

# Test Report

FCC ID:2ANQO-DN20

Date of issue: July 05, 2017

Report Number:	MTi170914E041
Sample Description:	Ultrasonic water meter
Model(s):	DN20, DN15, DN25
Applicant:	CNIRHURRICANE TECH(SHENZHEN)CO., LTD.
Address:	14F BLOCK 7/A, BaoNeng Science &Technology Park, No.1 QingXiang Road, Longhua, Shenzhen, China.
Date of Test:	June 23, 2017 to June 30, 2017

Shenzhen Microtest Co., Ltd.  
<http://www.mtitest.com>

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Test Result Certification	
<b>Applicant's name:</b>	<b>CNIRHURRICANE TECH(SHENZHEN)CO., LTD.</b>
Address:	14F BLOCK 7/A, BaoNeng Science &Technology Park, No.1 QingXiang Road, Longhua, Shenzhen, China.
<b>Manufacture's Name:</b>	<b>CNIRHURRICANE TECH(SHENZHEN)CO., LTD.</b>
Address:	14F BLOCK 7/A, BaoNeng Science &Technology Park, No.1 QingXiang Road, Longhua, Shenzhen, China.
Product name:	Ultrasonic water meter
Trademark:	N/A
Model name:	DN20, DN15, DN25
<b>Standards:</b>	FCC PART 15C, 15.249

*This device described above has been tested by Shenzhen Toby Technology Co., Ltd. and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.*

Tested by:

*Amy Lu*

Amy Lu

July 05, 2017

Reviewed by:

*Smith Chen*

Smith Chen

July 05, 2017

Approved by:

*Tom Xue*

Tom Xue

July 05, 2017

## Summary of Test Result

Item	FCC Part No.	Description of Test	Result
1	15.207	AC power line conducted emission	Pass
2	15.249 (a)	field strength of fundamental and harmonic emissions	Pass
3	15.215	20dB bandwidth & 99% occupied bandwidth	Pass
4	15.249 (d) 15.209	Band edge spurious emission	Pass
5	15.209	Radiated emission	Pass

NOTE: TEST ACCORDING TO ANSI C63.10-2013

## 1 General description

### 1.1 Feature of equipment under test (EUT)

Product name:	Ultrasonic water meter
Model name:	DN20, DN15, DN25
Operating frequency range:	915MHz
Modulation Type:	ASK
Power Source:	120V/60Hz
Antenna Designation:	Chip Antenna(Antenna Gain: -4.99dBi)
Remark:	All the models above are identical in interior structure, electrical circuits and components; just the appearance sizes are different. The model DN20 has been tested for the worst case.
Hardware version	V1.4
Software version	7908

### 1.2 Operation channel list

Channel	Frequency
1	915MHz

### 1.3 Test Frequency Channel

1	915MHz
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NOTE: NEW BATTERY IS USED DURING ALL TEST

### 1.4 EUT operation mode

During testing, RF test program provided by the manufacture to control the Tx operation followed the test requirement.

### 1.5 Test conditions

During the measurement the environmental conditions were within the listed ranges:

- Temperature: 20°C~30°C
- Humidity: 30%~70%
- Atmospheric pressure: 98kPa~101kPa

### 1.6 Ancillary equipment list

Equipment	Model	S/N	Manufacturer
/	/	/	/

## 1.7 Measurement uncertainty

Measurement Uncertainty for a Level of Confidence of 95 %,  $U=2 \times U_c(y)$

RF frequency	$1 \times 10^{-7}$
RF power, conducted	$\pm 1$ dB
Conducted emission(150kHz~30MHz)	$\pm 2.5$ dB
Radiated emission(30MHz~1GHz)	$\pm 4.2$ dB
Radiated emission (above 1GHz)	$\pm 4.3$ dB
Temperature	$\pm 1$ degree
Humidity	$\pm 5$ %

## 2 Testing site

Test Site	Shenzhen Toby Technology Co., Ltd.
Test Site Location	1 A/F., Bldg.6, Yusheng Industrial Zone The National Road No.107 Xixiang Section 467, Shenzhen, Guangdong, China
FCC Registration No.:	811562
CNAS Registration No.:	CNAS L5813

### 3 List of test equipment

For Conducted emission:

Equipment	Manufacturer	Model	Serial No.	Calibration Due
LISN	Schwarzbeck	NSLK8127	#841	2017/9/25
LISN	Laplace	LISN-16A	003420	2017/11/4
EMI Test Receiver	R&S	ESCI3	101368	2017/11/4

For Radiated test:

Equipment	Manufacturer	Model	Serial No.	Calibration Due
Broadband TRILOG Antenna	Schwarbeck	VULB9163	9163-872	2017/11/14
Horn Antenna	Schwarzbeck	BBHA 9120 D	9120D-1145	2017/11/14
Horn Antenna	Schwarzbeck	BBHA 9170	373	2017/11/14
Amplifier	HP	8447D	3113A06150	2017/11/4
Amplifier	Agilent	8449B	3008A02400	2018/8/20
Test Receiver	Schwarbeck	ESPI	100314	2017/11/4
Spectrum analyzer	Agilent	E4407B	MY41441082	2017/11/4

