

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
21 October 2004 (21.10.2004)

PCT

(10) International Publication Number  
**WO 2004/090466 A3**

(51) International Patent Classification<sup>7</sup>: **G01B 9/02**

[US/US]; 1665 E. 18th Street, Suite 206, Tucson, AZ 85719 (US).

(21) International Application Number:  
PCT/US2004/009984

(74) Agents: **PRAHL, Eric, L.** et al.; Hale and Dorr LLP, 60 State Street, Boston, MA 02109 (US).

(22) International Filing Date: 1 April 2004 (01.04.2004)

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
60/460,129 3 April 2003 (03.04.2003) US

(71) Applicant (for all designated States except US):  
**ZETETIC INSTITUTE** [US/US]; 1665 E. 18th Street, Suite 206, Tucson, AZ 85719 (US).

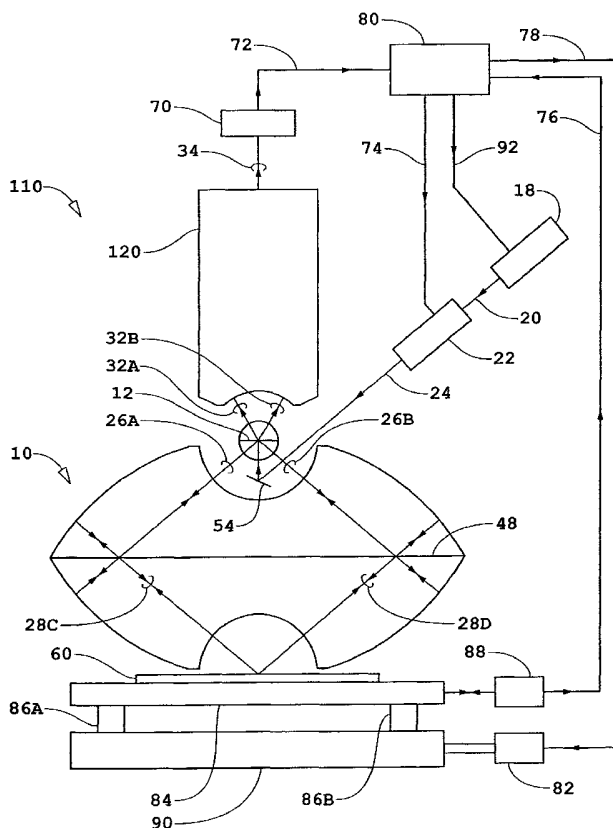
(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR,

(72) Inventor; and

(75) Inventor/Applicant (for US only): **HILL, Henry, Allen**

[Continued on next page]

(54) Title: APPARATUS AND METHOD FOR MEASUREMENT OF FIELDS OF BACKSCATTERED AND FORWARD SCATTERED/REFLECTED BEAMS BY AN OBJECT IN INTERFEROMETRY



(57) Abstract: An interferometry system for making interferometric measurements of an object (60), the system including a source assembly (18) that generates an input beam; a detector assembly (70) that includes a detector element; and an interferometer that includes a source imaging system (10) that images the input beam onto a spot on or in the object and an object imaging system (110) that images the spot onto the detector element as an interference beam, the object imaging system combining light coming from the spot (26A, 26B) with a reference beam (32A, 32B) to produce the interference beam (34), wherein the source imaging system is characterized by a first aperture stop (12) that defines a first aperture and includes a first phase shifter that introduces a first phase shift in light passing through a first region of the first aperture relative to light passing through a second region of the first aperture, and wherein the object imaging system is characterized by a second aperture stop (12) that defines a second aperture and includes a second phase shifter that introduces a second phase shift in light passing through a first region of the second aperture relative to light passing through a second region of the second aperture.



GB, GR, HU, IE, IT, LU, MC, 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).

(88) Date of publication of the international search report:  
29 December 2004

**Published:**

- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US04/09984

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : G01B 9/02

US CL : 356/450

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)

U.S. : 356/450, 489, 495, 496, 511, 512, 513, 514

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)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5,760,901 A (HILL) 02 June 1998 (02.06.1998), see figure 1a.	1-42
A	US 6,445,453 A (HILL) 03 September 2002 (03.09.2002), see figure 6c.	1-42
E, A	US 6,717,736 A (HILL) 06 April 2004 (06.04.2004), see figure 3.	1-42

☐ 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 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

23 July 2004 (23.07.2004)

Date of mailing of the international search report

19 NOV 2004

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US

Commissioner for Patents

P.O. Box 1450

Alexandria, Virginia 22313-1450

Facsimile No. (703) 305-3230

Authorized officer

Samuel A. Turner

Telephone No. 703-308-0956