

Digital Mixer Testing Methods and Solutions

----- Based on the GYT 274-2013 Standard

Doewe Technologies Application Notes-030-V1.0

https://www.doewe.com

1. Overview

This article, based on the testing procedures outlined in "GYT 274-2013 Technical Specifications and Measurement Methods for Digital Mixers," will introduce how to use an audio analyzer to test the analog input to analog output interface specifications of a digital mixer.

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序号	坝日	1	频举氾固	I 级	II 级	测重力法	
1	最大输出	出电平	997Hz	24dBu	22dBu	见 6.14	
2	最大输入	入电平	997Hz	24dBu	22dBu	见 6.15	
3	等效输入 (话筒轴	、噪声 前入)	997Hz	≪-125dBu	≪-110dBu	见 6.7	
4	信噪 (线路轴	比 俞入)	997Hz	≥70dB	≥65dB	见 6.8	
-	h百 北石市土 A4-	话筒输入	2011	±0.5dB 内	±1.0dB内	Псо	
э	啪狈符11:	线路输入	20Hz~20kHz	±0.2dB 内	±0.5dB内	火 ひ. 9	
6	总谐波失耳	真加噪声	$20 \mathrm{Hz} \sim 20 \mathrm{kHz}$	≤0.05%	≪0.10%	见 6.10	
7	通道间日	电平差	$20 \mathrm{Hz} \sim 20 \mathrm{kHz}$	±0.5dB 内	±1.0dB内	见 6.11	
8	通道间隔	鬲离度	$20 \mathrm{Hz} \sim 20 \mathrm{kHz}$	≥80dB	$\geq 70 dB$	见 6.12	
9	通道间相	目位差	20Hz~20kHz	≪0.5°	≤1.0°	见 6.13	

Figure 1

Figure 1 shows all the test specifications and their requirements for the analog input to analog output interface as stipulated by the standard, including: Maximum Output Level, Maximum Input Level, Equivalent Input Noise (Mic Input), Signal-to-Noise Ratio (Line Input), Amplitude-Frequency Response, Total Harmonic Distortion plus Noise (THD+N), Level Difference Between Channels, Crosstalk (Isolation) Between Channels, and Phase Difference Between Channels. The following sections will primarily focus on how to use an audio analyzer to test Signal-to-Noise Ratio (S/N), Amplitude-Frequency Response, and Total Harmonic Distortion plus Noise (THD+N).



2. Test Preparation

2.1 Connection Setup

2.2 Mixer Test State Configuration

3. Measurement Methods

3.1 Signal-to-Noise Ratio (S/N) - Line Input

Standard Measurement Method:

- 1) Enable the 20 Hz \sim 20 kHz bandpass filter on the test instrument's input.
- 2) Apply a sine wave test signal at 997 Hz with the reference measurement level to the input of the DUT digital mixer. Read the output level value U1 using the test instrument.
- 3) Remove the test signal and connect an equivalent matching resistor to the input.
- 4) Record the noise level value U2 at the output.
- 5) The Signal-to-Noise Ratio S/N is calculated as S/N = U1 U2.

Using Audio Analyzer: The audio analyzer's built-in S/N measurement function allows oneclick testing while adhering to the standard's principles. Figure 3 shows the S/N test interface. After setting the filter, output signal frequency, and level according to the standard requirements, click Start to obtain the S/N measurement value (e.g., S/N = 80.954 dB), meeting Grade I requirements.





Figure 3

3.2 Amplitude-Frequency Response

Standard Measurement Method:

- 1. Enable the 20 Hz \sim 20 kHz bandpass filter on the test instrument's input.
- Apply a sine wave test signal at 997 Hz with the reference measurement level to the input of the DUT digital mixer. Record the output level U0 as the reference level.
- Change the test signal frequency. The frequency sampling points are specified in standard section 6.1.
 Record the output level U at each frequency sampling point.

Using Audio Analyzer: Use the Stepped Frequency Sweep function in the audio analyzer to complete this test. As shown in Figure 4, set the parameters according to the method requirements and click **Start** to obtain the curve showing level versus frequency.



