



# PersonaSound™

**HEARING, VOICE, AUDIO,  
ENHANCEMENT TECHNOLOGIES**

for TWS earbuds, headsets, OTC  
hearing aids & beyond

Revision 2.0  
Feb 2024





# DSP SOFTWARE THAT MAKES SOUND BETTER

REMOVE



ENHANCE



IMPROVE



Founded **2002**, HQ in Israel, Haifa  
Offices in China, Korea, Armenia

**35** full time employees

Founder & CEO – Dr. Alexander Goldin

# OVER 70 MILLION PRODUCT LICENSES DELIVERED

BY 2023 AND GROWING FAST...



Automotive  
hands-free calls  
& audio



TWS earbuds,  
headsets &  
hearables



Audio/video  
conferencing



Hearing aids and  
assistive listening

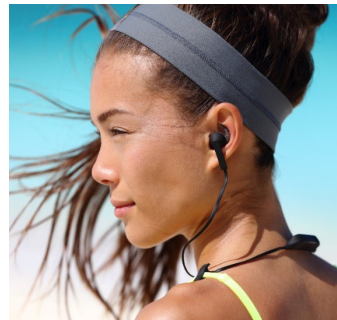
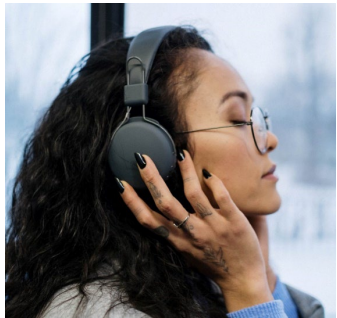
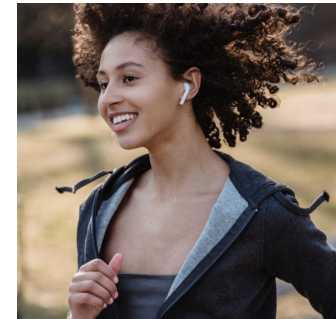


SMART: speakers,  
TV, appliances



# PersonaSound™ CONCEPT – ONE SOUND DOES NOT FIT ALL

**WE...** have individual hearing profiles • are in distinct places • use different devices



# PersonaSound™

## MAKES SOUND PERSONAL FOR...

- YOUR HEARING
- YOUR ENVIRONMENT
- YOUR DEVICE



Music and audio



Remote communications



Face-to-face  
communications



Live music



Sounds of nature



Hearing protection

**AUGMENTED LISTENING**

**AUGMENTED HEARING**

# PersonaSound FOR HEARABLES



**HEADPHONES**



**HEADSETS**



**TRUE WIRELESS  
STEREO EARBUDS**



**HEARING AIDS**

# PersonaSound IN ALANGO DSP SOFTWARE PACKAGES



## HEARING CONTROL PACKAGE (HCP)

Hearing test  
Loudness/tone control  
HEP parameters calculator



## HEARING ENHANCEMENT PACKAGE (HEP)

Adaptive Beamforming  
Noise Reduction  
Feedback cancellation  
Personalized Amplification  
Own-Voice Attenuation



## AUDIO ENHANCEMENT PACKAGE (AEP)

Personalized Audio Enhancement  
Ambient Noise Dependent Equalizer  
Smart Transparency  
Sound Effects Normalization

