

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc.,
Petitioners,

v.

Massively Broadband LLC,
Patent Owner.

Case IPR2025-01565

U.S. Patent No. 8,350,763

**PETITION FOR *INTER PARTES* REVIEW
UNDER 35 U.S.C. §§ 311-319 AND 37 C.F.R. §§ 42.100 *et seq.***

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EXHIBIT LIST

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1001	U.S. Pat. No. 8,350,763 (“’763 patent”)
1002	Prosecution History of U.S. Pat. No. 8,350,763
1003	Expert Declaration of Dr. Mark Mahon
1004	European Pat. App. No. 1,914,835 (“Wen”)
1005	U.S. Pat. No. 7,786,819 (“Ella”)
1006	U.S. Pat. Pub. No. 2004/0125027 (“Rubinshteyn”)
1007	Intentionally Left Blank
1008	U.S. Pat. No. 7,489,914 (“Govind”)
1009	Int. Pub. No. WO 2005/029720 (“Leenaerts”)
1010	U.S. Pat. No. 8,583,065 (“Ben-Bassat”)
1011	Infringement Contentions, <i>Massively Broadband LLC v. Samsung Electronics Co., Ltd., AND Samsung Electronics America, Inc.</i> , Case No. 2:25-cv-00608 (E.D. Tex.)
1012	IEEE dictionary, 7th ed. (2000)
1013	U.S. Pat. No. 5,962,751 (“Vlahos”)
1014	Molisch, Andreas F., <i>Wireless Communications</i> 2nd Ed., Wiley, 2011
1015	Balanis, Constantine A., <i>Antenna Theory: Analysis and Design</i> , 2nd Ed., Wiley, 1997
1016	Lathi, B. P., <i>Modern Digital and Analog Communication Systems</i> , HRW, 1983
1017	Beard, Cory and Stallings, William, <i>Wireless Communication Networks and Systems</i> , Pearson, 2016
1018	U.S. Patent Publication No. 2004/0021605 A1
1019	Sanchez-Hernandez, David A., Editor, <i>Multiband Integrated Antennas for</i>

Ex.	Description
	4G Terminals, Artech House, 2008
1020	U.S. Patent No. 5,794,145
1021	Marinez-Vazquez Marta, et al., “Integrated Planar Multiband Antennas for Personal Communication Handsets,” IEEE Transactions on Antennas and Propagation, Vol. 54, No. 2, February 2006
1022	Bhuiyan, Ekram, et al., “Active Tuning and Miniaturization of Microstrip Antennas,” IEEE Antennas and Propagation Society International Symposium, Vol. 4, 2002

CLAIM LISTING

Claim 1	
1[pre]	A wireless device, comprising:
1[a]	one or more antennas; and
1[b]	a plurality of transmitters, receivers or transceivers that operate in one or more frequency bands,
1[c]	wherein at least one antenna of said one or more antennas is used by said plurality of transmitters, receivers or transceivers in a plurality of different bands,
1[d]	wherein said at least one antenna is one or more of a) an actively tuned antenna, and b) is tuned by one or more passive elements which are selected or interconnected using electronic control.
Claim 2	
2	The wireless device of claim 1 wherein said passive elements are comprised of either or both lumped or distributed elements.
Claim 3	
3	The wireless device of claim 1 wherein said at least one antenna is used for transmitting, receiving, or transmitting and receiving simultaneously in said plurality of different bands.
Claim 4	
4[a]	The wireless device of claim 1 further comprising one or more tuners associated with one or more transmitters, receivers or transceivers of said plurality of transmitters, receivers or transceivers; and
4[b]	a controller for controlling tuning of the tuner for said at least one antenna to operate in said plurality of different bands.

Claim 5	
5	The wireless device of claim 1 wherein said mobile device is selected from the group consisting of computers, telephones, portable computing or communication devices, games, wireless post it notes, wireless memory media, RFID tags, vehicles, clothing, personal data assistants and navigation assistants.
Claim 6	
6[pre]	A wireless device, comprising:
6[a]	one or more antennas;
6[b]	at least one multiband transmitter, receiver or transceiver;
6[c]	a tuner associated with said at least one multiband transmitter, receiver, or transceiver; and
6[d]	a controller for controlling tuning of the tuner to a plurality of different bands,
6[e]	wherein at least one antenna of said one or more antennas is used by said at least one multiband transmitter, receiver or transceiver in a plurality of different bands,
6[f]	wherein said at least one antenna is one or more of a) an actively tuned antenna, and b) is tuned by one or more passive elements which are selected or interconnected using electronic control.
Claim 7	
7	The wireless device of claim 6 said at least one antenna is used for transmitting, receiving, or transmitting and receiving simultaneously in said plurality of different bands.
Claim 8	
8	The wireless device of claim 6 wherein said mobile device is selected from the group consisting of computers, telephones, portable

	computing or communication devices, games, wireless post it notes, wireless memory media, RFID tags, vehicles, clothing, personal data assistants and navigation assistants.
Claim 9	
9	The wireless device of claim 6 wherein said passive elements are comprised of either or both lumped or distributed elements.
Claim 10	
10[pre]	A wireless device, comprising:
10[a]	at least one multiband antenna;
10[b]	at least one multiband transmitter, receiver or transceiver; and
10[c]	a tuner associated with said at least one multiband transmitter, receiver, or transceiver, said tuner matching said at least one multiband antenna to said at least one multiband transmitter, receiver or transceiver in a plurality of different bands simultaneously.
Claim 11	
11	The mobile device of claim 10 wherein said at least one antenna is used for transmitting, receiving, or transmitting and receiving simultaneously in said plurality of different bands.
Claim 12	
12	The wireless device of claim 10 wherein said mobile device is selected from the group consisting of computers, telephones, portable computing or communication devices, games, wireless post it notes, wireless memory media, RFID tags, vehicles, clothing, personal data assistants and navigation assistants.
Claim 13	
13[pre]	A wireless portable device, comprising:
13[a]	one or more antennas radiating or receiving electromagnetic energy at particular frequency bands, at least one of said one or more antennas

	radiating or receiving electromagnetic energy at a plurality of particular frequency bands;
13[b]	one or more components selected from the group consisting of receivers, transmitters and transceivers, said one or more components connected to said at least one of said one or more antennas, whereby
13[c]	at least one of said one or more components transmits or receives electromagnetic energy simultaneously at two or more of said plurality of particular frequency bands, or two or more components transmit or receive electromagnetic energy simultaneously at two or more of said plurality of particular frequency bands.
Claim 14	
14	The wireless portable device of claim 13 wherein said wireless portable device is selected from the group consisting of computers, telephones, personal data assistants, and navigation assistants.
Claim 15	
15	The wireless portable device of claim 13 further comprising one or more tuners which match electromagnetic energy at a particular frequency band to only one of said one or more components.
Claim 16	
16	The wireless portable device of claim 13 further comprising isolation means for isolating said one or more components from more than one particular frequency band of said plurality of frequency bands.
Claim 17	
17[pre]	A wireless device component, comprising a tuner or a set of tuners or controller or other circuitry configurable to be coupled to at least one antenna and a plurality of transmitters, receivers, or transceivers that operate at one or more frequency bands, wherein said at least one antenna is used by said plurality of transmitters, receivers or transceivers in a plurality of different bands,
17[a]	wherein said at least one antenna is one or more of

	a) an actively tuned antenna, and b) is tuned by one or more passive elements which are selected or interconnected using electronic control.
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I. INTRODUCTION

Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc., (collectively, “Samsung” or “Petitioner”) respectfully requests *inter partes* review of all claims (1-17) of U.S. Patent No. 8,350,763 (the “’763 patent”). A reasonable likelihood exists that Petitioner will prevail on at least one challenged claim.

