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E.521

TELEPHONE NETWORK AND ISDN

QUALITY OF SERVICE, NETWORK MANAGEMENT AND TRAFFIC ENGINEERING

CALCULATION OF THE NUMBER OF CIRCUITS IN A GROUP CARRYING OVERFLOW TRAFFIC

ITU-T Recommendation E.521

(Extract from the *Blue Book*)

NOTES

1 ITU-T Recommendation E.521 was published in Fascicle II.3 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.

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Recommendation E.521

CALCULATION OF THE NUMBER OF CIRCUITS IN A GROUP CARRYING OVERFLOW TRAFFIC

A calculation of the number of circuits in a group carrying overflow traffic should be based on this Recommendation and on Recommendation E.522 dealing with high-usage groups.

The objective grade of service used is that the average blocking during the busy-hour of the 30 busiest days of the year will not exceed 1%.

To determine the number of circuits in a group carrying overflow traffic, three traffic parameters are required: the average traffic offered to the group, the weighted peakedness factor, and the level of day-to-day traffic variations.

The level of day-to-day traffic variations indicates the degree to which the daily busy-hour traffic deviates from the overall mean traffic, and is determined by the sample variance of the 30 busy-hour traffic.

The peakedness factor indicates the degree to which the variability of the traffic deviates from pure chance traffic within a single hour, and in statistical terms is the variance-to-mean ratio of the distribution of simultaneous overflow traffic.

1 Determination of the level of day-to-day traffic variations

Let $M_1, M_2, \dots, M_{30}$ denote the 30 busy-hour loads of the traffic offered to the final group. Determine the mean traffic M of the daily traffic by

$$M = \frac{1}{30} \sum_{j=1}^{30} M_j$$

Determine the sample variance V_d of the daily traffic by

$$V_d = \frac{1}{29} \sum_{j=1}^{30} (M_j - M)^2$$

Determine the point (M, V_d) on Figure I/E.521; M on the horizontal axis, and V_d on the vertical axis.

- i) If the point (M, V_d) is below the bottom curve, the level of variation is *Null*.
- ii) If the point is between the lower two curves, the level of variation is *Low*.
- iii) If the point is between the upper two curves, the level of variation is *Medium*.
- iv) If the point is above the highest curve, the level of variation is *High*.

Default procedures: if the data are not available to compute the variance V_d use the following guidelines:

- a) If no more than 25 per cent of the traffic offered to the final group is overflow from other groups, assume the level of day-to-day variation is *Low*.
- b) Otherwise, assume a *Medium* level of variation.

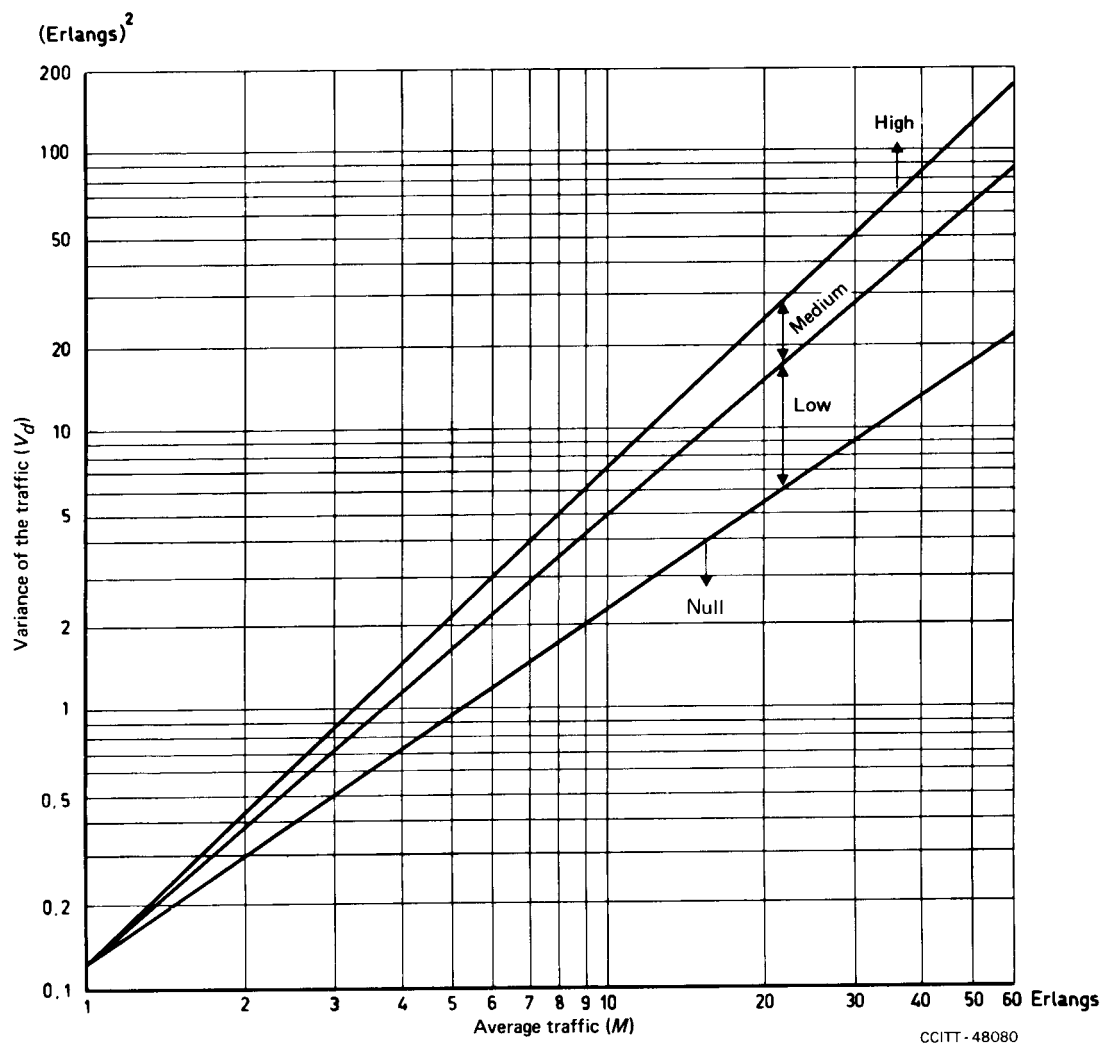


FIGURE 1/E.521
Determination of the level of day-to-day traffic variation

2 Determination of peakedness factor z

Peakedness factors depend principally upon the number of high-usage circuits over which random traffic has access. When the number of such high-usage circuits does not exceed 30, the actual peakedness of the traffic overflowing from a high-usage group will be only slightly below the maximum peakedness values^{1),2)}. The maximum peakedness values are given in Table 1/E.521.

- 1) Tables giving:
 - the exact mean of the overflow traffic, and
 - the difference between variance and mean of the overflow
 have been computed and are set out in [1].

- 2) Curves giving the exact mean and variance of overflow traffic are given in [2]. See also a more detailed description of the method in [3] and [4].