CLAIMS

1. A spectrum adjustment method for an optical transmission system, comprising:

taking a goal of providing at least one available idle frequency band for a first wavelength channel desired to be created, generating a spectrum adjustment scheme based on frequency band information of a second wavelength channel currently used by a transmitting-end and receiving-end device corresponding to the first wavelength channel in the optical transmission system, wherein the spectrum adjustment scheme is used to characterize frequency band adjustment information of a second wavelength channel that needs to be adjusted;

sending an adjustment instruction to the transmitting-end and receiving-end device based on the spectrum adjustment scheme,

wherein the step of generating the spectrum adjustment scheme comprises:

determining whether a frequency band width of the first wavelength channel is greater than a sum of widths of all unused frequency bands;

if the frequency band width of the first wavelength channel is less than or equal to the sum of the widths of all the unused frequency bands, determining whether the frequency band width of the first wavelength channel is less than or equal to a largest frequency band width of the unused frequency bands;

if the frequency band width of the first wavelength channel is greater than the largest frequency band width of the unused frequency bands, for each frequency band in at least part of the unused frequency bands, taking a goal of expanding the respective frequency band to a frequency band of the first wavelength channel, generating the spectrum adjustment scheme corresponding to the respective frequency band.

2. The method according to claim 1, further comprising:

determining feasibility of the spectrum adjustment scheme based on an adjustment capability of the transmitting-end and receiving-end device, and eliminating an unfeasible spectrum adjustment scheme; and/or

determining whether the spectrum adjustment scheme meets a pre-entered constraint condition, and eliminating a spectrum adjustment scheme that does not meet the constraint condition.

3. The method according to claim 2, further comprising:

performing index evaluation on a retained spectrum adjustment scheme, wherein an evaluated index comprises an amount of the to-be-adjusted second wavelength channel and/or a sum of a to-be-adjusted frequency of the to-be-adjusted second wavelength channel involved in the retained spectrum adjustment scheme;

selecting a spectrum adjustment scheme from the retained spectrum adjustment scheme based on an index evaluation result.

4. The method according to claim 1, further comprising:

obtaining intention information, wherein the intention information comprises at least one of identification information of the transmitting-end and receiving-end device, a transmission rate of the first wavelength channel, and a frequency band width of the first wavelength channel; and/or

obtaining constraint information, wherein the constraint information comprises at least one of a frequency band interval of the first wavelength channel, a priority of a frequency band where the first wavelength channel is located, a maximum value of a frequency band of the to-be-adjusted second wavelength channel involved in the spectrum adjustment scheme, a maximum frequency value of an adjustment step involved when the spectrum adjustment scheme is executed, and an adjustment range of a center frequency of a laser of the transmitting-end and receiving-end device;

wherein the step of generating the spectrum adjustment scheme comprises: generating the spectrum adjustment scheme based on the frequency band information of the second wavelength channel currently used by the transmitting-end and receiving-end device, the intention information and/or the constraint information.

5. The method according to claim 1, wherein the step of sending the adjustment instruction to the transmitting-end and receiving-end device based on the spectrum adjustment scheme comprises:

sending a first instruction for expanding a frequency band width of the second wavelength channel to the transmitting-end and receiving-end device;

in response to receiving a message that the first instruction is executed successfully, sending a second instruction for adjusting a laser frequency to the transmitting-end and

receiving-end device to prompt the transmitting-end and receiving-end device to adjust the laser frequency to a target value; and

sending a third instruction for reducing the frequency band width of the second wavelength channel to a pre-adjustment frequency band width to the transmitting-end and receiving-end device after the transmitting-end and receiving-end device adjust the laser frequency to the target value.

6. The method according to claim 5, wherein the step of sending the second instruction for adjusting the laser frequency to the transmitting-end and receiving-end device comprises:

sending the second instruction to a first electrical-layer device located at a transmitting-end and a second electrical-layer device located at a receiving-end, of the transmitting-end and receiving-end device respectively, wherein an adjustment range of the laser frequency characterized by the second instruction does not exceed a first value;

sending, after both the first electrical-layer device and the second electrical-layer device have executed the second instruction, the second instruction to the first electrical-layer device and the second electrical-layer device respectively again until both the first electrical-layer device and the second electrical-layer device have the laser frequency adjusted to the target value.

7. A spectrum adjustment method for an optical transmission system, comprising:

expanding a frequency band width of a wavelength channel currently used, based on frequency band adjustment information of the wavelength channel that is characterized by a spectrum adjustment scheme;

adjusting a laser frequency in a transmitting-end and receiving-end device corresponding to the wavelength channel so that a frequency of an optical signal emitted by an adjusted laser is within a frequency band range of the adjusted wavelength channel; and

reducing the frequency band width of the wavelength channel to a pre-adjustment frequency band width,

wherein the step of adjusting the laser frequency in the transmitting-end and receiving-end device corresponding to the wavelength channel comprises:

adjusting the laser frequency in the transmitting-end and receiving-end device to a target value through one or more adjustments, so that the frequency of the optical signal

emitted by the respective laser in the transmitting-end and receiving-end device is within the frequency band range of the adjusted wavelength channel, wherein an adjustment range of a center frequency of a laser in the transmitting-end and receiving-end device in each adjustment process does not exceed a first value, and a next round of adjustment is performed after both of a first electrical-layer device located at a transmitting-end and a second electrical-layer device located at a receiving-end, of the transmitting-end and receiving-end device perform an adjustment of the laser frequency.

