

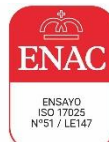
ISED CABid: ES1909
Lab Company Number: 4621A

Test report No:
76558REM.002A1

Test report

FCC Rules and Regulations CFR 47, Part 15, Subpart B (10-1-23 Edition) & ICES-003 Issue 7 (October 2020)

(*) Identification of item tested	HAIP Locator
(*) Trademark	Nokia
(*) Model and /or type reference	LD-7L
Other identification of the product	N/A
(*) Features	Features Supported: Bluetooth LE HW version: 1.5 SW version: 6.1 FCC ID: 2AVO2LD-7L (applicant: Nokia of America Corp) IC: 661AF-LD7L (applicant: Nokia solutions and Networks Canada)
Manufacturer	Scanfil Malmö AB Bronsyxegatan 6B, 213 75 Malmö, Sweden
Test method requested, standard	FCC Rules and Regulations CFR 47, Part 15, Subpart B (10-1-23 Edition) & ICES-003 Issue 7 (October 2020)
Summary	IN COMPLIANCE
Approved by (name / position & signature)	José Manuel Gómez EMC Consumer & RF Lab. Manager
Date of issue	2024-05-15
Report template No	FDT08_24 (* "Data provided by the client")



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Acronyms

Acronym ID	Acronym Description
Code	EMC Test Code
Freq Rng	Frequency Range
Line	Conducted Emissions - Tested Line
MP	Measurement Point
OM	Operation Mode
S/	Sample
V	Verdict

Competences and guarantees

DEKRA Testing and Certification S.A.U. is a testing laboratory accredited by the National Accreditation Body (ENAC -Entidad Nacional de Acreditación), to perform the tests indicated in the Certificate No. 51/LE 147.

DEKRA Testing and Certification S.A.U. is an FCC-recognized accredited testing laboratory with the appropriate scope of accreditation that covers the performed tests in this report, FCC designation number ES0004.

DEKRA Testing and Certification S.A.U. is an ISED recognized accredited testing laboratory, CABid: ES1909, Company Number: 4621A, with the appropriate scope of accreditation that covers the performed tests in this report.

In order to assure the traceability to other national and international laboratories, DEKRA Testing and Certification S.A.U. has a calibration and maintenance program for its measurement equipment.

DEKRA Testing and Certification S.A.U. guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated on the report and, it is based on the knowledge and technical facilities available at DEKRA Testing and Certification S.A.U. at the time of performance of the test.

DEKRA Testing and Certification S.A.U. is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

The results presented in this Test Report apply only to the particular item under test established in this document.

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4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA Testing and Certification S.A.U. and the Accreditation Bodies.

Uncertainty

Uncertainty (factor $k=2$) was calculated according to the DEKRA Testing and Certification S.A.U. internal document PODT000.

The total uncertainty of the measurement system for the measured conducted disturbance characteristics of EUT from 150 kHz to 30 MHz is $I = \pm 3,9$ dB for quasi-peak measurements, $I = \pm 3,2$ dB for peak measurements ($k = 2$).

The total uncertainty of the measurement system for the measured radio disturbance characteristics of EUT from 30 MHz to 1000 MHz is $I = \pm 4,9$ dB for quasi-peak measurements, $I = \pm 4,6$ dB for peak measurements ($k = 2$).

The total uncertainty of the measurement system for the measured radio disturbance characteristics of EUT from 1000 MHz to 12.75 GHz is $I = \pm 2,6$ dB for peak and average measurements ($k = 2$).

Data provided by the client

The following data has been provided by the client:

1. Information relating to the description of the sample ("Identification of the item tested", "Trademark", "Model and/or type reference tested").
2. The sample consists of a HAIP Locator LD-7L, it is a part of the Nokia HAIP (High Accuracy Indoor Positioning) system that is used to locate HAIP tags. LD-7L uses 2.4 GHz RF transceiver for locating and configuring HAIP tags and Ethernet to connect to the HAIP network. In addition to locating HAIP tags, LD-7L can be configured as Bluetooth Low Energy broadcaster to provide signals that Bluetooth low energy compatible devices can use for positioning.

DEKRA Testing and Certification S.A.U. declines any responsibility with respect to the information provided by the client and that may affect the validity of results.

Usage of samples

Samples undergoing test have been selected by: The client.

