
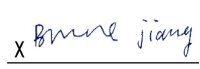



| | | | | |
|--|---|---|--|--|
| Prüfbericht-Nr.: Test report no.: | NN22S76T 002 | Auftrags-Nr.: Order no.: | 168377937 | Seite 1 von 24 Page 1 of 24 |
| Kunden-Referenz-Nr.: Client reference no.: | N/A | Auftragsdatum: Order date: | 2022-06-14 | |
| Auftraggeber: Client: | Shenzhen Sonoff Technologies Co.,Ltd. 3F & 6F, Bldg A, No. 663, Bulong Rd, Shenzhen, Guangdong, China | | | |
| Prüfgegenstand: Test item: | Smart Temperature and Humidity Monitoring Switch | | | |
| Bezeichnung / Typ-Nr.: Identification / Type no.: | THR316, THR320, THR316D, THR320D (Trademark: SONOFF) | | | |
| Auftrags-Inhalt: Order content: | RED approval | | | |
| Prüfgrundlage: Test specification: | EN 300 328 V2.2.2:2019 | | | |
| Wareneingangsdatum: Date of sample receipt: | 2022-06-14 |  | | |
| Prüfmuster-Nr.: Test sample no.: | A003291051-001 | | | |
| | A003284877-012 | | | |
| Prüfzeitraum: Testing period: | 2022-06-14 to 2022-07-30 | | | |
| Ort der Prüfung: Place of testing: | TÜV Rheinland (Shenzhen) Co., Ltd. | | | |
| Prüflaboratorium: Testing laboratory: | TÜV Rheinland (Shenzhen) Co., Ltd. | | | |
| Prüfergebnis*: Test result*: | Pass | | | |
| geprüft von: tested by: |  <small>Signed by: Breeze Jiang</small> | | genehmigt von: authorized by: |  <small>Signed by: Lin Lin</small> |
| Datum: Date: | 2022-10-18 | | Ausstellungsdatum: Issue date: | 2022-10-18 |
| Stellung / Position: | Assistant Project Manager | | Stellung / Position: | Reviewer |
| Sonstiges / Other: | This report is for BLE of Article 3.2 Radio Spectrum requirements only. | | | |
| Zustand des Prüfgegenstandes bei Anlieferung: Condition of the test item at delivery: | Prüfmuster vollständig und unbeschädigt Test item complete and undamaged | | | |
| * Legende: 1 = sehr gut 2 = gut 3 = befriedigend 4 = ausreichend 5 = mangelhaft P(ass) = entspricht o.g. Prüfgrundlage(n) F(ail) = entspricht nicht o.g. Prüfgrundlage(n) N/A = nicht anwendbar N/T = nicht getestet * Legend: 1 = very good 2 = good 3 = satisfactory 4 = sufficient 5 = poor P(ass) = passed a.m. test specification(s) F(ail) = failed a.m. test specification(s) N/A = not applicable N/T = not tested | | | | |
| 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>This test report only relates to the a. m. 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.</i> | | | | |

Test Summary

5.1.1 RF OUTPUT POWER

RESULT: Pass

5.1.2 POWER SPECTRAL DENSITY

RESULT: Pass

5.1.3 DUTY CYCLE, TX-SEQUENCE, TX-GAP

RESULT: Not applicable

5.1.4 MEDIUM UTILISATION (MU) FACTOR

RESULT: Not applicable

5.1.5 ADAPTIVITY

RESULT: Not applicable

5.1.6 OCCUPIED CHANNEL BANDWIDTH

RESULT: Pass

5.1.7 TRANSMITTER UNWANTED EMISSIONS IN THE OOB DOMAIN

RESULT: Pass

5.1.8 TRANSMITTER UNWANTED EMISSIONS IN THE SPURIOUS DOMAIN

RESULT: Pass

5.2.1 RECEIVER SPURIOUS EMISSIONS

RESULT: Pass

5.2.2 RECEIVER BLOCKING

RESULT: Pass

5.2.3 GEO-LOCATION CAPABILITY

RESULT: Not applicable

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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: Test Results of BLE of Article 3.2 Radio Spectrum.

2 Test Sites

2.1 Test Facilities

TÜV Rheinland (Shenzhen) Co., Ltd.

1/F., Building B, Zhuoke Science Park, No.190, Chongqing Road, Fuyong Street, Bao'an District, Shenzhen, Guangdong, China

CNAS Registration No.: L7649

The tests at the test sites have been conducted under the supervision of a TÜV engineer.

2.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

TÜV Rheinland (Shenzhen) Co., Ltd.

| Conducted Test equipment | | | | | |
|--------------------------------------|---------------------|------------------|-------------------|------------------|-------------------|
| Equipment | Manufacturer | Model No. | Serial No. | Cal. Date | Cal. Until |
| Power Sensor | Keysight | U2021XA | MY55520005 | 2021.09.30 | 2022.09.29 |
| | | | MY55520006 | 2021.09.30 | 2022.09.29 |
| | | | MY56120038 | 2021.09.30 | 2022.09.29 |
| | | | MY56280002 | 2021.09.30 | 2022.09.29 |
| Signal Generator | Agilent | N5182A | MY46240556 | 2021.09.30 | 2022.09.29 |
| Signal Analyzer | Agilent | N9020A | MY49100060 | 2021.09.30 | 2022.09.29 |
| Universal Radio communication tester | R&S | CMU200 | 111058 | 2021.09.29 | 2022.09.28 |
| Wireless Communications Test Set | R&S | CMW 500 | 131428 | 2022.03.01 | 2023.02.28 |
| Temperature & Humidity | HH660 | Mieo | N/A | 2021.10.09 | 2022.10.08 |
| Temperature& Humidity test chamber | Safety test | AG80L | 171200018 | 2022.03.01 | 2023.02.28 |
| Programmable power supply | Agilent | E3642A | MY40002025 | 2021.10.08 | 2022.10.07 |
| Attenuator | HP | 8494B | DC-18G | 2022.03.02 | 2023.03.01 |
| AC Power Source | APC | KDF-11010G | F214050035 | N.C.R | N.C.R |
| Router | WAVLINK | WL-WN575A2 | WL1512260336 | N.C.R | N.C.R |
| Digit Multi-meter | FLUKEF | 15B+ | N/A | 2021.10.08 | 2022.10.07 |

| Radiated Test equipment | | | | | |
|----------------------------------|---------------------|------------------|-------------------|------------------|-------------------|
| Equipment | Manufacturer | Model No. | Serial No. | Cal. Date | Cal. Until |
| Bilog Antenna | TESEQ | CBL6111D | 34678 | 2020.10.12 | 2022.10.11 |
| Horn Antenna | SCHWARZBECK | BBHA 9120D | 02014 | 2021.10.11 | 2023.10.10 |
| Pre-Amplifier(0.1M-3GHz) | EM | EM330 | 060665 | 2021.10.08 | 2022.10.07 |
| Pre-Amplifier (1G-18GHz) | SKET | LNPA-01018G-45 | SK2018080901 | 2021.09.30 | 2022.09.29 |
| Wireless Communications Test Set | R&S | CMW 500 | 131428 | 2022.03.01 | 2023.02.28 |
| Signal Analyzer | R&S | FSV 40-N | 101823 | 2021.09.30 | 2022.09.29 |
| Temperature & Humidity | SW-108 | SuWei | N/A | 2022.03.02 | 2023.03.01 |
| Turn table | EM | SC100_1 | 60531 | N/A | N/A |
| Antenna mast | EM | SC100 | N/A | N/A | N/A |
| AC Power Source | APC | KDF-11010G | F214050035 | N.C.R | N.C.R |
| Digit Multi-meter | FLUKEF | 15B+ | N/A | 2021.10.08 | 2022.10.07 |

2.3 Uncertainty of Measurement

According to the requirement of EN 300 328 V2.2.2, the value of the measurement uncertainty of each parameter is listed as below:

Table 2: Measurement Uncertainty

| Parameter | Uncertainty |
|---------------------------------------|---------------------------|
| Occupied Channel Bandwidth | $\pm 3.6 \%$ |
| RF Output Power, Conducted | $\pm 0.71\text{dB}$ |
| Power Spectral Density, Conducted | $\pm 2.19 \text{ dB}$ |
| Unwanted Emission, Conducted | $\pm 0.63\text{dB}$ |
| All Emissions, Radiated (Below 1GHz) | $\pm 2.25\text{dB}$ |
| All Emissions, Radiated (1GHz-18GHz) | $\pm 2.21\text{dB}$ |
| All Emissions, Radiated (18GHz-25GHz) | $\pm 3.46\text{dB}$ |
| Temperature | $\pm 0.5^{\circ}\text{C}$ |
| Humidity | $\pm 2\%$ |
| DC and Low Frequency Voltages | $\pm 2.1\%$ |
| Time | $\pm 2.8\%$ |
| Duty Cycle | $\pm 3.2\%$ |

3 General Product Information

3.1 Product Function and Intended Use

The EUT is a Smart Temperature and Humidity Monitoring Switch, which supported 802.11 b/g/n and BLE wireless technologies.

According to the client's declaration, the all models are the same as the original ones in circuit design, layout only different in appearance.

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

3.2 Ratings and System Details

Table 3: Technical Specification of EUT

| General Information of EUT | | Description |
|--------------------------------|--|--|
| Kind of Equipment | | Smart Temperature and Humidity Monitoring Switch |
| Type Designation | | THR316, THR320, THR316D, THR320D |
| Trade Mark | | SONOFF |
| Operating Voltage | | AC 100-240V, 50/60Hz |
| Operating Temperature Range | | -10°C - +40°C |
| Technical Specification of BLE | | |
| Characteristic | | Description |
| Frequency Range | | 2402 - 2480 MHz |
| Type of Modulation | | GFSK |
| Equipment types | | Only one adaptive mode is implemented and could not operate in a non-adaptive mode |
| Channel Number | | 40 Channels |
| Channel Spacing | | 2 MHz |
| Bluetooth Version | | 4.2 |
| Bluetooth Configuration | | LE(Support 1M PHY) |
| Receiver Categories | | Receiver category 2 |
| Antenna Type | | FPC Antenna |
| Antenna Gain | | 2.37 dBi |

Table 4: RF Channel and Frequency of BLE

| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|-----------|-----------------|-----------|-----------------|---------|-----------------|-----------|-----------------|
| 00 | 2402 | 10 | 2422 | 20 | 2442 | 30 | 2462 |
| 01 | 2404 | 11 | 2424 | 21 | 2444 | 31 | 2464 |
| 02 | 2406 | 12 | 2426 | 22 | 2446 | 32 | 2466 |
| 03 | 2408 | 13 | 2428 | 23 | 2448 | 33 | 2468 |
| 04 | 2410 | 14 | 2430 | 24 | 2450 | 34 | 2470 |
| 05 | 2412 | 15 | 2432 | 25 | 2452 | 35 | 2472 |
| 06 | 2414 | 16 | 2434 | 26 | 2454 | 36 | 2474 |
| 07 | 2416 | 17 | 2436 | 27 | 2456 | 37 | 2476 |
| 08 | 2418 | 18 | 2438 | 28 | 2458 | 38 | 2478 |
| 09 | 2420 | 19 | 2440 | 29 | 2460 | 39 | 2480 |

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, BLE wireless
 - 1 Transmitting (Low / Middle / High channel)
 - 2 Receiving (Low / Middle / High channel)
- B. On, BLE connecting mode
- C. Off

3.4 Noise Generating and Noise Suppressing Parts

For details refer to the Circuit Diagram.

3.5 Submitted Documents

- Application Form

- User Manual

4 Test Set-up and Operation Modes

4.1 Principle of Configuration Selection

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.

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.

4.2 Test Operation and Test Software

Test operation refers to test setup in chapter 5.

