

FCC - TEST REPORT

| | | | | | |
|----------------------------------|---|---------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|---|--------------------|
| Report Number | : | 60.790.23.007.01R01 | Date of Issue | : | <u>5 May, 2023</u> |
| Model | : | <u>CamLock, PlungerLock</u> | | | |
| Product Type | : | <u>SmartLock</u> | | | |
| Applicant | : | <u>Mobile Technologies Inc.</u> | | | |
| Address | : | <u>1050 NE 67th Ave, Hillsboro, Oregon, 97124, United States</u> | | | |
| Production Facility (1) | : | <u>e-BI International Technologies (Shenzhen) Co., Ltd.</u> | | | |
| Address | : | <u>Floor 13, Tower C, Chuangwei Building, 008 Gaoxin South First Road, High-Tech Park, Nanshan, Shenzhen, China 518057</u> | | | |
| Production Facility (2) | : | <u>IBE Electronics Co., Ltd.</u> | | | |
| Address | : | <u>IBE Industry Mansion, TangTou No.1 Industry Estate, Shiyuan Town, Bao'an District, Shenzhen, China.</u> | | | |
| Production Facility (3) | : | <u>VIETNAM IBE LASER TECHNOLOGY CO LTD.</u> | | | |
| Address | : | <u>Lot CN-34 and lot CN-39, Thuan Thanh II Industrial Park, An Binh & Mao Dien Commune, Thuan Thanh District, Bac Ninh Province, Vietnam.</u> | | | |
| Test Result | : | <input checked="" type="radio"/> Positive | <input type="radio"/> Negative | | |
| Total pages including Appendices | : | <u>43</u> | | | |

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2 Description of Equipment Under Test

Description of the Equipment Under Test

Product: SmartLock
 Model no.: CamLock, PlungerLock
 FCC ID: 2AA2X-15000333
 Rating: 3.0V DC (CR2477 battery)
 Frequency: 2405MHz-2480MHz (Tx and Rx)
 Antenna gain: 3.5 dBi
 Number of operated channel: 16
 Modulation: O-QPSK

Auxiliary Equipment Used during Test:

| DESCRIPTION | MANUFACTURER | MODEL NO. | S/N |
|-----------------|--------------|-----------|-------------------|
| Computer | Lenovo | X220 | 0A72168 |
| MTI Connect HUB | MTI | --- | System Monitoring |

Auxiliary Software Used during Test:

| DESCRIPTION | SOFTWARE NAME | VERSION | REMARK |
|-------------|---------------|---------|--------|
| --- | --- | --- | --- |

3 Summary of Test Standards

Test Standards

FCC Part 15 Subpart C 10-1-20 Edition
Federal Communications Commission, PART 15 — Radio Frequency Devices,
Subpart C —Intentional Radiators

All the test methods were according to KDB558074 D01 v05r02 DTS Measurement Guidance and ANSI C63.10 (2013).

4 Details about the Test Laboratory

Site 1

Company name: TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch
 Building 12&13 Zhiheng Wisdomland Business Park,
 Nantou Checkpoint Road 2, Nanshan District,
 Shenzhen 518052, P.R.China
 FCC Registration Number: 514049
 ISED test site number: 10320A

| Emission Tests | |
|------------------------------------------------------------------------------|-----------|
| Test Item | Test Site |
| FCC Part 15 Subpart C | |
| FCC Title 47 Part 15.205, 15.209 & 15.247(d) Spurious Radiated Emission | Site 1 |
| FCC Title 47 Part 15.207 Conduct Emission | N/A |
| FCC Title 47 Part 15.247(a)(1) 6dB & 99% Bandwidth | Site 1 |
| FCC Title 47 Part 15.247(b) Peak Output Power | Site 1 |
| FCC Title 47 Part 2.1051 & 15.247(d) Spurious Emissions at Antenna Terminals | Site 1 |
| FCC Title 47 Part 15.247(d) 100kHz Bandwidth of band edges | Site 1 |
| FCC Title 47 Part 15.247(e) Power Spectral Density | Site 1 |
| FCC Title 47 Part 15.203 & 15.247(b) Antenna Requirement | Site 1 |

4.1 Test Equipment Site List

Radiated emission Test – Site 1

| DESCRIPTION | MANUFACTURER | MODEL NO. | SERIAL NO. | CAL. DUE DATE |
|-------------------------------------|-----------------|-------------------|-----------------|---------------|
| EMI Test Receiver | Rohde & Schwarz | ESR 26 | 101269 | 2023-5-28 |
| Signal Analyzer | Rohde & Schwarz | FSV40 | 101031 | 2023-5-27 |
| Loop Antenna | Rohde & Schwarz | HFH2-Z2 | 100398 | 2023-8-17 |
| Trilog Super Broadband Test Antenna | Schwarzbeck | VULB 9163 | 707 | 2023-7-12 |
| Horn Antenna | Rohde & Schwarz | HF907 | 102294 | 2023-6-19 |
| Wideband Horn Antenna | Q-PAR | QWH-SL-18-40-K-SG | 12827 | 2023-7-12 |
| Pre-amplifier | Rohde & Schwarz | SCU 18 | 102230 | 2023-5-28 |
| Pre-amplifier | Rohde & Schwarz | SCU 40A | 100432 | 2023-7-27 |
| Attenuator | Mini-circuits | UNAT-6+ | 15542 | 2023-5-27 |
| 3m Semi-anechoic chamber | TDK | 9X6X6 | ---- | 2023-5-28 |
| Test software | Rohde & Schwarz | EMC32 | Version 9.15.00 | N/A |

Conducted Emission Test – Site 1

| DESCRIPTION | MANUFACTURER | MODEL NO. | SERIAL NO. | CAL. DUE DATE |
|--------------------|-------------------|----------------|----------------|---------------|
| EMI Test Receiver | Rohde & Schwarz | ESR 3 | 101782 | 2023-5-27 |
| LISN | Rohde & Schwarz | ENV4200 | 100249 | 2023-5-27 |
| LISN | Rohde & Schwarz | ENV432 | 101318 | 2023-5-27 |
| LISN | Rohde & Schwarz | ENV216 | 100326 | 2023-5-27 |
| LISN | Rohde & Schwarz | ENV216 | 102472 | 2023-5-27 |
| ISN | Rohde & Schwarz | ENY81 | 100177 | 2023-5-27 |
| ISN | Rohde & Schwarz | ENY81-CA6 | 101664 | 2023-5-27 |
| High Voltage Probe | Schwarzbeck | TK9420(VT9420) | 9420-584 | 2023-5-31 |
| RF Current Probe | Rohde & Schwarz | EZ-17 | 100816 | 2023-5-27 |
| Attenuator | Shanghai Huaxiang | TS2-26-3 | 080928189 | 2023-5-27 |
| Test software | Rohde & Schwarz | EMC32 | Version9.15.00 | N/A |
| Shielding Room | TDK | CSR #1 | ---- | 2023-5-27 |

20dB & 99% Bandwidth, Peak Output Power, Spurious Emissions at Antenna Terminals, 100kHz Bandwidth of band edges, Power Spectral Density – Site 1

| DESCRIPTION | MANUFACTURER | MODEL NO. | SERIAL NO. | CAL. DUE DATE |
|------------------|-----------------|-----------------|---------------|---------------|
| Signal Analyzer | Rohde & Schwarz | FSV40 | 101030 | 2023-5-27 |
| RF Switch Module | Rohde & Schwarz | OSP120/OSP-B157 | 101226/100851 | 2023-5-27 |

4.2 Measurement System Uncertainty

Measurement System Uncertainty Emissions

| System Measurement Uncertainty | |
|---------------------------------------------------------------------|------------------------------------------|
| Items | Extended Uncertainty |
| Uncertainty for Radiated Emission in 3m chamber 9kHz-30MHz | 4.76dB |
| Uncertainty for Radiated Emission in 3m chamber 30MHz-1000MHz | Horizontal: 5.12dB; Vertical: 5.10dB; |
| Uncertainty for Radiated Emission in 3m chamber 1000MHz-25000MHz | Horizontal: 5.01dB; Vertical: 5.00dB; |
| Uncertainty for Conducted Emission at AC Power Line 150kHz-30MHz | 3.21dB |
| Uncertainty for conducted power test | 1.16dB |
| Uncertainty for frequency test | 0.6×10^{-7} |

Measurement Uncertainty Decision Rule

Determination of conformity with the specification limits is based on the decision rule according to IEC Guide 115: 2007, clause 4.4.3 and 4.5.1.

5 Summary of Test Results

| Emission Tests | | | | | |
|------------------------------------------------------------------------------|----------------|-------|-------------------------------------|--------------------------|-------------------------------------|
| FCC Part 15 Subpart C | Test Condition | Pages | Test Result | | |
| | | | Pass | Fail | N/A |
| FCC Title 47 Part 15.205, 15.209 & 15.247(d) Spurious Radiated Emission | | 12-15 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| FCC Title 47 Part 15.247(a)(2) 6dB & 99% Bandwidth | | 16-18 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| FCC Title 47 Part 15.247(b) Peak Output Power | | 19-21 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| FCC Title 47 Part 2.1051 & 15.247(d) Spurious Emissions at Antenna Terminals | | 22-27 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| FCC Title 47 Part 15.247(d) 100kHz Bandwidth of band edges | | 28-29 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| FCC Title 47 Part 15.247(e) Power Spectral Density | | 30-32 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| FCC Title 47 Part 15.207 Conduct Emission (1) | | --- | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| FCC Title 47 Part 15.203 & 15.247(b) Antenna Requirement | | 33 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Remark:

(1) Test not applicable for the Battery Operate Device

6 General Remarks

Remarks

All tests were performed on model: **CamLock**.

