Misha Kucherenko On-Screen Interview

Gary Reber

Misha Kucherenko, known dearly to his friends as "Big Misha," is one of my best friends and teachers with respect to the appreciation of audiophile products and the listening experience. On my last three visits to Russia, he was my interpreter for my presentations at various audiophile and home theatre events. Misha has over two decades of high-end audiophile experience and his company, StereoPravda, is a distributor of leading-edge audio and video products in Russia.

While I prefer closed-back headphones for monitoring live recordings of jazz orchestras, and open-back for home listening, I must admit that I was enormously impressed with Misha's in-ear SPearphone SB-1, which I use both for on-the-go portable music listening and more, monitoring my live recordings.

The sound is well balanced and excels in fidelity, dynamics, and accuracy, while performing flawlessly with respect to spatial dimensionality, when listening through the Smyth R8 Realiser surround system. With proper in-ear fit, bass weight is excellent, extending deep, with excellent articulation. On motion picture soundtracks with intensely energized deep bass, the sound is strong and forceful, with superb transient attack and natural extended bass. Nuanced sonics, such as drum brush strokes and cymbals, are cleanly and articulately reproduced, and percussive instruments all have an extremely convincing level of impact, resonance, and decay.

Spatially, the SB-1 duplicates the all-Magnepan loudspeaker soundfield of *Widescreen Review*'s main reference system and delivers an exceptional holosonic® listening experience. The sonics are out-of-head and positioned precisely within the soundfield with dialogue, vocal, and instrument solos positioned center front, and sound effects and aggressive surround sonics localized in their respective channels. As such, the SB-1 delivers reference-quality immersive sound performance.

The full spectrum of sound is superbly balanced through the SB-1 in-ear transducer and delivers excellent midrange response, extended low-frequency response, and smooth high frequencies. The piercing high frequencies found on some headphones are not evident here. Instead, the response is balanced and smooth throughout the spectrum. The low-end presence is never overpowering or bloated, and is natural sounding. The sound is full-bodied, warm, and deep, and never fatiguing, with superb transient response. The soundstage is wide and deep, and layered, with good sound positioning outside the head. The sonics are never exaggerated and sound perfectly natural.

Overall, the SB-1 delivers an engaging and articulate natural and accurate sound with a smooth response throughout the entire frequency spectrum.

What follows is an interview with Misha on his audiophile experience with respect to portable listening and his development of the SB-1.

Gary Reber, *Widescreen Review*: What was the reason you decided to pursue the design of audiophile-quality, in-the-ear monitors (IEMs) or earphones?

Misha Kucherenko: There are several reasons. First, due to my lifestyle I've been always interested in portable audio. I spend a lot of time traveling and moving around using public transportation. So, not to waste all this time, my routine has always been to listen to music while on the go.

Second, every audiophile sooner or later will catch a "tweaking bug." As I see it, it's not simply an occupational malaise but the essential High End Audio's raison d'être. In his book *Listen To This* in an essay on the Marlboro-College music school, Alex Ross mentions famous pianist and long-term head of the establishment Rudolf Serkin's (in translation from the Russian edition of the book) "aspiration to reach a perfection beyond the accuracy—the truth of the most sublime and sincere effort." So, my own "sublime and the most sincere effort" demanded an outlet. For more than 20 years my home audiophile setup served as this outlet.

So, reaching a certain point in my audiophile endeavors with my Apogee Grand loudspeakers, Audio Research and Manley electronics, some MSB digital source components and the best Stereolab cables, any further positive developments in "Big" audio would require an investment, which currently, I cannot afford. If in "small" audio to hear an improvement I need to spend, say, a hundred dollars, then to hear a sonically equivalent improvement with my "big" audiophile setup I need to invest no less than a hundred times more.

The third reason is that I could do all my work on the IEM project at my own kitchen

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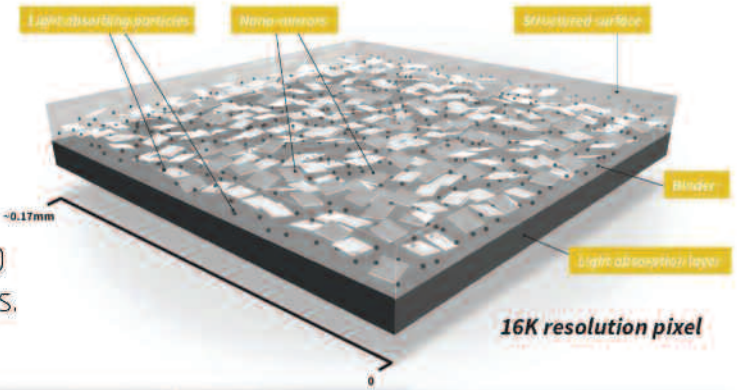

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table with minimal resources spent on toolware. I can't even imagine doing similar work on a "big" audio project considering the material resources I've got at my disposal.

The fourth, and, possibly, the main, reason I did this is because I saw the headphone/earphone products' obvious flaw in their pedigree. As a professional audiophile I saw the whole chain of high-end audio—from a manufacturer to a consumer—where its every link's "inner qualities and convictions"—that is the distributors, the dealers, etc.—strictly correlated with the inner qualities of their products, as a necessary condition for a "pure bred" product.

Briefly speaking, audiophile manufacturers catered their products to audiophile consumers via audiophile dealers. Even after eight years since starting this project I don't really see any "proper" IEM manufacturers aspire to cater their products to "pure" audiophile demand via a link of "pure" audiophile dealers.