The ’763 patent is directed to an antenna in a wireless device that can transmit and receive in a plurality of different frequency bands. Patent Owner even stated during prosecution that the “main feature” of the patent was a “single multiband antenna.” EX1002, 34. But a multiband antenna was not novel or non-obvious by the earliest effective filing date in 2008. The Wen and Rubinshteyn references on which the Grounds are primarily based both disclose wireless systems with a single antenna that operates in a plurality of different bands.

The claims of the ’763 patent simply recite the purported “main feature” of a multiband antenna in a wireless device, combined with conventional wireless communication components, such as transmitters, receivers, transceivers, tuners, and other active and/or passive antenna tuning elements. None of these elements—alone or in combination—were novel and non-obvious by the earliest possible effective filing date. For example, Wen (EX1004) discloses a wireless device including a multiband antenna used by a plurality of transmitters, receivers, or transceivers to transmit and/or receive in a plurality of different bands

simultaneously, with passive tuning. Similarly, Rubinshteyn (EX1006) discloses a wireless device including a multiband antenna used by a multiband transmitter and receiver in a plurality of different bands simultaneously, with passive tuning. Ella (EX1005), Govind (EX1008), and Vlahos (EX1013) disclose other conventional and well-known components in radio-frequency (RF) devices, such as tuners, multiband transceivers, and filters.

The '763 patent lacks any inventive aspect, and the Board should institute *inter partes* review.

II. STANDING

Petitioner certifies that the '763 patent is available for *inter partes* review and that Petitioner is not barred or estopped from requesting *inter partes* review.

III. TECHNICAL BACKGROUND

Modern wireless devices use radio waves to communicate with other devices. EX1003, ¶¶41-49. Antennas transmit and receive information on radio waves at predetermined frequencies. *Id.* In order for two devices to effectively communicate, they must transmit and receive information at the same frequency. *Id.* To facilitate such communications, wireless communication protocols typically operate at predetermined frequency bands (*e.g.*, 700 MHz-2.5 GHz for LTE, or 2.4, 5, and 6 GHz for Wi-Fi). *Id.* Within the corresponding wireless device, a transmission line

is used to communicate the signal containing the information between the antenna and other electronic components. *Id.*

Antennas are typically designed to operate at specific frequencies. *Id.* The physical characteristics of the antenna cause it to be more or less efficient at specific ranges of frequency (each referred to as a frequency “band”). *Id.* The range of frequencies where the antenna operates most efficiently is called the “resonant” frequency. *Id.* Early antennas only had one resonant frequency, and devices designed to support multiple wireless communication protocols at different frequency bands required multiple antennas. *Id.* As mobile devices became handheld and miniaturized, however, space constraints created a need for small, multiband antennas. *Id.* Well before the ’763 patent, numerous companies in the wireless communications space had developed multiband antennas that could operate at a plurality of different frequency bands. *Id.* These companies used a variety of different tuning techniques to enable tuning the antennas to a variety of different frequencies, and to match the antennas to the desired impedance. *Id.*

IV. OVERVIEW OF THE ’763 PATENT

A. Priority

The ’763 patent issued on January 8, 2013, and claims priority to Provisional Application No. 61/088,829, filed on August 14, 2008.

The prior art references relied upon in this Petition predate August 14, 2008, the earliest possible effective filing date.

B. Prosecution History

The nonprovisional application that became the '763 patent was filed on August 14, 2009. *See* EX1002.

After an initial non-final rejection by the Examiner, the Applicant amended the claims to add limitations reciting the use of an antenna that is either “actively tuned” or “tuned by one or more passive elements which are selected or interconnected using electronic control,” and that communicates “simultaneously” in a plurality of frequency bands. EX1002, 30-33. The Applicant represented that “the main feature of the patent application” was “the elimination of a number of antennas” and “the use of a single multiband antenna.” *Id.*, 34. The Examiner subsequently issued a Notice of Allowance.

C. Disclosure

The '763 patent describes “[w]ireless devices...which transmit or receive data or other signals at multiple frequency bands [that] utilize at least one antenna to transmit and receive and a plurality of different bands.” EX1001, Abstract. In one embodiment, the wireless devices “can simultaneously transmit or receive at a plurality of different bands.” EX1001, Abstract, 3:60-67. Multiple transceivers are “fed to a single antenna using multiple feedlines and active antenna tuners,

controlled by a controller,” where each tuner provide an impedance match for each transceiver. *Id.*, 4:40-45, 5:22-30, Fig. 3.

V. GROUNDS

Petitioner requests cancellation of Claims 1–17 on the following grounds¹:

Ground	Basis	Reference(s)	Claims
I	§102/§103	Wen	1-3, 5
II	§103	Wen in view of Ella	4, 17
III	§103	Wen in view of Ella and Govind	6-15
IV	§103	Wen in view of Ella, Govind, and Vlahos	16
V	§103	Rubinshteyn in view of Wen	1-3, 5
VI	§103	Rubinshteyn in view of Wen and Ella	4, 17
VII	§103	Rubinshteyn in view of Ella	6-15
VIII	§103	Rubinshteyn in view of Ella and Vlahos	16

VI. LEVEL OF ORDINARY SKILL

A person of ordinary skill in the art at the time of the ’763 patent (“POSITA”) would have had at least a Bachelor’s degree in electrical engineering, computer engineering, physics, or a related field, and at least two years of experience working with design and integration of RF circuits and antennas for wireless communication

¹ Petitioners are not presently aware of any secondary considerations of non-obviousness applicable to the ’763 Patent. To the extent the Patent Owner presents any such evidence, Petitioners reserve the right to respond.

devices. EX1003, ¶¶53-54. More education can substitute for practical experience and vice versa. *Id.* Petitioner’s expert, Dr. Mark Mahon, exceeds this skill level and thus has the qualifications and experience necessary to assess the ’763 patent from the perspective of a POSITA. *Id.*

VII. CLAIM CONSTRUCTION

Petitioner identifies one pre-AIA Section 112 Paragraph 6 means-plus-function limitation in dependent Claim 16 for construction. The remaining terms do not require construction for this proceeding and should be given their plain and ordinary meaning.

A. “isolation means for isolating said one or more components from more than one particular frequency band of said plurality of frequency bands” (Claim 16)

Function: “isolating said one or more components from more than one particular frequency band of said plurality of frequency bands.”

Structure: circuitry that provides overload protection, shielding, and/or filters out unwanted bands.²

The specification discloses that “proper operation” of an antenna requires “sufficient RF isolation,” which can be achieved using “filtering and overload protection” in “commercially available wireless transceivers.” EX1001, 5:33-38;

² Petitioner has identified the only structure disclosed in the specification, but does not concede that it is adequate structure under Section 112.

see also id., 5:30-6:1, 7:9-14 (describing exemplary shielding and filtering techniques). A POSITA would have understood that such circuitry may be used to isolate RF components from particular frequency bands. EX1003, ¶¶55-57.

