

Test Report

Report Number:

F241686E1

Equipment under Test (EUT):

AIS Class B CS Transponder with Antenna Splitter and Wi-Fi

B620WS

Applicant:

Alltek Marine Electronics Corporation

Manufacturer:

Alltek Marine Electronics Corporation



Deutsche
Akkreditierungsstelle
D-PL-17186-01-00

References

- [1] **ANSI C63.10: 2020** American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
- [2] **FCC CFR 47 Part 15** Radio Frequency Devices
- [3] **RSS-247 Issue 3 (August 2023)**
Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
- [4] **RSS-Gen, Issue 5 Amendment 2 (February 2021)**
General Requirements for Compliance of Radio Apparatus

Test Result

The requirements of the tests performed as shown in the overview (clause 4) were fulfilled by the equipment under test. The complete test results are presented in the following.

“Passed” indicates that the equipment under test conforms with the relevant limits of the testing standard without taking any measurement uncertainty into account as stated in clause 1.4 of ANSI C63.10 (2020). However, the measurement uncertainty is calculated and shown in this test report.

Tested and written
by:

o.b.o.

Signature

Reviewed and
approved by:

Signature

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The test results herein refer only to the tested sample. PHOENIX TESTLAB GmbH is not responsible for any generalisations or conclusions drawn from these test results concerning further samples. Any modification of the tested samples is prohibited and leads to the invalidity of this test report. Each page necessarily contains the PHOENIX TESTLAB Logo and the TEST REPORT NUMBER.

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1 Identification

1.1 Applicant

Name:	Alltek Marine Electronics Corporation
Address:	14F-2, No. 237, Sec. 1, Datong Rd., Xizhi Dist., New Taipei City, 22161
Country:	Taiwan
Name for contact purposes:	Mr. H.A. CHEN
Phone:	+886-2-8691-8568
eMail address:	ch@alltekmarine.com
Applicant represented during the test by the following person:	-

1.2 Manufacturer

Name:	Alltek Marine Electronics Corporation
Address:	14F-2, No. 237, Sec. 1, Datong Rd., Xizhi Dist., New Taipei City, 22161
Country:	Taiwan
Name for contact purposes:	Mr. H.A. CHEN
Phone:	+886-2-8691-8568
eMail address:	ch@alltekmarine.com
Manufacturer represented during the test by the following person:	-

1.3 Test Laboratory

The tests were carried out by: **PHOENIX TESTLAB GmbH**
Königswinkel 10
32825 Blomberg
Germany

accredited by Deutsche *Akkreditierungsstelle GmbH (DAkkS)* according to DIN EN ISO/IEC 17025:2018. The accreditation is only valid for the scope of accreditation listed in the annex of the certificate D-PL-17186-01-00. FCC Test Firm Designation Number DE0004, FCC Test Firm Registration Number 469623, CAB Identifier DE0003 and ISED# 3469A.

1.4 Host

Test object: *	AIS Class B CS Transponder with Antenna Splitter and Wi-Fi
PMN: *	B620WS
HVIN: *	B620S
FVIN: *	V2
FCC ID: *	WZ7AIS-B620S
IC: *	9547A-AISB620S
Model number: *	-
Order number: *	-

	EUT number		
	1	2	3
Serial number: *	00002	-	-
PCB identifier: *	M-PCB-B650MBV2, M-PCB-B650IOBV2, M-PCB-B650USBV2, M-PCB-WFB002V2	-	-
Hardware version: *	B620WS	-	-
Software version: *	V2	-	-

* Declared by the applicant

One EUT was used for all tests.

Note: PHOENIX TESTLAB GmbH does not take samples. The samples used for tests are provided exclusively by the applicant.

1.5 EUT (in Host)

Test object: *	WLAN / Bluetooth Module on Radio PCB
Model name: *	Radio PCB M-PCB-WFB002V2
Model number: *	-
Order number: *	-
FCC ID: *	WZ7-W151
IC certification number: *	9547A-W151
HMN: *	-
PMN: *	W151
HVIN: *	W151
FVIN: *	NA

1.6 Technical Data of Equipment

General			
Power supply EUT: *	DC		
Supply voltage EUT: *	$U_{nom} = 12.0 \text{ V}_{DC}$	$U_{min} = 9.6 \text{ V}_{DC}$	$U_{max} = 31.2 \text{ V}_{DC}$
Temperature range: *	-25 °C to +55 °C		
Lowest / highest internal frequency: *	0.032768 MHz / 2472 MHz		

* Declared by the applicant

WLAN part			
Fulfil WLAN specification: *	IEEE 802.11™ (b/g/n)		
Operating frequency range: *	2412 to 2462 MHz		
Number of channels: *	11		
Type of modulation: *	IEEE 802.11 b: DSSS (1Mbps DBPSK, 2Mbps DQPSK, 5.5/11Mbps CCK) IEEE 802.11 g: OFDM (6/9Mbps BPSK, 12/18Mbps QPSK, 24/36Mbps 16-QAM, 48/54Mbps 64-QAM) IEEE 802.11n (HT20): OFDM (BPSK, QPSK, 16-QAM, 64-QAM)		
Supply voltage WLAN module: *	$U_{nom} = 3.3 \text{ V}_{DC}$	$U_{min} = 3.0 \text{ V}_{DC}$	$U_{max} = 3.6 \text{ V}_{DC}$
Antenna type: *	Dipole		
Antenna name: *	GY196HT695-001 by WIESON TECHNOLOGIES CO., LTD.		
Antenna gain: *	2.94 dBi		
Antenna connector: *	U.FL on carrier PCB (Wi-Fi board)		

* Declared by the applicant

Identification	Connector		Length (during test)
	EUT	Ancillary	
PWR/DATA	12-pin connector	None	2.0 m
GNSS	TNC	-	Not used
Antenna	SO-239	N-Connector	None (terminated directly)
NMEA 2000	5-pin connector	-	Not used
USB	USB-C	USB-C	Not used
VHF Radio	SO-239	N-Connector	None (terminated directly)

Equipment used for testing	
Laptop computer*2	Lifebook U748 by Fujitsu Limited
Converter board*1	RS232-RS422-USB Adapter (Hardware: M-PCB-NU81MBV1)
-	-

*1 Provided by the applicant

*2 Provided by the laboratory

1.7 Dates

Date of receipt of test sample:	11.11.2024
Start of test:	02.12.2024
End of test:	23.01.2025

2 Operational States

Description of function of the EUT:

The EUT is an AIS class B CS transceiver. It contains two AIS receivers, which are continuously receiving on a certain frequency and an AIS transmitter, which operates on one channel and a Wi-Fi board. Both receivers are able to receive DSC data packets.

