Test report for

47 CFR Part 15 Subpart B

ICES-Gen, ICES-003

Test report No. : P000296052 002 Ver 7.0

The RvA is signatory to ILAC - MRA

Product name	: SmartTag-B neck
Manufacturer	: Nedap N.V.
FCC ID	: CGDIFERB
IC	: 1444A-IFERB

Laboratory information

Accreditation

Kiwa Nederland B.V. complies with the accreditation criteria for test laboratories as laid down in ISO/IEC 17025:2017. The accreditation covers the quality system of the laboratory as well as the specific activities as described in the authorized annex bearing the accreditation number L248 and is granted by the Dutch Council For Accreditation (RvA: Raad voor Accreditatie).

Kiwa Nederland B.V. is designated by the FCC as an Accredited Test Firm for compliance testing of equipment subject to Certification under Parts 15 & 18. The Designation number is: NL0001.

Kiwa Nederland B.V. is a Wireless Device Testing laboratory recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements.
The Industry Canada company number for Kiwa Nederland B.V. is: 4173A. The CABID is NL0001.

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Documentation

The test report must always be reproduced in full; reproduction of an excerpt only is subject to written approval of the testing laboratory. The documentation of the testing performed on the tested devices is archived for 10 years at Kiwa Nederland B.V.

Testing Location

Test Site	Kiwa Nederland B.V.
Test Site location	Wilmersdorf 50 7327 AC Apeldoorn The Netherlands Tel. +31 88998 3393
Test Site FCC	NL0001
CABID	NL0001

Revision History

Version	Date	Remarks	By
v0.50	24-02-2023	First draft	M.K
v1.00	14-03-2023	Final release	M.K
v1.50	30-03-2023	Revision 1	M.K
v2.0	13-04-2023	Release 2	M.K
v3.0	24-04-2023	Revision 3	M.K
v4.0	16-05-2023	Removed Rx frequencies Section 1.4 (customer request)	M.K
v5.0	15-06-2023	Update to applicant info	M.K
V6.0	26-06-2023	FCC & IC ID change, Added images for below 30MHz setup	M.K
V7.0	27-07-2023	1.4 Product specifications of Equipment under test, Aux equipment update.	M.K

Table of Contents

Summary of Test results

FCC	ISED	Description	Section in report	Verdict
15.109 (a)	ICES-003 Table 2	Radiated spurious emissions < 1GHz	3.1	Pass
15.109 (a)	ICES-003 Table 4	Radiated spurious emissions > 1GHz	3.1	Pass

Decision rule: Pass/Fail decisions are based on measurement results without taking into account measurement uncertainty.

1 General Description

1.1 Applicant

Client name:	Nedap N.V.
Address:	Parallelweg 2, Groenlo, Netherlands
Zip code:	7141 DC
Telephone:	+31 544 471 825
E-mail:	annepieter.haytema@nedap.com
Contact name:	Mr Anne Pieter Haytema

1.2 Manufacturer

Manufacturer name:	Nedap N.V.
Address:	Parallelweg 2, Groenlo, Netherlands
Zip code:	7141 DC
Telephone:	+31 544 471 825
E-mail:	annepieter.haytema@nedap.com
Contact name:	Mr Anne Pieter Haytema

1.3 Tested Equipment Under Test (EUT)

Product name:	SmartTag-B neck
Brand name:	Nedap
FCC ID:	CGDIFERB
IC:	1444A-IFERB
Product description:	Active RFID tag for cow activity monitoring
Variant model(s):	FE4, IFE4, FER4 and IFER4
Batch and/or serial No.	----
Software version:	----
Hardware version:	----
Date of receipt	24 January 2023
Tests started:	13 February 2023
Testing ended:	14 February 2023

1.3.1 Auxiliary items

AUX1

Product name:	Nedap, VP4102 reader and VSCAN
Product type:	Tag reader
Remarks:	To verify the functional working of the tags

AUX2

Product name:	134Khz, rsp. 434MHz tag reader
Product type:	Tag reader
Remarks:	To verify the functional working of the tags

AUX3

Product name:	Notebook
Product type:	--
Remarks:	Reader with PC sniffer software is used.

1.4 Product specifications of Equipment under test

Tx Frequency:	433.6 - 434.2 MHz
Rx frequency:	--
Occupied channel width:	--
Antenna type:	Integrated 434 MHz trace on PCB & 134 KHz Coil antenna
Antenna gain:	434 MHz trace antenna 0 dBi & 134 KHz Coil antenna gain unknown
Type of modulation:	FSK
Emission designator	106KF1D

Disclaimer: above info is declared by the applicant

The EUT is considered as a Class B device.

1.5 Environmental conditions

Test date	13-02-2023	14-02-2023
Ambient temperature	21.1C	20.6C
Humidity	33.45%	25.3%

1.6 Measurement standards

- ANSI C63.4:2014

1.7 Applicable standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC Part 15 Subpart B
- ICES-003 Issue 7
- ICES-Gen Issue 2

1.8 Observation and remarks

The client has supplied 2 sets of preconfigured EUTs for the tests that were performed. The EUTs configured in test modes and one set of EUTs were set up as sold in the market.

1.9 Conclusions

The sample of the product showed **NO NON-COMPLIANCES** to the specifications stated in paragraph 1.8 of this report.

The results of the test as stated in this report, are exclusively applicable to the product items as identified in this report. Kiwa Nederland B.V. accepts no responsibility for any properties of product items in this test report, which are not supported by the tests as specified in paragraph 1.8 *"Applicable standards".*

All tests are performed by:

Name : ing. Maaz Harris Khan under the supervision of ing, Peter Suringa

Review of test methods and report by:

Name : ing P.A. Suringa

The above conclusions have been verified by the following signatory:

Date : 09-08-2023

Name : ing. R. van Barneveld

Function : Test Engineer

Signature :

