

## Work Documentation

### *Resonance in Traditional Instruments:*

An eight-channel fixed-media work based on the sounds of the guzheng, pipa, erhu and dizi  
(15 minutes)

#### 1. Audio Files

*P1\_01\_8CH\_Interleaved\_48kHz\_24bit.wav*

Main 8-channel version; interleaved WAV, 48 kHz, 24-bit; 15:00.

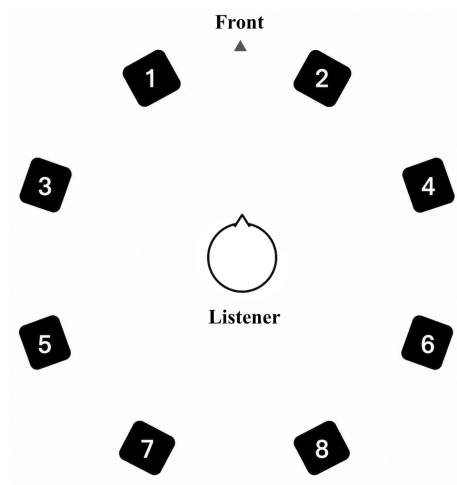
*P1\_02\_STEREO\_Reduction\_48kHz\_24bit.wav*

Stereo reduction; WAV, 48 kHz, 24-bit; duration: 15:00.

*P1\_03\_STEREO\_Reference\_44.1kHz\_16bit.wav*

Standard-quality stereo reference; WAV, 44.1 kHz, 16-bit; duration: 15:00.

#### 2. Speaker Setup and Channel Mapping



**Figure 1.** Speaker Setup and Channel Mapping.

Channels 1–8 in the interleaved file correspond directly to loudspeakers 1–8. The listener should sit at the centre of the array and face the front indicated in the diagram.

### 3. Project and Production Description

The source recordings for *Resonance in Traditional Instruments* were made by the composer in 2025 with members of the traditional Chinese orchestra at Shangrao Normal University.<sup>1</sup> They include instrumental tones, erhu slides, dizi staccato attacks, guzheng tremolos, and so on. During production, the recordings were resampled and transformed using technologies such as granular processing, phase-based and FFT-domain processing, and flanging.

All eight-channel mixing and spatialisation took place in NOVARS Studio 3 at the University of Manchester.<sup>2</sup> Across the fifteen-minute work, some materials are recognisable in terms of original instrumental gestures, while others are more abstracted with different speeds, densities, registers and spatial movement. The waveform overview of the final 8-channel interleaved mix is shown in Figure 2 below.

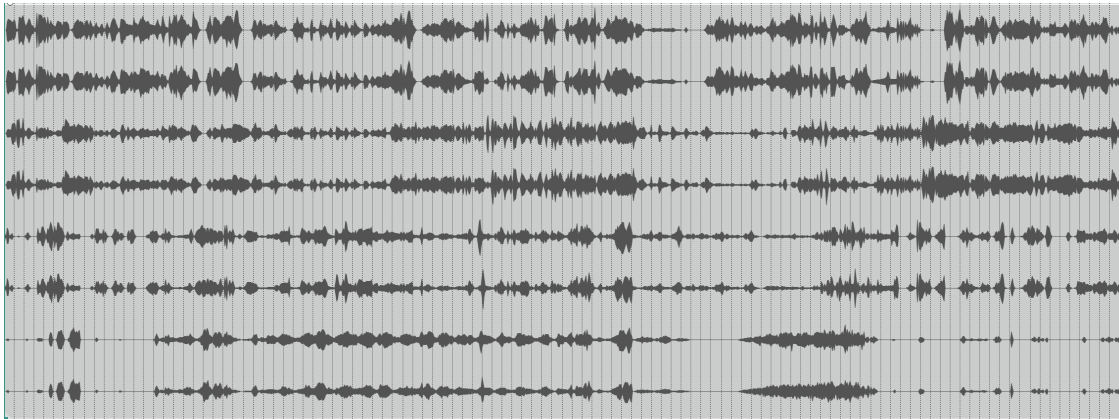


Figure 2. Waveform view of the final eight-channel interleaved mix.

The following section introduces the work's structural and spatial overview as a guide for listeners.

