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

ACCREDITED
Test Lab
Cert 3350.01

Test report No:
NIE:72263RBT.001

Test report
Bluetooth Low Energy RF-PHY Test Specification

(*) Identification of item tested	Multiprotocol wireless 32-bit MCU
(*) Trademark	STM32WB
(*) Model and /or type reference tested	STM32WB5Mxx
Other identification of the product	Not provided
(*) Features	BLE RF-PHY 5.3 SW version: V1.14.0.1 HW version: 2.2
(*) Manufacturer	ST MICROLECTRONICS Sky Sophia - Bâtiment B 776 rue Albert Caquot Sophia Antipolis 06410 BIOT France
Test method requested, standard	Full RF-PHY testing according to Bluetooth RF-PHY Test Specification, Document Number RF-PHY.TS.p17
Standard .....:	RF-PHY.TS.p17
Test Spec Errata(s) .....:	N/A
(*)ICS .....:	RF-PHY.ICS.p7
TCRL version .....:	TCRL.2021-2
Test procedure(s).....:	PEBT006_08 BluetoothRFConductedTesting
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Juan Manuel Gómez BQTF Technical Responsible 78963762R JUAN MANUEL GOMEZ (C:A29507456) Firmado digitalmente por 78963762R JUAN MANUEL GOMEZ (C:A29507456) Fecha: 2022.05.18 15:48:59 +02'00'
Date of issue	2022-05-18
Report template No	FBT039_15 (*) "Data provided by the client"

Index

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 testing laboratory 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 Testing and Certification, S.A.U has a calibration and maintenance program for its measurement equipment.

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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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Uncertainty

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

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", “Features”, “Manufacturer”)
2. The ICS and IXIT provided by the customer and used for testing are indicated in Annex B and C

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: ST MICROLECTRONICS

Id	Control Number	Description	Model	HW Version	SW Version	Serial Nº	Date of reception
S/01	72263_1.1	STM32-WB55 module	- STM32WB 5Mxx	2.2	V1.14.0.1	000003/1826	2022-05-16
S/01	72263_2.1	USB cable	-	-	-	-	2022-05-16
S/01	72263_3.1	USB to TTL cable	-	-	-	-	2022-05-16

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

Test sample description

The STM32WB5Mxx is an ultra-low-power and small form factor module which addresses 2.4 GHz solutions with Bluetooth® LE, and 802.15.4 protocols, including Zigbee, Thread, as well as proprietary protocols. Based on the STM32WB55 MCU which offers 1 Mbyte of Flash and is packaged in WLCSP100, this module is ready-to-use and embeds the full reference design up to the antenna for faster market introduction. It offers performance, multi-protocol flexibility, security features, the same ultra-low power features as STM32WB wireless MCUs, and its certifications ensure wide geographical coverage. Fully part of the STM32WB portfolio, the STM32WB5MMG is included in ST's longevity program, ensuring continuous supply for 10 years.

Identification of the client

ST MICROLECTRONICS

Sky Sophia - Bâtiment B 776 rue Albert Caquot Sophia Antipolis 06410 BIOT France

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2022-05-16
Date (finish)	2022-05-16

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Document history

Report number	Date	Description
72263RBT.001	2022-05-18	First release

Environmental conditions

The following limits were not exceeded during the test:

Temperature	Min= 18 ºC Max= 28 ºC
Relative humidity	Min= 20 % Max= 75 %

Remarks and comments

The tests have been realized by the technical personnel: Oscar San José Calvo

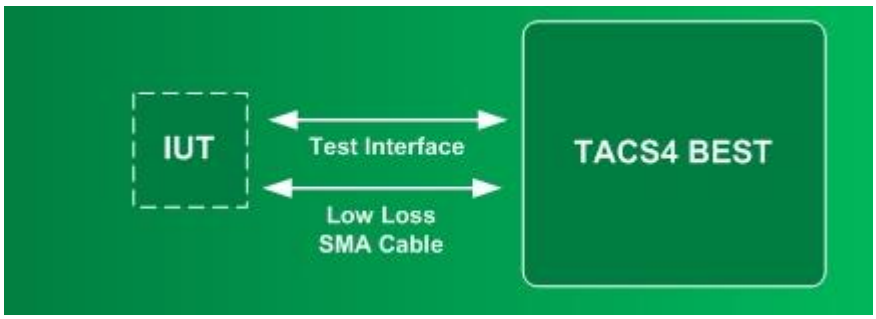
Means of testing identification

Control No.	Name	Technology Package	User Interface
5852	TACS4 BEST Bluetooth RF Test System	v4.11.0_R1	1.0 [Interface v1.20]

