



Product Service

**Choose certainty.
Add value.**

Report On

FCC and Industry Canada Testing of the Kohler Co.
VEIL INTELLIGENT TOILET-WALL HUNG K-5402 10.525GHz
In accordance with FCC CFR 47 Part 15C & Industry Canada RSS-210
and Industry Canada RSS-GEN

COMMERCIAL-IN-CONFIDENCE

FCC ID: N82-KOHLER018
IC ID: 4554A-KOHLER018

Document 708881550725-00 Report 01 Issue 1

April 2016



Product Service

TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
No.88 Heng Tong Road, Shanghai 200070, P.R. China
Tel: +86-(0)21 6141 0123. Website: www.tuv-sud.cn

COMMERCIAL-IN-CONFIDENCE

REPORT ON

FCC and INDUSTRY CANADA Testing of the
Kohler Co.
VEIL INTELLIGENT TOILET-WALL HUNG K-5402
In accordance with FCC CFR 47 Part 15C & Industry Canada RSS-
210 and Industry Canada RSS-GEN

Document 708881550725-00 Report 01 Issue 1

April 2016

PREPARED FOR

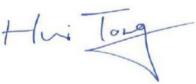
Kohler Co.

PREPARED BY



Wenwen Cheng
Project Engineer

APPROVED BY



Hui TONG
Project Engineer

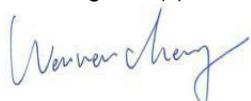
DATED

April 15, 2016

ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate limited compliance with FCC CFR 47 Part 15C & Industry Canada RSS-210 and Industry Canada RSS-GEN. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s):



Wenwen Cheng



CONTENTS

Section	Page No
1 REPORT SUMMARY	3
1.1 Introduction	4
1.2 Brief Summary of Results	5
1.3 Application Form.....	6
1.4 Product Information	7
1.5 Test Conditions.....	7
1.6 Deviations from the Standard.....	7
1.7 Modification Record.....	7
2 TEST DETAILS	8
2.1 AC Line Conducted Emissions.....	9
2.2 Field Strength of Fundamental.....	12
2.3 Field Strength of Spurious Emissions.....	14
2.4 Occupied Bandwidth.....	20
3 TEST EQUIPMENT USED.....	22
3.1 Test Equipment Used	23
3.2 Measurement Uncertainty.....	24
4 DISCLAIMERS AND COPYRIGHT.....	25
4.1 Accreditation, Disclaimers and Copyright	26



Product Service

SECTION 1

REPORT SUMMARY

FCC & INDUSTRY CANADA Testing of the
Kohler Co.
VEIL INTELLIGENT TOILET-WALL HUNG
K-5402

In accordance with FCC CFR 47 Part 15C & Industry Canada RSS-210 and Industry Canada RSS-GEN



1.1 INTRODUCTION

The information contained in this report is intended to show verification of the FCC and INDUSTRY CANADA Testing of the Kohler Co. VEIL INTELLIGENT TOILET-WALL HUNG K-5402 to the requirements of FCC CFR 47 Part 15C & Industry Canada RSS-210 and Industry Canada RSS-GEN.

Objective	To perform FCC Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	Kohler Co.
Model Number(s)	K-5402
Serial Number(s)	Engineering sample
Number of Samples Tested	1
Test Specification/Issue/Date	FCC CFR 47 Part 15C (2014) Industry Canada RSS-210 Issue 8 (2010) Industry Canada RSS-GEN Issue 4 (2014)
Incoming Release Date	Application Form October 19 2015
Order Number	Quote Acceptance Form
Date	October 21 2015
Start of Test	December 15, 2015
Finish of Test	January 25, 2016
Name of Engineer(s)	Hui TONG
Related Document(s)	ANSI C63.10: 2009



1.2 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out in accordance with FCC CFR 47 Part 15C & RSS-210 and RSS-GEN are shown below.

Section				Test Description	Result	Comments/Base Standard
	FCC	RSS -210	RSS-GEN			
Short range device wireless video transmitter DCS500T						
2.1	15.207	-	7.2.4	AC Line Conducted Emissions	Pass	Test Site 1
2.2	15.245 (a)	A2.9	-	Field Strength of Fundamental	Pass	Test Site 1
2.3	15.245 (a), 15.209	A2.9	-	Field Strength of Spurious Emissions	Pass	Test Site 1



1.3 APPLICATION FORM

APPLICANT'S DETAILS	
COMPANY NAME :	Kohler Co.
ADDRESS :	444 Highland Drive Wisconsin United States
NAME FOR CONTACT PURPOSES : Timothy Stessman	
TELEPHONE NO:	920-457-4441 Extension: 2122
FAX NO:	
E-MAIL: timothy.stessman@kohler.com	

