



Test report No:
NIE: 59675REM.004

Test report

FCC Rules and Regulations CFR 47, Part 15, Subpart B (10-1-16 Edition) & ICES-003 Issue 6 (Updated 2017-04)

Identification of item tested	IOT Module
Trademark	nRF91
Model and /or type reference	nRF9160
Other identification of the product	FCC ID: 2ANPO00NRF9160 IC: 24529-NRF9160 IMEI TAC: 35265610 HW Version: DEV2.1.6 SW Version: mfw_nrf9160_0.7.0-29.alpha
Features	LTE Cat-M1, LTE-NB1, GPS
Manufacturer	NORDIC SEMICONDUCTOR ASA Otto Nielsens Vei 12, 7052 Trondheim, Norway
Test method requested, standard	FCC CFR 47, Part 15, Subpart B (10-1-16 Edition) & ICES-003 Issue 6 (Updated 2017-04)
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Jose Manuel Gómez Industrial & Automotive EMC Lab. Manager
Date of issue	2019-05-22
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Competences and guarantees

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DEKRA Testing and Certification 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 at the time of performance of the test.

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

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1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or competent Authorities.
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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 sample is an IOT Module that has Application CPU, LTE Cat-M1, Cat-NB1 Radio and GPS Receiver.

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

Usage of samples

Samples under test have been selected by: The client.

Sample S/01 is composed of the following elements:

Control N°	Description	Model	Serial N°	Date of reception
58741C/008	IOT Module	nRF9160	---	2019-01-15

Test sample description

Ports..... :	Port name and description	Cable					
		Specified length [m]	Attached during test	Shielded			
	LTE RF	2	☒	☒			
	GPS	2	☒	☒			
			☐	☐			
			☐	☐			
			☐	☐			
Supplementary information to the ports..... :							
Rated power supply	Voltage and Frequency		Reference poles				
			L1	L2	L3	N	PE
	☐	AC:	☐	☐	☐	☐	☐
	☐	AC:	☐	☐	☐	☐	☐
	☒	DC: 3.3 – 5.5Vdc.					
☐	DC:						

Rated Power	1W		
Clock frequencies	32kHz, 32MHz		
Other parameters.....	---		
Software version	mfw_nrf9160_0.7.0-29.alpha		
Hardware version.....	DEV2.1.6		
Dimensions in cm (W x H x D).....	11x16x1.1mm		
Mounting position.....	☐	Table top equipment	
	☐	Wall/Ceiling mounted equipment	
	☐	Floor standing equipment	
	☐	Hand-held equipment	
	☒	Other: SMD Module	
Modules/parts	Module/parts of test item	Type	Manufacturer
	N/A		
Accessories (not part of the test item)	Description	Type	Manufacturer
	N/A		
Documents as provided by the applicant.....	Description	File name	Issue date
	User manual	4418_1177-0.3.1-20180905-140910-nRF9160_Objective_Product_Spec	23-Oct-2018
	Cover markings	SiP marking	23-Oct-2018

Copy of marking plate:



Identification of the client

Nordic Semiconductor ASA
Otto Nielsens Vei 12, 7052 Trondheim, Norway.

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2019-01-16
Date (finish)	2019-01-16

Document history

Report number	Date	Description
59675REM.004	2019-05-22	First release

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. = 860 mbar Max. = 1060 mbar

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. = 860 mbar Max. = 1060 mbar

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. = 860 mbar Max. = 1060 mbar

Remarks and comments

The test have been performed by the technical personnel: Lorena Oviedo.

