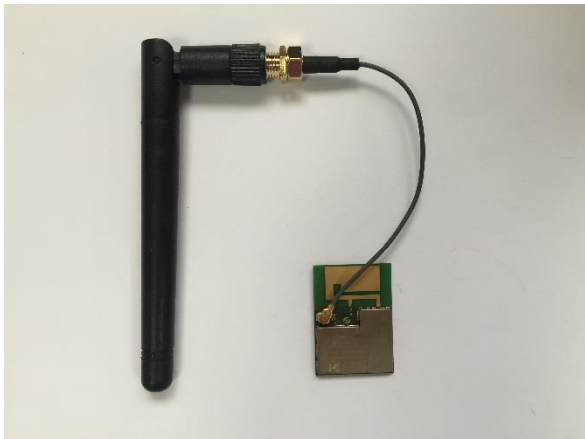

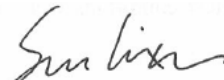


Prüfbericht-Nr.: Test Report No.:	16804753 005	Auftrags-Nr.: Order No.:	1140021818	Seite 1 von 18 Page 1 of 18
Kunden-Referenz-Nr.: Client Reference No.:	N/A	Auftragsdatum: Order date:	2015-03-21	
Auftraggeber: Client:	Honeywell (Beijing) Technology Solutions Lab Co., Ltd. A1 Building, C&W Industry Zone, No.14 Jiuxianqiao Road, Chaoyang District, Beijing 100015 P.R.China			
Prüfgegenstand: Test item:	802.11bgn Wireless LAN Module			
Bezeichnung / Typ-Nr.: Identification / Type No.:	WM-N-BM-14			
Auftrags-Inhalt: Order content:	FCC report			
Prüfgrundlage: Test specification:	FCC Part 15 Subpart C Section 15.247			
Wareneingangsdatum: Date of receipt:	2016-05-16			
Prüfmuster-Nr.: Test sample No.:	Engineering sample			
Prüfzeitraum: Testing period:	2016-05-16			
Ort der Prüfung: Place of testing:	Refer to Section 1.1			
Prüflaboratorium: Testing laboratory:	Refer to Section 1.1			
Prüfergebnis*: Test result*:	Passed			
geprüft von / tested by:		kontrolliert von / reviewed by:		
2016-06-27	Wang, Gang/ PE	2016-06-27	Sun, Lixun/Reviewer	
Datum Date	Name / Stellung Name / Position	Unterschrift Signature	Datum Date	Name / Stellung Name / Position
				
Sonstiges / Other: This report is for Class II Permissive Change of adding a new antenna (refer to table 4 of this report for detailed antenna information), based on FCCID: 2AF7K-WMNBM11.				
Zustand des Prüfgegenstandes bei Anlieferung: Condition of the test item at delivery:		Prüfmuster vollständig und unbeschädigt Test item complete and undamaged		
<p>* Legende: 1 = sehr gut 2 = gut 3 = befriedigend 4 = ausreichend 5 = mangelhaft P(ass) = entspricht o.g. Prüfgrundlage(n) F(ail) = entspricht nicht o.g. Prüfgrundlage(n) N/A = nicht anwendbar N/T = nicht getestet</p> <p>Legend: 1 = very good 2 = good 3 = satisfactory 4 = sufficient 5 = poor P(ass) = passed a.m. test specification(s) F(ail) = failed a.m. test specification(s) N/A = not applicable N/T = not tested</p>				
<p>Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</p>				

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TEST SUMMARY

4.1.1 PEAK CONDUCTED OUTPUT POWER

RESULT: Passed

4.1.2 RADIATED EMISSION

RESULT: Passed

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1. Test Sites

1.1 Test Facilities

Laboratory 1: TA Beijing Limited (FCC Registration No.: 413514)
Address: Building B-4, No.1, JingHai 3rd Road, BDA East Park, Beijing, 100176 China

Laboratory 2: TÜV Rheinland (China) Ltd.
Address: Room 303, 1st Area, Building B, Chuangxin Building, No.12, Hongda North Road, Economic - Technological Development Area, Beijing, China

1.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

Lab 1: (15.247(d) Radiated Emission)

