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Nemko Canada Inc., 303 River Road, R.R. 5, Ottawa, Ontario, Canada, K1V 1H2

Report number: 148080-1TRFWL
Apparatus: Smoke Alarm Transmitter (BE1282)
Applicant: Bellman & Symfon AB
Sodra Langebergsgatan 30
Vastra Frolunda
421 32, Sweden
FCC ID: WMSBETX1
IC Registration Number: 6693A-BETX1

Test specifications:

- **FCC §15.231 – Periodic operation in the band 40.66–40.70 MHz and above 70 MHz**
- **RSS-210, Issue 7, Annex 1.1 – Momentarily operated devices**
 - **Emissions verification**

Reviewed by:

Kevin Ma

Signature
Kevin Ma, Wireless/EMC Specialist

May 6, 2010
Date

Tested by: Andrey Adelberg, Senior Wireless/EMC Specialist

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Section 1: Report summary

Report Number: 148080-1TRFWL

Specification: FCC 15.231/RSS-210 A1.1

Section 1: Report summary

This report contains an assessment of apparatus against specifications based upon tests carried out on samples submitted at Nemko Canada Inc.

Test specifications:

FCC Part 15 Subpart C, 15.231

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

RSS-210, Issue 7, Annex 1.1

Momentary Operated Devices

Compliance status:	Complies
Exclusions:	Only partial tests for IC were performed.
Non-compliances:	None
Report release history:	Original release
Test location:	Nemko Canada Inc. 303 River Road, R.R. 5, Ottawa, Ontario, Canada, K1V 1H2
FCC Registration number:	176392 (3 m Semi anechoic chamber)
IC Registration number:	2040A-4 (3 m Semi anechoic chamber)

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. All results contain in this report are within Nemko Canada's ISO/IEC 17025 accreditation.

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Section 2: Equipment under test

2.1 Identification of equipment under test (EUT)

The following information identifies the EUT under test:

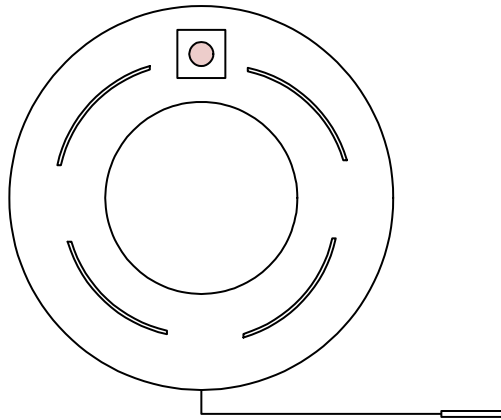
Type of equipment:	Smoke alarm
Product marketing name:	Bellman Visit; Bellman & Symfon®
Model number:	BE1282
Serial number:	BE1282108530015
Nemko sample number:	1
FCC ID:	WMSBETX1
IC Registration Number:	6693A-BETX1
Date of receipt:	April 12, 2010

2.2 EUT description

The EUT (Bellman Visit Smoke Alarm) is part of the Visit System. The EUT transmits signals to Bellman Visit receivers when activated by smoke or fire. The EUT operates at 433.92 MHz.

2.3 Technical specifications of the EUT

Operating frequency:	433.92 MHz
Modulation type:	Pulse width modulation
Occupied bandwidth:	232 kHz (99 % OBW)
Emission designator:	232KL1D
Antenna type:	Solid core wire
Power source	9 VDC internal battery

Section 2: Equipment under test, continued**2.4 EUT setup diagram****2.5 Operation of the EUT during testing**

The EUT was modified for constant transmission upon depression on the “Alarm” button.

2.6 Modifications incorporated in the EUT

There were no modifications performed to the EUT during this assessment.

2.7 Technical judgment

The RF portion of the EUT is identical to the BE1288. Upon manufacturer declaration the difference between two devices is in the smoke detector type. Therefore bandwidth and timing measurements are still valid since previous certification in 2006. Only radiated emissions are needed to be reassessed.



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Section 3: Test conditions

Report Number: 148080-1TRFWL

Specification: FCC 15.231/RSS-210 A1.1

Section 3: Test conditions

3.1 Deviations from laboratory tests procedures

No deviations were made from laboratory test procedures.

