

Prüfbericht-Nr.: Test report no.:	CN2594TN 002	Auftrags-Nr.: Order no.:	168538399	Seite 1 von 19 Page 1 of 19
Kunden-Referenz-Nr.: Client reference no.:	N/A	Auftragsdatum: Order date:	2025-06-09	
Auftraggeber: Client:	Robert Bosch LLC 15000 Haggerty Plymouth MI 48170			
Prüfgegenstand: Test item:	Perfectly Keyless Master			
Bezeichnung / Typ-Nr.: Identification / Type no.:	PKM2.0			
Auftrags-Inhalt: Order content:	Test Report			
Prüfgrundlage: Test specification:	Article 2 Paragraph 1 of Item 47			
Wareneingangsdatum: Date of sample receipt:	2025-06-09	Refer to photo document		
Prüfmuster-Nr.: Test sample no.:	A004026257-006~10			
Prüfzeitraum: Testing period:	2025-07-02 - 2025-11-21			
Ort der Prüfung: Place of testing:	TÜV Rheinland (Shenzhen) Co., Ltd.			
Prüflaboratorium: Testing laboratory:	TÜV Rheinland (Shenzhen) Co., Ltd.			
Prüfergebnis*: Test result*:	Pass			
geprüft von: tested by:			genehmigt von: authorized by:	
Datum: Date:	2026-02-09	Signed by: Bell Hu	Ausstellungsdatum: Issue date:	2026-02-09
Stellung / Position:	Sachverständige(r)/Expert		Stellung / Position:	Sachverständige(r)/Expert
Sonstiges / Other:				
Zustand des Prüfgegenstandes bei Anlieferung: Condition of the test item at delivery:	Prüfmuster vollständig und unbeschädigt Test item complete and undamaged			
* Legende:	P(ass) = entspricht o.g. Prüfgrundlage(n)	F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
* Legend:	P(ass) = passed a.m. test specification(s)	F(ail) = failed a.m. test specification(s)	N/A = not applicable	N/T = not tested
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. <i>This test report only relates to the above mentioned 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.</i>				

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Anmerkungen
Remarks

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3	Prüfklausel mit der Note * wurden an qualifizierte Unterauftragnehmer vergeben und sind unter der jeweiligen Prüfklausel des Berichts beschrieben. Abweichungen von Prüfspezifikation(en) oder Kundenanforderungen sind in der jeweiligen Prüfklausel im Bericht aufgeführt. <i>Test clauses with remark of * are subcontracted to qualified subcontractors and described under the respective test clause in the report.</i> <i>Deviations of testing specification(s) or customer requirements are listed in specific test clause in the report.</i>
4	Die Entscheidungsregel für Konformitätserklärungen basierend auf numerischen Messergebnissen in diesem Prüfbericht basiert auf der "Null-Grenzwert-Regel" und der "Einfachen Akzeptanz" gemäß ILAC G8:2019 und IEC Guide 115:2023, es sei denn, in der auf Seite 1 dieses Berichts genannten angewandten Norm ist etwas anderes festgelegt oder vom Kunden gewünscht. Dies bedeutet, dass die Messunsicherheit nicht berücksichtigt wird und daher auch nicht im Prüfbericht angegeben wird. Zu weiteren Informationen bezüglich des Risikos durch diese Entscheidungsregel siehe ILAC G8:2019. <i>The decision rule for statements of conformity, based on numerical measurement results, in this test report is based on the "Zero Guard Band Rule" and "Simple Acceptance" in accordance with ILAC G8:2019 and IEC Guide 115:2023, unless otherwise specified in the applied standard mentioned on Page 1 of this report or requested by the customer. This means that measurement uncertainty is not taken in account and hence also not declared in the test report. For additional information to the resulting risk based of this decision rule please refer to ILAC G8:2019.</i>

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1 General Remarks

1.1 Complementary Materials

All attachments are integral parts of this test report. This applies especially to the following appendix:
Appendix A: Test result of UWB

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2 Test Sites

2.1 Test Facilities

TÜV Rheinland (Shenzhen) Co., Ltd.

