INTERNATIONAL TELECOMMUNICATION UNION

ITU-T R.31

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STANDARDIZATION OF AMVFT SYSTEMS FOR A MODULATION RATE OF 50 BAUDS

ITU-T Recommendation R.31

(Extract from the *Blue Book*)

NOTES

1 ITU-T Recommendation R.31 was published in Fascicle VII.1 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 R.31

STANDARDIZATION OF AMVFT SYSTEMS FOR A MODULATION RATE OF 50 BAUDS

(Mar del Plata, 1968, incorporating former Recommendations R.31, R.32 and R.34; amended at Malaga-Torremolinos, 1984)

The CCITT,

unanimously declares the following view:

1 It is advisable to adopt, for amplitude-modulated voice-frequency telegraph (AMVFT) systems and for a modulation rate not exceeding 50 bauds, the series of frequencies formed by odd multiples of 60 Hz, the lowest frequency being 420 Hz as shown in Table 1/R.31.

TABLE 1/R.31

Channel position	Frequency Hz	Channel position	Frequency Hz
1	420	13	1860
2	540	14	1980
3	660	15	2100
4	780	16	2220
5	900	17	2340
6	1020	18	2460
7	1140	19	2580
8	1260	20	2700
9	1380	21	2820
10	1500	22	2940
11	1620	23	3060
12	1740	24	3180

2 This numbering is valid whatever use is made of the channel (e.g. traffic channel, pilot channel, etc.) or the method employed to obtain the line frequencies, e.g. by group modulation. For the numbering of channels that has been adopted in the international service see Recommendation R.70 *bis*.

3 In the case of systems on telephone-type circuits with a spacing of 3-kHz operating in accordance with the standardized frequency series, channel positions 23 and 24 cannot be used.

4 The frequencies applied to the telephone-type circuit that is used as the voice-frequency telegraph bearer circuit should not deviate by more than 6 Hz from the nominal value when the telegraph channels supplied are operating over a telephone-type circuit composed exclusively of audio-frequency sections, and not more than 3 Hz in other cases.

5 The power levels of carrier waves transmitted on the line and measured successively in as short a period as possible should not differ from one another by more than 1.74 dB when they are operating on a constant impedance.

6 The power of each of the carrier waves transmitted on the line should not vary in operation by more than ± 0.87 dB when it operates on a constant impedance.

7 The amplitude of the signals transmitted by a channel modulator during a transition from condition A to condition Z should remain within the tolerances of Figure 1/R.31 in which the values t_0 and y_2 and y_1 are fixed as follows:

t_0 = 11 ms,

y_1 = 95%,

y_2 = 110%.

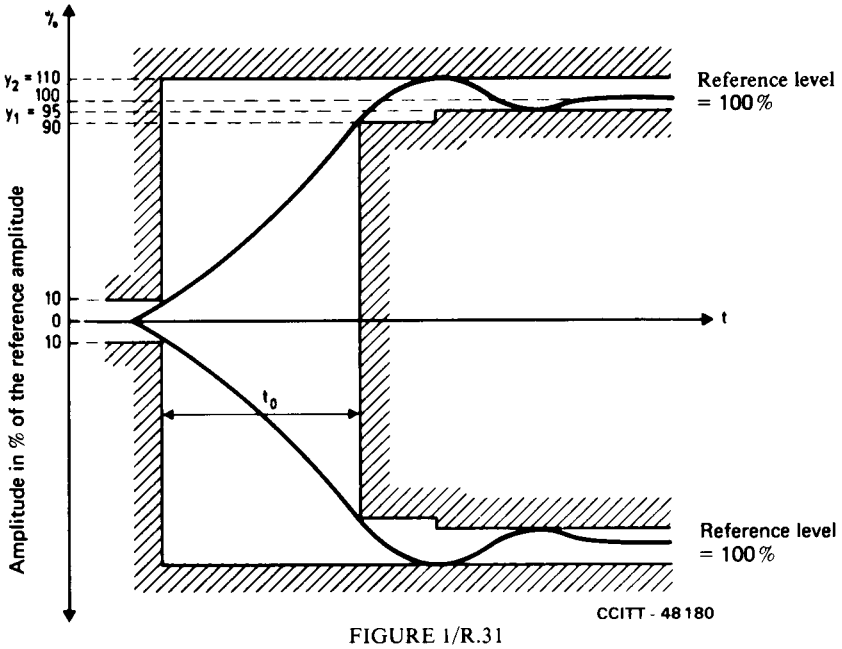

FIGURE 1/R.31

Diagram of tolerances to assess the waveform of the sent signals in AMVFT systems

