FCC/ISED Test Report (Co-location)

Report No.:	FCC_IC_SL19110601-TCG-001_Co-location
FCC ID:	HBW9545
IC:	2266A-9545
WIFI FCC ID:	2AATL-6220N-IS
WIFI IC:	24844-6220NIS
Model No.:	MYQ-G0401
Series Model:	MYQ-G0401-E, 821LMC
Received Date:	12/20/2019
Test Date:	12/23/2019 - 12/30/2019
Issued Date:	01/08/2020
Applicant:	Chamberlain Group, Inc
Address:	300 Windsor Drive, Oakbrook, IL 60523
Manufacturer:	Jabil, Inc.
Address:	Jabil Circuit India Pvt. Ltd. B -26, MIDC Industrial Area, Ranjangaon Taluka Shirur, Pune - 412220, Maharashtra, India
Issued By:	Bureau Veritas Consumer Products Services, Inc.
Lab Address:	775 Montague Expressway, Milpitas, CA 95035
FCC/IC Registration / Designation Number:	540430 / 4842D

ACCREDITED
TESTING CERT # 2742-01

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Release Control Record

Issue No.	Description	Date Issued
FCC_IC_SL19110601-TCG-001_Co-location	Original Report	01/08/2020

1 Certificate of Conformity

Product:	Smart Garage Control – C-Hub
Brand:	Chamberlain
Model No.:	MYQ-G0401, MYQ-G0401-E, 821LMC
Applicant:	Chamberlain Group, Inc
Test Date:	12/23/2019 - 12/30/2019
Standards:	FCC Part 15, Subpart C (15.247, 15.249, 15.231) KDB 558074 D01 15.247 Meas Guidance v05r02 ISED RSS-247, ISED RSS-210 Issue 10, ISED RSS-GEN Issue 5 ANSI C63.10-2013 2009

The above equipment has been tested by **Bureau Veritas Consumer Products Services, Inc., Milpitas Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

Prepared by : _____ , **Date:** 01/08/2020

Yao-Wei Lee / Test Engineer

Approved by : _____ , **Date:** 01/09/2020

Ge Chen / Engineer Reviewer

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (SECTION 15.247)/ ISED RSS-247				
FCC Clause	RSS Section(s)	Test Item	Result	Remarks
15.205 15.209 15.247 15.249 15.231	RSS-Gen[8.9] RSS-247[5.5]	Radiated Emissions & Band Edge Measurement	PASS	Meet the requirement of limit.

1. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	3.856 dB
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	4.638 dB
Radiated Emissions above 1 GHz	Above 1GHz	4.580dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Smart Garage Control – C-Hub
Brand	Chamberlain
Test Model	MYQ-G0401
Series Model	MYQ-G0401-E, 821LMC
Identification No. of EUT	446195020226
Power Supply Rating	5.0VDC @ 1.5A
Modulation Type	OOK, FSK, GFSK, OFDM
Transfer Rate	ISM: 256kbps WiFi 802.11b/g/n: (150Mbps) BLE: 1Mbps, 2Mbps
Operating Frequency	ISM : 310MHz, 315MHz, 390MHz, 902.25MHz, 914.75MHz, 926.75MHz WiFi : 2.4GHz BLE : 2.4GHz
Number of Channel	ISM : 3 WiFi : 11 BLE : 40
Antenna Type	Monopole (wire), 5.19dBi gain WiFi : Inverted-F PCB Trace, 2dBi gain BLE : Inverted-F PCB Trace, 2dBi gain
Antenna Connector	N/A

3.2 Description of Test Modes

40 channels are provided for BLE mode:

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

11 Channels are provided for WLAN 2.4GHz:

Channel	Freq. (MHz)
1	2412
2	2417
3	2422
4	2427
5	2432
6	2437
7	2442
8	2447
9	2452
10	2457
11	2462

6 Channels are provided for ISM bands:

Channel	Freq. (MHz)
1	310
2	315
3	390
4	902.25
5	914.75
6	926.75

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE≥1G	RE<1G	PLC	APCM	
-	√	√	-	-	-

Where **RE≥1G:** Radiated Emission above 1GHz **RE<1G:** Radiated Emission below 1GHz
PLC: Power Line Conducted Emission **APCM:** Antenna Port Conducted Measurement

NOTE:
"-" means no effect.