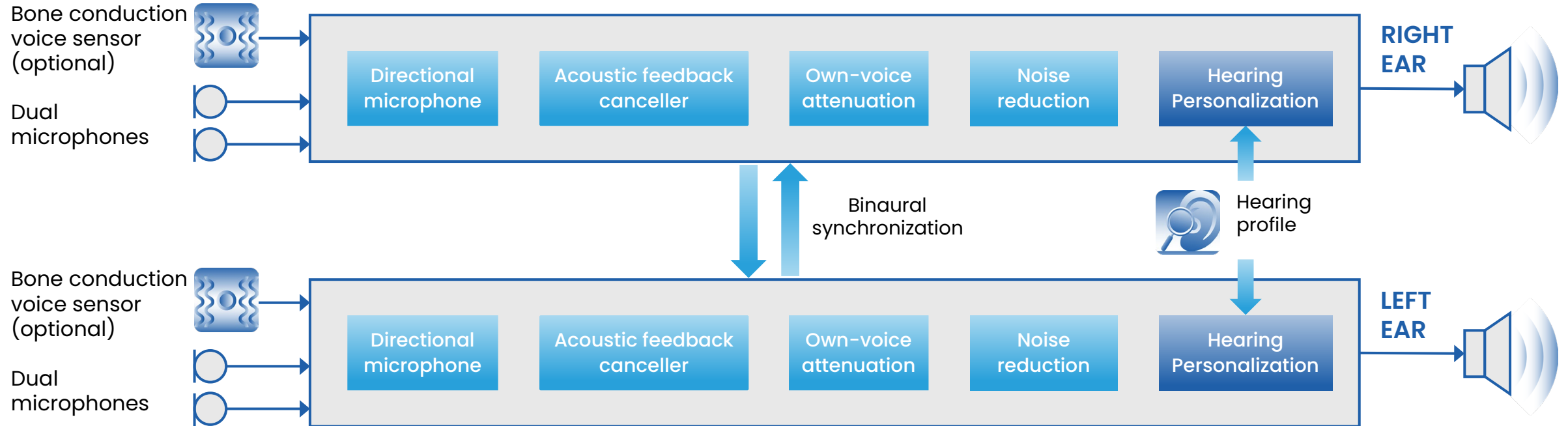


## VOICE COMMUNICATION PACKAGE (VCP)

Incoming Voice Personalization  
Incoming Noise Reduction  
Ambient Noise Dependent Equalizer



# HEARING ENHANCEMENT PACKAGE (HEP)

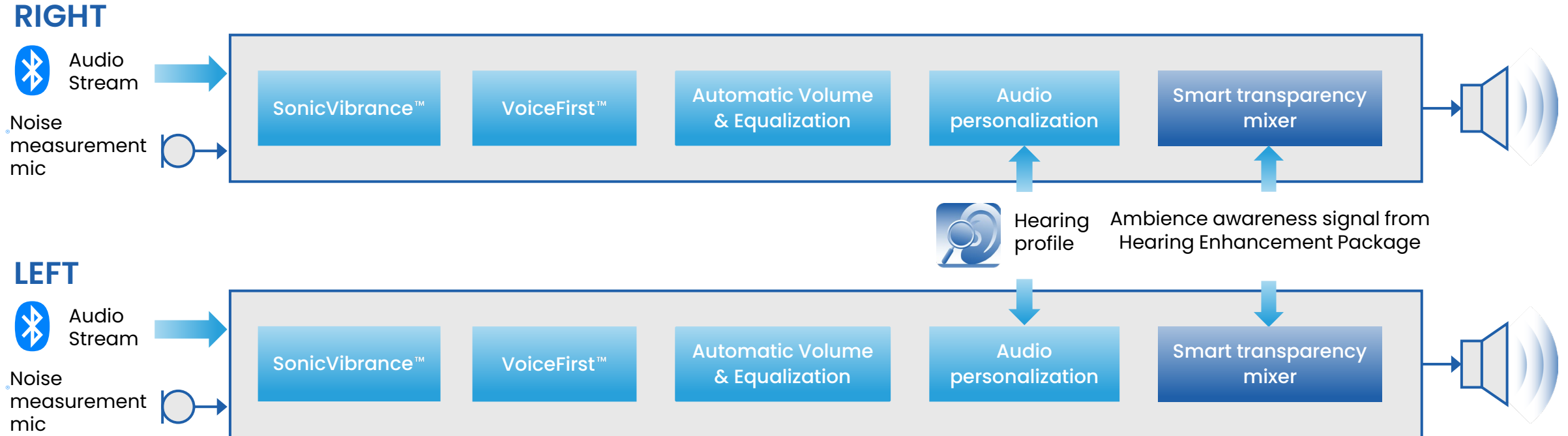


## Binaural synchronization improving perceptual quality and sound localization for:

- Hearing Personalization by Wide-band Dynamic Range Compression
- Directivity for conversation focus using 2 synchronized beamforming mic-pairs
- Coordinated left-right ear noise reduction
- Coordinated acoustic feedback cancellation
- Reliable user's own voice detection and attenuation using bone conducted voice vibration sensor