The following states were defined as the operating conditions:

The EUT was supplied by 12 V DC during all tests.

During all tests, software named S-center 7.0.1 (delivered by the applicant) was used to activate the test-mode of the EUT. The laptop computer with the test software was connected to the EUT via an USB cable and a converter board, which were also provided by the applicant.

The Bluetooth functionality of Wi-Fi Board was deactivated by the applicant and therefore is not tested.

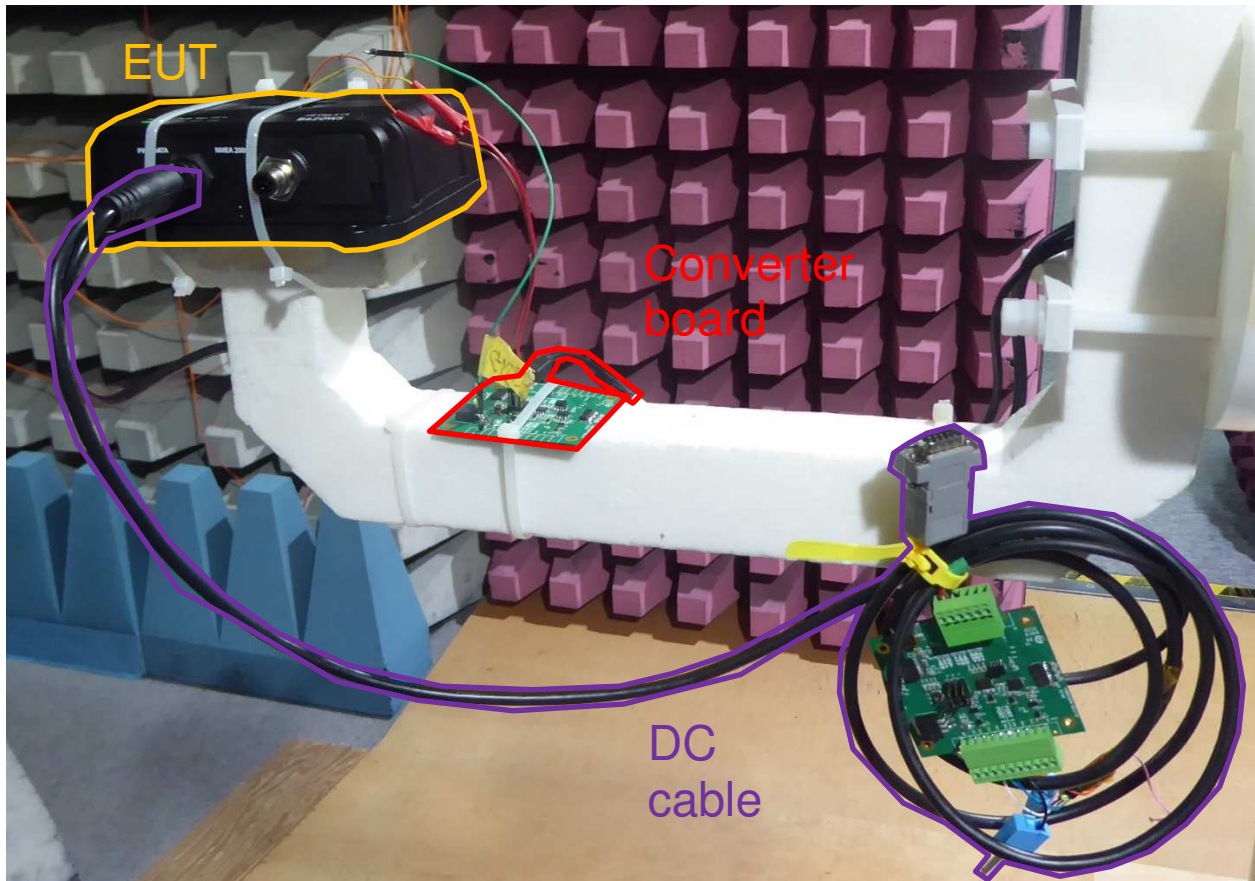
The worst-case modes and power settings from the original FCC report of the NINA-W151 were used (F170297E6 by PHOENIX TESTLAB GmbH).

2.1.1 Operation modes*

Operation mode #	Radio technology	Frequency [MHz]	Channel / Band	Modulation / Mode	Data rate	Power setting
1	IEEE 802.11, n20-mode	2437	6	ODFM	MCS7	0
2	IEEE 802.11, n40-mode	2422	3	ODFM	MCS5	20
3	IEEE 802.11, b-mode	2437	6	OFDM	1 Mbit/s	24
4	IEEE 802.11, b-mode	2412	1	OFDM	1 Mbit/s	34
5	IEEE 802.11, g-mode	2412	6	OFDM	6 Mbit/s	22
6	IEEE 802.11, g-mode	2437	6	OFDM	6 Mbit/s	8
7	IEEE 802.11, g-mode	2462	6	OFDM	6 Mbit/s	24

* Only the worst-case spurious emissions from the original test report "F241683E1" by "PHOENIX TESTLAB GmbH".

The system was setup as follows:



3 Additional Information

All tests were performed using an unmodified EUT. The AIS transceivers were in standby during all test, the RF-ports were terminated, AIS tests are not part of this test report.

The host was configurable as B620WS and B650WS, it uses the same AIS hardware. AIS transmitter was not active during the integration tests.

