

FCC Test Report

Report Number : 708882047120-00 Date of Issue: Dec. 22,2020

Model / Serial No. : OVU810019/01R, OVU8100YY/ZZR, ("Y"=0-9, "Z"=0-9. YY means the different running series of the product family. ZZ means version change)

FCC ID : 2AGOF OVU8100A

Product Type : SENTINEL READER

Applicant : HCS (Suzhou) Limited

Manufacturer : HCS (Suzhou) Limited

License holder : HCS (Suzhou) Limited

Address : 19F-20F, Building B-3rd, No.209 Zhuyuan Road,
New District,215011 Suzhou PEOPLE'S REPUBLIC OF CHINA

Test Result : ☒ Positive ☐ Negative

Total pages : 24

Date of Test : Dec 21,2020

Prepared by : *Jiaxi Xu* Dec. 22,2020

Approved by : Jiaxi XU

Zhining ZHANG

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1. Report Modification Record

Alterations and additions to this report will be issued to the holders of each copy in the form of a complete document.

Issue	Description of Change	Date of Issue
1	First Issue	12/22/2020

2. Test Facility

Test Site ☒ TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
No.16, Lane 1951, Du Hui Road, Shanghai 201108, P.R. China
(Test Firm Registration Number: 820234)
Telephone: +86 21 60379100 Fax: +86 21 60379100

☐ TÜV SÜD Certification and Testing (China) Co., Ltd.
10 Huaxia Road(M), Dongting, Wuxi, Jiangsu, 214100, P.R. China
Telephone: +86 0510 88203737 Fax: +86 0510 88203636

Test Firm 820234
Registration
Number:

Telephone: +86 21 6141 0123
Fax: +86 21 6140 8600

Ambient Condition in laboratory:

Items	Test	Required(IEC68-1)	Actual
Temperature(°C)	ANSI.C 63.4 CE	15-35	22.3
Humidity (%)		25-75	45.3
Atmospheric Pressure(mbar)		860-1060	1031
Temperature(°C)	ANSI.C 63.4 RE	15-35	21.4
Humidity (%)		25-75	45.3
Atmospheric Pressure(mbar)		860-1060	1031



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3. EUT Information

3.1 EUT Description

Product Type	:	SENTINEL READER
Model / Serial No.	:	OVU810019/01R, OVU8100YY/ZZR, ("Y"=0-9, "Z"=0-9. YY means the different running series of the product family. ZZ means version change)
EUT Voltage	:	USB 5V

The sample's mentioned in this report is/are submitted/ supplied/ manufactured by client. The laboratory therefore assumes no responsibility for accuracy of information on the brand name, model number, origin of manufacture, consignment or any information supplied.

3.2 EUT Configuration

SENTINEL READER	:	OVU810019/01R, OVU8100YY/ZZR, ("Y"=0-9, "Z"=0-9. YY means the different running series of the product family. ZZ means version change)
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3.3 EUT Operating Mode

The equipment under test was operated under the following conditions during emissions testing:

- ☐ - Test Program (H - Pattern)
- ☐ - Test Program (Color Bar)
- ☐ - Test Program (Customer Specified)
- ☒ - Normal Operating Mode
- ☒ - Power On with the SENTINEL SHIELD (provided by client)



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3.4 Peripheral devices and interface cables were connected during the testing:

- - Notebook Type : E470
- - SENTINEL SHIELD Type : A051, A05A
- Type :

3.5 EUT Exercise Software:

The EUT is programmable and use the software named "Contact Trace".

3.6 EUT Modification

N/A

4. Test Summary

Test	Specification	Test Result	Remark
Conducted Emission	CFR47 Part 15 §15.107,	N/A	Refer to page 6-11
Radiated Emission	CFR47 Part 15 §15.109,	Pass	Refer to page 8-14

Remarks:

According to the Section 15.33 of FCC part 15, the work frequency is above 1GHz(2.480GHz), so the radiated emission range is 30MHz to 13000MHz. (5th harmonic)

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30.
1.705-108	1000.
108-500	2000.
500-1000	5000.
Above 1000	5th harmonic of the highest frequency or 40 GHz, whichever is lower.

The Equipment Under Test (EUT) is a SENTINEL READER. Products are identical to electrical structure, mechanical structure. There are only cosmetic differences (color /painting/printed). We chose model OVU810019/01R to test it and listed the worst data in this report.

