Claims

1. A system configured to transmit a signal back, substantially simultaneously, towards a transmitting source, the system comprising:
   a) at least two antennas; and
   b) at least two communication units, each of which is connected to its corresponding antenna, said each communication unit comprising:
      b.1. a receiver for receiving a signal from a transmitting source;
      b.2. an Analog-to-Digital (A/D) unit for sampling the received signal for a predefined period of time, giving rise to signal samples;
      b.3. a digital memory unit for storing the signal samples of said received signal in its memory in a given sampling order, on a time scale;
      b.4. a processing unit for reconstructing a signal, including:
         b.4.1. deciding about at least one sub-group of signal samples that are sampled within said predefined period of time;
         b.4.2. inverting said sampling order of said signal samples within said at least one sub-group; and
         b.4.3. reconstructing said signal by using said signal samples, which have the inverted sampling order, as data carriers, giving rise to a reconstructed digital signal;
      b.5. a Digital-to-Analog (D/A) unit for converting said reconstructed digital signal to a reconstructed analog signal to be transmitted; and
      b.6. a transmitter for transmitting said reconstructed analog signal back towards said transmitting source substantially simultaneously from each of said at least two antennas.

2. The system according to claim 1, wherein the signal is one or more of the following:
   a) a Radio Frequency (RF) signal;
   b) an electromagnetic (EM) signal;
   c) an acoustic signal;

d) a seismic signal; and

e) a photonic signal.

3. The system according to claim 1, wherein the digital memory unit is a Digital Radio Frequency Memory (DRFM) unit.

4. The system according to claim 1, wherein the reconstructed digital signal is transmitted with a delay.

5. The system according to claim 1, wherein the processing unit is incorporated within the transmitter.

6. The system according to claim 1, wherein the reconstructed digital signal is modulated by means of a modulation unit.

7. The system according to claim 1, wherein the reconstructed analog signal is transmitted back towards the transmitting source from each of the at least two antennas irrespective of the location of one antenna with respect to another.

8. The system according to claim 1, wherein the reconstructed analog signal is transmitted back towards the transmitting source from each of the at least two antennas, giving rise to reconstructed analog signals, without calculating phase differences between said reconstructed analog signals.

9. A system configured to transmit a signal back, substantially simultaneously, towards a transmitting source, the system comprising:

a) at least two antennas; and

b) at least two communication units, each of which is connected to its corresponding antenna, said each communication unit comprising:

b.1. a receiver for receiving a signal from a transmitting source;

b.2. an Analog-to-Digital (A/D) unit for sampling the received signal for a predefined period of time, giving rise to signal samples, each of which has an amplitude and phase;

b.3. a digital memory unit for storing the signal samples of said received signal in its memory in a given sampling order, on a time scale;

b.4. a processing unit for reconstructing a signal, including:

b.4.1. deciding about at least one sub-group of signal samples that are sampled within said predefined period of time;

b.4.2 performing phase conjugation of each signal sample within said at least one sub-group, giving rise to phase conjugated signal samples; and

b.4.3. reconstructing said signal by using said phase conjugated signal samples as data carriers, giving rise to a reconstructed digital signal;

b.5. a Digital-to-Analog (D/A) unit for converting said reconstructed digital signal to a reconstructed analog signal to be transmitted; and

b.6. a transmitter for transmitting said reconstructed analog signal back towards said transmitting source substantially simultaneously from each of said at least two antennas.

10. The system according to claim 9, wherein the signal is one or more of the following:

a) a Radio Frequency (RF) signal;

b) an electromagnetic (EM) signal;

c) an acoustic signal;

d) a seismic signal; and

e) a photonic signal.

11. The system according to claim 9, wherein the digital memory unit is a Digital Radio Frequency Memory (DRFM) unit.

~~12. The system according to claim 9, wherein the reconstructed digital signal is transmitted with a delay.~~

13. The system according to claim 9, wherein the processing unit is incorporated within the transmitter.

14. The system according to claim 9, wherein the phase conjugation of the signal samples is performed by multiplying said signal samples by a corresponding function.

