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(19) **United States**

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

(10) **Pub. No.: US 2025/0023253 A1**

(43) **Pub. Date: Jan. 16, 2025**

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

(71) Applicant: **VIVO MOBILE COMMUNICATION CO., LTD.**, Guangdong (CN)

(72) Inventors: **Yue QIN**, Guangdong (CN); **Yijin WANG**, Guangdong (CN)

(73) Assignee: **VIVO MOBILE COMMUNICATION CO., LTD.**, Guangdong (CN)

(21) Appl. No.: **18/900,790**

(22) Filed: **Sep. 29, 2024**

Related U.S. Application Data

(63) Continuation of application No. PCT/CN2023/085014, filed on Mar. 30, 2023.

(30) **Foreign Application Priority Data**

Apr. 1, 2022 (CN) 202210348898.6

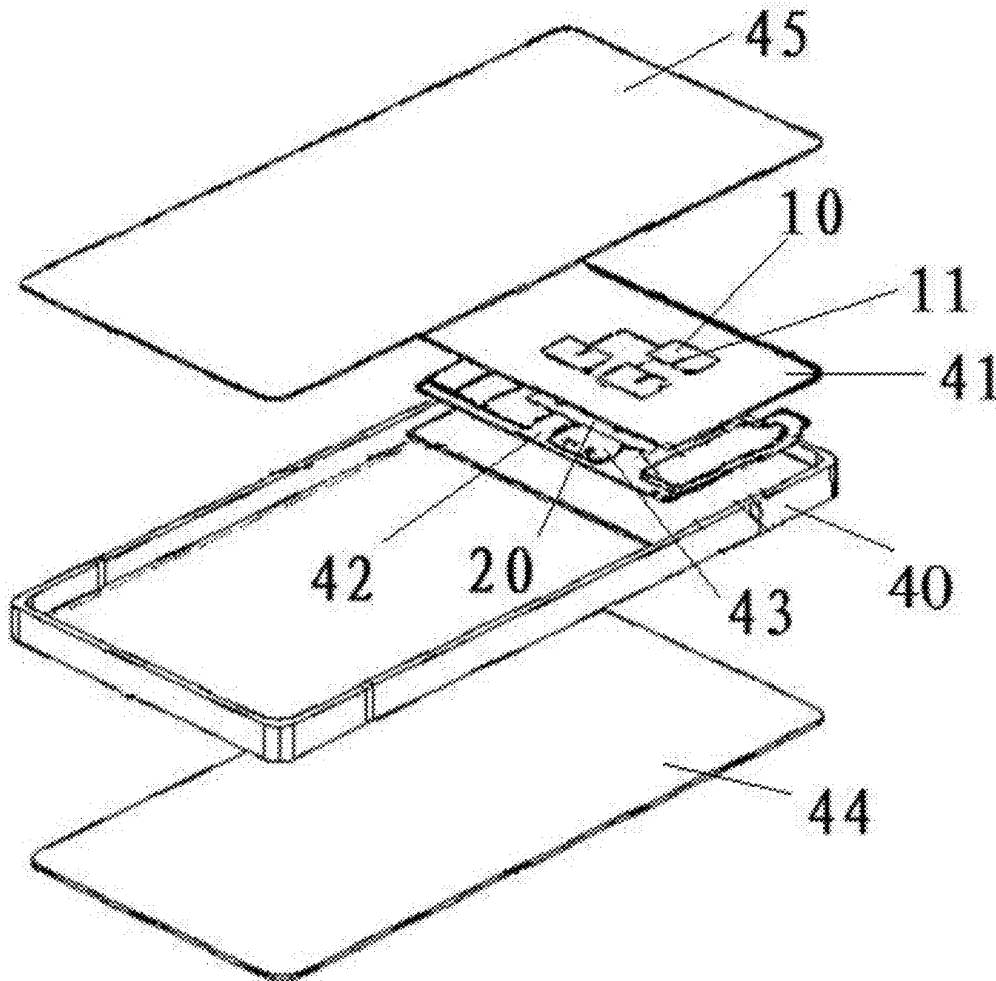
Publication Classification

(51) **Int. Cl.**
H01Q 15/24 (2006.01)
H01Q 1/52 (2006.01)
H01Q 9/04 (2006.01)

(52) **U.S. Cl.**
CPC *H01Q 15/24* (2013.01); *H01Q 1/52* (2013.01); *H01Q 9/0478* (2013.01)

(57) **ABSTRACT**

An antenna structure and an electronic device, where the antenna structure includes: a reference floor; and a radiator, where the radiator and the reference floor are stacked and spaced apart, and the radiator includes a feeding point and a first current distribution part and a second current distribution part that are respectively located at two ends of the radiator; where a cross-polarization current direction on the first current distribution part is opposite to a cross-polarization current direction on the second current distribution part under the effect of a feeding signal input on the feeding point.





US 20250030149A1

(19) **United States**

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

(10) **Pub. No.: US 2025/0030149 A1**

(43) **Pub. Date: Jan. 23, 2025**

(54) **ANTENNA MODULE INCLUDING
STRUCTURE FOR EXTENDING GROUND
AND ELECTRONIC DEVICE INCLUDING
SAME**

H01Q 1/48 (2006.01)

H01Q 1/52 (2006.01)

H05K 1/02 (2006.01)

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

CPC *H01Q 1/2283* (2013.01); *H01Q 1/2291*

(2013.01); *H01Q 1/38* (2013.01); *H01Q 1/48*

(2013.01); *H01Q 1/526* (2013.01); *H05K*

1/0237 (2013.01); *H05K 2201/10098*

(2013.01)

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

(72) Inventors: **Sinhyung JEON**, Suwon-si (KR);
Sanggi OH, Suwon-si (KR); **Jeongnam**
CHEON, Suwon-si (KR)

(21) Appl. No.: **18/908,429**

(57)

ABSTRACT

(22) Filed: **Oct. 7, 2024**

Related U.S. Application Data

(63) Continuation of application No. PCT/KR2023/
003853, filed on Mar. 23, 2023.

(30) Foreign Application Priority Data

Apr. 22, 2022 (KR) 10-2022-0049938

May 25, 2022 (KR) 10-2022-0064328

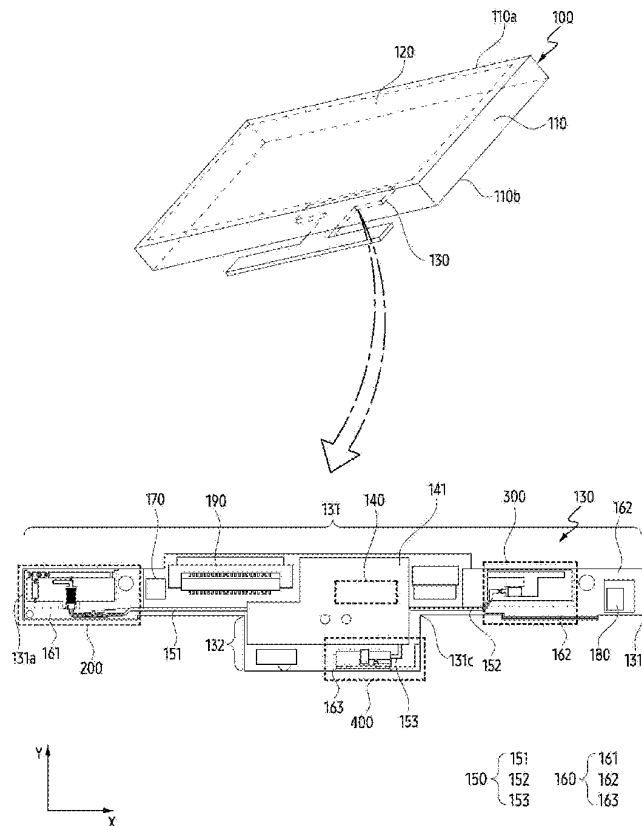
Publication Classification

(51) **Int. Cl.**

H01Q 1/22 (2006.01)

