

AMBISONICS EXPERIENCE: THE BRAHMA MICROPHONE

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In 2013 I had the luck to help manufacturing the Brahma microphone through its Kickstarter campaign.

I was interested in Ambisonics technique for a while but I didn't have the budget to invest in expensive microphones just "to give it a go" and I didn't know anyone who own one to borrow or rent it from, to try to use a technique I wasn't sure I would have been happy with. That was a good chance to try this technique and I became a backer of the project.

Ambisonics is a technique quite relegated to a niche market, mostly academics and enthusiasts and rarely used on a professional TV and film environment.

I heard of some use in sport and Video games, but I don't know much about that side of the industry and if you are one of those guys, please get in touch.

The good point of this technique is that with just 4 recorded tracks we get the full sphere environment to distribute to up to a theoretical limitless number of processed channels (speaker feeds) or convert to various surround formats.

This could be a future-proof technique to archive and build a library of sounds and recordings that can be played back on any past and future formats despite it involves a lot of mathematics to understand that deeply.



Once received it and played with it for a little while, I realised there are some nuances to get around to use this microphone.

That's because most of my work is on location and I spend quite a fair amount of time recording "atmos" environments tracks. One of my keys factor for any piece of equipment I use, is portability and possibility to use it in the most diverse environments and weather possible. The Brahma is

developed to be used in a controlled environment like a studio or a concert hall, on a tripod stand.

This microphone is small in size, which make it a good selling point for me. Due to the technology used, the capsules need a PIP power to work, instead of the most diffused 48V Phantom power.

This microphone comes with a plugin-box to feed the needed PIP voltage to the capsules; it needs to be plugged into the microphone then travel the recorder through a quite rigid CAT cable connected to another converter box to 4 male XLR connectors. The standard microphone holder is heavy and not very effective in isolating from shakes and rumbles.

To me all this arsenal is quite bulky, heavy and not really useable on location where set up speed is needed most of the time.

The Brahma has also a grid ball to protect the capsules and the 3D printing support, where we can dress a fluffy windshield on top of it.

The grid and the fluffy are not a good solution to protect from the wind as it's not enough protection and the wind still can hit the microphone body and the PIP box, ending up in all

recordings.

All these bits together made me decide to archive the microphone for a while thinking how to simplify and give easier usability to this nice little object. In my experience, the most efficient way to protect a microphone from wind and handling noise is having it floating suspended into a blimp covering the whole body of the microphone.

To be portable and easy to carry, a microphone has to be short and small in dimensions. Luckily the Brahma is a small one and I had to find a way to fit it into the smallest blimp possible. I already had a couple of Rycote WS1 and WS10 systems at home, which could have been the perfect choice for it. The grid ball unfortunately didn't fit in and I had to remove it, exposing the capsules, risking also to break the 3D printed holding module but if the microphone always live inside the blimp it should be quite safe, so I took the grid off and drilled a couple of holes to be able to put the original screws back in position to hold the whole system together.



This way I now have the microphone safe in the blimp.

I managed to fit it into a WS1 blimp which measure 28,5cm end to end. Despite is a quite small blimp, compared to the microphone itself, is a bit too big but due to the standard straight XLR connector I couldn't fit it into the WS10, which is smaller (22,5cm) and better to be carried around in a more discrete way not to be noticed too much when in crowds. In order to do that I had to build a low profile right angle 5 pins XLR.



The next bulky part is the power box that needs to be attached to the XLR connector making the whole system heavier. Also after few tests I noticed it introduced a fair amount of background

noise, so it definitely had to go. To get rid of the rigid CAT5 cable and the tailed XLR box converter, I built a multipair cable going from 5 pins XLR to four mini Lemo 3 pin connectors. I've chosen the Lemo connectors because I already have many lapel mics with that system that I use with my radio-microphones and feed with the Ambient Eumel EMP3L when I need to be hard wired. This way I can feed the Brahma capsules with the PIP power needed and connect the system easily to my recorder of choice.



Another issue I found is that the 5 pin XLR connector is wired in a non standard way so is not possible to use already existing cables in case of need of extensions or use an old retired cable for the purpose. I tried to open the Brahma to rewire it and have it back to universal standards but the in built XLR connector is tied up, probably glued and I didn't want to force it and break it. Another reason why it would be better to keep the standard wiring is because of the engineering of the XLR connectors where the Ground pin is a bit forward so when inserted it connects before any other signal pin avoiding issues and capsules or circuits break downs.

