Standards Council of Canada
Accredited Laboratory
Scope of Accreditation 75

Conseil canadien des normes
Laboratoire accrédité
Portée d'accréditation 75

TM

Test Report:	6W71018
Applicant:	Blue Line Innovations Inc. 1st Floor, ICON Building 187 Kenmount Rd. St. John's, Newfoundland and Labrador A1B 3P9, Canada
Apparatus:	PCMTX02
FCC ID:	SUE-PCMTX02
In Accordance With:	FCC Part 15 Subpart C, 15.231 Periodic operation in the band 40.66-40.70MHz and above 70 MHz.
Tested By:	Nemko Canada Inc. 303 River Road Ottawa, Ontario K1V 1H2
Authorized By:	Jin Xu, Wireless Specialist
Date:	September 20, 2006
Total Number of Pages:	20

Report Summary

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15, Subpart C. Radiated tests were conducted in accordance with ANSI C63.4-2003. Radiated emissions are made on an open area test site. A description of the test facility is on file with the FCC.

The assessment summary is as follows:

Apparatus Assessed: PCMTX02

Specification: FCC Part 15 Subpart C, 15.231

Compliance Status: Complies

Exclusions: None

Non-compliances: None

Report Release History: Original Release

Author: Roman Kuleba, EMC/Wireless Specialist

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

This test report has been completed in accordance with the requirements of ISO/IEC 17025.

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Section 1 : Equipment Under Test

1.1 Product Identification

The Equipment Under Test was identified as follows: PCMTX02 Transmitter

1.2 Samples Submitted for Assessment

The following samples of the apparatus have been submitted for type assessment:

Sample No.	Description	Serial No.
1	PCMTX02 TRANSMITTER	0705A06

The first samples were received on: July 31, 2006

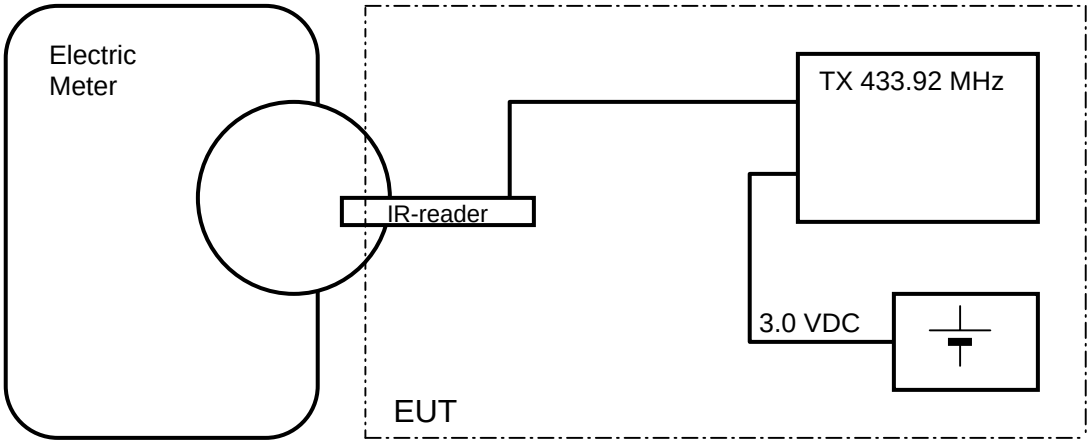
1.3 Theory of Operation

The PCMTX02 is a Power Cost Monitor that uses a radio transmitter to transfer data from electric power consumption meter. Data obtained by an IR-reader/sensor is transmitted in form of short bursts every 28.5 to 31.5 seconds on 433.92 MHz (single frequency). The carrier is On/Off pulse modulated (logic ‘1’: 0.5ms TX-on followed by 2ms TX-off, logic ‘0’: 0.5ms TX-on followed by 4ms TX-off).

1.4 Technical Specifications of the EUT

Manufacturer:	Blue Line Innovations Inc.
Operating Frequency:	433.92 MHz
Emission Designator:	L1D
Modulation:	Pulse-width Modulated
Antenna Data:	Integrated Loop on PCB
Antenna Connector:	None
Power Source:	3 VDC (Two AA 1.5 VDC Batteries)

1.5 Block Diagram of the EUT



Section 2 : Test Conditions

2.1 Specifications

The apparatus was assessed against the following specifications:

FCC Part 15 Subpart C, 15.231

Periodic operation in the band 40.66-40.70 MHz and above 70 MHz.

