# APPLICATION CERTIFICATION FCC Part 15C
On Behalf of
Lindab Ventilation AB

Highly accurate flow monitor
Model No.: FTMU 100

FCC ID: 2ARWPFTCU-FTMU

| | | |
|---|---|---|
| Prepared for | : | Lindab Ventilation AB |
| Address | : | Stalhogavagen 115, Bastad, Sweden |
| Prepared by | : | Shenzhen Accurate Technology Co., Ltd. |
| Address | : | 1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. China<br><br>Tel: (0755) 26503290<br>Fax: (0755) 26503396 |

| | | |
|---|---|---|
| Report No. | : | ATE20182090 |
| Date of Test | : | October 28-November 21, 2018 |
| Date of Report | : | November 29, 2018 |

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# Test Report Certification

| | | |
|---|---|---|
| Applicant | : | Lindab Ventilation AB |
| Address | : | Stalhogavagen 115, Bastad, Sweden |
| Manufacturer's | : | Lindab AB |
| Address | : | Järnvägsgatan 41, Grevie, SE-26982 Båstad, Sweden |
| EUT Description | : | Highly accurate flow monitor |
| Model No. | : | FTMU 100 |

Measurement Procedure Used:

**FCC Rules and Regulations Part 15 Subpart C Section 15.247**
**ANSI C63.10: 2013**

The EUT was tested according to DTS test procedure of August 24, 2018 KDB558074 D01 DTS Meas Guidance v05 for compliance to FCC 47CFR 15.247 requirements

The device described above is tested by Shenzhen Accurate Technology Co., Ltd. to determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the FCC Part 15 Subpart C Section 15.247 limits. The measurement results are contained in this test report and Shenzhen Accurate Technology Co., Ltd. is assumed full responsibility for the accuracy and completeness of these measurements. Also, this report shows that the Equipment Under Test (EUT) is to be technically compliant with the FCC requirements.

This report applies to above tested sample only. This report shall not be reproduced in part without written approval of Shenzhen Accurate Technology Co., Ltd.

| | |
|---|---|
| Date of Test : | October 28-November 21, 2018 |
| Date of Report : | November 29, 2018 |

Prepared by : _____
(Stan Yang, Engineer)

Approved & Authorized Signer : _____
(Sean Liu, Manager)

# 1. GENERAL INFORMATION

## 1.1.Description of Device (EUT)

| | | |
|---|---|---|
| EUT | : | Highly accurate flow monitor |
| Model Number | : | FTMU 100 |
| Bluetooth Version | : | Bluetooth 5.0, single mode |
| Frequency Range | : | 2402-2480MHz |
| Modulation Type | : | GFSK |
| Number of Channels | : | 40 channels |
| Channel Spacing | : | 2MHz |
| Antenna Gain | : | 1.1dBi |
| Antenna Type | : | Integral Antenna |
| Power Supply | : | 24Vdc (18-32Vdc) / 24Vac (23-32Vac), 0.4W |
| Trade Mark | : | (Lindab) |

## 1.2.Carrier Frequency of Channels

| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---|---|---|---|---|---|---|---|
| 0 | 2402 | 10 | 2422 | 20 | 2442 | 30 | 2462 |
| 1 | 2404 | 11 | 2424 | 21 | 2444 | 31 | 2464 |
| 2 | 2406 | 12 | 2426 | 22 | 2446 | 32 | 2466 |
| 3 | 2408 | 13 | 2428 | 23 | 2448 | 33 | 2468 |
| 4 | 2410 | 14 | 2430 | 24 | 2450 | 34 | 2470 |
| 5 | 2412 | 15 | 2432 | 25 | 2452 | 35 | 2472 |
| 6 | 2414 | 16 | 2434 | 26 | 2454 | 36 | 2474 |
| 7 | 2416 | 17 | 2436 | 27 | 2456 | 37 | 2476 |
| 8 | 2418 | 18 | 2438 | 28 | 2458 | 38 | 2478 |
| 9 | 2420 | 19 | 2440 | 29 | 2460 | 39 | 2480 |

## 1.3.Special Accessory and Auxiliary Equipment

N/A

## 1.4.Description of Test Facility

| | | |
|---|---|---|
| EMC Lab | : | Recognition of accreditation by Federal Communications Commission (FCC)<br>The Designation Number is CN1189<br>The Registration Number is 708358<br><br>Listed by Innovation, Science and Economic Development Canada (ISEDC)<br>The Registration Number is 5077A-2<br><br>Accredited by China National Accreditation Service for Conformity Assessment (CNAS)<br>The Registration Number is CNAS L3193<br><br>Accredited by American Association for Laboratory Accreditation (A2LA)<br>The Certificate Number is 4297.01 |
| Name of Firm | : | Shenzhen Accurate Technology Co., Ltd. |
| Site Location | : | 1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. China |

## 1.5.Measurement Uncertainty

| | | |
|---|---|---|
| Conducted Emission Expanded Uncertainty | = | 2.23dB, k=2 |
| Radiated emission expanded uncertainty (9kHz-30MHz) | = | 3.08dB, k=2 |
| Radiated emission expanded uncertainty (30MHz-1000MHz) | = | 4.42dB, k=2 |
| Radiated emission expanded uncertainty (Above 1GHz) | = | 4.06dB, k=2 |

# 2. MEASURING DEVICE AND TEST EQUIPMENT

**Table 1: List of Test and Measurement Equipment**

| Kind of equipment | Manufacturer | Type | S/N | Calibrated dates | Cal. Interval |
|---|---|---|---|---|---|
| EMI Test Receiver | Rohde&Schwarz | ESCS30 | 100307 | Jan. 05, 2019 | One Year |
| EMI Test Receiver | Rohde&Schwarz | ESR | 101817 | Jan. 05, 2019 | One Year |
| Spectrum Analyzer | Rohde&Schwarz | FSV-40 | 101495 | Jan. 05, 2019 | One Year |
| Pre-Amplifier | Agilent | 8447D | 294A10619 | Jan. 05, 2019 | One Year |
| Pre-Amplifier | Compliance Direction | RSU-M2 | 38322 | Jan. 05, 2019 | One Year |
| Loop Antenna | Schwarzbeck | FMZB1516 | 1516131 | Jan. 05, 2019 | One Year |
| Bilog Antenna | Schwarzbeck | VULB9163 | 9163-323 | Jan. 05, 2019 | One Year |
| Horn Antenna | Schwarzbeck | BBHA9120D | 9120D-655 | Jan. 05, 2019 | One Year |
| Horn Antenna | Schwarzbeck | BBHA9170 | 9170-359 | Jan. 05, 2019 | One Year |
| LISN | Schwarzbeck | NSLK8126 | 8126431 | Jan. 05, 2019 | One Year |
| Highpass Filter | Wainwright Instruments | WHKX3.6/18G-10SS | N/A | Jan. 05, 2019 | One Year |
| Band Reject Filter | Wainwright Instruments | WRCG2400/2485-2375/2510-60/11SS | N/A | Jan. 05, 2019 | One Year |
| Conducted Emission Measurement Software: ES-K1 V1.71 | | | | | |
| Radiated Emission Measurement Software: EZ_EMC V1.1.4.2 | | | | | |

# 3. OPERATION OF EUT DURING TESTING

## 3.1.Operating Mode

The mode is used: **Transmitting mode**

Low Channel: 2402MHz
Middle Channel: 2440MHz
High Channel: 2480MHz

Its duty cycle setting is greater than 98%.

## 3.2.Configuration and peripherals

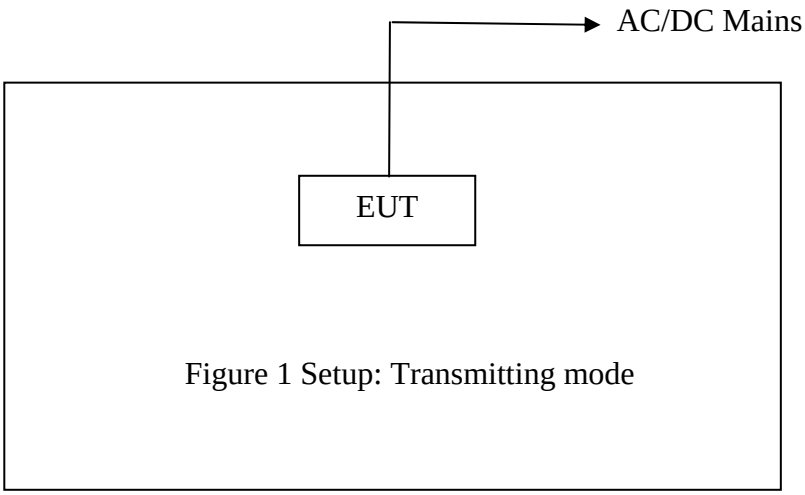


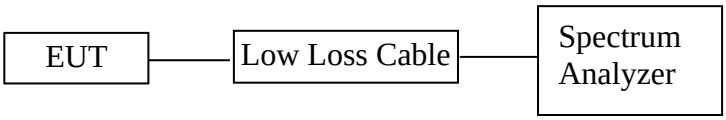

Figure 1 Setup: Transmitting mode

# 4. TEST PROCEDURES AND RESULTS

| FCC Rules | Description of Test | Result |
|---|---|---|
| Section 15.247(a)(2) | 6dB Bandwidth Test | Compliant |
| Section 15.247(b)(3) | Maximum Peak Output Power Test | Compliant |
| Section 15.247(e) | Power Spectral Density Test | Compliant |
| Section 15.247(d) | Band Edge Compliance Test | Compliant |
| Section 15.247(d)<br>Section 15.209 | Radiated Spurious Emission Test | Compliant |
| Section 15.207 | Power Line Conducted Emission Test | Compliant |
| Section 15.203 | Antenna Requirement | Compliant |

# 5. 6DB BANDWIDTH TEST

## 5.1.Block Diagram of Test Setup




## 5.2.The Requirement For Section 15.247(a)(2)

Section 15.247(a)(2): Systems using digital modulation techniques may operate in the 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

## 5.3.EUT Configuration on Measurement

The equipment is installed on the emission measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

## 5.4.Operating Condition of EUT

5.4.1.Setup the EUT and simulator as shown as Section 5.1.

5.4.2.Turn on the power of all equipment.

5.4.3.Let the EUT work in TX modes measure it. The transmit frequency are 2402-2480MHz. We select 2402MHz, 2440MHz, and 2480MHz TX frequency to transmit.

## 5.5.Test Procedure

5.5.1.The transmitter output was connected to the spectrum analyzer through a low loss cable.

5.5.2.Set RBW of spectrum analyzer to 100 kHz and VBW to 300 kHz.

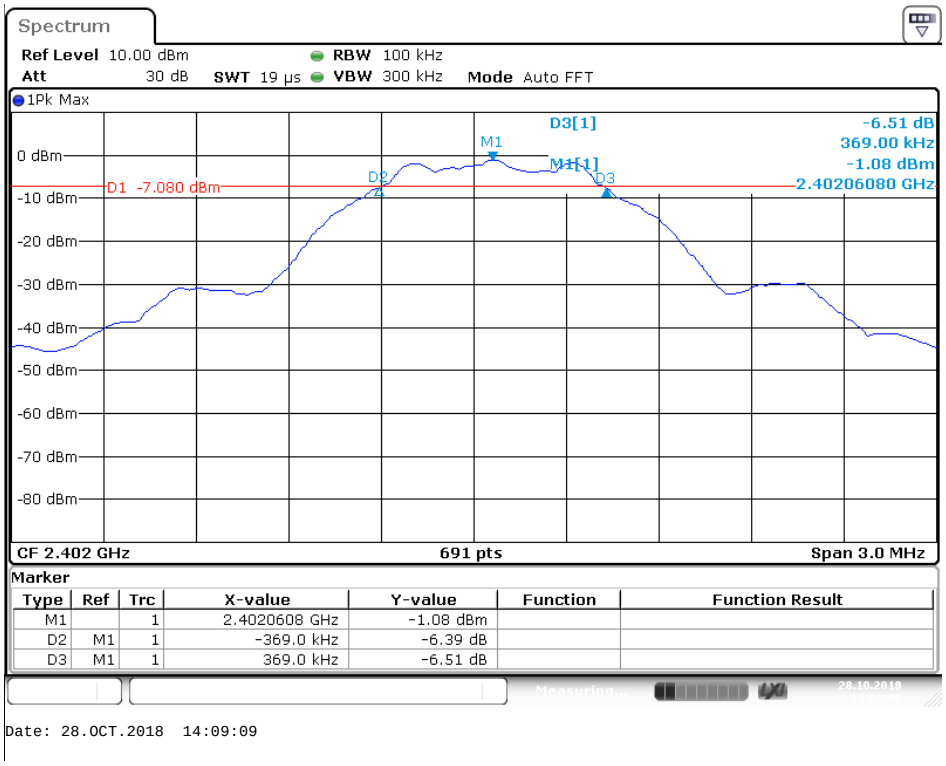
5.5.3.The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB.

## 5.6.Test Result

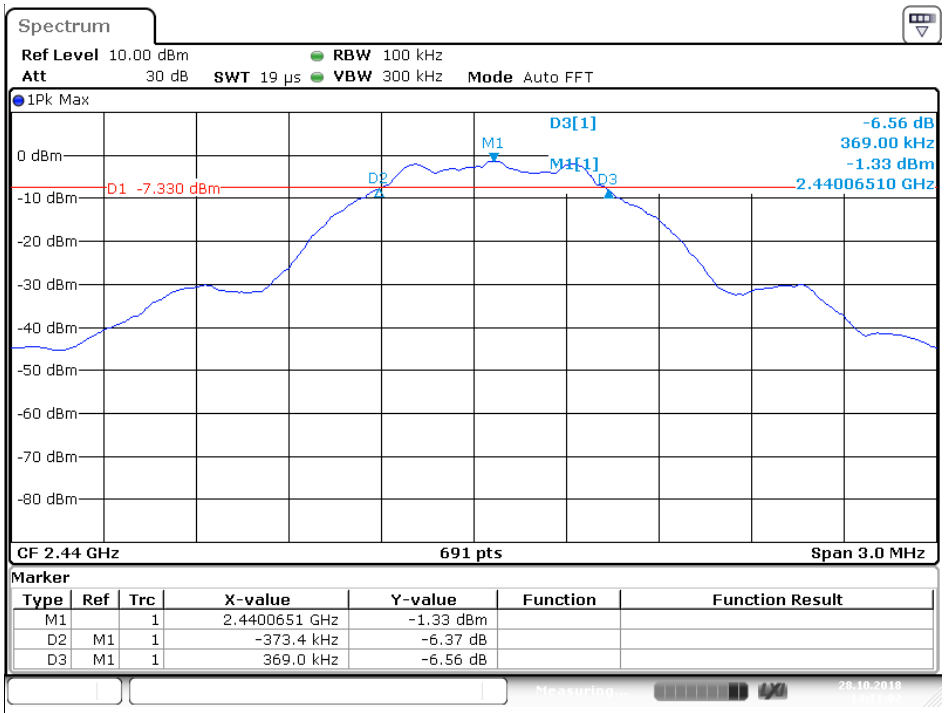
| Channel | Frequency (MHz) | 6 dB Bandwidth (MHz) | Minimum Limit(MHz) | Result |
|---|---|---|---|---|
| 0 | 2402 | 0.738 | 0.5 | Pass |
| 19 | 2440 | 0.742 | 0.5 | Pass |
| 39 | 2480 | 0.747 | 0.5 | Pass |

The spectrum analyzer plots are attached as below.

Channel 0

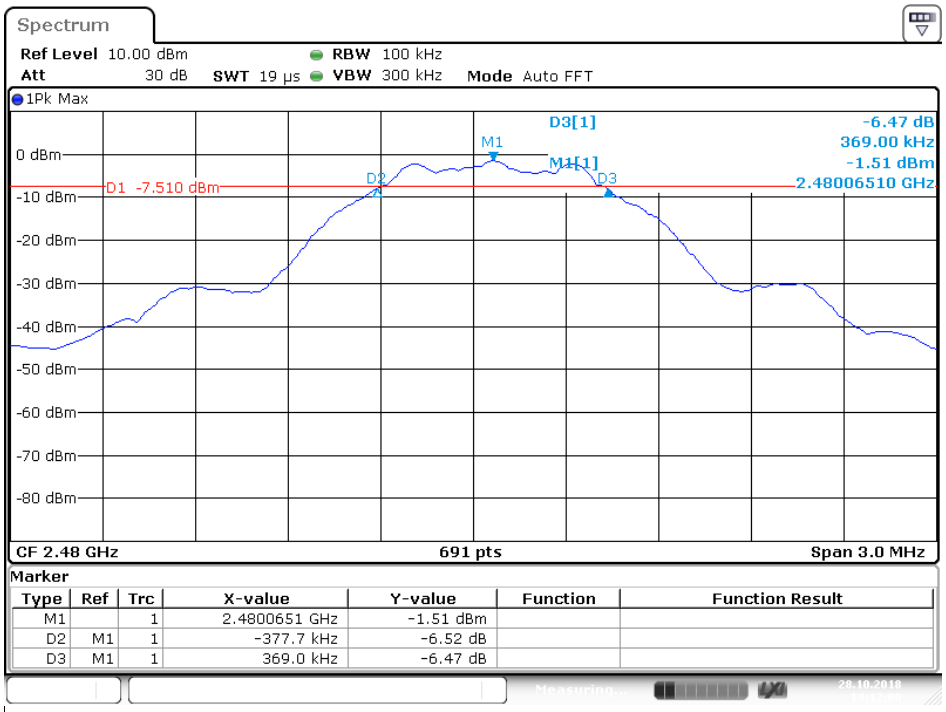


Channel 19




Date: 28.OCT.2018 14:11:03

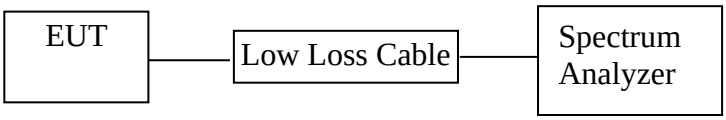
Channel 39




Date: 28.OCT.2018 14:12:01

# 6. MAXIMUM PEAK OUTPUT POWER TEST

## 6.1.Block Diagram of Test Setup




## 6.2.The Requirement For Section 15.247(b)(3)

Section 15.247(b)(3): For systems using digital modulation in the 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz bands: 1 Watt.

## 6.3.EUT Configuration on Measurement

The equipment are installed on the emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

## 6.4.Operating Condition of EUT

6.4.1.Setup the EUT and simulator as shown as Section 6.1.

6.4.2.Turn on the power of all equipment.

6.4.3.Let the EUT work in TX modes measure it. The transmit frequency are 2402-2480MHz. We select 2402MHz, 2440MHz, and 2480MHz TX frequency to transmit.

## 6.5.Test Procedure

6.5.1.The transmitter output was connected to the spectrum analyzer through a low loss cable.

6.5.2.Set RBW of spectrum analyzer to 3MHz and VBW to 10MHz.

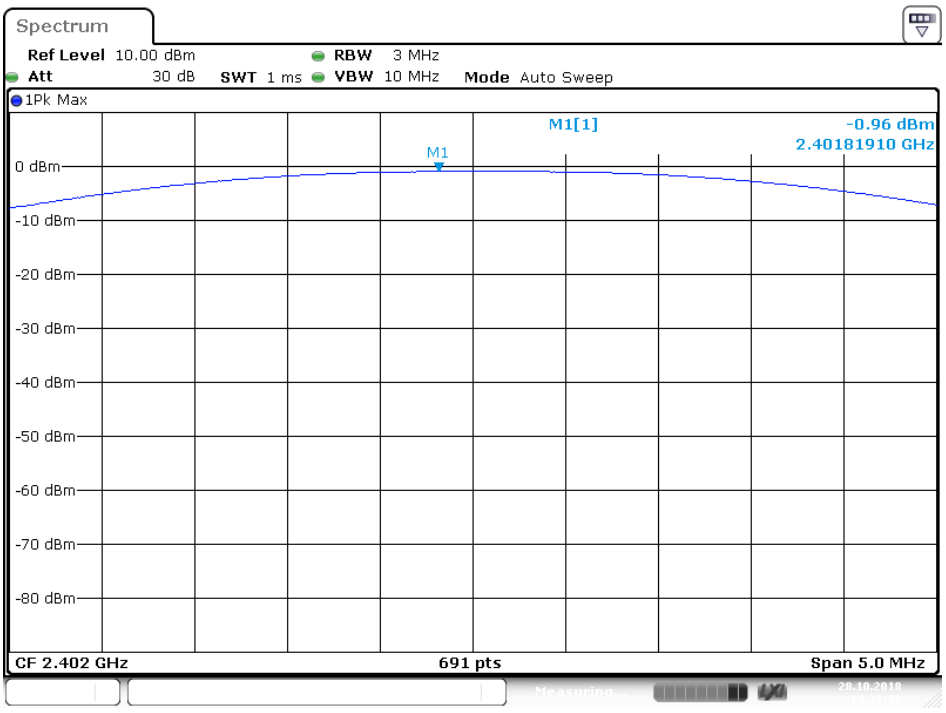
6.5.3.Measurement the maximum peak output power.

## 6.6.Test Result

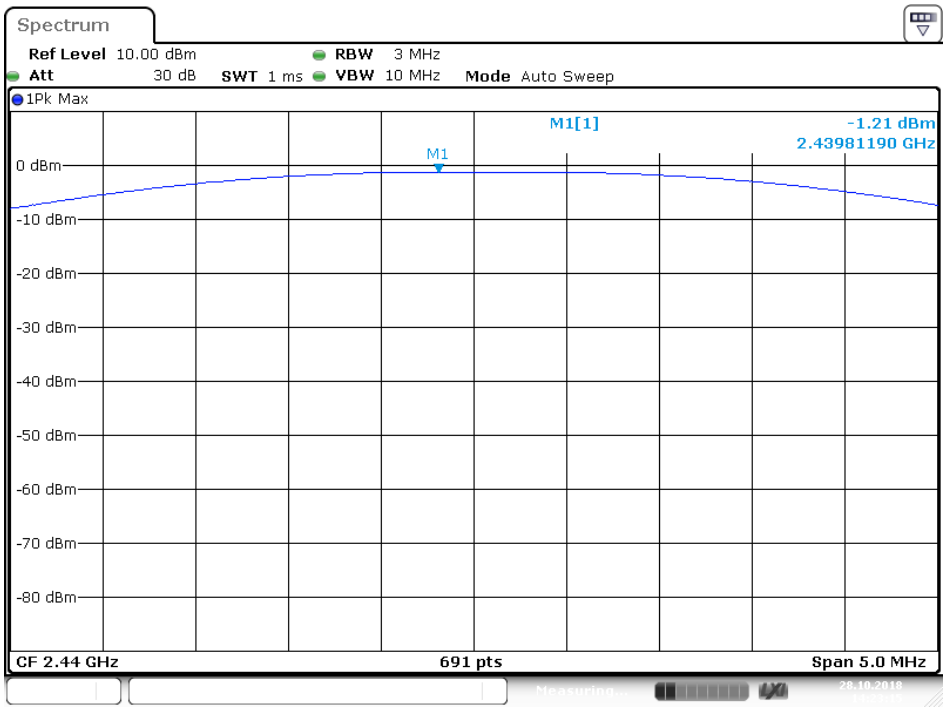
| Channel | Frequency (MHz) | Peak Power Output (dBm) | Peak Power Limit (dBm) | Result |
|---|---|---|---|---|
| 0 | 2402 | -0.96 | 30 | Pass |
| 19 | 2440 | -1.21 | 30 | Pass |
| 39 | 2480 | -1.40 | 30 | Pass |

The spectrum analyzer plots are attached as below.

