

The Accused Products identified in Exhibits 1 - 4 each infringe claims 1 and 2 (the "Asserted Claims") of the '339 Patent. In addition, all similar and/or subsequently introduced Samsung devices that have "reverse wireless charging" or "Wireless PowerShare" are also included within the meaning of "Accused Products."

P.R. 3-1 (c) A chart identifying specifically where each element of each asserted claim is found within each Accused Instrumentality; including for each element that such part contends Accused Instrumentality that performs the claimed function;

Each of the Accused Products meets each limitation of Claims 1 and 2 of the '339 Patent as shown in Exhibits 2 – 4 attached hereto. The following is intended to provide examples of infringement by the Accused Products (as defined in the Complaint, Dkt. 1, ¶¶ 22 – 30), and further including any and all additional instrumentalities disclosed herein, without limitation to other examples. The following Claim Chart is in addition to the allegations made in the Complaint, Dkt. 1, which is incorporated herein as if set forth in full. Furthermore, this Claim Chart is intended to be read as a whole for the purpose of providing reasonable notice of WiPQTUS' infringement contentions. While some evidence is cited herein, WiPQTUS is under no obligation to marshal all evidence, and the citation of some evidence should in no way be interpreted as excluding other evidence that WiPQTUS may rely upon. WiPQTUS' investigation is ongoing.

Each of the Accused Products has Wireless PowerShare functionality. Each of the Accused Products has a wireless power transceiver that supports the Wireless PowerShare functionality. Based on teardowns available online and/or disassembly of exemplar products conducted by WiPQTUS, it appears that all of the Accused Products use one of either (1) a Renesas P9320 chip, (2) a chip labelled MIW04 or S2MIW04, or (3) a chip labelled CPS4038 apparently made by Convenient Power (*see*

<https://www.ifixit.com/Guide/Galaxy+S23+Ultra+Chip+ID/158052;>

<https://www.convenientpower.com/productdetail/202.html>)(each last accessed 07/29/2023), or other materially similar chips.

WiPQTUS has based its contentions on a reasonable and diligent review of publicly available information. As such WiPQTUS cannot provide complete and final infringement contentions until Samsung and/or its third-party suppliers, such as Renesas and Convenient Power, respond to WiPQTUS discovery requests, provide deponents, and produce information that is not publicly available. A partial list, without limitation to other documents and information that may be sought, of non-public documents or information that are highly relevant and should be produced before WiPQTUS is required to provide more complete infringement contentions are the following: (1) complete list of all wireless power transceiver chips used by Samsung in its devices that provide Wireless PowerShare functionality; (2) datasheets for the Renesas P9320S chip, which on information and belief is materially the same as the P9415, the datasheet for which is public, the chip labelled MIW04 and/or S2MIW04, the manufacturer of which is not readily apparent, the chip labelled CPS4038 apparently made by Convenient Power, and any other datasheets for similar wireless power transceiver chips used by Samsung in its devices that provide Wireless PowerShare functionality; (2) circuit diagrams containing more detailed internal and external (to the chip) circuits than found in the datasheets; (3) the Functional Specification Document (“FSD”) for each of the P9320S, MIW04, CPS4038, and other transceiver chips used by Samsung in its devices that provide Wireless PowerShare functionality; (4) System Design Documents; (5) software and/or firmware specifications; (6) source code for the code run by the ARM or other processor believed to be within the aforementioned chips; and (7) at least source code for the modules associated with Wireless

PowerShare (as defined in Complaint, ¶ 22) that run on one or more additional controllers or processors within the Accused Products (beyond or outside the aforementioned chips), and possibly other source code. In addition, WiPQTUS cannot provide complete infringement contentions until the claims have been construed. For these Preliminary Infringement Contentions, WiPQTUS relies on the plain and ordinary meaning that the limitations would have to a person of ordinary skill in the art. WiPQTUS reserves the right to amend these contentions in the event that the Court construes terms of the Asserted Claims.

P.R. 3-1 (d) Whether each element of each asserted claim is claimed to be literally present or present under the doctrine of equivalents in the Accused Instrumentality;

Each limitation of the Asserted Claims is literally met. At this time WiPQTUS does not rely on the doctrine of equivalents but reserves the right to do so once Samsung has explained its non-infringement positions and/or after the Asserted Claims have been construed.

P.R. 3-1 (e) For any patent that claims priority to an earlier application, the priority date to which each asserted claim allegedly is entitled; and

The Asserted Claims of the '339 Patent are entitled to the priority date of U.S. Provisional Patent Application No. 61/682,312, which was filed on August 13, 2012. *See* '339 Patent, Col. 1, ll. 7 – 11. Alternatively, the Asserted Claims of the '339 Patent are entitled to the priority date of U.S. Application No. 13/964,310, which was filed on August 12, 2013, and which issued as U.S. Patent No. 9,343,929.

P.R. 3-1 (f) If a party claiming patent infringement wishes to preserve the right to rely, for any purpose, on the assertion that its own apparatus, product, device, process, method, act, or other instrumentality practices the claimed invention, the party must identify, separately for each asserted claim, each such apparatus, product, device, process, method, act, or other instrumentality that incorporates or reflects that

Page 4

PLAINTIFF'S DISCLOSURE OF ASSERTED CLAIMS AND
INFRINGEMENT CONTENTIONS PURSUANT TO P.R. 3-1 AND 3-2

particular claim.

WiPQTUS does not wish to rely for any purpose on an assertion that its own apparatus or products practiced the claimed inventions of the Asserted Claims.

ACCOMPANYING DOCUMENT PRODUCTION

WiPQTUS identifies the following documents, which may correspond to P.R. 3-2 categories (a), (b), and (c).

P.R. 3-2 (a) Documents (e.g., contracts, purchase orders, invoices, advertisements, marketing materials, offer letters, beta site testing agreements, and third party or joint development agreements) sufficient to evidence each discussion with, disclosure to, or other manner of providing to a third party, or sale of or offer to sell, the claimed invention prior to the date of application for the patent in suit. A party's production of a document as required herein shall not constitute an admission that such document evidences or is prior art under 35 U.S.C. §102;

WiPQTUS did not disclose the inventions to any third parties prior to August 13, 2012, the priority date for the Asserted Claims, and, therefore, no documents are being produced at this time.

P.R. 3-2 (b) All documents evidencing the conception, reduction to practice, design, and development of each claimed invention, which were created on or before the date of application for the patent in suit or the priority date identified pursuant to P. R. 3-1(e), whichever is earlier; and

The '339 Patent is post-AIA. Therefore, the date of conception is irrelevant for determining the priority date. Nevertheless, select pages of an inventor's notebook (bates labelled WIPQ_000437 - 438 produced herewith) demonstrate conception sometime after July 5, 2012 but before August 13, 2012. The inventor's notebook in its entirety will be made available for inspection upon reasonable notice.

P.R. 3-2 (c) A copy of the file history for each patent in suit.

The '339 Patent and its file history along with the file history of its parent, the '929 Patent, are provided herewith. *See* Bates Numbers WIPQ_000001 – WIPQ_000416.

Page 5

PLAINTIFF'S DISCLOSURE OF ASSERTED CLAIMS AND
INFRINGEMENT CONTENTIONS PURSUANT TO P.R. 3-1 AND 3-2

Respectfully Submitted,

/s/ Brian A. Carpenter

Brian A. Carpenter

Texas Bar No. 03840600

Theodore G. Baroody

Texas Bar No. 01797550

Rouel F. Rothenberger IV

Texas Bar No. 24131630

Carstens, Allen & Gourley, LLP

7500 Dallas Pkwy., Suite 300

Plano, TX 75024

Telephone: 972-367-2001

carpenter@caglaw.com

tbaroody@caglaw.com

rothenberger@caglaw.com

William E. Davis, III

Texas Bar No. 24047416

Rudolph Fink IV

Texas Bar No. 24082997

DAVIS FIRM, P.C.

213 N. Fredonia St., Suite 230

Longview, Texas 75601

Telephone: 903-230-9090

bdavis@davisfirm.com

rfink@davisfirm.com

Attorneys for WIPQTUS INC.

CERTIFICATE OF SERVICE

The undersigned hereby certifies that all counsel of record who are deemed to have consented to electronic service are being served with a copy of this document via the Court's CM/ECF system on this 09 day of August, 2023.

/s/ Brian A. Carpenter
Brian A. Carpenter

Exhibit 1

List of Accused Products

The following are the “Accused Products,” each of which infringes Claims 1 and 2 of U.S. Patent No. 10,038,339 (the “339 Patent”) as shown in Exhibits 2 *et al.* that follow. This list is not exclusive to other Samsung devices, and it should be understood that all Samsung devices sold in the past and all those introduced during the course of this litigation that have the “Wireless PowerShare” functionality (as, for example, described in the document ([<https://www.samsung.com/us/support/answer/ANS00047798/> and WIPQ_000418]) are accused of infringement and constitute “Accused Products” in this matter.

Year Released	Accused Samsung Product	Bates Number(s)
2019	Galaxy Fold	WIPQ_000421
2019	Galaxy Note 10	WIPQ_000422
2019	Galaxy Note 10+	WIPQ_000422
2019	Galaxy Note 10+ 5G	WIPQ_000422
2019	Galaxy S10	WIPQ_000423
2019	Galaxy S10e	WIPQ_000423 / WIPQ_000424
2019	Galaxy S10+	WIPQ_000423 / WIPQ_000424
2019	Galaxy S10 5G	WIPQ_000424
2020	Galaxy Note20	WIPQ_000425
2020	Galaxy Note 20 5G	WIPQ_000425
2020	Galaxy Note 20 Ultra 5G	WIPQ_000425
2020	Galaxy S20+	WIPQ_000426

2020	Galaxy S20+ 5G	WIPQ_000426
2020	Galaxy S20 Ultra	WIPQ_000426
2020	Galaxy S20 FE	WIPQ_000427
2020	Galaxy Z Fold2	WIPQ_000428
2020	Galaxy Z Flip	WIPQ_000428
2021	Galaxy S21 5G	WIPQ_000429
2021	Galaxy S21+	WIPQ_000429
2021	Galaxy S21 Ultra 5G	WIPQ_000430
2021	Galaxy Z Fold3	WIPQ_000436
2021	Galaxy Z Flip3	WIPQ_000436
2022	Galaxy S22	WIPQ_000431
2022	Galaxy S22+	WIPQ_000431
2022	Galaxy S22 Ultra	WIPQ_000431
2022	Galaxy Z Fold4	WIPQ_000432
2022	Galaxy Z Flip4	WIPQ_000433
2023	Galaxy S23	WIPQ_000434
2023	Galaxy S23+	WIPQ_000434
2023	Galaxy S23 Ultra	WIPQ_000434 / WIPQ.000435
2023	Galaxy Z Flip5	WIPQ.000435
2023	Galaxy Z Fold5	WIPQ.000435

Exhibit 2 – Claim Chart Showing Infringement of '339 Patent, Claims 1 and 2, by the Accused Products

Asserted Claim 1 as set forth below includes inserted reference numbers to facilitate the discussion that follows. These reference numbers should not be interpreted as any form of or relevant to claim construction. Asserted Claim 1 is as follows:

1. [1] *A dual mode wireless power receiver* configured to selectively apply a received power to a load device and utilize at least a part of the stored power to power-up [6] *a secondary wireless power receiver and communicate with said secondary wireless power receiver to cause an action or transaction or charge said secondary wireless power receiver's load device*, said *dual mode wireless power receiver* comprising:

[2] one of coil and capacitor electrodes;

[3] a first circuitry comprising:

[i] an impedance network;

[ii] a switch network;

[iii] a filter capacitor;

[4] a second circuitry comprising:

[i] a control logic circuit; and

[ii] a modulator/demodulator circuit;

said [3] first circuitry configured to receive said power from [5] *a wireless power transmitter*;

said [3] first circuitry, based on an input from said control logic circuit, configured to change impedance of said impedance network and topology of said switch network to obtain a modified form of said received power, and apply said modified form of said power to said load device;

said **[3] first circuitry**, based on an input from said control logic circuit, configured to change said topology of said switch network and said impedance of said impedance network to transmit at least part of said stored power to said **[6] secondary wireless power receiver** to power-up said secondary wireless power receiver;

said **[4] second circuitry**, on power-up of said **[6] secondary wireless power receiver**, configured to identify a type of said secondary wireless power receiver and identify a wireless power protocol of said secondary wireless power receiver;

said **[4] second circuitry**, configured to receive and interpret data from said **[6] secondary wireless power receiver** in said identified wireless power protocol;

said **[4] second circuitry**, based on said interpretation, configured to perform a function associated with said transmitted power in conjunction with said first circuitry.

The following is intended to provide examples of infringement by the Accused Products (as defined in the Complaint, Dkt. 1, ¶¶ 22 – 30), and further including any and all additional instrumentalities disclosed herein (including Exhibit 1 hereto), without limitation to other examples. The following Claim Chart is in addition to the allegations made in the Complaint, Dkt. 1, which is incorporated herein as if set forth in full. Furthermore, this Claim Chart is intended to be read as a whole for the purpose of providing reasonable notice of WiPQTUS' infringement contentions. While some evidence is cited herein, WiPQTUS is under no obligation to marshal all evidence, and the citation of some evidence should in no way be interpreted as excluding other evidence that WiPQTUS may rely upon. WiPQTUS' investigation is ongoing.

Each of the Accused Products has Wireless PowerShare functionality. Each of the Accused Products has a wireless power transceiver that supports the Wireless PowerShare functionality. Based on teardowns available online and/or disassembly of exemplar products conducted by WiPQTUS, it appears that all of the Accused Products use one of either (1) a Renesas P9320 chip, (2) a chip labelled MIW04 or S2MIW04, or (3) a chip labelled CPS4038 apparently made by Convenient Power (*see* <https://www.ifixit.com/Guide/Galaxy+S23+Ultra+Chip+ID/158052>; <https://www.convenientpower.com/productdetail/202.html> (each last accessed 07/29/2023)), or other materially similar chips.

WiPQTUS has based its contentions on a reasonable and diligent review of publicly available information. As such WiPQTUS cannot provide complete and final infringement contentions until Samsung and/or its third-party suppliers, such as Renesas and Convenient Power, respond to WiPQTUS' discovery requests, provide deponents, and produce information that is not publicly

available. A partial list, without limitation to other documents and information that may be sought, of non-public documents or information that are highly relevant and should be produced before WiPQTUS is required to provide more complete infringement contentions are the following: (1) complete list of all wireless power transceiver chips used by Samsung in its devices that provide Wireless PowerShare functionality; (2) datasheets for the Renesas P9320S chip, which on information and belief is materially the same as the P9415, the datasheet for which is public, the chip labelled MIW04 and/or S2MIW04, the manufacturer of which is not readily apparent, the datasheet for the chip labelled a chip labelled CPS4038 apparently made by Convenient Power, and any other datasheets for similar wireless power transceiver chips used by Samsung in its devices that provide Wireless PowerShare functionality; (2) circuit diagrams containing more detailed internal and external (to the chip) circuits than found in the datasheets; (3) the Functional Specification Document (“FSD”) for each of the P9320 and MIW04 and CPS4038; (4) System Design Documents; (5) software or firmware specifications; (6) source code for the code run by the ARM or other processor believed to be within the aforementioned chips; and (7) at least source code for the modules associated with Wireless PowerShare (as defined in Complaint, ¶ 22) that run on one or more additional controllers or processors within the Accused Products (beyond or outside the aforementioned chips), and possibly other source code.

As shown below, each limitation is met by Samsung’s¹ Accused Products. A Samsung Galaxy S10+ is used below as an exemplar Accused Product. On information and belief, all of the other Accused Products work in materially (with respect to Claims 1 and 2) the same manner.

In addition, WiPQTUS cannot provide complete infringement contentions until the claims have been construed. For these Preliminary Infringement Contentions, WiPQTUS relies on the plain and ordinary meaning that the limitations would have to a person of ordinary skill in the art. WiPQTUS reserves the right to amend these contentions in the event that the Court construes terms of the Asserted Claims.

¹ “Samsung,” as used in these contentions, encompasses Samsung devices and/or, alternatively, Samsung users, such as Samsung customers and others that are directed, controlled, and/or instructed to interact with the Samsung Accused Products.

Cl. 1 ²	Claim Limitation	Application to the Accused Products
1A	[1] <i>A dual mode wireless power receiver</i> configured to selectively apply a received power to a load device and utilize at least a part of the stored power to power-up [6] <i>a secondary wireless power receiver</i> and communicate with said secondary wireless power receiver to cause an action or transaction or charge said secondary wireless power receiver's load device, said dual mode wireless power receiver comprising:	To the extent the preamble is construed as a limitation, the preamble is met by each of the Accused Products. Each of the Accused Products has “a dual mode wireless power receiver configured to selectively apply a received power to a load device and utilize at least a part of the stored power to power-up a secondary wireless power receiver and communicate with said secondary wireless power receiver to cause an action or transaction or charge said secondary wireless power receiver's load device” alone or, alternatively, in combination with other components. By way of example and not as a limitation, the Samsung Galaxy S10+ has components, including chips such as the Renesas IDT³ P9320 chip or Samsung S2M1W04 (varying between years), that provide bi-directional wireless charging, aka “Power Share.” <i>See, e.g.,</i> https://www.techinsights.com/blog/samsung-galaxy-s10-5g-teardown/; <i>see also</i> https://www.techinsights.com/blog/samsung-galaxy-s10-teardown/; https://www.androidpolice.com/samsung-wireless-powershare-everything-you-need-to-know/; https://www.samsung.com/global/galaxy/what-is/wireless-powershare/; https://www.ifixit.com/Teardown/Samsung+Galaxy+S10+and+S10e+Teardown/120331. As further example, the following photographs show a disassembled Galaxy S10+:

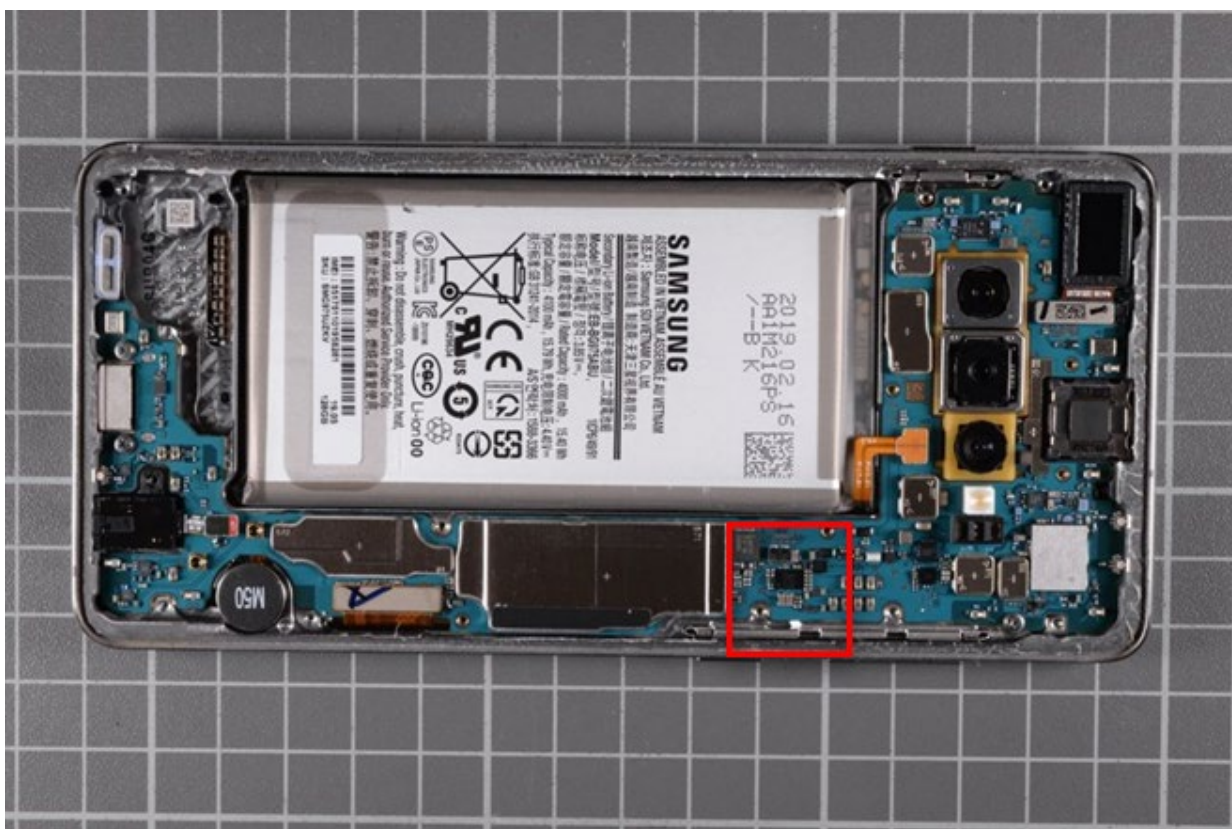
² These contentions have been formatted for convenience, including by dividing the claim into labeled sub-limitations. The formatting and divisions of the claims are for convenience only and should, in no way, be interpreted as modifying the claims, such as by adding additional limitations to the claims or changing existing limitations.

³As of March 30, 2019, IDT (Integrated Device Technology) is a subsidiary of Renesas. *See* <https://www.renesas.com/us/en/about/press-center/news/2019/news20190330.html>. In these contentions, IDT and Renesas may be used interchangeably.

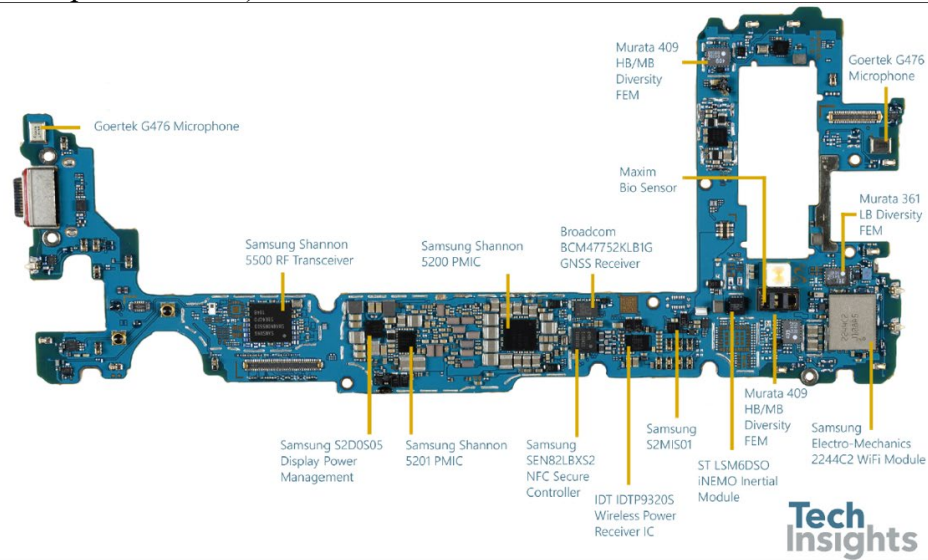


The coil in the part labelled B2-Rev.09G A905 (marked with a red arrow above) is used, at least in part, for wireless charging.

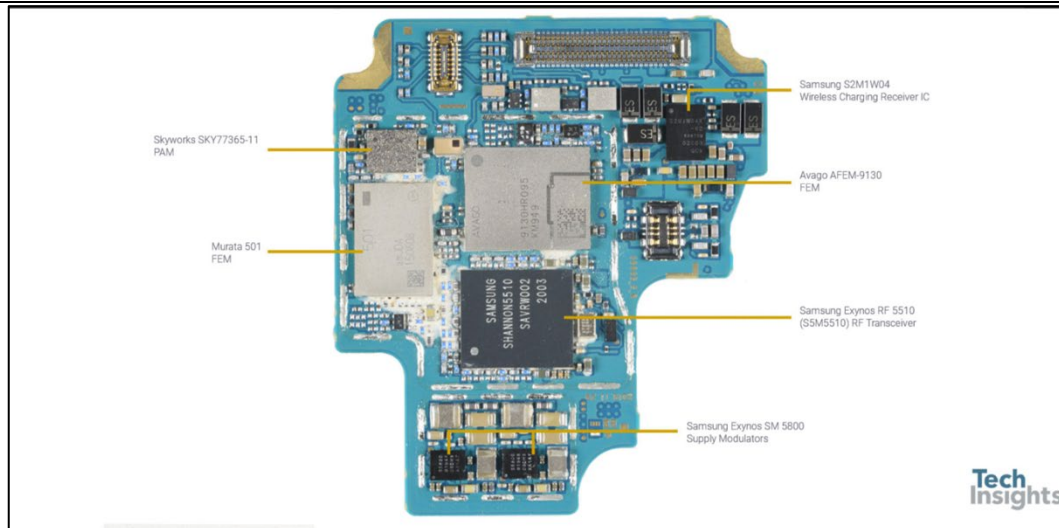
The following photograph shows the wireless charging coil removed, making the IDT P9320 chip visible (marked in the red box below):



Third party teardowns also show that Samsung's 2019 mobile smart phone products used IDT's P9320S (immediately below) while the 2020 mobile products use the Samsung S2M1W04 (second picture below).



<https://www.techinsights.com/blog/samsung-galaxy-s10-teardown.>



<https://www.techinsights.com/blog/samsung-galaxy-s20-teardown-analysis>; See Complaint, ¶ 26.

The datasheets for these devices are not in the public domain. On information and belief, the Renesas IDT P9415 appears to operate in materially the same manner (with respect to Claims 1 and 2) as the Renesas IDT P9320S. As an example and not as a limitation, Renesas has made public the datasheet for IDTP9415 which it advertises as “30W Wireless Power Receiver with WattShare TRx Mode.” See Complaint, [Dkt. 1], Exhibit 6. For all material purposes, on information and belief, the P9415 is materially the same (with respect to Claims 1 and 2) as the P9320S. As of March 30, 2019, IDT (Integrated Device Technology) is a subsidiary of Renesas. <https://www.renesas.com/us/en/about/press-center/news/2019/news20190330.html>.

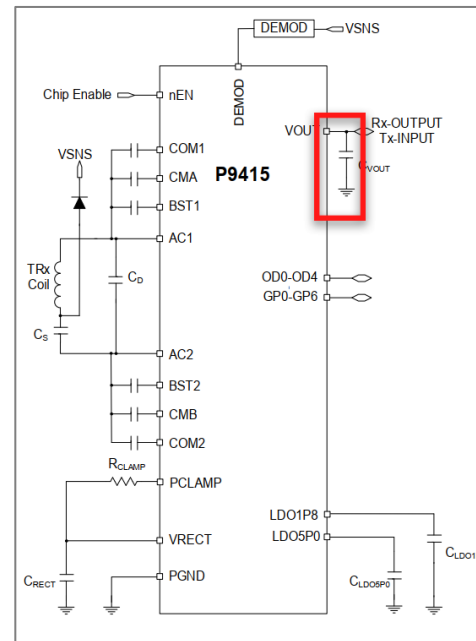
As explained on the first page of the P9415 Datasheet,

The P9415 is a highly-integrated single-chip wireless power transmitter/receiver IC (TRx). The device can be configured to receive or transmit an AC power signal through magnetic induction.

As an example and not as a limitation, each of the Accused Products includes a battery. For example and not as a limitation, a battery is shown in the photograph of the S10+ above (at page 6). On information and belief, wireless power is received and selectively applied to the battery. The battery of each of the Accused Products constitutes “a load device.”

The diagram is a detailed block diagram of an ARM M0 Controller system. At the center is the 'ARM M0 Controller (w/24KB MTP, 8 KB RAM)'. It is connected to several peripheral blocks: 'Digital IO (GPIO)' at the bottom, 'DAC + Comp' and '12b ADC' to its left, 'Freq Det' below that, and 'AFE(TX)' at the bottom left. To the right, it connects to 'LDO1P8', 'ECLAMP Gate Driver', and 'COM2 CMB'. Above the controller is a 'T/RX control' block, which is linked to '500MHz OSC', 'BIAS', and 'LDO5V'. The top of the diagram features a power management section with 'VRECT' input, 'BS1' and 'BS2' transistors, 'nEN & UVLO', and 'LDO6P0'. A red box highlights the 'M_LDO' block, which is connected to 'VRECT', 'LDO6P0', and 'VOUT'. Other components include 'AC1', 'AC2', 'COM1 CMA', and 'PQLAMP' at the bottom right, which is connected to a voltage divider network involving 'VRECT', 'VBIAS', and 'IOUT'.

As another example and not as a limitation, in addition to the above or alternatively, the output capacitor shown below also constitutes a “load device”:



Complaint, Ex. 6, p. 1.

Wireless power is received and selectively applied to each load device or, alternatively, to one or more of the load devices identified above. Thus, each of the Accused Products includes a “load device.”

Each of the Accused Products “utilize at least a part of the stored power to power-up a secondary wireless power receiver and communicate with said secondary wireless power receiver to cause an action or transaction or charge said secondary wireless power receiver’s load device.”

