

TEST REPORT

Product Name:	SMART HOME STATIONS
FCC ID:	2A2R6-SHS-101
Trademark:	SHINEVER®
Model Number:	SHS-101, SHS-102, SHS-103
Prepared For:	SHINEVER TECHNOLOGIES INC.
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Manufacturer:	SHINEVER TECHNOLOGIES INC.
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Sample Received Date:	Jul. 29, 2021
Sample tested Date:	Jul. 29, 2021 to Aug. 2, 2021
Issue Date:	Aug. 2, 2021
Report No.:	CTB210731019RFX
Test Standards	FCC Part15.225 ANSI C63.10:2013
Test Results	PASS
Remark:	This is 13.56MHz radio test report.

Compiled by:

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Reviewed by:

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Approved by:



Rita Xiao / Director

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(Note: N/A means not applicable)

1. VERSION

Report No.	Issue Date	Description	Approved
CTB210713019RFX	Aug. 2, 2021	Original	Valid

2. TEST SUMMARY

The Product has been tested according to the following specifications:

Test Item	Test Requirement	Test method	Result
AC Power Line Conducted Emission	47 CFR Part 15 Subpart C Section 15.207	ANSI C63.10-2013	PASS
Radiated Emission	47 CFR Part 15 Subpart C Section 15.209; 15.225(a)(b)(c)(d)	ANSI C63.10-2013	PASS
Frequency Tolerance	47 CFR Part 15 Subpart C Section 15.225(e)	ANSI C63.10-2013	PASS
Occupied Bandwidth	47 CFR Part 15 Subpart C Section 15.215	ANSI C63.10-2013	PASS
Antenna requirement	47 CFR Part 15 Subpart C Section 15.203	ANSI C63.10-2013	PASS

3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the Product as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.

Item	Uncertainty
Occupancy bandwidth	$U=\pm 54.3\text{Hz}$
Conducted output power Above 1G	$U=\pm 1.0\text{dB}$
Conducted output power below 1G	$U=\pm 0.9\text{dB}$
Power Spectral Density , Conduction	$U=\pm 1.0\text{dB}$
Conduction spurious emissions	$U=\pm 2.8\text{dB}$
Out of band emission	$U=\pm 54\text{Hz}$
3m chamber Radiated spurious emission(30MHz-1GHz)	$U=\pm 4.3\text{dB}$
3m chamber Radiated spurious emission(1GHz-18GHz)	$U=\pm 4.5\text{dB}$
humidity uncertainty	$U=\pm 5.3\%$
Temperature uncertainty	$U=\pm 0.59^\circ\text{C}$
Supply voltages	$U=\pm 3\%$
Time	$U=\pm 5\%$

4. PRODUCT INFORMATION AND TEST SETUP

4.1 Product Information

Model(s):	SHS-101, SHS-102, SHS-103
Model Description:	All the model are the same circuit and RF module, only for model name. Test sample model: SHS-101
Hardware Version:	SHINEVER-HW-2020-106-1
Software Version:	SHINEVER-FW-2020-16-1
Operation Frequency:	13.56MHz
Type of Modulation:	ASK
Antenna installation:	Internal Antenna
Antenna Gain:	1dBi
Ratings:	DC 5.0V charging from adapter

4.2 Test Setup Configuration

See test photographs attached in EUT TEST SETUP PHOTOGRAPHS for the actual connections between Product and support equipment.

4.3 Support Equipment

No.	Device Type	Brand	Model	Series No.	Note
1.	AC adapter	SHENZEHN ENGINE ELECTRONIC CO.,LTD	EE-0501 000E	N/A	N/A

Notes:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

4.4 Test Mode

All test mode(s) and condition(s) mentioned were considered and evaluated respectively by performing full tests, the worst data were recorded and reported.

Test mode
Keep the EUT in transmitting mode (NFC mode) with modulation.
The sample was placed (0.8m below 1GHz, 1.5m above 1GHz) above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.

4.5 Test Environment

Humidity(%):	55
Atmospheric Pressure(kPa):	101.1
Normal Voltage(DC):	5V
Normal Temperature(°C)	25

5. TEST FACILITY AND TEST INSTRUMENT USED

5.1 Test Facility

All measurement facilities used to collect the measurement data are located at Floor 1&2, Building A, No. 26 of Xinhe Road, Xinqiao Street, Baoan District, Shenzhen China. The site and apparatus are constructed in conformance with the requirements of ANSI C63.4 and CISPR 16-1-1 other equivalent standards.

