

RECOMMENDATION ITU-R BT.1662

General reference chain and management of post-processing headroom for programme essence in large screen digital imagery¹ applications

(Question ITU-R 15/6)

(2003)

The ITU Radiocommunication Assembly,

considering

- a) that the ITU is studying a new broadcasting service called large screen digital imagery (LSDI);
- b) that several LSDI applications will likely be identified that comply with the definition in *considering* a);
- c) that it would be useful to specify a general reference chain for typical LSDI applications, to provide a single framework in which they can be studied with uniform methodology,

recommends

- 1 that the general reference chain described in Annex 1 should be used as a framework to study post-processing headroom management for typical LSDI applications that are based on the use of a fully digital signal chain for programme essence;
- 2 that the general implementation guidelines detailed in Annex 1 for the various blocks in the reference chain should be used in the design of the signal path and of post-processing headroom management for programme essence for those LSDI applications. They recommend that:
 - the programme chain should be digital from acquisition to presentation where acquisition can be by means of:
 - digital camera producing a signal to the desired specification, or
 - film, which is then scanned via a telecine to a digital format of the desired LSDI specification;
 - a single native format depending upon the quality level should be used for programme essence throughout the chain, if possible;
 - if that is not possible due to complex post-processing requirements, then a minimum number of native formats should be used along the chain, and their parameter values should stand in a simple relationship to each other.

¹ Large screen digital imagery (LSDI) is a family of digital imagery systems applicable to programmes such as dramas, plays, sporting events, concerts, cultural events, etc., from capture to large screen presentation in high resolution quality in appropriately equipped cinema theatres, halls and other venues.

Annex 1

Reference chain and guidelines on the management of post-processing headroom for programme essence in LSDI applications

1 The reference chain

The general reference chain specified here is considered to be a useful tool in the design and analysis of the signal path and the management of post-processing headroom of programme essence for typical LSDI applications, namely for those applications that meet the definition for LSDI as outlined in Question ITU-R 15/6.

The general reference chain is made up of the following blocks, shown in Fig. 1. Each block in the chain is supposed to be digital.

- *Acquisition* – where images and sounds are transformed into their digital representation. The input to this block consists of light and sound stimuli, its outputs are digital, audio and video essence signals.
- *Post-production* – where the digital audio and video essence signals are processed to produce a finished master of the programme that suits the creative intent of the producer. The inputs to this block consist of the acquired audio, video and electronically generated digital signals, its output is the finished master of the programme.
- *Distribution* – where programme signals are encoded, multiplexed and modulated in view of their delivery to end users. The inputs of this block consist of the programme essence digital signals coming from the finished master, its outputs are the demodulated, demultiplexed and decoded digital signals fed to the presentation block.
- *Presentation* – where programme essence digital signals are transformed into light and sound stimuli to be presented to the audience. The inputs to this block are the programme essence signals received from the distribution block, its outputs are the image and sound stimuli presented to the audience.

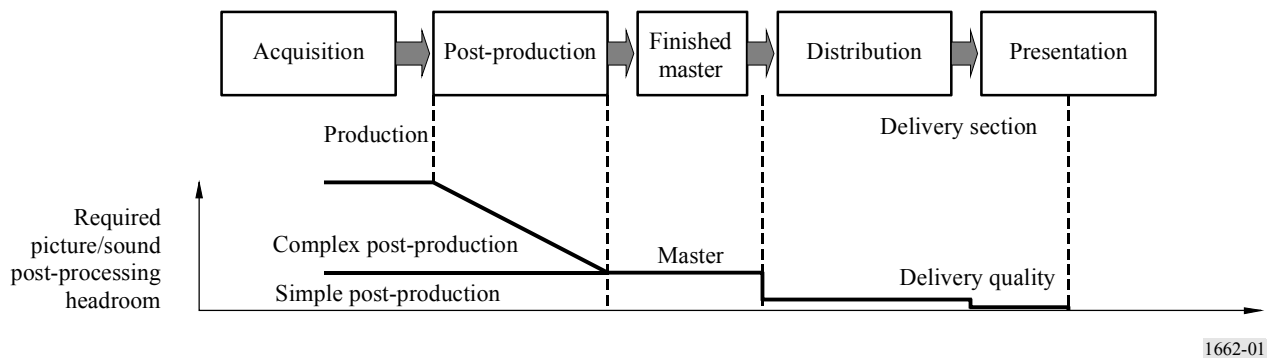
The two blocks of acquisition and post-production make up the production section of the chain which ends with the finished master.

The two blocks of distribution and presentation make up the delivery section of the chain which begins from the finished master.

The finished master is thus the hinge between the production section and the delivery section.

FIGURE 1

Reference chain for typical LSDI applications and cognitive evolution of picture/sound post-processing headroom along the chain



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2 Some general rules on picture/sound quality and the propagation of impairments

The general rules detailed below apply to picture/sound quality in a programme essence digital signal chain like the reference chain and to the propagation of impairments through it.

Rule 1 – As picture/sound signals proceed along the chain, picture/sound quality may decrease but it will never increase. In other words, all picture/sound quality lost along the chain is lost forever.

Rule 2 – Any transformation of picture/sound representations from their analogue to their digital form and back introduces some degree of impairment. This is so because every time an analogue picture/sound representation is transformed into the corresponding digital representation, this involves signal sampling and the accompanied filtering.

Rule 3 – Any transformation of picture/sound representations from one native format to a different one introduces some degree of impairment. This is so because every time the native format is changed this involves some kind of sample interpolation with the accompanied filtering.

Rule 4 – Any transformation of picture/sound representation from one source coding method to another one at a lower bit rate introduces some degree of impairment. This is so because every time the source coding bit rate is decreased this involves discarding some additional high-order source-coding components that contributed to picture/sound quality.

These fundamental rules allow setting general guidelines that help avoid unnecessary picture/sound impairments as programme essence signals progress along the chain. Those guidelines are given below for the various blocks of the reference chain. For better clarity the blocks are listed in reverse order, i.e. from the presentation block to the acquisition block.

3 Analysis of the digital reference chain

3.1 The presentation block

The picture and sound quality required for programme presentation of LSDI applications is dictated by the presentation objectives applicable for those applications.