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Test report

250056-1R2TRFWL

Date of issue: January 21, 2015

Applicant:

Logi-D

Product:

2BIN-iD

Model:

LD2-EA0002

FCC ID:

2ADCY-LD2EA0002

IC Registration number:

12416A-LD2EA0002

Specifications:

FCC 47 CFR Part 15 Subpart C, §15.225

Operation within the band 13.110–14.010 MHz

RSS-210 Issue 8, Annex 2.6

Devices operating within the 13.110–14.010 MHz band

Lab and test locations

Company name	Nemko Canada Inc.		
Designation number	CA2040		
Site number:	FCC test site registration number: 176392 (3 m semi anechoic chamber)		
Facility Name	Ottawa		
Address	303 River Road		
City	Ottawa		
Province	ON		
Postal code	K1V 1H2		
Country	Canada		
Telephone	+1 613 737 9680		
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Tested by	David Duchesne, Senior EMC/Wireless Specialist and Andrey Adelberg, Senior Wireless/EMC Specialist
Reviewed by	Kevin Rose, Wireless/EMC Specialist
Review date	January 21, 2015
Reviewer signature	

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 and manufacturer

Company name	Logi-D
Address	5550 des Rossignols Blvd.
City	Laval
Province/State	QC
Postal/Zip code	H7L 5W6
Country	Canada

1.2 Test specifications

FCC 47 CFR Part 15, Subpart C, Clause 15.225	Operation within the band 13.110–14.010 MHz
RSS-210 Issue 8, Annex 2.6	Devices operating in the 13.110–14.010 MHz band
RSS Gen Issue 4	General Requirements and Information for the Certification of Radio Apparatus
ANSI C64.3 v 2003	American National Standard for Methods of Measurement of Radio- Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

1.3 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.

1.4 Exclusions

None

1.5 Test report revision history

Revision #	Details of changes made to test report
TRF	Original report issued
R1	Corrected model, FCC ID, IC registration number and product description.
R2	Corrected model, FCC ID, IC registration number.

Section 2. Summary of test results

2.1 FCC Part 15 Subpart C, general requirements test results

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

Notes: [1] Measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, was performed with the supply voltage varied between 85 % and 115 % of the nominal rated supply voltage. No noticeable output power variation was observed

[2] The Antennas are located within the enclosure of EUT and not user accessible.

2.2 FCC Part 15 Subpart C, intentional radiators test results

Part	Test description	Verdict
§15.225(a)	Field strength within 13.553–13.567 MHz band	Pass
§15.225(b)	Field strength within 13.410–13.553 MHz and 13.567–13.710 MHz bands	Pass
§15.225(c)	Field strength within 13.110–13.410 MHz and 13.710–14.010 MHz bands	Pass
§15.225(d)	Field strength outside 13.110–14.010 MHz band	Pass
§15.225(e)	Frequency tolerance of carrier signal	Pass

Notes: None

2.3 IC RSS-GEN, Issue 4 test results

Part	Test description	Verdict
6.6	Occupied bandwidth (99%)	Pass
8.8	Power Line Conducted Emissions Limits for Licence-Exempt Radio Apparatus	Pass
7.1.2	Receiver radiated emission limits	Not applicable
7.1.3	Receiver conducted emission limits	Not applicable

Notes: [1] According to sections 5.2 and 5.3 of RSS-Gen, Issue 4 the EUT does not have a stand-alone receiver neither scanner receiver, therefore exempt from receiver requirements.

2.4 IC RSS-210, Issue 8, Annex 2.6 test results

Part	Test description	Verdict
A2.6 (a)	Field strength in the 13.553–13.567 MHz band	Pass
A2.6 (b)	Field strength in the 13.410–13.553 MHz and 13.567–13.710 MHz band	Pass
A2.6 (c)	Field strength in the 13.110–13.410 MHz and 13.710–14.010 MHz band	Pass
A2.6 (d)	Field strength of any emissions appearing outside of the 13.110–14.010 MHz band	Pass
A2.6	Carrier frequency stability	Pass

Notes: None

Section 3. Equipment under test (EUT) details

3.1 Sample information

Receipt date	December 18, 2013
Nemko sample ID number	1 and 2

3.2 EUT information

Product name	2BIN-iD
Model	LD2-EA0002
Serial number	None

3.3 Technical information

Operating band	13.553–13.567 MHz
Operating frequency	13.56 MHz
Modulation type	ASK
Occupied bandwidth (99 %)	79.16 kHz
Emission designator	79K2F1D
Power requirements	5 V_{DC}
Antenna information	Internal loop antenna The EUT uses a unique antenna coupling/ non-detachable antenna to the intentional radiator.

3.4 Product description and theory of operation

The LD2-EA0002R0 is comprised of the following sub-systems:

- A microcontroller with a communication interface
- Five (5) RFID transceivers
- Five (5) RFID antennas
- A LED controller with 5 RGB LED

The microcontroller communicates via full duplex RS-485 protocol to a local host computer. Upon host request, the microcontroller communicates with the RFID transceivers on a common SPI bus to read a tag that could have been place near the antenna. The microcontroller forwards the tag ID to the host computer. The host computer can then signal the microcontroller to change the color on each of the RGB LEDs.

Only a single RFID transceiver and antenna can be operated at a time.

3.5 EUT exercise details

EUT was in normal operation mode. The EUT was tested connected to a host housing with plastic enclosure.