At best, the IEM manufacturers stop at the "accuracy" stage of the above Serkin's quote, not seeing any reason (or means) to go "beyond it."

If the best examples of the headphone electronics, some headphone auxiliary equipment, and some stationary headphone setups completely follow the audiophile dogmas (at least, in their conception and execution methods), then with the vast majority of portable headphone and earphone products there is a serious want of such a "purely" audiophile chain of design, manufacturing, distribution, and sales.

As I see it, and it's been obvious at many portable audio festivals I've been visiting, if I compare the mismatch of even the best currently manufactured IEM hooked up to the best headphone electronics, in terms of "bottleneck" of their flaws, it'd be like mismatching a "mid-fi" bookshelf loudspeaker to a "no-holds-barred" system with the best-that-money-can-buy SET tube amplifier and the most expensive digital source. This analogy is not as exaggerated as it might seem, as currently there exists no better alternative for "the mid-fi loudspeaker" in terms of IEM, because there are no IEM manufacturers willing to provide a product designed and built "by audiophiles for audiophiles." Why it happens, it's another story, and to me, it's a good example of a downside of the market economy.

So I wanted to fill the void. At the very least, for my own purposes, and possibly not only for my own ones, especially considering how dramatically people's lifestyles have changed in the last 20 years in the whole world.

With the recent decline in high-end audio's appeal to the masses, as my project was going through its development phases, the fifth reason became obvious to me: to pass the torch of audiophile values to a new generation of people interested in high-performance audio via a new approach and a new medium of products.

SPearphone SB-1 in ear.

***WSR* Reber:** How do you define portable audio?

Kucherenko: Portable audio is defined by, first, an ability to physically carry the setup around, so, it's autonomous and fully driven by the batteries, and, second, by an ability of the headphones or earphones to effectively isolate the ear channel from the external noise.

In the latter respect, the "open can" headphones or non-isolating earphones I would not call portable audio products.

***WSR* Reber:** Why don't high-end audio enthusiasts take portable audio seriously?

Kucherenko: With some truly great headphone products beyond the scope of portable application, what's left in the portable field can barely fill an audiophile application form. From an audiophile standpoint, how seriously can you take the quality of a "mid-fi" loudspeaker?

Personally, if you can afford a decent home audiophile setup, I don't see much sense in using a stationary headphone/earphone rig.

But for an audiophile "on the go" there is not much proposition to choose from. It's a typical "chicken and egg" scenario. In the absence of proposition, obviously, there is no "serious" demand.

To break the vicious circle for the portable transducers and to appeal to the audiophiles, the IEM industry must take some radical steps to elevate itself from its "mid-fi" plateau.

Actually, I don't think the industry as a whole is capable of doing so.

Some small entrepreneurs are more likely to do this. At least, in high-end audio, we all know the bigger the company, the less chances they would come up with an absolute quality product, and vice versa. So the recent appearance of tiny headphone companies, like Abyss, shows the way how to perk up an audiophile's ears.

Now we need to see some similar efforts in the portable (probably, IEM) transducers segment, when real audiophiles would address the portable market for audiophiles with their products, then there will be no doubt that high-end audio enthusiasts will take notice.

If the joy from music is your top priority, then compared with using your home audio, portable listening can give you more than less. I am talking not only about the objective quality of reproduction, but also about the time you can spend on appreciating music and expanding your music horizons, especially for the big city dwellers.

We need to remember that high-end audio was born when you could not shove a turntable in your pocket and when to get a decent "portable" sound you'd need to carry the car batteries. At that time the only place where you could get a decent sound was at your home. Period. But the times "…they are changing…" I am absolutely sure that the sonics of the DAC in the portable player I currently use is better than the sonics of the DACs in the homes of the vast majority of those who are reading this.

To me the choice is very simple: life is too short, and all the recent technological breakthroughs in digital audio and battery capacities multiplied by the audio's artistic side can provide you with tons and tons of musical pleasures, which you miss if you don't resort to the capabilities of good portable audio.

Compared to my "full-blown" home setup, when I am listening to my portable rig I don't really think that I am missing anything music-wise. That's why I almost completely stopped listening to my "big" home system. Really, if I felt that I was missing a lot (like it was when I started with my IEM project), I would fire it up once in a while, but the more time I spent listening to my portable system, and the more sophisticated it becomes, the less inclination I feel to soak up the juice from my home AC power lines.

Yes, there is no tactile perception from the sheer volume of air moving in the room (and bumps on the walls from my neighbors), there is no soundstage at some distance in front of me, but then there are no negative effects from the listening space, no problems from the standing waves and the sound dispersion problems. Musical resolution via good IEMs becomes even more obvious than via a loudspeaker setup.

Economically, I don't even have to mention "the bang for the buck" you can get from a good quality portable system—and even in "purely" audiophile terms.

***WSR* Reber:** Why is portable audio attracting a diversified audience?

Kucherenko: Again, the times "…they are changing…" New generations don't have the same psychological fixations as the older ones. They don't perceive much value in having expensive "music" boxes splattered all over the floor in the living room.

Nevertheless, if an interest to use music as a path to Heaven is fading away, as there seems to appear some new ones, some (alas, rare) individuals still do think that "life without music would be a mistake." These rarities don't flock together under the "audiophile" umbrella anymore. On the opposite, some audiophile dogmas, especially, its "law of diminishing returns" and "omission but not commission" scare them away.

