Techniques, Acoustic, Characteristics and Music

When the sound becomes art

TRANSLATION IN PROGRESS
"First outline"

ENCEINTES ACOUSTIQUES
DE PRESTIGE

REHDÉKO

The world Reference of musical Realism

EDITO

Source of countless pleasures, our hearing is all the more perfect that it can be easily misled.

For example, let us take the ten best current loudspeakers and compare them.
Each one will charm us to its specific features but, undeniably, if we switch from one to the other, the sound will completely change. Each loudspeaker has its own sound which is more or less close to live music.
But which one is the closest to reality?

In addition to this question comes the sort of music we prefer in order to select which type of loudspeaker we are going to purchase !
You like classical music ? It will be necessary you need a certain type. You like jazz ? It will be necessary you need another type. You like modern music ? It will be necessary you need a third type. And if you want a home theater system, it will be necessary you need a new type !
And if, foolishly, inopportunely, you like various sorts of music, and in more home theater, what is to be done ?

So, after having solemnly decided on the "musical speciality" of our loudspeakers, we can finally make our choice.
Then we have to face the problems of the position, power, efficiency, distortion, reproduction quality at low level, dynamic, final listening in our flat... !

But return to source.

Does live listening of an orchestra present the same disadvantages ?
As spectators, depending on the country or personal tastes, we ask the conductor : " More bass, please ! " or " A bit less brilliance, thank you ! " or do we listen, simply and internationally, the same musical and orchestral quality ?

On the other hand, and if they are well used, do not the new processes of recording tend to be also closer and closer to the sensation of the direct, without sacrificing the sound fidelity to the profit of "trafficked" sound accordind to the "acoustic modes" ?
Of course so.

It is this same choice that we have follow, since several decades : reproduce the most authentically possible the live music.

And this is why, today, loudspeakers REHDEKO are considered as the world reference of musical realism.

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A TREMENDOUS WEEKEND !

Evening Friday, I have been going to see the last very spectacular film !

It was tremendous ! All the hall of cinema vibrated to each explosion. We were transported in the action and taken by a real resonant surge that stunned us to each instant. It is necessary to tell that the woofers were not spared ; whole trembled, and we too !! At the end of the film, we are "knock out" by these terrific acoustic attacks.

The next morning, I have gone in my video-club to buy this super film. I have profited some all the afternoon thanks to my home theater equipment. The sound was not as strong as to the cinema but what resonant effects and what bass ! My cones woofers moved at least 2 cm. It is mad ! All my room resonated and my head also !!

To change my ideas, the evening Saturday, I have gone in disco club. I like well to go in this disco club. I find there the same sound that to the cinema or that with my home theater system.

I like super bass and there, I am served, they push the bass to make burst your ear-drums. It is brilliant !

When I go out this disco club, I was super excited and, to remain in the atmosphere, by driving, I have put to the maximum the bass of my equalizer. Haaa, the bass "super hammer", what pleasure !

Perhaps tomorrow I will return to the cinema. It is so well these bass that dissarange the hair !!!

REHDEKO AND THE BASS

Our days, we assist a real auditive deformation, mainly, to bass frequencies.

Without generalizing to 100% - happily ! - we can assert that in many areas : sound equipments, discothèques, cinemas, current music concerts, electrical instrument amplification..., the sound is trafficked totally abnormal manner, with bass dominators and pushed to the extreme, without speaking the other frequencies !

The mode of the home theater with its parade of films with great sound effects, serves as springboard and multiplication to this catastrophic bass amplification.

In this type of films, and of course with a petrfect audio-vidéo installation, the simple sound of a closed door gives you a shock of bass and you vibrate until your interior !

What tell when there is an explosion ?!... And, unfortunately, when there is music !!...

When we exit a such spectacle, if spectacular and succeeded is-it, we are totally "crazy" by the avalanche of frequencies, noises and deshumaned sound.

This type of listening become the "reference sound" on which all loudspeakers must to be aligned if they want commercially subsist, with bass totaly idiots.

A lot of listeners think that "the quality is there ".

And they want to find these sensations "physico-vibrato-auditives" in all there listenings !

If we go in a discothèque with a similarly style, to unwind us, all is good !

But after if we go in a live concert, classic, jazz, folk, without sound equipments, solely acoustic, therefore purely authentic, we risk to be totally disoriented, of course : the instrumental reality, acoustic, natural, is a totaly other way. We are almost in an "other world", a harmonious and true music.

But begin with the beginning !

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BASS FREQUENCIES AND INSTRUMENTS OF MUSIC

In definitive, the alone and true base on comparison is found in reality.
It is necessary to know the source of things.
And, in our case, the source of things is in
acoustic musical instruments specialized in bass frequencies.

Do you know that, in instrumental family, there is only a tiny part of musical instruments who goes down really low in frequencies (by preserving LA 440 Hz).
We can count them on fingers of an alone hand :
1) The great organ that, if it is equipped with a pipe of 11 meters, the famous 32 feet,
goes down to 16.4 Hz.
2) The great concert piano that, generally, goes down to 27.5 Hz ; without fogeting the unique case of the majectic Imperial Bösendorfer piano that have 9 supplementary touches and that goes down, as the organ, until 16.4 Hz.
3) The great harp can goes down to 36 Hz.
4) The bass goes down to 40 Hz.
5) The contrabassoon goes down to 33 Hz.
6) The Imperial tuba goes down to 42 Hz (again more lower, if the instrumentalist is capable !).

There are again some ethnic musical instruments such the great asiatic gongs (2 meters of diameter), the bass balalaïka, some rare African percussions that go down in frequencies more their sizes are imposing, without forgeting our familiar symphonic bass drum (1.5 diameter meter,at least).
And it is the end !

Thus, on the very great number of different musical instruments, alone a tiny part is specific to the bass register and two only are specialized in the extreme bass.

It is a tiny percentage compared to the great quantity musical instruments.

Without forgeting that all these bass instruments play more often highest frequencies than lowest frequencies.
Example : during a solo of bass, the musician will not play in permanence the 40 Hz ; the quasi-totality of his solo will be constituted of more high notes.

In summary, there are few musical instruments destined for bass frequencies and, during the utilization of these same musical instruments, their very bass register will be requested only from time to time.

In classical orchestral scores, bass instruments are always used as "rearguard" musical instruments, for "musical depth".
They are never put front, never dominate and do not "crush" other musical instruments.

Some classical scores of Berlioz, Mahler or Richard Strauss, offer short orchestral passages with bass imposing (and precise !).
Otherwise, instrumental bass frequencies do not dominate the orchestral totality.
Bass musical instruments are always to "sustain" the orchestra, with an extraordinary manner.
Without more !

In jazz musical scores, folk and other acoustic musics, we find the same constant : the bass do not dominate the instrumental totality.
And even during a drums solo or a bass solo, extreme bass represent only a little percentage of the specter of these musical instruments.

On the other hand, what dynamic capacity is necessary for loudspeakers to be able to reproduce these sounds with accuracy !

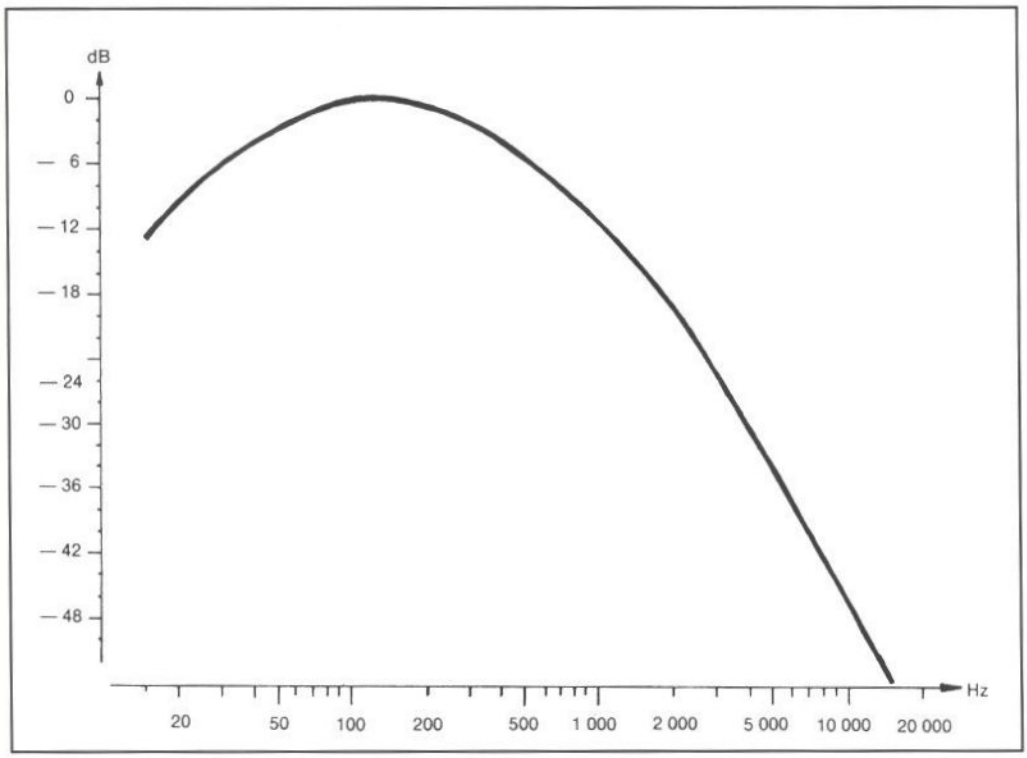
What do you think with actual "high figh" sound ?? !!

