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| **Recommendation ITU-R M.1073-3**  **(03/2012)** |
| **Digital cellular land mobile telecommunication systems** |
| **M Series**  **Mobile, radiodetermination, amateur**  **and related satellite services** |

Foreword

The role of the Radiocommunication Sector is to ensure the rational, equitable, efficient and economical use of the radio-frequency spectrum by all radiocommunication services, including satellite services, and carry out studies without limit of frequency range on the basis of which Recommendations are adopted.

The regulatory and policy functions of the Radiocommunication Sector are performed by World and Regional Radiocommunication Conferences and Radiocommunication Assemblies supported by Study Groups.

# Policy on Intellectual Property Right (IPR)

ITU-R policy on IPR is described in the Common Patent Policy for ITU-T/ITU-R/ISO/IEC referenced in Annex 1 of Resolution ITU-R 1. Forms to be used for the submission of patent statements and licensing declarations by patent holders are available from <http://www.itu.int/ITU-R/go/patents/en> where the Guidelines for Implementation of the Common Patent Policy for ITU‑T/ITU‑R/ISO/IEC and the ITU-R patent information database can also be found.

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| Series of ITU-R Recommendations  (Also available online at <http://www.itu.int/publ/R-REC/en>) | |
| **Series** | Title |
| **BO** | Satellite delivery |
| **BR** | Recording for production, archival and play-out; film for television |
| **BS** | Broadcasting service (sound) |
| **BT** | Broadcasting service (television) |
| **F** | Fixed service |
| M | Mobile, radiodetermination, amateur and related satellite services |
| **P** | Radiowave propagation |
| **RA** | Radio astronomy |
| **RS** | Remote sensing systems |
| **S** | Fixed-satellite service |
| **SA** | Space applications and meteorology |
| **SF** | Frequency sharing and coordination between fixed-satellite and fixed service systems |
| **SM** | Spectrum management |
| **SNG** | Satellite news gathering |
| **TF** | Time signals and frequency standards emissions |
| **V** | Vocabulary and related subjects |

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| ***Note***: *This ITU-R Recommendation was approved in English under the procedure detailed in Resolution ITU-R 1.* |

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RECOMMENDATION ITU-R M.1073-3

Digital cellular land mobile telecommunication systems

(1994-1997-2005-2012)

Scope

This Recommendation recommends the technical and operational characteristics of digital cellular land mobile telecommunication systems for international and regional use. By providing associated references to the specifications for each technology, the Recommendation provides guidance for administrations evaluating various cellular systems for their intended applications.

The ITU Radiocommunication Assembly,

considering

a) that digital signals in various formats are being used to improve the communications efficiency of the land mobile service;

b) that digital transmission systems which are not compatible with existing land mobile systems should also be considered, including the transmission of digitally encoded speech signals;

c) that mobile telephone services, i.e. services for public correspondence via radio stations connected to the public switched telephone network (PSTN), are in operation in a number of countries and that their use is extending;

d) that the various technical systems already in use or proposed for such services, are not necessarily compatible;

e) that system compatibility is necessary in the case of international operation;

f) that for international operation it is desirable to agree on the parameters of the system;

g) the need to improve spectrum utilization efficiency and hence system capacity per MHz per unit area;

h) the need for a flexible system structure able to match network investment to revenue growth, readily adapting to environmental factors and responding to new developments rather than restricting innovation;

j) the increasing importance of the various types of data and telematic services,

noting

that Recommendation ITU-R M.1457 covers the IMT-2000 radio interfaces,

recommends

that for digital cellular land mobile telecommunication systems (DCLMTS) the following technical and operational characteristics should be used:

# 1 General objectives

The general objectives of DCLMTSs are to provide:

– systems with high spectrum utilization efficiency, thereby accommodating more users within the limited spectrum resource than existing analogue cellular public land mobile telecommunication systems (PLMTS);

– users with a wide range of services and facilities, both voice and non-voice, that are compatible with, and access, those offered by the public fixed networks (PSTN, ISDN, PDN, etc.);

– services and facilities exclusive to mobile systems, including facilities for automatic roaming, locating and updating mobile users;

– users with a variety of mobile stations consistent with their requirements, ranging from vehicle mounted to hand‑held stations with voice and non-voice interfaces;

– services of high quality and integrity at an economic cost;

– mobile equipment and infrastructure at the reduced cost, weight, size and power drain offered by the adoption of digital processing and very large scale integration (VLSI) technology.

# 2 Digital technology

Digital technology is introduced into the PLMTS in five major areas:

– digital radio modulation/demodulation;

– digital speech coding;

– channel coding and digital signal processing;

– digital control and data channels;

– privacy and authentication.

