SGS-CSTC Standards Technical Services Co., Ltd.
Shenzhen Branch

No. 1 Workshop, M-10, Middle section, Science & Technology Park,
Shenzhen, Guangdong, China 518057
Telephone: +86 (0) 755 2601 2053
Fax: +86 (0) 755 2671 0594
Email: ee.shenzhen@sgs.com

RF Exposure Evaluation Report

Application No.:	SZEM1709009824CR
Applicant:	Sunwave Communications Co., Ltd
Manufacturer:	Sunwave Communications Co., Ltd
Factory:	Sunwave Communications Co., Ltd
Product Name:	Remote Unit
Product Description:	The RU conducts digital-analog conversion and power amplification of the input signals.
Model No.(EUT):	iDAS-R205
Trade Mark:	CROSSFIRE,SUNWAVE
FCC ID:	2AEJ4-R205
Standards:	47 CFR Part 1.1307 (2016) 47 CFR Part 1.1310 (2016)
Date of Receipt:	2017-08-15
Date of Test:	2017-08-15 to 2017-09-26
Date of Issue:	2017-09-28
Test Result :	**PASS***

* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:

Jack Zhang
EMC Laboratory 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.

2 Version

Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
01		2017-09-28		Original

Authorized for issue by:				
Tested By		Edison Li **Edison Li /Project Engineer**		2017-09-28 **Date**
Checked By		Eric Fu **Eric Fu /Reviewer**		2017-09-28 **Date**

3 Contents

4 General Information

4.1 Client Information

Applicant:	Sunwave Communications Co., Ltd.
Address of Applicant:	Sunwave Building 581 Huoju Avenue, Binjiang District, Hangzhou, P.R.China Zip: 310053
Manufacturer:	Sunwave Communications Co., Ltd.
Address of Manufacturer:	Sunwave Building 581 Huoju Avenue, Binjiang District, Hangzhou, P.R.China Zip: 310053
Factory:	Sunwave Communications Co., Ltd.
Address of Factory:	Sunwave Building 581 Huoju Avenue, Binjiang District, Hangzhou, P.R.China Zip: 310053

4.2 General Description of EUT

Product Name:	Remote Unit
Model No.:	iDAS-R205
Trade Mark:	CROSSFIRE,SUNWAVE
Sample Type:	Fixed production
Antenna Gain:	6dBi
Power Supply:	AC120V 60Hz
Optical Fiber:	200cm (unshielded)
DC Cable:	150cm (unshielded)
Type of Modulation:	LTE, WCDMA, CDMA
Frequency Band:	Downlink 1930MHz to 1995MHz include the Modulation: LTE, WCDMA, CDMA; Downlink 2110MHz to 2180MHz include the Modulation:LTE, WCDMA

4.3 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch

No. 1 Workshop, M-10, Middle section, Science & Technology Park, Shenzhen, Guangdong, China 518057

Telephone: +86 (0) 755 2601 2053 Fax: +86 (0) 755 2671 0594

No tests were sub-contracted.

4.4 Test Facility

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

• **CNAS (No. CNAS L2929)**

CNAS has accredited SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab to ISO/IEC 17025:2005 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.

• **A2LA (Certificate No. 3816.01)**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

• **VCCI**

The 10m Semi-anechoic chamber and Shielded Room of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-823, R-4188, T-1153 and C-2383 respectively.

• **FCC –Designation Number: CN1178**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized as an accredited testing laboratory.

Designation Number: CN1178. Test Firm Registration Number: 406779.

• **Industry Canada (IC)**

Two 3m Semi-anechoic chambers and the 10m Semi-anechoic chamber of SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab have been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 4620C-1, 4620C-2, 4620C-3.

4.5 Deviation from Standards

None.

4.6 Abnormalities from Standard Conditions

None.

4.7 Other Information Requested by the Customer

None.

5 RF Exposure Evaluation

5.1 RF Exposure Compliance Requirement

5.1.1 Limits

According to FCC Part1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in part1.1307(b)

TABLE 1—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 (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*(900/f^2)	6
30–300	61.4	0.163	1.0	6
300–1500	.....	.....	f/300	6
1500–100,000	.....	.....	5	6
(B) 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
1500–100,000	.....	.....	1.0	30

F= Frequency in MHz

Friis Formula

Friis transmission formula: Pd = (Pout*G)/(4* Pi * R 2)

Where

Pd = power density in mW/cm2

Pout = output power to antenna in mW

G = gain of antenna in linear scale

Pi = 3.1416

R = distance between observation point and center of the radiator in cm, manufacture declared the R is 20cm

Pd id the limit of MPE, 5 mW/cm2 . If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance r where the MPE limit is reached.

5.1.2 Test Procedure

Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

4.1.3 EUT RF Exposure Evaluation

1) exposure conditions for standalone operations for booster

Antenna Gain: 6 dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 4 in linear scale.

MPE Evaluation and MPE Ratio result:

1930~1995MHz							
Mode	Maximun Antenna Gain (dBi)	Maximum Antenna Gain (Numeric)	Peak Output Power including turn-up tolerance (dBm)	Peak Output Power (mW)	Power density (mW/cm2)	Power density (mW/cm2)	MPE Ratio
DL	6	4	17	50.12	0.0399	5	0.00798

2110~2180MHz							
Mode	Maximun Antenna Gain (dBi)	Maximum Antenna Gain (Numeric)	Peak Output Power including turn-up tolerance (dBm)	Peak Output Power (mW)	Power density (mW/cm2)	Power density (mW/cm2)	MPE Ratio
DL	6	4	17	50.12	0.0399	5	0.00798

2) exposure conditions for standalone operations for Bluetooth

Antenna Gain: -1.0 dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 0.80 in linear scale.

MPE Evaluation and MPE Ratio result:

BT							
Mode	Maximun Antenna Gain (dBi)	Maximum Antenna Gain (Numeric)	Peak Output Power including turn-up tolerance (dBm)	Peak Output Power including turn-up tolerance (mW)	Power density (mW/cm2)	Power density (mW/cm2)	MPE Ratio
Bluetooth	-1.0	0.80	8.84	7.66	0.0012	5	0.00024

Note: Antenna gain and output power fo Bluetooth is according to FCC ID: S78-I482E.

Exposure conditions for simultaneous transmission operation:

For the product provide 2*2 MIMO, when evaluate MPE two antennas should be taken into consideration.
We have evaluate all modes including two antennas transmit in 1930~1995MHz frequency range, two antennas transmit in 2110~2180MHz frequency range, one antenna transmit in 1930~1995MHz frequency range and another antenna transmit in 2110~2180MHz frequency range.
SAR test is not required for the simultaneous transmission MPE ratio is less than 1.0.
Simultaneous transmission MPE ratio: 0.00798*2+0.00024=0.0162