3.2 Test conditions, power source and ambient temperatures

<p>Normal temperature, humidity and air pressure test conditions</p>	<p>Temperature: 15–30 °C Relative humidity: 20–75 % Air pressure: 86–106 kPa</p> <p>When it is impracticable to carry out tests under these conditions, a note to this effect stating the ambient temperature and relative humidity during the tests shall be recorded and stated.</p>
<p>Power supply range:</p>	<p>The normal test voltage for equipment to be connected to the mains shall be the nominal mains voltage. For the purpose of the present document, the nominal voltage shall be the declared voltage, or any of the declared voltages $\pm 5\%$, for which the equipment was designed.</p>



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Section 3: Test conditions

Report Number: 148080-1TRFWL

Specification: FCC 15.231/RSS-210 A1.1

Section 3: Test conditions, continued

3.3 Measurement uncertainty

Nemko Canada measurement uncertainty has been calculated using guidance of UKAS LAB 34:2003 and TIA-603-B Nov 7, 2002. All calculations have been performed to provide a confidence level of 95 % and can be found in Nemko Canada document MU-003.

3.4 Test equipment

Equipment	Manufacturer	Model No.	Asset/Serial No.	Next cal.
3 m EMI Test Chamber	TDK	SAC-3	FA002047	Mar. 09/11
Flush Mount Turntable	Sunol	FM2022	FA002082	NCR
Controller	Sunol	SC104V	FA002060	NCR
Antenna Mast	Sunol	TLT2	FA002061	NCR
Bilog Antenna	Sunol	JB3	FA002108	Jan. 18/11
Horn Antenna #2	EMCO	3115	FA000825	Jan. 18/11
1-18 GHz Amplifier	JCA	JCA118-503	FA002091	Oct 07/10
Receiver/Spectrum Analyzer	Rohde & Schwarz	ESU 26	FA002043	Jan. 14/11

Note: N/A = Not Applicable, NCR = No Cal Required, COU = CAL On Use

Section 4: Result summary

4.1 FCC Part 15 Subpart C, 15.231: Test results

Part	Test description	Required	Result
General requirements for FCC Part 15			
§15.31(e)	Variation of power source	Y	Pass
§15.203	Antenna requirement	Y	Pass
§15.207(a)	Conducted limits	N	
Specific requirements for FCC Part 15 Subpart C, 15.231			
§15.231(a)	Conditions for intentional radiators to comply with periodic operation	---	---
§15.231(a)(1)	Manually operated transmitter	N	
§15.231(a)(2)	Automatically activated transmitter	Y	Pass
§15.231(a)(3)	Periodic transmissions at regular predetermined intervals	N	
§15.231(a)(4)	Radiators used in cases of emergency	Y	Pass
§15.231(a)(5)	Set-up information transmission for security systems	Y	Pass
§15.231(b)	Field strength of emissions	Y	Pass
§15.231(c)	Emission bandwidth	Y	Pass
§15.231(d)	Requirements for devices operating within 40.66–40.70 MHz band	N	
§15.231(e)	Field strength of emissions for periodic radiators	N	
Notes: None			

4.2 RSS-210 Annex A1.1: Test results

Part	Test description	Required	Result
IC RSS-210, Issue 7, Annex 1.1: Test results			
A1.1.2	Field strength and frequency bands	Y	Pass
Notes: Only emissions confidence test was performed according to Nemko quote 13904.			



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Appendix A: Test results

Report Number: 148080-1TRFWL

Specification: FCC 15.231/RSS-210 A1.1

Appendix A: Test results

Clause 15.31(e) Variation of the power source

For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85 % and 115 % of the nominal rated supply voltage. For battery-operated equipment, the equipment tests shall be performed using a new battery.

Test date: April 12, 2010

Test results: Pass

Test data

– All tests were performed with new battery.



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Clause 15.203 Antenna requirement

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

Test date: April 12, 2010

Test results: Pass

Test data

- The EUT uses a non-detachable antenna to the intentional radiator.