3.6 EUT setup diagram

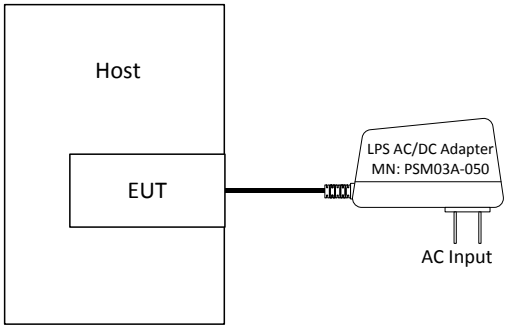


Figure 3.6-1: *Setup diagram*

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	860–1060 mbar

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

7.1 Test equipment list

Table 7.1-1: *Equipment list*

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
3 m EMI test chamber	TDK	SAC-3	FA002047	1 year	Mar. 09/14
Power source	California Instruments	3001i	FA001021	1 year	June 04/14
Power source	California Instruments	5001ix	FA002494	1 year	Oct. 22/14
Receiver/spectrum analyzer	Rohde & Schwarz	ESU 26	FA002043	1 year	Oct. 24/14
Spectrum analyzer	Rohde & Schwarz	FSP	FA001920	1 year	June 25/14
Bilog antenna (20–3000 MHz)	Sunol	JB3	FA002108	1 year	Feb. 21/14
Active loop antenna (0.01–30 MHz)	EMCO	6502	FA001686	1 year	Sept. 27/14
50 Ω coax cable	C.C.A.	None	FA002555	1 year	Oct. 07/14
50 Ω coax cable	Huber + Suhner	NONE	FA002074	1 year	Sep. 13/14
LISN	Rohde & Schwarz	ENV216	FA002023	1 year	Oct. 28/14
50 Ω coax cable	Huber + Suhner	None	FA002394	1 year	June 27/14
50 Ω coax cable	C.C.A.	None	FA002556	1 year	Oct. 07/14
Temperature chamber	Thermotron	SM-16C	FA001030	1 year	NCR
Multimeter	Fluke	16	FA001831	1 year	Jan. 30/14

Note: NCR - no calibration required

Section 8. Testing data

8.1 FCC 15.207(a) and RSS-Gen Issue 3 Section 8.8 – AC power line conducted emissions limits

8.1.1 Definitions and limits

FCC:
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 Ω 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.

IC:
A radio apparatus that is designed to be connected to the public utility (AC) power line shall ensure that the radio frequency voltage, which 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 table below.

Unless the requirements applicable to a given device state otherwise, for any radio apparatus equipped to operate from the public utility AC power supply either directly or indirectly (such as with a battery charger), the radio frequency voltage of emissions conducted back onto the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown in table below. The more stringent limit applies at the frequency range boundaries.

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

Note: * - The level decreases linearly with the logarithm of the frequency.
** - A linear average detector is required.

8.1.2 Test summary

Test date:	December 19, 2013	Temperature:	23.8 °C
Test engineer:	David Duchesne	Air pressure:	998.6 mbar
Verdict:	Pass	Relative humidity:	28 %

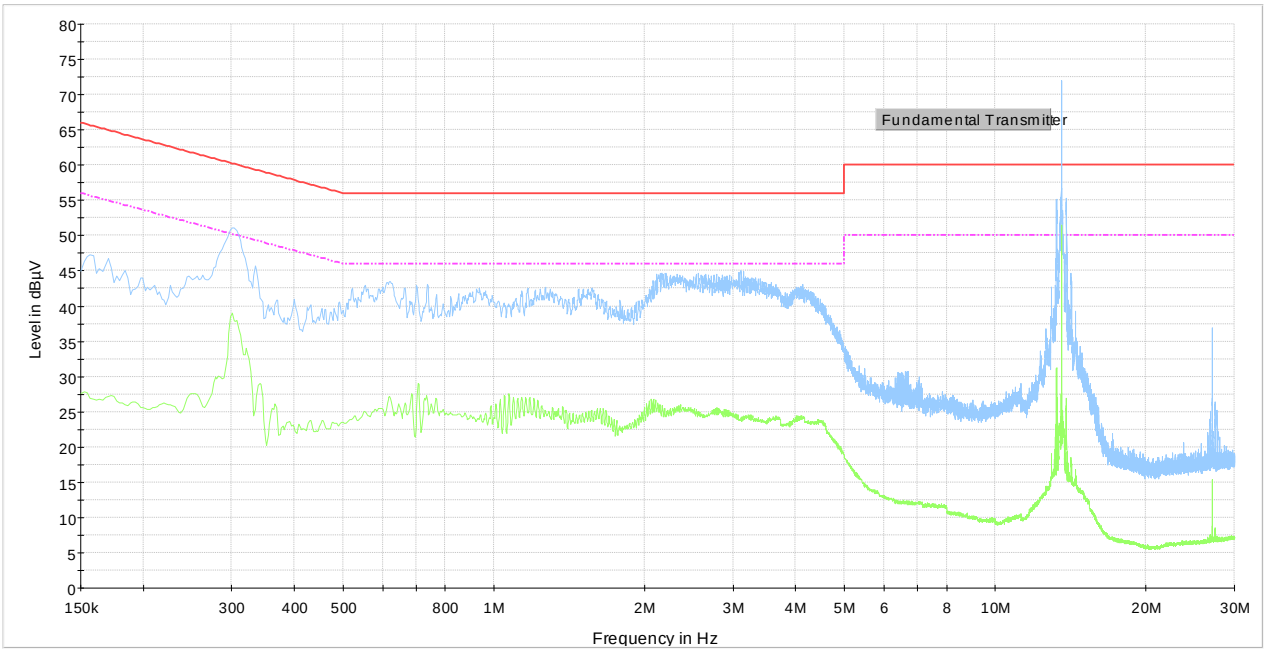
8.1.3 Observations, settings and special notes

Port under test	AC input of external AC Adapter
EUT setup configuration	Table top
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.

