

# Test Report

|                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Product</b>                                                                                                                                                                                                                                                                                                                                                                     | Beat Gateway                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Name and address of the applicant</b>                                                                                                                                                                                                                                                                                                                                           | Assa Abloy Global Solutions Czech Republic s.r.o.<br>Chlumecká 3203, Horní Počernice<br>198 00 Prague, Czech Republic                                                                                                                                                                                                                                                                                                                        |
| <b>Name and address of the manufacturer</b>                                                                                                                                                                                                                                                                                                                                        | Assa Abloy Global Solutions Czech Republic s.r.o.<br>Chlumecká 3203, Horní Počernice<br>198 00 Prague, Czech Republic                                                                                                                                                                                                                                                                                                                        |
| <b>Model</b>                                                                                                                                                                                                                                                                                                                                                                       | BGW/A1<br>BGW/A2                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Rating</b>                                                                                                                                                                                                                                                                                                                                                                      | BGW/A1: 6VDC (Primary Battery CR-P2)<br>BGW/A2: 12-24 V <sub>DC</sub>                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Trademark</b>                                                                                                                                                                                                                                                                                                                                                                   | Assa Abloy                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Additional information</b>                                                                                                                                                                                                                                                                                                                                                      | Bluetooth Low Energy, LTE                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Tested according to</b>                                                                                                                                                                                                                                                                                                                                                         | <b>ETSI EN 300 328 V2.2.2 (2019-07)</b><br>Wideband transmission systems; Data transmission equipment operating in the 2.4 GHz band;<br>Harmonised Standard for access to radio spectrum<br><b>ETSI EN 301 908-13 V13.2.1 (2022-02)</b><br>IMT cellular networks; Harmonised Standard for access to radio spectrum; Part 13: Evolved<br>Universal Terrestrial; Radio Access (E-UTRA) User Equipment (UE)                                     |
| <b>Order number</b>                                                                                                                                                                                                                                                                                                                                                                | PRJ0027408                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Tested in period</b>                                                                                                                                                                                                                                                                                                                                                            | 2024-01-16 to 2024-01-30                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Issue date</b>                                                                                                                                                                                                                                                                                                                                                                  | 2024-03-21                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Name and address of the testing laboratory</b>                                                                                                                                                                                                                                                                                                                                  | <br>Nemko Scandinavia AS<br>Instituttveien 6<br>2007 Kjeller, Norway<br>www.nemko.com <div style="display: flex; justify-content: space-around; align-items: center;">   </div> |
| An accredited technical test executed under the Norwegian accreditation scheme                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <br/> Prepared by [Frode Sveinsen] </div> <div style="width: 45%;"> <br/> Approved by [Jan G Eriksen] </div> </div> |                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| This report was originally distributed electronically with digital signatures. For more information, please contact Nemko Scandinavia AS.                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                              |

## Revision history

| Revision | Date       | Comment       | Sign |
|----------|------------|---------------|------|
| A        | 2024-03-21 | First edition | FS   |
|          |            |               |      |

## GENERAL REMARKS

This report applies only to the sample(s) tested. It is the manufacturer's responsibility to ensure the additional production units of this product are manufactured with identical electrical and mechanical components. The manufacturer is solely responsible for any modifications to the product that could result in non-compliance with the relevant regulations.

This report shall not be reproduced, except in full, without the written approval of Nemko.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Nemko Group accepts no responsibility for damage suffered by any third party because of decisions made or actions based on this report.

Opinions expressed within this report regarding general assessments and qualifications for PASS or FAIL to the standards limits and requirements, are not part of the current accreditation. Neither are opinions expressed regarding model variants covered by the testing of this report.

## CALIBRATION

All instruments used in the tests given in this test report are calibrated and traceable to national or international standards. Between calibrations all test set-ups are controlled and verified on a regular basis by periodic checks to ensure, with 95% confidence, that the instruments remain within the calibrated levels.

## MEASUREMENT UNCERTAINTY

Measurement uncertainties are calculated or considered for all instruments and instrument set-ups used during these tests. Uncertainty figures are found in a separate clause in this report.

## CONTENTS

|          |                                                             |           |
|----------|-------------------------------------------------------------|-----------|
| <b>1</b> | <b>TEST INFORMATION.....</b>                                | <b>4</b>  |
| 1.1      | Tested Item .....                                           | 4         |
| 1.2      | Normal test condition.....                                  | 4         |
| 1.3      | Test Engineer.....                                          | 4         |
| 1.4      | EUT Operating Modes.....                                    | 5         |
| 1.5      | Other Comments .....                                        | 5         |
| <b>2</b> | <b>TEST REPORT SUMMARY .....</b>                            | <b>5</b>  |
| 2.1      | General .....                                               | 5         |
| 2.2      | Abbreviations.....                                          | 5         |
| 2.3      | Test Summary .....                                          | 5         |
| <b>3</b> | <b>TEST RESULTS .....</b>                                   | <b>6</b>  |
| 3.1      | Transmitter spurious emissions - Radiated (Operating) ..... | 6         |
| <b>4</b> | <b>MEASUREMENT UNCERTAINTY .....</b>                        | <b>17</b> |
| <b>5</b> | <b>PHOTOS OF THE EUT.....</b>                               | <b>18</b> |
| <b>6</b> | <b>TEST SET-UP PHOTOS.....</b>                              | <b>19</b> |
| <b>7</b> | <b>TEST EQUIPMENT USED.....</b>                             | <b>20</b> |

# 1 Test Information

## 1.1 Tested Item

|                                  |                                                                                                                                                                                           |
|----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Name                             | Beat Gateway                                                                                                                                                                              |
| Model/version                    | BGW/A1<br>BGW/A2                                                                                                                                                                          |
| Serial number                    | PRJ00274080005                                                                                                                                                                            |
| Hardware identity and/or version | 1.0.0                                                                                                                                                                                     |
| Software identity and/or version | 0.0.1                                                                                                                                                                                     |
| Frequency Range                  | BLE: 2402 – 2480 MHz<br>LTE: 703-748, 832-862, 880-915, 1710-1785, 1920-1980 MHz                                                                                                          |
| Number of Channels               | BLE: 40                                                                                                                                                                                   |
| Channel Spacing                  | BLE: 2 MHz<br>LTE: 100 kHz                                                                                                                                                                |
| Operating Mode                   | Bluetooth Low Energy <input checked="" type="checkbox"/> 1MHz <input type="checkbox"/> 2MHz<br>LTE B1, B3, B8, B20, B28                                                                   |
| Type of Modulation               | BLE : GFSK<br>LTE : QPSK, 16QAM                                                                                                                                                           |
| Rated Output Power               | BLE: 5 mW<br>LTE: 200 mW                                                                                                                                                                  |
| Power Source                     | BGW/A1: Primary Batteries (6V <sub>DC</sub> , 2x CR-P2 or 4x CR-P2)<br>BGW/A2: External DC Supply (12-24V <sub>DC</sub> )                                                                 |
| Antenna Connector                | BLE: RP-SMA<br>LTE: SMA                                                                                                                                                                   |
| Antenna Type                     | BLE Antenna: Linx Technologies ANT-2.4-LCW-RPS (2400-2500 MHz)<br>LTE Antenna: Quectel YECT002AA (700-960, 1710-2690 MHz)<br>Dual Mode Antenna: 2J6947B (Cable length Min 20 cm, Max 2 m) |
| Diversity or Smart Antennas      | No                                                                                                                                                                                        |

### Description of Tested Device(s)

The EUT is a wireless gateway with Bluetooth Low Energy and LTE-M wireless interfaces.

The EUT uses LTE-M (Quectel BG95-M3 modem) to communicate with internet and BLE to communicate with locking devices.

All tests were performed on a BGW/A2 with powered from a regulated DC Power Supply.

## 1.2 Normal test condition

|                     |                |
|---------------------|----------------|
| Temperature         | 20.0 – 23.3 °C |
| Relative humidity   | 20.0 – 44.0 %  |
| Normal test voltage | 12 V DC        |

The values are the limit registered during the test period.

All tests have been performed with the EUT powered from a regulated power supply.

## 1.3 Test Engineer

Frode Sveinsen

## 1.4 EUT Operating Modes

|                                |                                                                                                                                                                                                                                                                                                                                            |
|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Description of operating modes | <p>The BLE transceiver was programmed using the Nordic Semiconductor nRF test software from a computer. The computer was connected to the USB-C interface when programming.</p> <p>The LTE module was controlled by the CMW500 radiocommunications tester and was set to transmit with maximum output power on a channel in each band.</p> |
|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## 1.5 Other Comments

The EUT have been tested to the radiated emissions tests in ETSI EN 300328 V2.2.2 with BLE and LTE both operating simultaneously.

# 2 TEST REPORT SUMMARY

## 2.1 General

The tests were conducted on a sample of the equipment for demonstrating compliance with the following standards:

| Standard                     | Description                                                                                                                                                |
|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| EN 300 328 V2.2.2 (2019-07)  | Wideband Transmission systems; Data transmission equipment operating in the 2,4GHz band; Harmonized Standard for access to radio spectrum                  |
| EN 301 908 V13.2.1 (2022-02) | IMT cellular networks; Harmonised Standard for access to radio spectrum; Part 13: Evolved Universal Terrestrial; Radio Access (E-UTRA) User Equipment (UE) |

The test methods have been in accordance with TM-NO-WLS-500, TM-NO-WLS-204A and EN 300 328 where applicable. Radiated tests were performed in accordance with TM-NO-WLS-500, TM-NO-WLS-204A and EN 300 328.

Radiated emissions are made in a 3m fully anechoic chamber.

|                                                     |
|-----------------------------------------------------|
| <input checked="" type="checkbox"/> Production Unit |
| <input type="checkbox"/> Pre-production Unit        |

## 2.2 Abbreviations

- N/A** Not applicable. The testcase is not applicable for the tested equipment.  
**N/T** Not tested. The testcase is not covered by this test report.

## 2.3 Test Summary

| Harmonized Standards                                  |                                                                       |         |
|-------------------------------------------------------|-----------------------------------------------------------------------|---------|
| Test Name                                             | Reference<br>Clause No                                                | Verdict |
| Transmitter unwanted emissions in the spurious domain | 4.3.1.10, 4.3.2.9, 5.4.9 (EN 300 328)<br>4.2.4, 5.3.3 (EN 301 908-13) | Pass*   |

\*Only emissions in the spurious domain caused by Intermodulation between BLE and LTE have been considered.