Control No.	Equipment	Serial No	Latest Calibration	Next Calibration
8426	CMW270 WIRELESS CONN. TESTER	102175	2021-06-28	2022-06-28
5767	LAN/GPIB/USB E5810B	MY56030024	--	--
2624	PICO TECHNOLOGY	IFY97/067	2022-04-06	2023-04-06
4733	PSG Signal Generators, 250KHZ-20GHZ	MY51501354	2021-12-03	2022-12-03
5398	Power Supply Agilent 66311B	MY52002833	2021-11-08	2022-11-08
3379	SIEPEL SHIELDED CHAMBER	06 825	--	--
5853	T4BCU100A	000001	--	--
4762	TEMPERATURE AND RELATIVE HUMIDITY MONITORING SOFTWARE	-	--	--
9042	ZTRC-8SPDT-A18 SWITCHING RF 8-PORT. RACK MOUNTED TEST EQUIPMENT	02106300143	--	--

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 values1, 2 and the corresponding limits, according to the RF-PHY Bluetooth Test Specification, can be found below:

Test Cases	Measurement uncertainty	Test System uncertainty	Test Specifications Limit
RFPHY/TRM/BV-01-C RFPHY/TRM/BV-18-C	Absolute RF power (wanted channel)	±0.98 dB	±1.2 dB
RFPHY/TRM/BV-03-C	Absolute RF power (unwanted emissions in the BT band)	±2.46 dB	±3 dB
RFPHY/TRM/BV-05-C	Absolute radio frequency	±4.70 kHz	±5 kHz
	Frequency deviation	±3.96 kHz	±4 kHz
RFPHY/TRM/BV-06-C	Absolute radio frequency	±4.70 kHz	±5 kHz
	Relative drift radio frequency	±1.00 kHz	±1 kHz
RFPHY/TRM/BV-08-C	Absolute RF power (unwanted emissions in the BT band)	±2.46 dB	±3 dB
RFPHY/TRM/BV-09-C	Absolute radio frequency	±4.70 kHz	±5 kHz
	Frequency deviation	±3.96 kHz	±4 kHz
RFPHY/TRM/BV-10-C	Absolute radio frequency	±4.70 kHz	±5 kHz
	Frequency deviation	±3.90 kHz	±4 kHz
RFPHY/TRM/BV-11-C	Absolute radio frequency	±4.70 kHz	±5 kHz
	Frequency deviation	±3.90 kHz	±4 kHz
RFPHY/TRM/BV-12-C	Absolute radio frequency	±4.70 kHz	±5 kHz
	Relative drift radio frequency	±1.00 kHz	±1 kHz
RFPHY/TRM/BV-13-C	Absolute radio frequency	±4.70 kHz	±5 kHz
	Frequency deviation	±3.96 kHz	±4 kHz
RFPHY/TRM/BV-14-C	Absolute radio frequency	±4.70 kHz	±5 kHz
	Relative drift radio frequency	±1.00 kHz	±1 kHz
RFPHY/TRM/BV-15-C	Absolute RF power (wanted channel)	±0.98 dB	±1.2 dB
RFPHY/TRM/BV-16-C	Absolute radio frequency	±4.70 kHz	±5 kHz
	Relative drift radio frequency	±1.00 kHz	±1 kHz
RFPHY/TRM/BV-17-C	Absolute radio frequency	±4.70 kHz	±5 kHz
	Relative drift radio frequency	±1.00 kHz	±1 kHz
RFPHY/TRM/PS/BV-xx-C	Absolute RF power (wanted channel)	±0.98 dB	±1.2 dB
RFPHY/TRM/ASI/BV-xx-C	Absolute RF power (wanted channel)	±0.98 dB	±1.2 dB

Note 1: All values reflect a 95% confidence level.
Note 2: All values are valid for a temperature range of 23±5ºC