In to-day sounds, even in high-fidelity, the bass are "pushed in before".
They occupy easily 15 to 20 % of the total musical register.

More, with most home theater amplifiers, very bass frequencies (inferior to 180 Hz) are intentionally increased of 10 dB (for the bass loudspeakers).
This increase is huge.

Nevertheless, we can likel ive music and also home theater !
Then try our loudspeakers with a quality home theater system and you will not have heard a sound so realistic,a dynamic so exceptional and a bass powerful, deep, but always remarkably authentic !

★★



"Specter" of a symphonic orchestra.
This curve shows the instrumental amplitude of the orchestra.
These amplitude have been memorized (integrated in time) during about fifteen minutes.
The essential event that we want to prove, it is the diminution of the extreme bass level .
This diminution is constant and idem with a jazz orchestra.
It comes from the rare musical instruments who go down very low in frequencies and that, no playing all the time in this register, entail inevitably this decline of level in this zone of bass frequencies, decline normal and so natural !

ACOUSTIC PRESSURE OR WIND PRESSURE ?

In majority, actual woofers have a very flexible suspension of their cone.
They "move" a great deal and are sometimes exposed in spectacle to the public which is always avid for enthousiastic sensation !
However, elastic performances and musical reproduction quality have nothing in common !

Consider some bass musical instruments whose we have spoken later on. Which of these musical instrumenrs produces wind ? None !

Contrabassoon goes down to 33 Hz, Imperial tuba to 42 Hz. This are two "wind" musical instruments but they do not produce wind in your face ! Elsewhere, this is entirely impossible since it is not with such small ports (beaks or mouthpieces) as an instrumentalist can arrive to create wind.
A big drum, when the mallet knocks the skin, does not create any wind either.

It is created just a disturbance of the mass of air and not an impetuous breath.

Imagine poor instrumentalists if they are obliged to create as much wind as the loudspeakers that are going to reproduce their execution, what symphonic tempest !!

A musical instrument does not create any wind.

It gives us what we can call an acoustic pressure, an excitation, a vibration of molecules of the mass of air, and not a perturbation and a strong disturbance of this air molecules.

A natural sound that propagates in the space does not displace practically air molecules.
Thus, a sound very few audible will be produced by a variation of 19^{10} of the normal pressure, and a sound, sufficiently strong to provoke an auditive pain sensation, will be produced by a variation of 14^{10} around the average pressure.

On the other hand, conceming the cone suspension of a woofer, the theory wants it must be very flexible, and able to move a lot. And there, inevitably, this is no longer a simple vibration of the mass of air that is created but a chaotic and huge displacement of molecules of the air, as would make a fan or even better a compressor !
There is no longer acoustic pressure but "air pressure".
And this too important flexibility is not only responsible of the wind, but also for an incorrect and imperfect reproduction.

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CONSEQUENCES OF CONE DISPLACEMENTS

As we come to see it, all cones that displace a lot in bass frequencies create a big disturbance of the air, a very great air pressure.

However, that contributes incontestably to warping measurements.

Thus, when plotting a frequency respons curve of a loudspeaker, the microphone, situated in front of the loudspeaker, is as much influenced by the air pressure (the wind) displaced by the woofer that by the real acoustic pressure.

Then the curve is also influenced since it is a paper representation of what the microphone receives ; and the dB level is higher, not by the alone acoustic pressure of the loudspeaker but because of wind displaced by the woofer, wind that will influence the microphone, not only to 1 meter in front of the loudspeaker (as wants the norm), but also to several meters of distance !

Let us take a very simple example for illustration : a good microphone connected to a tape recorder.

If we blow softly in the microphone, without producing any sound, the influence of the wind is going to make "knock" very strong the VU-meters of the tape recorder.

Acousticaly, the noise will be quasi imperceptible but, physically, the blow will entail an important flicker of the cone microphone due to air pressure and hence a strong increase of the dB level on the VU-meters.

It is exactly the same phenomon that poduced with all traditional woofers.

During a measurement, the great cone beats create wind pressure, this wind pressure influence the microphone, and there is an increase of several dB with low frequencies level.

This increase is only fictitious since it is created only with the wind displaced by the cone.

In the final analysis, we think to have bass and extreme bass, but this are only "false" bass, "ghost" bass, "artificial" bass, wind.

This is not the exact acoustic pressure that we hear (or measure), but the noise of the soft beating of the cone, that of its air mixing, or that of its mechanical shaking.

The woofer specific resonance itself (the low frequency which the cone overrides) will also tend to amplify this "good" low frequencies effect.

There is thus an "illusion" of bass, both in measurements and in listening which has very little in common with a live audition.

So in the study of musical instruments, varnishes, noble materials, or vibratory problems, or sound propagation, our researches have achieved their objective : THE REHDEKO'S CONE TREATMENT.

Very briefly, it does not concern the daubing of a mediocre material pompously qualified and applied on a commone cone.

It concerns the discovery of different varnishes and pastes, only make with natural material, not to be "green" or "poetical" but because alone natural and noble materials are capable to reproduce the exact sound harmonics.

Cones in synthesis materials , optimised or no, never can give a musical result so realistic.

Treatments that we realize impregnate perfectly our exclusive cones of all our speakers, in several well definited areas, specified by new laws discovered within our laboratories.

The application of our inventions (patented in the whole world and this, until Japan - we are the alone French inventor, in our job, to have patent in Japan !), leads to fantastic actual results :

- An almost inexistant displacement of all our cones, including those of our woofers, thanks to a cone self control.

- The complete removal of crossover filters from the woofers. All our woofers are "full range" and go very high in frequencies with acoustic attenuation.

- The elimination of phase distortion, which is inevitable to the use of these crossovers.

- An exemplary rigidity of all our cones, without deformation of their surface ; cones which we are able to keep thin and light (a heavy and thick cone offers very bad acoustic performances).

- The elimination of the specific disphasing of the cones, inevitable with all flexible suspensions, and cause of an important acoustic blurring.

- A constant quality over time with all our cones and their mobile equipment.

- An incredible impedance regularity.

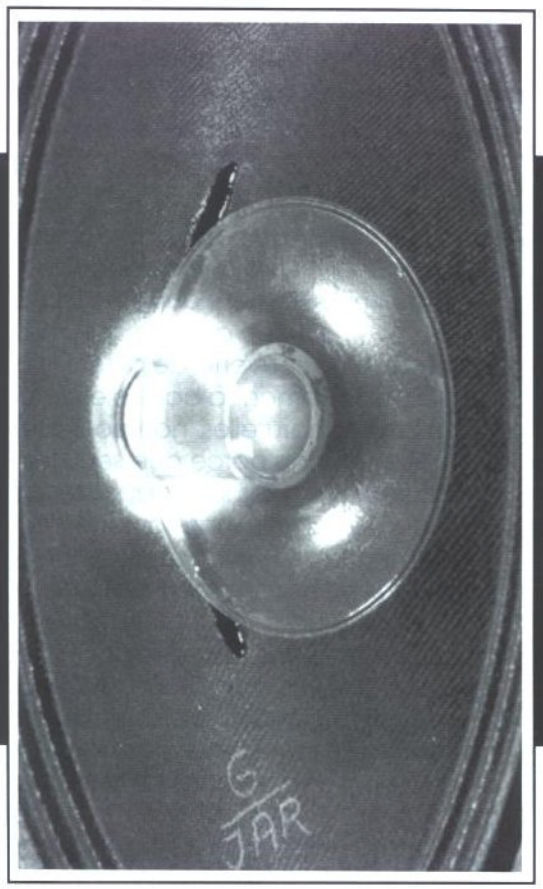
- A steady reproduction quality at very low as well as at very high levels (which is never the case).

- A lightning dynamic and transients respons !

- An extraordinary sensitivity of all our cones that react to the slightest sound informations and hence do not omit all musical details, so little they are.

- And the most important : THE NATURAL RECONSTITUTION OF FUNDAMENTALS AND HARMONICS OF ALL THE ORIGINAL TONES, OFFER AN INCREDIBLE AND REAL APPROACH TO LIVE LISTENING.

★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★



THE FAMOUS REHDEKO TWEETER WITH SUPRA EMISSIVITY

REHDEKO TWEETERS, DEVELOPED IN OUR LABORATORIES, MATERIALIZE MANY YEARS OF WORK. THEY REALLY OVERCOME ALL THE DIFFICULT PROBLEMS WITH THE REPRODUCTION OF THE HIGH FREQUENCIES AND OBTAIN THIS EXACT SENSATION OF A LIVE LISTENING.

Whatever the type of tweeter we listen to, the trebles tones fade very rapidly as soon as we move away from its sound direct dispersion angle.
Hence the usual advice to place well in face, in the middle, at equal distance from each loudspeaker, to benefit from a maximal listening quality.
However the listener that occupies the "ideal place" is the only one to savor this "beautiful high-fidelity", the others having to content themselves with "sound crumbs" and a quality that decreases with the distance.