VIII. GROUND I: WEN ANTICIPATES OR RENDERS OBVIOUS CLAIMS 1-3 AND 5

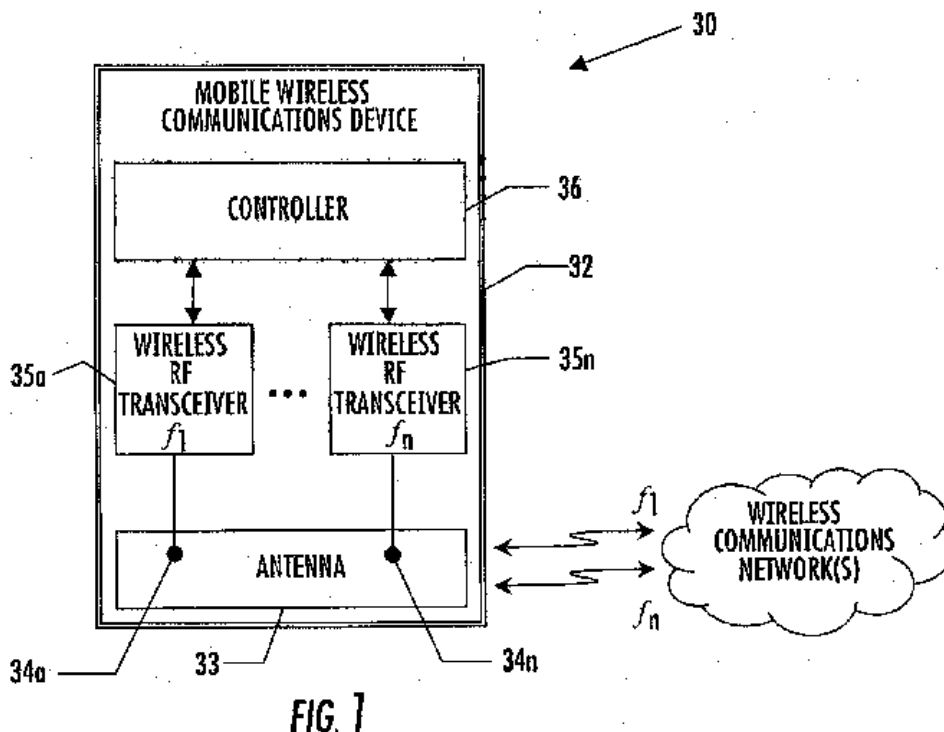
A. Wen (EX1004)

European Pat. No. 1,914,835 (“Wen”) was filed on October 20, 2006, and was first published on April 23, 2008. It is prior art under at least pre-AIA 35 U.S.C. § 102(a).

Wen discloses a mobile wireless communications device with multiple wireless RF transceivers that can “use [a] common antenna at a same time.” EX1004, [0027]. The common antenna has “a plurality of spaced apart signal feed points” to be coupled with “a plurality of wireless radio frequency (RF) transceivers” each having “a respective ***different operating frequency.***” *Id.*, [0027]. For example, the common antenna “may comprise a patch antenna” having “a plurality of slots” where “first and second slots...define a plurality of leg portions” that are “selected to tune the desired operating frequencies” through their geometries. *Id.*, [0028], [0035]. A controller is employed to “selectively operat[e] at least some of the wireless RF transceivers to advantageously ***use the common antenna at a same time.***” *Id.*, [0027].

Wen Figure 1 illustrates one embodiment of a mobile wireless

communications device with a multiband antenna.



The antenna 33 is connected to and used by a plurality of transceivers 35a-35n. *Id.*, [0031]. Each transceiver has a different associated frequency f_1 - f_n . *Id.* The plurality of transceivers each with a different frequency may use the antenna 33 “at a same time.” *Id.*

B. Claim 1

1. 1[pre]: “A wireless device, comprising”

To the extent the preamble is limiting, Wen discloses a wireless device. EX1003, ¶64. For example, Wen discloses “a mobile wireless communications device.” EX1004, [0027]. *See also id.*, [0030], [0041], [0043] (same).

2. 1[a]: “one or more antennas”

Wen discloses one or more antennas. EX1003, ¶65. For example, Wen discloses “a mobile wireless communications device ... which may include a housing and **a common antenna.**” EX1004, [0027]. “The antenna 33 is ‘common’” because “it is shared by a plurality of wireless radio frequency (RF) transceivers 35a-35n.” *Id.*, [0031]; *see also id.*, Fig. 1 (annotated, showing antenna as element 33 in yellow):

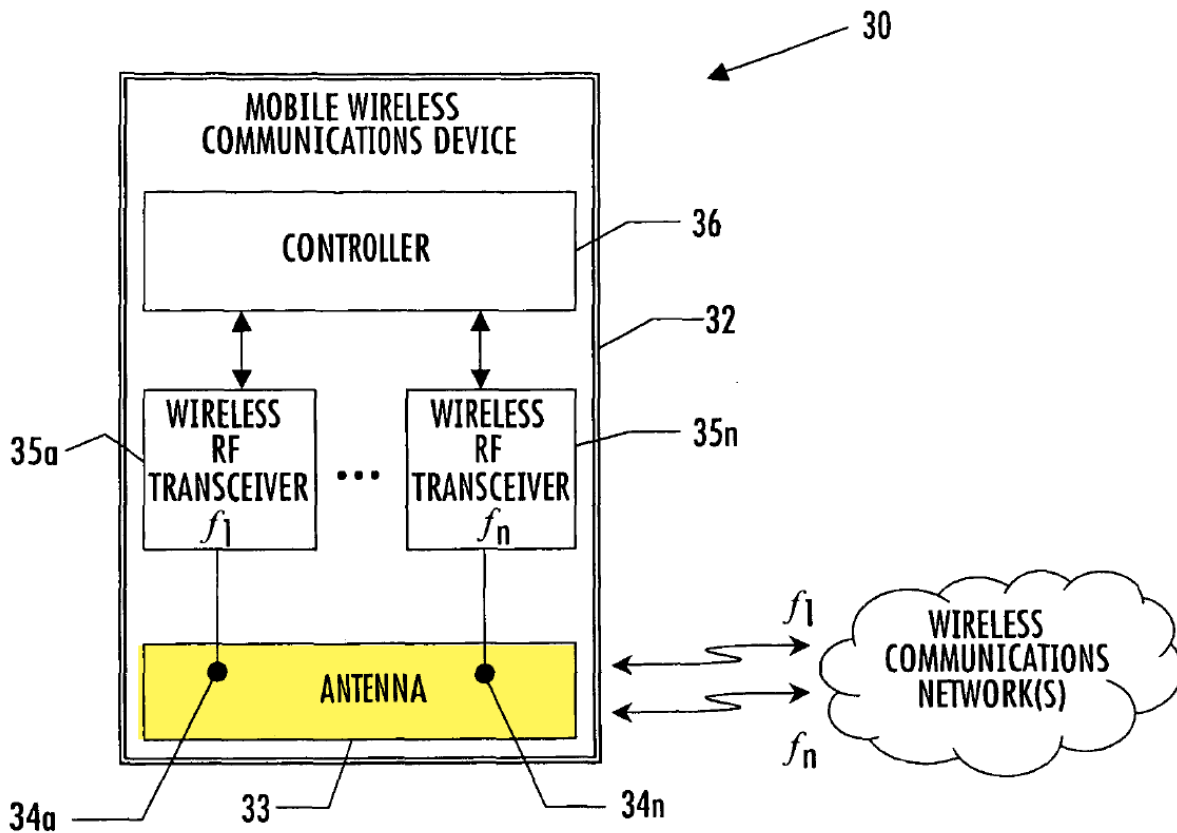
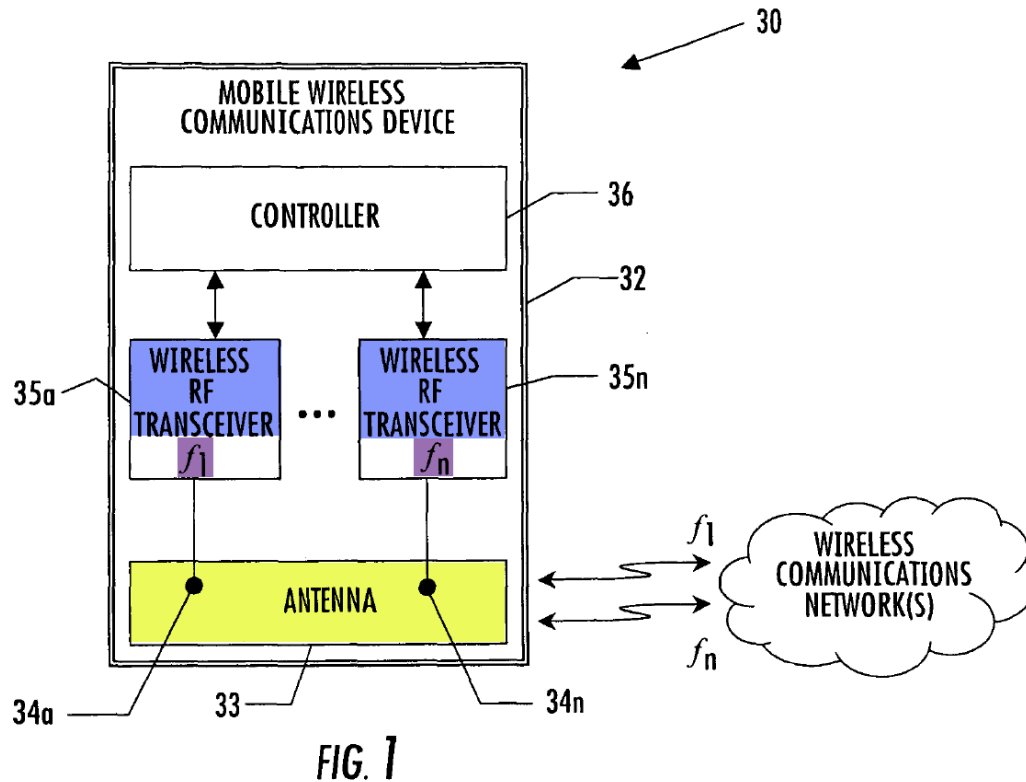


