ETSI TS 186 025-4 V2.2.1 (2013-06)

IMS Network Testing (INT);
IMS/PES Performance Benchmark;
Part 4: Reference Load network quality parameters

Reference
RTS/INT-0089-4

Keywords
IMS, performance, service

ETSI

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Contents

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee IMS Network Testing (INT).

The present document is part 4 of a multi-part deliverable covering the IMS/NGN Performance Benchmark, as identified below:

Part 1: "Core Concepts";

Part 2: "Subsystem Configurations and Benchmarks";

Part 3: "Traffic Sets and Traffic Profiles";

Part 4: "Reference Load network quality parameters".

1 Scope

The present document is for an initial release of a PSTN/ISDN Emulation Sub-system (PES) performance benchmark. The same tests can be used also for legacy PSTN/ISDN networks or for inter-working tests between PSTN/ISDN emulation subsystem and legacy PSTN and ISDN. The metrics measured and reported are for performance of this subsystem under a communications application load.

The present document is the fourth part of the multi-part deliverable which consists four parts.

TS 186 025-1 [i.1] contains the overall benchmark descriptions, architectures, processes, and information models that are common to all specific benchmarking scenarios.

TS 186 025-2 [i.2] contains the specific benchmarking use-cases and scenarios, along with scenario specific metrics and design objectives. It also defines the SUT configuration parameters. This part also contains any required extensions to the overall descriptions present in the present document, if necessary for the specific scenario.

TS 186 025-3 [i.3] defines an initial benchmark test through the specification of a traffic set, traffic-time profile and benchmark test procedure.

TS 186 025-4 [i.4] defines Reference Load network quality parameters for the use cases defined in TS 186 025-2 [i.2].

2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the reference document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at http://docbox.etsi.org/Reference.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

2.1 Normative references

The following referenced documents are necessary for the application of the present document.

[1] ETSI TS 101 563: "Speech and multimedia Transmission Quality (STQ); IMS/PES exchange performance requirements".

[2] Recommendation ITU-T Q.543: "Digital exchange performance design objectives".

[3] ETSI TS 183 036: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); ISDN/SIP interworking; Protocol specification".

[4] ETSI TS 124 229: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; IP multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3 (3GPP TS 24.229)".

[5] ETSI TS 183 043: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); IMS-based PSTN/ISDN Emulation; Stage 3 specification".

2.2 Informative references

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

[i.1] ETSI TS 186 025-1: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); IMS/PES Performance Benchmark; Part 1: Core Concepts".

[i.2] ETSI TS 186 025-2: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); IMS/PES Performance Benchmark; Part 2: Subsystem Configurations and Benchmarks".

[i.3] ETSI TS 186 025-3: "IMS Network Testing (INT); IMS/PES Performance Benchmark; Part 3: Traffic Sets and Traffic Profiles".

[i.4] ETSI TS 186 025-4: "Telecommunications and Internet Converged Services and Protocols for Advanced Networking (TISPAN); IMS/PES Performance Benchmark; Part 4: Reference Load network quality parameters".

[i.5] Recommendation ITU-T Q.541: "Digital exchange design objectives - General".

[i.6] Recommendation ITU-T G.812: "Timing requirements of slave clocks suitable for use as node clocks in synchronization networks".

[i.7] Recommendation ITU-T G.823: "The control of jitter and wander within digital networks which are based on the 2048 kbit/s hierarchy".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

background load: workload applied to an SUT during a benchmark test, for the purpose of consuming SUT resources during a benchmark test and changing the traffic intensity at which the capacity of the SUT is reached

benchmark report: documented generated at the conclusion of a test procedure containing the metrics measured during the execution of the test and/or computed from the data collected in the benchmark log

benchmark test: procedure by which a test system interacts with a System Under Test to measure its behaviour and produce a benchmark report

configuration: specification of a subset of IMS/PES architectural elements and metrics for which collection of benchmark tests can be defined

design objective: probabilistic model of delay and failure requirements for an SUT, associated with a use-case, specified by threshold values and probabilities for delay and scenario failure

idle load: load that is not dependent on the traffic or other external activities

maximum capacity: smallest scenario arrival rate at which the successful scenario rate cannot be increased

metric: performance measurement of an SUT reported in a benchmark report

parameter: attribute of a SUT, test system, system load, or traffic set whose value is set externally and prior to a benchmark test, and whose value affects the behaviour of the benchmark test

processor load: part of time the processor executes work, normally expressed in percent. The processor load consists of Idle load, Traffic load and Usage load

Reference Call (RC): is defined as a basic ISUP to ISUP call connected through two MGW in the same MGC domain

test parameters: parameters whose values determine the behaviour of a benchmark test

test procedure: specification of the steps to be performed by a benchmark test

test scenario: specific path through a use-case, whose implementation by a test system creates a system load

test system: collection of hardware and software which presents a system load to a system under test and collects data on the system under test's performance, from which metrics can be computed

traffic load: load that results from handling traffic events that are directly related to calls; this load varies with the traffic intensity

traffic-time profile: evolution of the average scenario over a time interval

traffic set: mixture of traffic scenarios

usage load: load that is reserved for the administrations operation and maintenance activities during busy hour

workload: expressed as reference calls per second (RC/s) is calculated by multiplying calls per second by its corresponding WLF

workload factor: traffic load for different types of calls in relation to the traffic load of the reference call (ISUP call)

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

AGCF	Access Gateway Control Function
DLE	Destination Local Exchange
IBCF	Interconnection Border Control Function
IMS	IP Multimedia Subsystem
ISDN	Media GateWay Controler
ISUP	ISDN User Part
MGC	Media GateWay Controler
MGW	Media Gateway
NGN	Next Generation Networks
OLE	Originating Local Exchange
PES	PSTN/ISDN Emulation Sub-system
PSTN	Public Switched Telecommunications Network
RC	Reference Call
RTP	Real Time Protocol
SUT	System Under Test
TIE	Time Interval Error
VGW	Voice Gateway
WLF	WorkLoad Factor

4 Metrics and design objectives

4.1 Delay probability - non-ISDN or mixed (ISDN - non-ISDN) environment

This clause defines **delay parameters** related to non-ISDN environment and mixed (ISDN - non-ISDN) environment. The values are based on the values in Recommendation ITU-T Q.543 [2] and TS 101 563 [1].

