CLAIMS

What is claimed:

1. A method of decoding a compressed Higher Order Ambisonics (HOA) representation of a sound or sound field, the method comprising:

receiving a bit stream containing the compressed HOA representation corresponding to a plurality of hierarchical layers that include a base layer and two or more hierarchical enhancement layers, and containing basic side information that is associated with the base layer and enhancement side information that is associated with the two or more hierarchical enhancement layers,

wherein a plurality of layers have assigned thereto components of a basic compressed sound representation of the sound or sound field, the components being assigned to respective layers in respective groups of components, wherein the components of the basic compressed sound representation correspond to monaural signals and the monaural signals represent either predominant sound signals or coefficient sequences of an HOA representation,

wherein the two or more hierarchical enhancement layers comprises a highest usable hierarchical enhancement layer, and

wherein each of the two or more hierarchical enhancement layers includes a portion of the enhancement side information including parameters for improving a basic reconstructed sound representation obtainable from data included in a respective layer and any layers lower than the respective layer; and

decoding the compressed HOA representation based on the basic side information that is associated with the base layer, based on the portion of the enhancement side information that is associated with the highest usable hierarchical enhancement layer, and not based on the portion of the enhancement side information that is associated with any other layer of the two or more hierarchical enhancement layers.

2. The method of claim 1, wherein the enhancement side information includes parameters related to at least one of: spatial prediction, sub-band directional signals synthesis, and parametric ambience replication.

3. The method of claim 1, wherein the enhancement side information includes information that allows prediction of missing portions of the sound or sound field from directional signals.

4. The method of claim 1, further comprising:

determining, for each layer, whether the respective layer has been validly received; and

determining a layer index of a layer immediately below a lowest layer that has not been validly received.

5. The method of claim 4, further comprising determining a further layer index that is either equal to the layer index or that indicates omission of enhancement side information during decoding.

6. The method of claim 1, wherein the base layer includes at least one portion of additional basic side information corresponding to the respective layer and including information that specifies decoding of one or more components among the components assigned to the respective layer in dependence on other components assigned to the respective layer and any layers lower than the respective layer, the method further comprising, for each portion of additional basic side information:

decoding the portion of additional basic side information by referring to the components assigned to its respective layer and any layers lower than the respective layer; and

correcting the portion of additional basic side information by referring to the components assigned to the highest usable hierarchical enhancement layer and any layers between the highest usable hierarchical enhancement layer and the respective layer,

wherein the basic reconstructed sound representation is obtained from the components assigned to the highest usable hierarchical enhancement layer and any layers lower than the highest usable hierarchical enhancement layer, using the basic side information and corrected portions of additional basic side information obtained from portions of additional basic side information corresponding to layers up to the highest usable hierarchical enhancement layer.

7. A non-transitory computer readable medium containing instructions that when executed by a processor perform the method of claim 1.

8. An apparatus for decoding a compressed Higher Order Ambisonics (HOA) representation of a sound or sound field, the apparatus comprising:

a receiver for receiving a bit stream containing the compressed HOA representation corresponding to a plurality of hierarchical layers that include a base layer and two or more hierarchical enhancement layers, and containing basic side information that is associated with the base layer and enhancement side information that is associated with the two or more hierarchical enhancement layers,

wherein a plurality of layers have assigned thereto components of a basic compressed sound representation of the sound or sound field, the components being assigned to respective layers in respective groups of components,

wherein the components of the basic compressed sound representation correspond to monaural signals and the monaural signals represent either predominant sound signals or coefficient sequences of an HOA representation,

wherein the two or more hierarchical enhancement layers comprises a highest usable hierarchical enhancement layer, and

wherein each of the two or more hierarchical enhancement layers includes a portion of the enhancement side information including parameters for improving a basic reconstructed sound representation obtainable from data included in a respective layers and any layers lower than the respective layer; and

a decoder for decoding the compressed HOA representation based on the basic side information that is associated with the base layer, based on the portion of the enhancement side information that is associated with the highest usable hierarchical enhancement layer, and not based on the portion of the enhancement side information that is associated with any other layer of the two or more hierarchical enhancement layers.

9. The apparatus of claim 8, wherein the enhancement side information includes parameters related to at least one of: spatial prediction, sub-band directional signals synthesis, and parametric ambience replication.

10. The apparatus of claim 8, wherein the enhancement side information includes information that allows prediction of missing portions of the sound or sound field from directional signals.

11. The apparatus of claim 8, configured to:

determine, for each layer, whether the respective layer has been validly received; and

determine a layer index of a layer immediately below a lowest layer that has not been validly received.

12. The apparatus of claim 11, further configured to determine a further layer index that is either equal to the layer index or that indicates omission of enhancement side information during decoding.

13. The apparatus of claim 8,

wherein the base layer includes at least one portion of additional basic side information corresponding to the respective layer and including information that specifies decoding of one or more components among the components assigned to the respective layer in dependence on other components assigned to the respective layer and any layers lower than the respective layer, and

wherein for each portion of additional basic side information, the apparatus is configured to:

decode the portion of additional basic side information by referring to the components assigned to its respective layer and any layers lower than the respective layer; and

correct the portion of additional basic side information by referring to the components assigned to the highest usable hierarchical enhancement layer and any layers between the highest usable hierarchical enhancement layer and the respective layer,

wherein the basic reconstructed sound representation is obtained from the components assigned to the highest usable hierarchical enhancement layer and any layers lower than the highest usable hierarchical enhancement layer, using the basic side information and corrected portions of additional basic side information obtained from portions of additional basic side information corresponding to layers up to the highest usable hierarchical enhancement layer.