FIG. 1

3. **1[b]: “a plurality of transmitters, receivers or transceivers that operate in one or more frequency bands”**

Wen discloses “a *plurality* of wireless radio frequency (RF) *transceivers* carried by the housing and coupled to respective ones of the signal feed points of the common antenna.” EX1004, [0027]. “Each wireless RF transceiver preferably has a *respective different operating frequency* associated therewith.” *Id.*, [0031]; see also *id.*, [0039] (example with antenna “tuned to provide operation at 900 MHz, 1800 MHz, and 5 GHz via a selective connection of appropriate wireless RF transceivers”). Thus, each transceiver operates in at least one frequency band, and the plurality of transceivers operate in multiple frequency bands (at least one per transceiver) (*i.e.*, *operate in one or more frequency bands*). EX1003, ¶66. Wen’s transceivers are illustrated in Figure 1, annotated below, where the plurality of transceivers are elements 35a-35n (annotated in blue) and their corresponding frequencies of operation are f_1 - f_n (annotated in purple):



EX1004, Fig. 1.

4. 1[c]: “wherein at least one antenna of said one or more antennas is used by said plurality of transmitters, receivers or transceivers in a plurality of different bands”

As described above, Wen discloses a **plurality of transceivers** that operate in **a plurality of different bands**. See Limitation 1[b]; see also EX1004, [0029] (example with “different operating frequencies ... within a range of about 900 MHz to 6 GHz”). EX1003, ¶67.

Further, Wen discloses **at least one antenna** (e.g., antenna 33) that **is used by the plurality of transceivers in a plurality of different bands** (e.g., transceivers 35a-35n operating in bands f_1 to f_n). EX1004, [0031], Fig. 1. As shown in Figure 1

(reproduced and annotated above), a single antenna is connected to and used by the plurality of transceivers. Wen expressly discloses that “[t]he antenna 33 ... is **shared** by a **plurality of wireless radio frequency (RF) transceivers 35a-35n** (e.g., cellular and/or wireless LAN transceivers)” and that “[e]ach wireless RF transceiver preferably has a respective **different operating frequency associated therewith.**” EX1004, [0031]; *see also id.*, [0039] (example where the antenna “provide[s] operation at 900 MHz, 1800 MHz, and 5 GHz via a selective connection of appropriate wireless RF transceivers 35”); [0036] (“[A] single multi-feed antenna [] may be used instead of a plurality of different antennas ... to provide multi-frequency band operation.”). Accordingly, the shared antenna is used in **a plurality of different bands**, *i.e.*, at least one band for each of the plurality of transceivers. EX1003, ¶68.

5. 1[d]: “wherein said at least one antenna is one or more of a) an actively tuned antenna, and b) is tuned by one or more passive elements which are selected or interconnected using electronic control”

Wen discloses or renders obvious this limitation.

Wen discloses at least prong (b) of Limitation 1[d] because Wen’s antenna is tuned by one or more passive elements which are selected or interconnected using electronic control.³ EX1003, ¶69. Wen discloses **passive elements** in the form of

³ Because Limitation 1[d] is stated in the disjunctive (*i.e.*, **one or more of**), it is satisfied by a reference that discloses either prong (a) or prong (b) of the

“leg portions” that make up the antenna and “may advantageously ***be selected to tune*** the desired operating frequencies of the antenna 33.” EX1004, [0035]. Each leg portion “may be substantially related to a given operating frequency band” or “may influence multiple operating frequency bands.” *Id.* Figure 2, reproduced and annotated below, illustrates an embodiment with “a plurality of leg portions” (annotated in grey) “defined by widths W_1 - W_7 and lengths L_2 and L_4 .” *Id.*, [0035], Fig. 2. A POSITA would have understood that the “leg portions” of Wen’s antenna are passive elements because they have fixed electrical characteristics—specifically, because they are implemented as “conductive trace[s] on the dielectric substrate,” and do not include any additional circuitry that changes their electrical characteristics during operation. *See* EX1003, ¶¶70-71; *see also* EX1004, [0032] (“[T]he common antenna 33 may include at least one conductive trace on the dielectric substrate.”).

limitation. PO has adopted a consistent interpretation of the limitation in its infringement contentions in the corresponding district court case. *See* EX1011, 14 (alleging infringement based on “part (b) of this claim element”).

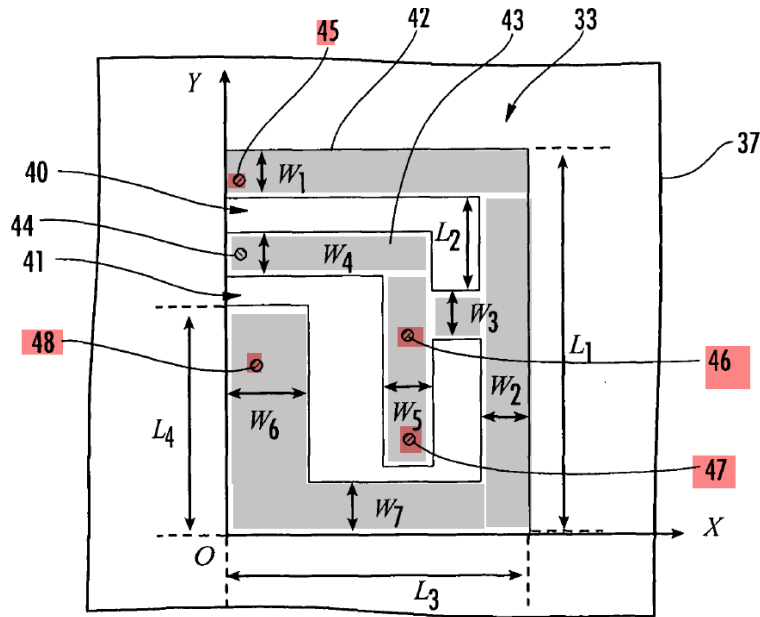


FIG. 2

Wen further discloses that the “leg portions” (*passive elements*) are used to *tune the antenna* by *selecting them using electronic control*, namely by the operation of a controller (36, annotated in green), illustrated in Figure 1 (annotated below).

