

無響室檢驗報告

Anechoic Chamber Test Report

委託單位(Entrusts by):

啓弘電子股份有限公司

OBO PRO.2 INC.

測試單位(Test by):

易祿達科技有限公司

IEA Electro-Acoustic Technology Co., Ltd.

監督單位：國立台北科技大學 劉興華 教授

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EQ. NO. 儀具編號	Anechoic Chamber 無響室		Applicant/Dept. 申請者/部門:	OBO PRO.2 INC. 啓弘電子股份有限公司	
Use Description 使用儀器名稱:	1.EA-2 with CLIO Measurement System 2. B&K 4231 Sound Level Calibrator. 3. GRAS 40HL Low Noise Free Field Microphone 4. GRAS 46AE Free Field Microphone				
Manufacturer 製造廠商:	易祿達科技有限公司 IEA ELECTRO-ACOUSTIC TECHNOLOGY CO., LTD.			Serial No. 序號:	None
Measurements Date 測試日期	May/26/2015	Next Retest Date 下次測試日期	NONE	Procedure Used 測試程序:	ISO-3744 ISO-3745
Condition of measurements 測試環境條件		Temp. R.H. 溫度: 25 ± 1 °C 相對濕度: 55 ± 5 %			
Standards Employed 測試時使用之標準器					
Equipment No. 儀器編號	MFG/Model No. 製造廠、型號		Description 儀器名稱		N.O. 序號

GRAS 40HL		1/2 inch Low Noise	122499
GRAS 46AE	GRAS 40HL	Microphone	196039 &
B&K 4231	GRAS 46AE	1/2inch Standard	212248
IEA EA-2	B&K 4231	Microphone	2498806
	IEA EA-2	Sound Level Calibrator	2106131437
B&K 5935L		Electro-Acoustic	
Tannoy System 800	B&K 5935L	Measurement System	1628043
	Tannoy System 800	Microphone Power Supply	123136S
		Loudspeaker	

Calibration Sources

追溯體系

Measurement Parameter 量測參數	Calibration Source 校正機構	Cal. Report No. 校正報告號碼	S/N and Model 序號與型號
AC Voltage True-rms	PINK Technology TAF 1120	P211064-C	34401A MY470630072
Frequency	PINK Technology TAF 1120	P211063	33210A MY48011316

說明

- This test report certifies that equipment noted here in has been compared with the above listed standards. The standards used to perform this calibration are traceable to Pink Technology ISO-17025 TAF Laboratory. 本測試報告內記載之受校儀器已與上列標準做過比較校正, 用以校正之標準儀器可追溯至品客科技ISO-17025 TAF實驗室。
- This test report is valid only to the items calibrated. Reproduced calibration report in partials not effective. 本測試報告僅對校正儀器之測試項目有效, 且本報告部份複製無效。

Tested by

Dept. Manager

TAF-17025 No. TAF-CNLA-ZY96121

TAF-17025 No. TAF-QM99024-C-05

測 試 者：陳本立

測 試 主 管：劉興華

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1. Use for :

Special Design for Microphone IEC-60268-4 and 3C audio product measuring environment (Issue by ISO3744/3745)

2. Integrated Specification:

2.1 Basic Request:

2.1.1 Inner Size(L*W*H)	241*241*197cm
2	362*361*386cm
1.2 Outside Size(L*W*H)	
2.1.3 Satisfy to inverse square range	150 Hz~20 k Hz (Issue 2.2 Standard)
2.1.4 Integrated Isolation Ability (When 80dB Pink Noise Outside)	≥ 50 dB(A)
2.1.5 Internal Noise(when outside noise ≤ 70 dB(A)	≤ 20 dB(A) Use the GRAS 40HL Low Noise Microphone System
2.1.6 Wedge Sound Absorption cut off frequency	≤ 150 Hz(Issue by 1/4 wavelength)
2.1.7 Floating Plate Nature Frequency	≤ 10 Hz (Issue by loading calculate)

2.2 When outside noise condition <70dB(A), Inverse Square Law must be under ISO3745

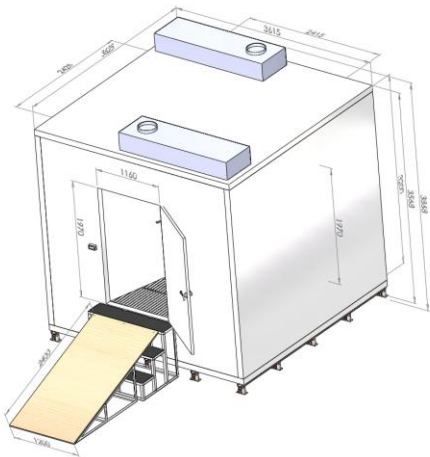
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Request tolerance limits:

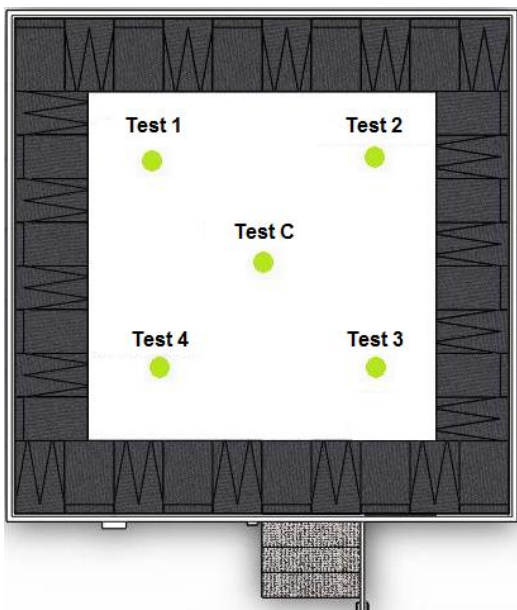
1/3Octave Band Frequency	≤630Hz	800Hz~5000Hz	≥6300Hz
Max Allow Deviation	±1.5dB	±1.0dB	±1.5dB