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Clause 15.231(a) Conditions for intentional radiators to comply with periodic operation

The provisions of this section are restricted to periodic operation within the band 40.66–40.70 MHz and above 70 MHz. Except as shown in paragraph (e) of this section, the intentional radiator is restricted to the transmission of a control signal such as those used with alarm systems, door openers, remote switches, etc. Continuous transmissions, voice, video and the radio control of toys are not permitted. Data is permitted to be sent with a control signal. The following conditions shall be met to comply with the provisions for this periodic operation:

- (1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.
- (2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.
- (3) Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions, including data, to determine system integrity of transmitters used in security or safety applications are allowed if the total duration of transmissions does not exceed more than two seconds per hour for each transmitter. There is no limit on the number of individual transmissions, provided the total transmission time does not exceed two seconds per hour.
- (4) Intentional radiators which are employed for radio control purposes during emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition
- (5) Transmission of set-up information for security systems may exceed the transmission duration limits in paragraphs (a)(1) and (a)(2) of this section, provided such transmissions are under the control of a professional installer and do not exceed ten seconds after a manually operated switch is released or a transmitter is activated automatically. Such set-up information may include data.

Test date: April 12, 2010

Test results: Pass

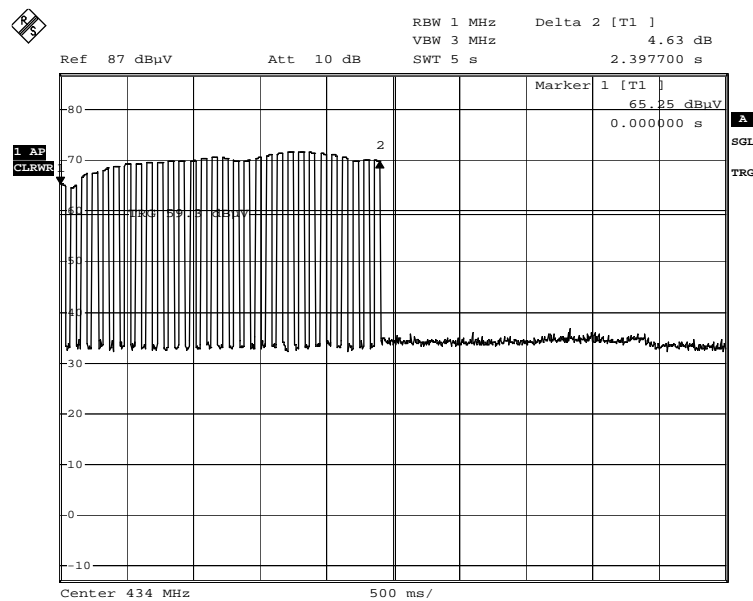
Special notes

None

Clause 15.231(a) Conditions for intentional radiators to comply with periodic operation, continued

Test data

- (1) The EUT is not manually triggered.
- (2) The EUT is deactivated automatically after 2.4 s.
See attached plot for the timing of an automatically trigger event.
- (3) The EUT is not a periodic transmitter.
- (4) The EUT usage is not for radio control purposes during emergencies.
The EUT operates as in 15.231(a)(2) during an alarm state.
- (5) The EUT does not transmit set-up information



FCC 15.231(b): Field strength of emissions and RSS-210 A1.1.2: Field strengths and frequency bands

FCC requirements

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

Fundamental frequency (MHz)	Field strength of fundamental		Field strength of spurious emissions	
	($\mu\text{V/m}$)	(dB $\mu\text{V/m}$)	($\mu\text{V/m}$)	(dB $\mu\text{V/m}$)
40.66–40.70	2,250	67	225	47
70–130	1,250	61.9	125	41.9
130–174	1,250 to 3,750*	61.9 to 71.5*	125 to 375*	41.9 to 51.5*
174–260	3,750	71.5	375	51.5
260–470	3,750 to 12,500*	71.5 to 81.9*	375 to 1,250*	51.5 to 61.9*
Above 470	12,500	81.9	1,250	61.9

Notes:

- *-Linear interpolations.
- The above field strength limits are specified at a distance of 3 meters. The tighter limits apply at the band edges.

