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Kunden-Referenz-Nr.: <i>Client Reference No.:</i>	352690	Auftragsdatum: <i>Order date.:</i>	03.Apr.2014		
Auftraggeber: <i>Client:</i>	Seikaku Technical Group Limited Offshore Chambers, P.O. Box 217 Apia, Samoa.				
Prüfgegenstand: <i>Test item:</i>	Digital Wireless System				
Bezeichnung / Typ-Nr.: <i>Identification / Type No.:</i>	DW-24H DW-24P	FCC ID: <i>FCC ID</i>	H38DW-24H H38DW-24P		
Auftrags-Inhalt: <i>Order content:</i>	TUV Rheinland - EMC service				
Prüfgrundlage: <i>Test specification:</i>	ANSI C63.4: 2009 FCC Part 15: October 1, 2013 Subpart C section 15.207, 15.209 and 15.247				
Wareneingangsdatum: <i>Date of receipt:</i>	31.Mar.2014				
Prüfmuster-Nr.: <i>Test sample No.:</i>	N/A				
Prüfzeitraum: <i>Testing period:</i>	Refer to test report				
Ort der Prüfung: <i>Place of testing:</i>	Refer to section 2.1				
Prüflaboratorium: <i>Testing laboratory:</i>	TÜV Rheinland (Guangdong) Ltd.				
Prüfergebnis*: <i>Test result*:</i>	Pass				
geprüft von / tested by:	kontrolliert von / reviewed by:				
18.Aug.2014 Frank Du/ Project Manager 	18.Aug.2014 Liangdong Xie/Project Manager 				
Datum <i>Date</i>	Name/Stellung <i>Name/Position</i>	Unterschrift <i>Signature</i>	Datum <i>Date</i>	Name/Stellung <i>Name/Position</i>	Unterschrift <i>Signature</i>
Sonstiges / Other:					
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>		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 specifications(s) F(ail) = failed a.m. test specifications(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. <i>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.</i></p>					

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Test Summary

FCC Rules		Test items	Result
Paragraph	Released Date		
Part 15 Per Section 15.207(a)	October 1, 2013	Conducted Emission	Pass
Part 15 Per Section 15.209(a)	October 1, 2013	Radiated Spurious Emission	Pass
Part 15 Per Section 15.203	October 1, 2013	Antenna requirement	Pass
Part 15 Per Section 15.247(b)(1)	October 1, 2013	Maximum Peak Output power	Pass
Part 15 Per Section 15.247(a)(1)	October 1, 2013	6dB Bandwidth	Pass
Part 15 Per Section 15.247(a)(1)	October 1, 2013	Hopping Channel Carrier Frequency Separation	N/A
Part 15 Per Section 15.247(a)(1)(iii)	October 1, 2013	Number of Hopping Frequency Used	N/A
Part 15 Per Section 15.247(a)(1)(iii)	October 1, 2013	Time of Occupancy (Dwell Time)	N/A
Part 15 Per Section 15.247(d)	October 1, 2013	Bandedge Emission	Pass
Part 15 Per Section 15.247(e)	October 1, 2013	Power spectral density	Pass
Part 15 Per Section 15.247(d)	October 1, 2013	Out-Of-Band Emission measurement	Pass
Safety Human exposure	FCC KDB Publication 447498	Electromagnetic Fields	Pass

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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 1: Test result

2 Test Sites

2.1 Test Facilities

TÜV Rheinland (Guangdong) Ltd. EMC Laboratory

No.102, 1F of Southwest Warehouse Building, No.767 TianYuan Road,
Tianhe District, Guangzhou, P.R.China, 510650

2.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

Kind of Equipment	Type	Manufacturer	S/N	Calibrated until	Calibrated Interval
EMI Test Receiver	ESCI-3	Rohde & Schwarz	100216	16.Mar.2015	1 year
Spectrum Analyzer	FSP30	Rohde & Schwarz	100286	16.Mar.2015	1 year
Trilog-Broadband Antenna	VULB9168 (30MHz-1GHz)	SCHWARZBECK MESSELEKTRONIK	209	16.Mar.2015	2 years
Double-Ridged Waveguide Horn Antenna	HF906 (1-18GHz)	Rohde & Schwarz	100385	16.Mar.2015	2 years
Pre-amplifier	AFS42-00101800-25-S-42	MITEQ	1101599	16.Mar.2015	2 years
Band Reject Filter	BRM50702	Micro-Tronics	023	16.Mar.2015	2 years
Standard Gain Horn Antenna	3160-09 (18-26.5GHz)	EMCO	21642	16.Mar.2015	5 years
Pre-amplifier	AFS33-18002650-30-8P-44	MITEQ	1108282	16.Mar.2015	2 years
3m Anechoic Chamber	N/A	Albatross Project GmbH	N/A	16.Mar.2015	1 year
Loop Antenna	HFH2-Z2 (<30MHz)	Rohde & Schwarz	100111	16.Mar.2015	2 years
EMI Test Receiver	ESCS30	Rohde & Schwarz	100316	16.Mar.2015	1 year
Two-Line V-Network	ESH3-Z5	Rohde & Schwarz	100308	16.Mar.2015	1 year
Pulse Limiter	ESH3-Z2	Rohde & Schwarz	100701	16.Mar.2015	1 year

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2.3 Traceability

All measurement equipment calibrations are traceable to NIST or where calibration is performed outside the United States, to equivalent nationally recognized standards organizations.

2.4 Calibration

Equipment requiring calibration is calibrated periodically by the manufacturer or according to manufacturer's specifications.

2.5 Measurement Uncertainty

Uncertainty for conducted emissions measurements is 2.68dB.

Uncertainty for radiated emissions measurements is 5.16dB (30M-1GHz) and 4.88dB (> 1GHz)

The reported expanded uncertainty is based on a standard uncertainty multiply by a coverage factor $k=2$, providing a level of confidence of approximately 95%.

2.6 Location of original data

The original copies of test data taken during actual testing were attached at Appendix 1 of this report and delivered to the applicant. A copy has been retained in the TÜV Rheinland (Guangdong) file for certification follow-up purposes.

2.7 Status of facility used for testing

TÜV Rheinland (Guangdong) Ltd. EMC Laboratory; No.102, 1F of Southwest Warehouse Building, No.767 TianYuan Road, Tianhe District, Guangzhou, P.R.China is listed on the US Federal Communications Commission list of facilities approved to perform measurements, the register no. 833845.

3 General Product Information

The submitted samples DW-24H, DW-24P are wireless transmitters. They use digital modulation technics and operate in 2400 frequency band.

They have same circuit diagram, but PCB layout is different, therefore all tests were performed on both models.

For details refer to the User Manual and Circuit Diagram.

3.1 Product Function and Intended Use

Refer to the Technical Documentation and user manual.

3.2 Ratings and System Details

Type Designation	:	DW-24H, DW-24P							
Frequency range	:	2.404GHz –2.472GHz							
Number of employed channels	:	32 channels (GHz)							
		2.404	2.406	2.408	2.410	2.412	2.414	2.416	2.418
		2.420	2.422	2.424	2.426	2.428	2.430	2.432	2.434
		2.436	2.444	2.446	2.448	2.450	2.452	2.454	2.456
		2.458	2.460	2.462	2.464	2.466	2.468	2.470	2.472
Channel Spacing	:	2MHz							
Modulation Type	:	GFSK							
Type of antenna	:	Integral antenna							
Power supply	:	DC3.0V(battery powered)							
Equipment type	:	Portable Equipment							
Protection Class	:	III							

Refer to the Technical Documentation for further information.

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3.3 Independent Operation Modes

A. Transmitting.

For further information refer to User Manual.

3.4 Submitted Documents

Block Diagram
Schematics
Operation Description
Components List
FCC label and location
User Manual
Internal Photos
External Photos
Application form

4 Test Set-up and Operation Mode

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.

4.2 Test Operation and Test Software

Refer to test set-up in chapter 5.

4.3 Special Accessories and Auxiliary Equipment

None.

4.4 Countermeasures to achieve EMC Compliance

The test sample, which has been tested, contained the noise suppression parts as described in the technical document. No additional measures were employed to achieve compliance.

