



Test report No:

NIE: 54033RBT.001

Test report

Bluetooth Low Energy RF-PHY Test Specification

Identification of item tested..... :	ISM band radio transceiver
Trademark	N52 Series
Model or type reference	N52810
Serial number	Sample #1
Final HW version	N52810 QFAA, PCA 70027 r1.0.0
Final SW version	nDTM 25953
Features	DTM 2-wire UART
Manufacturer	NORDIC SEMICONDUCTOR ASA Otto Nielsens veg 12, N-7052 Trondheim
Test method requested..... :	Full RF-PHY testing according to Bluetooth RF-PHY Test Specification, Document Number RF-PHY.TS/5.0.0
Standard..... :	RF-PHY.TS.5.0.0
Test Spec Errata(s)	N/A
ICS	RF-PHY.ICS.5.0.0
TCRL version	TCRL Core 2016-2
Test procedure(s)	PEBT006 BluetoothRFConductedTesting
Summary	IN COMPLIANCE
Approved by (name / position & signature) :	L. Natividad Caro García BQTF Technical Responsible
Date of issue	2017-07-13
Report template No	FBT039_04

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Competences and guarantees

DEKRA Testing and Certification S.A.U. is a BQTF competent to carry out the tests described in this report.

DEKRA Testing and Certification S.A.U. is a BQTF accredited by A2LA (The American Association for Laboratory Accreditation) to perform the test indicated in the Certificate 3350.01.

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

DEKRA. 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 at the time of performance of the test.

DEKRA. 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

1. This report is only referred to the item that has undergone the test.
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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. and the Accreditation Bodies.

Uncertainty

Uncertainty (factor k=2) was calculated according to the DEKRA internal document PODT000

Usage of samples

Samples undergoing test have been selected and supplied by: NORDIC SEMICONDUCTOR ASA.

Sample M/01 is composed of the following elements:

Control N° 54033/001	Model and/or type reference:	N52810
	Serial number:	Sample #1
	Hw version:	N52810 QFAA, PCA 70027 r1.0.0
	Sw version:	nDTM 25953
	Features supported:	DTM 2-wire UART
	Description of test sample	ISM band radio transceiver
	Date of reception	2017-06-28

The sample used for each test case is specified in the "Observations" field of the results annex

Test sample description

Bluetooth low energy transceiver.

Identification of the client

Company name:	NORDIC SEMICONDUCTOR ASA
Postal Address:	Otto Nielsens veg 12, N-7052 Trondheim

Testing period

The performed test started on 2017-06-30 and finished on 2017-06-30.
The tests have been performed at DEKRA.

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 %

Remarks and comments

N/A

Means of testing identification (BEST)

Test System	TACS4 BEST Bluetooth RF Test System				
Control No.	5852				
Hardware:	Control No.	Equipment	Serial No.	Latest Calibration Date	Next Calibration Date
	5767	LAN/GPIB/USB E5810B	MY56030024	N/A	N/A
	5398	Power Supply Agilent 66311B	MY52002833	2017-01-17	2018-01-17
	5399	Sweep Generator AGILENT E8257D	MY53401729	2017-01-20	2018-01-20
	5749	R&S® CMW270	100651	2017-03-13	2018-03-13
	5853	T4BCU100A	000001	N/A	N/A
Software:	5902	User Interface TACS4 BEST v1.8.0			
	5903	Technology Package Version: v3.1.0_R1			
Test Setup:	Conducted measurements: IUT (Item Under Test) connected directly to measuring instruments using low loss SMA cable. IUT controlled by test software. See “Test Setup” section.				

