

ISED CABid: ES1909

Test report No:
NIE: 66837REM.001A2

Test report

FCC Rules and Regulations CFR 47, Part 15, Subpart B & C (sec. 15.207) (10-1-19 Edition) & ICES-003 Issue 7 (October 2020)

(*) Identification of item tested	Flexi Zone MulteFire Outdoor Pico BTS
(*) Trademark	Nokia
(*) Model and /or type reference	FW2RH-m
Other identification of the product	HW version: 474710A.X21 SW version: FLF18A_MF19_0001_200408_000035 FCC ID: 2AVO2FW2RH01 IC: 661AF-FW2RH01
(*) Features	MulteFire 1.0, GPS, GLONASS
Manufacturer	Nokia Innovations US LLC 600-700 Mountain Ave Murray Hill, NJ, 07974 USA
Test method requested, standard	FCC Rules and Regulations CFR 47, Part 15, Subpart B & C (sec. 15.207) (10-1-19 Edition) & ICES-003 Issue 7 (October 2020) & ANSI C63.4-2014
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Rafael López Martín EMC Consumer & RF Lab. Manager
Date of issue	2021-10-07
Report template No	FDT08_23 (*) "Data provided by the client"

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Acronyms

Acronym ID	Acronym Description
Avg	Radiated Average Level
Avg	Conducted Average Level
Az	Azimuth
CPL	Zones / Coupling Cables
Code	EMC Test Code
EUT	Equipment Under Test
Freq	Frequency
Freq Rng	Frequency Range
H	Height
HR	High Range
Line	Conducted Emissions - Tested Line
LR	Low Range
MP	Measurement Point
Max	Conducted Maximum Level
MaxPeak	Radiated Maximum Peak Level
OM	Operation Mode
Pol	Polarization
QuasiPeak	Conducted Quasi Peak Level
QuasiPeak	Radiated Quasi Peak Level
S/	Sample
V	Verdict
Volt Immunity Lvl	Voltage Immunity Severity Level
Volt Immunity Type	Voltage Immunity Type

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.

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

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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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General conditions

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2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of DEKRA Testing and Certification S.A.U.
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Uncertainty

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

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 26 GHz is $I = \pm 2,6$ dB for peaks 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 Nokia Flexi Zone MulteFire Outdoor Pico BTS acts as an access point and provides wireless data service to connected client devices using MulteFire 1.0 protocol over UNII RF bands.

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	64023_01	Router VPN	SRX300	CV4119AF0252	2020-06-10	Auxiliary equipment
S/01	64023_02	AC/DC adaptor	---	---	2020-06-10	Auxiliary equipment
S/01	64023_05	RJ45-Serial Cable	---	---	2020-06-10	Element under test
S/01	64023_09	Flexi Zone MulteFire Outdoor Pico BTS	FW2RH-m	EB184990223	2020-06-10	Element under test
S/01	64023_10	GPS antenna	---	361.00659.005	2020-06-10	Auxiliary equipment
S/01	64023_12	Dell Embedded Box	PC5000	9FYSQ23	2020-06-10	Auxiliary equipment
S/01	64023_19	AC power cable	---	---	2020-06-10	Auxiliary equipment
S/01	64023_26	Antenna	---	YE201100034	2020-07-10	Auxiliary equipment

Notes referenced to samples during the project.

Id	Note
S/01	N/A

Test sample description

Ports..... :	Port name and description		Cable				
			Specified max length [m]	Attached during test	Shielded	Coupled to patient ⁽³⁾	
	Ant 1		0.55	☒	☒	☐	
	Ant 2		0.55	☒	☒	☐	
	RJ45-1		100	☒	☒	☐	
	RJ45-2		100	☒	☒	☐	
	GPS/GNSS		varies	☒	☒	☐	
Supplementary information to the ports..... :	N/A						
Rated power supply	Voltage and Frequency		Reference poles				
			L1	L2	L3	N	PE
	☒	AC: 100/240 VAC. 50/60 Hz	☒	☐	☐	☒	☒
	☐	DC:					
Rated Power	27 dBm/Ant						
Clock frequencies.....	Not provided data						
Other parameters	N/A						
Software version	FLF18A_MF19_0001_200408_000035						
Hardware version	474710A.X21						
Dimensions in cm (W x H x D) :	Not provided data						
Mounting position	☒	Wall/Ceiling mounted equipment					
	☐	Floor standing equipment					
	☐	Hand-held equipment					
	☒	Other: Pole					
Modules/parts..... :	Module/parts of test item		Type		Manufacturer		
	Flexi Zone MulteFire Outdoor Pico BTS		---		Nokia		

