Sonaptic 3D Positional Audio

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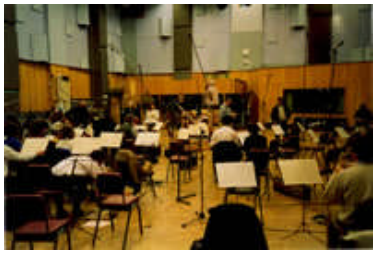
Sonaptic History

EMI



- 1930: EMI Music Research Laboratories
- 1990s: Sensaura Ltd. - CDs
- 1997 – 2002: Sensaura Ltd.
  PC and game console 3D Audio

- 2003: Sonaptic – Mobile audio technology

Technology

Sonaptic's Founders – Sensaura Technology:

- 12 Years Research in 3D-audio technology
- Royal Academy Gold Medal Award
- Over 200 million PCs shipped with this technology
- The defacto standard for PC 3D-audio
- Runs on dedicated H/W on the X-box
- Middleware for PS2, Game Cube, X-box and PC
- API is very widely used by game developers

Sonaptic Background

Sonaptic's Founders developed Sensaura background IP

- Founded by management team from Sensaura
- All new technology aimed at mobile devices
  - More efficient
  - Suitable for Resource-restrained environment
- Integrated Sonic Emitter acoustics technology
- Sonaptic has established new Intellectual Property

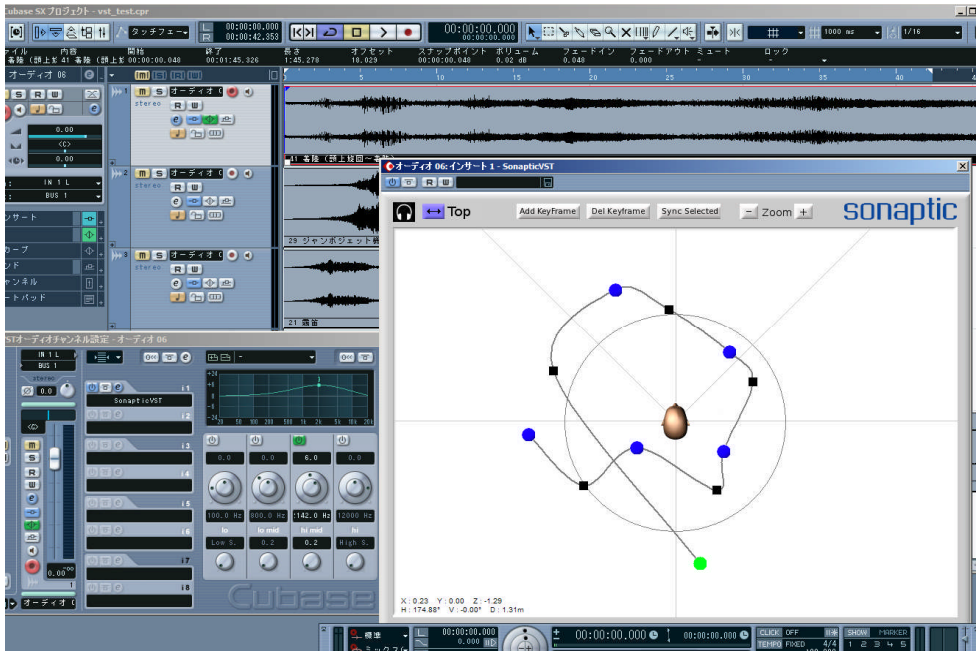
3D Positional Audio Product 1

- **Music3D** ™
  - Applicable for use with any type of audio sources
  - Superior sound delivery technology
  - Effective for playing back Ring-Tone, Ring-Voice and Ring –Song as well as AAC and MP3 (Music Player)
  - Works with both headphones and loudspeakers

3D Positional Audio Product 2

- **Game3D** ™
  - Management of 3D audio in real time by synchronizing with UI
  - Delivers “virtual reality” for 3D audio sound in adventure games and 3D graphic games
  - Works with both headphones and loudspeakers
  - Effect for V-Appli

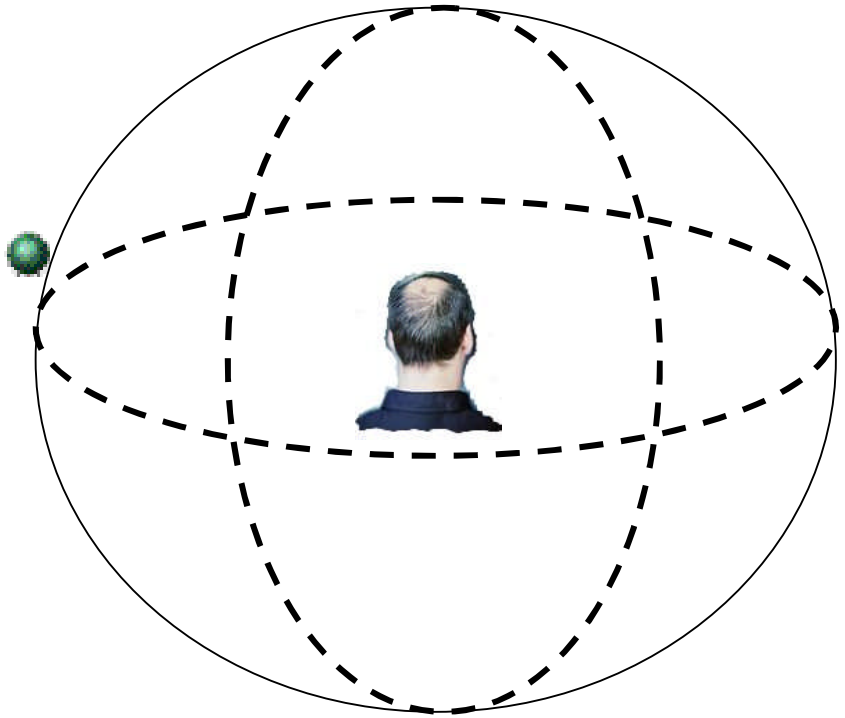
Pre-process Authoring Tool
Sonaptic VST Plug-In



- Tool for authoring pre-processed sound files
- VST Plug-In for content providers
- 3D processed audio file being played back on Sonaptic 3D engine

What is 3D Positional Audio ?

3D Audio API Specifications



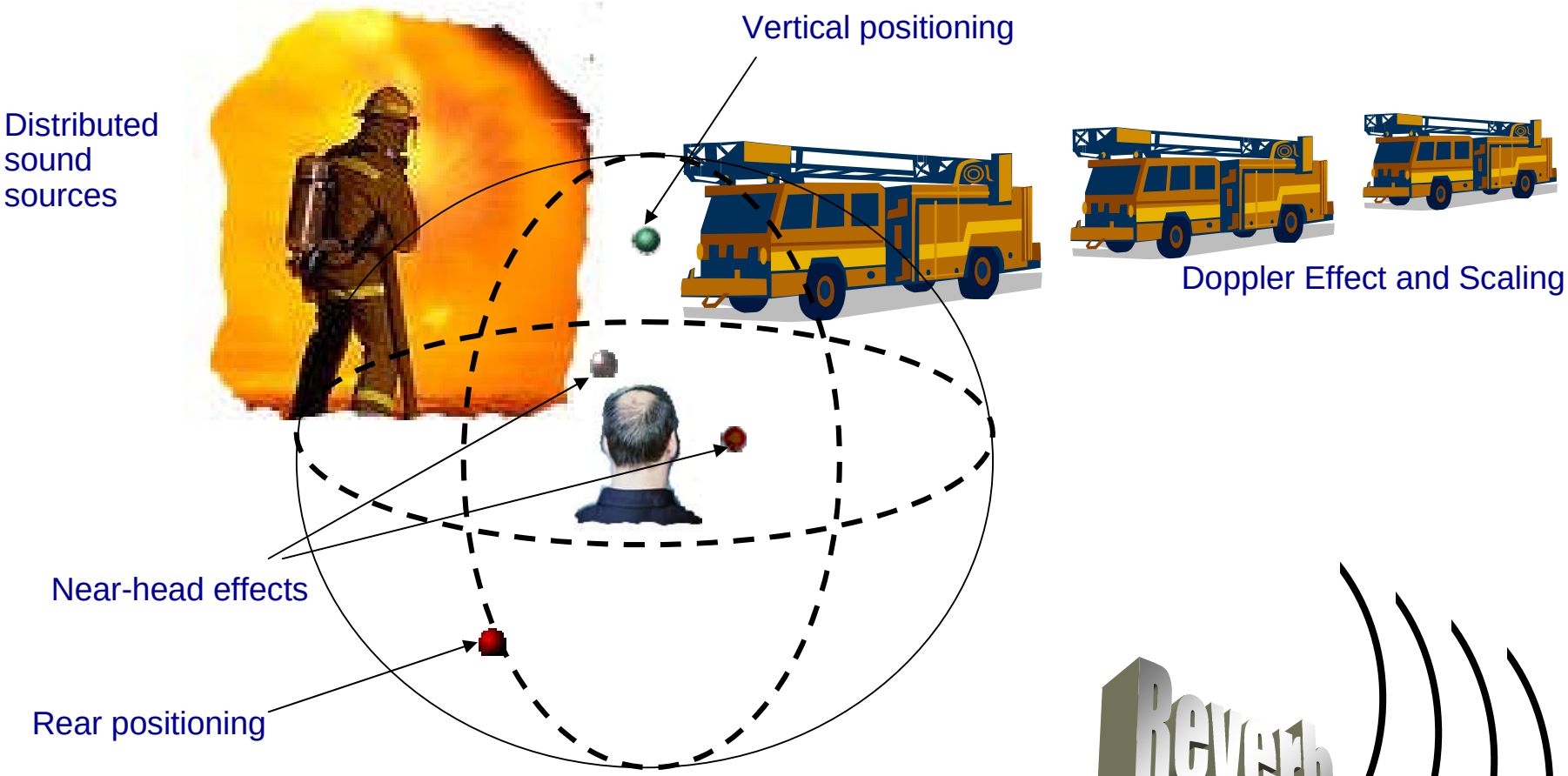
Audio APIs specify one side of an interface.

