CLAIMS

1. A method for controlling a concealment method for a lost audio frame of a received audio signal, the method comprising:

- detecting (101, 122) in a property of a previously received and reconstructed audio signal a transient condition that could lead to suboptimal reconstruction quality, when an original concealment method is used to create a substitution frame; and
- modifying (102, 125) the original concealment method by selectively adjusting a spectrum magnitude of a substitution frame spectrum, when the transient condition is detected;
- further detecting (101, 121) in a statistical property of observed frame losses a second condition that could lead to suboptimal reconstruction quality, when the original concealment method is used to create the substitution frame; and
- further modifying (102, 123, 127) the original concealment method by selectively adjusting the spectrum magnitude of the substitution frame spectrum, when the second condition is detected.

2. The method according to claim 1, wherein the original concealment method comprises:

- extracting a segment from a previously received or reconstructed audio signal, wherein said segment is used as a prototype frame;
- applying a sinusoidal model to the prototype frame to obtain sinusoidal frequencies of the sinusoidal model; and
- time-evolving obtained sinusoids to create the substitution frame.

3. The method according to claim 2, wherein the time-evolving comprises advancing the phase of spectral coefficients related to the obtained sinusoids (k) by θ_k, and wherein calculation of the substitution frame spectrum is performed according to the expression $Z(m) = Y(m) \cdot e^{j\theta}{}_k$, wherein $Y(m)$ is a frequency domain representation of the prototype frame.

4. The method according to any of claims 1 to 3, wherein the transient condition comprises a detected offset.

5. The method according to any of claims 1 to 4, wherein a transient detection is performed in a frequency domain.

6. The method according to claim 5, wherein the transient detection is performed frequency selectively on the basis of a frequency band.

7. The method according to claim 6, wherein frequency band widths follow the size of the human auditory critical bands.

8. The method according to claim 6 or 7, wherein selectively adjusting the spectrum magnitude of the substitution frame is performed frequency band selectively in response to a transient detected in the frequency band.

9. The method according to any of the preceding claims, wherein the second condition is an occurrence of several consecutive frame losses.

10. The method according to claim 9, wherein the spectrum magnitude is adjusted in response to detected several consecutive frame losses by performing attenuation with gradually increasing degree.

11. The method according to claim 9 or 10, wherein the spectrum magnitude is adjusted in response to detected several consecutive frame losses by a gradual increase of a first attenuation factor.

~~11.~~12. The method according to claim ~~10~~11, wherein a second attenuation factor is set in response to an indicated transient, the total attenuation being controlled by the product of the first and the second attenuation factors.

~~12.~~13. The method according to any of the preceding claims, wherein the original concealment method is further modified by selectively adjusting a phase of the substitution frame spectrum, when the second condition is detected.

~~13.~~14. The method according to claim ~~12~~13, wherein adjusting the phase of the substitution frame spectrum comprises randomizing or dithering a phase spectrum.

~~14.~~15. The method according to claim ~~13~~14, wherein the phase spectrum is adjusted by performing the dithering with gradually increasing degree.

~~15.~~16. An apparatus comprising means for performing a method according to at least one of claims 1 to ~~14~~15.

~~16.~~17. An apparatus comprising:
a processor (154), and
a memory (156) storing instructions (155) that, when executed by the processor, cause the apparatus to
- detect in a property of a previously received and reconstructed audio signal a transient condition that could lead to suboptimal reconstruction quality when an original concealment method is used to create a substitution frame;
- modify the original concealment method, when the transient condition is detected, by selectively adjusting a spectrum magnitude of a substitution frame spectrum;
- further detect in a statistical property of observed frame losses a second condition that could lead to suboptimal reconstruction quality when the original concealment method is used to create the substitution frame; and
- further modify the original concealment method, when the second condition is detected, by selectively adjusting the spectrum magnitude of the substitution frame spectrum.

~~17.~~18. The apparatus according to claim ~~16~~17, wherein when creating the substitution frame using the original concealment method the apparatus is caused to:
- extract a segment from a previously received or reconstructed audio signal, wherein said segment is used as a prototype frame;
- apply a sinusoidal model to the prototype frame to obtain sinusoidal frequencies of the sinusoidal model; and
- time-evolve obtained sinusoids to create the substitution frame.

