

Test report

313654-1TRFWL

Date of issue: September 22, 2016

Applicant:

Standard Innovation Corporation

Product:

Sync

Model:

3000

FCC ID:

ZUE3000

IC Registration number:

9804A-3000

Specifications:

◆ **FCC 47 CFR Part 15 Subpart C, §15.249**

Operation in the 902–928 MHz, 2400–2483.5 MHz, 5725–5875 MHz and 24.0–24.25 GHz

◆ **RSS-210, Issue 8, December 2010, Annex 2.9**

Devices operating in frequency bands 902–928, 2400–2483.5 and 5725–5875 MHz for any application

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:	Kevin Rose, Wireless/EMC Specialist
Reviewed by:	Andrey Adelberg, Senior Wireless/EMC Specialist
Date:	September 22, 2016
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.

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Section 1 Report summary

1.1 Applicant

Company name:	Standard Innovation Corporation
Address:	Suite 330, 1130 Morrison Drive
City:	Ottawa
Province/State:	Ontario
Postal/Zip code:	K2H 9N6
Country:	Canada

1.2 Manufacturer

Company name	Able-One Technology Ltd	Info Tronic International Ltd.
Company details	9/F, Guang Ying Building, No. 88 Di Hao Road ZhangMuTou Town, Dong Guan, China	528 Jinbi Rd., Biling Village, Pingshan Town, Longgang District Shenzhen City, Guangdong Province, China

1.3 Test specifications

FCC 47 CFR Part 15, Subpart C, Clause 15.249	Operation in the 902–928 MHz, 2400–2483.5 MHz, 5725–5875 MHz and 24.0–24.25 GHz
RSS-210, Issue 8 Annex 2.9	Devices operating in frequency bands 902–928, 2400–2483.5 and 5725–5875 MHz for any application

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
§15.207(a)	Conducted limits	Not applicable
§15.215(c)	20 dB emission bandwidth	Pass

Notes: The EUT is a battery operated.

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

Part	Test description	Verdict
§15.249(a)	Field strength of fundamental and harmonics emissions	Pass
§15.249(d)	Spurious emissions (except harmonics)	Pass

Notes: None

2.3 IC RSS-GEN, Issue 3, test results

Part	Test description	Verdict
§4.6.1	Occupied bandwidth	Pass
§7.2.4	AC power lines conducted emission limits	Not applicable

Notes: The EUT is a battery operated.

2.4 RSS-210, Issue 8, test results

Part	Test description	Verdict
§A2.9a	Field strength of fundamental and harmonics emissions	Pass
§A2.9b	Spurious emissions (except harmonics)	Pass

Notes: None

Section 3 Equipment under test (EUT) details

3.1 Sample information

Receipt date	July 25, 2016
Nemko sample ID number	133-002623

3.2 EUT information

Product name	Sync
Model	3000

3.3 Technical information

Operating band	2400–2483.5 MHz
Operating frequency	2402–2480 MHz
Modulation type	GFSK
Occupied bandwidth (99 %)	1.658 MHz
Emission designator	F1D
Power requirements	3.7 V _{DC}
Antenna information	Internal wire antenna The EUT uses a unique antenna coupling/ non-detachable antenna to the intentional radiator.

3.4 Product description and theory of operation

The EUT is a personal massager which can be controlled from remote controller. The massager has a charger base with USB interface for DC connection. The massager and remote communicate on the 2.4 GHz ISM band.

3.5 EUT exercise details

EUT was specially modified for RF testing to transmit continuously on the low, mid and high channels. Fresh battery was used throughout the assessment.

3.6 EUT setup Figure



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 $\pm 5\%$, 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

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
3 m EMI test chamber	TDK	SAC-3	FA002047	1 year	Dec. 01/16
Flush mount turntable	Sunol	FM2022	FA002082	—	NCR
Controller	Sunol	SC104V	FA002060	—	NCR
Antenna mast	Sunol	TLT2	FA002061	—	NCR
Bilog antenna (20–3000 MHz)	Sunol	JB3	FA002108	1 year	Apr. 28/17
Horn antenna (1–18 GHz)	EMCO	3115	FA000825	1 year	Apr. 26/17
Pre-amplifier (1–18 GHz)	JCA	JCA118-503	FA002091	1 year	April 26/17
Horn antenna 18–40 GHz	EMCO	3116	FA001847	1 year	Apr.15/17
18–26 GHz pre-amplifier	Narda	BBS-1826N612	FA001550	—	VOU
Spectrum analyzer	Rohde & Schwarz	FSU	FA001877	1 year	Apr. 15/17
Receiver/spectrum analyzer	Rohde & Schwarz	ESU 26	FA002043	1 year	Jan. 07/17

