



C2PC Test Report

APPLICANT	RADIO ACTIVITY S.R.L
ADDRESS	VIA PRIVATA CASCIA, 11 MILANO 20128 ITALY
FCC ID	Y9M-KA450
MODEL NUMBER	KA-450
PRODUCT DESCRIPTION	UHF BASE STATION
DATE SAMPLE RECEIVED	12/04/2018
FINAL TEST DATE	12/06/2018
TESTED BY	Tim Royer
APPROVED BY	Franklin Rose
TEST RESULTS	☒ PASS ☐ FAIL

Report Number	Report Version	Description	Issue Date
2060UT18_C2PC TestReport	Rev1	Initial Issue	12/06/2018

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

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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

Test



Sr. EMC Engineer
 EMC-003838-NE



Name and Title	Tim Royer, Project Manager / EMC Testing Engineer
Date	12/06/2018

Reviewed and Approved by:



Name and Title	Franklin Rose, Project Manager / EMC Testing Technician
Date	12/10/2018

GENERAL INFORMATION

EUT Description	UHF BASE STATION
FCC ID	Y9M-KA450
Model Number	KA-450
Operating Frequency	406.1- 470MHz
Type of Emission	7K60FXE/FXD, 8K10F1E/F1D
Modulation	Digital
EUT Power Source	☐ 110–120Vac/50– 60Hz
	☒ DC Power (12 V)
	☐ Battery Operated Exclusively
Test Item	☐ Prototype
	☒ Pre-Production
	☐ Production
Type of Equipment	☒ Fixed
	☐ Mobile
	☐ Portable
Antenna Connector	BNC
Test Conditions	The temperature was 26°C Relative humidity of 50%.
Modification to the EUT	None.
Test Exercise	The EUT was operated according to the User Manual.
Applicable Standards	RSS-GEN (i5), RSS-210 Annex E (i9), ANSI C63.10; Referencing ANSI C63.26, TIA 603-E:2016, Part 2, Part 90
Test Facility	Timco Engineering Inc. at 849 NW State Road 45 Newberry, FL 32669 USA. Designation #: US1070; IC Test Site: 2056-A

RESULTS SUMMARY

Applied Rule Part	Test Description	Result
2.1049 (c), RSS-GEN 6.7, RSS-119	Occupied Bandwidth	PASS
90.210(b)(1), (2); (d)(1), (2) RSS-GEN 6.7, RSS-119	Emission Mask	PASS
2.1053(a), 90.210(e)(3); (d)(3) RSS-GEN 6.13, RSS-119	Spurious Emissions at Antenna Terminals	PASS

MODULATION CHARACTERISTICS, P25 & DMR SIGNALS

FCC Rule Parts: Part 2.1033(c)(4), 90.209(b)(5)

STANDARD CHANNEL SPACING/BANDWIDTH

Frequency band (MHz)	Channel spacing (kHz)	Authorized bandwidth (kHz)
406-512 ²	¹ 6.25	¹³⁶ 20/11.25/6

¹For stations authorized on or after August 18, 1995.

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.

³Operations using equipment designed to operate with a 25 kHz channel bandwidth will be authorized a 20 kHz bandwidth. Operations using equipment designed to operate with a 12.5 kHz channel bandwidth will be authorized a 11.25 kHz bandwidth. Operations using equipment designed to operate with a 6.25 kHz channel bandwidth will be authorized a 6 kHz bandwidth. All stations must operate on channels with a bandwidth of 12.5 kHz or less beginning January 1, 2013, unless the operations meet the efficiency standard of §90.203(j)(3).

⁶Operations using equipment designed to operate with a 25 kHz channel bandwidth may be authorized up to a 22 kHz bandwidth if the equipment meets the Adjacent Channel Power limits of §90.221.

8K10F1E/F1D (P25) Bandwidth Calculation

$$\begin{aligned}
 B_n &= (R/\log_2 S) + 2DK \\
 B_n &= (9600/\log_2(4)) + 2(1800)(0.916) \\
 B_n &= 4800 + 3298 \\
 B_n &= 8.10 \text{ kHz}
 \end{aligned}$$

Where:

$$\begin{aligned}
 R \text{ (data rate)} &= 9600 \text{ bps} \\
 D \text{ (peak deviation)} &= 1800 \text{ Hz} \\
 S \text{ (symbols)} &= 4 \\
 K \text{ (constant)} &= 0.916
 \end{aligned}$$

Necessary Bandwidth for 8K10F1E/F1D = **8.10 kHz**

RESULT: 90.209(b)(5) Necessary Bandwidth for 8K10F1E/F1D = 8.10 kHz

MODULATION CHARACTERISTICS, P25 & DMR SIGNALS

7K60FXE/FXD (DMR) Bandwidth Calculation

$$\begin{aligned} B_n &= (R/\log_2 S) + 2DK \\ B_n &= (9600/\log_2(4)) + 2(1800)(0.905) \\ B_n &= (4800 + 3600) * 0.905 \\ B_n &= 7.602 \text{ kHz} \end{aligned}$$

Where:

R = baud rate (9600)
D = deviation kHz (1800 Hz)
S = signaling states (4)
K = constant (0.905)

RESULT: 90.209(b)(5) Necessary Bandwidth for 7K60FXE/FXD = 7.60 kHz

OCCUPIED BANDWIDTH

Rule Part: RSS-119 5.5, 2.1049 (c)

5.5 Channel Bandwidth, Authorized Bandwidth, Occupied Bandwidth and Spectrum Masks

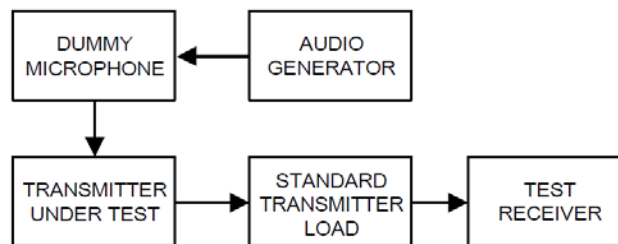
For the purpose of this document, channel bandwidth is the channel width in which the equipment is designed to operate.

The maximum permissible occupied bandwidth shall not exceed the authorized bandwidth specified in Table 3 for the equipment's frequency band. The authorized bandwidth is defined as the maximum width of the band of frequencies used to derive spectrum masks and is not necessarily equivalent to the bandwidth found on radio and spectrum licences.

Table 3 — Channel Bandwidths, Authorized Bandwidths and Spectrum Masks

Frequency Band (MHz)	Related SRSP for Channelling Plan and ERP	Channel Bandwidth (kHz)	Authorized Bandwidth (kHz)	Spectrum Masks for Equipment With Audio Filter	Spectrum Masks for Equipment Without Audio Filter
27.41-28 and 29.7-50	N/A	20	20	B	C
72-76	N/A	20	20	B	C
138-144, 148-149.9 and 150.05-174	SRSP-500	30	20	B	C
		15	11.25	D	D
		7.5	6	E	E
217-218 and 219-220	N/A	12.5	11.25	D or I	D or J
220-222	SRSP-512	5	4	F	F
406.1-430 and 450-470	SRSP-501	25	20 22	B Y	C (G) ¹ Y
		12.5	11.25	D	D
		6.25	6	E	E

Test Procedure: ANSI C63.10 s 6.9.3 (using test setup from TIA 603-E 2.2.11)



Note: The receiver's automatic 99% Occupied Bandwidth function was used. The function is identical in operation to ANSI C63.10 s 6.9.3, step g.

Measurement Parameter Calculation:

99 % OBW (kHz)	Min RBW (kHz)	Max RBW (kHz)	Min Span (kHz)	Max Span (kHz)
8.110	0.081	0.406	16.220	40.550

Test Data: 99 % Occupied Bandwidth Table (P25)

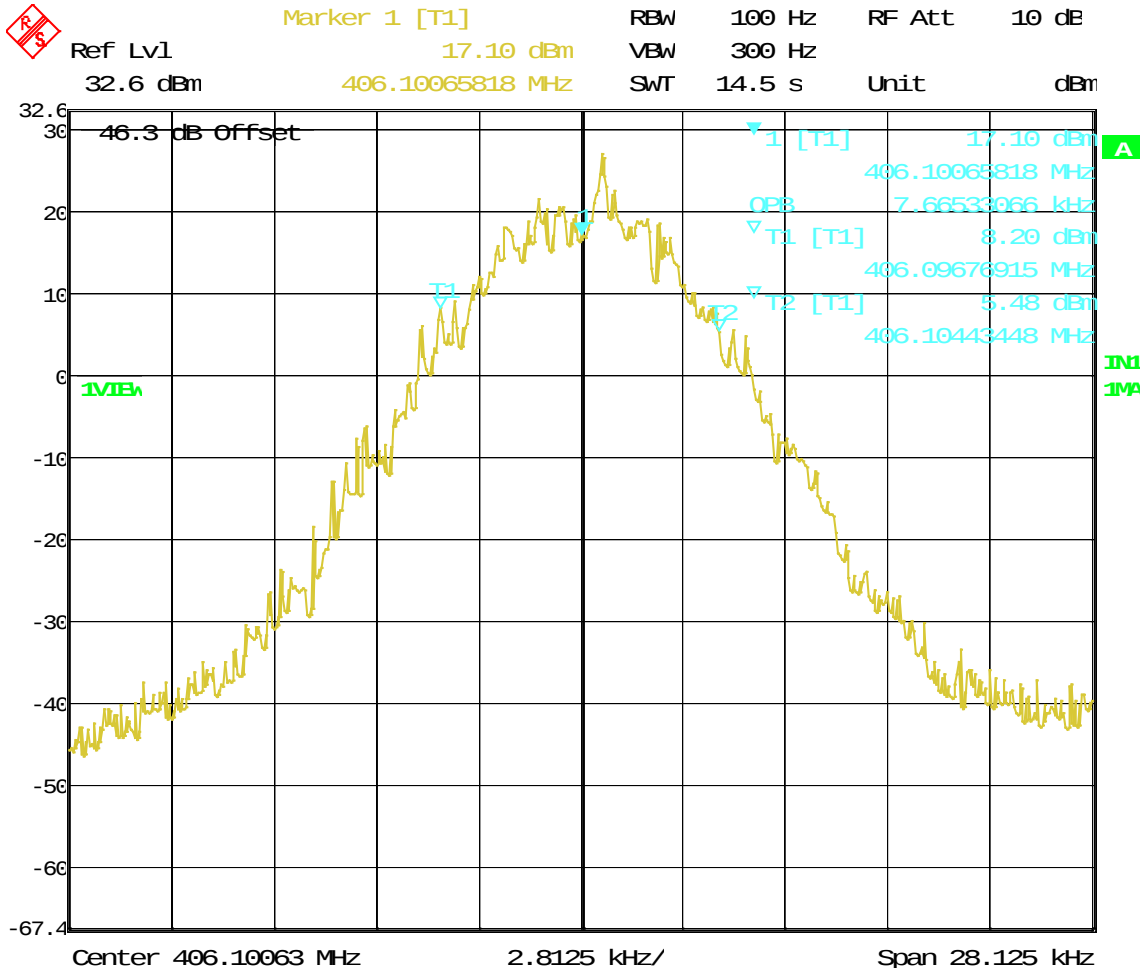
Frequency (MHz)	99 % OBW (kHz)	Limit (kHz)	Margin (kHz)
406.1006	7.66	11.3	3.59
421.0063	7.71	11.3	3.54
465.0000	7.86	11.3	3.39
469.9938	7.66	11.3	3.59

