

O3A Harpex Upsampler Plugin
v2.2.1

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1 Introduction

The O3A Harpex Upsampler Plugin converts first order ambisonic audio streams into third order ambisonic (O3A) audio streams suitable for use with other O3A plugins.

Various forms of first order ambisonics have been used since the 1970s. These typically use four audio channels to carry a 3D audio scene, which gives rather less spatial detail than modern third order ambisonics, which uses sixteen channels. First order ambisonics has the advantage that a number of commercial "A-Format" or "B-Format" microphones are available for recording.

There are ways to convert first order material to O3A other than by use of this plugin. It is often okay simply to mix first order material directly into the first four channels of an O3A stream, although a little processing can help (e.g. with the O3A Injector - First Order plugin from the Blue Ripple Sound O3A Upmixers library) and it is important to check you are using compatible formats. However, these approaches will not typically produce imaging that is as sharp spatially as that produced using the Harpex algorithm.

1.1 Compatibility

O3A streams require audio busses with at least 16 channels, which (at the time of writing) most Digital Audio Workstations (DAWs) cannot handle. Some are limited at 2 channel stereo and many are limited at the 8 channels used for 7.1 surround mixes. **The O3A plugins *will not work correctly with these DAWs***, which may even crash.

1.1.1 AAX

The AAX version of this plugin is compatible with [Pro Tools Ultimate](#) or Pro Tools HD 12.8.2 and later.

1.1.2 VST2

Most VST2-compatible DAWs (such as [Reaper](#)) have a plugin "path", which is a list of directories which will be searched for VST2 plugins. You may need to change this path to point at the location of the plugins, or move the plugins there. By default, these plugins are installed into `/Library/Audio/Plug-Ins/VST` on macOS. Various directories may be used on Windows, but `C:\Program Files\Steinberg\VST2` is not uncommon.

1.2 Technical Requirements

1.2.1 Operating System

Supported versions of Microsoft Windows are Windows 7, Windows 8 and Windows 10. Supported versions of Apple macOS X are 10.7 or later, Intel only. VST plugins are generally available in 32bit or 64bit forms on both platforms (packaged as a Universal Binary on macOS). The AAX plugins are 64bit only.

1.2.2 VST Host

This plugin does not work with all VST 2 hosts. One reason for this is that the plugin needs large numbers of channels on its input or output busses.

1.2.3 AAX Host

The AAX plugin requires Pro Tools Ultimate, or Pro Tools HD v12.8.2 or later.

1.2.4 PC Hardware

Please check your PC meets the following requirements:

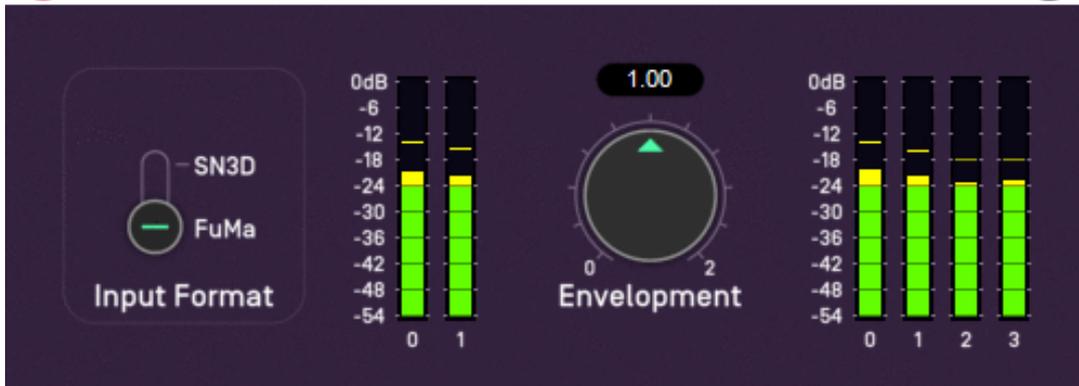
- Intel Pentium D CPU or better.
- 200MB of free disk space.

1.2.5 Permissions

You'll need administrator permissions while installing on Windows. The software probably won't install properly using a "restricted" account.

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2.1 Host Support

Host Type	Support
AAX	Yes
VST2	Yes

2.2 Audio

	Channels	Content
Input	4	First order B-Format ambisonics (SN3D/ACN O1A or FuMa, switchable)
Output	16	O3A

2.3 Controls

- Envelopment
- Format

2.4 Description

This plugin takes classic four channel first order B-Format and converts it to third order (O3A).

In general when we refer to B-Format we are referring to 16 channel third order ambisonic (O3A) B-Format, but this plugin is an exception. The first order ambisonic B-Format we are talking about here is less detailed and only uses four channels. The plugin supports two first order input formats, SN3D and FuMa. Please check which you have and set the switch accordingly.

The plugin does *not* perform conversion from A-Format to B-Format. If your microphone produces ambisonic A-Format, you will need to use software specific to your microphone to convert to B-Format before using this plugin.

The plugin uses the Harpex algorithm to estimate the original directions of sounds and then uses those directions to synthesise third order material. For more information about Harpex, see <http://www.harpex.net>.

2.5 Meters

Meters are shown on screen to show the average energy content within each of the ambisonic orders present. The meter on the left shows the zero and first order content of the input to the plugin and the meter on the right shows the zero, first, second and third order content of the output. Metering uses the same methodology as the O3A Meter plugin from the Blue Ripple Sound O3A Core library.

In a typical mix, the two input meters should have roughly the same level, as should the four output meters. If this is not the case, this probably indicates unusual content in the input mix, which may be for valid reasons but is more typically due to the choice of A/B filter used to convert from A- to B-Format. In these cases, you may want to set the envelopment control to something other than 1.

2.6 Controls

2.6.1 Control: Envelopment

The envelopment control allows control over how enveloping or diffuse the output of the plugin is. The control ranges from 0 (for a sharp image) to 2 (for a diffuse image). A value of 1 is normally recommended.

2.6.2 Control: Format

The input format describes the first order ambisonics that is being fed into this plugin. Setting this incorrectly will give bad results. The options are:

- "SN3D" (in the ACN channel ordering) is the format used by the O1A and O3A plugins. It is used by some recent first order microphones and is sometimes known as "AmbiX".
- First order "FuMa" is the same as "Classic" WXYZ B-Format, which dates back to the 1970's. It was used in versions of these plugins prior to version 2.0 and some hardware and software uses it, including a number of 3D microphones.