



US 20130076571A1

(19) **United States**

(12) **Patent Application Publication**  
**Desclos et al.**

(10) **Pub. No.: US 2013/0076571 A1**  
(43) **Pub. Date: Mar. 28, 2013**

(54) **N-SHOT ANTENNA ASSEMBLY AND RELATED MANUFACTURING METHOD**

**Publication Classification**

(75) Inventors: **Laurent Desclos**, San Diego, CA (US);  
**Jeffrey Shamblin**, San Marcos, CA (US);  
**Seung-Gi Jeong**, Gyeonggi-do (KR);  
**Seung-Woong Choi**, Gyeonggi-do (KR);  
**Cheol-Hun Seol**, Incheon (KR);  
**Won-Sui Lee**, Gyeonggi-do (KR)

(51) **Int. Cl.**  
*H01Q 1/38* (2006.01)  
*H01P 11/00* (2006.01)  
(52) **U.S. Cl.**  
USPC ..... **343/700 MS; 29/600**

(73) Assignee: **ETHERTRONICS, INC.**, San Diego, CA (US)

(57) **ABSTRACT**

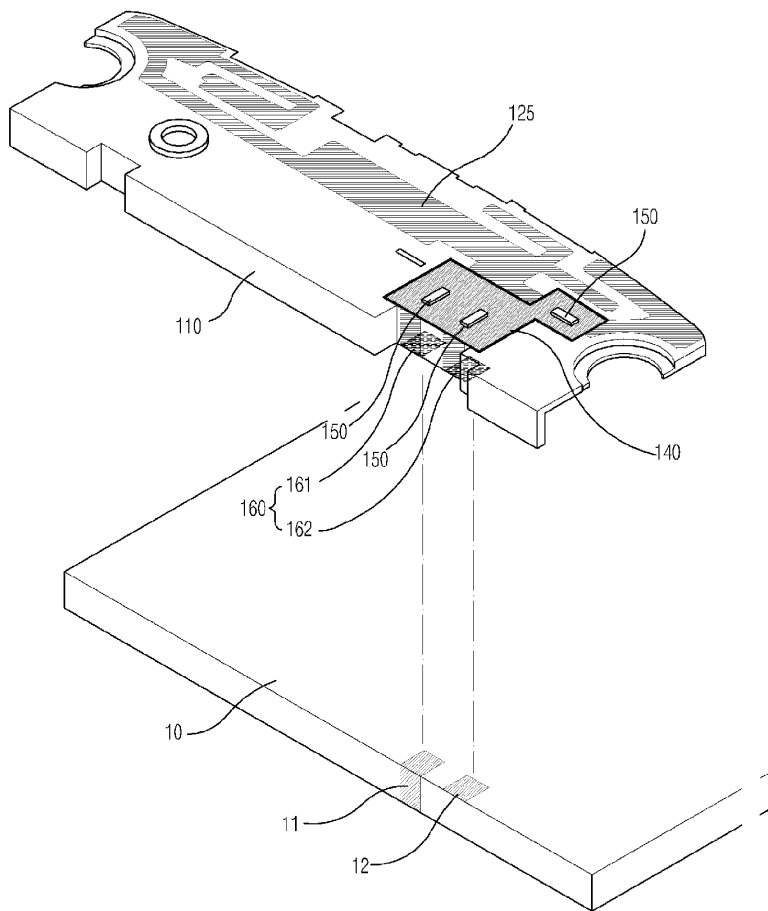
(21) Appl. No.: **13/413,427**

An antenna module and a manufacturing method for the same are disclosed. With the miniaturization trend for mobile communication terminals, the invention can achieve the miniaturization of antenna modules and facilitate the design of the antenna. The SMD as a matching component for given resonance frequency and impedance matching of the antenna is mounted on the antenna module to make the antenna module compact, and functions as a matching circuit for impedance matching to facilitate the design of mobile devices.

(22) Filed: **Mar. 6, 2012**

(30) **Foreign Application Priority Data**

Sep. 26, 2011 (KR) ..... 10-2011-0096954





US 20130076572A1

(19) **United States**

(12) **Patent Application Publication**

**Lee et al.**

(10) **Pub. No.: US 2013/0076572 A1**

(43) **Pub. Date: Mar. 28, 2013**

(54) **INK FOR PRINTING A MOBILE PHONE ANTENNA PATTERN, METHOD FOR MANUFACTURING A SYNTHETIC RESIN PART FOR A MOBILE PHONE ON WHICH AN ANTENNA PATTERN IS PRINTED USING THE INK, AND SYNTHETIC RESIN PART FOR A MOBILE PHONE ON WHICH AN ANTENNA PATTERN IS PRINTED**

(75) Inventors: **Kyung-Sook Lee**, Incheon-si (KR);  
**Se-Yong Park**, Incheon-si (KR);  
**Chul-An Lim**, Incheon-si (KR);  
**Byoung-Nam Kim**, Gyeonggi-do (KR)

(73) Assignees: **MOBITECH CORP.**, Seoul (KR); **YEN AN TECHNOLOGY CO., LTD.**, Incheon-si (KR)

(21) Appl. No.: **13/637,958**

(22) PCT Filed: **Jul. 5, 2010**

(86) PCT No.: **PCT/KR10/04364**

§ 371 (c)(1),

(2), (4) Date: **Dec. 11, 2012**

(30) **Foreign Application Priority Data**

Mar. 30, 2010 (KR) ..... 10-2010-0028626

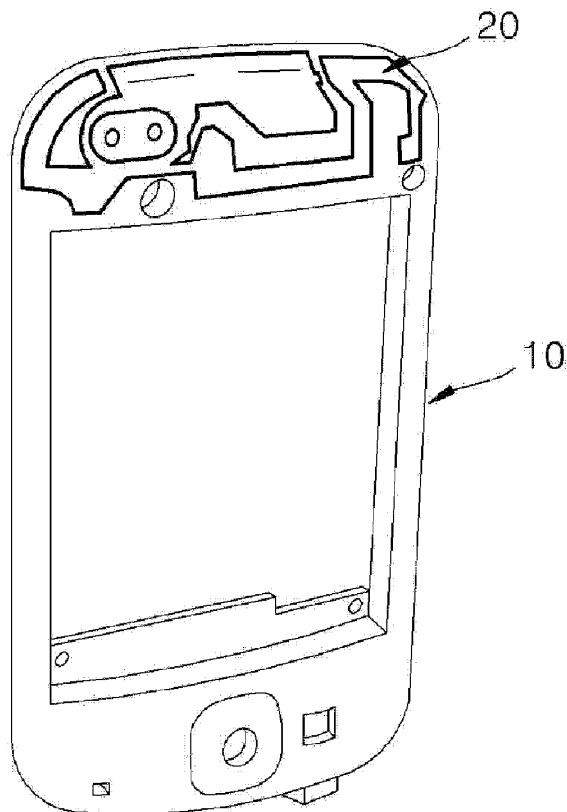
**Publication Classification**

(51) **Int. Cl.**  
**H01Q 1/38** (2006.01)  
**H01B 1/02** (2006.01)

(52) **U.S. Cl.**  
CPC ... **H01Q 1/38** (2013.01); **H01B 1/02** (2013.01)  
USPC .... **343/700 MS**; 427/532; 252/500; 252/514;  
252/513; 252/512

(57) **ABSTRACT**

The ink for printing an antenna pattern for a mobile phone according to an embodiment of the present invention includes a mixture of one of silver (Ag) powder, nickel (Ni) powder, copper (Cu) powder, and gold (Au) powder, liquid acrylonitrile, liquid polystyrene, liquid butadiene, and methyl ethyl ketone (MEK) as a diluent. The present invention does not include a plating process, and thus allows a significant improvement in productivity.





US 20130076573A1

(19) **United States**

(12) **Patent Application Publication**  
**Rappoport et al.**

(10) **Pub. No.: US 2013/0076573 A1**

(43) **Pub. Date: Mar. 28, 2013**

(54) **EMBEDDED ANTENNA STRUCTURES**

(52) **U.S. Cl.**

USPC ..... 343/702; 343/873; 29/600

(76) Inventors: **Benjamin M. Rappoport**, Los Gatos, CA (US); **Bruce E. Berg**, Santa Clara, CA (US); **John Raff**, Menlo Park, CA (US); **Stephen R. McClure**, San Francisco, CA (US)

(57)

**ABSTRACT**

An electronic device may be provided with antenna structures that are embedded in a dielectric such as plastic. The plastic may be molded over the antenna structures using molding equipment. Antenna structures may be embedded in molded plastic structures such as plastic electronic device housing structures. The plastic electronic device housing structures may form housing structures such as housing wall structures. The antenna structures may be embedded within the housing wall structures in the vicinity of an exterior surface of the housing wall structures. Embedded antenna structures may also be mounted under other dielectric structures such portions of a display cover layer.

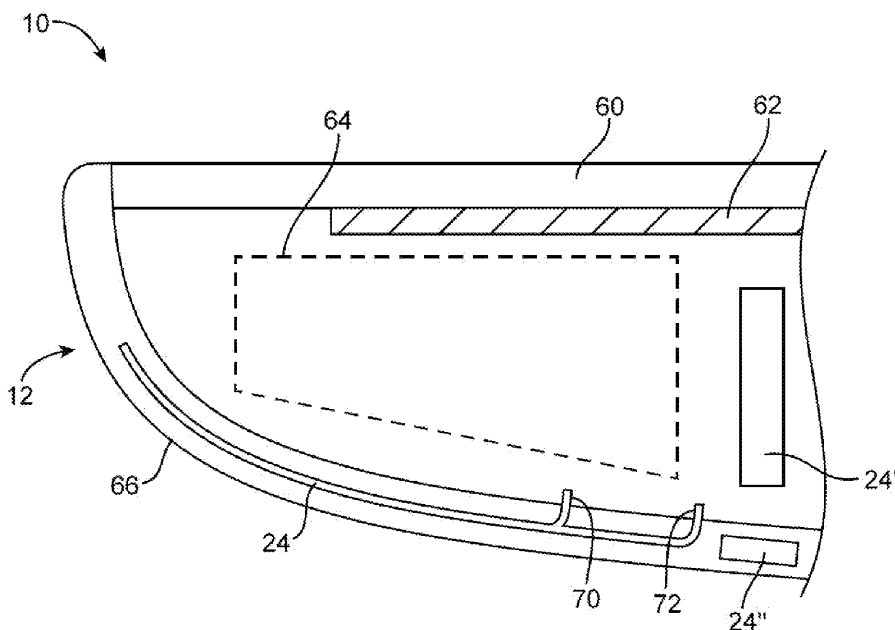
(21) Appl. No.: **13/243,549**

(22) Filed: **Sep. 23, 2011**

**Publication Classification**

(51) **Int. Cl.**

**H01Q 1/24** (2006.01)  
**H01P 11/00** (2006.01)  
**H01Q 1/40** (2006.01)





US 20130076574A1

(19) **United States**

(12) **Patent Application Publication**  
**Rappoport et al.**

(10) **Pub. No.: US 2013/0076574 A1**

(43) **Pub. Date: Mar. 28, 2013**

(54) **CUSTOMIZABLE ANTENNA STRUCTURES**

(52) **U.S. Cl.**

USPC ..... 343/702; 29/593

(76) Inventors: **Benjamin M. Rappoport**, Los Gatos, CA (US); **Bruce E. Berg**, Santa Clara, CA (US); **John Raff**, Menlo Park, CA (US); **Stephen R. McClure**, San Francisco, CA (US)

(57) **ABSTRACT**

Antenna structures may be customized to compensate for manufacturing variations in electronic device antennas. The antenna structures may include an antenna resonating element and a ground. Customizations may be made to the antenna structures by performing customization operations such as adding material, removing material, deforming material, and making electrical adjustments. Customizations may be performed to a conductive antenna resonating element structure, to a ground structure, or to associated antenna structures such as parasitic antenna elements. During manufacturing operations, antenna structures may be characterized by making radio-frequency antenna performance measurements. Antenna performance can be compared to desired performance levels and compensating customizations for the antenna structures can be identified. Customized antenna structures can be installed in electronic devices during manufacturing to produce devices that meet desired specifications.

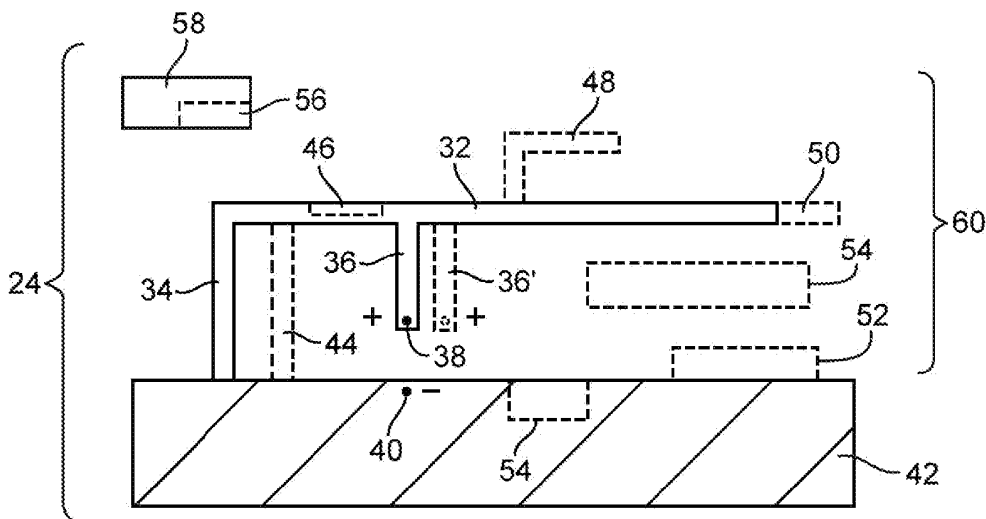
(21) Appl. No.: 13/243,722

(22) Filed: **Sep. 23, 2011**

**Publication Classification**

(51) **Int. Cl.**

**H01Q 1/24** (2006.01)  
**H01P 11/00** (2006.01)





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(19) **United States**

(12) **Patent Application Publication**  
**Zhang et al.**

(10) **Pub. No.: US 2013/0076579 A1**

(43) **Pub. Date: Mar. 28, 2013**

(54) **MULTI-BAND WIRELESS TERMINALS WITH  
MULTIPLE ANTENNAS ALONG AN END  
PORTION, AND RELATED MULTI-BAND  
ANTENNA SYSTEMS**

**Publication Classification**

(51) **Int. Cl.**  
*H01Q 19/10* (2006.01)  
*H01Q 1/00* (2006.01)

(76) Inventors: **Shuai Zhang**, Lund (SE); **Sailing He**,  
Akersberga (SE); **Kun Zhao**, Stockholm  
(SE); **Zhinong Ying**, Lund (SE)

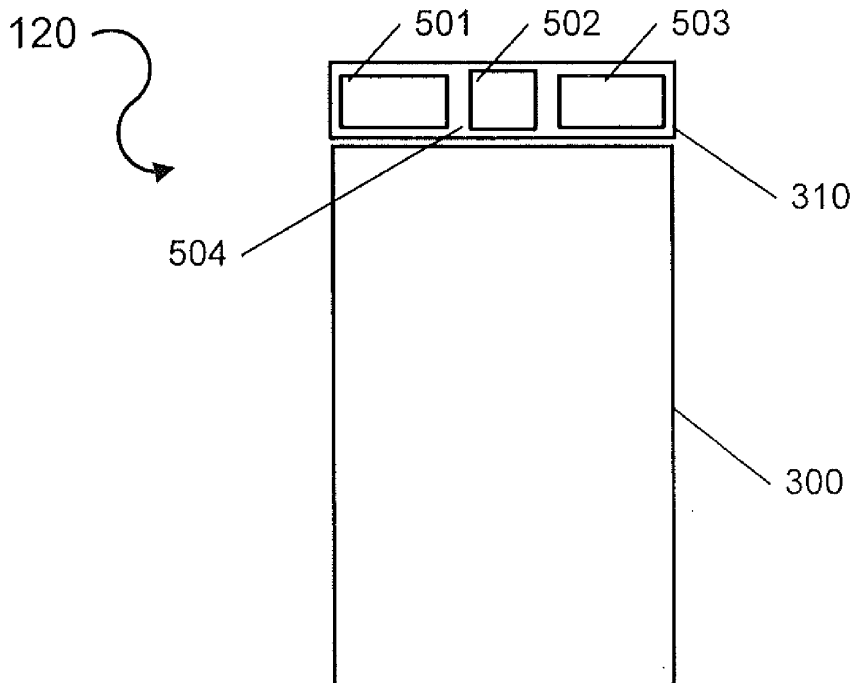
(52) **U.S. Cl.**  
USPC ..... **343/720; 343/834**

(57) **ABSTRACT**

An antenna system may include a backplate that includes an end portion. The antenna system may also include first and second antennas spaced apart from each other along the end portion of the backplate. The antenna system may additionally include a parasitic element between the first and second antennas along the end portion of the backplate.

(21) Appl. No.: **13/247,358**

(22) Filed: **Sep. 28, 2011**





US 20130076580A1

(19) **United States**

(12) **Patent Application Publication**  
**Zhang et al.**

(10) **Pub. No.: US 2013/0076580 A1**

(43) **Pub. Date: Mar. 28, 2013**

(54) **MULTI-BAND WIRELESS TERMINALS WITH A HYBRID ANTENNA ALONG AN END PORTION, AND RELATED MULTI-BAND ANTENNA SYSTEMS**

**Publication Classification**

(51) **Int. Cl.**  
*H01Q 21/30* (2006.01)  
*H01Q 1/00* (2006.01)  
(52) **U.S. Cl.**  
USPC ..... **343/720; 343/835**

(76) Inventors: **Shuai Zhang**, Stockholm (SE); **Zhinong Ying**, Lund (SE)

(57) **ABSTRACT**

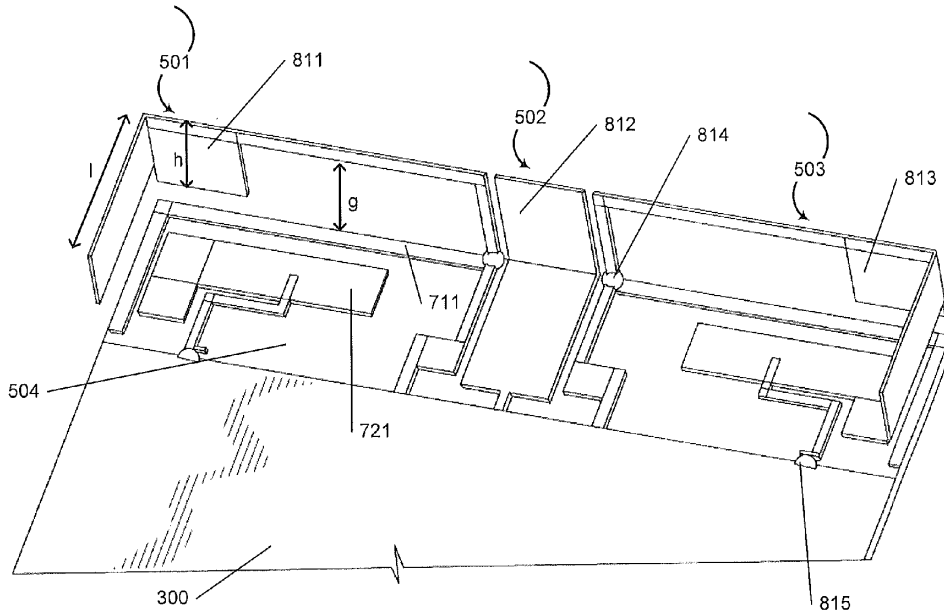
An antenna system may include a backplate that includes an end portion. The antenna system may also include a hybrid antenna that includes first and second antenna elements spaced apart from each other along the end portion of the backplate. The first antenna element may include a type of antenna element that is structurally different from the second antenna element. Additionally, the antenna system may further include a parasitic element between the first and second antenna elements along the end portion of the backplate.

(21) Appl. No.: **13/419,961**

(22) Filed: **Mar. 14, 2012**

**Related U.S. Application Data**

(63) Continuation-in-part of application No. 13/247,358, filed on Sep. 28, 2011.





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(19) **United States**

(12) **Patent Application Publication**  
Nysen

(10) **Pub. No.: US 2013/0076582 A1**

(43) **Pub. Date: Mar. 28, 2013**

(54) **WIRELESS DEVICE AND MULTI-ANTENNA SYSTEM HAVING DUAL OPEN-SLOT RADIATORS**

(52) **U.S. CL.**  
CPC ..... *H01Q 13/18* (2013.01)  
USPC ..... 343/770

(71) Applicant: **Sierra Wireless, Inc.**, Richmond (CA)  
(72) Inventor: **Paul A. Nysen**, Carlsbad, CA (US)  
(73) Assignee: **Sierra Wireless, Inc.**, Richmond (CA)  
(21) Appl. No.: **13/623,734**  
(22) Filed: **Sep. 20, 2012**

(57) **ABSTRACT**

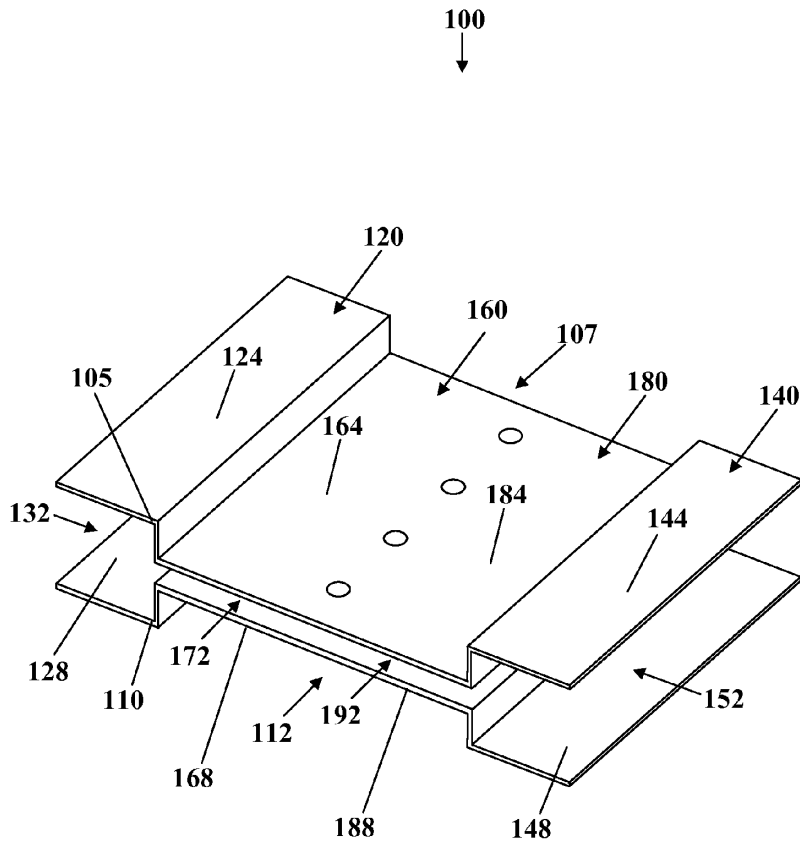
A multi-antenna system and wireless device comprising same are provided. The multi-antenna system comprises two open-slot antennas each coupled to its own resonant cavity. The two resonant cavities may be adjacent with common short circuit elements across their boundary. The short circuit elements may include apertures through which wires can be passed. The multi-antenna system may comprise two spaced-apart plates, each plate defining half of the first open-slot antenna, half of the second open-slot antenna, half of the first resonant cavity, and half of the second resonant cavity. The multi-antenna system can be fitted into a low-profile wireless device having a top face with a surface area about equal to or greater than that of the plates. A display such as a touch-screen may be fitted to the top face. The plate configuration may provide for a relatively large surface over which current can flow during antenna operation.

**Related U.S. Application Data**

(60) Provisional application No. 61/536,897, filed on Sep. 20, 2011.

**Publication Classification**

(51) **Int. Cl.**  
*H01Q 13/18* (2006.01)





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(19) **United States**

(12) **Patent Application Publication**  
**KIM**

(10) **Pub. No.: US 2013/0076585 A1**

(43) **Pub. Date: Mar. 28, 2013**

(54) **ANTENNA DEVICE FOR GENERATING RECONFIGURABLE HIGH-ORDER MODE CONICAL BEAM**

(52) **U.S. Cl.**  
USPC ..... 343/787; 343/700 MS

(75) Inventor: **Joung Myoun KIM**, Daejeon (KR)

(57) **ABSTRACT**

(73) Assignee: **Electronics and Telecommunications Research Institute**, Daejeon (KR)

(21) Appl. No.: **13/612,578**

(22) Filed: **Sep. 12, 2012**

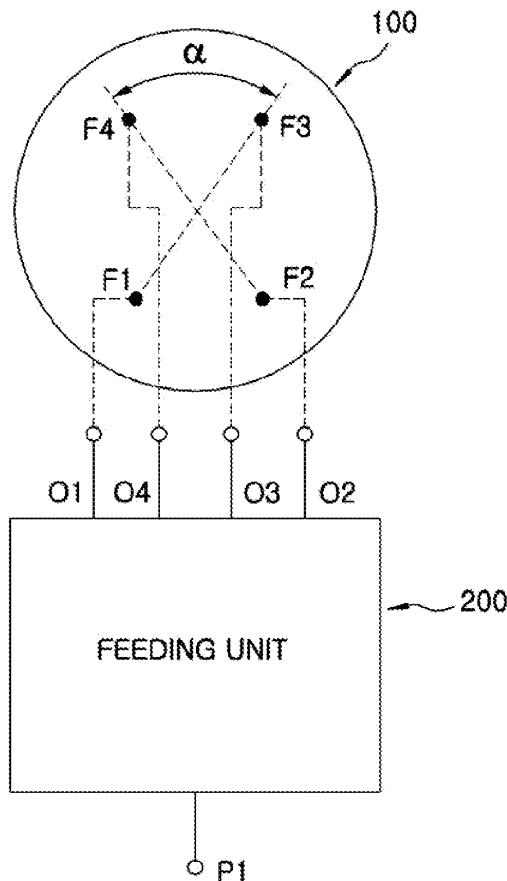
(30) **Foreign Application Priority Data**

Sep. 23, 2011 (KR) ..... 10-2011-0096139

**Publication Classification**

(51) **Int. Cl.**  
**H01Q 5/01** (2006.01)  
**H01Q 1/00** (2006.01)

An antenna device for generating a reconfigurable high-order mode conical beam, includes a micro-strip radiator having multiple feeding points, wherein one of the feeding points is a fixed feeding point, and a feeding unit for providing two signals having a same amplitude and a preset phase difference, wherein one of the two signals is fed through the fixed feeding point and the other is fed through any one of remaining feeding points. A mode reconfigurable switching unit, connected to the feeding unit, performs a switching operation to select any one of the remaining feeding points so that the other signal is feed through the selected feeding point in accordance with mode control data.







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(19) **United States**

(12) **Patent Application Publication**  
**Karhuketo et al.**

(10) **Pub. No.: US 2013/0076586 A1**

(43) **Pub. Date: Mar. 28, 2013**

(54) **ARRANGEMENT FOR REDUCING INTERFERENCE IN AN ELECTRONIC SHELF LABEL**

(52) **U.S. Cl.**  
CPC ..... *H01Q 1/526* (2013.01)  
USPC ..... **343/841**

(75) Inventors: **Hannu Karhuketo**, Tuusula (FI);  
**Gregory Wright**, Fair Haven, NJ (US)

(57) **ABSTRACT**

(73) Assignee: **MARISENSE OY**, Vantaa (FI)

An arrangement for reducing interference in a wireless electronic shelf label (ESL) (100) having a layered structure the ESL comprising: a display layer (101) comprising display material, a circuit board (203) with a backplane material structure and an antenna (202), and a circuit board arrangement with control electronics for controlling the operation of the label, such as the display and the radio communication, and a resilient layer having a space for a rigid component, such as a battery, wherein said resilient layer is arranged to provide a substantially even total thickness of said label (100), wherein the radio communication control further comprises means for radio frequency communication via modulated backscatter, wherein the arrangement is ring resonator arrangement isolating the ESL from the electrically conducting shelf arranged on the antenna circuit board, the ring resonator arrangement comprising a plurality of ring resonators (204) that are electrically isolated from the antenna and arranged at least on the side nearest the shelf when the ESL is attached to the shelf.

(21) Appl. No.: **13/698,392**

(22) PCT Filed: **May 31, 2011**

(86) PCT No.: **PCT/FI2011/050505**

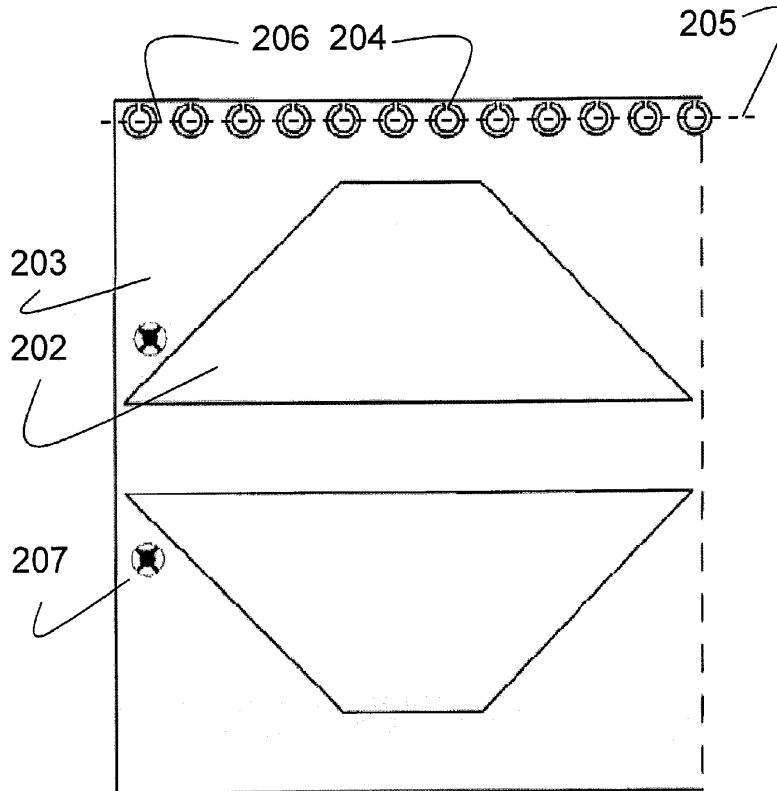
§ 371 (c)(1),  
(2), (4) Date: **Nov. 16, 2012**

(30) **Foreign Application Priority Data**

Jun. 1, 2010 (FI) ..... 20105616

**Publication Classification**

(51) **Int. Cl.**  
*H01Q 1/52* (2006.01)





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(19) **United States**

(12) **Patent Application Publication**  
**Wong et al.**

(10) **Pub. No.: US 2013/0076587 A1**

(43) **Pub. Date: Mar. 28, 2013**

(54) **COMMUNICATION ELECTRONIC DEVICE  
AND ANTENNA STRUCTURE THEREOF**

(52) **U.S. CL.**  
USPC ..... **343/848**

(76) Inventors: **Kin-Lu Wong**, New Taipei City (TW);  
**Yeh-Chun Kao**, New Taipei City (TW)

(57) **ABSTRACT**

(21) Appl. No.: **13/316,547**

A communication electronic device includes a grounding element and an antenna element. There is a first notch, a second notch and a first protruded portion disposed at an edge of the grounding element, and the first notch and the second notch are not located at corners of the edge of the grounding element. The first protruded portion is located between the first notch and the second notch. The antenna element and the grounding element are disposed on different planes. The antenna element has a projection on the grounding element, and the projection covers a portion of the first protruded portion, a portion of the first notch and a portion of the second notch.

(22) Filed: **Dec. 11, 2011**

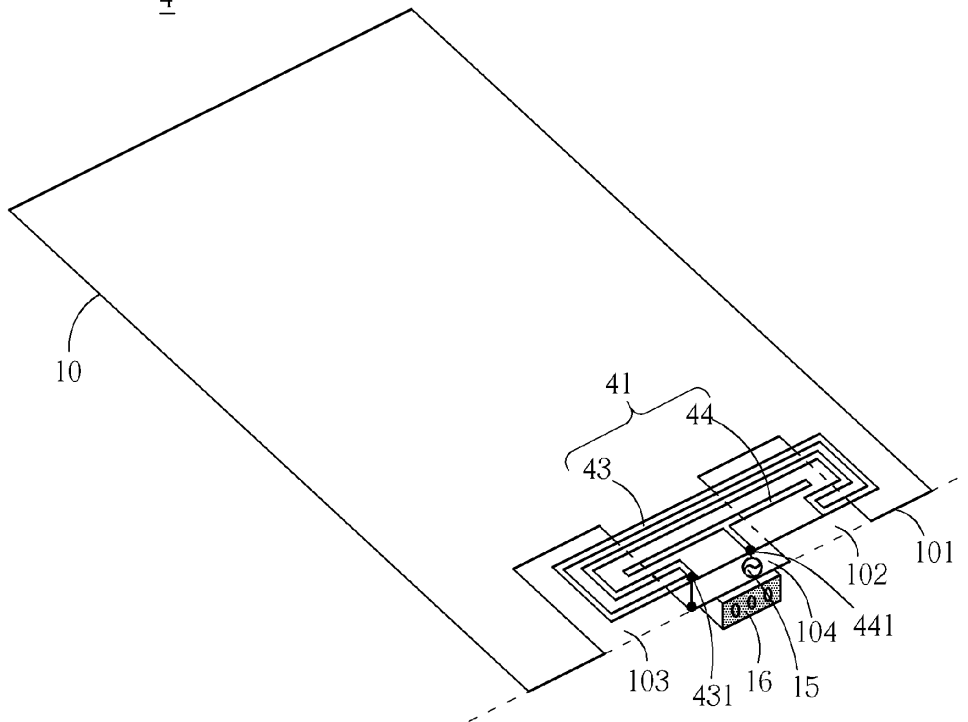
(30) **Foreign Application Priority Data**

Sep. 27, 2011 (TW) ..... 100134786

**Publication Classification**

(51) **Int. Cl.**  
**H01Q 1/48** (2006.01)

4





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(19) **United States**

(12) **Patent Application Publication**  
**PARK**

(10) **Pub. No.: US 2013/0076588 A1**

(43) **Pub. Date: Mar. 28, 2013**

(54) **ANTENNA**

**Publication Classification**

(71) Applicant: **LG INNOTEK CO., LTD.**, Seoul (KR)

(51) **Int. Cl.**  
**H01Q 1/50** (2006.01)

(72) Inventor: **Young Hun PARK**, Seoul (KR)

(52) **U.S. Cl.**  
USPC ..... **343/860**

(73) Assignee: **LG INNOTEK CO., LTD.**, Seoul (KR)

(21) Appl. No.: **13/631,435**

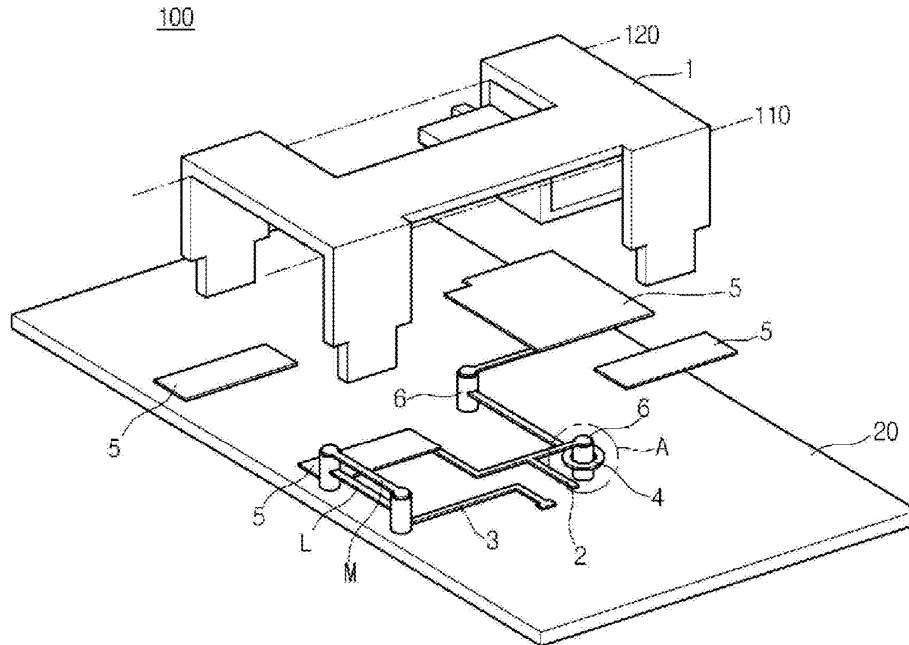
(57) **ABSTRACT**

(22) Filed: **Sep. 28, 2012**

Disclosed is an antenna. The antenna includes a first radiating part bent in a predetermined direction, a second radiating part under the first radiating part, a conductive member connected to the second radiating part, and a coupling part spaced apart from the conductive member while surrounding a lateral side of the conductive member.

(30) **Foreign Application Priority Data**

Sep. 28, 2011 (KR) ..... 10-2011-0098610





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(19) **United States**

(12) **Patent Application Publication**  
**Liu et al.**

(10) **Pub. No.: US 2013/0077566 A1**

(43) **Pub. Date: Mar. 28, 2013**

(54) **UNIPOLAR ANTENNA, WIRELESS ACCESS APPARATUS AND WIRELESS ROUTER**

(52) **U.S. Cl.**  
USPC ..... 370/328; 343/904

(76) Inventors: **Ruopeng Liu**, Shenzhen (CN);  
**Guanxiang Xu**, Shenzhen (CN)

(57) **ABSTRACT**

(21) Appl. No.: **13/521,744**

(22) PCT Filed: **Nov. 8, 2011**

(86) PCT No.: **PCT/CN11/81901**

§ 371 (c)(1),  
(2), (4) Date: **Jul. 12, 2012**

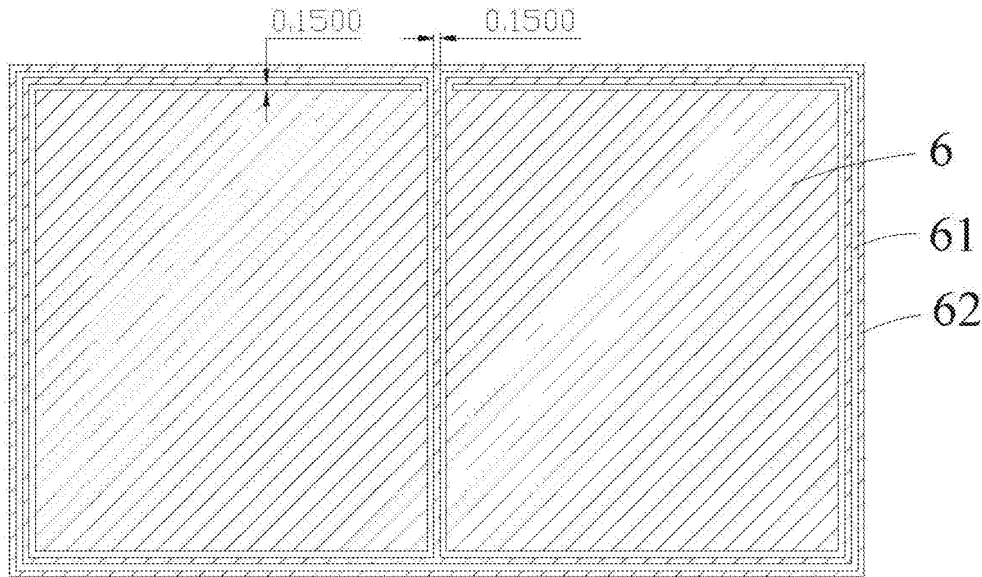
(30) **Foreign Application Priority Data**

Sep. 23, 2011 (CN) ..... 201110286453.1  
Sep. 23, 2011 (CN) ..... 201110286487.0  
Sep. 23, 2011 (CN) ..... 201110286499.3

**Publication Classification**

(51) **Int. Cl.**  
**H01Q 1/50** (2006.01)  
**H04W 88/08** (2009.01)

The present disclosure discloses a unipolar antenna, a wireless access apparatus and a wireless router. The unipolar antenna of the present disclosure comprises a medium substrate, as well as a power feeding point, a feeder line and a metal structure that are disposed on a surface of the medium substrate. The feeder line is connected to the power feeding point, and the feeder line and the metal structure are coupled with each other. The unipolar antenna, the wireless access apparatus and the wireless router of the present disclosure can transmit or receive electromagnetic signals of two or more different wavebands simultaneously so that they can operate within multiple operation wavebands in a single-frequency mode and operate within different operation wavebands simultaneously in a multi-frequency mode. Thereby, the antenna can be miniaturized on the premise of satisfying the performance requirements of the communication devices.





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(19) **United States**

(12) **Patent Application Publication**  
**Asrani et al.**

(10) **Pub. No.: US 2013/0078932 A1**

(43) **Pub. Date: Mar. 28, 2013**

(54) **TUNABLE ANTENNA WITH A CONDUCTIVE, PHYSICAL COMPONENT CO-LOCATED WITH THE ANTENNA**

(52) **U.S. Cl.**  
USPC ..... 455/90.3; 343/745

(57) **ABSTRACT**

A method and device for providing impedance tuning to compensate for capacitive loading effects on an antenna which are associated with conductive or physical components in close proximity to the antenna is provided. A dynamic impedance tuning (DIT) controller periodically receives information that indicates that one or more functions of a physical component and/or a particular device operating state are currently active. In response to one or more functions of the physical component being activated, the DIT controller configures the tunable impedance to a pre-set impedance level to compensate for capacitive loading effects on the antenna. In addition, the controller triggers a switch to connect the tunable impedance to the ground signal line to provide antenna tuning corresponding to the preset impedance level. The tunable impedance adjusts the terminal impedance of the ground signal line to minimize capacitive loading effects associated with the signal line.

(75) Inventors: **Vijay L. Asrani**, Round Lake, IL (US);  
**Adrian Napoles**, Lake Villa, IL (US)

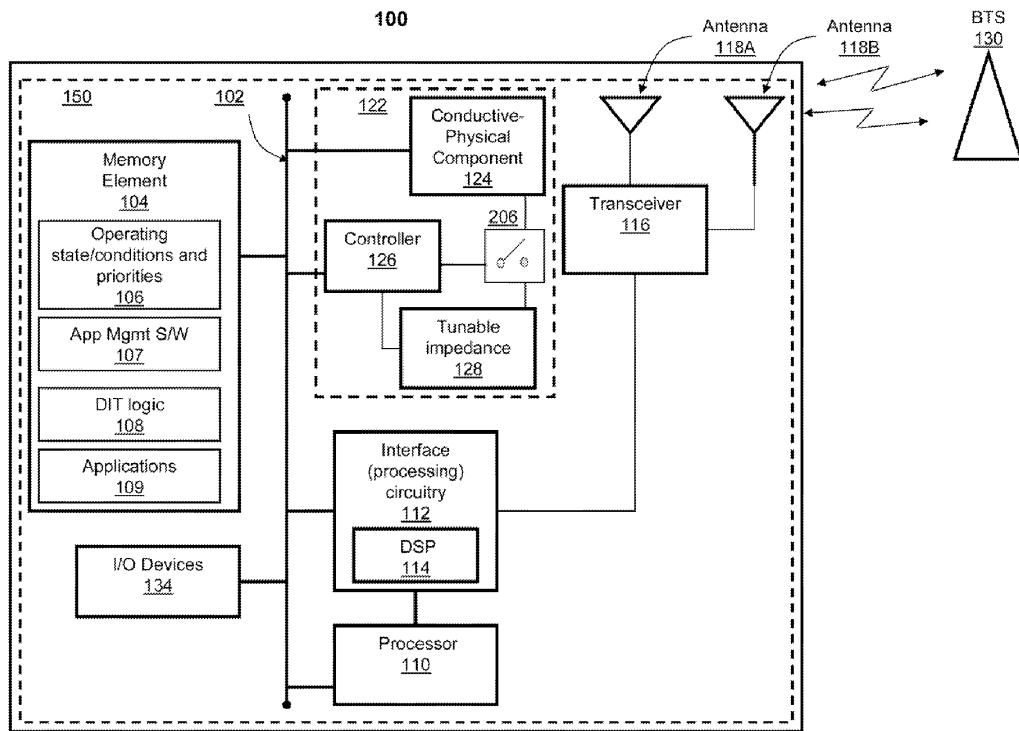
(73) Assignee: **MOTOROLA MOBILITY, INC.**,  
Libertyville, IL (US)

(21) Appl. No.: **13/246,883**

(22) Filed: **Sep. 28, 2011**

**Publication Classification**

(51) **Int. Cl.**  
**H04W 88/02** (2009.01)  
**H01Q 9/00** (2006.01)





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(19) **United States**

(12) **Patent Application Publication**  
Nysen

(10) **Pub. No.: US 2013/0078935 A1**

(43) **Pub. Date: Mar. 28, 2013**

(54) **COMPACT MULTI-ANTENNA AND MULTI-ANTENNA SYSTEM**

(52) **U.S. Cl.**

USPC ..... 455/129; 343/730

(75) Inventor: **Paul A. Nysen**, Carlsbad, CA (US)

(57) **ABSTRACT**

(73) Assignee: **SIERRA WIRELESS INC.**

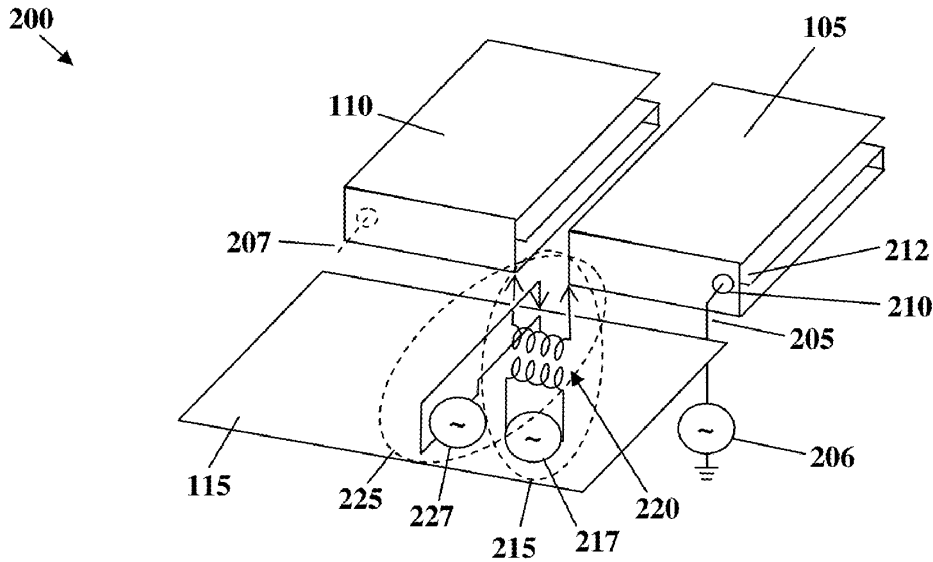
A compact multi-antenna, multi-antenna system, and wireless device comprising same are provided. The multi-antenna comprises first, second and third antennas. The second antenna contains the first antenna, and the third antenna contains at least part of the second antenna. The first antenna may be a slot-in-slot or other antenna, the second antenna may be a dipole, and the third antenna may be a dipole or monopole. The multi-antenna system comprises the multi-antenna plus first, second and third transmission systems operatively coupled thereto. The antennas of the multi-antenna and system may be concurrently operated, substantially independently, and may have mutually orthogonal polarizations. Particular antenna and system configurations are also disclosed.

(21) Appl. No.: **13/247,443**

(22) Filed: **Sep. 28, 2011**

**Publication Classification**

(51) **Int. Cl.**  
*H04B 1/04* (2006.01)  
*H01Q 5/01* (2006.01)  
*H01Q 21/28* (2006.01)





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(19) **United States**

(12) **Patent Application Publication**  
Nilsson et al.

(10) **Pub. No.: US 2013/0079047 A1**

(43) **Pub. Date: Mar. 28, 2013**

(54) **NODE IN A COMMUNICATION SYSTEM WITH SWITCHABLE ANTENNA FUNCTIONS**

(75) Inventors: **Andreas Nilsson**, Goteborg (SE);  
**Anders Derneryd**, Goteborg (SE);  
**Jonas Fridén**, Molndal (SE); **Lars Manholm**, Goteborg (SE)

(73) Assignee: **TELEFONAKTIEBOLAGET LM ERICSSON (PUBL)**, Stockholm (SE)

(21) Appl. No.: **13/702,542**

(22) PCT Filed: **Jun. 11, 2010**

(86) PCT No.: **PCT/EP10/58243**

§ 371 (c)(1),

(2), (4) Date: **Dec. 6, 2012**

**Publication Classification**

(51) **Int. Cl.**  
**H04B 7/04** (2006.01)

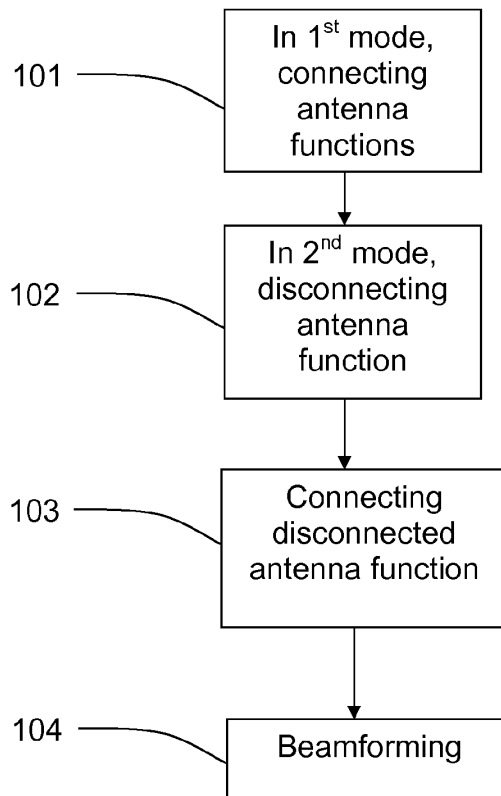
(52) **U.S. Cl.**

CPC ..... **H04B 7/0408** (2013.01)

USPC ..... **455/509**

(57) **ABSTRACT**

The present invention relates to a node (1) in a wireless communication system, the node (1) comprising at least a first and second antenna function (2, 3), and a first and second radio chain (4, 5). At least at the start of a first mode of operation, each antenna function (2, 3) is connected to a corresponding radio chain (4, 5). The node further comprises a switching network (6) and a beamforming network (7), which switching network (6), at least at the start of a second mode of operation, is arranged to disconnect at least one antenna function (2) from its corresponding radio chain (4) and connect it to another of the radio chains (5) via at least a part of the beamforming network (7), such that at least two antenna functions (2, 3) are connected to the same radio chain (5). The node (1) is arranged to perform beamforming for said at least two antenna functions (2, 3) by means of said beamforming network (7), the switching network (6) being arranged to switch between the first mode and the second mode.





US 20130079069A1

(19) **United States**

(12) **Patent Application Publication**  
**KWON et al.**

(10) **Pub. No.: US 2013/0079069 A1**

(43) **Pub. Date: Mar. 28, 2013**

(54) **MOBILE TERMINAL HAVING ANTENNA**

(52) **U.S. Cl.**

USPC ..... 455/575.5

(75) Inventors: **Oh Yong KWON**, Hwaseong-si (KR);  
**Jeon Il LEE**, Suwon-si (KR)

(57)

**ABSTRACT**

(73) Assignee: **Samsung Electronics Co. Ltd.**,  
Suwon-si (KR)

A mobile terminal that can prevent radiation performance deterioration of an antenna is provided. The mobile terminal includes a circuit board in which an antenna and one or more key buttons are mounted, a housing mounted on the antenna and the circuit board, and a case for enclosing a periphery of the one or more key buttons and having a plurality of openings according to the quantity of the key buttons, wherein an antenna adjacent opening among the plurality of openings is extended through a slot toward an edge of the case to embody a loop antenna. Therefore, radiation deterioration of an antenna due to a case can be prevented. In addition, production costs can be minimized, and a desired external appearance of the mobile terminal is not compromised.

(21) Appl. No.: **13/404,281**

(22) Filed: **Feb. 24, 2012**

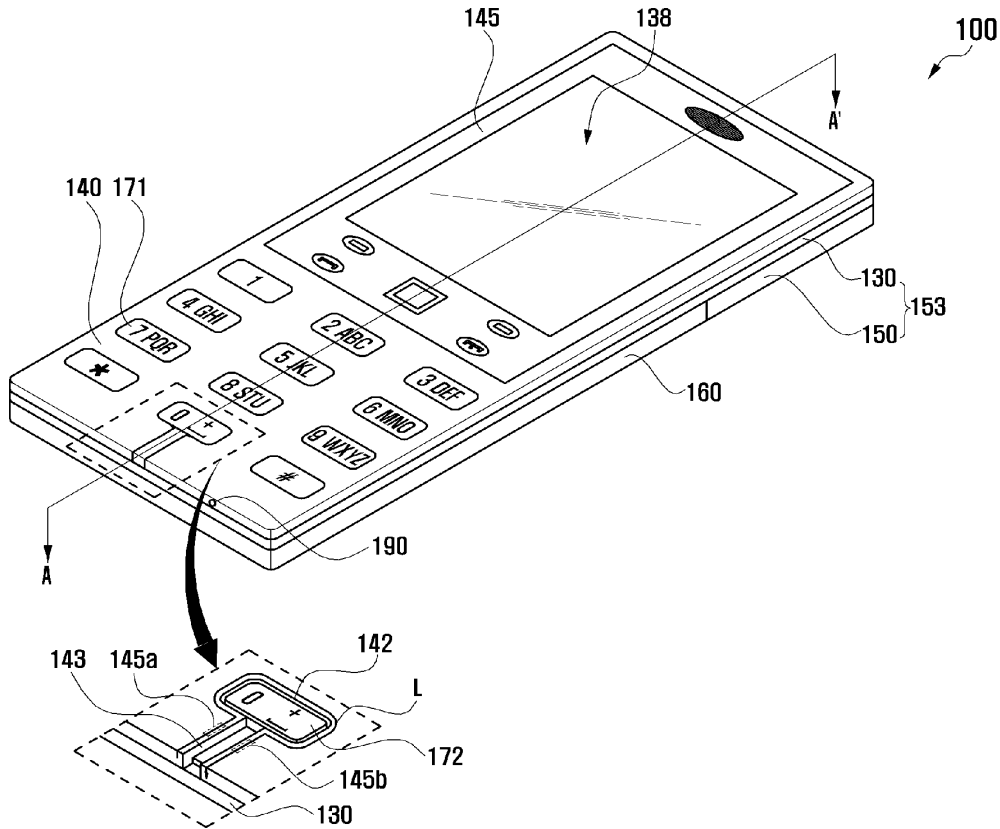
(30) **Foreign Application Priority Data**

Sep. 23, 2011 (KR) ..... 10-2011-0096203

**Publication Classification**

(51) **Int. Cl.**  
**H04B 15/00**

(2006.01)







US 20130082706A1

(19) **United States**

(12) **Patent Application Publication**  
**Evers et al.**

(10) **Pub. No.: US 2013/0082706 A1**

(43) **Pub. Date: Apr. 4, 2013**

(54) **LOCAL ANTENNA DEVICE FOR TRANSMITTING MAGNETIC RESONANCE SIGNALS**

**Publication Classification**

(71) Applicants: **Daniel Evers**, Otterfing (DE); **Klaus Pistor**, Neubiberg (DE); **Florian Poprawa**, Muenchen (DE); **Stefan Schwarzer**, Taufkirchen (DE); **Markus Vester**, Nuernberg (DE)

(51) **Int. Cl.**  
**G01R 33/34** (2006.01)  
**G01R 33/54** (2006.01)

(52) **U.S. Cl.**  
USPC ..... **324/309; 324/322**

(72) Inventors: **Daniel Evers**, Otterfing (DE); **Klaus Pistor**, Neubiberg (DE); **Florian Poprawa**, Muenchen (DE); **Stefan Schwarzer**, Taufkirchen (DE); **Markus Vester**, Nuernberg (DE)

(57) **ABSTRACT**

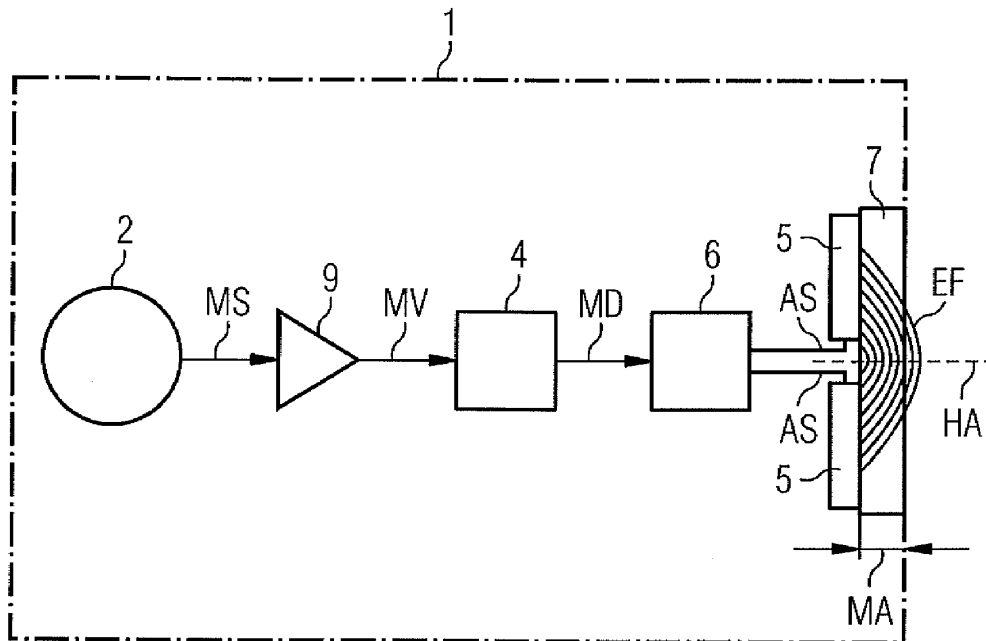
A local antenna device for transmitting magnetic resonance (MR) signals of a plurality of MR receiving antenna elements to an MR signal processing device is provided. The local antenna device includes a plurality of analog-to-digital converters for scanning the MR signals and converting the MR signals to digital MR data, and a plurality of transmitting antenna elements for wirelessly transmitting the digital MR data to the MR signal processing device by the emission of an electromagnetic field. The local antenna device includes a plurality of transmitting devices for triggering the transmitting antenna elements and a plurality of spacer elements that is arranged and embodied on the local antenna device such that at least a defined minimum emission spacing is produced between the plurality of transmitting antenna elements and articles adjoining the local antenna device in at least one direction of a principal axis of emission of the electromagnetic field.

(21) Appl. No.: **13/632,209**

(22) Filed: **Oct. 1, 2012**

(30) **Foreign Application Priority Data**

Sep. 30, 2011 (DE) ..... DE 102011083851.1





US 20130082880A1

(19) **United States**

(12) **Patent Application Publication**  
**YU et al.**

(10) **Pub. No.: US 2013/0082880 A1**

(43) **Pub. Date: Apr. 4, 2013**

(54) **PRINTED ANTENNA**

(52) **U.S. Cl.**

USPC ..... 343/700 MS

(75) Inventors: **ZHI-CHENG YU**, Shanghai (CN);  
**CHENG-QIU WEI**, Shanghai (CN)

(73) Assignees: **HON HAI PRECISION INDUSTRY CO., LTD.**, Tu-Cheng (TW); **AMBIT MICROSYSTEMS (SHANGHAI) LTD.**, SHANGHAI (CN)

(57) **ABSTRACT**

A printed antenna, disposed on a substrate including a first surface and a second surface, includes a plurality of holes, a radiating body, and a feeding portion. The radiating body includes a first radiator arranged on the first surface and a second radiator arranged on the second surface. The first radiator includes a plurality of first radiating portions spaced apart from each other and positioned between two adjacent holes on the first surface. The second radiator includes a plurality of second radiating portions spaced apart from each other and positioned between two adjacent holes on the second surface. The plurality of first radiating portions and the plurality of second radiating portions are put end to end via the plurality of holes from the first surface to the second surface.

(21) Appl. No.: **13/597,283**

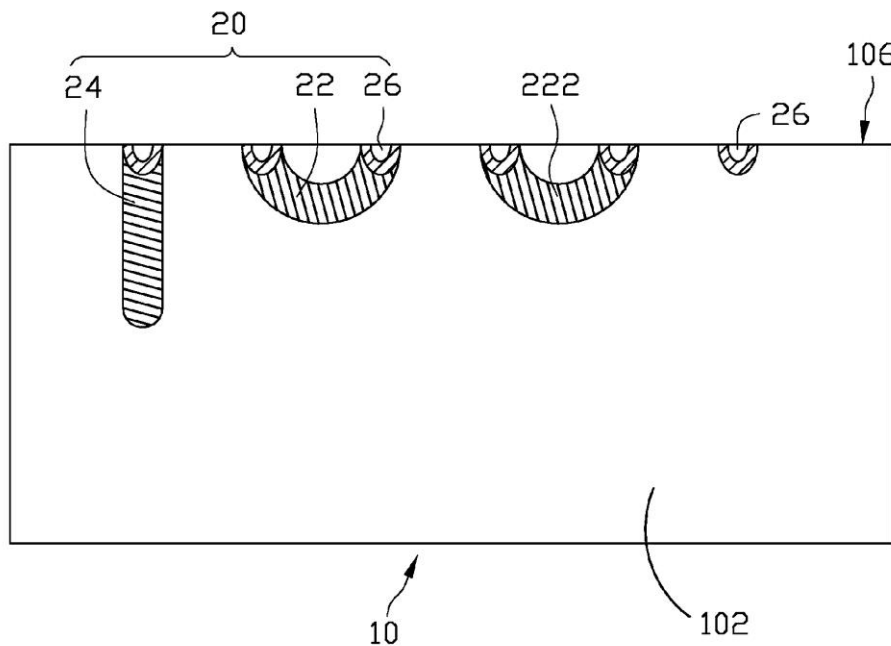
(22) Filed: **Aug. 29, 2012**

(30) **Foreign Application Priority Data**

Sep. 30, 2011 (CN) ..... 201120373001.2

**Publication Classification**

(51) **Int. Cl.**  
**H01Q 1/38** (2006.01)





US 20130082881A1

(19) **United States**

(12) **Patent Application Publication**  
**ZHU**

(10) **Pub. No.: US 2013/0082881 A1**

(43) **Pub. Date: Apr. 4, 2013**

(54) **MOBILE COMMUNICATION ANTENNA  
DEVICE AND MOBILE COMMUNICATION  
TERMINAL DEVICE**

**Publication Classification**

(71) Applicant: **HUAWEI DEVICE CO., LTD.**,  
Shenzhen (CN)

(51) **Int. Cl.**  
**H01Q 1/38** (2006.01)

(72) Inventor: **Dejin ZHU**, Wuhan (CN)

(52) **U.S. Cl.**  
CPC ..... **H01Q 1/38** (2013.01)  
USPC ..... **343/700 MS**

(73) Assignee: **HUAWEI DEVICE CO., LTD.**,  
Shenzhen (CN)

(57) **ABSTRACT**

(21) Appl. No.: **13/627,250**

The present invention discloses a mobile communication antenna device. The device includes: a monopole antenna, placed on one side of a printed circuit board, where a distance between the monopole antenna and a central position of the printed circuit board is less than a threshold, and the monopole antenna includes a first metal sheet which is vertical to the printed circuit board, and is conducted with a circuit of the printed circuit board through a feedpoint. The present invention also discloses a mobile communication terminal device. By adopting the present invention, an ultra wideband antenna may be achieved, thereby making it possible that a mobile communication terminal device product, such as a fixed station, supports more frequency bands.

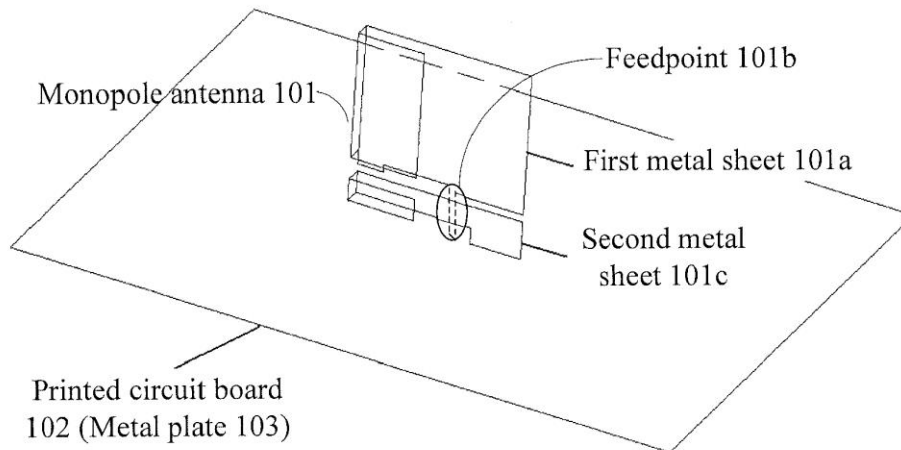
(22) Filed: **Sep. 26, 2012**

**Related U.S. Application Data**

(63) Continuation of application No. PCT/CN2011/072197, filed on Mar. 28, 2011.

**Foreign Application Priority Data**

(30) Mar. 26, 2011 (CN) ..... 201020144966.X





US 20130082883A1

(19) **United States**

(12) **Patent Application Publication**  
**Montevirgen et al.**

(10) **Pub. No.: US 2013/0082883 A1**

(43) **Pub. Date: Apr. 4, 2013**

(54) **PORTABLE ELECTRONIC DEVICE  
HOUSING HAVING INSERT MOLDING  
AROUND ANTENNA**

(52) **U.S. Cl.**  
USPC ..... **343/702; 156/107; 264/272.11**

(76) Inventors: **Anthony S. Montevirgen**, San Francisco, CA (US); **Emery A. Stanford**, San Francisco, CA (US); **Stephen B. Lynch**, Portola Valley, CA (US)

(57) **ABSTRACT**

(21) Appl. No.: **13/250,668**

(22) Filed: **Sep. 30, 2011**

**Publication Classification**

(51) **Int. Cl.**  
**H01Q 1/24** (2006.01)  
**B29C 65/48** (2006.01)

Embodiments are described herein in the context of housings for electronic devices. In one embodiment, a housing can make use of an outer member, which can be formed of glass. The outer member can be secured with respect to other portions of the housing for the electronic device. The output member can also be protected at its edges by a protective side member. Still further, one or more antenna can be provided at least partially internal to the protective side member. The electronic devices can be portable and in some cases handheld.





US 20130082884A1

(19) **United States**

(12) **Patent Application Publication**  
**Gummalla**

(10) **Pub. No.: US 2013/0082884 A1**

(43) **Pub. Date: Apr. 4, 2013**

(54) **ANTENNAS FOR COMPUTERS WITH CONDUCTIVE CHASSIS**

**Publication Classification**

(75) Inventor: **Ajay Chandra Venkata Gummalla**,  
Sunnyvale, CA (US)

(51) **Int. Cl.**  
**H01Q 13/10** (2006.01)

(73) Assignee: **GOOGLE INC.**, Mountain View, CA  
(US)

(52) **U.S. Cl.**  
USPC ..... **343/702**

(21) Appl. No.: **13/269,572**

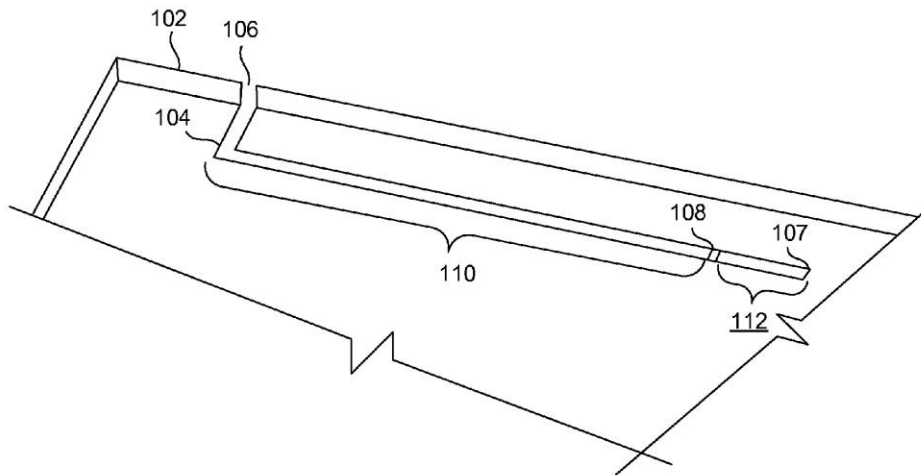
(57) **ABSTRACT**

(22) Filed: **Oct. 8, 2011**

According to one general aspect, an apparatus may include an electrically conductive frame and a slot antenna. The slot antenna may be formed, at least in part, by the electrically conductive frame, wherein the slot antenna includes a slot opening and is configured to provide at least a first frequency resonance. The width of the slot opening may be equal to or less than  $\frac{1}{200}^{th}$  of the wavelength of the first resonant frequency.

**Related U.S. Application Data**

(60) Provisional application No. 61/541,740, filed on Sep. 30, 2011.





US 20130082888A1

(19) **United States**

(12) **Patent Application Publication**  
**BYUN et al.**

(10) **Pub. No.: US 2013/0082888 A1**

(43) **Pub. Date: Apr. 4, 2013**

(54) **METHOD FOR FABRICATING ANTENNA  
DEVICE OF MOBILE COMMUNICATION  
TERMINAL**

(30) **Foreign Application Priority Data**

Jul. 22, 2009 (KR) ..... 10-2009-0066760

(71) Applicant: **Samsung Electronics Co. Ltd.**,  
Suwon-si (KR)

**Publication Classification**

(72) Inventors: **Joon-Ho BYUN**, Yongin-si (KR);  
**Seong-Tae JEONG**, Yongin-si (KR);  
**Bum-Jin CHO**, Hwaseong-si (KR);  
**Soon-Ho HWANG**, Seoul (KR);  
**Yong-Soo KWAK**, Suwon-si (KR);  
**Austin KIM**, Seongnam-si (KR);  
**Jae-Hoon JO**, Seoul (KR); **Jae-Hyung  
KIM**, Seoul (KR); **A-Hyun SIN**, Busan  
(KR)

(51) **Int. Cl.**  
**H01Q 1/38** (2006.01)

(52) **U.S. Cl.**  
CPC ..... **H01Q 1/38** (2013.01)  
USPC ..... **343/745**

(73) Assignee: **SAMSUNG ELECTRONICS CO.  
LTD.**, Suwon-si (KR)

(57) **ABSTRACT**

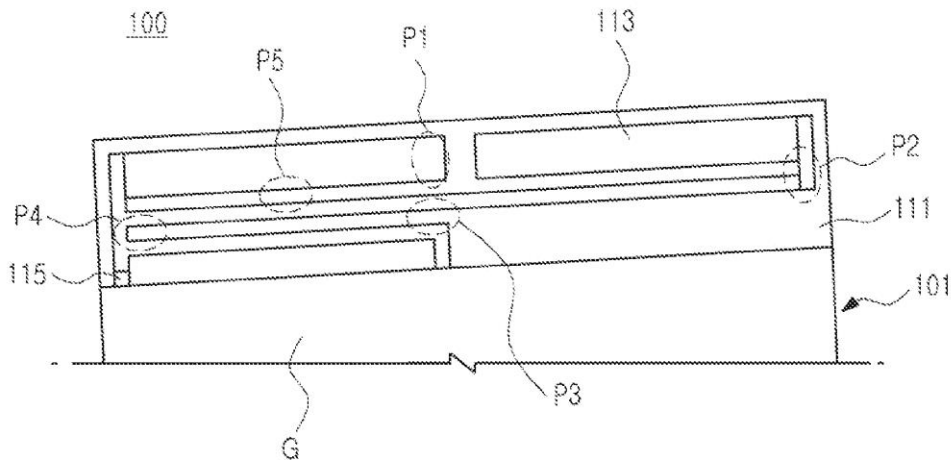
An antenna device of a mobile communication terminal is provided, the device including at least one radiation pattern and at least one magneto dielectric module or dielectric module installed in a selected position on the radiation pattern to tune one or more resonance frequencies of the radiation pattern according to resonance frequencies required for the terminal. The radiation pattern is selected from among one or more radiation patterns fabricated according to a usable frequency band. The one or more radiation patterns each include one or more resonance frequencies. The magneto dielectric module is selected from among one or more magneto dielectric modules fabricated for controlling the one or more resonance frequencies of the one or more radiation patterns. The dielectric module is selected from among one or more dielectric modules fabricated for controlling the one or more resonance frequencies of the one or more radiation patterns.

(21) Appl. No.: **13/686,555**

(22) Filed: **Nov. 27, 2012**

**Related U.S. Application Data**

(63) Continuation of application No. 12/841,389, filed on Jul. 22, 2010, now Pat. No. 8,353,097.





US 20130082891A1

(19) **United States**

(12) **Patent Application Publication**  
**HAN et al.**

(10) **Pub. No.: US 2013/0082891 A1**

(43) **Pub. Date: Apr. 4, 2013**

(54) **DIPOLE ANTENNA**

**Publication Classification**

(75) Inventors: **Myeong Woo HAN**, Hwaseong (KR);  
**Jung Aun Lee**, Suwon (KR)

(51) **Int. Cl.**  
**H01Q 9/16** (2006.01)

(73) Assignee: **SAMSUNG ELECTRO-MECHANICS**  
**CO., LTD.**

(52) **U.S. Cl.**  
USPC ..... **343/793**

(21) Appl. No.: **13/333,398**

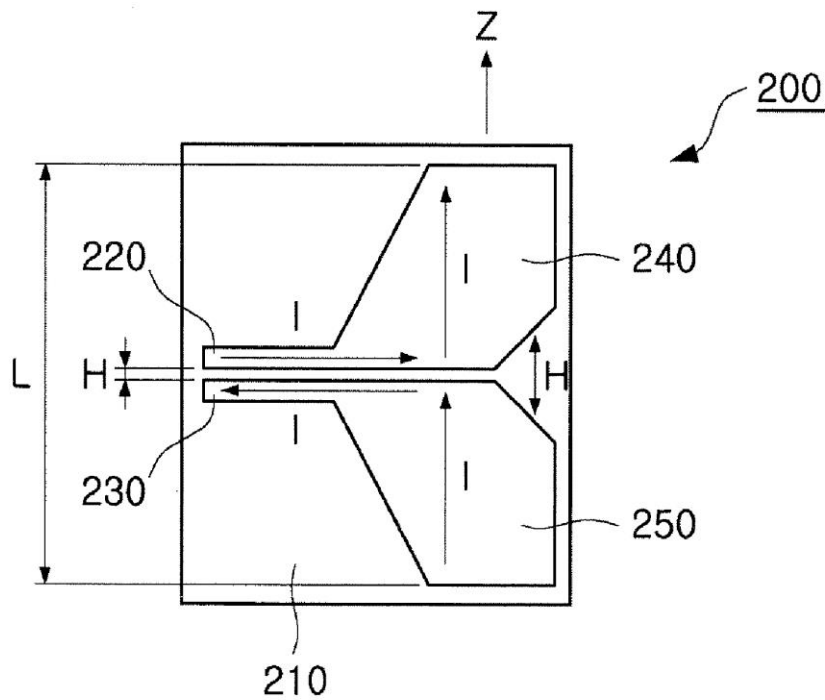
(57) **ABSTRACT**

(22) Filed: **Dec. 21, 2011**

There is provided a dipole antenna. The dipole antenna according to embodiments of the present invention includes: a substrate having a predetermined dielectric constant; and an antenna unit including at least one pair of electrodes and feed lines disposed on one surface of the substrate, wherein the electrodes receive current through the feed lines to generate a signal radiated in a direction in parallel with the one surface of the substrate.

(30) **Foreign Application Priority Data**

Sep. 29, 2011 (KR) ..... 10-2011-0098962





US 20130082892A1

(19) **United States**

(12) **Patent Application Publication**  
**Qi et al.**

(10) **Pub. No.: US 2013/0082892 A1**

(43) **Pub. Date: Apr. 4, 2013**

(54) **ANTENNA WITH NEAR-FIELD RADIATION CONTROL**

now Pat. No. 7,253,775, which is a continuation of application No. 10/317,659, filed on Dec. 12, 2002, now Pat. No. 6,791,500.

(71) Applicant: **Research In Motion Limited**, Waterloo (CA)

**Publication Classification**

(72) Inventors: **Yihong Qi**, Waterloo (CA); **Perry Jarmuszewski**, Waterloo (CA); **Adam D. Stevenson**, Waterloo (CA)

(51) **Int. Cl.**  
**H01Q 1/36** (2006.01)  
**H01Q 9/26** (2006.01)  
**H01Q 19/00** (2006.01)

(73) Assignee: **RESEARCH IN MOTION LIMITED**, Waterloo (CA)

(52) **U.S. Cl.**  
CPC ..... **H01Q 1/36** (2013.01); **H01Q 19/005** (2013.01); **H01Q 9/26** (2013.01)  
USPC ..... **343/803**; **343/700 MS**

(21) Appl. No.: **13/686,518**

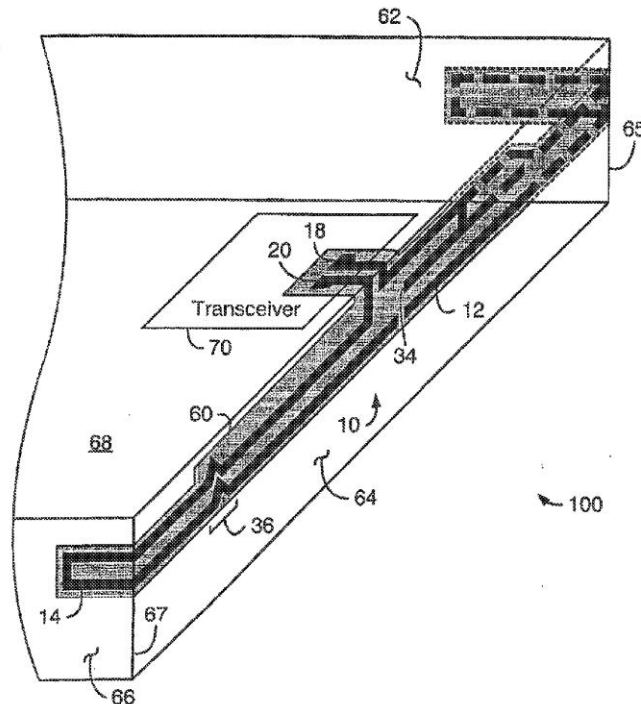
(22) Filed: **Nov. 27, 2012**

(57) **ABSTRACT**

**Related U.S. Application Data**

An antenna and a wireless mobile communication device incorporating the antenna are provided. The antenna includes a first conductor section electrically coupled to a first feeding point, a second conductor section electrically coupled to a second feeding point, and a near-field radiation control structure adapted to control characteristics of near-field radiation generated by the antenna. Near-field radiation control structures include a parasitic element positioned adjacent the first conductor section and configured to control characteristics of near-field radiation generated by the first conductor section, and a diffuser in the second conductor section configured to diffuse near-field radiation generated by the second conductor section into a plurality of directions.

(63) Continuation of application No. 13/529,531, filed on Jun. 21, 2012, now Pat. No. 8,339,323, which is a continuation of application No. 13/358,126, filed on Jan. 25, 2012, now Pat. No. 8,223,078, which is a continuation of application No. 13/156,728, filed on Jun. 9, 2011, now Pat. No. 8,125,397, which is a continuation of application No. 12/474,075, filed on May 28, 2009, now Pat. No. 7,961,154, which is a continuation of application No. 11/774,383, filed on Jul. 6, 2007, now Pat. No. 7,541,991, which is a continuation of application No. 10/940,869, filed on Sep. 14, 2004,







US 20130082894A1

(19) **United States**

(12) **Patent Application Publication**  
**Chung et al.**

(10) **Pub. No.: US 2013/0082894 A1**

(43) **Pub. Date: Apr. 4, 2013**

(54) **INTEGRATED ANTENNA AND METHOD FOR OPERATING INTEGRATED ANTENNA DEVICE**

**Publication Classification**

(51) **Int. Cl.**  
*H01Q 1/38* (2006.01)  
*H01P 11/00* (2006.01)

(75) Inventors: **Shyh-Jong Chung**, Hsinchu City (TW);  
**Ya-Ping Chen**, Hsinchu City (TW)

(52) **U.S. Cl.**  
USPC ..... **343/843**; 343/700 MS; 29/600

(73) Assignee: **NATIONAL CHIAO TUNG UNIVERSITY**, Hsinchu City (TW)

(57) **ABSTRACT**

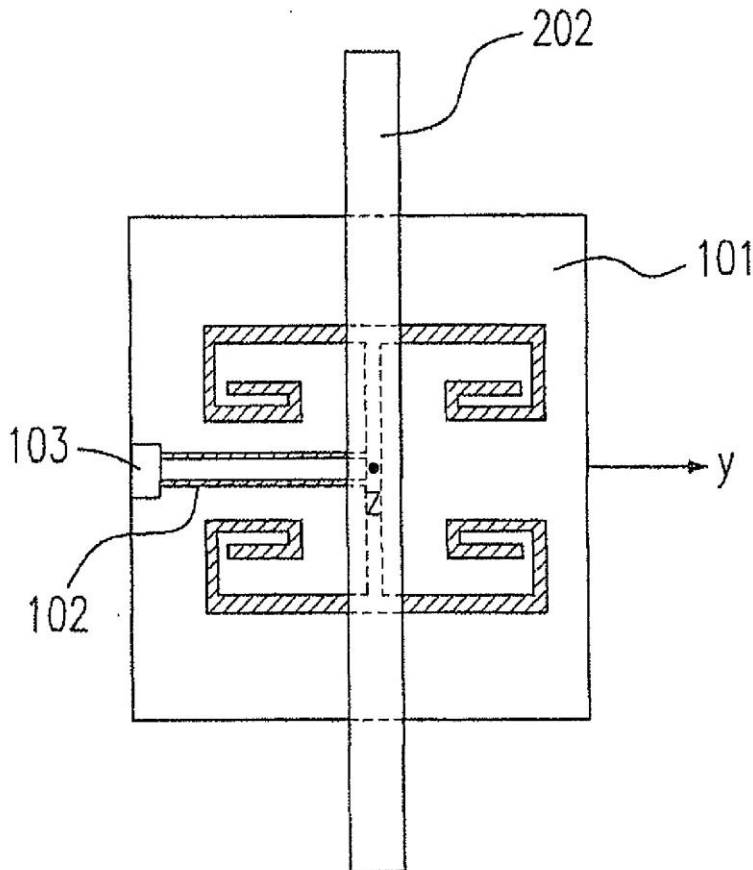
An integrated antenna is provided. The integrated antenna includes a first resonant element disposed on a chip, and receiving a first signal having a frequency from the chip; and a second resonant element disposed on a substrate, wherein the chip is disposed on the substrate, and the first signal enables a non-contact resonant coupling to be established between the first resonant element and the second resonant element due to the frequency to cause the second resonant element to generate and radiate a second signal.

(21) Appl. No.: **13/343,333**

(22) Filed: **Jan. 4, 2012**

(30) **Foreign Application Priority Data**

Oct. 4, 2011 (TW) ..... 100135964





US 20130082895A1

(19) **United States**

(12) **Patent Application Publication**  
**Shiu et al.**

(10) **Pub. No.: US 2013/0082895 A1**

(43) **Pub. Date: Apr. 4, 2013**

(54) **ANTENNA STRUCTURES WITH MOLDED AND COATED SUBSTRATES**

*C25D 5/02* (2006.01)  
*H01Q 7/00* (2006.01)

(76) Inventors: **Boon W. Shiu**, San Jose, CA (US); **Peter Bevelacqua**, Cupertino, CA (US); **Jiang Zhu**, Sunnyvale, CA (US); **Jerzy Guterman**, Mountain View, CA (US); **Robert W. Schlub**, Cupertino, CA (US); **Ruben Caballero**, San Jose, CA (US)

(52) **U.S. Cl.**  
USPC ..... **343/866**; 343/700 MS; 427/287; 205/118

(57) **ABSTRACT**

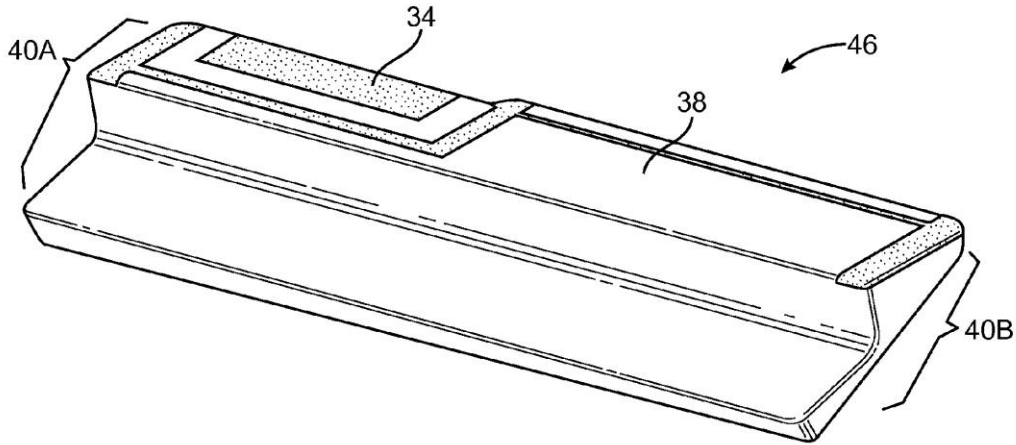
Electronic devices may be provided with antenna structures. The antenna structures may be used in wirelessly transmitting and receiving radio-frequency signals. Antenna structures may be formed from molded dielectric substrates. Patterned conductive material may be formed on the dielectric substrates. The dielectric substrates may be formed from molded materials such as glass or ceramic. Sheets of dielectric or dielectric powder may be compressed to form a dielectric substrate of a desired shape. The patterned conductive material may be formed from metallic paint or other conductors. A hollow antenna chamber may be formed by joining molded dielectric structures. An antenna such as an indirectly-fed loop antenna or other antennas may be formed from the molded dielectric substrates and patterned conductors.

(21) Appl. No.: **13/250,784**

(22) Filed: **Sep. 30, 2011**

**Publication Classification**

(51) **Int. Cl.**  
*H01Q 1/38* (2006.01)  
*B05D 5/12* (2006.01)





US 20130082897A1

(19) **United States**

(12) **Patent Application Publication**

**Liu et al.**

(10) **Pub. No.: US 2013/0082897 A1**

(43) **Pub. Date: Apr. 4, 2013**

(54) **UNIPOLAR, BIPOLAR AND HYBRID MIMO ANTENNAE**

(76) Inventors: **Ruopeng Liu**, Shenzhen (CN);  
**Yangyang Zhang**, Shenzhen (CN);  
**Chunlin Ji**, Shenzhen (CN)

(21) Appl. No.: **13/521,446**

(22) PCT Filed: **Sep. 29, 2011**

(86) PCT No.: **PCT/CN11/80354**

§ 371 (c)(1),  
(2), (4) Date: **Jul. 11, 2012**

(30) **Foreign Application Priority Data**

Mar. 14, 2011 (CN) ..... 201110062200.6

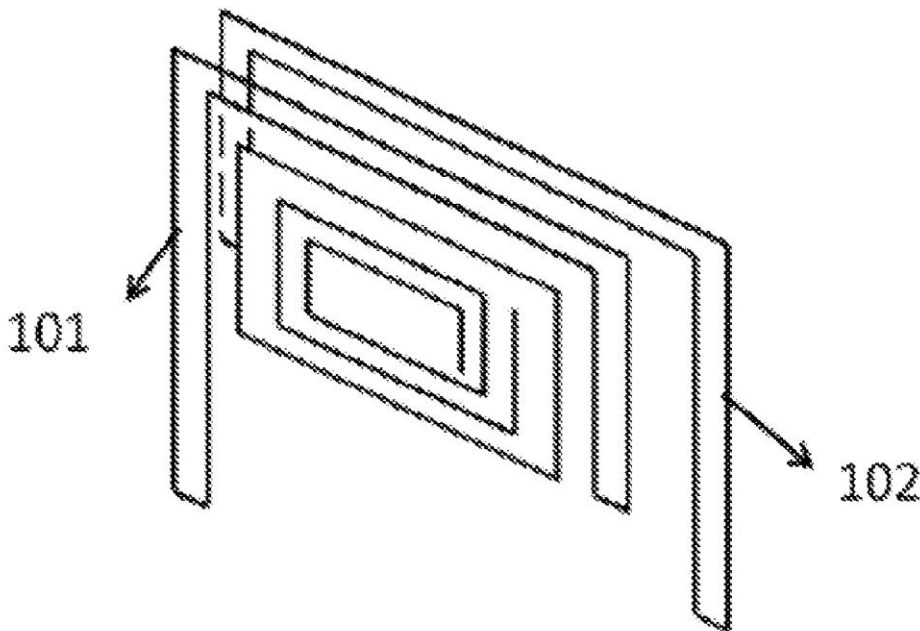
**Publication Classification**

(51) **Int. Cl.**  
**H01Q 21/00** (2006.01)

(52) **U.S. Cl.**  
CPC ..... **H01Q 21/00** (2013.01)  
USPC ..... **343/893**

(57) **ABSTRACT**

The present disclosure provides a unipolar MIMO antenna, which consists of a plurality of unipolar RF antennae. Each of the unipolar RF antennae comprises a metal sheet and a feeder line. The metal sheet is enmeshed with a metal microstructure thereon, and the feeder line and the metal sheet are connected in a signal communicative manner. The unipolar MIMO antenna of the present disclosure breaks through the framework of the conventional antenna design and eliminates the complex design of the impedance matching network to ensure miniaturization of the antenna. Thereby, the antenna can be used in a wireless apparatus having a small size, a high transmission efficiency and a high isolation degree among antennae and can satisfy the requirement of a low power consumption in the design of modern communication systems. Additionally, the present disclosure further provides a bipolar MIMO antenna and a hybrid MIMO antenna.





US 20130088304A1

(19) **United States**

(12) **Patent Application Publication**  
**Henderson et al.**

(10) **Pub. No.: US 2013/0088304 A1**

(43) **Pub. Date: Apr. 11, 2013**

(54) **ANTENNA FEED STRUCTURE**

**Publication Classification**

(75) Inventors: **Robert Ian Henderson**, Chelmsford (GB); **James Christopher Gordon Matthews**, Chelmsford (GB)

(51) **Int. Cl.**  
**H01P 3/08** (2006.01)

(73) Assignee: **BAE SYSTEMS plc**, London (GB)

(52) **U.S. Cl.**  
CPC ..... **H01P 3/026** (2013.01)  
USPC ..... **333/33**

(21) Appl. No.: **13/702,348**

(57) **ABSTRACT**

(22) PCT Filed: **Jun. 29, 2011**

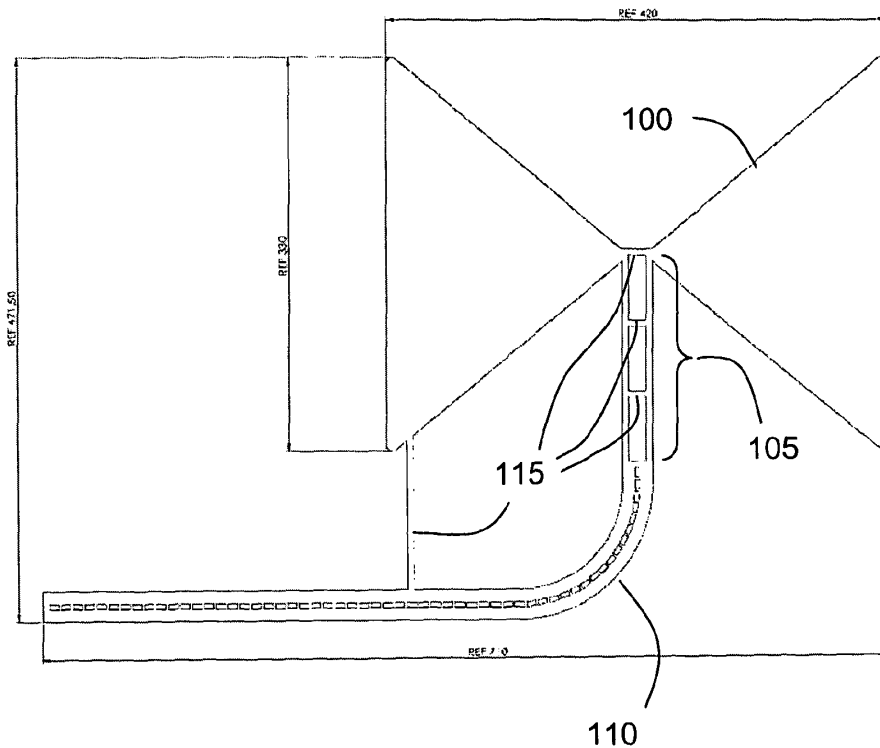
(86) PCT No.: **PCT/GB2011/000994**

§ 371 (c)(1),  
(2), (4) Date: **Dec. 6, 2012**

A feed structure for a wearable antenna incorporates a microstrip transmission line designed for mounting on opposite sides of a fabric. The transmission line has a perforated ground plane which reduces capacitance and offers an appropriate impedance, even when the fabric is thin, and allows the use of a relatively robust line conductor having a width of 3 mm or 5 mm or more. The ground plane can be extended to provide the ground plane of a balun and the material of that ground plane can in turn be extended to provide the wearable antenna.

(30) **Foreign Application Priority Data**

Jun. 30, 2010 (EP) ..... 10275069.2  
Jun. 30, 2010 (GB) ..... 1010988.2





US 20130088390A1

(19) **United States**

(12) **Patent Application Publication**  
**WANG**

(10) **Pub. No.: US 2013/0088390 A1**

(43) **Pub. Date: Apr. 11, 2013**

(54) **ADJUSTMENT MODULE, ELECTRONIC DEVICE WITH THE ADJUSTMENT MODULE, AND ANTENNA PERFORMANCE ADJUSTING METHOD THEREOF**

(52) **U.S. Cl.**  
USPC ..... **342/359**

(57) **ABSTRACT**

An adjustment module, an electronic device with the adjustment module, and an antenna performance adjusting method thereof are disclosed. The adjustment module is used for adjusting an antenna module. The antenna module is disposed in the electronic device and used for radiating a wireless signal. The adjustment module includes a monitoring module, a determining module, and a capacitance adjusting unit. The monitoring module is used for detecting an alternating current signal waveform when the antenna module radiates the wireless signal. The determining module receives the alternating current signal waveform and is used for generating an adjusting voltage value when the alternating current signal waveform is a non-constant amplitude. The capacitance adjusting unit is used for changing a capacitance value according to the adjusting voltage value to adjust a resonance point coordinate of the antenna module.

(76) Inventor: **Yin-Tsai WANG**, New Taipei City (TW)

(21) Appl. No.: **13/541,493**

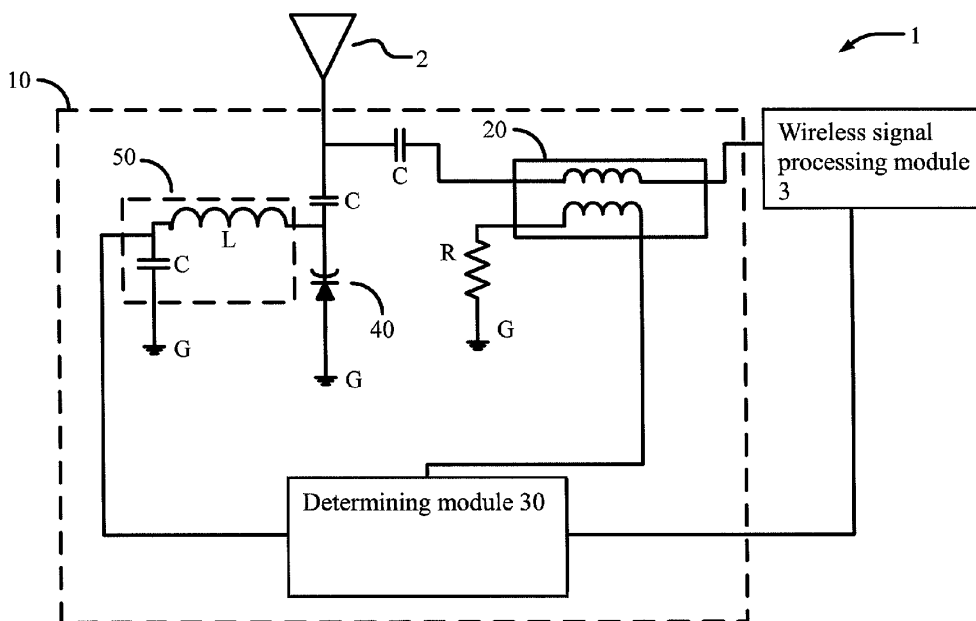
(22) Filed: **Jul. 3, 2012**

(30) **Foreign Application Priority Data**

Oct. 7, 2011 (TW) ..... 100136527

**Publication Classification**

(51) **Int. Cl.**  
**H01Q 3/00** (2006.01)





US 20130088391A1

(19) **United States**

(12) **Patent Application Publication**  
**Corman et al.**

(10) **Pub. No.: US 2013/0088391 A1**

(43) **Pub. Date: Apr. 11, 2013**

(54) **MULTI-BEAM ACTIVE PHASED ARRAY ARCHITECTURE WITH INDEPENDANT POLARIZATION CONTROL**

Nov. 6, 2009, provisional application No. 61/234,521, filed on Aug. 17, 2009, provisional application No. 61/265,605, filed on Dec. 1, 2009, provisional application No. 61/222,363, filed on Jul. 1, 2009.

(71) Applicant: **ViaSat, Inc.**, Carlsbad, CA (US)

**Publication Classification**

(72) Inventors: **David W. Corman**, Gilbert, AZ (US);  
**Rob Zienkewicz**, Chandler, AZ (US);  
**David Saunders**, Scottsdale, AZ (US)

(51) **Int. Cl.**  
**H04B 7/10** (2006.01)

(73) Assignee: **ViaSat, Inc.**, Carlsbad, CA (US)

(52) **U.S. Cl.**  
CPC ..... **H04B 7/10** (2013.01)  
USPC ..... **342/365**

(21) Appl. No.: **13/692,683**

(22) Filed: **Dec. 3, 2012**

(57) **ABSTRACT**

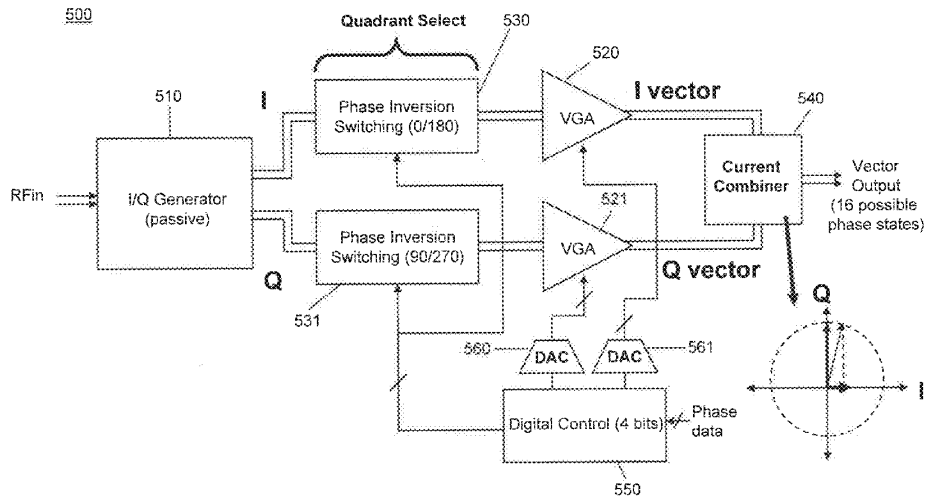
**Related U.S. Application Data**

(63) Continuation-in-part of application No. 13/412,901, filed on Mar. 6, 2012, which is a continuation of application No. 12/759,059, filed on Apr. 13, 2010, now Pat. No. 8,160,530.

In an exemplary embodiment, a phased array antenna comprises multiple subcircuits in communication with multiple radiating elements. The radio frequency signals are independently adjusted for both polarization control and beam steering. In a receive embodiment, multiple RF signals of various polarizations are received and combined into at least one receive beam output. In a transmit embodiment, at least one transmit beam input is divided and transmitted through multiple radiating elements, with the transmitted beams having various polarizations. In an exemplary embodiment, the phased array antenna provides multi-beam formation over multiple operating frequency bands. The wideband nature of the active components allows for operation over multiple frequency bands simultaneously.

(60) Provisional application No. 61/237,967, filed on Aug. 28, 2009, provisional application No. 61/259,375, filed on Nov. 9, 2009, provisional application No. 61/234,513, filed on Aug. 17, 2009, provisional application No. 61/222,354, filed on Jul. 1, 2009, provisional application No. 61/168,913, filed on Apr. 13, 2009, provisional application No. 61/259,049, filed on

### Active Vector Generator





US 20130088393A1

(19) **United States**

(12) **Patent Application Publication**

**Lee et al.**

(10) **Pub. No.: US 2013/0088393 A1**

(43) **Pub. Date: Apr. 11, 2013**

(54) **TRANSMIT AND RECEIVE PHASED ARRAY FOR AUTOMOTIVE RADAR IMPROVEMENT**

(52) **U.S. Cl.**  
USPC ..... 342/372

(75) Inventors: **Jae Seung Lee**, Ann Arbor, MI (US);  
**Paul Donald Schmalenberg**, Ann Arbor, MI (US)

(57) **ABSTRACT**

(73) Assignee: **Toyota Motor Engineering & Manufacturing North America, Inc.**, Erlanger, KY (US)

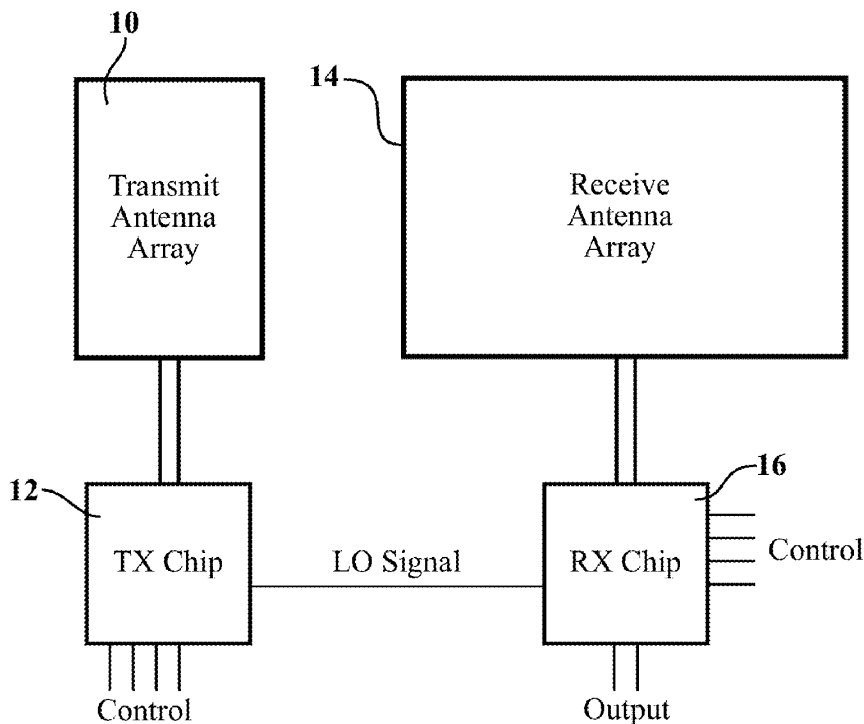
Examples of the present invention include methods and apparatus for phased array automotive radar which allow reductions in erroneous detections such as sidelobe clutter and ghost images. An example radar includes a steerable transmit antenna and a steerable receive antenna. Transmit and receive beams may be steered using an electronic control circuit so the main lobe of the transmit beam remains generally aligned with the main lobe of the receive beam, and the side lobe of the receive beam remains generally aligned with a null in the transmit beam.

(21) Appl. No.: **13/267,546**

(22) Filed: **Oct. 6, 2011**

**Publication Classification**

(51) **Int. Cl.**  
**H01Q 3/00** (2006.01)





US 20130088394A1

(19) **United States**

(12) **Patent Application Publication**  
**Gonikberg**

(10) **Pub. No.: US 2013/0088394 A1**

(43) **Pub. Date: Apr. 11, 2013**

(54) **METHOD AND SYSTEM FOR USING A WIRELESS LOCAL AREA NETWORK (WLAN) PHASE SHIFTER FOR SMART ANTENNA BEAM STEERING**

**Publication Classification**

(71) Applicant: **Broadcom Corporation**, Irvine, CA (US)

(51) **Int. Cl.**  
**H01Q 3/26** (2006.01)

(72) Inventor: **Mark Gonikberg**, Los Altos Hills, CA (US)

(52) **U.S. Cl.**  
CPC ..... **H01Q 3/2605** (2013.01)  
USPC ..... **342/372**

(73) Assignee: **BROADCOM CORPORATION**, Irvine, CA (US)

(57) **ABSTRACT**

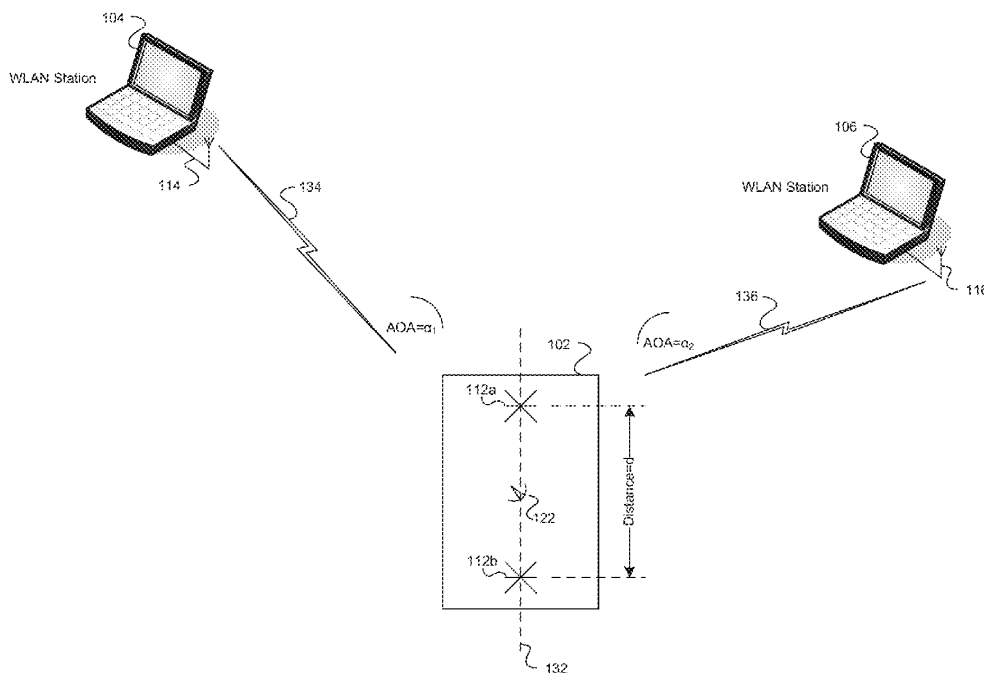
(21) Appl. No.: **13/689,405**

Phase shift values between signals received at a plurality of receiving antennas are determined to orient one or more receiving antennas of the plurality of receiving antennas during signal location. Subsequent signals are received utilizing the oriented receiving antennas. Candidate angle of arrival (AOA) values are computed based on the determined phase shift values during the signal location so as to adaptively orient the receiving antennas. Each of the candidate AOA values is iteratively selected one at a time to adaptively orient the receiving antennas. The receiving antennas may be adaptively oriented according to the computed receive signal power levels. The determined phase shift values may be rounded to nearest discrete phase shift values. In this regard, one candidate AOA value is selected for each of the receiving antennas based on the corresponding rounded phase shift values such that the receiving antennas may be adaptively oriented during the signal location.

(22) Filed: **Nov. 29, 2012**

**Related U.S. Application Data**

(63) Continuation of application No. 13/185,268, filed on Jul. 18, 2011, now Pat. No. 8,330,653, which is a continuation of application No. 12/104,644, filed on Apr. 17, 2008, now Pat. No. 7,982,671.







US 20130088396A1

(19) **United States**

(12) **Patent Application Publication**  
**HAN**

(10) **Pub. No.: US 2013/0088396 A1**

(43) **Pub. Date: Apr. 11, 2013**

(54) **BANDWIDTH ADJUSTABLE DIELECTRIC  
RESONANT ANTENNA**

(52) **U.S. Cl.**  
USPC ..... **343/700 MS**

(75) Inventor: **Myeong Woo HAN**, Gyeonggi-do (KR)

(57) **ABSTRACT**

(73) Assignee: **SAMSUNG ELECTRO-MECHANICS  
CO., LTD.**, Gyeonggi-do (KR)

Disclosed herein is a bandwidth adjustable dielectric resonant antenna. The dielectric resonator antenna includes: a multi-layer substrate; a first conductor plate formed on a top portion of an uppermost insulating layer to have an opening part; a second conductor plate formed on a bottom portion of a lowermost insulating layer; a plurality of metal via holes penetrating through a circumference of the opening part of the first conductor plate at a predetermined interval; a feeding unit supplying power to the dielectric resonator embedded in the multi-layer substrate in the cavity shape by the first conductor plate, the second conductor plate, and the plurality of metal via holes; and at least one multi-resonant generation via holes formed within the dielectric resonator so as to adjust the bandwidth by generating the multi-resonance within the dielectric resonator, thereby improving the bandwidth without increasing the size of the dielectric resonator and implementing miniaturization.

(21) Appl. No.: **13/326,921**

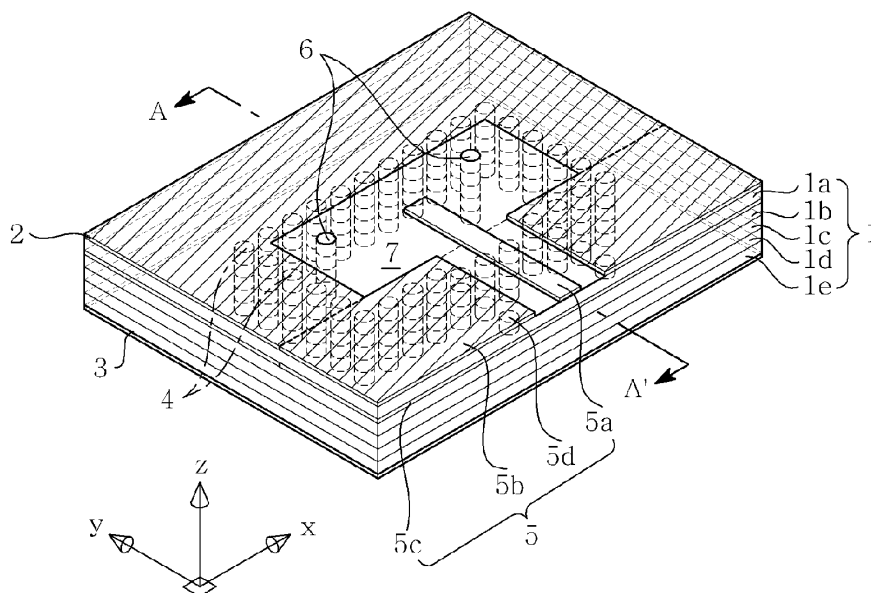
(22) Filed: **Dec. 15, 2011**

(30) **Foreign Application Priority Data**

Oct. 5, 2011 (KR) ..... 10-2011-0101429

**Publication Classification**

(51) **Int. Cl.**  
**H01Q 9/04** (2006.01)





US 20130088397A1

(19) **United States**

(12) **Patent Application Publication**  
**MO et al.**

(10) **Pub. No.: US 2013/0088397 A1**

(43) **Pub. Date: Apr. 11, 2013**

(54) **TERMINAL DEVICE**

**Publication Classification**

(71) Applicants: **LENOVO (BEIJING) CO., LTD.**,  
Beijing (CN); **BEIJING LENOVO**  
**SOFTWARE LTD.**, Beijing (CN)

(51) **Int. Cl.**  
**H01Q 1/24** (2006.01)  
**H01Q 13/10** (2006.01)

(72) Inventors: **Dafei MO**, Beijing (CN); **Kangkang**  
**CHEN**, Beijing (CN); **Zhaowei HU**,  
Beijing (CN); **Xiongbing GONG**,  
Beijing (CN); **Lu LU**, Beijing (CN)

(52) **U.S. Cl.**  
USPC ..... **343/702**

(73) Assignees: **BEIJING LENOVO SOFTWARE**  
**LTD.**, Beijing (CN); **LENOVO**  
**(BEIJING) CO., LTD.**, Beijing (CN)

(57) **ABSTRACT**

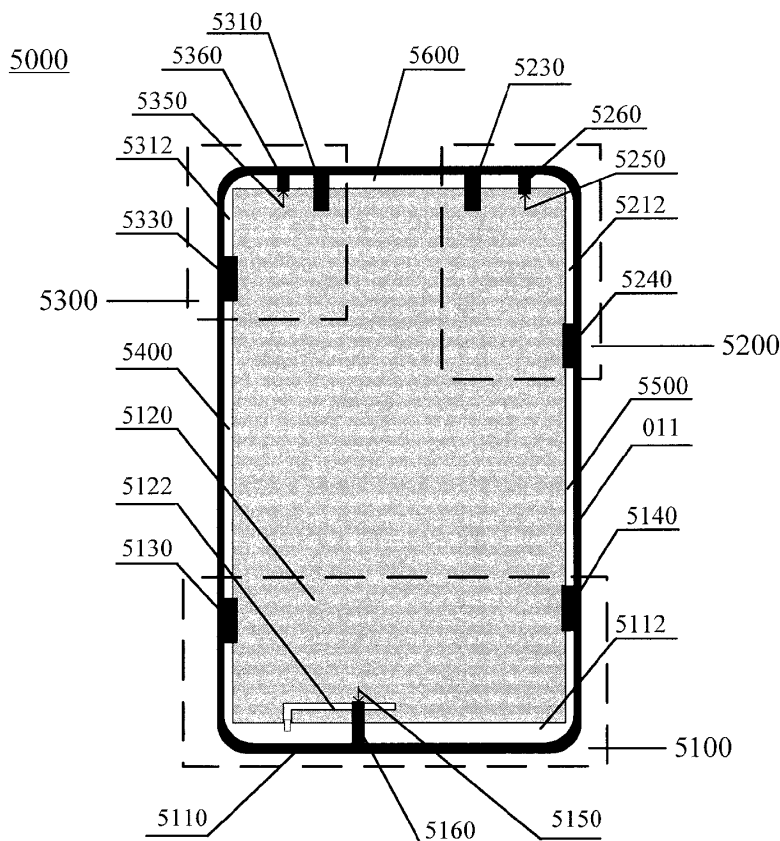
(21) Appl. No.: **13/647,602**

(22) Filed: **Oct. 9, 2012**

(30) **Foreign Application Priority Data**

Oct. 9, 2011 (CN) ..... 201110303440.0  
Oct. 24, 2011 (CN) ..... 201110326512.3

A terminal device includes a first house configured to at least accommodate a processing unit and a wireless communication unit. The wireless communication unit is configured to cause the terminal device to perform wireless communication with an external apparatus and exchange data. The wireless communication unit includes an antenna unit configured to receive and transmit a RF signal, a RF circuit connected with the antenna unit and configured to transmit the RF signal to or receive the RF signal from the antenna unit, wherein, an air vent is set on the first house, and the antenna unit is formed by the air vent.





US 20130088398A1

(19) **United States**

(12) **Patent Application Publication**  
**Utagawa et al.**

(10) **Pub. No.: US 2013/0088398 A1**

(43) **Pub. Date: Apr. 11, 2013**

(54) **ANTENNA APPARATUS AND WIRELESS COMMUNICATION DEVICE USING SAME**

**Publication Classification**

(51) **Int. Cl.**  
**H01Q 1/38** (2006.01)

(75) Inventors: **Naoaki Utagawa**, Tokyo (JP); **Manabu Kitami**, Tokyo (JP); **Masaki Matsushima**, Tokyo (JP); **Takeshi Oohashi**, Tokyo (JP); **Yasumasa Harihara**, Tokyo (JP)

(52) **U.S. Cl.**  
CPC ..... **H01Q 1/38** (2013.01)  
USPC ..... **343/745**

(57) **ABSTRACT**

An antenna device includes an antenna element 10 and a printed circuit board 20 on which the antenna element 10 is mounted. The antenna element 10 includes a base 11 which is made of a dielectric material and a radiation conductor formed on at least one surface of the base 11. The printed circuit board 20 includes ground clearance region 23a having substantially a rectangular shape and having one side contacting an edge of the printed circuit board and other three sides surrounded by an edge line of a ground pattern, an antenna mounting region 27 provided within the ground clearance region 23a, and at least one frequency adjusting element 30 provided within the ground clearance region 27. The frequency adjusting element 30 is provided on the far side of the antenna mounting region 27 as viewed from an edge 20e of the printed circuit board 20.

(73) Assignee: **TDK Corporation**, Tokyo (JP)

(21) Appl. No.: **13/637,836**

(22) PCT Filed: **Mar. 30, 2011**

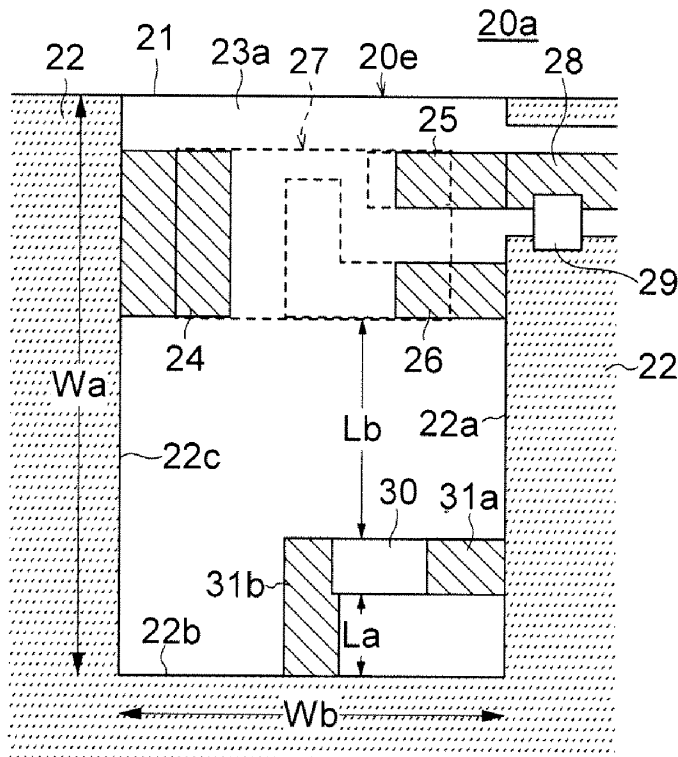
(86) PCT No.: **PCT/JP2011/057961**

§ 371 (c)(1),

(2), (4) Date: **Dec. 10, 2012**

(30) **Foreign Application Priority Data**

Apr. 1, 2010 (JP) ..... 2010-085543



(a)



US 20130088399A1

(19) **United States**

(12) **Patent Application Publication**  
**JEON et al.**

(10) **Pub. No.: US 2013/0088399 A1**

(43) **Pub. Date: Apr. 11, 2013**

(54) **ANTENNA HAVING A FEEDING STRUCTURE, AND A FEEDING METHOD**

May 7, 2010 (KR) ..... 10-2010-0042963  
Apr. 6, 2011 (KR) ..... 10-2011-0031507

(71) Applicant: **RADINA CO., LTD**, Seoul (KR)

**Publication Classification**

(72) Inventors: **Sin-Hyung JEON**, Seoul (KR);  
**Hyeng-Cheul Choi**, Seoul (KR);  
**Jae-Seok Lee**, Seoul (KR); **Oul Cho**,  
Suwon-si (KR); **Seung-Woo Kim**,  
Gunpo-si (KR); **Gyu-Han Kim**, Seoul  
(KR)

(51) **Int. Cl.**  
**H01Q 1/50** (2006.01)  
(52) **U.S. Cl.**  
CPC ..... **H01Q 1/50** (2013.01)  
USPC ..... **343/749**

(73) Assignee: **RADINA CO., LTD**, Seoul (KR)

(57) **ABSTRACT**

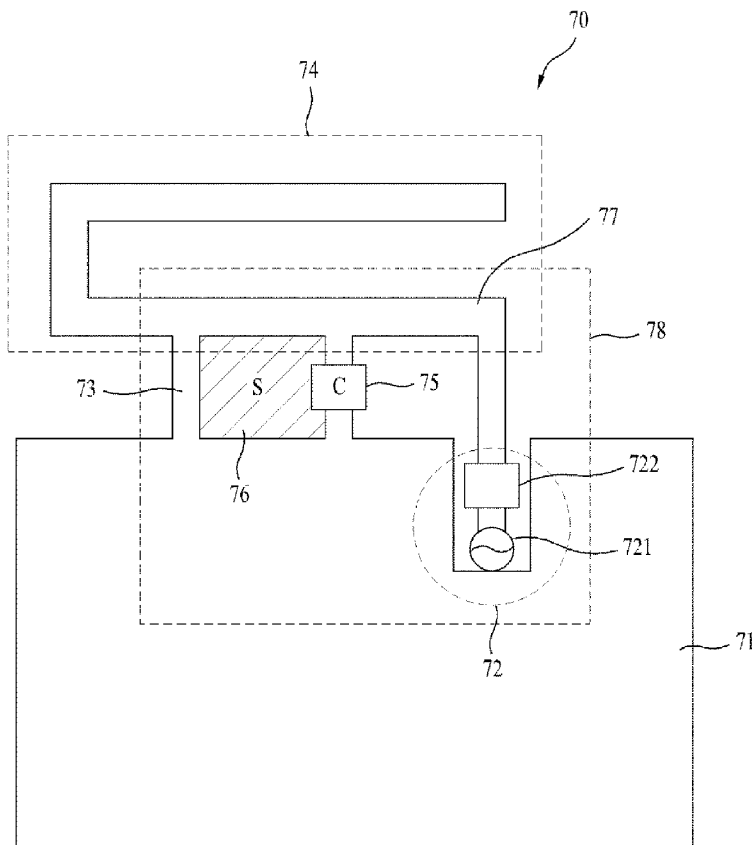
(21) Appl. No.: **13/645,534**

(22) Filed: **Oct. 5, 2012**

(30) **Foreign Application Priority Data**

Apr. 6, 2010 (KR) ..... 10-2010-0031240  
Apr. 6, 2010 (KR) ..... 10-2010-0031243

Provided is an antenna having broadband frequency characteristics due to the use of a power supply structural body having a closed loop consisting of a conductive circuit and an inductive element, such that the capacitance due to a capacitive element and the inductance due to the closed loop give rise to resonance, and the magnetic flux generated in the closed loop at the resonance frequency is coupled to a radiator. Also provided is an antenna having broadband characteristics in a plurality of bands.





US 20130088400A1

(19) **United States**

(12) **Patent Application Publication**  
**CHEN et al.**

(10) **Pub. No.: US 2013/0088400 A1**

(43) **Pub. Date: Apr. 11, 2013**

(54) **MONOPOLE SLOT ANTENNA FOR  
MULTIPLE INPUT AND MULTIPLE OUTPUT**

(52) **U.S. Cl.**  
CPC ..... **H01Q 13/10** (2013.01)

USPC ..... **343/770**

(71) Applicant: **SOUTHERN TAIWAN UNIVERSITY  
OF SCIENCE**, Tainan City (TW)

(72) Inventors: **Wen-Shan CHEN**, Tainan City (TW);  
**Chi-Huang LIN**, Tainan City (TW)

(57) **ABSTRACT**

(73) Assignee: **SOUTHERN TAIWAN UNIVERSITY  
OF SCIENCE AND TECHNOLOGY**,  
Tainan City (TW)

The present invention pertains to a monopole slot antenna for multiple input and multiple output comprising a substrate. An antenna module is disposed on the first surface of the substrate and includes a first antenna and a second antenna disposed symmetrically with each other. A first inner monopole slot and a first outer monopole slot are disposed on the first antenna. The first inner monopole slot is formed by connecting a first straight section with a plurality of first bended sections. The first outer monopole slot surrounds the outer periphery of the first inner monopole slot. The second antenna is disposed symmetrical to the first antenna. An isolation unit is defined between the first antenna and the second antenna and has a third straight section and a third bended section. Furthermore, two feeding units are defined on the second surface of the substrate.

(21) Appl. No.: **13/650,014**

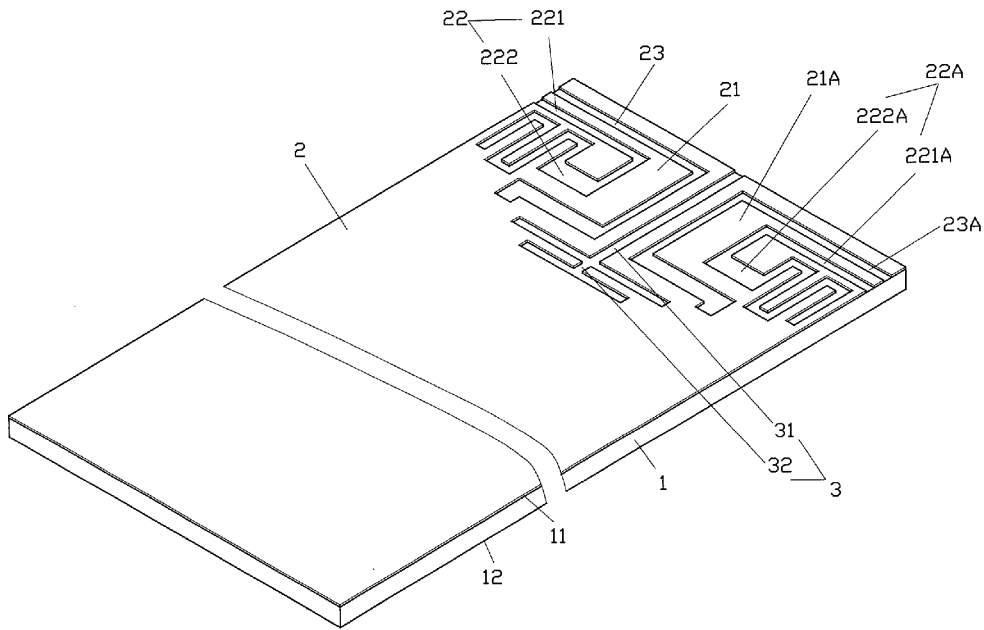
(22) Filed: **Oct. 11, 2012**

(30) **Foreign Application Priority Data**

Oct. 11, 2011 (TW) ..... 100136749

**Publication Classification**

(51) **Int. Cl.**  
**H01Q 13/10** (2006.01)





US 20130088404A1

(19) **United States**

(12) **Patent Application Publication**  
**Ramachandran et al.**

(10) **Pub. No.: US 2013/0088404 A1**

(43) **Pub. Date: Apr. 11, 2013**

(54) **MULTI-FEED ANTENNA APPARATUS AND METHODS**

(52) **U.S. Cl.**  
USPC ..... **343/853**; 343/700 MS; 343/861

(76) Inventors: **Prasadh Ramachandran**, Oulu (FI);  
**Ari Raappana**, Kello (FI); **Petteri Annamaa**, Oulunsalo (FI)

(57) **ABSTRACT**

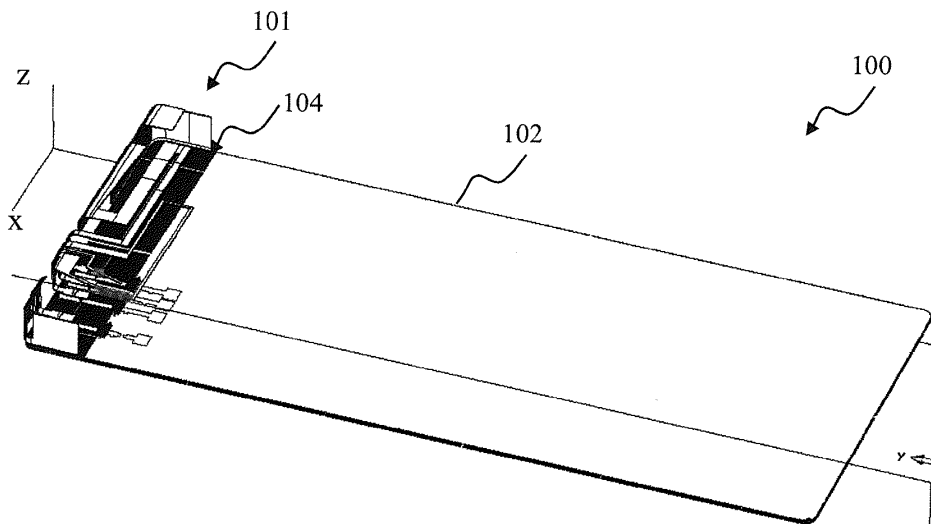
A space efficient multi-feed antenna apparatus, and methods for use in a radio frequency communications device. In one embodiment, the antenna assembly comprises three (3) separate radiator structures disposed on a common antenna carrier. Each of the three antenna radiators is connected to separate feed ports of a radio frequency front end. In one variant, the first and the third radiators comprise quarter-wavelength planar inverted-L antennas (PILA), while the second radiator comprises a half-wavelength grounded loop-type antenna disposed in between the first and the third radiators. The PILA radiators are characterized by radiation patterns having maximum radiation axes that are substantially perpendicular to the antenna plane. The loop radiator is characterized by radiation pattern having axis of maximum radiation that is parallel to the antenna plane. The above configuration of radiating patterns advantageously isolates the first radiator structure from the third radiator structure in at least one frequency band.

(21) Appl. No.: **13/269,490**

(22) Filed: **Oct. 7, 2011**

**Publication Classification**

(51) **Int. Cl.**  
**H01Q 21/24** (2006.01)  
**H01Q 1/50** (2006.01)  
**H01Q 1/52** (2006.01)  
**H01Q 9/04** (2006.01)





US 20130088405A1

(19) **United States**

(12) **Patent Application Publication**

LEE et al.

(10) **Pub. No.: US 2013/0088405 A1**

(43) **Pub. Date: Apr. 11, 2013**

(54) **APPARATUS AND METHOD FOR MATCHING ANTENNA IN WIRELESS TERMINAL**

**Publication Classification**

(71) Applicant: **Samsung Electronics Co., Ltd.**, Gyeonggi-do (KR)

(51) **Int. Cl. H01Q 1/50** (2006.01)

(72) Inventors: **Jun-Hui LEE**, Gyeongsangbuk-do (KR); **Yong-Joo SHIN**, Gyeonggi-do (KR); **Kong-Min SA**, Gyeonggi-do (KR); **Young-Deuk WON**, Gyeongsangbuk-do (KR); **Ji-Yeon YUN**, Gyeonggi-do (KR)

(52) **U.S. Cl. USPC** ..... **343/861**

(73) Assignee: **SAMSUNG ELECTRONICS CO., LTD.**, Gyeonggi-do (KR)

(57) **ABSTRACT**

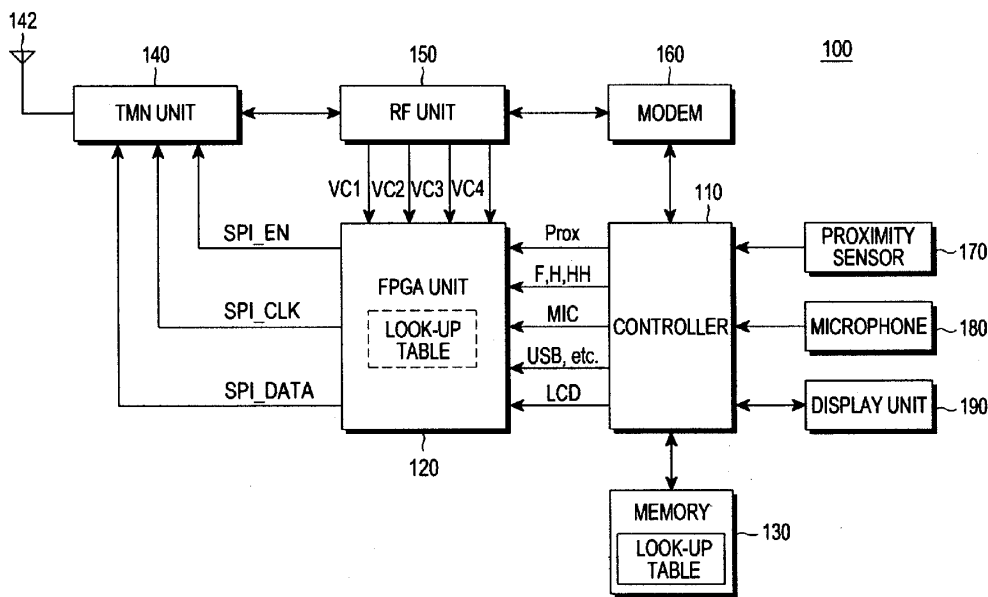
(21) Appl. No.: **13/647,736**

Disclosed are apparatus and method for matching an antenna in a wireless terminal, which are tailored for easy control of impedance matching. A controller is configured to generate state information corresponding to states of the wireless terminal, and providing the state information to a Field Programmable Gate Array (FPGA) unit. The FPGA unit outputs an optimal Tunable Matching Network (TMN) adjustment value corresponding to the state information of the wireless terminal. State information may include operating bands/protocols and modes discerning particular environmental conditions impacting electric fields, such as a hand-held condition.

(22) Filed: **Oct. 9, 2012**

(30) **Foreign Application Priority Data**

Oct. 10, 2011 (KR) ..... 10-2011-0103026





US 20130088406A1

(19) **United States**

(12) **Patent Application Publication**  
**HAMADA et al.**

(10) **Pub. No.: US 2013/0088406 A1**

(43) **Pub. Date: Apr. 11, 2013**

(54) **PRINTED CIRCUIT BOARD, ANTENNA,  
WIRELESS COMMUNICATION DEVICE AND  
MANUFACTURING METHODS THEREOF**

**Publication Classification**

(71) Applicant: **Furukawa Electric Co., Ltd.**,  
Chiyoda-ku (JP)

(51) **Int. Cl.**  
*H01Q 1/38* (2006.01)  
*H01Q 1/50* (2006.01)  
*H01Q 21/00* (2006.01)  
*H05K 1/03* (2006.01)

(72) Inventors: **Hiroki HAMADA**, Chiyoda-ku (JP);  
**Hiroyuki Tamaoka**, Chiyoda-ku (JP);  
**Yoichi Iso**, Chiyoda-ku (JP)

(52) **U.S. Cl.**  
CPC .. *H01Q 1/38* (2013.01); *H05K 1/03* (2013.01);  
*H01Q 1/50* (2013.01); *H01Q 21/00* (2013.01)  
USPC .... **343/893**; 174/255; 343/700 MS; 343/905;  
427/96.8; 427/555; 264/46.4

(73) Assignee: **Furukawa Electric Co., Ltd.**,  
Chiyoda-ku (JP)

(21) Appl. No.: **13/693,634**

(57) **ABSTRACT**

(22) Filed: **Dec. 4, 2012**

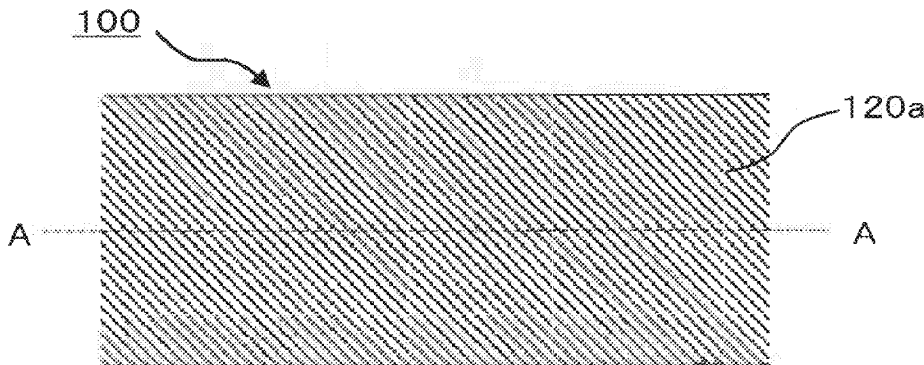
Low-loss printed circuit boards, low-loss wide-band antennas, and manufacturing methods thereof are provided by using a resin as a board material. A resin material (101) having a predetermined shape is prepared in a molding step, and the resin material (101) is foamed in a foaming step. As a result, a skin layer (111) and a foamed part (112) are formed. Since the skin layer (111) does not allow close contact of plating, the skin layer (111) is removed in the shape of a conductor pattern in a skin-layer removing step to expose the foamed part (112) in the interior. Electroless plating is carried out in a conductor-layer forming step; and, as a result, plating is brought into close contact with the foamed part (112) having an anchor effect, and a conductor layer (120) is formed.

**Related U.S. Application Data**

(63) Continuation of application No. PCT/JP2011/062850,  
filed on Jun. 3, 2011.

**Foreign Application Priority Data**

(30) Jun. 4, 2010 (JP) ..... 2010-129339  
Jun. 29, 2010 (JP) ..... 2010-147151  
Jul. 9, 2010 (JP) ..... 2010-156301  
Jan. 24, 2011 (JP) ..... 2011-012405







US 20130090072A1

(19) **United States**

(12) **Patent Application Publication**  
LIM et al.

(10) **Pub. No.: US 2013/0090072 A1**

(43) **Pub. Date: Apr. 11, 2013**

(54) **MOBILE TERMINAL, AND METHOD FOR IMPROVING RADIATION PERFORMANCE AND SPECIFIC ABSORPTION RATE OF AN ANTENNA OF A MOBILE TERMINAL**

(75) Inventors: **Young Kon LIM**, Suwon-si (KR); **Joo Hwan PARK**, Suwon-si (KR)

(73) Assignee: **SAMSUNG ELECTRONICS CO. LTD.**, Suwon-si (KR)

(21) Appl. No.: **13/399,447**

(22) Filed: **Feb. 17, 2012**

(30) **Foreign Application Priority Data**

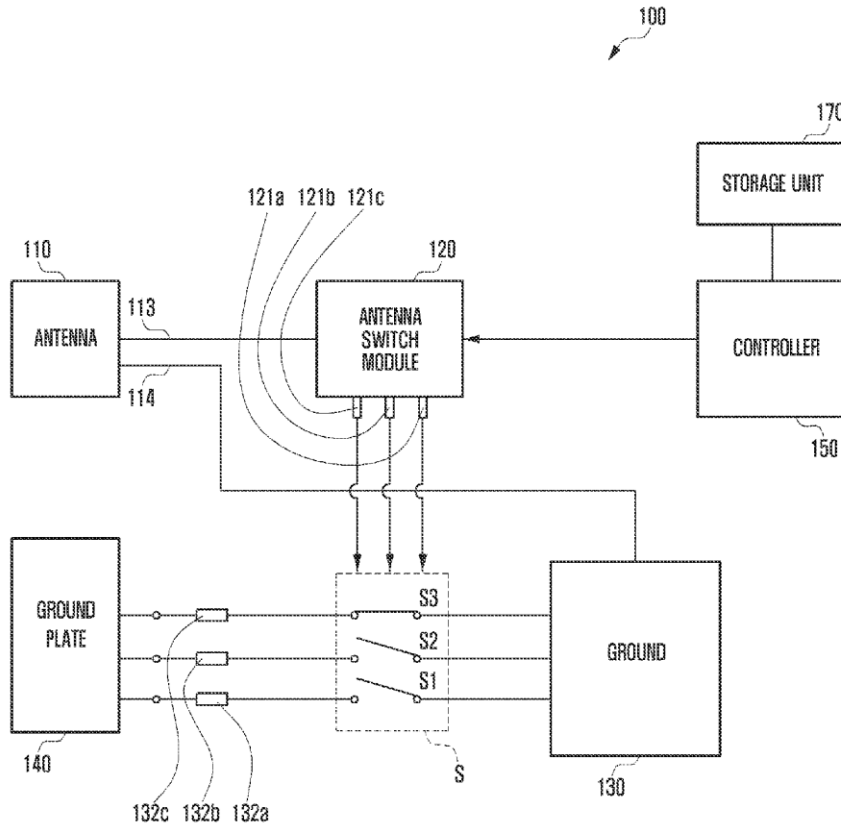
Oct. 10, 2011 (KR) ..... 10-2011-0102916

**Publication Classification**

(51) **Int. Cl.**  
*H04B 1/40* (2006.01)  
*H01Q 1/48* (2006.01)  
*H01Q 1/50* (2006.01)  
(52) **U.S. Cl.**  
USPC ..... **455/77**; 343/852; 343/848

(57) **ABSTRACT**

A method and a mobile terminal of improving radiation performance and Specific Absorption Rate (SAR) of an antenna are provided. The mobile terminal includes a controller for generating a control signal for switching a ground according to a frequency band used by an antenna, and a switch unit for switching a contact point for each frequency band according to the control signal.





US 20130090152A1

(19) **United States**

(12) **Patent Application Publication**  
**Yamazaki et al.**

(10) **Pub. No.: US 2013/0090152 A1**

(43) **Pub. Date: Apr. 11, 2013**

(54) **PORTABLE WIRELESS DEVICE**

**Publication Classification**

(75) Inventors: **Yukari Yamazaki**, Ishikawa (JP);  
**Hiroyuki Uejima**, Ishikawa (JP);  
**Hiroyuki Shioya**, Ishikawa (JP);  
**Mitsuru Saitou**, Toyama (JP); **Kenya**  
**Nagano**, Ishikawa (JP)

(51) **Int. Cl.**  
**H01Q 1/24** (2006.01)

(52) **U.S. Cl.**  
CPC ..... **H01Q 1/243** (2013.01)  
USPC ..... **455/575.7; 455/575.1**

(73) Assignee: **PANASONIC CORPORATION**, Osaka  
(JP)

(57) **ABSTRACT**

(21) Appl. No.: **13/700,227**

(22) PCT Filed: **Jun. 10, 2011**

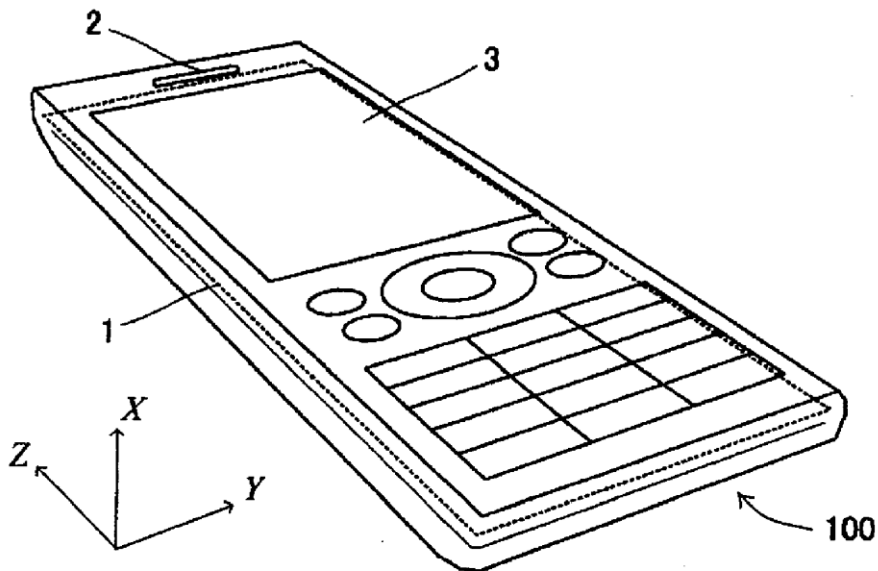
(86) PCT No.: **PCT/JP2011/003297**

§ 371 (c)(1),  
(2), (4) Date: **Nov. 27, 2012**

(30) **Foreign Application Priority Data**

Jun. 10, 2010 (JP) ..... 2010-132661

To provide a portable wireless device in which the portability is excellent, a decrease in a size or a closed call is enabled, and a bandwidth can be increased with a reduction in an SAR value, There is employed a structure which includes a housing forming an outer packaging of the portable telephone, a circuit board provided in the housing, an antenna element provided close to one of short sides of the circuit board, and a metal plate connected to at least one of long sides of the circuit board and the antenna element side along a side wall of the housing, and in which a side of the metal plate that is not connected to the circuit board is opened.





US 20130093629A1

(19) **United States**

(12) **Patent Application Publication**  
**Chiu et al.**

(10) **Pub. No.: US 2013/0093629 A1**

(43) **Pub. Date: Apr. 18, 2013**

(54) **PACKAGING STRUCTURE AND METHOD OF FABRICATING THE SAME**

**Publication Classification**

(75) Inventors: **Chih-Hsien Chiu**, Taichung (TW);  
**Tsung-Hsien Tsai**, Taichung (TW);  
**Chao-Ya Yang**, Taichung (TW)

(51) **Int. Cl.**  
**H01Q 1/38** (2006.01)  
**H01P 11/00** (2006.01)

(73) Assignee: **SILICONWARE PRECISION INDUSTRIES CO., LTD.**, Taichung (TW)

(52) **U.S. Cl.**  
USPC ..... **343/700 MS; 29/600**

(21) Appl. No.: **13/566,296**

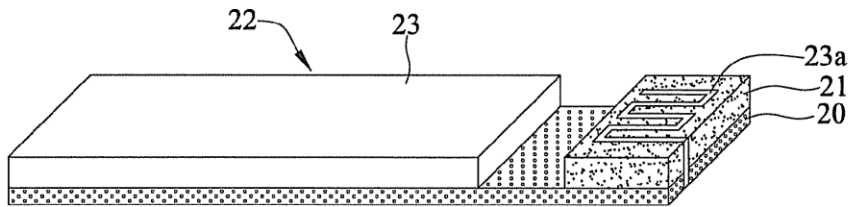
(57) **ABSTRACT**

(22) Filed: **Aug. 3, 2012**

A packaging structure and a method of fabricating the same are provided. The packaging structure includes a substrate, first packaging element disposed on the substrate, a second packaging element disposed on the substrate and spaced apart from the first packaging element, a first antenna disposed on the first packaging element, and a metal layer formed on the second packaging element. The installation of the metal layer and the antenna enhances the electromagnetic shielding effect.

(30) **Foreign Application Priority Data**

Oct. 17, 2011 (TW) ..... 100137484





US 20130093630A1

(19) **United States**

(12) **Patent Application Publication**  
HSU et al.

(10) **Pub. No.:** US 2013/0093630 A1

(43) **Pub. Date:** Apr. 18, 2013

(54) **ANTENNA MODULE AND WIRELESS COMMUNICATION DEVICE**

(52) **U.S. Cl.**  
USPC ..... 343/702; 343/700 MS

(75) Inventors: **CHO-KANG HSU**, Tu-Cheng (TW);  
**CHIA-HUNG SU**, Tu-Cheng (TW);  
**CHIN-HAO CHEN**, Tu-Cheng (TW)

(57) **ABSTRACT**

(73) Assignee: **CHI MEI COMMUNICATION SYSTEMS, INC.**, Tu-Cheng (TW)

An antenna module includes a printed circuit board (PCB), a first antenna, a second antenna, a connecting portion, and a feed portion. The first antenna and the second antenna are respectively positioned on two opposite surface of the PCB. The first antenna includes a first radiating body and a first supporting member positioned between the first radiating body and the PCB. A first space is formed between the first radiating body and the PCB. The second antenna includes a second radiating body and a second supporting member positioned between the second radiating body and the PCB. A second space is formed between the second radiating body and the PCB. The connecting portion is connected between the first antenna and the second antenna. The feed portion is positioned on the PCB and is connected to the first and second antennas.

