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Compliance test report ID 216640-1TRFWL

Date of issue
August 28, 2012

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, a Division of Tyco Safety Products Canada Ltd.
Product	Wireless Alarm Transceiver
Model	TR5164-433
Part number	TR5164-433 (UA609 Rev.01)
FCC ID	F5312TR5164

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

SCC Accredited LAB
LAB Accrédité CCN

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Tested by David Duchesne, Senior EMC/Wireless Specialist and Predrag Golic, EMC Specialist

Reviewed by Andrey Adelberg, Senior EMC/Wireless Specialist

August 28, 2012
Date

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.

Copyright notification

Table of Contents

Section 1 Report summary

1.1 Test specifications

FCC 47 CFR Part 15, Subpart C, Chapter 15.231

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

1.2 Statement of compliance

In the configuration tested, the EUT was found compliant.

Testing was completed against all relevant requirements of the test standard. Results obtained indicate that the product under test complies in full with the requirements tested. The test results relate only to the items tested.

See "Summary of test results" for full details.

1.3 Exclusions

None

1.4 Test report revision history

Original report issued

Section 2 Summary of test results

2.1 Results

Table 2.1-1: FCC Part 15 Radio frequency devices – results

Part	Test description	Verdict
§15.31(e)	Variation of power source	Pass [1]
§15.203	Antenna requirement	Pass [2]
§15.207(a)	Conducted limits	Pass [3]
§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	Not applicable [4]
§15.231(e)	Conditions for intentional radiators to comply with periodic operation	Not applicable [5]

Notes:
[1] Fundamental field strength was measured with supply voltage varied between 85 and 115% of the nominal rated supply voltage. (AC input of host panel is 120 V_{AC}. Voltage was varied between 102 and 138 V_{AC}. No change in fundamental field strength was observed.
[2] The EUT is equipped with an integral antenna.
[3] The EUT is not AC powered; however conducted disturbance at mains port was assessed on the host alarm panel.
[4] The EUT does not operate in the frequency range of 40.66–40.70 MHz.
[5] The EUT does not periodically transmit at predetermined intervals.

Section 3 Equipment under test (EUT) details

3.1 Applicant and manufacturer

Company name	Digital Security Controls, a Division of Tyco Safety Products Canada Ltd.
Company address	3301 Langstaff Road, Concord, ON, Canada L4K 4L2

3.2 Sample information

Receipt date	August 20, 2012
Nemko sample ID number	Item # 1

3.3 EUT information

Product name	Wireless Alarm Transceiver
Model	TR5164-433
HW	UA609 Rev.01
Serial number	None
Power requirements	12 V_{DC} (powered via a host alarm panel – Keybus connection)

Product description and theory of operation

The EUT is a 64 zone wireless alarm transceiver for use with DSC Power Series Control panels. The EUT monitors the status of the enrolled wireless initiating devices. Receives RF signals from security and fire detection devices (using 1-way RF protocol) and transmits RF commands to wireless keypad or sirens (using 2-way RF protocol). Operates at 433.92 MHz

Software details

Ver 1.0

3.4 Technical information

Operating frequency	433.92 MHz
Modulation type	On/Off Keying
Occupied bandwidth	72 kHz (20 dB bandwidth)
Antenna information	Integrated antenna

3.5 EUT exercise and monitoring details

Client provided modified sample that could be set for continuous transmission or normal functionality.

3.6 EUT setup diagram

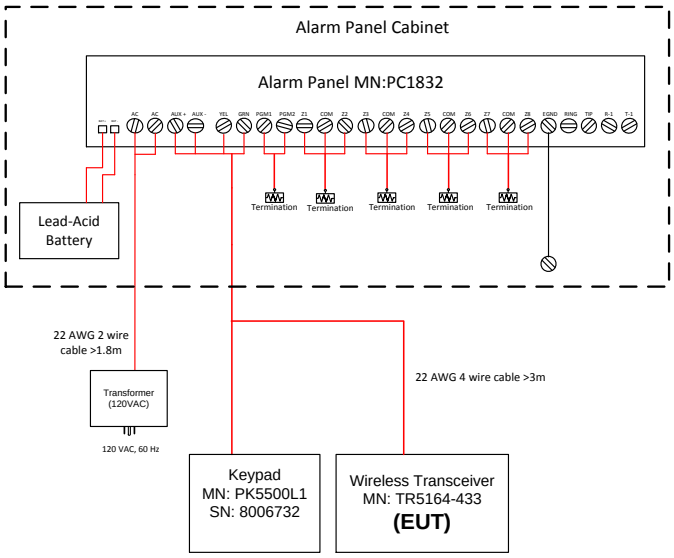


Diagram 3.6-1: Setup diagram (Conducted AC emissions setup)

