



LCIE



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Template : July 19<sup>th</sup>, 2024

# TEST REPORT

N°: 24329407-806664-B(FILE#9310523)

Version: 01

## Subject

Radio spectrum tests according to the standards:  
ETSI EN 300 328 V2.2.2 (Full test)

Electromagnetic Field (EMF) tests according to the standards:  
EN IEC 62311 (2020)

## Issued to

STMICROELECTRONICS (Rousset) SAS  
190 Avenue Celestin Coq  
13106 - Rousset  
FRANCE

## Apparatus under test

- Product
- Trade mark
- Manufacturer
- Model under test
- Serial number

Bluetooth® LE and IEEE 802.15.4 radio module  
STMICROELECTRONICS  
STMICROELECTRONICS  
STM32WBA5MMG  
None

## Conclusion

See Test Program chapter

Test date

November 21, 2024 to November 29, 2024

Test location

LCIE Grenoble

Sample receipt date

November 18, 2024

Composition of document

51 pages

Document issued on

February 26, 2025

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Tests operator

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## PUBLICATION HISTORY

| Version | Date              | Author         | Modification             |
|---------|-------------------|----------------|--------------------------|
| 01      | February 26, 2025 | Majid MOURZAGH | Creation of the document |

*Each new edition of this test report replaces and cancels the previous edition. The control of the old editions of report is under responsibility of client.*



## SUMMARY

|     |  |    |
|-----|--|----|
| 1.  | TEST PROGRAM .....   | 4  |
| 2.  | EQUIPMENT UNDER TEST: CONFIGURATION (DECLARED BY PROVIDER) ..... | 5  |
| 3.  | RF OUTPUT POWER .....  | 12 |
| 4.  | POWER SPECTRAL DENSITY .....                                     | 18 |
| 5.  | OCCUPIED CHANNEL BANDWIDTH .....                                 | 23 |
| 6.  | TRANSMITTER UNWANTED EMISSIONS IN THE OUT-OF-BAND DOMAIN .....   | 27 |
| 7.  | TRANSMITTER UNWANTED EMISSIONS IN SPURIOUS DOMAIN .....          | 32 |
| 8.  | RECEIVER SPURIOUS EMISSIONS .....                                | 39 |
| 9.  | RECEIVER BLOCKING .....  | 45 |
| 10. | ELECTROMAGNETIC FIELD .....                                      | 50 |
| 11. | UNCERTAINTIES CHART .....  | 51 |

## 1. TEST PROGRAM

### References

- ETSI EN 300 328 (V2.2.2)
- ERC Rec70-03<sup>(4)</sup> (March 2024) [P](#)
- EN IEC 62311 (2020) [P](#)
- Recommendation N° 1999/519/CE [P](#)

### Radio requirement:

| Clause - Test Description   | Test result - Comments |
|---|------------------------|
| 4.3.2.2 – RF output power   | PASS                   |
| 4.3.2.3 – Power Spectral Density  | PASS                   |
| 4.3.2.4 – Duty Cycle, Tx-sequence, Tx-gap   | NA                     |
| 4.3.2.5 – Medium Utilisation Factor   | NA                     |
| 4.3.2.6 – Adaptivity  | NA                     |
| 4.3.2.7 – Occupied Channel Bandwidth  | PASS                   |
| 4.3.2.8 – Transmitter Unwanted Emissions in the out-of-band domain                                    | PASS                   |
| 4.3.2.9 – Transmitter Unwanted Emissions in the spurious domain                                       | PASS                   |
| 4.3.2.10 – Receiver Spurious Emissions  | PASS                   |
| 4.3.2.11 – Receiver Blocking  | PASS                   |
| 4.3.1.12 – Geo-location capability  | NA                     |
| This table is a summary of test report, see conclusion of each clause of this test report for detail. |                        |

### Health requirement:

| Clause - EN IEC 62311 (2020)  | Test result |
|---|-------------|
| E-Field calculation   | PASS        |
| This table is a summary of test report, see conclusion of each clause of this test report for detail. |             |

(1) Limited program. The EUT integrates an assessed RF radio module

(2) Limited program - Normal condition only. The EUT integrates an assessed RF radio module

(3) See equipment information in chapter 2.2.


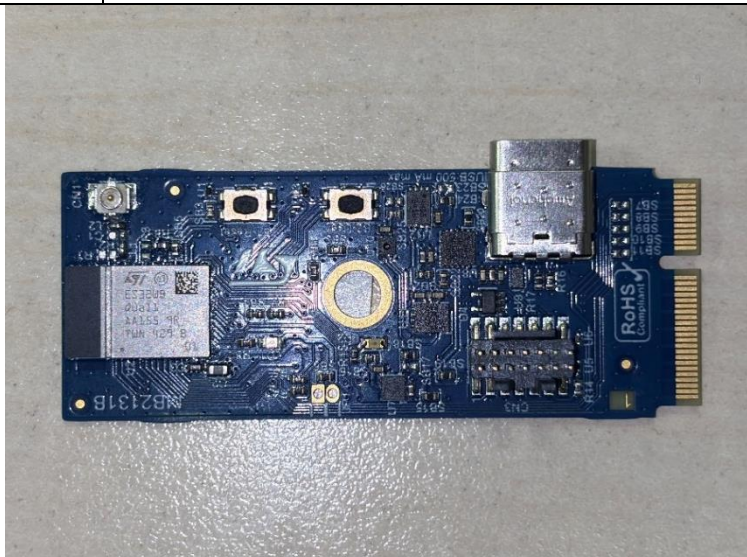
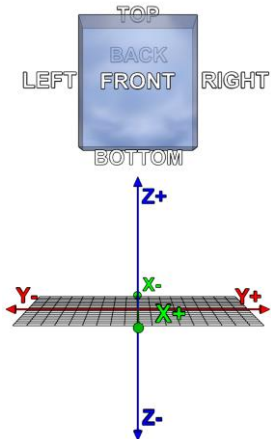
(4) National spectrum usage restrictions indicated in Appendix 1 and Appendix 3 aren't taken into account

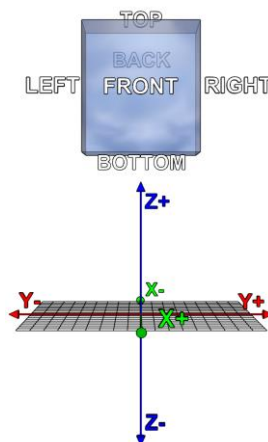
PASS: EUT complies with standard's requirement - FAIL: EUT does not comply with standard's requirement - NA: Not Applicable - NP: Not Performed

## 2. EQUIPMENT UNDER TEST: CONFIGURATION (DECLARED BY PROVIDER)

### 2.1. HARDWARE IDENTIFICATION (EUT AND AUXILIARIES):

#### Equipment under test (EUT):

|                   |  |  |  |
|-------------------|--|--|--|
| Model under test: | STM32WBA5MMG   |  |  |
| Serial Number:    | None   |  |  |
|                   | <div><div></div><div></div></div> |  |  |
| Dimensions:       | 8mm x 12mm x 1.372mm (Length x Width x Height)   |  |  |
| Type:             | Table-Top  |  |  |



#### Power supply:

| Name    | Type | Rating                       | Reference / Sn | Comments              |
|---------|------|------------------------------|----------------|-----------------------|
| Supply1 | DC   | 1.71 to 3.6 V                | /              | Module power supply   |
| Supply2 | DC   | USB power supply (4 – 5.75V) | /              | Switching AC/ Adapter |

NC: Not communicated by provider

**Inputs/outputs - Cable:**

| Access  | Type  | Length used (m) | Declared <3m | Shielded | Comments                             |
|---------|-------|-----------------|--------------|----------|--------------------------------------|
| Supply1 | USB C | 1.5             | No           | No       | USB only on board and only for power |
| Supply2 | USB C | 1.5             | No           | No       | 100/240VAC – 5VDC                    |
| Access1 | JTAG  | 0.1             | No           | No       | Only for debug                       |

NC: Not communicated by provider

**Auxiliary equipment used during test:**

| Type           | Reference     | Sn          | Comments |
|----------------|---------------|-------------|----------|
| LAPTOP         | Lenovo L490   | Lenovo L490 | /        |
| Daughter board | STLINK-V3MINE | /           | /        |

NC: Not communicated by provider


**Equipment information (declaration of provider):**

|                              |  |
|------------------------------|--|
| <b>Bluetooth Low Energy:</b> | <b>v5.4</b>                                      |
| Chipset / RF Module          | STM32WBA5MMG                                     |
| Frequency band:              | [2400 – 2483.5] MHz                              |
| Spectrum Modulation:         | DSSS (Tested like it – international agreements) |
| Number of Channel:           | 40   |
| Spacing channel:             | 2MHz   |
| Channel bandwidth:           | 1MHz / 2MHz                                      |
| Antenna Type:                | Internal   |
| Antenna connector:           | None   |
| Transmit chains:             | 1  |
| Receiver chains              | 1  |
| Adaptivity mode:             | No   |

| CHANNEL PLAN   |                 |                 |                 |
|----------------|-----------------|-----------------|-----------------|
| Channel        | Frequency (MHz) | Channel         | Frequency (MHz) |
| <b>Cmin: 0</b> | 2402            | <b>Cmid: 20</b> | 2442            |
| 1              | 2404            | 21              | 2444            |
| 2              | 2406            | 22              | 2446            |
| 3              | 2408            | 23              | 2448            |
| 4              | 2410            | 24              | 2450            |
| 5              | 2412            | 25              | 2452            |
| 6              | 2414            | 26              | 2454            |
| 7              | 2416            | 27              | 2456            |
| 8              | 2418            | 28              | 2458            |
| 9              | 2420            | 29              | 2460            |
| 10             | 2422            | 30              | 2462            |
| 11             | 2424            | 31              | 2464            |
| 12             | 2426            | 32              | 2466            |
| 13             | 2428            | 33              | 2468            |
| 14             | 2430            | 34              | 2470            |
| 15             | 2432            | 35              | 2472            |
| 16             | 2434            | 36              | 2474            |
| 17             | 2436            | 37              | 2476            |
| 18             | 2438            | 38              | 2478            |
| 19             | 2440            | <b>Cmax: 39</b> | 2480            |

| DATA RATE                           |                  |                 |                                     |
|-------------------------------------|------------------|-----------------|-------------------------------------|
| Available                           | Data Rate (Mbps) | Modulation Type | Worst Case Modulation               |
| <input type="checkbox"/>            | 0.25             | GFSK (1MHz)     | <input type="checkbox"/>            |
| <input checked="" type="checkbox"/> | 1                | GFSK (1MHz)     | <input checked="" type="checkbox"/> |
| <input checked="" type="checkbox"/> | 2                | GFSK (2MHz)     | <input type="checkbox"/>            |



| Antenna Characteristic              |            |                      |                       |
|-------------------------------------|------------|----------------------|-----------------------|
| Antenna reference                   | Gain (dBi) | Frequency Band (MHz) | Impedance( $\Omega$ ) |
| ethertronics, Part Number : 1001312 | 1.8        | 2400 to 2485 MHz     | 50                    |

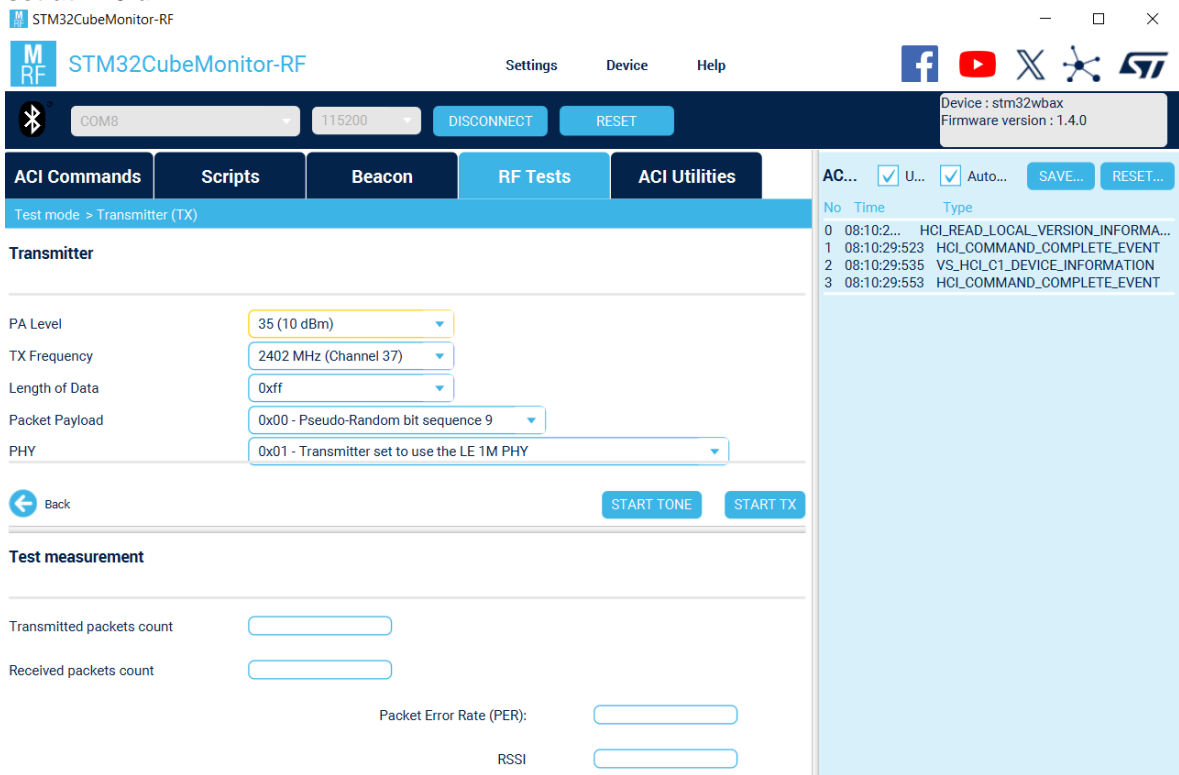
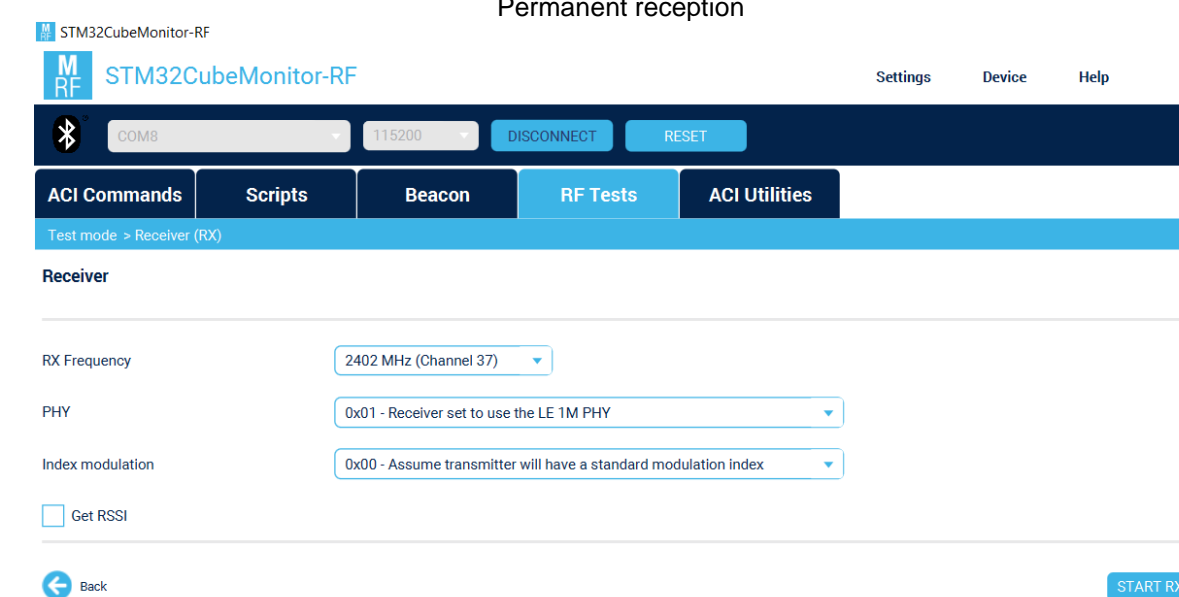
| Hardware information  |                    |                        |   |     |
|---|--------------------|------------------------|---|-----|
| Highest internal frequency (PLL, Quartz, Clock, Microprocessor...): |                    | F <sub>Highest</sub> : | 2500  | MHz |
| Firmware (if applicable):   |                    | V:                     | <div>Device : stm32wbax</div> <div>Firmware version : 1.4.0</div> |     |
| Software (if applicable):   |                    | V:                     |   |     |
| Equipment intended:   | Portable           |                        |   |     |
| Type of equipment:  | Stand-alone        |                        |   |     |
| Equipment sample:   | Production model   |                        |   |     |
| Duty cycle:   | Continuous duty    |                        |   |     |
| Operating temperature range:  | T <sub>min</sub> : | -40 °C                 |   |     |
|   | T <sub>nom</sub> : | 20°C                   |   |     |
|   | T <sub>max</sub> : | +85 °C                 |   |     |
| Operating voltage:  | V <sub>nom</sub> : | 5Vdc                   |   |     |

NC: Not communicated by provider

| Geo-location capability |
|-------------------------|
| No                      |



