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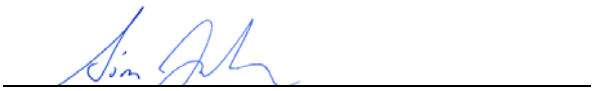
Report Reference ID:	156564-1TRFWL

Test specification:	Title 47-Telecommunication Chapter I - Federal Communications Commission Subchapter A - General Part 15 - Radio Frequency Devices Subpart C - Intentional Radiators **§15.231 Periodic operation in the band 40.66–40.70 MHz and above 70 MHz**

Applicant:	Digital Security Controls Ltd 3301 Langstaff Road Vaughan, ON L4K 4L2
Apparatus:	DSC Wireless Indoor Siren (M/N: WT4901)
FCC ID:	F5309WT4901
Model:	WT4901

Testing laboratory:	**Nemko Canada Inc.** 303 River Road Ottawa, ON, Canada K1V 1H2 Telephone: (613) 737-9680 Facsimile: (613) 737-9691

	Name and title	**Date**
Tested by:	Shawn He, Wireless/EMC Specialist	January 20, 2011
Reviewed by:	 Sim Jagpal, General Manager	January 20, 2011

SCC Accredited LAB
LAB Accrédité CCN

Nemko Canada Inc., a testing laboratory, is accredited by the Standards Council of Canada.
The tests included in this report are within the scope of this accreditation.

Table of contents

Section 1: Report summary

1.1 Test specification

Specifications	**FCC Part 15 Subpart C, 15.231** Periodic operation in the band 40.66–40.70 MHz and above 70 MHz

1.2 Statement of compliance

Compliance	In the configuration tested the EUT was found compliant Yes ☒ No ☐ This report contains an assessment of apparatus against specifications based upon tests carried out on samples submitted at Nemko Canada Inc. 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.

1.3 Exclusions

Exclusions	None

1.4 Registration number

Test site FCC ID number	176392 (3 m Semi anechoic chamber)

1.5 Test report revision history

Revision #	Details of changes made to test report
TRF	Original report issued

1.6 Limits of responsibility

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: Summary of test results

2.1 FCC Part 15 Subpart C – Intentional Radiators, test results

General requirements for FCC Part 15

Part	Test description	Verdict
§15.31(e)	Variation of power source	Pass
§15.31(m)	Number of operating frequencies	N/A
§15.203	Antenna requirement	N/A
§15.207(a)	Conducted limits	N/A

Specific requirements for FCC Part 15 Subpart C, 15.231

Part	Test description	Verdict
§15.231(a)	Conditions for intentional radiators to comply with periodic operation	Pass
§15.231(b)	Field strength of emissions	Pass
§15.231(c)	Emission bandwidth	Pass
§15.231(d)	Requirements for devices operating within 40.66–40.70 MHz band	N/A
§15.231(e)	Conditions for intentional radiators to comply with periodic operation	N/A

Notes: None

Section 3: Equipment under test (EUT) and application details

3.1 Applicant details

Applicant complete business name	Name:	Digital Security Control, a Division of Tyco Safety Products Canada Ltd.
Mailing address	Address: City: Province/State: Post code: Country:	3301 Langstaff Road Concord Ontario L4K 4L2 Canada

3.2 Modular equipment

a) Single modular approval	Single modular approval Yes ☐ No ☒
b) Limited single modular approval	Limited single modular approval Yes ☐ No ☐

3.3 Product details

Description of product as it is marketed	The EUT is a wireless Indoor Siren that transmits at 433.92 MHz used as part of an alarm system.	
	Model name/number:	WT4901
	Serial number:	23E6D272

3.4 Application purpose

Type of application	☐ Original certification ☐ Change in identification of presently authorized equipment Original FCC ID: Grant date: ☒ Class II permissive change or modification of presently authorized equipment

