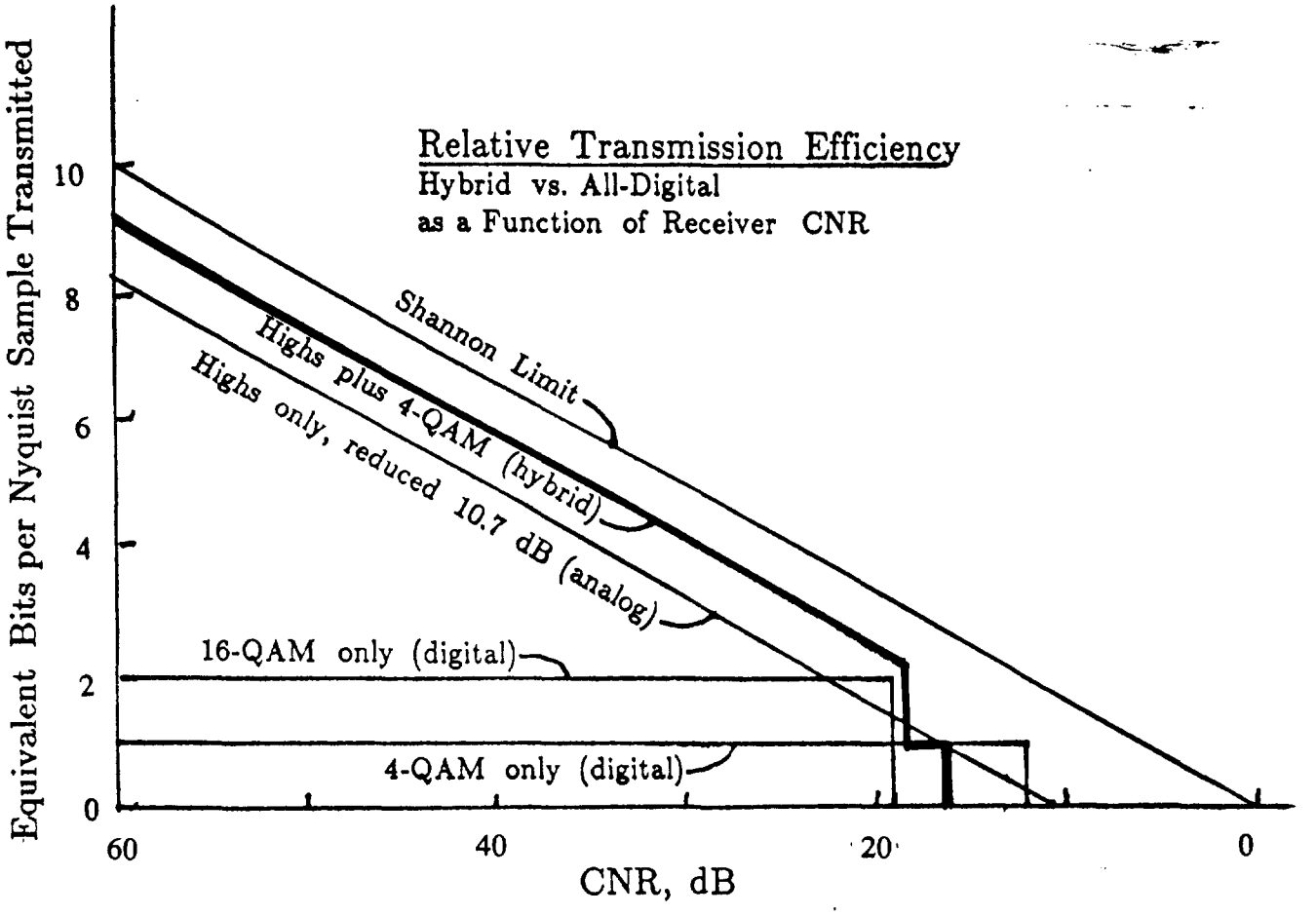

Fig. 5 Relative Transmission Efficiency of a Hybrid Format

Here we compare the transmission performance of the hybrid format used in the MIT-CC system with conventional 16-QAM and 4-QAM. As can readily be seen, the hybrid format gives about the same performance as QAM in the fringe area, but delivers much more data closer in, where most of the audience exists. The picture quality cannot, of course, be inferred directly from the transmission data rate; the specifics of the transmission systems must also be examined.

