

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

Tel: (0755) 26503290
Fax: (0755) 26503396

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

TABLE OF CONTENTS

Description	Page
Test Report Certification	
1. GENERAL INFORMATION	5
1.1. Description of Device (EUT).....	5
1.2. Carrier Frequency of Channels	5
1.3. Special Accessory and Auxiliary Equipment	6
1.4. Description of Test Facility	6
1.5. Measurement Uncertainty	6
2. MEASURING DEVICE AND TEST EQUIPMENT	7
3. OPERATION OF EUT DURING TESTING	8
3.1. Operating Mode	8
3.2. Configuration and peripherals	8
4. TEST PROCEDURES AND RESULTS	9
5. 6DB BANDWIDTH TEST.....	10
5.1. Block Diagram of Test Setup.....	10
5.2. The Requirement For Section 15.247(a)(2).....	10
5.3. EUT Configuration on Measurement	10
5.4. Operating Condition of EUT	10
5.5. Test Procedure	10
5.6. Test Result	11
6. MAXIMUM PEAK OUTPUT POWER TEST	13
6.1. Block Diagram of Test Setup.....	13
6.2. The Requirement For Section 15.247(b)(3).....	13
6.3. EUT Configuration on Measurement	13
6.4. Operating Condition of EUT	13
6.5. Test Procedure	13
6.6. Test Result	14
7. POWER SPECTRAL DENSITY TEST.....	16
7.1. Block Diagram of Test Setup.....	16
7.2. The Requirement For Section 15.247(e).....	16
7.3. EUT Configuration on Measurement	16
7.4. Operating Condition of EUT	16
7.5. Test Procedure	17
7.6. Test Result	17
8. BAND EDGE COMPLIANCE TEST	20
8.1. Block Diagram of Test Setup.....	20
8.2. The Requirement For Section 15.247(d)	20
8.3. EUT Configuration on Measurement	20
8.4. Operating Condition of EUT	20
8.5. Test Procedure	21
8.6. Test Result	21
9. RADIATED SPURIOUS EMISSION TEST	27
9.1. Block Diagram of Test Setup.....	27
9.2. The Limit For Section 15.247(d)	28
9.3. Restricted bands of operation	29
9.4. Configuration of EUT on Measurement	29

9.5.	Operating Condition of EUT	30
9.6.	Test Procedure	30
9.7.	Data Sample.....	31
9.8.	Test Result	31
10.	CONDUCTED SPURIOUS EMISSION COMPLIANCE TEST	59
10.1.	Block Diagram of Test Setup.....	59
10.2.	The Requirement For Section 15.247(d)	59
10.3.	EUT Configuration on Measurement	59
10.4.	Operating Condition of EUT	59
10.5.	Test Procedure	60
10.6.	Test Result	60
11.	POWER LINE CONDUCTED EMISSION TEST	62
11.1.	Block Diagram of Test Setup.....	62
11.2.	Test System Setup.....	62
11.3.	Test Limits	63
11.4.	Configuration of EUT on Measurement	63
11.5.	Operating Condition of EUT	63
11.6.	Test Procedure	63
11.7.	Data Sample.....	64
11.8.	Test Result	64
12.	ANTENNA REQUIREMENT.....	69
12.1.	The Requirement	69
12.2.	Antenna Construction	69

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 :

Star Yang
(Star Yang, Engineer)

Sean Liu

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) The Designation Number is CN1189 The Registration Number is 708358 Listed by Innovation, Science and Economic Development Canada (ISED) The Registration Number is 5077A-2 Accredited by China National Accreditation Service for Conformity Assessment (CNAS) The Registration Number is CNAS L3193 Accredited by American Association for Laboratory Accreditation (A2LA) 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-10S	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_EMV 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

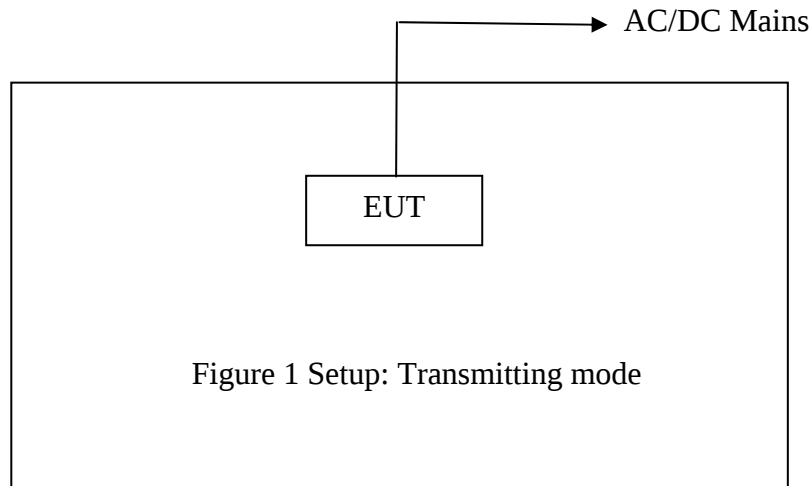


Figure 1 Setup: Transmitting mode

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) 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.

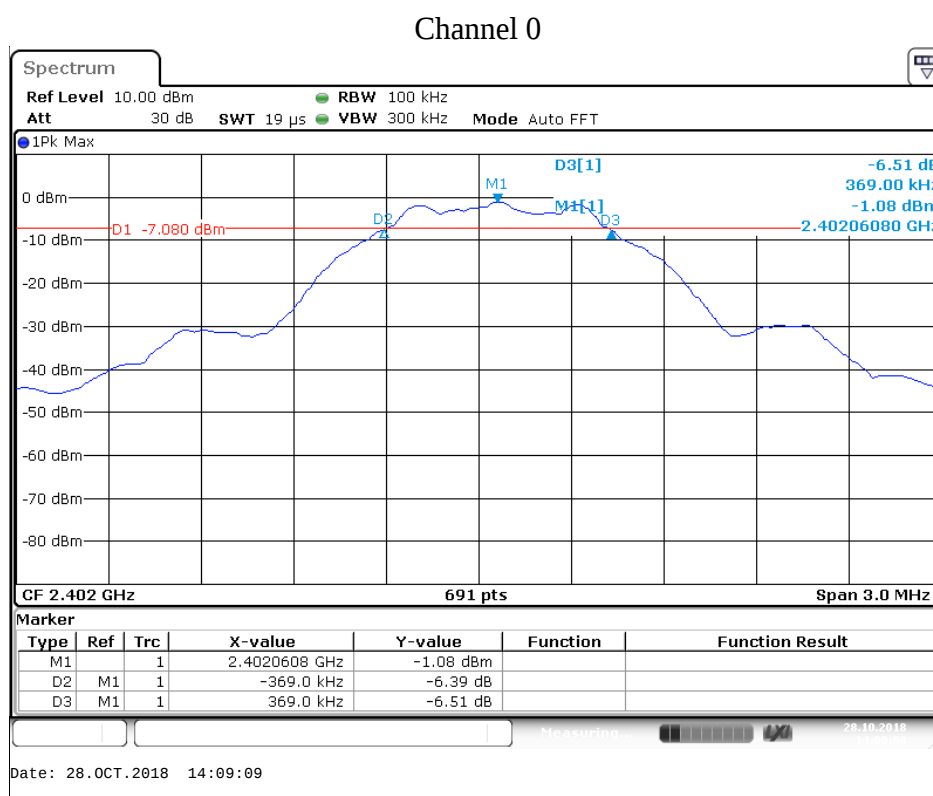
5.5.2. Set RBW of spectrum analyzer to 100 kHz and VBW to 300 kHz.

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

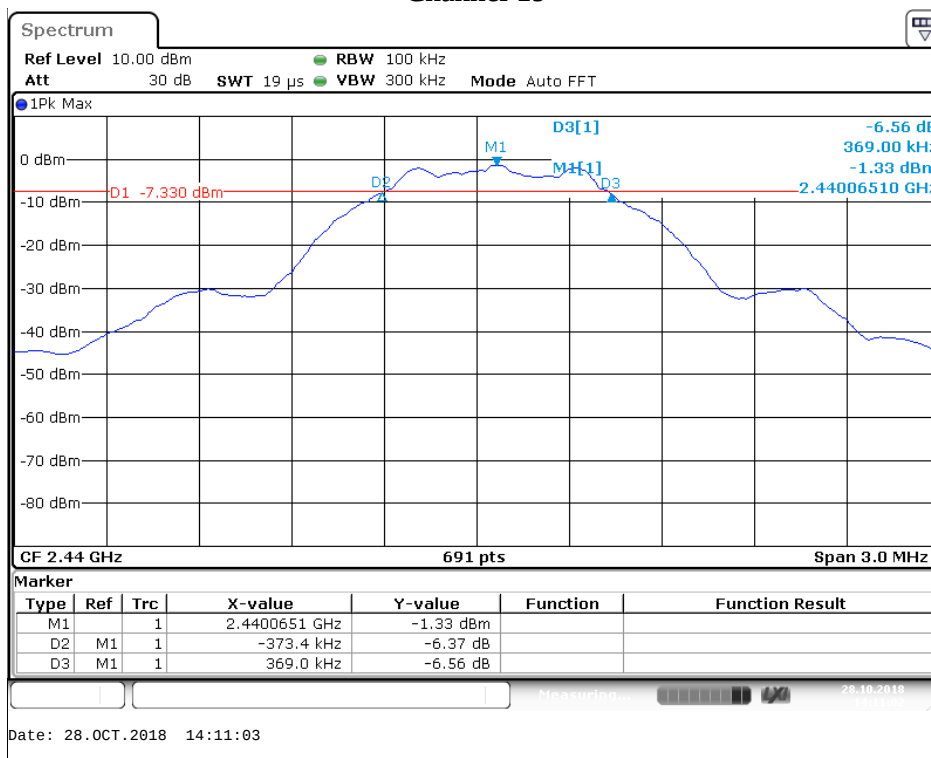
5.6.Test Result

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

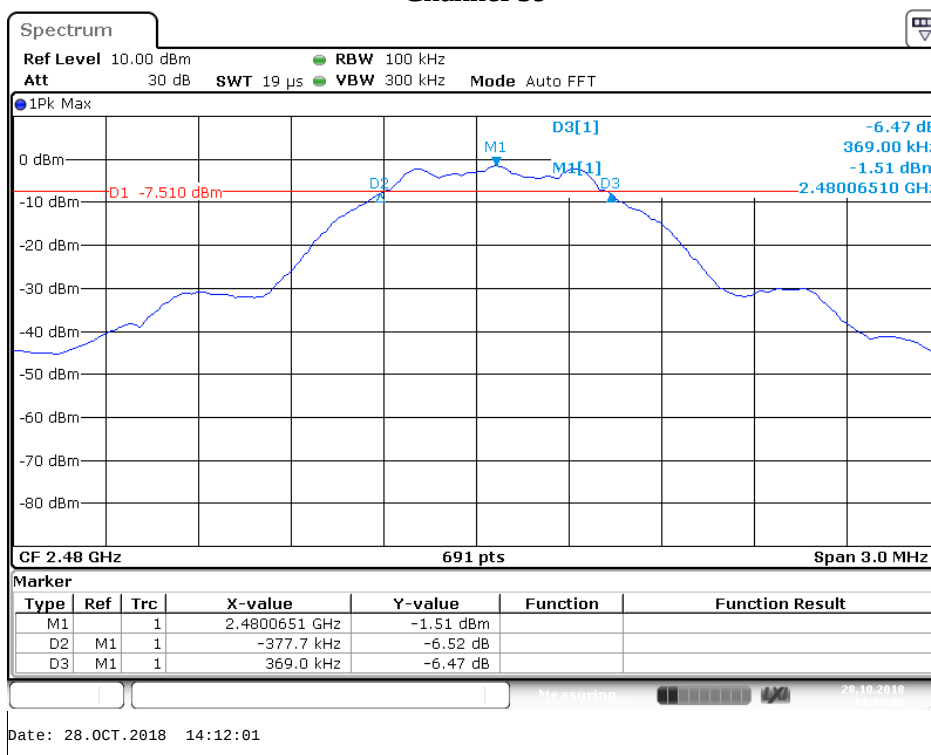
The spectrum analyzer plots are attached as below.



Channel 19



Channel 39



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.

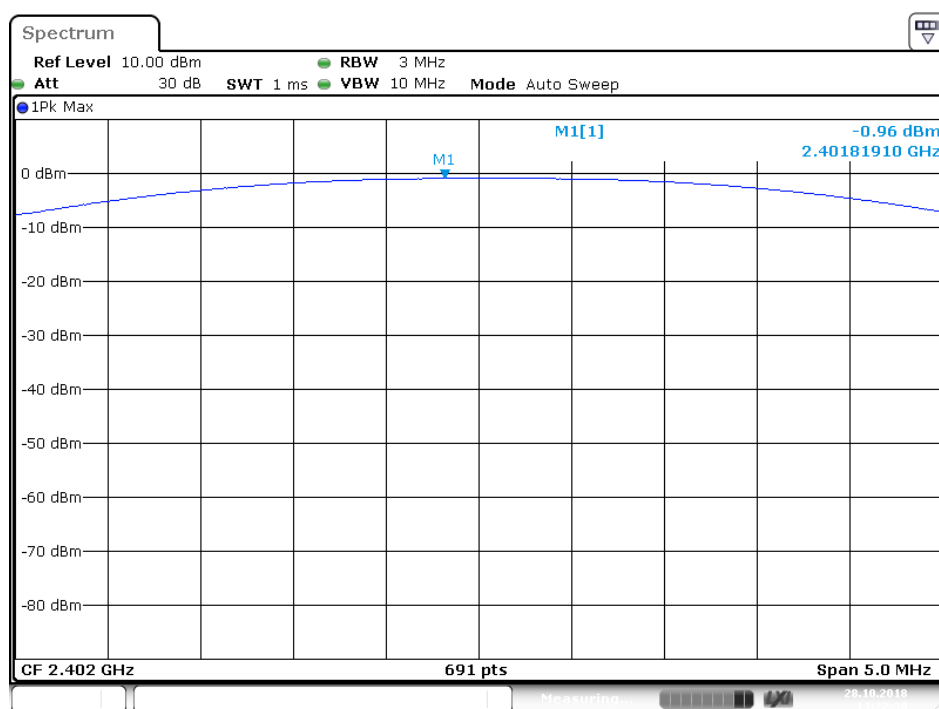
6.5.3. Measurement the maximum peak output power.

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

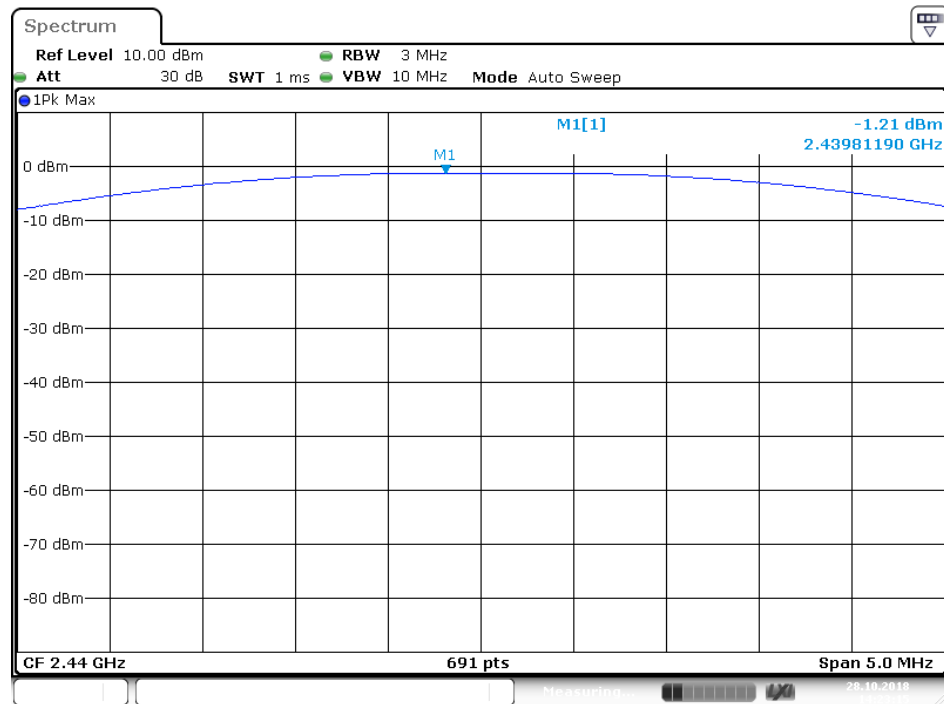
The spectrum analyzer plots are attached as below.