Here is the difference between a standard 5 pin connector wiring and the Brahma one:

	5 PIN XLR	BRAHMA
1	ground	Front Left
2	ch1 +	Back Left
3	ch2 -	ground
4	ch2 +	Back Right
5	ch2 -	Front Right

I finally was ready to go out and record!

Keep in mind that this mod is time consuming, and is not a cheap solution but the end result is a real improvement.

ON THE FIELD

The system is a quite lightweight and portable, easy to set and undo with a high degree of wind protection.

The Brahma is a nice sounding microphone based on Transound TSB-140A capsules and it can record a very balanced sound spectrum.

Unfortunately it doesn't have a RF protection circuit and is quite prone to catch cell phone signals and RF spray from badly grounded electric or electronic machines. I had some issue on the field because I am using my smartphone also as a geotagger to record notes of the place

where I am recording and I have to keep it far from the mic during a session. I had an issue in a Tea bar in Kurdistan where it was catching RF spray from old and badly grounded air conditioners and I couldn't leave it in my sweet spot of choice and I had to rotate it and fiddle with it to change the polarization because it was acting as an aerial at that point.

Ambisonics technique requires that every track must have the same recording level, so a recorder with the facility to drive multichannel inputs preamplifiers with one trim pot is required, otherwise we need to find a way to set the tracks at the same level.

THE WORKFLOW

The next challenge was to find a workflow to transform the A-format recordings to B-Format. Brahma microphone comes with a pre-recorded set files, which are the matrix of FIR filters, derived from anechoic measurements, and designed to convert the raw 4 capsules signal A-format recording, to standard 4 tracks, 1st-order B-format.

The software recommended is Brahmavolver which is old and with no actual further development. The actual version even if it runs on my computer, has many bugs and there are limitations in exporting, giving only the chance to export at 48Khz maximum and is locked to 16bit.

For a professional use where also more that 48Khz sample rate and 24bit dept may be needed, this tool won't be not the software of choice for the A-format to B-format stage.

As DAW I use mainly Nuendo and Pro Tools and soon I found out that the Ambisonics format is not supported at all in those softwares due to channel management restrictions where instead is needed to be fully manageable, to give us the chance to set up also high numbers of outputs. I then stopped for a while, quite frustrated realising I couldn't have access to this technique due to commercial or programming reasons from the main standard professional softwares. Support is the main reason why this technique is not used in the professional environment.

I got in touch with Andrew Horsburgh, Engineer working at the Solent University in Southampton, UK, who kindly hosted me for a day introducing me to this technique and his workflow.

He mostly use Reaper, which is a quite powerful DAW and have the maximum input and output flexibility needed for this technique. This software is also able to host all the actual plugins developed for it which are not supported in Nuendo and ProTools due to the already mentioned limitations.

The straight answer now would be to leave everything behind and use Reaper, but this software is not made for Film post-production, my main area of business and is not the professional standard (despite it can surely deliver professional results).

Since then I started thinking how to implement an Ambisonics format into Nuendo or ProTools. I then left behind ProTools because I don't own a HD version of it which for commercial reasons is the only version allowing "surround" multichannel tracks. From there on I focussed on Nuendo which has only one full version with "surround" facilities already implemented. Also most of the plugins developed for this technique are available in VST version, and I gave it a go.

I then faced immediately that despite the VST environment is the Steinberg's proprietary format, those plugins don't run in Nuendo because its channel management limitations. A functional loop that make Steinberg shoot in his own foot.

As already mentioned, the Brahma microphone comes with the "Brahma filters" and I needed to find a convolution software or plugin to convert my files.

Here comes Angelo Farina, Engineer working at the Università degli studi di Parma, Italy, which introduced me to the alternative to the non working Brahmavolver: X-volver.

Even this one shows its age and is almost not developed any more (again!) but luckily still run and support Sample Rates and Bit Depth. Doesn't work in Nuendo (uff!) for the already mentioned programming limitations but works in Reaper.

I had then to rethink my targets and accept to learn and use Reaper at list at some stage of my workflow.

After few tests I decided I could use Reaper during the A-format to B-format stage while I could keep using Nuendo for the editing and "surround" multichannel conversion to standard

formats.

In case of a full Ambisonics format projects, Reaper is the software to go with.

At the moment I split my post-production workflow in the following three steps.

STEP 1: FIRST EDIT – NUENDO

Once back home full of stunning 4 tracks Ambisonics recordings, is time to edit, clean them up and catalogue them.