H01Q 1/38 (2006.01)

An electronic device according to an embodiment includes: a printed circuit board; a first antenna module including at least one antenna; a second antenna module including at least one antenna; a Bluetooth module comprising circuitry; and at least one processor, comprising processing circuitry, wherein the first antenna module includes: a chip antenna; a feeding line; at least one first ground area; a set of first conductive patterns; and a first lumped element comprising a conductive material, set including a first lumped element, a second lumped element, a third lumped element, and a fourth lumped element. A third conductive pattern, fourth conductive pattern, and the at least one first ground area form a closed loop by the second lumped element, the third lumped element, and the fourth lumped element.





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(19) **United States**

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

(10) **Pub. No.: US 2025/0030151 A1**

(43) **Pub. Date: Jan. 23, 2025**

(54) **ELECTRONIC DEVICE INCLUDING ANTENNA**

H01Q 9/04 (2006.01)

H04M 1/02 (2006.01)

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

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

CPC **H01Q 1/243** (2013.01); **H01Q 1/38**
(2013.01); **H01Q 9/0492** (2013.01); **H04M**
1/0216 (2013.01)

(72) Inventors: **Sumin YUN**, Suwon-si (KR); **Hosaeng KIM**, Suwon-si (KR); **Seongjin PARK**, Suwon-si (KR); **Hyunjeong LEE**, Suwon-si (KR); **Hyunjoo LEE**, Suwon-si (KR)

(57)

ABSTRACT

An electronic device is provided. The electronic device includes a housing, an antenna structure disposed in the housing, wherein the antenna structure includes a substrate including a first substrate surface, a second substrate surface facing away from the first substrate surface, and a ground layer disposed between the first substrate surface and the second substrate surface, a first conductive patch including a plurality of sub-patches arranged to correspond to the ground layer, and a second conductive patch disposed between a first sub-patch and a second sub-patch among the plurality of sub-patches of the first conductive patch when viewed from above the first substrate surface, and a wireless communication circuit configured to transmit or receive a first wireless signal in a first frequency band through the plurality of sub-patches of the first conductive patch and to transmit or receive a second wireless signal in a second frequency band through the second conductive patch. The electronic device further includes a first non-conductive area disposed in a position overlapping at least a portion of the second conductive patch when viewed from above the first substrate surface.

(21) Appl. No.: **18/819,286**

(22) Filed: **Aug. 29, 2024**

Related U.S. Application Data

(63) Continuation of application No. PCT/KR2024/010166, filed on Jul. 16, 2024.

(30) **Foreign Application Priority Data**

Jul. 18, 2023 (KR) 10-2023-0092952

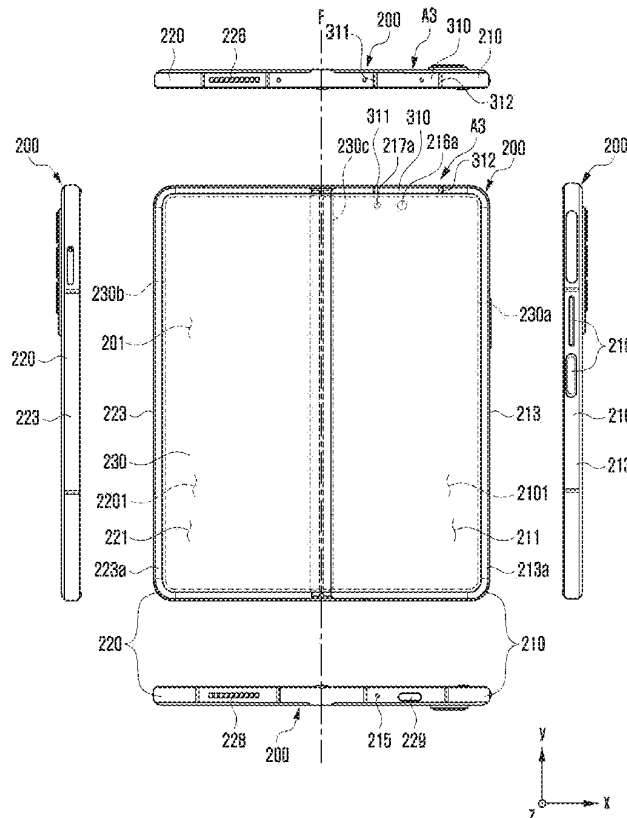
Jul. 19, 2023 (KR) 10-2023-0093909

Publication Classification

(51) **Int. Cl.**

H01Q 1/24 (2006.01)

H01Q 1/38 (2006.01)





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(19) **United States**

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

(10) **Pub. No.: US 2025/0030156 A1**

(43) **Pub. Date: Jan. 23, 2025**

(54) **ULTRA-WIDEBAND ANTENNA AND
ELECTRONIC APPARATUS**

Publication Classification

(71) Applicants: **BEIJING BOE TECHNOLOGY
DEVELOPMENT CO., LTD.**, Beijing
(CN); **BOE Technology Group Co.,
Ltd.**, Beijing (CN)

(51) **Int. Cl.**
H01Q 1/52 (2006.01)
H01Q 9/04 (2006.01)
H01Q 19/00 (2006.01)
(52) **U.S. Cl.**
CPC *H01Q 1/52* (2013.01); *H01Q 9/0407*
(2013.01); *H01Q 19/005* (2013.01)

(72) Inventors: **Qianhong Wu**, Beijing (CN); **Jingwen
Guo**, Beijing (CN); **Chunxin Li**,
Beijing (CN); **Jianxing Liu**, Beijing
(CN); **Zibo Cao**, Beijing (CN);
Jianyun Zhao, Beijing (CN); **Feng Qu**,
Beijing (CN)

(57) **ABSTRACT**

(73) Assignees: **BEIJING BOE TECHNOLOGY
DEVELOPMENT CO., LTD.**, Beijing
(CN); **BOE Technology Group Co.,
Ltd.**, Beijing (CN)

The present application provides an ultra-wideband antenna and an electronic apparatus, which relates to the technical field of mobile communication. The ultra-wideband antenna includes: a first substrate; a feed structure provided at a side of the first substrate; and a radiating structure provided on the one side of the first substrate and electrically connected to the feed structure, wherein the radiating structure includes a radiating patch and a wave-trapping unit, and the radiating patch is electrically connected to the feed structure. The novel ultra-wideband antenna has the characteristic of being capable of reconstructing the trapped wave provided by the present application may have a wide broadband, and may also trap wave, thereby reducing or even preventing mutual interference with communication protocols of other frequency bands during use.