5. Conducted Emission

5.1 Test Equipment

The following test equipments are used:

USED	Equipment Name	Model	Manufacturer	Equipment ID.	Calibration Date	Calibration Due Date
☒	EMI test receiver	ESR3	R&S	S1503001-YQ-EMC	2020-8-04	2021-8-03
☒	2-Line V-network	ENV216	R&S	S1503103-YQ-EMC	2020-8-04	2021-8-03
☐	4-Line V-network	ENV4200	R&S	S1503106-YQ-EMC	2020-8-04	2021-8-03

5.2 Test Specification

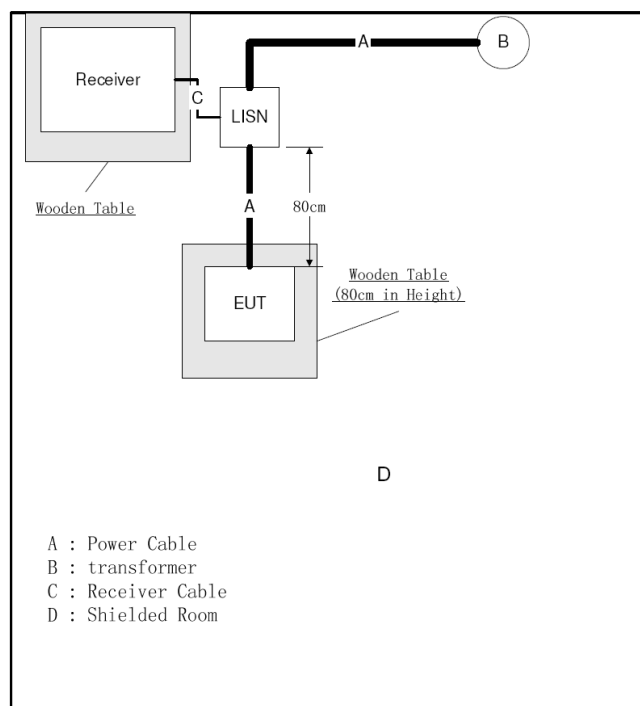
Tests are performed according to CFR47 Part 15 subpart B. Limit as below:

CFR47 Part 15 subpart B §15.107 Limits (dBμV)				
Frequency (MHz)	Class A		Class B	
	QP	AV	QP	AV
0.15-0.5	79	66	66-56	56-46
0.5-5.0	73	60	56	46
5.0-30	73	60	60	50

5.3 Test Procedure

The test is performed in shield room. EUT is placed on the table which is 80cm above ground plane and connected to a line Impedance Stabilization Network (LISN). The conducted emission is scanned over the frequency from 150KHz to 30MHz with peak detector. A final measurement is performed with quasi-peak detector and average detector. IF bandwidth is 10KHz.

