CLAIMS

What is claimed is:

1. A method implemented in a decoder, the method comprising:

receiving~~, by a receiver of the decoder,~~ a bitstream comprising a sequence parameter set (SPS), one or more sub-pictures partitioned from a picture, and one or more slice headers associated with one or more slices; wherein the SPS comprises a complete set of all sub-picture identifiers (IDs) for the one or more sub-pictures, wherein each sub-picture corresponds to a sub-picture ID; and wherein a slice header comprises a current sub-picture ID, the current sub-picture ID indicating a sub-picture that contains a slice associated with the slice header ; wherein the SPS further comprises a sub-picture size and a sub-picture location for each of the one or more sub-pictures partitioned from the picture;

decoding~~, by a processor of the decoder,~~ the SPS to obtain the sub-picture ~~identifiers (~~IDs~~),~~ the sub-picture size and the sub-picture location for each of the one or more sub-pictures; and

decoding~~, by the processor,~~ the slice header to obtain ~~a~~ the current sub-picture ID~~ associated with a current sub-picture, the current sub-picture ID indicating the slice is included in the current sub-picture from the one or more sub-pictures~~;

~~generating~~decoding~~, by the processor,~~ the current sub-picture based on the current sub-picture ID, a subpicture size and a subpicture location corresponding to the current sub-picture to create a video sequence.

~~2. The method of claim 1, wherein the SPS further comprises a sub-picture size for each sub-picture partitioned from the picture.~~

~~3. The method of any of claims 1-2, wherein the SPS further comprises a sub-picture location for each sub-picture partitioned from the picture.~~

~~4~~2. The method of ~~any of claims 1-3~~claim 1, wherein decoding the current sub-picture includes:

matching the slices to the current sub-picture based on the current sub-picture ID; and

positioning the slices based on the sub-picture size and the sub-picture location for the current sub-picture.

~~5~~3. The method of ~~any of claims 1-4~~claim 1 or 2, wherein the sub-picture location includes an offset distance between a top-left sample of the current sub-picture and a top-left sample of the picture.

~~6~~4. The method of any one of claims 1-~~5~~3, wherein the sub-picture size includes a sub-picture height in luma samples and a sub-picture width in luma samples.

~~7~~5. The method of any one of claims 1-~~6~~4, wherein the SPS further comprises an indication that one or more of the sub-pictures are motion constrained sub-pictures.

~~8~~6. A method implemented in an encoder, the method comprising:

partitioning~~, by a processor of the encoder,~~ a picture into a plurality of sub-pictures;

partitioning~~, by the processor,~~ each of the plurality of sub-pictures into one or more slices;

encoding into a bitstream, by the processor, a sequence parameter set (SPS) comprising a complete set of all sub-picture identifiers (IDs) for the plurality of sub-pictures partitioned from the picture, wherein each sub-picture corresponds to a sub-picture ID, and the SPS further comprises a sub-picture size and a sub-picture location for each of the plurality of sub-pictures partitioned from the picture;

encoding into the bitstream~~, by the processor,~~ slice headers comprising the sub-picture IDs to indicate the slices are included in indicated sub-pictures;

encoding~~, by the processor,~~ one or more of the plurality of sub-pictures into the bitstream.

~~9~~7. The method of claim ~~8~~6, the method further comprising:

storing, in a memory of the encoder, the bitstream for communication toward a decoder.

~~10. The method of any of claims 8-9, wherein the SPS further comprises a sub-picture size for each of the plurality of sub-pictures.~~

~~11. The method of any of claims 8-9, wherein the SPS further comprises a sub-picture location for each of the plurality of sub-pictures.~~

~~12~~8. The method of ~~any of claims 8-11~~claim 6 or 7, wherein the sub-picture location includes an offset distance between a top-left sample of a corresponding sub-picture and a top-left sample of the picture.

~~13~~9. The method of any one of claims ~~8~~6-~~12~~8, wherein the sub-picture size includes a sub-picture height in luma samples and a sub-picture width in luma samples.

~~14~~10. The method of any one of claims ~~8~~6-~~13~~9, wherein the SPS further comprises an indication that one or more of the sub-pictures are motion constrained sub-pictures.

~~15~~11. The method of any one of claims ~~8~~6-~~14~~10, wherein a union of the plurality of sub-pictures covers a total area of the picture without gap and without overlap.

~~16~~12. A video coding device comprising:

a processor, a memory, a receiver coupled to the processor, and a transmitter coupled to the processor, the processor, memory, receiver, and transmitter configured to perform the method of any one of claims 1-~~15~~11.