Indeed, when people are distanced of a loudspeaker, they know the disagreeable phenomenon of hearing only "bass hammer", strengthened more again to the woofer specific resonance.
On the other hand, during a live listening, in a good concert hall, for example, we can be sit in various places, even be far from the orchestra, and always benefit from the concert quality with the same sound perspective and low, mid-range and high frequencies balance.

The theory assert that with a large size traditional cone, it is absolutely impossible to reproduce correctly trebles.
It is true !
Such a cone is unable to reproduce them.
Therefore, more cones are small more there will be facility to make high frequencies.
With musical instruments, it is the same thing. Musical instruments for high frequencies are always little (example, the flute piccolo or the triangle).

And we are used to see circular shaped tweeters, with hemispherical domes, or with small sized cone. Sometimes other types of tweeters are used but they do not markedly improve sound dispersion or tone reproduction either. And often, their trebles are not very natural, hiss or skimpy, always directional.

With an exceptional turn round, the REHDEKO CONE TREATMENT has enabled us to create tweeters with great size cone and thus to reproduce the real acoustic pressure of tones with all their fundamentals and harmonics.

One must bear in mind that many musical instruments, specific to high frequencies, go down relatively low in medium, and that it is indispensable that the same unit be able to reproduce this specter, from the high medium to the last high pitched harmonics.

Therefore it was necessary to be able to profit from all resources offered by a large cone, while being able to control them for our application in the field of high frequencies.

This has been achieved with the REHDEKO CONE TREATMENT !

On the other hand, and due to the original research work carried out by REHDEKO on the sound dispersion of musical instruments, our laboratories have developed a "saucer" coaxial with the tweeter and high-medium cones.
This saucer makes one unit with the cone by the special support of the voice coil and results that derive from its utilization are absolutely breathtaking :

- Made from super light material , the saucer does not increase the weight of the tweeter mobile system, therefore does not hinder the cone effective reproduction.

- A perfect "structure/ resistance" compromise prevents all parasitic vibrations being able to be added to the musical original signal.

- An absolute neutrality as concern the reproduction and a total lack of coloration.

- A perfect phasing since saucer and cone follow each other integraly, without the slightest constraint.

- An incredible performance with the cone-saucer architecture : it is capable to stocked the sound energy, to amplify it strongly to avoid any high frequencies drop, and then to propagate it in all directions with a terrific radiance and this, up to over 40 000 Hz !

High frequencies are projected not only to the center, as usual, but all around the tweeter and the loudspeaker, with the same acoustic pressure, the same intensity, the same level of trebles that whith a live listening.
Due to this the musical quality remains exceptional not only at the front but also in all directions wherever the listener is.
More we go high in frequencies, more waves become small, in the order the centimeters.
For example, at the frequency of 15 000 Hz, the sound wave of a triangle will be approximately 2,2 cm.

The reputation of supra emissivity of our speakers is truly exceptional in the entire world !
During their tests of our loudspeakers many international journalists have writing with enthusiasm that they heard always a "extraordinary and communicative" sound even if they are in an other rooms !

And the sound dispersion of this small instrument is fabulous !
A simple note of triangle cross the orchestral mass and is hear in all the concert hall.

Thanks to the exceptional dispersion of our tweeters, there is no longer an impression of dullness, "sound wall" or "musical space" sadly delimited between two loudspeakers, but an absolute "musical bath".
There is no restricted listening area, we are "in" the music.
Music surrounds us !
The refinement and the riches harmonic of the high frequencies are truely striking !
And the rich and bright tone of a cymbal, the delicate sound of a triangle detaching from the orchestral mass, the fingers rubbing on guitar strings, the subtle breathing of a musician as well as a thousand and one other details detected by our ear are present, at their just value, from medium to extreme high frequencies, in a natural spatialization reconstituting sensations of the live music.

In addition we specifie that due to this quite astonishing supra dispersion of our tweeters, it is impossible to make measurements in the usual way : a single microphone, placed in face the loudspeaker, is totally incapable to capted all reflections of the combination cone-saucer.
Even with graph of a polar radiation diagram, with one or several microphones, it is impossible to make it, the technical equipment only picking up a small percentage of the percentage of radiated energy.

On the other hand, our ear that integrate sound energy in space and time, will recreate this live listening environment.

And it is the essential !

The human audibility threshold situates approximately at 20 000 Hz.
Most hear until 18 000 Hz, others hear truly until 20 000 Hz.
Some people hear beyond 20 000 Hz, but they are "phenomenon" !

In the family of musical instruments, there is only two whose last harmonics , the highest reach approximately 16 000 Hz : cymbals and triangle.
Other musical instruments (flute piccolo, violin...) can also reach 16 000 Hz, but this is not systematic.

We observe that our auditive system capacities exceed without problem instrumental frequencies and if a tweeter go in frequencies only to 18 000 Hz, it would cover largely the instrumental specter.

Our tweeters go in frequencies well beyond the human audibility threshold, they atteins 40 000 Hz ; but, in reality, they emit sound informations until more 100 000 Hz !
This incredible performance, for tweeters of this type, can seem irrelevant for instrumental specters, but in fact has been absolutely indispensable to obtain the exceptional measurement results within in the suite of this document.

Only our hearing is sensitive to the natural aspect of a sound and to its reproduction and dispersion in space.
It is true.

Nevertheless, there exists a number of measurements which are also able to determined qualities and defects of a loudspeaker.

Let us examine a few of them.

FREQUENCY RESPONSE CURVES

The frequency respons curve of a loudspeaker is the graphic visualization of a continuation of frequencies created by this loudspeaker.
The sound level is indicated in decibels (dB).
This curve is realized with a sine generator. It diffuse frequencies absolutely pure, without any harmonic. The frequencies are called sinusoids.
The sinusoids appear one after the other, simply, for instance in a range from 20 Hz to 20 000 Hz.

It is the easiest measurement. Indeed, most of the hi-fi loudspeakers are able to reproduce each frequencies of the sine generator, these frequencies being separated and successive (one after the other : 100 Hz... 101 Hz... 102 Hz... 103 Hz...).

There is no difficulty to realize this graph and the most beautiful frequency respons curve, the most linear possible, is never representative of the loudspeaker musical quality which could be very bad.

WHITE NOISE AND PINK NOISE

A white noise is composed with all frequencies together from 20 Hz to 100 000 Hz, all of them being at the same height (dB), at the same power level.
This noise is slightly similar to the "hiss" of a tuner that we can hear between two FM frequencies.

A pink noise is very similarly, exept that all frequencies have not the same power level : there is a progressive diminution of the high frequencies, the attenuation reaching 3 dB per octave.
This pink noise is like to the noise of a very great waterfall at the foot of which we would be.

These measurements are useful to know the power capacity of a loudspeaker, its efficiency, its sensitivity, for example.
With all frequencies at the same time, they are more severe that the simple and poor frequency respons curve which only reveals the behaviour of a loudspeaker with frequencies that appear one after the other without the slightest harmonic.

Therefore, loudspeakers will have quite a very different behaviour with the risk of a total "sound excitation" of the cones that will have to make their better to maintain the pace !

THE THIRD OCTAVE FILTER

This measurement with a third octave filter is more recent : it concerns to tracea loudspeaker respons curve not with a sine generator (sinusoid frequencies without harmonics) but with a pink noise generator (with thousands of frequencies together).
For more precision with this measurement, the "global sound mass" of the pink noise is divided in 3 parts by octave (the name : third octave filter).

This method is absolutely more valid.
Indeed if a sine generator does not discern the behaviour of an operating loudspeaker during its musical reproduction; the third octave measurment enables to be closer to this musical reproduction since the cone has to create a multitude of frequencies at the same time.

Hence the sound qualities and defects of a loudspeaker will be better highlighted.

However this method can not be fully compared with the results of a live audition.

Why?

Because if each octave is split only in three parts , what is each part composed of ?
A world of others frequencies which create, modify, improve or alter the natural of a tone.
All these frequencies are ignored by the third of octave measurment.

Therefore this method, due to its principle, tends to "delete" the multiple sound incidents that happen at certain precise frequencies.

Despite its advantages, this method is insufficient.

MEASUREMENTS THAT SLICE !

As we come to see, a frequency respons curve is not valid, a third octave measurment is more valid but not enough.
So it was necessary to find a new process capable to analyzing total loudspeaker reactions during the musical reproduction.

For the first time in the world, we have found and experimented it in our laboratories, in the beginning of years '70, and this measurement is, today, utilized in the whole world.

These vanguard measurements are only capable to determine, without errors, the accuracy of sound reproduction of a loudspeaker.

THIS ARE ANALYSES IN HARMONIC

What is-it precisely ?

First we have to analyze the tone of a live performing musical instrument.
The sound produced, on a continuous note, is "dissected" by our Brüel & Kjaer equipments.
We can therefore see what it is composed : its fundamental and all its harmonics (the composantes that form its tone).
Then we reproduce this tone through a loudspeaker and we analyze the result without omitting anything.
So there is a visual comparison, without cheating, between the live performance and the reproduction.

This analytic measurement is decisive and pitiless.
It highlights the behaviour (good or bad)of the cones, the influence of crossover filters, of distortion...
It is the only really valid measurement to judge the musical fidelity of a loudspeaker, because harmonics are good or not and they are deformed or not.