In reproduction of the sound the listener may get :

- Frontal plane only
- No near-head effects
- No Vertical positioning
- No advanced effects (Doppler, Scaling etc)

And still meet the spec

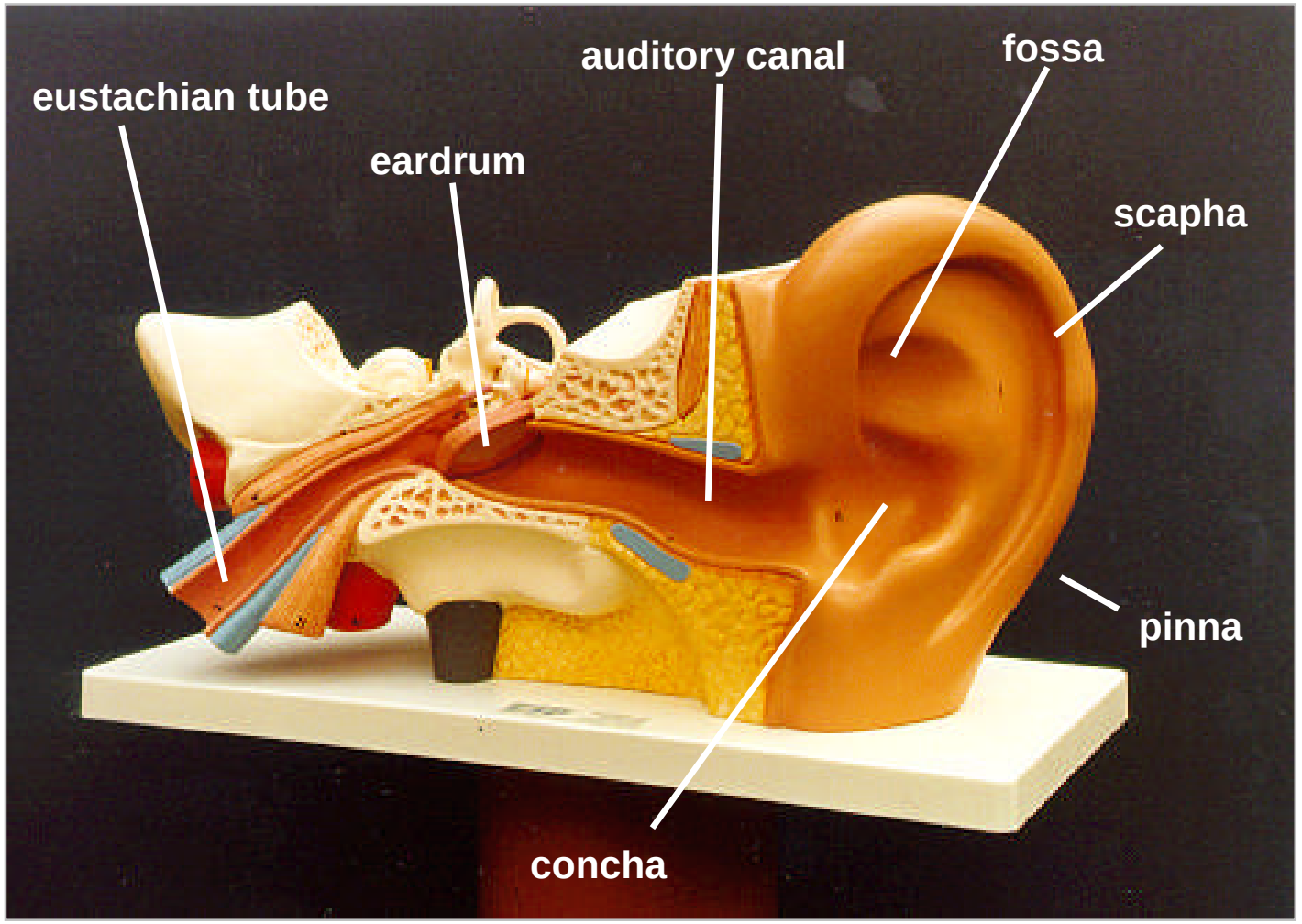
Sonaptic 3D Positional Audio



What the listener hears will determine success of 3D Positional Audio

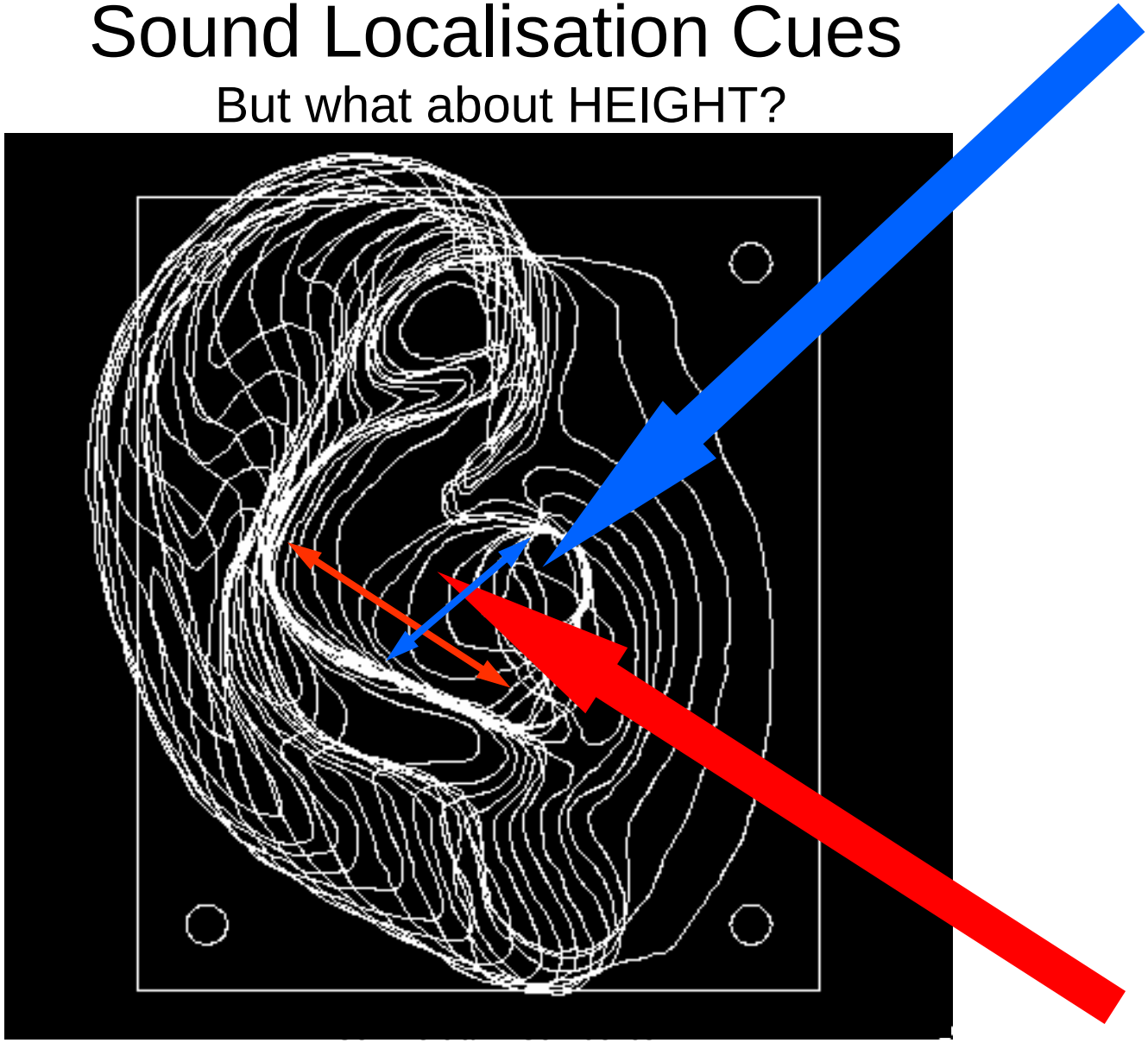
(not what is on the tick-list)

