

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                       |                                                            |                                                                                       |                                              |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|---------------------------------------------------------------------------------------|----------------------------------------------|
| <b>Test report no.:</b><br><i>Prüfbericht-Nr.:</i>                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>CN24VND9 001</b>                                                                                                                                                                                                                                                                   | <b>Order No.:</b><br><i>Auftragsnr.:</i>                   | 168483807                                                                             | <b>Page 1 of 24</b><br><i>Seite 1 von 24</i> |
| <b>Client reference no.:</b><br><i>Kunden-Referenz-Nr.:</i>                                                                                                                                                                                                                                                                                                                                                                                                          | N/A                                                                                                                                                                                                                                                                                   | <b>Order date:</b><br><i>Auftragsdatum:</i>                | 2024-05-19                                                                            |                                              |
| <b>Client:</b><br><i>Auftraggeber:</i>                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>Honeywell (Beijing) Technology Solutions Labs Co., Ltd.</b><br>A1 Building, C&W Industry Zone, No.14 Jiuxianqiao Road, Chaoyang District, 100015, Beijing, P.R. China                                                                                                              |                                                            |                                                                                       |                                              |
| <b>Test item:</b><br><i>Prüfgegenstand:</i>                                                                                                                                                                                                                                                                                                                                                                                                                          | Thermostat                                                                                                                                                                                                                                                                            |                                                            |                                                                                       |                                              |
| <b>Identification / Type no.:</b><br><i>Bezeichnung / Typ-Nr.:</i>                                                                                                                                                                                                                                                                                                                                                                                                   | TC320B-G, TC320C-G, TC320C-N, TC321B-G                                                                                                                                                                                                                                                |                                                            |                                                                                       |                                              |
| <b>Order content:</b><br><i>Auftrags-Inhalt:</i>                                                                                                                                                                                                                                                                                                                                                                                                                     | Test Report                                                                                                                                                                                                                                                                           |                                                            |                                                                                       |                                              |
| <b>Test specification</b><br><i>Prüfgrundlage:</i>                                                                                                                                                                                                                                                                                                                                                                                                                   | CFR47 FCC Part 15: Subpart C Section 15.247<br>RSS-247 Issue 3 August 2023                                                                                                                                                                                                            |                                                            |                                                                                       |                                              |
| <b>Date of sample receipt:</b><br><i>Wareneingangsdatum:</i>                                                                                                                                                                                                                                                                                                                                                                                                         | 2024-05-13                                                                                                                                                                                                                                                                            | Please refer to Photo Document                             |                                                                                       |                                              |
| <b>Test sample no:</b><br><i>Prüfmuster-Nr.:</i>                                                                                                                                                                                                                                                                                                                                                                                                                     | A003715423-001,<br>A003717216-002,<br>A003720087-001,002                                                                                                                                                                                                                              |                                                            |                                                                                       |                                              |
| <b>Testing period:</b><br><i>Prüfzeitraum:</i>                                                                                                                                                                                                                                                                                                                                                                                                                       | 2024-05-29 - 2024-06-25                                                                                                                                                                                                                                                               |                                                            |                                                                                       |                                              |
| <b>Place of testing:</b><br><i>Ort der Prüfung:</i>                                                                                                                                                                                                                                                                                                                                                                                                                  | Refer to section 2.1                                                                                                                                                                                                                                                                  |                                                            |                                                                                       |                                              |
| <b>Testing laboratory:</b><br><i>Prüflaboratorium:</i>                                                                                                                                                                                                                                                                                                                                                                                                               | TÜV Rheinland (Shenzhen)<br>Co., Ltd.                                                                                                                                                                                                                                                 |                                                            |                                                                                       |                                              |
| <b>Test result*:</b><br><i>Prüfergebnis*:</i>                                                                                                                                                                                                                                                                                                                                                                                                                        | Pass                                                                                                                                                                                                                                                                                  |                                                            |                                                                                       |                                              |
| <b>tested by:</b><br><i>geprüft von:</i>                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>authorized by:</b><br><i>genehmigt von:</i>                                                                                                                                                                                                                                        |                                                            |                                                                                       |                                              |
| <b>Date:</b> 2024-09-09<br><i>Datum:</i>                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                    |                                                            |  |                                              |
| <b>Position / Stellung:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                          | Expert/Sachverständige(r)                                                                                                                                                                                                                                                             | <b>Issue date:</b> 2024-09-09<br><i>Ausstellungsdatum:</i> | Signed by: Lin Lin                                                                    |                                              |
| <b>Position / Stellung:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                          | Expert/Sachverständige(r)                                                                                                                                                                                                                                                             | Signed by: Lin Lin                                         |                                                                                       |                                              |
| <b>Other:</b><br><i>Sonstiges:</i>                                                                                                                                                                                                                                                                                                                                                                                                                                   | FCC ID: 2ARTN-00011<br>IC: 24552-00011<br>HVIN: 545703: TC320B-G<br>545704: TC320C-G, TC320C-N<br>545708: TC321B-G<br>PMN: TC320B-G, TC320C-G, TC320C-N, TC321B-G                                                                                                                     |                                                            |                                                                                       |                                              |
| <b>Condition of the test item at delivery:</b><br><i>Zustand des Prüfgegenstandes bei Anlieferung:</i>                                                                                                                                                                                                                                                                                                                                                               | Test item complete and undamaged<br>Prüfmuster vollständig und unbeschädigt                                                                                                                                                                                                           |                                                            |                                                                                       |                                              |
| <b>* Legend:</b><br><i>* Legende:</i>                                                                                                                                                                                                                                                                                                                                                                                                                                | P(ass) = passed a.m. test specification(s)    F(ail) = failed a.m. test specification(s)    N/A = not applicable    N/T = not tested<br>P(ass) = entspricht o.g. Prüfgrundlage(n)    F(ail) = entspricht nicht o.g. Prüfgrundlage(n)    N/A = nicht anwendbar    N/T = nicht getestet |                                                            |                                                                                       |                                              |
| <b>This test report only relates to the above mentioned test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</b><br><i>Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.</i> |                                                                                                                                                                                                                                                                                       |                                                            |                                                                                       |                                              |

