

Produkte
Products

| | | | | | |
|---|--|---|---|--|---|
| Prüfbericht - Nr.: 14045655 001 <i>Test Report No.:</i> | | | Seite 1 von 15 <i>Page 1 of 15</i> | | |
| Auftraggeber: <i>Client:</i> | | | Megabyte Limited Unit 507, Building 12W, No. 12 Science Park West Avenue Hong Kong Science Park, Shatin, N.T., Hong Kong | | |
| Gegenstand der Prüfung: <i>Test Item:</i> | | | UHF Portable RFID Reader | | |
| Bezeichnung: <i>Identification:</i> | | mDongle-D1-BU D1B-01-39, D1B-01-MB | | Serien-Nr.: <i>Serial No.:</i> | |
| Wareneingangs-Nr.: <i>Receipt No.:</i> | | A000386196-008 | | Eingangsdatum: <i>Date of Receipt:</i> | |
| Prüfart: <i>Testing Location:</i> | | TÜV Rheinland Hong Kong Ltd. 8/F, First Group Centre, 14 Wang Tai Road, Kowloon Bay, Kowloon, Hong Kong Hong Kong Productivity Council HKPC Building, 78 Tat Chee Avenue, Kowloon, Hong Kong | | | |
| Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of test item at delivery:</i> | | | Test samples are not damaged and suitable for testing. | | |
| Prüfgrundlage: <i>Test Specification:</i> | | | FCC Part 15 Subpart C ANSI C63.10-2013 | | |
| Prüfergebnis: <i>Test Results:</i> | | | Das vorstehend beschriebene Gerät wurde geprüft und entspricht oben genannter Prüfgrundlage. The above mentioned product was tested and passed . | | |
| Prüflaboratorium: <i>Testing Laboratory:</i> | | | TÜV Rheinland Hong Kong Ltd. 8 - 10/F., Goldin Financial Global Square, 7 Wang Tai Road, Kowloon Bay, Kowloon, Hong Kong | | |
| geprüft/ tested by: | | | kontrolliert/ reviewed by: | | |
| 30.11.2016 David Cheng Test Engineer | | | 30.11.2016 Benny Lau Senior Project Manager | | |
| Datum <i>Date</i> | Name/Stellung <i>Name/Position</i> | Unterschrift <i>Signature</i> | Datum <i>Date</i> | Name/Stellung <i>Name/Position</i> | Unterschrift <i>Signature</i> |
| Sonstiges: <i>Other Aspects</i> | | | FCC ID: XEK-MDONGLED1 | | |
| Abkürzungen: | | | Abbreviations: | | |
| P(ass) = entspricht Prüfgrundlage F(ail) = entspricht nicht Prüfgrundlage N/A = nicht anwendbar N/T = nicht getestet | | | P(ass) = passed F(ail) = failed 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 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 safety mark on this or similar products.</i> | | | | | |

Table of Content

| | Page |
|--|----------------|
| Cover Page | 1 |
| Table of Content | 2 |
| Product information..... | 4 |
| Manufacturers declarations | 4 |
| Product function and intended use | 4 |
| Submitted documents..... | 4 |
| Independent Operation Modes | 4 |
| Related Submittal(s) Grants | 5 |
| Remark | 5 |
| Test Set-up and Operation Mode..... | 6 |
| Principle of Configuration Selection | 6 |
| Test Operation and Test Software | 6 |
| Special Accessories and Auxiliary Equipment..... | 6 |
| Countermeasures to achieve EMC Compliance..... | 6 |
| Test Methodology | 7 |
| Radiated Emission | 7 |
| Field Strength Calculation..... | 7 |
| Test Setup Diagram | 8 |
| List of Test and Measurement Instruments..... | 10 |
| Measurement Uncertainty | 11 |
| Results FCC Part 15 – Subpart C | 12 |
| FCC 15.203 – Antenna Requirement 1..... | Pass..... 12 |
| FCC 15.204 – Antenna Requirement 2..... | N/A..... 12 |
| FCC 15.207 – Conducted Emission on AC Mains | Pass..... 12 |
| FCC 15.215 (c) – 20 dB Bandwidth | Pass..... 13 |
| FCC 15.225 (a)(b)(c) – Radiated Emission | Pass..... 13 |
| FCC 15.225 (d) – Radiated Emissions | Pass..... 14 |
| FCC 15.225 (e) – Frequency Tolerance | Pass..... 15 |
| Appendix 1 – Test protocols | 4 pages |
| Appendix 2 – Test setup | 3 pages |

