MOLA MOLA KALUGA & MAKUA :

The use of stereotypes makes the world clear and ensures that you do not have to think about the qualifications used. Tubes sound hot, solid state harsh, class D emotionless and wedge and negative feedback is completely wrong. Many still walk around with this basic knowledge of audio. **That reality is different, Mola Mola proves. Modern Class D technology replaces the tube and classical solid state circuits.** This review is also a first step. Namely the first where the sound-like aspects of the product are not described.

The stereotypes and prejudices surrounding class D amplifiers are best understood. On the one hand, because the hifi world (unfortunately) knows too hobby-like inserts. But, on the other hand, due to the developments within Class D. The PWM principle was already known in the fifties of the last century. PWM was often used in the sixties to control motors (phase cutting). If you control a motor with a resistance, much energy in the form of heat will be lost. An early application as an amplifier can be found in the then Sinclair X10 computer (sixties).

Sony belonged to the manufacturers who introduced a hi-wave PWM amplifier. Many know undoubtedly the TA-N88 (1976). It features a high-speed comparator in the form of an IC with three coupled differential amplifiers in series. Its output consists of a square wave PWM signal. That goes to the power driver. The 8-volt p-p signal from the square is amplified here to 40 volts p-p and thus the gates of the high power V-FETs can be controlled. The TA-N88 rotates here a lot in the listening room and performed outstandingly for that time. A very nice airy sound image with clarity and drive, but not necessarily purely realistic. At the end of the seventies, the TA-N88 was a phenomenon. For the first time there was a high power switched amplifier, with a switching power supply in a compact and lightweight housing.

Then PWM remained fairly out of range of the high end audio. IC-type switching amplifiers mainly found a broad application in portable equipment due to the size, low heat output and low power consumption. Only in the last decade is there a rise of Class D in professional and consumer electronics, aimed at better display and for PA, of course, at higher levels. The aforementioned bias arose because most class D designs barely reached the level of the average hifi amplifiers and often better cloned in the low than in the high. As usual, products are developed over the heads of consumers.

The price that the industry pays for it is that a new technology immediately gets a dubious reputation. It will take a generation before phasing out the prejudices that possessed the audio-visual memory. Marketing, with its eternal talent for chaos, has instantly poured into the "digital" amplifiers, as they are often called in error. Currently, you can get the entire alphabet from class D. An additional screw means a new class. Consumers again think that the closer you get to the omega, the better the devices perform. But yes, we used to have a new class AB. Well, a Class D is not a digital amplifier, and not even if only a digital signal is accepted. It is and remains an analogue switching amplifier. The concept of digital amplifier is simply a marketing idea and something that is not possible at all. But maybe another powerbits are invented. Sets of ones and zeros that represent not only a voltage difference but also have an energy content. But for the time being, something that supplies energy to a loudspeaker is by definition analog.

Bruno Putzeys :

The story about Bruno is well known. Through his father he developed interest in hi-fi and he was wrong, like any starting audio file, first on the soft side. He, like many audio files, once said, to be negative feedback, without really understanding what exactly went on. Some never pass this stage, but Bruno quickly developed interest in the scientific side and wanted to know exactly why a tube amplifier performed so much better than a solid state at the time.

After completing his studies at Philips, he designed all kinds of nasty mini-stereo systems, but after some hassle he eventually got the free hand to further develop Class D technology. That resulted in UcD technology around 2001. Bruno developed consistently, knowing in advance what the final goal should be and then measuring it. That is contrary to how many audio professionals and manufacturers think and work. Namely, that measurements say nothing and that simply something is built or compounded, without a fixed purpose. It will be just as long as the thinker finds that the end result is acceptable. Some loudspeaker manufacturers call it 'voicing'. Listening to its self-developed Class D modules in 2001 in a real stereo system was a real experience. According to Bruno, the sound was then purely realistic and actual as it occurs. Until that time, Bruno had measured only. It is illustrative of the remarks and views expressed about it during his lectures. The undersigned does not know exactly the exact words Bruno used to use, but he also shared that you should measure at the input of an audio component and also measure what appears at the output. Those two must be identical.