3. Test Item :

3.1 Anechoic Chamber Inside Background Noise :

Test Position Statement :



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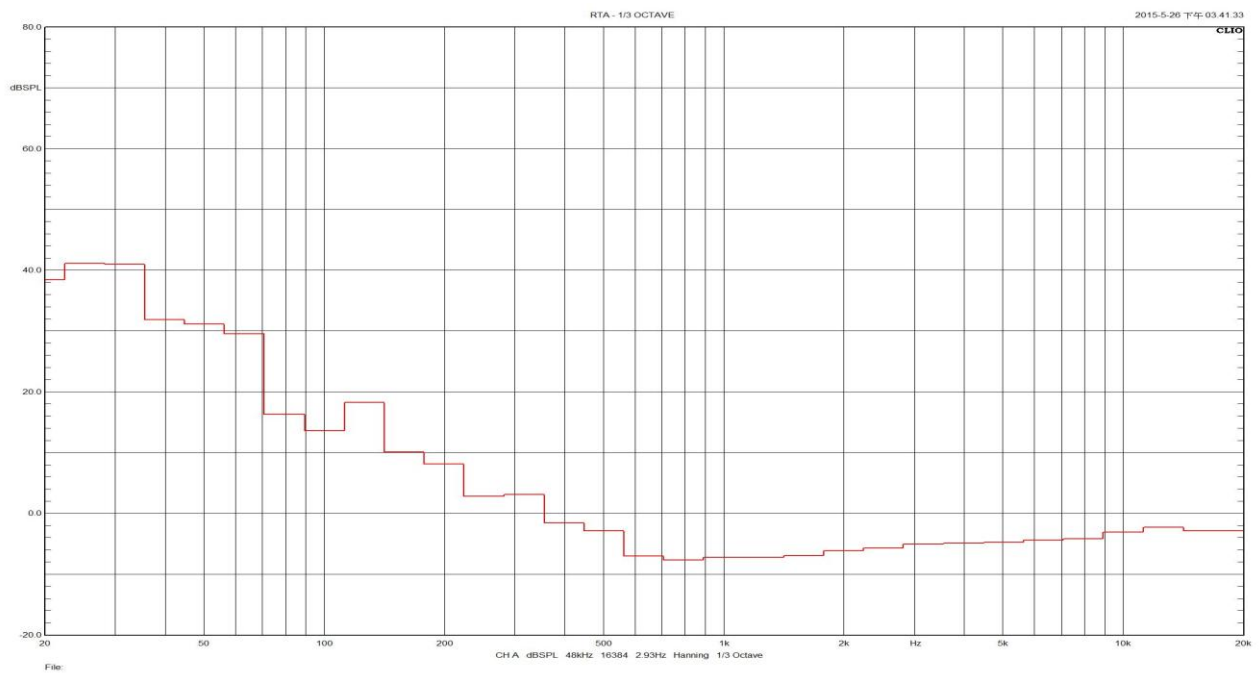
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Test Result :

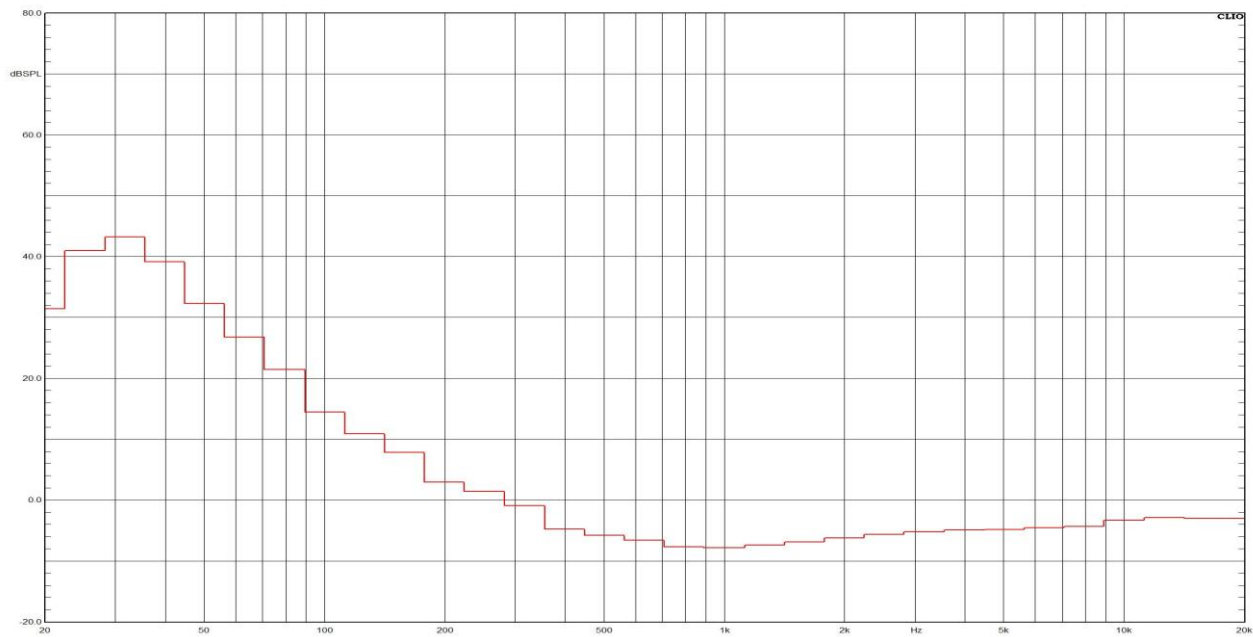
Test Position	Measurement dBSPL (A-Weighting) LEQ 30 sec
Test Position-C	11.47
Test Position-1	11.66
Test Position-2	11.84
Test Position-3	11.26
Test Position-4	11.60
Overall Average	11.57

