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Compliance test report **170757-1TRFWL**

Date of issue
April 12, 2011

FCC Part 15, Subpart C, Section §15.239

Operation in the band 88–108 MHz

Applicant	**Decade Transmitters inc.**
Product	**FM transmitter**
Model	**CM-10 / LT-100**
FCC ID	**MCHCM-LT**

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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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

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Section 1: Report summary

1.1 Applicant

Decade Transmitter Inc.
3232 Richard street, unit 4
Sherbrooke, QC
J1L 1Y2 Canada

1.2 Manufacturer

Decade Transmitter Inc.
3232 Richard street, unit 4
Sherbrooke, QC
J1L 1Y2 Canada

1.3 Test specification

FCC Part 15, Subpart C, Section §15.239: Operation in the band 88–108 MHz

1.4 Statement of compliance

In the configuration tested the EUT was found compliant.

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 FCC Part 15 Subpart C.

1.5 Site registration number

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

1.6 Test report revision history

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

Section 2: Summary of test results

2.1 General requirements for FCC Part 15

Part	Test description	Verdict
§15.31(e)	Variation of power source	Pass[1]
§15.31(m)	Number of operating frequencies	Pass[2]
§15.203	Antenna requirement	Pass[3]
§15.207(a)	Conducted limits	Pass
§15.215(c)	20 dB bandwidth	Pass

Notes:
[1] - Transmit field strength was verified while supply voltage was varied from 85 to 115 % of the nominal rated supply voltage. No change in transmit field strength was observed.
[2] - The frequency range over which the device operates is greater than 10 MHz. Tests were performed on three operating channels (low, mid and high).
[3] – The EUT has an integrated antenna

2.2 Specific requirements for FCC Section 15.239

Part	Test description	Verdict
§15.239(a)	Occupied bandwidth	Pass
§15.239(b)	Field strength of fundamental emission	Pass
§15.239(c)	Field strength of spurious emissions	Pass

Section 3: Equipment under test (EUT) details

3.1 Product details

Model	CM-10 / LT-100
FCC ID	MCHCM-LT
Type of product	Stereo FM Transmitter

3.2 Product description

The Decade CM-10 / Artika LT-100 is a low power FM transmitter operating in the 88–108 MHz band. It is designed around the Rohm BH1415F FM transmitter integrated circuit. This IC contains all the functions needed to implement an FM transmitter: audio limiter, pre-emphasis, 15 kHz low-pass filter, stereo generator (MPX), PLL frequency synthesizer, VCO with varicap diode modulator, RF buffer amplifier and crystal oscillator used by the PLL and the MPX.

Beside the BH1415F circuitry, the CM-10 also contains a microphone pre-amplifier, volume controls for both the line inputs and the microphone input, a low-pass filter at the RF output (for harmonics and spurious rejection) and an output attenuator. There is also a MCU used for frequency selection (through UP / DOWN push buttons) and display on a LCD display. Finally, it also contains a power supply that generates the +5 V_{DC} and the +12 V_{DC} voltages used by the various circuits.

3.3 Sample information

Receipt date	March 16, 2011
Nemko sample ID number	1, 2
Sample model provided	Decade CM-10 (representative model)

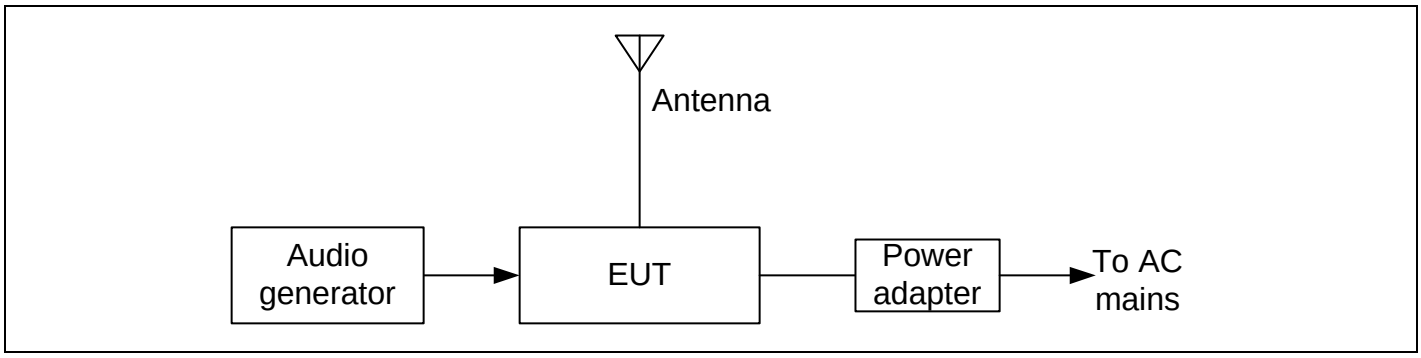
3.4 EUT technical specifications

Operating bands	88–108 MHz
Operating frequencies	88.1–107.5 MHz
Modulation type	FM with 75 kHz deviation
Channel spacing	200 kHz
Occupied bandwidth	40.7 kHz
Emission designator	40K7F8EHF
Power source	120 V_{AC}, 60 Hz
Antenna types	Integrated telescopic antenna

3.5 Operation of the EUT during testing

The EUT was set to transmit on low, mid and high channels. The transmitter input was modulated with a 2.5 kHz tone at a voltage level of 0.5 V_{rms}. to reach 50 % of rated deviation.