When we practice this measurement with a woofer with cone flexible suspension we have the same defects whose we have spoken previously but more visible :

- great cone displacements = wind.
- wind = air pressure.
- air pressure = influence on the measurment microphone cone.
- influence on the cone microphone = artificial increase of fundamentals and bass harmonics (several dB solely with the air pressure).

This abnormal and artificial increase of dB, visible on the graph paper and on the screen, is solely with the wind displaced by the woofer.

Thus all graphs are always falsified in bass frequencies by the woofer air pressure (more at the woofer resonance frequency).

And with the listening, we do not hear the exact tones of musical instruments but tones highly deformed by the noise of the cone beats and the air displacement.

Falsified measurements and falsified listening...

THE REVOLUTION REHDEKO!

New researches, innovations, radical discoveries have allowed us to exit of the vicious circles of static and annihilated theory, to get creation of REHDEKO loudspeakers.

Our cone drivers work uniformly, by all their surface, without energy loss.
They do not reproduce falsified, inflated and artificial bass, but they reproduce all the bass, like they are, at their just sound height, without influence of wind and noise of great cone beats.
To the opposite of other woofers, our cone woofers have a controlled and minimum displacement and they follow rigorously the musical informatons, without errors.

And as proof of what we advance, we invite you to turn the page !

Indeed, proof of our results, we present below the example of a very low note, whose specter is plotted first as live and then reproduced by our loudspeakers : we obtain, as close as possible, all the musical instrument harmonics !

On the other hand, with a woofer with great cone beats , therefore excellent wind producer, we will have on the graph an increase of frequencies of 5 dB at least, until 200 Hz, comparatively to the live performing.

It is the undeniable confirmation that these "supplementary" dB are only produced by the wind displaced by the cone since they exceed easily the dB height given by the musical instrument himself.

Proof doubly confirmed by the graph of our loudspeakers, identical to the direct note and this, thanks to our cones that produce a real acoustic pressure and not an air pressure.

It is an incredible measurement because it proves that with a minimum cone displacement, we obtain the exact acoustic pressure of the tones and this until the lowest frequencies.

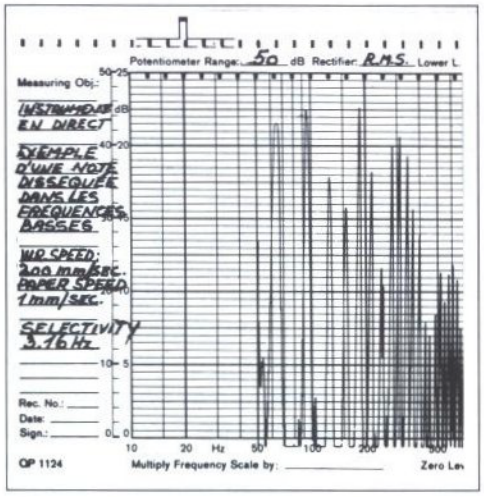
Our hearing is very sensitive to the respect of a natural sound balance of all the specter.

The enormous bass, to produce "more sound effect", distort totally the musical result, compared to live music.
And the positive reactions of listeners who like this type of "elephant" bass, explain it by the regrettable event that today many people listen a music reproduced (bad)and no a direct audition, a live and extraordinary audition of an orchestra.

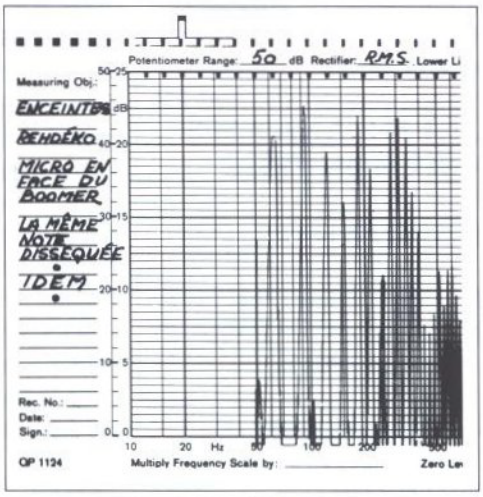
Thus a lot of persons accustom to a deformed sound and are very surprised when they hear a real classical orchestra or a jazz big band (without sound equipments !) ; because here, whole is balance and harmony.

In sound reproduction, it is necessary to have a respect of musical nuances, instrumental harmonic pitches, live music fidelity.

We sincerely believe thanks to the REHDEKO CONE TREATMENT and the other improvements brought to our loudspeakers, we have achieved the closest intimate relationship between reproduction and live listening.
It is also what international press think after have listened our loudspeakers !



Live performing musical instrument. Example of a note dissected in low frequencies.



Loudspeaker REHDEKO. The same note dissected. Microphone in front of the woofer.

Measurments realized with a filter whose bandwidth is constant, 3,16 Hz, i.e. in a very narow margin of more or less 1,58 Hz. All frequencies below and above are systematically eliminated. The severity of the analysis is all the more important.

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SQUARE WAVES MEASURMENTS

Now we speak of another type of measurement :
the square waves measurment.

A squared wave is visualized by a wave in form of crenel. A squared wave graph is like crenels of a castle ! This signal is composed of a fundamental frequency (as the sinusoidal signal) but, to this fundamental sound, a multitude of harmonics are added , all possessing a phase and a well definite amplitude (to the contrary of the sinusoidal that has no harmonics).
The squared wave is composed of two parts :
- A vertical part that necessitates, to be the most vertical possible, a perfect respons to high frequencies.
- An horizontal part that necessitates, to be the most horizontal possible, a perfect respons in low frequencies.

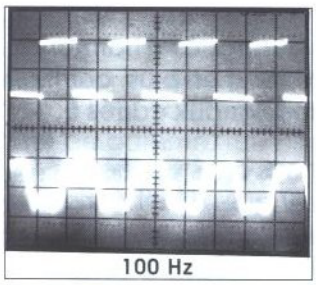
A squared signal is composed of the algebraic sum of its fundamental frequency plus the infinite number of its harmonics.
Easy to understand !
For example, if we limit this number to the thirtieth : with a fundamental frequency of 300Hz, we will have harmonics up to 9 000 Hz (= 300 x 30).
A squared wave with a fundamental frequency of 4 000 Hz will give us harmonics up to 120 000 Hz (= 4 000 x 30)...

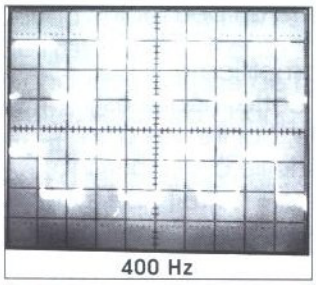
Consequently, due to the quasi unlimited number of its components, a square wave is much more difficult to reproduce.
Its correct reconstitution is very important because it is the proof that tested equipment accepts the totality of frequencies that compose this signal, from the extreme low frequencies to the extreme high frequencies.
Moreover it has a supplementary advantage because it informs us on phase distorson and transient respons.

Highly valuable in high-fidelity, these signals are ued to test amplifiers, tape recorders...

As concerns loudspeakers, they are totaly incapable to reproduce square waves and it is always replaced with the pure, no harmonics and hence much easier sine wave.
Being used to extending our researches to extrem limits we have achieved one of the most incredible success : we have obtained extraordinary square waves for loudspeakers thanks to REHDEKO processes.
Not on a single frequency, but over a multitude of frequencies.
Not in a well precise location, in front of drivers, without nothing elsewhere, but by placing the measurment microphone in a multitude of positions in front of the loudspeaker.
These results are the proof of one of the lowest phase distortion, a super extent bandwidth, an incredibly respected reconstitution of all harmonics , a terrific dynamics, an exceptional space dispersion.
Music in full dimension, as it has probably never been achieved.

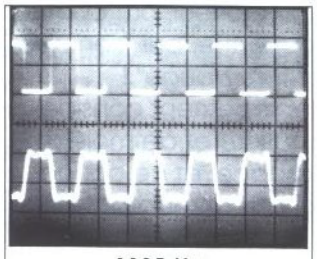
HERE WE PRESENT A PART OF OUR UNIQUE SERIES OF PHOTOGRAPHIES, ATESTING OUR EXTRAORDINARY RESULTS WHICH WE SUSPECT HAVE PROBABLY NEVER BEEN OBTAINED TO DATE WITH LOUDSPEAKERS EXCEPTED WITH REHDEKO LOUDSPEAKERS.

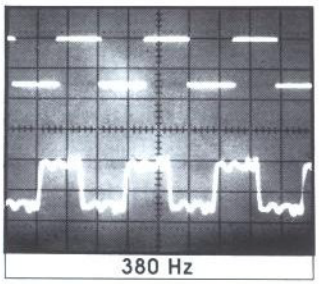

100 Hz

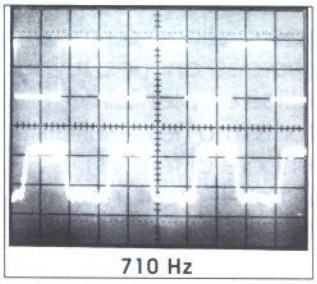

400 Hz

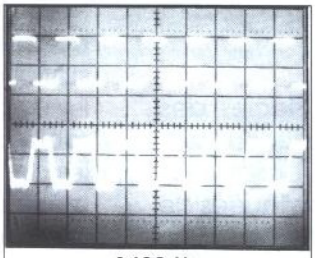
The 2 waves obtained have been taken strictly at the same loudspeakers output of the amplifier connected in parallel.
- The first trace indicates the amplifier respons and its perfect load with our loudspeakers.
- The second trace shows the loudspeaker respons (using a Brüel & Kjaer condenser microphone and the Brüel & Kjaer 2010 heterodyne analyzer.