Receiver settings:

Frequency span:	150 kHz to 30 MHz
Detector mode:	Peak and Average (preview mode); Quasi-Peak (final measurements)
Resolution bandwidth:	9 kHz
Video bandwidth:	30 kHz
Trace mode:	Max Hold
Measurement time:	100 ms (preview measurement); 1000 ms (final measurement)

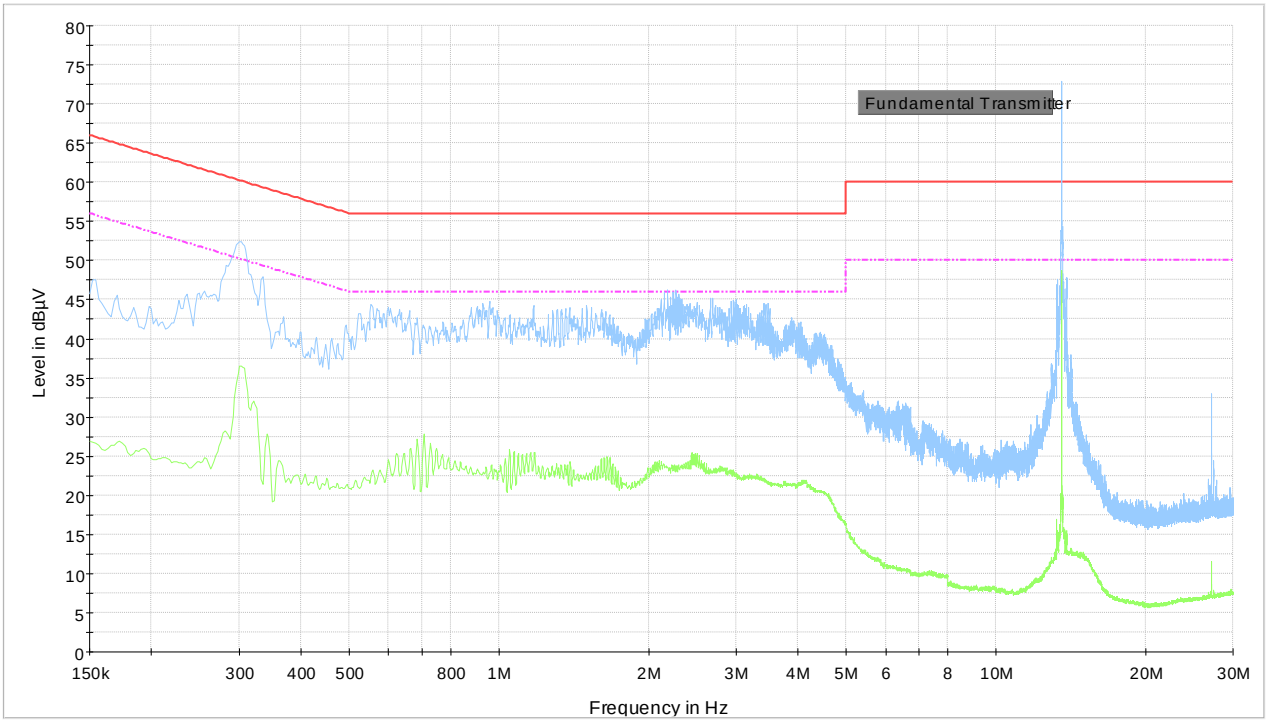
8.1.4 Test data



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

Plot 8.1-1: *AC power line conducted emissions limits – phase*

8.1.4 Test data, continued



120VAC/60Hz, Neutral
CISPR 22 Mains Q-Peak Class B Limit
CISPR 22 Mains Average Class B Limit
Preview Peak Detector
Preview Average Detector

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

Plot 8.1-2: *AC power line conducted emissions limits – neutral*

8.1.5 Setup photos

Figure 8.1-1: *AC power line conducted emissions limits setup photo*

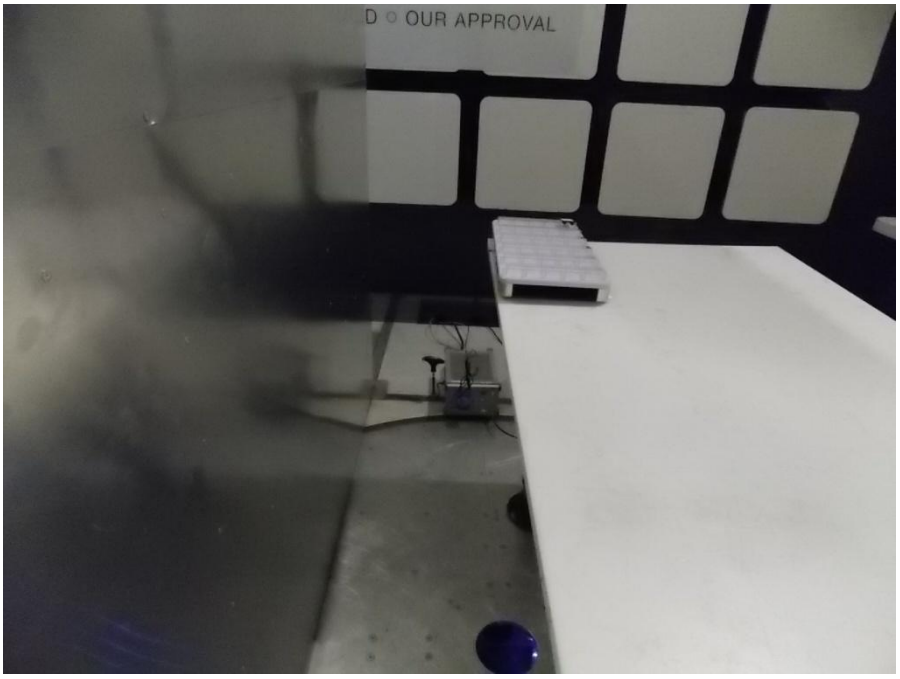


Figure 8.1-2: *AC power line conducted emissions limits setup photo*

8.2 FCC 15.215(c) 20 dB bandwidth and RSS-Gen Issue 4 – Section 6.6 99% occupied bandwidth

8.2.1 Definitions and limits

FCC 15.215 (c)

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.

RSS-Gen Issue 4 6.6 Occupied Bandwidth

When the occupied bandwidth limit is not stated in the applicable RSS or reference measurement method, the transmitted signal bandwidth shall be reported as the 99% emission bandwidth, as calculated or measured.

- The transmitter shall be operated at its maximum carrier power measured under normal test conditions.
- The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts.
- The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the occupied bandwidth (OBW) and video bandwidth (VBW) shall be approximately 3×RBW.

The trace data points are recovered and are directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded.

The difference between the two recorded frequencies is the 99% occupied bandwidth.

