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(74) Agent: **ROLAND, André**; c/o André Roland S.A., P.O. Box 1255, CH-1001 Lausanne (CH).

(21) International Application Number:  
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(71) Applicant (for all designated States except US): **ECOLE POLYTECHNIQUE FEDERALE DE LAUSANNE (EPFL)** [CH/CH]; CM-Ecublens, CH-1015 Lausanne (CH).

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

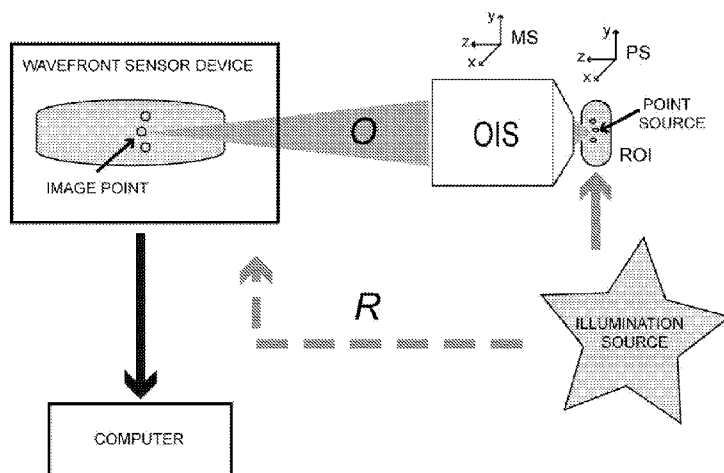
(72) Inventors; and

(75) Inventors/Applicants (for US only): **DEPEURSINGE, Christian** [CH/CH]; Ch. Neuf 31, CH-1028 Préverenges (CH). **CHARRIERE, Florian** [CH/CH]; Passage Perdonnet 1, CH-1005 Lausanne (CH). **COLOMB, Tristan** [CH/CH]; Av. de la Vallombreuse 87, CH-1008 Prilly (CH). **MARIAN, Mihaela, Anca** [RO/CA]; 1977 Galt Ouest, App. 302, Sherbrook, QC J1K 1J8 (CA). **MARQUET, Pierre** [CH/CH]; Grands-Champs 16, CH-1033 Cheseaux-sur-Lausanne (CH).

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[Continued on next page]

(54) Title: METHOD AND APPARATUS TO MEASURE AND COMPUTE THE AMPLITUDE POINT SPREAD FUNCTION AND ASSOCIATED PARAMETERS OF A COHERENT OPTICAL IMAGING SYSTEM



(57) Abstract: The invention concerns a method of and an apparatus for the measurement of the Amplitude Point Spread Function (APSF), of an Optical Imaging System (OIS), wherein the APSF is defined as the complex field distribution of the beam delivered by the OIS and originating from a point source. The apparatus comprising a) an illumination source; b) a point object, PO1 irradiated by said illumination source; c) an object beam coming from said point object, collected by the Optical imaging System and transmitted! to a Wavefront Sensing Device, WSD; and, d) a computer with processing means adapted to acquire the data from said WSD and adapted to compute the Amplitude Point Spread Function and derived parameters associated with the OIS. In a generic embodiment, the WSD is realized by means of a Mach-Zehnder interferometer providing a digital hologram to the processing means. The invention may be advantageously used in the field of Digital Holographic Microscopy (DHM).

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## INTERNATIONAL SEARCH REPORT

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## A. CLASSIFICATION OF SUBJECT MATTER

INV. G03H1/00 G01M11/02

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)

G03H G01M

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 practical, search terms used)

EPO-Internal, INSPEC, COMPENDEX

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	MARIAN A ET AL: "Point spread function model for microscopic image deconvolution in digital holographic microscopy" PROCEEDINGS OF THE SPIE - THE INTERNATIONAL SOCIETY FOR OPTICAL ENGINEERING SPIE-INT. SOC. OPT. ENG USA, vol. 5143, no. 1, 2003, pages 202-209, XP002456583 ISSN: 0277-786X	1,4,5, 10,11, 21-25, 28,29
Y	the whole document	3,4,6,9, 12, 18-20,26
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 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
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- \*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.
- \*Z\* document member of the same patent family

Date of the actual completion of the international search

25 October 2007

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European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+31-70) 340-3016

Authorized officer

Noirard, Pierre

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Y	US 6 262 818 B1 (CUCHE ETIENNE [CH] ET AL) 17 July 2001 (2001-07-17) cited in the application column 15, line 37 - column 17, line 40 ----- -/--	12

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A	WOODFORD P ET AL: "The Synthetic Aperture Microscope, Experimental Results" PROCEEDINGS OF THE SPIE, SPIE, BELLINGHAM, VA, US, vol. 2751, 8 April 1996 (1996-04-08), pages 230-240, XP002109571 ISSN: 0277-786X the whole document	13

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/IB2007/051257

## Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1.  Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
  
2.  Claims Nos.:  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
  
3.  Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1.  As all required additional search fees were timely paid by the applicant, this international search report covers allsearchable claims.
  
2.  As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
  
3.  As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
  
4.  No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-26, 28-29

### Remark on Protest

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.

## FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

## 1. claims: 1-26, 28-29

Method of and apparatus for the measurement of the amplitude point spread function of an optical imaging system comprising an illumination source, a point object, and a wavefront sensing device with processing means wherein the sensing device comprises two cameras for recording a Fourier and a Fresnel hologram of the image of the point source.

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## 2. claim: 27

Method of measuring the amplitude point spread function of an optical imaging system comprising an illumination source, a point object, and a wavefront sensing device with processing means wherein the point object is arranged to be moved in the object region of interest.

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## 3. claim: 30

Use of a method of measuring the amplitude point spread function of a microscope objective comprising an illumination source, a point object, and a wavefront sensing device with processing means wherein the point object is formed such as to preserve the linear polarization of an incident linearly polarized wave.

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# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IB2007/051257

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6262818	B1	17-07-2001	
		AT 290702 T	15-03-2005
		WO 0020929 A1	13-04-2000
		DE 69924129 D1	14-04-2005
		DE 69924129 T2	04-05-2006
		EP 1119798 A1	01-08-2001
		JP 2002526815 T	20-08-2002

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Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2  
 NL - 2280 HV Rijswijk  
 Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
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Authorized officer

Noirard, Pierre

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