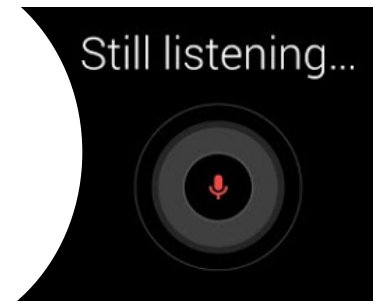




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## VoiceBoost™ Voice Activation Solutions

“Always listening” audio signal processing solutions allow hands-free device wakeup and voice control with biometric voice authentication

### The Challenge

As the use of voice interfaces on mobile devices has become more popular, users have become frustrated that prior to using a voice interface, the device must first be put into a state where it is actively listening for voice commands. Waking a phone, wearable device or smart home device from a standby state to its active state still requires a physical touch or button press, and perhaps also a PIN code, fingerprint scan or typed password entry to authenticate the user. Following wakeup, yet more physical interactions might be required, such as a long button press or app launch, before the device is “ready” for voice input. Particularly on wearable and smart devices without large touch screens these interactions require that users take their eyes and hands off their current task, reach for the device, orient the device “right side up” for button pressing, typing or swiping, and perhaps even don their eyeglasses.

A solution is needed in which these physical interactions are replaced entirely by a spoken keyword or password which the device is always

listening for, regardless of device position or orientation even when the device is in its standby state, optionally also authenticating that the password was spoken by the authorized user.

Smart devices must be designed with different power, price, and performance constraints in mind. Especially as the design of wearable and smart devices demands ever smaller batteries, smaller screens and lower prices, OEMs require a voice solution which achieves ultra-low power levels to avoid draining even the smallest battery; they require that the solution is available on entry level, mid-market, or premium processors matching the price and performance targets of the device, while at the same time ensuring that voice recognition is robust in the noise conditions in which the device will be used.

Use cases such as driving, running or cycling involve the device being at arm’s length or farther from the user, where it is more difficult to separate the background noise from the speech to be recognized. Environments may also include high background noise



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levels, such as vehicle noise while driving, or urban traffic noise if using a voice-controlled fitness band while walking. In all cases, the voice solution must meet the price and power targets of the device while ensuring robust performance even with users speaking with different accents and foreign languages.

## The Solutions

Malaspina Labs' VoiceBoost™ suite of products offer solutions to a number of real-time audio signal processing problems involving detecting, isolating and recognizing speech-of-interest from background noise within audio signals. VoiceBoost solutions are available for noise reduction, speech recognition, voice activation, phrase spotting, speaker verification and automatic speech recognition.

All VoiceBoost solutions are compact and CPU-efficient implementations designed for OEMs and are offered in binary form for DSPs, microcontrollers and SOCs. The Voice Activation solutions execute in an "always listening" mode even with the device in a standby state. The software listens continuously for a keyword or keyphrase spoken by the user to activate the device and place it in a full power mode.

## Key Features

- Speaker-independent and speaker-verification solutions
- Multiple keyphrases supported, in any language
- Multiple private user voiceprints supported, in any language
- Speaker verification solutions include anti-spoofing "liveness test"
- Speaker verification solutions provide Multi-factor authentication
- Effective with accents and non-native language speakers
- Effective to several metres distance in noisy environments
- Effective with single or multiple microphone devices
- Effective with off-axis and inverted device orientations

