the requirements specified in Clause 8. While it is recognized that a graphical format is not applicable to final tests that utilize the traditional two-stage substitution measurement for every emission, graph(s) of preliminary swept measurement(s) that identify the emissions to be measured during final testing shall be presented in the report.

Worst-Case EUT Orientation



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 EN TR 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
TR 100 028 PARAGRAPH 7.1.1 – FREQUENCY ERROR < 30 MHz	± 0.063 ppm	(1)
TR 100 028 PARAGRAPH 7.1.1 - FREQUENCY ERROR < 200 MHz	± 0.051 ppm	(1)
TR 100 028 PARAGRAPH 7.1.1 - FREQUENCY ERROR < 1 GHz	± 0.051 ppm	(1)
TR 100 028 PARAGRAPH 7.1.1 - FREQUENCY ERROR ≤ 18 GHz	± 0.051 ppm	(1)
TR 100 028 PARAGRAPH 7.1.1 - FREQUENCY ERROR ≤ 40 GHz	± 0.051 ppm	(1)
TR 100 028 PARAGRAPH 7.1.2 - CONDUCTED POWER MEASUREMENT	±0.643 dB	(1)
TR 100 028 PARAGRAPH 7.1.4.1 - CONDUCTED SPURIOUS EMISSIONS 9 kHz – 150 kHz	± 3.14 dB	(1)
TR 100 028 PARAGRAPH 7.1.4.1 - CONDUCTED SPURIOUS EMISSIONS 150 kHz – 30 MHz	± 3.08 dB	(1)
TR 100 028 PARAGRAPH 7.2 – RADIATED EMISSIONS < 200 MHz	± 2.16 dB	(1)
TR 100 028 PARAGRAPH 7.2 – RADIATED EMISSIONS < 1 GHz	± 2.15 dB	(1)
TR 100 028 PARAGRAPH 7.2 – RADIATED EMISSIONS < 18 GHz	± 2.14 dB	(1)
TR 100 028 PARAGRAPH 7.2 – RADIATED EMISSIONS ≤ 40 GHz	± 2.31 dB	(1)
FLUKE Multimeter AC Voltage Uncertainty	± 2.263 %	(1)
FLUKE Multimeter DC Voltage Uncertainty	± 0.453 %	(1)
Temperature (C°)	± 0.81 C°	

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	SN	Calibration Date	Cal Due Date
Function Generator	Standford	DS340	25200	02/21/18	02/21/21
Modulation Analyzer	HP	8901A	3050A05856	04/13/17	04/13/20
Audio Analyzer	HP	8903B	3011A13084	02/20/18	02/20/21
EMI Test Receiver R & S ESU 40 firmware v 4.43 SP 3 BIOS v5.1-24-3	Rohde & Schwarz	ESU 40	100320	08/28/18	08/28/20
Software: Field Strength Program	Timco	N/A	Version 4.10.7.0	N/A	N/A
Coaxial Cable - Chamber 3 cable set (backup)	Micro-Coax	Chamber 3 cable set (backup)	KMKM-0244-02 KMKM-0670-01 KFKF-0197-00	02/27/19	02/27/21
CHAMBER	Panashield	3M	N/A	03/15/19	03/15/21
Antenna: Active Loop	ETS-Lindgren	6502	00062529	12/11/17	12/11/20
Antenna: Biconical 1096	Eaton	94455-1	1096	08/01/17	08/01/20
Antenna: Log-Periodic 1122	Electro-Metrics	LPA-25	1122	07/26/17	07/26/20
Ant: Double-Ridged Horn/ETS Horn 1	ETS-Lindgren	3117	00035923	02/25/20	02/25/23

ANNEX I – MANUFACTURER-PROVIDED INFORMATION

Note: The accuracy and precision of the following information provided by the manufacturer of the equipment under test has not been verified using test methods, cannot be verified, or is not necessary to verify.

n/a

ANNEX II – MEASUREMENT DATA**90.209 OCCUPIED BANDWIDTH**Test Engineer: FR
Test Date: 04/06/2020**Table of Occupied Bandwidth Results**

Frequency (MHz)	Emission	99% Occupied Bandwidth (kHz)
72.025	C4FM Digital Voice	8.01
72.025	DMR Digital Voice	8.05
75.975	C4FM Digital Voice	7.85
75.975	DMR Digital Voice	8.09