EQUIPMENT INFORMATION	
MANUFACTURING DESCRIPTION	VEIL INTELLIGENT TOILET-WALL HUNG
MANUFACTURER	Kohler Co.
TYPE	K-5402
SERIAL NUMBER	Engineering sample
TRANSMITTER OPERATING RANGE	10.525GHz
COUNTRY OF ORIGIN	USA
Channel Number	1
Modulation Type	No modulation
Antenna Gain	8dbi
FCC ID	N82-KOHLER018
IC ID	4554A-KOHLER018
TECHNICAL DESCRIPTION (a brief description of the intended use and operation)	K-5402 is a Intelligent Toilet with 10.525GHz microwave detector function and 2.4GHz Transceiver
MANUFACTURING DESCRIPTION	The VEIL INTELLIGENT TOILET-WALL HUNG was powered by 120V AC / 60Hz



1.4 PRODUCT INFORMATION

1.4.1 Technical Description

The Equipment Under Test (EUT) K-5402 was a Kohler Co. VEIL INTELLIGENT TOILET-WALL HUNG K-5402. A full technical description can be found in the manufacturer's documentation.

1.5 TEST CONDITIONS

For all tests the EUT was set up in accordance with the relevant test standard and to represent typical operating conditions. Tests were applied with the EUT situated in a shielded enclosure.

The EUT was powered from 120VAC, 60Hz.

Test Site 1:

FCC Accreditation 809388

IC Accreditation 11384A-1

Test Firm Name: MRT Technology (Suzhou) Co., Ltd

Location: D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China

Test Site 2:

FCC Accreditation 904822

TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch

No.16 Lane, 1951 Du Hui Road,

Shanghai 201108,

P.R. China

1.6 DEVIATIONS FROM THE STANDARD

No deviations from the applicable test standard were made during testing.

1.7 MODIFICATION RECORD

Modification 0 - No modifications were made to the test sample during testing.



Product Service

SECTION 2

TEST DETAILS

FCC & INDUSTRY CANADA Testing of the Kohler Co.
VEIL INTELLIGENT TOILET-WALL HUNG K-5402

In accordance with FCC CFR 47 Part 15C & Industry Canada RSS-210 and Industry Canada
RSS-GEN



2.1 AC LINE CONDUCTED EMISSIONS

2.1.1 Specification Reference

FCC CFR 47 Part 15C, Clause 15.207 / Industry Canada RSS-GEN, Clause 7.2.4

2.1.2 Equipment Under Test and Modification State

VEIL INTELLIGENT TOILET-WALL HUNG K-5402 set up the 10.525GHz detector distance maximum - Modification State 0

2.1.3 Date of Test

December 15, 2015

2.1.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.1.5 Test Procedure

The EUT is set up on a test table 800mm above a horizontal ground plane. A vertical ground plane is also required and is placed 400mm from the EUT. Where a EUT is floor standing it will be stood on but insulated from the ground plane by up to 12mm.

The EUT is powered through a Line Impedance Stabilisation Network (LISN) which is bonded to the ground plane. The EUT is located so that the distance between the EUT and the LISN is no less than 800mm. Where possible the cable between the mains input of the EUT and the LISN is 1m. Where this is not possible the cable is non inductively bundled with the bundle not exceeding 400mm in length.

A preliminary profile of the Conducted Emissions is obtained over the frequency range 150kHz to 30MHz. Any points of interest are noted for formal measurements.

During formal measurements, the measuring receiver is tuned to the emission of interest where Quasi – Peak and Average measurements are performed in a 9kHz Video and Resolution Bandwidth.