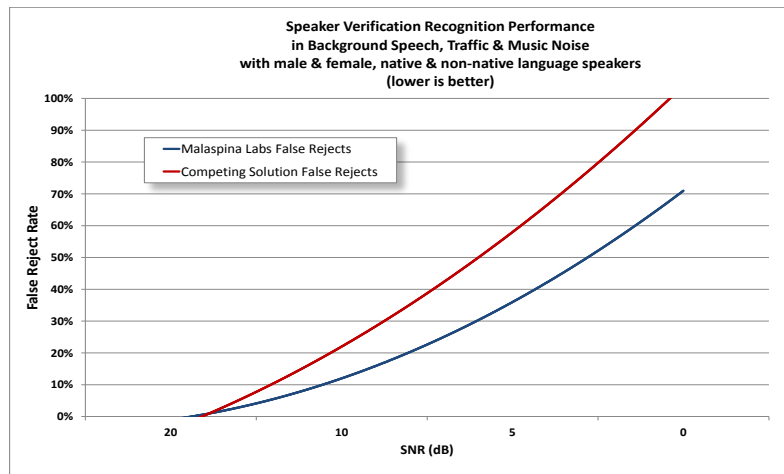
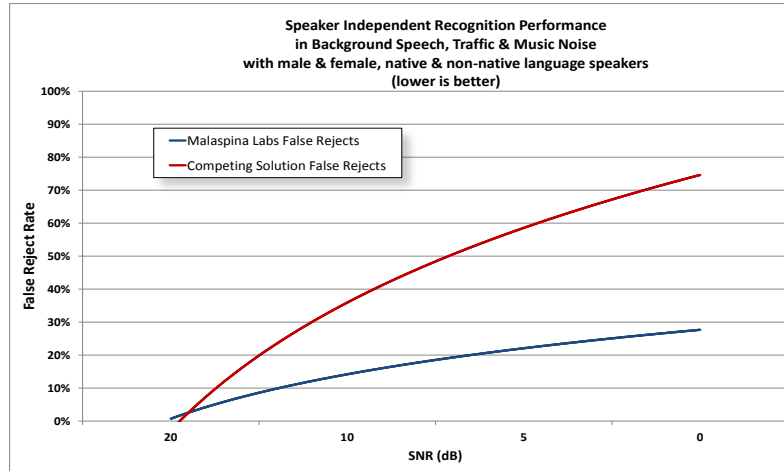
The speaker-independent solution allows an OEM to define a default keyphrase to wake up the device so that it works "out of the box" for any user. Multiple different wakeup phrases can be active concurrently for multi-language use. Multiple different phrases can also be recognized following the wakeup phrase as a limited vocabulary "phrase spotting" voice interface solution without the need for a separate speech recognition solution.

The Speaker Verification solution allows users to enroll their own private passwords in their own voice and in any language, so that the device wakes up only upon hearing the user's private password spoken by that user's own voice. Multiple different voiceprints can be active concurrently for multi-person use. The Speaker Verification solution uses biometric voiceprint identification to reject imposters who may have overheard the user's private password, and also recognizes and blocks attempts by imposters to gain access by playing back surreptitious recordings made on another device of an authorized user speaking her voice password. The Speaker Verification solution therefore provides three-factor authentication by requiring the device, the password and the voice of the authorized user.



## Performance

Malaspina Labs' VoiceBoost™ Voice Activation solutions are available in several power and footprint configurations to meet varying performance, resource or operational design constraints. Solutions can be configured for minimum power that consume as little as 35µW peak power, or for minimum footprint that require as little as 15KB or RAM memory. Both speaker independent and speaker verification solutions offer market-leading key phrase detection rates in low noise and high noise, near-field and far-field conditions.



## Software Framework

VoiceBoost solutions do not impose any restriction upon your selection of operating environment (nor is the presence of an operating system even required). No particular software task management or inter-task communication mechanism is imposed. VoiceBoost Voice Activation solutions easily integrate into existing audio and sensor processing pipelines used within mobile phones, tablets, wearable devices and automation devices.

To learn more about how VoiceBoost Voice Activation solutions can help increase user satisfaction of your communications products, contact Malaspina Labs or a Malaspina Labs channel partner today.

## About Malaspina Labs

Malaspina Labs performs applied research in the field of speech processing. Malaspina Labs and its subsidiaries provide portable software implementations of proprietary algorithms which execute in real-time on ultra-low power processors.

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