3.6 EUT setup diagram



Item 1 (EUT)	**Model**	FM Transmitter CM-10
	Part number	CM-10
	Serial number	None
Item 2 (Power adapter)	**Model**	JVC AC adapter
	Model number	AP-V400U
	Serial number	0706083890

Section 4: Engineering considerations

4.1 Modifications incorporated in the EUT

In order to comply with fundamental requirements the client had to perform the following modification:
The value of R23 was increased from 1.5K to 2.2K. R23 is part of the output attenuator.

4.2 Deviations from laboratory tests procedures

No deviations were made from laboratory test procedures

4.3 Technical judgment

None

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 Measurement uncertainty

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

7.1 Test equipment list

Equipment	Manufacturer	Model No.	Asset/Serial No.	Cal. Cycle	Next cal.
3 m EMI test chamber	TDK	SAC-3	FA002047	1 year	Mar. 09/12
Flush mount turntable	Sunol	FM2022	FA002082	—	NCR
Controller	Sunol	SC104V	FA002060	—	NCR
Antenna mast	Sunol	TLT2	FA002061	—	NCR
International power supply	California Inst.	3001I	FA001021	1 year	Jan. 26/12
Receiver/spectrum analyzer	Rohde & Schwarz	ESU 26	FA002043	1 year	April 14/11
Spectrum analyzer	Rohde & Schwarz	FSU	FA001877	1 year	Dec.06/11
Bilog antenna	Sunol	JB3	FA002108	1 year	Jan. 31/12
Horn antenna #2	Emco	3115	FA000825	1 year	Feb. 04/12
1–18 GHz pre-amplifier	JCA	JCA118-503	FA002091	1 year	Sept. 23/11
LISN	Rohde & Schwarz	ENV216	FA002023	1 year	Nov. 09/11
50 coax cable	Huber + Suhner	NONE	FA002015	1 year	Sept. 01/11
Audio generator	GW	GAG-808G	FA001034	—	COU
Note: NCR = No Calibrate Required; COU = Calibrate On Use					

Section 8: Testing data

8.1 Clause 15.207(a) Conducted limits

Except as shown in paragraphs (b) and (c) of this section, 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: Limits for conducted emissions on AC line

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.		

8.1.1 Test summary

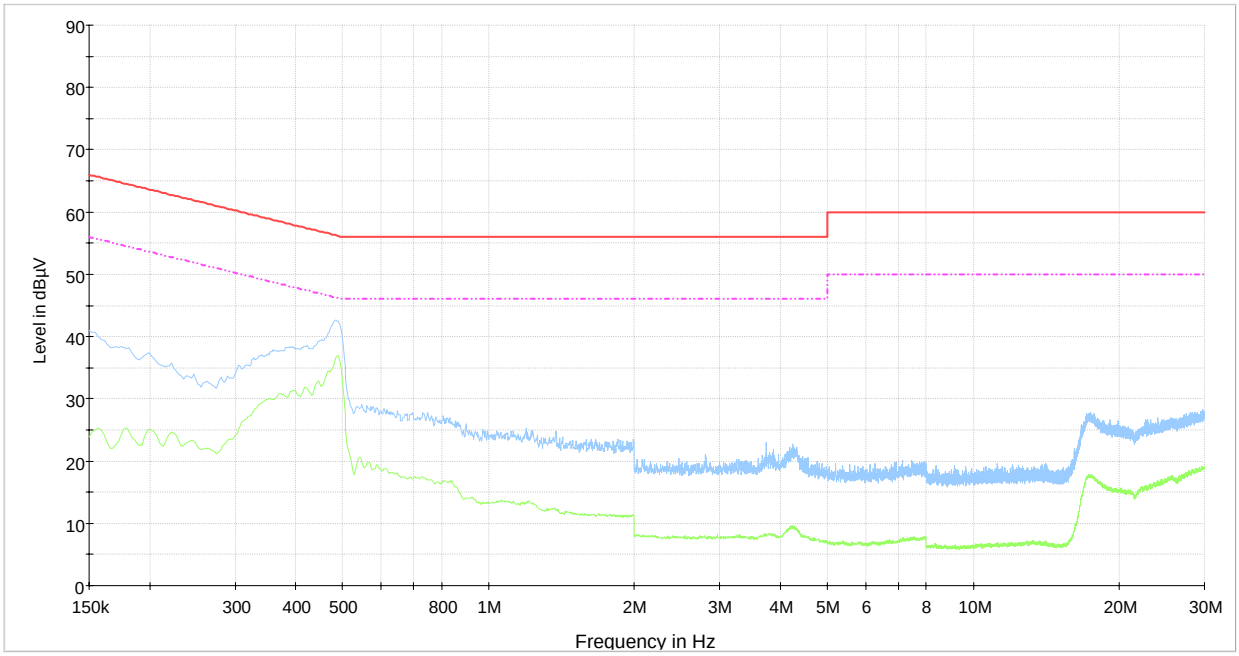
Test date	March 16, 2011	**Test engineer**	Andrey Adlberg	**Verdict**	Pass
Temperature	23 °C	**Air pressure**	1004 mbar	**Relative humidity**	30 %

8.1.2 Special notes

The spectral scan has been corrected with transducer factors (i.e. cable loss, LISN factors, and attenuators) for determination of compliance.