The field strength of emissions appearing within restricted bands (as specified in §15.205) shall not exceed the limits from §15.209:

Frequency (MHz)	Field strength		Measurement distance (m)
	($\mu\text{V/m}$)	(dB $\mu\text{V/m}$)	
0.009–0.490	2400/F	67.6–20log(F)	300
0.490–1.705	24000/F	87.6–20log(F)	30
1.705–30.0	30	29.5	30
30–88	100	40.0	3
88–216	150	43.5	3
216–960	200	46.0	3
above 960	500	54.0	3

Notes:

- F = fundamental frequency in kHz
- In the emission table above, the tighter limit applies at the band edges.
- For frequencies above 1 GHz the limit on peak RF emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test.

Test date: April 12, 2010

Test results: Pass

FCC 15.231(b): Field strength of emissions and RSS-210 A1.1.2: Field strengths and frequency bands, continued

RSS requirements

1. The field strength of emissions from momentarily operated intentional radiators shall not exceed the limits in Table 4.
2. Intentional radiators shall demonstrate compliance with the limits on the field strength of emissions, as shown in Table 4, based on the average value of the measured emissions. As an alternative, compliance with the limit in Table 4, may be demonstrated using a CISPR quasi-peak detector. If average emission measurements are employed, the provisions in Section 4.3 (Pulsed Operation) of RSS-Gen for averaging pulsed emissions and for limiting peak emissions apply.
3. The limits on the field strength of unwanted emissions in Table 4 are based on the fundamental frequency of the intentional radiator. Unwanted emissions shall be attenuated to the limits shown in Table 2 or to the limits shown in Table 4, whichever is the less stringent.

Table 4: Permissible field strength limits for momentarily operated devices

Fundamental frequency excluding restricted band frequencies of Table 1 (MHz)	Field strength of fundamental ^(Note 1) at 3 m		Field strength of spurious emissions ^(Note 1) at 3 m	
	(μ V/m)	(dB μ V/m)	(μ V/m)	(dB μ V/m)
40.66–40.70	<i>See section A 2.7</i>			
70–130	1,250	61.9	125	41.9
130–174	1,250 to 3,750*	61.9 to 71.5*	125 to 375*	41.9 to 51.5*
174–260 ^(Note 2)	3,750	71.5	375	51.5
260–470 ^(Note 2)	3,750 to 12,500*	71.5 to 81.9*	375 to 1,250*	51.5 to 61.9*
Above 470	12,500	81.9	1,250	61.9

Notes:

- *-Linear interpolations.
- For 130-174 MHz: FS (μ V/m) = (56.82 x F) – 6136
- For 260-470 MHz: FS (μ V/m) = (41.67 x F) – 7083.
- Note 1: Use quasi-peak or averaging meter
- Note 2: The frequency band 225–399.9 MHz is allocated for Government of Canada usage. There are different types of operations in different parts of this band of frequencies, including communications with aircraft and operations using high power transmitters. Besides avoiding the frequency bands of Table 1, designers of low-power devices are strongly recommended to also avoid wherever possible the entire 225–399.9 MHz band.
- The above field strength limits are specified at a distance of 3 meters.
- The tighter limits apply at the band edges.

FCC 15.231(b): Field strength of emissions and RSS-210 A1.1.2: Field strengths and frequency bands, continued

Special notes

- The spectrum was searched from 30 MHz to the 10th harmonic.
- The EUT was measured on three orthogonal axis.
- All measurements were performed at a distance of 3 m.
- All measurements were performed:
 - within 30–1000 MHz range: using a peak detector with 100 kHz/300 kHz RBW/VBW,
 - above 1 GHz: using peak detector with 1 MHz/3 MHz RBW/VBW for peak results
 - and using a duty cycle/average factor for average results calculations.
- Only the worst data presented in the test report.
- Fresh battery was used throughout the test.