All data packet type modes have been tested, only the worst case is shown on the report.

Client informs that the model **PlungerLock** have the same technical construction including circuit diagram, PCB Layout, components and component layout, all electrical construction and mechanical construction, with **SmartLock**, **CamLock**. The difference lies only in outlook / color of the different models.

This submittal(s) (test report) is intended for **FCC ID: 2AA2X-15000333**, complies with Section 15.203, 15.205, 15.209, 15.247 of the FCC Part 15, Subpart C rules for the DTS grant.

The TX and RX range is 2405MHz-2480MHz

SUMMARY:

- All tests according to the regulations cited on page 8 were

- Performed

- **Not** Performed

- The Equipment Under Test

- **Fulfills** the general approval requirements.

- **Does not** fulfill the general approval requirements.

Sample Received Date: 18 March, 2023

Testing Start Date: 21 March, 2023

Testing End Date: 2 April, 2023

- TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch -

Reviewed by:

Prepared by:

Tested by:



Eric LI
Section Manager



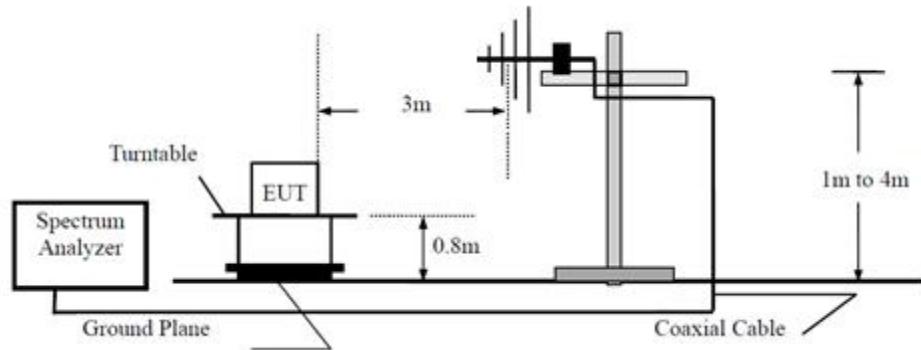

Hosea CHAN
EMC Project Engineer



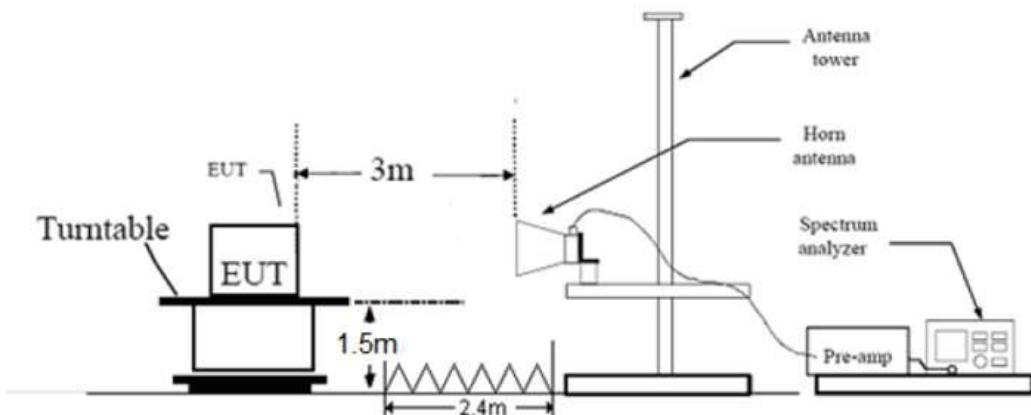
Louise Liu
EMC Test Engineer

7 Test Setups

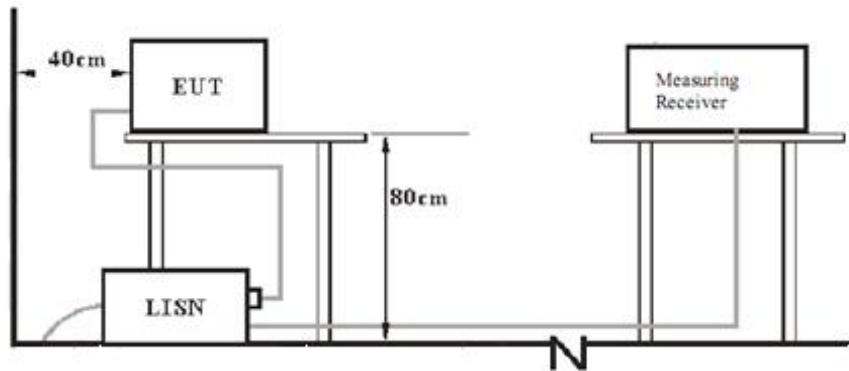
7.1 Radiated test setups Below 1GHz



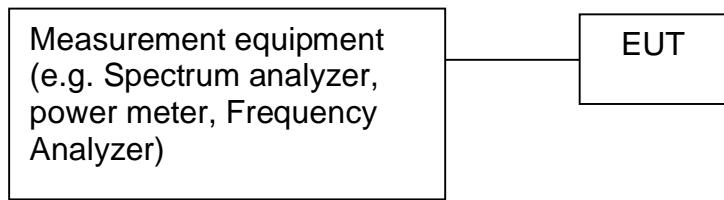
7.2 Radiated test setups Above 1GHz



7.3 AC Power Line Conducted Emission test setups



7.4 Conducted RF test setups



8 Emission Test Results

8.1 Spurious Radiated Emission

EUT: CamLock
 Op Condition: Operated, TX Mode
 (Highest channel is the worst case)
 Test Specification: FCC 15.205, 15.209 & 15.247(d)
 Comment: 3.0V DC
 Remark: Below 1GHz

Test Result
 Passed
 Not Passed

| Frequency MHz | Result dB μ V/m | Limit dB μ V/m | Margin dB | Detector PK/QP/AV | Ant. Polarity H/V | Corr. (dB) |
|------------------|------------------------|-----------------------|--------------|----------------------|----------------------|---------------|
| 43.849444 | 18.26 | 40.00 | 21.74 | Peak | H | 17.77 |
| 50.316111 | 17.77 | 40.00 | 22.23 | Peak | H | 18.23 |
| 103.720000 | 17.54 | 43.50 | 25.96 | Peak | H | 15.97 |
| 196.247222 | 17.81 | 43.50 | 25.69 | Peak | H | 16.57 |
| 306.018889 | 20.31 | 46.00 | 25.69 | Peak | H | 18.86 |
| 592.330556 | 28.98 | 46.00 | 17.02 | Peak | H | 25.22 |
| 46.651667 | 18.88 | 40.00 | 21.12 | Peak | V | 18.30 |
| 57.106111 | 17.99 | 40.00 | 22.01 | Peak | V | 17.59 |
| 96.552778 | 17.15 | 43.50 | 26.35 | Peak | V | 15.45 |
| 195.007778 | 17.88 | 43.50 | 25.62 | Peak | V | 16.36 |
| 352.093889 | 22.30 | 46.00 | 23.70 | Peak | V | 20.40 |
| 588.558333 | 28.47 | 46.00 | 17.53 | Peak | V | 25.06 |

Remark:

- As the measured peak value not exceeded the Quasi-peak limit, Quasi-peak value no need to be measured.
- Result Level=Reading Level + Correction Factor
 Above 1GHz: Corrector factor = Antenna Factor + Cable Loss- Amplifier Gain
 Below 1GHz: Corrector factor = Antenna Factor + Cable Loss
 (The Reading Level is recorded by software which is not shown in the sheet)

Spurious Radiated Emission

EUT: CamLock
 Op Condition: Operated, TX Mode (2405MHz)
 Test Specification: FCC 15.205, 15.209 & 15.247(d)
 Comment: 3.0V DC
 Remark: 1GHz to 25GHz

Test Result
 Passed
 Not Passed

| Frequency | Result | Limit | Margin | Detector | Ant. Polarity | Corr. |
|--------------|--------------|--------------|--------|----------|---------------|-------|
| MHz | dB μ V/m | dB μ V/m | dB | PK/QP/AV | H/V | (dB) |
| 2037.000000 | 42.39 | 74.00 | 31.61 | Peak | H | -2.89 |
| 3168.500000 | 47.42 | 74.00 | 26.58 | Peak | H | 0.64 |
| 3765.500000 | 47.96 | 74.00 | 26.04 | Peak | H | 2.97 |
| 7256.500000 | 41.47 | 74.00 | 32.53 | Peak | H | 8.75 |
| 9802.500000 | 44.13 | 74.00 | 29.87 | Peak | H | 12.24 |
| 12417.500000 | 44.69 | 74.00 | 29.31 | Peak | H | 16.02 |
| 2042.500000 | 42.53 | 74.00 | 31.47 | Peak | V | -2.82 |
| 3064.500000 | 46.12 | 74.00 | 27.88 | Peak | V | 0.80 |
| 3746.500000 | 46.90 | 74.00 | 27.10 | Peak | V | 2.93 |
| 7334.000000 | 39.72 | 74.00 | 34.28 | Peak | V | 8.69 |
| 8882.500000 | 41.52 | 74.00 | 32.48 | Peak | V | 11.32 |
| 10964.000000 | 43.43 | 74.00 | 30.57 | Peak | V | 14.12 |

Remark:

1. According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in data table if the peak value complies with average limit.
2. Consequence Level=Reading Level + Correction Factor
 Above 1GHz: Corrector factor = Antenna Factor + Cable Loss- Amplifier Gain
 Below 1GHz: Corrector factor = Antenna Factor + Cable Loss
 (The Reading Level is recorded by software which is not shown in the sheet)
3. No significant emissions were detected above 18 GHz.