Table 1

Meaning of timers	Parameter Q.543 [2]	IMS, PES equivalent	Reference Load A		Reference Load B	
	Detailed description		Mean Value	95 % probability of not exceeding	Mean Value	95 % probability of not exceeding
Local exchange call request delay - originating outgoing and internal traffic connections						
ANALOGUE SUBSCRIBER LINES Local exchange call request delay - originating outgoing and internal traffic connections.	clause 2.3.2.1 [2] For ANALOGUE SUBSCRIBER LINES, call request delay is defined as the interval from the instant when the off-hook condition is recognizable at the subscriber line interface of the exchange until the exchange begins to apply dial tone to the line. The call request delay interval is assumed to correspond to the period at the beginning of a call attempt during which the exchange is unable to receive any call address information from the subscriber.	PES [5] For ANALOGUE SUBSCRIBER LINES connected to the AGCF/MSAN . Call request delay is defined as the interval from the instant when the off-hook condition is recognizable at the subscriber line interface of the AGCF/MSAN until the AGCF/MSAN begins to apply dial tone to the line.	≤ 400 ms	≤ 600 ms	≤ 800 ms	≤ 1 000 ms
ANALOGUE SUBSCRIBER with IAD (VGW) Local exchange call request delay - originating outgoing and internal traffic connections.		PES [5] For ANALOGUE SUBSCRIBER LINES connected to the VGW. Call request delay is defined as the interval from the instant when the off-hook condition is recognizable at the subscriber line interface of the VGW until the VGW begins to apply dial tone to the line.	≤ 400 ms	≤ 600 ms	≤ 800 ms	≤ 1 000 ms

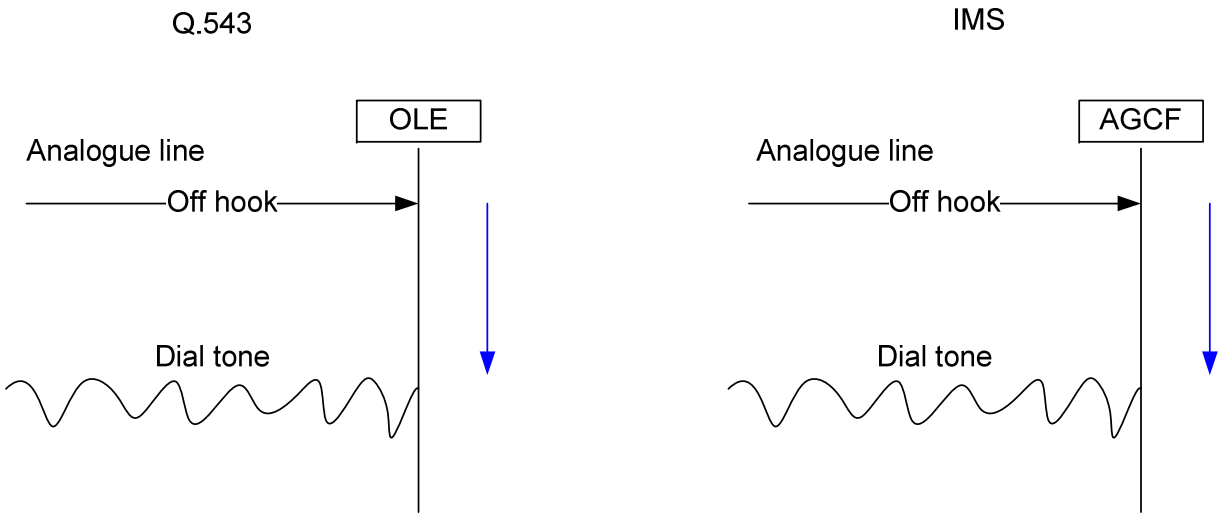


Figure 1: Local exchange analogue subscriber call request delay: overlap sending

Table 2

Meaning of timers	Parameter Q.543 [2]	IMS, PES equivalent	Reference Load A		Reference Load B	
	Detailed description		Mean Value	95 % probability of not exceeding	Mean Value	95 % probability of not exceeding
Local exchange ISDN subscriber call request delay: overlap sending						
ISDN SUBSCRIBER LINES Local exchange call request delay - Overlap sending.	clause 2.3.2.2 [2] Local exchange call request delay. Call request delay is defined as the interval from the instant at which the SETUP message has been received from the subscriber signalling system until the SETUP ACKNOWLEDGE message is passed back to the subscriber signalling system.	ISDN [3] Call request delay is defined as the interval from the instant at which the SETUP message has been received from the subscriber signalling system until the SETUP ACKNOWLEDGE message is passed back to the subscriber signalling system.	≤ 250 ms	≤ 400 ms	≤ 500 ms	≤ 600 ms
IMS SUBSCRIBER Local exchange call request delay.		IMS [4] Call request delay is defined as the interval from the instant at which the INVITE message has been received from the SIP subscriber until the 100 Trying from the SBC/P-CSCF is passed back to the subscriber.	≤ 15 ms	≤ 20 ms	≤ 30 ms	≤ 40 ms

