



FCC RF Test Report

APPLICANT : Fibocom Wireless Inc
EQUIPMENT : LTE module
BRAND NAME : Fibocom
MODEL NAME : NL668-AM-01
FCC ID : ZMONL668AM01
STANDARD : FCC 47 CFR Part 2, 22(H), 24(E), 27(L)
CLASSIFICATION : PCS Licensed Transmitter (PCB)

The product was received on Dec. 11, 2018 and completely tested on Dec. 22, 2018. We, Sporton International (Shenzhen) Inc., would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.26-2015 and shown compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International (Shenzhen) Inc., the test report shall not be reproduced except in full.



Approved by: Eric Shih / Manager

Sporton International (Shenzhen) Inc.

***1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan, Shenzhen City,
Guangdong Province 518055, China***



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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FG8O1914-03A	Rev. 01	Initial issue of report	Dec. 28, 2018

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.3	§2.1046	Conducted Output Power	Reporting Only	PASS	-
	§22.913(a)(5)	Effective Radiated Power	< 7 Watts	PASS	-
	§24.232(c)	Equivalent Isotropic Radiated Power	< 2 Watts	PASS	-
	§27.50(d)(4)	Equivalent Isotropic Radiated Power	< 1 Watts	PASS	-
4.4	§2.1053 §22.917(a) §24.238(a) §27.53(h)	Field Strength of Spurious Radiation	$< 43 + 10 \log_{10}(P[\text{Watts}])$	PASS	Under limit 36.67 dB at 3465.200 MHz



1 General Description

1.1 Applicant

Fibocom Wireless Inc

5/F, Tower A, Technology Building II, 1057 Nanhai Avenue, Shenzhen, China

1.2 Manufacturer

Fibocom Wireless Inc

5/F, Tower A, Technology Building II, 1057 Nanhai Avenue, Shenzhen, China

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	LTE module
Brand Name	Fibocom
Model Name	NL668-AM-01
FCC ID	ZMONL668AM01
EUT supports Radios application	WCDMA/HSPA/DC-HSDPA/ HSPA+(16QAM uplink is not supported)/LTE
IMEI Code	Radiation: 866857033443116
HW Version	V1.0.1
SW Version	19006.1000.00.02.79.02
EUT Stage	Production Unit

Remark:

1. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.
2. This is a variant report for NL668-AM-01. The product equality declaration could be referred to Appendix D. Based on the similarity between current and previous project, only the Output Power and Radiation Spurious Emission were verified for the differences, all the other test cases are quoted on original test report (Sporton Report Number FG8O1914-02A).

1.4 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx Frequency	WCDMA: Band V: 826.4 MHz ~ 846.6 MHz Band II: 1852.4 MHz ~ 1907.6 MHz Band IV: 1712.4 MHz ~ 1752.6 MHz
Rx Frequency	WCDMA: Band V: 871.4 MHz ~ 891.6 MHz Band II: 1932.4 MHz ~ 1987.6 MHz Band IV: 2112.4 MHz ~ 2152.6 MHz
Maximum Output Power to Antenna	WCDMA: Band V: 23.53 dBm Band II: 24.17 dBm Band IV: 23.74 dBm
Antenna Type	Dipole Antenna
Antenna Gain	Cellular Band: 4.00 dBi PCS Band: 4.00 dBi AWS Band: 4.50 dBi
Type of Modulation	WCDMA : BPSK (Uplink) HSDPA/DC-HSDPA : QPSK (Uplink) HSUPA : QPSK (Uplink) HSPA+ : 16QAM (uplink is not supported) DC-HSDPA : 64QAM

1.5 Modification of EUT

No modifications are made to the EUT during all test items.

1.6 Maximum ERP/EIRP Power, Frequency Tolerance, and Emission Designator

FCC Rule	System	Type of Modulation	Maximum ERP/EIRP (W)
Part 22H	WCDMA Band V RMC 12.2Kbps	BPSK	0.3451
Part 24E	WCDMA Band II RMC 12.2Kbps	BPSK	0.6561
Part 27L	WCDMA Band IV RMC 12.2Kbps	BPSK	0.6668



1.7 Testing Location

Sporton Lab is accredited to ISO 17025 by National Voluntary Laboratory Accreditation Program (NVLAP code: 600156-0).