## 2.2. RUNNING MODE

| Test mode   | Description of test mode   |
|-------------|--|
| Test mode 1 | <p>Permanent emission with modulation on a fixed channel in the data rate that produced the power set at <b>+10 dBm</b>.</p>  <p>The screenshot shows the STM32CubeMonitor-RF interface for Transmitter (TX) mode. The top bar includes the STM32 logo, the application name, and navigation links for Settings, Device, and Help. Below this is a Bluetooth connection status bar showing 'COM8' and '115200' baud rate, with 'DISCONNECT' and 'RESET' buttons. The main menu has tabs for 'ACI Commands', 'Scripts', 'Beacon', 'RF Tests' (selected), and 'ACI Utilities'. The 'RF Tests' tab is further divided into 'Test mode &gt; Transmitter (TX)'. The 'Transmitter' section contains several dropdown menus: 'PA Level' set to '35 (10 dBm)', 'TX Frequency' set to '2402 MHz (Channel 37)', 'Length of Data' set to '0xff', 'Packet Payload' set to '0x00 - Pseudo-Random bit sequence 9', and 'PHY' set to '0x01 - Transmitter set to use the LE 1M PHY'. At the bottom of this section are 'START TONE' and 'START TX' buttons. Below the transmitter settings is a 'Test measurement' section with input fields for 'Transmitted packets count', 'Received packets count', 'Packet Error Rate (PER)', and 'RSSI'. On the right side of the interface, there is a log window showing a list of events with columns for 'No', 'Time', and 'Type'. The log entries include 'HCL_READ_LOCAL_VERSION_INFORMA...', 'HCL_COMMAND_COMPLETE_EVENT', and 'VS_HCL_C1_DEVICE_INFORMATION'.</p> |
| Test mode 2 | <p>Permanent reception</p>  <p>The screenshot shows the STM32CubeMonitor-RF interface for Receiver (RX) mode. The top bar is identical to the transmitter mode. The main menu has tabs for 'ACI Commands', 'Scripts', 'Beacon', 'RF Tests' (selected), and 'ACI Utilities'. The 'RF Tests' tab is further divided into 'Test mode &gt; Receiver (RX)'. The 'Receiver' section contains several dropdown menus: 'RX Frequency' set to '2402 MHz (Channel 37)', 'PHY' set to '0x01 - Receiver set to use the LE 1M PHY', and 'Index modulation' set to '0x00 - Assume transmitter will have a standard modulation index'. There is also a checkbox for 'Get RSSI'. At the bottom of this section is a 'START RX' button. The log window on the right is empty.</p>   |



Test mode 3

## Receiver blocking

STM32CubeMonitor-RF

STM32CubeMonitor-RF

Settings Device Help

Device: stm32wbxx  
Firmware version: 1.4.0

COM8 115200 DISCONNECT RESET

ACI Commands Scripts Beacon RF Tests ACI Utilities

Test mode > Packet Error Rate (PER) > COM9 > COM8 > Settings

Configure additional settings

☒ PER tests on multiple channels Fill channel List: 0:39

☐ Get RSSI Measurement period (sec): 3

☐ Save test verdict in file

[Back](#) START TEST

Test measurement

Transmitted packets count: 678

Received packets count: 674

Packet Error Rate (PER): 0.59 %

RSSI:

ACI log ☒ Update ☒ Autoscroll

SAVE LOG RESET LOG

| No. | Time         | Type                           |
|-----|--------------|--------------------------------|
| 63  | 11:35:47:191 | HCI_COMMAND_COMPLETE_EVENT     |
| 64  | 11:35:47:197 | ACL_HALL_TX_TEST_PACKET_NUMBER |
| 65  | 11:35:47:203 | HCI_COMMAND_COMPLETE_EVENT     |
| 66  | 11:35:47:209 | HOLLE_TEST_END                 |
| 67  | 11:35:47:213 | HCI_COMMAND_COMPLETE_EVENT     |
| 68  | 11:36:04:334 | HOLLE_RECEIVER_TEST_V2         |
| 69  | 11:36:04:352 | HCI_COMMAND_COMPLETE_EVENT     |
| 70  | 11:36:04:397 | ACL_HALL_SET_TX_POWER_LEVEL    |
| 71  | 11:36:04:400 | HCI_COMMAND_COMPLETE_EVENT     |
| 72  | 11:36:04:402 | HOLLE_TRANSMITTER_TEST_V2      |
| 73  | 11:36:04:421 | HCI_COMMAND_COMPLETE_EVENT     |
| 74  | 11:36:06:643 | HOLLE_TEST_END                 |
| 75  | 11:36:06:648 | HCI_COMMAND_COMPLETE_EVENT     |
| 76  | 11:36:06:650 | ACL_HALL_TX_TEST_PACKET_NUMBER |
| 77  | 11:36:06:655 | HCI_COMMAND_COMPLETE_EVENT     |
| 78  | 11:36:06:662 | HOLLE_TEST_END                 |
| 79  | 11:36:06:666 | HCI_COMMAND_COMPLETE_EVENT     |
| 80  | 11:50:46:215 | HOLLE_RECEIVER_TEST_V2         |
| 81  | 11:50:46:231 | HCI_COMMAND_COMPLETE_EVENT     |
| 82  | 11:50:46:281 | ACL_HALL_SET_TX_POWER_LEVEL    |
| 83  | 11:50:46:285 | HCI_COMMAND_COMPLETE_EVENT     |
| 84  | 11:50:46:287 | HOLLE_TRANSMITTER_TEST_V2      |
| 85  | 11:50:46:305 | HCI_COMMAND_COMPLETE_EVENT     |
| 86  | 11:50:49:182 | HOLLE_TEST_END                 |
| 87  | 11:50:49:189 | HCI_COMMAND_COMPLETE_EVENT     |
| 88  | 11:50:49:196 | ACL_HALL_TX_TEST_PACKET_NUMBER |
| 89  | 11:50:49:201 | HCI_COMMAND_COMPLETE_EVENT     |
| 90  | 11:50:49:209 | HOLLE_TEST_END                 |
| 91  | 11:50:49:215 | HCI_COMMAND_COMPLETE_EVENT     |
| 92  | 11:50:49:265 | HOLLE_RECEIVER_TEST_V2         |
| 93  | 11:50:49:283 | HCI_COMMAND_COMPLETE_EVENT     |
| 94  | 11:50:49:331 | ACL_HALL_SET_TX_POWER_LEVEL    |
| 95  | 11:50:49:334 | HCI_COMMAND_COMPLETE_EVENT     |
| 96  | 11:50:49:336 | HOLLE_TRANSMITTER_TEST_V2      |
| 97  | 11:50:49:354 | HCI_COMMAND_COMPLETE_EVENT     |
| 98  | 11:50:51:045 | HOLLE_TEST_END                 |
| 99  | 11:50:51:050 | HCI_COMMAND_COMPLETE_EVENT     |
| 100 | 11:50:51:052 | ACL_HALL_TX_TEST_PACKET_NUMBER |
| 101 | 11:50:51:056 | HCI_COMMAND_COMPLETE_EVENT     |
| 102 | 11:50:51:063 | HOLLE_TEST_END                 |
| 103 | 11:50:51:066 | HCI_COMMAND_COMPLETE_EVENT     |

| Test   | Running mode |
|--|--------------|
| RF output power  | Test mode 1  |
| Power Spectral Density                                   | Test mode 1  |
| Occupied Channel Bandwidth                               | Test mode 1  |
| Transmitter Unwanted Emissions in the out-of-band domain | Test mode 1  |
| Transmitter Unwanted Emissions in the spurious domain    | Test mode 1  |
| Receiver Spurious Emissions                              | Test mode 2  |
| Receiver Blocking  | Test mode 3  |

(1) Testing covered the receive mode, and receiver spurious emissions are considered to be the same as transmitter.

### 2.3. EQUIPMENT LABELLING

| Label |
|-------|
| None  |

### 2.4. EQUIPMENT MODIFICATIONS DURING THE TESTS

None

N°24329407-806664-B(FILE#9310523)

TEST REPORT  
Version : 01

Page 10/51



## **2.5. CALIBRATION DATE**

The calibration intervals are extended at cal due +2 months. This extended interval is based on the fact that there is sufficient calibration data to statistically establish a trend or based on experience of use of the test equipment to assure good measurement results for a longer period. The symbol -/- replaces the date for equipment checking before test or that have none impact on the test or that have no calibration required by the standard.

## **2.6. METHOD TO DETERMINATE THE POWER RADIATED EMISSION**

The Normalized Site Attenuation (NSA) is added to the maximum values observed during the azimuth search in order to obtain the spurious radiated emission. For spurious above -6dB from the limit found with the NSA, the Substitution Method is applied.

The substitution antenna replaces the equipment under test (EUT) for Effective Radiated Power (ERP) or Effective Isotropically Radiated Power (EIRP) measurement following the standard. Power is measured for a high level and calculated for the same level of radiated field strength obtained on the measuring antenna and EUT.

### 3. RF OUTPUT POWER

#### 3.1. TEST CONDITIONS

Date of test : November 22, 2024  
 Test performed by : Majid MOURZAGH  
 Relative humidity (%) : 42  
 Ambient temperature (°C) : 24

#### 3.2. TEST SETUP

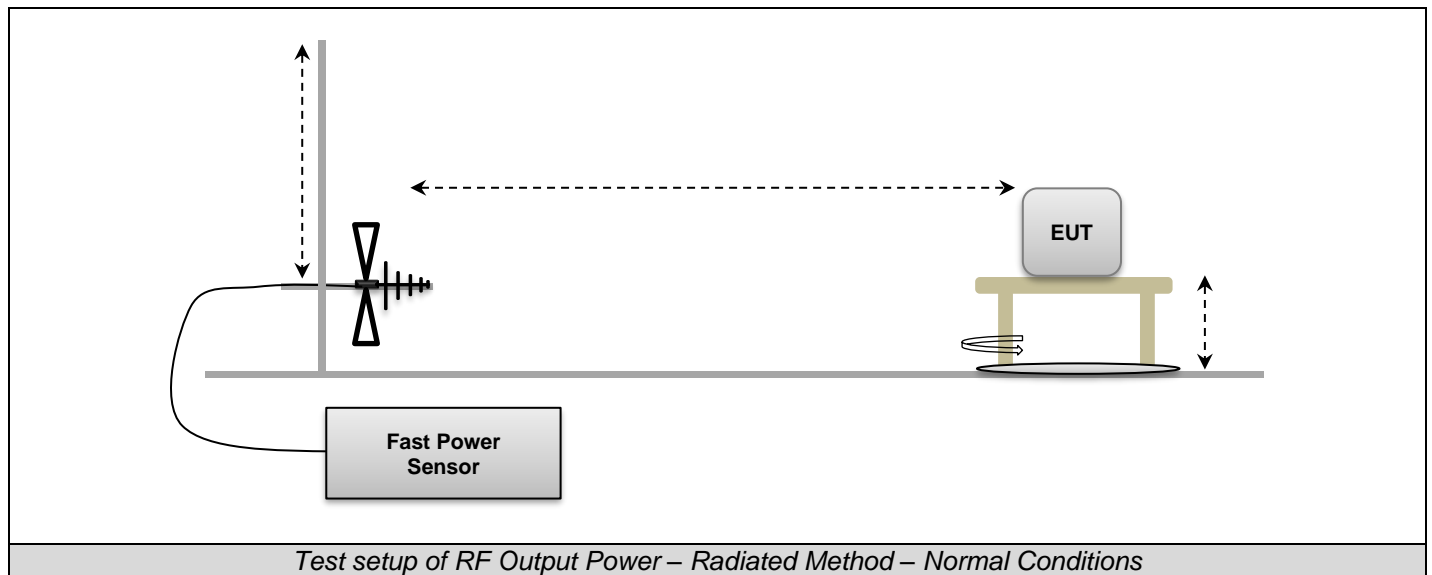
##### 3.2.1. For measurement in normal test conditions

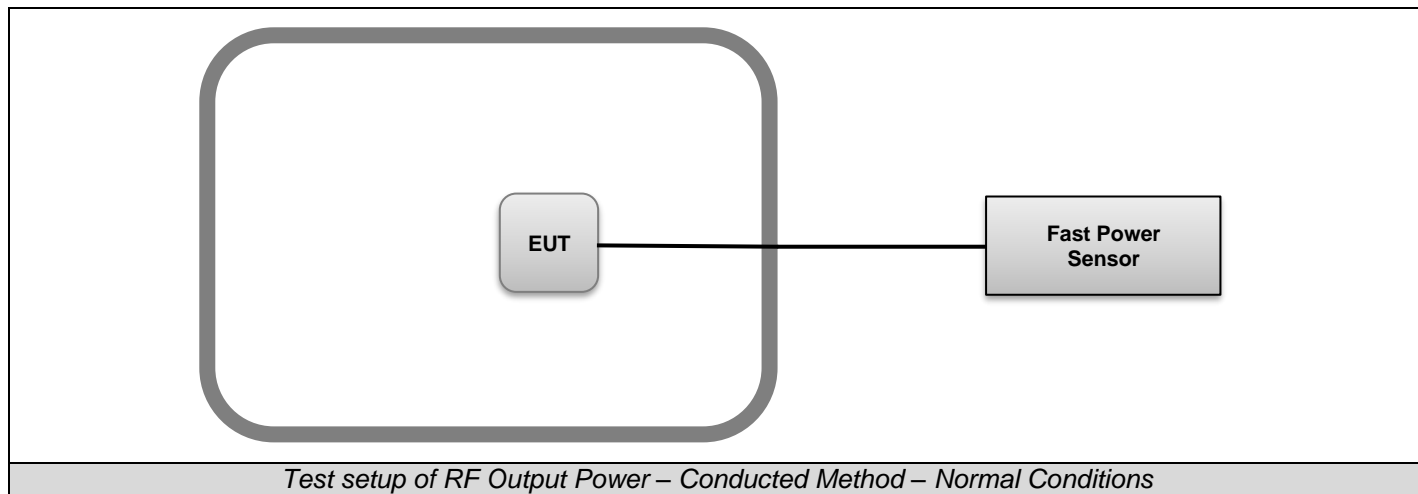
##### Radiated Method

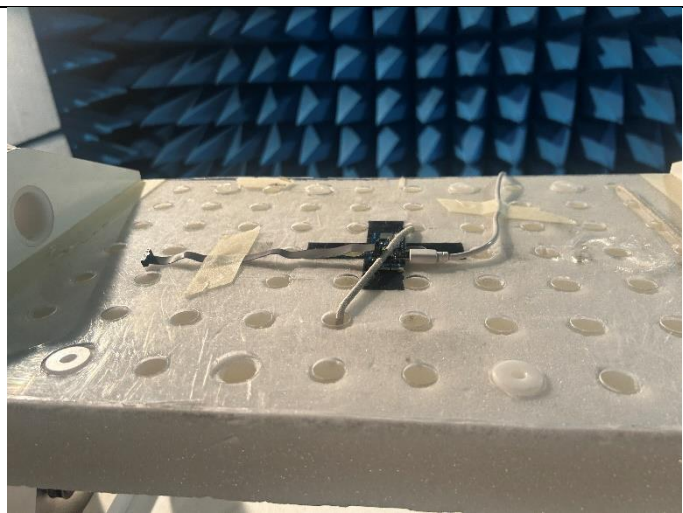
The Equipment Under Test is installed in Full Anechoic Room, 1.5m above the ground reference on an isolating support and distance between EUT and the measuring horn antenna is 3m.

The setup is on an isolating table and the maximum emitted power value from the EUT is found by the rotation of the 360° turntable and with measurement antenna height centered on the EUT, EUT smaller than the beamwidth of the measurement antenna. The measuring antenna is in vertical and then in horizontal polarization. Measurements are performed on all axis of EUT used in normal configuration. A summary of the worst case emissions found in all test configurations and modes is shown.

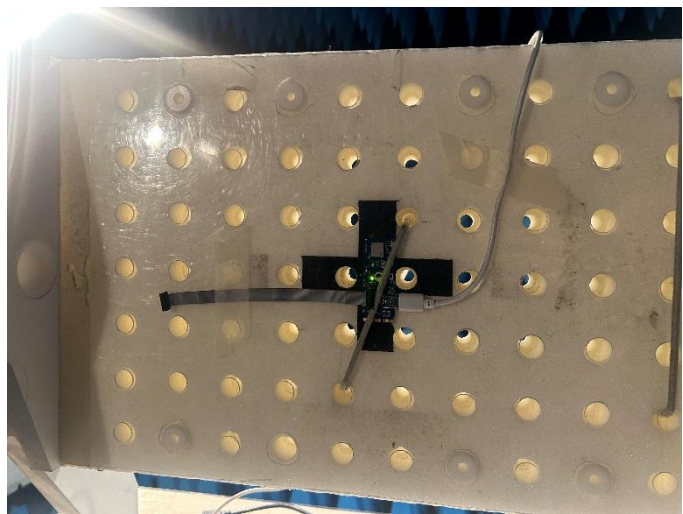
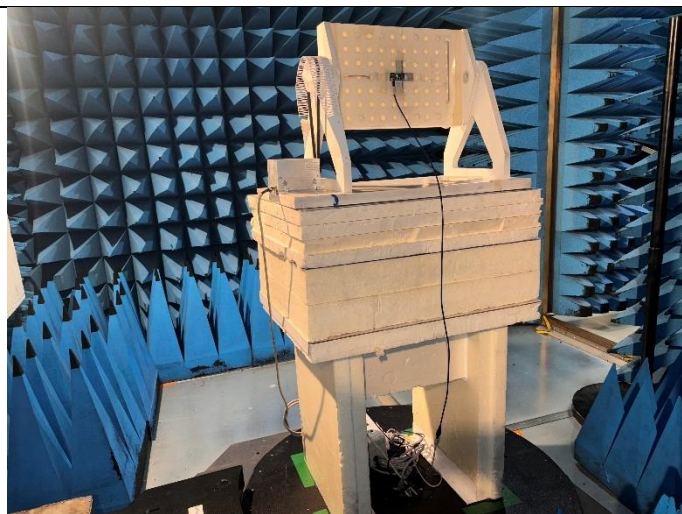
Mean power at the output of the transmitter and product antenna gain (A+G) are measured with a fast power sensor and deduced after correction due to the gain of the substitution antenna and the RF cables loss between the signal generator and the substitution antenna.