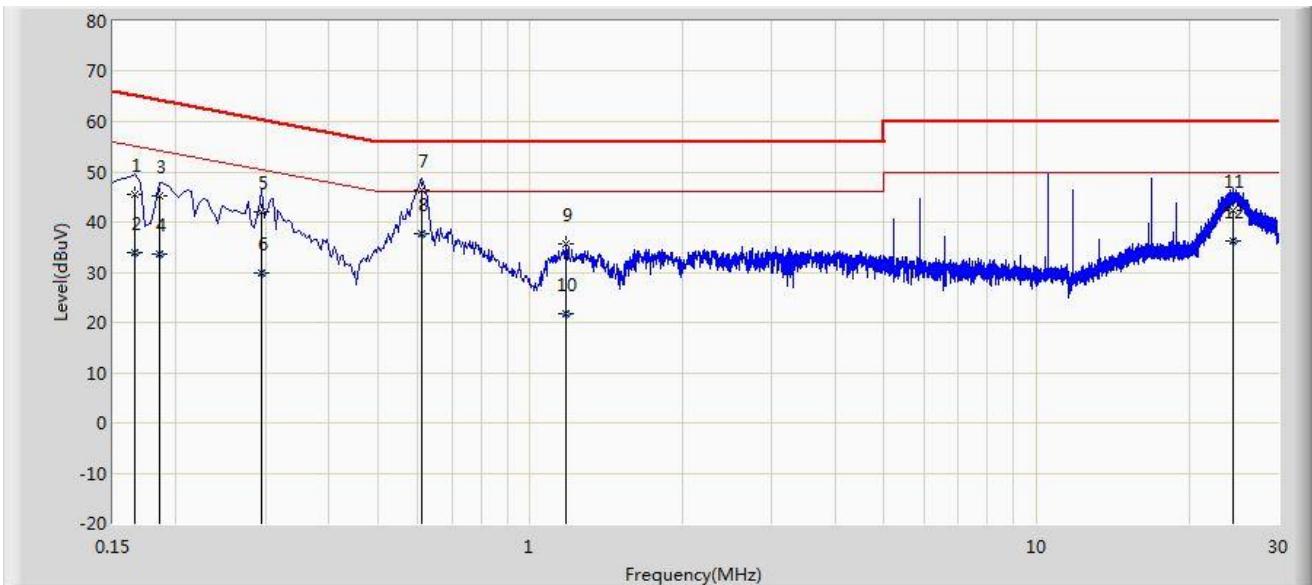
2.1.6 Environmental Conditions

Ambient Temperature	22.3°C
Relative Humidity	54.2%



2.1.7 Test Results

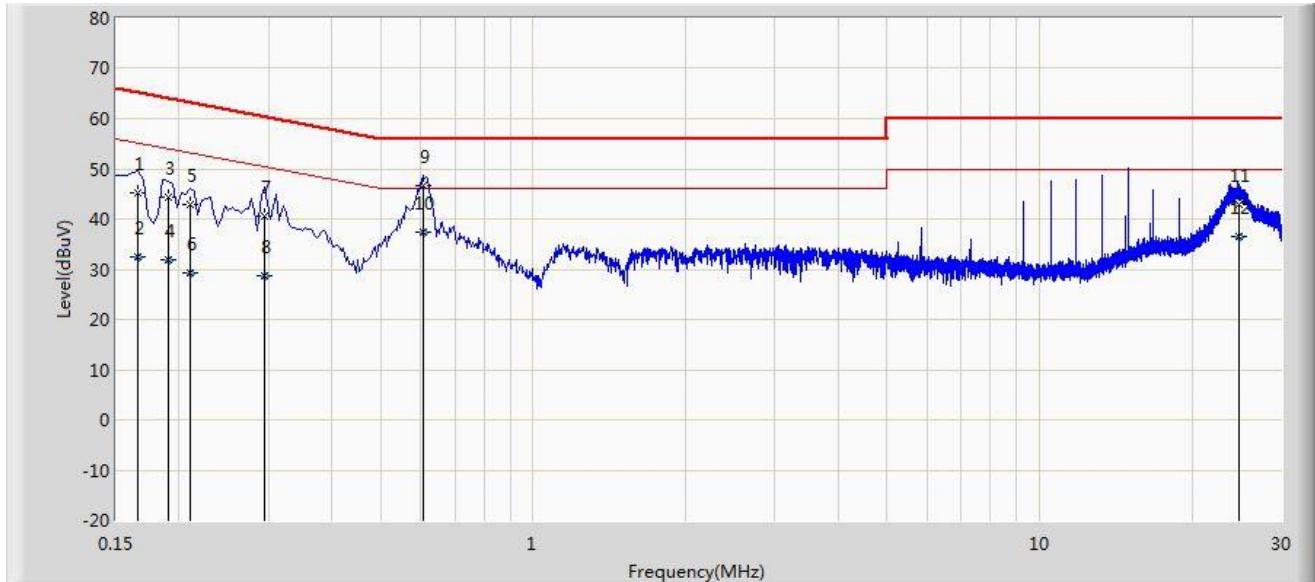
Product Type : VEIL INTELLIGENT TOILET-WALL HUNG
 M/N : K-5402
 Operating Condition : Transmit at 10.525GHz and 2.4G
 Test Specification : FCC_Part15.207_CE_AC Power
 Comment : AC 120V/60Hz, Line



