

Method and apparatus for selecting an optimum write parameter, and optical recording medium for use by said method and apparatus

The invention relates to a method for setting an optimum value of a write parameter for use in an optical recording apparatus for writing information on an optical recording medium by means of a radiation beam. The invention also relates to an optical recording apparatus for recording information on an optical recording medium, the apparatus
5 comprises a radiation source for emitting a radiation beam having a controllable value of a write power level for recording information on the recording medium. Additionally, the invention relates to an optical recording medium for recording information by irradiating the recording medium by means of a radiation beam, the recording medium comprising an area containing control information indicative of a recording process whereby information can be
10 recorded on said recording medium.

In an optical recording apparatus it is important to record information on optical recording media with the correct power of the irradiation beam, such as for example a laser beam. Though a media manufacturer can give this correct power in an absolute way (for example, pre-recorded on the disc) environment and apparatus-to-apparatus deviations for
15 every recording medium and recording apparatus combination makes it necessary for reliable optical recording to find the correct power dependent of the recording medium in question. Several optimization power control (OPC) routines for this purpose are known in the field, such as the gamma-OPC (generally used for rewritable media such as for example CR-RW and DVD+/-RW), the beta-OPC (generally used for recordable media such as for example
20 CD-R and DVD+/-R), and the kappa-OPC (for example used for BD-RE/R media).

In WO 02/41306, which is hereby incorporated in the present application by reference and considered part of the present application, methods are described in which an
25 optimum write power of a radiation beam in an optical recording apparatus is set by writing a series of test patterns on the optical recording medium, forming a read signal from the patterns and processing the read signal. Such processing involves fitting a function, preferably a straight line, to parameters obtained from the read signal without having to

perform a differentiation step. One such parameter obtainable from the read signal is the modulation (M). The curve fitting procedure requires one or more power values to define the interval wherein the fitting is to be performed. If the curve fitting results in an first value for a write parameter that does not qualify as the optimum write parameter for some reasons, e.g. out of range of a pre-set value, WO 02/41306 discloses several possible measures to be taken. One such being an iteration procedure, wherein said first value for a write parameter is used to define a second interval wherein the fitting is to be performed. The resulting second write parameter may subsequently be evaluated as an optimum write parameter, e.g. compared to a pre-set range. If the second write parameter does not qualify as the optimum write parameter the iteration may continue on until some pre-set condition is met.

However, an inherent problem for some combinations of optical recording apparatus and optical recording media is that the iteration may need a relative large amount of iteration steps before an optimum write parameter is obtained. Hence, the recording process may be delayed causing some user discomfort. Moreover, in some unfortunate combinations of optical recording apparatus and optical recording media the iteration may not be convergent towards an optimum write parameter. For such cases, the optical recording apparatus will not be able to record on the recording media resulting in a malfunction.

Hence, an improved optical recording apparatus would be advantageous, and in particular a more efficient and/or reliable optical recording apparatus would be advantageous.

Accordingly, the invention preferably seeks to mitigate, alleviate or eliminate one or more of the above-mentioned disadvantages singly or in any combination. In particular, it may be seen as an object of the present invention to provide a method that solves the above mentioned problems of the prior art when obtaining an optimum value of a write parameter for optical recording on an optical media. From said optimum value of a write parameter, an optimum value (P_{opt}) of the write power level (P) may be derived.

This object and several other objects are achieved in a first aspect of the invention by providing a method for setting an optimum value of a write parameter for use in an optical recording apparatus for writing information on an optical recording medium by means of a radiation beam, said method comprising the steps of:

1) writing a series of test patterns on the recording medium, each pattern being written with a different value of a write power level (P) of the radiation beam,

- 2) reading the patterns so as to form corresponding read signal portions (18, 19),
- 3) deriving a value of a read parameter from each read signal portion,
- 4) curve-fitting a function defining a relation between the read parameter and the write power level (P), to associated values of the read parameter and the write power level (P), the curve-fitting function having a initial value of write power level (P_{ini}),
- 5) obtaining a characteristic write power level (P_{char}) from the curve-fitting function, and assessing if the characteristic write power level (P_{char}) qualify as an optimum value of a write parameter, and
- if the characteristic write power level (P_{char}) does not qualify as an optimum value of a write parameter then start
- 6) obtaining one or more characteristic write power levels ($P_{char, n}$) by an iteration procedure where the subsequent initial values of write power level ($P_{ini, n}$), are given by

$$P_{ini, n+1} = A P_{ini, n} + (1-A) P_{char, n} ,$$

where A is a constant, and n is an integer.