Axis XY on FAR



Axis Z on FAR

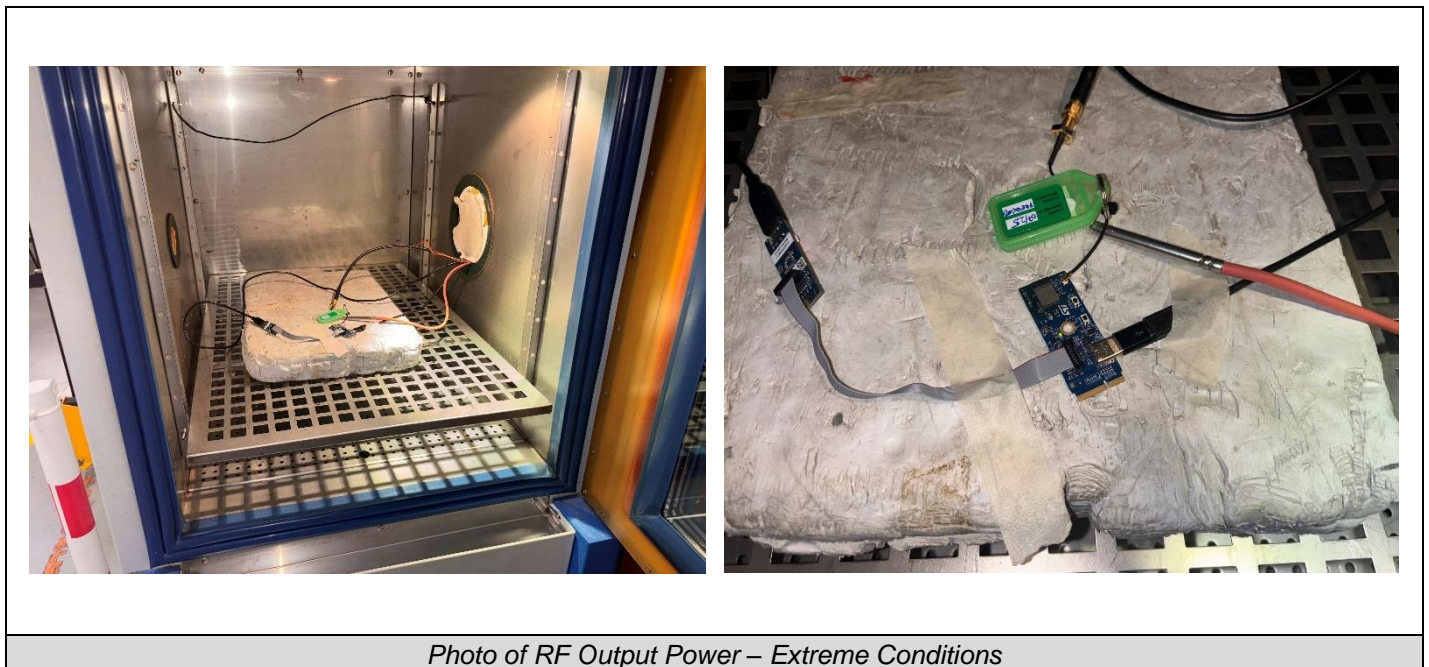
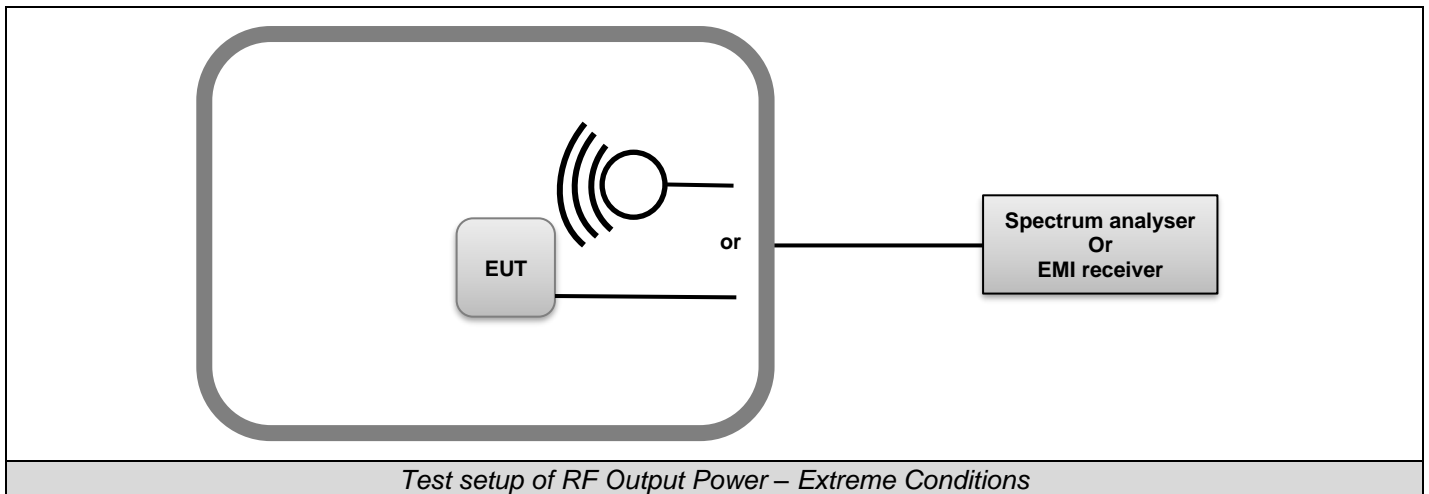
*Photo of RF Output Power– Normal Conditions*



### 3.2.2. For measurement under extreme test conditions

The Equipment under Test is installed in a climatic chamber and powered by a variable power supply. Measurement is performed at the EUT conducted acces.

The EIRP in extreme test conditions is measured in relation with the EIRP measured in normal conditions. In case of smart antenna systems operating in a multiple transmit chains active simultaneously, each chain is connected to a fast power sensor & measured synchronously.



### 3.3. LIMIT

The RF output power shall not exceed 20dBm.



### 3.4. TEST EQUIPMENT LIST

| TEST EQUIPMENT USED               |                 |                   |               |          |         |
|-----------------------------------|-----------------|-------------------|---------------|----------|---------|
| Description                       | Manufacturer    | Model             | Identifier    | Cal_Date | Cal_Due |
| Antenna horn 18GHz                | EMCO            | 3115              | C2042027      | 04/22    | 04/25   |
| Attenuator 10dB                   | AEROFLEX        | —                 | A7122268      | 07/23    | 07/25   |
| CABLE                             | MICRO-COAX      | CABLE N 1m coudé  | A5329652      | 07/23    | 07/26   |
| Cable SMA 40cm                    | WITHWAVE        | W101-SM1-0.4M     | A5329979      | 10/23    | 10/26   |
| Emission Cable (SMA 1m)           | TELEDYNE        | 26GHz             | A5329874      | 08/22    | 08/25   |
| Emission Cable (SMA 3.3m)         | TELEDYNE        | 26GHz             | A5329875      | 08/22    | 08/25   |
| Frequency generator 10MHz - 27GHz | ROHDE & SCHWARZ | SMR 27            | A5442045      | 04/24    | 04/26   |
| Multimeter - CEM                  | FLUKE           | 87                | A1240251      | 10/23    | 10/25   |
| RADIMATION                        | RADIMATION      | 2023.2.4          | L1000139      |          |         |
| RADIO ERP_EIRP                    | LCIE SUD EST    | RADIO ERP_EIRP v4 | L2000034      |          |         |
| Rehausse Table C3                 | LCIE            | —                 | F2000507      |          |         |
| Rehausse Table C3                 | LCIE            | —                 | F2000511      |          |         |
| RF Power sensor                   | DARE            | RPR3006W          | A1503029      | 12/23    | 12/25   |
| Semi-Anechoic chamber #3 (BF)     | SIEPEL          | —                 | D3044017_BF   | 04/22    | 04/25   |
| Semi-Anechoic chamber #3 (VSWR)   | SIEPEL          | —                 | D3044017_VSWR | 04/22    | 04/25   |
| SMA Cable 18GHz 0.5m              | TELEDYNE        | 18GHz             | A5330059      | 05/24    | 05/25   |
| SMA Cable 18GHz 0.5m              | TELEDYNE        | 18GHz             | A5330060      | 05/24    | 05/25   |
| SMA Cable 18GHz 0.6m              | TELEDYNE        | 18GHz             | A5330055      | 05/24    | 05/25   |
| SMA Cable 18GHz 3.5m              | TELEDYNE        | 18GHz             | A5330058      | 05/24    | 05/25   |
| SMK 6.50m                         | TELEDYNE        | A90-010-6.50MTR   | A5330061      | 08/24    | 08/25   |
| Spectrum analyzer                 | ROHDE & SCHWARZ | FSU 26            | A4060058      | 09/23    | 09/25   |
| Table C3                          | LCIE            | —                 | F2000461      |          |         |
| Thermo-hygrometer (PM1/2/3)       | KIMO            | HQ 210            | B4206022      | 05/23    | 05/25   |
| TILT                              | INNCO           | TILT              | D3044033      |          |         |
| Turntable chamber (Cage#3)        | ETS Lingren     | Model 2165        | F2000371      |          |         |
| Turntable controller (Cage#3)     | ETS Lingren     | Model 2090        | F2000444      |          |         |



| TEST EQUIPMENT USED on climatic chamber |                 |         |            |          |         |
|---|-----------------|---------|------------|----------|---------|
| Description                             | Manufacturer    | Model   | Identifier | Cal_Date | Cal_Due |
| Attenuator 10dB                         | AEROFLEX        | —       | A7122267   | 10/23    | 10/25   |
| Cable SMA 2m                            | —               | 6GHz    | A5329635   | 09/24    | 09/26   |
| Climatic chamber                        | BIA CLIMATIC    | CL 6-25 | D1022117   | 01/23    | 01/25   |
| Multimeter - CEM                        | FLUKE           | 87      | A1240251   | 10/23    | 10/25   |
| Data Logger (CEM1)                      | AGILENT         | 34970A  | A6440083   | 05/23    | 05/25   |
| Spectrum Analyzer 9kHz - 6GHz           | ROHDE & SCHWARZ | FSL6    | A2642020   | 10/22    | 02/25   |
| Thermocouple K (radio)                  | FLUKE           | Type K  | B4045005   | 10/23    | 10/25   |
| Thermocouple K (radio)                  | FLUKE           | Type K  | B4045004   | 10/23    | 10/25   |
| Thermometer (radio)                     | FLUKE           | 52 II   | B4043150   | 10/23    | 10/25   |

### 3.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

None

### 3.6. RESULTS

#### Configuration: BLE - 1Mbits/s

| Temperature | T <sub>min</sub> |                  |                  | T <sub>nom</sub> |                  |                  | T <sub>max</sub> |                  |                  |
|-------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| Voltage     | V <sub>nom</sub> |                  |                  | V <sub>nom</sub> |                  |                  | V <sub>nom</sub> |                  |                  |
| Channel     | C <sub>min</sub> | C <sub>mid</sub> | C <sub>max</sub> | C <sub>min</sub> | C <sub>mid</sub> | C <sub>max</sub> | C <sub>min</sub> | C <sub>mid</sub> | C <sub>max</sub> |
| EIRP (dBm)  | 8.10             | 7.30             | 6.65             | 9.30             | 8.36             | 7.70             | 9.48             | 8.57             | 7.90             |

#### Configuration: BLE - 2Mbits/s

| Temperature | T <sub>min</sub> |                  |                  | T <sub>nom</sub> |                  |                  | T <sub>max</sub> |                  |                  |
|-------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| Voltage     | V <sub>nom</sub> |                  |                  | V <sub>nom</sub> |                  |                  | V <sub>nom</sub> |                  |                  |
| Channel     | C <sub>min</sub> | C <sub>mid</sub> | C <sub>max</sub> | C <sub>min</sub> | C <sub>mid</sub> | C <sub>max</sub> | C <sub>min</sub> | C <sub>mid</sub> | C <sub>max</sub> |
| EIRP (dBm)  | 7.81             | 6.90             | 6.28             | 8.69             | 7.76             | 7.12             | 9.41             | 8.47             | 7.80             |

### 3.7. CONCLUSION

RF Output Power measurement performed on the sample of the product **STM32WBA5MMG**, Sn: **None**, in configuration and description presented in this test report, show levels **compliant** to the **ETSI EN 300 328** limits.

## 4. POWER SPECTRAL DENSITY

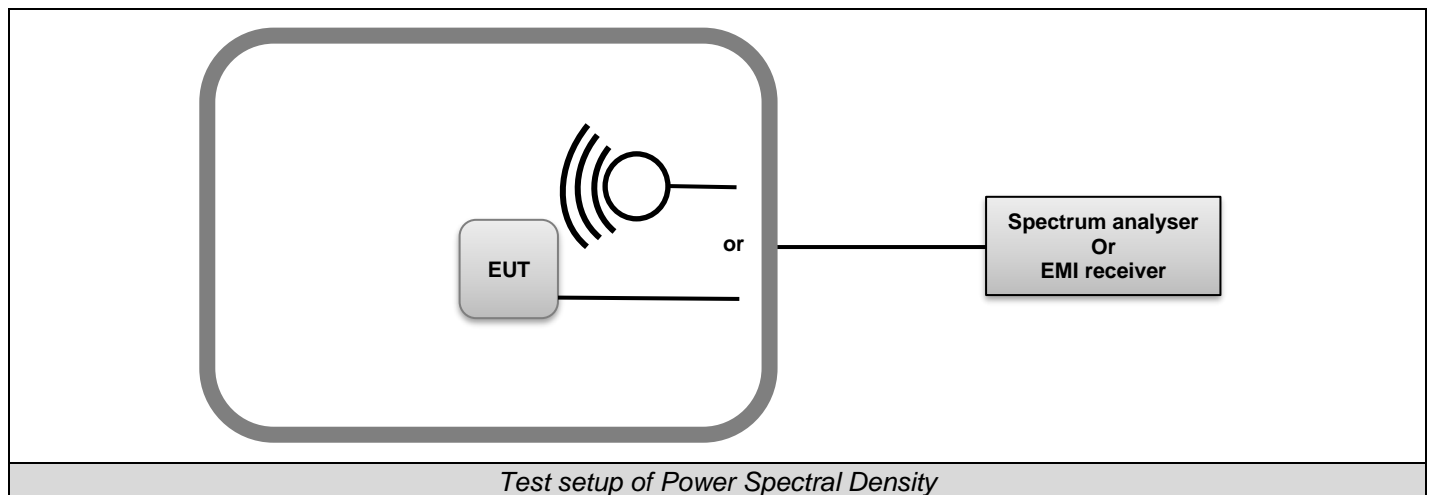
### 4.1. TEST CONDITIONS

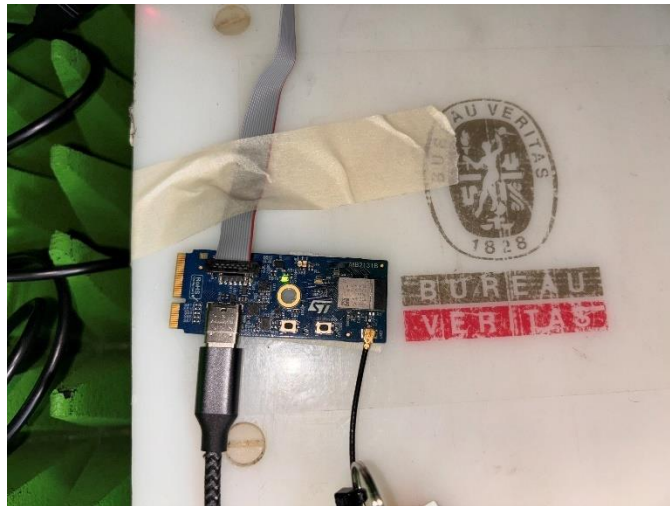
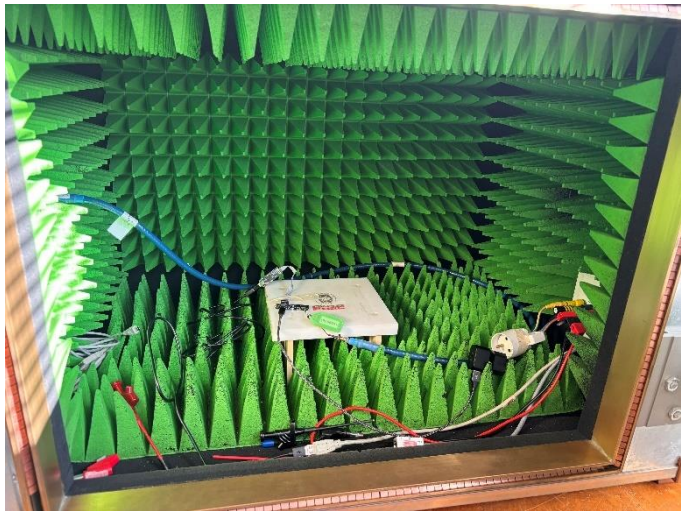
Date of test : November 27, 2024  
Test performed by : Majid MOURZAGH  
Relative humidity (%) : 39  
Ambient temperature (°C) : 24

### 4.2. TEST SETUP

The Equipment Under Test is installed in an anechoic chamber.  
Measurement is performed with a spectrum analyzer or receiver at the EUT conducted access.

The Power Spectral Density is measured in relation with the EIRP measured. In case of measurement on the EUT conducted access for smart antenna systems operating in a multiple transmits chains active simultaneously, each chain is measured separately with a spectrum analyzer.





*Photo of Power Spectral Density*

#### **4.3. LIMIT**

The Power Spectral Density shall not exceed 10dBm/MHz.