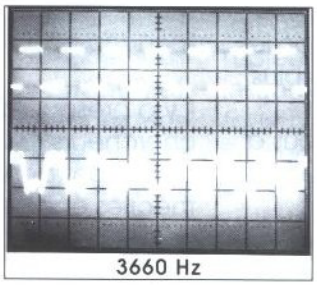
We wish to specify that, even under very high power, the square waves shape virtually remains unchanged and thus indicates a perfect power retention even instantaneously and one of the lowest distorsion rates.
Due to the very great difficulty of this measurement, the microphone has been located relatively near to the drivers, in order to eliminate any room influence.
We have voluntarily made these experiences in a normal room, so as to show that such performances have been obtained in a classic room and not "acousticaly appropriate".

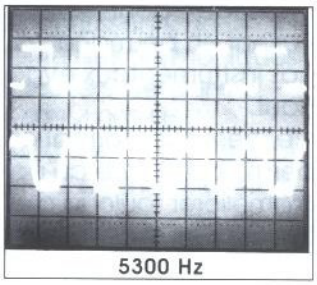

380 Hz


710 Hz


1115 Hz


1420 Hz


3660 Hz


5300 Hz

* * *

it is time that disappears this legend :

"good frequency respons curves = good loudspeaker"

Anyone having some experience with loudspeakers cannot deny that a frequency response curve is far from providing a fully correct idea of acoustic results that can be expected from a loudspeaker.
It is time to abandon the following myth :
"good frequency response curve = good loudspeaker".
This is absolutely wrong.

For many years now, as we have progressed in our research work, we have acquired a significant amount of datas on musical instruments, by analysing their components, the phenomena occurring according to whether an instrument is struck (percussions), or vibrated (strings, reeds, pipes), or used in pianissimo, mezzo-forte or fortissimo (the results are again different) ; then by studying loudspeakers, loudspeaker cones whose reactions are different depending on the above.
These "treasure" of informations have enabled us to develop and improve our techniques (REHDEKO cone treatment, used on such and such materials...).

Thus we have been able to obtain with our loudspeakers extraordinary squared waves and perfect graphs with fundamentals and harmonic, in all the frequency rangebut also whatever the tone analysed (voices, musical instruments...).

After these fantastic results, and by simple curiosity, we have plotted the frequency respons curve of our loudspeakers, according to the usual method : sine generator, sinusoidal frequencies, a single microphone placed to one meter in front of the loudspeaker.
And then... what surprise !

Our frequency respons curves were not linear !!
And it is with such curves that we obtain beautiful results for all the other measurements !

Then we have ask serious questions... Why these incredibe "phenomenons" ?!?!

But begin with the beginning.

There are two centuries, research workers such Fourier or Laplace, have posed bases of theories again applied to-day and notably the formula :

« Mathematicaly, the correct reproduction of all "transitory" functions entails a complete flat and linear sinusoidal functions ».
In other words, in our case, if the loudspeaker frequency respons curve is not linear with a sinusoidal graph, the loudspeaker can not reproduce anything correctly.

And here, in REHDEKO laboratories, we observe the contrary : with no linear respons curves, we obtain correct harmonic graphs and exceptional squared waves !

These facts stupefie us and demonstrate that, if the theory is formal, whereas from an experiment point of view it is no longer true ! Why is it so ?

With an amplifier, for instance, this theory is applicable because it is a phenomenon related to electrical current that "go" only in static electronic components.
However with a loudspeaker "nothing is static and all moves !".
There is a considerable displacement of materials and molecules in space, and this phenomenon is not comparable to the first.

More, many "acoustic facts" counter this theory.

Examine some of these facts :

1) A lot of actual loudspeakers have a very correct frequency respons curve.
We do not want enter in details on the manner whose they are plotted, because we can tell anything with a frequency respons curve ; it suffices to adjust at our advantage the paper speed and the writing speed to have the most linear respons curve in the world !
We do not speak of these curves.
Therefore, if a loudspeaker reproduce a good frequency respons curve, according to the "hard and pure theory", it would be able to reproduce also good squared waves and good transient respons.
This is never the case !
If we make measurements in squared waves, the quasi-totality of loudspeakers give execrable results, despite their good curves.
And the theory is contradicted !!

2) If we compare, in the same room, some very good loudspeakers, all having an identical and linear frequency respons curve, mathematicaly, they must to have the same musical sound even their curves are identical.
This is never the case !
To each passage of one to the other, the sound totally change.
And the theory is contradicted !!

3) Few years ago, a great hi-fi review has tested high end loudspeakers costing more 100 000 F.
This review shown the unique example of a squared wave delivered by these loudspeakers with the next legend : "Exceptional respons, in squared wave, with the loudspeaker X".
The frequency respons curve of these loudspeakers was not linear ! And it is necessary to believe that obtain a such squared wave was an event.
Contradiction with the theory !!

4) On the other hand, with some musical instruments, we can obtain squared waves : for example, with a trumpet with a special mute, or with a violin if we play just behind the easel.
And we can guarantee that there is no musical instruments with linear respons curves !

5) If we add to a fundamental three of its odd harmonics (combined with suitable respective phases) such harmonic 3, 5 and 7, the superposition of the four suffices to give a graph visually very closed to a squared wave signal.
More, the harmonics going until harmonic 10 sufficed to obtain a form of squared wave signal.
We are far from the theoretical linear sinusoidal curves !

One should not creduously imagine that the reproduction quality of a loudspeaker can be contained in a simple mathematical formula (this is all the more true with ours !).
Theory is one thing.
Experimental acoustic another !

Then we have the choice :

- Or we concentrate to obtain a frequency respons curve as linear as possible (what we have learnt and make, in the beginning) and the reconstitution of harmonics is bad and poor, therefore the sound is not natural but colored (to the taste of customers !).

- Or we choose the most difficult way and we prefer a correct reproduction of fundamentals and harmonics tones, with abstraction of the linearity of the frequency respons curve.

It is this way that we have chosen and we have gone more far !

The graph of our respons curves is not lamentable, it is simply different.
It look a bit like the curve of the hearing studied by Fletcher-Munson.
It approximately increases of 5 dB in the band of frequencies 500 Hz / 6 000 Hz, then approximately decreases of 10 dB, in sweet slope, gradually, until 20 000 Hz.
Due to the exceptional dispersion of our drivers, we trace these curves "point by point".

It is with a such respons curves that we obtain correct harmonics reproduction and squared waves !

How can this phenomenon be explained ?

In hi-fi term, frequencies bands are approximately :
bass correspond to frequencies inferior to 500 Hz, medium correspond to frequencies from 500 Hz to 5 000 Hz and trebles correspond to frequencies superior to 5 000 Hz.

Now with a good recording if we make the spectral analysis of a great orchestra with cords, winds and percussions, we observe a stupendous fact : the major part of instrumental harmonics situates in the band 60/4 000 Hz !!
Belove and above frequencies decrease more or less rapidly.

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So the tones major part is situated in the medium zone. And it is justly here, in this very important zone, that loudspeakers are the most defect with utilisation of crossover filters (that created always harmonic deformations) but also because of too great cones beats and enormous bass.

And it is justly why we have worked to suppress woofers filters and obtain a minimum cone displacement.

Facts are there.

It is in the medium part that situates the majority of tones. It is the most complex part of the specter for hi-fi reproduction. It is where a live orchestra gives the most important acoustic pressure and it is where reproduced acoustic pressure must be highest for a real reproduction high-fidelity.

Due to this infinite variety of harmonics that cones reproduce in permanence (for a symphonic orchestra or jazz for example) it is capital to have a highest acoustic pressure of some dB, in zone 500 Hz/6 000 Hz, as we obtain with our sinusoidal frequency respons curves. It is thus all harmonics are at their exact level, comparatively to the direct, during a harmonic measurments.

As concerns high frequencies acoustic pressure why should it decrease gradually, as we observe on our respons curves ?

We know that as frequency increases i.e. the closer to acoustic pressure acoustic pressureacoustic pressureacoustic pressure Hz the less harmonics we have and the more sine shaped they become.

