

# ABS SYSTEM

A Real-Time Neuroadaptive Audio Modulation Platform

## WHAT IS ABS?

ABS is a **real-time audio modulation technology** that layers precise, neuroscience-backed beat frequencies onto music during playback. These frequencies are known to influence brain activity and nervous system state, helping **guide listeners toward specific outcomes** such as focus or recovery.



Unlike traditional audio processing, ABS does not alter or replace the music itself. It operates **on-device, in real time**, subtly infusing stimulation into the listening experience to enhance music's natural impact, **turning familiar songs into functional, state-shaping sound**.

## BINAURAL BEATS AND THEIR ROLE IN ABS

Binaural beats are a form of **auditory stimulation** created when two slightly different frequencies are presented to each ear, causing the brain to perceive a **third "beat" frequency**. This phenomenon has been shown to **influence neural activity** and is associated with shifts in focus, relaxation, alertness, and emotional state.

LUCID's ABS system builds on this principle **and extends it**. While binaural beats are one method of delivering auditory beat stimulation, **ABS is a broader, more flexible modulation layer that can apply multiple forms of beat-based stimulation** in real time, directly within music playback.

*LUCID's patent preserves the strength of binaural beats, while reducing their dissonant nature, ultimately increasing therapeutic payload for the end user.*

### Theta Waves (4 – 8 Hz)

Associated With:

- Memory processing
- Emotional release
- Reduced muscle tension



### Alpha Waves (8 – 13 Hz)

Associated With:

- Reduced cortisol
- Calm, alert awareness
- Improved mood stability



### Gamma Waves (~30 – 100+ Hz)

Associated With:

- Elevated motivation
- Reduction of amyloid plaques
- Improved cognitive performance



## WHY ABS MATTERS

In practical terms, ABS allows LUCID to:

### Make music more effective, not just more personalized

By layering clinically validated beat frequencies at playback, ABS can **amplify music's ability to reduce anxiety, increase focus, or shift arousal**, without changing the song itself.

### Deliver neuromodulation without hardware or new content

Users get brain-state modulation using the **music they already love**, through software alone, running on their **own** device.

### Operate with zero licensing friction

Because ABS does **not** alter, store, or create derivative audio files, it avoids the legal, financial, and operational complexity that typically blocks innovation in music-tech.

### Scale instantly across any catalog

ABS works at **playback**, not at production. This means it can be **applied to millions of tracks in real time**, with no pre-processing, no re-encoding, and no changes to content pipelines.

ABS is what allows LUCID to move *beyond* recommendation and into **state modulation**:



Music as a tool



Scalable



Scientifically grounded



Preserves artist integrity



User safe

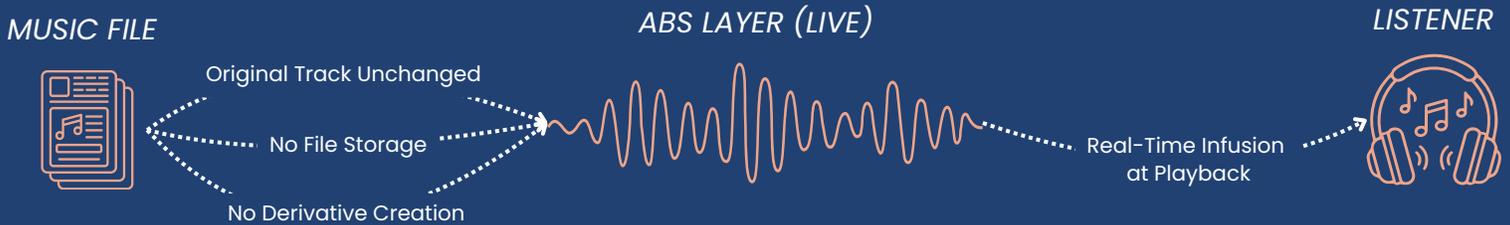


Enhances focus, recovery

## SYSTEM OVERVIEW

ABS is based on established principles of **frequency-following response**, where specific auditory beat patterns can elicit **measurable neural responses** depending on frequency and context.

The system is designed as a **playback-time modulation process**, rather than a content generation or transformation pipeline. ABS does not alter, store, or redistribute music assets, and can be applied **dynamically during playback**.



## METHOD & EXECUTION

ABS is implemented as a **real-time, edge-executed signal process**:

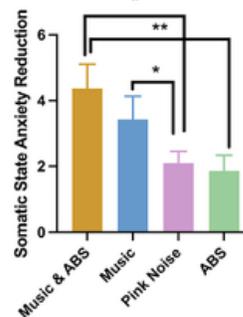
- Applied during playback **via audio mixing**
- No permanent modification of audio files
- No cloud-side audio processing
- Compatible with **streamed and locally stored music**

The system supports stimulation across **common frequency bands** (delta, theta, alpha, beta, gamma), allowing parameters to be selected based on session context, product requirements, or downstream control logic.

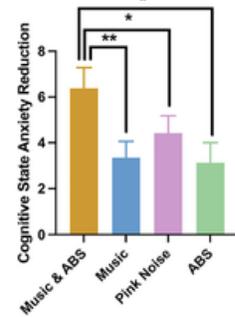
## VALIDATION & EVIDENCE

LUCID's ABS infusion method has been validated to improve the **anxiety-reducing properties of music**.

A) Somatic State Anxiety Reduction  
Moderate Trait Anxiety Participants



B) Cognitive State Anxiety Reduction  
Moderate Trait Anxiety Participants



**Randomized Controlled Trial** with 264 participants (adults 18-64 with moderate to severe anxiety) led by **Toronto Metropolitan University Neuroscience Lab (SMARTLab)**

## SCALABILITY & RISK PROFILE

ABS is designed for **low operational and legal risk** at scale:

- No derivative audio assets
- No additional licensing or redistribution obligations
- Minimal infrastructure and compute overhead
- Compatible with large, dynamic music catalogues

Because infusion occurs only at playback time, ABS can be **deployed broadly** without pre-processing, catalog changes, or content duplication.

Traditional Audio Processing	LUCID'S ABS
Creates new audio files	No new files
Requires new licenses	No new licenses
Cloud audio pipelines	Edge only
Catalog re-encoding	Playback injection

**LUCID's ABS enhances music delivery through real-time, on-device auditory modulation.**