2-3F, 101 & 102, No.2, Nuclear Power Industrial Park, Fuming Community, Fucheng Street, Longhua District, Shenzhen 518000, China

CNAS Registration No.: L3080

2.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

Equipment	Manufacturer	Model	Serial No.	Cal. Date	Cal. until	Calibration Body	Calibration Method*
Signal Analyzer	R&S	FSV 40	101441	2024-09-26	2025-09-25	GRGTEST	c
Power Meter	R&S	NRP2	107105	2024-10-31	2025-10-30	GRGTEST	c
Power Sensor	R&S	NRP-Z81	105677	2024-09-26	2025-09-25	GRGTEST	c
DC Power Supply	KIKUSUI	PAN35-5A	YM002997	2025-02-22	2026-02-21	GRGTEST	c
Digital Multi Meter	FLUKE	F15B	44350844WS	2025-02-24	2026-02-23	GRGTEST	c

Calibration Method:

- a) Calibration conducted by the National Institute of Information and Communications Technology (NICT) (hereinafter referred to as "NICT") or a designated calibration agency under Article 102-18 paragraph (1)
- b) Correction conducted pursuant to the provisions of Article 135 or Article 144 of the Measurement Law (Law No. 51 of 1992)
- c) Calibration conducted in foreign countries, which shall be equivalent to the calibration conducted by the NICT or a designated calibration agency under Article 102-18 paragraph (1)
- d) Calibration conducted by using measuring instruments and other equipment listed in the right column of Table No. 3 attached hereto, which shall have been given any of calibration, etc. listed above from a) to c)

2.3 Uncertainty of Measurement

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.

Table 2: Measurement Uncertainty

Parameter	Uncertainty
Occupied Bandwidth	$\pm 2.08 \%$
Spurious emissions	$\pm 3.68 \text{ dB}$
Output power density	$\pm 0.99 \text{ dB}$
Antenna Power	$\pm 0.99 \text{ dB}$
Frequency Tolerance	0.104 ppm

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3 General Product Information

3.1 Product Function and Intended Use

The product is Perfectly Keyless anchor which supports Bluetooth low energy and UWB wireless technology.

For details refer to the User Manual, Technical Description and Circuit Diagram.

3.2 Ratings and System Details

Table 3: Technical Specification of EUT

General Information of EUT	Description
Kind of Equipment:	Perfectly Keyless Master
Type Designation:	PKM2.0
MIC ID:	201-260110
Operating Voltage:	DC12.5V
Operating Temperature Range:	-40 ~+85°C
Hardware release No.:	0202
Software release No.:	14.06.09
Technical Specification of UWB	
Characteristic	Description
Frequency Range:	7737-8237MHz
Operating Frequency:	Channel 9: 7980MHz
Type of Modulation:	Impulse radio modulation
Antenna Type:	Integral Antenna
Antenna Gain:	5.5 dBi (Provided by the Client)
rated RF output power:	Please refer to Note 1
Conducted RF output power:	Please refer to Note 1
EIRP output power:	Please refer to Note 1

Note: The correctness of all data provided by customer in the test report is ensured and responsible of the customer. Any misjudgment of the test results caused by the use of incorrect data provided by customer shall be borne by the customer.

Note 1: The power table as below table:

UWB			
Test mode	Rated power density (dBm/MHz)	Conducted power density (dBm/MHz)	EIRP power density (dBm/MHz)
7980MHz	-41.3	-47.11	-41.61

Note: The power tested under the software power level setting at -2.



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3.3 Antenna Specifications

3.3.1 Antenna Gain

Ant. Type	Connector Type	Highest Peak Gain (dBi) 7737-8237MHz
Integral Antenna	N/A	5.5 dBi

3.3.2 Antenna Pattern

Please refer to the attached file (Antenna report).

3.4 Noise Generating and Noise Suppressing Parts

For details refer to the Circuit Diagram.

3.5 Submitted Documents

- Application Form
- User Manual
- Operation Description
- Rating Label

4 Test Set-up and Operation Modes

4.1 Principle of Configuration Selection

Emission: The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the instructions for use.

Radio Spectrum: The equipment under test (EUT) was configured at its highest power output in order to measure its highest possible radiation and conducted level. The test modes were adapted accordingly in reference to the instructions for use.

4.2 Test Operation and Test Software

Test operation refers to test setup in chapter 5 and chapter 6.