Id	Control Number	Description	Model	Serial N°	Date of Reception	Application
S/01	76558B_3.1	NOKIA LOCATOR UNIT WITH TIVA PCBA	LD-7L	---	2023-11-30	Element Under Test
S/02	76558B_4.1	NOKIA LOCATOR UNIT WITH TIVA PCBA	LD-7L	---	2023-11-30	Element Under Test

Notes referenced to samples during the project:

Id	Type	Note
S/01	Commercial	Samle used for RE test
S/02	Commercial	Sample used for CE test

Test sample description

Ports..... :	Port name and description		Cable			
			Specified max length [m]	Attached during test	Shielded	Coupled to patient ⁽³⁾
	Ethernet		100	[X]	[X]	[]
Supplementary information to the ports..... :	Not provided data					
Rated power supply	Voltage and Frequency		Reference poles			
			L1	L2	L3	N
	[]	AC:	[]	[]	[]	[]
	[X]	DC: 12V (alternative only, POE Powered)				
Rated Power	12W					
Clock frequencies..... :	Not provided data					
Other parameters	Not provided data					
Software version	6.1					
Hardware version	1.5					
Dimensions in cm (W x H x D)	diameter 205.6 mm, height 43.95 mm					
Mounting position	[]	Table top equipment				
	[X]	Wall/Ceiling mounted equipment				
	[]	Floor standing equipment				
	[]	Hand-held equipment				
	[]	Other:				
Modules/parts..... :	Module/parts of test item		Type	Manufacturer		
	Not provided data			
Accessories (not part of the test item)	Description		Type	Manufacturer		
	Not provided data			
Documents as provided by the applicant..... :	Description		File name	Issue date		
	Not provided data			

⁽³⁾ Only for Medical Equipment

Identification of the client

Nokia Solutions and Networks Ltd.
Budapest, Bókay János u. 36-42, 1083 Hungary

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2024-01-23
Date (finish)	2024-01-31

Document history

Report number	Date	Description
76558REM.002	2024-04-12	First release
76558REM.002A1	2024-05-15	First modification. In the features section of the cover page, the AoA feature is removed. Minor typos are corrected. This report cancels and replaces report 76558REM.002

Environmental conditions

In the control chamber, the following limits were not exceeded during the test:

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 30 % Max. = 75 %
Air pressure	Min. = 860mbar Max. = 1060mbar

In the semianechoic chamber, the following limits were not exceeded during the test.

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 30 % Max. = 75 %
Air pressure	Min. = 860mbar Max. = 1060mbar

In the chamber for conducted measurements, the following limits were not exceeded during the test:

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 30 % Max. = 60 %
Air pressure	Min. = 860mbar Max. = 1060mbar

Remarks and comments

The tests have been performed by the technical personnel: Jia Hao Luo Chen and Victoria Olmedo Villalba.

Testing verdicts

Fail	F
Inconclusive	I
Not applicable	N/A
Not measured	N/M
Pass	P
Partial Passed	P*

List of equipment used during the test

Control No.	Equipment	Model	Manufacturer	Next Calibration
07822	EMC SOFTWARE	RADIMATION	DARE INSTRUMENTS	--
04523	EMI TEST RECEIVER 20Hz-26.5GHz	ESU26	ROHDE AND SCHWARZ	2026-01-04
08165	GROUNDING PLANE LAB-3	--	--	--
07763	HORN ANTENNA 1-18GHz	BBHA 9120D	SCHWARZBECK MESS-ELEKTRONIK	2026-01-16
07769	PREAMPLIFIER 30dB 500MHz-18GHz	BBV 9718 C	SCHWARZBECK	2025-03-13
08130	SEMIANECHOIC ABSORBER LINED CHAMBER	P29419	ALBATROSS	--
08134	SHIELDED ROOM	P29419	ALBATROSS PROJECTS GMBH	--
04848	SOFTWARE FOR EMC/RF TESTING	EMC32	ROHDE AND SCHWARZ	--
07550	TEMPERATURE AND HUMIDITY PROBE	HWg-STE	HW GROUP	2024-05-02
07551	TEMPERATURE AND HUMIDITY PROBE	HWg-STE	HW GROUP	2024-05-02
07549	TEMPERATURE AND HUMIDITY PROBE	HWg-STE	HW GROUP	2024-05-02
07859	THREE-PHASE ARTIFICIAL NETWORK 32A	PMM L3-32	NARDA	2024-02-01

Summary

Test Specification	Requirement – Test case	Verdict	Remark
FCC CFR 47, Part 15, Subpart B (10-1-23 Edition) & ICES-003 Issue 7 (October 2020)	RE Radiated emission. Electromagnetic field measure	P	(1)
	CE Continuous conducted emission	P	---
<u>Supplementary information and remarks:</u> (1) Test required only to the 5th harmonics of the maximum internal work frequency in the EUT.			