Bruno indicates that everything that happens in audio is fully explained from the existing theory. There you do not need any views from another universe. According to him, however, the theory is not simple. Many often indicate that there is a difference between theory and practice. The scientifically correct view of Bruno is that the theoretical model used is not good enough. Logically, because there can be no difference between theory and practice. Measurements and models are important. You can measure everything, even subjective interpretations of sound properties. It simply has to do with the quality and diversity of the measurement methods and your design of the underlying theoretical model. Based on those measurements, you can fully predict how products sound and perform. Alon Wolf van Magico agreed at a mutual conversation that no listeners would be listened to. The development is based on measurements. As the granularity and completeness of the measurements improve and the model is more advanced, the final product also becomes better. All progress in this world has always been realized from models, hypotheses and theory. The only way to continue with audio.

As is often the case with multinationals, his design has been submerged somewhat. Bruno came in contact with Jan-Peter van Amerongen (Hypex) in 2003, who visited Philips. Van Amerongen did not want to hear the Class D amplifier, but only see the measurement results on a scope. Based on that, he bought a license on the modules. Some time later, Bruno worked for Hypex, and later later he founded Grimm Audio. The latter was due to his interest in the whole conversion process and what you can do in the development of DA and AD converters. A basic idea of Bruno, who has attached the undersigned for a long time, and actually where it is in high-end audio, is that audio equipment should not color the music. It is actually strange that there is audio device that adds coloring and other deviations to the recording. Writing, performing and recording music is an art form. Only the musicians, the conductor, the composer and the producer can determine which color is being given to music. That right is not with the manufacturer of equipment, nor with the listener. Audio equipment also has nothing to do with art, musicality and emotion, thus giving a free interpretation of what Bruno has ever said. Musicality is a feature of music and not of equipment. Thus, musical audio equipment does not exist. Emotion is something that is inherent in yourself and no transferable feature through electronics.

UcD and Ncore :

Why are the UcD modules now a step ahead in the development of Class D technology? The most simple answer is, of course, that the input signal and the output signal are as equal as possible, with a difference in amplitude after and the ability to supply power. If you measure at the output of many Class D modules, your screen will close with RF junk and popping distortion. It goes too far to explain the whole technique behind Class D, UcD and Ncore. There are sufficient AES articles, patents and whitepapers available for the relevant audio file. UcD formed a step forward in the development of Class D technology around 2001. Shortly by the curve, the characteristics of UcD were lower output impedance, higher degree of load independence and lower distortion.

In those years, these combined features resulted in significantly better sound quality over the D-Class modules of other manufacturers. In the meantime, competition was not silent and various manufacturers were able to reduce the deformation of class D modules, especially in the mid-frequencies. This was then brought to the attention of marketing, but it was of course not told that these class D modules still had other major problems. For Putzeys, it was in any case a reason to take a next step in class D design. The step is called Ncore. The main difference with UcD is that Ncore has a new control loop. The UcD and the Ncore are so-called self-oscillating amplifiers. Previous class D amplifiers had a modulator that was controlled by a clock. A modulator converts the audio signal into a pulse flow (PWM). A self-oscillating amplifier has advantages, but in order to work always need a control loop (feedback). This determines inter alia the switching frequency of the modulator. Well, feedback has a bad name within the audio-visual community. Sometimes that's right, but that's because of its poor implementation. Within such a design, the low tones experienced the benefits of feedback, but the amount of feedback for the high was often fewer pieces.

Bruno discovered that feedback is fundamental to the proper functioning and performance of amplifiers. In fact, with significantly higher feedback figures, the distortion decreases sharply and the amplifier will sound better. The essence of Ncore is, in fact, to increase that (favorable) loop gain without compromising stability problems. Class D has a limited bandwidth. Increasing the feedback may cause problems. The Ncore control circuit is therefore designed to allow the required amount of feedback to be applied within the available bandwidth and, in case of clipping (instability), the amplifier automatically returns to the normal operation status. In summary, the new design of the Ncore is based on an improvement in the control loop. This gives the amplifier all the sound benefits of feedback without compromising stability

problems.

