



Produkte  
Products

<b>Prüfbericht - Nr.: 14045652 001</b>			<b>Seite 1 von 16</b> Page 1 of 16		
<i>Test Report No.:</i>					
<b>Auftraggeber:</b> <i>Client:</i>		<b>Megabyte Limited</b> Unit 507, Building 12W, No. 12 Science Park West Avenue Hong Kong Science Park, Shatin, N.T., Hong Kong			
<b>Gegenstand der Prüfung:</b> <i>Test Item:</i>		<b>UHF Portable RFID Reader</b>			
<b>Bezeichnung:</b> <i>Identification:</i>		<b>mDongle-D1-BU</b> D1B-01-39, D1B-01-MB		<b>Serien-Nr.:</b> <i>Serial No.:</i> <b>Engineering sample</b>	
<b>Wareneingangs-Nr.:</b> <i>Receipt No.:</i>		<b>A000386196-008</b>		<b>Eingangsdatum:</b> <i>Date of Receipt:</i> <b>30.06.2016</b>	
<b>Prüfört:</b> <i>Testing Location:</i>		<b>TÜV Rheinland Hong Kong Ltd.</b> 8/F, First Group Centre, 14 Wang Tai Road, Kowloon Bay, Kowloon, Hong Kong <b>Hong Kong Productivity Council</b> HKPC Building, 78 Tat Chee Avenue, Kowloon, Hong Kong			
<b>Zustand des Prüfgegenstandes bei Anlieferung:</b> <i>Condition of test item at delivery:</i>			Test samples are not damaged and suitable for testing.		
<b>Prüfgrundlage:</b> <i>Test Specification:</i>		<b>FCC Part 15 Subpart C</b> <b>ANSI C63.10-2013</b>			
<b>Prüfergebnis:</b> <i>Test Results:</i>		<b>Das vorstehend beschriebene Gerät wurde geprüft und entspricht oben genannter Prüfgrundlage.</b>  The above mentioned product was tested and <b>passed</b> .			
<b>Prüflaboratorium:</b> <i>Testing Laboratory:</i>		<b>TÜV Rheinland Hong Kong Ltd.</b> 8 - 10/F., Goldin Financial Global Square, 7 Wang Tai Road, Kowloon Bay, Kowloon, Hong Kong			
<b>geprüft/ tested by:</b>			<b>kontrolliert/ reviewed by:</b>		
30.11.2016		David Cheng Test Engineer		30.11.2016	
				Benny Lau Senior Project Manager	
					
<b>Datum</b> <i>Date</i>	<b>Name/Stellung</b> <i>Name/Position</i>	<b>Unterschrift</b> <i>Signature</i>	<b>Datum</b> <i>Date</i>	<b>Name/Stellung</b> <i>Name/Position</i>	<b>Unterschrift</b> <i>Signature</i>
<b>Sonstiges:</b> Other Aspects <b>FCC ID: XEK-MDONGLED1</b>					
<b>Abkürzungen:</b> P(ass) = entspricht Prüfgrundlage F(ail) = entspricht nicht Prüfgrundlage N/A = nicht anwendbar N/T = nicht getestet			<b>Abbreviations:</b> P(ass) = passed F(ail) = failed N/A = not applicable N/T = not tested		
<b>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.</b> <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
<b>Cover Page .....</b>	<b>1</b>
<b>Table of Content .....</b>	<b>2</b>
<b>Product information.....</b>	<b>4</b>
Manufacturers declarations .....	4
Product function and intended use .....	4
Submitted documents.....	4
Independent Operation Modes .....	4
Related Submittal(s) Grants .....	5
Remark .....	5
<b>Test Set-up and Operation Mode.....</b>	<b>6</b>
Principle of Configuration Selection .....	6
Test Operation and Test Software.....	6
Special Accessories and Auxiliary Equipment.....	6
Countermeasures to achieve EMC Compliance.....	6
<b>Test Methodology .....</b>	<b>7</b>
Radiated Emission .....	7
Field Strength Calculation.....	7
<b>Test Setup Diagram .....</b>	<b>8</b>
<b>List of Test and Measurement Instruments .....</b>	<b>10</b>
<b>Measurement Uncertainty .....</b>	<b>11</b>
<b>Results FCC Part 15 – Subpart C.....</b>	<b>12</b>
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 15.247 (a)(2) – 6dB Bandwidth Measurement .....	Pass..... 13
FCC 15.247(b)(3) – Maximum Peak Couducted Output Power .....	Pass..... 13
FCC 15.247(e) – Power Spectral Density.....	Pass..... 14
FCC 15.247(d) – Spurious Conducted Emissions.....	Pass..... 14
FCC 15.205 – Radiated Emissions in Restricted Frequency Bands.....	Pass..... 15