3.5 Composite/related equipment

a) Composite equipment	The EUT is a composite device subject to an additional equipment authorization Yes ☐ No ☒
b) Related equipment	The EUT is part of a system that operates with, or is marketed with, another device that requires an equipment authorization Yes ☐ No ☒
c) Related FCC ID	If either of the above is “yes”: ☐ has been granted under the FCC ID(s) listed below: ☐ is in the process of being filled under the FCC ID(s) listed below: ☐ is pending with the FCC ID(s) listed below: ☐ has a mix of pending and granted statues under the FCC ID(s) listed below: i FCC ID: ii FCC ID:

3.6 Sample information

Receipt date:	August 30, 2010
Nemko sample ID number:	Item #1, 2

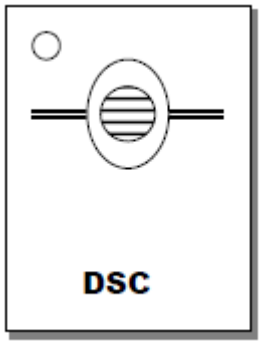
3.7 EUT technical specifications

Operating band:	433.92 MHz
Operating frequency:	433.92 MHz
Modulation type:	On/Off Keying
Occupied bandwidth:	88.5 kHz
Emission designator:	K1D
Antenna type:	Integral Permanent fixed antenna, which may be built-in, (Equipment does not have an external 50 Ω RF connector)
Power source:	6 VDC

3.8 Operation of the EUT during testing

Details:	A modified sample was provided for CW transmission to complete radiated measurements and a normal sample for occupied bandwidth and timing requirements.

3.9 EUT setup diagram



Section 4: Engineering considerations

4.1 Modifications incorporated in the EUT

Modifications	Modifications performed to the EUT during this assessment None ☒ Yes ☐, performed by Client ☐ or Nemko ☐ Details:

4.2 Deviations from laboratory tests procedures

Deviations	Deviations from laboratory test procedures None ☒ Yes ☐ - details are listed below:

4.3 Technical judgment

Judgment	None

Section 5: Test conditions

5.1 Power source and ambient temperatures

Normal temperature, humidity and air pressure test conditions	Temperature: 15–30 °C Relative humidity: 20–75 % Air pressure: 86–106 kPa 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.
Power supply range:	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 ±5 %, for which the equipment was designed.

Section 6: 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.

Section 7: Test equipment

7.1 Test equipment list

Equipment	Manufacturer	Model No.	Asset/Serial No.	Next cal.
3 m EMI Test Chamber	TDK	SAC-3	FA002047	March 9/11
Flush Mount Turntable	Sunol	FM2022	FA002082	NCR
Controller	Sunol	SC104V	FA002060	NCR
Antenna Mast	Sunol	TLT2	FA002061	NCR
Receiver/Spectrum Analyzer	Rohde & Schwarz	ESU 26	FA002043	Jan. 14/11
Bilog Antenna	Sunol	JB3	FA002108	Jan. 18/11
50 Coax cable	HUBER + SUHNER	None	FA002013	Sept. 1/11
50 Coax cable	HUBER + SUHNER	None	FA002074	July 13/11
Horn Antenna #2	EMCO	3115	FA000825	Jan. 18/11
1–18 GHz Amplifier	JCA	JCA118-503	FA002091	Oct 07/10
Spectrum Analyzer	Rohde & Schwarz	FSP	FA001920	May 17/11

Note: N/A = Not applicable, NCR = No cal required, COU = Cal on use

Section 8: Testing data

8.1 Clause 15.31(e) Variation of power source

§ 15.31 Measurement standards.

(e) 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.

Special notes

None

Test data

- All tests were performed with new battery.

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

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

(a) 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.

Special notes

None

Test data

(1) The EUT is not manually triggered.