5.4 Test Setup



5.5 Test Photo

Refer to the < Setup photo>



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5.6 Test Result

150k-30MHz Conducted Emission Test

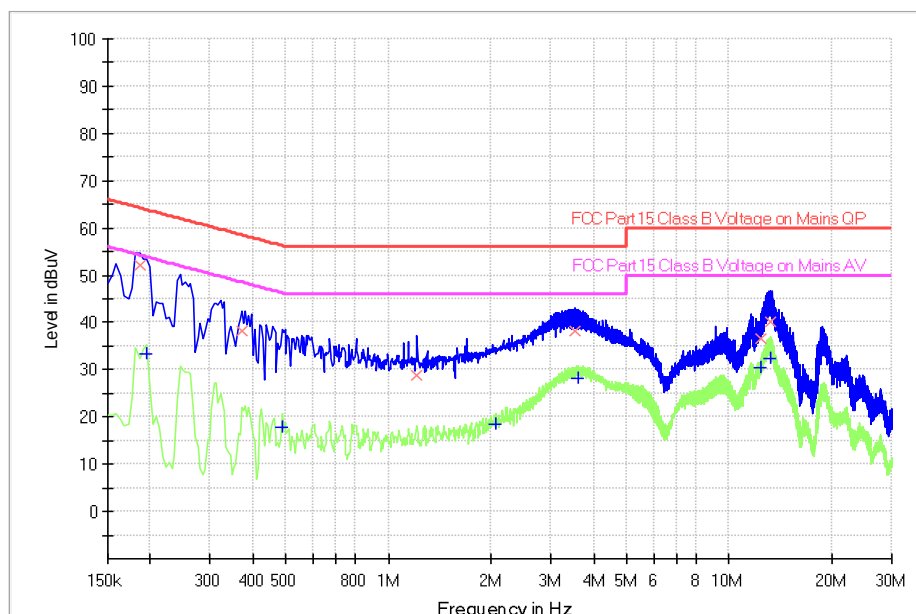
EUT Information

EUT Name: SENTINEL READER
Model: OVU810019/01R
Client: HCS (Suzhou) Limited
Op Cond: power on with SENTINEL SHIELD, DC5V, T22.3°C, H42.3%,
P103.1kPa
Operator: Shi Chaojun
Test Spec: FCC Part 15 Class B
Comment: L-line
Sample No: SHA-538830-1

Scan Setup: Voltage with 2-Line-LISN pre [EMI conducted]

Hardware Setup: Voltage with 2-Line-LISN
Receiver: [ESR 3]
Level Unit: dBuV

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamplifier
9 kHz - 150 kHz	100 Hz	PK+	200 Hz	0.01 s	0 dB
150 kHz - 30 MHz	4.5 kHz	PK+; AVG	9 kHz	0.01 s	0 dB





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Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.186000	52.15	---	64.21	12.06	1000.0	9.000	L1	19.5
0.195000	---	33.48	53.82	20.34	1000.0	9.000	L1	19.5
0.370500	38.27	---	58.49	20.22	1000.0	9.000	L1	19.5
0.487500	---	17.77	46.21	28.44	1000.0	9.000	L1	19.5
1.212000	28.77	---	56.00	27.23	1000.0	9.000	L1	19.5
2.058000	---	18.40	46.00	27.60	1000.0	9.000	L1	19.5
3.529500	38.15	---	56.00	17.85	1000.0	9.000	L1	19.5
3.597000	---	28.07	46.00	17.93	1000.0	9.000	L1	19.5
12.403500	36.53	---	60.00	23.47	1000.0	9.000	L1	19.7
12.403500	---	30.44	50.00	19.56	1000.0	9.000	L1	19.7
13.218000	40.00	---	60.00	20.00	1000.0	9.000	L1	19.7
13.236000	---	32.49	50.00	17.51	1000.0	9.000	L1	19.7



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150k-30MHz Conducted Emission Test

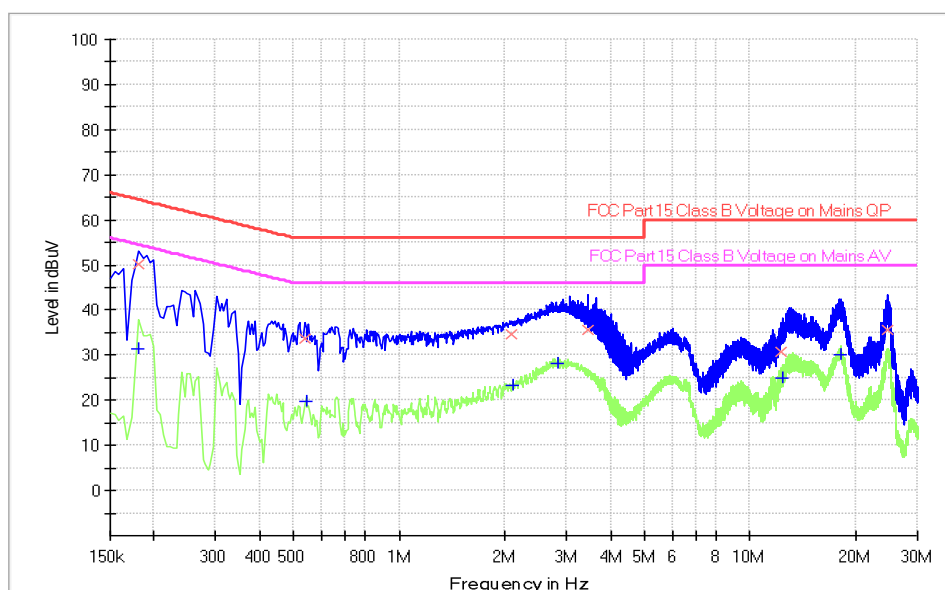
EUT Information

EUT Name: SENTINEL READER
Model: OVU810019/01R
Client: HCS (Suzhou) Limited
Op Cond: power on with SENTINEL SHIELD, DC5V, T22.3°C, H42.3%, P103.1kPa
Operator: Shi Chaojun
Test Spec: FCC Part 15 Class B
Comment: N-line
Sample No: SHA-538830-1