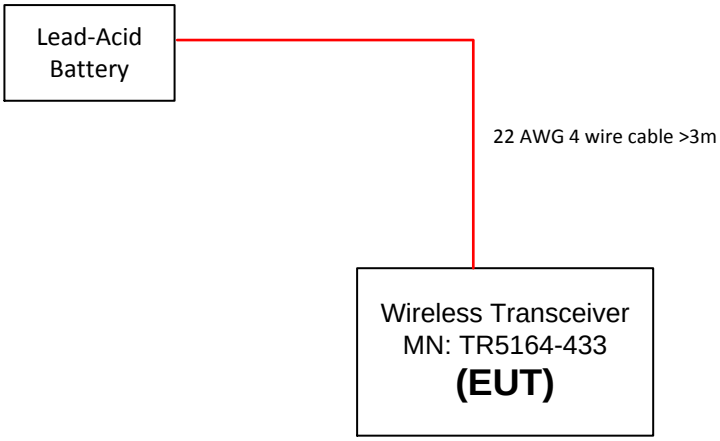


Diagram 3.6-2: Setup diagram

Section 4 Engineering considerations

4.1 Modifications incorporated in the EUT

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

4.2 Technical judgment

None

4.3 Deviations from laboratory tests procedures

No deviations were made from laboratory procedures.

Section 5 Test conditions

5.1 Atmospheric 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.

5.2 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

6.1 Uncertainty of measurement

Nemko Canada Inc. has calculated measurement uncertainty and is documented in EMC/MUC/001 “Uncertainty in EMC measurements.” Measurement uncertainty was calculated using the methods described in CISPR 16-4 Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC measurements; as well as described in UKAS LAB34: The expression of Uncertainty in EMC Testing. Measurement uncertainty calculations assume a coverage factor of K=2 with 95% certainty.

Section 7 Test equipment

Table 6.1-1: Test equipment

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
3 m EMI test chamber	TDK	SAC-3	FA002047	1 year	Mar. 09/13
Power Source	California Instruments	5001ix	FA001770	1 year	June 13/13
Receiver/spectrum analyzer	Rohde & Schwarz	ESU 26	FA002043	1 year	May 16/13
Bilog antenna	Sunol	JB3	FA002108	1 year	Feb. 07/13
Horn antenna #2	EMCO	3115	FA000825	1 year	Feb. 24/13
50 coax cable	Huber + Suhner	NONE	FA002392	1 year	June. 27/13
50 coax cable	Huber + Suhner	NONE	FA002074	1 year	Aug. 23/13
1–18 GHz pre-amplifier	JCA	JCA118-503	FA002091	1 year	July 03/13
50 coax cable	Huber + Suhner	None	FA002394	1 year	June 27/13
LISN	Rohde & Schwarz	ENV216	FA002023	1 year	Nov. 18/12

Notes: None

Section 8 Testing data

8.1 § 15.207(a) Conducted limits

8.1.1 Definitions and limits

(a) Except as shown in paragraphs (b) and (c) of this section (§ 15.207), for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Table 8.1-1: Conducted emissions limit

Frequency of emission (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50
*-Decreases with the logarithm of the frequency.		

8.1.2 Test summary

Verdict Pass

8.1.3 Observations/special notes

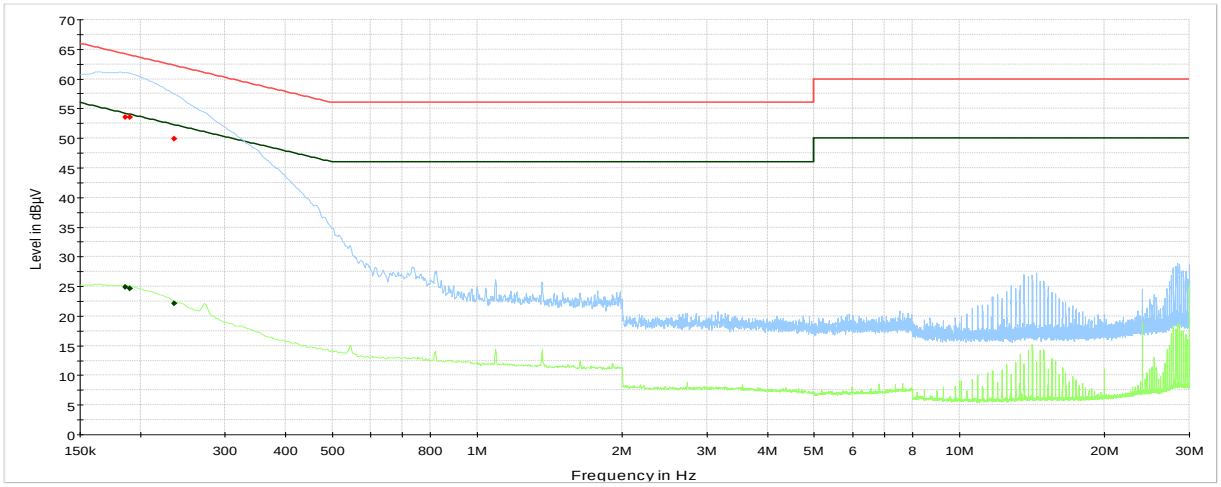
The EUT was set up as table top configuration.