4.5 Test set-up

Diagram 1 of Configuration for Testing Radiated Emission 30MHz -1 GHz

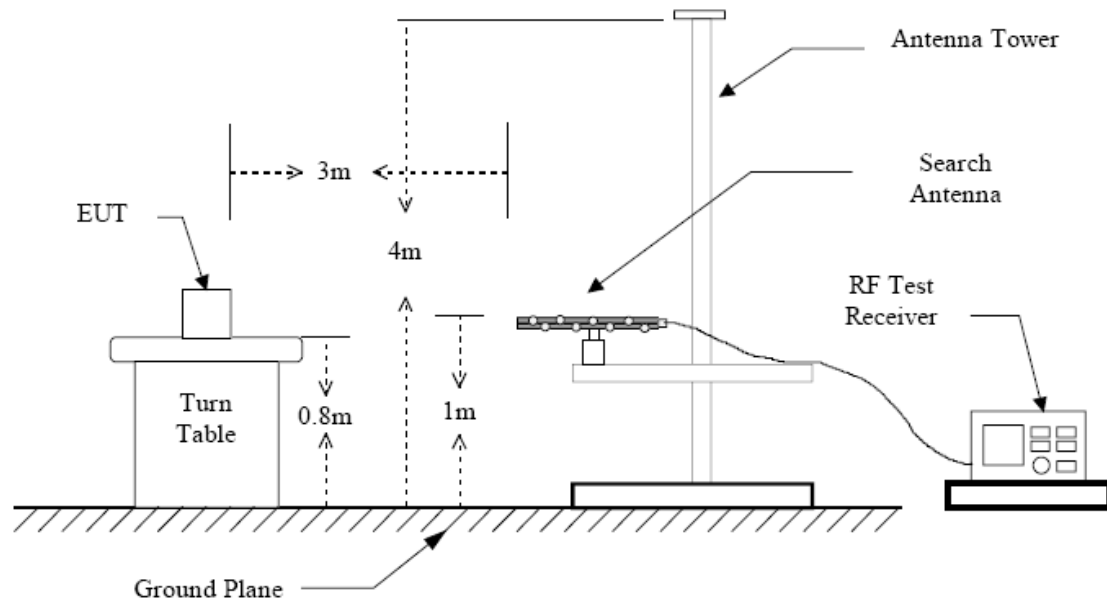


Diagram 2 of Configuration for Testing Radiated Emission above 1 GHz

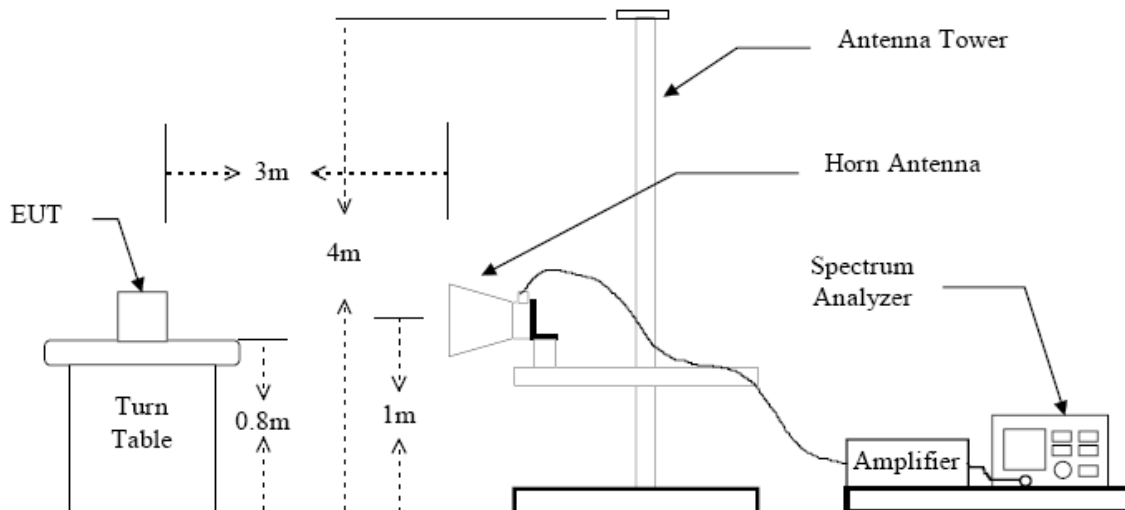


Diagram 3 of Configuration for Testing Conducted Emission

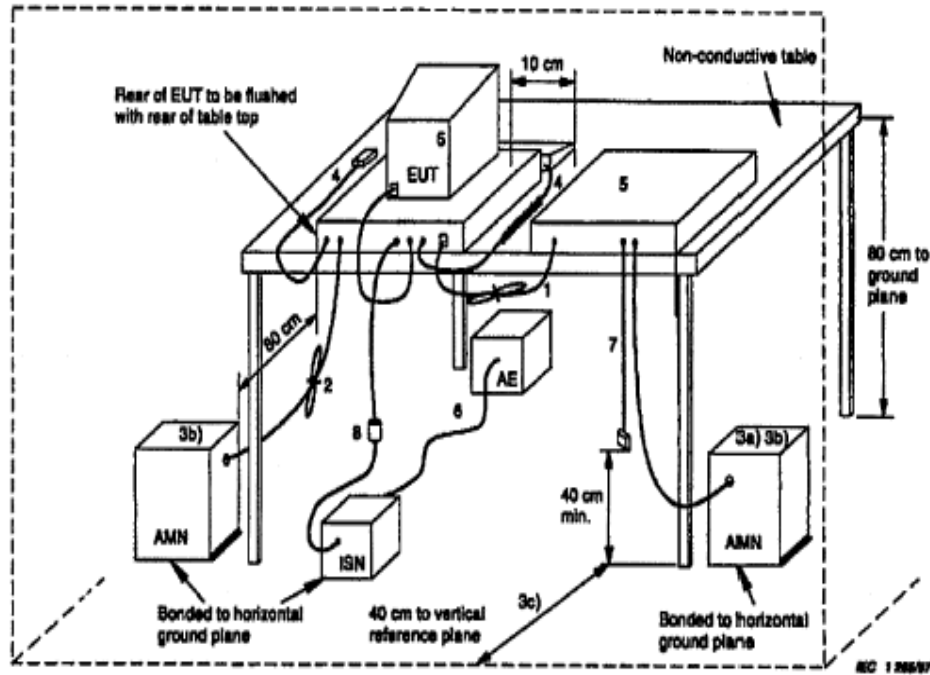
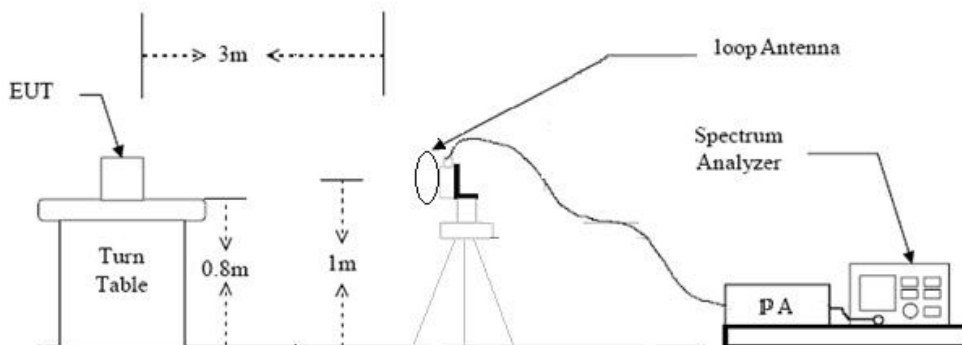


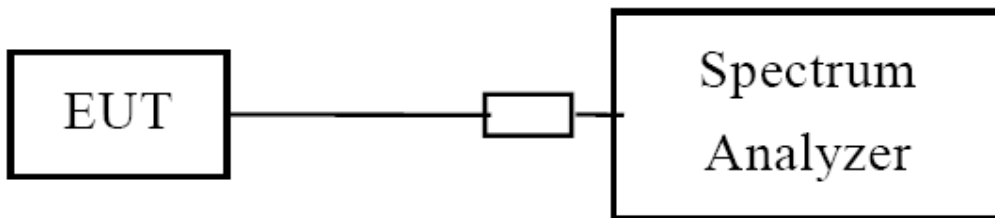
Diagram 4 of Configuration for Testing Radiated Emission below 30MHz



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Diagram 5 of Configuration for Testing other test items



5 Test Results EMISSION

5.1 Conducted Emission

RESULT: N/A

Date of testing	:	---.---.---
Test specification	:	FCC Part 15 Per Section 15.207(a)
Limits	:	FCC Part 15 Per Section 15.207(a)
Test procedure	:	Procedure specified in ANSI C63.4 were followed
Deviations from Standard Test	:	
Procedures	:	None
Kind of test site	:	Shielded room
Operation mode	:	--
Power supply	:	--
Temperature	:	--
Humidity	:	--

Test procedure:

For tabletop device, the EUT and its peripherals were placed on a wooden table, 0.8cm above the horizontal reference plane and 40cm away from vertical reference plane in a shielded room. For floor-standing device, the EUT shall be placed either directly on the reference ground plane or on insulating material as described in ANSI C63.4 Clause 6.3.2.1.

The EUT was connected to input power source through a line impedance stabilization network (LISN). The excess length of the power cord between the EUT and the LISN shall be folded back and forth at the center of the lead to form a bundle not exceeding 40cm in length.

The EUT was tested in a typical model of operation in accordance with ANSI C63.4:2009, Pre-test was performed in peak and average detection mode. final measurement was performed using quasi-peak and average detection on the live and neutral lines with the worst case.

The test software Rohde & Schwarz EMC32 was used during the test.

If the result of the measurement with the Quasi Peak detector is below the Average limit, the measurement with Average Detector may be omitted.

EUT is powered by battery, has no connection to Mains port, therefore this test is not applicable.

5.2 Radiated Spurious Emission

RESULT:

Pass

Date of testing	:	Apr.28.2014
Test specification	:	FCC Part 15 Per Section 15.209(a)
Limits	:	FCC Part 15 Per Section 15.209(a)
Test procedure	:	Procedure specified in ANSI C63.4
Deviations from Standard Test procedures	:	None
Kind of test site	:	3m Semi-anechoic chamber
Operation mode	:	Transmitting at fix channel with max power (High, Low, Mid)
Power supply	:	DC3.0V(powered by battery)
Temperature	:	23°C
Humidity	:	50%

Test procedure:

For tabletop device, the and its peripherals were placed on a wooden table,80cm above ground plane in semi-anechoic chamber. For floor-standing equipment, the EUT and all cables shall be insulated, if required, from the ground plane by up to 12mm of insulating material in semi-anechoic chamber.

The EUT was set 3 meters away from the receiving antenna, which was mounted on a variable-height antenna tower. Test shall be made with the antenna positioned in both the horizontal and vertical planes of polarization. The antenna height shall be varied from 1m to 4m. The table was rotated 360 degrees to detect the suspected emission frequency points. The position of the worst radiation case with both horizontal and vertical receiving antenna polarization was recorded together with the suspected emission frequency points above-mentioned.

The EUT was tested in a typical model of operation in accordance with ANSI C63.4:2009, Pre-test was performed in peak detection mode. Final measurement was performed using quasi-peak detection with the worst case.

The test software Rohde & Schwarz EMC32 was used during the test.

Note:

While testing, the EUT is connected with a serial port bridge board for test mode setup. The length of the communication cable between the EUT and the bridge board, which including Tx, Rx, GND serial pins, is minimized to reduce the unwanted influence to test result. The bridge board can be connected to a host computer with standard DB9 com port cable for running of the test setup software. After setup successfully, the EUT can keep the test mode with the host computer and the cable removed.

Refer to appendix 1 for test result.

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5.3 Antenna requirement

RESULT:

Pass

Date of testing : ---
Test specification : FCC Part 15 Per Section 15.203
FCC Part 15 Per Section 15.247(b)

For intentional device, according to 15.203, and intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

And according to 15.247(b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by amount in dB than the directional gain of the antenna exceeds of 6dBi.

As the antenna is permanently printed on RF Board, there is no consideration of replacement.

And the max gain of the antenna is 0dBi.

5.4 Maximum Peak Output Power

RESULT:

Pass

Date of testing : Aug.14.2014
 Test specification : FCC Part 15 Per Section 15.247(b)(3)
 Limits : FCC Part 15 Per Section 15.247(b)(3)

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt.

Deviations from Standard Test procedures : None
 Test procedure : Procedure specified in ANSI C63.4
 Kind of test site : Shielded room
 Operation mode : Transmitting on the measured channel.
 Power supply : DC3.0V(powered by battery)
 Temperature : 23°C
 Humidity : 50%

Table 2: Peak Conducted Power

DW-24H

Channel	Frequency (GHz)	Power Reading(dBm)	Output Power	Limit (mW)*
			(mW)	
high	2.472	2.24	1.68	1000
mid	2.448	4.92	3.11	1000
low	2.404	1.02	1.27	1000

DW-24P

Channel	Frequency (GHz)	Power Reading(dBm)	Output Power	Limit (mW)*
			(mW)	
high	2.472	3.45	2.22	1000
mid	2.448	5.40	3.47	1000
low	2.404	1.31	1.36	1000

Please refer to Appendix 1 for measurement data.

5.5 6dB Bandwidth

RESULT:

Pass

Date of testing	:	Aug.14, 2014
Test specification	:	FCC Part 15 Per Section 15.247(a)(2)
Limits	:	FCC Part 15 Per Section 15.247(a)(2) Systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz, and 5725 - 5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.
Deviations from Standard Test procedures	:	None
Test procedure	:	Procedure specified in ANSI C63.4
Operation mode	:	Transmitting on the measured channel.
Kind of test site	:	Shielded room
Power supply	:	DC3.0V(powered by battery)
Temperature	:	22°C
Humidity	:	52%

Test procedure:

1. Connect the antenna port of the EUT to the spectrum analyzer by a low loss cable.
2. Set the EUT to proper test mode with relative test software and hardware.
3. Spectrum analyzer setting: Centered Frequency= measured channel, RBW=100kHz, VBW=300kHz.
4. Mark the peak power frequency point and the -6dB upper and lower frequency points.
5. Read the frequency delta value between the -6dB upper and lower frequency points.
6. Repeat step 2 to 5 until all the channels required are finished.

Table 3: 6dB Bandwidth

DW-24H

Channel	Frequency (GHz)	Test Result (kHz)
high	2.472	940
mid	2.448	860
low	2.404	900

DW-24P

Channel	Frequency (GHz)	Test Result (kHz)
high	2.472	780
mid	2.448	900
low	2.404	960

5.6 Hopping Channel Carrier Frequency Separation

RESULT: N/A

Date of testing : ---
Test specification : FCC Part 15 Per Section 15.247(a)(1)
Limits : FCC Part 15 Per Section 15.247(a)(1)

Frequency hopping systems operating in the band 2400-2483.5 MHz may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 0.125W.

Deviations from Standard Test procedures : None
Test procedure : Procedure specified in ANSI C63.4
Kind of test site : Shielded room
Operation mode : ---
Power supply : ---
Temperature : ---
Humidity : ---

Test procedure:

1. Connect the antenna port of the EUT to the spectrum analyzer by a low loss cable.
2. Set the EUT to proper test mode with relative test software and hardware.
3. Spectrum analyzer setting: Centered Frequency = measured channel, RBW = 30 kHz, VBW = 100 kHz, Frequency Span = wide enough to cover the adjacent channel.
4. Mark the peak power frequency point of the measured channel and its adjacent channel(s)
5. Read the frequency delta value between the measured channel and its adjacent channel(s)
6. Repeat step 3 to 5 until all the channels measured are finished.

EUT does not use Frequency hopping technics, therefore this test is not applicable.

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5.7 Number of Hopping Frequency Used

RESULT: N/A

Date of testing	:	---
Test specification	:	FCC Part 15 Per Section 15.247(a)(1)(iii)
Limits	:	FCC Part 15 Per Section 15.247(a)(1)(iii) Frequency hopping system in the 2400-2483.5 MHz band shall use at least 15 non-overlapping channels
Deviations from Standard Test procedures	:	None
Test procedure	:	Procedure specified in ANSI C63.4
Kind of test site	:	Shielded room
Operation mode	:	---
Power supply	:	---
Temperature	:	---
Humidity	:	---

Test procedure:

1. Connect the antenna port of the EUT to the spectrum analyzer by a low loss cable.
2. Set the EUT to proper test mode with relative test software and hardware.
3. Spectrum analyzer setting: RBW = 100 kHz, VBW ≥ RBW, Frequency Span = wide enough to cover the channels to be plotted.
4. Set the spectrum analyzer to Max-hold mode and plot the result(s) with record of all hopping channel.

EUT does not use Frequency hopping technics, therefore this test is not applicable.

5.8 Time of Occupancy (Dwell Time)

RESULT: N/A

Date of testing : ---
Test specification : FCC Part 15 Per Section 15.247(a)(1)(iii)
Limits : FCC Part 15 Per Section 15.247(a)(1)(iii)

For frequency hopping system operating in the 2400-2483.5MHz band, the average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

Deviations from Standard Test procedures : None
Test Procedure : Procedure specified in ANSI C63.4
Kind of test site : Shielded room
Operation mode : ---
Power supply : ---
Temperature : ---
Humidity : ---

Test procedure:

1. Connect the antenna port of the EUT to the spectrum analyzer by a low loss cable.
2. Set the EUT to proper test mode with relative test software and hardware.
3. Spectrum analyzer setting: Centered Frequency = measured channel, RBW = 1MHz, VBW \geq RBW, Frequency Span = 0 Hz.
4. Set sweep time properly to capture the entire dwell time per hopping channel.
5. Set detector type to Peak and trace mode to Max Hold and make the measurement.
6. Repeat step 3-5 until all channels measured were complete.

