configuration of that of the first embodiment (see FIG. 1). Thus, a detailed description is given of the configuration of the receiver 302.

[0027]

The receiver 302 has three reception antennas 61, 62, and 63, which are spatially orthogonal to each other. Three signals received via the three reception antennas 61, 62, and 63 are passed to a polarization rotation circuit 60. The polarization rotation circuit 60 converts the received three signals into two pseudo reception signals (V', H'), which are spatially orthogonal to each other, and outputs the two pseudo reception signals (V', H').

[0028]

In other words, the polarization rotation circuit 60 applies angular weighting on the three reception signals from the reception antennas 61, 62, and 63, to convert the three reception signals into two pseudo reception signals (V',H'). Angular weighting is, for example, Euler angles such that two linearly polarized antennas are virtually formed in the three dimensional space by the reception antennas 61, 62, and 63, which are spatially orthogonal to one another. That is, the polarization rotation circuit 60 operates so that the receiver 302 virtually forms two spatially orthogonal antennas oriented in a freely-selected direction.

[0029]

The pseudo reception signals (V') outputted from the polarization rotation circuit 60 are passed to the multipliers 73 and 83. The pseudo reception signal (H') outputted from the

oscillators included in the transmitter 209 is smaller than that in the transmitter 201 (see FIG. 1) of the first and second embodiments.

In FIG. 9, the carrier frequency cosine oscillators 19 and 29 are illustrated as separate elements. However, because their oscillation frequencies are the same, a single oscillator can be used as the carrier frequency cosine oscillators 19 and 29. This allows the devices to be reduced in size and power consumption.

[0087]

[Tenth Embodiment]

FIGS. 10 and 11 are block diagrams of a radio communication system according to a tenth embodiment of the present invention. Note that, in FIGS. 10 and 11, elements corresponding to those shown in FIGS. 1 to 9 are respectively given the same symbols and duplicated descriptions thereof may be omitted. The radio communication system according to the present embodiment has two transceivers that perform bidirectional communication. In FIGS. 10 and 11, only a transceiver 400, one of the two transceivers, is shown. The transceiver 400 and the not-shown transceiver on the other end have the same configuration except that their spreading codes for transmission are different from each other. That is, the transceiver 400 uses orthogonal codes #1 and #2 as spreading codes for transmission, and the transceiver on the other end uses orthogonal codes #3 and #4 as spreading codes for transmission. Note that the orthogonal codes #1 to #4 are orthogonal to one another.

[0088]

In FIG. 10, the transceiver 400 has a transmission block 401,

CLAIMS

1. A transmitter comprising:

a first transmission block that generates a first radio wave having an information signal modulated thereon and having a plane of polarization that rotates; and

a second transmission block that generates a second radio wave having the information signal modulated thereon and having a plane of polarization that is fixed;

wherein the first transmission block and the second transmission block respectively generate the first radio wave and the second radio wave at the same time.

2. The transmitter of claim 1,

wherein the first transmission block comprises a first superimposing circuit that causes a first orthogonal code to be superimposed on the first radio wave, the first orthogonal code being a spreading code, and

wherein the second transmission block comprises a second superimposing circuit that causes a second orthogonal code to be superimposed on the second radio wave, the second orthogonal code being orthogonal to the first orthogonal code.

3. The transmitter of claim 2,

wherein the second transmission block causes a third orthogonal code to be superimposed on the second radio wave, the third orthogonal code being orthogonal to the first orthogonal code and the second

orthogonal code.

4. The transmitter of claim 1, further comprising a plurality of transmission antennas whose planes of polarizations are spatially orthogonal to one another,

wherein the first transmission block generates the first radio wave via the plurality of transmission antennas, and

wherein the second transmission block generates the second radio wave via the plurality of transmission antennas.

5. The transmitter of claim 1,

wherein the first transmission block uses a plurality of carrier frequencies to generate the first radio wave, such that the first radio wave has a plane of polarization that rotates at a rotational frequency depending on the plurality of carrier frequencies, and

wherein the second transmission block uses the plurality of carrier frequencies to generate the second radio wave.

6. The transmitter of claim 1,

wherein the first transmission block comprises:

a polarization plane rotating oscillator that oscillates at a frequency corresponding to a rotational frequency of the plane of polarization of the first radio wave, and

a carrier oscillator that oscillates at a frequency corresponding to a carrier frequency of the first radio wave, and

wherein the second radio wave has a component with a frequency

equal to the sum of the carrier frequency and the rotational frequency and has a component with a frequency equal to the difference between the carrier frequency and the rotational frequency.

7. The transmitter of claim 1,

wherein the first transmission block comprises:

a first sine oscillator that generates a sine wave of a first frequency;

a first cosine oscillator that generates a cosine wave of the first frequency;

a second sine oscillator that generates a sine wave of a second frequency; and

a second cosine oscillator that generates a cosine wave of the second frequency,

wherein the plane of polarization of the first radio wave rotates at a rotational frequency equal to half the difference between the first and second frequencies, and

wherein the second radio wave has a component with a carrier frequency equal to the first frequency and a component with a carrier frequency equal to the second frequency.

8. The transmitter of claim 1, further comprising:

an information signal generator that generates the information signal;

a synchronization signal generating circuit that generates a synchronization signal; and

a signal switching circuit that selects one of the information signal and the synchronization signal, and passes the selected signal to the first transmission block and the second transmission block.

9. A receiver comprising:

a first receive section that demodulates a first radio wave having an information signal modulated thereon and having a plane of polarization that rotates; and

a second receive section that demodulates a second radio wave having the information signal modulated thereon and having a plane of polarization that is fixed,

wherein the receiver restores the information signal on the basis of the result of reception by the first receive section and the second receive section.

10. The receiver of claim 9,

wherein the first radio wave contains a component of the information signal spread with a first orthogonal code, the first orthogonal code being a spreading code,

wherein the second radio wave contains a component of the information signal spread with a second orthogonal code, the second orthogonal code being a spreading code and being orthogonal to the first orthogonal code, and

wherein the receiver further comprises:

a first despreading section that despreads the result of the demodulation by the first receive section with the first orthogonal

code; and

a second despreading section that despreads the result of the demodulation by the second receive section with the second orthogonal code.

11. The receiver of claim 10,

wherein the second radio wave further contains a component of the information signal spread with a third orthogonal code, the third orthogonal code being a spreading code and being orthogonal to the first orthogonal code and the second orthogonal code, and

wherein the receiver further comprises a third despreading section that despreads the result of the demodulation by the second receive section with the third orthogonal code.

12. The receiver of claim 9, further comprising a plurality of reception antennas whose planes of polarization are spatially orthogonal to one another,

wherein the first receive section receives the first radio wave via one of the plurality of reception antennas, and

wherein the second receive section receives the second radio wave via the one and another of the plurality of reception antennas.

13. The receiver of claim 12,

wherein the first receive section and the second receive section receive the first radio wave and the second radio wave at the same time.

14. The receiver of claim 10, further comprising

a restoration section that restores the information signal on the basis of the difference between an output signal of the first despreading section and an output signal of the second despreading section.

15. The receiver of claim 9, further comprising:

three or more reception antennas whose planes of polarization are spatially orthogonal; and

a polarization rotation circuit that applies weighting on reception signals of the three or more reception antennas to output two pseudo reception signals,

wherein the first receive section receives one of the two pseudo reception signals as the first radio wave, and

wherein the second receive section receives both of the two pseudo reception signals as the second radio wave.