Test Data: 99 % Occupied Bandwidth Table (DMR)

Frequency (MHz)	99 % OBW (kHz)	Limit (kHz)	Margin (kHz)
406.1006	8.17	11.3	3.08
421.0063	8.11	11.3	3.14
465.0000	8.11	11.3	3.14
469.9938	8.11	11.3	3.14

OCCUPIED BANDWIDTH

Test Data: C4FM, 406.10063 MHz



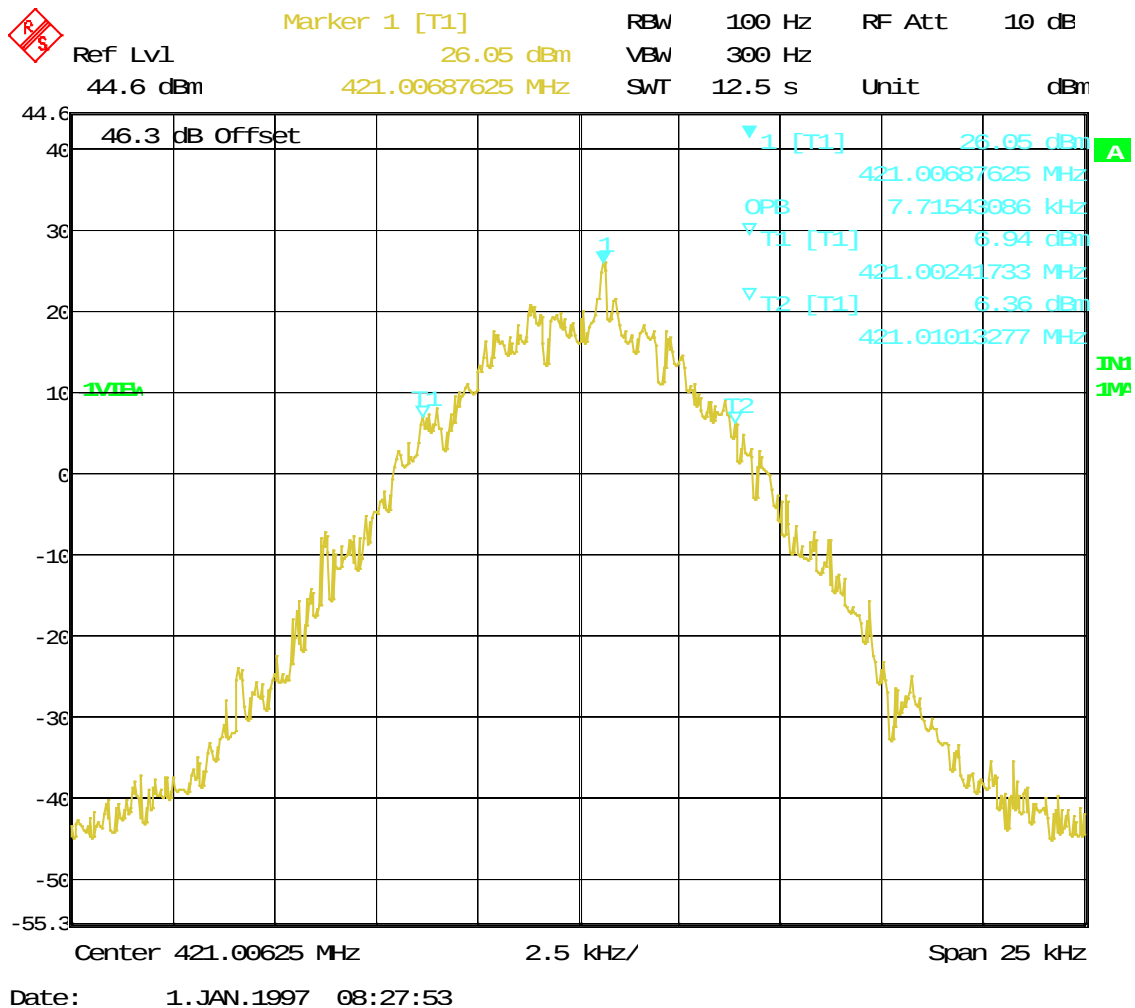
Date: 1.JAN.1997 00:28:37

Result: 99 % OBW = 7.665 kHz

Result: Meets Requirements

OCCUPIED BANDWIDTH

Test Data: C4FM, 421.006255 MHz

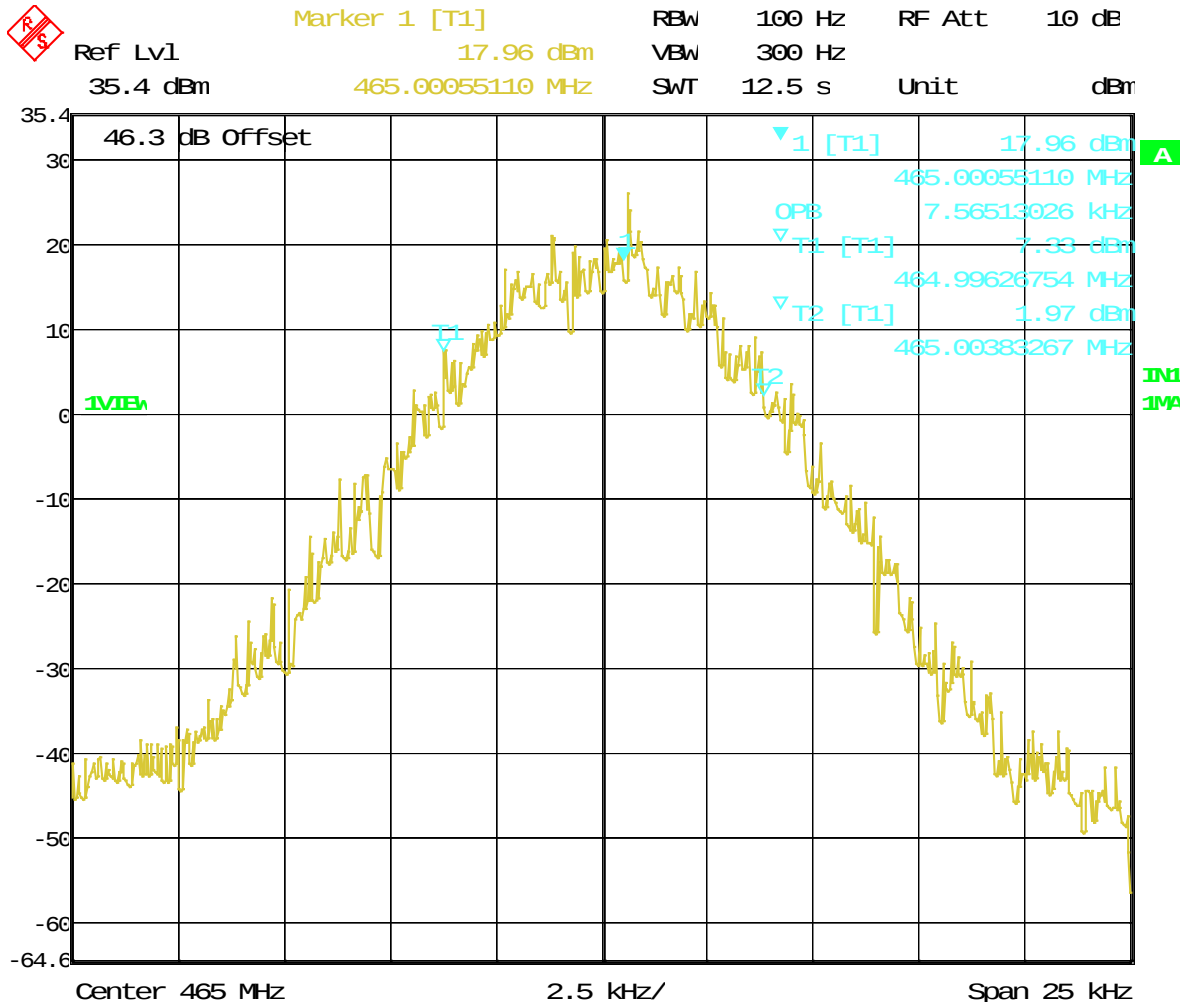


Result: 99 % OBW = 7.715 kHz

Result: Meets Requirements

OCCUPIED BANDWIDTH

Test Data: C4FM, 465.00000 MHz



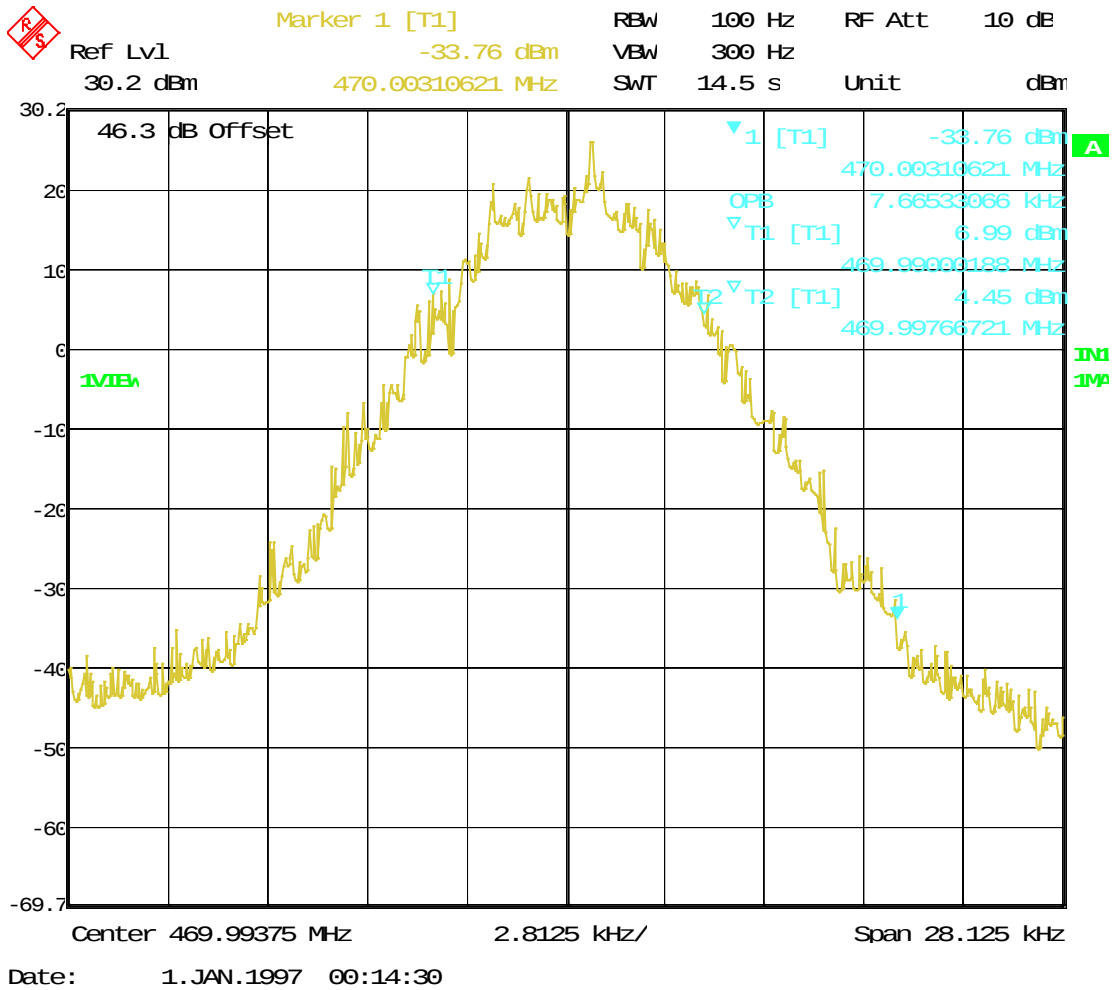
Date: 1.JAN.1997 08:53:13

Result: 99 % OBW = 7.565 kHz

Result: Meets Requirements

OCCUPIED BANDWIDTH

Test Data: C4FM, 469.99375 MHz

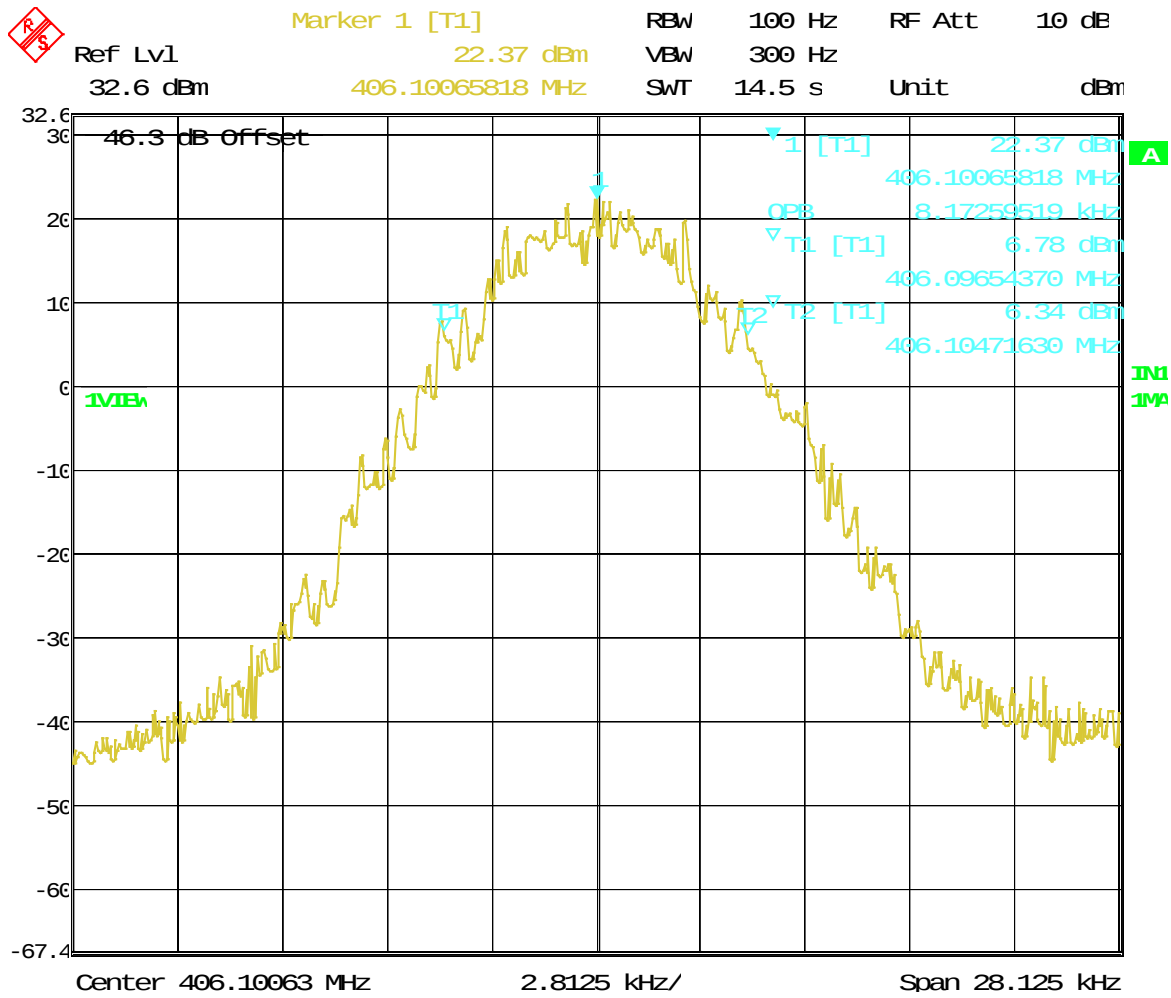


Result: 99 % OBW = 7.665 kHz

Result: Meets Requirements

OCCUPIED BANDWIDTH

Test Data: DMR, 406.10063 MHz



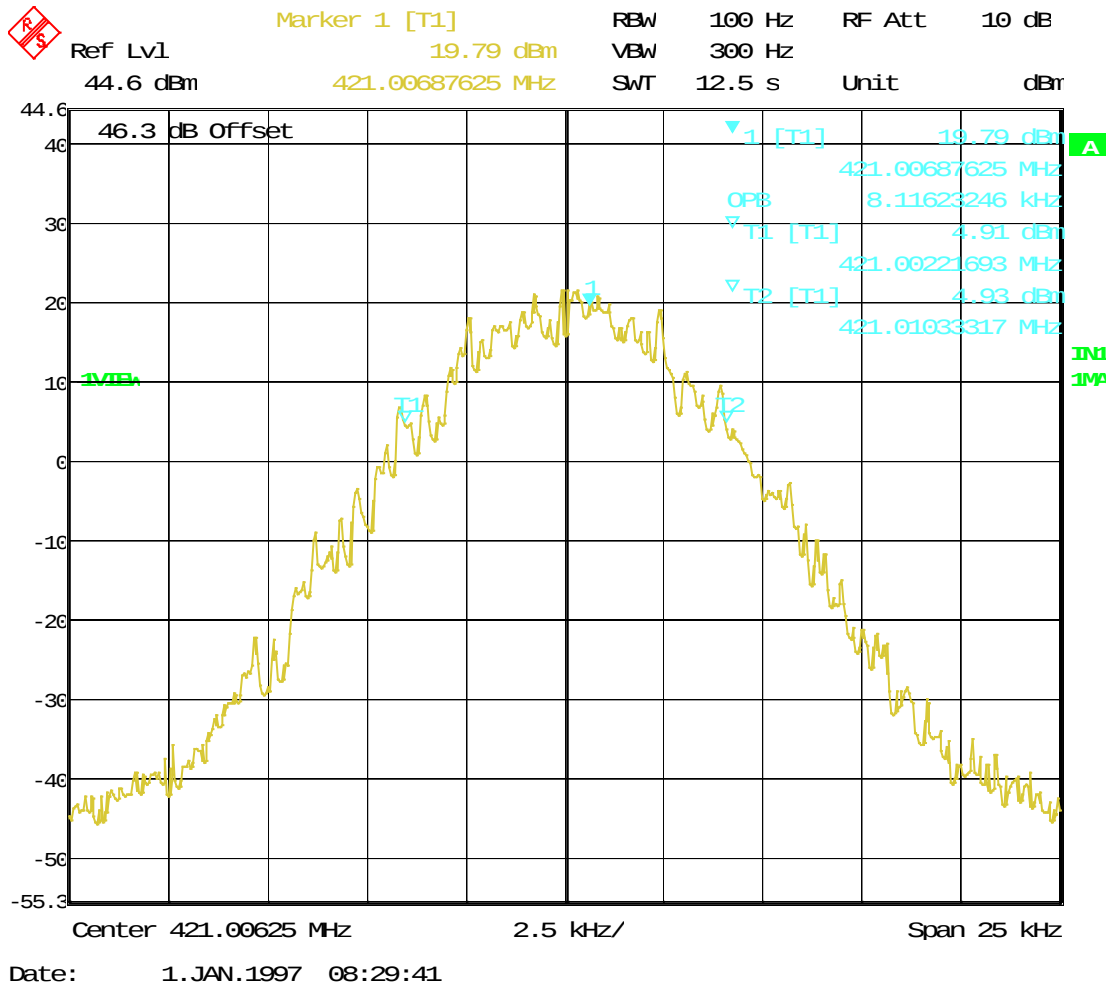
Date: 1.JAN.1997 00:26:44