Appendix 1 – Test protocols .....	16 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

	<b>Transceiver</b>
Operating frequency range	2402 - 2480 MHz
Type of modulation	GFSK
Number of channels	40
Channel separation	2 MHz
Type of antenna	Integral Chip Antenna
Antenna gain (dBi)	1.9 dBi
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

<b>Models</b>	<b>Product description</b>
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 Bluetooth Low Energy transmitter.

The RFID transmitter portion is authorized under the certification procedure (refer to test report 14045654 001 issued by TÜV Rheinland HK Ltd on 30.11.2016).

The Bluetooth Basic Rate portion is authorized under the certification procedure (refer to test report 14045653 001 issued by TÜV Rheinland HK Ltd on 30.11.2016).

The NFC portion is authorized under the certification procedure (refer to test report 14045655 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).

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)

## **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 customer was used to control the operating channel as well as the output power level. The RF output power was selected according to the instruction given by the manufacturer. The setting of the RF output power expected by the customer shall be fixed on the firmware of the final end product.

### Special Accessories and Auxiliary Equipment

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

### Countermeasures to achieve EMC Compliance

- Nil

## Test Methodology

### Radiated Emission

The radiated emission measurements of the transmitter part 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:

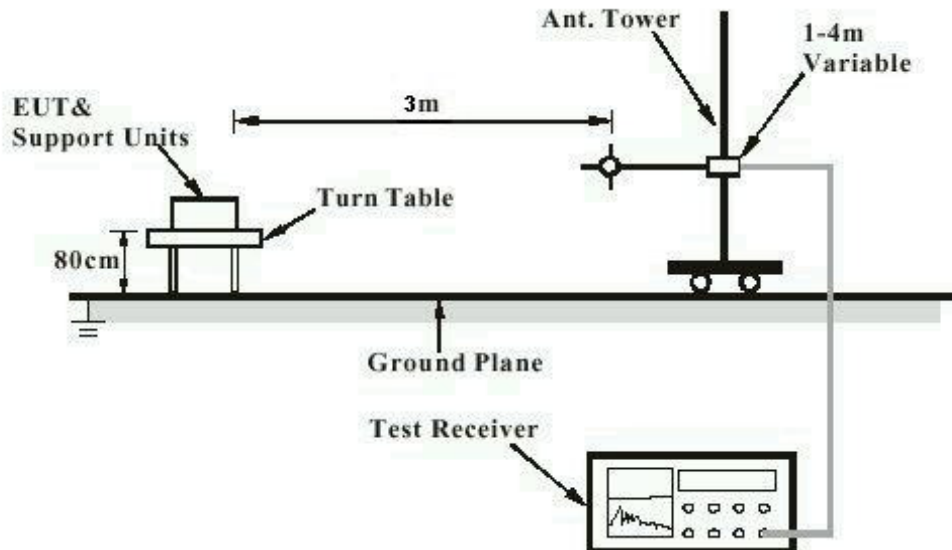
$$FS = R + AF + CF + FA - PA$$

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.

