Claims

1. A receiver for receiving a combination signal comprising two separate signal portions whose pulses are shifted relative to each other and/or whose carrier waves have a phase difference,

wherein the receiver is configured to obtain a first series of samples using a first sampling, the first sampling being adjusted to a symbol phase of the first signal portion;

wherein the receiver is configured to obtain a second series of samples using a second sampling, the second sampling being adjusted to a symbol phase of the second signal portion;

wherein the receiver is configured to obtain probabilities of transmission symbols of the first signal portion and probabilities of transmission symbols of the second signal portion for a plurality of sampling times based on the first series of samples and the second series of samples;

wherein the receiver is configured to determine probabilities for symbols of the first signal portion based on samples of the first sampling and estimated or calculated probabilities for symbols of the second signal portion without taking into account inter-symbol interference between transmission symbols of the first signal portion in the samples of the first sampling;

and

wherein the receiver is configured to determine probabilities for symbols of the second signal portion based on samples of the second sampling and estimated or calculated probabilities for symbols of the first signal portion without taking into account inter-symbol interference between transmission symbols of the second signal portion in the samples of the second sampling.

2. The receiver according to claim 1,

wherein sampling times of the first sampling are set to sample an output signal of a signal-adjusted filter such that an output signal portion of the signal-adjusted filter which is based on the first signal portion is sampled substantially free of inter-symbol interference; and

wherein sampling times of the second sampling are set to sample an output signal of a signal-adjusted filter such that an output signal portion of the signal-adjusted filter which is based on the second signal portion is sampled substantially free of inter-symbol interference.

3. The receiver according to claim 1 or 2,

wherein the receiver is configured to adjust the first sampling to the symbol phase of the first signal portion and to the carrier phase of the second signal portion; and

wherein the receiver is configured to adjust the second sampling to the symbol phase of the second signal portion and to the carrier phase of the first signal portion.

4. The receiver according to any of claims 1 to 3,

wherein the receiver is configured to evaluate a probability function describing a probability of a transmission symbol of the first signal portion in the presence of a current sample of the first sampling and in the presence of a superposition due to a sequence of transmission symbols of the second signal portion and in the presence of a noise disturbance to determine the probabilities for transmission symbols of the first signal portion; and

wherein the receiver is configured to evaluate a probability function describing a probability of a transmission symbol of the second signal portion in the presence of a current sample of the second sampling and in the presence of a superposition due to a sequence of transmission symbols of the first signal portion and in the presence of a noise disturbance to determine the probabilities for symbols of the second signal portion.

5. The receiver according to any of claims 1 to 4,

wherein the receiver is configured to evaluate the probability function describing a probability of a transmission symbol of the first signal portion, for a plurality of different superpositions resulting from different sequences of transmission symbols of the second signal portion, and to weight results of the evaluations according to associated probabilities of the respective sequences of transmission symbols of the second signal portion to obtain probability contributions to a probability for a transmission symbol of the first signal portion, and to sum the probability contributions associated to an equal transmission symbol of the first signal portion to obtain the probability for the transmission symbol of the first signal portion;

and/or

wherein the receiver is configured to evaluate the probability function describing a probability of a transmission symbol of the second signal portion, for a plurality of different superpositions resulting from different sequences of transmission symbols of the first signal portion, and to weight results of the evaluations according to associated probabilities of the respective sequences of transmission symbols of the first signal portion to obtain probability contributions to a probability for a transmission symbol of the second signal portion, and to sum the probability contributions associated to an equal transmission symbol of the second signal portion to obtain the probability for the transmission symbol of the second signal portion.

6. The receiver according to any of claims 1 to 5, wherein the receiver is configured to take into account a time-varying contribution of a transmission symbol of the first signal portion resulting from a difference of carrier frequencies of the first signal portion and the second signal portion, in an evaluation of the first probability function describing a probability of a transmission symbol of the first signal portion,

and/or

wherein the receiver is configured to take into account a time-variable contribution of a transmission symbol of the second signal portion resulting from a difference of carrier frequencies of the second signal portion and the first signal portion, in an evaluation of the second probability function describing a probability of a transmission symbol of the second signal portion.