### 3 Test Results

#### 3.1 Transmitter spurious emissions - Radiated (Operating)

ETSI EN 300328 Clause 4.3.2.9

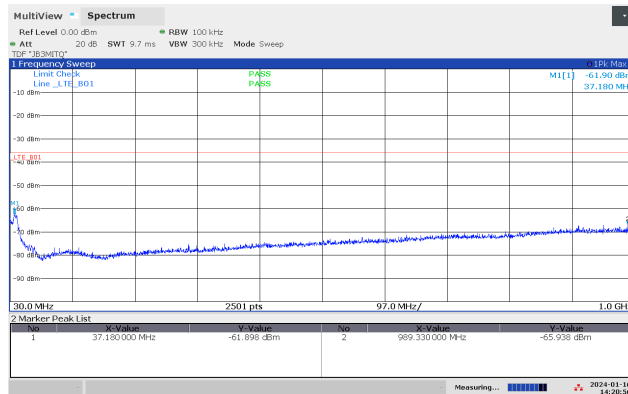
| Frequency (MHz)                | Spurious Emission Level (dBm) |
|--------------------------------|-------------------------------|
|                                | 1Mbps                         |
| 30 – 1000 MHz (limit: -54 dBm) | < -60                         |
| 30 – 1000 MHz (limit: -36 dBm) | < -50                         |
| 1000 – 12750 MHz               | < -35                         |

Measured values were corrected after substitution.

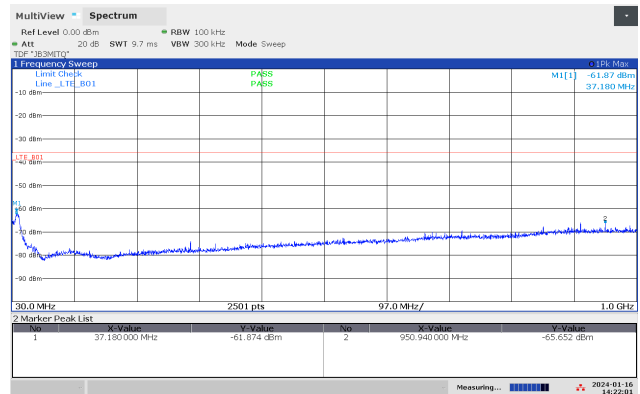
##### Limits:

| Frequency Range                                                                                        | Maximum power<br>e.r.p. ( $\leq 1$ GHz)<br>e.i.r.p. ( $> 1$ GHz) | Bandwidth |
|--------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|-----------|
| 30 MHz to 47 MHz<br>74 MHz to 87.5 MHz<br>118 MHz to 174 MHz<br>230 MHz to 470 MHz<br>694 MHz to 1 GHz | -36 dBm                                                          | 100 kHz   |
| 47 MHz to 74 MHz<br>87.5 MHz to 118 MHz<br>174 MHz to 230 MHz<br>470 MHz to 694 MHz                    | -54 dBm                                                          | 100 kHz   |
| 1 GHz to 12.75 GHz                                                                                     | -30 dBm                                                          | 1 MHz     |

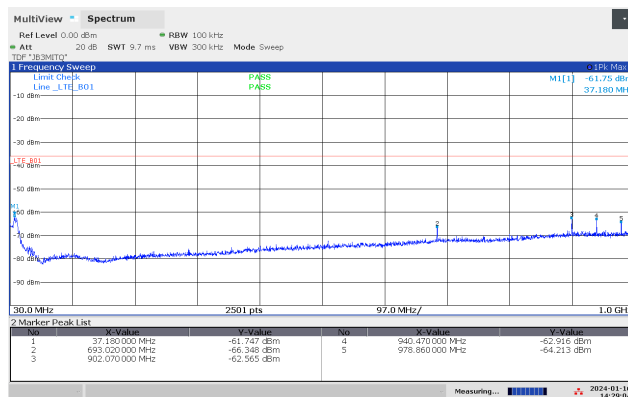
## LINX+Quectel Antenna



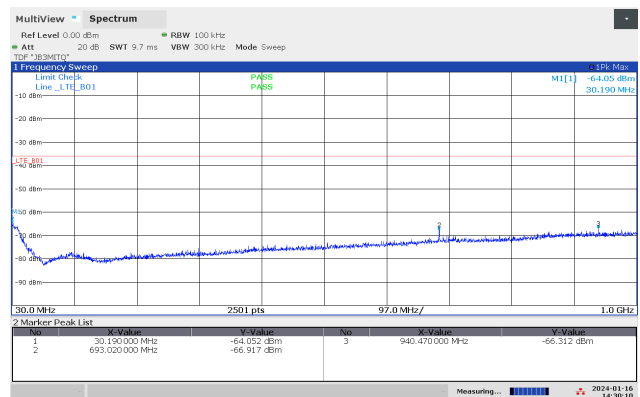
### Emissions 30-1000 MHz, BLE 2440 + LTE B01 Ch18300, VP



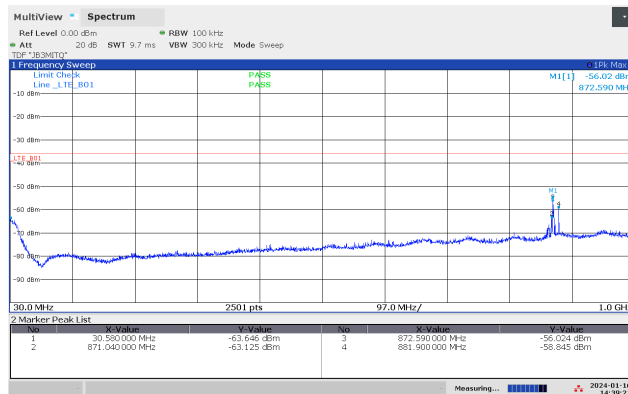
### HP



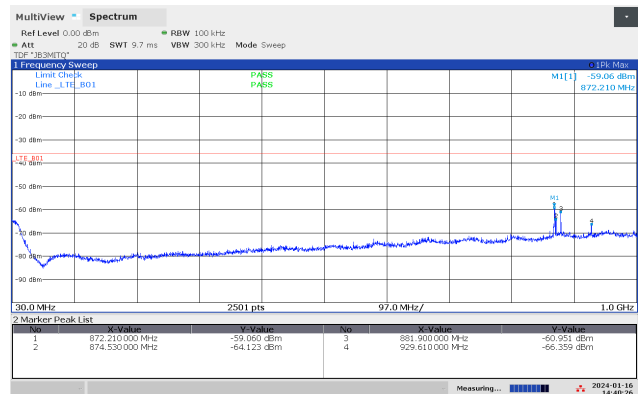
### Emissions 30-1000 MHz, BLE 2440 + LTE B03 Ch19575, VP



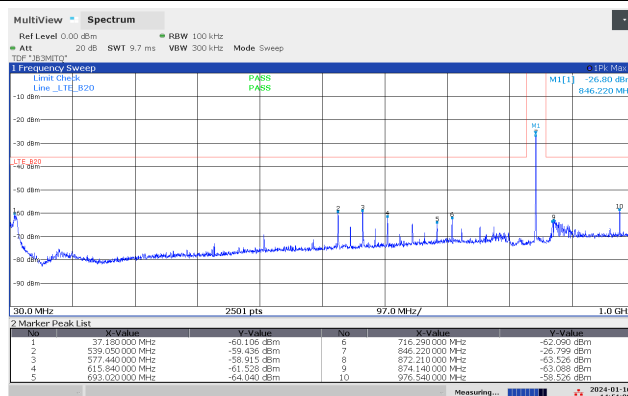
### HP



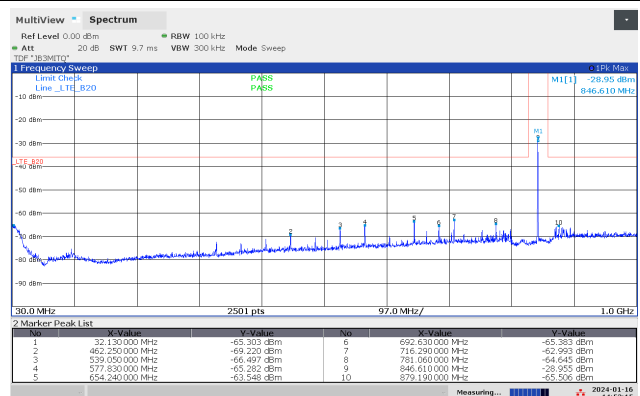
### Emissions 30-1000 MHz, BLE 2440 + LTE B08 Ch21475, VP