Test Position-C: 11.47 dBSPL (A-Weighting)

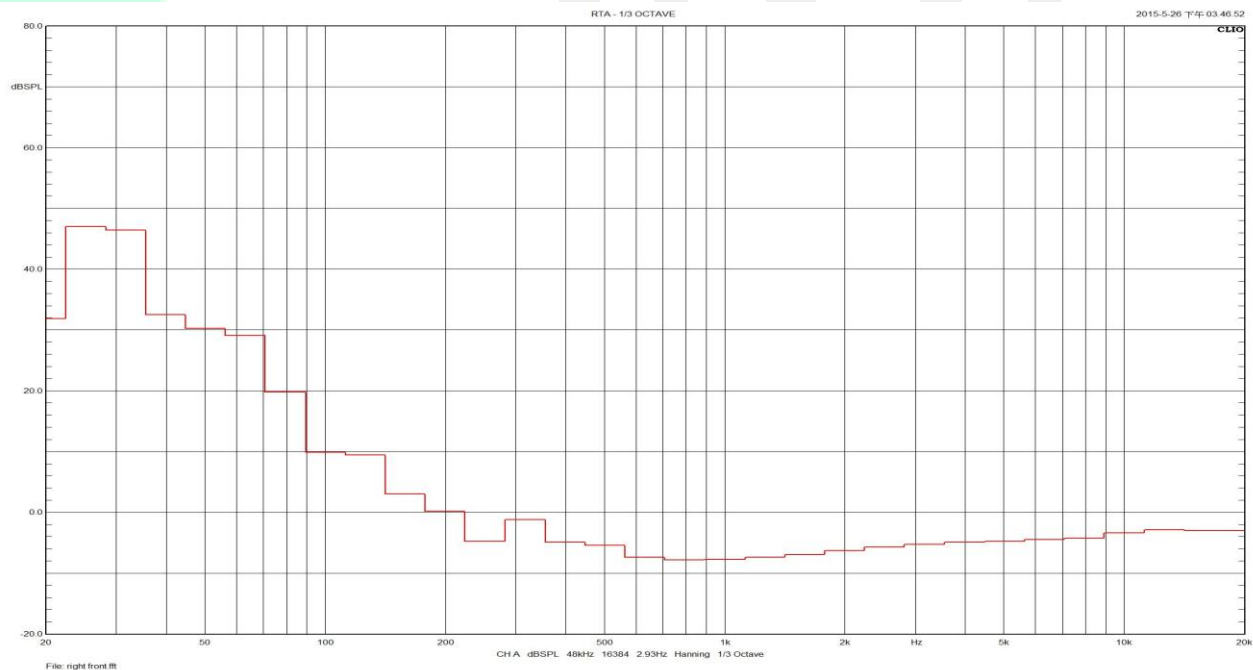


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Test Position-1 : 11.66 dBSPL (A-Weighting)



Test Position-2 : 11.84 dBSPL (A-Weighting)