| | |
|--|---------|
| Appendix 3 – EUT External Photos | 3 pages |
| Appendix 4 – EUT Internal Photos | 6 pages |
| Appendix 5 – RF exposure information | 2 pages |

Product information

Manufacturers declarations

| | Transmitter |
|---|--------------------------|
| Operating frequency range | 13.56 MHz |
| Type of modulation | ASK |
| Number of channels | 1 |
| Channel separation | N/A |
| Type of antenna | Integral Antenna |
| Antenna gain (dBi) | N/A |
| Power level | fix |
| Type of equipment | stand alone radio device |
| Connection to public utility power line | Yes |
| Nominal voltage | 100-240VAC/ 5VDC/ 3.7VDC |
| Independent Operation Modes | Transmitting |

Product function and intended use

The equipment under test (EUT) is a portable RFID reader. It is a compact NFC and RFID reader and OS independent. It can be connected to PC through USB cable and it has Bluetooth connectivity to any mobile devices.

The manufacturer declared that the model: D1B-01-39 and D1B-01-MB are identical to the model mDongle-D1-BU except the logo plate.

FCC ID: XEK-MDONGLED1

| Models | Product description |
|---------------------------------------|--------------------------|
| mDongle-D1-BU D1B-01-39, D1B-01-MB | UHF Portable RFID Reader |

Submitted documents

Circuit Diagram
Block Diagram
Technical Description
Bill of material
User manual
Label

Independent Operation Modes

The basic operation modes are:

- Transmitting mode.

For further information refer to User Manual

Related Submittal(s) Grants

- This device is a composite device.
- This is a single application for certification of the NFC transmitter.
- The Bluetooth portion is authorized under the certification procedure (refer to test report 14045652 001 and 14045653 001 issued by TÜV Rheinland HK Ltd on 30.11.2016).
- The RFID portion is authorized under the certification procedure (refer to test report 14045654 001 issued by TÜV Rheinland HK Ltd on 30.11.2016).
- The receiving function of the RFID transceiver is authorized under verification procedure (refer to test report 14045654 001 issued by TÜV Rheinland HK Ltd on 30.11.2016)
- The PC peripherals function is authorized under the certification procedure (refer to test report 14043219 001 issued by TÜV Rheinland HK Ltd on 30.11.2016).

Remark

The test results in this test report are only relevant to the tested sample and does not involve any assessment in the production.

Test Set-up and Operation Mode

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.

Test Operation and Test Software

Test operation should refer to test methodology.

- During test, Channel & Power Controlling Software provided by the applicant was used to control the operating channel as well as the maximum output power level. The maximum RF output power and the operating frequencies was selected according to the instruction given by the manufacturer. The setting of the maximum RF output power and the operating frequency range expected by the customer shall be fixed on the firmware of the final end product.

Special Accessories and Auxiliary Equipment

The product has been tested together with the following additional accessories:

- AC-DC adaptor Model: EA1024AR-050 Input: 100-240 VAC 50/60 Hz; Output: 5.0VDC 2A)
(Provided by the applicant)
-
- HP Notebook (Provided by TÜV)

Countermeasures to achieve EMC Compliance

- Nil

Test Methodology

Radiated Emission

The radiated emission measurements were performed according to the procedures in ANSI C63.10-2013.

