A Test Lab Techno Corp.

Changan Lab：No. 140-1, Changan Street, Bade District, Taoyuan City 33465, Taiwan (R.O.C)
Tel：886-3-271-0188 / Fax：886-3-271-0190

MPE Report

Test Report No.	:	1708FS12-01
Applicant	:	Phorus Inc.
Product Type	:	Phorus Play-Fi Speaker
Trade Name	:	phorus
Model Number	:	PS10 SPEAKER
Date of Received	:	Jun. 16, 2017
Test Period	:	Jun. 27, 2017
Date of Issued	:	Aug. 10, 2017
Test Specification	:	ANSI / IEEE Std.C95.1-1992 / IEEE Std. 1528-2013
		47 CFR § 2.1091
		47 CFR § 1.1310
Location of Test Lab.	:	Chang-an Lab.

1. The test operations have to be performed with cautious behavior, the test results are as attached.
2. The test results are under chamber environment of A Test Lab Techno Corp. A Test Lab Techno Corp. does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples.
3. The measurement report has to be written approval of A Test Lab Techno Corp. It may only be reproduced or published in full. This report shall not be reproduced except in full, without the written approval of A Test Lab Techno Corp.
4. This document may be altered or revised by A Test Lab Techno. Corp. personnel only, and shall be noted in the revision section of the document.

Approved By : (Mark Duan)

Tested By : (Sky Chou)

Contents

1. Description of Equipment under Test (EUT)

Applicant	Phorus Inc. 16255 Ventura Boulevard, Encino, California, 91436 , United States				
Manufacturer	Phorus, Inc. 16255 Ventura Boulevard, Suite 310,Encino ,United States,91436				
Product Type	Phorus Play-Fi Speaker				
Trade Name	phorus				
Model Number	PS10 SPEAKER				
FCC ID	2AAWQ-PS10SPEAKER				
Frequency Range	Operate Band			Frequency Range (MHz)	
	IEEE 802.11b / 802.11g IEEE 802.11n 2.4GHz 20MHz			2412 - 2462	
	IEEE 802.11n 2.4GHz 40 MHz			2422 - 2452	
	IEEE 802.11a U-NII Band I			5180 - 5240	
	IEEE 802.11a U-NII Band II-A			5260 - 5320	
	IEEE 802.11a U-NII Band II-C			5500 - 5700	
	IEEE 802.11a U-NII Band III			5745 - 5825	
	IEEE 802.11n 5GHz 20MHz U-NII Band I			5180 - 5240	
	IEEE 802.11n 5GHz 20MHz U-NII Band II-A			5260 - 5320	
	IEEE 802.11n 5GHz 20MHz U-NII Band II-C			5500 - 5700	
	IEEE 802.11n 5GHz 20MHz U-NII Band III			5745 - 5825	
	IEEE 802.11n 5GHz 40MHz U-NII Band I			5190 - 5230	
	IEEE 802.11n 5GHz 40MHz U-NII Band II-A			5270 - 5310	
	IEEE 802.11n 5GHz 40MHz U-NII Band II-C			5510 - 5670	
	IEEE 802.11n 5GHz 40MHz U-NII Band III			5755 - 5795	
Antenna information	ANT	Model	Type	Max. Gain (dBi)	
	ANT-0	MSA-3310-25GC4-A25	PIFA Antenna	2.4GHz	4.80
				5GHz	6.06
	ANT-1	MSA-3310-25GC4-A26	PIFA Antenna	2.4GHz	4.80
				5GHz	6.06
Antenna Delivery	1TX / 1RX (Diversity)				
RF Evaluation	0.043 mW/cm^2				
Temperature Range	0 ~ 35°C				

The above equipment was tested by A Test Lab Techno Corp. For compliance with the requirements set forth in 47 CFR § 2.1091 / 47 CFR § 1.1310. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties

2. Human Exposure Assessment

Due to the design and installation of this product, it is not possible to conduct SAR evaluation. This is because client either manufactures or supplies the antenna(s) that will be used in the installation of this product. Therefore, this product will be evaluated as a mobile device per 47 CFR § 1.1310 titled “Radiofrequency radiation exposure limits”, generally referred to as MPE limits.

In 47 CFR § 2.1091, paragraph (b) defines a mobile device as “a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 cm is normally maintained between the transmitter’s radiating structure(s) and the body of the user or nearby persons. ” This product is intended to be installed into a vehicle such that the unit is physically secured at one location. In the installation guide supplied with the product,

Client has made the following statement: “IMPORTANT: To meet the FCC’s RF Exposure Guidelines, the antenna should be installed so there is at least 20 cm of separation between the body of the user and nearby persons and the antenna”. Based on the installation of the transceiver and the antenna, the transmitters radiating structure is more than 20 cm from the user. Thus, this product is a “mobile device” as defined in section § 2.1091 paragraph (b).

