| | | | |
|---|---|---|---|
| **Prüfbericht - Nr.:**<br>Test Report No. | **14011260 001** | | **Seite 1 von 13**<br>Page 1 of 13 |
| **Auftraggeber:**<br>Applicant | **IDT Technology Ltd.**<br>**Block C, 9/F., Kaiser Estate, Phase 1**<br>**41 Man Yue Street**<br>**Hunghom, Kowloon**<br>**Hong Kong** | | |
| **Gegenstand der Prüfung:**<br>Test item | **Low Power Transmitter** | | |
| **Bezeichnung:**<br>Identification | **THR138, THR138R**<br>**THN138, THN138R** | **Serien-Nr.:**<br>Serial No. | **Engineering sample** |
| **Wareneingangs-Nr.:**<br>Receipt No. | **051101041-**<br>**051101042** | **Eingangsdatum:**<br>Date of receipt | **01.11.2005** |
| **Prüfort:**<br>Testing location | **TÜV Rheinland Hong Kong Ltd.**<br>Unit 8, 25th Floor, Skyline Tower, 39 Wang Kwong Road, Kowloon Bay Kowloon, Hong Kong<br><br>**Hong Kong Productivity Council**<br>HKPC Building, 78 Tat Chee Avenue, Kowloon, Hong Kong | | |
| **Prüfgrundlage:**<br>Test specification | **FCC Part 15, Subpart C** | | |
| **Prüfergebnis:**<br>Test Result | **Das vorstehend beschriebene Gerät wurde geprüft und entspricht oben genannter Prüfgrundlage.**<br>The above mentioned product was tested and **passed**. | | |

| **geprüft** / tested by: | | | **kontrolliert** / reviewed by: | | |
|---|---|---|---|---|---|
| 14.11.2005 | Hugo Wan | | 14.11.2005 | Thomas Berns | |
| **Datum**<br>Date | **Name**<br>Name | **Unterschrift**<br>Signature | **Datum**<br>Date | **Name**<br>Name | **Unterschrift**<br>Signature |

**Sonstiges:** **FCC ID NMTTHX1X8R-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 |
| Biconical Antenna | Rohde & Schwarz | HK116 | 841489/015 |
| Log.-Periodic Antenna | Rohde & Schwarz | HL223 | 841516/017 |
| Double Ridge Horn Antenna | EMCO | 3115 | 9002-3351 |
| Double Ridge Horn Antenna | EMCO | 3115 | 9002-3347 |
| Signal Generator | Rohde & Schwarz | SMY 01 | 844146/024 |
| Signal Generator | Rohde & Schwarz | SMY 01 | 844146/023 |
| 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.

A transmitter transmits signal for every 30.24 seconds, and the signal on period is about 0.143s. It activated automatically shall cease transmission within 5 seconds after activation.

**FCC ID: NMTTHX122NR-01**

| Models | Product descriptions |
|---|---|
| THR138, THR138R | Water Resistant Remote Sensor with LCD Display |
| THN138, THN138R | Water Resistant Remote Sensor |

The models THN138, THN138R are identical in construction including PCB layout to the model THR138R, except the change in housing design and removed LCD display.

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 THR138R is the most complex and integrated, the model THR138R was chosen as a representative model for testing.

## Circuit Description

THR138R is a remote thermometer sensor and transmit data by using 433.92MHz. After every time of thermometer measurement, the data will be transfer to the receiver unit through 433.92MHz. It composes of a controller part and a transmitter part. The transmitter is basically a Colippttis oscillator, where C5, C6 and Y1 are used to determinate the resonant frequency that is 433.92MHz. Transistor Q3 whose fT is greater than 6GHz, provides a good frequency response to the circuit. 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 | : | 1 |
| 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

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(a)

**RESULT:** **Pass**

A transmitter transmits signal for every 30.24 seconds automatically, and every signal duration is about 0.143s. Hence it meets the requirement that the transmitter shall cease transmission within 5 seconds after activation.

## 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) | System Factor (dB) | 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 | 433.863 | 18.1 | 72.0 | - | 72.0 | 100.8 | -28.8 |
| Average | 433.863 | 18.1 | 72.0 | -3.3 | 68.7 | 80.8 | -12.1 |

**Polarization: Horizontal**

| Value | Frequency (MHz) | System Factor (dB) | 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 | 433.863 | 18.1 | 65.4 | - | 65.4 | 100.8 | -35.4 |
| Average | 433.863 | 18.1 | 65.4 | -3.3 | 62.1 | 80.8 | -18.7 |

Remark; The calculation of average factor is shown in appendix 1 page 3-5.