Kind of Equipment	Type	S/N	Manufacturer	Calibration interval	Calibrated until
Bi-log Antenna	HL562	100488	Rohde & Schwarz	3 years	2018-02-15
Double Ridge Guide Horn Antenna	EMCO 3117	00056662	ETS-Lindgren	3 years	2018-02-15
Horn Antenna	3160-09	00165118	ETS-Lindgren	1 year	2017-03-21
EMI Test Receiver	ESIB26	100301	Rohde & Schwarz	1 year	2017-03-26
Signal Analyzer	FSQ26	200454	Rohde & Schwarz	1 year	2017-04-02
Low Frequency Amplifier	SCU03	/	Rohde & Schwarz	1 year	2017-03-17
High Frequency Amplifier	SCU18	/	Rohde & Schwarz	1 year	2017-03-17
RF Cable	NA	NA	NA	1 year	2017-03-17
RF Cable	NA	NA	NA	1 year	2017-03-17
Antenna Tower	2075	49402	ETS-Lindgren		/
Antenna Tower	7-TR/POL-3106	46587	ETS-Lindgren		/

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Lab 2: (15.247(b) output power, 15.247(d) Restrict band compliance)

Kind of Equipment	Type	S/N	Manufacturer	Calibrated until
Signal analyzer	FSV30	101402	R&S	2016-11-11
Power Sensor	NRP-Z81	103551	R&S	2017-01-11

1.3 Traceability

All measurement equipment calibrations are traceable to NIM (National Institute of Metrology P.R. China) or where calibration is performed outside the United States, to equivalent nationally recognized standards organizations.

1.4 Calibration

Equipment requiring calibration is calibrated periodically by the lab or according to lab's specifications. Additionally all equipment is verified for proper performance on a regular basis using in house standards or comparisons.

1.5 Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO/IEC 17025 are:

Table 2: Measurement Uncertainty

Items		Extended Uncertainty
RE (30-1000MHz)	Field strength (dBuV/m)	$U=\pm 4.94\text{dB}$, $k=2$, $\sigma=95\%$
RE (1-18GHz)	Field strength (dBuV/m)	$U=\pm 4.34\text{dB}$, $k=2$, $\sigma=95\%$

2. General Product Information

2.1 Product Function and Intended Use

The EUT (equipment under test) is an 802.11bgn wireless LAN module. For more information, please refer to the user manual.

2.2 Ratings and System Details

Table 3: Rating of EUT

Kind of Equipment:	802.11bgn Wireless LAN Module
Type Designation:	WM-N-BM-14
Rated Input Voltage	The product has 2 types of input power: 1. AC 24V, 60Hz 2. DC 5V via USB
Rated consumption power	5VA
Hardware version	WM-N-BM-14
Software version	5.90.230.7

Table 4: Technical Specification

Item	Description
Operating Frequency band	2.4GHz—2.4835GHz
Channel Number	11
Operating mode	802.11b/g/n (HT 20)
Channel Center Frequency	2412MHz, 2417MHz, 2422MHz, 2427MHz, 2432MHz, 2437MHz, 2442MHz, 2447MHz, 2452MHz, 2457MHz, 2462MHz
Modulation	DSSS/OFDM
Antenna Type	½ wave coaxial dipole antenna
Antenna Model	001-0001
Antenna Manufacturer	LS Research
Antenna Gain (dBi)	2
UFL to R-SMA adaptor cable length	4 inch

2.3 Independent Operation Modes

The basic operation modes are:

- A. On, continuously transmitting (802.11b/g/n (HT 20))
- B. On, receiving (802.11b/g/n (HT 20))
- C. Off

2.4 Noise Generating and Noise Suppressing Parts

Refer to the Circuit Diagram.

2.5 Submitted Documents

None.

3. Test Set-up and Operation Modes

3.1 Principle of Configuration Selection

The equipment under test (EUT) was configured to measure its maximum power level. The test modes were adapted accordingly in reference to the instructions for use.

Test note: 15.247(b) output power, 15.247(d) Radiated Emission and restrict band compliance were tested to verify the compliance.

3.2 Test Operation and Test Software

Test operation refers to test setup in chapter 5. All testing were performed according to the procedures in ANSI C63.10: 2013.

3.3 Special Accessories and Auxiliary Equipment

Below equipment was used to support the test.