Structure of the Outer Ear

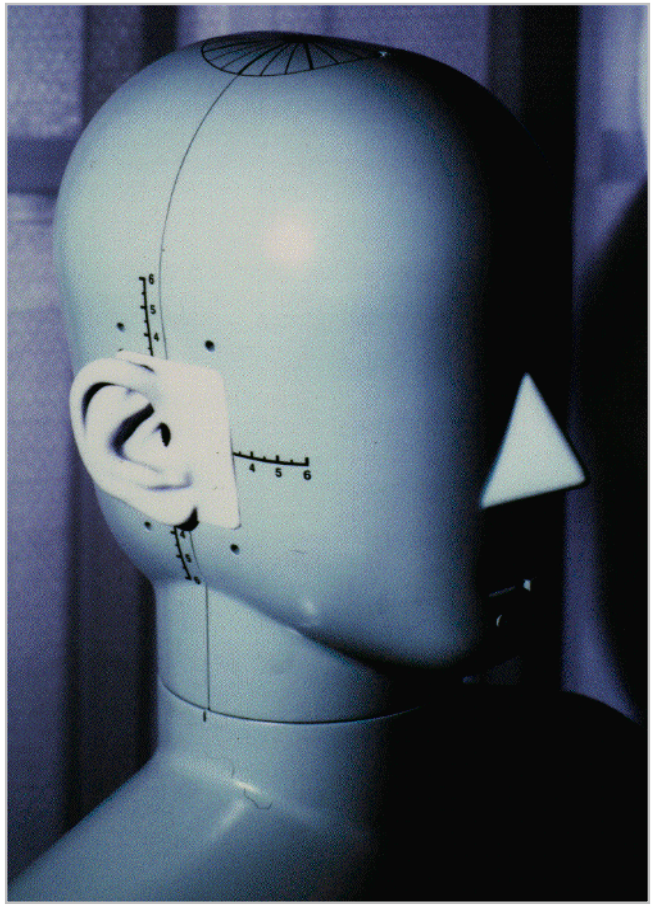


Sound Localisation Cues

But what about HEIGHT?

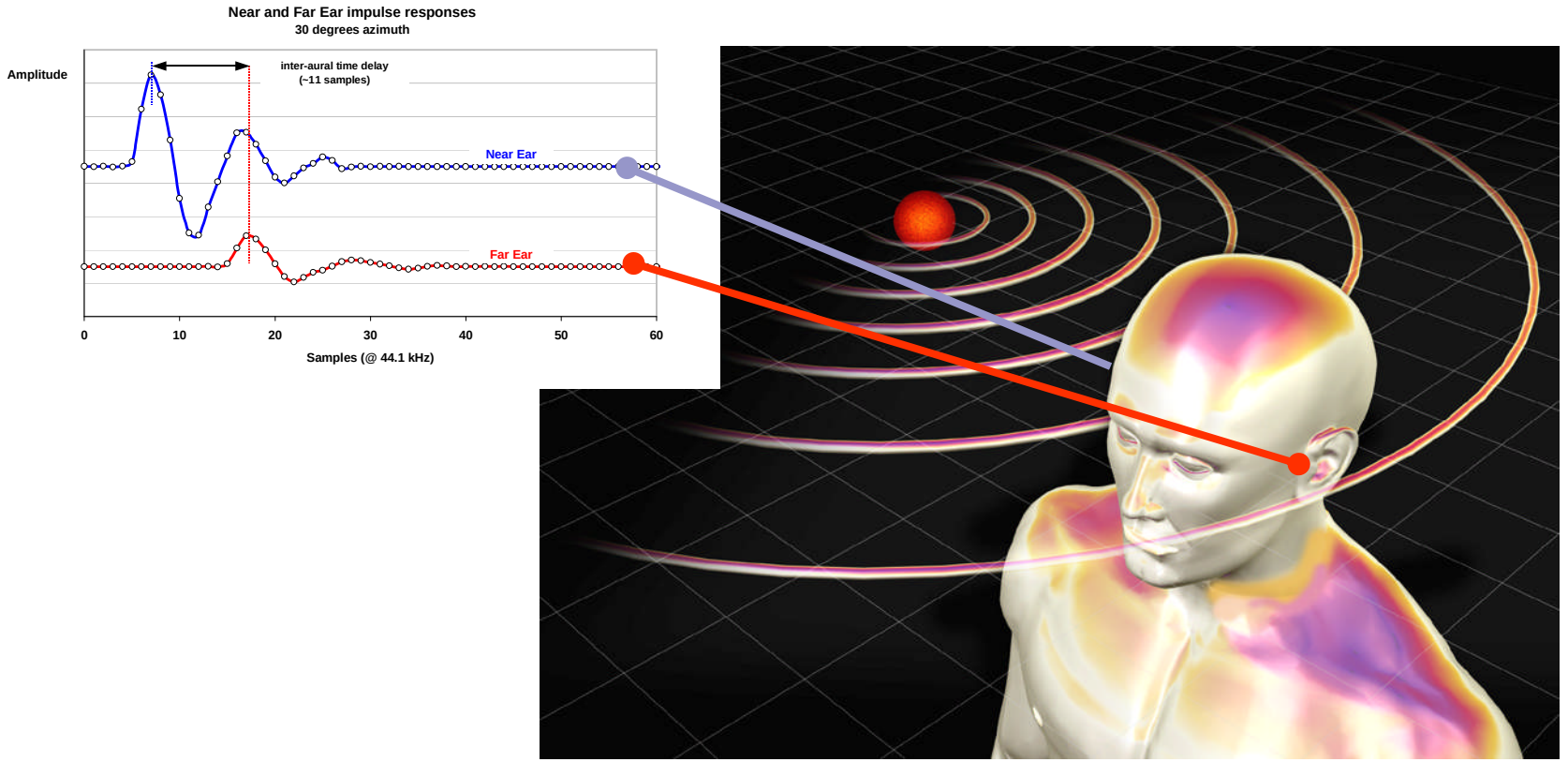


Artificial Head



An artificial head is used for the measurements, with microphones situated in the ear canal positions

