CLAIMS

1. A device comprising:

a low-band mid signal decoder configured to decode a low-band portion of an encoded mid signal to generate a decoded low-band mid signal, wherein the encoded mid signal corresponds to a sum of a first audio signal and a second audio signal;

a low-band residual prediction unit configured to process the decoded low-band mid signal to generate a low-band residual prediction signal;

an up-mix processor configured to generate a low-band left channel and a low-band right channel based partially on the decoded low-band mid signal and the low-band residual prediction signal;

a high-band mid signal decoder configured to decode a high-band portion of the encoded mid signal to generate a time-domain decoded high-band mid signal;

a high-band residual prediction unit configured to process the time-domain decoded high-band mid signal to generate a time-domain high-band residual prediction signal; and

an inter-channel bandwidth extension decoder configured to generate a high-band left channel and a high-band right channel based on the time-domain decoded high-band mid signal and the time-domain high-band residual prediction signal.

2. The device of claim 1, comprising a receiver configured to receive a bitstream that includes the encoded mid signal, one or more parameters, and a reference channel indicator, the one or more parameters comprising a residual prediction gain, wherein the up-mix processor is further configured to generate the low-band left channel and the low-band right channel at least partially based on the one or more parameters and the reference channel indicator.

3. The device of claim 1, wherein the high-band residual prediction unit comprises:

one or more all-pass filters configured to generate a filtered time-domain signal by filtering the time-domain decoded high-band mid signal; and

a gain mapper configured to generate the time-domain high-band residual prediction signal by performing a gain mapping operation on the filtered time-domain signal.

4. The device of claim 1, wherein the high-band residual prediction unit is further configured to:

generate a spectrally-mapped signal by performing a spectral mapping operation on the time-domain decoded high-band mid signal; and

generate the time-domain high-band residual prediction signal by filtering the spectrally-mapped signal.

5. The device of claim 1, further comprising:

a first combination circuit configured to combine the low-band left channel and the high-band left channel to generate a left channel;

a second combination circuit configured to combine the low-band right channel and the high-band right channel to generate a right channel; and

an output device configured to output the left channel and the right channel.

6. The device of claim 1, wherein the inter-channel bandwidth extension decoder comprises:

a high-band residual generation unit configured to apply a residual prediction gain to the time-domain high-band residual prediction signal to generate a high-band residual channel; and

a third combination circuit configured to combine the time-domain decoded high-band mid signal and the high-band residual channel to generate a high-band reference channel.

7. The device of claim 6, wherein the inter-channel bandwidth extension decoder further comprises:

a first spectral mapper configured to perform a first spectral mapping operation on the time-domain decoded high-band mid signal to generate a spectrally-mapped high-band mid signal; and

a second spectral mapper configured to perform a second spectral mapping operation on the high-band residual channel to generate a spectrally-mapped high-band residual channel.

8. The device of claim 6, wherein the inter-channel bandwidth extension decoder further comprises a first gain mapper configured to perform a first gain mapping operation on the time-domain decoded high-band mid signal to generate a first high-band gain-mapped channel.

9. The device of claim 8, wherein the inter-channel bandwidth extension decoder further comprises a second gain mapper configured to perform a second gain mapping operation on the high-band residual channel to generate a second high-band gain-mapped channel.

10. The device of claim 9, wherein the inter-channel bandwidth extension decoder further comprises:

a fourth combination circuit configured to combine the first high-band gain-mapped channel and the second high-band gain-mapped channel to generate a high-band target channel; and

a channel selector configured to:

receive a reference channel indicator; and

based on the reference channel indicator:

designate one of the high-band reference channel or the high-band target channel as the high-band left channel; and

designate the other of the high-band reference channel or the high-band target channel as the high-band right channel.

11. The device of claim 1, wherein the low-band mid signal decoder, the low-band residual prediction unit, the up-mix processor, the high-band mid signal decoder, the high-band residual prediction unit, and the inter-channel bandwidth extension decoder are integrated into a base station.

12. The device of claim 1, wherein the low-band mid signal decoder, the low-band residual prediction unit, the up-mix processor, the high-band mid signal decoder, the high-band residual prediction unit, and the inter-channel bandwidth extension decoder are integrated into a mobile device.

13. A method comprising:

decoding a low-band portion of an encoded mid signal to generate a decoded low-band mid signal, wherein the encoded mid signal corresponds to a sum of a first audio signal and a second audio signal;

processing the decoded low-band mid signal to generate a low-band residual prediction signal;

generating a low-band left channel and a low-band right channel based partially on the decoded low-band mid signal and the low-band residual prediction signal;

decoding a high-band portion of the encoded mid signal to generate a decoded high-band mid signal;

processing the decoded high-band mid signal to generate a high-band residual prediction signal; and

generating a high-band left channel and a high-band right channel based on the decoded high-band mid signal and the high-band residual prediction signal.

14. The method of claim 13, further comprising:

performing a first transform operation on the low-band residual prediction signal to generate a frequency-domain low-band residual prediction signal; and

performing a second transform operation on the decoded low-band mid signal to generate a frequency-domain low-band mid signal.

15. A non-transitory computer-readable medium comprising instructions that, when executed by a processor within a decoder, cause the processor to perform operations according to the method of claims 13 or 14.