

47 CFR FCC Part 15 Subpart C

Section 15.231

Test Report

Product : Car Alarm Transmitter

Trade Name : N/A

Model Number : 22870433

FCC ID : ELVMTVA

Prepared for

Nutek Corporation

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Remark:

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The test result in this report is only subjected to the test sample.

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Statement of Compliance

Applicant: Nutek Corporation
Manufacturer: Nutek Corporation
Product: Car Alarm Transmitter
Model No.: 22870433
Tested Power Voltage: DC 3V
Date of Final Test: Oct. 01, 2021

Configuration of Measurements and Standards Used :

FCC Rules and Regulations Part 15 Subpart C

I HEREBY CERTIFY THAT: The data shown in this report were made in accordance with the procedures given in ANSI C63.10, and the energy emitted by the device was founded to be within the limits applicable. I assume full responsibility for accuracy and completeness of these data.

- Note:**
1. The result of the testing report relate only to the item tested.
 2. This report shall not be partial reproduced without written approval by Interocean EMC Technology Corporation.
 3. Judgment of conformity is based on test result, regardless of measurement uncertainty.

Report Issued: 2021/10/20

Prepared by: Ivan Wang
Ivan Wang

Approved: Jerry Chang
Jerry Chang

1 General Information

1.1 Description of Equipment Under Test

Product	: Car Alarm Transmitter
Model Number	: 22870433
Applicant	: Nutek Corporation No.167, Lane 235, Bauchiau Rd., Xindian District, New Taipei City 23145, Taiwan
Manufacturer	: Nutek Corporation No.167, Lane 235, Bauchiau Rd., Xindian District, New Taipei City 23145, Taiwan
Power Supply	: DC 3V
Operating Frequency	: 433.92 MHz
Output Power	: 74.46 dBμV/m
Type of Modulation	: ASK
Antenna Description	: PCB Antenna. maximum Peak gain: 0dBi.
Measurement Software	: e3; Ver: 8.120803a7-2
Receipt Date of EUT	: Sep. 23, 2021
Date of Test	: Sep. 27 ~ Oct. 01, 2021
Additional Description	: 1) The test model is “ 22870433 ” and included in this report. 2) For more detailed specification about EUT, please refer to the user's manual.

1.2 Test Equipment

Instrument	Manufacturer	Model	Serial No.	Next Cal. Date
EMI Test Receiver	Rohde & Schwarz	ESI7	830154/002	2022/05/03
Spectrum Analyzer	R&S	FSP40	100478	2022/08/01
Loop Antenna	Electro-Metrics	EM-6879	261	2022/09/01
Bilog Antenna with 5 dB Pad	ETC & JYEBAO	MCTD 2786B & FAT-NM5NF5T3G2W5	BLB17S04020 & JB-5-020	2022/05/13
Horn Antenna	Schwarzbeck	BBHA9120	9120D-1051	2022/08/31
Pre-Amplifier	EMCI	EMC001150	980130	2022/08/24
Pre-Amplifier	EMCI	EMC051845	980110	2022/07/12
RF Cable	HARBOUR	27478LL142	CBL65	2022/01/22
RF Cable	Marvelous Microwave	MCBL-LL266.50	CBL70	2022/01/22
Measurement Software	AUDIX-e3			

Note: The above equipments are within the valid calibration period.