The RF circuits are located inside of the EUT, also it won't be easy to open and require special tools. Frequency Band, channels and modulation parameters are fixed inside the module. They cannot be edited or modified by end-user.

Table 4: Test Conditions

Test conditions	Unit
Voltage _{normal}	3.3V dc
Voltage _{max}	3.3V dc
Voltage _{min}	3.3V dc
Temperature	24.6 deg.C
Humidity	57 %

Note: During the input supply voltage to the EUT from the external power source is varied by +/- 10%, if output voltage had been confirmed that the fluctuation of power supply to the RF circuit of EUT (excluding power source) is equal to or less than +/-1%. Exempt extremely high and low supply voltage condition test, EUT only operated in normal voltage to test all regulations.

4.3 Special Accessories and Auxiliary Equipment

Table 5: List of Accessories and Auxiliary Equipment

Description	Manufacturer	Model	S/N
Laptop	Lenovo	T480	PF-16A6N8

4.4 Countermeasures to Achieve EMC Compliance

The test sample which has been tested contained the noise suppression parts as described in the Technical Construction File (TCF).

No additional measures were employed to achieve compliance.

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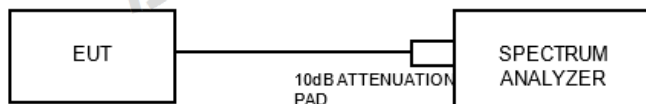
5 Test Results

5.1 Occupied Bandwidth Measurement (99% Power Bandwidth)

5.1.1 Limits of Occupied Bandwidth Measurement

Item	Limit	Remark
Occupied bandwidth	<1.4GHz	3.4 – 4.8GHz
Occupied bandwidth	<3GHz	7.25 – 10.25GHz

5.1.2 Test Setup



5.1.3 Measuring Instrument Conditions

Set the spectrum analyzer as follows.

Center frequency: Test frequency

Sweep frequency width: From about 2 times to about 3.5 times the allowable value specified in the equipment regulations

Resolution bandwidth: 3% or less of the allowable value specified in the equipment regulations

Video bandwidth: Same as resolution bandwidth

Input level: The level at which the carrier wave level can be measured without being affected by the noise level of the spectrum analyzer.

Sweep time: Minimum time for guaranteed measurement accuracy

(In the case of burst waves, when more than 1 burst per sample)

Sweep mode: Continuous sweep

Detection mode: Positive peak (Note)

Display mode: Max hold (Note)

5.1.4 Test Results

Result **PASS**

For the measurement records, refer to the appendix A.

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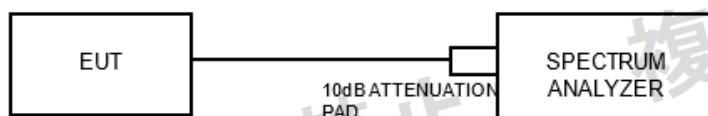
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5.2 Spreading Bandwidth Measurement (90% Power Bandwidth)

5.2.1 Limits of Spreading Bandwidth and Spreading Factor

Item	Limit	Remark
Spreading Bandwidth	$\geq 450\text{MHz}$	N/A

5.2.2 Test Setup



5.2.3 Measuring Instrument Conditions

Set the spectrum analyzer as follows.

Center frequency: Test frequency

Sweep frequency width From about 2 times to about 3.5 times the allowable value specified in the equipment regulations

Resolution bandwidth: 3% or less of the allowable value specified in the equipment regulations

Video bandwidth: Same as resolution bandwidth

Input level: The level at which the carrier wave level can be measured without being affected by the noise level of the spectrum analyzer.

Sweep time: Minimum time for guaranteed measurement accuracy
(In the case of burst waves, when more than 1 burst per sample)

Sweep mode: Continuous sweep

Detection mode: Positive peak (Note)

Display mode: Max hold (Note)

Note: For OFDM and other than burst waves, the following shall apply.

Average processing times 10 times or more

Detection mode sample

5.2.4 Test Results

Result

PASS

For the measurement records, refer to the appendix A.

