



Test report No:
NIE: 64430REM.001

Partial Test report

ETSI EN 301 489-1 V2.2.3 (2019-11): ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements; Harmonised Standard for ElectroMagnetic Compatibility;

ETSI EN 301 489-3 V2.1.1 (2019-03): ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 3: Specific conditions for Short-Range Devices (SRD) operating on frequencies between 9 kHz and 246 GHz; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU &

Draft ETSI EN 301 489-17 V3.2.0 (2017-03): ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 17: Specific conditions for Broadband Data Transmission Systems; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU

(*) Identification of item tested	ISM band radio transceiver
(*) Trademark	N53 Series
(*) Model and /or type reference tested	nRF5340
Other identification of the product	Hardware version: N5340 QKAA, nRF53 DK v0.9 Software version: nRF Connect SDK v1.3.0 4c0d3be2ed4ade4dc3e614e95e6f8e4330d663b4
(*) Features	Bluetooth LE, IEEE 802.15.4
Manufacturer	NORDIC SEMICONDUCTOR ASA Otto Nielsens veg 12 N-7052 Trondheim, NORWAY
Test method requested, standard	ETSI EN 301 489-1 V2.2.3 (2019-11); ETSI EN 301 489-3 V2.1.1 (2019-03) & Draft ETSI EN 301 489-17 V3.2.0 (2017-03)
Approved by (name / position & signature)	Rafael López Martín EMC Consumer & RF Lab. Manager
Date of issue	2020-11-09
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.

DEKRA Testing and Certification is a testing laboratory competent to carry out the tests described in this report.

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.
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.
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 and the Accreditation Bodies.

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 $I = \pm 5$ dB for quasi-peak measurements, $I = \pm 4,7$ 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 6000MHz is $I = \pm 4,8$ dB for average and $I = \pm 4,2$ dB for peaks 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 ISM band radio transceiver.

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 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
64430/003	ISM band radio transceiver	nRF5340	03	2020-06-15
64430/004	Antenna	---	---	2020-06-15

Sample S/02 (sample of NFC) is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
64430/001	ISM band radio transceiver	nRF5340	04	2020-06-15
64430/002	Antenna	---	---	2020-06-15

Sample S/03 (sample of Bluetooth) is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
64430/003	ISM band radio transceiver	nRF5340	03	2020-06-15
64430/006	Antenna	---	---	2020-06-15

Auxiliary elements used with Sample S/03:

Control Nº	Description	Model	Serial Nº	Date of reception
64430/001	ISM band radio transceiver	nRF5340	04	2020-06-15
64430/002	Antenna	---	---	2020-06-15

Test sample description

Ports.....:	Port name and description		Cable				
			Specified length [m]	Attached during test	Shielded		
	--			<input type="checkbox"/>	<input type="checkbox"/>		
				<input type="checkbox"/>	<input type="checkbox"/>		
Supplementary information to the ports.....:	--						
Rated power supply	Voltage and Frequency		Reference poles				
			L1	L2	L3	N	PE
	<input type="checkbox"/>	AC:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input checked="" type="checkbox"/>	DC: 5V USB Powered					
Rated Power	--						
Clock frequencies.....:	--						
Other parameters	--						
Software version	nRF Connect SDK v1.3.0 4c0d3be2ed4ade4dc3e614e95e6f8e4330d663b4						
Hardware version	N5340 QKAA, nRF53 DK v0.9						
Dimensions in cm (L x W x D).....:	135mm x 20mm x 65mm						
Mounting position	<input checked="" type="checkbox"/>	Table top equipment					
	<input type="checkbox"/>	Wall/Ceiling mounted equipment					
	<input type="checkbox"/>	Floor standing equipment					
	<input type="checkbox"/>	Hand-held equipment					
	<input type="checkbox"/>	Other:					
Modules/parts.....:	Module/parts of test item		Type		Manufacturer		
	--						
Accessories (not part of the test item)	Description		Type		Manufacturer		
	--						
Documents as provided by the applicant	Description		File name		Issue date		
	--						

Identification of the client

NORDIC SEMICONDUCTOR ASA
Otto Nielsens veg 12
N-7052 Trondheim, NORWAY

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2020-06-15
Date (finish)	2020-09-01

Document history

Report number	Date	Description
64430REM.001	2020-11-09	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 tests have been performed by the technical personnel: Lorena Oviedo & Daniel Mejías.