1.3 Measurement Uncertainty

Items	Measurement Items	Expanded Uncertainty					Estimation
		Frequency 9 kHz to 30 MHz	Frequency 30 MHz to 1000 MHz	Frequency 1 GHz to 18 GHz	Frequency 18 GHz to 26.5 GHz	Frequency 26.5 GHz to 40 GHz	
1.	Power-line Conducted Emissions (dBμV)	±2.120	-----	-----	-----	-----	LAB34
2.	Radiation Power (dBμV/m)	±3.336	±3.170	±2.284	±2.140	±2.140	LAB34
3.	Output Power (dB)	±1.109	±1.109	±1.970	±1.970	±1.970	ETSI TR 100 028
4.	E.I.R.P (dB)	±4.319	±4.319	±4.319	±4.319	±4.319	
5.	Spurious emissions (dB)	±4.090	±4.090	±4.111	±4.111	±4.111	
6.	Conducted RF Band Edge (dB)	±4.090	±4.090	±4.111	±4.111	±4.111	
7.	Conducted Spurious Emissions (dB)	±4.090	±4.090	±4.111	±4.111	±4.111	
8.	Radiation Spurious Emissions (dB)	±2.125	±3.419	±3.419	±3.419	±3.419	
9.	Operating Frequency (Hz)	±1.36*10 ⁻⁸	±1.36*10 ⁻⁸	±7.55*10 ⁻⁸	±6.60*10 ⁻⁸	±6.60*10 ⁻⁸	
10.	Frequency Stability (Hz)	±33.965	±48.779	±631.398	±928.835	±928.835	
11.	Frequency stability of input voltage (Hz)	±33.965	±48.779	±631.398	±928.835	±928.835	
12.	Frequency Deviation (%)	±1.296	±1.296	±1.296	±1.296	±1.296	
13.	Channel Bandwidth (Hz)	±33.951	±35.786	±206.505	±301.800	±301.800	
14.	6dB Channel Bandwidth (Hz)	±33.951	-----	±206.505	-----	-----	
15.	20dB Channel Bandwidth (Hz)	-----	±35.786	±206.505	-----	-----	
16.	Output Peak Power (dB)	±0.654	±0.654	±0.654	±0.654	±0.654	
17.	Power Density (dB)	±1.109	±1.109	±0.105	±1.970	±1.970	
18.	Number of Hopping Channel	-----	-----	-----	-----	-----	
19.	Hopping Channel Separation (Hz)	-----	-----	±206.505	-----	-----	
20.	Dwell Time (ms)	±2.225	±2.225	±2.225	±2.225	±2.225	
21.	ACLR (Adjacent Channel Leakage Ratio) (dB)	±1.442	±1.442	±1.442	±1.443	±1.443	
22.	Frequency Response (%)	±5.246	±5.246	±5.246	±5.246	±5.246	
23.	Max Modulation (%)	±1.296	±1.296	±1.296	±1.296	±1.296	
24.	Harmonic attenuation (dB)	±4.090	±4.090	±4.111	±4.111	±4.111	

1.4 Summary of Measurement

Test Parameter	Reference Document 47 CFR Part15	Results
Occupied Bandwidth	FCC Part 15: 15.231(c)	Pass
Transmission time and silent time	§15.231(a)(1)	Pass
Radiated Emission	FCC Part 15: 15.209 FCC Part 15: 15.231(b)	Pass
Power Line Conducted Emissions	FCC Part 15: 15.207	N/A
Antenna requirement	FCC Part 15: 15.203	Pass

Note: N/A is an abbreviation for Not Applicable.

2 Test Specifications

2.1 Test Standard

The EUT was performed according to FCC Part 15 Subpart C Section 15.231 procedure and setup followed by ANSI C63.10-2013 requirements.

2.2 Operation Mode

By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that “Y axis” position was the worst, then the final test was executed the worst condition and test data were recorded in this report.

2.3 Test Step of EUT

- 2.3.1 Set the fixture to EUT for power supplying.
- 2.3.2 Turn on the power of all equipments.
- 2.3.3 Let the EUT continuous transmission.
- 2.3.4 Execute the test.

3 Duty Cycle

3.1 Limits

No dedicated limit specified in the Rules.

3.2 Test Procedure

The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below. The Duty Cycle Was Determined By the Following Equation: To Calculate The Actual Field Intensity, The Duty Cycle Correction Factor In Decibel is needed for later use and can be obtained from following conversion Duty Cycle (%)=Total on interval in A complete pulse train/Length of A complete pulse train*% Duty Cycle Correction Factor (dB)= $20 \cdot \log_{10}(\text{Duty Cycle (\%)})$

3.3 Test Result

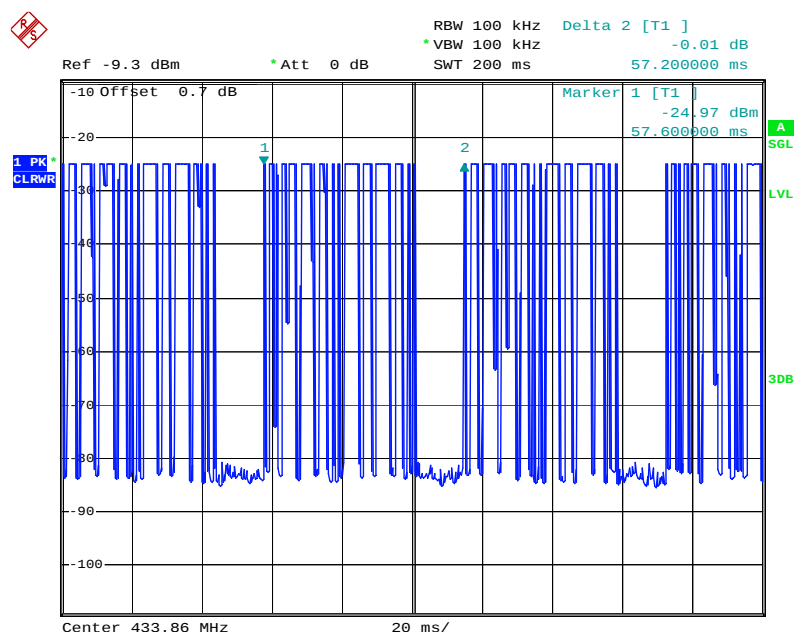
$T_p = 57.20(\text{ms})$

$T_{on} = 1.32 \cdot 12 + 0.36 \cdot 13 = 20.52(\text{ms})$

Factor = $20 \cdot \log(T_{on} / T_p) = 20 \cdot \log(20.52/57.20) = -8.90\text{dB}$

