

CLAIMS:

1. An apparatus for analysing a liquid sample comprising particles, comprising:
a first chamber and a second chamber, and an optical path between the first
5 chamber and the second chamber, wherein:
the first chamber is a sample chamber comprising:
a sample space for receiving the sample;
a light input for input of light into the first chamber for interaction with the
sample; and
10 an exit aperture arranged for scattered and/or reflected light to pass
from the first chamber via the optical path to the second chamber;
the second chamber is a detection chamber comprising:
an input aperture for receiving light from the optical path;
and a detector for detecting, or a detector aperture for receiving, light to
15 be detected;
wherein the first chamber and the second chamber provide at least one light
integrating volume, and wherein the first chamber is configured such that in operation
the liquid sample is present in the first chamber and isolated from the second chamber.
- 20 2. An apparatus according to claim 1, wherein at least one of a) or b):
a) the first chamber further comprises a light beam exit port aligned with the
light input and optionally leading to a beam dump;
b) the light input comprises a light input aperture.
- 25 3. An apparatus according to claim 1 or 2, wherein the first chamber is a light
integrating chamber and the second chamber is a light integrating chamber.
4. An apparatus according to any preceding claim, wherein the walls of the first
chamber are reflective.
- 30 5. An apparatus according to any preceding claim, wherein the first chamber is
configured to receive a removable sample cell for containing the sample

6. An apparatus according to claim 5, wherein the sample space is configured such that the removable sample cell substantially fills the sample space when inserted.
7. An apparatus according to claim 5 or 6, wherein the sample cell comprises at least one substantially opaque, reflective wall that includes at least one substantially transparent aperture arranged such that, when the sample cell is received in the first chamber the aperture or at least one of the apertures of the sample cell is aligned with the light input of the first chamber and/or such that the aperture or at least one of the apertures of the sample cell is aligned with the exit aperture of the first chamber.
8. An apparatus according to any preceding claim, wherein the light input and the exit aperture are arranged such that, in operation, at least some, optionally substantially all, of the light from the light input is reflected and/or scattered at least once before passing through the exit aperture.
9. An apparatus according to any preceding claim, wherein walls of the second chamber are reflective such that in operation at least some, optionally substantially all, of the light entering via the optical path undergoes at least one reflection before detection by the detector.
10. An apparatus according to any preceding claim, wherein the walls of the first chamber and/or the second chamber comprise a reflective material, optionally titanium oxide, aluminium, or silver.
11. An apparatus according to any preceding claim, wherein the walls of the first chamber and/or second chamber comprise a diffusive coating configured to produce diffuse light.
12. An apparatus according to any preceding claim, wherein the detector comprises a light receiving element.
13. An apparatus according to claim 12, wherein the arrangement of the optical path and the second chamber defines an optical axis from the input aperture to a point or region on a wall of the second chamber opposing the input aperture, and the light

receiving element of the detector is located in an off-axis position with respect to said optical axis.

14. An apparatus according to any preceding claim, wherein the light input
5 comprises, or is configured to receive light from a light source, optionally a laser and/or an LED.

15. An apparatus according to any preceding claim, wherein the light input
10 comprises, or is configured to receive light from, a light source and the light source is configured to input light with a known modulation.

16. A system for analysing a plurality of liquid samples comprising particles, the system comprising:
a plurality of sample chambers, a detection chamber and a coupling mechanism
15 operable to place a sample chamber of the plurality of sample chambers into a coupled configuration with the detection chamber such that, in the coupled configuration, the apparatus comprises an optical path between said sample chamber and the detection chamber:

wherein each sample chamber comprises:
20 a sample space for receiving a sample of the plurality of liquid samples;
a light input for input of light into the sample chamber for interaction with the sample; and
an exit aperture arranged for the light to pass from the sample chamber via the optical path to the detection chamber when said sample chamber is in the
25 coupled configuration with the detection chamber;
and the detection chamber comprises:
an input aperture for receiving light from the optical path when the sample chamber is in the coupled configuration with the detection chamber.
and a detector for detecting, or a detector aperture for receiving, light to
30 be detected;

wherein said sample chamber and the detection chamber comprise at least one light integrating volume, and wherein the sample chamber is configured such that in operation the liquid sample is present in the sample chamber and isolated from the detection chamber.

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17. A system as claimed in claim 16, wherein the coupling mechanism is operable to sequentially place each sample chamber into the coupling configuration with the detection chamber.
- 5 18. A system as claimed in claims 16 or 17, wherein the coupling mechanism is operable to rotate the sample chambers, optionally, wherein the coupling mechanism comprises a carousel mechanism.
- 10 19. A system as claimed in any of claims 16 to 18, further comprising a driving arrangement arranged to drive the coupling mechanism, optionally, wherein the driving arrangement comprises mechanical or electro-mechanical means.
- 15 20. A method of detecting particles in a liquid sample, comprising inputting light into a sample chamber for interaction with a sample, wherein the sample chamber is or comprises or forms part of an integrating volume that directs substantially all light scattered by the sample to a separate detection chamber; and detecting light received in the detection chamber from the sample chamber to obtain a measurement representative of the presence and/or quantity of particles in the liquid sample.
- 20 21. A method according to claim 20, comprising performing repeating the inputting of light and obtaining of a measurement at a plurality of different times thereby to determine a variation in a property of particles in the sample as a function of time and/or as a function of treatment of the sample.
- 25 22. A method according to claim 20 or 21, wherein at least one of a) or b):
a) the particles comprise micro-organisms;
b) the sample comprises at least one of blood, blood plasma, urine, water, bacterial growth fluid, cerebrospinal fluid (CSF), pus, or joint aspirate
- 30 23. A cuvette or other removable sample container comprising at least one reflective wall and at least one aperture, for entry and exit of light, wherein the cuvette or other removable sample container provides a light integrating volume.

24. A cuvette or other removable sample container configured for reception by the first chamber of the apparatus of any of claims 1 to 15 or for reception by the sample chambers of any of claims 16 to 19.
- 5 25. A sample container for use with one or more detectors and/or detection chambers, the sample container comprising:
- a containing portion for containing a liquid sample;
 - a sample cassette comprising a plurality of sample chambers, and
 - a liquid distribution mechanism for distributing the contained liquid sample from
- 10 the containing portion to the plurality of sample chambers, wherein each of the plurality of sample chambers is configured to be placed into a coupled configuration with the one or more detectors and/or detection chambers.