According to this definition, an objective of around 99.9 per cent could be selected. This corresponds to an estimated end-to-end mean time between failure of 20 000 hours and a mean time to restore service of 24 hours – both achievable figures for unprotected radio configurations. Other definitions of availability are possible, but they would alter the objective.

The availability objective is used during detailed design to balance such aspects as the reliability of the equipment, the location of maintenance centres, the level of maintenance personnel staffing, and the level of spares held.

7.3 Propagation Reliability

When radio systems are used, paths must be designed to a defined objective for propagation reliability. These objectives are usually stated as a probability that some noise or bit error rate will not be exceeded during any month (thus implying the worst propagation month).

Usually, two objectives are used: the first corresponds to the probability that circuit quality will be degraded below some reasonably acceptable level, and the second corresponds to the probability that circuit quality will be degraded to such a level that the channel is considered unusable and thus has failed.

Objectives for the first factor (probability of degradation below some reasonably acceptable circuit quality) are addressed in the next subsection (Noise or Bit Error Rate).

Objectives for the second factor (channel unusable) could be in the order of 99.5 to 99.95 per cent for a subscriber access system. It depends on the type of equipment, the paths encountered, and the subscriber's expectations.

If a channel is degraded to the following levels, the circuit is generally considered unusable (failed):

- noise of 10^6 pWO for analog systems and
- bit error rate of 10^{-3} or 10^{-4} for digital systems.

7.4 Noise or Bit Error Rate

Because a rural network generally has more transmission equipment between the exchange and the subscriber than that in an urban centre, the allowable noise for a rural network can be higher than that for the urban network. The CCITT handbook *Rural Telecommunications* (Geneva 1979) suggests that the distribution of noise shown in Figure 7.2 may be practical.

Since noise levels are referenced to the zero test level point (0TLP), the noise levels received by a subscriber is reduced by the amount of attenuation in the subscriber's loop. Thus, higher referenced noise levels can be tolerated by the subscriber when his or her line has higher attenuation.

Noise is statistically distributed; this is particularly evident when analog radios form part of the link. Therefore, the noise objectives should be stated as probabilities. Normally, these are given as noise values not to be exceeded for some percentage of the time. Often 20 per cent of any month is used, but 50 per cent or a median value is also common because of its convenience in propagation calculations.

When digital links are used, the concept of noise needs to be considered somewhat differently since, unlike analog facilities, a generally linear relationship between noise and received signal level does not exist. In the presence of a falling receive signal level (fading), a digital facility has low noise, although an increasing number of "clicks" can be heard, until eventually the bit error rate reaches some critical low value where the system loses synchronization and fails (typically around 10^{-3} or 10^{-4}). Bit error rates of 10^{-6} or 10^{-8} are often deemed good quality for voice; transmission designs are usually based on bettering these values more than 99 per cent of any month.