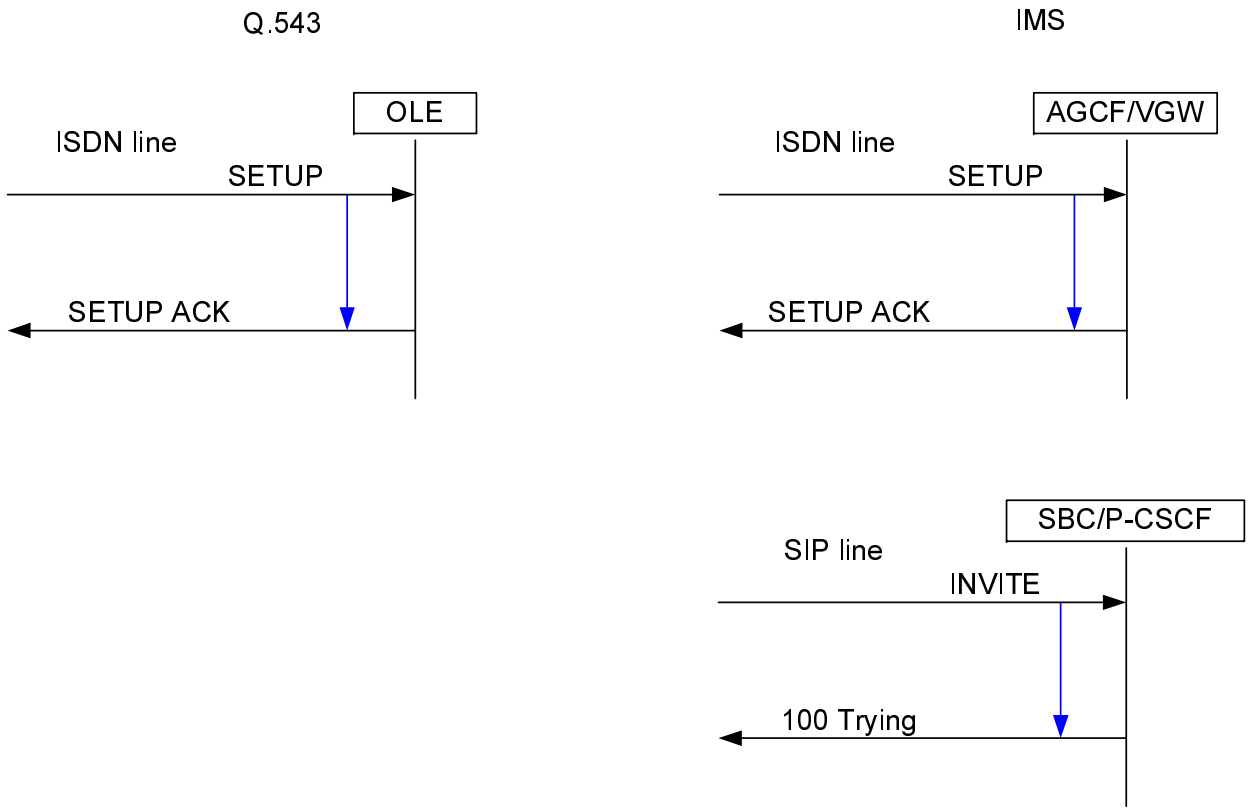


Figure 2: Local exchange ISDN subscriber call request delay: overlap sending

Table 3

Meaning of timers	Parameter Q.543	IMS, PES equivalent	Reference Load A		Reference Load B	
	Detailed description		Mean Value	95 % probability of not exceeding	Mean Value	95 % probability of not exceeding
Local exchange ISDN subscriber call request delay: en Block sending						
ISDN SUBSCRIBER LINES Local exchange call request delay en - block sending.	clause 2.3.2.3 [2] For DIGITAL SUBSCRIBER LINES using en-bloc sending, call request delay is defined as the interval from the instant at which the SETUP message is received from the subscriber signalling system until the call proceeding message is passed back to the subscriber signalling system.	ISDN [3] For ISDN using en-bloc sending, call request delay is defined as the interval from the instant at which the SETUP message is received from the subscriber signalling system until the CALL PROCCEDING message is passed back to the subscriber signalling system.	≤ 300 ms	≤ 450 ms	≤ 600 ms	≤ 750 ms

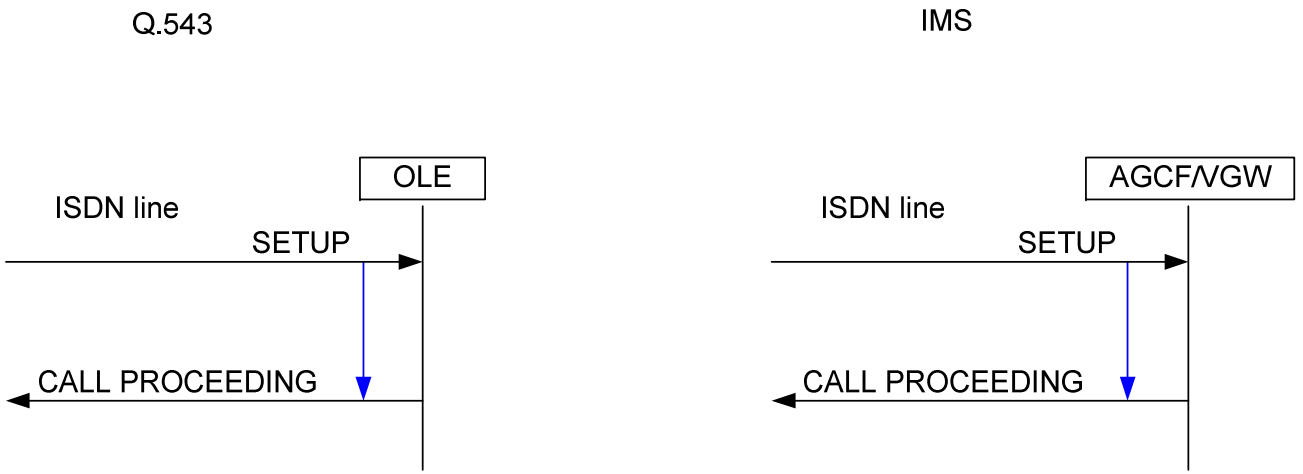


Figure 3: Local exchange ISDN subscriber call request delay: en Block sending

Table 4

Meaning of timers	Parameter Q.543 [2]	IMS, PES equivalent	Reference Load A		Reference Load B	
	Detailed description		**Mean Value**	**95 % probability of not exceeding**	**Mean Value**	**95 % probability of not exceeding**
Alerting sending delay for terminating traffic (the users are in different locations, controlled by different S-CSCF/P-CSCF)						
ANALOGUE SUBSCRIBER LINES Alerting sending Delay for terminating traffic.	clause 2.3.6.1.1 [2] For calls terminating on ANALOGUE SUBSCRIBER LINES, alerting sending delay is defined as the interval from the instant when the last digit is available for processing in the exchange until the ringing tone is sent backwards toward the calling user.	PES [5] For calls terminating on ANALOGUE SUBSCRIBER LINES, **alerting sending** delay is defined as the interval from the instant when the last digit is available for processing in the AGCF/MSAN until the **ringing tone** is sent toward the calling user.	≤ 300 ms	≤ 450 ms	≤ 600 ms	≤ 750 ms
ISDN SUBSCRIBER LINES Alerting sending Delay for terminating traffic.	clause 2.3.6.1.2 [2] For calls terminating on DIGITAL SUBSCRIBER LINES, the alerting sending delay is defined as the interval from the instant that an ALERTING message is received from the digital subscriber line signalling system to the instant at which an ADDRESS COMPLETE message is passed to the interexchange signalling system or ringing tone is sent backward toward the calling user.	ISDN [3] For calls terminating on ISDN, the alerting sending delay is defined as the interval from the instant that an ALERTING message is received from the digital subscriber line signalling to the instant at which an AGCF/MSAN sends the 180 Ringing backward toward the calling user.	≤ 300 ms	≤ 450 ms	≤ 600 ms	≤ 750 ms

