

RADIO FREQUENCY RADIATION EXPOSURE REPORT

Mobiles /Fixed Base Station Maximum Permissible Exposure (MPE)

OF

Product Name: 802.11b/g/n RTL8191SU miniCard

Brand Name: Realtek

Model Name: RTL8191SU

Model Different: N/A

FCC ID: TX2-RTL8191SU

Report No.: ER/2009/90039-01

Issue Date: Apr. 23, 2010

Prepared for: Realtek Semiconductor Corp.
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VERIFICATION OF COMPLIANCE

Applicant: Realtek Semiconductor Corp.
 No. 2, Innovation Road II, Hsinchu Science Park, Hsinchu 300,
 Taiwan

Product Name: 802.11b/g/n RTL8191SU miniCard

Brand Name: Realtek

FCC ID: TX2-RTL8191SU

Model No.: RTL8191SU

Model Difference: N/A

File Number: ER/2009/90039-01

Date of test: Mar. 23, 2010 ~ Apr. 22, 2010

Date of EUT Received: Mar. 23, 2010

We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd., Electronics & Communication Laboratory. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in FCC OET Bulletin 65 Supplement C and 47 CFR §2.1091.

The test results of this report relate only to the tested sample identified in this report.

Test By:		Date	Apr. 23, 2010
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Report Version

Version No.	Date	Description
00	Apr. 23, 2010	Initial creation of document

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Table of Contents

1.	GENERAL INFORMATION	5
1.1	STANDARD APPLICABLE	12
1.2	MAXIMUM PERMISSIBLE EXPOSURE (MPE) EVALUATION	13

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1. GENERAL INFORMATION

General:

Product Name:	802.11b/g/n RTL8191SU miniCard
Brand Name:	N/A
Model Name:	RTL8191SU
Model Difference:	N/A
Power Supply	3.3Vdc

WLAN:

Frequency Range & Channel number:	802.11 b/g: 2412 – 2462 MHz, 11 channels 802.11 n_20MHz: 2412 – 2462 MHz, 11 channels 802.11 n_40MHz: 2422 – 2452 MHz, 9 channels
Rated Power:	802.11 b: 19.90 dBm 802.11 g: 17.80 dBm 802.11 n_20MHz: 16.64 dBm 802.11 n_40MHz: 16.81 dBm
Modulation type:	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
Transmission Rate:	802.11 b: 1/2/5.5/11 Mbps; 802.11 g: 6/9/12/18/24/36/48/54 Mbps 802.11 n_20MHz: 6.5 – 72.2Mbps 802.11 n_40MHz: 13.5 - 300Mbps
Antenna Designation:	Max Antenna gain: 2.54 dBi, See next page for Antenna list
Type of Emission:	36M0M7D

This report applies for frequency IEEE 802.11 b/g/n.