FCC § 15.205 Restricted bands of operation and RSS Table 1: Restricted frequency bands

MHz	MHz	MHz	GHz
0.090–0.110	13.36–13.41	399.9–410	3.6–4.4
0.495–0.505	16.42–16.423	608–614	4.5–5.15
2.1735–2.1905	16.69475–16.69525	960–1240	5.35–5.46
3.020–3.026	16.80425–16.80475	1240–1427 (RSS)	7.25–7.75
4.125–4.128	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775	73–74.6	1645.5–1646.5	9.3–9.5
5.677–5.683 (RSS)	74.8–75.2	1660–1710	10.6–12.7
6.215–6.218	108–121.94	1718.8–1722.2	13.25–13.4
6.26775–6.26825	121.94–123 (RSS)	2200–2300	14.47–14.5
6.31175–6.31225	123–138	2310–2390	15.35–16.2
8.291–8.294	149.9–150.05	2483.5–2500	17.7–21.4
8.362–8.366	156.52475–156.52525	2655–2690 (RSS)	22.01–23.12
8.37625–8.38675	156.7–156.9	2690–2900	23.6–24.0
8.41425–8.41475	162.0125–167.17	3260–3267	31.2–31.8
12.29–12.293	167.72–173.2	3332–3339	36.43–36.5
12.51975–12.52025	240–285	3345.8–3358	Above 38.6
12.57675–12.57725	322–335.4	3500–3600 (RSS)	

FCC 15.231(b): Field strength of emissions and RSS-210 A1.1.2: Field strengths and frequency bands, continued

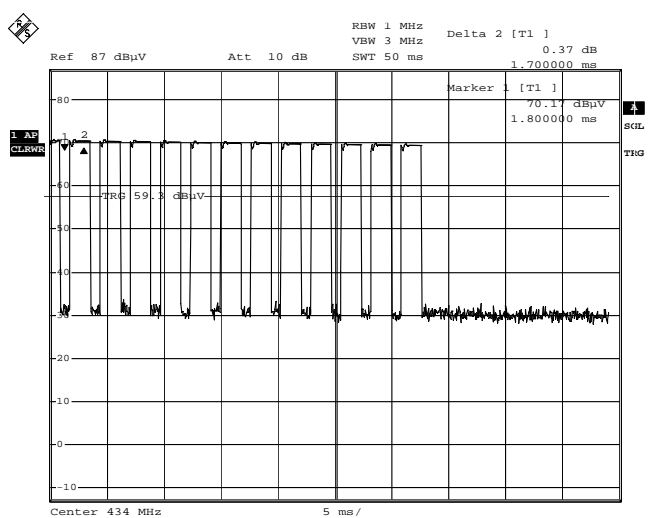
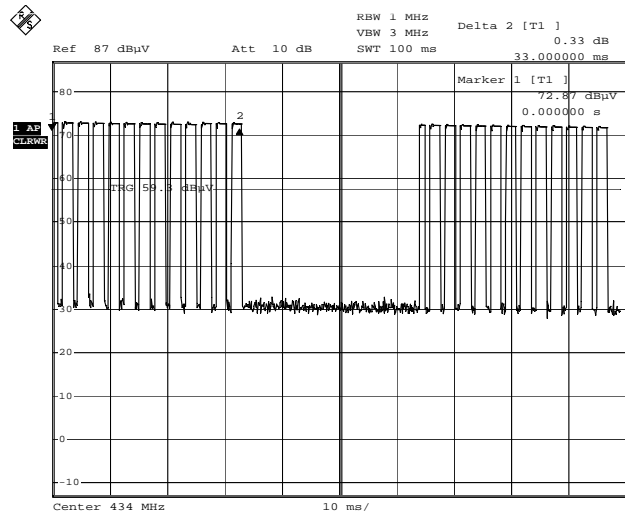
Test data

Duty cycle/average factor calculations

FCC §15.35(c) When the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds.

RSS-Gen Clause 4.5 Pulsed operation: When the field strength (or envelope power) is not constant or when it is in pulses, and an average detector is specified to be used, the value of field strength or power shall be determined by averaging over one complete pulse train, including blanking intervals within the pulse train, as long as the pulse train does not exceed 0.1 seconds. In cases where the pulse train exceeds 0.1 seconds, the average value (of field strength or output power) shall be determined during a 0.1 second interval during which the field strength or power is at its maximum value.

