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Evropski digitalni celiļ ni telekomunikacijski sistem (faza 2) ï Tehniļ na realizacija faksimilne skupine 3 netransparent (GSM 03.46)

European digital cellular telecommunications system (Phase 2); Technical realization of facsimile group 3 non-transparent (GSM 03.46)

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Foreword

This European Telecommunication Standard (ETS) has been produced by the Special Mobile Group (SMG) Technical Committee (TC) of the European Telecommunications Standards Institute (ETSI).

This ETS defines the technical realization of facsimile group 3 using non-transparent network support for the European digital cellular telecommunications system (Phase 2). This ETS corresponds to GSM Technical Specification (GSM-TS) GSM 03.46 version 4.1.2.

The specification from which this ETS has been derived was originally based on CEPT documentation, hence the presentation of this ETS may not be entirely in accordance with the ETSI/PNE rules.

Reference is made within this ETS to GSM-TSs (NOTE).

NOTE: TC-SMG has produced documents which give the technical specifications for the implementation of the European digital cellular telecommunications system. Historically, these documents have been identified as GSM Technical Specifications (GSM-TSs). These TSs may have subsequently become I-ETSs (Phase 1), or ETSs (Phase 2), whilst others may become ETSI Technical Reports (ETRs). GSM-TSs are, for editorial reasons, still referred to in current GSM ETSs.

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0 Scope

This specification deals with the procedures allowing the technical realization of the real time end-to-end facsimile group 3 service within the GSM PLMN using non-transparent network support according to the definition of the Teleservices 61 and 62 specified in GSM 02.03. Within this document particular attention is given to Teleservice "Alternate speech/facsimile group 3" (Teleservice 61). However, the definitions apply also to Teleservice "Automatic facsimile group 3" (Teleservice 62) with the exception of all actions concerned with the speech phase. Consequently, in the following descriptions the term "Teleservice" denotes both Teleservice 61 and Teleservice 62 as appropriate.

Note: Some facilities associated with alternate speech/ facsimile group 3 may not be available with version 1 of MAP. In particular, the in-call modification procedure following an inter MSC handover is not supported by this version. This imposes the limitation that for all calls it will not be possible to change between speech and facsimile following an inter MSC handover.

1 Normative references

This ETS incorporates by dated and undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this ETS only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies.

[1] GSM 01.04 (ETR 100): "European digital cellular telecommunication system (Phase 2); Abbreviations and acronyms".

[2] GSM 02.03 (ETS 300 502): "European digital cellular telecommunication system (Phase 2); Teleservices supported by a GSM Public Land Mobile Network (PLMN)".

[3] GSM 03.10 (ETS 300 528): "European digital cellular telecommunication system (Phase 2); GSM Public Land Mobile Network (PLMN) connection types".

[4] GSM 04.02 (ETS 300 551): "European digital cellular telecommunication system (Phase 2); GSM Public Land Mobile Network (PLMN) access reference configuration".

[5] GSM 04.08 (ETS 300 557): "European digital cellular telecommunication system (Phase 2); Mobile radio interface layer 3 specification".

[6] GSM 04.21 (ETS 300 562): "European digital cellular telecommunication system (Phase 2); Rate adaption on the Mobile Station - Base Station System (MS - BSS) interface".

[7] GSM 07.01 (ETS 300 582): "European digital cellular telecommunication system (Phase 2); General on Terminal Adaptation Functions (TAF) for Mobile Stations (MS)".

[8] GSM 07.03 (ETS 300 584): "European digital cellular telecommunication system (Phase 2); Terminal Adaptation Functions (TAF) for services using synchronous bearer capabilities".

[9] GSM 09.07 (ETS 300 604): "European digital cellular telecommunication system (Phase 2); General requirements on interworking between the Public Land Mobile Network (PLMN) and the Integrated Services Digital Network (ISDN) or Public Switched Telephone Network (PSTN)".

[10] CCITT Recommendation F.160: "General operational provisions for the international public facsimile services".

[11] CCITT Recommendation T.4: "Standardization of group 3 facsimile apparatus for document transmission".