Scan Setup: Voltage with 2-Line-LISN pre [EMI conducted]

Hardware Setup: Voltage with 2-Line-LISN
Receiver: IESR 3I
Level Unit: dBuV

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
9 kHz - 150 kHz	100 Hz	PK+	200 Hz	0.01 s	0 dB
150 kHz - 30 MHz	4.5 kHz	PK+; AVG	9 kHz	0.01 s	0 dB



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Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.181500	---	31.51	54.42	22.91	1000.0	9.000	N	19.5
0.181500	50.25	---	64.42	14.17	1000.0	9.000	N	19.5
0.537000	33.52	---	56.00	22.48	1000.0	9.000	N	19.5
0.541500	---	19.78	46.00	26.22	1000.0	9.000	N	19.5
2.089500	34.63	---	56.00	21.37	1000.0	9.000	N	19.5
2.112000	---	23.27	46.00	22.73	1000.0	9.000	N	19.5
2.827500	---	28.28	46.00	17.72	1000.0	9.000	N	19.6
3.448500	35.66	---	56.00	20.34	1000.0	9.000	N	19.6
12.313500	30.63	---	60.00	29.37	1000.0	9.000	N	19.8
12.390000	---	24.97	50.00	25.03	1000.0	9.000	N	19.8
18.100500	---	29.99	50.00	20.01	1000.0	9.000	N	19.8
24.679500	35.72	---	60.00	24.28	1000.0	9.000	N	20.0

6 Radiated Emission

6.1 Test Equipment

The following test Equipment are used:

USED	Equipment Name	Model	Manufacturer	Equipment ID.	Calibration Date	Calibration Due Date
☒	EMI test receiver	ESR3	R&S	S1503109-YQ-EMC	2020-8-04	2021-8-03
☒	Trilog super broadband antenna	VULB 9168	SCHWARZBECK	S1808296-YQ-EMC	2019-3-16	2022-3-15
☒	Double-ridged waveguide horn antenna	HF907	R&S	S1503009-YQ-EMC	2018-4-02	2021-4-01
☒	Signal conditioning unit	SCU-18D	R&S	S1503012-YQ-EMC	2020-8-4	2021-8-03
☒	Signal and spectrum analyzer	FSV40	R&S	S1503003-YQ-EMC	2020-8-4	2021-8-03
☐	Double Ridged Horn Antenna	3116C-PA	ETS-Lindgren	487/621839	2019-9-26	2022-9-25

6.2 Test Specification

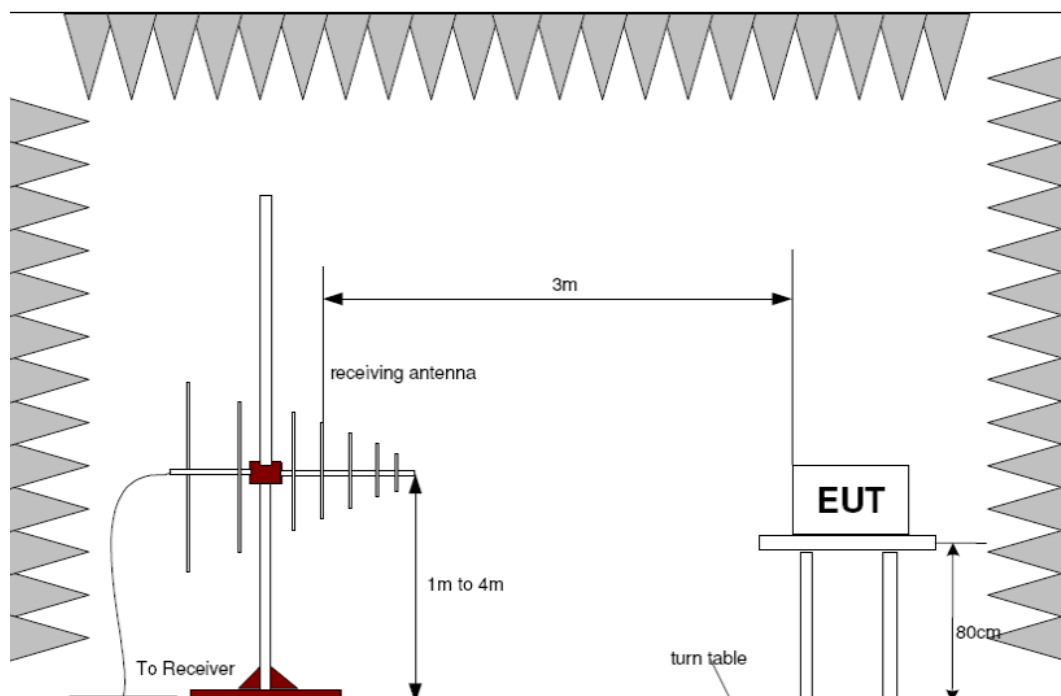
Tests are performed according to CFR47 Part 15 subpart B. Limit as below:

CFR47 Part 15 subpart B §15.109 (dBμV/m)				
Frequency (MHz)	Class A		Class B	
	Distance	QP	Distance	QP
30-88	10m	39	3m	40
88-216	10m	43.5	3m	43.5
216-960	10m	46.4	3m	46
Above 960	10m	49.5	3m	54

6.3 Test Procedure

The EUT is placed on a turntable which is 80cm above ground plane. The turn table rotates 360 degrees and antenna moves up and down between 1m and 4 m to find maximum emission. Both horizontal and vertical polarizations of antenna are set in the measurement. The EUT is positioned at 3m away from antenna.

6.4 Test Setup



Note: w : The dimension of the line tangent to the EUT formed by $\theta_{3\text{dB}}$ at the measurement distance 3m

w value	Measurement frequency band	Antenna Model
1.6m	1~18GHz	HF907
1.95m	18~26.5GHz	3116C-PA
0.74m	26.5~40GHz	3116C-PA



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6.5 Test Photo

Refer to the < Setup photo>



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6.6 Test Result

30-1000MHz Radiated Emission

EUT Information

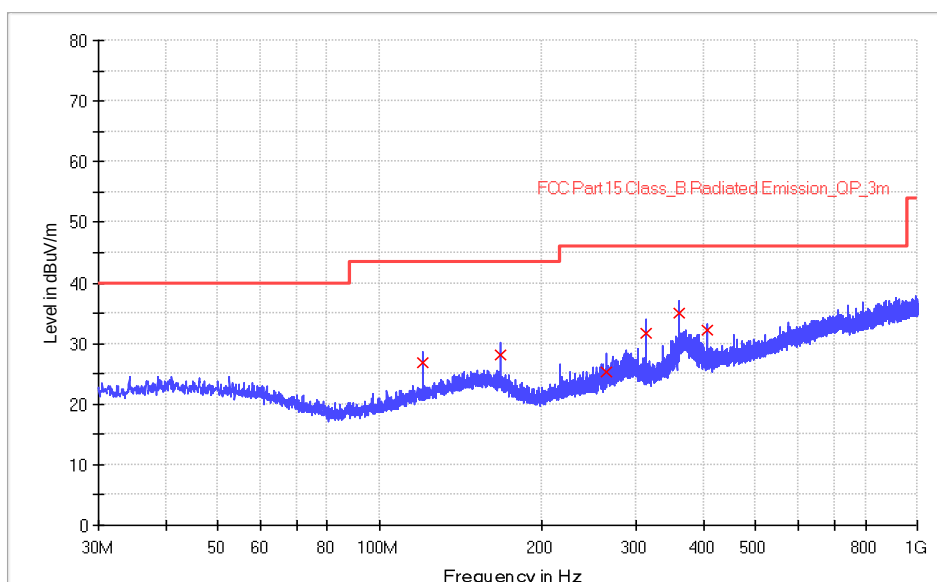
EUT Name: SENTINEL READER
Model: OVU810019/01R
Client: HCS (Suzhou) Limited
Op Cond: power on with SENTINEL SHIELD, DC5V, T21.4°C, H45.3%,
P103.1kPa
Operator: Shi Chaojun
Test Spec: FCC Part 15 Class B
Comment: Horizontal
Sample No: SHA-538830-1