### HP

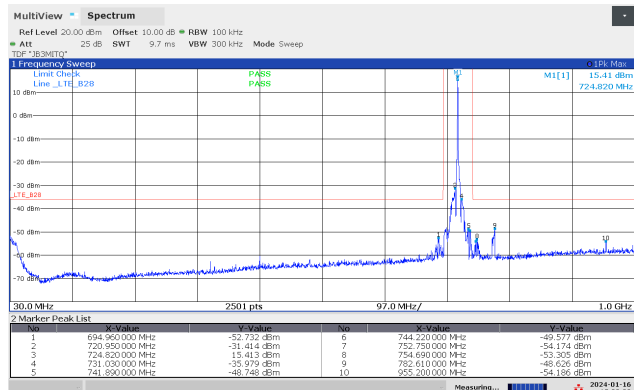


### Emissions 30-1000 MHz, BLE 2440 + LTE B20 Ch24300, VP

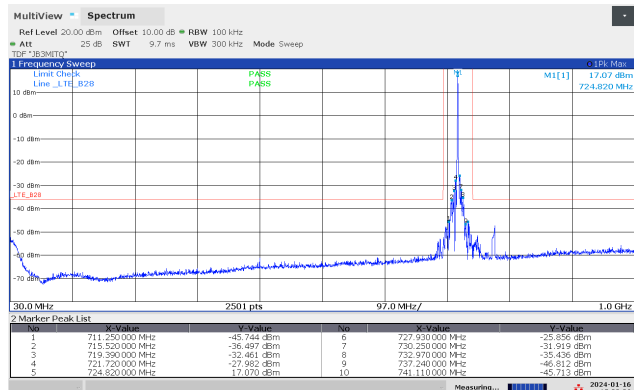


### HP

## LINX+Quectel Antenna

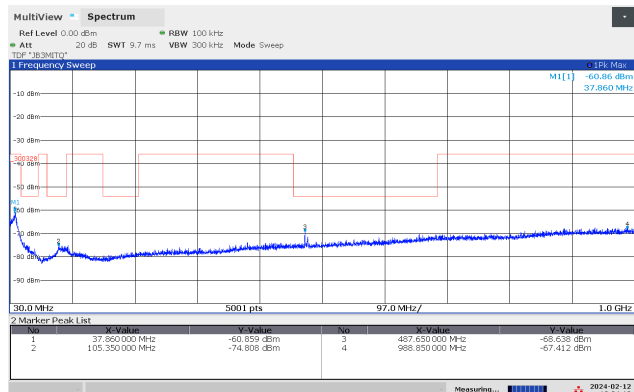


**Emissions 30-1000 MHz, BLE 2440 + LTE B28 Ch27435, VP**

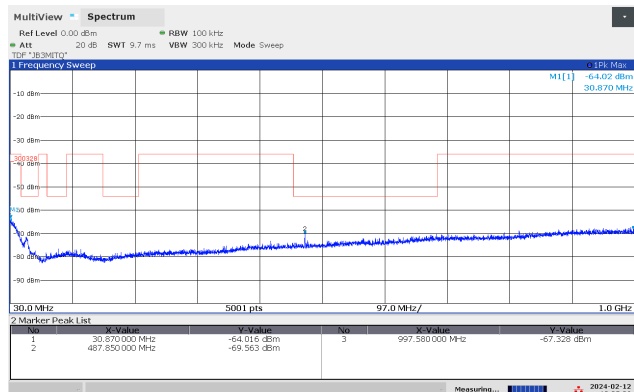


HP

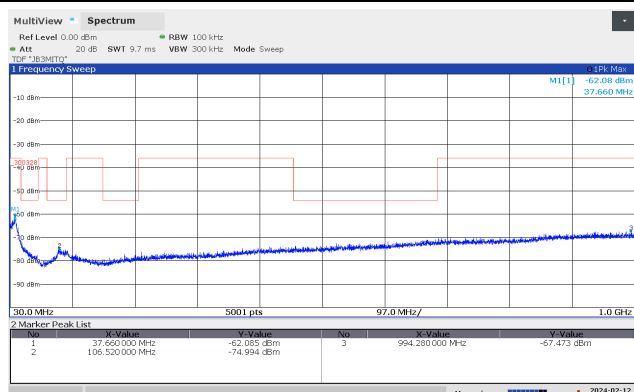
## 2J Antenna



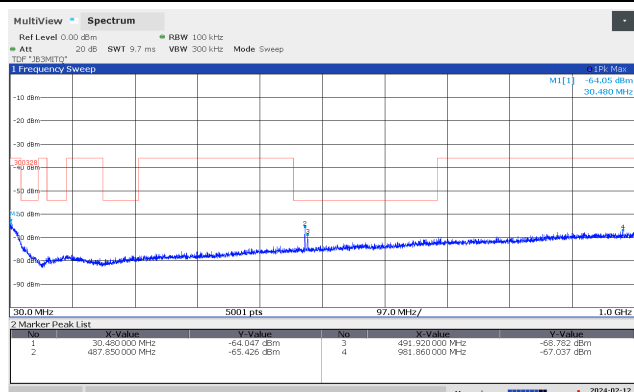
**Emissions 30-1000 MHz, BLE 2440 + LTE B01 Ch18300, EUT XY, VP**



HP

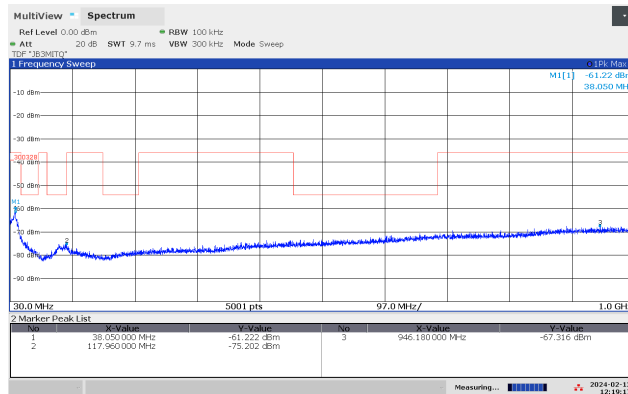


**Emissions 30-1000 MHz, BLE 2440 + LTE B01 Ch18300, EUT YZ, VP**

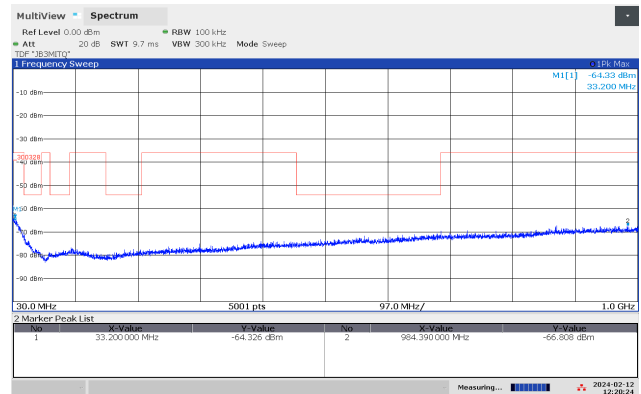


HP

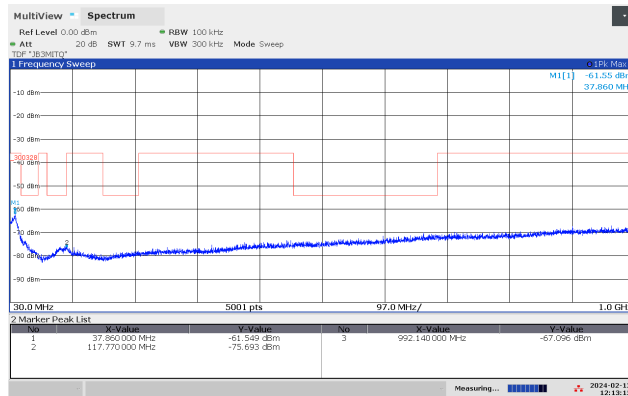
## 2J Antenna



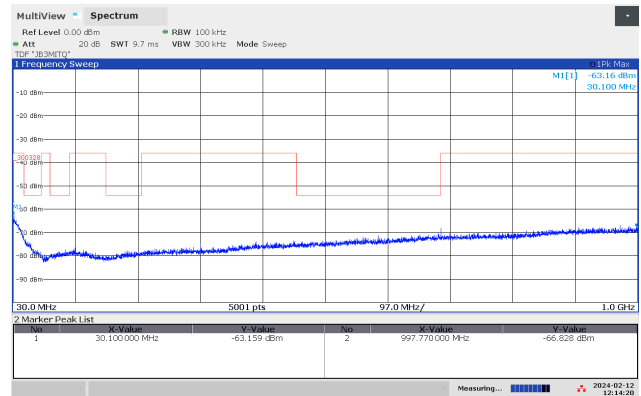
## Emissions 30-1000 MHz, BLE 2440 + LTE B03 Ch19575, EUT XY, VP



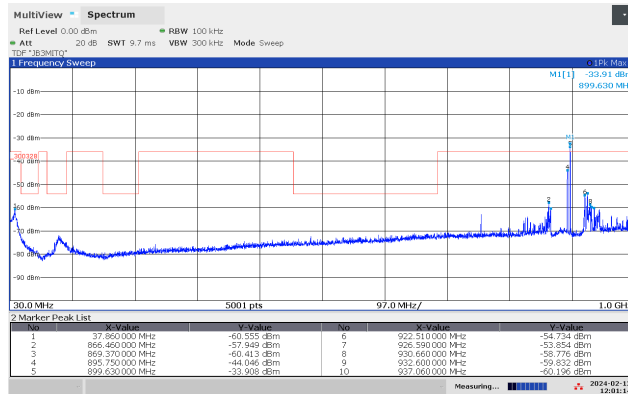
## HP



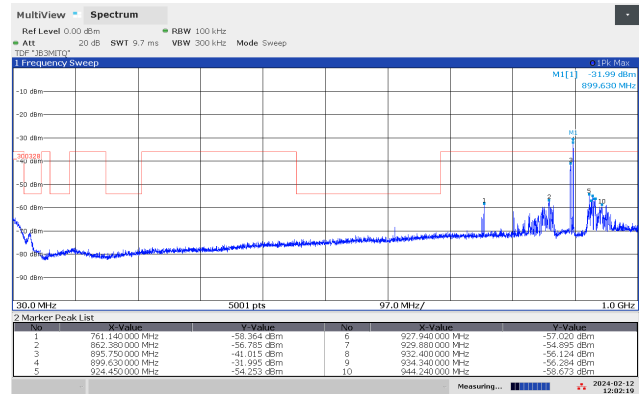
## Emissions 30-1000 MHz, BLE 2440 + LTE B03 Ch19575, EUT YZ, VP



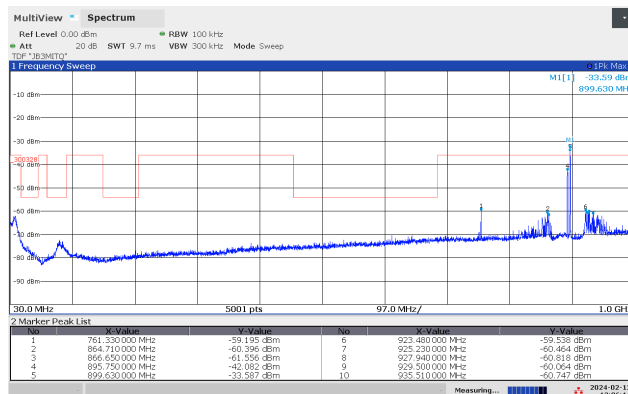
## HP



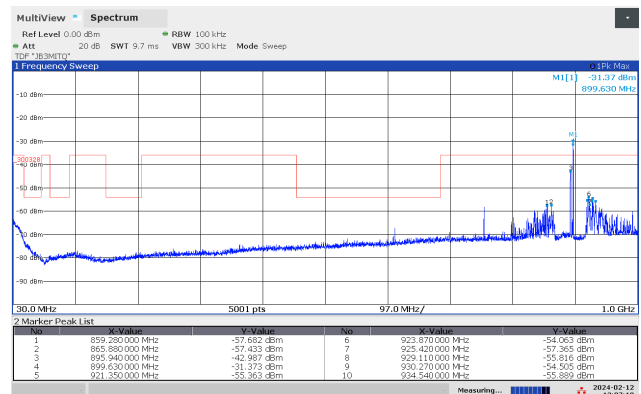
## Emissions 30-1000 MHz, BLE 2440 + LTE B08 Ch21625, EUT XY, VP



