

RF Exposure Evaluation Report

Application No.: SZEM2102002030CR
Applicant: AJAX SYSTEMS CYPRUS HOLDINGS LTD
Address of Applicant: Ifigeneias, 17, Strovolos, 2007, Nicosia, Cyprus
Manufacturer: AJAX SYSTEMS MANUFACTURING LIMITED LIABILITY COMPANY
Address of Manufacturer: Sklyarenka, 5, Kyiv, 04073, Ukraine
Factory: AJAX SYSTEMS MANUFACTURING LIMITED LIABILITY COMPANY
Address of Factory: Sklyarenka, 5, Kyiv, 04073, Ukraine

Equipment Under Test (EUT):

Product Name: Security control panel
Model No.: Ajax Hub 2 Plus (9NA/AFA)
Trade Mark: AJAX
FCC ID: 2AX5VHUB2PL
Standards: 47 CFR Part 1.1307
 47 CFR Part 1.1310
 47 CFR Part 2.1091
Date of Receipt: 2021-03-23
Date of Test: 2021-02-24 to 2021-03-25
Date of Issue: 2021-03-29

Test Result :	PASS*
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* In the configuration tested, the EUT complied with the standards specified above.



Keny Xu
 EMC Laboratory Manager



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 Shenzhen Branch EMC Testing Laboratory

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2 Version

Revision Record				
Version	Chapter	Date	Modifier	Remark
01		2021-03-29		Original

Authorized for issue by:			
		<i>Edison Li</i>	
		Edison Li/Project Engineer	
		<i>Eric Fu</i>	
		Eric Fu/Reviewer	





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4 General Information

4.1 General Description of EUT

Power supply:	AC 110~240V, 50/60Hz, 0.1A Backup Battery: 3.7V, Rechargeable Li-ion, 3000mAh
Cable(s):	AC cable:142cm unshielded network cable:94cm unshielded
Sample Type:	Fixed device
Environment:	Uncontrolled Environment
For Jeweller	
Operation Frequency:	905MHz to 926.5MHz
Spectrum Spread Technology:	Frequency Hopping Spread Spectrum(FHSS)
Modulation Type:	GFSK
Number of Channels:	The number of available frequency hopping channels of this device is 103, only 101 channels are used in normal operation and constantly involved, 2 is reserve in case of jamming.
Antenna Type:	PCB
Antenna Gain:	Antenna1: -5dBi, Antenna2: -6dBi Note: The two antennas can't simultaneous transmission because it's forbidden in firmware.
For Wings	
Operation Frequency:	905MHz to 926.5MHz
Spectrum Spread Technology:	Frequency Hopping Spread Spectrum(FHSS)
Modulation Type:	GFSK
Number of Channels:	The number of available frequency hopping channels of this device is 103, only 101 channels are used in normal operation and constantly involved, 2 is reserve in case of jamming.
Antenna Type:	PCB
Antenna Gain:	Antenna1: -6dBi, Antenna2: -6dBi Note: The two antennas can't simultaneous transmission because it's forbidden in firmware.





For 802.11b/g/n	
Operation Frequency:	802.11b/g/n(HT20): 2412MHz to 2462MHz
Modulation Type:	802.11b: DSSS(CCK, DQPSK, DBPSK) 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK) 802.11n(HT20): OFDM (BPSK, QPSK, 16QAM, 64QAM)
Channel Numbers:	802.11b/g, 802.11n HT20: 11 Channels
Antenna Type:	Flexible Inverted
Antenna Gain:	2dBi

For WCDMA/LTE module*	
Operation Frequency Band:	WCDMA Band II,IV,V; LTE FDD Band 2,4, 12
Modulation Type:	WCDMA: QPSK LTE: QPSK, 16QAM
HSDPA UE Category:	24
HSUPA UE Category:	6
LTE Category:	4
Antenna Type:	Flexible Multiband
Antenna Gain:	3dBi

*: The GSM/WCDMA/LTE single module approval by TCB(FCC ID:XMR201606EC21A), Grant at 04/13/2017.



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4.2 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.

4.3 Test Facility

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

- **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 3m Fully-anechoic chamber for above 1GHz, 10m Semi-anechoic chamber for below 1GHz, Shielded Room for Mains Port Conducted Interference Measurement and Telecommunication Port Conducted Interference Measurement of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-20026, R-14188, C-12383 and T-11153 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.

- **Innovation, Science and Economic Development Canada**

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

CAB identifier: CN0006.

IC#: 4620C.

4.4 Deviation from Standards

None.

4.5 Abnormalities from Standard Conditions

None.

