BBC Engineering Information

625-Line Television

Brief specification of transmitted signal

PART A GENERAL

Channel width		8 MHz
Spacing between unmodulated sound and vision carriers		6 MHz nominal
Vision modulation (AM negative)		
Upper sideband		5·5 MHz
Lower sideband		1·25 MHz
Synchronizing level	As percentage of	100%
Blanking level	maximum vision	76%
White level	carrier amplitude	20%
Sound modulation (FM)		
Peak deviation		50 kHz
Pre-emphasis		50 μs
Ratio of vision power during synchronizing pulses to sound power		5 : 1
Lines per picture		625
Interlace		2 : 1
Field frequency (f_{field})		50 Hz*
Line frequency (f_{line})		15,625 Hz*
Gamma		related to a display gamma of 2·8
Aspect ratio		4 : 3

PART B COLOUR (PAL system)

1. RELATIONSHIP BETWEEN COLOUR, LINE AND FIELD SYNCHRONIZING SIGNALS

Colour subcarrier frequency (f_{sc}) = $(284 - \frac{1}{4})f_{line} + \frac{1}{2}f_{field}$ = 4·43361875 MHz ±1 Hz

2. COMPLETE COLOUR PICTURE SIGNAL

2.1 General specification

The colour picture is formed by adding to the luminance (brightness) component a simultaneous pair of chrominance (colouring) components in the form of the amplitude-modulation sidebands of a pair of suppressed subcarriers in quadrature at the frequency defined in paragraph 1 above. The waveform is shown in Figure 1.

2.2 Delay specification

The group-delay characteristic of the transmitter is nominally flat; there is no pre-correction for receiver performance.

2.3 Luminance component

The *attenuation versus frequency* characteristic of the luminance signal is substantially uniform from dc to 5·5 MHz, except where it may be modified in a region embracing the colour subcarrier frequency, eg. by use of a notch filter.

* The transmissions are asynchronous; ie. the synchronizing signals are derived from a stable oscillator and are not locked to the mains.

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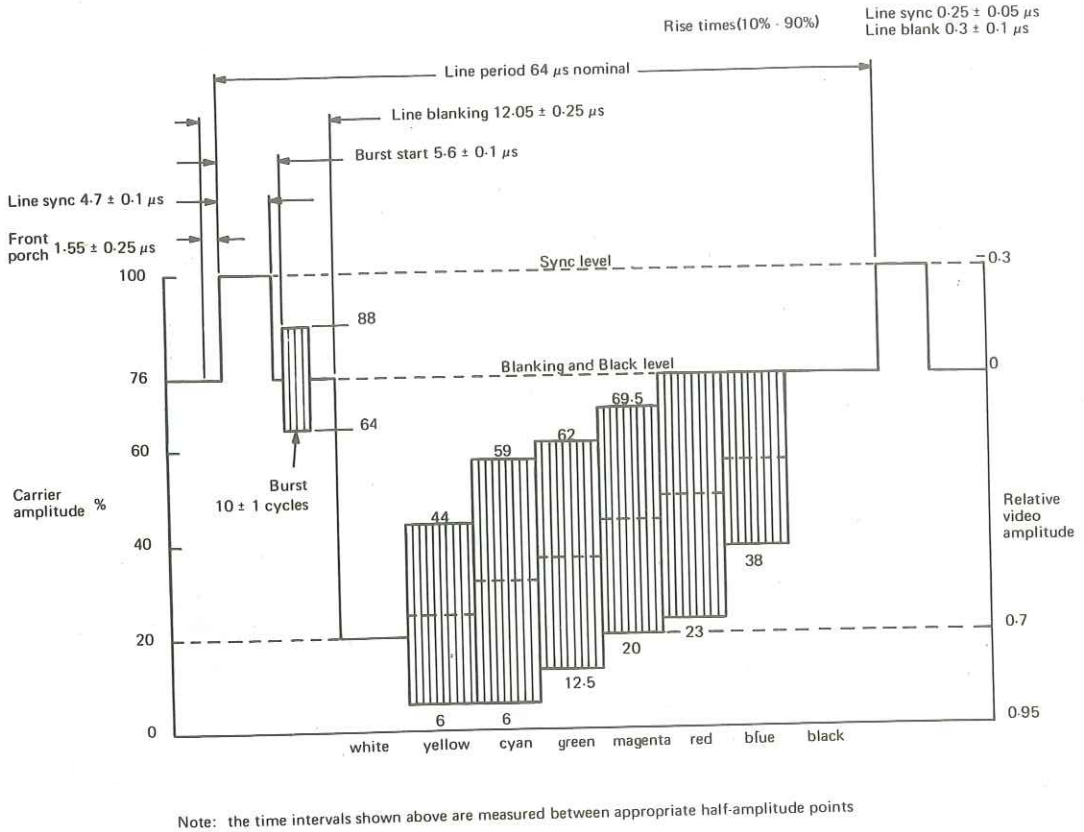

