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In a studio headphones don't play such an obvious role as a tool, so first we have to face the question in what fields these can be used in a sensible and advantageous manner. Compared against loudspeakers, the listening experience through headphones has quite another aesthetics – hence it cannot be rated simply as an equivalent substitute. In those days when film editing could not yet be done with a visual support by a waveform display, headphones served as a 'magnifying glass' for controlling tape cuts, and even today delicate cutting works must be checked by ear for artefacts. But for the musician in the recording booth headphones have been a part of their daily routine for decades, because this is the only playback method which is 'silent' for the microphones. However, a reproduction of reference quality is not of paramount importance here – performance and construction are in fact the most essential criteria. As a reference instrument for recording and mixdown a headphone set delivers a theoretical 180-degree stereo base due to the immediate coupling to the ears. This will lead to misinterpretations, especially when judging balance and spatiality, because unlike with the reproduction via loudspeakers, instruments and voices will ap-

pear 'overdimensional' in your head, which is why many sound engineer colleagues are sceptical about working with headphones; at best they will tolerate them as a complementary means of control. The frequency response of a loudspeaker at a given listening spot can be measured quite easily: something which, of course, will not work out with headphones when using the simple means of a measuring microphone. Thus for recording studios the individual equalisation of headphones will remain a question of judgement by ear – a process that can only lead to success in case of a prolonged listening experience and by comparing various mixdown results. This may also be down to the fact that sound engineers don't pay special attention to the quality of headphone amplifiers. In mobile recording technology, however, pretty often headphones are the only sensible way of evaluating recordings because quite a few times the on-site room acoustic working conditions are nothing short of disastrous. As a matter of principle, headphones shut out all (negative) influences which a room may have on a loudspeaker reproduction, but in such a systematic way that many sound engineers have trouble regaining their familiar orientation. Putting our test candidate and two

current high-quality headphone sets through their paces, I'd like to investigate which role is attached to the quality level of headphone amplifier and headphones in the evaluation of recordings and mixdowns.



Beside the headphone amplifier by Lehmann Audio two top level headphone sets will take on in this test which are supposed to help me also detect very small differences in the reproduction quality of the amplifier: Ultrason's top-level model Edition9 and the brand-new studio headphones model K 702 by AKG. Both headphones are very different in their design and their development approach – and, let's anticipate it right now, as for their sound or rather their interpretation of stereo reproduction. There are an estimated 50,000 different headphone models on the market and only a few of them are rated as studio headphones. And rightly so, for working audio pros listen to music in a different way than the hifi lover who indulges in music enjoyment in the evening hours with good intent not to bug his family. While it is true that also hifi enthusiasts put great demands on the reproduction quality, other criteria are decisive for the professional who places special emphasis on a linear reproduction, faithful transients and a realistic spatial image. Lately I've been dealing more thoroughly with the headphones topic in the course of two tests (beyerdynamic Headzone and SPL Phonitor). Contrary to the mentioned products, the combination of a headphone set with the Lehmann Black Cube Linear Pro takes a puristic approach which aims at only one goal, i.e. to elicit the theoretical optimum out of a headphone set by means of a custom-designed amplifier without interfering with the reproduction of the stereo base. Lehmann Audio, distributed by Synthax GmbH, manufactures the Black Cube in small quantities and is geared up well connection-wise for the studio requirements. By adjusting the basic gain via dip switches located on the bottom side

of the unit, headphones with different impedance and sensitivity specs can be driven in a convenient level range. This is particularly important because marketable headphones can have impedance values between 30 and 600 ohms which means that the same input level may result in loudness jumps by a factor of 20. A headphone's sensitivity can also result in considerable loudness discrepancies with the same level. Using the dip switches the gain can be set individually for both stereo channels within a range between 0 and 20 dB in four steps (0, 10, 18 and 20 dB with control at fully clockwise). On the front panel the Black Cube offers two parallel Neutrik ¼" headphone output jacks, where identical headphones should be connected if possible as different loads may affect the level and the sound. Inside we have a discrete bipolar Class A output stage which is fed by a regulated power supply and tuned altogether for a sound reproduction as 'transparent' as possible. The rear panel features two balanced XLR inputs. The case is neatly built with a plain aluminium front panel, optionally available in natural or black anodised, the smooth APLS control feels good and a little frontside LED indicates operational readiness. The manufacturer recommends a 5-minute warm-up phase.