8. A network management system, comprising a spectrum adjustment scheme generating device, an instruction generating device, and a communication device,

wherein the spectrum adjustment scheme generating device is configured to: take a goal of providing at least one available idle frequency band for a first wavelength channel desired to be created, generate a spectrum adjustment scheme based on frequency band information of a second wavelength channel currently used by a transmitting-end and receiving-end device corresponding to the first wavelength channel in an optical transmission system, wherein the spectrum adjustment scheme is used to characterize frequency band adjustment information of a second wavelength channel that needs to be adjusted;

the instruction generating device is configured to generate an adjustment instruction for execution by the transmitting-end and receiving-end device based on the spectrum adjustment scheme;

the communication device is configured to send the adjustment instruction to the transmitting-end and receiving-end device,

wherein the step of generating the spectrum adjustment scheme comprises:

determining whether a frequency band width of the first wavelength channel is greater than a sum of widths of all unused frequency bands;

if the frequency band width of the first wavelength channel is less than or equal to the sum of the widths of all the unused frequency bands, determining whether the frequency band width of the first wavelength channel is less than or equal to a largest frequency band width of the unused frequency bands;

if the frequency band width of the first wavelength channel is greater than the largest frequency band width of the unused frequency bands, for each frequency band in at least part

of the unused frequency bands, taking a goal of expanding the respective frequency band to a frequency band of the first wavelength channel, generating the spectrum adjustment scheme corresponding to the respective frequency band.

9. A computing device, comprising:

a processor; and

a memory, which stores thereon executable codes, wherein when the executable codes are executed by the processor, the processor is caused to execute the method according to claim 1.

10. A non-transitory machine-readable storage medium, which stores thereon executable codes, wherein when the executable codes are executed by a processor of an electronic device, the processor is caused to execute the method according to any one of claims 1 to 7.

11. The computing device according to claim 9, wherein the processor is further caused to:

determine feasibility of the spectrum adjustment scheme based on an adjustment capability of the transmitting-end and receiving-end device, and eliminate an unfeasible spectrum adjustment scheme; and/or

determine whether the spectrum adjustment scheme meets a pre-entered constraint condition, and eliminate a spectrum adjustment scheme that does not meet the constraint condition.

12. The computing device according to claim 11, wherein the processor is further caused to:

perform index evaluation on a retained spectrum adjustment scheme, wherein an evaluated index comprises an amount of the to-be-adjusted second wavelength channel and/or a sum of a to-be-adjusted frequency of the to-be-adjusted second wavelength channel involved in the retained spectrum adjustment scheme;

select a spectrum adjustment scheme from the retained spectrum adjustment scheme based on an index evaluation result.

13. The computing device according to claim 9, wherein the processor is further caused to:

obtain intention information, wherein the intention information comprises at least one of

identification information of the transmitting-end and receiving-end device, a transmission rate of the first wavelength channel, and a frequency band width of the first wavelength channel; and/or

obtain constraint information, wherein the constraint information comprises at least one of a frequency band interval of the first wavelength channel, a priority of a frequency band where the first wavelength channel is located, a maximum value of a frequency band of the to-be-adjusted second wavelength channel involved in the spectrum adjustment scheme, a maximum frequency value of an adjustment step involved when the spectrum adjustment scheme is executed, and an adjustment range of a center frequency of a laser of the transmitting-end and receiving-end device;

generate the spectrum adjustment scheme based on the frequency band information of the second wavelength channel currently used by the transmitting-end and receiving-end device, the intention information and/or the constraint information.

14. The computing device according to claim 9, wherein the processor is further caused to:

send a first instruction for expanding a frequency band width of the second wavelength channel to the transmitting-end and receiving-end device;

in response to receiving a message that the first instruction is executed successfully, send a second instruction for adjusting a laser frequency to the transmitting-end and receiving-end device to prompt the transmitting-end and receiving-end device to adjust the laser frequency to a target value; and

send a third instruction for reducing the frequency band width of the second wavelength channel to a pre-adjustment frequency band width to the transmitting-end and receiving-end device after the transmitting-end and receiving-end device adjust the laser frequency to the target value.

15. The computing device according to claim 14, wherein the processor is further caused to:

send the second instruction to a first electrical-layer device located at a transmitting-end and a second electrical-layer device located at a receiving-end, of the transmitting-end and

receiving-end device respectively, wherein an adjustment range of the laser frequency characterized by the second instruction does not exceed a first value;

send, after both the first electrical-layer device and the second electrical-layer device have executed the second instruction, the second instruction to the first electrical-layer device and the second electrical-layer device respectively again until both the first electrical-layer device and the second electrical-layer device have the laser frequency adjusted to the target value.

16. A computing device, comprising:

a processor; and

a memory, which stores thereon executable codes, wherein when the executable codes are executed by the processor, the processor is caused to execute the method according to claim 7.