EUT does not use Frequency hopping technics, therefore this test is not applicable.

5.9 Bandedge Emission

RESULT:

Pass

Date of testing : Aug.14.2014
Test specification : FCC Part 15 Per Section 15.247(d)
Limits : FCC Part 15 Per Section 15.247(d)

In any 100kHz 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 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

In addition:

FCC Part 15 - radiated emission 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).

Deviations from Standard Test procedures : None
Test Procedure : Procedure specified in ANSI C63.4
Kind of test site : Shielded room
Operation mode : Transmitting at the highest and lowest channel (band edge)
Power supply : DC3.0V(powered by battery)
Temperature : 22°C
Humidity : 55%

Test procedure:

1. Connect the antenna port of the EUT to the spectrum analyzer by a low loss cable.
2. Set the EUT to proper test mode with relative test software and hardware.
3. Spectrum analyzer setting: RBW = 100 kHz, VBW≥3RBW.
4. Set proper frequency span respectively for out-of-band emission measurement of the band edge and the whole range (up to 10 times of the carrier frequency.)
5. Set the trace mode to Max Hold and mark the peak reading of any spurious emission recorded.

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Table 4: Band Edges Emission in the Restricted Bands by Marker Delta Method

DW-24H

Frequency [MHz]	dBc [dB]	PK [dB μ V/m]	AV [dB μ V/m]	Polarity (H/V)	PK limit [dB μ V/m]	AV limit [dB μ V/m]
2.4856	49.41	48.76	---	V	74	54
2.4000	47.13	50.2	---	H	74	54

DW-24P

Frequency [MHz]	dBc [dB]	PK [dB μ V/m]	AV [dB μ V/m]	Polarity (H/V)	PK limit [dB μ V/m]	AV limit [dB μ V/m]
2.4841	52.11	46.06	---	V	74	54
2400.0	44.92	52.41	---	H	74	54

NOTE:

1. The Peak carrier field strength of the highest/lowest channel is 98.17dBuV/m, 97.33dBuV/m.
The above field strength levels were measured in horizontal polarity which is the worst case.
2. The dBc value between the carrier maximum power and band edge emission power of the frequency listed in the table is calculated from the test record showed in Appendix 1.
3. Peak value of the high/low band edge emission listed in the table is calculated by the below formula: PK value of band edge emission = Peak carrier field strength – dBc value in item2

*Note: Please refer to Appendix 1 for measurement data. Disturbances other than those mentioned above are small or not detectable. Please refer to the Appendix 1 for the noise floor of the band edge emission.

5.10 Power spectral density

RESULT:

Pass

Date of testing : Aug.14.2014
 Test specification : FCC Part 15 Per Section 15.247(e)
 Limits : FCC Part 15 Per 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.

Deviations from Standard Test procedures : None
 Test procedure : Procedure specified in ANSI C63.4
 Kind of test site : Shielded room
 Operation mode : Transmitting on the measured channel.
 Power supply : DC3.0V(powered by battery)
 Temperature : 23°C
 Humidity : 50%

Table 5: power spectral density

DW-24H

Channel	Frequency (GHz)	Power Reading(dBm)	Limit dBm/3kHz
high	2.472	-6.51	8.0
mid	2.448	-3.70	8.0
low	2.404	-7.90	8.0

DW-24P

Channel	Frequency (GHz)	Power Reading(dBm)	Limit dBm/3kHz
high	2.472	-5.88	8.0
mid	2.448	-2.68	8.0
low	2.404	-7.14	8.0

Please refer to Appendix 1 for measurement data.

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5.11 Out-of-Band Emission

RESULT:

Pass

Date of testing : Aug.14.2014
Test specification : FCC Part 15 Per Section 15.247(d)
Limits : FCC Part 15 Per Section 15.247(d)

In any 100kHz 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 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

In addition:

FCC Part 15 - radiated emission 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).

Deviations from Standard Test procedures : None
Test Procedure : Procedure specified in ANSI C63.4
Kind of test site : Shielded room
Operation mode : Transmitting at the highest and lowest channel
Power supply : DC3.0V(powered by battery)
Temperature : 22°C
Humidity : 55%

Test procedure:

1. Connect the antenna port of the EUT to the spectrum analyzer by a low loss cable.
2. Set the EUT to proper test mode with relative test software and hardware.
3. Spectrum analyzer setting: RBW = 100 kHz, VBW \geq 3RBW.
4. Set proper frequency span respectively for out-of-band emission measurement of the band edge and the whole range (up to 10 times of the carrier frequency.)
5. Set the trace mode to Max Hold and mark the peak reading of any spurious emission recorded.

Prüfbericht - Nr.: 16059572 001
Test Report No.:Seite 26 von 32
Page 26 of 32**Table 6: Out-Of-Band Emission measurement (conducted)**

Emission (Carrier operating at Channel low, mid and high)	Attenuation	Limit (dB)
30MHz to 25GHz	All emission in this 100kHz bandwidth are attenuated more than 20dB from the carrier	$\Delta \geq 20$

Note: Refer to Appendix 1 for measurement data.

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Test Report No.:

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6. Safety Human exposure

6.1 Radio Frequency Exposure Compliance

6.1.1 Electromagnetic Fields

RESULT:
Passed

Test standard : FCC KDB Publication 447498

The minimum distance for the EUT is <5mm, since maximum peak output power of the transmitter is 3.11mW(DW-24H) and 3.47mW(DW-24P) <10mW, hence the EUTs are excluded from SAR evaluation according to FCC KDB publication 447498 D01: Mobile and Portable RF Exposure. Guidance v05.

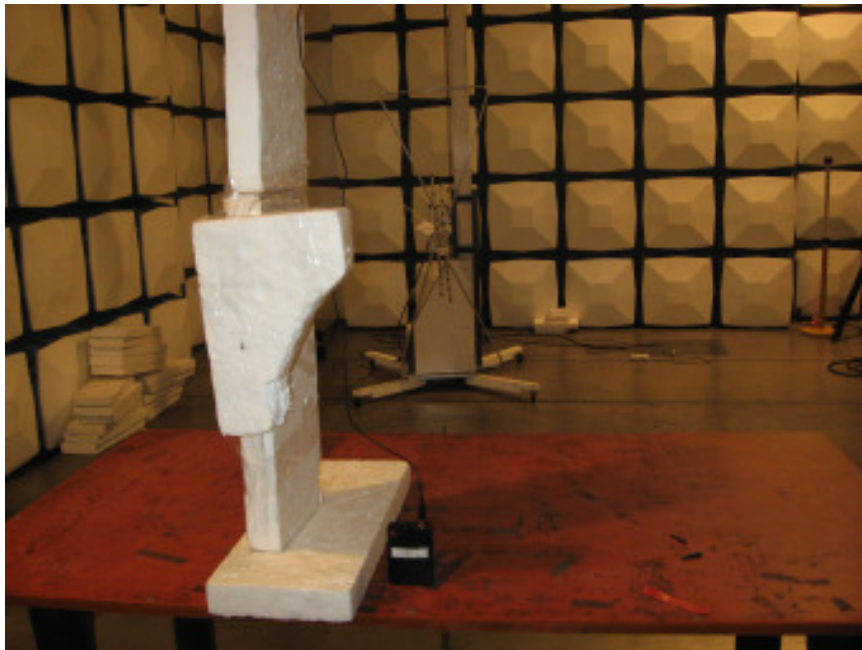
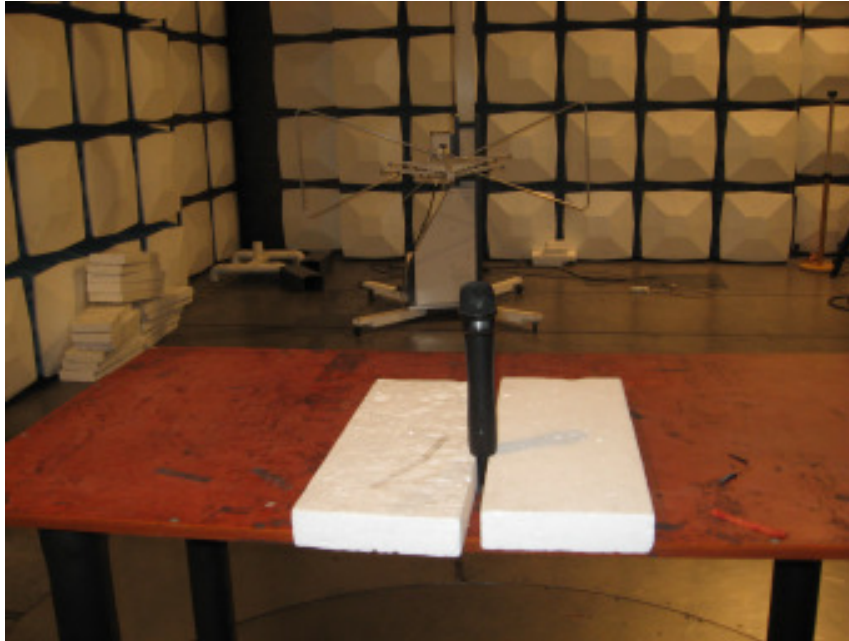
7. Photographs of the Test Set-Up

Photograph 1: Set-up for Radiation Measurement below 1GHz



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Photograph 2: Set-up for Radiation Measurement above 1GHz



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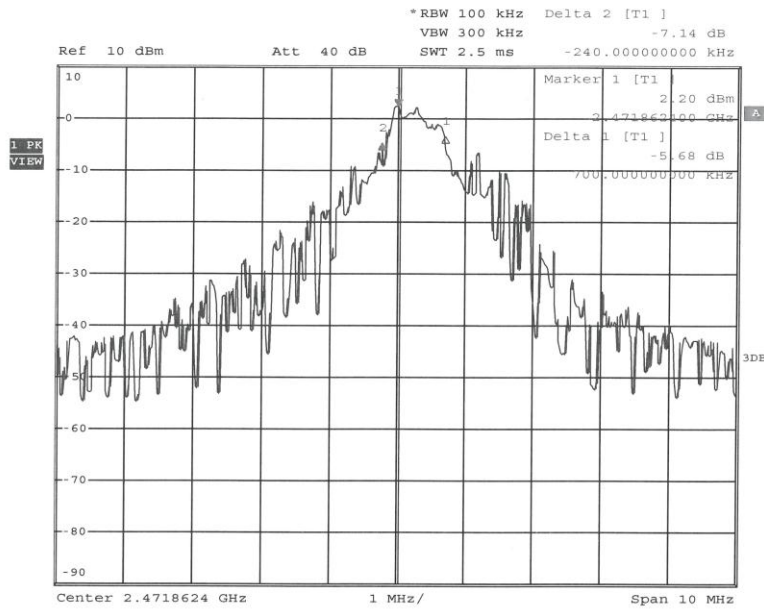
7 List of Photographs

Photograph 1: Set-up for Radiation Measurement below 1GHz.....	28
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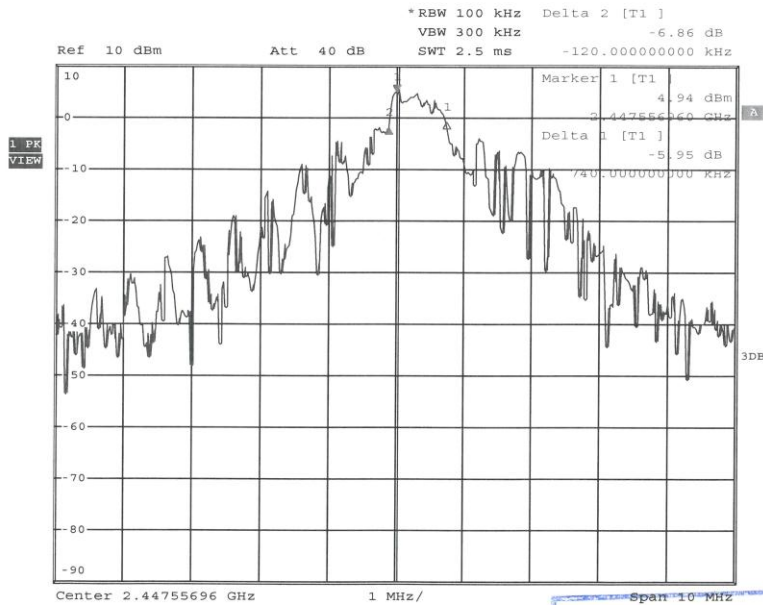
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20140814 DW-24H 6dB Band-width H