V05

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**Remarks**  
*Anmerkungen*

- |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | <p>The equipment used during the specified testing period was calibrated according to our test laboratory calibration program. The equipment fulfils the requirements included in the relevant standards. The traceability of the test equipment used is ensured by compliance with the regulations of our management system. Detailed information regarding test conditions, equipment and measurement uncertainty is available in the test laboratory and could be provided on request.</p> <p><i>Alle eingesetzten Prüfmittel waren zum angegebenen Prüfzeitraum gemäß eines festgelegten Kalibrierungsprogramms unseres Prüfhauses kalibriert. Sie entsprechen den in den Prüfprogrammen hinterlegten Anforderungen. Die Rückverfolgbarkeit der eingesetzten Prüfmittel ist durch die Einhaltung der Regelungen unseres Managementsystems gegeben.</i></p> <p><i>Detaillierte Informationen bezüglich Prüfkonditionen, Prüfequipment und Messunsicherheiten sind im Prüflabor vorhanden und können auf Wunsch bereitgestellt werden.</i></p>                                                                                                                                                       |
| 2 | <p>As contractually agreed, this document has been signed digitally only. TÜV Rheinland has not verified and unable to verify which legal or other pertaining requirements are applicable for this document. Such verification is within the responsibility of the user of this document. Upon request by its client, TÜV Rheinland can confirm the validity of the digital signature by a separate document. Such request shall be addressed to our Sales department. An environmental fee for such additional service will be charged.</p> <p><i>Wie vertraglich vereinbart, wurde dieses Dokument nur digital unterzeichnet. Der TÜV Rheinland hat nicht überprüft, welche rechtlichen oder sonstigen diesbezüglichen Anforderungen für dieses Dokument gelten. Diese Überprüfung liegt in der Verantwortung des Benutzers dieses Dokuments. Auf Verlangen des Kunden kann der TÜV Rheinland die Gültigkeit der digitalen Signatur durch ein gesondertes Dokument bestätigen. Diese Anfrage ist an unseren Vertrieb zu richten. Eine Umweltgebühr für einen solchen zusätzlichen Service wird erhoben.</i></p>                                                                                      |
| 3 | <p>Test clauses with remark of * are subcontracted to qualified subcontractors and described under the respective test clause in the report. Deviations of testing specification(s) or customer requirements are listed in specific test clause in the report.</p> <p><i>Prüfklausel mit der Note * wurden an qualifizierte Unterauftragnehmer vergeben und sind unter der jeweiligen Prüfklausel des Berichts beschrieben. Abweichungen von Prüfspezifikation(en) oder Kundenanforderungen sind in der jeweiligen Prüfklausel im Bericht aufgeführt.</i></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 4 | <p>The decision rule for statements of conformity, based on numerical measurement results, in this test report is based on the "Zero Guard Band Rule" and "Simple Acceptance" in accordance with ILAC G8:2019 and IEC Guide 115:2021, unless otherwise specified in the applied standard mentioned on Page 1 of this report or requested by the customer. This means that measurement uncertainty is not taken in account and hence also not declared in the test report. For additional information to the resulting risk based of this decision rule please refer to ILAC G8:2019.</p> <p><i>Die Entscheidungsregel für Konformitätserklärungen basierend auf numerischen Messergebnissen in diesem Prüfbericht basiert auf der "Null-Grenzwert-Regel" und der "Einfachen Akzeptanz" gemäß ILAC G8:2019 und IEC Guide 115:2021, es sei denn, in der auf Seite 1 dieses Berichts genannten angewandten Norm ist etwas anderes festgelegt oder vom Kunden gewünscht. Dies bedeutet, dass die Messunsicherheit nicht berücksichtigt wird und daher auch nicht im Prüfbericht angegeben wird. Zu weiteren Informationen bezüglich des Risikos durch diese Entscheidungsregel siehe ILAC G8:2019.</i></p> |

