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**Information technology — High  
efficiency coding and media delivery  
in heterogeneous environments —**

Part 2:  
**High efficiency video coding**

AMENDMENT 2: Main 10 still picture  
profile

*Technologies de l'information — Codage à haute efficacité et livraison  
des médias dans des environnements hétérogènes —*

*Partie 2: Codage vidéo à haute efficacité*

*AMENDEMENT 2: Profil main 10 pour image fixe*



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CH-1214 Vernier, Geneva  
Phone: +41 22 749 01 11  
Fax: +41 22 749 09 47  
Email: [copyright@iso.org](mailto:copyright@iso.org)  
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# Information technology — High efficiency coding and media delivery in heterogeneous environments —

## Part 2: High efficiency video coding

### AMENDMENT 2: Main 10 still picture profile

#### Clause 3

Replace 3.56 with the following:

#### 3.56

##### frequency index

one-dimensional or two-dimensional index associated with a *transform coefficient* prior to the application of a *transform* in the *decoding process*

Delete 3.70, and renumber the current 3.71 through 3.164 as 3.70 through 3.163.

Add the following as 3.164:

#### 3.164

##### transform

part of the *decoding process* by which a *block of transform coefficients* is converted to a *block* of spatial-domain values

Replace 3.165 with the following:

#### 3.165

##### transform block

rectangular  $M \times N$  *block* of samples resulting from the same *transform* in the *decoding process*

Replace 3.166 with the following:

#### 3.166

##### transform coefficient

scalar quantity, considered to be in a frequency domain that is associated with a particular one-dimensional or two-dimensional *frequency index* in a *transform* in the *decoding process*

Clause 7

Replace 7.3.3 with the following:

**7.3.3 Profile, tier and level syntax**

	<b>Descriptor</b>
profile_tier_level( profilePresentFlag, maxNumSubLayersMinus1 ) {	
if(profilePresentFlag) {	
<b>general_profile_space</b>	u(2)
<b>general_tier_flag</b>	u(1)
<b>general_profile_idc</b>	u(5)
for(j = 0; j < 32; j++)	
<b>general_profile_compatibility_flag[ j ]</b>	u(1)
<b>general_progressive_source_flag</b>	u(1)
<b>general_interlaced_source_flag</b>	u(1)
<b>general_non_packed_constraint_flag</b>	u(1)
<b>general_frame_only_constraint_flag</b>	u(1)
if(general_profile_idc == 4    general_profile_compatibility_flag[ 4 ]    general_profile_idc == 5    general_profile_compatibility_flag[ 5 ]    general_profile_idc == 6    general_profile_compatibility_flag[ 6 ]    general_profile_idc == 7    general_profile_compatibility_flag[ 7 ]    general_profile_idc == 8    general_profile_compatibility_flag[ 8 ]    general_profile_idc == 9    general_profile_compatibility_flag[ 9 ]    general_profile_idc == 10    general_profile_compatibility_flag[ 10 ] ) {	
/* The number of bits in this syntax structure is not affected by this condition */	
<b>general_max_12bit_constraint_flag</b>	u(1)
<b>general_max_10bit_constraint_flag</b>	u(1)
<b>general_max_8bit_constraint_flag</b>	u(1)
<b>general_max_422chroma_constraint_flag</b>	u(1)
<b>general_max_420chroma_constraint_flag</b>	u(1)
<b>general_max_monochrome_constraint_flag</b>	u(1)
<b>general_intra_constraint_flag</b>	u(1)
<b>general_one_picture_only_constraint_flag</b>	u(1)
<b>general_lower_bit_rate_constraint_flag</b>	u(1)
if(general_profile_idc == 5    general_profile_compatibility_flag[ 5 ]    general_profile_idc == 9    general_profile_compatibility_flag[ 9 ]    general_profile_idc == 10    general_profile_compatibility_flag[ 10 ] ) {	
<b>general_max_14bit_constraint_flag</b>	u(1)
<b>general_reserved_zero_33bits</b>	u(33)
} else	
<b>general_reserved_zero_34bits</b>	u(34)
} else if(general_profile_idc == 2    general_profile_compatibility_flag[ 2 ] ) {	
<b>general_reserved_zero_7bits</b>	u(7)
<b>general_one_picture_only_constraint_flag</b>	u(1)
<b>general_reserved_zero_35bits</b>	u(35)
} else	
<b>general_reserved_zero_43bits</b>	u(43)