8.2.2 Test summary

Test date:	December 6, 2013	Temperature:	21 °C
Test engineer:	Andrey Adelberg	Air pressure:	1001 mbar
Verdict:	Pass	Relative humidity:	32 %

8.2.3 Observations, settings and special notes

Spectrum analyzer settings:

Detector mode:	Peak
Resolution bandwidth:	≥1 % of span
Video bandwidth:	RBW × 3
Trace mode:	Max Hold

8.2.4 Test data

Table 8.2-1: *Lower 20 dBc frequency cross result*

Fundamental frequency, MHz	Lower 20 dBc frequency cross, MHz	Minimum limit, MHz	Margin, MHz
13.561	13.560	13.553	0.007

Table 8.2-2: *Upper 20 dBc frequency cross result*

Fundamental frequency, MHz	Upper 20 dBc frequency cross, MHz	Maximum limit, MHz	Margin, MHz
13.561	13.563	13.567	0.004

Table 8.2-3: *99 % occupied bandwidth result*

Frequency, MHz	99 % occupied bandwidth, kHz
13.56	79.16

8.2.4 Test data, continued

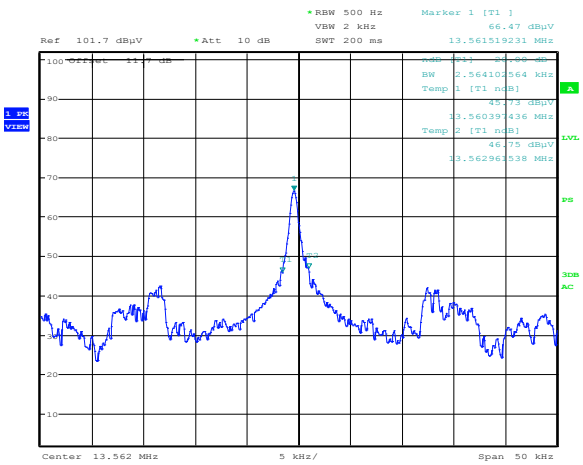


Figure 8.2-1: *20 dB bandwidth spectrum plot*

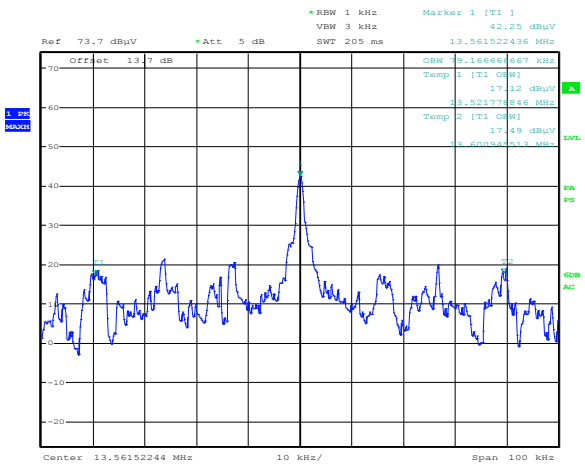


Figure 8.2-2: *99 % occupied bandwidth spectrum plot*

8.3 FCC 15.225(a–c) and RSS-210 Issue 8 Annex 2 A2.6 (a–c) Field strength within the 13.553–13.567 MHz band

8.3.1 Definitions and limits

FCC 15.225 (a-c)

a) The field strength of any emissions within the band 13.553–13.567 MHz shall not exceed 15848 µV/m (84 dBµV/m) at 30 m.
b) Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 µV/m (50.5 dBµV/m) at 30 m.
c) Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 µV/m (40.5 dBµV/m) at 30 m.

RSS-210 Issue 8 Annex 2 A2.6 (a–c)

The field strength of any emission shall not exceed the following limits:

a) 15.848 microvolts/m (84 dBµV/m) at 30 m, within the band 13.553–13.567 MHz.
b) 334 microvolts/m (50.5 dBµV/m) at 30 m, within the bands 13.410–13.553 MHz and 13.567–13.710 MHz.
c) 106 microvolts/m (40.5 dBµV/m) at 30 m, within the bands 13.110–13.410 MHz and 13.710–14.010 MHz.

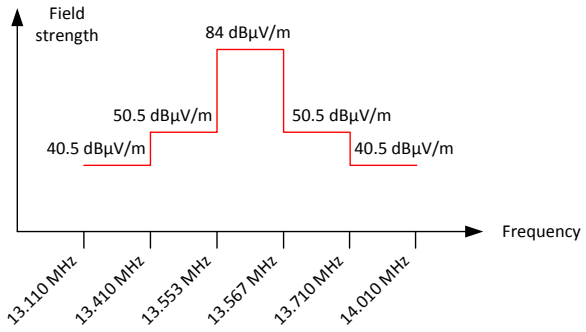


Figure 8.3-1: *30 m in-band spurious emissions limit*

8.3.2 Test summary

Test date:	December 6, 2013	Temperature:	21 °C
Test engineer:	Andrey Adelberg	Air pressure:	1001 mbar
Verdict:	Pass	Relative humidity:	32 %