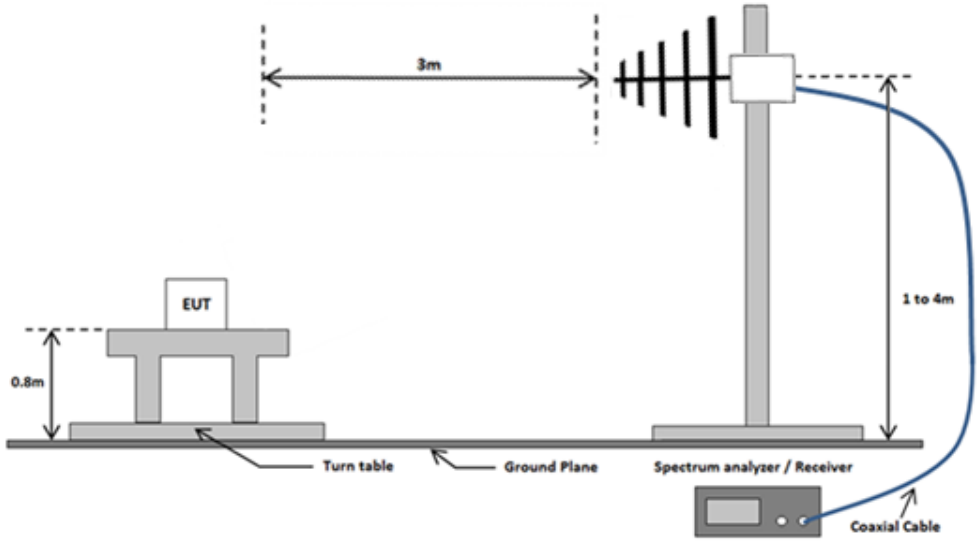
2 Test configuration of the Equipment Under Test

2.1 Test mode

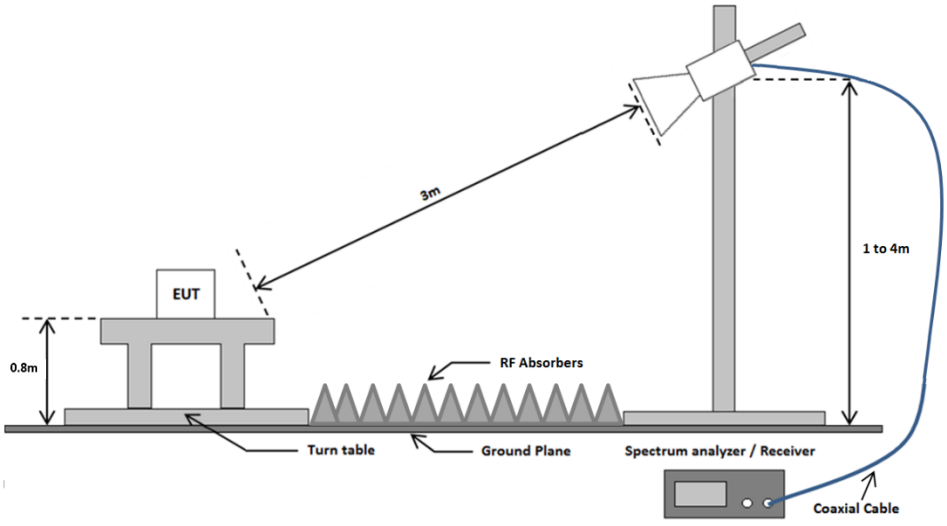
The client provided the means to set the EUT in the different test mode required for all the test cases.

2.2 Test setups

2.2.1 Radiated emissions test setup 30 MHz - 1 GHz



2.2.2 Radiated emissions test setup above 1 GHz



2.3 Test methodology.

The test methodology used is based on the requirements of 47 CFR Part 15, sections 15.31 and 15.109, ICES-003 and ICES-Gen. The test methods, which have been used, are based on ANSI C63.4-2014.

2.4 Equipment modifications.

No modifications have been made to the equipment.

2.5 Equipment used in the test configuration

Description	Manufacturer	Model	ID	Cal. Done date	Cal. due date	Used at Par.
EMI Receiver	Rohde & Schwarz	ESCI	114161	01-2023	01-2024	3.1
EMI Receiver	Rohde & Schwarz	ESR7	114534	02-2023	02-2025	3.1
Spectrum Analyzer	Rohde & Schwarz	FSV40	114527	05-2022	05-2023	3.1
1.1 GHz HPF	Wainwright	WHK1.1/15G-10EF	114682	09-2021	09-2024	3.1
Biconical antenna + 6dB attenuator	Schwarzbeck + HP	VHA9103 + 8491A	114436 + 114254	03-2021	03-2024	3.1
Logperiodic antenna	EMCO	3147	114385	03-2021	03-2024	3.1
Horn antenna	EMCO	3115	114607	01-2021	01-2024	3.1
Preamplifier 1-18 GHz	Schwarzbeck	BBV 9718D	114874	12-2022	12-2023	3.1
Test software	Raditeq	Radimation Version 2021.1.9	--	--	--	3.1
Test Site SAR	ETS-Lindgren	--	114624	--	--	3.1

*Note: Standard gain horn antennas do not need calibration
Conformance of the used measurement and test equipment with the requirements of ISO/IEC 17025:2017 has been confirmed before testing.
NA= Not Applicable

2.6 Sample calculations

All formulas for data conversions and conversion factors are reported in chapter 4 of this test report.

3 Test results

3.1 Radiated spurious emissions

3.1.1 Limit

Except for Class A digital devices, the field strength of radiated emissions from an unintentional radiator shall not exceed the field strength levels specified in the following tables.
On any frequency or frequencies below or equal to 1000 MHz, the limits shown are based on measuring equipment employing a CISPR quasi-peak detector function and related measurement bandwidths, unless otherwise specified.
Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function.
When average radiated emission measurements are specified in this part, there is also a limit on the peak level of the emissions. Unless otherwise specified, the limit on peak emissions is 20 dB above the average limit.
The product under test shall comply with both the average and the peak limits.

ICES-003 Issue 7 section 3.2.2
The quasi-peak limits for the electric component of the radiated field strength emitted from ITE or digital apparatus, within 30 MHz to 1 GHz, for a measurement distance of 3m are presented in table below.
At and above 1 GHz, except for outdoor units of home satellite receiving systems, the ITE or digital apparatus shall comply with the limits specified in table below up to the frequency F_M, which shall be determined. The product under test shall comply with both the average and the peak limits.