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
1985	POWER AMPLIFIER 100W 80MHz-1GHz	AP32MT210	PRANA	Before the test
1993	GENERADOR DE SEÑAL	SMT06	ROHDE AND SCHWARZ	2022-07-06
3548	USB TEMPERATURE AND HUMIDITY SENSOR	HUMIDIPROBE	PICO TECHNOLOGY	2021-04-29
4523	EMI TEST RECEIVER 20Hz-26.5GHz	ESU26	ROHDE AND SCHWARZ	2022-05-27
4530	AVG POWER SENSOR 6 GHZ	NRP-Z91	ROHDE AND SCHWARZ	2021-07-27
5641	HYBRID BILOG ANTENNA 30MHz-6GHz	3142E	ETS LINDGREN	2021-07-31
5678	ACOPLADOR DIRECCIONAL, 80MHZ-1000MHZ	BDC0810-50/1500	BONN ELEKTRONIK	2021-05-19
6064	SEMIANECHOIC ABSORBER LINED CHAMBER	SAC-3	Frankonia	---
6121	PRE-AMPLIFIER G>40dB 10MHz-6GHz	BLNA 0160-01N	BONN ELEKTRONIK	Before the test
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
6192	POWER AMPLIFIER 100W 0.7-6 GHZ	BBA150	ROHDE AND SCHWARZ	---
6238	ELECTROSTATIC DISCHARGE SIMULATOR (ESD)	esd NX30.1	EM TEST	2020-12-12
6329	SHIELDED ROOM		FRANKONIA	---
6339	LOG-PERIODIC BROADBAND ANTENNA	STPL 9129	SCHWARZBECK MESS-ELEKTRONIK	Before the test

Summary

Emission Test		
Requirement – Test case	Verdict	Remark
Radiated emission test (30 MHz – 1000 MHz)	Pass	--
Radiated emission test (1 GHz – 6 GHz)	Pass	--
Conducted emission test (150 KHz to 30 MHz)	N/A	See 1
Discontinuous disturbance (clicks) on AC power leads	N/A	See 1
Harmonic current emissions	N/A	See 1
Voltage changes, voltage fluctuations and flicker	N/A	See 1
<u>Supplementary information and remarks:</u>		
1) The test is not applicable because EUT is powered DC (by USB port).		

Immunity test		
Requirement – Test case	Verdict	Remark
Electrostatic discharge	Pass	See 2
Radio-frequency electromagnetic fields (80 MHz to 1000 MHz)	Pass	See 2
Radio-frequency electromagnetic fields (1 GHz to 6000 GHz)	Pass	See 2
Fast transients	N/A	See 1
Surges	N/A	See 1
Injected currents (radio-frequency common mode)	N/A	See 1
Voltage dips and short interruptions	N/A	See 1
<u>Supplementary information and remarks:</u>		
1) The test is not applicable because EUT is powered DC (by USB port).		
2) IEEE 802.15.4 monitorization according EN301 489-17 has not been requested by the applicant and it's not included in this test report.		

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. Stand Alone basis. Power supply: 5Vdc (via USB port)
OM#02	EUT ON. NFC reading continuously. Power supply: 5Vdc (via USB port)
OM#03	EUT ON. Bluetooth actived and paired. Power supply: 5Vdc (via USB port)
OM#04	EUT ON. Bluetooth actived and not paired. Power supply: 5Vdc (via USB port)

FAILS CRITERIA FOR IMMUNITY TEST

According to ETSI EN 301 489-1 V2.2.3 (2019-11):

6.1 Performance criteria for continuous phenomena

During the test, the equipment shall:

- continue to operate as intended;
- not unintentionally transmit;
- not unintentionally change its operating state;
- not unintentionally change critical stored data.

6.2 Performance criteria for transient phenomena

For all ports and transient phenomena with the exception described below, the following applies:

- The application of the transient phenomena shall not result in a change of the mode of operation (e.g. unintended transmission) or the loss of critical stored data.
- After application of the transient phenomena, the equipment shall operate as intended.

For surges applied to symmetrically operated wired network ports intended to be connected directly to outdoor lines the following criteria applies:

- For products with only one symmetrical port intended for connection to outdoor lines, loss of function is allowed, provided the function is self-recoverable, or can be otherwise restored. Information stored in non-volatile memory, or protected by a battery backup, shall not be lost.
- For products with more than one symmetrical port intended for connection to outdoor lines, loss of function on the port under test is allowed, provided the function is self-recoverable. Information stored in non-volatile memory, or protected by a battery backup, shall not be lost.

