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Dual Transfer Mode (DTM);  
Stage 2  
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# Contents

Intellectual Property Rights .....	2
Foreword.....	2
Modal verbs terminology.....	2
Foreword.....	5
Introduction .....	5
Motivation.....	5
Concept basis .....	5
Class A mode of operation.....	6
1 Scope .....	7
2 References .....	7
3 Definitions and abbreviations.....	8
3.1 Definitions .....	8
3.2 Abbreviations .....	8
4 Class A capabilities .....	9
4.1 Main DCCH with SAPI=0 .....	9
4.1.1 General.....	9
4.1.2 MS-SGSN tunnelling.....	9
4.2 Single slot operation.....	10
4.2.1 General.....	10
4.2.2 TCH/H + PDCH/H .....	10
4.3 Multislot operation .....	11
4.3.1 General.....	11
4.3.2 Shared PDCH.....	11
4.3.3 Exclusive use of PDCH/H .....	11
4.3.4 TCH/H + PDCH/F .....	11
4.3.5 Dual Carrier in the Downlink .....	11
4.4 Bearer capability.....	12
4.5 Indication of the DTM capabilities supported by the MS .....	12
4.5.1 Definition of MS DTM classes .....	12
4.5.1.1 MS DTM classes .....	12
4.5.1.2 Use of full and half rate.....	12
4.5.1.3 Incremental support.....	13
4.5.2 Options.....	13
4.6 Indication of the capabilities .....	13
4.7 Compatibility issues .....	14
5 Layer 1.....	14
5.1 Timing advance .....	14
5.2 Measurement reporting.....	15
5.3 Power control in multislot operation .....	15
5.3.1 General.....	15
5.3.2 Uplink multislot power control.....	15
5.3.3 Downlink multislot power control .....	15
6 Signalling procedures.....	15
6.1 Establishment .....	15
6.1.1 General.....	15
6.1.2 PS establishment while in dedicated mode.....	16
6.1.2.1 Principles.....	16
6.1.2.2 MO session: packet request procedure .....	16
6.1.2.3 MT session .....	18
6.1.2.3.1 Ready state: packet downlink assignment .....	18
6.1.2.3.2 Standby state: packet notification.....	18
6.1.3 CS establishment while in packet transfer mode .....	19

6.1.4	PS establishment while in dual transfer mode .....	22
6.2	Release .....	22
6.2.1	Release of packet resources .....	22
6.2.2	Release of CS resources.....	22
6.3	Handover .....	23
6.3.1	General.....	23
6.3.1a	DTM Handover – General .....	24
6.3.2	Internal handover .....	24
6.3.2a	Intra-BSS DTM Handover.....	25
6.3.2a.1	General .....	25
6.3.2a.2	Preparation Phase – using Optimized PS Handover procedure and without MSC involved.....	26
6.3.2a.3	Preparation Phase – using Non-Optimized PS Handover procedure and with MSC involved.....	26
6.3.2a.4	Execution Phase .....	26
6.3.3	External handover .....	28
6.3.3a	Inter-BSS DTM Handover.....	29
6.3.3a.1	General .....	29
6.3.3a.2	Preparation Phase .....	29
6.3.3a.3	Execution Phase .....	30
6.3.4	Inter-RAT DTM Handover .....	32
6.3.4.1	General .....	32
6.3.4.2	Inter-RAT DTM Handover from GERAN A/Gb mode to UTRAN .....	34
6.3.4.3	Inter-RAT DTM Handover from UTRAN to GERAN A/Gb mode .....	36
6.4	Location management .....	38
6.4.1	General.....	38
6.4.2	Cell update .....	39
6.4.3	Routeing Area update .....	40
6.4.4	Location update .....	41
6.4.4.1	Change of Location Area in dedicated mode .....	41
6.4.4.2	Simultaneous Location Area and Routeing Area update procedures .....	42
6.5	Provision of the IMSI to the BSC.....	43
6.5.1	General.....	43
6.5.2	Call establishment.....	43
6.5.3	Session establishment .....	43
6.5.3.1	Downlink session establishment .....	43
6.5.3.2	Uplink session establishment .....	44
6.5.4	External handover .....	44
6.6	In-band parameters .....	44
6.7	MS behaviour in <i>heterogeneous</i> networks .....	45
6.7.1	General.....	45
6.7.1	Suspension procedure .....	46
6.7.2	Resume procedure.....	46
7	DTM operation.....	47
8	GPRS attach procedure while in dedicated mode and packet idle mode .....	47
9	Security.....	47
10	Header and Data Compression .....	47
<b>Annex A (informative):</b>	<b>Possible improvements for future releases .....</b>	<b>48</b>
<b>Annex B (normative):</b>	<b>Incremental support of extended DTM multislot classes .....</b>	<b>49</b>
<b>Annex C (informative):</b>	<b>Change history .....</b>	<b>50</b>
History .....		52