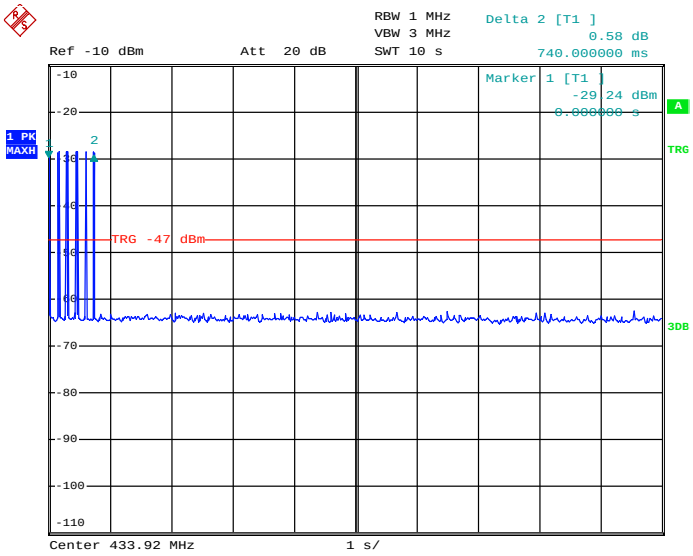
(2) The EUT is automatically triggered and ceases transmission within 740ms.
See attached plots for the timing of an automatically trigger event.

(3) The EUT is not a periodic transmitter.

(4) The EUT is used in security systems but complies with the automatically triggered device requirement.

(5) The EUT does not have an installer mode.

Transmission Time



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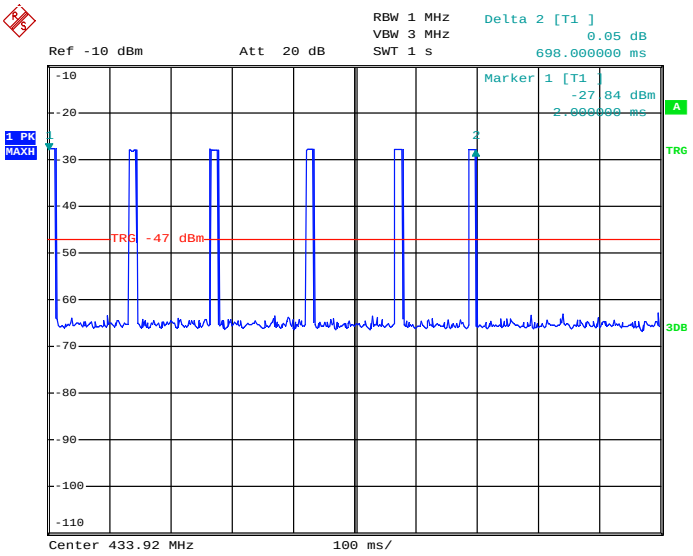

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8.3 Clause 15.231(b) Field strength of emissions

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

(b) 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	
	(µV/m)	(dBµV/m)	(µV/m)	(dBµV/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

* Linear interpolations

(1) The above field strength limits are specified at a distance of 3 meters. The tighter limits apply at the band edges.

(2) Intentional radiators operating under the provisions of this section shall demonstrate compliance with the limits on the field strength of emissions, as shown in the above table, based on the average value of the measured emissions. As an alternative, compliance with the limits in the above table may be based on the use of measurement instrumentation with a CISPR quasi-peak detector. The specific method of measurement employed shall be specified in the application for equipment authorization. If average emission measurements are employed, the provisions in §15.35 for averaging pulsed emissions and for limiting peak emissions apply. Further, compliance with the provisions of §15.205 shall be demonstrated using the measurement instrumentation specified in that section.

(3) The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in §15.209, whichever limit permits a higher field strength.

Special notes

§15.209 – Radiated emission limits

Frequency (MHz)	Field strength (μV/m)	Field strength (dBμV/m)	Measurement distance (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.

§15.205 – Restricted bands of operation

MHz	MHz	MHz	GHz
0.090–0.110	16.42–16.423	399.9–410	4.5–5.15
0.495–0.505	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905	16.80425–16.80475	960–1240	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
6.215–6.218	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225	123–138	2200–2300	14.47–14.5
8.291–8.294	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675	156.7–156.9	2690–2900	22.01–23.12
8.41425–8.41475	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025	240–285	3345.8–3358	36.43–36.5
12.57675–12.57725	322–335.4	3600–4400	Above 38.6
13.36–13.41			

- The spectrum was searched from 30 MHz to the 10th harmonic.
- 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
    - using a duty cycle/average factor for average results calculations.

