



(51) International Patent Classification:

G01S 7/497 (2006.01) G01S 17/931 (2020.01)  
G01S 7/481 (2006.01)

(21) International Application Number:

PCT/EP2023/065672

(22) International Filing Date:

12 June 2023 (12.06.2023)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

22178678.3 13 June 2022 (13.06.2022) EP

(71) Applicant: **AGC GLASS EUROPE** [BE/BE]; Avenue Jean Monnet 4, 1348 Louvain-la-Neuve (BE).

(72) Inventors: **ARIOUA, Madani**; Rue Louis Blériot 12, 6041 Gosselies (BE). **REMACLE, Sacha**; Rue Louis Blériot 12, 6041 Gosselies (BE). **KHEDR, Mahmoud**; Rue Louis Blériot 12, 6041 Gosselies (BE).

(74) Agent: **AGC GLASS EUROPE**; Rue Louis Blériot 12, 6041 Gosselies (BE).

(81) Designated States (unless otherwise indicated, for every kind of national protection available):

AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CV, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IQ, IR, IS, IT, JM, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, MG, MK, MN, MU, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available):

ARIPO (BW, CV, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SC, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, ME, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

(54) Title: CALIBRATION METHOD FOR AN AUTOMOTIVE GLAZING

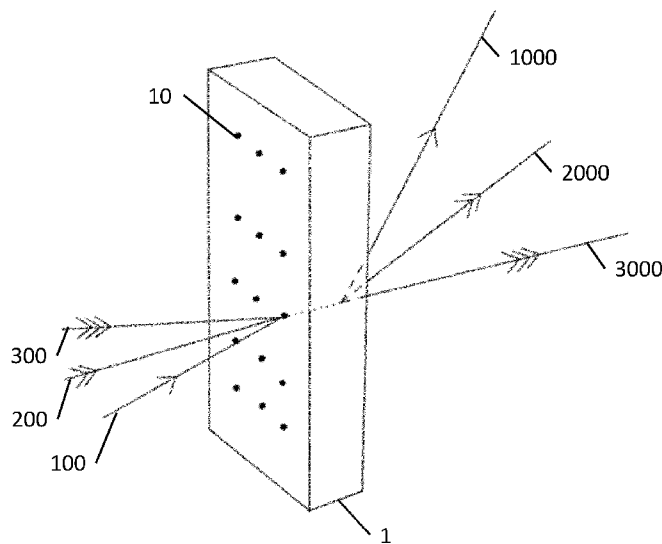


Fig. 1

(57) Abstract: The present invention relates to a method to determine a correction table for an automotive glazing intended to be used in front of a lidar. It also relates to an automotive glazing intended to be used in front of a lidar, the automotive glazing being linked to a correction table as obtained through the method.



**Declarations under Rule 4.17:**

- *as to the identity of the inventor (Rule 4.17(i))*
- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*
- *of inventorship (Rule 4.17(iv))*

**Published:**

- *with international search report (Art. 21(3))*
- *in black and white; the international application as filed contained color or greyscale and is available for download from PATENTSCOPE*

## **Calibration method for an automotive glazing**

### **FIELD OF THE INVENTION**

---

5 [0001] The present invention relates to the field of calibration for a glazing intended to be used in front of a lidar.

### **BACKGROUND OF THE INVENTION**

---

10 [0002] The trend in the automotive industry is to use lidar (for light detection and ranging, sometimes also written ladar) in order to assist the driver, or even to replace the driver for autonomous vehicles. The lidar indeed allows to detect obstacles located near the vehicle and to assess the distance between the vehicle and each obstacle. The current trend is to integrate the lidar inside the vehicle, as it allows to protect the lidar from external environment. The lidar can be mounted behind a window of the vehicle, such as behind the windshield, behind a sidelite (a sidelite is understood as a window placed on the left or the right of a vehicle) or even behind the rearlite (window  
15 at the back of a vehicle). Such kind of mounting is described in WO2018015312A1, WO2018178278A1 or WO2018178284A1. The lidar can also be mounted behind an exterior glass trim element, as described in WO2018015313A1, WO2018178281A1 or WO2018178286A1. An exterior trim element includes bumper, window/door seal, pillar, wheel well, wheel arch, fender, headlight, mirror body and roof cover. Such exterior trim element can also be deployable, meaning it can pop out from the vehicle only when needed. Vehicle manufacturers use these exterior trim elements to add aesthetics, increase function, and add flexibility to the vehicle design. The lidar can also be mounted in a housing placed on the vehicle, the housing being closed by a transparent (to the operating wavelength of the lidar) cover in front of the lidar, as  
20 described in WO2019030106A1.

