TÜVRheinland®

Produkte
Products

Prüfbericht - Nr.: *Test Report No.:*	**14045641 001**	**Seite 1 von 16** *Page 1 of 16*

Auftraggeber: *Client:*	**Megabyte Limited** **Unit 507, Building 12W** **No. 12 Science Park West Avenue** **Hong Kong Science Park, Shatin, N.T.** **Hong Kong**
Gegenstand der Prüfung: *Test Item:*	**UHF Portable RFID Reader**
Bezeichnung: *Identification:*	**H3B-01-MB, H3B-01-39, H3B-01-PH**
Serien-Nr.: *Serial No.:*	**Engineering sample**
Wareneingangs-Nr.: *Receipt No.:*	**A000386196-003**
Eingangsdatum: *Date of Receipt:*	**30.06.2016**
Prüfort: *Testing Location:*	**TÜV Rheinland Hong Kong Ltd.** 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: *Condition of test item at delivery:*	Test samples are not damaged and suitable for testing.
Prüfgrundlage: *Test Specification:*	**FCC Part 15 Subpart C** **ANSI C63.10-2013**
Prüfergebnis: *Test Results:*	**Das vorstehend beschriebene Gerät wurde geprüft und entspricht oben genannter Prüfgrundlage.** The above mentioned product was tested and **passed**.
Prüflaboratorium: *Testing Laboratory:*	**TÜV Rheinland Hong Kong Ltd.** 3-4, 11/F., Fou Wah Industrial Building, 10-16 Pun Shan Street, Tsuen Wan, Hong Kong

geprüft/ *tested by:*

Datum / Date	Name/Stellung / Name/Position	Unterschrift / Signature
12.12.2016	Mika Chan Project Manager	

kontrolliert/ *reviewed by:*

Datum / Date	Name/Stellung / Name/Position	Unterschrift / Signature
12.12.2016	Sharon Li Department Manager	

Sonstiges: Other Aspects — **FCC ID: XEK-MHANDH3**

Abkürzungen:				*Abbreviations:*			
P(ass)	=	*entspricht Prüfgrundlage*		*P(ass)*	=	*passed*	
F(ail)	=	*entspricht nicht Prüfgrundlage*		*F(ail)*	=	*failed*	
N/A	=	*nicht anwendbar*		*N/A*	=	*not applicable*	
N/T	=	*nicht getestet*		*N/T*	=	*not tested*	

Table of Content

Page

Product information

Manufacturers declarations

	Transceiver
Operating frequency range	2402 - 2480 MHz
Type of modulation	GFSK
Number of channels	40
Channel separation	2 MHz
Type of antenna	Chip Antenna
Antenna gain (dBi)	0.5
Power level	fix
Type of equipment	stand alone radio device
Connection to public utility power line	No
Nominal voltage	V_{nor}: 100-240VAC and 3.7 VDC
Independent Operation Modes	Transmit and receive

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 NFC (13.56 MHz) portion please refer to test report No. 14045643 001.
For RFID (902 MHz – 928 MHz) portion please refer to test report No. 14045640 001.
For classic Bluetooth portion please refer to test report No. 14045642 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 Bluetooth Low Energy 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.

1) 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.
2) 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 Appliant)

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:

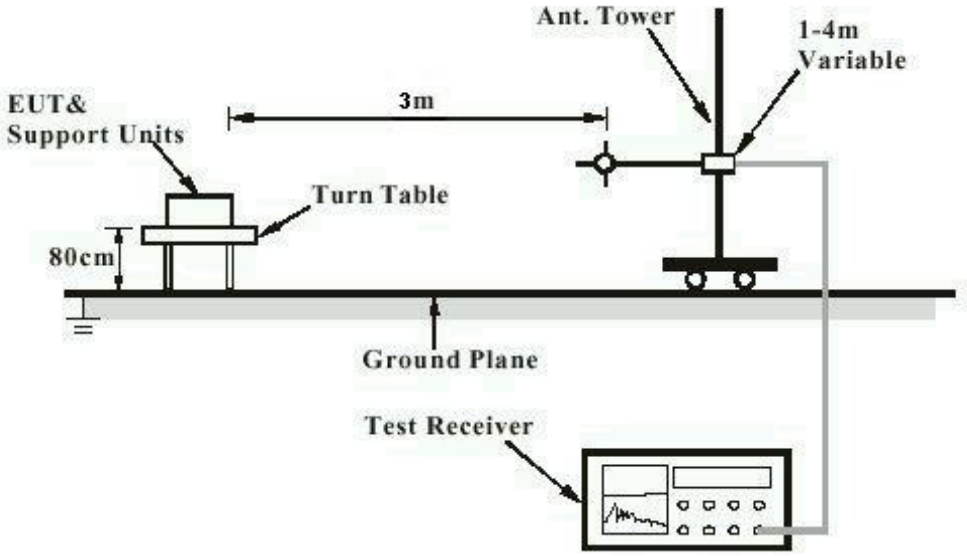
FS = R + AF + CF + FA – PA

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)

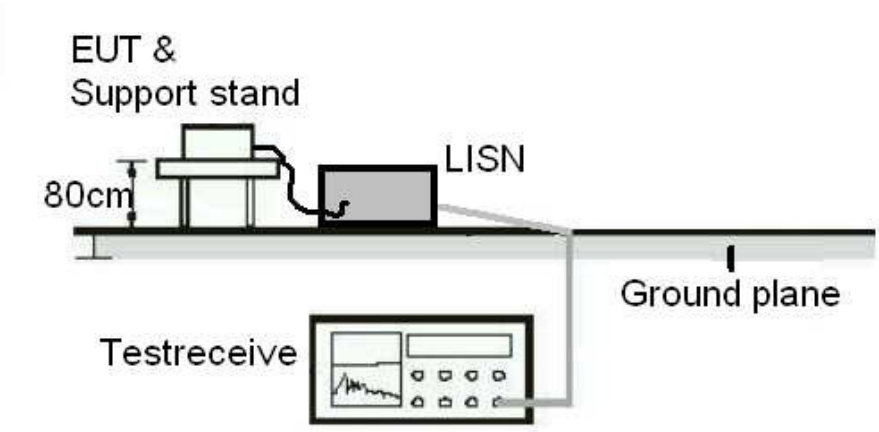
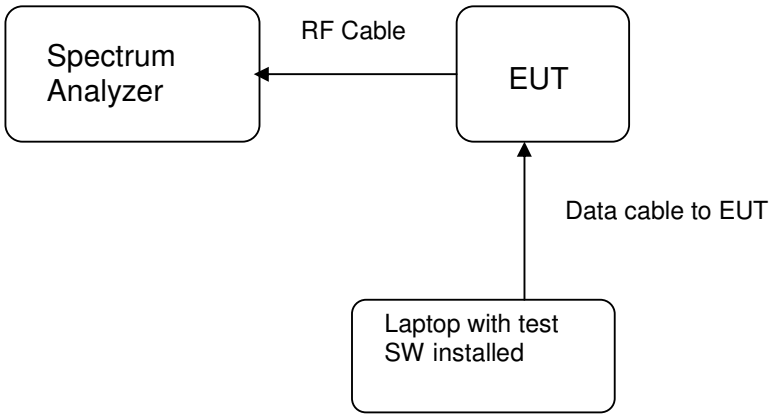


Diagram of Equipment Configuration for Antenna-port Conducted Measurement (if applicable)



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 amplifer 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

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

Measurement Uncertainty

The estimated combined standard uncertainty for power-line conducted emissions measurements is ±3.43dB.

The estimated combined standard uncertainty for radiated emissions measurements is ±5.10dB (30MHz to 200MHz) and ±5.08dB (200MHz to 1000MHz) and is ±5.10dB (30MHz to 200MHz) and ±5.08dB (above 1GHz).

