

Produkte  
Products

**Prüfbericht - Nr.:** 14047147 001  
Test Report No.:

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**Auftraggeber:** Megabyte Limited  
*Client:* Unit 507, Building 12W, No. 12 Science Park West Avenue  
Hong Kong Science Park, Shatin, N.T., Hong Kong

**Gegenstand der Prüfung:** UHF Mobile RFID Reader  
*Test Item:*

**Bezeichnung:** T8-01-MB  
*Identification:* T8-01-39, T8-01-PH

**Serien-Nr.:**  
*Serial No.:*

**Engineering sample**

**Wareneingangs-Nr.:** A000386196-002  
*Receipt No.:*

**Eingangsdatum:** 30.06.2016  
*Date of Receipt:*

**Prüfort:** TÜV Rheinland Hong Kong Ltd.  
*Testing Location:* 3-4, 11/F., Fou Wah Industrial Building, 10-16 Pun Shan Street, Tsuen Wan, N.T.,  
Hong Kong  
Hong Kong Productivity Council  
HKPC Building, 78 Tat Chee Avenue, Kowloon, Hong Kong

**Zustand des Prüfgegenstandes bei Anlieferung:** Test samples are not damaged and suitable  
*Condition of test item at delivery:* for testing.

**Prüfgrundlage:** FCC Part 15 Subpart C  
*Test Specification:* ANSI C63.10-2013

**Prüfergebnis:** Das vorstehend beschriebene Gerät wurde geprüft und entspricht oben  
*Test Results:* genannter Prüfgrundlage.  
The above mentioned product was tested and **passed**.

**Prüflaboratorium:** TÜV Rheinland Hong Kong Ltd.  
*Testing Laboratory:* 3-4, 11/F., Fou Wah Industrial Building, 10-16 Pun Shan Street, Tsuen Wan, N.T.,  
Hong Kong

geprüft/ tested by:

kontrolliert/ reviewed by:

23.12.2016 Benny Lau  
Senior Project Manager 

23.12.2016 Sharon Li  
Department Manager 

**Sonstiges:** FCC ID: XEK-MTRAYT8

**Other Aspects** This device is a composite device. This report contains the test result of the BLE  
Beacon transceiver portion.

**Abkürzungen:** P(pass) = entspricht Prüfgrundlage  
F(fail) = entspricht nicht Prüfgrundlage  
N/A = nicht anwendbar  
N/T = nicht getestet

**Abbreviations:** P(pass) = passed  
F(fail) = 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.  
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.

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## Product information

### Manufacturers declarations

	Transceiver
Operating frequency range	2402, 2426, 2480 MHz
Type of modulation	GFSK
Number of channels	3
Channel separation	2 MHz
Type of antenna	PCB Antenna
Antenna gain (dBi)	1.9 dBi
Power level	fix
Type of equipment	stand alone radio device
Connection to public utility power line	No
Nominal voltage	100-240VAC/ 3.7VDC
Independent Operation Modes	Transmitting

### Product function and intended use

The equipment under test (EUT) is a mobile RFID reader. It is a compact NFC and UHF RFID reader with Bluetooth and WIFI connectivity.

The manufacturer declared that the model: T8-01-39 and T8-01-PH are identical to the model T8-01-MB except the logo plate.

FCC ID: XEK-MTRAYT8

Models	Product description
T8-01-MB	
T8-01-39, T8-01-PH	UHF Mobile RFID Reader

### Submitted documents

Circuit Diagram  
 Block Diagram  
 Technical Description  
 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 BLE transceiver. The RFID transmitter portion is authorized under the certification procedure (refer to test report 14045645 001 issued by TÜV Rheinland HK Ltd on 23.12.2016). The NFC portion is authorized under the certification procedure (refer to test report 14045648 001 issued by TÜV Rheinland HK Ltd on 23.12.2016). The other Bluetooth portion is authorized under the certification procedure (refer to test report 14045646 001 and 14045647 001 issued by TÜV Rheinland HK Ltd on 23.12.2016). The WIFI portion is authorized under the certification procedure (refer to test report 14045649 001 and 14047148 001 and 14047149 001 issued by TÜV Rheinland HK Ltd on 23.12.2016).

