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SERIES Q: SWITCHING AND SIGNALLING

Interworking of Signalling Systems – Specifications of Signalling System No. 7

TELEPHONE USER PART (TUP) – SIGNALLING PERFORMANCE IN THE TELEPHONE APPLICATION

Reedition of CCITT Recommendation Q.725 published in the Blue Book, Fascicle VI.8 (1988)

NOTES

1 CCITT Recommendation Q.725 was published in Fascicle VI.8 of the *Blue Book*. This file is an extract from the *Blue Book*. While the presentation and layout of the text might be slightly different from the *Blue Book* version, the contents of the file are identical to the *Blue Book* version and copyright conditions remain unchanged (see below).

2 In this Recommendation, the expression “Administration” is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

Recommendation Q.725

SIGNALLING PERFORMANCE IN THE TELEPHONE APPLICATION

1 Introduction

This Recommendation gives the requirements of the telephone application of Signalling System No. 7.

In Recommendation Q.706, the Message Transfer Part performance is described. The Message Transfer Part is the basis of the telephone application of Signalling System No. 7 and provision of a signalling network to serve the telephone service must take account of the performance of the Message Transfer Part and the requirements of the telephone application. For example, taking account of the message transfer times detailed in Recommendation Q.706 and the requirements for message transfer times between two telephone exchanges, a figure may be derived for the total permissible number of signalling links in signalling relations in tandem for a particular call.

2 Unsuccessful calls due to signalling malfunction

The proportion of calls that are unsuccessful due to signalling malfunction should be less than 1 in 10^5.

By means of error detection (see Recommendation Q.703) as well as transmission fault indication (see Recommendations G.732 [1] and G.733 [2]), it is ensured that, overall, not more than one error in 10^8 of all signal units transmitted is accepted and will cause false operation.

Unsuccessful calls may be caused by undetected errors, loss of messages or messages delivered out of sequence (during emergency situations within the signalling network) and may result in:

- incomplete call set-up,
- misrouted calls (e.g. connection of wrong numbers),
- calls routed correctly but mishandled (e.g. false clearing).

3 Unavailability of a signalling route set

The overall unavailability of a signalling route set causing the unavailability of a signalling relation should not exceed a total of 10 minutes per year.

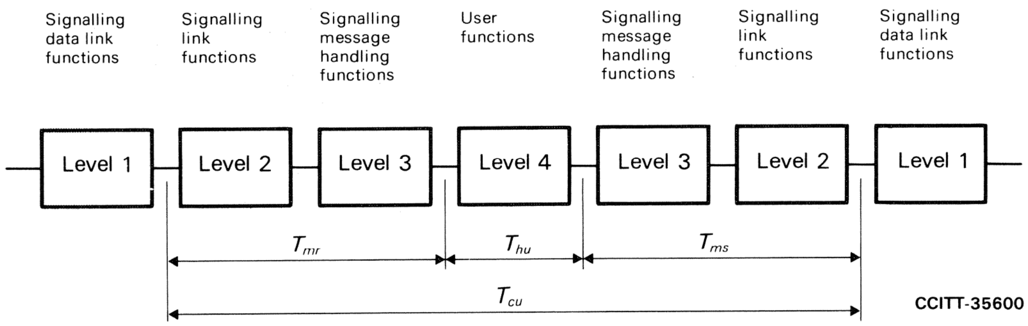
Note – The availability of a signalling route set within a signalling network may be enhanced by replication of signalling links, signalling paths and signalling routes.

4 Labelling potential

The label of the Telephone User Part of Signalling System No. 7 provides the potential to identify 16 384 signalling points and up to 4096 speech circuits for each signalling relation.

5 Cross-office transfer time

5.1 *Functional reference points and transfer time components*



T_{cu} Cross-office transfer time

T_{hu} Telephone User Part handling time

T_{mr} Message Transfer Part receiving time [a)]

T_{ms} Message Transfert Part sending time [a)]

[a)] The definitions of these times are given in Recommendation Q.706.

