

Basic Audio Debugging Methods

2019-09-16

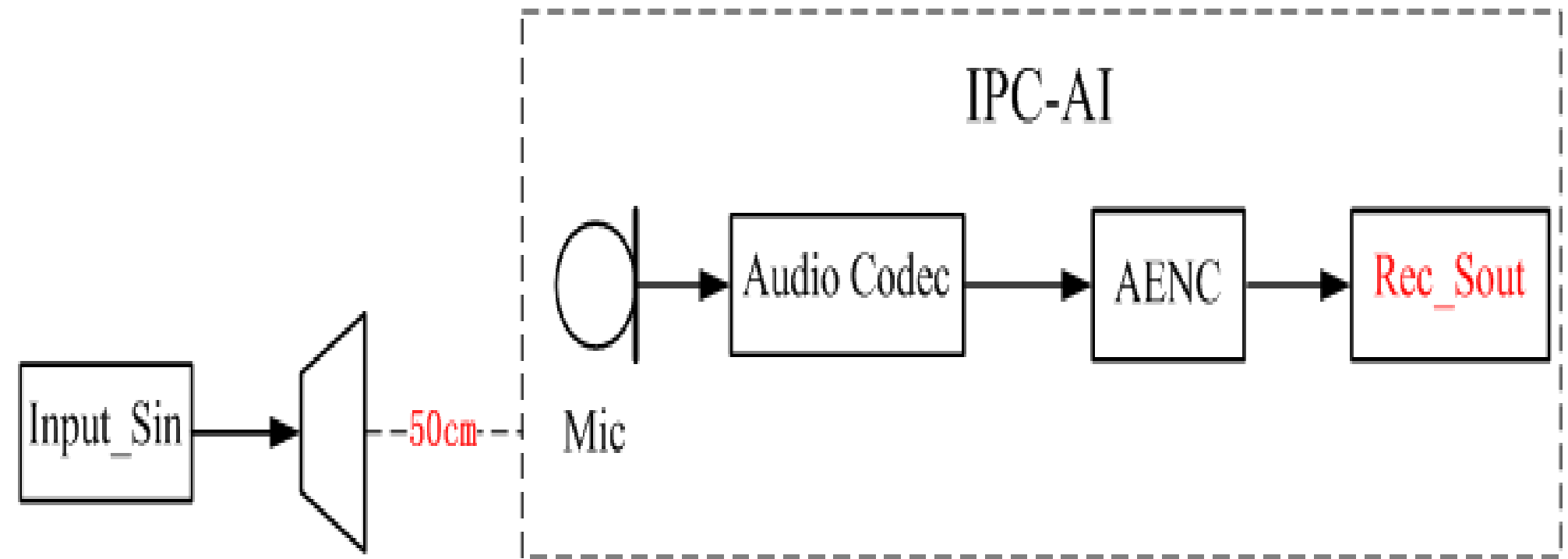


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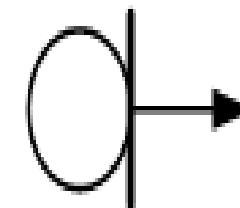
Debugging Item-AI

Basic Debugging Steps

1. Use a standard sound box to play the test sequence (Input_Sin), and read the decibel (80 dB) from the sound pressure meter.
2. Perform audio recording using a test case prepared in advance.
3. Generate the **Rec_Sout** file and analyze it.
4. Debug items including the AI gain, circuit interference, AI background noise, microphone (MIC) frequency response curve (optional).