2.2 Deviations From Laboratory Test Procedures

No deviations were made from laboratory test procedures.

2.3 Test Environment

All tests were performed under the following environmental conditions:

Temperature range	:	15 – 30 ^{o}C
Humidity range	:	20 - 75 %
Pressure range	:	86 - 106 kPa
Power supply range	:	+/- 5% of rated voltages

2.4 Test Equipment

Equipment	Manufacturer	Model No.	Asset/Serial No.	Next Cal.
Spectrum Analyzer	Rohde & Schwarz	FSU	FA001877	May 10/07
Spectrum Analyzer	Hewlett-Packard	8566B	FA001309	May 16/07
Spectrum Analyzer Display	Hewlett-Packard	85662A	FA001309	May 16/07
Biconical (1) Antenna	EMCO	3109	FA000805	May 03/07
Log Periodic Antenna #1	EMCO	LPA-25	FA000477	Aug. 29/06
Horn Antenna #2	EMCO	3115	FA000825	Dec. 16/06
1.0 – 2.0 GHz Amplifier	JCA	12-400	FA001498	Aug. 2/07
2.0 – 4.0 GHz Amplifier	JCA	24-600	FA001496	Aug. 2/07
4.0 – 8.0 GHz Amplifier	JCA	48-600	FA001497	Aug. 2/07

* COU (Calibrate on Use)

Section 3 : Observations

3.1 Modifications Performed During Assessment

No modifications were performed during assessment.

3.2 Record Of Technical Judgements

No technical judgements were made during the assessment.

3.3 EUT Parameters Affecting Compliance

The user of the apparatus could not alter parameters that would affect compliance.

3.4 Test Deleted

No Tests were deleted from this assessment.

3.5 Additional Observations

There were no additional observations made during this assessment.

Section 4 : Results Summary

This section contains the following:

FCC Part 15 Subpart C : Test Results

The column headed 'Required' indicates whether the associated clauses were invoked for the apparatus under test. The following abbreviations are used:

N	No : not applicable / not relevant.
Y	Yes : Mandatory i.e. the apparatus shall conform to these tests.
N/T	Not Tested, mandatory but not assessed. (See section 3.4 Test deleted)

The results contained in this section are representative of the operation of the apparatus as originally submitted.

4.1 FCC Part 15 Subpart C : Test Results

Part 15	Test Description	Required	Result
15.31(e)	Variation of Power source	N	N/A
15.207(a)	Powerline Conducted Emissions	N	N/A
15.209(a)	Radiated Emissions within Restricted Bands	Y	PASS
15.231(a)(1)	Manually operated transmitter	N	N/A
15.231(a)(2)	Automatically activated transmitter	N	N/A
15.231(a)(3)	Periodic transmissions at regular predetermined intervals	Y	PASS
15.231(a)(4)	Radiators used in cases of emergency	N	N/A
15.231(a)(5)	Set-up information for security systems	N	N/A
15.231(b)	Radiated Emissions	Y	PASS
15.231(c)	20dB Bandwidth	Y	PASS
15.231(d)	Devices operating within the frequency band 40.66-40.70 MHz	N	N/A
15.231(e)	Radiated emissions for Periodic radiators	Y	PASS

Notes:

Appendix A : Test Results

Clause 15.209(a) Radiated Emissions within Restricted Bands

Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009-0.490	2400/F (kHz)	300
0.490-1.705	24000/F (kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Test Conditions:

Sample Number:	1	**Temperature:**	23°C
Date:	August 6, 2006	**Humidity:**	45%
Modification State:	0	**Tester:**	Roman Kuleba
		Laboratory:	Ottawa

Test Results:

See Attached Table for Results.

Additional Observations:

These results apply to emissions found in the Restricted Bands defined in FCC Part 15 Subpart C, 15.205.

The Spectrum was searched from 30MHz to the 10^{th} Harmonic.

All measurements were performed using a Peak Detector with 100 kHz RBW on frequencies below 1GHz and 1MHz RBW on frequencies above 1GHz at a distance of 3 meters.