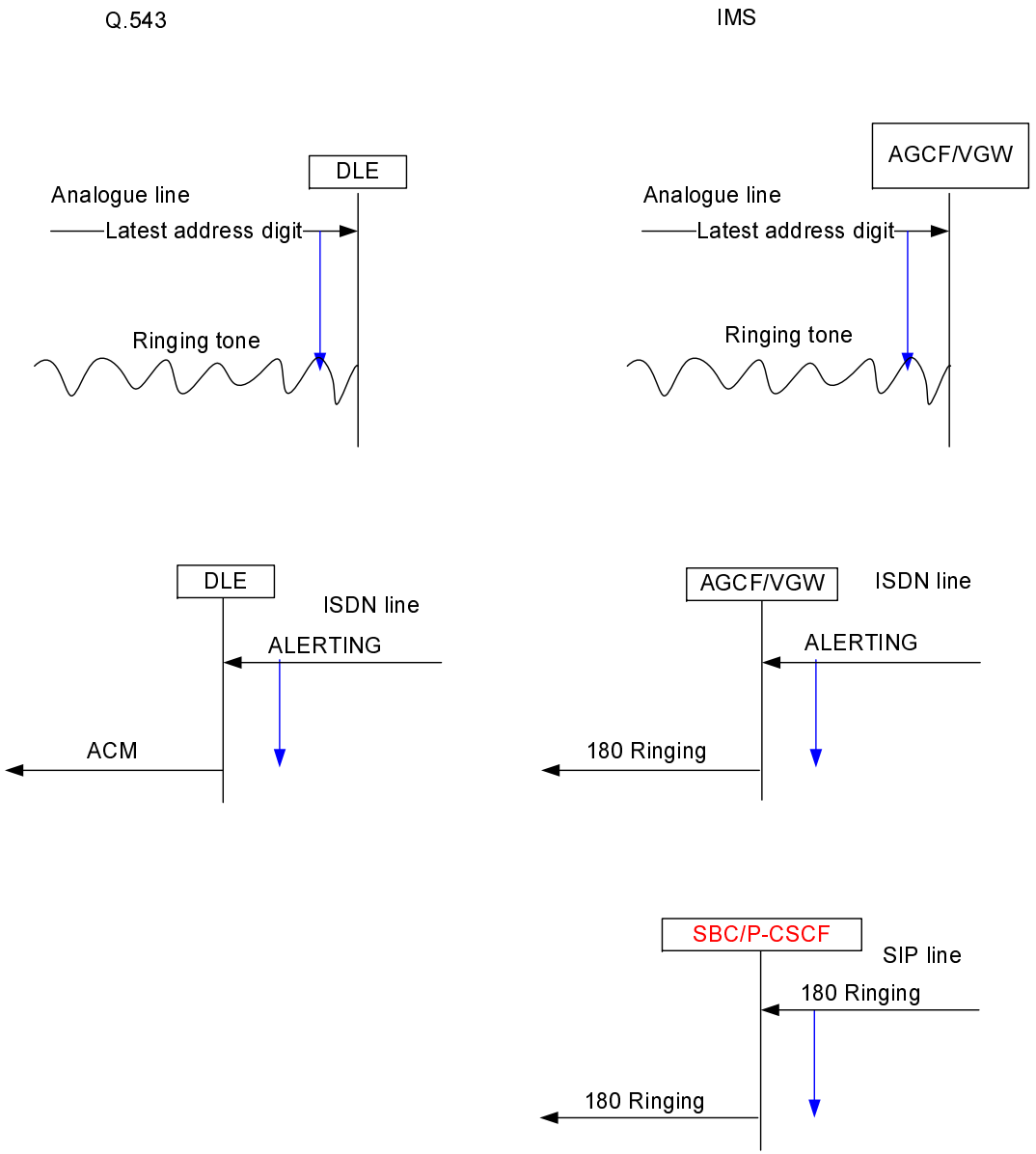
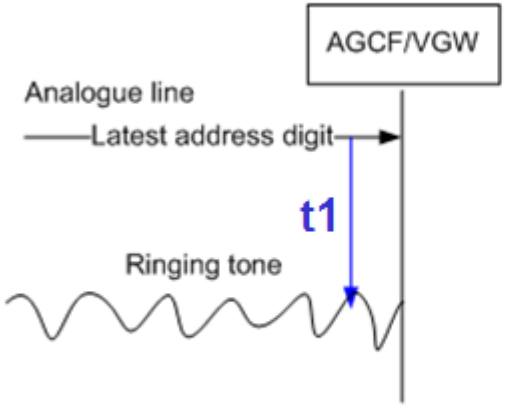


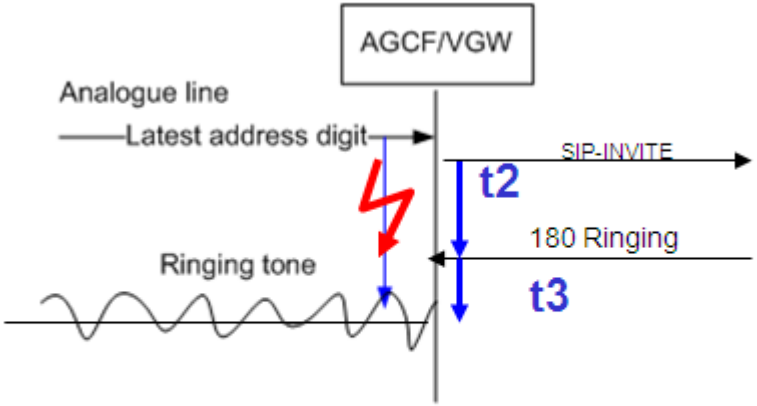
Figure 4: Local exchange Alerting sending delay for terminating traffic (in different locations)

Table 5

Meaning of timers	Parameter Q.543 [2]	IMS, PES equivalent	Reference Load A		Reference Load B	
	Detailed description		Mean Value	95 % probability of not exceeding	Mean Value	95 % probability of not exceeding
Alerting sending delay for internal traffic (the user are in same locations, controlled by same AGCF/VGW or P-CSCF)						
ANALOGUE SUBSCRIBER LINES Alerting sending Delay for internal traffic.	clause 2.3.6.2.1 [2] For calls terminating on ANALOGUE SUBSCRIBER LINES, alerting sending delay is defined as the interval from the instant that the signalling information is available for processing in the exchange until ringing tone is applied to an ANALOGUE calling subscriber.	PES [5] For calls terminating on ANALOGUE SUBSCRIBER LINES, alerting sending delay is defined as the interval from the instant that the signalling information is available for processing in the AGCF/MSAN until Ringing tone is sent towards the calling subscriber.	≤ 300 ms	≤ 450 ms	≤ 600 ms	≤ 750 ms
ANALOGUE SUBSCRIBER LINES VGW Alerting sending Delay for internal traffic.		PES [5] For calls terminating on ANALOGUE SUBSCRIBER LINES, alerting sending delay is defined as the interval from the instant that the signalling information is available for processing in the VGW until Ringing tone is sent towards the calling subscriber.	≤ 550 ms (see note)	≤ 800 ms	≤ 1 100 ms	≤ 1 350 ms
ISDN SUBSCRIBER LINES Alerting sending Delay for Internal traffic.	clause 2.3.6.2.2 [2] For internal calls terminating on DIGITAL SUBSCRIBER LINES originating from DIGITAL SUBSCRIBER LINES, alerting sending delay is defined as the interval from the instant that an ALERTING message is received from the signalling system of the called subscriber's line until the ALERTING message is applied to the calling subscriber line.	ISDN [3] For calls terminating on ISDN, alerting sending delay is defined as the interval from the instant that an ALERTING message is received and ALERTING is sent towards the calling subscriber.	≤ 300 ms VGW ≤ 350 ms	≤ 450 ms VGW ≤ 550 ms	≤ 600 ms VGW ≤ 700 ms	≤ 750 ms VGW ≤ 850 ms
IMS SUBSCRIBER LINES 180 sending Delay for Internal traffic.		IMS [4] For calls terminating sending delay is defined as the interval from the instant that an 180 message at the Gm interface has received and 180 is sent on the Gm towards the calling subscriber.	≤ 150 ms	≤ 200 ms	≤ 300 ms	≤ 350 ms

Meaning of timers	Parameter Q.543 [2]	IMS, PES equivalent	Reference Load A		Reference Load B	
	Detailed description		Mean Value	95 % probability of not exceeding	Mean Value	95 % probability of not exceeding
NOTE:						





Setup: CPE with two POTS, Setup connection between two POTS via IMS.
Time T1: T1+ T3
Time T2: Time between SIP-INVITE and 180 Ringing
Time T3: CPE-internal process-time T3