Special notes

Duty cycle/average factor calculations

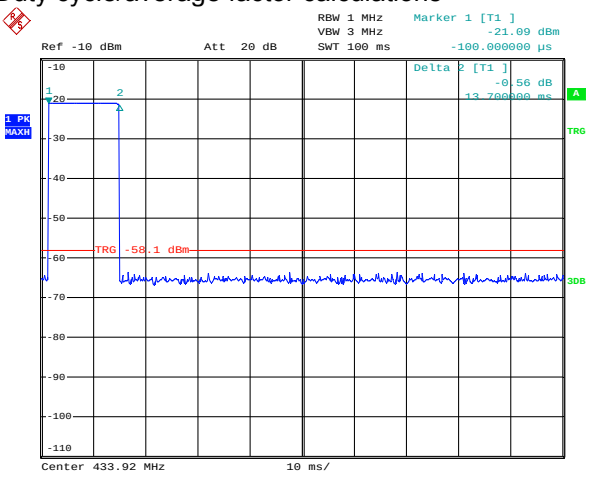
§15.35(c) When the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed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

Duty cycle/average factor calculations:

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

Test data

Duty cycle/average factor calculations



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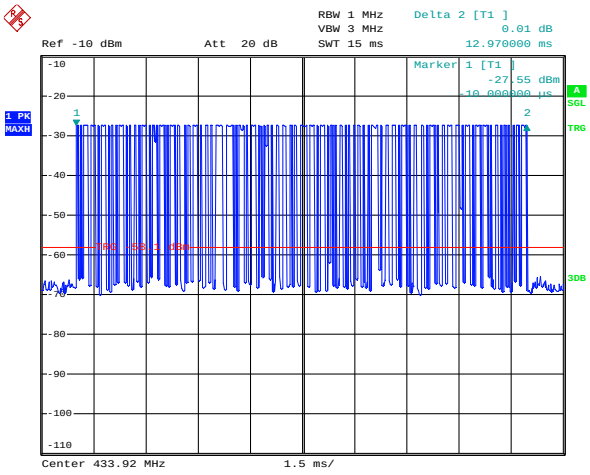

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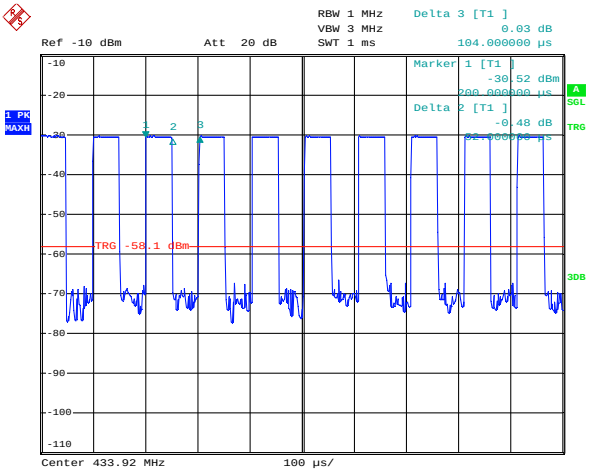

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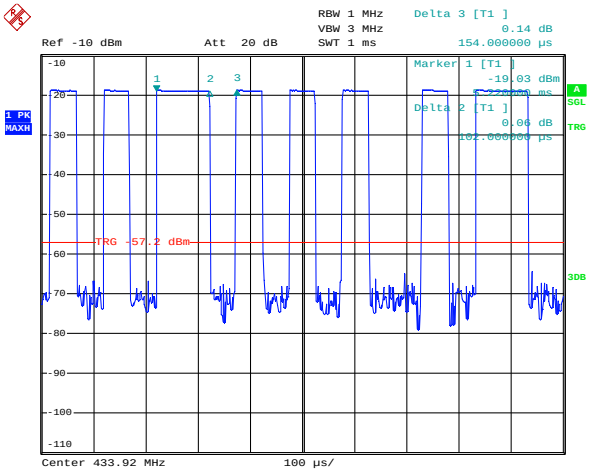