[12] CCITT Recommendation T.30: "Procedures for document facsimile transmission in the general switched telephone network".

[13] CCITT Recommendation T.35: "Procedure for the allocation of CCITT members' codes".

[14] CCITT Recommendation V.21: "300 bits per second duplex modem standardised for use in the general switched telephone network".

[15] CCITT Recommendation V.24: "List of definitions for interchange circuits between data terminal equipment (DTE) and data circuit-terminating equipment (DCE)".

[16] CCITT Recommendation V.25 bis: "Automatic calling and/or answering equipment on the general switched telephone network (GSTN) using the 100-series interchange circuits".

[17] CCITT Recommendation V.27 ter: "4800/2400 bits per second modem standardised for use in the general switched telephone network".

[18] CCITT Recommendation V.29: "9600 bits per second modem standardised for use on point-to-point 4-wire leased telephone-type circuits".

[19] CCITT Recommendation X.300: "General principles and arrangements for interworking between public data networks, and between public data networks and other networks".

2 Definitions and abbreviations

In addition to those below abbreviations used in this specification are listed in GSM 01.04.

BCS	Binary coded signalling
CCT	Circuit(s)
I/F	Interface
RA1,RA1',RA2	Rate adaptation functions
SREJ	Selective reject

The abbreviations for the facsimile specific protocol elements and signals are listed in appendix I.

3 Service definition

The fixed network facsimile group 3 service, as basically defined in CCITT Rec. F.160, is an international telematic service for document transmission between two facsimile group 3 terminals.

The service specifications are comprised of two parts:

- the control procedures described in CCITT Rec. T.30 and
- the document transmission coding described in CCITT Rec. T.4.

The GSM facsimile group 3 Teleservice is intended to allow connections between facsimile group 3 terminals using:

- a GSM PLMN as stand-alone facility for mobile-to-mobile communication;
- a GSM PLMN to have access to fixed networks PSTN and/or ISDN for mobile to/from fixed network communication.

For this Teleservice, the coding of the facsimile document is as per CCITT Rec. T.4 and the protocol as per CCITT Rec. T.30 both modified within the PLMN as detailed in this specification.

The interworking between different networks is based on CCITT Rec. X.300.

The particular features of this Teleservice are:

- it uses point-to-point communication;
- the information transfer mode is circuit, duplex, synchronous;
- the information transfer capability is alternate speech/ facsimile group 3 or facsimile group 3 only;
- both mobile originated and mobile terminated calls are supported;
- different end-to-end message speeds as per CCITT Rec T.30 may be used within the same connection to match the appropriate quality requirements;
- use of the standard synchronous terminal adaptation function for non-transparent network support (as per GSM 07.03) within the MS is envisaged.

4 Network architecture

The network architecture applicable to this Teleservice is shown in Figure 1/03.46 below.

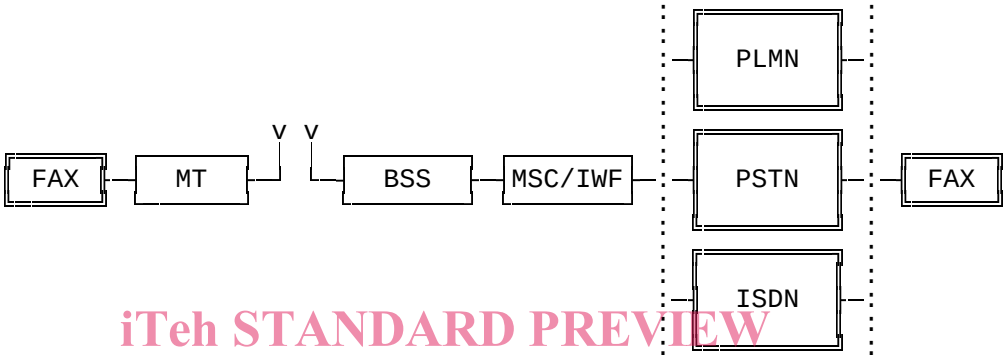

Figure 1/03.46: Network architecture

It shows the case of mobile to fixed network interworking. For mobile-to-mobile calls, there would effectively be a loop back within the PLMN using two IWFs.

