



**1 Cover Page**

# ***RF Exposure Evaluation Report***

**Application No.:** SHEM2002001015CR  
**FCC ID:** N82-KOHLER046  
**IC:** 4554A-KOHLER046  
**Applicant:** Kohler Co.  
**Address of Applicant:** 444 Highland Drive Kohler, WI 53044 United States  
**Manufacturer:** Shanghai Kohler Electronics., Ltd.  
**Address of Manufacturer:** No. 1955, Fengxiang Road, Baoshan Area, Shanghai, PRC Post code: 200444  
**Factory:** Shanghai Kohler Electronics., Ltd.  
**Address of Factory:** No. 1955, Fengxiang Road, Baoshan Area, Shanghai, PRC Post code: 200444

**Equipment Under Test (EUT):**  
**EUT Name:** NUMI 2.0 INTELLIGENT TOILET  
**Model No.:** K-30754  
**Trade mark:** KOHLER  
**Standard(s) :** FCC Rules 47 CFR §2.1091  
 KDB447498 D01 General RF Exposure Guidance v06  
 RSS-102 Issue 5 (March 2015)

**Date of Receipt:** 2020-02-21  
**Date of Test:** 2020-11-27 to 2020-12-22  
**Date of Issue:** 2020-12-24

<b>Test Result:</b>	<b>Pass*</b>
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\* In the configuration tested, the EUT complied with the standards specified above.

*Parlam Zhan*

Parlam Zhan  
E&E Section Manager

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS International Electrical Approvals or testing done by SGS International Electrical Approvals in connection with, distribution or use of the product described in this report must be approved by SGS International Electrical Approvals in writing.



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**Attention: To check the authenticity of testing /inspection report & certificate, please contact us at telephone: (86-755) 8307 1443, or email: CN.Doccheck@sgs.com**

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Revision Record			
Version	Description	Date	Remark
00	Original	2020-12-24	/

Authorized for issue by:			
			
	<hr/>		
	Vincent Zhu /Project Engineer		
			
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	Parlam Zhan /Reviewer		



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### 3 General Information

#### 3.1 General Description of E.U.T.

Product Description:	AC 120V 60Hz
Cable:	AC cable 1m
Serial Number:	ZM00001
Firmware Version:	V1.003

#### 3.2 Technical Specifications

##### BT

Antenna Gain:	2.45dBi(Provided by the manufacturer)
Antenna Type:	PCB Antenna
Bluetooth Version:	V5.0 Classic
Data Rate:	1/2/3Mbps
Channel Spacing:	1MHz
Modulation Type:	GFSK, $\pi/4$ DQPSK, 8DPSK
Number of Channels:	79
Operation Frequency:	2402MHz to 2480MHz
Spectrum Spread Technology:	Frequency Hopping Spread Spectrum(FHSS)

##### 2.4G WiFi

Antenna Gain:	2.45dBi(Provided by the manufacturer)
Antenna Type:	PCB Antenna
Channel Spacing:	5MHz
Modulation Type:	802.11b: DSSS (CCK, DQPSK, DBPSK) 802.11g/n: OFDM (64QAM, 16QAM, QPSK, BPSK)
Number of Channels:	802.11b/g/n(HT20):11 802.11n(HT40):7
Operation Frequency:	802.11b/g/n(HT20): 2412MHz to 2462MHz 802.11n(HT40): 2422MHz to 2452MHz

### 3.3 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd. Shanghai Branch  
588 West Jindu Road, Xinqiao, Songjiang, 201612 Shanghai, China.

Tel: +86 21 6191 5666

Fax: +86 21 6191 5678

### 3.4 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

• **CNAS (No. CNAS L0599)**

CNAS has accredited SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. to ISO/IEC 17025:2017 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

• **NVLAP (LAB CODE: 201034-0)**

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP).

• **FCC (Designation Number: CN5033)**

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been recognized as an accredited testing laboratory. Test Firm Registration Number: 479755.

• **ISED (CAB Identifier: CN0020)**

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. EMC Laboratory has been recognized by Innovation, Science and Economic Development Canada (ISED) as an accredited testing laboratory. ISED#: 8617A.

• **VCCI (Member No.: 3061)**

The 3m Semi-anechoic chamber and Shielded Room of SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-13868, C-14336, T-12221, G-10830 respectively.

## 4 Test Standards and Limits

### 4.1 FCC Radiofrequency radiation exposure limits:

According to §1.1310, the limit for general population/uncontrolled exposures

Frequency	Power density(mW/cm <sup>2</sup> )	Averaging time(minutes)
300MHz~1.5GHz	f/1500	30
1.5GHz~100GHz	1.0	30

### 4.2 IC Radiofrequency radiation exposure limits:

According to RSS-102 section 2.5.2, RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

below 20 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);

- at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than  $4.49/f^{0.5}$  W (adjusted for tune-up tolerance), where  $f$  is in MHz;
- at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
- at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than  $1.31 \times 10^{-2} f^{0.6834}$  W (adjusted for tune-up tolerance), where  $f$  is in MHz;
- at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).

