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.

◆ **Question 2**
What is the minimum sound pressure level iPhone or iPad can measure?

◆ **Answer 2**
35 dB (A) (iPhone 5)
30 dB (A) (iPhone 7)

◆ **Question 3**
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 Response Chart](chart.png)

◆ **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.
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

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.

![Image](image1)

**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

<table>
<thead>
<tr>
<th>Software Gain Setting</th>
<th>Minimum SPL dB</th>
<th>Maximum SPL dB</th>
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</thead>
<tbody>
<tr>
<td>Low</td>
<td>43</td>
<td>129</td>
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<tr>
<td>Middle</td>
<td>33</td>
<td>117</td>
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<tr>
<td>High</td>
<td>30</td>
<td>90</td>
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</table>

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.

Frequency Response of iPhone7 with i437L microphone

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

<table>
<thead>
<tr>
<th>Frequency (Hz)</th>
<th>Corrections (dB)</th>
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<tr>
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<td>-4.613</td>
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</table>

### 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.
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.