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## TEST SUMMARY

**5.1.1 ANTENNA REQUIREMENT**

*RESULT: Pass*

**5.1.2 MAXIMUM PEAK CONDUCTED OUTPUT POWER**

*RESULT: Pass*

**5.1.3 CONDUCTED POWER SPECTRAL DENSITY**

*RESULT: Pass*

**5.1.4 6dB BANDWIDTH**

*RESULT: Pass*

**5.1.5 99% BANDWIDTH**

*RESULT: Pass*

**5.1.6 CONDUCTED SPURIOUS EMISSIONS MEASURED IN 100 KHz BANDWIDTH**

*RESULT: Pass*

**5.1.7 RADIATED SPURIOUS EMISSION**

*RESULT: Pass*

**5.1.8 CONDUCTED EMISSION ON AC MAINS**

*RESULT: Pass*

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## 1 GENERAL REMARKS

### 1.1 COMPLEMENTARY MATERIALS

All attachments are integral parts of this test report. This applies especially to the following appendix:

Appendix A: Photographs of the Test Set-up

Appendix B: Test Results of Wi-Fi 802.11 b/g/n

Appendix C: Test Results of BLE

## 2 TEST SITES

### 2.1 TEST FACILITIES

**TÜV Rheinland (Shenzhen) Co., Ltd.**

No. 362 Huanguan Road Middle, Longhua District, 518110, Shenzhen, P. R. China.

FCC Registration No.: 694916

ISED wireless device testing laboratory: 25069

### 2.2 LIST OF TEST AND MEASUREMENT INSTRUMENTS

**Table 1: List of Test and Measurement Equipment**

| Radio Spectrum Testing (TS8997-R&S)       |              |                   |              |            |
|-------------------------------------------|--------------|-------------------|--------------|------------|
| Equipment                                 | Manufacturer | Model             | Serial No.   | Cal. until |
| Wireless Connectivity Tester              | R&S          | CMW270            | 101375       | 25.07.2024 |
| Signal Analyzer                           | R&S          | FSV 40            | 101441       | 25.07.2024 |
| Vector Signal Generator                   | R&S          | SMBV100A          | 263301       | 25.07.2024 |
| Signal Generator                          | R&S          | SMB100A           | 115186       | 25.07.2024 |
| OSP                                       | R&S          | OSP 150           | 101017       | 13.11.2024 |
| Control PC                                | DELL         | OptiPlex 7050     | FTJZ9P2      | N/A        |
| Test Software                             | R&S          | WMS32 (V11.00.00) | N/A          | N/A        |
| Power Meter                               | R&S          | NRP2              | 107105       | 13.11.2024 |
| Power Sensor                              | R&S          | NRP-Z81           | 105677       | 25.07.2024 |
| Humid & Temp Programmable Tester          | BOST         | NTH090-60         | 19040801     | 28.02.2025 |
| Shielding Room 8#                         | Albatross    | SR8               | APC17151-SR8 | 22.06.2024 |
| Unwanted Emission Testing (TS9975)        |              |                   |              |            |
| Equipment                                 | Manufacturer | Model             | Serial No.   | Cal. until |
| EMI Test Receiver                         | R&S          | ESR 7             | 102021       | 25.07.2024 |
| Signal Analyzer                           | R&S          | FSV 40            | 101439       | 25.07.2024 |
| System Controller Interface               | R&S          | SCI-100           | S10010038    | N/A        |
| Filterbank                                | R&S          | Wlan              | 100759       | 25.07.2024 |
| OSP                                       | R&S          | OSP 120           | 102040       | N/A        |
| Pre-amplifier                             | R&S          | SCU08F1           | 08320031     | 25.07.2024 |
| Amplifier                                 | R&S          | SCU-18F           | 180070       | 25.07.2024 |
| Amplifier                                 | R&S          | SCU40A            | 100475       | 25.07.2024 |
| Trilog Broadband Antenna (30 MHz - 7 GHz) | Schwarzbeck  | VULB 9162         | 193          | 06.08.2024 |
| Double-Ridged Antenna (1 -18 GHz)         | ETS-LINDGREN | 3117              | 00218717     | 06.08.2024 |
| Wideband Ridged Horn                      | Steatite     | QMS-00880         | 19067        | 27.08.2024 |

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|                          |             |                   |              |            |
|--------------------------|-------------|-------------------|--------------|------------|
| Antenna (18-40 GHz)      |             |                   |              |            |
| Active Loop Antenna      | Schwarzbeck | FMZB 1513         | 302          | 06.08.2024 |
| Test software            | R&S         | EMC32 (V10.60.10) | N/A          | N/A        |
| Control PC               | Dell        | OptiPlex 7050     | 36NV9P2      | N/A        |
| 3m Semi-Anechoic Chamber | Albatross   | SAC-3m            | APC17151-SAC | 22.06.2024 |

| Conducted Emission       |              |                     |            |            |
|--------------------------|--------------|---------------------|------------|------------|
| Equipment                | Manufacturer | Model No.           | Serial No. | Cal. Until |
| EMI Test Receiver        | R&S          | ESR3                | 102428     | 30.07.2024 |
| Artificial Mains Network | R&S          | ENV216              | 102333     | 31.07.2024 |
| EMC32 test software      | R&S          | EMC32(Ver.10.50.00) | N/A        | N/A        |

## 2.3 TRACEABILITY

All measurement equipment calibrations are traceable to NIM (National Institute of Metrology) or where calibration is performed in other countries, to equivalent nationally recognized standards organizations.