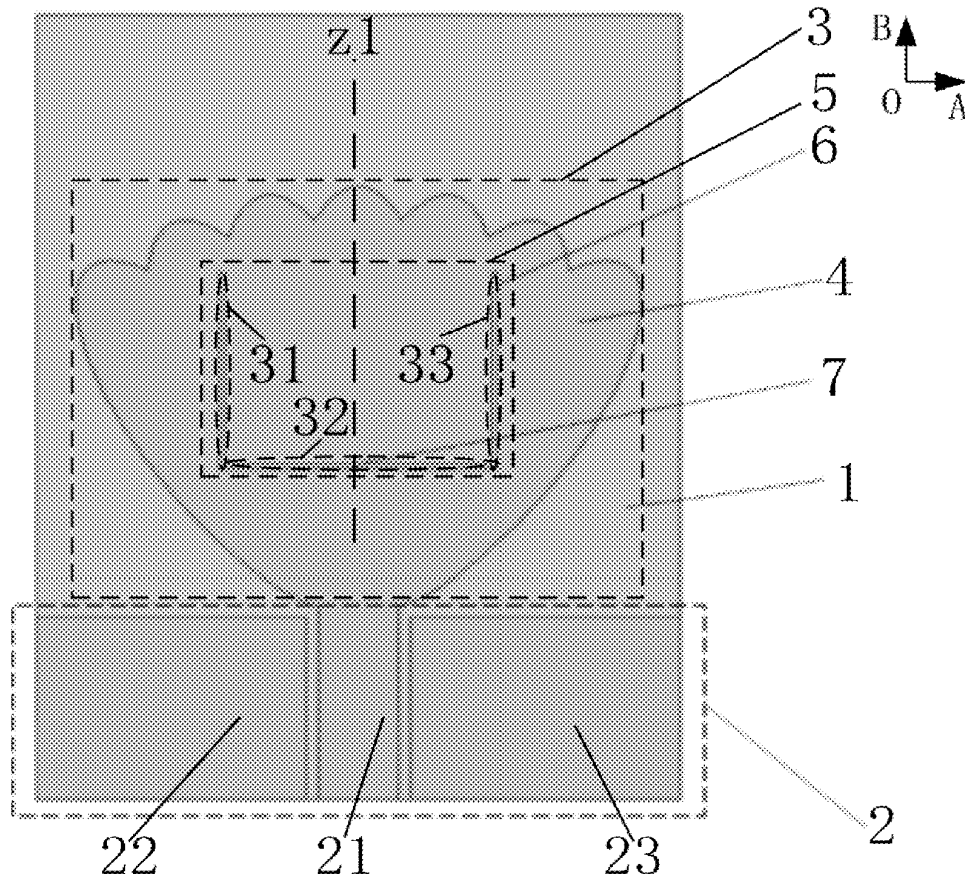
(21) Appl. No.: **18/281,647**

(22) PCT Filed: **Nov. 17, 2022**

(86) PCT No.: **PCT/CN2022/132641**

§ 371 (c)(1),

(2) Date: **Sep. 12, 2023**





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(19) **United States**

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

(10) **Pub. No.: US 2025/0038401 A1**

(43) **Pub. Date: Jan. 30, 2025**

(54) **ELECTRONIC APPARATUS**

H01Q 9/04 (2006.01)

H04B 1/38 (2015.01)

(71) Applicant: **Beijing Xiaomi Mobile Software Co., Ltd.**, Beijing (CN)

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

CPC *H01Q 1/525* (2013.01); *H01Q 1/24* (2013.01); *H01Q 9/0421* (2013.01); *H01Q 9/0428* (2013.01); *H04B 1/38* (2013.01)

(72) Inventors: **Peiyu LIANG**, Beijing (CN);
Ching-Sung WANG, Beijing (CN)

(21) Appl. No.: **18/614,060**

(57)

ABSTRACT

(22) Filed: **Mar. 22, 2024**

(30) **Foreign Application Priority Data**

Jul. 24, 2023 (CN) 202310912833.4

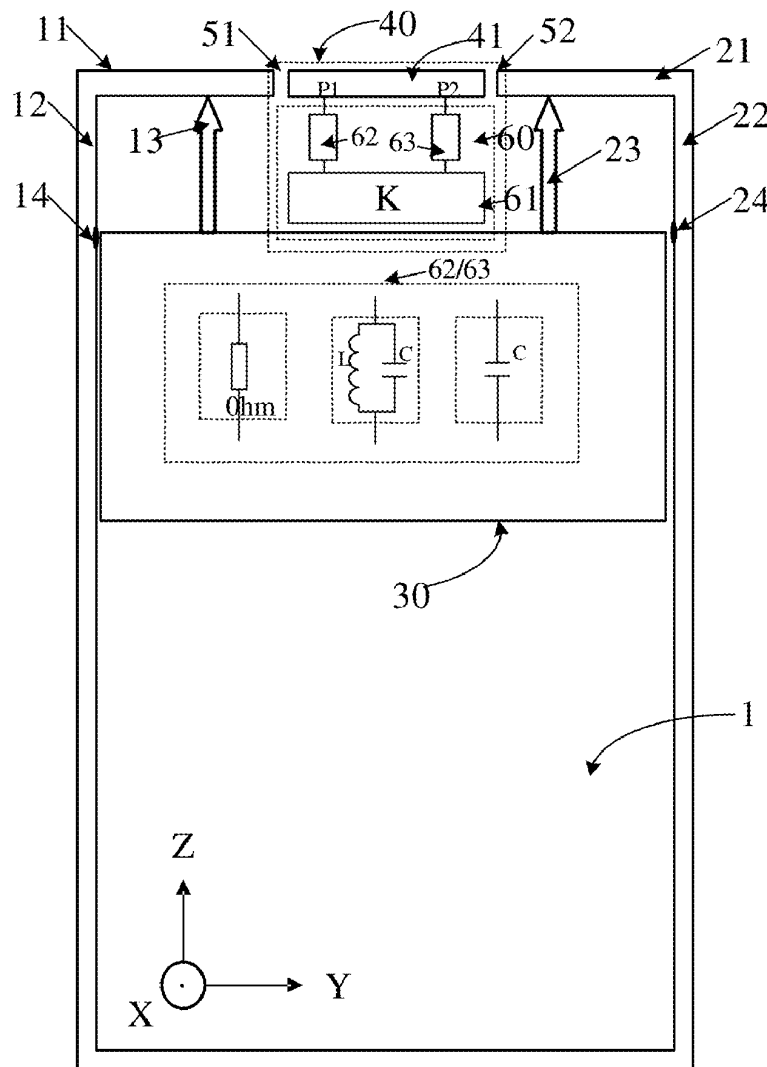
Publication Classification

(51) **Int. Cl.**

H01Q 1/52 (2006.01)

H01Q 1/24 (2006.01)

An electronic apparatus includes a first antenna; a second antenna; and an isolation device. Each of the first antenna and the second antenna includes a satellite L-band; the isolation device is arranged between the first antenna and the second antenna; and the isolation device is in a first state during a transmission phase of satellite communication and is in a second state during a reception phase of satellite communication or during non-satellite communication.