Notes: NCR - no calibration required
VOU - verify on use

Section 8 Testing data

8.1 FCC Clause 15.215(c) Emission bandwidth and RSS-Gen 4.6.1 Occupied bandwidth

8.1.1 Definitions and limits

FCC Part 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. 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.

RSS-Gen Clause 4.6.1 Occupied bandwidth

When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99 percent 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 shall be set to as close to 1 percent of the selected span as is possible without being below 1 percent. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used since a peak or, peak hold, may produce a wider bandwidth than actual.

The trace data points are recovered and are directly summed in linear terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5 percent of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points. This frequency is recorded.

The span between the two recorded frequencies is the occupied bandwidth.

8.1.2 Test summary

Verdict	Pass		
Test date	July 26, 2016	Temperature	22 °C
Test engineer	Kevin Rose	Air pressure	1004 mbar
Test location	Ottawa	Relative humidity	58 %

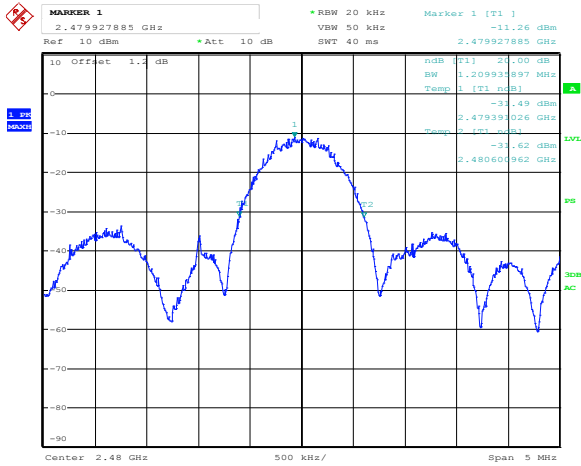
8.1.3 Observations, settings and special notes

Spectrum analyzer settings:

Resolution bandwidth	20 kHz
Video bandwidth	50 kHz
Detector mode	Peak
Trace mod	Max Hold
Function	20 dB BW (for FCC); 99 % bandwidth (for IC)

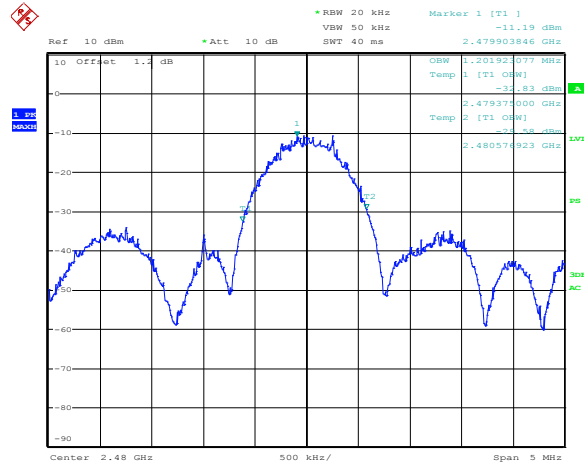


8.1.4 Test data



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Plot 8.1-1: 20 dB bandwidth example



Date: 26.JUL.2016 19:45:51

Plot 8.1-2: 99 % occupied bandwidth example

Table 8.1-1: 20 dB bandwidth results

Frequency (MHz)	20 dB bandwidth (MHz)
2402	1.218
2440	1.234
2480	1.201

Notes: None

Table 8.1-2: 99% bandwidth results

Frequency (MHz)	99 % bandwidth (MHz)
2402	1.266
2440	1.658
2480	1.202

Notes: None

Table 8.1-3: Frequency stability

State	Frequency f_i (GHz)	Frequency f_h (GHz)
0° at 3.145 V _{DC} (Lowest extreme)	2.400720	2.480640
0° at 3.7 V _{DC} (Lower extreme)	2.400720	2.480640
+20° at 3.7 V _{DC} (Nominal)	2400718	2.480601
+55° at 3.145 V _{DC} (Higher extreme)	2.400720	2.480620
+55° at 3.7 V _{DC} (Highest extreme)	2.400720	2.480620