## 2.4 CALIBRATION

Equipment requiring calibration is calibrated periodically by the manufacturer or according to manufacturer's specifications. Additionally all equipment is verified for proper performance on a regular basis using in house standards or comparisons.

## 2.5 MEASUREMENT UNCERTAINTY

The estimated combined standard uncertainty for radiated emissions and conducted emissions measurements as below table.

| Parameter                                              | Uncertainty                   |
|--------------------------------------------------------|-------------------------------|
| Radio Frequency                                        | $\pm 1 \times 10^{-7}$        |
| RF Power (conducted)                                   | $\pm 2.5$ dB                  |
| Radiated Emission of Transmitter, valid up to 26.5 GHz | $\pm 6$ dB                    |
| Radiated Emission of Receiver, valid up to 26.5 GHz    | $\pm 6$ dB                    |
| Conducted Emission, (9kHz to 150kHz)/(150kHz to 30MHz) | $\pm 3.70$ dB / $\pm 3.30$ dB |
| Temperature                                            | $\pm 1$ °C                    |
| Humidity                                               | $\pm 5$ %                     |
| Voltage (DC)                                           | $\pm 1$ %                     |
| Voltage (AC, <10kHz)                                   | $\pm 2$ %                     |

## 2.6 LOCATION OF ORIGINAL DATA

The original copies of all test data taken during actual testing were attached at Appendix A & B & C of this report and delivered to the applicant. A copy has been retained in the TÜV Rheinland (Shenzhen) Co., Ltd. file for certification follow-up purposes.

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## 2.7 STATUS OF FACILITY USED FOR TESTING

The TÜV Rheinland (Shenzhen) Co., Ltd. Test facility located at No. 362 Huanguan Road Middle, Longhua District, 518110, Shenzhen, P. R. China. is listed on the US Federal Communications Commission list of facilities approved to perform measurements.



### 3 GENERAL PRODUCT INFORMATION

#### 3.1 PRODUCT FUNCTION AND INTENDED USE

The Product is thermostat as an advanced, highly configurable device providing building automation connectivity well-suited for commercial building applications. This device supports Wi-Fi 2.4GHz and Bluetooth (Low Energy) technology.

For details refer to the User Manual, Technical Description and Circuit Diagram.

#### 3.2 RATINGS AND SYSTEM DETAILS

**Table 2: Technical Specification of EUT**

| General Information of EUT   | Value                                                              |
|------------------------------|--------------------------------------------------------------------|
| Kind of Equipment:           | Thermostat                                                         |
| Type Designation:            | TC320B-G, TC320C-G, TC320C-N, TC321B-G                             |
| FCC ID:                      | 2ARTN-00011                                                        |
| IC:                          | 24552-00011                                                        |
| HVIN:                        | 545703: TC320B-G<br>545704: TC320C-G, TC320C-N<br>545708: TC321B-G |
| PMN:                         | TC320B-G, TC320C-G, TC320C-N, TC321B-G                             |
| Operating Voltage:           | TC320B-G, TC321B-G: 24V AC                                         |
|                              | TC320C-G: 100-277V AC                                              |
|                              | TC320C-N: 120V AC                                                  |
| Testing Voltage:             | TC320B-G, TC321B-G: 24V AC via AC/AC transformer                   |
|                              | TC320C-G, TC320C-N: 120V AC                                        |
| Operating Temperature Range: | 0°C - 50°C                                                         |

There are 4 models as TC320C-G, TC320C-N, TC321B-G, TC320B-G, which share the same PCB layout and RF circuits, the differences among them are the Power supply circuit, CO2 sensor and AI ports, which have no impacts on RF performance, and already considered sufficiently in SDOC ICES report CN24EX47 001, details as listed in below table.

| SKU      | Power                                                                                                                                                                                                                                          | Sensors  | Peripheral                                                                    |
|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-------------------------------------------------------------------------------|
| TC320B-G | 1. The TC320C-G/TC320C-N is powered by AC 100-277V, and TC320B-G/ TC321B-G is powered by 24VAC with components of the transformer circuit removed, details as marked on the internal photos.<br>2. The relays are for different maximum loads. | T&H      | DO, UIO, AI<br>Note: AI port usually connects to a sensor for data collection |
| TC321B-G |                                                                                                                                                                                                                                                | T&H, CO2 |                                                                               |
| TC320C-G |                                                                                                                                                                                                                                                | T&H      | DO, UIO                                                                       |
| TC320C-N |                                                                                                                                                                                                                                                | T&H      | DO, UIO                                                                       |

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As above differences, full test performed on TC321B-G, and RSE re-checked for TC320C-G and TC320B-G, only the worst result is showed in this report.