Ref_Speaker

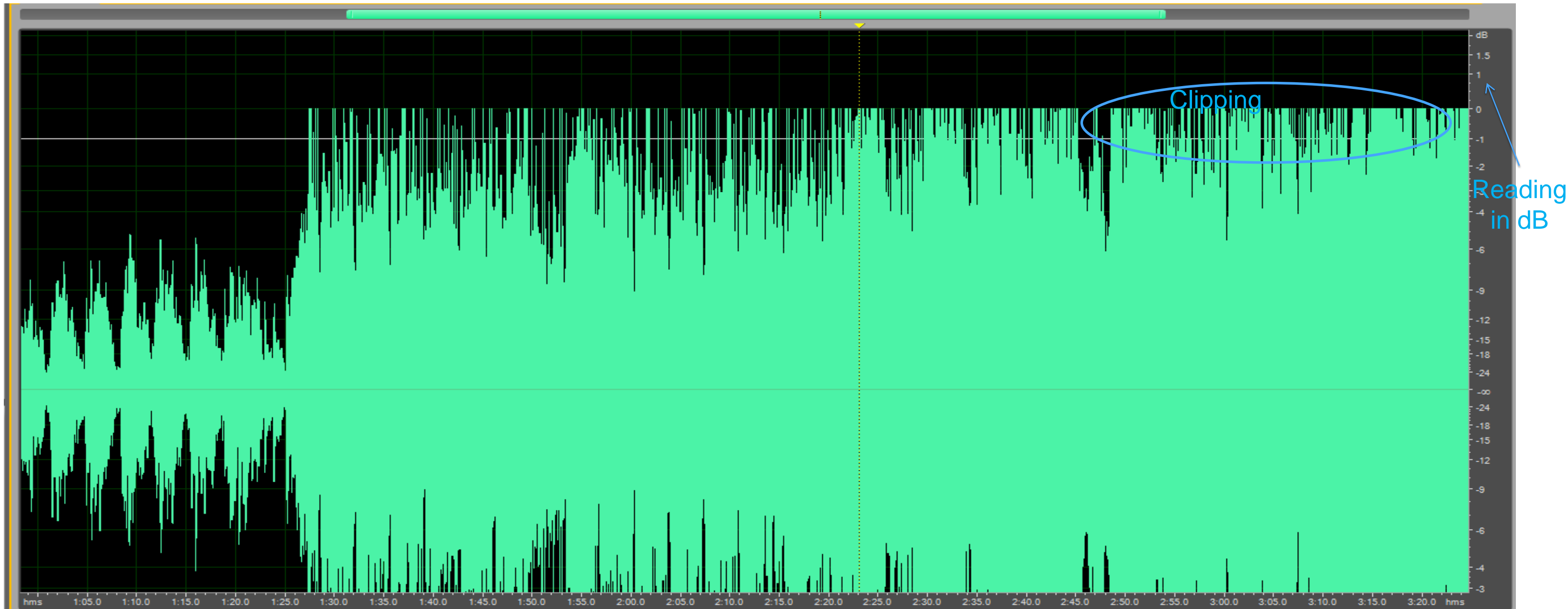


声压计

Precautions

1. Choose a **quiet** test environment.
2. Choose a standard sound box that has a smooth frequency response curve, for example, Genelec G One.
3. Horizontally place the sound pressure meter and tested Internet Protocol camera (IPC), and keep them **50 cm** away from the standard sound box.

Debugging Item-AI Gain



Note the following during debugging:

1. The **Music_Test_16k_Mono.pcm** file is played.
2. Import the **Rec_Sout** file to the Audition, and select **Show Spectral Frequency Display**.
3. Analyze the **Rec_Sout** file. If the overall energy is lower than -1 dB, increase the AI gain; if the clipping issue occurs, decrease the AI gain.