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# Foreword

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# Introduction

## Motivation

The definition of GPRS class A mode of operation in Release 97 assumes a total independence between the CS and PS domains. Thus the direct implementation of the existent standards for class A would result in mobile stations that are required to operate in two different frequencies either in the same timeslot, in timeslots  $n$  and  $n + 3$  or their adjacent ones. This complicates enormously the internal architecture of the ME, resulting in a very high development cost, which both operators and manufacturers would prefer to avoid.

Nevertheless, operators have expressed their need for this type of mobiles, since they want to offer services that demand the simultaneous existence of a CS connection and a PS session. This is particularly important during the coexistence of GSM/GPRS with UMTS, as these capabilities will exist in UMTS. However, UMTS coverage may not be available in some areas where there is GSM/GPRS coverage (e.g. deep inside buildings or when roaming to a 2G network). As coverage is a vital service, in order for an operator to be able to sell "UMTS class A services" it is necessary to be able to imitate class A services in areas of only GSM coverage. On the other hand, the provision of class A services with GERAN technology is also essential for operators without UMTS coverage.

## Concept basis

A constant aim throughout this document is to reuse the existing functionality when possible, in order to minimise the impact on current implementations. In general, the changes proposed have little impact on the core network elements (i.e. MSC and SGSN) and 3G TS 24.008 [11].

The solution outlined in this document overcomes the restrictions mentioned above and makes possible to have simultaneous CS and PS active connections. This is achieved by sending PS data (signalling and user data)

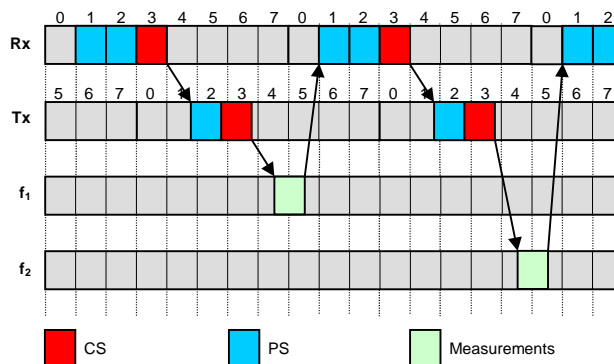
- on the timeslot use by the CS connection
- on timeslot(s) not used by the CS connection

The possible timeslot configurations are based on two restrictions in Release 99:

- the number of timeslots allocated to the CS connection is limited to one;
- the timeslots allocated in each direction are contiguous.

More flexible proposals are left for further study. In addition, for the definition of DTM multislot classes, the restrictions in 3G TS 45.002 [6] for multislot capabilities shall apply.

Figure 1 shows an example of a multislot configuration (2 uplink, 3 downlink).



**Figure 1: Example of multislot configuration of a GPRS *simple* class A mobile station in dual transfer mode.**

In a similar manner to UMTS, the A interface is modified so that the BSC knows the IMSI associated with each SCCP connection to the MSC. This means that the BSC is able to ensure that 'packet paging' messages can be delivered to mobile stations which have a connection to the MSC. The same functionality can be reused to deliver MSC originated pages to mobiles in packet transfer mode while the network is in mode of operation II (i.e. no Gs interface).

Mobility management is basically the same as is specified in 3GPP TS 23.060 [9] for class A mobiles, but using the same techniques as UMTS for control of "in connection" cell, routing area and location area updates (e.g. System Information 6 message is extended to contain the Routing Area Code).

