

KOSS ESP/950 EARPHONES

Transducer Design: Electrostatic.
Coupling to the Ear: Circumaural.
Equalization: Diffuse field.
Sensitivity: 104 dB SPL at 100 mV (see text).
Maximum Output: 123 dB SPL.
Impedance: 100 kilohms.
Absolute Polarity: Positive.
Cord: 4 feet long from both earcups, with 5¾-foot extension cord.
Weight: 'Phones, 10 oz. (0.283 kg); energizer box, 17½ oz. (0.496 kg); battery box, 12 oz. (0.340 kg) with six C cells.
Price: \$2,000.
Company Address: 4129 North Port Washington Ave., Milwaukee, Wisc. 53212.
 For literature, circle No. 95



Koss has specialized in producing earphones for a long time. They introduced the SP/3 dynamic earphones to the consumer market in 1958. There were other earphones available at the time, but they were never considered competition to loudspeakers for serious music listening. Koss developed the SP/3 to be sold with a portable record player. That combination product might have been ahead of its time and didn't take off, but when marketed separately, the SP/3 earphones were an immediate success. It could thus be said that Koss created the consumer market for earphones in America. Koss was also the first American company to make an electrostatic earphone as a consumer product back in the 1960s; I still have a pair of ESP/9s. Although I didn't weigh them, they are much heavier than the 10-ounce ESP/950 earphones. I hear that Koss has used the ESP/950s in setting balance and level for classical recordings that the company has produced with the Milwaukee Symphony and other groups.

The ESP/950 might be considered an earphone system rather than just a pair of earphones. They come in an 1½ x 7 x 8 inch leatherette carry

case with compartment dividers. These dividers are held in place against the plush lining by hook-and-loop fasteners so that the compartments can be rearranged. I did take advantage of this to make a portable listening system by adjusting the dividers to accommodate a portable CD player. The lid of the case has a double zipper, and there are additional zippered compartments on each end that I used to store CDs. The earcup yokes snap onto the headband, and

they are easy to remove for storage in the case. The front and rear of each black earcup has a gray "L" or "R" for the left and right channels; it is somewhat difficult to see the markings in dim light. For the portable system, I used the battery box, which weighs 12 ounces with the six C batteries. It supplies about 320 mA at 9 V d.c. for normal listening levels.

The 17½-ounce energizer box that supplies the audio signal to the Koss ESP/950s is ¼ inches wide x 2½

EARPHONE EVALUATION

PARAMETER	RATING	COMMENTS
Overall Sound	Excellent	"Great sound" and "Natural"
Bass	Excellent	"Realistic" and "Clean and tight"
Midrange	Excellent	"Very articulate" and "Natural"
Treble	Excellent	"Smooth and extended"
Overall Isolation	Poor	"Outside sounds easily heard"
Bass	Poor	"No bass isolation"
Midrange	Poor	"Easy to carry on conversations"
Treble	Fair	"Highs are reduced"
Comfort	Excellent	"Surrounds outer ear completely"
Value	Good	"Expensive but worth it"

GENERAL COMMENTS: Very clear and natural sound; transparent mid and treble; realistic bass; very comfortable for long-term listening; very similar to reference earphones.

The listening panel gave the Koss ESP/950 'phones excellent ratings for both sound quality and physical attributes.

inches high × 6¼ inches deep. With the battery box plugged into the back, and the audio input and the earphone cord plugged into the front, I was still able to place the energizer box in the case and close the soft top lid. I placed the energizer box vertically so that its volume control was easy to reach. This control has two concentric knobs allowing the left- and right-channel levels to be adjusted independently; a slight friction between the controls causes them to rotate together. The front panel also has a stereo mini 'phone jack for the audio input, a special five-pin socket for the earphone plug, a power switch, and an LED indicator that changes from green to red when the batteries are low. The rear of the box has the power input jack and left and right input phono jacks.



The Koss ESP/950 earphones have a 4-foot cord attached, but the system includes a 5-foot, 9-inch extension cord. Also included are three stereo patch cords with gold plugs for phono to phono, phono to mini, and mini to mini connections.