8 Receivers with rapid-action level correction should not be so sensitive to secondary pulses following the signal pulse provided that the amplitude of the signal emitted does not exceed the reference level by more than 10% and that the reference level does not exceed the normal level by 10.4 dB. (This provision applies only to new systems.)

9 If 1:1 reversals at frequency f_p corresponding to the modulation rate are sent over a channel with mid-frequency F_0, the voltage at frequency $F_0 \pm 3\ f_p$, must not exceed 3% of the nominal voltage at frequency F_0 and the voltage at the frequencies $F_0 \pm 5\ f_p$ must not exceed 0.4% of the nominal voltage at frequency F_0.

Note – These tolerances will be required only for future systems. Administrations should try as far as possible to use systems satisfying these tolerances on international relations.

10 The unbalance of the emitted signal should not be greater than ± 4% (methods of measuring this unbalance are described in [1] and [2]). This tolerance takes account of the limit in § 11 below for new systems.

11 For new systems, the static relay should introduce a difference of not less than 45 dB between the two signalling conditions. (For existing systems the limit is 30 dB.)

12 In the event of failure of the control current in the sending static relay, the attenuation of the residual signal relative to this nominal level should be at least 27 dB. This attenuation of the signal need not occur immediately on the failure of the control current.

13 Systems should be able to tolerate slow level variations of at least ± 6 dB. Administrations should equip systems that are unable to tolerate such variations with a common amplifier to enable them to tolerate variations of at least ± 6 dB.

14 The permissible limit for the power of the telegraph signal on each telegraph channel when a continuous tone is being transmitted is given in Table 2/R.31.

TABLE 2/R.31

Normal limits (nominal values) for the power per telegraph channel in AMVFT systems

Number of telegraph channels in the AMVFT system	Allowable power per telegraph channel at a point of zero relative level when sending a signal corresponding to continuous Z condition	
	microwatts	decibels
12 or less	35	–14.5
18	15	–18.3
24	9	–20.45

Note – These limits are such that the maximum instantaneous voltage will exceed that of a sinusoidal voltage with a power of 5 milliwatts at a point of zero relative level. This is the maximum permissible for voice-frequency circuits.

15 Audio-frequency is transmitted to line when stop polarity (condition Z) is sent.

16 When a signal, whose frequency is equal to the nominal frequency of the channel and whose level is 18.3 dB below the normal signal level of the channel, is applied to the detector of a 24-channel AMVFT system, the receiving relay should not respond.

17 It must be possible to subject any channel to a test without withdrawing from service a channel other than the return channel of the circuit planned.

18 In graded harmonic frequency telegraphy, it is desirable that the same frequencies be used separately for circuits established on different successive sections of a 4-wire circuit.

19 In graded harmonic frequency telegraphy, the attenuation of the filters that pass a group of frequencies must, in the suppressed frequency band, be higher by at least 35 dB than that shown in the transmission band.

20 In graded harmonic frequency telegraphy, in order to facilitate local tests, the frequencies used for communications set up between two international offices in one direction should also be used in the opposite direction, if possible.

References

[1] *Measuring method to determine the asymmetry of an amplitude-modulated telegraph signal*, Blue Book, Vol. VII, Supplement No. 11, ITU, Geneva, 1964.

[2] *The measurement of the distortion produced in the sending terminal equipment of an A.M.-V.F. telegraph system*, Blue Book, Vol. VII, Supplement No. 12, ITU, Geneva, 1964.