TÜVRheinland®

Produkte
Products

Prüfbericht - Nr.: *Test Report No.:*	**14037786 001**		**Seite 1 von 13** *Page 1 of 13*
Auftraggeber: *Client:*	**TRONICO TECHNOLOGY COMPANY LIMITED UNIT B, 20/F KAM MAN FUNG FACTORY BLDG 6 HONG MAN ST CHAI WAN HONG KONG**		
Gegenstand der Prüfung: *Test Item:*	**Direct Plug-in Z-Wave Repeater**		
Bezeichnung: *Identification:*	**ZRP-100NA (Refer model list on page 5 for additional models)**	**Serien-Nr.:** *Serial No.:*	**Engineering sample**
Wareneingangs-Nr.: *Receipt No.:*	**A000138193-001**	**Eingangsdatum:** *Date of Receipt:*	**07.12.2014**
Zustand des Prüfgegenstandes bei Anlieferung: *Condition of test item at delivery:*	Test sample(s) is/are not damaged and suitable for testing.		
Prüfort: *Testing Location:*	**Global United Technology Services Co., Ltd.** 2nd Floor, Block No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, China		
Prüfgrundlage: *Test Specification:*	**FCC Part 15 Subpart C FCC Part 15 Subpart B ANSI C63.4-2003**		
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.** 8 - 10/F., Goldin Financial Global Square, 7 Wang Tai Road, Kowloon Bay, Kowloon, Hong Kong		

geprüft/ *tested by:*			**kontrolliert/** *reviewed by:*		
22.01.2015	Benny Lau Project Manager	Benny Lau	22.01.2015	Joey Leung Project Engineer	Joey Leung
Datum *Date*	**Name/Stellung** *Name/Position*	**Unterschrift** *Signature*	**Datum** *Date*	**Name/Stellung** *Name/Position*	**Unterschrift** *Signature*

Sonstiges: **FCC ID: 2ADPENNC014**
Other Aspects

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*

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Test Summary

Conducted Emissions

Result: Pass

20dB bandwidth

Result: Pass

Radiated Emission of Carrier Frequency

Result: Pass

Spurious Radiated Emissions

Result: Pass

Product information

Manufacturers declarations

	Transceiver
Operating frequency range	908.42 MHz
Type of modulation	GFSK
Number of channels	1
Type of antenna	Integral
Power level	fix
Connection to public utility power line	No
Nominal voltage	V_{nor}: 120Vac

Product function and intended use

The equipment under test (EUT) is a Z-wave transceiver operating at 908.42 MHz. It is powered by 120 Vac.

FCC ID: 2ADPENNC014

Models	Product description
NNC014, NND032, NND033, 9614+02000-1UID, 9614+02000-2UID, 9614+02000-3UID, F-BW8140US-0001, F-BW8141US-0001, ZRP-100NA, ZRP-110NA	Z-wave Repeater

Submitted documents

Circuit Diagram
Block Diagram
Bill of material
User manual
Rating Label

Independent Operation Modes

The basic operation modes are:

- Z-wave communication link maintained with data transfer.

For further information refer to User Manual

Related Submittal(s) Grants

This is a single application for certification of the transmitter.
The receiving portion is authorized under the verification procedure.

Remark

- None.

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 exercise the device.

Special Accessories and Auxiliary Equipment

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

- none

Countermeasures to achieve EMC Compliance

- none

Test Methodology

Radiated Emission

The radiated emission measurements were performed according to the procedures in ANSI C63.4-2003.

The equipment under test (EUT) was placed at the middle of the 80 cm height turntable, and the turntable is 3 meters far from the 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.

List of Test and Measurement Instruments

Global United Technology Services Co., Ltd. (Registration number: 600491)

Radiated Emission

Equipment	Manufacturer	Type	S/N	Cal. Due date
3m Semi- Anechoic Chamber	ZhongYu Electron	9.0(L)*6.0(W)* 6.0(H)	---	05 Apr 2015
Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	---	N/A
ESU EMI Test Receiver	R&S	ESU26	---	27 Jun 2015
Loop Antenna	Zhinan	ZN30900A	---	27 Jun 2015
Bi-log Hybrid Antenna	SCHWARZBECK	VULB9163	---	08 Mar 2015
Double-ridged horn antenna	SCHWARZBECK	9120D	---	08 Mar 2015
RF Amplifier	HP	8347A	---	27 Jun 2015
RF Amplifier	HP	8349B	---	27 Jun 2015
EMI Test Software	AUDIX	E3	---	N/A
Coaxial cable	GTS	N/A	---	27 Jun 2015
Coaxial Cable	GTS	N/A	---	27 Jun 2015
Thermo meter	N/A	N/A	---	27 Jun 2015