For measurement below 1GHz - the equipment under test (EUT) was placed at the middle of the 80 cm height turntable. For measurement above 1GHz - the EUT was placed at the middle of the 1.5 m height turntable and RF absorbing material was placed on ground plane between turntable and measuring antenna. During the testing, the EUT was operated standalone and arranged for maximum emissions. The EUT was tested in three orthogonal planes.

The investigation is performed with the EUT rotated 360°, the antenna height scanned between 1m and 4m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations. Repeat the measurement steps until the maximum emissions were obtained.

All radiated tests were performed at an antenna to EUT with 3 meters distance, unless stated otherwise in particular parts of this test report.

Field Strength Calculation

The field strength at 3 m was established by adding the meter reading of the spectrum analyzer to the factors associated with antenna correction factor, cable loss, preamplifiers and filter attenuation.

The equation is expressed as follow:

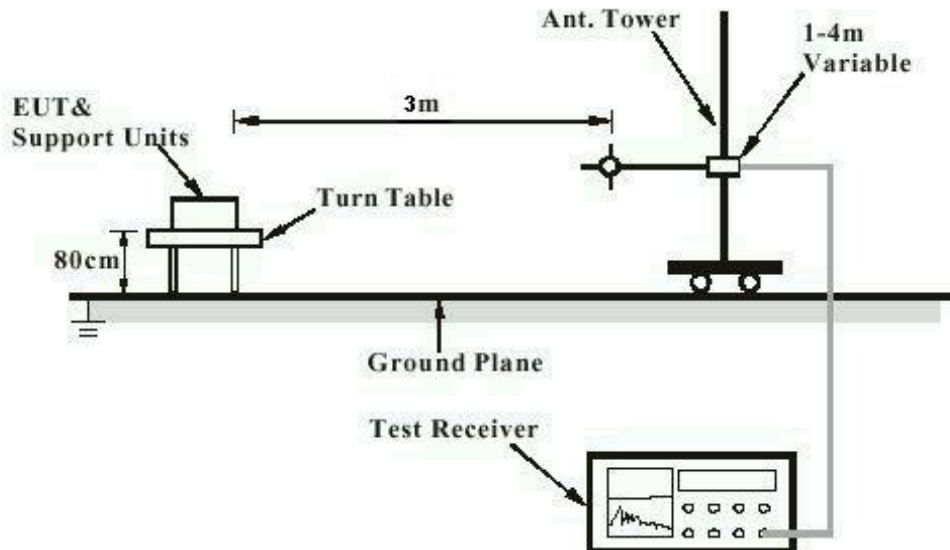
$$FS = R + AF + CF + FA - PA$$

Where FS = Field Strength in dBuV/m at 3 meters.
R = Reading of Spectrum Analyzer in dBuV.
AF = Antenna Factor in dB.
CF = Cable Attenuation Factor in dB.
FA = Filter Attenuation Factor in dB.
PA = Preamplifier Factor in dB.

FA and PA are only be used for the measuring frequency above 1 GHz.

Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test



Note: Measurements above 1 GHz are done with a table height of 1.5m. In addition, there is RF absorbing material on the floor of the test site for above 1GHz measurement.

Diagram of Measurement Equipment Configuration for Mains Conduction Measurement (if applicable)