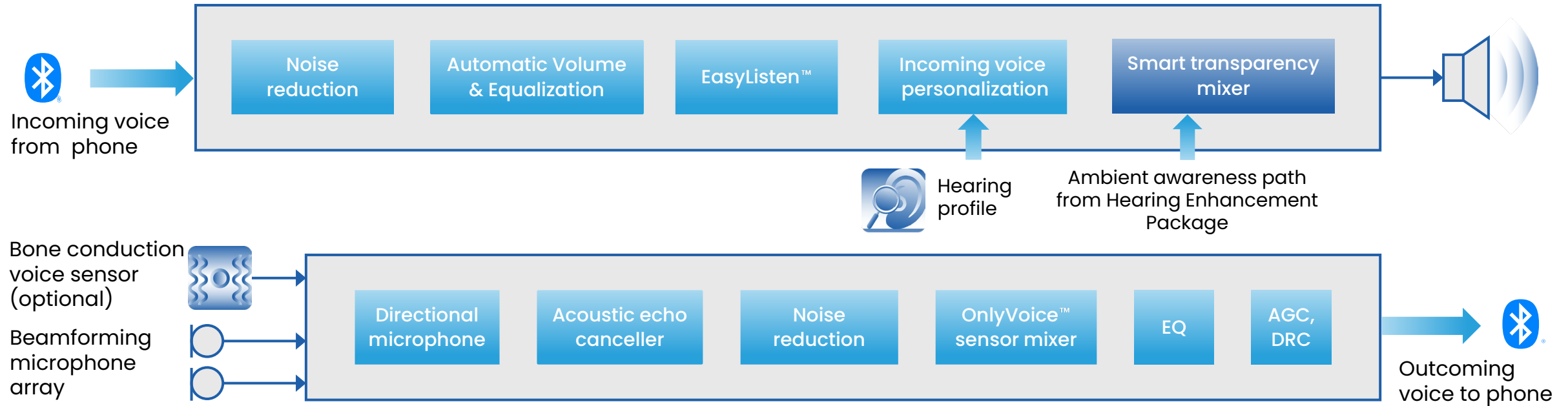


# AUDIO ENHANCEMENT PACKAGE (AEP)



- Audio-Personalization by Wide-band Dynamic Range Compression.
- SonicVibrance™ technology for stereo expansion, enhancement of spectral components and bass boost.
- VoiceFirst™ technology for reduction of background sound effects and speech intelligibility boost for streamed AV content.
- Automatic Volume and Equalization for adjusting sound according to ambient noise level and spectrum.
- Smart transparency mixer technology for ambient awareness

# VOICE COMMUNICATION PACKAGE (VCP)



- Incoming voice personalization by Wide-band Dynamic Range Compression
- Automatic Volume and frequency Equalization according to ambient noise amplitude and spectrum
- EasyListen™ technology slowing down speech of fast talkers in real time during a phone call
- Dual microphone array for exceptional voice transmit clarity even in noisy environments
- OnlyVoice™ technology for ultimate noise reduction combining microphone array output with a bone conducted voice vibration sensor signal

# ALANGO AI SPEECH ENHANCEMENT IN NOISE

## ALANGO APPROACH – THE BEST OF BOTH WORLDS

- ☹️ Slow convergence
- ☹️ Stationary noises only
- ☹️ Limited performance in low SNR

- 😊 Low computational resources
- 😊 Low processing delay
- 😊 Easy integration with other technologies
- 😊 Fast convergence
- 😊 Attenuation of non-stationary noises
- 😊 Good performance with low SNR

- ☹️ High computational resources (MIPS, RAM)
- ☹️ Processing delay
- ☹️ Difficulty of integration with other technologies