Nevertheless, they can positively react to an idea that elevated music reproduction can be a tool for their inner growth.

And such individuals can come from all generation groups and all social strata.

Listening to music is an acquired skill, where old technology is a very important part of it. As every teacher would say, "It's much easier to teach new skills than to make somebody forget the old ones." I am not surprised to see the hard-core audiophiles' reluctance to accept the virtues of portable audio as a need to master a new skill. But they don't see a value in it for themselves. Instead they continue to see a value in the old technology, and that's why they continue to take home high-end audio's economic toll for granted.

For the vast majority of the population not bitten by the audiophile bug—that is the mere mortals who are not willing or capable of spending much time, effort, and resources—high-performance portable audio is the only way to get to the sonic Nirvana as close as possible.

***WSR* Reber:** Why is the portable audio market a growth market? Why now?!

Kucherenko: The lifestyle change, the economic change, the demographic change, the technological change, all combined.

Also, high-end audio shot itself in its feet declining a usage of any meaningful common standards. Yes, its claim to position itself on the brink of art and science allowed the industry on its artistic side to write a lot of colorful prose, which helped to sell a lot of equipment, but long-term, without the scientific standards being accepted by all the players, such a position derailed the combined effort for the future positive growth. With the sole exception of the best up-to-date digital equipment, high-end audio's future happened to be in the past.

Most examples of high-end audio analog equipment and loudspeakers of, say, 20 years ago, were better quality and substantially cheaper (even with inflation) than what's being currently produced.

By the way, video is a good example of the opposite. Strictly enforced image quality standards allowed the video industry to demonstrate dramatic quality improvements over the years, which are obvious to everybody.

Without the accepted standards, home audio has got no choice but to stumble upon one spot and has got no vision for future development, and when the changes come it's got no idea how to adapt to them.

Portable audio was always a parallel to the home audio industry. In the absence of attracting and relevant propositions from the home audio side, and with all the technological breakthroughs and demographical and lifestyle changes, the atomization of societies, currently prompted by "powers that be," also played an important role in boosting portable audio's appeal to the masses.

***WSR* Reber:** Where does this leave the high-end enthusiast audiophile and videophile market?

Kucherenko: I am not sure about the videophile market, but the home audiophile market is in obvious decline.

I don't really see any reasons why it would improve without drastic changes in the whole chain from the manufacturer to the consumer. But it's a long story.

Two years ago I wrote a letter dedicated to the problem, which was published on my behalf by Paul McGowan on PS Audio's Web site.

All the problems listed there are still not resolved, so I see no reason why, without dealing with them, the situation would improve by itself.

High-end audio seems a generation phenomena, so to address all the shifts in demographics, etc. it has to pay attention and adequately react to it. But instead it looks as if it covers its head in sand.

Its priorities shifted from appealing to music enthusiasts to trying to appeal to people shopping for a status symbol. But it's a very tough competition, as you cannot wear a loudspeaker or an exotic cable on your wrist…

***WSR* Reber:** What are the distinguishing performance differences between quality dynamic headphones, planar magnetic headphones, and electrostatic headphones or earspeakers?

Kucherenko: I'd say that the best analo-

gy would be to compare the sound from a dynamic loudspeaker, planar magnetic and electrostatic loudspeaker. Those familiar with them could interpolate the differences and apply them to the sonic differences between the headphones and IEMs.

Generally speaking, "planar magnetics" are sort of in between. They come close to the resolution of electrostats (but usually not fully reaching it) and come close (but, again, usually not fully reaching it) to the punchy quality of dynamics.

As a rule, electrostatic headphones provide the best resolution but lack in low-frequency weight and extension, especially on popular music.

Dynamic headphones are great in weight but lack in the ultimate resolution.

Although, with electrostatic headphones you can reach a far more believable weight than you can generate with typical electrostatic loudspeakers in the room.

Trying to describe the sound of a particular IEM, you have to be very careful for several reasons.

First, its sound completely depends on its positioning within the subject's ear channel, and the level of the ear channels' isolation is critical to the description.

And, second, if the sound of a headphone is more-or-less "objective," with an over layer of subjective prejudices, than an earphone's sound is "subjectivism" squared—that is, nobody can tell how it sounds except the one who's listening to it, and then only with a "perfect" fit and decent isolation.

There are no electrostatic and planar magnetic earphones yet, but there are two main varieties: the dynamic ones and the balanced armature ones.

Dynamic IEMs, generally speaking, are bigger and their physical dimensions don't allow them to be inserted fully in the ear channel, especially if they contain a group of similar drivers.

Balanced armature drivers' catalog is very huge. Some of them are small enough to be fully inserted deep inside the ear channel. Within its class, the IEMs based on the balanced armature drivers' technology can be of several sub-types: some such IEMs can be designed to be placed outside the ear channel, some of them can be designed to be placed inside the ear channel, they can contain a single driver or up to 12 or more drivers; the drivers can be used in a two- or three-way passive or active filtering configuration, etc.

Generally speaking, the balanced armature drivers are considered a more expensive and more resolving option. Dynamic drivers can be as resolving, but usually require more physical space.

With very few exceptions, balanced armature-based IEM occupy the upper-tier group of IEMs. Dynamic drivers are usually used in less-expensive models and sometimes are combined with the balanced armature drivers to be used as a "subwoofer" for the punch.