8.3.3 Observations, settings and special notes

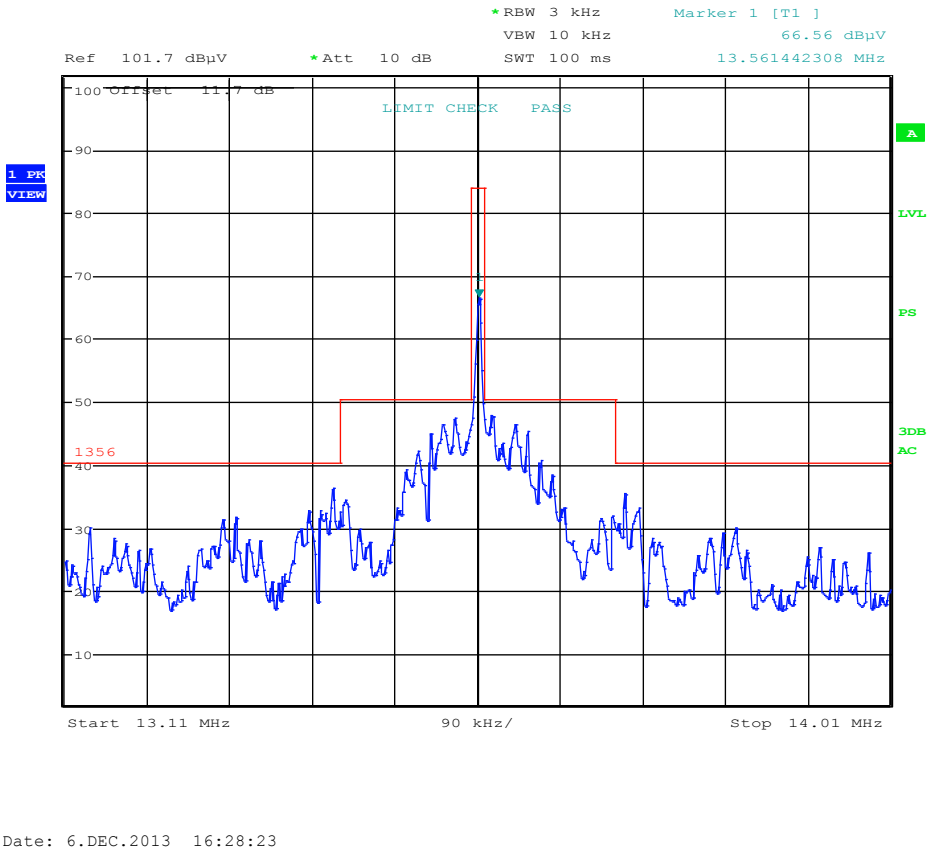
The measurements were performed at the distance of 3 m.
40 dB distance correction factor* was applied to the measurement result in order to comply with 30 m limits.
* 30 m to 3 m distance correction factor calculation (for 13 MHz band):

$$40 \times \mathrm{Log}_{10}\,(3\ \mathrm{m}/30\ \mathrm{m}) = 40 \times \mathrm{Log}_{10}\,(0.1) = -40\ \mathrm{dB}$$

Spectrum analyzer settings:

Detector mode:	Peak
Resolution bandwidth:	3 kHz
Video bandwidth:	10 kHz
Trace mode:	Max Hold

8.3.4 Test data



Special notes:

- *Limit lines on plot are for 30 m measurements. Spectral plot has only been corrected for antenna factor and cable loss. Limits with regards to spectral plot should be increased by 40 dB.*
- RBW ≥ 20 dB Bandwidth.

Figure 8.3-2: *Field strength measurement spectrum plot within 13.11 to 14.01 MHz band*

Table 8.3-1: *Fundamental Tx results*

Frequency, MHz	Field strength of emissions, dBµV/m [1]	3 m Limit, dBµV/m [3]	Margin, dB
13.561	66.56	124.00	57.44

Notes:
[1] Field strength (dBµV/m) measured at 3 m = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
[2] Correction factor = antenna factor ACF (dB) + cable loss (dB)
[3] An inverse proportionality factor of 40 dB per decade ($40 \times \log_{10}(3 / 30) = -40$ dB) has been used to normalize the specification limit to a measurement distance of 3 meters to determine compliance.

8.3.5 Setup photos

Figure 8.3-1: *Field strength within the 13.553–13.567 MHz band setup photo*

8.4 FCC 15.225(d) and RSS-210 Issue 8 Annex 2 A2.6 (d) Field strength of emissions outside 13.110–14.010 MHz band

8.4.1 Definitions and limits

FCC 15.225 (d)

d) The field strength of any emissions appearing outside of the 13.110–14.010 MHz band shall not exceed the general radiated emission limits in §15.209

RSS-210 Issue 8 Annex 2 A2.6 (d)

The field strength of any emission shall not exceed the following limits:

d) 30 microvolts/m (29.5 dBµV/m) at 30 m, outside the band 13.110–14.010 MHz.

Table 8.4-1: *Radiated emission limits*

Frequency, MHz	Field strength of emissions		Measurement distance, m
	µV/m	dBµV/m	
0.009–0.490	2400/F	$67.6 - 20 \times \log_{10}(F)$	300
0.490–1.705	24000/F	$87.6 - 20 \times \log_{10}(F)$	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: 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

8.4.2 Test summary

Test date:	December 6, 2013	Temperature:	21 °C
Test engineer:	Andrey Adelberg	Air pressure:	1001 mbar
Verdict:	Pass	Relative humidity:	32 %

8.4.3 Observations, settings and special notes

EUT setup configuration	Table top
Test facility	3 m Semi anechoic chamber
Measuring distance	3 m
Antenna height variation	– 1 m for emissions from 9 kHz to 30 MHz. – 1–4 m for emissions from 30 to 1000 MHz
Turn table position	0–360°
Measurement details	– 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. – The spectrum was searched from 9 kHz to 1 GHz.

Spectrum analyzer settings for frequencies below 150 kHz:

Detector mode:	Peak (preview measurement); Quasi-peak (final measurement)
Resolution bandwidth:	1 kHz
Video bandwidth:	3 kHz
Trace mode:	Max Hold
Measurement time:	100 ms (preview measurement); 1000 ms (final measurement)