Testing verdicts

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

Appendix A: Test results

Test campaign report

TC Code	Description	Date	Test Sample	Result
RFPHY/RCV/BV-01-C	Receiver sensitivity	2022-05-16	S/01	P
RFPHY/RCV/BV-03-C	C/I and receiver selectivity performance	2022-05-16	S/01	P
RFPHY/RCV/BV-04-C	Blocking performance	2022-05-16	S/01	P
RFPHY/RCV/BV-05-C	Intermodulation performance	2022-05-16	S/01	P
RFPHY/RCV/BV-06-C	Maximum input signal level	2022-05-16	S/01	P
RFPHY/RCV/BV-07-C	PER Report Integrity	2022-05-16	S/01	P
RFPHY/RCV/BV-08-C	Receiver sensitivity at 2 Ms/s	2022-05-16	S/01	P
RFPHY/RCV/BV-09-C	C/I and Receiver Selectivity Performance at 2 Ms/s	2022-05-16	S/01	P
RFPHY/RCV/BV-10-C	Blocking performance at 2 Ms/s	2022-05-16	S/01	P
RFPHY/RCV/BV-11-C	Intermodulation performance at 2 Ms/s	2022-05-16	S/01	P
RFPHY/RCV/BV-12-C	Maximum input signal level at 2 Ms/s	2022-05-16	S/01	P
RFPHY/RCV/BV-13-C	PER Report Integrity at 2 Ms/s	2022-05-16	S/01	P
RFPHY/TRM/BV-01-C	Output power	2022-05-16	S/01	P
RFPHY/TRM/BV-03-C	In-band emissions	2022-05-16	S/01	P
RFPHY/TRM/BV-05-C	Modulation characteristics	2022-05-16	S/01	P
RFPHY/TRM/BV-06-C	Carrier frequency offset and drift	2022-05-16	S/01	P
RFPHY/TRM/BV-08-C	In-band emissions at 2 Ms/s	2022-05-16	S/01	P
RFPHY/TRM/BV-10-C	Modulation Characteristics at 2 Ms/s	2022-05-16	S/01	P
RFPHY/TRM/BV-12-C	Carrier frequency offset and drift at 2 Ms/s	2022-05-16	S/01	P

Relevant numerical results

Bluetooth® RF-PHY TS

RFPHY/TRM/BV-01-C Output power

Results

Measurements											
Max Output Power [f=2402] (dBm)	**Max Output Power [f=2440] (dBm)**	**Max Output Power [f=2480] (dBm)**	**Average Output Power [f=2402] (dBm)**	**Average Output Power [f=2440] (dBm)**	**Average Output Power [f=2480] (dBm)**	**Max Output Power [f=2426] (dBm)**	**Average Output Power [f=2426] (dBm)**	**Average Output Power [EIRP] [f=2402] (dBm)**	**Average Output Power [EIRP] [f=2440] (dBm)**	**Average Output Power [EIRP] [f=2480] (dBm)**	**Average Output Power [EIRP] [f=2426] (dBm)**
6.31	6.22	6.10	6.24	6.16	6.04	N/A	N/A	6.240	6.160	6.040	N/A

Appendix B: ICS

Implementation Conformance Statement (ICS)

The ICS set for this IUT is consistent with the static conformance requirements in the referenced base specification.
The qualified ICS and IXIT menus of the test system were defined in accordance with the client.

Bluetooth LE RF Capabilities[a

Item	Capability	Reference	Status	Support: Yes or No
1	LE Transmitter (Non-connectable, Broadcaster)	[1] 3	C.1	Yes
2	LE Receiver (Non-connectable, Observer)	[1] 4	C.1	Yes
3	LE Transceiver (Connectable, Peripheral/Central)	[1] 3, 4	C.1	Yes
4	LE 2M PHY	[3] 3, 4	C.2	Yes
5	Stable Modulation Index - Transmitter	[3] 3.1.1	C.3	No
6	Stable Modulation Index - Receiver	[3] 3.1.1	C.4	No
7	LE Coded PHY	[3] 3, 4	C.2	No
8	Transmitting Constant Tone Extensions	[4] 5	C.3	No
9	2 µs Antenna Switching During Constant Tone Extension Transmission (AoD)	[4] 5	C.5	No
10	1 µs Antenna Switching During Constant Tone Extension Transmission (AoD)	[4] 5	C.6	No
11	2 µs Antenna Sampling During Constant Tone Extension Reception (AoD)	[4] 5	C.4	No
12	2 µs Antenna Switching and Sampling During Constant Tone Extension Reception (AoA)	[4] 5	C.7	No
13	1 µs Antenna Sampling During Constant Tone Extension Reception (AoD)	[4] 5	C.7	No
14	1µs Antenna Switching and Sampling During Constant Tone Extension Reception (AoA)	[4] 5	C.8	No
15	Power Class 1	[5] 4.6	C.9	No