## 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)

### Countermeasures to achieve EMC Compliance

- none

## 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:

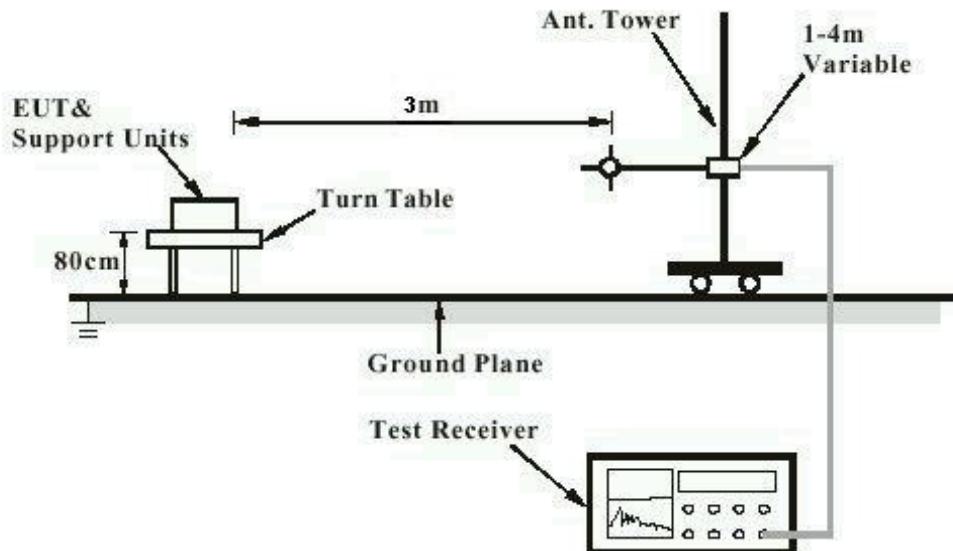
$$FS = R + AF + CF + FA - PA$$

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.

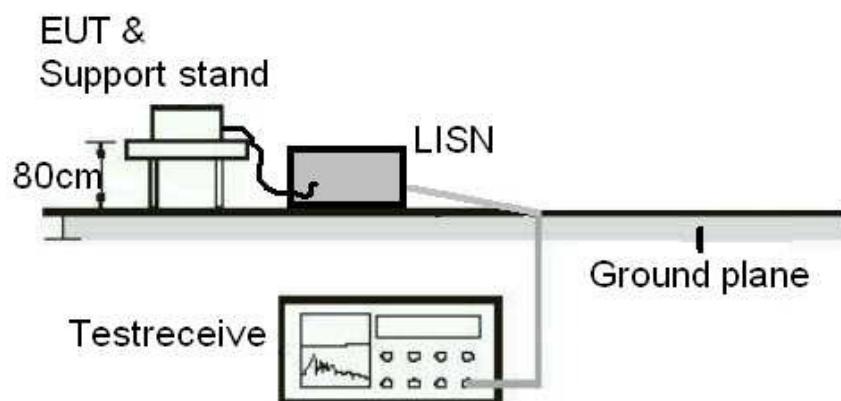
## Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test

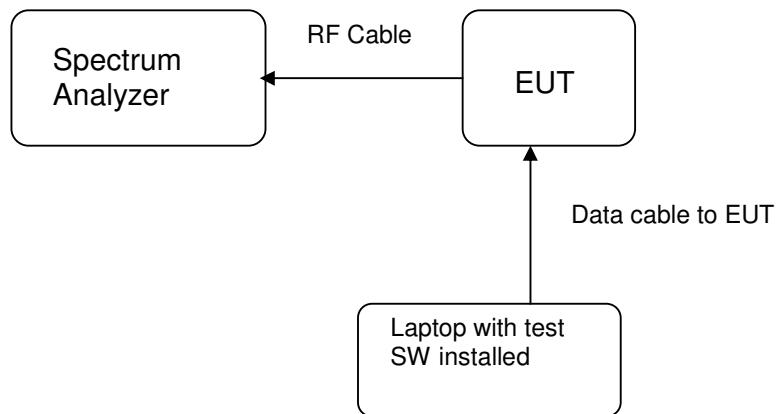


Note: Measurements above 1 GHz are done with a table height of 1.5m. In addition, there is RF absorbing material on the floor of the test site for above 1GHz measurement.