The ESP/950s have a spring steel headband, covered by a foam-filled leatherette cushion, terminated at each end by plastic retainers. The yokes can be unlocked from the headband, allowing the earcups to be installed or removed with ease. Plastic pins molded into yokes allow the earcups to swing about 30°, while some play in the steel clips allows the earcups to swivel slightly so they will fit properly against the head.

The foam-filled leatherette ear cushions are removable for cleaning or re-

placement. They encircle the entire outer ear; this, combined with the relatively low headband tension, make the ESP/950s very comfortable to wear for long listening sessions.

The Koss ESP/950 earphones are the "open" type, i.e., without a seal behind the transducer diaphragm. The seal between the head and the front of the diaphragm is reasonably good, so there is very good output down to the lowest bass. When I pulled the ESP/950s away from my ears, while listening to pink noise, the sound changed dramatically. The pitch of the noise in the bass range seemed to sweep upward as I moved the 'phones away from my ears. If you try this with the ESP/950s, be careful to keep your hands away from the rear of the earcups because this will also affect the sound quality. Placing the flat of your hands even as much as 6 inches from the earcups dramatically changes the sound of pink noise. Also, if you listen while in bed or on a deep-backed chair, expect some change in the sound. The lack of a seal behind the earphones allows outside sounds to be heard quite easily, especially in the low-frequency range.

The subjective sound qualities of the Koss ESP/950 earphones were rated by members of a listening panel. I asked them to compare the sound of the Koss ESP/950 earphones with the sound of the Stax SR-Lambda Pro ear-speakers. They rated the ESP/950s while listening to a variety of program material and also wrote comments about the sound. I compared their ratings and comments with measurements I made.

My measurements showed that the bass level and extension were definitely affected by the quality of the seal between the earphones and the head. With a good seal, the bass was very extended, with good output even at 20 Hz. The panel members rated the bass sound of the ESP/950s as excellent and made comments such as "realistic," "clean and tight," and "excellent deep bass." Comments about the mid-range included "very articulate," "natural," and "good presence." These comments correlate well with the smooth midrange response I measured. The comments about the treble range, such as "smooth and extend-

ed" and "open and clear," also confirmed my measurements. The ESP/950's high-frequency response was just as extended as the Stax's.

The Koss ESP/950 earphones are designed to have a diffuse-field response, although there is still no agreement between manufacturers as to the exact shape of a diffuse-field equalization curve. The shape of the 500-Hz square wave was excellent, with only a slight amount of "ringing," and was very similar to that of the Stax earphones.

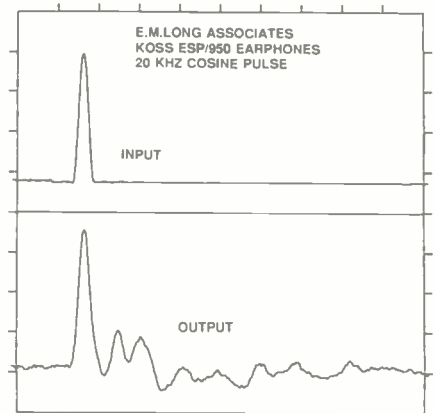


Fig. 1—20-kHz cosine-pulse test.

Figure 1 shows the output of the Koss ESP/950 earphones for a 20-kHz cosine input. The initial output is almost a duplicate of the input pulse and shows that the ESP/950s have a very fast rise-time. The output isn't perfect, but it indicates that the time-domain response is relatively well behaved. This correlates with panel-member comments such as "precise transients" and "excellent details." The output pulse also shows that the ESP/950s produce a positive acoustical output for a positive electrical input.

Because they have their own electronics, the ESP/950 earphones can produce very high sound levels of 104 dB with an input of only 100 mV. The listening panel members gave the ESP/950 earphones an overall sound quality rating of "excellent" and an "excellent" rating for physical attributes. Their sound makes them a close match to the Stax SR-Lambda Pros. Who would have thought that you could have electrostatic sound quality in a portable system? Edward M. Long