4.6 Other Information Requested by the Customer

None.



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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: $Pd = (Pout \cdot G) / (4 \cdot \pi \cdot R^2)$

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

Pd id the limit of MPE, f/1500 or 1 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

For jeweller:

Antenna Gain: -5dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 0.32 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Antenna	Max Antenna Gain (dBi)	Max Antenna Gain (Numeric)	Max tune-up tolerance power (dBm)	Max tune-up Tolerance power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)	Limit (mW/cm ²)	MPE Ratios	Result
1	-5	0.32	13.23	21.04	0.0013	0.6033	0.0022	PASS

Note: Refer to report No. SZEM210200203002 or EUT test Max Conducted Peak Output Power value.

The distancer (4th column) calculated from the Fries transmission formula is far greater than 20 cm separation requirement; the limit range of 905MHz-926.5MHz is 0.6033~0.6177 mW/cm², The max PSD should need to be less than or equal to the minimum limit;

For Wings:

Antenna Gain: -6dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 0.25 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Antenna	Max Antenna Gain (dBi)	Max Antenna Gain (Numeric)	Max tune-up tolerance power (dBm)	Max tune-up Tolerance power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)	Limit (mW/cm ²)	MPE Ratios	Result
1	-6	0.25	8.33	6.81	0.0003	0.6033	0.0006	PASS

Note: Refer to report No. SZEM210200203003 or EUT test Max Conducted Peak Output Power value.

The distancer (4th column) calculated from the Fries transmission formula is far greater than 20 cm separation requirement; the limit range of 905MHz-926.5MHz is 0.6033~0.6177 mW/cm², The max PSD should need to be less than or equal to the minimum limit;



For 2.4G WIFI:

Antenna Gain: 2dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 1.58 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Antenna	Max Antenna Gain (dBi)	Max Antenna Gain (Numeric)	Max tune-up tolerance power (dBm)	Max tune-up Tolerance power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)	Limit (mW/cm ²)	MPE Ratios	Result
1	2	1.58	15.67	36.90	0.0116	1	0.0116	PASS

Note: Refer to report No. SZEM210200203004 or EUT test Max Conducted Peak Output Power value.

The distancer (4th column) calculated from the Fries transmission formula is far greater than 20cm separation requirement; the limit range of 2412MHz-2462MHz is 1 mW/cm², The max PSD should need to be less than or equal to the minimum limit;

For WCDMA/LTE module:

The max tune-up tolerance power Into Antenna & RF Exposure Evaluation Distance:

Type	Test Freq. (MHz)	Max Antenna Gain (dBi)	Max Antenna Gain (Numeric)	Max tune-up tolerance power (dBm)	Max tune-up Tolerance power to Antenna (mW)	Power Density at R=20cm (mW/cm ²)	Limit (mW/cm ²)	MPE Ratios	Result
WCDMA Band II	1852.4	3	2.00	23.5	223.87	0.0889	1	0.0889	PASS
WCDMA Band IV	1712.4	3	2.00	23.5	223.87	0.0889	1	0.0889	PASS
WCDMA Band V	826.4	3	2.00	23.5	223.87	0.0889	0.5509	0.1613	PASS
LTE Band2	1850.7	3	2.00	24	251.19	0.0997	1	0.0997	PASS
LTE Band4	1710.7	3	2.00	24	251.19	0.0997	1	0.0997	PASS
LTE Band12	699.7	3	2.00	24	251.19	0.0997	0.4665	0.2138	PASS

Note: Refer to report No. RKS170320003-00A or EUT test Max Conducted Peak Output Power value.

The distancer (4th column) calculated from the Fries transmission formula is far greater than 20 cm separation requirement.

the limit range of 300MHz-1500MHz is f/1500 mW/cm²,



Both Jeweller antennas can't simultaneous transmission, and both wings antennas can't simultaneous Transmission;

The simultaneous transmission result between of Jeweller, Wings, 2.4G WiFi and WCDMA/LTE module:

The SAR Exclusion Threshold Level:

$$= \text{CPD1} / \text{LPD1} + \text{CPD2} / \text{LPD2} + \text{CPD3} / \text{LPD3} + \text{CPD4} / \text{LPD4}$$

(CPD = Calculation power density, LPD = Limit of power density)

$$= (0.0013/0.6033) + (0.0003/0.6033) + (0.0116/1) + (0.0997/0.4665) = 0.2282 < 1$$

Since the SAR Exclusion Threshold Level is well below the SAR low threshold level, so the EUT is considered to comply with SAR requirement without testing.

- End of the Report -