Each of the Accused Products is capable of implementing the functionality that Samsung refers to as “Wireless PowerShare.”

		For example and not as a limitation, using Wireless PowerShare, an Accused Product “can reverse wireless charge another phone, watch, or Galaxy Buds.” https://www.samsung.com/au/support/mobile-devices/how-to-use-powershare-on-your-galaxy-phone/ (last accessed 05/11/2023).⁴ As an example and not as a limitation, the Galaxy S10+ can charge at least Samsung Galaxy Buds, including Galaxy Buds2 Pro. Other devices are shown in the following Samsung publication: https://www.samsung.com/us/support/answer/ANS00047798/ (last accessed 05/24/2023). As an example and not as a limitation, a device such as a “phone, watch, or Galaxy Buds” meets the limitation “secondary wireless power receiver.” As an example and not as a limitation, each of the, for example, “phone, watch, or Galaxy Buds” has a battery that constitutes a “load device.” Therefore, as shown above, to the extent the preamble is construed as a limitation, the preamble is met by each of the Accused Products. As stated above, WiPQTUS reserves its right to provide more detailed infringement contentions after full discovery for these devices and their components and any other similar chips used in the Accused Products as well as other technical information are produced.
1B	[2] one of coil and capacitor electrodes;	Each of the Accused Products meets this limitation. For example, each of the Accused Products has at least “one of coil and capacitor electrodes.” For example and not as a limitation, the P9415 is shown in the following schematic as being attached to a “TRx Coil” (marked with red arrow below):

⁴ See also <https://www.samsung.com/levant/support/mobile-devices/how-to-use-powershare-on-your-galaxy-phone/>;
https://www.samsung.com/latin_en/support/mobile-devices/how-to-use-powershare-on-your-galaxy-phone/;
<https://www.samsung.com/us/support/answer/ANS00078081/>.

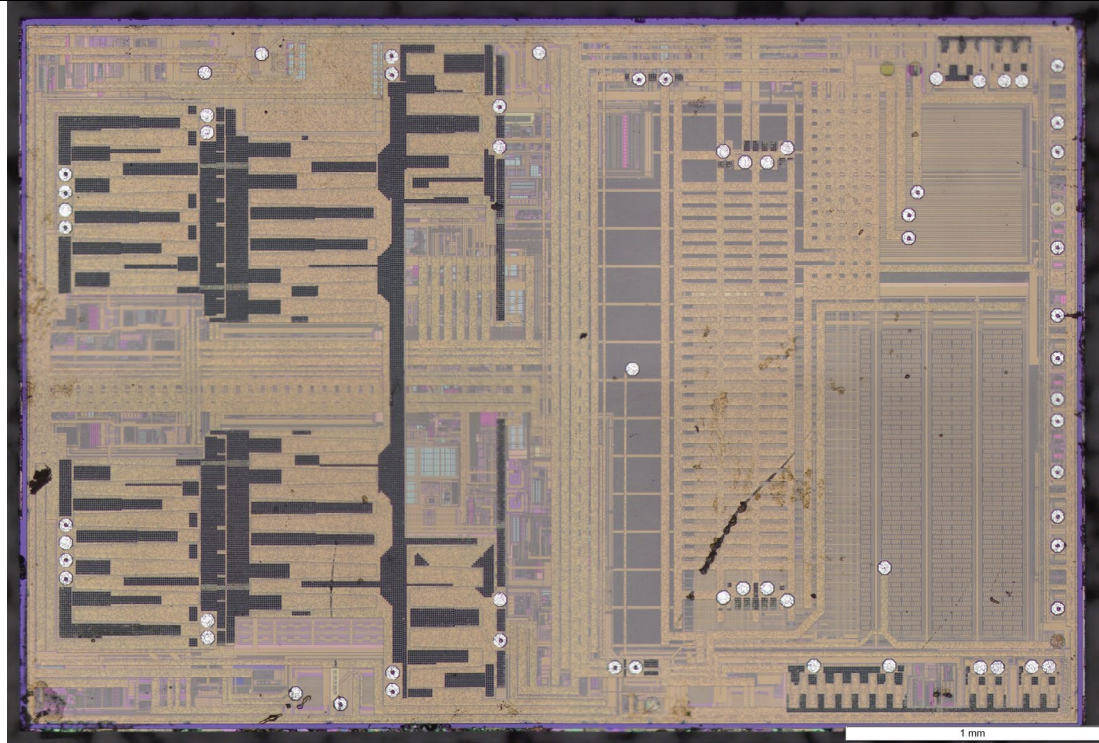
In the following teardown photograph of the S10+, the one or more coils is readily seen:



On information and belief, by necessary implication, each of the Accused Products has the same or materially similar coil, and, therefore, meets this limitation.

As stated above, WiPQTUS reserves its right to provide more detailed infringement contentions after full discovery for these devices and their components and any other similar chips used in the Accused Products as well as other technical information are produced.

1C	[3] a first circuitry comprising: [i] an impedance network;	Each of the Accused Products meets this limitation. Each of the Accused Products has at least “a first circuitry comprising: [i] an impedance network.” For example and not as a limitation, the datasheet for the P9415 contains a diagram titled “Typical Application Schematic.” On information and belief, each of the Accused Products has a circuit like the “Typical” one illustrated. <i>See</i> Complaint, Ex. 6, p. 1. For example and not as a limitation, the Samsung Galaxy S10+ has the external portions of the “first circuitry” identified below. In addition, on information and belief, the following photograph of a “de-capped” P9415 chip shows structures that are also shown in the “Internal Block Diagram”:



For example and not as a limitation, as shown in the diagram below, the P9415 chip and accompanying required circuitry includes at least the following capacitors and/or components that, alone or, alternatively, in combination, constitute an “impedance network” within the meaning of this claim:

- (1) the capacitors C_s and C_d and each of the capacitors connected to CMA and CMB;
- (2) the capacitors C_s and C_d , the capacitors connected to CMA and CMB, and the capacitors connected to each of COM1 and COM2;

- (3) any combination of the above and the switches (transistors) connected to each of CMA and CMB and GND;
- (4) any combination of the above and the BST1 and BST2 capacitors;
- (5) any combination of the above and the switches (transistors) connected to each of COM1 and COM2;
- (6) and/or any of the above in combination with additional components or circuits.

Typical Applications Schematic

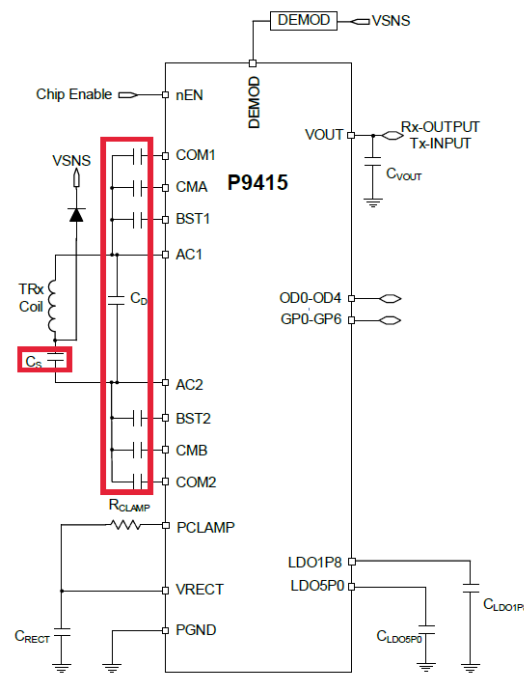
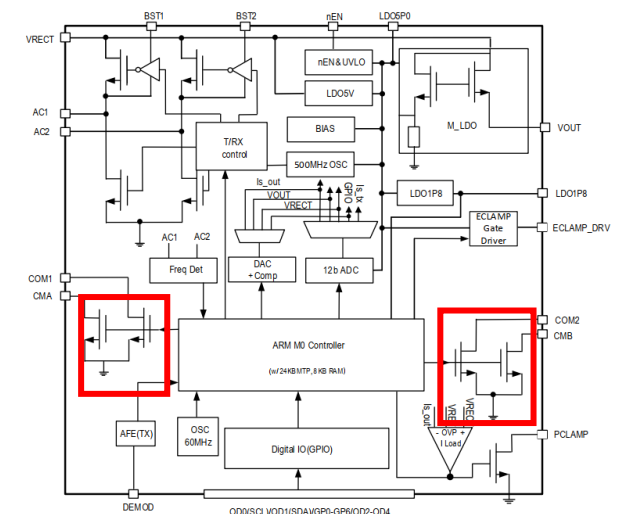


Figure 3. Internal Block Diagram



In addition or in the alternative, the capacitors BST1 and BST2, while primarily used for power to “high-side” drive the transistors (switches), also constitute part of the impedance network.

In addition or in the alternative, as noted in Section 7.4, p. 19, of the P9415 Datasheet, the P9415, when acting as transmitter of power, adjusts its operating frequency, and thus the impedance of the circuit, to control power delivered from the transmitter to the receiver.

It is well known that the impedance of a passive element of a circuit such as an inductor or capacitor is a function of frequency. For example, the following is found on Wikipedia:

Resistor [\[edit \]](#)

The impedance of an ideal [resistor](#) is purely real and is called *resistive impedance*:

$$Z_R = R$$

In this case, the voltage and current waveforms are proportional and in phase.

Inductor and capacitor [\[edit \]](#)

Ideal [inductors](#) and [capacitors](#) have a purely [imaginary reactive impedance](#):

the impedance of inductors increases as frequency increases;

$$Z_L = j\omega L^{[a]}$$

the impedance of capacitors decreases as frequency increases;

$$Z_C = \frac{1}{j\omega C}$$

In both cases, for an applied sinusoidal voltage, the resulting current is also sinusoidal, but in [quadrature](#), 90 degrees out of phase with the voltage.

However, the phases have opposite signs: in an inductor, the current is *lagging*; in a capacitor the current is *leading*.

		https://en.wikipedia.org/wiki/Electrical_impedance. Thus, each of the Accused Products meet the limitation “a first circuitry comprising: [i] an impedance network.” As stated above, WiPQTUS reserves its right to provide more detailed infringement contentions after full discovery for these devices and their components and any other similar chips used in the Accused Products as well as other technical information are produced.
1D	[[3] a first circuitry comprising:] [...] [ii] a switch network;	<i>(Note: “a first circuitry” does not appear in front of limitations [ii] and [iii] as written, but it is included here for reference and convenience as indicated by the brackets [...]).</i> Each of the Accused Products meets this limitation. For example and not as a limitation, each of the Accused Products has “a first circuitry comprising: ... [ii] a switch network.” For example and not as a limitation, when each of the Accused Product is in the receive power mode, such as when it is being charged by, for example, a wireless power charging station, the switch network is configured to act as a rectifier. When the Accused Product is acting as a transmitter of power, such as, for example, when the Wireless PowerShare functionality is activated, the switch network is configured as an inverter. For example and not as a limitation, the P9415 Datasheet describes a switch network that acts as a rectifier/inverter as follows:

When the device is configured as a wireless power transmitter, it uses an on-chip full/half-bridge inverter, a PWM generator, a modulator/demodulator for communication, and micro controller to produce an AC power signal to drive external L-C tank. As a receiver, the device receives an AC power signal from a wireless transmitter and converts it into rectified output voltage, which can be used to power devices or supply the charger input in mobile applications. The P9415 integrates a high efficiency Synchronous Full Bridge Rectifier and control circuitry to modulate the load to send message packets to the Transmitter (Tx) to optimize power delivery.

Complaint, Ex. 6, p. 1.

The switch network comprising four switches and configured as a rectifier is further explained in the following:

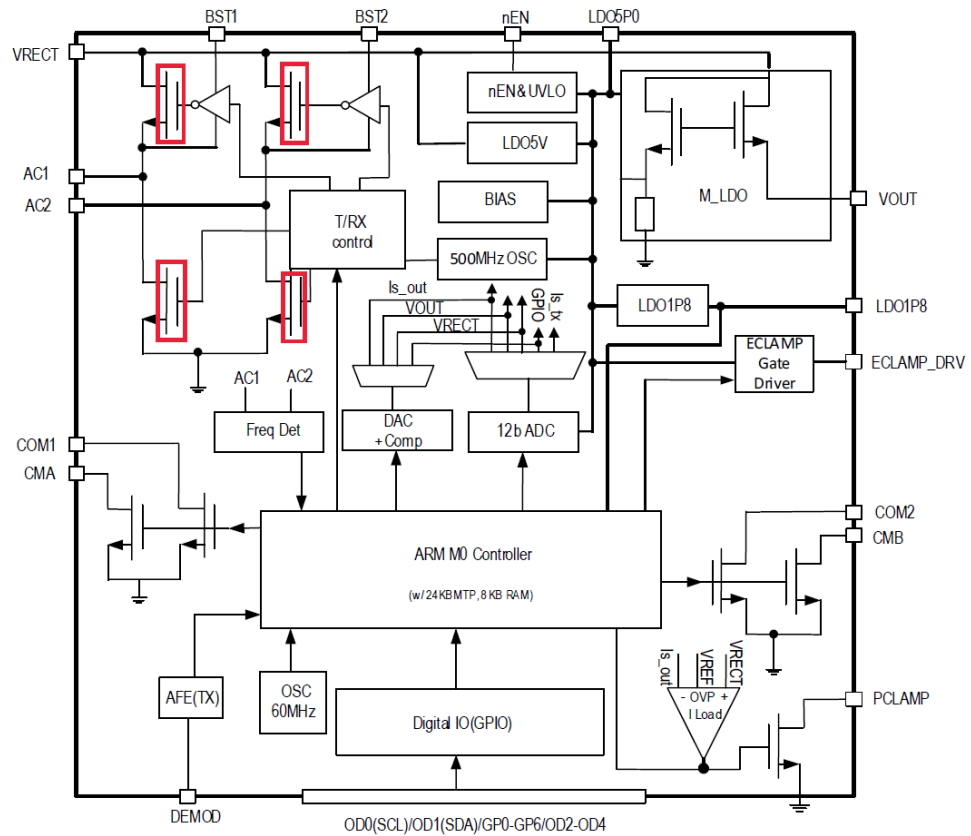
7.3.3 Synchronous Rectifier

The efficiency of the full-bridge rectifier in the P9415 is increased by implementing it as a synchronous rectifier. The rectifier comprises four internally-driven switches that work in a full synchronous mode of operation when the load applied to VOUT is higher than the programmed threshold value. Below that threshold, the rectifier works in half-synchronous rectification mode. In half-synchronous rectification mode, only the low-side N-MOSFETs are driven and the high-side N-MOSFETs are forced into diode mode. At power-up, when the voltage is below the UVLO threshold, the rectifier works by using the body diodes associated with the NMOS transistors. The BST capacitors are used to provide power to drive the gates of high-side NMOS switches.

Complaint, Ex. 6, p. 18.

For example and not as a limitation, as shown in the Internal Block Diagram of P9415 (p12), the P9415 includes a switch network comprised of four switching devices, which are transistors. The first switching device is between VRECT & AC1, the second between AC1 and GND, the third between VRECT & AC2 and the fourth between AC2 & GND.

Figure 3. Internal Block Diagram

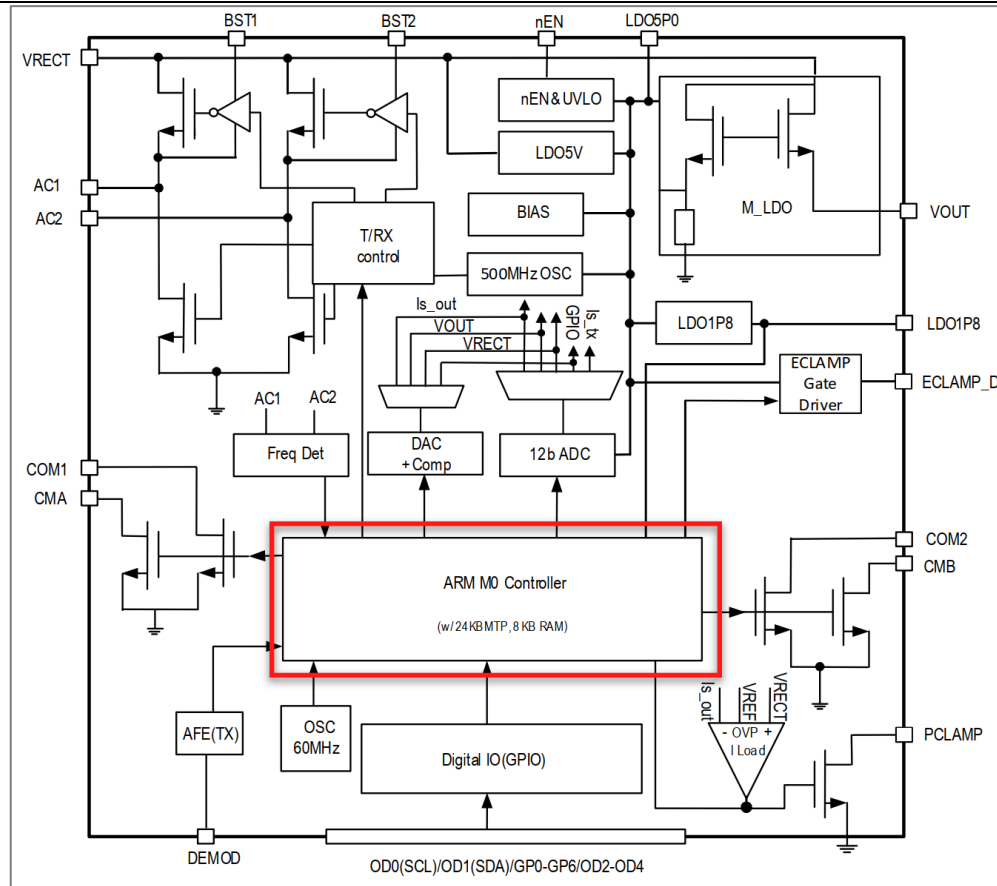


As an example and not as a limitation, the four transistors shown above constitute and/or function as an inverter/rectifier.

Thus, each of the Accused Products meet the limitation “a first circuitry comprising: ... [ii] a switch network;

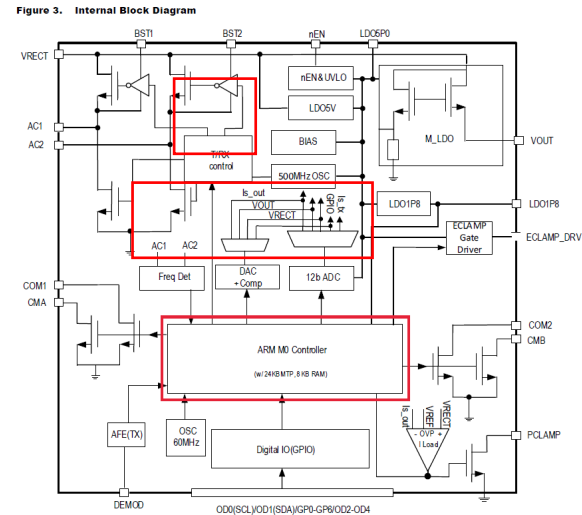
		As stated above, WiPQTUS reserves its right to provide more detailed infringement contentions after full discovery for these devices and their components and any other similar chips used in the Accused Products as well as other technical information are produced.
1E	[[3] a first circuitry comprising:] [. . .] [iii] a filter capacitor;	<i>(Note: “a first circuitry” does not appear in front of limitations [ii] and [iii] as written, but it is included here for reference and convenience as indicated by the brackets [...]).</i> Each of the Accused Products meets this limitation. Each of the Accused Products includes “first circuitry comprising: ... a filter capacitor.” For example and not as a limitation, as can be seen in the “Typical Applications Schematic” of the P9415 (p. 1), the P9415 is connected to capacitor CRECT, which is connected to VRECT, which capacitor meets the limitation “filter capacitor.” Typical Applications Schematic Thus, each of the Accused Products meets the limitation “first circuitry comprising: ... a filter capacitor.”

		In conclusion, each of the Accused Products meets the limitation “[3] a first circuitry comprising: [i] an impedance network; [ii] a switch network; [iii] a filter capacitor.” As stated above, WiPQTUS reserves its right to provide more detailed infringement contentions after full discovery for these devices and their components and any other similar chips used in the Accused Products as well as other technical information are produced.
1F	[4] a second circuitry comprising: [i] a control logic circuit; and	Each of the Accused Products meets this limitation. Each of the Accused Products meets the limitation “a second circuitry comprising: a control logic circuit.” As an example and not as a limitation, as shown in the Internal Block Diagram of the P9415, this chip includes an “ARM M0 Controller.”



Complaint, Exhibit 6.

As another example and not as a limitation, in addition to or in the alternative, any of the circuits highlighted below, alone or in combination with the ARM M0 Controller meet the limitation “a control logic circuit.” Complaint, Exhibit 6.



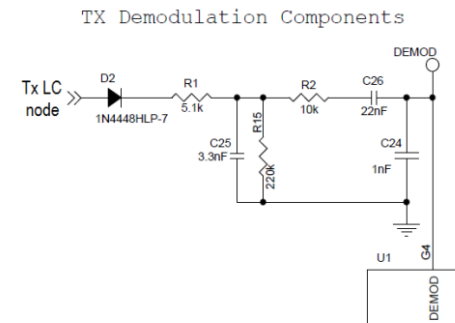
As another example, the above identified components and circuits in combination with additional components and/or circuits meet the limitation “a control logic circuit.”

Thus, each of the Accused Products meets the limitation “[4] a second circuitry comprising: [i] a control logic circuit.”

As stated above, WiPQTUS reserves its right to provide more detailed infringement contentions after full discovery for these devices and their components and any other similar chips used in the Accused Products as well as other technical information are produced.

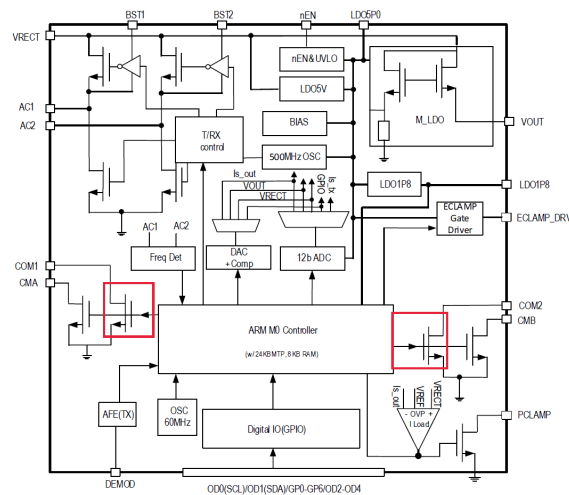
1G	[[4] a second circuitry comprising:] [. . .] [ii] a modulator/demodulator circuit;	<i>(Note: “a second circuitry” does not appear in front of limitation [ii] as written, but it is included here for reference and convenience as indicated by the brackets [...]).</i> Each of the Accused Products meets this limitation. Each of the Accused Products meets the limitation [4] “a second circuitry comprising ... [ii] a modulator/demodulator circuit.” For example and not as a limitation, the P9415 Datasheet, p. 1, states the following: When the device is configured as a wireless power transmitter, it uses an on-chip full/half-bridge inverter, a PWM generator, a modulator/demodulator for communication, and micro controller to Complaint, Ex. 6, p. 1. In addition or in the alternative to the above, at least a partial identification of likely circuits that alone or together form the “modulator/demodulator circuit” are provided in the following examples from the P9415 Datasheet without limitation to others. At least a portion of the modulator/demodulator circuit is at least partially shown in the following Fig. 9 (of Exhibit 6):
----	--	---

Figure 9. Tx DEMOD Filter and AC Coupling



In addition or in the alternative, at least a portion of the modulator/demodulator circuit is at least partially shown in the following Fig. 3 (of Exhibit 6):

Figure 3. Internal Block Diagram



In addition or in the alternative, at least a portion of the modulator/demodulator circuit is at least partially shown in the following Fig. 2 (of Exhibit 6):

		Figure 3. Internal Block Diagram Thus, each of the Accused Products meets the limitation “a modulator/demodulator circuit.” In conclusion, each of the Accused Products meets the limitation [4] a second circuitry comprising: [i] a control logic circuit; and [ii] a modulator/demodulator circuit.” As stated above, WiPQTUS reserves its right to provide more detailed infringement contentions after full discovery for these devices and their components and any other similar chips used in the Accused Products as well as other technical information are produced.
1H	said [3] first circuitry configured to receive said power from [5] a wireless power transmitter;	Each of the Accused Products meets this limitation. Each of the Accused Products includes “said first circuitry configured to receive said power from a [5] wireless power transmitter.” The term “[5] a wireless power transmitter” is merely the environment with which the first circuitry interacts, it provides the “received power” referenced in the preamble, but does not constitute a limitation.

Nevertheless, as an example, and not as a limitation, of “a wireless power transmitter” that can be used to charge the Accused Products, *see* <https://www.samsung.com/us/mobile/mobile-accessories/phones/15w-wireless-charger-duo-with-ta-dark-gray-ep-p5400tbegus/> (last accessed May 18, 2023). Samsung’s Accused Products are also designed to be compatible with wireless chargers manufactured other than by Samsung. *See, e.g.,* <https://www.samsung.com/us/support/answer/ANS00047798/> (describing compatibility with Qi-Compatible devices); <https://developer.samsung.com/mobile/wireless-fast-charge.html> (describing compatibility with Wireless Power Consortium standards).

The Accused Products are “configured to receive said power from a wireless power transmitter” as shown. For example and not as a limitation, by the Samsung Document, “Use Wireless charging or PowerShare with Galaxy devices,” <https://www.samsung.com/us/support/answer/ANS00047798/> (last accessed May 18, 2023).

As another example and not as a limitation, in addition to or alternatively, that the Accused Products are “configured to receive said power from a wireless power transmitter, is also shown by the Datasheet (Complaint, Ex. 6) as follows:

**30W Wireless Power Receiver
with WattShare™ TRx Mode**

**P9415
Datasheet**

Description

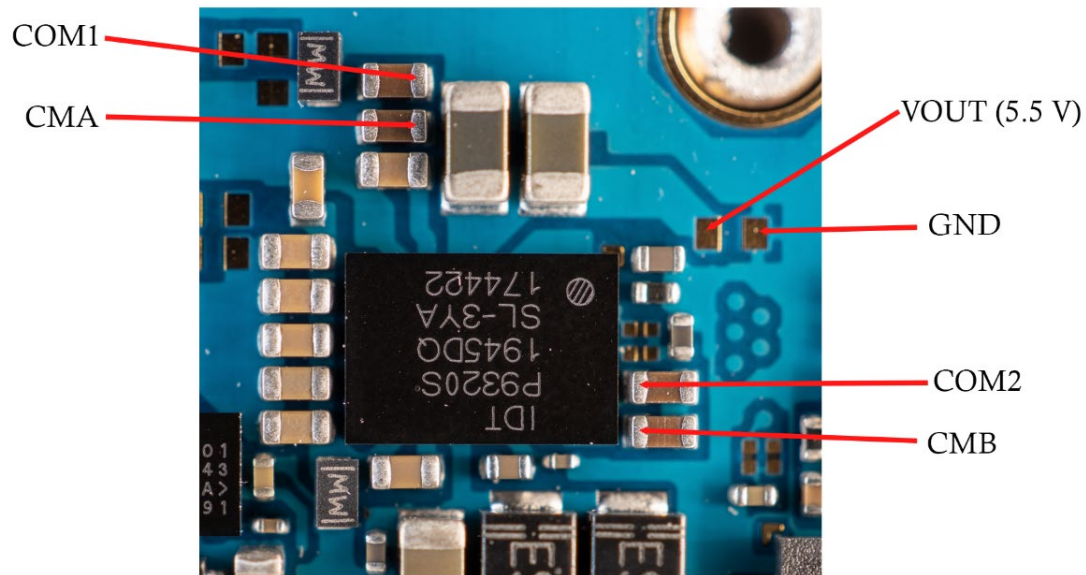
The P9415 is a highly-integrated single-chip wireless power transmitter/receiver IC (TRx). The device can be configured to receive or transmit an AC power signal through magnetic induction.

When the device is configured as a wireless power transmitter, it uses an on-chip full/half-bridge inverter, a PWM generator, a modulator/demodulator for communication, and micro controller to produce an AC power signal to drive external L-C tank. As a receiver, the device receives an AC power signal from a wireless transmitter and converts it into rectified output voltage, which can be used to power devices or supply the charger input in mobile applications. The P9415 integrates a high efficiency Synchronous Full Bridge Rectifier and control circuitry to modulate the load to send message packets to the Transmitter (Tx) to optimize power delivery.