5.2 Test Instrument Used

No.	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	Spectrum Analyzer	Agilent	N9020A	MY52090073	2021.09.27
2	Power Sensor	Agilent	U2021XA	MY56120032	2021.09.27
3	Power Sensor	Agilent	U2021XA	MY56120034	2021.09.27
4	Communication test set	R&S	CMW500	108058	2021.09.27
5	Spectrum Analyzer	R&S	FSP40	100550	2021.09.27
6	Signal Generator	Agilent	N5181A	MY49060920	2021.09.27
7	Signal Generator	Agilent	N5182A	MY47420195	2021.09.27
8	Communication test set	Agilent	E5515C	MY50102567	2021.09.27
9	band rejection filter	Shenxiang	MSF2400-2483.5MS-1154	20181015001	2021.09.27
10	band rejection filter	Shenxiang	MSF5150-5850 MS-1155	20181015001	2021.09.27
11	band rejection filter	Xingbo	XBLBQ-DZA120	190821-1-1	2021.09.27
12	BT&WI-FI Automatic test software	Micowave	MTS8310	Ver. 2.0.0.0	2021.09.27
13	Rohde & Schwarz SFU Broadcast Test System	R&S	SFU	101017	2021.09.27
14	Temperature humidity chamber	Hongjing	TH-80CH	DG-15174	2021.09.27
15	234G Automatic test software	Micowave	MTS8200	Ver. 2.0.0.0	2021.09.27
16	966 chamber	C.R.T.	966 Room	966	2021.09.27
17	Receiver	R&S	ESPI	100362	2021.09.27
18	Amplifier	HP	8447E	2945A02747	2021.09.27
19	Amplifier	Agilent	8449B	3008A01838	2021.09.27
20	TRILOG Broadband Antenna	Schwarzbeck	VULB 9163	869	2021.09.27
21	Horn Antenna	Schwarzbeck	BBHA9120D	1911	2021.09.27

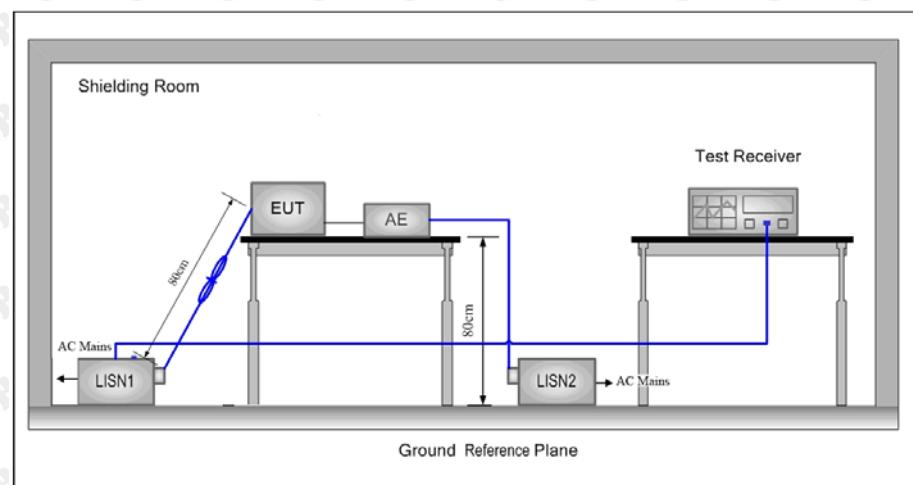
22	Software	Fala	EZ-EMC	FA-03A2 RE	2021.09.27
23	3-Loop Antenna	Daze	ZN30401	17014	2021.09.27
24	loop antenna	ZHINAN	ZN30900A	/	2021.09.27
25	Horn antenna	A/H/System	SAS-574	588	2021.09.27
26	Amplifier	AEROFLEX	/	S/N/ 097	2021.09.27

Continuous disturbance					
No.	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	AMN	ROHDE&SCHWARZ	ESH3-Z5	831551852	2021.09.27
2	Pulse limiter	ROHDE&SCHWARZ	ESH3Z2	357881052	2021.09.27
3	EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCS30	834115/006	2021.09.27
4	Coaxial cable	ZDECL	Z302S	18091904	2021.09.27
5	AAN	Schwarzbeck	NTFM8158	183	2021.09.27
6	Communication test set	Agilent	E5515C	MY50102567	2021.09.27
7	Communication test set	R&S	CMW500	108058	2021.09.27
8	EZ-EMC	Frad	EMC-con3A1.1	/	/

Radiated emission					
No.	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	Double Ridged Broadband Horn Antenna	Schwarzbeck	BBHA 9120D	1911	2021.11.01
2	TRILOG Broadband Antenna	Schwarzbeck	VULB 9168	869	2021.11.01
3	Amplifier	Agilent	8449B	3008A01838	2021.09.27
4	Amplifier	HP	8447E	2945A02747	2021.09.27
5	EMI TEST RECEIVER	ROHDE&SCHWARZ	ESPI7	100362	2021.09.27
6	Coaxial cable	ETS	RFC-SNS-100-NMS-80 NI	/	2021.09.27
7	Coaxial cable	ETS	RFC-SNS-100-NMS-20 NI	/	2021.09.27
8	Coaxial cable	ETS	RFC-SNS-100-SMS-20 NI	/	2021.09.27
9	Coaxial cable	ETS	RFC-NNS-100-NMS-30 0 NI	/	2021.09.27
10	Communication test set	Agilent	E5515C	MY50102567	2021.09.27
11	Communication test set	R&S	CMW500	108058	2021.09.27
12	EZ-EMC	Frad	EMC-con3A1.1	/	/