Kind of accessories	Model	Manufacture
Computer	X220	Lenovo
AC power transformer(120V to 24V)	GL-30	Shenzhen Yuliu Technology Co., Ltd.
HVAC controller	CPO-RL2	Honeywell
USB power adapter	ETA0U42CBC	SAMSUNG
Evaluation base board	32304830-001	Honeywell

3.4 Countermeasures to achieve EMC Compliance

The test sample which has been tested contained the noise suppression parts as described in the Constructional Data Form or the Technical Construction File. No additional measures were employed to achieve compliance.

3.5 Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test

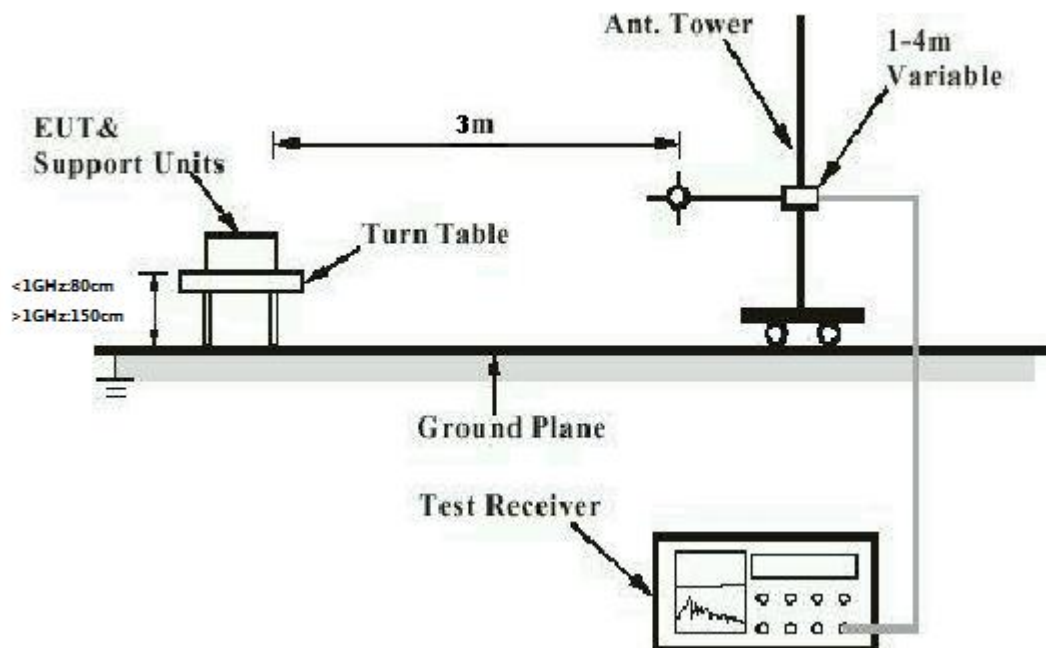
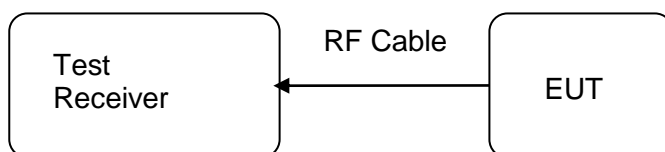


Diagram of Measurement Equipment Configuration for Transmitter Measurement



4. Test Results

4.1 Transmitter Requirement & Test Suites

4.1.1 Peak Conducted Output Power

RESULT:
Passed

Test date : 2016-05-16
 Test standard : FCC Part 15.247(b)(1)
 Basic standard : ANSI C63.10: 2013, 558074 D01 DTS
 Meas Guidance v03r05
 Limit : 1 Watt (30dBm)
 Kind of test site : Shielded room

Test setup

Test Channel : Low/ Middle/ High
 Operation Mode : A
 Ambient temperature : 21°C
 Relative humidity : 35%
 Atmospheric pressure : 101 kPa

The test was carried out using power sensor via USB on Laptop.

