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# G.174

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## GENERAL CHARACTERISTICS OF INTERNATIONAL TELEPHONE CONNECTIONS AND INTERNATIONAL TELEPHONE CIRCUITS

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## TRANSMISSION PERFORMANCE OBJECTIVES FOR TERRESTRIAL DIGITAL WIRELESS SYSTEMS USING PORTABLE TERMINALS TO ACCESS THE PSTN

### ITU-T Recommendation G.174

(Previously "CCITT Recommendation")

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## FOREWORD

The ITU-T (Telecommunication Standardization Sector) is a permanent organ of the International Telecommunication Union (ITU). The ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Conference (WTSC), which meets every four years, establishes the topics for study by the ITU-T Study Groups which, in their turn, produce Recommendations on these topics.

The approval of Recommendations by the Members of the ITU-T is covered by the procedure laid down in WTSC Resolution No. 1 (Helsinki, March 1-12, 1993).

ITU-T Recommendation G.174 was prepared by ITU-T Study Group 12 (1993-1996) and was approved under the WTSC Resolution No. 1 procedure on the 21th of June 1994.

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## NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

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## CONTENTS

|                                                            | <i>Page</i> |
|------------------------------------------------------------|-------------|
| 1 Scope .....                                              | 1           |
| 2 Normative References .....                               | 1           |
| 3 Abbreviations and Definitions .....                      | 2           |
| 4 Reference Configuration .....                            | 2           |
| 5 Overall PSTN Quality Perspective .....                   | 3           |
| 5.1 PSTN Quality of Service Perspective .....              | 3           |
| 5.2 PSTN Transmission Performance Perspective .....        | 4           |
| 6 Transmission Effects of the Digital Radio Channel .....  | 4           |
| 7 Speech Transmission Performance Objectives .....         | 5           |
| 7.1 General .....                                          | 5           |
| 7.2 Speech Coder Performance .....                         | 6           |
| 7.3 Loudness Ratings .....                                 | 6           |
| 7.4 Weighted Terminal Coupling Loss .....                  | 7           |
| 7.5 Delay .....                                            | 7           |
| 7.6 Delay and Echo Response Variations .....               | 8           |
| 7.7 Control of Echo from Outside the Wireless System ..... | 8           |
| 7.8 Clipping (temporal) .....                              | 9           |
| 7.9 Idle Channel Noise .....                               | 9           |
| 7.10 Noise Contrast and Comfort Noise .....                | 10          |
| 7.11 Random Bit Errors and Bursts of Errors .....          | 10          |
| 7.12 Bandwidth .....                                       | 10          |
| 7.13 Stability Loss (Minimum Echo Path Loss) .....         | 10          |
| 7.14 Quantization Distortion .....                         | 10          |
| 8 Voiceband Data and Other Non-Speech Transmission .....   | 10          |
| 8.1 General .....                                          | 10          |
| 8.2 Application Requirements .....                         | 11          |
| 8.3 Performance Suitability .....                          | 11          |
| 8.4 Interworking .....                                     | 11          |
| 8.5 DTMF .....                                             | 12          |
| 8.6 Call Progress Signals .....                            | 12          |

## SUMMARY

This Recommendation provides transmission performance objectives that, if realized, should facilitate widespread user acceptance of emerging wireless technologies. These objectives apply to terrestrial digital wireless systems that use portable terminals to access the PSTN. Additionally, this Recommendation reinforces the fact that “comparable PSTN quality” encompasses, among many other considerations, a broad set of transmission performance criteria, all of which need to be considered to achieve the robustness and interworking capabilities of the PSTN.

## INTRODUCTION

Next generation wireless personal communication systems, such as the Future Public Land Mobile Telecommunication System (FPLMTS) being standardized by the ITU-R, are expected to be globally deployed by the year 2000. A clearly stated objective of FPLMTS is to have its quality of service, which includes transmission performance, be comparable to that of the PSTN. It is widely recognized that this objective should be satisfied in order for these wireless access systems to achieve the general utility and wide acceptance that has been realized by the PSTN. Accordingly, this recommendation was developed with the goal of providing transmission performance objectives that should be met by a wireless system in order to be considered comparable to the PSTN. These objectives were derived to be generic, and may or may not be directly applicable to FPLMTS, which may require other specific requirements.

Because wireless personal communication systems can in effect replace the national extension part of an international connection, all the Recommendations dealing with the national extensions can also be applied to these wireless systems, unless this Recommendation gives other guidelines for planning the system. The objectives given here were derived in recognition of the fact that they should be specific enough to meaningfully guide sub-system development, yet flexible enough to accommodate the well-established need to tradeoff between quality and capacity in a variety of realistic radio operating environments. Finally, this Recommendation highlights the diversity of transmission performance criteria that need to be considered in order for the “comparable to PSTN” quality goal to be realized.