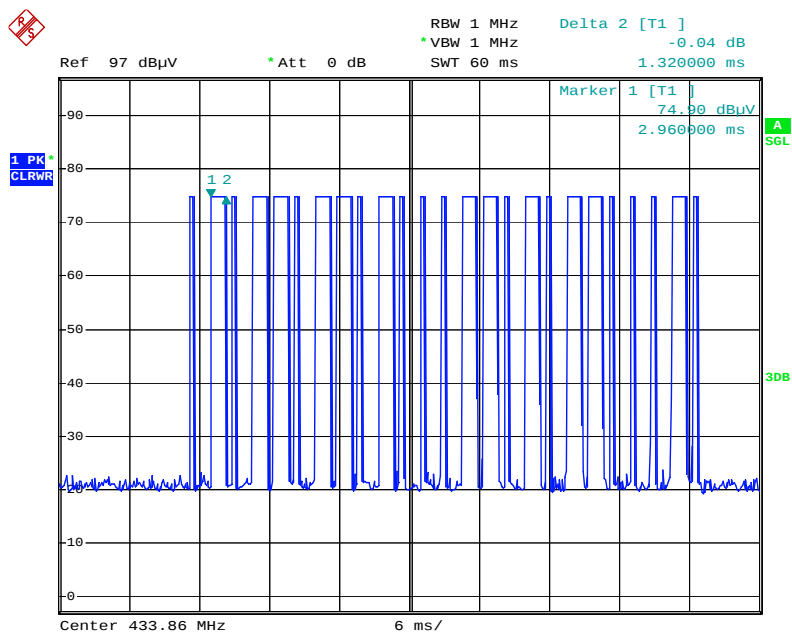
Plot:

T_p



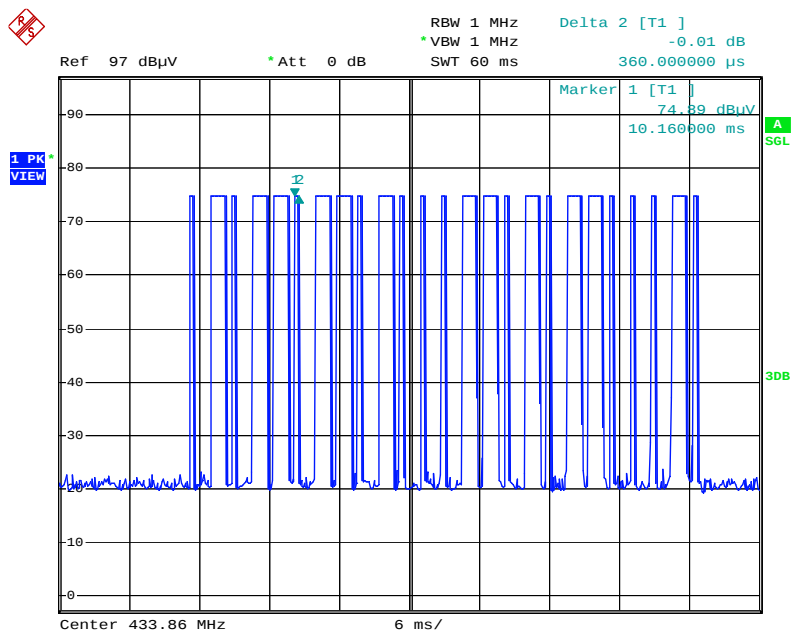
Date: 1.OCT.2021 18:32:53

Ton 1



Date: 1.OCT.2021 18:52:01

Ton 2



Date: 1.OCT.2021 18:52:41

4 Transmitter Deactivation Time

4.1 Limits

FCC 15.231 (a)(1)