Appendix A: Test results

Appendix A content

DESCRIPTION OF THE OPERATION MODES	13
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Description of the operation modes

The operation modes described in this paragraph constitute a functionality of the sample under test for itself.
The operation modes used by the samples to which the present report refers, are shown in the following table:

Id	Description
OM/01	EUT ON. BLE OFF. Power supply: PoE 37-57 Vdc. Auxiliary ACDC power supply: 115 Vac.
OM/02	EUT ON. BLE ON. Receiving packets from TAG. Power supply: PoE 37-57 Vdc. Auxiliary ACDC power supply: 115 Vac.

Test standards version applied

The product standards and test standards applied for each test cases are shown in the following table:

Product Test Standard	Test standard	Requirement – Test case
FCC CFR 47, Part 15, Subpart B (10-1-23 Edition) & ICES-003 Issue 7 (October 2020)	ANSI C63.4 (2014)	RE Radiated emission.
	ANSI C63.4 (2014)	CE Continuous conducted emission

Test Cases Details

FCC 47 CFR Part 15B CE Continuous conducted emission

Limits of interference Class B

The applied limit for continuous conducted emissions in power leads, according with the requirements of FCC Rules and Regulations 47 CFR Part 15, Subpart B and C (10-1-23 Edition), Secs. 15.107 and 15.207 & ICES-003 Issue 7 (October 2020), in the frequency range 0,15 to 30 MHz, for Class B equipment was:

Frequency range (MHz)	Limit (dB μ V)	
	Quasi-Peak	Average
0,15 to 0,5	66 – 56*	56 – 46*
0,5 to 5	56	46
5 to 30	60	50

*Decreases with the logarithm of the frequency.

Results

S/	OM	Code	Freq Rng (MHz)	Line	V
02	OM/01	CE02010N	[0.15, 30]	N	P
02	OM/01	CE0201L1	[0.15, 30]	L1	P
02	OM/02	CE02020N	[0.15, 30]	N	P
02	OM/02	CE0202L1	[0.15, 30]	L1	P

Verdict

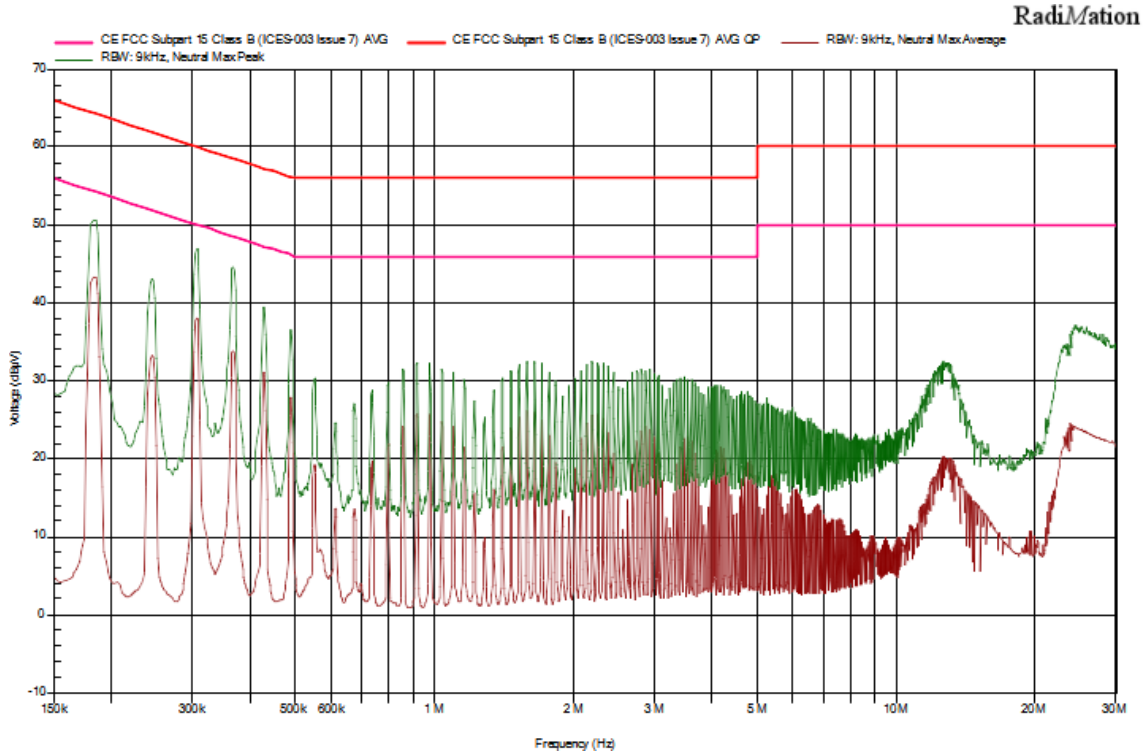
Pass

Attachments

EMC Test Code = CE02010N Frequency Range MHz = [0.15, 30]
 Conducted Emissions - Tested Line = N