~~18.~~19. The apparatus according to claim ~~17~~18, wherein the time-evolving is performed by advancing the phase of spectral coefficients related to the obtained sinusoids (k) by θ_k, and wherein calculation of the substitution frame spectrum is performed according to the expression $Z(m) = Y(m) \cdot e^{j\theta}{}_k$, wherein $Y(m)$ is a frequency domain representation of the prototype frame.

~~19.~~20. The apparatus according to any of claims ~~16-18~~17-19 further comprising a transient detector.

~~20.~~21. The apparatus according to claim 20~~19~~, wherein the transient detector is configured to perform transient detection in the frequency domain.

~~21.~~22. The apparatus according to claim 21~~20~~, wherein the transient detector is configured to perform a frequency selective transient detection on the basis of frequency bands.

~~22.~~23. The apparatus according to claim ~~21~~22, wherein selectively adjusting the spectrum magnitude of the substitution frame is performed frequency band selectively in response to a transient detected in the frequency band.

~~23.~~24. The apparatus according to any of claims ~~16-22~~17-23, wherein the second condition is an occurrence of several consecutive frame losses.

~~24.~~25. The apparatus according to claim ~~23~~24, wherein a spectrum magnitude is adjusted in response to a detected several consecutive frame losses by performing attenuation with gradually increasing degree.~~,~~

26. The apparatus according to claim 24 or 25, wherein the spectrum magnitude is adjusted in response to detected several consecutive frame losses by a gradual increase of a first attenuation factor.

~~25.~~27. The apparatus according to claim ~~24~~26, wherein a second attenuation factor is set in response to an indicated transient, the total attenuation being controlled by the product of the first and the second attenuation factors.

~~26.~~28. The apparatus according to any of the claims ~~16-25~~17-27, wherein the apparatus is configured to further modify the original concealment method, when the second condition is detected, by selectively adjusting a phase of the substitution frame spectrum.

~~27.~~29. The apparatus according to claim ~~26~~28, wherein adjusting the phase of the substitution frame spectrum comprises randomizing or dithering a phase spectrum.

~~28.~~30. The apparatus according to claim ~~15 or~~ 16 or 17, wherein the apparatus is a decoder in a mobile device.

~~29.~~31. A computer program (155) comprising computer readable code units which when run on an apparatus causes the apparatus to:

- detect (101) in a property of a previously received and reconstructed audio signal a transient condition that could lead to suboptimal reconstruction quality when an original concealment method is used to create a substitution frame; and
- modify (102) the original concealment method, when the transient condition is detected, by selectively adjusting a spectrum magnitude of a substitution frame spectrum
- further detect in a statistical property of observed frame losses a second condition that could lead to suboptimal reconstruction quality when the original concealment method is used to create the substitution frame; and
- further modify the original concealment method, when the second condition is detected, by selectively adjusting the spectrum magnitude of the substitution frame spectrum.

~~30.~~32. A computer program product (156), comprising computer readable medium and a computer program (155) according to claim ~~29~~ 31 stored on the computer readable medium.

~~31.~~33. A decoder (130) comprising:

- an input unit (132) configured to receive an encoded audio signal;
- a logical frame loss concealment-unit (134) configured to conceal a lost audio frame;
- a controller (136) configured to detect, in a property of a previously received and reconstructed audio signal a transient condition that could lead to suboptimal reconstruction quality when an original concealment method is used to create a substitution frame, and to modify the original concealment of a lost audio frame by selectively adjusting a spectrum magnitude of a substitution frame spectrum, when detecting the transient condition, wherein the controller is configured to further detect in a statistical property of observed frame losses a second condition that could lead to suboptimal reconstruction quality when the original concealment method is used to create the substitution frame, and to further modify the original concealment method, when the

second condition is detected, by selectively adjusting the spectrum magnitude of the substitution frame spectrum.

~~32.~~34. The decoder according to claim ~~31~~33, wherein the controller (136) comprises a detector unit (146) for performing the detection of a condition in a property of the previously received and reconstructed audio signal, or in the statistical property of the observed frame losses, and a modifier unit (148) for performing the modification of the concealment method.

~~33. An apparatus (130) configured to control a concealment method for a lost audio frame of a received audio signal, the apparatus comprising:~~

~~- a detection module (146) for detecting in a property of a previously received and reconstructed audio signal, or in a statistical property of observed frame losses, a condition that could lead to suboptimal reconstruction quality when an original concealment method is used to create a substitution frame; and~~

~~- a modification module (148) for modifying the original concealment method, when such a condition is detected, by selectively adjusting a spectrum magnitude of a substitution frame spectrum.~~