Spurious Radiated Emission

EUT: CamLock
 Op Condition: Operated, TX Mode (2440MHz)
 Test Specification: FCC 15.205, 15.209 & 15.247(d)
 Comment: 3.0V DC
 Remark: 1GHz to 25GHz

Test Result
 Passed
 Not Passed

| Frequency MHz | Result dB μ V/m | Limit dB μ V/m | Margin dB | Detector PK/QP/AV | Ant. Polarity H/V | Corr. (dB) |
|------------------|------------------------|-----------------------|--------------|----------------------|-------------------------|---------------|
| 2546.000000 | 47.35 | 74.00 | 26.65 | Peak | H | -0.89 |
| 2813.500000 | 43.57 | 74.00 | 30.43 | Peak | H | -0.93 |
| 3608.000000 | 47.61 | 74.00 | 26.39 | Peak | H | 2.30 |
| 7319.500000 | 40.54 | 74.00 | 33.46 | Peak | H | 8.68 |
| 9340.500000 | 41.96 | 74.00 | 32.04 | Peak | H | 11.68 |
| 11085.000000 | 44.73 | 74.00 | 29.27 | Peak | H | 14.37 |
| 1911.500000 | 40.61 | 74.00 | 33.39 | Peak | V | -3.79 |
| 2546.500000 | 47.96 | 74.00 | 26.04 | Peak | V | -0.89 |
| 3494.500000 | 46.74 | 74.00 | 27.26 | Peak | V | 1.44 |
| 7722.000000 | 39.42 | 74.00 | 34.58 | Peak | V | 9.09 |
| 9802.500000 | 43.43 | 74.00 | 30.57 | Peak | V | 12.24 |
| 12579.500000 | 47.65 | 74.00 | 26.35 | Peak | V | 16.26 |

Remark:

1. According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in data table if the peak value complies with average limit.
2. Consequence Level=Reading Level + Correction Factor
 Above 1GHz: Corrector factor = Antenna Factor + Cable Loss- Amplifier Gain
 Below 1GHz: Corrector factor = Antenna Factor + Cable Loss
 (The Reading Level is recorded by software which is not shown in the sheet)
3. No significant emissions were detected above 18 GHz.

Spurious Radiated Emission

EUT: CamLock
 Op Condition: Operated, TX Mode (2480MHz)
 Test Specification: FCC 15.205, 15.209 & 15.247(d)
 Comment: 3.0V DC
 Remark: 1GHz to 25GHz

Test Result
 Passed
 Not Passed

| Frequency MHz | Result dB μ V/m | Limit dB μ V/m | Margin dB | Detector PK/QP/AV | Ant. Polarity H/V | Corr. (dB) |
|------------------|------------------------|-----------------------|--------------|----------------------|-------------------------|---------------|
| 2963.000000 | 45.36 | 74.00 | 28.64 | Peak | H | 0.38 |
| 3739.500000 | 47.25 | 74.00 | 26.75 | Peak | H | 2.86 |
| 4727.500000 | 48.27 | 74.00 | 25.73 | Peak | H | 5.71 |
| 8368.500000 | 41.47 | 74.00 | 32.53 | Peak | H | 9.94 |
| 10924.000000 | 44.72 | 74.00 | 29.28 | Peak | H | 14.10 |
| 14691.000000 | 45.31 | 74.00 | 28.69 | Peak | H | 17.42 |
| 2039.000000 | 41.82 | 74.00 | 32.18 | Peak | V | -2.87 |
| 2921.500000 | 45.31 | 74.00 | 28.69 | Peak | V | 0.07 |
| 3864.000000 | 47.93 | 74.00 | 26.07 | Peak | V | 3.13 |
| 7189.000000 | 40.55 | 74.00 | 33.45 | Peak | V | 8.45 |
| 9922.000000 | 45.66 | 74.00 | 28.34 | Peak | V | 12.19 |
| 11953.000000 | 45.20 | 74.00 | 28.80 | Peak | V | 16.14 |

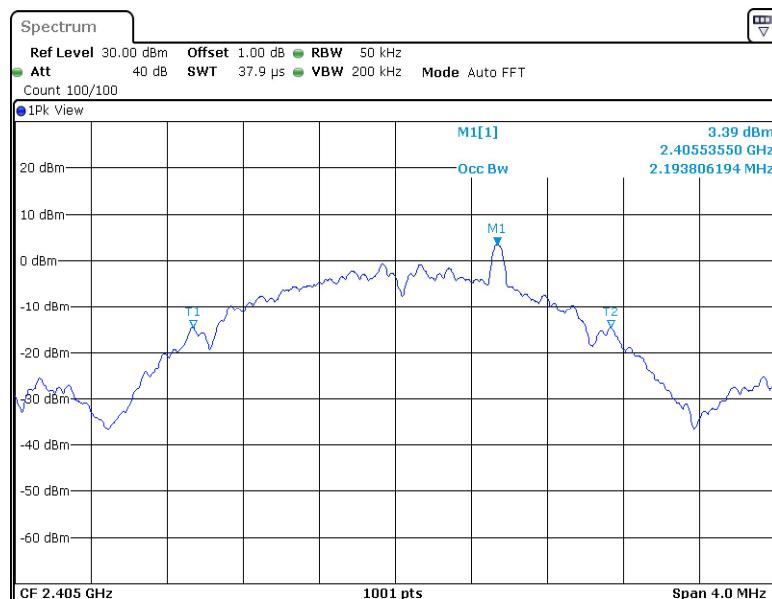
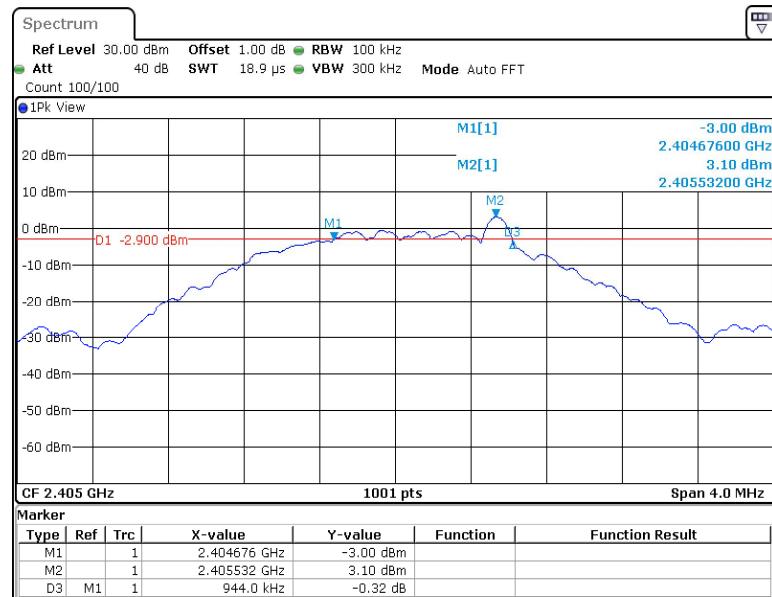
Remark:

1. According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in data table if the peak value complies with average limit.
2. Consequence Level=Reading Level + Correction Factor
 Above 1GHz: Corrector factor = Antenna Factor + Cable Loss- Amplifier Gain
 Below 1GHz: Corrector factor = Antenna Factor + Cable Loss
 (The Reading Level is recorded by software which is not shown in the sheet)
3. No significant emissions were detected above 18 GHz.

8.2 6dB & 99% Bandwidth

EUT: CamLock
 Op Condition: Operated, TX Mode (2405MHz)
 Test Specification: FCC 15.247(a)(2),
 6dB Bandwidth & 99% Bandwidth
 Comment: 3.0V DC

Test Result
 Passed
 Not Passed

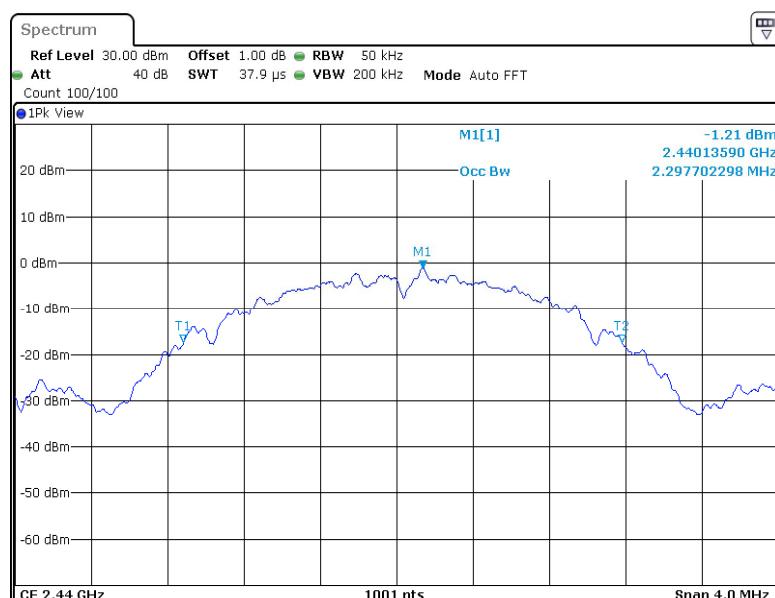
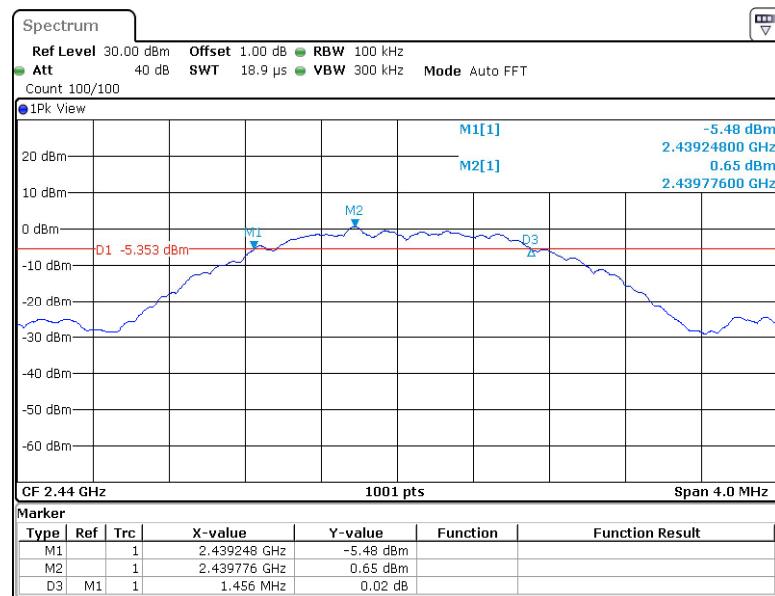


