



FRONT END DSP AUDIO TECHNOLOGIES FOR IN-CAR APPLICATIONS

Revision 5.6
October 2024



ABOUT ALANGO

SINCE 2002

- Embedded DSP Software for **digital sound enhancement**
- Twenty years of practical experience in algorithms, embedded DSP software and software licensing
- 35 Alango employees
- Sales offices and reps in China, Korea, Japan, Taiwan, Singapore



ALANGO SOLUTIONS PORTFOLIO



VOICE COMMUNICATION

Voice Communication
Package (VCP)

Sound Reinforcement
Package (SRP)



SPEECH RECOGNITION

Voice Enhancement
Package (VEP)

Voice Activity Detector
(VAD)



MUSIC ENHANCEMENT

Audio Enhancement
Package (AEP)

Auto Volume & Frequency
Equalization (EQ)

SonicVibrance™



SOUND PERSONALIZATION

PersonaSound™

VCP – VOICE COMMUNICATION PACKAGE



ESSENTIAL TECHNOLOGIES FOR AUTOMOTIVE HANDSFREE SYSTEMS

- Enables crystal clear, full-duplex, noise-free voice calling in car
- Reduces different types of noises, cancels echoes, enhances speech

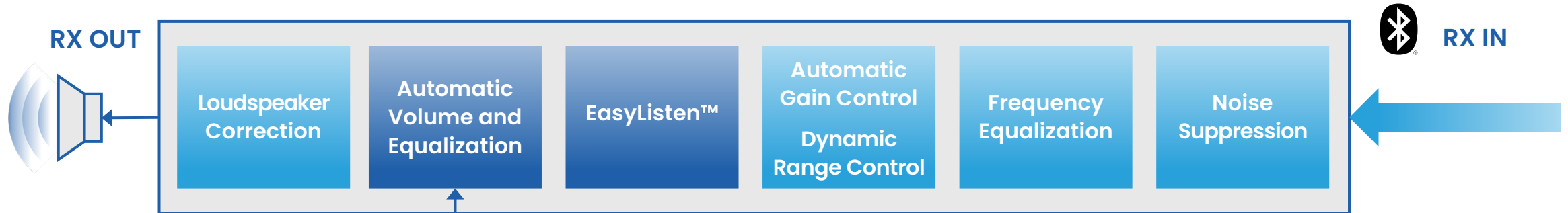


VOICE COMMUNICATION PACKAGE

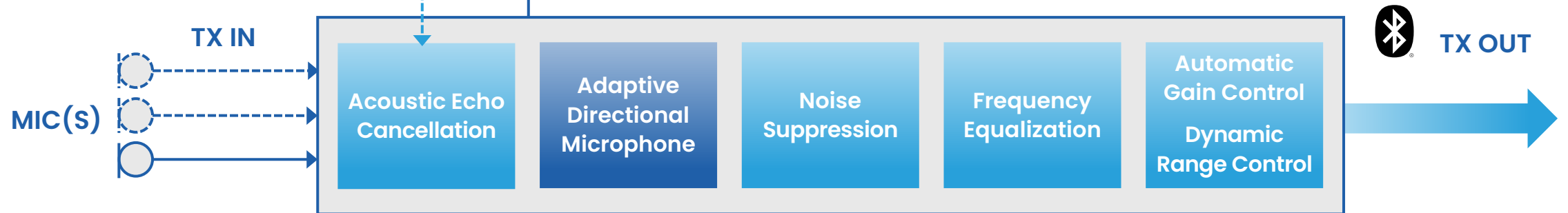
OVER 20 MILLION CARS USE ALANGO VCP
(Jan. 2019)

Basic VCP 
VCP Add-ons 

VCP RX PATH



VCP TX PATH





VCP NUMBERS

The numbers below are based on ARM Cortex A9 with Neon instructions and correspond to "typical" automotive acoustic settings with AEC echo tail of 100ms.

Library type	Processing type	Program RAM, kB	Sampling rate, kHz	Data RAM, kB	MHz, average/peak
VCP-F	With full RX processing	150 kB	16	95	75 / 85
VCP-F	Without RX processing	150 kB	16	80	65 / 75
VCP-L	With full RX processing	155 kB	16	80	60 / 70
VCP-L	Without RX processing	155 kB	16	55	35 / 40