8.1.4 Test data

Test date	August 23, 2012	**Test engineer**	Predrag Golic		
Temperature	22.8 °C	**Air pressure**	1005.6 mbar	**Relative humidity**	52.8 %

Port under test	AC input of host alarm panel
Receiver/spectrum analyzer settings	Preview measurements – Receiver: Peak and Average detector (Max hold), RBW = 9 kHz, VBW = 30 kHz, Measurement time = 100 ms Final measurements – Receiver: Q-Peak and Average detector, RBW = 9 kHz, VBW = 30 kHz, Measurement time = 100 ms
Measurement details	A preview measurement was generated with the receiver in continuous scan mode. 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.

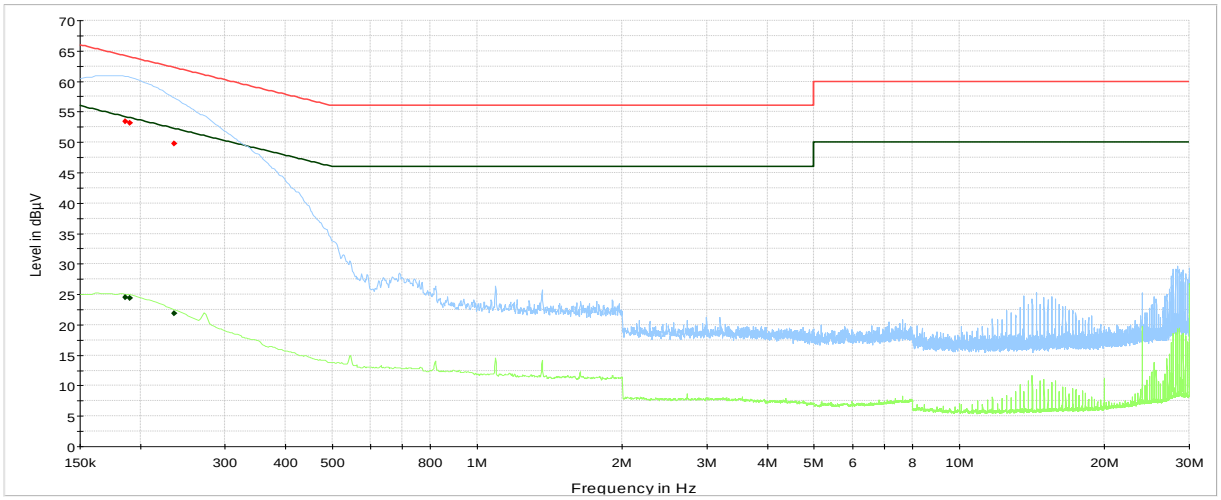
8.1.4 Test data, continued



2R216640 - CE 120VAC 60Hz; Phase
CISPR 22 Mains QP Class B
CISPR 22 Mains AV Class B
Peak Detector Scan
Average Detector Scan
Quasi-Peak Detector Measurement
Average Detector Measurement

The spectral plot has been corrected with transducer factors. (i.e. cable loss, LISN factors, and attenuators)

Plot 8.1-1: Conducted emissions on phase line



2R216640 - CE 120VAC 60Hz; Neutral
CISPR 22 Mains QP Class B
CISPR 22 Mains AV Class B
Peak Detector Scan
Average Detector Scan
Quasi-Peak Detector Measurement
Average Detector Measurement

The spectral plot has been corrected with transducer factors. (i.e. cable loss, LISN factors, and attenuators)

Plot 8.1-2: Conducted emissions on neutral line

8.1.5 Setup photos

Photo 8.1-1: Conducted emissions setup

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

8.2.1 Definitions and limits

(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.