Features

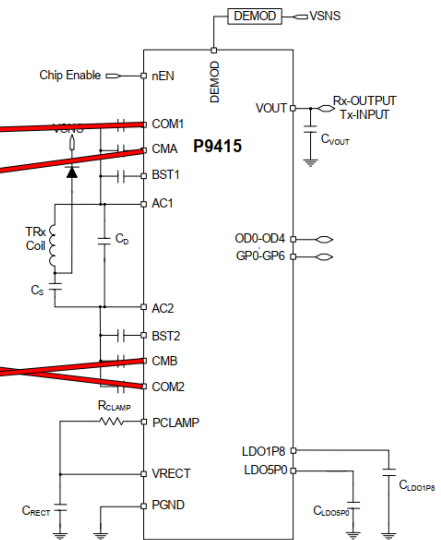
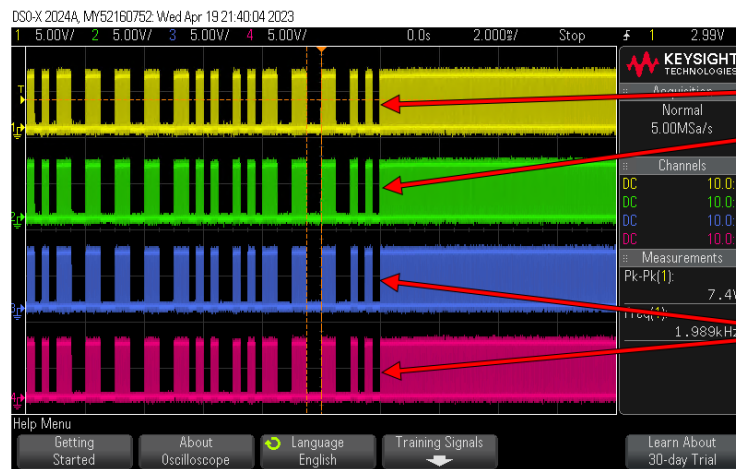
- Single-chip medium power wireless solution
- 24kB Multiple-time programmable (MTP) non-volatile memory for expanded feature support
- WPC 1.2.4 compatible
- Delivers up to 30W as a receiver
- WattShare™ TRx mode with up to 5W Tx capability
- Embedded 32-bit ARM® Cortex®-M0 processor
- Reliable over voltage clamping
- Proprietary Rx-to-Tx modulation/demodulation for two-way communication
- High-performance LDO
- Tx-to-Rx (backchannel) communication

		In conclusion, each of the Accused Products meets the limitation “said [3] first circuitry configured to receive said power from a wireless power transmitter.” As stated above, WiPQTUS reserves its right to provide more detailed infringement contentions after full discovery for these devices and their components and any other similar chips used in the Accused Products as well as other technical information are produced.
11	said [3] first circuitry, based on an input from said control logic circuit, configured to change impedance of said impedance network and topology of said switch network to obtain a modified form of said received power, and apply said modified form of said power to said load device;	Each of the Accused Products meets this limitation. Each of the Accused Products includes “said [3] first circuitry, based on an input from said control logic circuit, configured to change impedance of said impedance network and topology of said switch network to obtain a modified form of said received power, and apply said modified form of said power to said load device.” For example and not as a limitation, as shown above, the “first circuitry” is configured to receive power from a “wireless power transmitter.” Each of the Accused Products is “configured to change impedance of said impedance network” at various stages of operation. For example and not as a limitation, to demonstrate the activation of capacitors attached to COM1, COM2, CMA, and CMB, wires were attached to the capacitors depicted in the figure below and measured with an oscilloscope.



For example and not as a limitation, during communication COM1, COM2, and potentially CMA, and CMB are pulled to ground through switches connected to these points. In the image below, the periods of time where the voltage is zero indicates that the switches are turned on and thus the capacitors are pulled to ground.⁵

⁵ As discussed above and in all such references, the P9415 chip's datasheet is used on information and belief that it operates materially the same for the purposes of Claims 1 and 2 as the P9320S chip. Here, as with all such references, WiPQTUS reserves its rights to supplement its contentions after relevant discovery has occurred.



For example and not as a limitation, the above example shows the modification of power based on a change in impedance, and the chip communicates with the base station for the purpose of controlling power to the load device. This is also described in the Wireless Power Consortium (“WPC”)⁶ Document (at page 137) during a “power transfer phase”:

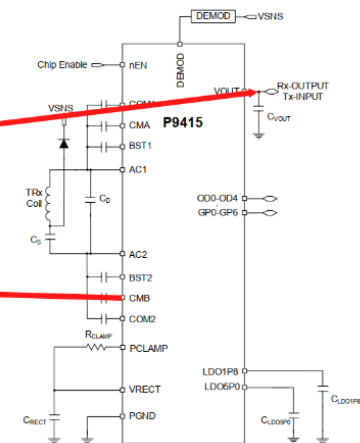
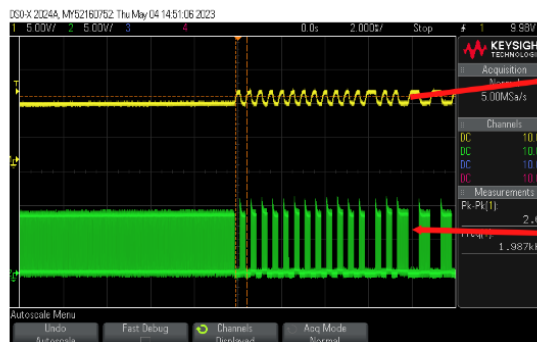
5.3.4 Power transfer phase

In the *power transfer* phase, the Power Receiver controls the power transfer from the Power Transmitter, by means of control data that it transmits to the latter. For this purpose, the Power Receiver shall transmit zero or more of the following Packets:

- **Control Error Packet.** The Power Receiver shall set the Control Error Value to zero if the actual Control Point is equal to the desired Control Point. The Power Receiver shall set the Control Error Value to a negative value to request a decrease of the Primary Cell current. The Power Receiver shall set the Control Error Value to a positive value to request an increase of the Primary Cell current. See also Sections 5.1 and 5.2.3.1.

⁶ The WPC, in part, develops standards for “worldwide compatibility of all wireless chargers and wireless power sources,” including the “Qi” standards. See <https://www.wirelesspowerconsortium.com/about/about-wpc>.

		In the description above, the P9415 implements the functionality of the “Power Receiver” and sends packets to the base station that change the “Primary Cell current,” and thus the power delivered to the load device. Communication back to the base station is performed by turning on (enabling) & turning off (disabling) the switches connected to COM1, COM2, CMA and CMB, which changes impedance of the impedance network by activating and deactivating the capacitors connected to COM1, COM2, CMA and CMB. As a result of the communication, a modified form of power is received. As another example and not as a limitation, in addition to or in the alternative, in the situation where the battery of the Accused Product is at a low charge, to communicate with the base station, the impedance of the impedance network is varied through activating and deactivating the capacitors connected to COM1 and COM2 and this change in impedance of the Accused Product is sensed by the base station. At some point, based on input from control logic circuit, such as for example, once the battery is charged to a sufficient threshold, such as, for example, approximately 50% charged in the case of one charger, or as another example, 80 – 90% charged in the case of a Samsung Wireless Charger, capacitors CMA and CMB are also activated to change the impedance of the impedance network. As another example, in addition to or in the alternative, CMA and CMB may also be activated at higher or lower thresholds depending on the characteristics of the charger and/or the positioning of an Accused Product on the charger. The change of impedance resulting from the use of CMA and CMB affects the power to the load device, hence the limitation of “to obtain a modified form of said received power” is met. As another example and not as a limitation, in addition to or in the alternative, the following shows the modification of power based on a change in impedance is the effect of activating CMA and CMB on power supplied to the load (<i>i.e.</i>, the battery) is shown in the following screenshot of an oscilloscope measuring the output voltage to the battery as compared to the activation of CMB (that is the capacitor connected to CMB being switched in and out):
--	--	--



The power delivered to the load connected to the VOUT pin is a function of the voltage measured at the VOUT pin, and thus the oscilloscope output illustrates power to the load being modified.

As another example and not as a limitation, in addition or in the alternative, as shown above in row 1A, the Cvout connected to VOUT represents a load device, and the activation of CMA and CMB modify power to the load device connected to VOUT.

Thus, each of the Accused Products is “configured to change impedance of said impedance network.”

Also, each of the Accused Products is “configured to change ... topology of said switch” at various stages of operation.

As an example, and not as the limitation, the topology of the “switch network,” e.g., the “MOSFET switches,” which constitute the “switch network,” operate “in various modes to maintain reliable connections” as explained in the P9415 Datasheet (p. 13) explains:

The wireless power is stored on a capacitor(s) connected to VRECT. Until the voltage across the VRECT capacitor exceeds the UVLO threshold, the rectification is performed by the body diodes of the Synchronous Full Bridge Rectifier FETs. After the internal biasing circuit is enabled, the Driver and Control block operate the MOSFET switches of the rectifier in various modes to maintain reliable connections at optimal efficiency. An internal ADC monitors the voltage at VRECT and the load current, the P9415 sends instructions to the wireless power transmitter to increase or decrease the amount of power transferred or to terminate power transmission based on these readings. The voltage at the output of the

These modes are described on page 18 in the P9415 Datasheet (Exhibit 6), a section of which is shown below. As described in this section, at power-up, rectification is achieved by the body diodes associated with the N-MOSFET transistors. This represents a single mode or topology of switches. After a programmed threshold has been passed, the rectifier is used in a “half-synchronous” mode whereby only the lower two transistors are driven internally. This represents another single mode or topology of switches. A final so called “full-synchronous” mode utilizes all four transistors that are driven internally. This represents yet another single mode or topology of switches. As described in the section below, these three modes, or topologies, are utilized to transfer energy to the load and thus modify power to the load. Further, the section below states that these N-MOSFET switchers are “internally-driven” and thus operate based on input from the control logic circuit.

7.3.3 Synchronous Rectifier

The efficiency of the full-bridge rectifier in the P9415 is increased by implementing it as a synchronous rectifier. The rectifier comprises four internally-driven switches that work in a full synchronous mode of operation when the load applied to VOUT is higher than the programmed threshold value. Below that threshold, the rectifier works in half-synchronous rectification mode. In half-synchronous rectification mode, only the low-side N-MOSFETs are driven and the high-side N-MOSFETs are forced into diode mode. At power-up, when the voltage is below the UVLO threshold, the rectifier works by using the body diodes associated with the NMOS transistors. The BST capacitors are used to provide power to drive the gates of high-side NMOS switches.

7.3.4 Rectifier and VRECT Level

Once VRECT powers up to greater than UVLO, the full-bridge rectifier switches to half synchronous or full synchronous mode (depending on the loading conditions) to efficiently transfer energy from the transmitter to the load applied to VOUT. The control loop of the P9415 maintains the rectifier voltage between 5V and 23.5V, depending on the output current (I_{OUT}) and the programmed output voltage. VRECT must not be directly loaded.

As another example and not as a limitation, alternatively or in addition to the above, the reference above states that once V_{RECT} becomes greater than UVLO the switch network goes into either “half synchronous mode” or “full synchronous mode,” whereby the MOSFET switches of the “switch network” (as identified above) change configuration at a rate that is synchronous to the power signal from the charging station. In other words, the switch network is

		constantly changing its topology while in both half synchronous rectification mode and full synchronous rectification mode for the purpose of modifying power. Section 7.3.3 shown of the P9415 Datasheet (shown above) states that these N-MOSFET switches are internally-driven. They are internally driven by the control logic circuit. Thus, each of the Accused Products meets the limitation “said first circuitry, based on an input from said control logic circuit, configured to change impedance of said impedance network and topology of said switch network to obtain a modified form of said received power, and apply said modified form of said power to said load device.” As stated above, WiPQTUS reserves its right to provide more detailed infringement contentions after full discovery for these devices and their components and any other similar chips used in the Accused Products as well as other technical information are produced.
1J	said [3] first circuitry, based on an input from said control logic circuit, <u>configured to</u> change said topology of said switch network and said impedance of said impedance network to transmit at least part of said stored power to said [6] secondary wireless power receiver to power-up said secondary wireless power receiver;	Each of the Accused Products meets this limitation. Each of the Accused Products has “[3] first circuitry, based on an input from said control logic circuit, configured to change said topology of said switch network and said impedance of said impedance network to transmit at least part of said stored power to said [6] secondary wireless power receiver to power-up said secondary wireless power receiver.” As an example and not as a limitation, the Accused Products “<i>change said topology of said switch network.</i>” As one example, and not as a limitation, an Accused Product, for example, the Galaxy S10+, may be configured by a user through selecting “Wireless PowerSharing” in the swipe down menu of the phone (<i>see</i> figure below) to act as a power transmitter to charge a “secondary wireless power receiver.”



See also https://www.samsung.com/latin_en/support/mobile-devices/how-to-use-powershare-on-your-galaxy-phone/. (containing video instructing Samsung customers)).⁷

Based upon input from the control logic circuit, upon activation of Wireless PowerShare, the switch network (identified above) is configured as an inverter. When power is initially provided to power-up the secondary wireless power receiver, the switch network may be configured as a half-bridge inverter. Subsequently, when the power contract is established and a higher level of power is requested by the secondary wireless power receiver, the switch network may be reconfigured to operate as a full-bridge inverter. For example, the first page of the P9415 Datasheet (Exhibit 6) describes as follows:

⁷ In addition to advertising these features, Samsung instructs its customers to operate the Accused Products in this way, by both providing online materials and providing physical material with the Accused Products that directs Samsung customers to its online materials. See *e.g.*, *id*; <https://www.samsung.com/levant/support/mobile-devices/how-to-use-powershare-on-your-galaxy-phone/>.

Description

The P9415 is a highly-integrated single-chip wireless power transmitter/receiver IC (TRx). The device can be configured to receive or transmit an AC power signal through magnetic induction.

When the device is configured as a wireless power transmitter, it uses an on-chip full/half-bridge inverter, a PWM generator, a modulator/demodulator for communication, and micro controller to produce an AC power signal to drive external L-C tank. As a

As noted on page 19 of P9415 datasheet, in Tx Mode, the “Rx is now the Tx”. The power is drawn from the battery via the VOUT pins (the power regulation circuitry is bypassed) and wirelessly transmitted.

P9415 Datasheet

7.4 Tx Mode

Power is transmitted using the VOUT pins as the input; this is the same node as the Rx output when in WPC Rx Mode (mobile device). In Tx Mode (base station), the Rx is now the Tx and sends instructions that are filtered using the DEMOD filter shown in Figure 9, and decoded internally using a dithered PWM controller for high resolution voltage modulation decoding. Based on the received packet, the P9415 will adjust the operating frequency to match the transmitted power level to the required receiver power level for reliable and efficient wireless power transfer.

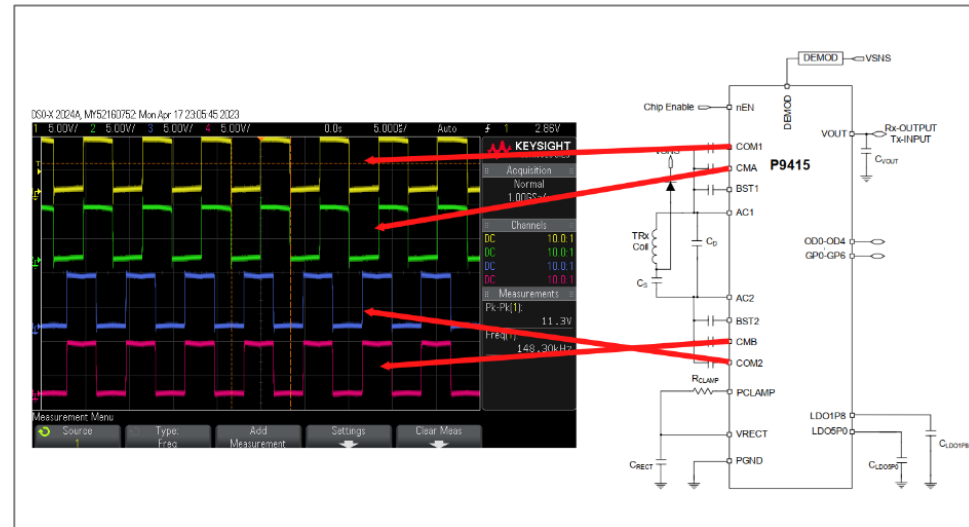
Complaint, Ex. 6, p. 19.

Alternatively or in addition to the above, in inversion mode when the Accused Products such as, for example, the Galaxy S10+, charges an external device, the MOSFET switches (of the “switch network” identified above) necessarily change their configuration at a rapid rate (for example, between 100-150 KHz) to charge the external device. When operating as a full-bridge inverter, in one instant two of the MOSFETs are on while the other two are off, and at another instant the MOSFETs that were on turn off and the ones that were off turn on.

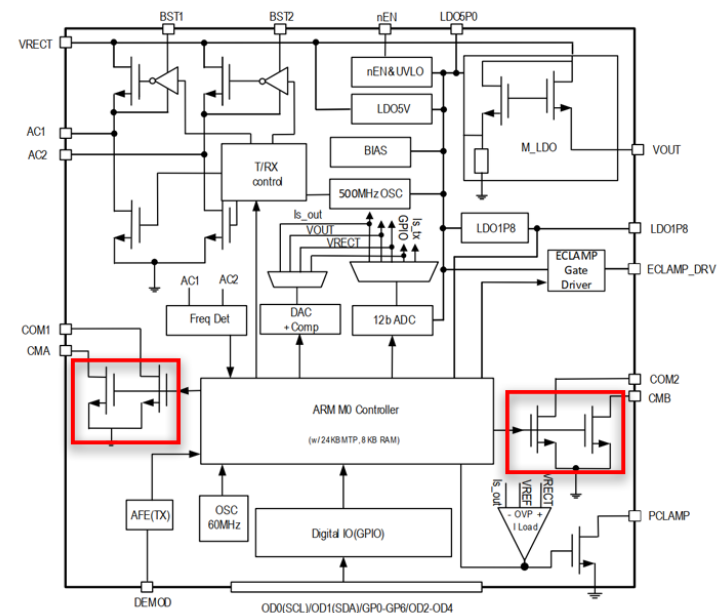
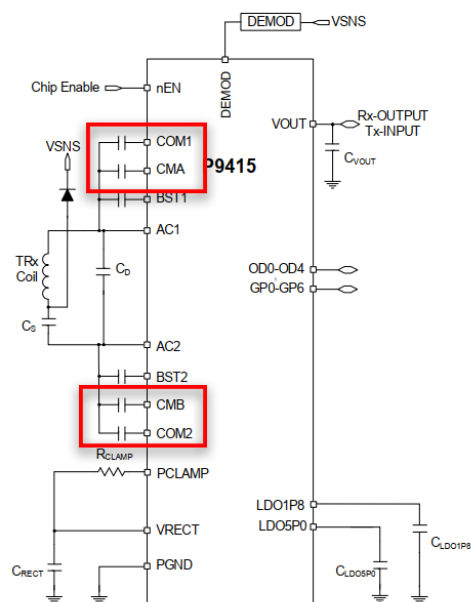
Thus, the Accused Products meet the limitation “*said first circuitry, based on an input from said control logic circuit, configured to change said topology of said switch network... .*”

As to the “*configured to change ... said impedance of said impedance network*” limitation, as an example and not as a limitation, when the Galaxy 10+ is wirelessly connected to a base station for charging, COM1, COM2, CMA, and CMB are switched on, that is, connected to ground, at various times to communicate with the base station. See screen captures in Row 1I above.

As an example and not as a limitation, after the Wireless PowerShare (as shown above) option has been selected, using a Galaxy 10+ phone (as an example) to charge the Galaxy Buds2 Pro device, the capacitors COM1, COM2, CMA, and CMB are switched off, that is, disconnected from ground, which is evident from the measurement shown below. If the capacitors were switched to ground, the signals shown would be constant, or otherwise be indicating a value of zero volts across the screen.



COM1, COM2, CMA, and CMB are connected to switches (these are different switches than those of the switch network described above):



All of these switches (connected to the capacitors COM1, COM2, CMA, CMB) are configured to be switched on and off, which is easily shown by measurements taken on the S10+ (as demonstrated herein at, *e.g.*, Row 1I above).

As an example and not as a limitation, alternatively or in addition to the above, the impedance of the impedance network within each of the Accused Products is configured to change due to the Accused Product's ability to adjust the frequency of the power signal.

The impedance of a passive element of a circuit such as an inductor or capacitor is a function of frequency. For example, the following is found on Wikipedia:

Resistor [edit]

The impedance of an ideal resistor is purely real and is called *resistive impedance*:

$$Z_R = R$$

In this case, the voltage and current waveforms are proportional and in phase.

Inductor and capacitor [edit]

Ideal inductors and capacitors have a purely imaginary reactive impedance:

the impedance of inductors increases as frequency increases;

$$Z_L = j\omega L^{[a]}$$

the impedance of capacitors decreases as frequency increases;

$$Z_C = \frac{1}{j\omega C}$$

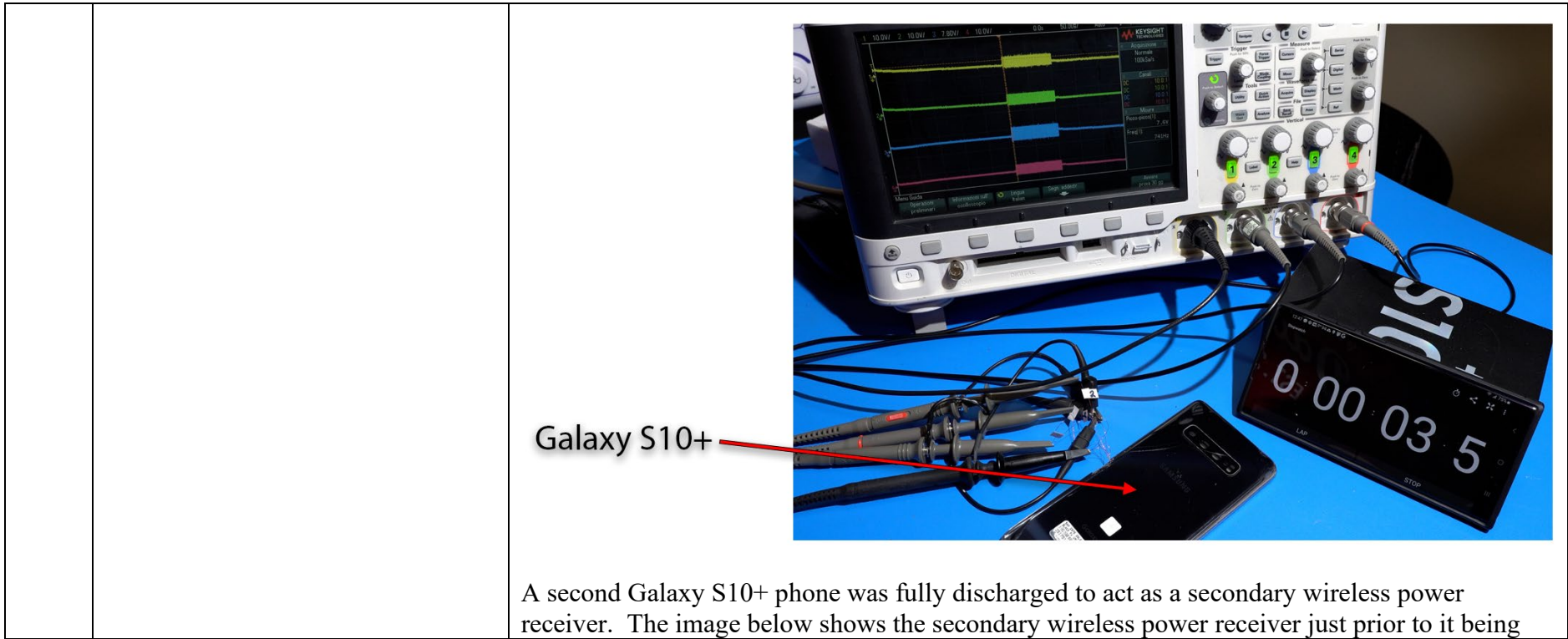
In both cases, for an applied sinusoidal voltage, the resulting current is also sinusoidal, but in *quadrature*, 90 degrees out of phase with the voltage.

However, the phases have opposite signs: in an inductor, the current is *lagging*; in a capacitor the current is *leading*.

https://en.wikipedia.org/wiki/Electrical_impedance (last visited July 31, 2023).

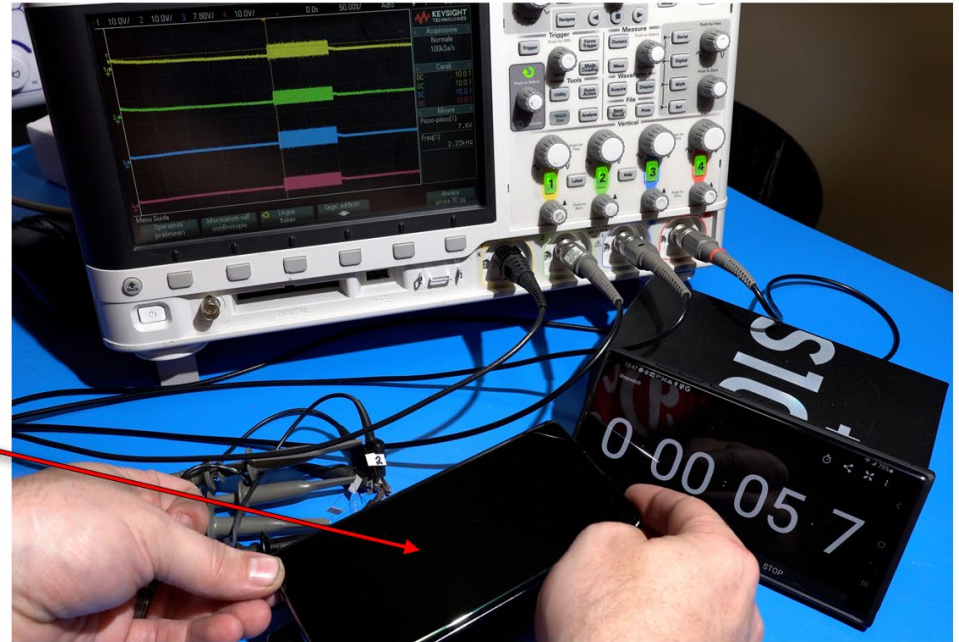
The P9415 Datasheet (*see* figure below), at page 19, the paragraph at the top of the page states that the P9415 chip will “adjust the operating frequency to match the transmitted power level to

		the required power level for reliable and efficient wireless power transfer” to the receiving device: 7.4 Tx Mode Power is transmitted using the VOUT pins as the input; this is the same node as the Rx output when in WPC Mode (base station), the Rx is now the Tx and sends instructions that are filtered using the DEMOD filter internally using a dithered PWM controller for high resolution voltage modulation decoding. Based on the received power level, the operating frequency is adjusted to match the transmitted power level to the required receiver power level for reliable transfer. Thus, the Accused Products meet the limitation “said first circuitry, based on an input from said control logic circuit, configured to change ... said impedance of said impedance network...” Each of the Accused Products is configured “to transmit at least part of said stored power to said secondary wireless power receiver to power-up said secondary wireless power receiver.” For example and not as a limitation, one of the wearables noted above or another phone can receive power from one of the Accused Products until sufficient charge has been received for the device to “power-up” its circuit similar to the P9415 so as to exchange a communication packet per the WPC or other protocol. As an example and not as a limitation, this is demonstrated (below) to show a second wireless power receiver being powered up from a first device. The image below shows a first instrumented Galaxy S10+ phone in the “Wireless PowerShare” mode prior to having a device placed on it.
--	--	---



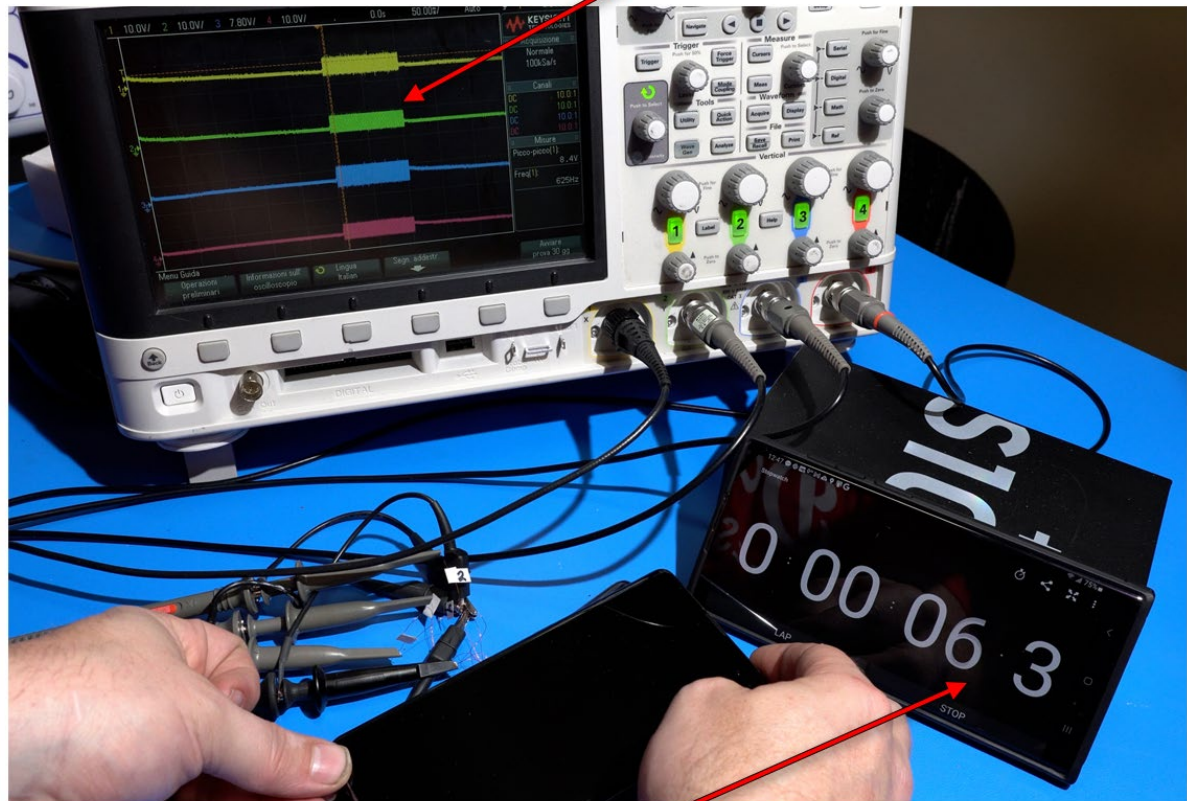
placed on the first Galaxy S10+.