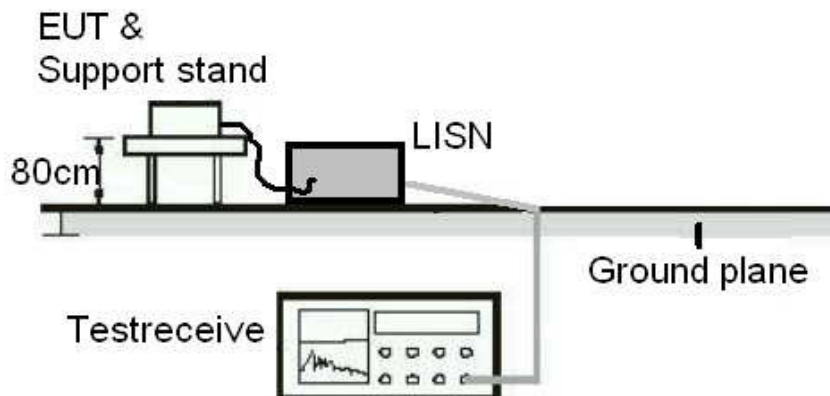
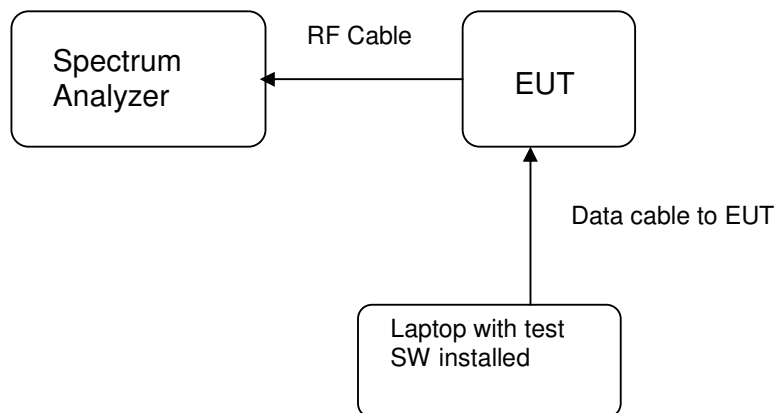


Diagram of Equipment Configuration for Antenna-port Conducted Measurement (if applicable)



List of Test and Measurement Instruments

Hong Kong Productivity Council (FCC Registration number: 90656)

Radiated Emission

| Equipment | Manufacturer | Type | Cal. Date | Due Date |
|--|--------------|--------------|-----------|-----------|
| Semi-anechoic Chamber | Frankonia | Nil | 25-Apr-16 | 25-Apr-17 |
| New Fully Anchoic Chamber | TDK | N/A | 19-Apr-16 | 19-Apr-17 |
| Cable | Hubersuhner | SUCOFLEX 104 | 31-Mar-16 | 31-Mar-18 |
| Test Receiver | R & S | ESU26 | 7-Dec-15 | 7-Dec-16 |
| Bi-conical Antenna | R & S | HK116 | 1-Sep-15 | 1-Sep-17 |
| Log Periodic Antenna | R & S | HL223 | 1-Sep-15 | 1-Sep-17 |
| Coaxial cable | Harbour | LL335 | 10-Jun-16 | 10-Jun-18 |
| Microwave amplifier 0.5-26.5GHz, 25dB gain | HP | 83017A | 18-Jul-16 | 18-Jul-18 |
| High Pass Filter (cutoff freq. =1000MHz) | Trilithic | 23042 | 28-Oct-15 | 28-Oct-17 |
| Horn Antenna | EMCO | 3115 | 26-Aug-15 | 26-Aug-17 |
| Active Loop Antenna | EMCO | 6502 | 27-Oct-16 | 27-Oct-17 |

AC Mains Conducted Emission

| Equipment | Manufacturer | Type | Cal. Date | Due Date |
|---------------------|--------------|---------|-----------|-----------|
| Test Receiver | R & S | ESU40 | 7-Dec-15 | 7-Dec-16 |
| RF Voltage Probe | Schwarzbeck | TK9416 | 11-Feb-16 | 11-Feb-17 |
| LISN | R&S | ESH3-Z5 | 15-Jun-16 | 15-Jun-17 |
| Double Shield Cable | Radiall | RG142 | 14-Sep-15 | 14-Sep-17 |
| Pulse Limiter | R&S | ESH3-Z2 | 3-Jun-16 | 3-Jun-18 |

TÜV Rheinland Hong Kong Ltd

Radio Test

| Equipment | Manufacturer | Type | Cal. Date | Due Date |
|---------------------|--------------|--------|-----------|-------------|
| Spectrum Analyzer | R & S | FSP30 | 12-Jan-15 | 12-Jan-2017 |
| Temperature Chamber | Binder | MK 240 | 9020-0028 | N/A |

Measurement Uncertainty

The estimated combined standard uncertainty for power-line conducted emissions measurements is $\pm 3.43\text{dB}$.