The invention is particularly but not exclusively advantageous for obtaining at least one optimum value of a write parameter within relatively short time. Beneficially, problems with non-convergent or unstable iterations are usually avoided. Thus, an improved and efficient method for obtaining a optimum value of a write parameter is provided.

The optimum value represents an optimum value obtained by the method of the present invention, but nevertheless the optimum value of the write parameter found may not be the very best value of the write parameter obtainable, e.g. a local optimum and not a global optimum may be obtained.

The read parameter may be a modulation (M) of the amplitude of a read signal derived from information recorded on the recording medium. This modulation (M) is computed from the following expression

$$M = ((I_H - I_L) / I_H) \cdot 100,$$

where I_H is the highest level of the amplitude and I_L is the lowest level of the amplitude in the read signal derived from reading information recorded on the information carrier comprising longer marks such as, for example, marks having a length of 14 times the channel bit length when Eight-to-Fourteen Modulation Plus (EFM+) coding is employed.

A function for curve-fitting may be of the form

$$P \cdot M = \alpha \cdot (P - \beta),$$

5 wherein α and β have values resulting from the curve-fitting. The characteristic value of the write parameter (P_{char}) for the function may be set to be substantially equal to the value of β times a first multiplication constant (κ). Generally speaking, any function of arbitrary shape that defines a relation between the read parameter and the write power level (P) can be used. However, it should be noted that a straight line could be very easily and accurately curve-
10 fitted. Therefore, arranging the values of the read parameter and of the write power level (P) in such a way that a straight line could be curve-fitted is advantageous. Additionally, the value of β is unambiguously determined from the straight line fitting procedure, which is quite advantageous relative to alternative fitting procedures where several solutions may result.

15 The first multiplication constant (κ) may be read from an area on the recording medium containing control information indicative of a recording process whereby information can be recorded on said recording medium. Thus, the media manufacturer may provide this information on the optical medium. Alternatively, the multiplication constant (κ) may be determined by the user in a calibration procedure.

20 The curve-fitting of the function defining a straight line may be carried out in a predetermined fit range of write power levels, where the position of the predetermined fit range may be determined by the initial value of the write power level (P_{ini}) associated with each curve-fitting function and a range factor (R), where R is a percentage number. The upper limit of the fit range may be given by P_{ini} times $(1+R)$, and the lower limit of the fit
25 range may be given by P_{ini} times $(1-R)$. Values of the range factor (R) may be 10%, 20%, or 30%.

The information indicative of the initial write power level may be read from an area on the recording medium containing control information indicative of a recording process whereby information can be recorded on said recording medium. Thus, the media
30 manufacturer may provide this information on the optical medium in order to facilitate an fast and accurate determination of the optimum write power level (P_{opt}) for recording information for the optical medium in question.

The constant A may be any value between 0 and 1, such as 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, or 0.9. The constant A may have a value in any of the following intervals; 0.1 - 0.4, 0.2 - 0.3, 0.6 - 0.9, or 0.7 - 0.8. Alternatively, the constant A may have a value in any of the following intervals; 0.15 - 0.35, 0.05 - 0.495, 0.01 - 0.499, 0.515 - 0.985, 0.505 - 0.995, or 0.501 - 0.999.