Original Antenna Specification

Item	Antenna Vendor	Model name	Antenna Type	Gain (dBi) With cable loss	Cable loss (dB)	Connector Type
1	wistron	DQ661500301(Main)	PIFA	3.95	N/A	IPEX
		DQ661500301(Aux)		3.9		
2	wistron	DQ661500115(Main)	PIFA	1.10	1.89	IPEX
		DQ661500115(Aux)		0.64	2.55	
3	wgt	AR830WIPI01A(L)	PIFA	2.17	-1.6	IPEX
		AR830WIPI02A(R)		2.39	-2.03	
4	wgt	AR320WIPI01B(L)	PIFA	0.86	-1.43	IPEX
		AR320WIPI02B(R)		2.11	-1.78	
5	wgt	ARW62WIPI01G(L)	PIFA	2.48	-2.39	IPEX
		ARW62WIP102G(R)		1.32	-1.76	
6	wgt	ARUMPWIPI02+C (R)	PIFA	2.41	N/A	IPEX
		ARUMPWIPI01+D (L)		2.07		
7	Foxconn	WDAN-GQMA6001-DF (Main)	PIFA	2.32	-1.262	IPEX
		WDAN-GQMA6001-DF (Aux)		1.10	-1.813	
8	Foxconn	WDAN-GQMA6002-DF (Main)	PIFA	0.74	-1.446	IPEX
		WDAN-GQMA6002-DF (Aux)		0.78	-2.009	
9	Galtronics	021020168NC3587 (Main)	PIFA	-0.25	1.75	U.FL
		021020168NC3587-1 (Aux)		3.64	2	
10	Galtronics	021020168NC3586 (Main)	PIFA	-0.04	1.9	U.FL
		021020168NC3586-1 (Aux)		3.25	1.85	
11	HIGH-TEK	AAFQ5050001LK0 (Main)	PIFA	2.86	2.4	IPEX
		AAFQ5050001RK0 (Aux)		1.52	1.7	
12	Hitachi	HFT40-IV17 (Main)	PIFA	0.48	N/A	IPEX
		HMG03-IV17 (Aux)		0.64		
13	WNC	81.EE215.016 (Main)	PIFA	0.34	2.52	IPEX
		81.EE215.016 (Aux)		0.79	3.17	
14	WNC	ASAW 001(L)	PIFA	1.34	N/A	IPEX
		ASAW 001(R)		1.25		
15	Wgt	B1425050G00003 (Main)	PIFA	0.03	-2.01	IPEX
		B1425050G00002 (Aux)		0.63	-2.05	
16	tyco	ASAT 001 (L)	PIFA	0.61	N/A	IPEX
		ASAT 001 (R)		0.16		
17	ACON	ASAA 001 (L)	PIFA	1.56	N/A	IPEX
		ASAA 001 (R)		1.36		

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18	Hitachi	HFT40 (Main) HFT40 (Aux)	PIFA	0.58 1.12	1.42 2.12	IPEX
19	Hitachi	HFT60 (Main) HFT60 (Aux)	PIFA	-1.65 -0.92	1.48 2.18	IPEX
20	Hitachi	HTL008 (Main) HTL008 (Aux)	PIFA	2.24 1.84	1.72 2.20	IPEX
21	Hitachi	HTL017 (Main) HTL017 (Aux)	PIFA	2.82 2.94	1.94 2.39	IPEX
22	WNC	WNC001(Main) WNC001 (Aux)	PIFA	-1.10 1.76	1.17 1.17	IPEX
23	WNC	WNC002(Main) WNC002(Aux)	PIFA	1.18 1.75	2.28 2.12	IPEX
24	Tyco	TIAN01 (Main) TIAN01 (Aux)	PIFA	0.57 0.87	-1.463 -1.865	IPEX
25	Tyco	TBN001 (Main) TBN001 (Aux)	PIFA	3.45 2.41	1.45 2.13	IPEX
26	Tyco	TBN003 (Main) TBN003 (Aux)	PIFA	-1.11 -1.11	1.84 2.16	IPEX
27	Tyco	2023935-1 (Main) 2023936-1 (Aux) 2023936-1(MIMO)	PIFA	2.95 1.90	1.88 2.03	U.FL
28	Tyco	2023937-1 (Main) 2023937-1 (Aux) 2023934-1(MIMO)	PIFA	1.60 0.05	1.85 2.00	U.FL
29	Tyco	2023938-1 (Main) 2023938-1 (Aux) 2023939-1(MIMO)	PIFA	1.41 1.24	2.17 2.40	U.FL
30	Tyco	2023954-1 (Main) 2023954-1 (Aux) 2023955-1(MIMO)	PIFA	1.68 0.92	2.14 3.02	U.FL
31	Hitachi	HBY07 (TX1) HBY07 (TX2)	PIFA	2.19 -0.33	0.95 0.95	IPEX
32	Hitachi	HBY051 (TX1) HBY051 (TX2)	PIFA	2.91 2.82	0.95 0.95	IPEX