Second
Galaxy S10+



In the bottom right hand corner of the next image, a timer shows the time stamp of the moment when the second Galaxy S10+ was placed on the first. The image also shows the measured output of the Galaxy S10+ on an oscilloscope. The reading on the oscilloscope indicates that the first Galaxy S10+ is in a searching mode (the ping phase described on page 126 of the WPC Document).

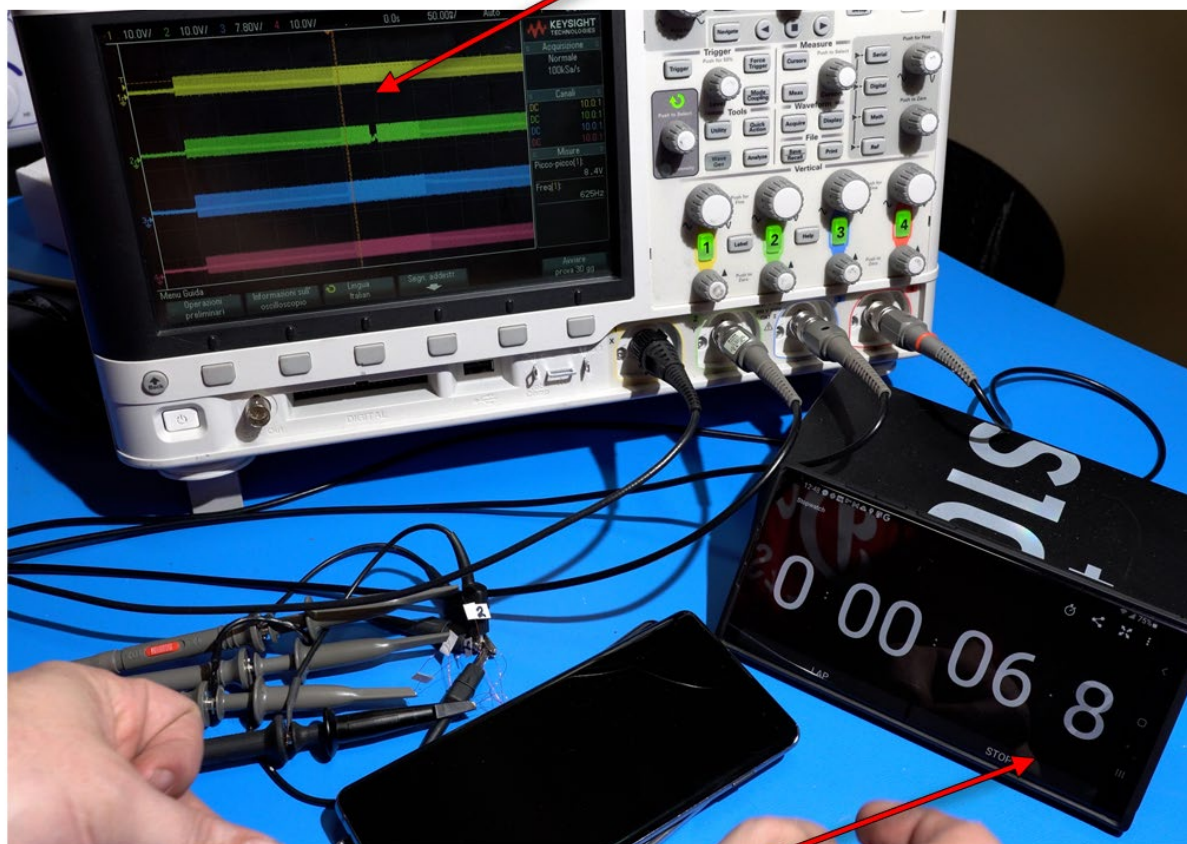
Galaxy S10+ searching for device



Time stamp

The final image below shows the second wireless power receiver being powered up 0.5 seconds after the second Galaxy S10+ was placed on the first.

First Galaxy S10+ charging second



Time stamp

		Thus, each of the Accused Products meets the limitation “said first circuitry, based on an input from said control logic circuit, configured to change said topology of said switch network and said impedance of said impedance network to transmit at least part of said stored power to said secondary wireless power receiver to power-up said secondary wireless power receiver.” As stated above, WiPQTUS reserves its right to provide more detailed infringement contentions after full discovery for these devices and their components and any other similar chips used in the Accused Products as well as other technical information are produced.
1K	said [4] second circuitry, on power-up of <i>said [6] secondary wireless power receiver</i>, configured to identify a type of said secondary wireless power receiver and identify a wireless power protocol of said secondary wireless power receiver;	Each of the Accused Products meets this limitation. Each of the Accused Products has “second circuitry,” that, “on power-up of said secondary wireless power receiver,” is “configured to identify a type of said secondary wireless power receiver and identify a wireless power protocol of said secondary wireless power receiver.” As an example and not as a limitation, each of the Accused Products with the Wireless PowerShare functionality is capable of powering-up a “secondary wireless power receiver” such as, for example and not as a limitation, those shown in https://www.samsung.com/us/support/answer/ANS00047798/ (listing devices that “can use and also be charged with Wireless Powershare”) (last accessed 05/24/2023). As an example, and not as a limitation, as shown in connection with Row 1J above, a second Galaxy S10+ phone that was completely discharged was “powered-up” by a first Galaxy S10+ in Wireless PowerShare mode. Other examples, in addition to the second Galaxy S10+ shown in the above demonstration, of “secondary wireless power” receivers, are, without limitation, another Accused Product, Galaxy Watch Active and Active2, Galaxy Buds, Galaxy Burd2, Galaxy Buds+, Galaxy Buds Live, Galaxy Buds Pro, Galaxy Buds2 Pro, Galaxy Watch, Galaxy Watch3, Galaxy Watch 4 series, Galaxy Watch5 series, Gear Sport, Gear S3, , Galaxy S7/S7 Edge, S8/S8+. Note8, Note9, Galaxy Watch Active , and Galaxy Watch Active 2. Galaxy Watch, Galaxy Buds+ and Galaxy Buds. As explained by Samsung, “[m]ost Qi-Compatible Samsung devices can be charged with Wireless PowerShare... .” <i>Id.</i>

As another example and not as a limitation, on power-up, the (secondary) wireless power receiver communicates information as per the protocol integrated within it. The “second circuitry” (identified above) of the Accused Products decodes the received information and identifies the protocol used by the secondary wireless power receiver.

The P9415 is WPC 1.2.4 compliant:

RENESAS

**30W Wireless Power Receiver
with WattShare™ TRx Mode**

**P9415
Datasheet**

Description

The P9415 is a highly-integrated single-chip wireless power transmitter/receiver IC (TRx). The device can be configured to receive or transmit an AC power signal through magnetic induction.

When the device is configured as a wireless power transmitter, it uses an on-chip full/half-bridge inverter, a PWM generator, a modulator/demodulator for communication, and micro controller to produce an AC power signal to drive external L-C tank. As a receiver, the device receives an AC power signal from a wireless transmitter and converts it into rectified output voltage, which can be used to power devices or supply the charger input in mobile applications. The P9415 integrates a high efficiency Synchronous Full Bridge Rectifier and control circuitry to modulate the load to send message packets to the Transmitter (Tx) to optimize power delivery.

The P9415 features Multiple-time programmable (MTP) non-volatile memory to easily update control firmware and device functions.

The device includes over-temperature and voltage protection. Fault conditions associated with power transfer are managed by an industry-leading 32-bit ARM® Cortex®-M0 processor offering high

Features

- Single-chip medium power wireless solution
- 24kB Multiple-time programmable (MTP) non-volatile memory for expanded feature support
- WPC 1.2.4 compatible
- Delivers up to 30W as a receiver
- WattShare™ TRx mode with up to 5W Tx capability
- Embedded 32-bit ARM® Cortex®-M0 processor
- Reliable over voltage clamping
- Proprietary Rx-to-Tx modulation/demodulation for two-way communication
- High-performance LDO
- Tx-to-Rx (backchannel) communication
- Supports proprietary mode magnetic induction wireless power solutions
- Supports I2C 400kHz standard interface and GPIOs
- Package: 6 × 9 ball array, 2.82 × 4.22 × 0.50 mm, 53-WLCSP with 0.40mm ball pitch

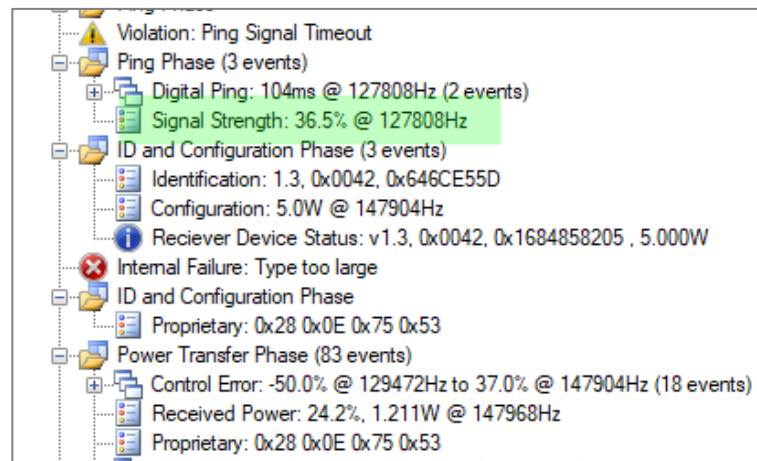
Complaint, Ex. 6, p. 1.

As an example and not as a limitation, in addition or in the alternative, as shown above, the P9415 also includes “[p]roprietary RX-to-TX modulation/demodulation for two-way communication.”

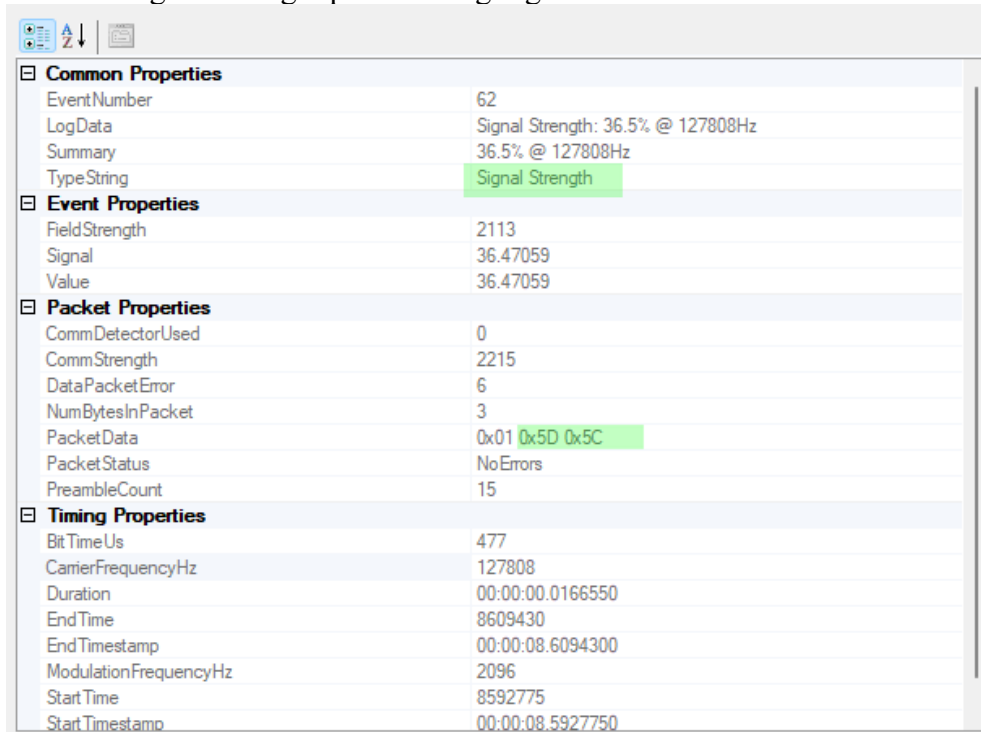
As another example and not as a limitation, “[t]he P9415 is fully compatible with WPC (latest specification) (also known as “Qi”) and has all the necessary circuitry to communicate ... with a receiver via WPC communication packets.” Complaint, Ex. 6, p. 15. The state machine for the communication scheme of the P9415 is shown in Figure 8 (Ex. 6, p. 16). The first step is the “Selection” step. *Id.* As an example and not as a limitation, and while more discovery is needed, apparently the secondary wireless power receiver, such as another phone or one of the wearables noted above, can receive power from one of the Accused Products until sufficient charge has been received for the device to “power-up” its circuit similar to the P9415 so as to exchange a communication packet per the WPC or, alternatively, other protocol.

As another example and not as a limitation, the actual packets can be observed with a Qi Packet Sniffer, such as the Avnet Qi Sniffer v 1.3 (available at <https://www.avnet.com/shop/us/products/avnet-engineering-services/101-01-3074457345632566717?autoSuggestSearchTerm=qi%2520sniffer>). The Avnet Sniffer was used to capture packets (shown below) exchanged between a Buds2 device that was mostly but not completely discharged very shortly after the moment when the Buds2 device was placed on a Galaxy S10+.

One of the very first packets sent by the Buds2 device to the Galaxy S10+ is the “Signal Strength Packet” captured as shown below:



The content of the Signal Strength packet is highlighted below:



Common Properties	
EventNumber	62
LogData	Signal Strength: 36.5% @ 127808Hz
Summary	36.5% @ 127808Hz
TypeString	Signal Strength
Event Properties	
FieldStrength	2113
Signal	36.47059
Value	36.47059
Packet Properties	
CommDetectorUsed	0
CommStrength	2215
DataPacketError	6
NumBytesInPacket	3
PacketData	0x01 0x5D 0x5C
PacketStatus	No Errors
PreambleCount	15
Timing Properties	
BitTimeUs	477
CarrierFrequencyHz	127808
Duration	00:00:00.0166550
EndTime	8609430
EndTimestamp	00:00:08.6094300
ModulationFrequencyHz	2096
StartTime	8592775
StartTimestamp	00:00:08.5927750

The WPC Document (at page 143) describes how this byte (the Signal Strength Value) is used for providing optimal power transfer:

6.3.1 Signal Strength Packet (0x01)

Table 6-4 defines the format of the message contained in a Signal Strength Packet

Table 6-4: Signal Strength

	b ₇	b ₆	b ₅	b ₄	b ₃	b ₂	b ₁	b ₀
B ₀	Signal Strength Value							

Signal Strength Value The unsigned integer value in this field indicates the degree of coupling between the Primary Cell and Secondary Coil, with the purpose to enable Power Transmitters that use Free Positioning to determine the Primary Cell that provides optimum power transfer (see also Annex C). To determine the degree of coupling, the Power Receiver shall monitor the value of a suitable variable during a Digital Ping. Examples of such variables are:

- The rectified voltage.
- The open circuit voltage (as measured at the output disconnect switch).
- The received Power (if the rectified voltage is actively or passively clamped during a Digital Ping).

The variable that is chosen shall result in a Signal Strength Value that increases monotonically with increasing degree of coupling. The Signal Strength Value is reported as

$$\text{Signal Strength Value} = \frac{U}{U_{\max}} \cdot 256,$$

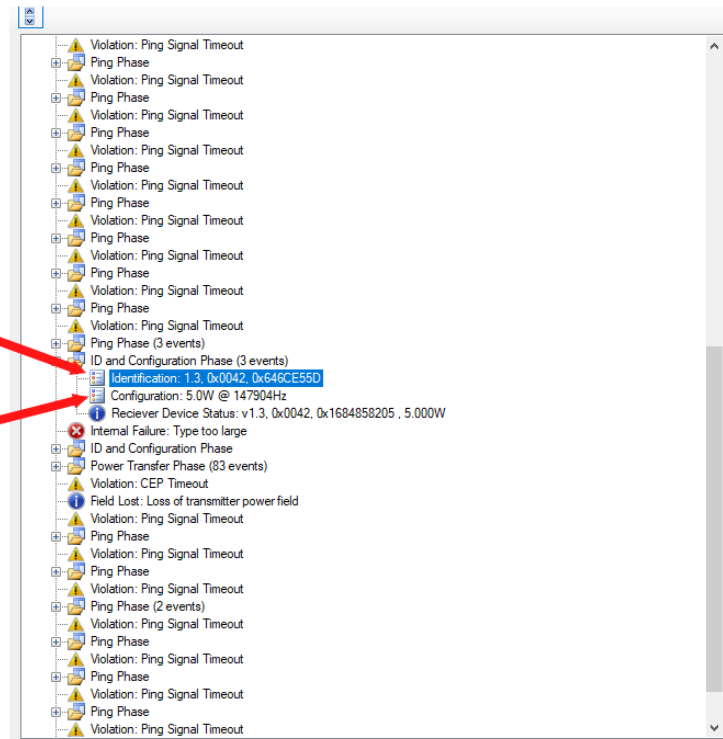
where U is the monitored variable, and $U_{\max}$ is the maximum value, which the Power Receiver expects for that variable during a Digital Ping. Note that the Power Receiver shall set the Signal Strength Value to 255 in the case that $U \geq U_{\max}$.

The Galaxy S10+ uses the signal strength to adjust, for example, its transmit frequency.

The Identification Packet (*see* page 147 of the WPC Specification, System Description Wireless Power Transfer, Vol. I: Low Power, Part 1, Interface Definition, Version 1.1.2, June 2013 (as used herein, the “WPC Specification”), and the Configuration Packet (*see* page 146 of the WPC Specification) are shown below.

Identification Packet

Configuration Packet



The Qi WPC specification describes that the Identification Packet identifies the device, including, in part, the type of the device:

6.3.8 Identification Packet (0x71)

Table 6-12 defines the format of the message contained in an Identification Packet.

Table 6-12: Identification

	b ₇	b ₆	b ₅	b ₄	b ₃	b ₂	b ₁	b ₀
B ₀	Major Version				Minor Version			
B ₁	(msb) Manufacturer Code (lsb)							
B ₂								
B ₃	Ext	(msb) Basic Device Identifier (lsb)						
⋮								
B ₆								

Major Version The combination of this field and the Minor Version field identifies to which revision of the System Description Wireless Power Transfer the Power Receiver complies. The Major Version field shall contain the binary coded digit value 0x1.

Minor Version The combination of this field and the Major Version field identifies to which minor revision of the System Description Wireless Power Transfer the Power Receiver complies. The Minor Version field shall contain the binary coded digit value 0x1.

Manufacturer Code The bit string contained in this field identifies the manufacturer of the Power Receiver, as specified in [PRMC].

Ext If this bit is set to ZERO, the bit string

Manufacturer Code || Basic Device Identifier

identifies the Power Receiver. If this bit is set to ONE, the bit string

Manufacturer Code || Basic Device Identifier || Extended Device Identifier

identifies the Power Receiver (see also Section 6.3.9).

Basic Device Identifier The bit string contained in this field contributes to the identification of the Power Receiver. A Power Receiver manufacturer should ensure that the combination of Basic Device Identifier and Manufacturer ID is sufficiently unique. Embedding a serial number of at least 20 bits in the Basic Device Identifier is sufficient. Alternatively, using a (pseudo) random number generator to dynamically generate part of the Basic Device Identifier is sufficient as well, provided that the generated part complies with the following requirements:

		WPC Document, p. 147. Thus, the Identification Packet is used by the Accused Products to <i>“identify a type of said secondary wireless power receiver.”</i> As another example and not as a limitation, in addition or in the alternative to the above, the Maximum Power and Power Class fields (which are part of the Configuration Packet discussed below) each or together are used at least in part by the Accused Product to <i>“identify a type of said secondary wireless power receiver,”</i> and, therefore, meets this limitation. Thus, the Identification Packet or, in addition or in the alternative, the Configuration Packet, is used by the Accused Product to <i>“identify a type of said secondary wireless power receiver,”</i> and, therefore, meets this limitation. Addressing the limitation, <i>“identify a wireless protocol of said secondary wireless protocol,”</i> the Accused Products meet this limitation at least by the use of the Identification Packet alone, the Configuration Packet alone, or, in the alternative, together. As an example and not as a limitation, the Accused Product uses the “Major Version” and “Minor Version” fields of the Identification Packet to identify the version of the “System Description Wireless Power Transfer” of the WPC Specification that the secondary wireless power receiver uses. As another example and not as a limitation, in addition or in the alternative, the Configuration Packet is used by the Accused Product to <i>“identify a wireless protocol of said secondary wireless protocol,”</i> and, therefore, meets this limitation. As another example and not as a limitation, in addition or in the alternative, the “Prop” field of the Configuration Packet is shown as follows:
--	--	--

6.3.7 Configuration Packet (0x51)

Table 6-11 defines the format of the message contained in a Configuration Packet.

Table 6-11: Configuration

	b ₇	b ₆	b ₅	b ₄	b ₃	b ₂	b ₁	b ₀
B ₀	Power Class		Maximum Power					
B ₁	Reserved							
B ₂	Prop	Reserved			ZERO		Count	
B ₃	Window Size					Window Offset		
B ₄	Reserved							

Power Class This field contains an unsigned integer value that indicates the Power Receiver's Power Class. Power Receivers that comply with this version 1.1.2 of the System Description Wireless Power Transfer, Volume I, Part 1, shall set this field to 0.

Maximum Power Apart from a scaling factor, the unsigned integer value contained in this field indicates the maximum amount of power, which the Power Receiver expects to provide at the output of the rectifier. This maximum amount of power is calculated as follows:

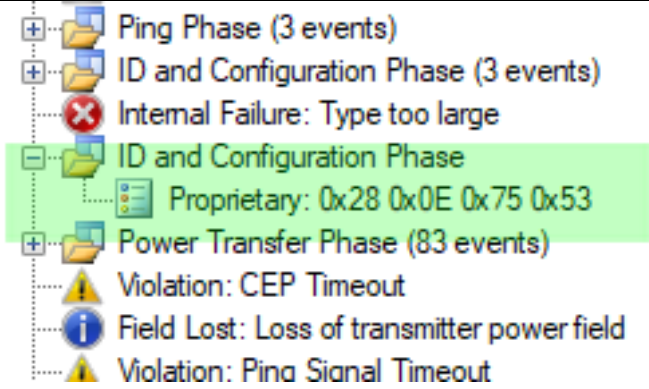
$$P_{\max} = \left(\frac{\text{Maximum Power}}{2} \right) \times 10^{\text{Power Class}} \text{ W.}$$

Prop If this bit is set to ZERO, the Power Transmitter shall control the power transfer according to the method defined in Section 5.2.3.1. If this bit is set to ONE, the Power Transmitter may control the power transfer according to a proprietary method instead of the method defined in Section 5.2.3.1. However, if this bit is set to ONE, the Power Transmitter shall continue to ensure that the received Control Error Packets comply with the timings defined in Section 5.2.3. (Informative) *This implies that a Power Transmitter terminates the power transfer if it times out when waiting for a Control Error Packet. Moreover, this implies that setting the Prop bit to ONE does not relieve the Power Receiver from transmitting Control Error Packets on a regular basis. Finally, if the Prop bit is set to ZERO, the Power Transmitter could still decide to abort the power transfer based on information contained in a Proprietary Packet.*

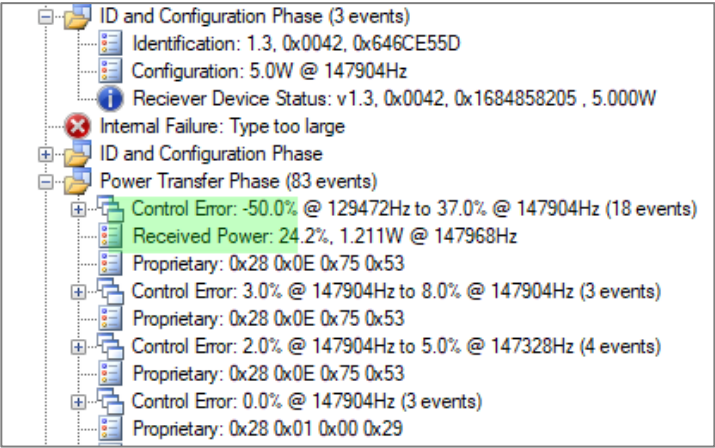
WPC Document, p. 146. In addition to the above or in the alternative, the Prop field appears to be a message from a device such as the Buds2 that describes how it would like to be charged. As an example and not a limitation, it defines a “wireless power protocol.”

As another example and not as a limitation, in addition to the above or in the alternative, the Maximum Power and Power Class fields each or together also constitute “a wireless power protocol.”

As another example and not as a limitation, in addition or in the alternative, a packet that the Qi Sniffer identified as “Proprietary” is shown below within the group called “ID and Configuration Phase”:

		 The “Proprietary” packet was identified within the ID and configuration phase of the communication sequence, which fact indicates that this packet contains information that is used by the Accused Products to both identify the secondary device and to identify a wireless power protocol used in communication. For at least these reasons, alone or in combination, the secondary circuitry of each of the Accused Products is configured to satisfy the limitation: “<i>identify a wireless power protocol of said secondary wireless power receiver.</i>” Thus, each of the Accused Products meets the limitation “said second circuitry, on power-up of said secondary wireless power receiver, configured to identify a type of said secondary wireless power receiver and identify a wireless power protocol of said secondary wireless power receiver.” As stated above, WiPQTUS reserves its right to provide more detailed infringement contentions after full discovery for these devices and their components and any other similar chips used in the Accused Products as well as other technical information are produced.
1L	said [4] second circuitry, configured to receive and interpret data from	Each of the Accused Products meets this limitation. Each of the Accused Products has “second circuitry” that is “configured to receive and interpret data from said secondary wireless power receiver in said identified wireless power protocol.”

	said [6] secondary wireless power receiver in said identified wireless power protocol;	As shown above, each of the Identification Packet and Configuration Packet, among other types of packets, are received by each of the Accused Products, each includes data (see format of packets above), and that data is interpreted by the Accused Product. <i>E.g.</i>, see Complaint, Ex. 6, pp 16 – 17. As another example and not a limitation, in addition or in the alternative, each Accused Device is configured to receive packets during a “Power Transfer Phase” (<i>see</i> WPC Document, p. 130). In this phase, power is transferred from the device transmitting power to the device receiving power (for example, from the Galaxy S10+ to the Buds2). To control power transferred between devices, the Qi standard requires packets to be sent from the device receiving power to the device transmitting power (for example, from the Buds2 to the Galaxy S10+). WPC Document (at p. 130) describes the use of multiple packets sent from the power receiving device to the power transmitting device: 5.2.3 Power transfer phase In the <i>power transfer</i> phase, the Power Transmitter controls the power transfer to the Power Receiver, in response to control data that it receives from the latter. For this purpose, the Power Transmitter shall receive zero or more of the following Packets: • Control Error Packet. • Received Power Packet. • Charge Status Packet. • End Power Transfer Packet. As another example and not a limitation, the actual packets can be observed, as, for example, in the measurement taken between the Galaxy S10+ and the Buds2 (above). There, both Control Error packets and Receive Power packets (highlighted below) were captured being sent from the Buds2 to the Galaxy S10+:
--	---	--

		 The WPC Document (at page 145) describes that these packets contain information to be received by the Galaxy S10+ from the Buds2:
--	--	---

6.3.3 Control Error Packet (0x03)

Table 6-7 defines the format of the message contained in a Control Error Packet.

Table 6-7: Control Error

	b ₇	b ₆	b ₅	b ₄	b ₃	b ₂	b ₁	b ₀
B ₀	Control Error Value							

Control Error Value The (two's complement) signed integer value contained in this field ranges between -128...+127 (inclusive), and provides input to the Operating Point controller of the Power Transmitter. See Sections 5.2.3.1 and 5.3.4 for more details. Values outside the indicated range are reserved and shall not appear in a Control Error Packet.