Accessories (not part of the test item).....:	Description	Type	Manufacturer
	FA2RE	Directional Ant	Nokia
	FA2WH	GPS Ant	Nokia
	FMWY	RF Cables	Nokia
	FPWZ	AC cable	Nokia
	FPW1	AC Cable	Nokia
Documents as provided by the applicant.....:	Description	File version	Issue date

⁽³⁾ Only for Medical Equipment

Identification of the client

NOKIA INNOVATIONS US LLC
600-700 Mountain Ave
Murray Hill, NJ, 07974 USA

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2021-03-11
Date (finish)	2021-06-11

Document history

Report number	Date	Description
66837REM.001	2021-07-28	First release
66837REM.001A1	2021-08-13	Second release. First modification due to include GNSS in the operation mode. This modification test report cancels and replaces the test report 66837REM.001
66837REM.001A2	2021-10-07	Third release. The reference to FCC CFR 47, Part 15, C Sec. 15.207, is included in the report for the Conducted Emission Test as this test is also performed as an intentional radiator, in communication mode. This modification test report cancels and replaces the test report 66837REM.001A1

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. = 20 % Max. = 75 %

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

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 20 % Max. = 75 %

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. = 20 % Max. = 75 %

Remarks and comments

The tests have been performed by the technical personnel: Antonio Ruiz.

Testing verdicts

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

List of equipment used during the test

Nº de Control / Control Number	Descripción / Description	Modelo / Model	Fabricante / Manufacturer	Próxima Calibración / Next Calibration
2942	EMI TEST RECEIVER 20Hz-40GHz	ESU40	ROHDE AND SCHWARZ	2021-09-17
4523	EMI TEST RECEIVER 20Hz-26.5GHz	ESU26	ROHDE AND SCHWARZ	2023-03-15
4573	TEMPERATURE AND HUMIDITY PROBE	HWg-STE	HW GROUP	2022-04-06
4612	HORN ANTENNA 1-18GHz	BBHA 9120 D	SCHWARZBECK MESS-ELEKTRONIK	2021-06-14
4656	HORN ANTENNA 18-40GHz	BBHA 9170	SCHWARZBECK	2021-07-19
5641	HYBRID BILOG ANTENNA 30MHz-6GHz	3142E	ETS LINDGREN	2021-07-31
6064	SEMIANECHOIC ABSORBER LINED CHAMBER III	SAC-3	Frankonia	---
6126	TEMPERATURE AND HUMIDITY PROBE	HWg-STE	HW GROUP	2022-04-05
6132	TEMPERATURE AND HUMIDITY PROBE	HWg-STE	HW GROUP	2022-04-05
6193	PRE-AMPLIFIER G>48dB 18-40GHz	JS44-18004000-33-8P	NARDA	2022-03-24
6195	PRE-AMPLIFIER G>55dB 1-18GHz	AMF-7D-01001800-22-10P	NARDA	2021-05-19
6205	THREE-PHASE ARTIFICIAL NETWORK 32A	PMM L3-32	NARDA	2021-12-11
6329	SHIELDED ROOM	---	FRANKONIA	---

Summary

Test Specification.	Requirement – Test case	Verdict	Remark
FCC CFR 47, Part 15, Subpart B (10-1-19 Edition) & ICES-003 Issue 7 (October 2020) & ANSI C63.4-2014	Radiated emission (30MHz-1GHz)	Pass	---
	Radiated emission (1GHz-26GHz)	Pass	---
FCC 47 CFR Part 15B & 15C (sec. 15.107 & 15.207) & ANSI C63.4-2014	Conducted emission. AC input power supply port	Pass	---

Supplementary information and remarks:

N/A

Appendix A: Test results

Appendix A Content

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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. Every operation mode takes a failure criteria for the immunity test that they were applying to it and a monitoring to guarantee performance of the same ones.

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. MulteFire 5GHz OFF, GNSS OFF. Ethernet port in transmission with central unit. Power supply: 110Vac.
OM#02	EUT ON. MulteFire 5GHz ON in communication. GNSS ON. Ethernet port in transmission with central unit. Power supply: 110Vac.

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 (10-1-19 Edition) & ICES-003 Issue 7 (October 2020)	ANSI C63.4 – 2014	Radiated emission
FCC CFR 47, Part 15, Subpart B (sec. 15.107) & C (sec. 15.207) (10-1-19 Edition) & ICES-003 Issue 7 (October 2020)	ANSI C63.4 – 2014	Conducted emission. AC input power supply port.

Test Cases Details

FCC CFR 47, Part 15, Subpart B (10-1-19 Edition) & ICES-003 Issue 7 (October 2020) & ANSI C63.4 – 2014 RE Radiated emission

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 (10-1-19 Edition), Sec. 15.109 & ICES-003 Issue 7 (October 2020) Sec 3.2.2:

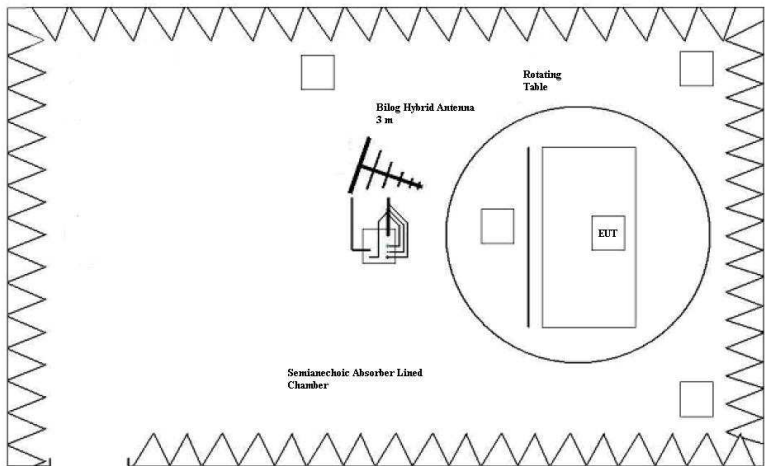
Table 2: Radiated emission limits

Frequency range (MHz)	FCC Part 15B Class B (3 m) Quasi-Peak (dBμV/m)	ICES-003 Issue 7 Limit for 3 m Quasi-Peak (dBμV/m)	FCC Part 15B & ICES-003 Issue 7	
			PK Limit for 3m (dBμV/m)	AVG Limit for 3m (dBμV/m)
30-88	40.0	40.0	---	---
88-216	43.5	43.5	---	---
216-230	46.0	46.0	---	---
230-960	46.0	47.0	---	---
960-1000	54.0	54.0	---	---
1 GHz – F _M	---	---	74	54

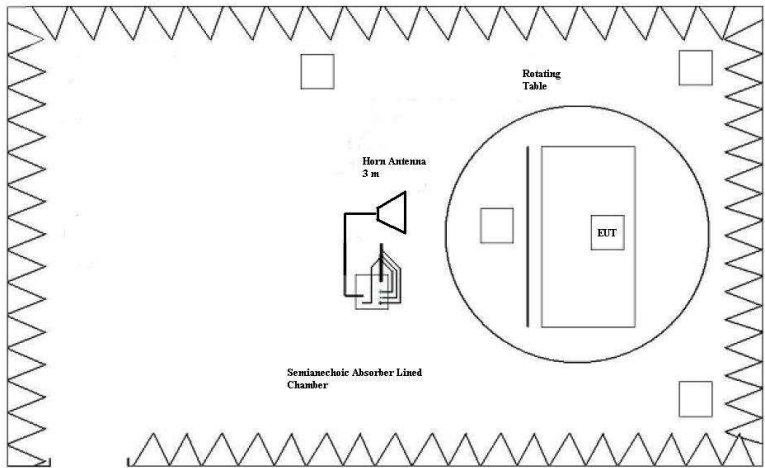
Above 1 GHz, except for outdoor units of home satellite receiving systems, the ITE or digital apparatus shall comply with the limits specified in table 2 up to the frequency F_M, which shall be determined as per table 3.

Table 3: Required highest measurement frequency for radiated emission

Highest internal Frequency (F _x)	Highest measurement Frequency (F _M)
F _x ≤ 108 MHz	1 GHz
108 MHz < F _x ≤ 500 MHz	2 GHz
500 MHz < F _x ≤ 1 GHz	5 GHz
F _x > 1 GHz	5 x F _x up to a maximum of 40 GHz
*F _x is the highest fundamental frequency generated and/or used in the ITE or digital apparatus under test.	



Setup for measurements < 1GHz.



Setup for measurements > 1GHz.

RESULTS

REmmnnRR	Description	Result
RE0101LR	Range: 30 MHz - 1000 MHz.	P
RE0101HR1	Range: 1 GHz – 17 GHz.	P
RE0101HR2	Range: 17 GHz – 26 GHz	P

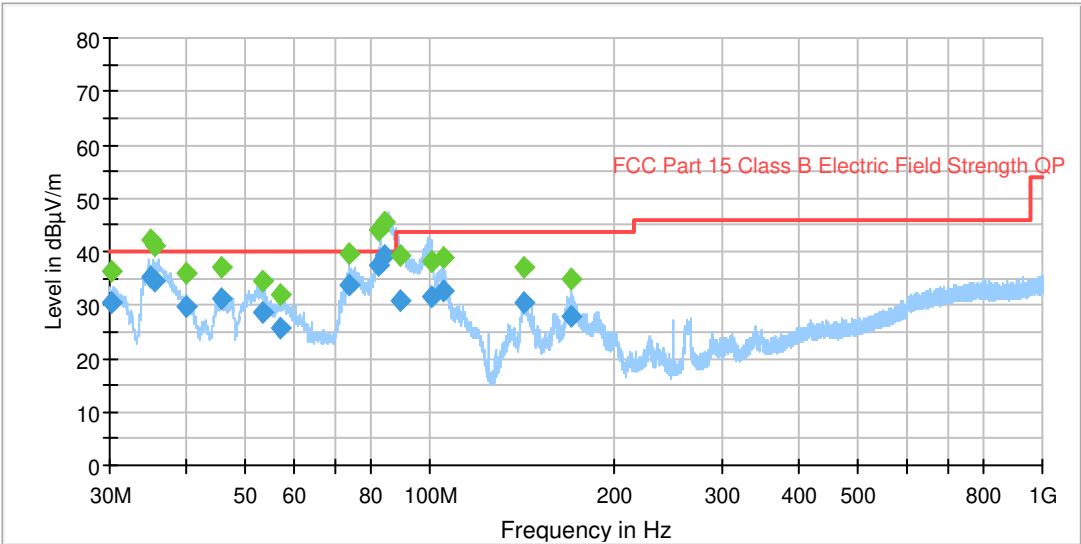
REmmnnRR: RE: Radiated Emission; mm: Sample number; nn: Operation mode; RR: Measurement range.

VERDICT

Pass

Project: 66837REM.001
Company: NOKIA INC.
Sample: S/01
Operation mode: 01
Graphical code: RE0101LR
Description: EUT ON. MulteFire 5GHz OFF, GNSS OFF. Ethernet port in transmission with central unit. Power supply: 110Vac.
Verdict: Passed

Full Spectrum



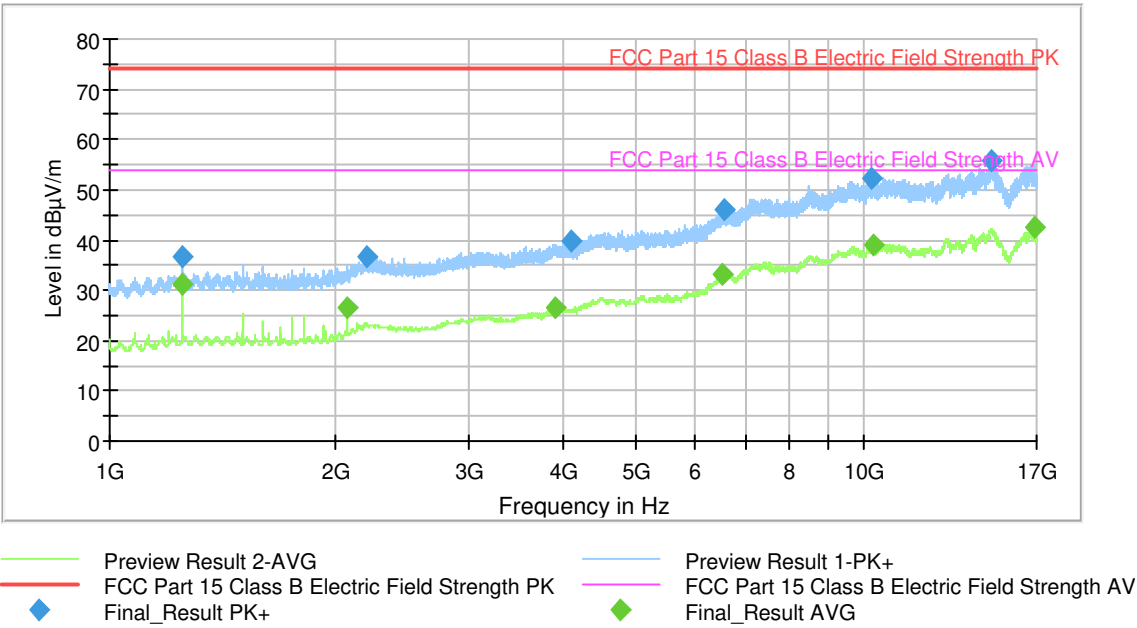
Preview Result 1-PK+ Final_Result QPK
FCC Part 15 Class B Electric Field Strength QF Final_Result PK+

Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)
30.227480	---	36.22	---	---	122.0	V	-118.0
30.227480	30.56	---	40.00	9.44	122.0	V	-118.0
35.054000	35.29	---	40.00	4.71	126.0	V	30.0
35.054000	---	42.10	---	---	126.0	V	30.0
35.662000	---	41.00	---	---	142.0	V	-165.0
35.662000	34.47	---	40.00	5.53	142.0	V	-165.0
39.977000	---	35.91	---	---	115.0	V	-115.0
39.977000	29.65	---	40.00	10.35	115.0	V	-115.0
45.745000	31.03	---	40.00	8.97	114.0	V	0.0
45.745000	---	37.06	---	---	114.0	V	0.0
53.171000	28.56	---	40.00	11.44	115.0	V	167.0
53.171000	---	34.62	---	---	115.0	V	167.0
57.009000	25.60	---	40.00	14.40	152.0	V	-128.0
57.009000	---	31.95	---	---	152.0	V	-128.0
74.053000	---	39.63	---	---	100.0	V	79.0
74.053000	33.94	---	40.00	6.06	100.0	V	79.0
82.214000	---	44.07	---	---	115.0	V	74.0
82.214000	37.26	---	40.00	2.74	115.0	V	74.0
84.501000	---	45.57	---	---	100.0	V	-165.0
84.501000	39.19	---	40.00	0.81	100.0	V	-165.0
89.626000	31.00	---	43.52	12.52	152.0	V	16.0
89.626000	---	39.42	---	---	152.0	V	16.0
100.406000	31.68	---	43.52	11.84	100.0	V	-149.0
100.406000	---	38.20	---	---	100.0	V	-149.0
104.935000	---	39.02	---	---	115.0	V	102.0
104.935000	32.74	---	43.52	10.78	115.0	V	102.0
142.429000	30.43	---	43.52	13.09	115.0	V	180.0
142.429000	---	37.21	---	---	115.0	V	180.0
170.346000	27.90	---	43.52	15.62	115.0	V	137.0
170.346000	---	34.71	---	---	115.0	V	137.0

Project: 66837REM.001
Company: NOKIA INC.
Sample: S/01
Operation mode: 01
Graphical code: RE0101HR1
Description: EUT ON. MulteFire 5GHz OFF, GNSS OFF. Ethernet port in transmission with central unit. Power supply: 110Vac.
Verdict: Passed

Full Spectrum

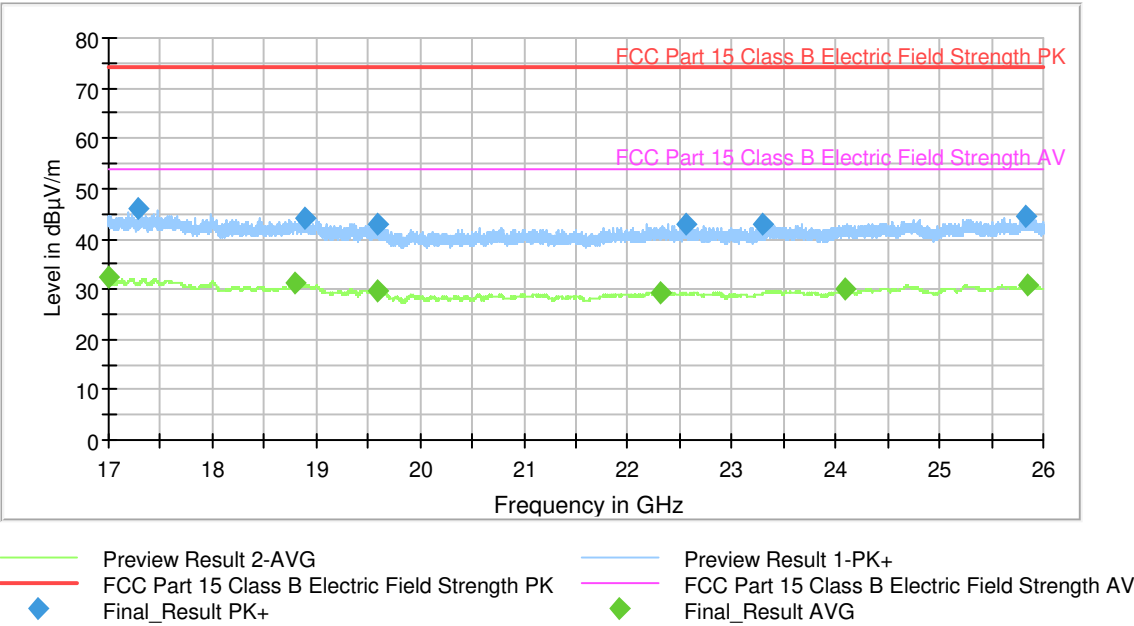


Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)
1250.000000	---	31.10	53.97	22.87
1250.000000	36.80	---	73.97	37.17
2062.400000	---	26.41	53.97	27.56
2200.800000	36.76	---	73.97	37.21
3912.000000	---	26.39	53.97	27.58
4088.400000	39.67	---	73.97	34.30
6525.200000	---	32.98	53.97	20.99
6532.800000	46.07	---	73.97	27.90
10262.400000	52.28	---	73.97	21.69
10349.600000	---	39.20	53.97	14.77
14796.000000	55.74	---	73.97	18.23
16884.000000	---	42.42	53.97	11.55

Project: 66837REM.001
Company: NOKIA INC.
Sample: S/01
Operation mode: 01
Graphical code: RE0101HR2
Description: EUT ON. MulteFire 5GHz OFF, GNSS OFF. Ethernet port in transmission with central unit. Power supply: 110Vac.
Verdict: Passed

Full Spectrum



Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)
17000.800000	---	32.32	53.97	21.65
17288.800000	45.94	---	73.97	28.03
18795.200000	---	31.25	53.97	22.72
18899.200000	44.03	---	73.97	29.94
19588.400000	42.81	---	73.97	31.16
19590.800000	---	29.55	53.97	24.42
22317.200000	---	29.44	53.97	24.53
22557.600000	42.91	---	73.97	31.06
23300.000000	43.02	---	73.97	30.95
24099.200000	---	30.10	53.97	23.87
25825.600000	44.49	---	73.97	29.48
25857.600000	---	31.02	53.97	22.95

FCC 47 CFR Part 15B sec 15.107 & 15C sec 15.207 & ANSI C63.4 – 2014 CE Conducted emission

Conducted emission on power leads: 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 (10-1-19 Edition), Secs. 15.107; Subpart C (10-1-19 Edition), Secs. 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 (dBμV)	
	Quasi-Peak	Average
0,15 to 0,5	66 – 56 ⁽¹⁾	56 – 46 ⁽¹⁾
0,5 to 5	56	46
5 to 30	60	50

(1) The limit level in dBμV decreases linearly with the logarithm of frequency

RESULTS

CCmmnnhh	Description	Result
CE0101N	Range: 150kHz – 30MHz.AC input power supply port.Neutral wire noise.	P
CE0101L1	Range: 150kHz – 30MHz.AC input power supply port. Phase wire noise.	P
CE0102N	Range: 150kHz – 30MHz. AC input power supply port.Neutral wire noise.	P
CE0102L1	Range: 150kHz – 30MHz. AC input power supply port.Phase wire noise.	P