The estimated combined standard uncertainty for radiated emissions measurements is $\pm 5.10\text{dB}$ (30MHz to 200MHz) and $\pm 5.08\text{dB}$ (200MHz to 1000MHz) and is $\pm 5.10\text{dB}$ (30MHz to 200MHz) and $\pm 5.08\text{dB}$ (above 1GHz).

The estimated combined standard uncertainty for antenna conducted emission is $\pm 1.56\text{dB}$

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor of $k=2$, which for the level of confidence is approximately 95%.

Results FCC Part 15 – Subpart C

| FCC 15.203 – Antenna Requirement 1 | | | Pass |
|---|-------------------------------|------------------------|------|
| FCC Requirement: No antenna other than that furnished by the responsible party shall be used with the device | | | |
| Results: | a) Antenna type: | Fixed Integral antenna | |
| | b) Manufacturer and model no: | N/A | |
| | c) Peak Gain: | N/A | |
| Verdict: | Pass | | |

| FCC 15.204 – Antenna Requirement 2 | | | N/A |
|--|--|--|-----|
| FCC Requirement: An intentional radiator may be operated only with the antenna with which it is authorized. If an antenna is marketed with the intentional radiator, it shall be of a type which is authorized with the intentional radiator. | | | |
| Results: | Only one integral antenna can be used. | | |
| Verdict: | N/A | | |

| FCC 15.207 – Conducted Emission on AC Mains | | | | | | Pass |
|---|-----------------|-----------------|--------------|-----------------|-----------------|---------|
| Test Specification : ANSI C63.10 – 2013 Mode of operation : TX mode Port of testing : AC Mains input port of power supply Detector : Quasi-peak and Average RBW : 9 kHz Supply voltage : 120Vac 60Hz Temperature : 23°C Humidity : 50% | | | | | | |
| Requirement: | | 15.207(a) | | | | |
| Results: | | Pass | | | | |
| Live measurement | | | | | | |
| Frequency range (MHz) | Frequency (MHz) | Quasi-peak dBμV | Average dBμV | Limit QP (dBμV) | Limit AV (dBμV) | Verdict |
| 0,15 – 0,5 | No peak found | --- | --- | 66 - 56 | 56 - 46 | Pass |
| > 0,5 - 5 | No peak found | --- | --- | 56 | 46 | Pass |
| > 5 - 30 | 13.562 | 52.3 | 49.7 | 60 | 50 | Pass |
| Neutral measurement | | | | | | |
| Frequency range (MHz) | Frequency (MHz) | Quasi-peak dBμV | Average dBμV | Limit QP (dBμV) | Limit AV (dBμV) | Verdict |
| 0,15 – 0,5 | No peak found | --- | --- | 66 - 56 | 56 - 46 | Pass |
| > 0,5 - 5 | No peak found | --- | --- | 56 | 46 | Pass |
| > 5 - 30 | 13.562 | 52.3 | 49.8 | 60 | 50 | Pass |

Results: Pre-scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and data rate.

The radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150kHz to 30MHz does not exceed the limits. For test Results plots refer to Appendix 1.

| FCC 15.215 (c) – 20 dB Bandwidth | | Pass | | |
|--|--|-------------|-------------------|-------------|
| Requirement: | The intentional radiators must be designed to ensure that the 20dB bandwidth of the emission, is contained within the frequency band designated in the rule section under which the equipment is operated. | | | |
| Test Specification : ANSI C63.10-2013 | | | | |
| Mode of operation : TX Mode | | | | |
| Supply voltage : 5VDC | | | | |
| Temperature : 23°C | | | | |
| Humidity : 50% | | | | |
| Results: For test protocols refer to Appendix 1. | | | | |
| Frequency (MHz) | 20 dB left (MHz) | Limit (MHz) | 20 dB right (MHz) | Limit (MHz) |
| 13.560 | 13.344 | > 13.110 | 13.700 | < 14.010 |

