


Prüfbericht - Nr.: Test Report No.	14010900 001	Seite 1 von 13 Page 1 of 13	
Auftraggeber: Applicant	IDT Technology Ltd. Block C, 9/F., Kaiser Estate, Phase 1 41 Man Yue Street Hunghom, Kowloon Hong Kong		
Gegenstand der Prüfung: Test item	Low Power Transmitter		
Bezeichnung: Identification	THGR228N, THGR228NR, THGN228N, THGN228NR, THR228N, THR228NR, THN228N, THN228NR	Serien-Nr.: Serial No.	Engineering sample
Wareneingangs-Nr.: Receipt No.	050905016- 050905018	Eingangsdatum: Date of receipt	05.09.2005
Prüfört: Testing location	TÜV Rheinland Hong Kong Ltd. Unit 8, 25 th Floor, Skyline Tower, 39 Wang Kwong 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	Das vorstehend beschriebene Gerät wurde geprüft und entspricht oben genannter Prüfgrundlage. The above mentioned product was tested and passed .		
geprüft / tested by:		kontrolliert / reviewed by:	
01.12.2005	Hugo Wan Project Engineer		01.12.2005
			Thomas Berns Senior Project Manager
Datum Date	Name Name	Unterschrift Signature	Datum Date
			Name Name
			Unterschrift Signature
Sonstiges: Other Aspects	FCC ID NMTTHX2X8NR-01		
Abkürzungen:	OK, Pass, P = entspricht Prüfgrundlage Fail, F = entspricht nicht Prüfgrundlage N/A = nicht anwendbar NT = nicht getestet	Abbreviations:	OK, Pass, P = passed Fail, F = failed N/A = not applicable NT = 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. This test report relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicate in extracts. This test report does not entitle to carry any safety mark on this or similar products.			

Test Summary

Periodic Operation Device

Result: Pass

Radiated Emission of Carrier Frequency

Result: Pass

Spurious Radiated Emissions

Result: Pass

Bandwidth Measurement

Result: Pass

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

General Product Information

Product Function and Intended Use

The equipment under test (EUT) is a transmitter for a weather station operating at 433.92 MHz. 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: NMTTHX2X8NR-01

Models	Product descriptions
THGR228N, THGR228NR	Water Resistant Remote Sensor with LCD Display
THGN228N, THGN228NR	Water Resistant Remote Sensor
THR228N, THR228NR	Water Resistant Remote Sensor with LCD Display
THN228N, THN228NR	Water Resistant Remote Sensor

The models THGR228N, THGR228NR, THGN228N, THGN228NR, THR228N, THR228NR, THN228N, THN228NR are identical in construction including schematic and PCB layout to the model THGR228NR, except the change in housing design, humidity sensor function and removed LCD display.

For those models with letter "G", they have temperature and humidity sensor function. Otherwise, they have temperature function only. For those models with suffix "R", they are re-engineering models and are used for internal reference only. They are totally identical to the models without suffix "R".

For the above multiple models, due to the model THGR228NR is the most complex and integrated, the model THGR228R was chosen as a representative model for testing.

Circuit Description

THGR228NR is a Remote thermo-hygro sensor and transmit data by using 433.92MHz. After every time of thermo-humid measurement. the data will be transferred to the receiver unit through 433.92MHz. It composes a controller part and a transmitter part. The transmitter is basically a Colipptis oscillator, where C5, C6 and Y1 are used to determinate the resonant frequency that is 433.92MHz. There is a filtering circuitry, use L1, that is used to suppress harmonics of the oscillator. Capacitance C12, C13, C14 are employed to match the impedance of the antenna.

Ratings and System Details

		Transmitter
Operated Frequency	:	433.92 MHz
Number of channels	:	3 (using same frequency with different coding scheme)
Type of antenna	:	Integral antenna
Power supply	:	Battery operated 3.0V
Ports	:	none
Protection Class	:	III
Equipment Class	:	B

Independent Operation Modes

The basic operation modes are:

- Transmitting weather information.

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

The test sample, which has been tested, contained the noise suppression parts as described in the Circuit Diagram or the Technical Construction File. No additional measures were employed to achieve compliance.

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 section 7.1.1 and 7.1.2 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:

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

$$\text{System Factor} = CF + FA - PA.$$

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.

Test Results

Periodic Operation Device

Section 15.231(e)

RESULT:

Pass

A transmitter transmits signal for every 39.10 seconds automatically, and every transmission duration is about 0.389 second. 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 63.4-2003
 Measurement Location : Semi Anechoic Chamber
 Measurement Distance : 3m
 Detector Function : Peak
 Measurement BW : 100 kHz
 Supply Voltage : DC 3.0V

Polarization: Vertical

Value	Frequency (MHz)	Measured Field Strength at 3m (PK) (dBuV/m)	Average Factor (dB)	Net Field Strength at 3m (dBuV/m)	Limit (dBuV/m)	Delta to Limit (dB)
Peak	433.9218	76.40	-	76.40	92.87	-16.47
Average	433.9218	76.40	-7.42	68.98	72.87	-3.89