OCCUPIED BANDWIDTH

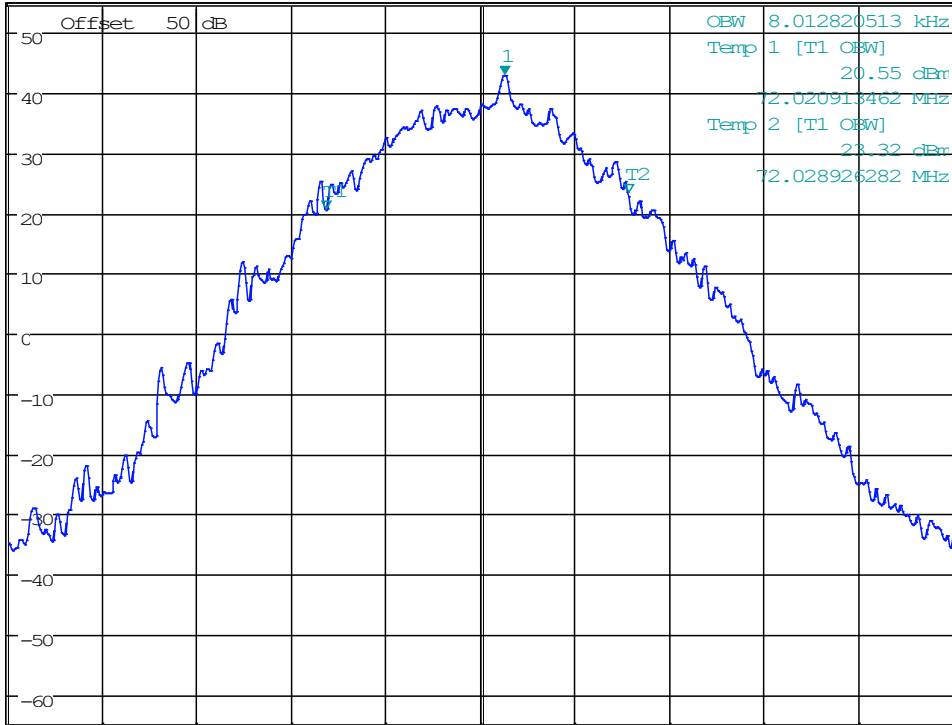
Frequency: 72.025 MHz, C4FM



*RBW 300 Hz Marker 1 [T1]
 VBW 1 kHz 43.15 dBm
 SWT 280 ms 72.025641026 MHz

Ref 55 dBm

*Att 0 dB



Center 72.025 MHz

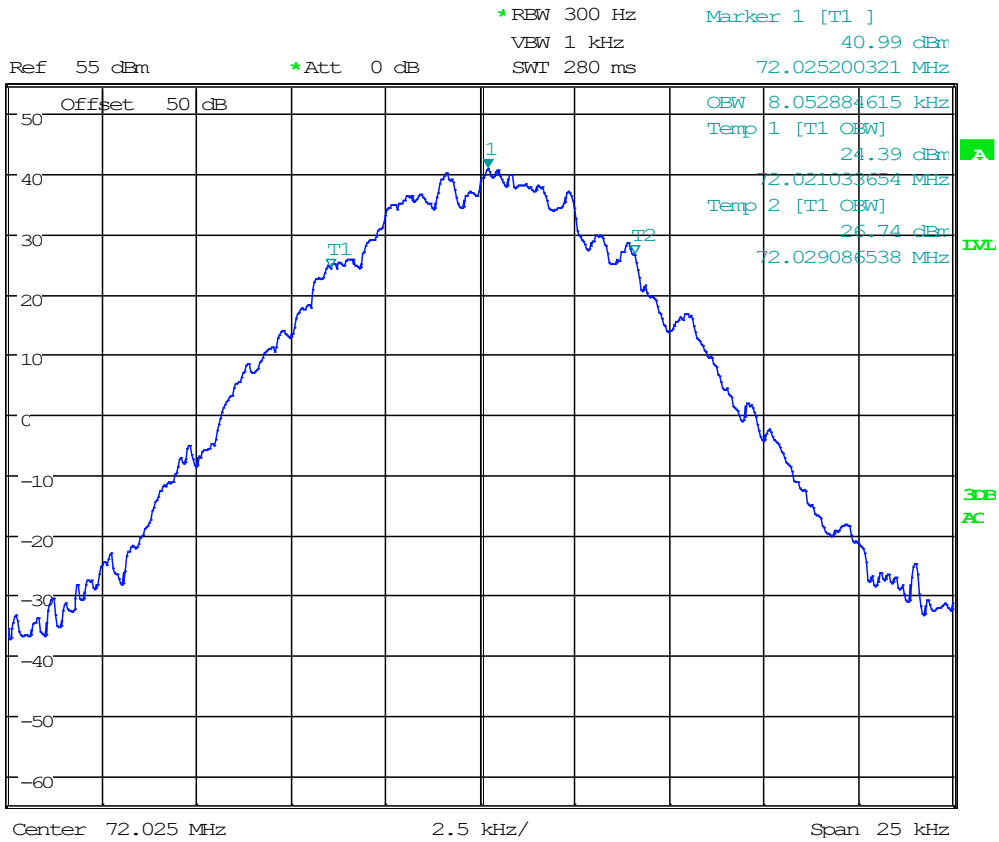
2.5 kHz/

Span 25 kHz

Date: 6.APR.2020 18:33:29

OCCUPIED BANDWIDTH

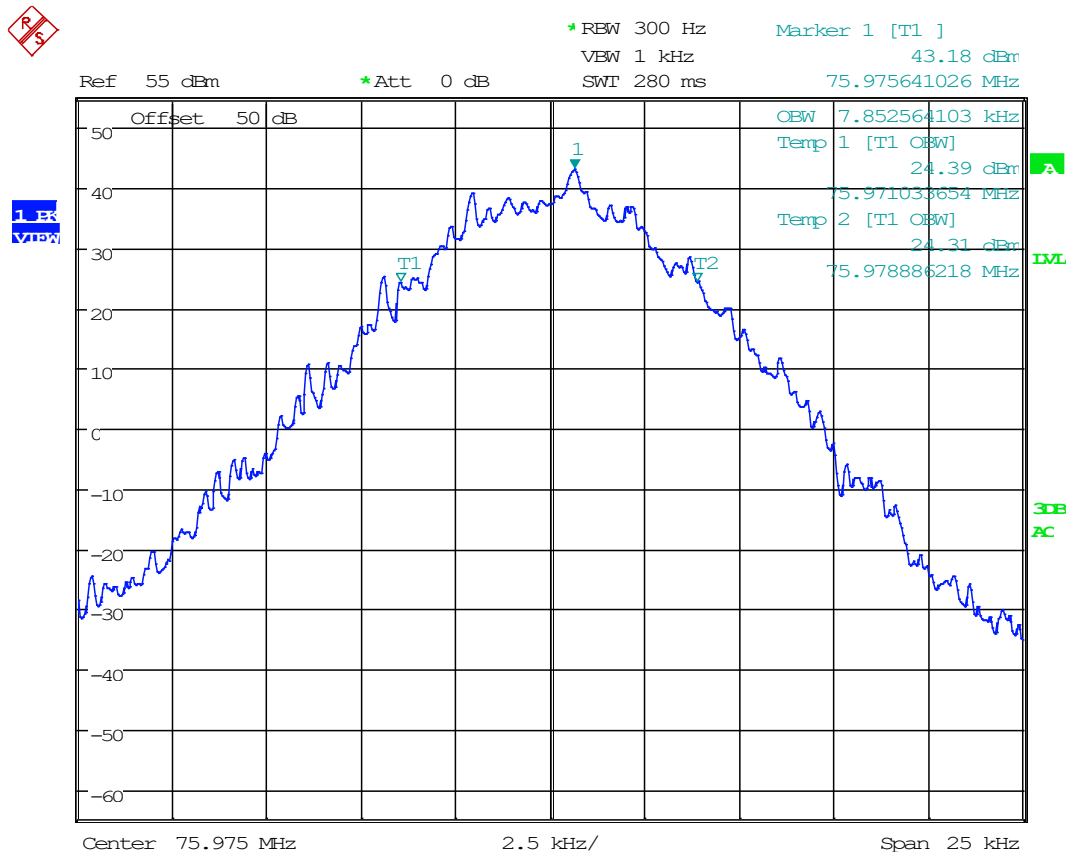
Frequency: 72.025 MHz, DMR



Date: 6.APR.2020 18:32:25

OCCUPIED BANDWIDTH

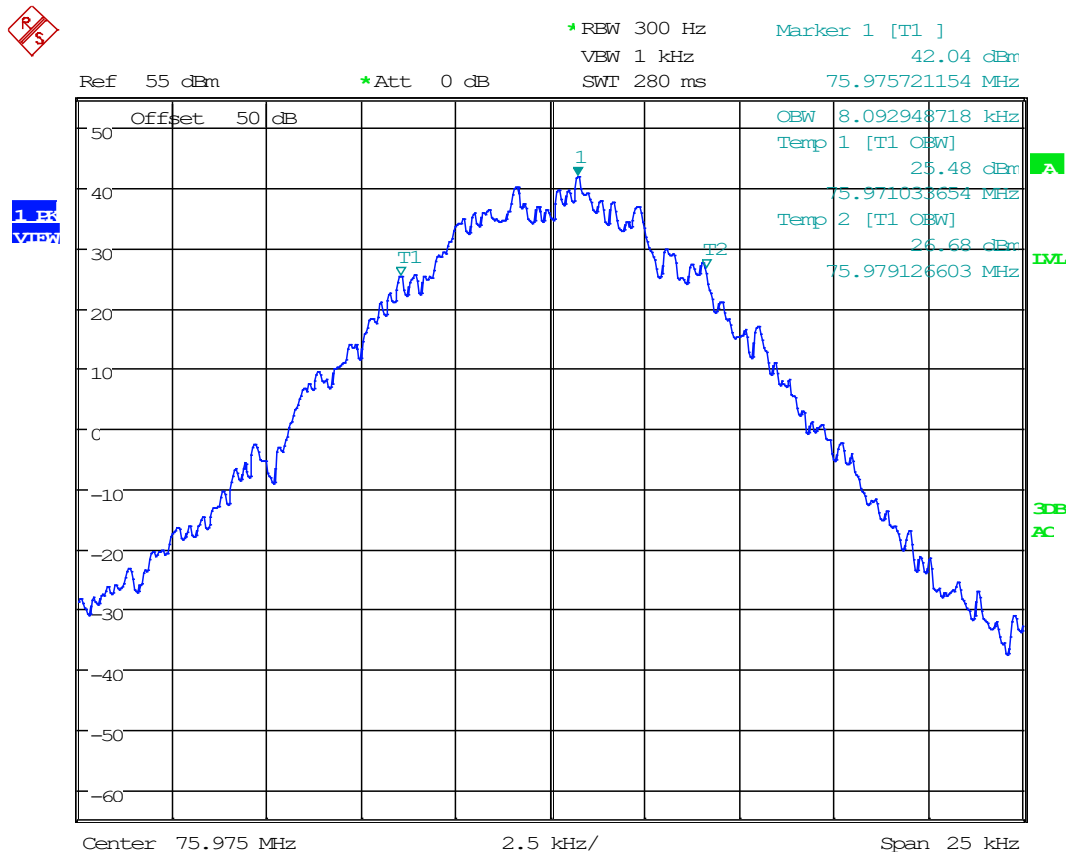
Frequency: 75.975 MHz, C4FM



Date: 6.APR.2020 18:36:11

OCCUPIED BANDWIDTH

Frequency: 75.975 MHz, DMR

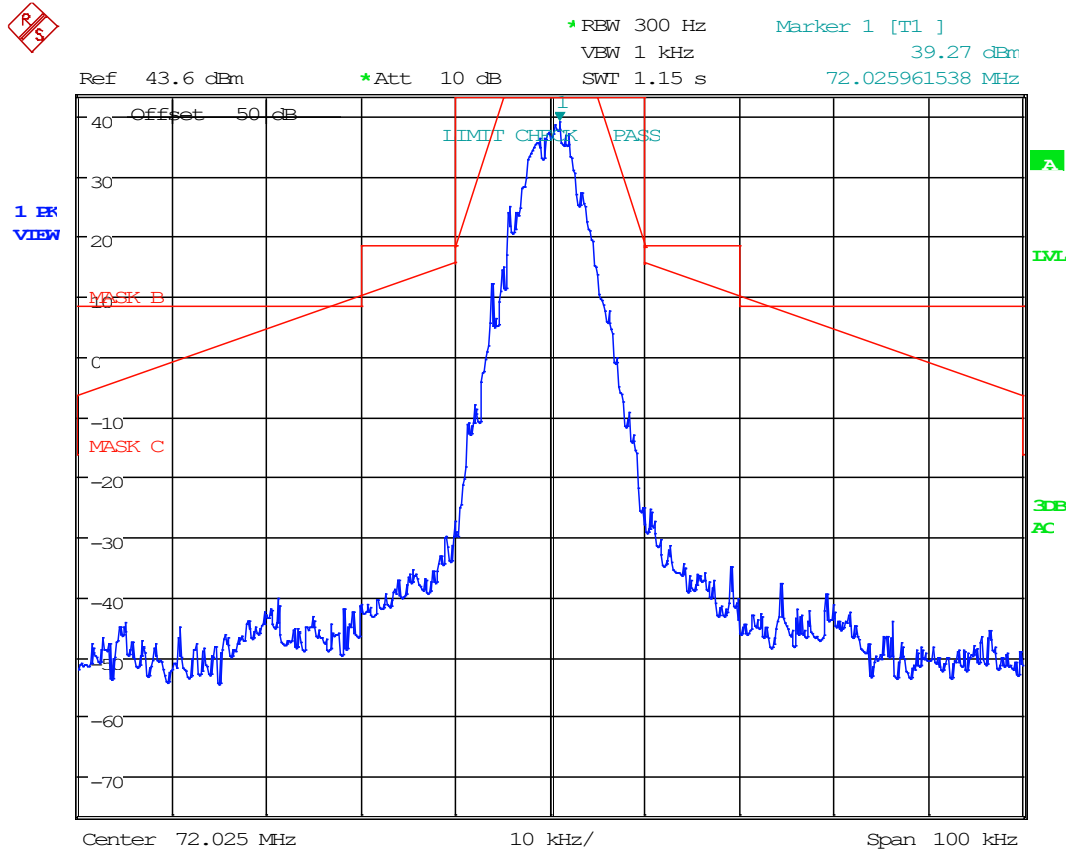


