

MPE TEST REPORT EN62311:2008

Applicant Name:
WISOL CO., LTD.

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Test Report No.: HCT-R-1710-E006-1

Test Site: HCT CO., LTD.

MODEL: SFM20R1

APPLICANT: WISOL CO., LTD.

Eut Type : Sigfox Quad-mode module

Applicable Standard : EN 62311: 2008

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Report Revision

TEST REPORT NO.	DATE	DESCRIPTION
HCT-R-1710-E006	October 16, 2017	- First Approval Report.
HCT-R-1710-E006-1	October 20, 2017	- It was recalculated.

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1. Product Information

Equipment	Sigfox Quad-mode module	
Equipment category:	Short Range Device	
Model No.:	SFM20R1	
Standard :	EN 62311: 2008	
frequency range:	WLAN : 2 412 MHz ~ 2 472 MHz Bluetooth : 2 402 MHz ~ 2 480 MHz Sigfox : 868.055 MHz ~ 868.205 MHz	
Version	Hardware : 1.0	
	Software : SFM20R_V204	
Power source:	Normal voltage :	DC 3.30 V
	Extreme lower voltage :	DC 3.20 V
	Extreme upper voltage :	DC 5.00 V
Temperature range:	Normal Temperature :	+24.3℃
	Extreme lower Temperature :	-30.0℃
	Extreme upper Temperature :	+85.0℃
Antenna type:	Dipole Antenna	

Note:

At the request of the customer, all test requirements were performed EN 62311: 2008

2. Power Density Calculation

Consideration of radio frequency radiation exposure for EUT is done as

Calculation standard	EN62311:2008
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SAR test results: not applicable

Electromagnetic Field Calculation:

The EUT is considered as a base station according to EN 62311:2008

Therefore distance to human body of min. 20 cm is determined.

The antenna used for this base station must provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

A safety statement concerning minimum separation distances from enclosure of the device will be integrated in the user's manual to provide end-users with transmitter operating conditions for satisfying exposure compliance.

Formula:

$$S = \frac{PG}{4\pi R^2} \quad or \quad S = \frac{EIRP}{4\pi R^2}$$

S = Power density

P = power input to antenna

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna

3. Test Limit

According to EN 62311:2008, the criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio frequency (RF) radiations specified 1999/5/EC

**Reference levels for electric, magnetic and electromagnetic fields
(0 Hz to 300 GHz, unperturbed rms values)**

Frequency Range	E-field Strength (V/m)	H-field Strength (A/m)	B-field (uT)	Equivalent plane Wave power Density S(W/m ²)
0-1 Hz	--	3.2×10^4	4×10^4	--
1-8 Hz	10000	$3.2 \times 10^4/f^2$	$4 \times 10^4/f^2$	--
8-25 Hz	10000	$4000/f$	$5000/f$	--
0.025-08 kHz	$250/f$	$4/f$	$5/f$	--
0.8-3 kHz	$250/f$	5	6.25	--
3-150 kHz	87	5	6.25	--
0.15-1 MHz	87	$0.73/f$	$0.92/f$	--
1-10 MHz	$87/f^{1/2}$	$0.73/f$	$0.92/f$	--
10-400 MHz	28	0.073	0.092	2
400-2000 MHz	$1.375 f^{1/2}$	$0.037 f^{1/2}$	$0.0046 f^{1/2}$	$f/200$
2-300 GHz	61	0.16	0.20	10

Notes:

1. F as indicated in the frequency range column.
2. For frequencies between 100 kHz and 10 GHz $S_{eq} E^2 H^2$ and B^2 are to be averaged over any six-minute period.
3. For frequencies exceeding 10 GHz $S_{eq} E^2 H^2$ and B^2 are to be averaged over any $68/f^{1.05}$ minute period (f in GHz)
4. No E-field value is provided for frequencies < 1 Hz, which are effectively static electric fields. For most people the annoying perception of surface electric charges will not occur at field strengths less than 25 kV/m. Spark discharges causing stress or annoyance should be avoided..

4. Calculation

[WLAN]

EIRP[Radiated Power]	15.0000	dBm
EIRP[Radiated Power]	31.623	mW
Prediction distance	20.00000	cm
Prediction frequency	2412 ~ 2472	MHz
Power density at prediction frequency (S)	0.006291	mW/cm2
MPE limit for uncontrolled exposure at prediction frequency	1.00000	mW/cm2

[Bluetooth]

EIRP[Radiated Power]	5.0000	dBm
EIRP[Radiated Power]	3.162	mW
Prediction distance	20.00000	cm
Prediction frequency	2402 ~ 2480	MHz
Power density at prediction frequency (S)	0.000629	mW/cm2
MPE limit for uncontrolled exposure at prediction frequency	1.00000	mW/cm2

[Sigfox]

EIRP[Radiated Power]	13.9000	dBm
EIRP[Radiated Power]	24.547	mW
Prediction distance	20.00000	cm
Prediction frequency	868.055 ~ 868.205	MHz
Power density at prediction frequency (S)	0.004883	mW/cm2
MPE limit for uncontrolled exposure at prediction frequency	1.00000	mW/cm2

Simultaneous transmission operations

->Simultaneous MPE 20cm is Sigfox(0.004883/1.0) + Bluetooth (0.000629/1.0) = 0.005512 < 1

->Simultaneous MPE 20cm is Bluetooth (0.000629/1.0) + WLAN(0.006291/1.0) = 0.006920 < 1