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Burst duration: 10.98 ms
Short Pulse duration: 52.0 µs
Silent period duration: 104.0 µs – 52.0 µs = 52.0 µs
Short Pulse period: 104 µs
Assume all pulses are short:
Number of short pulses within 1 burst: 10.98 ms / 0.104 ms = 105.6 ~ 106 short pulses
On-time = 106 x 52.0 µs = 5.5 ms
Duty cycle correction = $20 \cdot \log_{10}(5.5/100)$ = -25.2 dB

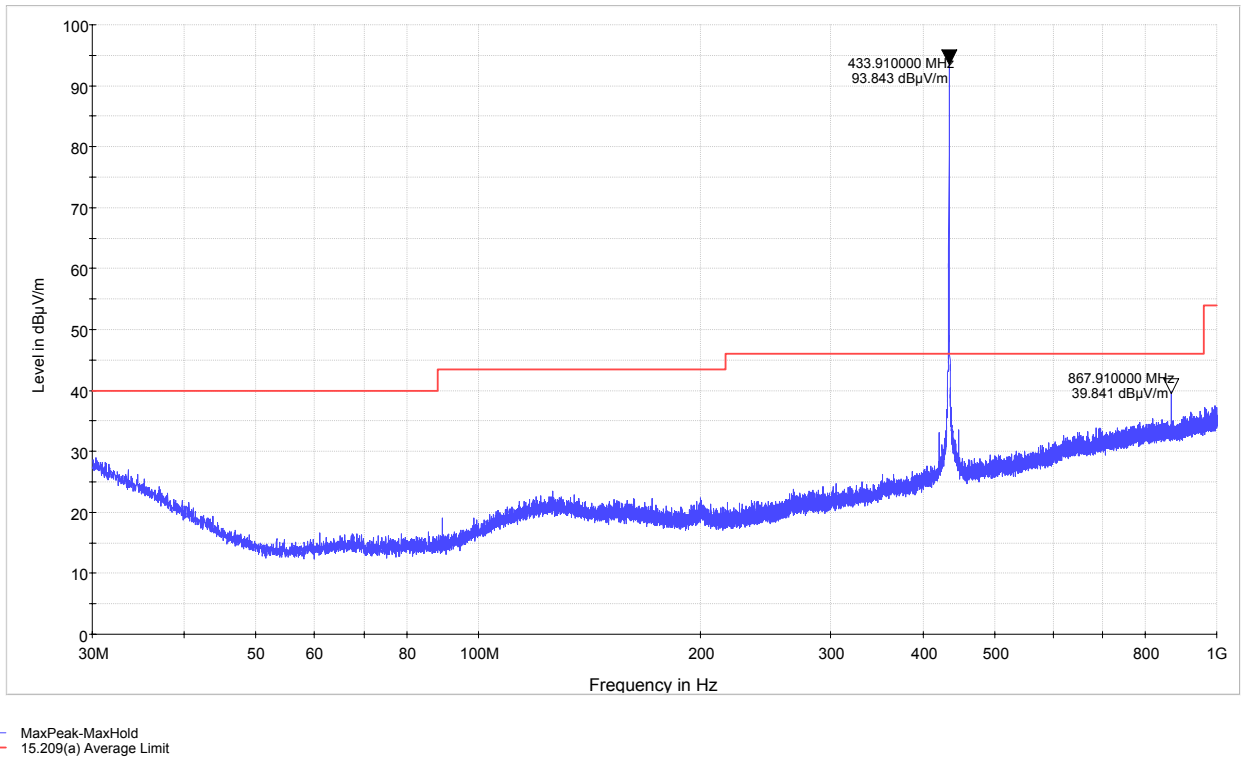
Test data, continued

Test facility	Measuring distance (m)	Antenna height variation (m)	Turn table position (°)
3 m Semi anechoic chamber	3	1–4	0–360

Results

Refer to spectral plots and tables of this section.

