INTERNATIONAL TELECOMMUNICATION UNION

ITU-T G.341

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

INTERNATIONAL ANALOGUE CARRIER SYSTEMS

INDIVIDUAL CHARACTERISTICS OF INTERNATIONAL CARRIER TELEPHONE SYSTEMS ON METALLIC LINES

1.3 MHz SYSTEMS ON STANDARDIZED 1.2/4.4 mm COAXIAL CABLE PAIRS

ITU-T Recommendation G.341

(Extract from the *Blue Book*)

NOTES

1 ITU-T Recommendation G.341 was published in Fascicle III.2 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 G.341

1.3 MHz SYSTEMS ON STANDARDIZED 1.2/4.4 mm COAXIAL CABLE PAIRS

(amended at Geneva, 1964; further amended)

Preliminary note

The present Recommendation describes two types of systems on coaxial cable pairs providing 300 telephone channels in the approximate frequency band 0.06 to 1.3 MHz. The length of the elementary cable section is about 6 km for the first type of system and about 8 km for the second. The first is to be preferred when it is planned to equip the cable with 6 MHz repeaters later on, the second when it is planned to install systems belonging to the other family on the cable later on, i.e. the 4 MHz system, 12 MHz system or 18 MHz system.

1 Line frequencies

The system will carry 300 telephony channels, transmitted to line:

- either between 60 kHz and 1300 kHz as supergroups Nos. 1-5 of the 4 MHz system (Figure 1 *a)*/G.341);
- or between 64 kHz and 1296 kHz as a mastergroup with erect channel sidebands (Figure 1 *b)*/G.341).

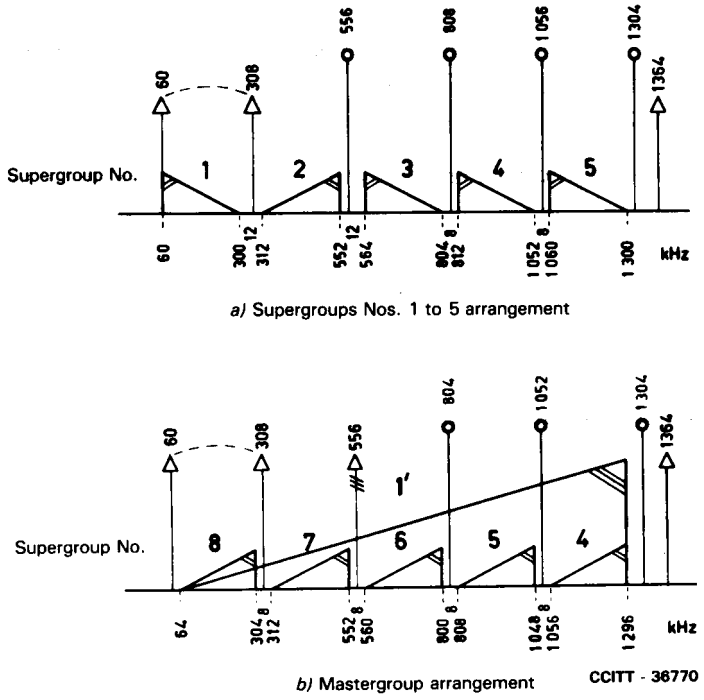

FIGURE 1/G.341

Line-frequency arrangements for international carrier 1.3-MHz systems on 1.2/4.4-mm coaxial pair

2 Pilots and additional measuring frequencies

2.1 *Line-regulating pilot*

The CCITT recommends that 1364 kHz be used for the main line-regulating pilot on all regulated-line sections

crossing a frontier. The main line-regulating pilot is used for automatic correction of cable attenuation with the temperature.

In any regulated-line section crossing a frontier, it is recommended that in both directions of transmission the Administration on the transmitting side permanently transmit an auxiliary line-regulating pilot at 60 or 308 kHz, as the Administration on the receiving side may choose, so as to provide for additional regulation, for example.

The frequency accuracy recommended for the pilots is $\pm 1 \times 10^{-5}$.

The power level of these pilots should be adjusted at the output of the transmit amplifier to have a nominal value of - 10 dBm0. The harmonics of the 60 and 308 kHz pilots should each have a level not higher than -70 dBm0.

The tolerances for this level are the same as in Recommendation G.332, § 2.1.

Note - Some systems in use employ a pilot at -1.2 Nm0.

2.2 *Frequency-comparison pilots*

For national frequency comparison, it is recommended that a 60 or 308 kHz pilot be used. Should international frequency comparison appear desirable, the Administrations concerned will reach agreement on which of these two frequencies they will use.

The power level of a frequency-comparison pilot should be adjusted at the output of the transmit amplifier, to a nominal value of -10 dBm0. The harmonics of the frequency-comparison pilots should each have a level not higher than -70 dBm0.