6.3.4 Received Power Packet (0x04)

Table 6-8 defines the format of the message contained in a Received Power Packet.

Table 6-8: Received Power

	b ₇	b ₆	b ₅	b ₄	b ₃	b ₂	b ₁	b ₀
B ₀	Received Power Value							

Received Power Value The unsigned integer contained in this field indicates the average amount of power that the Power Receiver receives through its Interface Surface, in the time window indicated in the Configuration Packet. This amount of power is calculated as follows:

$$P_{\text{received}} = \left(\frac{\text{Received Power Value}}{128} \right) \times \left(\frac{\text{Maximum Power}}{2} \right) \times 10^{\text{Power Class}} \text{ W.}$$

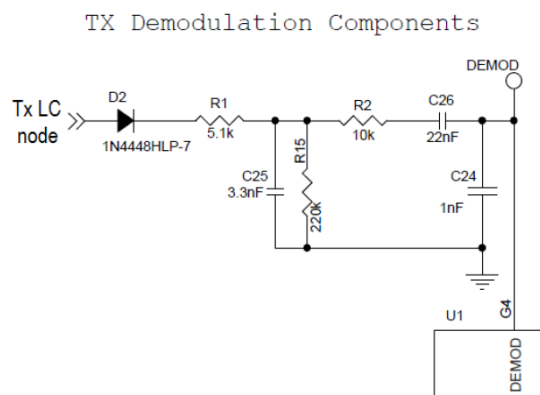
Here, Maximum Power and Power Class are the values contained in the Configuration Packet (see Section 6.3.7). Annex D defines how a Power Receiver shall determine its Received Power P_{received} .

As another example and not as a limitation, the Accused Products utilize the at least some or the same or similar to circuits shown in the P9415 Datasheet as follows:

7.4 Tx Mode

Power is transmitted using the VOUT pins as the input; this is the same node as the Rx output when in WPC Rx Mode (mobile device). In Tx Mode (base station), the Rx is now the Tx and sends instructions that are filtered using the DEMOD filter shown in Figure 9, and decoded internally using a dithered PWM controller for high resolution voltage modulation decoding. Based on the received packet, the P9415 will adjust the operating frequency to match the transmitted power level to the required receiver power level for reliable and efficient wireless power transfer.

Figure 9. Tx DEMOD Filter and AC Coupling



Complaint, Ex. 6, p. 19. As noted on IDTP9415 reference schematic (page 22 of the Datasheet), the data from the secondary wireless power receiver is received via the Tx_DeModulation Components,” which is at least part of the demodulation circuit in the second circuitry. As indicated on Page 19 of the IDTP9415 datasheet, the instructions are filtered through the DEMOD filter shown in Figure 9 and decoded internally.

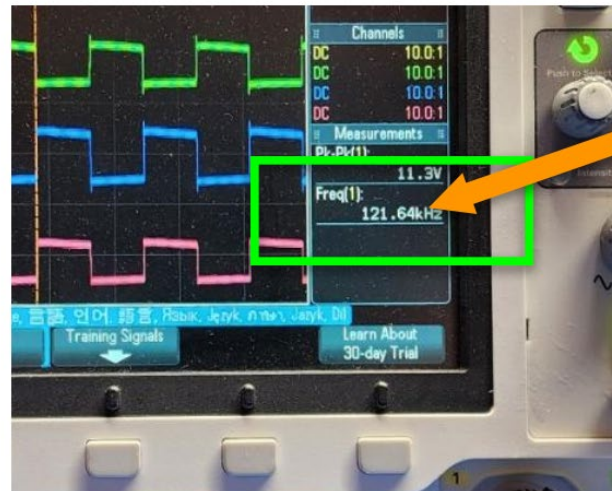
Thus, each of the Accused Products meets the limitation “said second circuitry, configured to receive and interpret data from said secondary wireless power receiver in said identified wireless power protocol.”

As stated above, WiPQTUS reserves its right to provide more detailed infringement contentions after full discovery for these devices and their components and any other similar chips used in the Accused Products as well as other technical information are produced.

1M	said [4] second circuitry, based on said interpretation, configured to perform a function associated with said transmitted power in conjunction with said first circuitry.	Each of the Accused Products meets this limitation. Each of the Accused Products has “second circuitry” that, “based on said interpretation,” is “configured to perform a function associated with said transmitted power in conjunction with said first circuitry.” For example and not as a limitation, the following explanation is found on page 19 of the P9415 Datasheet: “Based on the received packet, the P9415 will adjust the operating frequency to match the transmitted power level to the required receiver power level for reliable and efficient power transfer.” As another example and not as a limitation, the performance of the function, “match[ing] the transmitted power level to the required receiver power level” by the Accused Products can easily be demonstrated. Using the Samsung Galaxy 10+ phone to charge the Galaxy Buds2 Pro device, the following behaviors corresponding to packets exchanged are shown:
----	--	---

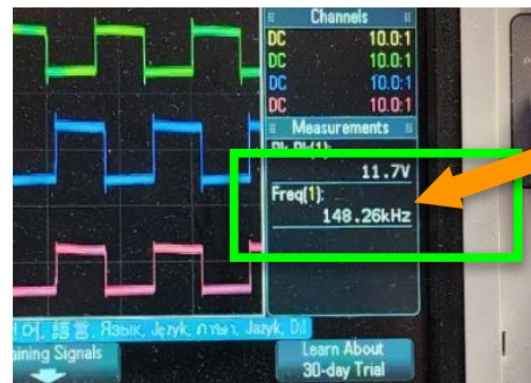


When the Galaxy S10+ phone detects that the Buds2 have low battery, the phone reduces the frequency of the power signal coupled to the Buds2. This is demonstrated in the following image:



121 KHz

As the Galaxy S10+ phone detects that the Buds2 are closer to fully charged (based on the packets the phone receives from the Buds2) the phone increases the frequency of the power signal. This is shown in the next image:



148 KHz

		Thus, each of the Accused Products meets the limitation “said second circuitry, based on said interpretation, configured to perform a function associated with said transmitted power in conjunction with said first circuitry.” As stated above, WiPQTUS reserves its right to provide more detailed infringement contentions after full discovery for these devices and their components and any other similar chips used in the Accused Products as well as other technical information are produced.
Cl. 2	The dual mode wireless power receiver of claim 1, wherein said switch network of said first circuitry is configured as one of an inverter and a rectifier.	Each of the Accused Products meets this limitation. Each of the Accused Products has “[t]he dual mode wireless power receiver of claim 1, wherein said switch network of said first circuitry is configured as one of an inverter and a rectifier.” <i>See</i> Row 1D above, incorporated herein by reference as if set forth in full. As stated above, WiPQTUS reserves its right to provide more detailed infringement contentions after full discovery for these devices and their components and any other similar chips used in the Accused Products as well as other technical information are produced.

Exhibit 3 – Claim Chart Showing Infringement of '339 Patent, Claims 1 and 2, by the Samsung Galaxy S23

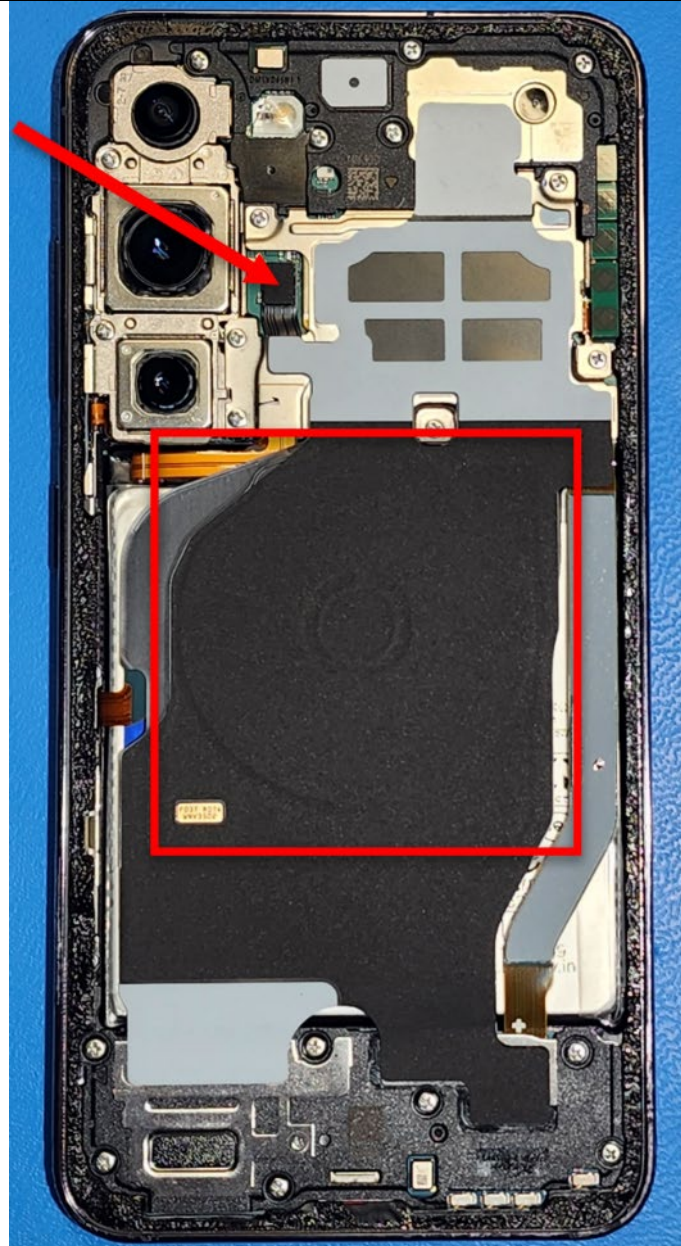
The following is intended to supplement the disclosures provided in Exhibit 2, which is incorporated herein by reference. The following Claim Chart is in addition to the allegations made in the Complaint, Dkt. 1, which is incorporated herein as if set forth in full. Furthermore, this Claim Chart is intended to be read as a whole for the purpose of providing reasonable notice of WiPQTUS' infringement contentions. While some evidence is cited herein, WiPQTUS is under no obligation to marshal all evidence, and the citation of some evidence should in no way be interpreted as excluding other evidence that WiPQTUS may rely upon. WiPQTUS' investigation is ongoing.

WiPQTUS has based its contentions on a reasonable and diligent review of publicly available information. As such WiPQTUS cannot provide complete and final infringement contentions until Samsung and/or its third-party suppliers, such as Renesas and Convenient Power, respond to WiPQTUS' discovery requests, provide deponents, and produce information that is not publicly available. A partial list, without limitation to other documents and information that may be sought, of non-public documents or information that are highly relevant and should be produced before WiPQTUS is required to provide more complete infringement contentions are the following: (1) datasheets for the Renesas MIW04 and/or MIW04X02 and/or S2MIW04, the manufacturer of which is not readily apparent, and any other datasheets for similar wireless power transceiver chips used by Samsung in the S23 that provides Wireless PowerShare functionality; (2) circuit diagrams containing more detailed internal and external (to the chip) circuits than found in the datasheet(s); (3) the Functional Specification Document ("FSD") for each of the MIW04X02 and/or MIW04 chips; (4) System Design Documents; (5) software or firmware specifications; (6) source code for the code run by the ARM or other processor believed to be within the aforementioned chips; and (7) at least source code for the modules associated with Wireless PowerShare (as defined in Complaint, ¶ 22) that run on one or more additional controllers or processors within the S23 (beyond or outside the aforementioned chips), and possibly other source code.

In addition, WiPQTUS cannot provide complete infringement contentions until the claims have been construed. For these Preliminary Infringement Contentions, WiPQTUS relies on the plain and ordinary meaning that the limitations would have to a person of ordinary skill in the art. WiPQTUS reserves the right to amend these contentions in the event that the Court construes terms of the Asserted Claims.

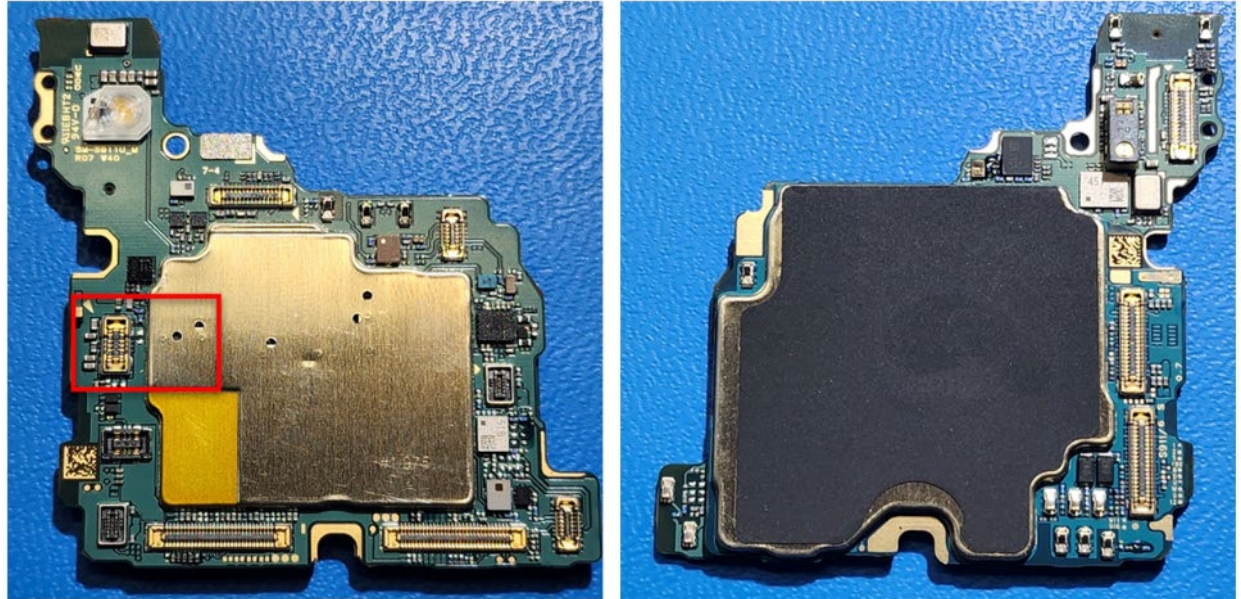
Cl. 1	Claim Limitation	Each limitation is met by the Samsung Galaxy S23.
1A	[1] <i>A dual mode wireless power receiver</i> configured to selectively	To the extent the preamble is construed as a limitation, the preamble is met by the S23.

apply a received power to a load device and utilize at least a part of the stored power to power-up [6] <i>a secondary wireless power receiver</i> and communicate with said secondary wireless power receiver to cause an action or transaction or charge said secondary wireless power receiver's load device, said dual mode wireless power receiver comprising:	The S23 has a "dual mode wireless power receiver" capable of operating as a receiver of wireless power or as a transmitter of wireless power alone or in combination with other components. By way of example and not as a limitation, the Samsung Galaxy S23 has an MIW04X02 (on information and belief, aka Samsung S2MIW04) chip to provide bi-directional wireless charging, aka "PowerShare." The following photographs show a disassembled Galaxy S23:
--	---



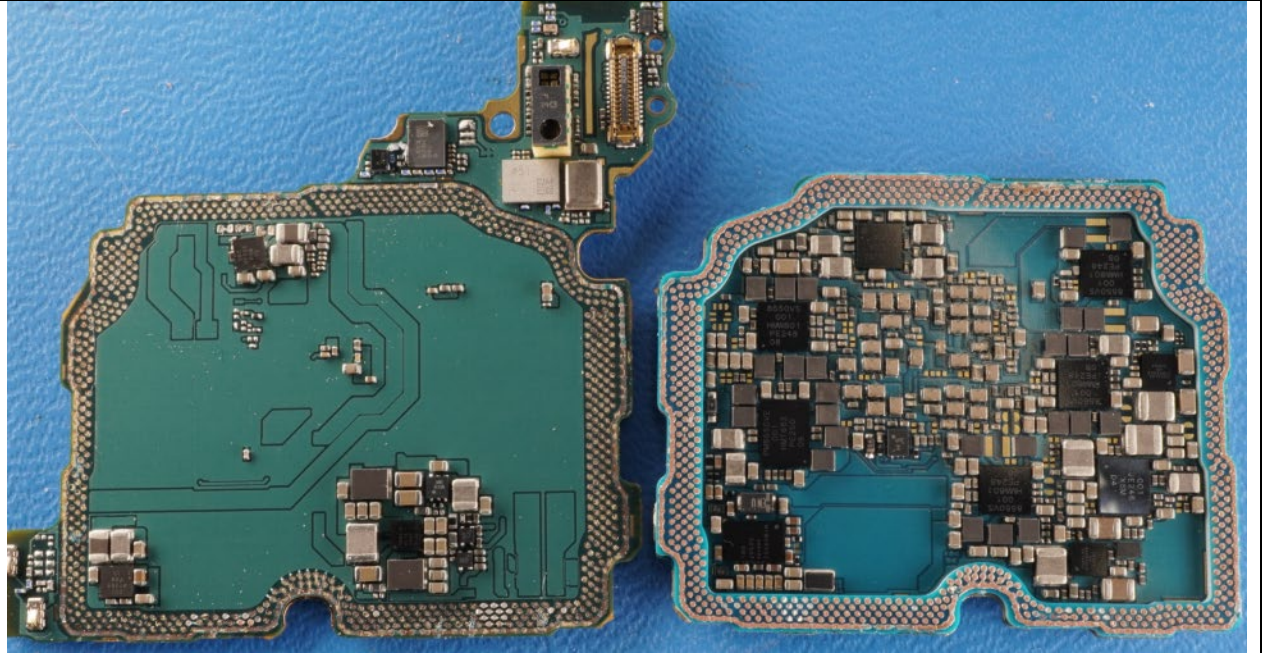
A coil used for wireless charging is highlighted (by the red box) in the image above. The red arrow points to the connector that connects the coil to the main PCB of the S23.

The following figure shows the top side of the main PCB (left image) and the bottom side of the main PCB (right image):

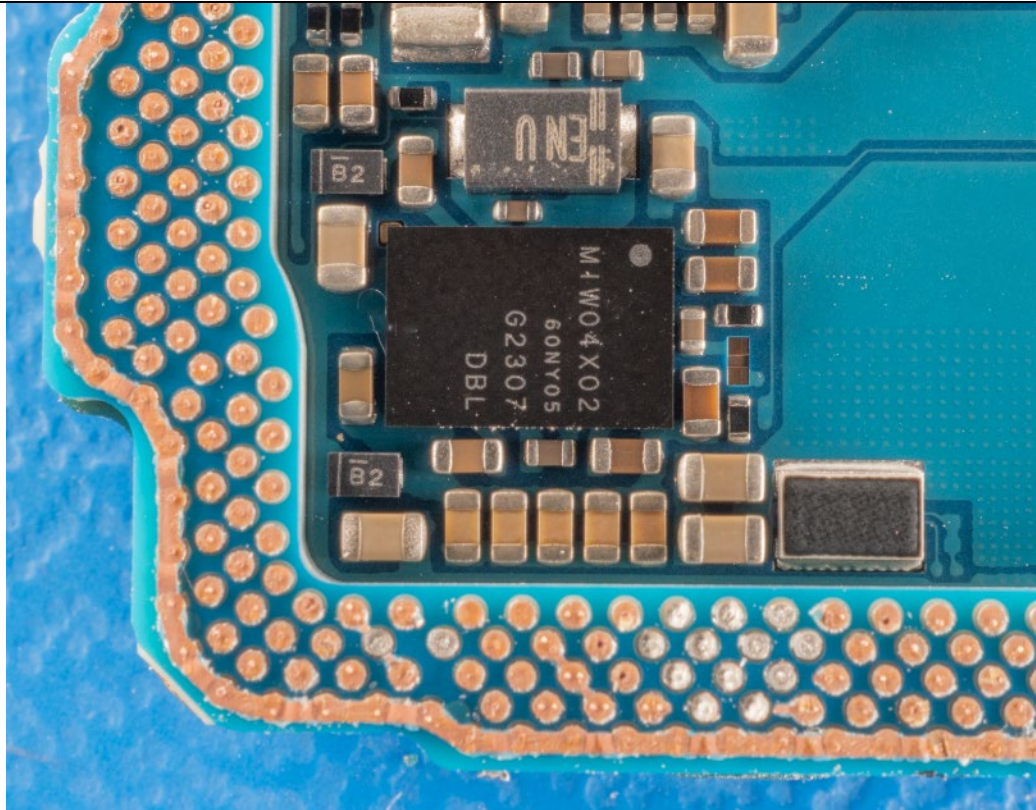


The red box in the left image above identifies where the coil connects to the main PCB.

The main PCB is composed of two circuit boards “sandwiched” together. The following image shows the circuitry in between the two circuit boards after they have been separated:



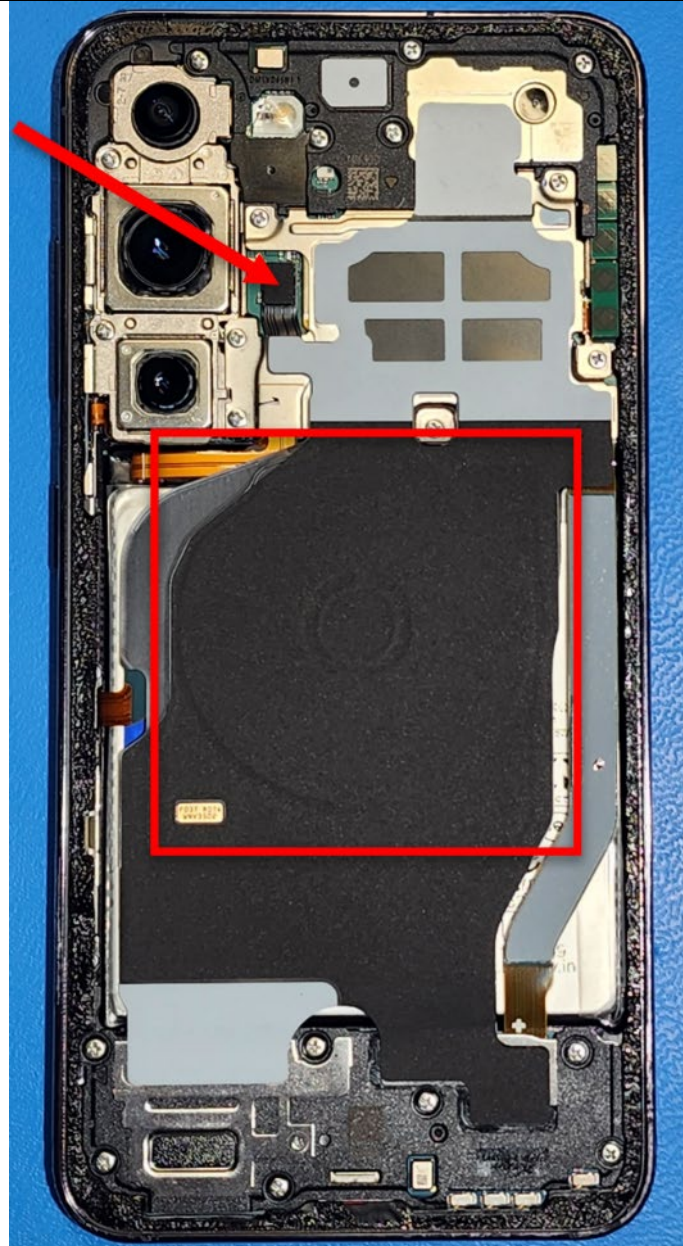
The PCB on the right of the image corresponds to the top side of the main PCB described above, the lower left corner of this PCB is shown in the image below.

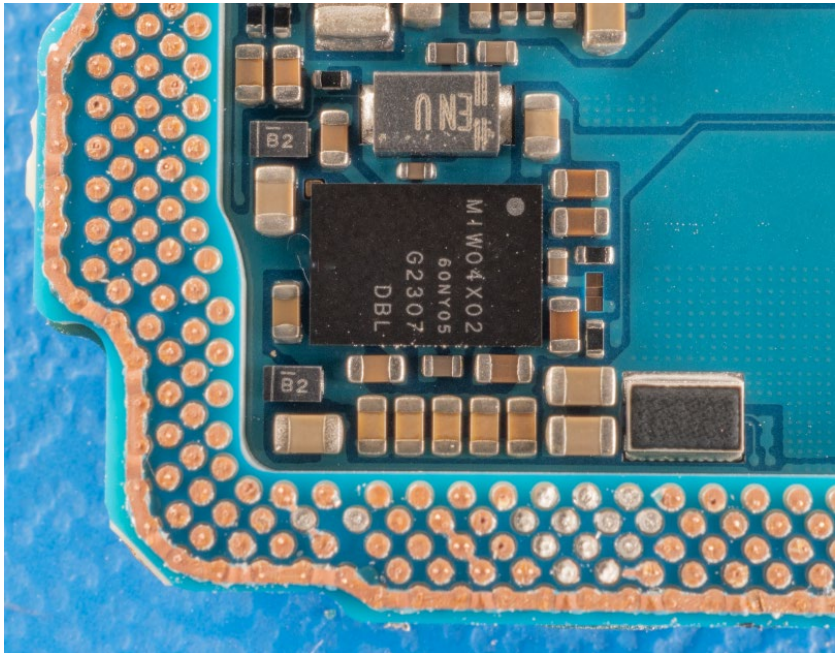


The text on the chip identifies it as a MIW04X02. The datasheets for this device is not in the public domain but will be sought in discovery in this matter. Therefore, WiPQTUS cannot provide complete infringement contentions until the datasheets for the MIW04X02 and/or M1W04, and any other similar chips used in the S23 as well as other technical information are produced.

The S23 is capable of implementing the functionality that Samsung refers to as "Wireless PowerShare."

		For example, and not as a limitation, using Wireless PowerShare, the S23 "can reverse wireless charge another phone, watch, or Galaxy Buds." https://www.samsung.com/au/support/mobile-devices/how-to-use-powershare-on-your-galaxy-phone/ (last accessed 05/11/2023). As an example and not as a limitation, the Galaxy S23 can charge at least Samsung Galaxy Buds, including Galaxy Buds2 Pro. Other devices are shown in the following Samsung publication: https://www.samsung.com/us/support/answer/ANS00047798/ (last accessed 05/24/2023). As an example and not as a limitation, a device such as a "phone, watch, or Galaxy Buds" meets the limitation "secondary wireless power receiver." As an example and not as a limitation, each of the, for example, "phone, watch, or Galaxy Buds" has a battery that constitutes a "load device." <i>See also</i> Row 1A of Exhibit 2, incorporated herein by reference. Therefore, as shown above, to the extent the preamble is construed as a limitation, the preamble is met by each of the S23. As stated above, WiPQTUS reserves its right to provide more detailed infringement contentions after full discovery for these devices and their components and any other similar chips used in the S23 as well as other technical information are produced.
1B	[2] one of coil and capacitor electrodes;	The S23 meets this limitation. For example, the S23 includes at least one coil for both receiving and transmitting wireless power. In the following teardown photograph of the S23, the one or more coils is readily seen (as highlighted by the red box):



		<i>See also</i> Row 1B of Exhibit 2, incorporated herein by reference. Thus, the S23 meets this limitation. As stated above, WiPQTUS reserves its right to provide more detailed infringement contentions after full discovery for these devices and their components and any other similar chips used in the S23 as well as other technical information are produced.
1C	[3] a first circuitry comprising: [i] an impedance network;	The S23 meets the limitation "a first circuitry comprising: [i] an impedance network." As shown in the teardown below, the MIW04X02 is connected to external capacitors in a similar pattern and of similar values as shown in Exhibit 2 (<i>see</i> Row 1C of Exhibit 2). 

		<i>See also</i> Row 1C of Exhibit 2, incorporated herein by reference. Thus, the S23 meets this limitation. As stated above, WiPQTUS reserves its right to provide more detailed infringement contentions after full discovery for these devices and their components and any other similar chips used in the S23 as well as other technical information are produced.
1D	[[3] a first circuitry comprising:] [ii] a switch network;	<i>(Note: "a first circuitry" does not appear in front of limitations [ii] and [iii] as written, but it is included here for reference and convenience as indicated by the brackets [...]).</i> The S23 meets the limitation "a first circuitry comprising: ... [ii] a switch network." Based on the similarities of the pin-outs and the layout of the external (to the chip) components as well as the packet-sniffing results shown below, the MIW04X02 appears to be materially (as to the Asserted Claims) the same as the P9415 and/or P9320. <i>See</i> Exhibit 2, incorporated herein by reference. For example, and not as a limitation, when the S23 is in the receive power mode, such as when it is being charged by, for example, a wireless power charging station, the switch network is configured to act as a rectifier. When the S23 is acting as a transmitter of power, such as, for example, when the Wireless PowerShare functionality is activated, the switch network is configured as an inverter. <i>See also</i> Row 1D of Exhibit 2, incorporated herein by reference. Thus, the S23 meets the limitation "a first circuitry comprising: ... [ii] a switch network; As stated above, WiPQTUS reserves its right to provide more detailed infringement contentions after full discovery for these devices and their components and any other similar chips used in the S23 as well as other technical information are produced.