Channel 0

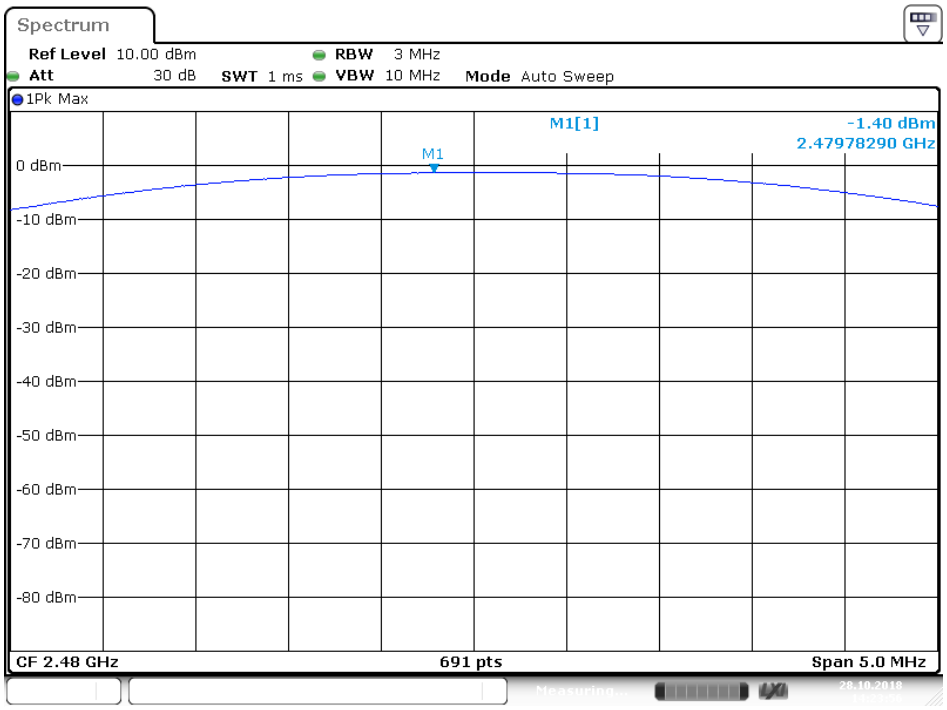


Channel 19




Date: 28.OCT.2018 14:23:16

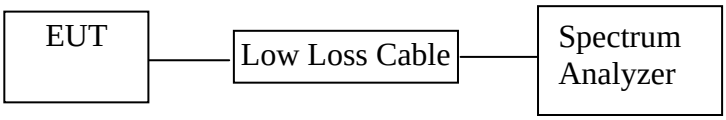
Channel 39




Date: 28.OCT.2018 14:23:57

# 7. POWER SPECTRAL DENSITY TEST

## 7.1.Block Diagram of Test Setup




## 7.2.The Requirement For Section 15.247(e)

Section 15.247(e): For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

## 7.3.EUT Configuration on Measurement

The equipment are installed on the emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

## 7.4.Operating Condition of EUT

7.4.1.Setup the EUT and simulator as shown as Section 7.1.

7.4.2.Turn on the power of all equipment.

7.4.3.Let the EUT work in TX modes measure it. The transmit frequency are 2402-2480MHz. We select 2402MHz, 2440MHz, and 2480MHz TX frequency to transmit.

## 7.5.Test Procedure

7.5.1.The transmitter output was connected to the spectrum analyzer through a low loss cable.

7.5.2.Measurement Procedure PKPSD:

7.5.3.This procedure must be used if maximum peak conducted output power was used to demonstrate compliance to the fundamental output power limit, and is optional if the maximum (average) conducted output power was used to demonstrate compliance.

1. Set analyzer center frequency to DTS Channel center frequency.
2. Set the span to 1.5 times the DTS Channel bandwidth.
3. Set the RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
4. Set the VBW ≥ 3 x RBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level.
10. If measured value exceeds limit, reduce RBW (no less than 3kHz) and repeat.

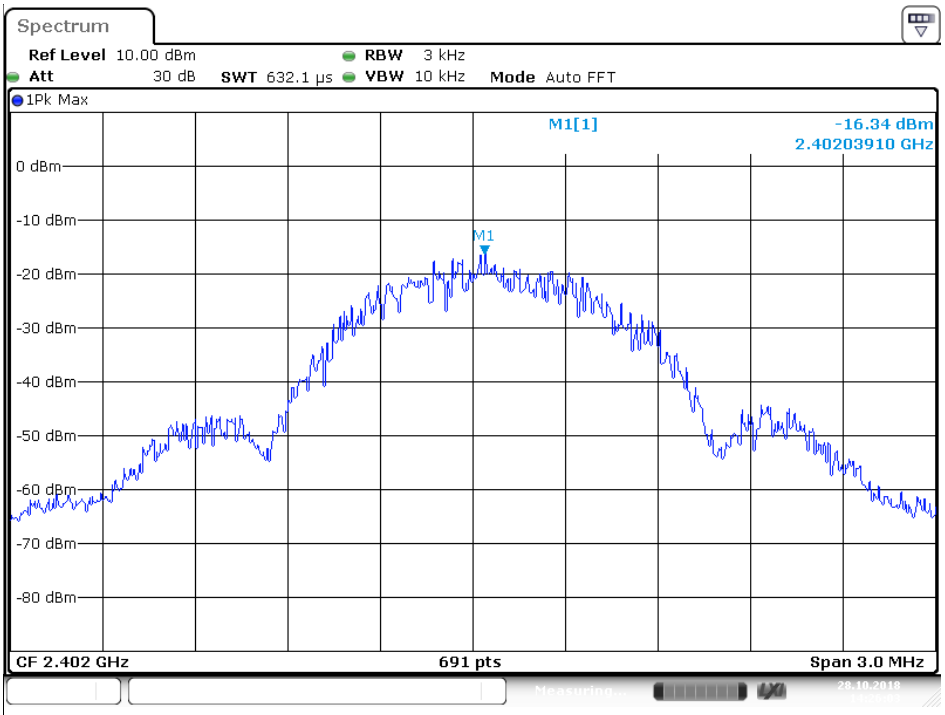
7.5.4.Measurement the maximum power spectral density.

## 7.6.Test Result

| Channel | Frequency (MHz ) | PSD (dBm/3KHz) | Limit (dBm/3KHz) | Result |
|---|---|---|---|---|
| 0 | 2402 | -16.34 | 8 | Pass |
| 19 | 2440 | -16.57 | 8 | Pass |
| 39 | 2480 | -16.83 | 8 | Pass |

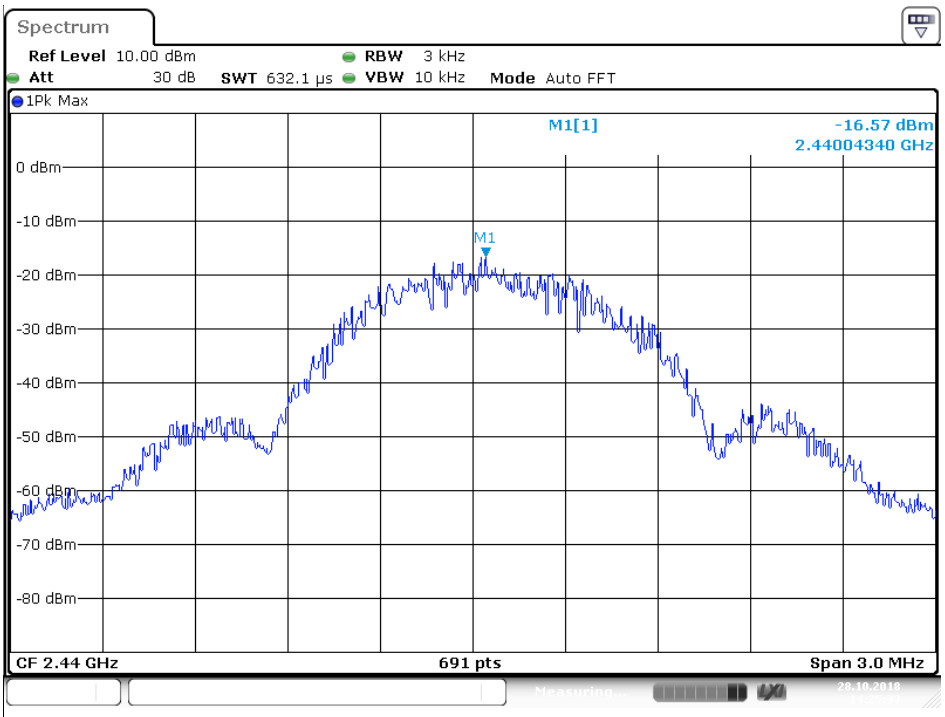
The spectrum analyzer plots are attached as below.

Channel 0



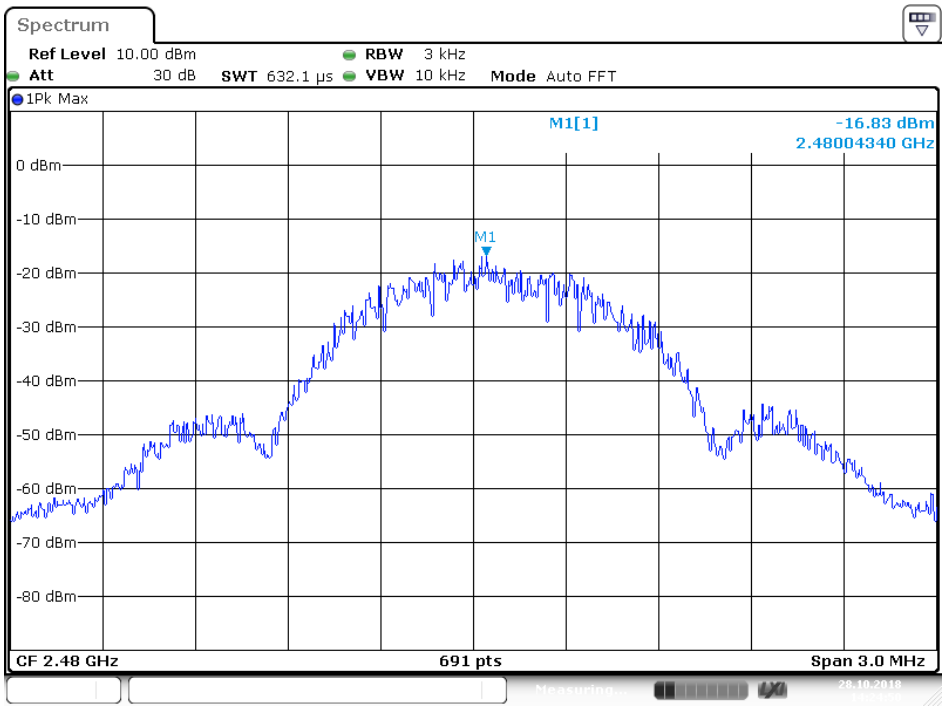

Date: 28.OCT.2018 14:26:03

Channel 19




Date: 28.OCT.2018 14:25:34

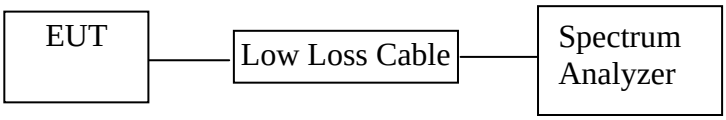
Channel 39




Date: 28.OCT.2018 14:24:51

# 8. BAND EDGE COMPLIANCE TEST

## 8.1.Block Diagram of Test Setup




## 8.2.The Requirement For Section 15.247(d)

Section 15.247(d): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).

## 8.3.EUT Configuration on Measurement

The equipment are installed on the emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

## 8.4.Operating Condition of EUT

8.4.1.Setup the EUT and simulator as shown as Section 8.1.

8.4.2.Turn on the power of all equipment.

8.4.3.Let the EUT work in TX modes measure it. The transmit frequency are 2402-2480MHz. We select 2402MHz, 2480MHz TX frequency to transmit.

## 8.5.Test Procedure

**Conducted Band Edge:**

8.5.1.The transmitter output was connected to the spectrum analyzer via a low loss cable.

8.5.2.Set RBW of spectrum analyzer to 100 kHz and VBW to 300 kHz.

**Radiate Band Edge:**

8.5.3.The EUT is placed on a turntable, which is 1.5m above the ground plane and worked at highest radiated power.

8.5.4.The turntable was rotated for 360 degrees to determine the position of maximum emission level.

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

8.5.6.Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:

8.5.7.RBW=1MHz, VBW=1MHz

8.5.8.The band edges was measured and recorded.

## 8.6.Test Result

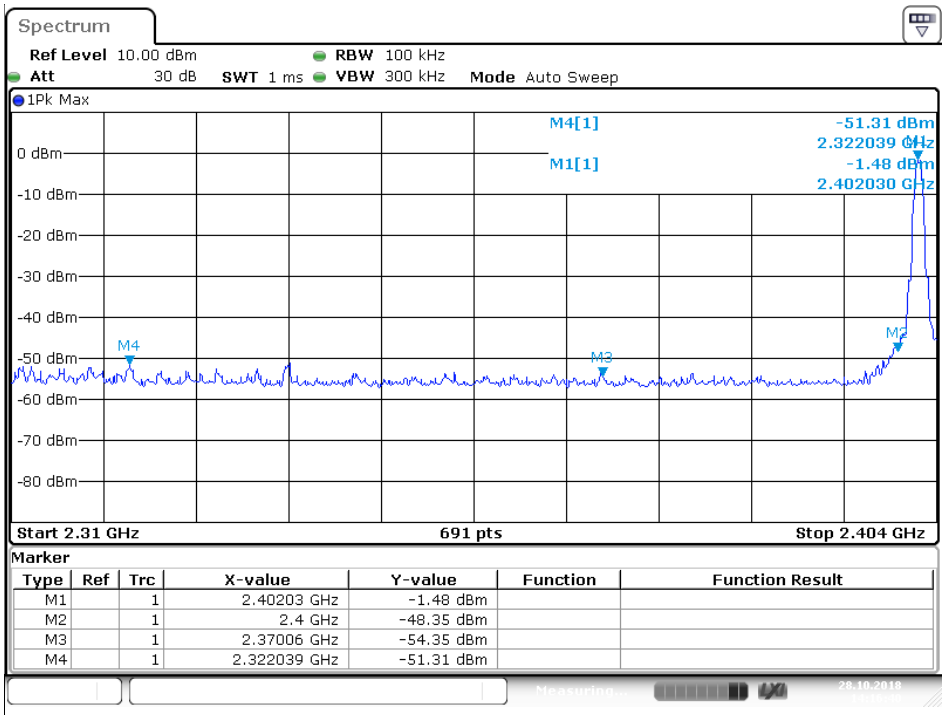
**Pass.**

**Conducted Band Edge Result**

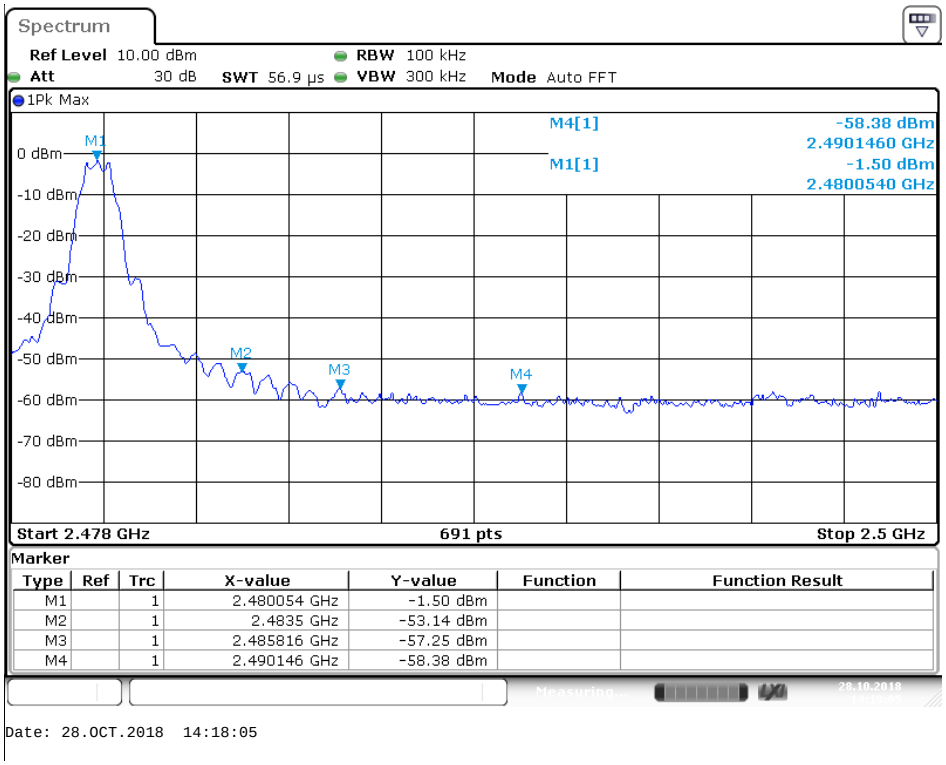
| Channel | Frequency | Delta peak to band emission | Limit(dBc) |
|---|---|---|---|
| 0 | 2402MHz | 46.87 | ＞20 |
| 39 | 2480MHz | 51.64 | ＞20 |

The spectrum analyzer plots are attached as below.

Channel 0




Channel 39

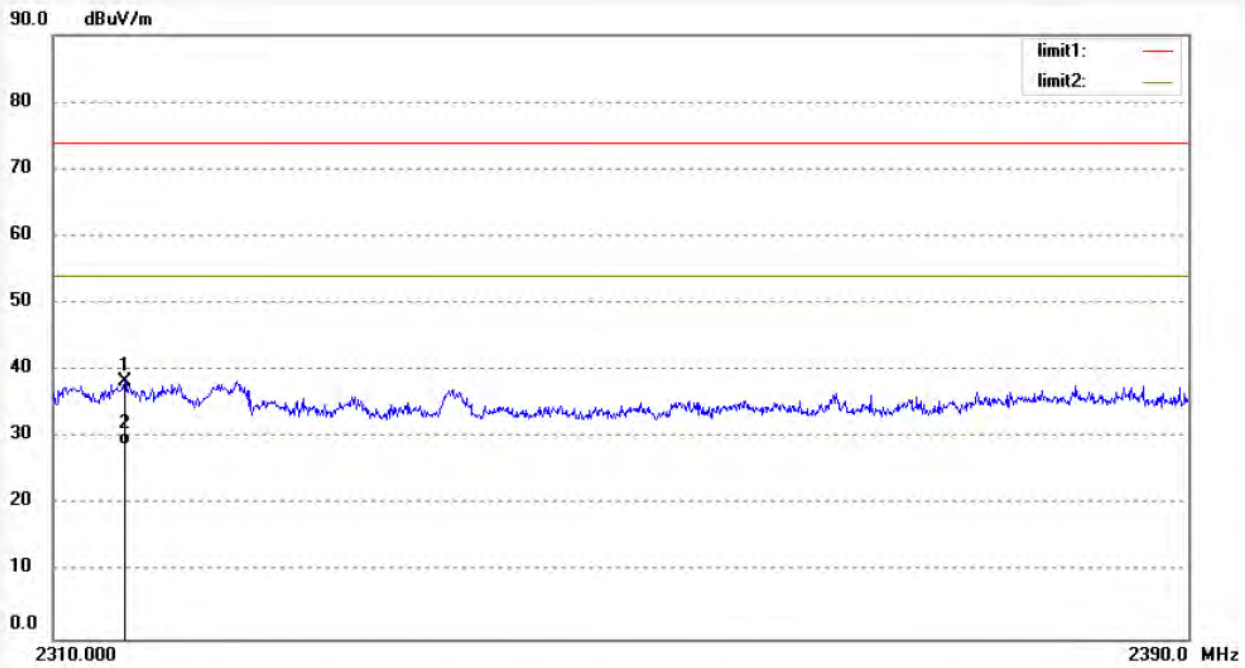


# Radiated Band Edge Result

ACCURATE TECHNOLOGY CO., LTD.
F1,Bldg,A,Changyuan New Material Port Keyuan Rd,
Science & Industry Park,Nanshan Shenzhen,P.R.China
Site: 2# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

| | |
|---|---|
| Job No.: LGW2018 #3021 | Polarization: Horizontal |
| Standard: FCC (Band Edge) | Power Source: DC 24V |
| Test item: Radiation Test | Date: 2018/10/28 |
| Temp.( C)/Hum.(%) 23 C / 48 % | Time: |
| EUT: Highly accurate flow monitor | Engineer Signature: WADE |
| Mode: TX 2402MHz | Distance: 3m |
| Model: FTMU 100 | |
| Manufacturer: Lindab AB | |

Note:

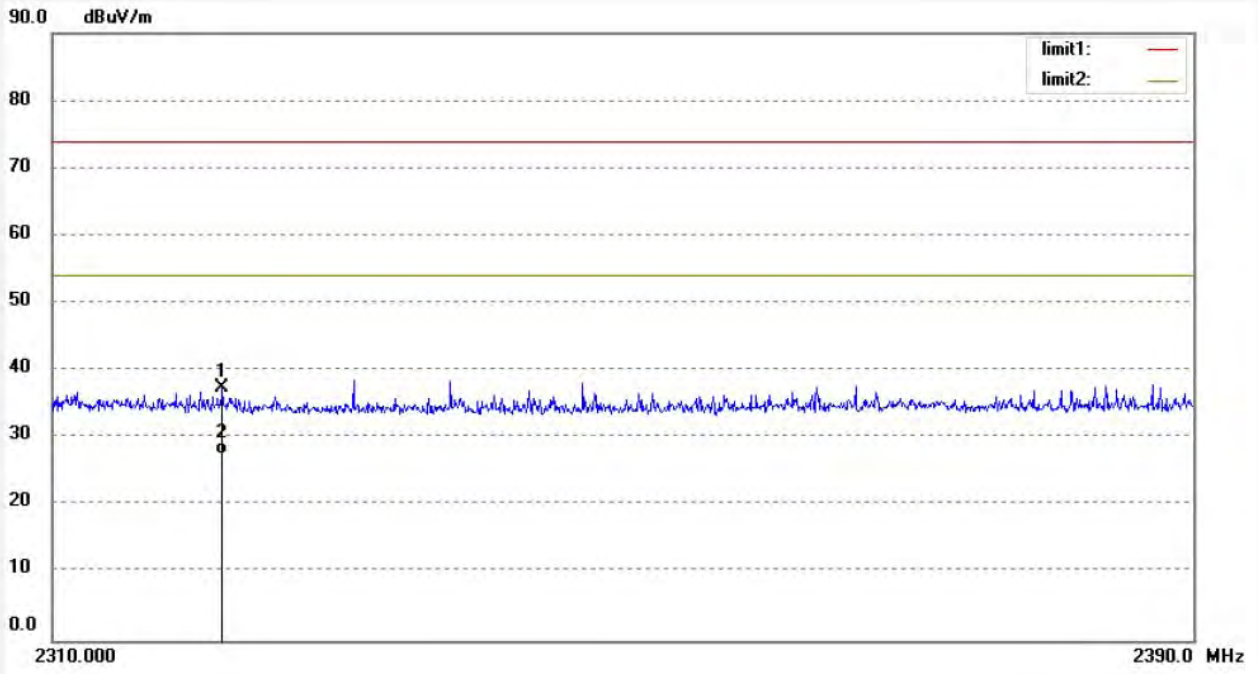



| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Degree (deg.) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2314.960 | 37.89 | 0.46 | 38.35 | 74.00 | -35.65 | peak | | | |
| 2 | 2314.960 | 28.50 | 0.46 | 28.96 | 54.00 | -25.04 | AVG | | | |