6. AC POWER LINE CONDUCTED EMISSION

6.1 Block Diagram Of Test Setup



6.2 Limit

Frequency (MHz)	Maximum RF Line Voltage (dB μ V)			
	CLASS A		CLASS B	
	Q.P.	Ave.	Q.P.	Ave.
0.15 - 0.50	79	66	66-56*	56-46*
0.50 - 5.00	73	60	56	46
5.00 - 30.0	73	60	60	50

* Decreasing linearly with the logarithm of the frequency

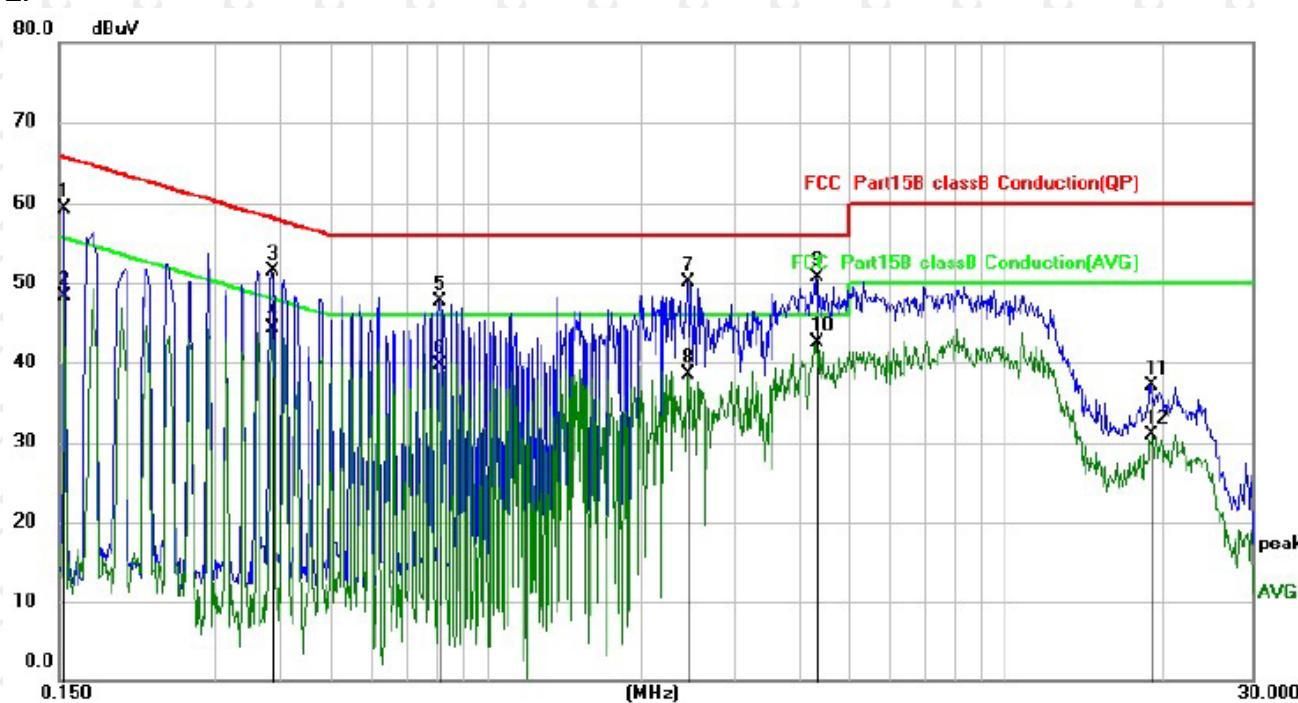
6.3 Test procedure

- 1) The mains terminal disturbance voltage test was conducted in a shielded room.
- 2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a $50\Omega/50\mu\text{H} + 5\Omega$ linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.
- 3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,
- 4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0,4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0,8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.

- 5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.