Channel 0



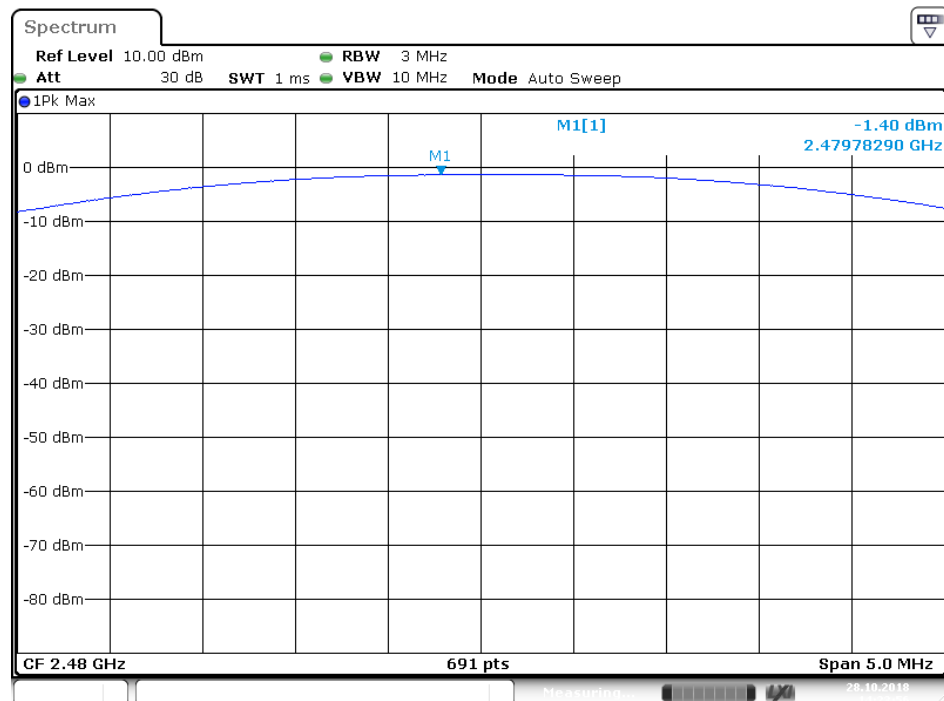
Date: 28.OCT.2018 14:22:30

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: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
4. Set the VBW $\geq 3 \times \text{RBW}$.
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.

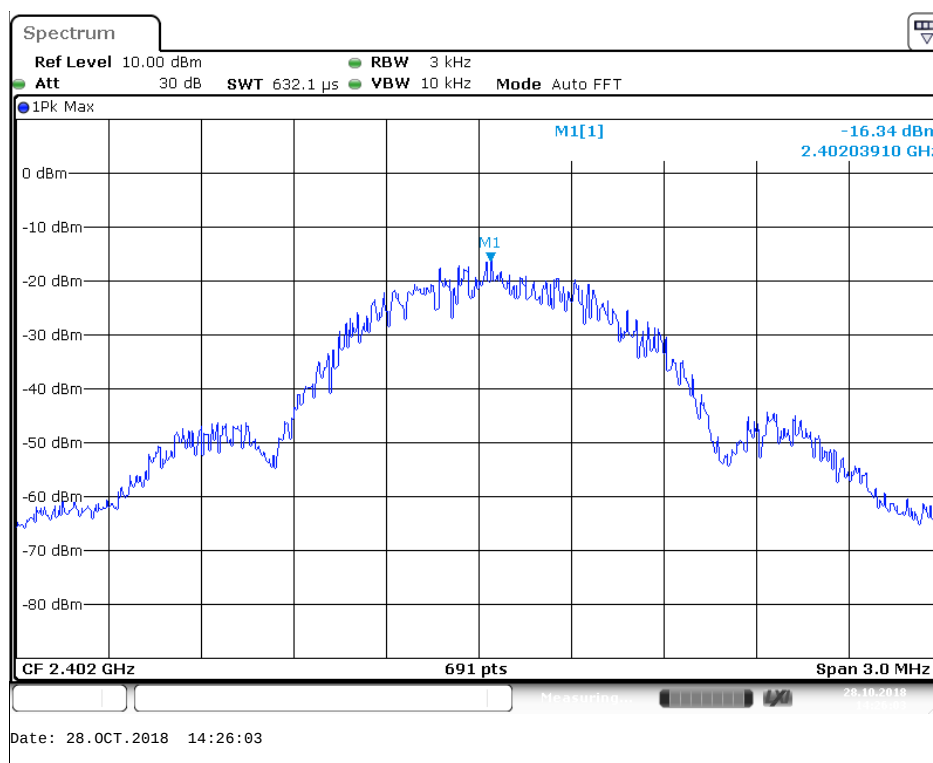
7.5.4. Measurement the maximum power spectral density.

7.6. Test Result

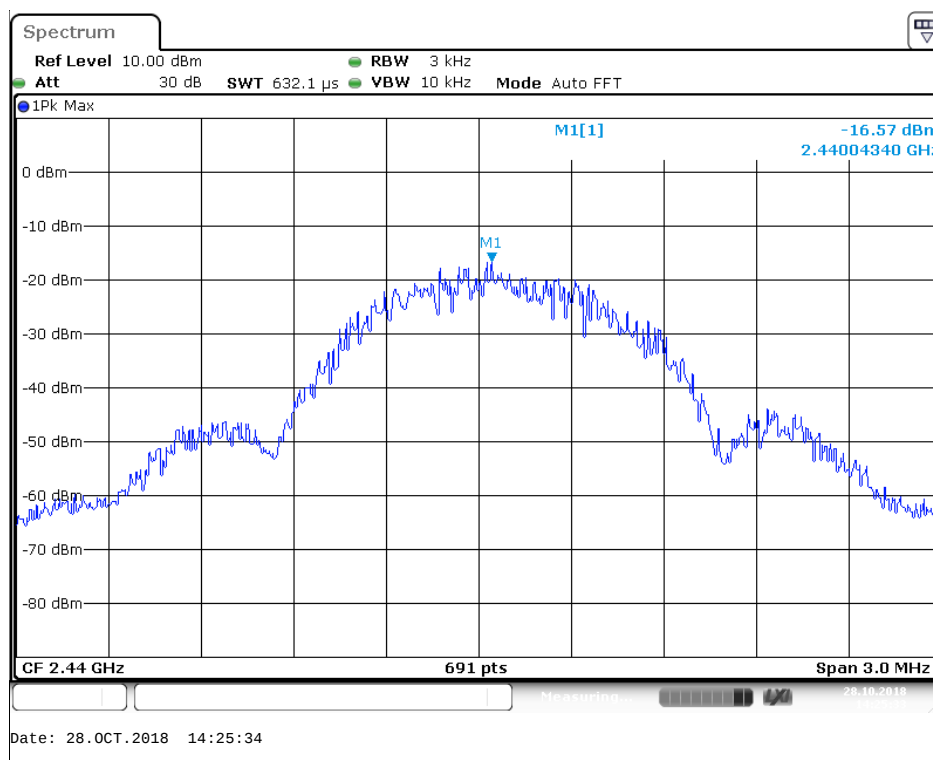
Channel	Frequency (MHz)	PSD (dBm/3KHz)	Limit (dBm/3KHz)	Result
0	2402	-16.34	8	Pass
19	2440	-16.57	8	Pass
39	2480	-16.83	8	Pass

The spectrum analyzer plots are attached as below.

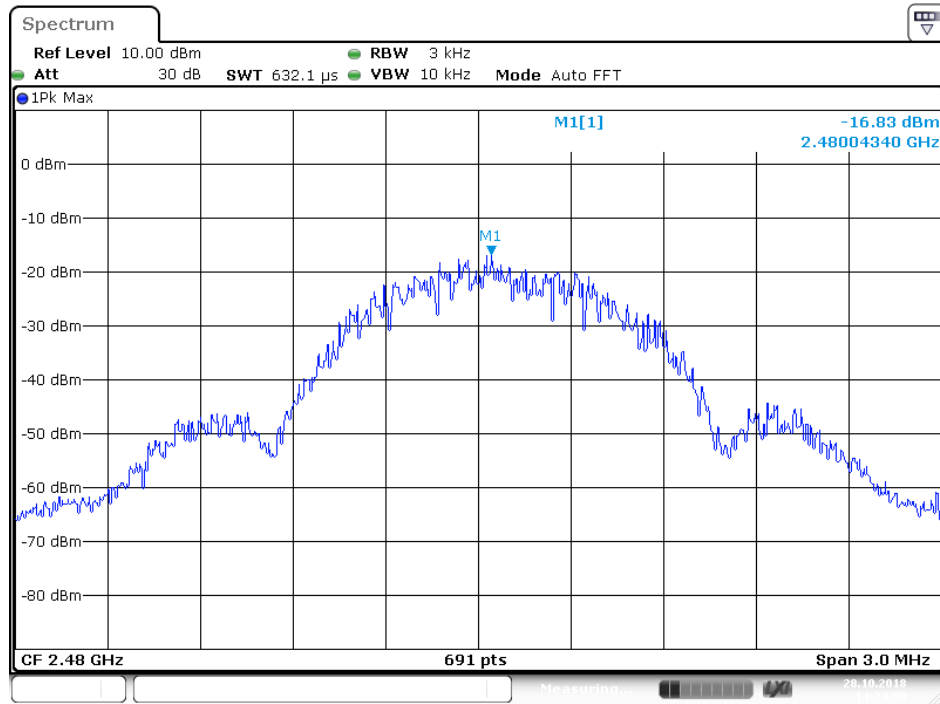
Channel 0



Channel 19



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

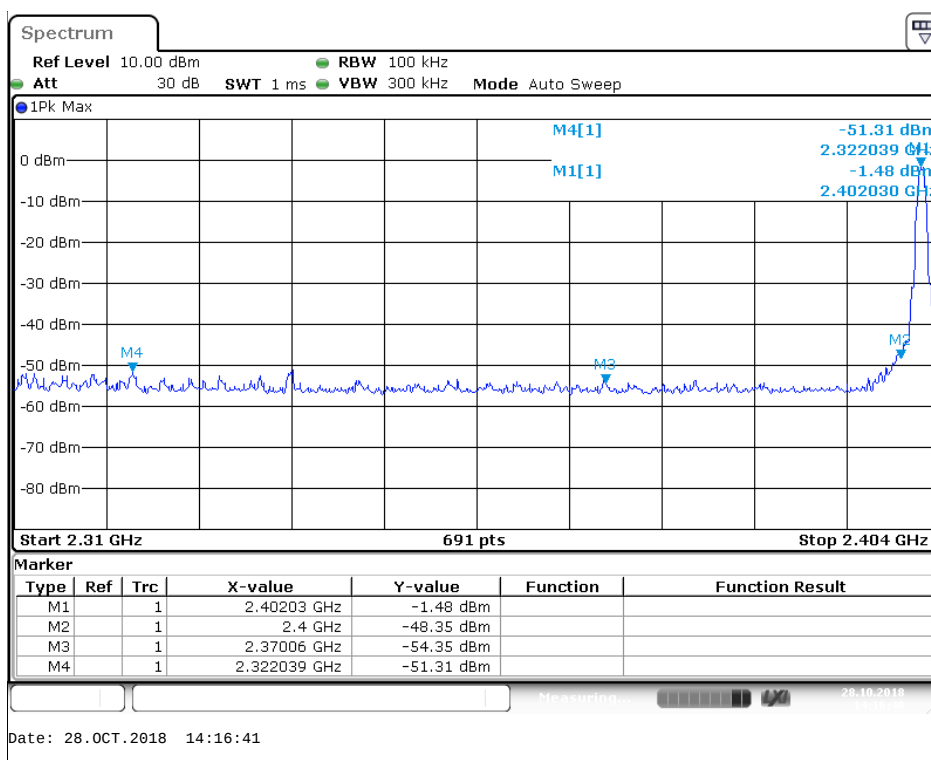
Pass.

Conducted Band Edge Result

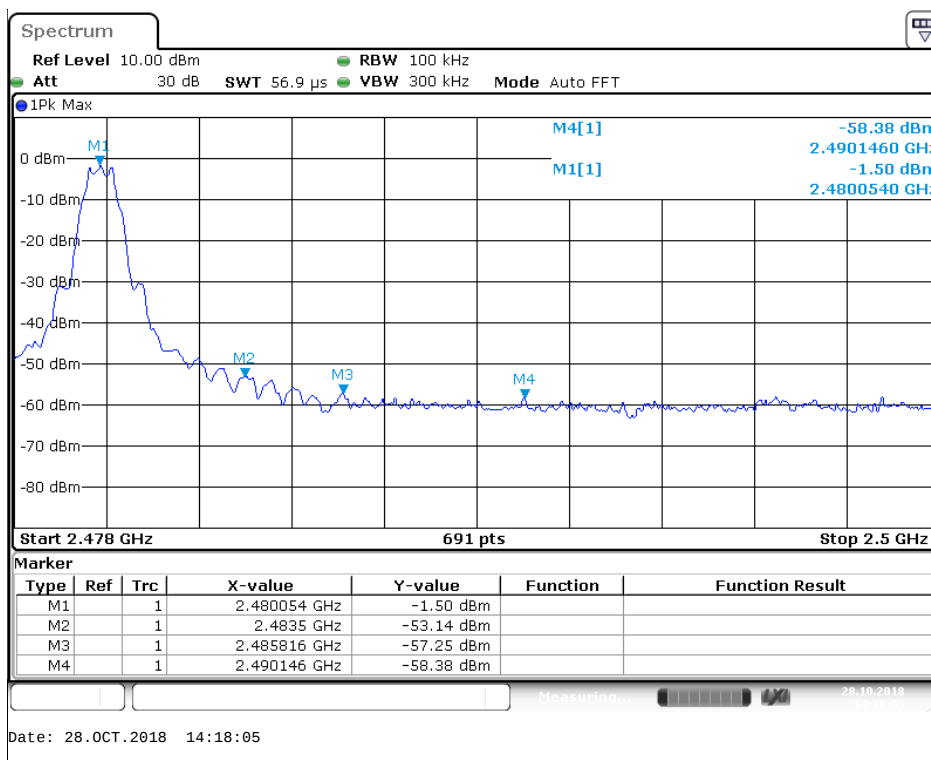
Channel	Frequency	Delta peak to band emission	Limit(dBc)
0	2402MHz	46.87	> 20
39	2480MHz	51.64	> 20

The spectrum analyzer plots are attached as below.

Channel 0



Channel 39





Radiated Band Edge Result

ACCURATE TECHNOLOGY CO., LTD.

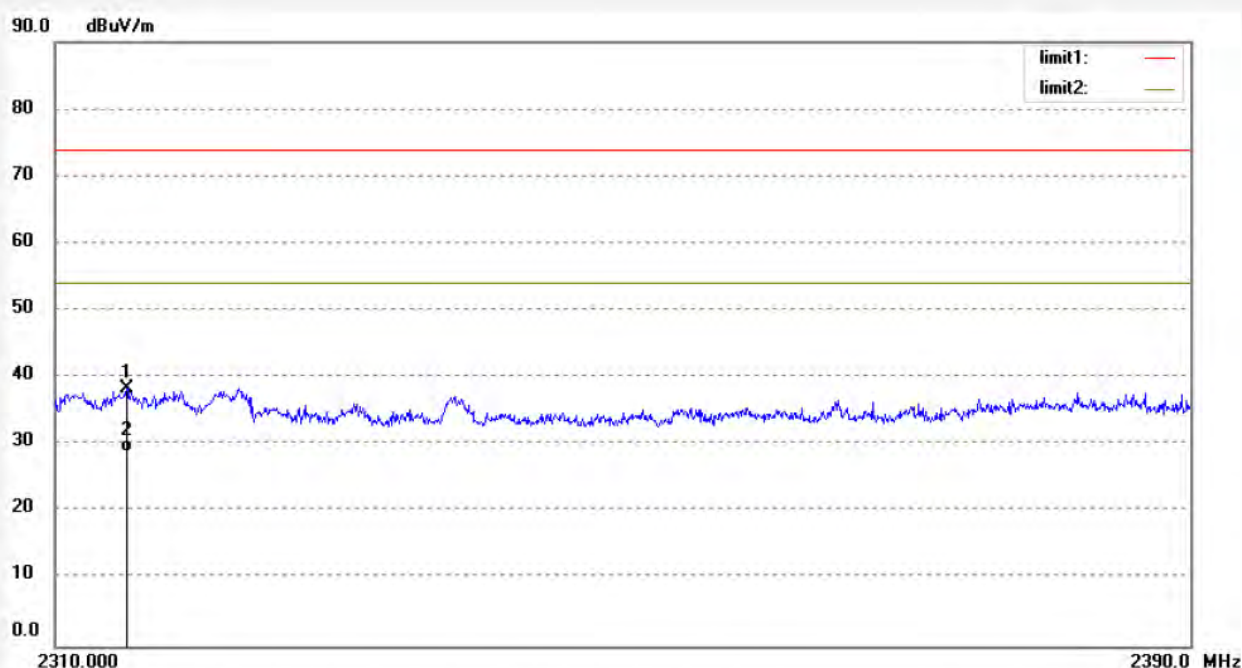
F1,Bldg,A,Changyuan New Material Port Keyuan Rd,
Science & Industry Park,Nanshan Shenzhen,P.R.China

Site: 2# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

Job No.: LGW2018 #3021
Standard: FCC (Band Edge)
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: Highly accurate flow monitor
Mode: TX 2402MHz
Model: FTMU 100
Manufacturer: Lindab AB

Polarization: Horizontal
Power Source: DC 24V
Date: 2018/10/28
Time:
Engineer Signature: WADE
Distance: 3m

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			

Job No.: LGW2018 #3020

Standard: FCC (Band Edge)

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: Highly accurate flow monitor