Result: 99 % OBW = 8.172 kHz

Result: Meets Requirements

OCCUPIED BANDWIDTH

Test Data: DMR, 421.00625 MHz

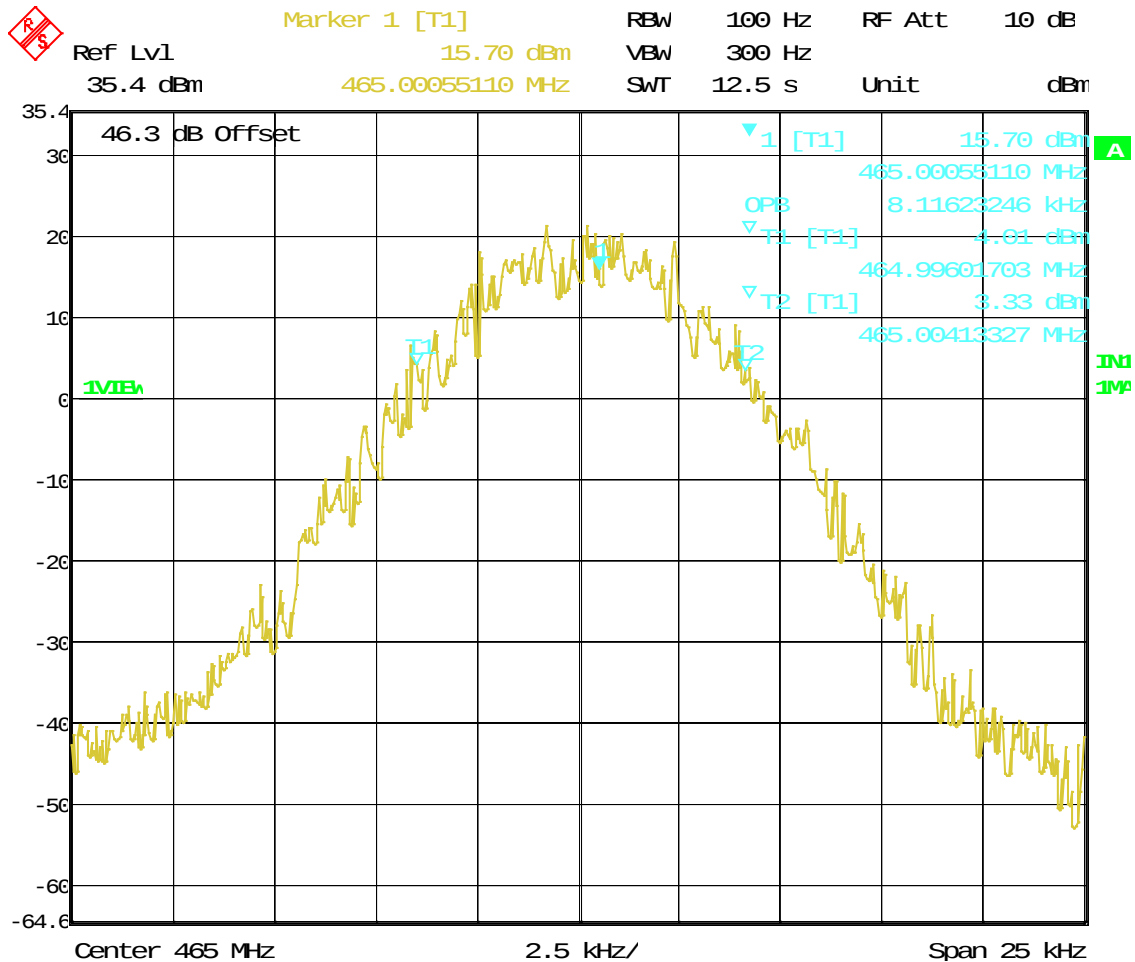


Result: 99 % OBW = 8.11 kHz

Result: Meets Requirements

OCCUPIED BANDWIDTH

Test Data: DMR, 465.00000 MHz



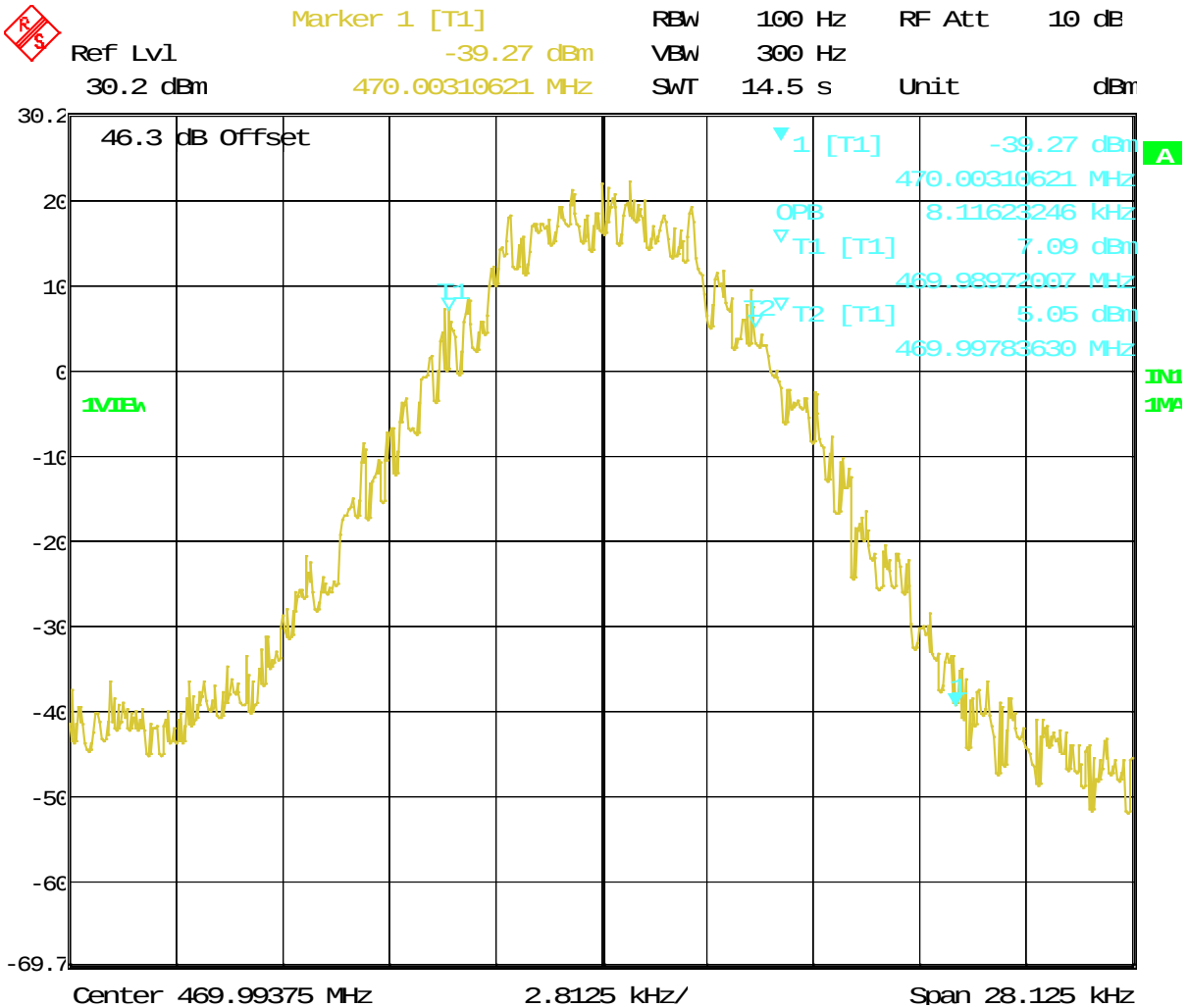
Date: 1.JAN.1997 08:52:20

Result: 99 % OBW = 8.11 kHz

Result: Meets Requirements

OCCUPIED BANDWIDTH

Test Data: DMR, 469.99375 MHz



Date: 1.JAN.1997 00:15:35

Result: 99 % OBW = 8.11 kHz

Result: Meets Requirements

EMISSION MASK

FCC Rule Parts: RSS-GEN 6.7, RSS-119, 90.210 (d)(1), (2)

5.8.3 Emission Mask D for Transmitters Equipped With or Without an Audio Low-Pass Filter

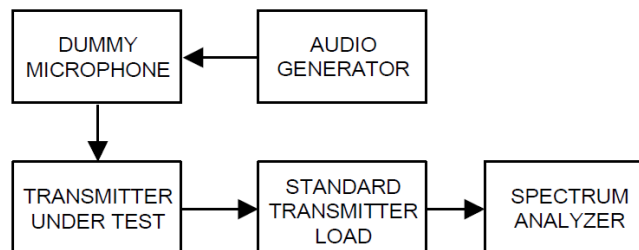
The power of any emission shall be attenuated below the transmitter output power P (dBW) as specified in Table 7.

Table 7 — Emission Mask D		
Displacement Frequency, f_d (kHz)	Minimum Attenuation (dB)	Resolution Bandwidth (Hz)