To do so, Nuendo needs a little workaround.

Keep in mind that once edited the files will need to be exported to a A-format 4 tracks poly file to be converted to B-format through the Brahma impulse filters.

The output of this session will be a 4 channel one and Nuendo can achieve that through a “Quadro” master track.

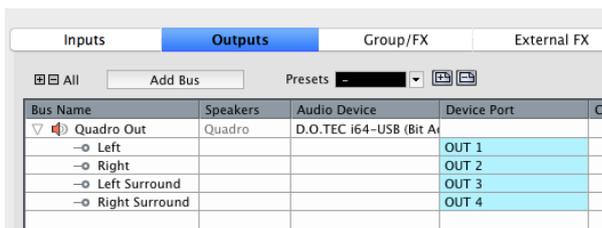
To do that go to menu:

Device – VST Connections – Outputs

Click on Add Bus button and select “Quadro”.

You can rename “Quadro Out” bus as you like but you cannot rename the single channels unfortunately.

Assign four different ordered outputs to the four Quadro output channels.



I then usually create 4 mono tracks where I will import my recordings.

That is because I will need to correct recorded levels for every single track due to the lack of some recorders to manage 4 recording tracks with just a single preamplifier's knob.



The output assignment for the edit tracks is:

- Front Left Up – Left
- Front Right Down – Right
- Rear Left Down – Left Surround
- Rear Right Up – Right Surround

I then apply EQ if needed and cut and edit as I like (applying the same process to all the tracks). I will then use the silence recorded at the end of the event, listening to it and matching it if needed.

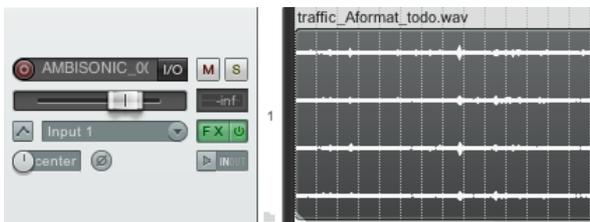
Once happy, export to a poly Broadcast wave file, via:

File – Export – Audio Mixdown

STEP 2: A-FORMAT TO B-FORMAT CONVERSION – REAPER

Import the edited A-format, 4 channels poly file in Reaper, simply with drag and drop into the edit window or via the menu :

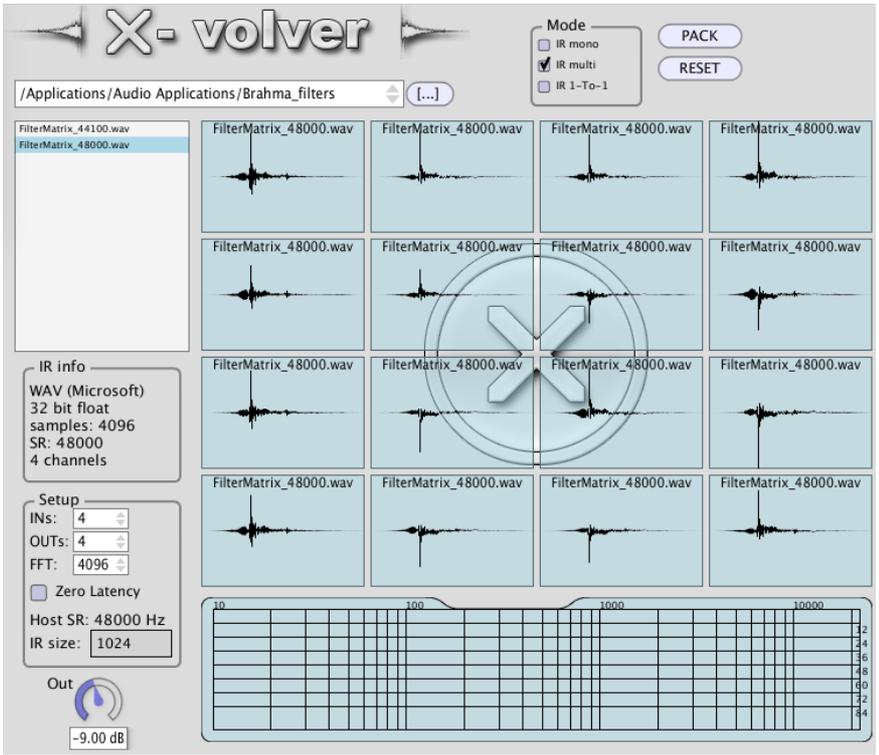
Insert – Media file...