15. The system according to claim 9, wherein the phase conjugation of the signal samples is performed by applying Fast Fourier Transform (FFT) on said signal samples.

16. The system according to claim 9, wherein the reconstructed digital signal is modulated by means of a modulation unit.

17. The system according to claim 9, wherein the reconstructed analog signal is transmitted back towards the transmitting source from each of the at least two antennas irrespective of the location of one antenna with respect to another.

18. The system according to claim 9, wherein the reconstructed analog signal is transmitted back towards the transmitting source from each of the at least two antennas, giving rise to reconstructed analog signals, without calculating phase differences between said reconstructed analog signals.

19. A system configured to transmit a signal back, substantially simultaneously, towards a transmitting source, the system comprising:

~~a) a corner reflector; and~~

b) at least two antennas connected to said corner reflector, each of said at least two antennas further connected to its corresponding communication unit that comprises:

b.1. a receiver for receiving a signal from a transmitting source;

b.2. an Analog-to-Digital (A/D) unit for sampling the received signal for a predefined period of time, giving rise to signal samples;

b.3. a digital memory unit for storing the signal samples of said received signal in its memory in a given sampling order, on a time scale;

b.4. a processing unit for reconstructing a signal by using said signal samples as data carriers, giving rise to a reconstructed digital signal;

b.5. a Digital-to-Analog (D/A) unit for converting said reconstructed digital signal to a reconstructed analog signal to be transmitted; and

b.6. a transmitter for transmitting said reconstructed analog signal to be reflected from said corner reflector back towards said transmitting source substantially simultaneously from each of said at least two antennas.

20. The system according to claim 19, wherein the signal is one or more of the following:

a) a Radio Frequency (RF) signal;

b) an electromagnetic (EM) signal;

c) an acoustic signal;

d) a seismic signal; and

e) a photonic signal.

21. The system according to claim 19, wherein the digital memory unit is a Digital Radio Frequency Memory (DRFM) unit.

~~22. The system according to claim 19, wherein the reconstructed digital signal is transmitted with a delay.~~

23. The system according to claim 19, wherein the processing unit is incorporated within the transmitter.

24. The system according to claim 19, wherein the reconstructed digital signal is modulated by means of a modulation unit.

25. The system according to claim 19, wherein the reconstructed analog signal is transmitted back towards the transmitting source from each of the at least two antennas irrespective of the location of one antenna with respect to another.

26. The system according to claim 19, wherein the reconstructed analog signal is transmitted back towards the transmitting source from each of the at least two antennas, giving rise to reconstructed analog signals, without calculating phase differences between said reconstructed analog signals.

27. A system configured to receive incoming signals from a transmitting source by means of at least two antennas and transmit outgoing signals back, substantially simultaneously, towards said transmitting source through said at least two antennas irrespective of the location of one antenna with respect to another and without calculating phase differences between said outgoing signals.

28. The system according to claim 27, wherein the signal is one or more of the following:

a) a Radio Frequency (RF) signal;
b) an electromagnetic (EM) signal;
c) an acoustic signal;
d) a seismic signal; and
~~e) a photonic signal.~~

~~29. The system according to claim 27, further comprising a receiver for receiving the signal from the transmitting source.~~

30. The system according to claim 29, further comprising an Analog-to-Digital (A/D) unit for sampling the received signal for a predefined period of time, giving rise to signal samples.

31. The system according to claim 30, further comprising a digital memory unit for storing the signal samples in its memory in a given sampling order, on a time scale.

32. The system according to claim 31, wherein the digital memory unit is a Digital Radio Frequency Memory (DRFM) unit.

33. The system according to claim 31, further comprising a processing unit for reconstructing a signal from the stored signal samples, giving rise to a reconstructed digital signal.

34. The system according to claim 33, further comprising a Digital-to-Analog (D/A) unit for converting the reconstructed digital signal to a reconstructed analog signal to be transmitted.

35. The system according to claim 33, wherein reconstructing the signal comprises:

a) deciding about at least one sub-group of signal samples that are sampled within the predefined period of time;

b) inverting said sampling order of said signal samples within said at least one sub-group; and

c) reconstructing said signal by using said signal samples, which have the inverted sampling order, as data carriers.