Testing verdicts

Not applicable :	N/A
Pass :	P
Fail :	F
Not measured :	N/M

Summary

Emission Test		
Requirement – Test case	Verdict	Remark
Radiated emission. Electromagnetic field measure (30 KHz – 1000 MHz)	P	---
Radiated emission. Electromagnetic field measure (1 GHz – 18 GHz)	P	---
Radiated emission. Electromagnetic field measure (18 GHz – 26 GHz)	P	---
Continuous conducted emission (150 KHz – 30 MHz)	N/A	See 1
<u>Supplementary information and remarks:</u>		
1) Test Not applicable		

Appendix A: Test results

Appendix A Content

DESCRIPTION OF THE OPERATION MODES11

RADIATED EMISSION. ELECTROMAGNETIC FIELD MEASURE12

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:

OPERATION MODE	DESCRIPTION
OM#01	EUT ON. LTE cat. NB-IoT. IDLE Band 12. Power supply: 3.8Vdc. (worst case)
OM#02	EUT ON. LTE cat. NB-IoT. IDLE Band 2. Power supply: 3.8Vdc.
OM#03	EUT ON. LTE cat. NB-IoT. IDLE Band 4. Power supply: 3.8Vdc.
OM#04	EUT ON. LTE cat. NB-IoT. IDLE Band 5. Power supply: 3.8Vdc.
OM#05	EUT ON. LTE cat. NB-IoT. IDLE Band 13. Power supply: 3.8Vdc.
OM#06	EUT ON. LTE cat. NB-IoT. IDLE Band 17. Power supply: 3.8Vdc.
OM#07	EUT ON. LTE cat. NB-IoT. IDLE Band 25. Power supply: 3.8Vdc.
OM#08	EUT ON. LTE cat. NB-IoT. IDLE Band 26. Power supply: 3.8Vdc.
OM#09	EUT ON. LTE cat. NB-IoT. IDLE Band 66. Power supply: 3.8Vdc.
OM#10	EUT ON. LTE cat. M1. IDLE Band 12. Power supply: 3.8Vdc.
OM#11	EUT ON. LTE cat. M1. IDLE Band 2. Power supply: 3.8Vdc.
OM#12	EUT ON. LTE cat. M1. IDLE Band 4. Power supply: 3.8Vdc.
OM#13	EUT ON. LTE cat. M1. IDLE Band 5. Power supply: 3.8Vdc.
OM#14	EUT ON. LTE cat. M1. IDLE Band 13. Power supply: 3.8Vdc.
OM#15	EUT ON. LTE cat. M1. IDLE Band 17. Power supply: 3.8Vdc.
OM#16	EUT ON. LTE cat. M1. IDLE Band 25. Power supply: 3.8Vdc.
OM#17	EUT ON. LTE cat. M1. IDLE Band 26. Power supply: 3.8Vdc.
OM#18	EUT ON. LTE cat. M1. IDLE Band 66. Power supply: 3.8Vdc.

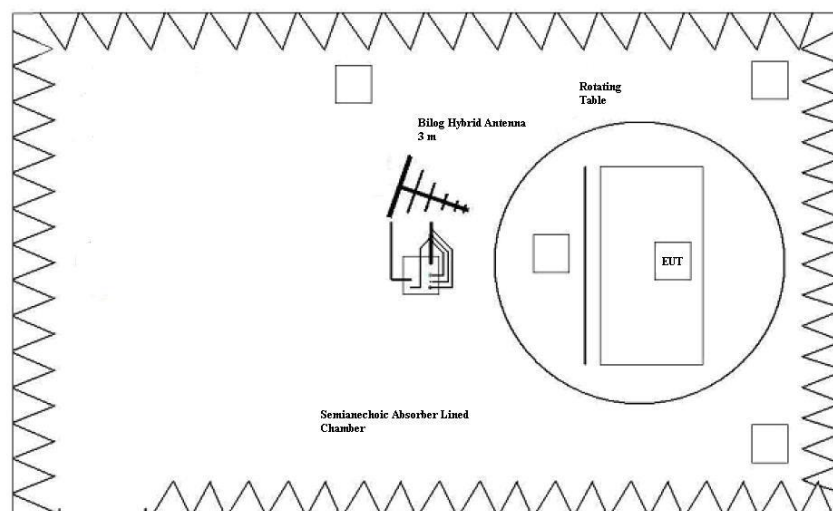
RADIATED EMISSION. ELECTROMAGNETIC FIELD MEASURE