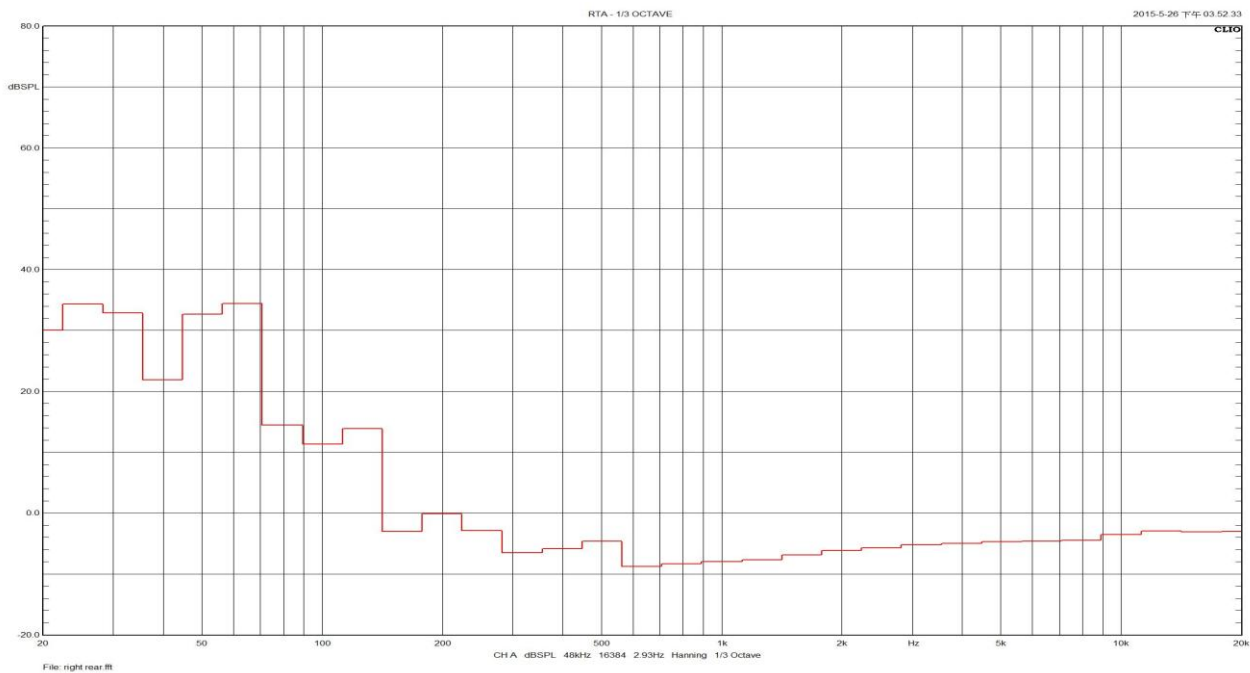


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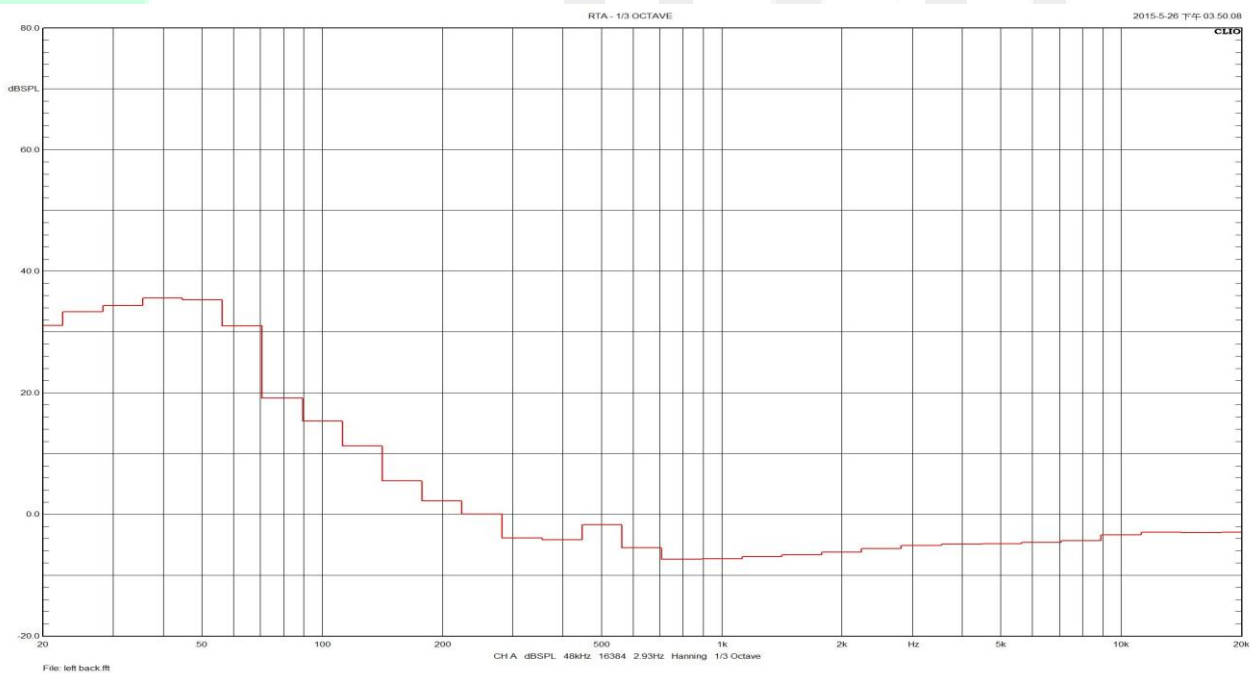
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Test Position-3 : 11.26 dBSPL LEQ 30 Sec. (A-Weighting)



Test Position-4 : 11.60 dBSPL LEQ 30 Sec. (A-Weighting)