According to clause 3.1, all tests were performed on model THR320D in this report.

This testing was carried out on all different data rates, but only the worst case was presented in this report.

4.3 Special Accessories and Auxiliary Equipment

Table 5: Auxiliary Equipment used during test

| Description | Manufacturer | Model | S/N |
|-------------|--------------|---------|-----------|
| sensor | client | THS01 | / |
| sensor | client | DS18B20 | / |
| sensor | client | MS01 | / |
| Laptop | Lenovo | T480 | PF-16A6N8 |

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.

5 Test Results

5.1 Transmitter Requirement & Test Suites

5.1.1 RF Output Power

RESULT:

Pass

Test Specification

| | |
|-------------------|--|
| Test standard | : EN 300 328 V2.2.2:2019 |
| Test requirement | : EN 300 328 V2.2.2:2019, Clause 4.3.2.2 |
| Limit | : EN 300 328 V2.2.2:2019, Clause 4.3.2.2.3 |
| Test suites | : EN 300 328 V2.2.2:2019, Clause 5.4.2 |
| Kind of test site | : Shielding Room |

Test Setup

| | |
|----------------------|---|
| Date of testing | : 2022-07-12 |
| Test voltage | : DC 5V |
| Test environment | : Normal and extreme temperature |
| Operation mode | : A.1 |
| Test channel | : <input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest |
| Ambient temperature | : 24.5 °C |
| Relative humidity | : 50 % |
| Atmospheric pressure | : 101 kPa |

For details refer to following test result.

Table 6: Test Result of RF Output Power, BLE

| Condition | Mode | Frequency (MHz) | Max Burst RMS Power (dBm) | Burst Number | Max EIRP (dBm) | Limit (dBm) | Verdict |
|-----------|--------|-----------------|---------------------------|--------------|----------------|-------------|---------|
| NVNT | BLE 1M | 2402 | 5.45 | 33 | 7.82 | <=20 | Pass |
| NVNT | BLE 1M | 2440 | 5.15 | 33 | 7.52 | <=20 | Pass |
| NVNT | BLE 1M | 2480 | 5.60 | 33 | 7.97 | <=20 | Pass |
| NVLT | BLE 1M | 2402 | 5.84 | 33 | 8.21 | <=20 | Pass |
| NVLT | BLE 1M | 2440 | 5.54 | 33 | 7.91 | <=20 | Pass |
| NVLT | BLE 1M | 2480 | 5.99 | 33 | 8.36 | <=20 | Pass |
| NVHT | BLE 1M | 2402 | 5.14 | 33 | 7.51 | <=20 | Pass |
| NVHT | BLE 1M | 2440 | 4.84 | 33 | 7.21 | <=20 | Pass |
| NVHT | BLE 1M | 2480 | 5.29 | 33 | 7.66 | <=20 | Pass |

NOTE:

The RF Output Power (E.I.R.P.) should be calculated using the formula below:

The RF Output Power (E.I.R.P.) = $A_{(RMS\ power)} + G + Y$

Antenna gain(G): 2.37 dBi

5.1.2 Power Spectral Density

RESULT:
Pass
Test Specification

Test standard : EN 300 328 V2.2.2:2019
 Test requirement : EN 300 328 V2.2.2:2019, Clause 4.3.2.3
 Limit : EN 300 328 V2.2.2:2019, Clause 4.3.2.3.3
 Test suites : EN 300 328 V2.2.2:2019, Clause 5.4.3
 Kind of test site : Shielding Room

Test Setup

Date of testing : 2022-07-12
 Test voltage : DC 5V
 Test environment : Normal temperature
 Test channel : ☒ Lowest ☒ Middle ☒ Highest
 Operation mode : A.1
 Ambient temperature : 24.5 °C
 Relative humidity : 50 %
 Atmospheric pressure : 101 kPa

For details refer to following test result.

Table 7: Test Result of Power Spectral Density

| Condition | Mode | Frequency (MHz) | Max PSD (dBm/MHz) | Limit (dBm/MHz) | Verdict |
|-----------|--------|-----------------|-------------------|-----------------|---------|
| NVNT | BLE 1M | 2402 | 7.88 | <=10 | Pass |
| NVNT | BLE 1M | 2440 | 9.11 | <=10 | Pass |
| NVNT | BLE 1M | 2480 | 9.37 | <=10 | Pass |

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5.1.3 Duty Cycle, TX-sequence, TX-gap

RESULT:

Not applicable

Test Specification

Test standard : EN 300 328 V2.2.2:2019
Test requirement : EN 300 328 V2.2.2:2019, Clause 4.3.2.4

Exemption Condition(s):

☒ These requirements apply to non-adaptive equipment or to adaptive equipment when operating in non-adaptive mode. The equipment is using wide band modulations other than FHSS.

Conclusion:

The EUT is adaptive equipment and does not support non-adaptive mode, hence this requirement is not applicable.

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5.1.4 Medium Utilisation (MU) Factor

RESULT:

Not applicable

Test Specification

Test standard : EN 300 328 V2.2.2:2019
Test requirement : EN 300 328 V2.2.2:2019, Clause 4.3.2.5

Exemption Condition(s):

☒ These requirements apply to non-adaptive equipment or to adaptive equipment when operating in non-adaptive mode. The equipment is using wide band modulations other than FHSS.

Conclusion:

The EUT is adaptive equipment and does not support non-adaptive mode, hence this requirement is not applicable.

5.1.5 Adaptivity

RESULT:**Not applicable****Test Specification**

| | |
|-------------------|--|
| Test standard | : EN 300 328 V2.2.2:2019 |
| Test requirement | : EN 300 328 V2.2.2:2019, Clause 4.3.2.6 |
| Limit | : EN 300 328 V2.2.2:2019, Clause 4.3.2.6 |
| Test suites | : EN 300 328 V2.2.2:2019, Clause 5.4.6 |
| Kind of test site | : Shielding Room |

*Remark: not applicable. Refer to the EN 300 328 clause 4.3.2.6 section for the details.

This requirement does not apply to non-adaptive equipment or adaptive equipment operating in a non-adaptive mode providing the equipment complies with the requirements and/or restrictions applicable to non-adaptive equipment.

In addition, this requirement does not apply for equipment with a maximum declared RF Output power level of less than 10 dBm e.i.r.p. or for equipment when operating in a mode where the RF Output power is less than 10 dBm e.i.r.p.

As the EUT about RF Output power level is less than 10 dBm e.i.r.p, so the test is not applicable and skipped.

5.1.6 Occupied Channel Bandwidth

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

Test standard : EN 300 328 V2.2.2:2019
Test requirement : EN 300 328 V2.2.2:2019, Clause 4.3.2.7
Limit : EN 300 328 V2.2.2:2019, Clause 4.3.2.7.3
Test suites : EN 300 328 V2.2.2:2019, Clause 5.4.7
Kind of test site : Shielding Room

Test Setup

Date of testing : 2022-07-12
Test voltage : DC 5V
Test environment : Normal temperature
Test channel : ☒ Lowest ☐ Middle ☒ Highest
Operation mode : A.1
Ambient temperature : 24.5 °C
Relative humidity : 50 %
Atmospheric pressure : 101 kPa

For details refer to following test result.

Table 8: Test Result of Occupied Channel Bandwidth

| Condition | Mode | Frequency (MHz) | Center Frequency (MHz) | OBW (MHz) | Lower Edge (MHz) | Upper Edge (MHz) | Limit OBW (MHz) | Verdict |
|-----------|--------|-----------------|------------------------|-----------|------------------|------------------|------------------|---------|
| NVNT | BLE 1M | 2402 | 2402.017 | 1.027 | 2401.503 | 2402.53 | 2400 - 2483.5MHz | Pass |
| NVNT | BLE 1M | 2480 | 2480.004 | 1.028 | 2479.49 | 2480.518 | 2400 - 2483.5MHz | Pass |

Prüfbericht - Nr.: NN22S76T 002
Test Report No.Seite 17 von 24
Page 17 of 24**5.1.7 Transmitter Unwanted Emissions in the OOB Domain****RESULT:****Pass****Test Specification**

Test standard : EN 300 328 V2.2.2:2019
Test requirement : EN 300 328 V2.2.2:2019, Clause 4.3.2.8
Limit : EN 300 328 V2.2.2:2019, Clause 4.3.2.8.3
Test suites : EN 300 328 V2.2.2:2019, Clause 5.4.8
Kind of test site : Shielding Room

Test Setup

Date of testing : 2022-07-12
Test voltage : DC 5V
Test environment : Normal temperature
Test channel : ☒ Lowest ☐ Middle ☒ Highest
Operation mode : B
Ambient temperature : 24.5 °C
Relative humidity : 50 %
Atmospheric pressure : 101 kPa

For the measurement records, refer to the appendix A.

Prüfbericht - Nr.: NN22S76T 002
Test Report No.Seite 18 von 24
Page 18 of 24**5.1.8 Transmitter Unwanted Emissions in the Spurious Domain****RESULT:****Pass****Test Specification**

Test standard : EN 300 328 V2.2.2:2019
Test requirement : EN 300 328 V2.2.2:2019, Clause 4.3.2.9
Limit : EN 300 328 V2.2.2:2019, Clause 4.3.2.9.3
Test suites : EN 300 328 V2.2.2:2019, Clause 5.4.9
Kind of test site : 3m Fully Anechoic Room

Test Setup

Date of testing : 2022-07-12
Test voltage : AC 230V, 50Hz
Test environment : Normal temperature
Operation mode : A.1
Test channel : ☒ Lowest ☐ Middle ☒ Highest
Ambient temperature : Refer to test results
Relative humidity : Refer to test results
Atmospheric pressure : 101 kPa

For the measurement records, refer to the appendix A.

5.2 Receiver Requirement & Test Suites

5.2.1 Receiver Spurious Emissions

RESULT:

Pass**Test Specification**

Test standard : EN 300 328 V2.2.2:2019
Test requirement : EN 300 328 V2.2.2:2019, Clause 4.3.2.10
Limit : EN 300 328 V2.2.2:2019, Clause 4.3.2.10.3
Test suites : EN 300 328 V2.2.2:2019, Clause 5.4.10
Kind of test site : 3m Fully Anechoic Room

Test Setup

Date of testing : 2022-07-12
Test voltage : AC 230V, 50Hz
Test environment : Normal temperature
Operation mode : A.2
Test channel : ☒ Lowest ☐ Middle ☒ Highest
Ambient temperature : Refer to test results
Relative humidity : Refer to test results
Atmospheric pressure : 101 kPa

For the measurement records, refer to the appendix A.

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5.2.2 Receiver Blocking**RESULT:****Pass****Test Specification**

| | |
|-------------------|---|
| Test standard | : EN 300 328 V2.2.2:2019 |
| Test requirement | : EN 300 328 V2.2.2:2019, Clause 4.3.2.11 |
| Limit | : EN 300 328 V2.2.2:2019, Clause 4.3.2.11.3 |
| Test suites | : EN 300 328 V2.2.2:2019, Clause 5.4.11 |
| Kind of test site | : Shielding Room |

Test Setup

| | |
|----------------------|--|
| Date of testing | : 2022-07-12 |
| Test voltage | : DC 5V |
| Test environment | : Normal temperature |
| Operation mode | : A.2 |
| Test channel | : <input checked="" type="checkbox"/> Lowest <input type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest |
| Ambient temperature | : 24.5 °C |
| Relative humidity | : 50 % |
| Atmospheric pressure | : 101 kPa |

Receiver category 2

For the measurement records, refer to the appendix A.