According to ETSI EN 301 489-3 V2.1.1 (2019-03):

In the table below:

- performance criterion A applies for immunity tests with phenomena of a continuous nature;
- performance criterion B applies for immunity tests with phenomena of a transient nature.

Criterion	During test	After test
A	Operate as intended No loss of function No unintentional responses	Operate as intended No loss of function No degradation of performance No loss of stored data or user programmable functions
B	May show loss of function No unintentional responses	Operate as intended Lost function(s) shall be self-recoverable No degradation of performance No loss of stored data or user programmable functions

Where "operate as intended" or "no loss of function" is specified, the EUT shall demonstrate correct functioning as described in clause 5.

Where the EUT has more than one mode of operation (see clause 4.5.2), an unplanned transition from one mode to another is considered as an unintentional response. The EUT shall be tested in sufficient modes to confirm there are no such unintentional responses.

According to Draft ETSI EN 301 489-17 V3.2.0 (2017-03) Subclause 6.2:

Criteria	During test	After test
A	Shall operate as intended. May show degradation of performance (see note 1). Shall be no loss of function. Shall be no unintentional transmissions.	Shall operate as intended. Shall be no degradation of performance (see note 3). Shall be no loss of function. Shall be no loss of stored data or user programmable functions.
B	May show loss of function (one or more). May show degradation of performance (see note 2). Shall be no unintentional transmissions.	Functions shall be self-recoverable. Shall operate as intended after recovering. Shall be no degradation of performance (see note 3). Shall be no loss of stored data or user programmable functions.
C	May be loss of function (one or more).	Functions shall be recoverable by the operator. Shall operate as intended after recovering. Shall be no degradation of performance (see note 3).

NOTE 1: Operate as intended during the test allows a level of degradation not below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.

NOTE 2: Degradation of performance during the test is understood as a degradation to a level not below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.

NOTE 3: No degradation of performance after the test is understood as no degradation below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. After the test no change of actual operating data or user retrievable data is allowed. If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.

MONITORING FOR IMMUNITY TEST

For every operation mode, the monitoring performed over the samples under test is shown in the following table:

OPERATION MODE	CONTINUOUS PHENOMENA MONITORING	TRANSIENT PHENOMENA MONITORING
OM#01	N/A	N/A
OM#02	By means of an auxiliary device, it is monitored that NFC tag is properly read during and after the test through the green led in the EUT and the orange Led in the auxiliary device.	By means of an auxiliary device, it is monitored that NFC tag is properly read after the test through the green led in the EUT and the orange Led in the auxiliary device.
OM#03	By means of an auxiliary device (nRF5340 board), it is monitored that Bluetooth communication remains active. The green Led must remain switched on during and after the test.	By means of an auxiliary device (nRF5340 board), it is monitored that Bluetooth communication remains active. The green Led must remain switched on after the test..
OM#04	By means of a spectrum analyzer, it is monitored that no undesired signal are produced during and after the test.	By means of a spectrum analyzer, it is monitored that no undesired signal are produced after the test.

RADIATED EMISSION. ELECTROMAGNETIC FIELD MEASURE

LIMITS:

Product standard:

ETSI EN 301 489-1 V2.2.3 (2019-11);
ETSI EN 301 489-3 V2.1.1 (2019-03) &
Draft ETSI EN 301 489-17 V3.2.0 (2017-03)

Test standard:

EN 55032 (2015) / AC (2016-07)

Limits for EN 55032 (2015) / AC (2016-07) Class B:

Frequency range (MHz)	Measured field limit at 3 m (dB μ V/m) Quasi-Peak measurement
30 to 230	40
230 to 1000	47

Frequency range (MHz)	Measured field limit at 3 m (dB μ V/m)	
	Average	Peak
1000 to 3000	50	70
3000 to 6000	54	74

TESTED SAMPLES:

S/01

TESTED OPERATION MODES:

OM#01

TEST RESULTS:

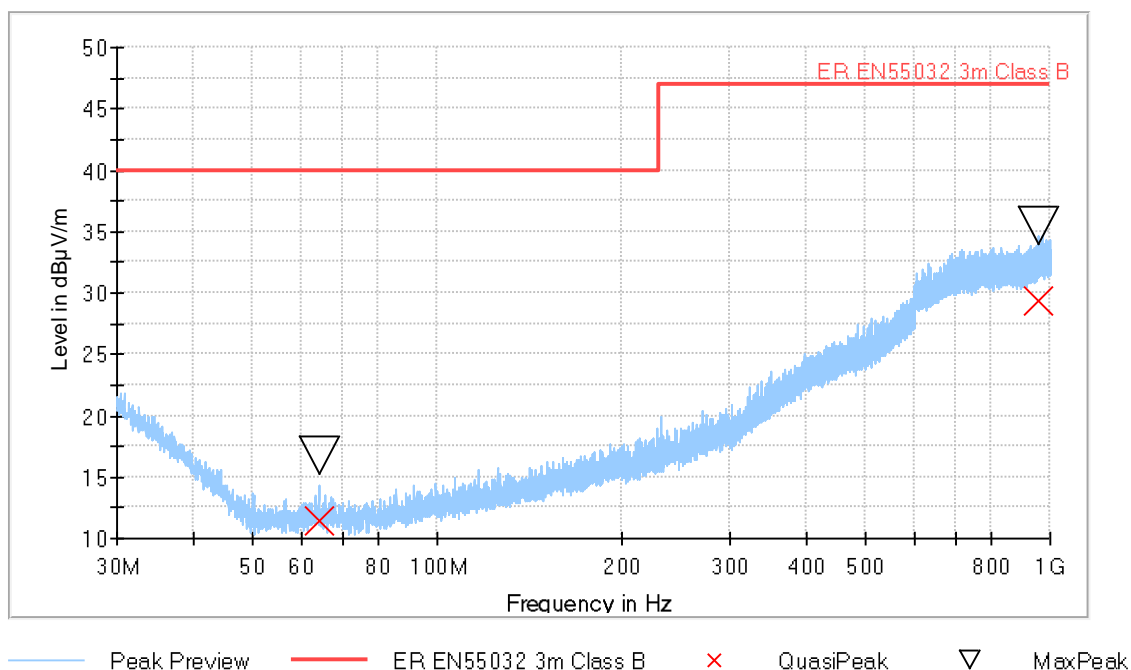
CRmmnn: CR, Radiated condition; mm: Sample number; nn: Operation mode; RR: Measured range.

CRmmnnRR	DESCRIPTION	RESULT
CR0101LR	Range: 30 MHz - 1000 MHz.	P
CR0101HR	Range: 1 GHz - 6 GHz.	P

Radiated Emission: CR0101LR

Project: 64430REM.001
Company: NORDIC SEMICONDUCTOR ASA
Sample: S/01
Operation mode: OM#01
Description: EUT ON. Stand Alone Basis. Power supply: 5Vdc (via USB port)

ER EN 55032 Class B



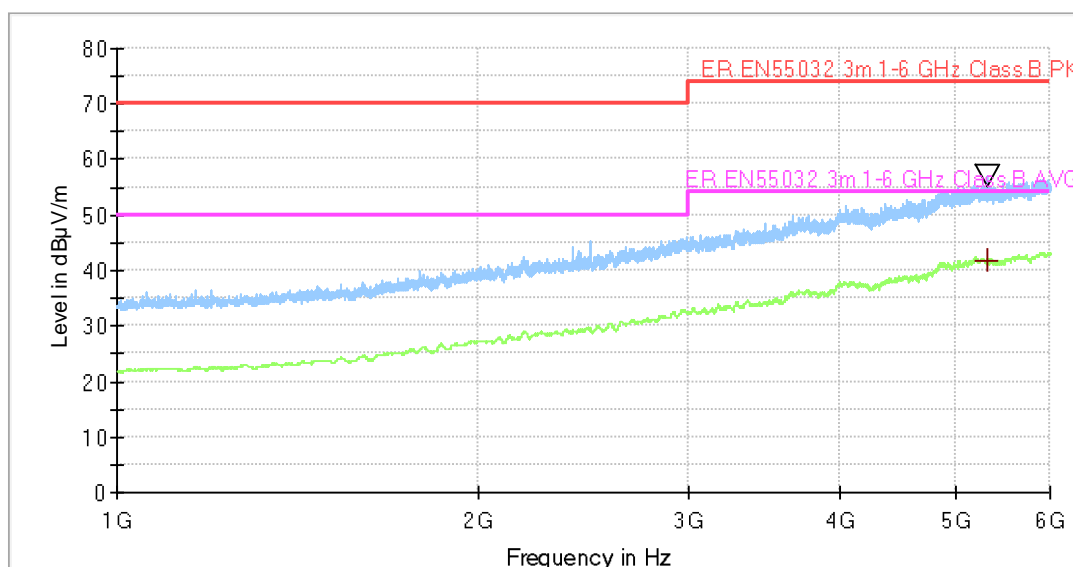
Maximizations

Frequency (MHz)	QuasiPeak (dBμV/m)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Azimuth (deg)
64.013000	11.40	16.73	40.00	28.60	V	-154.0
958.460000	29.38	35.45	47.00	17.62	V	64.0