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Factor (dB)	Type
1			0.166	45.487	35.400	-19.671	65.158	10.087	QP
2			0.166	33.787	23.700	-21.371	55.158	10.087	AV
3			0.186	45.339	35.300	-18.875	64.213	10.039	QP
4			0.186	33.539	23.500	-20.675	54.213	10.039	AV
5			0.294	41.899	31.900	-18.511	60.411	9.999	QP
6			0.294	29.799	19.800	-20.611	50.411	9.999	AV
7			0.609	46.310	36.200	-9.690	56.000	10.110	QP
8	*		0.609	37.710	27.600	-8.290	46.000	10.110	AV
9			1.174	35.795	25.893	-20.205	56.000	9.902	QP
10			1.174	21.669	11.767	-24.331	46.000	9.902	AV
11			24.460	42.308	32.100	-17.692	60.000	10.208	QP
12			24.460	36.108	25.900	-13.892	50.000	10.208	AV



Product Type : VEIL INTELLIGENT TOILET-WALL HUNG
 M/N : K-5402
 Operating Condition : Transmit at 10.525GHz and 2.4G
 Test Specification : FCC_Part15.207_CE_AC Power
 Comment : AC 120V/60Hz, Neutral



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Factor (dB)	Type
1			0.166	45.238	35.167	-19.920	65.158	10.071	QP
2			0.166	32.569	22.498	-22.589	55.158	10.071	AV
3			0.190	44.453	34.425	-19.583	64.037	10.028	QP
4			0.190	31.990	21.963	-22.046	54.037	10.028	AV
5			0.210	42.889	32.895	-20.316	63.205	9.995	QP
6			0.210	29.413	19.418	-23.792	53.205	9.995	AV
7			0.294	40.536	30.503	-19.874	60.411	10.033	QP
8			0.294	28.575	18.542	-21.835	50.411	10.033	AV
9			0.607	46.727	36.600	-9.273	56.000	10.127	QP
10	*		0.607	37.427	27.300	-8.573	46.000	10.127	AV
11			24.690	42.801	32.500	-17.199	60.000	10.301	QP
12			24.690	36.501	26.200	-13.499	50.000	10.301	AV



2.2 FIELD STRENGTH OF FUNDAMENTAL

2.2.1 Specification Reference

FCC CFR 47 Part 15C, Clause 15.245 (b) / Industry Canada RSS-210, Clause A2.9

2.2.2 Equipment Under Test and Modification State

VEIL INTELLIGENT TOILET-WALL HUNG K-5402 set up the 10.525GHz detector distance maximum - Modification State 0

2.2.3 Date of Test

December 15, 2015

2.2.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.2.5 Test Procedure

The EUT is placed on 12mm above the ground plane.

During formal measurement the spectrum analyser is tuned to the frequency of the fundamental. The turntable azimuth is adjusted from 0 to 360 degrees to determine the point at which the maximum level occurs. Then the height of the measuring antenna is adjusted from a height of 1m to 4m to determine the height at which the maximum level occurs. Once the point of maximum emission has been determined the emission is measured.

2.2.6 Environmental Conditions

Ambient Temperature	22.3°C
Relative Humidity	54.2%



2.2.7 Test Results

10525 MHz

Fundamental

Fundamental Frequency (MHz)	Polarisation (Vertical/Horizontal)	Reading Level	Factor	Field Strength	Over Limit	Limit		Type
		(dB μ V/)	(dB)	(dB μ V/m)	(dB)	(dB μ V/m)	mV/m	
10520.64	H	55.208	47.295	102.503	-25.497	128.0	2500	AV
10520.00	H	59.597	47.295	106.892	-41.108	148.0	25000	PK
10520.00	V	59.287	47.295	106.582	-21.418	128.0	2500	AV
10520.75	V	63.153	47.295	110.448	-37.552	148.0	25000	PK

Limit Clause 15.245 (b)

Fundamental Frequency (MHz)	Field Strength of Fundamental (millivolts/meter)
902 to 928	500
2435 to 2465	500
5785 to 5815	500
10500 to 10550	2500
24075 to 24175	2500



2.3 FIELD STRENGTH OF SPURIOUS EMISSIONS

2.3.1 Specification Reference

FCC CFR 47 Part 15C, Clause 15.245 (b)(3), 15.209 / Industry Canada RSS-210 and Industry Canada RSS-GEN

2.3.2 Equipment Under Test and Modification State

VEIL INTELLIGENT TOILET-WALL HUNG K-5402 set up the 10.525GHz detector distance maximum - Modification State 0

2.3.3 Date of Test

December 15, 2015

2.3.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.3.5 Test Procedure

A preliminary profile of the Spurious Radiated Emissions is obtained up to the 10th harmonic of the EUT's fundamental frequency. For frequencies from 30MHz to 18GHz the EUT is placed on 100mm above the ground plane. For frequencies above 18GHz, the EUT height is increased by 200mm to a height of 1000mm. This is to ensure the beam width of the measuring antenna gives sufficient vertical coverage of the EUT.