Table 5: Test result of Peak Output Power

	Channel	Channel Frequency (MHz)	Peak Output Power	Limit
			(dBm)	(dBm)
802.11b	1	2412	19.56	30
	6	2437	19.33	30
	11	2462	19.18	30

	Channel	Channel Frequency (MHz)	Peak Output Power	Limit
			(dBm)	(dBm)
802.11g	1	2412	23.80	30
	6	2437	23.77	30
	11	2462	23.47	30

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802.11n(HT20)	Channel	Channel Frequency (MHz)	Peak Output Power	Limit
			(dBm)	(dBm)
	1	2412	23.11	30
	6	2437	22.91	30
	11	2462	22.88	30

4.1.2 Radiated Emission

RESULT:**Passed**

Date of testing : 2016-05-16
Test standard : FCC part 15.247(d)
Basic standard : ANSI C63.10: 2013, 558074 D01 DTS Meas
Guidance v03r05
Limits : FCC part 15.247(d)
Kind of test site : 3m Semi-Anechoic Chamber

Test setup

Test Channel : Low/ Middle/ High
Operation mode : A
Ambient temperature : 21°C
Relative humidity : 35%
Atmospheric pressure : 101 kPa

For test below 1GHz, the EUT was placed on a turntable. The turntable can turn in 360°. A log periodic antenna or a loop antenna is fixed 3m from centre of the turntable. During the test, the turntable was rotated fully with a measurement antenna oriented for both horizontal and vertical polarisation. The antenna was adjusted between 1m and 4m in height above the ground plane to find the max disturbance.

For test above 1GHz, the setup was according to ANSI C63.10: 2013, the Radiated emission limits in both the restricted and non-restricted bands are based on antenna-port conducted measurements in conjunction with cabinet emissions tests to demonstrate compliance.

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, power supply type etc.

Based on pre-scan results, following channels and power supply were selected for the final test as listed below, and only the worst case result was shown in relevant result part.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)	Power Supply
802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1	USB 5V
802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6	USB 5V
802.11n (HT20)	1 to 11	1, 6, 11	OFDM	BPSK	6.5(MCS0)	USB 5V

Result table: Radiated emission measurement results <1GHz (worst case data 802.11n HT20 CH1)

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
33.87	27.1	1000.0	120.000	100.0	V	68.0	-25.8	12.90	40.00
46.29	25.8	1000.0	120.000	100.0	V	249.0	-33.2	14.20	40.00
49.74	33.5	1000.0	120.000	100.0	V	292.0	-35.5	6.50	40.00
65.20	31.2	1000.0	120.000	100.0	V	108.0	-36.2	8.80	40.00
88.12	24.1	1000.0	120.000	200.0	V	164.0	-32.9	19.40	43.50
108.49	29.9	1000.0	120.000	100.0	V	74.0	-32.6	13.60	43.50

Result table: Cabinet radiated emission measurement results 1GHz-25GHz (worst case data 802.11b CH11)
Peak result:

Frequency (MHz)	Emission Level MaxPeak-MaxHold (dBµV/m)	Height (cm)	Polarization	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
2326.65	50.2	150.0	V	-6.6	23.80	74.00
2594.18	53.5	150.0	H	-6.4	20.50	74.00
4924.84	43.3	150.0	H	-11.2	30.70	74.00
7386.00	43.2	150.0	H	-6.0	30.80	74.00

AV Result:

Frequency (MHz)	Emission Level Average-MaxHold (dBµV/m)	Height (cm)	Polarization	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
2320.64	41.5	150.0	V	-6.8	12.50	54.00
2593.18	44.9	150.0	H	-6.4	9.10	54.00
4923.84	33.2	150.0	H	-11.2	20.80	54.00
7386.00	32.2	150.0	H	-6.0	21.80	54.00

Note:

1. Emission Level(dBuV/m) = Original Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

Result table: RF Conducted emission restrict band (band edge) measurement results (worst case data)