ACCURATE TECHNOLOGY CO., LTD.
F1,Bldg,A,Changyuan New Material Port Keyuan Rd,
Science & Industry Park,Nanshan Shenzhen,P.R.China
Site: 2# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

| | |
|---|---|
| Job No.: LGW2018 #3020 | Polarization: Vertical |
| Standard: FCC (Band Edge) | Power Source: DC 24V |
| Test item: Radiation Test | Date: 2018/10/28 |
| Temp.( C)/Hum.(%) 23 C / 48 % | Time: |
| EUT: Highly accurate flow monitor | Engineer Signature: WADE |
| Mode: TX 2402MHz | Distance: 3m |
| Model: FTMU 100 | |
| Manufacturer: Lindab AB | |

Note:




| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Degree (deg.) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2321.760 | 37.02 | 0.46 | 37.48 | 74.00 | -36.52 | peak | | | |
| 2 | 2321.760 | 27.10 | 0.46 | 27.56 | 54.00 | -26.44 | AVG | | | |

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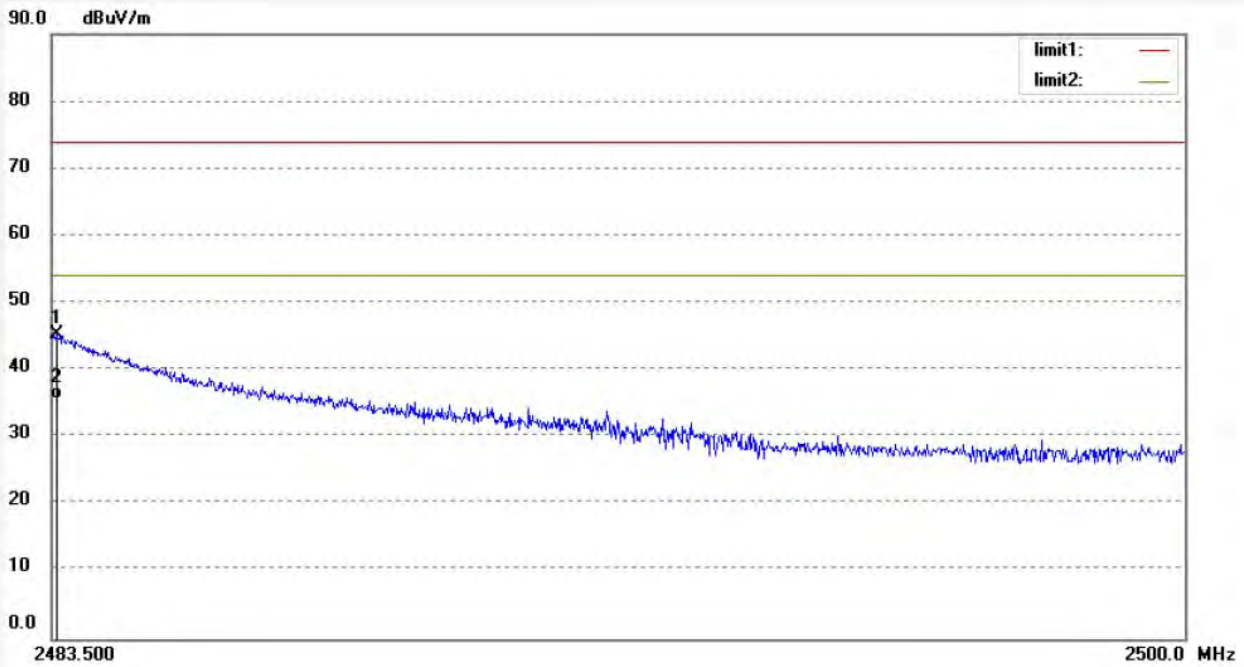
Science & Industry Park,Nanshan Shenzhen,P.R.China
Site: 2# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

| | |
|---|---|
| Job No.: LGW2018 #3026 | Polarization: Horizontal |
| Standard: FCC (Band Edge) | Power Source: DC 24V |
| Test item: Radiation Test | Date: 2018/10/28 |
| Temp.( C)/Hum.(%) 23 C / 48 % | Time: |
| EUT: Highly accurate flow monitor | Engineer Signature: WADE |
| Mode: TX 2480MHz | Distance: 3m |
| Model: FTMU 100 | |
| Manufacturer: Lindab AB | |

Note:




| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Degree (deg.) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2483.566 | 44.21 | 1.10 | 45.31 | 74.00 | -28.69 | peak | | | |
| 2 | 2483.566 | 34.58 | 1.10 | 35.68 | 54.00 | -18.32 | AVG | | | |

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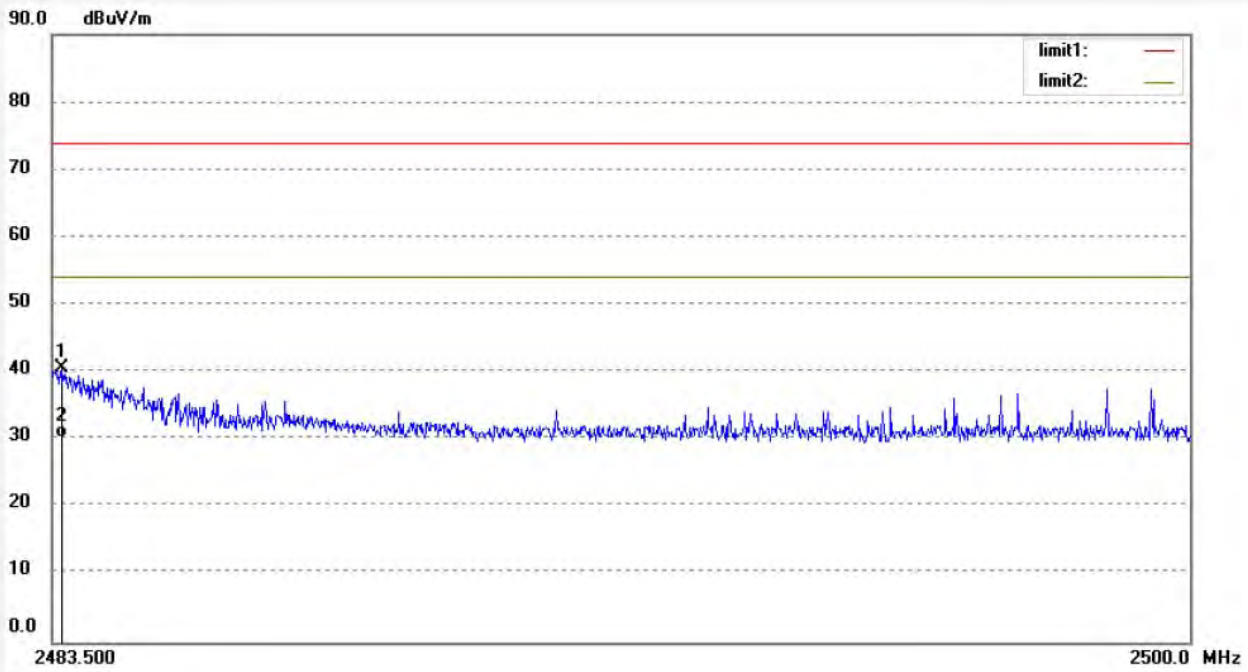
F1,Bldg,A,Changyuan New Material Port Keyuan Rd,
Science & Industry Park,Nanshan Shenzhen,P.R.China
Site: 2# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

| | |
|---|---|
| Job No.: LGW2018 #3027 | Polarization: Vertical |
| Standard: FCC (Band Edge) | Power Source: DC 24V |
| Test item: Radiation Test | Date: 2018/10/28 |
| Temp.( C)/Hum.(%) 23 C / 48 % | Time: |
| EUT: Highly accurate flow monitor | Engineer Signature: WADE |
| Mode: TX 2480MHz | Distance: 3m |
| Model: FTMU 100 | |
| Manufacturer: Lindab AB | |

Note:




| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Degree (deg.) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2483.648 | 39.53 | 1.10 | 40.63 | 74.00 | -33.37 | peak | | | |
| 2 | 2483.648 | 29.11 | 1.10 | 30.21 | 54.00 | -23.79 | AVG | | | |

Note:

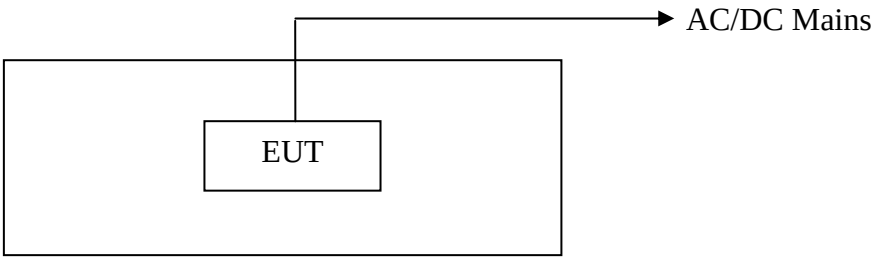
1. Emissions attenuated more than 20 dB below the permissible value are not reported.
2. The field strength is calculated by adding the antenna factor, high pass filter loss(if used) and cable loss, and subtracting the amplifier gain(if any)from the measured reading. The basic equation calculation is as follows:

   Result = Reading + Corrected Factor
3. We tested DC 24V and AC 24V, and recorded the worst case data(DC 24V)

# 9. RADIATED SPURIOUS EMISSION TEST

## 9.1.Block Diagram of Test Setup

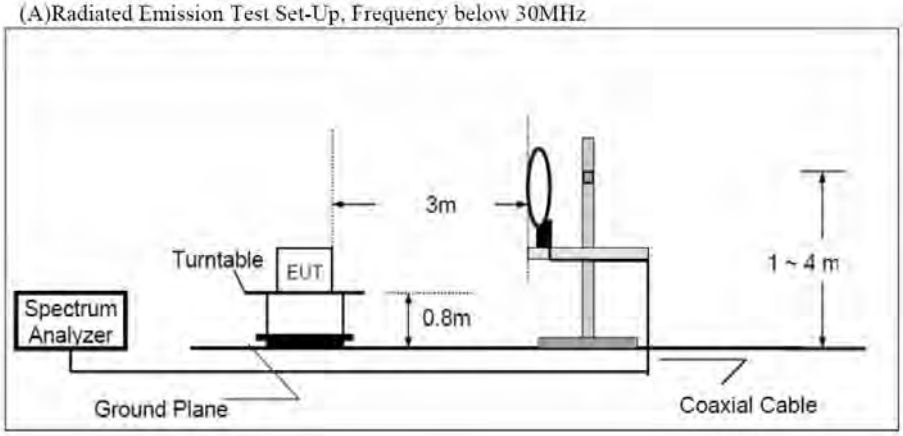
### 9.1.1.Block diagram of connection between the EUT and peripherals



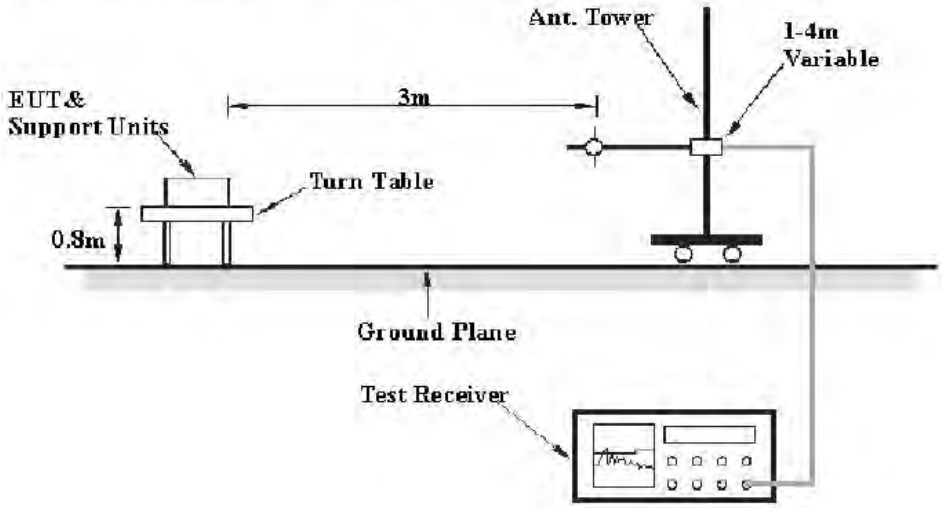

Setup: Transmitting mode

### 9.1.2.Semi-Anechoic Chamber Test Setup Diagram

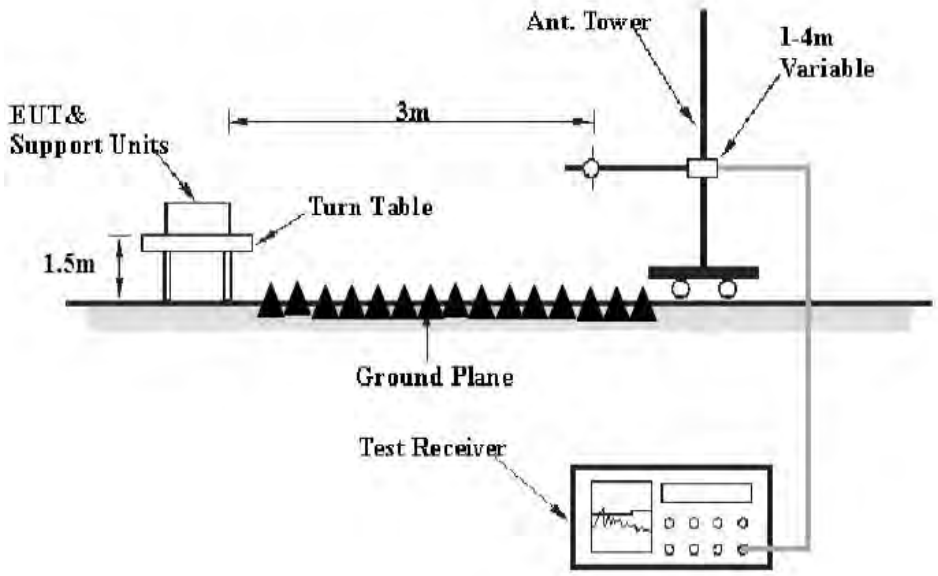
(A)Radiated Emission Test Set-Up, Frequency below 30MHz




(B)Radiated Emission Test Set-Up, Frequency 30MHz-1GHz



(C) Radiated Emission Test Set-Up. Frequency above 1GHz




## 9.2.The Limit For Section 15.247(d)

Section 15.247(d): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).

## 9.3. Restricted bands of operation

### 9.3.1.FCC Part 15.205 Restricted bands of operation

(a) Except as shown in paragraph (d) of this section, Only spurious emissions are permitted in any of the frequency bands listed below:

| MHz | MHz | MHz | GHz |
|---|---|---|---|
| 0.090-0.110 | 16.42-16.423 | 399.9-410 | 4.5-5.15 |
| [1]0.495-0.505 | 16.69475-16.69525 | 608-614 | 5.35-5.46 |
| 2.1735-2.1905 | 16.80425-16.80475 | 960-1240 | 7.25-7.75 |
| 4.125-4.128 | 25.5-25.67 | 1300-1427 | 8.025-8.5 |
| 4.17725-4.17775 | 37.5-38.25 | 1435-1626.5 | 9.0-9.2 |
| 4.20725-4.20775 | 73-74.6 | 1645.5-1646.5 | 9.3-9.5 |
| 6.215-6.218 | 74.8-75.2 | 1660-1710 | 10.6-12.7 |
| 6.26775-6.26825 | 108-121.94 | 1718.8-1722.2 | 13.25-13.4 |
| 6.31175-6.31225 | 123-138 | 2200-2300 | 14.47-14.5 |
| 8.291-8.294 | 149.9-150.05 | 2310-2390 | 15.35-16.2 |
| 8.362-8.366 | 156.52475-156.52525 | 2483.5-2500 | 17.7-21.4 |
| 8.37625-8.38675 | 156.7-156.9 | 2690-2900 | 22.01-23.12 |
| 8.41425-8.41475 | 162.0125-167.17 | 3260-3267 | 23.6-24.0 |
| 12.29-12.293 | 167.72-173.2 | 3332-3339 | 31.2-31.8 |
| 12.51975-12.52025 | 240-285 | 3345.8-3358 | 36.43-36.5 |
| 12.57675-12.57725 | 322-335.4 | 3600-4400 | ([2]) |
| 13.36-13.41 | | | |

[1]Until February 1, 1999, this restricted band shall be 0.490-0.510
[2]Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emission appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000MHz, Compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000MHz, compliance with the emission limits in Section15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

## 9.4.Configuration of EUT on Measurement

The equipment are installed on Radiated Emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

## 9.5. Operating Condition of EUT

9.5.1.Setup the EUT and simulator as shown as Section 9.1.

9.5.2.Turn on the power of all equipment.

9.5.3.Let the EUT work in TX modes measure it. The transmit frequency are 2402-2480MHz. We select 2402MHz, 2440MHz, and 2480MHz TX frequency to transmit.

## 9.6.Test Procedure

The EUT and its simulators are placed on a turntable, which is 0.8 meter high above ground(Below 1GHz). The EUT and its simulators are placed on a turntable, which is 1.5 meter high above ground(Above 1GHz). The turntable can rotate 360 degrees to determine the position of the maximum emission level. EUT is set 3.0 meters away from the receiving antenna, which is mounted on an antenna tower. The antenna can be moved up and down between 1.0 meter and 4 meters to find out the maximum emission level. Broadband antenna (calibrated bi-log antenna) is used as receiving antenna. Both horizontal and vertical polarizations of the antenna are set on measurement. In order to find the maximum emission levels, all of the EUT location must be manipulated according to ANSI C63.10:2013 on radiated emission measurement. This EUT was tested in 3 orthogonal positions and the worst case position data was reported.

The bandwidth of test receiver is set at 9 kHz in below 30MHz. and set at 120 kHz in 30-1000MHz, and 1MHz in above 1000MHz.

The final measurement in band 9-90 kHz, 110-490 kHz and above 1000MHz is performed with Average detector. Except those frequency bands mention above, the final measurement for frequencies below 1000MHz is performed with Quasi Peak detector.
The field strength is calculated by adding the antenna factor, and cable loss, and subtracting the amplifier gain from the measured reading.

## 9.7.Data Sample

| Frequency (MHz) | Reading (dBμv) | Factor (dB/m) | Result (dBμv/m) | Limit (dBμv/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|
| X.XX | 43.85 | -22.22 | 21.63 | 43.5 | -21.87 | QP |

Frequency(MHz) = Emission frequency in MHz
Reading(dBμv) = Uncorrected Analyzer/Receiver reading
Factor (dB/m) = Antenna factor + Cable Loss – Amplifier gain
Result(dBμv/m) = Reading(dBμv) + Factor(dB/m)
Limit (dBμv/m) = Limit stated in standard
Margin (dB) = Result(dBμv/m) - Limit (dBμv/m)
QP = Quasi-peak Reading

Calculation Formula:
Margin(dB) = Result (dBμV/m)–Limit(dBμV/m)
Result(dBμV/m)= Reading(dBμV)+ Factor(dB/m)

The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the limit.

## 9.8.Test Result

**Pass**.

The frequency range from 9kHz to 26.5GHz is checked.

Note: 1. Emissions attenuated more than 20 dB below the permissible value are not reported.

2. We tested DC 24V and AC 24V, and recorded the worst case data(DC 24V)

The spectrum analyzer plots are attached as below.

# 9kHz-30MHz test data

***ACCURATE TECHNOLOGY CO., LTD.***

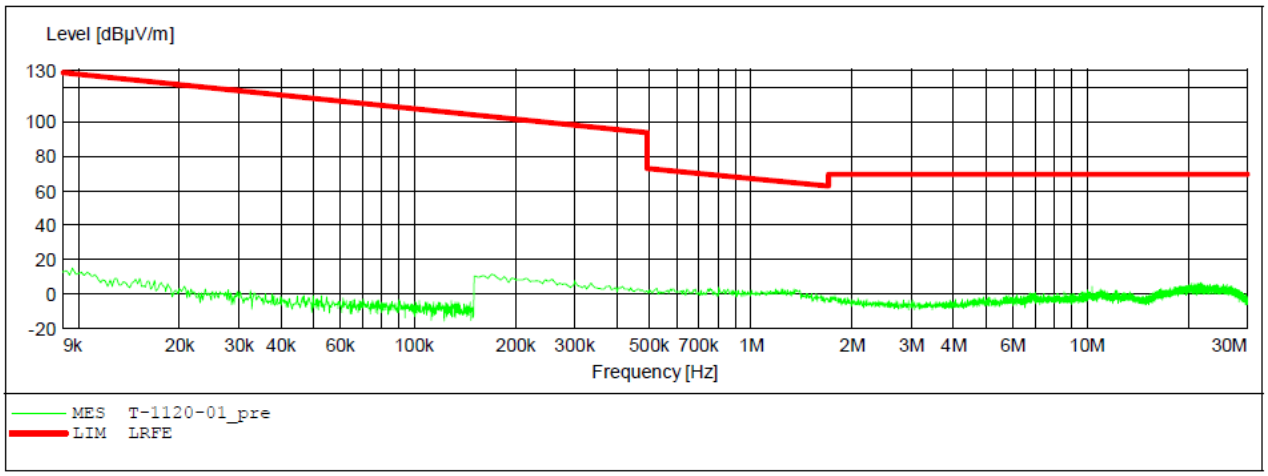
***FCC Part 15C 3M Radiated***

| | |
|---|---|
| EUT: | Highly accurate flow monitor M/N:FTMU 100 |
| Manufacturer: | Lindab AB |
| Operating Condition: | TX 2402MHz |
| Test Site: | 2# Chamber |
| Operator: | WADE |
| Test Specification: | DC 24V |
| Comment: | X |
| Start of Test: | 2018-11-20 / |

***SCAN TABLE: "LFRE Fin"***

Short Description: _SUB_STD_VTERM2 1.70

| Start Frequency | Stop Frequency | Step Width | Detector | Meas. Time | IF Bandw. | Transducer |
|---|---|---|---|---|---|---|
| 9.0 kHz | 150.0 kHz | 100.0 Hz | QuasiPeak | 1.0 s | 200 Hz | 1516M |
| 150.0 kHz | 30.0 MHz | 5.0 kHz | QuasiPeak | 1.0 s | 9 kHz | 1516M |



***ACCURATE TECHNOLOGY CO., LTD.***

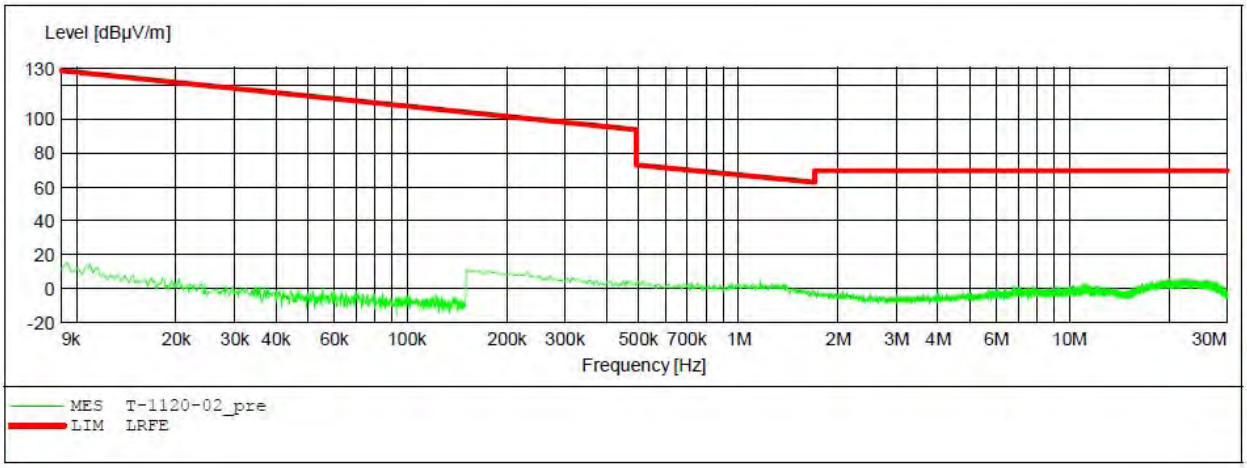
***FCC Part 15C 3M Radiated***

| | |
|---|---|
| EUT: | Highly accurate flow monitor M/N:FTMU 100 |
| Manufacturer: | Lindab AB |
| Operating Condition: | TX 2402MHz |
| Test Site: | 2# Chamber |
| Operator: | WADE |
| Test Specification: | DC 24V |
| Comment: | Y |
| Start of Test: | 2018-11-20 / |