FIGURE 1/Q.725

Functional diagram of the cross-office transfer time

5.2 *Definitions*

a) **cross-office transfer time, T_{cu}**

T_{cu} is the period which starts when the last bit of the signal unit leaves the incoming signalling data link and ends when the last bit of the signal unit enters the outgoing signalling data link for the first time. It also includes the queueing delay in the absence of disturbances but not the additional queueing delay caused by retransmission.

b) **user handling time, T_{hu}**

T_{hu} is the period which starts when the last bit of the message has entered the Telephone User Part and ends when the last bit of the derived message has left the Telephone User Part.

5.3 *Queueing delay*

The formulae for the queueing delays are described in Recommendation Q.706, § 4.2.

The telephone traffic model assumed is given in Table 1/Q.725, from which the proportion of signal messages may be obtained as shown in Table 2/Q.725. Using Table 2/Q.725, examples of queueing delays are calculated as shown in Figures 2/Q.725 to 5/Q.725, where one call attempt per second per 64 kbit/s signalling data link may yield 0.00577 Erlang of the traffic loading of each channel.

5.4 *Estimates for message transfer time*

The figures in Table 3/Q.725 are related to a signalling bit rate of 64 kbit/s.

5.5 *Effect of retransmission*

As a consequence of correction by retransmission, not more than one in 10^4 signals should be delayed more than 300 ms as a long-term average. This requirement refers to each signalling link.

This requirement is laid down in order to ensure satisfactory answer delays.

TABLE 1/Q.725

Traffic model

Sending procedure			"En bloc"				Overlap			
Type of call			AW	SB	CC	AB	AW	SB	CC	AB
Percent calls			30	10	5	5	30	10	5	5
Messages per call		Length (bits)								
	12—digit IAM	176	1	1	1	0				
	6—digit IAM	152					1	1	1	1
	3—digit SAM	128					1	1	0	1
	1—digit SAM	112					3	3	0	0
	Address complete	112	1	1	0	0	1	1	0	0
	Others	112	3,5	2	3	0	3,5	2	3	2

AW Answered
SB Subscriber busy and not answered
CC Circuit congestion
AB Abortive

Note – The assumptions used in this model are chosen for illustrative purposes, and should not be considered to be typical.

TABLE 2/Q.725

Proportion of messages

Length (bits)	176	152	128	112	104	Total
Messages per call i n both directions	0.45	0.5	0.45	2.0	2.9	6.3
Percent	7.1	7.9	7.1	31.7	46.0	100
Mean message length (*Tm*)	117.2 bits					
K_1	1.032					
K_2	1.107					
k_3	1.239					

