Produkte
Products

Prüfbericht - Nr.: *Test Report No.:*	**14024579 001**	**Seite 1 von 12** *Page 1 of 12*

Auftraggeber: *Client:*	**Hideki Electronics Ltd.** **Units 2304-06, 23/F., Riley House** **88 Lei Muk Road** **Kwai Chung, N.T.** **Hong Kong**
Gegenstand der Prüfung: *Test Item:*	**Wireless Thermo-Hygrometer** **Wireless Thermometer**
Bezeichnung: *Identification:*	**TS21, TS01**
Serien-Nr.: *Serial No.:*	**Engineering sample**
Wareneingangs-Nr.: *Receipt No.:*	**00100726005-003**
Eingangsdatum: *Date of Receipt:*	**26.07.2010**
Prüfort: *Testing Location:*	**Hong Kong Productivity Council** HKPC Building, 78 Tat Chee Avenue, Kowloon, Hong Kong
Prüfgrundlage: *Test Specification:*	**FCC Part 15, Subpart C**
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.** 9-10/F., Emperor International Square , 7 Wang Tai Road, Kowloon Bay, Kowloon, Hong Kong

geprüft/ *tested by:*

27.08.2010	Mika Chan Project Engineer	
Datum *Date*	**Name/Stellung** *Name/Position*	**Unterschrift** *Signature*

kontrolliert/ *reviewed by:*

27.08.2010	Sharon Li Project Manager	
Datum *Date*	**Name/Stellung** *Name/Position*	**Unterschrift** *Signature*

Sonstiges: **FCCID: Q9PTS21**
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*

Test Summary

Periodic Operation Device

Result: Pass

Radiated Emission of Carrier Frequency

Result: Pass

Spurious Radiated Emissions

Result: Pass

Bandwidth Measurement

Result: Pass

Contents

List of Test and Measurement Instruments

	Equipment used	Manufacturer	Model No.	S/N	Due Date
☒	Semi-anechoic Chamber	Frankonia	Nil	Nil	27-Apr-11
☒	Test Receiver	R & S	ESU26	100050	25-May-11
☒	Bi-conical Antenna	R & S	HK116	100242	13-Apr-12
☒	Log Periodic Antenna	R & S	HL223	841516/020	13-Apr-12
☒	Coaxial cable 50ohm	Rosenberger	RTK081-05S-05S-10m	LA2-001-10M / 002	07-Dec-10
☒	Horn Antenna	EMCO	3115	9002-3351	16-Apr-12
☒	Spectrum Analyser	R & S	FSP 30	100286	16-Mar-11
☒	Active Loop Antenna	EMCO	6502	9107-2651	06-Feb-11

General Product Information

Product Function and Intended Use

The equipment under test (EUT) is a transmitter for a thermo-hygrometer and thermometer operating at 433.92MHz. The EUT senses the temperature and humidity level and then transmit this information to the associated weather station.

The transmitter meets the requirement on periodic transmission as specified in Part 15.231 (e). For details, please refer to Appendix 1 page 1.

FCC ID: Q9PTS21

Models	Product descriptions
TS21	Wireless Thermo-Hygrometer
TS01	Wireless Thermometer

The model TS01 is identical in construction including schematic and PCB layout to the model TS21, except the change in humidity sensor function.

For the above multiple models, due to the model TS21 is the most complex and integrated, the model TS21 was chosen as a representative model for testing.

Ratings and System Details

		Transmitter
FCCID	:	Q9PTS21
Operated Frequency	:	433.92 MHz
Type of antenna	:	Integral antenna
Power supply	:	Battery operated 3.0V (AA Battery X2)
Ports	:	none

Independent Operation Modes

The basic operation modes are:

- Transmitting weather information of temperature and humidity to the associated weather station receiver.

For further information refer to User Manual

Submitted Documents

The submitted documents are listed as follow:

- Circuit diagram
- Block diagram
- User manual
- FCC ID label

Related Submittal(s) Grants

This is a single application for certification of the transmitter.

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.

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

System Factor = CF + FA – PA.

Where FS = Peak Value of Field Strength in dBuV/m at 3 meters.
R = Peak 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.

Average value of FS = FS –Average factor.

Average Factor = 20 log duty cycle.

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Test Results

Periodic Operation Device — Section 15.231(e)

RESULT: **Pass**

The EUT was preprogrammed to transmit signal for every 43 seconds and the duration of each transmission is about 0.374 seconds. Hence it meets the requirement that the duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.

