Prüfbericht - Nr.: Test Report No.	**14008786 002**		**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	**THWR228A** **THWR228**	**Serien-Nr.:** Serial No.	**Engineering sample**
Wareneingangs-Nr.: Receipt No.	**051101035-** **051101036**	**Eingangsdatum:** Date of receipt	**01.11.2005**
Prüfort: Testing location	**TÜV Rheinland Hong Kong Ltd.** Unit 8, 25th 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:		
21.03.2006	Hugo Wan Project Engineer		23.03.2006	Thomas Berns Senior Project Manager	
Datum Date	**Name** Name	**Unterschrift** Signature	**Datum** Date	**Name** Name	**Unterschrift** Signature

Sonstiges: **FCC ID NMTTHWR288-01**
Other Aspects

Abkürzungen:			Abbreviations:		
	OK, Pass, P	= entspricht Prüfgrundlage		OK, Pass, P	= passed
	Fail, F	= entspricht nicht Prüfgrundlage		Fail, F	= failed
	N/A	= nicht anwendbar		N/A	= not applicable
	NT	= nicht getestet		NT	= 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
Active Loop Antenna	EMCO	6502	9107-2651
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 waterproof remote sensor unit with LCD display and LED indicator. It is a transmitter operating at 433.92 MHz. It senses the water temperature level and then transmits 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: NMTTHWR288-01

Models	Product description
THWR288, THWR288A	Water Thermo Sensor

The model THWR288 is totally identical in construction including schematic and PCB layout to the model THWR288A. Model THWR288A was chosen as a representative for testing.

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	:	2 x 1.5V UM-4 or AAA size batteries, 3.0V
Ports	:	none
Protection Class	:	III
Equipment Class	:	B

Among the 3 channels, there is no significant difference between them in output power and pulse code shape. Hence channel 1 is chosen as a representative channel for testing.

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

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 39.00 seconds automatically, and every transmission duration is about 0.384 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.

For details, please refer to Appendix 1 page 1.

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
Detector Function	:	Peak
Measurement BW	:	100 kHz
Supply Voltage	:	DC 3.0V
Tested channel	:	1

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	433.9726	62.40	-	62.40	92.87	-30.47
Average	433.9726	62.40	-7.46	54.94	72.87	-17.93

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	433.9726	61.20	-	61.20	92.87	-31.67
Average	433.9726	61.20	-7.46	53.74	72.87	-19.13

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	
	(µV/m)	(dBµV/m)	(µV/m)	(dBµV/m)
433.9726	43995.578	92.87	4399.5578	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
Measurement Distance	:	3m
Detector Function	:	Peak
Measurement BW	:	100 kHz
Supply Voltage	:	DC 3.0V
Measuring Frequency Range	:	30-4500MHz
Tested channel	:	1

Polarization: Vertical

Frequency (MHz)	Field Strength at 3m (dBµV/m)	Detector (PK / AV)	Limit at 3m (dBµV/m)	Delta to Limit (dB)
867.9452	35.80	PK	72.87	-37.07
	22.10	AV	52.87	-30.77
*1301.9200	37.23	PK	72.87	-35.64
	35.44	AV	52.87	-17.43
1735.9000	46.64	PK	72.87	-26.23
	45.83	AV	52.87	-7.04
2169.9000	28.55	PK	72.87	-44.32
	24.27	AV	52.87	-28.60
2603.8600	29.07	PK	72.87	-43.80
	24.83	AV	52.87	-28.04
3037.8400	36.16	PK	72.87	-36.71
	30.14	AV	52.87	-22.73
3471.8200	32.66	PK	72.87	-40.21
	28.14	AV	52.87	-24.73
*3905.8200	39.81	PK	72.87	-33.06
	35.38	AV	52.87	-17.49
*4339.6800	52.66	PK	72.87	-20.21
	48.48	AV	52.87	-4.39

Polarization: Horizontal

Frequency (MHz)	Field Strength at 3m (dBµV/m)	Detector (PK / AV)	Limit at 3m (dBµV/m)	Delta to Limit (dB)
867.9452	31.30	PK	72.87	-41.57
	18.30	AV	52.87	-34.57
*1301.8800	39.91	PK	72.87	-32.96
	39.07	AV	52.87	-13.80
1735.8600	50.47	PK	72.87	-22.40
	49.91	AV	52.87	-2.96
2169.9000	34.61	PK	72.87	-38.26
	31.31	AV	52.87	-21.56
2603.8400	29.09	PK	72.87	-43.78
	25.03	AV	52.87	-27.84
3037.8400	35.10	PK	72.87	-37.77
	29.03	AV	52.87	-23.84
3471.8200	34.86	PK	72.87	-38.01
	26.84	AV	52.87	-26.03
*3905.8000	37.39	PK	72.87	-35.48
	30.84	AV	52.87	-22.03
*4339.6400	45.04	PK	72.87	-27.83
	42.82	AV	52.87	-10.05

Remark: (1) ' * ' indicates the frequency of the emissions fall into the restricted band.
(2) There is no spurious emission found between lowest oscillating frequency to 30 MHz.
(3) Within the frequency range 30-4500MHz, other than harmonics, there are no other spurious emissions found in the measurement.

Limit **Section 15.231(e)**

Frequency (MHz)	Field strength (µV/m)	Field strength (dBµV/m)	Measurement distance (m)
433.9726	439.956	20*log(439.956) = 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 (m)
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.

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 8.2kHz and 12.0kHz 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.