Sample ID: S/02
 Operation Mode: OM/01

Images:



Tables:

Frequency (MHz)	Average (dBµV)	Peak (dBµV)	Line
0,183 MHz	43,4 dBµV	50,7 dBµV	N
0,244 MHz	33,2 dBµV	43,1 dBµV	N
0,305 MHz	38,1 dBµV	46,9 dBµV	N
0,367 MHz	33,9 dBµV	44,7 dBµV	N
0,428 MHz	31,1 dBµV	39,4 dBµV	N
0,489 MHz	27,9 dBµV	36,5 dBµV	N
0,917 MHz	25,8 dBµV	32,3 dBµV	N
1,651 MHz	26 dBµV	32,4 dBµV	N
2,262 MHz	25,7 dBµV	32,3 dBµV	N
24,568 MHz	24 dBµV	36,7 dBµV	N

EMC Test Code = CE0201L1

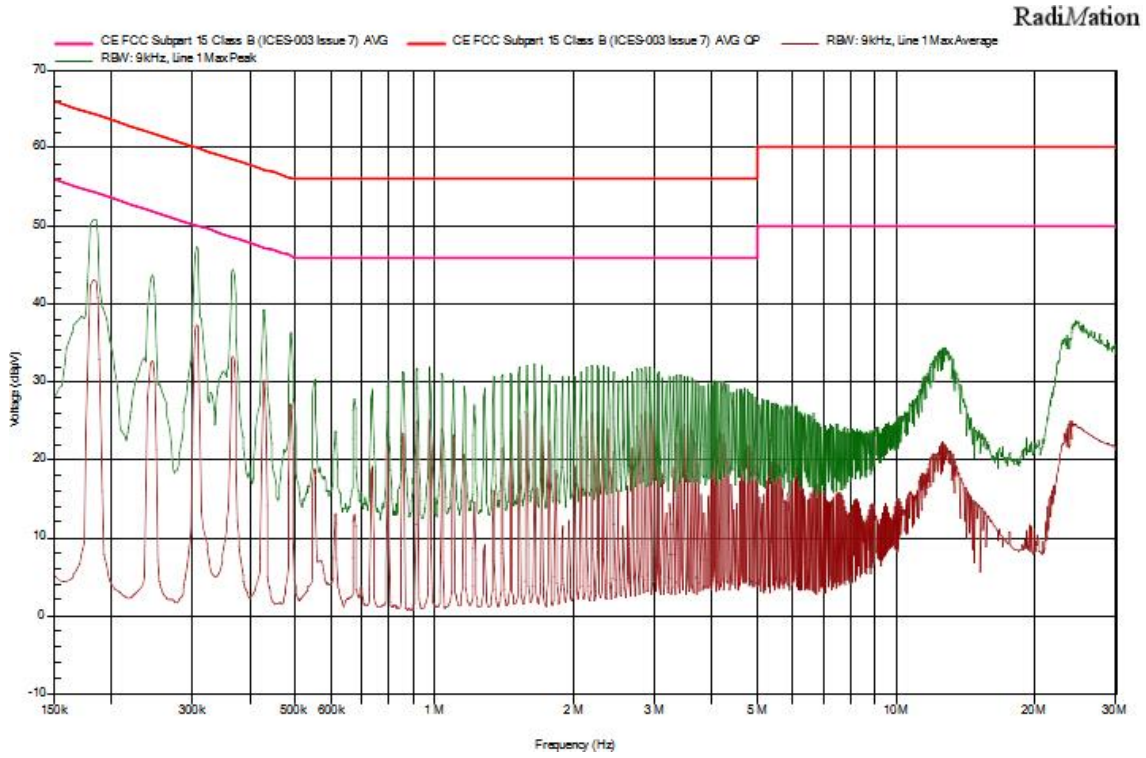
Frequency Range MHz = [0.15, 30]

Conducted Emissions - Tested Line = L1

Sample ID: S/02

Operation Mode: OM/01

Images:



Tables:

Frequency (MHz)	Average (dBµV)	Peak (dBµV)	Line
0,183 MHz	43,1 dBµV	50,9 dBµV	L1
0,244 MHz	32,7 dBµV	43,7 dBµV	L1
0,305 MHz	37,4 dBµV	47,3 dBµV	L1
0,367 MHz	33,3 dBµV	44,5 dBµV	L1
0,428 MHz	30,2 dBµV	39,2 dBµV	L1
0,489 MHz	27,2 dBµV	36,3 dBµV	L1
1,651 MHz	25,7 dBµV	32,2 dBµV	L1
2,321 MHz	25,6 dBµV	32,1 dBµV	L1
2,871 MHz	26,2 dBµV	32 dBµV	L1
24,467 MHz	24,3 dBµV	37,8 dBµV	L1

EMC Test Code = CE02020N

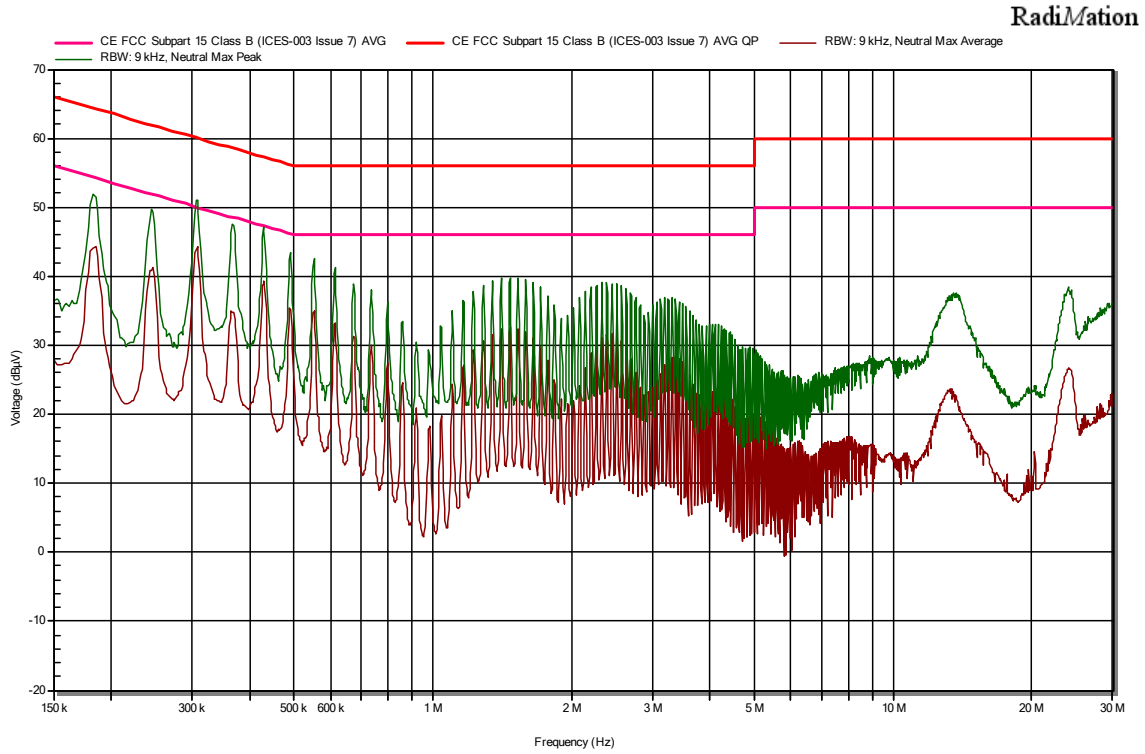
Frequency Range MHz = [0.15, 30]

Conducted Emissions - Tested Line = N

Sample ID: S/02

Operation Mode: OM/02

Images:



Tables:

Frequency (MHz)	Average (dBµV)	Peak (dBµV)	Line
0,183 MHz	44,1 dBµV	51,8 dBµV	N
0,244 MHz	40,9 dBµV	49,7 dBµV	N
0,307 MHz	44,4 dBµV	51,1 dBµV	N
0,367 MHz	34,7 dBµV	47,4 dBµV	N
0,428 MHz	38,9 dBµV	47 dBµV	N
0,489 MHz	35,1 dBµV	43,5 dBµV	N
0,551 MHz	34,9 dBµV	42,5 dBµV	N
0,612 MHz	33,2 dBµV	41,3 dBµV	N
1,53 MHz	32,4 dBµV	39,8 dBµV	N
1,591 MHz	32 dBµV	39,5 dBµV	N

EMC Test Code = CE0202L1

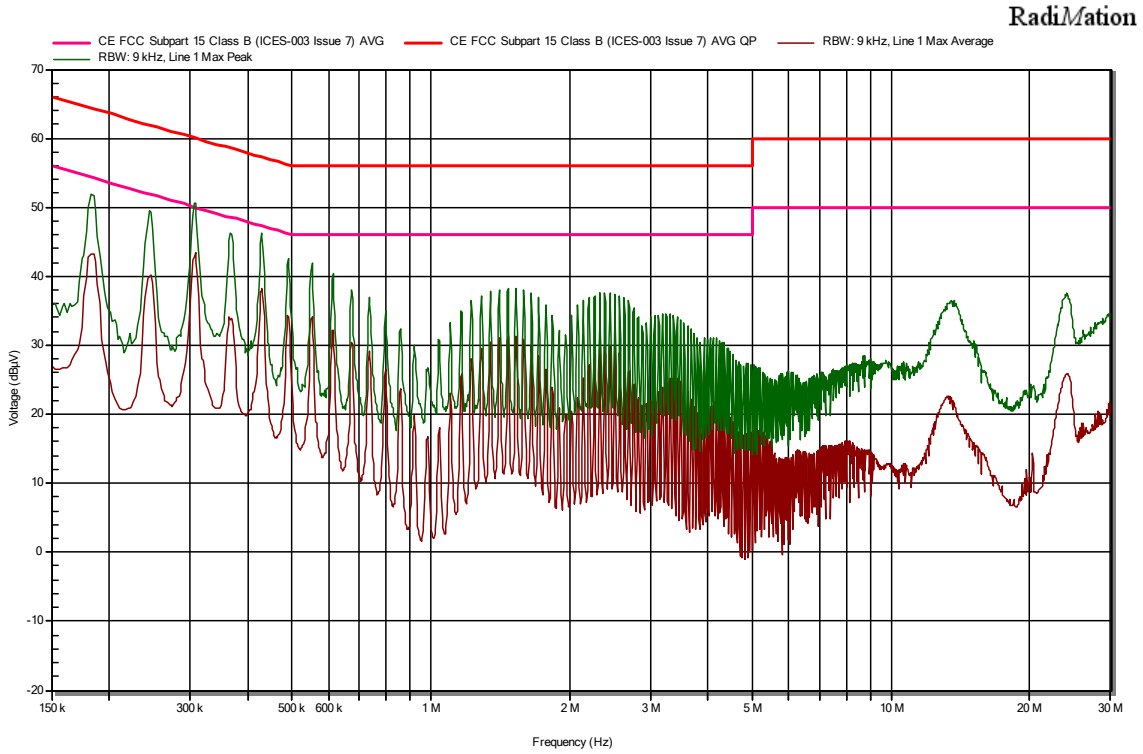
Frequency Range MHz = [0.15, 30]

Conducted Emissions - Tested Line = L1

Sample ID: S/02

Operation Mode: OM/02

Images:



Tables:

Frequency (MHz)	Average (dBµV)	Peak (dBµV)	Line
0,183 MHz	43,2 dBµV	51,9 dBµV	L1
0,244 MHz	40 dBµV	49,4 dBµV	L1
0,307 MHz	43,4 dBµV	50,7 dBµV	L1
0,367 MHz	33,6 dBµV	46,3 dBµV	L1
0,428 MHz	37,8 dBµV	46,2 dBµV	L1
0,489 MHz	34,1 dBµV	42,6 dBµV	L1
0,551 MHz	33,9 dBµV	41,9 dBµV	L1
0,612 MHz	32,2 dBµV	40,3 dBµV	L1
1,53 MHz	31,2 dBµV	38,3 dBµV	L1
1,591 MHz	30,8 dBµV	38,1 dBµV	L1

RE Radiated emission. Electromagnetic field measure

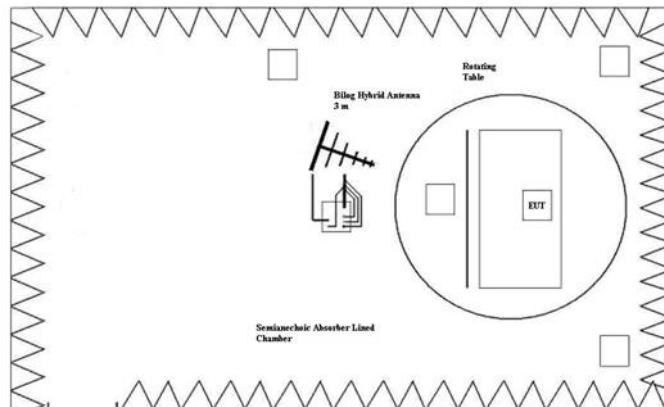
Limits of interference Class B

The applied limit for radiated emissions, 3 m distance, according to the requirements of FCC Rules and Regulations 47 CFR Part 15, Subpart B (10-1-23 Edition), Secs. 15.109 & ICES-003 Issue 7 (October 2020)

