R 118

TIERING OF CAMERAS FOR USE IN TELEVISION PRODUCTION

VERSION 2-1

Geneva  
July 2017

[[1]](#footnote-1)\*

**Conformance Notation**

This document contains both normative text and informative text.

All text is normative except for that in the Introduction, any section explicitly labelled as ‘Informative’ or individual paragraphs which start with ‘Note:’.

Normative text describes indispensable or mandatory elements. It contains the conformance keywords ‘shall’, ‘should’ or ‘may’, defined as follows:

|  |  |
| --- | --- |
| ‘Shall’ and ‘shall not’: | Indicate requirements to be followed strictly and from which no deviation is permitted in order to conform to the document. |
| ‘Should’ and ‘should not’: | Indicate that, among several possibilities, one is recommended as particularly suitable, without mentioning or excluding others. |
|  | OR indicate that a certain course of action is preferred but not necessarily required. |
|  | OR indicate that (in the negative form) a certain possibility or course of action is deprecated but not prohibited. |
| ‘May’ and ‘need not’: | Indicate a course of action permissible within the limits of the document. |

Default identifies mandatory (in phrases containing “shall”) or recommended (in phrases containing “should”) pre-sets that can, optionally, be overwritten by user action or supplemented with other options in advanced applications. Mandatory defaults must be supported. The support of recommended defaults is preferred, but not necessarily required.

Informative text is potentially helpful to the user, but it is not indispensable and it does not affect the normative text. Informative text does not contain any conformance keywords.

A conformant implementation is one which includes all mandatory provisions (‘shall’) and, if implemented, all recommended provisions (‘should’) as described. A conformant implementation need not implement optional provisions (‘may’) and need not implement them as described.

[[2]](#footnote-2)\*

Contents

Recommendation 7

considering that 7

recommends that 7

Appendix 1 8

Introduction 8

Video Signal Tolerance 8

the EBU recommends that, 8

Video Signal Filtering 8

For interlace signals 8

For progressive signals 9

Signal Issues 9

the EBU further recommends that 9

[[3]](#footnote-3)\*

Tolerance of Colours in Television Systems

|  |  |  |  |
| --- | --- | --- | --- |
| ***EBU Committee*** | ***First Issued*** | ***Revised*** | ***Re-issued*** |
| TC | 2000 | 2000 | 2016 |

**Keywords:** Gamut, Luminance, RGB Levels, HDR, HLG, PQ, Spatial Filtering

# Recommendation

#### The EBU

### considering that

* video levels have traditionally been measured with devices that display a trace like a traditional waveform monitor,
* that readings in mV no longer give relevant information in digital signal infrastructures,
* television systems now include high dynamic range and wide colour space images as well as standard dynamic range and colour space in the same digital container,
* that a certain tolerance can be allowed in digital signal levels,

### recommends that

the guidelines in Appendix 1 be used when measuring and assessing video signal levels.

# Appendix 1

## Introduction

In a video signal, each primary component should lie between 0 and 100% of the video range between black level and the peak level (R and G and B). Ideally, video levels should lie within the specified limits so that programmes can be distributed without adjustment.

When television signals are manipulated in YUV form, it is possible to produce "illegal" combinations that, when de-matrixed, would produce R, G or B signals outside the range 0% to 100%.

## Video Signal Tolerance

In practice it is difficult to avoid generating signals slightly out of range, and it is considered reasonable to allow a small tolerance, therefore

### the EBU recommends that,

* *the RGB components and the corresponding Luminance (Y) signal should not normally exceed* the “Preferred Minimum/Maximum” range of digital sample levels in the table below.

Any signals outside the “Preferred Minimum/Maximum” range are described as having a gamut error (or as, being out of gamut). Signals shall not exceed the “Total Video Signal Range”, overshoots that attempt to “exceed” these values may clip.

|  |  |  |  |
| --- | --- | --- | --- |
| System | Range in Digital Sample (Code) Values | | |
| System Bit Depth | Expected Video Range | Preferred Minimum/Maximum | Total Video Signal Range |
| 8 bit | 16 – 235 | 5 – 246 | 1 – 254 |
| 10 bit | 64 – 940 | 20 – 984 | 4 – 1 019 |
| 12 bit | 256 – 3 760 | 80 – 3 936 | 16 – 4 079 |
| 16 bit | 4 096 – 60 160 | 1 280 – 62 976 | 256 – 65 279 |

## Video Signal Filtering

In order to remove transient over and under-excursions of the signals, and to minimise the effect of high frequency noise on the colour gamut measurements, the use of appropriate filters in all measurement channels is recommended.

### For interlace signals

A quarter band filter applied horizontally and a half band filter applied vertically is recommended.

Horizontal Filter Coefficients: 1/16, 2/16, 3/16, 4/16, 3/16, 2/16, 1/16

Vertical Filter Coefficients: 1/4, 1/2, 1/4 applied intra field[[4]](#footnote-4).

### For progressive signals

A quarter band filter applied both horizontally and vertically is recommended.

Horizontal Filter Coefficients: 1/16, 2/16, 3/16, 4/16, 3/16, 2/16, 1/16

Vertical Filter Coefficients: 1/4, 1/2, 1/4 applied intra frame.

## Signal Issues

Certain operations and signal processing may produce relatively benign gamut overshoot errors in the picture therefore

### the EBU further recommends that

* *measuring equipment should indicate an “Out-of-Gamut” occurrence only when the error occupies an integrated area of the active screens exceeding 3%.*

Signals outside the active picture area shall be excluded from measurement.

Experience has shown that colour gamut "legalisers" should be used with caution as they may create artefacts in the picture that are more disturbing than the gamut errors they are attempting to correct. It is advisable not to “legalise” video signals before all signal processing has been carried out.

1. \* Page intentionally left blank. This document is paginated for two sided printing [↑](#footnote-ref-1)
2. \* Page intentionally left blank. This document is paginated for two sided printing [↑](#footnote-ref-2)
3. \* Page intentionally left blank. This document is paginated for two sided printing [↑](#footnote-ref-3)
4. In certain extreme cases vertical filteringon interlaced content could cause hue shifts that may affect measurements  [↑](#footnote-ref-4)