A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

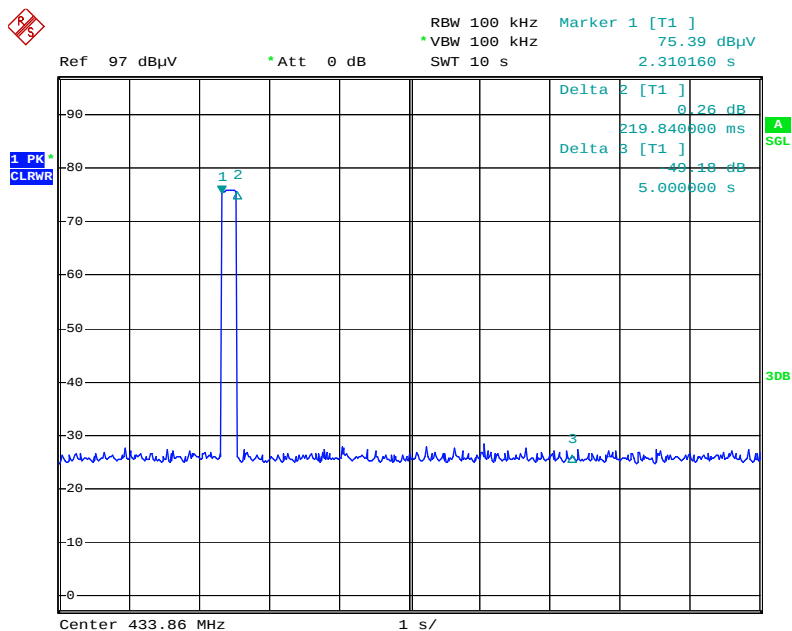
4.2 Test Procedure

Release the switch after pressing the switch.

4.3 Test Result

Frequency (MHz)	Activation time (Sec)	Limit (Sec)	Test conclusion
433.92	0.219	5	PASS

Plot:



Date: 1.OCT.2021 18:55:26

5 Radiated Emission Test

5.1 Limits

According to FCC 15.231(b) requirement:

In addition to the provisions of §15.205, the field strength of emissions from intentional radiator operated under this section shall not exceed the following:

Fundamental and Harmonics Emission Limits

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emissions (microvolts/meter)
40.66-40.70	2,250	225
70-130	1,250	125
130-174	¹ 1,250 to 3,750	¹ 125 to 375
174-260	3,750	375
260-470	¹ 3,750 to 12,500	¹ 375 to 1,250
Above 470	12,500	1,250

General Radiated Emission Limit

Spurious Emission tested through until 10th harmonic. Radiated emissions, which fall in the restricted bands, as defined in §15.205 (a), comply with the radiated emission limits specified in §15.209 (a).

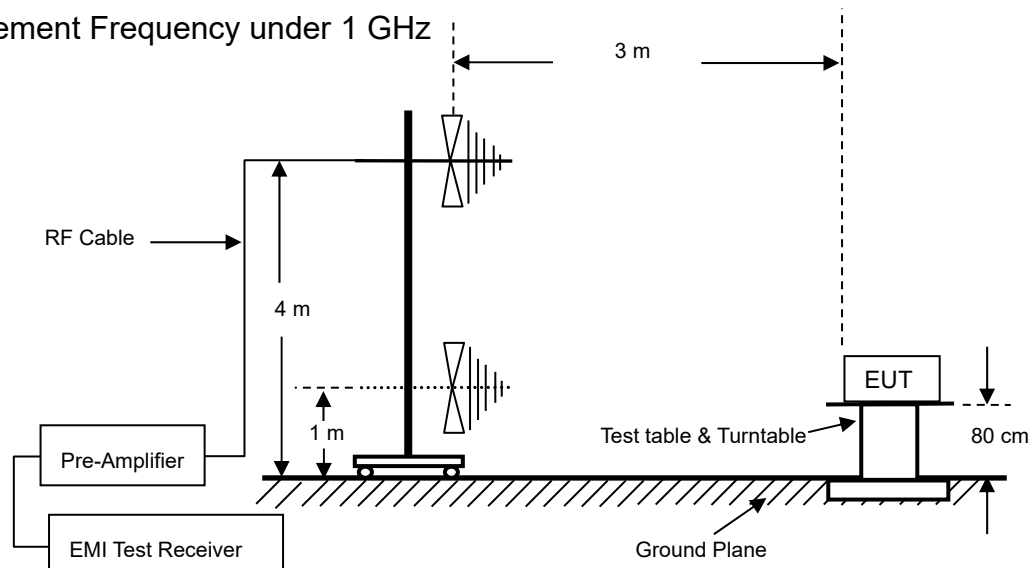
Frequency (MHz)	15.209 Limits	
	(μV/m@3m)	(dBμV/m@3m)
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

Remark :