~~36. The system according to claim 33, wherein reconstructing the signal comprises:~~

a) deciding about at least one sub-group of signal samples that are sampled within the predefined period of time;

b) performing phase conjugation of the signal samples within said at least one sub-group, giving rise to phase conjugated signal samples; and

c) reconstructing said signal by using said phase conjugated signal samples as data carriers.

37. The system according to claim 33, further comprising a modulation unit for modulating the reconstructed digital signal to be transmitted.

38. The system according to claim 34, further comprising a transmitter for transmitting the reconstructed analog signal back towards the transmitting source.

39. The system according to claim 38, wherein the reconstructed digital signal is transmitted with a delay.

40. The system according to claim 38, wherein the processing unit is incorporated within a transmitter.

41. A method of transmitting a signal back towards a transmitting source, the method comprising:

a) receiving a signal from a transmitting source;

b) sampling the received signal for a predefined period of time, giving rise to signal samples;

c) storing the signal samples in a given sampling order, on a time scale;

d) reconstructing a signal, including:

d.1 deciding about at least one sub-group of signal samples that are sampled within said predefined period of time;

d.2. inverting said sampling order of said signal samples within said at least one sub-group; and

~~d.3. reconstructing said signal by using said signal samples, which~~ have the inverted sampling order, as data carriers, giving rise to a reconstructed digital signal;

e) converting said reconstructed digital signal to a reconstructed analog signal; and

f) transmitting said reconstructed analog signal back towards said transmitting source.

42. The method according to claim 41, further comprising providing the signal as one or more of the following:

a) a Radio Frequency (RF) signal;

b) an electromagnetic (EM) signal;

c) an acoustic signal;

d) a seismic signal; and

e) a photonic signal.

43. The method according to claim 41, further comprising receiving the signal substantially simultaneously by means of at least two antennas.

44. The method according to claim 41, further comprising transmitting the reconstructed digital signal with a delay.

45. The method according to claim 43, further comprising transmitting the reconstructed analog signal back towards the transmitting source, substantially simultaneously by means of the at least two antennas.

46. The method according to claim 41, further comprising transmitting the reconstructed analog signal back towards the transmitting source from each of the at least two antennas irrespective of the location of one antenna with respect to another.

~~47. The method according to claim 41, further comprising transmitting the~~ reconstructed analog signal back towards the transmitting source from each of the at least two antennas, giving rise to reconstructed analog signals, without calculating phase differences between said reconstructed analog signals.

48. A method of transmitting a signal back towards a transmitting source, the method comprising:

a) receiving a signal from a transmitting source;

b) sampling the received signal for a predefined period of time, giving rise to signal samples;

c) storing the signal samples in a given sampling order, at the time scale;

d) reconstructing a signal, including:

d.1. deciding about at least one sub-group of signal samples that are sampled within said predefined period of time;

d.2. performing phase conjugation of signal samples within said at least one sub-group, giving rise to phase conjugated signal samples; and

d.3. reconstructing said signal by using said signal samples, which have been phase conjugated, as data carriers, giving rise to a reconstructed digital signal;

e) converting said reconstructed digital signal to a reconstructed analog signal; and

f) transmitting said reconstructed analog signal back towards said transmitting source.

49. The method according to claim 48, further comprising providing the signal as one or more of the following:

a) a Radio Frequency (RF) signal;

b) an electromagnetic (EM) signal;

c) an acoustic signal;

d) a seismic signal; and

~~e) a photonic signal.~~

50. The method according to claim 48, further comprising performing the phase conjugation of the signal samples by multiplying said signal samples by a corresponding function.

51. The method according to claim 48, further comprising performing the phase conjugation of the signal samples by applying Fast Fourier Transform (FFT) on said signal samples.

52. The method according to claim 48, further comprising receiving the signal substantially simultaneously by means of at least two antennas.

53. The method according to claim 48, further comprising transmitting the reconstructed digital signal with a delay.

54. The method according to claim 52, further comprising transmitting the reconstructed analog signal back towards the transmitting source, substantially simultaneously by means of the at least two antennas.