Considering that we're talking about portable audio application, we've got two choices: "closed cans" dynamic and planar magnetic headphones and isolating IEMs. Electrostats are out because of the power supply/amplifier, which should be powered by an AC line. And "open can" designs are out also because of the lack of outside noise isolation.

My opinion is that IEMs based on balanced armature drivers are actually the only current viable option for high-performance portable audio. First, because I haven't heard yet a dynamic or planar magnetic "closed can" headphone, which demonstrated a better sonic result. Second, both types of headphones' sensitivity is too low to use with a typical portable player without a dedicated amplifier. And, third, a single balanced armature driver or a group of such drivers placed deep within an ear channel, with proper isolation, can give you a much better efficiency and allow you to go (with a multiple driver design) for a two- or three-way active or passive configuration, which provides an additional tool and flexibility for a balanced armature-based design and implementation.

Highest-quality headphones and fully dynamic IEMs, due to the physical space and technological limitations, up until now utilize only a single driver per channel, so there is no way you can utilize the same flexibility as with a multi-driver balanced armature array.

***WSR* Reber:** What is your perspective on "personal statement products" as they relate to the audiophile, both in-home and portable audio?

Kucherenko: As high-end audio is on the brink between art and science, its artistic streak, by definition, relates to "personal statement." That's why we always see "signature" models and that's why a creator's profile is so high in promoting high-end audio products.

The creator's personality, audio vision, system of values, and ideology is widely propagated to boost an interest to a product.

Actually, high-end audio's main feature is its "personal statement" aspirations. That's how it's supposed to be different from the "mainstream," and this is why it's very common to see the last names of high-end audio personalities on the faceplates of their gear.

In the "mainstream," all the products are anonymous, we don't see a specific creator behind them, nor do we hear his opinion on how a product is supposed to sound. As a rule, not a single clue from the manufacturer would steer our attention in a certain direction. So, to formulate our own opinion about a product we have to rely upon, again, anonymous opinions. There is no personal information about a product that we can use as a baseline to form an initial relation to it.

Besides the objective sound qualities, the reason I referred to the existing IEM products as "mid-fi" is exactly because of the absence of these "personal statement" aspirations in this field.

It's interesting to note that such products represent a group where, figuratively speaking, manufacturers come in close physical contact with the customers. As IEMs are supposed to be inserted in a human body, a manufacturer designs a product, which is supposed to come into the most intimate contact with a customer. So, I am not surprised that as close physical contact is avoided in western cultures by any means possible, the field of IEM is so undeveloped.

Not every manufacturer is ready for such intimate contact with the human body.

Speaking seriously, for a manufacturer to consciously narrow down a scope of appeal of a product with its fit to a narrow range of possible human anatomies is a very tough choice. The biggest problem for all IEM manufacturers is to find a way to appeal to the widest common denominator, on the one hand, but to preserve their personal values, on the other.

With home audio and headphone electronics market it's not such a big deal, but for IEMs the factor of individual human anatomy is a stumbling block, which keeps the industry in constant debate over how to overcome this obstacle without losing face (or waste somebody's ears)?!

***WSR* Reber:** What distinguishes your IEMs from the numerous IEM designs and implementations on the market?

Kucherenko: As I already mentioned, before my goal was to pass the torch of home high-end audio to a new field of portable audio.

As a hard-core audiophile for the last 25 years, I've been disappointed with the lack of like-minded IEM manufacturers (I met and interviewed some of them for a Russian audio publication). To reiterate, they were thinking about "accuracy" but left an impression on me that they didn't think it's worth any trouble to strive "beyond that."

So, as I saw nobody (yet) go "beyond that," I decided to peek there myself, to try to see what can be hidden there.

I'll give you a brief list of what I did, so you have an idea. But bear in mind that I made no discoveries whatsoever, and as an

SPearphone SB-3 next to Mischa's ear-canal impression

isolated feature all of my solutions are commonly used in the IEM field.

To tell you the truth, this project, in terms of possible IEM developmental stages, was more about my exploration, identity, and concern than about my technical competence.

What distinguishes my effort, first and foremost, is that I was not afraid to combine all of them in a single design. Despite possible sonic gains, due to some form factors and ergonomic considerations, a typical IEM manufacturer would avoid such combinations not to limit an appeal for a product in the market place by too much.

Second, my procedure of trial and error building prototype after prototype was based on the devotion of a hardcore audiophile to bring the IEM sound as much as possible to the sonics of a no-holds-barred home audio system I've been using myself.

So here's the list of the features:

The First: It's supposed to be a deep insertion design, which allows sealing the ear channel close (an average of 5 to 8 mm in my case) to the ear drum. As the ear channel constantly narrows in the vicinity of the eardrum, safety is not an issue here.

There are a lot of reasons why this procedure allows you to get the best sound from IEM, but I am not going to dwell upon that at this time.

The Second: The final visual appearance of the product doesn't have a universal appeal, as it's a fully hand-made product. But what does matter is the mechanical and electrical reliability of its construction, which is very important in intensive and long-term portable use, with its constant mechanical stress on the IEMs, its connecting elements, and its connecting cable. The cable can be easily repaired or replaced with a spare one.

The Third: These IEMs are intended to be used in an excessive external noise environment, therefore, their design provides sufficient ear channel acoustical and mechanical (that means the noise generated by the connecting cable) isolation at its very tip.

