



*Soundproof Leader*

DATE: APRIL 17, 2019

ACOUSTIC SONIC INC.  
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305 4368360 off 305 436 8585 fax

**TO:** Calixto Vallejo or Andres Peres  
Range & Tactical Center  
14000 NW 82 Ave  
Miami Lakes. FL 33014

RECEIVED  
April 17, 2019

Re: Noise Survey for Shooting Range  
14000 NW 82 Ave. Miami Lakes. FL 33014

## INTRODUCTION

I am pleased to present the results of a noise survey which was conducted at your request. The purpose of this noise analysis is to examine the potential for noise impacts related to the Shooting Range inside 14000 NW 82 AVE Miami Lakes, FL and how surrounding properties might be affected. Noise analysis considers existing background noise levels. This study was made on Thursday, March 21, 2019, during morning hours (i.e from 11.00 am to 12.00 pm).

## Noise Fundamentals

Noise is typically measured in units called decibels (db), which are ten times the logarithm of the ratio of the sound pressure squared to a standard reference pressure squared. Because loudness is important in the assessment of the effects of noise on people, the dependence of loudness on frequency must be taken into account in the noise scale used in environmental assessment.

Frequency defines sound in terms of pitch components. One of the simplified scales that accounts for the dependence of perceived loudness on frequency is the use of a weighting network known as A-weighting in the measurement system, to simulate response of the human ear. For most noise assessments the A-weighted sound pressure level in units of dBA is used in view of its widespread recognition and its close correlation with perception. Common noise levels in dBA are shown in the Table 1.



## Sound Pressure Level (SPL) and Permissible Exposure Time for Noise

Sound Pressure Level	Sound pressure	Permissible Exposure Time
115 dB	11.2 Pa	0.46875 minutes (~30 sec)
112 dB	7.96 Pa	0.9375 minutes (~1 min)
109 dB	5.64 Pa	1.875 minutes (< 2 min)
106 dB	3.99 Pa	3.75 minutes (< 4 min)
103 dB	2.83 Pa	7.5 minutes
100 dB	2.00 Pa	15 minutes
97 dB	1.42 Pa	30 minutes
94 dB - - - - -	1.00 Pa - - - - -	1 hour - - - - -
91 dB	0.71 Pa	2 hours
88 dB	0.50 Pa	4 hours
85 dB	0.36 Pa	8 hours
82 dB	0.25 Pa	16 hours

Table 1 show Guidelines for recommended permissible exposure time for continuous time weighted average noise, according to OSHA Occupational Safety and Health Administration.

## SOUND CHARACTERISTICS OF FIREARMS

The muzzle report can be regarded as a point source with a directional characteristic. The ballistic wave can be treated as a coherent line source, radiating a conical shock wave. The propagation of the ballistic wave is extremely directional and is limited to a well-defined geometrical area. It is radiated mainly at an angle of 60° from the bullet path. The sound of a firearm usually concentrates on high frequency (i.e. above 1000 Hz).

The noise from firearms is described as being “impulsive,” which signifies that the sound lasts for only a very short period of time, typically less than 1 second.

Measurements using the impulse sound level meter response are commonly taken with the A-weighting and expressed in terms of dBA(I) or dBA(L). There are two main methods of measuring impulsive sound, and hence firearm sound levels. The first method is to measure the Leq of the sound from a range over a 1 hour period, and then apply a penalty between 5 dB and 12 dB . The second method is to measure typical shots with the impulse (or peak) meter response and A-weighting to obtain a level expressed in terms of dBA(I) (or dBA Peak). If the individual impulse (or peak) sound levels vary, then they can be averaged to obtain a single result.

## SCOPE OF WORK

We set up sound level meters located in the property line area. The sound level meters is Class A with a current calibration certificate and standard frequency weighting, frequency filtered by octave band and fast response. The noise analysis considers existing background noise levels. In order to ensure the accurate and repeatable measurement of impulsive sound levels from firearms, two parameters were established as being suitable for the measurement of firearm-



related sounds - that is, either a Leq measurement over a 1-hour period or a reading with the impulse meter response. The maximum 1-hour equivalent sound level (Leq) has been selected as the noise descriptor to be used in the noise impact evaluation. Leq is the noise descriptor used by the city and governmental agencies for noise impact evaluation and is used to provide an indication of highest expected sound levels.