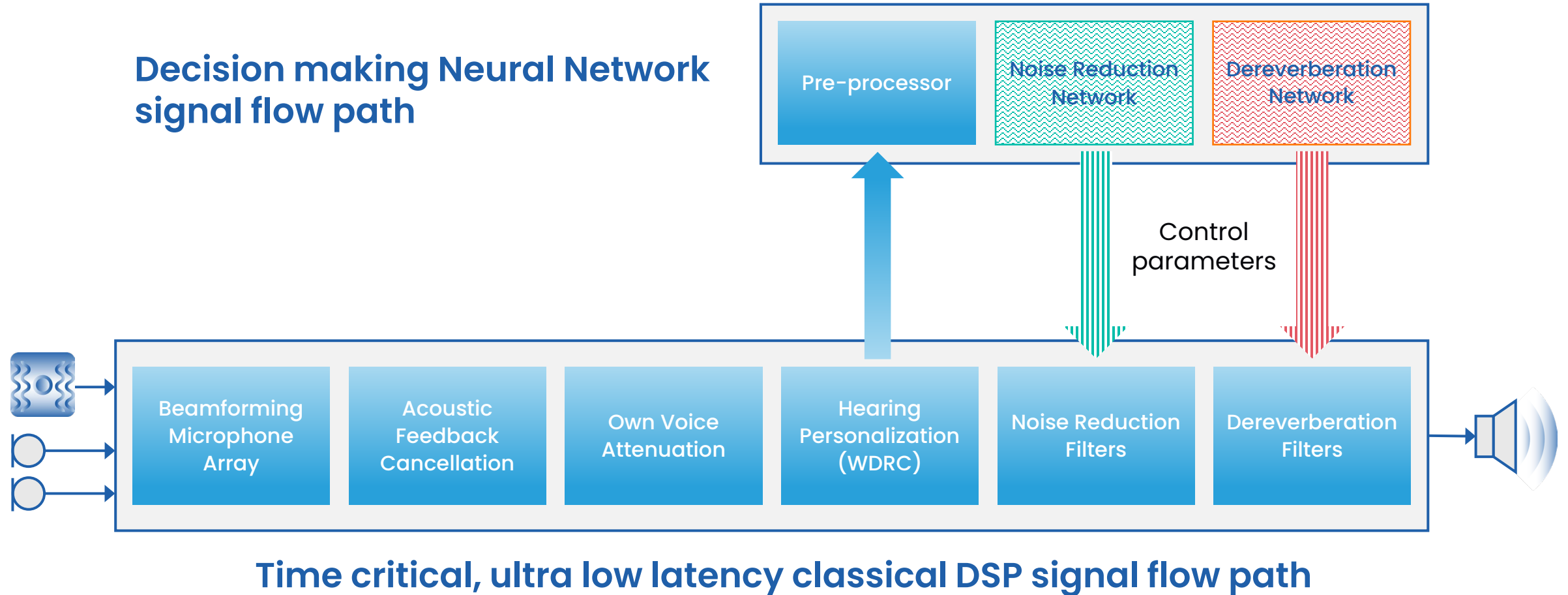
Classical



Neural Networks



# ALANGO ZERO LATENCY SIGNAL PROCESSING (ZLSP) COMING SOON, PATENT PENDING

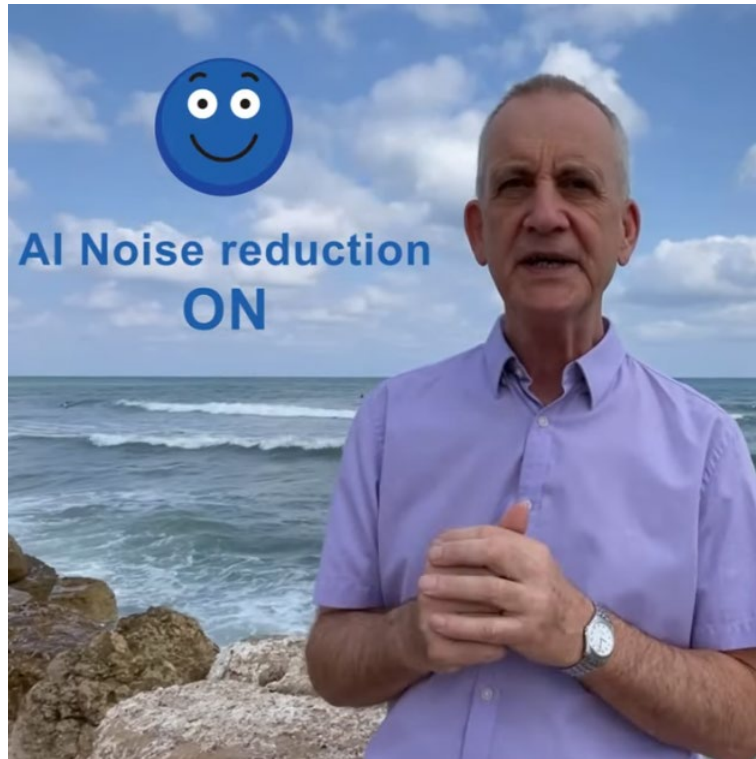




# ALANGO AI TECHNOLOGY DEMOS

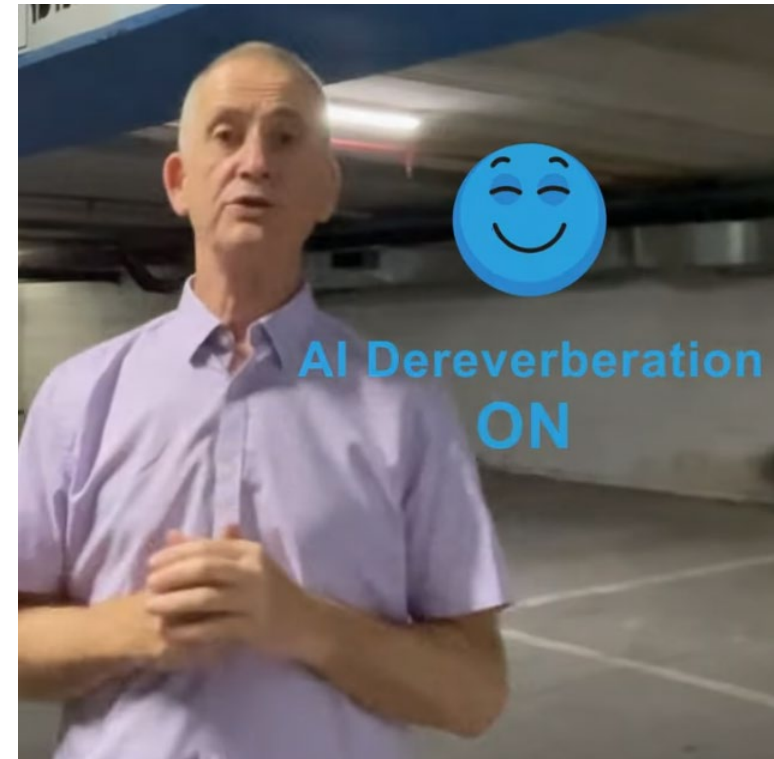
Click on the picture or the link...

## NOISE REDUCTION



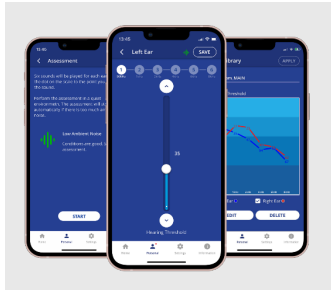
<https://www.youtube.com/shorts/SEwJXqx4Ms>

## DEREVERBERATION



<https://www.youtube.com/shorts/sSktLnZ8eIA>

# HEARING SELF-TEST: ASSESSMENT



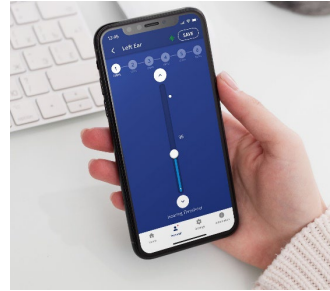
## LAUNCHING HEARING TEST USER INTERFACE ON A SMARTPHONE

Alango to provide supporting examples.



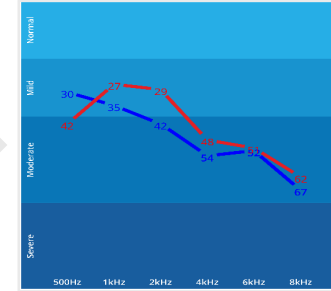
## START THE HEARING TEST

User hears wobbling test tones of different frequencies, one tone one ear at a time.



## FOR EACH TEST SOUND:

The user adjusts the volume until finding his/her hearing threshold (the level at which the tone is barely audible).



## AUDIOGRAM & HEARING PROFILE

Upon completion, the thresholds are presented as an audiogram and saved as a hearing profile.



## UPLOAD AND APPLY

The hearing profile is uploaded to the device and the user enjoys personalized sound in all device modes (hearing, music, phone calls).

# PersonaSound IS MUCH DIFFERENT THAN FREQUENCY EQUALIZATION

## TYPICAL HEARING LOSS

- Different for different frequencies.  
High frequency loss being the most common.
- Not a simple, equal attenuation of sounds.  
Quiet sounds are attenuated more than loud sounds.

## EQ IS A WRONG TOOL FOR HEARING LOSS COMPENSATION

- Additional amplification of loud sounds can become overbearing.