<pre> if((general_profile_idc &gt;= 1 &amp;&amp; general_profile_idc &lt;= 5)       general_profile_idc == 9       general_profile_compatibility_flag[ 1 ]    general_profile_compatibility_flag[ 2 ]       general_profile_compatibility_flag[ 3 ]    general_profile_compatibility_flag[ 4 ]       general_profile_compatibility_flag[ 5 ]    general_profile_compatibility_flag[ 9 ]) /* The number of bits in this syntax structure is not affected by this condition */ </pre>	
<b>general_inbld_flag</b>	u(1)
else	
<b>general_reserved_zero_bit</b>	u(1)
}	
<b>general_level_idc</b>	u(8)
for(i = 0; i < maxNumSubLayersMinus1; i++) {	
<b>sub_layer_profile_present_flag[ i ]</b>	u(1)
<b>sub_layer_level_present_flag[ i ]</b>	u(1)
}	
if(maxNumSubLayersMinus1 > 0)	
for(i = maxNumSubLayersMinus1; i < 8; i++)	
<b>reserved_zero_2bits[ i ]</b>	u(2)
for(i = 0; i < maxNumSubLayersMinus1; i++) {	
if(sub_layer_profile_present_flag[ i ]) {	
<b>sub_layer_profile_space[ i ]</b>	u(2)
<b>sub_layer_tier_flag[ i ]</b>	u(1)
<b>sub_layer_profile_idc[ i ]</b>	u(5)
for(j = 0; j < 32; j++)	
<b>sub_layer_profile_compatibility_flag[ i ][ j ]</b>	u(1)
<b>sub_layer_progressive_source_flag[ i ]</b>	u(1)
<b>sub_layer_interlaced_source_flag[ i ]</b>	u(1)
<b>sub_layer_non_packed_constraint_flag[ i ]</b>	u(1)
<b>sub_layer_frame_only_constraint_flag[ i ]</b>	u(1)
<pre> if(sub_layer_profile_idc[ i ] == 4    sub_layer_profile_compatibility_flag[ i ][ 4 ]       sub_layer_profile_idc[ i ] == 5    sub_layer_profile_compatibility_flag[ i ][ 5 ]       sub_layer_profile_idc[ i ] == 6    sub_layer_profile_compatibility_flag[ i ][ 6 ]       sub_layer_profile_idc[ i ] == 7    sub_layer_profile_compatibility_flag[ i ][ 7 ]       sub_layer_profile_idc[ i ] == 8    sub_layer_profile_compatibility_flag[ i ][ 8 ]       sub_layer_profile_idc[ i ] == 9    sub_layer_profile_compatibility_flag[ i ][ 9 ]       sub_layer_profile_idc[ i ] == 10    sub_layer_profile_compatibility_flag[ i ][ 10 ] ) { /* The number of bits in this syntax structure is not affected by this condition */ </pre>	
<b>sub_layer_max_12bit_constraint_flag[ i ]</b>	u(1)
<b>sub_layer_max_10bit_constraint_flag[ i ]</b>	u(1)
<b>sub_layer_max_8bit_constraint_flag[ i ]</b>	u(1)
<b>sub_layer_max_422chroma_constraint_flag[ i ]</b>	u(1)
<b>sub_layer_max_420chroma_constraint_flag[ i ]</b>	u(1)
<b>sub_layer_max_monochrome_constraint_flag[ i ]</b>	u(1)
<b>sub_layer_intra_constraint_flag[ i ]</b>	u(1)
<b>sub_layer_one_picture_only_constraint_flag[ i ]</b>	u(1)
<b>sub_layer_lower_bit_rate_constraint_flag[ i ]</b>	u(1)
if(sub_layer_profile_idc[ i ] == 5    sub_layer_profile_compatibility_flag[ i ][ 5 ]) {	