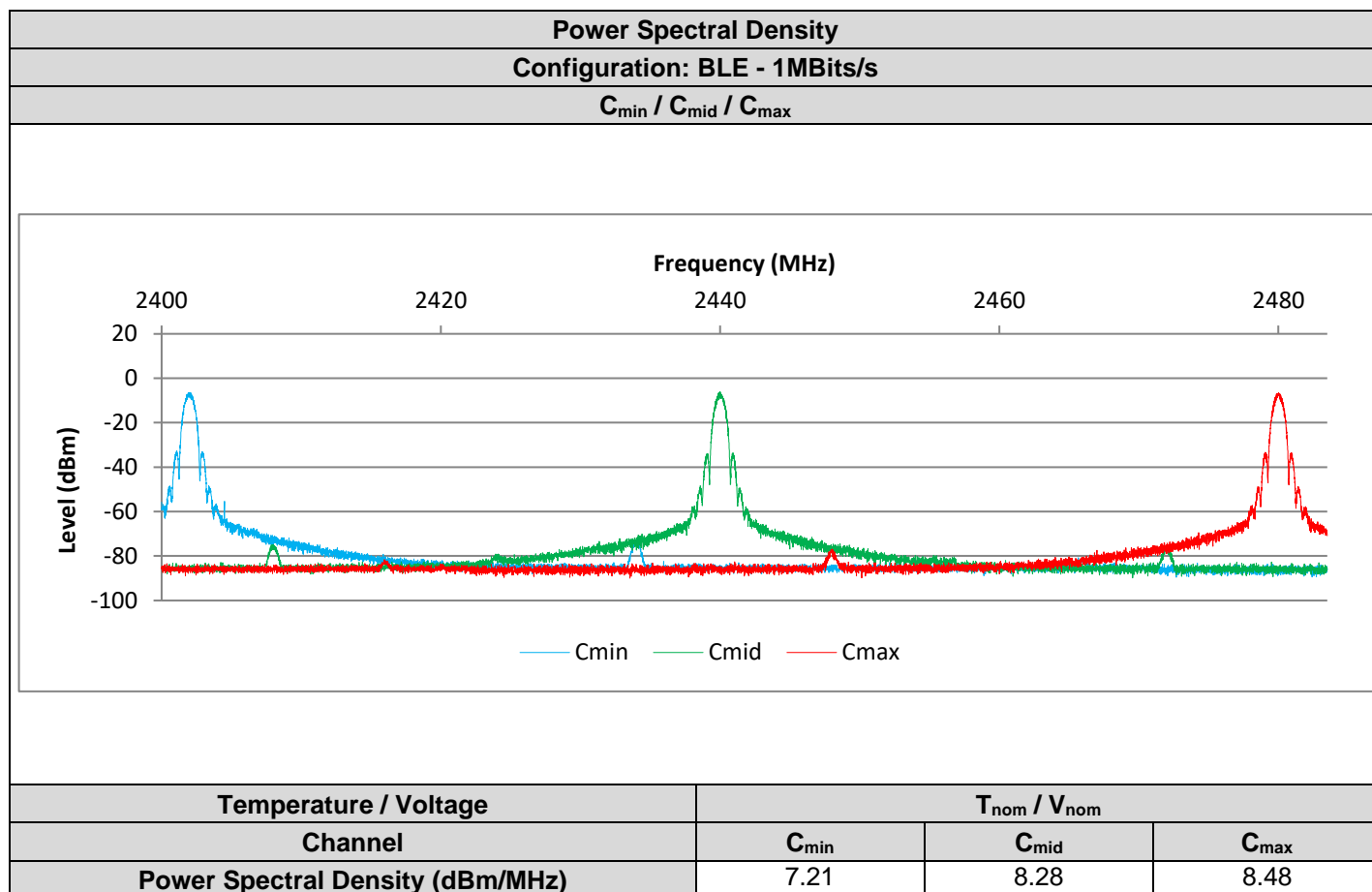
#### 4.4. TEST EQUIPMENT LIST

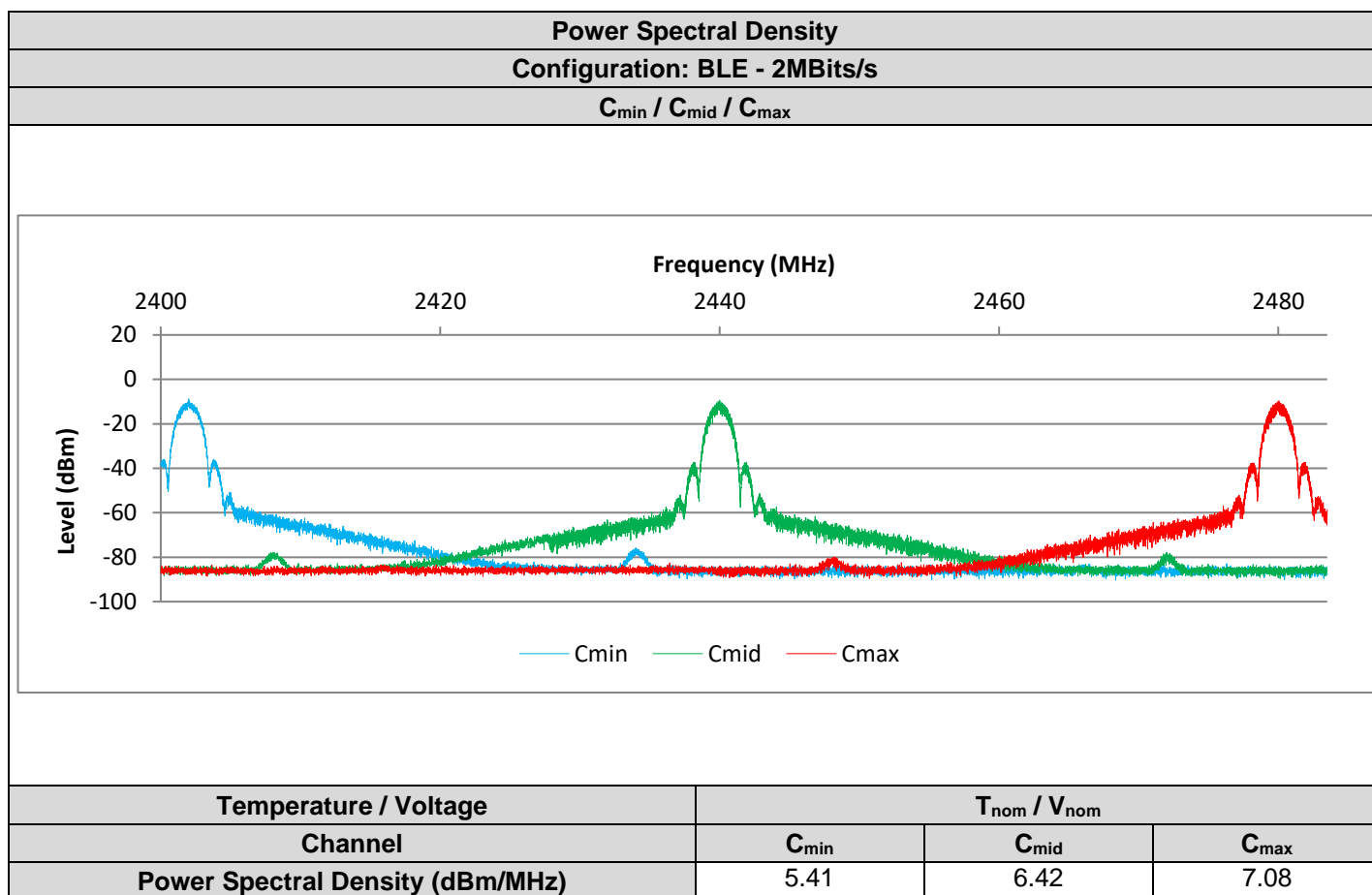
| TEST EQUIPMENT USED         |                 |        |            |          |         |
|-----------------------------|-----------------|--------|------------|----------|---------|
| Description                 | Manufacturer    | Model  | Identifier | Cal_Date | Cal_Due |
| Full Anechoic Room          | SIEPEL          | —      | D3044024   |          |         |
| Attenuator 10dB             | AEROFLEX        | —      | A7122267   | 10/23    | 10/25   |
| Multimeter - CEM            | FLUKE           | 87     | A1240251   | 10/23    | 10/25   |
| SMA 1.5m                    | SUCOFLEX        | 18GHz  | A5329864   | 10/23    | 02/25   |
| SMA 1.5m                    | SUCOFLEX        | 18GHz  | A5329863   | 08/24    | 08/25   |
| Spectrum analyzer           | ROHDE & SCHWARZ | FSV 40 | A4060059   | 04/24    | 04/26   |
| Thermo-hygrometer           | TESTO           | 608-H1 | B4204120   | 03/23    | 03/25   |
| Thermo-hygrometer (PM1/2/3) | KIMO            | HQ 210 | B4206022   | 05/23    | 05/25   |

#### 4.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

None

#### 4.6. RESULTS





#### 4.7. CONCLUSION

Power Spectral Density measurement performed on the sample of the product **STM32WBA5MMG**, Sn: **None**, in configuration and description presented in this test report, show levels **compliant** to the **ETSI EN 300 328** limits.

## 5. OCCUPIED CHANNEL BANDWIDTH

### 5.1. TEST CONDITIONS

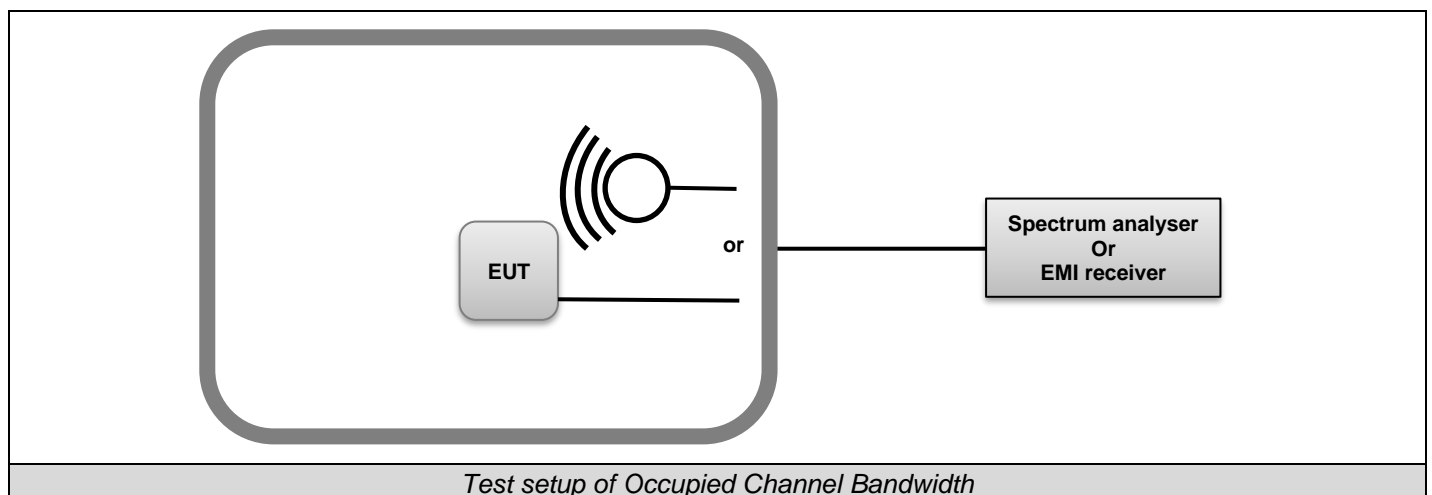
Date of test : November 27, 2024  
Test performed by : Majid MOURZAGH  
Relative humidity (%) : 39  
Ambient temperature (°C) : 24

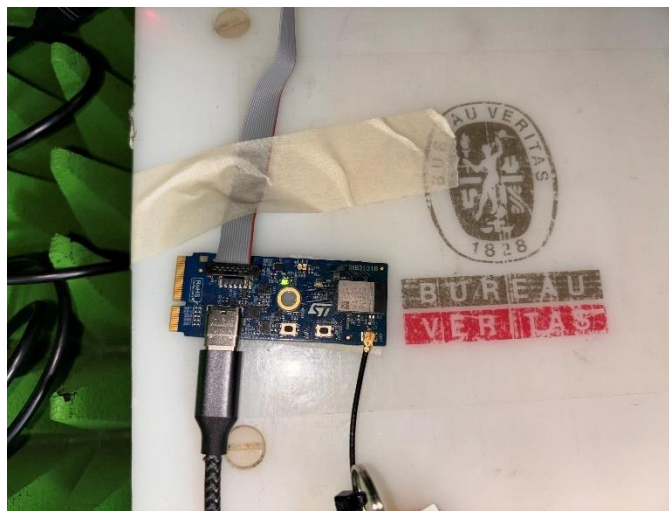
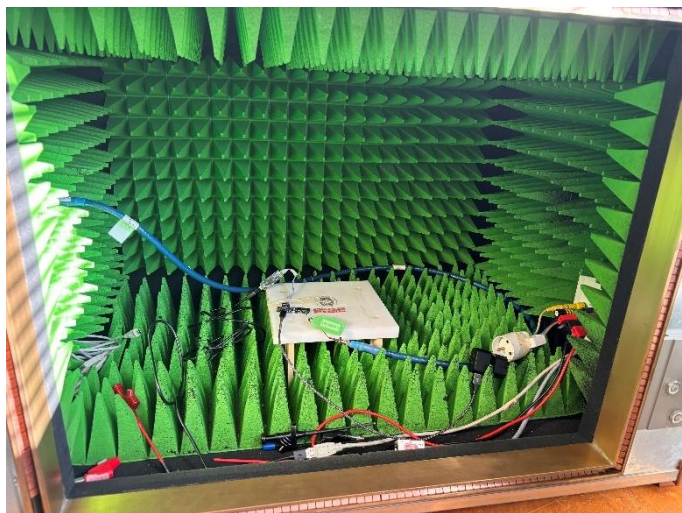
### 5.2. TEST SETUP

The Equipment Under Test is installed in an anechoic chamber.

Measurement is performed with a spectrum analyzer or receiver at the EUT conducted access.

The spectrum analyzer occupied bandwidth function is used to find the occupied channel bandwidth. In case of smart antenna systems operating in a multiple transmit chains active simultaneously, the measurement is only performed on one of the active transmit chains.





*Photo of Occupied Channel Bandwidth*

### 5.3. LIMIT

The Occupied Bandwidth shall fall completely within the 2400MHz-2483.5MHz Band.

### 5.4. TEST EQUIPMENT LIST

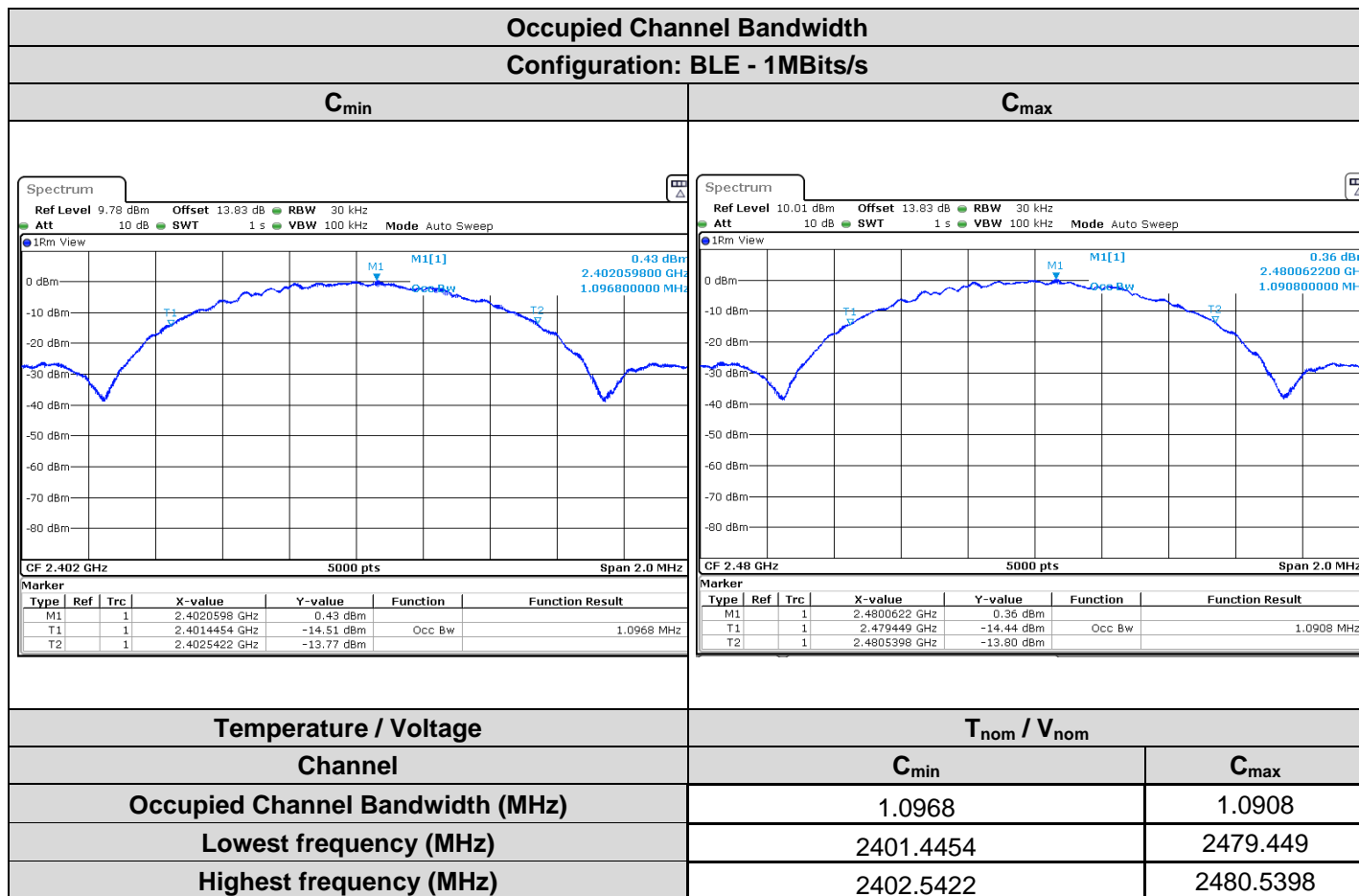
| TEST EQUIPMENT USED         |                 |        |            |          |         |
|-----------------------------|-----------------|--------|------------|----------|---------|
| Description                 | Manufacturer    | Model  | Identifier | Cal_Date | Cal_Due |
| Full Anechoic Room          | SIEPEL          | —      | D3044024   |          |         |
| Attenuator 10dB             | AEROFLEX        | —      | A7122267   | 10/23    | 10/25   |
| Multimeter - CEM            | FLUKE           | 87     | A1240251   | 10/23    | 10/25   |
| SMA 1.5m                    | SUCOFLEX        | 18GHz  | A5329864   | 10/23    | 02/25   |
| SMA 1.5m                    | SUCOFLEX        | 18GHz  | A5329863   | 08/24    | 08/25   |
| Spectrum analyzer           | ROHDE & SCHWARZ | FSV 40 | A4060059   | 04/24    | 04/26   |
| Thermo-hygrometer           | TESTO           | 608-H1 | B4204120   | 03/23    | 03/25   |
| Thermo-hygrometer (PM1/2/3) | KIMO            | HQ 210 | B4206022   | 05/23    | 05/25   |