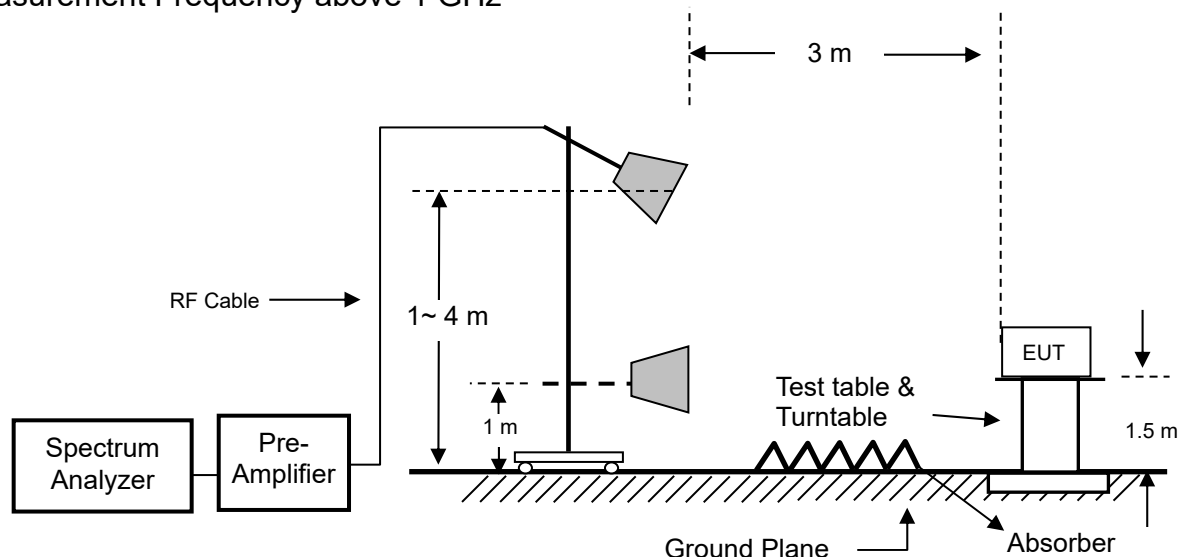
1. The table above tighter limit applies at the band edges.
2. The measurement distance in meters, which that between form closest point of EUT to instrument antenna.

5.2 Configuration of Measurement

Measurement Frequency under 1 GHz



Measurement Frequency above 1 GHz



5.3 Test Procedure

Radiated emission measurements frequency range were performed from 9 kHz to 5 GHz. Spectrum Analyzer Resolution Bandwidth set to 9 kHz for frequencies below 30 MHz, set 100 kHz or greater for frequencies from 30 MHz to 1 GHz, and set 1MHz Resolution Bandwidth for frequencies above 1 GHz.

The EUT is place on non-conductive turntable for the test. If peripheral devices apply to the EUT, the peripheral devices will be connected to EUT and whole system. During the emission test, the signal is maximized through rotation and all cables were present worst-case emissions. The height of antenna and polarization is constantly changed for exploring maximum signal reading. The height of antenna can be up form reference ground to 4 meter and down to 1 meter.

5.4 Test Result

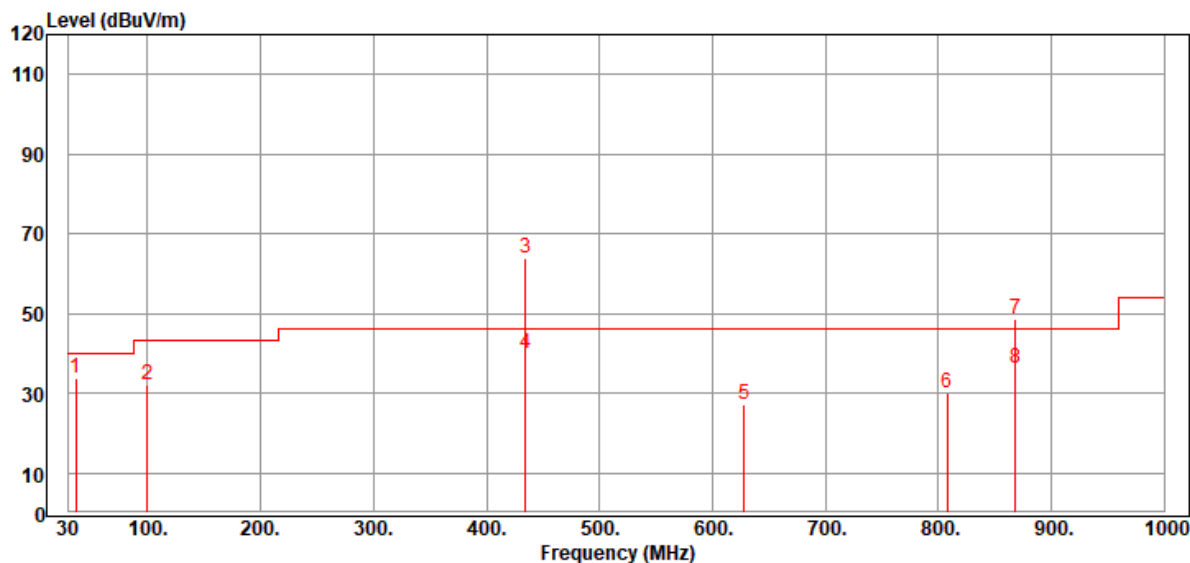
The frequency range from 9 kHz to 30 MHz was pre-scanned and the results were 20 dB lower than the limit line which according to FCC 15.31(o) needs not be recorded.

The final test emission data is shown as following tables.

