

Produkte
Products

Prüfbericht - Nr.: 14043109 001		Seite 1 von 16 Page 1 of 16	
<i>Test Report No.:</i>			
Auftraggeber: <i>Client:</i>	Remotec Technology Ltd. Workshop No. B2, 2/F., Block B, Tonic Industrial Centre 19 Lam Hing Street, Kowloon Bay, HK		
Gegenstand der Prüfung: <i>Test Item:</i>	Z-Wave Smart Thermostat		
Bezeichnung: <i>Identification:</i>	BW8170US, BW8171	Serien-Nr.: <i>Serial No.:</i>	Engineering sample
Wareneingangs-Nr.: <i>Receipt No.:</i>	A000322952-001 A000322952-002 A000322952-003	Eingangsdatum: <i>Date of Receipt:</i>	01.03.2016 01.03.2016 24.03.2016
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of test item at delivery:</i>	Test sample is not damaged and suitable for testing.		
Prüfört: <i>Testing Location:</i>	TÜV Rheinland Hong Kong Ltd. 8/F, First Group Centre, 14 Wang Tai Road, Kowloon Bay, Kowloon, Hong Kong Hong Kong Productivity Council HKPC Building, 78 Tat Chee Avenue, Kowloon, Hong Kong		
Prüfgrundlage: <i>Test Specification:</i>	FCC Part 15 Subpart B and C RSS-210 Issue 8 ANSI C63.10-2013 ANSI C63.4-2014		
Prüfergebnis: <i>Test Results:</i>	Das vorstehend beschriebene Gerät wurde geprüft und entspricht oben genannter Prüfgrundlage. The above mentioned product was tested and passed .		
Prüflaboratorium: <i>Testing Laboratory:</i>	TÜV Rheinland Hong Kong Ltd. 8 - 10/F., Goldin Financial Global Square, 7 Wang Tai Road, Kowloon Bay, Kowloon, Hong Kong		
geprüft/ tested by:		kontrolliert/ reviewed by:	
01.04.2016	Benny Lau	01.04.2016	Sharon Li
<i>Datum</i> Date	<i>Name/Stellung</i> Name/Position	<i>Datum</i> Date	<i>Name/Stellung</i> Name/Position
	<i>Unterschrift</i> Signature		<i>Unterschrift</i> Signature
Sonstiges: Other Aspects		FCC ID: M7N-BW8170 IC: 7311A-BW8170	
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	908.42 MHz
Type of modulation	GFSK
Number of channels	1
Type of antenna	PCB Antenna
Power level	fix
Connection to public utility power line	No
Nominal voltage	V _{nom} : 24 VAC and/ or 6VDC (4x1.5V AA batteries)

Product function and intended use

The equipment under test (EUT) is a Z-Wave transceiver operating at 908.42MHz. It is powered by 24VAC from the HVAC system and/ or 4 x 1.5V AA batteries.

FCC ID: M7N-BW8170/ IC: 7311A-BW8170

Models	Product description
BW8170US, BW8171	Z-Wave Smart Thermostat

Submitted documents

Circuit Diagram
Block Diagram
Bill of material
User manual
Rating Label

Independent Operation Modes

The basic operation modes are:

- Transmitting mode.
- Receiving mode
- Normal operation mode

For further information refer to User Manual

Related Submittal(s) Grants

This is a single application for certification of the transmitter.

The receiver portion and digital function which is independent from the transmitter is authorized under verification procedure.

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.

- There was no special software to excise the device.

Special Accessories and Auxiliary Equipment

The product has been tested together with the following additional accessories:

- AC-DC adaptor Model: KG4A-24-100A (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. The radiated emission measurements of the receiver 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:

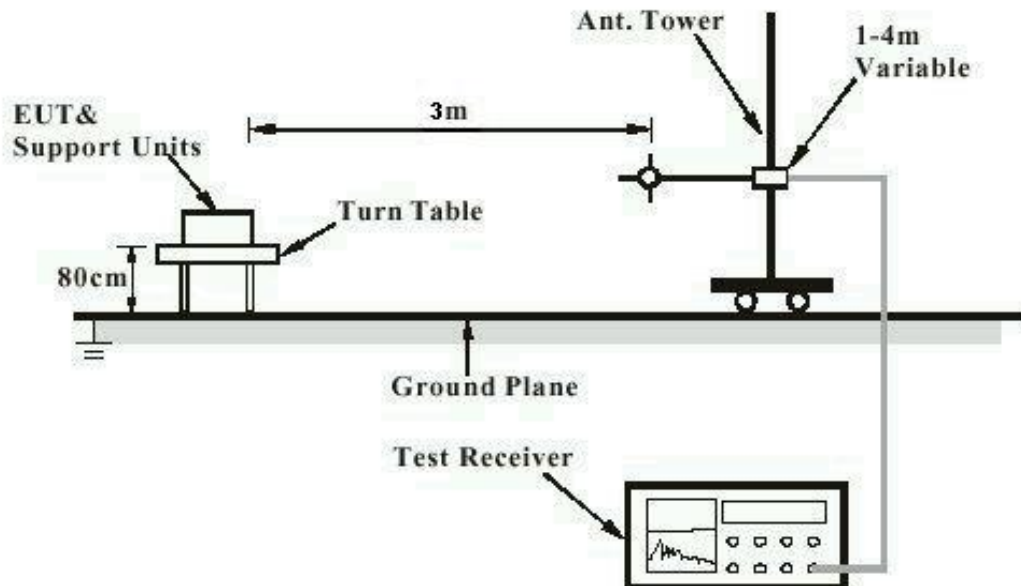
$$FS = R + AF + CF + FA - PA$$

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.