6.4 Test Result

L:

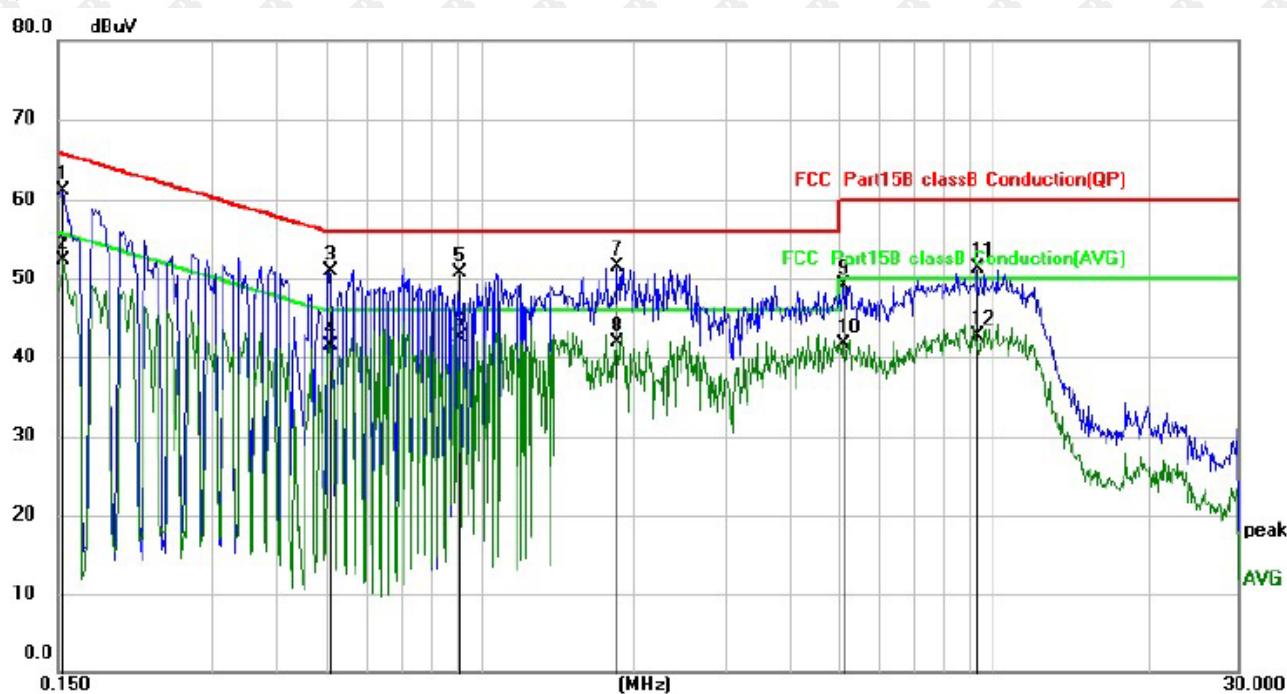


No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Margin
			Level	Factor	ment		
1		0.1539	49.14	10.08	59.22	65.79	-6.57
2		0.1539	38.14	10.08	48.22	55.79	-7.57
3		0.3860	41.37	10.19	51.56	58.15	-6.59
4		0.3860	34.19	10.19	44.38	48.15	-3.77
5		0.8100	37.52	10.21	47.73	56.00	-8.27
6		0.8100	29.59	10.21	39.80	46.00	-6.20
7		2.4420	39.98	10.19	50.17	56.00	-5.83
8		2.4420	28.23	10.19	38.42	46.00	-7.58
9		4.3219	40.23	10.43	50.66	56.00	-5.34
10	*	4.3219	32.13	10.43	42.56	46.00	-3.44
11		19.1018	26.44	10.75	37.19	60.00	-22.81
12		19.1018	20.13	10.75	30.88	50.00	-19.12

Remark:

Factor = Cable loss + LISN factor, Margin = Measurement – Limit

N:



No.	Mk.	Freq. MHz	Reading	Correct	Measure-	Limit	Margin
			Level dBuV	Factor dB	ment dBuV		
1		0.1539	51.09	10.08	61.17	65.79	-4.62
2		0.1539	42.17	10.08	52.25	55.79	-3.54
3		0.5100	40.61	10.23	50.84	56.00	-5.16
4		0.5100	31.21	10.23	41.44	46.00	-4.56
5		0.9060	40.61	10.18	50.79	56.00	-5.21
6	*	0.9060	32.29	10.18	42.47	46.00	-3.53
7		1.8420	41.34	10.13	51.47	56.00	-4.53
8		1.8420	31.82	10.13	41.95	46.00	-4.05
9		5.1100	38.61	10.51	49.12	60.00	-10.88
10		5.1100	31.21	10.51	41.72	50.00	-8.28
11		9.2576	40.74	10.62	51.36	60.00	-8.64
12		9.2576	32.08	10.62	42.70	50.00	-7.30

Remark:

Factor = Cable loss + LISN factor, Margin = Measurement – Limit

7. RADIATED EMISSION

7.1 Block Diagram Of Test Setup

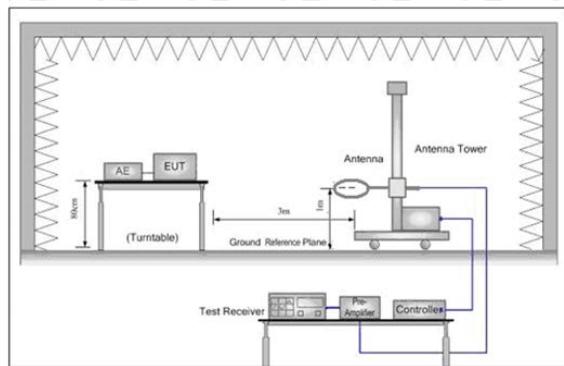


Figure 1. Below 30MHz

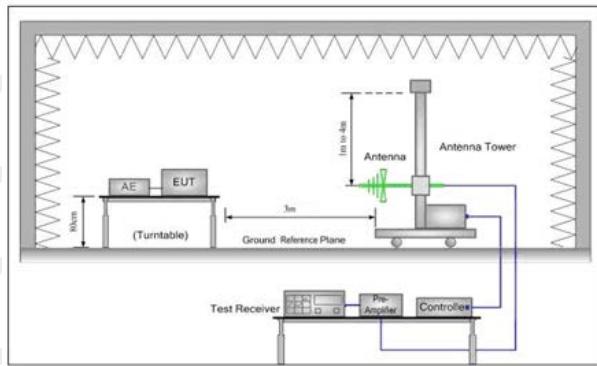


Figure 2. 30MHz to 1GHz

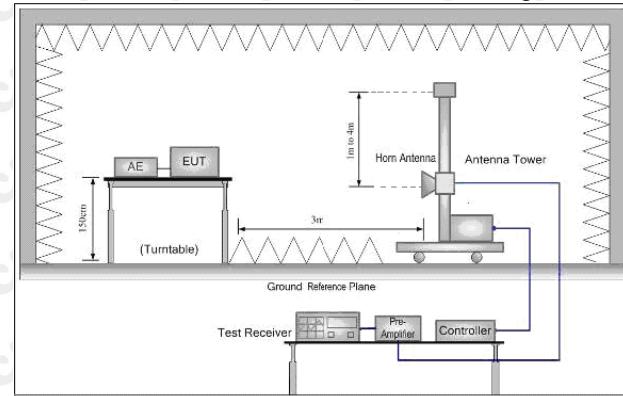


Figure 3. Above 1GHz

7.2 Limit

Spurious Emissions:

Frequency	Field strength (dB μ V/m)	Remark	Measurement distance (m)
0.009MHz-0.490MHz	$20\log 2400/F$ (kHz) + 80	Quasi-peak	3
0.490MHz-1.705MHz	$20\log 24000/F$ (kHz) + 40	Quasi-peak	3
1.705MHz-30MHz	$20\log 30 + 40$	Quasi-peak	3
30MHz-88MHz	40.0	Quasi-peak	3
88MHz-216MHz	43.5	Quasi-peak	3
216MHz-960MHz	46.0	Quasi-peak	3
960MHz-1GHz	54.0	Quasi-peak	3
Above 1GHz	54.0	Average	3

Note: 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.

Field Strength of Fundamental Limit:

- The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters. 15,848 microvolts/meter at 3 meters=124 dB μ V/m.
- Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters. 334 microvolts/meter at 3 meters=94.47 dB μ V/m.
- Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not

exceed 334 microvolts/meter at 30 meters.

7.3 Test procedure

Below 1GHz test procedure as below:

- a.The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b.The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c.The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d.For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rota table table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e.The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f.If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

Above 1GHz test procedure as below:

- g.Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change form table 0.8 meter to 1.5 meter(Above 18GHz the distance is 1 meter and table is 1.5 meter).
- h.Test the EUT in the lowest channel ,the middle channel ,the Highest channel
- j.Repeat above procedures until all frequencies measured was complete.

Receiver set:

Frequency	Detector	RBW	VBW	Remark
0.009MHz-0.090MHz	Peak	10kHz	30KHz	Peak
0.009MHz-0.090MHz	Average	10kHz	30KHz	Average
0.090MHz-0.110MHz	Quasi-peak	10kHz	30KHz	Quasi-peak
0.110MHz-0.490MHz	Peak	10kHz	30KHz	Peak
0.110MHz-0.490MHz	Average	10kHz	30KHz	Average
0.490MHz -30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
30MHz-1GHz	Quasi-peak	120 kHz	300KHz	Quasi-peak
Above 1GHz	Peak	1MHz	3MHz	Peak
	Peak	1MHz	10Hz	Average