4 Overview

Application	Frequency range [MHz]	FCC 47 CFR Part 15 section [2]	RSS-247 [4] RSS-Gen [5]	Tested EUT	Status
Maximum peak conducted output power	2400.0 - 2483.5	15.247 (b) (3), (4)	5.4 (d) [4]	_*2	-
Maximum conducted output power	2400.0 - 2483.5	15.247 (b) (3), (4)	5.4 (d) [4]	1	Passed*5
DTS Bandwidth / 99% Bandwidth	2400.0 - 2483.5	15.247 (a) (2)	5.2 (a) [4]	_*2	-
Peak Power Spectral Density	2400.0 - 2483.5	15.247 (e)	5.2 (b) [4]	_*2	-
Average Power Spectral Density	2400.0 - 2483.5	15.247 (e)	5.2 (b) [4]	_*2	-
Band edge compliance	2400.0 - 2483.5	15.247 (d) 15.205 (a) 15.209 (a)	5.5 [4]	_*2	-
Maximum unwanted emissions*4	0.009 – 26,500*1	15.247 (d) 15.205 (a) 15.209 (a)	8.9 [5]	1	Passed*4
Antenna Requirement	-	15.203 15.247 (b)	6.8 [5] 5.4 (f) (ii) [4]	1	Passed
Conducted emissions on supply line	0.15 – 30	15.207 (a)	8.8 [5]	_*2	-

- *1: As declared by the applicant the highest radio clock frequency is 2.462 GHz for WLAN in 2.4 GHz mode. Therefore, the radiated emission measurement must be carried out up to 10th of the highest radio clock frequency in this case 26.5 GHz.
- *2: Not tested, because not ordered by the applicant.
- *3: Power verification of the worst-case output power from the original radio report.
- *4: Retest of the worst-case emission of the original test report.
- *5: Power verification of the worst-case output power from the original radio report. The tests were performed using the stand-alone module as also documented in test report F241683E1 by PHOENIX TESTLAB GmbH.

5 Results

5.1 Test setups

5.1.1 Radiated: 30 MHz to 1 GHz

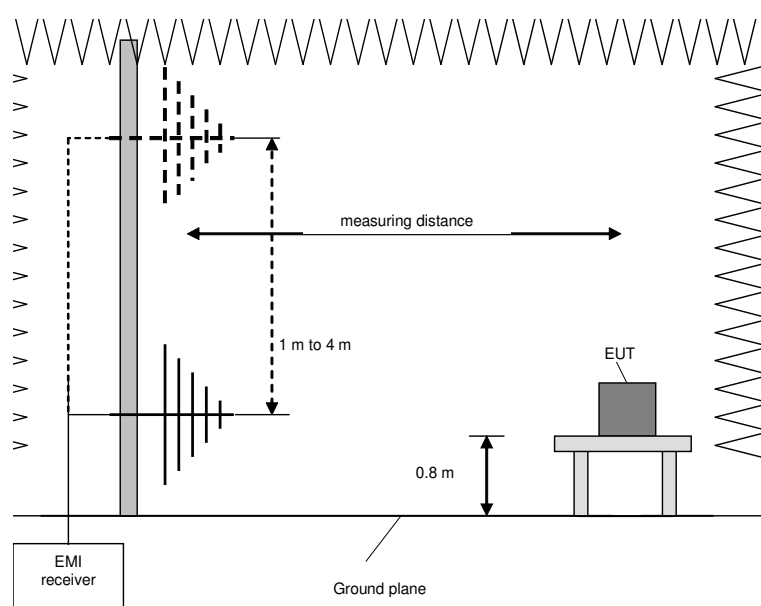
5.1.1.1 Preliminary and final measurement 30 MHz to 1 GHz

The preliminary and final measurements are performed in a semi-anechoic chamber with a metal ground plane at a measuring distance of 3 meters. Table-top devices are set up on a non-conducting support with a size of 1 m by 1.5 m and a height of 80 cm. Floor-standing devices are placed directly on the turntable / ground plane. The setup of the equipment under test is in accordance with [1].

During the tests the EUT is rotated in the range of 0 ° to 360 °, the measuring antenna is set to horizontal and vertical polarization and raised and lowered in the range from 1 m to 4 m to find the maximum level of emissions.

The resolution bandwidth of the EMI receiver is set to the following values:

Test	Frequency range	Step-size	Resolution bandwidth	Measuring time	Detector
Preliminary measurement	30 MHz to 1 GHz	30 kHz	120 kHz	-	Peak Average
Frequency peak search	± 120 kHz	10 kHz	120 kHz	1 s	Peak
Final measurement	30 MHz to 1 GHz	-	120 kHz	1 s	QuasiPeak



Procedure preliminary measurement:

The following procedure is used:

- 1) Set the measuring antenna to 1 m height.
- 2) Monitor the frequency range at horizontal polarization of the measuring antenna and an EUT / turntable azimuth of 0 °.

- 3) Rotate the EUT by 360° to maximize the detected signals.
- 4) Repeat steps 2 to 3 with the vertical polarization of the measuring antenna.
- 5) Increase the height of the measuring antenna for 0.5 m and repeat steps 2 to 4 until the final height of 4 m is reached.
- 6) The highest values for each frequency are saved by the software, including the measuring antenna height and polarization and the turntable azimuth for that value.

Procedure final measurement:

The following procedure is used:

- 1) Select the highest frequency peaks (lowest margin to the limit) for the final measurement.
- 2) The software determines the exact peak frequencies by doing a partial scan with reduced step size of the pre-scan of the selected peaks.
- 3) If the EUT is portable or ceiling mounted, find the worst-case EUT orientation (x,y,z) for the final test.
- 4) The worst-case measuring antenna height is found via varying the height by +/- 0.5 m from the value obtained in the preliminary measurement while monitoring the emission level.
- 5) The worst-case turntable position is found via varying the turntable azimuth by +/- 30° from the value obtained in the preliminary measurement while monitoring the emission level.
- 6) The final measurement is performed at the worst-case measuring antenna height and the worst-case turntable azimuth.
- 7) Steps 2 to 6 are repeated for each frequency peak selected in step 1.

5.1.2 Radiated: 1 GHz to 40 GHz

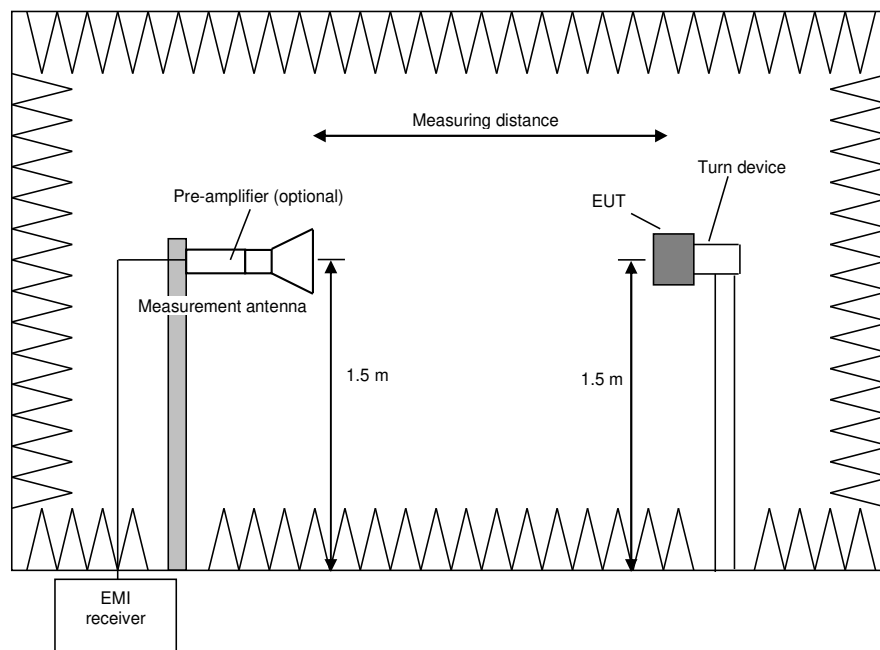
5.1.2.1 Preliminary and final measurement 1 GHz to 40 GHz

