

If you ask what a good digital to analog converter (DAC) for music is, the answer will rarely be about the technology. Yet that technology is very important. The Novum DAC uses a technique that puts the energy and impulse response of the music first.

### The music and its time domain

Acoustic or live music derives its quality from natural impulse responses. An impulse response means that all frequencies travel equally through space directly and via reflection and reach our ears, without added distortion. This is why we hear spaciousness. It is not self-evident that every type of DAC optimally imitates these properties in the living room at home.

#### **Digital sound**

Digital sound cannot capture sound waves. The sound is converted into measurements (samples) at discrete times. On a CD, the sound is measured 44,100 times per second. By placing these samples by a DAC one after the other in time, we can reconstruct the sound waves.

#### Gate between samples

However, information is missing between the samples. Those gaps between the samples must be bridged. A filter is required for this. A filter is able to connect the individual samples into a smooth waveform. Older DACs used an analog filter for this. Modern DACs use a digital filter for this. The Novum dac does NOT use any filter. Why? Keep reading!

## Filters in audio

So, there are analog and digital filters. An analog filter is an electronic circuit with capacitors and resistors that stores the energy between the samples and creates a smooth transition. A digital or Upsampling filter is a calculation tool which creates additional samples. The additional samples provide a smoother transition.

#### The disadvantage of audio filters

Audio filters have useful properties, but unfortunately they introduce errors. Digital filters cause time fading and energy loss in the music. Almost all modern DACs today use digital filters. To understand what is happening, let's make an analogy to a photo. Imagine taking a photo of a fast moving car. If the camera shutter is open for a longer time, the car will look blurry in the photo. Digital filtering works in a similar way. It 'looks' at passing samples over a certain period of time (more samples) The result is blurring of the music.

#### The advantage of audio filters

Audio filters can create a smoother transition from audio samples. This is an advantage for processing the sound in amplifiers. As by more monotonous sound, the limitations of digital filtering won't be as noticeable. However, for reproducing spatial stereo music like real in the living room, a blurring effect is not very desirable!

## Novum DAC, without filters

The Novum dac does not use any filter. The energy and impulse response in the music remains perfect. But how can we hear smoothness without a filter? Well, amplifiers, loudspeakers and our ears work like an analog filter! So we can skip harmful filtering in the dac. However, without any filter, artifacts can be observable in the sound.

#### Artifacts, prevention

To avoid audible artifacts, various innovative techniques have been built into the Novum dac, to reduce this effect. Furthermore; our speakers and our ears act like an analog filter! In different ways. Loudspeakers: the inertia of the cone and suspension damps sharp transitions in the sound, so that stepped signals are experienced naturally and smoothly. Ears: most people hear between 20 Hz and 20 kHz. Sounds outside this range are simply not perceived.

The Novum dac produces stereo music with spaciousness as you experience it at a live performance!

# **Innovations**

Do you remember the TDA1541 DAC chip? The Novum can be seen as a successor of this famous dac chip. We made a lot of innovations;

- Intelligent algorithms to handle component tolerance for more bitresolution.
- Intelligent algorithms to cancel quantisation errors.
- Independent masterclock (no sync with the streaming clock).
- Discrete current buffer.
- Every dac is calibrated and has unique firmware to assure the most lineair output.
- No PLL or third logic. All is driven with one single FPGA.

## **Specifications**

- Novum DAC can handle 44.1, 48 and 96 khz PCM sound up to 24bit.
- The output signal is fixed with a maximum amplitude of 5 Volt.
- The audio stream input is: Toslink

## Facts about unfiltered NOS dac's;

- These are sensitive to source jitter. Use a decent cd player or High-End audio-streamer as a source. A cheap solution will downgrade the performance
- Put a Power Conditioner between the mains and your audio-source, to reduce jitter
- Use a clean (audiophile) lan switch with a short lan cable between switch and audio-streamer.
- LAN is preferred over Wifi. Wifi has very high frequency distortions.
- Use a good quality Toslink cable, like the QED reference series.
- Avoid digital amplifiers with NOS dac's. It is not a happy marriage.
- NOS dac's are time and phase correct, speakers with the same properties will boost performance.

Enjoy the music!