$5.625 < f_d \leq 12.5$	$7.27(f_d - 2.88)$	Specified in Section 4.2.2
$f_d > 12.5$	Whichever is the lesser: 70 or $50 + 10 \log_{10}(P)$	Specified in Section 4.2.2

(d) *Emission Mask D—12.5 kHz channel bandwidth equipment.* For transmitters designed to operate with a 12.5 kHz channel bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:

- (1) On any frequency from the center of the authorized bandwidth f_0 to 5.625 kHz removed from f_0 : Zero dB.
- (2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 5.625 kHz but no more than 12.5 kHz: At least $7.27(f_d - 2.88)$ dB.
- (3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 12.5 kHz: At least $50 + 10 \log(P)$ dB or 70 dB, whichever is the lesser attenuation.

Test Procedure: ANSI C63.10, referencing TIA 603-E 2.2.11

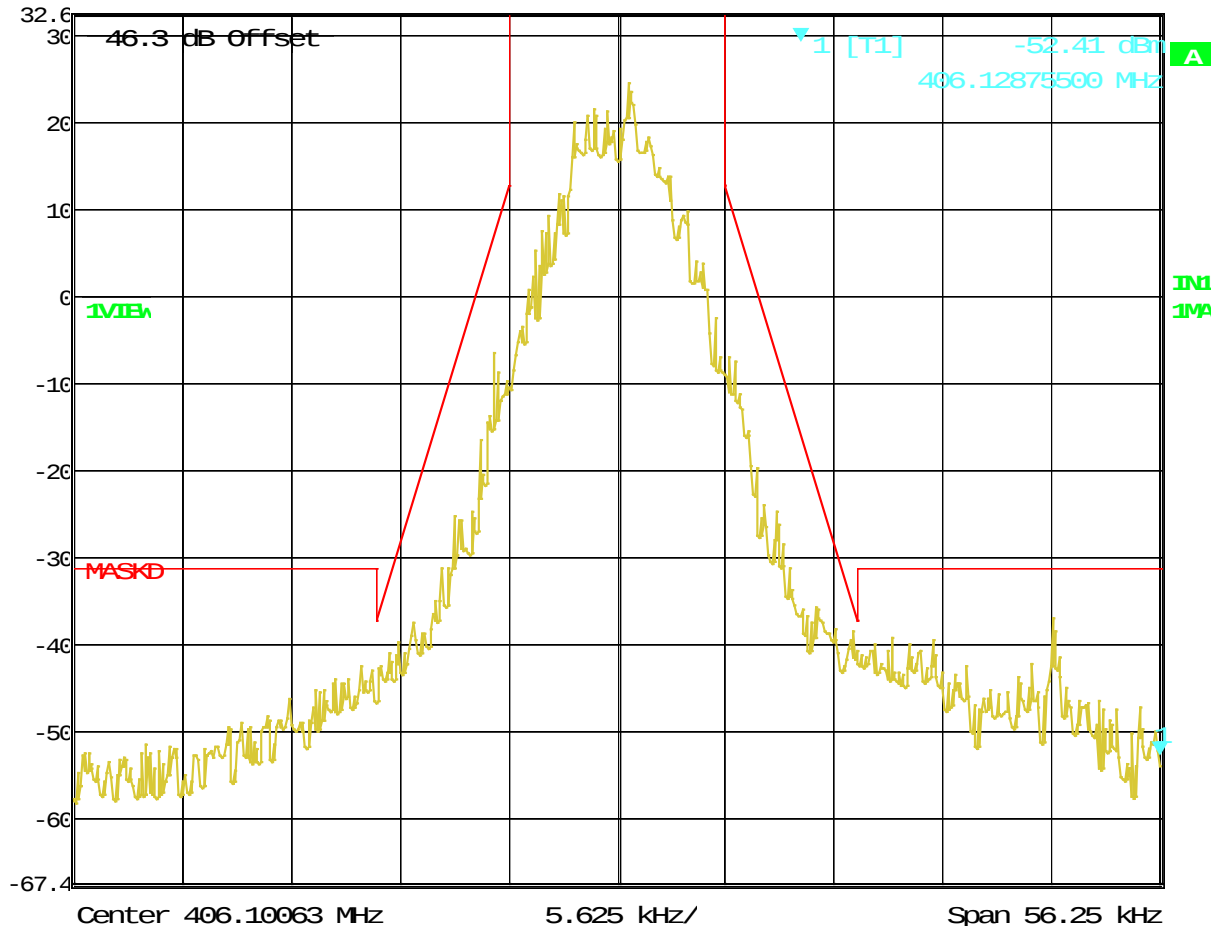


EMISSION MASK

Test Data: C4FM, 406.10063 MHz, 90.210 & RSS-119, Mask D



Marker 1 [T1] RBW 100 Hz RF Att 10 dB
 Ref Lvl -52.41 dBm VBW 300 Hz
 32.6 dBm 406.12875500 MHz SWT 29 s Unit dBm