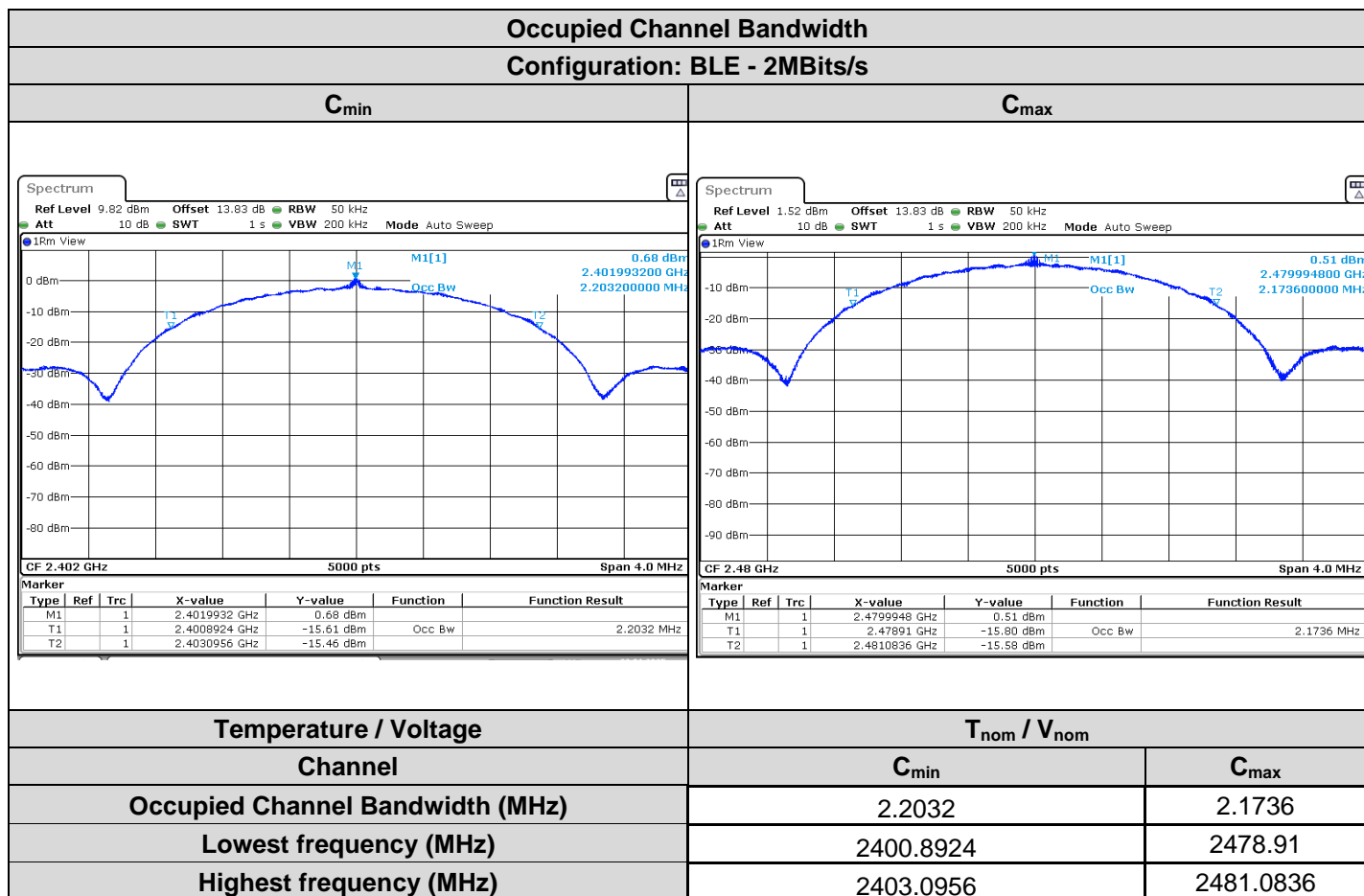
### 5.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

None



## 5.6. RESULTS





## 5.7. CONCLUSION

Occupied Channel Bandwidth measurement performed on the sample of the product **STM32WBA5MMG**, Sn: **None**, in configuration and description presented in this test report, show levels **compliant** to the **ETSI EN 300 328** limits.

## 6. TRANSMITTER UNWANTED EMISSIONS IN THE OUT-OF-BAND DOMAIN

### 6.1. TEST CONDITIONS

Date of test : November 27, 2024  
Test performed by : Majid MOURZAGH  
Relative humidity (%) : 39  
Ambient temperature (°C) : 24

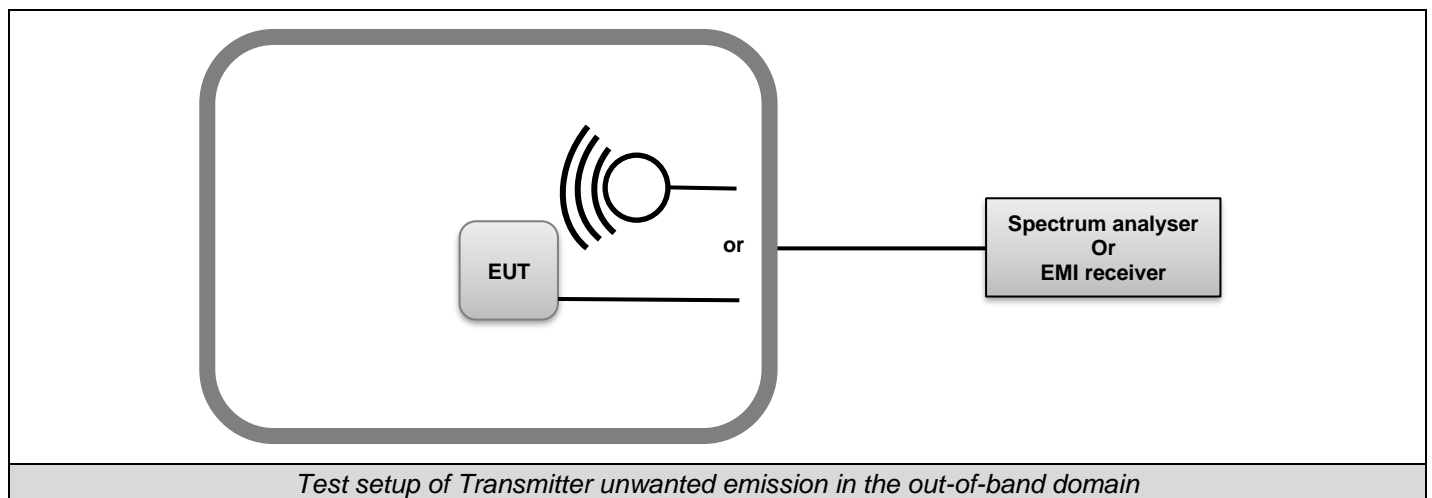
### 6.2. TEST SETUP

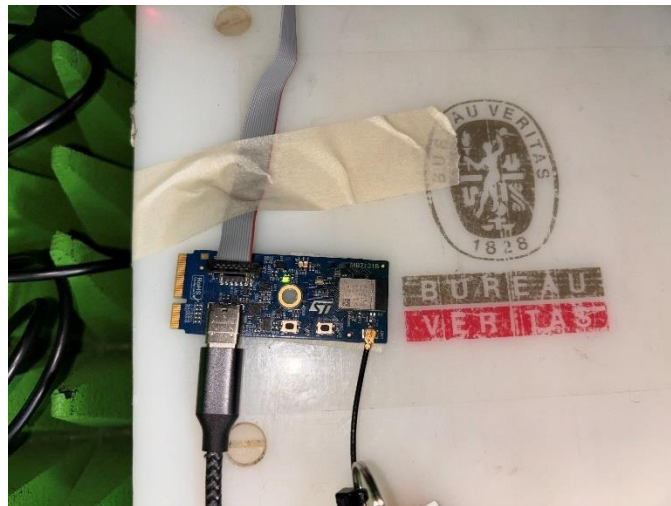
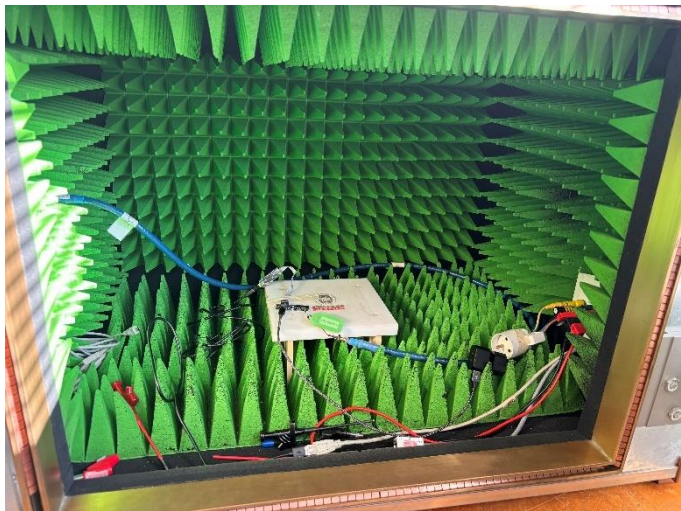
The Equipment Under Test is installed in an anechoic chamber.

Measurement is performed with a spectrum analyzer or receiver at the EUT conducted access.

The Transmitter unwanted emission in the out-of-band domain is measured in relation with the EIRP measured. In case of measurement on the EUT conducted access for smart antenna systems operating in a multiple transmits chains active simultaneously, each chain is measured separately with a spectrum analyzer.

Method of measurement used is Pre-scan Maxhold for each segment. If Pre-scan is above margin limit -6dB, then Time Domain Power is applied.

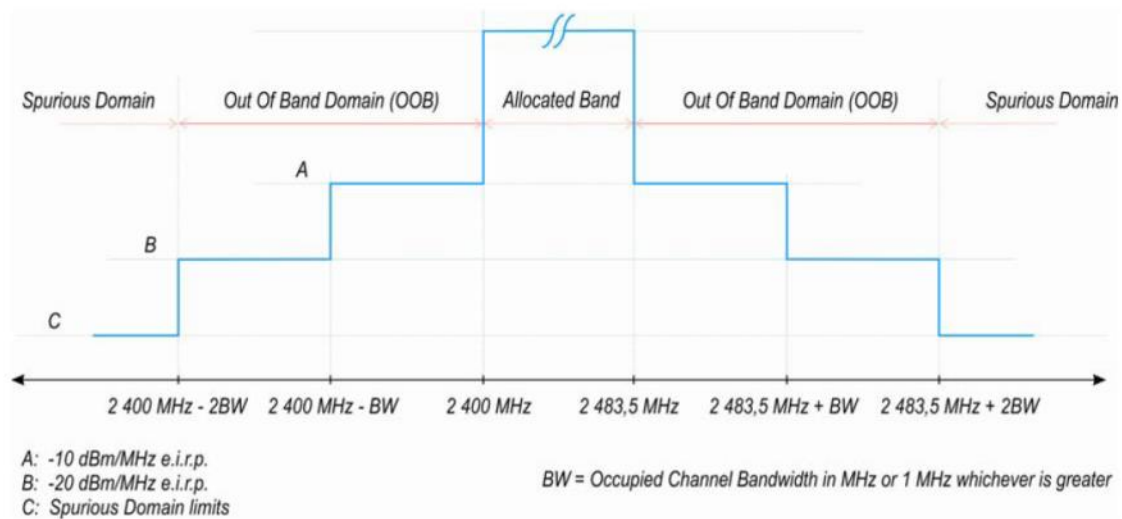




*Photo of Transmitter unwanted emission in the out-of-band domain*

### 6.3. LIMIT

The transmitter unwanted emissions in the out-of-band domain but outside the allocated band, shall not exceed the values provided by the following mask





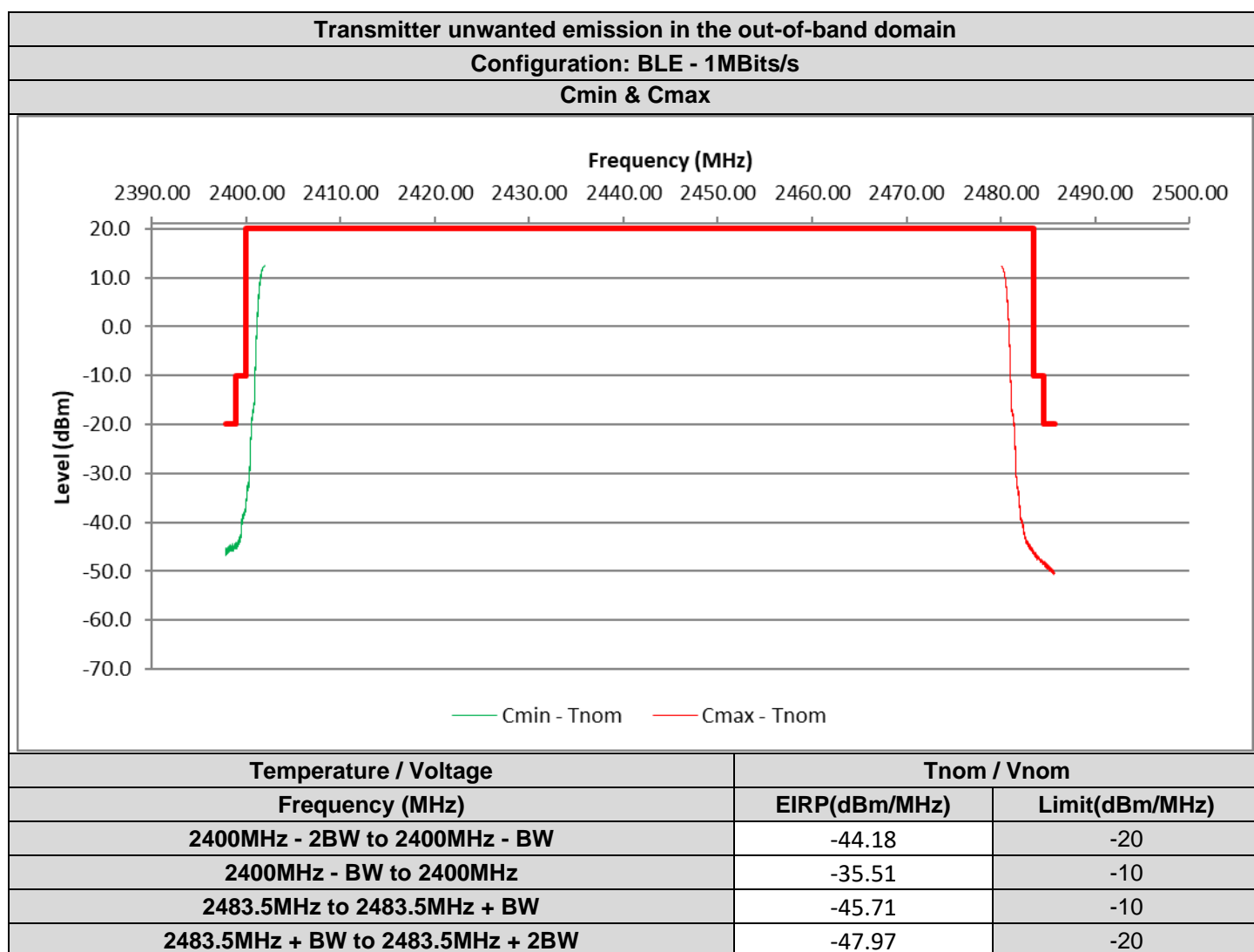
#### 6.4. TEST EQUIPMENT LIST

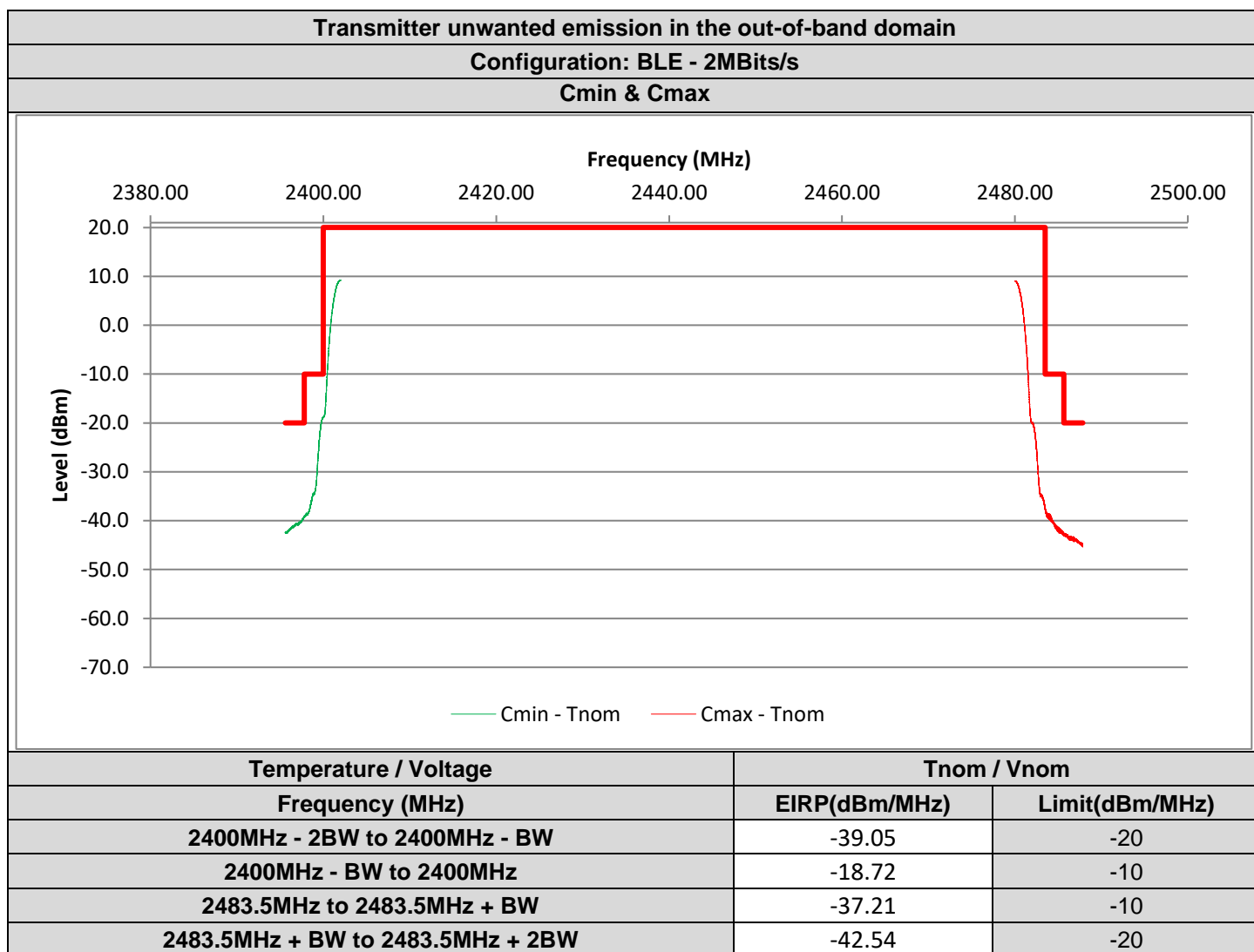
| TEST EQUIPMENT USED         |                 |        |            |          |         |
|-----------------------------|-----------------|--------|------------|----------|---------|
| Description                 | Manufacturer    | Model  | Identifier | Cal_Date | Cal_Due |
| Full Anechoic Room          | SIEPEL          | —      | D3044024   |          |         |
| Attenuator 10dB             | AEROFLEX        | —      | A7122267   | 10/23    | 10/25   |
| Multimeter - CEM            | FLUKE           | 87     | A1240251   | 10/23    | 10/25   |
| SMA 1.5m                    | SUCOFLEX        | 18GHz  | A5329864   | 10/23    | 02/25   |
| SMA 1.5m                    | SUCOFLEX        | 18GHz  | A5329863   | 08/24    | 08/25   |
| Spectrum analyzer           | ROHDE & SCHWARZ | FSV 40 | A4060059   | 04/24    | 04/26   |
| Thermo-hygrometer           | TESTO           | 608-H1 | B4204120   | 03/23    | 03/25   |
| Thermo-hygrometer (PM1/2/3) | KIMO            | HQ 210 | B4206022   | 05/23    | 05/25   |

#### 6.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

None

## 6.6. RESULTS





## 6.7. CONCLUSION

Transmitter unwanted emission in the out-of-band domain measurement performed on the sample of the product **STM32WBA5MMG**, Sn: **None**, in configuration and description presented in this test report, show levels **compliant** to the **ETSI EN 300 328** limits.



