



# BACCH4Hexagon Product Brief

v1.01.001

## 1 BACCH4Hexagon Overview

The patented BACCH 3D Sound technology provides highly realistic, spectrally un-colored 3D audio from any pair of loudspeakers.

BACCH4Hexagon is a complete Software Development Kit for the Hexagon Audio DSP v6 and later in Qualcomm SnapDragon SoCs that incorporates BACCH 3D Sound technology.

BACCH 3D Sound technology is provided as a library. The BACCH4Hexagon SDK and License are provided separately.

The BACCH4Hexagon library incorporates a default filter for generic speakers and generic headphones, as well as different modes for each. Libraries with different filters, including custom filters, are available upon request.

This product is intended for use with support of your embedded design, please contact your BACCH Labs representative if you do not have a support contact.



## 2 Processing Chains

The Hexagon audio processor is configured to use separate processing chains as the output source is switched between Speakers and Headphone. BACCH provides unique processing designed for each chain.

## 3 Modes

BACCH Provides multiple possible processing modes. For each target device, a manufacturer can choose to which mode to use. It is possible to deploy multiple modes.

**For any given device, a manufacturer can specify a maximum latency and resource requirements and BACCH Labs will deliver a custom filter that meets these requirements.**

### 3.1 Lite Mode

The Lite mode is not recommended for new designs. The Lite mode exists to demonstrate the minimum practical latency and resources requirements. Lite mode demonstrates the minimum latency and system resource requirements that still deliver a jaw-dropping user experience with high impact. Lite mode forgoes Mono Correction (BACCH-MX) and provides 75% of the Crosstalk Cancellation of Low Latency Mode.

### 3.2 Low Latency Mode

Low Latency mode demonstrates the low latency demanded by extreme gamers and demonstrates a reduction in system resource requirements that still deliver a jaw-dropping user experience with high impact. Low Latency mode provides a fast Mono Correction (BACCH-MX) and provides 100% of the Crosstalk Cancellation of Standard Mode. Refined music listening in Low Latency mode may reveal a less detailed spatial image than Standard Mode. The difference is much more apparent in careful auditions using music and video. The difference is difficult to discern in a First Person Shooter type soundtrack.

### 3.3 Standard Mode

This is BACCH Lab's recommended mode for standard gaming, movie, and music listening. For any given device, BACCH Labs can deliver a Standard Mode filter that meets the particular requirements of that device.



### 3.4 High Resolution Mode

High Resolution mode is design for uncompromising quality with premium quality sound reproduction equipment wherein refined listeners will be listening for the finest details that are most apparent in jazz and classical pieces. High Resolution mode is also recommended to bring out the detail in earbuds and was used for the most recent demo app for those devices.

## 4 MIPS

The results labeled MIPS represent raw instructions. The Hexagon v6 series of DSPs have 4 cores, each providing 400 MHz. Instructions are processed in packets, with up to 4 instructions per packet. With a highly optimized implementation, the DSP approaches 6400 MIPS. With further optimization within BACCH4Hexagon, the listed number of MIPS required can be reduced and the average number of instructions per packet will be increased. This will result in an overall reduction in instructions and cycles required.

All performance data is provided for a sampling rate of 44.1 kHz. To estimate performance at 48 kHz, multiply all tabular values by  $48/44.1 = 1.088$ . To estimate performance at a sampling rate that is 2x or 4x one of these rates, multiple these numbers by 2x or 4x or consider downsampling.



## 5 Specifications

<b>BACCH-SP. Loudspeaker Chain</b>			
<b>Mode</b>	<b>Latency (ms)</b>	<b>MIPS (raw instructions)</b>	<b>Memory (kB)</b>
<b>Lite</b>	5.8	32.1	605
<b>Low_Latency</b>	5.8	141.9	1226
<b>Standard</b>	23.2	183.4	2148
<b>High_Resolution</b>	30.2	203.5	2212

<b>BACCH-HP. Headphone Chain</b>			
<b>Mode</b>	<b>Latency (ms)</b>	<b>MIPS (raw instructions)</b>	<b>Memory (kB)</b>
<b>Lite</b>	2	172.7	2356
<b>Low_Latency</b>	7.8	302.5	2977
<b>Standard</b>	25.2	345.8	3892
<b>High_Resolution</b>	32.2	379.5	4497

<b>BACCH in Bypass. Baseline to bypass with BACCH loaded but disabled</b>			
<b>Mode</b>	<b>Latency (ms)</b>	<b>MIPS (raw instructions)</b>	<b>Memory (kB)</b>
<b>Bypass</b>	0	1.6	same as mode being bypassed



## 6 References

<http://developer.bacch.com/>

BACCH Labs developer portal

<https://developer.qualcomm.com/software/hexagon-dsp-sdk/dsp-processor>

Qualcomm developer network