DEKRA Testing and Certification, S.A.U.
Parque Tecnológico de Andalucía,
c/ Severo Ochoa nº 2 · 29590 Campanillas · Málaga · España
C.I.F. A29 507 456

DEKRA

ilac-MRA ENAC ENSAYOS Nº 51/LE147

Test report No:
NIE: 64610REM.002A2

Test report

ETSI EN 301 908-1 V13.1.1 (2019-11): IMT cellular networks; Harmonised Standard for access to radio spectrum; Part 1: Introduction and common requirements

(*) Identification of item tested	nRF9160 IOT Module
(*) Trademark	nRF91
(*) Model and /or type reference	nRF9160
Other identification of the product	HW Version: nRF9160-SICA-B1A SW Version: mfw_nrf9160_1.1.2-148 IMEI TAC: 35265610
(*) Features	LTE Cat-M1, LTE-NB1, GPS
Manufacturer	NORDIC SEMICONDUCTOR ASA Otto Nielsens Vel 12, 7052 Trondheim, Norway.
Test method requested, standard	ETSI EN 301 908-1 V13.1.1 (2019-11)
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Rafael López Martín EMC Consumer & RF Lab. Manager 2022.01.24 10:22:43 +01'00'
Date of issue	2022-01-24
Report template No	FDT08_22 (*) "Data provided by the client"

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Competences and guarantees

DEKRA Testing and Certification 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.

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

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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General conditions

1. This report is only referred to the item that has undergone the test.
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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 180 MHz to 1000 MHz is I = ± 2,9 dB for peak & average measurements.

The total uncertainty of the measurement system for the measured radio disturbance characteristics of EUT from 1 GHz to 12.75 GHz is I = ± 2,9 dB for peak & 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 an IOT Module that has Application CPU, LTE Cat-M1 Radio and GPS Receiver.

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.

Sample S/01 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
64610/002	nRF9160 IOT Module	nRF9160	352656102628230	2020-04-14

Test sample description

Ports…… :	Port name and description	Cable		
		Specified length [m]	Attached during test	Shielded
	LTE RF	2	☒	☒
	GPS	2	☐	☐
	BTLE		☐	☐
Supplementary information to the ports…… :	*N/A*			

Rated power supply .....:	Voltage and Frequency		Reference poles			
			L1	L2	L3	N	PE
	☐	AC:	☐	☐	☐	☐	☐
	☐	AC:	☐	☐	☐	☐	☐
	☒	DC: 3.0 – 5.5Vdc					
	☐	DC:					

Rated Power .....:	1W		
Clock frequencies.....:	32kHz, 32MHz.		
Other parameters .....:	Not provided data.		
Software version .....:	mfw_nrf9160_1.1.2-148		
Hardware version .....:	nRF9160-SICA-B1A		
Dimensions in cm (L x W 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_1315-v1.2 /2020-04-30-nRF9160_Objective_Product_Spec	30-Apr-2020
	Cover markings	nRF9160_SiP marking	15-Jun-2020

Identification of the client

NORDIC SEMICONDUCTOR ASA
Otto Nielsens Vel 12,
7052 Trondheim, Norway.

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2020-05-13
Date (finish)	2020-05-14

Document history

Report number	Date	Description
64610REM.002	2020-06-10	First release
64610REM.002A1	2020-08-25	First modification due to typos. This modification test report cancels and replaces the test report 64610REM.002
64610REM.002A2	2022-01-24	Second modification due to standard used and missing information. This modification test report cancels and replaces the test report 64610REM.002A1