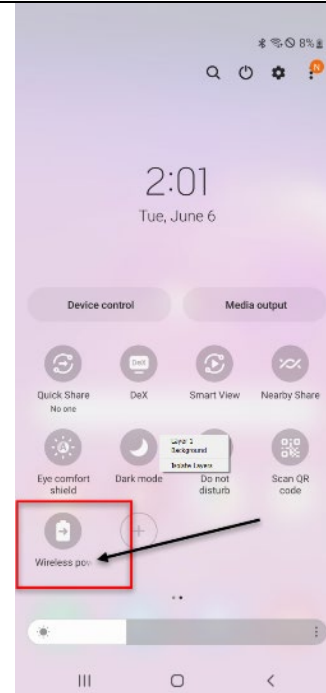
1E	[[3] a first circuitry comprising:] [iii] a filter capacitor;	<i>(Note: "a first circuitry" does not appear in front of limitations [ii] and [iii] as written, but it is included here for reference and convenience as indicated by the brackets [...]).</i> On information and belief, the S23 includes "first circuitry" that includes "a filter capacitor." <i>See also</i> Row 1E of Exhibit 2, incorporated herein by reference. In conclusion, the S23 meets the limitation [3], which is "a first circuitry" including the "impedance network," "switch network," and "filter capacitor" as shown above. As stated above, WiPQTUS reserves its right to provide more detailed infringement contentions after full discovery for these devices and their components and any other similar chips used in the S23 as well as other technical information are produced.
1F	[4] a second circuitry comprising: [i] a control logic circuit; and	The S23 meets the limitation "a second circuitry comprising: a control logic circuit." As an example and not as a limitation, on information and belief, the S23 includes a controller. <i>See</i> Row 1F of Exhibit 2, incorporated herein by reference. Thus, the S23 meets the limitation "[4] a second circuitry comprising: [i] a control logic circuit." As stated above, WiPQTUS reserves its right to provide more detailed infringement contentions after full discovery for these devices and their components and any other similar chips used in the S23 as well as other technical information are produced.

1G	[[4] a second circuitry comprising:] [ii] a modulator/demodulator circuit;	<i>(Note: "a second circuitry" does not appear in front of limitation [ii] as written, but it is included here for reference and convenience as indicated by the brackets [...]).</i> On information and belief, the S23 meets the limitation [4] a second circuitry comprising ... [ii] a modulator/demodulator circuit." As shown in 1K below, the packet captures from the S23 demonstrate that communications by the S23 when acting as a receiver and when acting as a transmitter of power are the same as those observed in the study of the S10 as shown in Exhibit 2. Therefore, by necessary implication, the S23 has a modulator/demodulator circuit. <i>See</i> Row 1G of Exhibit 2, incorporated herein by reference. Thus, the S23 meets the limitation "a modulator/demodulator circuit." In conclusion, the S23 meets the limitation [4], which is "a second circuitry" including the "a control logic circuit" and "a modulator/demodulator circuit" as shown above. WiPQTUS' investigation is ongoing. WiPQTUS cannot provide complete and final contentions as to this limitation until discovery has occurred.
1H	said [3] first circuitry configured to receive said power from [5] a wireless power transmitter;	The S23 includes "first circuitry" "configured to receive" "power from [5] a wireless power transmitter." The term "[5] a wireless power transmitter" is merely the environment with which the first circuitry interacts, it provides the "received power" referenced in the preamble, but does not constitute a limitation. Nevertheless, as an example, and not as a limitation, of "a wireless power transmitter" that can be used to charge the S23, <i>see</i> https://www.samsung.com/us/mobile/mobile-accessories/phones/15w-wireless-charger-duo-with-ta-dark-gray-ep-p5400tbegus/ (last accessed May 18, 2023). Samsung's S23 is also designed to be compatible with wireless chargers manufactured other than by Samsung. <i>See, e.g.,</i> https://www.samsung.com/us/support/answer/ANS00047798/ (describing compatibility with Qi-

		Compatible devices); https://developer.samsung.com/mobile/wireless-fast-charge.html (describing compatibility with Wireless Power Consortium standards). The S23 is “configured to receive said power from a wireless power transmitter” as shown, for example, and not as a limitation the Samsung Document, “Use Wireless charging or PowerShare with Galaxy devices,” https://www.samsung.com/us/support/answer/ANS00047798/ (last accessed May 18, 2023). <i>See also</i> Row 1H of Exhibit 2, incorporated herein by reference. In conclusion, the S23 meets the limitation “said [3] first circuitry configured to receive said power from a wireless power transmitter.” As stated above, WiPQTUS reserves its right to provide more detailed infringement contentions after full discovery for these devices and their components and any other similar chips used in the S23 as well as other technical information are produced.
11	said [3] first circuitry, based on an input from said control logic circuit, configured to change impedance of said impedance network and topology of said switch network to obtain a modified form of said received power, and apply said modified form	The S23 meets the limitation "said [3] first circuitry, based on an input from said control logic circuit, configured to change impedance of said impedance network and topology of said switch network to obtain a modified form of said received power, and apply said modified form of said power to said load device." The "first circuitry" identified above, is "configured to" "change impedance of said impedance network and topology of said switch network to obtain a modified form of said received power" based on "an input from said control logic circuitry." For example, and not as a limitation, as shown above, the "first circuitry" is configured to receive power from a "wireless power transmitter."

	of said power to said load device;	The S23 is "configured to change impedance of said impedance network" at various stages of operation. The S23 is "configured to change ... topology of said switch" at various stages of operation. <i>See also</i> Row 1I of Exhibit 2, incorporated herein by reference. Thus, the S23 meets the limitation "said first circuitry, based on an input from said control logic circuit, configured to change impedance of said impedance network and topology of said switch network to obtain a modified form of said received power, and apply said modified form of said power to said load device." As stated above, WiPQTUS reserves its right to provide more detailed infringement contentions after full discovery for these devices and their components and any other similar chips used in the S23 as well as other technical information are produced.
1J	said [3] first circuitry , based on an input from said control logic circuit, configured to change said topology of said switch network and said impedance of said impedance network to transmit at least part of said stored power to said [6] secondary wireless power receiver to power-up said secondary	The S23 meets the limitation "said [3] first circuitry, based on an input from said control logic circuit, configured to change said topology of said switch network and said impedance of said impedance network to transmit at least part of said stored power to said [6] secondary wireless power receiver to power-up said secondary wireless power receiver." Addressing the "<i>change said topology of said switch network</i>" limitation, as one example, and not as a limitation, an Accused Product, for example, the Galaxy S23, may be configured by a user through selecting "Wireless PowerSharing" in the swipe down menu of the phone (<i>see</i> figure below) to act as a power transmitter to charge a "secondary wireless power receiver," examples of which are shown above.

wireless power
receiver;



Note that the figure above is a screen capture from an S10+ phone; however, the user interface and process for placing the Galaxy S23 into “Wireless PowerSharing” mode is substantially the same.

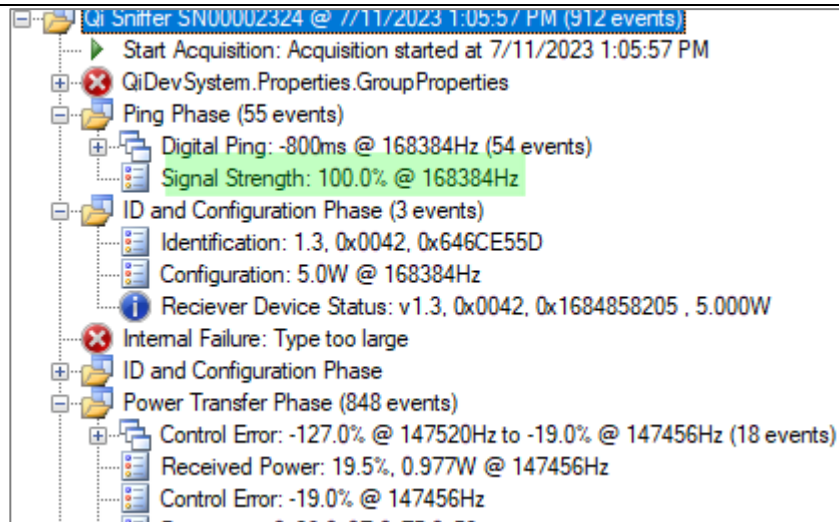
See also Row 1J of Exhibit 2, incorporated herein by reference.

Thus, the S23 meet the limitation “*said first circuitry, based on an input from said control logic circuit, configured to change said topology of said switch network... .*”

As to the “*configured to change ... said impedance of said impedance network*” limitation, based on the similarities of the pin-outs and the layout of the external (to the chip) components as well as the packet-sniffing results shown below, the MIW04X02 appears to be materially (as to the Asserted Claims) the same as the P9415 and/or P9320. *See* Exhibit 2, incorporated herein by reference.

		Alternatively, or in addition to the above, the impedance of the impedance network within the S23 is configured to change due to the Accused Product's ability to adjust the frequency of the power signal. <i>See also</i> Row 1J of Exhibit 2, incorporated herein by reference. Thus, the S23 meets the limitation "said first circuitry, based on an input from said control logic circuit, configured to change said topology of said switch network and said impedance of said impedance network to transmit at least part of said stored power to said secondary wireless power receiver to power-up said secondary wireless power receiver." As stated above, WiPQTUS reserves its right to provide more detailed infringement contentions after full discovery for these devices and their components and any other similar chips used in the S23 as well as other technical information are produced.
1K	said [4] second circuitry, on power-up of <i>said [6] secondary wireless power receiver</i>, configured to identify a type of said secondary wireless power receiver and identify a wireless power protocol of said secondary wireless power receiver;	The S23 meets the limitation "said second circuitry, on power-up of said secondary wireless power receiver, configured to identify a type of said secondary wireless power receiver and identify a wireless power protocol of said secondary wireless power receiver." The S23 with the Wireless PowerShare functionality is capable of powering-up a "secondary wireless power receiver" such as, for example and not as a limitation, those shown in https://www.samsung.com/us/support/answer/ANS00047798/ (last accessed 05/24/2023). Other examples of "secondary wireless power" receivers, are, without limitation, Galaxy Watch Active and Active2, Galaxy Buds, Galaxy Burd2, Galaxy Buds+, Galaxy Buds Live, Galaxy Buds Pro, Galaxy Buds2 Pro, Galaxy Watch, Galaxy Watch3, Galaxy Watch 4 series, Galaxy Watch5 series, Gear Sport, Gear S3, , Galaxy S7/S7 Edge, S8/S8+. Note8, Note9, Galaxy Watch Active , and Galaxy Watch Active 2. Galaxy Watch, Galaxy Buds+ and Galaxy Buds. As explained by Samsung, "[m]ost Qi-Compatible Samsung devices can be charged with Wireless PowerShare... ." <i>Id.</i> In addition or in the alternative, while discovery is needed, additional Samsung wearables may be chargeable using Wireless PowerShare. In addition or in the alternative, additional non-Samsung devices may be charged by the S23 using Wireless

		PowerShare. In addition or in the alternative, while discovery is needed, additional non-Samsung, non-Qi compatible devices may be charged by the S23 using Wireless PowerShare. On power-up, the (secondary) wireless power receiver communicates information as per the protocol integrated within it. The "second circuitry" (identified above) of the S23 decodes the received information and identifies the protocol used by the secondary wireless power receiver. As an example, and not as a limitation, communications between the S23 and a Buds2 device were captured very shortly after the moment when the Buds2 device is placed on the S23. The Buds2 device was only partially charged. To record the communications between the phone and the Buds2 device, a Qi packet sniffer can be used to "sniff" Qi data packets exchanged between a Samsung GalaxyS23 and a Galaxy Buds2 Pro device. An example of a Qi Packet Sniffer is the Avnet Qi Sniffer v 1.3 (available at https://www.avnet.com/shop/us/products/avnet-engineering-services/101-01-3074457345632566717?autoSuggestSearchTerm=qi%2520sniffer), which was used to capture the information below. One of the very first packets sent by the Buds2 device to the Galaxy S23 is the "Signal Strength Packet" which is shown in the capture below:
--	--	---



The content within the Signal Strength packet is a single byte indicating the signal strength between the phone and the Buds2. This byte contained within the packet identified above is highlighted below:

Common Properties <table> <tr> <td>Event Number</td> <td>62</td> </tr> <tr> <td>Log Data</td> <td>Signal Strength: 100.0% @ 168384Hz</td> </tr> <tr> <td>Summary</td> <td>100.0% @ 168384Hz</td> </tr> <tr> <td>Type String</td> <td>Signal Strength</td> </tr> </table>		Event Number	62	Log Data	Signal Strength: 100.0% @ 168384Hz	Summary	100.0% @ 168384Hz	Type String	Signal Strength								
Event Number	62																
Log Data	Signal Strength: 100.0% @ 168384Hz																
Summary	100.0% @ 168384Hz																
Type String	Signal Strength																
Event Properties <table> <tr> <td>Field Strength</td> <td>1156</td> </tr> <tr> <td>Signal</td> <td>100</td> </tr> <tr> <td>Value</td> <td>100</td> </tr> </table>		Field Strength	1156	Signal	100	Value	100										
Field Strength	1156																
Signal	100																
Value	100																
Packet Properties <table> <tr> <td>Comm Detector Used</td> <td>1</td> </tr> <tr> <td>Comm Strength</td> <td>4181</td> </tr> <tr> <td>Data Packet Error</td> <td>6</td> </tr> <tr> <td>Num Bytes In Packet</td> <td>3</td> </tr> <tr> <td>Packet Data</td> <td>0x01 0xFF 0xFE</td> </tr> <tr> <td>Packet Status</td> <td>No Errors</td> </tr> <tr> <td>Preamble Count</td> <td>14</td> </tr> </table>		Comm Detector Used	1	Comm Strength	4181	Data Packet Error	6	Num Bytes In Packet	3	Packet Data	0x01 0xFF 0xFE	Packet Status	No Errors	Preamble Count	14		
Comm Detector Used	1																
Comm Strength	4181																
Data Packet Error	6																
Num Bytes In Packet	3																
Packet Data	0x01 0xFF 0xFE																
Packet Status	No Errors																
Preamble Count	14																
Timing Properties <table> <tr> <td>Bit Time Us</td> <td>495</td> </tr> <tr> <td>Carrier Frequency Hz</td> <td>168384</td> </tr> <tr> <td>Duration</td> <td>00:00:00.0166290</td> </tr> <tr> <td>End Time</td> <td>4200006</td> </tr> <tr> <td>End Timestamp</td> <td>00:00:04.2000060</td> </tr> <tr> <td>Modulation Frequency Hz</td> <td>2020</td> </tr> <tr> <td>Start Time</td> <td>4183377</td> </tr> <tr> <td>Start Timestamp</td> <td>00:00:04.1833770</td> </tr> </table>		Bit Time Us	495	Carrier Frequency Hz	168384	Duration	00:00:00.0166290	End Time	4200006	End Timestamp	00:00:04.2000060	Modulation Frequency Hz	2020	Start Time	4183377	Start Timestamp	00:00:04.1833770
Bit Time Us	495																
Carrier Frequency Hz	168384																
Duration	00:00:00.0166290																
End Time	4200006																
End Timestamp	00:00:04.2000060																
Modulation Frequency Hz	2020																
Start Time	4183377																
Start Timestamp	00:00:04.1833770																

The WPC Document (at page 143) describes how this byte (the Signal Strength Value) is used for providing optimal power transfer:

6.3.1 Signal Strength Packet (0x01)

Table 6-4 defines the format of the message contained in a Signal Strength Packet

Table 6-4: Signal Strength

	b ₇	b ₆	b ₅	b ₄	b ₃	b ₂	b ₁	b ₀
B ₀	Signal Strength Value							

Signal Strength Value The unsigned integer value in this field indicates the degree of coupling between the Primary Cell and Secondary Coil, with the purpose to enable Power Transmitters that use Free Positioning to determine the Primary Cell that provides optimum power transfer (see also Annex C). To determine the degree of coupling, the Power Receiver shall monitor the value of a suitable variable during a Digital Ping. Examples of such variables are:

- The rectified voltage.
- The open circuit voltage (as measured at the output disconnect switch).
- The received Power (if the rectified voltage is actively or passively clamped during a Digital Ping).

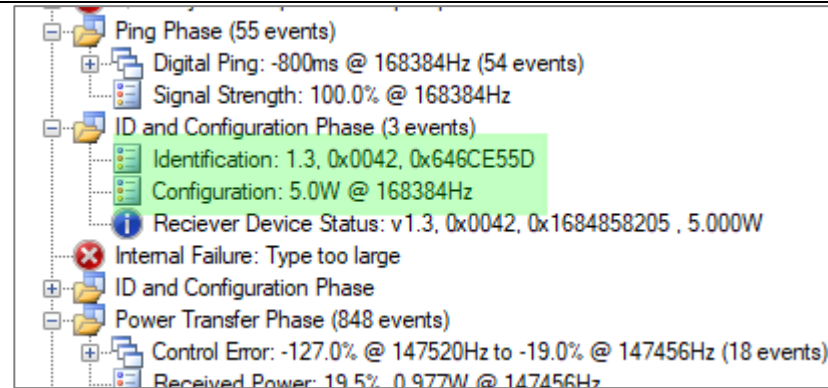
The variable that is chosen shall result in a Signal Strength Value that increases monotonically with increasing degree of coupling. The Signal Strength Value is reported as

$$\text{Signal Strength Value} = \frac{U}{U_{\max}} \cdot 256,$$

where U is the monitored variable, and $U_{\max}$ is the maximum value, which the Power Receiver expects for that variable during a Digital Ping. Note that the Power Receiver shall set the Signal Strength Value to 255 in the case that $U \geq U_{\max}$.

The Galaxy S23 uses the signal strength to adjust, for example, its transmit frequency.

Most relevant to this limitation [of this Row 1K] are the Identification Packet (*see* page 147 of the WPC specification, System Description Wireless Power Transfer, Vol. I: Low Power, Part 1, Interface Definition, Version 1.1.2, June 2013 (as used herein, the "WPC Specification"), and the Configuration Packet (*see* page 146 of the WPC Specification, also known as "Qi"). Both packets are shown more clearly in the image below, which shows the "sniff" results from the packet sniffer:



The Identification Packet is used by the S23 to "*identify a type of said secondary wireless power receiver.*"

This is clear from the Qi WPC specification:

6.3.8 Identification Packet (0x71)

Table 6-12 defines the format of the message contained in an Identification Packet.

Table 6-12: Identification

	b ₇	b ₆	b ₅	b ₄	b ₃	b ₂	b ₁	b ₀
B ₀	Major Version				Minor Version			
B ₁	(msb) Manufacturer Code (lsb)							
B ₂								
B ₃	Ext	(msb) Basic Device Identifier (lsb)						
⋮								
B ₆								

Major Version The combination of this field and the Minor Version field identifies to which revision of the System Description Wireless Power Transfer the Power Receiver complies. The Major Version field shall contain the binary coded digit value 0x1.

Minor Version The combination of this field and the Major Version field identifies to which minor revision of the System Description Wireless Power Transfer the Power Receiver complies. The Minor Version field shall contain the binary coded digit value 0x1.

Manufacturer Code The bit string contained in this field identifies the manufacturer of the Power Receiver, as specified in [PRMC].

Ext If this bit is set to ZERO, the bit string

Manufacturer Code || Basic Device Identifier

identifies the Power Receiver. If this bit is set to ONE, the bit string

Manufacturer Code || Basic Device Identifier || Extended Device Identifier

identifies the Power Receiver (see also Section 6.3.9).

Basic Device Identifier The bit string contained in this field contributes to the identification of the Power Receiver. A Power Receiver manufacturer should ensure that the combination of Basic Device Identifier and Manufacturer ID is sufficiently unique. Embedding a serial number of at least 20 bits in the Basic Device Identifier is sufficient. Alternatively, using a (pseudo) random number generator to dynamically generate part of the Basic Device Identifier is sufficient as well, provided that the generated part complies with the following requirements:

WPC Document, p. 147.

		In addition or in the alternative to the above, the Maximum Power and Power Class fields (which are part of the Configuration Packet discussed below) each or together are used at least in part by the Accused Product to <i>"identify a type of said secondary wireless power receiver,"</i> and, therefore, meets this limitation. Thus, the Identification Packet or, in addition or in the alternative, the Configuration Packet, is used by the Accused Product to <i>"identify a type of said secondary wireless power receiver,"</i> and, therefore, meets this limitation. Moving to the limitation, <i>"identify a wireless protocol of said secondary wireless protocol,"</i> the S23 meets this limitation at least by the use of the Identification Packet alone, the Configuration Packet alone, or, in the alternative, together. As to the Identification Packet, the Accused Product also uses the "Major Version" and "Minor Version" fields to identify the version of the "System Description Wireless Power Transfer" of the WPC Specification that the secondary wireless power receiver uses. In addition or in the alternative, the Configuration Packet is used by the Accused Product to <i>"identify a wireless protocol of said secondary wireless protocol,"</i> and, therefore, meets this limitation. The "Prop" field of the Configuration Packet is shown as follows:
--	--	---

6.3.7 Configuration Packet (0x51)

Table 6-11 defines the format of the message contained in a Configuration Packet.

Table 6-11: Configuration

	b ₇	b ₆	b ₅	b ₄	b ₃	b ₂	b ₁	b ₀
B ₀	Power Class		Maximum Power					
B ₁	Reserved							
B ₂	Prop	Reserved			ZERO	Count		
B ₃	Window Size					Window Offset		
B ₄	Reserved							

Power Class This field contains an unsigned integer value that indicates the Power Receiver's Power Class. Power Receivers that comply with this version 1.1.2 of the System Description Wireless Power Transfer, Volume I, Part 1, shall set this field to 0.

Maximum Power Apart from a scaling factor, the unsigned integer value contained in this field indicates the maximum amount of power, which the Power Receiver expects to provide at the output of the rectifier. This maximum amount of power is calculated as follows:

$$P_{\max} = \left(\frac{\text{Maximum Power}}{2} \right) \times 10^{\text{Power Class}} \text{ W.}$$

Prop If this bit is set to ZERO, the Power Transmitter shall control the power transfer according to the method defined in Section 5.2.3.1. If this bit is set to ONE, the Power Transmitter may control the power transfer according to a proprietary method instead of the method defined in Section 5.2.3.1. However, if this bit is set to ONE, the Power Transmitter shall continue to ensure that the received Control Error Packets comply with the timings defined in Section 5.2.3. (Informative) *This implies that a Power Transmitter terminates the power transfer if it times out when waiting for a Control Error Packet. Moreover, this implies that setting the Prop bit to ONE does not relieve the Power Receiver from transmitting Control Error Packets on a regular basis. Finally, if the Prop bit is set to ZERO, the Power Transmitter could still decide to abort the power transfer based on information contained in a Proprietary Packet.*

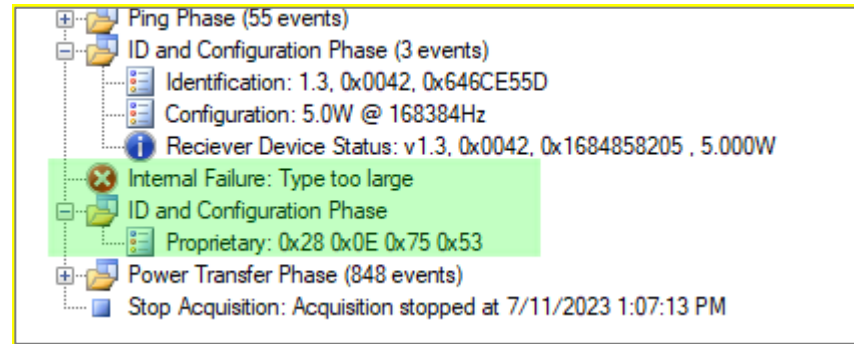
WPC Document, p. 146.

In addition to the above or in the alternative, the Prop field appears to be a message from a device such as the Buds2 that describes how it would like to be charged. In other words, it defines a “wireless power protocol.”

In addition to the above or in the alternative, the Maximum Power and Power Class fields each or together constitute "a wireless power protocol."

For at least these reasons, alone or in combination, the secondary circuitry of the S23 is configured to satisfy the limitation: *"identify a wireless power protocol of said secondary wireless power receiver;"*

In addition or in the alternative, a packet that the Qi Sniffer identified as “Proprietary” is shown below within the group called “ID and Configuration Phase”:



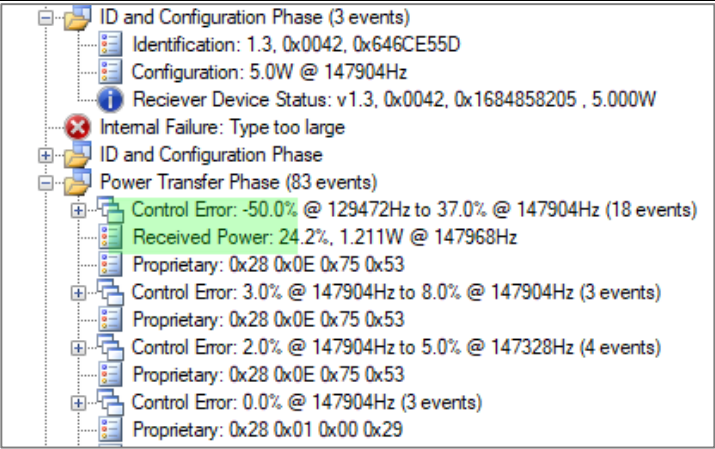
The fact that the “Proprietary” packet has been identified within the ID and configuration phase of the communication sequence, indicates that this packet contains information that both identifies the secondary device and identifies a protocol used in communication. On information and belief the “Proprietary” packet contains identification information of the secondary device and/or identification of a power protocol.

For at least these reasons, alone or in combination, the secondary circuitry of each of the S23 is configured to satisfy the limitation: *"identify a wireless power protocol of said secondary wireless power receiver."*

See also Row 1K of Exhibit 2 incorporated herein by reference.

Thus, the S23 meets the limitation “said second circuitry, on power-up of said secondary wireless power receiver, configured to identify a type of said secondary wireless power receiver and identify a wireless power protocol of said secondary wireless power receiver.”

		As stated above, WiPQTUS reserves its right to provide more detailed infringement contentions after full discovery for these devices and their components and any other similar chips used in the S23 as well as other technical information are produced.
1L	said [4] second circuitry , configured to receive and interpret data from said [6] secondary wireless power receiver in said identified wireless power protocol;	The S23 meets the limitation "said second circuitry, configured to receive and interpret data from said secondary wireless power receiver in said identified wireless power protocol." As shown above, each of the Identification Packet and Configuration Packet are received by the S23, each includes data (see format of packets above), and that data is interpreted by the Accused Product. In addition or in the alternative, the S23 is configured to receive packets during a "Power Transfer Phase" (<i>see</i> WPC Document, p. 130). In this phase, power is transferred from the device transmitting power to the device receiving power (for example, from the Galaxy S23 to the Buds2). To control power transferred between devices, the Qi standard requires packets to be sent from the device receiving power to the device transmitting power (for example, from the Buds2 to the Galaxy S23). WPC Document (at p. 130) describes the use of multiple packets sent from the power receiving device to the power transmitting device: 5.2.3 Power transfer phase In the <i>power transfer</i> phase, the Power Transmitter controls the power transfer to the Power Receiver, in response to control data that it receives from the latter. For this purpose, the Power Transmitter shall receive zero or more of the following Packets: - Control Error Packet. - Received Power Packet. - Charge Status Packet. - End Power Transfer Packet. For example, in the measurement taken between the Galaxy S23 and the Buds2, both Control Error packets and Receive Power packets were captured being sent from the Buds2 to the Galaxy S23:

		 The WPC Document (at page 145) indicates that these packets contain information required by the Galaxy S23 from the Buds2:
--	--	--

6.3.3 Control Error Packet (0x03)

Table 6-7 defines the format of the message contained in a Control Error Packet.

Table 6-7: Control Error

	b ₇	b ₆	b ₅	b ₄	b ₃	b ₂	b ₁	b ₀
B ₀	Control Error Value							

Control Error Value The (two's complement) signed integer value contained in this field ranges between -128...+127 (inclusive), and provides input to the Operating Point controller of the Power Transmitter. See Sections 5.2.3.1 and 5.3.4 for more details. Values outside the indicated range are reserved and shall not appear in a Control Error Packet.

6.3.4 Received Power Packet (0x04)

Table 6-8 defines the format of the message contained in a Received Power Packet.