## 7. TRANSMITTER UNWANTED EMISSIONS IN SPURIOUS DOMAIN

### 7.1. TEST CONDITIONS

Date of test : November 21, 2024  
Test performed by : Majid MOURZAGH  
Relative humidity (%) : 40  
Ambient temperature (°C) : 23

### 7.2. TEST SETUP

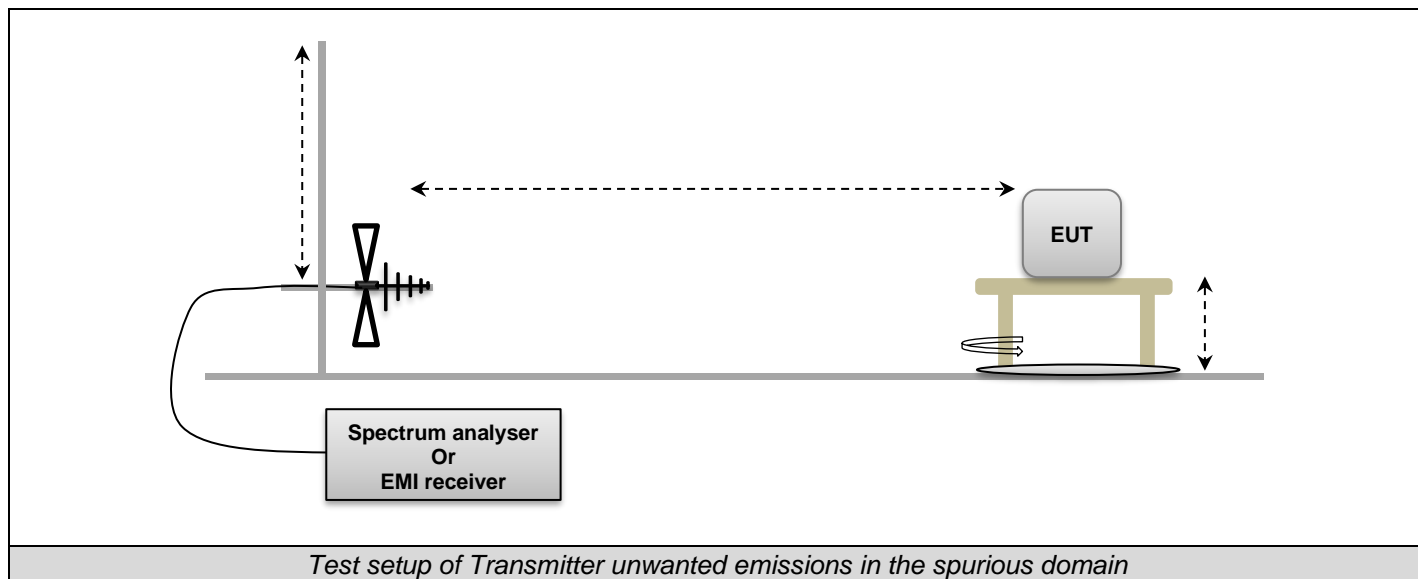
Method of measurement used is Effective Radiated Power, cabinet and antenna radiation.

Following frequency ranges, test setup parameters are different and specified in this table:

| Frequency range:        | 30MHz to 1GHz                           |                      |
|-------------------------|---|----------------------|
| Test:                   | Pre-Characterization                    | Qualification        |
| Antenna Polarization:   | Horizontal and Vertical                 |                      |
| Antenna Height:         | Centered on EUT                         | Varied from 1m to 4m |
| Antenna Type:           | Bi-Log                                  |                      |
| RBW Filter:             | 120kHz                                  |                      |
| Maximization:           | Turntable rotation of 360 degrees range |                      |
| EUT height:             | 1.5m                                    | 1.5m                 |
| Test site:              | Full Anechoic Chamber                   | Open Aera Test Site  |
| Distance EUT - Antenna: | 3m                                      | 10m                  |
| Detector:               | RMS                                     | RMS                  |
| Radiated Power:         | E.R.P                                   |                      |

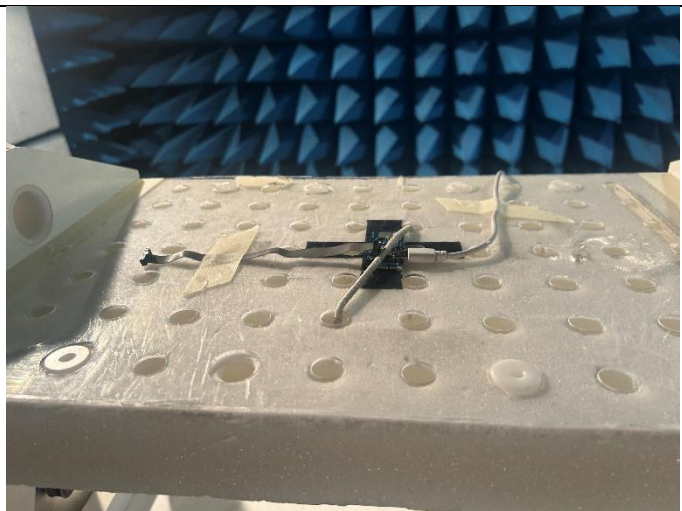
| Frequency range:        | 1GHz to 12.75GHz                        |                       |
|-------------------------|---|-----------------------|
| Test:                   | Pre-Characterization                    | Qualification         |
| Antenna Polarization:   | Horizontal and Vertical                 |                       |
| Antenna Height:         | Centered on EUT                         | Centered on EUT       |
| Antenna Type:           | Horn                                    |                       |
| RBW Filter:             | 1MHz                                    |                       |
| Maximization:           | Turntable rotation of 360 degrees range |                       |
| EUT height:             | 1.5m                                    | 1.5m                  |
| Test site:              | Full Anechoic Chamber                   | Full Anechoic Chamber |
| Distance EUT - Antenna: | 3m                                      | 3m                    |
| Detector:               | RMS                                     | RMS                   |
| Radiated Power:         | E.I.R.P                                 |                       |







Axis XY on FAR



Axis Z on FAR



*Photo of Transmitter unwanted emissions in the spurious domain*

### 7.3. LIMIT

| Transmitter unwanted emissions in the spurious domain |        |
|---|--------|
| Frequencies   | Limit  |
| 30MHz to 47MHz  | -36dBm |
| 47MHz to 74MHz  | -54dBm |
| 74MHz to 87,5MHz                                      | -36dBm |
| 87,5MHz to 118MHz                                     | -54dBm |
| 118MHz to 174MHz                                      | -36dBm |
| 174MHz to 230MHz                                      | -54dBm |
| 230MHz to 470MHz                                      | -36dBm |
| 470MHz to 694MHz                                      | -54dBm |
| 694MHz to 1GHz  | -36dBm |
| 1GHz to 2.4GHz  | -30dBm |
| 2.4835GHz to 12.75GHz                                 | -30dBm |



#### 7.4. TEST EQUIPMENT LIST

| TEST EQUIPMENT USED                 |                 |                  |               |          |         |
|-------------------------------------|-----------------|------------------|---------------|----------|---------|
| Description                         | Manufacturer    | Model            | Identifier    | Cal_Date | Cal_Due |
| Amplifier 10MHz - 18GHz             | LCIE SUD EST    | —                | A7102082      | 11/22    | 03/25   |
| Antenna Bi-log                      | AH System       | SAS-521-7        | C2040180      | 05/23    | 05/25   |
| BAT EMC                             | NEXIO           | v3.21.0.32       | L1000115      |          |         |
| Cable 0.75m                         | -               | 18GHz            | A5329900      | 08/24    | 08/26   |
| Cable SMA 40cm                      | WITHWAVE        | W101-SM1-0.4M    | A5329979      | 10/23    | 10/26   |
| CONTROLLER                          | INNCO           | CO3000           | D3044034      |          |         |
| Filter Matrice                      | LCIE SUD EST    | Combined filters | A7484078      | 03/23    | 03/25   |
| HF Radiated emission comb generator | LCIE SUD EST    | —                | A3169088      |          |         |
| Multimeter - CEM                    | FLUKE           | 87               | A1240251      | 10/23    | 10/25   |
| Rehausse Table C3                   | LCIE            | —                | F2000511      |          |         |
| Rehausse Table C3                   | LCIE            | —                | F2000507      |          |         |
| Semi-Anechoic chamber #3 (BF)       | SIEPEL          | —                | D3044017_BF   | 04/22    | 04/25   |
| Semi-Anechoic chamber #3 (VSWR)     | SIEPEL          | —                | D3044017_VSWR | 04/22    | 04/25   |
| SMA Cable 18GHz 0.5m                | TELEDYNE        | 18GHz            | A5330059      | 05/24    | 05/25   |
| SMA Cable 18GHz 0.5m                | TELEDYNE        | 18GHz            | A5330060      | 05/24    | 05/25   |
| SMA Cable 18GHz 0.6m                | TELEDYNE        | 18GHz            | A5330055      | 05/24    | 05/25   |
| SMA Cable 18GHz 3.5m                | TELEDYNE        | 18GHz            | A5330058      | 05/24    | 05/25   |
| SMA Cable 18GHz 6m                  | TELEDYNE        | 18GHz            | A5330057      | 05/24    | 05/25   |
| Spectrum analyzer                   | ROHDE & SCHWARZ | FSU 26           | A4060058      | 09/23    | 09/25   |
| Table C3                            | LCIE            | —                | F2000461      |          |         |
| Thermo-hygrometer (PM1/2/3)         | KIMO            | HQ 210           | B4206022      | 05/23    | 05/25   |
| TILT                                | INNCO           | TILT             | D3044033      |          |         |
| Turntable chamber (Cage#3)          | ETS Lingren     | Model 2165       | F2000371      |          |         |
| Turntable controller (Cage#3)       | ETS Lingren     | Model 2090       | F2000444      |          |         |

#### 7.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

None

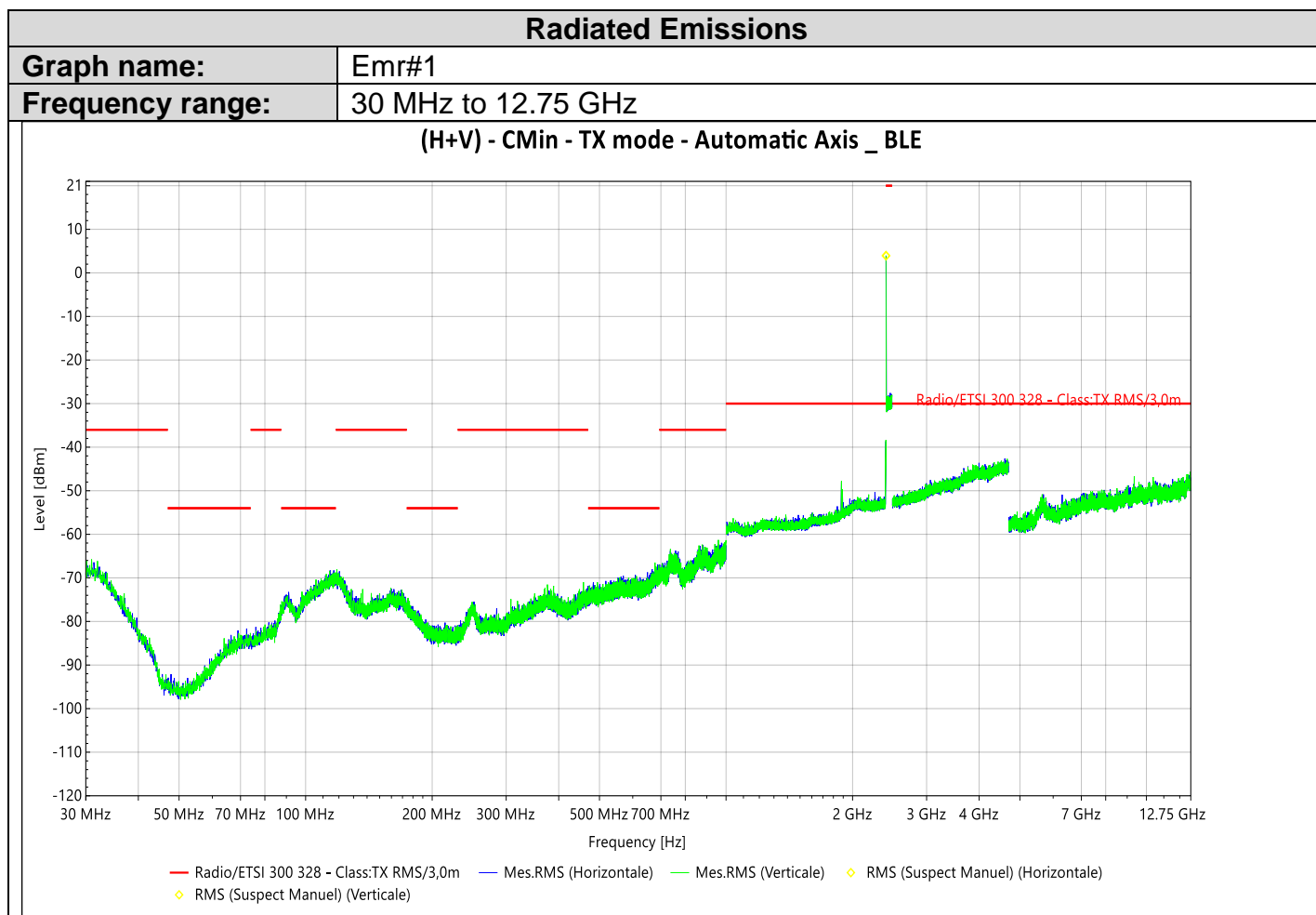
## 7.6. RESULTS

For all following measurements, worst case is presented with different configurations and modulations of EUT at nominal temperature and voltage.

### 7.6.1. 30MHz to 12.75GHz

#### Graphs – Pre characterization:

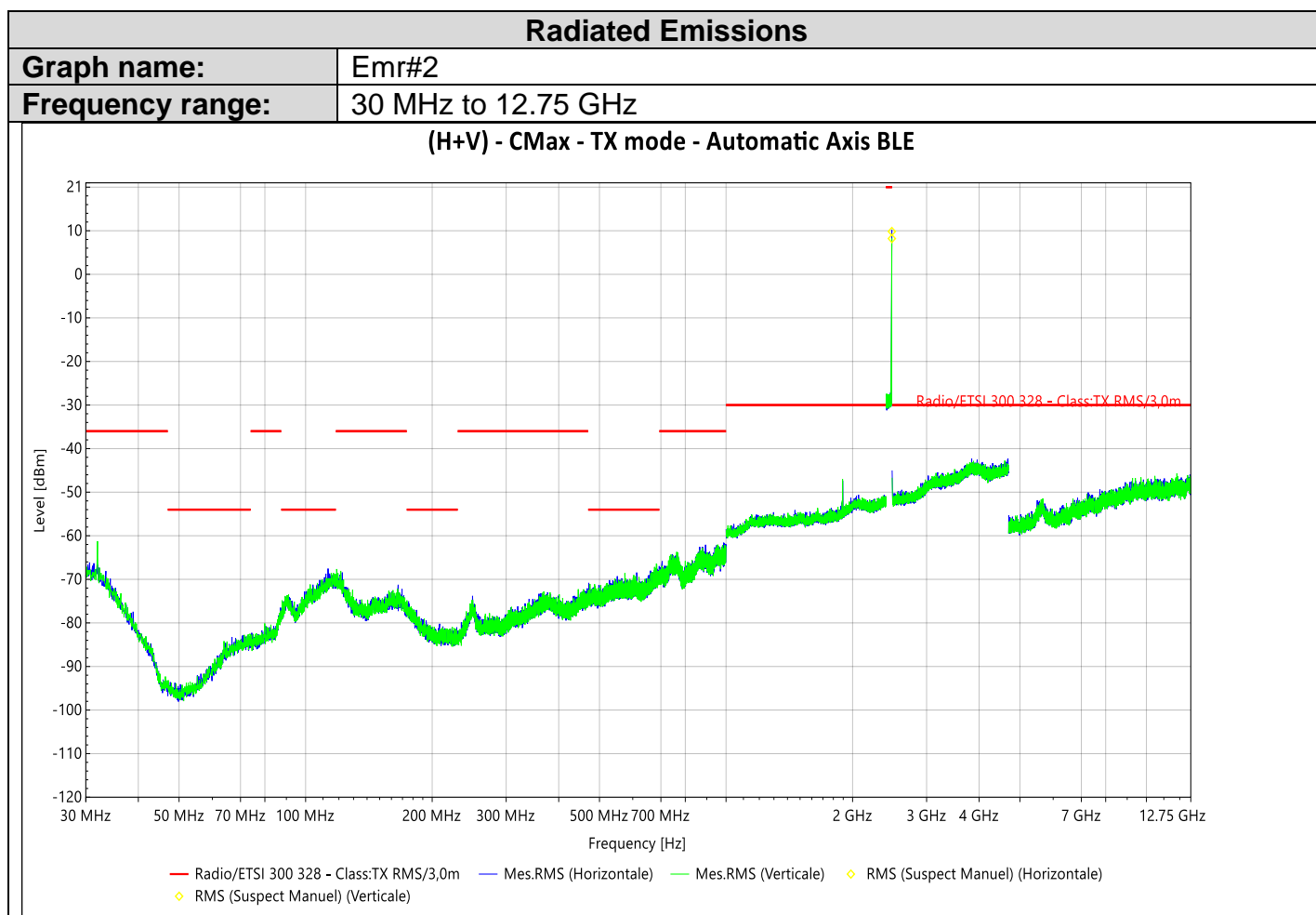
| Graph identifier | Polarization | Mode           | Channel | EUT position | Comments                  |
|------------------|--------------|----------------|---------|--------------|---------------------------|
| Emr# 1           | H/V          | BLE - 1Mbits/s | Cmin    | Axis XY/Z    | See the following results |
| Emr# 2           | H/V          | BLE - 1Mbits/s | Cmax    | Axis XY      | See the following results |



#### Pre-Characterization:

| Frequency  | RMS Level (dBm) | Lim.RMS (dBm) | Angle (°) | Polar. | Correct. (dB) |
|------------|-----------------|---------------|-----------|--------|---------------|
| 2.402 GHz* | 3.89            | 20.00         | 86        | H      | 46.59         |
| 2.402 GHz* | 4.00            | 20.00         | 85        | V      | 46.58         |

\*Carrier frequency



### Pre-Characterization:

| Frequency  | RMS Level (dBm) | Lim.RMS (dBm) | Angle (°) | Polar. | Correct. (dB) |
|------------|-----------------|---------------|-----------|--------|---------------|
| 2.480 GHz* | 9.83            | 20.00         | 83        | H      | 47.90         |
| 2.480 GHz* | 8.20            | 20.00         | 87        | V      | 47.90         |

\*Carrier frequency

### Final measurement:

No significant frequency observed, NSA margin >6dB

## 7.7. CONCLUSION

Transmitter unwanted emissions in the spurious domain measurement performed on the sample of the product **STM32WBA5MMG**, Sn: **None**, in configuration and description presented in this test report, show levels **compliant** to the **ETSI EN 300 328** limits.