8.2.2 Test summary

Verdict Pass

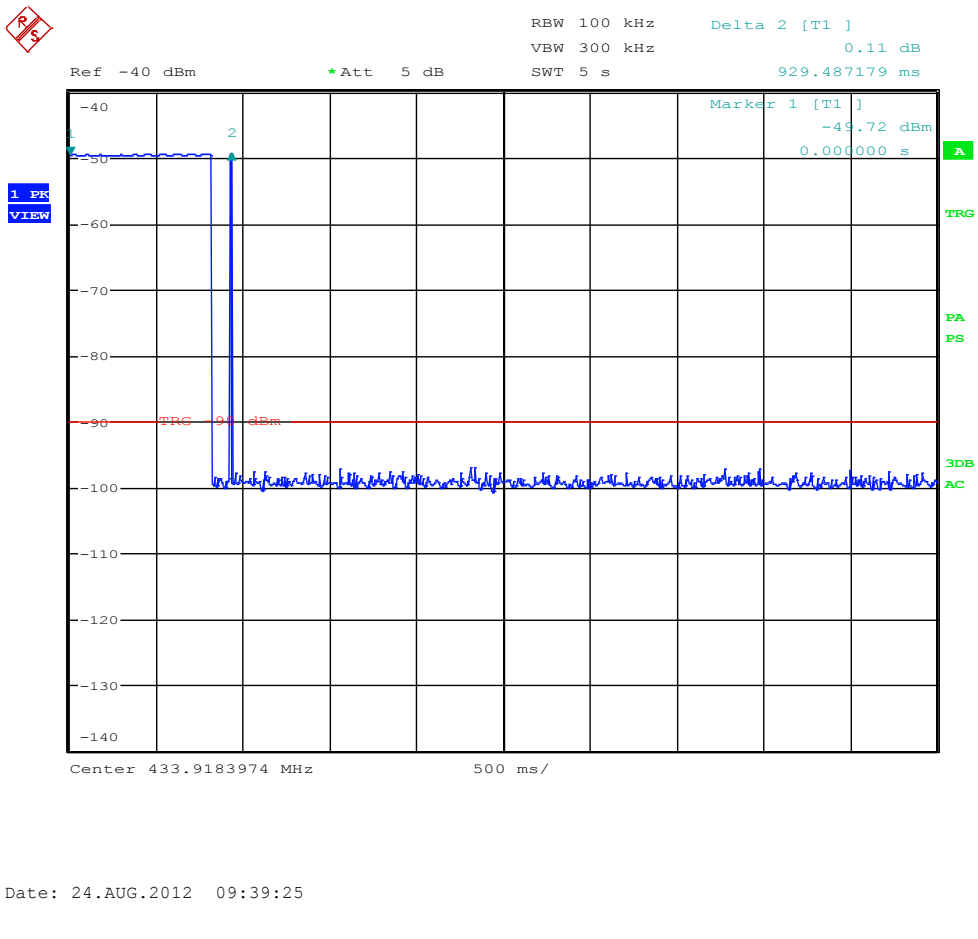
8.2.3 Observations/special notes

None

8.2.4 Test data

Test date	August 24, 2012		**Test engineer**	David Duchesne	
Temperature	23.6 °C	**Air pressure**	1009 mbar	**Relative humidity**	59 %

This EUT does not support wireless continuous transmissions, voice, video and the radio control of toys. This equipment is sending control signals to turn on/off the display of a wireless remote keypad (WT5500-433) when an emergency condition (fire, burglary, panic alarm) occurs in the alarm system. The device does not support manual initiation of wireless transmission. The automatically initiated transmission of the emergency condition does not exceed 2 seconds in duration. There are no periodic supervisory signals transmitted by this device.



Plot 8.2-1: Transmit duration

8.3 § 15.231(b) Field strength of emissions

8.3.1 Definitions and limits

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:

Table 8.3-1: Field strength limits

Fundamental frequency	Field strength of fundamental		Field strength of spurious emissions	
(MHz)	(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

Notes: * 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.

8.3.2 Test summary

Verdict Pass

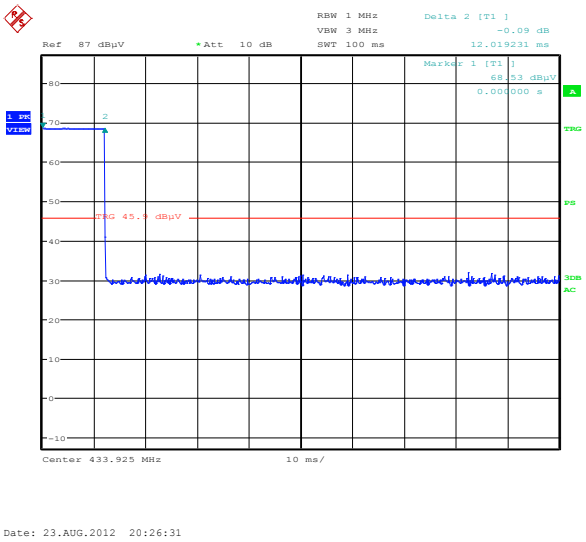
8.3.3 Observations/special notes

- The transmitter was operated at its maximum carrier power.
- The EUT was set up as table top configuration.
- The field strength from spurious emissions were below the general limits of §15.209. See spectral plots of this section.
- The spectrum was searched from 30 MHz to the 10th harmonic.

8.3.4 Test data

Test date	August 23, 2012		**Test engineer**	David Duchesne	
Temperature	22.7 °C	**Air pressure**	1006 mbar	**Relative humidity**	49 %

§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.



Plot 8.3-1: 100 ms sweep time

$Tx_{100\ ms}$ = 12.01 ms

$$Duty\ cycle/average\ factor = 20 \times Log_{10}\ \frac{Tx_{100\ ms}}{100\ ms}$$

$$Duty\ cycle/average\ factor = 20 \times Log_{10}\ \frac{12.01\ ms}{100\ ms} = -18.41\ dB$$

8.3.5 Test data, continued

Table 8.3-2: § 15.231(b) Field strength of fundamental results

Tx. freq. (MHz)	Antenna Pol. (V/H)	Peak field strength (dBµV/m)	Peak field strength Limit (dBµV/m)	Peak field strength Margin (dB)	Duty cycle correction factor (dB)	Average field strength (dBµV/m)	Average field strength Limit (dBµV/m)	Average field strength Margin (dB)
433.92	V	95.73	100.83	5.10	-18.41	77.32	80.83	3.51
433.92	H	89.64	100.83	11.19	-18.41	71.23	80.83	9.60

Notes:
- Spectrum analyzer setting: Peak detector, RBW = 100 kHz, VBW = 300 kHz, Measurement time = 100 ms
- Measuring distance (m): 3
- Test facility: 3 m Semi anechoic chamber
- Antenna height variation (m): 1–4
- Turn table position (°):0–360
- Duty cycle correction factor as calculated from §15.35 (c).
- Average field strength (dBµV/m) = Peak field strength (dBµV/m) + Duty cycle correction factor (dB)