LIMITS:	Product standard:	FCC CFR 47, Part 15, Subpart B (10-1-16 Edition), Secs. 15.109 & ICES-003 Issue 6 (Updated 04-2017)
	Test standard:	FCC CFR 47, Part 15, Subpart B (10-1-16 Edition), Secs. 15.109 & ICES-003 Issue 6 (Updated 04-2017)

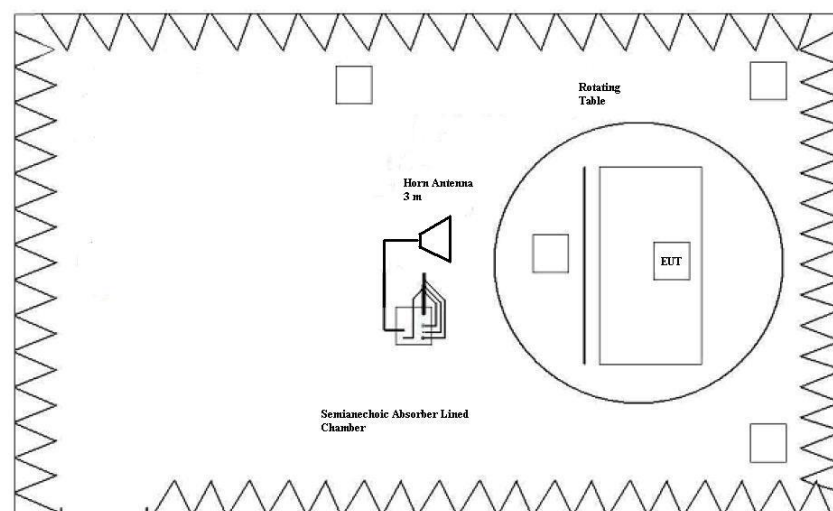
Limits of interference Class B

The applied limit for radiated emissions, 3 m distance, according with the requirements of FCC Rules and Regulations 47 CFR Part 15, Subpart B (10-1-16 Edition), Secs. 15.109 & ICES-003 Issue 6 (Updated 04-2017) in the frequency range 30 MHz to 26 GHz for class B equipments.

Frequency range (MHz)	QP Limit for 3 m		PK Limit for 3 m
	($\mu\text{V/m}$)	($\text{dB}\mu\text{V/m}$)	($\text{dB}\mu\text{V/m}$)
30 to 88	100	40	---
88 to 216	150	43.5	---
216 to 960	200	46	---
Above 960	500	54	74



Setup for measurements < 1GHz.



Setup for measurements > 1GHz.