Polarization: Horizontal

Value	Frequency (MHz)	Measured Field Strength at 3m (PK) (dBuV/m)	Average Factor (dB)	Net Field Strength at 3m (dBuV/m)	Limit (dBuV/m)	Delta to Limit (dB)
Peak	433.9218	71.30	-	71.30	92.87	-16.47
Average	433.9218	71.30	-7.42	63.88	72.87	-8.99

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)	dB μ V/m	(microvolt/meter)	dB μ V/m
433.9218	43986.80	92.87	4398.68	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(b)****RESULT:****Pass**

Test Specification : FCC Part 15 Section 15.231(b1 and b3)
 Test Method : ANSI 63.4-2003
 Measurement Location : Semi Anechoic Chamber
 Measurement Distance : 3m
 Detector Function : Peak
 Measurement BW : 100 kHz
 Supply Voltage : DC 3.0V
 Measuring Frequency Range : 30-5000MHz

Polarization: Vertical

Frequency (MHz)	Reading (dBuV/m)	Antenna Factor (dBuV/m)	System Factor (dB)	Field Strength at 3m (dBuV/m)	Detector (PK / AV)	Limit at 3m (dBuV/m)	Delta to Limit (dB)
867.844	15.93	22.20	2.67	40.80	PK	72.87	-32.07
	0.53	22.20	2.67	25.40	AV	52.87	-27.47
*1301.765	38.95	24.90	-33.70	30.15	PK	73.98	-43.83
	33.22	24.90	-33.70	24.42	AV	53.98	-29.56
1735.680	34.99	26.50	-33.30	28.19	PK	72.87	-44.68
	28.05	26.50	-33.30	21.25	AV	52.87	-31.62
2169.620	34.18	27.80	-32.56	29.42	PK	72.87	-43.45
	27.64	27.80	-32.56	22.88	AV	52.87	-29.99
2603.520	33.34	28.88	-31.18	31.04	PK	72.87	-41.83
	28.49	28.88	-31.18	26.19	AV	52.87	-26.68
3037.440	35.92	30.00	-29.73	36.19	PK	72.87	-36.68
	27.01	30.00	-29.73	27.28	AV	52.87	-25.59
3471.360	40.24	31.20	-31.09	40.35	PK	72.87	-32.52
	36.30	31.20	-31.09	36.41	AV	52.87	-16.46
*3905.300	34.64	32.50	-30.35	36.79	PK	73.98	-37.19
	26.45	32.50	-30.35	28.60	AV	53.98	-25.38
*4339.200	35.82	32.45	-29.91	38.36	PK	73.98	-35.62
	29.23	32.45	-29.91	31.77	AV	53.98	-22.21

Polarization: Horizontal

Frequency (MHz)	Reading (dBuV/m)	Antenna Factor (dBuV/m)	System Factor (dB)	Field strength at 3m (dBuV/m)	Detector (PK / AV)	Limit at 3m (dBuV/m)	Delta to Limit (dB)
867.844	9.53	22.20	2.67	34.40	PK	72.87	-38.47
	0.01	22.20	2.67	24.88	AV	52.87	-27.99
*1301.765	38.19	24.90	-33.70	29.39	PK	73.98	-44.59
	31.35	24.90	-33.70	22.55	AV	53.98	-31.43
1735.680	34.33	26.50	-33.30	27.53	PK	72.87	-45.34
	27.83	26.50	-33.30	21.03	AV	52.87	-31.84
2169.620	33.73	27.80	-32.56	28.97	PK	72.87	-43.90
	29.18	27.80	-32.56	24.42	AV	52.87	-28.45
2603.520	32.84	28.88	-31.18	30.54	PK	72.87	-42.33
	28.17	28.88	-31.18	25.87	AV	52.87	-27.00
3037.440	35.02	30.00	-29.73	35.29	PK	72.87	-37.58
	26.86	30.00	-29.73	27.13	AV	52.87	-25.74
3471.360	37.3	31.20	-31.09	37.41	PK	72.87	-35.46
	29.29	31.20	-31.09	29.40	AV	52.87	-23.47
*3905.300	34.91	32.50	-30.35	37.06	PK	73.98	-36.92
	25.70	32.50	-30.35	27.85	AV	53.98	-26.13
*4339.200	35.81	32.45	-29.91	38.35	PK	73.98	-35.63
	27.19	32.45	-29.91	29.73	AV	53.98	-24.25

Remark: ' * ' indicates the frequency of the emissions fall into the restricted band.
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 (dB μ V/m)	Measurement distance (meters)
433.9218	439.868	$20 \cdot \log(439.868) = 52.87$	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 (dB μ V/m)	Measurement distance (meters)
30-88	100	$20 \cdot \log(100) = 40.00$	3
88-216	150	$20 \cdot \log(150) = 43.52$	3
216-960	200	$20 \cdot \log(200) = 46.02$	3
960-2500	500	$20 \cdot \log(500) = 53.98$	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)
Port of Testing : Coupling device
Detector Function : Peak
Supply Voltage : DC 3.0V

Refer to the data graph, the 20dB points at lower edge and at higher edge are 10.8kHz and 10.6kHz respectively apart from the centre modulated carrier, the bandwidth of the emission is 0.005 % of the centre frequency. Therefore, the EUT meets the requirement of section 15.231(c).

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.