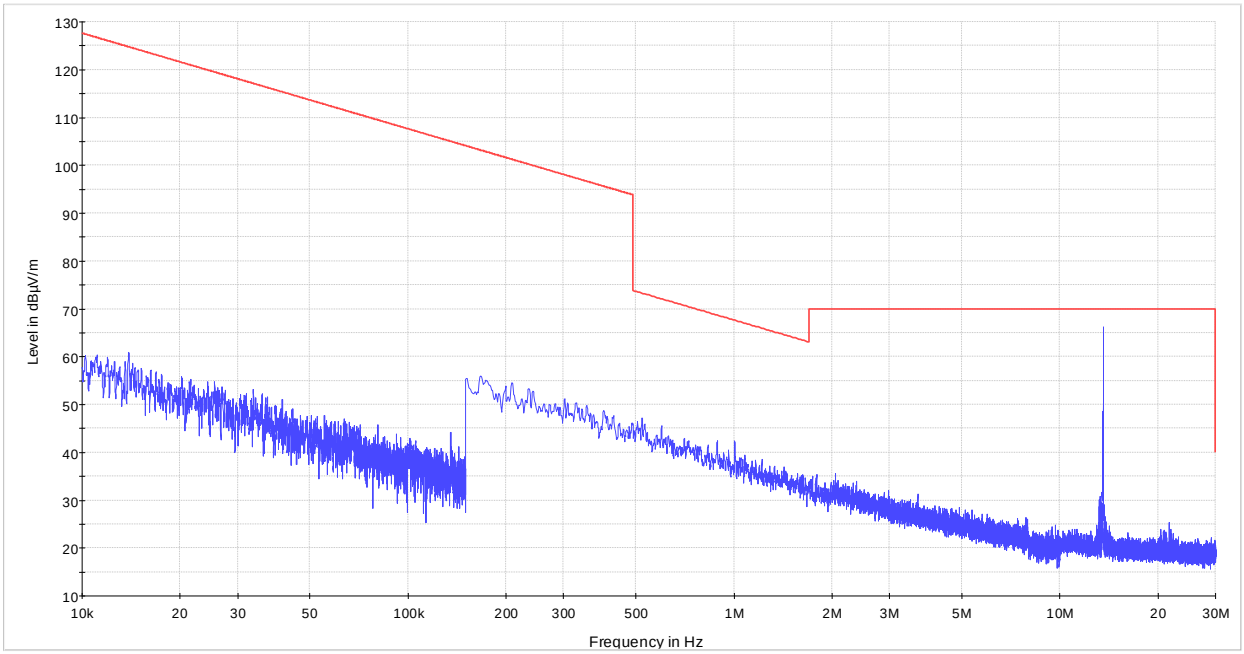
Spectrum analyzer settings for frequencies within 150 kHz to 30 MHz band:

Detector mode:	Peak (preview measurement); Quasi-peak (final measurement)
Resolution bandwidth:	9 kHz
Video bandwidth:	30 kHz
Trace mode:	Max Hold
Measurement time:	100 ms (preview measurement); 1000 ms (final measurement)

Receiver/spectrum analyzer settings for frequencies above 30 MHz:

Detector mode:	Peak (preview measurement); Quasi-peak (final measurement)
Resolution bandwidth:	120 kHz
Video bandwidth:	300 kHz
Trace mode:	Max Hold
Measurement time:	100 ms (preview); 1000 ms (final)

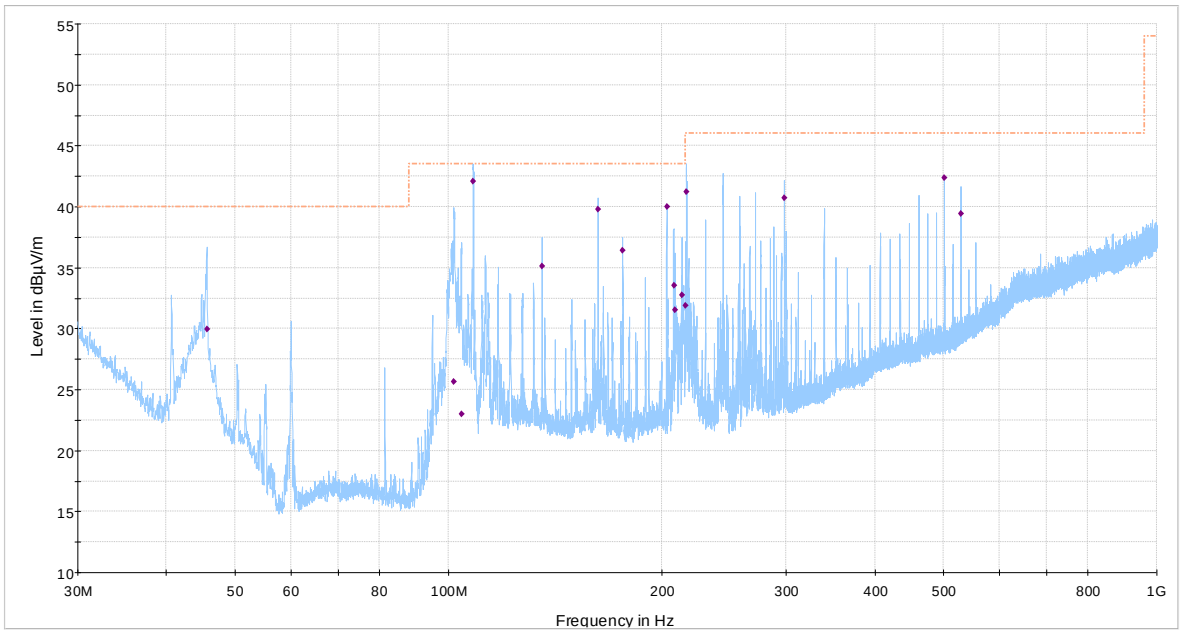
8.4.4 Test data



The spectral scan has been corrected with the associated transducer factors (i.e. antenna factors, cable loss and attenuators.

Figure 8.4-1: *Field strength of spurious emissions – 10 kHz to 30 MHz*

8.4.4 Test data, continued



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.

Figure 8.4-2: *Field strength of spurious emissions – 30 to 1000 MHz*

Table 8.4-2: *Radiated disturbance (Quasi-Peak) results*

Frequency (MHz)	Quasi-Peak field strength[1] (dBµV/m)	Measurement time (ms)	Bandwidth (kHz)	Antenna height (cm)	Pol. (V/H)	Turn table position (°)	Correction factor[2] (dB)	Margin (dB)	3 m Quasi-Peak limit [3] (dBµV/m)
45.630	30.0	1000	120	109.0	V	275.0	11.3	10.0	40.0
101.880	25.6	1000	120	266.0	H	0.0	12.2	17.9	43.5
104.430	23.0	1000	120	261.0	H	0.0	12.9	20.5	43.5
108.480	42.1	1000	120	243.0	H	159.0	13.7	1.4	43.5
135.600	35.1	1000	120	204.0	H	278.0	15.0	8.4	43.5
162.750	39.8	1000	120	239.0	H	116.0	13.9	3.7	43.5
176.310	36.4	1000	120	135.0	H	287.0	13.1	7.1	43.5
203.430	40.0	1000	120	150.0	H	98.0	13.5	3.5	43.5
208.050	33.5	1000	120	150.0	H	267.0	12.9	10.0	43.5
208.950	31.5	1000	120	132.1	H	262.0	12.9	12.0	43.5
213.660	32.7	1000	120	133.0	H	262.0	13.0	10.8	43.5
216.030	31.9	1000	120	122.0	H	258.0	13.0	14.1	46.0
216.990	41.2	1000	120	161.0	H	103.0	13.1	4.8	46.0
298.350	40.7	1000	120	100.0	H	106.0	15.9	5.3	46.0
501.780	42.4	1000	120	157.9	H	236.0	20.5	3.6	46.0
528.900	39.4	1000	120	150.0	H	0.0	20.9	6.6	46.0