Test Site	Sporton International (Shenzhen) Inc.		
Test Site Location	No. 3 Bldg the third floor of south, Shahe River west, Fengzeyuan Warehouse, Nanshan District, Shenzhen City, Guangdong Province 518055, China TEL: +86-755- 3320-2398		
Test Site No.	Sporton Site No.	FCC designation No.	FCC Test Firm Registration No.
	03CH02-SZ	CN5019	577730

1.8 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ♦ 47 CFR Part 2, 22(H), 24(E), 27(L)
- ♦ ANSI C63.26-2015
- ♦ FCC KDB 971168 D01 Power Meas. License Digital Systems v03r01
- ♦ FCC KDB 412172 D01 Determining ERP and EIRP v01r01

Remark: All test items were verified and recorded according to the standards and without any deviation during the test.



2 Test Configuration of Equipment Under Test

2.1 Test Mode

Antenna port conducted and radiated test items were performed according to KDB 971168 D01 Power Meas. License Digital Systems v03r01 with maximum output power.

Radiated measurements were performed with rotating EUT in different three orthogonal test planes to find the maximum emission.

Radiated emissions were investigated as following frequency range:

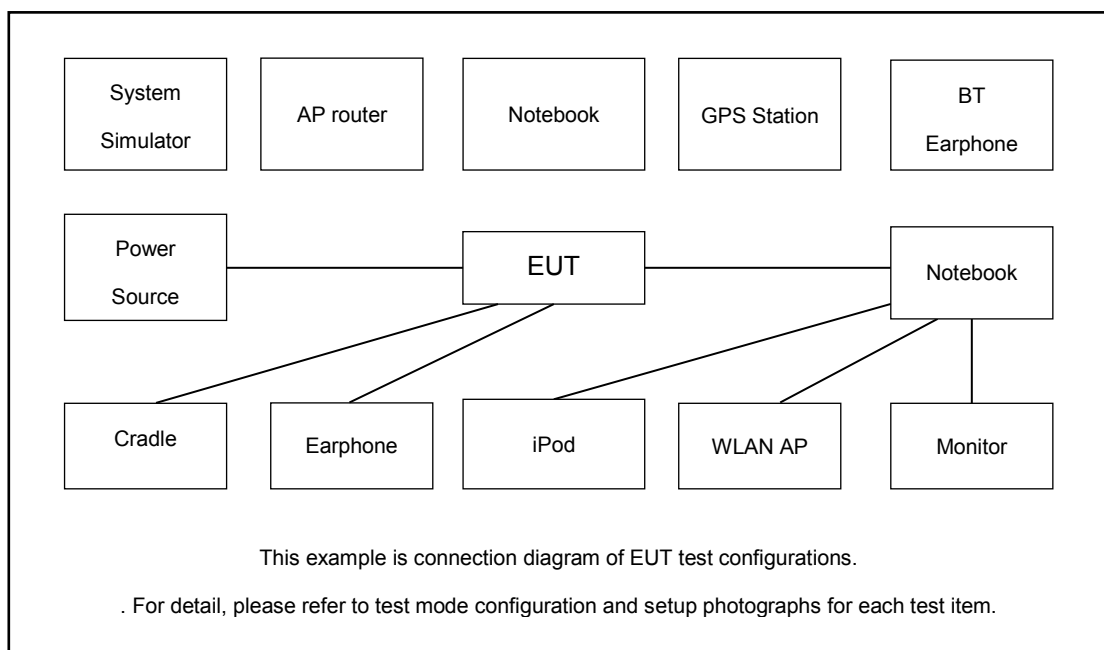
1. 30 MHz to 10th harmonic for WCDMA Band V.
2. 30 MHz to 10th harmonic for WCDMA Band IV.
3. 30 MHz to 10th harmonic for WCDMA Band II.