5.2.3 Geo-location Capability

RESULT:

Not applicable

Test Specification

Test standard : EN 300 328 V2.2.2:2019
Test requirement : EN 300 328 V2.2.2:2019, 4.3.2.12

Exemption Condition(s):

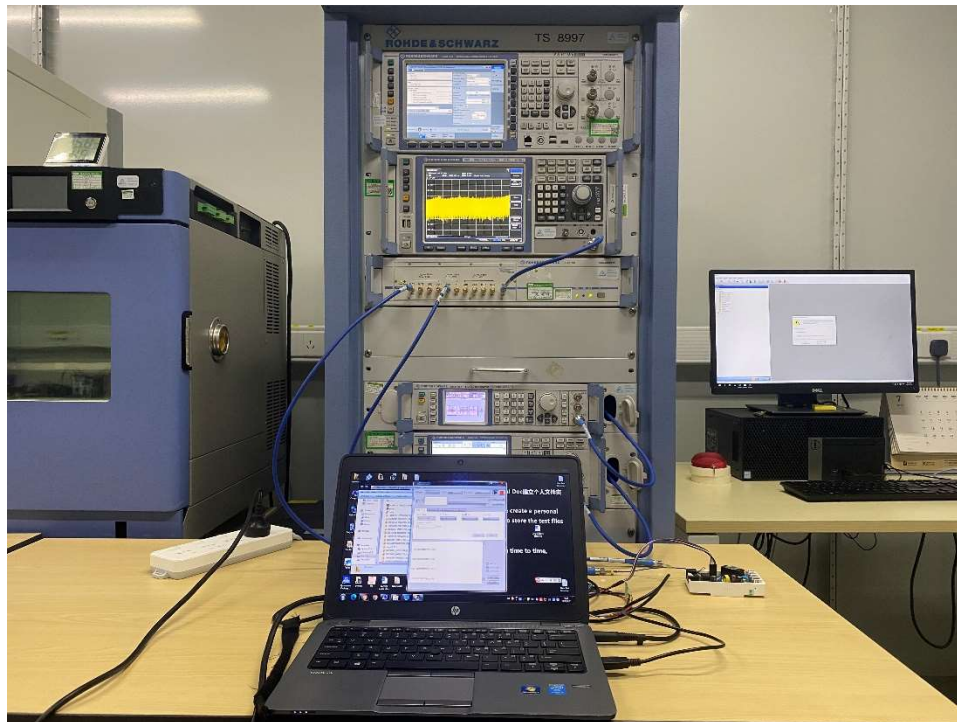
This requirement only applies to equipment with geo-location capability as defined in clause 4.3.2.12.2.

Conclusion:

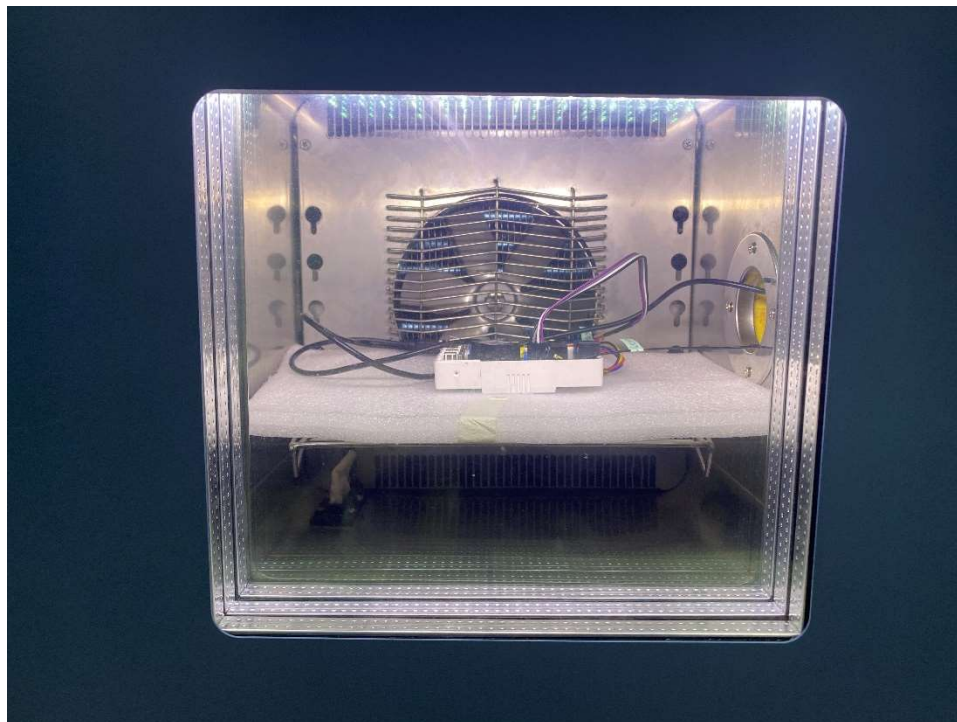
The EUT is adaptive equipment and does not support geo-location capability, hence this requirement is not applicable.

6 Photographs of the Test Set-Up

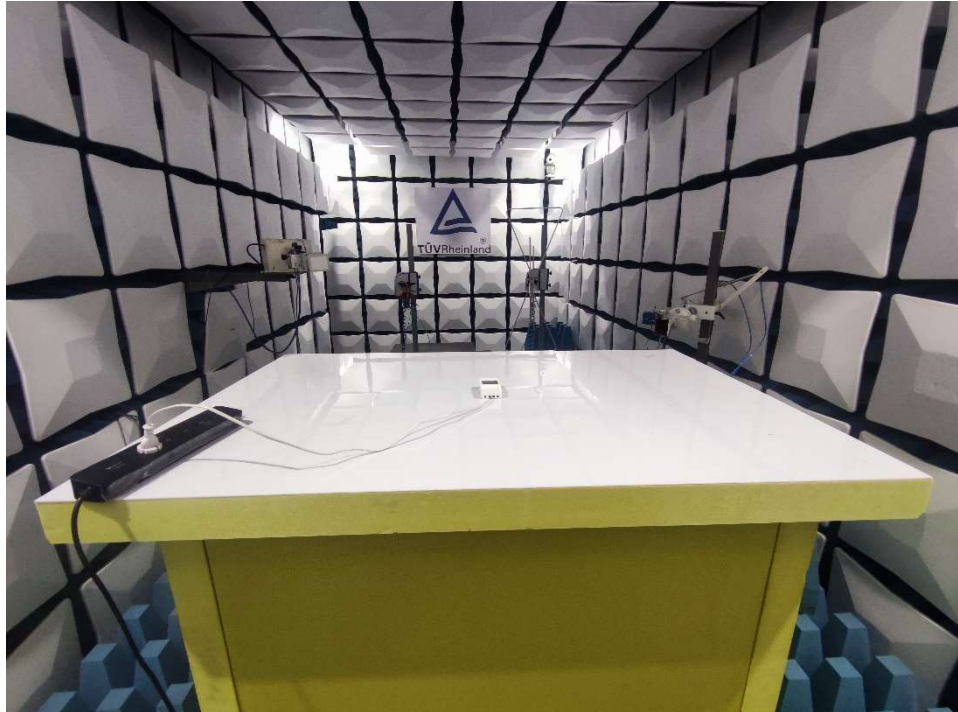
Photograph 1: Set-up for Radio Spectrum Testing, Normal Condition



Photograph 2: Set-up for Radio Spectrum Testing, Extreme Condition



Photograph 3: Set-up for Transmitter & Receiver Spurious Emissions



7 List of Tables

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Appendix A:
Test results of Bluetooth Low Energy

Content

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Appendix A.1 Occupied Channel Bandwidth

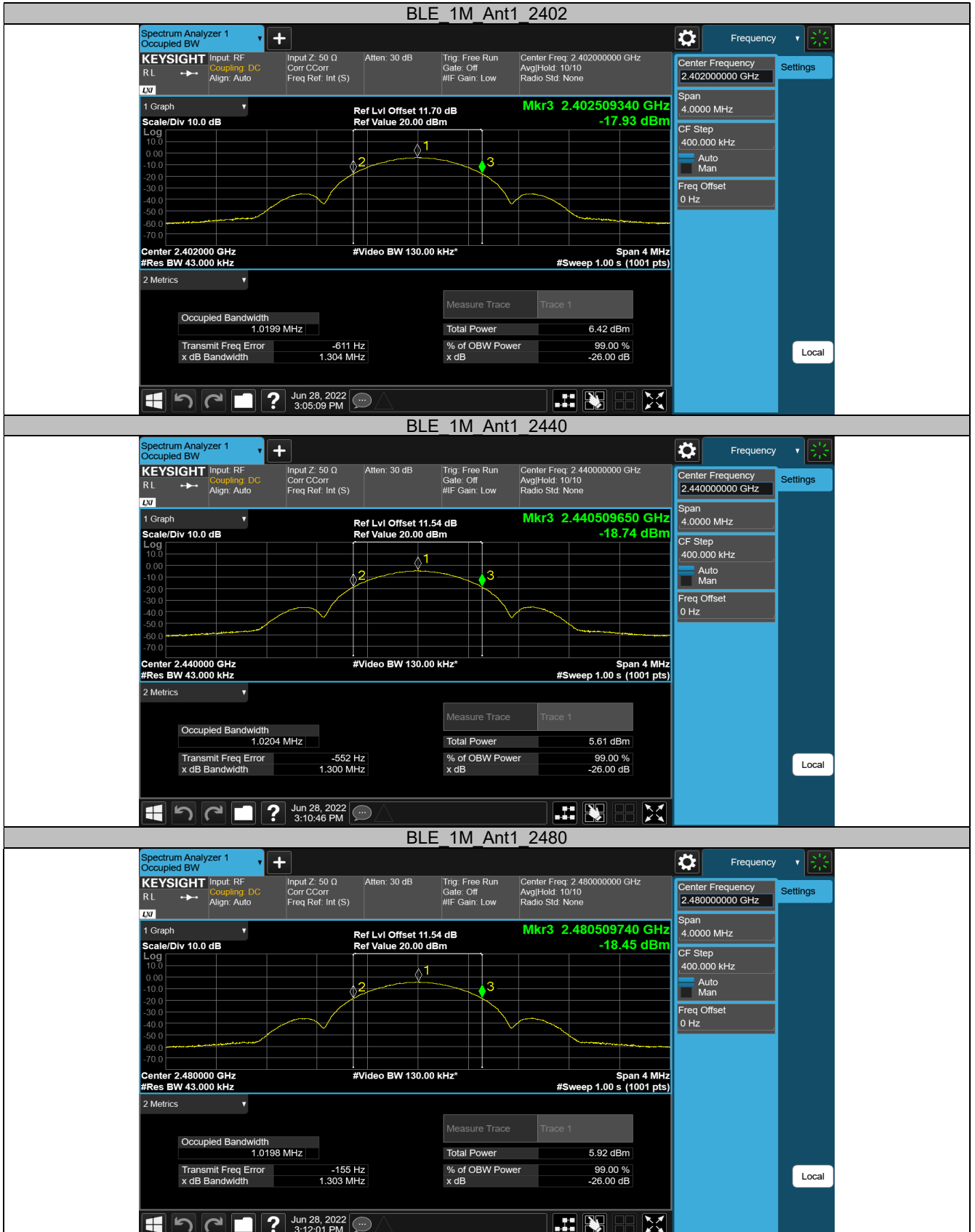
| TestMode | Antenna | Frequency[MHz] | OCB[MHz] | FL[MHz] | FH[MHz] | Limit[MHz] | Verdict |
|----------|---------|----------------|----------|-----------|-----------|----------------|---------|
| BLE_1M | Ant1 | 2402 | 1.0199 | 2401.4894 | 2402.5093 | 2400 to 2483.5 | PASS |
| | | 2440 | 1.0204 | 2439.4893 | 2440.5097 | 2400 to 2483.5 | PASS |
| | | 2480 | 1.0198 | 2479.4899 | 2480.5097 | 2400 to 2483.5 | PASS |