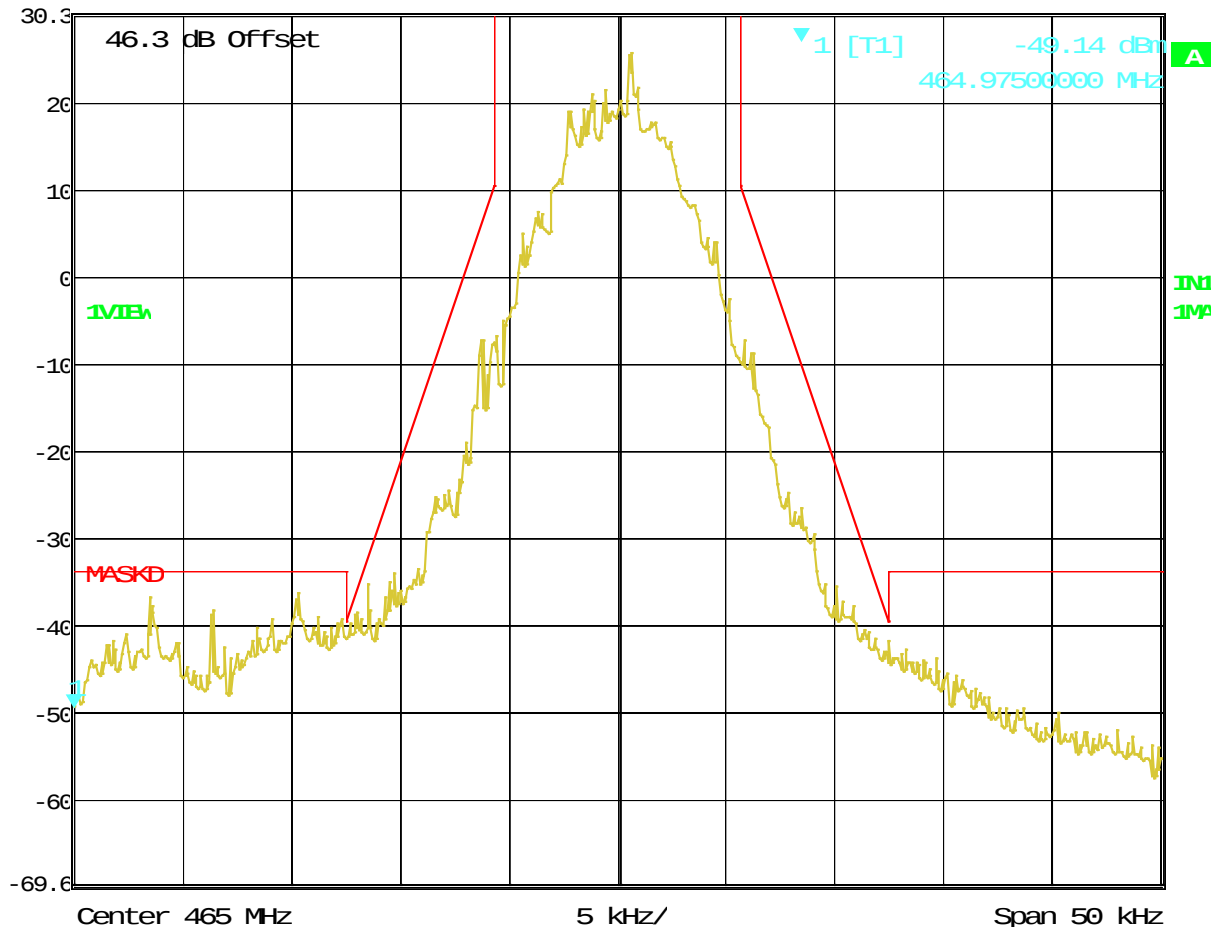
Date: 1.JAN.1997 00:22:05

EMISSION MASK

Test Data: C4FM, 421.00625 MHz, 90.210 & RSS-119, Mask D



Marker 1 [T1] RBW 100 Hz RF Att 10 dB
 Ref Lvl -49.14 dBm VBW 300 Hz
 30.4 dBm 464.97500000 MHz SWT 25 s Unit dBm



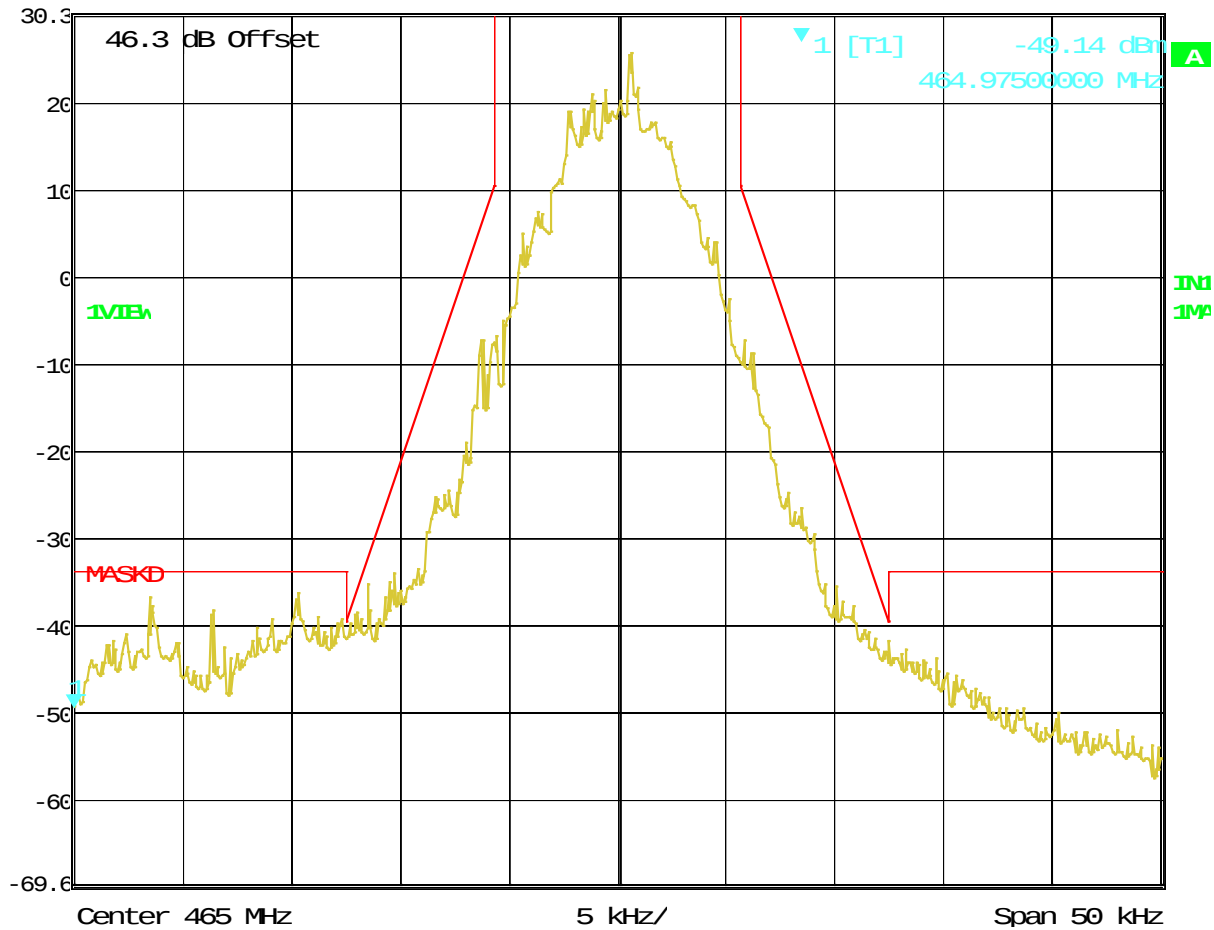
Date: 1.JAN.1997 08:37:37

EMISSION MASK

Test Data: C4FM, 465 MHz, 90.210 & RSS-119, Mask D



Marker 1 [T1] RBW 100 Hz RF Att 10 dB
 Ref Lvl -49.14 dBm VBW 300 Hz
 30.4 dBm 464.97500000 MHz SWT 25 s Unit dBm



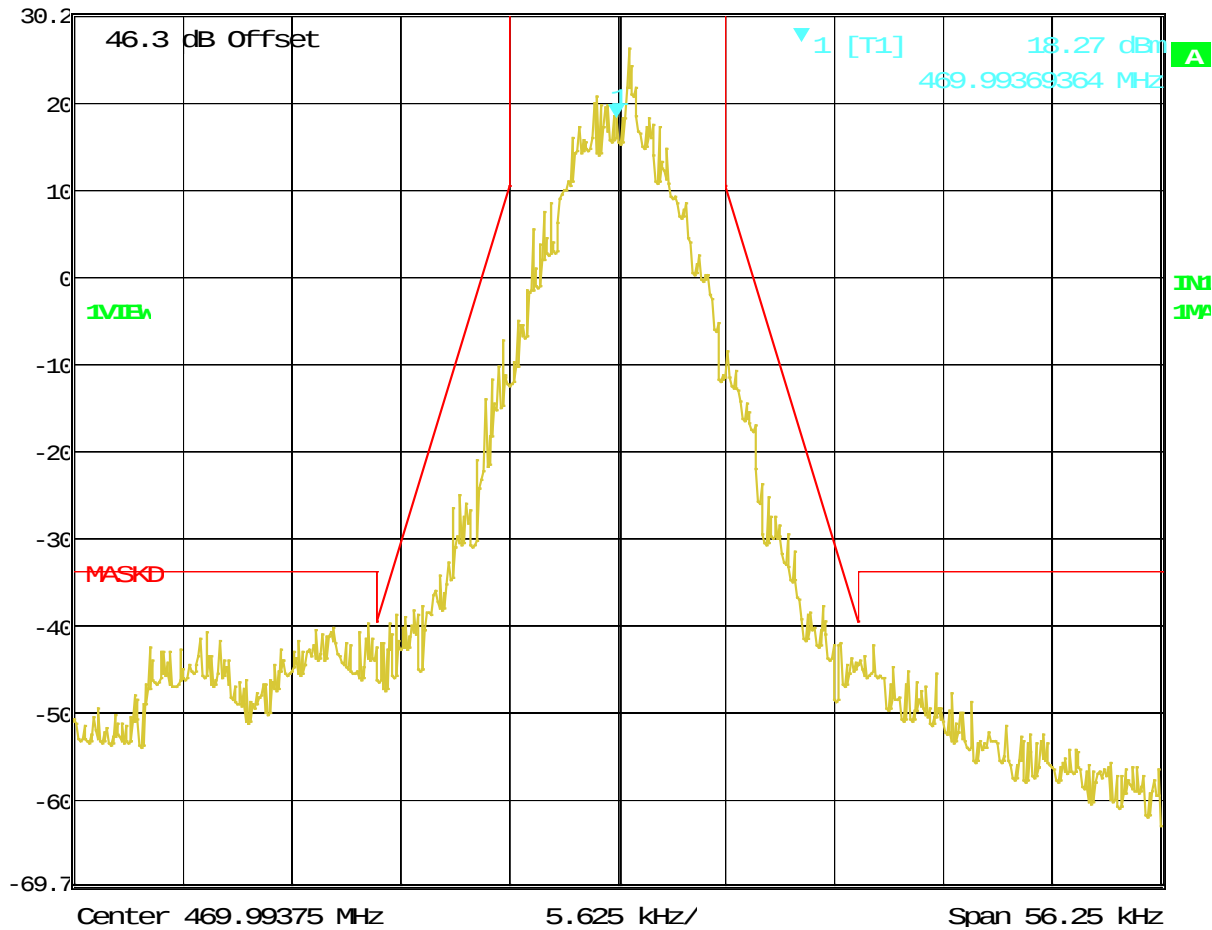
Date: 1.JAN.1997 08:37:37

EMISSION MASK

Test Data: C4FM, 469.99375 MHz, 90.210 & RSS-119, Mask D



Marker 1 [T1] RBW 100 Hz RF Att 10 dB
 Ref Lvl 18.27 dBm VBW 300 Hz
 30.2 dBm 469.99369364 MHz SWT 29 s Unit dBm



Date: 1.JAN.1997 00:17:59

EMISSION MASK

Test Data: DMR, 406.10063 MHz, 90.210 & RSS-119, Mask D



Marker 1 [T1]