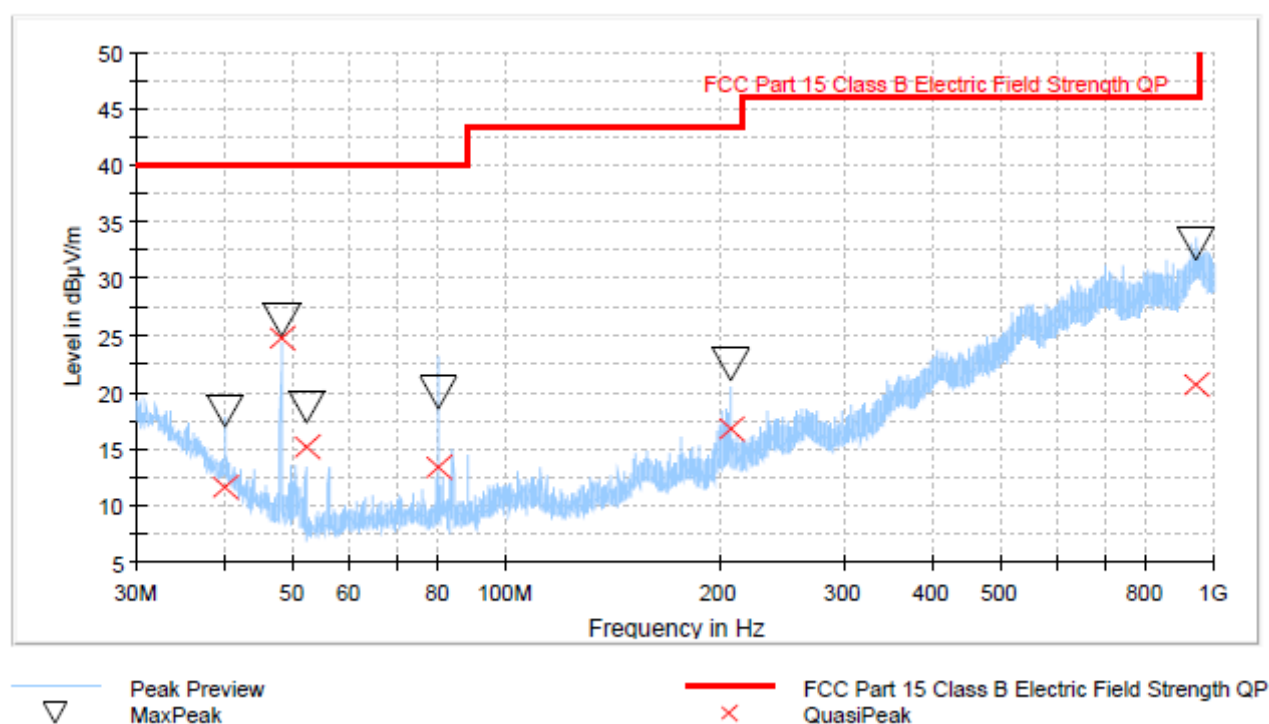
TESTED SAMPLE:	S/01
TESTED OPERATION MODES:	OM#01
TEST RESULTS:	CRmmnnRRPP: CR, Radiated Condition; mm: Sample number; nn: Operation mode; RR: Range; PP: Polarization.

CRmmnnRRPP	Description	Result
CR0101LR	Range: 30 MHz - 1000 MHz.	P
CR0101HR1 PH	Range: 1 GHz - 18 GHz. Horizontal Polarization.	P
CR0101HR1 PV	Range: 1 GHz - 18 GHz. Vertical Polarization.	P
CR0101HR2 PH	Range: 18 GHz - 26 GHz. Horizontal Polarization.	P
CR0101HR2 PV	Range: 18 GHz - 26 GHz. Vertical Polarization.	P

Radiated Emission. CR0101LR

Project: 59675REM.004
Company: NORDIC SEMICONDUCTOR OY
Sample: S/01
Operation mode: OM#01
Description: EUT ON. LTE cat. NB-IoT. IDLE Band 12. Power supply: 3.8Vdc.