Radiated Emission: CR0101HR

Project: 64430REM.001
Company: NORDIC SEMICONDUCTOR ASA
Sample: S/01
Operation mode: OM#01
Description: EUT ON. Stand Alone Basis. Power supply: 5Vdc (through USB port)

ER EN 55032 (1-6GHz) Class B



— Average Scan
— Peak Scan
— MaxPeak
— ER EN55032 3m 1-6 GHz Class B PK
▽ MaxPeak
+ QuasiPeak

Maximizations

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)
5322.590000	57.02	---	74.00	16.98	150.0	H	175.0
5322.590000	---	41.85	54.00	12.15	150.0	H	175.0

RADIATED RF ELECTROMAGNETIC FIELD IMMUNITY TEST

LIMITS:

Product standard:

ETSI EN 301 489-1 V2.2.3 (2019-11);
ETSI EN 301 489-3 V2.1.1 (2019-03) &
Draft ETSI EN 301 489-17 V3.2.0 (2017-03)

Test standard:

EN 61000-4-3 (2006) / A1 (2008) / A2 (2010)

RANGE	FREQUENCY	MODULATION	STEP	LEVEL
A	80-1000MHz	AM 1 kHz Prof: 80%	LOG 1%	3 V/m
B	1000-2700MHz	AM 1 kHz Prof: 80%	LOG 1%	3 V/m
C	1000-6000MHz	AM 1 kHz Prof: 80%	LOG 1%	3 V/m

TESTED SAMPLES:

S/02 & S/03

TESTED OPERATION MODES:

OM#02 to OM#04

FAIL CRITERIA AND MONITORING:

A

ZONES/COUPLING CABLES (CPL):

CPL	DESCRIPTION
1	EUT frontal
2	EUT rear side
3	EUT left side
4	EUT right side

TEST RESULTS :

CPL	S/	OM#	RANGE	POL	COMMENTS	RESULT
1 2 3 4	02	02	A	H, V	Ok, no fails detected	P
1 2 3 4	02	02	B	H, V	Ok, no fails detected	P
1 2 3 4	03	03	A	H, V	Ok, no fails detected	P
1 2 3 4	03	03	C	H, V	Ok, no fails detected	P
1 2 3 4	03	04	A	H, V	Ok, no fails detected	P
1 2 3 4	03	04	C	H, V	Ok, no fails detected	P

ELECTROSTATIC DISCHARGE IMMUNITY TEST

LIMITS:	Product standard:	ETSI EN 301 489-1 V2.2.3 (2019-11); ETSI EN 301 489-3 V2.1.1 (2019-03) & Draft ETSI EN 301 489-17 V3.2.0 (2017-03)
	Test standard:	EN 61000-4-2 (2009)

COUPLING	LEVEL
Direct contact discharge:	±4kV
Indirect contact discharge:	±4kV
Air discharge:	±2kV ±4kV ±8kV

TESTED SAMPLES:	S/02 & S/03
TESTED OPERATION MODES:	OM#02 to OM#04
MONITORING AND FAIL CRITERIA:	B
NUMBER OF DISCHARGES FOR POINT:	10
ZONES/COUPLING CABLES (CPL):	

CPL	DESCRIPTION	COUPLING TYPE			
		ICH	ICV	DC	DA
1	EUT Frontal	X	X		
2	EUT right side	X	X		
3	EUT rear side	X	X		
4	EUT left side	X	X		