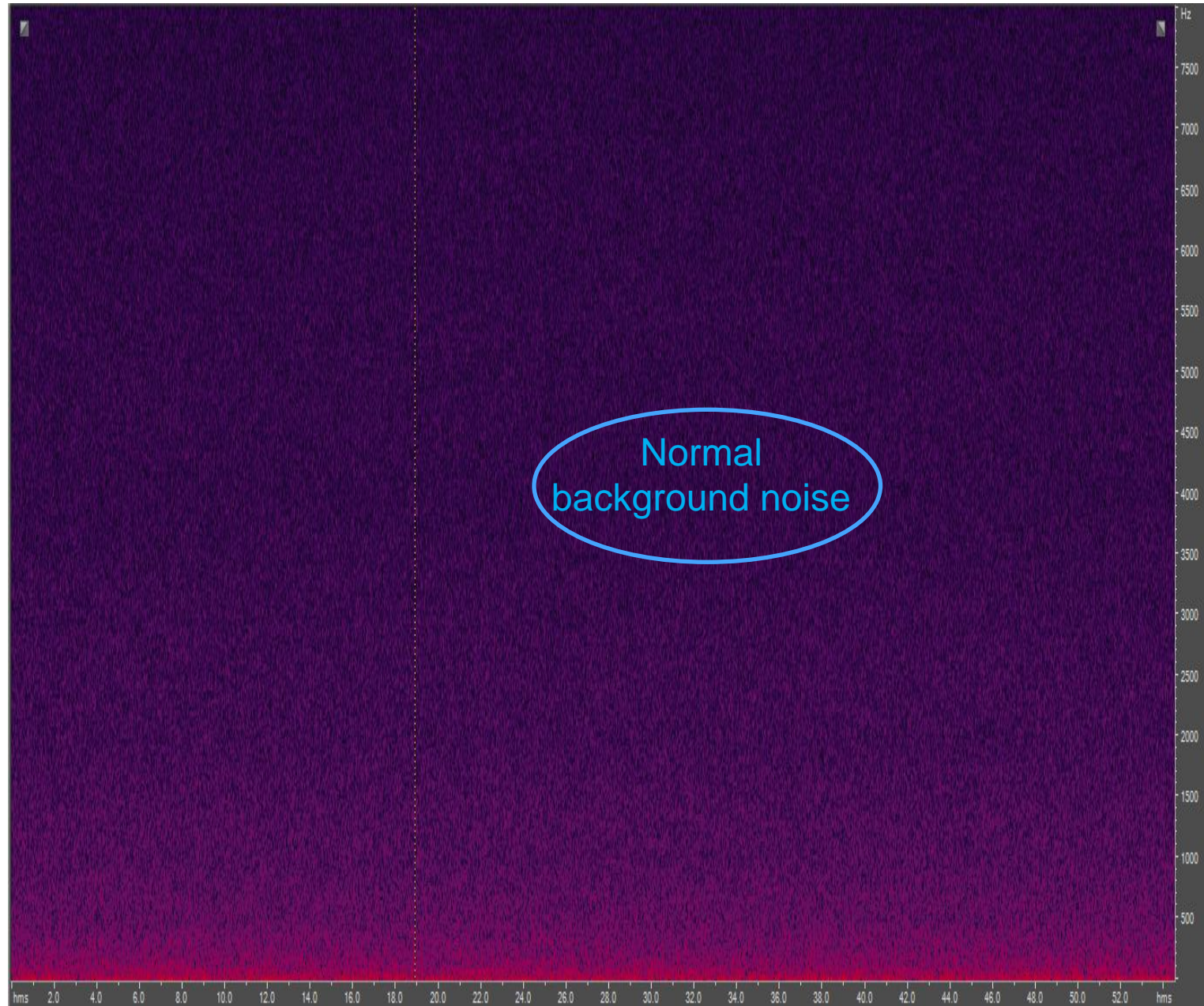
Terminology

Clipping: During analog-to-digital (AD) conversion, the maximum value of the digital domain is exceeded if the energy is too high. In this case, clipping occurs, and most signals within a certain time interval of the digital domain are 0 dB.



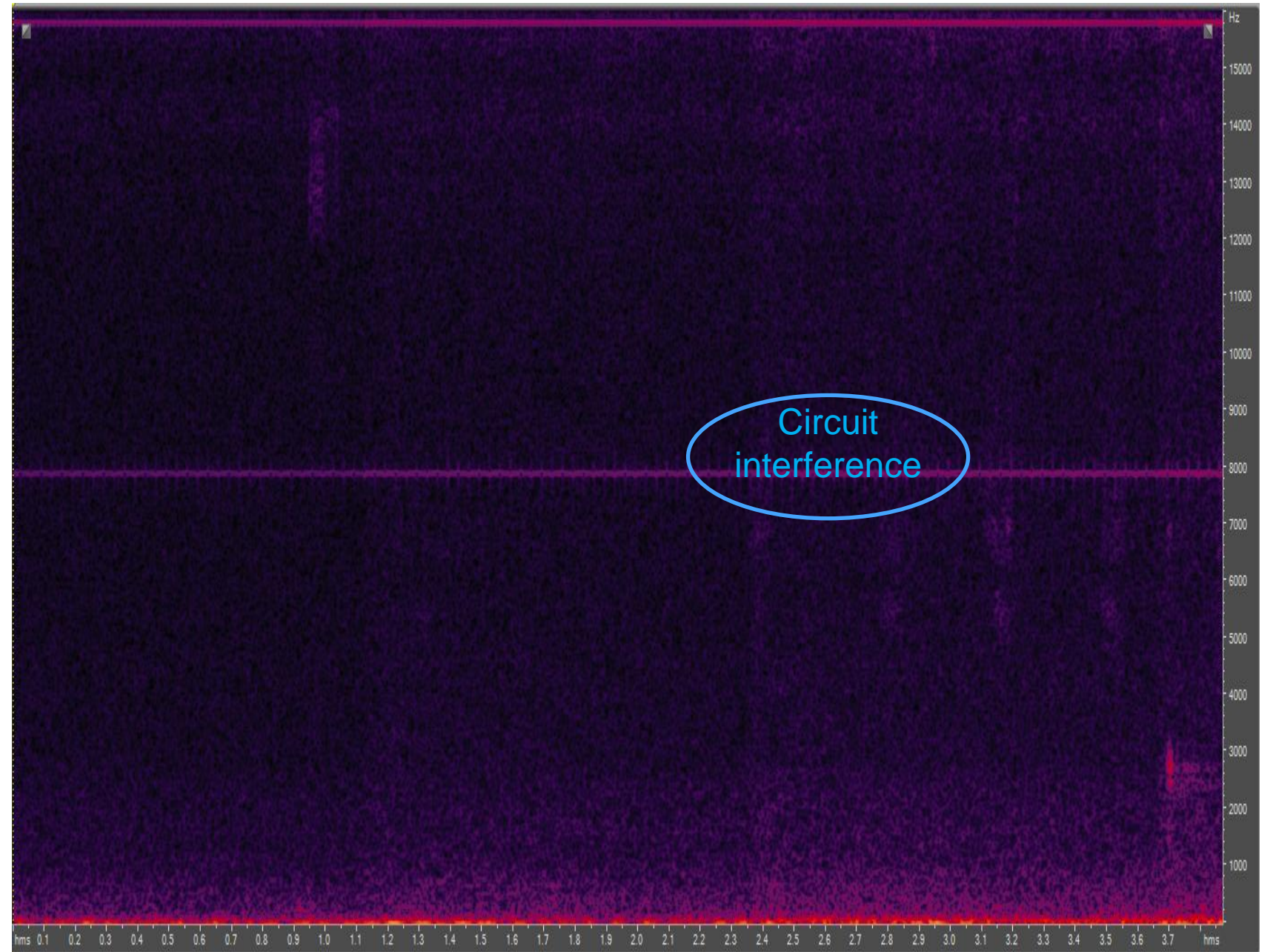
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Debugging Item-AI Circuit Interference



