

RECOMMENDATION ITU-R BR.714-2

**International exchange of programmes produced
by means of high-definition television**

(Question ITU-R 108/11)

(1990-1994-2001)

The ITU Radiocommunication Assembly,

considering

- a) that there is a need to exchange programmes produced in high-definition television (HDTV) among broadcasters, following the approval of Recommendation ITU-R BT.709-4;
- b) that programmes produced in HDTV at frame rates of 24/25 frames/s can be converted to film with minimal loss of quality. Programmes produced at 50/60 fields/s may also be converted to film through the use of interpolation technology;
- c) that conversion from film to HDTV is also possible with minimal loss of quality,

recommends

1 that when programmes produced in HDTV are exchanged between broadcasters, in order to preserve the best quality, they should be exchanged in digital video form, e.g. live or videotape (see Annex 1).

ANNEX 1

**International exchange of programmes produced
by means of HDTV****1 Introduction**

Such exchanges consist of the delivery of programmes available in HDTV to broadcasters who wish to use them for emission.

2 International exchanges

When HDTV programmes are produced and when broadcasters wish to use them for HDTV emission, the delivery could conceivably be effected:

- by means of HDTV video at field rates of 50/60 fields/s, such as a tape copy of the edited master videotape in HDTV followed by field or frame rate conversion if required;
- by means of HDTV video at frame rates of 24/25 frames/s with transparent conversion to the emission rates of 50/60 fields/s through the use of segmented frame technology (see Recommendation ITU-R BT.709, Annex 1 to Part 2);
- by means of 35 mm cinematographic film (24 or 25 frame/s) transferred from the edited master videotape.

The exchange of programme material at 24/25 frames/s affords the broadcaster the greatest opportunity for transparent conversion to the emission and other field/frame rates. Where there is fast movement in the picture content such as in some sporting events, the use of higher field/frame rates is recommended in order to avoid motion judder artefacts.

Conversion of 24/25 frames/s picture material to other field rates such as 50/60 fields/s requires no temporal standards conversion. To convert from 25 frames/s progressive to 50 fields/s interlace the segmented frame format may be used (see Recommendation ITU-R BT.709, Annex 1 to Part 2). The segmented frame format simply transmits alternate lines of the progressive format as an interlaced field.

Conversion from 24 frames/s to 60 fields/s rate simply requires the play back device to insert the equivalent of the film 3:2 pull down to achieve the increased frame rate. It should be noted that no spatial resolution is lost in either of the above processes.

Conversion from 25 frames/s to 60 fields/s transparently requires that the original material is first played back at 24 frames/s, and as a second function the 3:2 pull down performed. The term 3:2 pull down is used to describe a sequence of 5 fields where one of the fields is repeated. This technology is in common practice for telecine transfers at a 60 field/s rate.

If 35 mm film is used as the exchange medium, users are cautioned that the double passage from the electronic to the optical domain (in the film recorder) and back (in the telecine) is bound to affect overall picture quality.

3 Conclusions

For international exchange of HDTV-produced programmes between broadcasters, technical considerations suggest that clear preference should be given to an all-electronic process, i.e. to the exchange of videotape copies of the HDTV edited master videotape. It is recommended that standards converters be only used when frame rate conversions cannot be achieved through simple speed changes, the use of segmented frame technology, or the application of the 3:2 pull down sequence.

4 Future considerations

It has been widely demonstrated that major film productions originated in HDTV formats are suitable for application in cinemas using electronic displays.

Those programmes can also be distributed to conventional film cinemas using 35 mm prints obtained by transfer of HDTV videotape masters to film.

Ongoing studies related to the application of HDTV video to D-cinema applications should result in harmonization of broadcasting requirements and those of a D-cinema distribution format.