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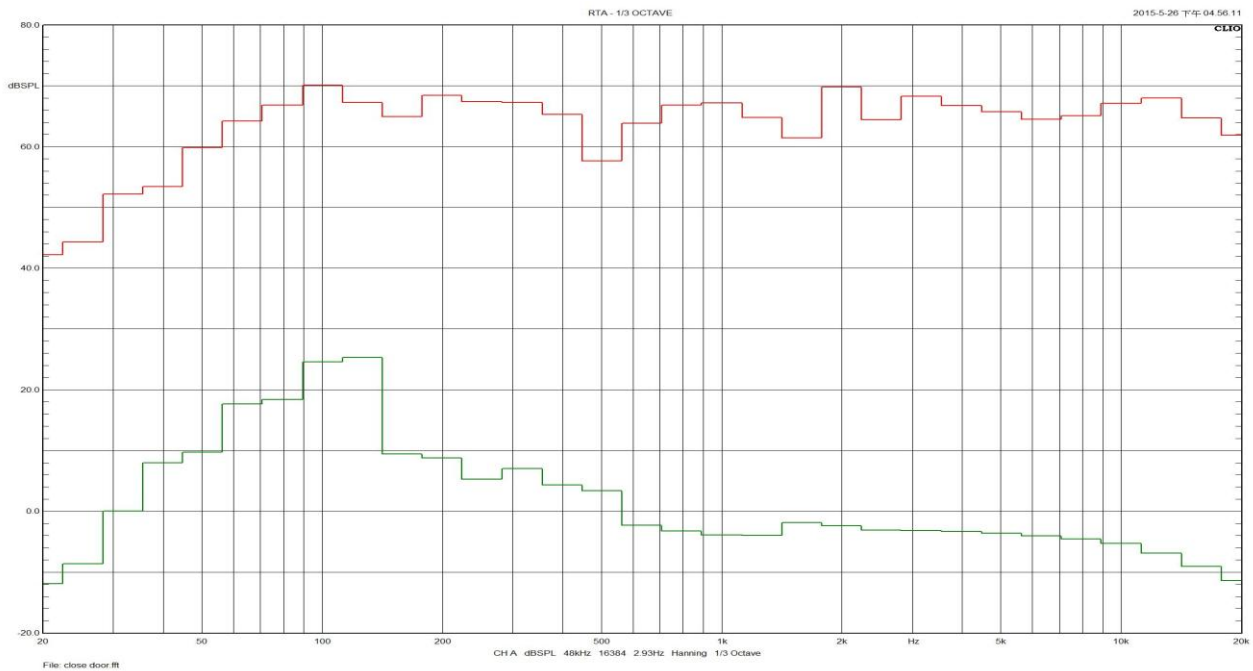


3.2 Acoustical Isolation Ability

$$80.70 \text{ dBSPL} - 29.24 \text{ dBA} = 51.46 \text{ dBA} (\geq 50 \text{ dBA})$$

A. Reference Sound Source Pink Noise Spectrum Level **80.70 dBSPL**

B. Close Door Inside Background Noise Level **29.24 dBA**



TECH



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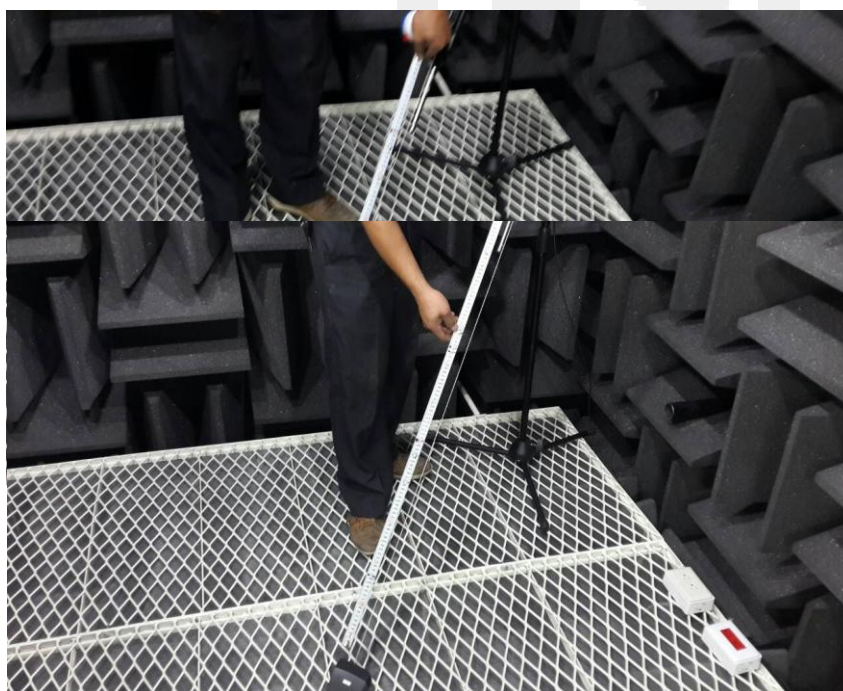
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3.3 Satisfy the inverse square.

Satisfy the inverse square of the frequency range (150Hz ~20KHz), the table is specified in ISO 3745 free field allowable deviation range, the maximum deviation is within the standard permit.

Table A Issue by ISO 3745 Free Field Allowable Deviation Range

Test Type	1/3 Octave Center Frequency	Allowable Deviation
Anechoic Chamber	$\leq 630\text{Hz}$	± 1.5
	800~5000	± 1.0
	≥ 6300	± 1.5



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Inverse Square Law Test Results

Distance Center Freq.	A.50cm Reference Source	B.100cm Reference Source	A-B -6dB Deviation	Allowable Deviation	Test Result
80	37.98	30.61	1.37	±1.5	Pass
100	42.42	32.77	3.65	±1.5	None
125	46.79	40.17	0.62	±1.5	Pass
160	51.58	44.70	0.88	±1.5	Pass
200	57.04	49.65	1.39	±1.5	Pass
250	59.83	54.44	-0.61	±1.5	Pass
315	63.03	58.12	-1.09	±1.5	Pass
400	63.98	57.58	0.40	±1.5	Pass
500	64.04	57.51	0.53	±1.5	Pass
630	63.65	57.94	-0.29	±1.5	Pass
800	63.70	57.60	0.1	±1.0	Pass
1000	63.27	56.54	0.73	±1.0	Pass
1250	63.01	57.02	-0.01	±1.0	Pass
1600	63.71	58.12	-0.41	±1.0	Pass
2000	64.76	58.98	-0.22	±1.0	Pass
2500	70.48	63.67	0.81	±1.0	Pass