Note: the time intervals shown above are measured between appropriate half-amplitude points

Figure 1 *Transmitted carrier waveform showing line synchronizing signals, colour synchronizing burst signal and colour bar waveforms (ideal double sideband example)*

2.4 Equation of the colour picture signal

The colour picture signal has the following composition:

during odd lines of first and second fields, even lines of third and fourth fields

$$E_{M_n} = E_Y' + E_U' \sin \omega t + E_V' \cos \omega t$$

during even lines of first and second fields, odd lines of third and fourth fields

$$E_{M_{n+1}} = E_Y' + E_U' \sin \omega t - E_V' \cos \omega t$$

where $E_Y' = 0{\cdot}299E_R' + 0{\cdot}587E_G' + 0{\cdot}114E_B'$

$E_U' = 0{\cdot}493(E_B' - E_Y')$

$E_V' = 0{\cdot}877(E_R' - E_Y')$

$\omega = 2\pi f_{sc}$

E_M is the instantaneous video voltage applied to the modulator of the transmitter during the picture period. E_Y' is the instantaneous voltage of the luminance signal, corresponding to brightness information only.

E_R', E_G' and E_B' are the instantaneous voltages (gamma-corrected) corresponding to the red, green and blue signals. E_U' and E_V' are the amplitudes of the two orthogonal components of the chrominance signal; their bandwidths are restricted as specified in 2.4.2.

The gamma-corrected voltages E_R', E_G' and E_B' are suitable for a colour picture tube having primary colours with the following chromaticities in the CIE system of specification.

Red: $x = 0{\cdot}64$, $y = 0{\cdot}33$ Green: $x = 0{\cdot}29$, $y = 0{\cdot}60$ Blue: $x = 0{\cdot}15$, $y = 0{\cdot}06$

2.4.1 Colour synchronizing burst

The burst consists of 10±1 cycles of subcarrier frequency; it starts 5·6±0·1μs after the line synchronizing datum point (see Figure 1) and is symmetrical about black level. The burst is omitted during nine lines of each field blanking interval (see Figure 3). The phase of the burst on alternate lines is shown in Figure 2.