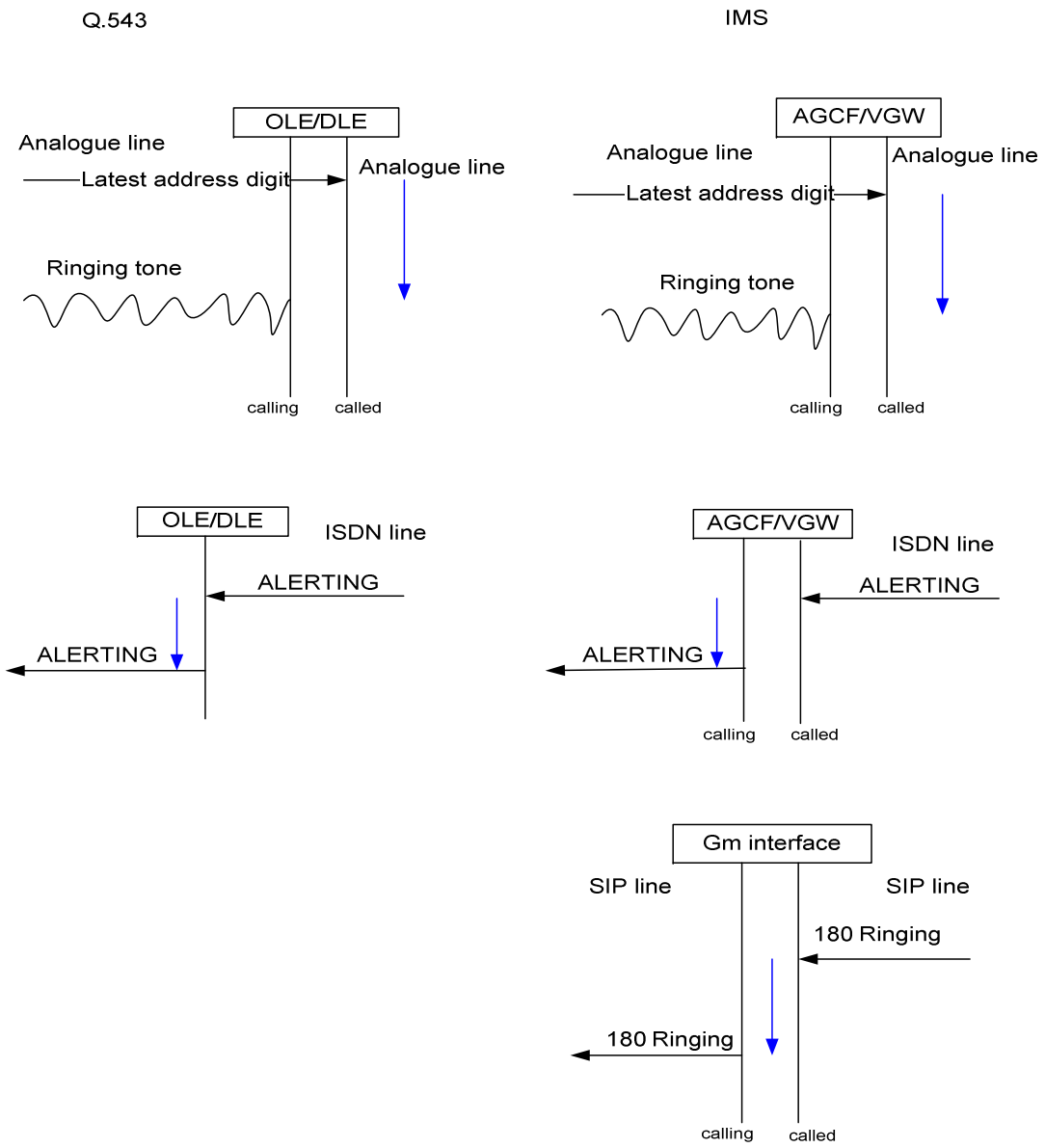


Figure 5: Alerting sending delay for internal traffic
(the user are in same locations, controlled by same AGCF/VGW or P-CSCF)

Table 6

Meaning of timers	Parameter Q.543 [2]	IMS, PES equivalent	Reference Load A		Reference Load B	
	Detailed description		Mean Value	95 % probability of not exceeding	Mean Value	95 % probability of not exceeding
Call set up delay						
ISDN SUBSCRIBER LINES Call set up delay using overlap signalling.	clause 2.4.3.1 [2] Call set-up delay is defined as the interval from the instant when the signalling information required for routing is received from the incoming signalling system until the instant when the corresponding signalling information is passed to the outgoing signalling system. Exchange call setup delay for originating outgoing traffic connections, digital subscriber lines. The time interval starts when the INFORMATION message received contains a "sending complete indication" or when the address information necessary for call set-up is complete and ends when the corresponding signalling information is passed to the outgoing signalling system.	ISDN [3] Sending, the time interval starts when the INFORMATION message received contains a "sending complete indication" and ends when the INVITE message on the Ic interface has been sent.	≤ 450 ms	≤ 650 ms	≤ 800 ms	≤ 950 ms
		ISDN [3] Sending, the time interval starts when the INFORMATION message received contains a "sending complete indication" and ends when the INVITE message on terminating Gm interface has been sent.	≤ 350 ms VGW ≤ 400 ms	≤ 550 ms VGW ≤ 600 ms	≤ 700 ms VGW ≤ 800 ms	≤ 850 ms VGW ≤ 1 000 ms
		IMS [4] Session initiation delay is defined as the interval from the instant when the INVITE signalling information is received from the calling user on the originating Gm interface until the instant when the corresponding INVITE signalling information is passed on the terminating Gm interface to the called user.	≤ 300 ms	≤ 450 ms	≤ 600 ms	≤ 750 ms
		IMS [4] Session initiation delay is defined as the interval from the instant when the INVITE signalling information is received from the calling user on the originating Gm interface until the instant when the corresponding INVITE signalling information is passed on the terminating Ic interface to the called user.(without preconditions)	≤ 350 ms	≤ 550 ms	≤ 700 ms	≤ 850 ms