7. The receiver according to any of claims 1 to 6,

wherein the receiver is configured to obtain the probability $p_{1,m}[k]$ for a symbol with transmission symbol index m of the first signal portion according to

$$p_{1,m}[k] = c_{1,\mathrm{sbs}} \sum_{p=0}^{M_2^{L_{\mathrm{dec}}+1}-1} \Pr\{i_1[k] = i_{1,p}\} \mathrm{e}^{-\frac{\left|y_1[k]-(\nu_1 a_{1,m}+i_{1,p})\right|^2}{\nu_3^2}}$$

wherein $c_{1,sbs}$ is a normalization factor;

wherein p is a control variable denoting different superpositions $i_{1,p}$ resulting from different sequences of transmission symbols of the second signal portion;

wherein M_2 is a number of constellation points of the second signal portion;

wherein L_{dec} describes a relevant extent of inter-symbol interference between transmission symbols of the second signal portion;

wherein $\Pr\{i_1[k]=i_{1,p}\}$ describes a probability for the presence of a sequence of transmission symbols of the second signal portion resulting in the superposition $i_{1,p}$;

wherein $y_1[k]$ is a sample of the first sampling at a time step k;

wherein v_1 is a gain factor of the first signal portion;

wherein $a_{1,m}$ is a transmission symbol of the first signal portion with transmission symbol index m, which is a time-variable contribution $a_{1,m}[k]$ in the case of a difference between a carrier frequency of the first signal portion and a carrier frequency of the second signal portion;

wherein $i_{1,p}$ is a superposition resulting from a sequence of transmission symbols of the second signal portion;

where v_3 describes a noise intensity;

and/or

wherein the receiver is configured to obtain the probability $p_{2,m}[k]$ for a symbol with transmission symbol index m of the second signal portion according to

$$p_{2,m}[k] = c_{2,\mathrm{sbs}} \sum_{p=0}^{M_1^{L_{\mathrm{dec}}+1}-1} \Pr\{i_2[k] = i_{2,p}\} \mathrm{e}^{-\frac{\left|y_2[k]-(\nu_2 a_{2,m}+i_{2,p})\right|^2}{\nu_3^2}}$$

wherein $c_{2,sbs}$ is a normalization factor;

wherein p is a control variable denoting different superpositions $i_{2,p}$ resulting from different sequences of transmission symbols of the first signal portion;

wherein M_1 is a number of constellation points of the first signal portion;

wherein L_{dec} describes a relevant extent of inter-symbol interference between transmission symbols of the first signal portion;

wherein $\Pr\{i_2[k]=i_{2,p}\}$ describes a probability for the presence of a sequence of transmission symbols of the first signal portion resulting in the superposition $i_{2,p}$;

wherein $y_2[k]$ is a sample of the second sampling at a time step k;

wherein v_2 is a gain factor of the second signal portion;

wherein $a_{2,m}$ is a transmission symbol of the second signal portion with transmission symbol index m, which is a time-variable contribution $a_{2,m}[k]$ in the case of a difference between a carrier frequency of the second signal portion and a carrier frequency of the first signal portion;

where $i_{2,p}$ is a superposition resulting from a sequence of transmission symbols of the first signal portion;

where v_3 describes a noise intensity.

8. The receiver according to any of claims 1 to 7,

wherein the receiver is configured to obtain an improved estimate of the probabilities of transmission symbols of another one of the two signal portions based on an updated estimate of the probabilities of transmission symbols of one of the two signal portions.

9. A method for receiving a combination signal comprising two separate signal portions whose pulses are shifted relative to each other and/or whose carrier oscillations have a phase difference,

wherein the method comprises obtaining a first series of samples using a first sampling, the first sampling being adjusted to a symbol phase of the first signal portion;

wherein the method comprises obtaining a second series of samples using a second sampling, the second sampling being adjusted to a symbol phase of the second signal portion;

wherein the method comprises obtaining probabilities of transmission symbols of the first signal portion and probabilities of transmission symbols of the second signal portion for a plurality of sampling times based on the first series of samples and the second series of samples;

wherein probabilities for symbols of the first signal portion are determined based on samples of the first sampling and estimated or calculated probabilities for symbols of the second signal portion without taking into account inter-symbol interference between transmission symbols of the first signal portion in the samples of the first sampling;

and

wherein probabilities for symbols of the second signal portion are determined based on samples of the second sampling and estimated or calculated probabilities for symbols of the first signal portion without taking into account inter-symbol interference between transmission symbols of the second signal portion in the samples of the second sampling.

10. A computer program comprising program code for performing the method of claim 9, when the program runs on a computer.