Measurements sites were selected at the followings locations:

- Site 1 (P1) located in front of the Shooting Range door 14000 NW 82 AVE nearest property line at several points of reception to determine which location is the one with the highest sound levels and thus be designated as the critical point of reception just to property line.



- Site 2 (P2) located at the office of the unit 14004 NW 82 AVE just inside of the property.





### EQUIPMENT USED DURING NOISE SURVEY

The equipment and measuring procedures followed the prevailing America Society for Testing and Materials, ASTM designation E1503. Calculations, classifications and storage of the data were accomplished by computer.

- Sound Level Meter Cesva SC 420 Class 1 (precision) Calibrate Noise Level- Lab (94 db)
- Spectrum Analyzer Cesva SC-420

### WEATHER CONDITIONS

Time (EST)	Temp.	Humidity	Wind Dir	Wind Speed	Conditions
11:00 AM	75.0 °F	66%	NNW	9 mph	Clear



## Noise Ordinance Miami Dade, Florida.

### Ordinance: 10754

#### Maximum Permitted Sound Level in Decibels dBA

Receiving Land Use	At Property Line or Beyond Between 10:00 p.m. and 7:00 a.m.	At Property Line or Beyond Between 7:00 a.m. and 10:00 p.m
Single-family	5 dBA above ambient or maximum of 55 dBA	10 dBA above ambient or maximum of 60 dBA
Multifamily, institutional, parks and noise-sensitive zones	5 dBA above ambient or maximum of 60 dBA	10 dBA above ambient or maximum of 65 dBA
Retail commercial (offices, retail, restaurants and movies)	5 dBA above ambient or maximum of 65 dBA	10 dBA above ambient or maximum of 65 dBA
Wholesale commercial and industrial	5 dBA above ambient or maximum of 70 dBA	10 dBA above ambient or maximum of 75 dBA

### Distance and Sound Propagation

Sound spreads spherically from the source and dissipates at a rate of 6 dB each time the distance from the source is doubled. For each 6 decibel reduction, there is also a 50% reduction in sound pressure and a 75% in sound intensity of the initial value. When developing a range or modifying an existing one it is important to keep in mind that distance can be one of your greatest assets when it comes to noise management. Something as simple as buying land adjacent to you can significantly help in reducing noise complaints. Additional reductions in sound levels can occur depending on surrounding environmental factors. For example, a soft surface such as a grass-covered field creates a reflection that interferes with the sound going in a straight line from the source, resulting in as much as a 25 dB reduction. The weather also has a significant effect on the way sound travels. Since under most weather conditions wind and temperature vary with height above the ground, the vertical gradients cause the speed of sound to also vary with height. It is also important to note that sound levels can be increased or decreased depending on atmospheric conditions, and therefore could differ daily even if the source remains the same.



## MEASUREMENTS RESULTS

FIRE ARM	TEST 1 Noise Level Outside unit 14400		TEST 2 Noise Level Office with shooting range operating		Audible
	dbA	dbAI	dbA	dbAI	
9 MM CALIBER	45	50	50	57	Barely Audible
.45 PISTOL	50	55	55	60	Audible
Rifle	53	57	60	65	Audible

