

# Spatial Audio

Last Update 2021-03-11

## ***The Spatial Audio SDK from the first leading spatial audio company***

Head-tracking capable TWS's are getting popular. The most significant application of the IMU (Inertial Measurement Units)-installed TWS is going to be the Spatial Audio. It provides similar sonic experience as immersion in VR/AR HMDs. The Gaudio Spatial Audio (GSA) is the enable technology coming from the first leading spatial audio company to provide lifelike immersive experience for any input audio sources (it is important) on any motion-trackable hearables.

When you watch movies on your smartphone along with the GSA, you can feel as if you are in the same event with the characters as the story unfolds. When listening to music, you are in the stage and the sound come alive and surround you.

### ***Where to apply***



**IMU-supported electronic devices** : Smartphone-TWS combo, TWS, Bluetooth headphones, HMD, AR glasses, and etc.

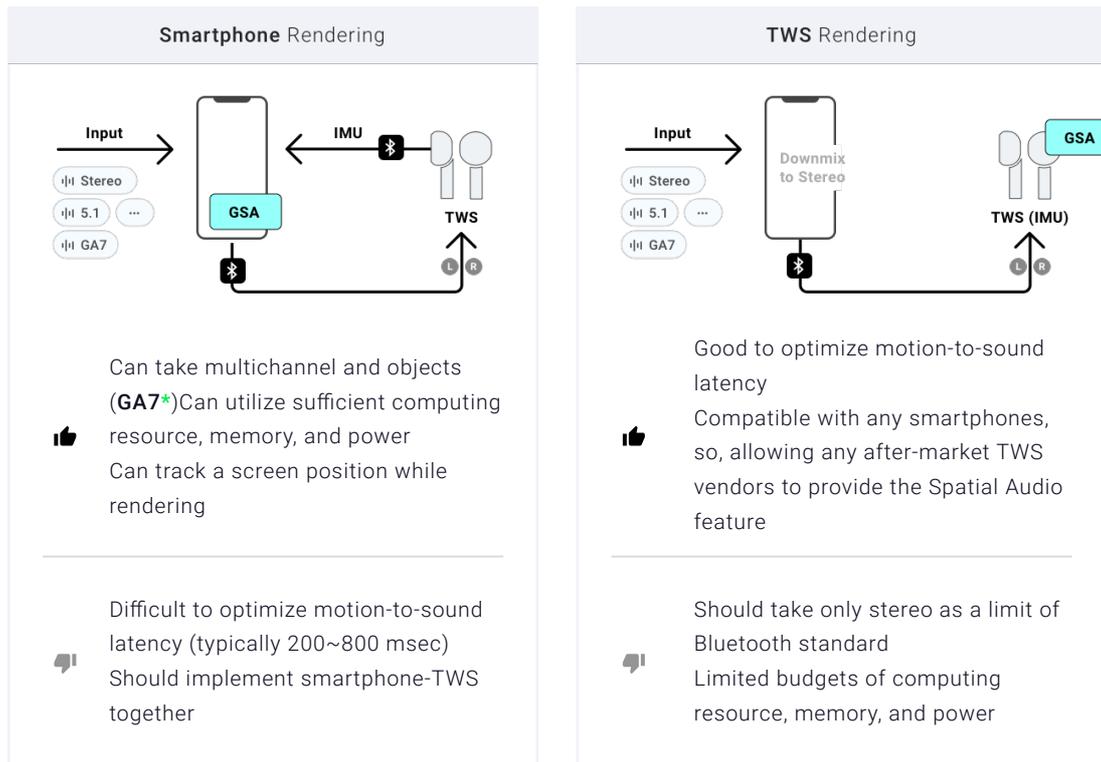
---

## ***TECHNOLOGY***

Binaural renderer is the core engine to realize the Spatial Audio. Gaudio Lab's leadership in this technology has been proven since it was adopted as the binaural renderer for the ISO/IEC MPEG-H Audio standard in 2014. Furthermore, it was awarded as the innovative company of the year in 2017 in VR Awards. As the first leading company of the Spatial Audio, Gaudio Lab holds more than 60 patents world-wide.

To support not only immersive audio formats as multi-channel or object-based audio but also legacy stereo (more than 90% of content in the world is stereo), the Gaudio Spatial Upmix (GSU) was introduced as a preprocessor for the Spatial Audio renderer. The GSU analyzes input stereo mix to separate it into sound-components and places them in 3 dimensional space. This space is then rotated according to the head-orientation and binaurally rendered for headphone listening.

In smartphone-TWS connection scenario, there are two options regarding where to place a spatial audio processing. One is the smartphone and the other is the TWS. They have clear pros and cons (please see the picture). The GSA can be implemented in any places and it is provided as an easy-to-integrate SDK accompanying with guides and tips.



\*GA7 is Gaudio's proprietary object-based spatial audio format to effectively deliver any combination of channels, objects and Ambisonics.

## FEATURES

- **High quality sound** : Lifelike immersive experience without degrading timbral quality
- **Stereo support** : thanks to the Gaudio Spatial Upmix, spatial audio experience can be made with legacy stereo input
- **Future extension ready** : Object-based audio (GA7, MPEG-H) and any channel configurations up to 22.2 channels with standard sampling rates up to 192kHz
- **Flexibility in complexity** : From Premium for enough computing/memory resource as smartphones to LC for extremely limited budgets, algorithm is optimized to fit the target device and results in the best quality and performance in the class
- **Easy-to-Integrate SDK** : based on the market-proven expertise with the SDK having 10M+ active users, the SDK is provided as ready to integrate into any embedded devices and apps. It is served with accessory features and technical know-hows for your convenience
- **Technical support** : complete and safe integration can be guaranteed from a customer oriented technical support team

## SOFTWARE SPECIFICATION

GSA SDK version 3.0.0 (measured at 48kHz, stereo)

	Premium	High Quality	Low Complexity
<b>Algorithm Latency*</b>	11 ms	11 ms	0 ms
<b>Complexity</b>	approx. 91 MIPS	approx. 31 MIPS	approx. 28 MIPS
<b>Memory</b>	1,966 KB	approx. 470 KB	approx. 18 KB
<b>Library Size</b>	TBD	TBD	TBD
<b>Deliverable Type</b>	<ul style="list-style-type: none"><li>• DSP instruction level optimized (SIMD) DSP library</li><li>• Cross-platform native C/C++ library</li><li>• Android / iOS native SDK</li><li>• Custom build to any DSPs and embedded CPUs</li></ul>		

\* In Spatial Audio application, motion-to-sound latency is important but it can't be measured without a specific device implementation. If a reasonable IMU is installed and no additional major latency is invoked in the DAC and audio amplifier in TWS, it is confident to meet the requirement of "below 50 msec" which is known as the imperceptible limit for a motion-to-sound round-trip latency.