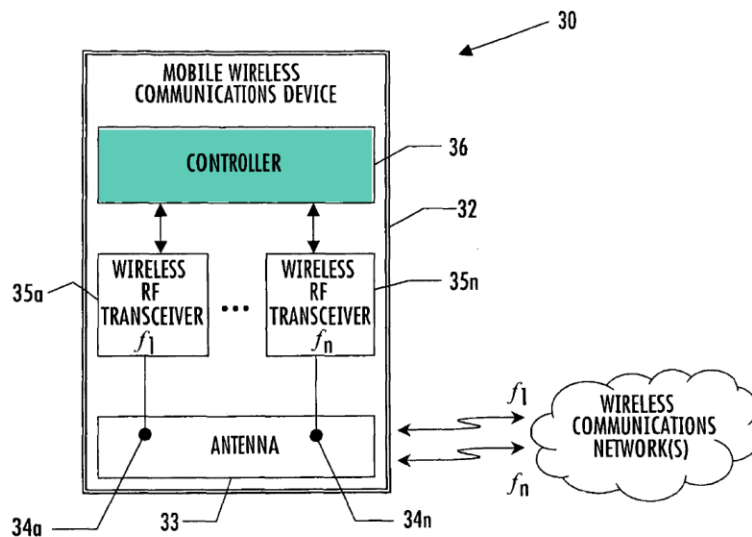


FIG. 1

EX1004, Fig. 1. Wen's controller "selectively operat[es] at least some of the wireless RF transceivers to ... use the common antenna at a same time." *Id.*, [0027]. The antenna is then "tuned to provide operation at" specific frequency bands "via a selective connection of appropriate wireless RF transceivers" to different "feed point[s]" on different leg portions of the antenna (annotated in red in Figure 2, above). EX1004, [0039]-[0040]; *see also id.*, [0034] (describing the structure of the feed points). For example, Wen discloses an embodiment where "the antenna 33 is tuned to provide operation at 900 MHz, 1800 MHz, and 5 GHz via a selective connection of appropriate wireless RF transceivers 35 to the first feed point 45." *Id.*, [0039]. Other frequencies may be obtained by selective connection of appropriate transceivers to the other three feed points. *Id.*, [0040] (examples using the second, third, and fourth feed points to tune the antenna to operating frequencies of 2.45 GHz; 2.1 GHz, 5.2 GHz, and 5.8 GHz; and 1.54 GHz, respectively).

In light of the above disclosures, a POSITA would have understood that Wen uses controller 36 (*i.e.*, **electronic control**) to tune the antenna by **selecting** different leg portions (**passive elements**). EX1003, ¶73. Specifically, by selectively operating individual transceivers, the controller causes the selected transceiver to provide a signal to one of the feed points on a particular leg portion of the antenna, thereby selecting the corresponding leg portion and tuning the antenna to the operating frequency or frequencies associated with that leg portion. Thus, the selective

connection of a transceiver to a feed point on a leg portion is performed via electronic control by the controller. *Id.*; see also EX1004, Abstract, [0027], [0031-32], [0039-40].

To the extent PO argues that Wen does not disclose using electronic control to select passive elements for tuning, Wen also discloses, or at least renders obvious, an ***actively tuned antenna*** because Wen's selective operation of transceivers operates to actively tune the antenna. EX1003, ¶74. Specifically, as described above, Wen discloses a controller that ***actively*** selects different leg portions ("passive elements") by operating transceivers connected to different spaced-apart signal feed points "***to tune the desired operating frequencies*** of the antenna 33." EX1004, [0035]. The controller actively selects to "operate[] at least some (i.e., two or more) of the wireless RF transceivers 35a-35n to advantageously use the common antenna 33 at a same time." *Id.*, [0031]. A POSITA would have understood, or it would have been obvious, that the selective operation of particular transceivers is accomplished using active circuit elements, such as switches. EX1003, ¶74. In addition, a POSITA would have reasonably expected to be successful in using active circuit elements such as switches to selectively operate Wen's transceivers. Active circuit elements, and switches in particular, are basic components that have been routinely used in circuits for decades, and a POSITA would have been more than capable to use them in Wen's system for their conventional purpose. *Id.*

C. Claim 2: “The wireless device of claim 1 wherein said passive elements are comprised of either or both lumped or distributed elements”

Wen discloses passive elements (*i.e.*, leg portions of an antenna) that comprise ***distributed elements***. The claim terms “lumped” and “distributed” are terms of art that a POSITA would understand describe how the electrical properties of the elements may be modeled. EX1003, ¶¶75-76. Lumped element modeling assumes that electrical properties concentrate at a single discrete point in a circuit, while distributed element modeling recognizes that elements may have electrical properties spread throughout the physical dimensions of a component. EX1003, ¶75; *see also* EX1012, 3 (“distributed: Spread out over an electrically significant length or area.”), 4 (“lumped: effectively concentrated at a single point”).

Wen’s “leg portions” (***passive elements***) have electrical characteristics (*e.g.*, operating frequency) that are dependent on their lengths and widths. EX1004, [0034]-[0035] (explaining how the widths and lengths of the leg portions are “selected to tune the desired operating frequencies of the antenna”). Because these dimensions must be accounted for when electrically modelling the elements, a POSITA would view Wen’s leg portions as ***distributed elements***.

D. Claim 3: “The wireless device of claim 1 wherein said at least one antenna is used for transmitting, receiving, or transmitting and receiving simultaneously in said plurality of different bands”

Wen discloses that its common antenna is used for transmitting, receiving, or transmitting and receiving simultaneously in a plurality of different bands. EX1003, ¶¶77-78. Wen discloses that two or more transceivers (*i.e.*, used for ***transmitting, receiving, or transmitting and receiving***), each having “respective different operating frequency associated therewith” (*i.e.*, a ***plurality of different bands***), may use the common antenna “at a same time” (*i.e.*, ***simultaneously***). EX1004, [0031] (“Furthermore, the device 30 may also include a controller 36 that selectively operates at least some (*i.e.*, two or more) of the wireless RF transceivers 35a-35n to advantageously use the common antenna 33 at a same time ... [meaning] there is some overlap in time.”). Because the transceivers operate at different frequencies, when two or more transceivers are used at the same time, the common antenna will transmit and/or receive at two or more frequencies simultaneously. EX1003, ¶79.

E. Claim 5: “The wireless device of claim 1 wherein said mobile device is selected from the group consisting of computers, telephones, portable computing or communication devices, games, wireless post it notes, wireless memory media, RFID tags, vehicles, clothing, personal data assistants and navigation assistants”

Wen discloses that its system relates to “***cellular telephone*** technology” and other ***portable communication devices***. EX1004, [0002]; *see also id.*, [0006] (discussing improvements for “handheld wireless communications devices”);

EX1003, ¶¶80-82. For example, Wen teaches configuring its antenna to support operating frequencies for “cellular phone calls,” and “for communicating with one or more communications networks.” *Id.*, [0030], [0038].

IX. GROUND II: WEN IN VIEW OF ELLA RENDERS OBVIOUS CLAIMS 4 AND 17

Wen discloses a wireless device comprising a multiband antenna and transceivers, as described in Ground I. Ella discloses tuners for impedance matching in a wireless device such as Wen’s. A POSITA would have been motivated to apply Ella’s teachings regarding tuners to Wen’s wireless device, as detailed below. EX1003, ¶83.

A. Ella (EX1005)

U.S. Patent No. 7,786,819 (“Ella”) was filed on August 31, 2007, published on March 5, 2009, and issued on August 31, 2010. It is prior art under at least pre-AIA 35 U.S.C. § 102(e).

Ella discloses a tuner for “an antenna element operable in a first frequency band and a second frequency band.” EX1005, Abstract. The tuner may be implemented in a “mobile cellular telephone.” *Id.*, 4:15-18. The tuner comprises a “matching circuit” and two “variable reactance component[s].” *Id.*, 1:39-56. A “controller” determines “optimum ratios of second reactance values to first reactance values” based on the frequency bands of the antenna. *Id.* The tuner is connected to “an antenna arrangement” and a “transceiver” and “configured to adaptively tune ...

one or more antenna elements in the antenna arrangement.” *Id.*, 4:19-29, Fig. 1. The tuner is “able to compensate for changes in the impedance of a dual band antenna element and optimize the antenna in both resonant frequency bands.” 7:30-37.

