

RECOMMENDATION ITU-R M.1073-2

Digital cellular land mobile telecommunication systems

(Question ITU-R 107/8)

(1994-1997-2005)

Scope

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;
- k) Question ITU-R 101/8 on digitized speech transmission, Question ITU-R 37/8 on cellular systems;
- l) Recommendation ITU-R M.622 on analogue cellular systems;

noting

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

recommends

that the following technical and operational characteristics of digital cellular land mobile telecommunication systems (DCLMTS) 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:

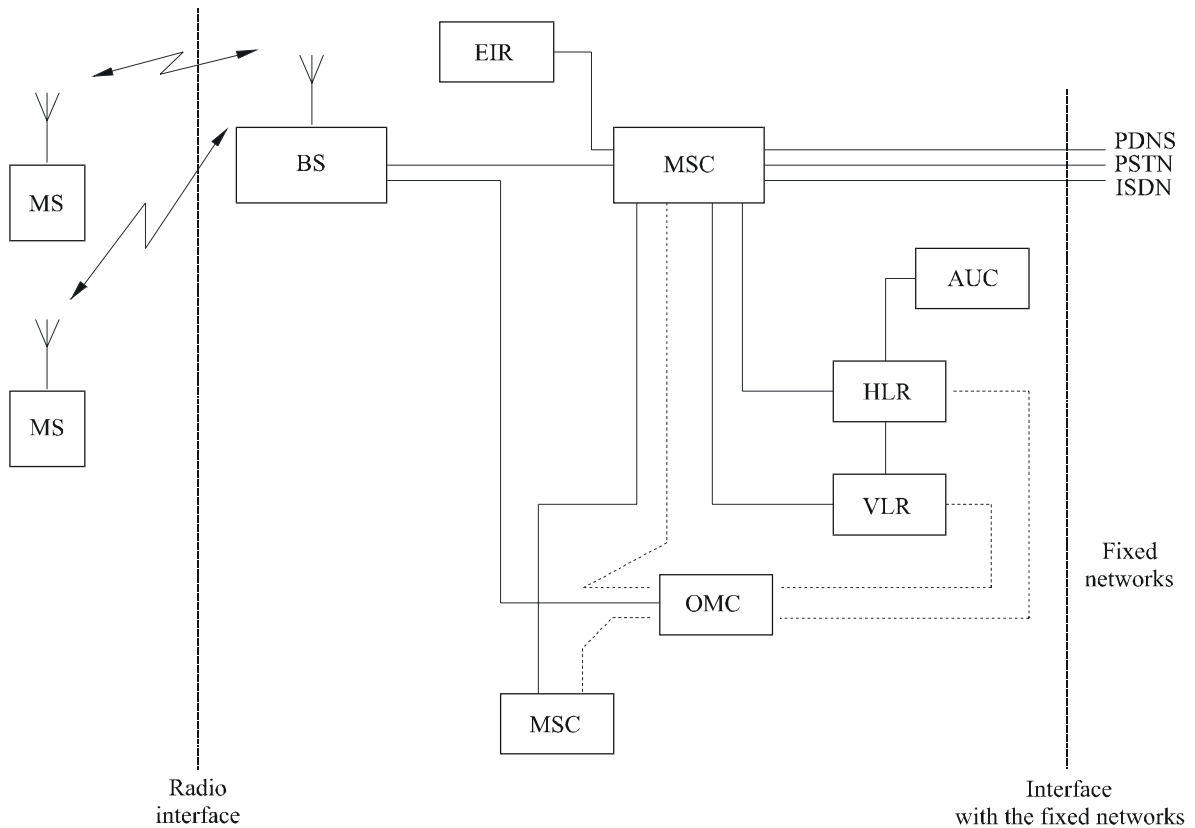
- common control channels (CCCH) which are used for paging, random access, etc.;
- broadcast control channels (BCCH) which are used for broadcast messages, and/or synchronization and frequency correction;
- associated control channels (ACCH) which can be divided into slow ACCH (SACCH) and fast ACCH (FACCH) 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



- AUC: authentication centre
- BS: base station
- EIR: equipment identity register
- HLR: home location register
- MS: mobile station
- MSC: mobile services switching centre
- OMC: operation and maintenance centre
- VLR: visitor location register

- Physical connection
- Logical relationships

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://webapp.etsi.org/exchange/older/ts_102338v010000p.pdf

6.2 TIA/EIA-136 TDMA

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

	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	ftp://ftp.tiaonline.org/TR-45/TR455/Public/ITUM1073/TIA-2000.00_CDMA_List%20of%20Standards.doc

6.4 PDC

These reference links describe the characteristics of PDC.

	Document No.	Version	Status	Issued date	Location
ARIB	RCR STD-27	K	Published	July 2003	http://www.arib.or.jp/english/html/overview/itu/rcr_std-27_e.pdf