Appendix A NN22S76T 002



Prüfbericht - Produkte
Test Report - Products

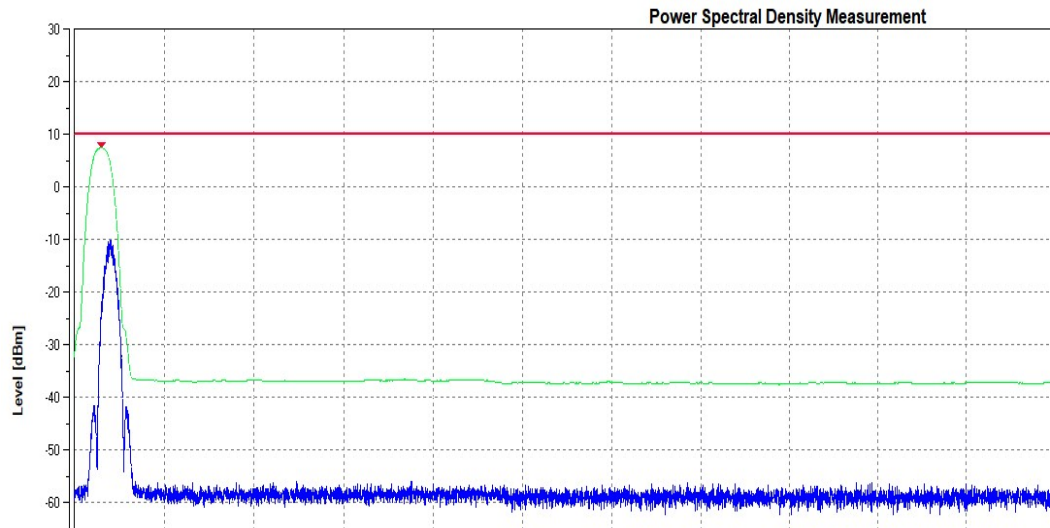
Page 3 of 25



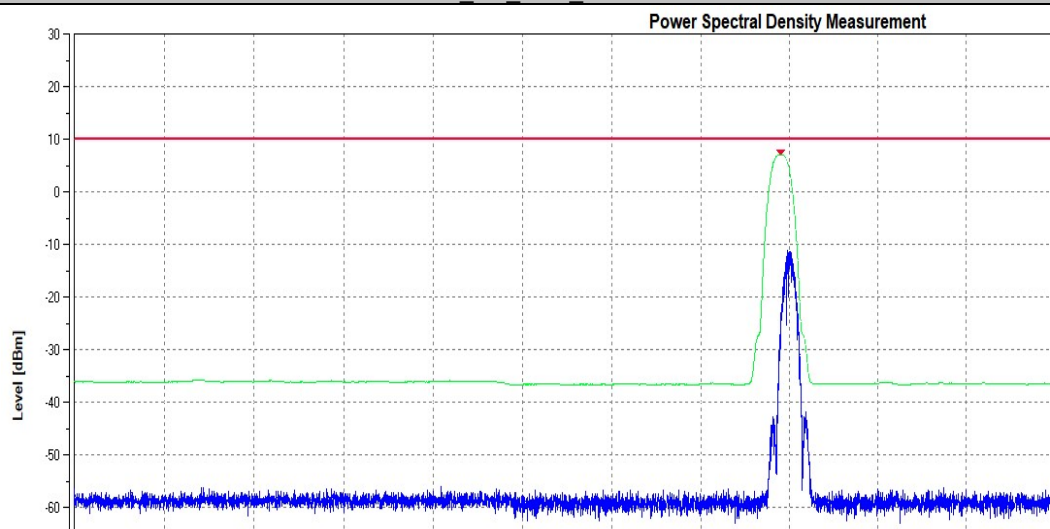
Appendix A.2 Power Spectral Density

| TestMode | Antenna | Frequency[MHz] | EIRP PSD[dBm/MHz] | Limit[dBm/MHz] | Verdict |
|----------|---------|----------------|-------------------|----------------|---------|
| BLE_1M | Ant1 | 2402 | 7.39 | 10 | PASS |
| | | 2440 | 7.09 | 10 | PASS |
| | | 2480 | 7.54 | 10 | PASS |

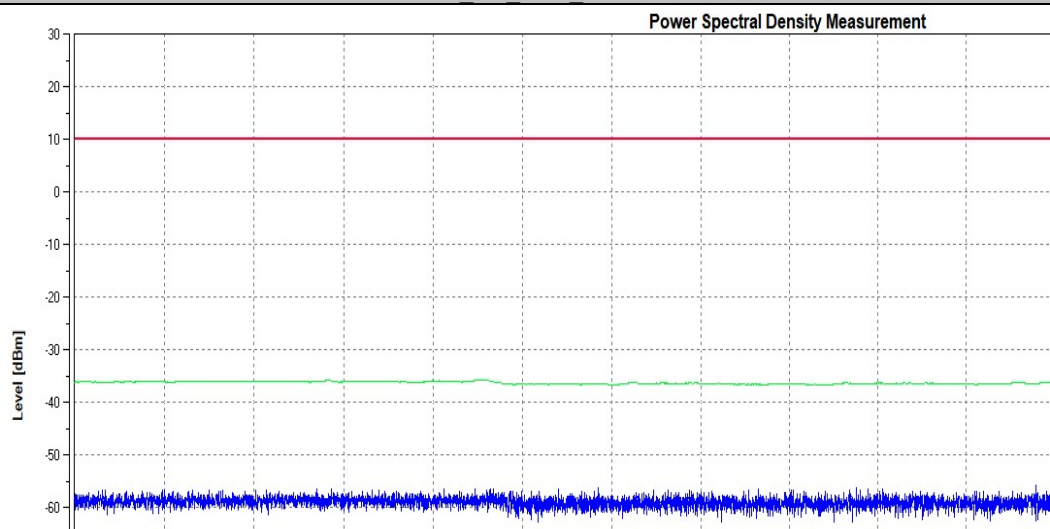
BLE_1M_Ant1_2402



BLE_1M_Ant1_2440



BLE_1M_Ant1_2480



Appendix A.3 Receiver Blocking

| Wanted signal meanpower from companion device (dBm) | Test Channel | Blocking signal frequency (MHz) | Blocking signal power(dBm) CW | PER | Limit | Results |
|--|--------------|--|----------------------------------|-------|-------|---------|
| -66.91 | Low | 2300 2380 | -32 | 0.21% | ≤10% | PASS |
| | | | | 0.03% | | |
| | High | 2504 2584 | | 0.16% | | |
| | | | | 0.37% | | |

NOTE 1: OCBW is 1009000Hz.

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

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

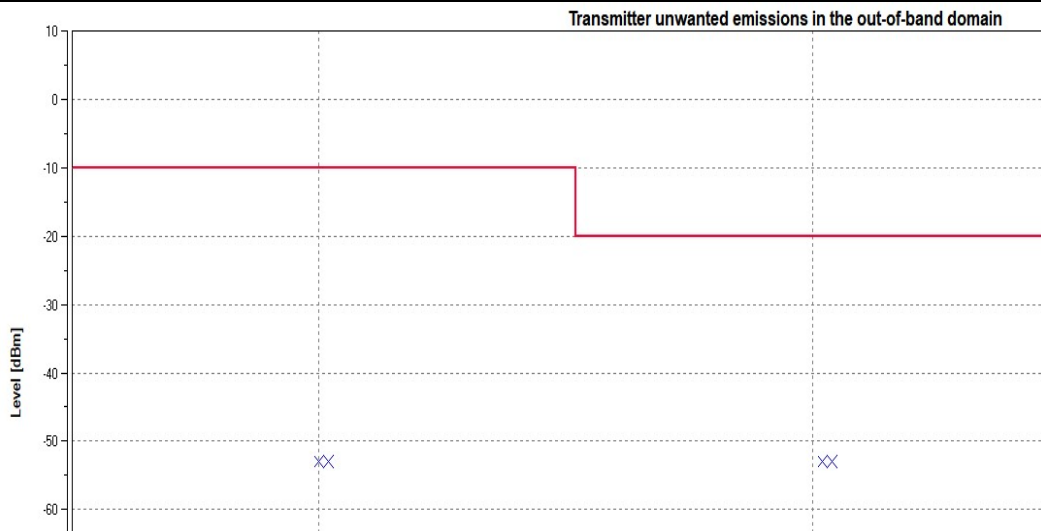
Appendix A.4 Tx unwanted emissions in the out-of-band domain

| TestMode | Antenna | Frequency[MHz] | Freq. [MHz] | Level[dBm] | Limit[dBm] | Verdict |
|----------|---------|----------------|-------------|------------|------------|---------|
| BLE_1M | Ant1 | 2402 | 2398.4602 | -50.45 | -20.00 | PASS |
| | | | 2398.4801 | -50.26 | -20.00 | PASS |
| | | | 2399.4801 | -44.49 | -10.00 | PASS |
| | | | 2399.5 | -44.30 | -10.00 | PASS |
| | | | 2484 | -53.02 | -10.00 | PASS |
| | | | 2484.0199 | -53.04 | -10.00 | PASS |
| | | | 2485.0199 | -53.00 | -20.00 | PASS |
| | | | 2485.0398 | -53.00 | -20.00 | PASS |
| | | 2480 | 2398.4604 | -53.30 | -20.00 | PASS |
| | | | 2398.4802 | -53.29 | -20.00 | PASS |
| | | | 2399.4802 | -52.36 | -10.00 | PASS |
| | | | 2399.5 | -52.29 | -10.00 | PASS |
| | | | 2484 | -51.29 | -10.00 | PASS |
| | | | 2484.0198 | -51.33 | -10.00 | PASS |
| | | | 2485.0198 | -51.88 | -20.00 | PASS |
| | | | 2485.0396 | -51.91 | -20.00 | PASS |

BLE 1M Ant1 2402 2400MHz-2BW to 2400MHz



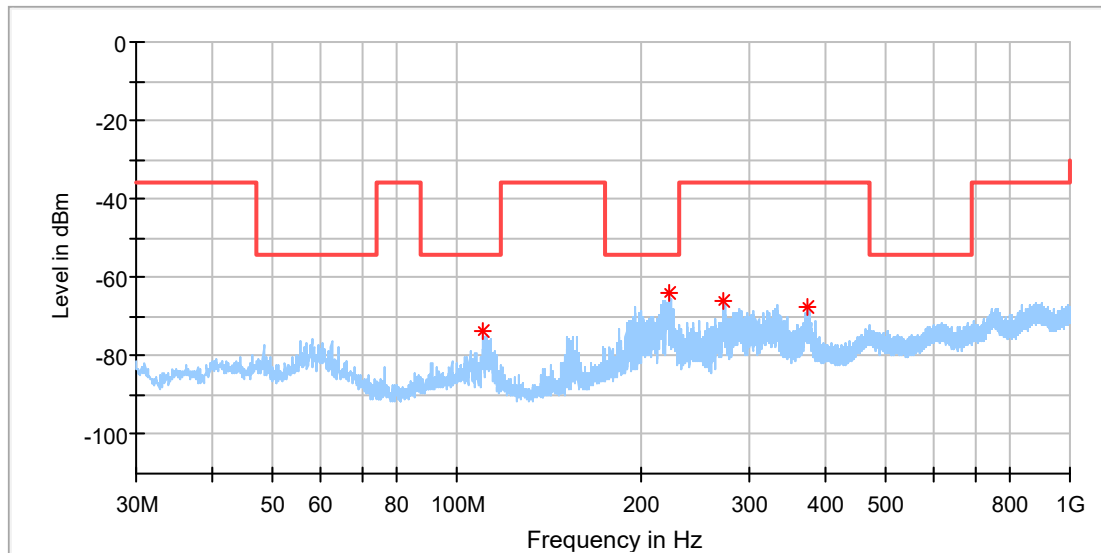
BLE 1M Ant1 2402 2483.5MHz to 2483.5MHz+2BW