Notes: [1] Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
[2] Correction factor = antenna factor ACF (dB) + cable loss (dB)

Sample calculation: 42.1 dBµV/m (field strength) = 28.4 dBµV (receiver reading) + 13.7 dB (Correction factor)

8.4.5 Setup photos

Figure 8.4-1: *Field strength of emissions outside 13.110–14.010 MHz band setup photo – below 30 MHz*

Figure 8.4-2: *Field strength of emissions outside 13.110–14.010 MHz band setup photo – above 30 MHz*

8.4.5 Setup photos, continued

Figure 8.4-3: *Field strength of emissions outside 13.110–14.010 MHz band setup photo – above 30 MHz*

8.5 FCC 15.225(e) and RSS-210 Issue 8 Annex 2 A2.6 Frequency tolerance of the carrier signal

8.5.1 Definitions and limits

FCC 15.225 (e)

e) The frequency tolerance of the carrier signal shall be maintained within ±0.01% of the operating frequency over a temperature variation of −20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

RSS-210 Issue 8 Annex 2 A2.6

Carrier frequency stability shall be maintained to ±0.01% (±100 ppm).

8.5.2 Test summary

Test date:	December 19, 2013
Test engineer:	David Duchesne
Verdict:	Pass

8.5.3 Observations/special notes

Spectrum analyzer settings:

Detector mode:	Peak
Resolution bandwidth:	≥1 % of emission bandwidth
Video bandwidth:	RBW × 3
Trace mode:	Max Hold

