

DOPE FROM HOPE

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QUESTIONS AND ANSWERS

1. Do we need zero to 100,000 Hz range in audio amplifiers?
 2. Do we benefit from zero phase shift in amplifiers?
 3. Would transient response be improved by electronic crossover, zero phase shift and infinite frequency response?
- These are some of the questions we have to answer almost daily in correspondence and interviews.

1.

Several years ago, McIntosh fielded a show where it was demonstrated that extending the frequency response of an amplifier beyond 20,000 Hz produced no audible change. This is as it should be expected to be: if the microphone, recording, transmission media, loudspeaker, and human ear are band pass devices limited (optimistically) to a range of 30 to 20,000 Hz, isn't it ridiculous to demand one link of that chain to transmit zero to 100,000 Hz?

When an amplifier manufacturer proudly proclaims such a range, there may be advantage in permitting larger feedback and lower distortion. But the benefits are in the reduced distortion, not in extending the range beyond audibility. The fact is demonstrable that insertion of a 30 Hz high pass filter and 20,000 Hz low pass filter does not make an audible change.

2.

Phase shift and band width are not two different things but different aspects of the same thing. Any amplitude-response variations are functionally related to phase shifts. With the exception of all pass filters, the converse is true; phase shifts are functionally related to amplitude-response variations. You can't have amplitude variations without phase shift, or (except in all-pass filters) you can't have phase shift without amplitude variations.

Therefore, since band-pass limiting to 30-20,000 Hz is not audibly different from zero-200,000 Hz it must be concluded that the resultant phase effects are likewise inaudible.

In 1972 I presented a paper "Delay Effects in Loudspeakers".⁽¹⁾ Time Delay and "Phase" are one and the same. You can move your head a foot and change the "phase" of a 6500 Hz tone a matter of 2160 degrees. The delay is only 0.0009 second. The fact that speaker displacements in 2-way and 3-way systems of up to 2 feet are undetected should indicate the insignificance of the delay effect as long as it is within the 2 foot limit. As a matter of fact our experiments here indicate the limits may be of the order of 4 feet or nearly 0.004 second.

3.

The question of improved "phase shift" and "transient response" by means of an electronic crossover can best be answered by our DOPE FROM HOPE on Electronic Crossover.⁽²⁾ The experimental evidence should suffice. If you want "theory" to explain effect, it would take a book. There are a lot of other experimental data that precedes and is referred to in my "Delay Effects" paper. I will cite just one reference (No. 4 in my Delay paper) wherein Dr. Ashley points out that phase shifts are inaudible as long as they do not produce significant "wrinkles" in the amplitude response curve.

This DOPE FROM HOPE is intended to be accompanied with the one on "Electronic Crossover"⁽²⁾ and the reprint of my paper on "Delay Effects in Loudspeakers"⁽¹⁾. If you get this "DOPE" without the other material, send 2 bits for the paper; the other "DOPE" is free.

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(1) "Delay Effects in Loudspeakers", Paul W. Klipsch, Jour. Audio Engineering Society, Vol. 20, 8 October 1972, pp 634-637.

(2) "DOPE FROM HOPE" on "Electronic Crossover", Vol. 12, No. 2, March 1972.



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