55. The method according to claim 48, further comprising transmitting the reconstructed analog signal back towards the transmitting source from each of the at least two antennas irrespective of the location of one antenna with respect to another.

56. The method according to claim 48, further comprising transmitting the reconstructed analog signal back towards the transmitting source from each of the at least two antennas, giving rise to reconstructed analog signals, without calculating phase differences between said reconstructed analog signals.

57. A method of transmitting a signal back towards a transmitting source, the method comprising:

a) providing a corner reflector, connected to at least two antennas;

b) receiving an incoming signal from a transmitting source by means of said at least two antennas;

c) sampling the received signal for a predefined period of time, giving rise to signal samples;

d) storing the signal samples in a given sampling order, at the time scale;

e) reconstructing a signal by using the signal samples as data carriers, giving rise to a reconstructed digital signal;

f) converting said reconstructed digital signal to a reconstructed analog signal; and

g) transmitting said reconstructed analog signal to be reflected from said corner reflector back towards said transmitting source substantially simultaneously from each of said at least two antennas.

58. The method according to claim 57, further comprising providing the signal as one or more of the following:

a) a Radio Frequency (RF) signal;

b) an electromagnetic (EM) signal;

c) an acoustic signal;

d) a seismic signal; and

e) a photonic signal.

59. The method according to claim 57, further comprising transmitting the reconstructed digital signal with a delay.

60. The method according to claim 57, further comprising transmitting the reconstructed analog signal back towards the transmitting source from each of the at least two antennas irrespective of the location of one antenna with respect to another.

61. The method according to claim 57, further comprising transmitting the reconstructed analog signal back towards the transmitting source from each of

~~the at least two antennas, giving rise to reconstructed analog signals, without~~ calculating phase differences between said reconstructed analog signals.

62. A method of receiving incoming signals from a transmitting source by means of at least two antennas and transmitting outgoing signals back towards said transmitting source, substantially simultaneously, through said at least two antennas irrespective of the location of one antenna with respect to another and without calculating phase differences between said outgoing signals.

63. The method according to claim 62, further comprising providing the signal as one or more of the following:
    a) a Radio Frequency (RF) signal;
    b) an electromagnetic (EM) signal;
    c) an acoustic signal;
    d) a seismic signal; and
    e) a photonic signal.

64. The method according to claim 62, further comprising sampling each received incoming signal for a predefined period of time, giving rise to signal samples.

65. The method according to claim 64, further comprising storing the signal samples in a given sampling order, on a time scale.

66. The method according to claim 65, further comprising reconstructing a signal from the stored signal samples, giving rise to a reconstructed digital signal.

67. The method according to claim 64, further comprising:
    a) deciding about at least one sub-group of signal samples that are sampled within the predefined period of time;
    b) inverting the sampling order of the signal samples within the at least one ~~sub-group; and~~

c) reconstructing the signal by using the signal samples, which have the inverted sampling order, as data carriers, giving rise to a reconstructed digital signal.

68. The method according to claim 64, further comprising:

a) deciding about at least one sub-group of signal samples that are sampled within the predefined period of time;

b) performing phase conjugation of the signal samples within said at least one sub-group; and

c) reconstructing the signal by using said signal samples, which have been phase conjugated, as data carriers, giving rise to a reconstructed digital signal.

69. The method according to any of claims 66, 67 and 68, further comprising converting the reconstructed digital signal to a reconstructed analog signal to be transmitted.

70. The method according to claim 66, further comprising transmitting the reconstructed analog signal back, substantially simultaneously, towards the transmitting source from the at least two antennas.

71. The method according to claim 70, further comprising transmitting the reconstructed digital signal with a delay.

72. The system according to any of claims 1, 9, 19 and 27, wherein two or more transmitting sources are provided, each transmitting at least one signal and receiving back a corresponding reconstructed signal.

73. The method according to any of claims 41, 48, 57 and 62, further comprising communicating with two or more transmitting sources, each transmitting source transmitting at least one signal and receiving back a corresponding reconstructed signal.