25 [0003] In order to detect an obstacle and to determine its distance to the vehicle, a lidar emits a signal in the infrared wavelength range in the direction of the object and measures the propagation time round trip of the signal. It illuminates the scene within its field of view and measures the propagation time when signal bounces back to the  
30 lidar. However, the presence of the glazing on the trajectory of the signal generates errors, due to glass imperfections, in the evaluation of the position of the object by the lidar.

**[0004]** Classically, these errors are corrected by calibrating the lidar already installed behind the glazing using calibration charts. In the document DE102017003634, the lidar is calibrated using a fluorescent pattern allowing to film the points of intersection between the target and the signal emitted by the lidar. However, such solution adds a long and costly step during the quality control of the vehicle and uses cumbersome equipment using special patterns having geometric tolerances to control.

**[0005]** WO2021152256A1 describes a method for analyzing a glazing for a correction intended to be used by a lidar configured to emit, according to a given angle of emission, light waves intended to pass through the glazing of the vehicle. It allows to obtain an angular correction map for a lidar by using existing glass characterization method, such as the thickness. However, the thickness evaluation methodology does not address all the glass imperfections, such as local defects, impact of glass curvature, impact of an interlayer in case of a laminated glazing, impact of the use of a wedge, impact of any polarization change.

**[0006]** There is therefore a need to define a method remedying the aforementioned drawbacks.

## **SUMMARY OF THE INVENTION**

---

**[0007]** The present invention concerns a method to determine a correction table for an automotive glazing intended to be used in front of a lidar, the automotive glazing having a representative collection of zones, the method comprising the steps of:

- i. For each zone of the representative collection of zones on the automotive glazing, define at least 3 incident light beams, each of the incident light beam having a vertical component and a horizontal component, the at least 3 incident light beams being produced by a laser diode or an LED;
- ii. For each incident light beam, measure a vertical and a horizontal angles of incidence, based on, respectively, the vertical and the horizontal components of the incident light beam;
- iii. For each component of each incident light beam, measure a vertical and a horizontal beam deviation due to the presence of the automotive glazing and establish a vertical deviation angle table and a horizontal deviation angle table, such measurement being done by a CCD camera connected to a

processing unit;

- iv. For each component of each vertical deviation angle table and each horizontal deviation angle table, interpolate the beam deviation in between the collection of zones which have been measured at step iii.;
- 5 v. Establish a vertical angular transfer function based on the interpolation of all vertical deviation angle tables of respectively the at least 3 vertical components and the at least 3 horizontal components, and a horizontal angular transfer function based on the interpolation of all horizontal deviation angle tables of respectively the at least 3 vertical components and the at
- 10 least 3 horizontal components;
- vi. Compile the angular transfer functions in a single correction table able to be used for calibration of the lidar coupled to the automotive glazing.

**[0008]** The present invention also concerns an automotive glazing intended to be used in front of a lidar, the automotive glazing being linked to a correction table as obtained

15 through the method.

### **BRIEF DESCRIPTION OF THE DRAWINGS**

---

**[0009]** The invention will now be described further, by way of examples, with reference to the accompanying drawings, wherein like reference numerals refer to like elements in the various figures. These examples are provided by way of illustration and not of

20 limitation. The drawings are a schematic representation and not true to scale. The drawings do not restrict the invention in any way. More advantages will be explained with examples.

**[0010]** Fig. 1 illustrates the basic concept of the method of the invention.

**[0011]** Fig. 2a, 2b, and 2c illustrates the vertical component decomposition.

25 **[0012]** Fig. 3a, 3b, and 3c illustrates the horizontal component decomposition.

### **DETAILED DESCRIPTION OF ILLUSTRATIVE EMBODIMENTS**

---

**[0013]** The present invention will be described with respect to particular embodiments and with reference to certain drawings but the invention is not limited thereto but only by the claims.

**[0014]** While some embodiments described herein include some but not other features included in other embodiments, combinations of features of different embodiments are meant to be within the scope of the invention, and form different embodiments, as would be understood by those in the art. For example, in the following claims, any of the claimed embodiments can be used in any combination.

**[0015]** The present invention proposes a method to determine a correction table for an automotive glazing. An automotive glazing refers to a glazing used on a vehicle, and could therefore refer to a glazing used as a window of a vehicle, as a glass trim element or as a cover for a housing placed on a vehicle. A vehicle includes car, van, lorry, motorbike, bus, tram, train, drone, airplane, helicopter and the like.