## PersonaSound HEARING LOSS COMPENSATION

- Based on Wide-band Dynamic Range Compression (WDRC) principals.
- Sounds are amplified depending on their frequency and level according to the individual hearing profile.

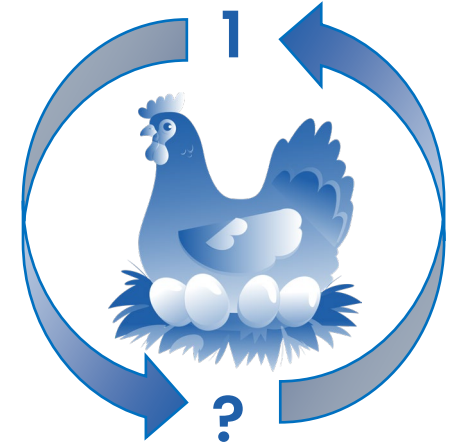


Parameters  
of Wide-band  
Dynamic Range  
Compressor

# ALANGO BeHear® PRODUCTS – PERFECTING THE CONCEPT

MAKING SUCCESSFUL PRODUCTS REQUIRES A GOOD TECHNOLOGY  
PERFECTING A TECHNOLOGY REQUIRES MULTIPLE PRODUCTS

- Self-fit, advanced, personalized listening & hearing amplification
- Full Bluetooth voice/audio functionality optimized for individual hearing
- Assistive listening capabilities with personal sound



**BeHear SMARTO**



**BeHear ACCESS**



**BeHear PROXY**



**BeHear ACTIVE**  
(coming soon)



# ALANGO BeHear – BETTER THAN ADVANCED HEARING AIDS

Speech Intelligibility Index (SII) demonstrates which percentage of speech is intelligible to the user. More information on SSI: <https://blog.ansi.org/2016/06/speech-intelligibility-index>

BeHear ACCESS SSI is higher compared to Advanced HA in all three tests at 55dB, 65dB, 75dB.\*



## BeHear ACCESS

LEGEND, RIGHT		
1	SII: [46%]	NAL NL2 – 55 (84) dB – ISTS Si...
2	SII: [63%]	NAL NL2 – 65 (90) dB – ISTS Si...
3	SII: [71%]	NAL NL2 – 75 (93) dB – ISTS Si...

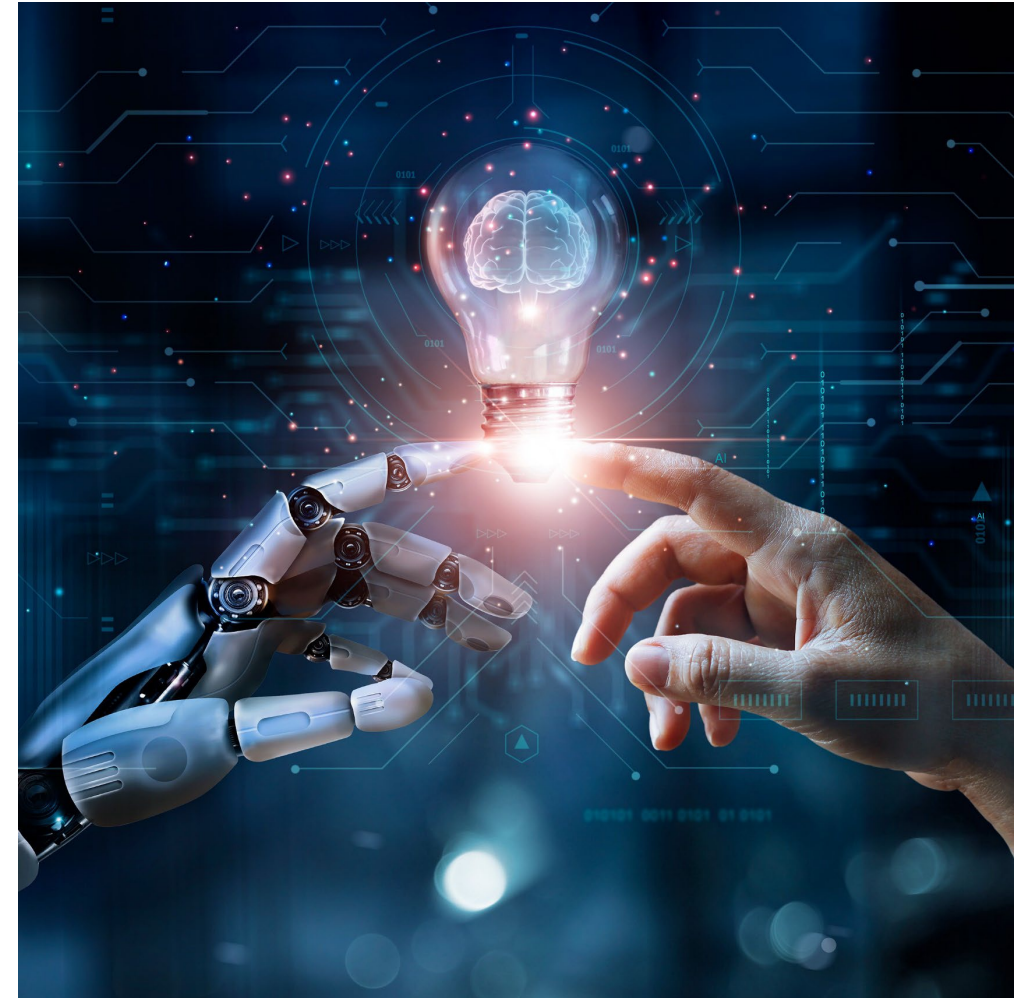
## Advanced Hearing Aids (a top model from one of big 5)

