

A SHIELDING SYSTEM

FIELD OF INVENTION

- 5 The present invention relates to a shielding system for controlling emission of electromagnetic interference from a plurality of wireless modules electrically connected to a printed circuit board (PCB).

BACKGROUND OF INVENTION

10

WiWi Generation 1.5 basically is the integration of WiFi a/b/g and 2.3 GigaHertz (GHz) WiMax which poses many complications during the development stage. Most of the solutions today focus on 3.5 GHz WiMax and 2.4 GHz at WiFi.

- 15 The complication when integrating two products of very close frequency on a same device as this introduces interference and distorts signal quality. Low Noise Amplifiers (LNA) suffers from interference at both frequencies that are being used. This results in poor Quality of Service (QoS) which translates to less coverage and low data rate. These undesirable traits cause instability of devices where device needs to resend packets too
- 20 frequently due to data loss.

- High speed processors usually work with high speed buses and high clock. These high speed transmission elements introduce strong electromagnetic interference that can possibly affect the performance of WiMax and WiFi systems. The problems usually start
- 25 to occur when the processors at the main board begin operating at 166 MegaHertz (MHz) to 2 GHz.

Most existing systems combine WiFi and WiMax in Mini Peripheral Component Interconnect (MiniPCI) bus due to the standardized form factor issues that do not allow them to be integrated in any other method. Therefore it miniaturization of modules is an
5 issue which causes the devices to support only a limited frequency range.

Existing methods of shielding only using metal cases are good for performance but however, introduce an increase in cost of devices.

10 Therefore, there is a need for a method or system to allow integration of multiple transmission standards such as WiMax and WiFi in order to improve frequency range in a cost effective manner.

SUMMARY OF INVENTION

Accordingly there is provided a shielding system for controlling emission of electromagnetic interference from a plurality of wireless modules electrically connected to a printed circuit board (PCB), characterized in that, the system includes a plurality of wireless modules operational in at least two different frequencies, wherein the frequencies cause electromagnetic interference to one another, a plurality of metal casings positionable around the plurality of wireless modules wherein the plurality of metal casings shield electronic components of a wireless modules from said electromagnetic interference, wherein the wireless modules are connected to a metal ground plane.

There is also provided a method for shielding wireless modules from emission of electromagnetic interference from a plurality of wireless modules electrically connected to a printed circuit board (PCB), characterized in that, the method includes positioning the wireless modules at a predetermined distance from one another such that the electromagnetic interference does not affect each other and placing a metal shielding around electronic components of each wireless module.

The present invention consists of several novel features and a combination of parts hereinafter fully described and illustrated in the accompanying description and drawings, it being understood that various changes in the details may be made without departing from the scope of the invention or sacrificing any of the advantages of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

The drawings constitute part of this specification and include an exemplary or preferred embodiment of the invention, which may be embodied in various forms. It should be understood, however, the disclosed preferred embodiments are merely exemplary of the invention. Therefore, the figures (not to scale) disclosed herein are not to be interpreted as limiting, but merely as the basis for the claims and for teaching one skilled in the art of the invention.

Figure 1 is a front view and a side view of a first embodiment of a shielding system;

10 Figure 2 is a front view and a side view of a second embodiment of a shielding system;

Figure 3 is a front view and a side view of a third embodiment of a shielding system.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

5 The present invention relates to a shielding system for controlling emission of electromagnetic interference from a plurality of wireless modules electrically connected to a printed circuit board (PCB). Hereinafter, this specification will describe the present invention according to the preferred embodiments of the present invention. However, it is to be understood that limiting the description to the preferred embodiments of the invention is merely to facilitate discussion of the present invention and it is envisioned that
10 those skilled in the art may devise various modifications and equivalents without departing from the scope of the appended claims.

The following detailed description of the preferred embodiments will now be described in
15 accordance with the attached drawings, either individually or in combination.

Figure 1 shows an embodiment of the invention which is a shielding system (100) for controlling emission of electromagnetic interference from a plurality of wireless modules (101, 103) electrically connected to a printed circuit board (PCB), where a plurality of
20 wireless modules (101,103) operational in at least two different frequencies, wherein the frequencies cause electromagnetic interference to one another, a plurality of metal casings positionable around the plurality of wireless modules (101, 103) wherein the plurality of metal casings shield electronic components of a wireless modules (101, 103) from said electromagnetic interference, (101, 103) wherein the wireless modules (101,
25 103) are connected to a metal ground plane of the PCB such that electromagnetic interference does not affect each other. An example of wireless modules (101, 103) used are WiFi and Worldwide Interoperability for Microwave Access (WiMax).