Note the following during debugging

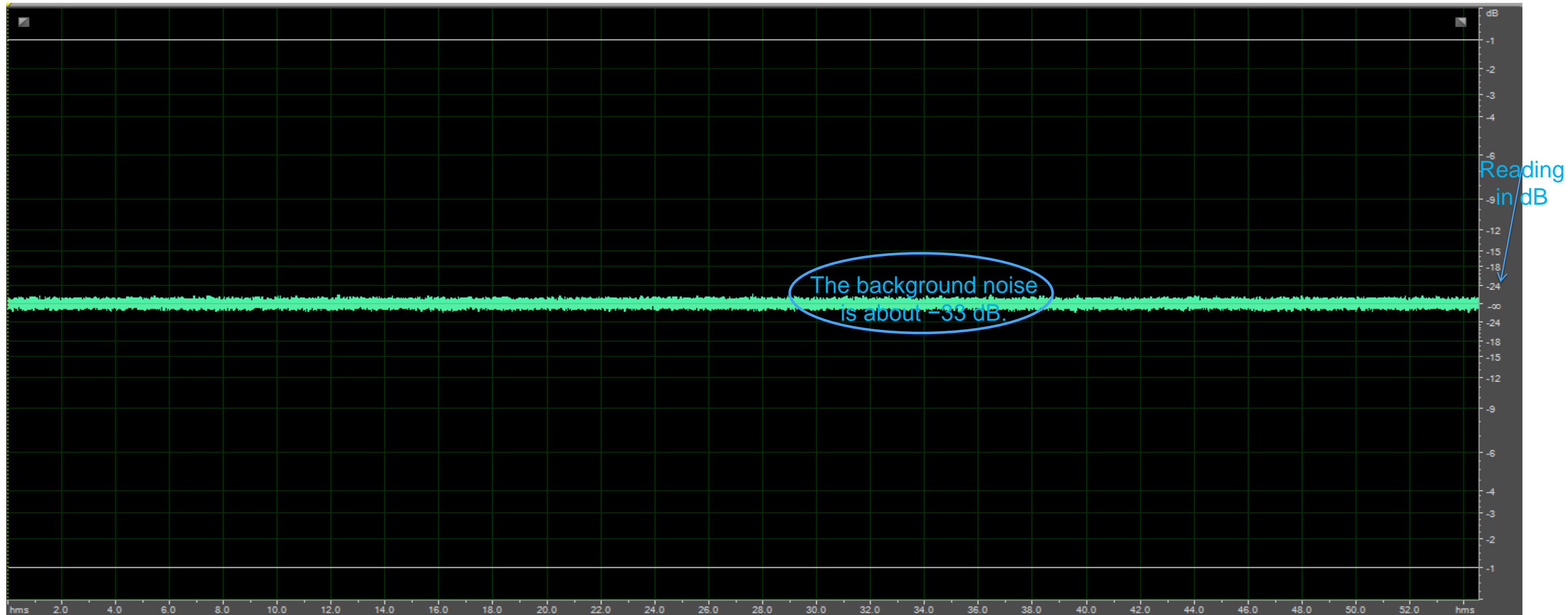
1. The standard sound box does not play the sequence.
2. Import the **Rec_Sout** file to the Audition, and select **Show Spectral Frequency Display**.
3. In normal cases, there is no obvious bright stripe in the frequency domain, indicating that there is no circuit interference. If there are obvious bright stripes in the frequency domain, there is circuit interference.



Terminology

1. Frequency domain: The audio signal is analyzed in the frequency domain to determine the frequency-domain components of the audio signal.
2. Circuit interference: Due to circuit design errors, the audio analog signals are coupled with other circuit signals, which results in circuit interference such as the common Wi-Fi circuit interference.

Debugging Item-AI Background Noise



Note the following during debugging:

1. The standard sound box does not play the sequence.
2. Import the **Rec_Sout** file to the Audition, and select **Waveform Display**.
3. Read the decibel reading of the background noise. If the background noise is too large, you need to check the signal-to-noise ratio (SNR) of the corresponding MIC and replace the MIC with a better one.

Precaution

Ensure that the gain is set to an appropriate value and there is no circuit interference.