Mode: TX 2402MHz

Model: FTMU 100

Manufacturer: Lindab AB

Polarization: Vertical

Power Source: DC 24V

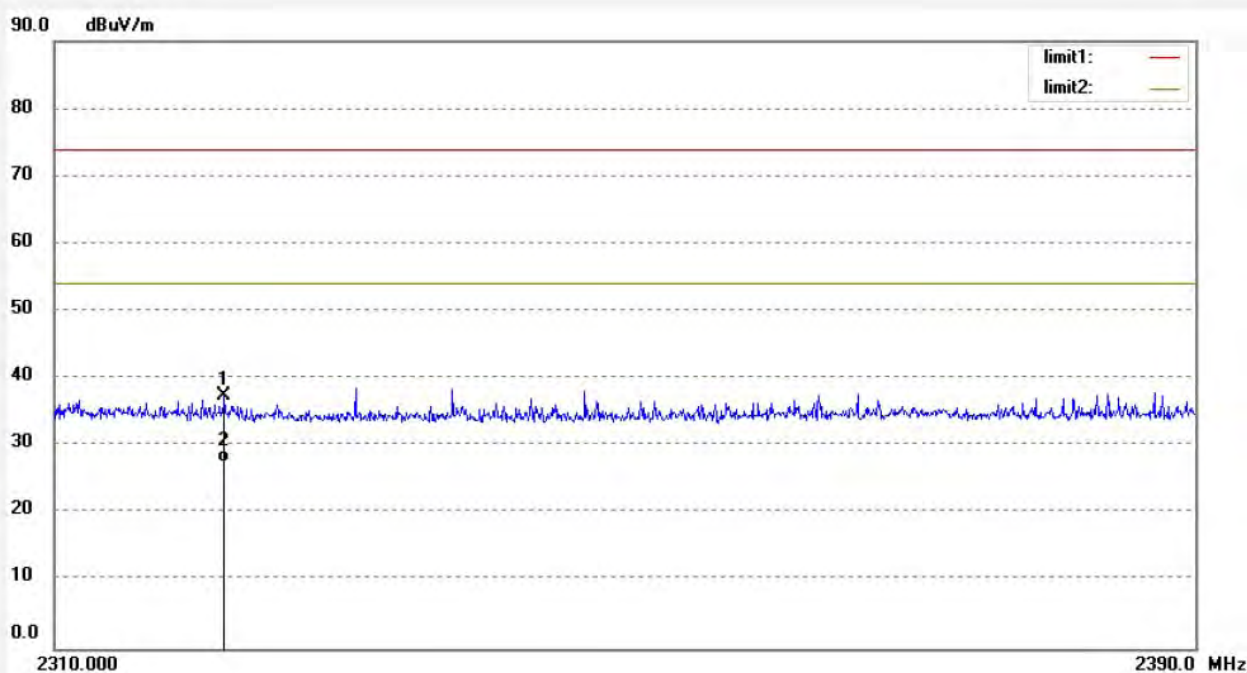
Date: 2018/10/28

Time:

Engineer Signature: WADE

Distance: 3m

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			

Job No.: LGW2018 #3026

Standard: FCC (Band Edge)

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: Highly accurate flow monitor

Mode: TX 2480MHz

Model: FTMU 100

Manufacturer: Lindab AB

Polarization: Horizontal

Power Source: DC 24V

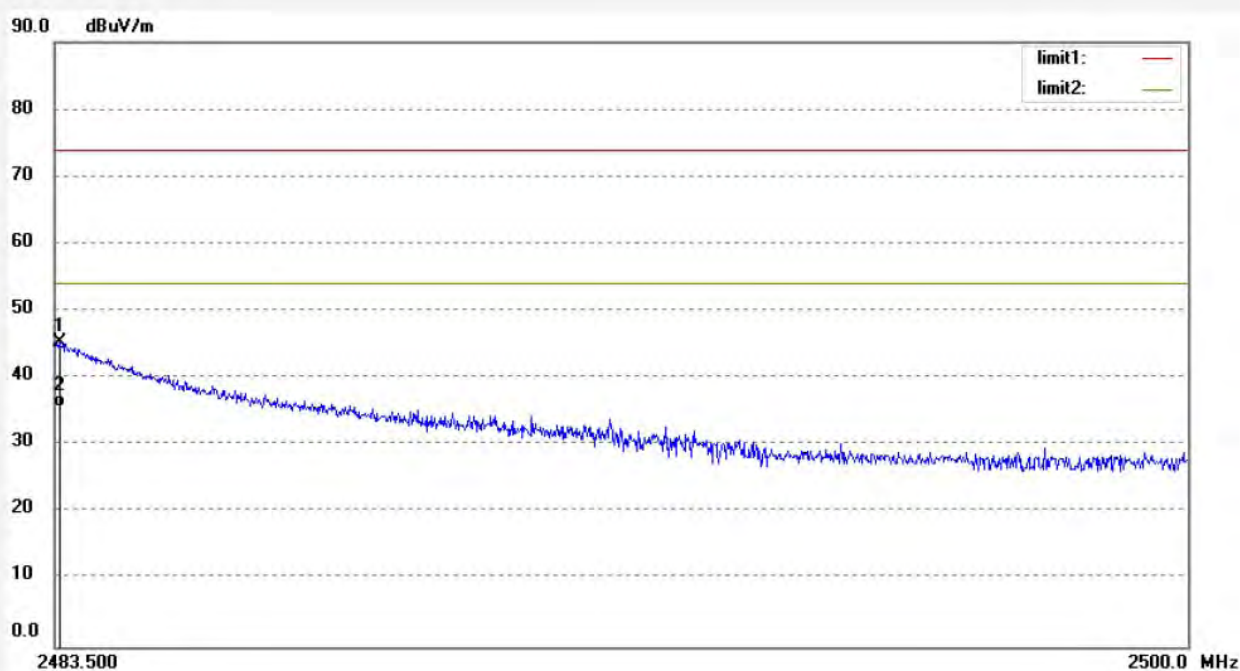
Date: 2018/10/28

Time:

Engineer Signature: WADE

Distance: 3m

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			

Job No.: LGW2018 #3027

Standard: FCC (Band Edge)

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: Highly accurate flow monitor

Mode: TX 2480MHz

Model: FTMU 100

Manufacturer: Lindab AB

Polarization: Vertical

Power Source: DC 24V

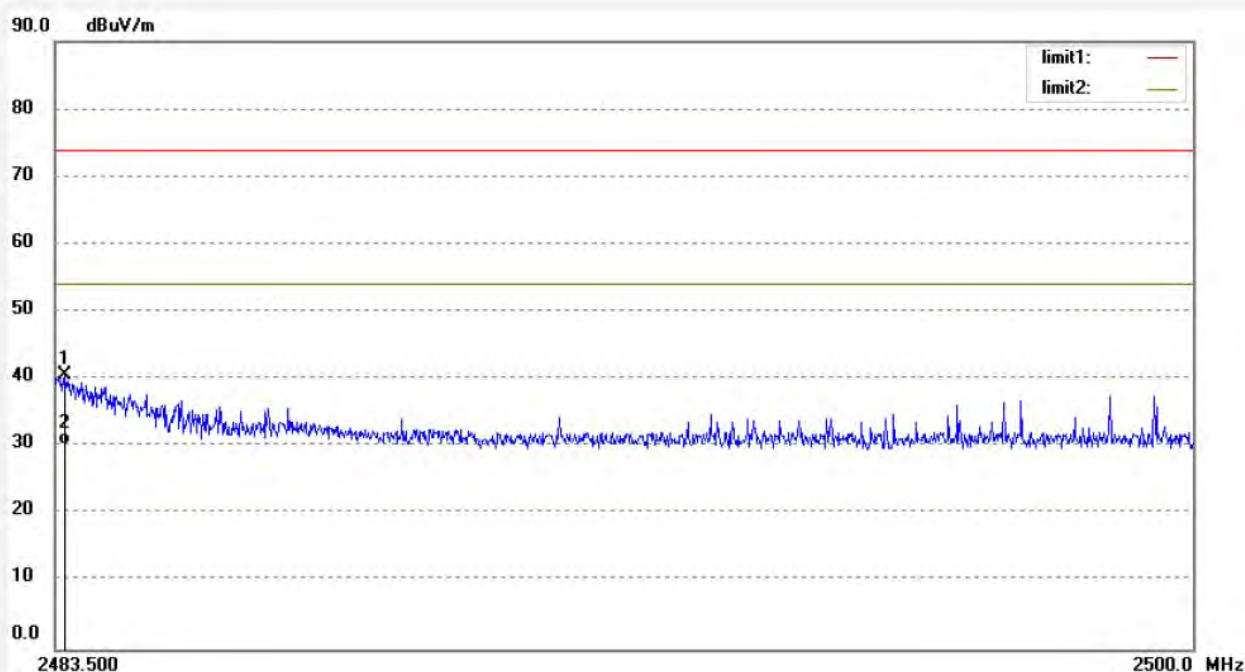
Date: 2018/10/28

Time:

Engineer Signature: WADE

Distance: 3m

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			

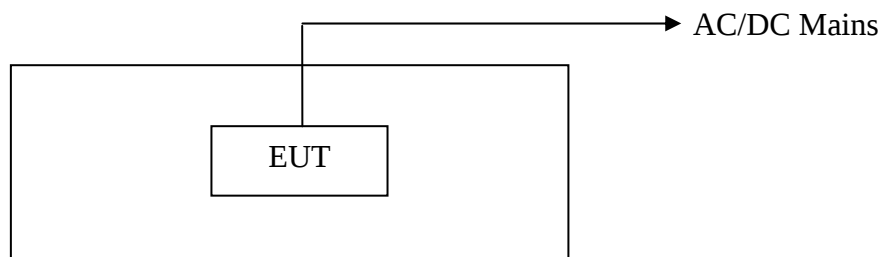
Note:

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

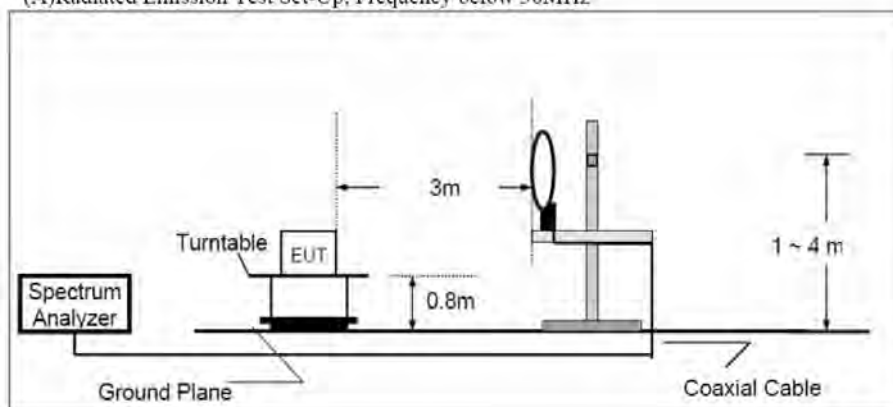
9.1.1. Block diagram of connection between the EUT and peripherals



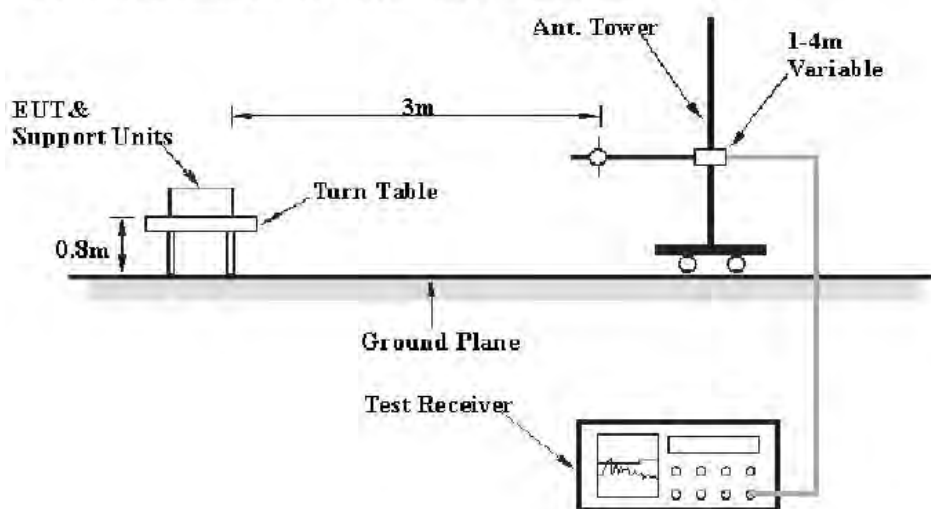
Setup: Transmitting mode

9.1.2. Semi-Anechoic Chamber Test Setup Diagram

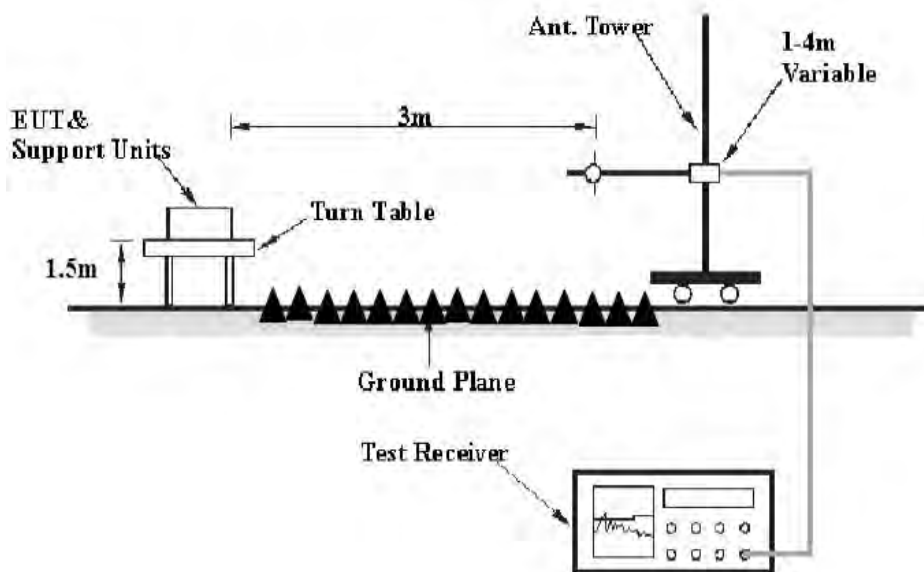
(A) Radiated Emission Test Set-Up, Frequency below 30MHz



(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			

¹Until February 1, 1999, this restricted band shall be 0.490-0.510

²Above 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 Section 15.209 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 (dB μ v)	Factor (dB/m)	Result (dB μ v/m)	Limit (dB μ v/m)	Margin (dB)	Remark
X.XX	43.85	-22.22	21.63	43.5	-21.87	QP

Frequency(MHz) = Emission frequency in MHz

Reading(dB μ v) = Uncorrected Analyzer/Receiver reading

Factor (dB/m) = Antenna factor + Cable Loss – Amplifier gain

Result(dB μ v/m) = Reading(dB μ v) + Factor(dB/m)

Limit (dB μ v/m) = Limit stated in standard

Margin (dB) = Result(dB μ v/m) - Limit (dB μ v/m)

QP = Quasi-peak Reading

Calculation Formula:

Margin(dB) = Result (dB μ V/m)–Limit(dB μ V/m)

Result(dB μ V/m)= Reading(dB μ V)+ 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

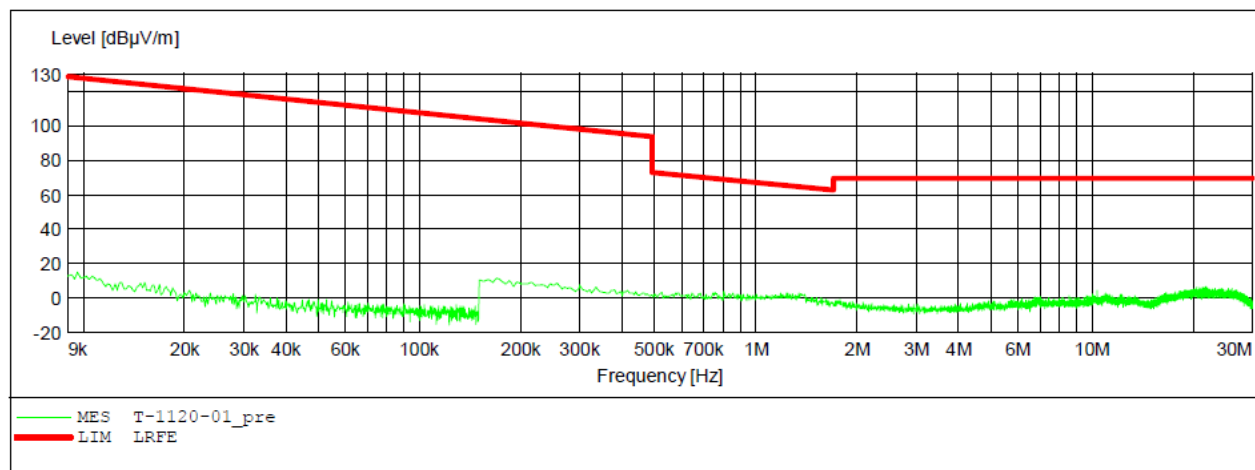
ACCURATE TECHNOLOGY CO., LTD.

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	Stop	Step	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	



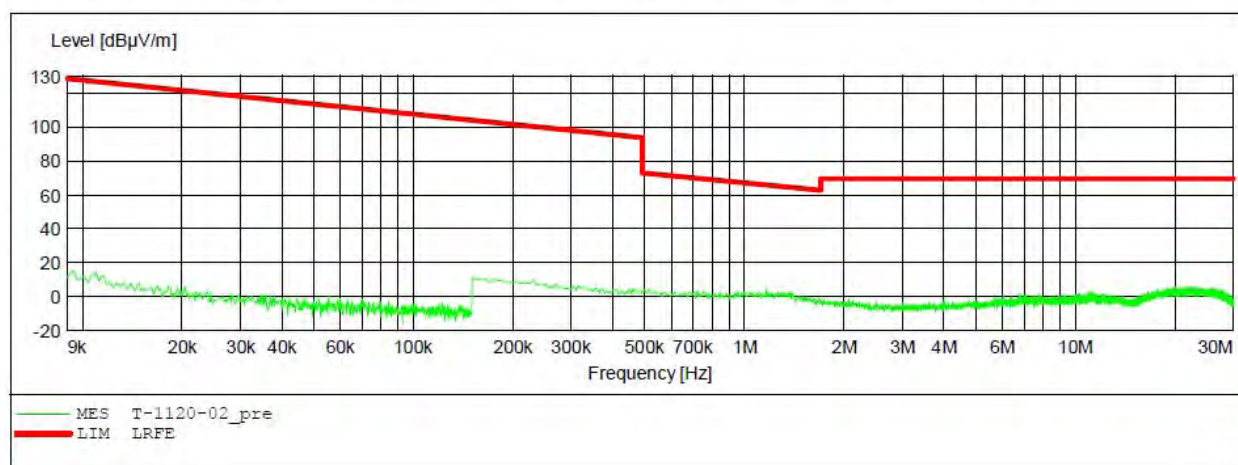
ACCURATE TECHNOLOGY CO., LTD.