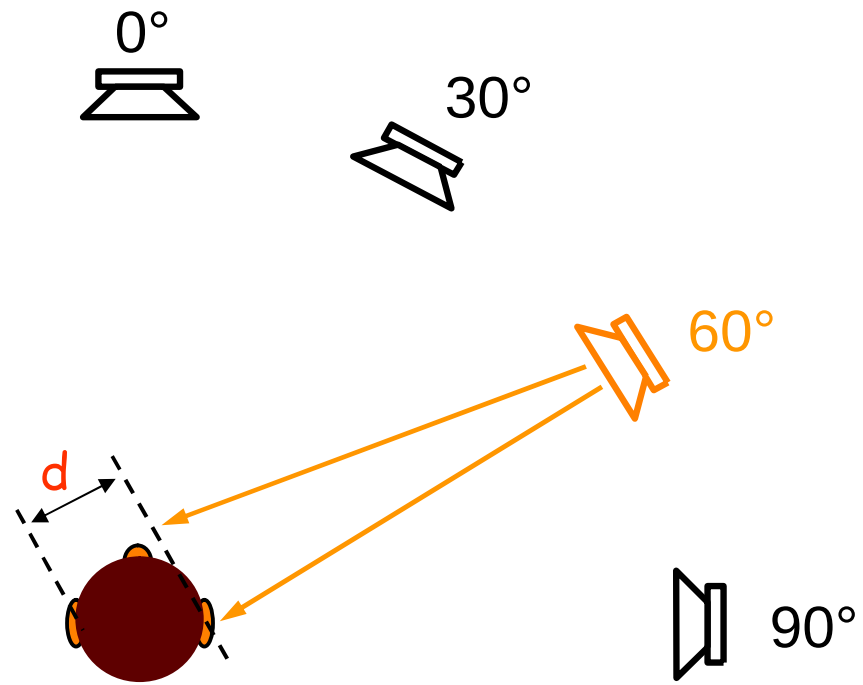
Measuring the Transfer Functions



The ear canal microphone signals are recorded and analyzed to provide the impulse response of each ear, and the inter-aural time delay

Sound Localization Cues

Inter-aural Time Delay

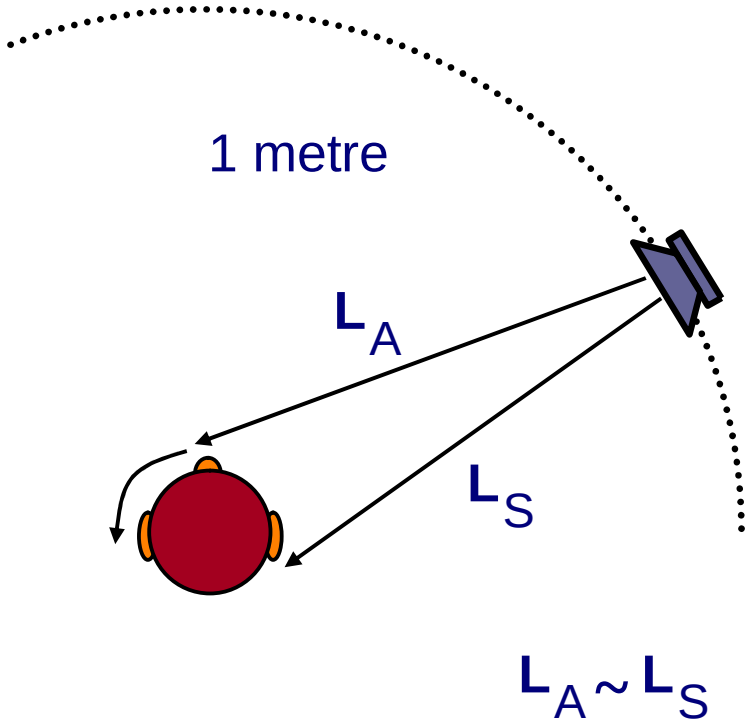


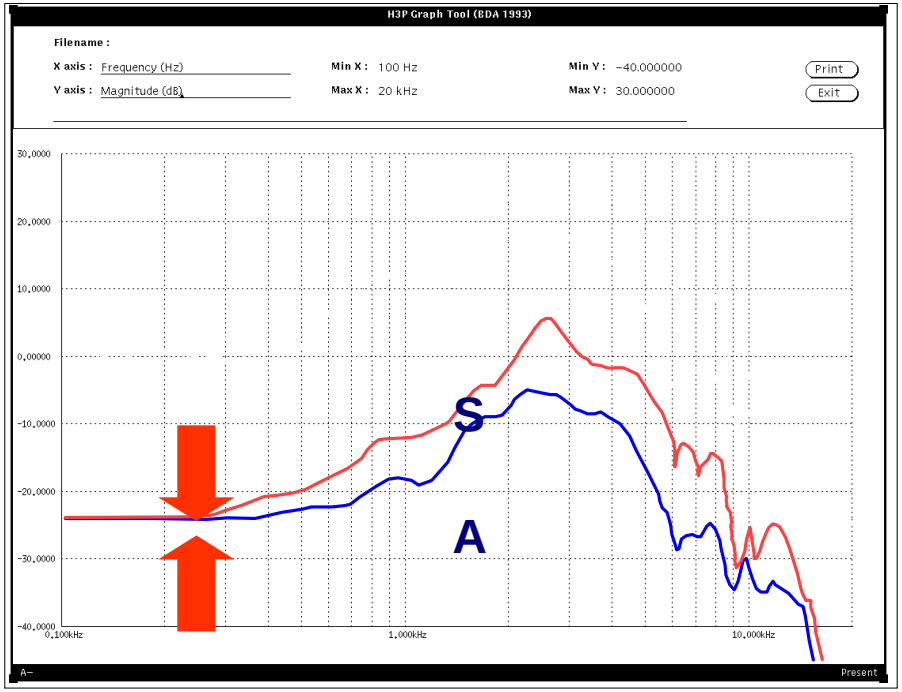
The different path length d between the source and each ear causes an inter-aural time difference in the range 0 to 0.68 ms which is direction dependent

Audio Reality Engine

- Near-Field Algorithm
  - Provides “close approach” effect
- Volumetric Algorithm
  - Creates area and volume sources (not just point sources)
- Dynamic Ambient ™ Processing Algorithm
  - For creating external headphone imaging
  - Simulates ‘out-of-the-head’ effect
  - Simulates distance effects

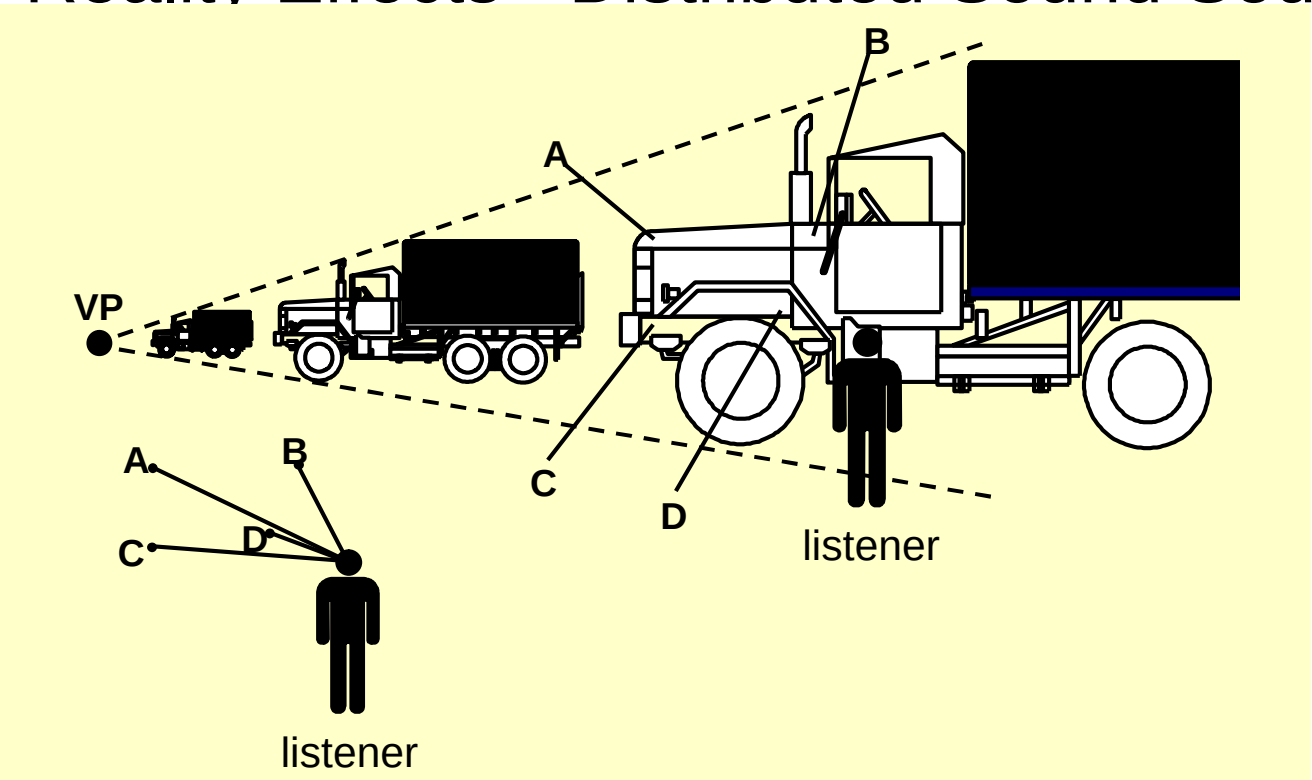
Audio Reality Effects – Near Field Effects