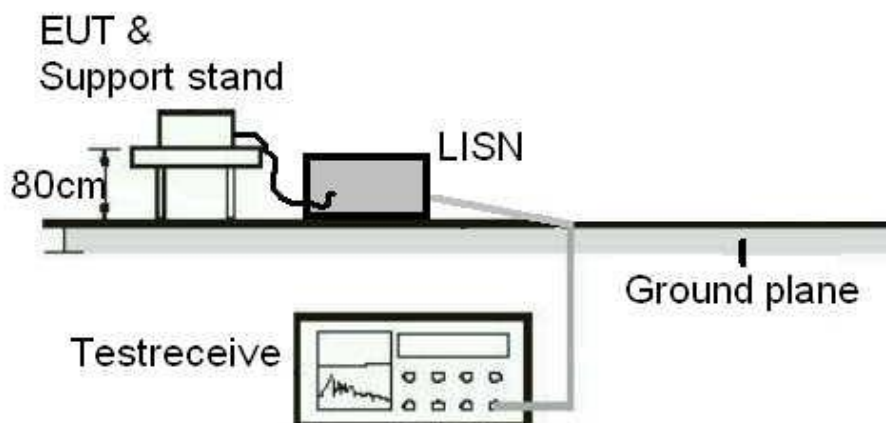
Test Setup Diagram

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)



List of Test and Measurement Instruments

Hong Kong Productivity Council (FCC/ IC Registration number: 90656/ 4780A-1)

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	ESU40	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-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	15-Aug-15	15-Aug-16

AC Mains Conducted Emission

Equipment	Manufacturer	Type	Cal. Date	Due Date
Test Receiver	R & S	ESU40	7-Dec-15	7-Dec-16
LISN	R&S	ESH3-Z5	15-Jun-15	15-Jun-16
Double Shield Cable	Radiall	RG142	14-Sep-15	14-Sep-17
Pulse Limiter	R&S	ESH3-Z2	4-Jun-14	4-Jun-16

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 $\pm 4.68\text{dB}$ (30MHz to 200MHz) and $\pm 5.73\text{dB}$ (200MHz to 1000MHz) and $\pm 5.57\text{dB}$ (above 1GHz).

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 / RSS-210 Issue 8

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:	Antenna type:	Fixed Integral wire antenna
Verdict:	Pass	

FCC 15.204 – Antenna Requirement 2		Pass
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	

RSS-Gen 6.3 – External Control		Pass
IC Requirement:	The device shall not have any external controls accessible to the user that enable it to be adjusted, selected or programmed to operate in violation of the limits prescribed in the applicable RSS.	
Results:	The device does not have any transmitter external controls accessible to the user that can be adjusted and operated in violation of the limits of this standard.	
Verdict:	Pass	

RSS-Gen 8.3 – Antenna Requirement		Pass
IC Requirement:	When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on measurement or on data from the antenna manufacturer.	
Results:	a) Antenna type: b) Manufacturer c) model no d) Gain with reference to an isotropic radiator:	Fixed Integral PCB antenna N/A N/A -9 dBi
Verdict:	Pass	

FCC 15.207/ RSS-Gen 8.8 – 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	47.4	36.1	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	0.150	47.5	36.7	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.						

Subclause 15.215 (c) – 20 dB Bandwidth				Pass
Test Specification : ANSI C63.10 – 2013 Mode of operation : Tx mode Port of testing : Enclosure RBW/VBW : 10 kHz / 30 kHz Supply voltage : 24 VAC and/ or 6VDC (4x1.5V AA batteries) Temperature : 23°C Humidity : 50%				
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.				
Results: For test protocols refer to Appendix 1.				
Frequency (MHz)	20 dB left (MHz)	Limit (MHz)	20 dB right (MHz)	Limit (MHz)
908.42	908.37658	> 902	908.46776	< 928

RSS-Gen 6.6 – Occupied Bandwidth				Pass
FCC/ IC Requirement : N/A				
Test Specification : RSS-Gen Mode of operation : Tx mode Port of testing : Temporary antenna port Detector : Peak RBW/VBW : 10 kHz / 30 kHz Supply voltage : 24 VAC and/ or 6VDC (4x1.5V AA batteries) Temperature : 23°C Humidity : 50%				
Results: Pre-scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and packet types. For test protocols refer to Appendix 1.				
Frequency (MHz)	Left (MHz)	Right (MHz)	99% bandwidth (MHz)	
908.42	908.378755	908.467757	0.089	

Subclause 15.249(a)/RSS-210 A2.9(a)–Field Strength of Fundamental and Harmonics Pass

Test Specification : ANSI C63.10 – 2013
 Mode of operation : Tx mode
 Port of testing : Enclosure
 Frequency range : 9kHz – 25GHz
 RBW/VBW : 100 kHz / 300 kHz for $f < 1$ GHz
 1 MHz / 3 MHz for $f > 1$ GHz
 Supply voltage : 24 VAC and/ or 6VDC (4x1.5V AA batteries)
 Temperature : 23°C
 Humidity : 50%

Requirement: The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following limit.