Radiated Emission Test (Above 1GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
☒ Following channel(s) was (were) selected for the final test as listed below.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE	DATA RATE (Mbps)
0-10	11	OFDM	150
0 - 39	19	GFSK	1Mbps, 2Mbps
0 - 5	6	OOK	0.256

Radiated Emission Test (Below 1GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
☒ Following channel(s) was (were) selected for the final test as listed below.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE	DATA RATE (Mbps)
0-10	11	OFDM	150
0 - 39	19	GFSK	1Mbps, 2Mbps
0 - 5	6	OOK	0.256

Test Condition:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE≥1G	25deg. C, 65%RH	5VDC	Yao Wei Lee
RE<1G	25deg. C, 65%RH	5VDC	Yao Wei Lee

3.3 Description of Support Units

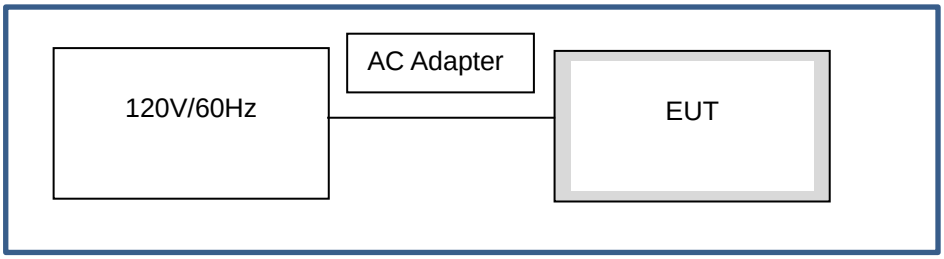
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Laptop	Dell	Latitude 3550	2MHWY32	N/A	Provided by Lab
B.	AC Adapter	QQJQ Power Supply	A912-050150W-US1	N/A	N/A	To Power Up EUT

Note: The core(s) is (are) originally attached to the cable(s).

3.3.1 Configuration of System under Test

Test Chamber



3.4 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC Part 15, Subpart C (15.247, 15.249, 15.231)
KDB 558074 D01 15.247 Meas Guidance v05r02
ISED RSS-247, ISED RSS-210 Issue 10, ISED RSS-GEN Issue 5
ANSI C63.10-2013

All test items have been performed and recorded as per the above standards.

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20dB below the highest level of the desired power:

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

Per FCC part 15.249 (a)(c)(d)(e) the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:
r FCC part 15.249 (a)(c)(d)(e) the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
Fundamental 902 – 928 MHz	94.0 dBµV/m	3
Fundamental 2.4 – 2.4835 GHz	94.0 dBµV/m	3
Harmonics	54.0 dBµV/m	3

4.1.2 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
PXA Signal Analyzer KEYSIGHT	N9030B	MY57140584	03/05/2019	03/05/2020
Horn Antenna ETS-Lindgren	3117	218554	11/06/2019	11/06/2020
Biconilog Antenna Sunol	JB1	A030702	03/09/2018	03/09/2020
Preamplifier RF BAY INC	LPA-6-30	11170601	04/27/2019	04/27/2020

4.1.3 TEST PROCEDURES

For Radiated emission below 30MHz

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. Both Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

For Radiated emission above 30MHz

a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

f. The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

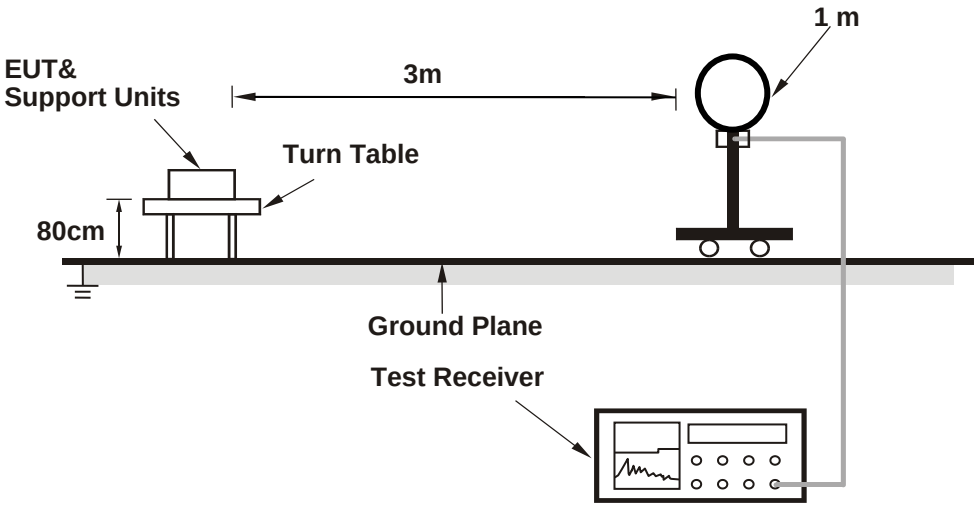
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98%) or 10Hz (Duty cycle ≥ 98%) for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