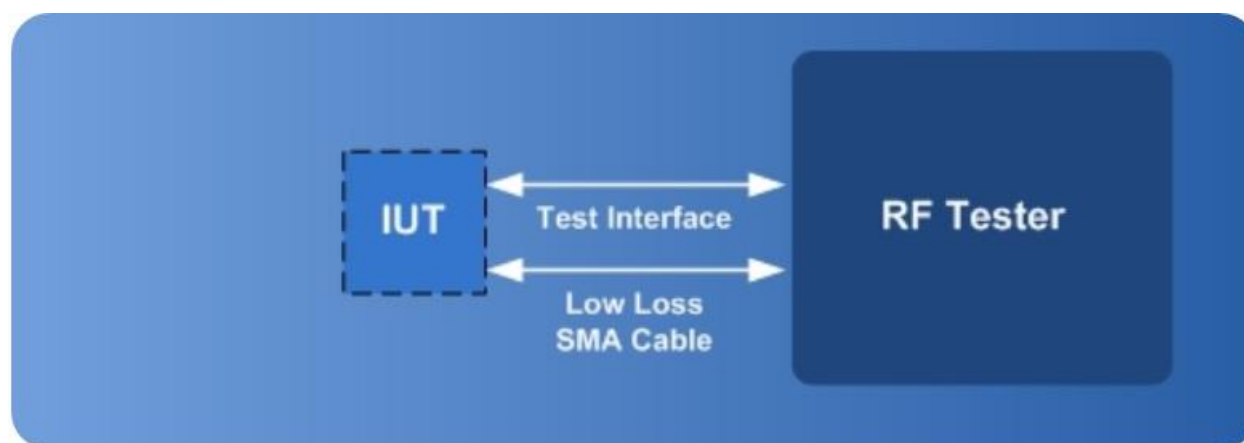
	Control No.	Equipment	Serial No.	Latest Calibration Date	Next Calibration Date
Hardware:	3379	Shielded Chamber	06825	N/A	N/A

For nominal temperature conditions, the following equipment was used:

	Control No.	Equipment	Serial No.	Latest Calibration Date	Next Calibration Date
Hardware:	2624	HUMIDIPROBE	IFY97/067	2017-04-17	2018-04-17
Software:	4762	Control temp_Hum v2.5.1			

Test setup

The configuration used for Test Cases in nominal temperature conditions was the following one:



Measurement uncertainty

TACS4 BEST Bluetooth RF Test System uncertainty values^{1, 2} and the corresponding limits, according to the RF-PHY *Bluetooth* Test Specification, can be found below:

Measurement uncertainty	RF Tester uncertainty	Specification limit	Test Case
Absolute RF power (wanted channel)	±0.98 dB	±1.2dB	TP/TRM-LE/CA/BV-01-C
Absolute RF power (for unwanted emissions in the BT band)	±2.46 dB	±3dB	TP/TRM-LE/CA/BV-03-C
Absolute radio frequency	±4.70 kHz	±5 kHz	TP/TRM-LE/CA/BV-05-C TP/TRM-LE/CA/BV-06-C
Relative drift radio frequency	±1.00 kHz	±1 kHz	TP/TRM-LE/CA/BV-06-C
Frequency deviation	±3.96 kHz	±4 kHz	TP/TRM-LE/CA/BV-05-C

Note 1: All values reflect a 95% confidence level.

Note 2: All values are valid for a temperature range of 23±5°C.

Testing verdicts

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

Appendix A – Test result

Test campaign report

The abbreviations used in the header row of the test campaign report tables are:

Test Case ID : As it can be found on the TCRL.

Description: As it can be found on the TCRL.

Temp/Volt Temperature and Voltage conditions during the test case.

Date: Date of the beginning of the execution.

Verdict: Records the verdict assigned to each Test Case run to completion. Following verdicts are possible:

Pass: If the Test Case passed.

Fail: If the Test Case failed.

NA: Not applicable.

NM: Not measured.

Observations: Provides a reference to additional information relevant to the test presented in “Test Setup” section.