The Fourth: The IEMs should be positioned as deep as possible in the ear channel, preferably close or at its second bend, the spot of transition from cartilage tissue to the bone tissue (it's a well-established fact in audiology that such a position allows to avoid pain when touching the thin skin further down the bone part, and at the same time provides a minimal "occlusion" effect).

The Fifth: All the drivers in the earphone are positioned at the same axis, and this axis' direction is, as much as possible, parallel to the direction of soundwaves' propagation along the ear channel.

The Sixth: The IEM is a fully differential design ready made to work in a two-way active system with two separate amplifiers.

Throughout my 20+ years' worth of home audio experience I learned all the advantages of using active multi-way home audio systems, so this two-way active earphone system can be used with a specially designed and built dedicated DAC/DSP/two-way electronic crossover/two dedicated bal-

anced amplifiers—all in one box (a separate offshoot from this IEM project).

The Seventh: Via a special mini XLR-mini jack adapter this IEM can work with any music player or a smart phone.

If you have to use the IEMs with a portable audio player that is when you cannot use the dedicated DAC/DSP/crossover/two amplifiers capability. I wanted to avoid the use of any passive crossover on the IEMs to avoid the passive filters' inherent distortions. Besides, speaking of absolute, I was aware of the complexity of the passive crossover's implementation within physical dimensions of a portable device so I was reluctant to even consider using it.

So this IEM doesn't have any passive filters, only master resistors.

The Eighth: The combination of seven drivers in both left and right channel and their acoustic loading characteristics is selected to avoid usage of any passive filtering to achieve the seamlessness of sound. The sound outlets are of maximum diameter and of shortest lengths possible.

One driver is "naked"—that is it's got no tubing at all; it shoots directly into the ear channel.

I was anticipating that the drivers' selection process is going to be long and painstaking and has to be performed only after all seven previous conditions are fulfilled. And I was determined to consider all the Balanced Armature driver options available.

As the IEM seals close to the ear drum, all the open ear resonances are lost, so to restore the natural sound perception and presentation, the combination of the drivers in the IEM should resonate at the lost resonances' frequencies. This challenge was successfully met in the final design, and the natural high-frequency response is supported. As a result of it, the sound of the IEM is perceived outside the head.

The Ninth: The connecting cable was selected with its sonic virtues as a top priority. At the same time, as its mechanical properties still do matter, the final version of the cable is completely applicable with its specific application and "tear and wear" status.

With the help of cable guru Chris Sommovigo of Stereolab, after several iterations a dedicated IEM audiophile cable was born and being used in this IEM.

The Tenth: No additional ready-made acoustic filters are used (with the sole exception of necessary tube outlets acting as such filters, leading to the drivers).

I decided that the common "Band-Aid" approach of using such industry-standard filters allows you to cut some corners but brings much more harm to the sound than does any good.

***WSR* Reber:** If sound isolation is a critical performance attribute, how do you optimally solve this challenge?

Kucherenko: A proper solution for the isolation issue was one of the most difficult to overcome. As I wanted to position the earphone as close to the ear drum as possible, I had to find a way to seal the ear over there to minimize the operational volume of air and to avoid some weird resonances.

The ear channel close to the second bend typically widens and then shrinks again towards the eardrum, so I was lucky to find out that positioning the IEMs' specially prepared and positioned sealing tip at this area allows you not only to seal the ear channel at a good spot, but also to avoid unnecessary pressurizing the ear and to minimize the "occlusion effect" (lowering sound bone conduction due to maximizing the efficiency of the transducer at its operational volume of air close to the ear drum).

Of course, what I described just above worked in the case of my own ear channel, which, according to an audiology nurse who took my ear channel impressions, is slightly bigger than an average one.

If your ear channel is smaller, you're out of luck—sealing your ear channel using this earphone can be problematic: either uncomfortable or you cannot achieve a proper seal at all.

I haven't run yet into somebody with a substantially bigger ear channel than mine. I presume, with an appropriate vigilance it's still going to work just fine.

From about 50 people who auditioned this IEM about 20 percent complained that they're too uncomfortable.

The rest, after some initial adjustment, said that they can use them with no problem. But most of those were men. With women I don't have any substantial statistics yet.

I am fully aware that one of the reasons I am interviewed here is because what I did appeals to a very unpredictable niche, so a "proper" manufacturer would not touch a product like this even with a long stick.

But what worked for me, and, seems, worked very well for you, Gary, can work for, I am hoping, for a lot of other people.

***WSR* Reber:** How do you optimize a balance between sonics and form ergonomics in the design of earphones?

Kucherenko: Briefly speaking, as much as I could. Setting the sonic quality as an uppermost top priority, obviously I ran into some tough decisions I had to make over ergonomics in the design.

Custom ear-mold IEMs are the opposite: a great ergonomics idea and a fantastic logistics scheme, but, in my view, too compromised sonically. First of all, all the drivers in custom ear monitors are shooting from different angles (up to 90 degrees in a typical example). Second, they are located, in most of the cases, outside the entrance to the ear channel, emitting the sound through narrow, long, and curved sound bores. Also, to mend all the problems associated with a specific model, appealing to the lowest common denominator on the market—that is to ensure that this model's form ergonomics would provide a comfortable fit to all these people who would use it. You can't avoid a usage of some crude (because of physical space limitations) passive electrical filtering and some crude acoustical filtering as well.