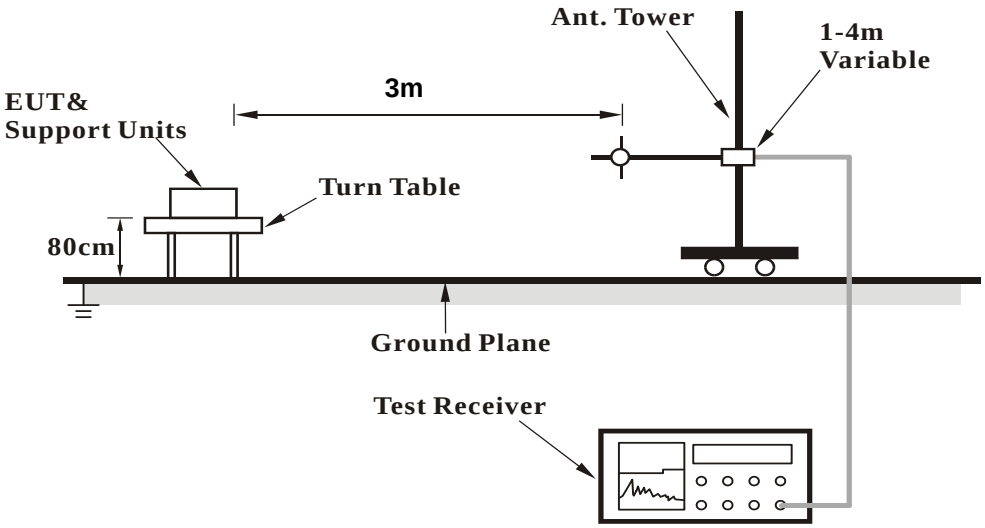
No deviation.

4.1.5 Test Setup

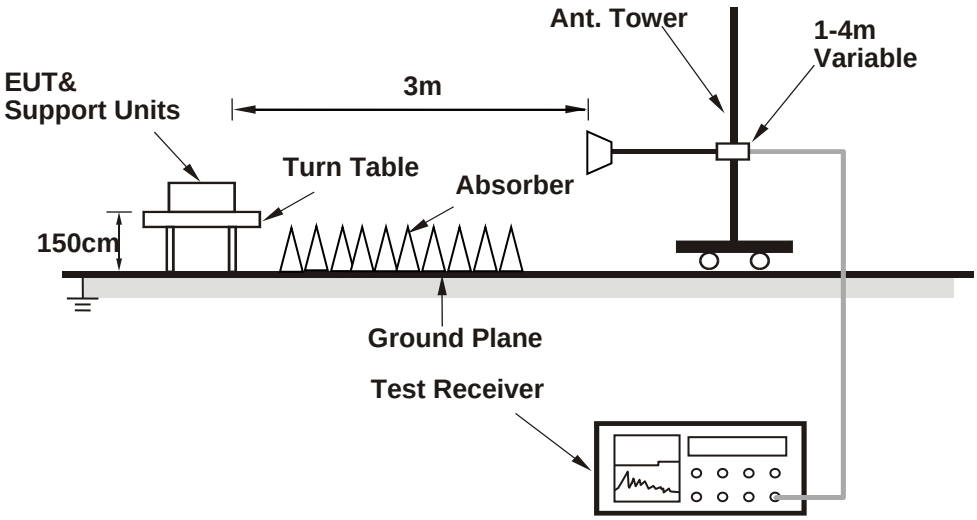
For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz



For Radiated emission above 1GHz



For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.1.6 EUT Operating Conditions

a. Notebook Computer is connected to EUT to make EUT transmit.
b. EUT is powered by a DC adapter and doesn't have to be connected to Notebook Computer while being tested.

4.1.7 Test Results

Worst case : WLAN 2.4GHz + 900MHz + 300MHz

Correction Factor for 900Mhz: -25.2 dB

EMISSION WORST-CASE Above 1GHz DATA:

Freq (MHz)	Reading (dBuV/m)	Angle (Deg)	Height (m)	Polar H/V	Factors (dB)	CF	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Comment
1804.5	80.52	222	191	H	-10.9	-	69.62	74	4.38	Peak
1804.5	-	-	-	H	-	-25.2	44.42	54	9.58	Average
1804.5	77.81	214	182	V	-10.8	-	67.01	74	6.99	Peak
1804.5	-	-	-	V	-	-25.2	41.81	54	12.19	Average
1829.5	80.11	213	179	H	-11	-	69.11	74	4.89	Peak
1829.5	-	-	-	H	-	-25.2	43.91	54	10.09	Average
1829.5	80.23	145	188	V	-11.1	-	69.13	74	4.87	Peak
1829.5		-	-	V	-	-25.2	43.93	54	10.07	Average
1853.5	82.03	209	171	H	-11.1	-	70.93	74	3.07	Peak
1853.5	-	-	-	H	-	-25.2	45.73	54	8.27	Average
1853.5	81.99	201	208	V	-11.1	-	70.89	74	3.11	Peak
1853.5	-	-	-	V	-	-25.2	45.69	54	8.31	Average
2706.75	80.89	209	178	H	-9	-	71.89	74	2.11	Peak
2706.75	-	-	-	H	-	-25.2	46.69	54	7.31	Average
2706.75	72.38	210	179	V	-9	-	63.38	74	10.62	Peak
2706.75	-	-	-	V	-	-25.2	38.18	54	15.82	Average
2744.25	79.89	261	168	H	-9.1	-	70.79	74	3.21	Peak
2744.25	-	-	-	H	-	-25.2	45.59	54	8.41	Average
2744.25	75.31	235	179	V	-9.1	-	66.21	74	7.79	Peak
2744.25	-	-	-	V	-	-25.2	41.01	54	12.99	Average
2780.25	81.88	231	185	H	-9.3	-	72.58	74	1.42	Peak
2780.25	-	-	-	H	-	-25.2	47.38	54	6.62	Average
2780.25	80.68	192	281	V	-9.3	-	71.38	74	2.62	Peak
2780.25	-	-	-	V	-	-25.2	46.18	54	7.82	Average