B. Motivation to Combine

A POSITA would have been motivated to add a tuner and controller, as taught by Ella, to Wen’s wireless device, and would have reasonably expected the combination to succeed. EX1003, ¶86.

First, tuners were well known in the art and were commercially available prior to August 2008. EX1003, ¶87. For example, U.S. Pat. No. 8,583,065 (“Ben-Bassat”), filed in June 2007, discloses that “antenna tuning circuits are in **widespread use today**” and used to “allow[] [an antenna] to operate over a wide range of frequencies” and adjust the impedance of the antenna to “minimize[] the SWR [standing wave ratio] and maximize[] power transfer through the antenna system.” EX1010, 1:51-2:9. A POSITA would have known that tuners are frequently used in RF systems to match the impedance at the antenna to the impedance of a transmitter, receiver, or transmitter in order to achieve well-known benefits, such as improving power transfer, minimizing distortion, and preventing overheating. EX1003, ¶87. Accordingly, adding tuners associated with Wen’s transceivers would have entailed nothing more than the use of a known technique (*i.e.*, tuners for impedance

matching) to improve similar devices (*i.e.*, Wen’s wireless device and associated transceivers) in the same way. *Id.*

Second, Ella provides express motivations to combine. EX1003, ¶88. Ella identifies two advantages associated with its tuning apparatus and associated controller. EX1005, 1:51-2:9. First, Ella teaches that its invention “provide[s] an advantage” because it “provide[s] adaptive tuning of an antenna element.” *Id.*, 7:21-23. Specifically, Ella “detect[s] changes in impedance of an antenna element and then reactively compensate for the changes in impedance.” *Id.*, 7:23-25. This “result[s] in the device operating more efficiently (since the electrical energy supplied to the antenna element will be maximized) and effectively (the signal strength of the antenna element may be improved).” *Id.*, 7:25-29. Second, Ella teaches that its invention provides an additional advantage because it is “able to compensate for changes in the impedance of a **dual band** antenna element and optimize the antenna in **both resonant frequency bands**.” *Id.*, 7:30-33. A POSITA would have thus been particularly motivated to use a tuner and controller as taught by Ella with Wen’s multiband antenna in order to optimize performance in the plurality of frequency bands used by the antenna. EX1003, ¶88.

In addition, Wen, Ella, and the ’763 patent are all analogous art because they are directed to the same technological subject matter, namely radio frequency (RF) components for wireless devices. EX1001, Abstract (describing “wireless devices”

that “use a single physical structure (e.g., an antenna) for transmission and reception of many different bands”); EX1004, Abstract (describing a “mobile wireless communications device” with “a common antenna” and “a plurality of wireless radio frequency (RF) transceivers ... coupled to ... the common antenna” with “respective different operating frequency”); EX1005, 1:10-13 (“invention” relates to “a portable radio telephone”), 4:15-29 (describing the tuning “apparatus” in the context of a “mobile cellular phone” with an “antenna arrangement”).

Finally, a POSITA would have reasonably expected the combination to succeed. EX1003, ¶90. As noted above, tuners were well known and commercially available prior to the ’763 patent. *Id.*; EX1010, 1:51-2:9. A POSITA would have been capable of adding a tuner and controller as taught by Ella for impedance matching between Wen’s multiband antenna and transceivers using routine engineering to achieve predictable results. EX1003, ¶90.

C. Claim 4:

- 1. 4[a]: “The wireless device of claim 1 further comprising:
one or more tuners associated with one or more
transmitters, receivers or transceivers of said plurality of
transmitters, receivers or transceivers”**

Wen discloses tuning the operating frequencies of the common antenna. For example, Wen discloses selectively connecting the wireless RF transceivers to corresponding feed points on the common antenna in order to “tune[]” the antenna “to provide operation” at specific frequencies. EX1004, [0039].

It would have been obvious to a POSITA in view of Ella to add a tuner between Wen's antenna and Wen's transceivers to improve antenna tuning and provide impedance matching. EX1003, ¶¶91-92.

For example, Ella discloses an "apparatus" in a mobile device "configured to adaptively tune [an] antenna element ... so that it efficiently resonates in two predetermined resonant frequency bands." EX1005, 5:54-56. Ella's tuning apparatus comprises a "first variable reactance component 22, a matching circuit 24, a second variable reactance component 26, a detector 28 and a controller 30." *Id.*, 4:40-44, Fig. 2:

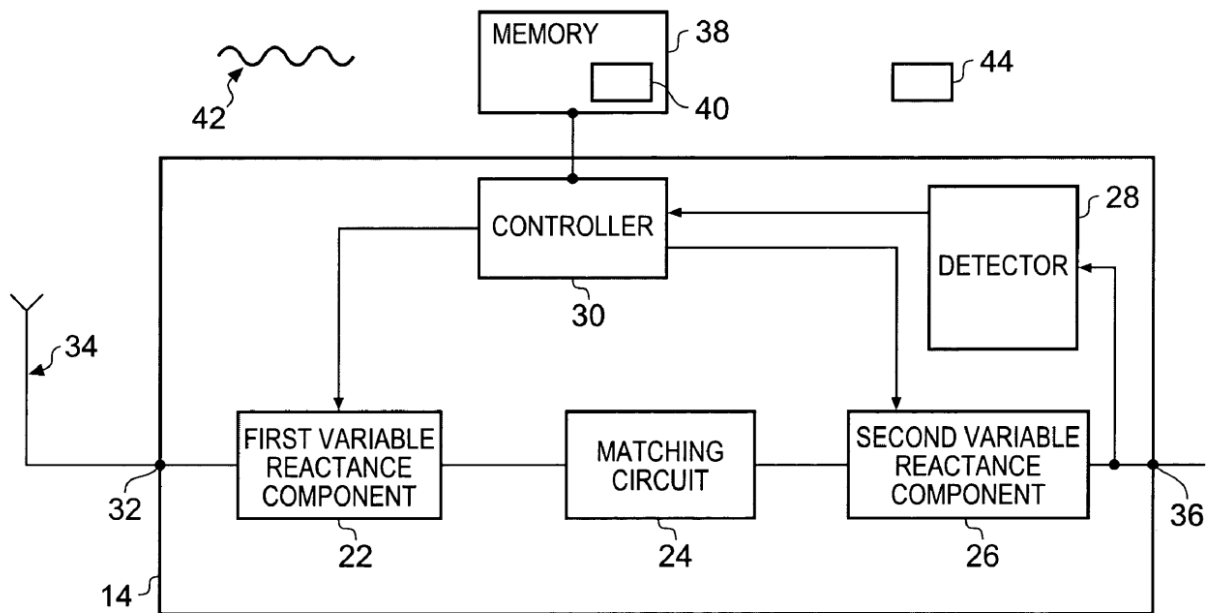


Fig. 2

Ella's apparatus is a **tuner** as the term is used in the claims of the '763 patent because (1) it adaptively tunes the antenna, *see id.*, and (2) it matches the impedance

of the antenna to the transceiver by “compensat[ing] for changes in the impedance of a dual band antenna element and optimiz[ing] the antenna in both resonant frequency bands,” *id.*, 7:30-33; *see also* EX1001, 5:22-30 (disclosing the use of “individual RF tuners” to “provide a good impedance match for each of the transceivers”); EX1003, ¶93. In the related district court proceeding, PO has admitted that an antenna tuner serves the same “purpose” as Ella’s tuning apparatus, *i.e.*, “to match the impedance of the transmitter, receiver, or transceiver to the antenna at a given operating frequency.” EX1011, 20. PO has also argued that “adaptive impedance matching,” as disclosed by Ella, satisfies claimed tuner. *Id.*, 15.