## HP

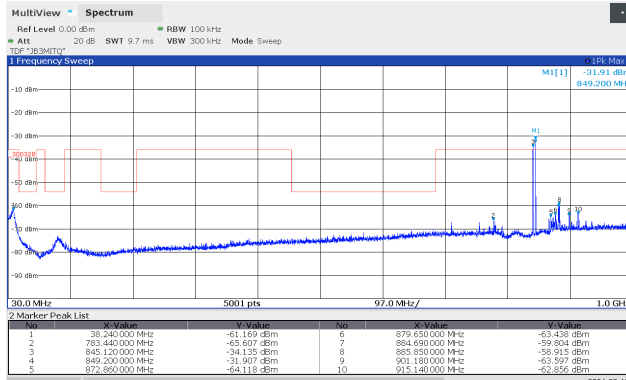


## Emissions 30-1000 MHz, BLE 2440 + LTE B08 Ch21625, EUT YZ, VP

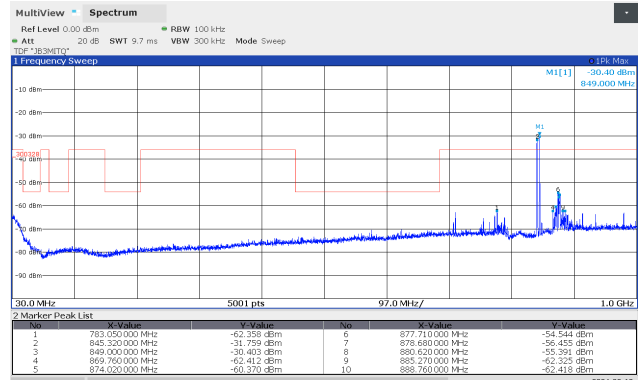


## HP

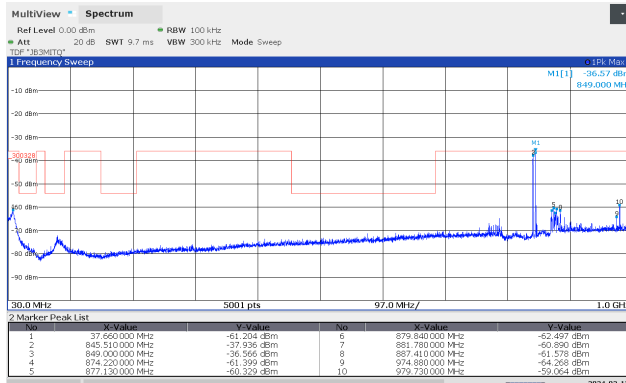
## 2J Antenna



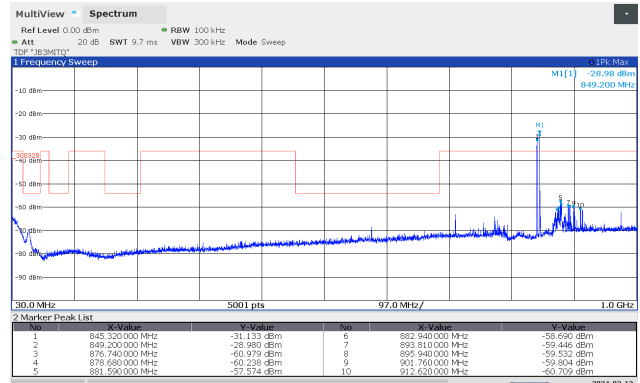
## Emissions 30-1000 MHz, BLE 2440 + LTE B20 Ch24300, EUT XY, VP



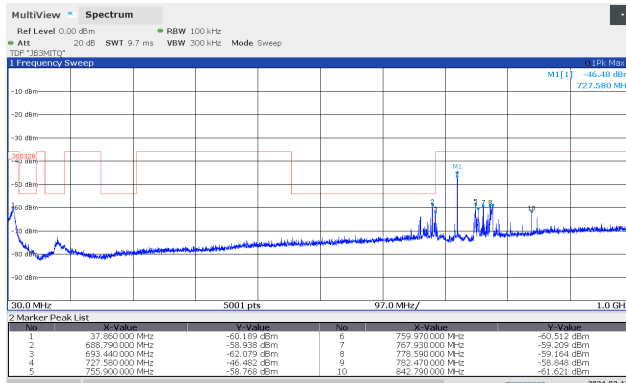
## HP



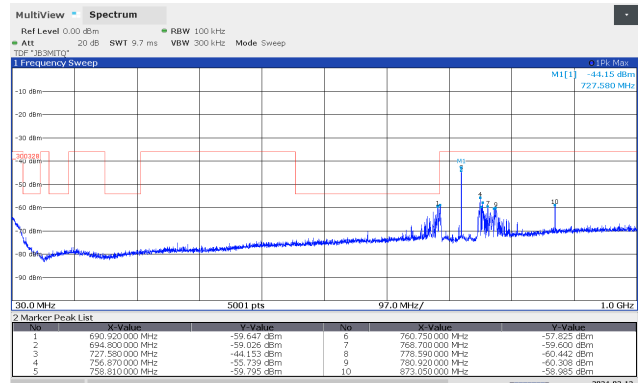
## Emissions 30-1000 MHz, BLE 2440 + LTE B20 Ch24300, EUT YZ, VP



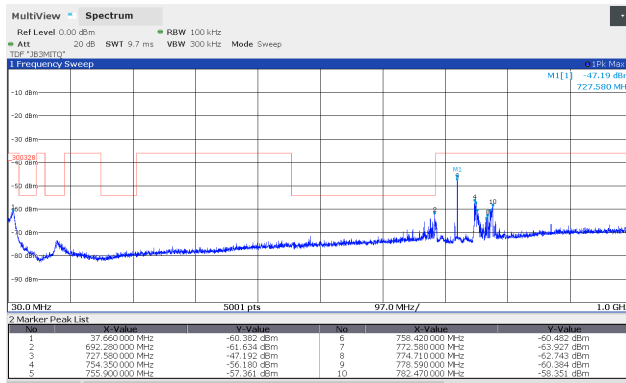
## HP



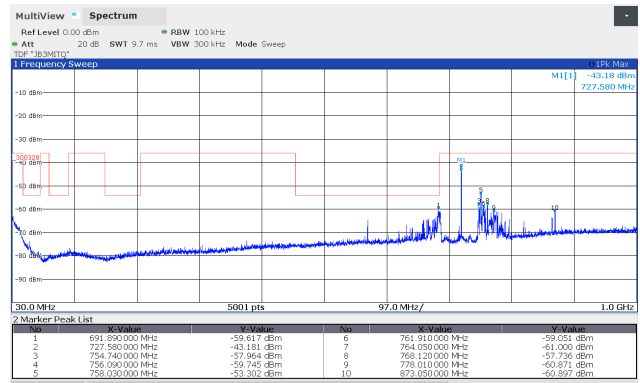
## Emissions 30-1000 MHz, BLE 2440 + LTE B28 Ch27435, EUT XY, VP



## HP

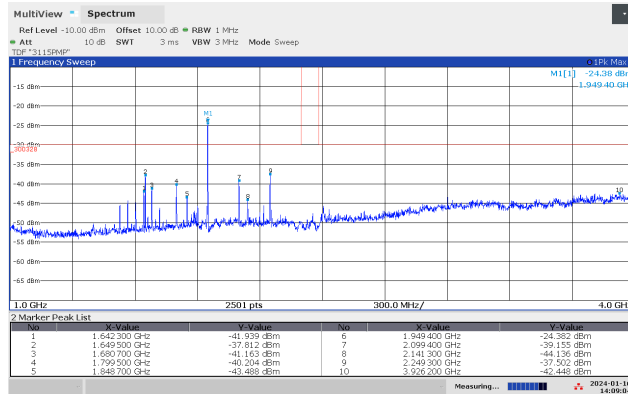


## Emissions 30-1000 MHz, BLE 2440 + LTE B28 Ch27435, EUT YZ, VP

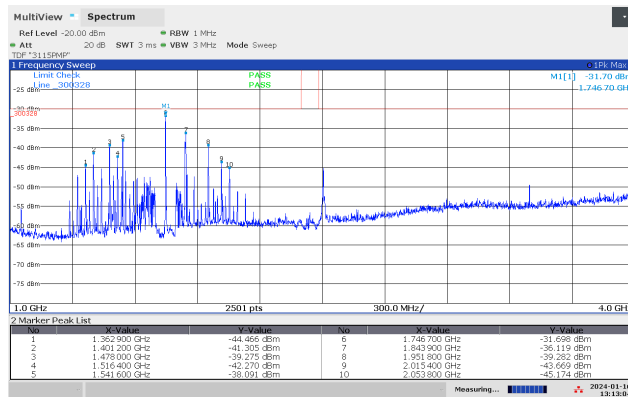


## HP

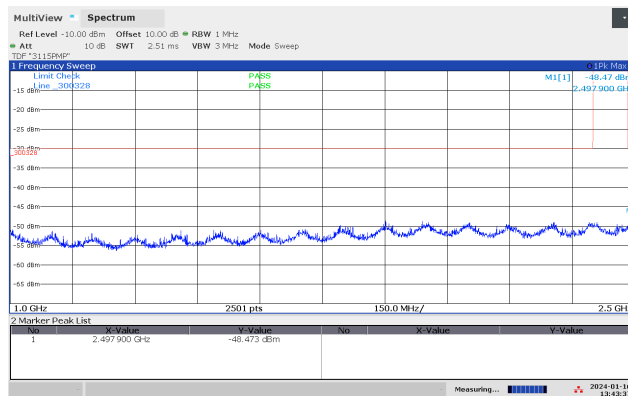
## LINX Antenna



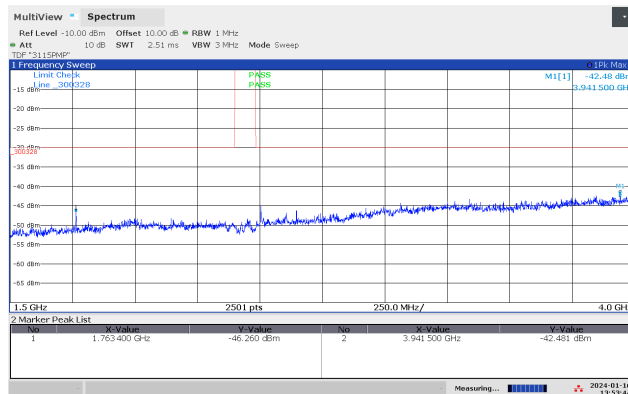
## Emissions 1-4 GHz, BLE 2440 + LTE B01 Ch18300, VP