Radiated Emission Below 1 GHz

CLIENT: Nutek Corporation
EUT: Car Alarm Transmitter
MODEL: 22870433
RATING: DC 3V
COMMENT: 433.92-X-H-30-1G
Data:341

OPERATOR : Scott
TEST SITE : Chamber 3
TEST DISTANCE : 3 m
POLARIZATION : HORIZONTAL
TEMP/HUM : 24.5°C/50%
2021-09-27

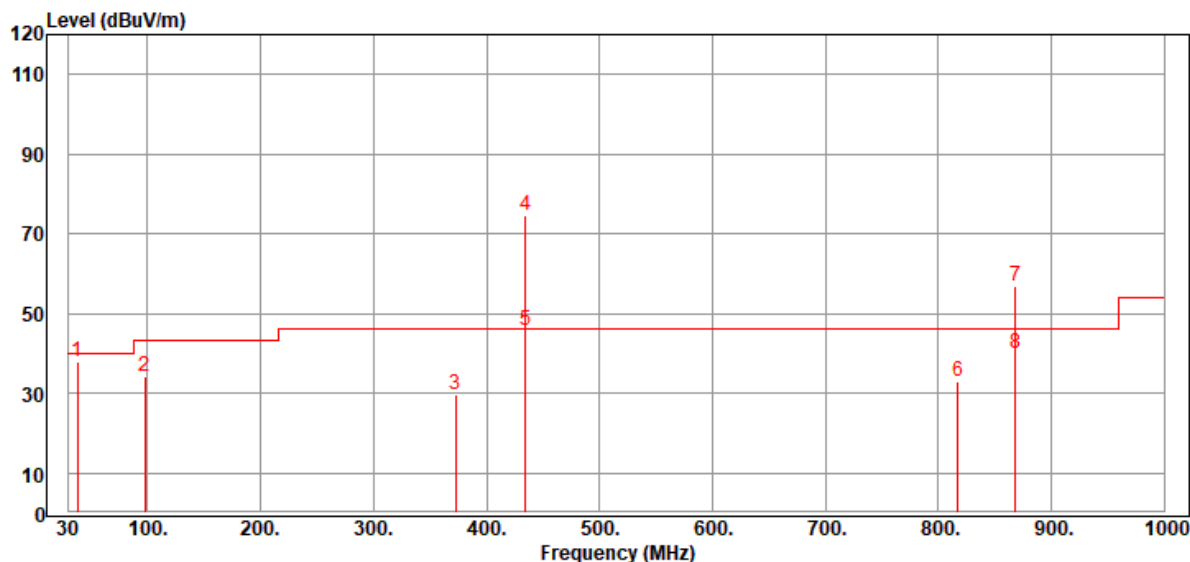


Item Mark	Freq. MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Remark
1	36.790	66.05	-32.33	33.72	40.00	-6.28	Peak
2	99.840	65.03	-32.78	32.25	43.50	-11.25	Peak
3	434.490	90.71	-26.96	63.75	100.83	-37.08	Peak
4	434.490	67.00	-26.96	40.04	80.83	-40.79	Average
5	628.490	52.27	-25.00	27.27	46.02	-18.75	Peak
6	807.940	52.10	-22.08	30.02	46.02	-16.00	Peak
7	868.080	70.14	-21.34	48.80	80.83	-32.03	Peak
8	868.080	57.58	-21.34	36.24	60.83	-24.59	Average

Remark : Corrected Level = Reading + Correction Factor – Preamp
Correction Factor = Antenna Factor + Cable Loss
Margin = Corrected Level – Limits
“ * ” Mark indicated Background Noise Level
Avg Level=Peak Level – Factor

CLIENT: Nutek Corporation
EUT: Car Alarm Transmitter
MODEL: 22870433
RATING: DC 3V
COMMENT: 433.92-X-V-30-1G
Data:342