The preliminary and final measurements are performed in a fully anechoic chamber. All measurements were done at a measuring distance of 3 meters. Table-top devices are set up on a non-conducting turn device at the height of 1.5 m. The setup of the equipment under test is in accordance with [1].

During the tests the EUT is rotated in the range of 0 ° to 360 ° and the measuring antenna is set to horizontal and vertical polarization to find the maximum level of emissions. After these steps, the measurement is repeated after reorientating the EUT in 30 ° steps.

The resolution bandwidth of the EMI receiver is set to the following values:

Test	Frequency range	Step-size	Resolution bandwidth	Measuring time	Detector
Preliminary measurement	1 GHz - 40 GHz	250 kHz	1 MHz	-	Peak Average
Final measurement	1 GHz - 40 GHz	-	1 MHz	100 ms	Peak Average



Procedure preliminary measurement:

The following procedure is used:

- 1) Monitor the frequency range at horizontal polarisation of the measuring antenna and an EUT / turntable azimuth of 0 °.
- 2) Rotate the EUT by 360° to maximize the detected signals.
- 3) Repeat steps 1 to 2 with the vertical polarisation of the measuring antenna.
- 4) Repeat steps 1 to 3 with the EUT reorientated by an angle of 30° (60°, 90°, 120° and 150°), according to 6.6.5.4 in [1].
- 5) The highest values for each frequency are saved by the software, including the measuring antenna polarization, the turntable azimuth and the turn device elevation for that value.

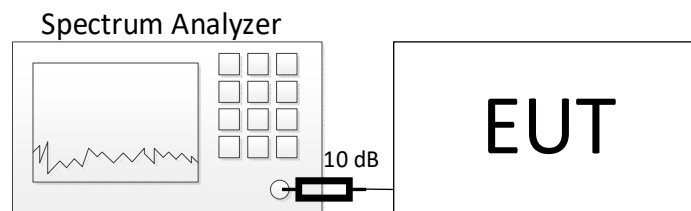
Procedure final measurement:

The following procedure is used:

- 1) Set the turntable and the turn device to the position which leads to the highest emission for the first frequency identified in the preliminary measurements.
- 2) Set the measurement antenna to the polarisation which leads to the highest emission for the first frequency identified in the preliminary measurements.
- 3) Set the spectrum analyser to EMI mode with Peak and Average detector activated.
- 4) The worst-case turntable position is found via varying the turntable azimuth by +/- 30° from the value obtained in the preliminary measurement while monitoring the emission level.
- 5) The final measurement is performed at the worst-case turntable azimuth.
- 6) Repeat steps 1 to 5 for each frequency detected during the preliminary measurements.

5.1.3 Conducted: Antenna port

Test setup (conducted)		
Used	Antenna connector	Comment
<input type="checkbox"/>	Temporary antenna connector	As provided by the applicant
<input checked="" type="checkbox"/>	Normal antenna connector	-



The 10 dB external attenuation are considered in all relevant plots

5.2 Results

5.2.1 Test setup (DTS fundamental emission output power)

Test setup (DTS fundamental emission output power)			
Used	Setup	See sub-clause	Comment
<input type="checkbox"/>	Radiated: 1 GHz to 40 GHz	5.1.2	-
<input checked="" type="checkbox"/>	Conducted: Antenna port	5.1.3	-

5.2.2 Test method (DTS fundamental emission output power)

Test method (Maximum peak conducted output power)				
Used	Sub-Clause [1]	Name of method	Applicability	Comment
<input type="checkbox"/>	11.9.1.1	RBW \geq DTS bandwidth	-	Zero span mode
<input type="checkbox"/>	11.9.1.2	PKPM1 Peak power meter method* ¹	-	-

*¹ VBW of the peak power meter has to be $>$ OBW of the fundamental.

Test method (Maximum conducted (average) output power)				
Used	Sub-Clause [1]	Name of method	Applicability	Comment
<input type="checkbox"/>	11.9.2.2.2	Method AVGSA-1	D \geq 98%	-
<input checked="" type="checkbox"/>	11.9.2.2.3	Method AVGSA-1A (alternative)	D \geq 98%	-
<input type="checkbox"/>	11.9.2.2.4	Method AVGSA-2	Constant D ($\pm 2\%$)	-
<input type="checkbox"/>	11.9.2.2.5	Method AVGSA-2A (alternative)	Constant D ($\pm 2\%$)	-
<input type="checkbox"/>	11.9.2.2.6	Method AVGSA-3A	-	-
<input type="checkbox"/>	11.9.2.2.7	Method AVGSA-3A (alternative)	-	-
<input type="checkbox"/>	11.9.2.3.1	Method AVGPM	Constant D ($\pm 2\%$)	-
<input type="checkbox"/>	11.9.2.3.2	Method AVGPM-G	-	-