All modes and data rates and positions were investigated.

Test modes are chosen to be reported as the worst case configuration below:

Test Modes		
Band	Radiated TCs	Conducted TCs
WCDMA Band V	■ RMC 12.2Kbps Link	■ RMC 12.2Kbps Link
WCDMA Band II	■ RMC 12.2Kbps Link	■ RMC 12.2Kbps Link
WCDMA Band IV	■ RMC 12.2Kbps Link	■ RMC 12.2Kbps Link

2.2 Connection Diagram of Test System



2.3 Support Unit used in test configuration

Item	Equipment	Trade Name	Model No.	FCC ID	Data Cable	Power Cord
1.	System Simulator	Anritsu	MT8820C	Fcc DoC	N/A	Unshielded, 1.8m
2.	USB cable	N/A	N/A	N/A	Unshielded, 1.2m	N/A
3.	Adapter	N/A	N/A	N/A	N/A	N/A
4.	Test Jig	N/A	N/A	N/A	N/A	N/A
5.	WWAN Antenna	N/A	HYT-690-2700H-3	N/A	N/A	N/A

2.4 Frequency List of Low/Middle/High Channels

Frequency List				
Band	Channel/Frequency(MHz)	Lowest	Middle	Highest
WCDMA Band V	Channel	4132	4182	4233
	Frequency	826.4	836.4	846.6
WCDMA Band II	Channel	9262	9400	9538
	Frequency	1852.4	1880.0	1907.6
WCDMA Band IV	Channel	1312	1413	1513
	Frequency	1712.4	1732.6	1752.6

3 Conducted Test Result

3.1 Measuring Instruments

See list of measuring instruments of this test report.

3.2 Test Setup

3.2.1 Conducted Output Power



3.3 Conducted Output Power and ERP/EIRP

3.3.1 Description of the Conducted Output Power and ERP/EIRP

A system simulator was used to establish communication with the EUT. Its parameters were set to enforce EUT transmitting at the maximum power. The measured power in the radio frequency on the transmitter output terminals shall be reported.

The ERP of mobile transmitters must not exceed 7 Watts for GSM850 and WCDMA Band V.

The EIRP of mobile transmitters must not exceed 2 Watts for GSM1900 and WCDMA Band II.

The EIRP of mobile transmitters must not exceed 1 Watts for WCDMA Band IV.

According to KDB 412172 D01 Power Approach,

$EIRP = P_T + G_T - L_C$, $ERP = EIRP - 2.15$, where

P_T = transmitter output power in dBm

G_T = gain of the transmitting antenna in dBi

L_C = signal attenuation in the connecting cable between the transmitter and antenna in dB

3.3.2 Test Procedures

1. The testing follows ANSI C63.26 Section 5.2
2. The transmitter output port was connected to the system simulator.
3. Set EUT at maximum power through the system simulator.
4. Select lowest, middle, and highest channels for each band and different modulation.
5. Measure and record the power level from the system simulator.

4 Radiated Test Items

4.1 Measuring Instruments

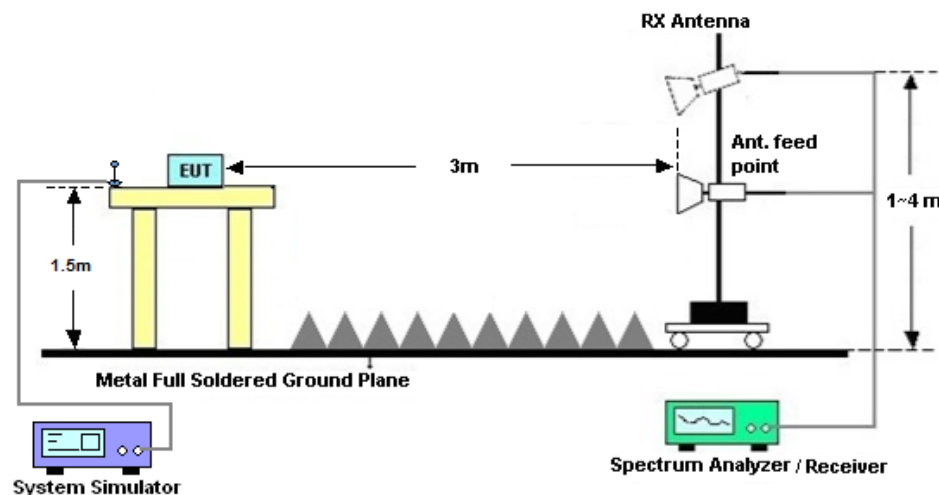
See list of measuring instruments of this test report.