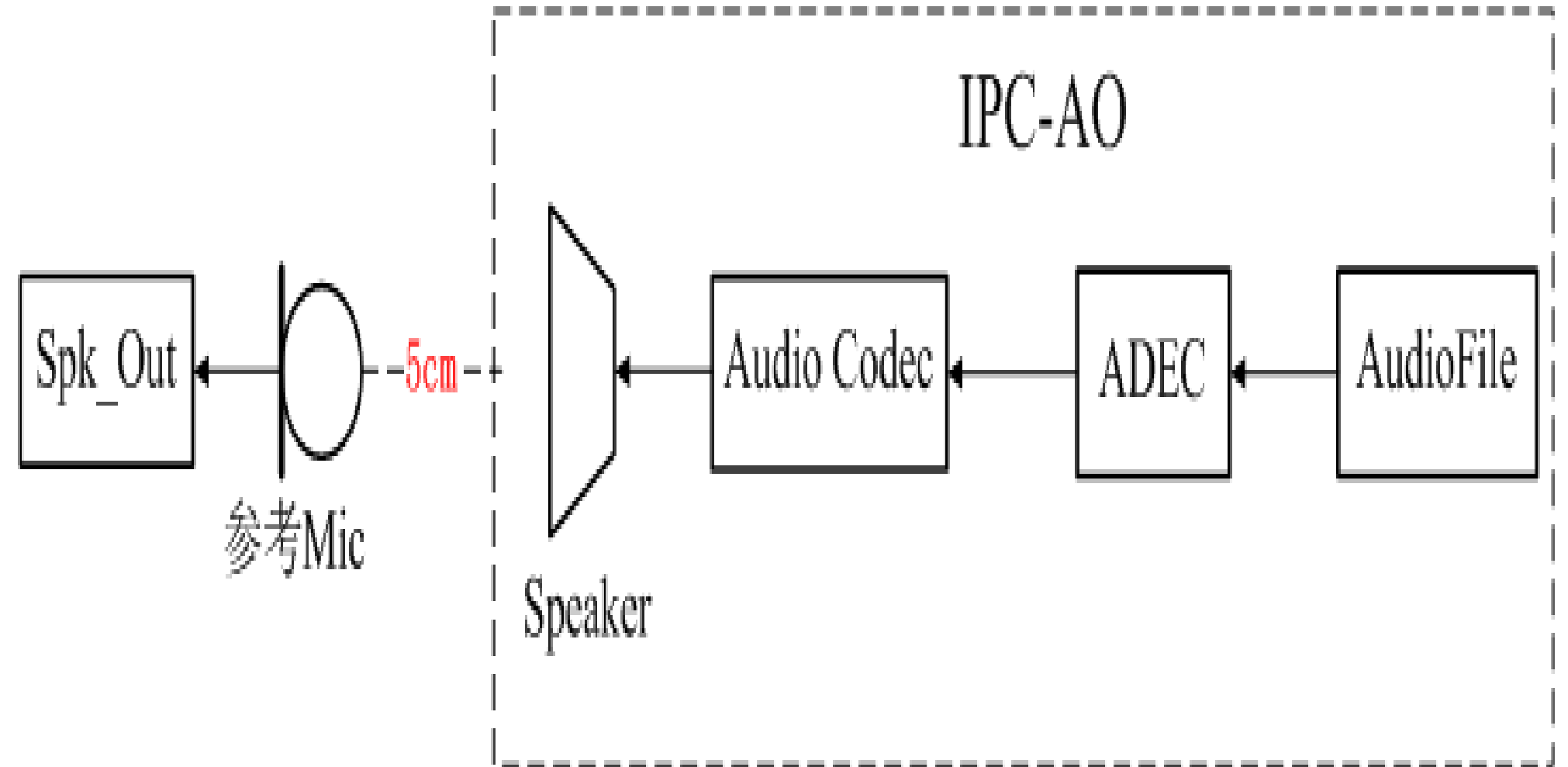


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Debugging Item-AO

Basic Debugging Steps

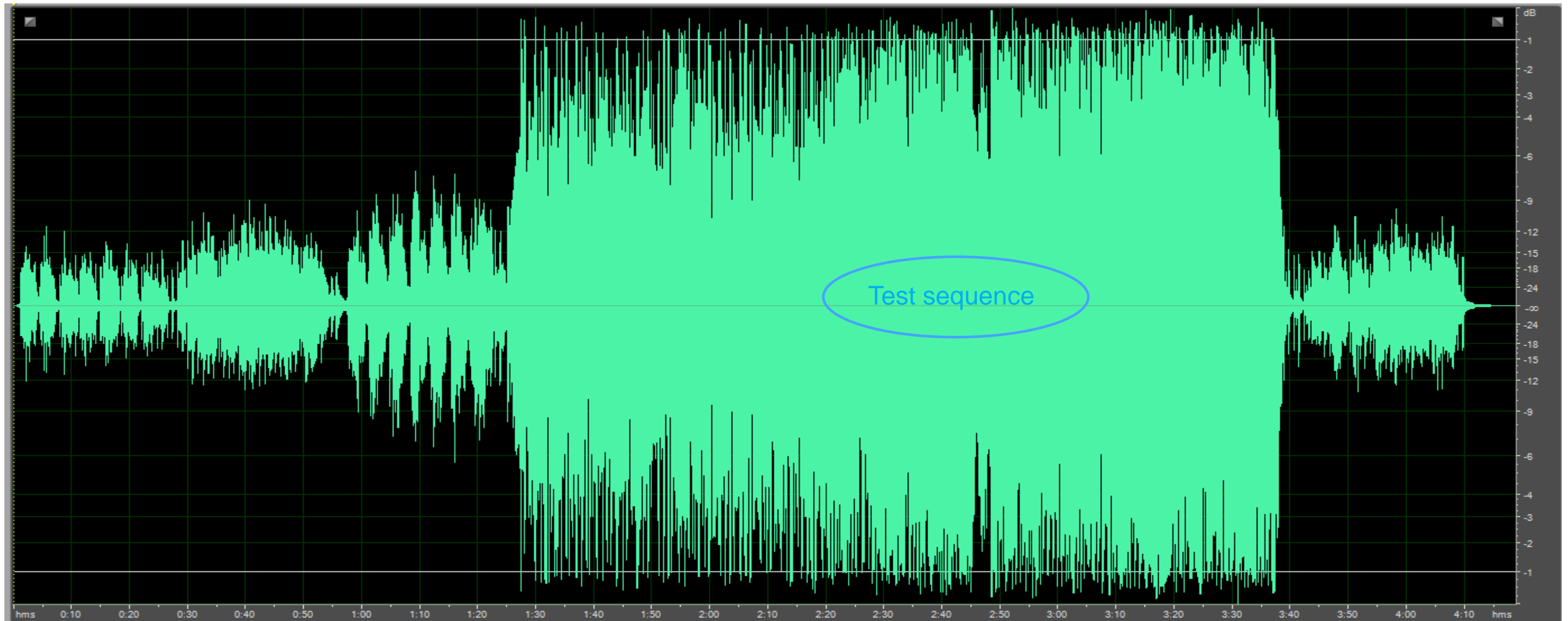
1. Place the reference MIC close to the IPC speaker, as shown in the right figure.
2. Execute the test instance, select the corresponding sampling rate, and select **TestAO** for **WorkCase**.
3. Analyze the **Spk_Out** file generated by the reference MIC.
4. Debug the AO gain and the frequency response curve of the speaker (optional).



Precautions

1. Choose a **quiet** test environment.
2. Choose a reference MIC that has a smooth curve, for example, Behringer ECM 8000.
3. Place the reference MIC 5 cm away from the IPC speaker.

Debugging Item-AO Gain



Note the following during debugging

1. Choose the **Music_Test_16k_Mono.pcm** audio file.
2. Gradually increase the AO gain until the speaker outputs cracking sound.
3. Adjust the AO gain until there is no cracking sound and keep the AO gain unchanged.

Precaution

The sound is not loudest in this case. To obtain louder sound, adjust the equalizer (EQ) parameter based on the frequency response curve of the speaker.