The EUT was measured on three orthogonal axes.

For all measurements the EUT was powered with fully charged battery.

Radiated Emissions within Restricted Bands, continued

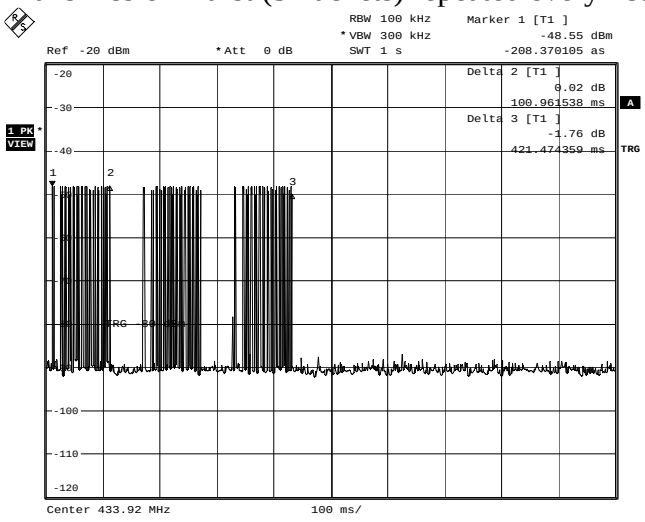
	Frequency (MHz)	Antenna	Polarity	RCVD Signal (dBµV)	Ant. Factor (dB)	Duty Cycle Corr.	Cable Loss (dB)	Emission Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
1	1301.7600	Horn1	V	40.6	25.1	N/A	3.4	69.1	74.0	4.9
2	3905.2800	Horn1	V	22.0	32.7	N/A	7.1	61.8	74.0	12.2
3	4339.2000	Horn1	V	17.0	32.5	N/A	7.9	57.4	74.0	16.6
4	1301.7600	Horn1	H	24.8	25.1	N/A	3.4	53.3	74.0	20.7
5	3905.2800	Horn1	H	21.5	32.8	N/A	7.1	61.4	74.0	12.6
6	4339.2000	Horn1	H	16.5	32.5	N/A	7.9	56.9	74.0	17.1
1	1301.7600	Horn1	V	40.6	25.1	-17.4	3.4	51.7	54.0	2.3
2	3905.2800	Horn1	V	22.0	32.7	-17.4	7.1	44.4	54.0	9.6
3	4339.2000	Horn1	V	17.0	32.5	-17.4	7.9	39.9	54.0	14.1
4	1301.7600	Horn1	H	24.8	25.1	-17.4	3.4	35.9	54.0	18.1
5	3905.2800	Horn1	H	21.5	32.8	-17.4	7.1	44.0	54.0	10.0
6	4339.2000	Horn1	H	16.5	32.5	-17.4	7.9	39.5	54.0	14.5

Note 1: Antenna Legend: BC = Biconical, BL = Bilog, LP = Log-Periodic, Horn = Horn, ED = EMCO Dipole
Note 2: Positive Peak detector used

Radiated Emissions within Restricted Bands, continued

Duty Cycle:

Transmission Burst (3 Packets) repeated every 28.5 to 31.5 seconds:



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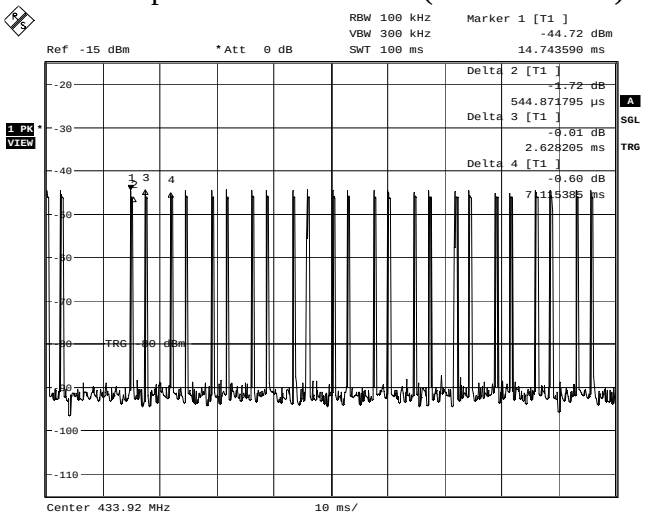
Number of pulses within 100ms (the worst case) : N = 26



