i437L- Frequent Asked Questions

◆ Question 1 :

What are the advantages of MicW i437L?

◆ Answer 1 :

The i437L is a digital microphone connected to iPhone Lightning connector. It has flat frequency response and low noise. It can be calibrated using normal sound level calibrators.

◆ Question2

What is the minimum sound pressure level iPhone or iPad can measure?

◆ Answer 2

35 dB (A) (iPhone 5)
30 dB (A) (iPhone 7)

◆ Question3

What is the maximum sound pressure level iPhone or iPad can measure?

◆ Answer 3

120 dB (A) (iPhone 5)
129 dB (A) (iPhone 7)

◆ Question 4

What kind of device does it work with?

◆ Answer 4

The i437L is designed specially for iPhone, iPad, iPad mini, iTouch (iOS Lightning connector).

◆ Question 5

What is the bit depth and the sampling rate of the iPhone?
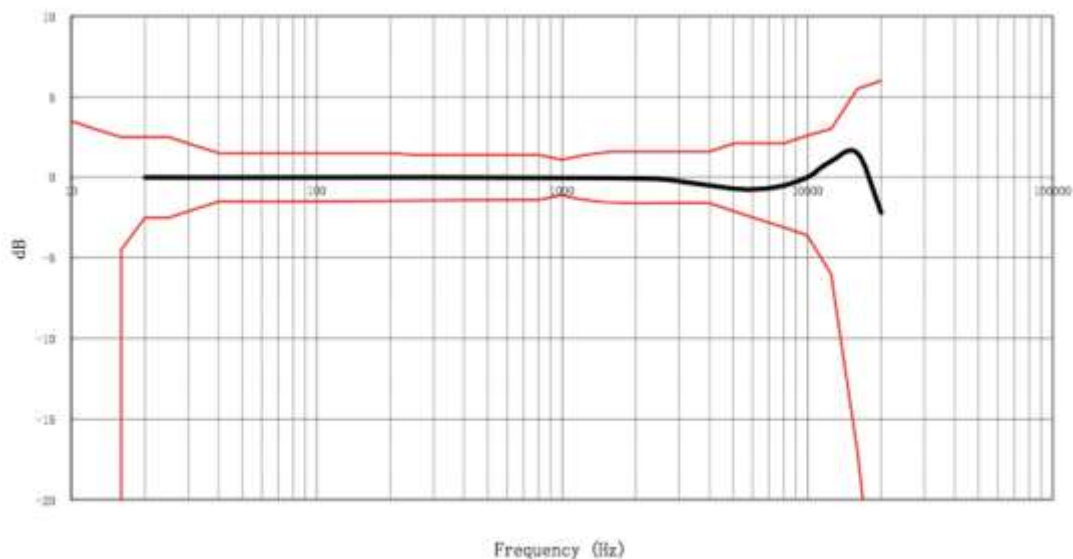
◆ Answer 5

The iPhones use 24 bits and 48kHz sampling. This specification may change with new iPhone.

◆ Question 6

What are the typical frequency responses of i437L and how the results related to IEC61672 standard?

◆ Answer 6

The typical frequency response of i437L is shown in black line of the following chart. The red lines are the limits specified in IEC 61672 standards for Class 1 Sound Level Meter. Our production are followed those limits as quality control.

Frequency (Hz)

◆ Question 7

Does the i437L can be used as an industrial standard measurement device?

◆ Answer 7

MicW i437L can be as the iPhone based real time analyzer. Appendix A is the measurement setup and results for i437L.

◆ Question 8

What kind of software could i437L work with? Which is the price

range?

◆ Answer 8

It can work with most of the Sound Level Meter, Real Time Analyzer (RTA) and Recording software. The software is available in App Store and Google Play. The price ranges from $1.0 to $500.
We did not fully test any software against IEC61672 standard. Please note that the different software could give you different results.
We tested SignalScopePro and DSP mobile which have professional calibration functions.