Test Case ID	Description	Verdict	Date	Observations
TP/TRM-LE/CA/BV-01-C	Output power	Pass	2017-06-30	M/01
TP/TRM-LE/CA/BV-02-C	No Longer Used	N/A	-	-
TP/TRM-LE/CA/BV-03-C	In-band emissions	Pass	2017-06-30	M/01
TP/TRM-LE/CA/BV-04-C	No Longer Used	N/A	-	-
TP/TRM-LE/CA/BV-05-C	Modulation characteristics	Pass	2017-06-30	M/01
TP/TRM-LE/CA/BV-06-C	Carrier frequency offset and drift	Pass	2017-06-30	M/01
TP/TRM-LE/CA/BV-07-C	No Longer Used	N/A	-	-
TP/TRM-LE/CA/BV-08-C	In-band emissions at 2 Ms/s	Pass	2017-06-30	M/01
TP/TRM-LE/CA/BV-09-C	Stable Modulation Characteristics at 1 Ms/s	N/A	-	-
TP/TRM-LE/CA/BV-10-C	Modulation Characteristics at 2 Ms/s	Pass	2017-06-30	M/01
TP/TRM-LE/CA/BV-11-C	Stable Modulation Characteristics at 2 Ms/s	N/A	-	-
TP/TRM-LE/CA/BV-12-C	Carrier frequency offset and drift at 2 Ms/s	Pass	2017-06-30	M/01
TP/TRM-LE/CA/BV-13-C	Modulation Characteristics, LE Coded (S=8)	N/A	-	-
TP/TRM-LE/CA/BV-14-C	Carrier frequency offset and drift, LE Coded (S=8)	N/A	-	-
TP/RCV-LE/CA/BV-01-C	Receiver sensitivity	Pass	2017-06-30	M/01
TP/RCV-LE/CA/BV-02-C	No Longer Used	N/A	-	-
TP/RCV-LE/CA/BV-03-C	C/I and receiver selectivity performance	Pass	2017-06-30	M/01
TP/RCV-LE/CA/BV-04-C	Blocking performance	Pass	2017-06-30	M/01
TP/RCV-LE/CA/BV-05-C	Intermodulation performance	Pass	2017-06-30	M/01
TP/RCV-LE/CA/BV-06-C	Maximum input signal level	Pass	2017-06-30	M/01
TP/RCV-LE/CA/BV-07-C	PER Report Integrity	Pass	2017-06-30	M/01
TP/RCV-LE/CA/BV-08-C	Receiver sensitivity at 2 Ms/s	Pass	2017-06-30	M/01
TP/RCV-LE/CA/BV-09-C	C/I and Receiver Selectivity Performance at 2 Ms/s	Pass	2017-06-30	M/01
TP/RCV-LE/CA/BV-10-C	Blocking performance at 2 Ms/s	Pass	2017-06-30	M/01
TP/RCV-LE/CA/BV-11-C	Intermodulation performance at 2 Ms/s	Pass	2017-06-30	M/01