The method of the invention may provide a method for setting an optimum value (P_{opt}) of a write power level (P), of a radiation beam, which method is intended for use in an optical recording apparatus for writing information on an optical recording medium by the radiation beam having the write power level (P), using a method as describe above for setting an optimum value of a write parameter, wherein the optimum value (P_{opt}) of the write power level (P) is set to be equal to the optimum value of the write parameter times a second multiplication constant (ρ). Notice, that this definition of the optimum value (P_{opt}) of the write power level (P) is different from the disclosure of WO 02/41306, i.e. the multiplication constants are defined differently. The optimum value (P_{opt}) of the write power level may be defined as the write power level for which the lowest jitter of the read signal from information recorded on the recording medium is obtained. Additionally, the optimum value (P_{opt}) of the write power level may take into account the stability of the read signal against variations around the optimum value (P_{opt}) of the write power level. The optimum value (P_{opt}) of the write power level may differ depending on the purpose of the recording medium. Thus, the optimum value (P_{opt}) of the write power level for one time recording may be different from the optimum value (P_{opt}) of the write power level for multiple recordings on the same region of the recording medium.

The second multiplication constant (ρ) may be read from an area on the recording medium containing control information indicative of a recording process whereby information can be recorded on said recording medium. Thus, the optical medium manufacturer may under standardized condition determine the second multiplication constant (ρ) and provide this information on the optical medium.

In a second aspect, the invention provides an optical recording apparatus for implementing the method according to the first aspect of the invention, the apparatus comprising:

- a radiation source for emitting a radiation beam having a controllable value of a write power level (P) for recording information on the recording medium,
- a control unit for recording a series of test patterns, each pattern being recorded with a different value of the write power level,

- a read unit for reading the patterns and forming corresponding read signal portions,
- first means for deriving a value of a read parameter from each read signal portion,
- second means for curve-fitting a function defining a relation between the read parameter and the write power level (P), to associated values of the read parameter and the write power level (P), the curve-fitting function having a initial value of write power level (P_{ini}),
- third means for obtaining a characteristic write power level (P_{char}) from the curve-fitting function, and assessing if the characteristic write power level (P_{char}) qualify as an optimum value of a write parameter, and
- if the characteristic write power level (P_{char}) does not qualify as an optimum value of a write parameter then initiate,
- fourth means for obtaining one or more characteristic write power levels ($P_{char, n}$) by an iteration procedure where the subsequent initial values of write power level ($P_{ini, n}$), are given by

$$P_{ini, n+1} = A P_{ini, n} + (1-A) P_{char, n} ,$$

where A is a constant, and n is an integer.

It is particularly beneficial that the present invention may be applied by means already known in the art, though the way of finding the optimum value of a write parameter of the present invention has several advantages relative to the known way of finding the optimum value of a write parameter.

In a third aspect the invention provides an optical recording medium for recording information by irradiating the recording medium by means of a radiation beam, the recording medium comprising an area containing control information indicative of a recording process whereby information can be recorded on said recording medium, the control information comprising values of recording parameters for the recording process, wherein the control information comprises a information indicative of the initial write power level (P_{ini}) for use in the method according to the first aspect of the invention or the apparatus according to the second aspect of the invention.

It is particularly advantageous that the control information may be provided on the recording medium itself as this enable the medium manufacturer to distribute the control information to the user in an efficient manner.

Furthermore, the optical recording medium for recording information by irradiating the recording medium by means of a radiation beam may comprise an area

containing control information indicative of a recording process whereby information can be recorded on said recording medium, the control information comprising values of recording parameters for the recording process, wherein the control information comprises at least one of the constant A, the first multiplication constant (κ) or the second multiplication constant (ρ) for use in the method of the invention.

These and other aspects of the invention will be apparent from and elucidated with reference to the embodiments described hereinafter. The present invention will now be explained, by way of example only, with reference to the accompanying figures, where

Figure 1 is a diagram of an embodiment of an optical recording apparatus according to the invention,

Figure 2 illustrates two read signal portions from two test patterns,

Figure 3 is a graph showing the measured modulation times the write power as a function of the write power and two curve-fitted functions, and

Figure 4 is a flow-chart of a method according to the invention.