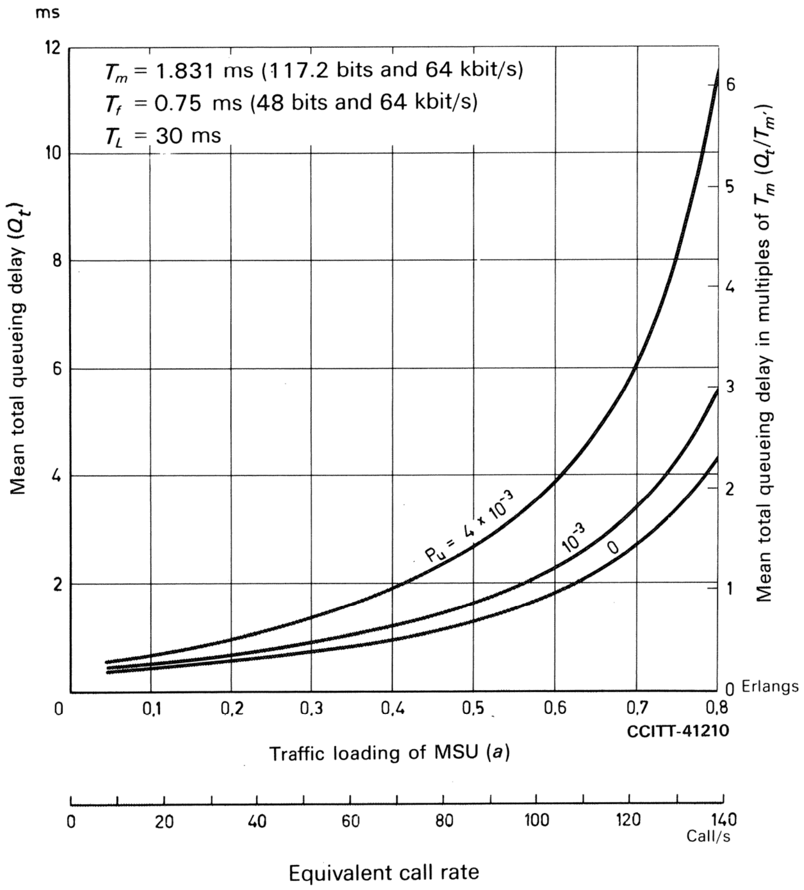


FIGURE 2/Q.725

Mean total queueing delay of each channel of traffic; basic error correction method

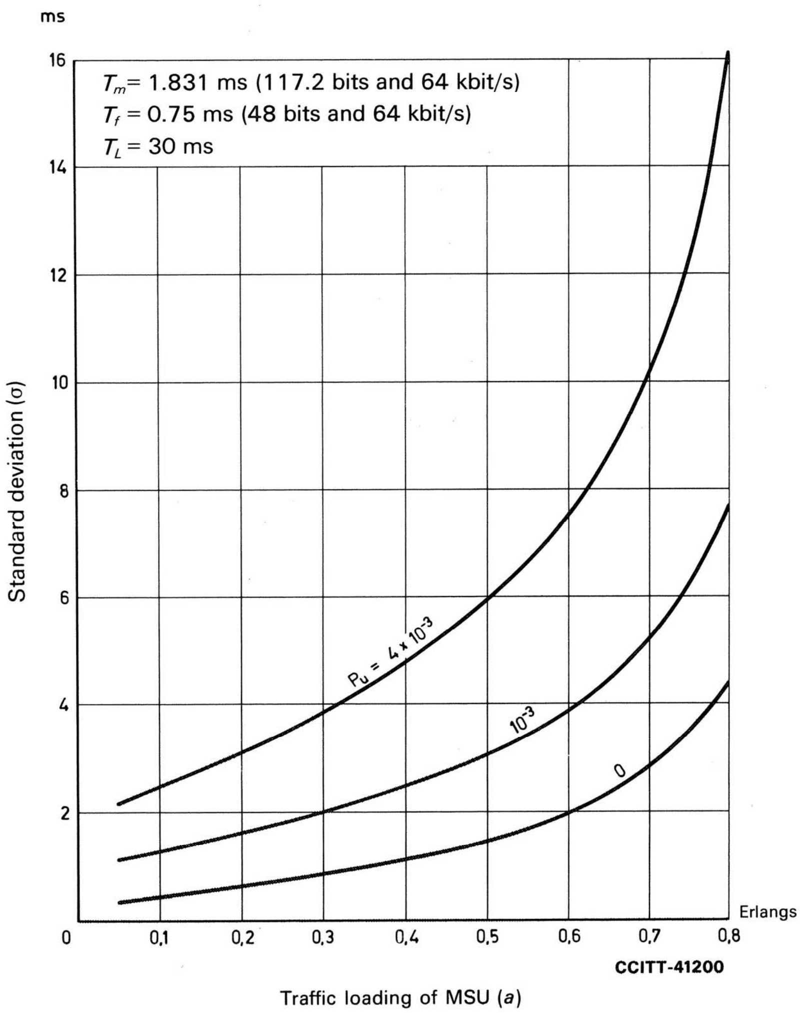


FIGURE 3/Q.725

Standard deviation of queueing delay of each channel of traffic; basic error correction method