Appendix A.5 Transmitter unwanted emissions

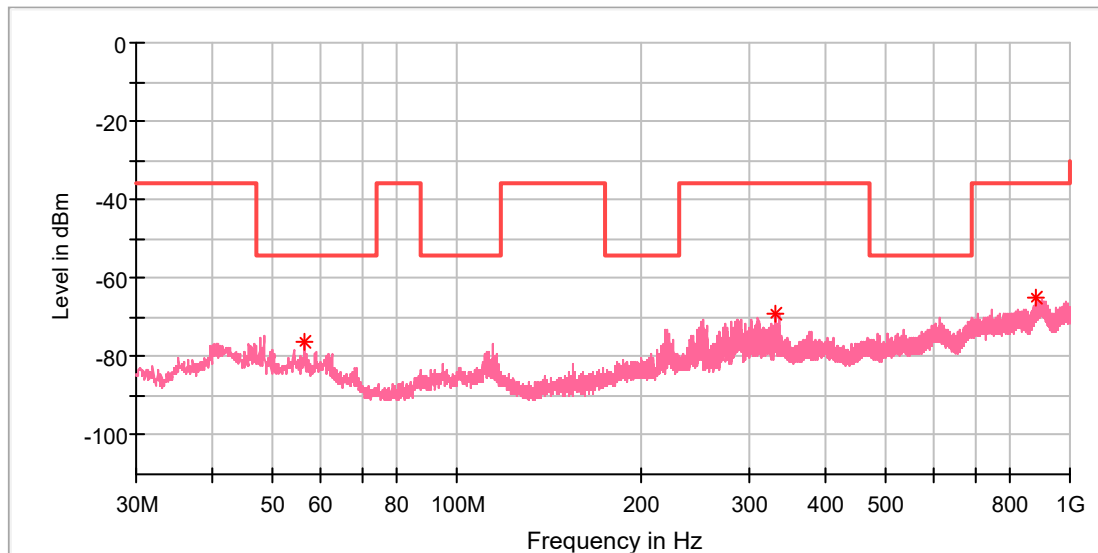
| | |
|----------------|--|
| EUT Name: | Smart Temperature and Humidity Monitoring Switch |
| Model: | THR320D |
| Sample No: | A003284877-012 |
| Test Mode: | TX_BLE L CH |
| Test Voltage: | AC 230V |
| Remark: | Temp:23.4;Humi:51% |
| Test standard: | EN 300328 |
| Tested By: | Xiqiang Ma |
| Reviewed by | Terry Yin |



Critical_Freqs

| Frequency (MHz) | RMS (dBm) | Limit (dBm) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|-----------|-------------|-------------|-------------|-----|---------------|------------|
| 110.607000 | -73.43 | -54.00 | 19.43 | 150.0 | H | 84.0 | -119.8 |
| 222.157000 | -63.95 | -54.00 | 9.95 | 150.0 | H | 260.0 | -117.3 |
| 272.791000 | -66.19 | -36.00 | 30.19 | 150.0 | H | 263.0 | -117.5 |
| 373.380000 | -67.52 | -36.00 | 31.52 | 150.0 | H | 103.0 | -113.7 |

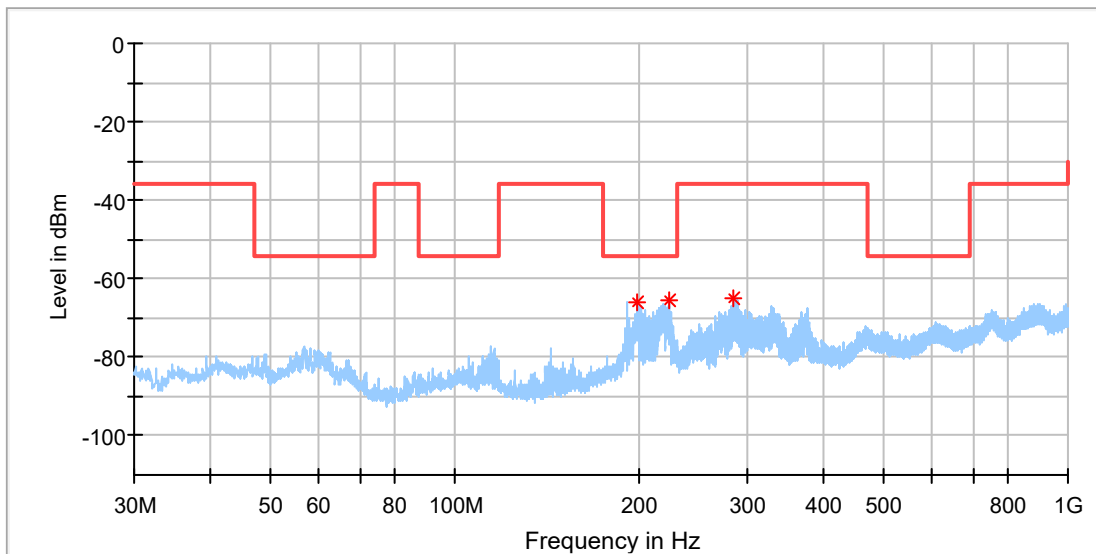
| | |
|----------------|--|
| EUT Name: | Smart Temperature and Humidity Monitoring Switch |
| Model: | THR320D |
| Sample No: | A003284877-012 |
| Test Mode: | TX_BLE L CH |
| Test Voltage: | AC 230V |
| Remark: | Temp:23.4;Humi:51% |
| Test standard: | EN 300328 |
| Tested By: | Xiqiang Ma |
| Reviewed by | Terry Yin |



Critical_Freqs

| Frequency (MHz) | RMS (dBm) | Limit (dBm) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|-----------|-------------|-------------|-------------|-----|---------------|------------|
| 56.481000 | -76.01 | -54.00 | 22.01 | 150.0 | V | 138.0 | -116.6 |
| 330.894000 | -68.85 | -36.00 | 32.85 | 150.0 | V | 324.0 | -113.0 |
| 883.212000 | -64.89 | -36.00 | 28.89 | 150.0 | V | 166.0 | -103.0 |

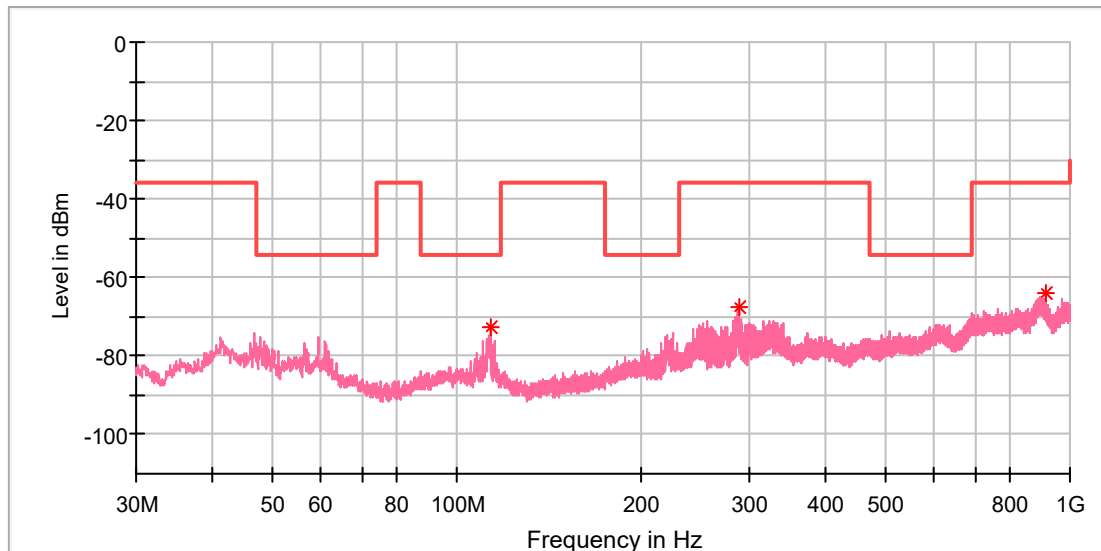
| | |
|----------------|--|
| EUT Name: | Smart Temperature and Humidity Monitoring Switch |
| Model: | THR320D |
| Sample No: | A003284877-012 |
| Test Mode: | TX_BLE H CH |
| Test Voltage: | AC 230V |
| Remark: | Temp:23.4;Humi:51% |
| Test standard: | EN 300328 |
| Tested By: | Xiqiang Ma |
| Reviewed by | Terry Yin |



Critical_Freqs

| Frequency (MHz) | RMS (dBm) | Limit (dBm) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|-----------|-------------|-------------|-------------|-----|---------------|------------|
| 198.586000 | -66.18 | -54.00 | 12.18 | 150.0 | H | 228.0 | -117.5 |
| 223.418000 | -65.29 | -54.00 | 11.29 | 150.0 | H | 264.0 | -117.1 |
| 285.304000 | -64.90 | -36.00 | 28.90 | 150.0 | H | 97.0 | -116.8 |

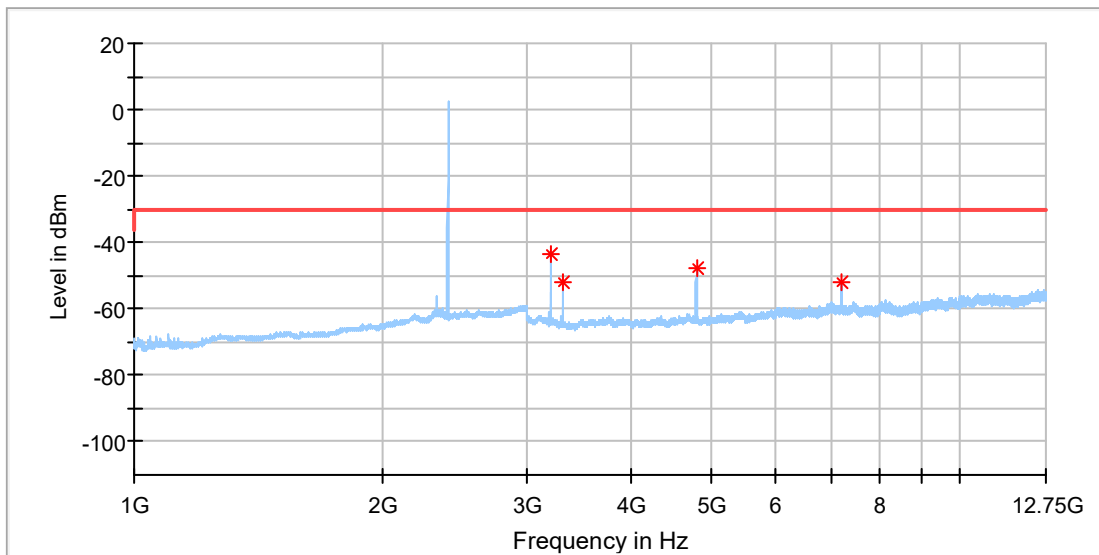
EUT Name: Smart Temperature and Humidity Monitoring Switch
 Model: THR320D
 Sample No: A003284877-012
 Test Mode: TX_BLE H CH
 Test Voltage: AC 230V
 Remark: Temp:23.4;Humi:51%
 Test standard: EN 300328
 Tested By: Xiqiang Ma
 Reviewed by: Terry Yin



