

Prüfbericht - Nr.: 14045643 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 Portable RFID Reader
Test Item:

Bezeichnung: H3B-01-MB, H3B-01-39, H3B-01-PH
Identification: Serial No.:
Engineering sample

Wareneingangs-Nr.: A000386196-003
Receipt No.: **Eingangsdatum:** 30.06.2016
Date of Receipt:

Prüfort: TÜV Rheinland Hong Kong Ltd.
Testing Location:
 3/F., Fou Wah Industrial Building, 10-16 Pun Shan Street, Tsuen Wan, 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
Test Results: obengenannter 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,
 Hong Kong

geprüft/ tested by:
kontrolliert/ reviewed by:

 12.12.2016 Mika Chan
 Project Manager

 12.12.2016 Sharon Li
 Department Manager

 Datum Name/Stellung
 Date Name/Position

 Unterschrift
 Signature

 Datum
 Date

 Name/Stellung
 Name/Position

 Unterschrift
 Signature

Sonstiges:
 Other Aspects

FCC ID: XEK-MHANDH3

Abkürzungen: P(ass) = entspricht Prüfgrundlage
 F(all) = entspricht nicht Prüfgrundlage
 N/A = nicht anwendbar
 N/T = nicht getestet

Abbreviations: P(ass) = passed
 F(all) = 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

	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	V _{nor} : 100-240VAC and 3.7 VDC
Independent Operation Modes	Transmitting

Product function and intended use

The equipment under test (EUT) is a UHF Portable RFID Reader with Bluetooth (dual mode) and NFC function.

The manufacturer declared that the model: H3B-01-39 and H3B-01-PH are identical to the model H3B-01-MB except the logo plate.

FCC ID: XEK-MHANDH3

Models	Product description
H3B-01-MB, H3B-01-39, H3B-01-PH	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 is a composite device, for BLE portion please refer to test report No. 14045641 001.
For classic Bluetooth portion please refer to test report No. 14045642 001.
For RFID (902 MHz – 928 MHz) portion please refer to test report No. 14045640 001.
For receiver portion of the RFID transceiver please refer to test report No. 14045640 001.

This is a single application for certification of the NFC transmitter.

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.

- Special software is provided by the applicant to set the device to operate in a fixed frequency channel and maximum RF output power level. The setting of the maximum RF output power shall be fixed on the final product.
- Pre-scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and data rate.

Special Accessories and Auxiliary Equipment

- AC-DC adaptor model: EA1024AR-050 (Provided by 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. The radiated emission measurements of the battery pack charging part were performed according to the procedures in ANSI C63.4-2014.

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:

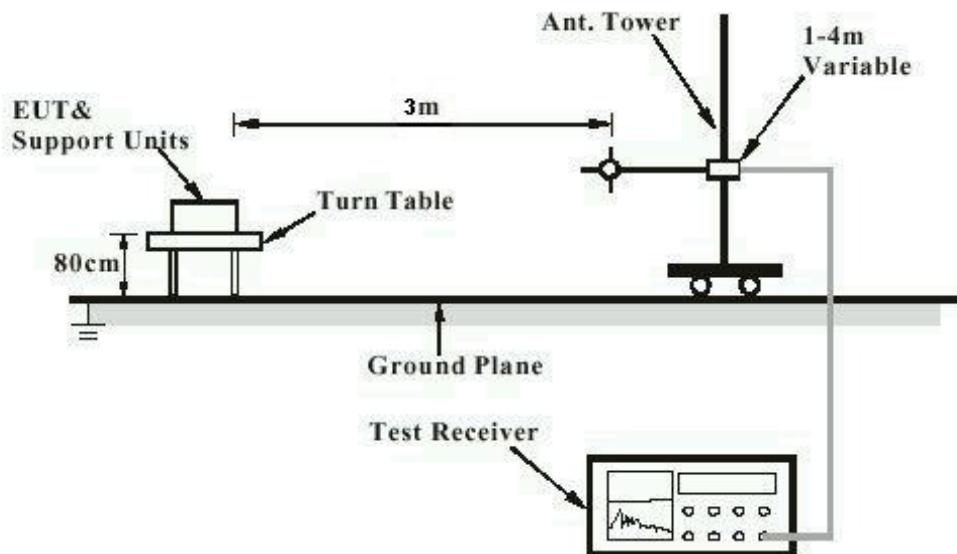
$$FS = R + AF + CF + FA - PA$$

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)

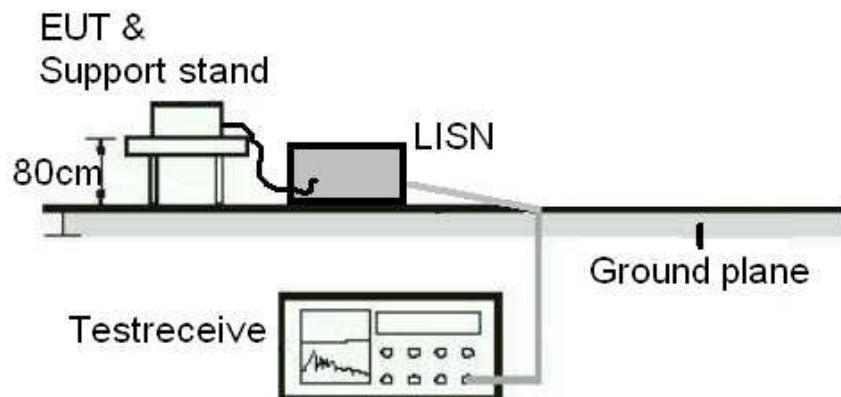
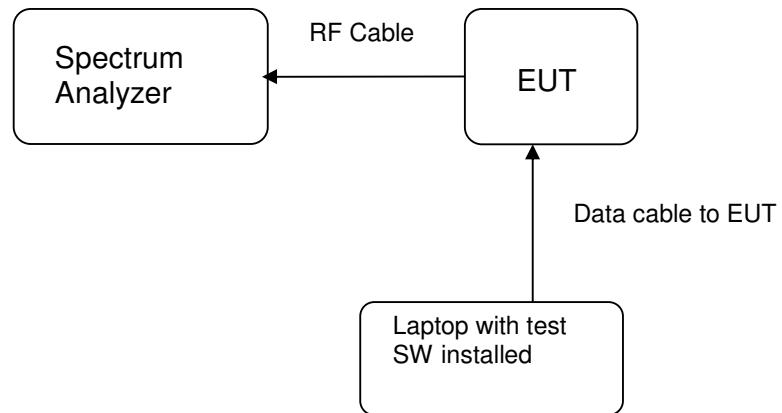