**Numbers may vary for different VCP versions, DSP/MCU/MPU types, levels of optimization*

VCP-F – VCP full version, 32Hz frequency resolution

VCP-L – VCP lite version, 64Hz frequency resolution

NEXT GENERATION HANDS-FREE VOICE COMMUNICATION

DUAL-MICROPHONE VCP

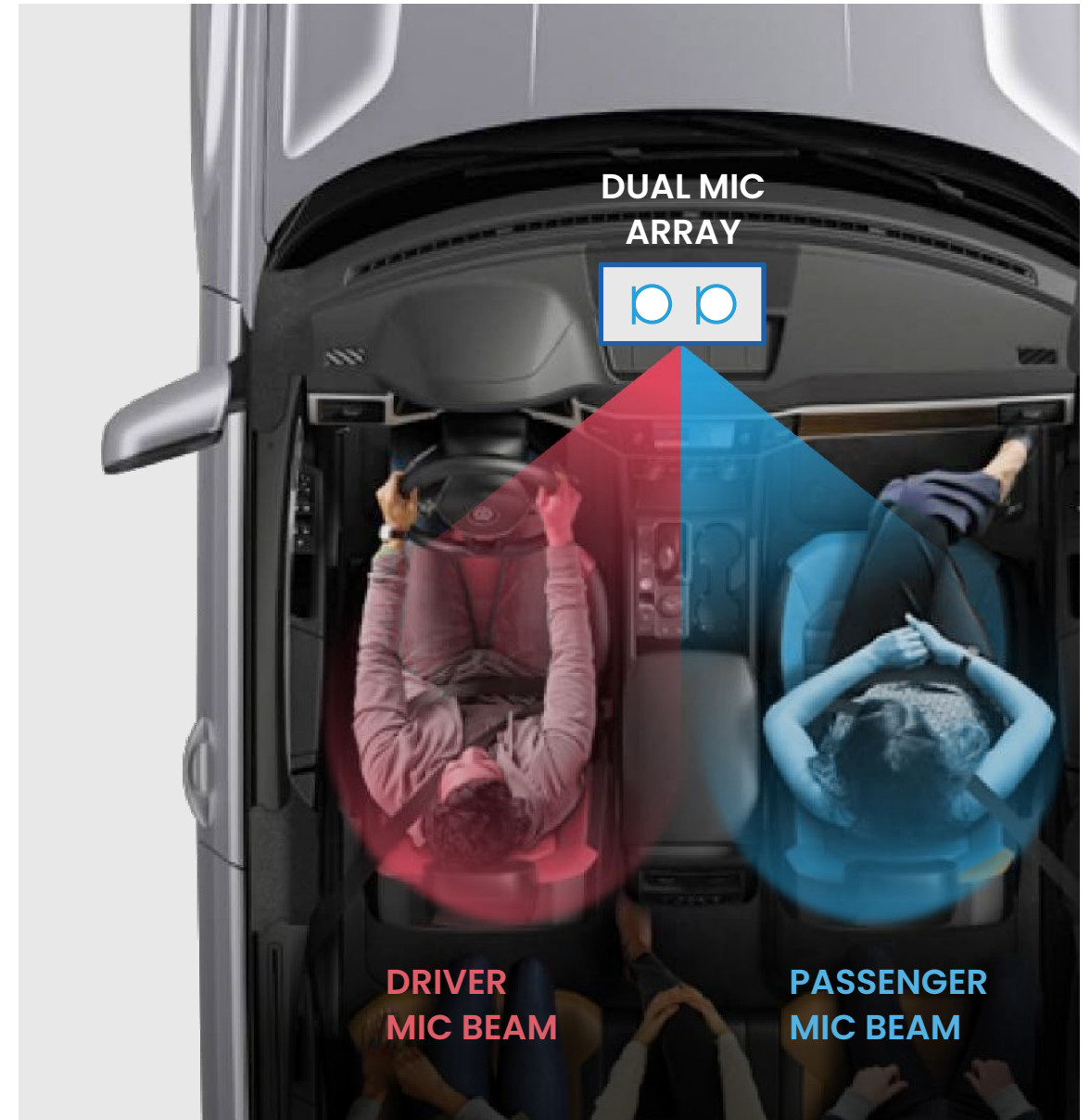
Improved noise reduction:

- Road, engine, and wind noises
- Rear passenger voices

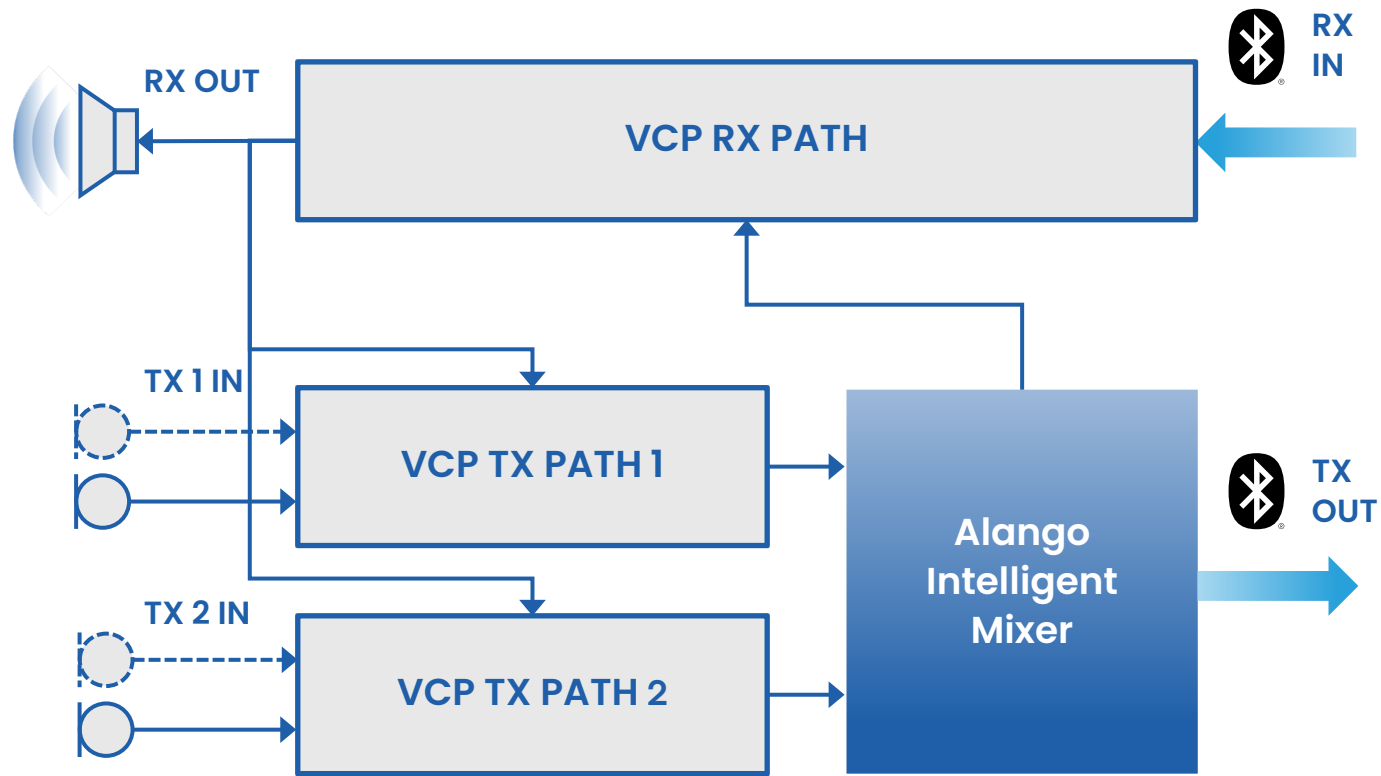
Driver-selectable mic zones:

- Driver's voice enhanced
- Passenger's voice enhanced
- Both voices enhanced

Support for mic beamforming arrays
or driver/passenger mic mixer



EXTENDED VCP (eVCP) FOR DISTRIBUTED MIC ZONES



In **INTELLIGENT MIXING MODE** both the driver's and passenger's voices are preserved, while ambient noise and echo are attenuated.

In **PASSENGER REJECTION MODE** the driver's voice is preserved while the passenger's voice, ambient noise and echo are attenuated.



eVCP NUMBERS

eVCP footprint (MIPS and memory) depends on the number of zones and other acoustic settings. Single-zone footprint is identical for VCP8 footprint (refer to VCP8 data-sheet).

Dual-zone, single-microphone eVCP footprint based on ARM Cortex A9 with Neon instructions and correspond to "typical" automotive acoustic settings with AEC echo tail of 100ms.

Library type	Processing type	Program RAM, kB	Sampling rate, kHz	Data RAM, kB	MHz, average/peak
eVCP (VCP Full-based)	With full RX processing	160 kB	16	175	130 / 150
eVCP (VCP Light-based)	With full RX processing	165 kB	16	130	90 / 100

**Numbers may vary for different eVCP versions, DSP/MCU/MPU types, levels of optimization*

eVCP-F – VCP full version, 32Hz frequency resolution

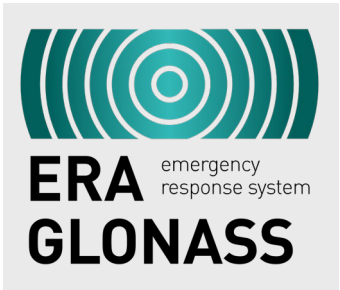
eVCP-L – VCP lite version , 64Hz frequency resolution

