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### DETAILED ACTION

1. The present application is being examined under the pre-AIA first to invent provisions.
2. Claims 1-27 are presented for examination.

#### *Claim Rejections - 35 USC § 112*

3. The following is a quotation of 35 U.S.C. 112(b):  
(b) CONCLUSION.—The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention.

The following is a quotation of 35 U.S.C. 112 (pre-AIA), second paragraph:  
The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 1-27 are rejected under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or a joint inventor, or for pre-AIA the applicant regards as the invention.

Claim 1 recites the limitation “having dipole ends configured and oriented to generally minimize coupling to the ground plane”. The limitation provides a desired result without actually defining how that result is achieved. There are multiple ways to minimize coupling to the ground plane, and therefore, it would not be clear to one of ordinary skill in the art what are the metes and bounds of the claimed invention.

Claims 15 and 27 recite the limitation “used to achieve reduced SAR values when both antennas are used for simultaneous transit.” The limitation provides a desired result without actually defining how that result is achieved. The term “reduced” in the claim is a relative term which renders the claim indefinite. The term “reduced” is not defined by the claim, the

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specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. There are many ways to reduce SAR, and therefore, it would not be clear to one of ordinary skill in the art what are the metes and bounds of the claimed invention.

Regarding claims 1, 2, 10, 13, 16, 17 and 25 the modifier "generally" renders the claim indefinite because it is unclear whether the limitations following the phrase are part of the claimed invention. See MPEP § 2173.05(d).

Claims 2-25 and 17-27 are indefinite due to their dependency on claims 1 and 16.

### ***Claim Rejections - 35 USC § 102***

5. The following is a quotation of the appropriate paragraphs of pre-AIA 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1, 2, 4, and 7 are rejected under pre-AIA 35 U.S.C. 102(b) as being anticipated by Rutfors et al. (US 2003/0189519 A1).

As to claim 1, Rutfors teaches a portable electronics device having a printed circuit board assembly (10, Fig. 1), an antenna system comprising:

a first antenna (20, Fig. 1) provided on the printed circuit board assembly, said first antenna being fed from a portion of the printed circuit board assembly such that a ground plane (10, Fig. 1) of the printed circuit board assembly serves as a counterpoise for the first antenna

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("PCB 10 functions as a ground plane for a PIFA, the radiating element designated 20," [0023]);  
and

a second balanced antenna (230, Fig. 2) provided on the printed circuit board assembly, said second balanced antenna having dipole ends (231a, 231b, Fig. 2) configured and oriented to generally minimize coupling to the ground plane of the printed circuit board assembly to increase isolation between the first antenna and the second balanced antenna ("the electrical coupling between the transmit and receive antenna elements is minimized," [0006], also see paragraphs [0040] – [0041]).

As to claim 2, Ruffors teaches the dipole ends are oriented such that the axis of polarization is generally normal to the ground plane of the printed circuit board assembly (Fig. 3 and paragraph [0036]).

As to claim 4, Ruffors teaches the first antenna and the second balanced antenna are provided at the same end of the printed circuit board assembly (Fig. 3).

As to claim 7, Ruffors teaches the second balanced antenna comprises two antenna pieces (231a, 231b, Fig. 2), each attached to an opposite side (right and left sides, Fig. 2) of the printed circuit board assembly.

### ***Claim Rejections - 35 USC § 103***

7. The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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8. Claims 6 and 12 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Rutfors (US 2003/0189519 A1).

As to claim 6, Rutfors does not explicitly teach the second balanced antenna comprises a stamped metal part. However, forming antennas from stamped metal parts is well known as a low cost method of manufacturing antennas and would have been obvious to those of ordinary skill in the art.

As to claim 12, Rutfors does not teach said first antenna operates in a WiMAX frequency band and said second balanced antenna operates in a WiFi frequency band. However, tuning the antenna of Rutfors to a specific frequency band is within the skill of those of ordinary skill in the art, by common methods of adjusting matching circuits or adjusting the electrical length.

9. Claims 3, 8, 9 and 14 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Rutfors (US 2003/0189519 A1) in view of Ollikainen (US 2007/0285319 A1).

As to claim 3, Rutfors does not teach the first antenna and the second balanced antenna are provided at opposite ends of the printed circuit board. Ollikainen teaches the first antenna (10, Fig. 1) and the second antenna (30, Fig. 1) are provided at opposite ends of the printed circuit board assembly. It would have been obvious to one of ordinary skill in the art to modify the antenna of Rutfors by placing the first and second antennas at opposite end of a PCB in order to minimize coupling between the antennas.

As to claim 8, Rutfors does not teach of the two antenna pieces is soldered to a pad on opposite sides of the printed circuit board assembly, wherein the pads are connected to form an inductive connecting element. Ollikainen an antenna element having two ends on opposite sides of a printed circuit board (20, Fig. 1) connected to an inductive connecting element (40, Fig. 1)

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It would have been obvious to one of ordinary skill in the art to modify the antenna of Rutfors by including an inductive connecting element between the two ends of the antenna because the inductive connecting element provides an additional means of tuning the antenna to a resonant frequency without altering the physical size of the antenna.