Figure 2 shows a second embodiment of the invention where a shielding system (100) for controlling emission of electromagnetic interference from a plurality of wireless modules (101, 103) electrically connected to a printed circuit board (PCB) is shown. The system (100) includes a plurality of wireless modules (101,103) operational in at least two different frequencies, wherein the frequencies cause electromagnetic interference to one another, a processor, wherein the processor is positionable between and of a predetermined distance from the plurality of wireless modules (101, 103), a plurality of metal casings positionable around the plurality of wireless modules (101, 103) wherein the plurality of metal casings shield electronic components of a wireless modules (101, 103) from said electromagnetic interference, wherein the wireless modules (101, 103) are positionable at a predetermined distance from each module (101, 103) such that electromagnetic interference does not affect each other. The system (100) in Figure 2 further includes a common cable (104) wherein the plurality of wireless modules (101, 103) are connectable to a transmitting or receiving means, such as an antenna, by the cable (104), wherein output from the plurality of wireless modules (101, 103) are transmitted and received digitally in the common cable (104). An example of wireless modules (101, 103) used are WiFi and WiMax. The cable (104) used may be up to 1 meter length and supports digital transmission such as Universal Serial Bus (USB), Secure Digital Input Output (SDIO) and Parallel Bus. However, the examples given herein are not limitative of the scope of the invention and may be extended to include more standards of transmission as required.

Figure 3 shows another embodiment where a shielding system (100) for controlling emission of electromagnetic interference from a plurality of wireless modules (101, 103) electrically connected to a printed circuit board (PCB), where a plurality of wireless modules (101,103) operational in at least two different frequencies, wherein the

frequencies cause electromagnetic interference to one another, a processor, wherein the processor is positionable between and of a predetermined distance from the plurality of wireless modules (101, 103), a plurality of metal casings positionable around the plurality of wireless modules (101, 103) wherein the plurality of metal casings shield electronic components of a wireless modules (101, 103) from said electromagnetic interference, wherein the wireless modules (101, 103) are positionable at a predetermined distance from each module (101, 103) such that electromagnetic interference does not affect each other. An example of wireless modules (101, 103) used are WiFi and WiMax.

10 A method for shielding wireless modules (101, 103) from emission of electromagnetic interference from a plurality of wireless modules (101, 103) electrically connected to a printed circuit board (PCB) is also described in that the method includes positioning the wireless modules (101, 103) at a predetermined distance from one another such that the electromagnetic interference does not affect each other and placing a metal shielding
15 around electronic components of each wireless module (101, 103) as seen in Figure 3.

A second method for shielding wireless modules (101, 103) from emission of electromagnetic interference from a plurality of wireless modules (101, 103) electrically connected to a printed circuit board (PCB) is also described in that the method includes
20 placing a metal shielding around electronic components of each wireless module (101, 103) a wherein the wireless modules (101, 103) are connected to the metal ground plane of the PCB as seen in Figure 1. The metal ground plane prevents crosstalk between any components in both modules. Optimum metal shielding thickness can be as thick as possible to isolate signals. However, this introduces a complication of causing weight
25 issues as the PCB will become too heavy. The metal ground plane in the shielding system (100) is 1.2mm thickness.

Another method for shielding wireless modules (101,103) from emission of electromagnetic interference from a plurality of wireless modules (101, 103), characterized in that, the method includes positioning the wireless modules (101, 103) at a predetermined distance from one another such that the electromagnetic interference
5 does not affect each other, placing a metal shielding around electronic components of a wireless module (101, 103) and connecting to a transmitting or receiving means by one common cable (104), wherein output from the plurality of wireless modules (101, 103) are transmitted and received digitally in the common cable (104) as seen in Figure 2. This separation of signal on a common cable (104) is able to solve multi-module solution from
10 various vendors as there are less shielding components used, thereby reducing compatibility issues between multiple components. The cable (104) used is a Radio Frequency (RF) cable that is fully shielded and grounded. The positioning of the wireless modules (101,103) is designed to suit various needs such as fitting a specific form factor, easy installation and spaced far apart enough to prevent any crosstalk in signals.