- Other technologies give poor/no reproduction of near-head effects due to merging of A and S at close proximity and at low frequencies (ear-to-source distance ratio)
- Sonaptic technology replaces conventional HRTF measurement methods giving excellent near-head effect reproduction

Audio Reality Effects - Distributed Sound Sources



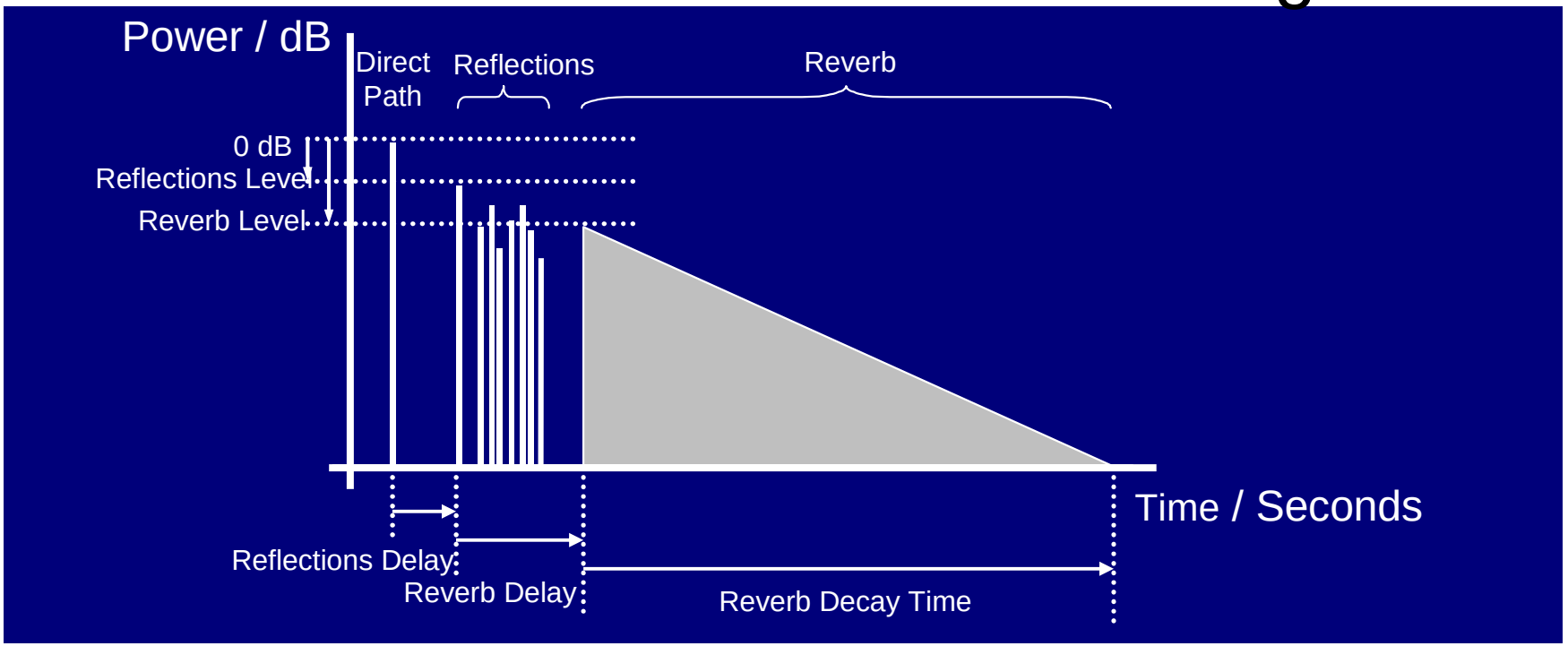
- Conventional 3D-processing synthesises “point” sources – but real-world sound emitters can be large areas.
- Sonaptic Volumetric algorithm:
  - Transforms single sound sources into arrays
  - Sounds are no longer point sources
  - Size scales with distance – “Zoom”

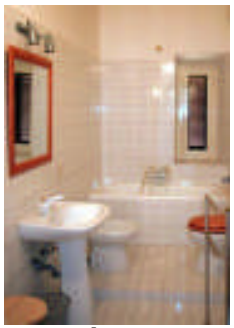
Audio Reality Effects - Distributed Sound Sources

Why is this important?

Sound sources in games can be large objects with sounds that scale with distance or with movement of themselves or the listener.