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D Interchannel Phase		O High Performance Sine Generator	+30														
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Figure 4

As shown in Figure 5, you can view a table of specific level values at different frequency

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1	20.0010k	+4.375	20.0010k	-98.159						
2	16.0010k	+4.455	16.0010k	-98.239						
3	12.5030k	+4.502	12.5030k	-98.392						
4	10.0070k	+4.522	10.0070k	-98.299						
5	7.99300k	+4.525	7.99300k	-98.212						
6	6.30100k	+4.511	6.30100k	-98.303						
7	4.99900k	+4.479	4.99900k	-98.028						
8	4.00100k	+4.432	4.00100k	-98.321						
9	3.16300k	+4.365	3.16300k	-98.332						
10	2.50300k	+4.286	2.50300k	-98.341						
11	1.99900k	+4.202	1.99900k	-98.070						
12	1.60100k	+4.120	1.60100k	-98.180						
13	1.24900k	+4.034	1.24900k	-98.161						
14	0.99700k	+3.963	0.99700k	-98.180						
15	797.000	+3.900	797.000	-98.289						
16	631.000	+3.837	631.000	-98.232						
17	499.000	+3.775	499.000	-98.269						
18	401.000	+3.716	401.000	-98.191						
19	317.000	+3.653	317.000	-98.286						
20	251.000	+3.593	251.000	-98.296						
21	199.000	+3.539	199.000	-98.268						
22	163.000	+3.490	163.000	-98.325						
23	127.000	+3.431	127.000	-98.237						
24	101.000	+3.372	101.000	-98.224						
25	79.0000	+3.294	79.0000	-98.293						
26	61.0000	+3.181	61.0000	-98.275						
27	53.0000	+3.100	53.0000	-98.284						
28	41.0000	+2.898	41.0000	-98.143						
29	33.0000	+2.643	33.0000	-98.223						
30	23.0000	+1.950	23.0000	-98.211						
31	19.0000	+1.344	19.0000	-98.244						

points and also export the data.

Figure 5

As shown in Figure 6, the flatness result, representing the DUT's amplitude-frequency response, can be viewed directly within this function, eliminating the need for manual calculation.





Figure 6

3.3 Total Harmonic Distortion plus Noise (THD+N)

Standard Measurement Method:

- 1) Enable the 20 Hz \sim 20 kHz bandpass filter on the test instrument's input.
- Apply the reference measurement level to the input of the DUT digital mixer. The test signal frequency sampling points are specified in section 6.1. Record the output THD+N value at each frequency sampling point.

Using Audio Analyzer: THD+N can also be tested using the Stepped Frequency Sweep function. As shown in Figure 7, select THD+N Ratio in the result display. Configure the parameters according to the test method and click Start to obtain the curve showing THD+N versus frequency.



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Figure 7

As shown in Figure 8, you can view a table of specific THD+N values at different

frequency points and also export the data.

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1	20.0010k	0.156617	20.0010k		
2	16.0010k	0.133710	16.0010k		
3	12.5030k	0.126463	12.5030k		
4	10.0070k	0.124147	10.0070k		
5	7.99300k	0.122779	7.99300k		
6	6.30100k	0.125052	6.30100k		
7	4.99900k	0.124320	4.99900k		
8	4.00100k	0.124489	4.00100k		
9	3.16300k	0.126284	3.16300k		
10	2.50300k	0.126575	2.50300k		
11	1.99900k	0.128058	1.99900k		
12	1.60100k	0.129393	1.60100k		
13	1.24900k	0.131873	1.24900k		
14	0.99700k	0.132210	0.99700k		
15	797.000	0.131413	797.000		
16	631.000	0.132465	631.000		
17	499.000	0.134700	499.000		
18	401.000	0.134889	401.000		
19	317.000	0.135547	317.000		
20	251.000	0.136609	251.000		
21	199.000	0.138040	199.000		
22	163.000	0.138581	163.000		
23	127.000	0.139561	127.000		
24	101.000	0.141375	101.000		
25	79.0000	0.142451	79.0000		
26	61.0000	0.143600	61.0000		
27	53.0000	0.144634	53.0000		
28	41.0000	0.147796	41.0000		
29	33.0000	0.152969	33.0000		
30	23.0000	0.165735	23.0000		
31	19.0000	0.175732	19.0000		

Figure 8

Signal-to-Noise Ratio (S/N), Amplitude-Frequency Response, and Total Harmonic



Distortion plus Noise (THD+N) are three common test indicators. The audio analyzer can also be used to test other indicators specified in the standard. For detailed test methods, please consult Beijing Doewe Technologies Co., Ltd.