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33	Hitachi	HB Y052 (TX1) HB Y052 (TX2)	PIFA	0.27 0.02	0.95 0.95	IPEX
34	Hitachi	HB Y061 (TX1) HB Y061 (TX2)	PIFA	1.30 2.42	0.95 0.95	IPEX
35	Hitachi	HB Y062 (TX1) HB Y062 (TX2)	PIFA	-1.04 -1.19	0.95 0.95	IPEX
36	Hitachi	HFT65 (TX1) HFT65 (TX2)	PIFA	-1.74 1.16	0.95 0.95	IPEX
37	QUANTA	AN-090-B (Tx1) AN-090-A (Tx2)	PIFA	-1.4 -2.2	-1	IPEX
38	Hitachi	HCT01 (Main) HCT01 (Aux)	PIFA	0.87 1.94	0.89	IPEX
39	FOXCONN	WDAN-TQ (Tx1) WDAN-TQ (Tx2)	PIFA	-0.43 -0.7	2.5	IPEX
40	Tyco	TBN005 TBN006	PIFA	-1.11	N/A	IPEX
41	Whayu	DQ652016100 (Tx1) DQ652016100 (Tx2)	PIFA	1.31 0.09	0.37 0.92	FAF
42	WNC	WNC004 (Main) WNC004 (Aux)	PIFA	2.40 1.50	1.53 1.92	IPEX
43	QUANTA	ON1 (Tx1) ON1 (Tx2)	PIFA	1.8 0.1	N/A	IPEX
44	HON HAI	WDAN-DQZM1001-DF (Tx1) WDAN-DQZM1001-DF (Tx2)	PIFA	1.67 -0.10	0.827 0.849	IPEX
45	ACON	AMM8P-700006(Tx1) AMM8P-700006 (Tx2)	PIFA	1.29 -0.8	0.97 0.9	IPEX
46	Yageo	CAN4313880012501B (Tx1) CAN4313880012501B (Tx2)	PIFA	1.12 0.7	1.05 1.08	IPEX
47	Wanshih	1415-00JK000	PIFA	3.34	N/A	IPEX
48	Wanshih	1415-00JL000	PIFA	2.05	N/A	IPEX
49	WNC	WNC001 (Main) WNC001(Aux)	PIFA	0.31 -0.75	1.98 2.01	IPEX
50	WNC	WNC003 (Main) WNC003 (Aux)	PIFA	0.52 1.07	1.49 2.13	IPEX

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51	Wha Yu	DQ652015800 (Tx1) DQ652015800 (Tx2)	PIFA	1.13 0.74	1.68 2.29	IPEX
52	Smart Approach	PE-AB0370 (Main) PE-AB0430 (Aux)	PIFA	2.95 0.94	N/A	IPEX
53	ARISTOTLE	RFA-02-P23-70-300-L	PIFA	-5	N/A	IPEX
54	ARISTOTLE	RFA-02-P23-70B-350-R	PIFA	-5	N/A	IPEX
55	ARISTOTLE	RFA-02-P24-70-305-L	PIFA	-5	N/A	IPEX
56	ARISTOTLE	RFA-02-P24-70B-340-R	PIFA	-5	N/A	IPEX
57	WNC	81.EEO15.001 (Main) 81.EEO15.002 (Aux)	PIFA	1.52 1.72	1.86 2.03	IPEX
58	HON HAI	WDAN-M1OS1001-DF(Main) WDAN-M1OS1002-DF(Aux)	PIFA	0.13 -0.13	-1.871 -2.072	IPEX
59	Amphenol KAE	SS-03-03-099 (Main) SS-03-03-100 (Aux)	PIFA	0.77 -0.90	1.59 1.76	IPEX
60	WNC	81.EHD15.003 (Main) 81.EHD15.002 (Aux)	PIFA	0.94 -0.77	1.39 1.71	IPEX
61	Foxconn	WDAN-M1SN1002-DF(Main) WDAN-M1SN1001-DF(Aux)	PIFA	0.93 -0.53	-1.357 -1.727	IPEX
62	HON HAI	WDAN-M1NY1001-DF	PIFA	0.56	-0.054	U.FL
63	WNC	81.EHD15.004 (Main) 81.EHD15.006 (Aux)	PIFA	0.95 -0.49	1.07 1.82	IPEX
64	HON HAI	WDAN-M1WC1001-DF(Main) WDAN-M1BN1001-DF(Aux)	PIFA	-0.28 -0.14	-1.407 2.3	IPEX
65	WNC	81.EHD15.004 (Main) 81.EHD15.007 (Aux)	PIFA	0.95 -0.09	1.07 1.60	IPEX
66	HON HAI	WDAN-M1WC1001-DF(Main) WDAN-M1MM1001-DF(Aux)	PIFA	-0.28 -1.24	-1.407 1.99	IPEX
67	WNC	81.EHD15.G09 (Tx1) 81.EHD15.G10 (Tx2)	PIFA	0.31 -1.21	1.08 1.39	IPEX
68	HON HAI	WDAN-M1PB1001-DF (Tx1) WDAN-M1PB1002-DF(Tx2)	PIFA	0.54 -1.40	0.99 1.36	IPEX
69	WNC	81.EHD15.004 (Main) 81.EHD15.005 (Aux)	PIFA	0.95 -1.51	1.07 1.61	IPEX