Figure 1 shows an optical recording apparatus and an optical recording medium 1 according to the invention. The recording medium 1 has a transparent substrate 2 and a recording layer 3 arranged on it. The recording layer 3 comprises a material suitable for recording information by means of a radiation beam 5. The recording material may be of, for example, the magneto-optical type, the phase-change type, the dye type, metal alloys like Cu/Si or any other suitable material. Information may be recorded in the form of optically detectable regions, also called marks, on the recording layer 3. The apparatus comprises a radiation source 4, for example a semiconductor laser, for emitting a radiation beam 5. The radiation beam is directed to the recording layer 3 via a beam splitter 6, an objective lens 7 and the substrate 2. The recording medium may alternatively be air-incident, the radiation beam then being directly incident on recording layer 3 without passing through a substrate. Radiation reflected from the medium 1 is collected by the objective lens 7 and, after passing through the beam splitter 6, falls on a detection system 8 which converts the incident radiation in the electric detector signals. The detector signals are applied to a circuit 9. The circuit 9 derives several signals from the detector signals, such as a read signal S_R representing the information being read from the recording medium 1. The radiation source

4, the beam splitter 6, the objective lens 7, the detection system 8 and circuit 9 together form a read unit 90.

The read signal from the circuit 9 is processed in a first processor 10 in order to derive signals representing a read parameter from the read signal. The derived signals are fed to a second processor 101 and subsequently to a third processor 102 which processors process a series of values of the read parameter and derive therefrom a value for a write power control signal necessary for controlling the laser power level.

The write power control signal is applied to a control unit 12. An information signal 13, representing the information to be recorded on the recording medium 1, is also fed to the control unit 12. The output of the control unit 12 is connected to the radiation source 4. A mark on the recording layer 3 can be recorded by a single radiation pulse, the power of which is determined by the optimum write power level (P_{opt}) as determined by the processor 102. Alternatively, a mark can also be recorded by a series of radiation pulses of equal or different length and one or more power levels determined by the write power signal.

A processor is understood to mean any means suitable for performing calculations, for example a microprocessor, a digital signal processor, a hard-wired analog circuit or a field programmable circuit. Moreover, the first processor 10, the second processor 101 and third the processor 102 may be separate devices or, alternatively, may be combined into a single device executing all three processes.

Before recording information on the medium 1 the apparatus sets its write power (P) to the optimum value (P_{opt}) by performing a method according to the invention. This method is schematically depicted in the flow-chart shown in Figure 4.

In a first step 41 the apparatus writes a series of test patterns on the medium 1. The test patterns should be selected so as to give a desired read signal. If the read parameter to be derived from the read signal is the modulation (M) of a read signal portion pertaining to a test pattern, the test pattern should comprise marks sufficiently long to achieve a maximum modulation of the read signal portion. When the information is coded according to the so-called Eight-to-Fourteen Modulation (EFM), the test patterns preferably comprise the long I11 marks of the modulation scheme. When the information is coded according to the Eight-to-Fourteen Plus Modulation (EFM+), the test patterns should comprise the long I14 marks of this modulation scheme. When the information is coded according to the so-called 17PP modulation, the test patterns preferably comprise the long I8 marks of the modulation scheme. Each test pattern is recorded with a different write power level (P). The range of powers can be selected on the basis of an indicative power level (P_{ini}) recorded as control

information on the recording medium. Subsequent test patterns may be recorded with a step-wise increased write power level (P) under the control of the control unit 12. The test patterns may be written anywhere on the recording medium. They can alternatively be written in specially provided test areas on the recording medium.

5 In a second step 42 the recorded test patterns are read by the read unit 90 so as to form a read signal S_R . Figure 2 shows the read signal portions 18 and 19 obtained from two test patterns written at two different write power levels. The patterns shown comprise a short mark, a long mark and a short mark, as denoted by the signal parts 15, 16 and 17, respectively, in both the read signal portion 18 and the read signal portion 19. An actual
10 pattern may comprise a few hundred marks of different or equal length.

In a third step 43 the processor 10 derives from the read signal S_R a read parameter for each read signal portion. A possible read parameter is the ratio of the lowest level of the amplitude of a read signal portion (for read the signal portion 18 indicated by 'a' in Figure 2) to the maximum level of the amplitude of the same read signal portion (indicated
15 by 'b'). A preferred read parameter is the modulation (M), being the ratio of the maximum peak-to-peak value of a read signal, indicated by 'c', to the maximum amplitude 'b' of the read signal portion.