VCP AUTO INDUSTRY COMPLIANCE

CLASS "TYPE 1":
FULL DUPLEX ECHO CANCELLATION



ITU-T
P.1100/P.1110 /P.1120



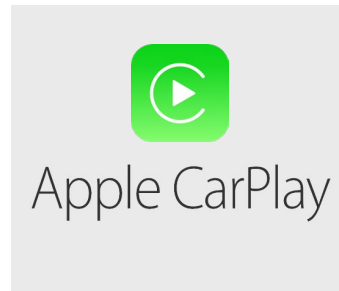
GOST R55531



eCALL



VCP FOR SMART PHONE ENABLED DISPLAY AUDIO

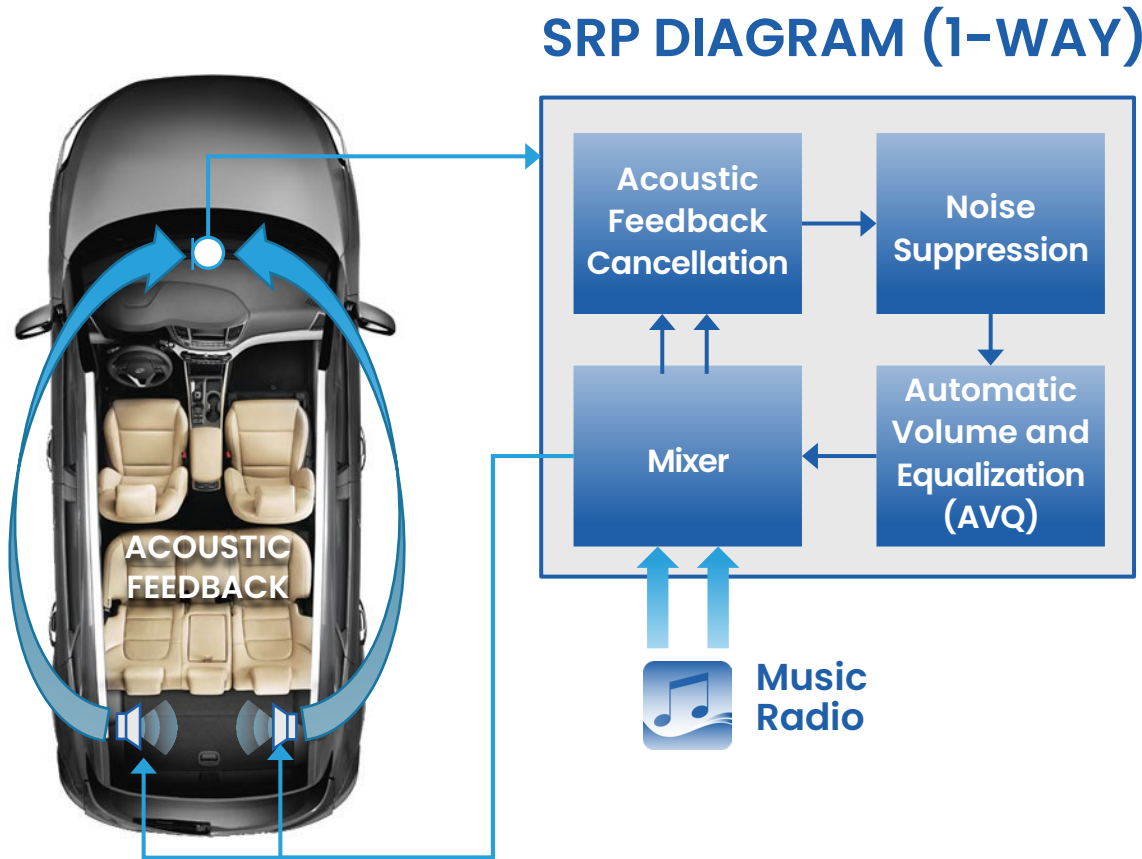


**SUITABLE FOR AFTERMARKET
PRODUCTS**
(single tuning for multiple cars)



SOUND REINFORCEMENT PACKAGE (SRP) FOR ICC

SRP ENABLES COMFORTABLE, CONVENIENT VOICE COMMUNICATION BETWEEN DRIVER AND REAR SEAT PASSENGERS.



- Supports 1-way and 2-way ICC modes; single-mic and multi-microphone configurations
- Enables >12dB of additional voice amplification before feedback
- Adaptive noise suppression provides up to 30dB noise reduction with low distortion
- Stereo Echo Cancellation allows for amplified voice communication with no need to pause the music
- When integrated into a low-latency audio framework, SRP's total delay of 8ms (6ms algorithm delay + 2ms audio buffer) is virtually imperceptible to the driver and passengers
- Output volume and voice equalization are automatically adjusted based on cabin noise conditions to ensure comfortable, intelligible voice output in varying driving scenarios

SOUND REINFORCEMENT PACKAGE



SRP DEMO VIDEO

2-way SRP demonstrated on ADI SHARC+ processor



[Watch video on youtube](#)



[Watch video on alango.com](#)



[Download video from alango.Com \(69mb\)](#)