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.

8.1.3 Test data



Plot 8.1-1: Conducted emissions on phase line

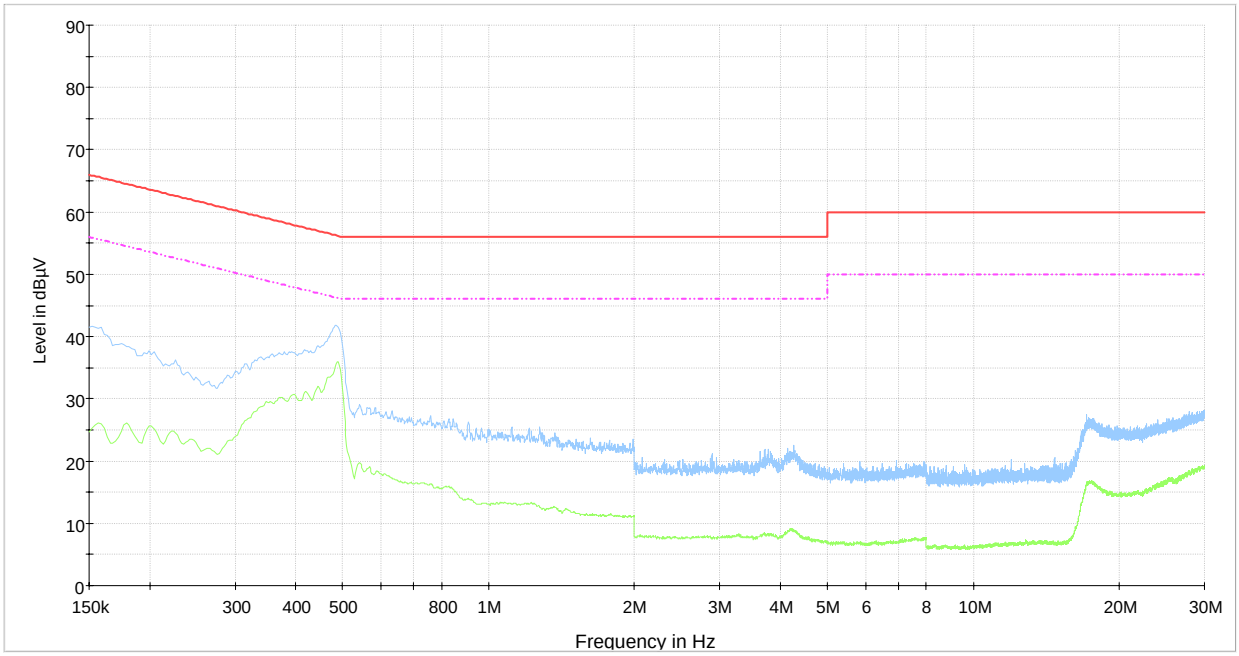
Receiver/Spectrum analyzer settings:

0.15 MHz to 30 MHz

Preview measurements	Receiver: 9 kHz RBW, Peak (blue) and Average (green) detector, max hold
Final measurement	Receiver: 9 kHz RBW, Quasi-peak and Average (green) detector

Measurement time 100 ms

8.1.3 Test data, continued



Plot 8.1-2: Conducted emissions on neutral line

Receiver/Spectrum analyzer settings:

0.15 MHz to 30 MHz

Preview measurements	Receiver: 9 kHz RBW, Peak (blue) and Average (green) detector, max hold
Final measurement	Receiver: 9 kHz RBW, Quasi-peak and Average (green) detector

Measurement time 100 ms

8.2 Clause 15.215(c) 20 dB bandwidth

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80 % of the permitted band in order to minimize the possibility of out-of-band operation.