In a typical universal fit an IEM model, especially a multi-driver one, the off-axis compromises and filtering are even more dramatic.

Can you imagine what kind of sound you'd get from a loudspeaker with all its drivers, including tweeters and midrange drivers, pointing in all the different directions, up to 90 degrees apart? And it's exactly what happens in a typical multi-driver IEM. Add a long curved bore to this analogy, and it'd be like listening to a loudspeaker playing in a living room but from your bedroom via a long curved corridor. It's not surprising that audiophiles, accustomed to sitting in a "sweet spot" in front of a properly set up pair of loudspeakers, don't like a typical IEM sound.

My goal was to re-create, as much as possible, a "near-field" listening experience for the IEM.

For that I had to move the drivers as close as possible to the eardrum, first, and place all the drivers on axis with each other, second, and, finally, to direct this common axis, as much as possible, straight to the ear drum. In the latter aspect of the design, deep insertion is of a big help.

To reach this IEM "sweet spot" positioning I could not avoid compromises in its ergonomics in terms of a universally comfortable fit. But at this stage of development, as much as I tried, I could not go any further in terms of making the IEM appealing to a wider audience. The drivers' compliment is crucial to attain the sound I want, and the physical configuration of the final assembly is the sole restricting factor to achieve this wide appeal. There is no doubt that some future attempts to improve the ergonomics and to expand the appeal of such-like IEMs by using different drivers and technologies can be very successful. So, we will see.

Realizing the futility of competing with the Goliaths on their own turf, I didn't see much sense in a "homebrew" imitation of what was already done by "the proper" IEM manufacturers—be it a universal tip or a custom ear-mold type of solution.

In his recent book, *David and Goliath*, Malcolm Gladwell writes that "There is a set of advantages that have to do with material

resources, and there is a set that have to do with the absence of material resources—and the reason underdogs win as often as they do is that the latter is sometimes every bit the equal of the former."

Even if I do recognize the deficiency in my IEM appearances and its form factor, at the same time, I see its feature list above dictating the ergonomics as my "David's sling list."

***WSR* Reber:** What is your approach to universal usage of your earphones, given that people have different in-ear auditory characteristics?

Kucherenko: Judging by the feedback that I am getting, with the proper positioning and the isolation people generally react to the earphones the same way as they react to the sound of a particular loudspeaker setup in different rooms.

Yes, a loudspeaker would sound differently in different acoustic environments, but there is a common thread, especially when we're talking about a proper installation.

I presume that "a proper installation" in the IEM case is just a correct positioning and a good isolation. That's it. Then, I would also presume that a variance of acoustic environment in the IEM's case is much smaller than a possible variance in acoustic properties of all the different rooms where a particular loudspeaker might be used.

Considering that deep insertion IEMs work in a tiny space not far from the eardrum, where its shape and acoustic properties are more or less defined by a typical human anatomy, I see the variance in such an IEM's acoustic properties of the sound as very small, especially compared to the variance in sonics of the same loudspeaker setup in different rooms.

Inner ear operation and psycho-acoustics is another story (let alone all sorts of subjective prejudices). I'd imagine the subjective experience of sound from an IEM can be quite different for different individuals, but, still, within the limits of "normal" hearing. How different I can't tell, except to say that the reaction I get from the people exposed to my IEM under conditions of good personal fit is more or less universally positive.

***WSR* Reber:** What are the unique construction aspects incorporated into your IEM design?

Kucherenko: As I already mentioned, the listed above separate construction aspects are not unique, what's unique is their combination.

One of these construction aspects I want to dwell upon a little bit further is that the whole IEM is built completely by hand from the commercially available drivers and auxiliary components.

Even the custom-made cable is built in a process, which can, as close as it gets, be called "made by hand."

This handmade process can be described as craft, and it allows much tighter control over each stage of production. Each finished piece goes through an individual quality auditioning and assurance stage.

This technique allows me to compare the difference of class between this IEM and the mass-produced, machine-made ones, like the difference between cigars and cigarettes. By the way, hopefully, nobody would see this analogy as an ad for smoking.

When people comment on the handmade appearance of this product versus a common IEM built in big numbers, my reaction is that, yes, I would love to make it look "nicer," but how much nicer can you make a cigar's appearance?! As a completely handmade job, there is a certain shabbiness in a cigar appearance, and it's never going to look like a tidy cigarette, but then, the quality of the experience with a cigar is in another league compared to the cigarette's, so the appearance becomes irrelevant, doesn't it?! The wrapper leaf of some of the best cigars I smoked looked far from perfect. But what's important is not so much the wrapper's appearance and its taste, which, incidentally, do not necessarily coincide with its look, but, more important, what's inside of it.

The same analogy goes regarding the convenience of use. The cigar experience requires more dedication and involvement than just smoking cigarettes, but then the return, both from the cigars and a perfectionist handmade headphone or an IEM, is of much higher value than from an "ordinary" mass-produced product.

***WSR* Reber:** What should one expect to experience as differences in listening to music through a quality in-room loudspeaker system and your earphones?

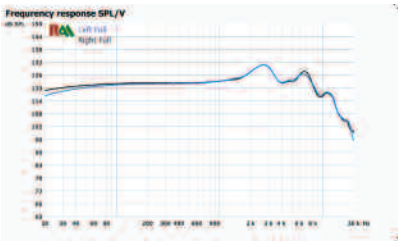
Kucherenko: It goes without saying that a loudspeaker setup in the room imitates a live performance better than a portable experience. But, still, that imitation is riddled with a lot of flaws, most of which come from imperfections of the room acoustics, the loudspeaker, the necessary amplification, and the loudspeakers' setup in that room.