***SCAN TABLE: "LFRE Fin"***

Short Description: _SUB_STD_VTERM2 1.70

| Start Frequency | Stop Frequency | Step Width | Detector | Meas. Time | IF Bandw. | Transducer |
|---|---|---|---|---|---|---|
| 9.0 kHz | 150.0 kHz | 100.0 Hz | QuasiPeak | 1.0 s | 200 Hz | 1516M |
| 150.0 kHz | 30.0 MHz | 5.0 kHz | QuasiPeak | 1.0 s | 9 kHz | 1516M |



***ACCURATE TECHNOLOGY CO., LTD.***

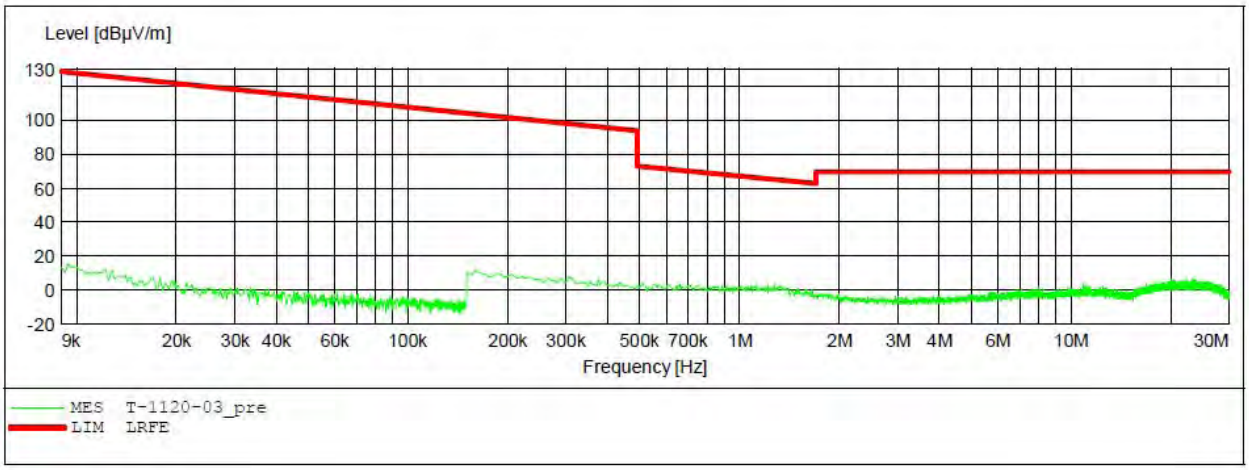
***FCC Part 15C 3M Radiated***

```
EUT:                    Highly accurate flow monitor  M/N:FTMU 100
Manufacturer:           Lindab AB
Operating Condition:    TX 2402MHz
Test Site:              2# Chamber
Operator:               WADE
Test Specification:     DC 24V
Comment:                Z
Start of Test:          2018-11-20 /
```

***SCAN TABLE: "LFRE Fin"***

Short Description: _SUB_STD_VTERM2 1.70

| Start Frequency | Stop Frequency | Step Width | Detector | Meas. Time | IF Bandw. | Transducer |
|---|---|---|---|---|---|---|
| 9.0 kHz | 150.0 kHz | 100.0 Hz | QuasiPeak | 1.0 s | 200 Hz | 1516M |
| 150.0 kHz | 30.0 MHz | 5.0 kHz | QuasiPeak | 1.0 s | 9 kHz | 1516M |



***ACCURATE TECHNOLOGY CO., LTD.***

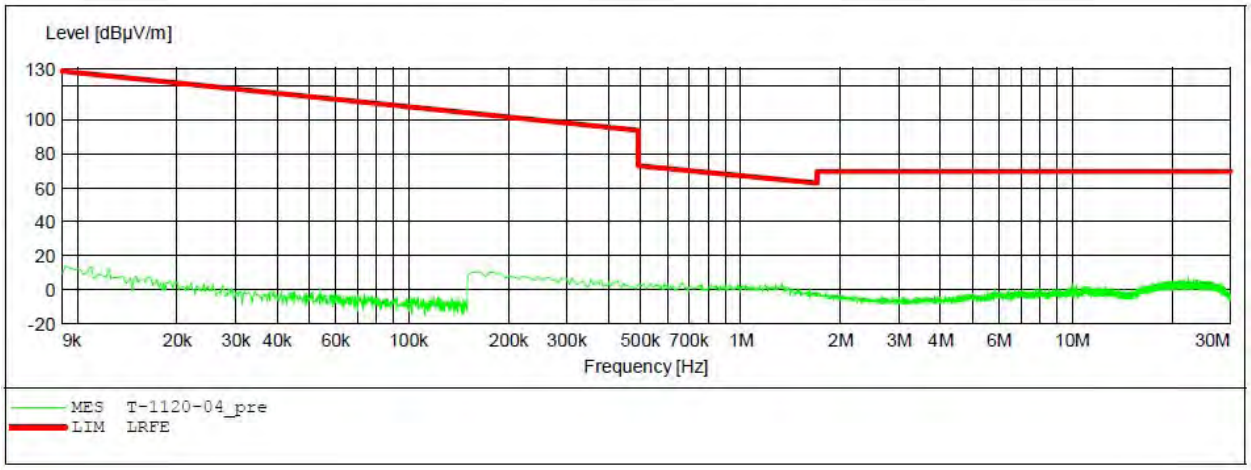
***FCC Part 15C 3M Radiated***

EUT: Highly accurate flow monitor M/N:FTMU 100
Manufacturer: Lindab AB
Operating Condition: TX 2440MHz
Test Site: 2# Chamber
Operator: WADE
Test Specification: DC 24V
Comment: X
Start of Test: 2018-11-20 /

***SCAN TABLE: "LFRE Fin"***

Short Description: _SUB_STD_VTERM2 1.70

| Start Frequency | Stop Frequency | Step Width | Detector | Meas. Time | IF Bandw. | Transducer |
|---|---|---|---|---|---|---|
| 9.0 kHz | 150.0 kHz | 100.0 Hz | QuasiPeak | 1.0 s | 200 Hz | 1516M |
| 150.0 kHz | 30.0 MHz | 5.0 kHz | QuasiPeak | 1.0 s | 9 kHz | 1516M |



***ACCURATE TECHNOLOGY CO., LTD.***

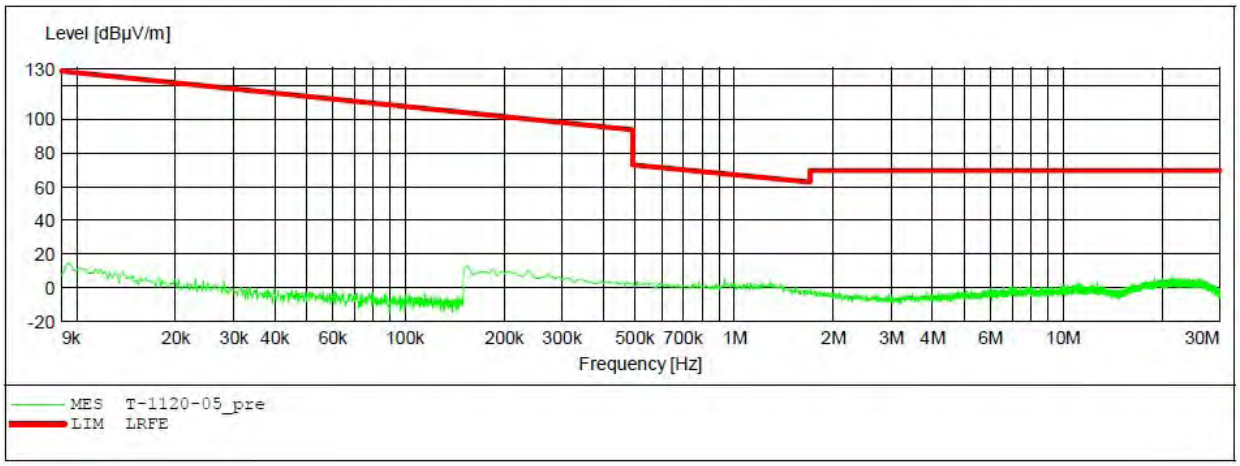
***FCC Part 15C 3M Radiated***

| | |
|---|---|
| EUT: | Highly accurate flow monitor M/N:FTMU 100 |
| Manufacturer: | Lindab AB |
| Operating Condition: | TX 2440MHz |
| Test Site: | 2# Chamber |
| Operator: | WADE |
| Test Specification: | DC 24V |
| Comment: | Y |
| Start of Test: | 2018-11-20 / |

***SCAN TABLE: "LFRE Fin"***

Short Description: _SUB_STD_VTERM2 1.70

| Start Frequency | Stop Frequency | Step Width | Detector | Meas. Time | IF Bandw. | Transducer |
|---|---|---|---|---|---|---|
| 9.0 kHz | 150.0 kHz | 100.0 Hz | QuasiPeak | 1.0 s | 200 Hz | 1516M |
| 150.0 kHz | 30.0 MHz | 5.0 kHz | QuasiPeak | 1.0 s | 9 kHz | 1516M |



*ACCURATE TECHNOLOGY CO., LTD.*

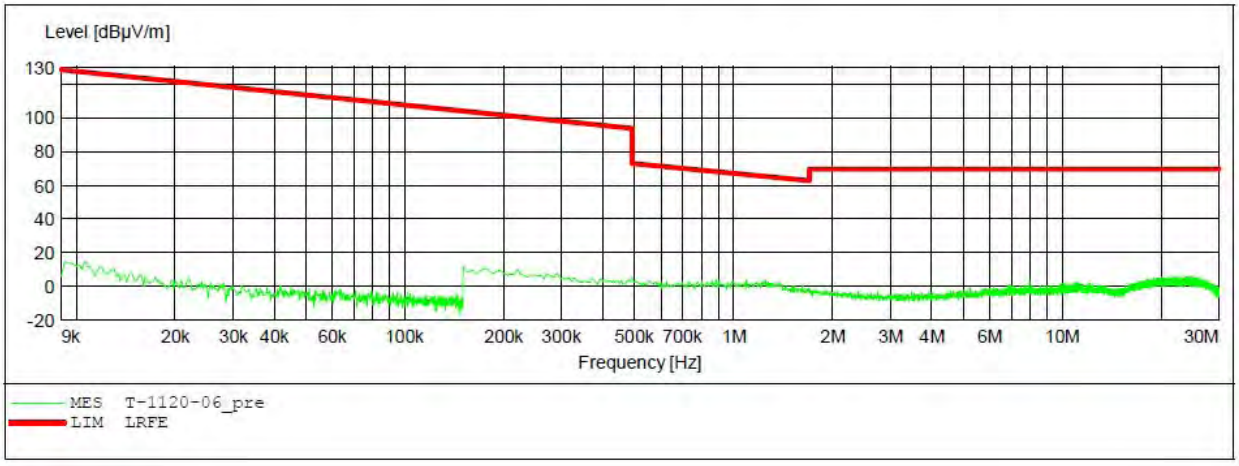
*FCC Part 15C 3M Radiated*

| | |
|---|---|
| EUT: | Highly accurate flow monitor M/N:FTMU 100 |
| Manufacturer: | Lindab AB |
| Operating Condition: | TX 2440MHz |
| Test Site: | 2# Chamber |
| Operator: | WADE |
| Test Specification: | DC 24V |
| Comment: | Z |
| Start of Test: | 2018-11-20 / |

*SCAN TABLE: "LFRE Fin"*

Short Description: _SUB_STD_VTERM2 1.70

| Start Frequency | Stop Frequency | Step Width | Detector | Meas. Time | IF Bandw. | Transducer |
|---|---|---|---|---|---|---|
| 9.0 kHz | 150.0 kHz | 100.0 Hz | QuasiPeak | 1.0 s | 200 Hz | 1516M |
| 150.0 kHz | 30.0 MHz | 5.0 kHz | QuasiPeak | 1.0 s | 9 kHz | 1516M |



***ACCURATE TECHNOLOGY CO., LTD.***

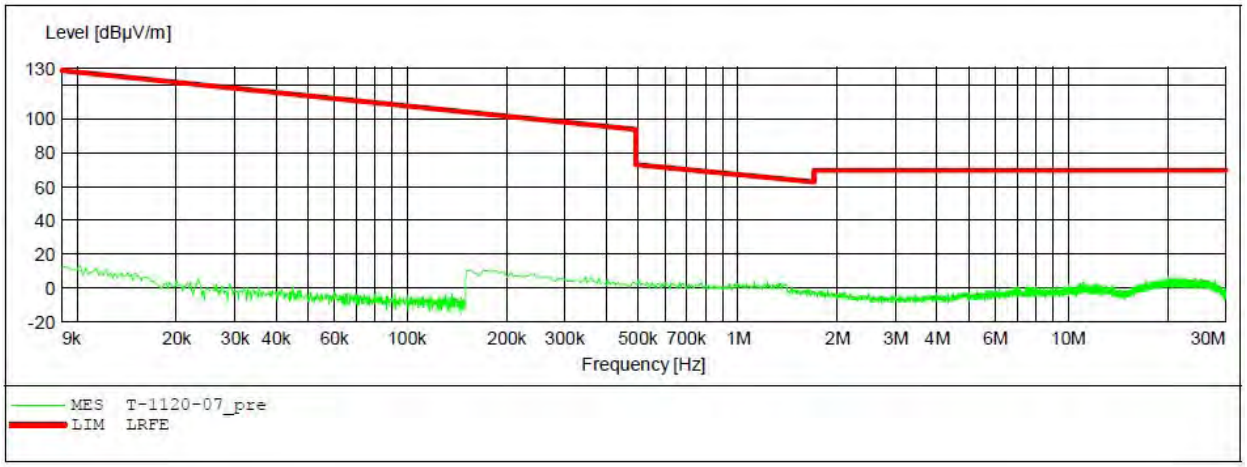
***FCC Part 15C 3M Radiated***

| | |
|---|---|
| EUT: | Highly accurate flow monitor M/N:FTMU 100 |
| Manufacturer: | Lindab AB |
| Operating Condition: | TX 2480MHz |
| Test Site: | 2# Chamber |
| Operator: | WADE |
| Test Specification: | DC 24V |
| Comment: | X |
| Start of Test: | 2018-11-20 / |

***SCAN TABLE: "LFRE Fin"***

Short Description: _SUB_STD_VTERM2 1.70

| Start Frequency | Stop Frequency | Step Width | Detector | Meas. Time | IF Bandw. | Transducer |
|---|---|---|---|---|---|---|
| 9.0 kHz | 150.0 kHz | 100.0 Hz | QuasiPeak | 1.0 s | 200 Hz | 1516M |
| 150.0 kHz | 30.0 MHz | 5.0 kHz | QuasiPeak | 1.0 s | 9 kHz | 1516M |



***ACCURATE TECHNOLOGY CO., LTD.***

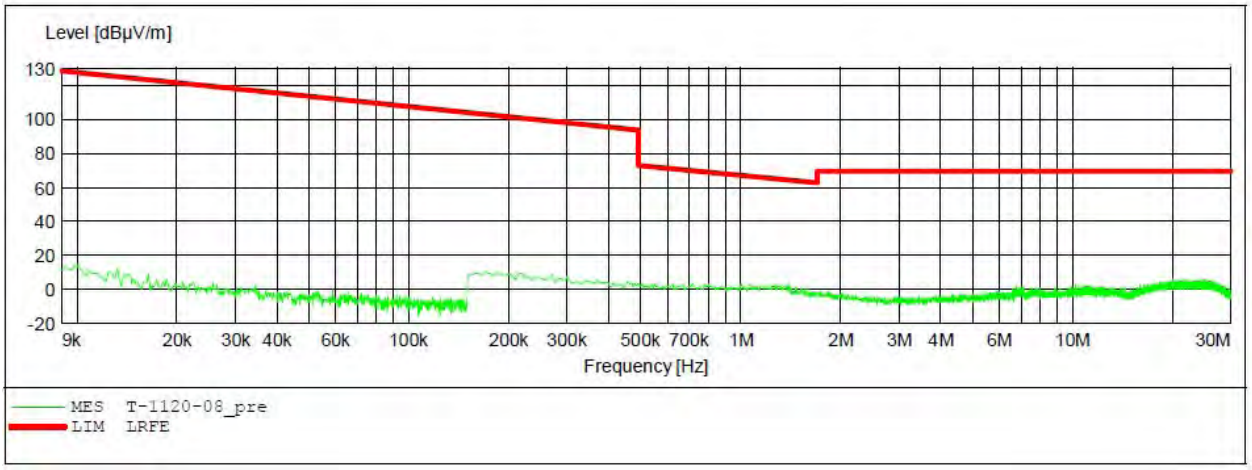
***FCC Part 15C 3M Radiated***

| | |
|---|---|
| EUT: | Highly accurate flow monitor M/N:FTMU 100 |
| Manufacturer: | Lindab AB |
| Operating Condition: | TX 2480MHz |
| Test Site: | 2# Chamber |
| Operator: | WADE |
| Test Specification: | DC 24V |
| Comment: | Y |
| Start of Test: | 2018-11-20 / |

***SCAN TABLE: "LFRE Fin"***

Short Description: _SUB_STD_VTERM2 1.70

| Start Frequency | Stop Frequency | Step Width | Detector | Meas. Time | IF Bandw. | Transducer |
|---|---|---|---|---|---|---|
| 9.0 kHz | 150.0 kHz | 100.0 Hz | QuasiPeak | 1.0 s | 200 Hz | 1516M |
| 150.0 kHz | 30.0 MHz | 5.0 kHz | QuasiPeak | 1.0 s | 9 kHz | 1516M |



*ACCURATE TECHNOLOGY CO., LTD.*

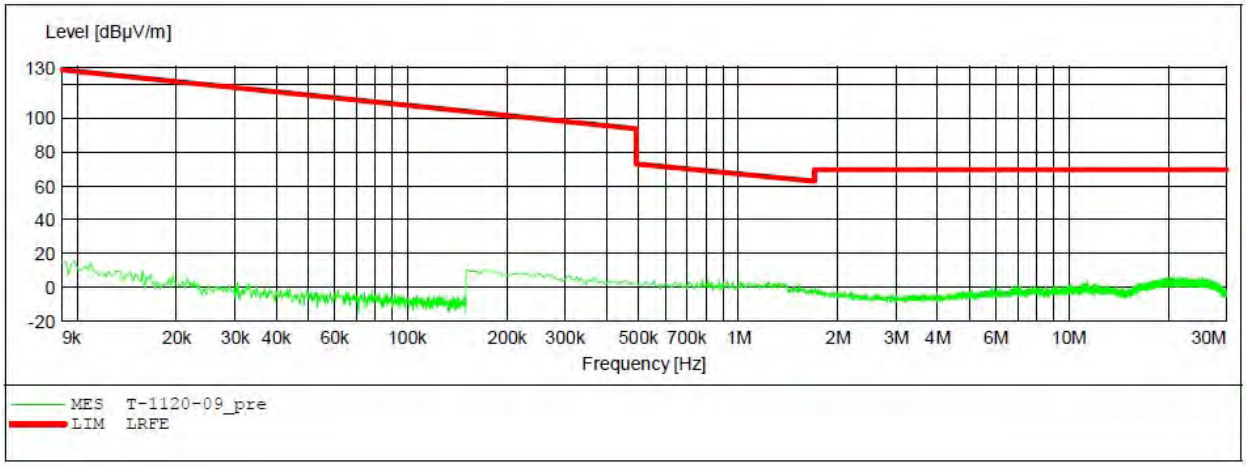
*FCC Part 15C 3M Radiated*

EUT: Highly accurate flow monitor M/N:FTMU 100
Manufacturer: Lindab AB
Operating Condition: TX 2480MHz
Test Site: 2# Chamber
Operator: WADE
Test Specification: DC 24V
Comment: Z
Start of Test: 2018-11-20 /

***SCAN TABLE: "LFRE Fin"***

Short Description: _SUB_STD_VTERM2 1.70

| Start Frequency | Stop Frequency | Step Width | Detector | Meas. Time | IF Bandw. | Transducer |
|---|---|---|---|---|---|---|
| 9.0 kHz | 150.0 kHz | 100.0 Hz | QuasiPeak | 1.0 s | 200 Hz | 1516M |
| 150.0 kHz | 30.0 MHz | 5.0 kHz | QuasiPeak | 1.0 s | 9 kHz | 1516M |

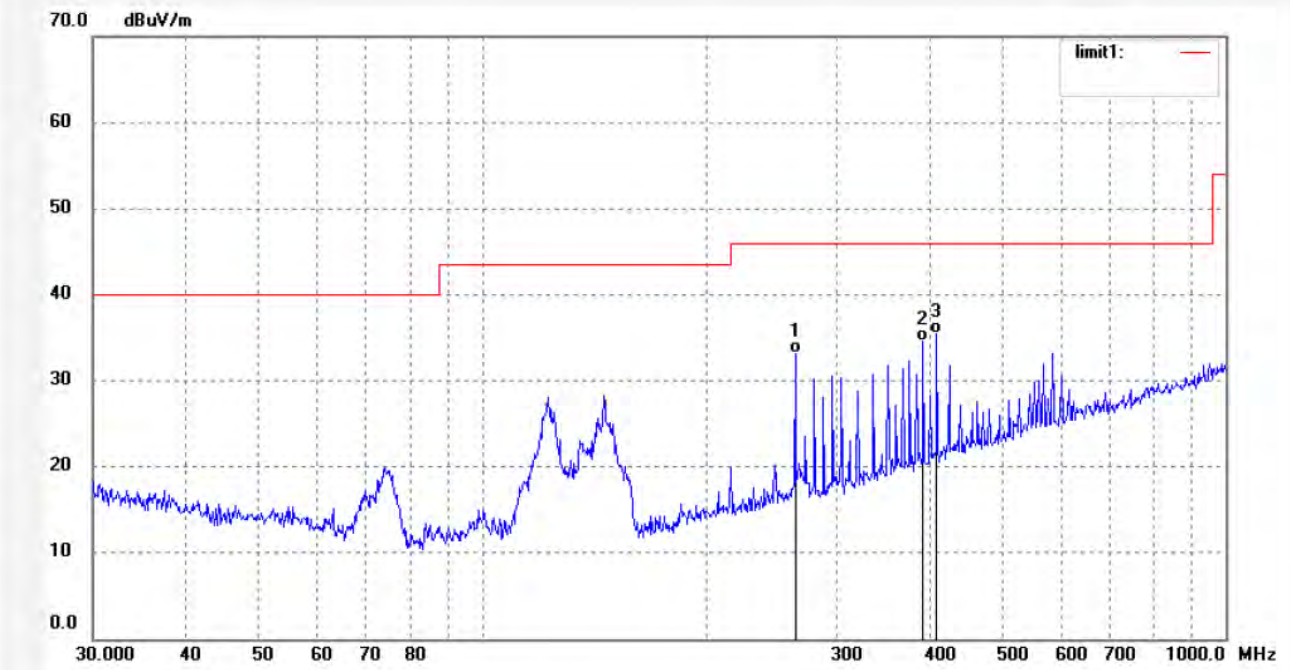


## 30MHz-1000MHz test data

ACCURATE TECHNOLOGY CO., LTD.
F1,Bldg,A,Changyuan New Material Port Keyuan Rd,
Science & Industry Park,Nanshan Shenzhen,P.R.China
Site: 2# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

| | |
|---|---|
| Job No.: LGW2018 #3050 | Polarization: Horizontal |
| Standard: FCC Part 15C 3M Radiated | Power Source: DC 24V |
| Test item: Radiation Test | Date: 2018/10/28 |
| Temp.( C)/Hum.(%) 23 C / 48 % | Time: |
| EUT: Highly accurate flow monitor | Engineer Signature: WADE |
| Mode: TX 2402MHz | Distance: 3m |
| Model: FTMU 100 | |
| Manufacturer: Lindab AB | |