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(19) **United States**

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

(10) **Pub. No.: US 2025/0038407 A1**

(43) **Pub. Date: Jan. 30, 2025**

(54) **ANTENNA STRUCTURE**

(71) Applicant: **Wistron NeWeb Corp.**, Hsinchu (TW)

(72) Inventors: **Yen-Ming HONG**, Hsinchu (TW);
Chin-Tang HUANG, Hsinchu (TW);
Wei-Shin CHEN, Hsinchu (TW)

(21) Appl. No.: **18/754,843**

(22) Filed: **Jun. 26, 2024**

(30) **Foreign Application Priority Data**

Jul. 28, 2023 (TW) 112128374

Publication Classification

(51) **Int. Cl.**
H01Q 5/357 (2006.01)
H01Q 5/20 (2006.01)
H01Q 13/18 (2006.01)

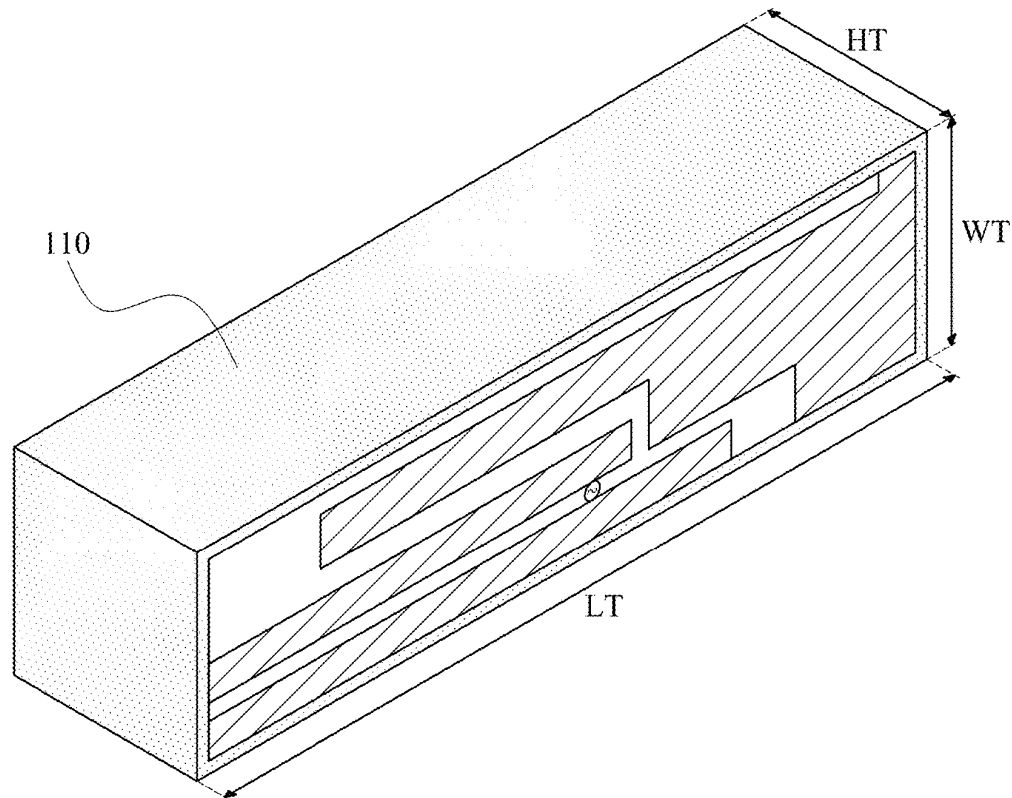
(52) **U.S. Cl.**

CPC **H01Q 5/357** (2015.01); **H01Q 5/20**
(2015.01); **H01Q 13/18** (2013.01)

(57) **ABSTRACT**

An antenna structure includes a metal cavity, a first radiation element, a second radiation element, a third radiation element, and a dielectric substrate. The metal cavity has an opening region. The first radiation element has a first feeding point. The first radiation element is coupled to the metal cavity. The second radiation element has a second feeding point. The second radiation element is coupled to the metal cavity. The third radiation element is adjacent to the first radiation element and the second radiation element. The third radiation element is coupled to the metal cavity. The dielectric substrate is adjacent to the opening region of the metal cavity. The first radiation element, the second radiation element, and the third radiation element are disposed on the dielectric substrate.

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(19) **United States**

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

(10) **Pub. No.: US 2025/0038410 A1**

(43) **Pub. Date: Jan. 30, 2025**

(54) **MIMO ANTENNA WITH IMPROVED
STANDING WAVE RATIO
CHARACTERISTICS**

Publication Classification

(51) **Int. Cl.**
H01Q 7/00 (2006.01)
H01Q 1/48 (2006.01)
(52) **U.S. Cl.**
CPC *H01Q 7/00* (2013.01); *H01Q 1/48*
(2013.01)

(71) Applicant: **ACE TECHNOLOGIES
CORPORATION**, Incheon (KR)

(72) Inventors: **Byung Hwa KWAK**, Incheon (KR);
Tae Hwan HEO, Anyang-si (KR)

(73) Assignee: **ACE TECHNOLOGIES
CORPORATION**, Incheon (KR)

(21) Appl. No.: **18/913,047**

(22) Filed: **Oct. 11, 2024**

Related U.S. Application Data

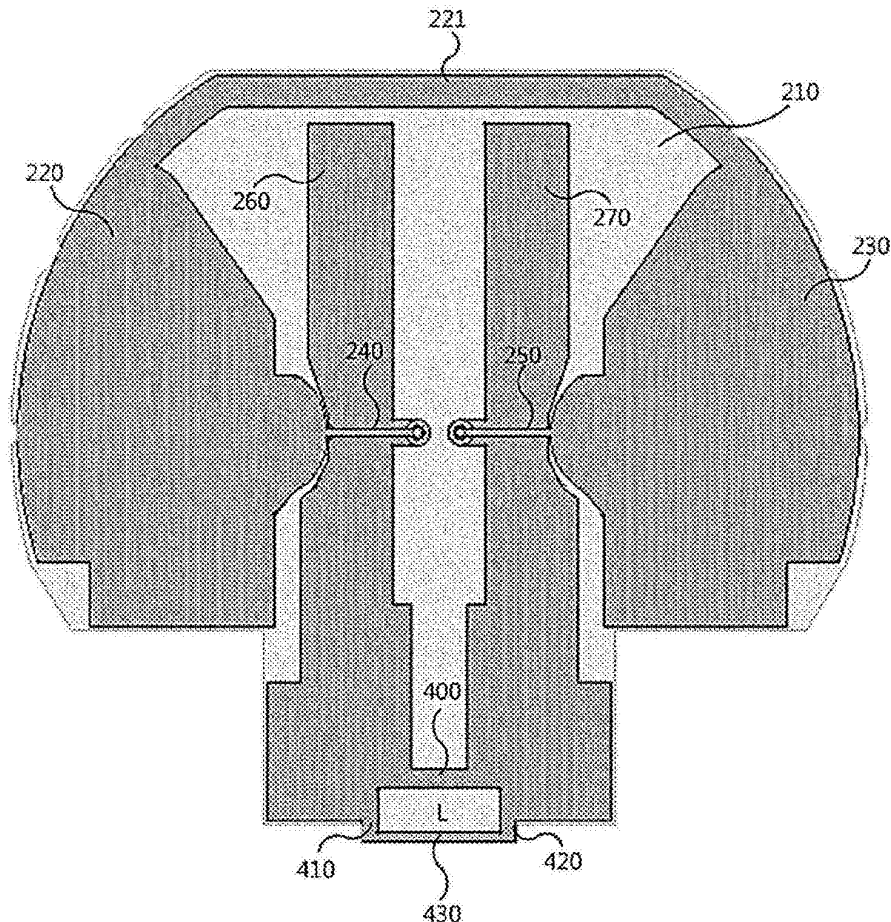
(63) Continuation of application No. PCT/KR2023/
003388, filed on Mar. 14, 2023.