5 Reference configuration at the mobile station

The mobile station reference configurations described in this clause are defined as per GSM 04.02.

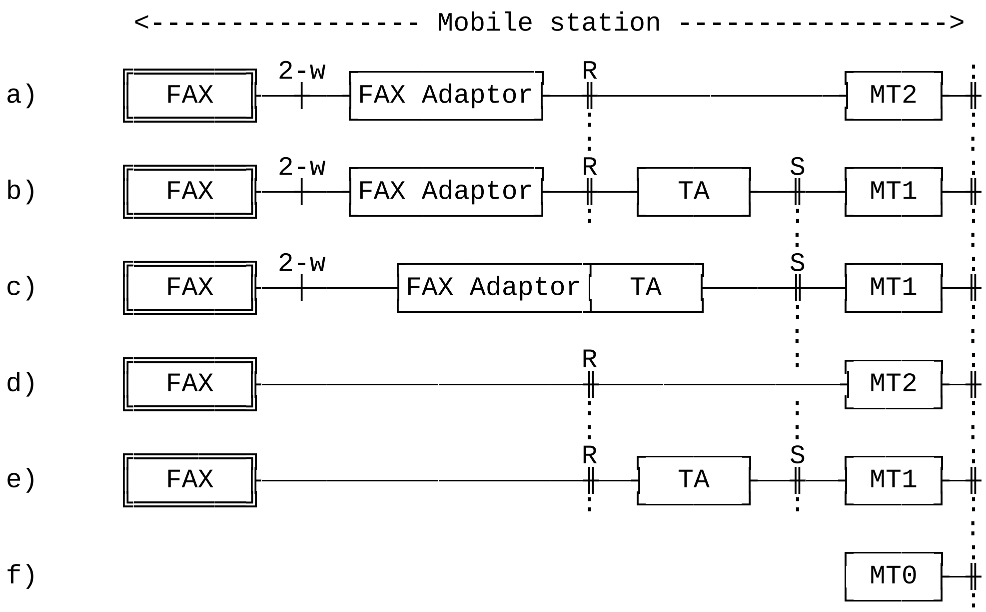

Figure 2/03.46: Reference configurations

The teleservice definitions in GSM 02.03 regard the facsimile group 3 terminal as a 2-wire analogue terminated equipment. In order to connect this to the MT2 a separate "fax adaptor" device is necessary. This configuration, shown in Figure 2a/03.46, has to be considered as the standard configuration, so that all the existing facsimile group 3 terminals can be connected to the PLMN.

An alternative realization would be to combine a facsimile group 3 terminal and the fax adaptor into a special "GSM facsimile machine", directly providing a digital output. Although such a terminal must appear to the MT2 as identical as the fax adaptor (i.e. with an identical interface and protocol), it would allow for a significantly smaller and simpler facsimile machine. This configuration is shown in Figure 2d/03.46.

In addition of course, it is always possible to realize an MT0, as per Figure 2f/03.46, where both the facsimile and mobile termination functions are considered to be part of one integrated unit.

The remaining configurations concern the use of an S interface and are considered as optional configurations. Their use is for further study.

The particular terminal adaptation functions used are those detailed in GSM 07.03 for non-transparent bearer capability. The interface to the MT2 used is according to CCITT Rec. V.24 with an option for support of CCITT Rec. V.25bis procedures for auto calling and auto answering.

5.1 Fax adaptor functionality

The fax adaptor block, Figure 3/03.46, is intended to specifically complement the facsimile group 3 terminal in order to be able to communicate over a GSM PLMN.