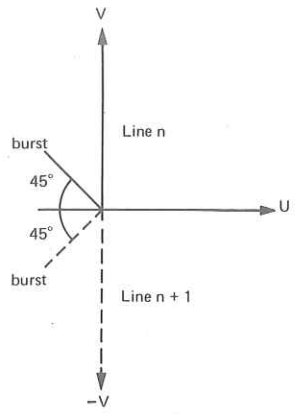

Figure 2

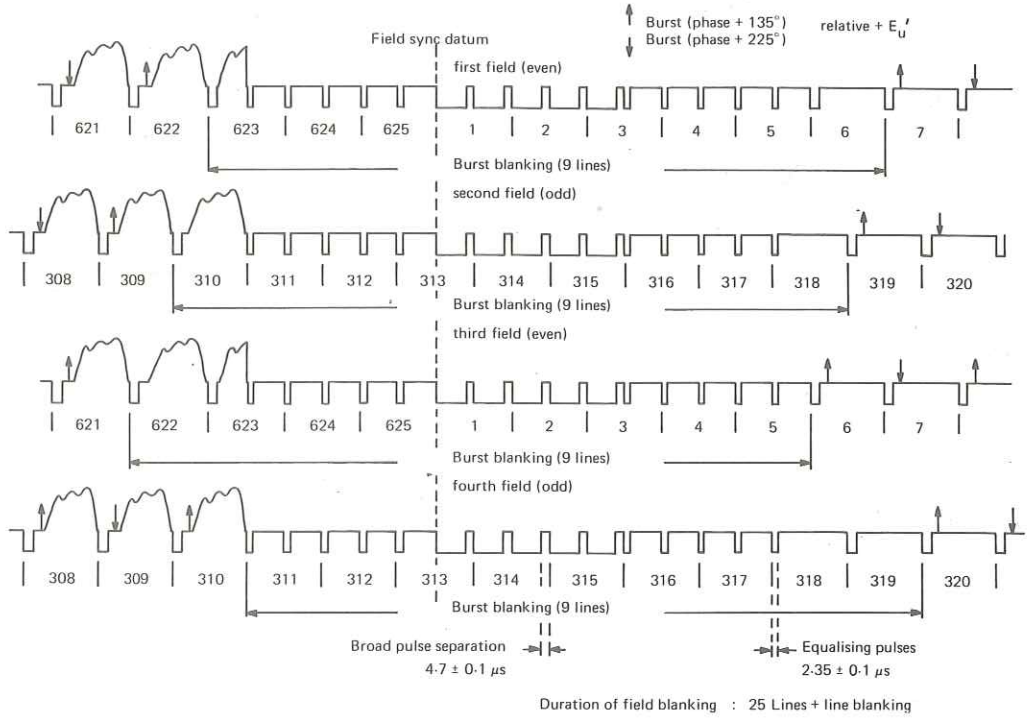

Figure 3 *Waveforms showing field synchronizing signals, colour synchronizing burst signals, and burst blanking*

2.4.2 Bandwidth of chrominance signals

The video colour difference signals E_U' and E_V' are filtered so that they are ⩾3 dB down at 1·3 MHz and ⩽20 dB down at 4 MHz

2.4.3 Timing of component signals

The delay inequality between chrominance and luminance signals will not normally exceed about 100ns

2.4.4 Chromaticity response

The chrominance signal is so proportioned that it vanishes for an intended display chromaticity of CIE Illuminant D_{65} (x = 0·313, y = 0·329)

2.4.5 Tolerances

Chrominance signal phase errors with respect to the mean phase of the burst and independent of the luminance signal amplitude, are less than ±5°.

The ratio of the amplitude of the chrominance signal to that of the luminance signal is between +5% and –30%.

Differential gain of the chrominance signal will normally be less than 25%.

Differential phase of the chrominance signal will normally be less than 25°

3 INSERTION TEST SIGNALS

Insertion Test Signal 1 is transmitted on lines 19 and 332. It consists of a 10μs white bar, which may contain an inverted sine-squared pulse (half-amplitude duration, 0·2μs), followed by a sine-squared pulse (half-amplitude duration, 0·2μs), a composite pulse (half-amplitude duration, 1μs) and a five-step staircase. The steps are of equal height and each one has a duration of 4μs. The top step is at white level. A colour subcarrier signal, having a peak-to-peak value equal to the step height, is superimposed on the whole staircase. The 2T pulse and 10μs bar enable the K rating to be obtained, while measurement of line-time nonlinearity may be made by passing the staircase waveform through a filter of restricted bandwidth. The 10T composite pulse permits assessment of chrominance-to-luminance gain and delay inequalities.