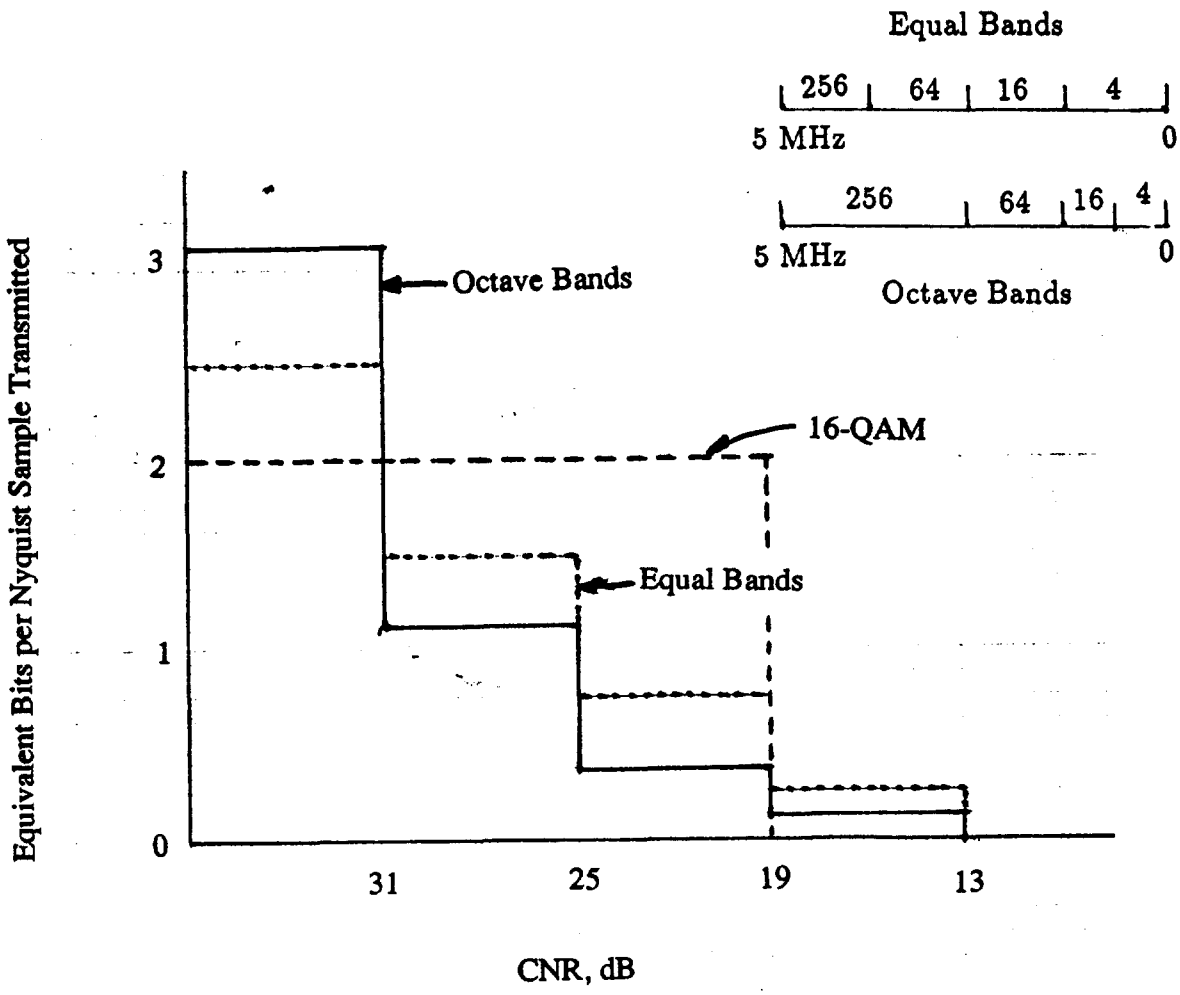

Fig. 6 Transmission Efficiency of Multichannel Digital Schemes

One way to achieve a soft threshold is to divide the channel into subchannels and to transmit with a different format each. Here we use 4-QAM, 16-QAM, 64-QAM, and 256-QAM in four subchannels. The solid line divides the channel into octave bands and the dotted line divides the channel into equal bands. The dashed line shows 16-QAM for comparision. As can easily be seen, the multichannel scheme does better than QAM at high CNR and worse at low CNR.