Test Case ID	Description	Verdict	Date	Observations
TP/RVC-LE/CA/BV-12-C	Maximum input signal level at 2 Ms/s	Pass	2017-06-30	M/01
TP/RVC-LE/CA/BV-13-C	PER Report Integrity at 2 Ms/s	Pass	2017-06-30	M/01
TP/RVC-LE/CA/BV-14-C	Receiver Sensitivity at NOC, Stable Modulation Index	N/A	-	-
TP/RVC-LE/CA/BV-15-C	C/I and Receiver Selectivity Performance, Stable Modulation Index	N/A	-	-
TP/RVC-LE/CA/BV-16-C	Blocking Performance, Stable Modulation Index	N/A	-	-
TP/RVC-LE/CA/BV-17-C	Intermodulation Performance, Stable Modulation Index	N/A	-	-
TP/RVC-LE/CA/BV-18-C	Maximum input signal level, Stable Modulation Index	N/A	-	-
TP/RVC-LE/CA/BV-19-C	PER Report Integrity, Stable Modulation Index	N/A	-	-
TP/RVC-LE/CA/BV-20-C	Receiver sensitivity at 2 Ms/s, Stable Modulation Index	N/A	-	-
TP/RVC-LE/CA/BV-21-C	C/I and Receiver Selectivity Performance at 2 Ms/s, Stable Modulation Index	N/A	-	-
TP/RVC-LE/CA/BV-22-C	Blocking performance at 2 Ms/s, Stable Modulation Index	N/A	-	-
TP/RVC-LE/CA/BV-23-C	Intermodulation performance at 2 Ms/s, Stable Modulation Index	N/A	-	-
TP/RVC-LE/CA/BV-24-C	Maximum input signal level at 2 Ms/s, Stable Modulation Index	N/A	-	-
TP/RVC-LE/CA/BV-25-C	PER Report Integrity at 2 Ms/s, Stable Modulation Index	N/A	-	-
TP/RVC-LE/CA/BV-26-C	Receiver sensitivity, LE Coded (S=2)	N/A	-	-
TP/RVC-LE/CA/BV-27-C	Receiver sensitivity, LE Coded (S=8)	N/A	-	-
TP/RVC-LE/CA/BV-28-C	C/I and Receiver Selectivity Performance, LE Coded (S=2)	N/A	-	-
TP/RVC-LE/CA/BV-29-C	C/I and Receiver Selectivity Performance, LE Coded (S=8)	N/A	-	-
TP/RVC-LE/CA/BV-30-C	PER Report Integrity, LE Coded (S=2)	N/A	-	-
TP/RVC-LE/CA/BV-31-C	PER Report Integrity, LE Coded (S=8)	N/A	-	-
TP/RVC-LE/CA/BV-32-C	Receiver sensitivity, LE Coded (S=2), Stable Modulation Index	N/A	-	-
TP/RVC-LE/CA/BV-33-C	Receiver sensitivity, LE Coded (S=8), Stable Modulation Index	N/A	-	-
TP/RVC-LE/CA/BV-34-C	C/I and Receiver Selectivity Performance, LE Coded (S=2), Stable Modulation Index	N/A	-	-
TP/RVC-LE/CA/BV-35-C	C/I and Receiver Selectivity Performance, LE Coded (S=8), Stable Modulation Index	N/A	-	-
TP/RVC-LE/CA/BV-36-C	PER Report Integrity, LE Coded (S=2), Stable Modulation Index	N/A	-	-
TP/RVC-LE/CA/BV-37-C	PER Report Integrity, LE Coded (S=8), Stable Modulation Index	N/A	-	-

Test Case ID	Parameter	Value
TP/TRM-LE/CA/BV-01-C Output power measurements for each frequency.	Peak Power; f=2402	4.21 dBm
	Peak Power; f=2440	4.22 dBm
	Peak Power; f=2480	4.23 dBm
	Average Power; f=2402	4.18 dBm
	Average Power; f=2440	4.19 dBm
	Average Power; f=2480	4.2 dBm

Appendix B - ICS

Static Conformance Summary

Item	Capability	Reference	Status	Support: Yes or No
1	LE Transmitter (Non-connectable, Broadcaster)	[2], [3]	C.1	No
2	LE Receiver (Non-connectable, Observer)	[2], [4]	C.1	No
3	LE Transceiver (Connectable, Peripheral/Central)	[2], [3] & [4]	C.1	Yes
4	LE 2M PHY	[6] 3, 4	C.2	Yes
5	Stable Modulation Index - Transmitter	[6] 3.1.1	C.3	No
6	Stable Modulation Index - Receiver	[6] 3.1.1	C.4	No
7	LE Coded PHY	[6] 3, 4	C.2	No

C.1: Mandatory to support at least one of these capabilities.

C.2: Optional IF SUM ICS 21/16 “Core 5.0” AND RF PHY 1/3 “LE Transceiver” are supported, otherwise Excluded.

C.3: Optional IF SUM ICS 21/16 “Core 5.0” AND (RF PHY 1/1 “LE Transmitter” OR RF PHY 1/3 “LE Transceiver”) are supported, otherwise Excluded.

C.4: Optional IF SUM ICS 21/16 “Core 5.0” AND (RF PHY 1/2 “LE Receiver” OR RF PHY 1/3 “LE Transceiver”) are supported, otherwise Excluded.

