INTERNATIONAL TELECOMMUNICATION UNION

ITU-T   Q.454

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

SPECIFICATIONS OF SIGNALLING SYSTEM R2

INTERREGISTER SIGNALLING

MULTIFREQUENCY SIGNALLING EQUIPMENT

THE SENDING PART OF THE MULTIFREQUENCY SIGNALLING EQUIPMENT

ITU-T Recommendation Q.454

(Extract from the *Blue Book*)

NOTES

1 ITU-T Recommendation Q.454 was published in Fascicle VI.4 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.454

4.4.4 THE SENDING PART OF THE MULTIFREQUENCY
SIGNALLING EQUIPMENT

4.4.4.1 *Signalling frequencies*

The composition of the multifrequency combinations is specified in Recommendation Q.441.

The frequencies in the forward direction are:

$f_0 = 1380$, $f_1 = 1500$, $f_2 = 1620$, $f_3 = 1740$, $f_4 = 1860$, $f_5 = 1980$ Hz.

The frequencies in the backward direction are:

$f_0 = 1140$, $f_1 = 1020$, $f_2 = 900$, $f_3 = 780$, $f_4 = 660$, $f_5 = 540$ Hz.

The frequency variation at the sending point must not exceed ± 4 Hz relative to the nominal value.

4.4.4.2 *Absolute power level transmitted*

a)   Four-wire multifrequency signalling equipment for outgoing international R2 and incoming R2 registers assumed to be directly connected to the virtual switching point in an international exchange:

   i)   The absolute power level of each non-modulated signalling frequency transmitted by the sending part of the multifrequency signalling equipment in the international exchange concerned will have a nominal value of -8 dBm0 with a tolerance ± 1 dB. At an analogue input of the exchange, this corresponds to -11.5 dBm ± 1 dB.

   ii) The difference in level between the two signalling frequencies making up a multifrequency combination must be less than 1 dB.

   The tolerances specified apply to the sending point itself, i.e. terminal B in Figure 16/Q.451.

b)   Four-wire multifrequency signalling equipment for outgoing international R2 registers situated in a national exchange further down in the network of the country of origin:

   i)   The sending-level conditions mentioned above under a) are applicable in such national exchanges, provided that the national 4-wire extension links between the national exchange and the outgoing international exchange have the same nominal transmission loss (0.5 dB) and the same upper limit of standard deviation of transmission loss variations with time (1 dB) as the international links.

   ii) If these national links do not have a nominal transmission loss of 0.5 dB, the level of interregister frequencies must be compensated as required.

c)   Multifrequency signalling equipment for incoming R2 registers in national exchanges:

The nominal absolute power level N of a single signalling frequency transmitted by the sending part of the multifrequency signalling equipment (2-wire or 4-wire) in any national exchange must be chosen within the limits:

$$N \geqslant A_b + 0{,}5\,m + 2.3\,\sqrt{(m + k) + (m + k + 1)\,0.04} - 31 \text{ dBm} \tag{1}$$

and

$$N \leqslant A_b - 11.5 \text{ dBm} \tag{2}$$

or

$$N \leqslant A_b + 0.5\,m - 2.3\,\sqrt{(m + k) + (m + k + 1)\,0.04} - 9 \text{ dBm} \tag{3}$$

whichever of (2) or (3) yields the lower value.

In order to avoid marginal operation, it is recommended that levels higher than the minimum levels given by formula (1) be specified.

In these formulae:

- m = the number of 4-wire links switched in tandem between the outgoing international R2 register and the incoming international exchange. The number m thus includes the national 4-wire extension links in the country of origin (see Recommendation Q.457) and the international links. In formula (1) m should always be given the maximum value 4. In formula (3), m should be given all its values, from minimum to maximum, and the lowest value so obtained or derived from formula (2) is to be taken as the upper limit of N.

- k = the number of national 4-wire extension links switched in tandem between the incoming international terminal exchange and the national exchange. The maximum value of k will be 4.

- A_b = the nominal transmission loss at 800 Hz in the backward direction between the output terminals of the sending part of the multifrequency signalling equipment of the incoming R2 register in the exchange under consideration and the *send* side of the virtual switching point of the backward speech path in the incoming international exchange.

Formulae (1), (2) and (3) were derived as shown in Annex A to Section 4.

The variation in level relative to the nominal value N chosen for a given exchange must not exceed ± 1 dB.

However, the difference in level between the two signalling frequencies making up a multifrequency combination must not exceed 1 dB.

4.4.4.3 *Signalling frequency leak level*

The total power level of the leak current transmitted to line must be:

a) at least 50 dB below the nominal level of one signalling frequency when no multifrequency combination is being sent;

b) at least 30 dB below the level of either of the signalling frequencies when a multifrequency combination is being sent. Furthermore, any single leak current must be at least 34 dB below the level of either of the signalling frequencies when a multifrequency combination is being sent.

4.4.4.4 *Harmonic distortion and intermodulation*

The total power level of all frequencies due to harmonic distortion and intermodulation within the frequency band 300-3400 Hz must be at least 37 dB below the level of one signalling frequency.

4.4.4.5 *Time tolerance for multifrequency combinations*

The time interval between the start of sending of each of the two frequencies constituting a multifrequency combination must not exceed 1 ms.

The time interval between the cessation of sending of each of the two frequencies must not exceed 1 ms.