instructions may be discussed as executed by a processor, the instructions may be executed simultaneously, serially, or otherwise executed by one or multiple processors.

[0043] Therefore, the present invention is well adapted to attain the ends and advantages mentioned as well as those that are inherent therein. The particular embodiments disclosed above are illustrative only, as the present invention may be modified and practiced in different but equivalent manners apparent to those skilled in the art having the benefit of the teachings herein. Furthermore, no limitations are intended to the details of construction or design herein shown, other than as described in the claims below. It is therefore evident that the particular illustrative embodiments disclosed above may be altered, combined, or modified and all such variations are considered within the scope and spirit of the present invention. The invention illustratively disclosed herein suitably may be practiced in the absence of any element that is not specifically disclosed herein and/or any optional element disclosed herein. While compositions and methods are described in terms of "comprising," "containing," or "including" various components or steps, the compositions and methods can also "consist essentially of" or "consist of" the various components and steps. All numbers and ranges disclosed above may vary by some amount. Whenever a numerical range with a lower limit and an upper limit is disclosed, any number and any included range falling within the range is specifically disclosed. In particular, every range of values (of the form, "from about a to about b," or, equivalently, "from approximately a to b," or, equivalently, "from approximately a-b") disclosed herein is to be understood to set forth every number and range encompassed within the broader range of values. Also, the terms in the claims have their plain, ordinary meaning unless otherwise explicitly and clearly defined by the patentee. Moreover, the indefinite articles "a" or "an," as used in the claims, are defined herein to mean one or more than one of the element that it introduces. If there is any conflict in the usages of a word or term in this specification and one or more patent or other documents that may be incorporated herein by reference, the definitions that are consistent with this specification should be adopted.

CLAIMS

The invention claimed is:

1. A telemetry communication system for communicating wellbore data, comprising:

a downhole transceiver coupled to a pipe string and arranged within a wellbore, the downhole transceiver being configured to retrieve wellbore data and transmit a first uplink signal corresponding to a first component of the wellbore data and a second uplink signal corresponding to a second component of the wellbore data;

a plurality of repeaters coupled to the pipe string and in communication with the downhole transceiver, the plurality of repeaters being configured to receive and simultaneously transmit the first and second uplink signals, wherein transmission of the first uplink signal successively precedes transmission of the second uplink signal through the plurality of repeaters;

a surface transceiver in communication with the plurality of repeaters and configured to receive the first and second uplink signals.

2. The system of claim 1, wherein the first and second uplink signals are separated by one or more repeaters of the plurality of repeaters.

3. The system of claim 1, wherein the first and second uplink signals are separated by a single repeater of the plurality of repeaters.

4. The system of claim 1, wherein the first and second uplink signals are acoustic signals.

5. The system of claim 4, wherein the plurality of repeaters are configured to receive the first and second uplink signals across a first acoustic frequency and transmit the first and second uplink signals across a second acoustic frequency, the first acoustic frequency being different than the second acoustic frequency.

6. The system of claim 4, wherein the plurality of repeaters are configured to receive the first and second uplink signals across a first acoustic frequency and transmit the first and second uplink signals across a second acoustic

frequency, the first acoustic frequency being the same as the second acoustic frequency.

7. The system of claim 1, wherein the first and second uplink signals are electromagnetic signals.

8. The system of claim 1, wherein the downhole transceiver, the plurality of repeaters, and the surface transceiver are communicably coupled to facilitate the synchronization of the transmission of the first and second uplink signals.

9. A method for communicating wellbore data, comprising:

transmitting a first uplink signal with a downhole transceiver coupled to a pipe string arranged within a wellbore, the first uplink signal corresponding to a first component of the wellbore data;

receiving the first uplink signal with a first repeater communicably coupled to the downhole transceiver;

transmitting the first uplink signal with the first repeater to a second repeater communicably coupled to the first repeater;

transmitting a second uplink signal with the downhole transceiver to the first repeater, the second uplink signal corresponding to a second component of the wellbore data;

receiving the first and second uplink signals with a surface transceiver in communication with the first and second repeaters, wherein the first and second uplink signals are simultaneously transmitted between the downhole transceiver and the surface transceiver and transmission of the first uplink signal successively precedes transmission of the second uplink signal.