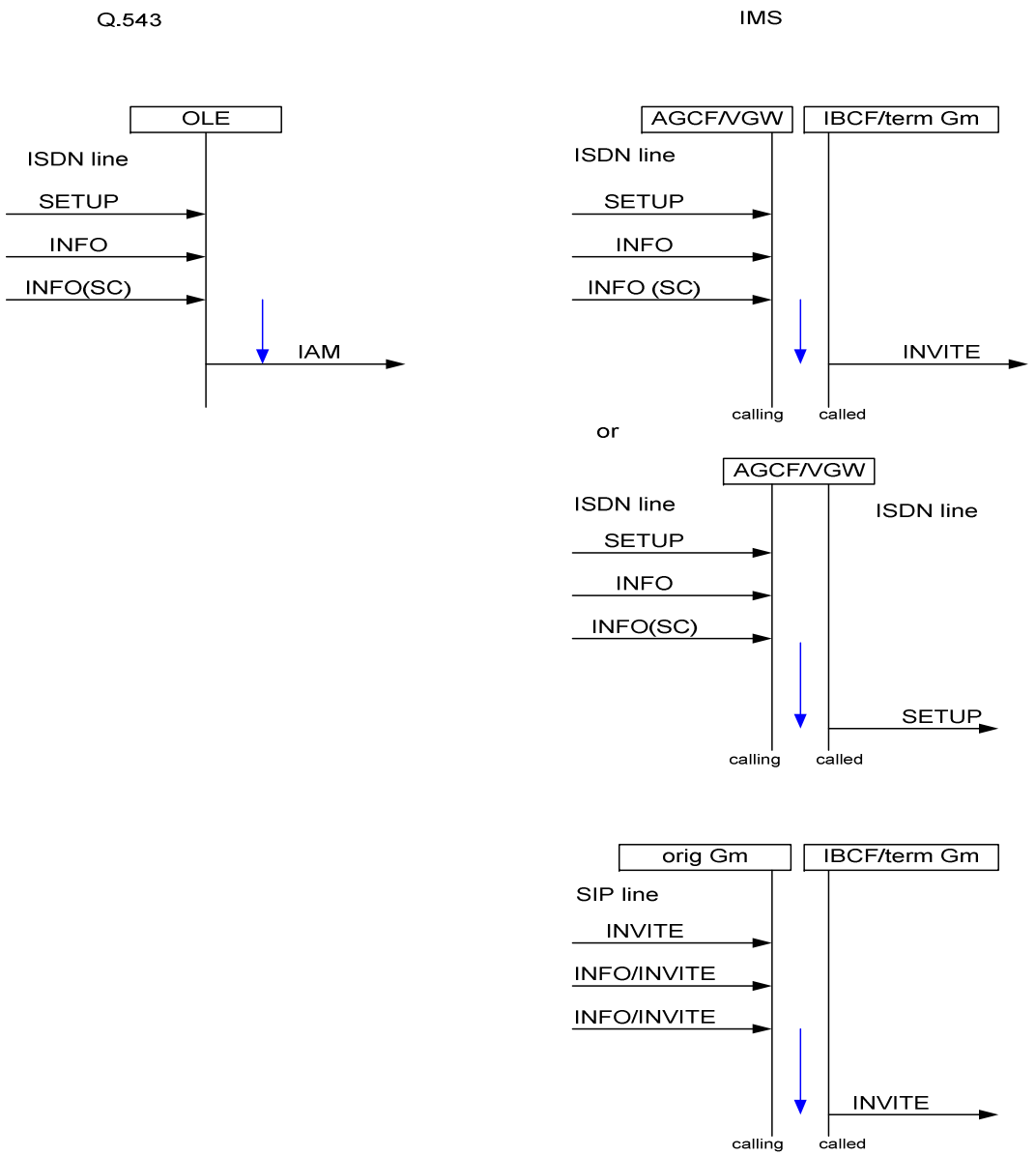


Figure 6: Call set up delay: Overlap sending is used

Table 7

Meaning of timers	Parameter Q.543 [2]	IMS, PES equivalent	Reference Load A		Reference Load B	
	Detailed description		Mean Value	95 % probability of not exceeding	Mean Value	95 % probability of not exceeding
Call set up delay: en Block sending is used						
ISDN SUBSCRIBER LINES Call set up delay using en-block signalling.	clause 2.4.3.1 [2] Exchange call setup delay for originating outgoing traffic connections. For call attempts using en-bloc sending Call set-up delay is defined as the interval from the instant when the signalling information required for routing is received from the incoming signalling system until the instant when the corresponding signalling information is passed to the outgoing signalling system. The time interval starts when the SETUP message received contains a "sending complete indication" or when the address information necessary for call set-up is complete and ends when the call setup is sent on the outgoing signalling system.	ISDN [3] Call set-up delay is defined as the interval from the instant when the signalling information including Sending Complete (#) is received from the incoming signalling system until the instant when the corresponding INVITE signalling information is passed to the Ic interface.	≤ 450 ms	≤ 650 ms	≤ 800 ms	≤ 950 ms
		ISDN [3] Call set-up delay is defined as the interval from the instant when the signalling information including Sending Complete (#) is received from the incoming signalling system until the instant when the corresponding INVITE signalling information is passed to the terminating Gm interface.	≤ 350 ms VGW ≤ 400 ms	≤ 550 ms VGW ≤ 600 ms	≤ 700 ms VGW ≤ 800 ms	≤ 850 ms VGW ≤ 1 000 ms
		ISDN [3] Call set-up delay for Internal traffic is defined as the interval from the instant when the SETUP including Sending Complete (#) is received from the incoming signalling system until the instant when the corresponding SETUP signalling information is passed to the called line signalling system (see note).	≤ 350 ms VGW ≤ 500 ms	≤ 550 ms VGW ≤ 750 ms	≤ 700 ms VGW ≤ 1 000 ms	≤ 850 ms VGW ≤ 1 200 ms
IMS SUBSCRIBER Call set up delay using for Internal traffic.		IMS [4] Session initiation delay is defined as the interval from the instant when the INVITE signalling information is received from the calling user on the originating Gm interface until the instant when the corresponding INVITE signalling information is passed on the terminating Gm interface to the called user.	≤ 300 ms	≤ 450 ms	≤ 600 ms	≤ 750 ms

Meaning of timers	Parameter Q.543 [2]	IMS, PES equivalent	Reference Load A		Reference Load B	
	Detailed description		Mean Value	95 % probability of not exceeding	Mean Value	95 % probability of not exceeding
Call set up delay: en Block sending is used						
		IMS [4] Session initiation delay is defined as the interval from the instant when the INVITE signalling information is received from the calling user on the originating Gm interface until the instant when the corresponding INVITE signalling information is passed on the terminating Ic interface to the called user (without preconditions).	≤ 350 ms	≤ 550 ms	≤ 700 ms	≤ 850 ms
NOTE: If SC (#) is not included the setup delay may increase up to the digit collection timer (15 s).						

