## INTERNATIONAL ORGANISATION FOR STANDARDISATION
## ORGANISATION INTERNATIONALE DE NORMALISATION
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## CODED REPRESENTATION OF PICTURE AND AUDIO INFORMATION

**Title:**    **NEXT Profile Level Parameters for 4:2:0 formats**
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**Purpose:**  **Information**

## Introduction

The CCITT H.261 video coding standard defines CIF[1] as exchange format for audio-visual communication, which is a progressive image format.
As

- videoconferencing scenes are characterised by relatively *smooth motion* and, therefore, require only a moderate frame rates (comparable with cinema film: 30 Hz),

- *high spatial resolution* is important to transmit a detailed and wide view of a videoconferencing scene,

- the world population of *non-interlaced computer displays* constitute a huge potential platform for *desktop videoconferencing*,

the successor standard ITU-TSS H.26X is likely to be used in combination with progressive image formats as well.

NEXT profile codecs are able to process both 4:2:2 and 4:2:0 image formats. Given an image size and a frame rate, a 4:2:2 image requires a larger processing power than a 4:2:0 image. The amount of chrominance data of a 4:2:0 image is only half as large for a corresponding 4:2:2 image. Therefore, we suggest that in the definition of the maximum pixel rate of the NEXT profile a distinction is made between 4:2:2 and 4:2:0 image formats.

## Level parameters of the NEXT profile

The requirement subgroup has made a reservation in the specification of the *maximum luminance pixel* rate of the NEXT profile2. The aim of such a limit in addition to upper bounds on image height, image width and frame rate is to limit the required processing and memory speed in an implementation. Given an image size and a frame rate, a 4:2:0 image format requires a lower processing throughput rate than a corresponding 4:2:2 format. The relative advantage in the

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[1]    Common Intermediate Format
[2]    ISO-IEC JTC1/SC29/WG11 NO 489, Requirements subgroup, *"Agreements on Profile, level"*, 16 July, 1993.

number of operations required amounts to a factor of 6/8 or 25%, which is significant. For the NEXT profile, which is the only profile defined yet that can process both 4:2:2 and 4:2:0 formats, we suggest to define level parameters such that the

total pixel rate = luminance pixel rate + chrominance pixel rate.

is the same for 4:2:2 and 4:2:0 formats. As a result, the maximum luminance pixel rate for 4:2:0 can in principle exceed that for 4:2:2 by a factor of 4/3. Observe that for the maximum possible format at Main@NEXT, i.e. a 720 x 576 x 30 format, the luminance pixel rate amounts to 12.44 M lumimance pixels/s. The present limit for 4:2:2 formats is 11.06 M lumimance pixels/s. When the latter bound is increased by a factor of 4/3 it exceeds 12.44 M lumimance pixels/s and can, therefore, be omitted.

## Conclusions

There are several very good reasons why H.26X-based videoconferencing, just as for H.261, would use progressive 4:2:0 image formats rather than interlaced standards, e.g. for videoconferencing.

With respect to 4:2:2 image formats - which NEXT profile apparatus is capable of handling of - a 4:2:0 image format requires a substantially lower processing throughput of the codec hardware, because the amount of luminance data is only half. If this is taken into account, the restriction on the present maximum pixel rate can be omitted for 4:2:0 formats.