10. The method of claim 9, wherein transmitting the second uplink signal further comprises separating the first and second uplink signals by one or more repeaters.

11. The method of claim 9, wherein transmitting the second uplink signal further comprises separating the first and second uplink signals by a single repeater.

12. The method of claim 9, further comprising:

determining with the downhole transceiver a size of the first uplink signal and a size of the second uplink signal;

determining with the downhole transceiver a data transmission speed of the first and second repeaters; and

determining with the downhole transceiver when the second uplink signal can be transmitted such that the first and second uplink signals do not collide in transit to the surface transceiver.

13. The method of claim 9, further comprising:

receiving the first and second uplink signals with the first and second repeaters across a first acoustic frequency; and

transmitting the first and second uplink signals with the first and second repeaters across a second acoustic frequency, the first acoustic frequency being different than the second acoustic frequency.

14. The method of claim 9, further comprising:

transmitting a first downlink signal with the surface transceiver;

receiving the first downlink signal with a third repeater communicably coupled to the surface transceiver;

transmitting the first downlink signal with the third repeater to a fourth repeater communicably coupled to the third repeater;

transmitting a second downlink signal with the surface transceiver to the third repeater;

receiving the first and second downlink signals with the downhole transceiver, the downhole transceiver being in communication with the third and fourth repeaters, wherein the first and second downlink signals are simultaneously transmitted between the surface transceiver and the downhole transceiver and transmission of the first downlink signal successively precedes transmission of the second downlink signal.

15. A method of communicating wellbore data, comprising:

transmitting a first uplink signal with a downhole transceiver to a plurality of repeaters communicably coupled to the downhole transceiver, the plurality of repeaters comprising individual repeaters axially spaced

from each other along a length of a pipe string arranged within a wellbore;

successively transmitting the first uplink signal through the individual repeaters;

transmitting a second uplink signal with the downhole transceiver to the plurality of repeaters;

successively transmitting the second uplink signal through the individual repeaters, wherein the first and second uplink signals are simultaneously transmitted through the plurality of repeaters and transmission of the first uplink signal precedes transmission of the second uplink signal; and

receiving the first and second uplink signals with a surface transceiver in communication with the plurality of repeaters.

16. The method of claim 15, further comprising:

determining with the downhole transceiver a size of the first uplink signal and a size of the second uplink signal;

determining with the downhole transceiver a data transmission speed of each of the plurality of repeaters; and

determining with the downhole transceiver when the second uplink signal can be transmitted such that the first and second uplink signals do not collide in transit to the surface transceiver.

17. The method of claim 16, further comprising delaying the successive transmission of the second uplink signal at one or more of the individual repeaters such that the second uplink signal does not collide with the first uplink signal.

18. The method of claim 16, further comprising delaying the transmission of the second uplink signal from the downhole transceiver such that the second uplink signal does not collide with the first uplink signal.

19. The method of claim 15, further comprising separating the first and second uplink signals with a single repeater of the plurality of repeaters.

20. The method of claim 15, further comprising separating the first and second uplink signals with one or more repeaters of the plurality of repeaters.

21. The method of claim 15, further comprising:

receiving the first and second uplink signals with the plurality of repeaters across a first acoustic frequency; and

transmitting the first and second uplink signals with the plurality of repeaters across a second acoustic frequency, the first acoustic frequency being either the same or different than the second acoustic frequency.

22. A method of communicating wellbore data, comprising:

transmitting a first uplink signal with a downhole transceiver to a plurality of repeaters communicably coupled to the downhole transceiver, the plurality of repeaters comprising individual repeaters axially spaced from each other along a length of a pipe string arranged within a wellbore;

successively transmitting the first uplink signal through the individual repeaters while simultaneously transmitting a second uplink signal with the downhole transceiver to the plurality of repeaters, wherein transmission of the first uplink signal precedes transmission of the second uplink signal;

determining with the downhole transceiver a size of each of the first and second uplink signals and a data transmission speed of the first and second repeaters;

determining with the downhole transceiver when the second uplink signal can be transmitted such that the first and second uplink signals do not collide during transmission; and

receiving the first and second uplink signals with a surface transceiver in communication with the plurality of repeaters.

instructions may be discussed as executed by a processor, the instructions may be executed simultaneously, serially, or otherwise executed by one or multiple processors.