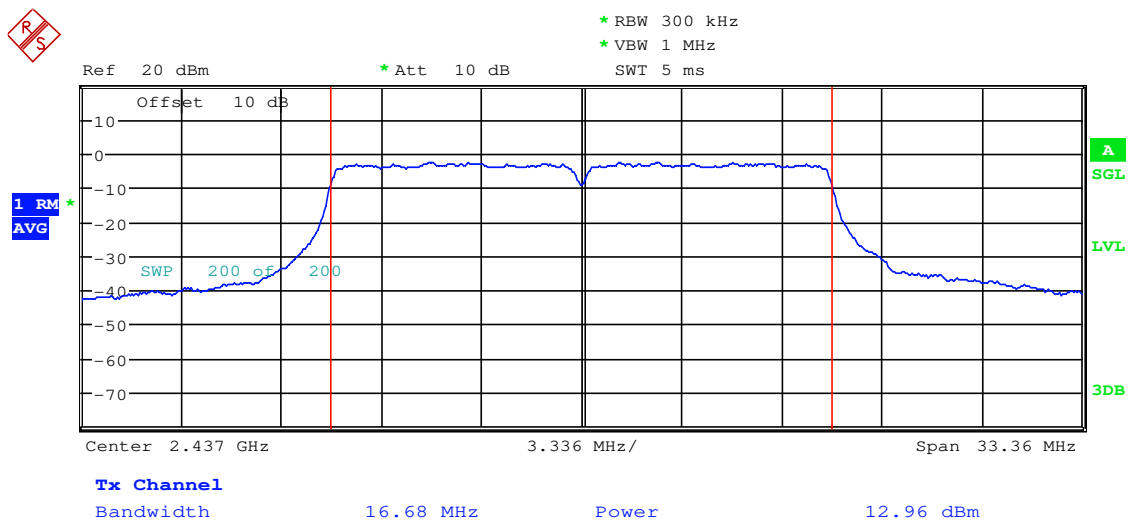
5.2.3 Test results (DTS fundamental emission output power)

Ambient temperature:	23 °C
Relative humidity:	30 %

Date:	02.12.2024
Tested by:	P. Neufeld

5.2.3.1 Maximum conducted (average) output power

Worst case plot (operation mode 2):



Operation mode	Reading [dBm]	Corr. Fact. [dB]	DCCF [dB]	Result [dBm]	Result Orig. Report [dBm]	EIRP* [dBm]	Limit conducted [dBm]	Limit EIRP [dBm]
5	10.3	0.5	1.0	11.8	12.5	14.74	30	36
6	13.0	0.5	1.0	14.5	15.6	17.44	30	36
7	7.2	0.5	1.0	8.7	11.6	11.64	30	36

* EIRP [dBm] = Result [dBm] + Antenna gain [dBi]. The antenna gain of the EUTs antenna is 2.94 dBi, see **Fehler! Verweisquelle konnte nicht gefunden werden.** for details.

Test result: Passed

Test equipment (please refer to chapter 7 for details)
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5.2.4 Maximum unwanted emissions

5.2.4.1 Test results (30 MHz – 1 GHz)

Ambient temperature:	22 °C
Relative humidity:	25 %

Date:	23.01.2025
Tested by:	P. Neufeld

Position of EUT: For tests for f between 30 MHz to 1 GHz, the EUT was set-up on a table with a height of 80 cm. The distance between EUT and antenna was 3 m.

Cable guide: For detail information of test set-up and the cable guide refer to the pictures in the annex A in the test report.

Test record: Only the worst-case position from the original test report was tested.

Remark: Only the worst-case orthogonal plane from the original test report was tested.

Calculations:

Result [dBμV/m] = Reading [dBμV] + Correction [dB/m]

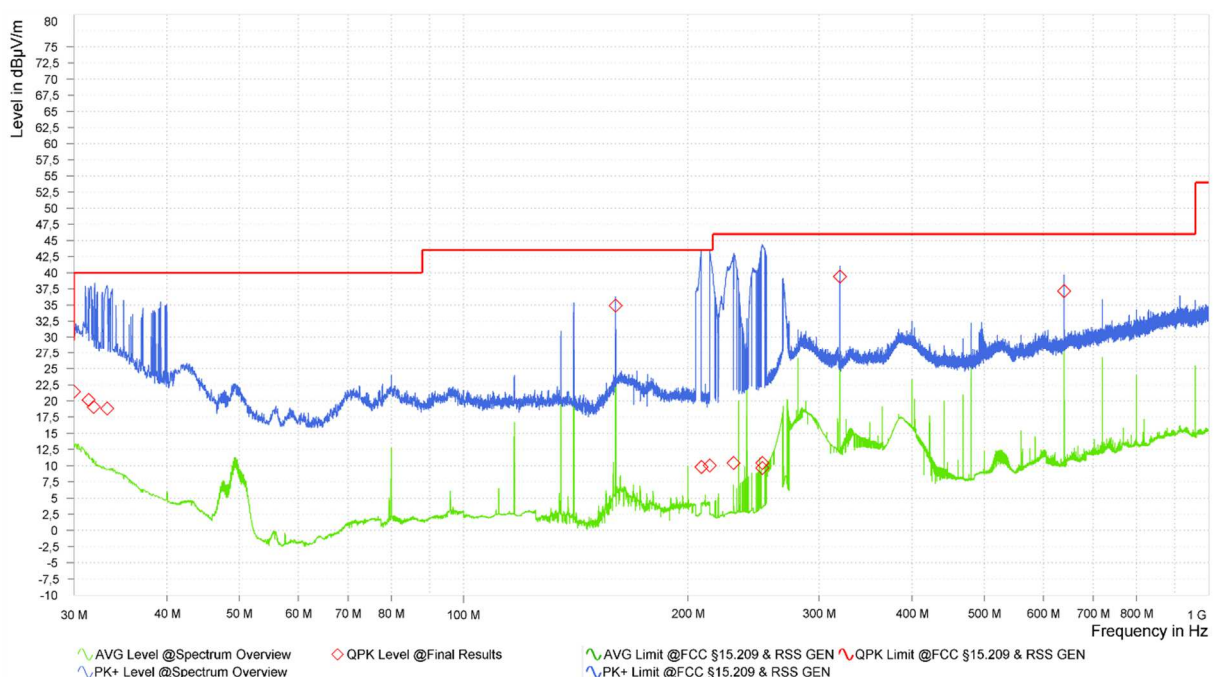
Correction [dB/m] = AF [dB/m] + Cable attenuation [dB] + optional preamp gain [dB]

Margin [dB] = Limit [dBμV/m] - Result [dBμV/m]

The measured points and the limit line in the following diagram refer to the standard measurement of the emitted interference in compliance with the above-mentioned standard. The measured points marked with “◇” are the measured results of the standard subsequent measurement in a semi-anechoic chamber.