7.4 Test Result

Field Strength of Fundamental

Frequency (MHz)	Reading (dBuV/m)	Correction Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Polar (H/V)	Detector
13.56	46.44	15.82	62.26	80.51	-18.25	H	QP
13.56	46.10	15.82	61.92	80.51	-18.59	V	QP
13.89	45.99	15.82	61.81	80.51	-18.70	H	QP
13.89	48.35	15.82	64.17	80.51	-16.34	V	QP
13.57	88.19	12.33	100.52	124	-23.48	H	QP
13.57	84.88	12.33	97.21	124	-26.79	V	QP
13.47	53.80	15.82	69.62	90.47	-20.85	H	QP
13.47	52.16	15.82	67.98	90.47	-22.49	V	QP
13.66	50.35	15.82	66.17	90.47	-24.30	H	QP
13.66	49.37	15.82	65.19	90.47	-25.28	V	QP
13.30	46.41	15.82	62.23	80.51	-18.28	H	QP
13.30	46.08	15.82	61.90	80.51	-18.61	V	QP
13.87	46.00	15.82	61.82	80.51	-18.69	H	QP
13.87	48.37	15.82	64.19	80.51	-16.32	V	QP
13.58	88.19	12.33	100.52	124	-23.48	H	QP
13.60	84.87	12.33	97.20	124	-26.80	V	QP
13.51	53.78	15.82	69.60	90.47	-20.87	H	QP
13.51	52.17	15.82	67.99	90.47	-22.48	V	QP

Harmonics and Spurious Emissions

Frequency Range (9 kHz-30MHz)

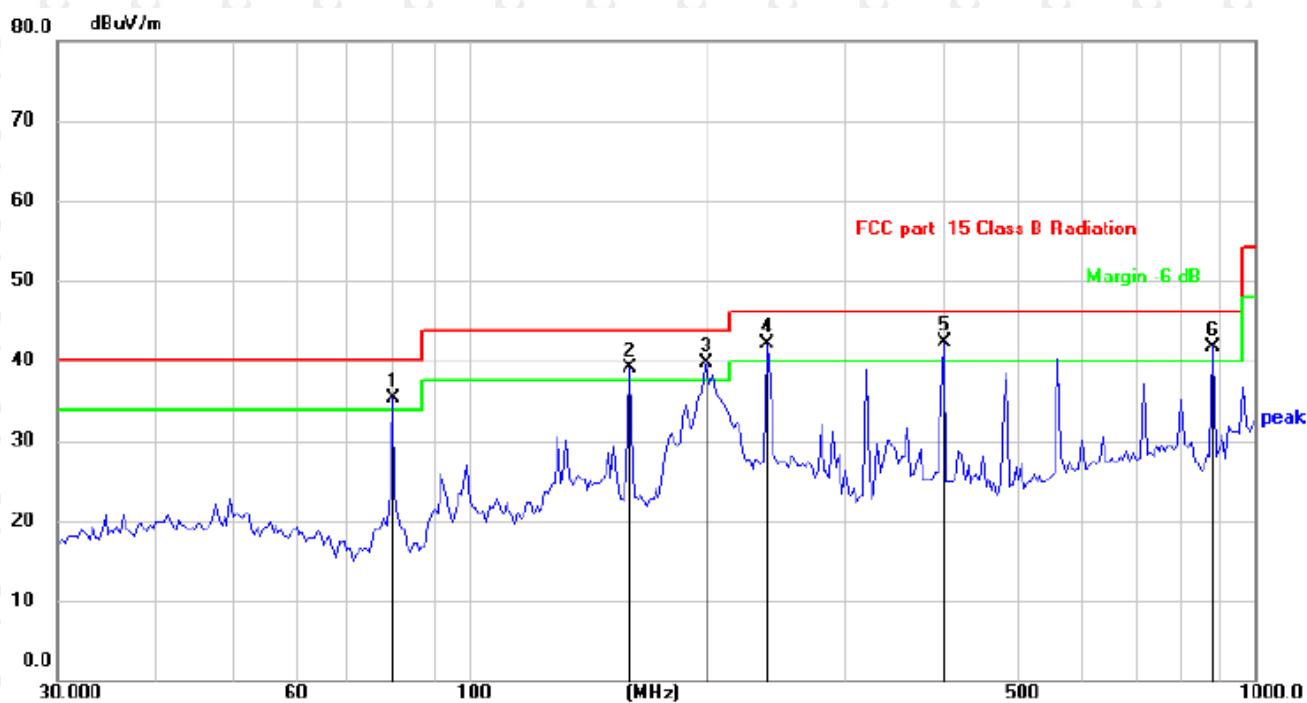
Frequency (MHz)	Level@3m (dB μ V/m)	Limit@3m (dB μ V/m)
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--	--	--
--	--	--
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Note: 1. Emission Level=Reading+ Cable loss-Antenna factor-Amp factor