3150	72.22	67.20	-0.98	±1.0	Pass
4000	69.04	62.43	0.61	±1.0	Pass
5000	67.80	62.20	-0.40	±1.0	Pass
6300	69.08	63.13	-0.05	±1.0	Pass
8000	68.31	62.63	-0.32	±1.5	Pass
10000	68.24	62.36	-0.12	±1.5	Pass
12500	68.32	61.74	0.58	±1.5	Pass
16000	65.27	58.59	0.68	±1.5	Pass
20000	58.82	51.39	1.43	±1.5	Pass

Note: 原設計目標為150 Hz以上需滿足自由音場條件，實際測量可以接近滿足至125 Hz自由音場條件，且自由場條件可以滿足100 cm。

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3.4 The natural frequency of the floating floor <10Hz

Machine specification			
Type	Anechoic Chamber		
Output	輸出能力 HP		
Frequency	環境振動頻率 Hz	fd	25
Total weight	設備重量 kg	W	5233
Mounting points	支撐點數	n	25
Installation Place. Environment	按裝環境		
Design purposes	初步設計計算		
Total weight	無響室總重量 kg	W	5233
Mounting point weight	支撐點負荷 / 個 kg	$P=W/n$	209
Isolating vibration frequency	運轉頻率 hz	fd	25
Vibration transmissibility	設定振動傳遞率 %	Tr	0.02
Natural vibration frequency	振動自然頻率 hz	$f'n=fd/\sqrt{(1/Tr')+1}$	4
Rubber Mounting deflection	靜態位移量 mm	$d=(15.76/f'n)^2$	20
Spring rate	彈性常數 kg/mm	$K=P/d$	10.33
Product name	避振器選用規格 落地式		
Product Type	避振器型式		YS-B 型

Spring deflections	彈簧壓縮量	mm	25	
Product NO.	避振器名稱		YS-300BS	YS-200BS
Mounting points	按裝數量	n	16	9
Allowable deflection	最大位移	mm	37.5	37.5
Design value	預期計效益			
Mounting point weight	支撐點負荷 / 個	kg	$P=W/n$ 225	237.2 159.7
Rubber Mounting deflection	避振器位移量	mm	$ds=P/Ks$	19.8 19.97
Isolating vibration frequency	避振器自然頻率	hz	$fn=15.76/\sqrt{ds}$	3.54 3.53
Frequency	機器運轉頻率	hz	fd	25 25
Vibration frequency ratio	振動頻率比		$R=fd/fn$	7.05 7.09
Vibration transmissibility	振動傳遞率	%	$Tr = \frac{1}{R^2-1} \times 100$	2.05 2.03
Anticipate vibration efficiency	防振效率	%		97.9 98.0

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3.5 Test results:

OBO PRO.2 INC. anechoic chamber design and construction are in compliance with specifications and requirements of ISO3744 standard.

Notes :

Please note that this document is not separating used, for information on our calibration services please contact IEA Service Center.

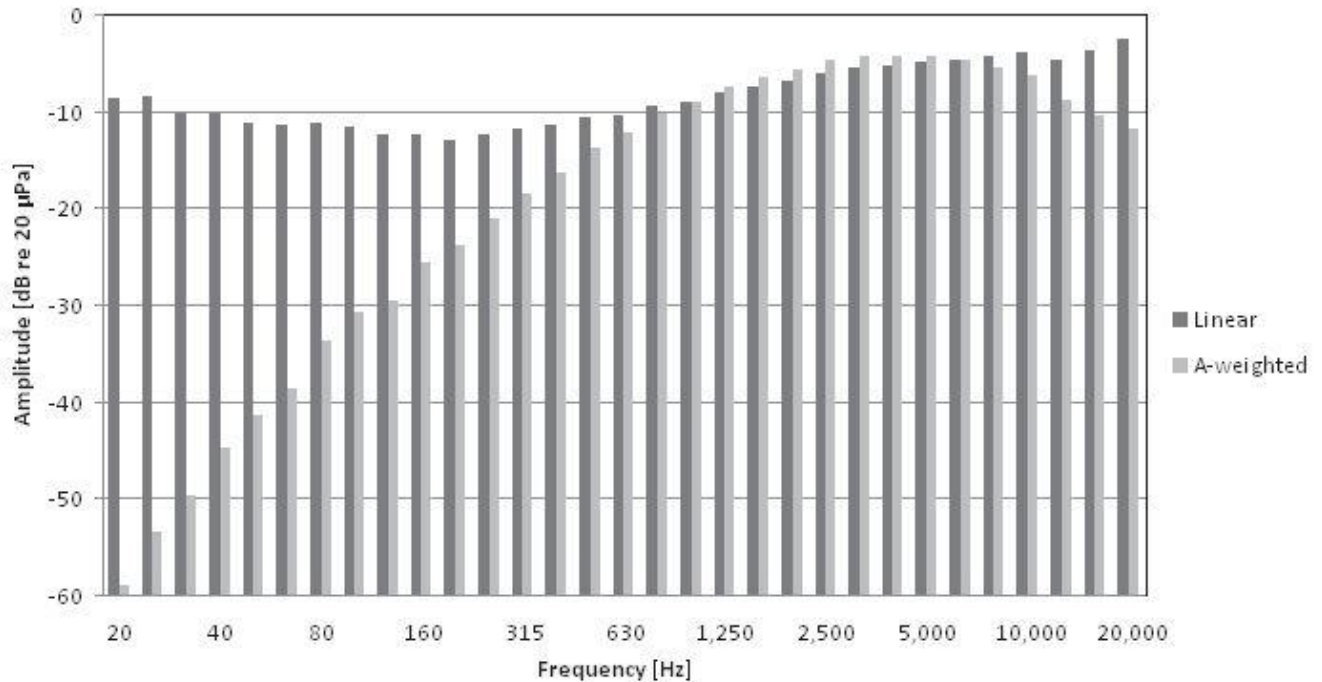
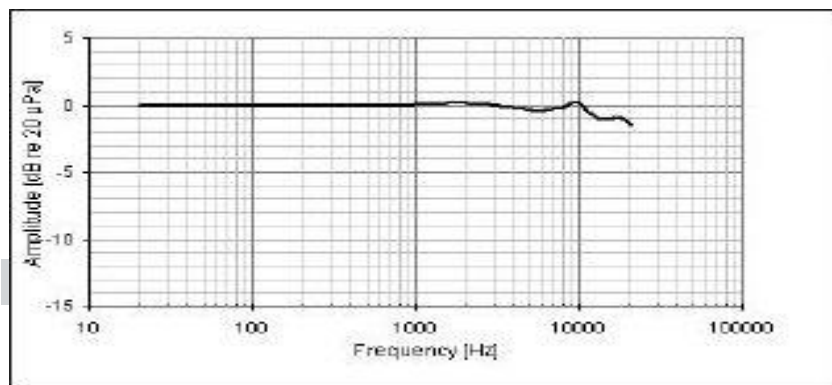
依據國際標準ISO3745 "Acoustics-Determination of sound power levels of noise sources---Precision methods for anechoic and semi-anechoic rooms" 和國家標準聲學—噪音源聲功率的測定：消聲室和半消聲室精密法”中規定的消聲室自由場測試方法進行測試。即在125 Hz以下和4 kHz以上採用1/3倍頻程中心頻率間隔單頻信號，在125Hz ~ 4 kHz之間採用1/1倍頻程中心頻率間隔單頻信號，測出實測聲壓級和理論聲壓級之間的差值，據此，根據ISO 3745規定的最大允許差值，可確定出允許的測量半徑和滿足標準的自由聲場空間區域。

