

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

PCT

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**
(PCT Rule 43*bis*.1)

To:

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Date of mailing
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Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.
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29.09.2017

International Patent Classification (IPC) or both national classification and IPC
INV. G01N21/49

Applicant
MASSETA TECHNOLOGIES LLC

1. This opinion contains indications relating to the following items:

- Box No. I Basis of the opinion
- Box No. II Priority
- Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- Box No. IV Lack of unity of invention
- Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- Box No. VI Certain documents cited
- Box No. VII Certain defects in the international application
- Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA:



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Date of completion of this opinion

see form
PCT/ISA/210

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Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:
 - the international application in the language in which it was filed.
 - a translation of the international application into , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1 (b)).
2. This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))
3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing:
 - a. forming part of the international application as filed:
 - in the form of an Annex C/ST.25 text file.
 - on paper or in the form of an image file.
 - b. furnished together with the international application under PCT Rule 13ter.1(a) for the purposes of international search only in the form of an Annex C/ST.25 text file.
 - c. furnished subsequent to the international filing date for the purposes of international search only:
 - in the form of an Annex C/ST.25 text file (Rule 13ter.1(a)).
 - on paper or in the form of an image file (Rule 13ter.1(b) and Administrative Instructions, Section 713).
4. In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that forming part of the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non obvious), or to be industrially applicable have not been examined in respect of

the entire international application

claims Nos. 10-17

because:

the said international application, or the said claims Nos. relate to the following subject matter which does not require an international search (*specify*):

the description, claims or drawings (*indicate particular elements below*) or said claims Nos. are so unclear that no meaningful opinion could be formed (*specify*):

the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed (*specify*):

no international search report has been established for the whole application or for said claims Nos. 10-17

a meaningful opinion could not be formed without the sequence listing; the applicant did not, within the prescribed time limit:

furnish a sequence listing in the form of an Annex C/ST.25 text file, and such listing was not available to the International Searching Authority in the form and manner acceptable to it; or the sequence listing furnished did not comply with the standard provided for in Annex C of the Administrative Instructions.

furnish a sequence listing on paper or in the form of an image file complying with the standard provided for in Annex C of the Administrative Instructions, and such listing was not available to the International Searching Authority in the form and manner acceptable to it; or the sequence listing furnished did not comply with the standard provided for in Annex C of the Administrative Instructions.

pay the required late furnishing fee for the furnishing of a sequence listing in response to an invitation under Rule 13ter.1(a) or (b).

See Supplemental Box for further details

Box No. IV Lack of unity of invention

1. In response to the invitation (Form PCT/ISA/206) to pay additional fees, the applicant has, within the applicable time limit:
- paid additional fees
 - paid additional fees under protest and, where applicable, the protest fee
 - paid additional fees under protest but the applicable protest fee was not paid
 - not paid additional fees
2. This Authority found that the requirement of unity of invention is not complied with and chose not to invite the applicant to pay additional fees.
3. This Authority considers that the requirement of unity of invention in accordance with Rule 13.1, 13.2 and 13.3 is
- complied with
 - not complied with for the following reasons:
see separate sheet
4. Consequently, this report has been established in respect of the following parts of the international application:
- all parts.
 - the parts relating to claims Nos. 1-9, 18-20

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	<u>8, 9</u>
	No: Claims	<u>1-7, 18-20</u>
Inventive step (IS)	Yes: Claims	
	No: Claims	<u>1-9, 18-20</u>
Industrial applicability (IA)	Yes: Claims	<u>1-9, 18-20</u>
	No: Claims	

2. Citations and explanations

see separate sheet

Box No. VI Certain documents cited

1. Certain published documents (Rules 43*bis*.1 and 70.10)
and / or
2. Non-written disclosures (Rules 43*bis*.1 and 70.9)
see form 210

Box No. VII Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

1 **Mentioned prior art**

2 Reference is made to the following documents:

D1 US 2012/033211 A1 (WANG WILLIAM [TW] ET AL) 9 February
2012 (2012-02-09)

D2 WO 2017/040431 A1 (BRIBBLA DYNAMICS LLC [US]) 9 March
2017 (2017-03-09)

D3 US 2016/091368 A1 (FISH GREGORY ALAN [US] ET AL) 31
March 2016 (2016-03-31)

D4 US 2015/177065 A1 (WU XUECHENG [CN] ET AL) 25 June
2015 (2015-06-25)