[0043] Therefore, the present invention is well adapted to attain the ends and advantages mentioned as well as those that are inherent therein. The particular embodiments disclosed above are illustrative only, as the present invention may be modified and practiced in different but equivalent manners apparent to those skilled in the art having the benefit of the teachings herein. Furthermore, no limitations are intended to the details of construction or design herein shown, other than as described in the claims below. The invention illustratively disclosed herein suitably may be practiced in the absence of any element that is not specifically disclosed herein and/or any optional element disclosed herein. While compositions and methods are described in terms of "comprising," "containing," or "including" various components or steps, the compositions and methods can also "consist essentially of" or "consist of" the various components and steps. All numbers and ranges disclosed above may vary by some amount. Whenever a numerical range with a lower limit and an upper limit is disclosed, any number and any included range falling within the range is specifically disclosed. In particular, every range of values (of the form, "from about a to about b," or, equivalently, "from approximately a to b," or, equivalently, "from approximately a-b") disclosed herein is to be understood to set forth every number and range encompassed within the broader range of values. Also, the terms in the claims have their plain, ordinary meaning unless otherwise explicitly and clearly defined by the patentee. Moreover, the indefinite articles "a" or "an, as used in the claims, are defined herein to mean one or more than one of the element that it introduces. If there is any conflict in the usages of a word or term in this specification and one or more patent or other documents that may be incorporated herein by reference, the definitions that are consistent with this specification should be adopted.

CLAIMS

The invention claimed is:

1. A telemetry communication system for communicating wellbore data, comprising:

a downhole transceiver coupled to a pipe string and arranged within a wellbore, the downhole transceiver being configured to retrieve wellbore data and transmit a first uplink signal corresponding to a first component of the wellbore data and a second uplink signal corresponding to a second component of the wellbore data;

a plurality of repeaters coupled to the pipe string and in communication with the downhole transceiver, the plurality of repeaters being configured to receive and simultaneously transmit the first and second uplink signals, wherein transmission of the first uplink signal successively precedes transmission of the second uplink signal through the plurality of repeaters;

a surface transceiver in communication with the plurality of repeaters and configured to receive the first and second uplink signals wherein the first and second uplink signals are separated by one or more repeaters of the plurality of repeaters.

2. The system of claim 1, wherein the first and second uplink signals are separated by a single repeater of the plurality of repeaters.

3. The system of claim 1, wherein the first and second uplink signals are acoustic signals.

4. The system of claim 3, wherein the plurality of repeaters are configured to receive the first and second uplink signals across a first acoustic frequency and transmit the first and second uplink signals across a second acoustic frequency, the first acoustic frequency being different than the second acoustic frequency.

5. The system of claim 3, wherein the plurality of repeaters are configured to receive the first and second uplink signals across a first acoustic frequency and transmit the first

and second uplink signals across a second acoustic frequency, the first acoustic frequency being the same as the second acoustic frequency.

6. The system of claim 1, wherein the first and second uplink signals are electromagnetic signals.

7. The system of claim 1, wherein the downhole transceiver, the plurality of repeaters, and the surface transceiver are communicably coupled to facilitate the synchronization of the transmission of the first and second uplink signals.

8. A method for communicating wellbore data, comprising:

transmitting a first uplink signal with a downhole transceiver coupled to a pipe string arranged within a wellbore, the first uplink signal corresponding to a first component of the wellbore data;

receiving the first uplink signal with a first repeater communicably coupled to the downhole transceiver;

transmitting the first uplink signal with the first repeater to a second repeater communicably coupled to the first repeater;

transmitting a second uplink signal with the downhole transceiver to the first repeater, the second uplink signal corresponding to a second component of the wellbore data;

receiving the first and second uplink signals with a surface transceiver in communication with the first and second repeaters, wherein the first and second uplink signals are simultaneously transmitted between the downhole transceiver and the surface transceiver and transmission of the first uplink signal successively precedes transmission of the second uplink signal

wherein transmitting the second uplink signal further comprises separating the first and second uplink signals by one or more repeaters.