Sweep Setup: RE_VULB9168_pre_Cont_30-1000 [EMI radiated]

Hardware Setup: RE VULB9168
Receiver: IESR 3I
Level Unit: dBuV/m

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamplifier
30 MHz - 1 GHz	48.5 kHz	PK+	120 kHz	0.005 s	20 dB

RE_VULB9168_pre_Cont_30-1000





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Limit and Margin

Frequency (MHz)	QuasiPeak (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBuV/m)
119.960000	26.8	1000.0	120.000	100.0	H	0.0	13.5	16.7	43.5
168.000000	28.0	1000.0	120.000	100.0	H	0.0	14.9	15.5	43.5
263.960000	25.3	1000.0	120.000	100.0	H	0.0	13.9	20.7	46.0
311.960000	31.7	1000.0	120.000	100.0	H	0.0	15.3	14.3	46.0
360.000000	34.9	1000.0	120.000	100.0	H	0.0	16.5	11.1	46.0
408.000000	32.2	1000.0	120.000	100.0	H	0.0	17.5	13.8	46.0



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1-18GHz Radiated Emission

EUT Information

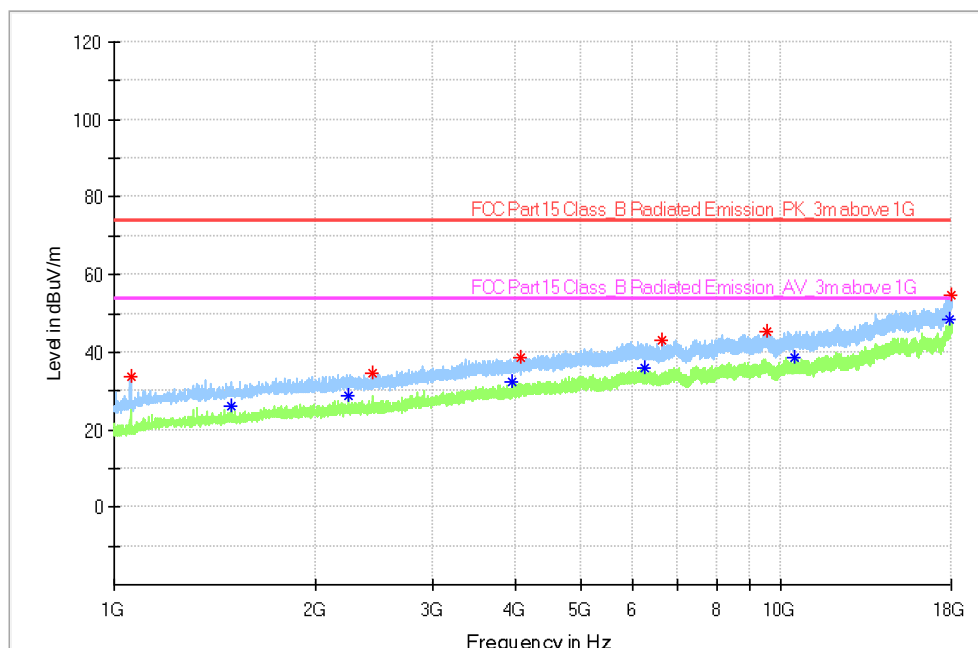
EUT Name: SENTINEL READER
Model: OVU810019/01R
Client: HCS (Suzhou) Limited
Op Cond: power on with SENTINEL SHIELD, DC5V, T21.4°C, H45.3%,
P103.1kPa
Operator: Shi Chaojun
Test Spec: FCC Part 15 Class B
Comment: Horizontal
Sample No: SHA-538830-1

Sweep Setup: RE_HF907_pre [EMI radiated]

Hardware Setup: RE HF907
Receiver: IFSV 401
Level Unit: dBuV/m

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
1 GHz - 18 GHz	566.667 kHz	PK+: AVG	1 MHz	0.2 s	0 dB