(21) Appl. No.: 13/307,217

(22) Filed: Nov. 30, 2011

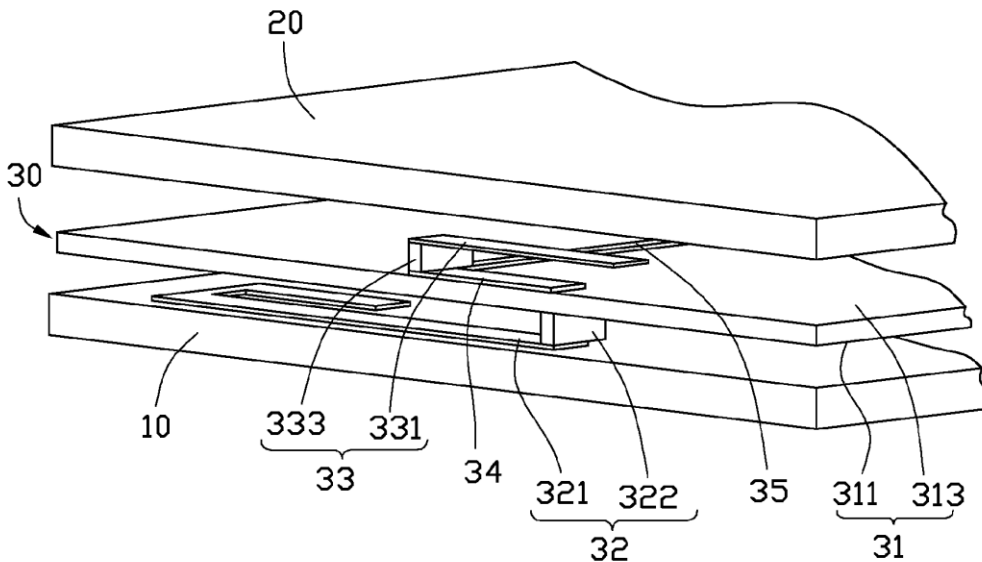
(30) **Foreign Application Priority Data**

Oct. 13, 2011 (TW) ..... 100137200

**Publication Classification**

(51) **Int. Cl.**  
*H01Q 1/38* (2006.01)  
*H01Q 1/24* (2006.01)

100





US 20130093634A1

(19) **United States**

(12) **Patent Application Publication**  
**Rowson et al.**

(10) **Pub. No.: US 2013/0093634 A1**

(43) **Pub. Date: Apr. 18, 2013**

(54) **MULTI-BAND MIMO ANTENNA**

**Publication Classification**

(75) Inventors: **Sebastian Rowson**, San Diego, CA (US); **Jeffrey Shamblin**, San Marcos, CA (US); **Laurent Desclos**, San Diego, CA (US); **Young Cha**, San Diego, CA (US)

(51) **Int. Cl.**  
**H01Q 21/28** (2006.01)  
**H01Q 21/00** (2006.01)

(73) Assignee: **ETHERTRONICS, INC.**, San Diego, CA (US)

(52) **U.S. Cl.**  
CPC ..... **H01Q 21/28** (2013.01); **H01Q 21/0006** (2013.01)  
USPC ..... **343/745**; 343/852; 343/853

(21) Appl. No.: **13/548,221**

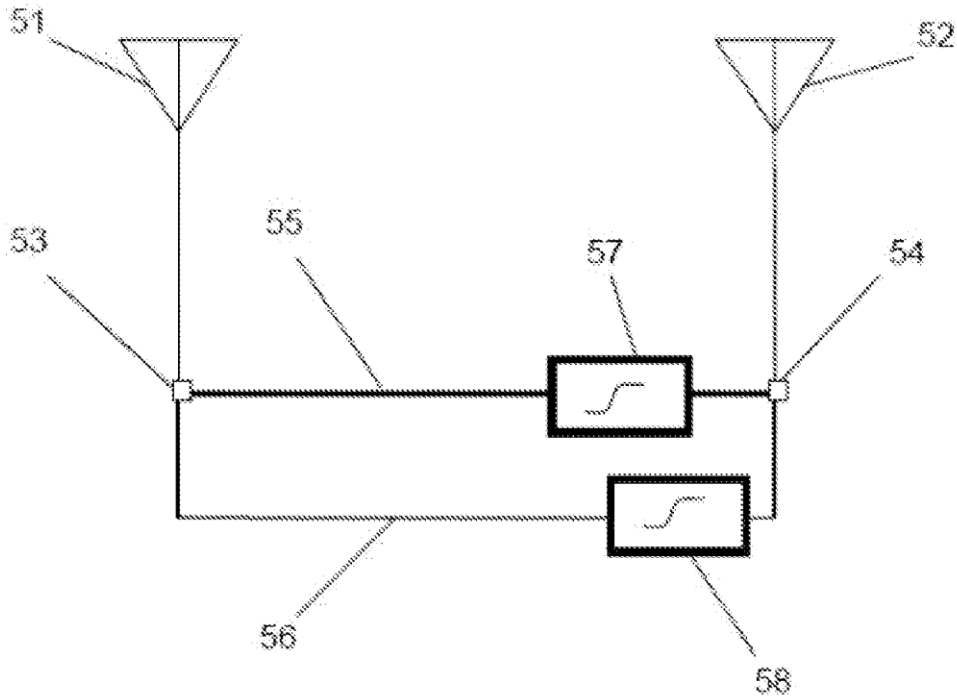
(57) **ABSTRACT**

(22) Filed: **Jul. 13, 2012**

**Related U.S. Application Data**

(63) Continuation-in-part of application No. 13/548,211, filed on Jul. 13, 2012, Continuation-in-part of application No. 13/289,901, filed on Nov. 4, 2011, Continuation of application No. 12/894,052, filed on Sep. 29, 2010, now Pat. No. 8,077,116, Continuation of application No. 11/841,207, filed on Aug. 20, 2007, now Pat. No. 7,830,320.

A multi-band antenna system for MIMO applications is adapted to provide high isolation between antennas across a wide range of frequencies. Multiple Isolated Magnetic Dipole (IMD) antennas are co-located and connected with a feed network that can include switches that adjust phase length for transmission lines connecting the antennas. Filtering is integrated into the feed network to improve rejection of unwanted frequencies. Filtering can also be implemented on the antenna structure. Either one or multi-port antennas can be used.





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(19) **United States**

(12) **Patent Application Publication**  
**Kenoun**

(10) **Pub. No.: US 2013/0093636 A1**

(43) **Pub. Date: Apr. 18, 2013**

(54) **BROAD-BAND, MULTI-BAND ANTENNA**

(52) **U.S. Cl.**

USPC ..... 343/749

(76) Inventor: **Robert Kenoun**, Sunnyvale, CA (US)

(57) **ABSTRACT**

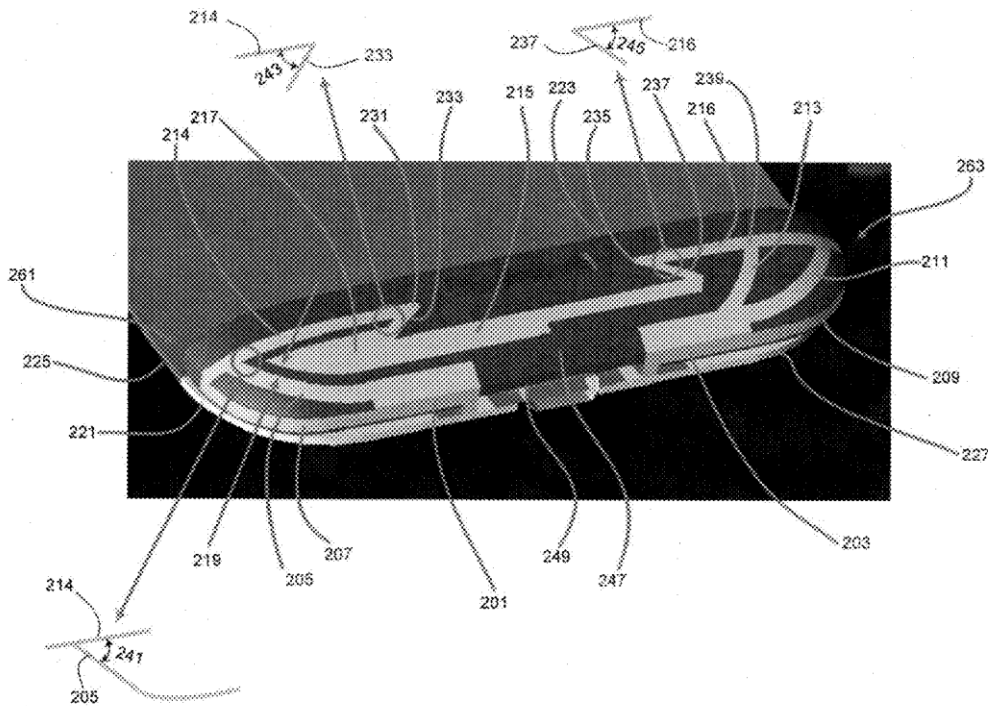
(21) Appl. No.: **13/274,910**

A broad-band, multi-band antenna. The antenna includes a ground terminal and a feed terminal, an elongated inductor, a first inductive element electrically coupled between the ground terminal and a first extremity of the elongated inductor, a capacitive element in parallel connection with the first inductive element, and a second inductive element electrically coupled between a second extremity of the elongated inductor and the feed terminal.

(22) Filed: **Oct. 17, 2011**

**Publication Classification**

(51) **Int. Cl.**  
**H01Q 9/04** (2006.01)





US 20130093640A1

(19) **United States**

(12) **Patent Application Publication**  
**KWON et al.**

(10) **Pub. No.: US 2013/0093640 A1**

(43) **Pub. Date: Apr. 18, 2013**

(54) **PORTABLE TERMINAL**

**Publication Classification**

(71) Applicant: **Samsung Electronics Co., Ltd.**,  
Gyeonggi-do (KR)

(51) **Int. Cl.**  
**H01Q 1/52** (2006.01)

(72) Inventors: **Tae-Wook KWON**, Gyeonggi-do (KR);  
**Jong-Min KIM**, Gyeonggi-do (KR);  
**Sang-Ho HONG**, Gyeonggi-do (KR);  
**Yang-Tack OH**, Gyeonggi-do (KR);  
**Ok-Kyung LEE**, Gyeonggi-do (KR)

(52) **U.S. Cl.**  
USPC ..... **343/841**

(57) **ABSTRACT**

(73) Assignee: **Samsung Electronics Co., Ltd.**,  
Gyeonggi-do (KR)

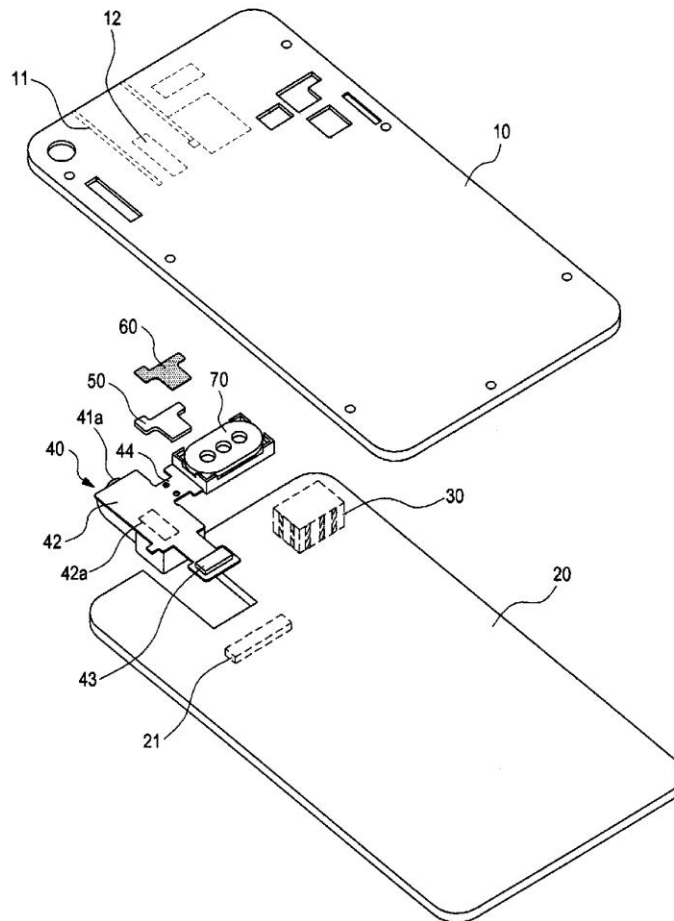
Apparatus for improving the reception sensitivity of a portable terminal includes: a peripheral body combined with a main body; a main circuit board mounted to the peripheral body and providing a connection terminal; an antenna formed on the main circuit board; a module arranged to be adjacent to the antenna; and a ground portion installed between the module and the peripheral body, for conducting noise which has been induced into the antenna, into the peripheral body by conducting current through the module and the peripheral body.

(21) Appl. No.: **13/650,663**

(22) Filed: **Oct. 12, 2012**

(30) **Foreign Application Priority Data**

Oct. 14, 2011 (KR) ..... 10-2011-0105356





US 20130093642A1

(19) **United States**

(12) **Patent Application Publication**  
**Kurashima et al.**

(10) **Pub. No.: US 2013/0093642 A1**

(43) **Pub. Date: Apr. 18, 2013**

(54) **ANTENNA DEVICE**

**Publication Classification**

(71) Applicant: **FUJITSU COMPONENT LIMITED,**  
Tokyo (JP)

(51) **Int. Cl.**  
**H01Q 1/38** (2006.01)  
**H01Q 1/42** (2006.01)  
**H01Q 1/48** (2006.01)

(72) Inventors: **Shigemi Kurashima,** Tokyo (JP);  
**Masahiro Yanagi,** Tokyo (JP); **Hideaki**  
**Yoda,** Tokyo (JP)

(52) **U.S. Cl.**  
USPC ..... **343/848; 343/872; 343/700 MS**

(73) Assignee: **FUJITSU COMPONENT LIMITED,**  
Tokyo (JP)

(57) **ABSTRACT**

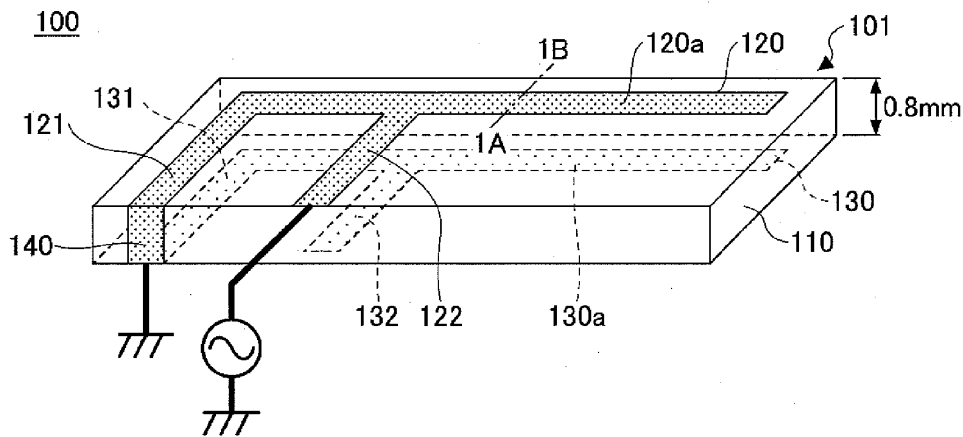
An antenna device to be inserted in a memory card slot of an electronic device, includes an insulating layer, an antenna element formed on one surface of the insulating layer, and a ground element formed on the other surface of the insulating layer, the antenna element and the ground element being formed such that at least a part of the antenna element and at least a part of the ground element protrude from the memory card slot of the electronic device when the antenna device is inserted in the memory card slot, respectively; and a ground pattern extending in parallel relationship with the antenna element to be electrically connected to at least the ground element.

(21) Appl. No.: **13/645,752**

(22) Filed: **Oct. 5, 2012**

(30) **Foreign Application Priority Data**

Oct. 18, 2011 (JP) ..... 2011-229216







US 20130093644A1

(19) **United States**

(12) **Patent Application Publication**  
**HE**

(10) **Pub. No.: US 2013/0093644 A1**

(43) **Pub. Date: Apr. 18, 2013**

(54) **ANTENNA HOLDING DEVICE**

**Publication Classification**

(75) Inventor: **Xiao-Lian HE**, Shenzhen City (CN)

(51) **Int. Cl.**  
**H01Q 1/52** (2006.01)

(73) Assignees: **HON HAI PRECISION INDUSTRY CO., LTD.**, Tu-Cheng (TW); **HONN FU JIN PRECISION INDUSTRY(ShenZhen) CO., LTD.**, Shenzhen City (CN)

**H01Q 1/12** (2006.01)

(52) **U.S. Cl.**  
USPC ..... **343/907; 248/523**

(57) **ABSTRACT**

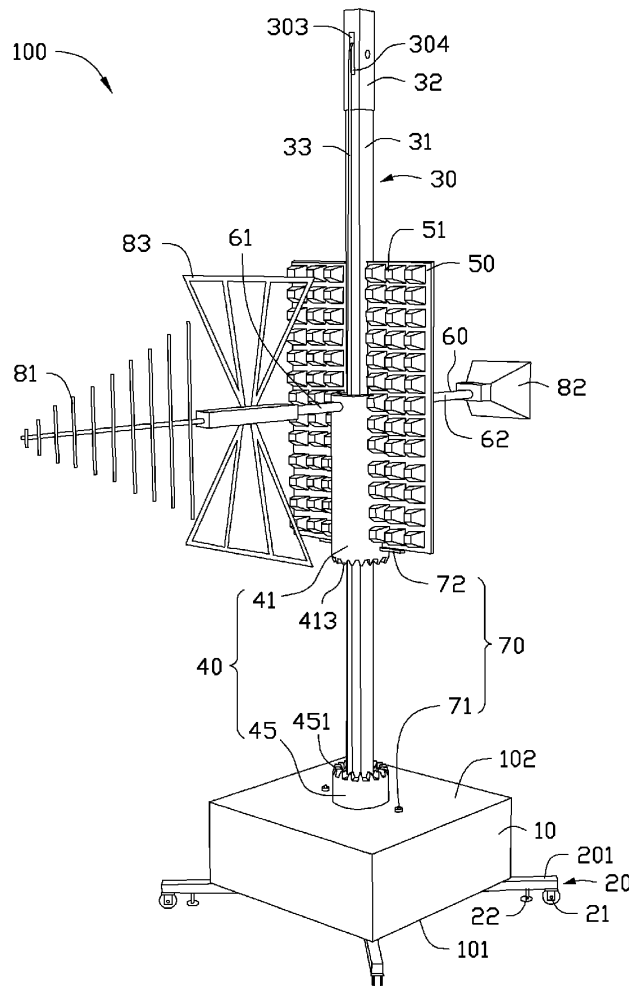
(21) Appl. No.: **13/337,129**

An antenna holding device for holding test antennas includes a base, a holding pole, a sleeve unit, and a support pole. The holding pole is perpendicularly mounted on the base. The sleeve unit includes a movable sleeve, and the movable sleeve slidably and rotatably mounted on the holding pole. The support pole is mounted on the sleeve unit for mounting the test antennas.

(22) Filed: **Dec. 25, 2011**

(30) **Foreign Application Priority Data**

Oct. 14, 2011 (CN) ..... 201110311591.0





US 20130095869A1

(19) **United States**

(12) **Patent Application Publication**  
**Christoffersson et al.**

(10) **Pub. No.: US 2013/0095869 A1**

(43) **Pub. Date: Apr. 18, 2013**

(54) **UPLINK SWITCHED ANTENNA TRANSMIT DIVERSITY METHOD AND APPARATUS**

(75) Inventors: **Jan Christoffersson**, Lulea (SE);  
**Mårten Ericson**, Lulea (SE)

(73) Assignee: **TELEFONAKTIEBOLAGET LM ERICSSON (PUBL)**, Stockholm (SE)

(21) Appl. No.: **13/703,401**

(22) PCT Filed: **Jun. 29, 2010**

(86) PCT No.: **PCT/SE2010/050744**

§ 371 (c)(1),  
(2), (4) Date: **Dec. 11, 2012**

**Publication Classification**

(51) **Int. Cl.**  
**H04B 7/06** (2006.01)

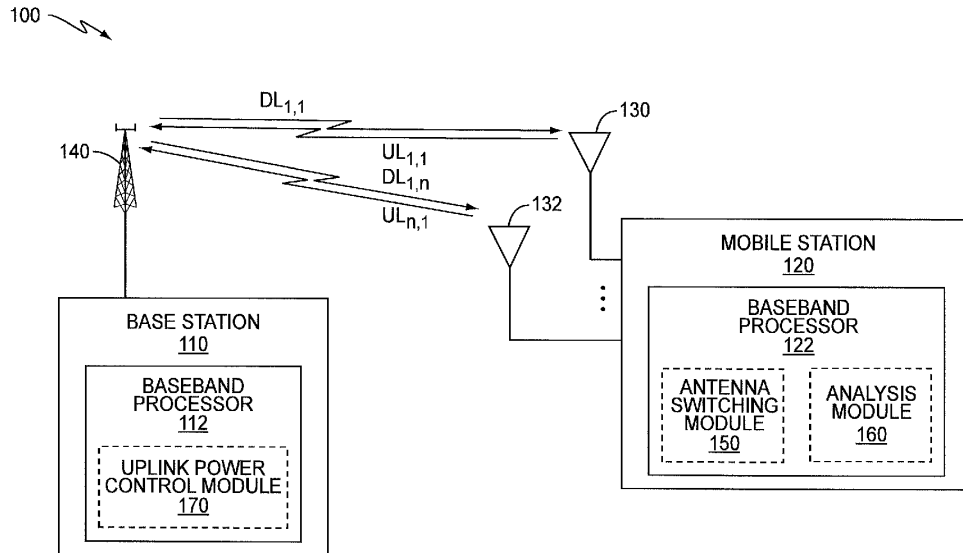
(52) **U.S. Cl.**

CPC ..... **H04B 7/0608** (2013.01)

USPC ..... **455/501**

(57) **ABSTRACT**

A first wireless communication device is in communication with a second wireless communication device over an uplink communication link from the first wireless communication device to the second wireless communication device. Adaptive uplink antenna switching is performed at the first wireless communication device by switching between at least two antennas at the first wireless communication device in accordance with at least one antenna switching parameter to support the uplink communication link, determining whether each antenna switch is successful or unsuccessful and accumulating a history of successful and unsuccessful antenna switches. The at least one antenna switching parameter is modified based on the accumulated history of successful and unsuccessful antenna switches.





US 20130095875A1

(19) **United States**

(12) **Patent Application Publication**  
**REUVEN**

(10) **Pub. No.: US 2013/0095875 A1**

(43) **Pub. Date: Apr. 18, 2013**

(54) **ANTENNA SELECTION BASED ON ORIENTATION, AND RELATED APPARATUSES, ANTENNA UNITS, METHODS, AND DISTRIBUTED ANTENNA SYSTEMS**

**Publication Classification**

(51) **Int. Cl.**  
*H04B 7/10* (2006.01)  
*H01Q 21/24* (2006.01)  
(52) **U.S. Cl.**  
CPC . *H04B 7/10* (2013.01); *H01Q 21/24* (2013.01)  
USPC ..... **455/509**; 343/876; 455/507

(71) Applicant: **RAMI REUVEN, RISHON LETZION (IL)**

(72) Inventor: **RAMI REUVEN, RISHON LETZION (IL)**

(21) Appl. No.: **13/628,467**

(22) Filed: **Sep. 27, 2012**

**Related U.S. Application Data**

(60) Provisional application No. 61/541,566, filed on Sep. 30, 2011.

(57) **ABSTRACT**  
Antenna apparatuses and related antenna units that include antenna selection based on orientation are disclosed. Related methods and distributed antenna systems are also disclosed. Antenna selection is provided between two or more antennas disposed in different polarization orientations according to orientation of the antenna unit in which the antennas are included. The antenna(s) oriented most closely to perpendicular to the ground in one embodiment may be selected for use in wireless communications with wireless client devices. In this manner, the antenna(s) employed in wireless communications is likely to be the closest in polarization to the polarization of wireless client device antennas. Otherwise, an unacceptable reduction in communications link quality with the wireless client devices may occur.

