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Test report

295026-5TRFWL

Date of issue: November 27, 2015

Applicant:

Kantech, a division of Tyco Safety Products Canada Ltd.

Product:

Smart Card Reader

Model:	Model variant:
KT-MUL-MT-KP	KT-MUL-MT

FCC ID:	IC Registration number:
V8515KTMULMTKP	5690B-KTMULMTKP

Specifications:

- FCC 47 CFR Part 15 Subpart C, §15.209

  Unlicensed National Information Infrastructure Devises, Radiated emission limits; general requirements

  - RSS-Gen, Issue 4, Section 8.9, November 13, 2014

    Transmitter Emission Limits for Licence-Exempt Radio Apparatus

Test location

Company name	Nemko Canada Inc.
Address	303 River Road
City	Ottawa
Province	Ontario
Postal code	K1V 1H2
Country	Canada
Telephone	+1 613 737 9680
Facsimile	+1 613 737 9691
Toll free	+1 800 563 6336
Website	www.nemko.com
Site number	FCC: 176392; IC: 2040A-4 (3 m semi anechoic chamber)

Tested by	Andrey Adelberg, Senior Wireless/EMC Specialist
Reviewed by	Kevin Rose, Wireless/EMC Specialist
Date	November 27, 2015
Signature of the reviewer	

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 Applicant and manufacturer

Company name	Kantech, a division of Tyco Safety Products Canada Ltd.
Address	9995-L Catania Avenue
City	Brossard,
Province/State	Québec,
Postal/Zip code	J4Z 3V7
Country	Canada

1.2 Test specifications

FCC 47 CFR Part 15, Subpart C, Clause 15.209	Unlicensed National Information Infrastructure Devises, Radiated emission limits; general requirements
RSS-Gen, Issue 4, Section 8.9, November 13, 2014	Transmitter Emission Limits for Licence-Exempt Radio Apparatus

1.3 Test methods

ANSI C63.10 v2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

1.4 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.

1.5 Exclusions

None

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 FCC Part 15 Subpart C, general requirements test results

Part	Test description	Verdict
§15.31(e)	Variation of power source	Pass[1]
§15.209	Radiated emission limits; general requirements.	Pass
§15.207	Conducted limits	Pass

Notes: [1]EUT was tested with fully charged battery

2.2 IC RSS-GEN, Issue 4, test results

Part	Test description	Verdict
8.9	Transmitter Emission Limits for Licence-Exempt Radio Apparatus	Pass
8.8	AC Power Line Conducted Emissions Limits for Licence-Exempt Radio Apparatus	Pass

Notes: EUT is a battery operated device

Section 3. Equipment under test (EUT) details

3.1 Sample information

Receipt date	September 28, 2015
Nemko sample ID number	133-000444

3.2 EUT information

Product name	Smart Card Reader
Brand name	KANTECH
Model	KT-MUL-MT-KP
Model variant	KT-MUL-MT
Serial number	None
Hardware version	UA593 Rev. 04/UA668 Rev. 03
Software version	1.0

3.3 Technical information

Applicant IC company number	5690B
IC UPN number	KTMULMTKP
All used IC test site(s) Reg. number	2040A-4
RSS number and Issue number	RSS-Gen Issue 4, Section 8.9, May 2015
Frequency band	9 kHz to 30 MHz
Frequency Min (MHz)	N/A
Frequency Max (MHz)	0.125
RF power Min (W)	N/A
RF power Max (W)	N/A
Field strength, Units @ distance	68.78 dBµV/m @ 3 m
Measured BW (kHz) (99% dB)	0.0465
Calculated BW (kHz), as per TRC-43	N/A
Type of modulation	Sinusoidal continuous wave
Emission classification (F1D, G1D, D1D)	N0N
Transmitter spurious, Units @ distance	None detected
Power requirements	12 V_{DC} from battery or control panel via 120 V_{AC}, 60 Hz
Antenna information	Internal antenna The EUT uses a unique antenna coupling/ non-detachable antenna to the intentional radiator.

3.4 Product description and theory of operation

These are Smart Card readers that are capable to read Kantech IoProx (125 kHz) and MIFAIR (13.56 MHz) access cards and send credential information to an access control unit for granting access in a protected area. Connection to the ACU is done using Wiegand interface or RS-485 bus (Kantech proprietary). The smart card reader has also an optional keypad that allows using PIN in conjunction with card credential to gain access in the protected area.