Ella’s tuner is also ***associated with*** a transceiver. For example, as illustrated in Figure 1 (reproduced below), Ella’s tuner (*i.e.*, apparatus 14) is connected to and associated with transceiver 16. EX1005, 4:19-29, Fig. 1:

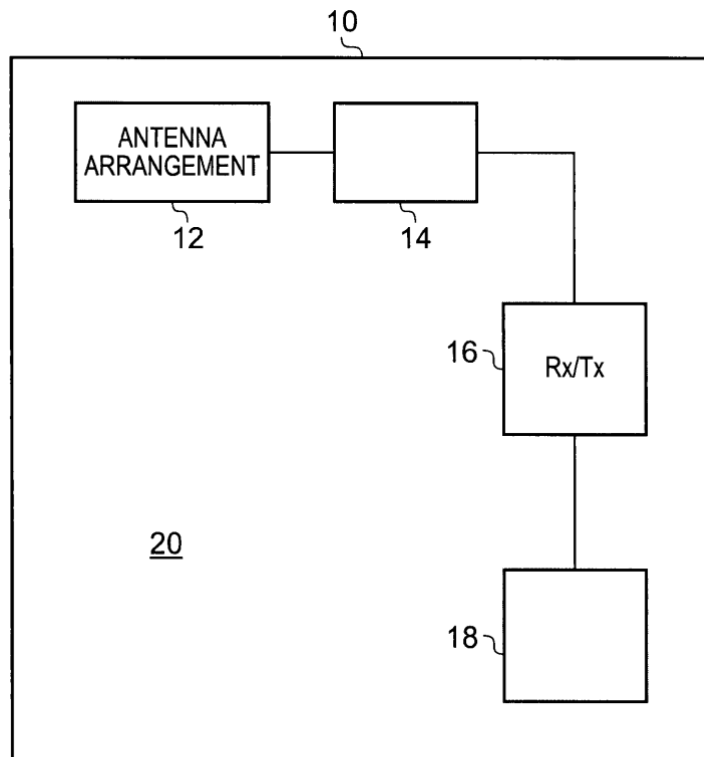


Fig. 1

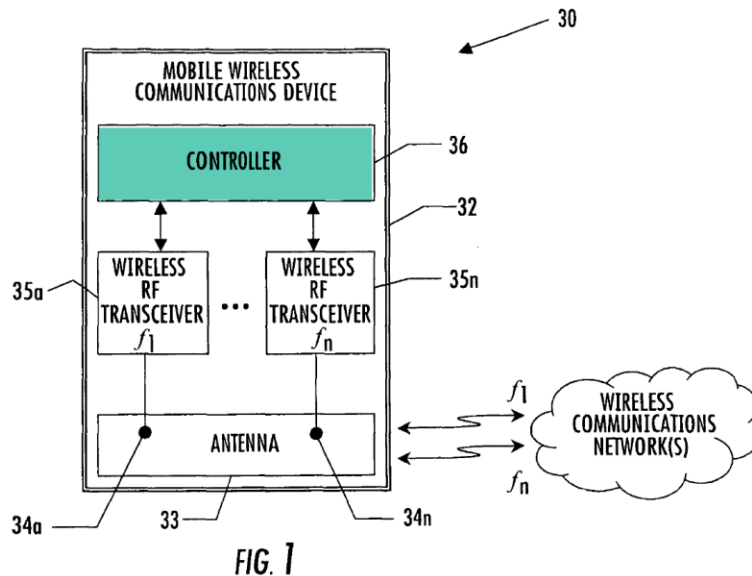
See also id., 4:51-57 (the “second interface” of the tuning apparatus is “connectable to the transceiver”)

A POSITA would have been motivated to apply Ella’s teachings regarding tuners to Wen’s transceivers, and would have reasonably expected the combination to succeed. *See* Section IX.B.

2. **4[b]: “a controller for controlling tuning of the tuner for said at least one antenna to operate in said plurality of different bands”**

Wen discloses “**a controller 36** that selectively operates at least some (*i.e.*, two or more) of the wireless RF transceivers 35a-35n to advantageously use the

common antenna 33 at a same time,” whereas these “transceivers 35a-35n” are “coupled to respective ones of the signal feed points 34a-34n of the common antenna 33.” EX1004, [0031]; EX1003, ¶197.



It would have been obvious to a POSITA in view of Ella to use Wen’s controller to digitally control a tuner (as disclosed by Ella, see Limitation 4[a]), or to add a separate controller to control each such tuner. EX1003, ¶198.

For example, Ella discloses that its tuning apparatus (**tuner**) is “connected to” a “**controller**” (annotated in green above) that is “operable to control the first variable reactance component ... and the second variable reactance component” in the tuner. EX1005, 5:34-42; *see also id.*, Fig. 2:

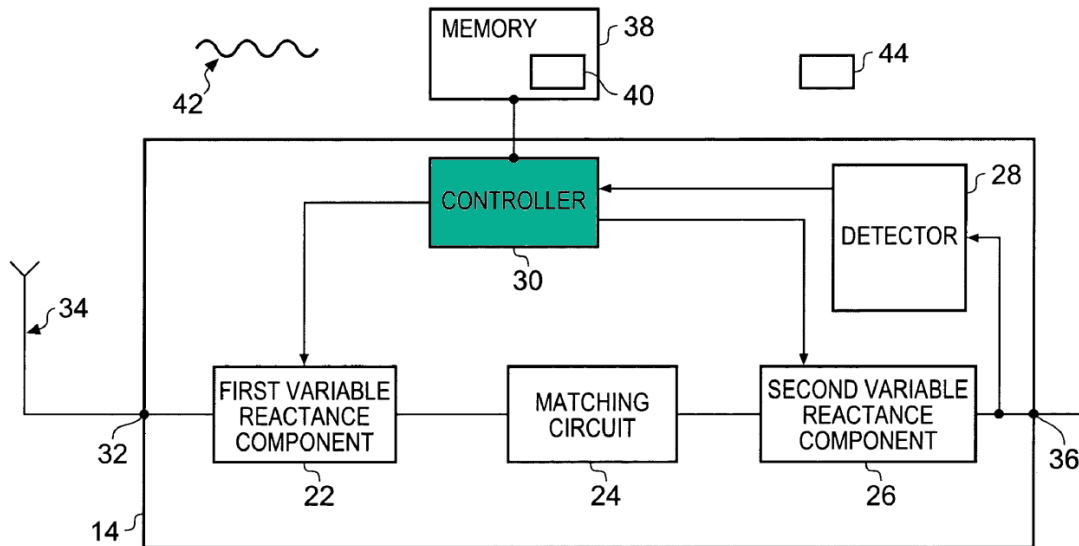


Fig. 2

The controller “*control[s] the operation*” of the [tuning] apparatus,” including to “adaptively *tune the antenna element*” to “efficiently resonate[] in two predetermined resonant frequency bands” (*i.e., operate in said plurality of different bands*). *Id.*, 5:43-46, 5:54-7:8, Fig. 3.

A POSITA would have been motivated to apply Ella’s teachings regarding tuners to Wen’s transceivers, and would have reasonably expected the combination to succeed. *See* Section IX.B.

D. Claim 17

1. 17

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[pre]: “A wireless device component, comprising a tuner or a set of tuners or controller or other circuitry configurable to be coupled to at least one antenna and a plurality of transmitters, receivers, or transceivers that operate at one or more frequency bands, wherein said at
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least one antenna is used by said plurality of transmitters, receivers or transceivers in a plurality of different bands”

“A wireless device component”: Wen discloses a wireless device. See Ground I, Limitation 1[pre]. The wireless device includes components such as antennas and transceivers. See Ground I, Limitations 1[a], 1[b].

“comprising a tuner or a set of tuners or controller or other circuitry configurable to be coupled to at least one antenna and a plurality of transmitters, receivers, or transceivers”: Wen discloses a *controller coupled to an antenna and a plurality of transceivers*. See Ground I, Limitation 1[d]; EX1004, Fig. 1 (showing controller (36) coupled to wireless RF transceivers 35a-35n and antenna 33), [0027] (controller “selectively operat[es] at least some of the wireless RF transceivers to ... use the common antenna at a same time”). Alternatively, Wen and Ella render obvious a tuner coupled to at least one antenna and a plurality of transceivers. See Limitation 4[a].