Notes: None

8.2 FCC Clause 15.249(a) and RSS-210 A2.9(a) Field strength of fundamental and harmonics emissions

8.2.1 Definitions and limits

In addition to the provisions of §15.205 and RSS Gen the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

Table 8.2-1: Field strength limits

Fundamental frequencies (MHz)	Field strength of fundamental		Field strength of harmonics	
	(mV/m)	(dBµV/m)	(µV/m)	(dBµV/m)
902–928	50	94	500	54
2400–2483.5	50	94	500	54
5725–5875	50	94	500	54
24.0–24.25*	250	108	2500	68

Notes: * - Only FCC band.

(e) As shown in §15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For point-to-point operation under paragraph (b) of this section, the peak field strength shall not exceed 2500 millivolts/meter (128 dBµV/m) at 3 meters along the antenna azimuth.

8.2.2 Test summary

Verdict	Pass		
Test date	July 26, 2016	Temperature	22 °C
Test engineer	Kevin Rose	Air pressure	1004 mbar
Test location	Ottawa	Relative humidity	58 %

8.2.3 Observations, settings and special notes

- The spectrum was searched from 2.4 GHz to the 10th harmonic at a distance of 3 m.
- The test was performed with vertical and horizontal antenna polarizations and the EUT was measured on three orthogonal axis, only the highest emissions were reported.

Spectrum analyzer/receiver settings:

Resolution bandwidth	1 MHz
Video bandwidth	3 MHz
Detector mode	Peak
Trace mode	Max Hold

8.2.4 Test data

Table 8.2-2: Field strength of fundamental measurement results

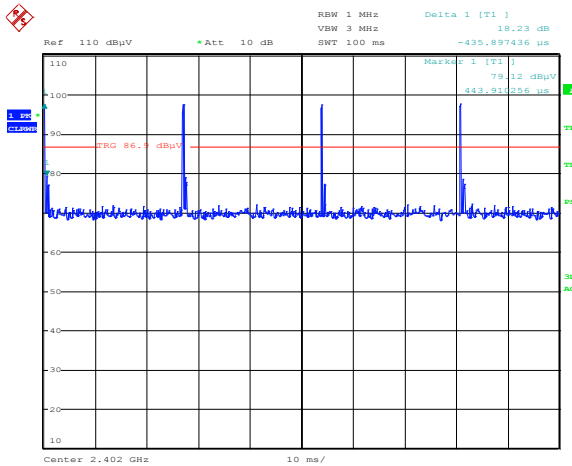
Channel	Frequency, (MHz)	Peak field strength, (dBµV/m)	Peak limit, (dBµV/m)	Peak margin, (dB)	Average Calculated, (dBµV/m)	Average limit, (dBµV/m)	Average margin, (dB)
Low	2402	72.43	114	41.57	52.43	94	21.57
Mid	2440	73.37	114	40.63	53.37	94	20.63
High	2480	73.43	114	40.57	53.43	94	20.57

Notes: Field strength includes correction factor of antenna, cable loss, amplifier, and attenuators where applicable.
 Average field strength = Peak field strength - DCCF

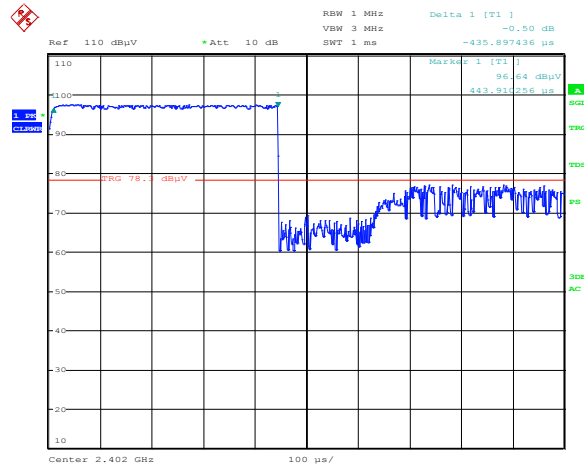
Table 8.2-3: Field strength of harmonics measurement results