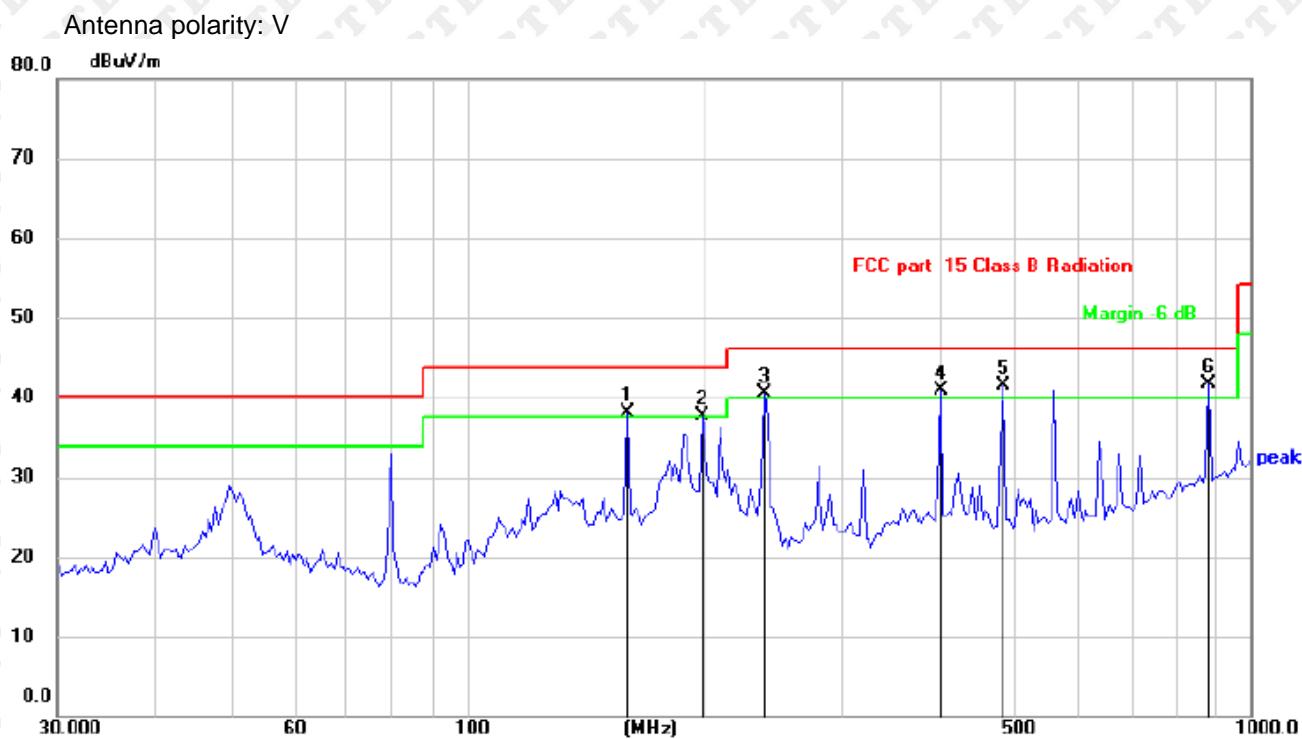
2. The emission levels are 20 dB below the limit value, which are not reported. It is deemed to comply with the requirement

About 30MHz-1GHz Test Results:

Antenna polarity: H



No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	
			Level	Factor	ment			
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1	!	80.0805	47.26	-11.90	35.36	40.00	-4.64	QP
2	!	160.0648	46.33	-7.19	39.14	43.50	-4.36	QP
3	*	201.0402	50.60	-10.86	39.74	43.50	-3.76	QP
4	!	239.5669	51.63	-9.58	42.05	46.00	-3.95	QP
5	!	401.8384	47.47	-5.26	42.21	46.00	-3.79	QP
6	!	884.5028	38.16	3.55	41.71	46.00	-4.29	QP

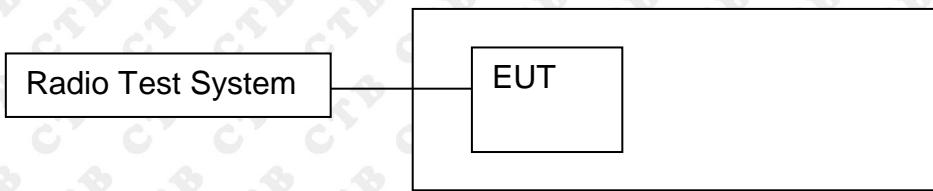


No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over
			Level	Factor	ment		
		MHz	dBuV	dB	dBuV/m	dB/m	dB
1	!	160.0648	45.24	-7.19	38.05	43.50	-5.45
2	!	199.2855	48.62	-10.85	37.77	43.50	-5.73
3	!	239.5669	50.14	-9.58	40.56	46.00	-5.44
4	!	401.8384	46.18	-5.26	40.92	46.00	-5.08
5	!	483.0617	44.99	-3.48	41.51	46.00	-4.49
6	*	884.5028	38.14	3.55	41.69	46.00	-4.31

Remark: 1. Factor = Cable lose + Antenna factor - Pre-amplifier; Margin = Limit – Level
2. This EUT was tested in 3 axis and the worst case position data was reported.

