
AURAL SENSITIVITY TO PHASE

As comment on the two letters in the February issue may I summarise some comment that I have made many times on the subject of the effects of phase shift in a monaural channel?

If a wideband speech or music signal is fed into a transmission system the system design must ensure that the low frequency components and the high frequency components arrive at the output end at about the same time. Clearly there will be some loss in sound quality if the low frequency components arrive today and the high frequency components arrive tomorrow. Thus there must be a limit to the differences in the transmission time that can be allowed. The CCIR standards define the permissible differential time delays for high quality systems, typically the 5kHz components may be delayed by around 5 milliseconds with respect to the 1kHz reference signal before a quality change is noticeable.

If we (mistakenly) choose to express this permissible time delay as a phase shift, it is some 9000 degrees, that is, the start of the 5kHz component can be delayed by about twenty five cycles before the shift is aurally noticeable. The wave shape at the system output then bears no relation to the waveshape at the system input.

If anybody has any evidence that time delays inside the CCIR values can result in

obvious differences in sound quality then the data should be produced as a contribution to the art. Our own work appears to show that if a skilled listener has the opportunity to listen repeatedly to a signal while the time delay is switched in and out of circuit, he will eventually come to detect a shift of about 3 milliseconds (rather than 5 milliseconds quoted above) but these observations only serve to confirm that the delay limit specified by CCIR is a reasonable choice for the ordinary situation where repeated comparison is not possible.

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