Channel	Frequency, (MHz)	Peak field strength, (dBµV/m)	Peak limit, (dBµV/m)	Peak margin, (dB)	Average field strength, (dBµV/m)	Average limit, (dBµV/m)	Average margin, (dB)
Low	4804	43.65	74	30.35	23.65	54	30.35
Mid	4880	45.16	74	28.84	25.16	54	28.84
High	4960	43.94	74	30.06	23.94	54	30.06

Notes: Field strength includes correction factor of antenna, cable loss, amplifier, and attenuators where applicable.
 Average field strength = Peak field strength - DCCF



Plot 8.2-1: 100 ms transmissions



Plot 8.2-2: Single transmission duration

Duty cycle calculation: $20 \times \log_{10}(\text{TX}_{100 \text{ ms}} / 100 \text{ ms}) = 20 \times \log_{10}(4 \times 443.9 \mu\text{s} / 100 \text{ ms}) = -47.05 \text{ dB}$
 Max DCCF of 20 dB was used.

8.2.5 Setup photos



Figure 8.2-1: Emissions setup photo

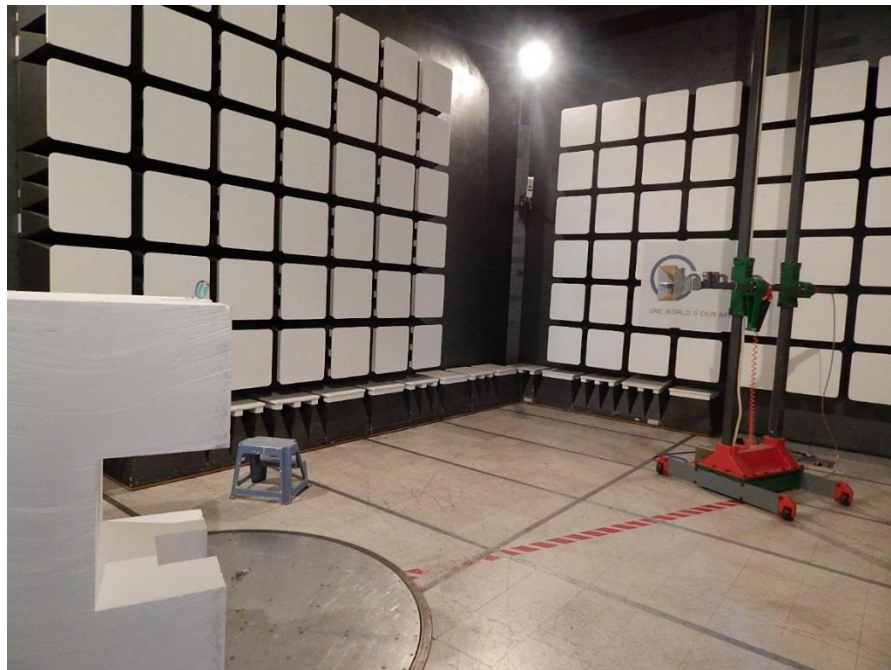


Figure 8.2-2: Emissions setup photo

8.3 FCC Clause 15.249(d) and RSS-210 A2.9(b) Spurious emissions (except for harmonics)

8.3.1 Definitions and limits

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in FCC §15.209 and RSS-Gen, whichever is the lesser attenuation.

Table 8.3-1: Field strength of spurious emissions

Frequency (MHz)	Field strength		Measurement distance (m)
	($\mu\text{V}/\text{m}$)	($\text{dB}\mu\text{V}/\text{m}$)	
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.

8.3.2 Test summary

Verdict	Pass		
Test date	July 26, 2016	Temperature	22 °C
Test engineer	Kevin Rose	Air pressure	1004 mbar
Test location	Ottawa	Relative humidity	58 %

8.3.3 Observations, settings and special notes

- The spectrum was searched from 30 MHz to the 10th harmonic at a distance of 3 m.
- The test was performed with vertical and horizontal antenna polarizations and the EUT was measured on three orthogonal axis, only the highest emissions were reported.