| Characteristic                                           | Description                                                                |
|----------------------------------------------------------|----------------------------------------------------------------------------|
| Wireless Technology:                                     | WLAN                                                                       |
| Operating Frequency Range:                               | 2412 - 2462 MHz for 802.11b/g/n(HT20)<br>2422 - 2452 MHz for 802.11n(HT40) |
| Channel Separation:                                      | 5 MHz                                                                      |
| Type of Modulation:                                      | DSSS (DBPSK/DQPSK/CCK)<br>OFDM (BPSK/QPSK/16QAM/64QAM)                     |
| Antenna Type:                                            | PCB Antenna                                                                |
| Antenna Gain:                                            | 3.26 dBi (max. gain is declared by the manufacture)                        |
| Number of Antenna:                                       | 1                                                                          |
| Characteristic                                           | Description                                                                |
| <b>Technical Specification of Bluetooth (Low Energy)</b> |                                                                            |
| Operating Frequency:                                     | 2400 - 2483.5 MHz                                                          |
| Operating Frequency Range:                               | 2402 - 2480 MHz                                                            |
| Type of Modulation:                                      | GFSK                                                                       |
| Channel Number:                                          | 40 channels                                                                |
| Channel Separation:                                      | 2 MHz                                                                      |
| Data Rate:                                               | 2Mbps, 1Mbps, 500kbps, 250kbps                                             |
| Antenna Type:                                            | PCB Antenna                                                                |
| Antenna Gain :                                           | 3.26 dBi (max. gain is declared by the manufacture)                        |

**Table 3: RF Channel and Frequency of Wi-Fi 802.11 b/g/n**

| RF Channel | b/g/n(HT20)     | n(HT40)         |
|------------|-----------------|-----------------|
|            | Frequency (MHz) | Frequency (MHz) |
| <b>01</b>  | <b>2412</b>     | /               |
| 02         | 2417            | /               |
| <b>03</b>  | <b>2422</b>     | <b>2422</b>     |
| 04         | 2427            | 2427            |
| 05         | 2432            | 2432            |
| <b>06</b>  | <b>2437</b>     | <b>2437</b>     |
| 07         | 2442            | 2442            |
| 08         | 2447            | 2447            |
| <b>09</b>  | <b>2452</b>     | <b>2452</b>     |
| 10         | 2457            | /               |
| <b>11</b>  | <b>2462</b>     | /               |

Test frequencies are lowest channel: 2412 MHz, middle channel: 2437 MHz and highest channel: 2462 MHz for 20MHz Bandwidth mode.

**Table 4: RF Channel and Frequency of Bluetooth (Low Energy)**

| RF Channel | Frequency (MHz) | RF Channel | Frequency (MHz) | RF Channel | Frequency (MHz) | RF Channel | Frequency (MHz) |
|------------|-----------------|------------|-----------------|------------|-----------------|------------|-----------------|
| <b>0</b>   | <b>2402</b>     | 10         | 2422            | 20         | 2442            | 30         | 2462            |
| 1          | 2404            | 11         | 2424            | 21         | 2444            | 31         | 2464            |
| 2          | 2406            | 12         | 2426            | 22         | 2446            | 32         | 2466            |
| 3          | 2408            | 13         | 2428            | 23         | 2448            | 33         | 2468            |
| 4          | 2410            | 14         | 2430            | 24         | 2450            | 34         | 2470            |

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|   |      |           |             |    |      |           |             |
|---|------|-----------|-------------|----|------|-----------|-------------|
| 5 | 2412 | 15        | 2432        | 25 | 2452 | 35        | 2472        |
| 6 | 2414 | 16        | 2434        | 26 | 2454 | 36        | 2474        |
| 7 | 2416 | 17        | 2436        | 27 | 2456 | 37        | 2476        |
| 8 | 2418 | 18        | 2438        | 28 | 2458 | 38        | 2478        |
| 9 | 2420 | <b>19</b> | <b>2440</b> | 29 | 2460 | <b>39</b> | <b>2480</b> |

Test frequencies are lowest channel: 2402 MHz, middle channel: 2440 MHz and highest channel: 2480 MHz

### 3.3 INDEPENDENT OPERATION MODES

The basic operation modes are:

- A. On, Wi-Fi 802.11 b/g/n wireless transmitting mode
  - 1) Low Channel
  - 2) Middle Channel
  - 3) High Channel
- B. On, BLE wireless transmitting mode
  - 1) Low Channel
  - 2) Middle Channel
  - 3) High Channel
- C. On, Normal operation (Wi-Fi & BLE Link)
- D. Off

### 3.4 Noise Generating and Noise Suppressing Parts

Refer to Circuit Diagram for further details.

### 3.5 SUBMITTED DOCUMENTS

- Application Form
- Operation Description
- Schematics
- PCB Layout
- Model Difference Letter
- User Manual
- Block Diagram
- Rating Label
- Parts List

## 4 TEST SET-UP AND OPERATION MODES

### 4.1 PRINCIPLE OF CONFIGURATION SELECTION

**Radio Spectrum:** The equipment under test (EUT) was configured at its highest power output in order to measure its highest possible radiation and conducted level. The test modes were adapted accordingly in reference to the instructions for use.

**Emission:** The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the instructions for use.

### 4.2 TEST OPERATION AND TEST SOFTWARE

Test operation refers to test setup in chapter 5. All tests were performed according to the procedures in ANSI C63.10: 2013.

According to clause 3.1, all tests were performed on models TC321B-G in this report.