Conducted Emission

Equipment	Manufacturer	Type	S/N	Cal. Due date
Test Receiver	R & S	ESCS30	100201	28-Feb-15
LISN	R & S	ENV216	100273	26-Feb-15
EMC32	R & S	v9.12	N/A	N/A

Results FCC Part 15 – Subpart C

Subclause 15.203 – Antenna Information	**Pass**
Requirement:	No antenna other than that furnished by the responsible party shall be used with the device
Results:	Permanent attached antenna
Verdict:	Pass

Subclause 15.207 – Conducted Emission on AC Mains **Pass**

Test Specification : ANSI C63.4 – 2003
Mode of operation : Tx mode
Port of testing : AC Mains input port of PC
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	No peak found	---	---	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	No peak found	---	---	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 packet types.

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 2-3.

Subclause 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 C63.4 – 2003
Mode of operation : Tx mode
Port of testing : Enclosure
RBW/VBW : 10 kHz/ 30 kHz
Supply voltage : 120Vac 60Hz
Temperature : 23ºC
Humidity : 50%

Results: Pass

Frequency (MHz)	20 dB left (MHz)	Limit (MHz)	20 dB right (MHz)	Limit (MHz)
908.420	908.357	> 902.000	908.504	< 928.000

Subclause 15.249 (a) – Radiated Emission (Fundamental and Harmonics) **Pass**

Test Specification : ANSI C63.4 – 2003
Mode of operation : Tx mode
Port of testing : Enclosure
RBW/VBW : 120 kHz for f < 1 GHz
1 MHz / 3 MHz for f > 1 GHz
Supply voltage : 120Vac 60Hz
Temperature : 23ºC
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
908.400	79.90	94.0 / QP

Fundamental Frequency Horizontal Polarization

Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
908.400	84.20	94.0 / QP

Harmonics Vertical Polarization

Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
No peak found	---	74.0 / P
No peak found	---	54.0 / A

Harmonics Horizontal Polarization

Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
No peak found	---	74.0 / P
No peak found	---	54.0 / A

Subclause 15.205, 15.249 (d) – Spurious Radiated Emissions **Pass**

Test Specification : ANSI C63.4 - 2003
Mode of operation : Tx mode
Port of testing : Enclosure
Detector : Peak
RBW/VBW : 120 kHz for f < 1 GHz
1 MHz / 3 MHz for f > 1 GHz
Supply voltage : 120Vac 60Hz
Frequency range : 9kHz to tenth harmonic
Temperature : 23ºC
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: Pass

Transmit mode comply with the field strength within the restricted bands. There is no spurious found below 30MHz.

Vertical Polarization

Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
56.43	28.9	40.0 / QP
902.000	23.3	46.0 / QP
928.000	23.2	46.0 / QP

Horizontal Polarization

Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
902.000	23.1	46.0 / QP
928.000	23.2	46.0 / QP

Results FCC Part 15 – Subpart B

Subclause 15.107 – Conducted Emission on AC Mains **Pass**

Test Specification : ANSI C63.4 – 2003
Mode of operation : Rx mode
Port of testing : AC Mains input port
Detector : Quasi-peak and Average
RBW : 9 kHz
Supply voltage : 120Vac 60Hz
Temperature : 23ºC
Humidity : 50%

Requirement: 15.107(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	No peak found	---	---	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	No peak found	---	---	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 packet types.

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 4-5.

Subclause 15.109 – Spurious Radiated Emissions		**Pass**
Test Specification : ANSI C63.4 - 2003 Mode of operation : Rx mode Port of testing : Enclosure Detector : Peak RBW/VBW : 120 kHz for f < 1 GHz 1 MHz / 3 MHz for f > 1 GHz Supply voltage : 120Vac 60Hz Temperature : 23ºC Humidity : 50%		
Requirement: 15.109(a)		
Results: Pass		
Vertical Polarization		
Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
37.890	21.5	40.0 / QP
57.510	32.1	40.0 / QP
77.850	19.3	40.0 / QP
Horizontal Polarization		
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