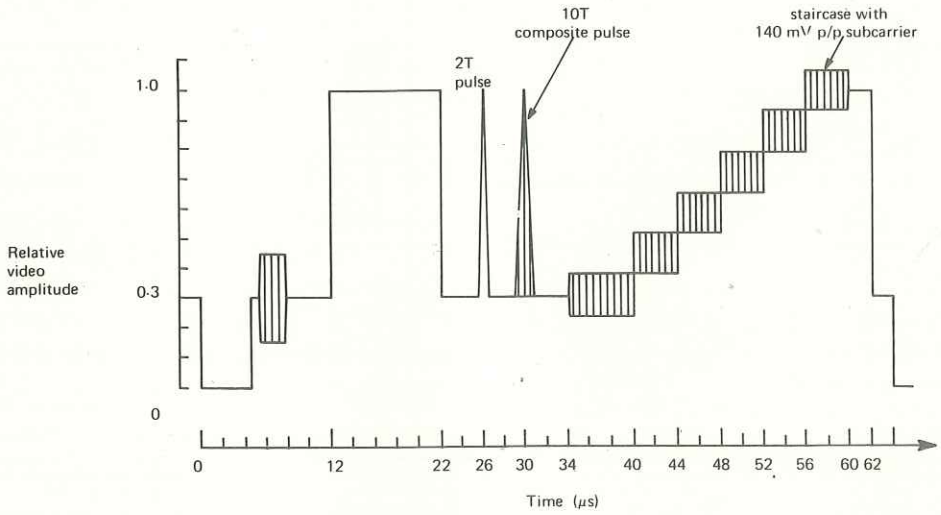

Figure 4 *Insertion Test Signal 1*

Insertion Test Signal 2, transmitted on lines 20 and 333, contains a 20μs half-amplitude luminance bar (part of which has full-amplitude subcarrier superimposed) followed by an extended burst of subcarrier covering the second half of the scanning line. Chrominance-to-luminance crosstalk can be measured from the bar waveform. The extended burst is of constant phase and amplitude and is intended for demodulating the subcarrier on the previous line in order to measure the differential phase.

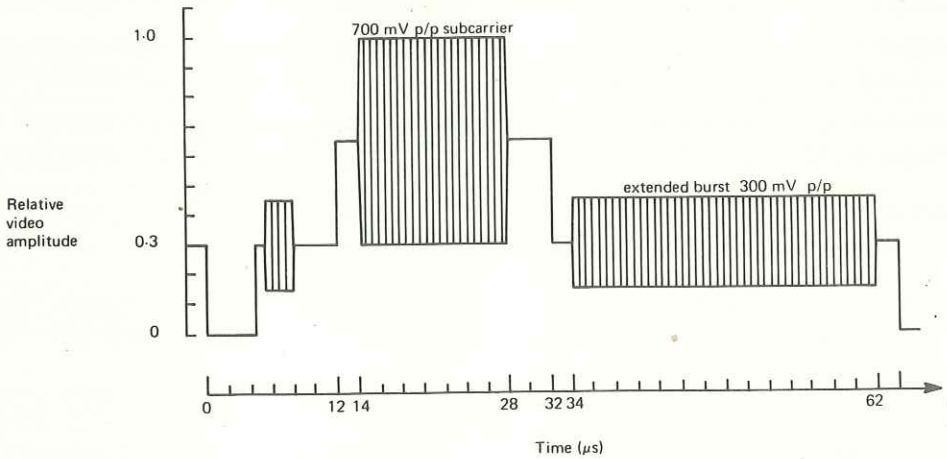

Figure 5 *Insertion Test Signal 2*

The colour burst is present on both test signals during colour transmissions only. The added subcarrier in both test signals is locked at a nominal angle of 60° to the axis when the burst is present.

'Specification of television standards for 625-line system-I transmissions', which is a fully detailed specification, is available from the address on page 1, price 50p, post free.