FCC 15.109(a)

Frequency (MHz)	Field strength (µV/meter)	Field strength (dBµV/m)	Measurement distance (meters)
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
Above 960	500	54.0	3

ICES-003 tables 2, 4

Frequency (MHz)	Field strength (µV/meter)	Field strength (dBµV/m)	Measurement distance (meters)
30-88	100	40.0	3
88-216	150	43.5	3
216-230	200	46.0	3
230 -960	224	47.0	3
Above 960	500	54.0	3

3.1.2 Measurement instruments

The measurement instruments are listed in chapter 2.5 of this report.

3.1.3 Test setup

The test setup is as shown in chapter 2.2.1 and 2.2.2 of this report.

3.1.4 Test procedure

30 MHz to 26.5 GHz: According to ANSI C63.4-2014, section 8.3

30 MHz to 1 GHz: IRN 441 – Method 1
1 GHz to 18 GHz: IRN 441 – Method 2

In case of handheld and/or body-worn equipment, the EUT's orientation (X, Y, Z) was varied in order to ensure that maximum emission amplitudes were attained. In all other cases the associated cabling and the EUT orientation was varied for maximum emissions.

The spectrum was examined from 30MHz to the highest measurement frequency according to the table below. Final radiated emission measurements were made at 3m distance.

Highest internal frequency (F_X) [i]	Highest measurement frequency (F_M)
$F_X \leq 108$ MHz	1 GHz
108 MHz < $F_X \leq 500$ MHz	2 GHz
500 MHz < $F_X \leq 1$ GHz	5 GHz
$F_X > 1$ GHz	5 x F_X up to a maximum of 40 GHz
i. F_X is the highest fundamental frequency generated and/or used in the ITE or digital apparatus under test.	

The 6 highest emission amplitudes relative to the appropriate limit were recorded in this report. Field strength values of radiated emissions at frequencies not listed in the tables are more than 20 dB below the applicable limit.

3.1.5 Measurement Uncertainty

Frequency range	Polarization	Uncertainty
30 – 200 MHz	Horizontal	±4.5 dB
	Vertical	±5.4 dB
200 -1000 MHz	Horizontal	±3.6 dB
	Vertical	±4.6 dB
1 – 18 GHz	Horizontal	±5.7 dB
	Vertical	±5.7 dB

3.1.6 Test results

Below results are pre-scan tests.

30MHz – 250MHz (Tag ID 5499 and tag reader)

Frequency	Peak	Quasi-Peak	Quasi-Peak Limit	Status	Height	Polarization
49.7 MHz	39.4 dBµV/m	35.7 dBµV/m	40 dBµV/m	Pass	1 m	Horizontal

250MHz – 1000MHz (Sample 7)

Frequency	Peak	Quasi-Peak	Quasi-Peak Limit	Status	Height	Polarization
433.629 MHz	85.7 dBµV/m	81.7 dBµV/m	46 dBµV/m	**	1.2 m	Vertical

1000MHz – 5GHz (Sample 7)

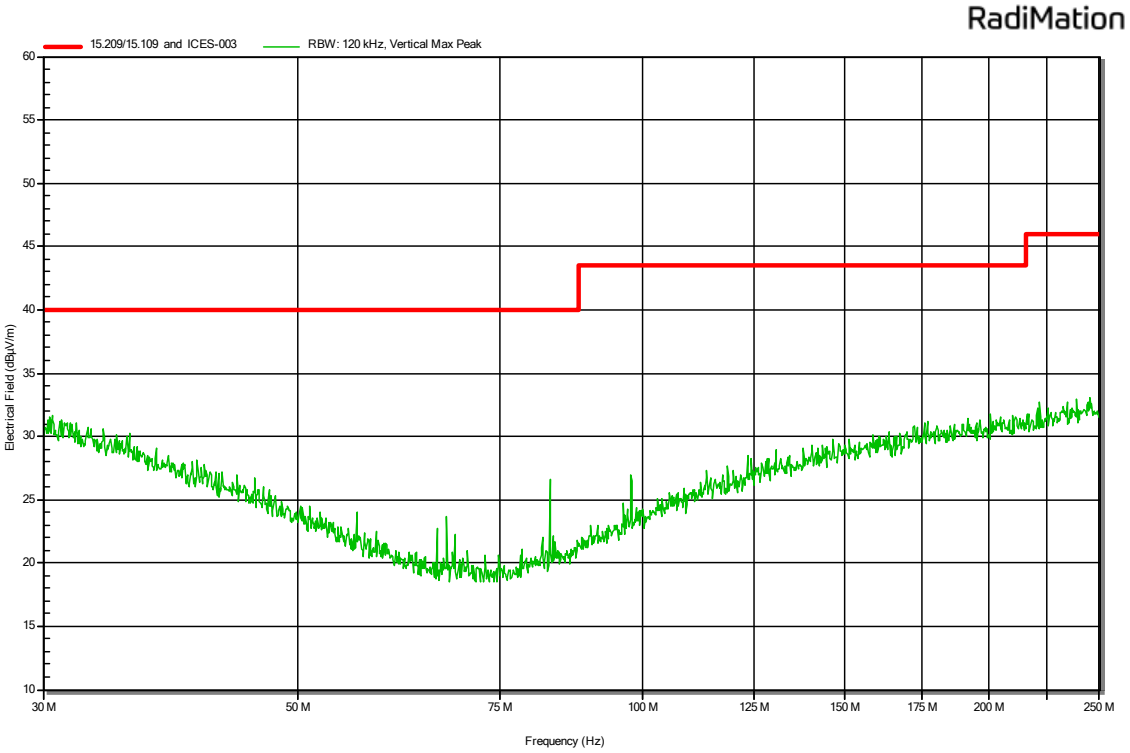
Frequency	Peak	Peak Limit	Average	Average Limit	Status	Height	Polarization
4.361 GHz	48.6 dBµV/m	74 dBµV/m	36.1 dBµV/m	54 dBµV/m	Pass	1.3 m	Vertical
3.087 GHz	45.9 dBµV/m	74 dBµV/m	34 dBµV/m	54 dBµV/m	Pass	3.2 m	Vertical
1.301 GHz	45 dBµV/m	74 dBµV/m	41.2 dBµV/m	54 dBµV/m	Pass	3 m	Vertical
2.21 GHz	41.5 dBµV/m	74 dBµV/m	28.8 dBµV/m	54 dBµV/m	Pass	1 m	Horizontal
2.168 GHz	48.1 dBµV/m	74 dBµV/m	44.9 dBµV/m	54 dBµV/m	Pass	2.5 m	Vertical