<b>sub_layer_max_14bit_constraint_flag[ i ]</b>	u(1)
<b>sub_layer_reserved_zero_33bits[ i ]</b>	u(33)
} else	
<b>sub_layer_reserved_zero_34bits[ i ]</b>	u(34)
} else if(sub_layer_profile_idc[ i ] == 2    sub_layer_profile_compatibility_flag[ i ][ 2 ] ) {	
<b>sub_layer_reserved_zero_7bits[ i ]</b>	u(7)
<b>sub_layer_one_picture_only_constraint_flag[ i ]</b>	u(1)
<b>sub_layer_reserved_zero_35bits[ i ]</b>	u(35)
} else	
<b>sub_layer_reserved_zero_43bits[ i ]</b>	u(43)
if((sub_layer_profile_idc[ i ] >= 1 && sub_layer_profile_idc[ i ] <= 5)    sub_layer_profile_idc[ i ] == 9    sub_layer_profile_compatibility_flag[ 1 ]    sub_layer_profile_compatibility_flag[ 2 ]    sub_layer_profile_compatibility_flag[ 3 ]    sub_layer_profile_compatibility_flag[ 4 ]    sub_layer_profile_compatibility_flag[ 5 ]    sub_layer_profile_compatibility_flag[ 9 ] ) /* The number of bits in this syntax structure is not affected by this condition */	
<b>sub_layer_inbld_flag[ i ]</b>	u(1)
else	
<b>sub_layer_reserved_zero_bit[ i ]</b>	u(1)
}	
if(sub_layer_level_present_flag[ i ])	
<b>sub_layer_level_idc[ i ]</b>	u(8)
}	
}	

In 7.4.4, delete the two sentences:

“When profilePresentFlag is equal to 1 and one or more of these syntax elements are not present, their values are inferred to be equal to 0. When general\_profile\_idc is not equal to 10 and is not in the range of 4 to 7, inclusive, and general\_profile\_compatibility\_flag[ 10 ] is not equal to 1 and general\_profile\_compatibility\_flag[ j ] is not equal to 1 for any value of j in the range of 4 to 7, inclusive, the value of each of these syntax elements shall be equal to 0.”

In 7.4.4, after the semantics of general\_reserved\_zero\_34bits, add the following:

**general\_reserved\_zero\_7bits**, when present, shall be equal to 0 in bitstreams conforming to this version of this Specification. Other values for general\_reserved\_zero\_7bits are reserved for future use by ITU-T | ISO/IEC. Decoders shall ignore the value of general\_reserved\_zero\_7bits.

**general\_reserved\_zero\_35bits**, when present, shall be equal to 0 in bitstreams conforming to this version of this Specification. Other values for general\_reserved\_zero\_35bits are reserved for future use by ITU-T | ISO/IEC. Decoders shall ignore the value of general\_reserved\_zero\_35bits.

In 7.4.4, replace the paragraph specifying the semantics of `sub_layer_profile_space[ i ]`, `sub_layer_tier_flag[ i ]`, `sub_layer_profile_idc[ i ]`, etc., with the following:

The semantics of the syntax elements `sub_layer_profile_space[ i ]`, `sub_layer_tier_flag[ i ]`, `sub_layer_profile_idc[ i ]`, `sub_layer_profile_compatibility_flag[ i ][ j ]`, `sub_layer_progressive_source_flag[ i ]`, `sub_layer_interlaced_source_flag[ i ]`, `sub_layer_non_packed_constraint_flag[ i ]`, `sub_layer_frame_only_constraint_flag[ i ]`, `sub_layer_max_12bit_constraint_flag[ i ]`, `sub_layer_max_10bit_constraint_flag[ i ]`, `sub_layer_max_8bit_constraint_flag[ i ]`, `sub_layer_max_422chroma_constraint_flag[ i ]`, `sub_layer_max_420chroma_constraint_flag[ i ]`, `sub_layer_max_monochrome_constraint_flag[ i ]`, `sub_layer_intra_constraint_flag[ i ]`, `sub_layer_one_picture_only_constraint_flag[ i ]`, `sub_layer_lower_bit_rate_constraint_flag[ i ]`, `sub_layer_max_14bit_constraint_flag`, `sub_layer_reserved_zero_33bits[ i ]`, `sub_layer_reserved_zero_34bits[ i ]`, `sub_layer_reserved_zero_7bits[ i ]`, `sub_layer_reserved_zero_35bits[ i ]`, `sub_layer_reserved_zero_43bits[ i ]`, `sub_layer_inbld_flag[ i ]`, `sub_layer_reserved_zero_bit[ i ]`, and `sub_layer_level_idc[ i ]` are, apart from the specification of the inference of not present values, the same as the syntax elements `general_profile_space`, `general_tier_flag`, `general_profile_idc`, `general_profile_compatibility_flag[ j ]`, `general_progressive_source_flag`, `general_interlaced_source_flag`, `general_non_packed_constraint_flag`, `general_frame_only_constraint_flag`, `general_max_12bit_constraint_flag`, `general_max_10bit_constraint_flag`, `general_max_8bit_constraint_flag`, `general_max_422chroma_constraint_flag`, `general_max_420chroma_constraint_flag`, `general_max_monochrome_constraint_flag`, `general_intra_constraint_flag`, `general_one_picture_only_constraint_flag`, `general_lower_bit_rate_constraint_flag`, `general_max_14bit_constraint_flag`, `general_reserved_zero_33bits`, `general_reserved_zero_34bits`, **general\_reserved\_zero\_7bits**, **general\_reserved\_zero\_35bits**, `general_reserved_zero_43bits`, `general_inbld_flag`, `general_reserved_zero_bit`, and `general_level_idc`, respectively, but apply to the sub-layer representation with `TemporalId` equal to `i`.

In 7.4.3.2.2, replace the paragraph specifying the semantics of the `extended_precision_processing_flag` syntax element with the following:

**extended\_precision\_processing\_flag** equal to 1 specifies that an extended dynamic range is used for transform coefficients and transform processing. `extended_precision_processing_flag` equal to 0 specifies that the extended dynamic range is not used. When not present, the value of `extended_precision_processing_flag` is inferred to be equal to 0.

In 7.4.2.2, replace NOTE 1 with the following:

NOTE 1 NAL unit types in the range of UNSPEC48..UNSPEC63 can be used as determined by the application. No decoding process for these values of `nal_unit_type` is specified in this Specification. Since different applications might use these NAL unit types for different purposes, it is expected that particular care would be exercised in the design of encoders that generate NAL units with these `nal_unit_type` values, and in the design of decoders that interpret the content of NAL units with these `nal_unit_type` values. This specification does not define any management for these values. These `nal_unit_type` values might only be suitable for use in contexts in which “collisions” of usage (i.e. different definitions of the meaning of the NAL unit content for the same `nal_unit_type` value) are unimportant, or not possible, or are managed – e.g. defined or managed in the controlling application or transport specification, or by controlling the environment in which bitstreams are distributed.

Clause 8

In 8.6.2, replace Formula (8-300) (computation of  $r[x][y]$  using the variable rotateCoeffs when cu\_transquant\_bypass\_flag is equal to 0 and transform\_skip\_flag[xTbY][yTbY][cldx] is equal to 1) with the following:

$$r[x][y] = (rotateCoeffs ? d[nTbS - x - 1][nTbS - y - 1] : d[x][y]) \ll tsShift \quad (8-300)$$

Annexes A, G and H

In A.3.2, A.3.4, A.3.5, A.3.6, A.3.7, G.11.1.1, H.11.1. and H.11.1.2, replace the phrase “level constraints” with “tier and level constraints”.