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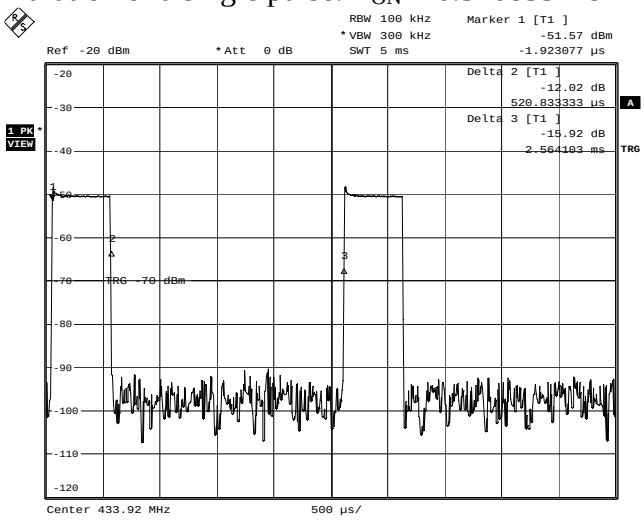
Radiated Emissions within Restricted Bands, continued

Duty Cycle:

Duration of a single pulse: T_{ON} = 0.520833 ms



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Correction for Duty Cycle (Pulse Desensitization):

$$DCF = 20 \cdot \log_{10} (26 \times 0.520833\text{ms}/100\text{ms}) = -17.4\text{ dB}$$

Clause 15.231(c) 20 dB Bandwidth

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

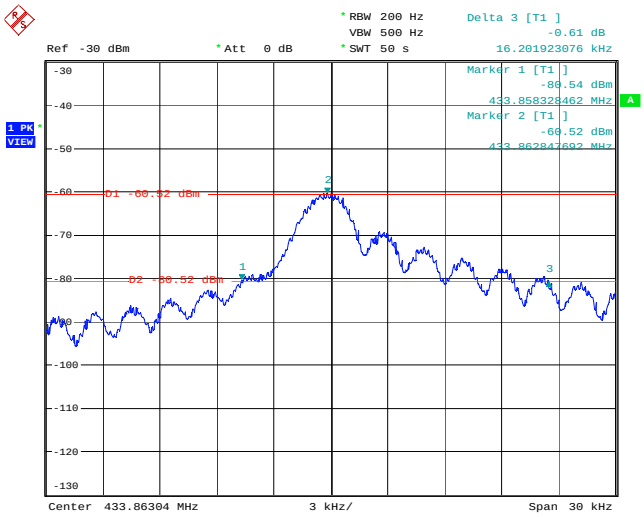
Test Conditions:

Sample Number:	1	**Temperature:**	23°C
Date:	August 6, 2006	**Humidity:**	45%
Modification State:	0	**Tester:**	Roman Kuleba
		Laboratory:	Ottawa

Test Results: See Plot

Criteria: $0.25 \times (433.92 \cdot 10^6 \text{ Hz}/100) = 1.0848 \cdot 10^6 \text{ Hz}$

20 dB Bandwidth: 16.2 kHz < 1.0848 MHz



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Clause 15.231(e) Radiated emissions for Periodic radiators

Intentional radiators may operate at a periodic rate exceeding that specified in paragraph (a) of this section and may be employed for any type of operation, including operation prohibited in paragraph (a) of this section, provided the intentional radiator complies with the provisions of paragraphs (b) through (d) of this section, except the field strength table in paragraph (b) of this section is replaced by the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental (microvolts/meter)	Field Strength of Spurious Emissions (microvolts/meter)
40.66-40.70	1,000	100
70-130	500	50
130-174	500 to 1,500	50 to 150
174-260	1,500	150
260-470	1,500 to 5,000	150 to 500
Above 470	5,000	500

In addition, devices operated under the provisions of this paragraph shall be provided with a means for automatically limiting operation so that the duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.