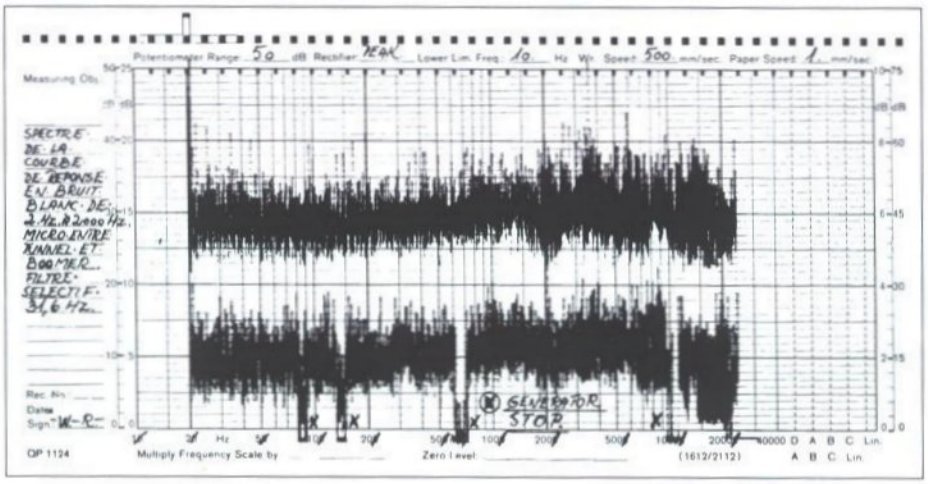
This brings about two things :
- First, an increase in directivity. We have radically solved this defect thanks to our supra dispersion tweeters.
- Secondly, if the sine respons curve is truly linear up 20 000 Hz, and if we make, in this case, harmonics graphs , the height of high pitched harmonics will be abnormally increased (compared with live analysis ; for example, with a knock of cymbal or with harmonics very high of a violin).

During the listening of a recording, the high frequencies acoustic level will be much too important compared to reality, and hence the high pitched notes on playback will be too aggressive being too emphazised, in other words absolutely not natural.

Consequently it is necessary to have this smooth grading of high frequencies on a sinusoidal curve to obtain a correct specter of highest harmonic. Of course, it is not a brutal high frequencies fall ! It is necessary that tweeters go very high in frequencies with this smooth grading of high frequencies.

We obtain that with all tweeters of our range, as we have explained, and too with our full-range driver that easily go to 25 000 Hz !

We have tempted an other original experience : we have arrived to trace the equal of a frequency respons curve, not solely with its sinusoidal frequencies but with a white noise and its thousands of harmonics, superposed to the sine signal (with a selective filter of a constant bandwidth of 31,6 Hz). This measurement, absolutely amazing, eneables the virtually real reactions of loudspeakers. It exceeds the poor information of traditional respons curves. Thanks to it, we can observe a great homogeneity of the whole spectrum even from extreme bass and have the confirmation of the excellent results of our loudspeakers at the other various measurements as well as to the listening.



* * *

And impédance curves ?

All current loudspeakers have, in principle, a 8 Ohms impedance. This impedance is become an international "norm" and 4 Ohms loudspeakers are rare on the market.

The regularity of the impedance is very important at the different frequencies as well as to different levels of power.
A loudspeaker impedance curve is plotted on the same principle that a frequency respons curve : with sinusoidal frequencies.

And there also, REHDEKO has put its salt grain !

Before to continue, once more we recall that the behavior of a loudspeaker is completely different when plotting a sine curve (one frequency at a time) or when the graph involves harmonics (many frequencies at the same time).

We have wanted to see how behaved truly the impedance of a loudspeaker during a musical reproduction.

But how to make ?

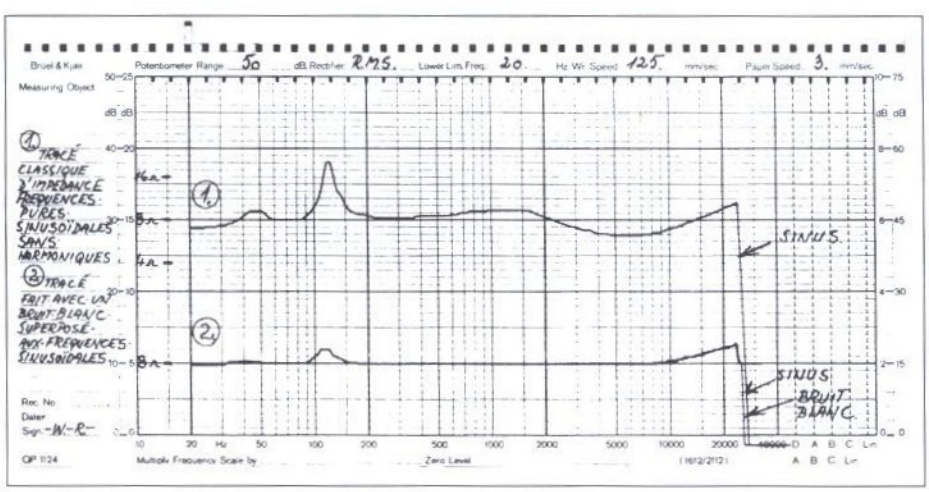
We invite you to look the double graph below :

- The graph n° 1 is a conventional graph of the impedance curve made using a pure sine signal without harmonic.
It is to be remarked that due to the slight cone displacement of our cones, the impedance is exceptionally stable and the graph quite regular.
It is a definite advantage for amplifiers.

- The graph n° 2 is a surprising graph that necessitates some explanations :
We have begun to trace normally the sine impedance curve and at the highest point of the curve (on the woofer resonance frequency or on a higher frequency of the tweeters) we have stopped the frequency generator and the plot.
Then we have take a musical instrument and we have played a note rigorously at the same frequency (the impedance hump)in a microphone connected to the measuring device, but this time with the two signals t the same time. (sinus + instrumental).
We have then observed a surprising fact : the impedance curve changes totally which is logical since there is now not only a single frequency but a multitude of harmonics at the same time and added to this sinus frequency.
Loudspeakers behaved all differently.

An single musical instrument is unable to cover the whole frequency range (of harmonics), we have used a white noise, obtained with Brüel & Kjaer 1405 generator.
We have superposed this white noise to the sine signal in order that these two signals could be delivered at the same time by the loudspeakers.
The two signals have been exactly pre-set to the same power level to avoid any predominance of one on the other.
And we have observed that the impedance curve changes and becomes not more tormented, but practically linear !

That mathematicians reassure them ! This experience is not to cancel mathematics theories concening impedance, but to show, once of more, than the behaviour of loudspeakers (and their impedance) ae different when we have an emission of harmonics. With this method, we can see virtually the behavior of the impedance, as during a musical reproduction.



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DYNAMIC & Transient respons

The attack of a bow on a bass strings, the sound impact of the mallet on piano strings, the shock of the pedal on a bass drum, the extreme bass of the organ where one could almost be able to identify the beats, the pizzicato of a strings instrument, a drum roll, the very fine sound of a brush over a cymbal, are all examples requiring perfect dynamic and transients of a very great perfection, from the lowest to the highest frequencies.

The dynamic is one factors of the most important for a quality reproduction.
The dynamic is the difference between maximal sound pressure and minimal sound pressure, in other words the difference between the extreme fortissimo and extreme pianissimo.

The scale used by musicians to graduate their "dynamic" instrumental comprises several levels, ppp to fff (p = piano or pianissimo ; f = fort or fortissimo).
Each level increases approximately 10 dB the orchestral or instrumental dynamic.
A symphonic orchestra reaches 100 dB during its interpretation, and even sometimes far more.

The sound level of a trumpet with a virtuoso musician can exceed 125 dB !

We have made ourselves incredible measurements in our laboratories.
For example, with a clarinet, by playing a real Re^2 the clarinet entirely closed, the microphone very near the pavilion,
we have obtained 128 dB !
More, by playing other notes, fortissimo, we have measured acoustic pressure by the pierces, the long of the instrument, and
we have obtained 134 dB !

Few people know truly the dynamic and real acoustic pressure of musical instruments.
And nevertheless, it is there, and there only, that been found the richness of all instrumental nuances.
Do not respect the dynamic and you have a very important deformation of the orchestral interpretation.

A high dynamic is indispensable to have a reproduction really high-fidelity.

Unfortunately, very few loudspeakers are capable to reproduce the exact dynamic. Their drivers are too slow to react. They are not apt to reply the most rapidly possible to all level changes, to all instrumental variations and the fallibility of their cones and their flexible suspensions entails a time of too slow reaction.

And the dynamic is very diminished.

All musical degrees, force or softness, are strongly reduced and the spectacular of a live listening disappears to the profit of a flat reproduction, well far of musical reality.

Phenomenon directly linked to dynamic, the transient respons is very important.

It concerns the accuracy of attacks, the time duration of a sound and the rapidity of its execution by the loudspeakers.

To obtain correct transients, the cone has to have an infinitesimal trailing time. It must return to its position immediately and be ready for the next pulse.
So how do you think that a flexible cone suspension can reproduce say the striking ups of a drum solo ?
That is perfectly impossible because the loudspeaker is too slow to react, its trailing is too important (it is too "soft" !) and the cone has not the time to return to its position as it is already activated due to the following pulses. The result is a completely weakened drum solo !

The transients must be immediate, precise, and stopped when sound stops.

With a cymbal, a triangle, a big drum, the percussion should be heard at the very moment the musical instrument is struck, followed by the sound persistence, and its fading to the last harmonics.
No more, no less.
One should "hear" the metal, the skin.
But these characteristics, if particular, disappear too often, since they are flooded within the acoustic fuzziness caused by the loudspeaker.

REHDEKO LOUDSPEAKERS REPRODUCE THIS DYNAMIC WHICH IS SPECIFIC TO LIVE MUSIC

Thanks to minimum displacement of all our cones, thanks to the self-control of their displacement, our drivers reply instantaneously to the most brutal attacks as to the subtlest details.

They respect, without alteration, the original program dynamic.

From extreme bass to extreme trebles, the wealth of nuances and flaming esthetics of music are fully reproduced, in width and in depth, with an sound extent, a relief and a separation extraordinary of each stamps.