**Table 2**



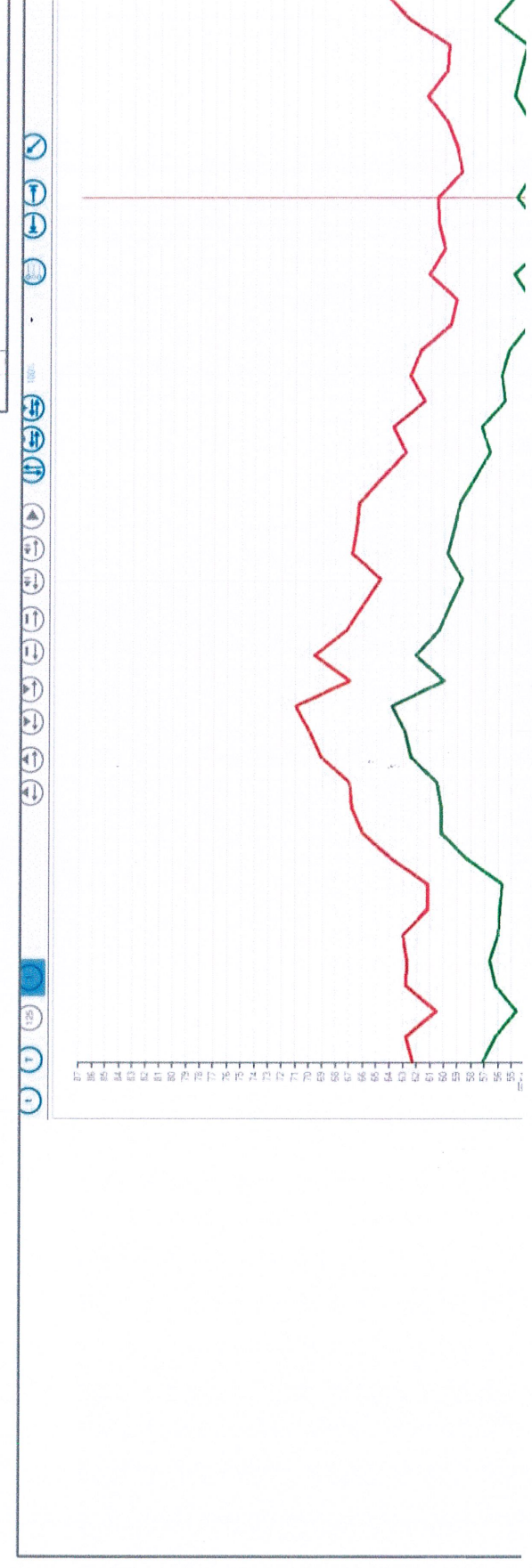
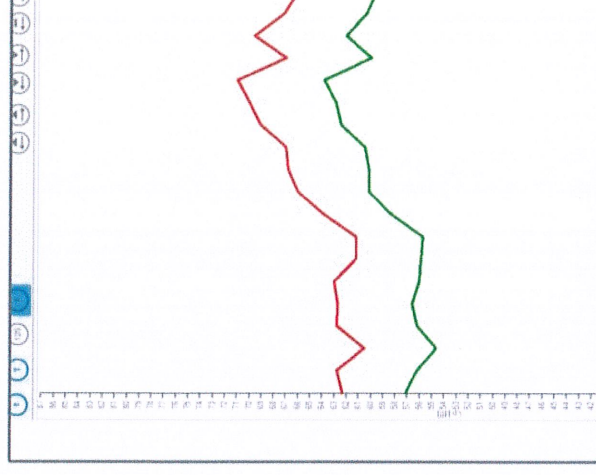
# Noise Level in office . Caliber 9