3.5 EUT exercise details

EUT was powered and transmission was turned on automatically.

3.6 EUT setup diagram

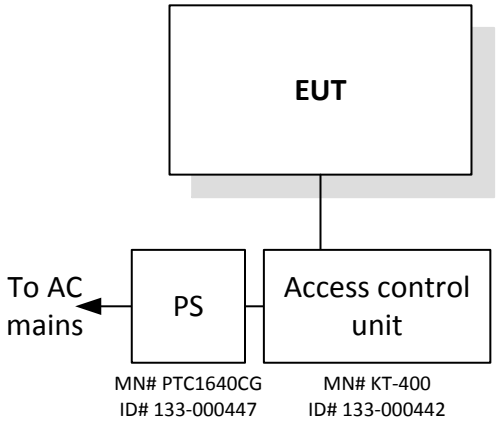


Figure 3.6-1: *Setup diagram*

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

The tested sample with model#: KT-MUL-MT-KP is the most representative of the whole lineup, since all other model variants are depopulated versions of the unit tested. All models contain BLE transmitter. Models MT contain both RFID transmitters: 13.56 MHz and 125 kHz. Models KP have a KeyPad.

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

Measurement uncertainty budgets for the tests are detailed below. Measurement uncertainty calculations assume a coverage factor of K = 2 with 95% certainty.

Test name	Measurement uncertainty, dB
All antenna port measurements	0.55
Conducted spurious emissions	1.13
Radiated spurious emissions	3.78
AC power line conducted emissions	3.55

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	Feb. 25/16
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	1 year	Jan. 07/16
Active loop antenna (0.01–30 MHz)	Com-Power	AL-130	FA002674	1 year	Jan. 13/16
Bilog antenna (20–3000 MHz)	Sunol	JB3	FA002108	1 year	Apr. 12/16
LISN	Rohde & Schwarz	ENV216	FA002023	1 year	Jan. 09/16

Note: NCR - no calibration required

Section 8. Testing data

8.1 FCC 15.207(a) and RSS-Gen 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	October 20, 2015	Temperature	32 °C
Test engineer	Andrey Adelberg	Air pressure	1006 mbar
Verdict	Pass	Relative humidity	33 %

8.1.3 Observations, settings and special notes

The EUT was set up as tabletop configuration.

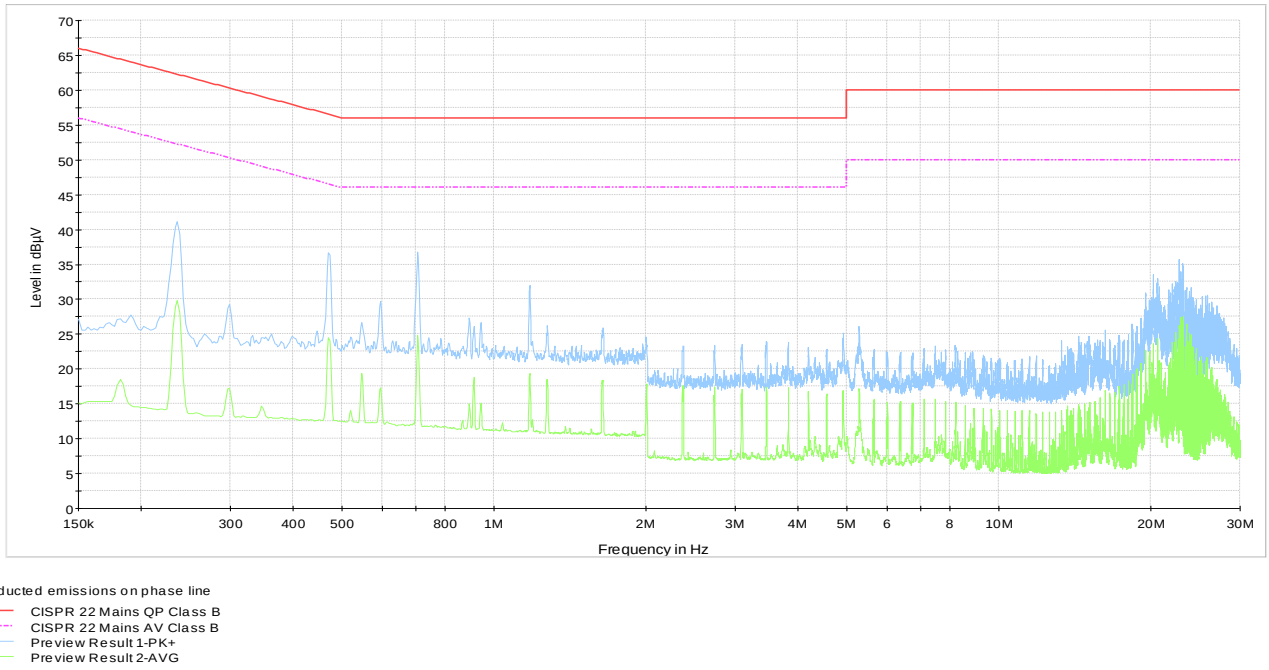
The spectral scan has been corrected with transducer factors (i.e. cable loss, LISN factors, and attenuators) for determination of compliance.