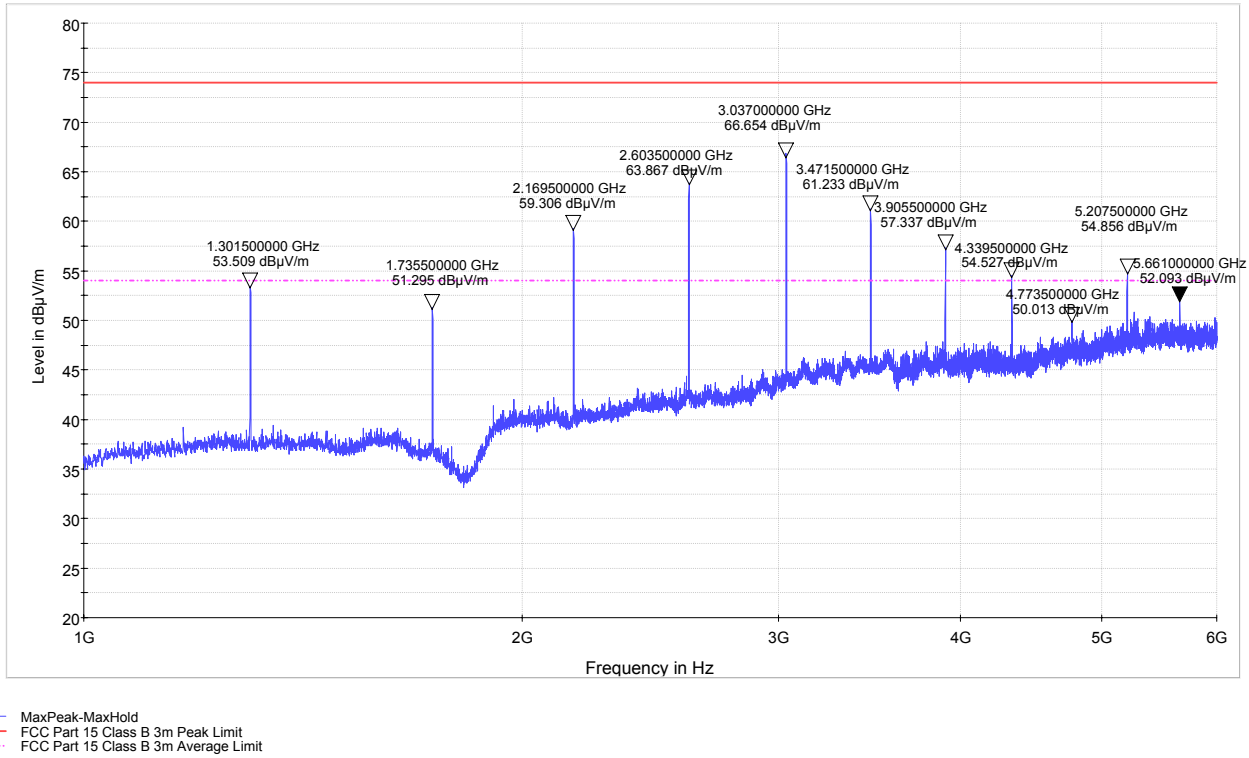
Spectral plots



The spectral plot is a summation of a vertical and horizontal scan. The spectral scan has been corrected with transducer factors (i.e. antenna factors, cable loss, amplifier gains, and attenuators) for determination of compliance. Limits have been adjusted to reflect 3 m requirements.

A preview measurement was generated with receiver in continuous scan or sweep mode while the EUT was rotated and antenna adjusted to maximize radiated emission. Emissions detected within 6 dB or above limit were re-measured with the appropriate detector against the correlating limit and recorded as the final measurement.

Spectral plots



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A preview measurement was generated with receiver in continuous scan or sweep mode while the EUT was rotated and antenna adjusted to maximize radiated emission. Emissions detected within 6 dB or above limit were re-measured with the appropriate detector against the correlating limit and recorded as the final measurement.

