Channel Separation

This specification is not often quoted in multi-channel equipment. I personally feel that it is somewhat of an over rated specification. Here are my reasons.

The ultimate signal source is still the vinyl LP. For those who use only CD as a playback source they are really missing out. The compact disc is convenient but it cannot compare to the best that vinyl has to offer. Of course the playback system for vinyl must be of top quality to take advantage of its performance. The cartridge, turntable and phono preamplifier must work in harmony. Now what does this have to do with channel separation? The moving magnet or moving coil (the two most popular types) limit the amount of channel separation possible. A very good cartridge may have 35dB of channel separation at 1KHz and this drops off at higher frequencies. What does 35dB mean? It means that the "leakage" between channels is one fifty sixth of the signal level. If we could magically remove the signal from one of the cartridge's output terminals, it would still output a signal which is coupled from the other channel but it would be at 1/56 of the level of that channel and again do not forget that this is at middle frequencies only. But for the sake of argument, let us accept this 35dB figure as being broadband.

For ease of arithmetic I shall pick some easy numbers from which we can see how this affects what we hear. Let us assume that the one channel of the cartridge has an output of 1mV (quite typical of magnetic cartridges and even some very high output moving coil types). The other channel into which the signal is "leaking" will output 1/56 of this 1mV (0.001v). This means that it shall have an output of 0.018mV (0.000018v).

The typical amplification signal chain is 40dB for the RIAA preamplifier, 20dB for the high level amplifier (Typical home preamplifier) and then another 26dB for the power amplifier. Let's see how much voltage we end up with at our loudspeaker. 40dB = 100x voltage gain, 20dB = 10x voltage gain and 26dB = 20x voltage gain. So the 1mV is x20,000 =20 volts and the other channel is 0.36 volts.

OK what do we have now? 20 volts across a 4 ohm speaker is 100 watts and 0.36 volts is 0.0324 watts (32.4mW). The separation is still 35dB but consider the power numbers! Thirty two thousandths of a watt, as compared to one hundred watts. I challenge anyone who has one speaker been driven with 100 watts of average power to even hear the other with 0.0324 watts of average power. So who needs more separation? I am not saying that we as electronic designers should not strive to have the channel separation as good as we can make it, but not go overboard with it. It is not that difficult to design equipment with channel separation of over 80dB at middle frequencies. The channel separation shall ultimately be determined by the phono cartridge. CD users do not have to contend with these issues.

Consider for one moment that our signal source is a CD player and typically they have excellent channel separation. If our amplifier "only" has an 80dB separation specification, this means that the un-driven channel shall have one ten thousandths of the signal from driven channel, injected into it. So using our 100 watt amplifier above, the un-driven channel shall have an output of 0.000001 watts (1 microwatt). Hardly worth worrying about

I would think. A separation figure of a mere 50dB shall yield the un-driven channel to have an output of 0.001 watts (1 thousandth of a watt).