(30) **Foreign Application Priority Data**

Apr. 14, 2022 (KR) 10-2022-0046398

(57) **ABSTRACT**

A MIMO antenna comprises: a substrate; a first feed line and a second feed line formed on the front side of the substrate and spaced apart from each other; a first radiator receiving a feed signal from the first feed line; a second radiator spaced apart from the first radiator by a predetermined distance and receiving a feed signal from the second feed line; a first ground pattern surrounding the first feed line, electrically connected to the ground, and extending in the longitudinal direction of the substrate; a second ground pattern spaced apart from the first ground pattern by a predetermined distance, surrounding the second feed line, electrically connected to the ground, and extending in the longitudinal direction of the substrate; a first connection line connecting the first ground pattern and the second ground pattern in an area adjacent to the first longitudinal ends of the first ground pattern and the second ground pattern.





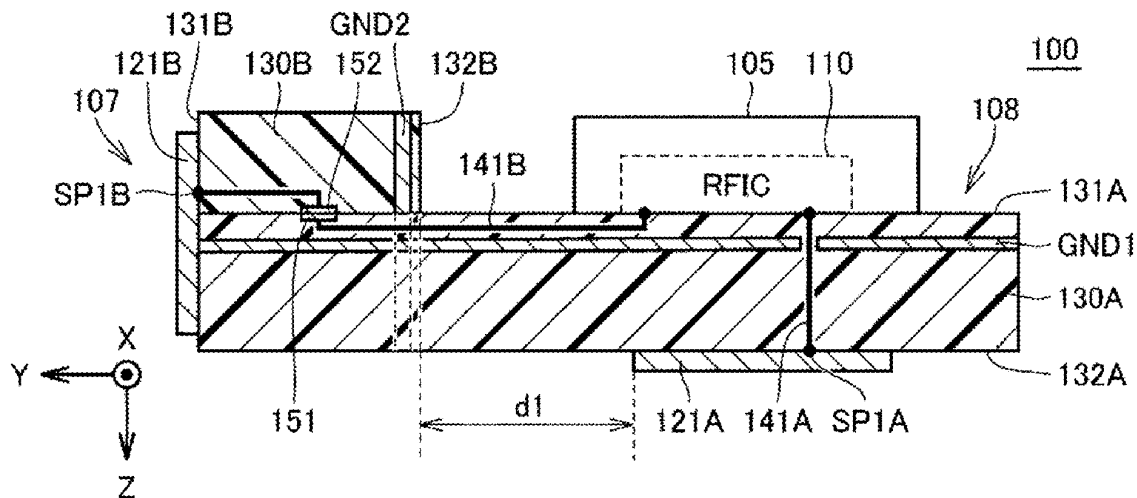
US 20250038415A1

(19) **United States**(12) **Patent Application Publication**
ONAKA et al.(10) **Pub. No.: US 2025/0038415 A1**(43) **Pub. Date: Jan. 30, 2025**(54) **ANTENNA MODULE****Publication Classification**(71) Applicant: **Murata Manufacturing Co., Ltd.**,
Nagaokakyo-shi (JP)(51) **Int. Cl.**
H01Q 9/04 (2006.01)
H01Q 1/48 (2006.01)
H01Q 5/10 (2006.01)
H01Q 5/50 (2006.01)(72) Inventors: **Kengo ONAKA**, Nagaokakyo-shi (JP);
Yosuke SATO, Nagaokakyo-shi (JP);
Hirotsugu MORI, Nagaokakyo-shi (JP)(52) **U.S. Cl.**
CPC **H01Q 9/0414** (2013.01); **H01Q 1/48**
(2013.01); **H01Q 5/10** (2015.01); **H01Q 5/50**
(2015.01)(73) Assignee: **Murata Manufacturing Co., Ltd.**,
Nagaokakyo-shi (JP)(57) **ABSTRACT**

An antenna module includes a first dielectric substrate at which a first radiating electrode with a flat plate shape is disposed and a second dielectric substrate at which a second radiating electrode shape is disposed. The first dielectric substrate has a first surface and a second surface that are opposite each other. The first radiating electrode is disposed on the second surface of the first dielectric substrate or at a position between the first and second surfaces of the first dielectric substrate. The second dielectric substrate includes a region that is arranged so as to abut the first dielectric substrate and a region that is in contact with the first surface of the dielectric substrate. A normal direction of the radiating electrode is different from a normal direction of the radiating electrode.

(21) Appl. No.: **18/918,133**(22) Filed: **Oct. 17, 2024****Related U.S. Application Data**(63) Continuation of application No. PCT/JP2023/
005375, filed on Feb. 16, 2023.(30) **Foreign Application Priority Data**