Replacing the widely variable room acoustics with much more predictable human ear-channel acoustics, especially in the case of a deep insertion IEM, and substantially reducing the amplifier power demands, which are necessary to create an adequate SPL at the ear drum, creates a lot of new possibilities to shift the priorities in the design effort from creating a pleasant acoustical impact from music to supporting its inner detail to uncover its true meaning.

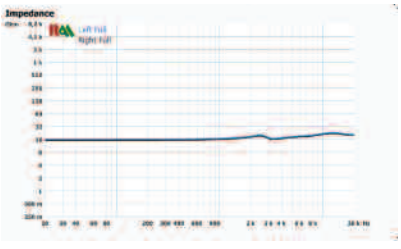
I'd compare the difference in music listening experience between excellent headphones and IEMs versus a typical loudspeaker listening to music with a difference in movie experience via a highest resolution studio monitor and a typical consumer video projector experience. Yes, if you've got a perfectly dark room with an excellent and expensive up-to-date video projector, it'd provide your video presentation with an excellent quality and a huge impact, but if you don't… a good studio monitor can provide you with many more image details and overall better image quality. As an additional perk, you can carry the studio monitor around, but you cannot do the same with a good video projector installation.

Some people claim that through the best headphones and earphones music is reproduced like through a magnifying glass, when its subtlety becomes more obvious than when reproduced through a home system. I agree, but with a reservation that it all depends on the type of music we're talking about. When this abundance of detail is missing in the original recording, the sheer impact from a powerful home system can be closer to the original idea of how it should sound like.

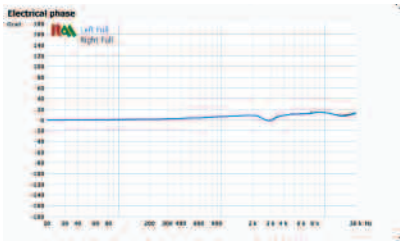
But when the inner detail is crucial to



SPearphone SB-3 frequency response.



SPearphone SB-3 impedance.



SPearphone SB-3 phase.

appreciate the meaning of a particular music piece, then the best quality headphone or earphone reproduction is capable of proving a much more elevated and intimate personal emotional experience.

With a good-quality headphone system, and especially with good-quality IEMs, you can get well-defined imaging and soundstage. Unfortunately, realistic 3D imaging with the headphones and earphones is still a distant possibility, especially for the portable applications. Currently, the best you can hope for is to get rid of the "inside-head" imaging and to get the imaging just outside your head at its perimeter (like with my IEMs), but there are a lot of recent technological breakthroughs in the field, so this distance is actually not huge.

Going from a loudspeaker system to the headphone or earphone system, a listener still needs not only a certain adjustment of musical perception habits, let's call them acquired "skills," but what's even more important, a conscious determination to follow this path.

A bait for that path could be a promise to have an ability to hear more new music (while on the go) and to hear "more music" (i.e. more musically significant inner detail) in the old one.

***WSR* Reber:** IEMs work well with the Smyth Research Realiser surround system. Have you had any experience using your IEMs with the Smyth Realiser?

Kucherenko: Unfortunately, even though I've got the Smyth Research "Realiser" system at my disposal and have got very satisfying 3D aural results with it with a pair of supplied stationary Stax electrostatic headphones, I haven't tried it yet using my IEMs.

Generally speaking, from my past experience with it, I am sure, it'd work well. The problem is that the "Realiser" system is not a portable one, first, and, second, its head tracker is as important to get the 3D aural imaging, possibly even more important as its "room" and its "headphone" calibration procedures. So as the portable head tracking is a very complicated issue, I don't think that at this moment using this technology for my IEM's intended application can be a viable option. To reiterate, the dynamic and spatial resolution of the head tracker is crucial to the creation of this effect.

Let alone the confusion and the possibility of danger using the virtual 3D imaging overlapping with the actual reality if you're walking on the street…

At the same time, under stationary conditions the "Realiser" can be very effective in creating the 3D aural imaging from an earphone. In the latter case, I presume, the "Realiser" personal room/audio system calibration can be adapted much easier from person to person, so the experiences can be shared. An additional layer of processing, due to the absence of differences in individual outer ear anatomies, will not be present during the playback. I presume, with a deeply inserted, properly positioned, and isolating IEM, the differences in ear channel properties for various individuals will be insignificant for the "Realiser" processing.

And, by the way, a tiny calibration microphone with a tube outlet at its tip can be easily incorporated in my IEM design. This opens up a lot of interesting future possibilities from all sorts of in-the-ear calibrations to the real time on spot (in the vicinity of the ear drum!) measurements. These measurements can be used to optimize the IEM operation using an external DSP, for instance, for active multiway crossovers, adjusted individually.

SPearphone SB-3 in ear.

***WSR* Reber:** Most of the available content is encoded in an aggressively compressed lossy MP3 format. Do your IEMs result in a higher fidelity experience?

Kucherenko: The bottleneck in quality of music reproduction via a pair of good IEMs is not the compression format and not even the quality of original recording and mastering. The bottleneck is the quality of the transducer (a headphone or an earphone). The difference between reproduced full-resolution files and, say, MP3 files of the same recording does exist, but it becomes irrelevant when you listen to a lot of different recordings and hear the huge difference in the original quality of them. Even less relevant it becomes when an inferior transducer is being used.