| Bandwidth | Measured Value | Limit |
|---------------|----------------|----------|
| 6dB bandwidth | 0.944 MHz | > 0.5MHz |
| 99% OCB | 2.194 MHz | NA |

6dB & 99% Bandwidth

EUT: CamLock
 Op Condition: Operated, TX Mode (2440MHz)
 Test Specification: FCC 15.247(a)(2),
 6dB Bandwidth & 99% Bandwidth
 Comment: 3.0V DC

Test Result
 Passed
 Not Passed

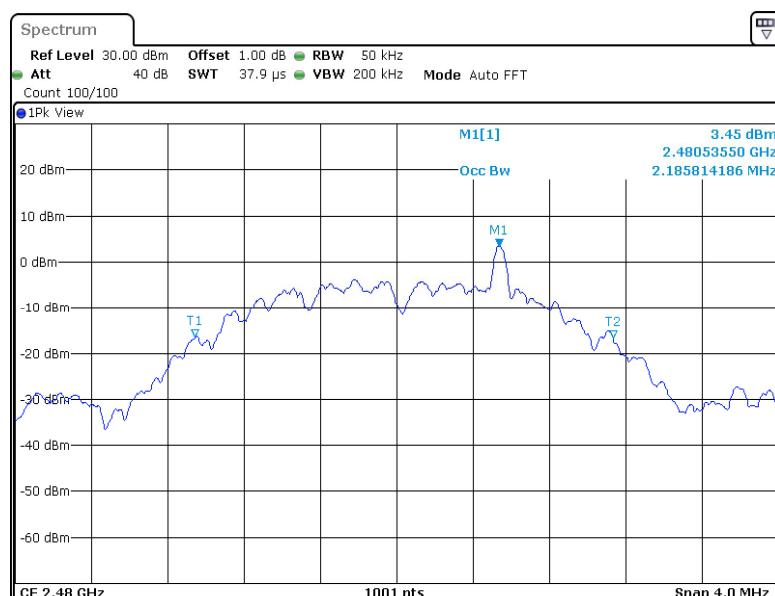
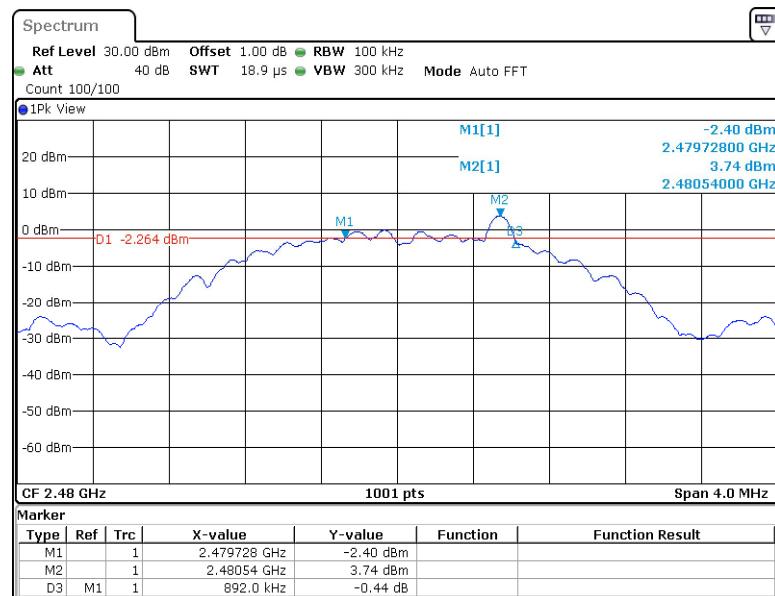


| Bandwidth | Measured Value | Limit |
|---------------|----------------|-----------|
| 6dB bandwidth | 1.4567 MHz | > 0.5 MHz |
| 99% OCB | 2.298 MHz | NA |

6dB & 99% Bandwidth

EUT: CamLock
 Op Condition: Operated, TX Mode (2480MHz)
 Test Specification: FCC 15.247(a)(2), 6dB Bandwidth & 99% Bandwidth
 Comment: 3.0V DC

Test Result
 Passed
 Not Passed

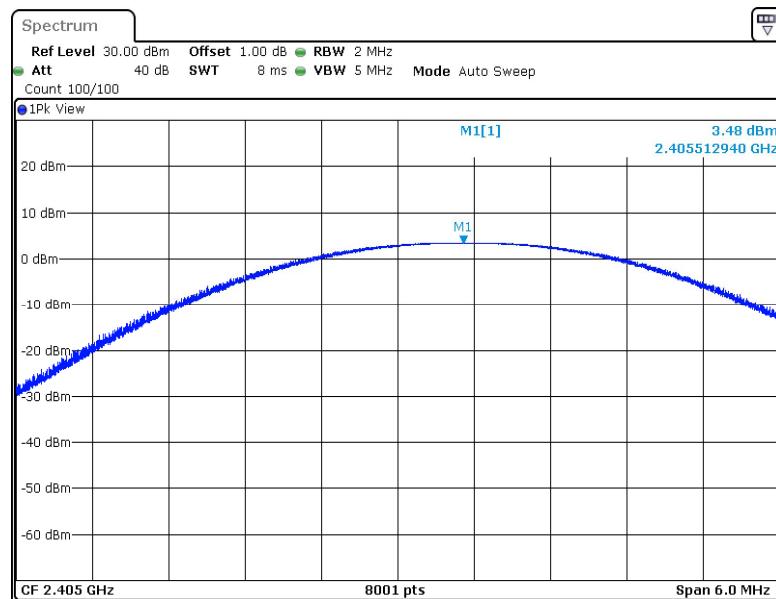


| Bandwidth | Measured Value | Limit |
|---------------|----------------|-----------|
| 6dB bandwidth | 0.892 MHz | > 0.5 MHz |
| 99% OCB | 2.186 MHz | NA |

8.3 Peak Output Power

EUT: CamLock
 Op Condition: Operated, TX Mode (2405MHz)
 Test Specification: FCC15.247(b)
 Comment: 3.0V DC

Test Result
 Passed
 Not Passed

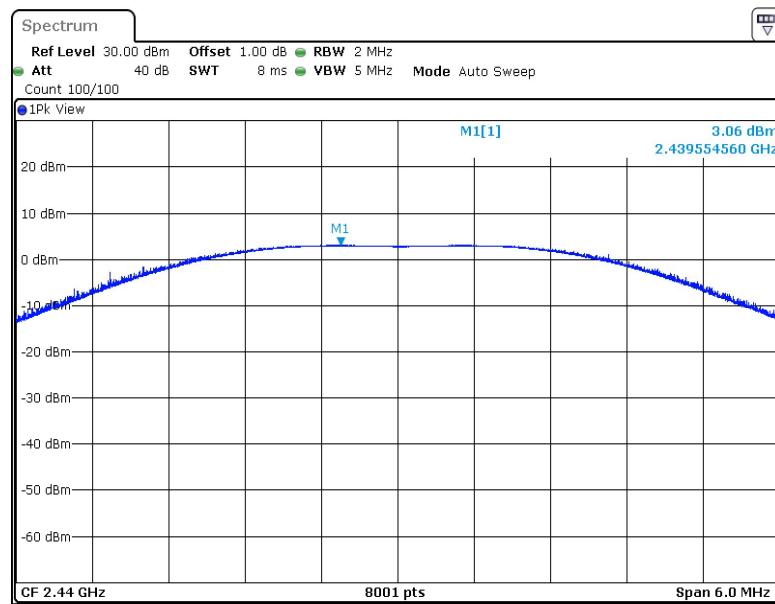


| Max. Conducted Output Power (dBm) | Limit (dBm) |
|-----------------------------------|-------------|
| 3.48 | < 30.00 |

Peak Output Power

EUT: CamLock
 Op Condition: Operated, TX Mode (2440MHz)
 Test Specification: FCC15.247(b)
 Comment: 3.0V DC

