

Prüfbericht - Nr.: 14045643 001		Seite 1 von 15	
<i>Test Report No.:</i>		<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>	H3B-01-MB, H3B-01-39, H3B-01-PH	Serien-Nr.: <i>Serial No.:</i>	Engineering sample
Wareneingangs-Nr.: <i>Receipt No.:</i>	A000386196-003	Eingangsdatum: <i>Date of Receipt:</i>	30.06.2016
Prüfört: <i>Testing Location:</i>	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: <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 obengenannter Prüfgrundlage. The above mentioned product was tested and passed .		
Prüflaboratorium: <i>Testing Laboratory:</i>	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:		kontrolliert/ reviewed by:	
12.12.2016	Mika Chan Project Manager	12.12.2016	Sharon Li Department 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-MHANDH3	
Abkürzungen:	P(ass) = entspricht Prüfgrundlage F(ail) = entspricht nicht Prüfgrundlage N/A = nicht anwendbar N/T = nicht getestet	Abbreviations:	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>			

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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 _{nom} : 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 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:

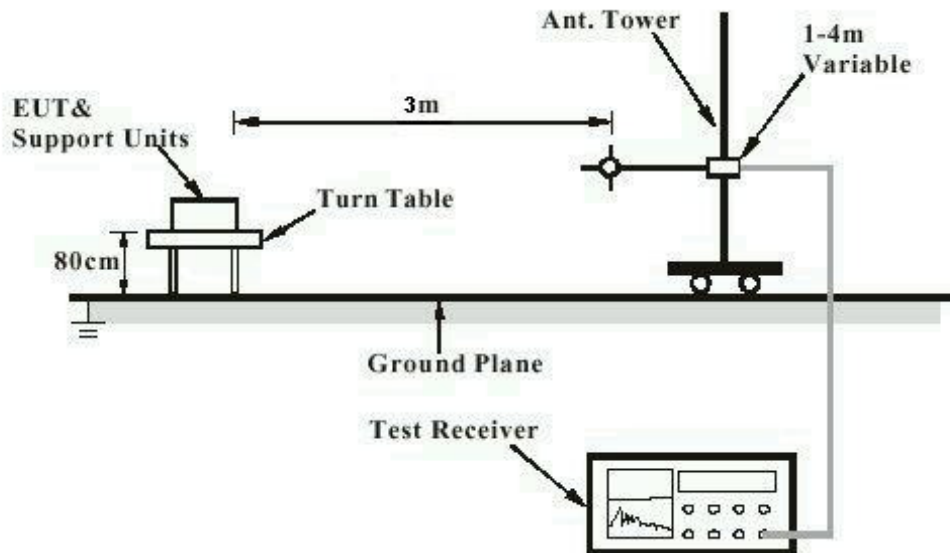
$$FS = R + AF + CF + FA - PA$$

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)

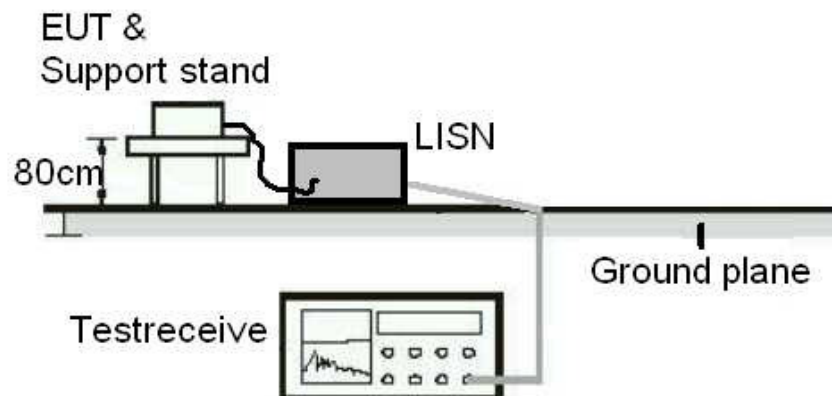
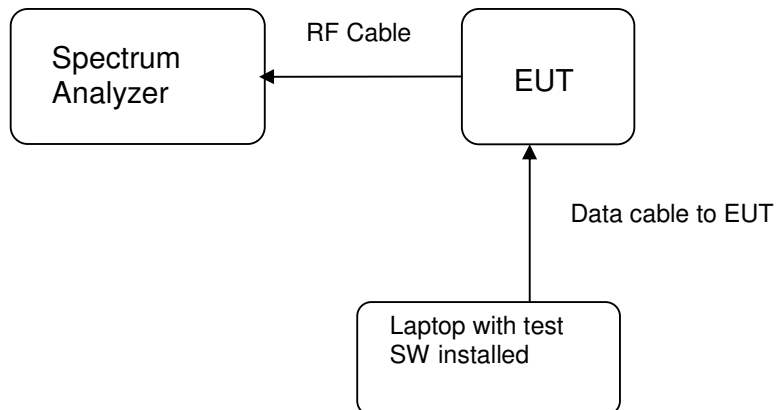


Diagram of Equipment Configuration for Antenna-port Conducted Measurement (if applicable)



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 Anchoenic 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: Integral loop antenna b) Manufacturer and model no: Pulse / W3579 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	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 dBuV	Average dBuV	Limit QP (dBuV)	Limit AV (dBuV)	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 dBuV/m
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 dBuV/m
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		<p>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.</p> <p>The equation is expressed as follow:</p> $MR = R + AF + CF + FA - PA$ <p>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.</p> <p>FA and PA are only be used for the measuring frequency above 1 GHz.</p>		
Requirement:		<p>(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).</p> <p>(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).</p> <p>(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).</p> <p>(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 dBuV/m) at 30 m (69.5 dBuV /m at 3 meters with extrapolation factor of 40 dB/decade).</p>		

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					