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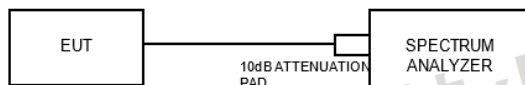
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5.3 Spurious Emissions for Transmitter Measurement

5.3.1 Limits of Spurious Emissions

	Average	Peak
30MHz - 1600MHz	-90dBm/MHz	-84dBm/MHz
1600MHz - 2700MHz	-85dBm/MHz	-79dBm/MHz
2700MHz - 10.6GHz	-70dBm/MHz	-64dBm/MHz
10.6GHz - 10.7GHz	-85dBm/MHz	-79dBm/MHz
10.7GHz - 11.7GHz	-70dBm/MHz	-64dBm/MHz
11.7GHz - 12.75GHz	-85dBm/MHz	-79dBm/MHz
12.75GHz - 26GHz	-70dBm/MHz	-64dBm/MHz

5.3.2 Test Setup



5.3.3 Conditions of The Measuring Instrument.

- (1) The spectrum analyzer when searching for **unwanted emissions** is set as follows.
 - Sweep frequency width: 30MHz to 26GHz (Note)
 - Resolution bandwidth: 1MHz
 - Video bandwidth: Same as resolution bandwidth
 - Y-axis scale: 10dB/Div
 - Input level: Maximum dynamic range value
 - Sweep time: The minimum time for which measurement accuracy is guaranteed (in the case of burst waves, it can be longer than the time obtained by "(sweep frequency width (MHz)/resolution Bandwidth (MHz)) × burst period (s)".) It can be longer than the time required
 - Number of data points: 400 or more data points
 - Sweep mode: Single sweep
 - Detection mode: positive peak
- (2) Set the spectrum analyzer as follows when measuring unwanted emission amplitude.
 - Center frequency: Unwanted emission frequency (searched frequency)
 - Sweep frequency width: 0Hz
 - Resolution bandwidth: 1MHz
 - Video bandwidth: Same as resolution bandwidth
 - Y-axis scale: 10dB/Div
 - Input level: Maximum dynamic range value
 - Sweep time: The minimum time for which the measurement accuracy is guaranteed (in the case of burst waves, the duration of one burst or more)
 - Number of data points: 400 or more data points
 - Sweep mode: Single sweep
 - Detection mode: sample

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5.3.4 Conditions of the measuring instrument

(1) Since the object to be measured is at a low level, a low noise amplifier is used. Or a low-noise amplifier built-in type etc.

The attenuation amount of the similar load (attenuator) is minimized.

(2) The spectral component at the time of searching secondary radio waves (hereinafter referred to as "secondary fire" in this section)

Resolution bandwidth 1 MHz

video bandwidth About 3 times the Resolution bandwidth

Sweep mode Single sweep

Detection mode Positive peak

(3) The setting of the spectrum analyzer at the amplitude measurement of the secondary emission is as follows.

Center Frequency Search Secondary Firing Frequency

Sweep frequency 0 Hz

Resolution bandwidth 1 MHz

Equivalent to the video bandwidth resolution bandwidth

Sweep mode Single sweep

Detection mode sample

5.3.5 Test Results

Result

PASS

For the measurement records, refer to the appendix A.

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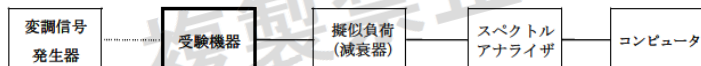
5.4 Antenna Power Measurement

5.4.1 Limits of Antenna Power

Mode	Frequency band used	Antenna power (max.)	EIRP (max)
			Omni-directional case
UWB	3.4 – 4.8GHz	-41.3dBm / MHz	0dBm / 50MHz
UWB	7.25 – 10.25GHz		

Tolerance of antenna power shall be +20% (upper value)

5.4.2 Test Setup



5.4.3 (1) Measurement Procedure

Resolution bandwidth 1 MHz

More than 3 times the video bandwidth resolution bandwidth

Sweep mode continuous

Detection mode Positive peak

Display mode max hold

a) The setting of the spectrum analyzer at the time of average power measurement is as follows.

Center frequency Search frequency

Sweep frequency width 0 Hz

Resolution bandwidth 1 MHz

More than 3 times the video bandwidth resolution bandwidth

Sweep time

Time when the number of sample points per 1 ms is 100 or more

Sweep mode Single sweep

Detection mode sample

Regardless of a), the setting of spectrum analyzer at the time of average power measurement can be as follows Show.

