

WHAT IS CLAIMED IS:

1. Apparatus comprising:

a signal processor or processing module configured to:

receive signaling containing information about reflected light off one or

5 more fluorescence species-of-interest in a liquid sample that is swept with
light having a variable frequency range, the information including a
characteristic optical frequency corresponding to a fluorescence species-of-
interest in the liquid, and a characteristic/lifetime optical frequency
corresponding to a distinct fluorescence lifetime in which the fluorescence
10 species-of-interest remains in an excited state; and

provide corresponding signaling containing information about an
identity of the fluorescence species-of-interest detected and distinguished
from overlapping fluorescence species in the liquid using the
characteristic/lifetime optical frequency, based upon the signaling received
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2. Apparatus according to claim 1, wherein the apparatus comprises a light
sensor configured to sense the light across the variable frequency range, and
provide the signaling.

20 3. Apparatus according to claim 2, wherein the light sensor is a linear sensor
array configured to sense the light across the variable frequency range along the
length of a light source providing the light.

4. Apparatus according to claim 1, wherein the apparatus comprises a light source configured to sweep excitation light having an excitation optical wavelength across the variable frequency range to excite the one or more fluorescence species-of-interest.

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5. Apparatus according to claim 4, wherein the light source is a swept-frequency light source, including a quasi-collimated light source.

6. Apparatus according to claim 1, wherein the variable frequency range includes a lock-in frequency that is swept by gradually increasing excitation light from an initial modulation frequency f_i to a final modulation frequency f_f .

7. Apparatus according to claim 1, wherein the variable frequency range includes a mid-point frequency that corresponds to the characteristic/lifetime optical frequency.

8. Apparatus according to claim 1, wherein the apparatus is a swept frequency fluorometer.

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9. A method, comprising:

receiving, with a signal processor or processing module, signaling containing information about reflected light off one or more fluorescence species-of-interest in a liquid sample that is swept with light having a variable frequency range, the

5 information including a characteristic optical frequency corresponding to a fluorescence species-of-interest in the liquid, and a characteristic/lifetime optical frequency corresponding to a distinct fluorescence lifetime in which the fluorescence species-of-interest remains in an excited state; and

providing, with the signal processor or processing module, corresponding
10 signaling containing information about an identity of the fluorescence species-of-interest detected and distinguished from overlapping fluorescence species in the liquid using the characteristic/lifetime optical frequency, based upon the signaling received.

15 10. A method according to claim 9, wherein the method comprises configuring a light sensor to sense the light across the variable frequency range, and provide the signaling.

11. A method according to claim 10, wherein the method comprises
20 configuring the light sensor as a linear sensor array to sense the light across the variable frequency range along the length of a light source providing the light.

12. a method according to claim 9, wherein the method comprises configuring a light source to sweep excitation light having an excitation optical wavelength across the variable frequency range to excite the one or more fluorescence species-of-interest.

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13. A method according to claim 12, wherein the method comprises configuring the light source as a swept-frequency light source, including a quasi-collimated light source.

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14. A method according to claim 9, wherein the variable frequency range includes a lock-in frequency that is swept by gradually increasing excitation light from an initial modulation frequency f_i to a final modulation frequency f_f .

15. A method according to claim 9, wherein the variable frequency range includes a mid-point frequency that corresponds to the characteristic/lifetime optical frequency.

16. A method according to claim 9, wherein the method comprises configuring the signal processor or signal processing module as part of a swept frequency fluorometer.

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17. A swept frequency fluorometer comprising:

a light source configured to provide light on a liquid sample having one or more fluorescence species-of-interest, the light having a variable frequency range with an initial frequency f_i and a final frequency of f_f ;

5 a light sensor configured to sense reflected light off the fluorescence species-of-interest in the liquid sample and provide signaling containing information about the reflected light off the one or more fluorescence species-of-interest in the liquid sample that is swept with the light having the variable frequency range, the information including a characteristic optical frequency corresponding to a
10 fluorescence species-of-interest in the liquid, and a characteristic/lifetime optical frequency corresponding to a distinct fluorescence lifetime in which the fluorescence species-of-interest remains in an excited state; and

a signal processor or processing module configured to:

receive the signaling, and

15 provide corresponding signaling containing information about an identity of the fluorescence species-of-interest detected and distinguished from overlapping fluorescence species in the liquid using
characteristic/lifetime optical frequency, based upon the signaling received.

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18. A swept frequency fluorometer according to claim 17, wherein
- the light source is a swept-frequency light source, including a quasi-collimated light source; and
- the light sensor is a linear sensor array configured to sense the light across
- 5 the variable frequency range along the length of a light source providing the light.