P3DA API : Reverb Processing

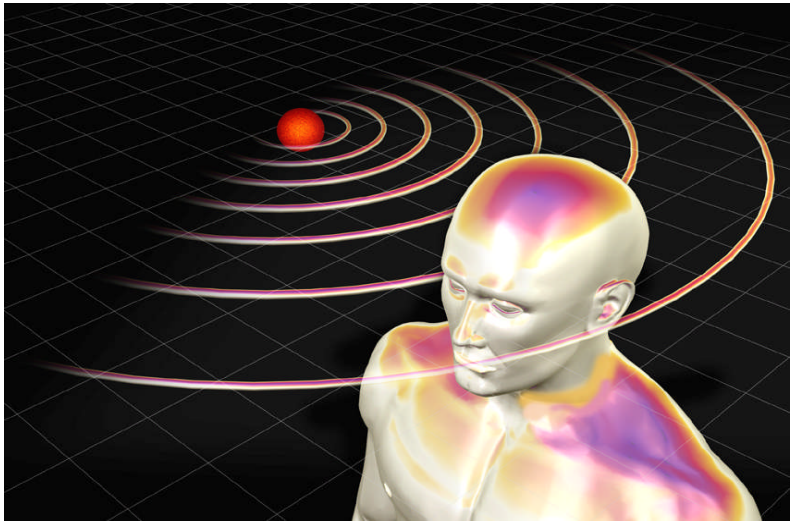




No Reverb Bathroom Cave Tunnel

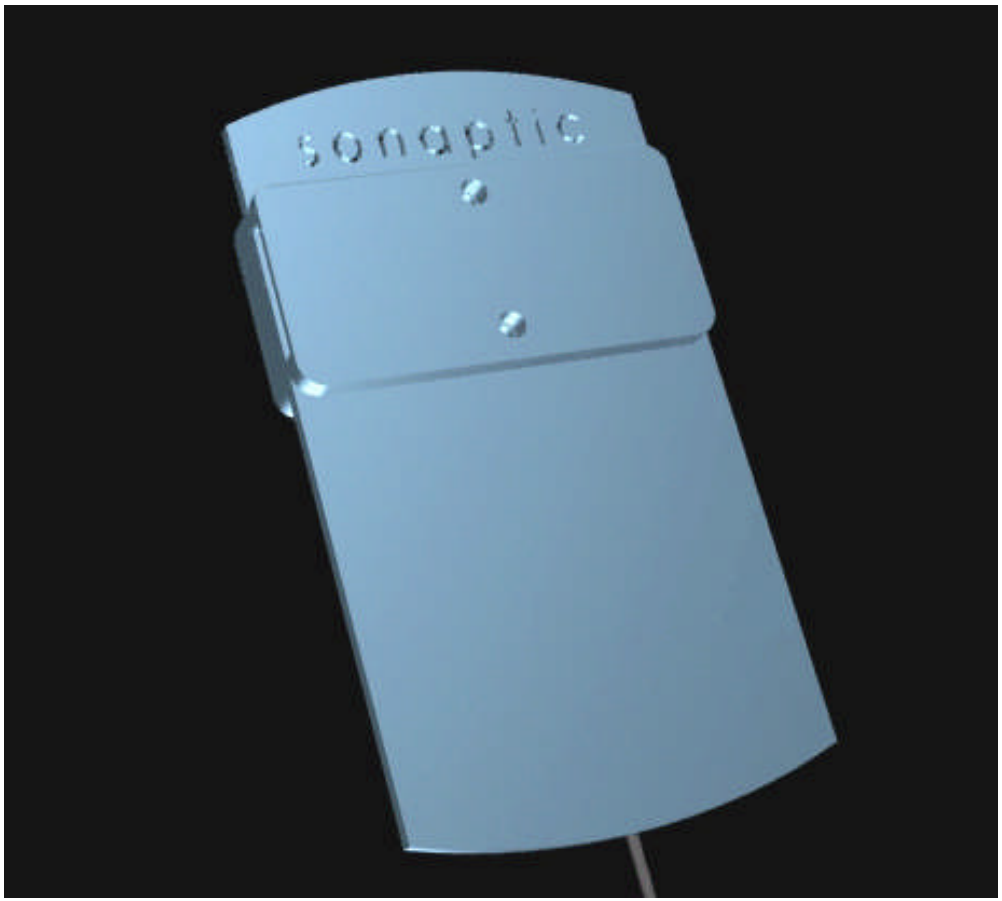
Synthesizing 3D Audio for Headphones and Loudspeakers

3D Audio for Headphones



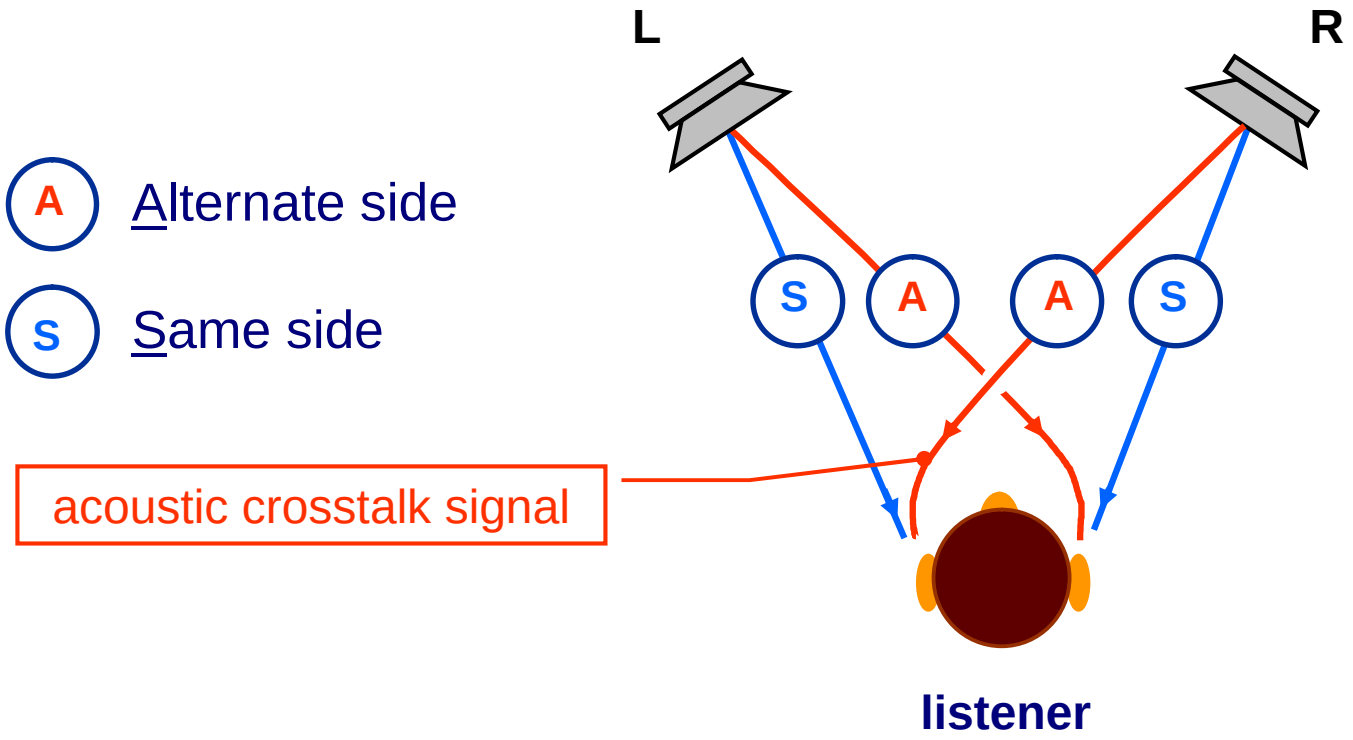
- 3D audio for headphones is synthesized by electronically copying the acoustic processes of our ears and head
- But how about playback over loudspeakers?

Integrated Sonic Emitter Technology



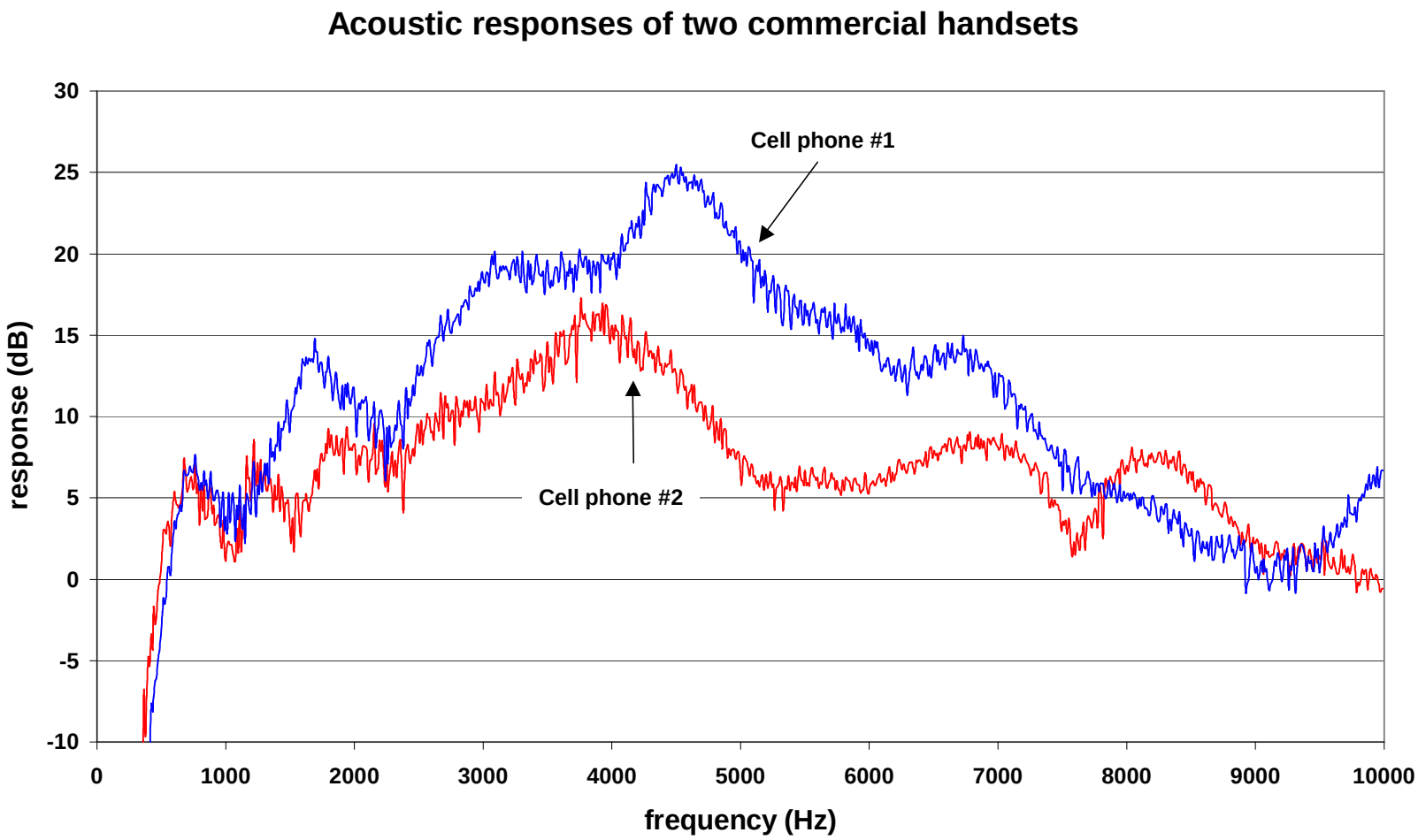
In order to ensure best 3D effects, Sonaptic has developed a new microspeaker technology for handsets - the Integrated Sonic Emitter

