



- (51) International Patent Classification:  
*H05H 1/24* (2006.01)
- (21) International Application Number:  
PCT/IB2014/003264
- (22) International Filing Date:  
5 June 2014 (05.06.2014)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:  
61/831,678 6 June 2013 (06.06.2013) US
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- (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, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, 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, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

- (84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, 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, 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).

**Declarations under Rule 4.17:**

- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))
- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))
- of inventorship (Rule 4.17(iv))

**Published:**

- with international search report (Art. 21(3))

- (88) Date of publication of the international search report:  
26 November 2015

(54) Title: SPLIT-RING RESONATOR PLASMA SOURCE

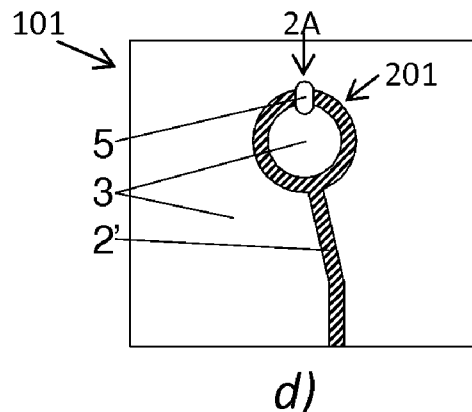


Figure 3

(57) Abstract: A miniaturized plasma source includes a stripline split-ring resonator. The split-ring resonator is sandwiched between two dielectric substrates and two metal ground planes. In order to make the plasma accessible from the outside of the ground planes, a hole is made through the gap between the ends of the split ring. The two ground planes act as an electromagnetic shield, protecting the split-ring resonator from electromagnetic interference due to changes in the electric or dielectric environment surrounding it. The miniaturized plasma source is particularly useful in optogalvanic spectroscopy applications.

# INTERNATIONAL SEARCH REPORT

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| International application No<br><b>PCT/IB2014/003264</b> |
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| <b>A. CLASSIFICATION OF SUBJECT MATTER</b><br>INV. H05H1/24<br>ADD.  |  |   |
| According to International Patent Classification (IPC) or to both national classification and IPC  |  |   |
| <b>B. FIELDS SEARCHED</b><br>Minimum documentation searched (classification system followed by classification symbols)<br>H05H   |  |   |
| 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)<br>EPO-Internal, WPI Data   |  |   |
| <b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>  |  |   |
| Category*  | Citation of document, with indication, where appropriate, of the relevant passages   | Relevant to claim No.                                 |
| X<br>Y<br>A  | US 2007/170996 A1 (DUTTON DAVID T [US] ET AL) 26 July 2007 (2007-07-26)<br>figures 1a-1d<br>paragraph [0003] - paragraph [0006]<br>paragraph [0020] - paragraph [0042]<br>paragraph [0060] - paragraph [0069]<br>-----<br>-/--   | 1-12, 14,<br>15<br>13, 17,<br>24, 29,<br>30, 34<br>23 |
| <input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <span style="margin-left: 200px;"><input checked="" type="checkbox"/> See patent family annex.</span>   |  |   |
| * Special categories of cited documents :  |  |   |
| "A" document defining the general state of the art which is not considered to be of particular relevance<br>"E" earlier application or patent but published on or after the international filing date<br>"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)<br>"O" document referring to an oral disclosure, use, exhibition or other means<br>"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<br>"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<br>"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<br>"&" document member of the same patent family |   |
| Date of the actual completion of the international search  | Date of mailing of the international search report   |   |
| 22 July 2015   | 28/07/2015   |   |
| Name and mailing address of the ISA/<br>European Patent Office, P.B. 5818 Patentlaan 2<br>NL - 2280 HV Rijswijk<br>Tel. (+31-70) 340-2040,<br>Fax: (+31-70) 340-3016   | Authorized officer<br><br>Clemente, Gianluigi  |   |

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International application No  
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| C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT |   |  |
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| Category*  | Citation of document, with indication, where appropriate, of the relevant passages  | Relevant to claim No.                  |
| X  | <p>TRAN T H ET AL: "Atmospheric pressure microplasma source based on parallel stripline resonator",<br/>CURRENT APPLIED PHYSICS, NORTH-HOLLAND, AMSTERDAM, NL,<br/>vol. 11, no. 5, 28 April 2011 (2011-04-28), pages S126-S130, XP028111305,<br/>ISSN: 1567-1739, DOI:<br/>10.1016/J.CAP.2011.04.049<br/>[retrieved on 2011-05-14]<br/>page s127, left-hand column, line 6 - line 13<br/>figure 1</p> | 1,2,15                                 |
| X  | <p>-----<br/>HOPWOOD J A ET AL: "Low-power microwave plasma source based on a microstrip split-ring resonator",<br/>IEEE TRANSACTIONS ON PLASMA SCIENCE, IEEE SERVICE CENTER, PISCATAWAY, NJ, US,<br/>vol. 31, no. 4, 1 August 2003 (2003-08-01), pages 782-787, XP011099886,<br/>ISSN: 0093-3813, DOI:<br/>10.1109/TPS.2003.815470</p>   | 33                                     |
| Y  | <p>figures 1,4<br/>page 782, right-hand column, line 1 - line 23<br/>page 784, left-hand column, line 6 - page 785, left-hand column, line 2</p>  | 13,<br>22-28,<br>31,32,<br>34-36<br>14 |
| A  |   |  |
| X  | <p>-----<br/>MIURA NAOTO ET AL: "Spatially resolved argon microplasma diagnostics by diode laser absorption",<br/>JOURNAL OF APPLIED PHYSICS, AMERICAN INSTITUTE OF PHYSICS, US,<br/>vol. 109, no. 1,<br/>10 January 2011 (2011-01-10), pages 13304-1-13304-6, XP012146640,<br/>ISSN: 0021-8979, DOI: 10.1063/1.3531557</p>   | 16,19,20                               |
| Y  | <p>pages 13304-2, right-hand column, line 5 - line 44; figures 1-2<br/>pages 13304-4, right-hand column, line 14 - line 16</p>  | 17,18,<br>21,22,<br>26,27,30<br>23,29  |
| A  |   |  |
| A  | <p>-----<br/>BARBIERI B ET AL: "OPTOGALVANIC SPECTROSCOPY",<br/>REVIEWS OF MODERN PHYSICS, AMERICAN PHYSICAL SOCIETY, US,<br/>vol. 62, no. 3,<br/>1 January 1990 (1990-01-01), pages 603-644, XP000916046,<br/>ISSN: 0034-6861, DOI:<br/>10.1103/REVMODPHYS.62.603<br/>abstract</p> <p>-----<br/>-/--</p>   | 16                                     |

**INTERNATIONAL SEARCH REPORT**

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| International application No<br>PCT/IB2014/003264 |
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages  | Relevant to claim No.                         |
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| Y         | <p>GERRIET EILERS ET AL: "The Radiocarbon Intracavity Optogalvanic Spectroscopy Setup at Uppsala", PROCEEDINGS OF THE 21ST INTERNATIONAL RADIOCARBON CONFERENCE, vol. 55, no. 2-3, 1 January 2013 (2013-01-01), pages 237-250, XP055203782, ISSN: 0033-8222<br/>                     figures 1-2<br/>                     abstract<br/>                     page 237 - page 240<br/>                     page 244</p> <p align="center">-----</p> | <p>18,21,<br/>23-25,<br/>28-32,<br/>35,36</p> |

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No  
PCT/IB2014/003264

| Patent document<br>cited in search report | Publication<br>date | Patent family<br>member(s) | Publication<br>date |
|---|---------------------|----------------------------|---------------------|
| US 2007170996                             | A1                  | NONE                       |                     |
| -----                                     |                     |                            |                     |