The results of the radiated emission tests are depicted in the table above. A selection of plots is provided on the next pages

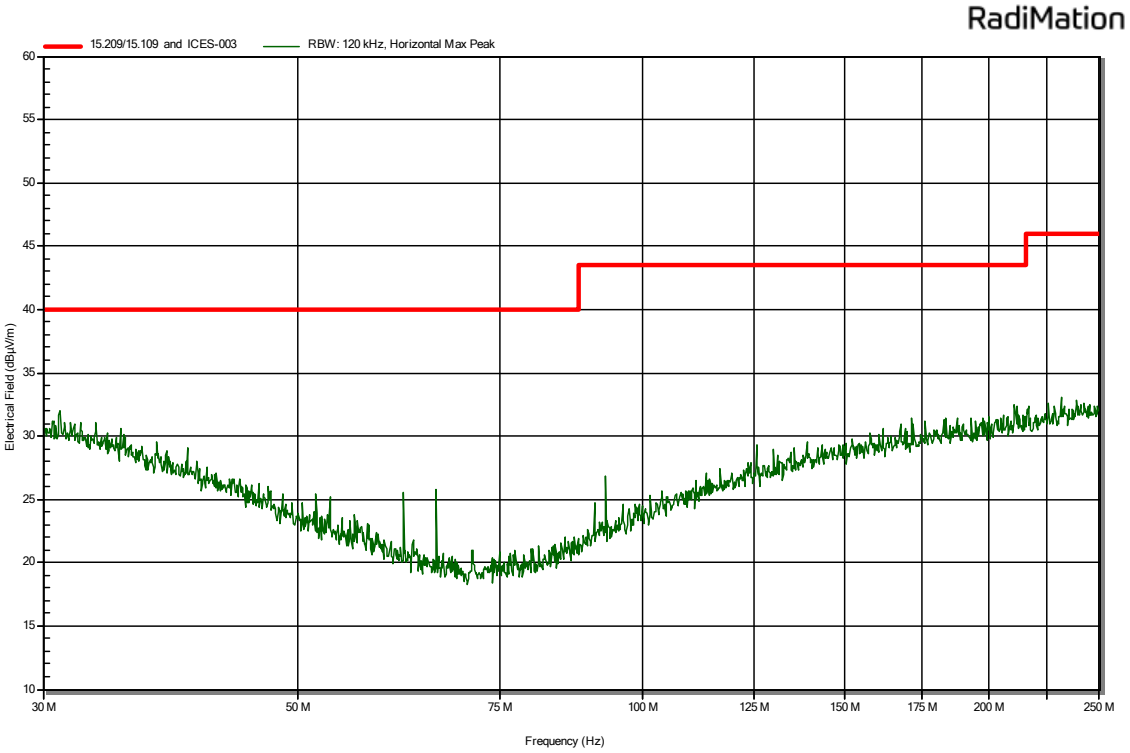
3.1.7 Plots of the Radiated Spurious Emissions Measurement

30MHz – 250MHz (Sample 7)