Table 6-8: Received Power

	b ₇	b ₆	b ₅	b ₄	b ₃	b ₂	b ₁	b ₀
B ₀	Received Power Value							

Received Power Value The unsigned integer contained in this field indicates the average amount of power that the Power Receiver receives through its Interface Surface, in the time window indicated in the Configuration Packet. This amount of power is calculated as follows:

$$P_{\text{received}} = \left(\frac{\text{Received Power Value}}{128} \right) \times \left(\frac{\text{Maximum Power}}{2} \right) \times 10^{\text{Power Class}} \text{ W.}$$

Here, Maximum Power and Power Class are the values contained in the Configuration Packet (see Section 6.3.7). Annex D defines how a Power Receiver shall determine its Received Power P_{received} .

For at least these reasons the secondary circuitry of each the S23 satisfies the limitation:
“configured to receive and interpret data from said [6] secondary wireless power receiver in said identified wireless power protocol.”

The S23 receives and interprets data in each of the aforementioned packets.

See also Row 1L of Exhibit 2, incorporated herein by reference.

Thus, the S23 meets the limitation “said second circuitry, configured to receive and interpret data from said secondary wireless power receiver in said identified wireless power protocol.”

		As stated above, WiPQTUS reserves its right to provide more detailed infringement contentions after full discovery for these devices and their components and any other similar chips used in the S23 as well as other technical information are produced.
1M	said [4] second circuitry , based on said interpretation, configured to perform a function associated with said transmitted power in conjunction with said first circuitry.	Each of the S23 meets the limitation "said second circuitry, based on said interpretation, configured to perform a function associated with said transmitted power in conjunction with said first circuitry." For example, the following explanation is found on page 19 of the P9415 Datasheet: "Based on the received packet, the P9415 will adjust the operating frequency to match the transmitted power level to the required receiver power level for reliable and efficient power transfer." This functionality, matching the transmitted power level to the required power level, meets the limitation "a function." The S23 performs the aforementioned function while charging another device as can easily be demonstrated. <i>See</i> also Exhibit 2, row 1M, incorporated herein by reference. Therefore, on information and belief, the MIW04X02 has "second circuitry" that is materially the same as the P9415 and/or P9320. Thus, the S23 meets the limitation "said second circuitry, based on said interpretation, configured to perform a function associated with said transmitted power in conjunction with said first circuitry." As stated above, WiPQTUS reserves its right to provide more detailed infringement contentions after full discovery for these devices and their components and any other similar chips used in the S23 as well as other technical information are produced.
Claim 2	The dual mode wireless power receiver of claim 1, wherein said switch network of said first circuitry is configured as	The S23 meets this limitation. The S23 has "[t]he dual mode wireless power receiver of claim 1, wherein said switch network of said first circuitry is configured as one of an inverter and a rectifier."

	one of an inverter and a rectifier.	<i>See</i> Row 1D above, incorporated herein by reference as if set forth in full. <i>See also</i> Row 1D of Exhibit 2, incorporated herein by reference. As stated above, WiPQTUS reserves its right to provide more detailed infringement contentions after full discovery for these devices and their components and any other similar chips used in the S23 as well as other technical information are produced.
--	--	---

Exhibit 4 – Claim Chart Showing Infringement of '339 Patent, Claims 1 and 2, by the Samsung Galaxy S23 Ultra

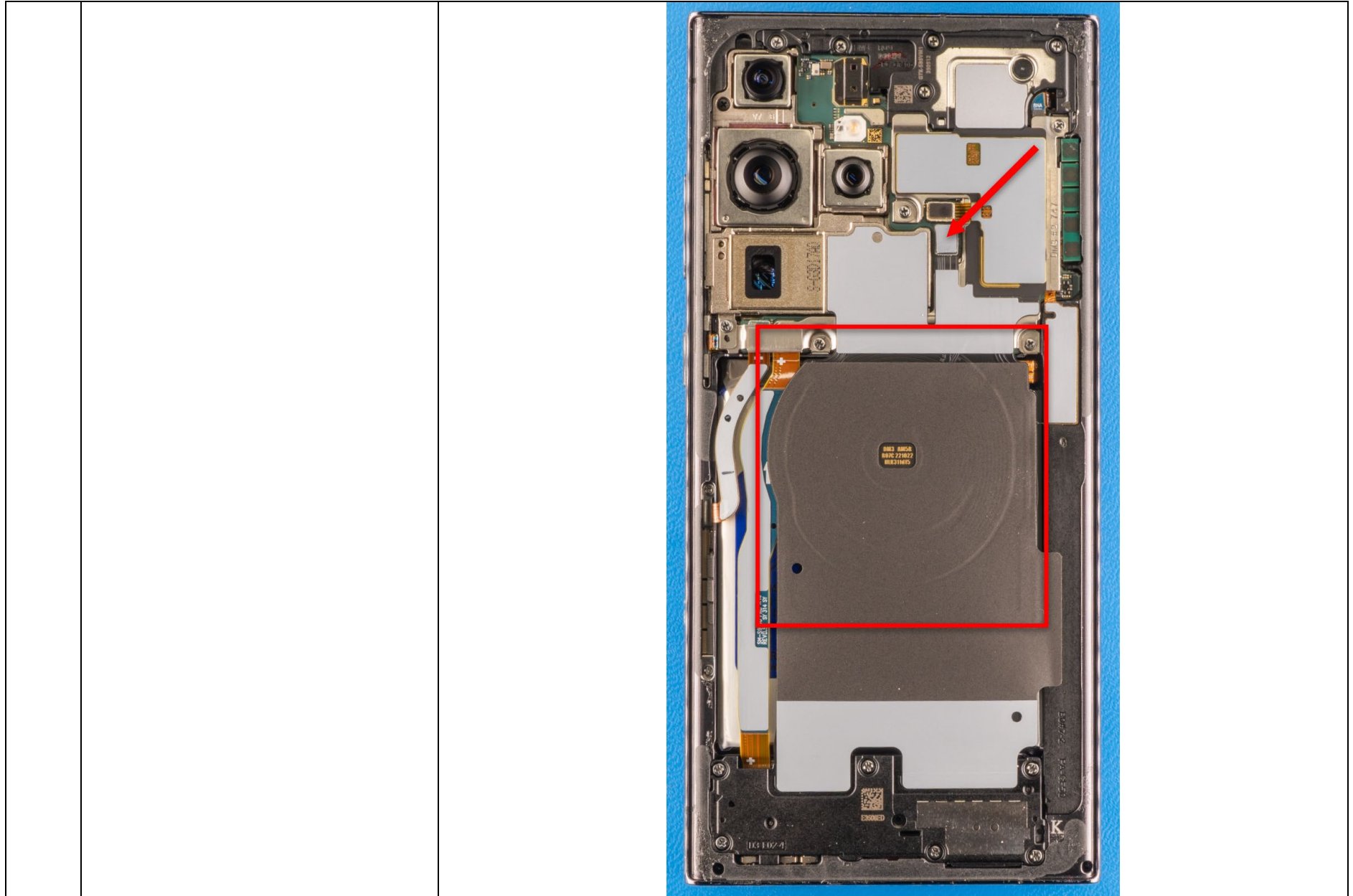
The following is intended to supplement the disclosures provided in Exhibit 2, which is incorporated herein by reference. The following Claim Chart is in addition to the allegations made in the Complaint, Dkt. 1, which is incorporated herein as if set forth in full. Furthermore, this Claim Chart is intended to be read as a whole for the purpose of providing reasonable notice of WiPQTUS' infringement contentions. While some evidence is cited herein, WiPQTUS is under no obligation to marshal all evidence, and the citation of some evidence should in no way be interpreted as excluding other evidence that WiPQTUS may rely upon. WiPQTUS' investigation is ongoing.

WiPQTUS has based its contentions on a reasonable and diligent review of publicly available information. As such WiPQTUS cannot provide complete and final infringement contentions until Samsung and/or its third-party suppliers, such as Renesas and Convenient Power, respond to WiPQTUS' discovery requests, provide deponents, and produce information that is not publicly available. A partial list, without limitation to other documents and information that may be sought, of non-public documents or information that are highly relevant and should be produced before WiPQTUS is required to provide more complete infringement contentions are the following: (1) datasheets for the chip labelled CPS4038 apparently made by Convenient Power, and any other datasheets for similar wireless power transceiver chips used by Samsung in the S23 Ultra that provides Wireless PowerShare functionality; (2) circuit diagrams containing more detailed internal and external (to the chip) circuits than found in the datasheet(s); (3) the Functional Specification Document ("FSD") for each of the chip labelled CPS4038 apparently made by Convenient Power; (4) System Design Documents; (5) software or firmware specifications; (6) source code for the code run by the ARM or other processor believed to be within the aforementioned chip(s); and (7) at least source code for the modules associated with Wireless PowerShare (as defined in Complaint, ¶ 22) that run on one or more additional controllers or processors within the S23 Ultra (beyond or outside the aforementioned chips), and possibly other source code.

In addition, WiPQTUS cannot provide complete infringement contentions until the claims have been construed. For these Preliminary Infringement Contentions, WiPQTUS relies on the plain and ordinary meaning that the limitations would have to a person of ordinary skill in the art. WiPQTUS reserves the right to amend these contentions in the event that the Court construes terms of the Asserted Claims.

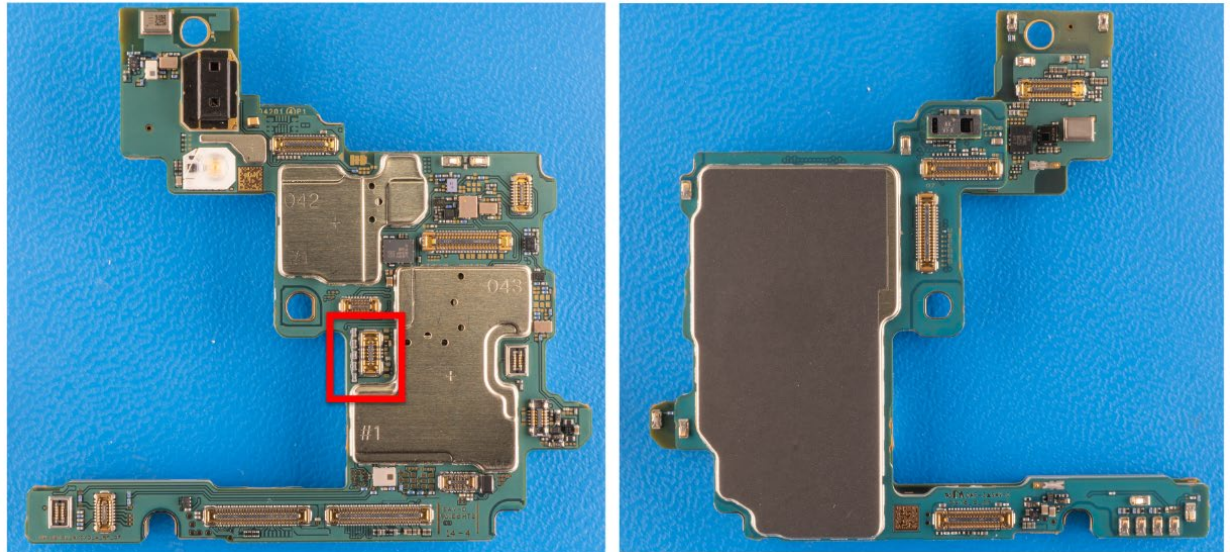
Cl. 1	Claim Limitation	Each limitation is met by the Samsung Galaxy S23 Ultra.
1A	[1] <i>A dual mode wireless power receiver</i> configured to selectively	To the extent the preamble is construed as a limitation, the preamble is met by the S23 Ultra.

apply a received power to a load device and utilize at least a part of the stored power to power-up [6] <i>a secondary wireless power receiver</i> and communicate with said secondary wireless power receiver to cause an action or transaction or charge said secondary wireless power receiver's load device, said dual mode wireless power receiver comprising:	The S23 Ultra has a "dual mode wireless power receiver" capable of operating as a receiver of wireless power or as a transmitter of wireless power alone or in combination with other components. By way of example and not as a limitation, the Samsung Galaxy S23 Ultra has an CSP4038 chip to provide bi-directional wireless charging, aka “PowerShare.” The following photographs show a disassembled Galaxy S23 Ultra:
--	---



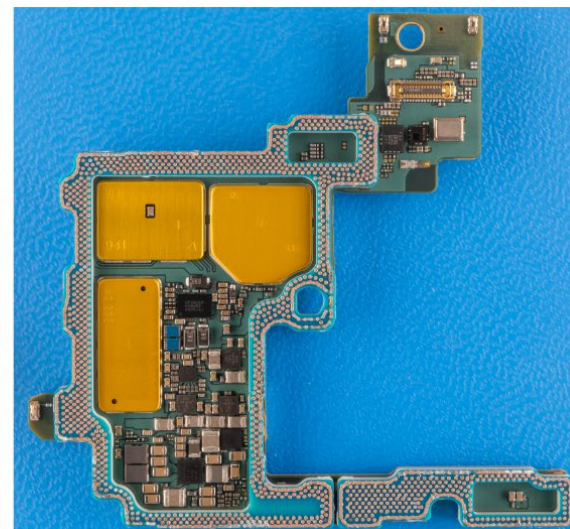
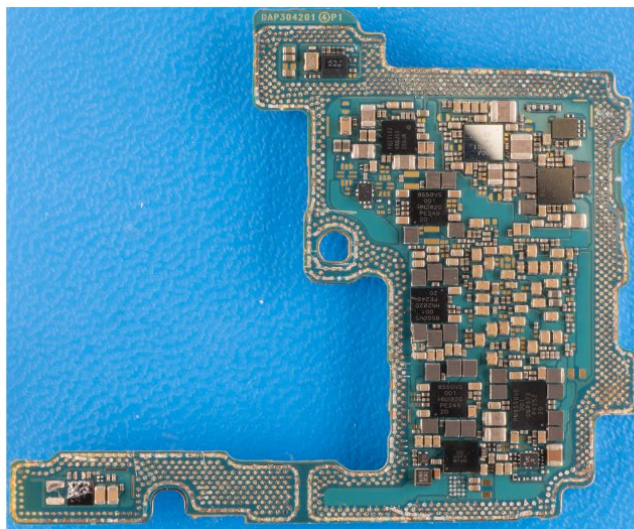
A coil used for wireless charging is highlighted (by the red box) in the image above. The red arrow points to the connector that connects the coil to the main PCB of the S23 Ultra.

The following figure shows the top side of the main PCB (left image) and the bottom side of the main PCB (right image):

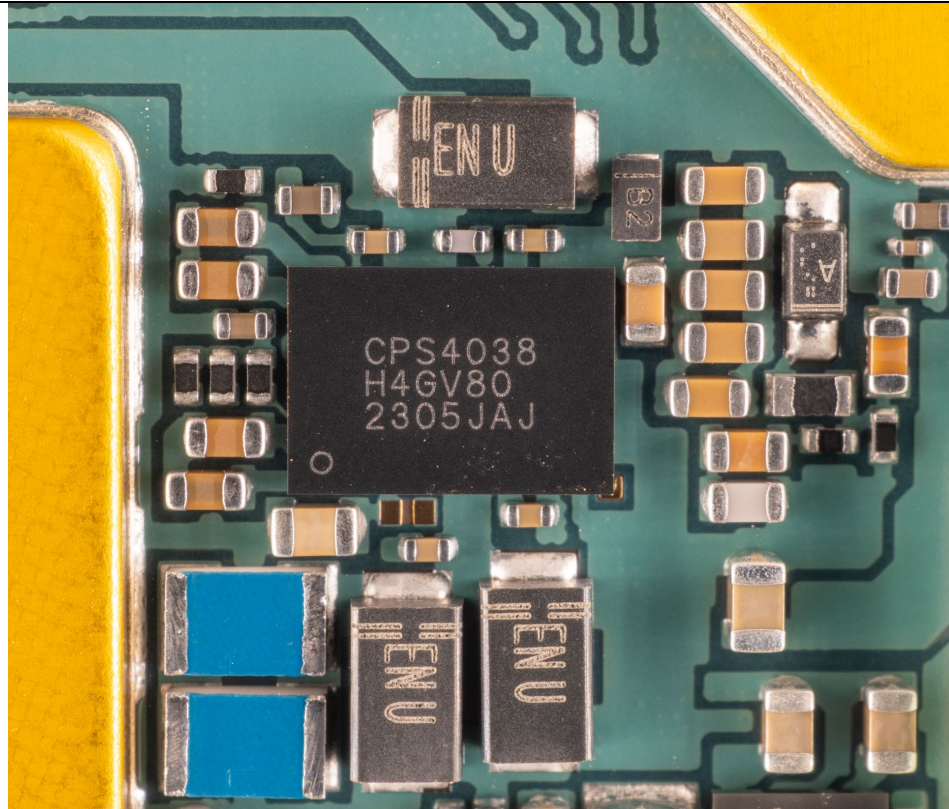


The red box in the left image above identifies where the coil connects to the main PCB.

The main PCB is composed of two circuit boards “sandwiched” together. The following image shows the circuitry in between the two circuit boards after they have been separated:



The PCB on the right of the image corresponds to the top side of the main PCB described above, the center of this PCB is shown in the image below.

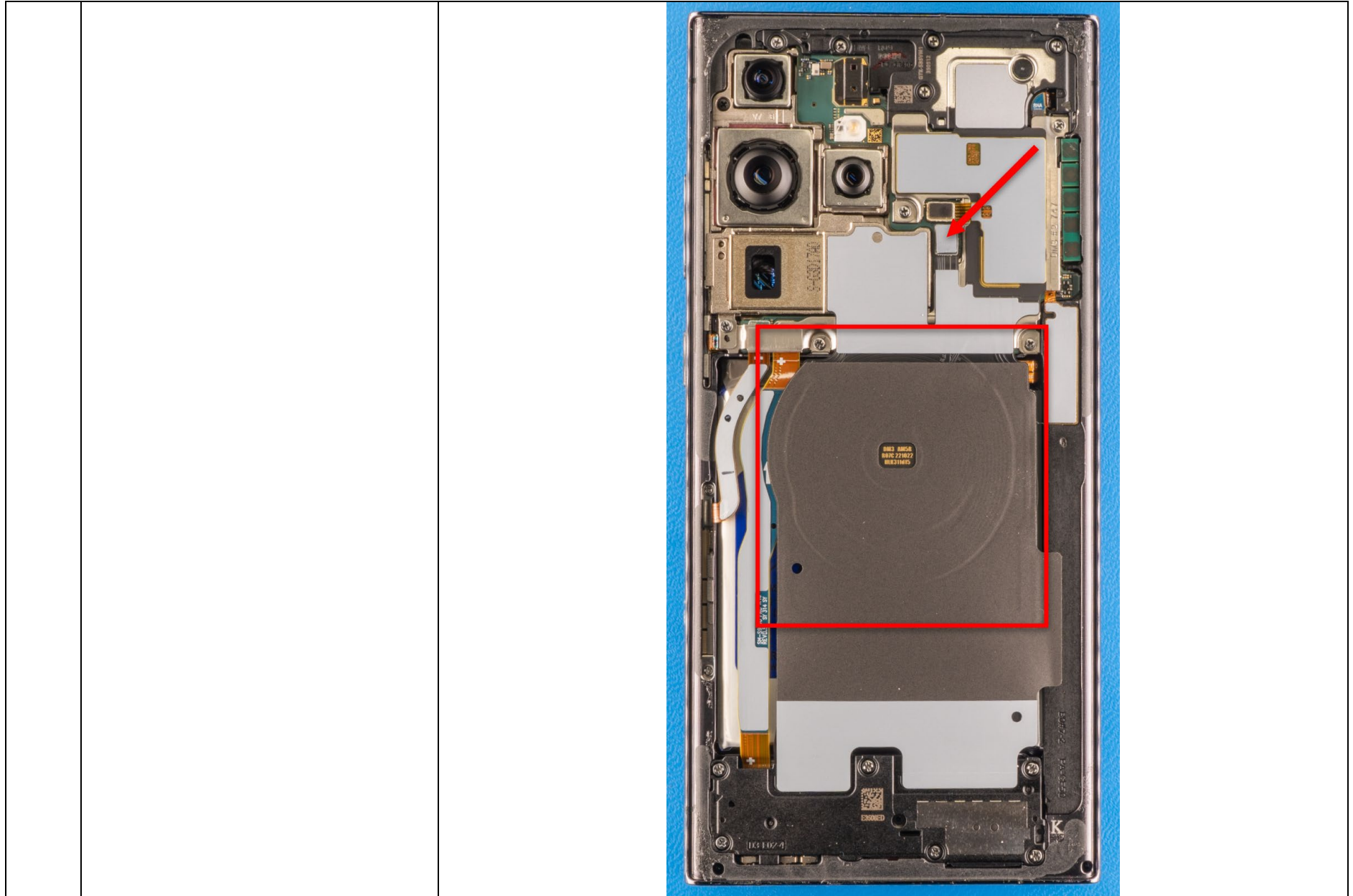


The text on the chip identifies it as a CSP4038. The datasheets for this device is not in the public domain but will be sought in discovery in this matter. Therefore, WiPQTUS cannot provide complete infringement contentions until the datasheet for the CSP4038, and any other similar chips used in the S23 Ultra as well as other technical information are produced.

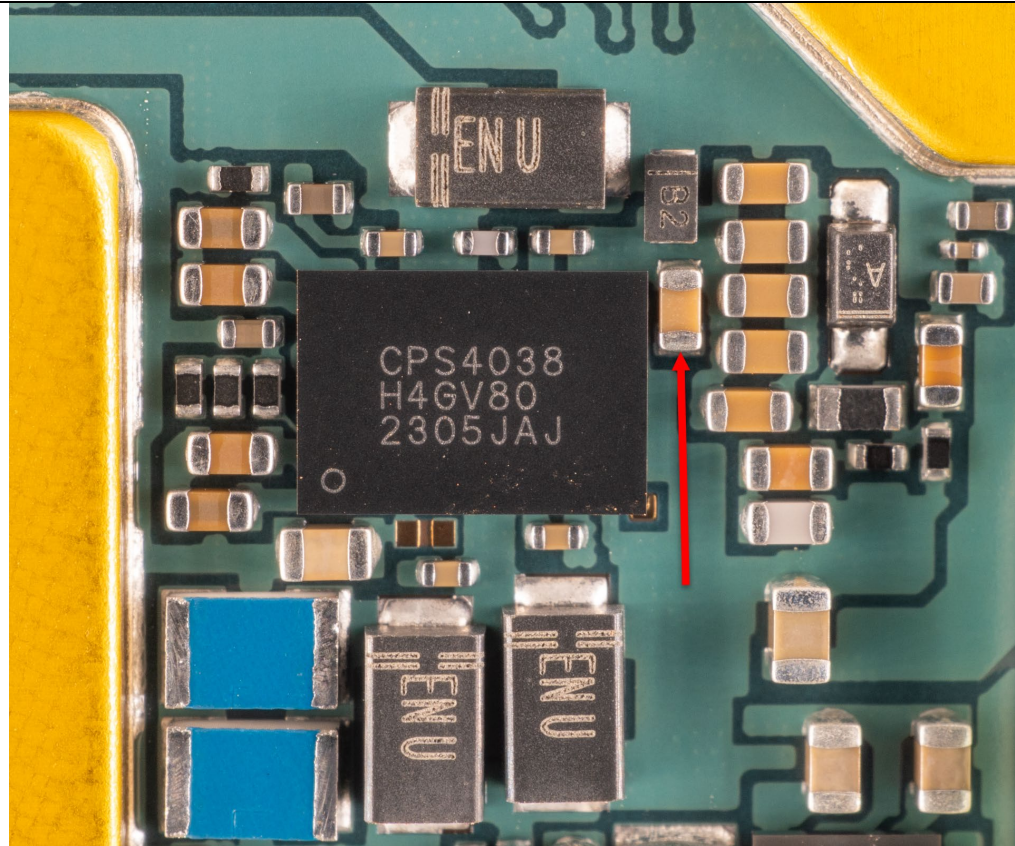
The S23 Ultra is capable of implementing the functionality that Samsung refers to as "Wireless PowerShare."

For example, and not as a limitation, using Wireless PowerShare, the S23 Ultra "can reverse wireless charge another phone, watch, or Galaxy Buds."

		https://www.samsung.com/au/support/mobile-devices/how-to-use-powershare-on-your-galaxy-phone/ (last accessed 05/11/2023). As an example and not as a limitation, the Galaxy S23 Ultra can charge at least Samsung Galaxy Buds, including Galaxy Buds2 Pro. Other devices are shown in the following Samsung publication: https://www.samsung.com/us/support/answer/ANS00047798/ (last accessed 05/24/2023). As an example and not as a limitation, a device such as a "phone, watch, or Galaxy Buds" meets the limitation "secondary wireless power receiver." As an example and not as a limitation, each of the, for example, "phone, watch, or Galaxy Buds" has a battery that constitutes a "load device." <i>See also</i> Row 1A of Exhibit 2, incorporated herein by reference. As stated above, WiPQTUS reserves its right to provide more detailed infringement contentions after full discovery for these devices and their components and any other similar chips used in the S23 Ultra as well as other technical information are produced.
1B	[2] one of coil and capacitor electrodes;	The S23 Ultra meets this limitation. For example, the S23 Ultra includes at least one coil for both receiving and transmitting wireless power. In the following teardown photograph of the S23 Ultra, the one or more coils is readily seen:



		<i>See also</i> Row 1B of Exhibit 2, incorporated herein by reference. Thus, the S23 Ultra meets this limitation. As stated above, WiPQTUS reserves its right to provide more detailed infringement contentions after full discovery for these devices and their components and any other similar chips used in the S23 Ultra as well as other technical information are produced.
1C	[3] a first circuitry comprising: [i] an impedance network;	The S23 Ultra meets the limitation "a first circuitry comprising: [i] an impedance network." As shown in the teardown below, the CSP4038 is connected to external capacitors in a similar pattern and of similar values as shown in Exhibit 2 in Row C.



Additionally, a continuity test with a digital multimeter (DMM) was performed and proved that the point indicated by the arrow above is connected directly to the coil identified in 1B.

See also Row 1C of Exhibit 2, incorporated herein by reference.

Thus, the S23 Ultra meets this limitation.

As stated above, WiPQTUS reserves its right to provide more detailed infringement contentions after full discovery for these devices and their components and any other similar chips used in

		the S23 Ultra as well as other technical information are produced.
1D	[[3] a first circuitry comprising:] [ii] a switch network;	<i>(Note: "a first circuitry" does not appear in front of limitations [ii] and [iii] as written, but it is included here for reference and convenience as indicated by the brackets [...]).</i> The S23 Ultra meets the limitation "a first circuitry comprising: ... [ii] a switch network." Based on the similarities of the pin-outs and the layout of the external (to the chip) components as well as the packet-sniffing results shown below, the CSP4038 appears to be materially (as to the Asserted Claims) the same as the P9415 and/or P9320. <i>See</i> Exhibit 2, incorporated herein by reference. For example, and not as a limitation, when the S23 Ultra is in the receive power mode, such as when it is being charged by, for example, a wireless power charging station, the switch network is configured to act as a rectifier. When the S23 Ultra is acting as a transmitter of power, such as, for example, when the Wireless PowerShare functionality is activated, the switch network is configured as an inverter. <i>See also</i> Row 1D of Exhibit 2, incorporated herein by reference. Thus, the S23 Ultra meets the limitation "a first circuitry comprising: ... [ii] a switch network; As stated above, WiPQTUS reserves its right to provide more detailed infringement contentions after full discovery for these devices and their components and any other similar chips used in the S23 as well as other technical information are produced.
1E	[[3] a first circuitry comprising:] [iii] a filter capacitor;	<i>(Note: "a first circuitry" does not appear in front of limitations [ii] and [iii] as written, but it is included here for reference and convenience as indicated by the brackets [...]).</i> On information and belief, the S23 Ultra includes "first circuitry" that includes "a filter capacitor." <i>See also</i> Row 1E of Exhibit 2, incorporated herein by reference.