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	Stop	Step	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



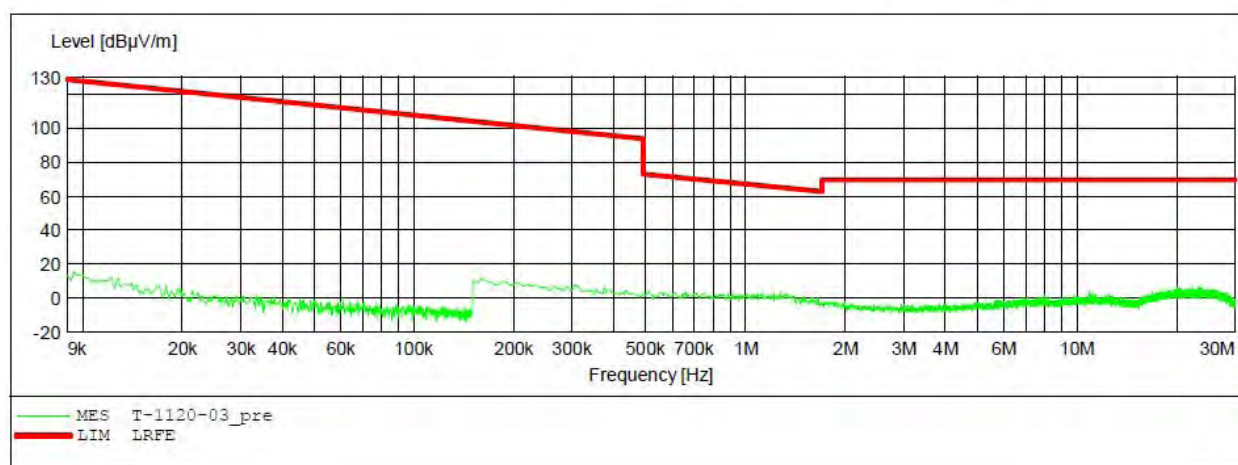
ACCURATE TECHNOLOGY CO., LTD.

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	Stop	Step	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



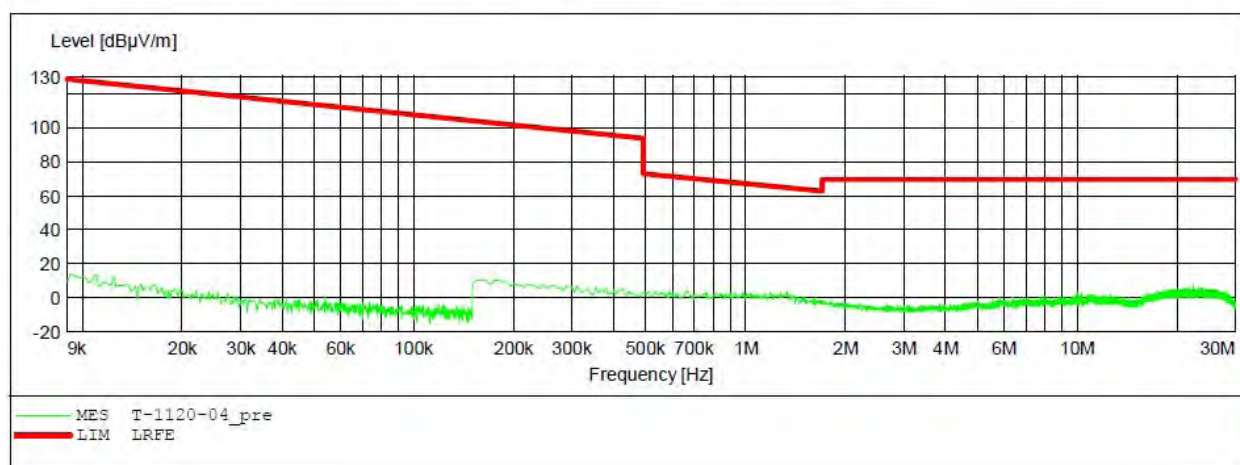
ACCURATE TECHNOLOGY CO., LTD.

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	Stop	Step	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



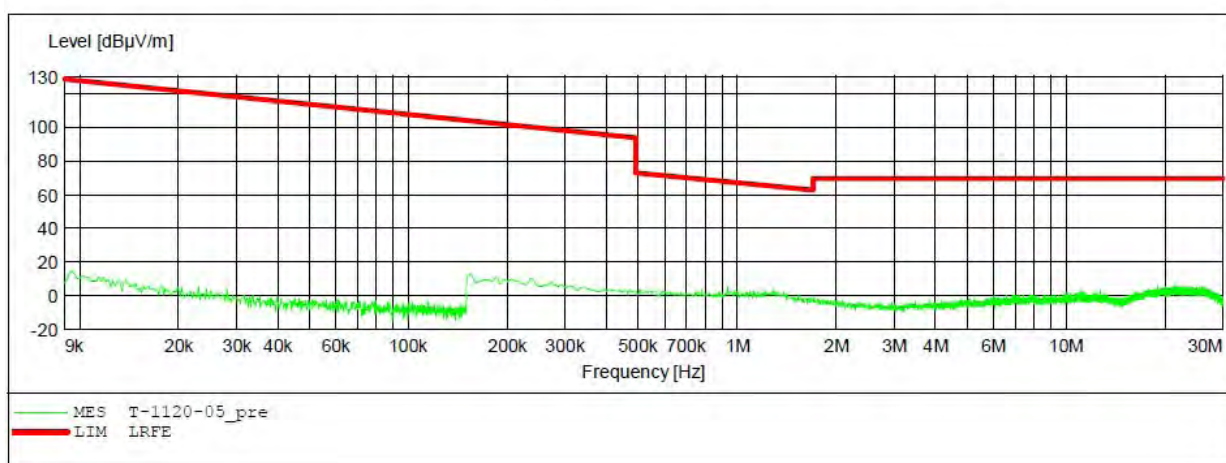
ACCURATE TECHNOLOGY CO., LTD.

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"

Start	Stop	Step	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



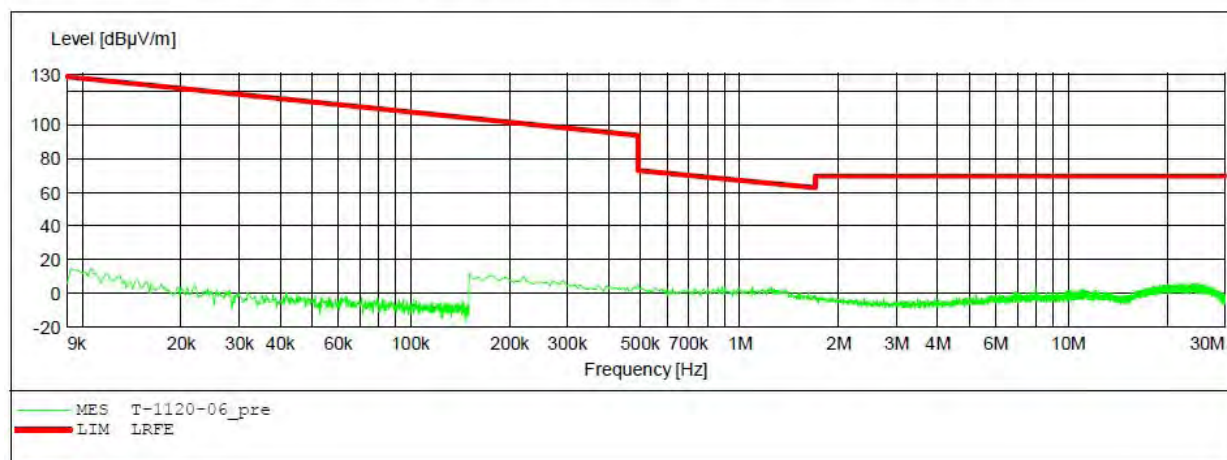
ACCURATE TECHNOLOGY CO., LTD.

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	Stop	Step	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



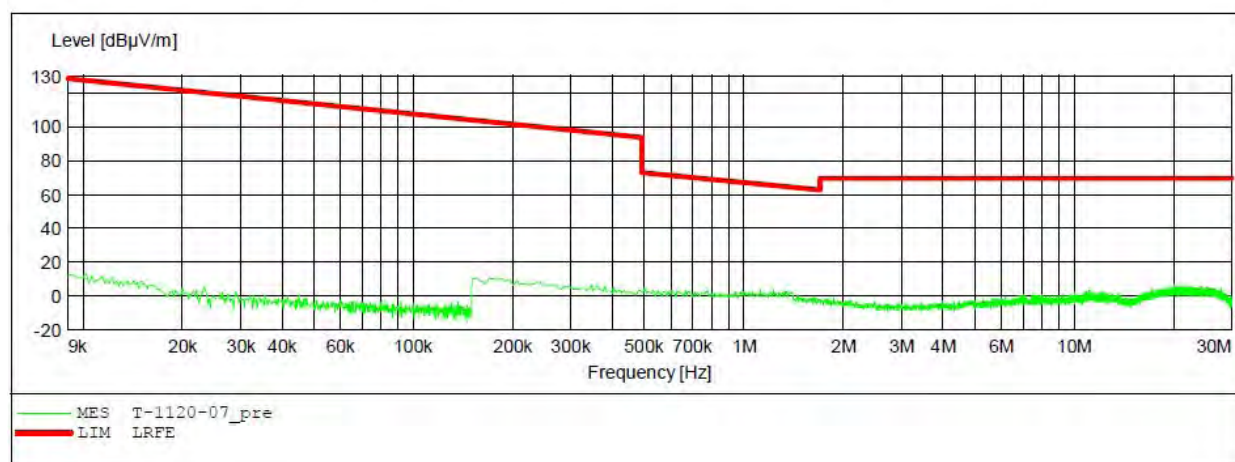
ACCURATE TECHNOLOGY CO., LTD.

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	Stop	Step	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



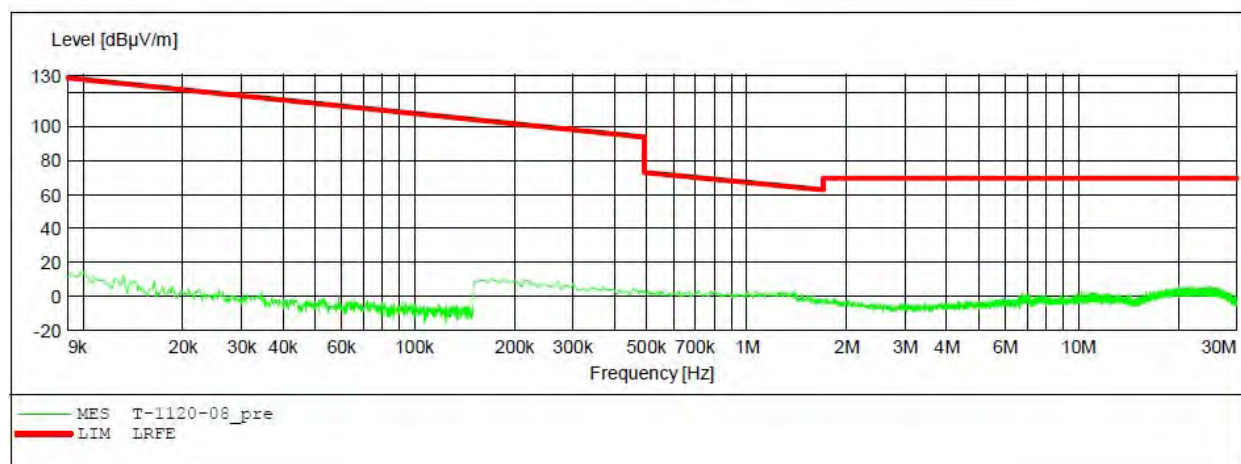
ACCURATE TECHNOLOGY CO., LTD.

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	Stop	Step	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



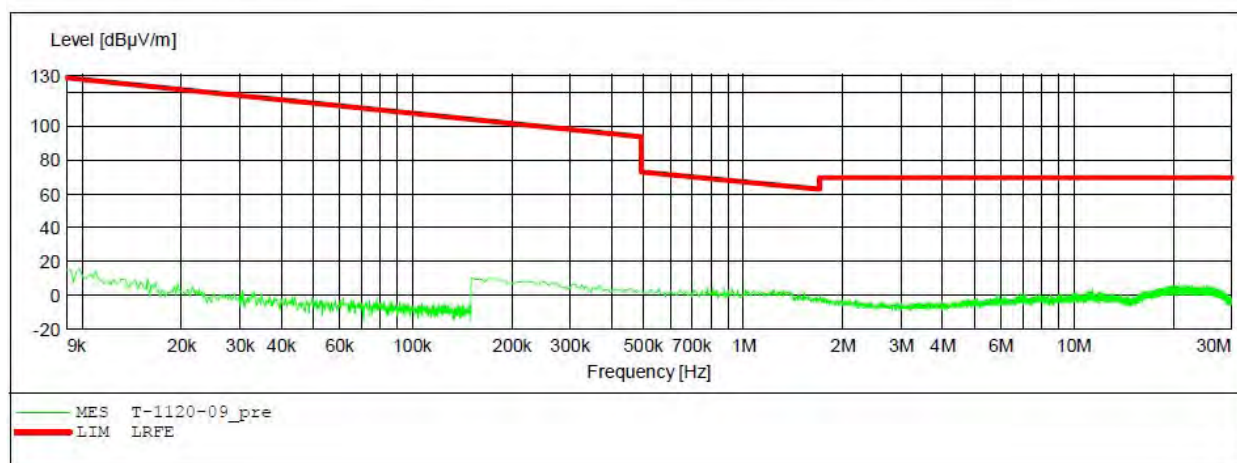
ACCURATE TECHNOLOGY CO., LTD.

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	Stop	Step	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.

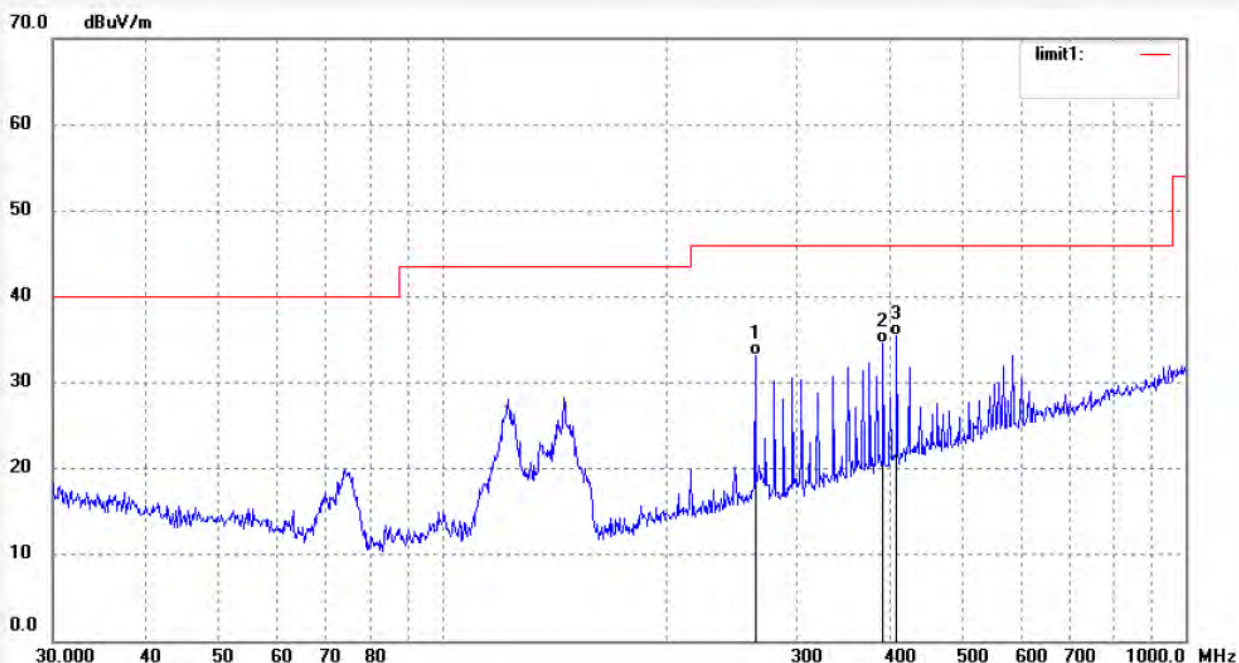
F1,Bldg,A,Changyuan New Material Port Keyuan Rd,
Science & Industry Park,Nanshan Shenzhen,P.R.China

Site: 2# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

Job No.: LGW2018 #3050
Standard: FCC Part 15C 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: Highly accurate flow monitor
Mode: TX 2402MHz
Model: FTMU 100
Manufacturer: Lindab AB