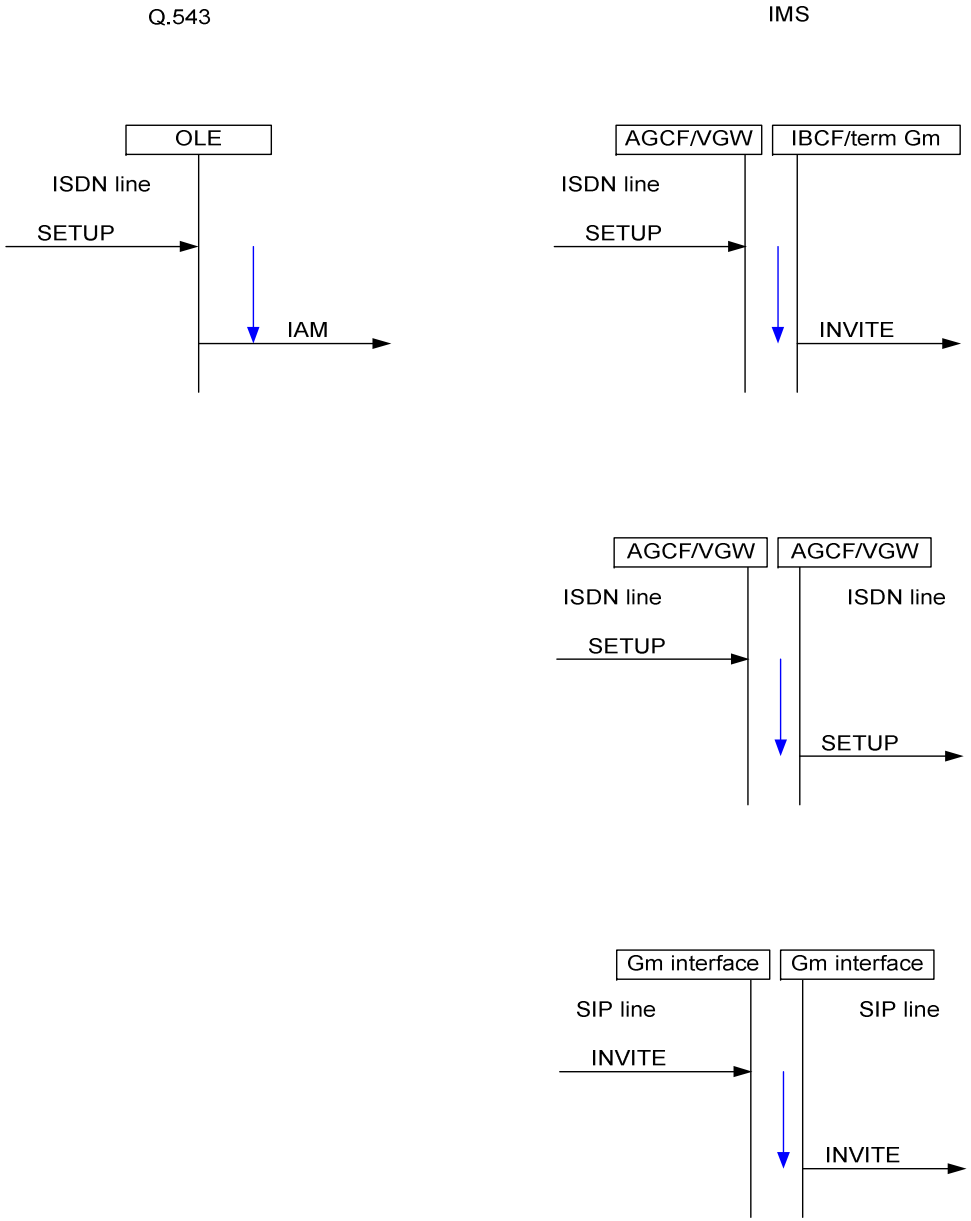


Figure 7: Call set up delay: en Block sending is used

Table 8

Meaning of timers	Parameter Q.543 [2]	IMS, PES equivalent	Reference Load A		Reference Load B	
	Detailed description		Mean Value	95 % probability of not exceeding	Mean Value	95 % probability of not exceeding
Through-connection delay						
ISDN SUBSCRIBER LINES Through-connection delay.	clause 2.4.4.2 [2] Through-connection delay. The through connection delay is defined as the interval from the instant that the CONNECT message is received from the called line signalling system until the through connection is established and available for carrying traffic and the ANSWER and CONNECT ACKNOWLEDGEMENT messages have been passed to the appropriate signalling systems.	ISDN [3] The through connection delay is defined as the interval from the instant that the CONNECT message is received from the called line signalling system until the through connection is established and available for carrying traffic and the CONNECT message has been sent to the calling user signalling system (see note).	≤ 350 ms	≤ 550 ms	≤ 700 ms	≤ 850 ms
IMS Through-connection delay Delay for Internal traffic.		IMS [4] The through connection delay is defined as the interval from the instant that the 200 OK message is received from the called user at the terminating Gm interface until the through connection is established and available for carrying traffic and the 200 OK message has been sent to the calling user on the originating Gm interface.	≤ 150 ms	≤ 200 ms	≤ 300 ms	≤ 350 ms
NOTE: The through connection of RTP is not considered.						