20140814 DW-24H 6dB Band-width M

Sign-off Test Data

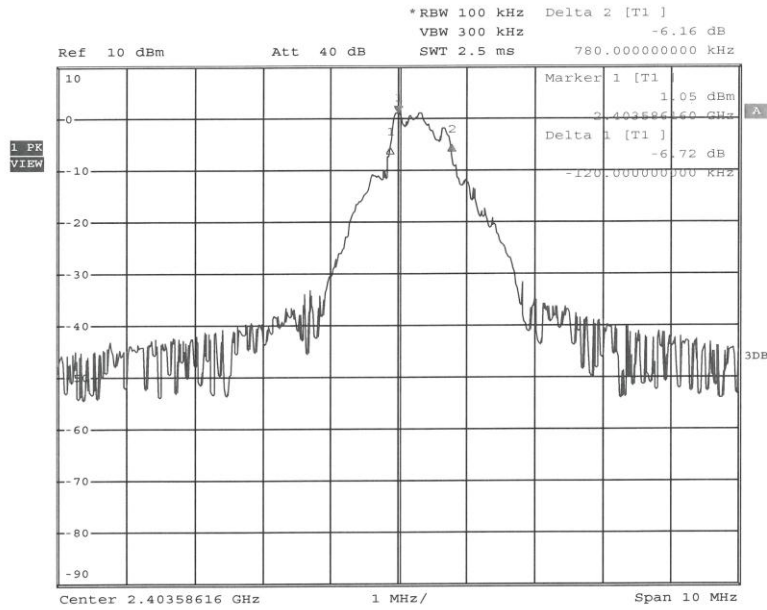
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Checked

HCH
2014-08-14
Checked

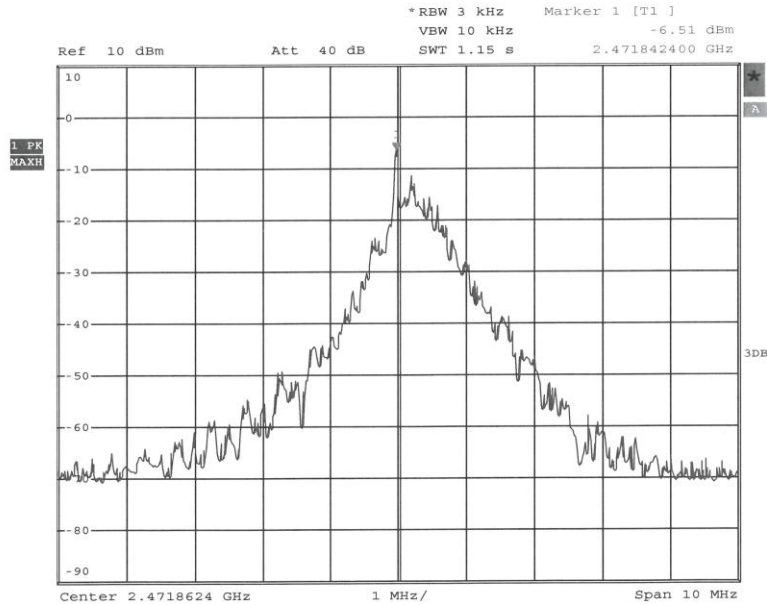
Prüfbericht - Nr.:
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20140814 DW-24H 6dB Band-width L



20140814 DW-24H Power spectral density H

Sign-off Test Data

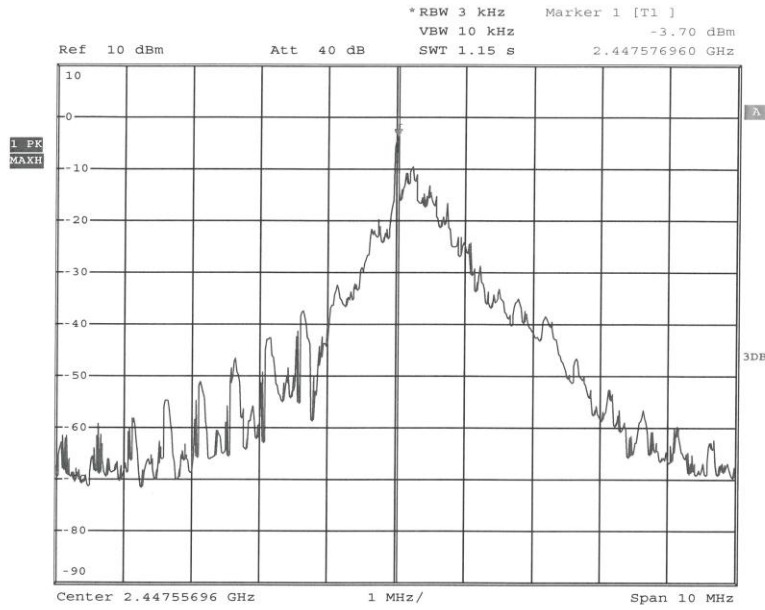
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2014-08-14

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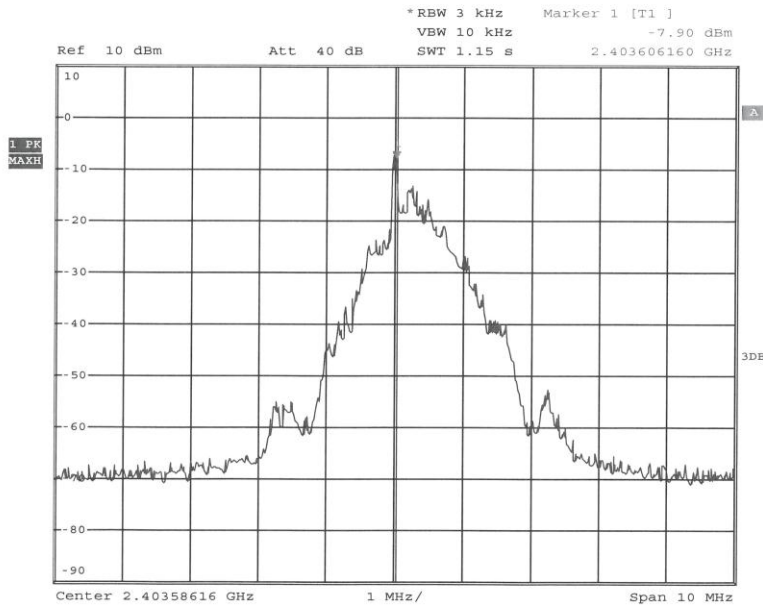
Prüfbericht - Nr.:
Test Report No.

16059572 001

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20140814 DW-24H Power spectral density M



20140814 DW-24H Power spectral density L

Sign-off Test Data

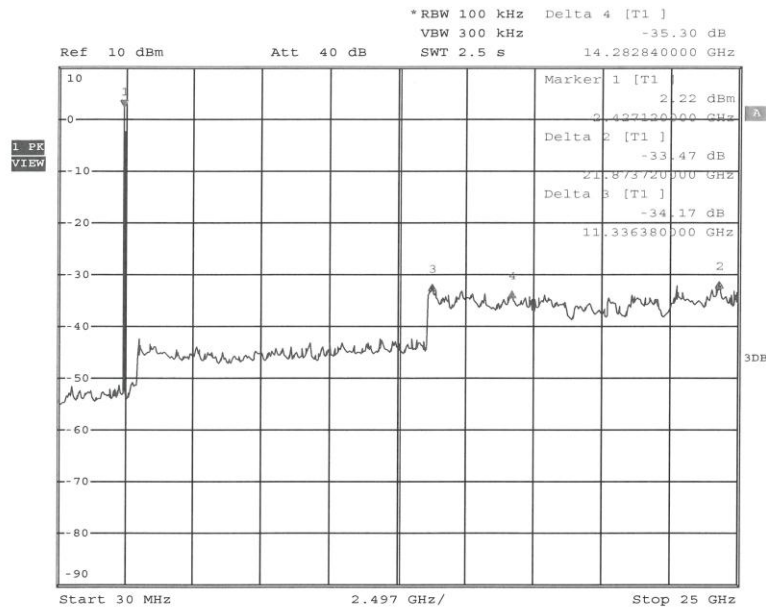
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HCH
2014-08-14
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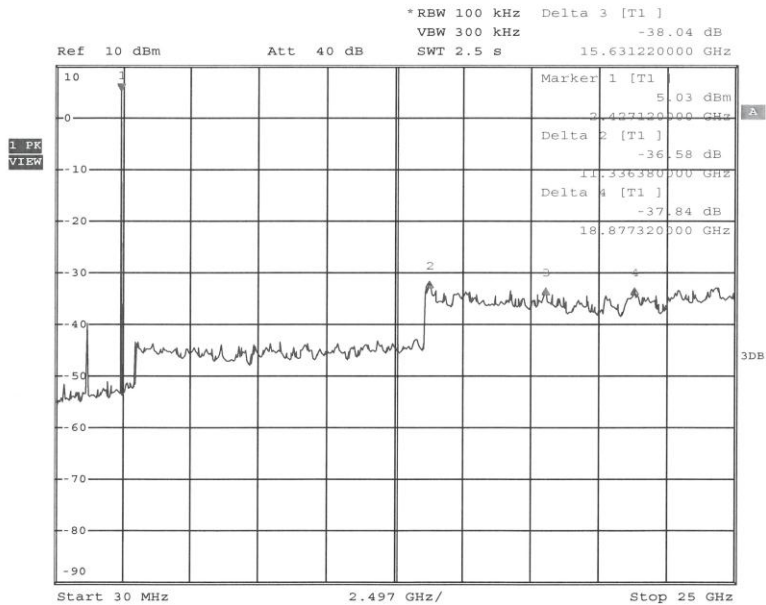
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20140814 DW-24H Conducted Spurious Emission H



20140814 DW-24H Conducted Spurious Emission M

Original Test Data

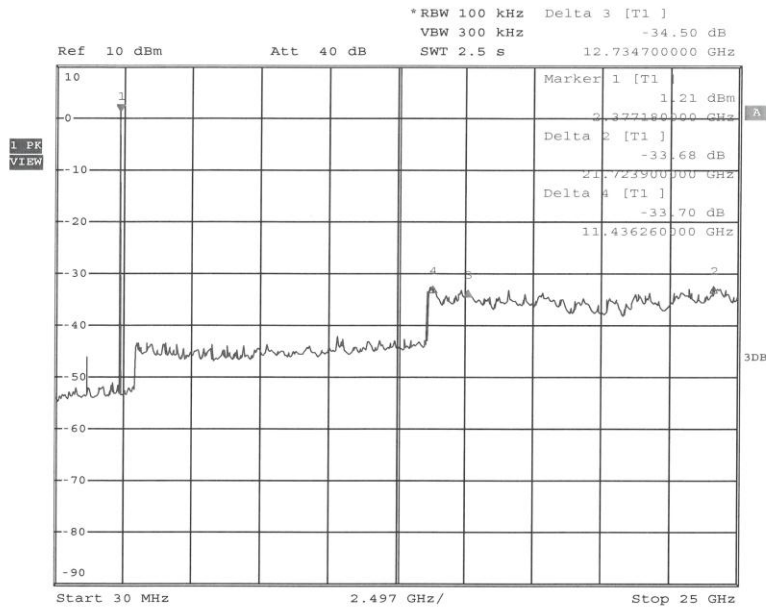
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2014-08-14
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HCH
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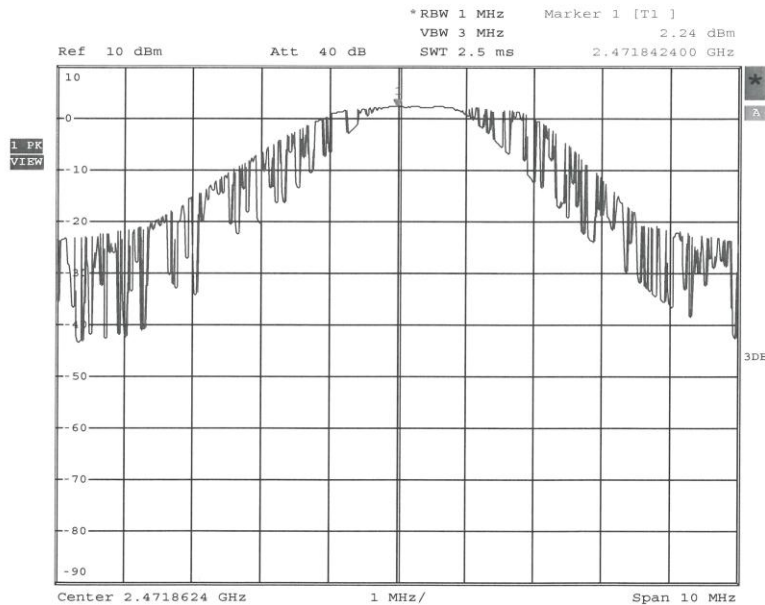
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20140814 DW-24H Conducted Spurious Emission L