Annex A

Replace A.3.3 with the following:

**A.3.3 Main 10 and Main 10 Still Picture profiles**

Bitstreams conforming to the Main 10 or Main 10 Still Picture profile shall obey the following constraints:

- In bitstreams conforming to the Main 10 Still Picture profile, the bitstream shall contain only one picture with nuh\_layer\_id equal to 0.
- Active VPSs shall have vps\_base\_layer\_internal\_flag and vps\_base\_layer\_available\_flag both equal to 1 only.
- Active SPSs for the base layer shall have chroma\_format\_idc equal to 1 only.
- Active SPSs for the base layer shall have bit\_depth\_luma\_minus8 in the range of 0 to 2, inclusive.
- Active SPSs for the base layer shall have bit\_depth\_chroma\_minus8 in the range of 0 to 2, inclusive.
- In bitstreams conforming to the Main 10 Still Picture profile, active SPSs for the base layer shall have sps\_max\_dec\_pic\_buffering\_minus1[sps\_max\_sub\_layers\_minus1] equal to 0 only.
- Active SPSs for the base layer shall have transform\_skip\_rotation\_enabled\_flag, transform\_skip\_context\_enabled\_flag, implicit\_rdpcm\_enabled\_flag, explicit\_rdpcm\_enabled\_flag, extended\_precision\_processing\_flag, intra\_smoothing\_disabled\_flag, high\_precision\_offsets\_enabled\_flag, persistent\_rice\_adaptation\_enabled\_flag, cabac\_bypass\_alignment\_enabled\_flag, sps\_curr\_pic\_ref\_enabled\_flag, palette\_mode\_enabled\_flag, motion\_vector\_resolution\_control\_idc, and intra\_boundary\_filtering\_disabled\_flag, when present, equal to 0 only.
- CtbLog2SizeY derived according to active SPSs for the base layer shall be in the range of 4 to 6, inclusive.
- Active PPSs for the base layer shall have log2\_max\_transform\_skip\_block\_size\_minus2, chroma\_qp\_offset\_list\_enabled\_flag, and residual\_adaptive\_colour\_transform\_enabled\_flag, when present, equal to 0 only.
- When an active PPS for the base layer has tiles\_enabled\_flag equal to 1, it shall have entropy\_coding\_sync\_enabled\_flag equal to 0.
- When an active PPS for the base layer has tiles\_enabled\_flag equal to 1, ColumnWidthInLumaSamples[i] shall be greater than or equal to 256 for all values of i in the range of 0 to num\_tile\_columns\_minus1, inclusive, and RowHeightInLumaSamples[j] shall be greater than or equal to 64 for all values of j in the range of 0 to num\_tile\_rows\_minus1, inclusive.

- The number of times `read_bits( 1 )` is called in subclauses 9.3.4.3.3 and 9.3.4.3.4 when parsing `coding_tree_unit( )` data for any coding tree unit shall be less than or equal to  $5 * \text{RawCtuBits} / 3$ .
- In bitstreams conforming to the Main 10 profile that do not conform to the Main 10 Still Picture profile, `general_level_idc` and `sub_layer_level_idc[ i ]` for all values of `i` in active SPSs for the base layer shall not be equal to 255 (which indicates level 8.5).
- The tier and level constraints specified for the Main 10 or Main 10 Still Picture profile in Clause A.4, as applicable, shall be fulfilled.

Conformance of a bitstream to the Main 10 profile is indicated by `general_profile_idc` being equal to 2 or `general_profile_compatibility_flag[ 2 ]` being equal to 1. Conformance of a sub-layer representation with `TemporalId` equal to `i` to the Main 10 profile is indicated by `sub_layer_profile_idc[ i ]` being equal to 2 or `sub_layer_profile_compatibility_flag[ i ][ 2 ]` being equal to 1.

Conformance of a bitstream to the Main 10 Still Picture profile is indicated by `general_one_picture_only_constraint_flag` being equal to 1 together with `general_profile_idc` being equal to 2 or `general_profile_compatibility_flag[ 2 ]` being equal to 1. Conformance of a sub-layer representation with `TemporalId` equal to `i` to the Main 10 Still Picture profile is indicated by `sub_layer_one_picture_only_constraint_flag` being equal to 1 together with `sub_layer_profile_idc[ i ]` being equal to 2 or `sub_layer_profile_compatibility_flag[ i ][ 2 ]` being equal to 1.