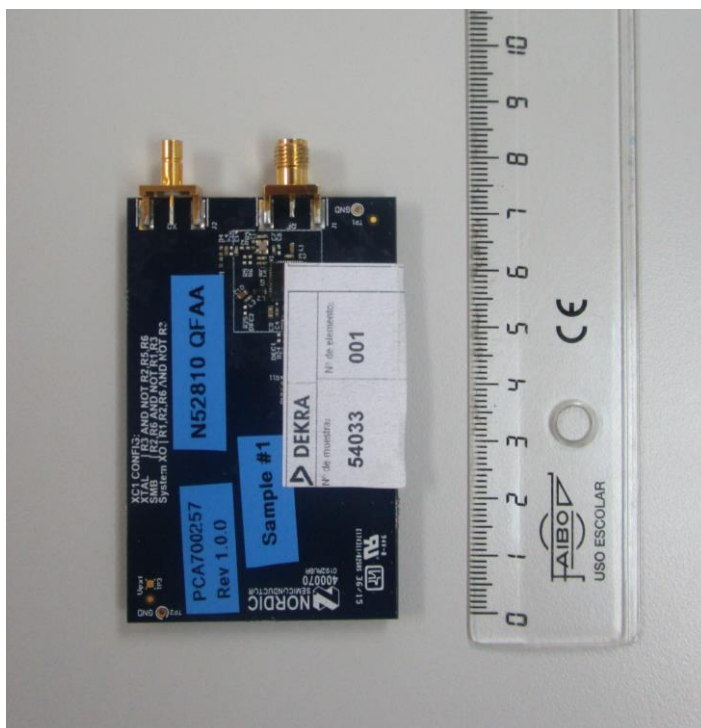
Appendix C - IXIT

IXIT Proforma

PIXIT Reference	Identifier	Sub-Identifier (Optional)	Value	Units
RF-PHY:P1:1	Inband Image frequency	Low frequency	2404	MHz
RF-PHY:P1:2		Middle frequency	2438	MHz
RF-PHY:P1:3		High frequency	2474	MHz
RF-PHY:P2:1	Value n for Intermodulation test	Low frequency	5	Integer
RF-PHY:P2:2		Middle frequency	5	Integer
RF-PHY:P2:3		High frequency	5	Integer
RF-PHY:P4	Power source voltage Nominal (NOC)		3	V
RF-PHY:P5	Normal operating temperature Nominal (NOC)		25	°C
RF-PHY:P6:1	Air humidity range (relative)	Maximum (EOC)	N/A	%
RF-PHY:P6:2		Minimum (EOC)	N/A	%
RF-PHY:P6:3		Air humidity level for NOC/EOC tests	N/A	%
RF-PHY:P7:1	Test interface implementation	HCI or 2-wire UART	2-wire	
RF-PHY:P7:2		Datarate	19200	bps
RF-PHY:P9:1	Maximum TX packet length (MAX_TX_LENGTH)	37 to 255	255	Bytes
RF-PHY:P9:2	Maximum RX packet length (MAX_RX_LENGTH)	37 to 255	255	Bytes
RF-PHY:P9:3	Maximum TX packet length (MAX_TX_LENGTH) 2M	37 to 255	255	Bytes
RF-PHY:P9:4	Maximum TX packet length (MAX_TX_LENGTH) S=2	37 to 255	-	Bytes
RF-PHY:P9:5	Maximum TX packet length (MAX_TX_LENGTH) S=8	37 to 255	-	Bytes
RF-PHY:P9:6	Maximum RX packet length (MAX_RX_LENGTH) 2M	37 to 255	255	Bytes
RF-PHY:P9:7	Maximum RX packet length (MAX_RX_LENGTH) S=2	37 to 255	-	Bytes
RF-PHY:P9:8	Maximum RX packet length (MAX_RX_LENGTH) S=8	37 to 255	-	Bytes
RF-PHY:P10:1	Maximum TX mode output power		4.23	dBm
RF-PHY:P11:1	Inband Image Frequency (2Ms/s)	Low frequency	2402	MHz
RF-PHY:P11:2		Middle frequency	2436	MHz
RF-PHY:P11:3		High frequency	2472	MHz
RF-PHY:P12:1	Value n for Intermodulation test (2Ms/s)	Low frequency	5	Integer
RF-PHY:P12:2		Middle frequency	5	Integer
RF-PHY:P12:3		High frequency	5	Integer
RF-PHY:P13:1	Inband Image Frequency (Stable Modulation Receiver)	Low frequency	Not Suported	MHz
RF-PHY:P13:2		Middle frequency	Not Suported	MHz
RF-PHY:P13:3		High frequency	Not Suported	MHz
RF-PHY:P14:1	Value n for Intermodulation test (Stable Modulation Receiver)	Low frequency	Not Suported	Integer
RF-PHY:P14:2		Middle frequency	Not Suported	Integer
RF-PHY:P14:3		High frequency	Not Suported	Integer
RF-PHY:P15:1	Inband Image Frequency (Stable Modulation Receiver, 2Ms/s)	Low frequency	Not Suported	MHz
RF-PHY:P15:2		Middle frequency	Not Suported	MHz
RF-PHY:P15:3		High frequency	Not Suported	MHz
RF-PHY:P16:1	Value n for Intermodulation test (Stable Modulation Receiver, 2Ms/s)	Low frequency	Not Suported	Integer
RF-PHY:P16:2		Middle frequency	Not Suported	Integer
RF-PHY:P16:3		High frequency	Not Suported	Integer