### 4.3 SPECIAL ACCESSORIES AND AUXILIARY EQUIPMENT

Table 5: Auxiliary Equipment Used during Test

| Description                    | Model      | Manufacturer |
|--------------------------------|------------|--------------|
| Laptop                         | T480       | Lenovo       |
| Transformer (AC 120V - AC 24V) | N/A        | N/A          |
| Phone                          | Redmi K50  | Xiaomi       |
| Router                         | TL-XDR5430 | TP-LINK      |
| Auxiliary Load Board           | N/A        | Honeywell    |

### 4.4 COUNTERMEASURES TO ACHIEVE EMC COMPLIANCE

The test sample which has been tested contained the noise suppression parts as described in the Technical Construction File (TCF).

No additional measures were employed to achieve compliance.

## 4.5 TEST SETUP DIAGRAM

Diagram of Measurement Configuration for Radiation Test (Below 1GHz)

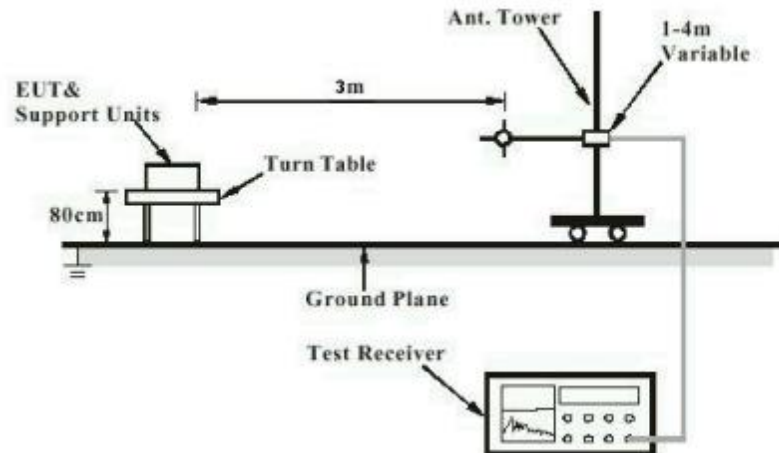
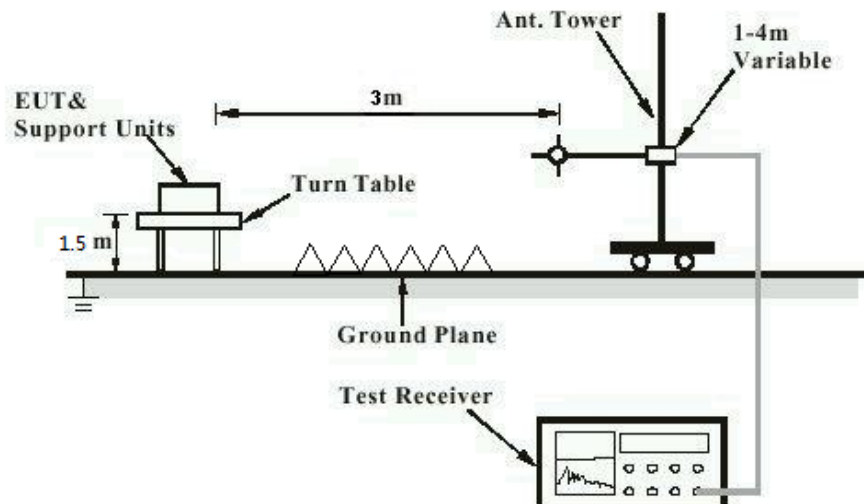
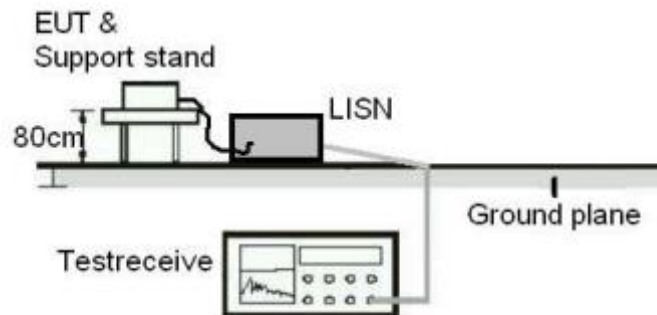


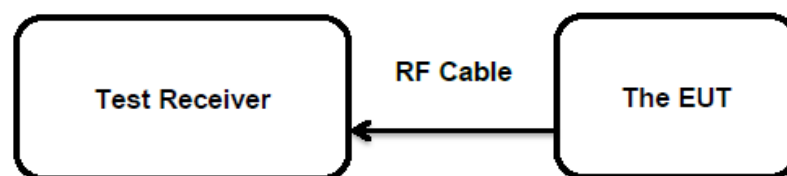
Diagram of Measurement Configuration for Radiation Test (Above 1GHz)



### Diagram of Measurement Configuration for Mains Conduction Measurement



### Diagram of Measurement Configuration for Conducted Transmitter Measurement



## 5 TEST RESULTS

### 5.1 TRANSMITTER REQUIREMENT & TEST SUITES

#### 5.1.1 Antenna Requirement

RESULT:

**Pass**

**Test Specification**

Test standard : FCC Part 15.247(b)(4) and Part 15.203  
RSS-Gen Clause 6.8

The EUT has a PCB antenna, the directional gain of antenna is 3.26 dBi, permanent attachment and no consideration of replacement.