**[0016]** The glazing is intended to be used in front of a lidar. Lidar is an acronym for "light detection and ranging". It is sometimes called "laser scanning" or "3D scanning". The technology uses eye-safe laser beams to create a 3D-representation of the surveyed environment. Operating wavelength of lidar compatible with the present invention is comprised between 750 and 1650 nm (usually referred to as near-infrared range). More specifically, known operating wavelengths of currently produced lidars compatible with the present invention are 850 nm, 905 nm, 940 nm, 1064 nm, 1310 nm, 1350 nm, 1550 nm, 1650 nm. An acceptable variance of 25 nm around the nominal value of the wavelength may be considered, such that, for example, a wavelength range of 1525 to 1575 nm may be accepted around the nominal value of 1550 nm. The glazing could also be used in front of the combination of a lidar and another optical measurement system, such as a camera, an infrared camera, a radar, distance meter.

**[0017]** The automotive glazing has a representative collection of zones. A zone in this context is to indicate an area (meaning a collection of points) which is illuminated by a light beam. The term "representative" indicates that these zones are selected to cover a comprehensive characterization of the full sample surface.

**[0018]** The first step of the method is to define at least 3 incident light beams for each zone of a representative collection of zones on the automotive glazing. The at least 3 incident light beams could be laser beams or LED beams, and produced by a laser diode or an LED inducing photons in the near infrared range. The at least 3 incident light beams are not necessarily the exact same wavelength as the working wavelength

of the lidar. It is sufficient if these at least 3 incident light beams are in the same wavelength range, usually near infrared wavelength range. Each of the at least 3 incident light beams has a vertical component and a horizontal component. The 3 incident light beams must be identical in term of optical properties (wavelength, polarization, ...) for each zone of the representative collection of zones on the automotive glazing.

**[0019]** The second step of the method is to measure, for each incident light beam, a vertical angle of incidence and a horizontal angle of incidence based on, respectively, the vertical component of the beam and the horizontal component of the incident light beam.

**[0020]** The third step is to measure, for each component of each incident light beam, a vertical beam deviation and a horizontal beam deviation due to the presence of the automotive glazing. This step allows to establish a vertical deviation angle table and a horizontal deviation angle table. Such measurement is done by a CCD camera connected to a processing unit. It views the primary image coming from the light source after it has gone through all the optical components.

**[0021]** The fourth step is to interpolate, for each vertical deviation angle table and each horizontal deviation angle table, the beam deviation in between the collection of zones which have been measured at second step.

**[0022]** The fifth step is to establish a vertical angular transfer function based on the interpolation of all vertical deviation angle tables of respectively the at least 3 vertical components and the at least 3 horizontal components, and a horizontal angular transfer function based on the interpolation of all horizontal deviation angle tables of respectively the at least 3 vertical components and the at least 3 horizontal components.

**[0023]** The sixth step is to compile the angular transfer functions tables in a single correction table able to be used for the calibration of the lidar coupled to the automotive glazing.

**[0024]** According to a preferred embodiment, the at least 3 incident light beams are generated through an optical component intended to split an expanded collimated incident light beam into multiple pencils of rays. An expanded collimated incident light beam is generated via the suitable optical components. Then it is passed through an

optical component (such as an array of micro-lenses or a plate with an arrangement of holes or an optimized diffractive optical element) to break down the incident light beam into multiple pencils of rays in ray optics view. Such optical component is to produce multiple versions of the original incident light beam to have similar incident angle on surface under test. This requires that the light beam source, collimation, and beam expansion system in addition to the optical component/s for beam sampling are always on the same optical axis and well aligned during both on- & off-axis measurements.

**[0025]** The present invention also concerns an automotive glazing intended to be used in front of a lidar. The automotive glazing is linked to a correction table as described previously.

**[0026]** According to a preferred embodiment, the automotive glazing is a windshield, sidelite or rearlite of a vehicle. According to another preferred embodiment, the automotive glazing is an external glass trim element. According to another preferred embodiment, the automotive glazing is a cover of a housing enclosing said lidar.

**[0027]** Referring to **Fig.1**, an automotive glazing (1) is intended to be placed in front of a lidar (not shown). A representative collection of zones (10) is defined for the automotive glazing (1). In this figure, a total of 15 zones (10) are shown for illustration purpose. The number of zones can be significantly higher, further depending on the dimensions of the automotive glazing. The higher the number of zones, the more precise the method. However, increasing the number of zones also increases the time needed to complete the method. It is therefore a compromise between the accuracy of the method and the time needed to perform the method that define how many zones are needed.

**[0028]** At least 3 incident light beams (100, 200, 300) with 3 different incident angles are sent for each of the zones (10) of the representative collection of zones (10). Each incident light beam (100, 200, 300) has a vertical component and a horizontal component. Passing through the automotive glazing (1), each incident light beam (100, 200, 300) is deviated to result into 3 transmitted light beams (1000, 2000, 3000).