For 2.4G device, the limit of worse case is 2.68 W

For 5G device, the limit of worse case is 4.53 W

## 5 Measurement and Calculation

### 5.1 Maximum transmit power

The Power Data is based on the RF Test Report SHEM200200101501 & SHEM200200101502.

#### BT

Test Mode	Test Channel	Power[dBm]	Power[mW]
DH5	2402	-1.19	0.76
DH5	2441	-0.75	0.84
DH5	2480	-0.08	0.98
2DH5	2402	0.94	1.24
2DH5	2441	1.4	1.38
2DH5	2480	1.98	1.58
3DH5	2402	1.3	1.35
3DH5	2441	1.77	1.50
3DH5	2480	2.37	<b>1.73</b>

#### 2.4G WiFi

Test Mode	Test Channel	Ant	Power [dBm]	Power [mW]
11B	2412	Ant1	14.46	27.93
11B	2437	Ant1	15.77	37.76
11B	2462	Ant1	16.09	<b>40.64</b>
11G	2412	Ant1	12.38	17.30
11G	2437	Ant1	13.60	22.91
11G	2462	Ant1	14.26	26.67
11N20SISO	2412	Ant1	12.29	16.94
11N20SISO	2437	Ant1	13.51	22.44
11N20SISO	2462	Ant1	14.08	25.59
11N40SISO	2422	Ant1	12.44	17.54
11N40SISO	2437	Ant1	13.46	22.18
11N40SISO	2452	Ant1	13.43	22.03

The EUT also contains three RF module:

“2.4GHz Wireless Module”, FCC ID: 2AOFDLSD4RF043610D0, IC: 25210-LSD043610D0

“New Microwave Sensor”, FCC ID: N82-KOHLER036, IC: 4554A-KOHLER036

“Dual-Band Wi-Fi Module”, FCC ID: Z64-CC3235MOD, IC: 4511-CC3235MOD

Base on Certification of FCC ID: Z64-CC3235MOD, IC: 4511-CC3235MOD

The max power for 2.4GHz band is 93.1mW, for 5GHz band is 26.9mW

The antenna gain for 2.4GHz is 2.5dBi, the antenna gain for 5GHz band is 4.5dBi

## 5.2 MPE Calculation

For FCC:

According to the formula  $S=P/4\pi R^2$ , we can calculate S which is MPE.

Note:

- 1) P (mW)
- 2) R = distance to the center of radiation of antenna (in meter) = 20cm
- 3) MPE limit = 1mW/cm<sup>2</sup>

**For BT**

The max. antenna gain is 2.45 dBi

Max. Conducted Power P(mW)	Gain in Linear Scale G	Operation Distance R(cm)	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )	Result
1.73	1.758	20	0.00061	1	Pass

**For 2.4G WiFi**

The max. antenna gain is 2.45 dBi

Max. Conducted Power P(mW)	Gain in Linear Scale G	Operation Distance R(cm)	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )	Result
40.64	1.758	20	0.01421	1	Pass

**“Dual-Band Wi-Fi Module”**

**2.4GHz**

The max. antenna gain is 2.5 dBi

Max. Conducted Power P(mW)	Gain in Linear Scale G	Operation Distance R(cm)	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )	Result
93.1	1.778	20	0.03294	1	Pass

**5GHz**

The max. antenna gain is 4.5 dBi

Max. Conducted Power P(mW)	Gain in Linear Scale G	Operation Distance R(cm)	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )	Result
26.9	2.818	20	0.01508	1	Pass

All band can simultaneous transmitting, so the maximum rate of MPE is  $0.00061/1+0.01421/1+0.03294/1+0.01508/1=0.0628<1$





For IC:

**For BT**

$$E.I.R.P.= P \cdot G = 0.00173 \times 1.758 = 0.003W < 2.68W$$

**For 2.4G WiFi**

$$E.I.R.P.= P \cdot G = 0.04064 \times 1.758 = 0.07W < 2.68W$$

**For Dual-Band Wi-Fi Module**

$$2.4GHz \text{ band: } E.I.R.P.= P \cdot G = 0.0931 \times 1.778 = 0.166W < 2.68W$$

$$5GHz \text{ band: } E.I.R.P.= P \cdot G = 0.0269 \times 2.818 = 0.076W < 4.53W$$

All band can simultaneous transmitting, so the maximum rate of MPE is  $0.003/2.68 + 0.07/2.68 + 0.166/2.68 + 0.076/4.53 = 0.11 < 1$

So the device is exclusion from SAR test.

**--End of the Report--**