D5 US 6 122 042 A (WUNDERMAN IRWIN [US] ET AL) 19
September 2000 (2000-09-19)

D6 WO 2017/184423 A1 (BRIBBLA DYNAMICS LLC [US]) 26
October 2017 (2017-10-26)

D7 WO 2017/184420 A1 (BRIBBLA DYNAMICS LLC [US]) 26
October 2017 (2017-10-26)

3 **Re Item IV**

Lack of unity of invention

3.1 This Authority considers that the application does not meet the requirements
of unity of invention and that there are two inventions covered by the claims
indicated as follows:

- **Invention I** [claims 1-9 and 18-20]: System for investigating a sample and
a corresponding method for operating the system.

- **Invention II** [claims 10-17]: Light emitter.

The reasons for which the inventions are not so linked as to form a single general inventive concept, as required by Rule 13.1 PCT, are as follows.

3.2 The common matter linking together the two inventions [claim 1 and claim 10] can be regarded as: *a light emitter*.

This common matter is known *per se*. However, for sake of completeness, reference is made to document **D1**, which discloses *a light emitter* in a system for investigating a sample (Fig. 5, par. 47).

In particular, **D1** discloses a system comprising:

at least one light emitter that emits light (Fig. 5, par. 47: "light source 30");

a system interface (see Fig. 5: interface between the sample 36 and the element 32) including:

a launch region from which the light emitted by the at least one light emitter is capable of exiting the system (see Fig. 5: launch region 32), wherein the launch region includes a first dimension and a second dimension, the second dimension of the launch region is elongated relative to the first dimension of the launch region, wherein the launch region is configured to form (see Fig. 5: launch region 32), from the light emitted by the at least one light emitter, a first light beam having a second dimension that is elongated relative to a first dimension of the first light beam as the first light beam exits the system (see Fig. 5: the light beam incident on the sample 36, wherein the second dimension of the light beam is the propagation direction of the light beam), and

a detection region through which light is capable of entering the system (see Fig. 5: detection region 32), wherein the detection region includes a first dimension and a second dimension, the second dimension of the detection region elongated relative to the first dimension of the detection region, wherein the second dimension of the launch region is elongated along a same direction that the second dimension of the detection region is elongated (see Fig. 5), and wherein the detection region is configured

to form, from the light entering the system, a second light beam within the system, the second light beam having a second dimension that is elongated relative to a first dimension of the second light beam (see Fig. 5: the light beam incident on the detector 37, wherein the second dimension of the light beam is the propagation direction of the light beam); a detector that detects at least a portion of the second light beam and generates one or more signals indicative of the portion of the second light beam (Fig. 5, par. 47: "sensing module 37"; Fig. 2, par. 34: "sensing module 27 senses the plurality of reflected lights to generate a sensing result related to the object to be diagnosed 26"); and logic that determines one or more sample properties from the one or more signals (Fig. 2, par. 34: "data processing module 28 generates an optical data related to a vertical cross-section of the object to be diagnosed 26 according to the sensing result").

Hence, the subject-matter of **claim 1** is not novel over **D1**.

In addition, **D1** discloses the subject-matter of **claim 2** (see Fig. 5: launch/detection region 32).

- 3.3 Consequently, starting from **D1** the special technical feature associated with **Invention I** can be regarded as [claim 3]: *the second dimension of the detection region is longer than the second dimension of the launch region.*
- The special technical feature of **Invention II** can be regarded as:
one or more waveguides that output the light emitted by the one or more light sources; and
one or more outcouplers that direct the light, output by the one or more waveguides, to a second plane,
wherein the light directed by the one or more outcouplers is a first light beam having different properties relative to the light output by the one or more waveguides, the properties including in-plane launch angles, in-plane launch locations, or both;
wherein the first light beam has a second dimension that is elongated relative to a first dimension of the first light beam.
- Thus, the special technical features of **Inventions I** and **II** are not same special technical features.

3.4 Accordingly, the technical effect associated with **Inventions I** is: allowing to collect more light that may undergo multiple small-angle scattering events (see par. 67 of the present invention).

The corresponding technical effect of the **Invention II** is: providing a light emitter.

Thus, the special technical features of **Inventions I** and **II** are not corresponding special technical features.