Full Spectrum





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Limit and Margin

Frequency (MHz)	MaxPeak (dBuV/m)	Average (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)
1499.800000	---	26.26	54.00	27.74	100.0	H	0.0
2437.633333	34.50	---	74.00	39.50	100.0	H	27.0
2250.066667	---	28.97	54.00	25.03	100.0	H	34.0
10470.700000	---	38.71	54.00	15.29	100.0	H	99.0
6632.666667	42.88	---	74.00	31.12	100.0	H	130.0
17952.400000	54.59	---	74.00	19.41	100.0	H	130.0
1058.366667	33.75	---	74.00	40.25	100.0	H	148.0
17942.766667	---	48.44	54.00	5.56	100.0	H	160.0
9507.933333	45.38	---	74.00	28.62	100.0	H	251.0
3941.566667	---	32.48	54.00	21.52	100.0	H	274.0
4071.333333	38.77	---	74.00	35.23	100.0	H	316.0
6248.466667	---	35.99	54.00	18.01	100.0	H	346.0



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30-1000MHz Radiated Emission

EUT Information

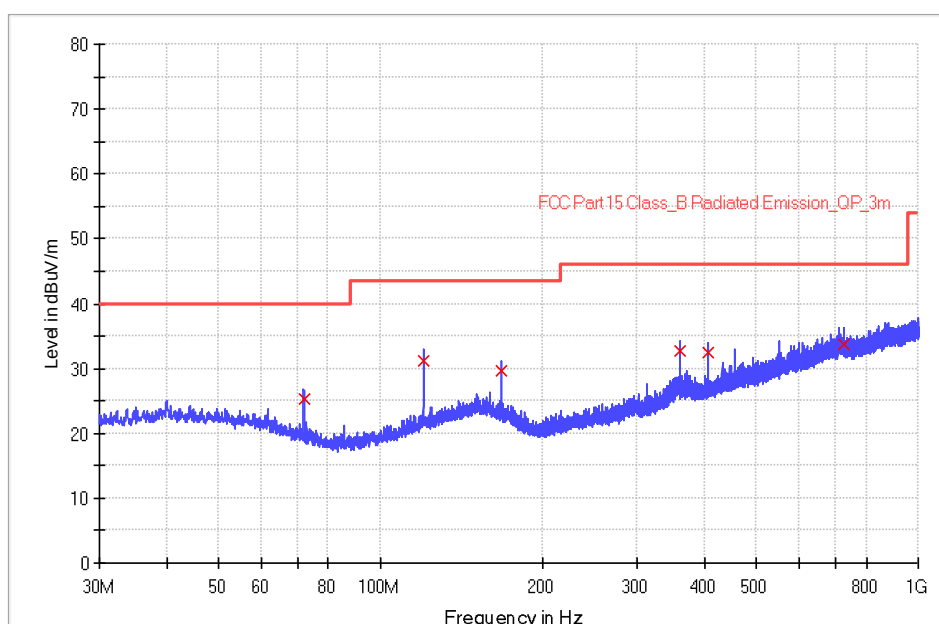
EUT Name: SENTINEL READER
Model: OVU810019/01R
Client: HCS (Suzhou) Limited
Op Cond: power on with SENTINEL SHIELD, DC5V, T21.4°C, H45.3%,
P103.1kPa
Operator: Shi Chaojun
Test Spec: FCC Part 15 Class B
Comment: Vertical
Sample No: SHA-538830-1

Sweep Setup: RE_VULB9168_pre_Cont_30-1000 [EMI radiated]

Hardware Setup: RE VULB9168
Receiver: IESR 3I
Level Unit: dBuV/m

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
30 MHz - 1 GHz	48.5 kHz	PK+	120 kHz	0.005 s	20 dB

RE_VULB9168_pre_Cont_30-1000





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Limit and Margin

Frequency (MHz)	QuasiPeak (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBuV/m)
71.960000	25.4	1000.0	120.000	100.0	V	102.0	11.5	14.6	40.0
119.960000	31.1	1000.0	120.000	100.0	V	81.0	13.5	12.4	43.5
168.000000	29.7	1000.0	120.000	100.0	V	206.0	14.9	13.8	43.5
360.000000	32.7	1000.0	120.000	100.0	V	39.0	16.5	13.3	46.0
408.000000	32.6	1000.0	120.000	100.0	V	52.0	17.5	13.4	46.0
727.120000	33.7	1000.0	120.000	100.0	V	114.0	23.6	12.3	46.0