In a fourth step 44 the processor 101 fits a function to associated values of the read parameter and the write power level (P). The function defines a relation between the
20 read parameter and the write power level (P). As input for a curve fitting function a corresponding initial value of write power level (P_{ini}) is provided. The write power can be taken from the value of the write power control signal during the recording of the test patterns or, alternatively, from a measurement of the radiation power. The curve-fitting function may be of many different mathematical forms readily available for a person skilled
25 in the art. Thus, a curve, e.g. a polynomial, may be fitted to the power levels around the initial write power level (P_{ini}) in question.

In Figure 3 a graph with a preferred embodiment of the curve-fitting procedure is shown.

The vertical axis indicates the write power (P) times the modulation (M),
30 whereas the horizontal axis indicates the write power (P). Each of the points 51 represents a pair of values for the measured modulation (M) times the write power (P) and the write power (P), respectively.

In the preferred embodiment of Figure 3 an initial write power level $P_{ini,1}$ is shown. In a pre-defined interval around the initial write power level $P_{ini,1}$, indicated

schematically by the arrow 52, the measured points 51 of the graph in Figure 3 is fitted to a function of the form

$$P \cdot M = \alpha \cdot (P - \beta),$$

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where α and β are fitting constants. The fitting function is a straight line 53 in the graph of Figure 3. The values of β correspond to the intersection 54 of the line 53 with the horizontal axis. The straight line 53 and the associated constants α and β , are to be found by the least-square method or other appropriate mathematical methods.

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The interval 52 may be defined as a range fraction (R) of the initials write power levels (P_{ini}), e.g. 10%, 20%, 30% or 40% of the initials write power levels (P_{ini}), but could also be a pre-defined constant, e.g. 0.1 or 0.2 mW.

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In a fifth step 45 the processor 102 performs a pre-defined procedure in order to derive a characteristic write power level (P_{char}) from the curve-fitting function of the fourth step. Hence, the characteristic write power level (P_{char}) thereby has an associated initial value of the write power level (P_{ini}). In the preferred embodiment the characteristic value of the write power level (P_{char}) is given by

$$P_{char} = \kappa \cdot \beta,$$

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where κ is a first multiplication constant. κ is read from the optical recording medium (1). As the value of β is dependent on the initial value of the write power level (P_{ini}) the characteristic value of the write power level (P_{char}) is a function of the initial write power level (P_{ini}) in question. In order to assess if the found characteristic value of the write power level (P_{char}) is an optimum value a pre-defined procedure is performed where the just obtained characteristic value of the write power level (P_{char}) is evaluated under said pre-defined procedure. Hence, the characteristic value of the write power level (P_{char}) can be compared to a certain interval of allowed values and/or compared to certain set of fixed values.

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In the most preferred embodiment, the characteristic value of the write power level (P_{char}) is compared to the corresponding initial value of the write power level (P_{ini}) by evaluating the numerical difference between the characteristic value of the write power level (P_{char}) and the corresponding initial value of the write power level (P_{ini}). If said numerical difference is below a certain threshold level, such as 0.1 mW, 0.05 mW, 0.01 mW or 0.005

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mW, the characteristic value of the write power level (P_{char}) is considered an optimum value and the method of invention is terminated in the step marked 47 where the write procedure is initiated. Said threshold level is advantageously dependent on the power stepping resolution of the writing laser, where the power stepping resolution may be given by the difference
 5 between consecutive laser power levels during power calibration, i.e. the power difference between the points 51 on the horizontal axis in Figure 3. However, if the characteristic value of the write power level (P_{char}) is not an optimum value according to said pre-defined procedure a sixth step 46 is initiated.

Numerous different evaluation schemes of the characteristic value of the write
 10 power level (P_{char}) are readily available to the skilled person in the art, including statistical methods beneficial for reducing the sensitivity of the comparison by inherent scattering of the measured values.