Critical_Freqs

| Frequency (MHz) | RMS (dBm) | Limit (dBm) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|-----------|-------------|-------------|-------------|-----|---------------|------------|
| 113.856500 | -72.59 | -54.00 | 18.59 | 150.0 | V | 139.0 | -118.9 |
| 287.874500 | -67.60 | -36.00 | 31.60 | 150.0 | V | 155.0 | -117.0 |
| 914.155000 | -64.05 | -36.00 | 28.05 | 150.0 | V | 239.0 | -103.9 |

| | |
|----------------|--|
| EUT Name: | Smart Temperature and Humidity Monitoring Switch |
| Model: | THR320D |
| Sample No: | A003284877-012 |
| Test Mode: | TX_BLE L CH |
| Test Voltage: | AC 230V |
| Remark: | Temp:23.4;Humi:51% |
| Test standard: | EN 300328 |
| Tested By: | Xiqiang Ma |
| Reviewed by | Terry Yin |



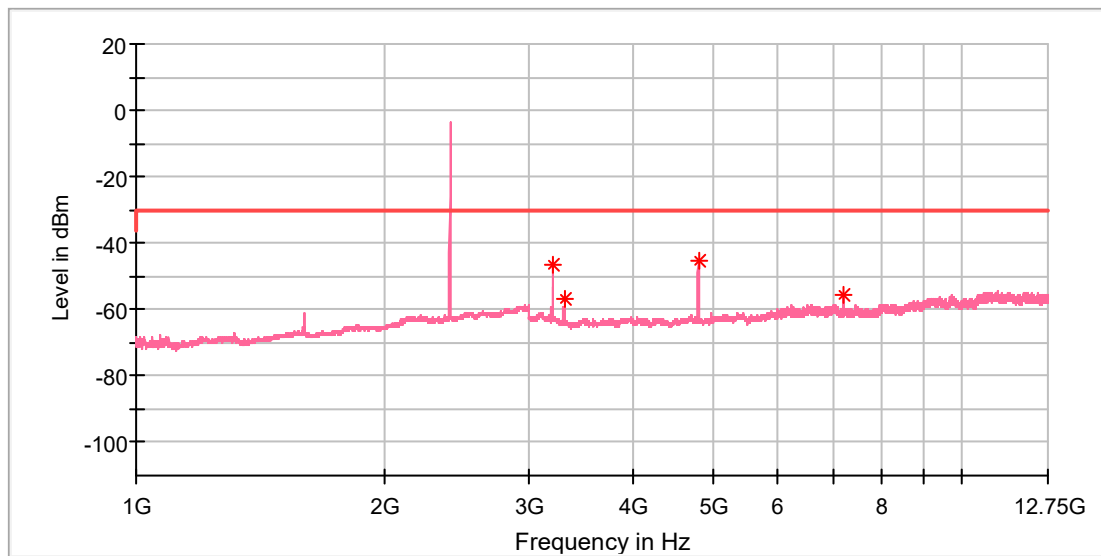
Critical_Freqs

| Frequency (MHz) | RMS (dBm) | Limit (dBm) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|-----------|-------------|-------------|-------------|-----|---------------|------------|
| 3202.500000 | -43.42 | -30.00 | 13.42 | 150.0 | H | 273.0 | -96.3 |
| 3312.000000 | -51.83 | -30.00 | 21.83 | 150.0 | H | 257.0 | -97.6 |
| 4804.000000 | -47.48 | -30.00 | 17.48 | 150.0 | H | 291.0 | -94.8 |
| 7206.321429 | -51.71 | -30.00 | 21.71 | 150.0 | H | 47.0 | -90.7 |

The highest waveform in the figure is BLE Fundamental.

Remarks: The emission over limit is fundamental frequency signal which can be ignored.

| | |
|----------------|--|
| EUT Name: | Smart Temperature and Humidity Monitoring Switch |
| Model: | THR320D |
| Sample No: | A003284877-012 |
| Test Mode: | TX_BLE L CH |
| Test Voltage: | AC 230V |
| Remark: | Temp:23.4;Humi:51% |
| Test standard: | EN 300328 |
| Tested By: | Xiqiang Ma |
| Reviewed by | Terry Yin |

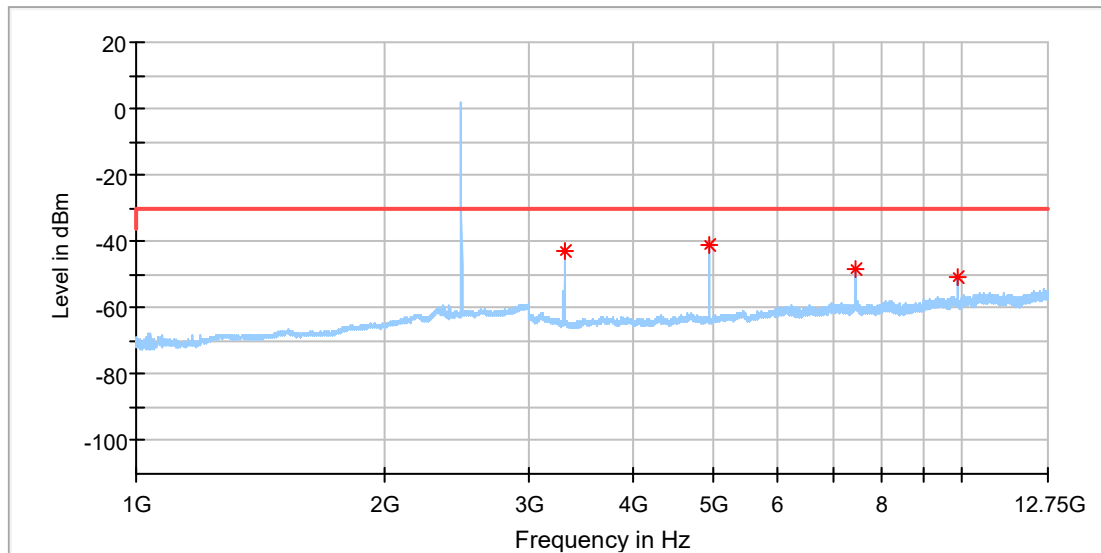


Critical_Freqs

| Frequency (MHz) | RMS (dBm) | Limit (dBm) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|-----------|-------------|-------------|-------------|-----|---------------|------------|
| 3202.500000 | -46.52 | -30.00 | 16.52 | 150.0 | V | 242.0 | -96.0 |
| 3312.000000 | -57.01 | -30.00 | 27.01 | 150.0 | V | 229.0 | -97.5 |
| 4804.000000 | -45.11 | -30.00 | 15.11 | 150.0 | V | 110.0 | -95.1 |
| 7205.839286 | -55.81 | -30.00 | 25.81 | 150.0 | V | 5.0 | -91.4 |

The highest waveform in the figure is BLE Fundamental.
 Remarks: The emission over limit is fundamental frequency signal which can be ignored.

| | |
|----------------|--|
| EUT Name: | Smart Temperature and Humidity Monitoring Switch |
| Model: | THR320D |
| Sample No: | A003284877-012 |
| Test Mode: | TX_BLE H CH |
| Test Voltage: | AC 230V |
| Remark: | Temp:23.4;Humi:51% |
| Test standard: | EN 300328 |
| Tested By: | Xiqiang Ma |
| Reviewed by: | Terry Yin |

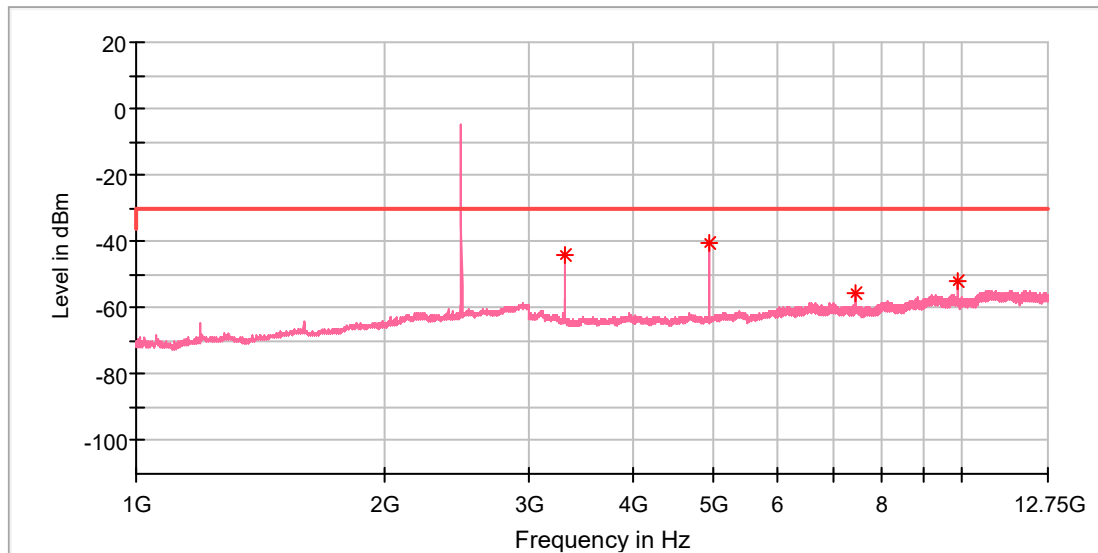


Critical_Freqs

| Frequency (MHz) | RMS (dBm) | Limit (dBm) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|-----------|-------------|-------------|-------------|-----|---------------|------------|
| 3306.500000 | -43.16 | -30.00 | 13.16 | 150.0 | H | 271.0 | -97.5 |
| 4960.000000 | -41.12 | -30.00 | 11.12 | 150.0 | H | 295.0 | -94.8 |
| 7440.160714 | -48.23 | -30.00 | 18.23 | 150.0 | H | 46.0 | -90.6 |
| 9920.785714 | -50.57 | -30.00 | 20.57 | 150.0 | H | 331.0 | -89.5 |

The highest waveform in the figure is BLE Fundamental.
 Remarks: The emission over limit is fundamental frequency signal which can be ignored.

| | |
|----------------|--|
| EUT Name: | Smart Temperature and Humidity Monitoring Switch |
| Model: | THR320D |
| Sample No: | A003284877-012 |
| Test Mode: | TX_BLE H CH |
| Test Voltage: | AC 230V |
| Remark: | Temp:23.4;Humi:51% |
| Test standard: | EN 300328 |
| Tested By: | Xiqiang Ma |
| Reviewed by | Terry Yin |



Critical_Freqs

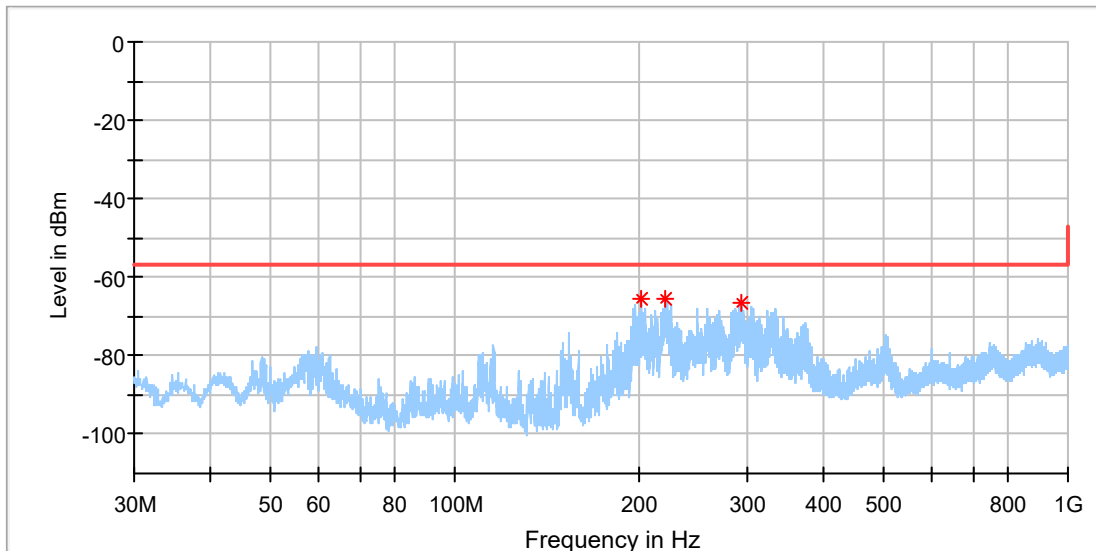
| Frequency (MHz) | RMS (dBm) | Limit (dBm) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|-----------|-------------|-------------|-------------|-----|---------------|------------|
| 3306.500000 | -44.28 | -30.00 | 14.28 | 150.0 | V | 248.0 | -97.5 |
| 4960.500000 | -40.36 | -30.00 | 10.36 | 150.0 | V | 110.0 | -95.0 |
| 7439.678572 | -55.64 | -30.00 | 25.64 | 150.0 | V | 241.0 | -91.6 |
| 9921.267857 | -52.06 | -30.00 | 22.06 | 150.0 | V | 226.0 | -89.3 |

The highest waveform in the figure is BLE Fundamental.