Mola Mola :

The development of converters took place during the creation of Mola Mola. For the development of the Grimm products, a standard converter chip was initially used. However, Putzeys did not want to go with current mode in audio country, with most products based on hype-of-day converter ICs. According to Putzeys, these are very good, but he suggested a discrete converter that would be much better than the standard chips everyone uses. Recently, Bruno gave a lecture, explaining his theoretical conversion model and immediately hearing the differences between converters and digital formats. That story in a huge way compares the current opinions about this subject. In the forums, the rarely substantiated views on digital all the way out. You know them. "DSD is better, streaming is better, streaming is worse, hi-res is better, hi-res and cd differ or do not differ, and so on." Bruno has the need to override it, but it is always based on a theoretical model And corresponding argumentation. He can also hear all (any) differences immediately. Putzeys always makes it clear that the theory around all these subjects is complex and that knowledge about this is what we know today. This means that the model will be further refined and that there will no doubt be new insights in one year. Bruno is simply a scientist and knows why things are (currently) as they are. Like any scientist, he also has a clear picture of what needs to be explored, where there are still questions and what we do not know yet.

The development of the dac goes back to work Putzeys performed in the development of the Class D. The idea was to build a digital PWM modulator and thus send the power stage. In retrospect, a dumb idea (Putzeys), because a Class D amplifier is analog and hard to combine with digital techniques. But, the digital PWM modulator was completely deformed and an ideal base for building a dac. The dac offers a number of advantages. There is no digital noise, the output looks completely analogue, the signal / noise ratio is at 130 dB, there is no noise modulation and there are no in-harmonic components in the output. Any existing deformation is not possible with the existing equipment.

The idea behind Mola Mola is that if you delete everything that is not related to music, you keep the music. The problem of the high end is that there are designers who think they should add sound-like elements to the equipment because such a thing would sound the right way. Some brands therefore have the guts to call it a 'philosophy'. The basic principle from Mola Mola is that you

need to get closer to the music as intended by the artist. That means you need to make sure that the audio system can not change that. Ultimately, you do not hear any difference between an input signal and an output signal.

Makua :

The Makua is an analogue preamplifier with maximum transparency. Apparently, for some reason, it is difficult to build a really good preamplifier. Of many well-known brands, the power amplifiers have qualities. Then you often help them to fully connect soap by the associated proprietary preamplifier. Perhaps this Mola Mola preamplifier performs better. The Makua has five balanced and five unbalanced entrances. There is a programmable routing matrix on board. In the default Makua, optionally, the previously mentioned dac and a phono module can be placed. Through the array, all kinds of presets can be created. Each input can thus be line, phono or digital and it is possible to configure, for example, three inputs as phono, with each input possibly receiving a different (phono) equalizer setting.

The Makua can be operated with a standard included remote control, but also through an Android app and an on-going iOS app. The amplifier stages in the Makua consist of single-ended differentials. In many Japanese audio equipment, you'll see double-ended signal paths. The entire chain from the CD player to the power amplifier is then coupled with xlr cables. Pin '2' then has its own 'amplifier channel' and pin '3' idem dito. A fairly strange architecture because you pump the picked up failures throughout the system. Where then is your phase extinction that should be inherent to a well-implemented balanced architecture? The Makua design is also such that the influence of power cables and interlinks is not important (insofar as it was important or caused significant differences). The basic principle is that if (filtering) power cords affect the sound image, the appropriate audio component is not properly designed. The volume control is done with relays. Here the gain is controlled and the volume is not set on the basis of attenuation. Linearity is therefore much better.