Transaural Acoustic Crosstalk

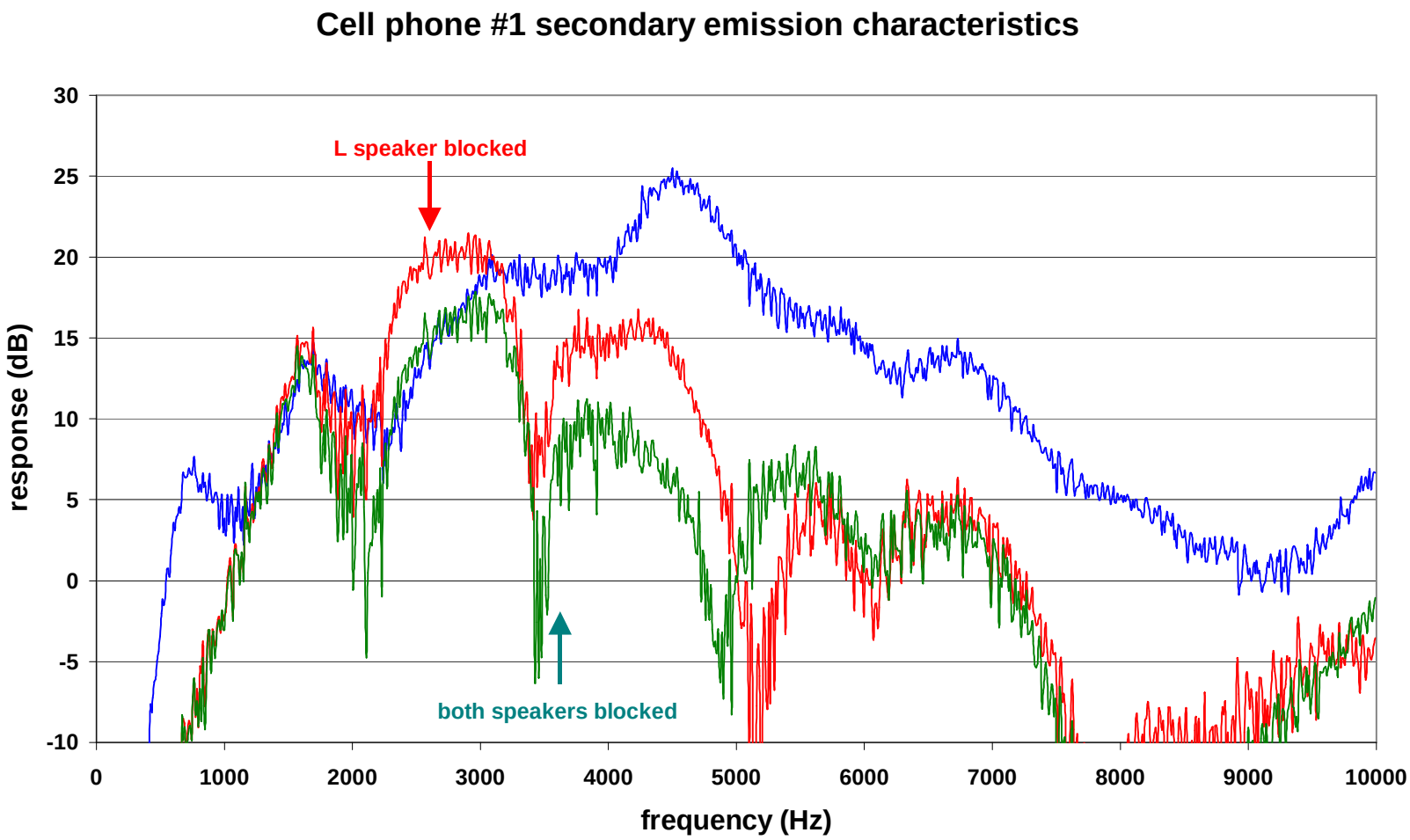


Transaural acoustic crosstalk occurs during loudspeaker listening, interfering with the correct delivery of the L and R audio channels to the listener