Remarks: The emission over limit is fundamental frequency signal which can be ignored.

Appendix A.6 Receiver spurious emissions

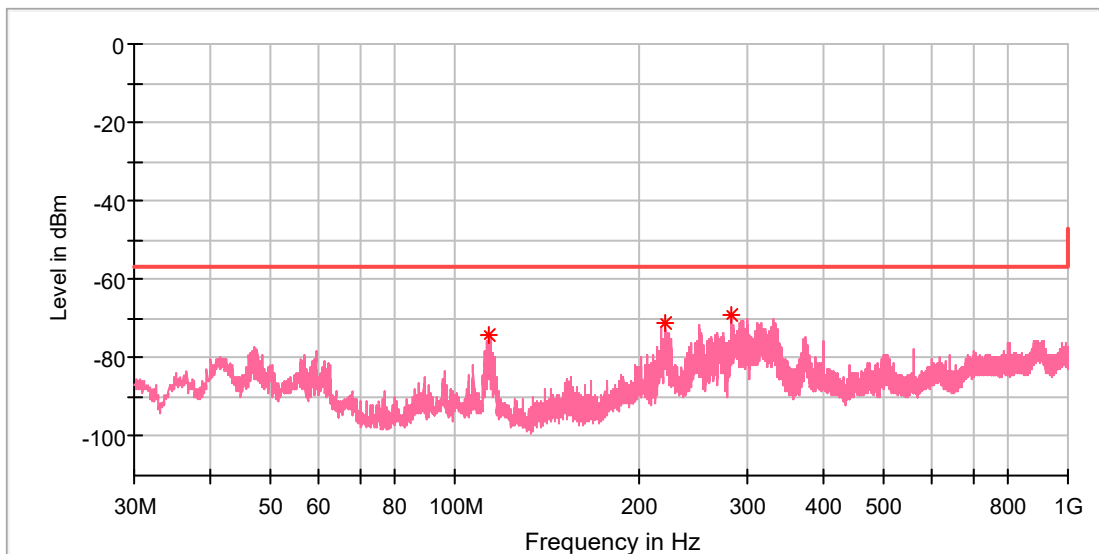
| | |
|----------------|--|
| EUT Name: | Smart Temperature and Humidity Monitoring Switch |
| Model: | THR320D |
| Sample No: | A003284877-012 |
| Test Mode: | RX_BLE L CH |
| Test Voltage: | AC 230V |
| Remark: | Temp:23.4;Humi:51% |
| Test standard: | EN 300328 |
| Tested By: | Xiqiang Ma |
| Reviewed by | Terry Yin |



Critical Freqs

| Frequency (MHz) | RMS (dBm) | Limit (dBm) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|-----------|-------------|-------------|-------------|-----|---------------|------------|
| 201.302000 | -65.24 | -57.00 | 8.24 | 150.0 | H | 243.0 | -118.0 |
| 220.847500 | -65.62 | -57.00 | 8.62 | 150.0 | H | 228.0 | -117.5 |
| 294.373500 | -66.36 | -57.00 | 9.36 | 150.0 | H | 87.0 | -116.2 |

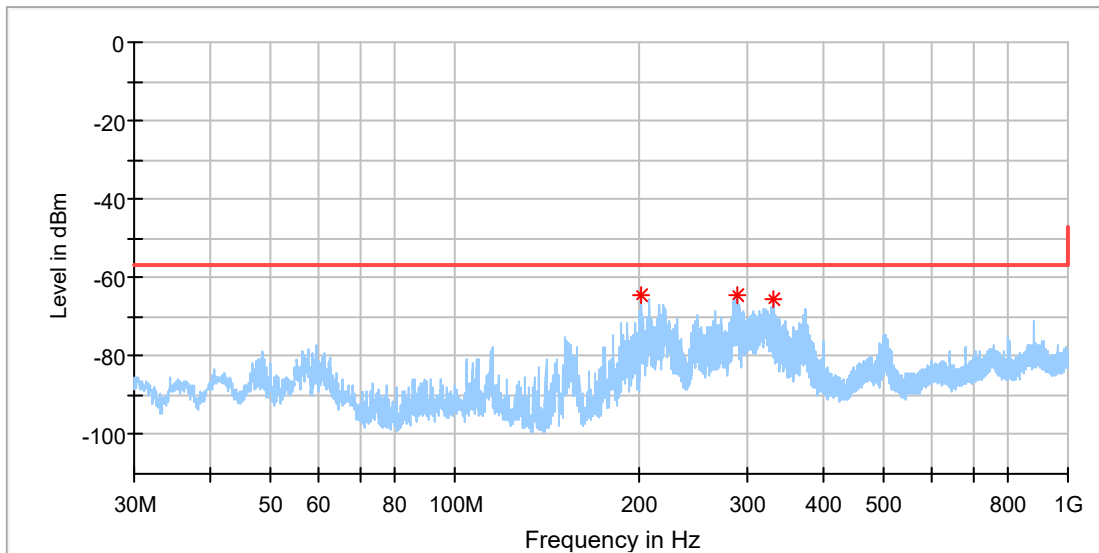
| | |
|----------------|--|
| EUT Name: | Smart Temperature and Humidity Monitoring Switch |
| Model: | THR320D |
| Sample No: | A003284877-012 |
| Test Mode: | RX_BLE L CH |
| Test Voltage: | AC 230V |
| Remark: | Temp:23.4;Humi:51% |
| Test standard: | EN 300328 |
| Tested By: | Xiqiang Ma |
| Reviewed by: | Terry Yin |



Critical_Freqs

| Frequency (MHz) | RMS (dBm) | Limit (dBm) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|-----------|-------------|-------------|-------------|-----|---------------|------------|
| 114.002000 | -74.32 | -57.00 | 17.32 | 150.0 | V | 112.0 | -118.9 |
| 219.829000 | -71.33 | -57.00 | 14.33 | 150.0 | V | 89.0 | -118.1 |
| 282.782000 | -69.13 | -57.00 | 12.13 | 150.0 | V | 65.0 | -117.0 |

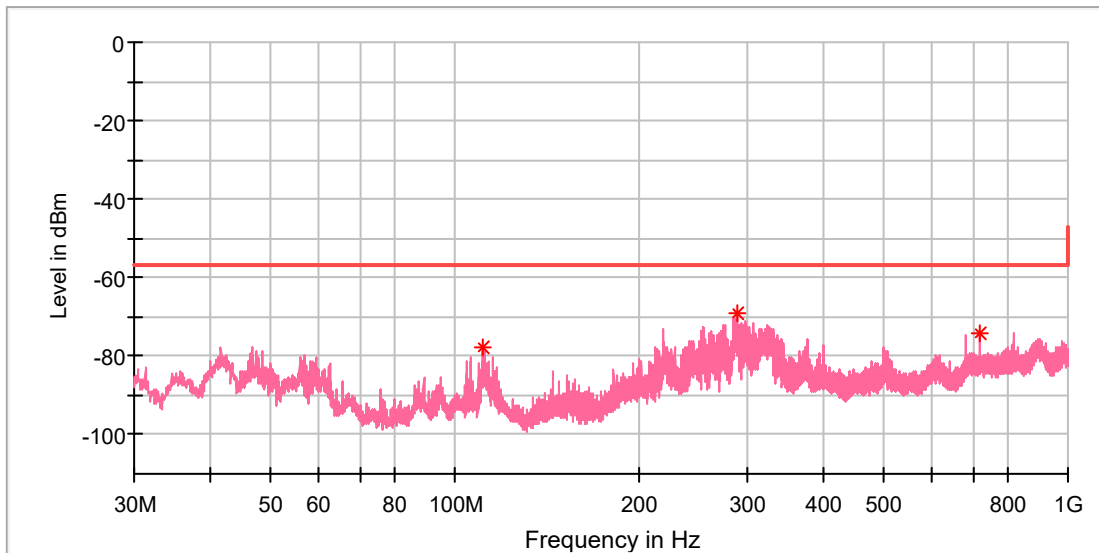
| | |
|----------------|--|
| EUT Name: | Smart Temperature and Humidity Monitoring Switch |
| Model: | THR320D |
| Sample No: | A003284877-012 |
| Test Mode: | RX_BLE H CH |
| Test Voltage: | AC 230V |
| Remark: | Temp:23.4;Humi:51% |
| Test standard: | EN 300328 |
| Tested By: | Xiqiang Ma |
| Reviewed by | Terry Yin |



Critical_Freqs

| Frequency (MHz) | RMS (dBm) | Limit (dBm) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|-----------|-------------|-------------|-------------|-----|---------------|------------|
| 200.817000 | -64.46 | -57.00 | 7.46 | 150.0 | H | 260.0 | -117.8 |
| 289.523500 | -64.53 | -57.00 | 7.53 | 150.0 | H | 248.0 | -116.6 |
| 330.263500 | -65.67 | -57.00 | 8.67 | 150.0 | H | 279.0 | -114.3 |

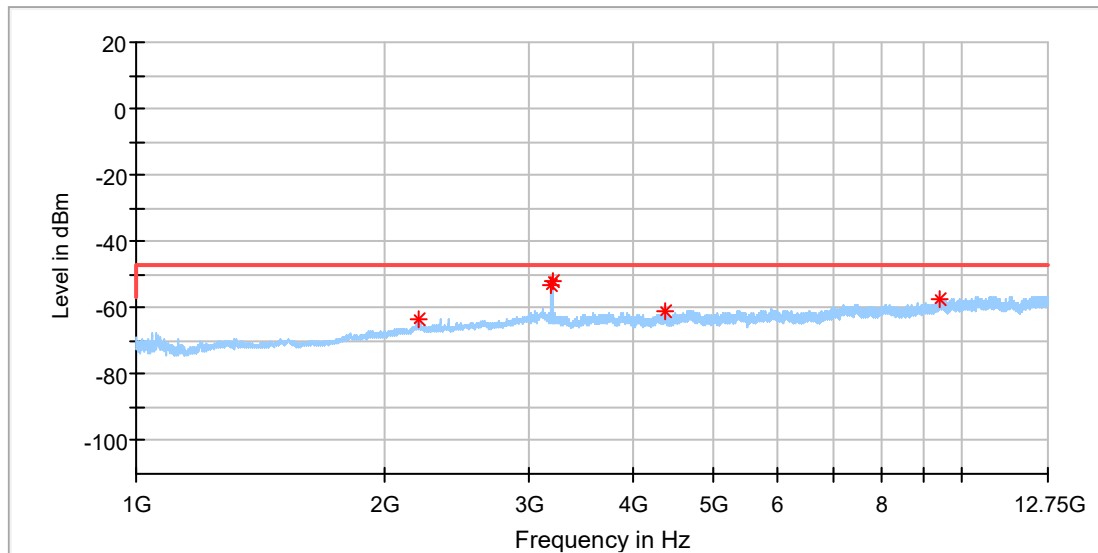
| | |
|----------------|--|
| EUT Name: | Smart Temperature and Humidity Monitoring Switch |
| Model: | THR320D |
| Sample No: | A003284877-012 |
| Test Mode: | RX_BLE H CH |
| Test Voltage: | AC 230V |
| Remark: | Temp:23.4;Humi:51% |
| Test standard: | EN 300328 |
| Tested By: | Xiqiang Ma |
| Reviewed by | Terry Yin |