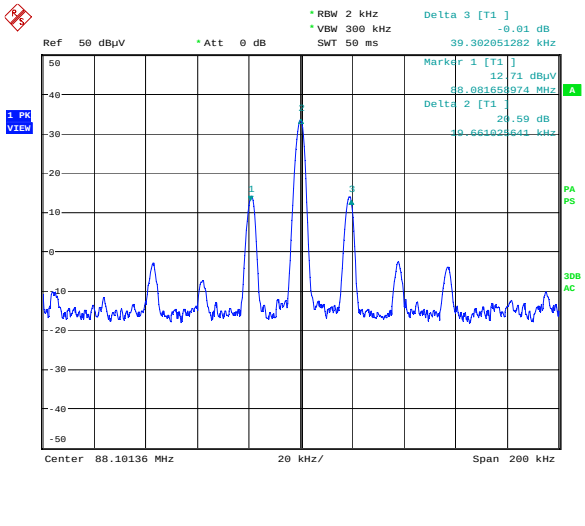
8.2.1 Test summary

Test date	March 29, 2011	**Test engineer**	Andrey Adlberg	**Verdict**	Pass
Temperature	22 °C	**Air pressure**	1002 mbar	**Relative humidity**	31 %

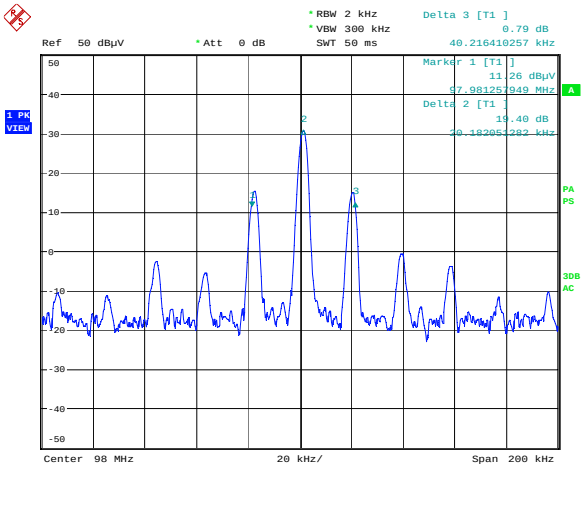
8.2.2 Special notes

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

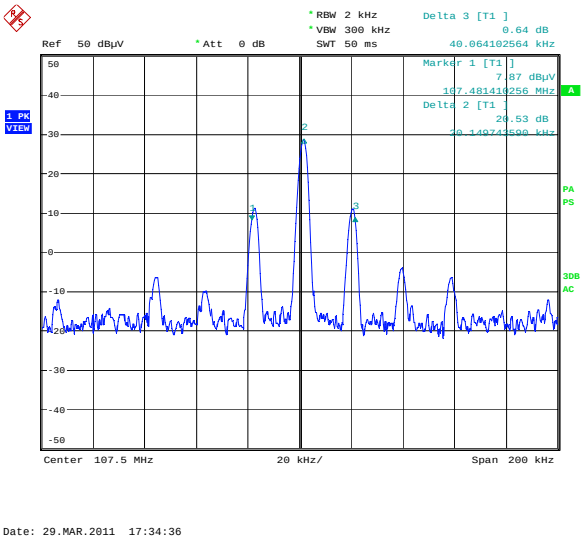
8.2.3 Test data



Plot 8.2-1: 20 dB BW, low channel



Plot 8.2-2: 20 dB BW, mid channel



Plot 8.2-3: 20 dB BW, high channel

Table 8.2-1: 20 dB bandwidth results

Channel	20 dB bandwidth, kHz
Low	39.3
Mid	40.2
High	40.1

8.3 Clause 15.239(a) Occupied bandwidth

Emissions from the intentional radiator shall be confined within a band 200 kHz wide centered on the operating frequency. The 200 kHz band shall lie wholly within the frequency range of 88–108 MHz.

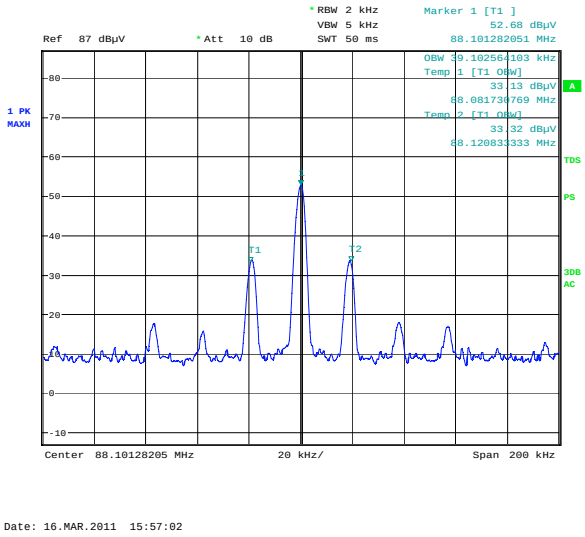
8.3.1 Test summary

Test date	March 16, 2011	**Test engineer**	Andrey Adlberg	**Verdict**	Pass
Temperature	23 °C	**Air pressure**	1004 mbar	**Relative humidity**	31 %