**[0029]** For ease of explanation, the following example only refers to a single zone (10). It further refers to a single incident light beam (100) with a vertical component (100V) and a horizontal component (100H). Each component is treated separately, also for

sake of clarity. The following example also refers to the transmitted light beam (1000) corresponding to the incident light beam (100) passing through the automotive glazing (1).

5 **[0030]** Referring to **Fig.2a**, the vertical component (100V) of the incident light beam (100) is determined. It allows to measure the vertical angle of incidence ( $\alpha_{1V}$ ). Considering only the vertical component (100V) of the incident light beam (100), as this incident light beam (100) passes through the automotive glazing (1), it undergoes a deviation. This deviation results in a transmitted light beam (1000V).

10 **[0031]** Referring to **Fig.2b**, the vertical component (1000VV) of the transmitted light beam (1000V) is compared with the reference transmitted light beam (1000Vref), corresponding to the transmitted light beam as if the vertical component of the incident light beam (100V) was not deviated by the automotive glazing (1). The reference transmitted light beam (1000Vref) only has a vertical component. This comparison gives the vertical deviation angle ( $\delta_{1VV}$ ) of the vertical component (100V) of the  
15 incident light beam (100).

**[0032]** Referring to **Fig.2c**, the horizontal component (1000VH) of the transmitted light beam (1000V) is compared with the normal (N), as the reference vertical light beam (1000Vref) only has a vertical component, and therefore corresponds to the normal (N). This comparison gives the horizontal deviation angle ( $\delta_{1VH}$ ) of the vertical  
20 component (100V) of the incident light beam (100).

**[0033]** Referring to **Fig.3a**, the horizontal component (100H) of the incident light beam (100) is determined. It allows to measure the horizontal angle of incidence ( $\alpha_{1H}$ ). Considering only the horizontal component (100H) of the incident light beam (100), as this incident light beam (100) passes through the automotive glazing (1), it undergoes  
25 a deviation. This deviation results in a transmitted light beam (1000H).

**[0034]** Referring to **Fig.3b**, the vertical component (1000HV) of the transmitted light beam (1000H) is compared with the normal (N), as the reference horizontal transmitted light beam (1000Href) only has a horizontal component, and therefore corresponds to the normal (N). This comparison gives the vertical deviation angle  
30 ( $\delta_{1HV}$ ) of the horizontal component (100H) of the incident light beam (100).

**[0035]** Referring to **Fig.3c**, the horizontal component (1000HH) of the transmitted light beam (1000H) is compared with the reference transmitted light beam (1000Href),

corresponding to the transmitted light beam as if the horizontal component of the incident light beam (100H) was not deviated by the automotive glazing (1). The reference transmitted light beam (1000H<sub>ref</sub>) only has a horizontal component. This comparison gives the horizontal deviation angle ( $\delta_{1HH}$ ) of the horizontal component (100H) of the incident light beam (100).

**[0036]** Instead of only one incident light beam (100), at least 3 incident light beams (100, 200, 300) are considered for each of the zones (10) of the representative collection. There is therefore, for each of the zones (10) a set of 3 vertical deviation angles ( $\delta_{1VV}$ ,  $\delta_{2VV}$ ,  $\delta_{3VV}$ ) and 3 horizontal deviation angles ( $\delta_{1VH}$ ,  $\delta_{2VH}$ ,  $\delta_{3VH}$ ) of the vertical component of each incident light beam (100, 200, 300) and a set of 3 vertical deviation angles ( $\delta_{1HV}$ ,  $\delta_{2HV}$ ,  $\delta_{3HV}$ ) and 3 horizontal deviation angles ( $\delta_{1HH}$ ,  $\delta_{2HH}$ ,  $\delta_{3HH}$ ) of the horizontal component of each incident light beam (100, 200, 300).

**[0037]** For each incident light beam (100, 200, 300), based on the measured vertical deviation angles ( $\delta_{1VV}$ ,  $\delta_{2VV}$ ,  $\delta_{3VV}$ ) of the vertical component of each incident light beam (100, 200, 300) for each of the zones (10) of the representative collection, an interpolation is done in between the zones (10) of the representative collection. And similarly for the horizontal deviation angles ( $\delta_{1VH}$ ,  $\delta_{2VH}$ ,  $\delta_{3VH}$ ) of the vertical component of each incident light beam (100, 200, 300), as well as for the vertical deviation angles ( $\delta_{1HV}$ ,  $\delta_{2HV}$ ,  $\delta_{3HV}$ ) and horizontal deviation angles ( $\delta_{1HH}$ ,  $\delta_{2HH}$ ,  $\delta_{3HH}$ ) of the vertical component of each incident light beam (100, 200, 300).

**[0038]** Then, for each of the zones (10) of the representative collection, as well as in between those zones (10), an angular transfer function is established for each deviation angles of each component of each incident light beam (100, 200, 300).

