

**Universal Mobile Telecommunications System (UMTS);
High level requirements relevant for the definition of the
UMTS Terrestrial Radio Access (UTRA) concept
(UMTS 21.02 version 3.0.1)**

UMTS

Universal Mobile
Telecommunications System



Reference

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concept

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Foreword

This ETSI Technical Report has been produced by ETSI Special Mobile Group (SMG).

This TR summarises all the key requirements identified for UMTS Terrestrial Radio Access concept.

The contents of this TR is subject to continuing work within SMG and may change following formal SMG approval.

Version 3.x.y

where:

- 3 indicates UMTS;
- x the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- y the third digit is incremented when editorial only changes have been incorporated in the specification;

Introduction

This document summarises the requirements for the UMTS Terrestrial Radio Access concepts. The purpose of this document is to enable the proposals for UTRA technologies to be developed and evaluated. UMTS 21.01 will be developed to give further details on the UMTS radio requirements.

1 Key requirements

The following table summarises all the key requirements identified for UMTS Terrestrial Radio Access concept:

NOTE: Not all combinations of options are required; for details see UMTS 21.01 (ETSI TR 101 111).

Table

Key Requirements	Description
Bearer capabilities	
Maximum User Bit Rates	The UTRA should support a range of maximum user bit rates that depend upon a users current environment as follows: Rural Outdoor ¹ : at least 144 kbit/s (goal to achieve 384 kbit/s), maximum speed: 500 km/h Suburban Outdoor ² : at least 384 kbps (goal to achieve 512 kbit/s), maximum speed: 120 km/h Indoor/Low range outdoor ³ : at least 2Mbps, maximum speed: 10 km/h It is desirable that the definition of UTRA should allow evolution to higher bit rates.
Flexibility	Negotiation of bearer service attributes (bearer type, bit rate, delay, BER, up/down link symmetry, protection including none or unequal protection), parallel bearer services (service mix), real-time / non-real-time communication modes, adaptation of bearer service bit rate Circuit and packet oriented bearers Supports scheduling (and pre-emption) of bearers (including control bearers) according to priority Adaptivity of link to quality, traffic and network load, and radio conditions (in order to optimise the link in different environments). Wide range of bit rates should be supported with sufficient granularity Variable bit rate real time capabilities should be provided. Bearer services appropriate for speech shall be provided.
Handover	Provide seamless (to user) handover between cells of one operator. The UTRA should not prevent seamless HO between different operators or access networks. Efficient handover between UMTS and 2nd generation systems, eg GSM, should be possible.
Operational requirements	
Compatibility with services provided by present Core Transport Networks	ATM bearer services GSM services IP (internet protocol) based services B/N-ISDN services
Radio Access Network Planning	If radio resource planning is required, automatic planning shall be supported.
Public network operators	It shall be possible to guarantee pre-determined levels of quality-of-service and quality to public UMTS network operators, in the presence of other authorised UMTS users.
Private and residential operators	The radio access scheme should be suitable for low cost applications where range, mobility and user speed may be limited. Multiple unsynchronised systems should be able to successfully coexist in the same environment. It should be possible to install basestations without co-ordination. Frequency planning should not be needed.
(continued)	

¹ The specified bit rate will be available throughout the operator's service area, with the possibility of large cells

² The specified bit rate will be available with complete coverage of a suburban or urban area, using microcells or smaller macrocells

³ The specified bit rate will be available indoors and localised coverage outdoors.

Table (concluded)

Key Requirements	Description
	Efficient spectrum usage
Spectrum efficiency	High spectrum efficiency for typical mixtures of different bearer services. Spectrum efficiency at least as good as GSM for low bit rate speech.
Variable Asymmetry of Total Band Usage	variable division of radio resource between uplink and down link resources from a common pool (NB: This division could be in either frequency, time, or code domains)
Spectrum Utilisation	Allow multiple operators to use the band allocated to UMTS without co-ordination. ⁴ It should be possible to operate the UTRA in any suitable frequency band that becomes available such as first & second generation system's bands
Coverage / Capacity	The system should be flexible to support a variety of initial coverage/capacity configurations and facilitate coverage/capacity evolution Flexible use of various cell types and relations between cells (e.g. indoor cells, hierarchical cells) within a geographical area without undue waste of radio resources. Ability to support cost effective coverage in rural areas
	Complexity/cost
Mobile Terminal viability	Handportable and PCM-CIA card sized UMTS terminals should be viable in terms of size, weight, operating time, range, effective radiated power and cost.
Network complexity and cost	The development and equipment cost should be kept at a reasonable level, taking into account the cost of cell sites, the associated network connections, signalling load and traffic overhead (e.g. due to handovers).
Mobile station types	It should be possible to provide a variety of mobile station types of varying complexity, cost and capabilities in order to satisfy the needs of different types of users.
	Requirements from bodies outside SMG
Alignment with IMT 2000	UTRA shall meet at least the technical requirements for submission as a candidate technology for IMT 2000 (FPLMTS)
Minimum bandwidth allocation	It should be possible to deploy and operate a network in a limited bandwidth
Electro-Magnetic Compatibility (EMC)	The peak and average power and envelope variations have to be such that the degree of interference caused to other equipment is not higher than in today's systems.
RF Radiation Effects	UMTS shall be operative at RF emission power levels which are in line with the recommendations related to electromagnetic radiation.
Security	The UMTS radio interface should be able to accommodate at least the same level of protection as the GSM radio interface does.
Coexistence with other systems	The UMTS Terrestrial Radio Access should be capable to co-exist with other systems within the same or neighbouring band depending on systems and regulations
	Multimode implementation capabilities
	It should be possible to implement dual mode UMTS/GSM terminals cost effectively.

⁴ NOTE: the feasibility of spectrum sharing requires further study.

History

Document history		
V3.0.1	October 1998	Publication