Sound level meter -- S/N: T241695 -- 00017 2019-03-21 11-37-36 S.cdf

Start: 3/21/2019 11:37:36 AM / Mode: Sound Level Meter

End: 3/21/2019 11:38:55 AM / Field correction: Free field

T time: 00:00:30 / t time: 0:01:19





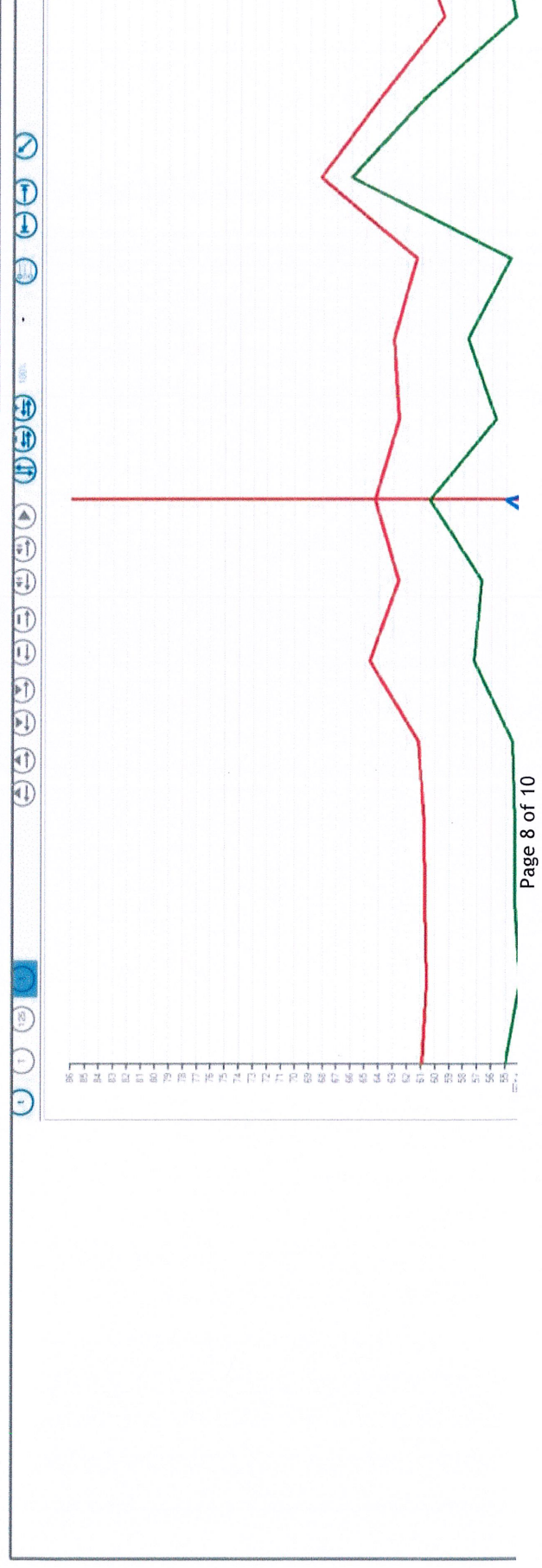
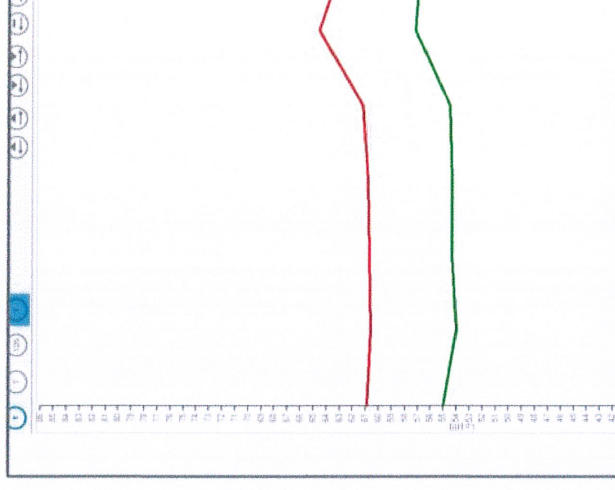
# Noise Level Office. Cal 45