Radiated Emission of Carrier Frequency — Section 15.231(e)

RESULT: **Pass**

Test Specification	:	FCC Part 15 Section 15.231(e, b1 and b2)
Test Method	:	ANSI 63.4-2003
Measurement Location	:	Semi Anechoic Chamber
Measurement Distance	:	3m
Measurement BW	:	120 kHz
Supply Voltage	:	DC 3.0V

Polarization: Vertical

Value	Frequency (MHz)	Measured Field Strength at 3m (PK) (dBµV/m)	Average Factor (dB)	Net Field Strength at 3m (dBµV/m)	Limit (dBµV/m)	Delta to Limit (dB)
Peak	433.991	73.60	-	73.60	92.87	-19.27
Average	433.991	56.00	-7.92	48.08	72.87	-24.79

Polarization: Horizontal

Value	Frequency (MHz)	Measured Field Strength at 3m (PK) (dBµV/m)	Average Factor (dB)	Net Field Strength at 3m (dBµV/m)	Limit (dBµV/m)	Delta to Limit (dB)
Peak	433.991	67.70	-	67.70	92.87	-25.17
Average	433.991	49.80	-7.92	41.88	72.87	-30.99

Remark; The calculation of average factor is shown in appendix 1 page 3-4.

Limit **Section 15.231(e)**

Frequency within the band (MHz)	Peak Emission		Average Emission	
	(microvolt/meter)	dBµV/m	(microvolt/meter)	dBµV/m
433.991	43998.64	92.87	4399.86	72.87

According to section 15.35(b), when average radiated emission measurements are specified, including emission measurement below 1000MHz, there also is limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit for the frequency being investigated.

Spurious Radiated Emissions — Section 15.231(e)

RESULT: **Pass**

Test Specification	:	FCC Part 15 Section 15.231(e, b1 and b3)
Test Method	:	ANSI 63.4-2003
Measurement Location	:	Semi Anechoic Chamber
Detector Function	:	Peak
Measurement BW	:	120 kHz for frequency range of 30M-1GHz 1MHz for frequency>1GHz
Supply Voltage	:	DC 3.0V
Measuring Frequency Range	:	30-5000MHz

Frequency (MHz)	Antenna Polarization	Field Strength at 3m (dBµV/m)	Limit at 3m (dBµV/m)	Delta to Limit (dB)
867.982	Vertical	29.5	52.87	-23.37
1301.970	Vertical	37.3	52.87	-15.57
1735.960	Vertical	33.5	52.87	-19.37
2169.950	Vertical	34.5	52.87	-18.37
2603.940	Vertical	34.1	52.87	-18.77
3037.930	Vertical	36.3	52.87	-16.57
3471.920	Vertical	37.4	52.87	-15.47
3905.910	Vertical	33.2	52.87	-19.67
4339.910	Vertical	32.6	52.87	-20.27
867.982	Horizontal	30.7	52.87	-22.17
1301.970	Horizontal	34.1	52.87	-18.77
1735.960	Horizontal	31.5	52.87	-21.37
2169.950	Horizontal	32.9	52.87	-19.97
2603.940	Horizontal	33.9	52.87	-18.97
3037.930	Horizontal	35.9	52.87	-16.97
3471.920	Horizontal	38.2	52.87	-14.67
3905.910	Horizontal	33.7	52.87	-19.17
4339.910	Horizontal	33.5	52.87	-19.37

There is no spurious emission found between lowest oscillating frequency to 30 MHz.

Limit **Section 15.231(e)**

Frequency (MHz)	Field strength (microvolt/meter)	Field strength (dBµV/m)	Measurement distance (meters)
433.991	439.986	20*log(439.986) = 52.87	3

Section 15.209

Radiated emissions, which fall in the restricted bands, as defined in Section 15.205(a), was also comply with the radiated emission limits specified in Section 15.209.

Limit for Radiated Emission under Section 15.209:

Frequency (MHz)	Field strength (microvolt/meter)	Field strength (dBµV/m)	Measurement distance (meters)
30-88	100	20*log(100) = 40.00	3
88-216	150	20*log(150) = 43.52	3
216-960	200	20*log(200) = 46.02	3
960-2500	500	20*log(500) = 53.98	3

The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector and above 1000 MHz are based on the measurements employing an average detector.

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Bandwidth Measurement — Section 15.231(c)

RESULT: **Pass**

Test Specification : FCC Part 15 section 15.231(c)
Detector Function : Peak
Supply Voltage : DC 3.0V

Centre Frequency (MHz)	20dB Bandwidth (KHz)	FCC Limits * (KHz)
433.991	304	1084.775

* FCC Limit of 20dB bandwidth measurement = (0.25%) (Centre Frequency)
= (0.25%) (433.991x10^6)
= 1084.775 KHz

For test results refer to Appendix 1, page 2.

Limit **Section 15.231(c)**

The bandwidth of the emission shall be no wider than 0.25% if the center frequency for devices operating above 70MHz and below 900MHz.