In the mixer window you will find a track layout similar to this one:



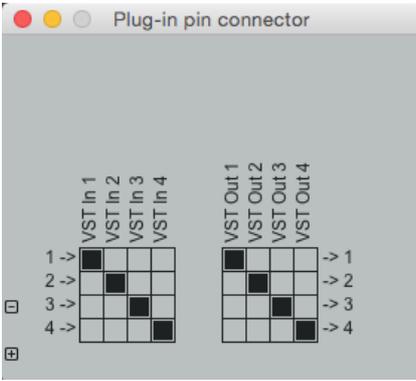
As we can see from this pictures, we need to insert the X-Volver plugin in the Ambisonics track form the plugins list. Once open we need to select the correct Brahma filters for the B-format conversion and make sure to have all the settings like this picture:



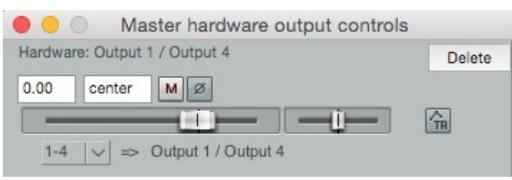
Make sure the plugins UI is set with the right number of inputs and output needed:



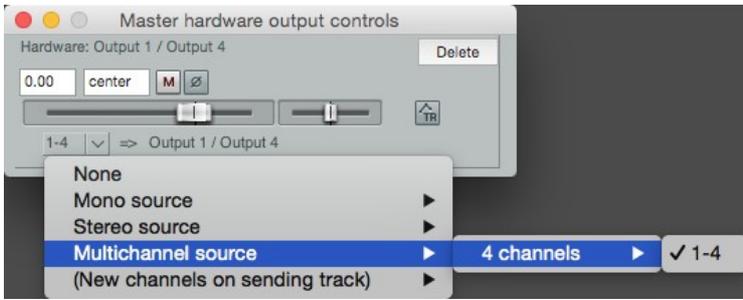
Click on the “4 in 4 out” button to make sure to set the matrix correctly:



On the Master Output track make sure to set up the Master Hardware to 4 outputs via the Master Hardware Output Control. To do this double click on the Hardware Output of the Master Output track and a window will pop up:

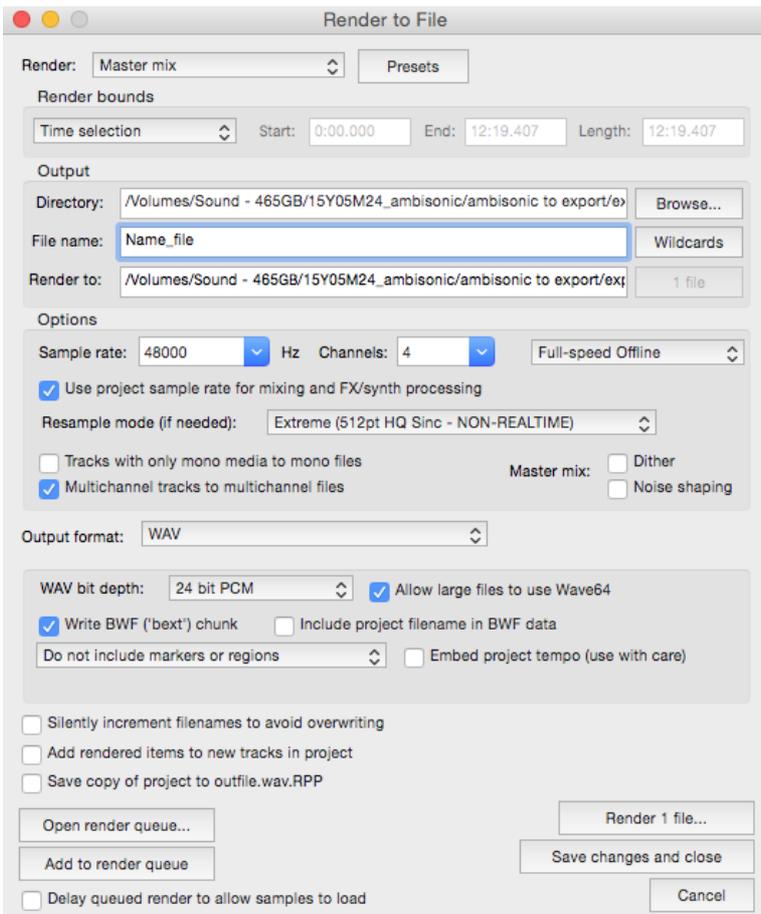


Then click on the lower left arrow to open the options to select the desired number of output:



If all is set correctly we are now ready to export a B-format version of our recording. In Reaper is called “Render”:

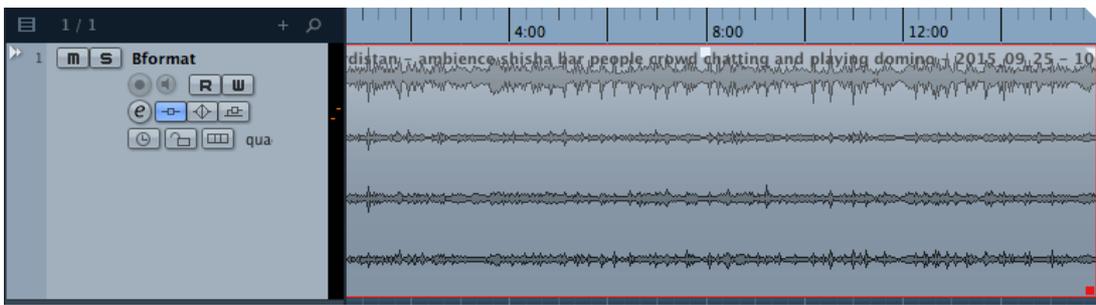
File – Render...



Check the setting and proceed to the Rendering. If all went well we now have our filters free version available for any B-format processors.

STEP 3: DOUBLE CHECK AND STANDARD FORMATS CONVERSION – NUENDO

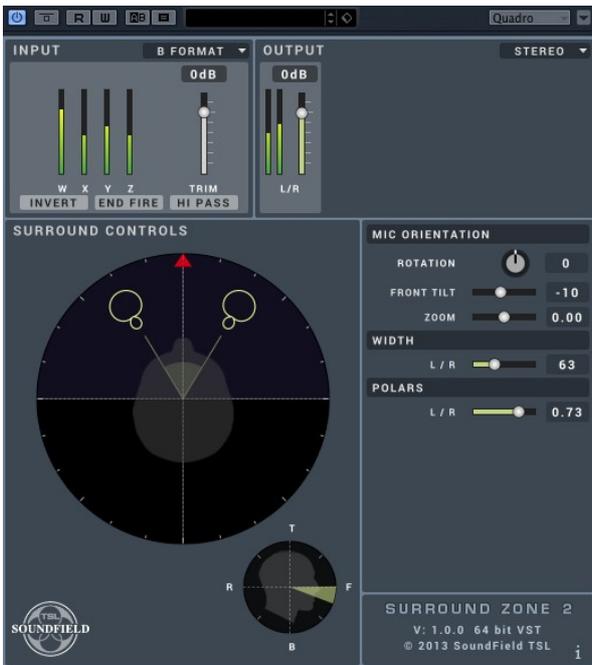
We can finally integrate our recording into any session via the already mentioned Quadro track. If just a mono track is needed, just import the poly file into Nuendo with the “split tracks” function and use just channel 1 (which is the real mono signal of the B-format recording). In this example I inserted my Ambisonics recording into a stereo session. I used “Surround Zone 2” plugin by Soundfield, but there are few plugins out there to choose from.



Once imported we need to insert a B-format processor onto our track:



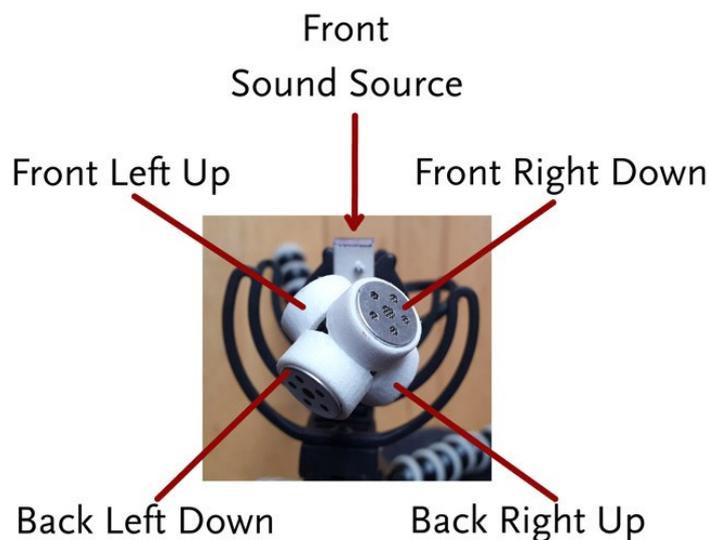
In Surround Zone 2 or the processor of your choice, make sure to select the output needed for the session, in this case “stereo”.