Test Result
 Passed
 Not Passed

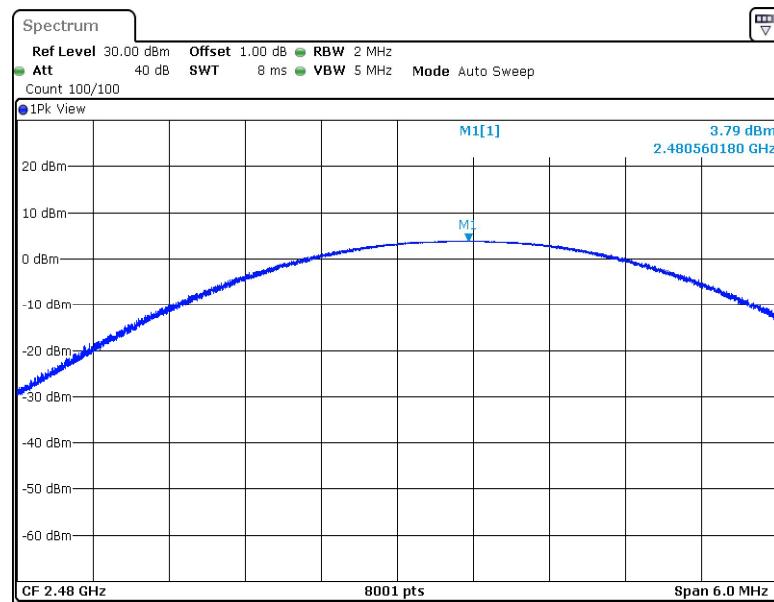


| Max. Conducted Output Power (dBm) | Limit (dBm) |
|-----------------------------------|-------------|
| 3.06 | < 30.00 |

Peak Output Power

EUT: CamLock
 Op Condition: Operated, TX Mode (2480MHz)
 Test Specification: FCC15.247(b)
 Comment: 3.0V DC

Test Result
 Passed
 Not Passed



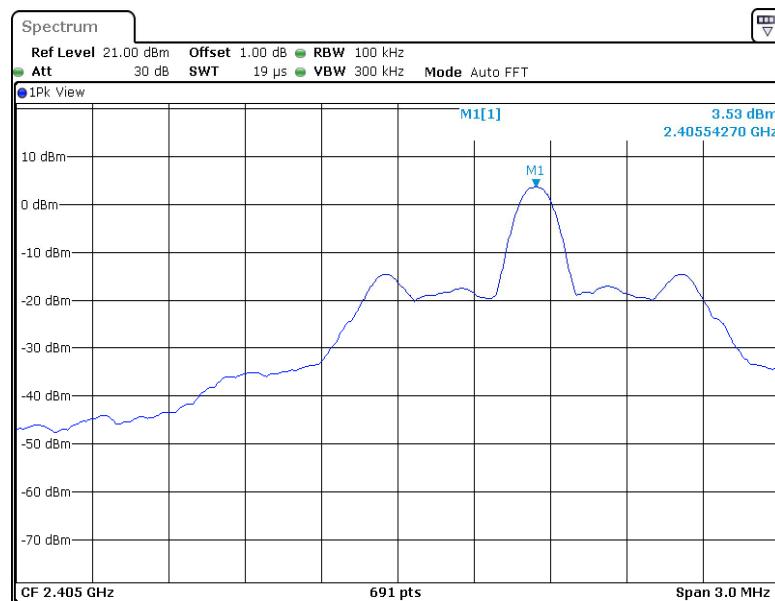
| Max. Conducted Output Power (dBm) | Limit (dBm) |
|-----------------------------------|-------------|
| 3.79 | < 30.00 |

8.4 Spurious Emissions at Antenna Terminals

EUT: CamLock
 Op Condition: Operated, TX Mode (2405MHz)
 Test Specification: FCC2.1051 & 15.247(d)
 Comment: 3.0V DC

Test Result
 Passed
 Not Passed

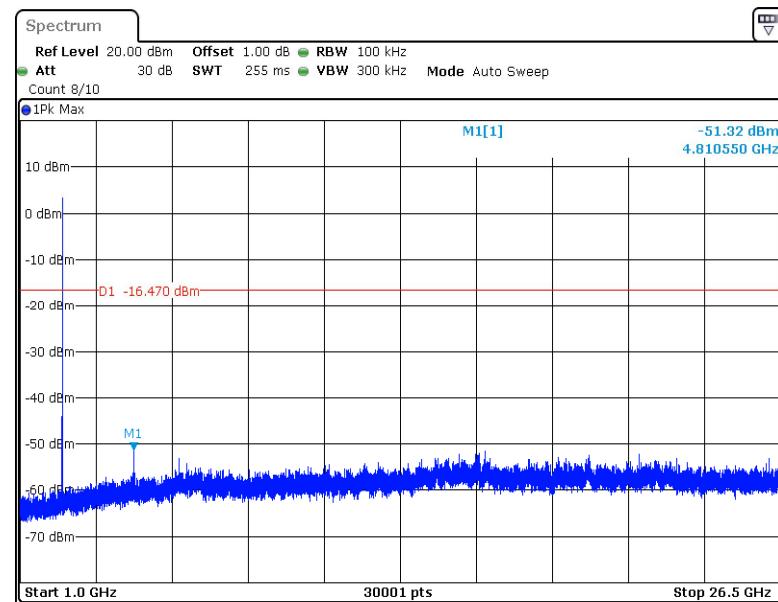
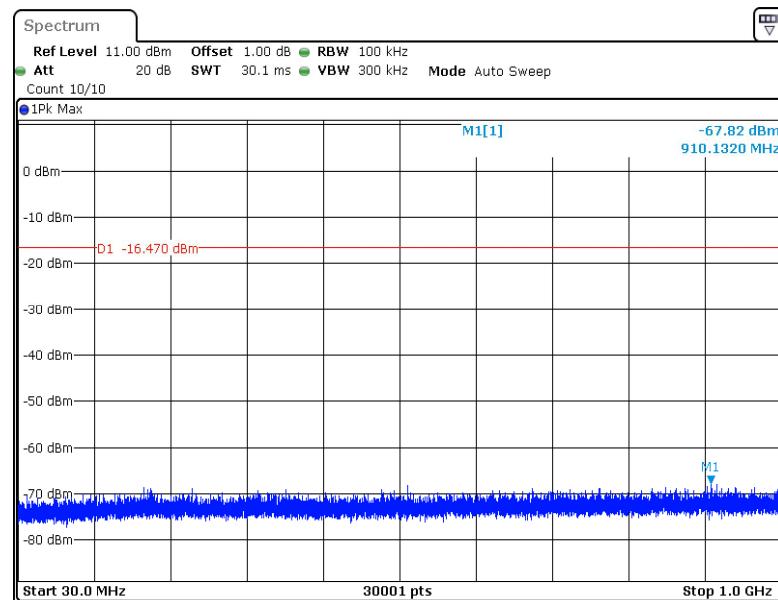
| Channel | FreqRange MHz | RefLevel dBm | Result dBm | Limit dBm | Verdict |
|---------|---------------|--------------|------------|-----------|---------|
| 2405 | 2405 | 3.53 | 3.53 | --- | PASS |
| 2405 | 30~1000 | 3.53 | -67.82 | <=-16.47 | PASS |
| 2405 | 1000~26500 | 3.53 | -51.32 | <=-16.47 | PASS |



Spurious Emissions at Antenna Terminals

EUT: CamLock
 Op Condition: Operated, TX Mode (2405MHz)
 Test Specification: FCC2.1051 & 15.247(d)
 Comment: 3.0V DC

Test Result
 Passed
 Not Passed

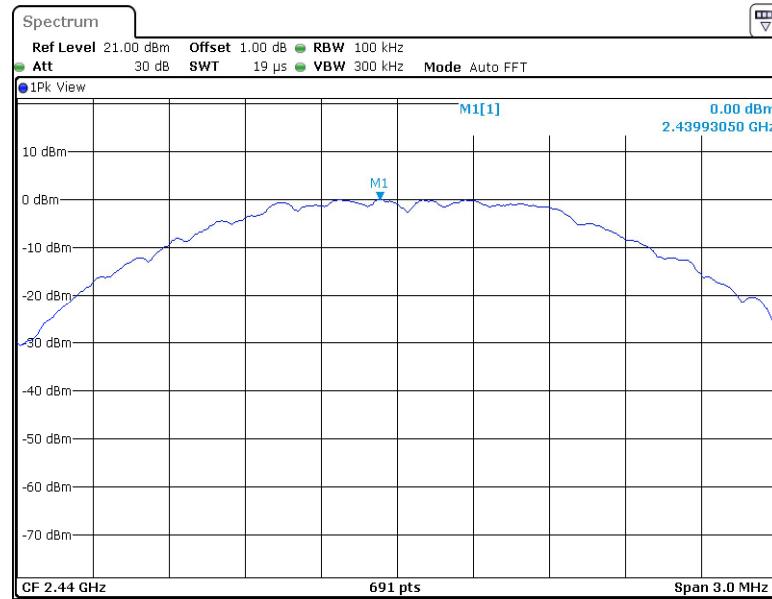


Spurious Emissions at Antenna Terminals

EUT: CamLock
 Op Condition: Operated, TX Mode (2440MHz)
 Test Specification: FCC2.1051 & 15.247(d)
 Comment: 3.0V DC