Polarization: Horizontal
Power Source: DC 24V
Date: 2018/10/28
Time:
Engineer Signature: WADE
Distance: 3m

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			

Job No.: LGW2018 #3051

Standard: FCC Part 15C 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: Highly accurate flow monitor

Mode: TX 2402MHz

Model: FTMU 100

Manufacturer: Lindab AB

Polarization: Vertical

Power Source: DC 24V

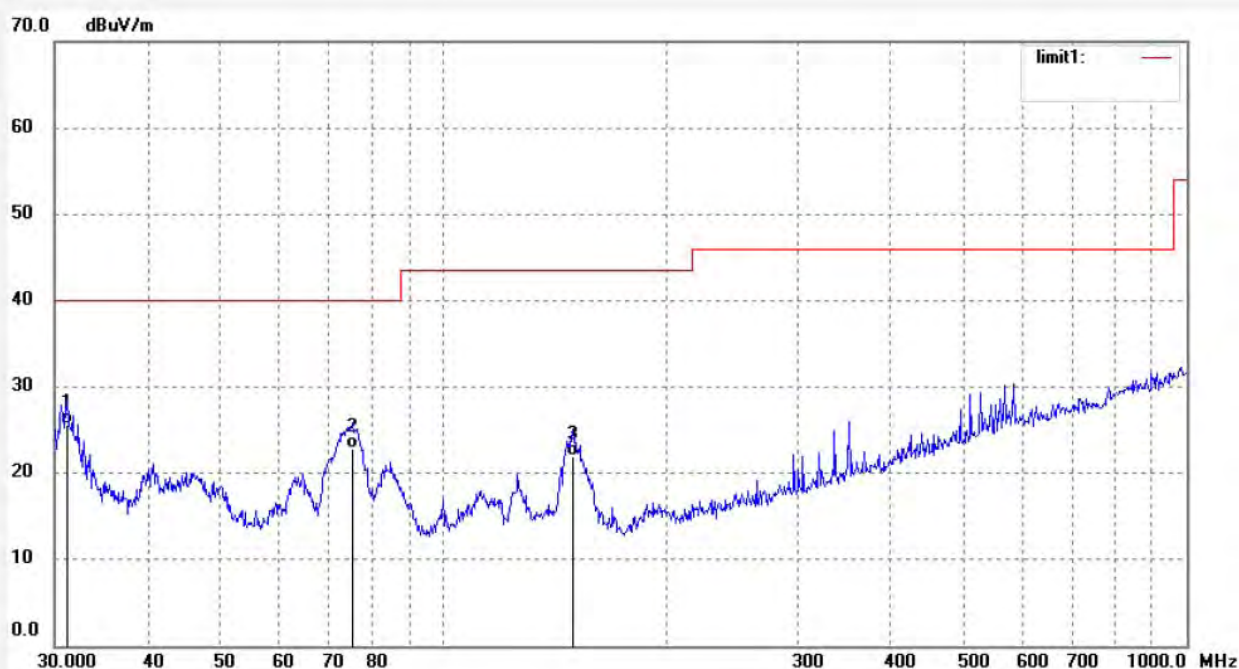
Date: 2018/10/28

Time:

Engineer Signature: WADE

Distance: 3m

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			

Job No.: LGW2018 #3053

Standard: FCC Part 15C 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: Highly accurate flow monitor

Mode: TX 2440MHz

Model: FTMU 100

Manufacturer: Lindab AB

Polarization: Horizontal

Power Source: DC 24V

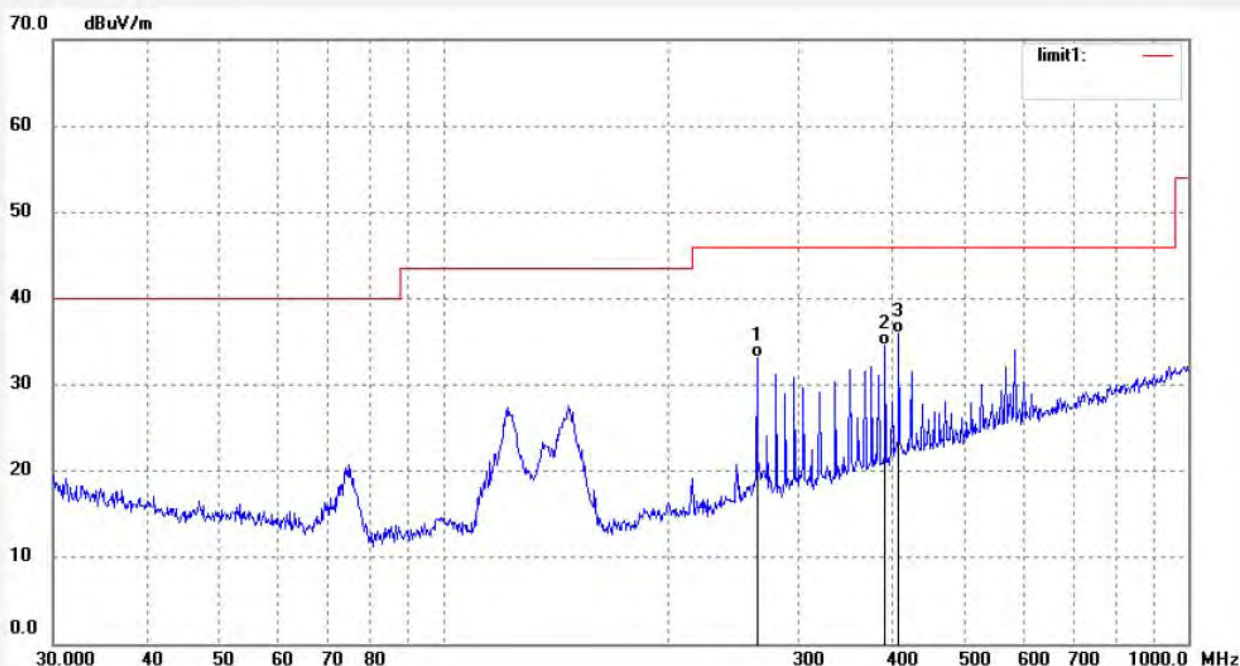
Date: 2018/10/28

Time:

Engineer Signature: WADE

Distance: 3m

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			

Job No.: LGW2018 #3052

Standard: FCC Part 15C 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: Highly accurate flow monitor

Mode: TX 2440MHz

Model: FTMU 100

Manufacturer: Lindab AB

Polarization: Vertical

Power Source: DC 24V

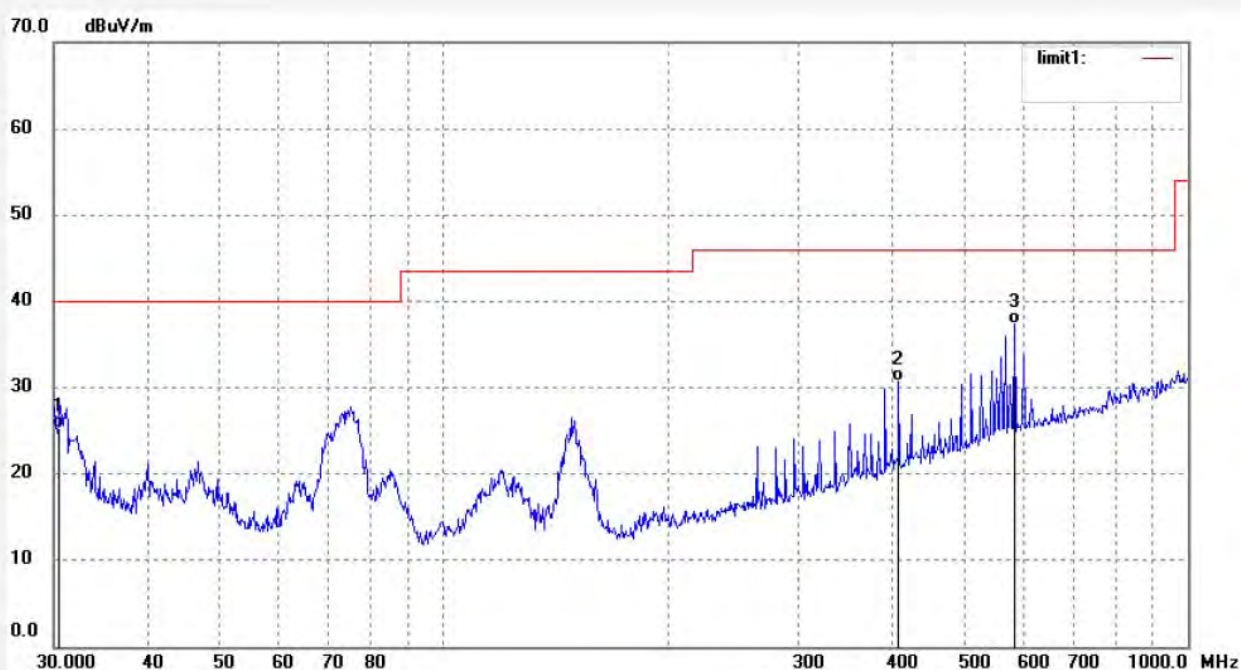
Date: 2018/10/28

Time:

Engineer Signature: WADE

Distance: 3m

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			

Job No.: LGW2018 #3054

Standard: FCC Part 15C 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: Highly accurate flow monitor

Mode: TX 2480MHz

Model: FTMU 100

Manufacturer: Lindab AB

Polarization: Horizontal

Power Source: DC 24V

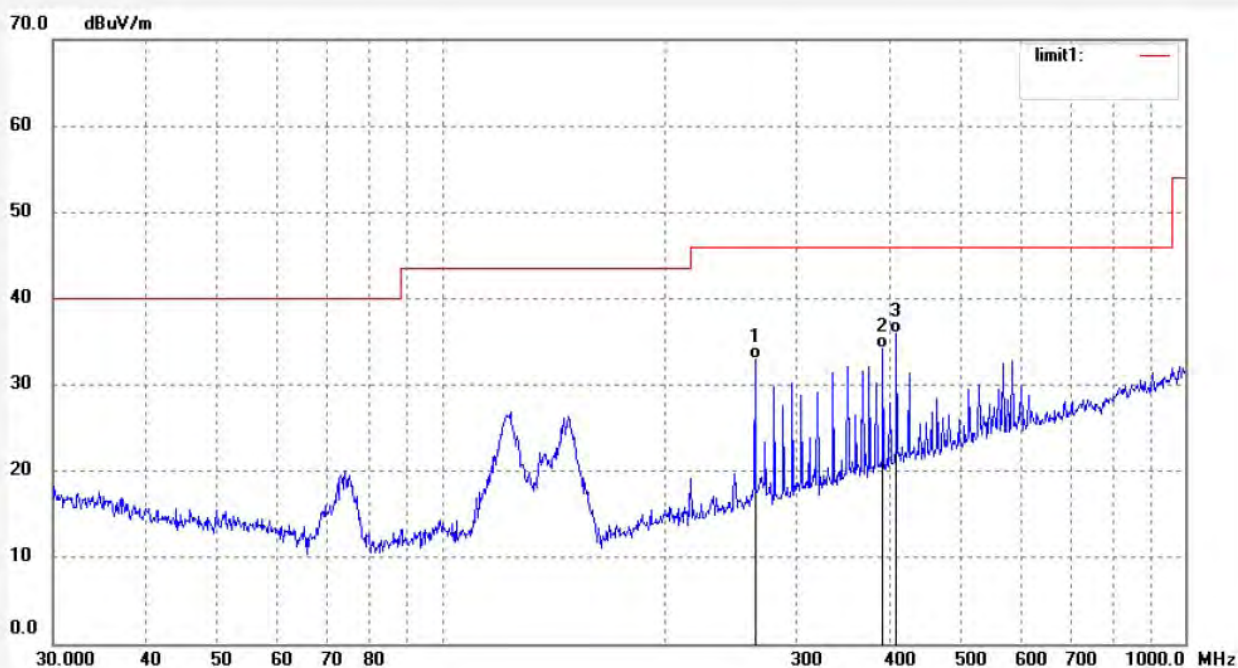
Date: 2018/10/28

Time:

Engineer Signature: WADE

Distance: 3m

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			

Job No.: LGW2018 #3055

Standard: FCC Part 15C 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: Highly accurate flow monitor

Mode: TX 2480MHz

Model: FTMU 100

Manufacturer: Lindab AB

Polarization: Vertical

Power Source: DC 24V

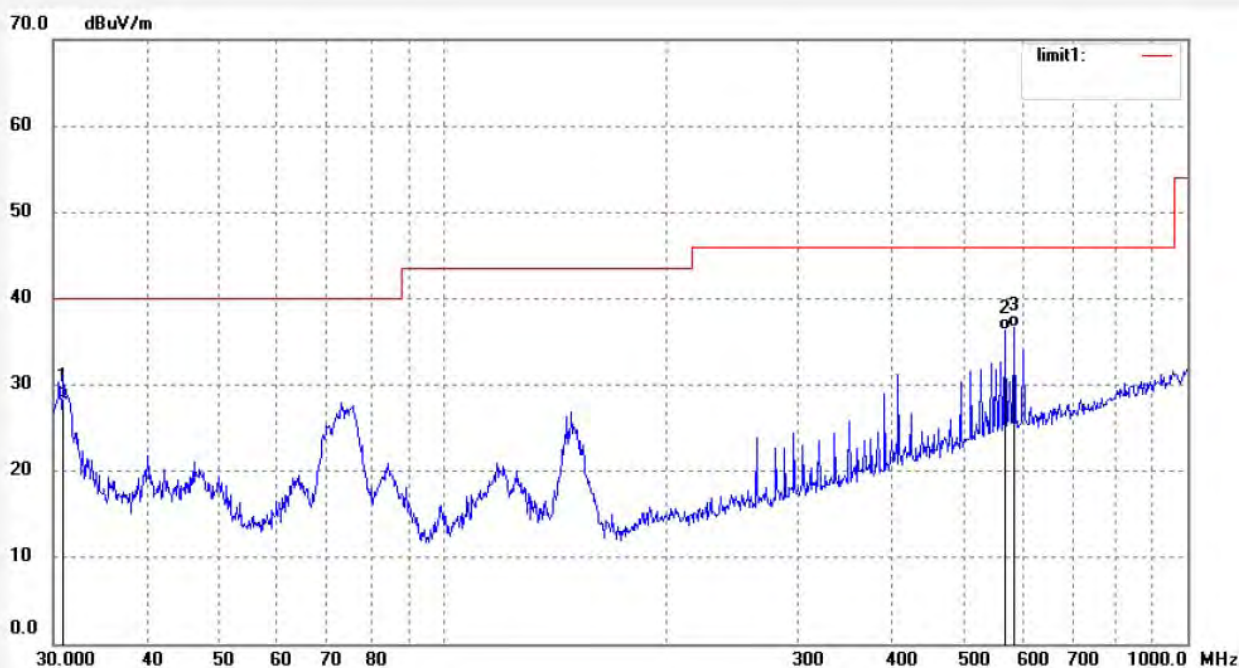
Date: 2018/10/28

Time:

Engineer Signature: WADE

Distance: 3m

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



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 #3018

Standard: FCC Part 15C 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: Highly accurate flow monitor

Mode: TX 2402MHz

Model: FTMU 100

Manufacturer: Lindab AB

Polarization: Horizontal

Power Source: DC 24V

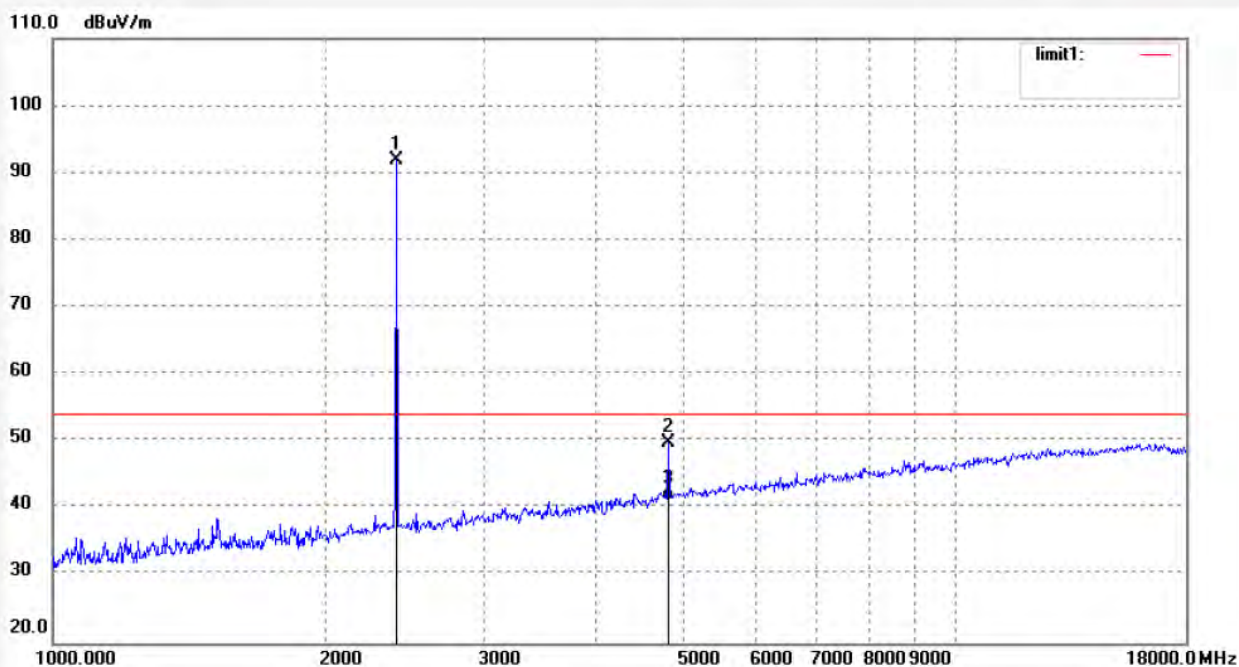
Date: 2018/10/28

Time:

Engineer Signature: WADE

Distance: 3m

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			

Job No.: LGW2018 #3019

Standard: FCC Part 15C 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: Highly accurate flow monitor

Mode: TX 2402MHz

Model: FTMU 100

Manufacturer: Lindab AB

Polarization: Vertical

Power Source: DC 24V

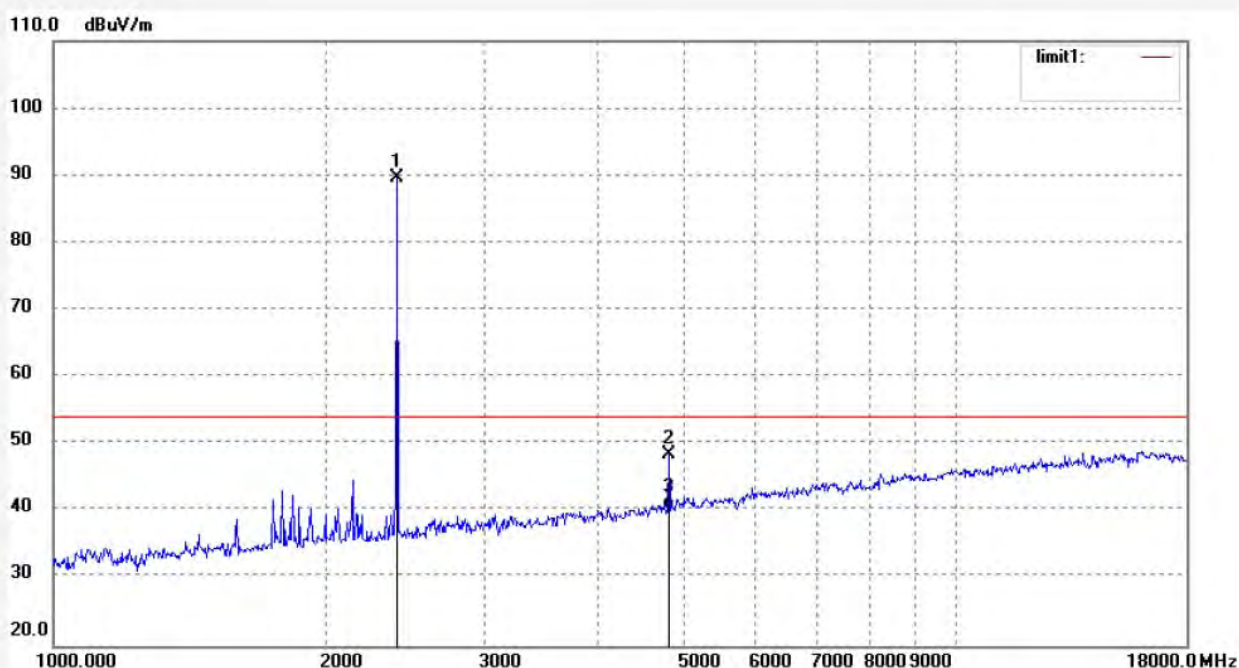
Date: 2018/10/28

Time:

Engineer Signature: WADE

Distance: 3m

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			

Job No.: LGW2018 #3022

Standard: FCC Part 15C 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: Highly accurate flow monitor

Mode: TX 2440MHz

Model: FTMU 100

Manufacturer: Lindab AB

Polarization: Horizontal

Power Source: DC 24V

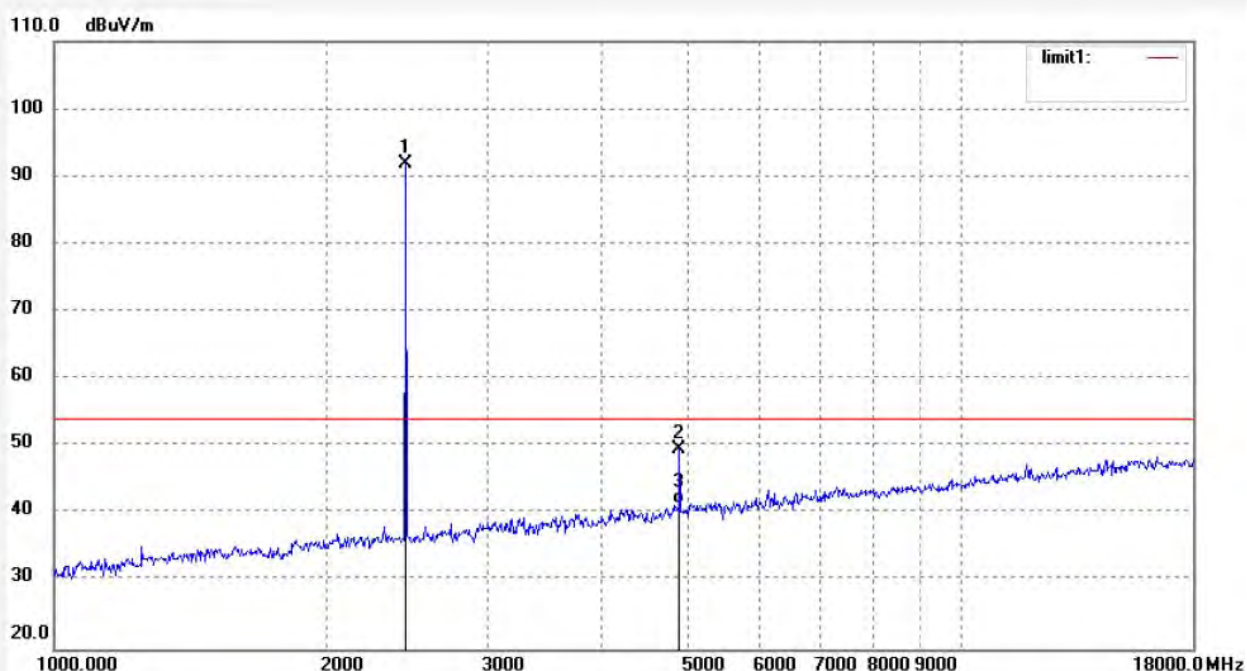
Date: 2018/10/28

Time:

Engineer Signature: WADE

Distance: 3m

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			

Job No.: LGW2018 #3023

Standard: FCC Part 15C 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: Highly accurate flow monitor

Mode: TX 2440MHz

Model: FTMU 100

Manufacturer: Lindab AB

Polarization: Vertical

Power Source: DC 24V

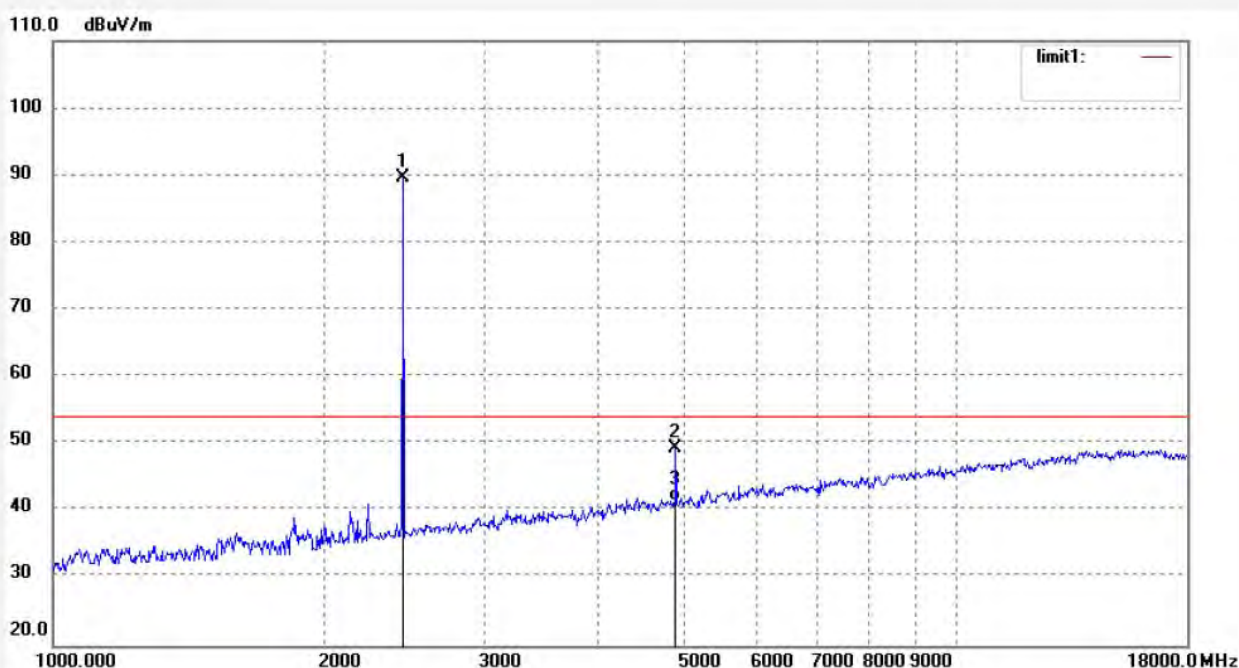
Date: 2018/10/28

Time:

Engineer Signature: WADE

Distance: 3m

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			

Job No.: LGW2018 #3025

Standard: FCC Part 15C 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: Highly accurate flow monitor

Mode: TX 2480MHz

Model: FTMU 100

Manufacturer: Lindab AB

Polarization: Horizontal

Power Source: DC 24V

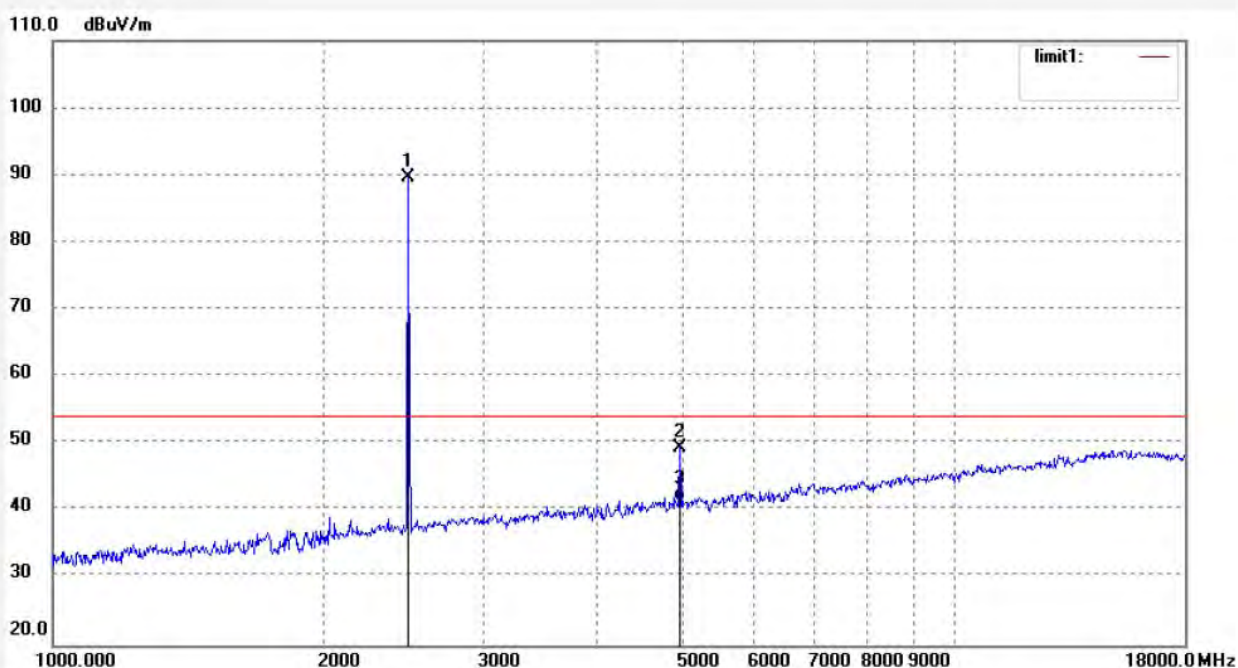
Date: 2018/10/28

Time:

Engineer Signature: WADE

Distance: 3m

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			



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 #3024

Standard: FCC Part 15C 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: Highly accurate flow monitor

Mode: TX 2480MHz

Model: FTMU 100

Manufacturer: Lindab AB

Polarization: Vertical

Power Source: DC 24V

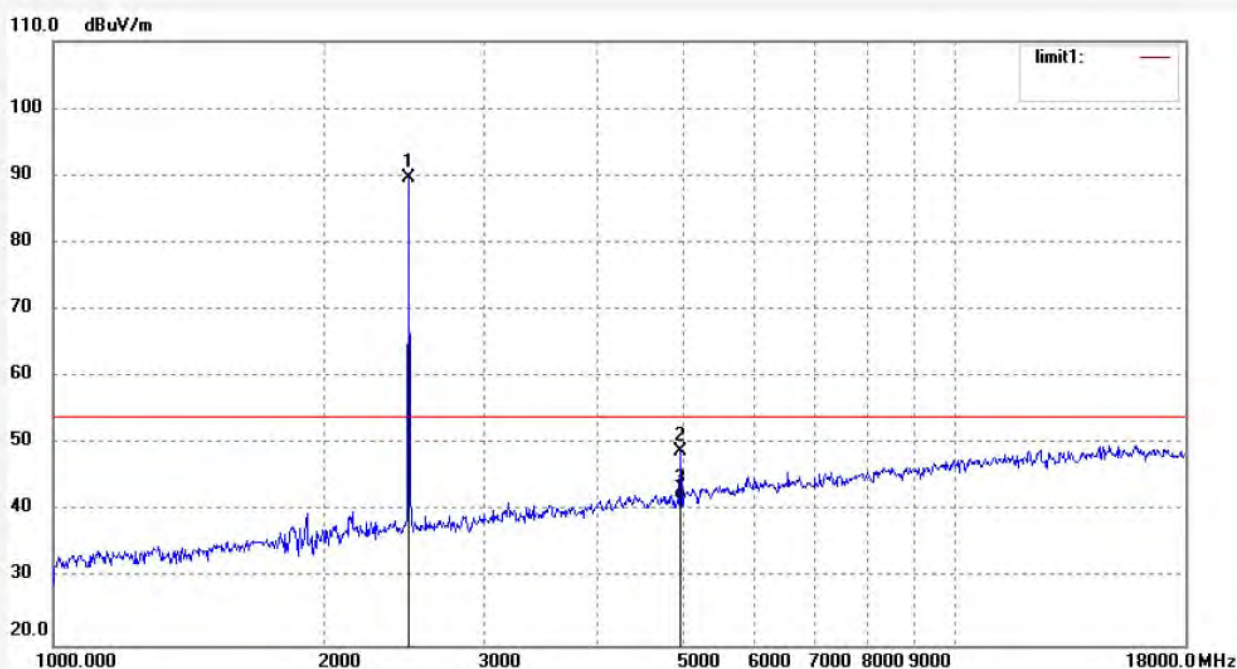
Date: 2018/10/28

Time:

Engineer Signature: WADE

Distance: 3m

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

Standard: FCC Part 15C 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: Highly accurate flow monitor

Mode: TX 2402MHz

Model: FTMU 100

Manufacturer: Lindab AB

Polarization: Horizontal

Power Source: DC 24V

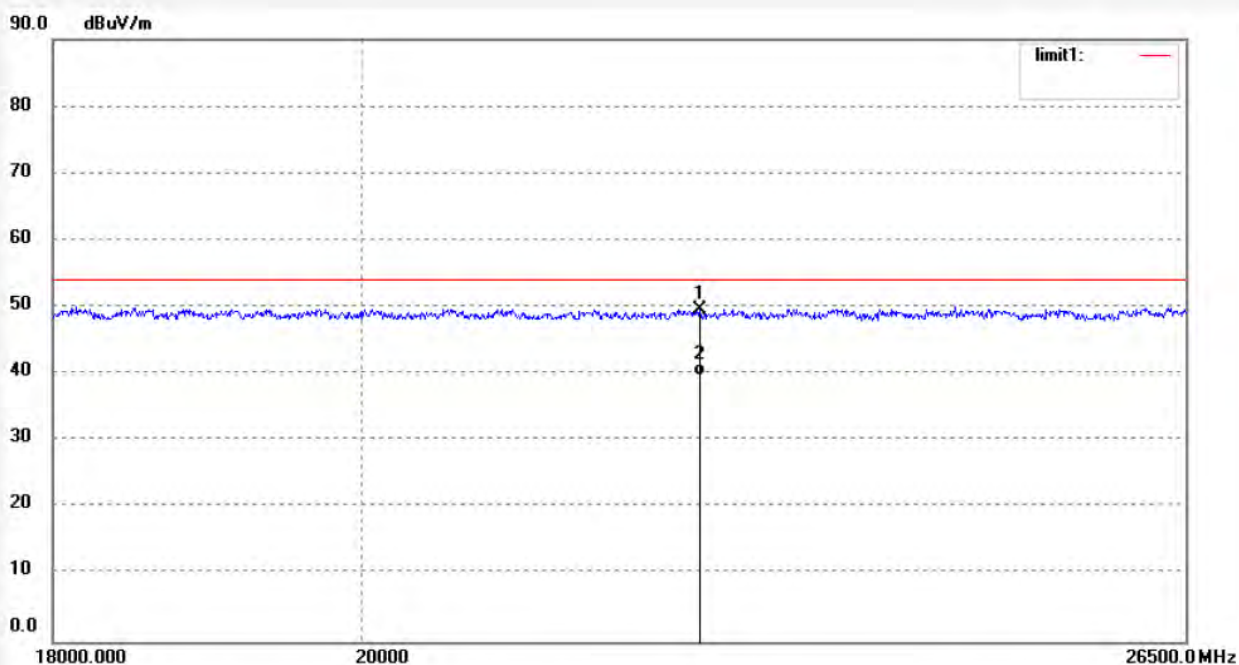
Date: 2018/10/28

Time:

Engineer Signature: WADE

Distance: 3m

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			

Job No.: LGW2018 #3028

Standard: FCC Part 15C 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: Highly accurate flow monitor

Mode: TX 2402MHz

Model: FTMU 100

Manufacturer: Lindab AB

Polarization: Vertical

Power Source: DC 24V

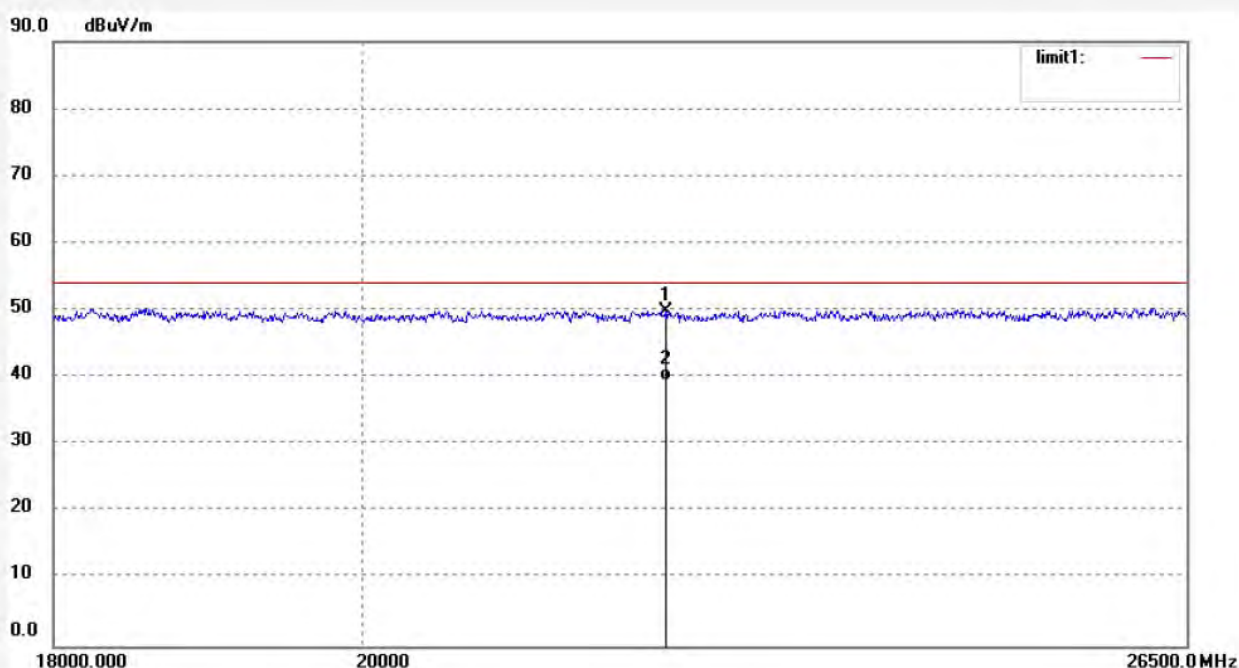
Date: 2018/10/28

Time:

Engineer Signature: WADE

Distance: 3m

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			

Job No.: LGW2018 #3030

Standard: FCC Part 15C 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: Highly accurate flow monitor

Mode: TX 2440MHz

Model: FTMU 100

Manufacturer: Lindab AB

Polarization: Horizontal

Power Source: DC 24V

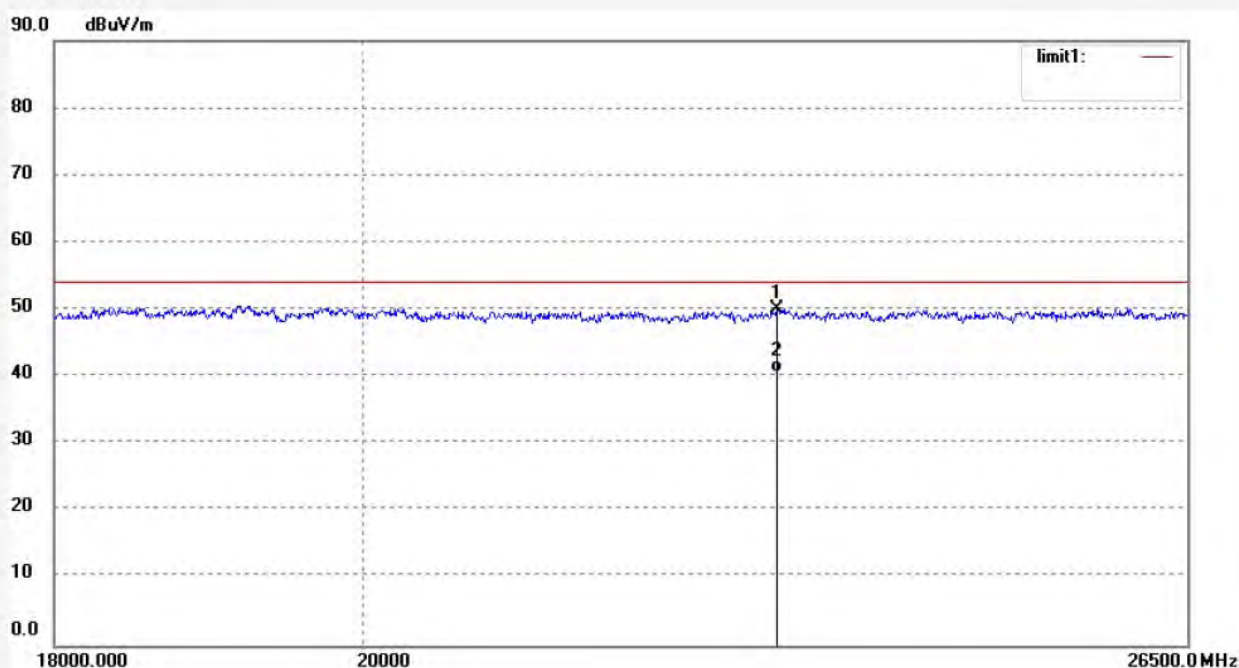
Date: 2018/10/28

Time:

Engineer Signature: WADE

Distance: 3m

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			

Job No.: LGW2018 #3031

Standard: FCC Part 15C 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: Highly accurate flow monitor

Mode: TX 2440MHz

Model: FTMU 100

Manufacturer: Lindab AB

Polarization: Vertical

Power Source: DC 24V

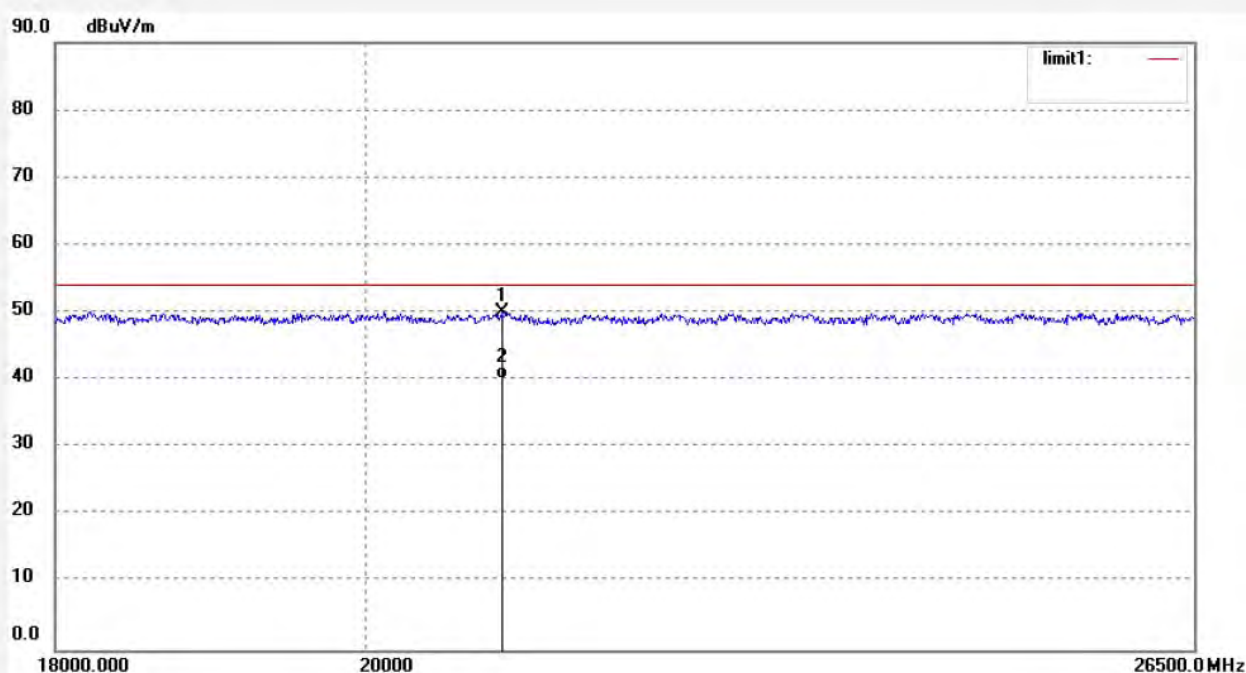
Date: 2018/10/28

Time:

Engineer Signature: WADE

Distance: 3m

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			

Job No.: LGW2018 #3033

Standard: FCC Part 15C 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: Highly accurate flow monitor

Mode: TX 2480MHz

Model: FTMU 100

Manufacturer: Lindab AB

Polarization: Horizontal

Power Source: DC 24V

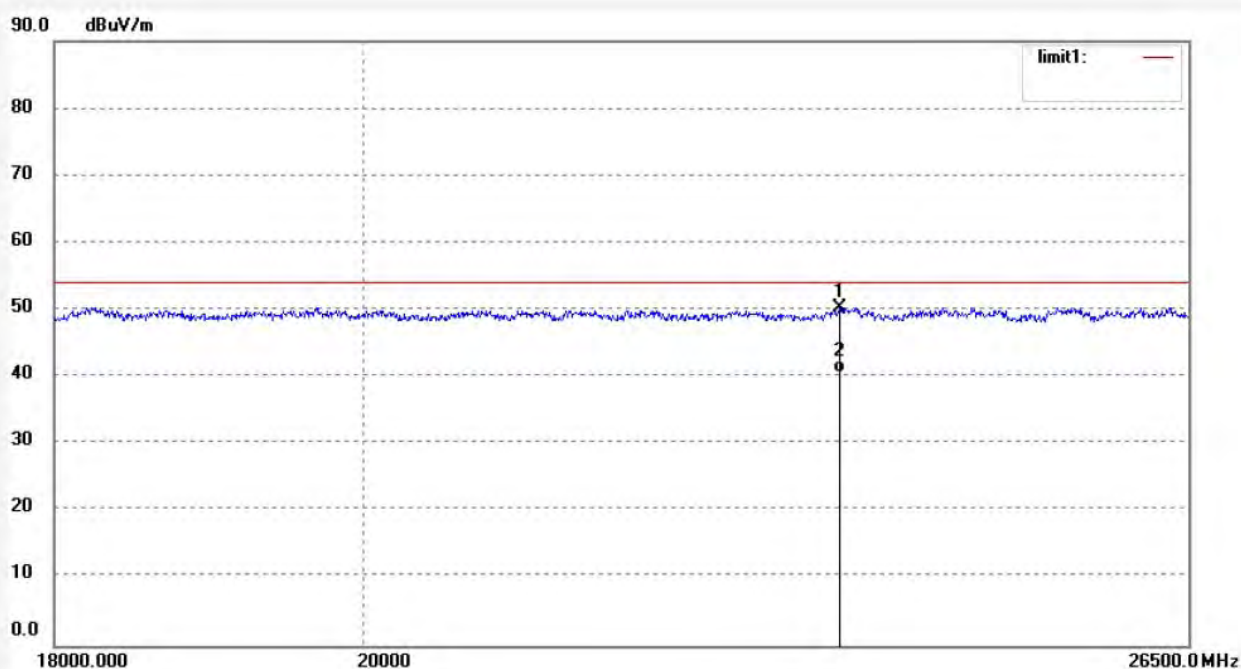
Date: 2018/10/28

Time:

Engineer Signature: WADE

Distance: 3m

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			

Job No.: LGW2018 #3032

Standard: FCC Part 15C 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: Highly accurate flow monitor

Mode: TX 2480MHz

Model: FTMU 100

Manufacturer: Lindab AB

Polarization: Vertical

Power Source: DC 24V

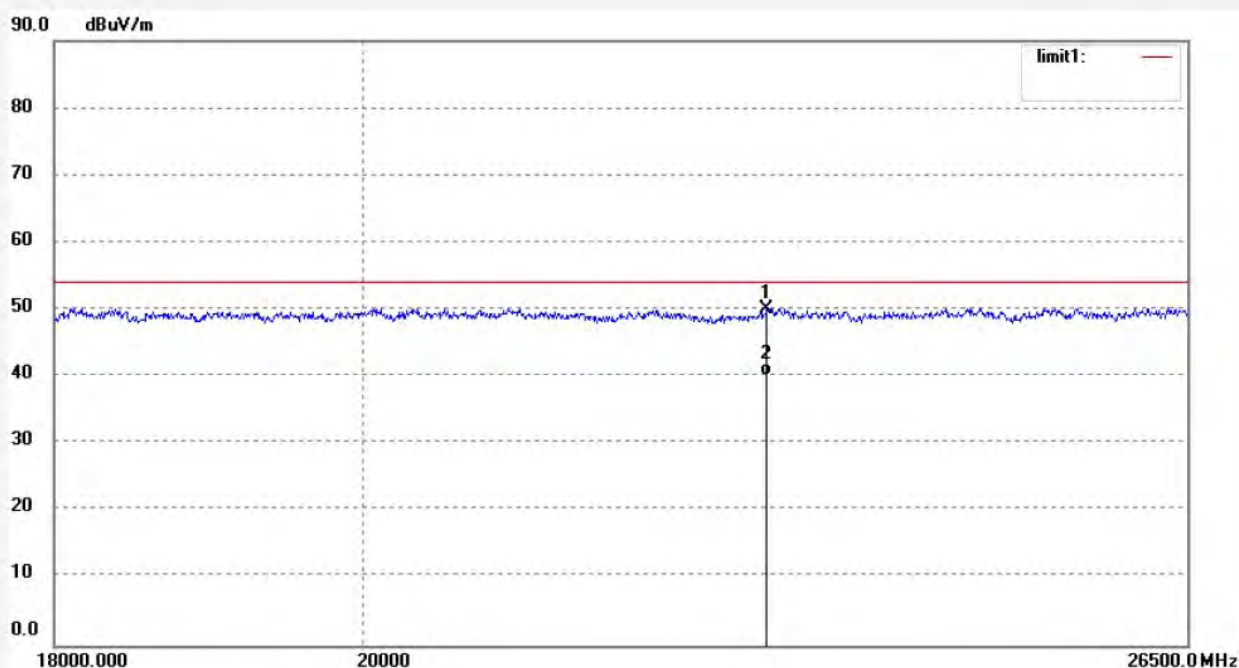
Date: 2018/10/28

Time:

Engineer Signature: WADE

Distance: 3m

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.

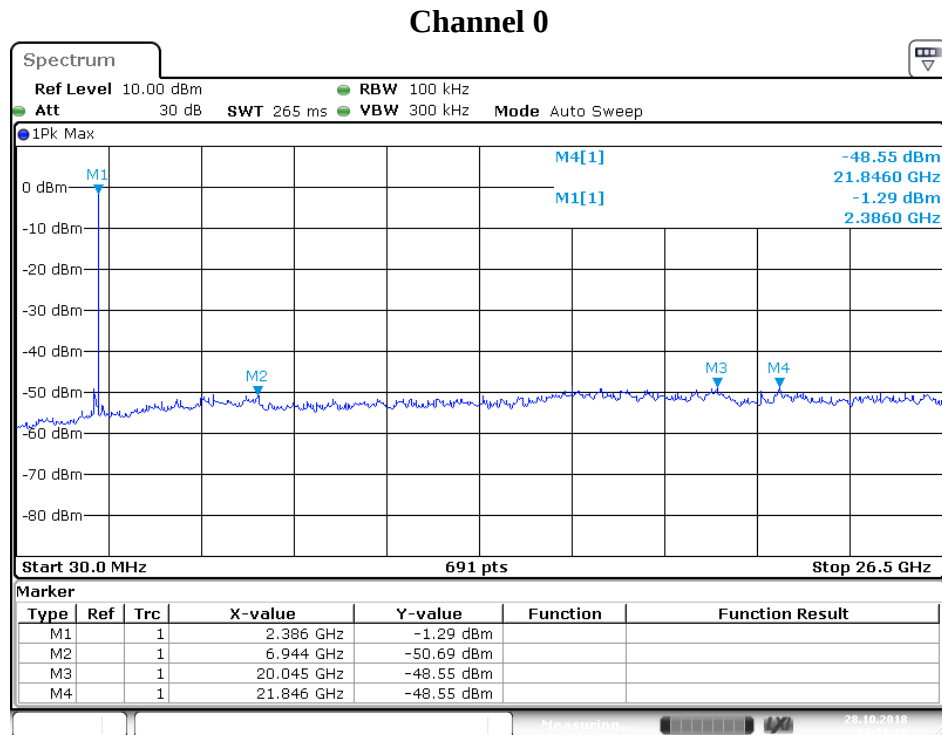
10.5.2.Set RBW of spectrum analyzer to 100kHz and VBW to 300kHz

10.5.3.The Conducted Spurious Emission was measured and recorded.