I AM NOT THERE YET!

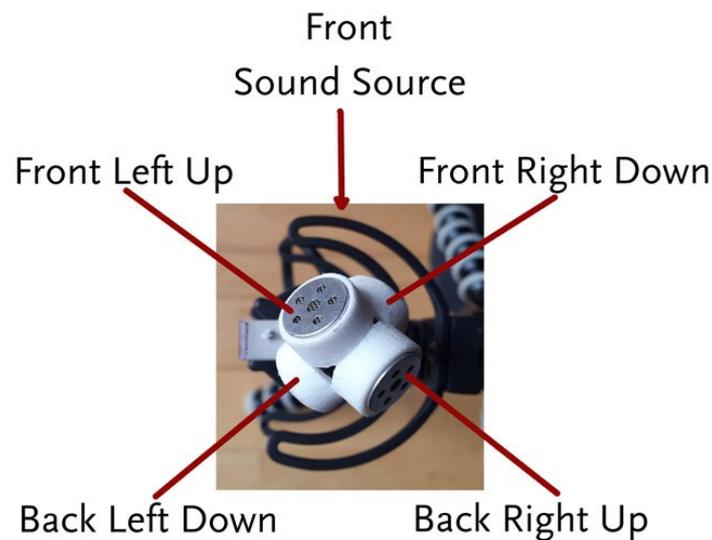
In January 2016, back from a trip in Thailand with lots of Ambisonics recordings, after few tests where I still couldn't get a proper stereo format matching what I remember was the soundstage over there. I found out my Brahma was connected wrongly with consequences over the FilterMatrix and the workflow.

Here is what I have (Brahma serial number #010):



As it is now according to the red reference on the original grid

The picture is taken from the top.
Looking at it is not matching the A-format capsule assignment as the Front Left Up is in fact Front Left Down and so on.
This is how it should be:



How it should be?

Which means my Brahma was wired wrongly in the factory and all my recording made so far are rotated of 90° and my actual center stage is on my left.
My FilterMatrix is made following this mistake and after some back and forth with Umashankar I decided is unusable because now we don't know which capsule was recorded on what channel during the measurements and again my Brahma is back on the shelf collecting dust.
I have corrected the wiring on my low profile adapter to now have the Brahma connected correctly but I am in need of new a FilterMatrix.
Angelo Farina and Andrew Horsburg gave me their availability with that but is quite difficult to find availability of an anechoic chamber as those are always booked. Angelo told me I could do it without it in a very big room, but being London based, where big rooms are quite unique and also because I don't have experience with this process, it could end up in another mess.
At the moment then is again waiting time, thinking to save money to get another brand microphone, which won't be that small though and more difficult to carry with me in my trips.

SPECIAL THANKS

- Umashankar Manthravadi – Who developed this microphone and made this experience happen.
- Andrew Horsburgh – For the help in my first steps over this technique.
<http://www.ajhorsburgh.com/>
- Angelo Farina – To help me go further and find a workflow for my purposes.
<http://pcfarina.eng.unipr.it/>

REFERENCES

- The Brahma Mic – <http://embracecinema.com/gear/product-view.php?pid=52>
Kickstarter campaign:
<https://www.kickstarter.com/projects/1569945514/brhma-affordable-Ambisonicss-microphone>
- Brahmavolver – <http://www.ramsete.com/Public/Brahma/Brahmavolver/>
- Reaper – <http://www.reaper.fm/>
- X-volver – <http://pcfarina.eng.unipr.it/Public/Xvolver/>

More plugins (which weren't working on Nuendo during my tests or still I haven't managed to experiment with, but they are actively developed):

- Daniel Courville – <http://www.Ambisonicstudio.com/>
- Bruce Wiggins – <http://www.brucewiggins.co.uk/>
- VVAudio – <https://www.vvaudio.com/products>

More infos about Ambisonics:

- Wikipedia – <https://en.wikipedia.org/wiki/ambisonics>
- Ambisonics.net – <http://www.ambisonics.net/>
- Ambisonics.info – ambisonics.info
- Ambisonia – <http://www.ambisonia.com/>

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