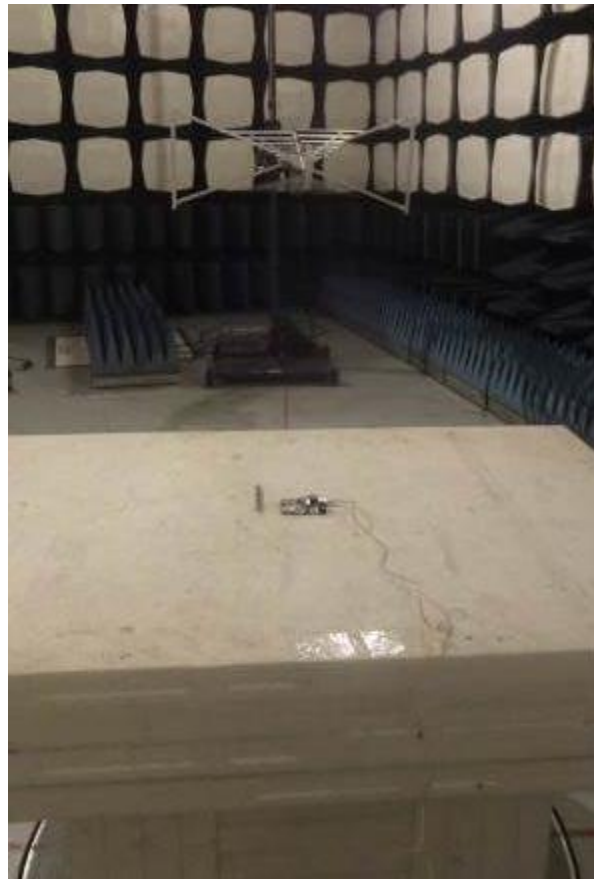
Frequency(MHz)	EMISSION LEVEL (dBµV/m)	LIMIT (dBµV/m)	MARGIN (dB)	ORIGINAL VALUE (dBm)	CORRECTION FACTOR (dB)
2389.9(PK)	71.70	74(PK)	-2.3	-25.56	2
2389.9(AV)	49.19	54(AV)	-4.81	-48.07	2
2483.5(PK)	69.06	74(PK)	-4.94	-28.2	2
2483.5(AV)	47.48	54(AV)	-6.52	-49.78	2

Note:

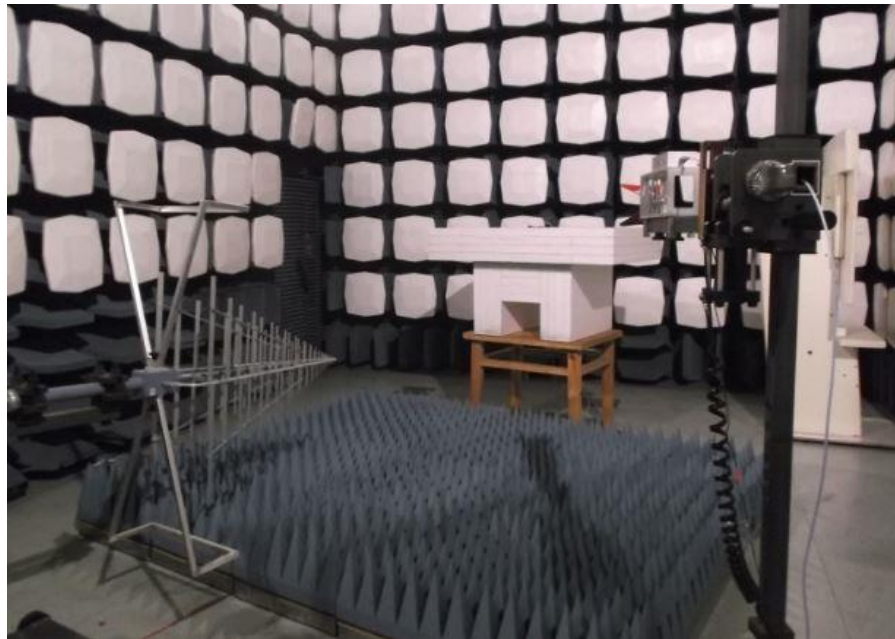
1. Emission Level(dBµV/m) = Original Value(dBm) + Correction Factor(dB) - 20logD + 104.8
Where D = specified measurement distance in meters, in this case D = 3m.
2. The other emission levels were very low against the limit.
3. Margin value = Emission Level – Limit value
4. Worst case data: 802.11n HT20 CH1 for 2389.9MHz , 802.11g CH11 for 2483.5MHz
5. Correction Factor = Antenna Gain(dBi)

5. Photographs of the Test Set-Up

Photograph 1: Set-up for Radiated Spurious Emissions, below 1GHz



Photograph 2: Set-up for Spurious Emissions, above 1GHz



Photograph 3: RF Module fixed on test board with the antenna



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