As to claim 9, Rutfors teaches the second balanced antenna comprises a center fed dipole antenna (231a, 231b, Fig. 2) having capacitive end plates on opposite sides of the printed circuit board assembly. Rutfors does not teach said capacitive end plates being connected by an inductive connecting element. Ollikainen an antenna element having two ends on opposite sides of a printed circuit board (20, Fig. 1) connected to an inductive connecting element (40, Fig. 1)

It would have been obvious to one of ordinary skill in the art to modify the antenna of Rutfors by including an inductive connecting element between the two ends of the antenna because the inductive connecting element provides an additional means of tuning the antenna to a resonant frequency without altering the physical size of the antenna.

As to claim 14, Rutfors does not teach one or more additional antennas attached to an edge of the printed circuit board assembly such that the ground plane of the printed circuit board assembly serves as a counterpoise for the one or more additional antennas.

Ollikainen teaches additional antennas attached to an edge of the printed circuit board assembly such that the ground plane serves as a counterpoise for the additional antenna (see [0045]). It would have been obvious to one of ordinary skill in the art to provide an additional unbalanced antenna to the antenna device of Rutfors in order to increase the diversity of the antenna system and provide an additional operating frequency.

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10. Claims 5 and 11 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Rutfors (US 2003/0189519 A1) in view of Ali et al. (US 8,044,863 B2).

As to claim 5, Rutfors does not teach the second balanced antenna comprises a conductive foil pattern printed on a carrier attached to the printed circuit board assembly. Ali teaches an antenna comprising a conductive foil on a carrier attached to the printed circuit board assembly. It would have been obvious to one of ordinary skill in the art to modify the antenna if Rutfors by providing the antenna as a conductive foil pattern on a carrier because providing the dielectric carrier would provide additional isolation between the first and second antenna (see Rutfors, paragraph [0041] for example) or would allow the antenna to be reduced in length.

As to claim 11, Rutfors does not teach the second balanced antenna has a C-shaped cross section, and is disposed around an edge of the printed circuit board assembly. Ali teaches an antenna (40, Fig. 4) having a C-shaped cross section disposed around an edge of a printed circuit board (22, Fig. 4). It would have been obvious to one of ordinary skill in the art to modify the antenna if Rutfors as a C-shaped cross sectioned antenna upon a dielectric carrier. Providing the dielectric carrier would provide additional isolation between the first and second antenna (see Rutfors, paragraph [0041] for example) or would allow the antenna to be reduced in length, and utilizing the C-shaped cross section around an edge of the PCB would reduce the height of the portable device (Ali, abstract).

11. Claim 13 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Rutfors (US 2003/0189519 A1) in view of Bell (US 5,189,434).

As to claim 13, Rutfors does not teach the second balanced antenna comprising a plurality of antenna elements, each operatively coupled to a different antenna port, and one or

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more connecting elements electrically connecting the antenna elements such that electrical currents on one antenna element flow to a connected neighboring antenna element and generally bypass the antenna port coupled to the neighboring antenna element, the electrical currents flowing through the one antenna element and the neighboring antenna element being generally equal in magnitude, such that an antenna mode excited by one antenna port is generally electrically isolated from a mode excited by another antenna port at a given desired signal frequency range.

Bell teaches a multimode antenna structure comprising:

a plurality of antenna ports operatively coupled to the circuitry (col 12, In 17-20);

a plurality of antenna elements (col 3, lines 27- 29), each operatively coupled to a different one of the antenna ports [terminal] (col 2, lines 32-37); and

one or more connecting elements electrically connecting the antenna elements such that electrical currents on one antenna element flow to a connected neighboring antenna element and generally bypass the antenna port coupled to the neighboring antenna element, the electrical currents flowing through the one antenna element and the neighboring antenna element being generally equal in magnitude (Fig. 6-9), such that an antenna mode excited by one antenna port is generally electrically isolated from a mode excited by another antenna port at a given desired signal frequency range (abstract).

It would have been obvious to one of ordinary skill in the art to modify the antenna structure of Rutfors by providing a multimode antenna structure as taught by Bell in order to increase the diversity of the antenna system and allow the system to operate in additional bandwidths.

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***Allowable Subject Matter***

Claims 16-27 would be allowable if rewritten or amended to overcome the rejection(s) under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), 2nd paragraph, set forth in this Office action.

The following is an examiner's statement of reasons for allowance: Rutfors teaches the device substantially as claimed as applied to claim 1 above, but does not teach:

a second balanced antenna comprising two symmetrical dipole ends positioned equidistant from the printed circuit board assembly on opposite sides of the printed circuit board assembly, said dipole ends being excitable to an electrical potential of equal magnitude and opposite sign, resulting in a neutral potential at the ground plane to minimize coupling to the ground plane to increase isolation between the first antenna and the second balanced antenna.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JENNIFER F. HU whose telephone number is (571)272-5486. The examiner can normally be reached on Monday-Friday 8am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dameon Levi can be reached on (571) 272-2105. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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