Environmental conditions

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

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

Remarks and comments

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

Testing verdicts

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

List of equipment used during the test

Control Number	Description	Model	Manufacturer	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	2022-05-27
4612	HORN ANTENNA 1-18GHz	BBHA 9120 D	SCHWARZBECK MESS-ELEKTRONIK	2021-06-14
5641	HYBRID BILOG ANTENNA 30MHz-6GHz	3142E	ETS LINDGREN	2021-07-31
6064	SEMIANECHOIC ABSORBER LINED CHAMBER	SAC-3	Frankonia	---
6121	PRE-AMPLIFIER G>40dB 10MHz-6GHz	BLNA 0160-01N	BONN ELEKTRONIK	---
6126	ETHERNET TEMPERATURE AND HUMIDITY LOGGER	HWg-STE	HW GROUP	2021-04-17
6132	ETHERNET TEMPERATURE AND HUMIDITY LOGGER	HWg-STE	HW GROUP	2021-04-20
6195	PRE-AMPLIFIER G>55dB 1-18GHz	AMF-7D-01001800-22-10P	NARDA	2021-05-19
6329	SHIELDED ROOM	---	FRANKONIA	---

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:

OPERATION MODE	DESCRIPTION
OM#01	EUT ON. MS in IDLE mode. NBiOT Band 1. Power supply: 3,8Vdc.
OM#02	EUT ON. MS in IDLE mode. NBiOT Band 3. Power supply: 3,8Vdc.
OM#03	EUT ON. MS in IDLE mode. NBiOT Band 8. Power supply: 3,8Vdc.
OM#04	EUT ON. MS in IDLE mode. NBiOT Band 20. Power supply: 3,8Vdc.
OM#05	EUT ON. MS in IDLE mode. NBiOT Band 28. Power supply: 3,8Vdc.
OM#06	EUT ON. MS in traffic mode. NBiOT Band 1. Power supply: 3,8Vdc.
OM#07	EUT ON. MS in traffic mode. NBiOT Band 3. Power supply: 3,8Vdc.
OM#08	EUT ON. MS in traffic mode. NBiOT Band 8. Power supply: 3,8Vdc.
OM#09	EUT ON. MS in traffic mode. NBiOT Band 20. Power supply: 3,8Vdc.
OM#10	EUT ON. MS in traffic mode. NBiOT Band 28. Power supply: 3,8Vdc.
OM#11	EUT ON. Control and monitoring function. Power supply: 3,8Vdc

RADIATED SPURIOUS EMISSIONS IDLE AND TRAFFIC MODE

LIMITS:	Product standard :	ETSI EN 301 908-1 V13.1.1 (2019-11)
	Test standard :	ETSI EN 301 908-1 V13.1.1 (2019-11)

LIMITS
Traffic mode spurious emission limits.
Bellow, the limits for the measurement are stated in dBm.

GENERAL SPURIOUS EMISSIONS REQUIREMENTS

Frequency bandwidth	Measurement bandwidth	Minimum requirement
30 MHz ≤ f < 1000 MHz	100 kHz	-36 dBm
1 GHz ≤ f < 12,75 GHz	1 MHz	-30 dBm

IDLE mode spurious emission limits
Bellow, the limits for the measurement are stated in dBm.

GENERAL RECEIVER SPURIOUS EMISSIONS REQUIREMENTS

Frequency band	Measurement bandwidth	Maximum level
30 MHz ≤ f < 1 GHz	100 kHz	-57 dBm
1 GHz ≤ f < 12,75 GHz	1 MHz	-47 dBm

TESTED SAMPLES:	S/01
TESTED OPERATION MODES:	OM#01 to OM#10
TEST RESULTS :	**CR**mmnn: CR, Radiation Condition; mm: Sample number; nn: Operation mode.