Test Result
 Passed
 Not Passed

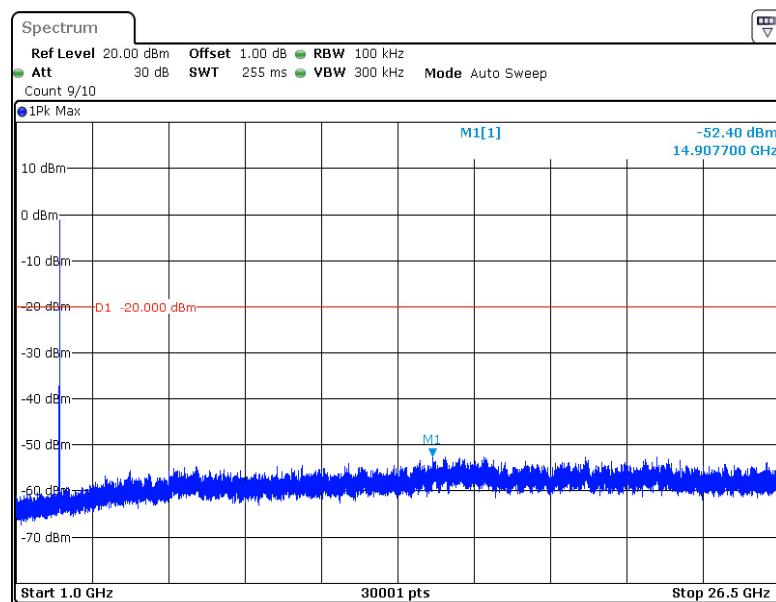
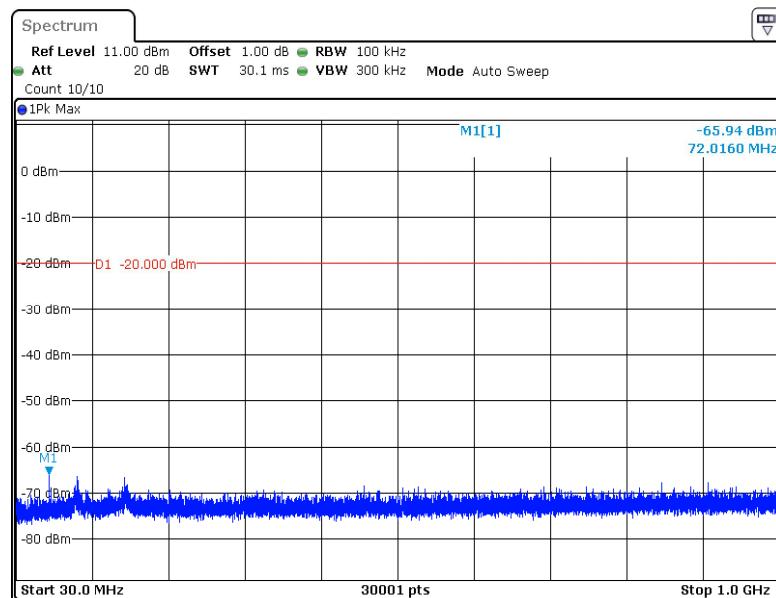
| Channel | FreqRange MHz | RefLevel dBm | Result dBm | Limit dBm | Verdict |
|---------|---------------|--------------|------------|-----------|---------|
| 2440 | 2440 | 0.00 | 0.00 | --- | PASS |
| 2440 | 30~1000 | 0.00 | -65.94 | <=-20 | PASS |
| 2440 | 1000~26500 | 0.00 | -52.4 | <=-20 | PASS |



Spurious Emissions at Antenna Terminals

EUT: CamLock
 Op Condition: Operated, TX Mode (2440MHz)
 Test Specification: FCC2.1051 & 15.247(d)
 Comment: 3.0V DC / 1M bps (worst case)

Test Result
 Passed
 Not Passed

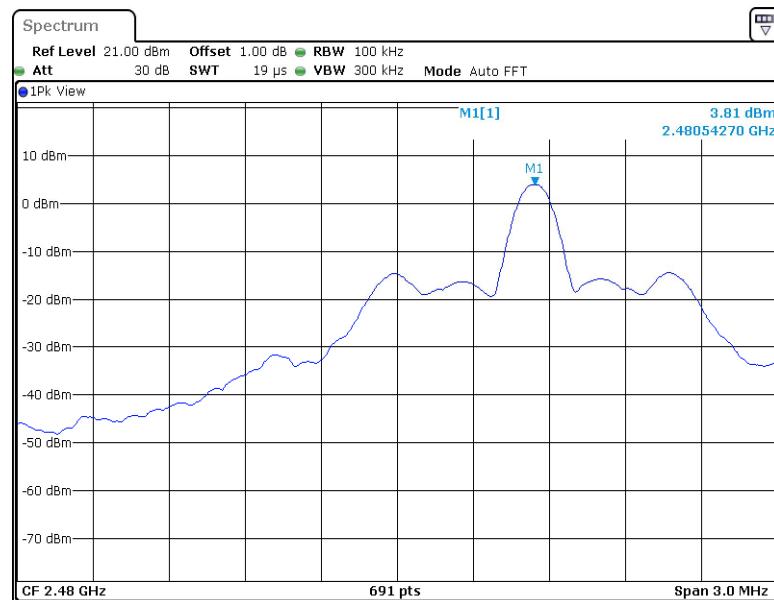


Spurious Emissions at Antenna Terminals

EUT: CamLock
 Op Condition: Operated, TX Mode (2480MHz)
 Test Specification: FCC2.1051 & 15.247(d)
 Comment: 3.0V DC

Test Result
 Passed
 Not Passed

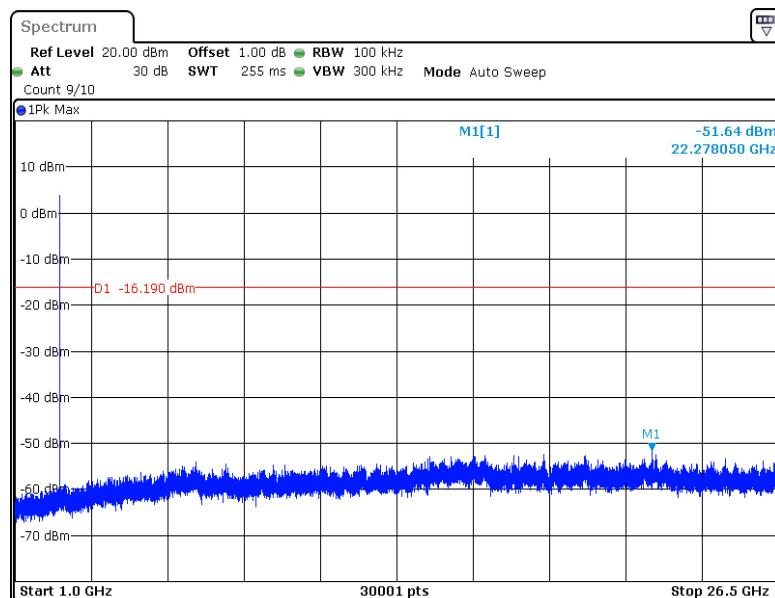
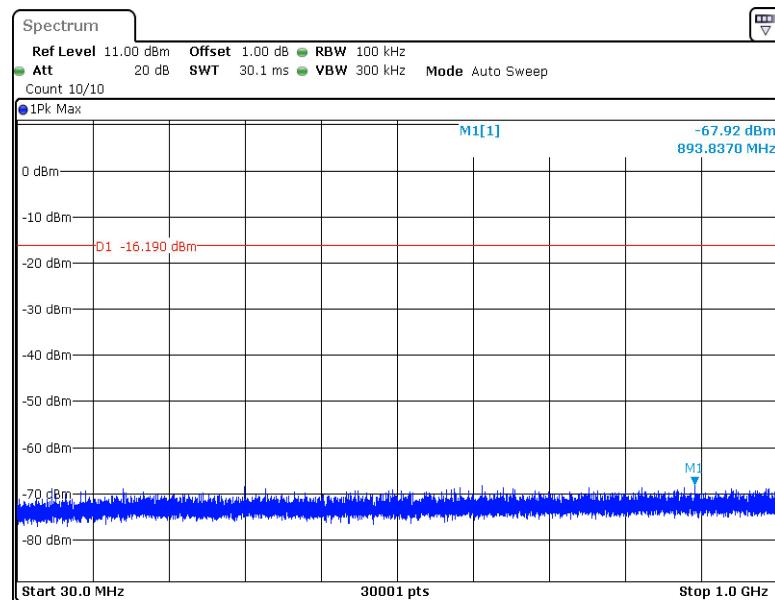
| Channel | FreqRange MHz | RefLevel dBm | Result dBm | Limit dBm | Verdict |
|---------|---------------|--------------|------------|-----------|---------|
| 2480 | 2480 | 3.81 | 3.81 | --- | PASS |
| 2480 | 30~1000 | 3.81 | -67.92 | <=-16.19 | PASS |
| 2480 | 1000~26500 | 3.81 | -51.64 | <=-16.19 | PASS |



Spurious Emissions at Antenna Terminals

EUT: CamLock
 Op Condition: Operated, TX Mode (2480MHz)
 Test Specification: FCC2.1051 & 15.247(d)
 Comment: 3.0V DC