ER FCC Part 15 Subpart B 30-1000 MHz Class B



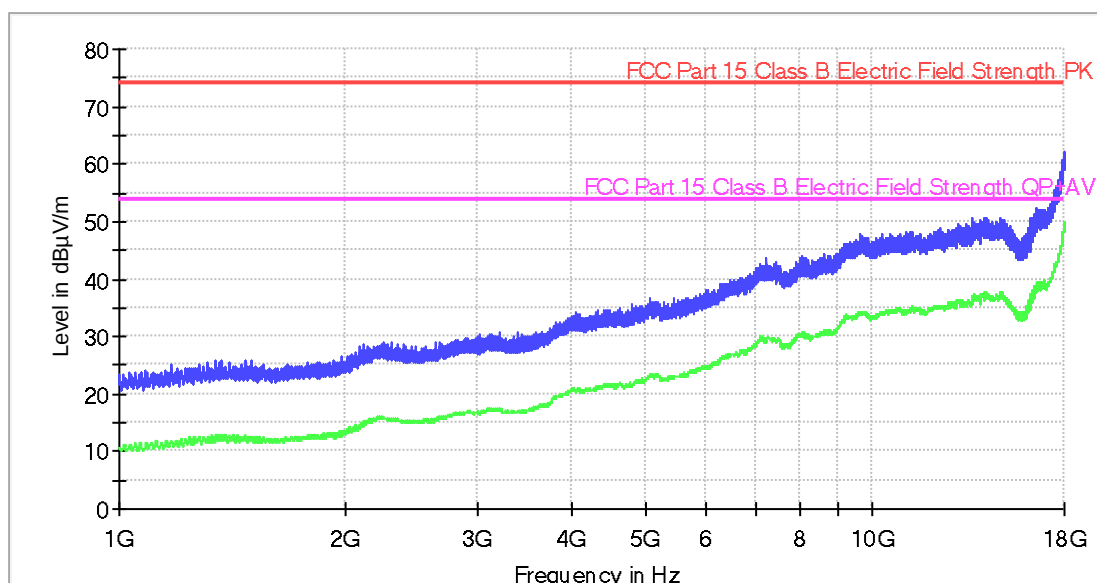
Maximizations

Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Height (cm)	Pol	Azimuth (deg)
39.980000	18.37	11.63	166.0	V	154.0
48.001000	26.40	24.82	100.0	V	134.0
52.001000	18.68	15.11	102.0	V	180.0
80.043000	19.98	13.42	147.0	V	35.0
207.999000	22.46	16.77	259.0	V	29.0
940.231000	33.06	20.62	282.0	H	63.0

Radiated Emission. CR0101HR1_PH

Project: 59675REM.004
Company: NORDIC SEMICONDUCTOR OY
Sample: S/01
Operation mode: OM#01
Description: EUT ON. LTE cat. NB-IoT. IDLE Band 12. Power supply: 3.8Vdc.
Horizontal Polarization

ER FCC Part 15 Subpart B 1-18 GHz Class B



— Average Scan
— Peak Scan
— FCC Part 15 Class B Electric Field Strength PK
— FCC Part 15 Class B Electric Field Strength QP+AV