Test Conditions:

Sample Number:	1	**Temperature:**	23°C
Date:	Aug 6, 2006	**Humidity:**	45%
Modification State:	0	**Tester:**	Roman Kuleba
		Laboratory:	Ottawa

Test Results:

See attached table and plots for results.

Total Duration of Transmission for one burst is less than 1 s.
Minimum Silent Period is greater than 10s and greater than 30 × Total Duration of Transmission.

Additional Observations:

The Spectrum was searched from 30MHz to the 10^{th} Harmonic.
All measurements were performed using a Peak Detector with 100 kHz RBW on frequencies below 1GHz and 1MHz RBW on frequencies above 1GHz at a distance of 3 meters.
The EUT was measured on three orthogonal axes.
All measurements were performed using new batteries to power the EUT.

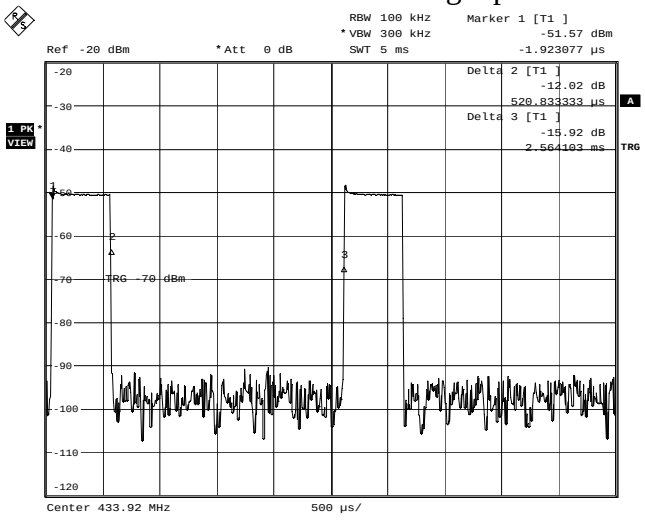
Radiated emissions for Periodic radiators, continued

	Frequency (MHz)	Antenna	Polarity	RCVD Signal (dBµV)	Ant. Factor (dB)	Duty Cycle Corr.	Cable Loss (dB)	Emission Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
1	216.9600	BC1	V	6.0	14.9	-17.4	2.2	5.7	43.5	37.8
2	433.8653	LP1	V	69.8	16.1	-17.4	3.1	71.6	72.8	1.2
3	650.8800	LP1	V	11.4	20.4	-17.4	3.7	18.1	52.8	34.7
4	867.8400	LP1	V	43.6	22.1	-17.4	4.3	52.6	52.8	0.2
5	1735.6800	Horn1	V	29.4	27.2	-17.4	4.0	43.2	52.8	9.6
6	2169.6000	Horn1	V	27.9	28.7	-17.4	4.7	43.9	52.8	8.9
7	2603.5200	Horn1	V	20.9	30.2	-17.4	5.3	39.0	52.8	13.8
8	3037.4400	Horn1	V	31.9	31.2	-17.4	5.8	51.5	52.8	1.3
9	3471.3600	Horn1	V	21.9	31.3	-17.4	6.4	42.2	52.8	10.6
10	216.9600	BC1	H	6.0	14.7	-17.4	2.2	5.5	43.5	38.0
11	433.8653	LP1	H	69.6	16.8	-17.4	3.1	72.1	72.8	0.7
12	650.8800	LP1	H	11.4	20.4	-17.4	3.7	18.1	52.8	34.7
13	867.8400	LP1	H	40.1	23.1	-17.4	4.3	50.1	52.8	2.7
14	1735.6800	Horn1	H	24.5	27.3	-17.4	4.0	38.4	52.8	14.4
15	2169.6000	Horn1	H	26.7	28.7	-17.4	4.7	42.7	52.8	10.1
16	2603.5200	Horn1	H	18.9	30.2	-17.4	5.3	37.0	52.8	15.8
17	3037.4400	Horn1	H	29.4	31.3	-17.4	5.8	49.1	52.8	3.7
18	3471.3600	Horn1	H	20.4	31.4	-17.4	6.4	40.8	52.8	12.0

Note 1: Antenna Legend: BC = Biconical, BL = Bilog, LP = Log-Periodic, Horn = Horn, ED = EMCO Dipole
Note 2: Positive Peak detector used