TAIPEI



Note: New Advance Test System List:

1. GRAS Low Noise Microphone System



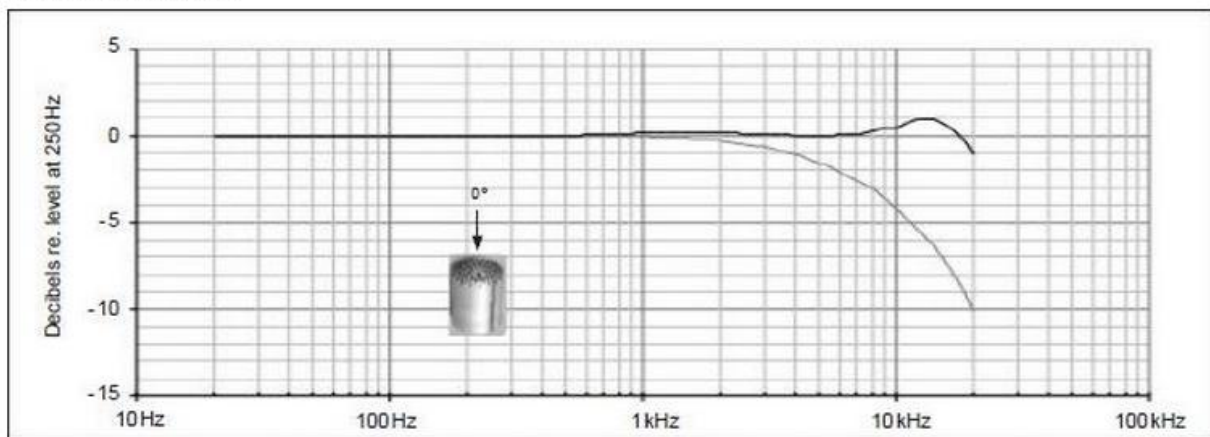
2. GRAS 40AE Standard Condenser Microphone with 26CA preamplifier



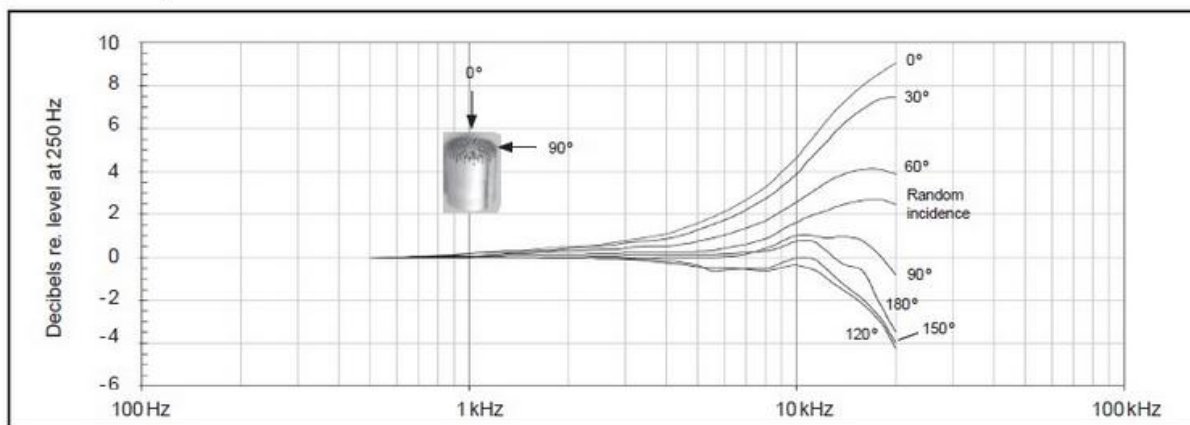
Test conditions

Temperature: 20C

Pressure: 760mm



Typical frequency response. Upper curve shows free-field response for 0°, lower curve shows pressure response.