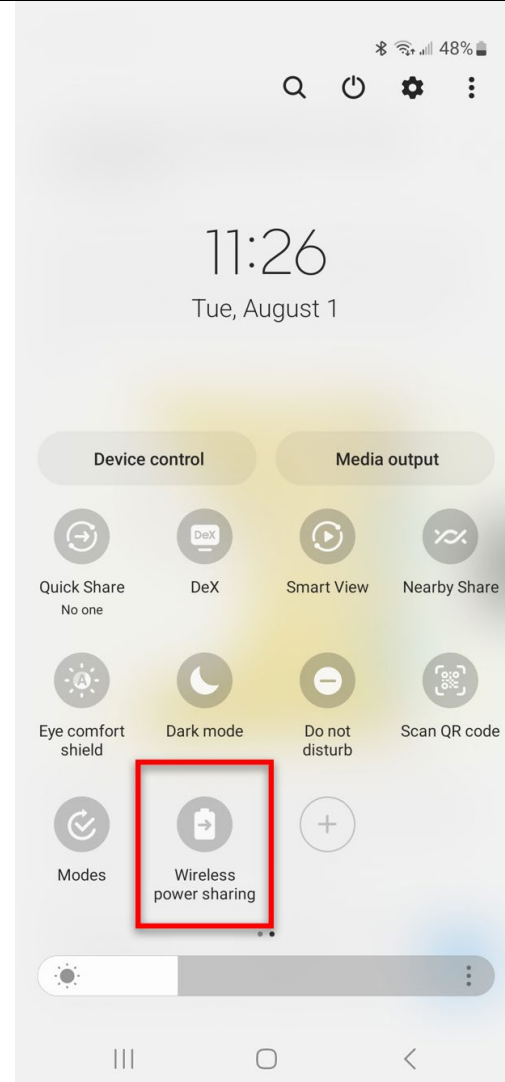
		In conclusion, the S23 Ultra meets the limitation [3], which is "a first circuitry" including the "impedance network," "switch network," and "filter capacitor" as shown above. As stated above, WiPQTUS reserves its right to provide more detailed infringement contentions after full discovery for these devices and their components and any other similar chips used in the S23 Ultra as well as other technical information are produced.
1F	[4] a second circuitry comprising: [i] a control logic circuit; and	The S23 Ultra meets the limitation "a second circuitry comprising: a control logic circuit." As an example and not as a limitation, on information and belief, the S23 Ultra includes a controller. <i>See also</i> Row 1F of Exhibit 2, incorporated herein by reference. Thus, the S23 Ultra meets the limitation "[4] a second circuitry comprising: [i] a control logic circuit." As stated above, WiPQTUS reserves its right to provide more detailed infringement contentions after full discovery for these devices and their components and any other similar chips used in the S23 Ultra as well as other technical information are produced.

1G	[[4] a second circuitry comprising:] [ii] a modulator/demodulator circuit;	<i>(Note: "a second circuitry" does not appear in front of limitation [ii] as written, but it is included here for reference and convenience as indicated by the brackets [...]).</i> On information and belief, the S23 Ultra meets the limitation [4] a second circuitry comprising ... [ii] a modulator/demodulator circuit." As shown in 1K below, the packet captures from the S23 Ultra demonstrate that communications by the S23 Ultra when acting as a receiver and when acting as a transmitter of power are the same as those observed in the study of the S10+ as shown in Exhibit 2. Therefore, by necessary implication, the S23 Ultra has a modulator/demodulator circuit. <i>See also</i> Row 1G of Exhibit 2, incorporated herein by reference. Thus, the S23 Ultra meets the limitation "a modulator/demodulator circuit." In conclusion, the S23 Ultra meets the limitation [4], which is "a second circuitry" including the "a control logic circuit" and "a modulator/demodulator circuit" as shown above. WiPQTUS' investigation is ongoing. WiPQTUS cannot provide complete and final contentions as to this limitation until discovery has occurred.
1H	said [3] first circuitry configured to receive said power from [5] a wireless power transmitter;	The S23 Ultra includes "first circuitry" "configured to receive" "power from [5] a wireless power transmitter." The term "[5] a wireless power transmitter" is merely the environment with which the first circuitry interacts, it provides the "received power" referenced in the preamble, but does not constitute a limitation. Nevertheless, as an example, and not as a limitation, of "a wireless power transmitter" that can be used to charge the S23 Ultra. <i>See</i> https://www.samsung.com/us/mobile/mobile-accessories/phones/15w-wireless-charger-duo-with-ta-dark-gray-ep-p5400tbegus/ (last accessed May 18, 2023). Samsung's S23 is also designed to be compatible with wireless chargers manufactured other than by Samsung. <i>See, e.g.,</i>

		https://www.samsung.com/us/support/answer/ANS00047798/ (describing compatibility with Qi-Compatible devices); https://developer.samsung.com/mobile/wireless-fast-charge.html (describing compatibility with Wireless Power Consortium standards). The S23 Ultra is “configured to receive said power from a wireless power transmitter” as shown, for example, and not as a limitation the Samsung Document, “Use Wireless charging or PowerShare with Galaxy devices,” https://www.samsung.com/us/support/answer/ANS00047798/ (last accessed May 18, 2023). <i>See also</i> Row 1H of Exhibit 2, incorporated herein by reference. In conclusion, the S23 Ultra meets the limitation “said [3] first circuitry configured to receive said power from a wireless power transmitter.” As stated above, WiPQTUS reserves its right to provide more detailed infringement contentions after full discovery for these devices and their components and any other similar chips used in the S23 as well as other technical information are produced.
11	said [3] first circuitry, based on an input from said control logic circuit, configured to change impedance of said impedance network and topology of said switch network to obtain a modified form of said received power, and apply said modified form	The S23 Ultra meets the limitation "said [3] first circuitry, based on an input from said control logic circuit, configured to change impedance of said impedance network and topology of said switch network to obtain a modified form of said received power, and apply said modified form of said power to said load device." The "first circuitry" identified above, is "configured to" "change impedance of said impedance network and topology of said switch network to obtain a modified form of said received power" based on "an input from said control logic circuitry." For example, and not as a limitation, as shown above, the "first circuitry" is configured to receive power from a "wireless power transmitter."

	of said power to said load device;	The S23 Ultra is "configured to change impedance of said impedance network" at various stages of operation. The S23 Ultra is "configured to change ... topology of said switch" at various stages of operation. <i>See also</i> Row 1I of Exhibit 2, incorporated herein by reference. Thus, the S23 Ultra meets the limitation "said first circuitry, based on an input from said control logic circuit, configured to change impedance of said impedance network and topology of said switch network to obtain a modified form of said received power, and apply said modified form of said power to said load device." As stated above, WiPQTUS reserves its right to provide more detailed infringement contentions after full discovery for these devices and their components and any other similar chips used in the S23 Ultra as well as other technical information are produced.
1J	said [3] first circuitry, based on an input from said control logic circuit, configured to change said topology of said switch network and said impedance of said impedance network to transmit at least part of said stored power to said [6] secondary wireless power receiver to power-up	The S23 Ultra meets the limitation "said [3] first circuitry, based on an input from said control logic circuit, configured to change said topology of said switch network and said impedance of said impedance network to transmit at least part of said stored power to said [6] secondary wireless power receiver to power-up said secondary wireless power receiver." Addressing the "<i>change said topology of said switch network</i>" limitation, as one example, and not as a limitation, an Accused Product, for example, the Galaxy S23 Ultra, may be configured by a user through selecting "Wireless PowerSharing" in the swipe down menu of the phone (<i>see figure below</i>) to act as a power transmitter to charge a "secondary wireless power receiver," examples of which are shown above.

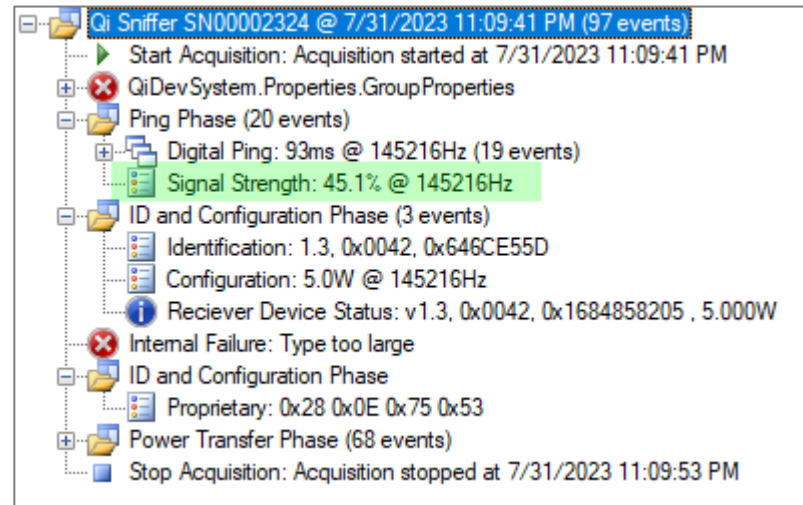
said secondary
wireless power
receiver;



		<i>See also</i> Row 1J of Exhibit 2, incorporated herein by reference. Thus, the S23 Ultra meet the limitation “<i>said first circuitry, based on an input from said control logic circuit, configured to change said topology of said switch network... .</i>” As to the “<i>configured to change ... said impedance of said impedance network</i>” limitation, based on the similarities of the pin-outs and the layout of the external (to the chip) components as well as the packet-sniffing results shown below, the CSP4038 appears to be materially (as to the Asserted Claims) the same as the P9415 and/or P9320. <i>See</i> Exhibit 2, incorporated herein by reference. As an example, when the S23 Ultra is wirelessly connected to a base station for charging, capacitors are switched on, that is, connected to ground, at various times to communicate with the base station. Alternatively, or in addition to the above, the impedance of the impedance network within the S23 Ultra is configured to change due to the Accused Product’s ability to adjust the frequency of the power signal. <i>See also</i> Row 1J of Exhibit 2, incorporated herein by reference. Thus, the S23 Ultra meets the limitation “said first circuitry, based on an input from said control logic circuit, configured to change said topology of said switch network and said impedance of said impedance network to transmit at least part of said stored power to said secondary wireless power receiver to power-up said secondary wireless power receiver.” As stated above, WiPQTUS reserves its right to provide more detailed infringement contentions after full discovery for these devices and their components and any other similar chips used in the S23 Ultra as well as other technical information are produced.
1K	said [4] second circuitry , on power-up of <i>said [6] secondary wireless power receiver</i> ,	The S23 Ultra meets the limitation "said second circuitry, on power-up of said secondary wireless power receiver, configured to identify a type of said secondary wireless power receiver and identify a wireless power protocol of said secondary wireless power receiver."

	configured to identify a type of said secondary wireless power receiver and identify a wireless power protocol of said secondary wireless power receiver;	The S23 Ultra with the Wireless PowerShare functionality is capable of powering-up a "secondary wireless power receiver" such as, for example and not as a limitation, those shown in https://www.samsung.com/us/support/answer/ANS00047798/ (last accessed 05/24/2023). Other examples of "secondary wireless power" receivers, are, without limitation, Galaxy Watch Active and Active2, Galaxy Buds, Galaxy Buds2, Galaxy Buds+, Galaxy Buds Live, Galaxy Buds Pro, Galaxy Buds2 Pro, Galaxy Watch, Galaxy Watch3, Galaxy Watch 4 series, Galaxy Watch5 series, Gear Sport, Gear S3, , Galaxy S7/S7 Edge, S8/S8+. Note8, Note9, Galaxy Watch Active , and Galaxy Watch Active 2. Galaxy Watch, Galaxy Buds+ and Galaxy Buds. As explained by Samsung, "[m]ost Qi-Compatible Samsung devices can be charged with Wireless PowerShare... ." <i>Id.</i> In addition or in the alternative, while discovery is needed, additional Samsung wearables may be chargeable using Wireless PowerShare. In addition or in the alternative, additional non-Samsung devices may be charged by the S23 Ultra using Wireless PowerShare. In addition or in the alternative, while discovery is needed, additional non-Samsung, non-Qi compatible devices may be charged by the S23 Ultra using Wireless PowerShare. On power-up, the (secondary) wireless power receiver communicates information as per the protocol integrated within it. The "second circuitry" (identified above) of the S23 Ultra decodes the received information and identifies the protocol used by the secondary wireless power receiver. As an example, and not as a limitation, communications between the S23 Ultra and a Buds2 device were captured very shortly after the moment when the Buds2 device is placed on the S23 Ultra. The Buds2 device was only partially charged. To record the communications between the phone and the Buds2 device, a Qi packet sniffer can be used to "sniff" Qi data packets exchanged between a Samsung GalaxyS23 Ultra and a Galaxy Buds2 Pro device. An example of a Qi Packet Sniffer is the Avnet Qi Sniffer v 1.3 (available at https://www.avnet.com/shop/us/products/avnet-engineering-services/101-01-3074457345632566717?autoSuggestSearchTerm=qi%2520sniffer), which was used to capture the information below.
--	--	---

One of the very first packets sent by the Buds2 device to the Galaxy S23 Ultra is the "Signal Strength Packet" which is shown in the capture below:



The content within the Signal Strength packet is a single byte indicating the signal strength between the phone and the Buds2. This byte contained within the packet identified above is highlighted below:

Common Properties	
EventNumber	27
LogData	Signal Strength: 45.1% @ 145216Hz
Summary	45.1% @ 145216Hz
TypeString	Signal Strength
Event Properties	
FieldStrength	3069
Signal	45.0980377
Value	45.0980377
Packet Properties	
CommDetectorUsed	1
CommStrength	4187
DataPacketError	6
NumBytesInPacket	3
PacketData	0x01 0x73 0x72
PacketStatus	NoErrors
PreambleCount	15
Timing Properties	
BitTimeUs	496
CarrierFrequencyHz	145216
Duration	00:00:00.0165230
EndTime	4742577
EndTimestamp	00:00:04.7425770
ModulationFrequencyHz	2016
StartTime	4726054
StartTimestamp	00:00:04.7260540

The WPC Document (at page 143) describes how this byte (the Signal Strength Value) is used for providing optimal power transfer:

6.3.1 Signal Strength Packet (0x01)

Table 6-4 defines the format of the message contained in a Signal Strength Packet

Table 6-4: Signal Strength

	b ₇	b ₆	b ₅	b ₄	b ₃	b ₂	b ₁	b ₀
B ₀	Signal Strength Value							

Signal Strength Value The unsigned integer value in this field indicates the degree of coupling between the Primary Cell and Secondary Coil, with the purpose to enable Power Transmitters that use Free Positioning to determine the Primary Cell that provides optimum power transfer (see also Annex C). To determine the degree of coupling, the Power Receiver shall monitor the value of a suitable variable during a Digital Ping. Examples of such variables are:

- The rectified voltage.
- The open circuit voltage (as measured at the output disconnect switch).
- The received Power (if the rectified voltage is actively or passively clamped during a Digital Ping).

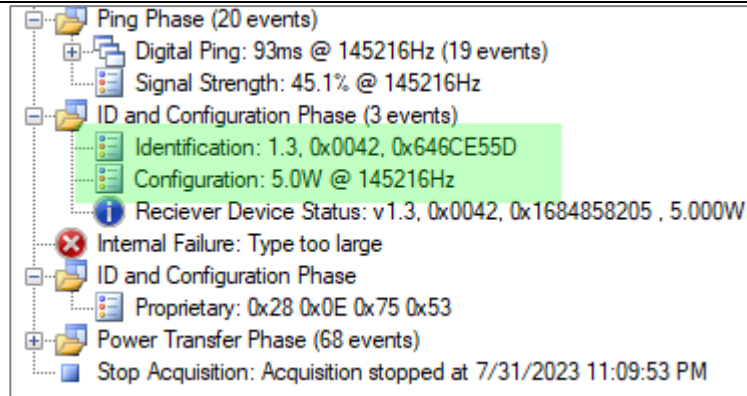
The variable that is chosen shall result in a Signal Strength Value that increases monotonically with increasing degree of coupling. The Signal Strength Value is reported as

$$\text{Signal Strength Value} = \frac{U}{U_{\max}} \cdot 256,$$

where U is the monitored variable, and $U_{\max}$ is the maximum value, which the Power Receiver expects for that variable during a Digital Ping. Note that the Power Receiver shall set the Signal Strength Value to 255 in the case that $U \geq U_{\max}$.

The Galaxy S23 Ultra uses the signal strength to adjust, for example, its transmit frequency.

Most relevant to this limitation [of this Row 1K] are the Identification Packet (*see* page 147 of the WPC specification, System Description Wireless Power Transfer, Vol. I: Low Power, Part 1, Interface Definition, Version 1.1.2, June 2013 (as used herein, the "WPC Specification"), and the Configuration Packet (*see* page 146 of the WPC Specification). Both packets are shown more clearly in the image below, which shows the "sniff" results from the packet sniffer:



The Identification Packet is used by the S23 Ultra to "*identify a type of said secondary wireless power receiver.*"

This is clear from the Qi WPC specification:

6.3.8 Identification Packet (0x71)

Table 6-12 defines the format of the message contained in an Identification Packet.

Table 6-12: Identification

	b ₇	b ₆	b ₅	b ₄	b ₃	b ₂	b ₁	b ₀
B ₀	Major Version				Minor Version			
B ₁	(msb) Manufacturer Code (lsb)							
B ₂								
B ₃	Ext	(msb) Basic Device Identifier (lsb)						
⋮								
B ₆								

Major Version The combination of this field and the Minor Version field identifies to which revision of the System Description Wireless Power Transfer the Power Receiver complies. The Major Version field shall contain the binary coded digit value 0x1.

Minor Version The combination of this field and the Major Version field identifies to which minor revision of the System Description Wireless Power Transfer the Power Receiver complies. The Minor Version field shall contain the binary coded digit value 0x1.

Manufacturer Code The bit string contained in this field identifies the manufacturer of the Power Receiver, as specified in [PRMC].

Ext If this bit is set to ZERO, the bit string

Manufacturer Code || Basic Device Identifier

identifies the Power Receiver. If this bit is set to ONE, the bit string

Manufacturer Code || Basic Device Identifier || Extended Device Identifier

identifies the Power Receiver (see also Section 6.3.9).

Basic Device Identifier The bit string contained in this field contributes to the identification of the Power Receiver. A Power Receiver manufacturer should ensure that the combination of Basic Device Identifier and Manufacturer ID is sufficiently unique. Embedding a serial number of at least 20 bits in the Basic Device Identifier is sufficient. Alternatively, using a (pseudo) random number generator to dynamically generate part of the Basic Device Identifier is sufficient as well, provided that the generated part complies with the following requirements:

WPC Document, p. 147.

		In addition or in the alternative to the above, the Maximum Power and Power Class fields (which are part of the Configuration Packet discussed below) each or together are used at least in part by the Accused Product to <i>"identify a type of said secondary wireless power receiver,"</i> and, therefore, meets this limitation. Thus, the Identification Packet or, in addition or in the alternative, the Configuration Packet, is used by the Accused Product to <i>"identify a type of said secondary wireless power receiver,"</i> and, therefore, meets this limitation. Moving to the limitation, <i>"identify a wireless protocol of said secondary wireless protocol,"</i> the S23 Ultra meets this limitation at least by the use of the Identification Packet alone, the Configuration Packet alone, or, in the alternative, together. As to the Identification Packet, the Accused Product also uses the "Major Version" and "Minor Version" fields to identify the version of the "System Description Wireless Power Transfer" of the WPC Specification that the secondary wireless power receiver uses. In addition or in the alternative, the Configuration Packet is used by the Accused Product to <i>"identify a wireless protocol of said secondary wireless protocol,"</i> and, therefore, meets this limitation. The "Prop" field of the Configuration Packet is shown as follows:
--	--	---

6.3.7 Configuration Packet (0x51)

Table 6-11 defines the format of the message contained in a Configuration Packet.

Table 6-11: Configuration

	b ₇	b ₆	b ₅	b ₄	b ₃	b ₂	b ₁	b ₀
B ₀	Power Class		Maximum Power					
B ₁	Reserved							
B ₂	Prop	Reserved			ZERO		Count	
B ₃	Window Size					Window Offset		
B ₄	Reserved							

Power Class This field contains an unsigned integer value that indicates the Power Receiver's Power Class. Power Receivers that comply with this version 1.1.2 of the System Description Wireless Power Transfer, Volume I, Part 1, shall set this field to 0.

Maximum Power Apart from a scaling factor, the unsigned integer value contained in this field indicates the maximum amount of power, which the Power Receiver expects to provide at the output of the rectifier. This maximum amount of power is calculated as follows:

$$P_{\max} = \left(\frac{\text{Maximum Power}}{2} \right) \times 10^{\text{Power Class}} \text{ W.}$$

Prop If this bit is set to ZERO, the Power Transmitter shall control the power transfer according to the method defined in Section 5.2.3.1. If this bit is set to ONE, the Power Transmitter may control the power transfer according to a proprietary method instead of the method defined in Section 5.2.3.1. However, if this bit is set to ONE, the Power Transmitter shall continue to ensure that the received Control Error Packets comply with the timings defined in Section 5.2.3. (Informative) *This implies that a Power Transmitter terminates the power transfer if it times out when waiting for a Control Error Packet. Moreover, this implies that setting the Prop bit to ONE does not relieve the Power Receiver from transmitting Control Error Packets on a regular basis. Finally, if the Prop bit is set to ZERO, the Power Transmitter could still decide to abort the power transfer based on information contained in a Proprietary Packet.*

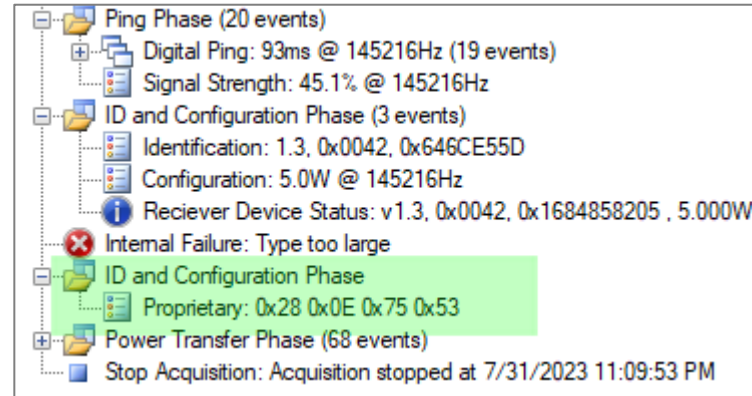
WPC Document, p. 146.

In addition to the above or in the alternative, the Prop field appears to be a message from a device such as the Buds2 that describes how it would like to be charged. In other words, it defines a “wireless power protocol.”

In addition to the above or in the alternative, the Maximum Power and Power Class fields each or together constitute "a wireless power protocol."

For at least these reasons, alone or in combination, the secondary circuitry of the S23 Ultra is configured to satisfy the limitation: *"identify a wireless power protocol of said secondary wireless power receiver;"*

In addition or in the alternative, a packet that the Qi Sniffer identified as “Proprietary” is shown below within the group called “ID and Configuration Phase”:



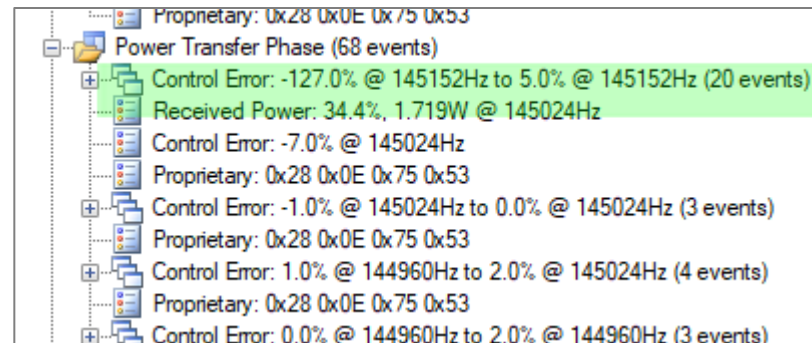
The fact that the “Proprietary” packet has been identified within the ID and configuration phase of the communication sequence, indicates that this packet contains information that both identifies the secondary device and identifies a protocol used in communication. On information and belief, the “Proprietary” packet contains identification information of the secondary device and/or identification of a power protocol.

For at least these reasons, alone or in combination, the secondary circuitry of each of the S23 is configured to satisfy the limitation: *"identify a wireless power protocol of said secondary wireless power receiver."*

See also Row 1K of Exhibit 2 incorporated herein by reference.

		Thus, the S23 Ultra meets the limitation “said second circuitry, on power-up of said secondary wireless power receiver, configured to identify a type of said secondary wireless power receiver and identify a wireless power protocol of said secondary wireless power receiver.” As stated above, WiPQTUS reserves its right to provide more detailed infringement contentions after full discovery for these devices and their components and any other similar chips used in the S23 Ultra as well as other technical information are produced.
1L	said [4] second circuitry, configured to receive and interpret data from said [6] secondary wireless power receiver in said identified wireless power protocol;	The S23 Ultra meets the limitation "said second circuitry, configured to receive and interpret data from said secondary wireless power receiver in said identified wireless power protocol." As shown above, each of the Identification Packet and Configuration Packet are received by the S23 Ultra, each includes data (see format of packets above), and that data is interpreted by the Accused Product. In addition or in the alternative, the S23 Ultra is configured to receive packets during a “Power Transfer Phase” (<i>see</i> WPC Document, p. 130). In this phase, power is transferred from the device transmitting power to the device receiving power (for example, from the Galaxy S23 Ultra to the Buds2). To control power transferred between devices, the Qi standard requires packets to be sent from the device receiving power to the device transmitting power (for example, from the Buds2 to the Galaxy S23 Ultra). WPC Document (at p. 130) describes the use of multiple packets sent from the power receiving device to the power transmitting device: 5.2.3 Power transfer phase In the <i>power transfer</i> phase, the Power Transmitter controls the power transfer to the Power Receiver, in response to control data that it receives from the latter. For this purpose, the Power Transmitter shall receive zero or more of the following Packets: • Control Error Packet. • Received Power Packet. • Charge Status Packet. • End Power Transfer Packet.

For example, in the measurement taken between the Galaxy S23 Ultra and the Buds2, both Control Error packets and Receive Power packets were captured being sent from the Buds2 to the Galaxy S23 Ultra:



The WPC Document (at page 145) indicates that these packets contain information required by the Galaxy S23 Ultra from the Buds2:

6.3.3 Control Error Packet (0x03)

Table 6-7 defines the format of the message contained in a Control Error Packet.

Table 6-7: Control Error

	b ₇	b ₆	b ₅	b ₄	b ₃	b ₂	b ₁	b ₀
B ₀	Control Error Value							

Control Error Value The (two's complement) signed integer value contained in this field ranges between -128...+127 (inclusive), and provides input to the Operating Point controller of the Power Transmitter. See Sections 5.2.3.1 and 5.3.4 for more details. Values outside the indicated range are reserved and shall not appear in a Control Error Packet.

6.3.4 Received Power Packet (0x04)

Table 6-8 defines the format of the message contained in a Received Power Packet.

Table 6-8: Received Power

	b ₇	b ₆	b ₅	b ₄	b ₃	b ₂	b ₁	b ₀
B ₀	Received Power Value							

Received Power Value The unsigned integer contained in this field indicates the average amount of power that the Power Receiver receives through its Interface Surface, in the time window indicated in the Configuration Packet. This amount of power is calculated as follows:

$$P_{\text{received}} = \left(\frac{\text{Received Power Value}}{128} \right) \times \left(\frac{\text{Maximum Power}}{2} \right) \times 10^{\text{Power Class}} \text{ W.}$$

Here, Maximum Power and Power Class are the values contained in the Configuration Packet (see Section 6.3.7). Annex D defines how a Power Receiver shall determine its Received Power P_{received} .

For at least these reasons the secondary circuitry of each the S23 Ultra satisfies the limitation: “configured to receive and interpret data from said [6] secondary wireless power receiver in said identified wireless power protocol.”

The S23 Ultra receives and interprets data in each of the aforementioned packets.

See also Row 1L of Exhibit 2, incorporated herein by reference.

		Thus, the S23 Ultra meets the limitation “said second circuitry, configured to receive and interpret data from said secondary wireless power receiver in said identified wireless power protocol.” As stated above, WiPQTUS reserves its right to provide more detailed infringement contentions after full discovery for these devices and their components and any other similar chips used in the S23 Ultra as well as other technical information are produced.
1M	said [4] second circuitry, based on said interpretation, configured to perform a function associated with said transmitted power in conjunction with said first circuitry.	Each of the S23 Ultra meets the limitation "said second circuitry, based on said interpretation, configured to perform a function associated with said transmitted power in conjunction with said first circuitry." For example, the following explanation is found on page 19 of the P9415 Datasheet: “Based on the received packet, the P9415 will adjust the operating frequency to match the transmitted power level to the required receiver power level for reliable and efficient power transfer.” This functionality, matching the transmitted power level to the required power level, meets the limitation "a function." The S23 Ultra performs the aforementioned function while charging another device can easily be demonstrated. <i>See</i> also Exhibit 2, row 1M, incorporated herein by reference. Therefore, on information and belief, the CSP4038 has "second circuitry" that is materially the same as the P9415 and/or P9320. Thus, the S23 Ultra meets the limitation “said second circuitry, based on said interpretation, configured to perform a function associated with said transmitted power in conjunction with said first circuitry." As stated above, WiPQTUS reserves its right to provide more detailed infringement contentions after full discovery for these devices and their components and any other similar chips used in the S23 Ultra as well as other technical information are produced.

Claim 2	The dual mode wireless power receiver of claim 1, wherein said switch network of said first circuitry is configured as one of an inverter and a rectifier.	The S23 Ultra meets this limitation. The S23 Ultra has “[t]he dual mode wireless power receiver of claim 1, wherein said switch network of said first circuitry is configured as one of an inverter and a rectifier.” <i>See</i> Row 1D above, incorporated herein by reference as if set forth in full. <i>See also</i> Row 1D of Exhibit 2, incorporated herein by reference. As stated above, WiPQTUS reserves its right to provide more detailed infringement contentions after full discovery for these devices and their components and any other similar chips used in the S23 Ultra as well as other technical information are produced.
---------------------------	---	---