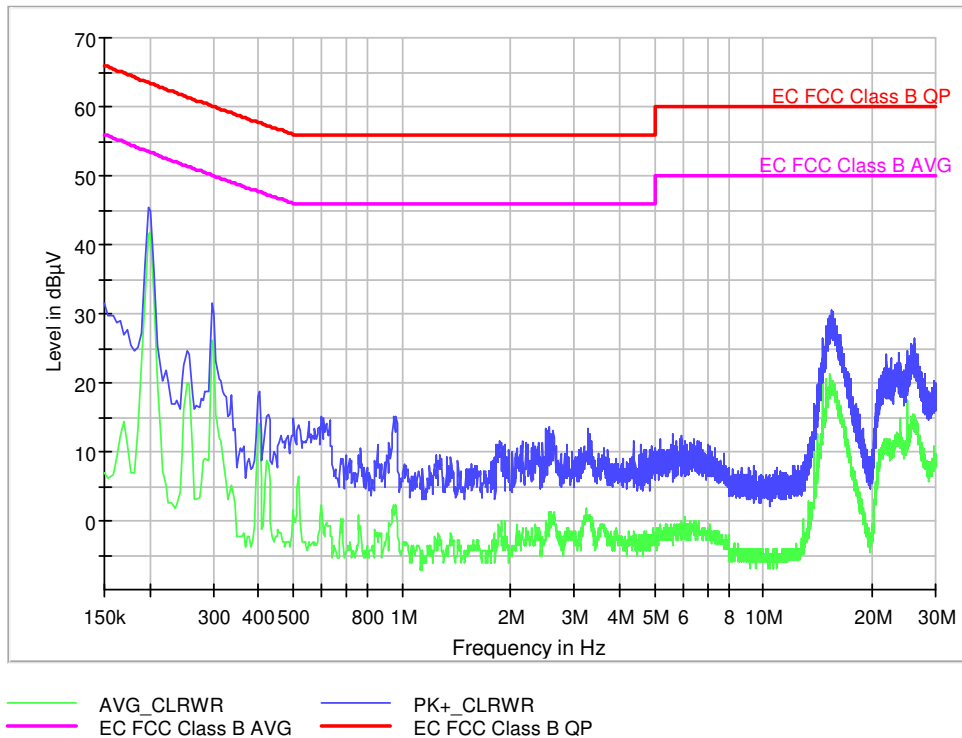
CEmmnnhh: CE: Conducted Emission; mm: Sample number; nn: Operation mode; hh: Wire

VERDICT

Pass

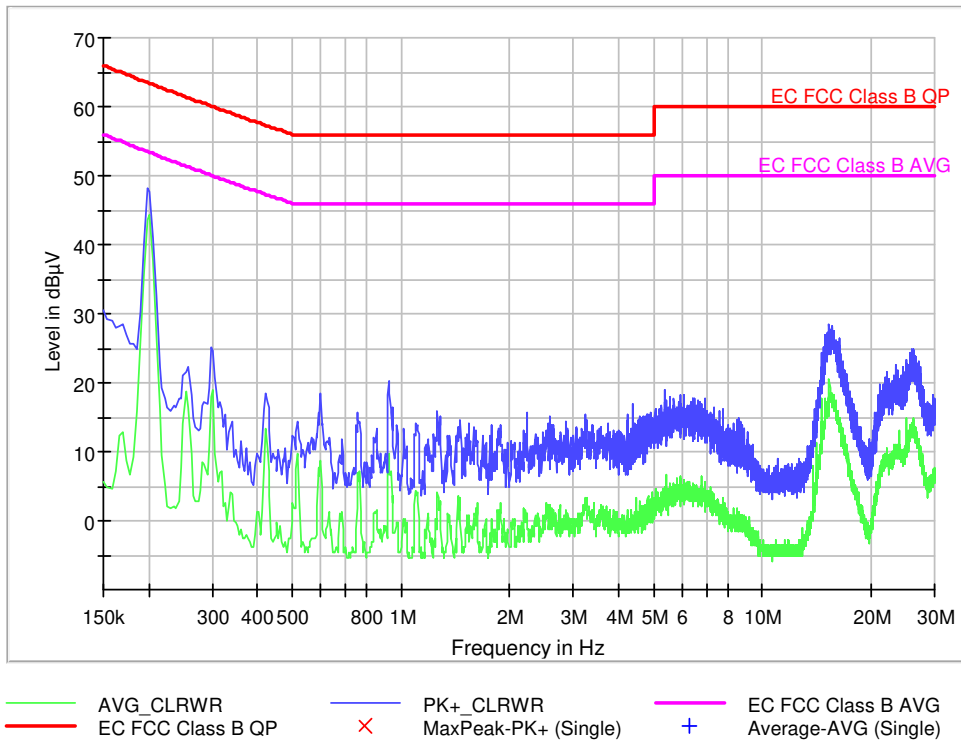
Project: 66837REM.001
Company: NOKIA INC.
Sample: S/01
Operation mode: 01
Graphical code: CE0101N
Description: EUT ON. MulteFire 5GHz OFF, GNSS OFF. Ethernet port in transmission with central unit. Power supply 110Vac. Neutral wire
Verdict: Passed