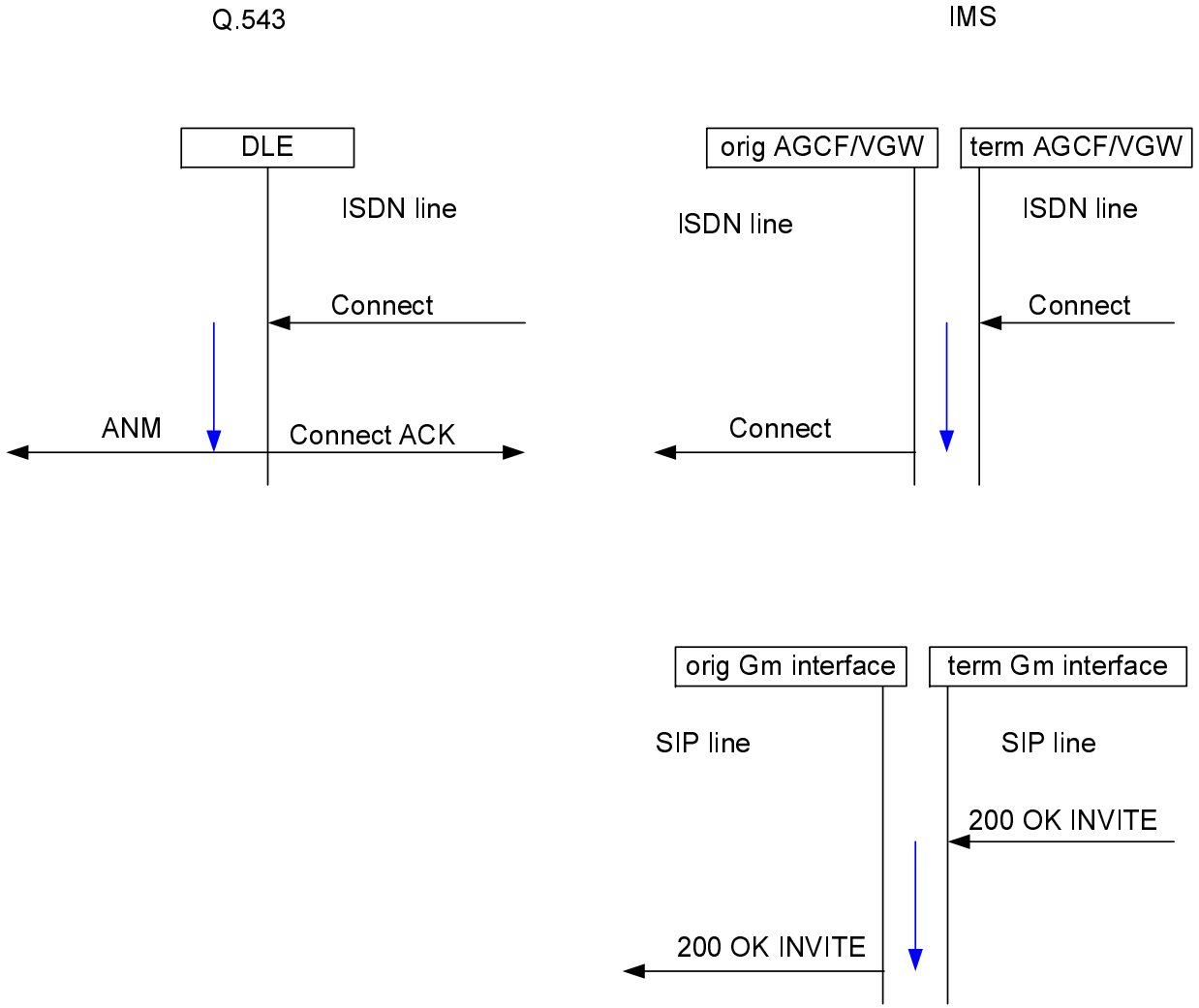


Figure 8: Through-connection delay

Table 9

Meaning of timers	Parameter Q.543 [2]	IMS, PES equivalent	Reference Load A		Reference Load B	
	Detailed description		Mean Value	95 % probability of not exceeding	Mean Value	95 % probability of not exceeding
Connection release delay:						
ISDN SUBSCRIBER LINES Connection call release delay.	clause 2.4.6 [2] Connection release delay is defined as the interval from the instant when DISCONNECT or RELEASE message is received from a signalling system until the instant when the connection is no longer available for use on the call (and is available for use on another call) and a corresponding RELEASE or DISCONNECT message is passed to the other signalling system involved in the connection.	ISDN [3] Connection release delay is defined as the interval from the instant when DISCONNECT or RELEASE message is received from a signalling system until the instant when RELEASE COMPLETE is sent and a corresponding RELEASE or DISCONNECT message is sent, or vice versa.	≤ 350 ms	≤ 550 ms	≤ 700 ms	≤ 850 ms
IMS SUBSCRIBER Connection call release delay Delay for Internal traffic.		IMS [4] Connection release delay is defined as the interval from the instant when a BYE message is received at the originating or terminating Gm interface until the instant when 200OK is sent and a corresponding BYE message is sent at the terminating or originating Gm interface respectively.	≤ 150 ms	≤ 200 ms	≤ 300 ms	≤ 350 ms

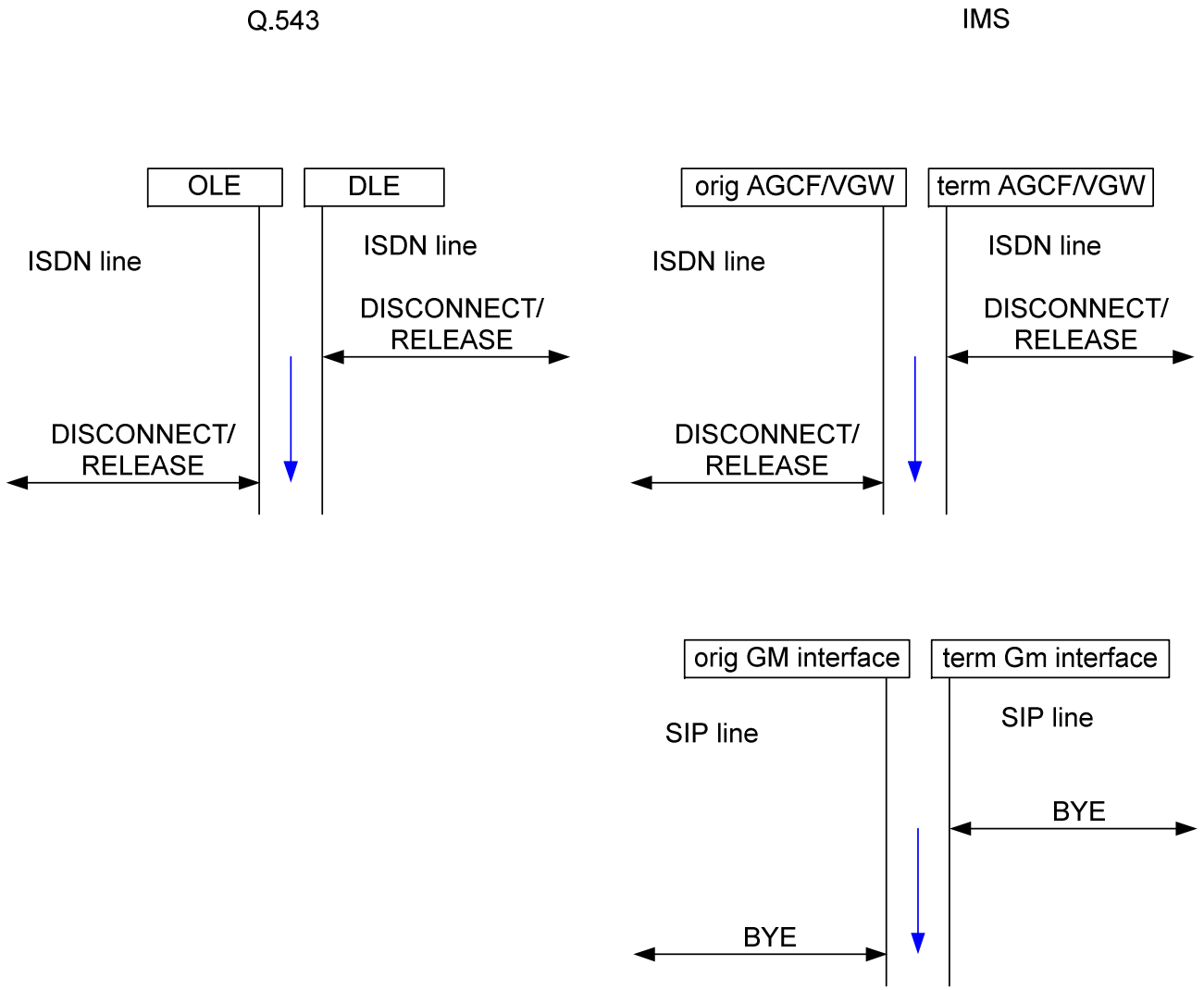


Figure 9: Connection call release delay

4.2 Call processing performance objectives

4.2.1 Premature release

The probability that an exchange malfunction will result in the premature release of an established connection in any one minute interval should be:

$$P \leq 2 \times 10^{-5}$$

4.2.2 Release failure

The probability that an exchange malfunction will prevent the required release of a connection should be:

$$P \leq 2 \times 10^{-5}$$

4.2.3 Incorrect charging or accounting

The probability of a call attempt receiving incorrect charging or accounting treatment due to an exchange malfunction should be:

$$P \leq 10^{-4}$$

4.2.4 Misrouting

The probability of a call attempt misrouted following receipt by the exchange of a valid address should be:

$$P \leq 10^{-4}$$

4.2.5 No tone

The probability of a call attempt encountering no tone following receipt of a valid address by the exchange should be:

$$P \leq 10^{-4}$$

4.2.6 Other failures

The probability of the exchange causing a call failure for any other reason not identified specifically above should be:

$$P \leq 10^{-4}$$

4.3 Transmission performance

4.3.1 64 kbit/s switched connections

The probability of a connection being established with an unacceptable transmission quality across the exchange should be:

$$P \leq 10^{-5}$$

The transmission quality across the exchange is said to be unacceptable when the bit error ratio is above the alarm condition.

4.4 Slip rate

4.4.1 Normal conditions

The slip rate under normal conditions is covered in Recommendation ITU-T Q.541 [i.5].

4.4.2 Temporary loss of timing control

The case of temporary loss of timing control corresponds to the "holdover operation" defined and recommended in Recommendation ITU-T G.812 [i.6]. The allowable slip rate will correspond to the maximum relative TIE also recommended therein.

4.4.3 Abnormal conditions at the exchange input

The slip rate in case of abnormal conditions (wide phase deviations, etc.) at the exchange input is the subject of further study taking into account the requirements of Recommendation ITU-T G.823 [i.7].

History

Document history		
V2.1.1	July 2011	Publication
V2.2.1	June 2013	Publication