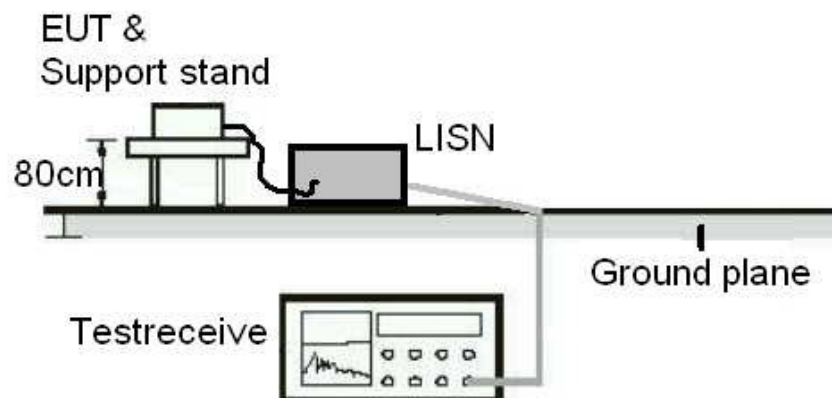
## Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test



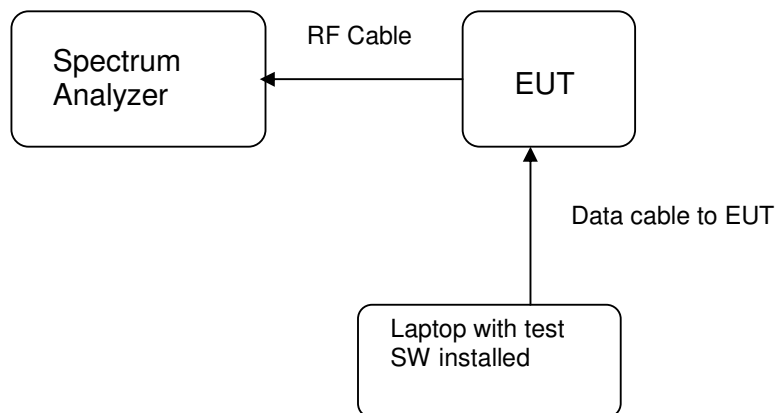
**Note:** Measurements above 1 GHz are done with a table height of 1.5m. In addition, there is RF absorbing material on the floor of the test site for above 1GHz measurement.

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 (Registration number: 90656)**

### Radiated Emission

Equipment	Manufacturer	Type	Cal. Date	Due Date
Semi-anechoic Chamber	Frankonia	Nil	14-Apr-15	14-Apr-16
New Fully Anchoic Chamber	TDK	N/A	15-Apr-15	15-Apr-16
Cable	Hubersuhner	SUCOFLEX 104	31-Mar-14	31-Mar-16
Test Receiver	R & S	ESU26	12-Feb-15	12-Feb-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-14	10-Jun-16
Microwave amplifier 0.5-26.5GHz, 25dB gain	HP	83017A	17-Jul-14	17-Jul-16
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

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### Radio Test

Equipment	Manufacturer	Type	Cal. Date	Due Date
Spectrum Analyzer	R & S	FSP30	12-Jan-15	12-Jan-17

## 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
<b>FCC Requirement:</b> No antenna other than that furnished by the responsible party shall be used with the device		
<b>Results:</b>	a) Antenna type: Integral Chip Antenna b) Manufacturer and model no: WIESON GY197HC030-002 c) Peak Gain: 1.9 dBi	
<b>Verdict:</b>	Pass	

FCC 15.204 – Antenna Requirement 2		N/A
<b>FCC Requirement:</b> 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.		
<b>Results:</b>	Only one integral antenna can be used.	
<b>Verdict:</b>	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 AC-DC adaptor 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	0.150	42.3	23.2	66 - 56	56 - 46	Pass
> 0,5 - 5	No peak found	---	---	56	46	Pass
> 5 - 30	17.414	33.9	26.4	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	0.166	40.1	20.2	66 - 56	56 - 46	Pass
> 0,5 - 5	No peak found	---	---	56	46	Pass
> 5 - 30	17.386	35.0	27.7	60	50	Pass