Date: 6.APR.2020 18:36:45

90.210 EMISSION MASKS

Test Engineer: FR
Test Date: 04/08/2020

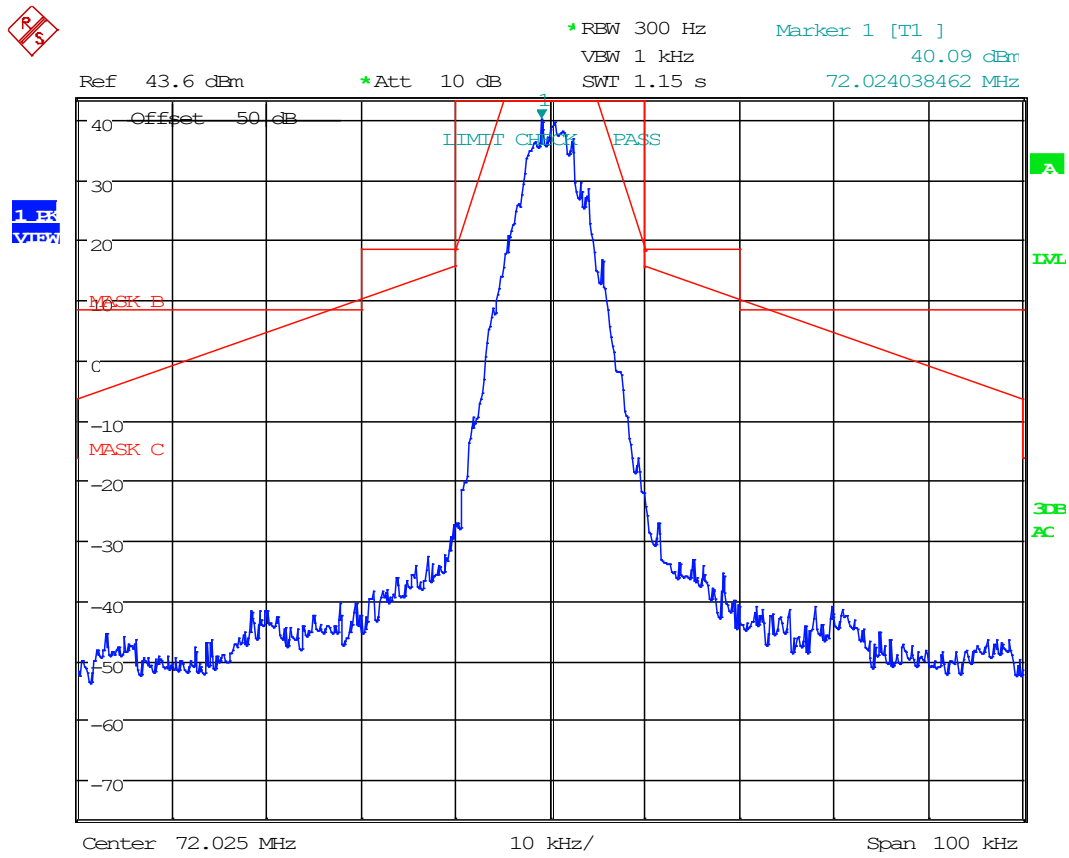
Frequency: 72.025 MHz, C4FM



Date: 8.APR.2020 15:31:10

EMISSION MASK

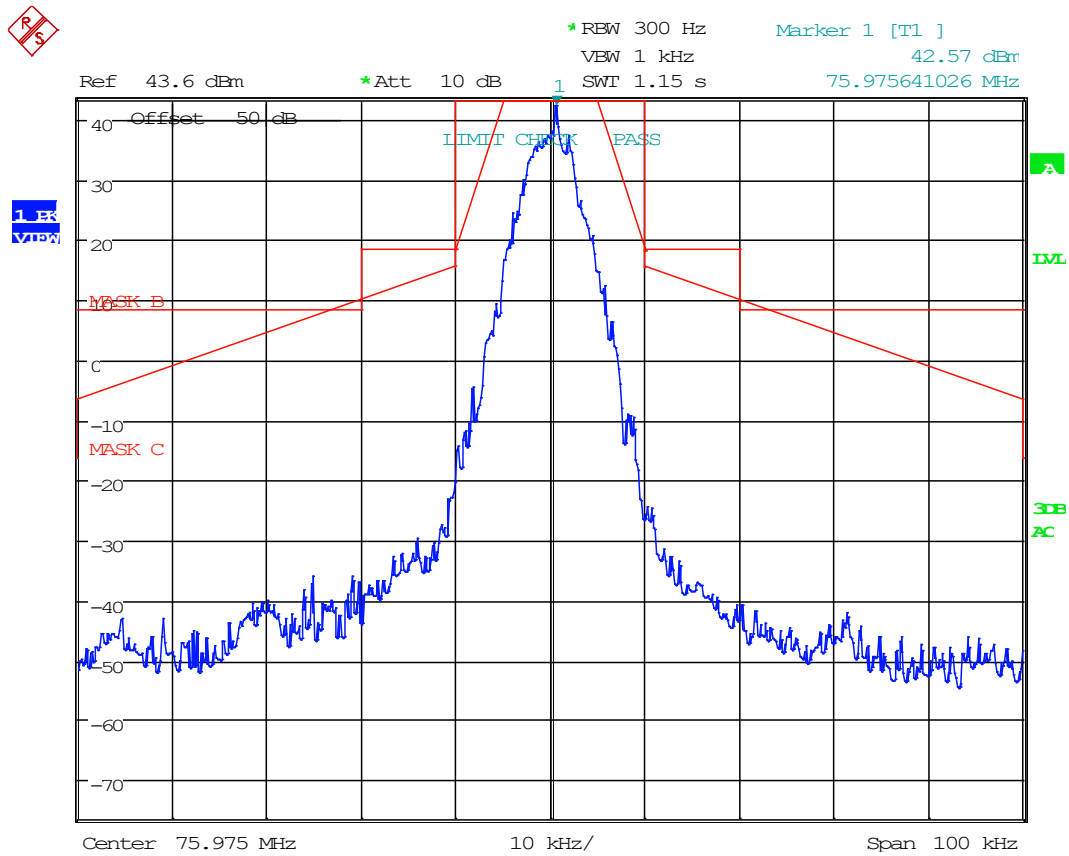
Frequency: 72.025 MHz, DMR



Date: 8.APR.2020 15:32:16

EMISSION MASK

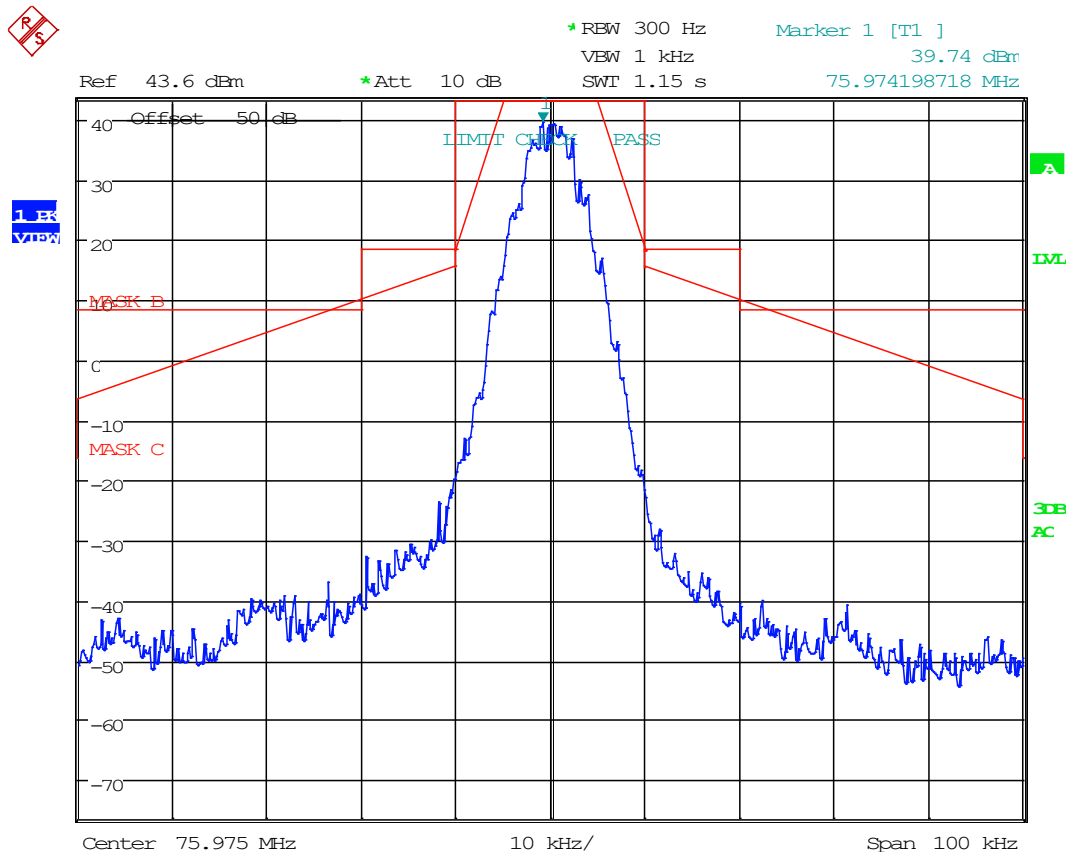
Frequency: 75.975 MHz, C4FM



Date: 8.APR.2020 15:36:38

EMISSION MASK

Frequency: 75.975 MHz, DMR

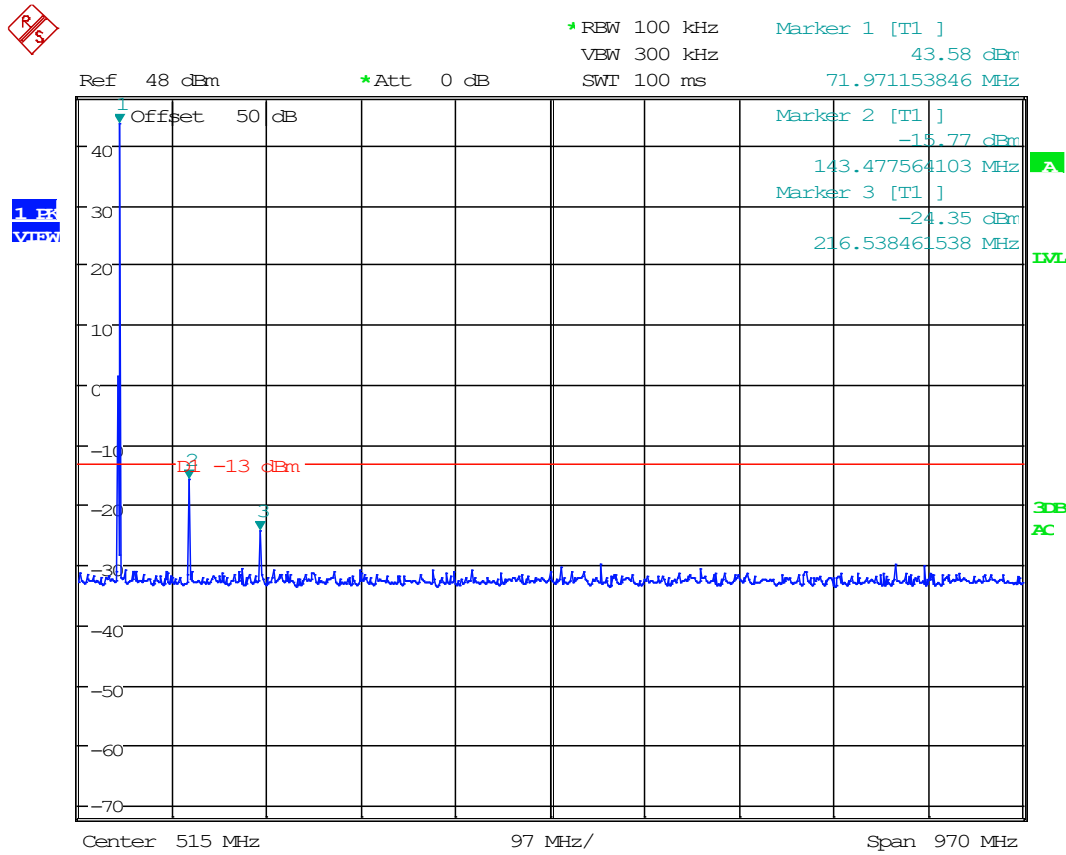


Date: 8.APR.2020 15:37:27

2.1051 CONDUCTED SPURIOUS EMISSIONS

Test Engineer: FR
 Test Date: 04/08/2020