4.2 Test Setup

4.2.1 For radiated test from 30MHz to 1GHz



4.2.2 For radiated test above 1GHz



4.3 Test Result of Radiated Test

Please refer to Appendix B.

4.4 Field Strength of Spurious Radiation Measurement

4.4.1 Description of Field Strength of Spurious Radiated Measurement

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitter power (P) by a factor of at least $43 + 10 \log (P)$ dB. The spectrum is scanned from 30 MHz up to a frequency including its 10th harmonic.

4.4.2 Test Procedures

1. The testing follows ANSI C63.26 Section 5.5
2. The EUT was placed on a rotatable wooden table 0.8 meters for frequency below 1GHz and 1.5 meter for frequency above 1GHz above the ground.
3. The EUT was set 3 meters from the receiving antenna, which was mounted on the antenna tower.
4. The table was rotated 360 degrees to determine the position of the highest spurious emission.
5. The height of the receiving antenna is varied between one meter and four meters to search for the maximum spurious emission for both horizontal and vertical polarizations.
6. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz, taking record of maximum spurious emission.
7. A horn antenna was substituted in place of the EUT and was driven by a signal generator.
8. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.
9. Taking the record of output power at antenna port.
10. Repeat step 7 to step 8 for another polarization.
11. $EIRP \text{ (dBm)} = S.G. \text{ Power} - Tx \text{ Cable Loss} + Tx \text{ Antenna Gain}$
12. $ERP \text{ (dBm)} = EIRP - 2.15$
13. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
14. The limit line is derived from $43 + 10\log(P)$ dB below the transmitter power P(Watts)
 $= P(W) - [43 + 10\log(P)] \text{ (dB)}$
 $= [30 + 10\log(P)] \text{ (dBm)} - [43 + 10\log(P)] \text{ (dB)}$
 $= -13\text{dBm}.$



5 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSV40	101041	10Hz~40GHz	Oct. 20, 2018	Dec. 21, 2018~ Dec. 22, 2018	Oct. 19, 2019	Radiation (03CH02-SZ)
Bilog Antenna	TeseQ	CBL6112D	35407	30MHz-2GHz	May 10, 2018	Dec. 21, 2018~ Dec. 22, 2018	May 09, 2019	Radiation (03CH02-SZ)
Double Ridge Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-1474	1GHz~18GHz	Feb. 07, 2018	Dec. 21, 2018~ Dec. 22, 2018	Feb. 06, 2019	Radiation (03CH02-SZ)
SHF-EHF Horn	com-power	AH-840	101071	18GHz-40GHz	Mar. 30, 2018	Dec. 21, 2018~ Dec. 22, 2018	Mar. 29, 2019	Radiation (03CH02-SZ)
LF Amplifier	Burgeon	BPA-530	102211	0.01~3000Mhz	Oct. 20, 2018	Dec. 21, 2018~ Dec. 22, 2018	Oct. 19, 2019	Radiation (03CH02-SZ)
HF Amplifier	Agilent	8449B	3008A01023	1GHz~26.5GHz	Oct. 20, 2018	Dec. 21, 2018~ Dec. 22, 2018	Oct. 19, 2019	Radiation (03CH02-SZ)
HF Amplifier	MITEQ	TTA1840-35 -HG	1871923	18GHz~40GHz	Jul. 30, 2018	Dec. 21, 2018~ Dec. 22, 2018	Jul. 29, 2019	Radiation (03CH02-SZ)
AC Power Source	Chroma	61601	61601000247 0	N/A	NCR	Dec. 21, 2018~ Dec. 22, 2018	NCR	Radiation (03CH02-SZ)
Turn Table	Chaintek	T-200	N/A	0~360 degree	NCR	Dec. 21, 2018~ Dec. 22, 2018	NCR	Radiation (03CH02-SZ)
Antenna Mast	Chaintek	MBS-400	N/A	1 m~4 m	NCR	Dec. 21, 2018~ Dec. 22, 2018	NCR	Radiation (03CH02-SZ)