3.5 Hence, the separate **Inventions I** and **II** comprise neither the same, nor corresponding special technical features, so the technical relationship between the subject matter of the separate **Inventions I** and **II** required by Rule 13.2 PCT is lacking and the claims are not so linked as to form a single general inventive concept as required by Rule 13.1 PCT.

Consequently the application does not meet the requirement for unity of invention.

4 **Re Item VIII**

4.1 **Insufficiency of disclosure (Article 5 PCT)**

The invention such as defined in **claims 1** and **18** is not sufficiently disclosed.

Neither the claim nor the description of the present application provides clear instructions on how to select the first and second dimensions of the launch region, detection region and the first and second light beams. In particular, neither the claim nor the description of the present application clearly defines which physical dimensions are meant by the first and the second dimension of the launch and detection region (height, width, length, diagonal, volume, cross-section?) of the first and second light beams (dimensions of the cross-section of the beam or radial and propagation dimensions?). Moreover, there is no clear indication in the claim on how to arrange the launch region, detection region and the sample with respect to each other and which sample property is determined.

Due to this severe lack of clarity, the skilled person is not able to carry out the invention such as defined in **claims 1** and **18**.

4.2 **Certain defects with regard to Article 6 PCT**

4.2.1 The terms "first dimension" and "second dimension" used in **claims 1** and **18** are not clear in the context of the claims. In particular, it is not clear to which physical dimension of the launch and detection region the term "dimension" refers (height, width, length, diagonal, volume, cross-section?). Also in the context of the first and second beam it is not clear to which physical dimension of the beam the term "dimension" refers (dimensions of the cross-section of the beam, radial dimension, propagation dimension?)

4.2.2 From the wording of **claims 1** and **18** it is not clear how the sample is arranged with respect to the system, and in particular with respect to the light emitter and the detector. Moreover, it is not clear which light is detected by the detector (transmitted, scattered, reflected, emitted by the sample?).

In order to meet the requirements of Article 6 PCT, it should have been clarified how the sample is arranged and which light is detected.

In addition, the generic terms/expressions "system" used in **claim 1** and "method for using a system" used in **claim 18** should have been clarified such as to clearly claim a system for sample investigation and a method for investigating a sample.

4.2.3 Due to this severe lack of clarity of **claims 1** and **18** the search was based on a system detecting the light scattered/reflected from a sample and on the interpretation of the second dimension of the light beam being the propagation dimension of the light beam.

4.2.4 **Claim 4** is unclear in that it defines the subject-matter with the reference to the light beam, which is a not part of the system. Moreover, from the part of the claim with wording "the second light beam meets a change in angle criteria" it is not clear how the change in the angle criteria is created.

In addition, **claim 4** does not meet the requirements of Article 6 PCT because the claim attempts to define the subject-matter by in terms of the **result to be achieved**, since it only mentions an arbitrary optics without defining which features of the optics make it suitable for selectively allowing a portion of the second light beam to the detector.

4.2.5 **Claim 5** is defined by the reference to the change in the angle criteria and a targeted optical path. However, it is not clear how the change in the angle criteria and/or a certain optical path is created. In particular, it is not clear which technical features of the system allow for the setting of a certain optical path and/or for the selection of a certain change in angle criteria.

4.2.6 **Claim 6** does not meet the requirements of Article 6 PCT because the matter for which protection is sought is not clearly defined. The claim attempts to define the subject-matter by "the detection region forms the second light beam by selectively allowing light, from the light entering the system, that meets a change in angle criteria" in terms of the **result to be achieved**, which merely amounts to a statement of the underlying problem, without providing the technical features necessary for achieving this result.

4.2.7 From the wording of **claim 7** it is not clear where the reflector is located with respect to the light source, the outcouplers and the launch region.

In addition, **claim 7** claims a specific arrangement of the light source and the detector with respect to the reflector. However, the instructions provided in the claim as well as in the description of the present application are not sufficient to carry out the system of claim 7, especially since the arrangement is defined with reference to a total of a targeted optical path length, which is not clearly defined. Thus, **claim 7** is not sufficiently disclosed (Art. 5 PCT)

5 Re Item V

Reasoned statement with regard to novelty and inventive step

The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of **claims 1 - 6** and **18 - 20** is not new in the sense of Article 33(2) PCT, and because the subject-matter of **claims 1 - 9** and **18 - 20** does not involve an inventive step in the sense of Article 33(3) PCT.