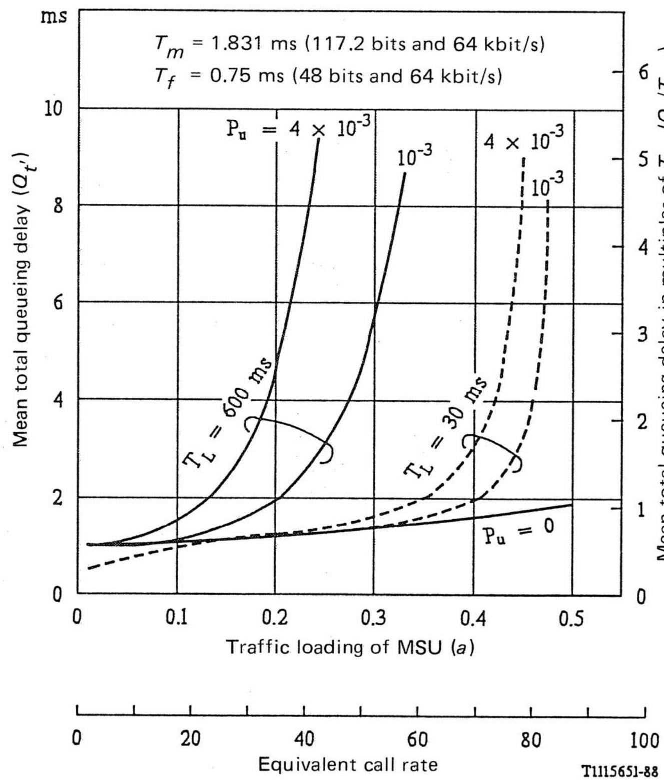


FIGURE 4/Q.725

Mean total queueing delay of each channel of traffic; preventive cyclic retransmission error correction method

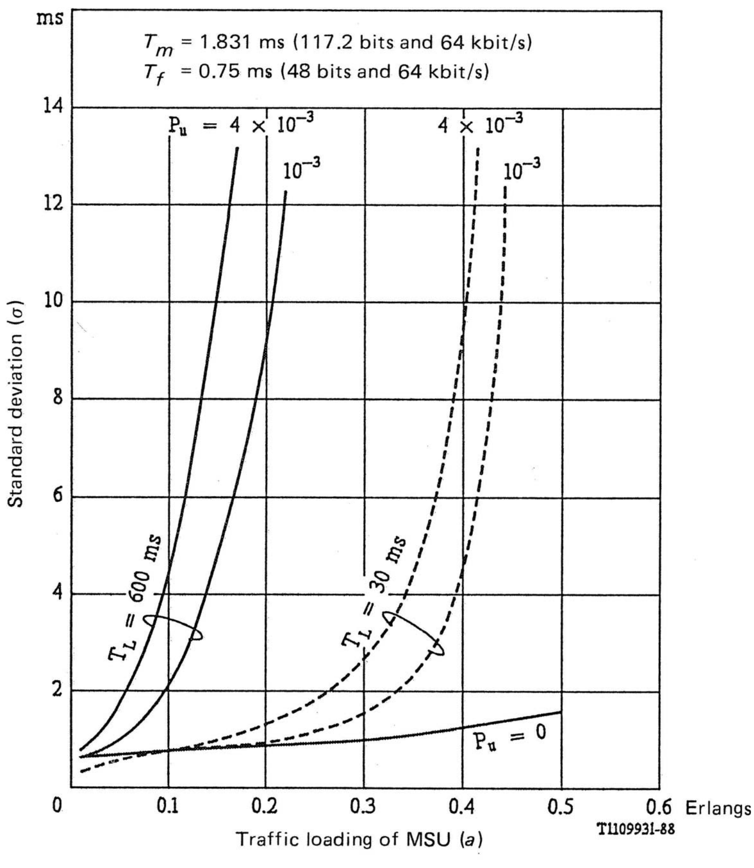


FIGURE 5/Q.725

Standard deviation of queueing delay of each channel of traffic; preventive cyclic retransmission error correction method

TABLE 3/Q.725

Message type	Exchange call attempt loading	Cross—office transfer time T_{cu} (ms) [a]	
		Mean	95%
Simple (e.g. answer)	Normal +15% +30%	110 165 275	220 330 550
Processing intensive (e.g. IAM)	Normal +15% +30%	180 270 450	360 540 900

[a] Provisional values.

References

[1] CCITT Recommendation *Characteristics of primary PCM multiplex equipment operating at 2048 kbit/s*, Rec. G.732.

[2] CCITT Recommendation *Characteristics of primary PCM multiplex equipment operating at 1544 kbit/s*, Rec. G.733.

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