REMARKS:

1. Peak Emission level (dBuV/m) = Reading Value (dBuV) + Factors(dB)
2. Average Emission level (dBuV/m) = Peak Emission level (dBuV/m) + Correction Factor (CF)
3. Frequency range is up to 4GHz.
4. The emission levels of other frequencies were less than 20dB margin against the limit.
5. Margin value = Emission level – Limit value.

ANTENNA POLARITY & test distance: HORIZONTAL& Vertical at 3 m									
Frequency [MHz]	Pol	Reading [dB(uV)]	Factor [dB(1/m)]	Measurement Type	Level [dB(uV/m)]	Limit [dB(uV/m)]	Margin [dB]	Height [cm]	Angle [deg]
1207.565	H	40.7	-16.1	Average	24.6	54	-29.4	302	174.4
2415.688	H	43.1	-9.9	Average	33.2	54	-20.8	100.5	10.6
2969.035	V	37.5	-7.9	Average	29.6	54	-24.4	122.8	222.3
4336.229	V	35.6	-4.2	Average	31.4	54	-22.6	396.9	151.9
1207.565	H	54.1	-16.1	Peak	38	74	-36	302	174.4
2415.688	H	55	-9.9	Peak	45.1	74	-28.9	100.5	10.6
2969.035	V	50.6	-7.9	Peak	42.7	74	-31.3	122.8	222.3
4336.229	V	48.8	-4.2	Peak	44.6	74	-29.4	396.9	151.9

REMARKS:

1. Emission level (dBuV/m) = Reading (dBuV) + Factor (dB)
2. Factor (dB) = Antenna Factor (dB) – Cable Loss (dB).
3. The emission levels of other frequencies were less than 20dB margin against the limit.
4. Margin value = Limit Value – Emission level (dBuV/m)

EMISSION WORST-CASE Below 1GHz DATA:

ANTENNA POLARITY & Test Distance: Horizontal & Vertical at 3m								
Frequency [MHz]	**Pol**	**Reading QP [dB(uV)]**	**Factor [dB(1/m)]**	**Level QP [dB(uV/m)]**	**Limit\QP [dB(uV/m)]**	**Margin QP [dB]**	**Height [cm]**	**Angle [deg]**
35.196	V	0.3	21.7	22	40	-18.0	107.3	90.9
65.98	V	0.9	12.9	13.8	40	-26.2	99.9	332.8
66.106	V	0.8	12.9	13.7	40	-26.3	102	300.3
67.615	V	1.0	12.9	13.9	40	-26.1	99.9	6.8
71.568	H	0.4	13.4	13.8	40	-26.2	362.9	248.5

REMARKS:

1. Emission level (dBuV/m) = Reading QP (dBuV) + Factor (dB)
2. Factor (dB) = Antenna Factor (dB) – Cable Loss (dB).
3. The emission levels of other frequencies were less than 20dB margin against the limit.
4. Margin value = Limit Value – Emission level (dBuV/m)

5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

Appendix – Information on the Testing Laboratories

Bureau Veritas is a global leader in testing, inspection and certification (TIC) services. We help businesses improve safety, sustainability and productivity; and our clients include the majority of leading brands in retail, manufacturing and other industries. With a presence in every major country around the world, our quality assurance and compliance solutions are vital in helping our customers enhance product quality and concept-to-consumer journeys. We also assist with increasing speed to market, profitability and brand equity throughout the supply chain. Bureau Veritas is a leading wireless/IoT testing, inspection, audit and certification provider, with a global network of test laboratories to support the IoT industry in areas of connectivity, security, interoperability as well as quality, health & safety, and environmental/chemical requirements.

If you have any comments, please feel free to contact us at the following:

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The address and road map of all our labs can be found in our web site also.

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