



- (51) International Patent Classification:
H01Q 5/01 (2006.01) H01Q 1/48 (2006.01)
H01Q 1/24 (2006.01)
- (21) International Application Number:
PCT/US2012/064616
- (22) International Filing Date:
12 November 2012 (12.11.2012)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
61/558,976 11 November 2011 (11.11.2011) US
- (71) Applicant: UTAH STATE UNIVERSITY [US/US];
1780 North Research Park Way, Suite 108, North Logan,
Utah 84341 (US).
- (72) Inventors; and
- (71) Applicants : CETINER, Bedri [US/US]; 1585 North 400
East, Apt. 628, Logan, Utah 84341 (US). MOPIDEVI,
Hema Swaroop [IN/US]; 944 North 700 East, Apt. 3, Lo-
gan, Utah 84321 (US). RODRIGO, Daniel [ES/ES];
Alacant 45, Montcada, E-08110 Barcelona (ES). JOFRE,
Luis [ES/ES]; Fragata Numancia, 3, Canet de Mar, E-
08360 Barcelona (ES).

- (74) Agent: ANDERSEN, Dale; 1780 North Research Park
Way, Suite 108, North Logan, Utah 84341 (US).
- (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, IS, JP, KE, KG, KM, 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, 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,
ML, MR, NE, SN, TD, TG).

Published:
— with international search report (Art. 21(3))

[Continued on next page]

(54) Title: BROADBAND ANTENNA SYSTEMS AND METHODS

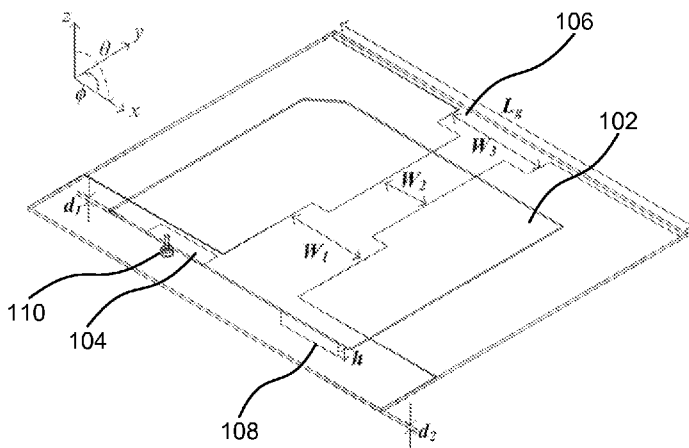
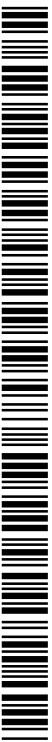


FIG. 1A

(57) Abstract: A multi-band antenna that may be designed to operate well in both Public Safety (PS) and Long-Term Evolution (LTE) wireless communication may employ a stepped T-shape structure in conjunction with patch tapering or a reconfigurable ground plane architecture and capacitive feeding to achieve broad bandwidth performance (e.g., over a frequency range from 220 MHz to 4900 MHz). To achieve desired performance, the antenna may include a three-dimensional structure having lateral dimensions of approximately 0.25λ in length and 0.01λ in height at a low desired frequency of operation (e.g., 426 MHz). In some embodiments, the disclosed antenna may exhibit good gain flatness and have a radiation pattern that remains substantially constant over a broad range of operating frequencies.





— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

(88) Date of publication of the international search report:
24 October 2013

A. CLASSIFICATION OF SUBJECT MATTER**H01Q 5/01(2006.01)i, H01Q 1/24(2006.01)i, H01Q 1/48(2006.01)i**

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)

H01Q 5/01; H01Q 13/08; H01Q 21/26; H01Q 1/24; H01Q 1/48

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS(KIPO internal) & Keywords: antenna, patch, shaped ground, reconfigurable

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	MOPIDEVI et al., Compact and Broadband Antenna for LTE and Public Safety Applications, IEEE Antennas and Wireless Propagation Letters, 28 October 2011, Vol. 10, pages 1224-1227, ISSN 1536-1225. See abstract, pages 1224-1225 and figures 1, 3.	1, 4, 6-11, 21-24
Y		2-3, 5, 12-20, 25-26
Y	KHOSHNIAT et al., 'MEMS Integrated Reconfigurable Antenna for Cognitive Public Safety Radios', Proceedings of the Fourth European Conference on Antennas and Propagation (EuCAP), Barcelona, Spain, April 12-16, 2010, pages 1-3. See abstract, pages 1-2, and figures 1-2.	2, 12-20
Y	KR 10-2008-0053081 A (ELECTRONICS AND TELECOMMUNICATIONS RESEARCH INSTITUTE) 12 June 2008 See paragraphs <61>-<63> and figure 6.	3
Y	JOFRE, L. et al., Miniature Multi-element Antenna for Wireless Communications, IEEE Transactions on Antennas and Propagation, May 2002, Vol. 50, Issue 5, pages 658-669, ISSN 0018-926X. See pages 659, 667 and figure 1.	5, 25-26

 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 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 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

26 August 2013 (26.08.2013)

Date of mailing of the international search report

27 August 2013 (27.08.2013)

Name and mailing address of the ISA/KR


 Korean Intellectual Property Office
 189 Cheongsa-ro, Seo-gu, Daejeon Metropolitan City,
 302-701, Republic of Korea

Facsimile No. +82-42-472-7140

Authorized officer

KANG Sung Chul

Telephone No. +82-42-481-8405



INTERNATIONAL SEARCH REPORTInternational application No.
PCT/US2012/064616

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2010-0171675 A1 (BORJA et al.) 08 July 2010 See paragraphs [0183]-[0245] and figures 5c, 7a-7b.	1-26

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/US2012/064616

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
KR 10-2008-0053081 A	12/06/2008	US 2008-0136597 A1	12/06/2008
US 2010-0171675 A1	08/07/2010	US 8354972 B2	15/01/2013
		WO 2008-148569 A2	11/12/2008
		WO 2008-148569 A3	19/02/2009