Apr. 27, 2022 (JP) 2022-073406





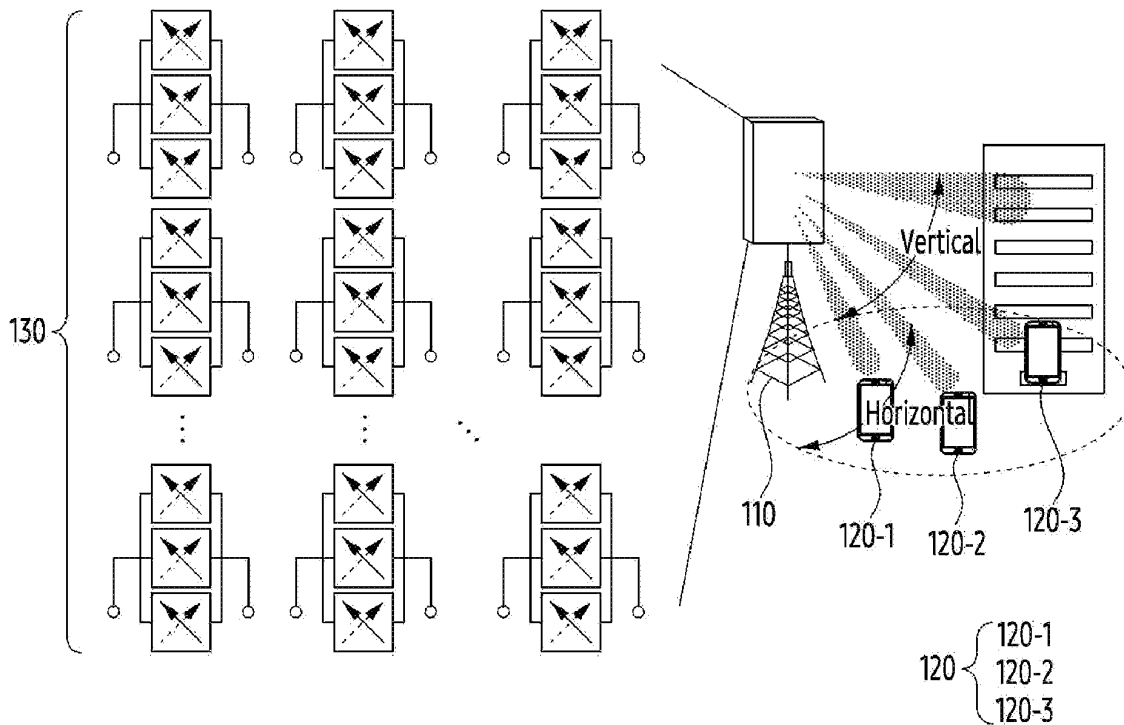
US 20250038426A1

(19) **United States**(12) **Patent Application Publication**
LEE et al.(10) **Pub. No.: US 2025/0038426 A1**(43) **Pub. Date: Jan. 30, 2025**(54) **MATCHING NETWORK FOR DECOUPLING
BETWEEN POLARIZATIONS OF ANTENNA
ARRAY, AND ELECTRONIC DEVICE
COMPRISING SAME**(71) Applicant: **Samsung Electronics Co., Ltd.**,
Suwon-si (KR)(72) Inventors: **Seokmin LEE**, Suwon-si (KR);
Yoongeon KIM, Suwon-si (KR);
Seungho CHOI, Suwon-si (KR);
Seungtae KO, Suwon-si (KR);
Jungyub LEE, Suwon-si (KR); **Jun
HUR**, Suwon-si (KR)(21) Appl. No.: **18/918,817**(22) Filed: **Oct. 17, 2024****Related U.S. Application Data**(63) Continuation of application No. PCT/KR2023/
003887, filed on Mar. 23, 2023.(30) **Foreign Application Priority Data**

Apr. 22, 2022 (KR) 10-2022-0050450

Publication Classification(51) **Int. Cl.**
H01Q 21/24 (2006.01)
H01Q 21/00 (2006.01)
H04B 1/04 (2006.01)
(52) **U.S. Cl.**
CPC **H01Q 21/24** (2013.01); **H01Q 21/0006**
(2013.01); **H04B 1/0458** (2013.01)(57) **ABSTRACT**

An electronic device is provided. The electronic device includes an antenna substrate and an antenna array comprising a sub array, the sub array includes a plurality of antenna elements, feeding network circuitry including a first power divider for first polarization and a second power divider for second polarization, which differs from the first polarization, and network circuitry for decoupling of a first signal of the first power divider and a second signal of the second power divider, wherein the sub array is disposed on a first surface of the antenna substrate, and wherein the feeding network circuitry disposed on the first side or a second side opposite to the first side of the antenna substrate, and wherein the network circuitry for decoupling is disposed in a region between the first power divider and the second power divider in the first side or the second side of the antenna substrate.





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(19) **United States**

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

(10) **Pub. No.: US 2025/0046988 A1**

(43) **Pub. Date: Feb. 6, 2025**

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

(30) **Foreign Application Priority Data**

Dec. 9, 2021 (CN) 202111495734.8

(71) Applicant: **Huawei Technologies Co., Ltd.,
shenzhen (CN)**

Publication Classification

(72) Inventors: **Naida Zhu, Shenzhen (CN); Hanyang
Wang, Reading (GB); Yu Yao,
Shanghai (CN)**

(51) **Int. Cl.**
H01Q 1/38 (2006.01)
H01Q 1/22 (2006.01)

(52) **U.S. Cl.**
CPC **H01Q 1/38** (2013.01); **H01Q 1/22**
(2013.01)

(21) Appl. No.: **18/717,866**

(57) **ABSTRACT**

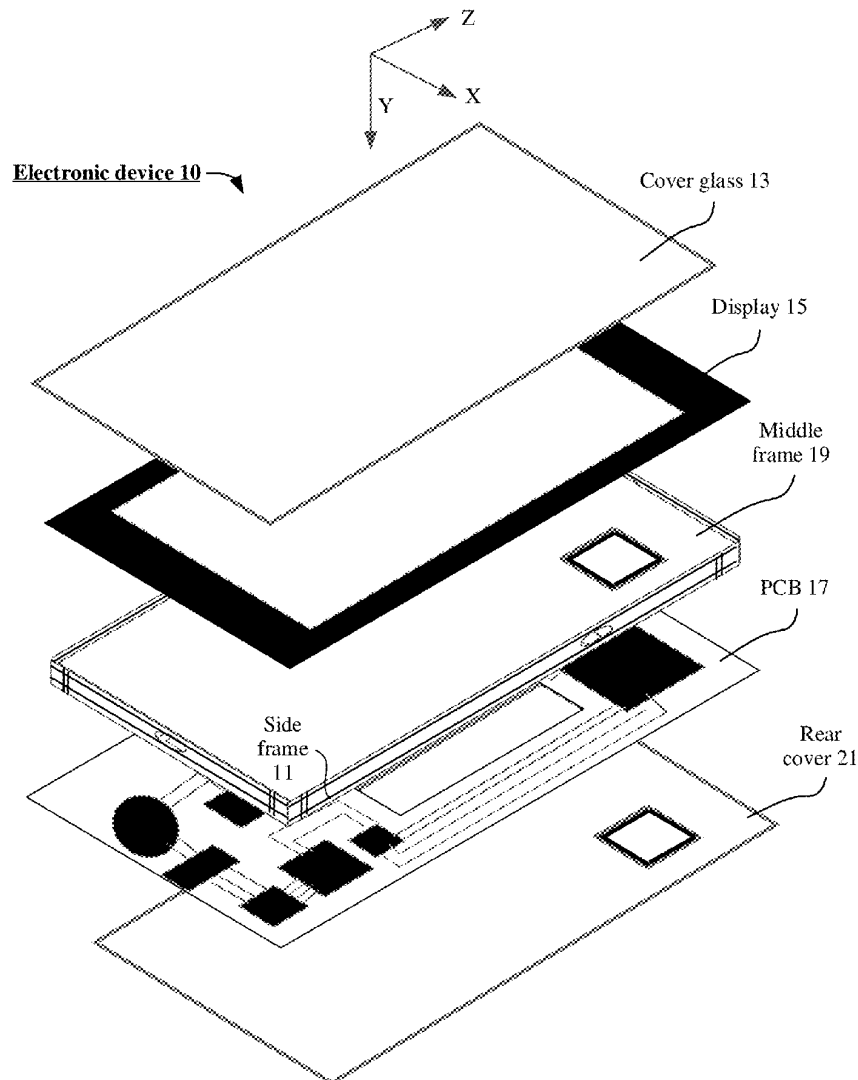
(22) PCT Filed: **Dec. 5, 2022**

An antenna structure includes a metal cavity and a first radiator. A first slot and a second slot are provided on a first metal layer of the metal cavity, and a first end of the second slot is connected to the first slot. A first feed point is disposed in the first slot, and a second feed point is disposed in the second slot.