**[0039]** Finally a single correction table is compiled based on the four angular transfer functions. It is that table which is then used for calibrating a lidar intended to be coupled to the automotive glazing.

**[0040]** While the invention has been illustrated and described in detail in the drawings and foregoing description, such illustration and description are to be considered illustrative or exemplary and not restrictive. The foregoing description details certain embodiments of the invention. It will be appreciated, however, that no matter how detailed the foregoing appears in text, the invention may be practiced in many ways.

The invention is not limited to the disclosed embodiments.

### Claims

1. Method to determine a correction table for an automotive glazing (1) intended to be used in front of a lidar, the automotive glazing (1) having a representative collection of zones (10), the method comprising the steps of:
  - i. For each zone (10) of the representative collection of zones (10) on the automotive glazing (1), define at least 3 incident light beams (100, 200, 300), each of the light beam (100, 200, 300) having a vertical component (100V) and a horizontal component (100H), the at least 3 incident light beams (100, 200, 300) being produced by a laser diode or an LED;
  - ii. For each incident light beam (100, 200, 300), measure a vertical ( $\alpha 1V$ ) and a horizontal ( $\alpha 1H$ ) angles of incidence, based on, respectively, the vertical (100V) and the horizontal (100H) components of the incident light beam (100, 200, 300);
  - iii. For each component of each incident light beam (100, 200, 300), measure a vertical and a horizontal beam deviation due to the presence of the automotive glazing (1) and establish a vertical deviation angle table and a horizontal deviation angle table, such measurement being done by a CCD camera connected to a processing unit;
  - iv. For each component of each vertical deviation angle table and each horizontal deviation angle table, interpolate the beam deviation in between the collection of zones (10) which have been measured at step iii.;
  - v. Establish a vertical angular transfer function based on the interpolation of all vertical deviation angle tables of respectively the at least 3 vertical components and the at least 3 horizontal components, and a horizontal angular transfer function based on the interpolation of all horizontal deviation angle tables of respectively the at least 3 vertical components and the at least 3 horizontal components;

- vi. Compile the angular transfer functions in a single correction table able to be used for calibration of the lidar coupled to the automotive glazing (1).
2. Method according to claim 1 wherein the at least 3 incident light beams (100, 200, 300) are generated through an optical component intended to split an expanded collimated incident light beam (100, 200, 300) into multiple pencils of rays.
3. Automotive glazing (1) intended to be used in front of a lidar, the automotive glazing (1) being linked to a correction table obtained by a method according to any of the previous claims.
4. Automotive glazing (1) according to claim 3 wherein the automotive glazing (1) is a windshield, sidelite or rearlite of a vehicle.
5. Automotive glazing (1) according to claim 3 wherein the automotive glazing (1) is an external glass trim element.
6. Automotive glazing (1) according to claim 3 wherein the automotive glazing (1) is a cover of a housing enclosing said lidar.