Exposure evaluation
$$S = \frac{PG}{4\pi R^2}$$ Where S: power density P: power input to the 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.

3. RF Output Power

The conducted power turn-up tolerance reference manufacturer specification.

Band	Date Rate (Mbps)	Frequency (MHz)	Average Conducted power (dBm)	
			ANT-0	ANT-1
IEEE 802.11b	1	2412.0	15.27	15.19
		2437.0	15.74	15.72
		2462.0	15.38	15.28
	2	2437.0	15.70	15.65
	5.5	2437.0	15.65	15.63
	11	2437.0	15.62	15.58
IEEE 802.11g	6	2412.0	14.55	14.51
		2437.0	14.70	14.66
		2462.0	13.87	13.77
	9	2437.0	14.65	14.61
	12	2437.0	14.62	14.58
	18	2437.0	14.60	14.53
	24	2437.0	14.56	14.52
	36	2437.0	14.54	14.48
	48	2437.0	14.51	14.42
	54	2437.0	14.49	14.41
IEEE 802.11n 2.4GHz 20MHz	6.5	2412.0	13.73	13.64
		2437.0	13.16	13.11
		2462.0	12.48	12.47
	14.4	2437.0	13.13	13.08
	21.7	2437.0	13.10	13.05
	28.9	2437.0	13.06	13.00
	43.3	2437.0	13.04	12.97
	57.8	2437.0	13.01	12.92
	65	2437.0	12.97	12.89
	72.2	2437.0	12.95	12.87
IEEE 802.11n 2.4GHz 40MHz	13.5	2422.0	12.30	12.24
		2437.0	12.43	12.40
		2452.0	8.69	8.63
	30	2437.0	12.40	12.36
	45	2437.0	12.37	12.30
	60	2437.0	12.35	12.28
	90	2437.0	12.31	12.26
	120	2437.0	12.27	12.18
	135	2437.0	12.23	12.15
	150	2437.0	12.20	12.11

Note: The relevant measured result has the offset with cable loss already.

Band	Date Rate (Mbps)	Frequency (MHz)	Average Conducted power (dBm)	
			ANT-0	ANT-1
IEEE 802.11a	6	5180.0	13.50	13.42
		5200.0	13.34	13.28
		5220.0	13.38	13.30
		5240.0	13.87	13.81
		5260.0	13.25	13.18
		5280.0	13.28	13.22
		5300.0	13.46	13.44
		5320.0	13.78	13.75
		5500.0	13.12	13.07
		5520.0	13.17	13.15
		5540.0	13.65	13.63
		5560.0	13.09	13.03
		5580.0	13.14	13.10
		5660.0	13.06	13.02
		5680.0	13.17	13.08
		5700.0	13.07	12.97
		5745.0	13.53	13.50
		5765.0	13.57	13.52
		5785.0	13.70	13.63
		5805.0	13.78	13.72
		5825.0	13.82	13.77

Note: The relevant measured result has the offset with cable loss already.

Band	Date Rate (Mbps)	Frequency (MHz)	Average Conducted power (dBm)	
			ANT-0	ANT-1
IEEE 802.11a	54	5180.0	13.44	13.38
		5200.0	13.30	13.28
		5220.0	13.36	13.30
		5240.0	13.82	13.72
		5260.0	13.21	13.13
		5280.0	13.24	13.17
		5300.0	13.44	13.42
		5320.0	13.73	13.69
		5500.0	13.10	13.04
		5520.0	13.14	13.08
		5540.0	13.63	13.59
		5560.0	13.06	13.00
		5580.0	13.11	13.08
		5660.0	13.02	12.99
		5680.0	13.13	13.07
		5700.0	13.05	12.94
		5745.0	13.47	13.38
		5765.0	13.56	13.48
		5785.0	13.64	13.60
		5805.0	13.75	13.68
		5825.0	13.79	13.69

Note: The relevant measured result has the offset with cable loss already.