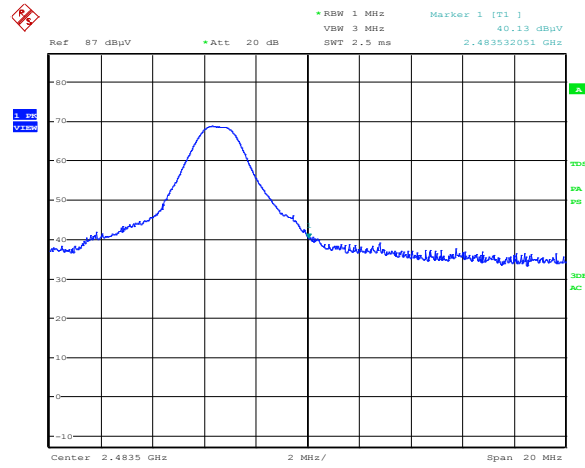
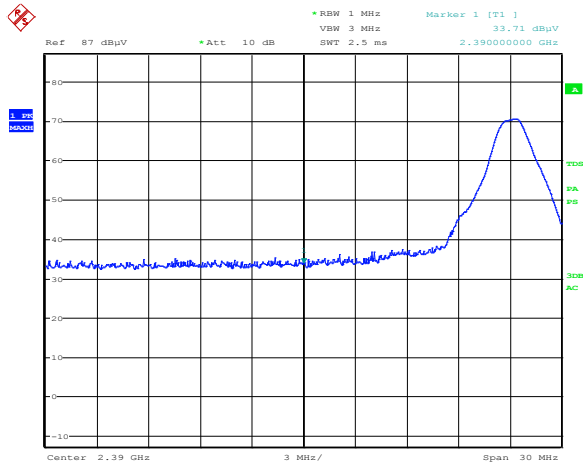
Spectrum analyzer/receiver settings for frequencies below 1 GHz:

Resolution bandwidth:	120 kHz
Video bandwidth:	300 kHz
Detector mode:	Quasi-Peak
Trace mode:	Max Hold

Spectrum analyzer/receiver settings for frequencies above 1 GHz:

Resolution bandwidth:	1 MHz
Video bandwidth:	3 MHz
Detector mode:	Peak
Trace mode:	Max Hold
Average measurements:	Duty cycle/average factor was used for calculation of the average level.

8.3.4 Test data



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Plot 8.3-1: Lower band edge measurement

Plot 8.3-2: Upper band edge measurement

The spectral plots have been corrected with the associated transducer factors (i.e. antenna factors, cable loss, amplifier gains, and attenuators.)

Table 8.3-2: Field strength of spurious emissions measurement results

Channel	Frequency, (MHz)	Peak field strength, (dBµV/m)	Peak limit, (dBµV/m)	Margin, (dB)	Average field strength, (dBµV/m)	Average limit, (dBµV/m)	Margin, (dB)
Low	2439.0	33.71	74	40.29	33.71	54	20.29
High	2483.5	40.13	74	33.87	40.13	54	13.87

Notes: Field strength includes correction factor of antenna, cable loss, amplifier, and attenuators where applicable.
 Peak field strength meets Average limit

All other spurious emissions were greater 20 dB below the field strength spurious emissions limits.