2.3 *Additional measuring frequencies*

Frequencies that can be used as additional measuring frequencies are as follows:

- supergroups Nos. 1 to 5 frequency allocation: (60), (308), 556, 808, 1056, 1304 kHz;
- mastergroup frequency allocation: (60), (308), 804, 1052, 1304 kHz.

Note - One of the two frequencies in brackets will be used for the auxiliary line-regulating pilot.

The power level of these additional measuring frequencies should be adjusted, at the output of the transmit amplifier, to have a nominal value of -10 dBm0. The harmonics of the additional measuring frequencies below 650 kHz should each have a level at this point not higher than -70 dBm0.

Note - Some systems in use employ additional pilots at -1.2 Nm0.

The additional measuring frequencies should not be permanently transmitted. They will be transmitted only for as long as is necessary for actual measurement purposes.

3 Hypothetical reference circuit

The CCITT has defined two hypothetical reference circuits, one for supergroup arrangement and the other for mastergroup arrangement. Both are 2500 km long and are divided into nine homogeneous sections of 280 km each.

3.1 *Hypothetical reference circuit used in supergroup arrangement*[1)]

This hypothetical reference circuit (see Figure 2/G.341) has, for each direction of transmission, a total of:

- three pairs of channel modulators, each pair including translation from the audio-frequency band to the basic group and vice versa;
- six pairs of group modulators, each pair including translation from the basic group to the basic supergroup

---

1) This hypothetical reference circuit is also used for 4 MHz and 6 MHz systems transmitting supergroups on 1.2/4.4 mm coaxial pairs and for systems providing two supergroups on symmetric pairs.

and vice versa;

- nine pairs of supergroup modulators, each pair including translation from the basic supergroup to the frequency band transmitted on the coaxial cable and vice versa.

It will be seen that there is a total of 18 modulations and 18 demodulations for each direction of transmission, assuming that each modulation or demodulation is carried out in a single stage.

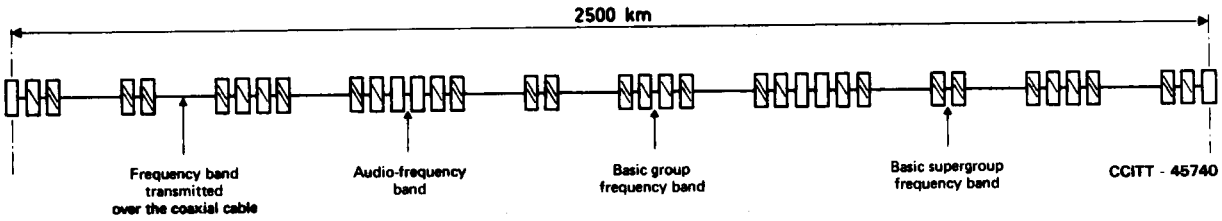

FIGURE 2/G.341

Diagram of the hypothetical reference circuit for 1.3-MHz systems on coaxial cable using supergroup arrangement

3.2 *Hypothetical reference circuit used in mastergroup arrangement*

This hypothetical reference circuit (see Figure 3/G.341) has, for each direction of transmission, a total of:

- three pairs of channel modulators, each pair including translation from the audio-frequency band to the basic group and vice versa;
- three pairs of group modulators, each pair including translation from the basic group to the basic supergroup and vice versa;
- six pairs of supergroup modulators, each pair including translation from the basic supergroup to the frequency band of the basic mastergroup and vice versa;
- nine pairs of mastergroup modulators, each pair including translation from the basic mastergroup to the frequency band transmitted on the coaxial cable and vice versa.

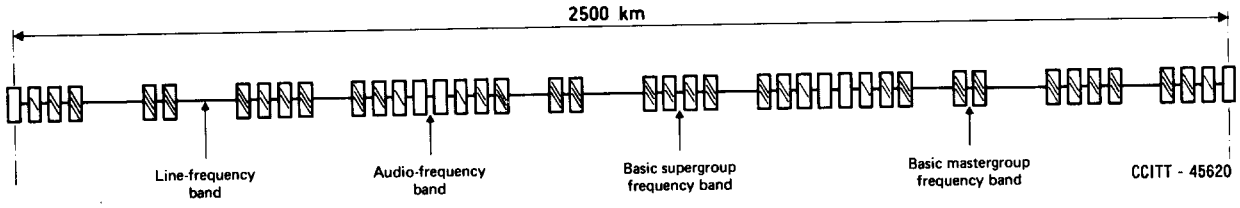

FIGURE 3/G.341

Diagram of a hypothetical reference circuit for 1.3-MHz coaxial pair systems using mastergroup arrangement

4 Circuit noise

The general target noise values for cable systems (see Recommendation G.222) apply also to systems on 1.2/4.4 mm coaxial pairs, with the conditions given in Recommendation G.223.