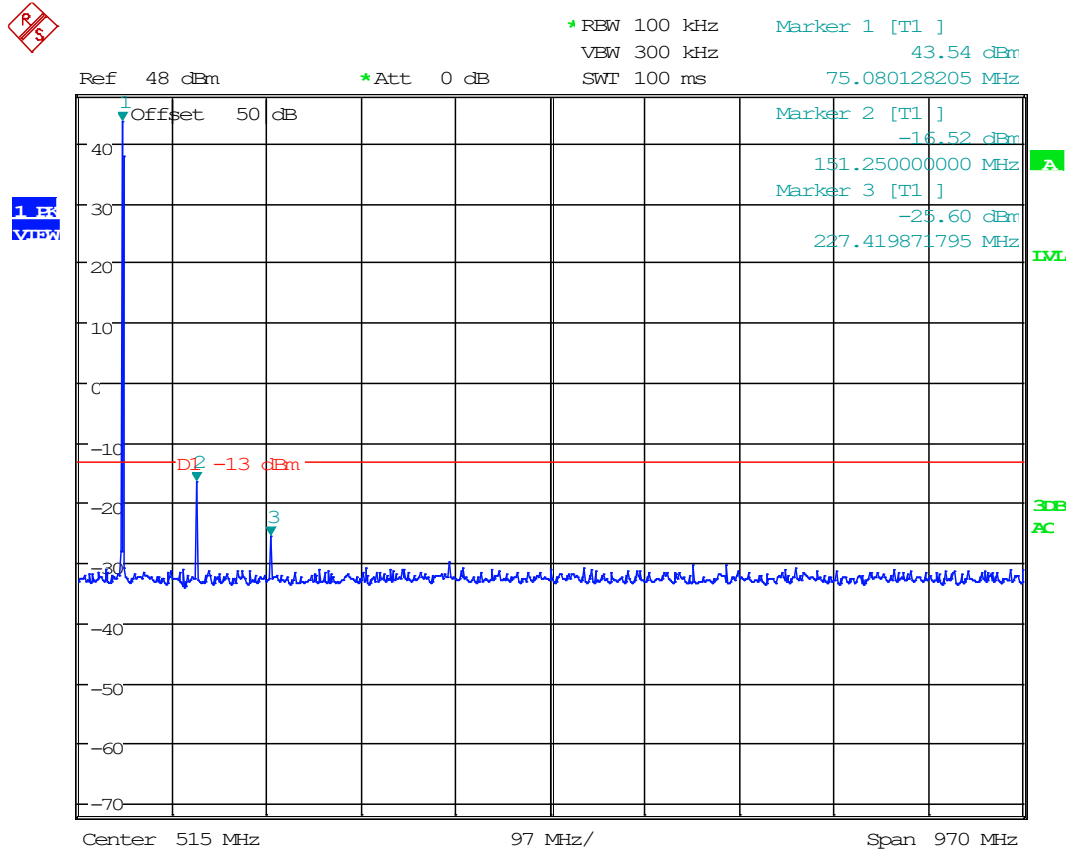
Frequency: 72.025 MHz, Digital



Date: 8.APR.2020 15:47:09

CONDUCTED SPURIOUS EMISSIONS

Frequency: 75.975 MHz, Digital



Date: 8.APR.2020 15:42:20

2.1053 FIELD STRENGTH OF SPURIOUS EMISSIONS

Test Engineer: TR
 Test Date: 04/09/2020

Frequency: 72.025 MHz

Tuned Frequency (MHz)	Emission Frequency (MHz)	Meter Reading (dBμV)	Antenna Polarity	Coax Loss (dB)	Correction Factor (dB/m)	Distance (m)	Field Strength (dBμV/m)	ERP (dBm)	Limit (dBm)	Margin (dB)
72.03	144.05	18.00	V	1.41	16.90	3.000	36.310	-61.067	-13.00	48.07
72.03	144.05	23.02	H	1.41	16.90	3.000	41.330	-56.047	-13.00	43.05