Tabular data (15.231(b) emissions limit)

Freq. (MHz)	Peak field strength (dBµV/m)	Peak limit (dBµV/m)	Peak margin (dB)	Duty cycle corr. (dB)	Avg field strength (dBµV/m)	Avg limit (dBµV/m)	Avg margin (dB)
433.91	93.84	100.82	6.98	-25.2	68.64	80.82	12.18
867.91	39.84	80.82	40.98	-25.2	14.64	60.82	46.18
1301.50	53.51	80.82	27.31	-25.2	28.31	60.82	32.51
1735.50	51.30	80.82	29.52	-25.2	26.10	60.82	34.73
2169.50	59.31	80.82	21.51	-25.2	34.11	60.82	26.71
2603.50	63.87	80.82	16.95	-25.2	38.67	60.82	22.15
3037.00	66.65	80.82	14.17	-25.2	41.45	60.82	19.37
3471.50	61.23	80.82	19.59	-25.2	30.03	60.82	24.79
3905.50	57.34	80.82	23.48	-25.2	32.14	60.82	28,68
4339.50	54.53	80.82	26.29	-25.2	29.33	60.82	31.49
4773.50	50.01	80.82	30.81	-25.2	24.81	60.82	36.01
5207.50	54.86	80.82	25.96	-25.2	29.66	60.82	31.16
5661.00	52.09	80.82	28.73	-25.2	26.89	60.82	33.93

8.4 Clause 15.231(c) Emission bandwidth

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

(c) 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.

Special notes

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

Test data

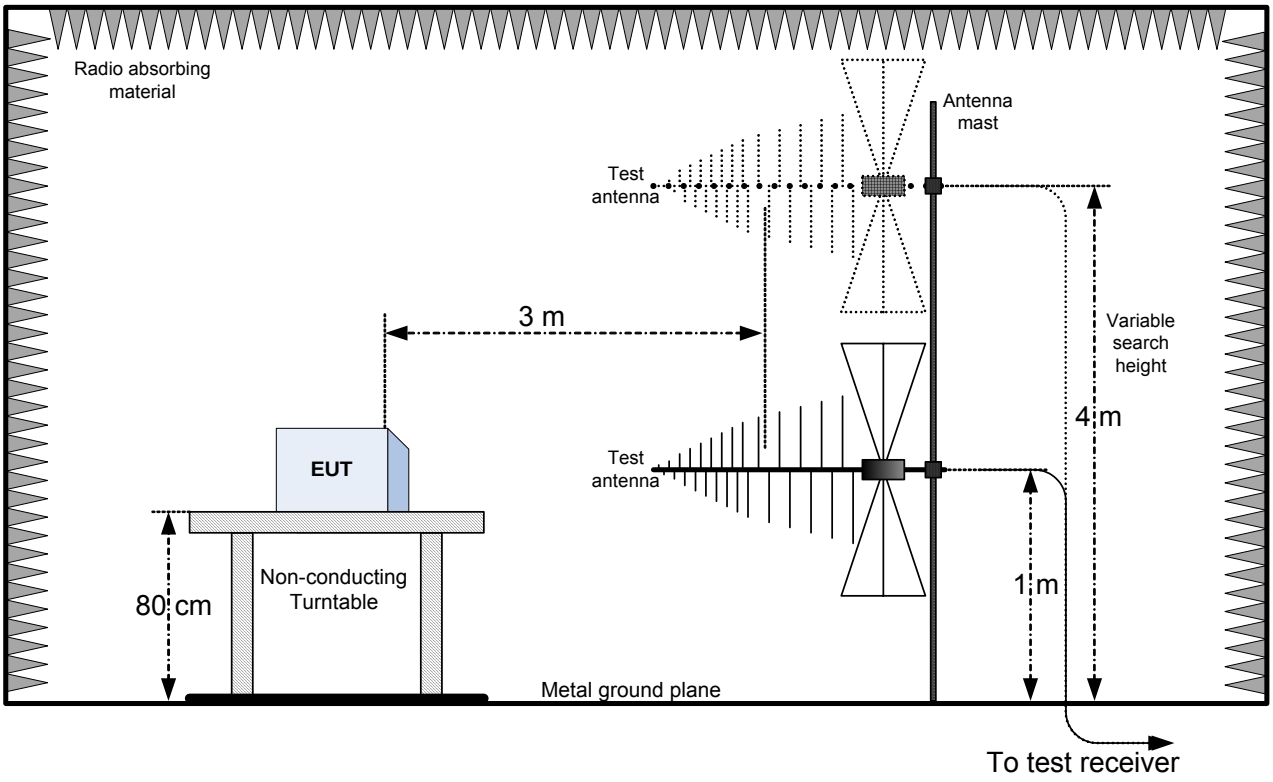
Limits
0.25 % of 433.92 MHz is 1084.8 kHz