For RF conducted test:

Equipment	Manufacturer	Model	Serial No.	Calibration Due
Spectrum analyzer	Agilent	N9020A	MY49100060	2018/03/03

Note: the calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

## 4 Test Result

### 4.1 Conducted emission

#### 4.1.1 Limit

Frequency (MHz)	Limit	
	Quasi-peak	Average
0.15-0.5	66 to 56	56 to 46
0.5-5	56	46
5-30	60	50

Note: Decreases with the logarithm of the frequency from 0.15MHz to 0.5MHz.

#### 4.1.2 Test method

1. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipment powered from additional LISN(s). The LISN provide 50 Ohm/50uH of coupling impedance for the measuring instrument.
2. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
3. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
4. LISN is at least 80 cm from nearest part of EUT chassis.
5. The resolution bandwidth of EMI test receiver is set at 9kHz.

#### 4.1.3 Test Result

**Not application**



## 4.2 Field strength of fundamental and harmonic emissions

### 4.2.1 Limits

The field strength of fundamental and harmonic emissions, measured at 3 m, shall not exceed 50 mV/m and 0.5 mV/m respectively.

The field strength limits shall be measured using an average detector, except for the fundamental emission in the frequency band 902-928 MHz, which is based on measurements using an International Special Committee on Radio Interference (CISPR) quasi-peak detector

Frequency	Field Strength(dBuv/m)	Detector
Fundamental	114	PK
Fundamental	94	AV
Harmonic emissions	74	PK
Harmonic emissions	54	AV

### 4.2.2 Test Method

1. The EUT is placed on a turntable, which is 0.8m above ground plane for test frequency range below 1GHz, and 1.5m above ground plane for test frequency range above 1GHz.
2. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
3. Use the following spectrum analyzer settings:  
Span = wide enough to fully capture the emission being measured, RBW = 1 MHz for  $f \geq 1\text{GHz}$ , 120 kHz for  $f < 1\text{GHz}$ , VBW  $\geq$  RBW, Sweep = auto, Detector function =QP, Trace = max hold
4. Follow the guidelines in ANSI C63.4-2014 with respect to maximizing the emission by rotating the EUT, adjusting the measurement antenna height and polarization, etc. The peak reading of the emission, after being corrected by the antenna factor, cable loss, pre-amp gain, etc., is the peak field strength, submit this data. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
5. The peak level, once corrected, must comply with the limit specified in Section 15.209. Set the RBW = 1MHz, VBW = 10Hz, Detector = PK for AV value, while maintaining all of the other instrument settings.

#### 4.2.3 Test Result

##### ASK

Transmitter channel: 915MHz

Frequency	Ant. Polarization	Emission level	Limits	Detector
(MHz)	H / V	dBμV/m	dBμV/m	
915	V	83.84	94	QP
915	H	87.55	94	QP

Note: If the PK measured values lower than average mode limit, the EUT shall be deemed to meet average limits and then no additional average mode measurement performed.

### 4.3 occupied bandwidth

#### 4.3.1 Test method

Use the following spectrum analyzer settings:

Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel

RBW  $\geq 1\%$  of the 20 dB bandwidth

VBW  $\geq$  RBW

Sweep = auto

Detector function = peak

Trace = max hold

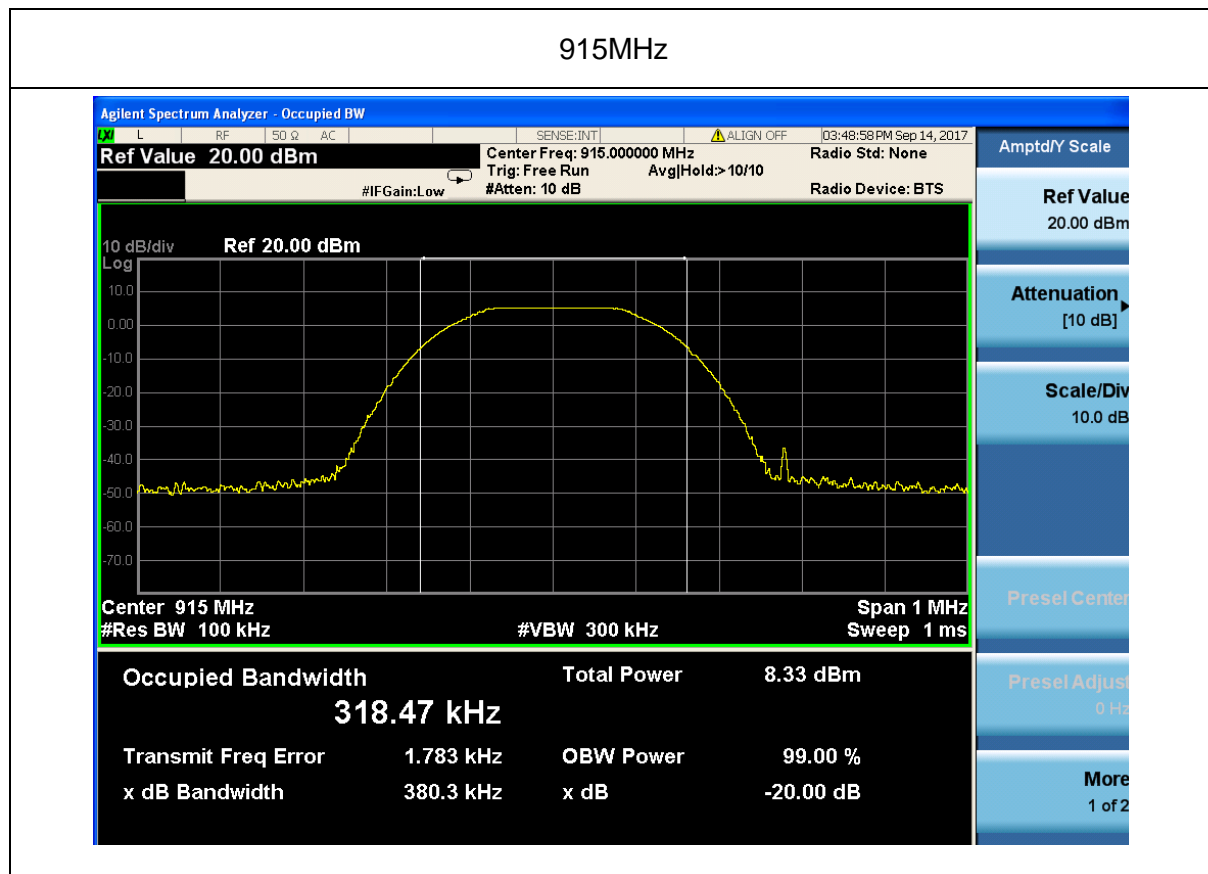
The EUT should be transmitting at its maximum data rate. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 20 dB down one side of the emission. Reset the marker-delta function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is the 20 dB bandwidth and 99% occupied bandwidth of the emission.

#### 4.3.2 Test result

ASK

Frequency (MHz)	20dB emission bandwidth (MHz)	99% occupied bandwidth (MHz)
915	0.38	0.3185

Test plots as below



## 4.4 Radiated emission & Band edge spurious emission

### 4.4.1 Limit

Emissions radiated outside of the specified frequency bands, except for harmonic emissions, (b) shall be attenuated by at least 50 dB below the level of the fundamental emissions or to the general field strength limits listed in RSS-Gen, whichever is less stringent.

Frequency (MHz)	Field strength $\mu\text{V/m}$	Field strength $\text{dB}\mu\text{V/m}$	Detector	Measurement distance
30-88	100	40	QP	3m
88-216	150	43.5	QP	
216-960	200	46	QP	
960-1000	500	54	QP	
Above 1000	500	54	AV	
Above 1000	5000	74	PK	

### 4.4.2 Test method

1. The EUT is placed on a turntable, which is 0.8m above ground plane for test frequency range below 1GHz, and 1.5m above ground plane for test frequency range above 1GHz.

2. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.

3. Use the following spectrum analyzer settings:

Span = wide enough to fully capture the emission being measured, RBW = 1 MHz for  $f \geq 1\text{GHz}$ , 120 kHz for  $f < 1\text{GHz}$ , VBW  $\geq$  RBW, Sweep = auto, Detector function = QP, Trace = max hold

4. Follow the guidelines in ANSI C63.4-2014 with respect to maximizing the emission by rotating the EUT, adjusting the measurement antenna height and polarization, etc. The peak reading of the emission, after being corrected by the antenna factor, cable loss, pre-amp gain, etc., is the peak field strength, submit this data. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.

5. The peak level, once corrected, must comply with the limit specified in Section 15.209. Set the RBW = 1MHz, VBW = 10Hz, Detector = PK for AV value, while maintaining all of the other instrument settings.

### 4.4.3 Test Result

Remark:

If the PK measured values lower than average mode limit, the EUT shall be deemed to meet average limits and then no additional average mode measurement performed.

Radiated emission (ASK mode)

Transmitter channel: 915MHz					
Frequency	Ant. Polarization	Emission level	Limits	Detector	Result
(MHz)	H / V	dBμV/m	dBμV/m		
346.56	V	28.41	43.5	QP	Pass
346.56	H	33.69	43.5	QP	
902	V	34.56	46	QP	
928	H	33.17	46	QP	
1280.64	V	45.68	74	PK	
1280.64	H	43.26	74	PK	

----END OF REPORT----