Therefore, the EUT is considered sufficient to comply with the provision.

Refer to EUT Photo for further details.

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## 5.1.2 Maximum peak conducted output power

**RESULT:**
**Pass**

### Test Specification

Test standard : FCC Part 15.247(b)(3)  
RSS-247 Clause 5.4(d)  
Basic standard : ANSI C63.10: 2013  
Limits : 1.0 Watts  
Kind of test site : Shielded Room

### Test Setup

Date of testing : 2024-05-30 - 2024-06-25  
Input voltage : AC 120V  
Operation mode : A,B  
Test channel : Low / Middle / High  
Ambient temperature : 23.8 °C  
Relative humidity : 52 %  
Atmospheric pressure : 101 kPa

**Table 6: Test Result of Maximum Peak Conducted Output Power, Wi-Fi**

| Test Mode      | Data Rate | Test Channel (MHz) | Measured Peak Conducted Power |       | Measured Average Conducted Power |       | Limit (W) |
|----------------|-----------|--------------------|-------------------------------|-------|----------------------------------|-------|-----------|
|                |           |                    | (dBm)                         | (W)   | (dBm)                            | (W)   |           |
| 802.11b        | 1 Mbps    | 2412               | 20.8                          | 0.120 | 18.7                             | 0.074 | < 1.0     |
|                |           | 2437               | 20.4                          | 0.110 | 18.1                             | 0.065 |           |
|                |           | 2462               | 20.8                          | 0.120 | 18.7                             | 0.074 |           |
| 802.11g        | 6 Mbps    | 2412               | 24.2                          | 0.263 | 18.1                             | 0.065 |           |
|                |           | 2437               | 23.9                          | 0.245 | 17.5                             | 0.056 |           |
|                |           | 2462               | 24.2                          | 0.263 | 18.2                             | 0.066 |           |
| 802.11n (HT20) | MCS0      | 2412               | 21.9                          | 0.155 | 16.9                             | 0.049 |           |
|                |           | 2437               | 21.5                          | 0.141 | 16.2                             | 0.042 |           |
|                |           | 2462               | 22.2                          | 0.166 | 16.9                             | 0.049 |           |
| 802.11n (HT40) | MCS0      | 2422               | 20.9                          | 0.123 | 16.4                             | 0.044 |           |
|                |           | 2437               | 20.2                          | 0.105 | 16.0                             | 0.040 |           |
|                |           | 2452               | 21.2                          | 0.132 | 16.5                             | 0.045 |           |

Note:

- 1) The cable loss is taken into account in results.
- 2) Antenna gain(G): 3.26 dBi,  
e.i.r.p.= $P_{(\text{Peak power})} + G$ , which is far below the 4 W



**Table 7: Test Result of Maximum Peak Conducted Output Power, BLE**

| Test Mode              | Data Rate | Test Channel (MHz) | Measured Peak Power |        | Limit (W) |
|------------------------|-----------|--------------------|---------------------|--------|-----------|
|                        |           |                    | (dBm)               | (W)    |           |
| Bluetooth (Low Energy) | 1Mbps     | 2402               | 7.1                 | 0.0051 | < 1.0     |
|                        |           | 2440               | 5.8                 | 0.0038 |           |
|                        |           | 2480               | 6.0                 | 0.0040 |           |
|                        | 2Mbps     | 2402               | 6.4                 | 0.0044 |           |
|                        |           | 2440               | 5.8                 | 0.0038 |           |
|                        |           | 2480               | 6.0                 | 0.0040 |           |
|                        | 125kbps   | 2402               | 6.1                 | 0.0041 |           |
|                        |           | 2440               | 5.0                 | 0.0032 |           |
|                        |           | 2480               | 5.2                 | 0.0033 |           |
|                        | 500kbps   | 2402               | 5.9                 | 0.0039 |           |
|                        |           | 2440               | 5.0                 | 0.0032 |           |
|                        |           | 2480               | 5.1                 | 0.0032 |           |
| Maximum Measured Value |           |                    | 7.1                 | 0.0051 |           |

Note:

- 3) The cable loss is taken into account in results.
- 4) Antenna gain(G): 3.26 dBi,  
e.i.r.p.= $P_{(\text{Peak power})} + G$ , which is far below the 4 W

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### 5.1.3 Conducted Power Spectral Density

**RESULT:**

**Pass**

#### Test Specification

Test standard : FCC Part 15.247(e)  
RSS-247 Clause 5.2(b)  
Basic standard : ANSI C63.10: 2013  
Limits : < 8 dBm / 3kHz  
Kind of test site : Shielded Room

#### Test Setup

Date of testing : 2024-05-30 - 2024-06-25  
Input voltage : AC 120V  
Operation mode : A, B  
Test channel : Low / Middle / High  
Ambient temperature : 23.8 °C  
Relative humidity : 52 %  
Atmospheric pressure : 101 kPa

For the measurement records, refer to the appendixes B, C.