Measured results: Refer to report 116935-1TRFWL

20 dB bandwidth (kHz)	Limit (kHz)	Margin (kHz)
88.5	1084.8	996.3

Section 9: Block diagrams of test set-ups

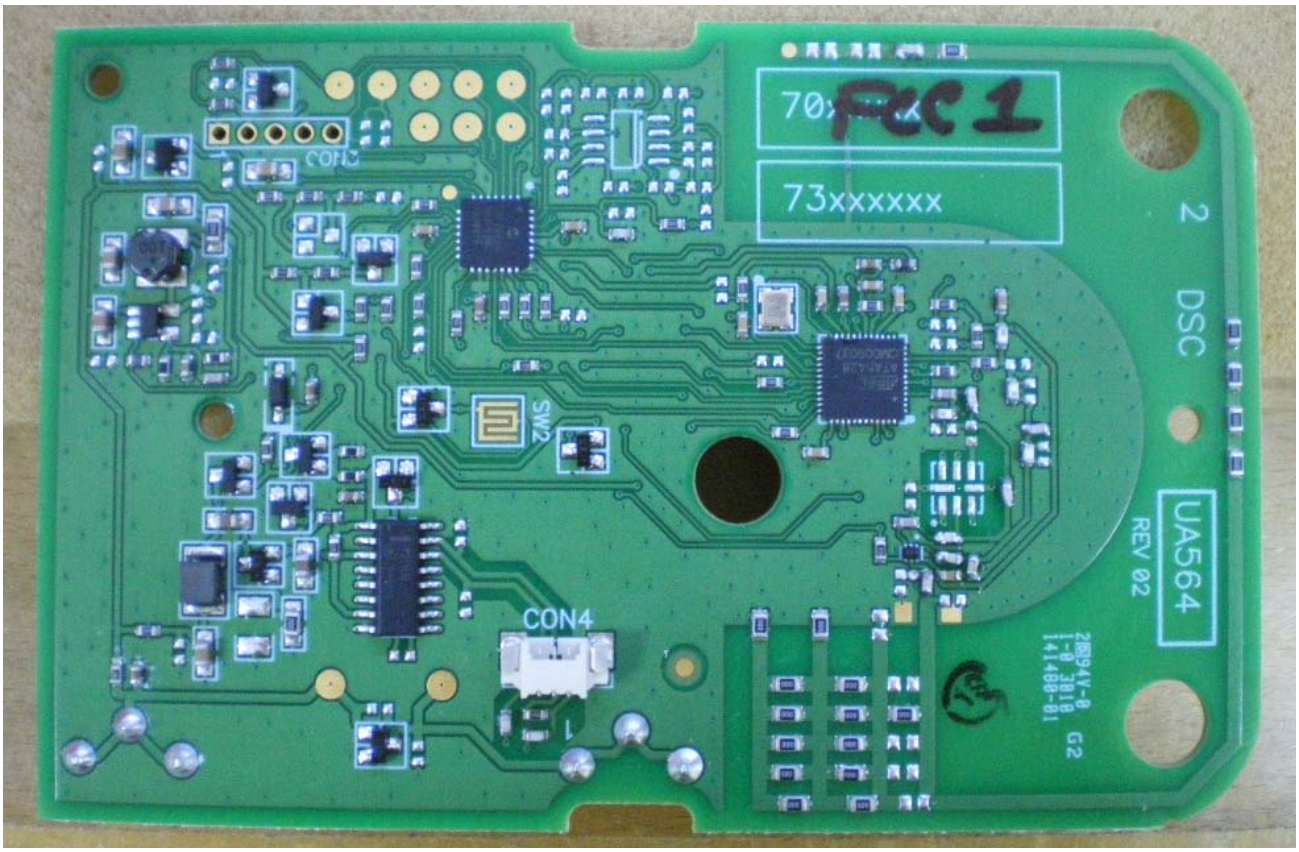
Radiated emissions set-up



Section 10: EUT photos

EUT photos

EUT photos, continued



EUT photos, continued