---

<sup>1</sup> Shangrao Normal University, official website, <https://www.sru.edu.cn/> (accessed 25 August 2026).

<sup>2</sup> NOVARS, “Studio Three – 10.2 Surround”, The University of Manchester, <https://www.novars.manchester.ac.uk/study/facilities/studio-three/> (accessed 25 August 2026).

#### 4. Structural and Spatial Overview

| Timecode    | Formal Function                           | Sound Materials and Processing                                                                                                                                                                                                                                                                                                                                 | Spatial Organisation                                                                                                                                                                                                                                                                    |
|-------------|-------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 00:00–03:22 | Opening and first arrival                 | The piece opens with erhu slides and the muted hollow sounds of guzheng and pipa. Short dizi attacks, guzheng tremolos and processed forms of these sounds gradually create an energetic instrumental texture. The materials then overlap and develop towards the first arrival at 03:22. Processed guzheng plucks carry the music into the following section. | At first, most of the activity is concentrated across the front and sides of the array. Fragmented textures later appear behind the listener, widening the perceived space and preparing the fully surrounding sound field of the next section.                                         |
| 03:22–06:40 | Textural expansion and second arrival     | With resampling, regeneration and flanging, which brings about comb-filter motion, continuously advancing textures are developed through the layers. Near the end, processed pipa-soundboard hits have a revolving chain that continues to the next arrival.                                                                                                   | When overlap zones occur around the listener, full circumspace is achieved. The rotating pipa figure moves in a vectorial circular space, continually embracing and releasing egocentric space by approach and recession, from 06:25.                                                   |
| 06:40–08:35 | Gestural intensification and first climax | Distorted and resampled dizi gestures gradually give way to granular pipa and guzheng particle streams. Increasing speed, density and registral span drive the first major climax, after which recognisable instrumental timbres briefly return.                                                                                                               | The granular streams form rapid vectors across and around egocentric space. Their distribution creates immersive circumspace and approaches circumspectral space, placing the listener inside an enlarged resonance before the image contracts with the return of the original timbres. |

| Timecode                | Formal Function                                 | Sound Materials and Processing                                                                                                                                                                                                                                                                                                                                            | Spatial Organisation                                                                                                                                                                                                                                                                                                                                                                                                            |
|-------------------------|-------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>08:35–<br/>11:40</b> | <b>Transformed recurrence and second climax</b> | The preceding material returns in a more abstract form. Granular, phase-based and FFT-domain processing produces spectral smearing and redistribution, progressively weakening source identity. All registers from the low-frequency foundation to the aeriform dizi-derived mass remain transformed from the four recorded instruments and culminate in a second climax. | Low and high spectra spread out, resulting in a greater and more open circumspectral volume. The spectral separation opens up to the ouverture, which in turn brings the separated areas together in the final moment at the climax to a unified space.                                                                                                                                                                         |
| <b>11:40–<br/>11:58</b> | <b>Transition</b>                               | A low-frequency pad derived from dizi is combined with a wind-like transformation of muted guzheng, suspending the preceding momentum and connecting to the final section.                                                                                                                                                                                                | The pad acts as a low spectral plane and point of gravitation, while the wind texture becomes an aeriform presence. The attack at 11:58 contracts the spatial field and leads to the last space of the work.                                                                                                                                                                                                                    |
| <b>11:58–<br/>15:00</b> | <b>Recapitulation and coda</b>                  | The four instruments reappear in different forms alternated by phase-processed, spectrally blurred and temporally diffused versions. There are a lot of dynamic gestures that build up towards the coda, where the pipa-soundboard attacks are delayed and echoed, and then become mobile afterimages.                                                                    | At both the frontal and mid-distal planes, the spatial field is stabilised and at the deepest rear circumspace, relatively inactive. Transformed and original gestures are in the proximity and mid-distal positions. The pipa, in the coda, plays the vectors of the two traces in both directions across the front and back and also the left and right axes, the sound goes out of view and then comes back to end the work. |

## References

NOVARS, “Studio Three – 10.2 Surround”, *The University of Manchester*, <https://www.novars.manchester.ac.uk/study/facilities/studio-three/> (accessed 25 August 2026).

Shangrao Normal University, official website, <https://www.sru.edu.cn/> (accessed 25 August 2026).