In a sixth step 46 the processor 102 performs a pre-defined procedure for starting an iteration procedure with the aim of finding an improved characteristic value of the
 15 write power level (P_{char}) that meets the conditions of the fifth step 45, i.e. a characteristic value of the write power level (P_{char}) that is an optimum value. This is done by an iteration scheme or procedure where the subsequent initial values of write power level ($P_{\text{ini}, n}$), are given by

$$P_{\text{ini}, n+1} = A P_{\text{ini}, n} + (1-A) P_{\text{char}, n},$$

where A is a constant, preferably between 0 and 1, and n is an integer.

In Figure 3, this is schematically illustrated by $P_{\text{ini}, 2}$ which is given by the above iteration formula with n equal to 1. By the same procedure given in the fourth step 44,
 25 the measured values 51 of the modulation (M) times power (P) are fitted in a pre-defined interval around $P_{\text{ini}, 2}$ indicated by the arrow 55. Thus, a straight line 56 is obtained, the straight line 56 intersecting with the horizontal axis in the point 57 having the value β_2 . From β_2 a new characteristic value of the write power level ($P_{\text{char}, 2}$) is obtained, which is subsequently assessed as an optimum value according to fifth step 45 of the invention. If the
 30 obtained characteristic value of the write power level ($P_{\text{char}, 2}$) is not an optimum value, yet another iteration step with may be taken in order to obtain another characteristic value of the write power level ($P_{\text{char}, 3}$) and evaluate if $P_{\text{char}, 3}$ qualify as an optimum value. Henceforth, the iteration may proceed until an optimum value is obtained.

Thus, for each characteristic value of the write power level ($P_{\text{char}, i}$) obtained, an assessment is made in the fifth step 45. The loop between the fifth step 45 and the sixth step 46 is preferably continued until an optimum value is obtained, but a pre-defined stop procedure may also break the loop if an optimum value is not obtained after a relatively large number of iteration loops.

Numerical calculations have shown that the present invention enables a relatively faster and more stable iteration process for finding a characteristic value of the write power level (P_{char}) that is optimum. Thus, usually just a few iteration steps are needed, and non-convergence is seldomly observed.

Subsequently, an optimum value (P_{opt}) of the write power level (P), of the radiation beam 5 shown in Figure 1 can be found. The optimum value (P_{opt}) of the write power level (P) is set to be equal to the optimum value of the write parameter times a second multiplication constant (ρ);

$$P_{\text{opt}} = \rho \cdot P_{\text{char}}.$$

Hence, an optimum value (P_{opt}) of the write power level (P) for writing information on the optical recording media is obtained.

It is contemplated that the values of the constants, i.e. A , ρ and κ , may be varied to find an optimum value of the write parameter, possibly to evaluate the stability of one or more found optimum value(s) of the write parameter. Similar, the range fraction (R) may be varied in an iterative manner to assess the found optimum value of the write parameter and its stability.

Although the present invention has been described in connection with the specified embodiments, it is not intended to be limited to the specific form set forth herein. Rather, the scope of the present invention is limited only by the accompanying claims. In the claims, the term comprising does not exclude the presence of other elements or steps. Additionally, although individual features may be included in different claims, these may possibly be advantageously combined, and the inclusion in different claims does not imply that a combination of features is not feasible and/or advantageous. In addition, singular references do not exclude a plurality. Thus, references to "a", "an", "first", "second" etc. do not preclude a plurality. Furthermore, reference signs in the claims shall not be construed as limiting the scope.

CLAIMS:

1. A method for setting an optimum value of a write parameter for use in an optical recording apparatus for writing information on an optical recording medium (1) by means of a radiation beam (5), the method comprising the steps of:
 - 1) writing a series of test patterns on the recording medium, each pattern being written with a different value of a write power level (P) of the radiation beam,
 - 2) reading the patterns so as to form corresponding read signal portions (18, 19),
 - 3) deriving a value of a read parameter from each read signal portion,
 - 4) curve-fitting a function defining a relation between the read parameter and the write power level (P), to associated values of the read parameter and the write power level (P), the curve-fitting function having a initial value of write power level (P_{ini}),
 - 5) obtaining a characteristic write power level (P_{char}) from the curve-fitting function, and assessing if the characteristic write power level (P_{char}) qualify as an optimum value of a write parameter, and
 - if the characteristic write power level (P_{char}) does not qualify as an optimum value of a write parameter then start
 - 6) obtaining one or more characteristic write power levels ($P_{char, n}$) by an iteration procedure where the subsequent initial values of write power level ($P_{ini, n}$), are given by

$$P_{ini, n+1} = A P_{ini, n} + (1-A) P_{char, n} ,$$

where A is a constant, and n is an integer.