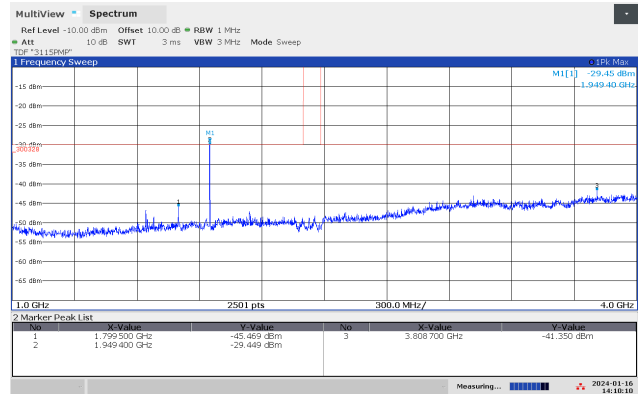
## Emissions 1-4 GHz, BLE 2440 + LTE B03 Ch19575, VP



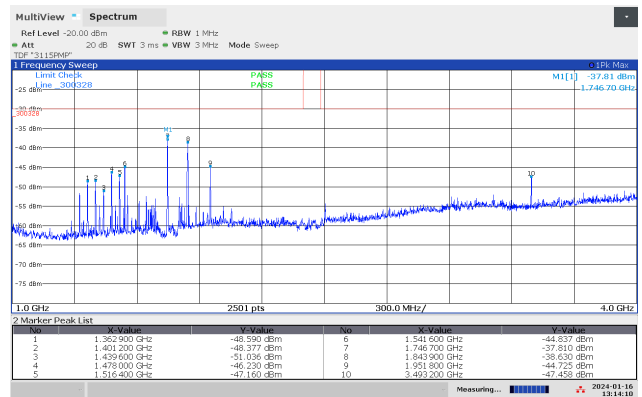
## Emissions 1-2.5 GHz, BLE 2440 + LTE B08 Ch19575, VP



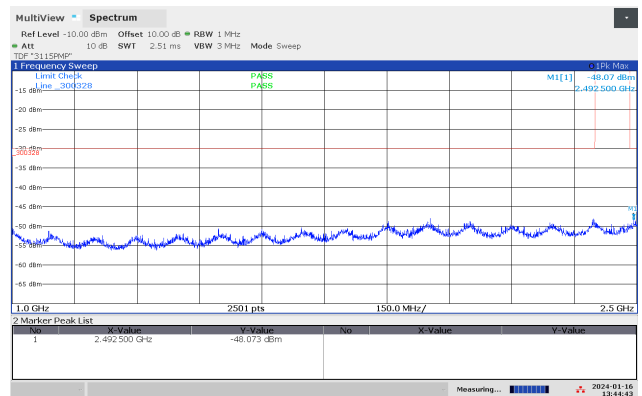
## Emissions 1.5-4 GHz, BLE 2440 + LTE B08 Ch19575, VP