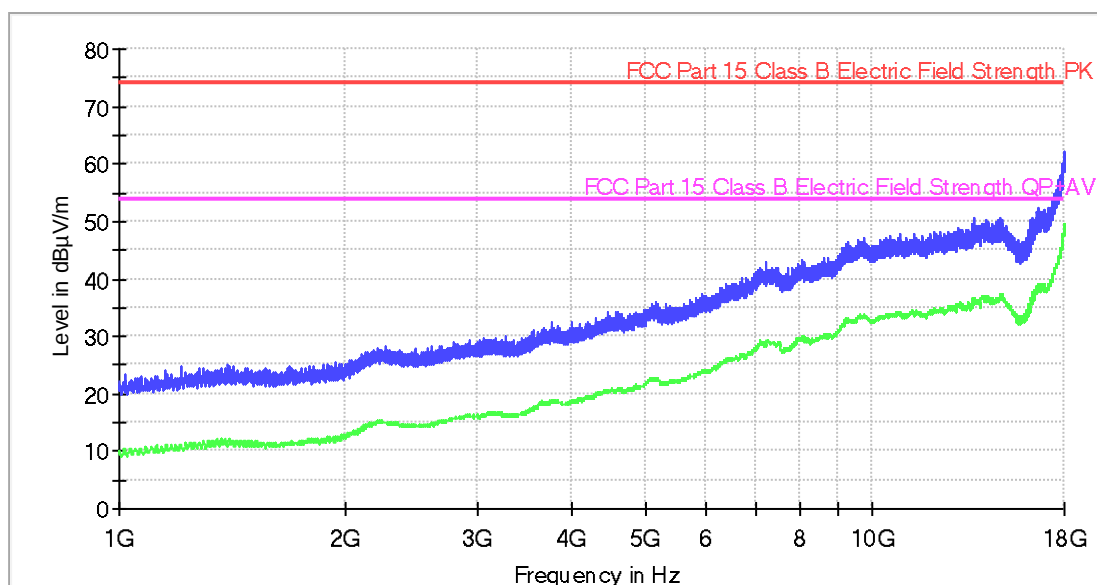
Subrange Maxima

Frequency (MHz)	PK+ CLRWR (dBμV/m)	AVG CLRWR (dBμV/m)
3833.200000	32.0	19.6
6666.400000	38.2	26.9
9500.000000	44.5	33.3
12333.200000	46.7	35.1
15166.400000	47.5	36.0
18000.000000	61.7	49.9

Radiated Emission. CR0101HR1_PV

Project: 59675REM.004
Company: NORDIC SEMICONDUCTOR OY
Sample: S/01
Operation mode: OM#01
Description: EUT ON. LTE cat. NB-IoT. IDLE Band 12. Power supply: 3.8Vdc.
Vertical Polarization

ER FCC Part 15 Subpart B 1-18 GHz Class B



— Average Scan
— Peak Scan
— FCC Part 15 Class B Electric Field Strength PK
— FCC Part 15 Class B Electric Field Strength QP+AV

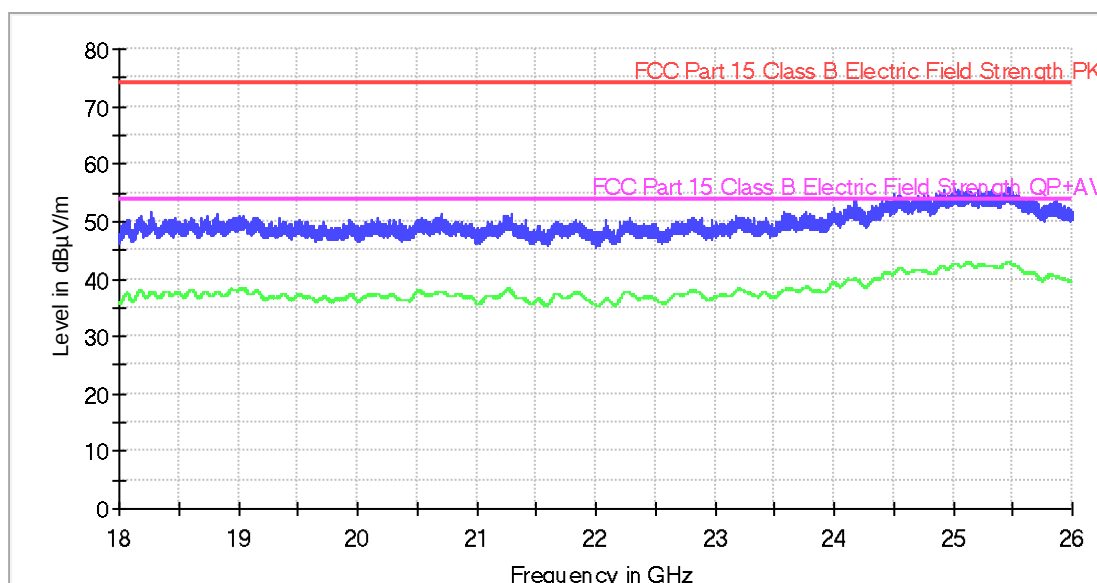
Subrange Maxima

Frequency (MHz)	PK+ CLRWR (dBμV/m)	AVG CLRWR (dBμV/m)
3745.200000	32.4	18.7
6596.400000	39.3	26.1
9313.200000	46.3	32.8
12278.000000	48.2	34.6
13652.400000	50.7	36.3
17998.400000	62.2	49.4