I can be wrong, but it seems that in developing these compression algorithms, a headphone listening was taken into account as a priority. That's why I've got an impression that in a lot of cases an MP3 file reproduced by a portable music player sounds "more exciting" over the earphones than a "raw" full-resolution file (or even the hi-res file of the same recording, although in the latter case the origins of that hi-res file can be questionable, and/or the player's ability to correctly read the proper hi-res files can be the culprit).

As I mentioned before, my portable system allows me to spend more time listening to music. As a result of it, I immensely expanded my music outlook. If I want to explore a certain volume of work using my portable rig any further, often I've got no choice but to resort to listening to compressed music files. Believe me, in such cases the compression is not an issue; the biggest issue is the original recording's quality. And with a poor quality to begin with, the difference between full resolution and compressed files is not an important issue. At the same time, when the recording is great it sounds great even in a compressed format, although, if it's easily available, I'd rather listen to it in full resolution, so my audiophile mind is quiet…

***WSR* Reber:** What recommendations do you have for enthusiasts to choose IEMs?

Kucherenko: The venerable Etymotic Research's ER-4s, which started it all almost 30 years ago, are still almost impossible to beat. It's the first Balanced Armature driver design, and, as Mead Killion, the head of the company, admitted to me in one of his interviews, ironically, it was born as a "bastard" product from this highly esteemed audiology company. Incidentally, the fact that its roots are not from the CE industry, in my opinion, is the main reason why it's so exceptional.

Its claim to fame is its simplicity. That's why I found bemusing that it's got more than 500 pages thread at one of the Russian audio forums because, I thought to myself, how many words can you write about, basically, an earplug with a single Balanced Armature driver in it?! At the same time, such a page count to me is a testament to how great this product is.

This piece has been an original inspira-

Under the hood of the SPearphone DACCA-2D.

tion for my project, as I wanted to improve on it, to get "beyond its accuracy." Incidentally, when I showed one of my prototypes to Mead he was also bemused: "Why would you do that?! A symphony orchestra sounds through our earphones exactly as I hear it in a concert hall!" Seeing his reluctance to go any further with ER-4s actually boosted my determination to continue my effort.

My first choice with universal fit IEMs would be single driver units. Due to their "on-axis" design, as a rule, they are more accurate than their multi-driver cousins, which, even if they've got a common axis for their drivers, this axis is, usually, substantially off towards the ear channel's sound propagation axis. The latter's trade-off from accuracy towards bass weight and extension, for me personally, is not a viable option.

Also, even if the top-tier IEM field is mostly populated by Balanced Armature designs, there are some exceptions: the Sennheiser IE-800 is an exceptional single proprietary dynamic driver product.

If you are ready to sacrifice some resolution and dynamic subtlety for the bass extension and weight, then some "custom" IEM models from various reputable manufacturers would be a good choice.

Choosing between accuracy of the best single driver universal fit units and the "customs'" bass extension and stunning looks, personally, I'd rather go for the former, than for the latter.

***WSR* Reber:** Have you decided on a name and model for your IEMs, and at what price are they available from what distribution?

Kucherenko: At this point, we build to order three StereoPravda "Second Bend" models: "SPearphone SB-1" (5 Balanced Armature drivers per channel, generic cable, $1,000 MSRP), "SPearphone SB-2" (7 Balanced Armature drivers per channel, custom cable, mini-jack-only, $2,000 MSRP), and "SPearphone SB-3," that you've got, Gary (7 Balanced Armature drivers per channel, custom cable, ready-made for two-way active operation, mini XLR-mini jack adaptor included, $2,500 MSRP).

The dedicated optional portable differential two-way DAC/DSP/crossover/tone control/IEM control center-amplifier StereoPravda "SPearphone DACCA-2D" is also built to order at $6,000 MSRP.

We accept orders via our Web site at www.stereopravda.com, by e-mail at bigmisha@stereopravda.com, or by phone: +7 (901) 517 7805.

***WSR* Reber:** What are your concluding remarks?

Kucherenko: When I started to work on this project a few years ago, I read numerous DIY threads at various portable audio forums.

As I was impressed with the participants' highest levels of expertise, I was disappointed by the lack of imagination the vast majority of the posts demonstrated. It was all about amateur imitations of the established designs and the solutions from the reputable manufacturers.

I thought to myself, "What's the point in trying to reproduce an idea or a design, which is already available from a reputable manufacturer with a "ham" version of it?! Wasting all the time, money, and effort to make something that already exists?! Yes, an existing product costs some money, but in the long run, calculating all the time spent, all the broken drivers' cost, and all the experiments with the materials and the components going awry, a DIY replica would cost much more."

"On the opposite"—I thought to myself—"if you are going to spend all your effort, it should be spent on something that nobody else produces yet."

Considering the ongoing importance of quality music reproduction to a lot of people who are not contemplating a substantial investment into a high-performance loudspeaker-based home audio system, my biggest hope at the moment is not to gain commercially on this project, which would be nice, of course, but to instigate, as much as I can, the creativity in the field of portable audio and the IEM design with my own example and effort.

***WSR* Reber:** Thank you, Misha, for sharing your perspectives, experience, and creativity with respect to advancing portable audiophile quality. **WSR**