C.1: Mandatory to support at least one of RFPHY 1/1 “LE Transmitter” OR RFPHY 1/2 “LE Receiver” OR RFPHY 1/3 “LE Transceiver”. Note: Selecting both RFPHY 1/1 “LE Transmitter” and RFPHY 1/2 “LE Receiver” is equivalent to selecting RFPHY 1/3 “LE Transceiver” and vice versa.
C.2: Excluded IF SUM ICS 21/14 “Core v4.2”, otherwise Optional.
C.3: Excluded IF SUM ICS 21/14 “Core v4.2”, otherwise Optional IF RFPHY 1/1 “LE Transmitter” OR RFPHY 1/3 “LE Transceiver”, otherwise Excluded.
C.4: Excluded IF SUM ICS 21/14 “Core v4.2”, otherwise Optional IF RFPHY 1/2 “LE Receiver” OR RFPHY 1/3 “LE Transceiver”, otherwise Excluded.
C.5: Optional IF RFPHY 1/8 “Transmitting Constant Tone Extensions”, otherwise Excluded.
C.6: Optional IF RFPHY 1/9 “2 µs Antenna Switching During Constant Tone Extension Transmission (AoD)”, otherwise Excluded.
C.7: Optional IF RFPHY 1/11 “2 µs Antenna Sampling During Constant Tone Extension Reception (AoD)”, otherwise Excluded.
C.8: Mandatory IF RFPHY 1/12 “2 µs Antenna Switching and Sampling During Constant Tone Extension Reception (AoA)” AND RFPHY 1/13 “1 µs Antenna Sampling During Constant Tone Extension Reception (AoD)”, otherwise Excluded.
C.9: Excluded IF SUM ICS 21/14 “Core v4.2” AND NOT SUM ICS 21/15 “CSA 5”, otherwise Optional.

Bluetooth LE Test Interfaces Capabilities

Item	Capability	Reference	Status	Support: Yes or No
1	HCI Test Interface	[2] 2	C.1	Yes
2	UART Test Interface	[2] 3	C.1	No

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

References:

[1] Specification of the Bluetooth System, Physical Layer Specification (PHY) Volume 6, Part A, Version 4.0 or later
[2] Specification of the Bluetooth System, Direct Test Mode, Volume 6, Part F, Version 4.0 or later
[3] Specification of the Bluetooth System, Physical Layer Specification (PHY) Volume 6, Part A, Version 5.0 or later
[4] Specification of the Bluetooth System, Physical Layer Specification (PHY) Volume 6, Part A, Version 5.1 or later
[5] Specification of the Bluetooth System, Link Layer Specification (PHY) Volume 6, Part B, Version 4.2 or later

Appendix C: IXIT

Implementation eXtra Information for Test, IXIT

The IXIT set for this IUT is consistent with the static conformance requirements in the referenced base specification. The qualified ICS and IXIT menus of the test system were defined in accordance with the client

Description	Value	Units
Test frequency for Inband Image test, Low	-3	MHz
Test frequency for Inband Image test, Middle	-3	MHz
Test frequency for Inband Image test, High	-3	MHz
Test frequency for Intermodulation test, Low	3	N/A
Test frequency for Intermodulation test, Middle	3	N/A
Test frequency for Intermodulation test, High	3	N/A
Power source voltage	3,3	V
Normal operating temperature	25	°C
Air humidity level for NOC tests	-	%
Test interface implementation	HCI	N/A
Maximum TX packet length (MAX_TX_LENGTH)	255	Bytes
Maximum RX packet length (MAX_RX_LENGTH)	255	Bytes
Maximum TX packet length (MAX_TX_LENGTH_2M)	255	Bytes
Maximum TX packet length (MAX_TX_LENGTH_CODED_S2)	NA	Bytes
Maximum TX packet length (MAX_TX_LENGTH_CODED_S8)	NA	Bytes
Maximum RX packet length (MAX_RX_LENGTH_2M)	255	Bytes
Maximum RX packet length (MAX_RX_LENGTH_CODED_S2)	NA	Bytes
Maximum RX packet length (MAX_RX_LENGTH_CODED_S8)	NA	Bytes
Maximum TX mode output power	6	dBm
Inband Image Frequency (2Ms/s), Low	-4	MHz
Inband Image Frequency (2Ms/s), Middle	-4	MHz
Inband Image Frequency (2Ms/s), High	-4	MHz
Value n for Intermodulation test (2Ms/s), Low	3	N/A
Value n for Intermodulation test (2Ms/s), Middle	3	N/A
Value n for Intermodulation test (2Ms/s), high	3	N/A
Inband Image Frequency (Stable Modulation Receiver), Low	-4	MHz
Inband Image Frequency (Stable Modulation Receiver), Middle	-4	MHz
Inband Image Frequency (Stable Modulation Receiver), High	-4	MHz