Vertical

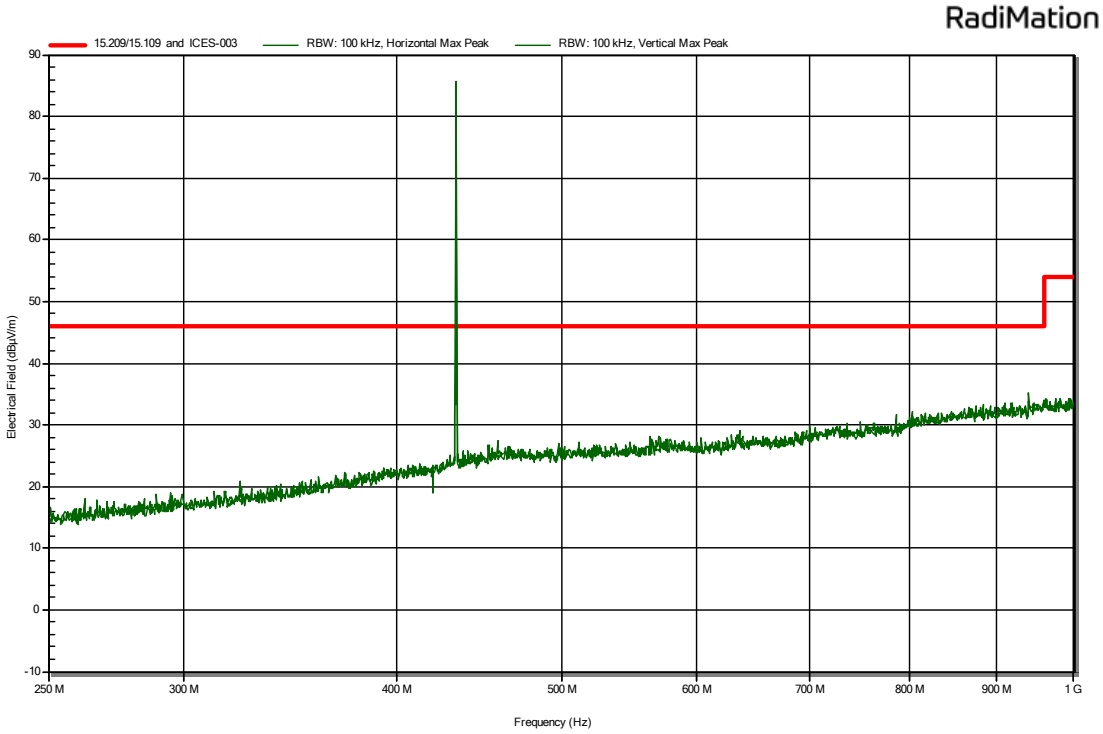


Horizontal

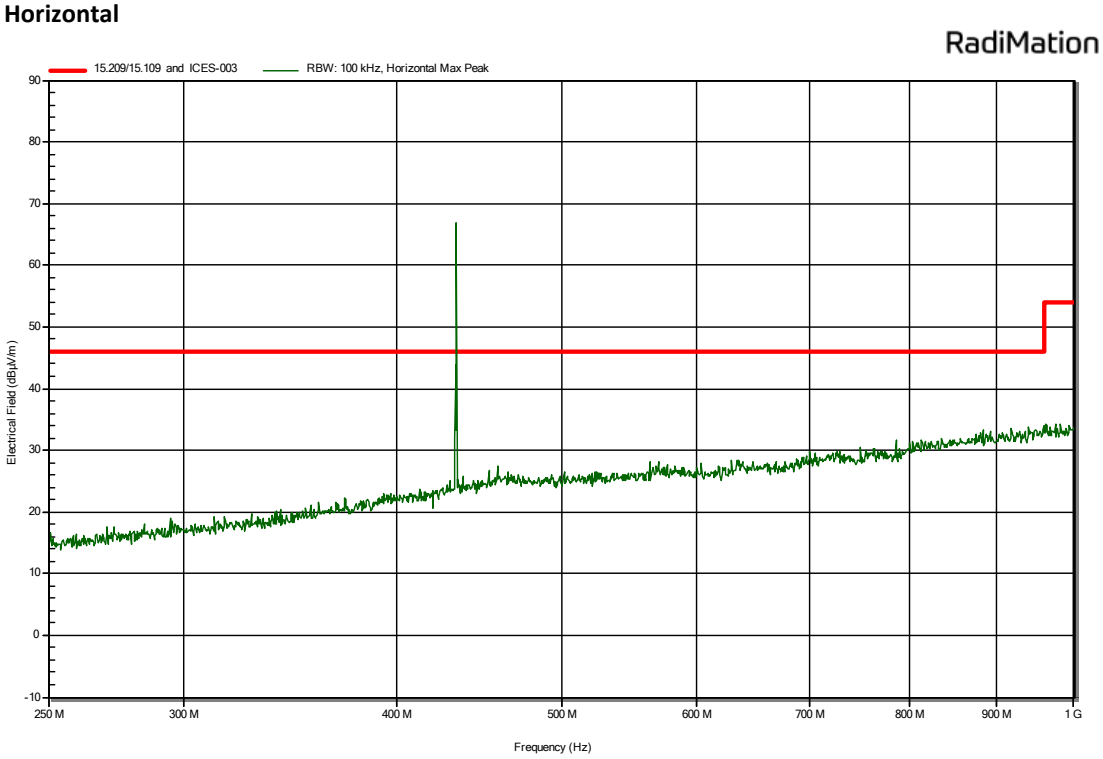


250MHz – 1000MHz (Sample 7)

Vertical



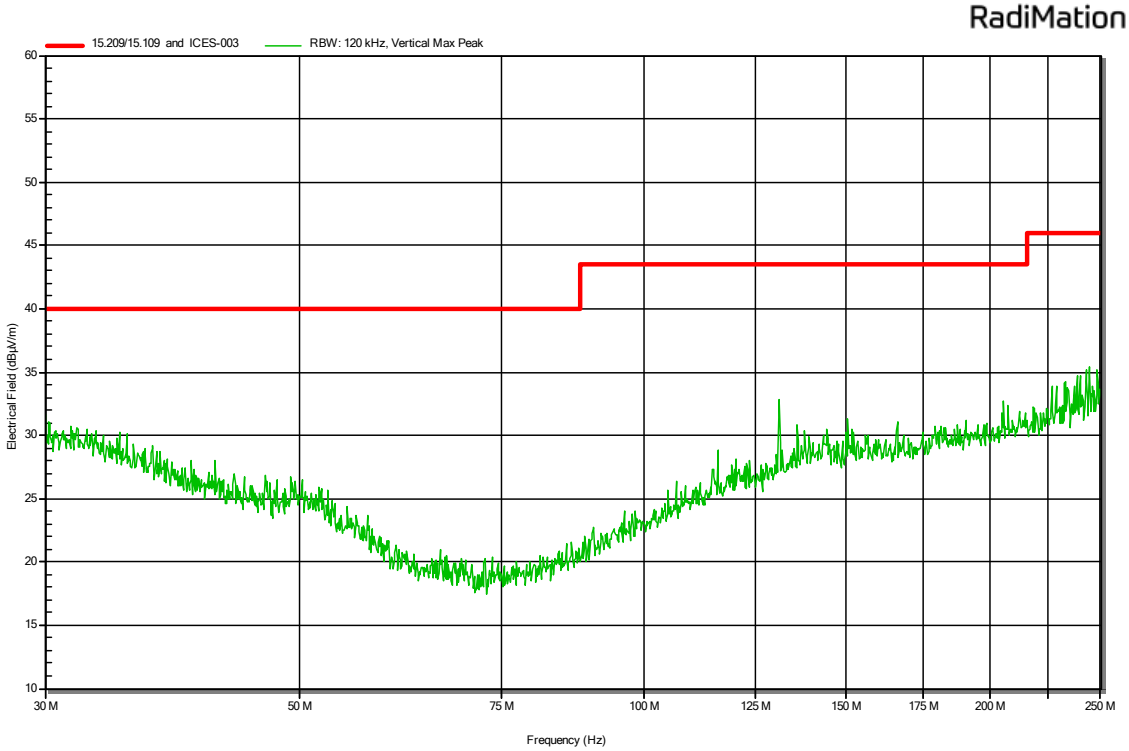
Horizontal



*Note: Peak at 433MHz is the transmitted signal.

30MHz – 250MHz (Tag ID 5499 and tag reader)