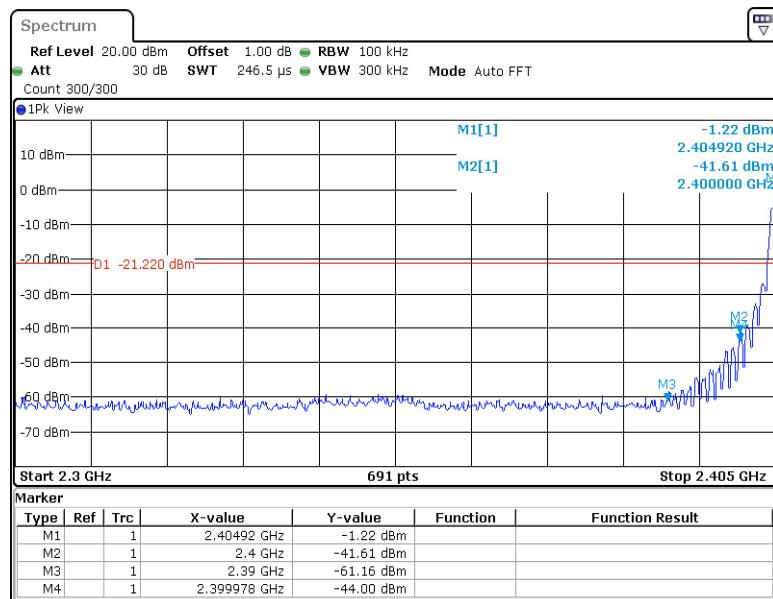
Test Result
 Passed
 Not Passed



8.5 100kHz Bandwidth of band edges

EUT: CamLock
 Op Condition: Operated, TX Mode (2405MHz)
 Test Specification: FCC15.247(d), Conducted
 Comment: 3.0V DC

Test Result
 Passed
 Not Passed

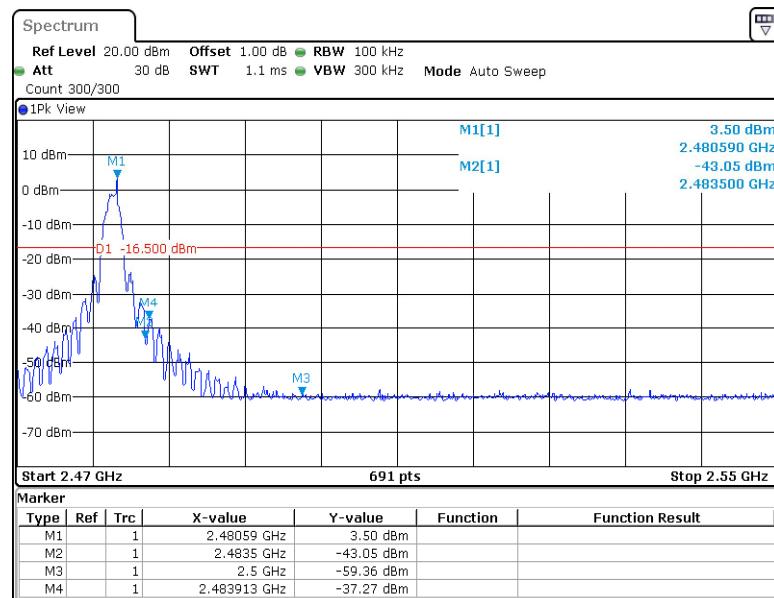


| Band edges | Limit |
|------------|--------|
| 41.61 | > 20dB |

100kHz Bandwidth of band edges

EUT: CamLock
 Op Condition: Operated, TX Mode (2480MHz)
 Test Specification: FCC15.247(d), Conducted
 Comment: 3.0V DC

Test Result
 Passed
 Not Passed

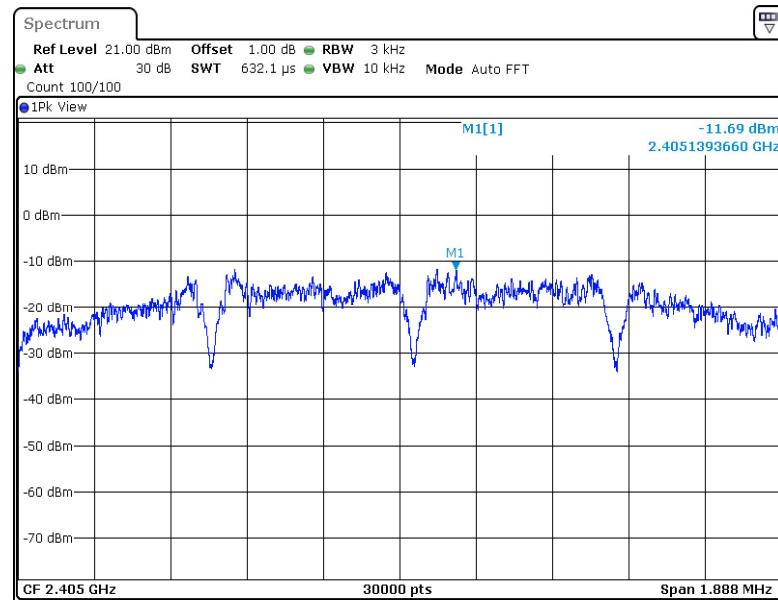


| Band edges | Limit |
|------------|--------|
| 43.05 | > 20dB |

8.6 Power Spectral Density

EUT: CamLock
 Op Condition: Operated, TX Mode (2405MHz)
 Test Specification: FCC15.247(e)
 Comment: 3.0V DC

Test Result
 Passed
 Not Passed

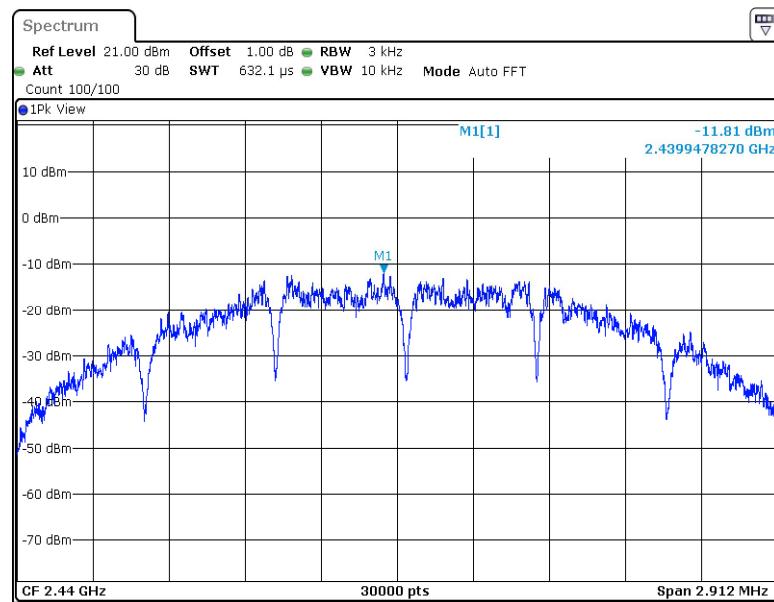


| PSD | Limit |
|-----------------|--------------|
| -11.69 dBm/3kHz | < 8 dBm/3kHz |

Power Spectral Density

EUT: CamLock
 Op Condition: Operated, TX Mode (2440MHz)
 Test Specification: FCC15.247(e)
 Comment: 3.0V DC

Test Result
 Passed
 Not Passed

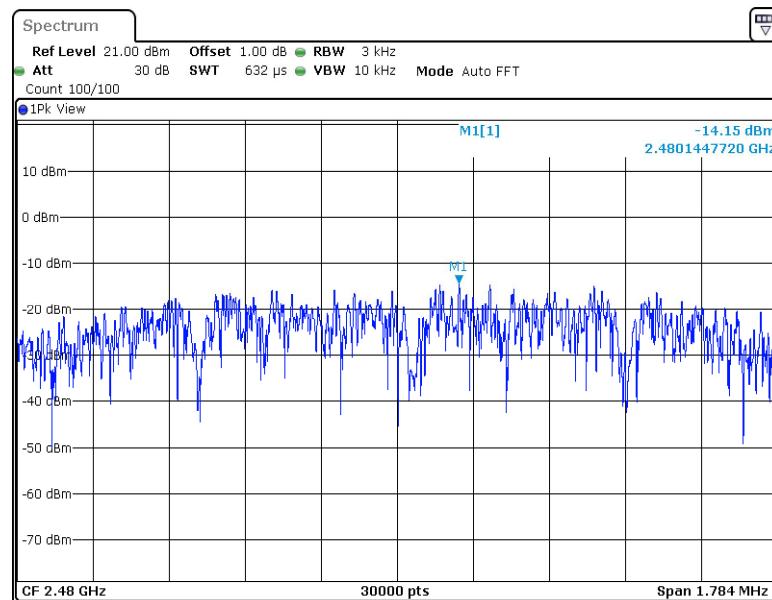


| PSD | Limit |
|-----------------|--------------|
| -11.81 dBm/3kHz | < 8 dBm/3kHz |

Power Spectral Density

EUT: CamLock
 Op Condition: Operated, TX Mode (2480MHz)
 Test Specification: FCC15.247(e)
 Comment: 3.0V DC

Test Result
 Passed
 Not Passed



| PSD | Limit |
|-----------------|--------------|
| -14.15 dBm/3kHz | < 8 dBm/3kHz |

8.7 Antenna Requirement

EUT: CamLock
Op Condition: Operated, TX Mode
Test Specification: FCC15.203 & 15.247(b)
Comment: 3.0V DC

Test Result
 Passed
 Not Passed

Limit

For intentional device, according to FCC Title 47 Part 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC Title 47 Part 15.247(b), if transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Antenna Connector Construction

The antenna used in this product is a chip antenna, and the maximum gain of this antenna is 3.5 dBi.

9 Test setup procedure

9.1 Spurious Radiated Emission

Test Method

- 1: The EUT was place on a turn table which is 1.5m above ground plane for above 1GHz and 0.8m above ground for below 1GHz at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- 2: The EUT was set 3 meters away from the interference – receiving antenna, which was mounted on the top of a variable – height antenna tower.
- 3: The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- 4: For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- 5: Use the following spectrum analyzer settings According to C63.10:

For Below 1GHz

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious
 RBW = 100 KHz to 120KHz, $VBW \geq RBW$ for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.