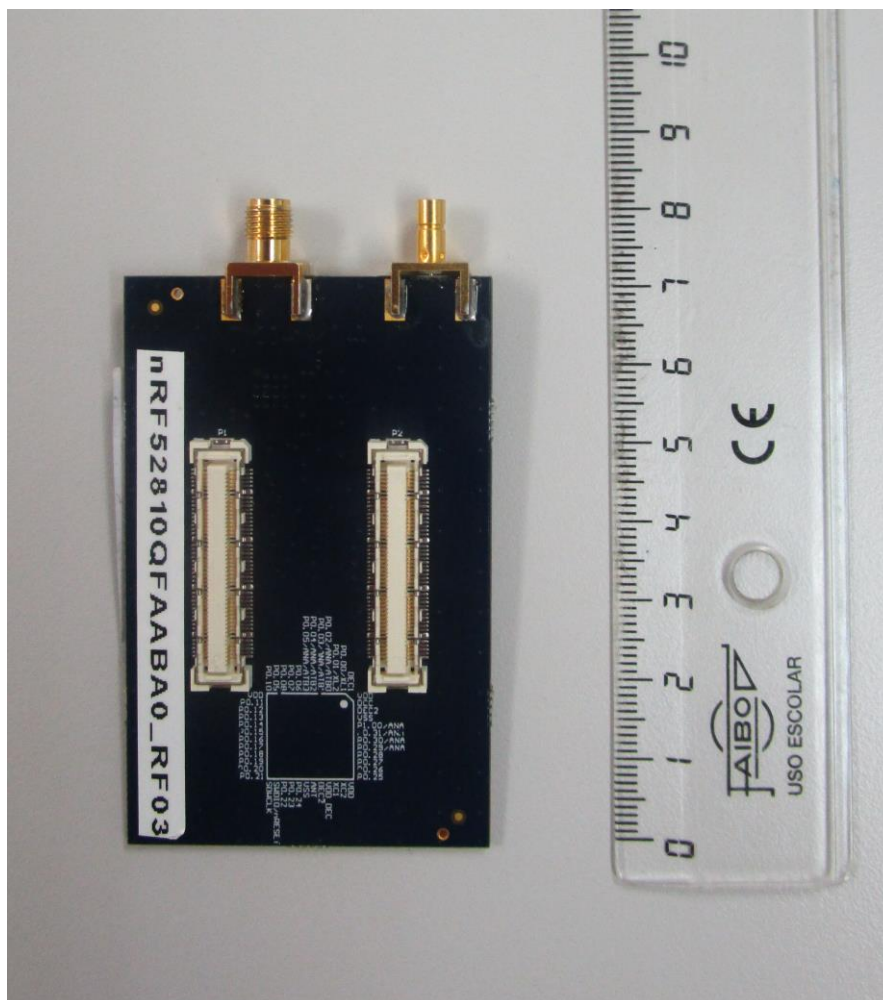
Appendix D - Photographs

FRONT VIEW



Sample M/01

REAR VIEW



Sample M/01