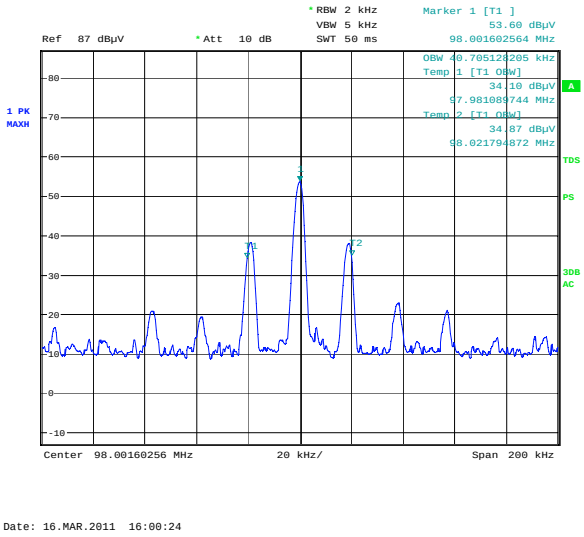
8.3.2 Special notes

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

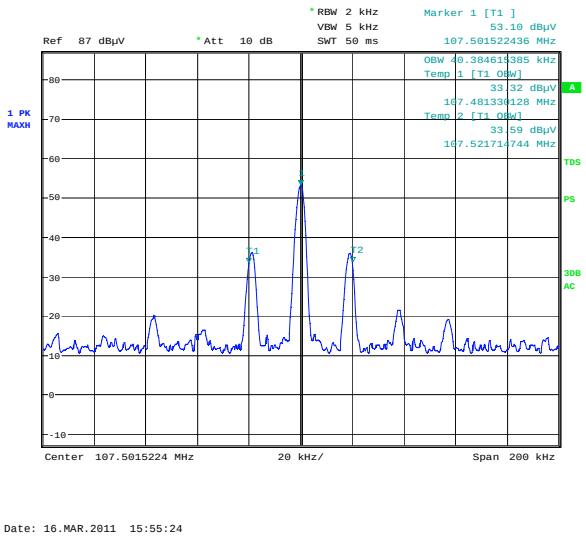
8.3.3 Test data



Plot 8.3-1: 99 % occupied BW, low channel



Plot 8.3-2: 99 % occupied BW, mid channel



Plot 8.3-3: 99 % occupied BW, high channel

Table 8.3-1: 99 % occupied bandwidth results

Channel	99 % bandwidth, kHz	BW limit, kHz	Margin, kHz
Low	39.1	200	160.9
Mid	40.7	200	159.3
High	40.4	200	159.6

Lower band edge is 88.082 MHz (Plot 8.3-1, Temp1; above 88 MHz) and upper band edge is 107.52 MHz (Plot 8.3-3, Temp2; below 108 MHz). 99 % bandwidth lies wholly within 88–108 MHz band. Lower channel central frequency is 88.101 MHz – 100 kHz = 88.001 MHz (lies within 88–108 MHz band). Upper channel central frequency is 107.501 MHz + 100 kHz = 107.601 MHz (lies within 88–108 MHz band).

8.4 Clause 15.239(b) Field strength of fundamental emission

The field strength of any emissions within the permitted 200 kHz band shall not exceed 250 microvolts/meter at 3 meters. The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply.

8.4.1 Test summary

Test date	March 29, 2011	**Test engineer**	Andrey Adlberg	**Verdict**	Pass
Temperature	23 °C	**Air pressure**	1003 mbar	**Relative humidity**	31 %

8.4.2 Special notes

The test was performed using spectum analyzer with 100 kHz RBW and 300 kHz VBW average and peak detector were applied.

8.4.3 Test data

Table 8.4-1: Field strength of average fundamental emissions results

Frequency, MHz	Average field strength, dBµV/m	Average field strength limit, dBµV/m	Margin, dB
88.1	41.4	48.0	6.6
98.0	41.4	48.0	6.6
107.5	41.3	48.0	6.7

Table 8.4-2: Field strength of peak fundamental emissions results

Frequency, MHz	Peak field strength, dBµV/m	Peak field strength limit, dBµV/m	Margin, dB
88.1	42.5	68.0	25.5
98.0	42.1	68.0	25.9
107.5	42.1	68.0	25.9

The test was performed using spectum analyzer with 100 kHz RBW, after the test RBW was tuned to 200 kHz, no significant change in peak and average field strengths were observed.

8.5 Clause 15.239(c) Field strength of spurious emissions

The field strength of any emissions radiated on any frequency outside of the specified 200 kHz band shall not exceed the general radiated emission limits in §15.209.

Table 8.5-1: FCC 15.209 Radiated emissions limits

Frequency (MHz)	Field strength	
	(µV/m)	(dBµV/m)
30–88	100	40.0
88–216	150	43.5
216–960	200	46.0
above 960	500	54.0