Diagram of Equipment Configuration for Antenna-port Conducted Measurement (if applicable)



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	ESU40	26-Jul-16	26-Jul-17
Bi-conical Antenna	R & S	HK116	1-Sep-15	01-Sep-17
Log Periodic Antenna	R & S	HL223	1-Sep-15	01-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	03-Jun-16	03-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
FCC Requirement: No antenna other than that furnished by the responsible party shall be used with the device		
Results:	a) Antenna type: b) Manufacturer and model no: c) Peak Gain:	Integral loop antenna Pulse / W3579 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 dB μ V	Average dB μ V	Limit QP (dB μ V)	Limit AV (dB μ V)	Verdict
0,15 – 0,5	0.150	59.6	42.3	66 - 56	56 - 46	Pass
	0.210	50.5	31.2	66 - 56	56 - 46	Pass
	0.258	45.6	27.6	66 - 56	56 - 46	Pass
> 0,5 - 5	no peak found	---	---	56	46	Pass
> 5 - 30	13.558	41.3	40.7	60	50	Pass
Neutral measurement						
Frequency range	Frequency (MHz)	Quasi-peak dB μ V	Average dB μ V	Limit QP (dB μ V)	Limit AV (dB μ V)	Verdict

(MHz)						
0,15 – 0,5	0.154	60.0	42.2	66 - 56	56 - 46	Pass
	0.210	51.7	33.8	66 - 56	56 - 46	Pass
	0.257	46.4	28.6	66 - 56	56 - 46	Pass
> 0,5 - 5	no peak found	---	---	56	46	Pass
> 5 - 30	13.56	43.6	43.4	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, page 2.

FCC 15.209 – Radiated Emissions			Pass
Test Specification	:	ANSI C63.10-2013	
Mode of operation	:	TX mode	
Supply voltage	:	3.7 Vdc	
Measurement distance	:	3 meters	
Detector	:	Quasi-Peak detector for frequency below 1000MHz except for frequency bands 9-90KHz and 110-490KHz. Average detector for frequency bands 9-90KHz, 110-490KHz and above 1000MHz.	
Temperature	:	23°C	
Humidity	:	50%	
Requirement:	The emissions from an intentional radiator shall not exceed the field strength levels specified in the table mentioned in section 15.209.		
Vertical Polarization			
Freq MHz	Level dBuV/m	Limit/ Detector	
27.118	23.43	69.5 / QP	
44.250	30.80	40.0 / QP	
447.470	36.30	46.0 / QP	
Horizontal Polarization			
Freq MHz	Level dBuV/m	Limit/ Detector	
27.120	33.57	69.5 / QP	
447.473	36.80	40.0 / QP	
Verdict:	Pass		

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 RBW/VBW : 10KHz/30KHz Supply voltage : 3.7 Vdc Temperature : 23°C Humidity : 50%					
Results: For test protocols refer to Appendix 1, page 2.					
Frequency (MHz)	20 dB left (MHz)	Limit (MHz)	20 dB right (MHz)	Limit (MHz)	
13.560	13.342	> 13.110	13.780	< 14.010	
FCC 15.225 (a-d) – Radiated Emission					Pass
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:					
$MR = R + AF + CF + FA - PA$					
Where MR = Measurement Results 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.					
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).					
(d) 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 § FCC 15.209 / 30 microvolts/m (29.5 dB μ V/m) at 30 m (69.5 dBuV /m at 3 meters with extrapolation factor of 40 dB/decade).					

Test Specification : ANSI C63.10-2013
 Mode of operation : TX Mode
 Detector : peak detector
 Temperature : 23°C
 Humidity : 50%

Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
13.560	54.55	124.0 / PK

Results: For test Results plots refer to Appendix 1, page 3.

Verdict: Pass

FCC 15.225 (e) – Frequency Tolerance					
Pass					
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.					
Test Specification : ANSI C63.10-2013 Mode of operation : TX Mode Detector : Peak RBW/VBW : 100 Hz / 300 Hz					
Temp. (°C)	Supply Voltage (V)	Frequency (MHz)	Tolerance (Hz)	Limit (KHz)	Verdict
-20	3.7	13.559880	-40.0	±1.3559840	Pass
-10	3.7	13.559880	-40.0	±1.3559840	Pass
0	3.7	13.559870	-30.0	±1.3559840	Pass
10	3.7	13.559860	-20.0	±1.3559840	Pass
20	3.7	13.559840	-	-	Reference
20	3.145	13.559850	-10.0	±1.3559840	Pass
30	3.7	13.559840	0.0	±1.3559840	Pass
40	3.7	13.559830	+10.0	±1.3559840	Pass
+50	3.7	13.559820	+20.0	±1.3559840	Pass
Results: The measured peak frequency is within +/- 0.01% of the fundamental frequency.					
Verdict: Pass					