8.3.5 Setup photos



Figure 8.3-1: Emissions setup photo

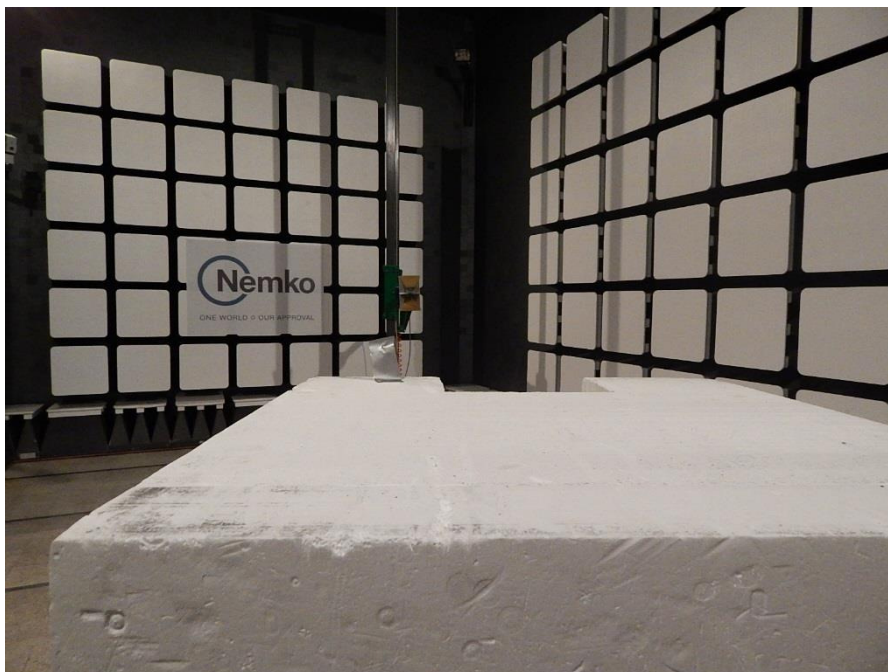
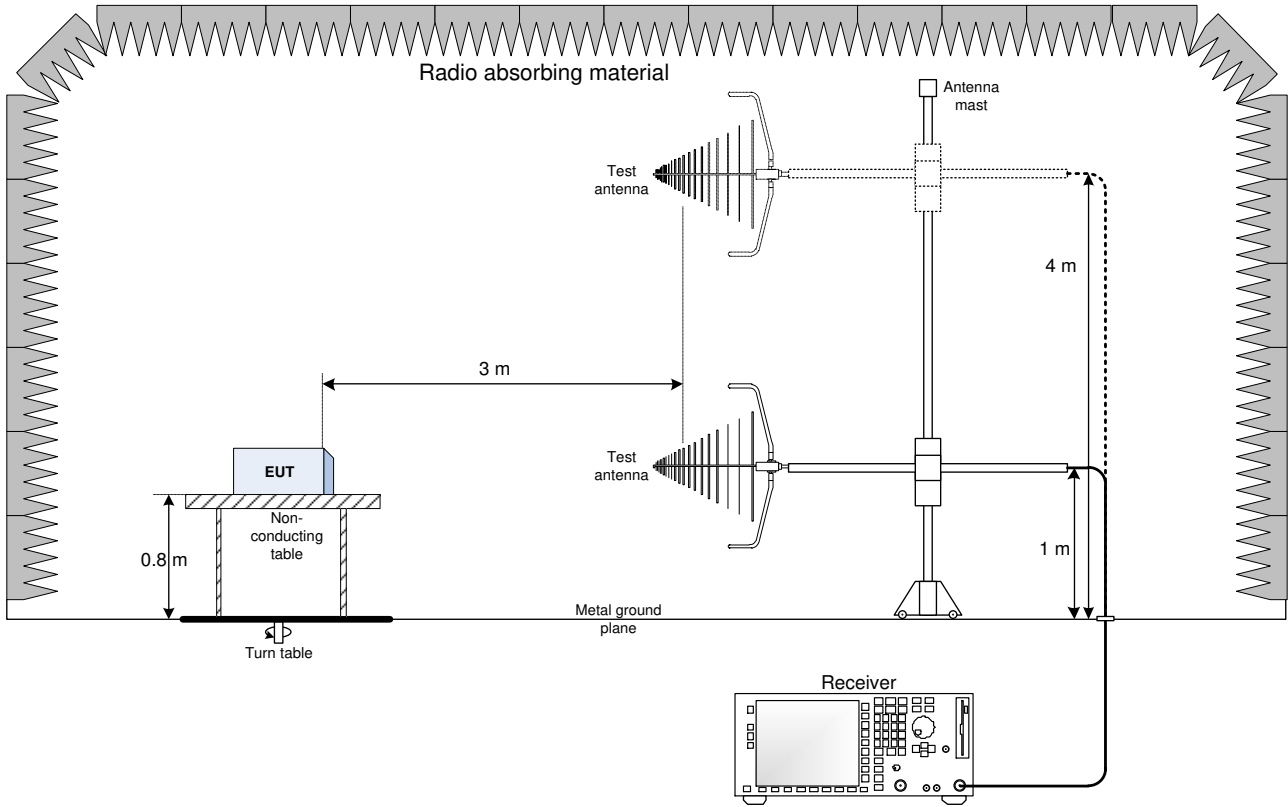


Figure 8.3-2: Emissions setup photo

Section 9 Block Figures of test set-ups

9.1 Block diagram of Radiated emissions set-up below 1GHz



9.2 Radiated emissions set-up above 1 GHz

