

Virtual Hemispherical Amplitude Panning (VHAP)

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Introduction

The VHAP technology has been developed by Dr Hyunkook Lee and Dr Dale Johnson of the APL at the University of Huddersfield. The VST plugin has been written by Maksims Mironovs. The plugin is freely available under the **CC-BY-4.0** license.

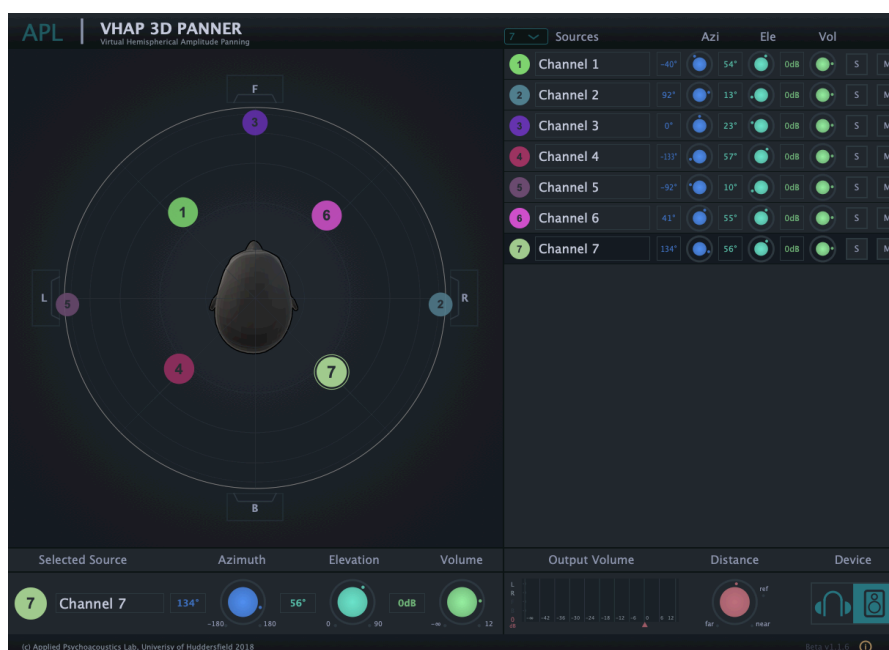
VHAP exploits a psychoacoustic phenomenon called the phantom image elevation effect to virtual place a phantom source over the upper-hemisphere using only three or four loudspeakers at the ear level.

It can be used to render virtually elevated sound images in mixing or upmixing for the conventional 5.1 format as well as in the “cross” quadrasonic format. Originally, it requires four loudspeakers arranged in the cross layout, but our recent study found that, if the target elevated positions lie within the front upper-hemisphere or at typical height loudspeaker positions (azi $\pm 45^\circ$ and 135° /ele $\pm 45^\circ$), VHAP works equally well with just three speakers at the front centre, rear left and rear right loudspeakers of the 5.1 setup.

Detailed information about the research and algorithm used for VHAP and experimental results can be found at the following links.

- Fundamental theory: <http://www.aes.org/e-lib/browse.cfm?elib=18468>
- VHAP algorithm: <http://www.aes.org/e-lib/browse.cfm?elib=19482>
- Binaural rendering of VHAP: <http://www.aes.org/e-lib/browse.cfm?elib=20356>
- VHAP for Dolby Atmos and Auro-3D: <http://www.aes.org/e-lib/browse.cfm?elib=20830>

Note that the current version of the plugin is optimized and tested for the Reaper digital audio workstation. In the current version, the sampling frequency of sound source should ideally be 44.1 kHz.



Quick start guide

The plugin is designed to support both loudspeaker and binaural reproductions. On the graphical user interface (GUI), multiple source objects can be assigned and the user can move them using a mouse.

For loudspeaker reproduction with the current release, select the loudspeaker option at the bottom of the user interface. The channel output routing must be configured as follows. As mentioned above, if only the frontal upper-hemispherical panning is desired, the rear centre channel can be omitted.

Output	Channel	Position
1	Side Left	Azi 90° to 120° / Ele 0°
2	Side Right	Azi -90° to -120° / Ele 0°
3	Front Centre	Azi 0° / Ele 0°
4	Rear Centre	Azi 180° / Ele 0°

For the four-channel outputs, a bus track should be created, where the plugin is inserted and multiple source tracks (max. 24) can be assigned to. A Reaper session template for this setup is included in this release. To increase the number of source tracks, go to “Route” on the bus track in the mixer window – “add new receive” – assign the input channel number between 1 and 24. Make sure that master send is turned off in the individual source tracks, and only the bus track is sent to the final master output track. Also the total number of channels (track channels are set to 4 in the bus and master tracks).

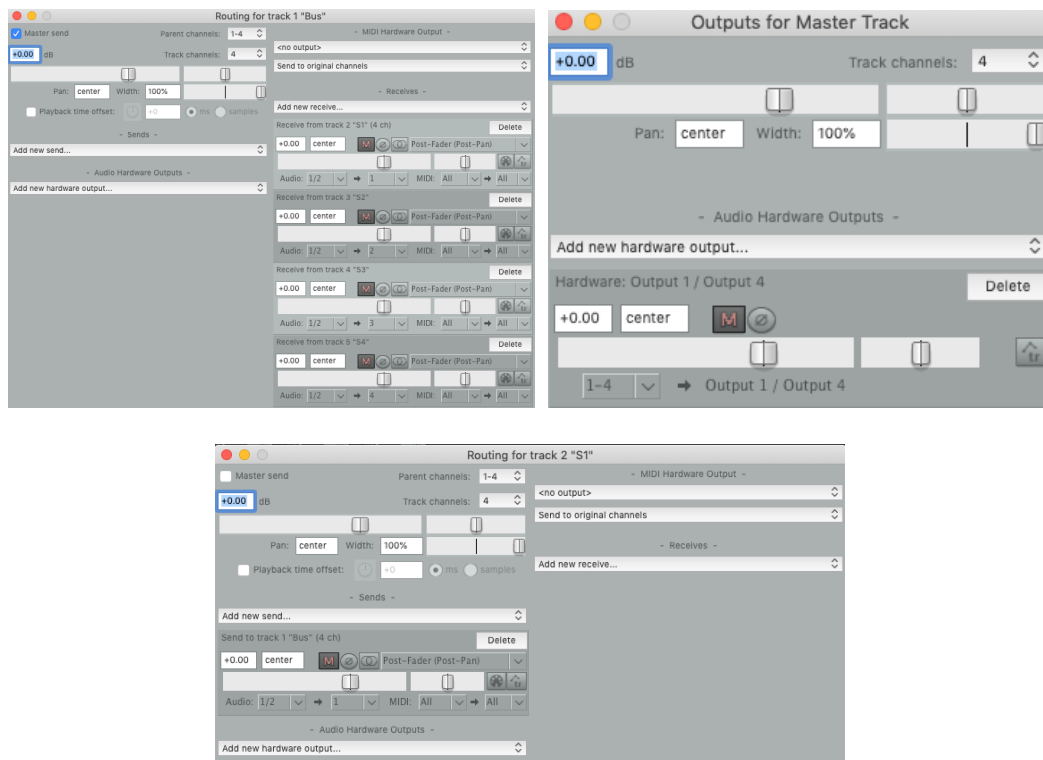


Figure 1. Snapshots of the Bus, Master and Individual source track routing sections.

For binaural rendering, simply click the headphone icon at the bottom of the plugin. In the binaural mode, perceived image distance can be controlled by turning the pink Distance knob to far or near. Ref is the original loudspeaker-source distance.