LEGEND, RIGHT		
1	SII: [42%]	NAL NL2 – 55 (82) dB – ISTS Si...
2	SII: [54%]	NAL NL2 – 65 (86) dB – ISTS Si...
3	SII: [63%]	NAL NL2 – 75 (89) dB – ISTS Si...

\* Full report available upon request

# ALANGO UNIQUE TECHNOLOGIES

- Ultra low complexity Neural Networks:
  - Noise reduction
  - Dereverberation
- Patent pending:  
Zero Latency Signal Processing (ZLSP) combining high frequency resolution with ultra-low delay signal path
- Patent pending:  
Own Voice Attenuation (OVA) using a bone conduction voice sensor
- EasyListen™ – slowing down speech in real time
- Blind Interference Cancellation (BIC) with dual or multi-microphone arrays



# WHAT MAKES ALANGO NUMBER ONE

Alango Technologies is the only company having:

- Comprehensive portfolio of proven technologies (hearing, voice, audio)
- Established relevant customer base of major OEMs
- Established partnership networks with major chipset providers and ODM manufacturers
- Line of BeHear concept products that users love  
<https://alango-behear.com>
- 20 years of successful experience in DSP software licensing



# PersonaSound BEYOND HEARABLES

We can help making all these devices to sound personal:



**TV, SOUNDBAR**



**CAR**



**PC**



**STEREO**



# THANK YOU!

**DON'T HESITATE TO CONTACT US.  
WE ARE ALWAYS LOOKING FORWARD  
TO HEARING FROM YOU!**

Email us your questions, comments,  
thoughts, or proposals.



General enquires - [info@alango.com](mailto:info@alango.com)

Sales enquiries - [sales@alango.com](mailto:sales@alango.com)

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**APPENDIX**



# APPENDIX

## VOICE TECHNOLOGIES

EasyListen™

OnlyVoice™

Dynamic Noise Suppression

Wind Noise Reduction

Acoustic Echo Cancellation

Acoustic Feedback Reduction

Adaptive Dual Microphone

Multi-Microphone Arrays

Automatic Volume and eQualization Control

Automatic Gain Control

Multiband Dynamic Range Processing

Voice Activity Detection

## AUDIO ENHANCEMENT TECHNOLOGIES

ListenThrough™

SonicVibrance™

Automatic Volume and eQualization Control

Loudspeaker Frequency Response Correction

Multiband Dynamic Range Processing

VoiceFirst™

# ALANGO VOICES TECHNOLOGIES

**EasyListen™:**

## **REAL-TIME SPEECH TEMPO MODIFICATION**

Real-time audio processing technology that slows incoming speech, making it more intelligible.

Works by dynamically stretching (slowing) certain parts of speech while adding no noticeable overall delay.

# ALANGO VOICES TECHNOLOGIES

## **OnlyVoice™:** **ULTIMATE VOICE QUALITY FROM EVERYWHERE**

Enables robust voice acquisition in True Wireless earbuds from extreme noise conditions.

Works by intelligently mixing the output of adaptive dual microphone beamforming with bone conduction voice sensor.

Can work with in-ear feedback microphone instead of the sensor.