**Limit** **Section 15.231(b2)**

| Frequency within the band (MHz) | Peak Emission | | Average Emission | |
|---|---|---|---|---|
| | (microvolt/meter) | dBµV/m | (microvolt/meter) | dBµV/m |
| 433.86 | 109,954 | 100.8 | 10,995 | 80.8 |

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 (PK) (dBuV/m) | Antenna Factor (dBuV/m) | System Factor (dB) | Field strength at 3m (PK) (dBuV/m) | Average Factor (dB) | Field strength at 3m (AV) (dBuV/m) | Limit at 3m (dBuV/m) | Delta to Limit (dB) |
|---|---|---|---|---|---|---|---|---|
| 867.726 | 13.33 | 22.20 | 2.67 | 38.20 | -3.28 | 34.92 | 60.80 | -25.88 |
| *1301.589 | 40.98 | 24.90 | -33.70 | 32.18 | -3.28 | 28.90 | 54.00 | -25.10 |
| 1735.532 | 38.08 | 26.50 | -33.30 | 31.28 | -3.28 | 28.00 | 60.80 | -32.80 |
| 2169.515 | 37.82 | 27.80 | -32.56 | 33.06 | -3.28 | 29.78 | 60.80 | -31.02 |
| 2601.578 | 36.73 | 28.88 | -31.18 | 34.43 | -3.28 | 31.15 | 60.80 | -29.65 |
| 3304.924 | 43.20 | 30.00 | -29.73 | 43.47 | -3.28 | 40.19 | 60.80 | -20.61 |
| 3471.064 | 45.11 | 31.20 | -31.09 | 45.22 | -3.28 | 41.94 | 60.80 | -18.86 |
| *3904.707 | 43.27 | 32.50 | -30.35 | 45.42 | -3.28 | 42.14 | 54.00 | -11.86 |
| 4338.810 | 42.58 | 32.45 | -29.91 | 45.12 | -3.28 | 41.84 | 60.80 | -18.96 |

**Polarization: Horizontal**

| Frequency (MHz) | Reading (PK) (dBuV/m) | Antenna Factor (dBuV/m) | System Factor (dB) | Field strength at 3m (PK) (dBuV/m) | Average Factor (dB) | Field strength at 3m (AV) (dBuV/m) | Limit at 3m (dBuV/m) | Delta to Limit (dB) |
|---|---|---|---|---|---|---|---|---|
| 867.726 | 9.63 | 22.20 | 2.67 | 34.50 | -3.28 | 31.22 | 60.80 | -29.58 |
| *1301.589 | 40.88 | 24.90 | -33.70 | 32.08 | -3.28 | 28.80 | 54.00 | -25.20 |
| 1735.232 | 39.11 | 26.50 | -33.30 | 32.31 | -3.28 | 29.03 | 60.80 | -31.77 |
| 2169.175 | 38.09 | 27.80 | -32.56 | 33.33 | -3.28 | 30.05 | 60.80 | -30.75 |
| 2603.439 | 37.37 | 28.88 | -31.18 | 35.07 | -3.28 | 31.79 | 60.80 | -29.01 |
| 3037.241 | 44.35 | 30.00 | -29.73 | 44.62 | -3.28 | 41.34 | 60.80 | -19.46 |
| 3470.984 | 50.13 | 31.20 | -31.09 | 50.24 | -3.28 | 46.96 | 60.80 | -13.84 |
| *3904.787 | 45.06 | 32.50 | -30.35 | 47.21 | -3.28 | 43.93 | 54.00 | -10.07 |
| 4338.750 | 44.90 | 32.45 | -29.91 | 47.44 | -3.28 | 44.16 | 60.80 | -16.64 |

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(b3)**

| Frequency (MHz) | Field strength (microvolt/meter) | Field strength (dBµV/m) | Measurement distance (meters) |
|---|---|---|---|
| 433.86 | 1,099 | 20*log(1099) = 60.8 | 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) = 40.0 | 3 |
| 88-216 | 150 | 20*log(150) = 43.5 | 3 |
| 216-960 | 200 | 20*log(200) = 46.0 | 3 |
| 960-2500 | 500 | 20*log(500) = 54.0 | 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 |
| Detector Function | : | Peak |
| Supply Voltage | : | DC 3.0V |

Refer to the data graph, the 20dB points at lower edge and at higher edge are 9.2KHz and 7.4KHz respectively apart from the centre modulated carrier, the bandwidth of the emission is 0.004 % 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.