The Makua can be provided with the dac. There is support for pcm (384kHz / 32bit) and quad speed dsd. Inputs are USB, XLR, optical and bluetooth. The optional mm / mc phonoboard is special. Via the app, the usual settings can be made for the phono cartridge. It's handy that you can not make the mistake of providing a mc cartridge with capabilities. Such a thing can happen at a turntable, where you can swap in and out of 10 different cartridges at a fast

paced speed and rattle with the known dip switches. But the absolute attraction factor is the choice of more than forty equalizer curves. Basically all used curves are known, even for 78-turn discs. Since 1954, the RIAA curve is the standard to cut discs. Before that time, each label used its own curve. The golden age or hifi preamplifiers, Marantz, Fisher, McIntosh, Leak and so on all had a number of switchable curves on the phono input. Many will still have a significant collection of albums cut by Columbia-78, BBC, Decca-U.S, Orthacoustic, Victor-78 and others.

Kaluga :

To this name, the (mono) power amplifier is listening. It features the NC1200 Class D module (Ncore) and a switching power supply. The inputs are xlr and rca of your choice. The outputs are suitable for bi-wiring. It is remarkable that the design of the Kaluga and the Makua has been taken care of. Putzeys is a frustrating and elusive aspect. Design for the consumer market has to do with culture and with people. It is also very different from how it works in the pro market, Putzeys said. Due to the arched top, it is not possible to stack the Mola Mola components. Perhaps a conscious design choice to accentuate the specific design within a well-balanced living environment. As always: design is a matter of taste but no sound quality at all.

Listen :

When writing a review, there is also room for the less serious aspects of the subject. If it is correct, the sound features of the device in question are described accurately and recognizable to the reader. You can also formulate this as follows: Describing everything in which the component differs from what true music should sound like. This makes reviewing an incredibly frustrating activity, but there is still work for many years. However, if it is on Mola Mola there is hope for the future. The company shares the vision of a number of other players in the high end audio, which aim to develop products that do not have 'soundje' but show in a fairest way how the music is registered on the chosen medium.

According to Putzeys, there is nothing exciting about the Mola Mola equipment, hence this short review. You're listening to music only. If this development continues and high-end equipment simply lets you hear the music, then the subject of a reviewer changes. Less focus on how equipment sounds "and perhaps some extra attention to functionality and user-

friendliness. But, the world of audio files will also change. Normally, a set is built that most of the music collection should sound pleasant. A form of mistake thinking. Such a thing does not work, so do you connect any other speaker or amplifier to any twenty CDs? Do you have a different set of interlinks per CD? The right way is to build a set that just shows straight how the quality of the recorded material is. You can also hear that some material is not technically worth the price. But, it is quite honest to accept that historical reality. Or do you put up a pink spectacle at work, which causes management-induced shit to resemble a story by Andersen?

The set of Mola Mola has been here for quite some time and also listened to in many other locations. Six different speaker systems have been deployed, including the phenomenal Conquistar and Andrew Jones' equally spectacular Elac Debut miniatures. There are a number of observations. Despite the Class D technology, the Mola Mola set requires some time to reach operating temperature. Within this set, the preamplifier is not the showstopper that chases performance down the drain. There are only a few top level preamplifiers in this world. You may add the Makua to this list. What the set does is exactly what Putzeys describes. Nothing at all. Only amplify sound. It is therefore right in the leaflet that this is only an amplifier.

Together with the equally neutral Conquistar, you look straight through an imaginary glass tube to the shooting floor. That is also getting used to. Some will miss that nice sounding system, with basses that are a sum of the audio signal, cabinet resonance, elimination behavior and driver distortion. The squealing high and phase distortion complete the popular hi-fi sound. Just say the sum of all aspects that are called musicality and emotion. Listening to the Ncore is therefore all but sexy. But, the venom is in the tail (of the Mola Mola, although the tetraodon mola of the order tetraodontiformes does not really have a tail). This set leaves nothing but does not add anything to the disc or the CD. It is therefore not possible to note that this class D has the sound of a solid state, a tube amplifier or a class D. If you listen to a set and you can blindly indicate which type of amplifier is playing, then it is already well wrong. This amplifier sets the most honest way through what happened during the recording. You will hear the sound differences between applied microphones, basins, different types of guitars, acoustic environments and wings, with the greatest ease.