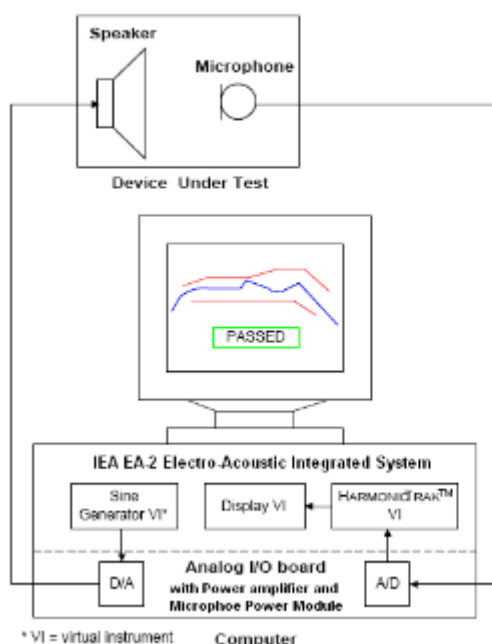


Free-field corrections for different angles of incidence

3. IEA EA-2 Electro-Acoustic Integrated System



EA-2 MEASUREMENT TECHNIQUES



Compared to other measurement systems, **EA-2** concentrates the power of many different instruments into a single one.

Three different measurement techniques are available for system identification and characterization: (Issue by CLIOFW Version 10 options)

Using all the aforementioned measuring and post-processing techniques it is possible to tailor powerful Quality Control scripts that will manage and identify any production line of electronics or electro-acoustic devices.

GENERATOR

Two channels 24 Bit sigma-delta D/A Converter
Frequency range: 1Hz-90kHz (CLIOFW options)

Frequency range: 1Hz-40 kHz (Soundcheck options from customer offer)

Frequency accuracy: >0.01%

Frequency resolution: 0.01Hz

Output impedance: 660Ohm

Max output level (Sine): 17dBu (5.5Vrms)

Attenuation: 0.1 dB steps to full mute

THD+Noise (Sine): 0.008%

Digital out: SPDIF

ANALYZER

Two channels 24 bit sigma-delta A/D Converter

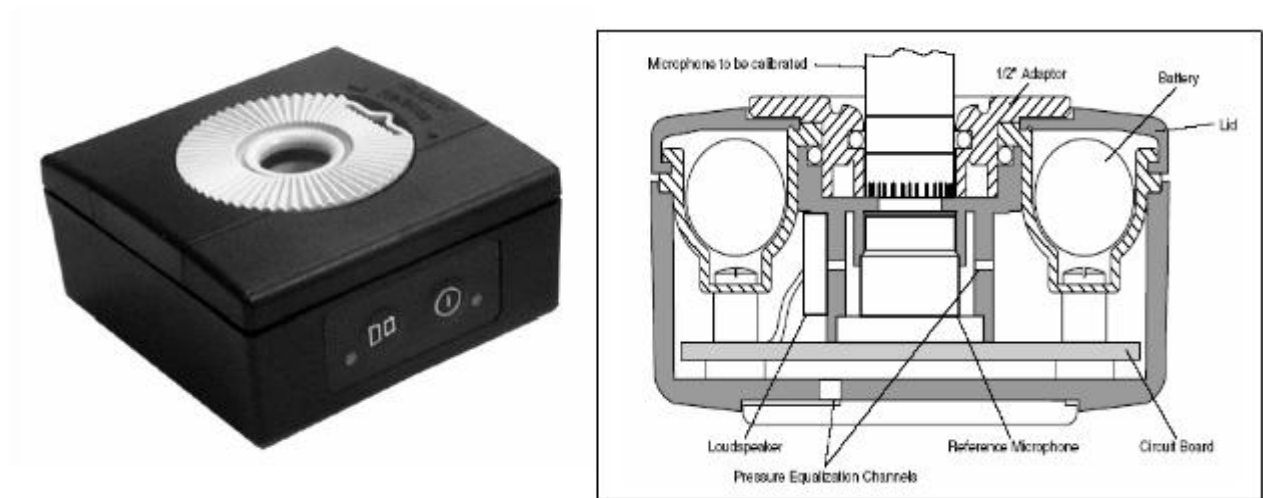
Input range: +40 ÷ -40dBV

Max input acceptance: +40dBV (283Vpp)

Input impedance: 128kOhm (5.6kOhm mic)

Phantom power supply: 24V

4. B&K 4231 Sound Level Calibrator



Features

- Conforms to IEC942 (1988) Class 1 and ANSI S1.40-1984 (R1997)
- Robust pocket-size design with highly stable level and frequency
- Calibration accuracy ± 0.2 dB
- 94 dB SPL, or 114 dB SPL for calibration in noisy environments
- Extremely small influence of static pressure
- Sound pressure independent of microphone equivalent volume
- 1 kHz calibration frequency for correct calibration level independent of weighting networks
- Fits Brüel & Kjær 1" and 1/2 "microphones (1/4" and 1/8"microphones with adaptor)
- Switches off automatically when removed from the microphone