**Title: Stereo capture on UE**

**Source: Beijing Xiaomi Mobile Software Co., Ltd**

**Document for: Discussion&Agreement**

**Agenda Item: 7.8**

# Introduction

This proposal is a revision of S4-231323, which was initially presented in sa4#125 meeting. It has been adjusted based on feedback received during the meeting, aligned with the existing content in the TR26.933, and includes a difference between binaural and stereo audio.

# Discussion

The following content is proposed for include in the starting of Chapter 6-Acoustic Design of TR 26.933, and the previous clause 6.1 Stereo microphone configurations will be clause 6.1.4 Stereo microphone configurations and other related sections will be adjusted correspondingly.

## Stereo capture

### Principle of stereo signal representation

The basic idea behind the stereo recording technique is to capture two signals with a proper relationship. By controlling the relationship between the two signals, it creates sound image with spaciousness, direction and depth feeling for listeners. And it can be reproduced through headphones or loudspeakers.

### Characteristic of stereo capture

Compared to other formats, stereo capture does not aim to accurately reproduce the original sound field. Instead, its focus is on creating convincing illusory sound images for listeners, which is achieved by generating enough perceptual cues. It can provide a natural and realistic experience to the listeners in a limited range of listening zone. And it is more technically mature.

### Factors that affect stereo capture

The key cues that may influence the quality of stereo capture are interchannel time differences, interchannel level differences and frequency range, which have been discussed since the emergence of stereo audio.

In the past, the discussion of factors that affect stereo capture always revolves around microphone properties (such as directionality and frequency range) and the placement of microphones.

With advancements in audio processing, we now have more methods to control audio signals, which is highly promising for stereo applications. This is especially relevant since UE imposes strict restrictions on hardware due to space constraints. The ability to fine-tune audio signals through processing offers great potential for enhancing stereo performance despite various limitations, but it may also import more influence on audio experience, which needs to be carefully analyzed. Therefore acoustic design also needs to consider the characteristics of relevant processing.

### Differences between binaural and stereo audio

While both binaural and stereo formats consist of two left and right channels. Several differences are outlined below in Table 1.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Format** | **Distance between left and right channels** | **Spatial cues** | **Suggest playback** | **Relationship between interaural differences and interchannel differences** | **Sound image** | **Binaural render** |
| **Stereo** | 0 to few meters  | Interaural time differences and interaural level differences, | Headphone  | Interaural differences equal to interchannel differences.  | -90° to 90 ° (see note 1) | Allowed |
| Loudspeaker | Interaural differences equal to interchannel differences plus differences caused by propagation from speakers to ears | Between left and right loudspeakers | Not allowed |
| **Binaural** | Equal to distance between ears [about 15cm] | Interaural time differences, interaural level differences, interaural phase differences and spectral characteristics  | Headphone | Interaural differences equal to interchannel differences.  | All directions. | Not allowed |

**Table 1: Differences between binaural and stereo audio**

NOTE 1: When stereo audio playback on headphones is processed with binaural rendering, the sound image transforms to be positioned between left and right virtual loudspeakers.

# Conclusion

It’s a reversion of S4-231323, and it is proposed to include sections from 6.1 to 6.2.4 into Chapter 6-Acoustic Design of TR 26.933.

**References**

1. S4aA230089:Stereo capture on UE
2. S4-230881: Binaural capture on UE
3. S4-230971:[FS\_DaCED] TR 26.933 v0.1.0