OPERATOR : Scott
TEST SITE : Chamber 3
TEST DISTANCE : 3 m
POLARIZATION : VERTICAL
TEMP/HUM : 24.5°C/50%
2021-09-27



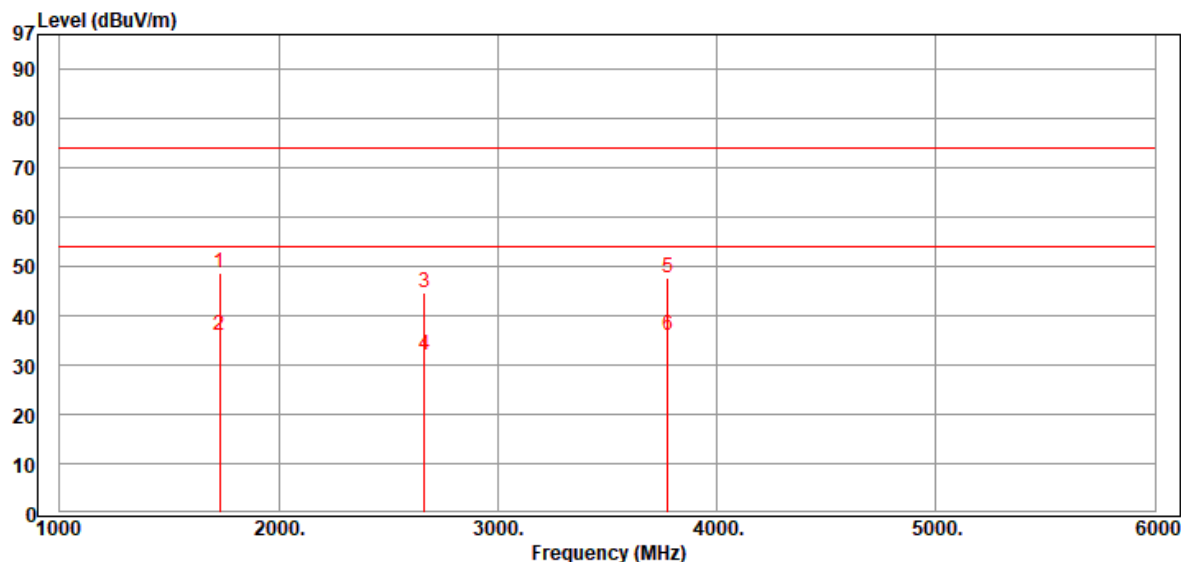
Item Mark	Freq. MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Remark
1	37.760	70.60	-32.53	38.07	40.00	-1.93	Peak
2	97.900	67.91	-33.50	34.41	43.50	-9.09	Peak
3	372.410	58.24	-28.47	29.77	46.02	-16.25	Peak
4	434.490	101.42	-26.96	74.46	100.83	-26.37	Peak
5	434.490	72.93	-26.96	45.97	80.83	-34.86	Average
6	817.640	55.12	-22.07	33.05	46.02	-12.97	Peak
7	868.080	78.08	-21.34	56.74	80.83	-24.09	Peak
8	868.080	61.36	-21.34	40.02	60.83	-20.81	Average

Remark : Corrected Level = Reading + Correction Factor – Preamp
Correction Factor = Antenna Factor + Cable Loss
Margin = Corrected Level – Limits
“ * ” Mark indicated Background Noise Level
Avg Level=Peak Level – Factor

Radiated Emission Above 1 GHz

CLIENT: Nutek Corporation
EUT: Car Alarm Transmitter
MODEL: 22870433
RATING: DC 3V
COMMENT: 433.92-X-H-1G-6G
Data:344