Note:




| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Degree (deg.) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 263.8190 | 43.34 | -10.26 | 33.08 | 46.00 | -12.92 | QP | | | |
| 2 | 392.0951 | 41.33 | -6.77 | 34.56 | 46.00 | -11.44 | QP | | | |
| 3 | 408.9460 | 41.73 | -6.21 | 35.52 | 46.00 | -10.48 | QP | | | |

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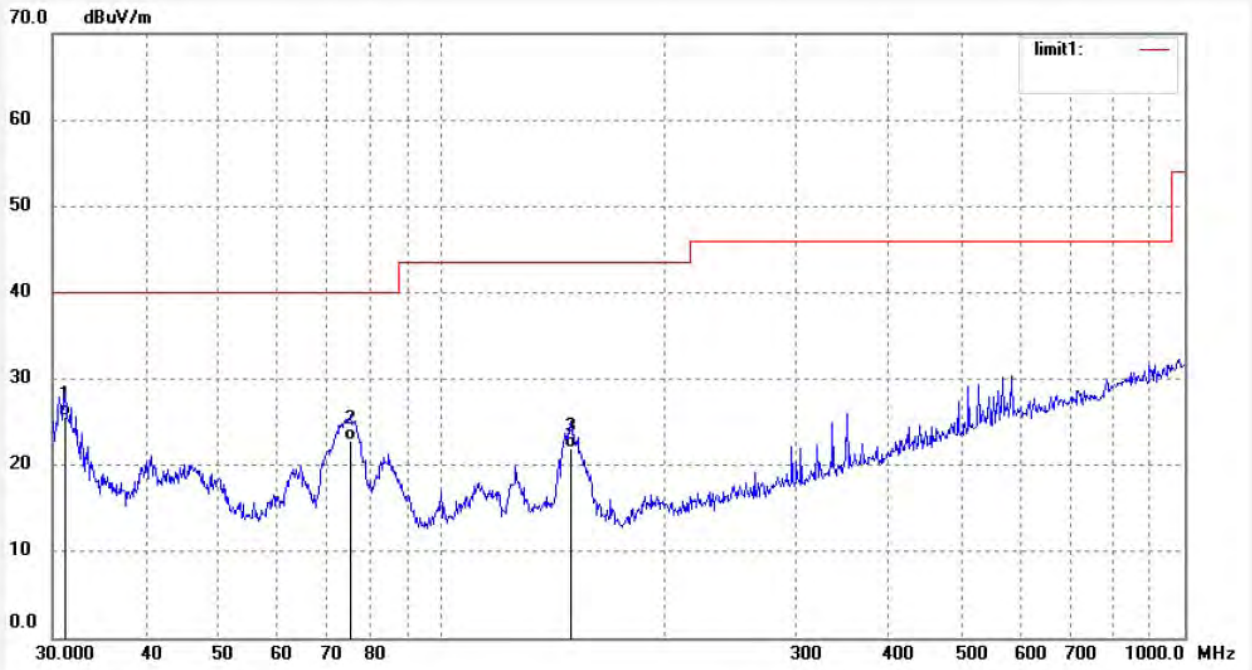
F1,Bldg,A,Changyuan New Material Port Keyuan Rd,
Science & Industry Park,Nanshan Shenzhen,P.R.China
Site: 2# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

| | |
|---|---|
| Job No.: LGW2018 #3051 | Polarization: Vertical |
| Standard: FCC Part 15C 3M Radiated | Power Source: DC 24V |
| Test item: Radiation Test | Date: 2018/10/28 |
| Temp.( C)/Hum.(%) 23 C / 48 % | Time: |
| EUT: Highly accurate flow monitor | Engineer Signature: WADE |
| Mode: TX 2402MHz | Distance: 3m |
| Model: FTMU 100 | |
| Manufacturer: Lindab AB | |

Note:




| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Degree (deg.) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 31.1798 | 34.97 | -9.27 | 25.70 | 40.00 | -14.30 | QP | | | |
| 2 | 75.4463 | 39.56 | -16.69 | 22.87 | 40.00 | -17.13 | QP | | | |
| 3 | 149.4857 | 37.10 | -15.05 | 22.05 | 43.50 | -21.45 | QP | | | |

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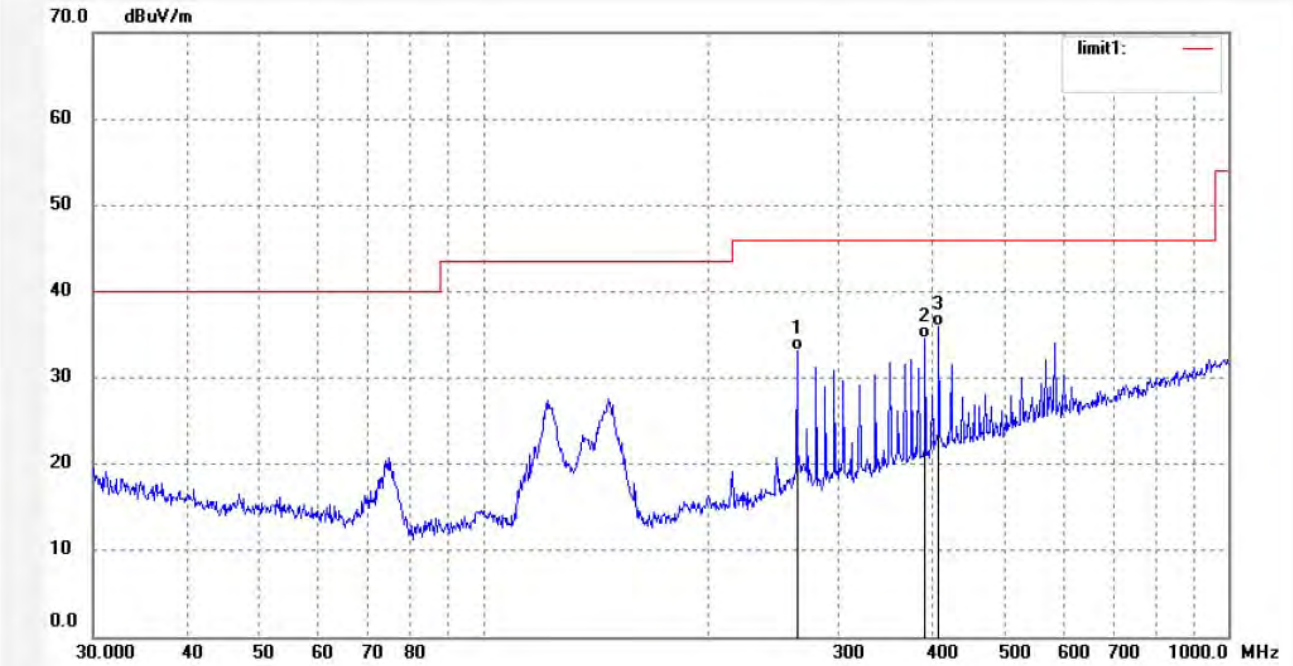
F1,Bldg,A,Changyuan New Material Port Keyuan Rd,
Science & Industry Park,Nanshan Shenzhen,P.R.China
Site: 2# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

| | |
|---|---|
| Job No.: LGW2018 #3053 | Polarization: Horizontal |
| Standard: FCC Part 15C 3M Radiated | Power Source: DC 24V |
| Test item: Radiation Test | Date: 2018/10/28 |
| Temp.( C)/Hum.(%) 23 C / 48 % | Time: |
| EUT: Highly accurate flow monitor | Engineer Signature: WADE |
| Mode: TX 2440MHz | Distance: 3m |
| Model: FTMU 100 | |
| Manufacturer: Lindab AB | |

Note:




| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Degree (deg.) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 263.8190 | 43.36 | -10.26 | 33.10 | 46.00 | -12.90 | QP | | | |
| 2 | 392.0951 | 41.31 | -6.77 | 34.54 | 46.00 | -11.46 | QP | | | |
| 3 | 408.9460 | 42.25 | -6.21 | 36.04 | 46.00 | -9.96 | QP | | | |

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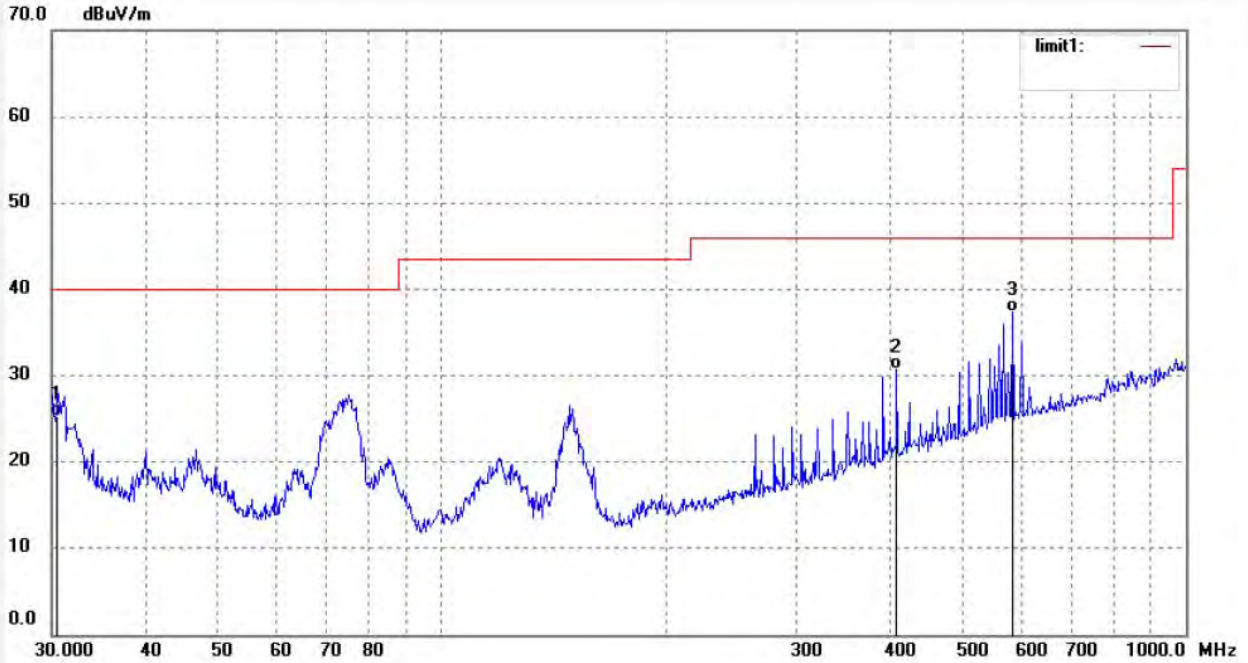
F1,Bldg,A,Changyuan New Material Port Keyuan Rd,
Science & Industry Park,Nanshan Shenzhen,P.R.China
Site: 2# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

| | |
|---|---|
| Job No.: LGW2018 #3052 | Polarization: Vertical |
| Standard: FCC Part 15C 3M Radiated | Power Source: DC 24V |
| Test item: Radiation Test | Date: 2018/10/28 |
| Temp.( C)/Hum.(%) 23 C / 48 % | Time: |
| EUT: Highly accurate flow monitor | Engineer Signature: WADE |
| Mode: TX 2440MHz | Distance: 3m |
| Model: FTMU 100 | |
| Manufacturer: Lindab AB | |

Note:




| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Degree (deg.) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30.5305 | 34.29 | -9.08 | 25.21 | 40.00 | -14.79 | QP | | | |
| 2 | 408.9460 | 36.92 | -6.21 | 30.71 | 46.00 | -15.29 | QP | | | |
| 3 | 584.7894 | 39.86 | -2.52 | 37.34 | 46.00 | -8.66 | QP | | | |

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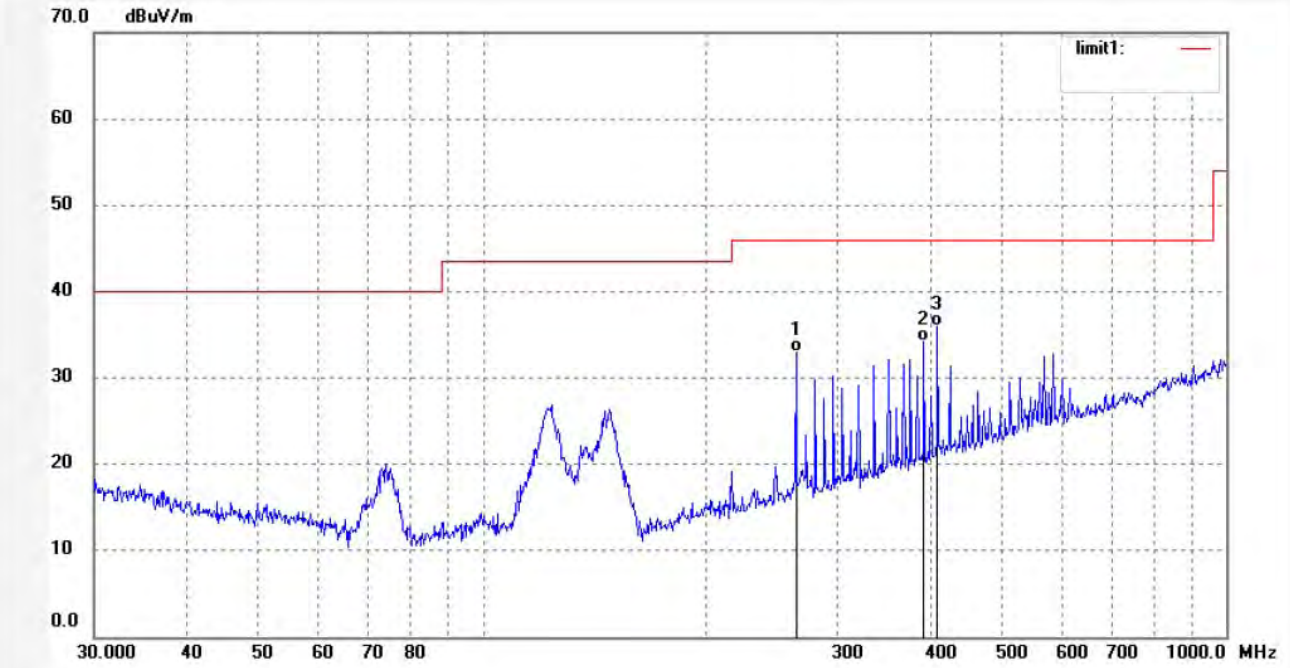
F1,Bldg,A,Changyuan New Material Port Keyuan Rd,
Science & Industry Park,Nanshan Shenzhen,P.R.China
Site: 2# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

| | |
|---|---|
| Job No.: LGW2018 #3054 | Polarization: Horizontal |
| Standard: FCC Part 15C 3M Radiated | Power Source: DC 24V |
| Test item: Radiation Test | Date: 2018/10/28 |
| Temp.( C)/Hum.(%) 23 C / 48 % | Time: |
| EUT: Highly accurate flow monitor | Engineer Signature: WADE |
| Mode: TX 2480MHz | Distance: 3m |
| Model: FTMU 100 | |
| Manufacturer: Lindab AB | |

Note:




| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Degree (deg.) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 263.8190 | 43.29 | -10.26 | 33.03 | 46.00 | -12.97 | QP | | | |
| 2 | 392.0951 | 40.97 | -6.77 | 34.20 | 46.00 | -11.80 | QP | | | |
| 3 | 408.9460 | 42.10 | -6.21 | 35.89 | 46.00 | -10.11 | QP | | | |

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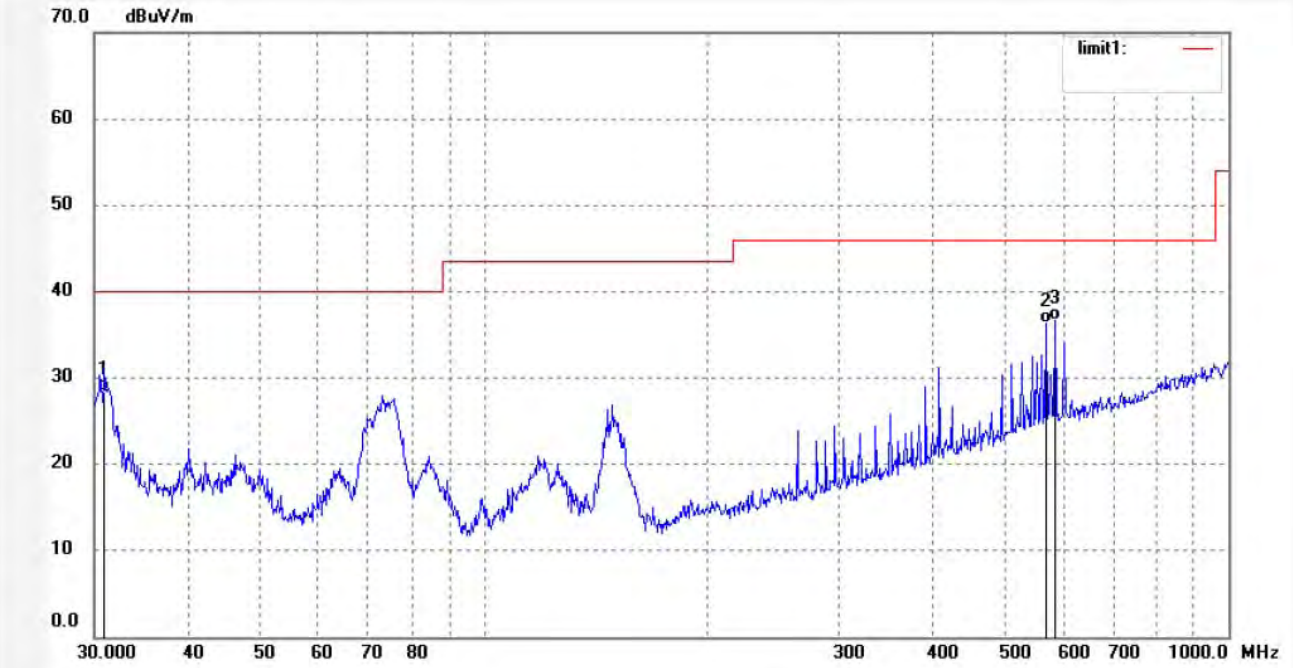
F1,Bldg,A,Changyuan New Material Port Keyuan Rd,
Science & Industry Park,Nanshan Shenzhen,P.R.China
Site: 2# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

| | |
|---|---|
| Job No.: LGW2018 #3055 | Polarization: Vertical |
| Standard: FCC Part 15C 3M Radiated | Power Source: DC 24V |
| Test item: Radiation Test | Date: 2018/10/28 |
| Temp.( C)/Hum.(%) 23 C / 48 % | Time: |
| EUT: Highly accurate flow monitor | Engineer Signature: WADE |
| Mode: TX 2480MHz | Distance: 3m |
| Model: FTMU 100 | |
| Manufacturer: Lindab AB | |

Note:




| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Degree (deg.) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30.9618 | 37.71 | -9.21 | 28.50 | 40.00 | -11.50 | QP | | | |
| 2 | 568.6127 | 39.05 | -2.78 | 36.27 | 46.00 | -9.73 | QP | | | |
| 3 | 584.7894 | 39.11 | -2.52 | 36.59 | 46.00 | -9.41 | QP | | | |

## 1GHz-18GHz test data

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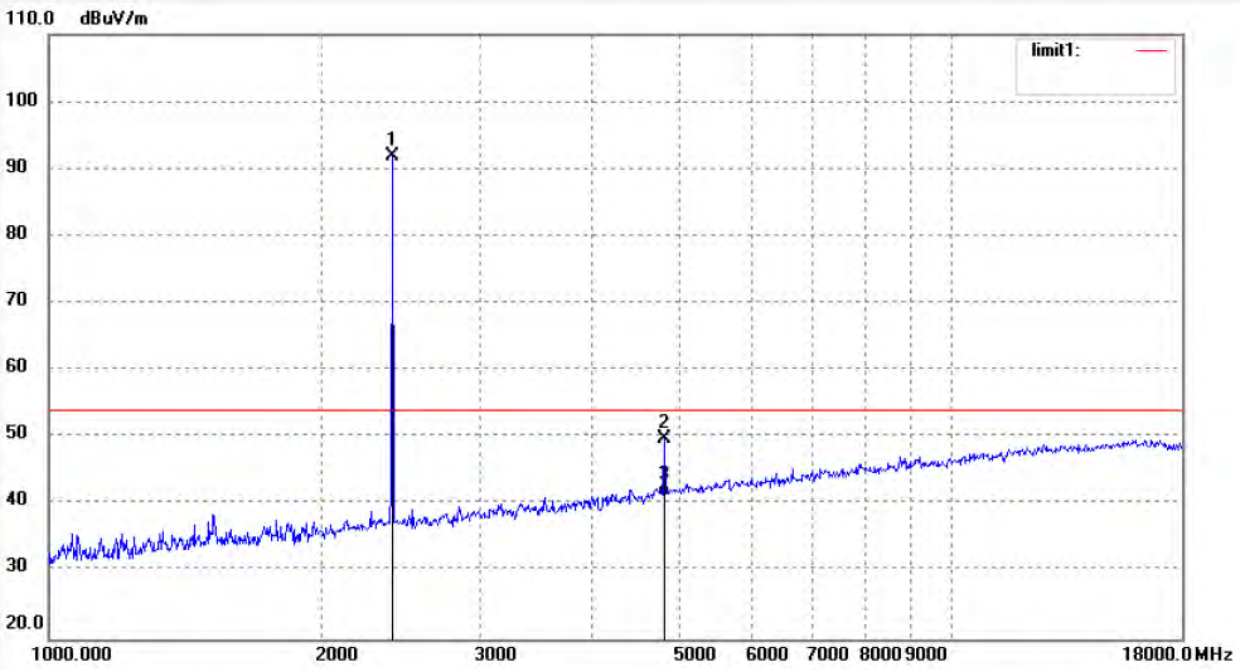
F1,Bldg,A,Changyuan New Material Port Keyuan Rd,
Science & Industry Park,Nanshan Shenzhen,P.R.China
Site: 2# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

| | |
|---|---|
| Job No.: LGW2018 #3018 | Polarization: Horizontal |
| Standard: FCC Part 15C 3M Radiated | Power Source: DC 24V |
| Test item: Radiation Test | Date: 2018/10/28 |
| Temp.( C)/Hum.(%) 23 C / 48 % | Time: |
| EUT: Highly accurate flow monitor | Engineer Signature: WADE |
| Mode: TX 2402MHz | Distance: 3m |
| Model: FTMU 100 | |
| Manufacturer: Lindab AB | |

Note:




| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Degree (deg.) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2402.000 | 90.98 | 0.89 | 91.87 | / | / | peak | | | |
| 2 | 4804.026 | 42.30 | 7.40 | 49.70 | 74.00 | -24.30 | peak | | | |
| 3 | 4804.026 | 33.85 | 7.40 | 41.25 | 54.00 | -12.75 | AVG | | | |