During characterisation the turntable azimuth is adjusted from 0 to 360 degrees with the measuring antenna in one polarity. It is then repeated for the other polarity. Any frequencies of interest are noted for formal measuring later. The distance from the measuring antenna to the boundary of the EUT is 3m. Above 18GHz this distance may be reduced to 1m.

During formal measurement the spectrum analyser is tuned to the frequency of the emission. The turntable azimuth is adjusted from 0 to 360 degrees to determine the point at which the maximum emission level occurs. Then the height of the measuring antenna is adjusted from a height of 1m to 4m to determine the height at which the maximum emission level occurs. Once the point of maximum emission has been determined the emission is measured. Emissions in the 30MHz to 1GHz range are measured using a CISPR Quasi – Peak detector function in a 120kHz bandwidth. Emissions in the range 1GHz to 60GHz require Peak and Average measurements. The Peak measurements are made using a peak detector with 1MHz Resolution and Video bandwidths. The average measurements employ a peak detector with a Resolution bandwidth of 1MHz and a Video bandwidth of 10Hz. If measurements are made at a 1m measuring distance, then 10dB is added to the specification limit.

2.3.6 Environmental Conditions

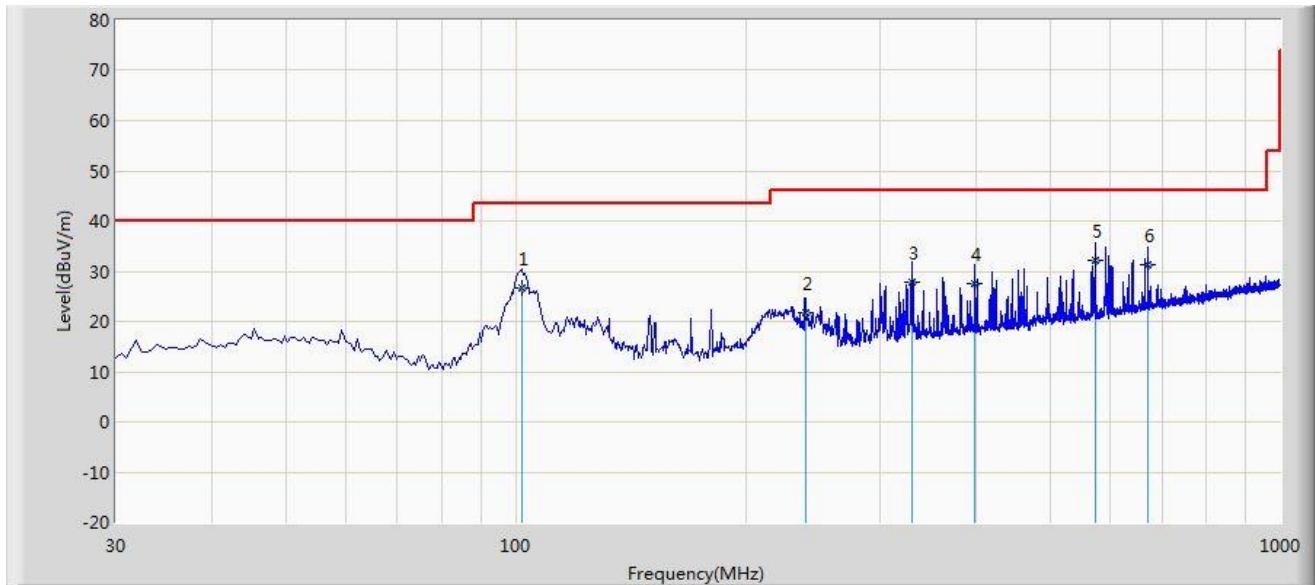
Ambient Temperature	22.3°C
Relative Humidity	54.2%