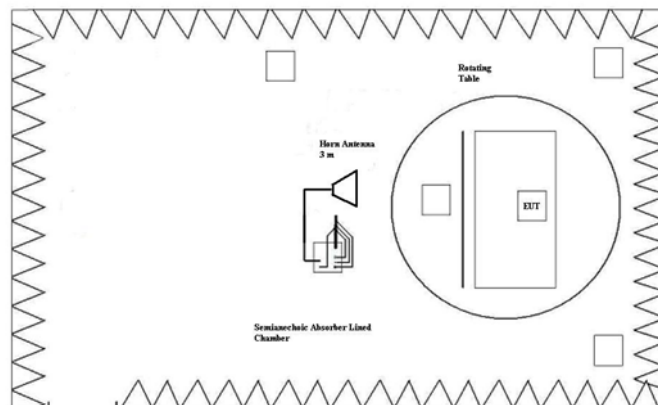
Frequency range (MHz)	FCC Part 15B		ICES-003 Issue 7		FCC Part 15B & ICES-003 Issue 7	
	QP Limit for 3 m		QP Limit for 3 m		PK Limit for 3 m	AVG Limit for 3 m
	($\mu\text{V/m}$)	($\text{dB}\mu\text{V/m}$)	($\mu\text{V/m}$)	($\text{dB}\mu\text{V/m}$)	($\text{dB}\mu\text{V/m}$)	($\text{dB}\mu\text{V/m}$)
30 to 88	100	40	100	40	---	---
88 to 216	150	43.5	150	43.5	---	---
216 to 230	200	46	200	46	---	---
230 to 960	200	46	224	47		
960 to 1000	500	54	500	54	---	---
Above 1000	---	---	---	---	74	54

Limits according to FCC Part 15B, are equal or more stringent than those of ICES-003 Issue 7.

Setup for measurements



Setup for measurements < 1GHz.



Setup for measurements > 1GHz.

Results

S/	OM	Code	Freq Rng (MHz)	V
01	OM/01	RE0101LR	[30, 1000]	P
01	OM/01	RE0101HR	[1000, 12750]	P

Verdict

Pass

Attachments

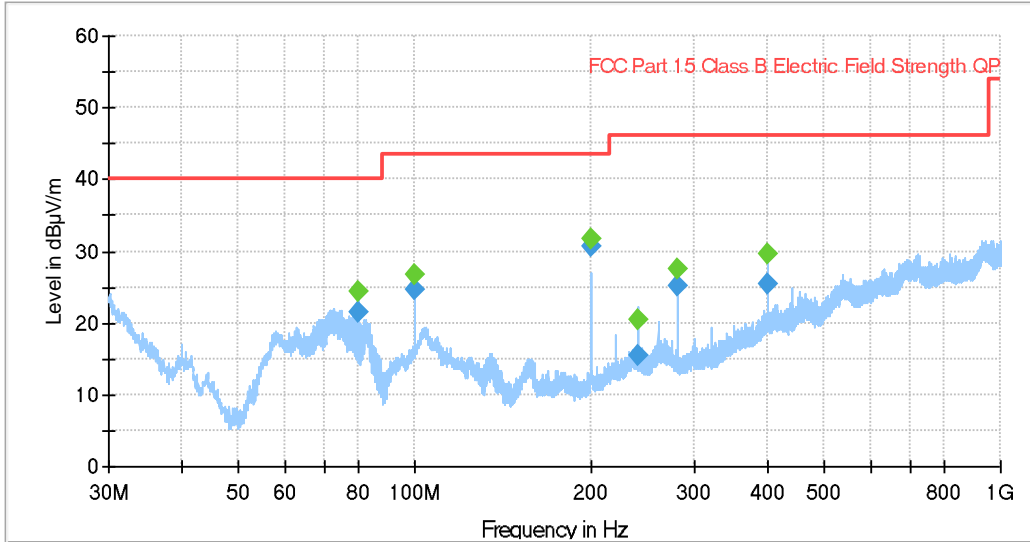
EMC Test Code = RE0101LR Frequency Range MHz = [30, 1000]

Sample ID: S/01

Operation Mode: OM/01

Images:

Full Spectrum



◆ Preview Result 1-PK+ Final_Result QPK
 — FCC Part 15 Class B Electric Field Strength QP
◆ Final_Result PK+

Tables:

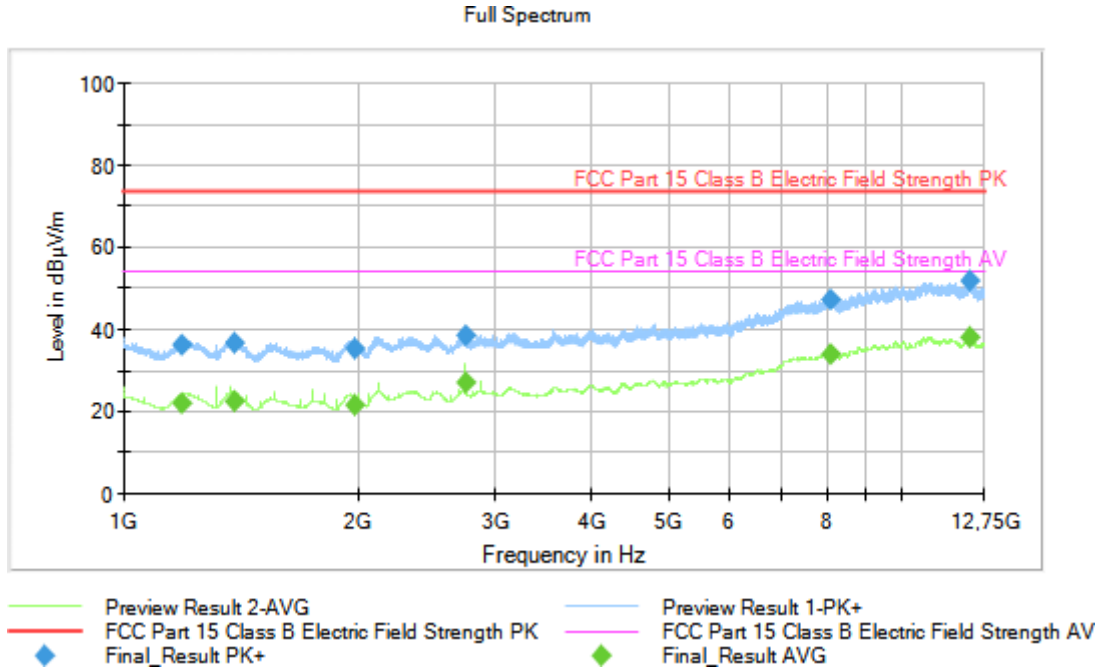
Frequency (MHz)	QuasiPeak (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)
79.952000	---	24.38	---	---	100.0	V	116.0
79.952000	21.57	---	40.00	18.43	100.0	V	116.0
99.996000	24.51	---	43.52	19.01	122.0	V	348.0
99.996000	---	26.60	---	---	122.0	V	348.0
199.983000	30.55	---	43.52	12.97	103.0	V	92.0
199.983000	---	31.76	---	---	103.0	V	92.0
239.991000	15.45	---	46.00	30.55	100.0	V	65.0
239.991000	---	20.56	---	---	100.0	V	65.0
280.010000	25.03	---	46.00	20.97	103.0	V	210.0
280.010000	---	27.41	---	---	103.0	V	210.0
399.990000	---	29.58	---	---	119.0	V	209.0
399.990000	25.35	---	46.00	20.65	119.0	V	209.0

EMC Test Code = RE0101HR Frequency Range MHz = [1000, 12750]

Sample ID: S/01

Operation Mode: OM/01

Images:



Tables:

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)
1190.860000	---	22.12	53.97	31.85	336.0	H	152.0
1190.860000	36.32	---	73.97	37.65	336.0	H	152.0
1384.740000	---	22.55	53.97	31.42	100.0	V	128.0
1384.740000	36.50	---	73.97	37.47	100.0	V	128.0
1977.780000	35.46	---	73.97	38.51	309.0	H	12.0
1977.780000	---	21.78	53.97	32.19	309.0	H	12.0
2750.760000	---	26.84	53.97	27.13	234.0	H	224.0
2750.760000	38.49	---	73.97	35.48	234.0	H	224.0
8070.480000	47.28	---	73.97	26.69	107.0	V	350.0
8070.480000	---	33.77	53.97	20.20	107.0	V	350.0
12195.460000	---	38.06	53.97	15.91	124.0	H	344.0
12195.460000	51.66	---	73.97	22.31	124.0	H	344.0