Band	Date Rate (Mbps)	Frequency (MHz)	Average Conducted power (dBm)	
			ANT-0	ANT-1
IEEE 802.11n 5GHz 20MHz	6.5	5180.0	11.58	11.52
		5200.0	11.35	11.30
		5220.0	11.51	11.47
		5240.0	11.78	11.68
		5260.0	11.04	11.00
		5280.0	11.15	11.11
		5300.0	11.65	11.59
		5320.0	11.71	11.63
		5500.0	11.10	11.01
		5520.0	11.30	11.22
		5540.0	11.03	10.98
		5560.0	11.55	11.52
		5580.0	11.62	11.58
		5660.0	11.79	11.72
		5680.0	11.44	11.37
		5700.0	11.23	11.13
		5745.0	11.56	11.52
		5765.0	11.86	11.78
		5785.0	11.82	11.75
		5805.0	11.80	11.76
		5825.0	11.94	11.85

Note: The relevant measured result has the offset with cable loss already.

Band	Date Rate (Mbps)	Frequency (MHz)	Average Conducted power (dBm)	
			ANT-0	ANT-1
IEEE 802.11n 5GHz 20MHz	72.2	5180.0	11.53	11.47
		5200.0	11.32	11.22
		5220.0	11.46	11.39
		5240.0	11.76	11.63
		5260.0	11.03	10.98
		5280.0	11.11	11.04
		5300.0	11.61	11.55
		5320.0	11.67	11.61
		5500.0	11.09	10.98
		5520.0	11.24	11.15
		5540.0	10.99	10.97
		5560.0	11.53	11.49
		5580.0	11.59	11.52
		5660.0	11.78	11.69
		5680.0	11.41	11.32
		5700.0	11.18	11.12
		5745.0	11.52	11.43
		5765.0	11.81	11.75
		5785.0	11.79	11.72
		5805.0	11.77	11.73
		5825.0	11.92	11.80

Note: The relevant measured result has the offset with cable loss already.

Band	Date Rate (Mbps)	Frequency (MHz)	Average Conducted power (dBm)	
			ANT-0	ANT-1
IEEE 802.11n 5GHz 40MHz	13.5	5190.0	9.61	9.52
		5230.0	11.39	11.33
		5270.0	11.66	11.62
		5310.0	8.24	8.18
		5510.0	10.68	10.60
		5550.0	11.69	11.59
		5670.0	11.68	11.60
		5755.0	11.43	11.35
		5795.0	11.69	11.63
	150	5190.0	9.52	9.49
		5230.0	11.35	11.31
		5270.0	11.64	11.59
		5310.0	8.18	8.12
		5510.0	10.62	10.52
		5550.0	11.68	11.57
		5670.0	11.63	11.56
		5755.0	11.40	11.32
		5795.0	11.66	11.53

Note: The relevant measured result has the offset with cable loss already.

4. Test Results

Band	Data Rate (Mbps)	Frequency (MHz)	Limit (mw)	Distance [R] (cm)	Max tune-up Power (upper limit) [P] (dBm)	ANT Gain (dBi)	Numeric Gain [G]	Duty Cycle	[P] x [G] with Duty cycle [TP] (mW)	Power Density [S] (mw/cm^2)
IEEE 802.11b	1	2412.0	1	20	15.80	4.80	3.02	1	114.82	0.023
		2437.0	1	20	15.80	4.80	3.02	1	114.82	0.023
		2462.0	1	20	15.80	4.80	3.02	1	114.82	0.023
IEEE 802.11g	6	2412.0	1	20	14.80	4.80	3.02	1	91.2	0.018
		2437.0	1	20	14.80	4.80	3.02	1	91.2	0.018
		2462.0	1	20	14.80	4.80	3.02	1	91.2	0.018
IEEE 802.11n 2.4GHz 20MHz	6.5	2412.0	1	20	13.80	4.80	3.02	1	72.44	0.014
		2437.0	1	20	13.80	4.80	3.02	1	72.44	0.014
		2462.0	1	20	13.80	4.80	3.02	1	72.44	0.014
IEEE 802.11n 2.4GHz 40MHz	13.5	2422.0	1	20	12.50	4.80	3.02	1	53.7	0.011
		2437.0	1	20	12.50	4.80	3.02	1	53.7	0.011
		2452.0	1	20	8.80	4.80	3.02	1	22.91	0.005
IEEE 802.11a	6	5180.0	1	20	13.9	6.06	4.04	1	99.17	0.020
		5200.0	1	20	13.9	6.06	4.04	1	99.17	0.020
		5220.0	1	20	13.9	6.06	4.04	1	99.17	0.020
		5240.0	1	20	13.9	6.06	4.04	1	99.17	0.020
		5260.0	1	20	13.8	6.06	4.04	1	96.91	0.019
		5280.0	1	20	13.8	6.06	4.04	1	96.91	0.019
		5300.0	1	20	13.8	6.06	4.04	1	96.91	0.019
		5320.0	1	20	13.8	6.06	4.04	1	96.91	0.019
		5500.0	1	20	13.7	6.06	4.04	1	94.71	0.019
		5520.0	1	20	13.7	6.06	4.04	1	94.71	0.019
		5540.0	1	20	13.7	6.06	4.04	1	94.71	0.019
		5560.0	1	20	13.7	6.06	4.04	1	94.71	0.019
		5580.0	1	20	13.7	6.06	4.04	1	94.71	0.019
		5660.0	1	20	13.7	6.06	4.04	1	94.71	0.019
		5680.0	1	20	13.7	6.06	4.04	1	94.71	0.019
		5700.0	1	20	13.7	6.06	4.04	1	94.71	0.019
		5745.0	1	20	13.9	6.06	4.04	1	99.17	0.020
		5765.0	1	20	13.9	6.06	4.04	1	99.17	0.020
		5785.0	1	20	13.9	6.06	4.04	1	99.17	0.020
		5805.0	1	20	13.9	6.06	4.04	1	99.17	0.020
		5825.0	1	20	13.9	6.06	4.04	1	99.17	0.020