## 8. RECEIVER SPURIOUS EMISSIONS

### 8.1. TEST CONDITIONS

Date of test : November 21, 2024  
Test performed by : Majid MOURZAGH  
Relative humidity (%) : 40  
Ambient temperature (°C) : 23

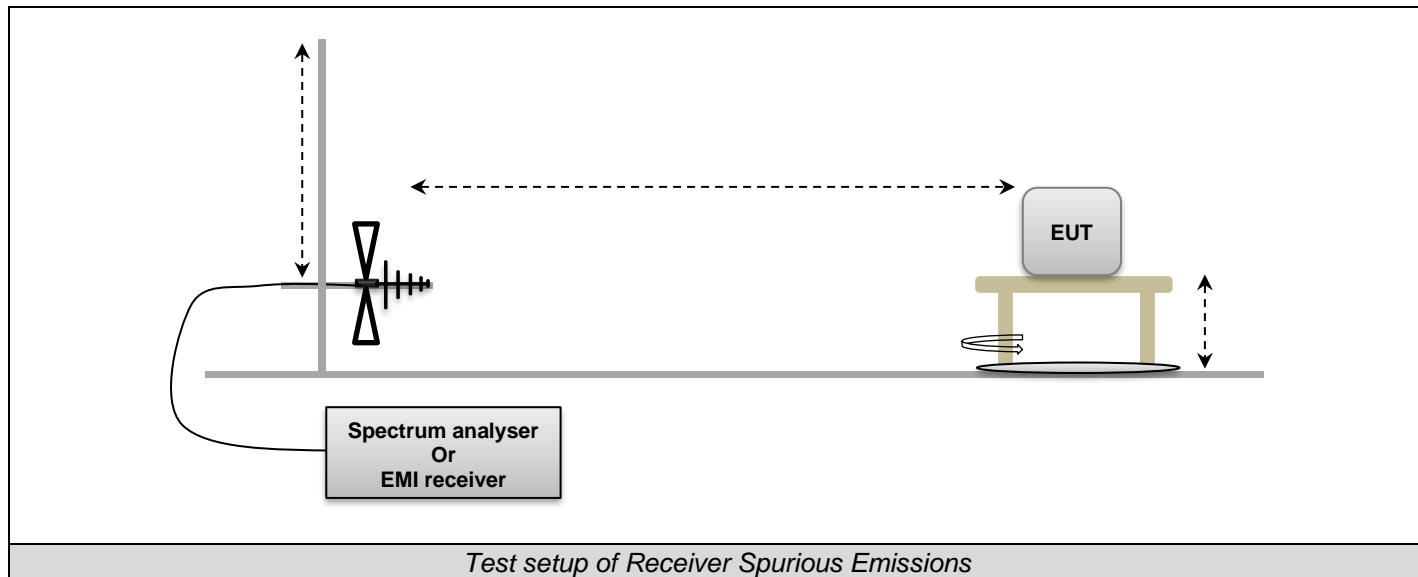
### 8.2. TEST SETUP

Method of measurement used is Effective Radiated Power, cabinet and antenna radiation.

Following frequency ranges, test setup parameters are different and specified in this table:

| Frequency range:        | 30MHz to 1GHz                           |                      |
|-------------------------|---|----------------------|
| Test:                   | Pre-Characterization                    | Qualification        |
| Antenna Polarization:   | Horizontal and Vertical                 |                      |
| Antenna Height:         | Centered on EUT                         | Varied from 1m to 4m |
| Antenna Type:           | Bi-Log                                  |                      |
| RBW Filter:             | 120kHz                                  |                      |
| Maximization:           | Turntable rotation of 360 degrees range |                      |
| EUT height:             | 1.5m                                    | 1.5m                 |
| Test site:              | Full Anechoic Chamber                   | Open Aera Test Site  |
| Distance EUT - Antenna: | 3m                                      | 10m                  |
| Detector:               | RMS                                     | RMS                  |
| Radiated Power:         | E.R.P                                   |                      |

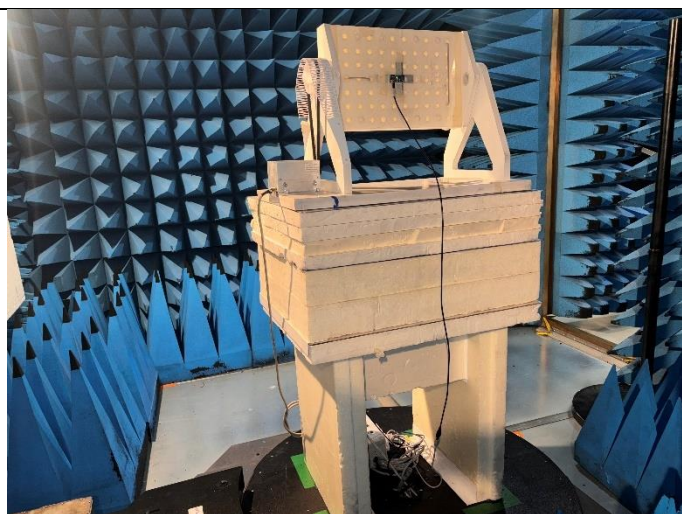
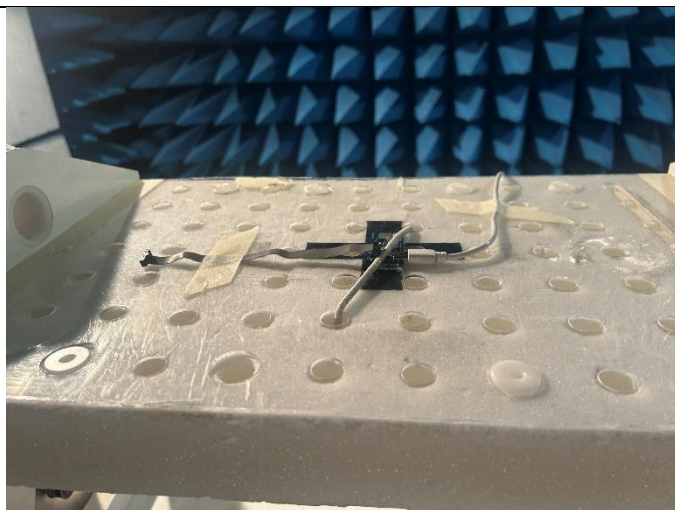
| Frequency range:        | 1GHz to 12.75GHz                        |                       |
|-------------------------|---|-----------------------|
| Test:                   | Pre-Characterization                    | Qualification         |
| Antenna Polarization:   | Horizontal and Vertical                 |                       |
| Antenna Height:         | Centered on EUT                         | Centered on EUT       |
| Antenna Type:           | Horn                                    |                       |
| RBW Filter:             | 1MHz                                    |                       |
| Maximization:           | Turntable rotation of 360 degrees range |                       |
| EUT height:             | 1.5m                                    | 1.5m                  |
| Test site:              | Full Anechoic Chamber                   | Full Anechoic Chamber |
| Distance EUT - Antenna: | 3m                                      | 3m                    |
| Detector:               | RMS                                     | RMS                   |
| Radiated Power:         | E.I.R.P                                 |                       |



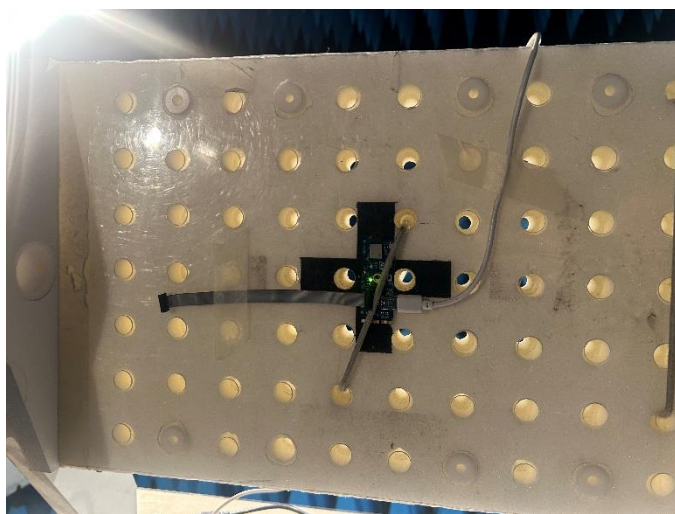




Axis XY on FAR



Axis Z on FAR



*Photo of Receiver Spurious Emissions*

### 8.3. **LIMIT**

| Receiver Spurious Emissions |        |
|-----------------------------|--------|
| Frequencies                 | Limit  |
| 30MHz to 1GHz               | -57dBm |
| 1GHz to 12.75GHz            | -47dBm |



#### 8.4. TEST EQUIPMENT LIST

| TEST EQUIPMENT USED                 |                 |                  |               |          |         |
|-------------------------------------|-----------------|------------------|---------------|----------|---------|
| Description                         | Manufacturer    | Model            | Identifier    | Cal_Date | Cal_Due |
| Amplifier 10MHz - 18GHz             | LCIE SUD EST    | —                | A7102082      | 11/22    | 03/25   |
| Antenna Bi-log                      | AH System       | SAS-521-7        | C2040180      | 05/23    | 05/25   |
| BAT EMC                             | NEXIO           | v3.21.0.32       | L1000115      |          |         |
| Cable 0.75m                         | -               | 18GHz            | A5329900      | 08/24    | 08/26   |
| Cable SMA 40cm                      | WITHWAVE        | W101-SM1-0.4M    | A5329979      | 10/23    | 10/26   |
| CONTROLLER                          | INNCO           | CO3000           | D3044034      |          |         |
| Filter Matrice                      | LCIE SUD EST    | Combined filters | A7484078      | 03/23    | 03/25   |
| HF Radiated emission comb generator | LCIE SUD EST    | —                | A3169088      |          |         |
| Multimeter - CEM                    | FLUKE           | 87               | A1240251      | 10/23    | 10/25   |
| Rehausse Table C3                   | LCIE            | —                | F2000511      |          |         |
| Rehausse Table C3                   | LCIE            | —                | F2000507      |          |         |
| Semi-Anechoic chamber #3 (BF)       | SIEPEL          | —                | D3044017_BF   | 04/22    | 04/25   |
| Semi-Anechoic chamber #3 (VSWR)     | SIEPEL          | —                | D3044017_VSWR | 04/22    | 04/25   |
| SMA Cable 18GHz 0.5m                | TELEDYNE        | 18GHz            | A5330059      | 05/24    | 05/25   |
| SMA Cable 18GHz 0.5m                | TELEDYNE        | 18GHz            | A5330060      | 05/24    | 05/25   |
| SMA Cable 18GHz 0.6m                | TELEDYNE        | 18GHz            | A5330055      | 05/24    | 05/25   |
| SMA Cable 18GHz 3.5m                | TELEDYNE        | 18GHz            | A5330058      | 05/24    | 05/25   |
| SMA Cable 18GHz 6m                  | TELEDYNE        | 18GHz            | A5330057      | 05/24    | 05/25   |
| Spectrum analyzer                   | ROHDE & SCHWARZ | FSU 26           | A4060058      | 09/23    | 09/25   |
| Table C3                            | LCIE            | —                | F2000461      |          |         |
| Thermo-hygrometer (PM1/2/3)         | KIMO            | HQ 210           | B4206022      | 05/23    | 05/25   |
| TILT                                | INNCO           | TILT             | D3044033      |          |         |
| Turntable chamber (Cage#3)          | ETS Lingren     | Model 2165       | F2000371      |          |         |
| Turntable controller (Cage#3)       | ETS Lingren     | Model 2090       | F2000444      |          |         |

#### 8.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

None

## 8.6. RESULTS

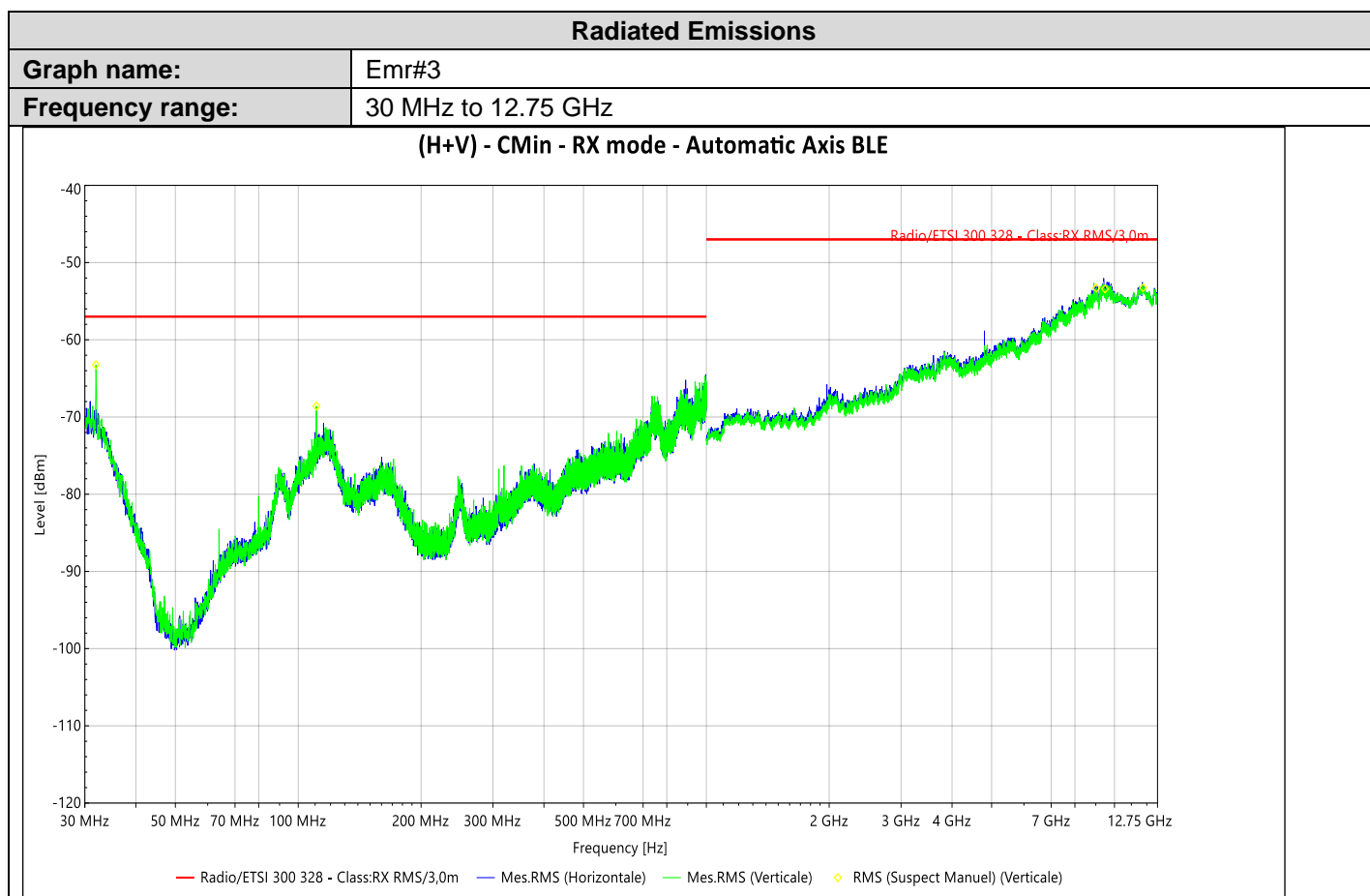
For all following measurements, worst case is presented with different configurations and modulations of EUT at nominal temperature and voltage.