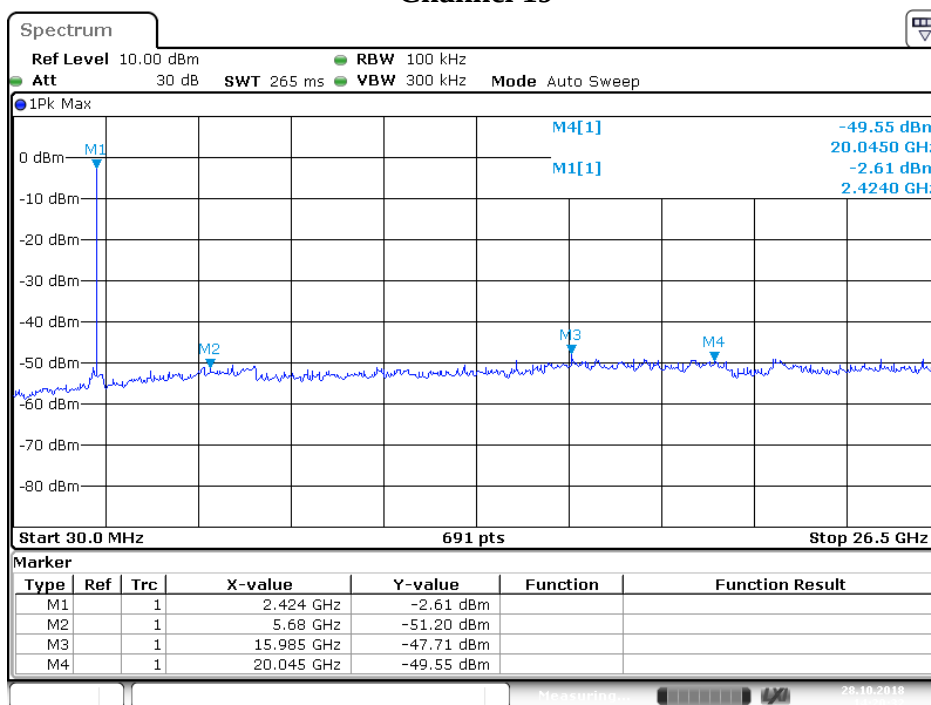
10.6.Test Result

Pass.

The spectrum analyzer plots are attached as below.

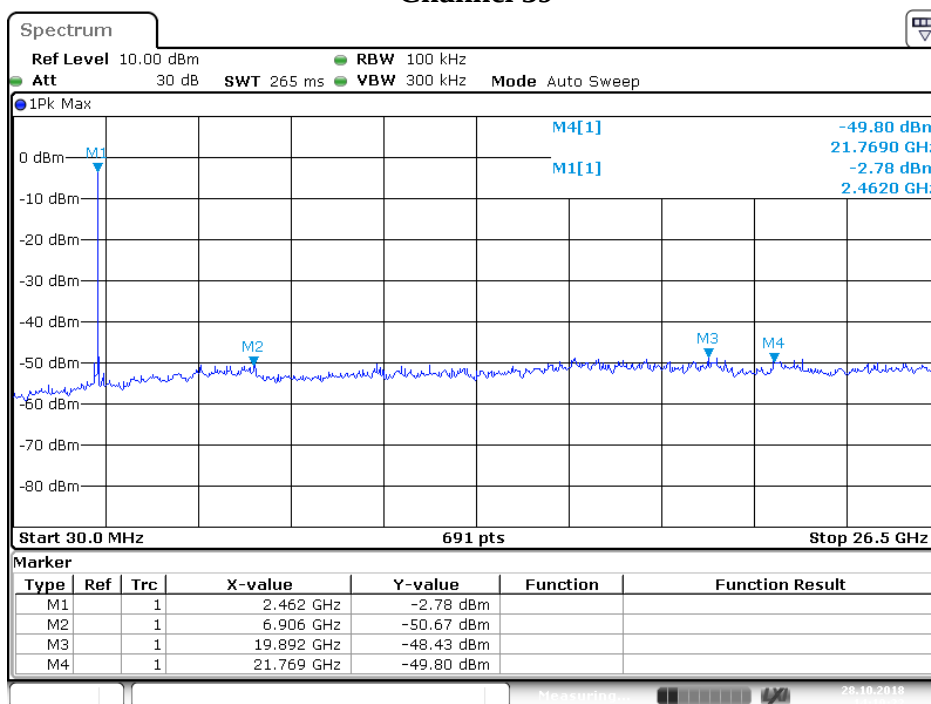


Channel 19



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

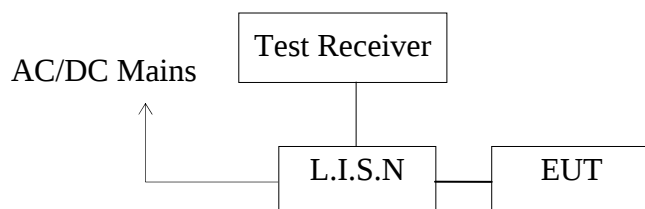
Channel 39



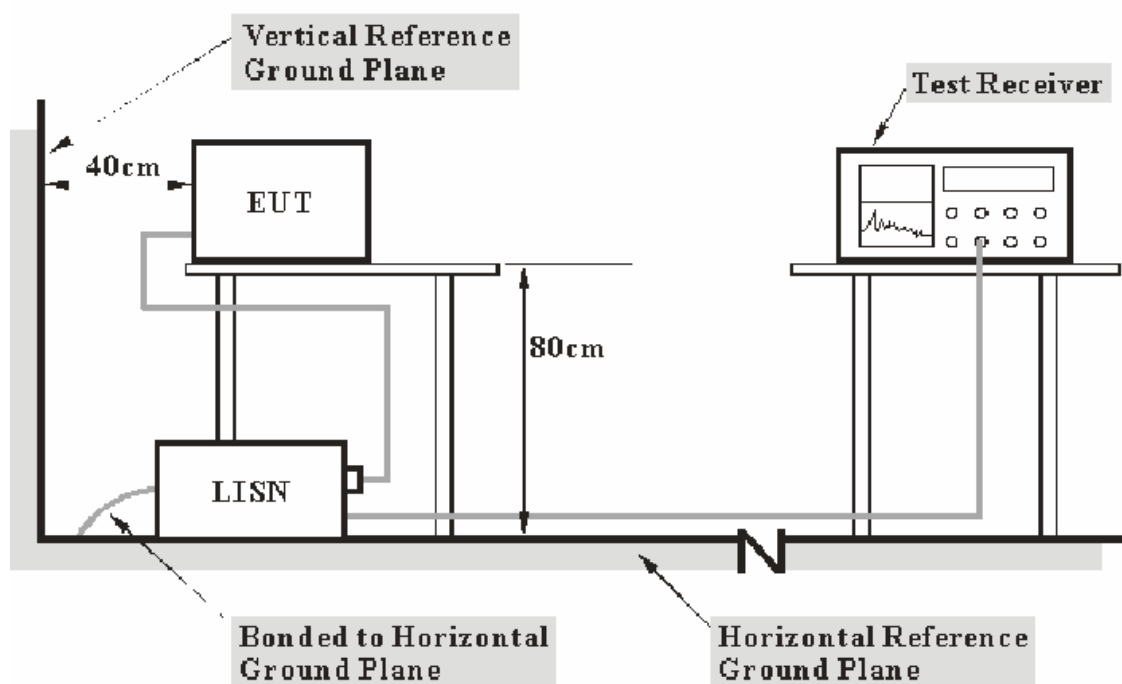
Date: 28.OCT.2018 14:19:23

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(μ V)	
	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. 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

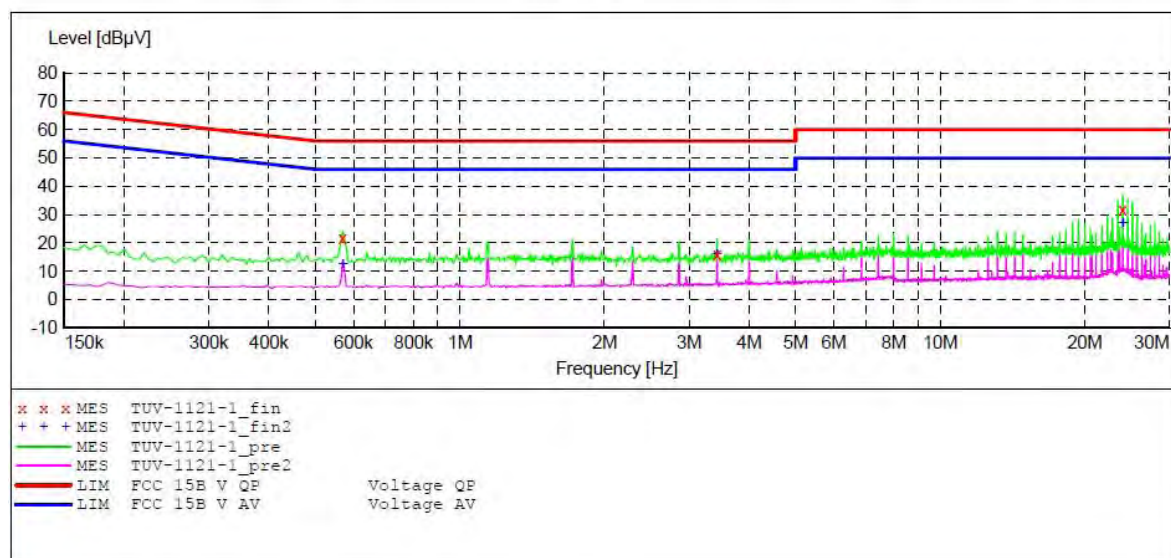
CONDUCTED EMISSION STANDARD FCC PART 15 C

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	1.0 s	200 Hz	NSLK8126 2008
150.0 kHz	30.0 MHz	5.0 kHz	Average			
150.0 kHz	30.0 MHz	5.0 kHz	QuasiPeak	1.0 s	9 kHz	NSLK8126 2008
			Average			



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

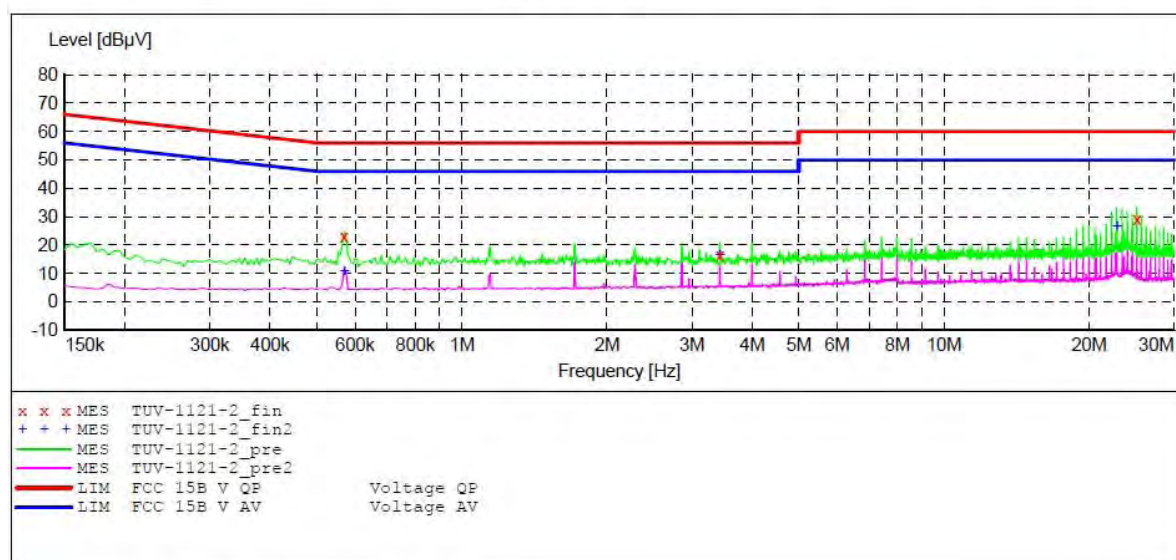
CONDUCTED EMISSION STANDARD FCC PART 15 C

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	1.0 s	200 Hz	NSLK8126 2008
150.0 kHz	30.0 MHz	5.0 kHz	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

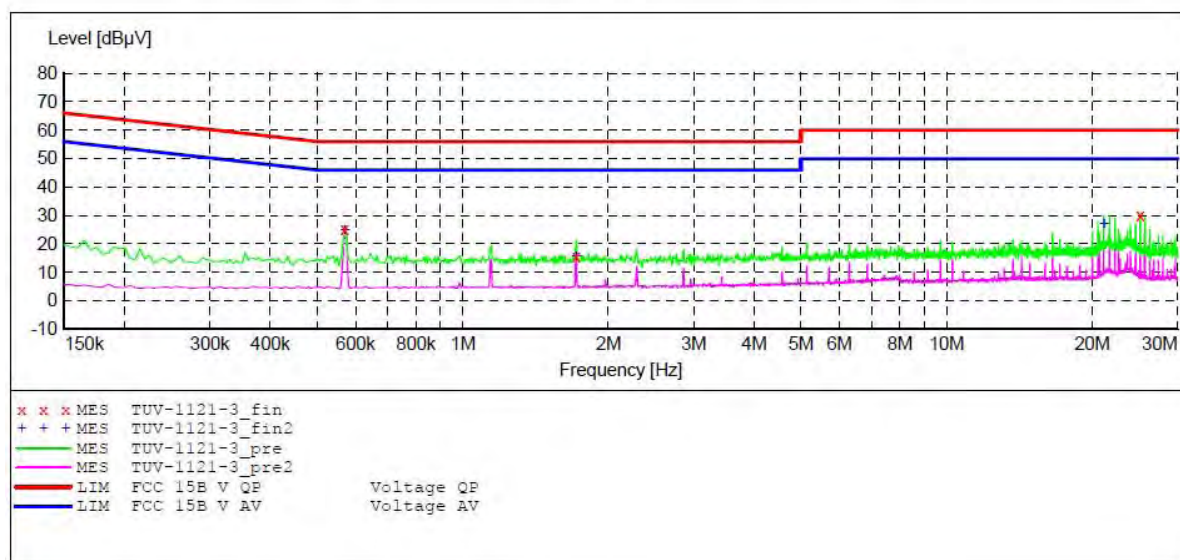
CONDUCTED EMISSION STANDARD FCC PART 15 C

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	1.0 s	200 Hz	NSLK8126 2008
150.0 kHz	30.0 MHz	5.0 kHz	Average			
			QuasiPeak	1.0 s	9 kHz	NSLK8126 2008
			Average			



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

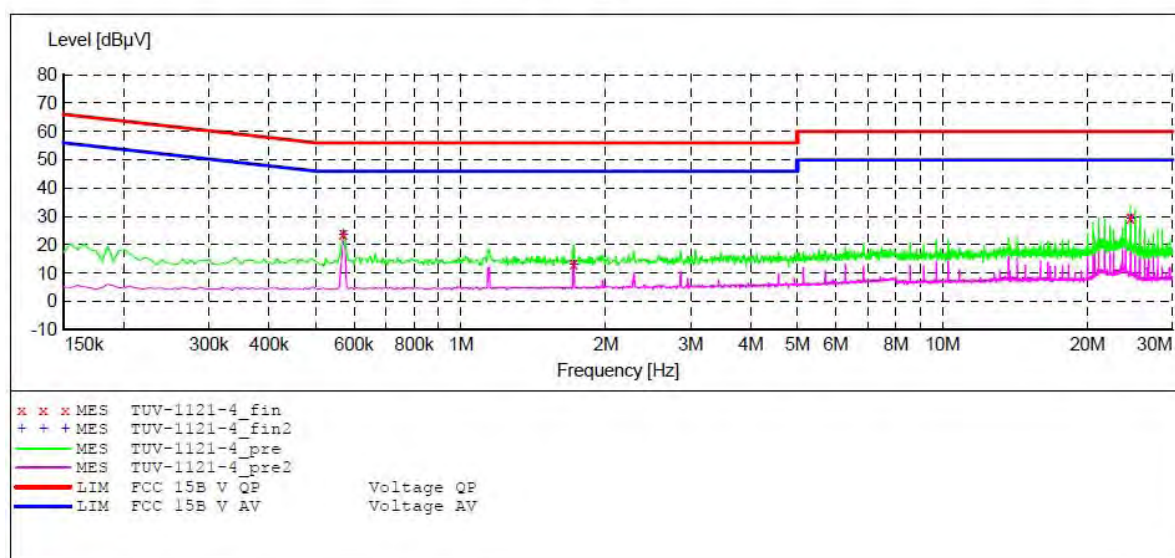
CONDUCTED EMISSION STANDARD FCC PART 15 C

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	1.0 s	200 Hz	NSLK8126 2008
150.0 kHz	30.0 MHz	5.0 kHz	Average			
150.0 kHz	30.0 MHz	5.0 kHz	QuasiPeak	1.0 s	9 kHz	NSLK8126 2008
			Average			



MEASUREMENT RESULT: "TUV-1121-4_fin"

11/21/2018

Frequency MHz	Level dBuV	Transd dB	Limit dBuV	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 dBuV	Transd dB	Limit dBuV	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 *******