Band	Data Rate (Mbps)	Frequency (MHz)	Limit (mw)	Distance [R] (cm)	Max tune-up Power (upper limit) [P] (dBm)	ANT Gain (dBi)	Numeric Gain [G]	Duty Cycle	[P] x [G] with Duty cycle [TP] (mW)	Power Density [S] (mw/cm^2)
IEEE 802.11n 5GHz 20MHz	6.5	5180.0	1	20	11.8	6.06	4.04	1	61.15	0.012
		5200.0	1	20	11.8	6.06	4.04	1	61.15	0.012
		5220.0	1	20	11.8	6.06	4.04	1	61.15	0.012
		5240.0	1	20	11.8	6.06	4.04	1	61.15	0.012
		5260.0	1	20	11.8	6.06	4.04	1	61.15	0.012
		5280.0	1	20	11.8	6.06	4.04	1	61.15	0.012
		5300.0	1	20	11.8	6.06	4.04	1	61.15	0.012
		5320.0	1	20	11.8	6.06	4.04	1	61.15	0.012
		5500.0	1	20	11.9	6.06	4.04	1	62.57	0.012
		5520.0	1	20	11.9	6.06	4.04	1	62.57	0.012
		5540.0	1	20	11.9	6.06	4.04	1	62.57	0.012
		5560.0	1	20	11.9	6.06	4.04	1	62.57	0.012
		5580.0	1	20	11.9	6.06	4.04	1	62.57	0.012
		5660.0	1	20	11.9	6.06	4.04	1	62.57	0.012
		5680.0	1	20	11.9	6.06	4.04	1	62.57	0.012
		5700.0	1	20	11.9	6.06	4.04	1	62.57	0.012
		5745.0	1	20	12	6.06	4.04	1	64.03	0.013
		5765.0	1	20	12	6.06	4.04	1	64.03	0.013
		5785.0	1	20	12	6.06	4.04	1	64.03	0.013
		5805.0	1	20	12	6.06	4.04	1	64.03	0.013
		5825.0	1	20	12	6.06	4.04	1	64.03	0.013
IEEE 802.11n 5GHz 40MHz	13.5	5190.0	1	20	9.7	6.06	4.04	1	37.7	0.008
		5230.0	1	20	11.4	6.06	4.04	1	55.77	0.011
		5270.0	1	20	11.7	6.06	4.04	1	59.76	0.012
		5310.0	1	20	8.3	6.06	4.04	1	27.31	0.005
		5510.0	1	20	11.8	6.06	4.04	1	61.15	0.012
		5550.0	1	20	11.8	6.06	4.04	1	61.15	0.012
		5670.0	1	20	11.8	6.06	4.04	1	61.15	0.012
		5755.0	1	20	11.8	6.06	4.04	1	61.15	0.012
		5795.0	1	20	11.8	6.06	4.04	1	61.15	0.012

Note:

1.Mobile or fixed location transmitters, minimum separation distance is 20cm, even if calculations indicate MPE distance is less.

2.The Numeric Gain calculated by 10^(ant. Gain(dBi) /10).

3.Each band max power which perform MPE of any configurations.

4.The MPE results are evaluated by lowest data rate for WLAN.

5.The device operating IEEE 802.11 a/b/g/n mode is 1TX diversity.

6.We choose the antenna with higher power results to provide the worst-case MPE results.

Simultaneous Transmitting:

Total MPE = 2.4GHz MPE + 5GHz MPE = 0.023 + 0.02 = 0.043 mw/cm^2 < 1 mw/cm^2