In practice, it is sufficient to check by calculation that, for every telephone channel as defined by the relevant

hypothetical reference circuit, the mean psophometric power at the end of the channel, referred to a zero relative level point, does not exceed 10 000 pW0p during any period of one hour.

5 Matching of the coaxial pair impedance and the repeater impedances

The sum *N* of three terms defined in Recommendation G.332, § 5 must be at least equal to:

- 54 dB for a 6 km elementary cable section;
- 52 dB for an 8 km elementary cable section.

These figures have been calculated so as to get a ripple in the attenuation/frequency characteristic not exceeding 0.8 dB at the end of a homogeneous section 280 km long. It has been assumed that the reflected currents add in phase in all the elementary cable sections of this homogeneous section (the spacing of the buried repeaters, on a small coaxial pair, generally being very regular). In addition, it has been assumed that it is highly improbable that a telephone channel will be on more than one homogeneous section of the hypothetical reference circuit in the lower part of the band of line frequencies. At higher frequencies, *N* should be well above the limit.

6 Relative levels and interconnection

6.1 *Relative levels and cabling loss for any repeater section*

6.1.1 The loss on any 6 km elementary cable section should be 35 dB at 1300 kHz. The relative power level at the input of the cable section (output of the repeater equipment) should be -13 dBr at 1300 kHz. Each Administration may so select the pre-emphasis characteristic that the level at this point and at frequency 60 kHz lies in the range -18 to -28 dBr.

6.1.2 The nominal loss on any 8 km elementary cable section should be 49 dB at 1300 kHz. The relative levels at the input of any cable section are not strictly standardized, values of -3.5 dBr and -4.3 dBr at the top channel are being used in connection with pre-emphasis values of 9 dB and 10 dB respectively.

6.2 *Frontier section*

For interconnection between two systems using different pre-emphasis characteristics, unless there are special arrangements between the Administrations concerned, the following recommendation will be applied:

6.2.1 In a 6 km elementary cable section crossing a frontier, the level at the end of the cable section (input of the repeater equipment) should be equal to -48 dBr at 1300 kHz.

As it may be necessary to insert equipment at the frontier crossing to eliminate the monitoring or fault-locating frequencies used in each country or to terminate the remote power supply section, it is possible that the sending relative power level at 1300 kHz may be less than -13 dBr. It is then necessary that the frontier section should be less than 6 km long. If the difference between the pre-emphasis characteristics used in both countries is too great to be compensated for in this way, one of the Administrations concerned, chosen by mutual agreement, will have to make up for this difference at the attended receiving station on its territory which lies closest to the frontier.

6.2.2 For interconnection between two different systems of this type with 8-km elementary cable sections, the relative level at the frequency 1300 kHz should be -4.0 dBr at the input of the frontier cable section. According to Recommendation G.352 one of the Administrations concerned, chosen by mutual agreement, will have to make up for the slight differences in relative level and pre-emphasis at the attended repeater station which lies closest to the frontier.

6.3 *Relative levels in a terminal station; interconnection with other systems*

Recommendation G.213 explains the general principles to be adopted to facilitate interconnection of different systems in terminal stations.

7 Power-feeding and alarm systems

7.1 *Power-feeding across a frontier*

In the absence of a special agreement between the Administrations concerned with a power-feeding section crossing a frontier, it is recommended that each Administration power-feed only those repeater stations in its own country. Many Administrations use looped power-feeding on the two sides of a power-feeding station, half of each of the sections between this station and the adjacent power stations being so fed; they can close the loop at their frontier stations. Agreements will be necessary if, for example, the frontier is very far from the mid-point between the two nearest feeding stations, or if the Administrations concerned use looped power-feeding on the entire section between two feeding stations.

If the repeater stations in a country are fed from another country, special precautions will be required to protect the staff working on the cables.

7.2 *Remote power-feeding systems*

The CCITT is studying these systems from the following viewpoints:

- precautions to be taken to protect staff against normal voltages and remote power-feed currents, or the use of voltages and currents which are innocuous to persons working in repeater stations or on lines;
- protection of staff and equipment against induced voltages and currents;
- trouble in remote power-feeding operation caused by induced voltages and currents.

7.3 *Supervision and alarms in a frontier section*

This should be governed by agreement between the Administrations concerned. In particular, it is necessary at the points of interconnection between two systems that if frequencies are used for monitoring or for locating faults they be attenuated to a level of -50 dBm0 on the receiving sides to prevent any disturbance to similar frequencies used in the system farther down the line.

Note - Frequencies sent only over a system already withdrawn from service because of a fault may be selected by each Administration on the national level.