Vertical



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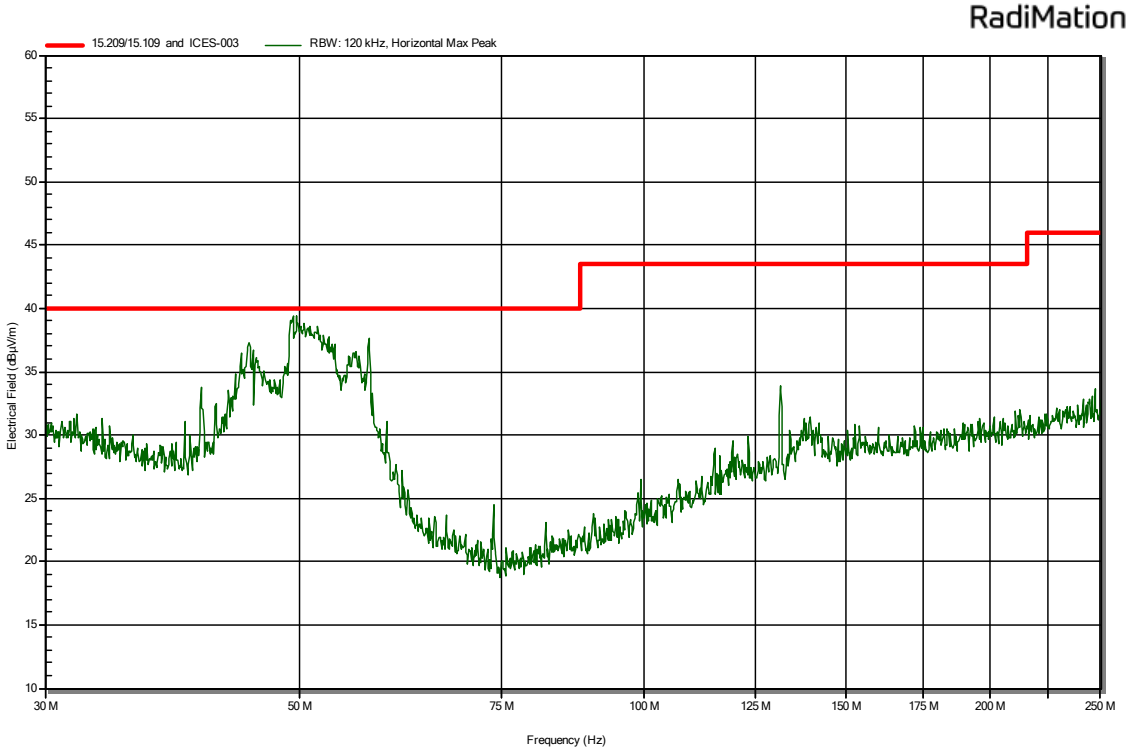
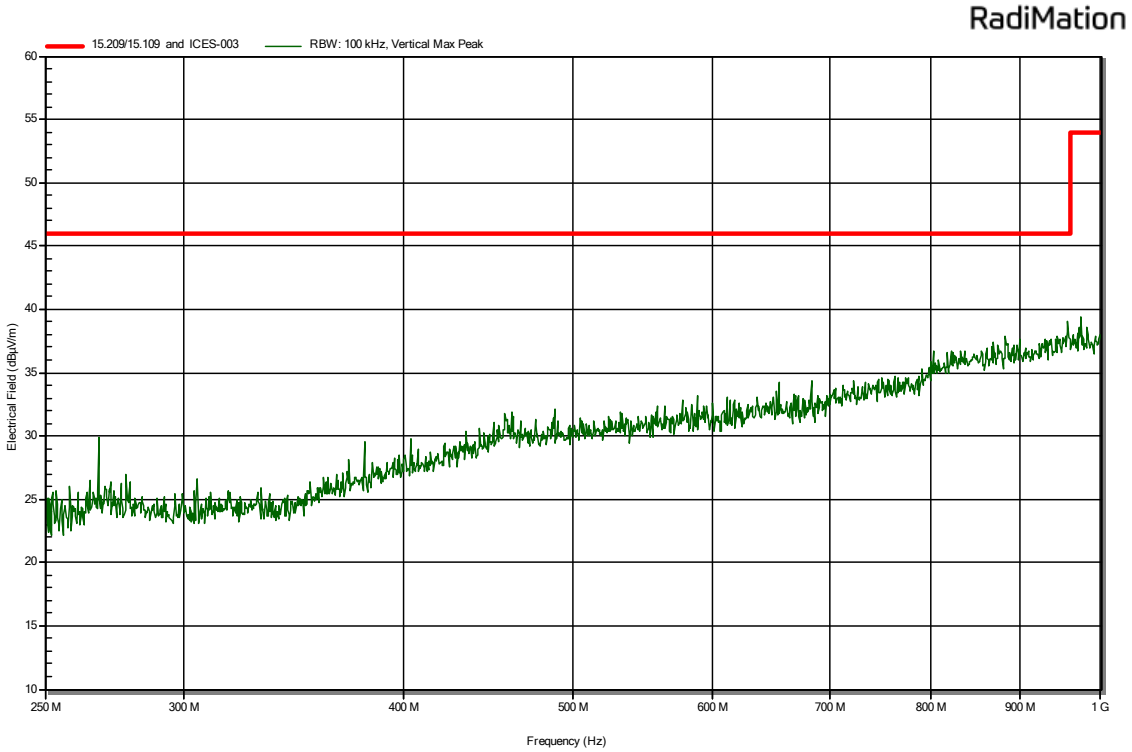
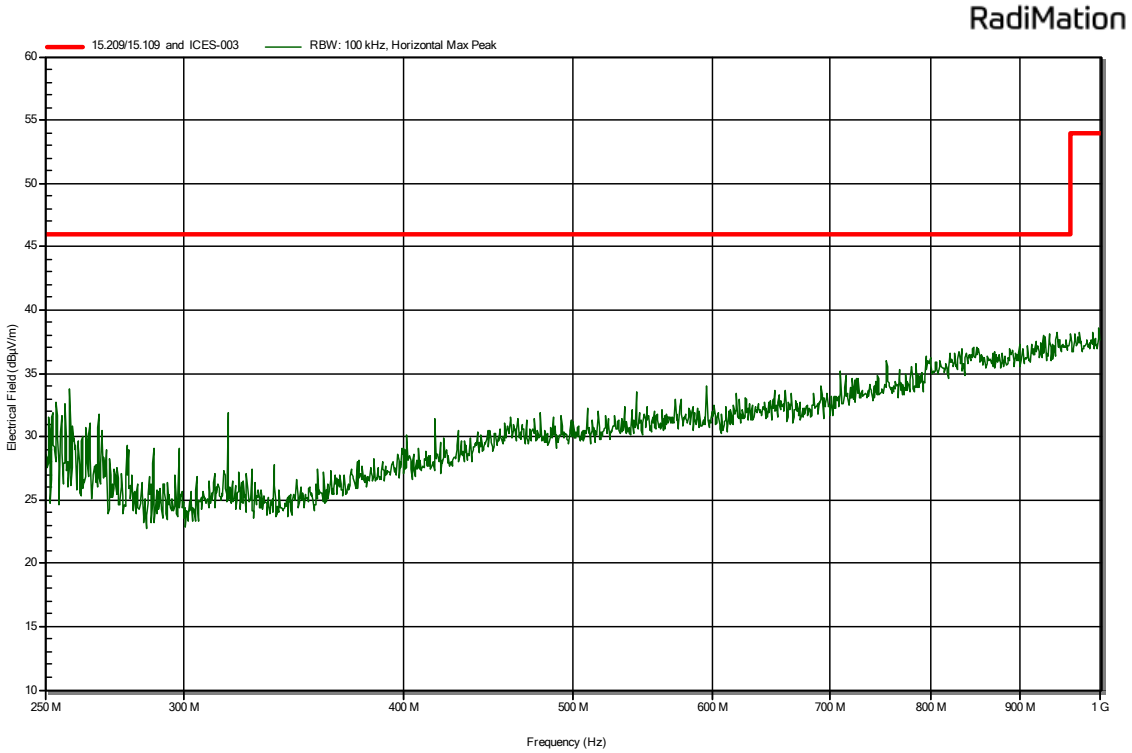