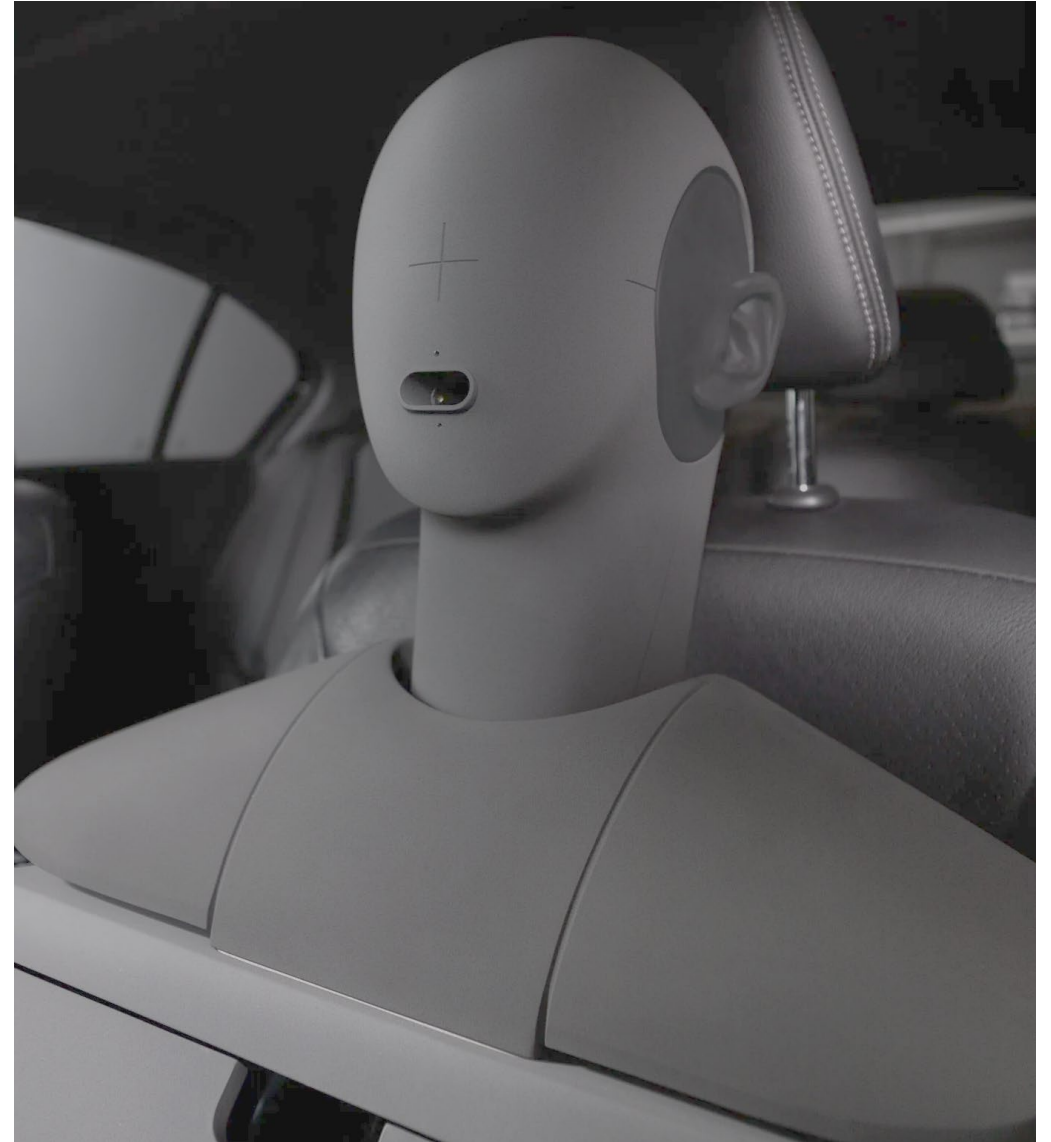
IN CABIN COMMUNICATION SRP AUTO INDUSTRY COMPLIANCE



ITU-T P.1150



CERTIFIED BY



SPEECH RECOGNITION IMPROVEMENT WITH VCP

Using the **same DSP processing blocks with alternate configurations**, VCP can be configured for both human-to-human voice communication and human-to-machine voice preprocessing.

VCP CONFIGURED FOR ASR:

- Cleans and enhances the voice signal
- Leads to higher accuracy of speech recognition
- Works with any speech recognition engine
- Supports voice pickup during music playback



AUTOMATIC SPEECH RECOGNITION ENHANCEMENT TESTS

TEST SCENARIO:

By what measure is
speech recognition rate in cars
improved by Alango preprocessing
technologies?

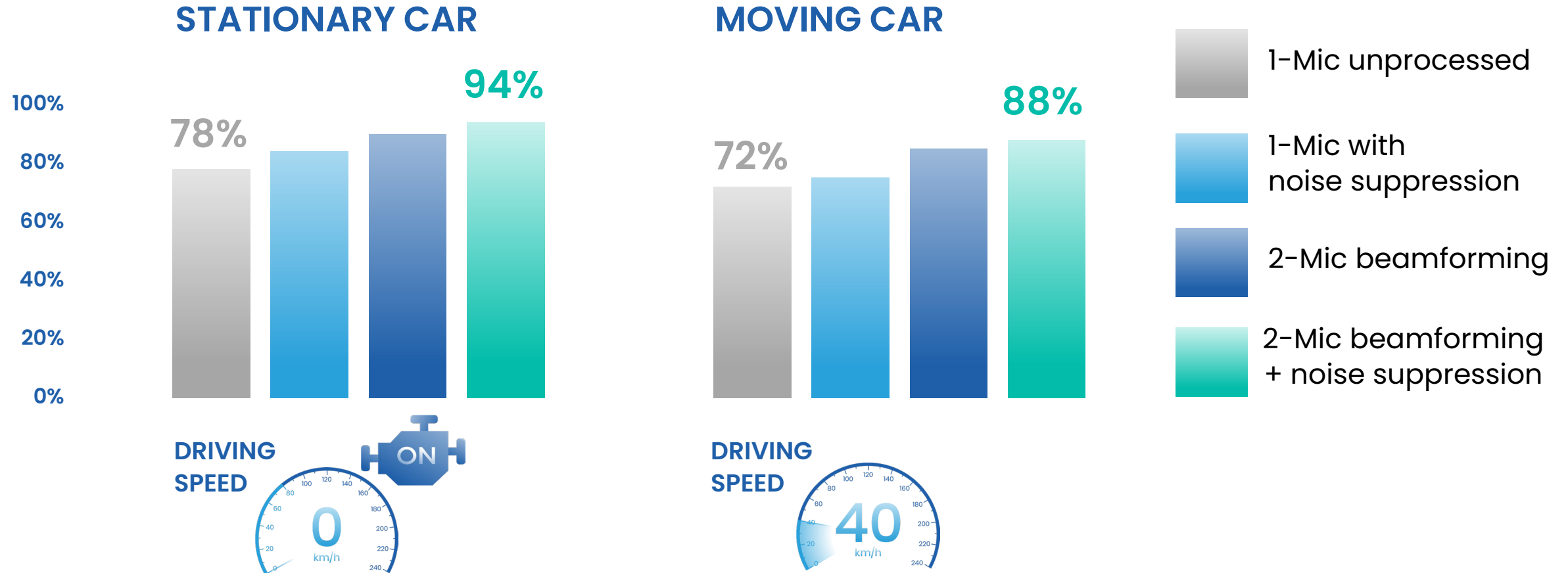
TEST STANDARD:

Using Google speech recognition,
only phrases recognized exactly
correctly are counted



SPEECH RECOGNITION ENHANCEMENT WITH VCP

Only phrases recognized **exactly** are counted as success



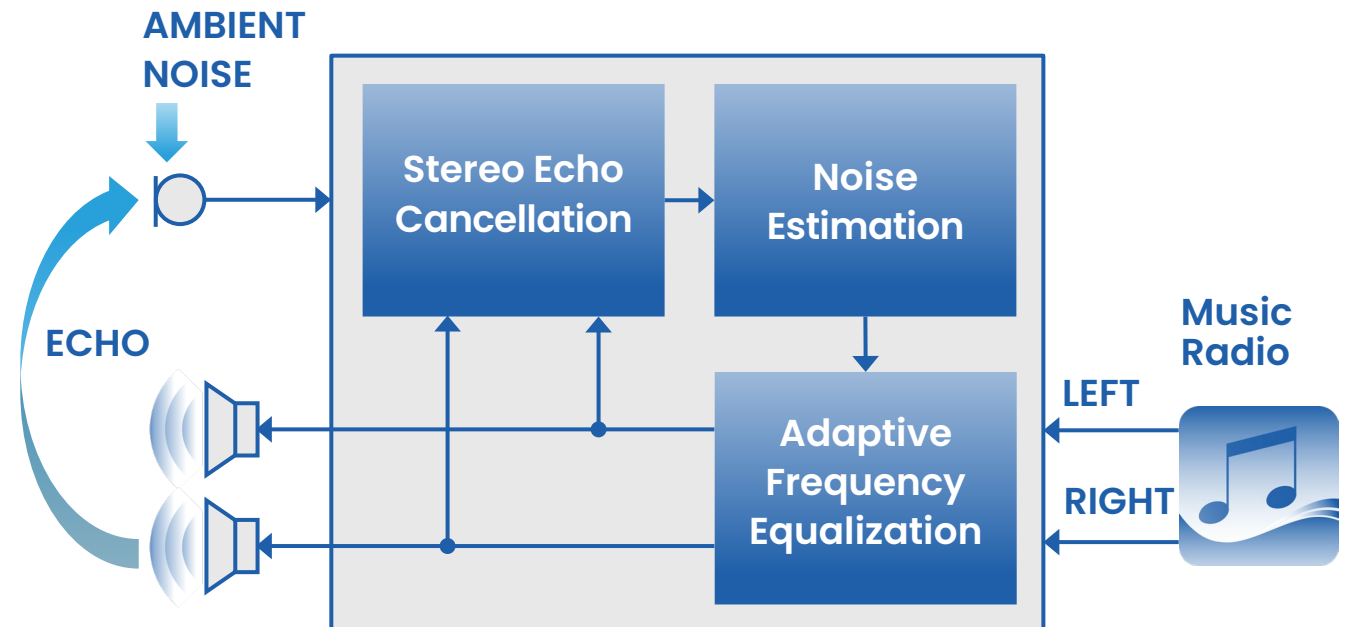
AUTOMATIC VOLUME AND eQUALIZATION (AVQ)

AVQ DYNAMICALLY AMPLIFIES AND EQUALIZES MUSIC CONTENT TO COMPENSATE FOR VARIATIONS OF IN-CABIN NOISE LEVEL AND SPECTRUM

- Uses existing handsfree mic
- Directly measures cabin noise level and spectrum as heard inside the car, rather than RPM-based noise estimation
- Provides equal perceptual loudness and sound coloration of music in different driving conditions
- Improves intelligibility of speech, such as navigation prompts and voice calls