Practice and Listening

As my source material I chose CDs, SACDs and Audio DVDs of very different music styles which I listened to through our Benchmark DAC1 converter which was connected directly to the Black Cube headphone amplifier. As a 'reference' I took our Genelec 8050 monitoring system switched into parallel whose properties I regard as 'authoritative'. My task actually consisted of two parts, because I had to evaluate differences between the Black Cube and other headphone amps and at the same time judge the sound qualities of the two headphone sets. So I set up two alternatives for the amplifier

evaluation, i.e. the headphone output of the Benchmark converter and the player's direct headphone output. Aiming to evaluate subtle distinctions as I expected them to occur in a comparison between headphone amplifiers, I've made it a habit to listen extensively to the respective configuration with the same programme and then switch over after quite some time to document the spontaneous impression of the resulting difference. But as it turned out the differences were so amazingly conspicuous right away that I didn't need to harbour any doubts about the validity of my evaluation. Furthermore it should be mentioned that I was using the AKG headphone set exclusively with this test procedure. At first the headphone output stages of the Benchmark DAC1 and of the player left a pretty decent impression so I was worried if I could hear any distinctions at all. With some goodwill I was able to give the Benchmark converter's headphone output slightly better marks: a little less midrange sharpness, slightly better contoured lows and a more open overall sound, yet within a scale that I would consider neglectable with good conscience.

The first changeover to the Black Cube by Lehmann Audio did fill me with wonder: the acoustic landscape opened up noticeably, the listening became more relaxed, 'hissing mids' had almost vanished completely and the lows showed more punch and contour like one would rather expect from a loudspeaker. At the same time fine details, transient-like components and also the spatial information were reproduced more clearly and more precisely. As the phrase goes, they were as different as day and night – in marked contrast to my expectations. Honestly, I wouldn't have believed the quality gap could be that big. Apart from the special listening situation which occurs when you put on headphones, the sound of our monitoring system differed only marginally from the reproduction via headphones. Balance and spatiality were correct when judged from the aspect of 'in-head localisation' and the '180-degree stereo base' which is typical of headphones. Of course, this also issues an outstanding testimonial to the AKG K 702 which first made the differences between the amplifiers audible and second had to compare with our monitoring system. The large earpads of the AKG headphones allow an individual fixation of the acoustic transducers in front of the ears. The best results I got with the pads located as low as possible, because shifting this position yielded appreciable differences in the repro-

duction of the upper mids and highs. When I was sure I had matched the headphones and the loudspeaker system in such a way that the differences between speakers and headphones could not be optimised any more, I switched over to the Ultrason Edition9 which was at least twice as loud as the AKG with the same input level – by no means amazing since its nominal impedance is a mere fifty percent. After a fresh volume adjustment I could start off with the acoustic evaluation of the Ultrason headphone set. Instantly the much more substantial reproduction of the lows became evident which even dwarfed the listening impression over loudspeakers. If I had to grade all three listening situations, the AKG K 702 sounded a bit weaker, but very close to the bass impression over loudspeakers while the Edition9 outperformed it clearly. In terms of transient fidelity, richness of detail and spatiality the two headphones revealed no appreciable differences, although the Ultrason appeared a bit 'milder' at first which, however, is to be attributed to the stronger lows. When doing a correcting equalisation I would have intuitively cut the lows of the Ultrason somewhat and boosted those of the AKG K 702. Yet it's interesting to note that, from a psychoacoustic aspect, the lows of the Ultrason were more spot-on with modest listening levels, while those of the AKG became a bit too feeble.

Conclusion

(...) In my opinion, the Black Cube headphone amplifier by Lehmann Audio belongs to the reference class of its kind. It creates a relaxed, open, neutral and detailed acoustic image which will hardly allow any fatigue effects to sneak in, with a far superior reproduction of spatiality, low frequencies and transients than what my reference candidates could have delivered which I would not exactly classify as 'audio junk'.

(...) For instance, I imagine working as a sound engineer with an Edition9 and the musicians in a room without having to sacrifice my perspective for a loudspeaker feeling and wearing an AKG K 702 on my head whenever I need to be able to 'hear the fleas cough'. Anyway, both headphones are perfectly suited for evaluating audio material without a trace of doubt. If you are lucky enough to have a Black Cube on hand for this purpose – so much the better!

Fritz Fey