2. A method according to claim 1, wherein the read parameter is a modulation (M) of the amplitude of a read signal derived from information recorded on the recording medium (1).
3. A method according to claim 2, wherein a curve-fitting functions is of the form $P \cdot M = \alpha \cdot (P - \beta)$, wherein α and β have values resulting from the curve-fitting, and

wherein the characteristic value of the write parameter (P_{char}) for the at least one function is set to be substantially equal to the value of β times a first multiplication constant (κ).

4. A method according to claim 3, wherein the first multiplication constant (κ) is read from an area on the recording medium (1) containing control information indicative of a recording process whereby information can be recorded on said recording medium.

5. A method according to claim 3, wherein the curve-fitting of the function defining a straight line is carried out in a predetermined fit range of write power levels.

6. A method according to claim 5, wherein the position of the predetermined fit range is determined by the initial value of the write power level (P_{ini}) associated with each curve-fitting function and a range factor (R).

7. A method according to claim 1, wherein the constant A is between 0 and 1.

8. A method for setting an optimum value (P_{opt}) of a write power level (P), of a radiation beam, which method is intended for use in an optical recording apparatus for writing information on an optical recording medium (1) by the radiation beam (5) having the write power level (P), using a method as claimed in claim 1 for setting an optimum value of a write parameter, wherein the optimum value (P_{opt}) of the write power level (P) is set to be equal to the optimum value of the write parameter times a second multiplication constant (ρ).

9. A method according to claim 8, wherein the second multiplication constant (ρ) is read from an area on the recording medium (1) containing control information indicative of a recording process whereby information can be recorded on said recording medium.

10. An optical recording apparatus for implementing the method according to claim 1, the apparatus comprising:

- a radiation source (4) for emitting a radiation beam (5) having a controllable value of a write power level (P) for recording information on the recording medium,
- a control unit (12) for recording a series of test patterns, each pattern being recorded with a different value of the write power level,
- a read unit (90) for reading the patterns and forming corresponding read signal portions

(18,19),

- first means (10) for deriving a value of a read parameter from each read signal portion,
 - second means (101) for curve-fitting a function defining a relation between the read parameter and the write power level (P), to associated values of the read parameter and the write power level (P), the curve-fitting function having a initial value of write power level (P_{ini}),

- third means (102) for obtaining a characteristic write power level (P_{char}) from the curve-fitting function, and assessing if the characteristic write power level (P_{char}) qualify as an optimum value of a write parameter, and

if the characteristic write power level (P_{char}) does not qualify as an optimum value of a write parameter then initiate,

- fourth means (102) for obtaining one or more characteristic write power levels ($P_{char, n}$) by an iteration procedure where the subsequent initial values of write power level ($P_{ini, n}$), are given by

$$P_{ini, n+1} = A P_{ini, n} + (1-A) P_{char, n} ,$$

where A is a constant, and n is an integer.

11. An optical recording medium (1) for recording information by irradiating the recording medium by means of a radiation beam (5), the recording medium comprising an area containing control information indicative of a recording process whereby information can be recorded on said recording medium, the control information comprising values of recording parameters for the recording process, wherein the control information comprises a information indicative of the initial write power level (P_{ini}) for use in the method as claimed in claim 1 or the apparatus as claimed in claim 10.

12. An optical recording medium (1) for recording information by irradiating the recording medium by means of a radiation beam (5), the recording medium comprising an area containing control information indicative of a recording process whereby information can be recorded on said recording medium, the control information comprising values of recording parameters for the recording process, wherein the control information comprises at least one of the constant A, the first multiplication constant (κ) or the second multiplication

constant (ρ) for use in the method as claimed in claim 1 or as claimed in claim 3 or as claimed in claim 8, respectively.