Worst case plot:

Spurious emissions from 30 MHz to 1 GHz (operation mode 1):



Result tables:

(Operation mode 1):

Frequency [MHz]	Result (QP) [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Readings [dBμV]	Correction [dB/m]	Pol. (H/V)	Azimuth [deg]	Height [m]	Position #
30.000	21.4	29.5	8.1	-5.2	26.7	V	66.0	2.6	1
31.410	20.2	40.0	19.8	-5.6	25.8	V	371.0	1.1	1
31.890	19.1	40.0	20.9	-6.4	25.5	V	371.0	1.5	1
33.240	18.8	40.0	21.2	-5.8	24.7	V	372.0	1.1	1
159.990	34.9	43.5	8.6	19.7	15.2	H	304.0	2.3	1
208.560	9.8	43.5	33.7	-6.4	16.2	V	97.0	1.4	1
213.990	10.0	43.5	33.5	-6.2	16.2	V	75.0	1.1	1
230.430	10.4	46.0	35.6	-6.2	16.7	V	73.0	1.1	1
251.730	10.4	46.0	35.6	-6.8	17.2	V	99.0	1.1	1
251.790	9.7	46.0	36.4	-7.5	17.2	V	132.0	1.1	1
320.010	39.4	46.0	6.6	19.9	19.5	H	242.0	1.1	1
639.990	37.2	46.0	8.9	10.9	26.2	V	235.0	1.0	1
639.990	37.2	46.0	8.8	10.9	26.2	V	235.0	1.0	1

Test result: Passed

Test equipment (please refer to chapter 7 for details)
1 - 9

5.2.4.2 Test results (radiated 1 to 40 GHz)

Ambient temperature:	21 °C
Relative humidity:	45 %

Date:	19.12.2024
Tested by:	P. Neufeld

Position of EUT: For tests for f between 1 GHz and the 10th harmonic, the EUT was set-up on a positioner device with a height of 150 cm. The distance between EUT and antenna was 3 m.

Cable guide: For detail information of test set-up and the cable guide refer to the pictures in the annex A in the test report.

Test record: Plots for each frequency range are submitted below.

Remark: -

Calculation:

Max Peak [dBμV/m] = Reading [dBμV] + Correction [dB/m]

Average [dBμV/m] = Reading [dBμV] + Correction [dB/m]

Correction [dB/m] = AF [dB/m] + Cable attenuation [dB] + optional preamp gain [dB] + DCCF* [dB]
* (if applicable – only for Average values, that are fundamental related)

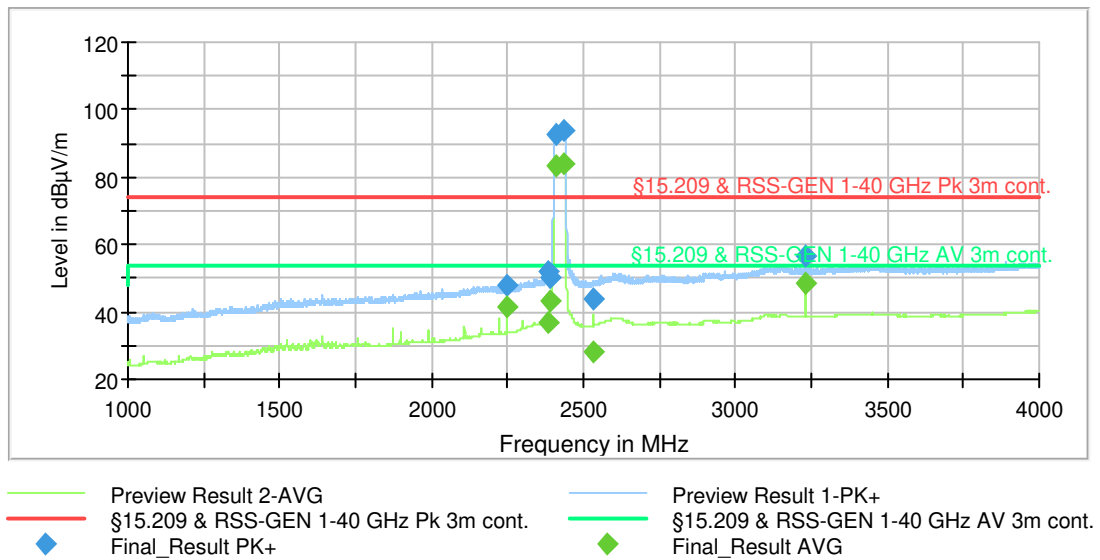
Margin [dB] = Limit [dBμV/m] – Max Peak | Average [dBμV/m]

The curves in the diagram only represent the maximum measured value for each frequency point of all preliminary measurements, which were carried out with various EUT and antenna positions.

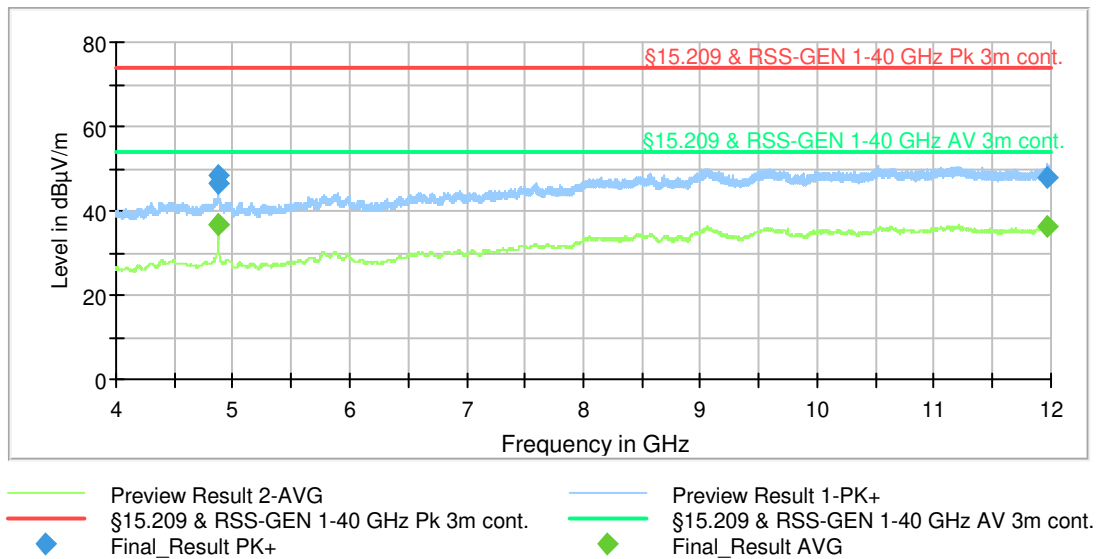
The top measured curve represents the peak measurement. The measured points marked with "◆" or "◇" are frequency points for the final peak detector measurement. These values are indicated in the following table. The bottom measured curve represents the average measurement. The measured points marked with "◆" or "◇" are frequency points for the final average detector measurement.