Sound level meter -- S/N: T241695 -- 00019 2019-03-21 11:40-30 S.cdf

Start: 3/21/2019 11:40:30 AM / Mode: Sound Level Meter

End: 3/21/2019 11:40:55 AM / Field correction: Free field

T time: 00:00:30 / t time: 0:00:25

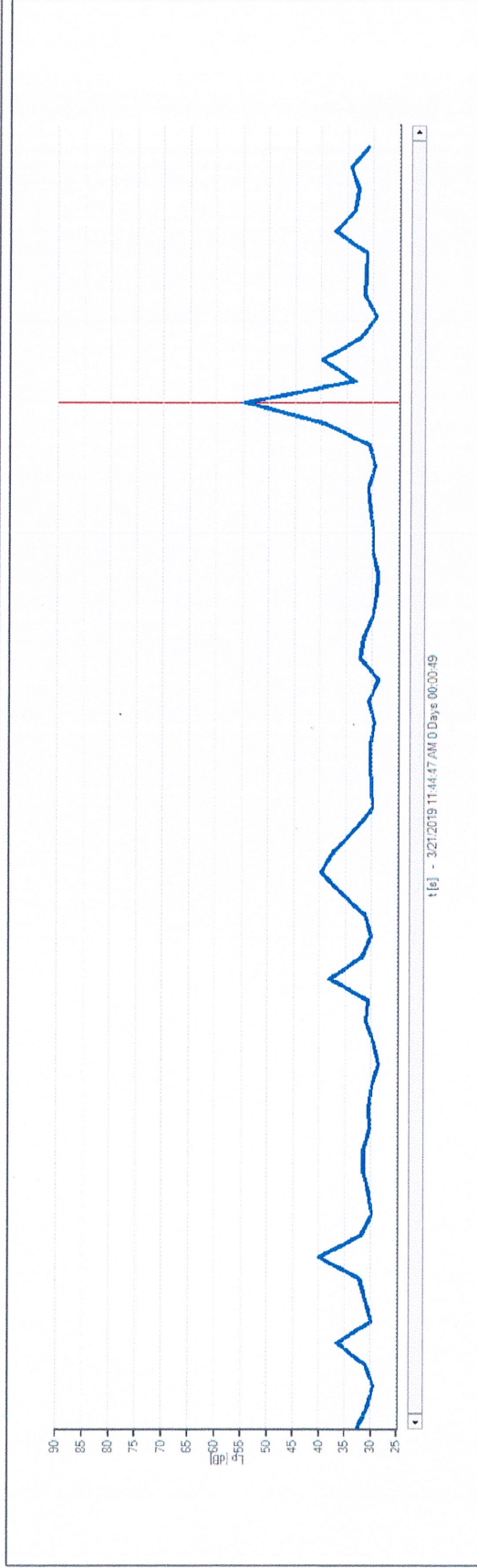
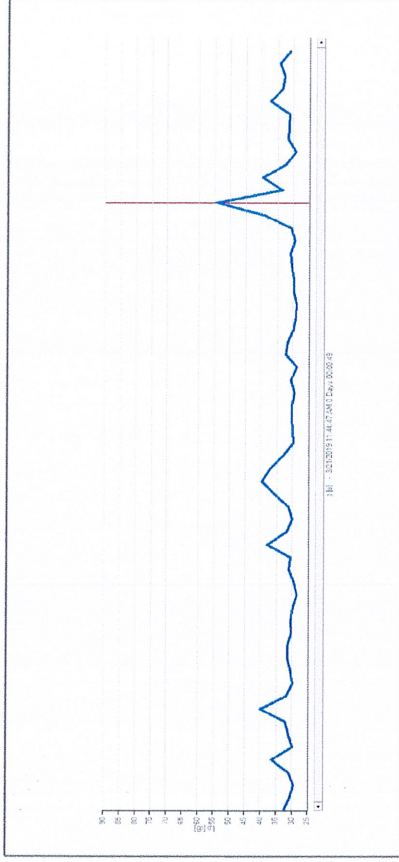




# Noise Level in Office Rifle

Sound level meter -- S/N: T241695 -- 00021 2019-03-21 11:43:58 S.cdf

Start: 3/21/2019 11:43:58 AM / Mode: Sound Level Meter  
 End: 3/21/2019 11:44:59 AM / Field correction: Free field  
 T time: 00:00:30 / t time: 0:01:01



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## CONCLUSIONS

The shooting noise was inaudible or only barely audible outside the building just in front of the property. (Test 1)

The maximum level recorded in the office 14004 when the shooting noise was audible (not just "barely audible") was 65 dbAI with the rifle shooting, however it was only audible a few minutes. Although the potential noise impact to the nearest office, 14004, is well within compliance with the standards, gunshot noise is clearly audible at this locations at times. Reaction to noise is subjective. It is impossible to predict an individual's sensitivity to noise. Anytime a sound is audible there is a potential for annoyance.

Due to the room being small, the direction of the shooting range and land used does not affect significantly the noise level in the adjacent spaces.

## RECOMMENDATIONS

Sound-absorbing materials on the inside of the indoor range should be add in order to provide reduction of noise to the exterior and will reduce interior sound level.

The walls and roof of the indoor range building should be checked, some opening could be affecting transmission loss of walls.

## GLOSSARY OF ACOUSTICAL TERMS

### A-Weighted Sound Pressure Level

The sound pressure level that is modified by the application of A-weighting. It is measured in A-weighted decibels and denoted dBA. A-Weighting The frequency weighting characteristic as specified in IEC 123 or IEC 179 and intended to approximate the relative sensitivity of the normal human ear to different frequencies (pitches) of sound.

### Impulse Sound Level dbAI

The sound level of an impulsive sound as measured with an Impulse Sound Level Meter set to impulse response. It is measured in A-weighted decibels and denoted dbAI.

### Acoustic Calibrator

An electro-mechanical or mechanical device intended for the calibration of sound level meters and meeting the specifications of Publication NPC-102 - Instrumentation, for Acoustic Calibrators.

