

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
19 October 2006 (19.10.2006)

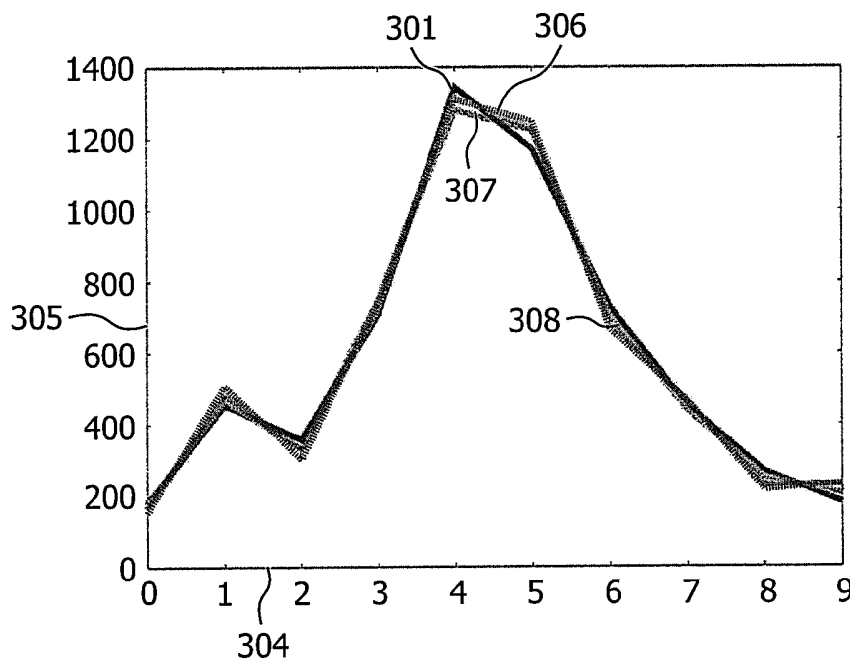
PCT

(10) International Publication Number  
**WO 2006/109227 A3**

- (51) **International Patent Classification:**  
G01V 5/00 (2006.01) G01T 1/164 (2006.01)  
G01T 1/29 (2006.01)
  - (21) **International Application Number:**  
PCT/IB2006/051068
  - (22) **International Filing Date:** 7 April 2006 (07.04.2006)
  - (25) **Filing Language:** English
  - (26) **Publication Language:** English
  - (30) **Priority Data:**  
05102971.8 14 April 2005 (14.04.2005) EP
  - (71) **Applicant (for DE only):** PHILIPS INTELLECTUAL PROPERTY & STANDARDS GMBH [DE/DE]; Lübeckertordamm 5, 20099 Hamburg (DE).
  - (71) **Applicant (for all designated States except DE, US):** KONINKLIJKE PHILIPS ELECTRONICS N. V. [NL/NL]; Groenewoudseweg 1, NL-5621 BA Eindhoven (NL).
  - (72) **Inventor; and**
  - (75) **Inventor/Applicant (for US only):** ZIEGLER, Andy [DE/DE]; C/o Philips Intellectual Property &, Standards Gmbh Weisshausstr. 2, 52066 Aachen (DE).
  - (74) **Agent:** VOLMER, Georg; Philips Intellectual Property &, Standards Gmbh Weisshausstr. 2, 52066 Aachen (DE).
  - (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, KM, KN, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
  - (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, 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).
- Published:**  
— with international search report

[Continued on next page]

(54) **Title:** ENERGY DISTRIBUTION RECONSTRUCTION IN CT



(57) **Abstract:** The reconstruction of the energy distribution at a detector with a detector element that consists of many small pixels, which count the number of photons above certain thresholds, is performed with a Maximum Likelihood analysis, according to an aspect of the present invention. Thus, the reconstruction scheme may use the redundancy in the measurement and may treat the Poisson statistics accordingly.

WO 2006/109227 A3



— 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.

**(88) Date of publication of the international search report:**

7 December 2006

## INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2006/051068

## A. CLASSIFICATION OF SUBJECT MATTER

INV. G01V5/00 G01T1/29 G01T1/164

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)

G01T G01V A61B

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, WPI Data, INSPEC, COMPENDEX

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5 565 684 A (GULLBERG ET AL) 15 October 1996 (1996-10-15) column 3, line 14 - line 17 column 3, line 24 - line 28 column 3, line 41 - line 45 column 3, line 66 - column 4, line 2 column 4, line 56 - line 60; figures 1,2	1-17
Y	US 5 530 248 A (NATANZON ET AL) 25 June 1996 (1996-06-25) column 5, line 10 - line 55 column 11, line 38 - line 49	1-17
	-/--	

 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 document 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.

"&amp;" document member of the same patent family

Date of the actual completion of the international search

1 September 2006

Date of mailing of the international search report

28/09/2006

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,  
Fax: (+31-70) 340-3016

Authorized officer

Eberle, Katja

## INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2006/051068

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	FESSLER J A ET AL: "Maximum-likelihood dual-energy tomographic image reconstruction" PROCEEDINGS OF THE SPIE - THE INTERNATIONAL SOCIETY FOR OPTICAL ENGINEERING SPIE-INT. SOC. OPT. ENG USA, vol. 4684, 2002, pages 38-49, XP002397241 ISSN: 0277-786X -----	3
A	BERT CH ET AL: "Computed tomography using the Medipix1 chip" NUCLEAR INSTRUMENTS & METHODS IN PHYSICS RESEARCH, SECTION - A: ACCELERATORS, SPECTROMETERS, DETECTORS AND ASSOCIATED EQUIPMENT, ELSEVIER, AMSTERDAM, NL, vol. 509, no. 1-3, 21 August 2003 (2003-08-21), pages 240-250, XP004446797 ISSN: 0168-9002 abstract -----	7,8
A	HARDING G: "X-ray scatter tomography for explosives detection" RADIATION PHYSICS AND CHEMISTRY, ELSEVIER SCIENCE PUBLISHERS BV., AMSTERDAM, NL, vol. 71, no. 3-4, October 2004 (2004-10), pages 869-881, XP004532582 ISSN: 0969-806X abstract page 876, paragraph 6 figure 9 -----	9
A	KUDO H ET AL: "Newton-SOR method for fast statistical tomographic image reconstruction" SYSTEMS AND COMPUTERS IN JAPAN SCRIPTA TECHNICA USA, vol. 34, no. 4, April 2003 (2003-04), pages 1-11, XP002397239 ISSN: 0882-1666 page 1, paragraph SUMMARY -----	14

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IB2006/051068

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5565684	A	15-10-1996	NONE
US 5530248	A	25-06-1996	NONE