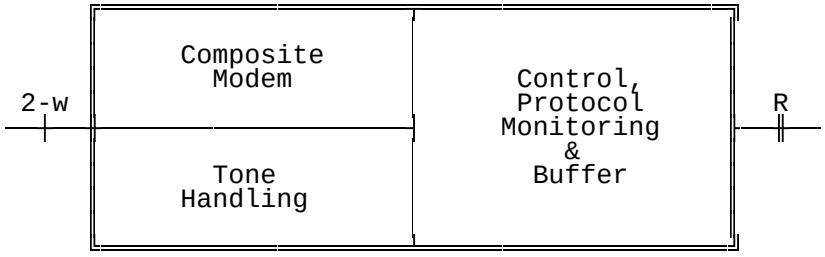

Figure 3/03.46: Fax adaptor scheme

Whether it has to be a function internal to the GSM PLMN, or an external accessory associated with the facsimile group 3 terminal, is beyond the scope of this specification, and in any case, does not affect the working of the procedure as described here.

It can be functionally partitioned in two sections:

- an analogue section, dealing with:

  -- the modulation and demodulation processes according to CCITT Rec. V.21, V.27ter, and V.29 as explained in CCITT Rec. T.4 and T.30;
  -- handling of the signalling on the 2-wire path to the associated facsimile terminal, including auto calling and auto answering functions where necessary (see clause 8).

- a digital section, dealing with:

  -- overall control of the adaptor;
  -- monitoring and, where necessary, manipulating the CCITT Rec. T.30 protocol as detailed in this specification;
  -- connection to the MT using the interface according to CCITT Rec. V.24 as described in GSM 07.03;
  -- buffering of facsimile data;
  -- transcoding of the CCITT Rec. T.4 document content for transmission across the radio interface as detailed in this specification;
  -- where necessary, auto calling and auto answering functions according to CCITT Rec. V.25bis.

5.2 GSM facsimile machine functionality

The special GSM facsimile machine shown in the MS configuration of Figure 2d/03.46 is similar to the digital part of the fax adaptor, but without any of the analogue portions.

It appears at the CCITT Rec. V.24 interface as identical as the fax adaptor, i.e. the MT2 needs to have no knowledge of the particular configuration used.

6 Connection types

Table 1/03.46 shows the connection elements attributes applicable to these Teleservices, extracted from GSM 03.10.

Protocol type of fig. 6 GSM 03.10	Access to TAF of the Mobile Station	Radio interface connection element	Intermediate rate RA1 to RA2	BS-MSC/IWF connection element
Model 6: Speech	----	Speech/GSM	----	CCITT A-law
Model 7: Facsimile Group 3 NT	C/D/S UDI - 9.6 kbit/s (- 4.8 kbit/s) (- 2.4 kbit/s)	C/D/S UDI - 12 kbit/s	C/D/S UDI - 16 kbit/s	C/D/S UDI - 64 kbit/s

C = circuit switched S = synchronous
D = duplex UDI = unrestricted digital information

Table 1/03.46: Connection elements

Figure 4/03.46 shows the scheme of a typical GSM PLMN connection for these teleservices, considering R and S access, respectively, at network termination.

To support the CCITT Rec. T.30, requiring different transmission rates, the following strategy shall be implemented:

- the channel on the radio interface shall be a full rate channel used for RLP protocol transmission (non-transparent network support);
- no modification procedure (Channel Mode Modify: CMM) shall be performed during the data phase of the call;
- the user rate of the MT2 is preferably set to 9600 bit/s;
- the transmission rate between the fax adaptor and the associated facsimile terminal at both ends shall be the same, i.e. there will be only one common end-to-end transmission rate at any given time;
- the negotiation of the message speed shall be end-to-end between the two facsimile terminals; this allows also for a message speed of 7200 bit/s to be used;
- the connection between the fax terminals is divided into three logical sections (fax terminal -(1)- fax adaptor -(2)- fax adaptor -(3)- fax terminal);
- flag stuffing is applied by the fax adaptor towards the associated facsimile terminal within the constraints of CCITT Rec. T.30, to keep the data link active whenever a procedure delay occurs;
- the BCS protocol elements and the facsimile coded data are buffered at both ends of the radio interface (in the fax adaptors), if necessary, to guarantee data integrity;
- a specific fax adaptor protocol (FA protocol) is provided between both the fax adaptors to cater for the appropriate link control.