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.

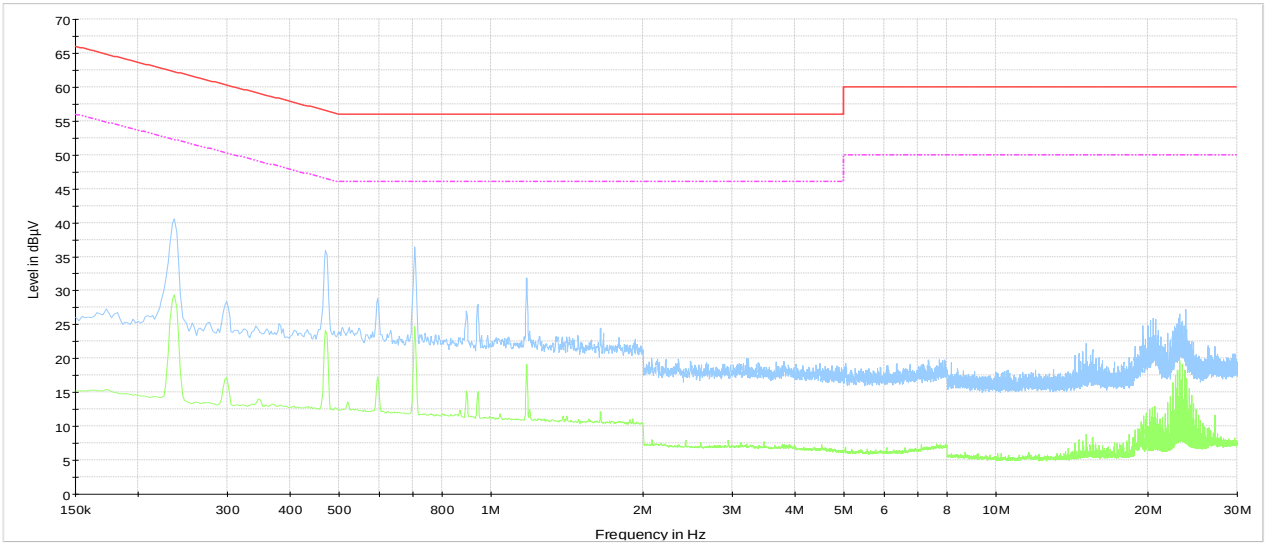
Test receiver settings:

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	1000 ms

8.1.4 Test data



Plot 8.1-1: *Conducted emissions on phase line*



Plot 8.1-2: *Conducted emissions on neutral line*

8.2 FCC 15.209(a) and RSS-Gen 8.9 Radiated emissions

8.2.1 Definitions and limits

FCC:
(a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table.

IC:
Except when the requirements applicable to a given device state otherwise, emissions from licence‑exempt transmitters shall comply with the field strength limits shown in Table 4 and Table 5 below. Additionally, the level of any transmitter emission shall not exceed the level of the transmitter's fundamental emission.
RSS-Gen 8.10 Emissions falling within restricted frequency bands
Restricted bands, identified in Table 8.2-2, are designated primarily for safety-of-life services (distress calling and certain aeronautical bands), certain satellite downlinks, radio astronomy and some government uses. Except where otherwise indicated, the following restrictions apply:
(a) fundamental components of modulation of licence-exempt radio apparatus shall not fall within the restricted bands of below;
(b) unwanted emissions falling into restricted bands of below shall comply with the limits specified in RSS-Gen;
(c) unwanted emissions not falling within restricted frequency bands shall either comply with the limits specified in the applicable RSS, or with those specified in RSS-Gen.