Results: PASS.

Fundamental Frequency Vertical Polarization

Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
908.439	83.1	94.0 / QP

Fundamental Frequency Horizontal Polarization

Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
908.401	92.5	94.0 / QP

Harmonics Vertical Polarization

Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
No peak found	---	74.0 / PK
No peak found	---	54.0 / AV

Harmonics Horizontal Polarization

Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
No peak found	---	74.0 / PK
No peak found	---	54.0 / AV

Subclause 15.249 (d), 15.205 / RSS-210 A2.9(b) – Out Of Band Radiated Emission **Pass**

Test Specification : ANSI C63.10 – 2013
 Mode of operation : Tx mode
 Port of testing : Enclosure
 Frequency range : 9kHz – 10GHz
 RBW/VBW : 120 kHz for $f < 1$ GHz
 1 MHz / 3 MHz for $f > 1$ GHz
 Supply voltage : 24 VAC and/ or 6VDC (4x1.5V AA batteries)
 Temperature : 23°C
 Humidity : 50%

Requirement: Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.

Results: The EUT complies with the field strength limit of section 15.209. There is no spurious found below 30MHz and above 1GHz.

Vertical Polarization

Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
902.000	24.4	46.0 / QP
928.000	26.0	46.0 / QP

Horizontal Polarization

Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
902.000	31.9	46.0 / QP
928.000	25.6	46.0 / QP

Results FCC Part 15 – Subpart B

FCC 15.107 – Conducted Emission on AC Mains						Pass
Test Specification : ANSI C63.4 – 2014 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: 15.107(a)						
Results: Pass						
Live measurement – RX mode						
Frequency range (MHz)	Frequency (MHz)	Quasi-peak dBµV	Average dBµV	Limit QP (dBµV)	Limit AV (dBµV)	Verdict
0,15 – 0,5	0.150	47.5	37.8	66 - 56	56 - 46	Pass
> 0,5 - 5	No peak found	---	---	56	46	Pass
> 5 - 30	No peak found	---	---	60	50	Pass
Neutral measurement – RX mode						
Frequency range (MHz)	Frequency (MHz)	Quasi-peak dBµV	Average dBµV	Limit QP (dBµV)	Limit AV (dBµV)	Verdict
0,15 – 0,5	0.150	47.0	35.7	66 - 56	56 - 46	Pass
> 0,5 - 5	No peak found	---	---	56	46	Pass
> 5 - 30	No peak found	---	---	60	50	Pass
Live measurement – Normal operating mode						
Frequency range (MHz)	Frequency (MHz)	Quasi-peak dBµV	Average dBµV	Limit QP (dBµV)	Limit AV (dBµV)	Verdict
0,15 – 0,5	0.150	38.8	29.9	66 - 56	56 - 46	Pass
> 0,5 - 5	No peak found	---	---	56	46	Pass
> 5 - 30	No peak found	---	---	60	50	Pass
Neutral measurement – Normal operating mode						
Frequency range (MHz)	Frequency (MHz)	Quasi-peak dBµV	Average dBµV	Limit QP (dBµV)	Limit AV (dBµV)	Verdict
0,15 – 0,5	0.150	47.9	39.2	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.

FCC 15.109 – Radiated Emissions**Pass**

Test Specification : ANSI C63.4 – 2014
 Port of testing : Enclosure
 Frequency range : 30MHz – 5GHz
 RBW/VBW : 100 kHz / 300 kHz for $f < 1$ GHz
 1 MHz / 3 MHz for $f > 1$ GHz
 Supply voltage : 120Vac 60Hz
 Temperature : 23°C
 Humidity : 50%

FCC Requirement: 15.109(a)**Results:** Pass

Vertical Polarization – RX mode

Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
No peak found	---	40.0 / QP
No peak found	---	43.5 / QP
No peak found	---	46.0 / QP

Horizontal Polarization – RX mode

Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
81.870	19.8	40.0 / QP
No peak found	---	43.5 / QP
No peak found	---	46.0 / QP

Vertical Polarization – Normal operating mode

Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
No peak found	---	40.0 / QP
No peak found	---	43.5 / QP
No peak found	---	46.0 / QP

Horizontal Polarization – Normal operating mode

Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
No peak found	---	40.0 / QP
No peak found	---	43.5 / QP
No peak found	---	46.0 / QP