Value n for Intermodulation test (Stable Modulation Receiver), Low	N/A	N/A
Value n for Intermodulation test (Stable Modulation Receiver), Middle	N/A	N/A
Value n for Intermodulation test (Stable Modulation Receiver), Hgh	N/A	N/A
Inband Image Frequency (Stable Modulation Receiver, 2Ms/s), Low	N/A	MHz
Inband Image Frequency (Stable Modulation Receiver, 2Ms/s), Middle	N/A	MHz
Inband Image Frequency (Stable Modulation Receiver, 2Ms/s), High	N/A	MHz
Value n for Intermodulation test (Stable Modulation Receiver, 2Ms/s), Low	N/A	N/A
Value n for Intermodulation test (Stable Modulation Receiver, 2Ms/s), Middle	N/A	N/A
Value n for Intermodulation test (Stable Modulation Receiver, 2Ms/s), High	N/A	N/A
IQ Report Rate	N/A	N/A
The length of the Constant Tone Extension(1Ms/s)	N/A	bits
The length of the Constant Tone Extension(2Ms/s)	N/A	bits
The number of antennae	1	N/A
Antenna gain	0	dBi

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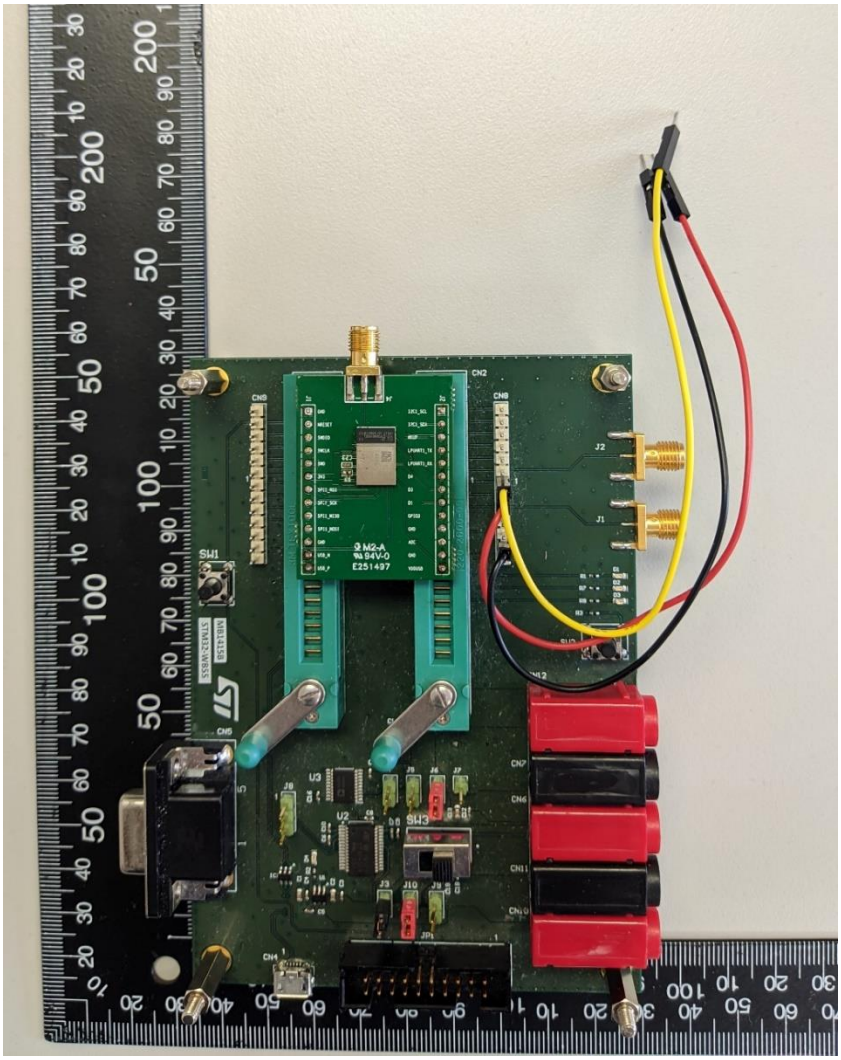
Appendix D: Photographs

Front view – Sample S/01



Rear view – Sample S/01