2.3.7 Test Results

30 MHz to 1 GHz

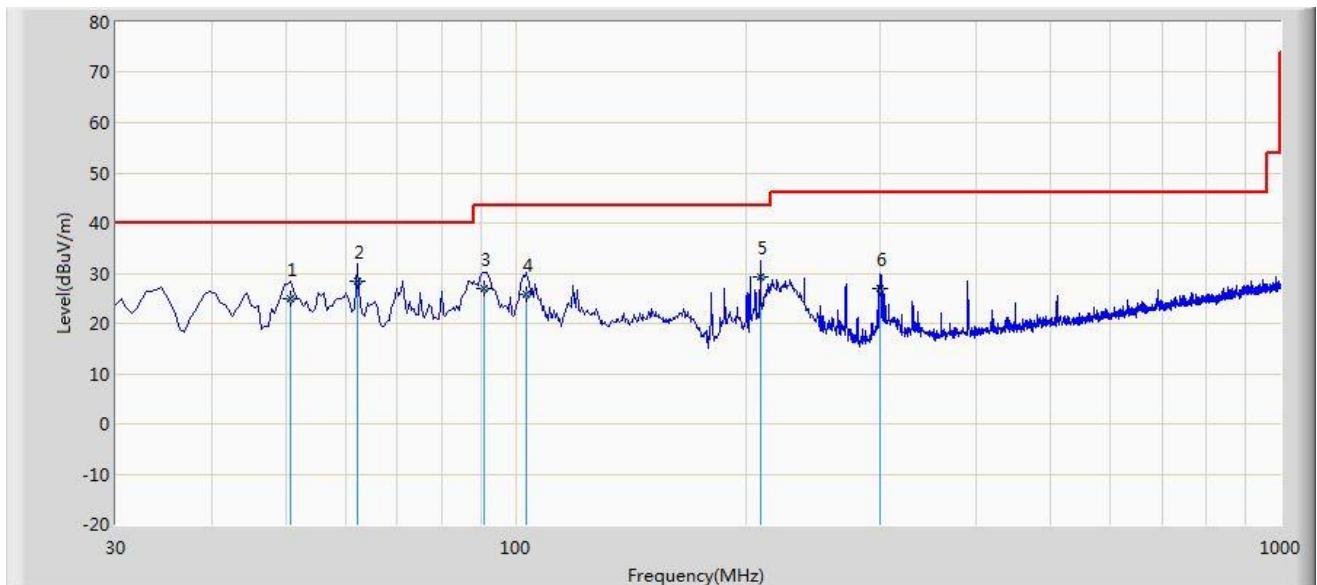
Horizontal Polarisation



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			101.780	26.654	13.450	-16.846	43.500	13.204	QP
2			239.520	21.873	8.470	-24.127	46.000	13.403	QP
3			330.215	27.865	12.470	-18.135	46.000	15.395	QP
4			399.085	27.572	10.840	-18.428	46.000	16.732	QP
5	*		572.230	32.259	12.640	-13.741	46.000	19.619	QP
6			670.685	31.233	10.140	-14.767	46.000	21.093	QP



Vertical Polarisation



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			50.855	25.062	10.140	-14.938	40.000	14.921	QP
2	*		62.010	28.287	14.760	-11.713	40.000	13.527	QP
3			91.110	26.887	15.370	-16.613	43.500	11.517	QP
4			103.235	25.701	12.540	-17.799	43.500	13.161	QP
5			208.965	29.270	16.840	-14.230	43.500	12.430	QP
6			300.145	26.999	12.420	-19.001	46.000	14.579	QP

Above 1GHz

Frequency (MHz)	Polarisation (Vertical/ Horizontal)	Field Strength	Over Limit	Limit	Type
		dB μ V/m	(dB)	(dB μ V/m)	AV/PK
21036.00*	H	77.56	-30.44	108.00	PK
31563.00*	H	72.56	-35.44	108.00	PK
21036.00*	H	66.18	-21.82	88.00	AV
31563.00*	H	62.23	-25.77	88.00	AV

Frequency (MHz)	Polarisation (Vertical/ Horizontal)	Field Strength	Over Limit	Limit	Type
		dB μ V/m	(dB)	(dB μ V/m)	AV/PK
21036.00*	V	78.73	-29.27	108.00	PK
31563.00*	V	74.73	-33.27	108.00	PK
21036.00*	V	69.45	-18.55	88.00	AV
31563.00*	V	65.18	-22.82	88.00	AV

Note: Emission was scanned up to 60GHz; no emissions were detected above the noise floor which was at least 20dB below the specification limit.

Remark: "*" is marked as harmonic frequency.

15.245(b)(1)

(1) Regardless of the limits shown in the above table, harmonic emissions in the restricted bands below 17.7 GHz, as specified in §15.205, shall not exceed the field strength limits shown in §15.209. Harmonic emissions in the restricted bands at and above 17.7 GHz shall not exceed the following field strength limits:

(i) For the second and third harmonics of field disturbance sensors operating in the 24075-24175 MHz band and for other field disturbance sensors designed for use only within a building or to open building doors, 25.0 mV/m.