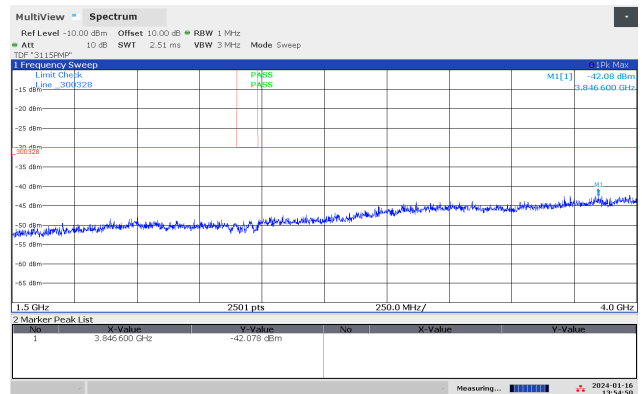
## HP



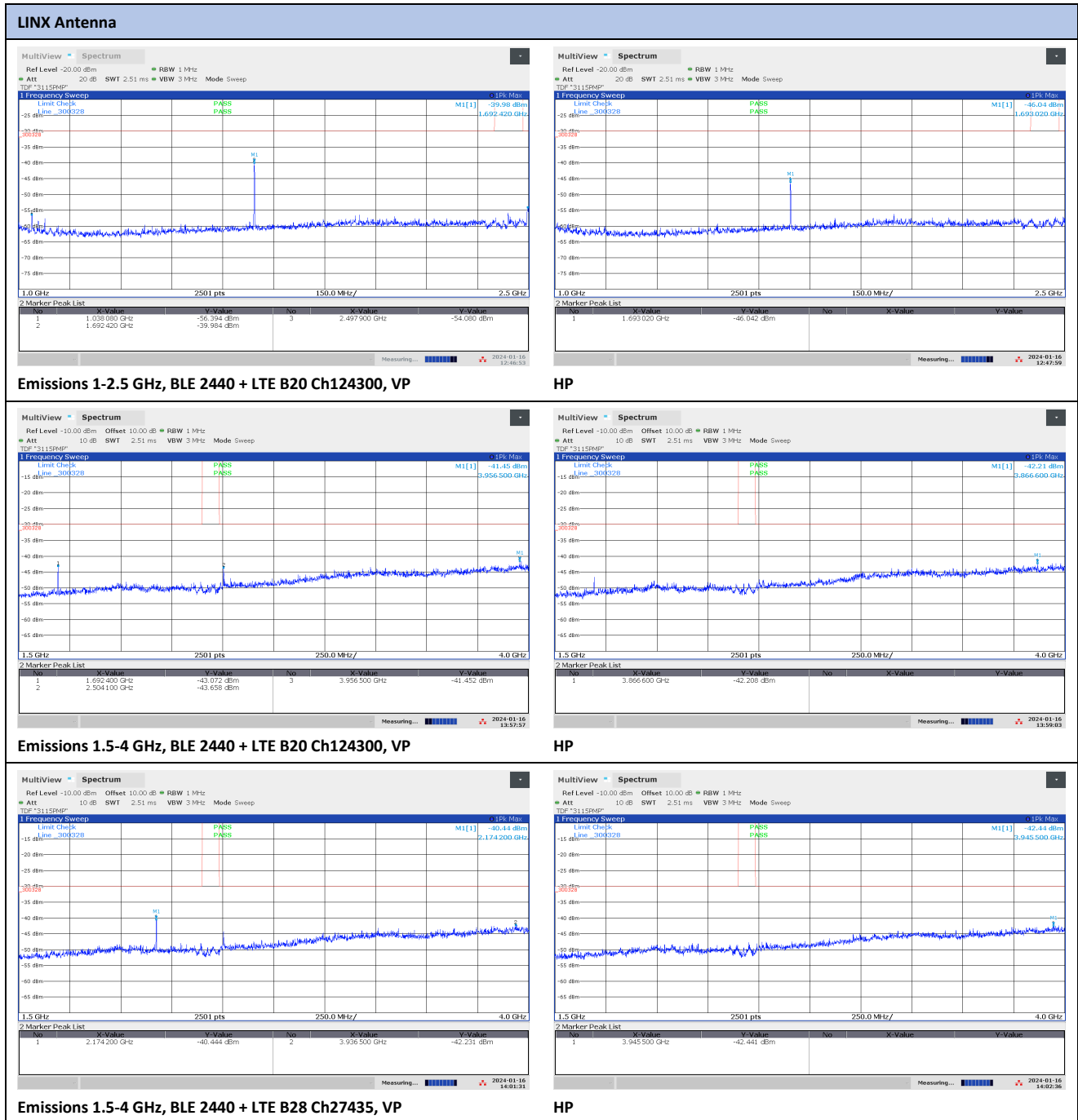
## HP



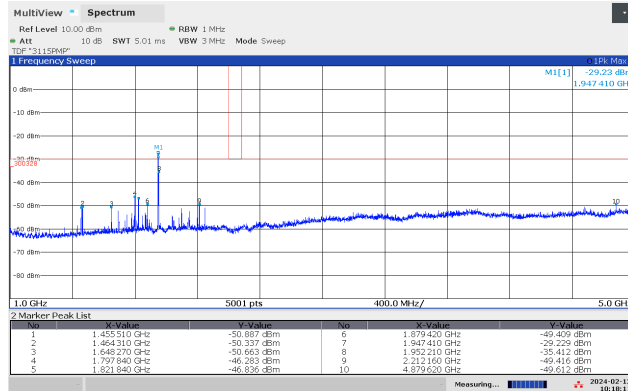
## HP



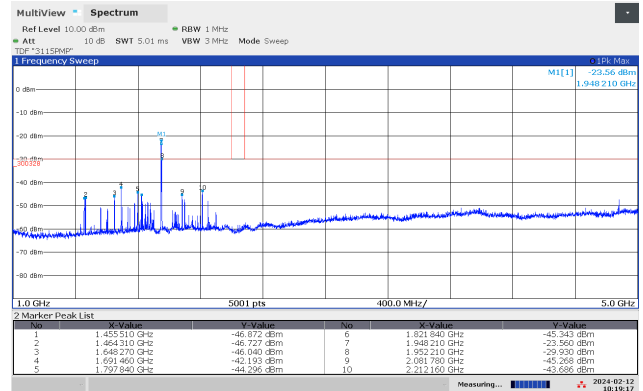
## HP



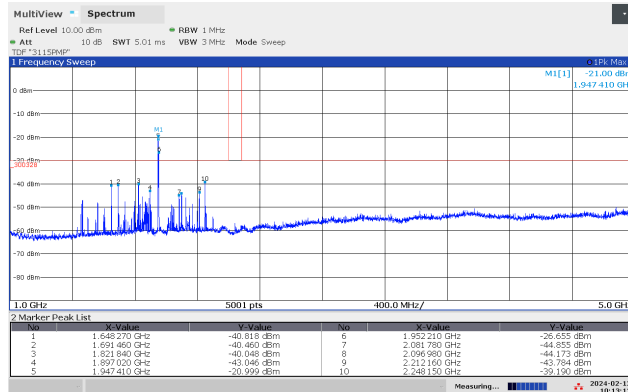
## 2J Antenna



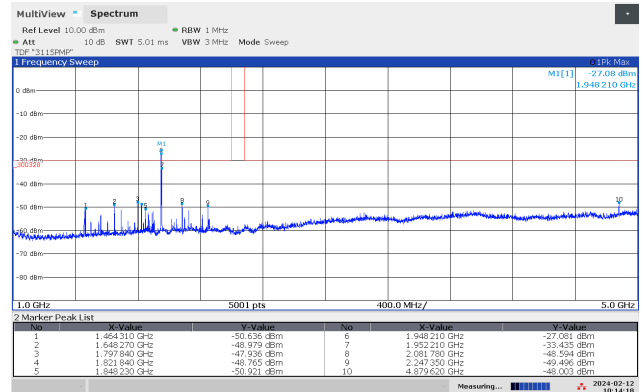
### Emissions 1-5 GHz, BLE 2440 + LTE B01 Ch18300, EUT XY, VP



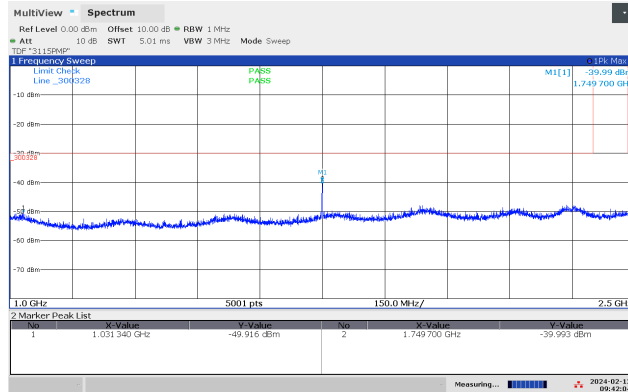
### HP



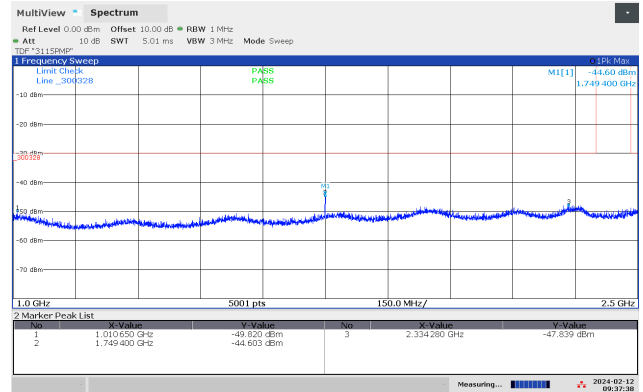
### Emissions 1-5 GHz, BLE 2440 + LTE B01 Ch18300, EUT YZ, VP



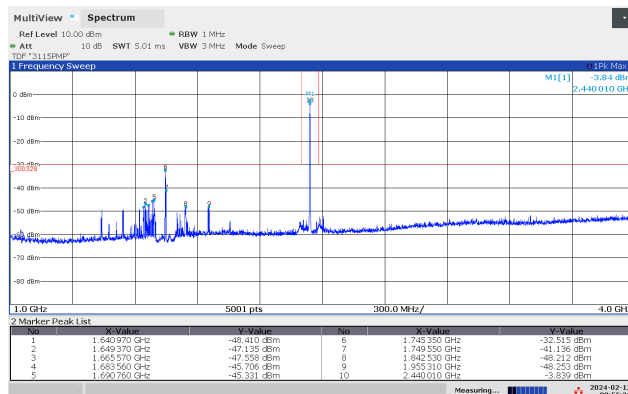
### HP



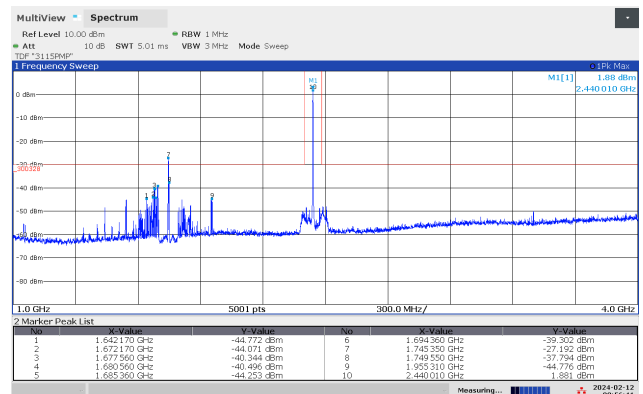
### Emissions 1-2.5 GHz, BLE 2436 + LTE B03 Ch19575, EUT YZ, VP



### HP

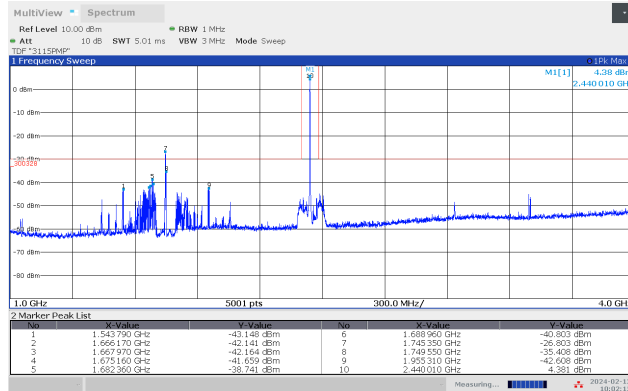


### Emissions 1-4 GHz, BLE 2440 + LTE B03 Ch19575, EUT XY, VP

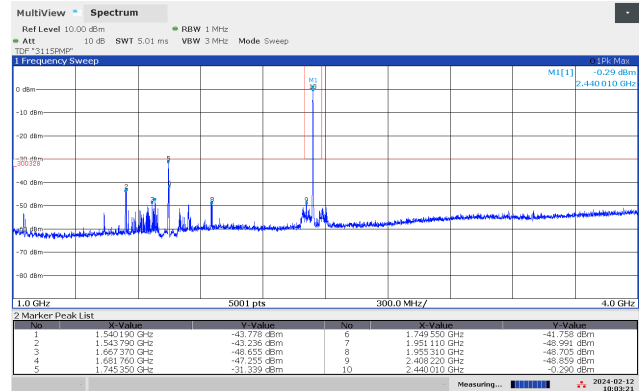


### HP

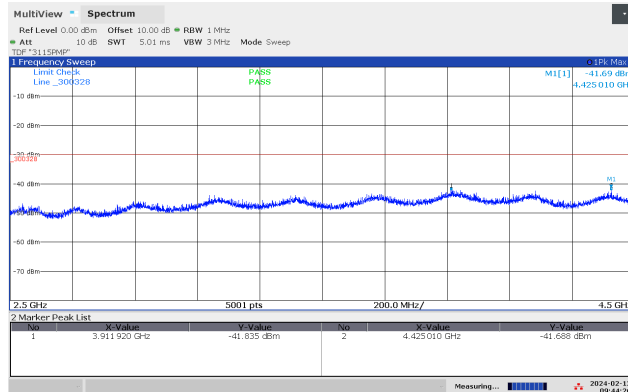
## 2J Antenna



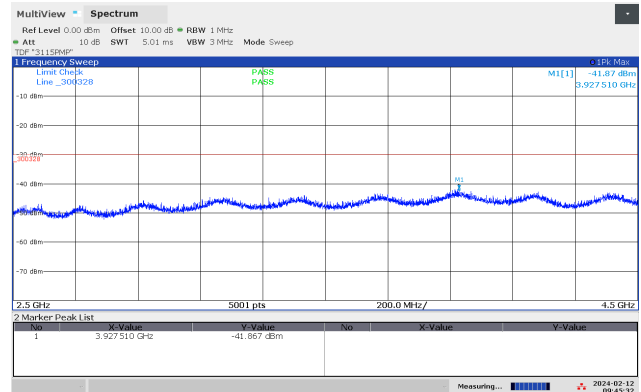
### Emissions 1-4 GHz, BLE 2440 + LTE B03 Ch19575, EUT YZ, VP



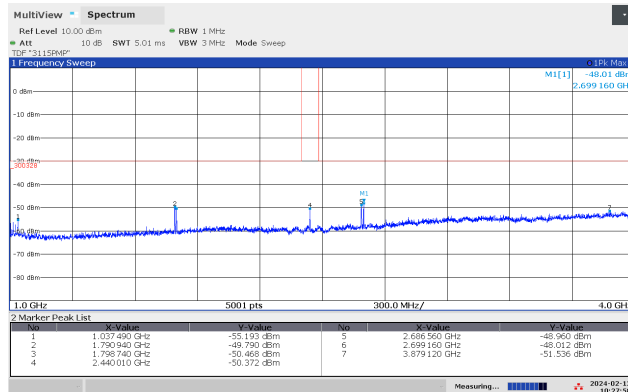
### HP



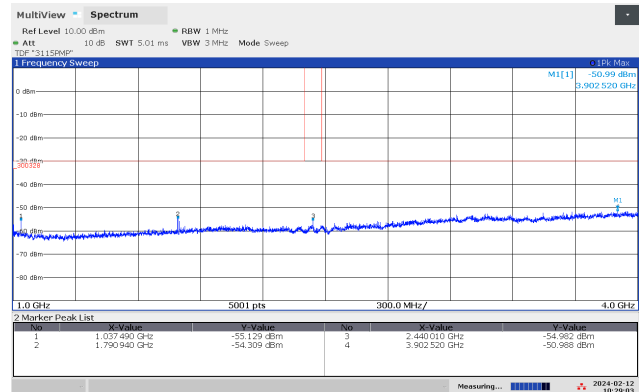
### Emissions 2.5-4.5 GHz, BLE 2440 + LTE B03 Ch19575, EUT YZ, VP



