INTERNATIONAL TELECOMMUNICATION UNION

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

M.540

MAINTENANCE:

INTERNATIONAL TRANSMISSION SYSTEMS (ANALOGUE)

ROUTINE MAINTENANCE OF CARRIER AND PILOT GENERATING EQUIPMENT

ITU-T Recommendation M.540

(Extract from the *Blue Book*)

NOTES

1 ITU-T Recommendation M.540 was published in Fascicle IV.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.

Recommendation M.540

ROUTINE MAINTENANCE OF CARRIER AND PILOT GENERATING EQUIPMENT

1 If a country has a national frequency standard, it is desirable to use it for checking the frequency of the master oscillators of carrier systems. (See Table 1/M.540 showing the recommended frequency accuracy for various carrier systems.) This frequency standard can be guaranteed to about 1 part in 10^8 by means of the three-way frequency comparisons organized by the CCIR. However, we must note that a larger accuracy can be obtained in the countries that will use an atomic frequency standard (for example cesium or rubidium).

2 If a country has no national frequency standard, there are two possibilities:

a) to receive by radio the standard signals transmitted in accordance with CCIR Recommendations;

b) to receive from a neighbouring country, over a metallic circuit, a frequency derived from the national standard of that country.

It may be necessary in some cases to make a direct comparison of the frequency of the master oscillators of the carrier systems of different countries; this comparison will be effected by means of the frequency comparison pilots.

3 The changeover of master oscillators may cause a short interruption of a few milliseconds and a sudden phase-change. Because the effect of these interruptions and phase-changes is felt throughout the carrier system, changeover of master oscillators should be made only when absolutely necessary.

TABLE 1/M.540

Table showing the recommended frequency accuracy for reference pilots, carriers, etc., in various carrier systems

<table>
<tr><td rowspan="2" colspan="2">System</td><td colspan="3">Frequency and accuracy</td></tr>
<tr><td colspan="2">Reference pilot</td><td>Carrier generator</td></tr>
<tr><td colspan="2">(1)</td><td colspan="2">(2)</td><td>(3)</td></tr>
<tr><td colspan="2">(1 + 3) open-wire</td><td>16.110 kHz
31.110 kHz</td><td>2.5×10^{-5}</td><td>2.5×10^{-5}</td></tr>
<tr><td colspan="2">8 circuit open-wire</td><td colspan="2"></td><td>10^{-5}</td></tr>
<tr><td colspan="2">12 circuit open-wire</td><td colspan="2">5×10^{-6}</td><td>5×10^{-6}</td></tr>
<tr><td colspan="2">Symmetric pair

1, 2, 3, 4 or 5 groups</td><td colspan="2">Line regulating
60 kHz ± 1 Hz
Auxiliary ± 3 Hz</td><td rowspan="6">Channel virtual carriers of a group
$\pm 10^{-6}$

Groups and supergroups
$\pm 10^{-7}$

Mastergroups and supergroups
$\pm 5 \times 10^{-8}$</td></tr>
<tr><td colspan="2">2 supergroups</td><td colspan="2">Line regulating
60 kHz ± 1 Hz
556 kHz ± 3 Hz</td></tr>
<tr><td>Coaxial pair
2.6/9.5 mm</td><td>2,6 MHz</td><td colspan="2">Line regulating
2 604 kHz ± 30 Hz</td></tr>
<tr><td rowspan="4">Coaxial pair
2.6/9.5 mm</td><td>4 MHz</td><td colspan="2">Line regulating
60 kHz ± 1 Hz
308 kHz ± 3 Hz
4 092 kHz ± 40 Hz
Auxiliary
2 792 kHz ± 5 Hz</td></tr>
<tr><td>4 MHz</td><td colspan="2">Additional measuring frequencies (all) ± 40 Hz</td></tr>
<tr><td>12 MHz</td><td>Line regulating
308 kHz
4 287 kHz
12 435 kHz</td><td>$\pm 1 \times 10^{-5}$</td></tr>
<tr><td>12 MHz</td><td>Additional measuring frequencies:
< 4 MHz
> 4 MHz</td><td>
± 40 Hz
$\pm 1 \times 10^{-5}$</td></tr>
<tr><td rowspan="2">Coaxial pair
2.6/9.5 mm</td><td>60 MHz</td><td>Line regulating
4 287 kHz
12 435 kHz
22 372 kHz
40 920 kHz
61 160 kHz</td><td>$\pm 1 \times 10^{-5}$</td></tr>
<tr><td>60 MHz</td><td colspan="2">Additional measuring frequencies (all) $\pm 1 \times 10^{-5}$</td></tr>
<tr><td rowspan="3">Coaxial pair
1.2/4.4 mm</td><td>1.3 MHz</td><td colspan="2">Line regulating
1 364 kHz $\pm 1 \times 10^{-5}$
Auxiliary
60 or 308 kHz $\pm 1 \times 10^{-5}$</td><td rowspan="2"></td></tr>
<tr><td>4 MHz</td><td colspan="2">Line regulating
60, 308, 4 287 kHz $\pm 1 \times 10^{-5}$</td></tr>
<tr><td>6 MHz</td><td colspan="2">Line regulating
308, 4 287 kHz $\pm 1 \times 10^{-5}$</td><td></td></tr>
</table>

TABLE 1/M.540 *(end)*

System	Frequency and accuracy	
	Reference pilot	Carrier generator
(1)	(2)	(3)
12 + 12	60 kHz ± 1 Hz Others by agreement between Administrations	Error in reconstituted frequency over a 140 km section and not to exceed 0.3 Hz (provisional value)
6 MHz		Video carrier 1056 kHz ± 5 Hz
12 MHz		Video carrier 6799 kHz ± 100 Hz
4 kHz spacing Basic group B and Basic supergroup	84.080 kHz 104.080 kHz ± 1 Hz 411.920 kHz and 547.920 kHz ± 1 Hz 84.140 kHz and 411.860 kHz ± 3 Hz	
Basic mastergroup and 15-supergroup assembly	1 552 kHz ± 2 Hz	
Basic supermastergroup	11 096 kHz ± 10 Hz	
3 kHz spacing	84 kHz (or other frequency by agreement) ± 1 Hz	
Basic group and Basic supergroup	a)	

a) A supergroup reference pilot frequency of 444 kHz with a tolerance of ± 1 Hz is used.