~~17~~13. A non-transitory computer readable medium comprising a computer program product for use by a video coding device, the computer program product comprising computer executable instructions stored on the non-transitory computer readable medium such that when executed by a processor cause the video coding device to perform the method of any one of claims 1-~~15~~11.

~~18~~14. A decoder comprising:

a receiving unit, configured to receive a bitstream comprising a sequence parameter set (SPS), one or more sub-pictures partitioned from a picture, and one or more slice headers associated with one or more slices; wherein the SPS comprises a complete set of all sub-picture identifiers (IDs) for the one or more sub-pictures, wherein each sub-picture corresponds to a sub-picture ID; and wherein a slice header comprises a current sub-picture ID, the current sub-picture ID indicating a sub-picture that contains a slice associated with the slice header; wherein the SPS further comprises a sub-picture size and a sub-picture location for each of the one or more sub-pictures partitioned from the picture;

a decoding unit, configured to:

~~decoding~~ decode the SPS to obtain the sub-picture ~~identifiers (~~IDs~~)~~, the sub-picture size and the sub-picture location for each of the one or more sub-pictures; and

~~decoding~~ decode the slice headers to obtain ~~a~~ the current sub-picture ID ~~associated with a current sub-picture, the current sub-picture ID indicating the slices are included in the current sub-picture from the one or more sub-pictures~~;

~~a generating unit, configured to generate~~ decode the current sub-picture based on the current sub-picture ID, a subpicture size and a subpicture location corresponding to the current sub-picture to create a video sequence.

~~19~~15. The decoder of claim ~~18~~14, wherein the decoder is further configured to perform the method of any one of claims ~~1~~2-~~7~~5.

~~20~~16. An encoder comprising:

a partitioning unit, configured to:

partitioning a picture into a plurality of sub-pictures; and

partitioning each of the plurality of sub-pictures into one or more slices;

an encoding unit, configured to:

encoding into a bitstream a sequence parameter set (SPS) comprising a complete set of all sub-picture identifiers (IDs) for the plurality of sub-pictures partitioned from the picture, wherein each sub-picture corresponds to a sub-picture ID, and the SPS further comprises a sub-picture size and a sub-picture location for each of the plurality of sub-pictures partitioned from the picture;

encoding into the bitstream slice headers comprising sub-picture IDs indicating the slices are included in indicated sub-pictures; and

encoding one or more of the plurality of sub-pictures into the bitstream.

~~21~~17. The encoder of claim ~~20~~16, the encoder further comprising:

a storing unit, configured to store the bitstream for communication toward a decoder.

~~22~~18. The encoder of ~~any of claims 20-21~~claim 16 or 17, wherein the encoder is further configured to perform the method of any one of claims ~~8~~7-~~15~~11.

~~23~~19. A non-transitory storage medium which includes an encoded bitstream, the bitstream comprising one or more sub-pictures partitioned from a picture, and comprising one or more slice headers associated with one or more slices and a sequence parameter set (SPS) comprising a complete set of all sub-picture identifiers (IDs) for the plurality of sub-pictures partitioned from the picture, wherein each sub-picture corresponds to a sub-picture ID; and wherein a

slice header comprises a current sub-picture ID, the current sub-picture ID indicating a sub-picture that contains a slice associated with the slice header; wherein the SPS further comprises a sub-picture size and a sub-picture location for each of the one or more sub-pictures partitioned from the picture.

~~24~~20. A device for coding, comprising:

receiving unit, configured to receive a bitstream to decode;

transmission unit coupled to the receiving unit, the transmission unit, configured to transmit a decoded image to a display unit;

storage unit coupled to at least one of the receiving unit or the transmission unit, the storage unit, configured to store instructions; and

processing unit coupled to the storage unit, the processing unit, configured to execute the instructions stored in the storage unit to perform the method in any one of claims 1 to ~~15~~11.

~~25~~21. A~~n~~ decoder comprising processing circuitry for carrying out the method according to any one of claims 1 to ~~7~~5.

~~26~~22. An encoder comprising processing circuitry for carrying out the method according to any one of claims ~~8~~ 6 to ~~15~~11.

~~27~~23. A computer program product comprising program code for performing the method according to any one of claims 1 to ~~15~~ 11 when executed on a computer or a processor.

~~28~~24. A non-transitory computer-readable medium carrying a program code which, when executed by a computer device, causes the computer device to perform the method of any one of claims 1 to ~~15~~11.