72.03	216.08	37.13	H	1.67	10.70	6.000	49.502	-41.855	-13.00	28.85
72.03	216.08	31.53	V	1.67	10.70	7.000	43.902	-46.116	-13.00	33.12
72.03	288.10	33.88	V	2.07	14.50	8.000	50.454	-38.404	-13.00	25.40
72.03	288.10	36.70	H	2.07	14.50	9.000	53.274	-34.561	-13.00	21.56
72.03	360.13	29.85	H	2.16	14.70	10.000	46.710	-40.210	-13.00	27.21
72.03	360.13	23.45	V	2.16	14.70	11.000	40.310	-45.782	-13.00	32.78
72.03	432.15	25.89	V	2.38	16.90	12.536	45.174	-39.783	-13.00	26.78
72.03	432.15	25.86	H	2.38	16.90	13.738	45.144	-39.017	-13.00	26.02
72.03	504.18	23.62	H	2.66	17.50	14.940	43.782	-39.650	-13.00	26.65
72.03	504.18	25.33	V	2.66	17.50	16.143	45.492	-37.268	-13.00	24.27
72.03	576.20	18.79	V	2.86	18.90	17.345	40.550	-41.586	-13.00	28.59
72.03	576.20	18.24	H	2.86	18.90	18.548	40.000	-41.554	-13.00	28.55
72.03	648.23	35.39	H	2.96	20.20	19.750	58.550	-22.458	-13.00	9.46
72.03	648.23	33.16	V	2.96	20.20	20.952	56.320	-24.175	-13.00	11.17
72.03	720.25	32.87	V	3.15	20.10	22.155	56.120	-23.890	-13.00	10.89
72.03	720.25	32.59	H	3.15	20.10	23.357	55.840	-23.711	-13.00	10.71

Frequency: 75.975 MHz

Tuned Frequency (MHz)	Emission Frequency (MHz)	Meter Reading (dBμV)	Antenna Polarity	Coax Loss (dB)	Correction Factor (dB/m)	Distance (m)	Field Strength (dBμV/m)	ERP (dBm)	Limit (dBm)	Margin (dB)