8. FREQUENCY TOLERANCE

8.1 Block Diagram Of Test Setup



8.2 Limit

The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ of the operating frequency over a temperature variation of -20 degrees to + 50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

Limit: $\pm 0.01\%$ of 13.56MHz= $\pm 1356\text{Hz}$

8.3 Test procedure

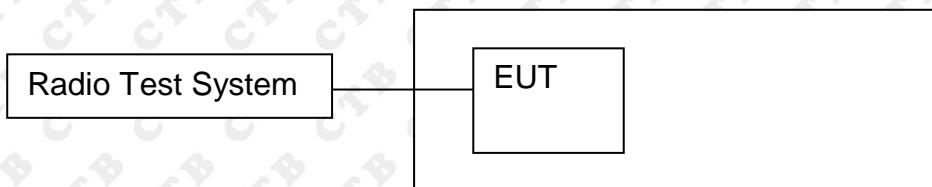
1. Set RBW = 10 kHz.
2. Set the video bandwidth (VBW) \geq RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. The transmitter output (antenna port) was connected to the spectrum analyzer.

8.4 Test Result

Test Conditions			Frequency Deviation		Limit
Frequency MHz	Power(Vdc)	Temperature (°C)	Measured Freq. (MHz)	Deviation (%)	
13.56	Normal	-20	13.560304	0.000304	$\pm 0.01\%$
	Normal	-10	13.560410	0.000410	
	Normal	0	13.560174	0.000174	
	Normal	10	13.560578	0.000578	
	Normal	20	13.560280	0.000280	
	Normal	30	13.560435	0.000435	
	Normal	40	13.560233	0.000233	
	Normal	50	13.560377	0.000377	
	Normal*85%	20	13.560304	0.000304	
	Normal *115%	20	13.560410	0.000410	

9. OCCUPIED BANDWIDTH

9.1 Block Diagram Of Test Setup



9.2 Limit

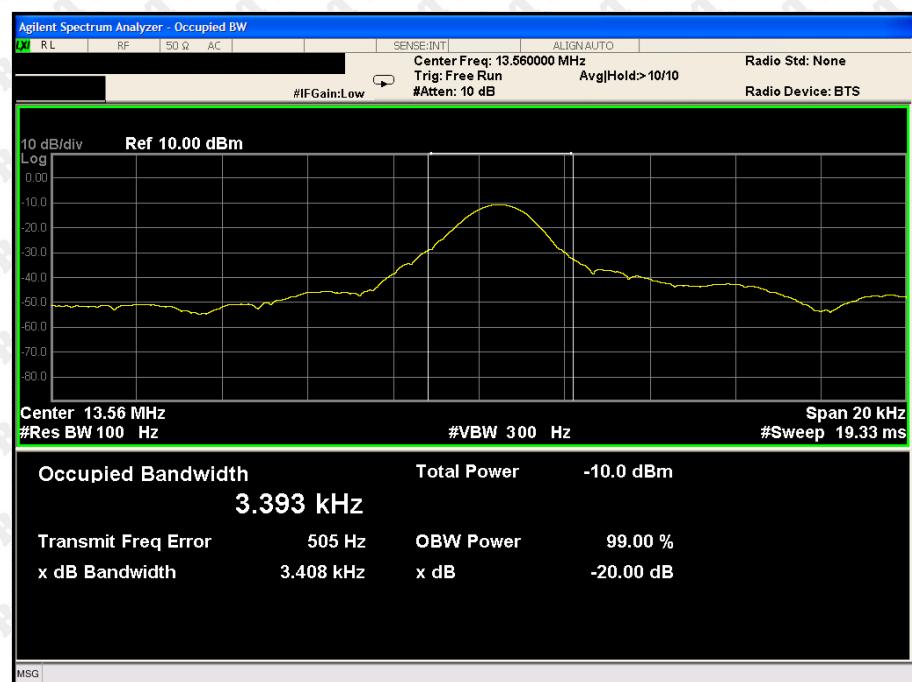
Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in subpart E of this part, must be designed to ensure that 20dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equip compliance with the 20dB attenuation specification may base on measurement at the intentional radiator's antenna output terminal unless the intentional radiator uses a permanently attached antenna, in which case compliance shall be demonstrated by measuring the radiated emissions.

9.3 Test procedure

1. Set RBW = 10 kHz.
2. Set the video bandwidth (VBW) \geq RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 20 dB relative to the maximum level measured in the fundamental emission.

9.4 Test Result

Test Channel (MHz)	20dB Occupy Bandwidth (kHz)	Limit (kHz)	Conclusion
13.56	3.408	10	PASS



10. ANTENNA REQUIREMENT

15.203 requirement:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

EUT Antenna:

The antenna is Internal Antenna and no consideration of replacement. The best case gain of the antenna is 1dBi.

11. EUT PHOTOGRAPHS

EUT Photo 1**EUT Photo 2**

12. EUT TEST SETUP PHOTOGRAPHS

Radiated Emission

Below 30MHz



30MHz- 1GHz



***** END OF REPORT *****