What is claimed:

1. A method of decoding a compressed Higher Order Ambisonics (HOA) representation of a sound or sound field, the method comprising: receiving a bit stream containing the compressed HOA representation, wherein the bit stream comprises a plurality of hierarchical layers that include a base layer and two or more hierarchical enhancement layers, and wherein the bit stream further comprises basic side information that is associated with the base layer and enhancement side information that is associated with the two or more hierarchical enhancement layers, wherein the plurality of hierarchical layers have assigned thereto components of the compressed HOA representation of the sound or sound field, wherein the components of the basic compressed sound representation correspond to monaural signals and the monaural signals represent either predominant sound signals or coefficient sequences of an HOA representation, wherein the two or more hierarchical enhancement layers comprises a highest usable hierarchical enhancement layer, and wherein each of the two or more hierarchical enhancement layers includes a portion of the enhancement side information including parameters for improving a basic reconstructed sound representation obtainable from data included in a respective layer and any layers lower than the respective layer; and decoding the compressed HOA representation based on the basic side information that is associated with the base layer and based on the portion of the enhancement side information that is associated with the highest usable hierarchical enhancement layer, and not based on a second portion of the enhancement side information that is associated with any other layer of the two or more hierarchical enhancement layers.

2. The method of claim 1, wherein the enhancement side information includes parameters related to at least one of: spatial prediction, sub-band directional signals synthesis, and parametric ambience replication.

3. The method of claim 1, further comprising: determining, for each layer, whether the respective layer has been validly received; and determining a layer index of a layer immediately below a lowest layer that has not been validly received.

4. The method of claim 3, further comprising determining a further layer index that is either

equal to the layer index or that indicates omission of enhancement side information during decoding.

5. The method of claim 1, wherein the base layer includes at least one portion of additional basic side information corresponding to the respective layer and including information that specifies decoding of one or more components among the components assigned to the respective layer in dependence on other components assigned to the respective layer and any layers lower than the respective layer, the method further comprising, for each portion of additional basic side information: decoding the portion of additional basic side information by referring to the components assigned to its respective layer and any layers lower than the respective layer; and correcting the portion of additional basic side information by referring to the components assigned to the highest usable hierarchical enhancement layer and any layers between the highest usable hierarchical enhancement layer and the respective layer, wherein the basic reconstructed sound representation is obtained from the components assigned to the highest usable hierarchical enhancement layer and any layers lower than the highest usable hierarchical enhancement layer, using the basic side information and corrected portions of additional basic side information obtained from portions of additional basic side information corresponding to layers up to the highest usable hierarchical enhancement layer.

6. A non-transitory computer readable medium containing instructions that when executed by a processor perform the method of claim 1.

7. An apparatus for decoding a compressed Higher Order Ambisonics (HOA) representation of a sound or sound field, the apparatus comprising: a receiver for receiving a bit stream containing the compressed HOA representation, wherein the bit stream comprises a plurality of hierarchical layers that include a base layer and two or more hierarchical enhancement layers, and wherein the bit stream further comprises basic side information that is associated with the base layer and enhancement side information that is associated with the two or more hierarchical enhancement layers, wherein the plurality of hierarchical layers have assigned thereto components of the compressed HOA representation of the sound or sound field, wherein the components of the basic compressed sound representation correspond to monaural signals and the monaural signals represent either predominant sound signals or coefficient sequences of an HOA representation, wherein the two or more hierarchical enhancement layers comprises a highest usable hierarchical enhancement layer, and wherein

each of the two or more hierarchical enhancement layers includes a portion of the enhancement side information including parameters for improving a basic reconstructed sound representation obtainable from data included in a respective layers and any layers lower than the respective layer; and a decoder for decoding the compressed HOA representation based on the basic side information that is associated with the base layer and based on the portion of the enhancement side information that is associated with the highest usable hierarchical enhancement layer, and not based on a second portion of the enhancement side information that is associated with any other layer of the two or more hierarchical enhancement layers.

8. The apparatus of claim 7, wherein the enhancement side information includes parameters related to at least one of: spatial prediction, sub-band directional signals synthesis, and parametric ambience replication.

9. The apparatus of claim 7, configured to: determine, for each layer, whether the respective layer has been validly received; and determine a layer index of a layer immediately below a lowest layer that has not been validly received.

10. The apparatus of claim 9, further configured to determine a further layer index that is either equal to the layer index or that indicates omission of enhancement side information during decoding.

11. The apparatus of claim 7, wherein the base layer includes at least one portion of additional basic side information corresponding to the respective layer and including information that specifies decoding of one or more components among the components assigned to the respective layer in dependence on other components assigned to the respective layer and any layers lower than the respective layer, and wherein for each portion of additional basic side information, the apparatus is configured to: decode the portion of additional basic side information by referring to the components assigned to its respective layer and any layers lower than the respective layer; and correct the portion of additional basic side information by referring to the components assigned to the highest usable hierarchical enhancement layer and any layers between the highest usable hierarchical enhancement layer and the respective layer, wherein the basic reconstructed sound representation is obtained from the components assigned to the highest usable hierarchical

enhancement layer and any layers lower than the highest usable hierarchical enhancement layer, using the basic side information and corrected portions of additional basic side information obtained from portions of additional basic side information corresponding to layers up to the highest usable hierarchical enhancement layer.