Claims

1. A system configured to transmit a signal back towards a transmitting source, the system comprising:

a) a retro directive apparatus composed of a single corner reflector carrying a plurality of antennas at either surface thereof; and

b) a plurality of communication units each communication unit connected to a corresponding one of the antennas, the communication unit comprising:

b.1.a receiver for receiving a signal from a transmitting source;

b.2. an Analog-to-Digital (A/D) unit for sampling the received signal for a predefined period of time, giving rise to signal samples;

b.3.a digital memory unit for storing the signal samples of said received signal in its memory in a given sampling order, on a time scale;

b.4. a processing unit for reconstructing a signal by using said signal samples as data carriers, giving rise to a reconstructed digital signal;

b.5. a Digital-to-Analog (D/A) unit for converting said reconstructed digital signal to a reconstructed analog signal to be transmitted; and

b.6.a transmitter for transmitting said reconstructed analog signal to be reflected from said corner reflector back towards said transmitting source substantially simultaneously from each of said at least two antenas;

wherein said processing unit for reconstructing a signal is configured to:

decide about at least one sub-group of wideband signal samples, independently of the bandwidth and modulation of said transmitted signal, that are sampled within said predefined period of time;

perform spectral decomposition of signal samples, giving rise to a set of frequency components;

modulate each of said frequency components of said set by means of a modulation unit;

reconstruct said signal by using said signal samples as data carriers, giving rise to a reconstructed digital signal; and modulate said reconstructed digital signals utilizing each of said frequency components of said set, respectively.

2. The system according to claim 1, wherein the digital memory unit is a Digital Radio Frequency Memory (DRFM) unit.
3. The system according to claim 1, wherein the reconstructed digital signal is transmitted with a delay.
4. The system according to claim 1, wherein the processing unit is incorporated within the transmitter.
5. The system according to claim 1, wherein the reconstructed analog signal is transmitted back towards the transmitting source from each of the at least two antennas irrespective of the location of one antenna with respect to another.
6. The system according to claim1, wherein the reconstructed analog signal is transmitted back towards the transmitting source from each of the at least two antennas, giving rise to reconstructed analog signals, without calculating phase differences between said reconstructed analog signals.
7. The system according to claim 1, wherein two or more transmitting sources are provided, each transmitting at least one signal and receiving back a corresponding reconstructed signal.

8. A method of transmitting a radio frequency (RF) signal back towards a transmitting source, the method comprising:

a. providing a retro directive apparatus comprising a single right-angled corner reflector carrying a plurality of at least two antennas;

b. receiving an incoming RF signal from a transmitting source by means of said at least two antennas;

c. sampling the received RF signal for a predefined period of time, giving rise to signal samples;

d. storing the signal samples in a given sampling order, at the time scale;

e. reconstructing a signal by using the signal samples as data carriers, giving rise to a reconstructed digital signal;

f. converting said reconstructed digital signal to a reconstructed analog signal; and

transmitting said reconstructed analog signal to be reflected from said corner reflector back towards said transmitting source substantially simultaneously from each of said at least two antennas;

wherein the signal is reconstructed by:

deciding about at least one sub-group of wideband signal samples, independently of the bandwidth and modulation of said transmitted signal, that are sampled within said predefined period of time;

performing spectral decomposition of signal samples, giving rise to a set of frequency components;

modulating each of said frequency components of said set by means of a modulation unit;

reconstructing said signal by using said signal samples as data carriers, giving rise to a reconstructed digital signal;

modulating said reconstructed digital signals utilizing each of said frequency components of said set, respectively.

9. The method according to claim 8, further comprising transmitting the reconstructed digital signal with a delay.

10. The method according to claim 8, further comprising transmitting the reconstructed analog signal back towards the transmitting source from each of the at least two antennas irrespective of the location of one antenna with respect to another.

11. The method according to claim 8, further comprising transmitting the reconstructed analog signal back towards the transmitting source from each of the at least two antennas, giving rise to reconstructed analog signals, without calculating phase differences between said reconstructed analog signals.

12. The method according to claim 8, further comprising communicating with two or more transmitting sources, each transmitting source transmitting at least one signal and receiving back a corresponding reconstructed signal.

13. The method according to claim 8, wherein reconstructing said signal includes modulating said signal utilizing each of said frequency components of said set, respectively.