RBW

100 Hz

RF Att

10 dB

Ref Lvl

-48.25 dBm

VBW

300 Hz

32.6 dBm

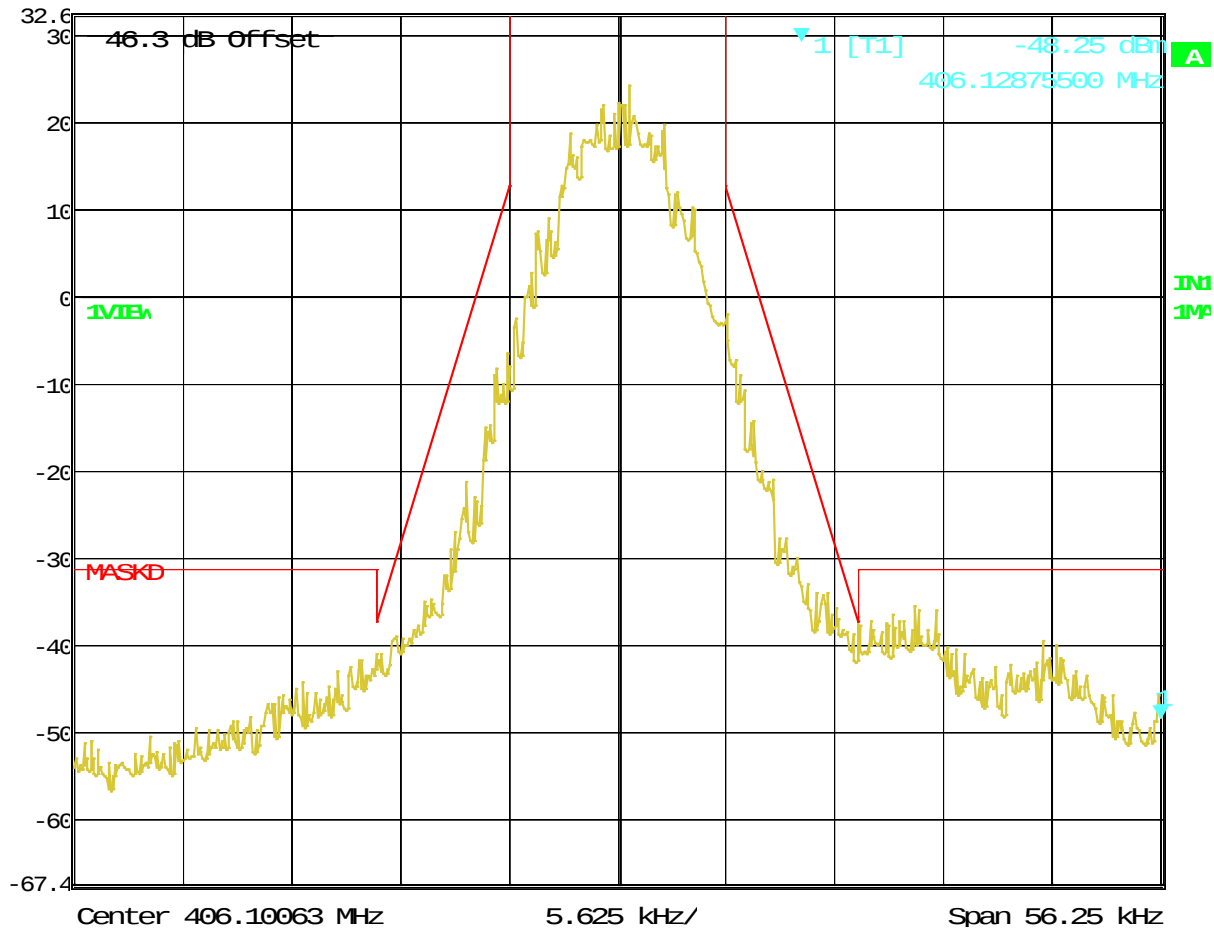
406.12875500 MHz

SWT

29 s

Unit

dBm



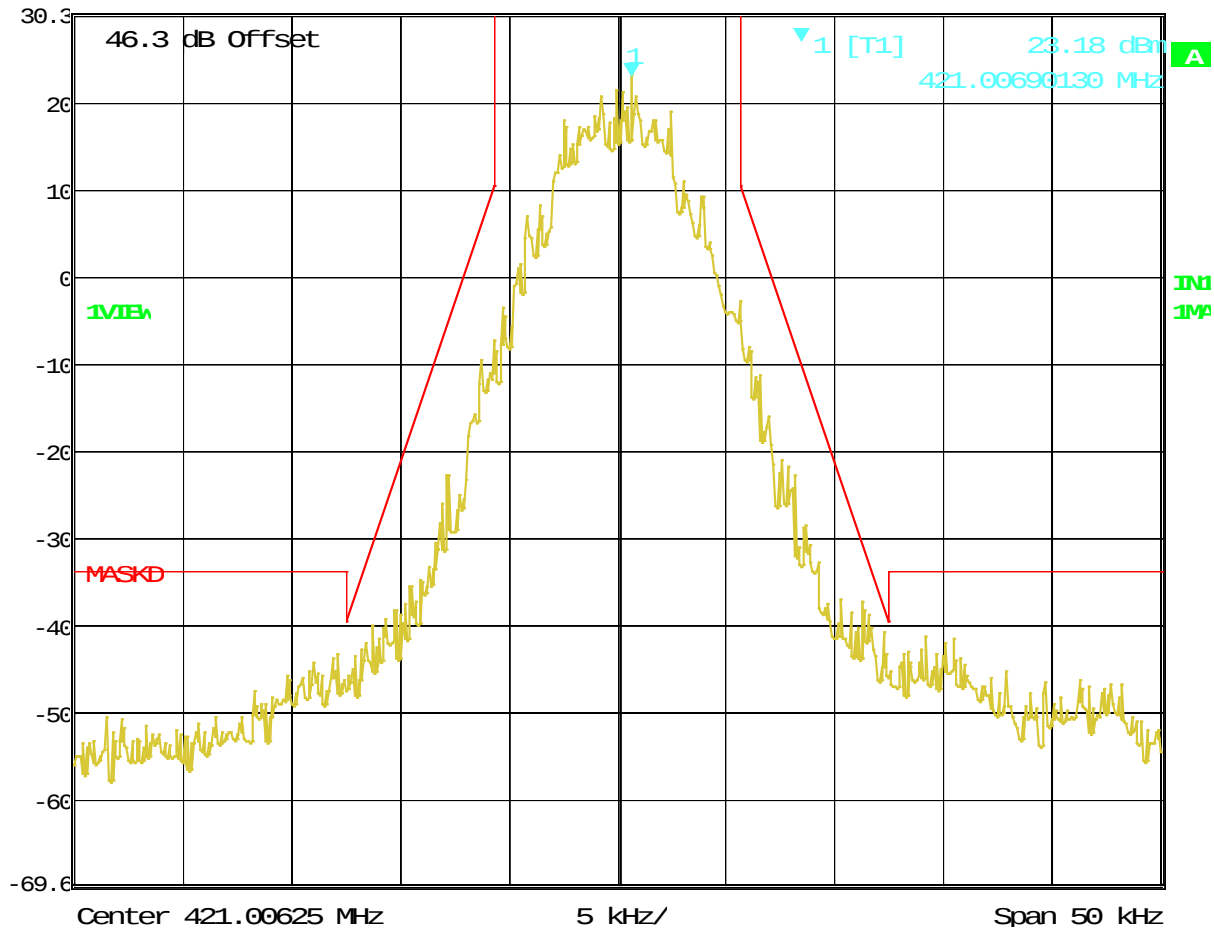
Date: 1.JAN.1997 00:25:20

EMISSION MASK

Test Data: DMR, 421.00625 MHz, 90.210 & RSS-119, Mask D



Marker 1 [T1] RBW 100 Hz RF Att 10 dB
 Ref Lvl 23.18 dBm VBW 300 Hz
 30.4 dBm 421.00690130 MHz SWT 25 s Unit dBm



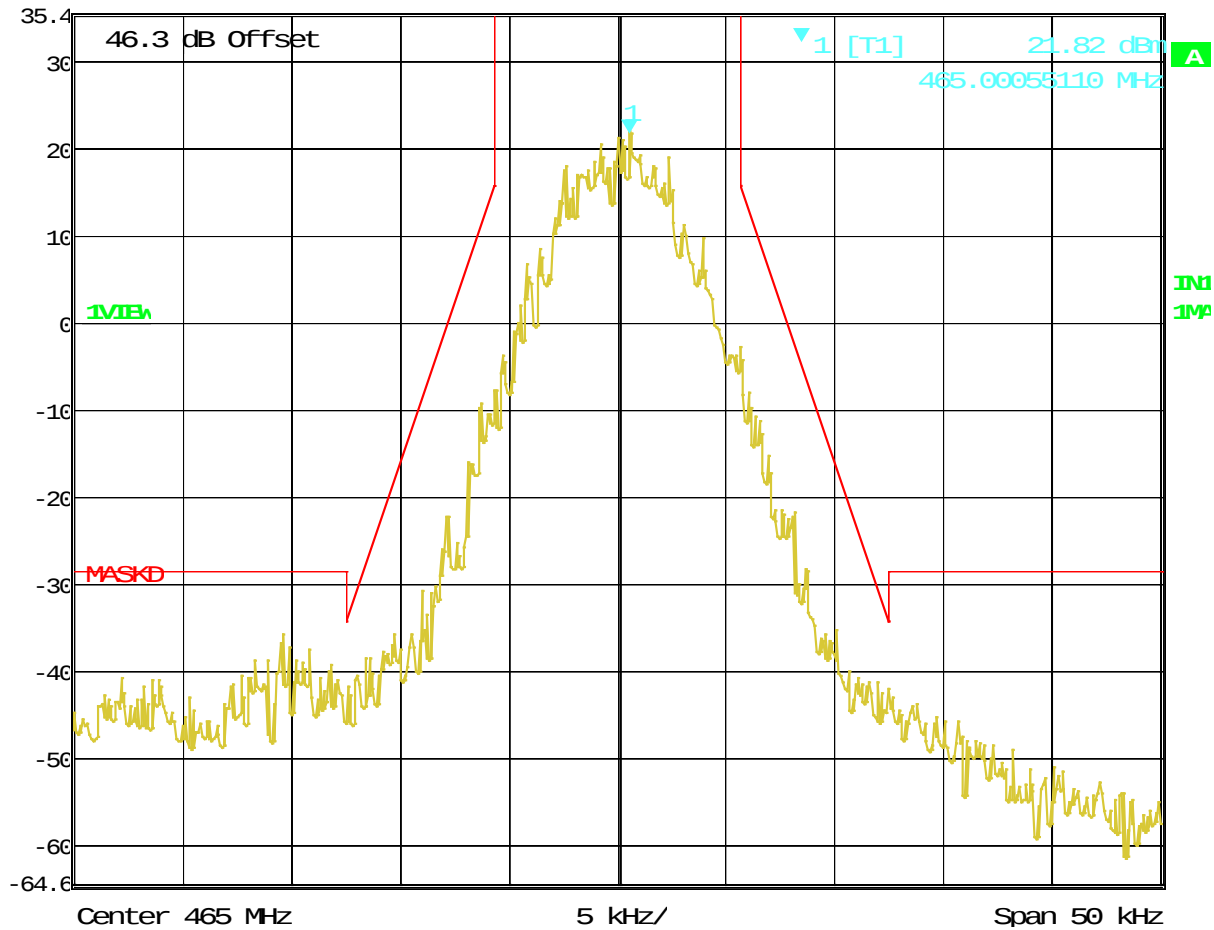
Date: 1.JAN.1997 08:31:33

EMISSION MASK

Test Data: DMR, 465 MHz, 90.210 & RSS-119, Mask D



Marker 1 [T1] RBW 100 Hz RF Att 10 dB
 Ref Lvl 21.82 dBm VBW 300 Hz
 35.4 dBm 465.00055110 MHz SWT 25 s Unit dBm



