THÖRESS

Puristic . Audio . Apparatus

==============================

"BEHIND THE CURTAIN"

●●

THÖRESS P.A.A was founded about 25 years ago after I had finished my studies (mathematics with physics as subsidiary subject) at the RWTH University of Aachen. My laboratory is located in the center of Aachen in walking distance to the famous Cathedral. Aachen has about 250.000 inhabitants and is located very close to the german border right at the spot where the territories of Germany, Begium and Netherlands meet, about 50 miles away from Cologne and Düsseldorf.

MUSIC...

Music has always played an important role in my life. I am fascinated by all kinds of music ... Classical, Jazz, Rock, Blues, Metal, Fusion, Funk, Pop... It never occurred to me that one particular music style is more important or valuable than any of the others. And I stick to this attitude until the present day, having reached an age of 50 plus. Accordingly, it is my opinion that a truly world-class audio system should be designed to be neutral and universal in the sense that every kind of musical program can be reproduced in an equally appealing and convincing way. Otherwise the system will tend to narrow the horizon of the user.

In my childhood I was so fortunate to own one of those large vacuum tube radiogramms. It was a pretty outstanding if not avant-garde piece of audio gear featuring a 800 ohm full rage oval paper cone driver fired by a unique single-ended OTL (output-transformer-less) vacuum tube power stage invented by Philips in the late 1950s, as I got aware decades later on. The sound quality of this old machine delivered was fantastic! We Germans call such old radiogramms Musik-TRUHE. TRUHE as in the word Schatz-TRUHE, treasure box. And that is exactly what the Philips receiver was to me: a treasure box, filled to the top with pretious jewels in the shape of musical tunes which daily called for my attention. And I clearly remember that I have made extensive use of my beloved receiver, even when I reached teenager age, transistorized audio gear had begun to raise its head, and I had picked-up the piano which since then is my favorite musical instrument I use to play with unbound passion almost every day.

Since my early teenager years I have also begun to attend all kinds of concerts regularly and such became acquainted with numerous concert halls, opera houses, churches, jazz clubs... within reachable distance to my home. Whereas in each of which auditory I had over the time figured out specific sweet spots in which I seeked to take seat on concert events. Luckily, I found that expensive seats were rarely blessed with extraordinary listening quality, which kept things fairly affordable for poor me. After school classes, I used to travel to Düsseldorf frequently. Where I would spent a couple of hours in various record stores until closing time so as to move on to TONHALLE, SCHUMANN SAAL or some church to attend a good concert. On other opportunities, I traveled to Cologne, to go to the opera or the SENDESAAL DES WDR to listen to the WDR Big Band or some avantgarde music. Such a trip was usually preceeded by a visit of the SATURN store (which at that period of time was the biggest record store in Europe) which I usually left with a big heap of vinyl records under my arm.

In view of such a lifestyle it was only a question of time until HiFi would become a point of concern in my life.

LOUDSPEAKERS...

The THÖRESS story is about amplifiers - AND LOUDSPEAKERS. A fact which has been frequently overlooked in the past. Perhaps the rather unique amplifier products steal attention from the speakers? Or does the radical, non-mainstream speaker design regarding technical principles and appearance consternate? In any case, I strongly believe that amplifier and speaker design are so closely related to each other that they need to be treated simultaniously in order to reach the very top of musical reproduction. Meanwhile, THÖRESS speakers gain increasing reputation aside the amplifier products, which I admittedly note with a certain pride.

DESIGN PRINCIPLES...

After decades of occupation with live and recorded music, I have attained a very clear vision of how a truly musical system should sound like and all my design choices have been ruled by this vision. In case of amplification I strongly believe in the supremacy of

<u>MINIMALISTIC , SINGLE-ENDED , ZERO-FEEDBACK , VACUUM TUBE TOPOLOGIES</u>

while strictly avoiding balanced schematics, push-pull operation in particular. My MKIII Phono Enhancer, for example, offers purely active MC phono amplification with excellent signal to noise performance with a modest lot of 2

triodes per channel operated at high idle currents. The idea to pass the phono signal trough three (or even more) operational amplifier chips (OPAmps) each of which is composed of an army of at least 30 individual on-chip transistors operated at piddly idle currents (as it is done in numerous balanced or single-ended phono devices which are claimed to be high end products) makes me shudder.

Not only that balanced circuits require (roughly spoken) twice as many components as comparable single-ended structures (or a large array of transistors in case of OPAmp based topologies) and as such contradict a minimalist design approach in principle.

BALANCED VERSUS SINGLE-ENDED TOPOLOGIES...

The only right to exist of balanced technology is the immunity of cable lines against EMI (electromagnetic interference). Based on the so called common mode noise cancellation effect. A purely technical advantage gained at the expenses of sonic degration, as far as I see it. Desirable and necessary for sound studio and public address applications where cable lines often have to be conducted trough environments poisoned with electromagnetic smog. Yet, unnecessary technical overkill and a waste of parts in domestic audio installation. In order to make use of the noise cancellation effect the sender component needs to transmit the wanted signal along with its 180-degree phase mirror to the receiver component trough the balanced cable line. Whereas the receiver device has to present either an active differential amplifier (with a dual input, inverting and non-inverting) or an audio transformer with center tapped primary winding to the incoming balanced signal. That is what I mean by technical overkill.

The cancellation principle also gives rise to a very particular distortion behavior of balanced topologies know as

HARMONIC CANCELLATION...