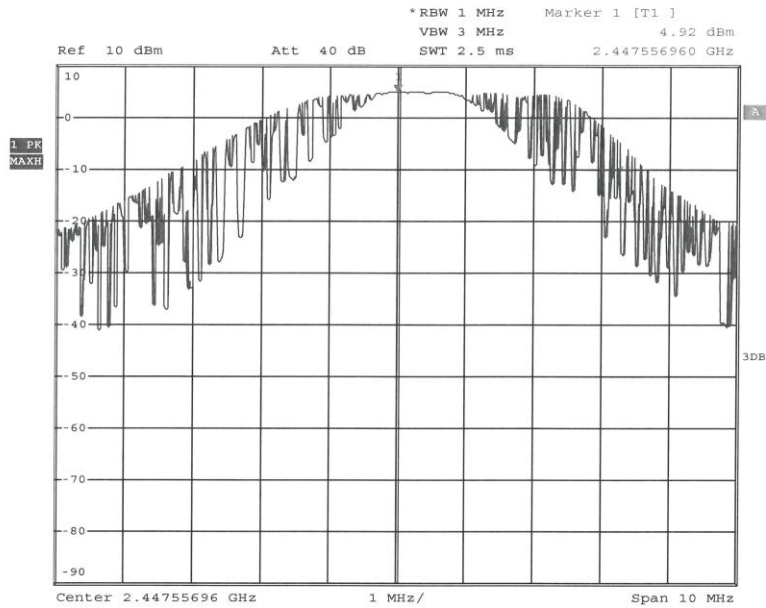
20140814 DW-24H Peak power H



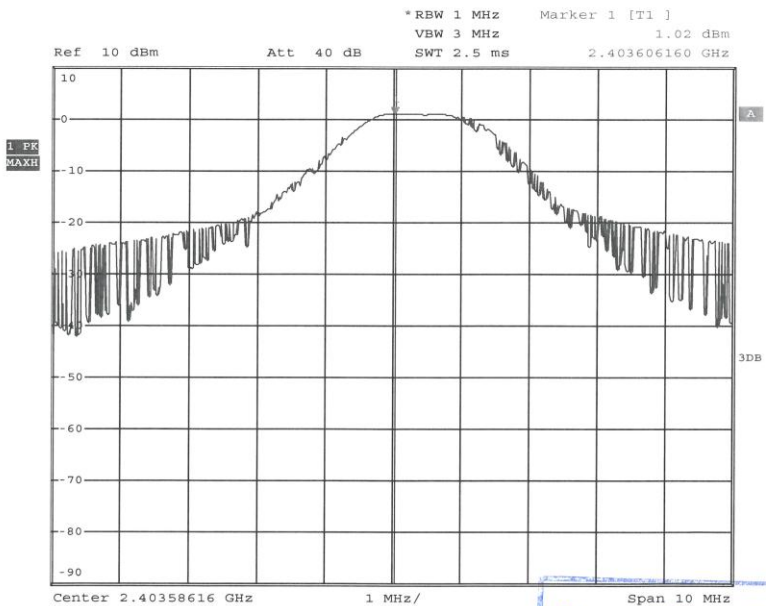
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20140814 DW-24H Peak power M



Sign-off Test Data

20140814 DW-24H Peak power L

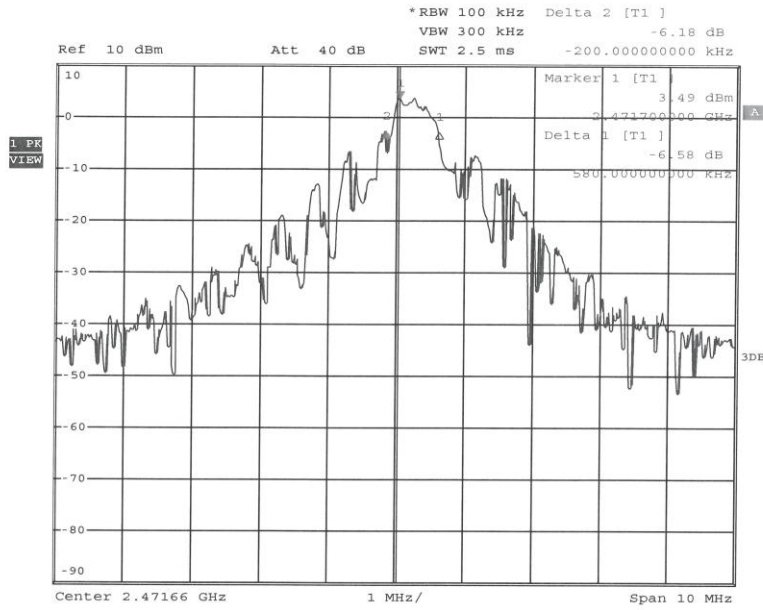
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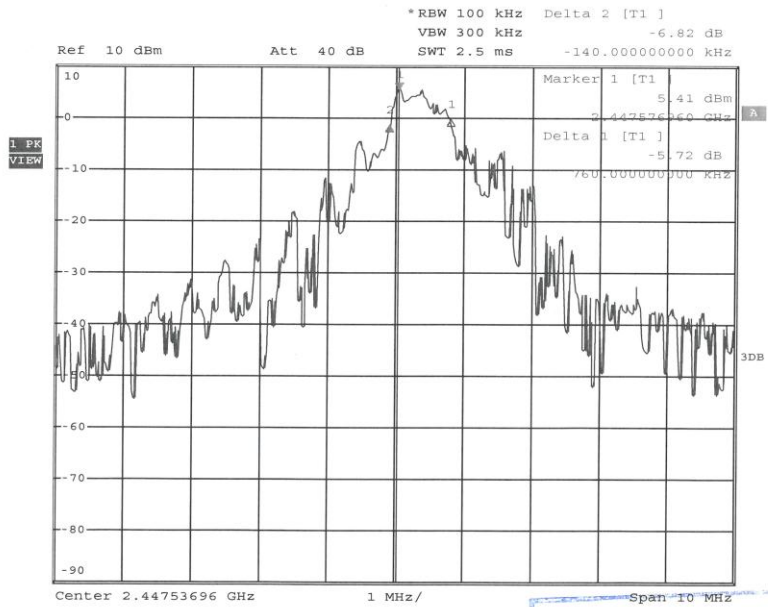
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20140805 DW-24P 6dB Band-width H



20140805 DW-24P 6dB Band-width M

Sign of Test Data

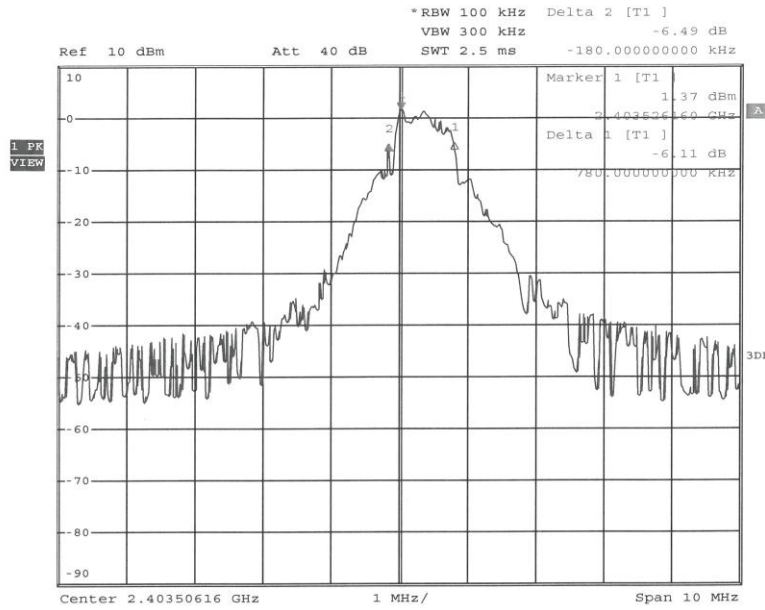
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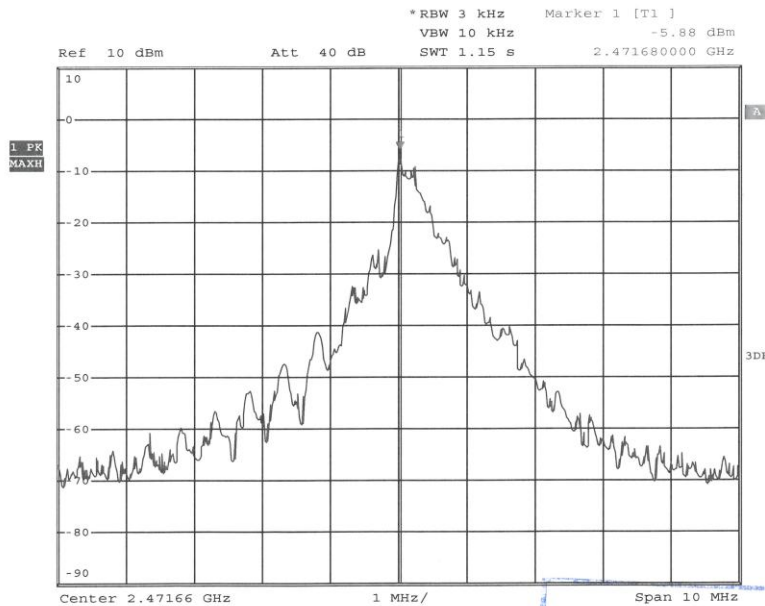
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Test Report No.

16059572 001

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20140805 DW-24P 6dB Band-width L



20140805 DW-24P Power spectral density H

Sign-off Test Data

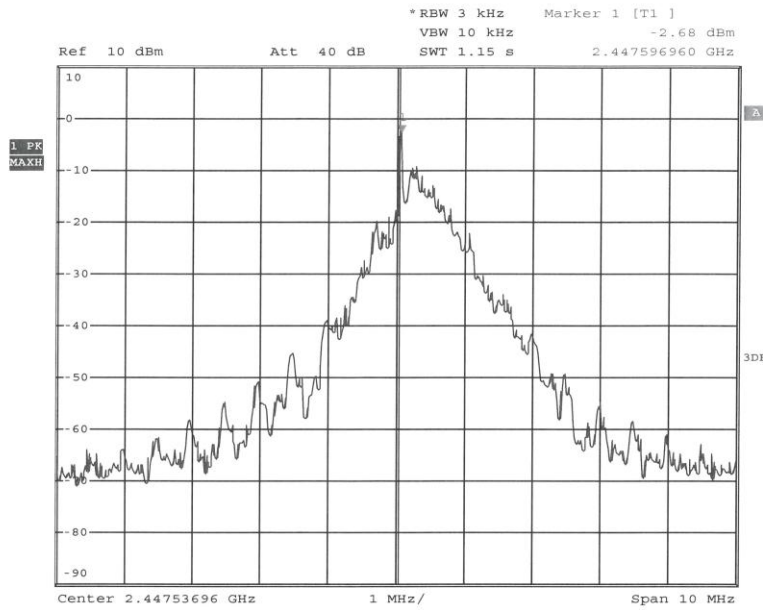
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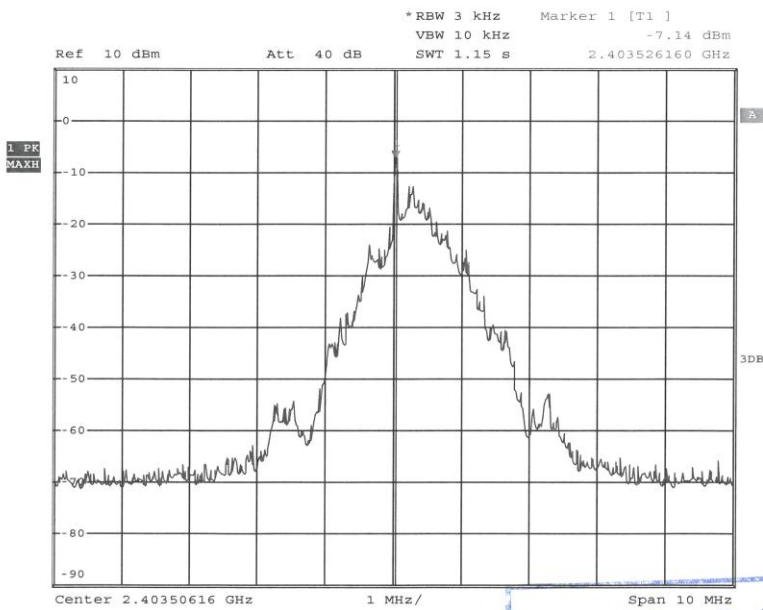
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20140805 DW-24P Power spectral density M