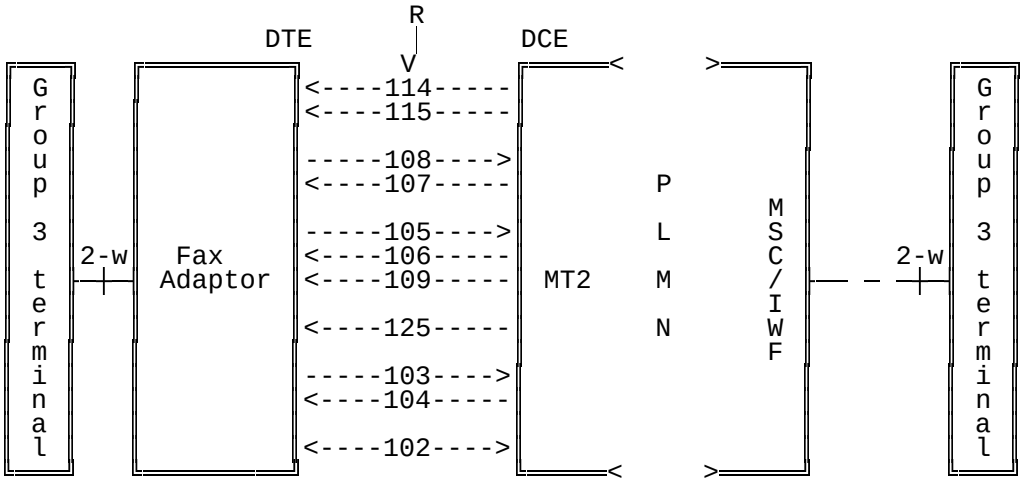

Figure 4a/03.46: Standard Teleservice connection

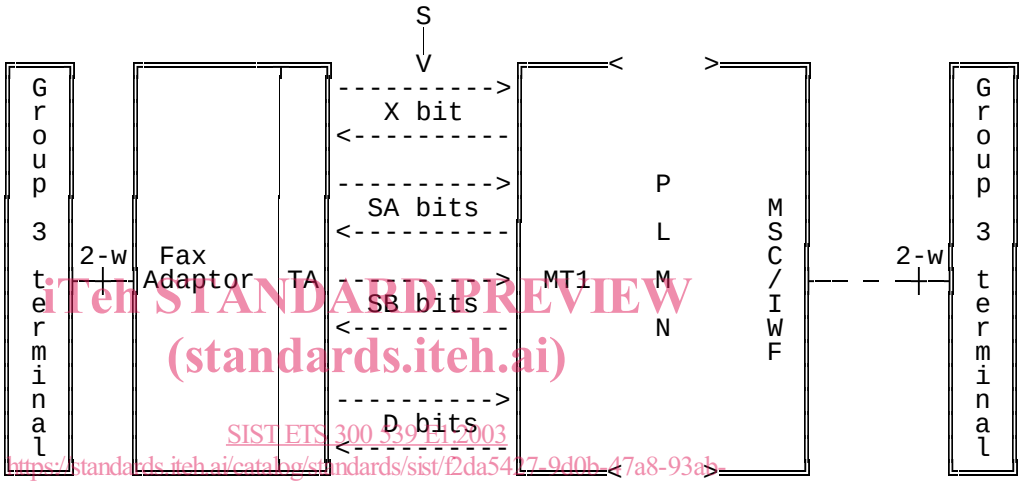

Figure 4b/03.46: Optional Teleservice connection

6.1 Protocol model

Figure 5/03.46 depicts the protocol model for this Teleservice, deduced from model 7 of Figure 6/GSM 03.10.

It should be noted that depending on the particular implementation the R reference point may not explicitly exist. In this case the LAPB protocol and consequently the LAPB entities operating across this interface may be omitted. The protocol stack at the radio interface, however, is not affected by this consideration, i.e. RLP and L2RBOP always apply.

The main point to be underlined is that all the protocol modules specific for this Teleservice are confined in the fax adaptor functions at both the MT and MSC/IWF ends. This includes the layer 2 entity function for LAPB to be operated towards the standard TAF for synchronous non-transparent bearer capability.