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### 5.1.4 6dB Bandwidth

**RESULT:****Pass****Test Specification**

|                   |                         |
|-------------------|-------------------------|
| Test standard     | : FCC Part 15.247(a)(2) |
|                   | : RSS-247 Clause 5.2(a) |
| Basic standard    | : ANSI C63.10: 2013     |
| Limits            | : > 500 kHz             |
| Kind of test site | : Shielded Room         |

**Test Setup**

|                      |                           |
|----------------------|---------------------------|
| Date of testing      | : 2024-05-30 - 2024-06-25 |
| Input voltage        | : AC 120V                 |
| Operation mode       | : A, B                    |
| Test channel         | : Low / Middle / High     |
| Ambient temperature  | : 23.8 °C                 |
| Relative humidity    | : 52 %                    |
| Atmospheric pressure | : 101 kPa                 |

For the measurement records, refer to the appendixes B, C.

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### 5.1.5 99% Bandwidth

**RESULT:**

**Pass**

#### Test Specification

|                   |   |                                          |
|-------------------|---|------------------------------------------|
| Test standard     | : | FCC Part 15.247(a)<br>RSS-Gen Clause 6.7 |
| Basic standard    | : | ANSI C63.10: 2013                        |
| Kind of test site | : | Shielded Room                            |

#### Test Setup

|                      |   |                         |
|----------------------|---|-------------------------|
| Date of testing      | : | 2024-05-30 - 2024-06-25 |
| Input voltage        | : | AC 120V                 |
| Operation mode       | : | A, B                    |
| Test channel         | : | Low / Middle / High     |
| Ambient temperature  | : | 23.8 °C                 |
| Relative humidity    | : | 52 %                    |
| Atmospheric pressure | : | 101 kPa                 |

For the measurement records, refer to the appendixes B, C.

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## 5.1.6 Conducted Spurious Emissions Measured in 100 kHz Bandwidth

**RESULT:****Pass****Test Specification**

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test standard     | : FCC Part 15.247(d)<br>RSS-247 Clause 5.1(b)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Basic standard    | : ANSI C63.10: 2013                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Limits            | : If the tested output power based on peak test:<br>At least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.<br><br>If the tested output power based on RMS averaging over a time interval:<br>At least 30 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.<br>In addition, radiated emissions which fall in the restricted bands, must also comply with the radiated emission limits specified in 15.209(a) |
| Kind of test site | : Shielded Room                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

**Test Setup**

|                      |                           |
|----------------------|---------------------------|
| Date of testing      | : 2024-05-30 - 2024-06-25 |
| Input voltage        | : AC 120V                 |
| Operation mode       | : A,B                     |
| Test channel         | : Low / Middle / High     |
| Ambient temperature  | : 23.8 °C                 |
| Relative humidity    | : 52 %                    |
| Atmospheric pressure | : 101 kPa                 |

Test results of 100kHz Bandwidth of Frequency Band Edge by Conducted method refer to test plots, and compliance is achieved as well.

For the measurement records, refer to the appendixes B, C.

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### 5.1.7 Radiated Spurious Emission

**RESULT:****Pass****Test Specification**

|                   |                                                               |
|-------------------|---------------------------------------------------------------|
| Test standard     | : FCC Part 15.247(d) & FCC Part 15.205<br>RSS-247 Clause 3.3  |
| Basic standard    | : ANSI C63.10: 2013                                           |
| Limits            | : Refer to 15.209(a) of FCC part 15.247(d)<br>RSS-Gen Table 5 |
| Kind of test site | : 3m Semi-anechoic Chamber & 3m Full-anechoic Chamber         |

**Test Setup**

|                      |                           |
|----------------------|---------------------------|
| Date of testing      | : 2024-05-30 - 2024-06-25 |
| Input voltage        | : AC 120V                 |
| Operation mode       | : A, B                    |
| Test channel         | : Low / Middle / High     |
| Ambient temperature  | : Refer to test result    |
| Relative humidity    | : Refer to test result    |
| Atmospheric pressure | : 101 kPa                 |

**Remark:**

Testing was carried out within frequency range 9kHz to the tenth harmonics.  
RSE test performed on models TC321B-G, TC320C-G and TC320B-G for all configurations, only the worst-case mode reported.

For the measurement records, refer to the appendixes B, C.

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## 5.1.8 Conducted Emission on AC Mains

**RESULT:**

**Pass**

### Test Specification

|                   |                                            |
|-------------------|--------------------------------------------|
| Test standard     | : FCC Part 15.207(a)<br>RSS-GEN clause 8.8 |
| Basic standard    | : ANSI C63.10: 2013                        |
| Frequency range   | : 0.15 – 30MHz                             |
| Limits            | : FCC Part 15.207(a)                       |
| Kind of test site | : Shielded Room                            |

### Test Setup

|                      |                 |
|----------------------|-----------------|
| Date of testing      | : 2024-05-29    |
| Input voltage        | : AC 120V       |
| Operation mode       | : C             |
| Earthing             | : Not connected |
| Ambient temperature  | : 22.5 °C       |
| Relative humidity    | : 54.7 %        |
| Atmospheric pressure | : 101 kPa       |

For the measurement records, refer to the appendixes B, C.

## 6 PHOTOGRAPHS OF THE TEST SET-UP

For photographs of the test set-up, refer to the appendix A.

## 7 LIST OF TABLES

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