Table 8.2-1: *FCC §15.209 and RSS-Gen – Radiated emission limits*

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

Table 8.2-2: *IC restricted frequency bands*

MHz	MHz	MHz	GHz
0.090–0.110	12.51975–12.52025	399.9–410	5.35–5.46
2.1735–2.1905	12.57675–12.57725	608–614	7.25–7.75
3.020–3.026	13.36–13.41	960–1427	8.025–8.5
4.125–4.128	16.42–16.423	1435–1626.5	9.0–9.2
4.17725–4.17775	16.69475–16.69525	1645.5–1646.5	9.3–9.5
4.20725–4.20775	16.80425–16.80475	1660–1710	10.6–12.7
5.677-5.683	25.5–25.67	1718.8–1722.2	13.25–13.4
6.215–6.218	37.5–38.25	2200–2300	14.47–14.5
6.26775–6.26825	73–74.6	2310–2390	15.35–16.2
6.31175–6.31225	74.8–75.2	2655–2900	17.7–21.4
8.291–8.294	108–138	3260–3267	22.01–23.12
8.362–8.366	156.52475–156.52525	3332–3339	23.6–24.0
8.37625–8.38675	156.7–156.9	3345.8–3358	31.2–31.8
8.41425–8.41475	240–285	3500–4400	36.43–36.5
12.29–12.293	322–335.4	4500–5150	Above 38.6

Note: Certain frequency bands listed in Table 8.2-2 and above 38.6 GHz are designated for low-power license-exempt applications. These frequency bands and the requirements that apply to the devices are set out in this Standard

Table 8.2-3: *FCC restricted frequency bands*

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			

8.2.2 Test summary

Test date:	October 7, 2015	Temperature:	23 °C
Test engineer:	Andrey Adelberg	Air pressure:	1007 mbar
Verdict:	Pass	Relative humidity:	34 %

8.2.3 Observations, settings and special notes

The spectrum was searched from 20 kHz to 30 MHz.
Radiated measurements were performed at a distance of 3 m.

Spectrum analyser pre-scan measurements within 10–150 kHz:

Resolution bandwidth:	100 Hz
Video bandwidth:	300 Hz
Detector mode:	Peak
Trace mode:	Max Hold

Spectrum analyser pre-scan measurements within 150 kHz to 30 MHz:

Resolution bandwidth:	10 MHz
Video bandwidth:	30 MHz
Detector mode:	Peak
Trace mode:	Max Hold

Limit calculation for the fundamental frequency of 125 kHz:
Field strength $limit_{110.9\ kHz} = 67.6 - 20 \times Log_{10}\ (125) = 25.66$ dBµV/m @ 300 m.
Distance correction factor at frequencies below 30 MHz is according to the following formula:
$Distance_{3\ m} = 40 \times Log_{10}\ (300 / 3) = 80$ dB

8.2.4 Test data

Table 8.2-4: *Fundamental measurements results*

Frequency, kHz	Field strength @ 3 m dBµV/m	Field strength @ 300 m, dBµV/m	Limit @ 300 m, dBµV/m	Margin, dB
125.8	68.78	-11.22	25.66	36.88

Note: Field strength at 3 m calculation = 68.78 – 80 dB.