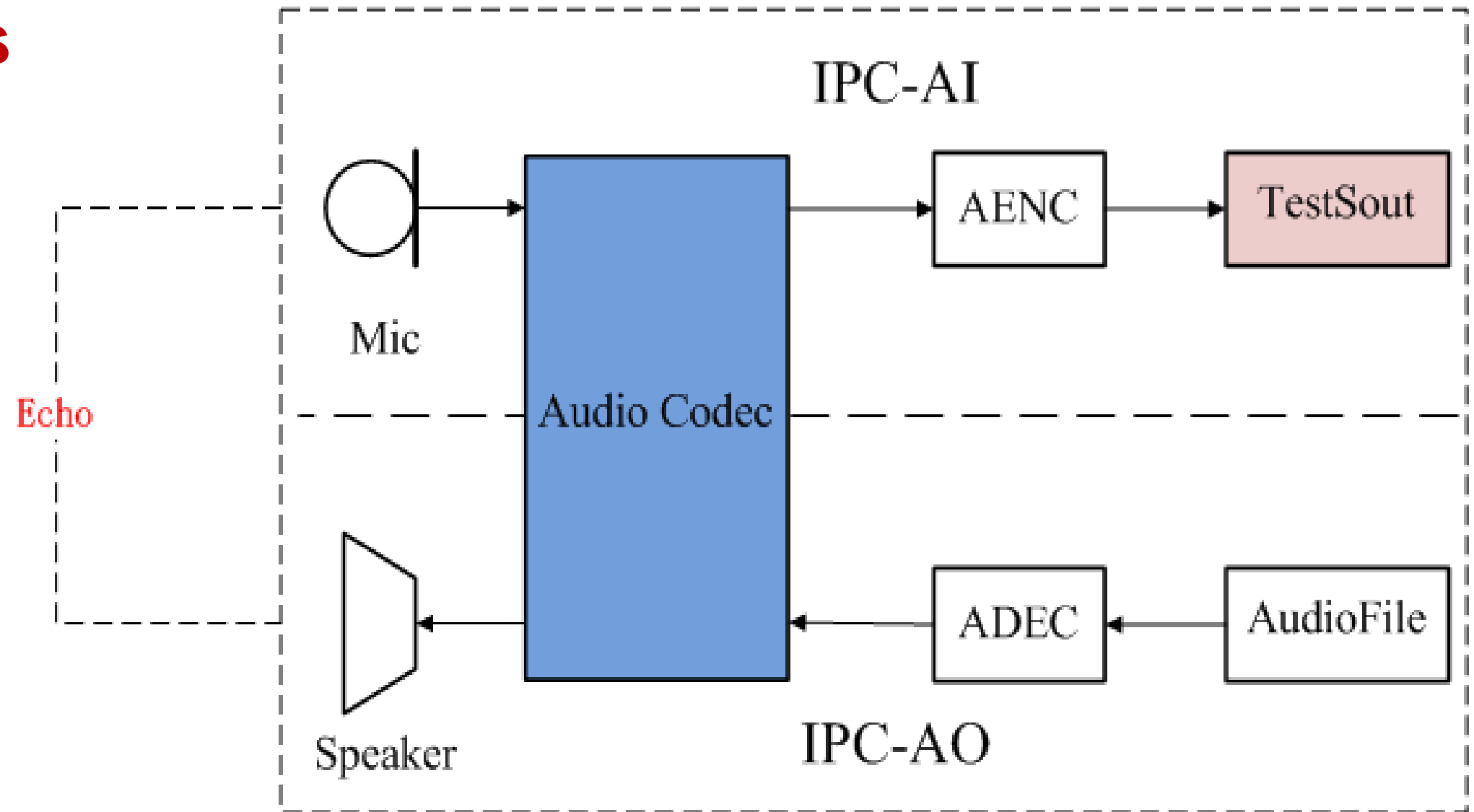


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Debugging Item-Echo Coupling

Basic Debugging Steps

1. Place the IPC in a quiet environment, as shown in the right figure.
2. Execute the test instance, select the corresponding sampling rate, and select **TestLoop** for **WorkCase**.
3. Set the AI or AO gain to an appropriate value.
4. Debug the AI and AO gains as well as echo distortion (optional).



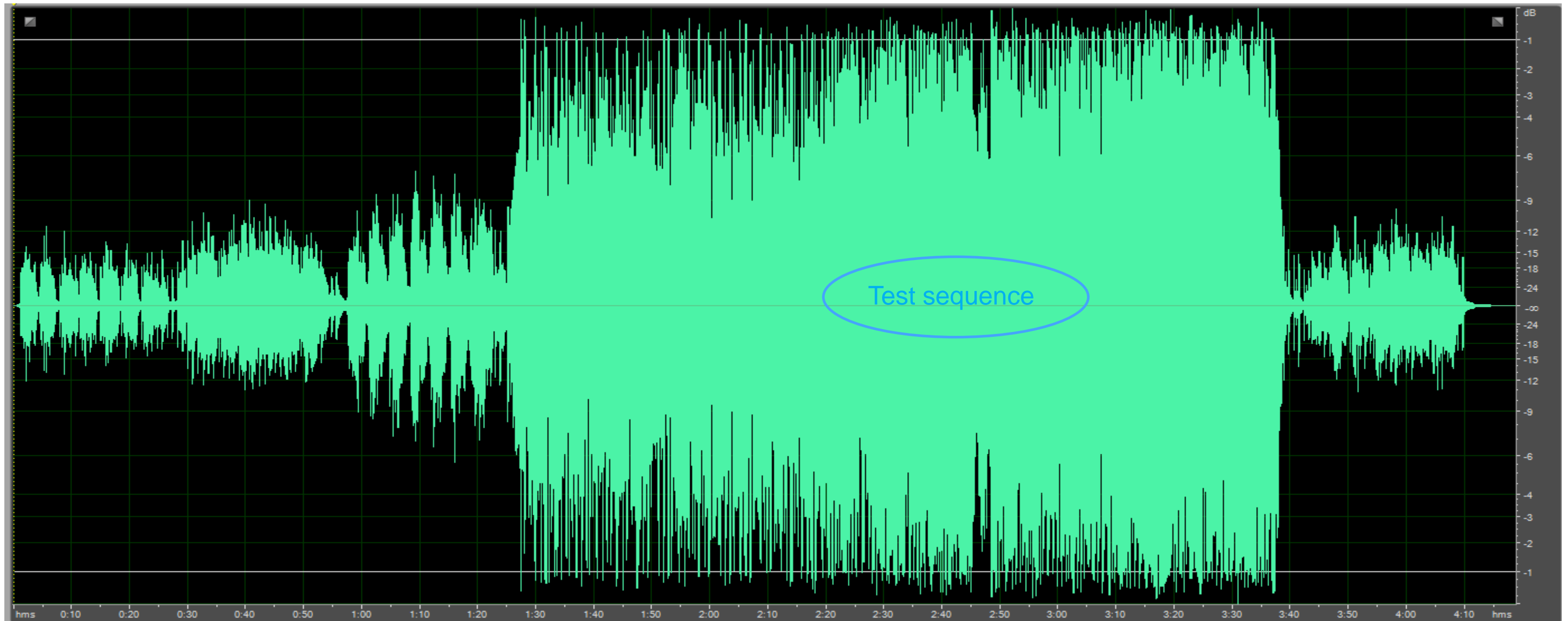
Precaution

Choose a **quiet** test environment.