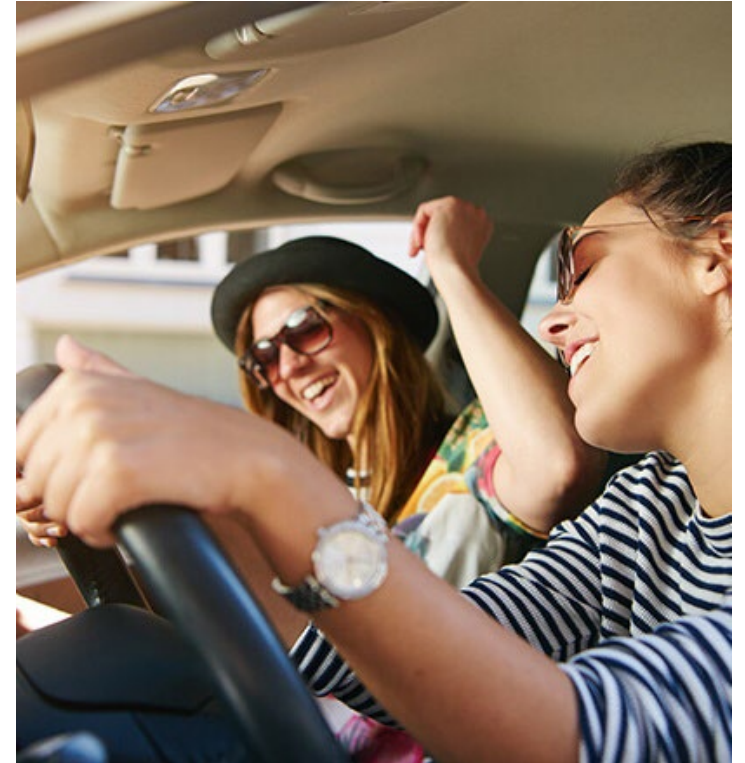
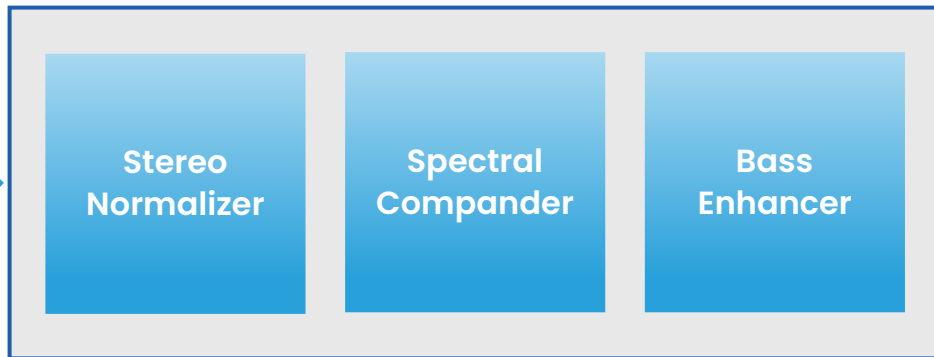
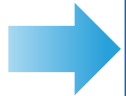
[Watch video on YouTube](#)



SonicVibrance™

SONICVIBRANCE MAKES IN-CAR MUSIC MORE ENJOYABLE BY BRIGHTENING VOCALS, ENHANCING BASS, AND WIDENING THE STEREO FIELD.

Music
Radio



More information about the technology, sound examples and demonstration software download is [here](#)

AUTOMOTIVE PersonaSound™

Without **sound personalization**, hearing impaired drivers do not enjoy the car infotainment system in full. With PersonaSound, all sounds are automatically tuned to match the driver's hearing profile.