1/3

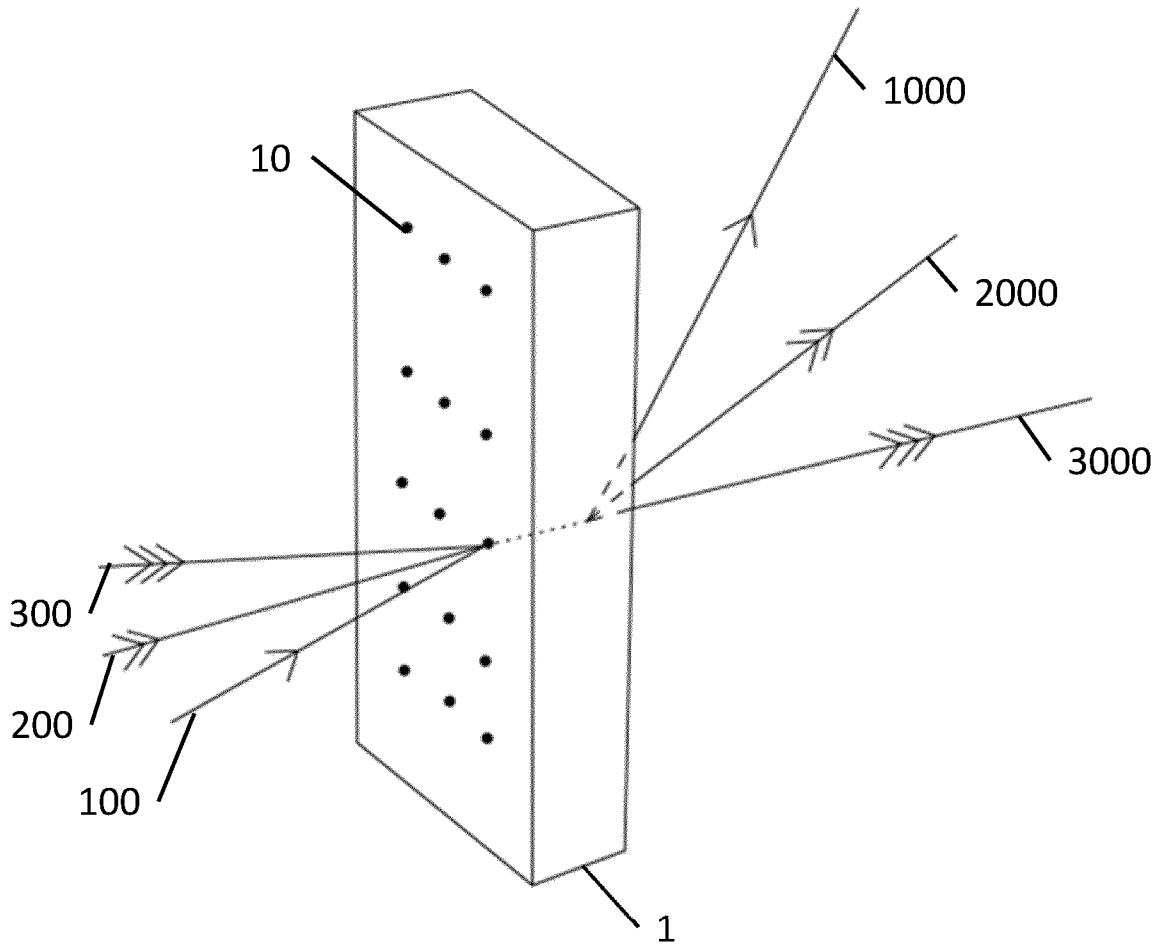


Fig. 1

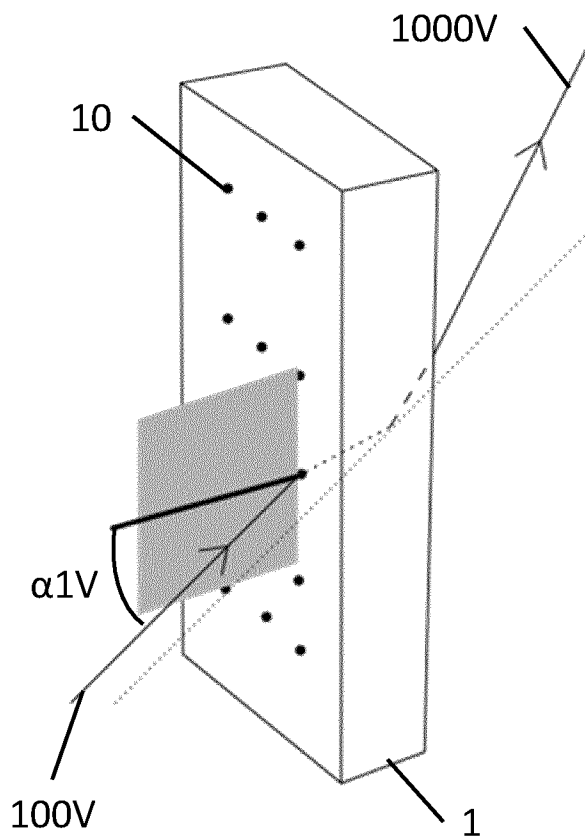


Fig. 2a

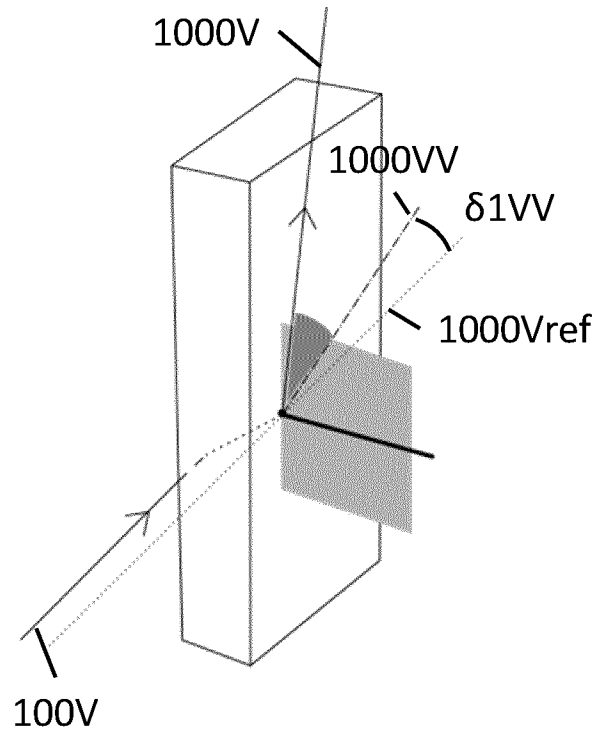


Fig. 2b

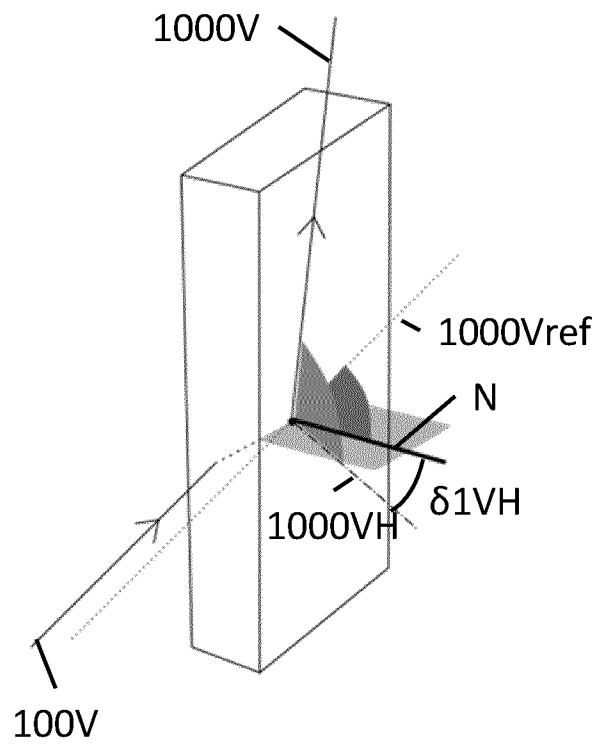


Fig. 2c

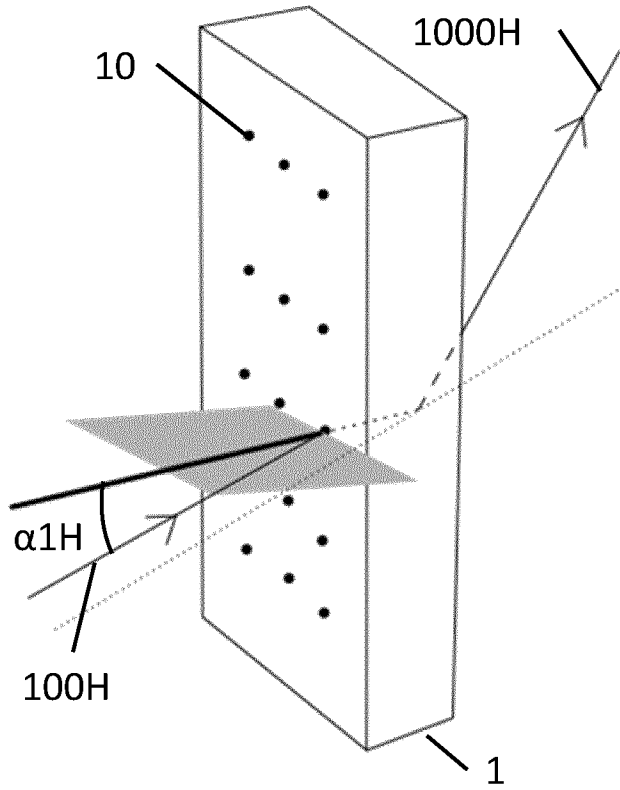


Fig. 3a

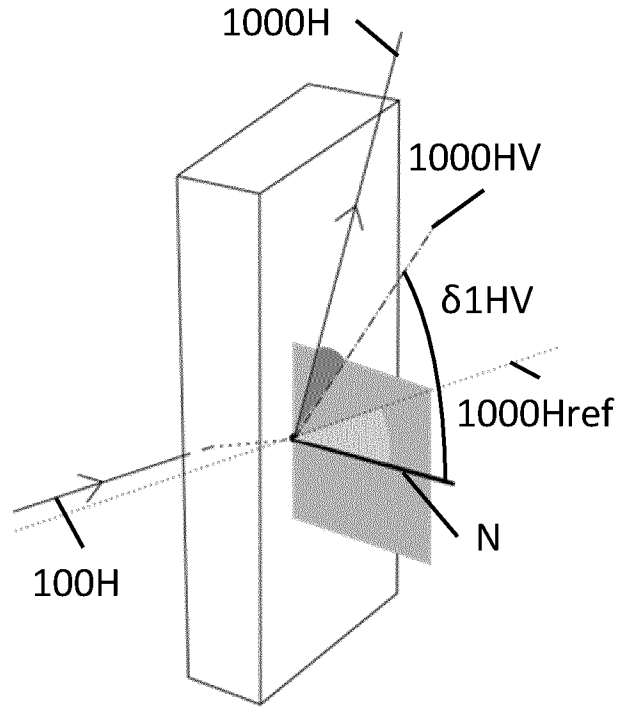


Fig. 3b

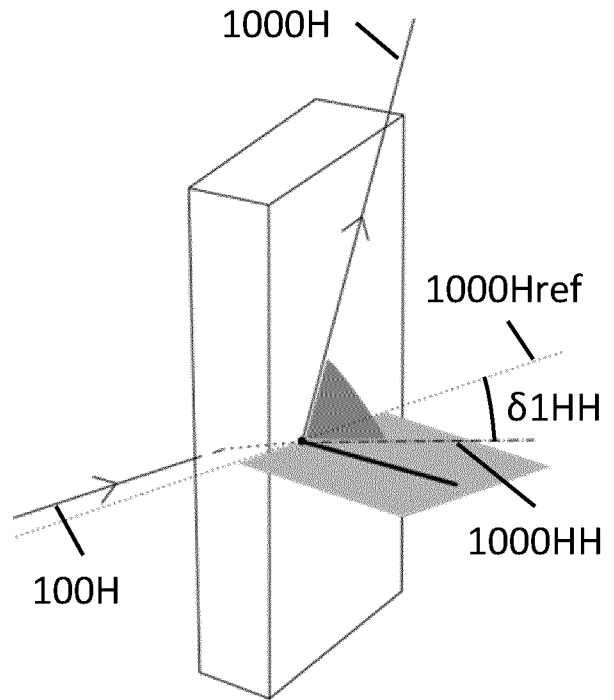


Fig. 3c

# INTERNATIONAL SEARCH REPORT

International application No  
**PCT/EP2023/065672**

**A. CLASSIFICATION OF SUBJECT MATTER**  
**INV. G01S7/497 G01S7/481 G01S17/931**  
**ADD.**

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)  
**G01S**

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

**EPO-Internal, WPI Data**

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
<b>Y</b>	<b>WO 2021/152256 A1 (SAINT GOBAIN [FR]) 5 August 2021 (2021-08-05) cited in the application paragraphs [0001], [0002], [0008] - [0058], [0147] - [0193]; figures 1-5,7-9</b> -----	<b>1-6</b>