Limit Clause15.245 (b)

Fundamental Frequency (MHz)	Field Strength of Harmonics (microvolts/meter)
902 to 928	500
2435 to 2465	500
5785 to 5815	500
10500 to 10550	2500
24075 to 24175	2500

15.209

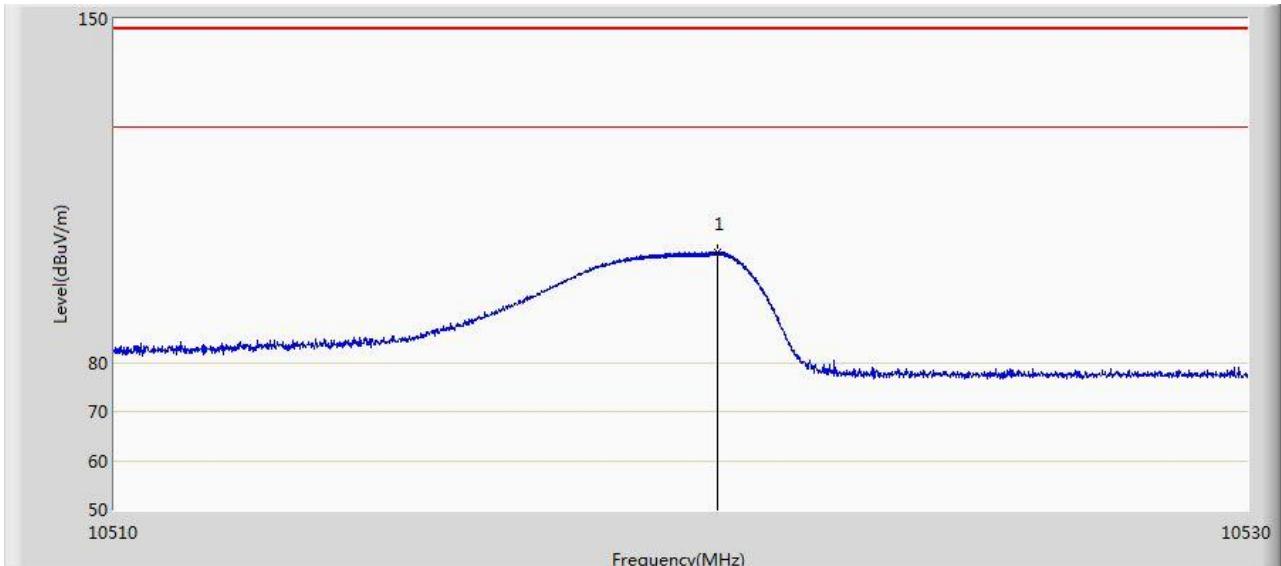
Frequency (MHz)	Field Strength (microvolts/meter)
0.009 to 0.490	2400/F (kHz)
0.490 to 1.705	24000/F (kHz)
1.705 to 30.0	30
30 to 88	100
88 to 216	150
216 to 960	200
Above 960	500