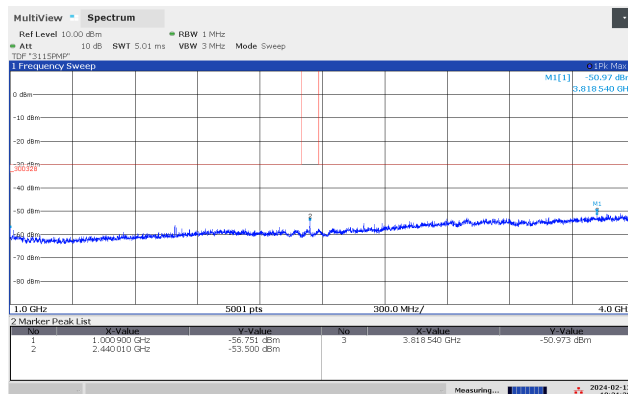
### HP



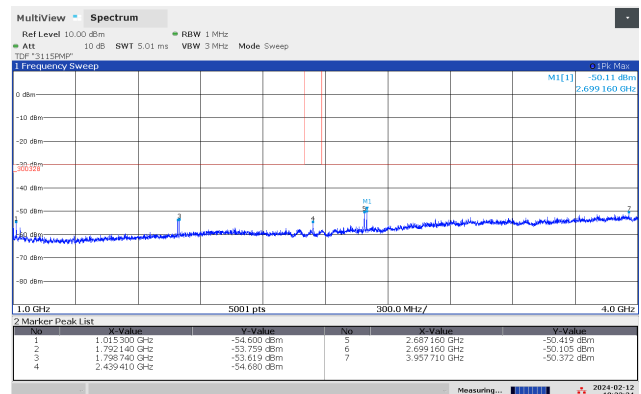
### Emissions 1-4 GHz, BLE 2440 + LTE B08 Ch21625, EUT XY, VP



### HP

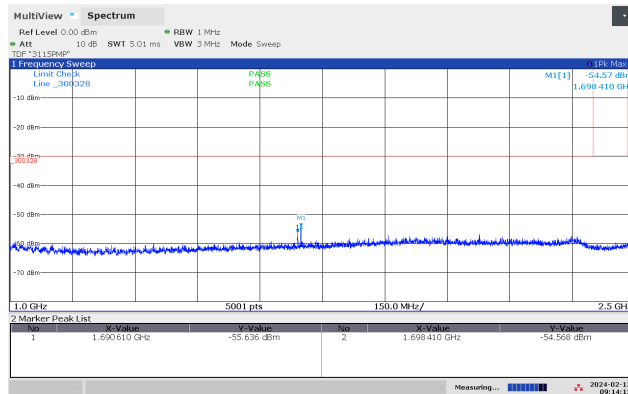


### Emissions 1-4 GHz, BLE 2440 + LTE B08 Ch21625, EUT YZ, VP

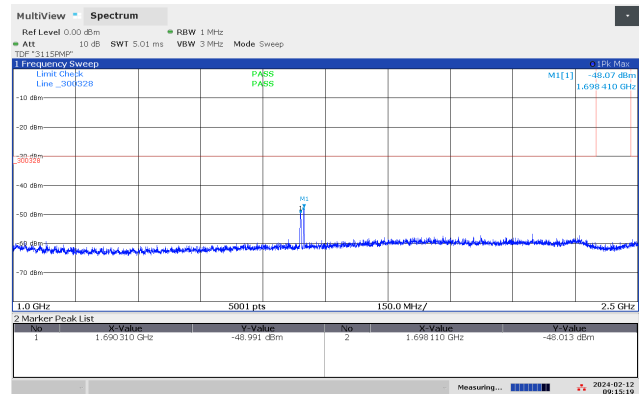


### HP

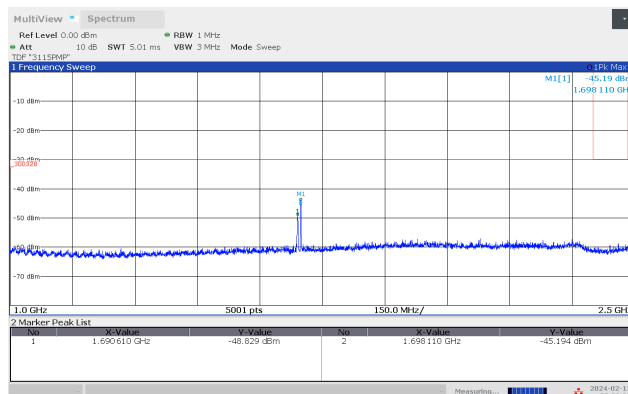
## 2J Antenna



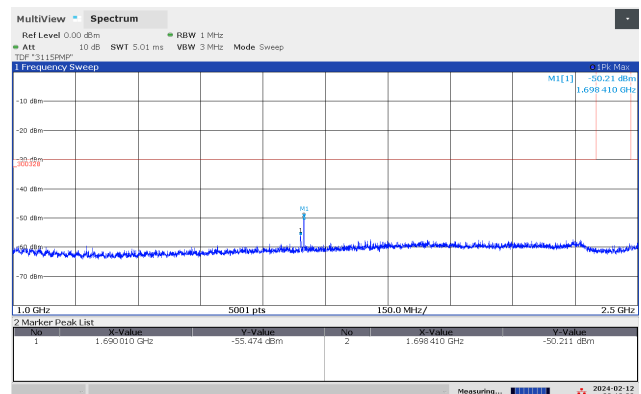
Emissions 1-2.5 GHz, BLE 2436 + LTE B20 Ch24300, EUT XY, VP



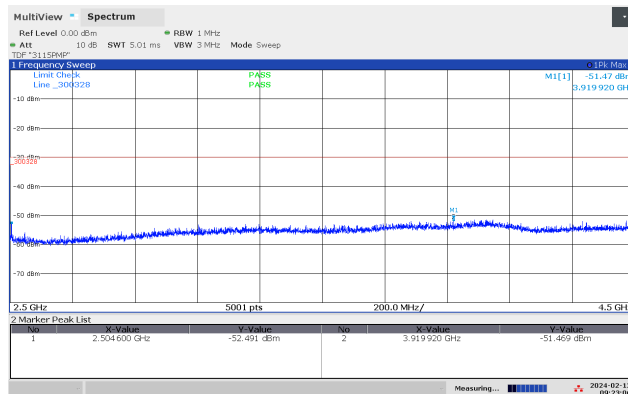
HP



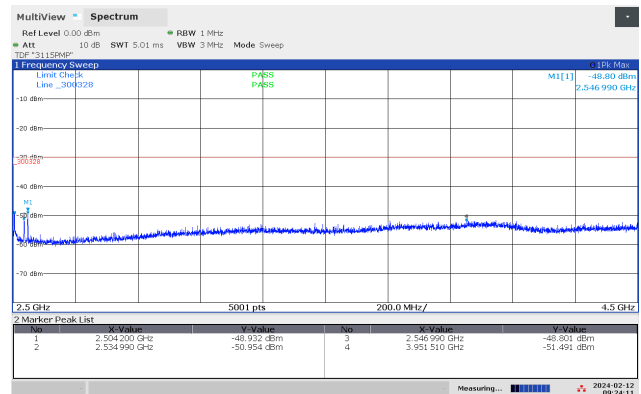
Emissions 1-2.5 GHz, BLE 2436 + LTE B20 Ch24300, EUT YZ, VP



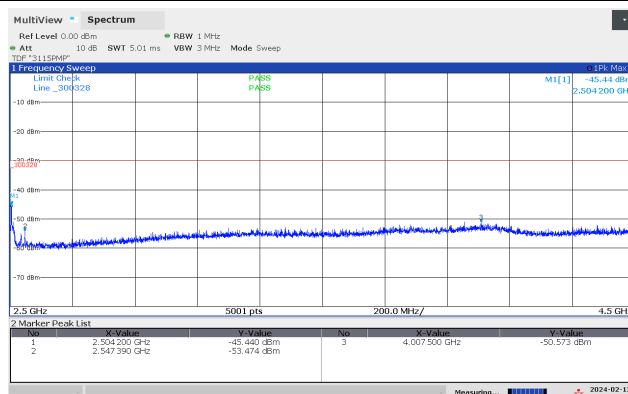
HP



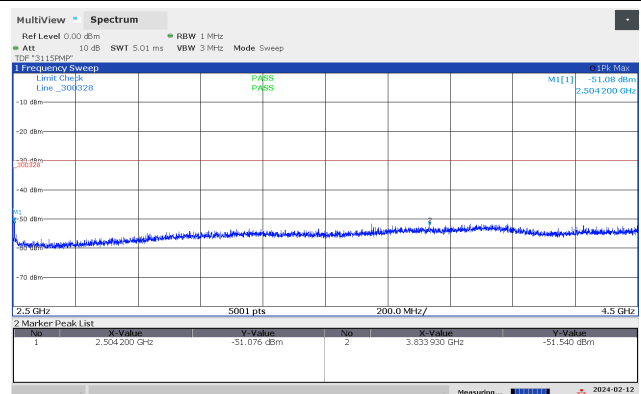
Emissions 2.5-4.5 GHz, BLE 2436 + LTE B20 Ch24300, EUT XY, VP