USE THE APP TO MAKE THE CAR SOUND PERSONAL



TEST HEARING
PREFERENCE



OBTAIN HEARING
RESULTS



UPLOAD HEARING
PROFILE TO CAR

SoundAround™

ACQUIZITION OF EXTERNAL SOUNDS WITHOUT EXTERNAL MICROPHONES

BACKGROUND

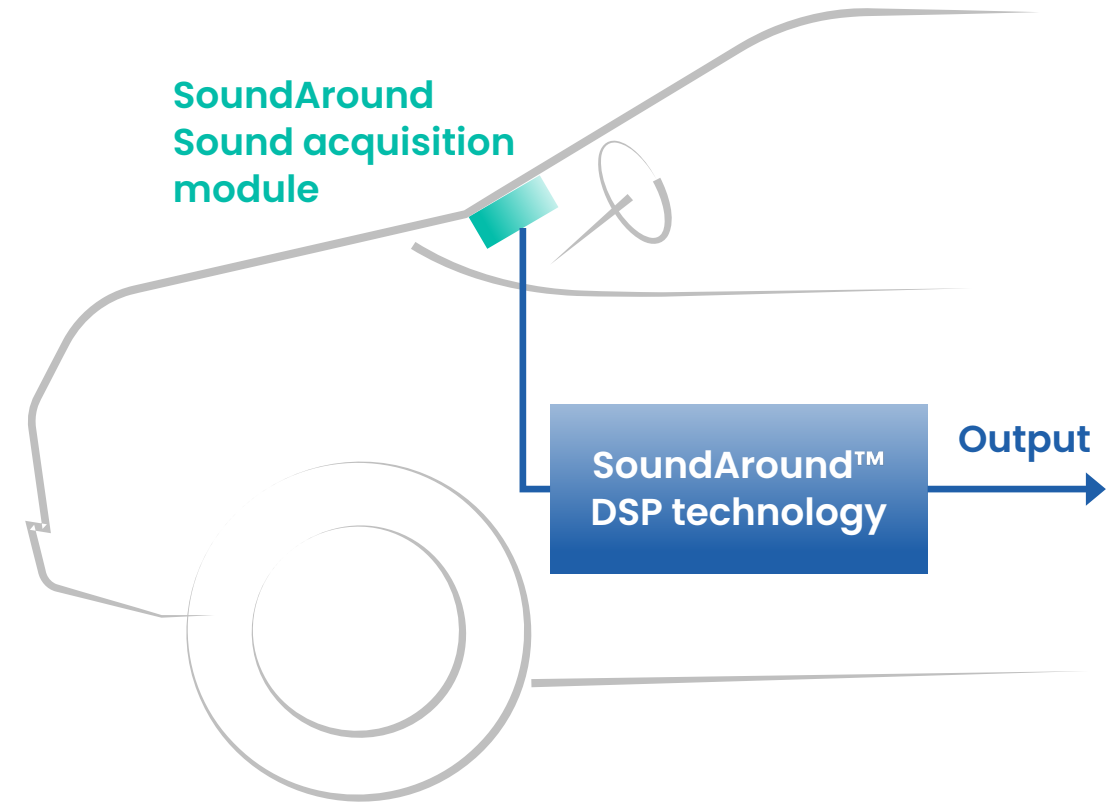
- Combines an interior window-mounted sound pickup module and DSP software to acquire outside sounds while ignoring sounds inside a car

APPLICATIONS

- Autonomous and assisted driving
- Dashcam
- Blackbox

BENEFITS

- Reliable siren and acoustic events detection
- Outside sounds recording for all incidents
- Driver's alert to critical events around the vehicle
- Liability determination through preceding and collision sounds



WHY WORK WITH ALANGO?

OUR TECHNOLOGIES ARE FIELD PROVEN

30 million cars and aftermarket products use Alango technologies

OUR SOFTWARE IS EASY TO IMPLEMENT

extensive development tools and documentation available to ease tuning and integration

OUR SOFTWARE IS EFFICIENT

low computational footprint; wide range of supported DSP/MCU platforms



IP PARTNERS



SELECTED CUSTOMERS

SONY

Pioneer

JVC

HYUNDAI
MOBIS



MOVON

GARMIN®

HSAE

HUMAX

DESAYSV

 **LG Innotek**


SIERRA
WIRELESS®

OEMs USING ALANGO TECHNOLOGIES



ALANGO INSIDE



Citroen C4
Aircross



Chevrolet Aveo



Chevrolet Captiva



Chevrolet
New Cruze



Chevrolet Spark



Chevrolet
New Spark



Honda CR-Z



Honda N-Box



Hyundai Accent



Hyundai New
Avante



Hyundai Equus



Hyundai
New Genesis



Hyundai
Grandeur HG



Hyundai i30



Hyundai i40



Hyundai IONYQ



Hyundai ix25



Hyundai ix35



Hyundai Santa Fe



Hyundai Sonata



Hyundai
Sonata LF



Hyundai
Sonata YF



Hyundai
iMax/iLoad



Hyundai Veracruz



Kia Carens



Kia Carnival



Kia K3



Kia K5



Kia K7



Kia K9



Kia Mohave



Kia Niro
Hybrid



Kia Ray



Kia Sedona



Kia Sorento



Kia Soul



Kia New Soul



Kia New Soul
EV



Kia Sportage R



New Kia
Sportage

ALANGO INSIDE



GM Alpheon



Hyundai Tucson



Hyundai Venue



MG 6



MG ZS



MG HS



Mitsubishi
Lancer



Mitsubishi
Outlander



Nissan Kicks



Nissan Leaf



Opel Adam



Opel Astra



Opel
Junior



Opel Meriva



Opel Zafira



Qoros 5 SUV



Renault Samsung
Motors SM5



Renault Samsung
Motors QM3



Renault Samsung
Motors QM5



Renault Samsung
Motors SM3



Roewe i5



Roewe Marvel X



Roewe RX8



Ssangyong
Chairman



Ford Maverick



Ssangyong
Korando



Ssangyong
Rexton



Ssangyong
Tivoli



Suzuki S-Cross



Volkswagen
Amarok



Volkswagen
Passat



Maxus G50



Baijun RS-5



Toyota Rav4



Daedong NX
Series



Kia K5 Fastback
Series



Kia Forte



Roewe RX5
Plus



Isuzu Elf



MAN TGS35.500

INTERESTED?

WE ARE LOOKING FORWARD TO HEARING FROM YOU

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