

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor	:	Sang Hoon LEE
App. No.	:	17/105,012
Filed	:	November 25, 2020
Examiner	:	Not Yet Assigned
Art Unit	:	OPAP
Conf No.	:	2304

PRELIMINARY AMENDMENT**Mail Stop Amendment**

Commissioner for Patents

P.O. Box 1450

Alexandra, VA 22313-1450

Dear Sir:

Prior to examination of the above-identified application on the merits, please amend the application as follows:

Amendments to the Claims begin on page 2 of this paper.

Remarks begin on page 4 of this paper.

AMENDMENTS TO THE CLAIMS

1. (Canceled Herein)

2. (New) A smartphone antenna module comprising:

a substrate having a first major surface and a second major surface facing away from the first major surface;

the first major surface comprising a first central portion, a first inner ring portion surrounding the first central portion, and a first outer ring portion surrounding the first inner ring portion;

the second major surface comprising a second central portion overlapping the first central portion, a second inner ring portion surrounding the second central portion and overlapping the first inner ring portion, and a second outer ring portion surrounding the second inner ring portion and overlapping the first outer ring portion;

a first antenna pattern formed on the first major surface and comprising an inner coil formed on the first inner ring portion and an outer coil on the first outer ring portion;

a second antenna pattern formed on the second major surface and comprising an NFC antenna pattern formed on the second central portion, an inner antenna pattern formed on the second inner ring portion, an outer antenna pattern formed on the second inner ring portion;

the inner antenna pattern comprising a plurality of concentric C-shaped lines forming a radially-extending inner gap on the second inner ring portion;

the outer antenna pattern comprising a plurality of concentric C-shaped lines forming a radially-extending outer gap on the second outer ring portion;

wherein the radially-extending outer gap on the second outer ring portion and the radially-extending inner gap on the second inner ring portion are connected and aligned in a radial direction;

two NFC antenna extension lines formed on the second major surface, in which the two NFC antenna extension lines connect to the NFC antenna pattern and extend along the radial direction through both the radially-extending inner gap and the radially-extending outer gap;

an inner extension line formed on the second major surface, in which the inner extension line connects to the inner antenna pattern and extends along the radial direction through both the radially-extending inner gap and the radially-extending outer gap;

an outer extension line formed on the second major surface, in which the outer extension connects to the outer antenna pattern and extends along the radial direction through the radially-extending outer gap;

wherein the two NFC antenna extension lines, the inner extension line, and the outer extension lines are extending substantially in parallel;

wherein each of the two NFC antenna extension lines, the inner extension line, and the outer extension lines formed on the second major surface overlaps the outer coil formed on the first outer ring portion of the first major surface;

wherein the inner coil and the outer coil are electrically connected in parallel.

3. (New) The smartphone antenna module of Claim 1, wherein the first antenna pattern and the second antenna pattern are electrically connected each other through a plurality of vias.

4. (New) The smartphone antenna module of Claim 1, wherein the inner extension line is referred to as a first inner extension line, wherein the smartphone antenna module further comprises a second inner extension line formed on the second major surface, in which the second inner extension connects to the inner antenna pattern and extends along the radial direction through the radially-extending outer gap.

5. (New) The smartphone antenna module of Claim 1, wherein the inner coil includes a wire line having a width different from that of a wire line of the outer coil.

6. (New) The smartphone antenna module of Claim 1, wherein the inner coil has a first number of turns that is greater than that of the outer coil.

7. (New) A smartphone comprising:

a battery; and

the smartphone antenna module of Claim 1, wherein the inner coil and the outer coil are configured for wireless battery charging.

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REMARKS

Applicant has amended the claims as set forth above. Support for the features of Claims 2-7 can be found in the drawings, for example, Figures 47-49 and 51-54C and their associated discussions in the specification. Accordingly, no new matter is added by the amendments.

Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 02-1818.

Respectfully submitted,
K&L GATES, LLP

Dated: November 5, 2021

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First Named Inventor/Applicant Name:	Sang Hoon LEE
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Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		2021-11-05_Preliminary_Amen dment_AQCRP_41A.pdf	104923	yes	4
			3f930045b207669fcdcb038cd78d0012b2 81fd5		

Multipart Description/PDF files in .zip description			
Document Description	Start	End	
Preliminary Amendment	1	1	
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Applicant Arguments/Remarks Made in an Amendment	4	4	

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