The true warmth of voices and instruments is passed on. It is not heat that is caused by the electronics. Mola Mola and, incidentally, the Conquistar have

now come to the fore of the professional audio world. Of course, this also applies to other products based on Putzeys class D modules, such as the Grimm LS1 series, although the Ncore's used there are slightly modified. The listed equipment (Grimm, Conquistar and Mola Mola) are very useful for mixing and mastering. Decisions that are taken are therefore correct and are not wrong due to deviations in the electronics and / or speakers. What is also noticeable is the degree of control that the set has, without the impression that the end result sounds "controlled". This becomes clear when Beethoven's Waldstein (Pentatone) is performed by Mari Kodama. An absolutely sublime recording. After a number of measures, Kodama plays an agreement within the bass range of the wing. The sound, power and control that the set represents this is unprecedented and extremely realistic. Then there are (just) two examples of recordings that can hardly be played well on many sets. Christina Aquilera's Hurt has such a gigantic drive and dynamics in the voice that most systems fail to control. The Mola Mola / Conquistar set makes this effortless. Idem for Skyfall (Adele). This title number has a certain complexity, which often leads to fading and clustering on systems. However, the set in question does not make any effort to provide an overview and authority. The display of digital material is phenomenal and that also applies to what the phono amplifier does. In the record archive are many pre-RIAA recordings that are cut according to different curves. It's great to be able to play those with the right curve. For 78-turn discs, it often means that the audible noise largely disappears.

With Mola Mola, a good recording really comes from the paint and material of lesser quality, sounds as such. Nevertheless, it is fascinating that many badly recorded material does not become unpredictable and actually sounds good. You simply hear what it really is. Then it seems that music almost never sounds really sharp or mean. If that happens, it usually occurs in the match between amplifier and speakers, amplifier or loudspeaker itself or many modern cables, which simply work as parametric equalizer, to give consumers a kick after connecting. As neutral cables as possible, therefore, are a better solution. Think of Grimm Audio TPR. Sound issues with the display also have causes that can be found in some studios. Guido Tent recently said that it was very nice. "What you hear on many discs and CDs is an inverse of the shortcomings of monitor systems in studios." But whoever does not listen to sound quality but to music will readily accept that there is material from every decade that musical is often extremely interesting, but sometimes audio-visual is somewhat less. Most of the time, those are the discs you find the most beautiful.

Epilogue :

The Mola Mola set sounds like nothing. This is reminiscent of experiences with the classic Audio Note Ongaku. That is also an amplifier that is virtually virtually absent. The Mola Mola electronics makes a direct connection to what was happening during the recording and the beginning of a major shift. Reviews are always about the sound and the sound aspects of equipment. With regard to Mola Mola, that is a pointless activity. As more fully transparent audio components will come into play, a review will focus more on the sound of voices and instruments in their mutual context and within the context of acoustic environments. But also on the beauty and essence of musical performances and the intentions of musicians, composers, arrangers and producers.

We will talk about music again. This puts an end to the audio file that searches for a short-range sound-based kick based on a particular CD, fuse, cable, amplifier and set of speakers. For the audio file that expands activities in the light of such an authentic and fairest possible reproduction of music, there is a new and fascinating perspective. In the field of electronics, for the time being, a certain search termination is terminated. That's how it should be. You go to the store, buy a Mola Mola set and a corresponding neutral speaker. You spend an hour placing it and optimizing acoustics. Then you're done and you can enjoy music. You will then have a more enjoyable life than all those audiofigures, triggered by pseudo-science, for a decade running without the holy grail and wiping out with cables, miraculous cones and lava lamps. You save a lot of money.

To be very honest: what the Mola Mola set up with the Conquistar and some other (neutral) speakers is terrifyingly good. Mola Mola simply explains a fair amount of all electronics. The extremely focused, plastic, natural, deep, wide and far to the left and right expanding soundtrack makes a huge impression. Similar to the performance that sets the systems around YG and TAD here.