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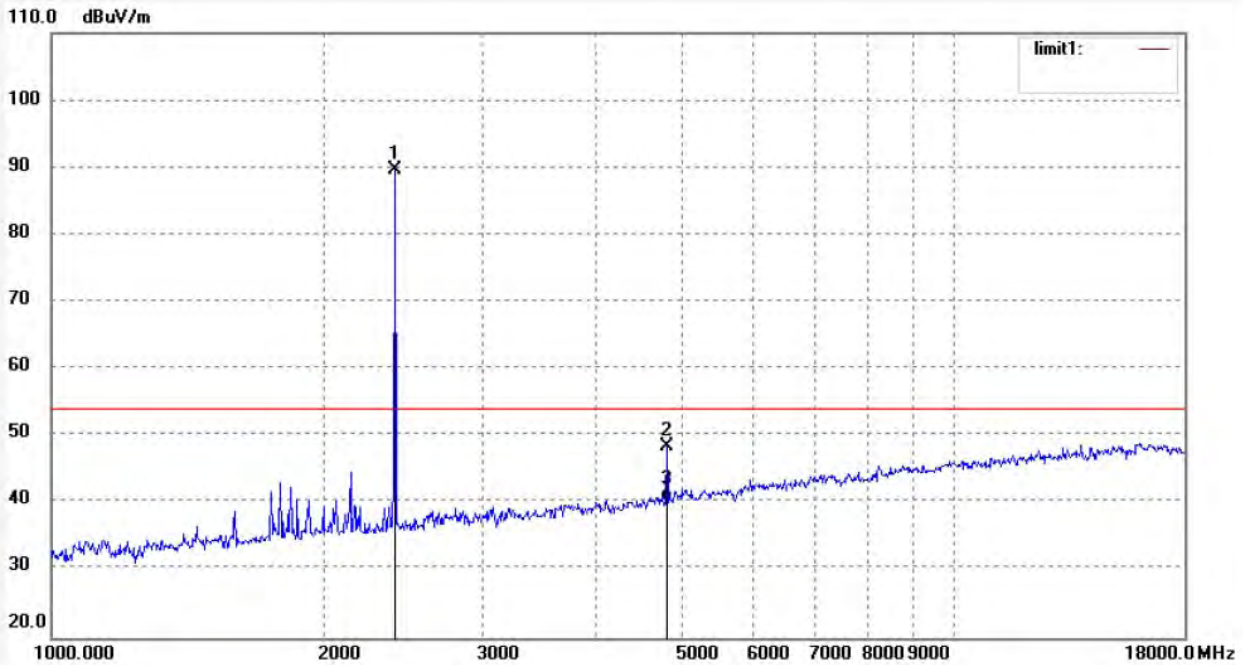
F1,Bldg,A,Changyuan New Material Port Keyuan Rd,
Science & Industry Park,Nanshan Shenzhen,P.R.China
Site: 2# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

| | |
|---|---|
| Job No.: LGW2018 #3019 | Polarization: Vertical |
| Standard: FCC Part 15C 3M Radiated | Power Source: DC 24V |
| Test item: Radiation Test | Date: 2018/10/28 |
| Temp.( C)/Hum.(%) 23 C / 48 % | Time: |
| EUT: Highly accurate flow monitor | Engineer Signature: WADE |
| Mode: TX 2402MHz | Distance: 3m |
| Model: FTMU 100 | |
| Manufacturer: Lindab AB | |

Note:




| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Degree (deg.) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2402.000 | 88.72 | 0.89 | 89.61 | / | / | peak | | | |
| 2 | 4804.032 | 41.16 | 7.40 | 48.56 | 74.00 | -25.44 | peak | | | |
| 3 | 4804.032 | 32.95 | 7.40 | 40.35 | 54.00 | -13.65 | AVG | | | |

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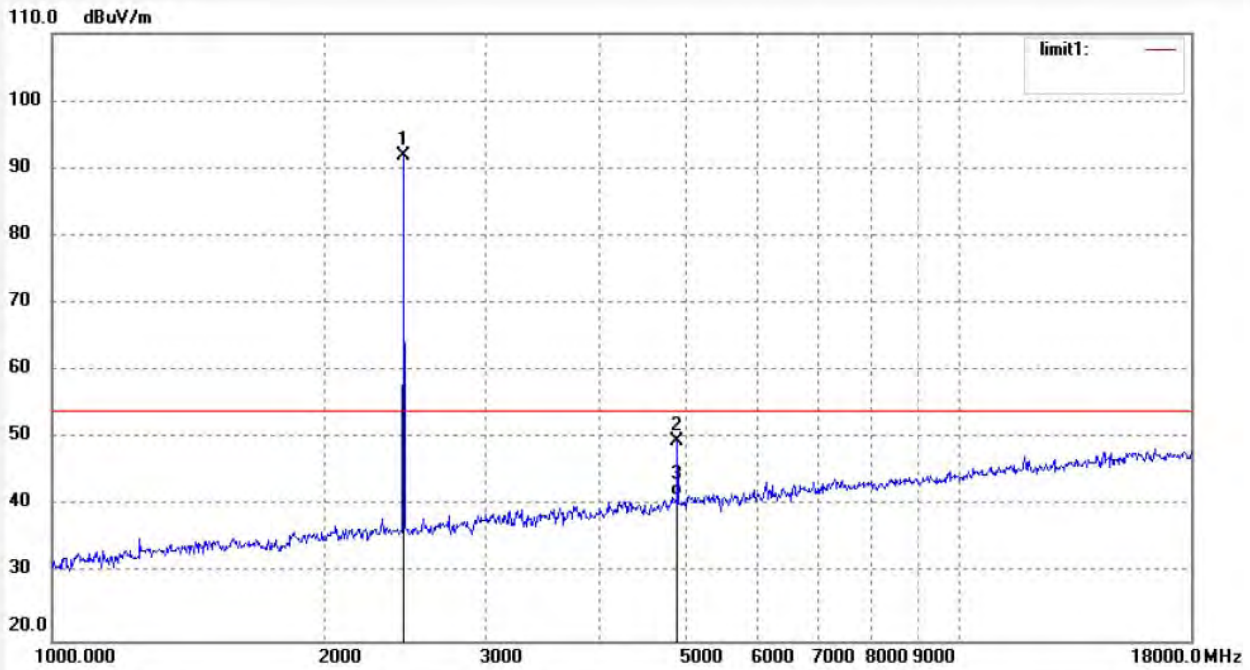
F1,Bldg,A,Changyuan New Material Port Keyuan Rd,
Science & Industry Park,Nanshan Shenzhen,P.R.China
Site: 2# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

| | |
|---|---|
| Job No.: LGW2018 #3022 | Polarization: Horizontal |
| Standard: FCC Part 15C 3M Radiated | Power Source: DC 24V |
| Test item: Radiation Test | Date: 2018/10/28 |
| Temp.( C)/Hum.(%) 23 C / 48 % | Time: |
| EUT: Highly accurate flow monitor | Engineer Signature: WADE |
| Mode: TX 2440MHz | Distance: 3m |
| Model: FTMU 100 | |
| Manufacturer: Lindab AB | |

Note:




| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Degree (deg.) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2440.000 | 90.74 | 1.04 | 91.78 | / | / | peak | | | |
| 2 | 4880.027 | 41.54 | 8.10 | 49.64 | 74.00 | -24.36 | peak | | | |
| 3 | 4880.027 | 33.47 | 8.10 | 41.57 | 54.00 | -12.43 | AVG | | | |

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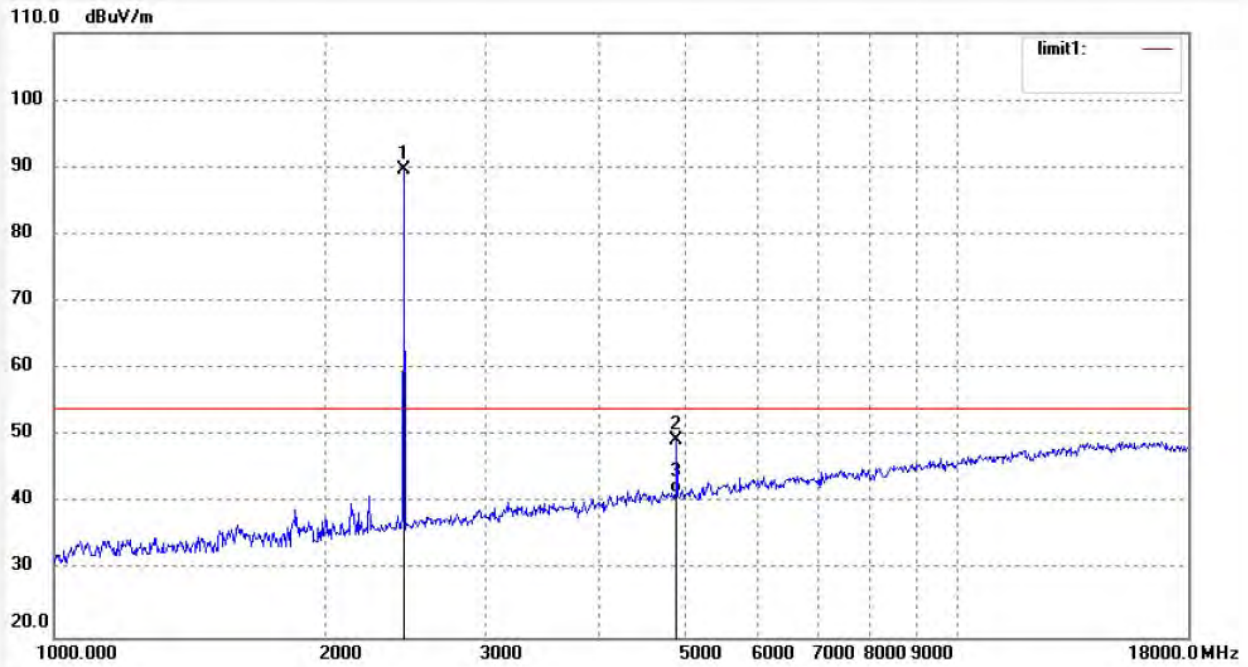
F1,Bldg,A,Changyuan New Material Port Keyuan Rd,
Science & Industry Park,Nanshan Shenzhen,P.R.China
Site: 2# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

| | |
|---|---|
| Job No.: LGW2018 #3023 | Polarization: Vertical |
| Standard: FCC Part 15C 3M Radiated | Power Source: DC 24V |
| Test item: Radiation Test | Date: 2018/10/28 |
| Temp.( C)/Hum.(%) 23 C / 48 % | Time: |
| EUT: Highly accurate flow monitor | Engineer Signature: WADE |
| Mode: TX 2440MHz | Distance: 3m |
| Model: FTMU 100 | |
| Manufacturer: Lindab AB | |

Note:




| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Degree (deg.) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2440.000 | 88.56 | 1.04 | 89.60 | / | / | peak | | | |
| 2 | 4880.029 | 41.18 | 8.10 | 49.28 | 74.00 | -24.72 | peak | | | |
| 3 | 4880.029 | 33.47 | 8.10 | 41.57 | 54.00 | -12.43 | AVG | | | |

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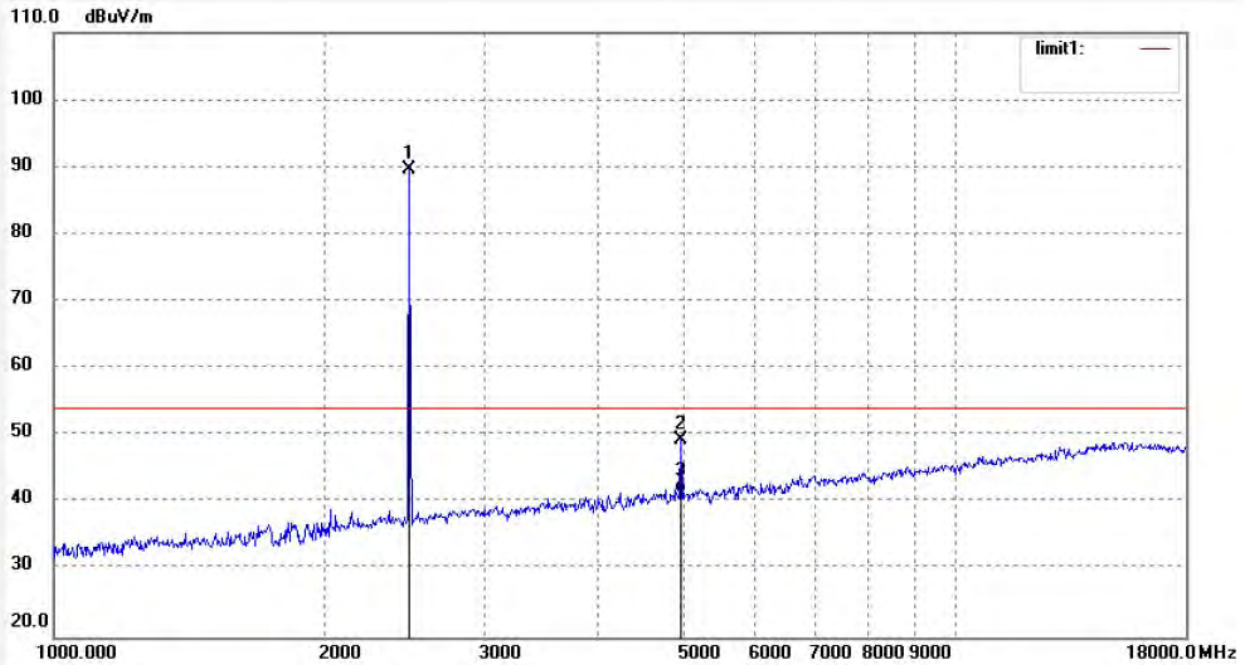
F1,Bldg,A,Changyuan New Material Port Keyuan Rd,
Science & Industry Park,Nanshan Shenzhen,P.R.China
Site: 2# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

| | |
|---|---|
| Job No.: LGW2018 #3025 | Polarization: Horizontal |
| Standard: FCC Part 15C 3M Radiated | Power Source: DC 24V |
| Test item: Radiation Test | Date: 2018/10/28 |
| Temp.( C)/Hum.(%) 23 C / 48 % | Time: |
| EUT: Highly accurate flow monitor | Engineer Signature: WADE |
| Mode: TX 2480MHz | Distance: 3m |
| Model: FTMU 100 | |
| Manufacturer: Lindab AB | |

Note:




| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Degree (deg.) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2480.000 | 88.58 | 1.10 | 89.68 | / | / | peak | | | |
| 2 | 4960.028 | 40.70 | 8.60 | 49.30 | 74.00 | -24.70 | peak | | | |
| 3 | 4960.028 | 32.94 | 8.60 | 41.54 | 54.00 | -12.46 | AVG | | | |

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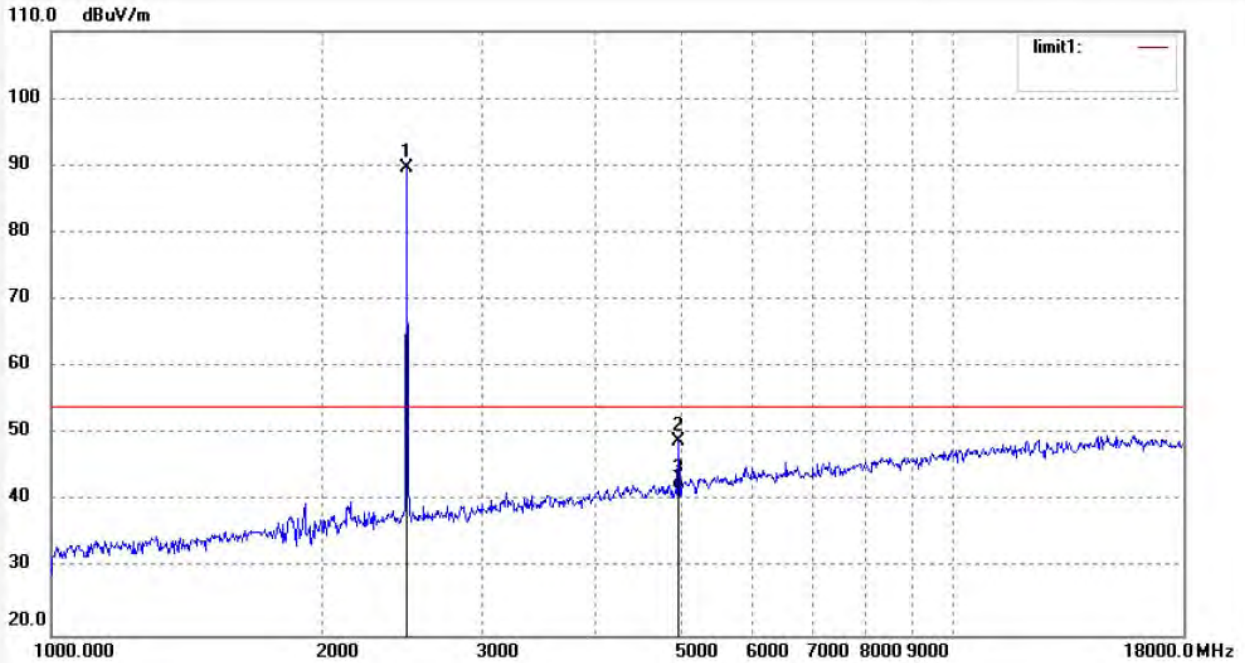
F1,Bldg,A,Changyuan New Material Port Keyuan Rd,
Science & Industry Park,Nanshan Shenzhen,P.R.China
Site: 2# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

| | |
|---|---|
| Job No.: LGW2018 #3024 | Polarization: Vertical |
| Standard: FCC Part 15C 3M Radiated | Power Source: DC 24V |
| Test item: Radiation Test | Date: 2018/10/28 |
| Temp.( C)/Hum.(%) 23 C / 48 % | Time: |
| EUT: Highly accurate flow monitor | Engineer Signature: WADE |
| Mode: TX 2480MHz | Distance: 3m |
| Model: FTMU 100 | |
| Manufacturer: Lindab AB | |

Note:



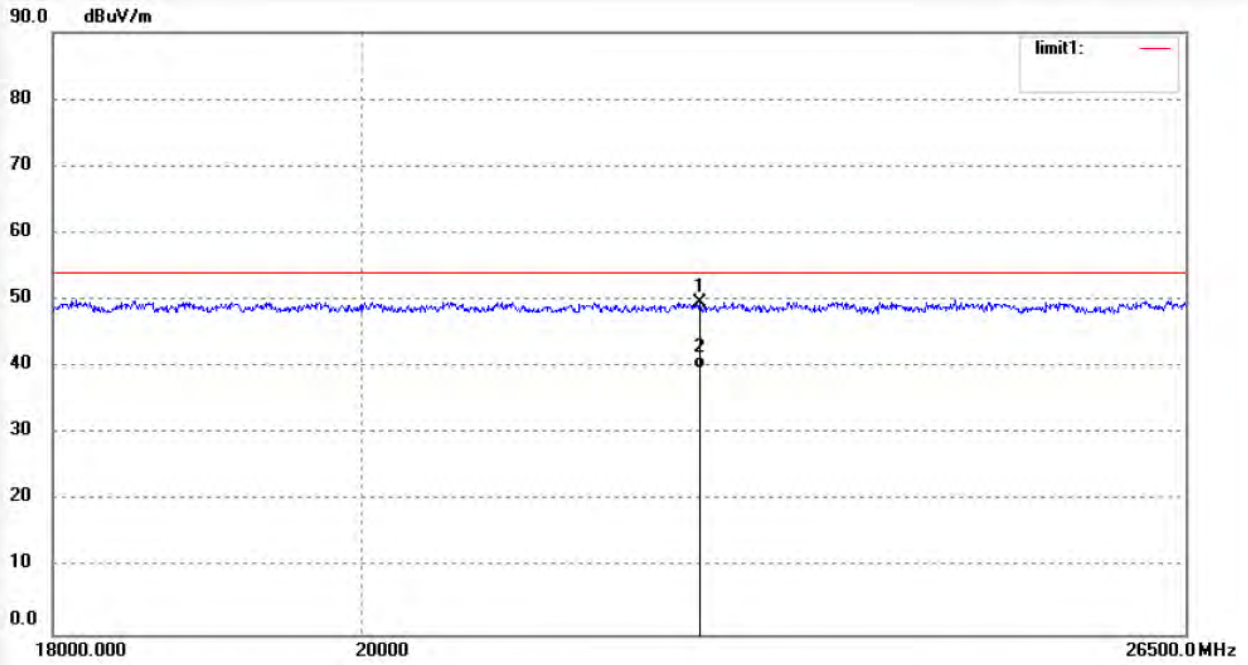

| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Degree (deg.) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2480.000 | 88.53 | 1.10 | 89.63 | / | / | peak | | | |
| 2 | 4960.031 | 40.42 | 8.60 | 49.02 | 74.00 | -24.98 | peak | | | |
| 3 | 4960.031 | 33.11 | 8.60 | 41.71 | 54.00 | -12.29 | AVG | | | |

## 18GHz-26.5GHz test data

ACCURATE TECHNOLOGY CO., LTD.
F1,Bldg,A,Changyuan New Material Port Keyuan Rd,
Science & Industry Park,Nanshan Shenzhen,P.R.China
Site: 2# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

| | |
|---|---|
| Job No.: LGW2018 #3029 | Polarization: Horizontal |
| Standard: FCC Part 15C 3M Radiated | Power Source: DC 24V |
| Test item: Radiation Test | Date: 2018/10/28 |
| Temp.( C)/Hum.(%) 23 C / 48 % | Time: |
| EUT: Highly accurate flow monitor | Engineer Signature: WADE |
| Mode: TX 2402MHz | Distance: 3m |
| Model: FTMU 100 | |
| Manufacturer: Lindab AB | |

Note:




| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Degree (deg.) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 22448.395 | 9.79 | 39.79 | 49.58 | 74.00 | -24.42 | peak | | | |
| 2 | 22448.395 | -0.14 | 39.79 | 39.65 | 54.00 | -14.35 | AVG | | | |