<b>Y</b>	<b>US 2022/091267 A1 (KNIPL CHRISTIAN ADAM [DE] ET AL) 24 March 2022 (2022-03-24) paragraphs [0033] - [0037], [0044] - [0047]; figures 1-3</b> -----	<b>1-6</b>
<b>A</b>	<b>WO 2021/050882 A1 (CARLEX GLASS AMERICA LLC [US]) 18 March 2021 (2021-03-18) paragraphs [0004] - [0014], [0042] - [0070]; figures 1-3,10</b> -----	<b>1-6</b>
	-/--	

Further documents are listed in the continuation of Box C.

See patent family annex.

\* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier application or patent but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- "&" document member of the same patent family

Date of the actual completion of the international search

Date of mailing of the international search report

**11 July 2023**

**24/07/2023**

Name and mailing address of the ISA/  
 European Patent Office, P.B. 5818 Patentlaan 2  
 NL - 2280 HV Rijswijk  
 Tel. (+31-70) 340-2040,  
 Fax: (+31-70) 340-3016

Authorized officer

**Fernández Cuenca, B**

# INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2023/065672

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
<b>A</b>	<b>US 2022/075040 A1 (FREDERIKSEN ANNETTE [DE] ET AL) 10 March 2022 (2022-03-10) paragraphs [0020] - [0038], [0055] - [0068]; figures 1-5</b> -----	<b>1-6</b>

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

**PCT/EP2023/065672**

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2021152256 A1	05-08-2021	CN 114341666 A	12-04-2022
		EP 4097503 A1	07-12-2022
		FR 3106887 A1	06-08-2021
		US 2023120203 A1	20-04-2023
		WO 2021152256 A1	05-08-2021
-----			
US 2022091267 A1	24-03-2022	CN 114252887 A	29-03-2022
		DE 102020211879 A1	24-03-2022
		US 2022091267 A1	24-03-2022
-----			
WO 2021050882 A1	18-03-2021	CN 114391096 A	22-04-2022
		EP 4028755 A1	20-07-2022
		JP 2022551042 A	07-12-2022
		US 2022349837 A1	03-11-2022
		WO 2021050882 A1	18-03-2021
-----			
US 2022075040 A1	10-03-2022	CN 114167389 A	11-03-2022
		DE 102020211369 A1	10-03-2022
		US 2022075040 A1	10-03-2022
-----			