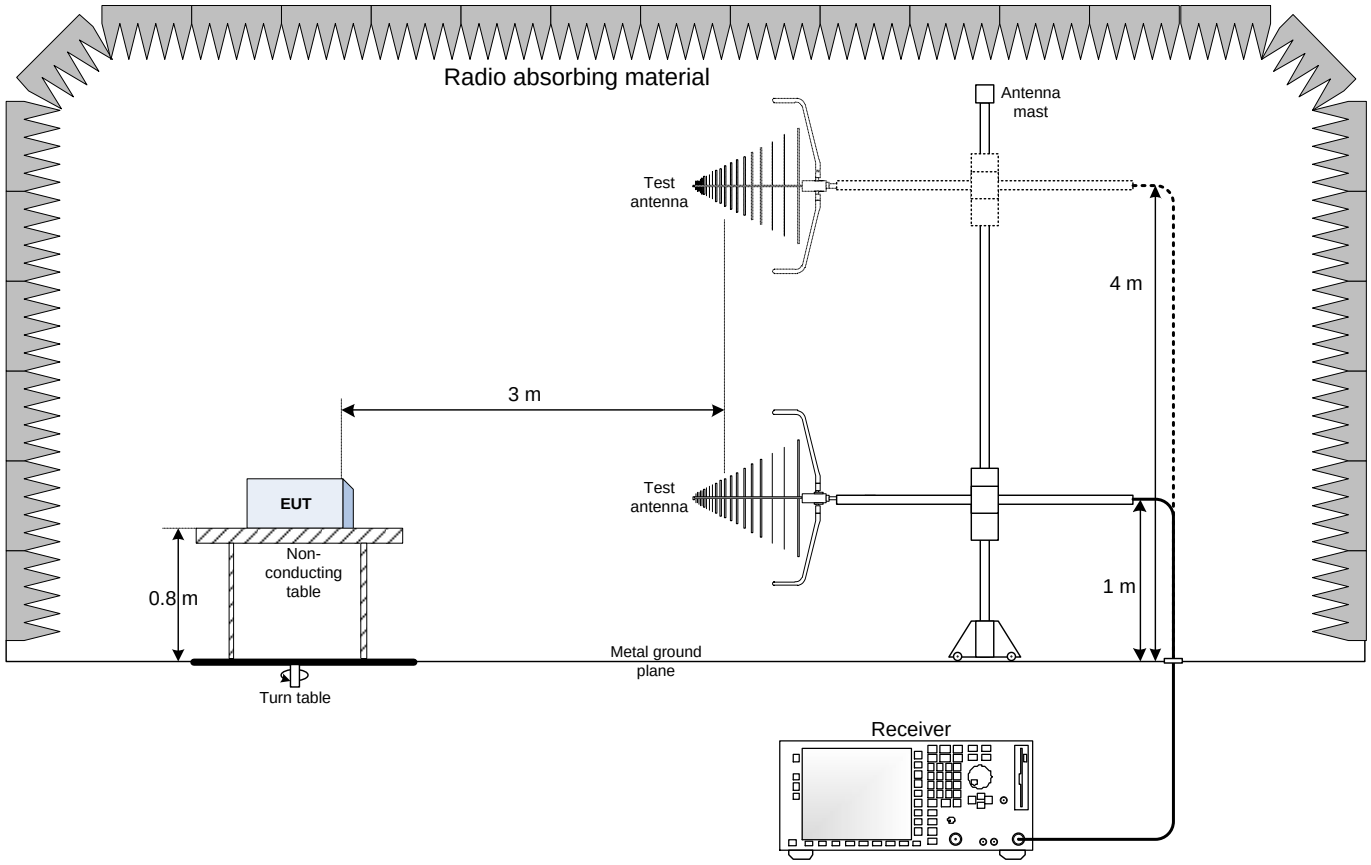
8.5.4 Test data

Table 8.5-1: *Frequency drift measurements results*

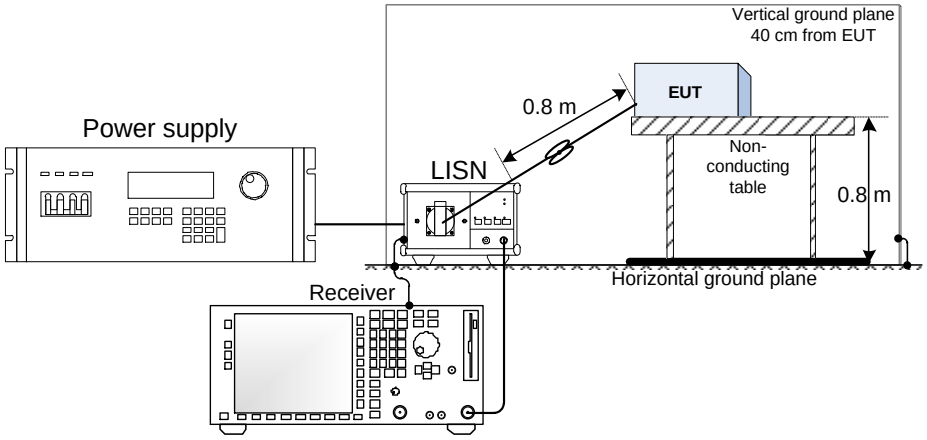
Test conditions	Frequency, MHz	Frequency drift, Hz	Frequency drift, %	Limit, ±%	Margin, %
+50 °C, Nominal	13.561522	0	0	0.01	100
+20 °C, +15 %	13.561522	0	0	0.01	100
+20 °C, Nominal	13.561522	*Reference*	*Reference*	*Reference*	*Reference*
+20 °C, −15 %	13.561522	0	0	0.01	100
−20 °C, Nominal	13.561362	160	0.000012	0.01	99.88

Section 9. Block diagrams of test set-ups

9.1 Radiated emissions set-up



9.2 Conducted emissions set-up



Section 10. Detailed photos

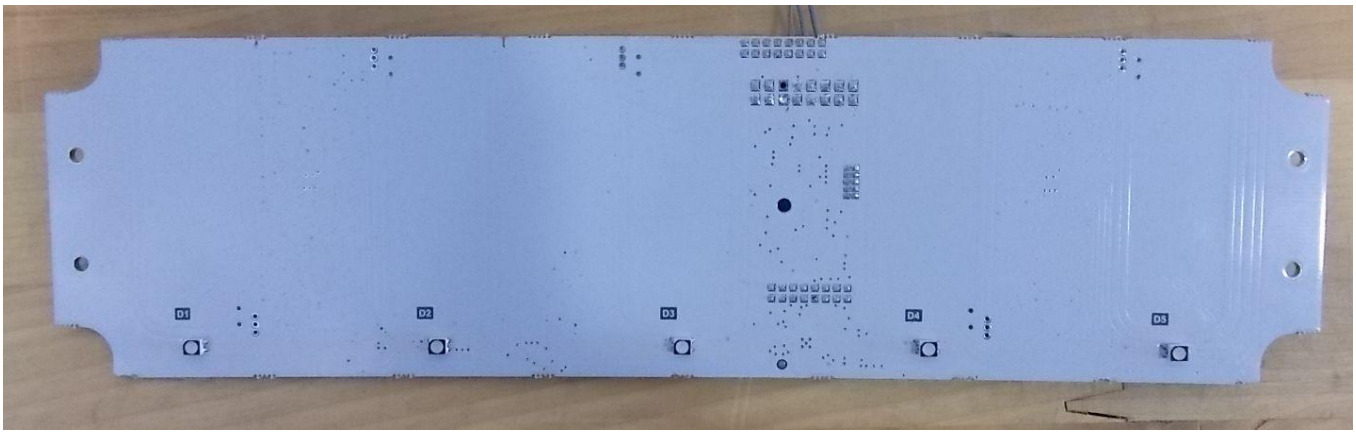


Figure 9.2-1: *RF Module bottom view*

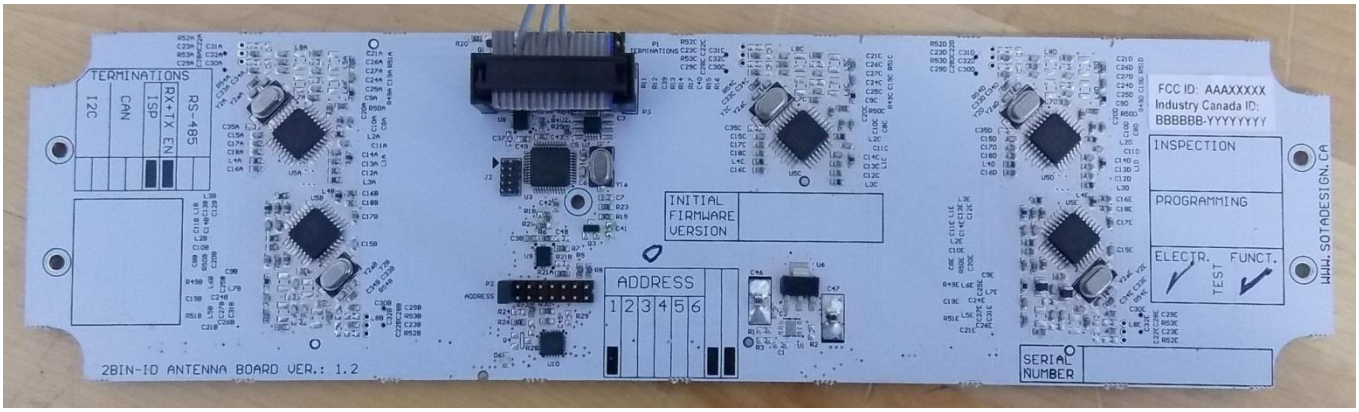


Figure 9.2-2: *RF Module top view*