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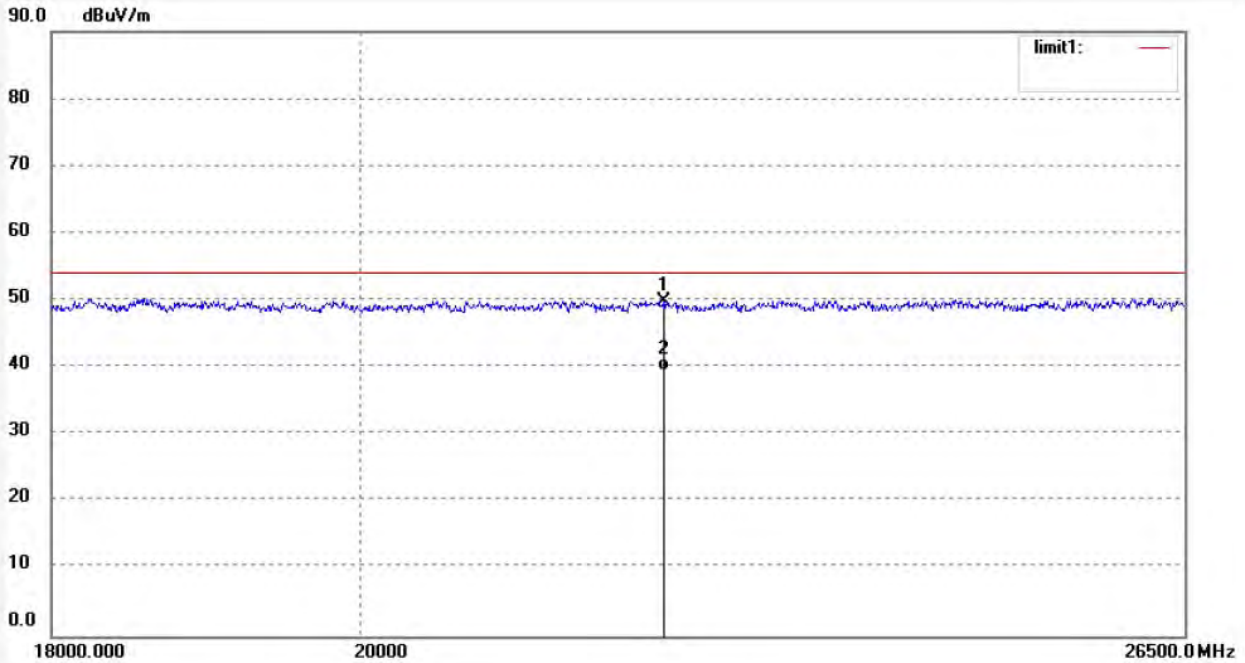
F1,Bldg,A,Changyuan New Material Port Keyuan Rd,
Science & Industry Park,Nanshan Shenzhen,P.R.China
Site: 2# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

| | |
|---|---|
| Job No.: LGW2018 #3028 | Polarization: Vertical |
| Standard: FCC Part 15C 3M Radiated | Power Source: DC 24V |
| Test item: Radiation Test | Date: 2018/10/28 |
| Temp.( C)/Hum.(%) 23 C / 48 % | Time: |
| EUT: Highly accurate flow monitor | Engineer Signature: WADE |
| Mode: TX 2402MHz | Distance: 3m |
| Model: FTMU 100 | |
| Manufacturer: Lindab AB | |

Note:




| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Degree (deg.) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 22180.847 | 10.55 | 39.27 | 49.82 | 74.00 | -24.18 | peak | | | |
| 2 | 22180.847 | 0.18 | 39.27 | 39.45 | 54.00 | -14.55 | AVG | | | |

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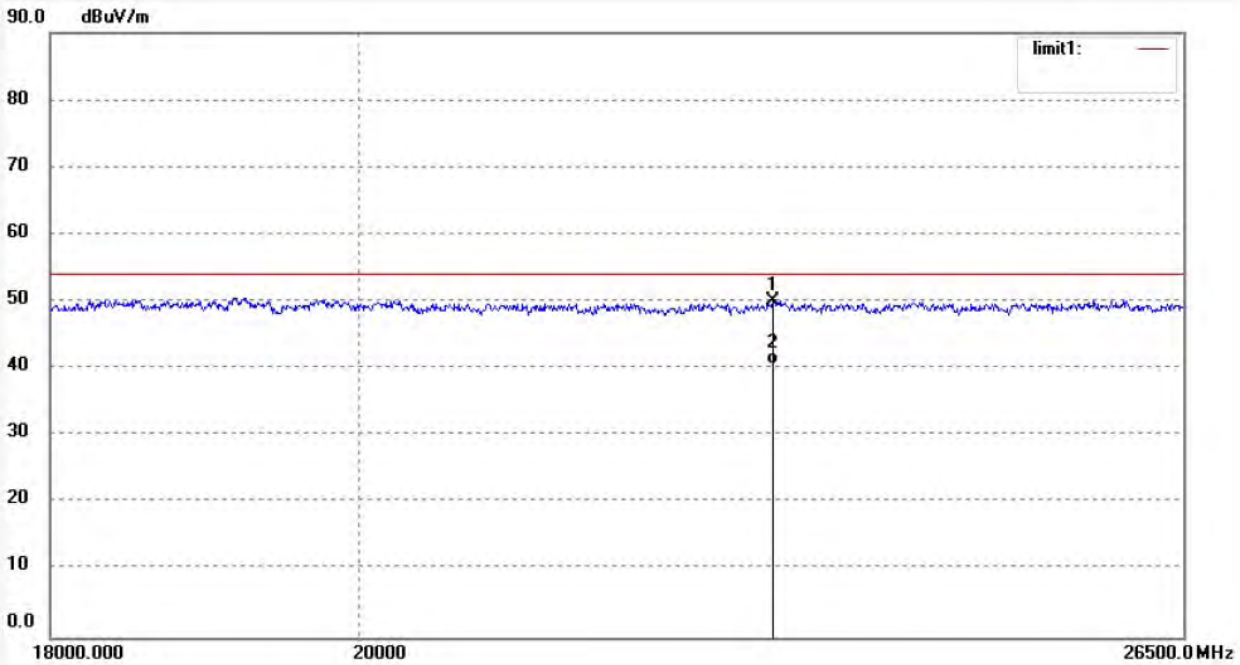
F1,Bldg,A,Changyuan New Material Port Keyuan Rd,
Science & Industry Park,Nanshan Shenzhen,P.R.China
Site: 2# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

| | |
|---|---|
| Job No.: LGW2018 #3030 | Polarization: Horizontal |
| Standard: FCC Part 15C 3M Radiated | Power Source: DC 24V |
| Test item: Radiation Test | Date: 2018/10/28 |
| Temp.( C)/Hum.(%) 23 C / 48 % | Time: |
| EUT: Highly accurate flow monitor | Engineer Signature: WADE |
| Mode: TX 2440MHz | Distance: 3m |
| Model: FTMU 100 | |
| Manufacturer: Lindab AB | |

Note:




| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Degree (deg.) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 23037.721 | 10.40 | 39.62 | 50.02 | 74.00 | -23.98 | peak | | | |
| 2 | 23037.721 | 0.94 | 39.62 | 40.56 | 54.00 | -13.44 | AVG | | | |

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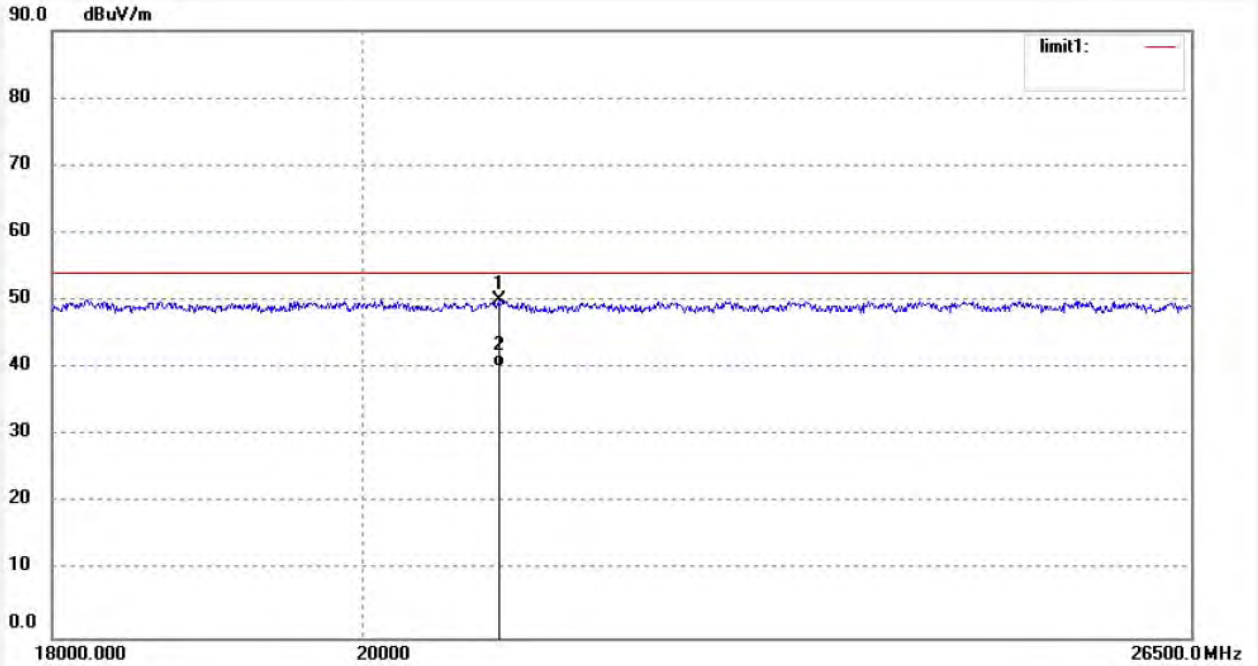
F1,Bldg,A,Changyuan New Material Port Keyuan Rd,
Science & Industry Park,Nanshan Shenzhen,P.R.China
Site: 2# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

| | |
|---|---|
| Job No.: LGW2018 #3031 | Polarization: Vertical |
| Standard: FCC Part 15C 3M Radiated | Power Source: DC 24V |
| Test item: Radiation Test | Date: 2018/10/28 |
| Temp.( C)/Hum.(%) 23 C / 48 % | Time: |
| EUT: Highly accurate flow monitor | Engineer Signature: WADE |
| Mode: TX 2440MHz | Distance: 3m |
| Model: FTMU 100 | |
| Manufacturer: Lindab AB | |

Note:




| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Degree (deg.) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 20946.818 | 10.76 | 39.29 | 50.05 | 74.00 | -23.95 | peak | | | |
| 2 | 20946.818 | 0.96 | 39.29 | 40.25 | 54.00 | -13.75 | AVG | | | |

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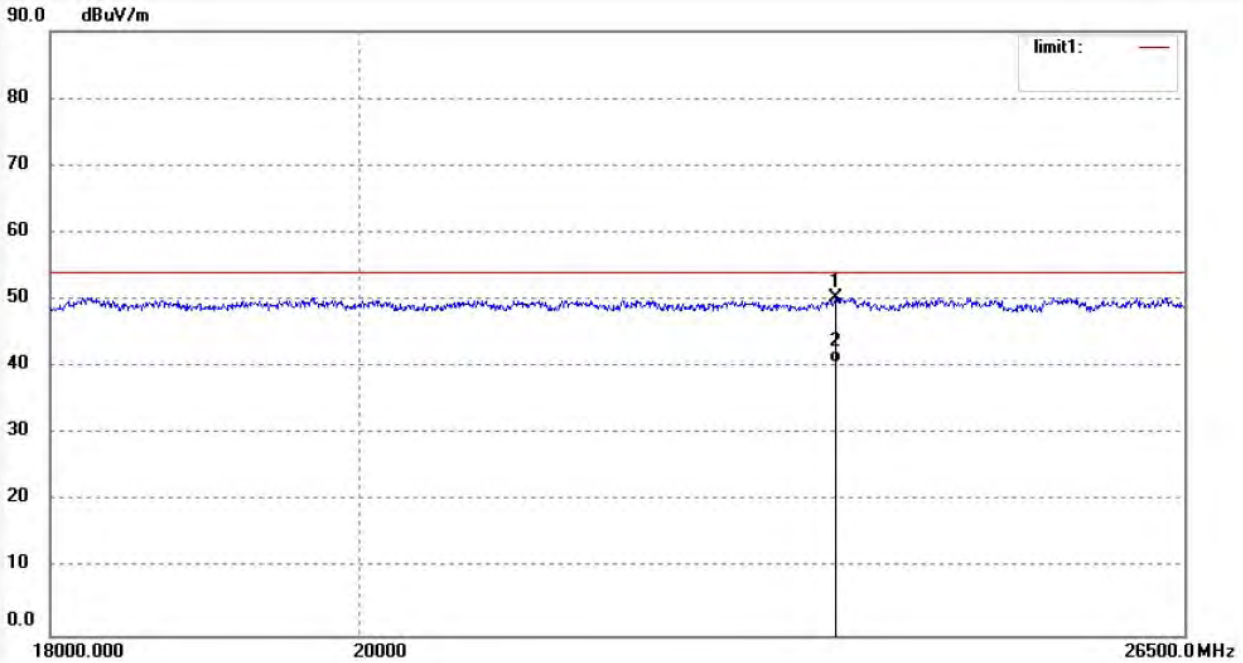
F1,Bldg,A,Changyuan New Material Port Keyuan Rd,
Science & Industry Park,Nanshan Shenzhen,P.R.China
Site: 2# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

| | |
|---|---|
| Job No.: LGW2018 #3033 | Polarization: Horizontal |
| Standard: FCC Part 15C 3M Radiated | Power Source: DC 24V |
| Test item: Radiation Test | Date: 2018/10/28 |
| Temp.( C)/Hum.(%) 23 C / 48 % | Time: |
| EUT: Highly accurate flow monitor | Engineer Signature: WADE |
| Mode: TX 2480MHz | Distance: 3m |
| Model: FTMU 100 | |
| Manufacturer: Lindab AB | |

Note:




| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Degree (deg.) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 23533.041 | 10.26 | 40.07 | 50.33 | 74.00 | -23.67 | peak | | | |
| 2 | 23533.041 | 0.47 | 40.07 | 40.54 | 54.00 | -13.46 | AVG | | | |

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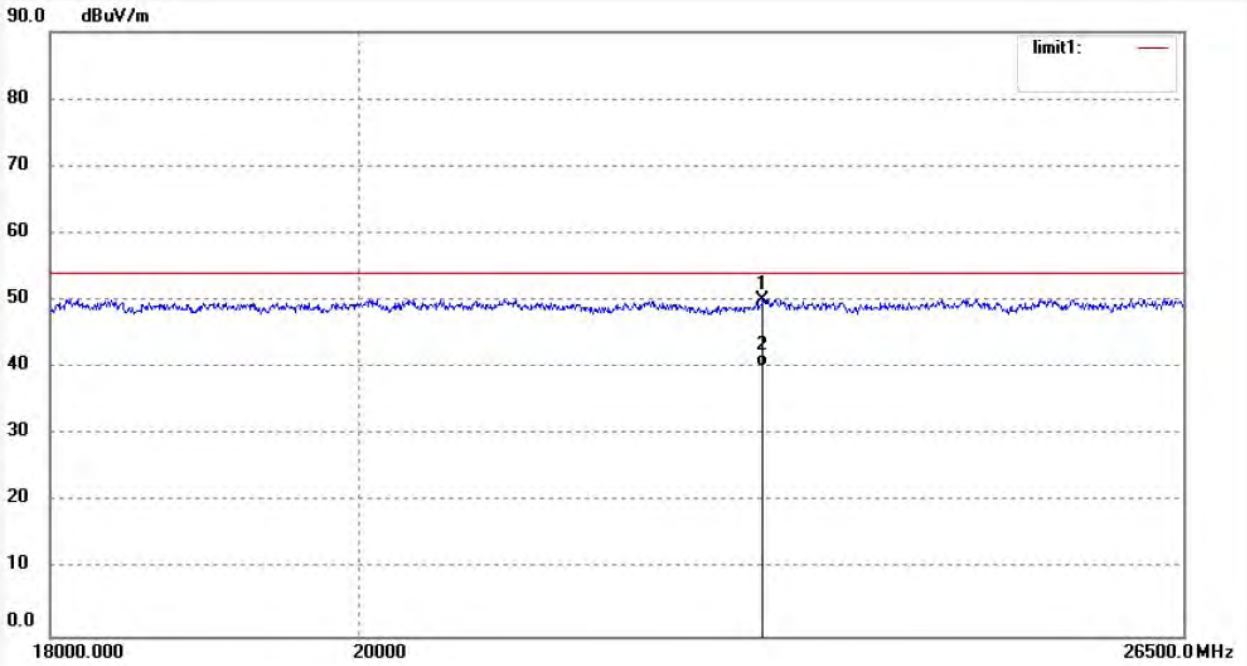
F1,Bldg,A,Changyuan New Material Port Keyuan Rd,
Science & Industry Park,Nanshan Shenzhen,P.R.China
Site: 2# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

| | |
|---|---|
| Job No.: LGW2018 #3032 | Polarization: Vertical |
| Standard: FCC Part 15C 3M Radiated | Power Source: DC 24V |
| Test item: Radiation Test | Date: 2018/10/28 |
| Temp.( C)/Hum.(%) 23 C / 48 % | Time: |
| EUT: Highly accurate flow monitor | Engineer Signature: WADE |
| Mode: TX 2480MHz | Distance: 3m |
| Model: FTMU 100 | |
| Manufacturer: Lindab AB | |

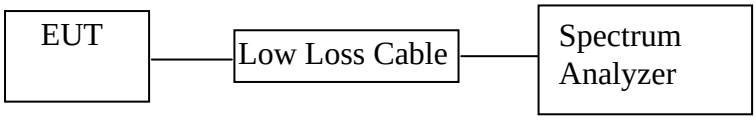
Note:




| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Degree (deg.) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 22957.667 | 10.28 | 39.79 | 50.07 | 74.00 | -23.93 | peak | | | |
| 2 | 22957.667 | 0.45 | 39.79 | 40.24 | 54.00 | -13.76 | AVG | | | |

# 10. CONDUCTED SPURIOUS EMISSION COMPLIANCE TEST

## 10.1. Block Diagram of Test Setup




## 10.2. The Requirement For Section 15.247(d)

Section 15.247(d): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).

## 10.3. EUT Configuration on Measurement

The equipment is installed on the emission measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

## 10.4. Operating Condition of EUT

10.4.1. Setup the EUT and simulator as shown as Section 10.1.

10.4.2. Turn on the power of all equipment.

10.4.3. Let the EUT work in TX modes measure it. The transmit frequency are 2402-2480 MHz. We select 2402MHz, 2441MHz, and 2480MHz TX frequency to transmit.

## 10.5.Test Procedure

10.5.1.The transmitter output was connected to the spectrum analyzer via a low loss cable.

10.5.2.Set RBW of spectrum analyzer to 100kHz and VBW to 300kHz

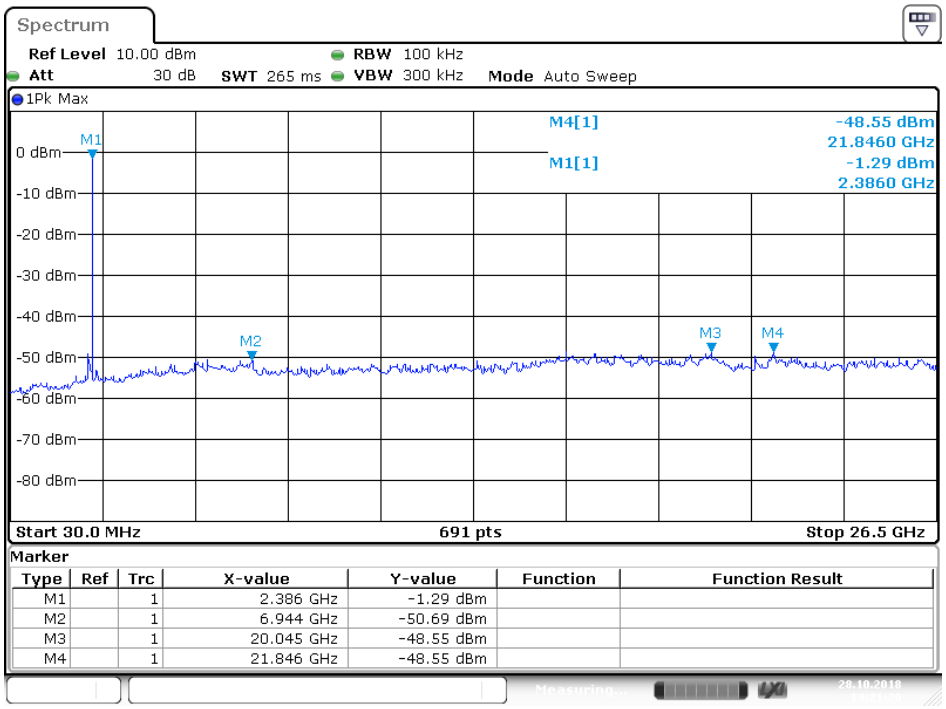
10.5.3.The Conducted Spurious Emission was measured and recorded.

## 10.6.Test Result

**Pass.**

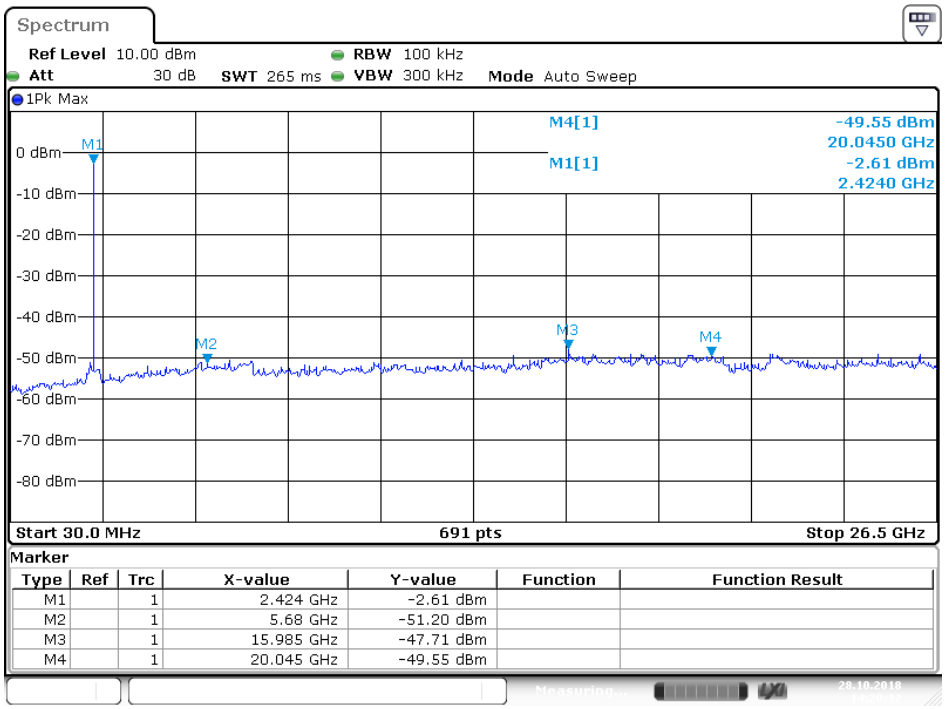
The spectrum analyzer plots are attached as below.