| FCC 15.225 (a)(b)(c) – Radiated Emission | | | Pass |
|--|--------------|---|------|
| Test Specification : ANSI C63.10 – 2013 Mode of operation : Tx mode Port of testing : Enclosure Supply voltage : 5VDC Temperature : 23°C Humidity : 50% | | | |
| Requirement: | | (a) The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters (124 dBuV /m at 3 meters with extrapolation factor of 40 dB/decade). (b) Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters (90.5 dBuV /m at 3 meters with extrapolation factor of 40 dB/decade). (c) Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters (80.5 dBuV /m at 3 meters with extrapolation factor of 40 dB/decade). | |
| Results: | | For test protocols refer to Appendix 1. | |
| Freq MHz | Level dBuV/m | Limit/ Detector dBuV/m | |
| 13.560 | 48.90 | 124.0 / PK | |
| 13.772 | 22.99 | 80.5 / PK | |
| 13.346 | 25.22 | 80.5 / PK | |

| FCC 15.225 (d) – Radiated Emissions | | Pass |
|---|---|---------------------------|
| Test Specification : ANSI C63.10 – 2013 Mode of operation : TX mode Port of testing : Enclosure Frequency range : 9kHz to 1GHz Supply voltage : 120Vac 60Hz Temperature : 23°C Humidity : 50% | | |
| Requirement: | The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in §15.209. | |
| Results: | Pre-scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and data rate. Simultaneous transmission was investigated and no new emissions were found. All three transmit frequency modes comply with the field strength within the restricted bands. There is no spurious found below 30MHz. | |
| Vertical Polarization | | |
| Freq MHz | Level dBuV/m | Limit/ Detector dBuV/m |
| 99.803 | 31.9 | 43.5 / QP |
| 488.173 | 36.5 | 46.0 / QP |
| Horizontal Polarization | | |
| Freq MHz | Level dBuV/m | Limit/ Detector dBuV/m |
| 99.803 | 36.7 | 43.5 / QP |
| 488.173 | 44.9 | 46.0 / QP |

| FCC 15.225 (e) – Frequency Tolerance | | | | | Pass |
|--|----------------------|-----------------|---------------------|-----------|-----------|
| Test Specification : ANSI C63.10-2013 Mode of operation : Tx mode Port of testing : Antenna port | | | | | |
| Requirement: The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency over a temperature variation of -20 degrees to +50 degrees C in 10 degrees C steps at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage or battery end point at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery. | | | | | |
| Results: Pass | | | | | |
| Frequency stability with respect to ambient temperature | | | | | |
| Temp. (°C) | Supply Voltage (VDC) | Frequency (MHz) | Frequency error (%) | Limit (%) | Verdict |
| 50 | 3.7 | 13.560360 | 0.000516 | +/- 0.01 | Pass |
| 40 | 3.7 | 13.560380 | 0.000369 | +/- 0.01 | Pass |
| 30 | 3.7 | 13.560400 | 0.000221 | +/- 0.01 | Pass |
| 20 | 3.7 | 13.560430 | 0.000000 | +/- 0.01 | Reference |
| 10 | 3.7 | 13.560450 | -0.000147 | +/- 0.01 | Pass |
| 0 | 3.7 | 13.560470 | -0.000295 | +/- 0.01 | Pass |
| -10 | 3.7 | 13.560470 | -0.000295 | +/- 0.01 | Pass |
| -20 | 3.7 | 13.560450 | -0.000147 | +/- 0.01 | Pass |
| Frequency stability when varying supply voltage | | | | | |
| Temp. (°C) | Supply Voltage (VDC) | Frequency (MHz) | Frequency error (%) | Limit (%) | Verdict |
| 20 | 102 | 13.560390 | -0.000074 | +/- 0.01 | Pass |
| 20 | 120 | 13.560380 | 0.000000 | +/- 0.01 | Reference |
| 20 | 138 | 13.560390 | -0.000074 | +/- 0.01 | Pass |