Even overtones (harmless and pleasant) due to non-linear amplifier distortion CANCEL OUT whereas (ugly) uneven overtones DOUBLE. Therefor successive distortion products introduced by a chain of balanced amplifier stages will be exclusively composed of (harmfull) uneven overtones, of UNeven overtones, of uneven overtones... while all even overtones cancel away completely. Hereby every balanced stage adds twice the amount of uneven tones to the wanted signal as a respective single-ended topology (incorporating the same active elements). Common electronic wisdom tells us that this is not a problem because unwanted distortion products can be reduced to almost nothing by

applying NEGATIVE FEEDBACK. Curiously, the following simple common sense considerations readily reveal that things are not as simple as that and raise serious doubts that the common theory of non-linear distortion and negative feedback is able to adequately describe the real world situation - AT ALL.

The notion of distortion reduction by negative feedback most essentially relies on the assumption that the frequencies of the overtones added to a sine wave ground tone (the indivisible atoms of a periodic signal, so to speak) by a distorting amplifier device are PERFECT INTEGRAL MULTIPLES of the ground tone frequency. Therefor non-linear distortion products are often referred to as HARMONICS *(*of the ground tone), suggesting a similarity of relations between electronic amplifiers and swinging strings. But can this assumption be in fair accordance with the real world conditions? Most likely not!

Let me illustrate my doubts with the following allegory.

It is well known that the overtones of REAL WORLD strings are IN-HARMONIC with respect to the ground tone. This means to express that the frequency of each individual overtone deviates to a certain (very slight) degree from the integral multiple frequency predicted by the theory of the IDEAL string. Hereby, the grade of in-harmonicity is dependent on length, diameter, tension and material of the string in question. In-harmonicity is a commonly accepted notion and measurable effect in the field of musical string instruments. It practically rules the diapason and tuning procedure of these instruments. So it would be a miracle if real world amplifying elements emit perfectly harmonic overtones as non-linearity products...

The overtones arising in electronic amplifiers due to non-linear distortion must be IN-HARMONIC too!

Moreover, it is easy to imagine that the various amplification elements such as vacuum tubes, FETs, MOSFETs or bipolar transistors exhibit different grades of in-harmonicity under various operation conditions. Curiously, I have never come across a single scientific paper dealing with a notion like *in-harmonic non-linearity products of amplifying elements* (although the measuring tools in the digital age are sufficiently resolvent for a revealing analysis of the conditions). The concept of in-harmonicity seems to be totaly unknown in the field of audio electronics until the present day.

But what happens to IN-HARMONIC distortion products (overtones) under negative feedback ???

Their amount is reduced, that is certain, as it is clearly shown by common

distortion measurement (a measuring method which is much too rough to ever detect or even quantise in-harmonicity). On the other hand, it is equally certain that the reduction of overtones via negative feedback as demonstrated by the standard theory with the aid of Fourier series transformation COLLAPSES if one declines the perfect integral multiple assumption. This naturally gives rise to questions like...

Does negative feedback reduce distortion products at the expenses of other still UNKNOWN sound degrading effects???

Is it possible to extend the existing theory of linear distortion in a meaningful way if one introduces the concept of in-harmonicity???

Which technical and psychological effects result from in-harmonicity in audio???

Do vacuum tubes exhibit lower in-harmonicity than solid state devices???

Well, having evaluated all vacuum tube based circuit topologies one can think of as a practitioner over the years, by ear, I found that balanced technology and negative feed-back are sound degrading concepts. So I decided to stay away from these concepts and devote myself EXCLUSIVELY to single-ended no-feedback topologies. The sonic coherence and beauty attainable with this kind of circuit architecture is simply matchless.

THÖRESS is not about dogmatic tube design. At a rather early stage it became clear to me that I had to melt together the ancient and the new technology, so to speak, in order to reach the very top of performance. So I freely dispose of the whole palette of ingredients and spices the universe of electronics offers to me. As a matter of consequence, in my circuits vacuum tubes are usually complemented by light emission diodes, MOSFETs or bipolar transistors as side elements, in this way providing the tubes with optimal operation conditions so as to let them perform at their very best. An approach which could be classified as

CONTEMPORARY SOLID STATE INTERLEAVED TUBE TECHNOLOGY

and should not get mixed-up with the more common vacuum tube transistor hybrid technology, where tube and transistor stages are merely combined as modules rather than interleaved.

Nevertheless, my amplifiers are made in meticulous hand construction using CLASSIC point-to-point wiring techniques. Integrated circuits and printed circuit

boards are strictly forbidden, except for remote control purpose!

TRANSFORMERS...

All THÖRESS Amplifiers are equipped with proprietary mains transformers, output transformers (OPTs) and filter chokes made in-house to the highest possible standards. This allowed me to tailor the OPTs to perfectly suit the circuits and keep full control over built quality. In case of the mains transformers this ensures maximum reliability, deadly quiet operation and low leakage field emission. Apart from that, it enables me to readily design and make dedicated power transformers for all kinds of mains voltages such as 100Vac (Japan), 220Vac (South Korea, China, Thailand, Russia, Indonesia) or 245 Vac (Australia).

APPEARANCE...

All components which nowadays form the THÖRESS product line have been initially and primarily developed to serve my own needs. So their appearance display my attitude and personal taste. I want my speakers and amplifiers to get percepted as apparatus, Puristic Audio Apparatus as I call them. Tools meant to serve committed music lovers to broaden their musical acquaintance. Rather than status objects or fancy toys for showing off. Whereas I imagine my speakers to represent neutral, timeless pieces of furniture. This attitude naturally dictates a form-follows-function design approach. The undeniable more or less subtle retro touch my products emanate are understood as a tribute to the tradition of professional audio components from the early times of HiFi which I always considered as a major root of my own approach.

Greetings to all music lovers world wide!

REINHARD THÖRESS