Table 8.3-3: § 15.231(b) Field strength of spurious emissions results

Emission frequency (GHz)	Antenna Pol. (V/H)	Peak field strength (dBµV/m)	Peak field strength Limit (dBµV/m)	Peak field strength Margin (dB)	Duty cycle correction factor (dB)	Average field strength (dBµV/m)	Average field strength Limit (dBµV/m)	Average field strength Margin (dB)
1.7355	V	55.15	80.83	25.68	-18.41	36.74	60.83	24.09
3.4715	V	56.45	80.83	24.38	-18.41	38.04	60.83	22.79

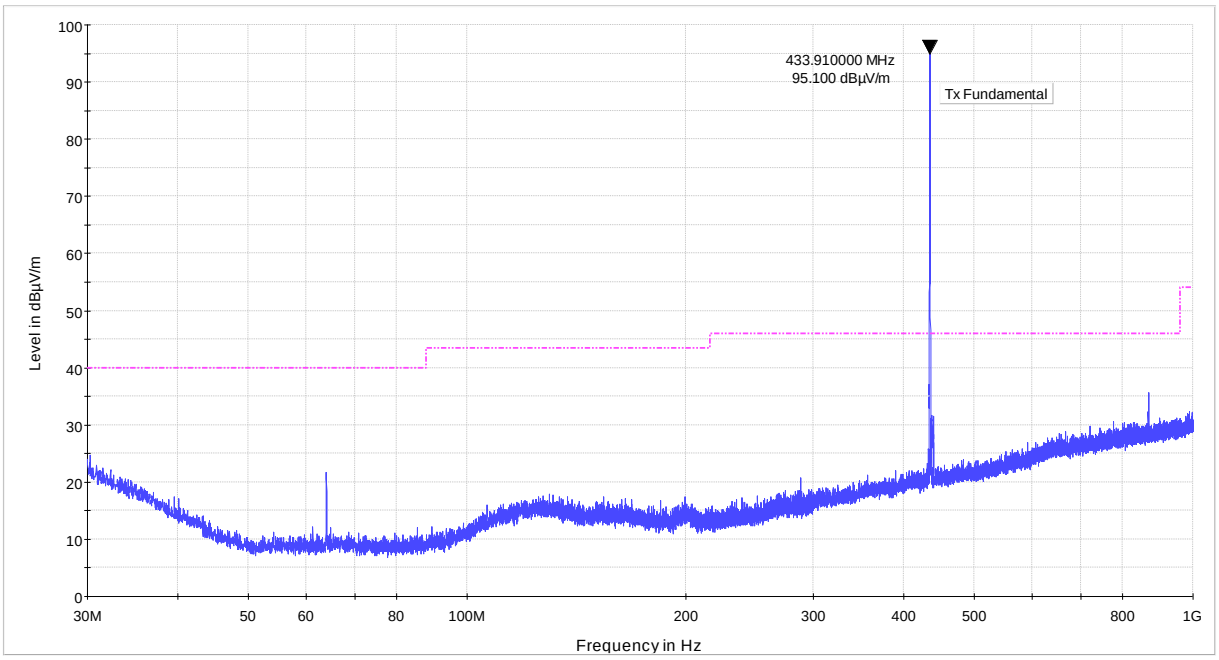
Notes:
- Spectrum analyzer setting for measurements:
  - 30 to 1000 MHz: Peak detector, RBW = 100 kHz, VBW = 300 kHz, Measurement time = 100 ms
  - Above 1 GHz: Peak detector, RBW = 1 MHz, VBW = 3 MHz, Measurement time = 100 ms
- Measuring distance (m): 3
- Test facility: 3 m Semi anechoic chamber
- Antenna height variation (m): 1–4
- Turn table position (°):0–360
- Duty cycle correction factor as calculated from §15.35 (c).
- Average field strength (dBµV/m) = Peak field strength (dBµV/m) + Duty cycle correction factor (dB)
- All other emissions were greater than 10 dB from limit.

Table 8.3-4: Radiated emissions falling within restricted bands as defined in §15.205(a), results

All emissions within restricted bands were attenuated more than 10 dB below limit.

Notes:
- Spectrum analyzer setting: Peak detector, RBW = 1 MHz, VBW = 3 MHz, Measurement time = 100 ms
- Measuring distance (m): 3
- Test facility: 3 m Semi anechoic chamber
- Antenna height variation (m): 1–4
- Turn table position (°):0–360
- Duty cycle correction factor as calculated from §15.35 (c).
- Average field strength (dBµV/m) = Peak field strength (dBµV/m) + Duty cycle correction factor (dB)