◆ Question 9

How accuracy does iPhone or iPad with i437L measure overall dBA for Pink noise?
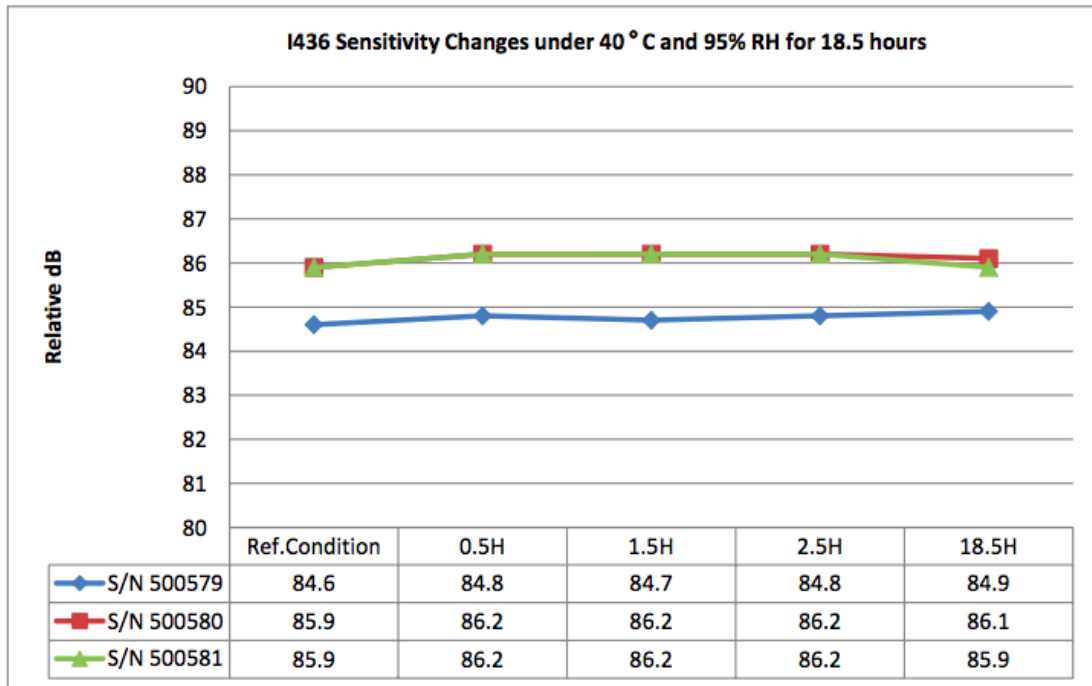
◆ Answer 9

We made comparison measurements in our Anechoic Chamber with BSWA801 Class 1 sound level meter. We used a loudspeaker to generate the Pink noise and used BSWA CA114 to calibrate both iPhone device and BSWA801. The measurements are taking at the same position. The overall dBA readings from two devices are within ±1.0 dBA.

◆ Question 10

How does the i437L perform under high temperature and humidity environments?

◆ Answer 10

Three i437L microphones were tested in the environmental chamber for 18,5 hours under 40 C and 95% RH humidity. The related sensitivity changes are within 0.5 dB.

I436 Sensitivity Changes under 40 °C and 95% RH for 18.5 hours

	Ref.Condition	0.5H	1.5H	2.5H	18.5H
S/N 500579	84.6	84.8	84.7	84.8	84.9
S/N 500580	85.9	86.2	86.2	86.2	86.1
S/N 500581	85.9	86.2	86.2	86.2	85.9

Relative dB (Y-axis: 80 to 90)

◆ **Question 11**

What APP do you recommend for STIPA (Speech Transmission Index) measurements?
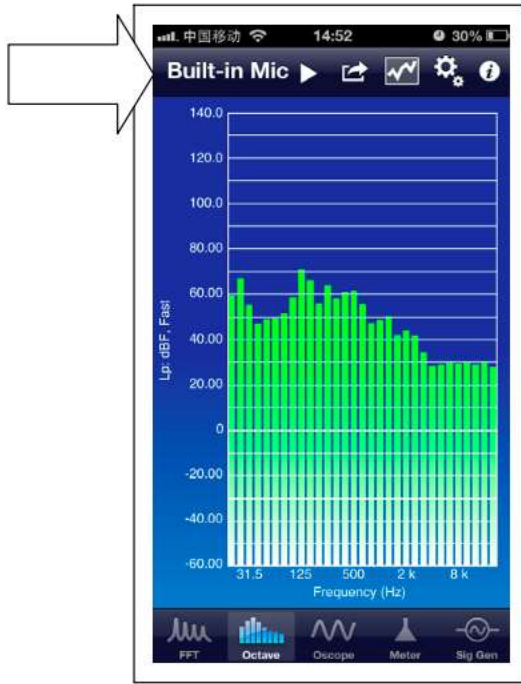
◆ **Answer 11**