9. The method of claim 8, wherein transmitting the second uplink signal further comprises separating the first and second uplink signals by a single repeater.

10. The method of claim 8, further comprising:

determining with the downhole transceiver a size of the first uplink signal and a size of the second uplink signal;

determining with the downhole transceiver a data transmission speed of the first and second repeaters; and

determining with the downhole transceiver when the second uplink signal can be transmitted such that the first and second uplink signals do not collide in transit to the surface transceiver.

11. The method of claim 8, further comprising:

receiving the first and second uplink signals with the first and second repeaters across a first acoustic frequency; and

transmitting the first and second uplink signals with the first and second repeaters across a second acoustic frequency, the first acoustic frequency being different than the second acoustic frequency.

12. The method of claim 8, further comprising:

transmitting a first downlink signal with the surface transceiver;

receiving the first downlink signal with a third repeater communicably coupled to the surface transceiver;

transmitting the first downlink signal with the third repeater to a fourth repeater communicably coupled to the third repeater;

transmitting a second downlink signal with the surface transceiver to the third repeater;

receiving the first and second downlink signals with the downhole transceiver, the downhole transceiver being in communication with the third and fourth repeaters, wherein the first and second downlink signals are simultaneously transmitted between the surface transceiver and the downhole transceiver and transmission of the first downlink signal successively precedes transmission of the second downlink signal.

13. A method of communicating wellbore data, comprising:

transmitting a first uplink signal with a downhole transceiver to a plurality of repeaters communicably coupled to the downhole transceiver, the plurality of repeaters comprising individual repeaters axially spaced from each other along a length of a pipe string arranged within a wellbore;

successively transmitting the first uplink signal through the individual repeaters;

transmitting a second uplink signal with the downhole transceiver to the plurality of repeaters;

successively transmitting the second uplink signal through the individual repeaters, wherein the first and second uplink signals are simultaneously transmitted through the plurality of repeaters and transmission of the first uplink signal precedes transmission of the second uplink signal; and

receiving the first and second uplink signals with a surface transceiver in communication with the plurality of repeaters,

said method further comprising separating the first and second uplink signals with one or more repeaters of the plurality of repeaters.

14. The method of claim 13, further comprising separating the first and second uplink signals with a single repeater of the plurality of repeaters.

15. The method of claim 13, further comprising:

determining with the downhole transceiver a size of the first uplink signal and a size of the second uplink signal;

determining with the downhole transceiver a data transmission speed of each of the plurality of repeaters; and

determining with the downhole transceiver when the second uplink signal can be transmitted such that the first and second uplink signals do not collide in transit to the surface transceiver.

16. The method of claim 13, further comprising delaying the successive transmission of the second uplink signal at one or more of the individual repeaters such that the second uplink signal does not collide with the first uplink signal.

17. The method of claim 15, further comprising delaying the transmission of the second uplink signal from the downhole transceiver such that the second uplink signal does not collide with the first uplink signal.

18. The method of claim 13, further comprising:

receiving the first and second uplink signals with the plurality of repeaters across a first acoustic frequency; and

transmitting the first and second uplink signals with the plurality of repeaters across a second acoustic frequency, the first acoustic frequency being either the same or different than the second acoustic frequency.

19. A method of communicating wellbore data, comprising:

transmitting a first uplink signal with a downhole transceiver to a plurality of repeaters communicably coupled to the downhole transceiver, the plurality of repeaters

comprising individual repeaters axially spaced from each other along a length of a pipe string arranged within a wellbore;

successively transmitting the first uplink signal through the individual repeaters while simultaneously transmitting a second uplink signal with the downhole transceiver to the plurality of repeaters, wherein transmission of the first uplink signal precedes transmission of the second uplink signal;

determining with the downhole transceiver a size of each of the first and second uplink signals and a data transmission speed of the first and second repeaters;

determining with the downhole transceiver when the second uplink signal can be transmitted such that the first and second uplink signals do not collide during transmission; and

receiving the first and second uplink signals with a surface transceiver in communication with the plurality of repeaters

wherein transmitting the second uplink signal further comprises separating the first and second uplink signals by one or more repeaters.