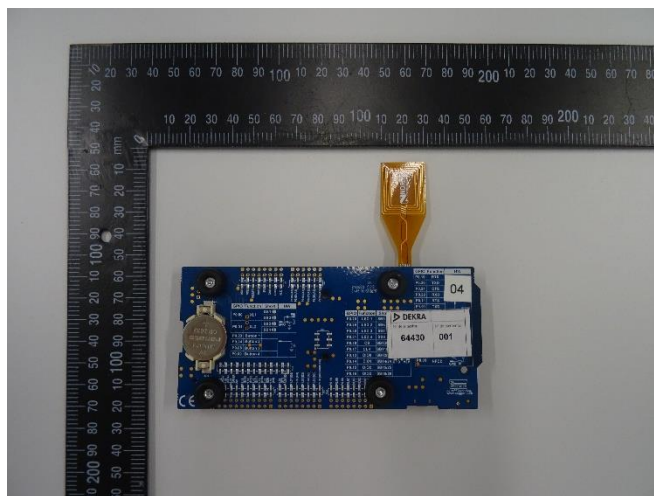
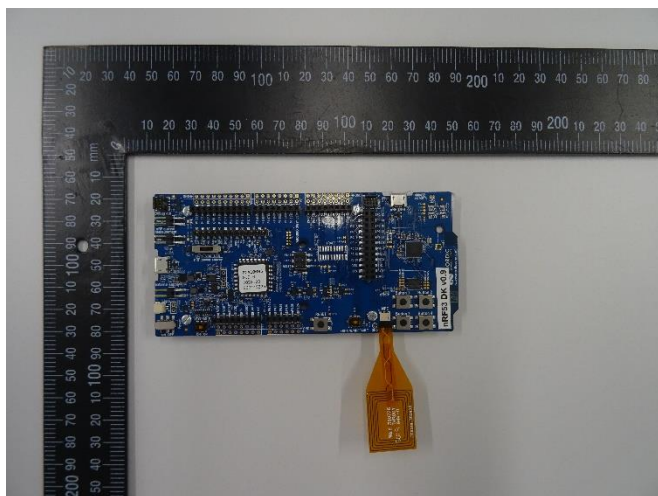
COUPLING RESUME : ICH (Indirect by contact on horizontal plane)
ICV (Indirect by contact on vertical plane), DC (Direct by contact), DA (Direct by air)

TEST RESULTS:	
----------------------	--

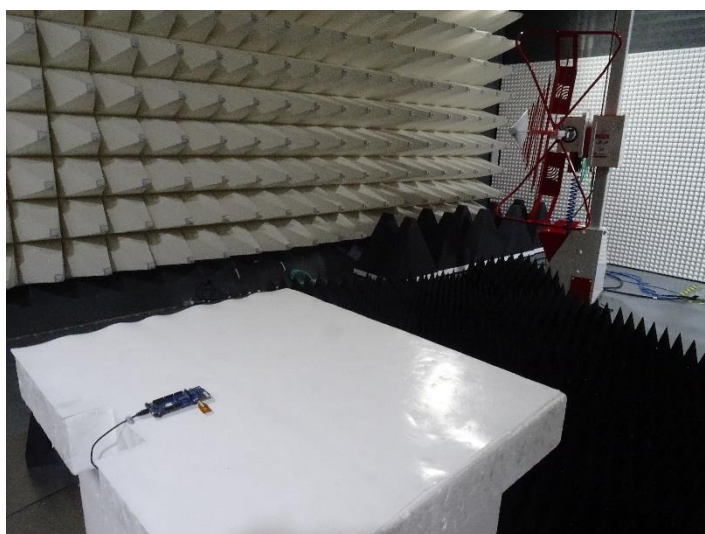
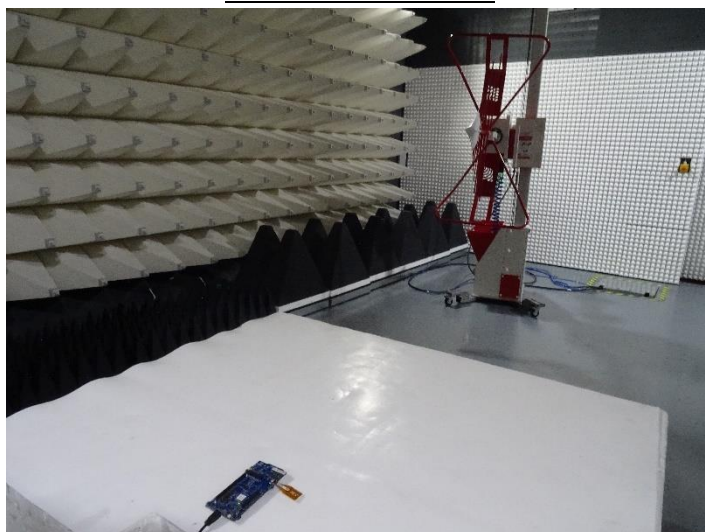
CPL	S/	OM#	COMMENTS	RESULT
1 to 4	02	02	Ok, no fails detected.	P
1 to 4	03	03	Ok, no fails detected.	P
1 to 4	03	04	Ok, no fails detected.	P

Appendix B: Photographs

EUT



Radiated emission test



Radiated immunity test



Electrostatic discharge immunity test