# ALANGO VOICES TECHNOLOGIES

## DYNAMIC NOISE SUPPRESSION

Reduces stationary and dynamic noises (e.g. approaching car) in single-channel speech signals without noticeable artefacts.

Dynamic Noise Suppression increases the signal-to-noise ratio and improves speech intelligibility thus reducing listening fatigue.



# ALANGO VOICES TECHNOLOGIES

## WIND NOISE REDUCTION (WNR)

Automatically detects and attenuates wind noise while preserving clear speech.

WNR uses sub-band processing to filter out wind noise in affected frequency regions leaving “good” frequency regions untouched.

# ALANGO VOICES TECHNOLOGIES

## ACOUSTIC ECHO CANCELLATION (AEC)

Eliminates acoustic coupling between speaker and microphone, allowing high-quality, full-duplex voice communication without echo.

Alango AEC technology supports mono and stereo echo cancellation with very fast adaptation times.

Alango AEC includes highly efficient, sub-band Acoustic Echo Suppressor.

# ALANGO VOICES TECHNOLOGIES

## ACOUSTIC FEEDBACK REDUCTION

Alleviates acoustic feedback by using sub-band adaptive filtering, noise and howling suppression, and quasi-proportional frequency shifting.

# ALANGO VOICES TECHNOLOGIES

## ADAPTIVE DUAL MICROPHONE

Creates a directional or noise-canceling microphone using just two omnidirectional microphones.

Adaptively changes mic directionality to achieve best possible noise reduction.

Includes adaptive wind noise suppression.

Allows optional microphone calibration during the production.

# ALANGO VOICES TECHNOLOGIES

## MULTI-MICROPHONE ARRAYS

Multi-microphone adaptive beamforming with 2 or more microphones.

Allows multi-beam configurations and sound of arrival detection.

Robust to wind noises.



# ALANGO VOICES TECHNOLOGIES

## AUTOMATIC VOLUME AND EQUALIZATION CONTROL

Improves perceptual loudness and intelligibility of voice in dynamic environment with changing noises.

Works by automatically amplifying and equalizing sounds in response to ambient noise characteristics.

# ALANGO VOICES TECHNOLOGIES

## AUTOMATIC GAIN CONTROL

Used in conjunction with Dynamic Range Processing to amplify a weak voice signal.

To reduce noise pickup, gain is applied only when user voice activity is detected.

# ALANGO VOICES TECHNOLOGIES

## VOICE ACTIVITY DETECTION

Differentiates between voice and ambient noises in an acoustic signal, enabling low-power operation of always-on devices.

The VAD block acts as a low-power “watchdog,” alerting the system to use heavier processing blocks only when the user’s voice is detected.

# ALANGO AUDIO ENHANCEMENT TECHNOLOGIES

## ListenThrough™: ENVIRONMENTAL AUDIO AWARENESS

Improves situational awareness for stereo headset users.

Important external sounds are emphasized to avoid masking by music, while ambient noise is filtered out.

# ALANGO AUDIO ENHANCEMENT TECHNOLOGIES

## SonicVibrance™: MUSIC ENHANCEMENT

An integrated set of DSP technologies to enhance the audio experience in music and entertainment applications, including:

- stereo expansion (normalization)
- spectral enhancement,
- bass correction and amplification



# ALANGO AUDIO ENHANCEMENT TECHNOLOGIES

## **AUTOMATIC VOLUME AND EQUALIZATION CONTROL**

Increases the perceived loudness and clarity of music being played in noisy environments.

Works by adaptively amplifying and equalizing the music in response to changing ambient noise characteristics.

# ALANGO AUDIO ENHANCEMENT TECHNOLOGIES

## LOUDSPEAKER FREQUENCY RESPONSE CORRECTION

Corrects loudspeaker amplitude and phase responses for reproducing natural sound.

# ALANGO VOICES TECHNOLOGIES

## MULTIBAND DYNAMIC RANGE PROCESSING

Adjusts the dynamic range of an audio signal by

- splitting into frequency sub-bands,
- processing each band according to specified characteristics, and
- synthesizing the resultant signal.

# ALANGO AUDIO ENHANCEMENT TECHNOLOGIES

## VoiceFirst™

Improves listening experience by enhancing speech intelligibility of TV, movies, and sports broadcasts.

Works by detecting and attenuating background sounds while preserving speech and dialogue.