15

The methods and system described are intended to cater for reducing electromagnetic interference issues for high and low power output transmission such as from 18 to 30 (decibel-milliwatt) dBm. Quality of service can be improved by reducing the interference and a providing a better reception and transmission as Low Noise Amplifiers (LNA) would
20 have a better performance with less interference. The system and method described in Figure 3 allows WiMax (up to 30dBm) and WiFi(18-23dBm) to be on the same module without interference.

This invention is adapted for use with a variety of wireless modules. The shielding system
25 and method can be used for preventing interference in any wireless applications. The disclosed invention is suitable, but not restricted to, for use in WiMax and WiFi systems.

CLAIMS

1. A shielding system (100) for controlling emission of electromagnetic interference from a plurality of wireless modules (101, 103) electrically connected to a printed circuit board (PCB), characterized in that, the system (100) includes:
- 5 a plurality of wireless modules (101,103) operational in at least two different frequencies, wherein the frequencies cause electromagnetic interference to one another;
- a plurality of metal casings positionable around the plurality of wireless modules (101, 103) wherein the plurality of metal casings shield electronic components of a wireless
- 10 modules (101, 103) from said electromagnetic interference,
- wherein the wireless modules (101, 103) are connected to a metal ground plane.
2. A shielding system (100) for controlling emission of electromagnetic interference from a plurality of wireless modules (101, 103) electrically connected to a printed circuit board (PCB), characterized in that, the system (100) includes:
- 15 a plurality of wireless modules (101,103) operational in at least two different frequencies, wherein the frequencies cause electromagnetic interference to one another;
- a processing means, wherein the processing means is positionable between and of a predetermined distance from the plurality of wireless modules (101, 103);
- 20 a plurality of metal casings positionable around the plurality of wireless modules (101, 103) wherein the plurality of metal casings shield electronic components of a wireless modules (101, 103) from said electromagnetic interference,
- wherein the wireless modules (101, 103) are positionable at a predetermined distance from each module (101, 103) such that electromagnetic interference does not affect each
- 25 other.

3. The shielding system (100) as described in claim 2, wherein the plurality of wireless modules (101, 103) are connectable to a transmitting or receiving means by one common cable (104), wherein output from the plurality of wireless modules (101, 103) are
5 transmitted and received digitally in the common cable (104).

4. The system (100) as described in claim 3, wherein the wireless modules (101, 103) are WiFi and WiMax modules.

10 5. A method for shielding wireless modules (101, 103) from emission of electromagnetic interference from a plurality of wireless modules (101, 103) electrically connected to a printed circuit board (PCB), characterized in that, the method includes positioning the wireless modules (101, 103) at a predetermined distance from one another such that the electromagnetic interference does not affect each other and placing a metal shielding
15 around electronic components of each wireless module (101, 103).

6. The method as claimed in claim 5, wherein the wireless modules (101, 103) are connected to the metal ground plane of the PCB.

20 7. A method for shielding wireless modules (101,103) from emission of electromagnetic interference from a plurality of wireless modules (101, 103), characterized in that, the method includes positioning the wireless modules (101, 103) at a predetermined distance from one another such that the electromagnetic interference does not affect each other, placing a metal shielding around electronic components of a wireless module (101, 103)
25 and connecting to a transmitting or receiving means by one common cable (104), wherein output from the plurality of wireless modules (101, 103) are transmitted and received digitally in the common cable (104).