(86) PCT No.: **PCT/CN2022/136513**

§ 371 (c)(1),

(2) Date: **Jun. 7, 2024**





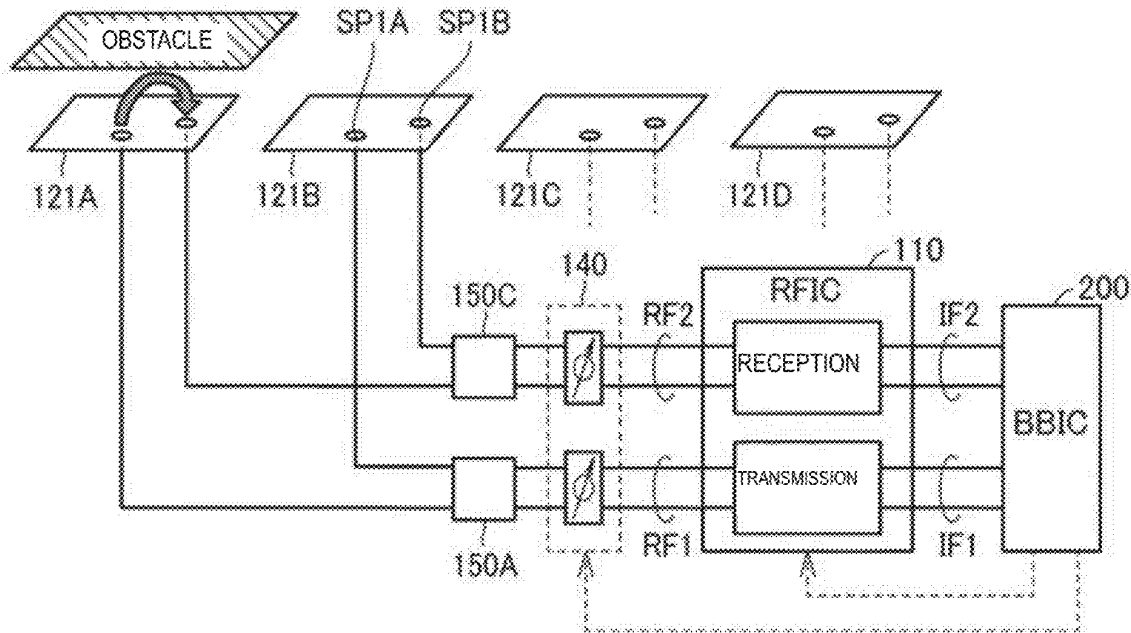
US 20250046995A1

(19) **United States**(12) **Patent Application Publication**
KINUGAWA et al.(10) **Pub. No.: US 2025/0046995 A1**(43) **Pub. Date: Feb. 6, 2025**(54) **ANTENNA MODULE AND
COMMUNICATION APPARATUS
INCLUDING THE SAME**(71) Applicant: **Murata Manufacturing Co., Ltd.**,
Nagaokakyo-shi (JP)(72) Inventors: **Kota KINUGAWA**, Nagaokakyo-shi
(JP); **Hideki UEDA**, Nagaokakyo-shi
(JP); **Takaya NEMOTO**,
Nagaokakyo-shi (JP)(73) Assignee: **Murata Manufacturing Co., Ltd.**,
Nagaokakyo-shi (JP)(21) Appl. No.: **18/925,077**(22) Filed: **Oct. 24, 2024****Related U.S. Application Data**(63) Continuation of application No. PCT/JP2023/
014087, filed on Apr. 5, 2023.(30) **Foreign Application Priority Data**

Jul. 19, 2022 (JP) 2022-114997

Publication Classification(51) **Int. Cl.**
H01Q 3/36 (2006.01)
H01Q 9/04 (2006.01)
H01Q 21/24 (2006.01)
(52) **U.S. Cl.**
CPC **H01Q 3/36** (2013.01); **H01Q 9/0407**
(2013.01); **H01Q 21/24** (2013.01)(57) **ABSTRACT**

An antenna module includes radiating elements including a first element and a second element and an RFIC and exchanges signals with a BBIC. The RFIC includes a transmission circuit that supplies radio frequency signals to the radiating elements and a reception circuit that receives radio frequency signals from the radiating elements. The RFIC exchanges intermediate frequency signals with the BBIC. A first intermediate frequency signal is used for communication between the transmission circuit and the BBIC. A second intermediate frequency signal is used for communication between the reception circuit and the BBIC. Assuming a variation in the reception level of a radio frequency signal received by the reception circuit during transmission of a radio frequency signal from the transmission circuit exceeds a predetermined value, the RFIC stops emission of radio waves from the first element.





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(19) **United States**(12) **Patent Application Publication**
SU et al.(10) **Pub. No.: US 2025/0046996 A1**(43) **Pub. Date: Feb. 6, 2025**(54) **ANTENNA STRUCTURE**(71) Applicant: **Wistron NeWeb Corp.**, Hsinchu (TW)(72) Inventors: **Guan-Ren SU**, Hsinchu (TW);
Ying-Hsuan CHEN, Hsinchu (TW);
Hsieh-Chih LIN, Hsinchu (TW)(21) Appl. No.: **18/760,360**(22) Filed: **Jul. 1, 2024**(30) **Foreign Application Priority Data**