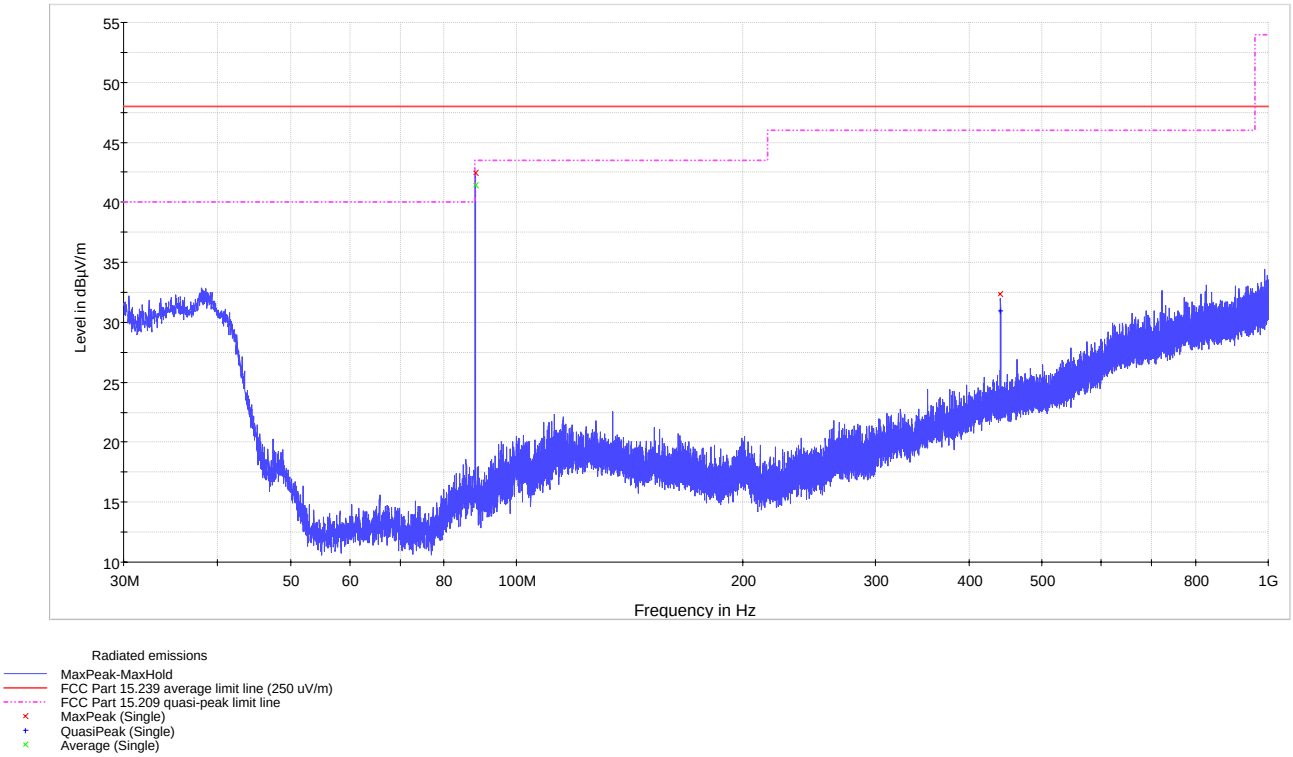
8.5.1 Test summary

Test date	March 29, 2011	**Test engineer**	Andrey Adlberg	**Verdict**	Pass
Temperature	22 °C	**Air pressure**	1003 mbar	**Relative humidity**	30 %

8.5.2 Special notes

The EUT was scanned from 30 to 1000 MHz. Spectrum analyzer was set to use CISPR quasi-peak detector with RBW of 120 kHz.