For Peak unwanted emissions Above 1GHz:

Span = wide enough to capture the peak level of the in-band emission and all spurious
 RBW = 1MHz, $VBW \geq RBW$ for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.

Procedures for average unwanted emissions measurements above 1000 MHz

- a) RBW = 1MHz.
- b) $VBW \geq [3 \times RBW]$.
- c) Detector = RMS (power averaging), if $[span / (\# of points in sweep)] \geq RBW / 2$.
 Satisfying this condition can require increasing the number of points in the sweep or reducing the span. If the condition is not satisfied, then the detector mode shall be set to peak.
- d) Averaging type = power (i.e., rms) (As an alternative, the detector and averaging type may be set for linear voltage averaging. Some instruments require linear Quantum RTLS Dot Compact Mobile Node mode to use linear voltage averaging. Log or dB averaging shall not be used.)
- e) Sweep time = auto.
- f) Perform a trace average of at least 100 traces if the transmission is continuous. If the transmission is not continuous, then the number of traces shall be increased by a factor of $1 / D$, where D is the duty cycle. For example, with 50% duty cycle, at least 200 traces shall be averaged. (If a specific emission is demonstrated to be continuous—i.e., 100% duty cycle—then rather than turning ON and OFF with the transmit cycle, at least 100 traces shall be averaged.)

g) If tests are performed with the EUT transmitting at a duty cycle less than 98%, then a correction factor shall be added to the measurement results prior to comparing with the emission limit, to compute the emission level that would have been measured had the test been performed at 100% duty cycle. The correction factor is computed as follows:

- 1) If power averaging (rms) mode was used in the preceding step e), then the correction factor is $[10 \log (1 / D)]$, where D is the duty cycle. For example, if the transmit duty cycle was 50%, then 3 dB shall be added to the measured emission levels.
- 2) If linear voltage averaging mode was used in the preceding step e), then the correction factor is $[20 \log (1 / D)]$, where D is the duty cycle. For example, if the transmit duty cycle was 50%, then 6 dB shall be added to the measured emission levels.
- 3) If a specific emission is demonstrated to be continuous (100% duty cycle) rather than turning ON and OFF with the transmit cycle, then no duty cycle correction is required for that emission.

Limit

The radio emission outside the operating frequency band shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power. Radiated emissions which fall in the restricted bands, as defined in section RSS-GEN 8.10, must comply with the radiated emission limits specified in section 15.209.

| Frequency MHz | Field Strength uV/m | Field Strength dB μ V/m | Detector |
|------------------|------------------------|--------------------------------|----------|
| 30-88 | 100 | 40 | QP |
| 88-216 | 150 | 43.5 | QP |
| 216-960 | 200 | 46 | QP |
| 960-1000 | 500 | 54 | QP |
| Above 1000 | 500 | 54 | AV |
| Above 1000 | 5000 | 74 | PK |

According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit.

9.2 Conducted Emission at AC Power line

Test Method

1. The EUT was placed on a table, which is 0.8m above ground plane
2. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.).
3. Maximum procedure was performed to ensure EUT compliance
4. A EMI test receiver is used to test the emissions from both sides of AC line

Limit

According to §15.207 & RSS-GEN 8.8, conducted emissions limit as below:

| Frequency MHz | QP Limit dB μ V | AV Limit dB μ V |
|------------------|------------------------|------------------------|
| 0.150-0.500 | 66-56* | 56-46* |
| 0.500-5 | 56 | 46 |
| 5-30 | 60 | 50 |

Remark: “*” Decreasing linearly with logarithm of the frequency

9.3 6dB & 99% Bandwidth

Test Method

1. Use the following spectrum analyzer settings:
RBW=100K, VBW \geq 3RBW, Sweep = auto, Detector function = peak, Trace = max hold
2. Use the automatic bandwidth measurement capability of an instrument, may be employed using the X dB bandwidth mode with X set to 6 dB, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be \geq 6 dB.
3. Allow the trace to stabilize, record the X dB Bandwidth value.

Limit

Limit [kHz]

\geq 500

9.4 Peak Output Power

Test Method

1. Connect the spectrum analyzer to the EUT
 - a) The EUT is configured to transmit continuously, or to transmit with a constant duty factor.
 - b) At all times the EUT is transmitting at its maximum power control level.
 - c) The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five.
2. Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.
3. Adjust the measurement in dBm by adding $10\log (1/x)$, where x is the duty cycle to the measurement result.

Limits

According to §15.247 (b) (1) & RSS-247 5.4(d), conducted peak output power limit as below:

| Frequency Range MHz | Limit W | Limit dBm |
|------------------------|------------|--------------|
| 2400-2483.5 | ≤1 | ≤30 |

For e.i r.p:

| Frequency Range MHz | Limit W | Limit dBm |
|------------------------|------------|--------------|
| 2400-2483.5 | ≤4 | ≤36 |

9.5 Spurious Emissions at Antenna Terminals

Test Method

1. Establish a reference level by using the following procedure:
 - a. Set RBW=100 kHz. VBW \geq 3RBW. Detector =peak, Sweep time = auto couple, Trace mode = max hold.
 - b. Allow trace to fully stabilize, use the peak marker function to determine the maximum PSD level.
2. Use the maximum PSD level to establish the reference level.
 - a. Set the center frequency and span to encompass frequency range to be measured.
 - b. Use the peak marker function to determine the maximum amplitude level. Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) are attenuated by at least the minimum requirements, report the three highest emissions relative to the limit.
3. Repeat above procedures until other frequencies measured were completed.

Limit

| Frequency Range MHz | Limit (dBc) |
|------------------------|-------------|
| 30-25000 | -20 |

9.6 100kHz Bandwidth of band edges

Test Method

- 1 Use the following spectrum analyzer settings:
Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 100 kHz, VBW \geq RBW, Sweep = auto, Detector function = peak, Trace = max hold.
- 2 Allow the trace to stabilize, use the peak and delta measurement to record the result.
- 3 The level Quantum RTLS Dot Compact Mobile Nodeed must comply with the limit specified in this Section.

Limit

| Frequency Range MHz | Limit (dBc) |
|------------------------|-------------|
| 30-25000 | -20 |

9.7 Power Spectral Density

Test Method

This procedure shall be used if maximum peak conducted output power was used to demonstrate compliance:

1. Set analyzer center frequency to DTS channel center frequency. RBW=3kHz, VBW \geq 3RBW, Span=1.5 times DTS bandwidth, Detector=Peak, Sweep=auto, Trace=max hold.
2. Allow trace to fully stabilize, use the peak marker function to determine the maximum amplitude level within the RBW.
3. Repeat above procedures until other frequencies measured were completed.

Limit

Limit [dBm/3KHz]

\leq 8

10 Appendix A – General Models Information

Model Declaration Letter



To: TÜV SÜD Hong Kong Limited

Attention: Eric Li

From:

Fax No:

Project No.:

Date: May 3, 2023

Total Page (Cover Included): 1

Subject: **Declaration letter**

We:

Company name: Mobile Technologies Inc.

Address: 1050 NE 67th Ave, Hillsboro OR 97124,

Country: United States of America

Officially notify TÜV SÜD Hong Kong Limited that the <<Model A>> have the same technical construction including circuit diagram, PCB Layout, components and component layout, all electrical construction and mechanical construction, with <<PRODUCT>>, <<Model B>>. The difference lies only in the mechanism of opening and close of the different models.

<<Model A>>: **CamLock**

<<Model B>>: **PlungerLock**

<<Product>>: **SmartLock**

Applicant:

(Apr 18,2023)

(Applicant's authorized signature and company Chop)



11 Appendix B – General Product Information

Radiofrequency radiation exposure evaluation

This exposure evaluation is intended for **FCC ID: 2AA2X-15000333**

According to KDB 447498 D01v06 section 4.3.1, For frequencies between 100 MHz to 6GHz and test separation distances \leq 50 mm, the Numeric threshold is determined as:

Step a)

$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0$ for 1-g SAR

>> The fundamental frequency of the EUT is 2405-2480MHz,
the test separation distance is \leq 50mm.
(Manufacturer specified the separation distance is: 5mm)
(5mm is the worst case according to the KDB)

Step b)

>> Numeric threshold (2405MHz), $\text{mW} / 5\text{mm} * \sqrt{2.402\text{GHz}} \leq 3.0$
Numeric threshold (2405MHz) $\leq 9.678\text{mW}$

>> Numeric threshold (2440MHz), $\text{mW} / 5\text{mm} * \sqrt{2.440\text{GHz}} \leq 3.0$
Numeric threshold (2440MHz) $\leq 9.602\text{mW}$

>> Numeric threshold (2480MHz), $\text{mW} / 5\text{mm} * \sqrt{2.480\text{GHz}} \leq 3.0$
Numeric threshold (2480MHz) $\leq 9.525\text{mW}$

>> The power (measured + tune up tolerance) of EUT at 2405MHz is: 3.48 dBm = 2.23mW
The power (measured + tune up tolerance) of EUT at 2440MHz is: 3.06 dBm = 2.02mW
The power (measured + tune up tolerance) of EUT at 2480MHz is: 3.79 dBm = 2.40mW

Which is smaller than the Numeric threshold.

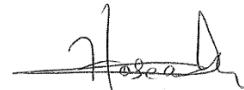
Therefore, the device is exempt from stand-alone SAR test requirements.

Reviewed by:



Eric LI
Section Manager

Prepared by:



Hosea CHAN
EMC Project Engineer