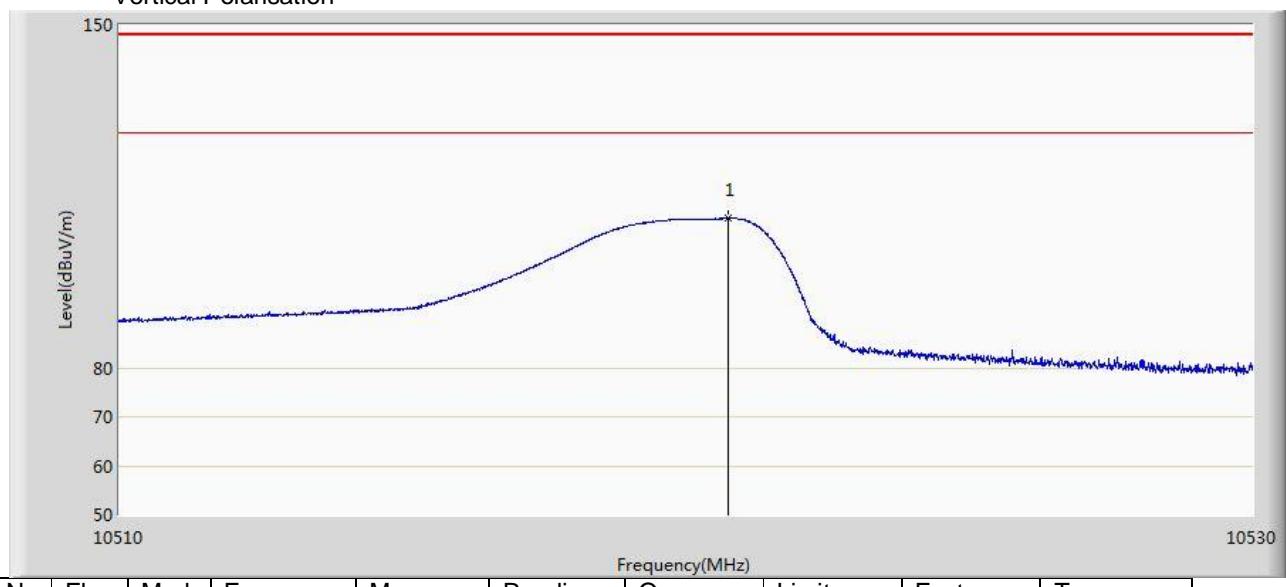
Band Edge Emissions

The requirement is to ensure the 20dB bandwidth of the emission, or whatever bandwidth may otherwise be specified, is contained within the frequency band designated in the rule section under which the equipment is operated.

Horizontal Polarisation



Vertical Polarisation





2.4 OCCUPIED BANDWIDTH

2.4.1 Specification Reference

FCC CFR 47 Part 2: 2008, Clause 2.1049(h) / RSS 210 Issue 8

2.4.2 Equipment Under Test and Modification State

VEIL INTELLIGENT TOILET-WALL HUNG K-5402 set up the 10.525GHz detector distance maximum - Modification State 0

2.4.3 Date of Test

January 25, 2016

2.4.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.4.5 Test Procedure

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 2: 2008.

Connect EUT's antenna terminal to the spectrum analyser via a low loss cable with transmitting mode.

Adjust the centre frequency of the spectrum analyser on the frequency to be measured, and set for peak detector mode; max hold trace mode RBW=100 KHz and VBW=300 KHz.

The span of the analyzer approximately 2 to 3 times the channel bandwidth shall be set to capture all products of the modulation process, including the emission skirts. Use the marker-to-peak function to set the marker to the peak of the emission.

Use the OBW function to measure -20db bandwidth and 99% emission bandwidth..

2.4.6 Environmental Conditions

Ambient Temperature	23.6°C
Relative Humidity	56.0%



2.4.7 Test Results

Frequency (GHz)	20dB Occupied Bandwidth (MHz)
10.525	2.13

Frequency (GHz)	99% Occupied Bandwidth (MHz)
10.525	2.99





Product Service

SECTION 3

TEST EQUIPMENT USED



3.1 TEST EQUIPMENT USED

List of Test Instruments

Conducted Emissions

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR7	MRTSUE06001	1 year	2016/11/03
Two-Line V-Network	R&S	ENV216	MRTSUE06002	1 year	2016/11/03
Two-Line V-Network	R&S	ENV216	MRTSUE06003	1 year	2016/11/03
Temperature/Humidity Meter	Ouleinuo	N/A	MRTSUE06114	1 year	2016/11/20

Radiated Emission

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Spectrum Analyzer	Agilent	E4447A	MRTSUE06028	1 year	2016/12/08
EMI Test Receiver	R&S	ESR7	MRTSUE06001	1 year	2016/11/03
Preamplifier	Schwarzbeck	BBV 9721	MRTSUE06121	1 year	2016/04/16
Preamplifier	Agilent	83017A	MRTSUE06076	1 year	2016/03/29
Loop Antenna	Schwarzbeck	FMZB1519	MRTSUE06025	1 year	2016/12/14
TRILOG Antenna	Schwarzbeck	VULB9162	MRTSUE06022	1 year	2016/11/07
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	MRTSUE06023	1 year	2016/11/07
Broadband Horn Antenna	Schwarzbeck	BBHA9170	MRTSUE06024	1 year	2016/01/05
Temperature/Humidity Meter	Ouleinuo	N/A	MRTSUE06115	1 year	2016/11/20



3.2 MEASUREMENT UNCERTAINTY

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

System Measurement Uncertainty	
Test Items	Extended Uncertainty
Uncertainty for Radiated Emission in 3m chamber 9kHz-1000MHz	4.18dB
Uncertainty for Radiated Emission in 3m chamber 1000MHz-40000MHz	4.76dB
Uncertainty for Conducted Emission 150KHz-30MHz	3.46dB



Product Service

SECTION 4

DISCLAIMERS AND COPYRIGHT



Product Service

4.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

This report relates only to the actual item/items tested.

This report must not be reproduced, except in its entirety, without the written permission of

TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch

© 2016 TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch