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(71) **Applicant** *(for all designated States except US):* **TERAVIEW LIMITED** [GB/GB], Platinum Building, St John's Innovation Park, Cambπdge CB4 OWS (GB)

(72) Inventor; and

(75) Inventor/Applicant *(for US only):* **GREGORY, Ian, Stephen** [GB/GB], Teraview Ltd, Platinum Building, St John's Innovation Park, Cambπdge, Cambridgeshire CB4 **OW** (GB)

(74) Agent: GRANLEESE, Rhian, Jane, Marks & Clerk, 90 Long Acre, London WC2E 9RA (GB)

(81) **Designated States** *(unless otherwise indicated, for every kind of national protection available):* AE, AG, AL, AM, AT, **AU, AZ, BA, BB, BG, BH, 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,** GT, **HN, HR, HU,** ID, **IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM,** PG, **PH, PL,** PT, RO, **RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN,** TR, TT, **TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW**

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(88) Date of publication of the international search report:
24 January 2008

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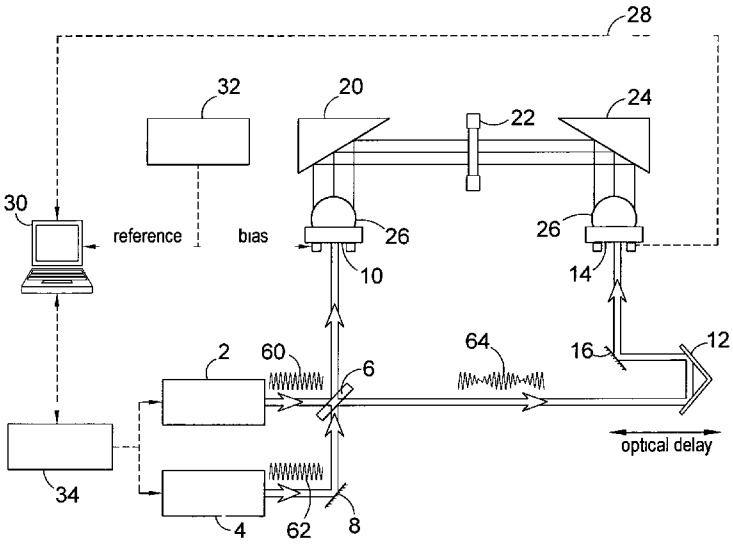
(54) Title: TEMPERATURE TUNABLE DISTRIBUTED FEEDBACK DIODE LASERS FOR THE GENERATION OF THZ RADIATION BY PHOTOMIXING



(57) Abstract: Apparatus for measurement of a sample comprises means for generating electromagnetic radiation comprising a photoconductive device, the generating means is arranged to generate an output signal comprising electromagnetic radiation in dependence upon radiation received by the photoconductive device and to transmit the output signal towards a sample space, the apparatus further compπses a first radiation source and a second radiation source, arranged such that the radiation received by the photoconductive device compπses a mixture of radiation from the first radiation source and radiation from the second radiation source, control means for varying the frequency of the electromagnetic radiation of the output signal by varying the temperature of the first radiation source and/or the temperature of the second radiation source, and detecting means for detecting a response signal

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A. CLASSIFICATION OF SUBJECT MATTER
INV. G01N21/35

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
GOIN

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with Indication, where appropriate, of the relevant passages	Relevant to claim No.
X	IWAO KAWAYAMA ET AL: "A tunable sub-terahertz wave generation and detection system with a photomixer and a high-Tc Josephson junction" SUPERCONDUCTOR SCIENCE & TECHNOLOGY, INSTITUTE OF PHYSICS PUBLISHING, BRISTOL, GB, vol. 19, no. 5, 1 May 2006 (2006-05-01), pages S403-S406, XP020100950 ISSN: 0953-2048 the whole document	1-3, 5-10,14, 16,31, 35-37,42

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[X] Further documents are listed In the continuation of Box C.

[X] 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 clalm(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 docu¬ments, 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
23 November 2007	03/12/2007

Name and mailing address of the ISA/	Authorized officer
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	Strohmayer, Bernhard

INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2007/001828

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*,	Citation of document, with Indication, where approprlato, of the relevant passages	Relevant to claim No.
X	MIYADERA ET AL: "Frequency detection of focused sub-THz waves using a hï gh-Tc Josephson junction" PHYSICA C, NORTH-HOLLAND PUBLISHING, AMSTERDAM, NL, vol . 426-431, 1 October 2005 (2005-10-01), pages 1726-1730, XP005092212 ISSN: 0921-4534 the whole document	1-3, 5-10,14, 16,31, 35-37,42
X	MATSUURA S ET AL: "GENERATION OF COHERENT TERAHERTZ RADIATION BY PHOTOMIXING I N DIPOLEPHOTOCONDUCTIVE ANTENNAS" APPLIED PHYSICS LETTERS, AIP , AMERICAN INSTITUTE OF PHYSICS , MELVILLE, NY, US, vol . 70, no . 5 , 3 February 1997 (1997-02-03) , pages 559-561, XP000685259 ISSN: 0003-6951 the whole document	1-11 ,14, 16,31 , 35-38, 40-42
X	MATSUURA S ET AL: "Generation of CW THz radi ation by optical heterodyne with diode l asers and LTG-GaAs photoconductors" MICROWAVE PHOTONICS, 1996. MWP '96. TECHNICAL DIGEST. , 1996 INTERNATONAL TOPICAL MEETING ON KYOTO, JAPAN 3-5 DEC. 1996, NEW YORK, NY, USA, IEEE, US, 3 December 1996 (1996-12-03), pages 13-16, XP010270549 ISBN: 0-7803-3129-X the whole document	1-11,14, 16,31, 35-38, 40-42
X	SPENCER L ET AL: "Homodyne Detection Up To 2 THz Using Continuous Wave Laser Diodes" INFRARED AND MILLIMETER WAVES AND 13TH INTERNATIONAL CONFERENCE ON TERAHERTZ ELECTRONICS, 2005. IRMMW-THZ 2005. THE JOINT 30TH INTERNATIONAL CONFERENCE ON WILLIAMSBURG, VA, USA 19-23 SEPT. 2005, PISCATAWAY, NJ, USA, IEEE, 19 September 2005 (2005-09-19), pages 249-250, XP010875020 ISBN: 0-7803-9348-1 page 250, penultimate paragraph and Fig. 3	1-11 , 14, 16, 20-31, 35-38, 40-43

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INTERNATIONAL St=ARCH REPORT

International application No
PCT/GB2007/001828

C(Continuatlon). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with Indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GREGORY I S ET AL: "Multichannel Continuous-Wave Terahertz Imaging" INFRARED AND MILLIMETER WAVES AND 13TH INTERNATIONAL CONFERENCE ON TERAHERTZ ELECTRONICS, 2005. IRMMW-THZ 2005. THE JOINT 30TH INTERNATIONAL CONFERENCE ON WILLIAMSBURG, VA, USA 19-23 SEPT. 2005, PISCATAWAY, NO, USA, IEEE, 19 September 2005 (2005-09-19), pages 46-47, XP010874869 ISBN: 0-7803-9348-1 Fig. 2 and paragraph below this Figure on p .47	1-11,14, 16, 20-31, 35-38, 40-43
X	US 6 348 683 Bl (VERGHESE SIMON [US] ET AL) 19 February 2002 (2002-02-19) column 5 , line 29 - line 32; figure 3	1-11, 20-27, 31,35, 37,38, 40-43

FURTHER INFORMATION CONTINUED FROM PCTΛSA/ 210

Continuation of Box 11.Z

Claims Nos.: 44,45

These claims rely in respect of the technical features of the invention on references to the drawings contrary to Rule 6.2a PCT, which renders their subject matter so unclear contrary to Art. 6 PCT that no meaningful search is possible.

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guideline C-VI, 8.5), should the problems which led to the Article 17(2) declaration be overcome.

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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. [X] Claims Nos.: 44,45
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:

see FURTHER INFORMATION sheet PCT/ISA/210

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. [J] As only some of the required additional search fees were timely paid by the applicant, this international search reportcovers only those claims for which fees were paid, specifically claims Nos.:

1-11 , 14, 16,20-31,35-38,40-43

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.:

Remark on Protest

[ ] The additional search fees were accompanied by the applicants 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.

[A] 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: 4,11,38,40,41 and not novel claims 1-3,5-10,14,16,31,35-37,42

1.1. claims: 4 , 40

The output signal comprises electromagnetic radiation having a frequency/power spectrum with a half-power width of less than 10 GHz/1 GHz/100 MHz or a coherence length above 5ra/l θra/15n.
Problem: selection of half-power width/coherence length (application p .33,1 .5,6)

1.2. claims: 11, 41

The selected range of frequencies of the output signal is in the range O THz to 10 THz, preferable in the range O to 5 THz, more preferably in the range O THz to 2.2 THz.
Problem: selection of the frequency range of the output signal

1.3. claim: 38

The or each temperature-tunable laser is adapted to output radiation with a centre wavelength in the range 760nm to 1090 nm, preferably in the range 770 nm to 870 nm.
Problem: choice of particular laser wavelength

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2. claims: 12,13,15,17,18

The control means is adapted to vary the temperature of the first radiation source and/or the second radiation source in a certain way.
Problem: optimizing the tunable frequency range of each laser without mode hops

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3. claim: 19

The control means is adapted to maintain the frequency of the radiation from the first radiation source substantially constant and the frequency from the second radiation source substantially constant for a pre-determined period of time, and preferably the predetermined period of time is at least 50 ms.
Problem: selection of a time necessary to sample a data point

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4. claims: 20-30, 43

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

An apparatus comprising detecting means with a photoconductive device.
Problem: selection of particular detecting means

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5. claim: 32

The processing means is adapted to fit the variation of the detection signal with time to a function.
Problem: measurement of amplitude and phase (application p.28, last two paragraphs)

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6. claims: 33,34

The processing means is adapted to compare the detection signal to a reference/threshold.
Problem: identifying presence of a certain condition (paragraph bridging pages 33,34 of the description)

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7. claim: 39

A sample cell adapted to be located in the sample space.
Problem: measuring a fluid sample

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/GB2007/001828

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6348683 B1	19-02-2002	NONE	