250MHz – 1000MHz (Tag ID 5499 and tag reader)

Vertical

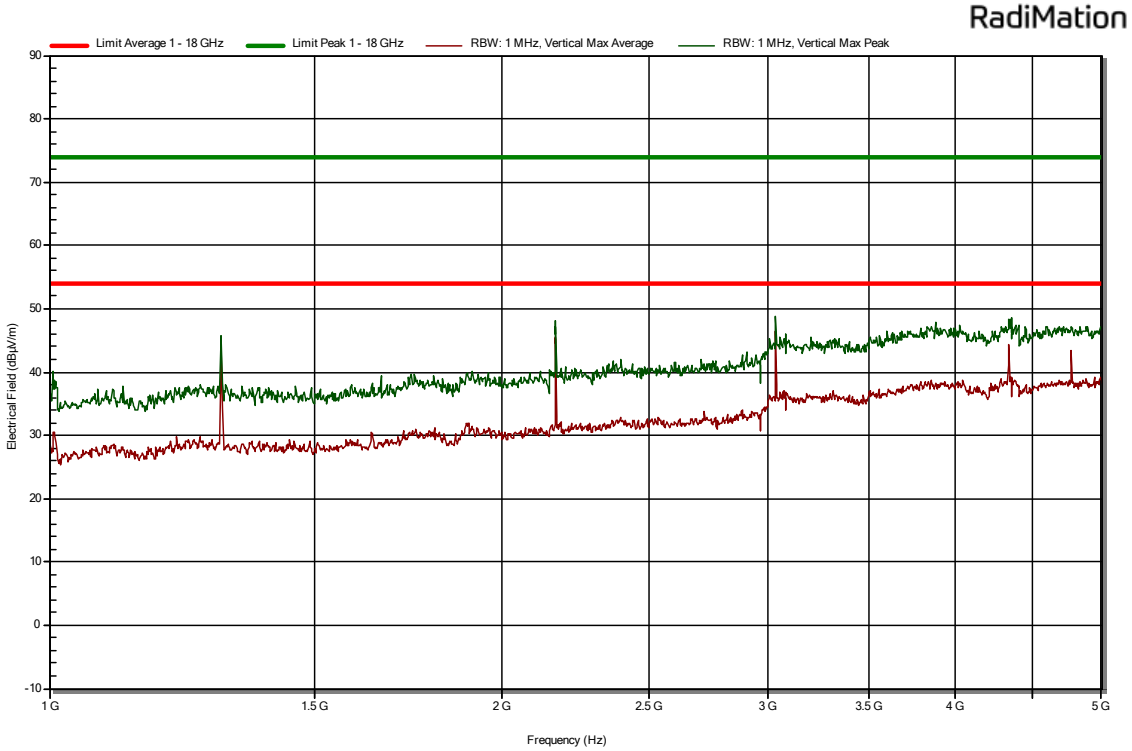


Horizontal

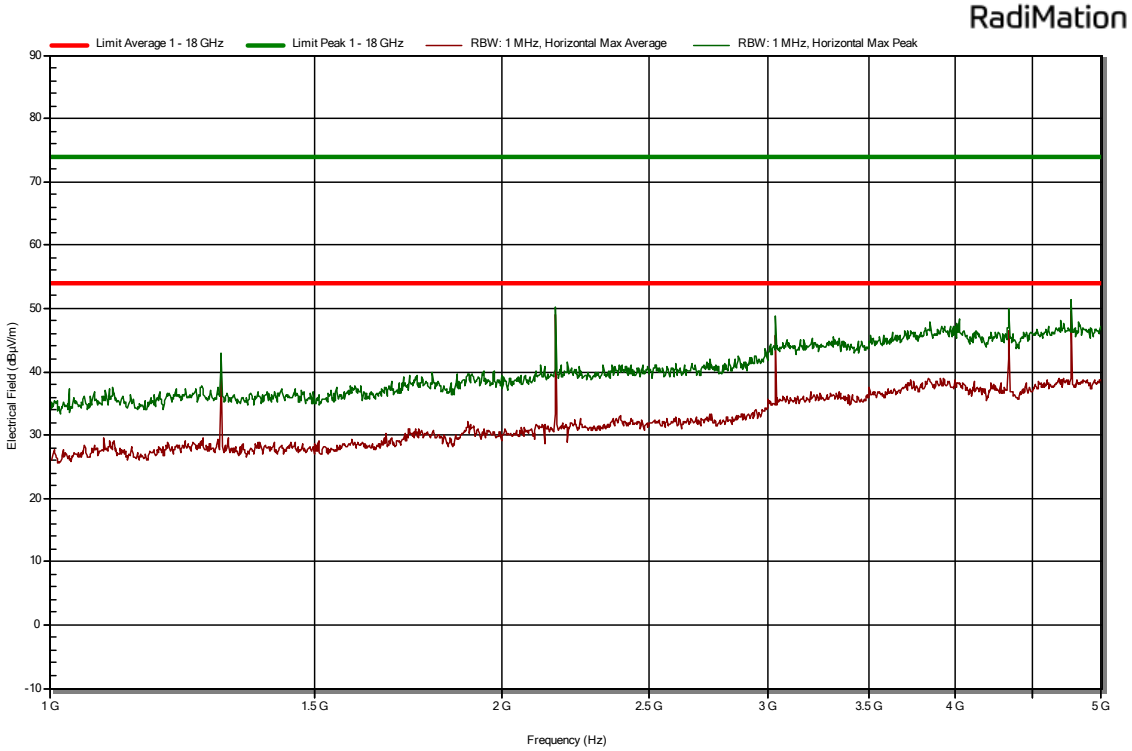


1000MHz – 5GHz (Sample 7)

Vertical



Horizontal



4 Sample calculations

All formulas for data conversions and conversion factors are reported in this chapter.