CRmmnn	Description	Result
CR0101LR_PH	Range 30 - 1000 MHz. Horizontal Polarization.	P
CR0101LR_PV	Range 30 - 1000 MHz. Vertical Polarization.	P
CR0102LR_PH	Range 30 - 1000 MHz. Horizontal Polarization.	P
CR0102LR_PV	Range 30 - 1000 MHz. Vertical Polarization.	P
CR0103LR_PH	Range 30 - 1000 MHz. Horizontal Polarization.	P
CR0103LR_PV	Range 30 - 1000 MHz. Vertical Polarization.	P
CR0104LR_PH	Range 30 - 1000 MHz. Horizontal Polarization.	P
CR0104LR_PV	Range 30 - 1000 MHz. Vertical Polarization.	P
CR0105LR_PH	Range 30 - 1000 MHz. Horizontal Polarization.	P
CR0105LR_PV	Range 30 - 1000 MHz. Vertical Polarization.	P
CR0106LR_PH	Range 30 - 1000 MHz. Horizontal Polarization.	P
CR0106LR_PV	Range 30 - 1000 MHz. Vertical Polarization.	P
CR0107LR_PH	Range 30 - 1000 MHz. Horizontal Polarization.	P
CR0107LR_PV	Range 30 - 1000 MHz. Vertical Polarization.	P
CR0108LR_PH	Range 30 - 1000 MHz. Horizontal Polarization.	P
CR0108LR_PV	Range 30 - 1000 MHz. Vertical Polarization.	P
CR0109LR_PH	Range 30 - 1000 MHz. Horizontal Polarization.	P
CR0109LR_PV	Range 30 - 1000 MHz. Vertical Polarization.	P
CR0110LR_PH	Range 30 - 1000 MHz. Horizontal Polarization.	P
CR0110LR_PV	Range 30 - 1000 MHz. Vertical Polarization.	P

TEST RESULTS :	(Cont)

CRmmnn	Description	Result
CR0101HR_PH	Range 1 – 12,75 GHz. Horizontal Polarization.	P
CR0101HR_PV	Range 1 – 12,75 GHz. Horizontal Polarization.	P
CR0102HR_PH	Range 1 – 12,75 GHz. Horizontal Polarization.	P
CR0102HR_PV	Range 1 – 12,75 GHz. Horizontal Polarization.	P
CR0103HR_PH	Range 1 – 12,75 GHz. Horizontal Polarization.	P
CR0103HR_PV	Range 1 – 12,75 GHz. Horizontal Polarization.	P
CR0104HR_PH	Range 1 – 12,75 GHz. Horizontal Polarization.	P
CR0104HR_PV	Range 1 – 12,75 GHz. Horizontal Polarization.	P
CR0105HR_PH	Range 1 – 12,75 GHz. Horizontal Polarization.	P
CR0105HR_PV	Range 1 – 12,75 GHz. Horizontal Polarization.	P
CR0106HR_PH	Range 1 – 12,75 GHz. Horizontal Polarization.	P
CR0106HR_PV	Range 1 – 12,75 GHz. Horizontal Polarization.	P
CR0107HR_PH	Range 1 – 12,75 GHz. Horizontal Polarization.	P
CR0107HR_PV	Range 1 – 12,75 GHz. Horizontal Polarization.	P
CR0108HR_PH	Range 1 – 12,75 GHz. Horizontal Polarization.	P
CR0108HR_PV	Range 1 – 12,75 GHz. Horizontal Polarization.	P
CR0109HR_PH	Range 1 – 12,75 GHz. Horizontal Polarization.	P
CR0109HR_PV	Range 1 – 12,75 GHz. Horizontal Polarization.	P
CR0110HR_PH	Range 1 – 12,75 GHz. Horizontal Polarization.	P
CR0110HR_PV	Range 1 – 12,75 GHz. Horizontal Polarization.	P

CONTROL AND MONITORING FUNCTIONS

Test method

a) At the start of the test, the UE shall be switched off. The UE antenna connector shall be connected to a power measuring equipment

b) The UE shall be switched on for a period of approximately fifteen minutes, and then switched off.

c) The EUT shall remain switched off for a period of at least thirty seconds, and shall then be switched on for a period of approximately one minute.

d) The maximum power emitted from the UE throughout the duration of the test shall be recorded.