5.1 **Independent system claim 1**

- 5.1.1 The subject-matter of **claim 1** is not novel over **D1** (see the comments given in unit 3.2 of this opinion).
- 5.1.2 The subject-matter of **claim 1** is also not novel over **D2**, which discloses a system comprising *at least one light emitter that emits light* [Fig. 13: light source 1302]; *a system interface* [Fig. 13: interface between the system 1300 and the sample 1320]; *a launch region* [Fig. 13: input region 1382], *a first light beam having a second dimension that is elongated relative to a first dimension of the first light beam as the first light beam exits the system* [Fig. 13: light beam 1352, wherein the second dimension of the light beam is the propagation direction of the light beam]; *a detection region* [Fig. 13: optics 1310]; *a second light beam within the system, the second light beam having a second dimension that is elongated relative to a first dimension of the second light beam* [Fig. 13: light beam 1354, 1355, wherein the second dimension of the light beam is the propagation direction of the light beam]; *a detector that detects at least a portion of the second light beam and generates one or more signals indicative of the portion of the second light beam* [Fig. 13: detector array 1330, par. 96: "Detector pixel 1333 can detect light 1366 and can generate an electrical signal indicative of the properties of light 1366"]; *and logic that determines one or more sample properties from the one or more signals* [Fig. 13, par. 96: "Controller 1340 can utilize the signal information measured from light 1354 to determine the reflectivity or concentration of the substance located at location 1357 within sample 1320"].
- 5.1.3 The subject-matter of **claim 1** is also not novel over **D3**, which discloses a system comprising *at least one light emitter that emits light* [Fig. 2B: light sources 202]; *a system interface* [see Fig. 2B: interface between the system and the sample 290]; *a launch region* [Fig. 2B: coupler 204], *a first light beam having a second dimension that is elongated relative to a first dimension of the first light beam as the first light beam exits the system* [Fig. 2B: first light beam 230, wherein the second dimension of the light beam is the propagation direction of the light beam]; *a detection region* [Fig. 2B: region associated to detectors 211-214]; *a second light beam within the system, the second light beam having a second dimension that is elongated relative to a first dimension of the second light beam* [Fig. 2B: second light beam 235, wherein the second dimension of the light beam is the propagation direction of the

light beam]; *a detector that detects at least a portion of the second light beam and generates one or more signals indicative of the portion of the second light beam* [Fig. 2B: detectors 211-214; generating signals is implicit]; *and logic that determines one or more sample properties from the one or more signals* [follows directly from par. 21: "may be used for spectroscopic processes (e.g., determining aspects of an object based on the interaction of the object with electromagnetic radiation, such as light)" or par. 37: "detect characteristics of the media for sensing"].

- 5.1.4 Moreover, also **D4** discloses a system according to **claim 1** comprising *at least one light emitter that emits light* [Fig. 1, par. 45: "laser 45"]; *a system interface* [Fig. 1: interface between the system with elements 4, 5 and the sample 11]; *a launch region* [Fig. 1: launch region 4], *a first light beam having a second dimension that is elongated relative to a first dimension of the first light beam as the first light beam exits the system* [Fig. 1: first beam incident on the sample 11]; *a detection region* [Fig. 1: detection region 5]; *a second light beam within the system, the second light beam having a second dimension that is elongated relative to a first dimension of the second light beam* [Fig. 1: second beam incident on the detector 10]; *a detector that detects at least a portion of the second light beam and generates one or more signals indicative of the portion of the second light beam* [Fig. 1, par. 48: "signal collector 10"; generating signals is implicit]; *and logic that determines one or more sample properties from the one or more signals* [par. 49: "signal processing unit ... obtain the measured values"].

Hence, the subject-matter of **claim 1** is not novel over **D4**.

- 5.1.5 **D5** also discloses a system according to **claim 1** and comprising *at least one light emitter that emits light* [Fig. 2A, col. 12, l. 37: "LEDs 46"]; *a system interface* [Fig. 2A: interface between the element 50, 56 and the sample 32]; *a launch region* [Fig. 2A, col. 12, l. 38: "clear epoxy 50"], *a first light beam having a second dimension that is elongated relative to a first dimension of the first light beam as the first light beam exits the system* [Fig. 2A: first beam incident on the sample 32, wherein the second dimension of the light beam is the propagation direction of the light beam]; *a detection region* [Fig. 2A, col. 12, l. 45: "clear epoxy 56"]; *a second light beam within the system, the second light beam having a second dimension that is elongated relative to a first dimension of the second light beam* [Fig. 2A: second beam incident on

the detector 48, wherein the second dimension of the light beam is the propagation direction of the light beam]; *a detector that detects at least a portion of the second light beam and generates one or more signals indicative of the portion of the second light beam* [Fig. 2A, col. 12, l. 47: "detectors 48"; generating signals is implicit]; *and logic that determines one or more sample properties from the one or more signals* [follows directly from col. 2, l. 61-65: "identification process for "real time" material/object/property identification"].