HP

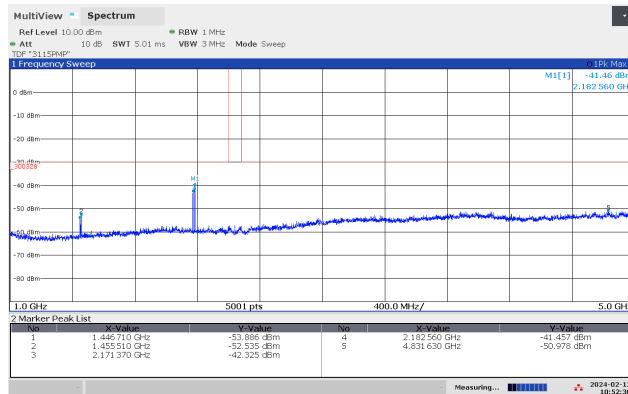


Emissions 2.5-4.5 GHz, BLE 2436 + LTE B20 Ch24300, EUT YZ, VP

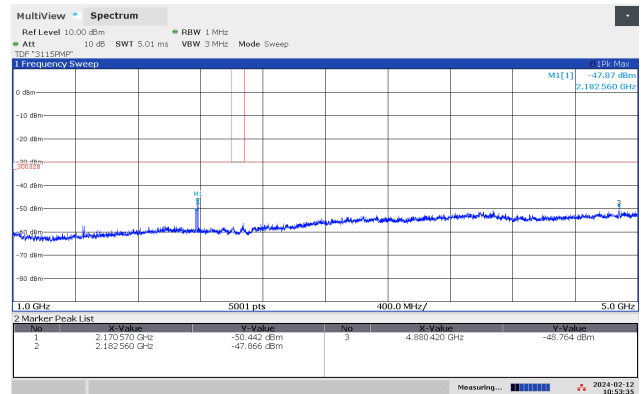


HP

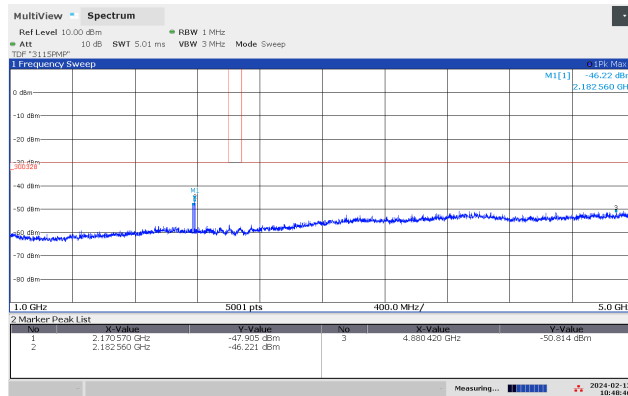
## 2J Antenna



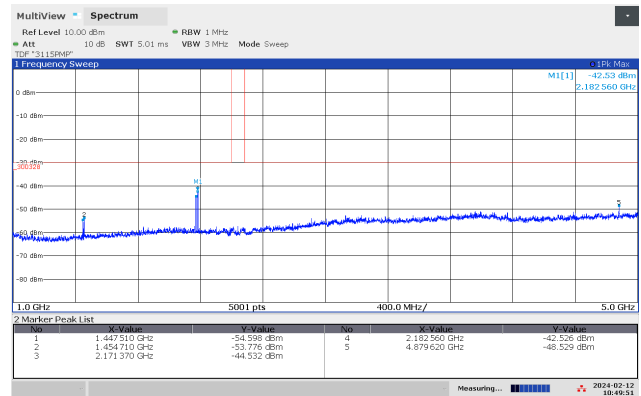
Emissions 1-5 GHz, BLE 2440 + LTE B28 Ch27435, EUT XY, VP



HP



Emissions 1-5 GHz, BLE 2440 + LTE B28 Ch27435, EUT YZ, VP



HP

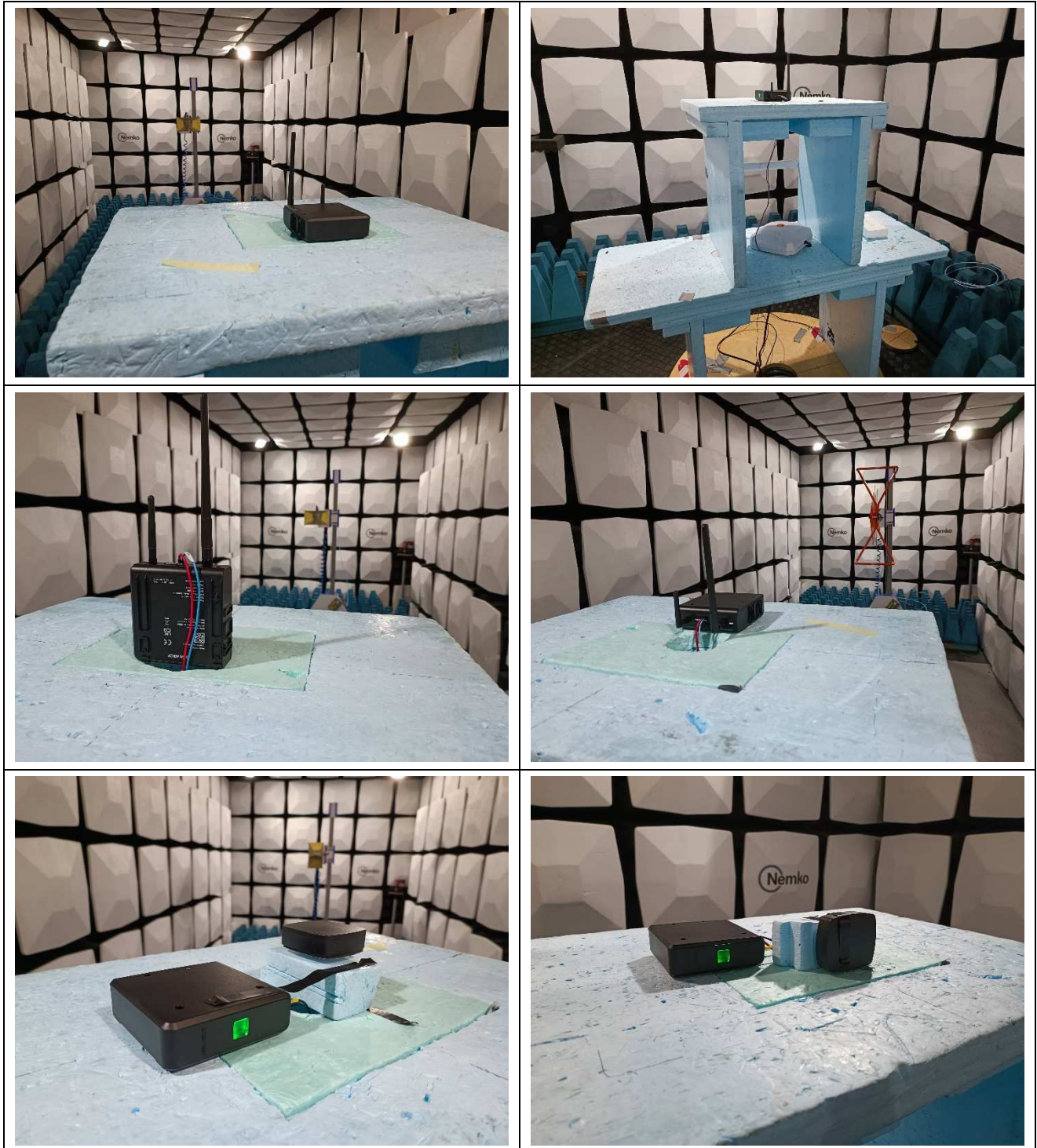
## 4 Measurement Uncertainty

| Measurement Uncertainty Values |         |             |
|--------------------------------|---------|-------------|
| Test Item                      |         | Uncertainty |
| Spurious Emissions, Radiated   | < 1 GHz | ±2.5 dB     |
|                                | > 1 GHz | ±2.2 dB     |
| Temperature Uncertainty        |         | ±1 °C       |

All uncertainty values are expanded standard uncertainty to give a confidence level of 95%, based on coverage factor k=2



## 6 Test Set-up Photos



## 7 Test Equipment Used

To facilitate inclusion on each page of the test equipment used for related tests, each item of test equipment and ancillaries are identified (numbered) by the testhouse.

| No. | Instrument                           | Type of instrument                   | Manufacturer       | Ref. no. | Cal Date | Cal Due |
|-----|--------------------------------------|--------------------------------------|--------------------|----------|----------|---------|
| 1   | FSW26                                | Spectrum Analyzer                    | Rohde & Schwarz    | LR 1640  | 2024-01  | 2025-01 |
| 2   | SMB100A                              | RF Signal Generator                  | Rohde & Schwarz    | LR 1790  | 2023-01  | 2025-01 |
| 3   | LNA-40-00101800                      | Pre-Amplifier                        | NardaMiteq         | LR 1747  | 2023-08  | 2024-08 |
| 4   | 3115                                 | Double Ridged Horn Antenna           | EMCO               | LR 1330  | 2022-11  | 2027-11 |
| 5   | JB1                                  | Bilog Antenna                        | SunAR              | LR 1734  | 2022-11  | 2025-11 |
| 6   | N0324415                             | BandStop Filter                      | Microwave Circuits | LR 1760  | COU      |         |
| 7   | WLK5-1100-1485-7000-40SS             | Low Pass Filter (1 GHz)              | Wainwright Inst.   | LR 1762  | COU      |         |
| 8   | WRCGV14-693.5-703.5-746.5-756.5-70EE | Band Reject Filter (703.5-746.5 MHz) | Wainwright Inst.   | LR 1794  | COU      |         |
| 9   | WRCGV8-790.5-810.5-865.5-885.5-40EE  | Band Reject Filter (810.5-865.5 MHz) | Wainwright Inst.   | LR 1795  | COU      |         |
| 10  | N0417483                             | Band Reject Filter (1710-1785MHz)    | Microwave Circuits | LR 1767  | COU      |         |
| 11  | N0408981                             | Band Reject Filter (880-915MHz)      | Microwave Circuits | LR 1766  | COU      |         |
| 12  | 6HC1500/18000-3-KK                   | High Pass Filter (1.5 GHz)           | Trilithic Inc.     | LR 1612  | COU      |         |
| 13  | WLK5-1100-1485-7000-40SS             | Low Pass Filter                      | Wainwright Inst.   | LR 1761  | COU      |         |
| 14  | 9205B                                | Power Supply                         | BK Precision       | LR 1844  | COU      |         |
| 15  | Model 87V                            | Multimeter                           | Fluke              | LR 1597  | 2023-04  | 2024-04 |
| 16  | CMW500                               | Radiocommunications Tester           | Rohde & Schwarz    | LR 1791  | 2022-02  | 2024-02 |

The software listed below has been used for one or more tests.

| No. | Manufacturer | Name   | Version | Comment                                 |
|-----|--------------|--------|---------|-----------------------------------------|
| 1   | Nemko        | RSPlot | 1.0.8.0 | Screenshots from R&S Spectrum Analyzers |
|     |              |        |         |                                         |