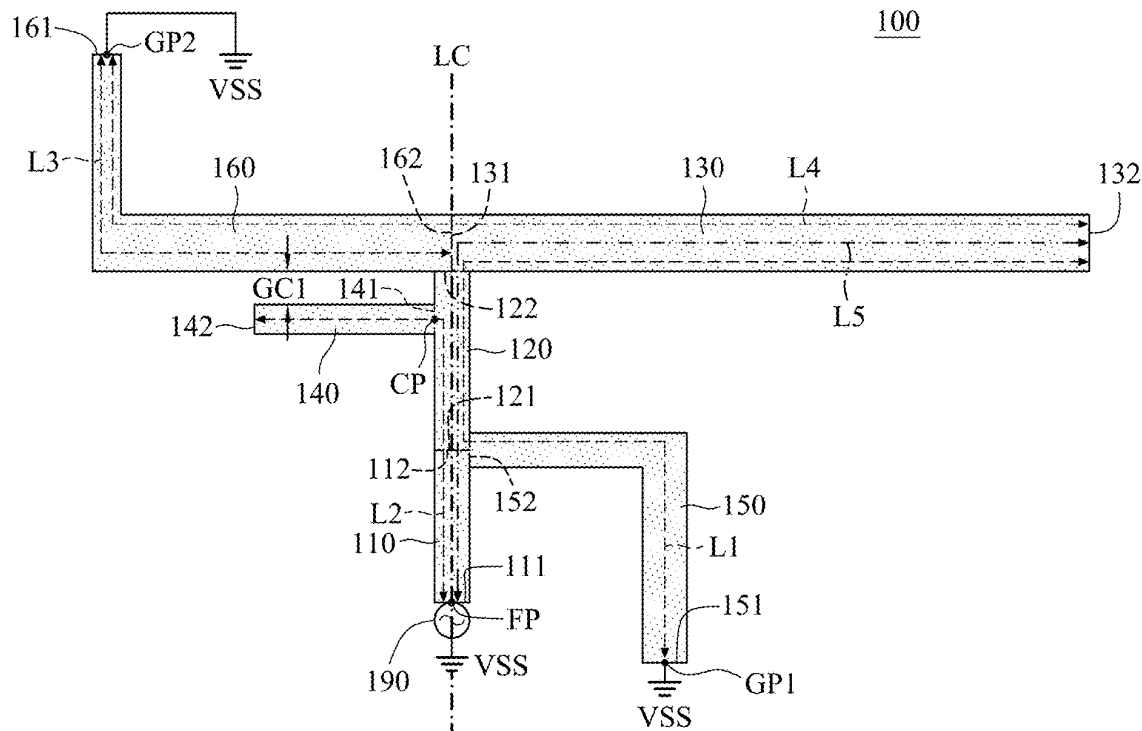
Aug. 2, 2023 (TW) 112129013

Publication Classification(51) **Int. Cl.**
H01Q 5/50 (2006.01)
H01Q 5/328 (2006.01)
H01Q 5/364 (2006.01)(52) **U.S. Cl.**CPC **H01Q 5/50** (2015.01); **H01Q 5/328**
(2015.01); **H01Q 5/364** (2015.01)

(57)

ABSTRACT

An antenna structure includes a feeding radiation element, a connection radiation element, a first radiation element, a second radiation element, a first shorting radiation element, a second shorting radiation element, and a carrier element. The feeding radiation element has a feeding point. The connection radiation element is coupled to the feeding radiation element. The first radiation element is coupled to the connection radiation element. The second radiation element is coupled to the connection radiation element. The second radiation element and the first radiation element substantially extend in opposite directions. The feeding radiation element and the connection radiation element are coupled through the first shorting radiation element to a first grounding point. The second shorting radiation element is adjacent to the second radiation element. The connection radiation element and the first radiation element are coupled through the second shorting radiation element to a second grounding point.





US 20250046998A1

(19) **United States**(12) **Patent Application Publication**
HASHIMOTO(10) **Pub. No.: US 2025/0046998 A1**(43) **Pub. Date: Feb. 6, 2025**(54) **ANTENNA DEVICE AND METHOD FOR
MANUFACTURING THE SAME***H01Q 1/38* (2006.01)*H01Q 1/42* (2006.01)(71) Applicant: **KABUSHIKI KAISHA TOSHIBA,**
Tokyo (JP)(52) **U.S. Cl.**CPC *H01Q 9/0407* (2013.01); *H01Q 1/2283*
(2013.01); *H01Q 1/38* (2013.01); *H01Q 1/422*
(2013.01)(72) Inventor: **Koh HASHIMOTO,** Yokohama
Kanagawa (JP)(73) Assignee: **KABUSHIKI KAISHA TOSHIBA,**
Tokyo (JP)(21) Appl. No.: **18/429,183**(22) Filed: **Jan. 31, 2024**(30) **Foreign Application Priority Data**

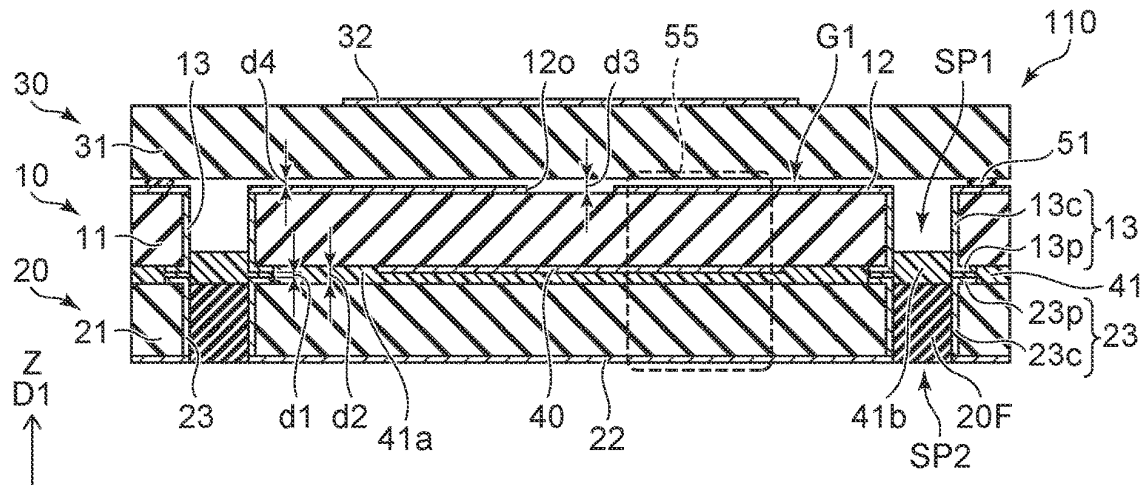
Jul. 31, 2023 (JP) 2023-124491

Publication Classification(51) **Int. Cl.***H01Q 9/04* (2006.01)*H01Q 1/22* (2006.01)

(57)

ABSTRACT

According to one embodiment, an antenna device includes a first structure, a second structure, a third structure, a signal line, a first resin member, and a first intermediate member. The first structure includes a first insulating member, a first conductive layer, and a first connecting conductive member that pierces the first insulating member along a first direction and includes a first cylindrical portion along the first direction. The second structure includes a second insulating member, a second conductive layer, and a second connecting conductive member that pierces the second insulating member along the first direction. The signal line is provided between the second insulating member and the first insulating member. The third structure includes a third insulating member and a third conductive layer. The first intermediate member is provided between the first structure and the third structure, and in contact with the first structure and the third structure.





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VARHEENMAA et al.(10) **Pub. No.: US 2025/0047000 A1**(43) **Pub. Date: Feb. 6, 2025**(54) **ANTENNA APPARATUS**(52) **U.S. Cl.**(71) Applicant: **NOKIA TECHNOLOGIES OY**,
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Certain examples of the present disclosure relate to and antenna apparatus. Certain examples provide an apparatus (10) comprising: an antenna radiator (101) having a first end (101_{e1}) and a second end (101_{e2}); a ground plane (200) spaced from the antenna radiator (101); a first feed element (102₁) and a second feed element (102₂); a first feed point (103₁) configured to couple a first radio frequency signal to the first end of the antenna radiator (101_{e1}) and the first feed element (102₁); a second feed point (103₂) configured to feed a second radio frequency signal to the second end of the antenna radiator (101_{e2}) and the second feed element (102₂); wherein the first and second feed elements (102₁) (102₂) are configured to capacitively couple to the antenna radiator (101); and wherein the antenna radiator (101) comprises: a strip portion (101'), which extends from the first end (101_{e1}) to the second end (101_{e2}) of the antenna radiator (101), that is unbroken and devoid of slots; a plurality of slots (104₁) on a first side (101_{s1}) of the strip portion; and a plurality of slots (104₂) on a second side (101_{s2}) of the strip portion.

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