Center frequency Search frequency

Sweep frequency width about 100 MHz

Resolution bandwidth 1 MHz

About 3 times the video bandwidth resolution bandwidth

Sweep time

Less than or equal to 1 ms per sample

Sweep mode Continuous sweep

Detection mode RMS

Display mode max hold

5.4.4 Test Results

Result **PASS**

For the measurement records, refer to the appendix A.

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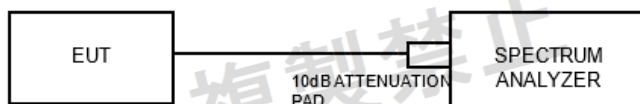
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5.5 Spurious Emissions for Receiver

5.5.1 Limits of Spurious Emissions for Receiver

	3.4 - 4.8GHz (Low Band)	7.25 - 10.25GHz (High Band)
30MHz - 1600MHz	-90dBm/MHz	
1600MHz - 2700MHz	-85dBm/MHz	
2700MHz - 3.4GHz	-70dBm/MHz	
3.4GHz - 4.8GHz	-54dBm/MHz	-70dBm/MHz
4.8GHz - 7.25GHz	-70dBm/MHz	
7.25GHz - 10.25GHz	-70dBm/MHz	-54dBm/MHz
10.25GHz - 10.6GHz	-70dBm/MHz	
10.6GHz - 10.7GHz	-85dBm/MHz	
10.7GHz - 11.7GHz	-70dBm/MHz	
11.7GHz - 12.75GHz	-85dBm/MHz	
12.75GHz - 26GHz	-70dBm/MHz	

5.5.2 Test Setup



5.5.3 Conditions of The Measuring Instrument.

- (1) The spectrum analyzer when searching for **unwanted emissions** is set as follows.
 - Sweep frequency width: 30MHz to 26GHz (Note)
 - Resolution bandwidth: 1MHz
 - Video bandwidth: Same as resolution bandwidth
 - Y-axis scale: 10dB/Div
 - Input level: Maximum dynamic range value
 - Sweep time: The minimum time for which measurement accuracy is guaranteed (in the case of burst waves, it can be longer than the time obtained by "(sweep frequency width (MHz)/resolution Bandwidth (MHz)) × burst period (s)".) It can be longer than the time required
 - Number of data points: 400 or more data points
 - Sweep mode: Single sweep
 - Detection mode: positive peak
- (2) Set the spectrum analyzer as follows when measuring unwanted emission amplitude.
 - Center frequency: Unwanted emission frequency (searched frequency)
 - Sweep frequency width: 0Hz
 - Resolution bandwidth: 1MHz
 - Video bandwidth: Same as resolution bandwidth
 - Y-axis scale: 10dB/Div
 - Input level Maximum dynamic range value
 - Sweep time; The minimum time for which the measurement accuracy is guaranteed (in the case of burst waves, the duration of one burst or more)
 - Number of data points: 400 or more data points
 - Sweep mode: Single sweep
 - Detection mode: sample

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5.5.4 Conditions of the measuring instrument

(1) Since the object to be measured is at a low level, a low noise amplifier is used. Or a low-noise amplifier built-in type etc.

The attenuation amount of the similar load (attenuator) is minimized.

(2) The spectral component at the time of searching secondary radio waves (hereinafter referred to as "secondary fire" in this section)

Resolution bandwidth 1 MHz

video bandwidth About 3 times the Resolution bandwidth

Sweep mode Single sweep

Detection mode Positive peak

(3) The setting of the spectrum analyzer at the amplitude measurement of the secondary emission is as follows.

Center Frequency Search Secondary Firing Frequency

Sweep frequency 0 Hz

Resolution bandwidth 1 MHz

Equivalent to the video bandwidth resolution bandwidth

Sweep mode Single sweep

Detection mode sample

5.5.5 Test Results

Result **PASS**

For the measurement records, refer to the appendix A.