NOTE When the conformance of a bitstream to the Main 10 Still Picture profile is indicated as specified above, and the indicated level is not level 8.5, the conditions for indication of the conformance of the bitstream to the Main 10 profile are also fulfilled.

Decoders conforming to the Main 10 profile at a specific level (identified by a specific value of `general_level_idc`) of a specific tier (identified by a specific value of `general_tier_flag`) shall be capable of decoding all bitstreams and sub-layer representations for which all of the following conditions apply:

- The bitstream or sub-layer representation is indicated to conform to the Main 10 profile, the Main profile, or the Main Still Picture profile.
- The bitstream or sub-layer representation is indicated to conform to a level that is not level 8.5 and is lower than or equal to the specified level.
- The bitstream or sub-layer representation is indicated to conform to a tier that is lower than or equal to the specified tier.

Decoders conforming to the Main 10 Still Picture profile at a specific level (identified by a specific value of `general_level_idc`) of a specific tier (identified by a specific value of `general_tier_flag`) shall be capable of decoding all bitstreams and sub-layer representations for which all of the following conditions apply:

- The bitstream or sub-layer representation is indicated to conform to the Main 10 Still Picture profile or the Main Still Picture profile.
- The bitstream or sub-layer representation is indicated to conform to a level that is not level 8.5 and is lower than or equal to the specified level.

The bitstream or sub-layer representation is indicated to conform to a tier that is lower than or equal to the specified tier.

In A.3.4, A.3.5, A.3.6, A.3.7 replace the phrase “at a specific level (identified by a specific value of `general_level_idc`)” with “at a specific level (identified by a specific value of `general_level_idc`) of a specific tier (identified by a specific value of `general_tier_flag`)”.

In A.3.7 delete the following item from the list:

- The decoder conforms to the Main Intra, Main 10 Intra, Main 12 Intra, Main 4:2:2 10 Intra, Main 4:2:2 12 Intra, Main 4:4:4 Intra, Main 4:4:4 10 Intra, or Main 4:4:4 12 Intra, Main 4:4:4 16 Intra, Main 4:4:4 Still Picture, or Main 4:4:4 16 Still Picture profile, and the bitstream or sub-layer representation is indicated to conform to the Main Still Picture profile.

In A.4.2 replace the NOTE at the beginning of the subclause with the following:

NOTE The term “video profiles”, as used in this clause, refers to those profiles that are not still picture profiles. The still picture profiles include the Main Still Picture, Main 10 Still Picture, Main 4:4:4 Still Picture, and Main 4:4:4 16 Still Picture profiles.

Replace Table A.8 with the following:

**Table A.8 — Specification of CpbVclFactor, CpbNalFactor, FormatCapabilityFactor, and MinCrScaleFactor**

Profile	CpbVclFactor	CpbNalFactor	FormatCapabilityFactor	MinCrScaleFactor
Monochrome	667	733	1.000	1.0
Monochrome 12	1000	1100	1.500	1.0
Monochrome 16	1333	1467	2.000	1.0
Main	1000	1100	1.500	1.0
Screen-Extended Main	1000	1100	1.500	1.0
Main 10	1000	1100	1.875	1.0
Screen-Extended Main 10	1000	1100	1.875	1.0
Main 12	1500	1650	2.250	1.0
Main Still Picture	1000	1100	1.500	1.0
Main 10 Still Picture	1000	1100	1.875	1.0
Main 4:2:2 10	1667	1833	2.500	0.5
Main 4:2:2 12	2000	2200	3.000	0.5
Main 4:4:4	2000	2200	3.000	0.5
High Throughput 4:4:4	2000	2200	3.000	0.5
Screen-Extended Main 4:4:4	2000	2200	3.000	0.5
Screen-Extended High Throughput 4:4:4	2000	2200	3.000	0.5
Main 4:4:4 10	2500	2750	3.750	0.5
High Throughput 4:4:4 10	2500	2750	3.750	0.5
Screen-Extended Main 4:4:4 10	2500	2750	3.750	0.5
Screen-Extended High Throughput 4:4:4 10	2500	2750	3.750	0.5
Main 4:4:4 12	3000	3300	4.500	0.5