**Recommendation G.174****TRANSMISSION PERFORMANCE OBJECTIVES FOR  
TERRESTRIAL DIGITAL WIRELESS SYSTEMS USING  
PORTABLE TERMINALS TO ACCESS THE PSTN***(Geneva, 1994)***1 Scope**

This Recommendation provides transmission performance objectives for terrestrial digital wireless systems that use portable terminals to access the PSTN (or the PSTN network interface). While satellite access to a base station is not within the scope of this Recommendation, interconnection with the PSTN, which may involve satellite access, or a satellite link within the PSTN, is not excluded. In this Recommendation, these portable terminals are generically referred to as wireless personal communication systems; however, there is no intent that the objectives herein necessarily apply to any specific wireless personal communication system. The objectives provided here have been derived with the explicit assumption that the switching and transmission systems used in the PSTN, above and including the local exchanges, are digital, with subscriber lines being either analogue or digital. This assumption allows for more pertinent guidance for the time frame in which these future wireless systems are expected to be deployed. Such wireless systems are not expected to introduce, during stable operation, any significant transmission quality degradation relative to PSTN links covered by the G.100-Series of Recommendations. Currently, Recommendation G.173 exists for established mobile technologies that may not comply with this Recommendation for economic reasons.

This Recommendation has two major purposes: first, to provide, in a single document, transmission performance objectives that, if realized, should facilitate widespread user acceptance of emerging wireless technologies. The second major purpose of this Recommendation is to reinforce the fact that "comparable PSTN quality" encompasses, among many other considerations, a broad set of transmission performance criteria, all of which need to be considered to achieve the robustness and interworking capabilities of the PSTN.

**2 Normative References**

|                       |                                                                                               |
|-----------------------|-----------------------------------------------------------------------------------------------|
| Recommendation E.430  | <i>Quality of Service Framework</i>                                                           |
| Recommendation E.800  | <i>Quality of Service and Dependability Vocabulary</i>                                        |
| Recommendation G.113  | <i>Transmission Impairments</i>                                                               |
| Recommendation G.114  | <i>One-Way Transmission Time</i>                                                              |
| Recommendation G.131  | <i>Stability and Echo</i>                                                                     |
| Recommendation G.165  | <i>Echo Cancellers</i>                                                                        |
| Recommendation G.173  | <i>Transmission Planning Aspects of Speech Service in Digital Public Land Mobile Networks</i> |
| Recommendation G.711  | <i>Pulse Code Modulation (PCM) of Voice Frequencies</i>                                       |
| Recommendation G.712  | <i>Transmission Performance Characteristics of Pulse Code Modulation</i>                      |
| Recommendation G.726  | <i>40, 32, 24, 16 kbit/s Adaptive Differential Pulse Code Modulation (ADPCM)</i>              |
| Recommendation G.728  | <i>Coding of Speech at 16 kbit/s Using Low Delay-Code Excited Linear Prediction</i>           |
| Recommendation P.31   | <i>Transmission Characteristics of Digital Telephone Sets</i>                                 |
| Recommendation P.79   | <i>Determination of Loudness Ratings</i>                                                      |
| Recommendation Q.1001 | <i>General Aspects of Public Land Mobile Network</i>                                          |

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1

**Recommendation G.174**

### 3 Abbreviations and Definitions

For the purposes of this Recommendation, the following abbreviations apply:

|                  |                                                     |
|------------------|-----------------------------------------------------|
| ADPCM            | Adaptive Differential Pulse Code Modulation         |
| BER              | Bit Error Ratio                                     |
| BLER             | Block Error Ratio                                   |
| DTMF             | Dual Tone Multiple Frequency                        |
| EPL              | Echo Path Loss                                      |
| FPLMTS           | Future Public Land Mobile Telecommunication Systems |
| LD-CELP          | Low Delay-Code Excited Linear Prediction            |
| PCM              | Pulse Code Modulation                               |
| PCS              | Personal Communications Systems                     |
| PLMN             | Public Land Mobile Network                          |
| PSTN             | Public Switched Telephone Network                   |
| QDU              | Quantization Distortion Unit                        |
| RLR              | Receiving Loudness Rating                           |
| SLR              | Sending Loudness Rating                             |
| TCL <sub>w</sub> | Terminal Coupling Loss (weighted)                   |

Where possible, definition sources have been included in brackets :

**base station:** The common name for all the radio equipment located at one and the same place used for serving one or several cells. [See Recommendation Q.1001.]

**handoff:** The action of switching a call in progress from one cell to another (or between radio channels in the same cell), to allow established calls to continue when mobile stations move from one cell to another (or as a method to minimize co-channel interference). [See Recommendation Q.1001.]

**public land mobile network (PLMN):** A network established and operated by an Administration or Recognized Operating Agency (ROA) for the specific purpose of providing land mobile telecommunication services to the public. A PLMN may be regarded as an extension of a fixed network (e.g. PSTN) or as an integral part of the PSTN. [See Recommendation Q.1001.]

**PSTN:** In this Recommendation, this term is intended to represent a fully digital path in the switched network, local exchange to local exchange, that is terminated at the far end (from the wireless access system) by either an analogue subscriber line and terminal or by a digital line and terminal.

**wireless access:** Terminal access to the network using wireless technology. Examples are: digital mobile phones, digital cordless phones, and FPLMTS personal stations.

**wireline access:** Terminal access to the network which uses wireline technology (e.g. conventional telephone sets and subscriber lines).

**wireless terminal:** A general term used for any mobile station, personal station or personal terminal, with which non-fixed access to the network is used.

### 4 Reference Configuration

Figure 1 gives the general configuration of digital wireless personal access system to which the performance objectives of this Recommendation apply. When the network interface is digital, it should have a relative level of 0 dBr in both directions of transmission. When an analogue line is used to interconnect the base station to the digital paths in the PSTN, other considerations apply (see for example Figure 4).