NCR: No Calibration Required



6 Uncertainty of Evaluation

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	2.5 dB
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Uncertainty of Radiated Emission Measurement (1 GHz ~ 18 GHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	3.3 dB
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Uncertainty of Radiated Emission Measurement (18 GHz ~ 40 GHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	3.7 dB
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Appendix A. Test Results of Conducted Test

Conducted Output Power(Average power)

Conducted Power (*Unit: dBm)									
Band	WCDMA Band V			WCDMA Band II			WCDMA Band IV		
Channel	4132	4182	4233	9262	9400	9538	1312	1413	1513
Frequency	826.4	836.4	846.6	1852.4	1880	1907.6	1712.4	1732.6	1752.6
RMC 12.2K	23.42	23.53	23.45	24.17	24.02	23.78	23.74	23.63	23.65
HSDPA Subtest-1	22.58	22.52	22.49	22.87	22.76	22.89	22.38	22.44	22.41
HSDPA Subtest-2	22.62	22.60	22.54	22.88	22.82	22.85	22.39	22.40	22.35
HSDPA Subtest-3	22.12	22.12	22.04	22.40	22.35	22.47	21.92	21.93	21.88
HSDPA Subtest-4	22.13	22.12	22.05	22.38	22.34	22.45	21.91	21.92	21.88
DC-HSDPA Subtest-1	22.31	22.24	22.23	22.63	22.52	22.65	22.12	22.18	22.16
DC-HSDPA Subtest-2	22.36	22.33	22.29	22.64	22.57	22.60	22.12	22.12	22.09
DC-HSDPA Subtest-3	21.86	21.85	21.79	22.16	22.10	22.22	21.65	21.65	21.62
DC-HSDPA Subtest-4	21.88	21.86	21.80	22.14	22.08	22.19	21.65	21.65	21.62
HSUPA Subtest-1	22.12	22.15	21.90	22.16	22.24	22.18	21.64	21.84	21.66
HSUPA Subtest-2	21.53	21.37	21.38	21.69	21.70	21.66	21.02	21.23	21.22
HSUPA Subtest-3	21.23	20.92	20.96	21.40	21.31	21.59	20.93	20.81	20.93
HSUPA Subtest-4	21.57	21.47	21.52	21.75	21.66	21.85	21.46	21.37	21.21
HSUPA Subtest-5	22.50	22.20	22.40	22.80	22.80	22.90	22.30	22.30	22.30

ERP/EIRP

WCDMA Band V ($G_T - L_C = 4.00$ dBi)			
Channel	4132	4182	4233
	(Low)	(Mid)	(High)
Frequency	826.4	836.4	846.6
(MHz)			
Conducted Power (dBm)	23.42	23.53	23.45
Conducted Power (Watts)	0.2198	0.2254	0.2213
ERP(dBm)	25.27	25.38	25.30
ERP(Watts)	0.3365	0.3451	0.3388

WCDMA Band II ($G_T - L_C = 4.00$ dBi)			
Channel	9262	9400	9538
	(Low)	(Mid)	(High)
Frequency	1852.4	1880	1907.6
(MHz)			
Conducted Power (dBm)	24.17	24.02	23.78
Conducted Power (Watts)	0.2612	0.2523	0.2388
EIRP(dBm)	28.17	28.02	27.78
EIRP(Watts)	0.6561	0.6339	0.5998