Radiated Emission. CR0101HR2_PH

Project: 59675REM.004
Company: NORDIC SEMICONDUCTOR OY
Sample: S/01
Operation mode: OM#01
Description: EUT ON. LTE cat. NB-IoT. IDLE Band 12. Power supply: 3.8Vdc.
Horizontal Polarization

ER FCC Part 15 Subpart B 18-26 GHz Class B



- Average Scan
- Peak Scan
- FCC Part 15 Class B Electric Field Strength PK
- FCC Part 15 Class B Electric Field Strength QP+AV

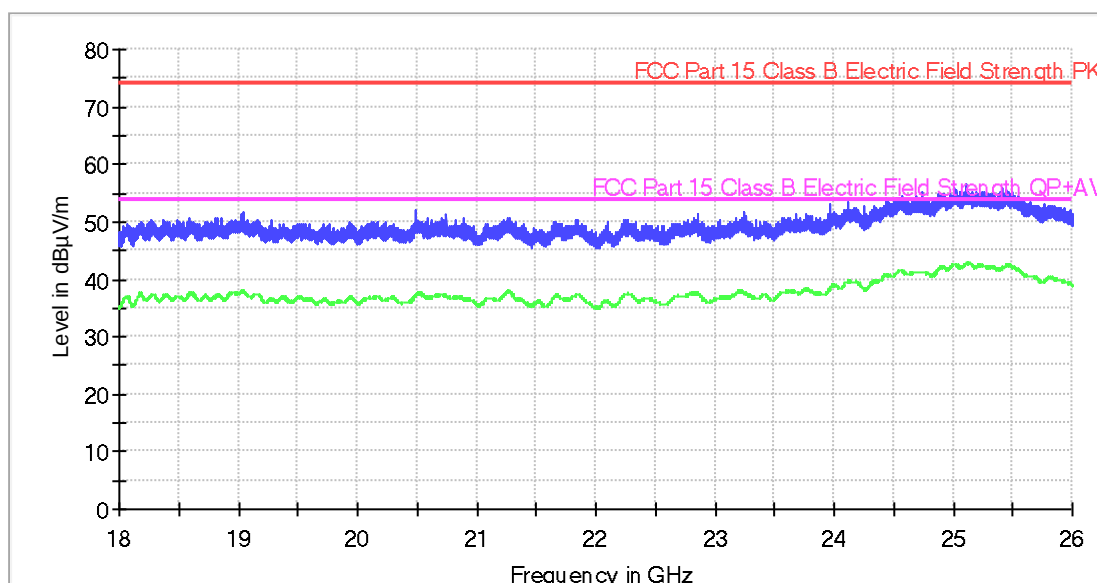
Subrange Maxima

Frequency (MHz)	PK+ CLRWR (dBμV/m)	AVG CLRWR (dBμV/m)
18276.800000	51.6	37.8
20535.600000	50.7	37.7
20699.200000	51.5	37.8
23178.400000	50.9	38.0
24506.000000	55.0	41.0
25455.200000	56.0	43.0

Radiated Emission. CR0101HR2_PV

Project: 59675REM.004
Company: NORDIC SEMICONDUCTOR OY
Sample: S/01
Operation mode: OM#01
Description: EUT ON. LTE cat. NB-IoT. IDLE Band 12. Power supply: 3.8Vdc.
Vertical Polarization

ER FCC Part 15 Subpart B 18-26 GHz Class B



— Average Scan
— Peak Scan
— FCC Part 15 Class B Electric Field Strength PK
— FCC Part 15 Class B Electric Field Strength QP+AV

Subrange Maxima

Frequency (MHz)	PK+ CLRWR (dBµV/m)	AVG CLRWR (dBµV/m)
19048.400000	51.7	37.8
20493.600000	52.0	37.3
20747.600000	51.2	37.1
23243.600000	51.7	37.6
24566.400000	54.5	41.5
25102.400000	56.5	42.6