The estimated combined standard uncertainty for antenna conducted emission is ±1.56dB

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 Chip antenna ACX AT3216-B2R7HAA_3216 0.5 dBi
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 : 23ºC
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	0.17	49.1	32.6	66 - 56	56 - 46	Pass
	0.19	52.1	36.4	66 - 56	56 - 46	Pass
	0.21	45.0	27.3	66 - 56	56 - 46	Pass
> 0,5 - 5	no peak found	---	---	56	46	Pass
> 5 - 30	no peak found	---	---	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	0.154	48.5	29.1	66 - 56	56 - 46	Pass

	0.190	51.7	35.3	66 - 56	56 - 46	Pass
	0.214	43.2	24.4	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, page 2.

FCC 15.247 (a)(2) – 6dB Bandwidth Measurement **Pass**

FCC Requirement: 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
Detector : Peak
RBW/VBW : 100KHz/ 300KHz
Supply voltage : 3.7 Vdc
Temperature : 23ºC
Humidity : 50%

Results: For test protocols please refer to Appendix 1

Channel frequency (MHz)	6 dB left (MHz)	6 dB right (MHz)	6dB bandwidth (kHz)
2402	2401.648	2402.360	712
2440	2439.636	2440.344	708
2480	2479.632	2480.356	724

FCC 15.247(b)(3) – Maximum Peak Conducted Output Power **Pass**

FCC Requirement: 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
Detector : Peak
Supply voltage : 3.7 Vdc
Temperature : 23ºC
Humidity : 50%

Results: For test protocols please refer to Appendix 1

Frequency (MHz)	Measured Output Power (dBm)	Limit (W/dBm)	Verdict
2402	5.61	1 / 30.0	Pass
2440	6.85	1 / 30.0	Pass

2480	7.47	1 / 30.0	Pass

FCC 15.247(e) – Power Spectral Density **Pass**

FCC Requirement: 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
Detector : Peak
RBW/VBW : ≥100 KHz / ≥3xRBW
span : ≥1.5 x DTS BW
Supply voltage : 3.7 Vdc
Temperature : 23ºC
Humidity : 50%

Results: For test protocols please refer to Appendix 1

Operating frequency (MHz)	Power density (dBm)	Limit (dBm)	Verdict
2402	5.30	8.0	Pass
2440	6.57	8.0	Pass
2480	7.23	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 : 3.7 Vdc
Temperature : 23 ºC
Humidity : 50 %

FCC Requirement: 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.

Results: 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	2400.000	-33.63	5.30	-38.93	Pass
2440	No peak found	---	6.57	---	Pass
2480	2485.660	-39.44	7.23	-46.67	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
Detector : Peak
RBW/VBW : 100 kHz / 300 kHz for f < 1 GHz
1 MHz / 3 MHz for f > 1 GHz
Supply voltage : 3.7 Vdc
Temperature : 23ºC
Humidity : 50%

FCC Requirement: 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 section15.205(a), must also comply with the radiated emission limits specified in section 15.205(c).

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

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
4804.272	55.43	74.0 / PK
4803.935	42.57	54.0 / AV

Mode: 2402 MHz TX Horizontal Polarization

Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
383.909	38.40	46.0 / QP
4804.544	53.94	74.0 / PK
4803.919	40.30	54.0 / AV
7206.705	59.20	74.0 / PK
7206.432	44.56	54.0 / AV

Mode: 2440 MHz TX Vertical Polarization

Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
44.580	23.80	40.0 / QP
4880.256	54.71	74.0 / PK
4879.935	41.59	54.0 / AV
7319.070	62.44	74.0 / PK
7319.996	49.31	54.0 / AV

Mode: 2440 MHz TX Horizontal Polarization

Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
383.088	39.60	46.0 / QP
4880.000	53.99	74.0 / PK
4879.967	40.84	54.0 / AV

7319.134	59.42	74.0 / PK
7319.615	45.60	54.0 / AV
Mode: 2480MHz TX	Vertical Polarization	
Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
44.700	27.60	40.0 / QP
4959.423	57.28	74.0 / PK
4960.000	45.28	54.0 / AV
7439.278	59.43	74.0 / PK
7439.887	46.62	54.0 / AV
Mode: 2480 MHz TX	Horizontal Polarization	
Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
383.050	34.20	46.0 / QP
4959.759	56.43	74.0 / PK
4959.951	45.02	54.0 / AV
7439.246	58.69	74.0 / PK
7439.631	45.14	54.0 / AV