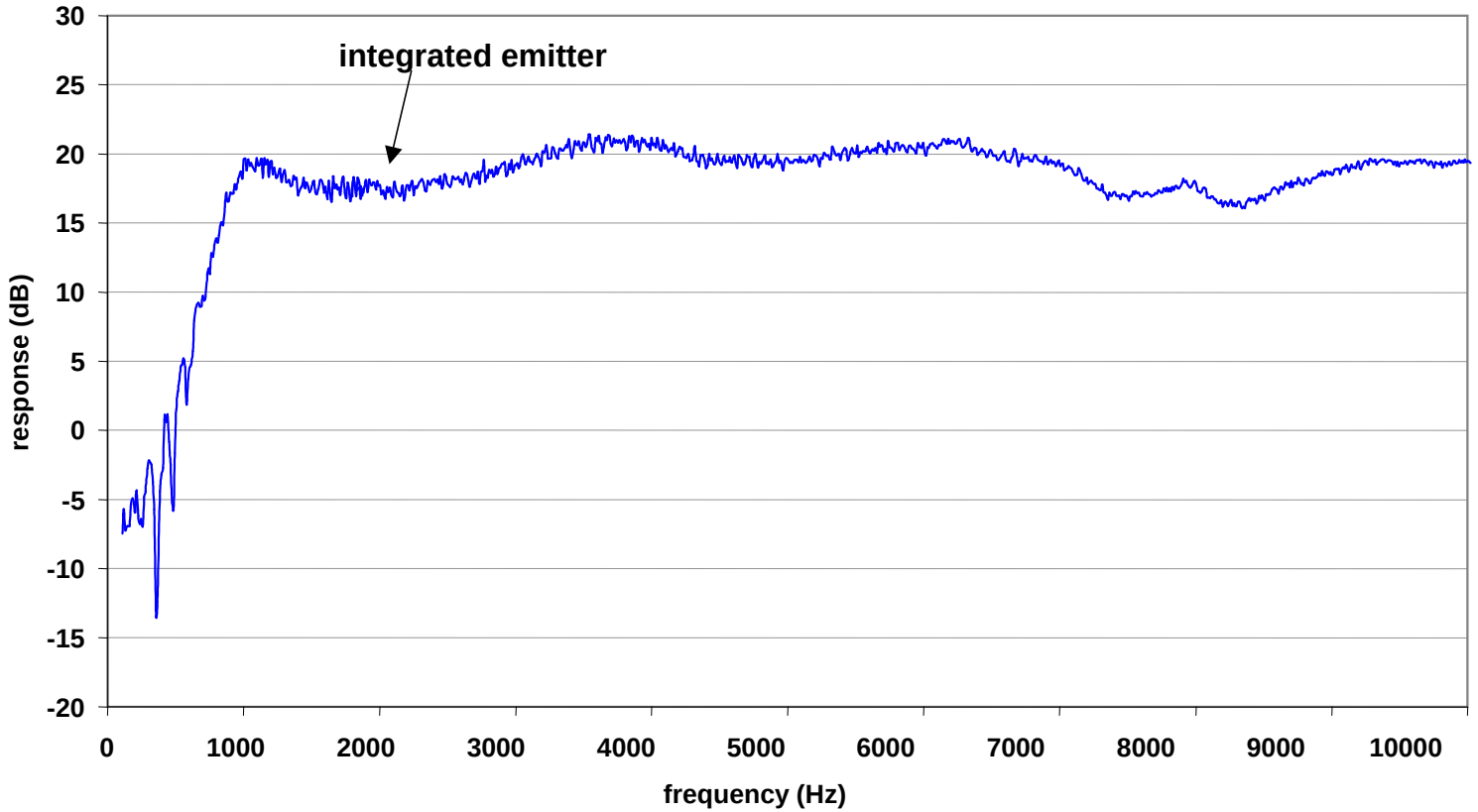
Handset Acoustic Response



Secondary Acoustic Emission



Integrated Sonic Emitter Technology

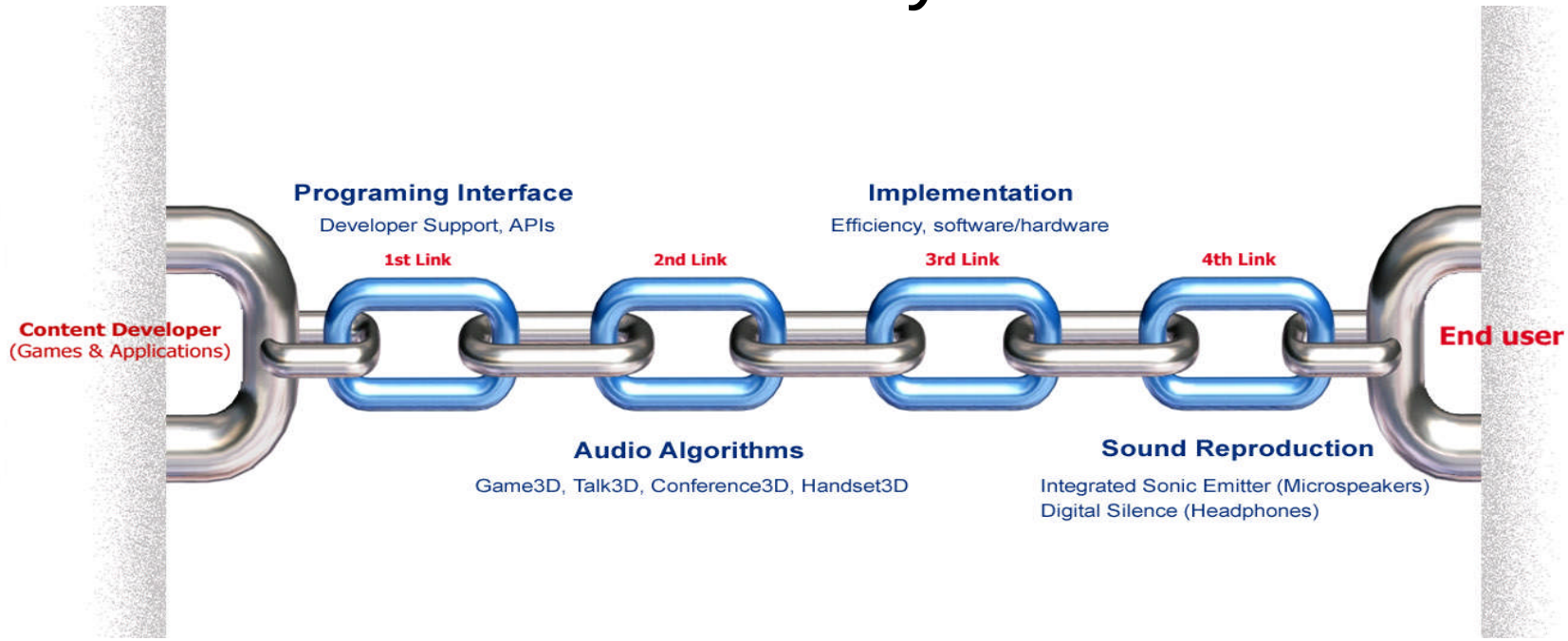


The ISE has a flat response and good properties for 3D audio

Games API

- Design and Evolution
  - Based on many years in PC Sound Technology work at Sensaura (80% of PC Games Card Market)
  - Games designers use familiar constructs
  - Core Sonaptic APIs mapped to common developer APIs using mapping layer

Audio Delivery Chain

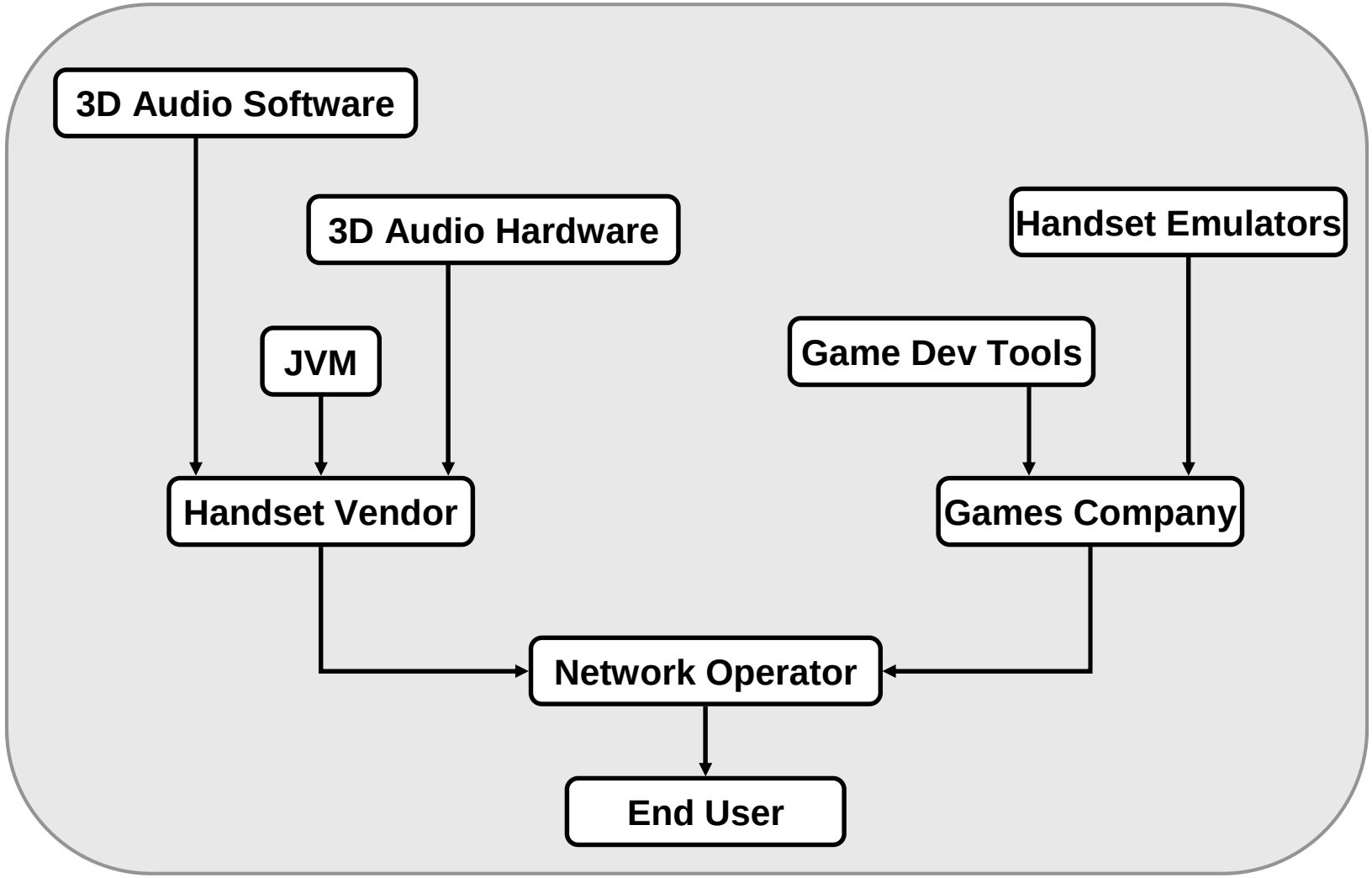


The audio algorithms are only one link in the delivery chain

The system is only as good as the weakest link…

…so for good effects, the handset acoustics must also be good

P3DA Partner Program



Sonaptic Advantages

- Specialists in 3D-sound for mobile devices
  - 12 years research
  - Innovative handset acoustic design
- Standardising 3D-audio API
  - Working with industry leaders
  - Substantial experience supporting game developers
- Proven solution and fast Java implementation