EFFICIENCY and...

The average efficiency of current hi-fi loudspeakers is about 85 to 92 dB / 1 W / 1 meter.
It is the acoustic level that they give, for a power of 1 watt, measured by a microphone placed at 1 meter in front of the loudspeaker.
Very few exceed 95 dB.

And nevertheless, when we can added high eficiency with quality of reproduction the result is marvellous !

Let us take some examples :
- A loudspeaker has an efficiency of 85 dB / 1 W / 1 meter.
To reach 115 dB (as reached by a symphonic ochestra), it will have 1000 times more power !
- Two loudspeakers, different sensitivities, require to obtain 90 dB to 1 meter : the first, only 0,3 watt ; the second 2,5 watts. To reach 110 dB, it will be necessary to the most sensitive only 30 watts of power, while the other will require 250 watts !
The difference is huge.

It is quite interesting to seek loudspeakers having the greatest possible efficiency while preserving a certain listening quality.
Because, sometimes, good eficiency means only over excessive volume to the detriment of a truly high-fidelity reproduction.
So one must be very carefull !

To follow...

EFFICIENCY and... SENSITIVITY

Our research works, concretized by REHDEKO loudspeakers, have enabled us to obtain quite exceptionnal efficiencies :

from 102 to 106 dB / 1 W / 1 meter !!

To get 90 dB, we only need about 0,7 volt,
i.e. one fourth of a watt !!
(with a 8 Ohms loudspeaker).

These figures are practically similar with all our models, (1, 2 or 3 drivers).
Whereas normally the more drivers and crossover filters in a loudspeaker, the more watts it needs.

Due to this extraordinary efficiency of our loudspeakers, just a few watts are necessary to reach a remarkable listening leve, with a dynamic and a musicality preserved.

Clarinets are very rich musical instruments with harmonics. So we have taken a clarinet in SI bémol, by playing a real SOL^5 (a very high note), to 1 meter in front of the microphone (Brüel & Kjaer 4133), and we have obtained an acoustic pressure of 114 dB !

This is incredible and confirms, for a new time, the necessity to have loudspeakers with a very great efficiency, not directional, with large dynamic capacity, to does not alter the musical message.

On the other hand, with all traditional loudspeaker , when we listen softly, at little level, the sound becomes disagreeable : bass and trebles disappear largely to leave to the benefit of a little medium output.
The result is the well know listening fatigue.

Thanks to REHDEKO CONE TREATMENT and to the very high sensitivity of our drivers, our loudspeakers are able to maintain, whatever the level listening, a pleasant and luminous audition.

Soundt relief and musicality remain the same whether at low or high level, without this characteristic collapse with many loudspeakers.

Our loudspeakers preserve equally an even spectacular relief during a listening in mono.
In besides, each musical instrument tones of a same register are distinct and recognizable, by this exceptional separation of all musical tones.

The sound is refined, relieved of all acoustical impurities.
It remains only the Music, pure, beautiful, true.
And this to all listening levels.

A high quality luxury cabinets

Cabinets of the market are realized, in quasi-totality, with fibreboard panels or, a bit better, with medium panels .
Why ?
Simply by habit, facility of job and cost price ; certainly not for sound quality questions.

Nevertheless, this is not so bad since a good fibreboard panel can have an approximately density of 600.
This density, if it is important, does not make all.
In this type of particles panels there is so much paste that wood particles, sometimes more, and the paste is bad for the sound !

Then we have tried massive woods.
The oak, for example, has a density of 650 and gives good sound results comparative to these obtain with particles panels.

But it was insufficient for us.

Then we have turned to plywoods.
It exists some sorts but, habitually, they are built with poplar with a veneering of "gaboon".
There is also the marine plywood, denser, but too waterproofed and no good for the sound.

What make ?

We then ordered, exclusively for our productions and on a very precise costs notebook, a high density multi-layer plywood, solely realized from massive beech (French, because it is one of the best that exist).

We preserve advantages from a massive woods and optimised them.
These panels, veneering of the two faces also with beech for a homogeneous balance, have a 20 millimeters thick.

The final product which is beyond all the current products on the market reaches the tremendous density of 850 !

At what price...
But what results !!

A such wood was necessary for an absolute sound neutrality during the reproduction, while participant to the final musical result.

On the other hand, the process of manufacture of a normal cabinet is thus :
fibreboard panels of the size of the cabinet (as if the case was unfolded), three "fraisage" at 45 degree there where one must to fold sides, three lines of paste, one pastes the front, one pastes the back, and all is OK !
Most of these panels are veneered with a very beautiful plastic imitating perfectly wood.
Rapid buil, beautiful finish, no complication !

But this manner to make did not please us.
We have then made much better !
5 panels of our cabinets (the back and 4 sides) are individual, separated.
They are manufactured with a very great precision so as to insert one in others according to the told technique "strips and grooves".
Then, these 5 panels are put in a press and penetrate one in the other until to form a totality coherence cabinet.

TThe cabinet is then consolidated, strengthened.
Our knowledge in "lutherie", notably on harmony tables have a lot inspired.

Then the finish begins.

We do not like plastic veneerings then it is necessary "to support consequences" !

The finish of our cabinets been made in 5 stages :
3 rubs down, 2 passages to the stain, 1 varnishing, at last a beauty polish.
All entirely handmade.
A total luxury !

Simultaneously is realized the baffle-supports (panels where are screwed speakers).
They fix in the cabinet, by the front (after the fixation and the cablage of speakers, realized by us).
This manufacture of the baffle-supports asks a precision again more elaborate.
A little irregularity and they pass " in the boiler" !
Their finish is identical to cabinets.

Built with passion by "wood masters", in the tradition of great French furniture, our cabinets are luxurious on each of their faces.

The wood choice, the nobility of the work, the remarkable finish, make a very high quality of our cabinets.

They are not just ordinary mass-produced cabinets but the result of a patient and long work, the fruit of several centuries of tradition, therefore high quality.

It was necessary for us and it is what we have, for all our production.

The "Piédestal" Stand Rehdéko

During a concert given by an orchestra, in a non specialized hall, we are on the same plan that musicians, sat in front of us.

According to you, what height are found musical instruments "in action" ?

The position of a piano keyboard is to 70 cm of the ground, approximately. All the other instruments, without exception, are situated higher : winds , cords (violins, altos, guitars... and even cellos or basss that rest always on their peak), percussions (always posed on supports of at least 50 cm of high : kettledrums, cymbals, big drum...) without tell the organ, instrument in height by excellence.

In besides, in a true concert hall, musicians are installed on a heightened scene of approximately one meter and their instruments are therefore again more high !

We do not speak the opera, where musicians are found often in the "pit of orchestra" in order that the music comes down and does not dominate the singers situated on the scene.

Then why placed loudspeaker on the ground and even column loudspeakers ? That represents a " non-sens" compared with the real musical instruments position.

Very few have understood the importance of loudspeaker stands and the real height that they would have for an optimal musical reconstitution.

It is our habit to the concert that has brought us to the idea of an ideal loudspeaker stand, to which have given the name of "Piédestal".

As for our cabinets, this stand is built in the great tradition of "wood masters".

It is entirely realized from massive beech (French).

It is composed with two trays of thickness of 3,5 or 5 cm.

These trays have the dimensions of our different basis loudspeakers.

They are united by 4 "pilastres" (of section 6 x 6 cm), pegged and pasted by the interior so as to keep a perfect external aspect.

The ended stand has a 60 cm height.

What wants to tell that, when our loudspeakers are installed over, we have the ideal height : virtually, musical instruments "in action" in front of you.

The "more acoustic" that it brings are undeniable. And we find, how so much, advantages of a noble matter.

High quality, the REHDEKO stand optimised indisputably the musical quality of all loudspeakers.

The wood quality, the perfection of the anti-vibratory fixation, the ideal height, the luxurious finish, make, really, an essential complement.

The Rehdéko Interfaces

What are interfaces?

Whole simply small isolation platforms, in specific materials, that one places under loudspeakers or under an amplifier, a CD player...

To the contrary of spikes that do not bring always an improvement to the listening, interfaces bring always a "more acoustic".

Fruit of a very elaborate study of materials, resonances, vibratory absorption rates, connections between different materials retained and especially of the respect of the tones harmonics, we have developed a three range models of interfaces : for loudspeakers, for amplifiers, for CD players. All is interchangeable due to the products of the market.

The improvement is exceptional : best instrumental separation, bass improvement, more perceptible details, better spatialisation, tones more natural, harmonics preserved (and not deformed).

Brief, a small indispensable element for a great improvement to the listening !