20140805 DW-24P Power spectral density L

Sign-off Test Data

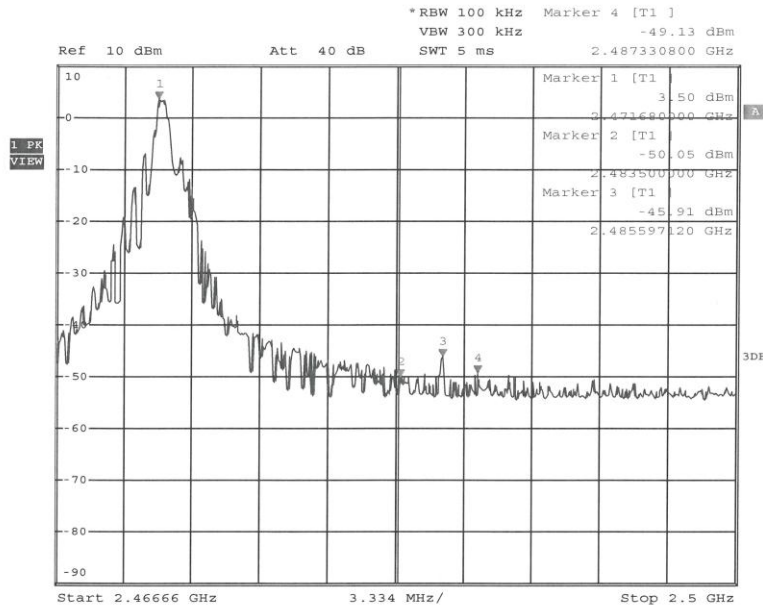
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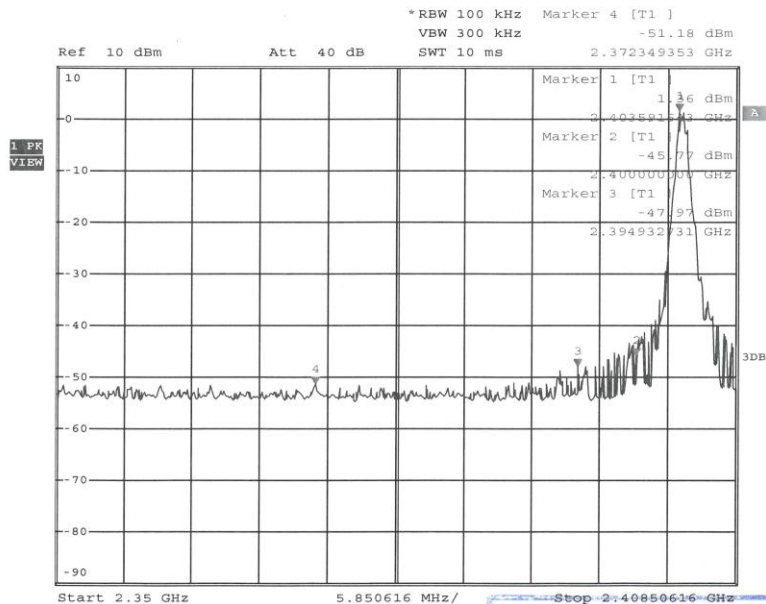
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20140805 DW-24P Band edge Emission H



20140805 DW-24P Band edge Emission L

Sign-off Test Data

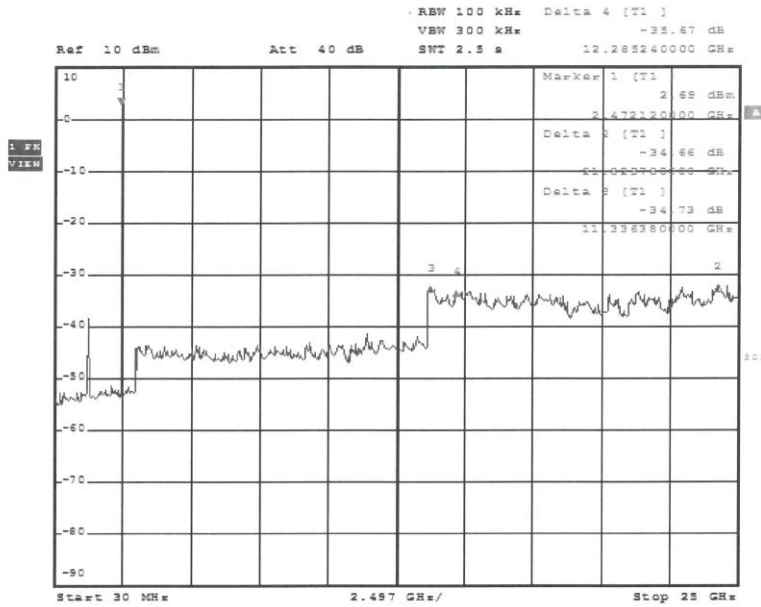
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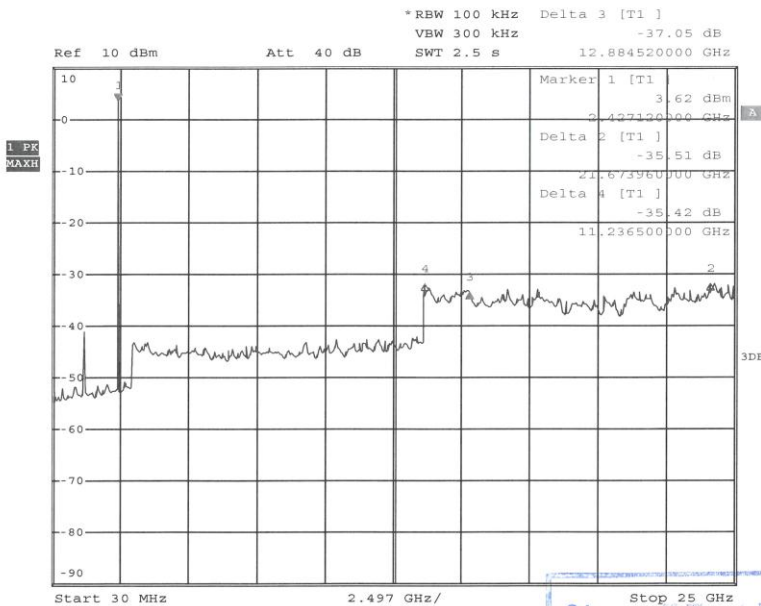
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20140805 DW-24P Conducted Spurious Emission H



20140805 DW-24P Conducted Spurious Emission M

Sign-off Test Data

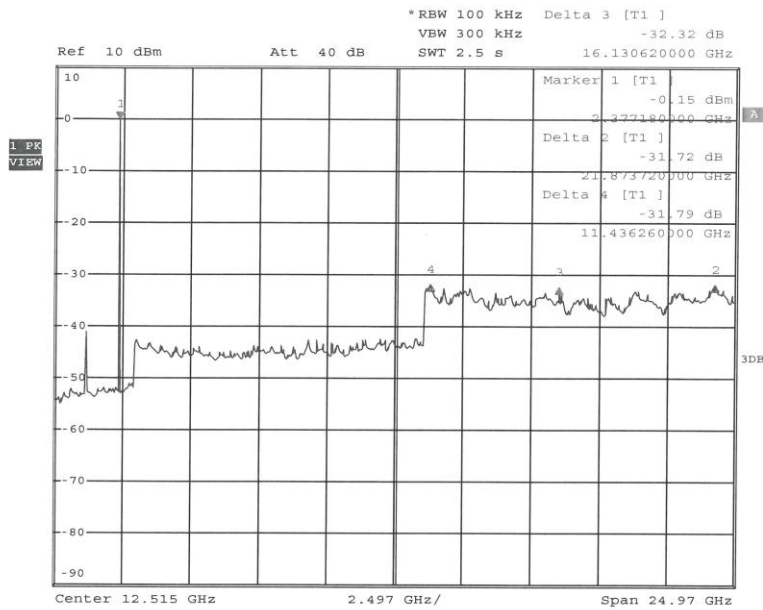
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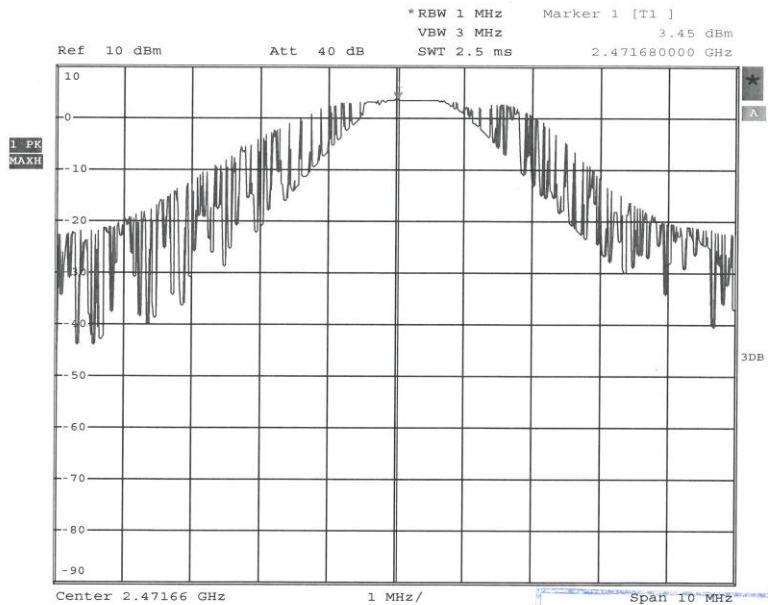
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20140805 DW-24P Conducted Spurious Emission L



20140805 DW-24P Peak power H

Sign-off Test Data

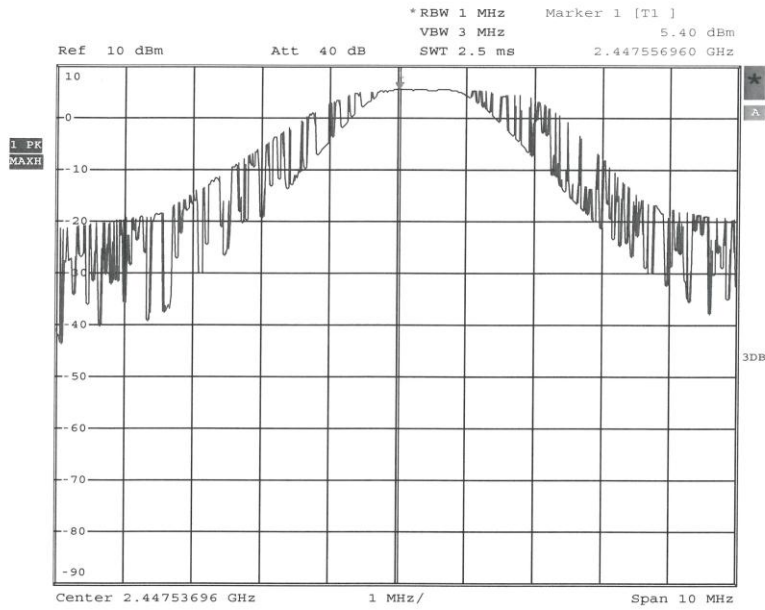
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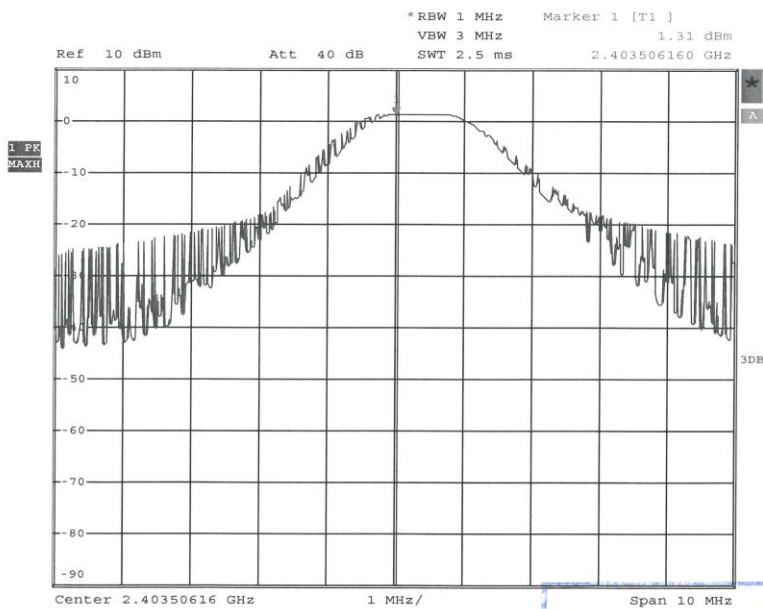
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20140805 DW-24P Peak power M



20140805 DW-24P Peak power L

Signified Data

YJX
2014-08-14
Checked

HCH
2014-08-14
Checked

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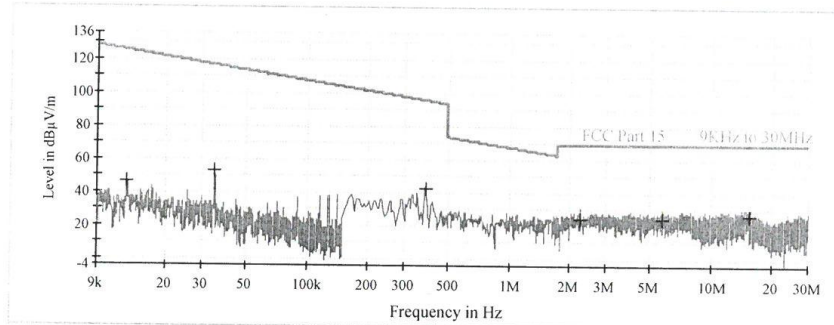
EMC Test Service Hotline: +86-20-28391188

EMC Test Record (Emission)

Common Information

Manufacturer: Seikaku
 Test Item: Wireless System
 Identification: DW-24H
 Test Standard: FCC Part 15.209
 Test Detail: RE
 Operation Mode: Tx @ High channel
 Climate Condition: 23 °C; 50 %RH; 101 kPa.
 Test Voltage/ Freq: DC 3.0V
 Receipt No: 174019548
 Report No: 16059572 001
 Result: Pass
 Comment: Test distance is 3m, Horizontal

Subrange 1
 Frequency Range: 9K-30MHz
 Receiver: TUV ESCI 3
 Transducer: TUV SAC HFH2-Z2/ TUV ESCI 3-TUV SAC HFH2-Z2



Limit and Margin QP

Frequency (MHz)	QuasiPeak (dBµV/m)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Polarization	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
0.012760	/	46.4	1000.0	0.200	H	20.9	79.1	125.6
0.034840	/	53.3	1000.0	0.200	H	20.5	63.5	116.8
0.386000	/	42.8	1000.0	9.000	H	20.8	53.0	95.9
2.266000	24.8	/	1000.0	9.000	H	20.6	44.7	69.5
5.730000	24.3	/	1000.0	9.000	H	20.6	45.2	69.5
15.406000	26.8	/	1000.0	9.000	H	22.3	42.7	69.5

Sign-off Test Data



Date: 4/28/2014 - Time: 1:36:32

Tested by: _____ Reviewed by: _____

Prüfbericht - Nr.:
Test Report No.