Duty cycle/average factor calculations:



$$Duty\ cycle / average\ factor = 20 \times \log_{10} \left(\frac{T_{x_{100ms}}}{100ms} \right)$$

$$Duty\ cycle / average\ factor = 20 \times \log_{10} \left(\frac{13 \times 7 \times 2}{100} \right) = -7.1 [dB]$$



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FCC 15.231(b): Field strength of emissions and RSS-210 A1.1.2: Field strengths and frequency bands, continued

Tabular data

Radiated measurements:

Frequency (MHz)	Pol. V/H	Peak FS (dB μ V/m)	Correction (dB)	Limit (dB μ V/m)	Margin (dB)	Corr. (dB)	Average FS (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
<i>Fundamental</i>									
433.92	V	82.2	18.3	100.8	18.6	-7.1	75.1	80.8	5.7
433.92	H	84.0	18.9	100.8	16.8	-7.1	76.9	80.8	3.9
<i>Harmonics</i>									
867.8	V	41.2	25.0	80.8	39.6	-7.1	34.1	60.8	26.7
867.8	H	44.0	24.5	80.8	36.8	-7.1	36.9	60.8	23.9
1302.8	V	43.8	-18.1	74.0	30.2	-7.1	36.7	54.0	17.3
1302.8	H	50.7	-18.4	74.0	23.3	-7.1	43.6	54.0	10.4

Notes: Correction factor includes antenna, cable loss, amplifier, and attenuators.



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Appendix A: Test results

Report Number: 148080-1TRFWL

Specification: FCC 15.231/RSS-210 A1.1

Clause 15.231(c) Emission bandwidth

The bandwidth of the emission shall be no wider than 0.25 % of the center 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 date: April 12, 2010

Test results: Pass

Special notes

- The test was performed using peak detector of the spectrum analyzer with RBW no narrower than 1 % of the emission bandwidth.

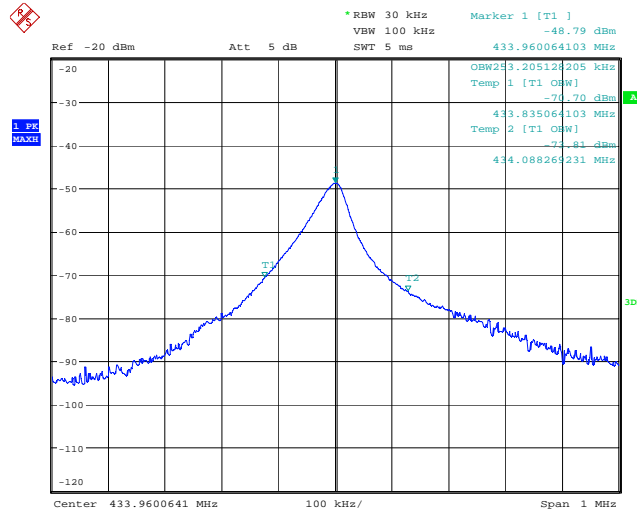
Clause 15.231(c) Emission bandwidth, continued

Test data

Limits

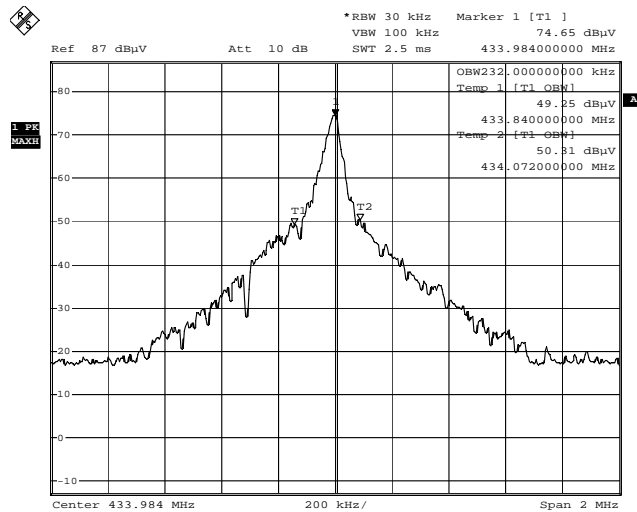
0.25 % of 433.92 MHz is 1084.8 kHz

Measured results



20 dB bandwidth (kHz)	Limit (kHz)	Margin (kHz)
253.2	1084.8	831.6

99 % Occupied bandwidth:



Appendix B: Block diagrams of test set-ups

Radiated emissions set-up