8.3.5 Test data, continued

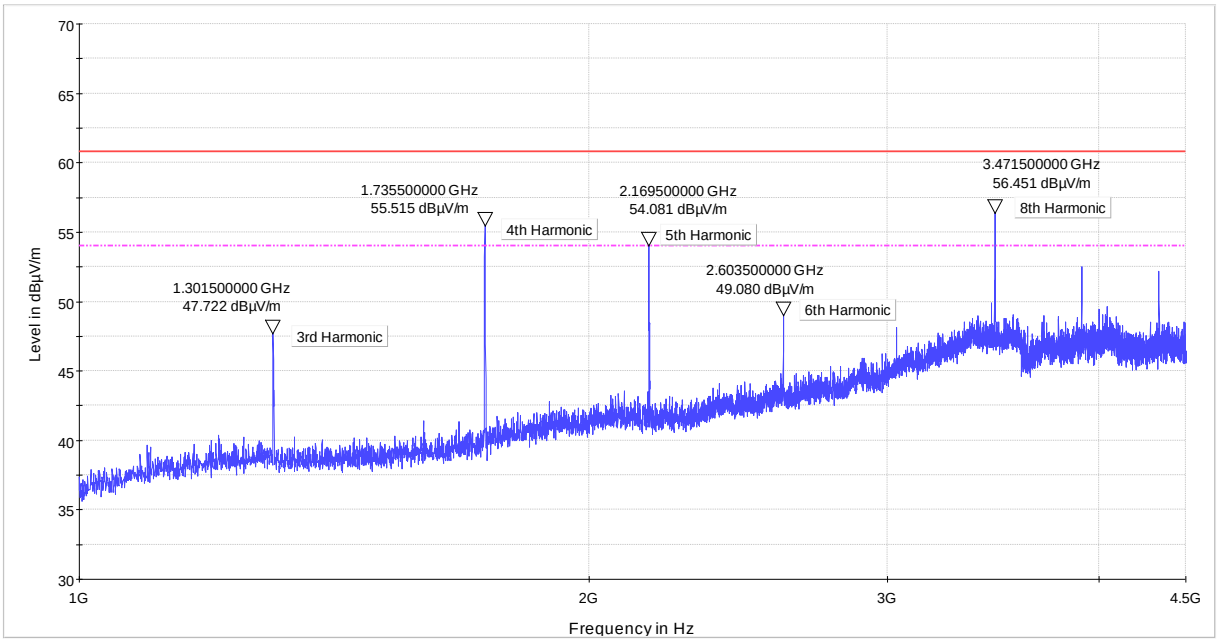


Vertical and Horizontal
Preview Peak Detector
FCC 15.209 and RSS-210 3m Q-Peak Limit

The spectral plot is a summation of a vertical and horizontal scan. The spectral scan has been corrected with the associated transducer factors (i.e. antenna factors, cable loss, amplifier gains, and attenuators.

Plot 8.3-2: Radiated emissions (30 to 1000 MHz)

8.3.6 Test data, continued



Vertical and Horizontal
Preview Peak Detector
FCC 15.231 (b) 3m Average Limit
FCC 15.209 and RSS-210 3m Average Limit

The spectral plot is a summation of a vertical and horizontal scan. The spectral scan has been corrected with the associated transducer factors (i.e. antenna factors, cable loss, amplifier gains, and attenuators.

Plot 8.3-3: Radiated emissions (1 to 4.5 GHz)