<b>Results:</b>	<p>Pre-scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and data rate.</p> <p>Both AC-DC adaptor and PC AC input were verified. Only the worst case is shown.</p> <p>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.</p>
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<b>FCC 15.247 (a)(2) – 6dB Bandwidth Measurement</b>			<b>Pass</b>
<b>FCC Requirement:</b> Systems using digital modulation techniques may operate in the 902 – 928 MHz, 2400 – 2483.5 MHz, and 5725 – 5850 MHz bands. The minimum 6dB bandwidth shall be at least 500kHz.			
Test Specification : ANSI C63.10 – 2013 Mode of operation : TX mode Port of testing : Temporary antenna port Supply voltage : 5.0 Vdc Temperature : 23°C Humidity : 50%			
<b>Results:</b> For test protocols please refer to Appendix 1			
Channel frequency (MHz)	6 dB left (MHz)	6 dB right (MHz)	6dB bandwidth (kHz)
2402	2401.652	2402.368	716
2440	2439.636	2440.344	708
2480	2479.640	2480.344	704

<b>FCC 15.247(b)(3) – Maximum Peak Conducted Output Power</b>			<b>Pass</b>
<b>FCC Requirement:</b> For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850MHz bands: 1 Watt (30dBm)			
Test Specification : ANSI C63.10 – 2013 Mode of operation : TX mode Port of testing : Temporary antenna port Supply voltage : 5.0 Vdc Temperature : 23°C Humidity : 50%			
<b>Results:</b> For test protocols please refer to Appendix 1			
Frequency (MHz)	Measured Output Power (dBm)	Limit (W/dBm)	Verdict
2402	-1.63	30.0	Pass
2440	1.28	30.0	Pass
2480	2.43	30.0	Pass

FCC 15.247(e) – Power Spectral Density			Pass
<b>FCC Requirement:</b> For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.			
Test Specification : ANSI C63.10 – 2013 Mode of operation : TX mode Port of testing : Temporary antenna port Supply voltage : 5.0 Vdc Temperature : 23°C Humidity : 50%			
<b>Results:</b> For test protocols please refer to Appendix 1.			
Operating frequency (MHz)	Power density (dBm)	Limit (dBm)	Verdict
2402	-2.10	8.0	Pass
2440	0.94	8.0	Pass
2480	2.11	8.0	Pass

FCC 15.247(d) – Spurious Conducted Emissions					Pass
Test Specification : ANSI C63.10 – 2013 Mode of operation : TX mode Port of testing : Temporary antenna port Detector : Peak RBW/VBW : 100 kHz / 300 kHz Supply voltage : 5.0 Vdc Temperature : 23 °C Humidity : 50 %					
<b>FCC Requirement:</b> In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator 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, based on either an RF conducted or a radiated measurement.					
<b>Results:</b> Pre-scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and data rate.  Only the worst cases is shown below. For test protocols refer to Appendix 1					
Operating frequency (MHz)	Spurious frequency (MHz)	Spurious Level (dBm)	Reference value (dBm)	Delta (dB)	Verdict
2402	2399.960	-49.35	-2.10	47.25	Pass
2440	2596.000	-48.17	0.94	49.11	Pass
2480	2636.000	-47.98	2.11	50.09	Pass

Page 15 of 16

Mode: 2480MHz TX Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
132.030	27.80	40.0 / QP
2483.500	48.15	74.0 / PK
2483.500	36.17	54.0 / AV
4959.446	62.21	74.0 / PK
4959.958	50.09	54.0 / AV
Mode: 2480 MHz TX Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2483.500	49.02	74.0 / PK
2483.500	34.29	54.0 / AV
4959.487	59.96	74.0 / PK
4959.904	48.13	54.0 / AV