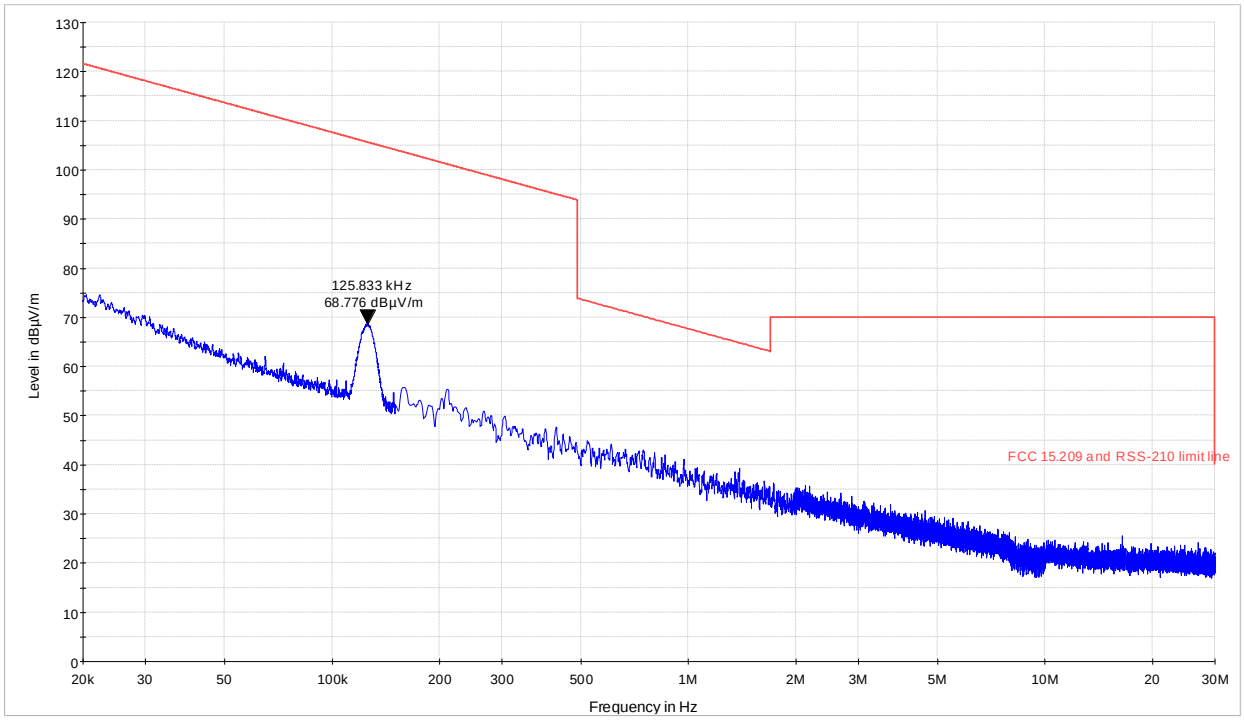
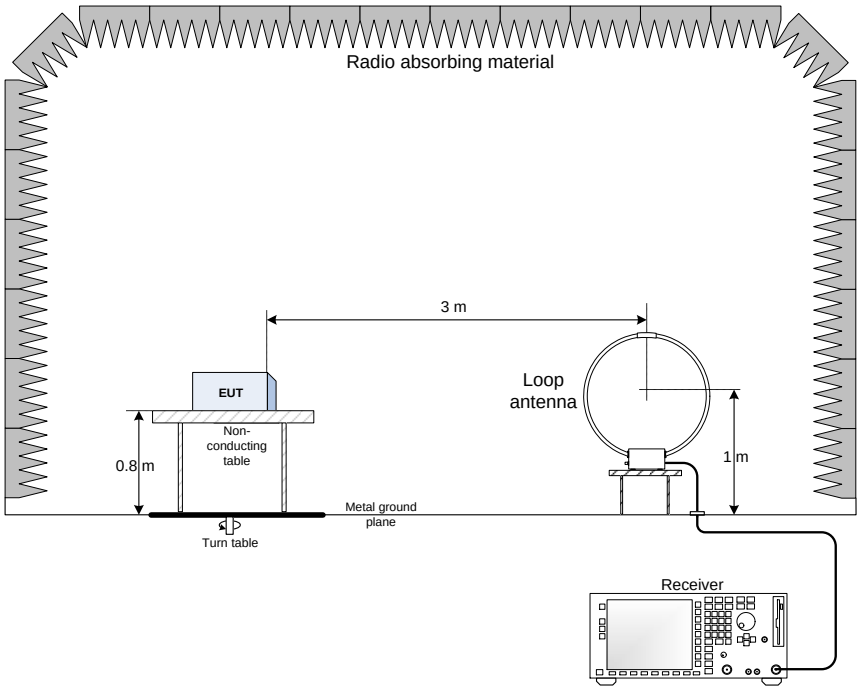


Figure 8.2-1: *Radiated emissions below 30 MHz*

Section 9. Block diagrams of test set-ups

9.1 Radiated emissions below 30 MHz set-up



9.2 Conducted emissions set-up