FCC Part 15 Class B



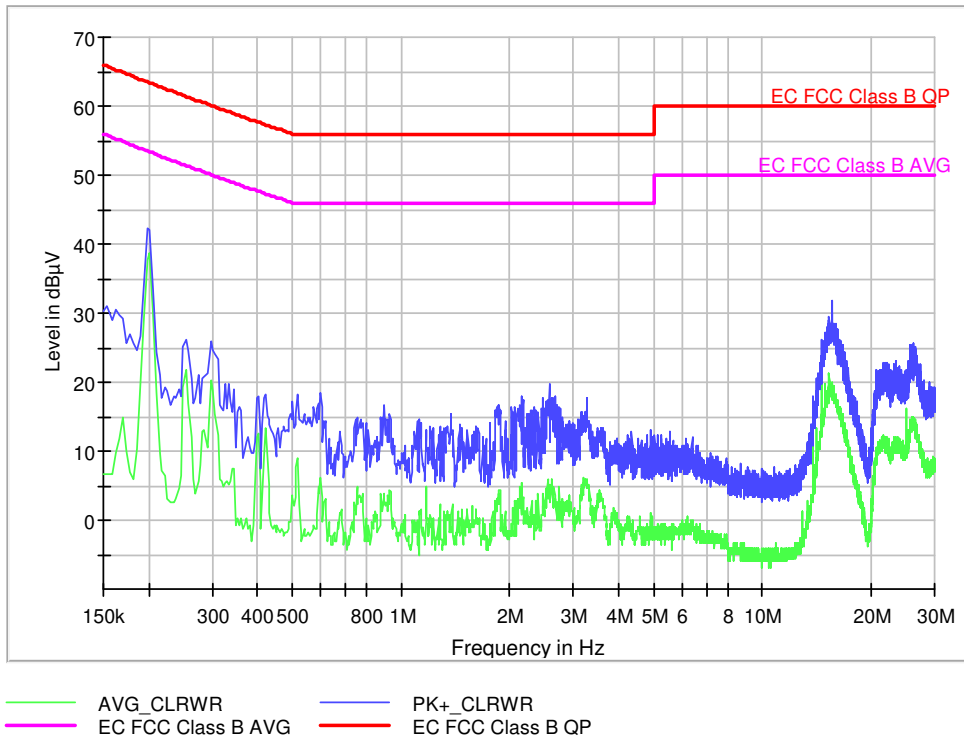
Project: 66837REM.001
Company: NOKIA INC.
Sample: S/01
Operation mode: 01
Graphical code: CE0101L1
Description: EUT ON. MulteFire 5GHz OFF, GNSS OFF. Ethernet port in transmission with central unit. Power supply 110Vac. Phase wire
Verdict: Passed

FCC Part 15 Class B



Project: 66837REM.001
Company: NOKIA INC.
Sample: S/01
Operation mode: 02
Graphical code: CE0102N
Description: EUT ON. MulteFire 5GHz ON in communication. GNSS ON. Ethernet port in transmission with central unit. Power supply 110Vac. Neutral wire noise.
Verdict: Passed

FCC Part 15 Class B



Project: 66837REM.001
Company: NOKIA INC.
Sample: S/01
Operation mode: 02
Graphical code: CE0102L1
Description: EUT ON. MulteFire 5GHz ON in communication. GNSS ON. Ethernet port in transmission with central unit. Power supply 110Vac
Verdict: Passed

FCC Part 15 Class B

