

6. Supplement No. 30 (new)

Recommendation G.173

TRANSMISSION PLAN ASPECTS OF LAND MOBILE TELEPHONY NETWORKS

(This Supplement is proposed for study during the present study period with the aim of converting it into a Recommendation.)

1. General

This Recommendation is primarily concerned with the special planning aspects which pertain to analogue or digital land mobile systems. Such systems, due to technical or economic factors, will prevent a full compliance with the general characteristics of international telephone connections and circuits recommended by CCITT.

The scope of this Recommendation is thus to give guidelines and advice to administrations as to what kind of precautions, measures and minimum requirements which are needed for a successful incorporation of such networks in the national PSTN.

The performance objectives of such systems may vary between different groups of customers. For normal customers the objective should be to reach a quality as close as possible to CCITT standards. For other groups of very disciplined customers, other performance objectives might be acceptable.

2. Network configurations

Under study.

Under this headline administrations should be advised to use four-wire transmission to avoid problems when accessing inherently four-wire mobile links.

3. Nominal transmission loss of mobile links

Under study.

Under this headline the problems with the application of loudness ratings and the correct loading of the radio channels should be discussed.

The recommended LR values in CCITT Recommendation G.121 are not directly applicable due to the fact that the background noise level is higher in a car than that assumed in Recommendation G.121.

What is the design objective for the speech levels from the radio path and what levels should be delivered to the network?

4. Stability

Under study.

5. Echo

Under study.

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Under this headline the need for echo control devices should be discussed.

6. Noise

Under study.

(Can the European group give indications of the inherent noise performance of the codec algorithms being considered?)

7. Delay

Under study.

8. Effects of errors in digital systems

Several coding methods, such as SBC, ATC, RELP and APC-AB with transmission bit rates below 16 kbit/s have been proposed to achieve spectrum utilization efficiency and quality comparable with conventional analogue FM systems. However, the application of such highly efficient speech coding methods to land mobile radio can lead to a significant degradation in quality because of transmission errors.

Mobile radio links are not always error-free. Burst errors occur frequently due to multipath fading. It has been reported that the average bit error rate (BER) performance of diversity reception is  $10^{-2}$  -  $10^{-4}$  in the 10 - 20 dB range of the average carrier-to-noise power ratio (CNR), and burst error length reaches 20 - 100 bits in case of 16 kbit/s digital signal transmissions. Therefore, robustness against burst error is an important characteristic for speech coding applied to mobile communication. Speech CODECs in mobile radio links should involve error control techniques so as to provide robustness in multipath fading channels. Thus, the transmission bit rate includes redundancy bits for error control.

Concerning quality evaluations, it may be better to use the average CNR as the receiving level for comparisons among analogue and digital systems. This is because it can present the receiving level as a normalized unit for both analogue FM and digital systems. In quality evaluations between digital systems, the average signal energy per bit to noise power density ratio ( $E_b/N_0$ ) is suitable for the presentation of the receiving level. This is because it can describe the receiving level as a normalized unit for any transmission bit rate and receiving bandwidth.

9. Quantizing distortion

Under study.

10. Effect of transmission impairments on voice band

Under study.