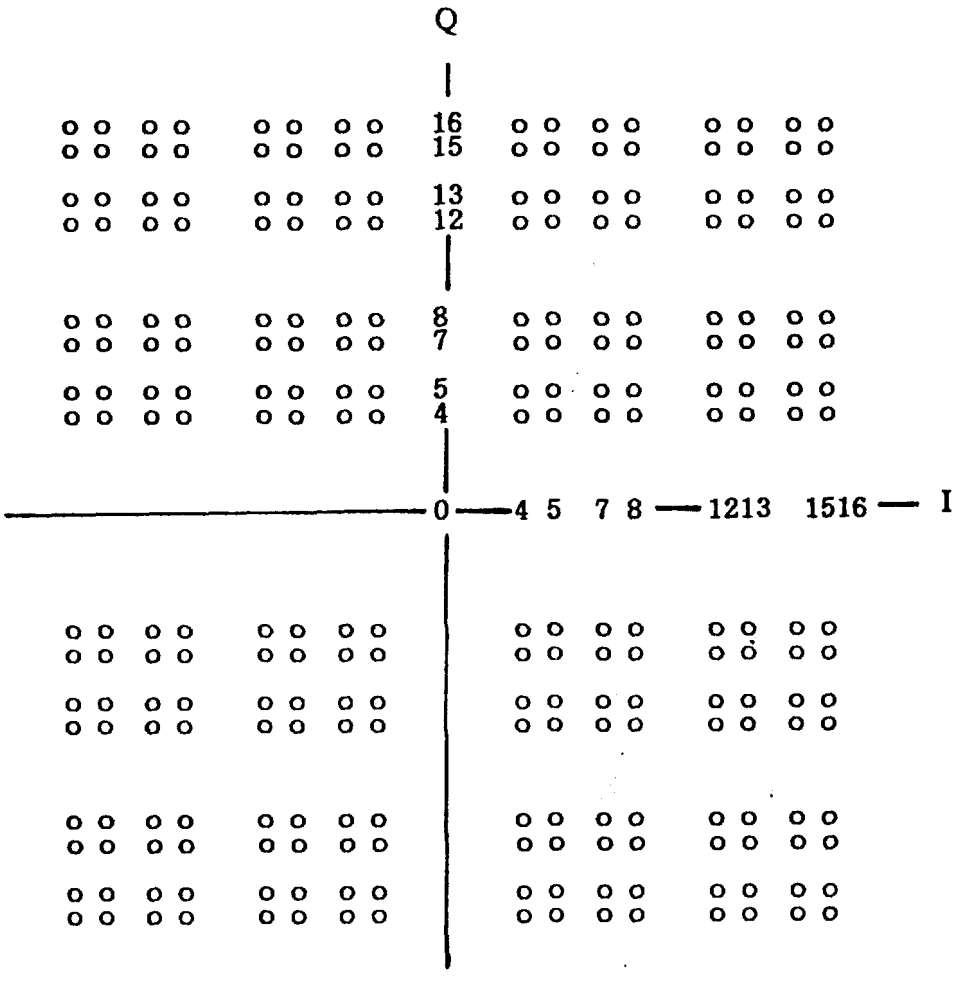

Fig. 7 256-QAM with Nonuniform Levels

The various level spacings are 1, 2, 4, and 8, corresponding to thresholds of 37, 31, 25, and 19 dB. Errors of the most significant bit are caused by an instantaneous noise level of 4, while errors of the least signficant bit by a noise level of .5. Such a scheme is intended to be used with a progressive coding system in which each bit corresponds to a different level of resolution.