We recommend iSTI Professional from Embedded Acoustics.
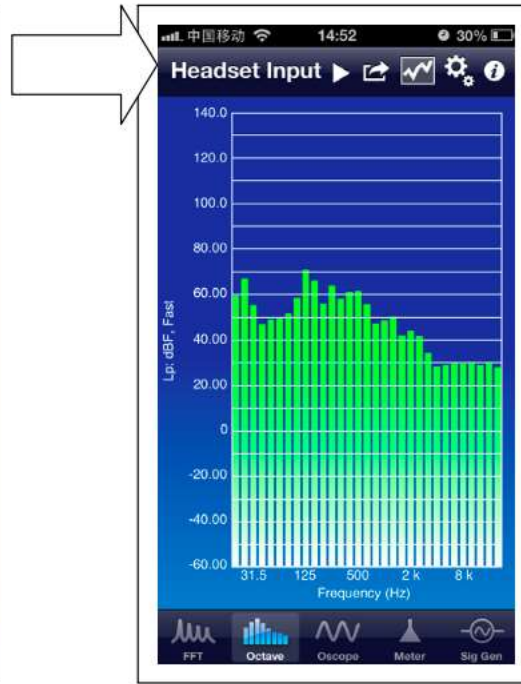
◆ **Question 12**

How do I know the i437L is connected to the iPhone?

◆ **Answer 12**

The APP software such as SigScopePro has indication when external microphone is inserted into the headset connector.

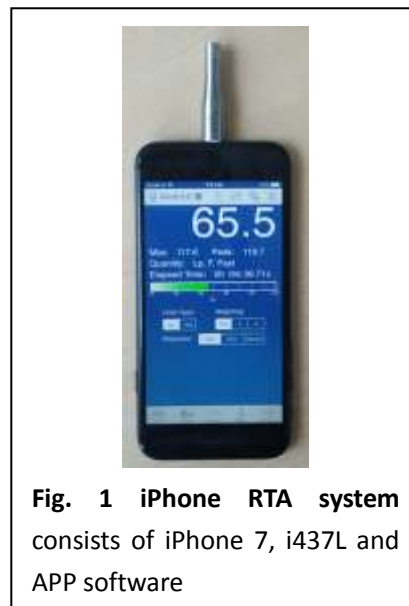Built-in Microphone   i437L is inserted

Appendix A is the measurement setup and results for i437L.

1. Introductions

MicW i437L microphone for iPhone becomes very popular in the sound measurement community. With new iPhone 7 released in September 2016, the iPhone based real time analyzer will become industrial standard measurement devices. This Technical Notes will evaluate the performance of i437L on new iPhones. The topics will be covered

1) Measurement Range

2) Frequency Responses

3) Frequency Response Data for corrections

4) Calibration

5) Applications and comparisons

Fig. 1 iPhone RTA system consists of iPhone 7, i437L and APP software

2. Hardware and Software

The following hardware and software are used in the study:

    1) Five (5) units of i437L microphones

    2) iPhone 7 (model A1549)

    3) SignalScopePro 6.4.4 (r1594)

3. Measurement Range

The measurement range is the minimum and maximum sound pressure level the iPhone RTA system can measure.

3.1 The minimum sound pressure levels of the iPhone RTA system

    The minimum sound pressure level of the iPhone system was tested in BSWA anechoic chamber. The background noise level of the chamber is 16 dB (A). The measurements were taken at three Gain settings in

the software.