8. The method as described in claim 6 and 7, wherein the wireless modules (101, 103) are WiFi and WiMax modules.

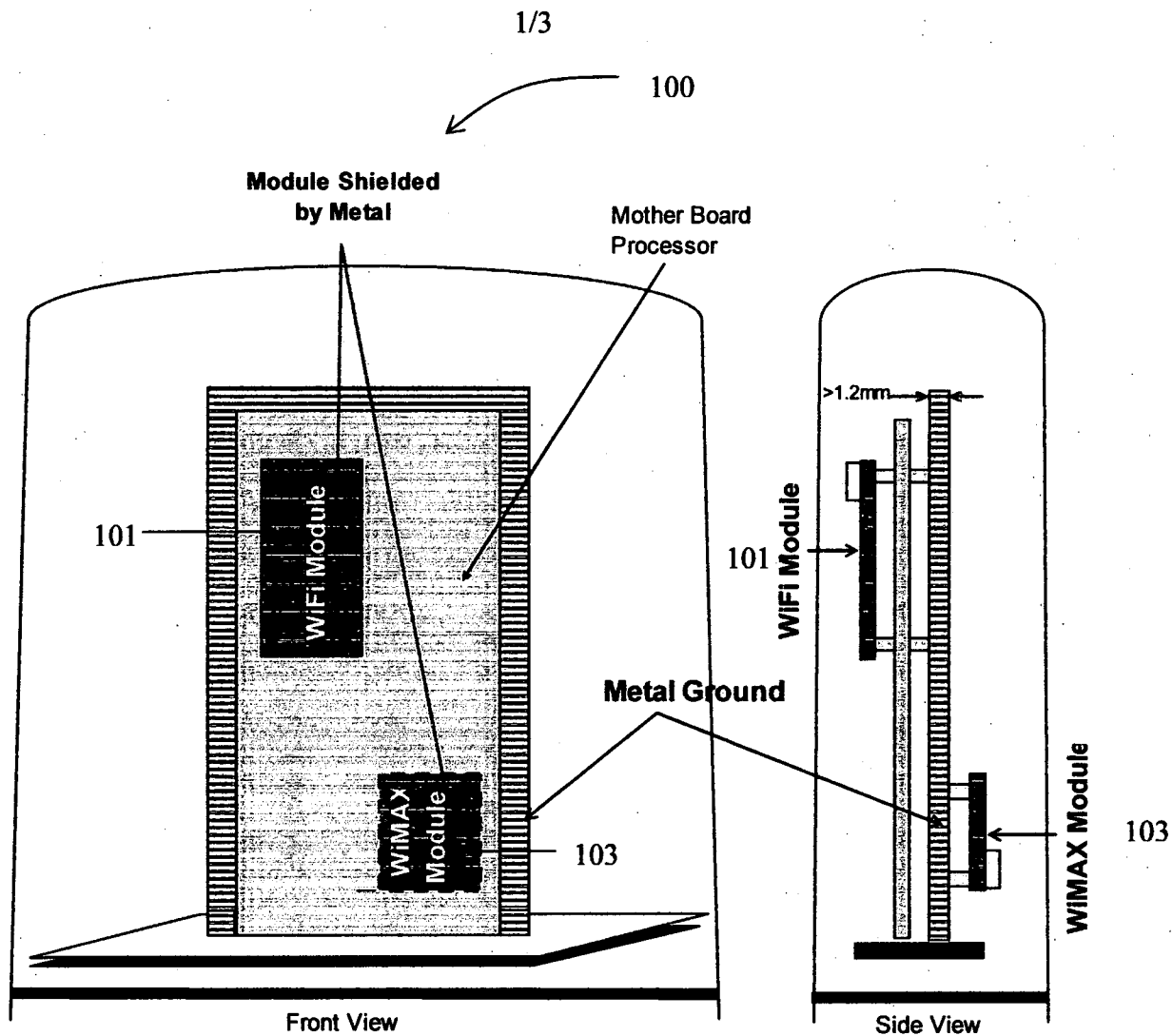
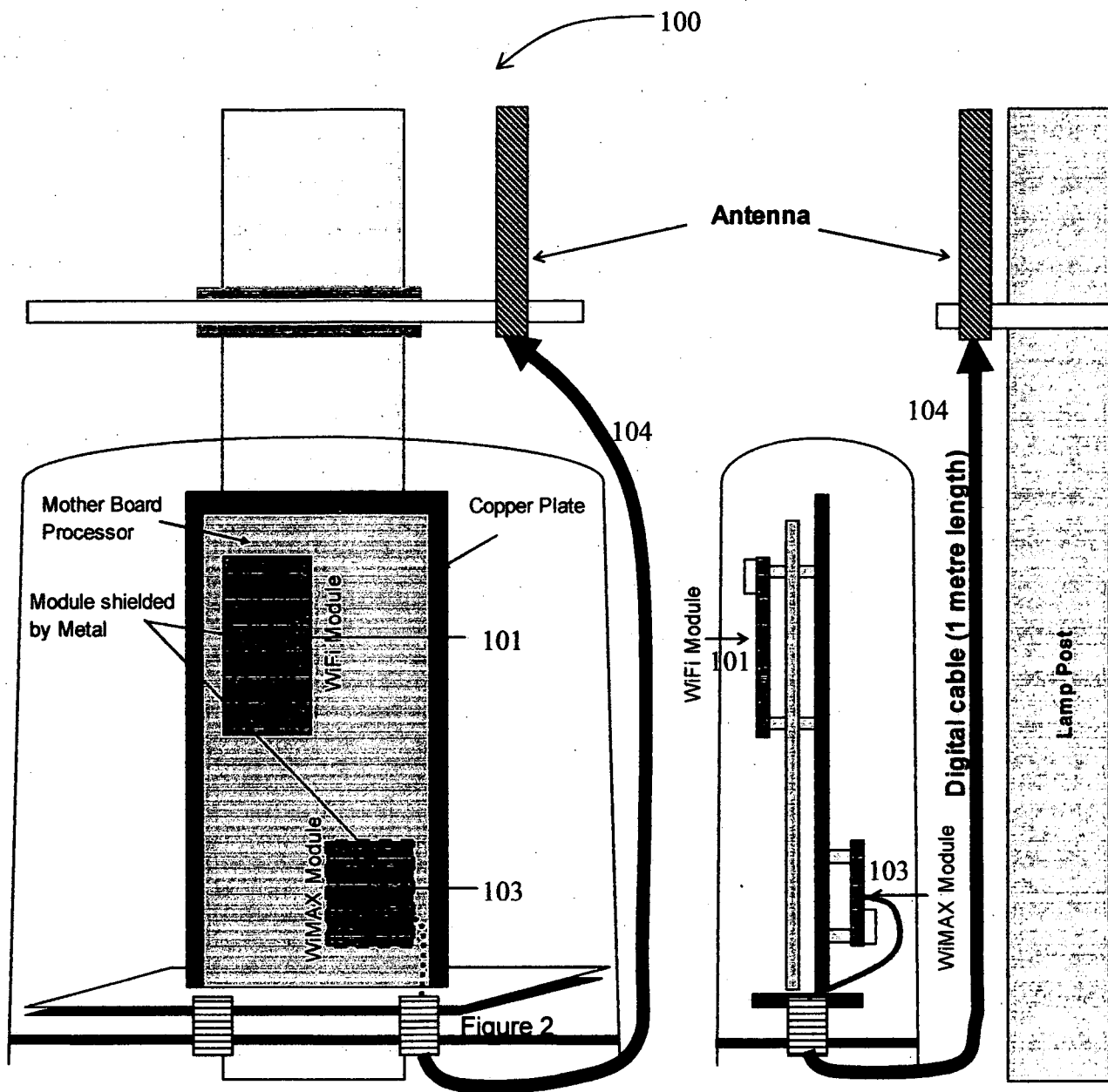
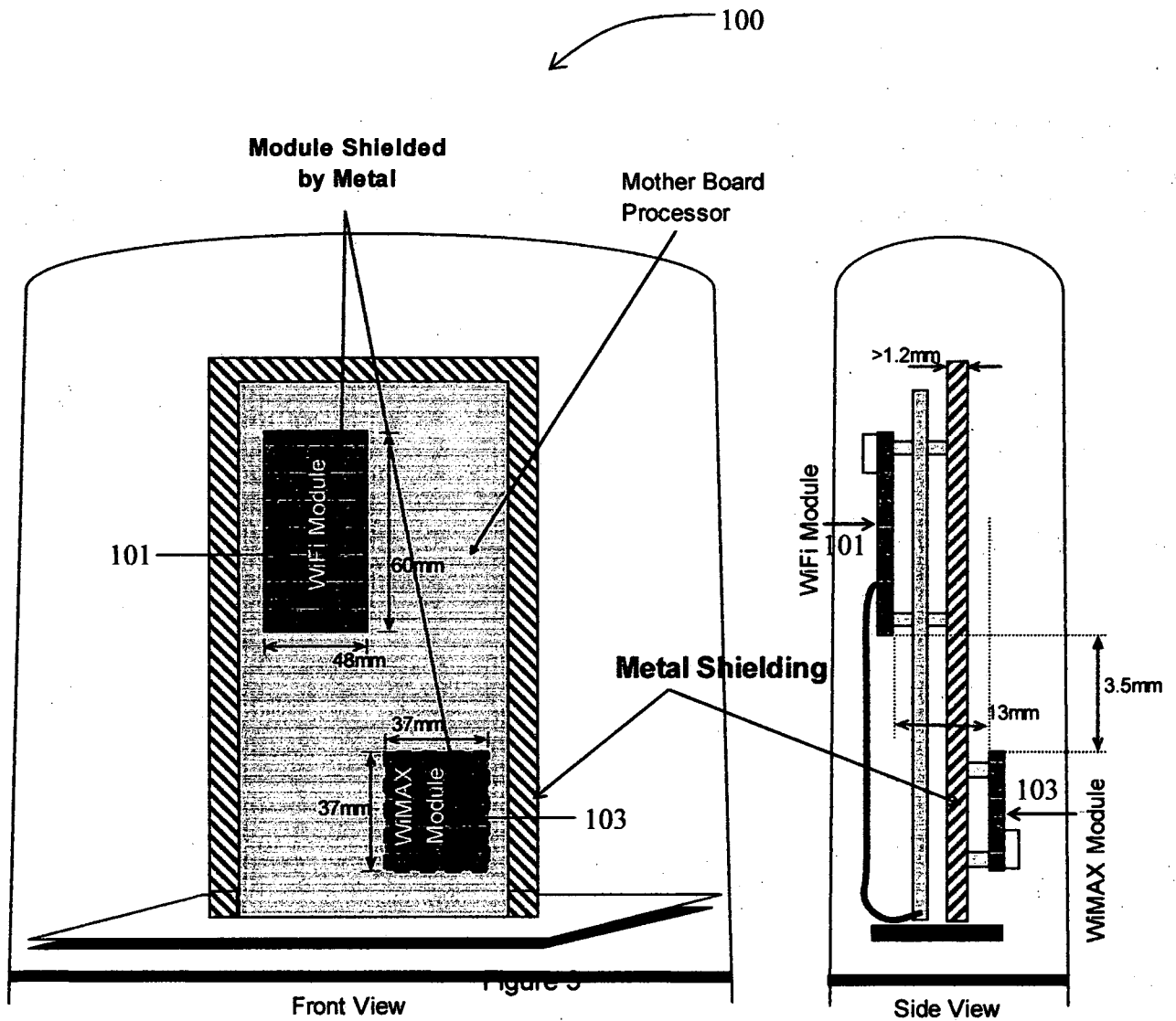


