Produkte
Products

TÜVRheinland®

Prüfbericht - Nr.: *Test Report No.*	**14015800 001**		**Seite 1 von 12** *Page 1 of 12*
Auftraggeber: *Client:*	**Hideki Electronics Ltd.** **Unit 2304-06, 23/F, Riley House,** **88 Lei Muk Road,** **Kwai Chung, N.T.,** **Hong Kong**		
Gegenstand der Prüfung: *Test item:*	**Thermo-Hygro Sensor**		
Bezeichnung: *Identification:*	**TS35-C**	**Serien-Nr.:** *Serial No.*	**Engineering sample**
Wareneingangs-Nr.: *Receipt No.:*	**070312007**	**Eingangsdatum:** *Date of receipt:*	**12.03.2007**
Prüfort: *Testing location:*	**TÜV Rheinland Hong Kong Ltd.** 9th Floor, Oriental News Building, 7 Wang Tai Road, Kowloon Bay, Kowloon, Hong Kong **Hong Kong Productivity Council** HKPC Building, 78 Tat Chee Avenue, Kowloon, Hong Kong		
Prüfgrundlage: *Test specification:*	**FCC Part 15, Subpart C**		
Prüfergebnis: *Test Result:*	**Der Prüfgegenstand entspricht oben genannter Prüfgrundlage(n).** *The test item passed the test specification(s).*		
Prüflaboratorium: *Testing Laboratory:*	**TÜV Rheinland Hong Kong Ltd.**		

geprüft / *tested by:* | **kontrolliert** / *reviewed by:*

22.5.2007	Derek Leung Project Manager		22.5.2007	Thomas Berns Manager	
Datum *Date*	**Name/Stellung** *Name/Position*	**Unterschrift** *Signature*	**Datum** *Date*	**Name/Stellung** *Name/Position*	**Unterschrift** *Signature*

Sonstiges / *Other Aspects:* **FCC ID: Q9PTS35-C**

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

Kind of Equipment	Manufacturer	Type	S/N
Test Receiver	Rohde & Schwarz	ESVS30	842807/009
Biconical Antenna	Rohde & Schwarz	HK116	841489/015
Log.-Periodic Antenna	Rohde & Schwarz	HL223	841516/017
Double Ridge Horn Antenna	EMCO	3115	9002-3347
Spectrum Analyzer	Rohde & Schwarz	FSP30	1093.4495K30
Active Loop Antenna	EMCO	6502	9107-2651

General Product Information

Product Function and Intended Use

The equipment under test (EUT) is a “thermo-hygro sensor” operating at 433.9 MHz. The EUT senses and transmits the information of temperature and humidity to the associated weather station receiver.

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

Ratings and System Details

FCCID	:	Q9PTS35-C
Operating Frequency	:	433.9 MHz
Type of antenna	:	Integral antenna
Power supply	:	Battery operated 3.0V (AA battery x 2)
Port(s)	:	none

Independent Operation Mode

The basic operation mode :

- transmits 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 test mode was configured on the equipment under test (EUT) to obtain the maximum emission.

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 measurement was 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 factor, cable loss, preamplifiers gain and filter attenuation.

The equation is expressed as follow:

FS = R + AF + CF + FA – PA

System Factor = 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 Loss in dB.
FA = Filter Attenuation Factor in dB.
PA = Preamplifier Gain in dB.

FA and PA are only be used for the measuring frequency above 1 GHz.

Average value of FS(dB) = FS (dB) – Duty cycle averaging factor (dB).

Duty Cycle Averaging Factor (dB) = 20 log [duty cycle].

Test Results

Periodic Operation Device — Section 15.231(e)

RESULT: **Pass**

The EUT was preprogrammed to transmit signal for every 48.2 seconds, and the duration of each transmission is about 0.376 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(b)

RESULT:
Pass

Test Specification	:	FCC Part 15 Section 15.231(b1 and b2)
Test Method	:	ANSI C63.4-2003
Measurement Location	:	Semi Anechoic Chamber
Measurement BW	:	120 kHz
Supply Voltage	:	DC 3.0V

Polarization: Vertical

Detector	Frequency (MHz)	Measured Field Strength at 3m (dBµV/m)	Duty Cycle Averaging Factor (dB)	Field Strength at 3m (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Peak	433.898	81.0	-	81.0	92.87	-11.87
Average	433.898	79.4	-7.3	72.1	72.87	-0.77

Polarization: Horizontal

Detector	Frequency (MHz)	Measured Field Strength at 3m (dBµV/m)	Duty Cycle Averaging Factor (dB)	Field Strength at 3m (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Peak	433.898	75.7	-	78.7	92.87	-14.17
Average	433.898	74.5	-7.3	67.2	72.87	-5.67

Remark: The calculation of average factor is shown in appendix 1 page 2-4.

Section 15.231(e)

Limit

Frequency within the band (MHz)	Peak Emission		Average Emission	
	(microvolt/meter)	dBµV/m	(microvolt/meter)	dBµV/m
433.898	43983.1	92.87	4398.31	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, corresponding to 20dB above the maximum permitted average limit for the frequency being investigated.

Spurious Radiated Emissions — Section 15.231(b)

RESULT: **Pass**

Test Specification : FCC Part 15 Section 15.231(b1 and b3)
Test Method : ANSI C63.4-2003
Measurement Location : Semi Anechoic Chamber
Detector Function : Peak
Measurement BW : 120 kHz for frequency range of 30Mz-1GHz,
1MHz for frequency > 1GHz.
Supply Voltage : DC 3.0V
Measuring Frequency Range : 30kHz-4500MHz (10^{th} harmonic of the fundamental frequency)

Frequency	Antenna Polarization (MHz)	Field Strength at 3m (dBµV/m)	Limit (dBµV/m)	Margin (dB)
867.784	Vertical	46.70	52.87	-6.2
1301.70	Vertical	36.06	52.87	-16.8
1735.58	Vertical	32.30	52.87	-20.6
2169.44	Vertical	32.05	52.87	-20.8
2606.36	Vertical	32.92	52.87	-20.0
867.956	Horizontal	44.40	52.87	-8.5
1301.66	Horizontal	32.17	52.87	-20.7
1735.58	Horizontal	32.97	52.87	-19.9
2169.48	Horizontal	31.38	52.87	-21.5
2603.34	Horizontal	31.52	52.87	21.35

There is no spurious emission was found between the lowest oscillating frequency within the EUT (32.768kHz) and 30 MHz.

Section 15.231(e)

Limit

Frequency (MHz)	Field strength (µV/m)	Field strength (dBµV/m)	Measurement distance (meters)
433.898	439.831	20*log(439.831) = 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 (µV/m)	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
Above 960	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.

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)
433.910	354	1084.8

* FCC Limit of 20dB bandwidth measurement =(0.25%)(Center Frequency)

=(0.25%)(433.910 x 10^{6})

=1084.775kHz

For test results refer to Appendix 1, page 1.

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.