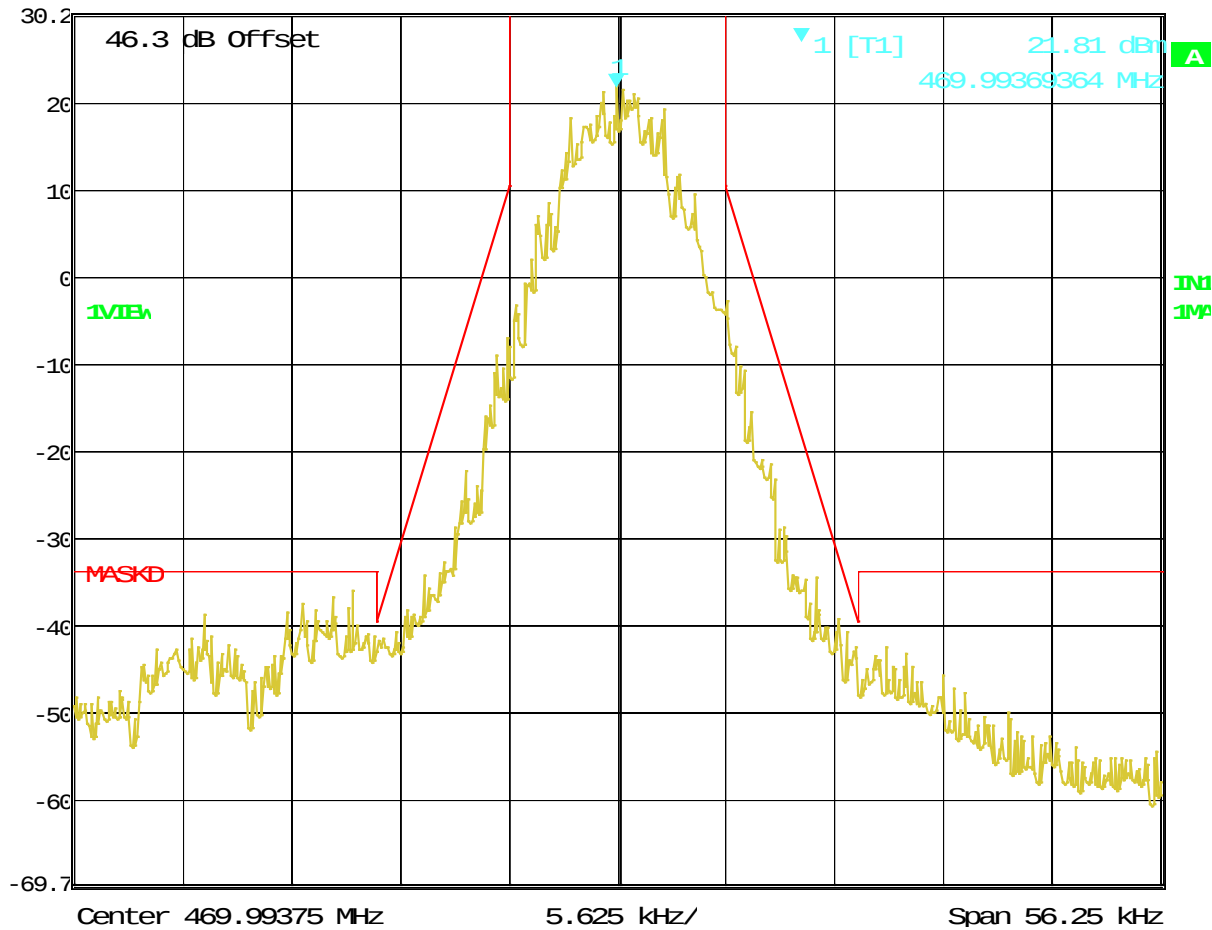
Date: 1.JAN.1997 08:45:29

EMISSION MASK

Test Data: DMR, 469.99375 MHz, 90.210 & RSS-119, Mask D



Marker 1 [T1] RBW 100 Hz RF Att 10 dB
 Ref Lvl 21.81 dBm VBW 300 Hz
 30.2 dBm 469.99369364 MHz SWT 29 s Unit dBm



Date: 1.JAN.1997 00:16:43

SPURIOUS EMISSIONS AT ANTENNA TERMINALS (CONDUCTED)

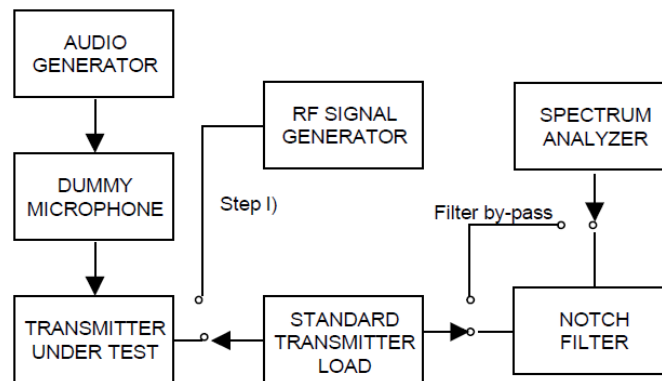
Rule Part: RSS-GEN 6.13, RSS-119 5.8.3

5.8.3 Emission Mask D for Transmitters Equipped With or Without an Audio Low-Pass Filter

The power of any emission shall be attenuated below the transmitter output power P (dBW) as specified in Table 7.

Table 7 — Emission Mask D		
Displacement Frequency, f_d (kHz)	Minimum Attenuation (dB)	Resolution Bandwidth (Hz)
$5.625 < f_d \leq 12.5$	$7.27(f_d - 2.88)$	Specified in Section 4.2.2
$f_d > 12.5$	Whichever is the lesser: 70 or $50 + 10 \log_{10}(P)$	Specified in Section 4.2.2

Test Procedure: ANSI C63.10, referencing TIA 603-E s 2.2.13



SPURIOUS EMISSIONS AT ANTENNA TERMINALS

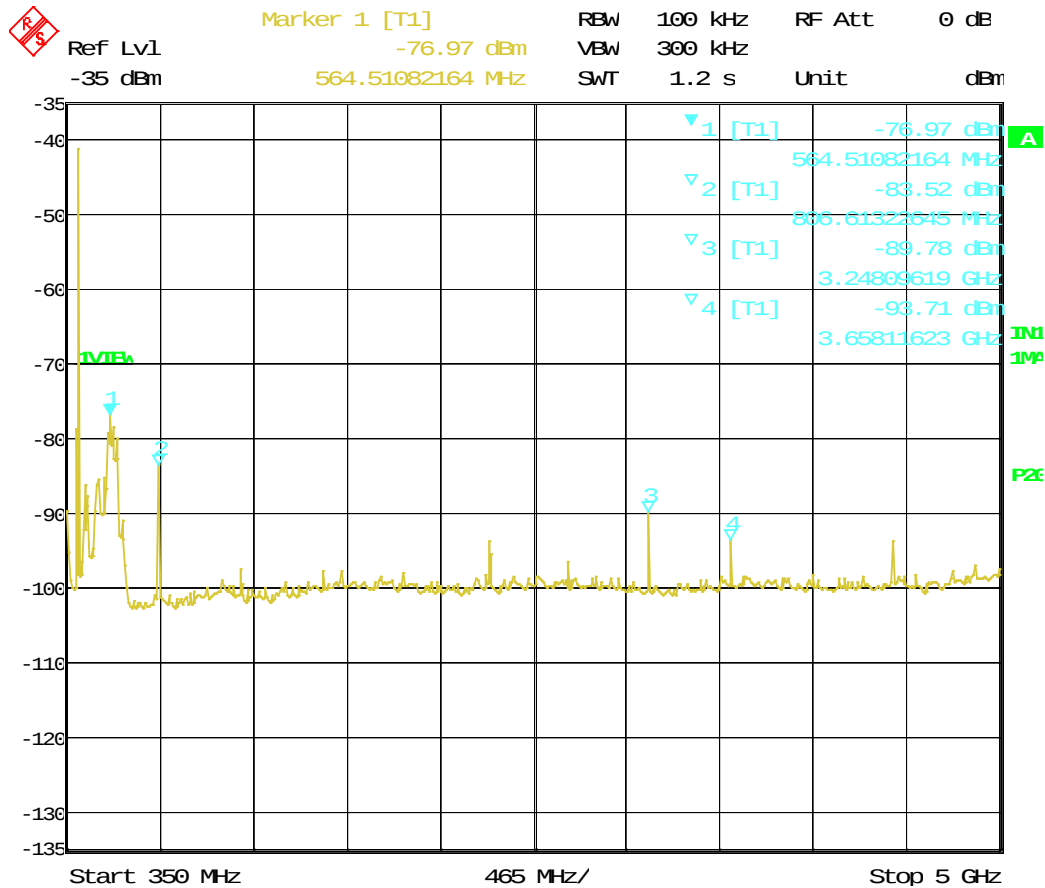
Limit Calculation:

Frequency (MHz)	Channel Type	Power Output (dBm)	$50 + 10 \cdot \log(W)$ (dBc)	(dBc) to (dBm)
465.0000	Digital	44.000	64.000	-20.000

Note: A notch filter was used to attenuate the fundamental frequency of the EUT. TIA 603-E s. 2.2.13 was referenced for this Test Procedure. Digital emissions (P25 & DMR) were determined and generated via software.

SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Test Data: 406.10063 MHz



Date: 1.JAN.1997 02:56:25

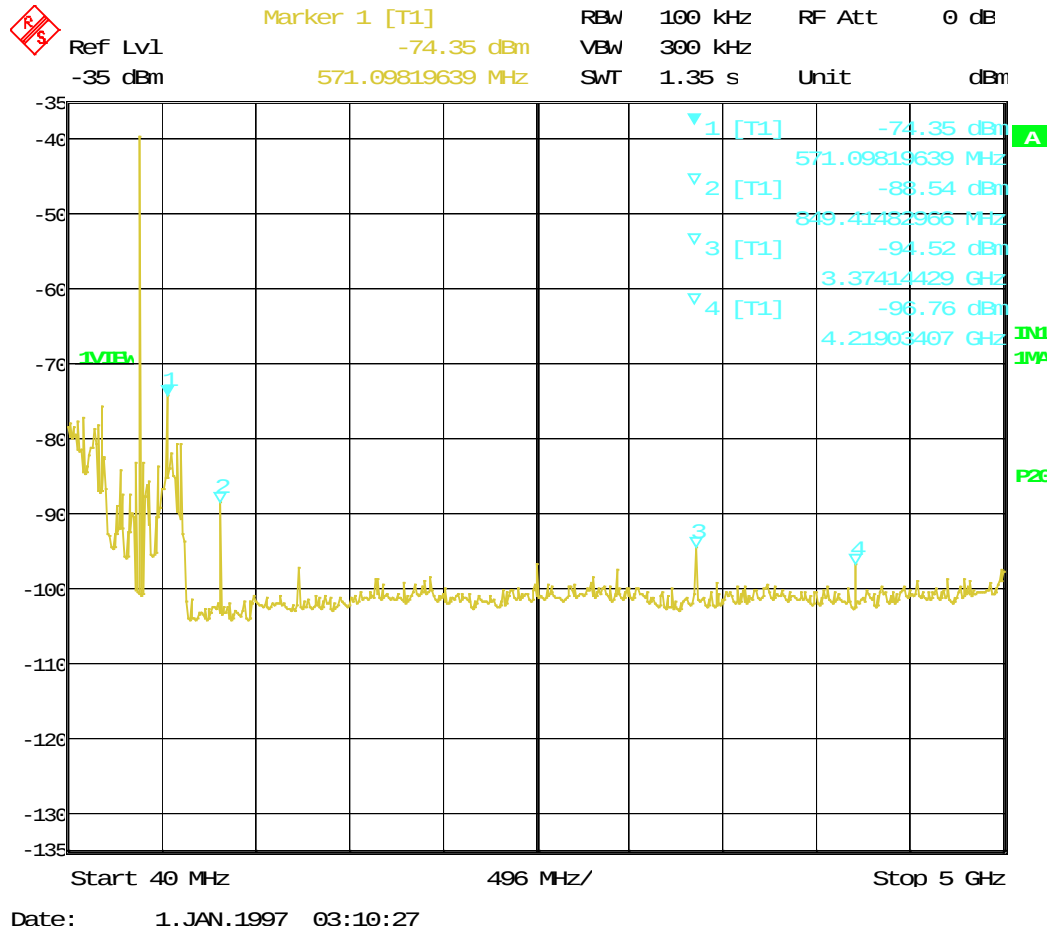
Spurious Emission Calculation:

Marker	Frequency (MHz)	Measured Level (dBm)	Substitution Level (dBm)	Limit (dBm)	Margin (dB)
1	564.50	-76.97	-41.92	-20.00	21.920
2	806.61	-83.52	-48.47	-20.00	28.470
3	3248.00	-89.78	-54.73	-20.00	34.730
4	3658.10	-93.71	-58.66	-20.00	38.660

Result: Meets Requirements

SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Test Data: 421.00625 MHz



Spurious Emission Calculation:

Marker	Frequency (MHz)	Measured Level (dBm)	Substitution Level (dBm)	Limit (dBm)	Margin (dB)
1	571.09	-74.35	-39.30	-20.00	19.300
2	849.41	-88.54	-53.49	-20.00	33.490
3	3374.10	-94.52	-59.47	-20.00	39.470
4	4219.00	-96.76	-61.71	-20.00	41.710

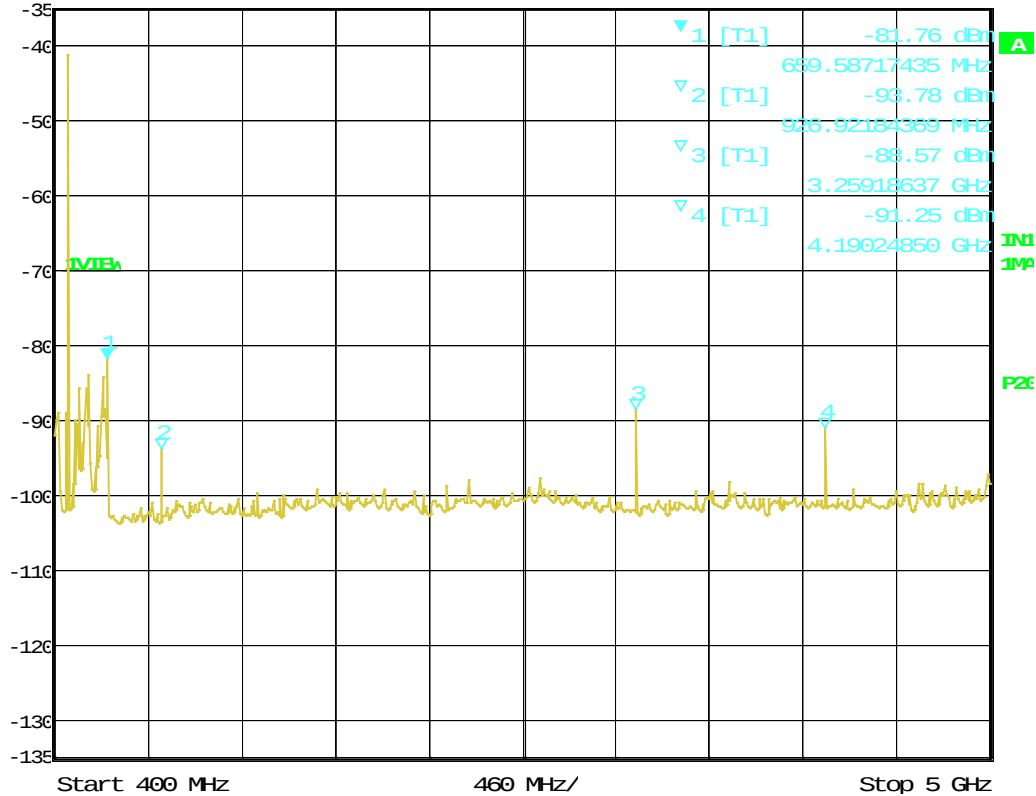
Result: Meets Requirements

Applicant: RADIO ACTIVITY S.R.L
 FCC ID: Y9M-KA450
 Report: 2060UT18TestReport_Rev1

SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Test Data: 465.00000 MHz


 Ref Lvl -35 dBm
 Marker 1 [T1] -81.76 dBm
 659.58717435 MHz
 RBW 100 kHz RF Att 0 dB
 VBW 300 kHz
 SWT 1.2 s Unit dBm



Date: 1.JAN.1997 03:13:08

Spurious Emission Calculation:

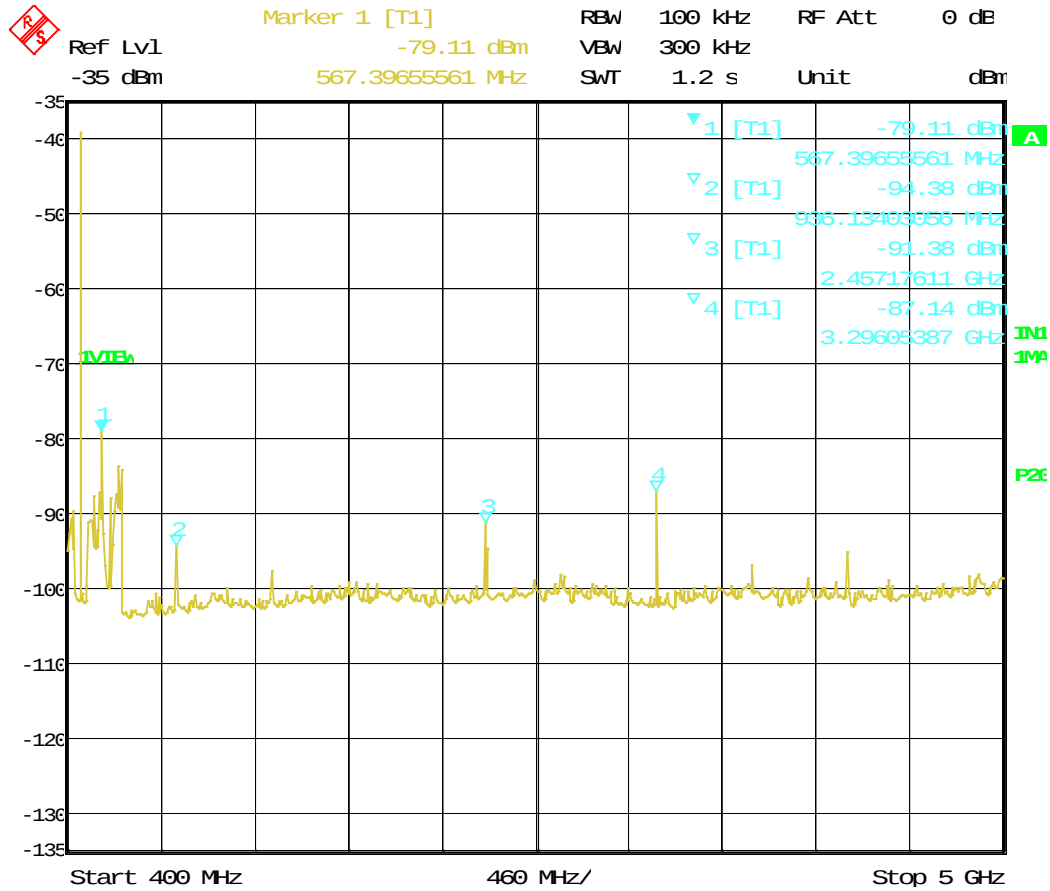
Marker	Frequency (MHz)	Measured Level (dBm)	Substitution Level (dBm)	Limit (dBm)	Margin (dB)
1	659.58	-81.76	-46.71	-20.00	26.710
2	926.92	-93.78	-58.73	-20.00	38.730
3	3259.18	-88.57	-53.52	-20.00	33.520
4	4190.20	-91.25	-56.20	-20.00	36.200

Result: Meets Requirements

Applicant: RADIO ACTIVITY S.R.L
 FCC ID: Y9M-KA450
 Report: 2060UT18TestReport_Rev1

SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Test Data: 469.99375 MHz



Date: 1. JAN. 1997 03:16:22

Spurious Emission Calculation:

Marker	Frequency (MHz)	Measured Level (dBm)	Substitution Level (dBm)	Limit (dBm)	Margin (dB)
1	567.39	-79.11	-44.06	-20.00	24.060
2	936.13	-94.38	-59.33	-20.00	39.330
3	2457.17	-91.38	-56.33	-20.00	36.330
4	3296.00	-87.14	-52.09	-20.00	32.090

Result: Meets Requirements

Applicant: RADIO ACTIVITY S.R.L.
 FCC ID: Y9M-KA450
 Report: 2060UT18TestReport_Rev1

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	± 0.93 dB	(1)
Conducted spurious emission of transmitter valid up to 40GHz	± 1.86 dB	
Occupied Bandwidth	± 2.65 %	
Radiated RF Power	± 1.4 dB	
Maximum frequency deviation: Within 300 Hz and 6kHz of audio freq.	± 1.88 %	
Within 6kHz and 25kHz of audio Freq.	± 2.04 %	

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
Coaxial Cable - BMBM-0072-00 Black	Times Wire	N/A	BMBM-0072-00	02/16/17	02/16/19
Coaxial Cable - BMBM-0061-01 RG400	Pasternack	PE3582LF-24	BMBM-0061-01	01/31/17	01/31/19
EMI Test Receiver R & S ESU 40 Chamber	Rohde & Schwarz	ESU 40	100320	09/07/18	09/07/20
Attenuator BNC 10dB DC-2G	MiniCircuits	HAT-10+	#54	07/14/17	07/14/19
Tunable Notch Filter 250-850 MHz	Eagle	TNF-200	250-850 MHz (#19)	11/19/17	11/19/19
Attenuator BNC 6dB 50Ohm DC-2G	Mini-Circuits	HAT-6+	#53	07/14/17	07/14/19
DC Power Supply	HP	6286A	1744A03842	N/A	N/A
Attenuator N 30dB 100W DC-6G	PASTERNAK	PE7214-30	#109	5/24/17	5/24/19

*EMI RECEIVER SOFTWARE VERSION

The receiver firmware used was version 4.43 Service Pack 3

END OF TEST REPORT