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70	HON HAI	WDAN-M1WC1002-DF (Main) MDAN-M1WC1001-DF(Aux)	PIFA	0.18 -0.28	-0.866 -1.407	IPEX
71	JEM	M810L (WM-1) M810L (WM-1)	PIFA	-2.04 0.83	-1.46 -1.14	IPEX
72	wgt	M810L (WM-1) M810L (Wimax-2)	PIFA	2.1 2.99	N/A	IPEX
73	wgt	M980N (WM1) M980N (WM2)	PIFA	2.94 2.04	N/A	IPEX
74	FVC	TN120R-WLAN-1 TN120R-WLAN-2	PIFA	0.9 2.8	N/A	IPEX
75	FVC	W760-WiMAX-1 W760-WiMAX-2	PIFA	2.87 2.08	N/A	IPEX
76	Kim Well	89G 17356Z 61	PIFA	1.04	N/A	IPEX
77	ACON	APP6P-700261	PIFA	3.08	N/A	IPEX
78	TYCO	TBN007 (Tx1) TBN007 (Tx2)	PIFA	1.98 1.97	-0.97 -0.97	IPEX
79	Favortron	K05007010501 (WM-1) K05007010601 (WM-2)	PIFA	1.54 2.68	-2.71 -1.36	IPEX
80	Well Green	SKR13WMPB01+A (Tx1) SKR13WMPB01+A (Rx2)	PIFA	0.73 -0.98	-2.01 -2.01	IPEX
81	Well Green	SK840WMPB01+B (Tx1) SK840WMPB01+B (Rx2)	PIFA	-0.16 0.74	-1.81 -1.62	IPEX
82	Favortron	N01001146001 (WM-1) N01001146001 (WM-2)	PIFA	0.71 2.05	-2.69 -2.71	IPEX
83	Favortron	K05007009701 (WM-1) K05007009801 (WM-2)	PIFA	0.46 -0.29	-2.73 -3.87	IPEX
84	wgt	C4800 (WM-1) C4800 (WM-2)	PIFA	2.6 3.04	N/A	IPEX
85	wgt	D900F (WM-1) D900F (WM-2)	PIFA	2.76 1.13	N/A	IPEX
86	wgt	T890M (ANT-1) T890M (ANT-2)	PIFA	2.93 -0.32	N/A	IPEX

* The max antenna gain is 3.95dBi

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Additional antenna specifications

Item	Antenna Vendor	Model name	Antenna Type	Gain (dBi) With cable loss	Cable loss (dB)	Connector Type
1	WNC	81.EBC15.GAA (Main) 81.EBC15.GAA (Aux)	PIFA	-1.18 -0.36	0.35 0.47	IPEX
2	YAGEO	CAN4313748012501B (Main) CAN4313907022501B (Aux)	PIFA	-2.08 0.67	N/A	IPEX IpeX/Hirose/Technova
3	WNC	81.XCC15.G03 (Main) 81.KEM15.G01 (Aux)	Dipole PIFA	2.56 0.05	0.96 0.67	IPEX Bellweather

The max antenna gain is 2.56dBi which was choosing for Radiated Spurious Emission test.

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1.1 Standard Applicable

According to §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission’s guideline.

This is a Mobile device, the MPE is required.

According to §1.1310 and §2.1093 RF exposure is calculated.