In order to prove compliance, the results obtained shall be compared with the following limit:

Limits

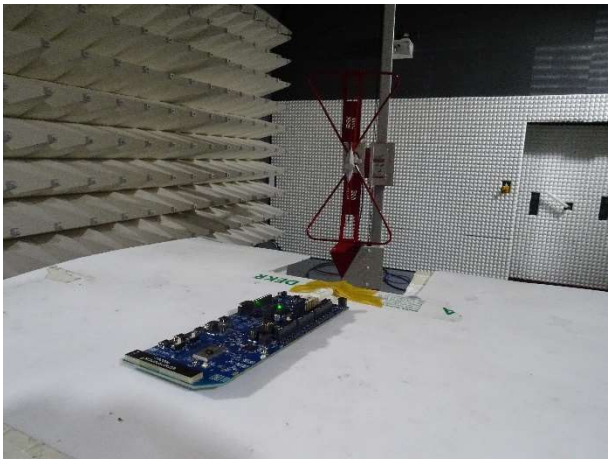
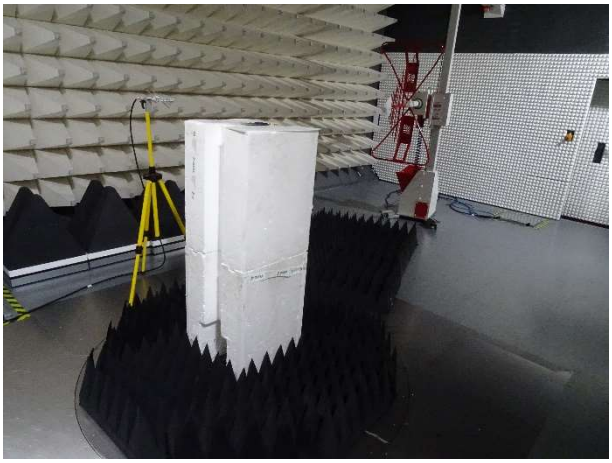
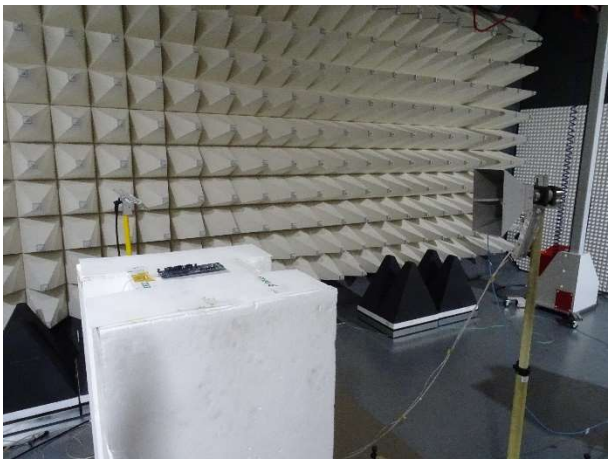
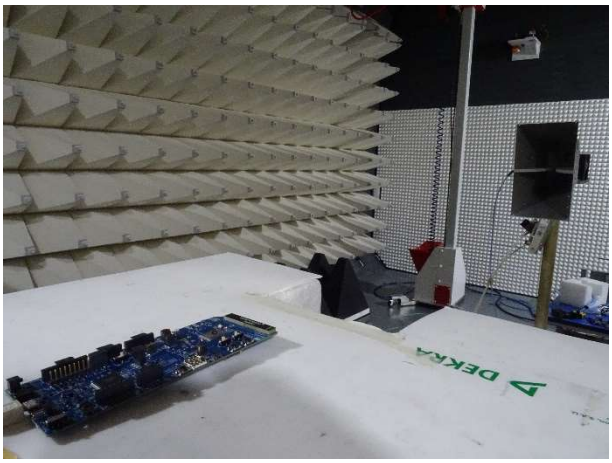
Frequency range	Limit
700 MHz ≤ f < 2,7 GHz	-30 dBm

Result

C&Mmmnn	Description	Result
C&M0111	Maximum emission point detected at 2.4708 GHz. Level -61.82 dBm.	P

C&Mmmnn: C&M: Control and monitoring function; mm: Sample number; nn: Operation mode;

Verdict

Pass

Appendix B: Photographs