Hence, the subject-matter of **claim 1** is not novel over **D5**.

5.2 For analogous reasons as for claim 1 also the subject-matter of the independent method **claim 18** is not new in view of any of **D1** to **D5**.

5.3 Dependent **claims 2 - 9, 19** and **20** do not appear to contain any additional features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT with respect to novelty and/or inventive step.

In particular, **claim 2** is not new in view of **D1** (see Fig. 5: launch/detection region 32), **D3** (see Fig. 3: launch/detection region 320) and **D5** (see Fig. 2A: launch region 50, detection region 56).

Claim 3 is not new in view of **D2** (see Fig. 13: launch region 1382, detection region 1310) and **D3** (see Fig. 2B: launch region 204, detection region 211-214) and **D4** (see Fig. 1).

The above-mentioned lack of clarity notwithstanding, the subject-matter of **claims 4 - 6** is not new in view of **D2** (see Fig. 16, par. 120: "optics 1616 ... Aperture 1686 can be capable of selecting light with one or more specific path lengths, angles of incidence, or both and rejecting or attenuating light with other path lengths or angles of incidence ... accepting one or more incident light rays with a path length within a range of path lengths and an angle of incidence within a range of angles, and rejecting optical paths with a path length outside the range of path lengths and with an angle of incidence outside the range of angles"; also from Fig. 13 it is clear that light beams 1354 and 1355 are measured separately).

The subject-matter of **claims 4 - 6** is also not new in view of **D3** (see Figs. 2A, 2B and par. 31: "multiple lenses 221-225 to collect light emitted from the media for sensing 290 at different angles"), and in view of **D4** (par. 48: "the range of detecting rainbow angle is 10°-20°").

Claim 7 is not new in view of **D5** (Fig. 2A, col. 12, l. 39-40: "reflective member;" see also the comments regarding the clarity of the claim provided in unit 4.5 of the opinion).

Claims 8, 9 relate to obvious modifications of the system of **D2** or **D3** and are therefore not inventive.

Claim 19 is not new in view of **D2** (see Fig. 8, par. 64: "Filter 806 can be any filter capable of tuning and selecting a single wavelength", par. 65: "chopper 834 can modulate the intensity of light 854"), **D3** (see Figs. 1A, 1B: modulator array 114, multiplexer 170; and par. 13-17) and in view of **D5** (col. 12, l. 37: "sequentially activated LEDs 46").

It is noted that even switching the light source on and off can be regarded as selectively controlling a parameter of the light source. Thus, the subject-matter of claim 19 is also not new in view of **D1** and **D4**.

Claim 20 is not new in view of **D2** (see Fig. 13, par. 89: "lens 1310 ... capable of changing the behavior and properties of the incoming light", see also Figs 14 - 17), **D3** (see Figs. 2A, 2B and par. 31: "multiple lenses 221-225 to collect light emitted from the media for sensing 290 at different angles") and **D4** (par. 48: "the range of detecting rainbow angle is 10°-20°").

6 **Re Item VI**

With entry into European phase also the intermediate documents **D6** and **D7**, which were published after the filing date of the present application, but have earlier priority date, will become relevant with regard to novelty of **claims 1, 2 - 9** and **18 - 20** (see **D6**: Fig. 2 and par. 29-32; and **D7**: Figs 4A, 4I, 5-7 and par. 67-84, 88-104).

7 **Re Item VII**

Certain defects in the international application

- 7.1 To meet the requirements of Rule 5.1(a)(ii) PCT, the documents **D1 - D5** should have been identified in the description and the relevant background art disclosed therein should have been briefly discussed.
- 7.2 The features of claims are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).
- 7.3 The statements "*incorporate by reference*" in par. 1 should have been deleted (Art. 5 PCT and PCT/GL/ISPE/6, 4.26).