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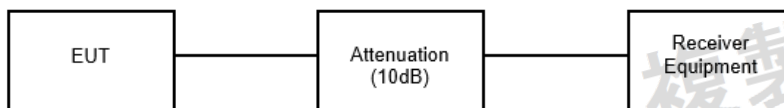
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5.6 Interference Prevention Function

5.6.1 Limits of Interference Prevention Function

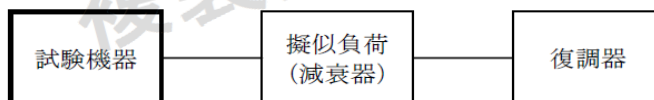
N/A

5.6.2 Test Setup

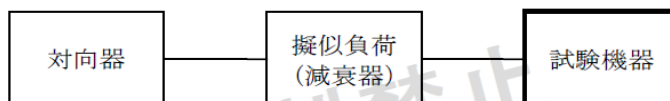


Measurement system diagram

(1) When sending an identification code



(2) When receiving an identification code



5.6.3 How to describe test results

- (1) When EUT has a function to automatically transmit an identification code
If the code stipulated in the equipment rule and the demodulated code are the same, it is described as "passed", and if they are different, it is described as "failed".
- (2) When the test equipment has a function to automatically receive the identification code
If the received code is the code stipulated in the equipment regulations, normal reception is performed, and if the code is different from the code stipulated in the equipment regulations, a message indicating that the code is different is displayed. "No" shall be entered in other case.

5.6.4 Test Results

For the measurement records, refer to the appendix A.

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6 Photographs of the Test Set-Up

Photograph 1: Set-up for Radio Spectrum Testing



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**Appendix A.1: Test Results of Antenna Power***Test Result*

Test Condition	Freq (MHz)	Average EIRP Result (dBm/MHz)	Average Result (dBm/MHz)	Average limit (dBm/MHz)	Verdict
NTNV	7980	-41.61	-47.11	-41.3	PASS

Test Condition	Freq (MHz)	Peak EIRP Result (dBm/50MHz)	Peak Result (dBm/50MHz)	Peak limit (dBm/50MHz)	Verdict
NTNV	7980	-9.80	-15.30	0	PASS

The Antenna Gain is 5.5dBi.

Appendix A.2: Test Results of Occupied Channel Bandwidth (99%)

Test Result

TestCondition	Freq (MHz)	Result [MHz]	Limit [MHz]	Verdict
NTNV	7980	603.48	≤3000	PASS

Appendix A.3: Test Results of Spread Bandwidth (90%)

Test Result

TestCondition	Freq (MHz)	Result [MHz]	Limit [MHz]	Verdict
NTNV	7980	570.9	≥450	PASS

Appendix A.4: Test Results of Spurious Emissions for Transmitter

Test Result

Test Condition	Test Mode	Antenna	Freq. Range [MHz]	Freq. [MHz]	Result [dBm/MHz]	Peak Limit [dBm/MHz]	Verdict
NTNV	7980MHz	Ant1	30~1600	942.96	-85.83	-84	PASS
			1600~2700	2605.73	-80.13	-79	PASS
			2700~10600	7197.15	-69.25	-64	PASS
			10600~10700	10603.33	-80.94	-79	PASS
			10700~11700	10902.02	-76.51	-64	PASS
			11700~12750	12640.55	-80.35	-79	PASS
			12750~26000	15974.08	-71.45	-64	PASS

Appendix A.5: Test Results of Spurious Emissions for Receiver

Test Result

Test Condition	Test Mode	Antenna	Freq. Range [MHz]	Freq. [MHz]	Result [dBm/MHz]	Peak Limit [dBm/MHz]	Verdict
NTNV	7980MHz	Ant1	30~1600	888.94	90.23	-90	PASS
			1600~2700	1999.823	-86.23	-85	PASS
			2700~7250	5990.60	-70.89	-70	PASS
			7250~10250	7272.62	77.21	-54	PASS
			10250~10600	10559.77	-77.63	-70	PASS
			10600~10700	10612.69	-86.89	-85	PASS
			10700~11700	11632.84	-77.42	-70	PASS
			11700~12750	12276.90	-87.39	-85	PASS
			12750~26000	15785.50	-73.86	-70	PASS

Appendix A.6: Test Results of Interference Prevention Function

Requirement	the one automatically to transmit and to receive identification code with the wireless equipment of the wireless station used in the same premises.	Test result:	Conform
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