16059572 001

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TUV Rheinland (Guangdong) Ltd.

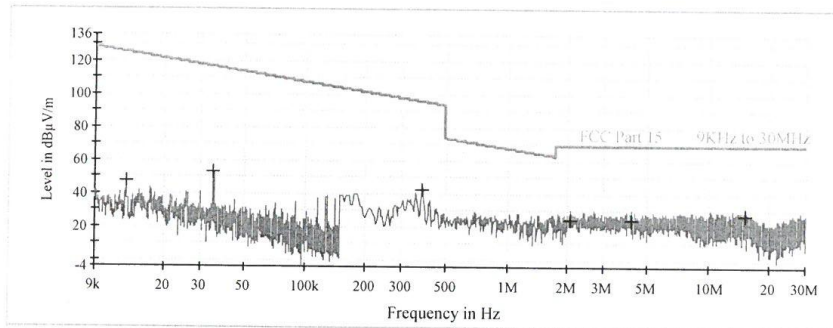
EMC Test Service Hotline: +86-20-28391188

EMC Test Record (Emission)

Common Information

Manufacturer: Seikaku
 Test Item: Wireless System
 Identification: DW-24H
 Test Standard: FCC Part 15.209
 Test Detail: RE
 Operation Mode: Tx @ High channel
 Climate Condition: 23 °C; 50 %RH; 101 kPa.
 Test Voltage/ Freq: DC 3.0V
 Receipt No: 174019548
 Report No: 16059572 001
 Result: Pass
 Comment: Test distance is 3m, Vertical

Subrange 1
 Frequency Range: 9K-30MHz
 Receiver: TUV ESCI 3
 Transducer: TUV SAC HFH2-Z2/ TUV ESCI 3-TUV SAC HFH2-Z2



Limit and Margin QP

Frequency (MHz)	QuasiPeak (dBµV/m)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Polarization	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
0.012840	/	47.5	1000.0	0.200	V	20.9	78.1	125.5
0.034840	/	53.1	1000.0	0.200	V	20.5	63.7	116.8
0.382000	/	42.4	1000.0	9.000	V	20.8	53.6	96.0
2.046000	25.0	/	1000.0	9.000	V	20.7	44.5	69.5
4.126000	24.5	/	1000.0	9.000	V	20.8	45.0	69.5
15.150000	27.1	/	1000.0	9.000	V	22.8	42.4	69.5

Sign-off Test Data



Date: 4/28/2014 - Time: 1:40:20

Tested by: _____ Reviewed by: _____

Prüfbericht - Nr.:
Test Report No.

16059572 001

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TUV Rheinland (Guangdong) Ltd.

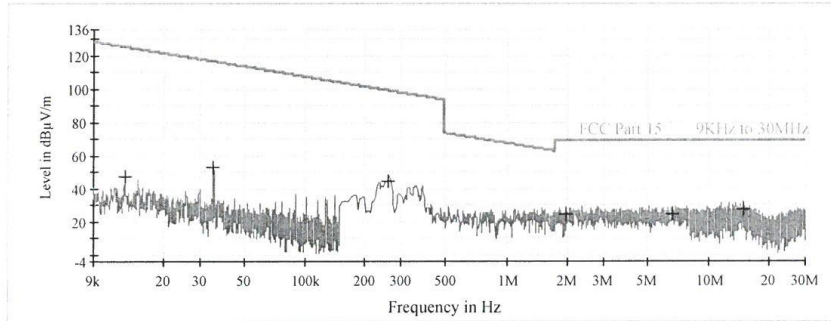
EMC Test Service Hotline: +86-20-28391188

EMC Test Record (Emission)

Common Information

Manufacturer: Seikaku
 Test Item: Wireless System
 Identification: DW-24H
 Test Standard: FCC Part 15.209
 Test Detail: RE
 Operation Mode: Tx @ Mid channel
 Climate Condition: 23 °C; 50 %RH; 101 kPa.
 Test Voltage/ Freq: DC 3.0V
 Receipt No: 174019548
 Report No: 16059572 001
 Result: Pass
 Comment: Test distance is 3m, Horizontal

Subrange 1
 Frequency Range: 9K-30MHz
 Receiver: TUV ESCI 3
 Transducer: TUV SAC HFH2-Z2/ TUV ESCI 3-TUV SAC HFH2-Z2



Limit and Margin QP

Frequency (MHz)	QuasiPeak (dBµV/m)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Polarization	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
0.012840	/	47.6	1000.0	0.200	H	20.9	77.9	125.5
0.034840	/	53.2	1000.0	0.200	H	20.5	63.7	116.8
0.262000	/	44.9	1000.0	9.000	H	21.0	54.3	99.3
1.950000	24.8	/	1000.0	9.000	H	20.7	44.7	69.5
6.582000	24.7	/	1000.0	9.000	H	20.7	44.8	69.5
14.770000	27.1	/	1000.0	9.000	H	23.0	42.4	69.5

Sign-off Test Data



Date: 4/28/2014 - Time: 1:46:41

Tested by: _____ Reviewed by: _____

Prüfbericht - Nr.:
Test Report No.

16059572 001

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TUV Rheinland (Guangdong) Ltd.

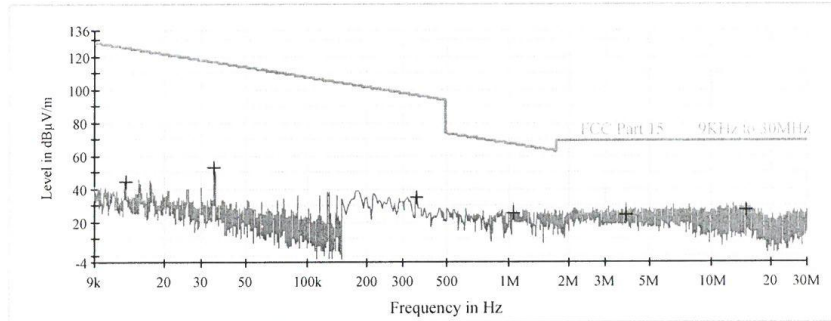
EMC Test Service Hotline: +86-20-28391188

EMC Test Record (Emission)

Common Information

Manufacturer: Seikaku
 Test Item: Wireless System
 Identification: DW-24H
 Test Standard: FCC Part 15.209
 Test Detail: RE
 Operation Mode: Tx @ Mid channel
 Climate Condition: 23 °C; 50 %RH; 101 kPa.
 Test Voltage/ Freq: DC 3.0V
 Receipt No: 174019548
 Report No: 16059572 001
 Result: Pass
 Comment: Test distance is 3m, Vertical

Subrange 1
 Frequency Range: 9K-30MHz
 Receiver: TUV ESCI 3
 Transducer: TUV SAC HFH2-Z2/ TUV ESCI 3-TUV SAC HFH2-Z2



Limit and Margin QP

Frequency (MHz)	QuasiPeak (dBµV/m)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Polarization	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
0.012920	/	44.3	1000.0	0.200	V	20.9	81.1	125.5
0.034840	/	53.2	1000.0	0.200	V	20.5	63.6	116.8
0.350000	/	35.3	1000.0	9.000	V	20.9	61.5	96.7
1.054000	25.3	/	1000.0	9.000	V	20.4	41.9	67.2
3.786000	24.6	/	1000.0	9.000	V	20.7	44.9	69.5
15.006000	27.2	/	1000.0	9.000	V	23.1	42.3	69.5

Sign-off Test Data



Date: 4/28/2014 - Time: 1:44:05

Tested by: _____ Reviewed by: _____

Prüfbericht - Nr.:
Test Report No.

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TUV Rheinland (Guangdong) Ltd.

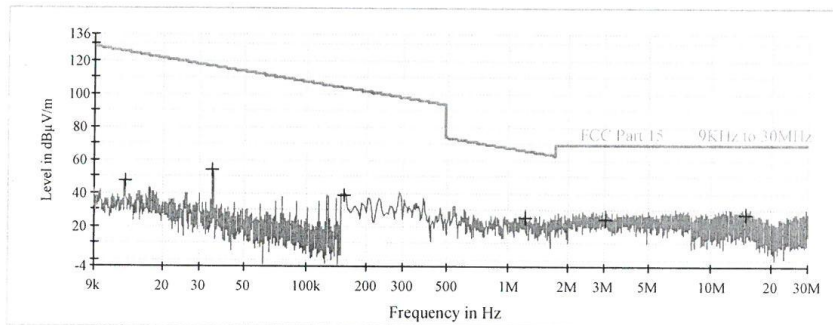
EMC Test Service Hotline: +86-20-28391188

EMC Test Record (Emission)

Common Information

Manufacturer: Seikaku
 Test Item: Wireless System
 Identification: DW-24H
 Test Standard: FCC Part 15.209
 Test Detail: RE
 Operation Mode: Tx @ Low channel
 Climate Condition: 23 °C; 50 %RH; 101 kPa.
 Test Voltage/ Freq: DC 3.0V
 Receipt No: 174019548
 Report No: 16059572 001
 Result: Pass
 Comment: Test distance is 3m, Horizontal

Subrange 1
 Frequency Range: 9K-30MHz
 Receiver: TUV ESCI 3
 Transducer: TUV SAC HFH2-Z2/ TUV ESCI 3-TUV SAC HFH2-Z2



Limit and Margin QP

Frequency (MHz)	QuasiPeak (dBµV/m)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Polarization	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
0.012840	/	47.5	1000.0	0.200	H	20.9	78.0	125.5
0.034920	/	54.5	1000.0	0.200	H	20.5	62.3	116.8
0.154000	/	38.4	1000.0	9.000	H	20.5	65.5	103.9
1.218000	25.3	/	1000.0	9.000	H	20.5	40.6	65.9
3.042000	24.4	/	1000.0	9.000	H	20.4	45.1	69.5
14.914000	27.2	/	1000.0	9.000	H	23.1	42.3	69.5

Sign-off Test Data

YJX
2014-05-04
Checked

HCH
2014-05-05
Checked

Date: 4/28/2014 - Time: 1:49:56

Tested by: _____ Reviewed by: _____

Prüfbericht - Nr.:
Test Report No.

16059572 001

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TUV Rheinland (Guangdong) Ltd.