Fig.2 Gain settings in the software.   Fig. 3 Measurement in the anechoic chamber

3.2 The maximum sound pressure levels

The maximum sound pressure level of the iPhone system was tested using BSWA high-pressure calibrator CA905 that is capable to generate 170 dB in a small cavity.
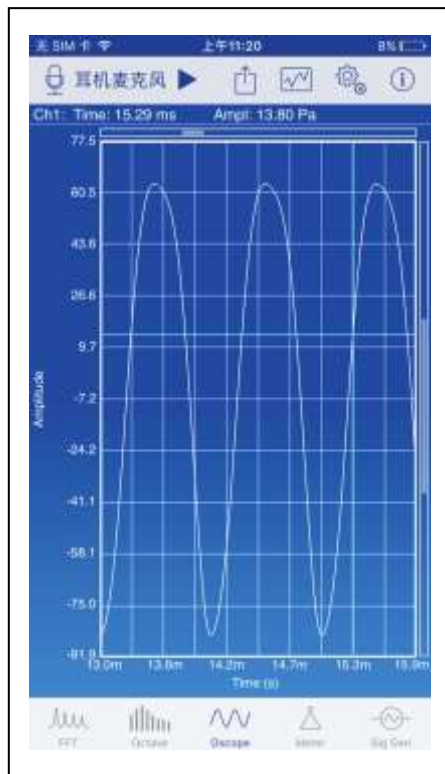
Fig. 4 Measurement setup for Maximum SPL testing. The sine signal starts the distortion when the SPL reaches 129 dB.

3.3 The results of measurement ranges

The results are shown in Table 1.

Table 1 Measurement Ranges for Phone 7 based RTA with i437L

Software Gain Setting	Minimum SPL dBA	Maximum SPL dB
Low	43	129
Middle	33	117
High	30	90

4. Frequency Responses of iPhone7 based RTA with i437L

Frequency response of iPhone 7 with i437L was tested by comparison method. The reference microphone is B&K 4189 microphone. (The frequency response was tested with a standard acoustic source. The method of the testing follows IEC 61094- 8.)

Fig. 5 Measurement setup for testing the frequency response of iPhone 7 RTA with i437L
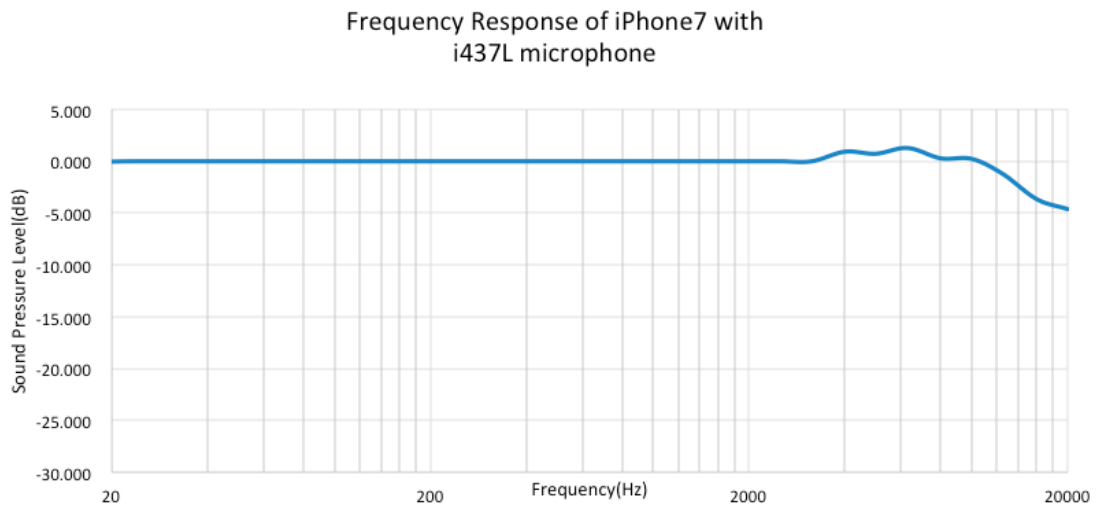
by comparison method.