Figure 1

2/3





INTERNATIONAL SEARCH REPORT

International application No.

PCT/MY2010/000149

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl. *H05K 9/00* (2006.01)

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

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

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

WPI, EPODOC, Esp@cenet, USPTO, Google patents, Internet: wireless, WiFi, shield, electromagnetic, interference, frequency, PCB, metal, ground and similar terms

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2009/0032300 A1 (JOSHI) 5 February 2009 abstract; paragraphs [0003], [0004], [0007], [0008], [0017], [0028]	1 - 8
X Y	US 2007/0273602 A1 (ZHU et al.) 29 November 2007 paragraphs [0003], [0004], [0011], [0015], [0054]; claim 1; figures 5-8	2-5, 7-8 1, 6



Further documents are listed in the continuation of Box C



See patent family annex

* Special categories of cited documents:	
"A" document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"E" earlier application or patent but published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search
02 December 2010

Date of mailing of the international search report

10 DEC 2010

Name and mailing address of the ISA/AU
AUSTRALIAN PATENT OFFICE
PO BOX 200, WODEN ACT 2606, AUSTRALIA
E-mail address: pct@ipaustralia.gov.au
Facsimile No. +61 2 6283 7999Authorized officer
MANISH RAJ
AUSTRALIAN PATENT OFFICE
(ISO 9001 Quality Certified Service)
Telephone No : +61 2 6283 2175

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/MY2010/000149

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report			Patent Family Member		
US	2009/0032300	NONE			
US	2007/0273602	US 7310067	US 2008007475	US 7477202	
		US 2009093286	US 7825870		
Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.					
END OF ANNEX					