### Decibel A

dbA dimensionless measure of sound level or sound pressure level; see "Sound Pressure Level."

### Effective Sound Pressure

The "effective sound pressure" at a point is the root-mean square value of the instantaneous sound pressure, over a time interval, at the point under consideration as detected with a sound level meter.

### Equivalent Sound Level

Sometimes denoted as Leq. It is the value of the constant sound level that results from exposure to the same total A-weighted energy as does the specified time-varying sound, if the



mathematical definition of Equivalent Sound Level (Leq) for an interval defined.

**Fast Response**

A dynamic characteristic setting of a sound level meter.

Frequency The “frequency” of a periodic quantity is the number of times that the quantity repeats itself in a unit interval of time. The unit of measurement is hertz (Hz), which represents the number of cycles per second.

General Purpose Sound Level Meter Fast Response A dynamic characteristic setting of a sound level meter.

Please contact me if you have any questions or need additional information.

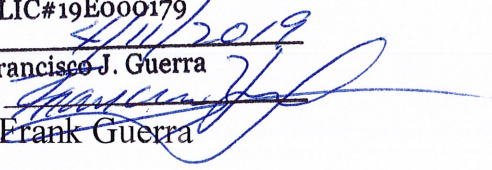
Tested by:



Roberto Gonzalez. BS. INCE,ASA.  
Acoustical Consultant  
Acoustic Sonic Inc

Approved  
AudioVideo Technical Services  
LIC#19E000179

Date: 4/11/2019  
Francisco J. Guerra

Signature:   
Ing Frank Guerra



# Scantek, Inc.

CALIBRATION LABORATORY

ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1  
ACCREDITED by NVLAP (an ILAC MRA signatory)



## Calibration Certificate No.39334

**Instrument:** Sound Level Meter  
**Model:** SC420  
**Manufacturer:** Cesva  
**Serial number:** T241695  
**Tested with:** Microphone C140 s/n 13403  
Preamplifier PA020 s/n 261  
**Type (class):** 1  
**Customer:** Acoustic Sonic, Inc.  
**Tel/Fax:** 305-436-8360 / 305-436-8585

**Date Calibrated:** 9/18/2017 **Cal Due:**

Status:	Received	Sent
In tolerance:	X	X
Out of tolerance:		

**See comments:**

**Contains non-accredited tests:** Yes ☒ No

**Calibration service:** Basic ☒ Standard

**Address:** 6946 NW 50th Street,  
Miami, FL 33166

**Tested in accordance with the following procedures and standards:**  
Calibration of Sound Level Meters, Scantek Inc., Rev. 6/26/2015  
SLM & Dosimeters – Acoustical Tests, Scantek Inc., Rev. 7/6/2011

**Instrumentation used for calibration:** Nor-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence	Cal. Due
				Cal. Lab / Accreditation	
483B-Norsonic	SME Cal Unit	31052	Oct 26, 2016	Scantek, Inc./ NVLAP	Oct 26, 2017
DS-360-SRS	Function Generator	33584	Oct 20, 2015	ACR Env./ A2LA	Oct 20, 2017
34401A-Agilent Technologies	Digital Voltmeter	US36120731	Oct 12, 2016	ACR Env./ A2LA	Oct 12, 2017
HM30-Thommen	Meteo Station	1040170/39633	Nov 1, 2016	ACR Env./ A2LA	Nov 1, 2017
PC Program 1019 Norsonic	Calibration software	v.6.1T	Validated Nov 2014	Scantek, Inc.	-
1251-Norsonic	Calibrator	30878	Nov 10, 2016	Scantek, Inc./ NVLAP	Nov 10, 2017

**Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK).**

### Environmental conditions:

Temperature (°C)	Barometric pressure (kPa)	Relative Humidity (%)
21.5	100.40	58.9

<b>Calibrated by:</b>	Lydon Dawkins	<b>Authorized signatory:</b>	Steven E. Marshall
Signature	<i>Lydon Dawkins</i>	Signature	<i>Steven E. Marshall</i>
Date	9/18/2017	Date	9/18/2017

Calibration Certificates or Test Reports shall not be reproduced, except in full, without written approval of the laboratory.

This Calibration Certificate or Test Reports shall not be used to claim product certification, approval or endorsement by NVLAP, NIST, or any agency of the federal government.

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