Critical_Freqs

| Frequency (MHz) | RMS (dBm) | Limit (dBm) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|-----------|-------------|-------------|-------------|-----|---------------|------------|
| 111.092000 | -77.63 | -57.00 | 20.63 | 150.0 | V | 84.0 | -118.4 |
| 288.165500 | -69.05 | -57.00 | 12.05 | 150.0 | V | 138.0 | -117.0 |
| 719.961000 | -73.97 | -57.00 | 16.97 | 150.0 | V | 0.0 | -106.9 |

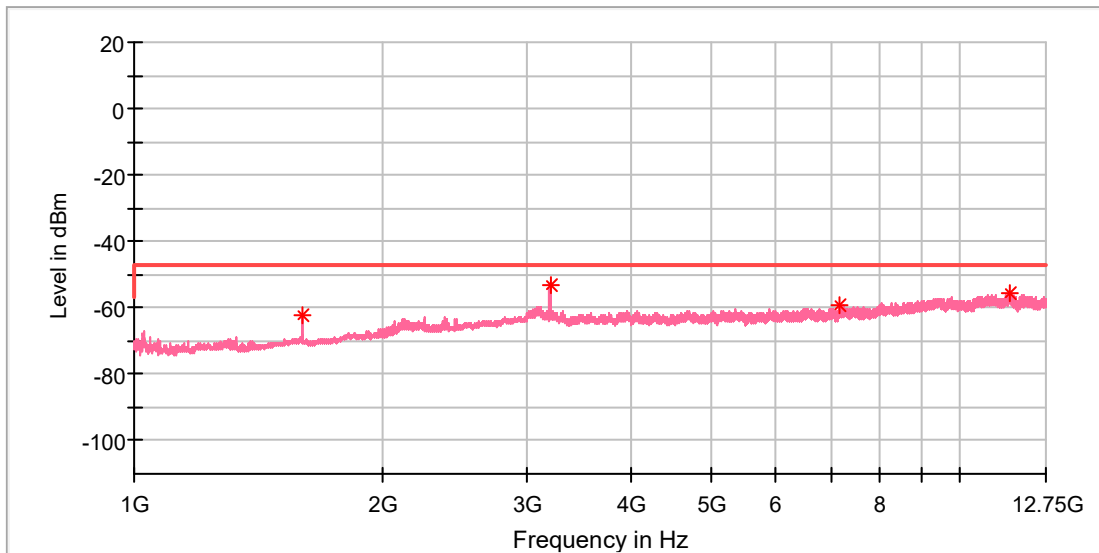
| | |
|----------------|--|
| EUT Name: | Smart Temperature and Humidity Monitoring Switch |
| Model: | THR320D |
| Sample No: | A003284877-012 |
| Test Mode: | RX_BLE L CH |
| Test Voltage: | AC 230V |
| Remark: | Temp:23.4;Humi:51% |
| Test standard: | EN 300328 |
| Tested By: | Xiqiang Ma |
| Reviewed by: | Terry Yin |



Critical_Freqs

| Frequency (MHz) | RMS (dBm) | Limit (dBm) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|-----------|-------------|-------------|-------------|-----|---------------|------------|
| 2199.500000 | -63.45 | -47.00 | 16.45 | 150.0 | H | 144.0 | -94.2 |
| 3190.666667 | -53.09 | -47.00 | 6.09 | 150.0 | H | 268.0 | -96.3 |
| 3205.291667 | -52.21 | -47.00 | 5.21 | 150.0 | H | 268.0 | -96.4 |
| 4382.875000 | -61.09 | -47.00 | 14.09 | 150.0 | H | 92.0 | -96.3 |
| 9440.958333 | -57.15 | -47.00 | 10.15 | 150.0 | H | 88.0 | -89.3 |

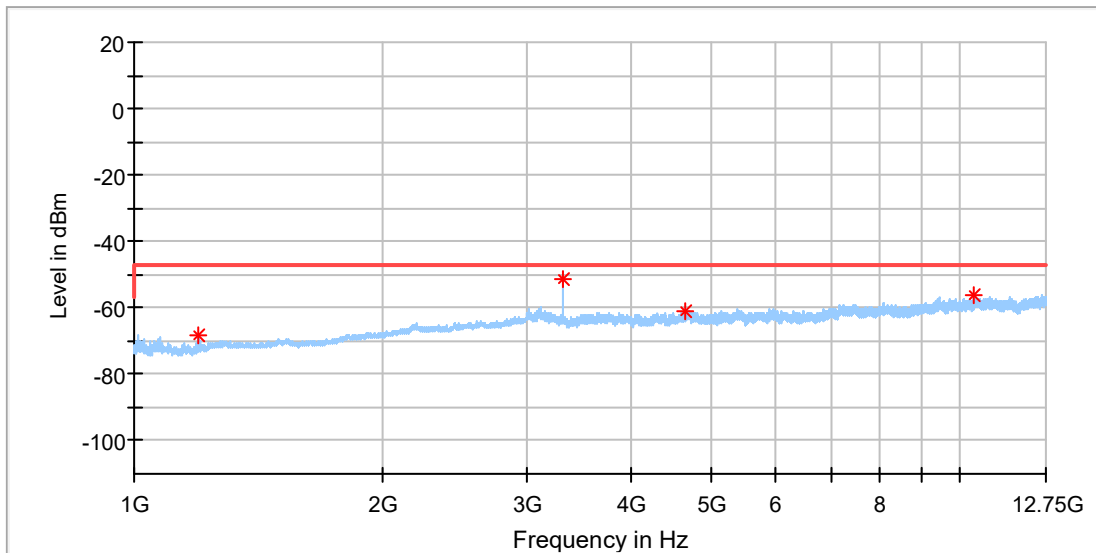
EUT Name: Smart Temperature and Humidity Monitoring Switch
 Model: THR320D
 Sample No: A003284877-012
 Test Mode: RX_BLE L CH
 Test Voltage: AC 230V
 Remark: Temp:23.4;Humi:51%
 Test standard: EN 300328
 Tested By: Xiqiang Ma
 Reviewed by: Terry Yin



Critical_Freqs

| Frequency (MHz) | RMS (dBm) | Limit (dBm) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|-----------|-------------|-------------|-------------|-----|---------------|------------|
| 1599.000000 | -62.17 | -47.00 | 15.17 | 150.0 | V | 182.0 | -98.7 |
| 3205.291667 | -53.08 | -47.00 | 6.08 | 150.0 | V | 227.0 | -96.1 |
| 7184.916667 | -59.21 | -47.00 | 12.21 | 150.0 | V | 184.0 | -91.4 |
| 11501.458333 | -55.74 | -47.00 | 8.74 | 150.0 | V | 304.0 | -87.1 |

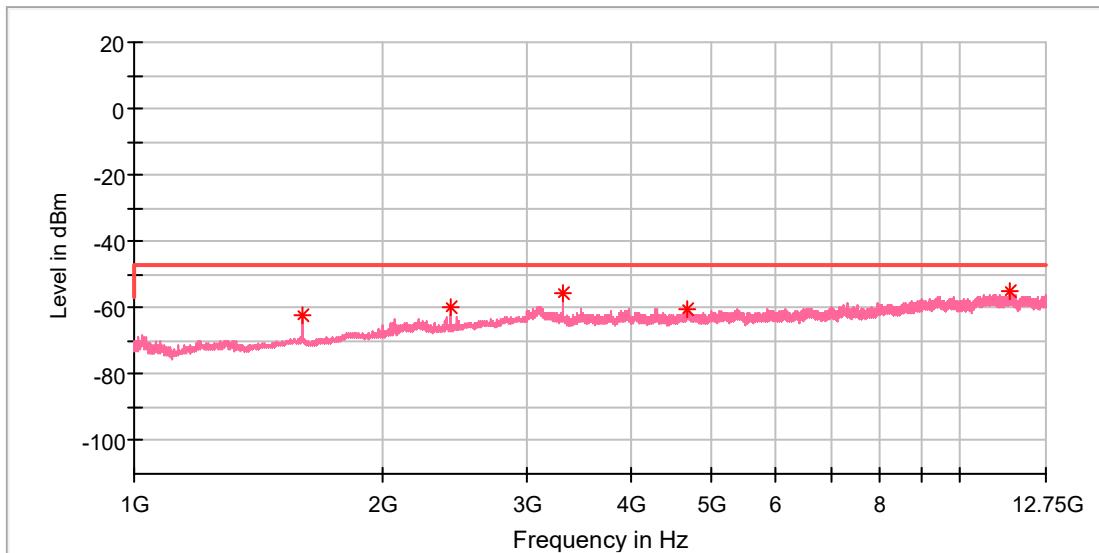
| | |
|----------------|--|
| EUT Name: | Smart Temperature and Humidity Monitoring Switch |
| Model: | THR320D |
| Sample No: | A003284877-012 |
| Test Mode: | RX_BLE H CH |
| Test Voltage: | AC 230V |
| Remark: | Temp:23.4;Humi:51% |
| Test standard: | EN 300328 |
| Tested By: | Xiqiang Ma |
| Reviewed by | Terry Yin |



Critical_Freqs

| Frequency (MHz) | RMS (dBm) | Limit (dBm) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|-----------|-------------|-------------|-------------|-----|---------------|------------|
| 1199.000000 | -68.54 | -47.00 | 21.54 | 150.0 | H | 163.0 | -102.2 |
| 3309.291667 | -51.15 | -47.00 | 4.15 | 150.0 | H | 270.0 | -97.6 |
| 4670.500000 | -60.88 | -47.00 | 13.88 | 150.0 | H | 179.0 | -94.5 |
| 10441.958333 | -56.34 | -47.00 | 9.34 | 150.0 | H | 0.0 | -88.6 |

| | |
|----------------|--|
| EUT Name: | Smart Temperature and Humidity Monitoring Switch |
| Model: | THR320D |
| Sample No: | A003284877-012 |
| Test Mode: | RX_BLE H CH |
| Test Voltage: | AC 230V |
| Remark: | Temp:23.4;Humi:51% |
| Test standard: | EN 300328 |
| Tested By: | Xiqiang Ma |
| Reviewed by: | Terry Yin |



Critical_Freqs

| Frequency (MHz) | RMS (dBm) | Limit (dBm) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|-----------|-------------|-------------|-------------|-----|---------------|------------|
| 1598.500000 | -62.16 | -47.00 | 15.16 | 150.0 | V | 180.0 | -98.7 |
| 2421.000000 | -59.95 | -47.00 | 12.95 | 150.0 | V | 161.0 | -94.5 |
| 3309.291667 | -55.34 | -47.00 | 8.34 | 150.0 | V | 247.0 | -97.5 |
| 4684.041667 | -60.27 | -47.00 | 13.27 | 150.0 | V | 91.0 | -95.0 |
| 11522.583333 | -55.17 | -47.00 | 8.17 | 150.0 | V | 350.0 | -87.1 |