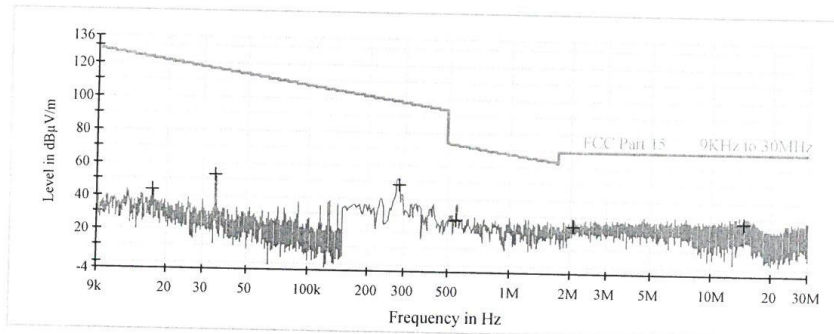
EMC Test Service Hotline: +86-20-28391188

EMC Test Record (Emission)

Common Information

Manufacturer: Seikaku
 Test Item: Wireless System
 Identification: DW-24H
 Test Standard: FCC Part 15.209
 Test Detail: RE
 Operation Mode: Tx @ Low channel
 Climate Condition: 23 °C; 50 %RH; 101 kPa.
 Test Voltage/ Freq: DC 3.0V
 Receipt No: 174019548
 Report No: 16059572 001
 Result: Pass
 Comment: Test distance is 3m, Vertical

Subrange 1
 Frequency Range: 9K-30MHz
 Receiver: TUV ESCI 3
 Transducer: TUV SAC HFH2-Z2/ TUV ESCI 3-TUV SAC HFH2-Z2



Limit and Margin QP

Frequency (MHz)	QuasiPeak (dBµV/m)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Polarization	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
0.017000	/	43.6	1000.0	0.200	V	20.7	79.4	123.1
0.034840	/	53.1	1000.0	0.200	V	20.5	63.7	116.8
0.282000	/	48.5	1000.0	9.000	V	20.9	50.1	98.6
0.546000	27.1	/	1000.0	9.000	V	20.7	45.8	72.9
2.062000	24.9	/	1000.0	9.000	V	20.7	44.6	69.5
14.594000	27.0	/	1000.0	9.000	V	23.0	42.5	69.5

Sign-off Test Data



Date: 4/28/2014 - Time: 1:52:55

Tested by: _____ Reviewed by: _____

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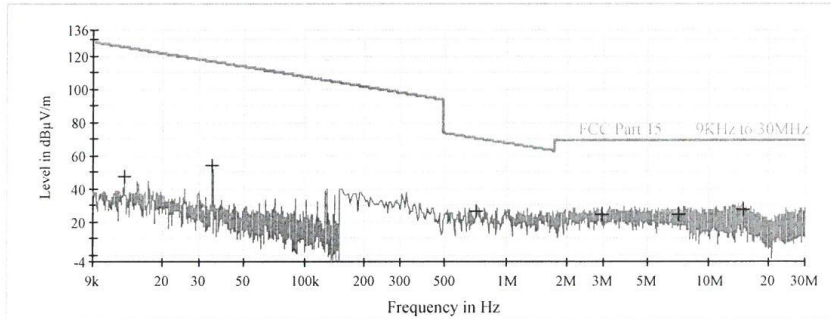
EMC Test Service Hotline: +86-20-28391188

EMC Test Record (Emission)

Common Information

Manufacturer: Seikaku
 Test Item: Wireless System
 Identification: DW-24P
 Test Standard: FCC Part 15.209
 Test Detail: RE
 Operation Mode: Tx @ High channel
 Climate Condition: 23 °C; 50 %RH; 101 kPa.
 Test Voltage/ Freq: DC 3.0V
 Receipt No: 174019548
 Report No: 16059572 001
 Result: Pass
 Comment: Test distance is 3m, Horizontal

Subrange 1
 Frequency Range: 9K-30MHz
 Receiver: TUV ESCI 3
 Transducer: TUV SAC HFH2-Z2/ TUV ESCI 3-TUV SAC HFH2-Z2



Limit and Margin QP

Frequency (MHz)	Average (dBµV/m)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Polarization	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
0.012840	47.5		1000.0	0.200	H	20.9	78.0	125.5
0.034920	54.5		1000.0	0.200	H	20.5	62.3	116.8
0.718000	/	26.2	1000.0	9.000	H	20.6	44.3	70.5
2.950000	/	24.5	1000.0	9.000	H	20.4	45.0	69.5
7.126000	/	24.7	1000.0	9.000	H	20.7	44.8	69.5
14.970000	/	27.2	1000.0	9.000	H	23.1	42.3	69.5

Sign-off Test Data



Date: 4/28/2014 - Time: 2:12:04

Tested by: _____ Reviewed by: _____

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TUV Rheinland (Guangdong) Ltd.

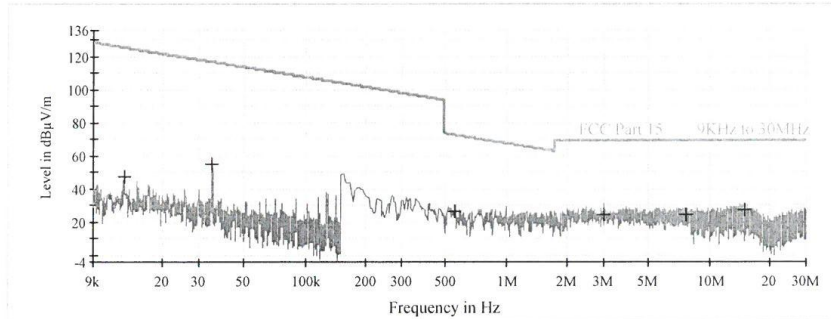
EMC Test Service Hotline: +86-20-28391188

EMC Test Record (Emission)

Common Information

Manufacturer: Seikaku
 Test Item: Wireless System
 Identification: DW-24P
 Test Standard: FCC Part 15.209
 Test Detail: RE
 Operation Mode: Tx @ High channel
 Climate Condition: 23 °C; 50 %RH; 101 kPa.
 Test Voltage/ Freq: DC 3.0V
 Receipt No: 174019548
 Report No: 16059572 001
 Result: Pass
 Comment: Test distance is 3m, Vertical

Subrange 1
 Frequency Range: 9K-30MHz
 Receiver: TUV ESCI 3
 Transducer: TUV SAC HFH2-Z2/ TUV ESCI 3-TUV SAC HFH2-Z2



Limit and Margin QP

Frequency (MHz)	Average (dBµV/m)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Polarization	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
0.012840	47.6	/	1000.0	0.200	V	20.9	77.9	125.5
0.034920	54.7	/	1000.0	0.200	V	20.5	62.1	116.8
0.558000	/	26.9	1000.0	9.000	V	20.7	45.8	72.7
2.978000	/	24.5	1000.0	9.000	V	20.4	45.0	69.5
7.710000	/	24.7	1000.0	9.000	V	20.7	44.8	69.5
14.862000	/	27.3	1000.0	9.000	V	23.0	42.2	69.5

Sign-off Test Data



Date: 4/28/2014 - Time: 2:09:43

Tested by: _____ Reviewed by: _____

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TUV Rheinland (Guangdong) Ltd.

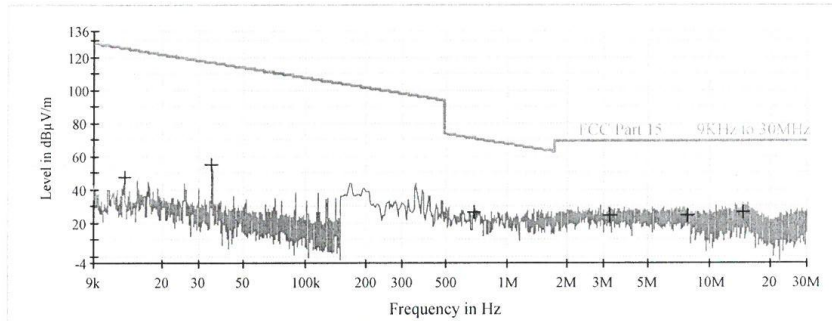
EMC Test Service Hotline: +86-20-28391188

EMC Test Record (Emission)

Common Information

Manufacturer: Seikaku
 Test Item: Wireless System
 Identification: DW-24P
 Test Standard: FCC Part 15.209
 Test Detail: RE
 Operation Mode: Tx @ Mid channel
 Climate Condition: 23 °C; 50 %RH; 101 kPa.
 Test Voltage/ Freq: DC 3.0V
 Receipt No: 174019548
 Report No: 16059572 001
 Result: Pass
 Comment: Test distance is 3m, Horizontal

Subrange 1
 Frequency Range: 9K-30MHz
 Receiver: TUV ESCI 3
 Transducer: TUV SAC HFH2-Z2/ TUV ESCI 3-TUV SAC HFH2-Z2



Limit and Margin QP

Frequency (MHz)	Average (dBµV/m)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Polarization	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
0.012840	47.6	/	1000.0	0.200	H	20.9	77.9	125.5
0.034920	54.6	/	1000.0	0.200	H	20.5	62.2	116.8
0.690000	/	26.6	1000.0	9.000	H	20.6	44.2	70.8
3.214000	/	24.4	1000.0	9.000	H	20.5	45.1	69.5
7.778000	/	24.7	1000.0	9.000	H	20.8	44.8	69.5
14.702000	/	26.9	1000.0	9.000	H	23.0	42.6	69.5

Sign-off Test Data



Date: 4/28/2014 - Time: 2:04:38

Tested by: _____ Reviewed by: _____

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TUV Rheinland (Guangdong) Ltd.

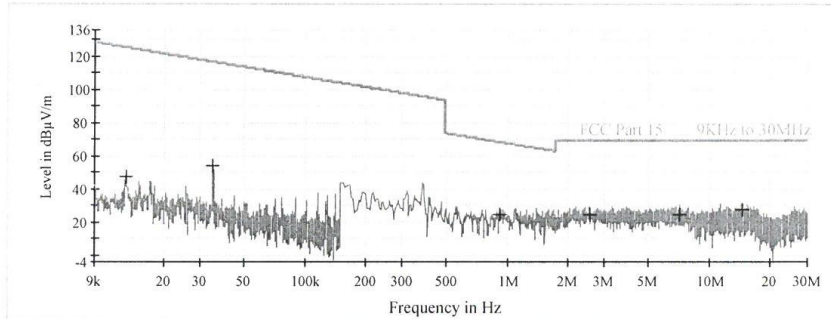
EMC Test Service Hotline: +86-20-28391188

EMC Test Record (Emission)

Common Information

Manufacturer: Seikaku
 Test Item: Wireless System
 Identification: DW-24P
 Test Standard: FCC Part 15.209
 Test Detail: RE
 Operation Mode: Tx @ Mid channel
 Climate Condition: 23 °C; 50 %RH; 101 kPa.
 Test Voltage/ Freq: DC 3.0V
 Receipt No: 174019548
 Report No: 16059572 001
 Result: Pass
 Comment: Test distance is 3m, Vertical

 Subrange 1
 Frequency Range: 9K-30MHz
 Receiver: TUV ESCI 3
 Transducer: TUV SAC HFH2-Z2/ TUV ESCI 3-TUV SAC HFH2-Z2



Limit and Margin QP

Frequency (MHz)	QuasiPeak (dBµV/m)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Polarization	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
0.012840	/	47.3	1000.0	0.200	V	20.9	78.2	125.5
0.034920	/	54.5	1000.0	0.200	V	20.5	62.3	116.8
0.914000	25.0	/	1000.0	9.000	V	20.5	43.4	68.4
2.538000	24.7	/	1000.0	9.000	V	20.5	44.8	69.5
7.118000	24.6	/	1000.0	9.000	V	20.7	44.9	69.5
14.534000	27.1	/	1000.0	9.000	V	22.9	42.4	69.5

Sign-off Test Data



Date: 4/28/2014 - Time: 2:07:10

Tested by: _____ Reviewed by: _____

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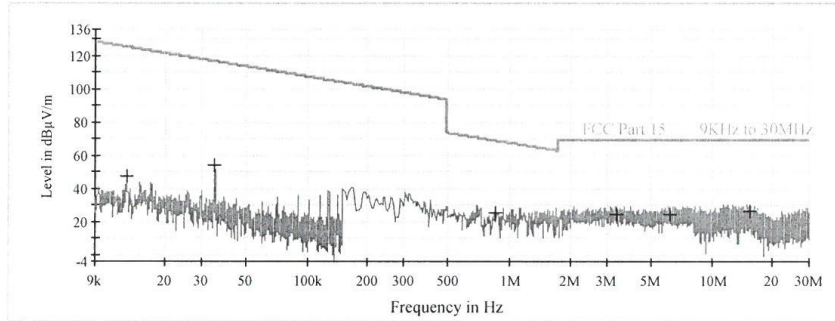
EMC Test Service Hotline: +86-20-28391188

EMC Test Record (Emission)

Common Information

Manufacturer: Seikaku
 Test Item: Wireless System
 Identification: DW-24P
 Test Standard: FCC Part 15.209
 Test Detail: RE
 Operation Mode: Tx @ Low channel
 Climate Condition: 23 °C; 50 %RH; 101 kPa.
 Test Voltage/ Freq: DC 3.0V
 Receipt No: 174019548
 Report No: 16059572 001
 Result: Pass
 Comment: Test distance is 3m, Horizontal

Subrange 1
 Frequency Range: 9K-30MHz
 Receiver: TUV ESCI 3
 Transducer: TUV SAC HFH2-Z2/ TUV ESCI 3-TUV SAC HFH2-Z2



Limit and Margin QP

Frequency (MHz)	Average (dBµV/m)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Polarization	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
0.012840	47.4	/	1000.0	0.200	H	20.9	78.1	125.5
0.034920	54.5	/	1000.0	0.200	H	20.5	62.3	116.8
0.846000	/	25.5	1000.0	9.000	H	20.5	43.6	69.1
3.338000	/	24.6	1000.0	9.000	H	20.5	45.0	69.5
6.126000	/	24.6	1000.0	9.000	H	20.6	44.9	69.5
15.362000	/	26.7	1000.0	9.000	H	22.4	42.8	69.5

Sign-off Test Data



Date: 4/28/2014 - Time: 2:01:58

Tested by: _____ Reviewed by: _____