WCDMA Band IV ($G_T - L_C = 4.50$ dBi)			
Channel	1312	1413	1513
	(Low)	(Mid)	(High)
Frequency	1712.4	1732.6	1752.6
(MHz)			
Conducted Power (dBm)	23.74	23.63	23.65
Conducted Power (Watts)	0.2366	0.2307	0.2317
EIRP(dBm)	28.24	28.13	28.15
EIRP(Watts)	0.6668	0.6501	0.6531



Appendix B. Test Results of Conducted Test

Radiated Spurious Emission

WCDMA Band V(RMC 12.2Kbps)									
Channel	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)
Middle	1672.8	-68.42	-13	-55.42	-78.79	-71.67	4.00	9.40	H
	2509.2	-64.96	-13	-51.96	-79.94	-68.53	4.88	10.60	H
	3345.6	-64.44	-13	-51.44	-81.41	-69.37	5.52	12.60	H
	1672.8	-66.64	-13	-53.64	-76.80	-69.89	4.00	9.40	V
	2509.2	-65.41	-13	-52.41	-80.24	-68.98	4.88	10.60	V
	3345.6	-64.36	-13	-51.36	-81.33	-69.29	5.52	12.60	V

Remark: Spurious emissions within 30-1000MHz were found more than 20dB below limit line.

WCDMA Band II (RMC 12.2Kbps)									
Channel	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)
Middle	3760	-59.04	-13	-46.04	-77.54	-65.79	5.85	12.60	H
	5640	-53.55	-13	-40.55	-75.72	-59.35	7.30	13.10	H
	7520	-55.59	-13	-42.59	-83.36	-58.74	8.35	11.50	H
	3760	-60.44	-13	-47.44	-78.98	-67.19	5.85	12.60	V
	5640	-53.51	-13	-40.51	-76.08	-59.31	7.30	13.10	V
	7520	-55.63	-13	-42.63	-83.21	-58.78	8.35	11.50	V

Remark: Spurious emissions within 30-1000MHz were found more than 20dB below limit line.

WCDMA Band IV (RMC 12.2Kbps)									
Channel	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)
Middle	3465.2	-55.35	-13	-42.35	-72.47	-62.20	5.65	12.50	H
	5197.8	-55.47	-13	-42.47	-77.14	-61.14	7.13	12.80	H
	6930.4	-57.12	-13	-44.12	-83.92	-60.52	8.40	11.80	H
	3465.2	-49.67	-13	-36.67	-66.82	-56.52	5.65	12.50	V
	5197.8	-53.69	-13	-40.69	-75.81	-59.36	7.13	12.80	V
	6930.4	-57.10	-13	-44.10	-84.01	-60.50	8.40	11.80	V

Remark: Spurious emissions within 30-1000MHz were found more than 20dB below limit line.



Appendix D. Product Equality Declaration

Fibocom Wireless Inc.

5/F, Tower A, Technology Building II, 1057# Nanhai Avenue, Shenzhen

Date: December 24, 2018

Product Equality Declaration

We, Fibocom Wireless Inc., declare on our sole responsibility for the product of NL668-AM-01 as below:

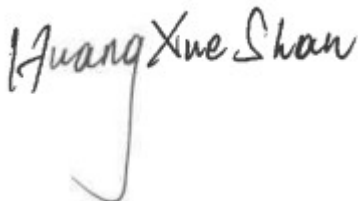
The differences between LCC and previous model, LCC are as below:

- 1, The power supply is different between LCC and previous model, LCC's power supply is DC power source by the ADP substrate, previous model's power supply is MiniPCIe interface
- 2, The I/O interface is different between LCC and previous model, LCC's I/O interface is ADP substrate. previous model's I/O interface is MiniPCIe interface
- 3, The RF antenna trace is different between LCC and previous model, LCC's RF antenna trace is ADP substrate. previous model's RF antenna trace is MiniPCIe RF antenna trace

Except listings above, the others are all the same as previous version.

Should you have any questions or comments regarding this matter, please have my best attention.

Sincerely yours,



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