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	25-Apr-16	25-Apr-17
New Fully Ancheonic 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	26-Jul-16	26-Jul-17
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-2017

## 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: b) Manufacturer and model no: c) Peak Gain:	Integral FR4 PCB antenna WIESON GY197HC030-002 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 power supply						
Supply voltage : 120Vac 60Hz						
Temperature : 23°C						
Humidity : 50%						
Requirement: 15.207(a)						
<b>Results:</b>	Pass					
<b>Live measurement</b>						
Frequency range (MHz)	Frequency (MHz)	Quasi-peak dB $\mu$ V	Average dB $\mu$ V	Limit QP (dB $\mu$ V)	Limit AV (dB $\mu$ V)	Verdict
0,15 – 0,5	0.150	49.5	31.3	66 - 56	56 - 46	Pass
> 0,5 - 5	No peak found	---	---	56	46	Pass
> 5 - 30	No peak found	---	---	60	50	Pass
<b>Neutral measurement</b>						
Frequency range (MHz)	Frequency (MHz)	Quasi-peak dB $\mu$ V	Average dB $\mu$ V	Limit QP (dB $\mu$ V)	Limit AV (dB $\mu$ V)	Verdict
0,15 – 0,5	0.155	47.4	29.8	66 - 56	56 - 46	Pass
> 0,5 - 5	No peak found	---	---	56	46	Pass
> 5 - 30	No peak found	---	---	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.

<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 : 120VAC and/ or 3.7VDC 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	2401.490	2402.140	650.000
2426	2425.480	2426.160	680.000
2480	2479.470	2480.160	690.000

<b>FCC 15.247(b)(3) – Maximum Peak Coudected 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 : 120VAC and/ or 3.7VDC Temperature : 23°C Humidity : 50%			
<b>Results:</b> For test protocols please refer to Appendix 1			
Frequency (MHz)	Measured Output Power (dBm)	Limit (dBm)	Verdict
2402	-6.86	30.0	Pass
2426	-6.39	30.0	Pass
2480	-5.79	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 : 120VAC and/ or 3.7VDC 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	-6.88	8.0	Pass
2426	-6.49	8.0	Pass
2480	-5.97	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 Supply voltage : 120VAC and/ or 3.7VDC 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	24616	-39.65	-6.88	32.77	Pass
2426	24280	-39.67	-6.49	33.18	Pass
2480	9260	-39.75	-5.97	33.78	Pass

FCC 15.205 – Radiated Emissions in Restricted Frequency Bands			Pass
Test Specification : ANSI C63.10 – 2013 Mode of operation : TX mode Port of testing : Enclosure Supply voltage : 120VAC and/ or 3.7VDC Temperature : 23°C Humidity : 50%			
<b>FCC Requirement:</b> In any 100kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in section 15.205(a), must also comply with the radiated emission limits specified in section 15.205(c).			
<b>Results:</b> 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.			
Mode: 2402MHz TX			Vertical Polarization
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	
30.025	27.40	40.0 / QP	
299.690	27.00	43.5 / AV	
2390.000	47.25	74.0 / PK	
2390.000	33.60	54.0 / AV	
Mode: 2402 MHz TX			Horizontal Polarization
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	
2390.000	45.66	74.0 / PK	
2390.000	33.57	54.0 / AV	
No peak found	---	74.0 / PK	
No peak found	---	54.0 / AV	
Mode: 2426 MHz TX			Vertical Polarization
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	
30.024	27.80	40.0 / QP	
No peak found	---	74.0 / PK	
No peak found	---	54.0 / AV	
Mode: 2426 MHz TX			Horizontal Polarization
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	
No peak found	---	74.0 / PK	
No peak found	---	54.0 / AV	

Mode: 2480MHz TX		
Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2483.500	46.62	74.0 / PK
2483.500	33.77	54.0 / AV
No peak found	---	74.0 / PK
No peak found	---	54.0 / AV

Mode: 2480 MHz TX		
Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2483.500	47.65	74.0 / PK
2483.500	33.65	54.0 / AV
No peak found	---	74.0 / PK
No peak found	---	54.0 / AV