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1-18GHz Radiated Emission

EUT Information

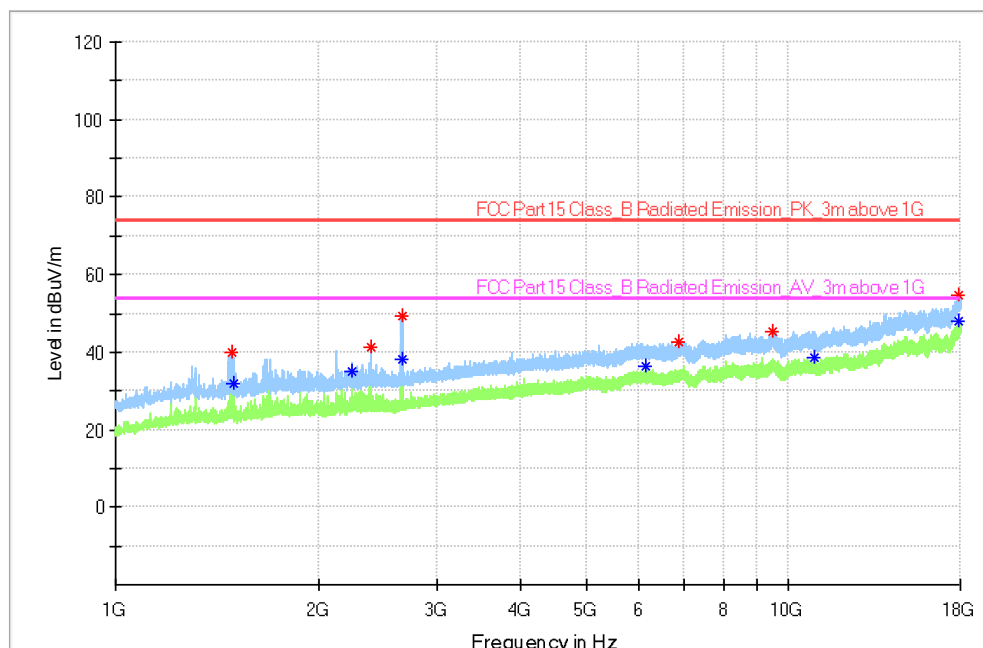
EUT Name: SENTINEL READER
Model: OVU810019/01R
Client: HCS (Suzhou) Limited
Op Cond: power on with SENTINEL SHIELD, DC5V, T21.4°C, H45.3%,
P103.1kPa
Operator: Shi Chaojun
Test Spec: FCC Part 15 Class B
Comment: Vertical
Sample No: SHA-538830-1

Sweep Setup: RE_HF907_pre [EMI radiated]

Hardware Setup: RE HF907
Receiver: IFSV 401
Level Unit: dBuV/m

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamplifier
1 GHz - 18 GHz	566.667 kHz	PK+; AVG	1 MHz	0.2 s	0 dB

Full Spectrum





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Limit and Margin

Frequency (MHz)	MaxPeak (dBuV/m)	Average (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)
9458.633333	45.50	---	74.00	28.50	100.0	V	0.0
17939.366667	---	48.03	54.00	5.97	100.0	V	28.0
2250.066667	---	35.00	54.00	19.00	100.0	V	81.0
1488.466667	40.06	---	74.00	33.94	100.0	V	94.0
2663.166667	---	38.15	54.00	15.85	100.0	V	125.0
2663.166667	49.29	---	74.00	24.72	100.0	V	125.0
2392.300000	41.41	---	74.00	32.59	100.0	V	168.0
6867.266667	42.42	---	74.00	31.58	100.0	V	259.0
6140.233333	---	36.33	54.00	17.67	100.0	V	265.0
10911.000000	---	38.56	54.00	15.44	100.0	V	277.0
17946.166667	54.75	---	74.00	19.25	100.0	V	314.0
1499.800000	---	31.91	54.00	22.09	100.0	V	350.0

Note 1: Emission Level = Reading level + Correction Factor

Corrector Factor = Antenna Factor + Cable Loss - Pre-amplifier Gain

Margin=Limit – Emission Level



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7 Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

Items	Extended Uncertainty
Radiated Disturbance	30MHz to 1GHz, $\pm 5.03\text{dB}$ (Horizontal)
	$\pm 5.12\text{dB}$ (Vertical)
	1GHz to 18GHz, $\pm 5.49\text{dB}$
	18GHz to 40GHz, $\pm 5.63\text{dB}$



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8 EUT Photograph

Refer to the < External Photos > & < Internal Photos >.

THE END