If GPRS signalling needs to be sent during a standalone voice call, then it is proposed that these LLC frames can be sent on the main DCCH (FACCH or SDCCH) with layer 2 SAPI 0. This uses a new Protocol Discriminator in 3GPP TS 24.007 for LLC: GTTP (GPRS Transparent Transport Protocol). The use of the main DCCH for GPRS signalling is subject to certain restrictions to reduce the harm to the speech quality.

Inter-BSC handover is planned to be controlled by A interface signalling. The *Old BSS to New BSS* information element is used to indicate to the target BSC that the mobile station is in DTM.

DTM Handover procedure is realized by utilizing in parallel the handover procedures that are defined in 3GPP TS43.129 [13] for the PS domain and in 3GPP TS 23.009 [14] for the CS domain.

## Class A mode of operation

For paging, the behaviour of the mobile station is as in class B mode of operation: the PCH takes priority to PPCH, and both to CBCH.

The implementation described in this document also applies the restriction that the mobile station shall not be required to operate in two different frequencies in the same moment in time. However, GSM CS and GSM GPRS services will be still supported simultaneously. Thus, the feature here described is a subset of the GPRS class A capabilities.

The mentioned subset will be referred as DTM.

The specification of an *unrestricted* class A mode of operation that requires the mobile station to operate in different frequencies simultaneously shall not be forbidden.

---

# 1 Scope

The present document is a description of the practical implementation of GSM-GPRS class A mobiles and a basis for discussion on the changes and additions to the current specifications.

This work is part of the Release 99 Work Item "BSS co-ordination of Radio Resource allocation for class A GPRS services - GSM Radio Access (R99)" for which M Mouly of Nortel Networks is rapporteur. This work item was supported by Nortel, Motorola, Vodafone and Lucent.

In the following, GPRS refers to EGPRS, EGPRS2 and GPRS unless explicitly stated otherwise.

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# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

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- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

- [1] 3GPP TR 21.905: " Vocabulary for 3GPP Specifications ".
- [2] 3GPP TS 22.060: "General Packet Radio Service (GPRS); Service description; Stage 1".
- [3] 3GPP TS 44.013: "Performance requirements on the mobile radio interface".
- [4] 3GPP TS 44.018: "Mobile radio interface layer 3 specification, Radio Resource Control Protocol".
- [5] 3GPP TS 44.060: "General Packet Radio Service (GPRS); Mobile Station (MS) - Base Station System (BSS) interface; Radio Link Control/ Medium Access Control (RLC/MAC) protocol".
- [6] 3GPP TS 45.002: "Multiplexing and multiple access on the radio path".
- [7] 3GPP TS 45.008: "Radio subsystem link control".
- [8] 3GPP TS 45.010: "Radio subsystem synchronization".
- [9] 3GPP TS 23.060: "3<sup>rd</sup> Generation Partnership Project; Technical Specification Group Services and System Aspects; General Packet Radio Service (GPRS); Service description; Stage 2".
- [10] 3GPP TS 23.121: "3<sup>rd</sup> Generation Partnership Project; Technical Specification Group Services and Systems Aspects; Architectural Requirements for Release 1999".
- [11] 3GPP TS 24.007: "3<sup>rd</sup> Generation Partnership Project; Technical Specification Group Core Network; Mobile radio interface signalling layer 3; General aspects".
- [12] 3GPP TS 24.008: "3<sup>rd</sup> Generation Partnership Project; Universal Mobile Telecommunications System; Mobile radio interface layer 3 specification, Core Network Protocols - Stage 3".
- [13] 3GPP TS 43.129: "3<sup>rd</sup> Generation Partnership Project; Packet-switched handover for GERAN A/Gb mode; Stage 2".
- [14] 3GPP TS 23.009: "3<sup>rd</sup> Generation Partnership Project; Technical Specification Group Core Network and Terminals; Handover procedures; Stage 2".
- [15] 3GPP TS 25.331: "3<sup>rd</sup> Generation Partnership Project; Technical Specification Group Radio Access Network; Radio Resource Control (RRC); Protocol Specification".