### 8.6.1. 30MHz to 1GHz

Graphs – Pre characterization:

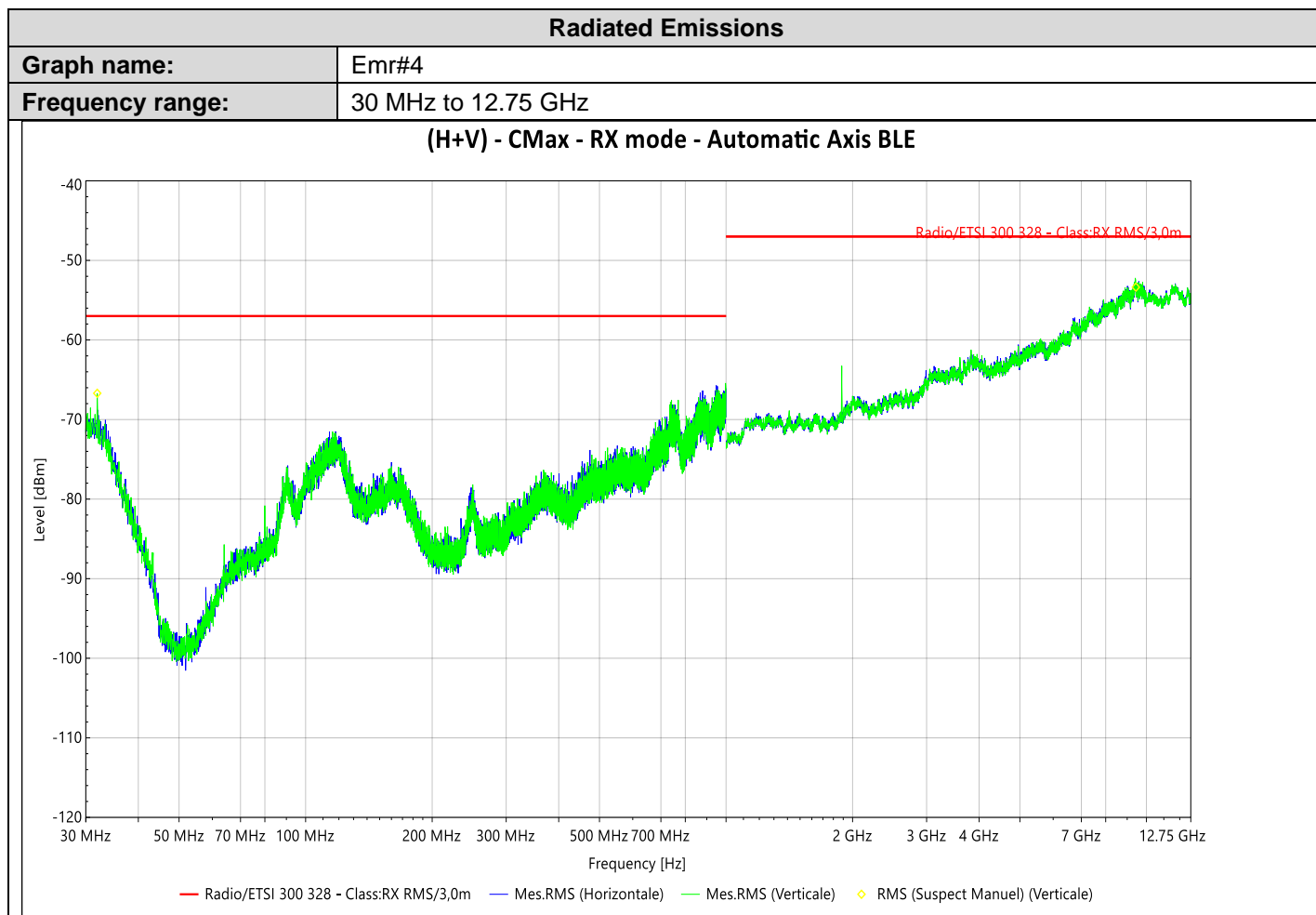
Worst case presented

| Graph identifier | Polarization | Mode           | Channel | EUT position | Comments                  |
|------------------|--------------|----------------|---------|--------------|---------------------------|
| Emr# 3           | H/V          | BLE - 1Mbits/s | Cmin    | Axis XY/Z    | See the following results |
| Emr# 4           | H/V          | BLE - 1Mbits/s | Cmax    | Axis XY/Z    | See the following results |



Pre-Characterization:

| Frequency   | Lim.PK (dBm) | RMS Level (dBm) | Lim.RMS (dBm) | Angle (°) | Polar. | Correct. (dB) |
|-------------|--------------|-----------------|---------------|-----------|--------|---------------|
| 11.753 GHz  | -47.00       | -53.24          | -47.00        | 157       | V      | 1.30          |
| 9.021 GHz   | -47.00       | -53.30          | -47.00        | 103       | V      | 0.56          |
| 9.485 GHz   | -47.00       | -53.41          | -47.00        | 48        | V      | 1.05          |
| 31.940 MHz  | -57.00       | -63.24          | -57.00        | 177       | V      | 12.32         |
| 110.801 MHz | -57.00       | -68.59          | -57.00        | 284       | V      | 11.57         |



**Pre-Characterization:**

| Frequency  | Lim.PK (dBm) | RMS Level (dBm) | Lim.RMS (dBm) | Angle (°) | Polar. | Correct. (dB) |
|------------|--------------|-----------------|---------------|-----------|--------|---------------|
| 9.437 GHz  | -47.00       | -53.37          | -47.00        | 297       | V      | 1.31          |
| 31.940 MHz | -57.00       | -66.70          | -57.00        | 214       | V      | 12.32         |

**Final measurement:**

*No significant frequency observed, NSA margin >6dB*

**8.7. CONCLUSION**

Receiver Spurious Emissions measurement performed on the sample of the product **STM32WBA5MMG**, Sn: **None**, in configuration and description presented in this test report, show levels **compliant** to the **ETSI EN 300 328** limits.

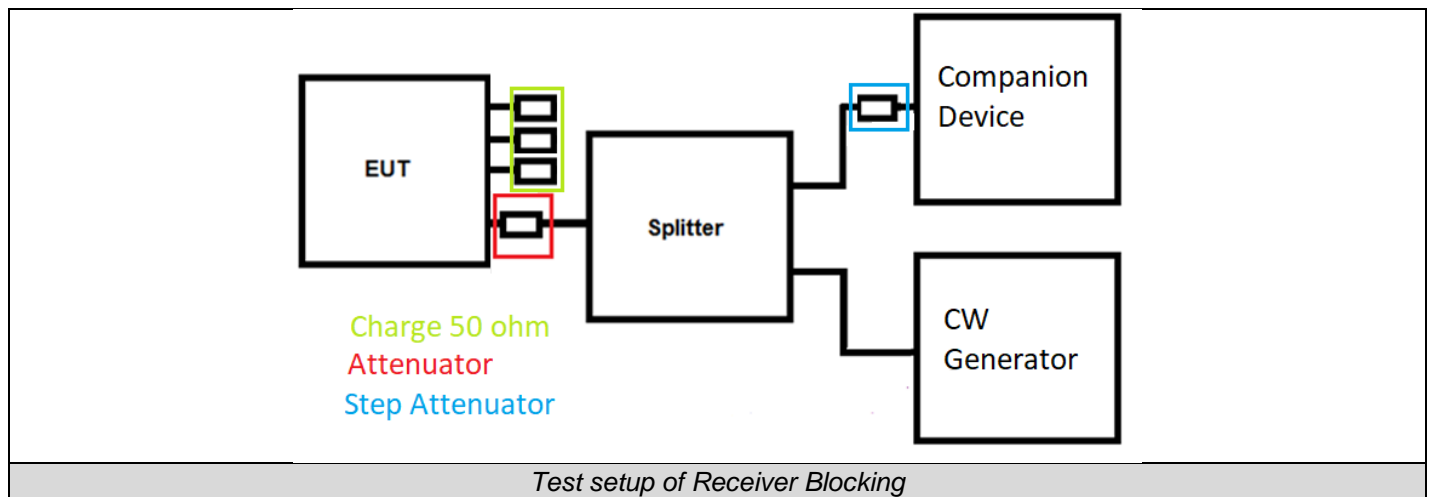
## 9. RECEIVER BLOCKING

### 9.1. TEST CONDITIONS

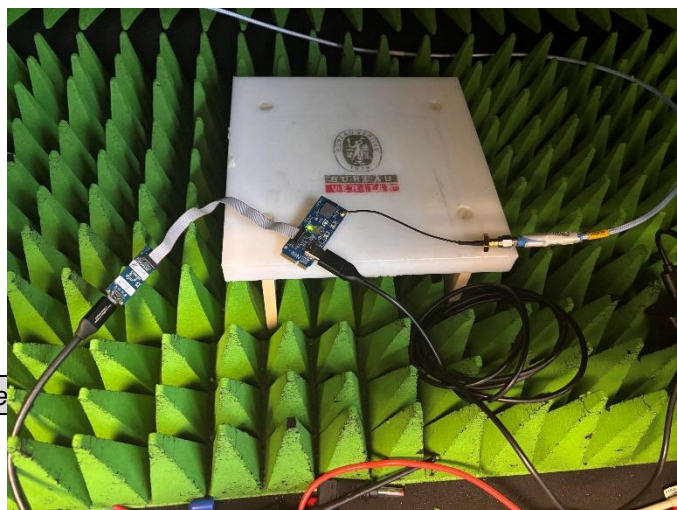
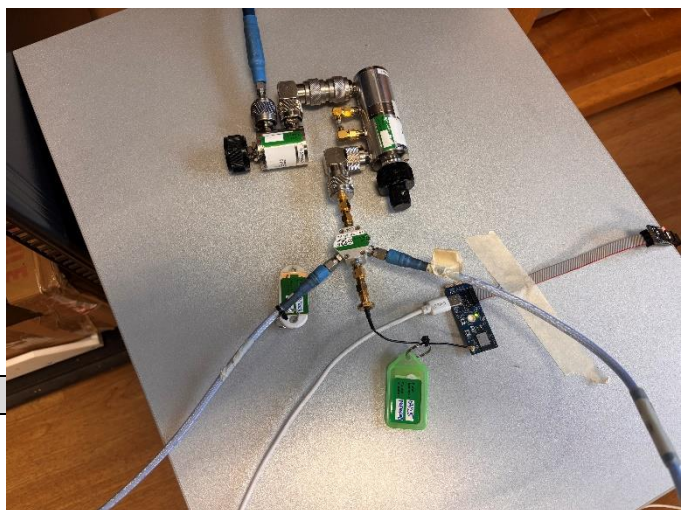
Date of test : November 29, 2024  
 Test performed by : Majid MOURZAGH  
 Relative humidity (%) : 39  
 Ambient temperature (°C) : 23

### 9.2. TEST SETUP

The Equipment Under Test is installed in an anechoic chamber.  
 Measurement is performed with a spectrum analyzer or receiver at the EUT conducted access.







### 9.3. LIMIT

#### Receiver Category 1

| Wanted signal mean power from companion device (dBm)<br>(see notes 1 and 4)                                       | Blocking signal frequency (MHz)          | Blocking signal power (dBm)<br>(see note 4) | Type of blocking signal |
|---|--|---|-------------------------|
| $(-133 \text{ dBm} + 10 \times \log_{10}(\text{OCBW}))$<br>or $-68 \text{ dBm}$ whichever is less<br>(see note 2) | 2380 / 2504                              | -53   | CW                      |
| $(-139 \text{ dBm} + 10 \times \log_{10}(\text{OCBW}))$<br>or $-74 \text{ dBm}$ whichever is less<br>(see note 3) | 2300 / 2330 / 2360<br>2524 / 2584 / 2674 | -47   | CW                      |

NOTE 1: OCBW is in Hz.

NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to  $P_{\min} + 26 \text{ dB}$  where  $P_{\min}$  is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.

NOTE 3: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to  $P_{\min} + 20 \text{ dB}$  where  $P_{\min}$  is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.

NOTE 4: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.

#### Receiver Category 2

| Wanted signal mean power from companion device (dBm)<br>(see notes 1 and 3)   | Blocking signal frequency (MHz) | Blocking signal power (dBm)<br>(see note 3) | Type of blocking signal |
|---|---------------------------------|---|-------------------------|
| $(-139 \text{ dBm} + 10 \times \log_{10}(\text{OCBW}) + 10 \text{ dB})$<br>or $(-74 \text{ dBm} + 10 \text{ dB})$ whichever is less<br>(see note 2) | 2380 / 2504<br>2300 / 2584      | -34   | CW                      |

NOTE 1: OCBW is in Hz.

NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to  $P_{\min} + 26 \text{ dB}$  where  $P_{\min}$  is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.

NOTE 3: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.

#### Receiver Category 3

| Wanted signal mean power from companion device (dBm)<br>(see notes 1 and 3)   | Blocking signal frequency (MHz) | Blocking signal power (dBm)<br>(see note 3) | Type of blocking signal |
|---|---------------------------------|---|-------------------------|
| $(-139 \text{ dBm} + 10 \times \log_{10}(\text{OCBW}) + 20 \text{ dB})$<br>or $(-74 \text{ dBm} + 20 \text{ dB})$ whichever is less<br>(see note 2) | 2380 / 2504<br>2300 / 2584      | -34   | CW                      |

NOTE 1: OCBW is in Hz.

NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to  $P_{\min} + 26 \text{ dB}$  where  $P_{\min}$  is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.

NOTE 3: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.



#### 9.4. TEST EQUIPMENT LIST

| TEST EQUIPMENT USED         |                 |              |            |          |         |
|-----------------------------|-----------------|--------------|------------|----------|---------|
| Description                 | Manufacturer    | Model        | Identifier | Cal_Date | Cal_Due |
| Cable 1m                    | HUBER & SUHNER  | 18GHz        | A5329705   | 07/23    | 07/25   |
| Cable 1m                    | HUBER & SUHNER  | 18GHz        | A5329706   | 07/23    | 07/25   |
| Full Anechoic Room          | SIEPEL          | —            | D3044024   |          |         |
| Multimeter - CEM            | FLUKE           | 87           | A1240251   | 10/23    | 10/25   |
| RADIMATION                  | RADIMATION      | 2023.2.4     | L1000139   |          |         |
| RF Power sensor             | DARE            | RPR3006W     | A1503032   | 11/24    | 11/26   |
| SMA 1.5m                    | SUCOFLEX        | 18GHz        | A5329864   | 10/23    | 02/25   |
| SMK 1.2m (Ampl <-> chamber) | HUBER-SUHNER    | SUCOFLEX 102 | A5330062   | 04/23    | 04/26   |
| Spectrum analyzer           | ROHDE & SCHWARZ | FSV 40       | A4060059   | 04/24    | 04/26   |
| Splitter                    | JFW             | 50PD-469     | A7132063   | 07/23    | 07/25   |
| Thermo-hygrometer           | TESTO           | 608-H1       | B4204120   | 03/23    | 03/25   |
| Variable Attenuator         | -               | ATR-100/10   | A7126012   | 02/24    | 02/26   |
| Variable Attenuator         | -               | ATR-10/1     | A7126013   | 02/24    | 02/26   |
| Vector Signal Generator     | ROHDE & SCHWARZ | SMJ100A      | A5400043   | 09/24    | 09/26   |

#### 9.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

None



## 9.6. RESULTS

| Temperature / Voltage                             |                        |                                 |                             | T <sub>nom</sub> / V <sub>nom</sub>                  |                        |
|---|------------------------|---------------------------------|-----------------------------|--|------------------------|
| Configuration: BLE - 1Mbits/s                     |                        |                                 |                             |  |                        |
| Receiver Category 2                               |                        |                                 |                             |  |                        |
| Blocking  |                        |                                 |                             |  |                        |
|   |                        |                                 |                             | Gain (dBi) :   | 1.88                   |
| Wanted signal mean power from companion device on |                        | Blocking signal Frequency (MHz) | Blocking signal Level (dBm) | Blocking signal measured following the Criteria Used |                        |
| C <sub>min</sub> (dBm)                            | C <sub>max</sub> (dBm) |                                 |                             | C <sub>min</sub> (dBm)                               | C <sub>max</sub> (dBm) |
| -67   | -67                    | 2380                            | -32.12                      | -2.9   | /                      |
| -67   | -67                    | 2504                            | -32.12                      | /  | -5.5                   |
| -67   | -67                    | 2300                            | -32.12                      | 5.4  | /                      |
| -67   | -67                    | 2584                            | -32.12                      | /  | 5.1                    |

## 9.7. CONCLUSION

Receiver Blocking measurement performed on the sample of the product **STM32WBA5MMG**, Sn: **None**, in configuration and description presented in this test report, show levels **compliant** to the **ETSI EN 300 328** limits.



## 10. ELECTROMAGNETIC FIELD

### 10.1. TEST CONDITIONS

Date of test : November 22, 2024  
Test performed by : Majid MOURZAGH  
Relative humidity (%) : 42  
Ambient temperature (°C) : 24

### 10.2. TEST SETUP

#### Calculation

With EIRP or ERP of EUT measured in this test report maximum reference level is calculated in using following formula and worst distance User-EUT = 10cm:

$$E = \frac{\sqrt{30PG_{(\theta,\phi)}}}{r}$$

### 10.3. LIMITS

| BAND           | Electric Field Limit @ 10cm |
|----------------|-----------------------------|
| 2400-2483.5MHz | 61.0V/m                     |

### 10.4. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

None

### 10.5. TEST RESULTS

| BLE - 1Mbits/s        |                                     |
|-----------------------|-------------------------------------|
| Temperature / Voltage | T <sub>nom</sub> / V <sub>nom</sub> |
| Channel               | <b>C0</b>                           |
| Frequency (MHz)       | <b>2402</b>                         |
| Reference Level (V/m) | 5.16                                |

### 10.6. CONCLUSION

EMF measurement, performed on the sample of the product **STM32WBA5MMG**, Sn: **None**, in configuration and description presented in this test report, show levels **compliant** to the Choisir une norme limits.

## 11. UNCERTAINTIES CHART

| <i>Kind of measurement</i>   | <i>Wide uncertainty laboratory</i> |
|--|------------------------------------|
| Occupied Channel Bandwidth   | ±2.8 %                             |
| Humidity   | ±3.2 %                             |
| Power Spectral Density, Conducted                                    | ±1.7 dB                            |
| Radio frequency  | ±0.3 ppm                           |
| RF power, conducted  | ±1.2 dB                            |
| RF power, radiated (Full anechoic chamber above 1GHz)                | ±3.7 dB                            |
| RF power, radiated (Semi anechoic chamber & open test site)          | ±5.6 dB                            |
| Spurious emission, conducted   | ±2.3 dB                            |
| Spurious emission, radiated (Full anechoic chamber above 1GHz)       | ±3.8 dB                            |
| Spurious emission, radiated (Semi anechoic chamber & open test site) | ±5.7 dB                            |
| Temperature  | ±0.75 °C                           |
| Time   | ±2.3 %                             |
| Voltage  | ±1.7 %                             |

The uncertainty values calculated by the laboratory are lower than limit uncertainty values defined by the standard. The conformity of the sample is directly established by the applicable limit values. This table includes all uncertainties maximum feasible for testing in the laboratory, whether or not made in this report.