8.5.3 Test data

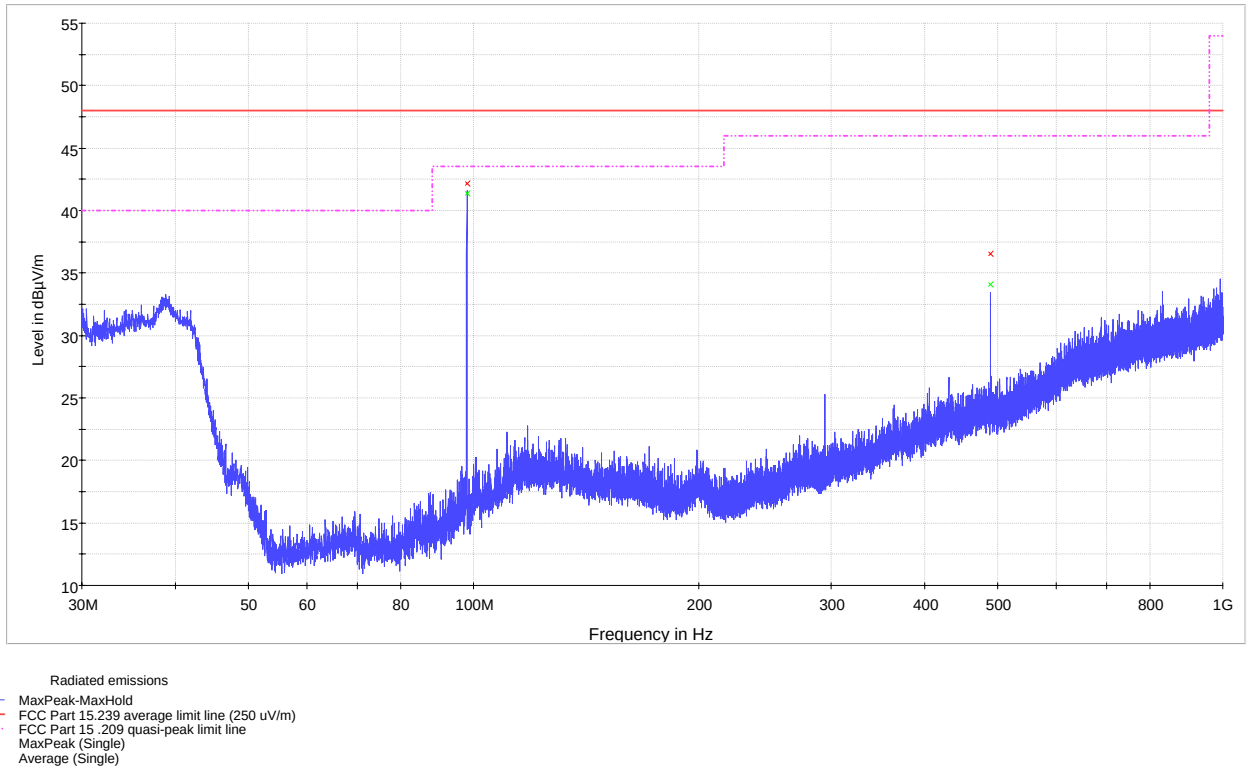


Plot 8.5-1: Radiated spurious emissions, low channel

Table 8.5-2: Low channel radiated spurious emissions results

Frequency, MHz	Field strength, dBµV/m	Limit, dBµV/m	Margin, dB
88.00	21.85	40.00	18.15
440.48	32.40	46.00	13.60

8.5.3 Test data, continued

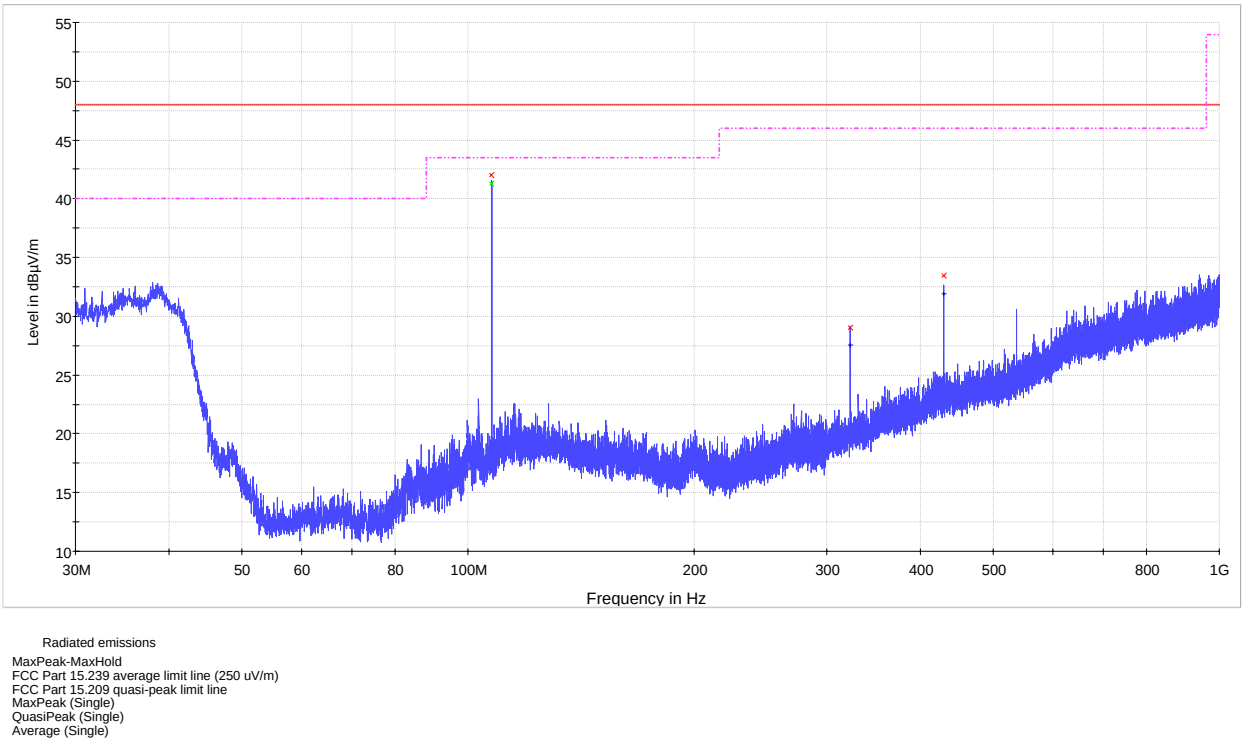


Plot 8.5-2: Radiated spurious emissions, mid channel

Table 8.5-3: Mid channel radiated spurious emissions results

Frequency, MHz	Field strength, dBµV/m	Limit, dBµV/m	Margin, dB
490.00	34.1	46.0	11.9