**Channel 0**




Date: 28.OCT.2018 14:21:21

## Channel 19

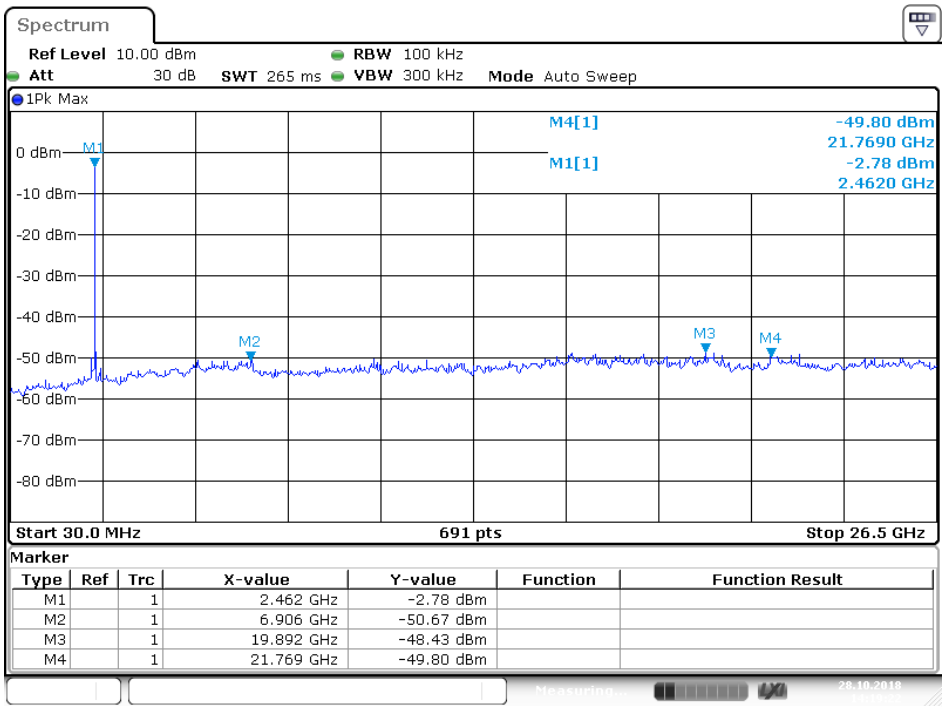



Marker

| Type | Ref | Trc | X-value | Y-value | Function | Function Result |
|---|---|---|---|---|---|---|
| M1 | | 1 | 2.424 GHz | -2.61 dBm | | |
| M2 | | 1 | 5.68 GHz | -51.20 dBm | | |
| M3 | | 1 | 15.985 GHz | -47.71 dBm | | |
| M4 | | 1 | 20.045 GHz | -49.55 dBm | | |

Date: 28.OCT.2018 14:20:33

## Channel 39



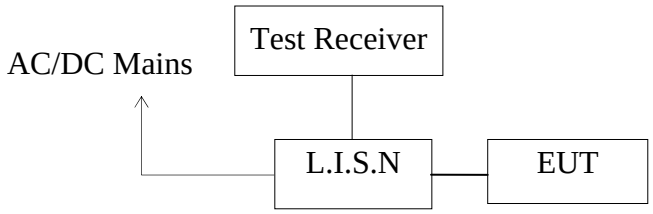

Marker

| Type | Ref | Trc | X-value | Y-value | Function | Function Result |
|---|---|---|---|---|---|---|
| M1 | | 1 | 2.462 GHz | -2.78 dBm | | |
| M2 | | 1 | 6.906 GHz | -50.67 dBm | | |
| M3 | | 1 | 19.892 GHz | -48.43 dBm | | |
| M4 | | 1 | 21.769 GHz | -49.80 dBm | | |

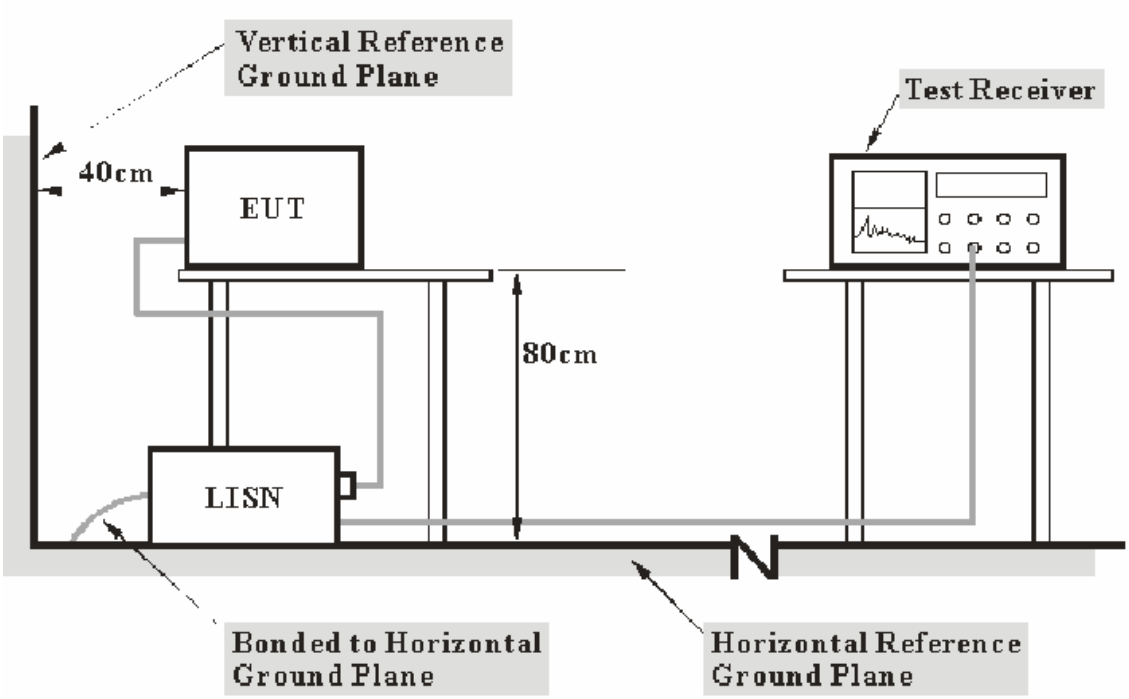
Date: 28.OCT.2018 14:19:23

# 11.POWER LINE CONDUCTED EMISSION TEST

## 11.1.Block Diagram of Test Setup




## 11.2.Test System Setup




Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

## 11.3.Test Limits

| Frequency (MHz) | Limit dB(μV) | |
|---|---|---|
| | Quasi-peak Level | Average Level |
| 0.15 - 0.50 | 66.0 – 56.0 * | 56.0 – 46.0 * |
| 0.50 - 5.00 | 56.0 | 46.0 |
| 5.00 - 30.00 | 60.0 | 50.0 |
| NOTE1: The lower limit shall apply at the transition frequencies.<br>NOTE2: The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.50MHz. | | |

## 11.4.Configuration of EUT on Measurement

The equipments are installed on Power Line Conducted Emission Measurement to meet the commission requirement and operating regulations in a manner, which tends to maximize its emission characteristics in a normal application.

## 11.5.Operating Condition of EUT

11.5.1.Setup the EUT and simulator as shown as Section 11.1.

11.5.2.Turn on the power of all equipment.

11.5.3.Let the EUT work in test mode and measure it.

## 11.6.Test Procedure

The EUT is put on the plane 0.8m high above the ground by insulating support and is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs. Both sides of AC lines are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to ANSI C63.10: 2013 on Conducted Emission Measurement.
The bandwidth of test receiver (R & S ESCS30) is set at 9kHz.

The frequency range from 150kHz to 30MHz is checked.

## 11.7.Data Sample

| Frequency (MHz) | Transducer value (dB) | QuasiPeak Level (dBμV) | Average Level (dBμV) | QuasiPeak Limit (dBμV) | Average Limit (dBμV) | QuasiPeak Margin (dB) | Average Margin (dB) | Remark (Pass/Fail) |
|---|---|---|---|---|---|---|---|---|
| X.XX | 10.5 | 51.1 | 34.2 | 56.0 | 46.0 | 4.9 | 11.8 | Pass |

Frequency(MHz) = Emission frequency in MHz
Transducer value(dB) = Insertion loss of LISN + Cable Loss
Level(dBμV) = Quasi-peak Reading/Average Reading + Transducer value
Limit (dBμV) = Limit stated in standard

Calculation Formula:
Margin = Limit (dBμV) - Level (dBμV)

## 11.8.Test Result

**Pass.**

The frequency range from 150kHz to 30MHz is checked.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

Emissions attenuated more than 20 dB below the permissible value are not reported.

All data was recorded in the Quasi-peak and average detection mode.

We tested DC 24V and AC 24V.

The spectral diagrams are attached as below.

***ACCURATE TECHNOLOGY CO.,LTD***

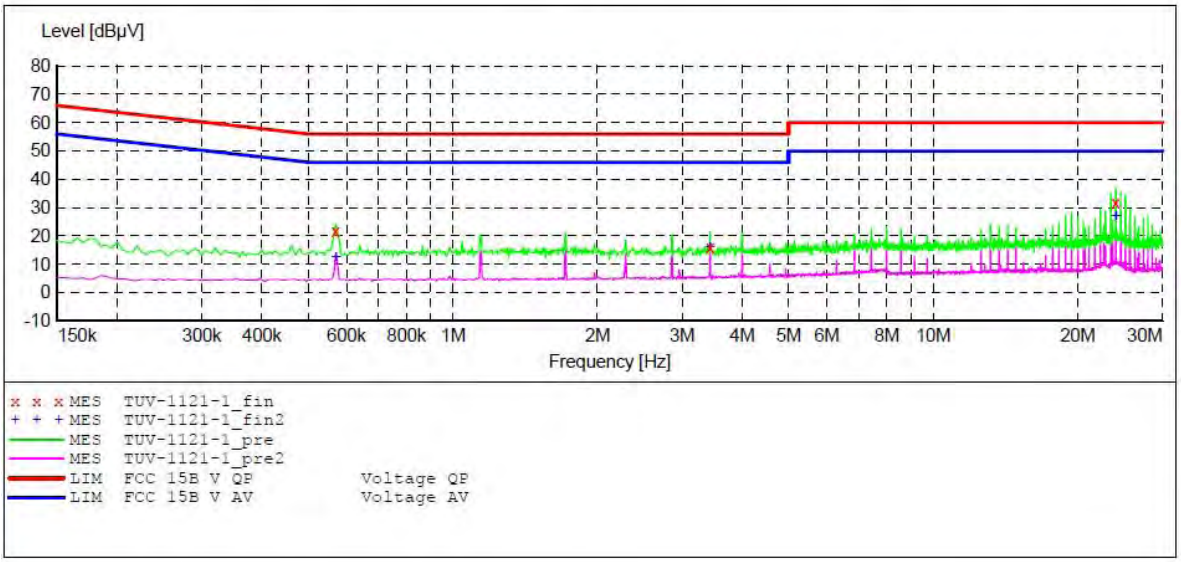
***CONDUCTED EMISSION STANDARD FCC PART 15 C***

```
EUT:                  Highly accurate flow monitor  M/N:FTMU 100
Manufacturer:         Lindab AB
Operating Condition:  BT Communication
Test Site:            1#Shielding Room
Operator:             WADE
Test Specification:   N AC 24V
Comment:              Mains port
Start of Test:        11/21/2018 /
```

***SCAN TABLE: "V 9K-30MHz fin"***

Short Description: _SUB_STD_VTERM2 1.70

| Start Frequency | Stop Frequency | Step Width | Detector | Meas. Time | IF Bandw. | Transducer |
|---|---|---|---|---|---|---|
| 9.0 kHz | 150.0 kHz | 100.0 Hz | QuasiPeak Average | 1.0 s | 200 Hz | NSLK8126 2008 |
| 150.0 kHz | 30.0 MHz | 5.0 kHz | QuasiPeak Average | 1.0 s | 9 kHz | NSLK8126 2008 |




***MEASUREMENT RESULT: "TUV-1121-1_fin"***

11/21/2018

| Frequency MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Detector | Line | PE |
|---|---|---|---|---|---|---|---|
| 0.570000 | 21.80 | 10.7 | 56 | 34.2 | QP | N | GND |
| 3.430000 | 16.00 | 11.1 | 56 | 40.0 | QP | N | GND |
| 24.010000 | 31.80 | 11.5 | 60 | 28.2 | QP | N | GND |

***MEASUREMENT RESULT: "TUV-1121-1_fin2"***

11/21/2018

| Frequency MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Detector | Line | PE |
|---|---|---|---|---|---|---|---|
| 0.570000 | 12.60 | 10.7 | 46 | 33.4 | AV | N | GND |
| 3.430000 | 15.80 | 11.1 | 46 | 30.2 | AV | N | GND |
| 24.010000 | 27.10 | 11.5 | 50 | 22.9 | AV | N | GND |

***ACCURATE TECHNOLOGY CO.,LTD***

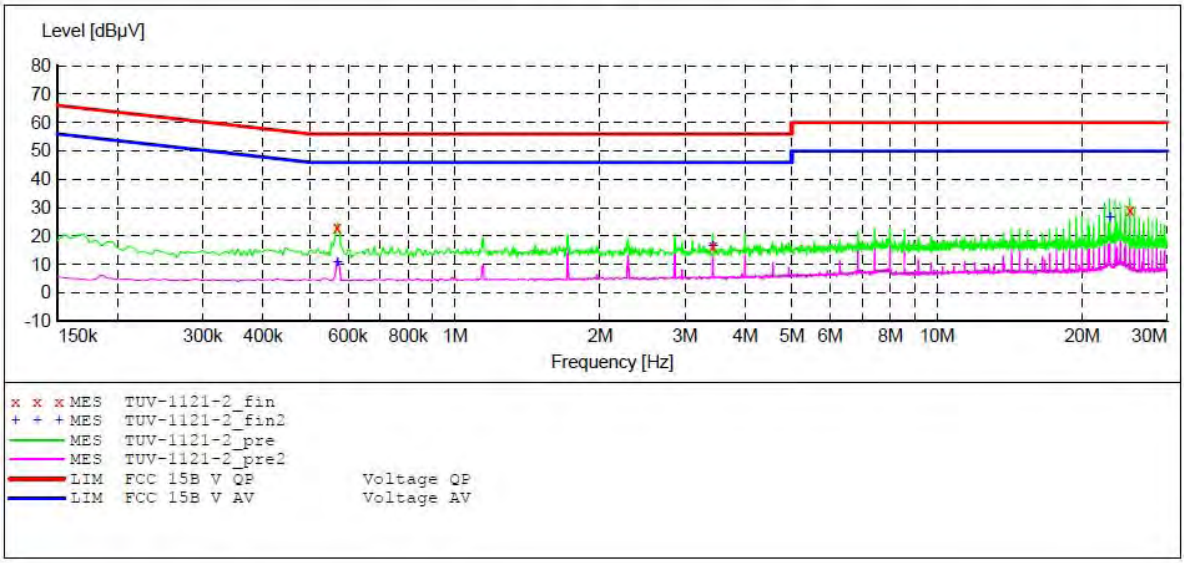
***CONDUCTED EMISSION STANDARD FCC PART 15 C***

EUT: Highly accurate flow monitor M/N:FTMU 100
Manufacturer: Lindab AB
Operating Condition: BT Communication
Test Site: 1#Shielding Room
Operator: WADE
Test Specification: L AC 24V
Comment: Mains port
Start of Test: 11/21/2018 /

***SCAN TABLE: "V 9K-30MHz fin"***

Short Description: _SUB_STD_VTERM2 1.70

| Start Frequency | Stop Frequency | Step Width | Detector | Meas. Time | IF Bandw. | Transducer |
|---|---|---|---|---|---|---|
| 9.0 kHz | 150.0 kHz | 100.0 Hz | QuasiPeak Average | 1.0 s | 200 Hz | NSLK8126 2008 |
| 150.0 kHz | 30.0 MHz | 5.0 kHz | QuasiPeak Average | 1.0 s | 9 kHz | NSLK8126 2008 |




***MEASUREMENT RESULT: "TUV-1121-2_fin"***

11/21/2018

| Frequency MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Detector | Line | PE |
|---|---|---|---|---|---|---|---|
| 0.570000 | 22.80 | 10.7 | 56 | 33.2 | QP | L1 | GND |
| 3.430000 | 16.60 | 11.1 | 56 | 39.4 | QP | L1 | GND |
| 25.150000 | 29.00 | 11.5 | 60 | 31.0 | QP | L1 | GND |

***MEASUREMENT RESULT: "TUV-1121-2_fin2"***

11/21/2018

| Frequency MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Detector | Line | PE |
|---|---|---|---|---|---|---|---|
| 0.570000 | 10.70 | 10.7 | 46 | 35.3 | AV | L1 | GND |
| 3.430000 | 16.40 | 11.1 | 46 | 29.6 | AV | L1 | GND |
| 22.855000 | 26.40 | 11.4 | 50 | 23.6 | AV | L1 | GND |

***ACCURATE TECHNOLOGY CO.,LTD***

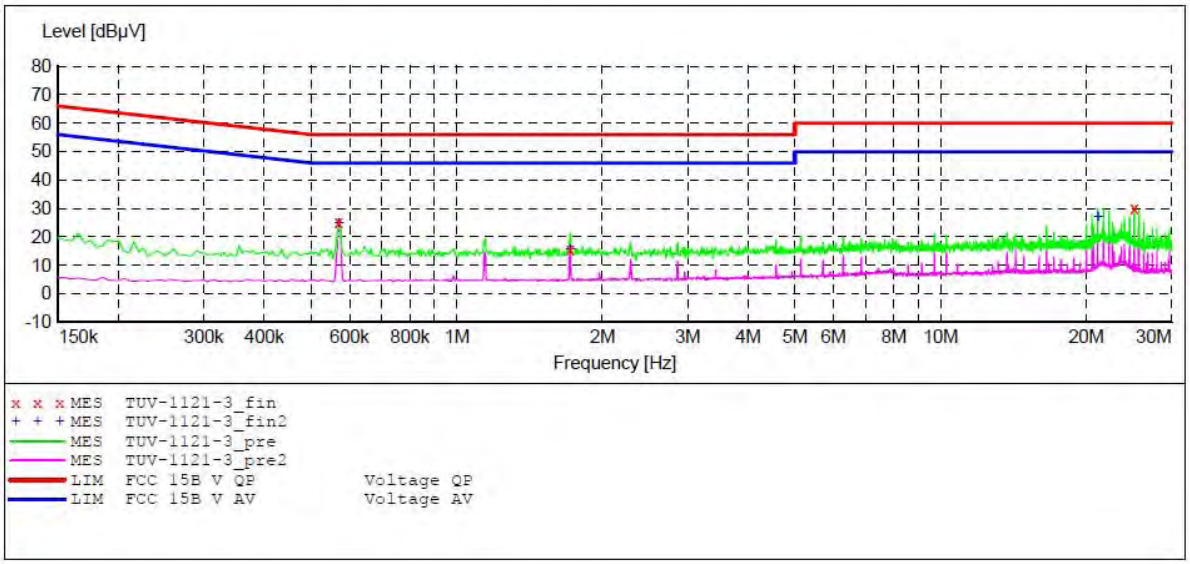
***CONDUCTED EMISSION STANDARD FCC PART 15 C***

EUT: Highly accurate flow monitor M/N:FTMU 100
Manufacturer: Lindab AB
Operating Condition: BT Communication
Test Site: 1#Shielding Room
Operator: WADE
Test Specification: DC +24V
Comment: Mains port
Start of Test: 11/21/2018 /

***SCAN TABLE: "V 9K-30MHz fin"***

Short Description: _SUB_STD_VTERM2 1.70

| Start Frequency | Stop Frequency | Step Width | Detector | Meas. Time | IF Bandw. | Transducer |
|---|---|---|---|---|---|---|
| 9.0 kHz | 150.0 kHz | 100.0 Hz | QuasiPeak Average | 1.0 s | 200 Hz | NSLK8126 2008 |
| 150.0 kHz | 30.0 MHz | 5.0 kHz | QuasiPeak Average | 1.0 s | 9 kHz | NSLK8126 2008 |




***MEASUREMENT RESULT: "TUV-1121-3_fin"***

11/21/2018

| Frequency MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Detector | Line | PE |
|---|---|---|---|---|---|---|---|
| 0.570000 | 25.00 | 10.7 | 56 | 31.0 | QP | + | GND |
| 1.715000 | 15.50 | 10.9 | 56 | 40.5 | QP | + | GND |
| 25.150000 | 30.20 | 11.5 | 60 | 29.8 | QP | + | GND |

***MEASUREMENT RESULT: "TUV-1121-3_fin2"***

11/21/2018

| Frequency MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Detector | Line | PE |
|---|---|---|---|---|---|---|---|
| 0.570000 | 24.60 | 10.7 | 46 | 21.4 | AV | + | GND |
| 1.715000 | 15.40 | 10.9 | 46 | 30.6 | AV | + | GND |
| 21.145000 | 26.80 | 11.4 | 50 | 23.2 | AV | + | GND |

***ACCURATE TECHNOLOGY CO.,LTD***

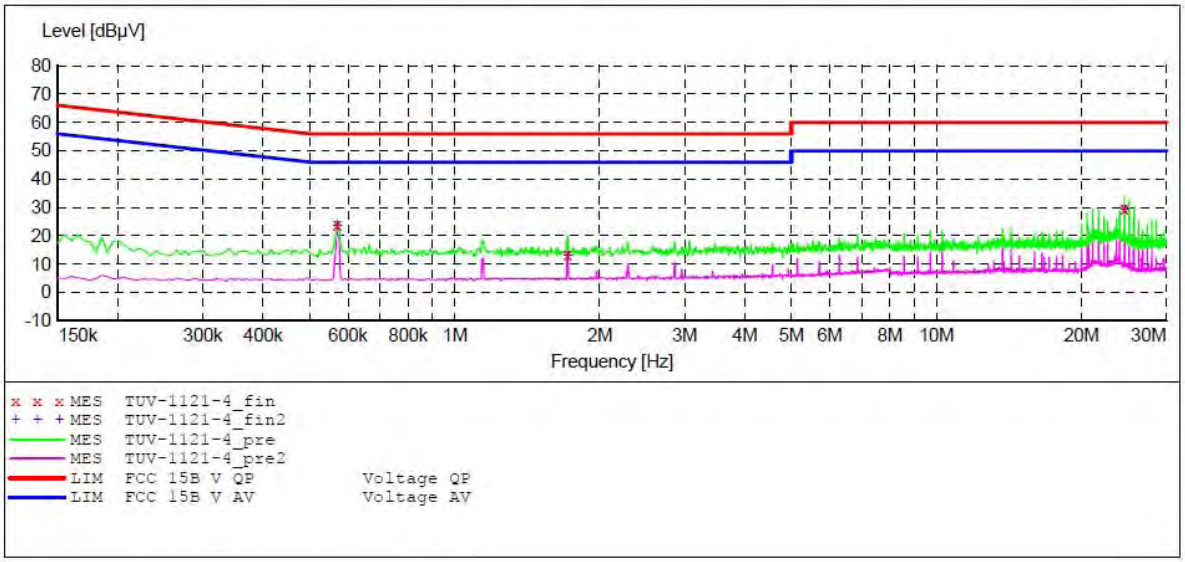
***CONDUCTED EMISSION STANDARD FCC PART 15 C***

EUT: Highly accurate flow monitor M/N:FTMU 100
Manufacturer: Lindab AB
Operating Condition: BT Communication
Test Site: 1#Shielding Room
Operator: WADE
Test Specification: DC -24V
Comment: Mains port
Start of Test: 11/21/2018 /

***SCAN TABLE: "V 9K-30MHz fin"***

Short Description: _SUB_STD_VTERM2 1.70

| Start Frequency | Stop Frequency | Step Width | Detector | Meas. Time | IF Bandw. | Transducer |
|---|---|---|---|---|---|---|
| 9.0 kHz | 150.0 kHz | 100.0 Hz | QuasiPeak Average | 1.0 s | 200 Hz | NSLK8126 2008 |
| 150.0 kHz | 30.0 MHz | 5.0 kHz | QuasiPeak Average | 1.0 s | 9 kHz | NSLK8126 2008 |




***MEASUREMENT RESULT: "TUV-1121-4_fin"***

11/21/2018

| Frequency MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Detector | Line | PE |
|---|---|---|---|---|---|---|---|
| 0.570000 | 23.80 | 10.7 | 56 | 32.2 | QP | - | GND |
| 1.715000 | 13.30 | 10.9 | 56 | 42.7 | QP | - | GND |
| 24.580000 | 29.40 | 11.5 | 60 | 30.6 | QP | - | GND |

***MEASUREMENT RESULT: "TUV-1121-4_fin2"***

11/21/2018

| Frequency MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Detector | Line | PE |
|---|---|---|---|---|---|---|---|
| 0.570000 | 23.20 | 10.7 | 46 | 22.8 | AV | - | GND |
| 1.715000 | 13.00 | 10.9 | 46 | 33.0 | AV | - | GND |
| 24.580000 | 29.10 | 11.5 | 50 | 20.9 | AV | - | GND |

# 12. ANTENNA REQUIREMENT

## 12.1. The Requirement

According to Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

## 12.2. Antenna Construction

Device is equipped with permanent attached antenna, which isn't displaced by other antenna. The Antenna gain of EUT is 1.1dBi. Therefore, the equipment complies with the antenna requirement of Section 15.203.

******* End of Test Report *******