Radiated emissions for Periodic radiators, continued

Duration of Transmission for a single pulse: 0.520833 ms



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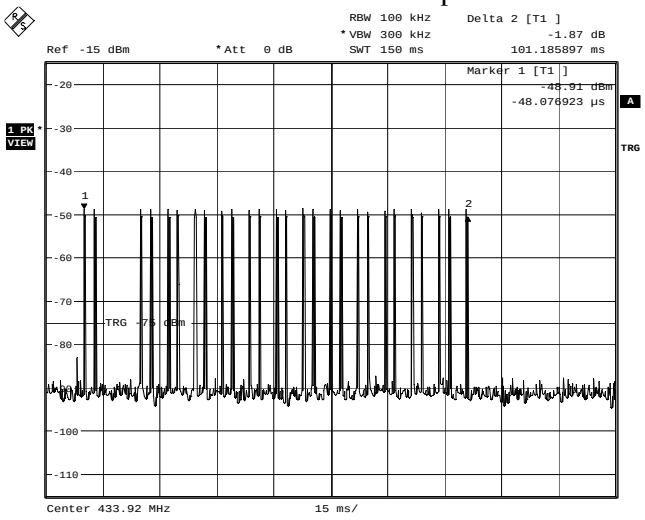
Duration of Transmission for one packet: 27 × 0.520833 ms = 14.0625 ms



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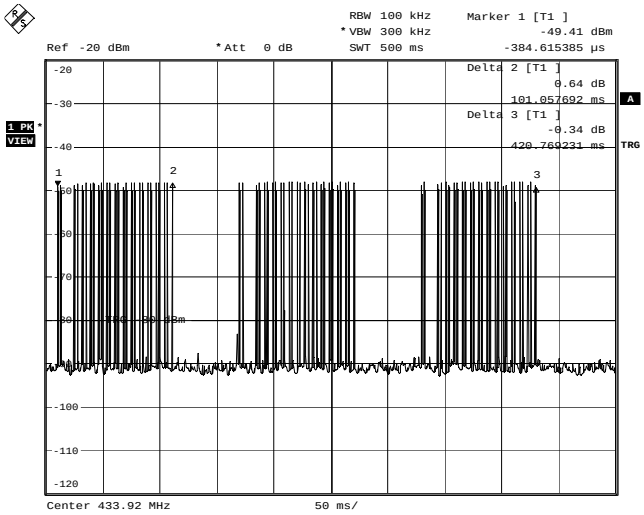
Radiated emissions for Periodic radiators, continued

Duration of Transmission for one burst: 3 × 14.0625 ms = 42.1875 ms < 1 s
Total Duration of Transmission is less than 1 s.



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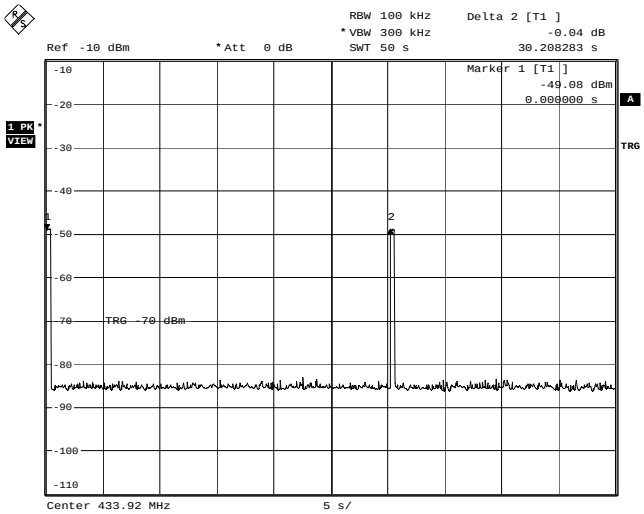
Measured Silent Period: 30.208283 s – 0.0421875 s = 30.166096 s
Minimum Rated Silent Period: 28.5 s > 30 × 42.1875 ms = 1.2656 s



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Minimum Silent Period is greater than 10s and greater than 30 × Total Duration of Transmission.

Appendix B : Setup Photographs

Spurious Emissions Setup:

Appendix C : Block Diagram of Test Setups

Test Site For Radiated Emissions