8.3.7 Setup photos

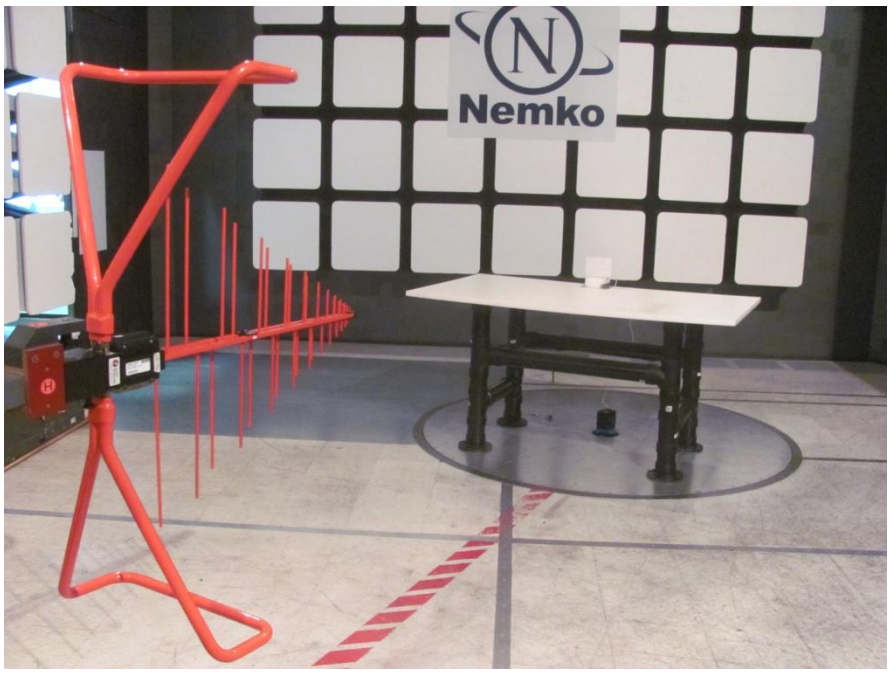


Photo 8.3-1: Field strength of emissions setup

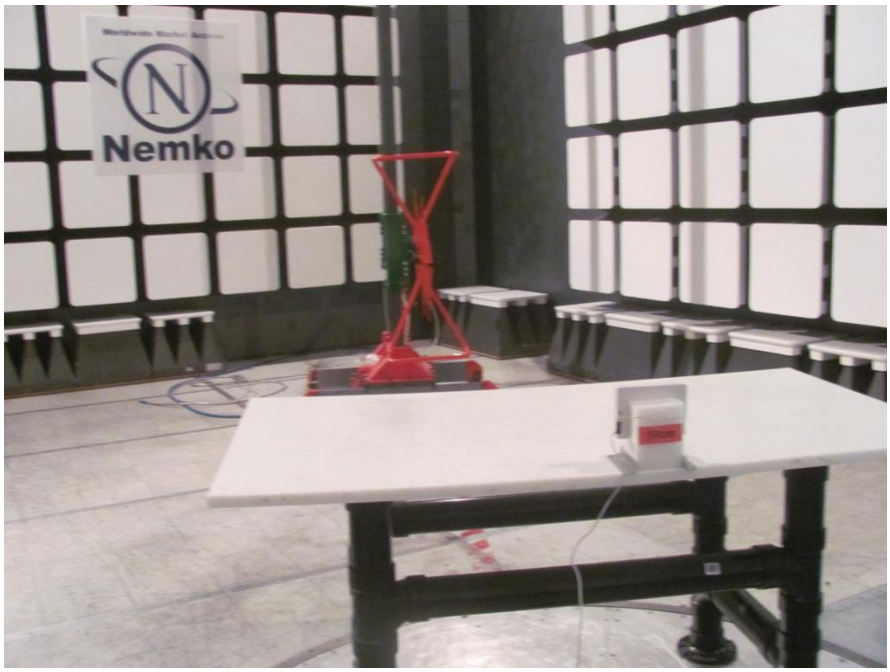


Photo 8.3-2: Field strength of emissions setup

8.4 § 15.231(c) Emission bandwidth

8.4.1 Definitions and limits

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.

8.4.2 Test summary

Verdict Pass

8.4.3 Observations/special notes

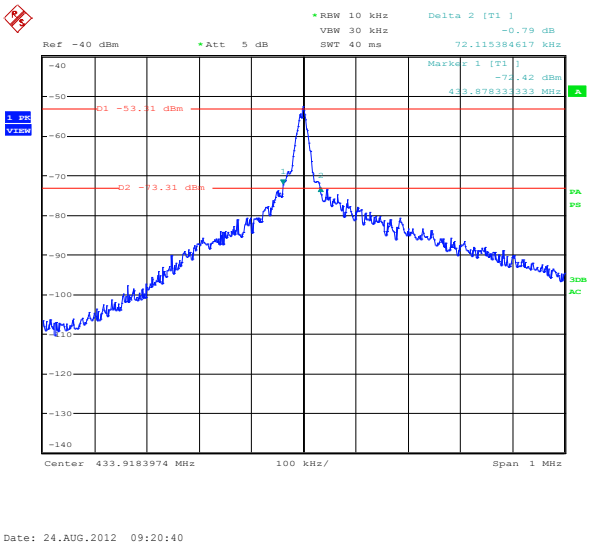
The transmitter was operated at its maximum carrier power.

8.4.4 Test data

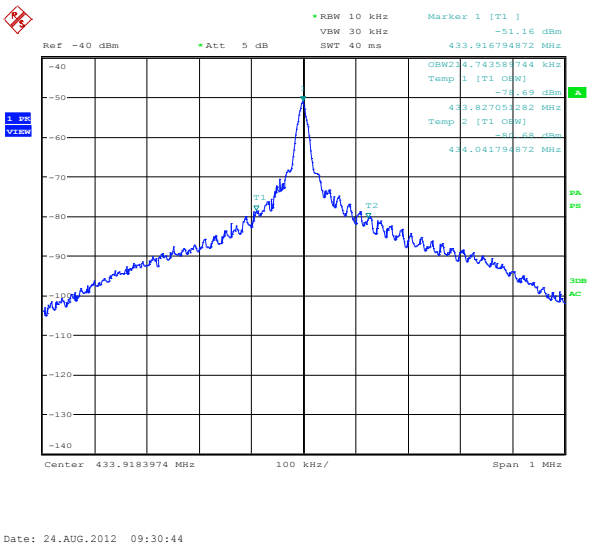
Test date	August 23, 2012		**Test engineer**	David Duchesne	
Temperature	22.7 °C	**Air pressure**	1006 mbar	**Relative humidity**	49 %

Table 8.4-1: 20 dB bandwidth results

20 dB bandwidth (kHz)	Limit (kHz)
72	1084.8
Notes: Limit = 0.25 % of 433.92 MHz is 1084.8 kHz	



