

RADIO FREQUENCY RADIATION EXPOSURE REPORT

Mobiles /Fixed Base Station Maximum Permissible Exposure (MPE)

OF

Product Name: 802.11b/g/n RTL8191SU miniCard

Brand Name: N/A

Model Name: RTL8191SU

Model Different: N/A

FCC ID: TX2-RTL8191SU

IC: 6317A-RTL8191SU

Report No.: ER/2009/90039~40

Issue Date: Sep. 23, 2009

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: Silex

FCC ID: TX2-RTL8191SU

IC: 6317A-RTL8191SU

Model No.: RTL8191SU

Model Difference: N/A

File Number: ER/2009/90039~40



Date of test: Sep. 15, 2009 ~ Sep. 23, 2009

Date of EUT Received: Sep. 15, 2009

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 and RSS102.

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

Test By:		Date	Sep. 23, 2009
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Prepared By:		Date	Sep. 23, 2009
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Approved By:		Date	Sep. 23, 2009
	_____ <i>Vincent Su/Manager</i>		_____

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Report Version

Version No.	Date	Description
00	Sep. 23, 2009	Initial creation of document

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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: 19.92 dBm 802.11 g: 17.81 dBm 802.11 n_20MHz: 16.79 dBm 802.11 n_40MHz: 16.86 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: 3.95 dBi, See next page for Antenna list
Type of Emission:	36M0M7D

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

Antenna Specification

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

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17	ACON	ASAA 001 (L) ASAA 001 (R)	PIFA	1.56 1.36	N/A	IPEX
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	HB Y07 (TX1) HB Y07 (TX2)	PIFA	2.19 -0.33	0.95 0.95	IPEX

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32	Hitachi	HBV051 (TX1) HBV051 (TX2)	PIFA	2.91 2.82	0.95 0.95	IPEX
33	Hitachi	HBV052 (TX1) HBV052 (TX2)	PIFA	0.27 0.02	0.95 0.95	IPEX
34	Hitachi	HBV061 (TX1) HBV061 (TX2)	PIFA	1.30 2.42	0.95 0.95	IPEX
35	Hitachi	HBV062 (TX1) HBV062 (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	T BN005 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) CAN4343880012501B (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

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50	WNC	WNC003 (Main) WNC003 (Aux)	PIFA	0.52 1.07	1.49 2.13	IPEX
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 (WM1) M810L (WM2)	PIFA	-2.04 0.83	-1.46 -1.14	IPEX
72	wgt	M810L (WM1) M810L (WM2)	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 (WM1) W760 (WM2)	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 (WM1) C4800 (WM2)	PIFA	2.6 3.04	N/A	IPEX
85	wgt	D900F (WM1) D900F (WM2)	PIFA	2.76 1.13	N/A	IPEX
86	wgt	T890M (WM1) T890M (WM2)	PIFA	2.93 -0.32	N/A	IPEX

The max antenna gain is 3.95dBi which was choosing for MPE calculation.

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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

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	19.92	0.00	19.92	0.09817	1
2437.00	19.90	0.00	19.90	0.09772	1
2462.00	19.71	0.00	19.71	0.09354	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:	19.92	(dBm)
Maximum peak output power at antenna input terminal:	98.1747943	(mW)
Duty cycle:	100	(%)
Maximum Pav :	98.1747943	(mW)
Antenna gain (typical):	3.95	(dBi)
Maximum antenna gain:	2.483133105	(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)	0.0485233	(mW/cm ²)

Measurement Result

The predicted power density level at 20 cm is 0.0485 mW/cm². This is below the uncontrolled exposure limit of 1 mW/cm² at 2412MHz.

802.11g Power Table

Frequency (MHz)	Reading Power (dBm)	Cable Loss	Output Power (dBm)	Output Power (W)	Limit (W)
2412.00	17.73	0.00	17.73	0.05929	1
2437.00	17.80	0.00	17.80	0.06026	1
2462.00	17.81	0.00	17.81	0.06039	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:	17.81	(dBm)
Maximum peak output power at antenna input terminal:	60.39486294	(mW)
Duty cycle:	100	(%)
Maximum Pav :	60.39486294	(mW)
Antenna gain (typical):	3.95	(dBi)
Maximum antenna gain:	2.483133105	(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)	0.0298504	(mW/cm ²)

Measurement Result

The predicted power density level at 20 cm is 0.0299 mW/cm². This is below the uncontrolled exposure limit of 1 mW/cm² at 2462.

802.11n_20M Power Table

Frequency (MHz)	Reading Power (dBm)	Cable Loss	Output Power (dBm)	Output Power (W)	Limit (W)
2412.00	16.71	0.00	16.71	0.04688	1
2437.00	16.37	0.00	16.37	0.04335	1
2462.00	16.79	0.00	16.79	0.04775	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:	16.79	(dBm)
Maximum peak output power at antenna input terminal:	47.75292737	(mW)
Duty cycle:	100	(%)
Maximum Pav :	47.75292737	(mW)
Antenna gain (typical):	3.95	(dBi)
Maximum antenna gain:	2.483133105	(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)	0.0236021	(mW/cm ²)

Measurement Result

The predicted power density level at 20 cm is 0.0236 mW/cm². This is below the uncontrolled exposure limit of 1 mW/cm² at 2462.

802.11n_40M Power Table

Frequency (MHz)	Reading Power (dBm)	Cable Loss	Output Power (dBm)	Output Power (W)	Limit (W)
2422.00	16.70	0.00	16.70	0.04677	1
2437.00	16.86	0.00	16.86	0.04853	1
2452.00	16.75	0.00	16.75	0.04732	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:	16.86	(dBm)
Maximum peak output power at antenna input terminal:	48.52885002	(mW)
Duty cycle:	100	(%)
Maximum Pav :	48.52885002	(mW)
Antenna gain (typical):	3.95	(dBi)
Maximum antenna gain:	2.483133105	(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)	0.0239856	(mW/cm ²)

Measurement Result

The predicted power density level at 20 cm is 0.0240 mW/cm². This is below the uncontrolled exposure limit of 1 mW/cm² at 2437.

~ End of Report ~

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