Worst case plots:

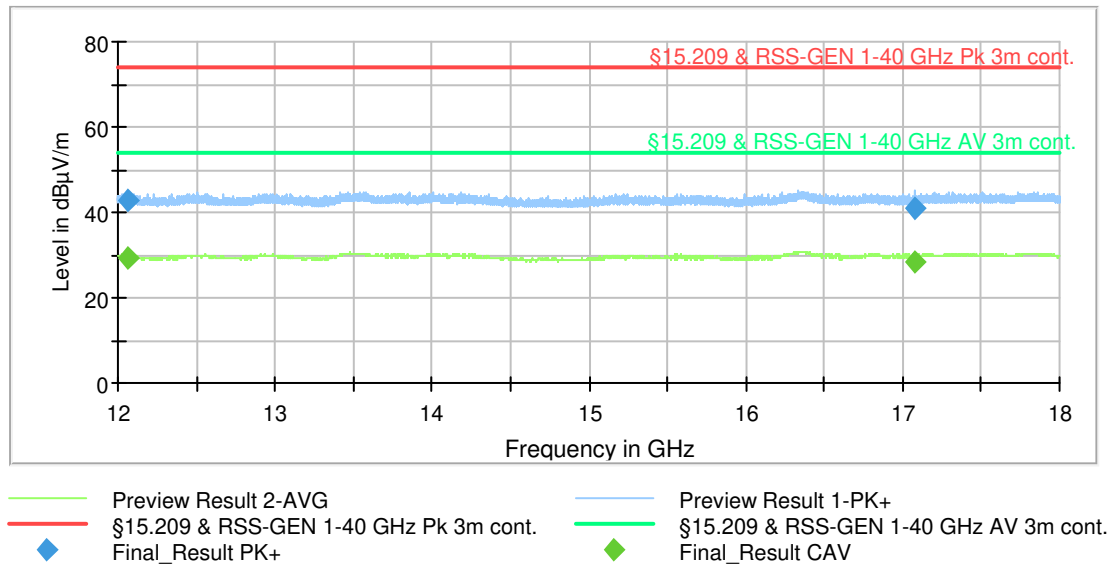
Spurious emissions from 1 GHz to 4 GHz (operation mode 2):



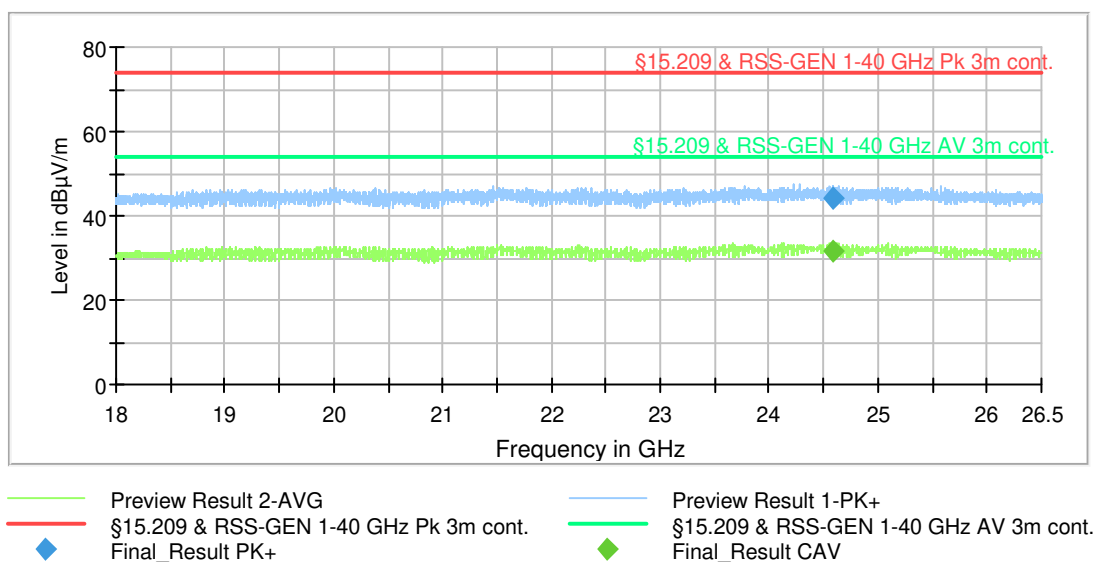
Spurious emissions from 4 GHz to 12 GHz (operation mode 3):



Spurious emissions from 12 GHz to 18 GHz (operation mode 4):



Spurious emissions from 18 GHz to 26.5 GHz (operation mode 4):



Result tables:

Operation mode 2:

Frequency [MHz]	MaxPeak [dB(μV/m)]	Average [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Pol [H/V]	Azimuth [deg]	Elevation [deg]	Corr. [dB/m]
2249.250	---	41.6	54.0	12.4	V	87	90	32.0
2249.250	47.8	---	74.0	26.2	V	87	90	32.0
2385.750	51.7	---	74.0	22.3	H	283	60	33.0
2385.750	---	36.6	54.0	17.4	H	283	60	33.0
2389.750	50.4	---	74.0	23.6	V	122	150	33.0
2389.750	---	43.4	54.0	10.6	V	122	150	33.0
2410.500	---	83.6	Fund.	-	H	282	90	33.3
2410.500	92.8	---	Fund.	-	H	282	90	33.3
2433.250	---	83.8	Fund.	-	H	280	90	33.6
2433.250	94.1	---	Fund.	-	H	280	90	33.6
2530.250	44.1	---	74.0	29.9	V	103	90	33.3
2530.250	---	28.4	54.0	25.6	V	103	90	33.3
3229.250	56.6	---	74.0	17.4	H	291	30	36.4
3229.250	---	48.3	54.0	5.7	H	291	30	36.4

Operation mode 3:

Frequency [MHz]	MaxPeak [dB(μV/m)]	Average [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Pol [H/V]	Azimuth [deg]	Elevation [deg]	Corr. [dB/m]
4873.250	46.6	---	74.0	27.4	V	153	30	-1.6
4873.250	---	36.9	54.0	17.1	V	153	30	-1.6
4874.750	48.4	---	74.0	25.6	V	154	30	-1.6
4874.750	---	36.7	54.0	17.3	V	154	30	-1.6
11963.500	---	36.3	54.0	17.7	H	126	0	6.4
11963.500	48.0	---	74.0	26.0	H	126	0	6.4

Operation mode 4:

Frequency [MHz]	MaxPeak [dB(μV/m)]	Average [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Pol [H/V]	Azimuth [deg]	Elevation [deg]	Corr. [dB/m]
12061.500	---	29.1	54.0	24.9	H	280	60	10.2
12061.500	42.9	---	74.0	31.1	H	280	60	10.2
17073.250	---	28.4	54.0	25.6	V	84	90	9.5
17073.250	41.0	---	74.0	33.0	V	84	90	9.5
24589.500	---	31.5	54.0	22.5	V	137	0	4.1
24589.500	44.1	---	74.0	29.9	V	137	0	4.1

Test result: Passed

Test equipment (please refer to chapter 7 for details)
10 - 26

6 Measurement Uncertainties

Conducted measurements		
Measurement method	Standard used for calculating measurement uncertainty	Expanded measurement uncertainty (95 %) U_{lab}
Frequency error	ETSI TR 100 028	4.5×10^{-8}
Bandwidth measurements	-	9.0×10^{-8}
Conducted emissions from 150 kHz to 30 MHz with LISN	CISPR 16-4-2	2.8 dB

Radiated measurements		
Frequency error		
(Semi-) Anechoic chamber	ETSI TR 100 028	4.5×10^{-8}
OATS	ETSI TR 100 028	4.5×10^{-8}
Test fixture	ETSI TR 100 028	4.5×10^{-8}
Bandwidth measurements		
(Semi-) Anechoic chamber	-	9.0×10^{-8}
OATS	-	9.0×10^{-8}
Test fixture	-	9.1×10^{-8}
Radiated field strength M20		
CBL6112B @ 3 m 30 MHz – 1 GHz	CISPR 16-4-2	5.3 dB
R&S HL050 @ 3 m		
1 – 6 GHz	CISPR 16-4-2	5.1 dB
6 – 18 GHz	CISPR 16-4-2	5.4 dB
Flann Standard Gain Horns 18 – 40 GHz	-	5.9 dB
Radiated field strength M276		
R&S HL562E @ 3 m 30 MHz – 1 GHz	CISPR 16-4-2	4.8 dB
R&S HL050 @ 3 m	-	
1 – 6 GHz	CISPR 16-4-2	5.1 dB
6 – 18 GHz	CISPR 16-4-2	5.4 dB
Flann Standard Gain Horns 18 – 40 GHz	-	5.9 dB
OATS		
Field strength measurements below 30 MHz on OATS without ground plane	-	4.4 dB

7 Test Equipment used for Tests

No.	Test equipment	Type	Manufacturer	Serial No.	PM. No.	Cal. Date	Cal Due
1	Attenuator 6 dB	WA2-6	Weinschel	8254	410119	Calibration not necessary	
2	Ultralog Antenna	HL562E	Rohde & Schwarz	101079	482978	24.04.2024	04.2027
3	EMC test software	Elektra V5.05.00	Rohde & Schwarz	---	483755	Calibration not necessary	
4	RF Switch Matrix	OSP220	Rohde & Schwarz	101391	482976	Calibration not necessary	
5	Turntable	TT3.0-3t	Maturo	825/2612/.01	483224	Calibration not necessary	
6	Antenna support	BAM 4.5-P-10kg	Maturo	222/2612.01	483225	Calibration not necessary	
7	Controller	NCD	Maturo	474/2612.01	483226	Calibration not necessary	
8	Semi Anechoic Chamber M276	SAC5-2	Albatross Projects	C62128-A540-A138-10-0006	483227	Calibration not necessary	
9	EMI Test receiver	ESW44	Rohde & Schwarz	101828	482979	21.02.2024	02.2026
10	Standard gain horn 12 GHz - 18 GHz	18240-20	Flann	483	480294	Calibration not necessary	
11	Standard gain horn 18 GHz - 26 GHz	20240-20	Flann	411	480297	Calibration not necessary	
12	Microwave cable 2m	Insulated Wire Inc.	Insulated Wire	KPS-1533-800-KPS	480302	Calibration not necessary	
13	Fully anechoic chamber M20	B83117-E2439-T232	Albatross Projects	103	480303	Calibration not necessary	
14	Turntable	DS420 HE	Deisel	420/620/00	480315	Calibration not necessary	
15	Antenna support	AS620P	Deisel	620/375	480325	Calibration not necessary	
16	Low Noise Amplifier 10 MHz - 18 GHz	LNA-30-00101800-25-10P	MITEQ	2110917	482967	20.02.2024	02.2027
17	Preamplifier 18 GHz - 26 GHz	JS4-18002600-20-5A	MITEQ.	658697	480342	19.02.2024	02.2026
18	Preamplifier 12 GHz - 18 GHz	JS3-12001800-16-5A	MITEQ	571667	480343	19.02.2024	02.2026
19	RF Kabel 38	SF106B/11N/11 N/4500.0	Huber & Suhner	500218/6B	482415	Calibration not necessary	
20	Multiple Control Unit	MCU	Maturo	MCU/043/971107	480832	Calibration not necessary	
21	Antenna (Log.Per.)	HL050	Rohde & Schwarz	100977	483511	25.04.2024	04.2027
23	Software	EMC32 V10.60.20	Rohde & Schwarz	---	483261	Calibration not necessary	
24	High-pass filter	WHKX4.0/18G-8SS	Wainwright	1	480587	Calibration not necessary	
25	Positioner	TDF 1.5- 10Kg	Maturo	15920215	482034	Calibration not necessary	
26	EMI Receiver / Spectrum Analyser	ESW44	Rohde & Schwarz	101635	482467	27.02.2024	02.2026
27	Signal & spectrum analyzer	FSW43	Rohde & Schwarz	100586 & 100926	481720	07.05.2024	05.2026

8 Test site Verification

Test equipment	PM. No.	Frequency range	Type of validation	According to	Val. Date	Val Due
Semi anechoic chamber M276	483227	30 – 1000 MHz	NSA	ANSI C63.4-2014 ANSI C63.4a-2017	01.03.2023	28.02.2026
Fully anechoic chamber M20	480303	1 -18 GHz	SVSWR	CISPR 16-1-4 Amd. 1	17.08.2022	16.08.2025

9 Report History

Report Number	Date	Comment
F241686E1	07.08.2025	Initial Test Report
-	-	-
-	-	-

10 List of Annexes

Annex A	Test Setup Photos	6 pages
Annex B	External Photographs	6 pages
Annex C	Internal Photographs	11 pages

----- end of test report -----