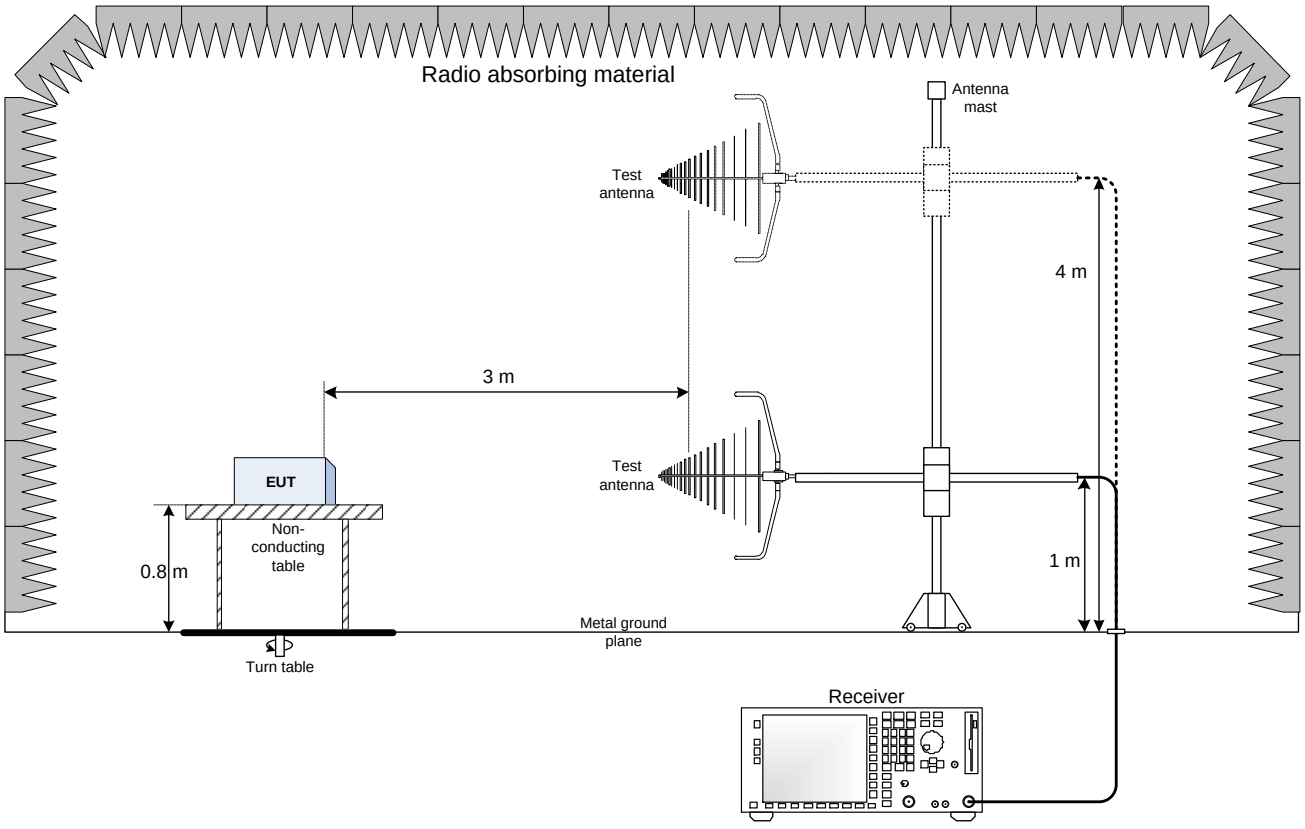
Plot 8.4-1: 20 dB bandwidth



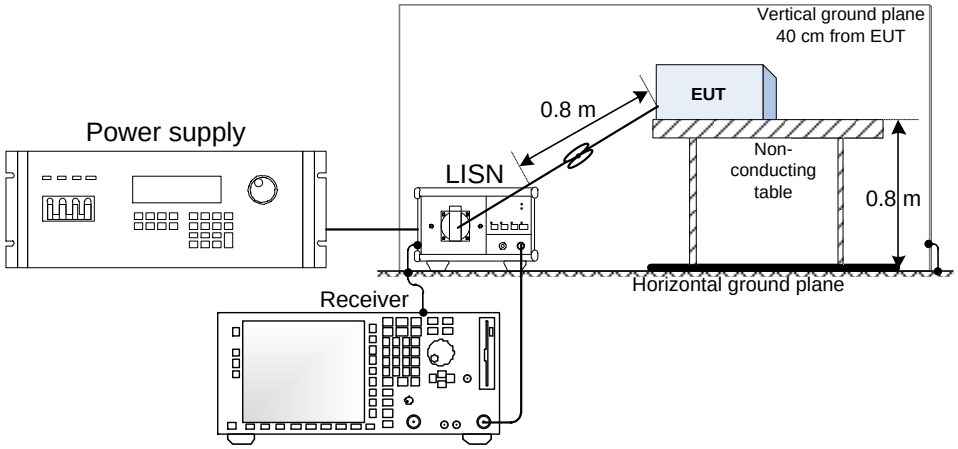
Plot 8.4-2: 99% OBW

Section 9 Block diagrams of test set-ups

9.1 Radiated emissions set-up



9.2 AC conducted emissions set-up



Section 10 EUT photos

10.1 External photos