All our Range benefits from the same advantages of manufacture

- Cones and treatment products only realized from noble materials. We manufacture all our varnishes, pastes... from "natural" products and not synthetic products.
- Different specific REHDEKO cones treatment according to the drivers and models of loudspeakers.
- Ultra stiff die cast chassis, non resonant, in aluminium or zamac, for all our woofers and full-ranges.
- Woofers and full-range drivers without crossover filters : a guaranteed in excellence phase and an harmonic tone structure perfectly respected.
- Elliptical tweeters and high midranges with supra-dispersion (with a "saucer" coaxial with the cone but forming one unit with it) ; for an absolutely natural and omnidirectional dispersion.
- Symmetric mounting of tweeters and high midranges for a more attractive sound image.
- High quality high temperature voice coils.
- Polypropylène condensers of very high musical performances, studied by our laboratories and exclusively manufactured for our tweeters and high midranges.
- Fixation of drivers on metal inserts (BTR screws) with gasket giving a perfect coupling with the baffle-support.
- High definition wiring (DNM and REHDEKO) soldered directly onto the gold plated drivers terminals.
- Strip connectors fitted with gold plated sockets and force fitted into a thick brass plate.
- Gold plated laboratory multilam plugs (Ø 4mm) with 10 twisted multilam louvers (top professional connectors well above standard quality).
- Special mounting with front fixation of the drivers baffle-support.
- Elimination of "edge fringing effects" (parasite reflexions at the edges of the cabinet).
- Specific absorbant covering to avoid the spread of sound waves inside the cabinet.
- Exclusive solid beech cabinet work transformed into multilayer plywood with a thickness of 20 mm reaching the exceptional density of 850 !
- Genuine wood veneer on all sides (both inside and outside) as well as on the loudspeaker baffle-support.
- Very rigid removable front panel with milled edge for a better spatial dispersion and covered with an acoustically transparent material.
- Color : the natural beauty of the beech tinted brown or deep black.

AND THE GUARANTEE...

We guarantee 5 YEARS our loudspeakers, "covering parts and labour against manufacturing defects, in normal utilization conditions" according to the formula !
But, the simple fact that we use only the highest degree of quality for all our materials, in addition to the drastic controls of our laboratories on all the production, we can insure constant technical and musical performances, as those of prestigious musical instruments.

28 INTERNATIONAL SALES YEARS CONFIRM IT WITH FORCE

Nevertheless, we reserve the right to modify characteristics and models without preliminary notice, in accordance of the development of our researches.

THE REHDEKO RANGE

RK 115

- Drive units : 1 full-range driver (Ø 26 cm)with treated and metallized cone for high frequencies.
- Efficiency at 1 meter with 1 watt (2,8 V) : 104.5 dB ! Pink noise : 99 dB. White noise : 100 dB.
- Frequency respons : hyper extent (proof is, our comparative graphs in harmonics and squares waves that we obtain).
- Total harmonic distortion at 50 - 500 - 1,000 and 5,000 Hz :
  with 2.8 V : 0.6% - 0.4% - 0.08% - 0.3%.
  with 0.5 V : 0.39% - 0.035% - 0.032 % - 0.073%.
- Effect power : 15 W.
- Repetitive peak power : 80 W.
- Impedance : 8 Ω.
- Dimensions (H x W x D) in cm : 42 x 34 x 28.
- Weight : 11 kg.
- Use : must always be raised off the floor. Recommended special REHDEKO stands.

RK 125

- Drive units : 1 full-range woofer (Ø 26 cm), 1 elliptical tweeter (12 x 19 cm) with supra-dispersion (with the famous REHDEKO "saucer").
- Efficiency at 1 meter with 1 watt (2.8 V) : 102 dB ! Pink noise : 99.5 dB. White noise : 100 dB.
- Frequency respons : hyper extent (proof is, our comparative graphs in harmonics and squares waves that we obtain).
- Total harmonic distortion at 50 - 500 - 1,000 and 5,000 Hz :
  with 2.8 V : 0.7% - 0.6% - 0.09% - 0.1%.
  with 0.5 V : 0.35% - 0.084% - 0.022% - 0.07%.
- Effect power : 25 W.
- Repetitive peak power : 100 W.
- Impedance : 8 Ω.
- Dimensions : (H x W x D) in cm : 61 x 34 x 28.
- Weight: 15 kg.
- Use : must always be raised off the floor. Recommended special REHDEKO stands.

RK 145

- Drive units : 1 full-range woofer (Ø 26 cm), 1 high midrange (12 x 19 cm) with REHDEKO "saucer", 1 elliptical tweeter (12 x 19 cm) with supra-dispersion (with the famous REHDEKO "saucer").
- Efficiency at 1 meter with 1 watt (2.8 V) : 102 dB ! Pink noise : 98 dB. White noise : 99 dB.
- Frequency respons : hyper extent (proof is, our comparative graphs in harmonics and squares waves that we obtain).
- Total harmonic distortion at 50 - 500 - 1,000 and 5,000 Hz :
  with 2.8 V : 0.8% - 0.8% - 0.29% - 0.28%.
  with 0.5 V : 0.46% - 0.08% - 0.079% - 0.064%.
- Effect power : 45 W.
- Repetitive peak power : 150 W.
- Impedance : 8 Ω.
- Dimensions (H x W x D) in cm : 66 x 39 x 29.
- Weight: 18 kg.
- Use : must always be raised off the floor. Recommended special REHDEKO stands.

* * *

The prodigious

RK 175

SYMBOL OF THE HIGHEST DEGREE OF NATURAL REPRODUCTION THAT CAN BE ATTAINED WITH HIGH FIDELITY

- Drive units : 1 full-range woofer (Ø 30 cm), 1midrange-high midrange (Ø 26 cm), 1 elliptical tweeter (12 x 19 cm) with supra-dispersion (with the famous REHDEKO "saucer").
- Efficiency with 1 watt at 1 meter (2.8 V) : 106 dB ! Pink noise : 99 dB. White noise : 100 dB.
- Sensitivity : only 0.64 V for 94 dB SPL / 1meter
- dB obtained with orchestral measurements (classic and jazz), fortissimo, microphone at 1 meter : with 1 W : 109.5 dB ! - with 7 W : 120 dB ! - with 30 W : 123 dB !
- Frequency respons : hyper extent (proof is, our comparative graphs in harmonics and squares waves that we obtain).
- Total harmonic distortion at 50 - 500 - 1,000 and 5,000 Hz :
  with 2.8 V : 0.7% - 0.8% - 0.28% - 0.3%.
  with 0.5 V : 0.38% - 0.08% - 0.07% - 0.045%.
- Effect power : 100 W.
- Repetitive peak power : 300 W.
- Impedance : 8 Ω.
- Dimensions (H x W x D) in cm : 96 x 50 x 37.
- Weight : 36 kg.
- Use : must always be raised off the floor. Recommended special REHDEKO stands.

HARMONIC DISTORTION :

The harmonic distortions of our loudspeakers have been calculated at 1 watt (2.8 volts - impedance 8 Ω).

They are very low even when considering injected frequency. But in view of the exceptional efficiency of our loudspeakers (from 102 to 106 dB/1w/1m !!!) it is difficult to appreciate the results that are obtained when they are compared with other loudspeakers. So, we decided to resume these measurements with only 0.5 volts which roughly corresponds to the mean efficiency of current high-fidelity loudspeakers. The comparison of values is thus easier and more accurate.

All our measurements are made on Brüel & Kjær test equipment and more particularly with the famous "1902" control unit for distortion measurements (programs of measurements by computer can not give results as convincing and satisfactory compared with harmonics graphs).

* * *

Why ?...

Indeed, how have come these comparative harmonics graphs ideas, comparisons with true musical instruments, new analyzes so instrumental that technical ?
Why we have been precursors in this area of research pure, unexplored at this time, there are more 20 years !
At the origine, it is due to Weber Rehde, electronician engineer, sound engineer and virtuoso clarinetist.
But begin with... It was a time !
Born to Denmark, Weber Rehde makes an international musical career as soloist from the age of 9 years. Its father, Anders Rehde, himself virtuoso soloist, learns him the art of the music carried to its summum, but also the "lutherie" and secrets of the great factors of musical instruments of its time.
When Weber Rehde has 10 years, the king Christian X (king of Denmark) awards him his personal medal, what equals to our French Honor Legion.
Then, to the thread of years, he accepts to be professor of very high level in most reputed Conservatories. He is soloist, between other, to BBC as invited of honor. He continuous his international career as virtuoso clarinetist and conductor. He manage symphonic and jazz orchestras (his Big Band makes fury on radios). He records a lot of discs and realised quantity of radio emissions, in direct, of course ! He frequent the "great names" of the artistic world. He is requested by many conductors, as clarinetist soloist notably, because he play one octave higher than the UT (the higher note mentioned in tutors manuals), what is unique !
He is several times soloist to O.R.T.F., the "old" Radio-France. Then, he is bind by Radio-Luxemburg, as soloist, orchestra conductor, engineer and, sound fanatic, like sound engineer himself. He realizes many discs, films and televised emissions and spent 11 years in RTL. It is in these years that he invents the first reverberating microphone in the world that was sensation in international studios. Then, he develops the first reverberating loudspeaker in the world, used by all studios and professionals of avant-garde.
Then, he is director during more 5 years, of a laboratory of research at one of the greatest drivers european constructor.
Finally, in 1968, he decides to base his company : REHDEKO.
His son, Joël, comes to shoulder him from 1974. Himself is clarinetist and specialist in acoustic and technical instrumental.
They obtain, officially, several tens of patents, in USA, in Canada, in Germany, in England, in many other European countries, and even to Japan, unique fact in annalss of hi-fi French !
They develop special drivers for the research on the hearing, drivers for the aeronautic and how much others things.
It is this incomparable experience, marriage of an extreme musical knowledge and a pointed technological experience, that are born Rehdéko loudspeakers.
It is from there that had come all these new ideas.
And Rehdéko loudspeakers become the world reference of musical realism.