Limits for Maximum Permissible Exposure (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Averaging Time (minute)
Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f ²)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	F/1500	30
1500-15000	/	/	1.0	30

F = frequency in MHz

* = Plane-wave equipment power density

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1.2 Maximum Permissible Exposure (MPE) Evaluation

802.11b Power Table

Frequency (MHz)	Reading Power (dBm)	Cable Loss	Output Power (dBm)	Output Power (W)	Limit (W)
2412.00	19.90	0.00	19.90	0.09772	1
2437.00	19.62	0.00	19.62	0.09162	1
2462.00	19.59	0.00	19.59	0.09099	1

MPE Prediction (802.11b)

Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = PG / 4 \pi R^2$$

Where: 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

Maximum peak output power at antenna input terminal:	19.9	(dBm)
Maximum peak output power at antenna input terminal:	97.7237221	(mW)
Duty cycle:	100	(%)
Maximum Pav :	97.7237221	(mW)
Antenna gain (typical):	2.56	(dBi)
Maximum antenna gain:	1.803017741	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2412	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm ²)
Power density at predication frequency at 20 (cm)	0.0350712	(mW/cm ²)

Measurement Result

The predicted power density level at 20 cm is 0.0350 mW/cm². This is below the uncontrolled exposure limit of 1 mW/cm² at 2412MHz.

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802.11g Power Table

Frequency (MHz)	Reading Power (dBm)	Cable Loss	Output Power (dBm)	Output Power (W)	Limit (W)
2412.00	17.71	0.00	17.71	0.05902	1
2437.00	17.73	0.00	17.73	0.05959	1
2462.00	17.80	0.00	17.80	0.06026	1

MPE Prediction (802.11g)

Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = PG / 4 \pi R^2$$

Where: 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

Maximum peak output power at antenna input terminal:	17.8	(dBm)
Maximum peak output power at antenna input terminal:	60.25595861	(mW)
Duty cycle:	100	(%)
Maximum Pav :	60.25595861	(mW)
Antenna gain (typical):	2.56	(dBi)
Maximum antenna gain:	1.803017741	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2462	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm ²)
Power density at predication frequency at 20 (cm)	0.0216247	(mW/cm ²)

Measurement Result

The predicted power density level at 20 cm is 0.0216 mW/cm². This is below the uncontrolled exposure limit of 1 mW/cm² at 2462.

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802.11n_20M Power Table

Frequency (MHz)	Reading Power (dBm)	Cable Loss	Output Power (dBm)	Output Power (W)	Limit (W)
2412.00	16.64	0.00	16.64	0.04613	1
2437.00	16.36	0.00	16.36	0.04325	1
2462.00	16.60	0.00	16.60	0.04571	1

MPE Prediction (802.11n_20M)

Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = PG / 4 \pi R^2$$

Where: 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

Maximum peak output power at antenna input terminal:	16.64	(dBm)
Maximum peak output power at antenna input terminal:	46.13175746	(mW)
Duty cycle:	100	(%)
Maximum Pav :	46.13175746	(mW)
Antenna gain (typical):	2.54	(dBi)
Maximum antenna gain:	1.794733627	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2462	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm ²)
Power density at predication frequency at 20 (cm)	0.0164797	(mW/cm ²)

Measurement Result

The predicted power density level at 20 cm is 0.0164 mW/cm². This is below the uncontrolled exposure limit of 1 mW/cm² at 2462.

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802.11n_40M Power Table

Frequency (MHz)	Reading Power (dBm)	Cable Loss	Output Power (dBm)	Output Power (W)	Limit (W)
2422.00	16.63	0.00	16.63	0.04603	1
2437.00	16.81	0.00	16.81	0.04797	1
2452.00	16.69	0.00	16.69	0.04667	1

MPE Prediction (802.11n_40M)

Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = PG / 4 \pi R^2$$

Where: 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

Maximum peak output power at antenna input terminal:	16.81	(dBm)
Maximum peak output power at antenna input terminal:	47.97334486	(mW)
Duty cycle:	100	(%)
Maximum Pav :	47.97334486	(mW)
Antenna gain (typical):	2.54	(dBi)
Maximum antenna gain:	1.794733627	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2437	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm ²)
Power density at predication frequency at 20 (cm)	0.0171376	(mW/cm ²)

Measurement Result

The predicted power density level at 20 cm is 0.0171 mW/cm². This is below the uncontrolled exposure limit of 1 mW/cm² at 2437.

~ End of Report ~