OPERATOR : Scott
TEST SITE : Chamber 3
TEST DISTANCE : 3 m
POLARIZATION : HORIZONTAL
TEMP/HUM : 25.9°C/51%
2021-09-27

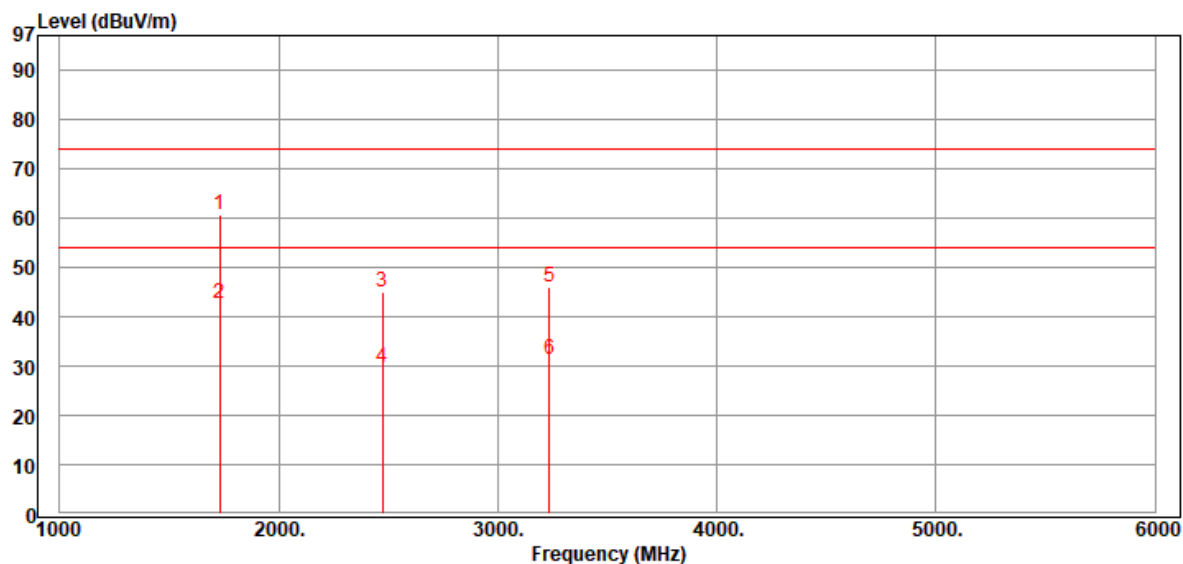


Item Mark	Freq. MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Remark
1	1730.000	68.47	-19.67	48.80	74.00	-25.20	Peak
2	1730.000	55.76	-19.67	36.09	54.00	-17.91	Average
3	2665.000	59.99	-15.30	44.69	74.00	-29.31	Peak
4	2665.000	47.39	-15.30	32.09	54.00	-21.91	Average
5	3775.000	59.70	-12.06	47.64	74.00	-26.36	Peak
6	3775.000	47.91	-12.06	35.85	54.00	-18.15	Average

Remark : Corrected Level = Reading + Correction Factor – Preamp
Correction Factor = Antenna Factor + Cable Loss
Margin = Corrected Level – Limits
“ * ” Mark indicated Background Noise Level
Avg Level=Peak Level – Factor

CLIENT: Nutek Corporation
EUT: Car Alarm Transmitter
MODEL: 22870433
RATING: DC 3V
COMMENT: 433.92-X-V-1G-6G
Data: 343

OPERATOR : Scott
TEST SITE : Chamber 3
TEST DISTANCE : 3 m
POLARIZATION : VERTICAL
TEMP/HUM : 25.9°C/51%
2021-09-27



Item	Freq.	Reading	Factor	Level	Limit	Margin	Remark
Mark	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	
1	1730.000	80.22	-19.67	60.55	74.00	-13.45	Peak
2	1730.000	62.38	-19.67	42.71	54.00	-11.29	Average
3	2475.000	60.88	-15.79	45.09	74.00	-28.91	Peak
4	2475.000	45.30	-15.79	29.51	54.00	-24.49	Average
5	3235.000	59.58	-13.55	46.03	74.00	-27.97	Peak
6	3235.000	45.00	-13.55	31.45	54.00	-22.55	Average

Remark : Corrected Level = Reading + Correction Factor – Preamp
Correction Factor = Antenna Factor + Cable Loss
Margin = Corrected Level – Limits
“ * ” Mark indicated Background Noise Level
Avg Level=Peak Level – Factor

6 Emission Bandwidth

6.1 Limits

According to FCC 15.231(c) requirement:

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating between 70 MHz to 900 MHz. Those devices operating above 900 MHz, the emission spurious shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

B.W (20dBc) Limit = $0.25\% \times f(\text{MHz}) = 0.25\% \times 433.92 \text{ MHz} = 1084.8 \text{ kHz}$

6.2 Test Procedure

With the EUT's antenna attached, the EUT's 20dB Bandwidth power was received by the test antenna which was connected to the spectrum analyzer with the START and STOP frequencies set to the EUT's operation band.

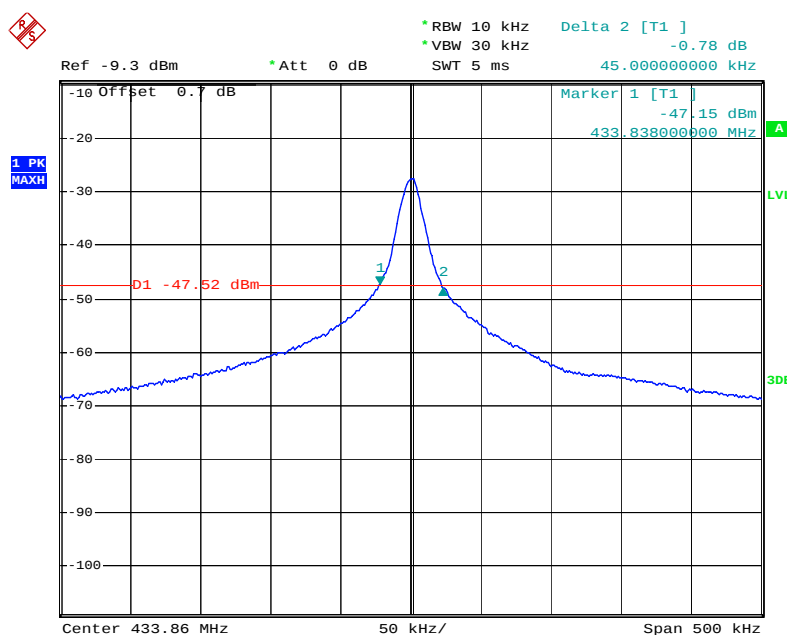
6.3 Test Result

PASS.

The final test data is shown as following.

Channel Frequency (MHz)	Measured 20dB Bandwidth (kHz)	Limit (kHz)	Result
433.92	45	1084.8	PASS

Plot:



Date: 1.OCT.2021 18:29:53