# 3 Service types

The basic telecommunication services offered by the DCLMTS, as fully described in the reference material, can be divided into two types:

– bearer services which give the user the capacity needed to transmit appropriate signals between certain access points;

– teleservices which provide the user with the full capacity, including terminal equipment functions, to communicate with other users.

Supplementary services are also available in association with the basic services.

All the DCLMTS support some services in each category, but the range offered varies between systems.

## 3.1 Bearer services

Typical bearer services offered include:

– synchronous, asynchronous and packet data;

– unrestricted digital capability at specific bit rates.

In general, connection of voice-band modems to the speech path of mobile stations is not supported. Equivalent service to that offered by the use of voice-band modems on the PSTN or ISDN can be provided via the bearer services listed above.

## 3.2 Teleservices

All the DCLMTS support telephony and facsimile teleservices. Some extend the teleservice offerings to include videotex, teletex, etc.

## 3.3 Supplementary services

The range of supplementary services supported by the DCLMTS varies depending on the system and also the particular implementation.

# 4 Architecture common to all digital systems

## 4.1 Base station layout

The geographical distribution of base stations is organized around two types of structure:

– regular cell structures using omnidirectional antennas;

– sector cell structures using directional antennas.

## 4.2 Channel design

Two basic categories of channels are defined for DCLMTS:

– traffic channels (TCH) which are used for voice and data transmission (i.e. bearer services and teleservices);

– control channels (CCH) which are used for signalling and control purposes, including handover.

The CCH can be further divided into three broad types:

– common control channels (CCCH) which are used for paging, random access, etc.;

– broadcast control channels (BCCH) which are used for broadcast messages, and/or synchronization and frequency correction;

– associated control channels (ACCH) which can be divided into slow ACCH (SACCH) and fast ACCH (FACCH) and provide control and signalling functions for individual users.

Some systems may also define other types of control channel for particular applications (e.g. stand-alone dedicated control channels).

## 4.3 Network architecture and assignment of functions

Figure 1 shows the basic system architecture for a DCLMTS, including the major functional components. The communication protocols are specified according to the 7-layer OSI model, while the interfaces between mobile switching centres (MSCs) and the interfaces to the ISDN, PSTN and PDN are all specified according to ITU‑T Recommendations. The numbering plan also follows ITU‑T Recommendations.

FIGURE 1

Network architecture



# 5 Incorporation of externally developed specification material

The detailed standardization of the technologies in this Recommendation has been undertaken within standards development organizations. This Recommendation therefore makes use of references to externally developed standards.

# 6 Digital cellular systems and their enhancements

High capacity digital wireless systems have been developed in all three Regions. Each of the systems delineated below is incorporated by using a simple reference pointer. References to these systems are shown in the following Tables.

## 6.1 GSM

These reference links describe the characteristics of GSM.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | | Document No. | Version | Status | Issued date | Location |
|  | ETSI | TS 102 338 | 1.0.0 | Published | June 2004 | <http://pda.etsi.org/exchangefolder/ts_102338v010000p.pdf> |

## 6.2 TIA/EIA-136 TDMA

These reference links describe the characteristics of TIA/EIA-136 TDMA.

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| --- | --- | --- | --- | --- | --- | --- |
|  | | Document No. | Version | Status | Issued date | Location |
|  | TIA | TIA-136-000 | E | Published ANS | 2004-01-14 | <http://ftp.tiaonline.org/uwc136/136-000-E.pdf> |

## 6.3 TIA/EIA-95 CDMA

These reference links describe the characteristics of TIA/EIA-95 CDMA.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | | Document No. | Version | Status | Issued date | Location |
|  | TIA | TIA-2000.000 | 1.0 | Published | 2004-06 | <http://ftp.tiaonline.org/TR-45/TR-45.5/Public/ITUM1073/TIA-2000.00_CDMA_List%20of%20Stds.doc> |

## 6.4 PDC

These reference links describe the characteristics of PDC.

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| --- | --- | --- | --- | --- | --- | --- |
|  | | Document No. | Version | Status | Issued date | Location |
|  | ARIB | RCR STD-27 | L | Published | Nov. 2005 | <http://www.arib.or.jp/english/html/overview/doc/5-STD-27_L-1p3-E.pdf> <http://www.arib.or.jp/english/html/overview/doc/5-STD-27_L-2p3-E.pdf> <http://www.arib.or.jp/english/html/overview/doc/5-STD-27_L-3p3-E.pdf> |