Fig. 6 Frequency Response data for iPhone 7 with i437L

The Frequency response data could be upload to SigScopePro APP to correct the measurement data.
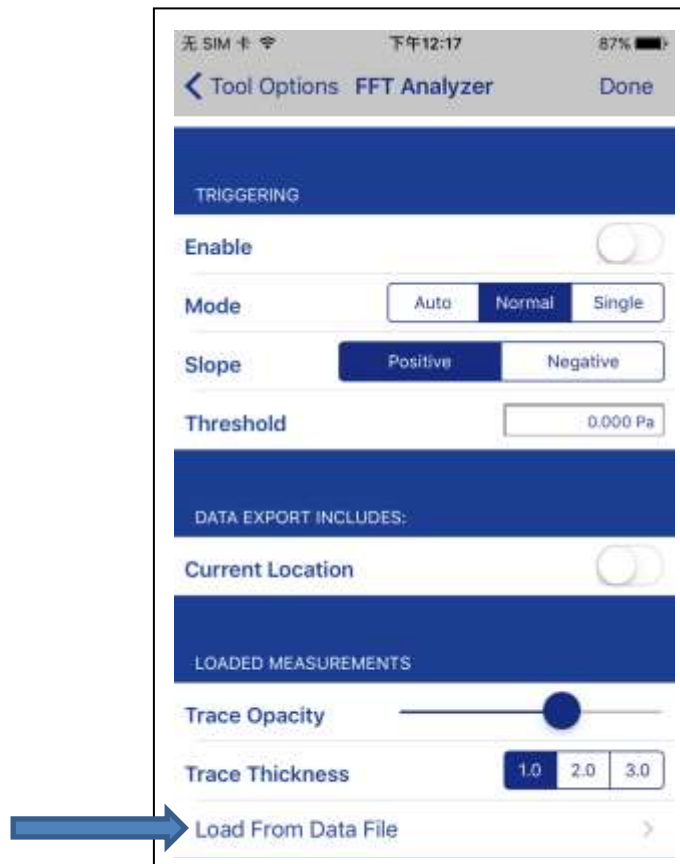

Fig. 7 Upload the Frequency Response Data to the APP

Table 2 Frequency Response data for iPhone 7 with i437L

Frequency (Hz)	Corrections (dB)
20	0.000
25	0.000
31.5	0.000
40	0.000
50	0.000
63	0.000
80	0.000
100	0.000
125	0.000
160	0.000
200	0.000
250	0.000
315	0.000
400	0.000
500	0.000
630	0.000
800	0.000
1000	0.000
1250	0.000
1600	0.000
2000	0.000
2500	0.000
3150	0.000
4000	0.925
5000	0.728
6300	1.280
8000	0.285
10000	0.236
12500	-1.202
16000	-3.650
20000	-4.613

5. Sensitivity of i437L

Each i437L is calibrated in the factory and the sensitivity of i437L is given in the User's Manual with unique serial number. The sensitivity is in Pa/FS units.

Fig 8. The calibration data supplied with each i437L with Serial Number. The sensitivity is given in Pa/FS.

6. Calibration

To calibrate the iPhone 7 based RTA, the customers need to do :

1) Read the sensitivity from the Calibration Chart in the User's Manual. As example from Fig. 8, it is 19.28 Pa/FS.

2) Set the Device Units to FS.

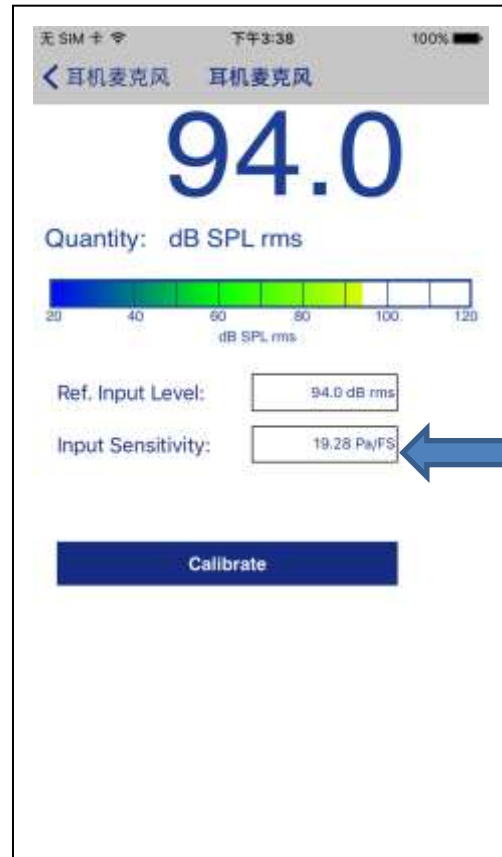3) Input 19.28(Pa/FS) into the APP as shown in Fig.9.

4) The calculation is done.

Fig. 9 Type the Input Sensitivity into the APP.