Field Strength Measurement:

E (dBµV/m) = U(dBµV) + AF (dB/m) + Corr. (dB)

Where:
E = Electric field strength
U = Measuring receiver voltage
AF = Antenna factor
CL = Cable loss

Corr. = sum of single correction factors of used cable and amplifier (if applicable).
Linear interpolation will be used for frequencies in between the values in the table.
Tables shows an extract of the values.

Frequency (Mhz)	**AF (dB/m)** **Id: 109683** **Chase CBL6112B** **SN: 2408**	**Cable loss (dB)** **Id: SAR cable**	**Corr. (dB)**
30	25,4	0,68	26,1
100	16,8	1,15	18,0
150	16,8	1,41	18,2
200	15,3	1,63	16,9
250	19,3	1,93	21,2
300	13,3	2,12	15,4
350	14,6	2,20	16,8
400	22,0	2,29	24,3
450	23,0	2,53	25,5
500	23,8	2,67	26,5
550	25,4	2,90	28,3
600	24,8	3,02	27,8
650	25,2	3,09	28,3
700	25,0	3,22	28,2
750	25,8	3,56	29,4
800	25,8	3,69	29,5
900	26,5	3,81	30,3
950	27,0	3,91	30,9
1000	27,4	4,30	31,7

Frequency (MHz)	AF (dB/m) TE 00531 Emco 3115 SN: 9412-4377	Gain (dB) TE 11132 Miteq JS4-18004000-30-8P-A1	Cable loss (dB) TE 01315	Corr, (dB)
1000	23,6	40,4	2,0	66
1500	25,1	40,5	2,4	68
2000	27,1	40,5	2,7	70,3
2500	28,6	40,7	3,2	72,5
3000	30,5	40,7	3,2	74,4
3500	31,2	40,7	3,4	75,3
4000	32,7	40,9	4,9	78,5
4500	32,4	40,9	4,4	77,7
5000	33,2	40,7	4,6	78,5
5500	34,0	40,5	4,5	79
6000	34,6	40,0	5,2	79,8
6500	34,3	39,4	5,9	79,6
7000	35,2	38,6	5,7	79,5
7500	36,4	39,2	5,9	81,5
8000	37,0	38,9	6,3	82,2
8500	37,5	38,4	6,4	82,3
9000	38,1	37,4	6,5	82
9500	37,8	37,0	7,1	81,9
10000	38,2	36,5	7,3	82
10500	38,1	36,7	7,6	82,4
11000	38,3	36,9	8,3	83,5
11500	38,5	37,6	8,1	84,2
12000	39,1	38,3	8,4	85,8
12500	38,7	38,5	8,3	85,5
13000	39,2	38,9	9,2	87,3
13500	40,5	40,2	8,3	89
14000	41,1	40,0	8,2	89,3
14500	41,4	40,1	8,2	89,7
15000	40,2	41,4	8,3	89,9
15500	37,9	41,4	8,6	87,9
16000	37,5	42,8	9,2	89,5
16500	38,6	42,3	8,8	89,7
17000	41,1	43,1	9,4	93,6
17500	42,7	43,2	9,4	95,3
18000	44,0	44,2	9,8	98

5 Photograph test setup

5.1 Photograph test setup Radiated Emissions

Photo 1 Photograph test setup radiated emissions 30-250 MHz, report section 3.1

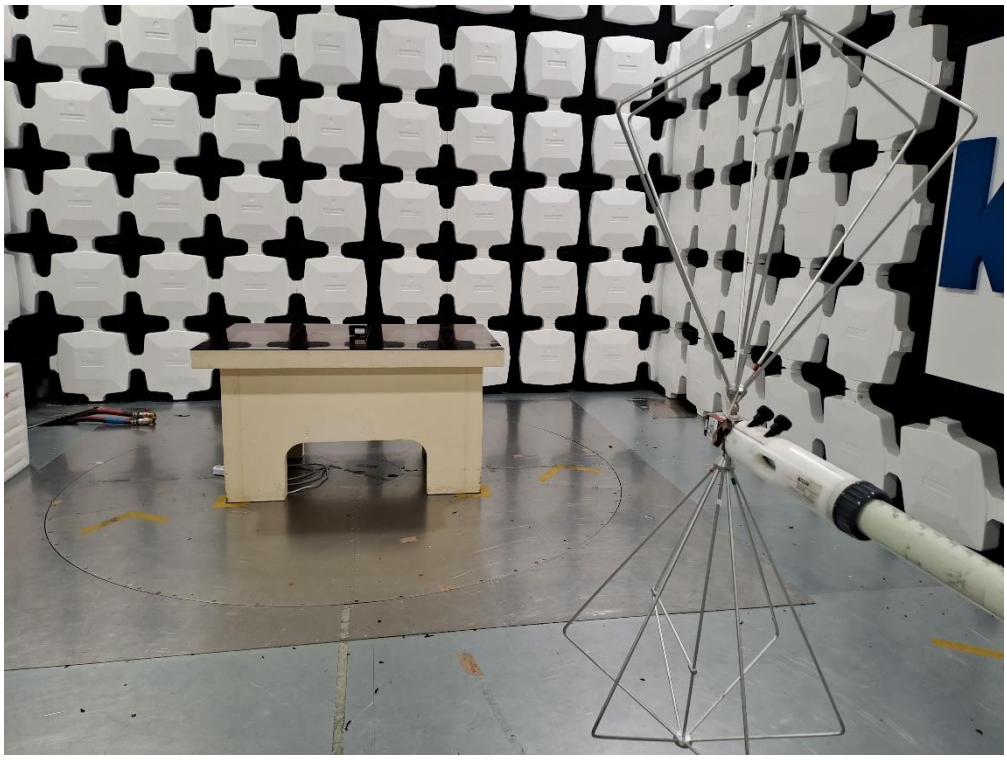


Photo 2 Photograph test setup radiated emissions 250-1000 MHz, report section 3.1

END OF REPORT