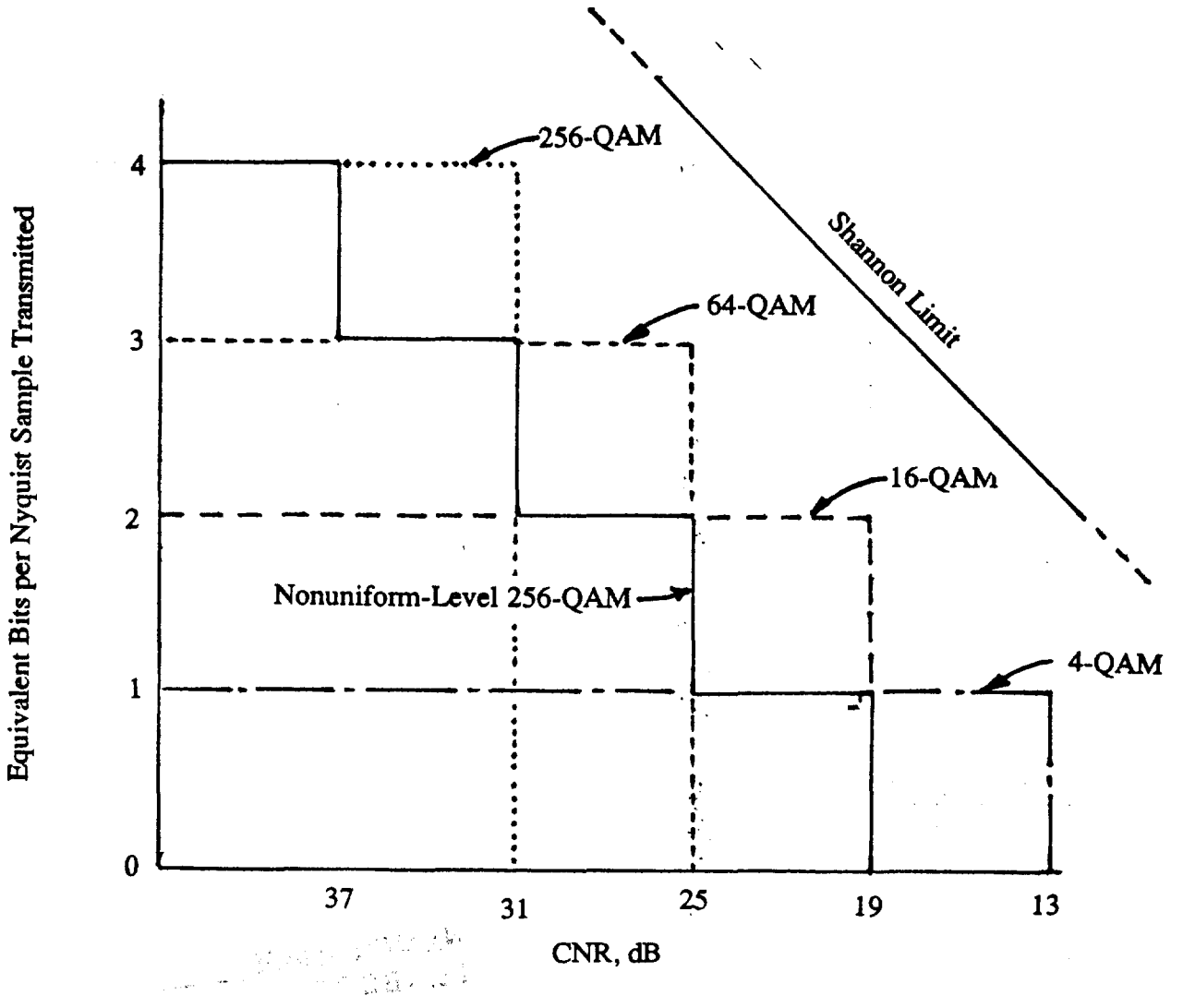

Fig. 8 Performance of the Nonuniform-Level QAM Scheme

Here we compare the performance of the scheme of Fig. 7 with 4-QAM through 256-QAM. While the simple QAM schemes are about 6 dB better at their optimum CNR, the nonuniform-level scheme operates quite well over a 24-dB range of CNR. (N.B. The method of calculation used in all these figures is approximate; more refined calculations may yield slightly different results.)