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Debugging Item-Loop Gain



Note the following during debugging

1. Choose the **Music_Test_16k_Mono.pcm** audio file.
2. Analyze the AI output file **TestSout**. If clipping occurs, decrease the AI or AO gain until there is no clipping.

Precaution

If clipping occurs in **TestSout**, you can decrease the AI or AO gain based on the actual customer requirement (for example, decrease the AI gain if customers expect a high speaker volume).

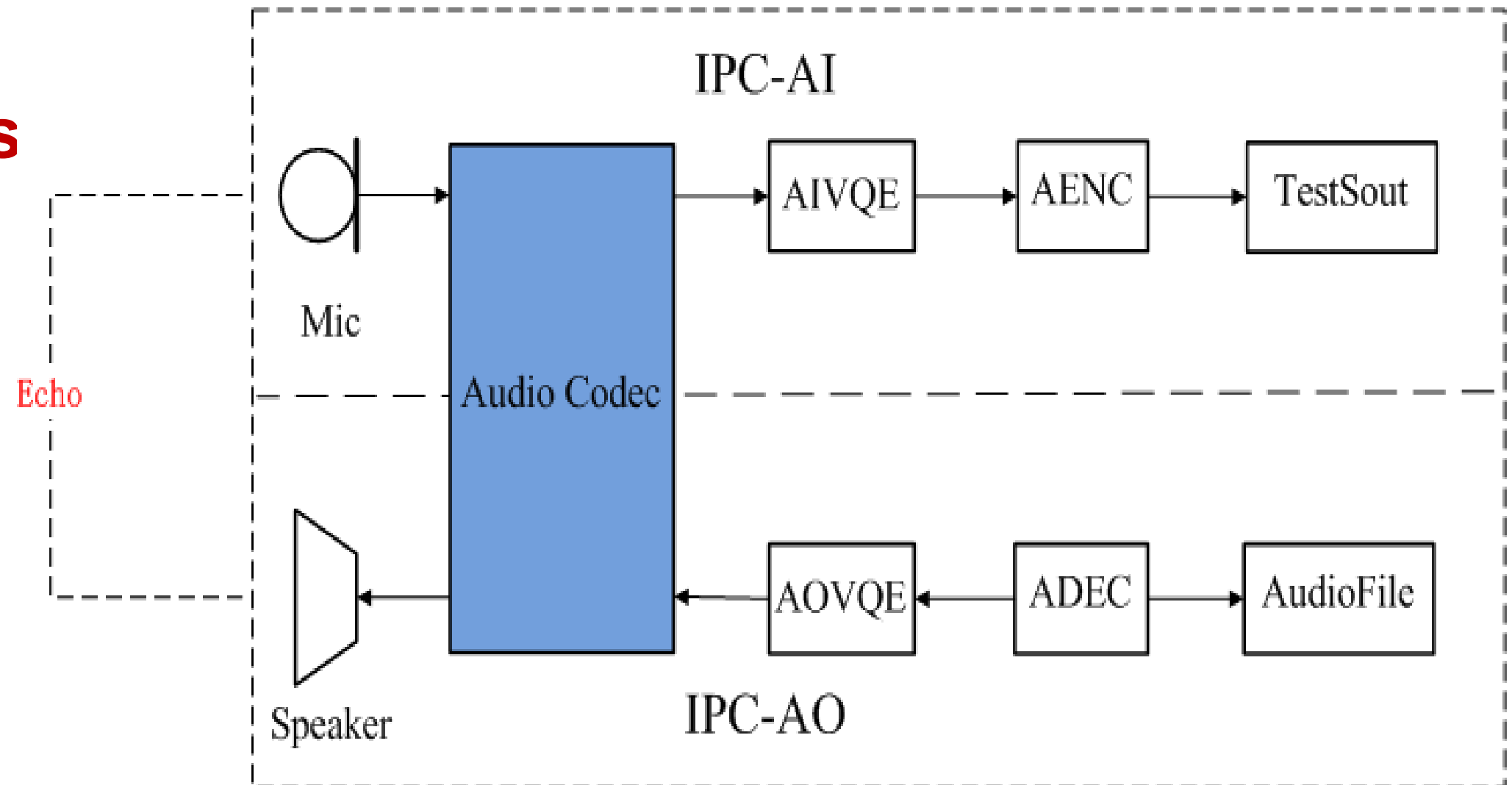


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Debugging Item-AEC Effect Test

Basic Debugging Steps

1. Place the IPC in a quiet environment, as shown in the right figure.
2. Choose the **Voice-Test-16k-Mono.pcm** audio file.
3. Execute the test instance, select the corresponding sampling rate, and select **TestVQELoop** for **WorkCase**.
4. Set the AI or AO gain to an appropriate value.
5. Analyze the **TestSout** file. If there is no obvious echo leakage, there is no structure issue.



Precautions

1. Choose a **quiet** test environment.
2. Select **Voice-Test-16k-Mono.pcm** as the file to be played at the 8 kHz sampling rate.



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