8.5.3 Test data, continued



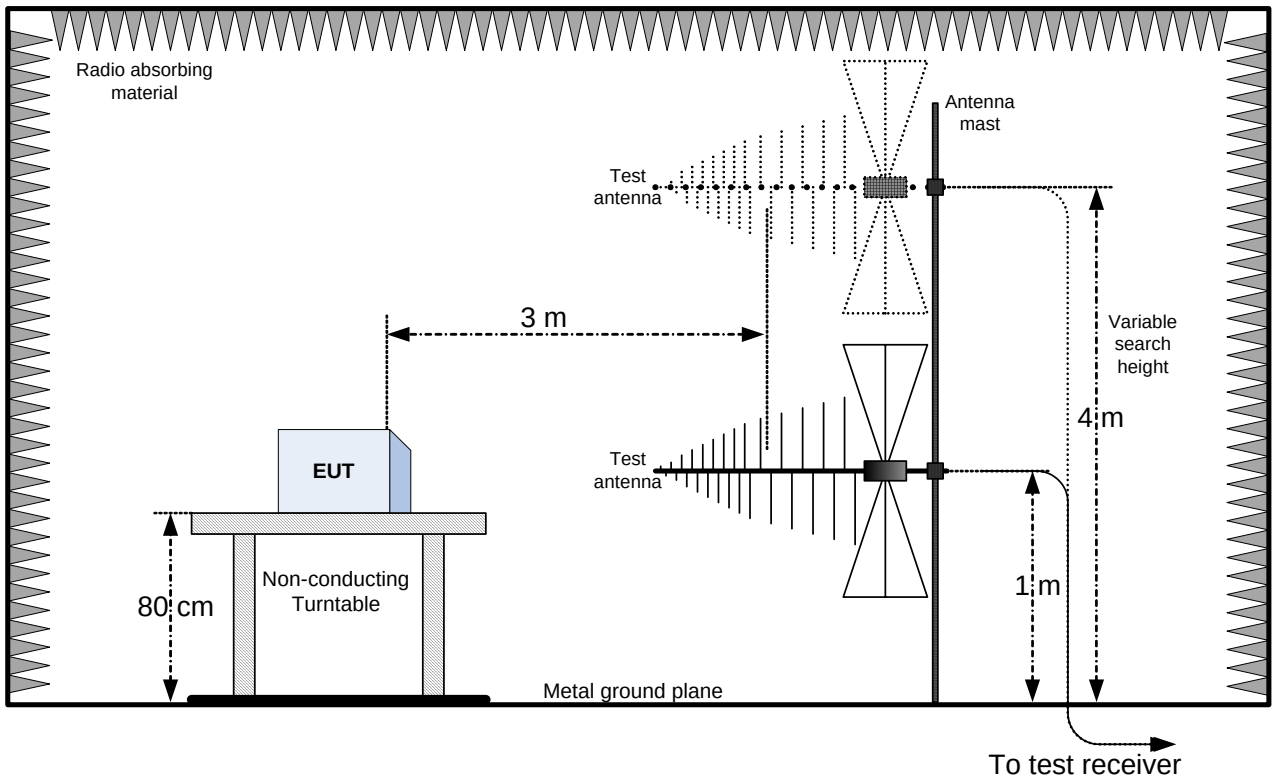
Plot 8.5-2: Radiated spurious emissions, high channel

Table 8.5-4: High channel radiated spurious emissions results

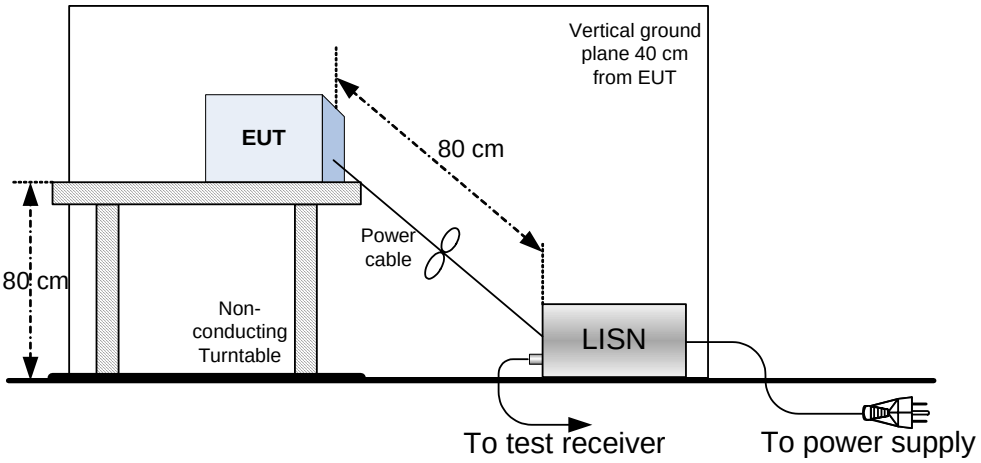
Frequency, MHz	Field strength, dBµV/m	Limit, dBµV/m	Margin, dB
108.00	21.79	43.50	21.71
322.48	27.60	46.00	18.40
430.00	31.90	46.00	14.10

Section 9: Block diagrams of test set-ups

Radiated emissions set-up



Conducted emissions set-up



Section 10: EUT photos

EUT

EUT, continued