75.98	151.95	23.49	H	1.36	16.00	26.964	40.854	-37.450	-13.00	24.45
75.98	151.95	22.09	V	1.36	16.00	28.167	39.454	-38.471	-13.00	25.47
75.98	227.93	42.60	H	1.73	10.70	29.369	55.032	-22.530	-13.00	9.53
75.98	227.93	41.82	V	1.73	10.70	30.571	54.252	-22.961	-13.00	9.96
75.98	303.90	28.24	V	2.08	13.90	31.774	44.220	-32.658	-13.00	19.66
75.98	303.90	38.28	H	2.08	13.90	32.976	54.260	-22.296	-13.00	9.30
75.98	379.88	34.23	H	2.24	14.80	34.179	51.270	-24.975	-13.00	11.97
75.98	379.88	30.17	V	2.24	14.80	35.381	47.210	-28.734	-13.00	15.73
75.98	455.85	33.14	V	2.48	15.90	36.583	51.518	-24.136	-13.00	11.14
75.98	455.85	34.28	H	2.48	15.90	37.786	52.658	-22.715	-13.00	9.72
75.98	531.83	19.29	H	2.77	17.40	38.988	39.462	-35.639	-13.00	22.64
75.98	531.83	17.49	V	2.77	17.40	40.190	37.662	-37.175	-13.00	24.18
75.98	607.80	28.28	V	2.88	18.90	41.393	50.064	-24.517	-13.00	11.52
75.98	607.80	33.16	H	2.88	18.90	42.595	54.944	-19.388	-13.00	6.39
75.98	683.78	31.60	H	3.06	20.90	43.798	55.558	-18.533	-13.00	5.53
75.98	683.78	24.65	V	3.06	20.90	45.000	48.608	-25.247	-13.00	12.25
75.98	759.75	24.62	V	3.23	21.00	46.202	48.850	-24.776	-13.00	11.78
75.98	759.75	30.60	H	3.23	21.00	47.405	54.830	-18.573	-13.00	5.57

END OF TEST REPORT