“at least one antenna and a plurality of transmitters, receivers, or transceivers that operate at one or more frequency bands”: Wen discloses at *least one antenna*, see Ground I, Limitation 1[a], and *a plurality of transceivers*, see Ground I, Limitation 1[b]. The antenna operates at *multiple frequency bands*, and each transceiver operates at *a different respective frequency band*. See Ground I, Limitation 1[c].

“wherein said at least one antenna is used by said plurality of transmitters, receivers or transceivers in a plurality of different bands”: See Ground I, Limitation 1[c].

2. **17[a]: “wherein said at least one antenna is one or more of an actively tuned antenna, and is tuned by one or more passive elements which are selected or interconnected using electronic control”**

See Ground I, Limitation 1[d].

X. GROUND III: WEN IN VIEW OF ELLA AND GOVIND RENDERS OBVIOUS CLAIMS 6-15

Wen discloses a wireless device comprising a multiband antenna and transceivers, as described in Ground I. Ella discloses tuners for impedance matching in a wireless device such as Wen’s, as described in Ground II. Govind further discloses ***multiband*** transceivers, specifically. In the combined system, Wen’s transceivers are substituted with one or more multiband transceivers, as taught by Govind, and tuners are added for each transceiver, as taught by Ella. EX1003, ¶105.

A. Govind (EX1008)

U.S. Pat. No. 7,489,914 (“Govind”) was filed on April 25, 2005 and published on November 10, 2005. It is prior art under at least pre-AIA 35 U.S.C. § 102(b).

Govind discloses “multi-band, multimode integrated RF transceiver topologies” that enable “a multi-band transceiver” to operate at “a first frequency and a second frequency different from the first frequency.” EX1008, 2:8-13, 2:21-31. Govind discloses such a multi-band transceiver may be connected to “a multi-

band antenna ... for receiving signals in various frequency ranges.” *Id.*, 17:17-31.

The multi-band transceiver comprises a voltage controlled oscillator (VCO) “for simultaneously generating oscillation signals at a first frequency and a second frequency for a multi-band transceiver,” which enables concurrent operation in multiple frequency bands. *Id.*, 2:8-20, 2:32-47.

B. Motivation to Combine

A POSITA would have been motivated to add a tuner and controller, as taught by Ella, to Wen’s wireless device, and would have reasonably expected the combination to succeed. *See* Section IX.B.

A POSITA would have further been motivated to add multiband transceivers, as taught by Govind, to Wen’s wireless device, and would have reasonably expected the combination to succeed. EX1003, ¶110.

First, multiband transceivers were well known in the art and were commercially available prior to August 2008. EX1003, ¶111. For example, Int. Pub. No. WO 2005/029720 (“Leenaerts”), published on March 31, 2005, discloses that multiband transceivers were already in use, noting that “[r]elatively recent, multi-band transceivers and accordingly multi-band receivers and multi-band transmitters have been considered,” offering the advantage of being able to “work with signals situated in different bands and being adapted to different communication protocols.” EX1009, 1:11-15. The ’763 patent similarly

acknowledges that “it is possible to purchase multi-band transceiver chips for popular wireless standards where different antenna ports are provided for various RF output bands.” EX1001, 6:54-57. Accordingly, replacing the plurality of transceivers connected to Wen’s multiband antenna with one or more multiband transceivers would have been a simple substitution of known elements with predictable results. EX1003, ¶111.

Second, Wen provides an express motivation to combine. EX1003, ¶112. Wen teaches that “as the functionality of cellular communications devices continues to increase, so too does the demand for *smaller devices which are easier and more convenient for users to carry.*” EX1004, [0003]. One “challenge” in reducing device size is “the relatively limited amount of space available for the antenna,” particularly “where multi-frequency band operation is required.” *Id.* A POSITA would have thus been motivated to look to multiband transceivers to reduce the number and size of transceiver components necessary to support multiple frequency bands. EX1003, ¶112.

Third, Govind provides a similar express motivation to combine. EX1003, ¶113. For example, Govind discloses using multiband transceivers in systems with “a multi-band antenna ... for receiving signals in various frequency ranges.” EX1008, 17:17-31. In particular, Govind’s multiband transceivers “can be reused at different frequency ranges, thereby reducing the number of components required.”

Id., 2:8-13. Govind’s approach allows for “optimization of space and power requirements,” “reduced power consumption,” and “lower costs,” among other advantages. *Id.*, 21:48-57. A POSITA would have understood that these improvements are particularly beneficial for mobile devices, where size, power consumption (*i.e.*, battery life), and cost are all important design factors. EX1003, ¶113.

In addition, Wen, Govind, and the ‘763 patent are all analogous art because they are directed to the same technological subject matter, namely radio frequency (RF) components for wireless devices that operate in multiple frequency bands. EX1001, Abstract (describing “wireless devices” that “use a single physical structure (e.g., an antenna) for transmission and reception of many different bands”); EX1004, Abstract (describing a “mobile wireless communications device” with “a common antenna” and “a plurality of wireless radio frequency (RF) transceivers ... coupled to ... the common antenna” with “respective different operating frequency”); EX1008, 1:23-27 (invention relates to “RF single-band and multi-band transceivers ... for use in radio frequency (RF) applications”).

Finally, a POSITA would have reasonably expected the combination to succeed. EX1003, ¶115. As noted above, multiband transceivers were well known and commercially available prior to the ‘763 patent. EX1009, 1:11-15; EX1001, 6:54-57. A POSITA would have been capable of replacing Wen’s plurality of

transceivers with one or more multiband transceivers using routine engineering to achieve predictable results. EX1003, ¶115. In addition, because Wen’s controller and antenna are already configured to operate using multiple frequency bands, it would have been trivial for a POSITA to integrate multiband transceivers into Wen’s system. *Id.*

C. Claim 6:

1. 6[pre]: “A wireless device, comprising”

See Ground I, Limitation 1[pre].

2. 6[a]: “one or more antennas”

See Ground I, Limitation 1[a].

3. 6[b]: “at least one multiband transmitter, receiver or transceiver”

Wen renders this limitation obvious in view of Govind. EX1003, ¶¶118-20. It would have been obvious to a POSITA to use a multiband transceiver in Wen’s system based on Govind. *Id.*

Govind discloses “multi-band, multimode integrated RF transceiver topologies” that enable a “a ***multi-band transceiver***” to operate at “a first frequency and a second frequency different from the first frequency.” EX1008, 2:8-13, 2:21-31. Govind’s multi-band transceiver comprises voltage controlled oscillators (VCOs) “for simultaneously generating oscillation signals at a first frequency and a second frequency for a multi-band transceiver.” *Id.*, 2:8-20, 2:32-47. The multi-

band transceiver may be connected to “a multi-band antenna ... for receiving signals in various frequency ranges.” *Id.*, 17:17-31.

For the reasons discussed above in Section X.B, a POSITA would have been motivated to apply Govind’s teachings regarding multi-band transceivers to Wen’s wireless device, and would have reasonably expected the combination to succeed.

4. 6[c]: “a tuner associated with said at least one multiband transmitter, receiver, or transceiver”

See Ground II, Limitation 4[a].

5. 6[d]: “a controller for controlling tuning of the tuner to a plurality of different bands”

See Ground II, Limitation 4[b].

6. 6[e]: “wherein at least one antenna of said one or more antennas is used by said at least one multiband transmitter, receiver or transceiver in a plurality of different bands”

Wen discloses a multiband antenna that is used by a plurality of transceivers in a plurality of different bands. *See* Ground I, Limitation 1[c]. In addition, each of Wen’s transceivers is connected to a feed point on one of the leg portions of the antenna. EX1004, [0034]-[0035], [0039]-[0040]. Each feed point may operate at a plurality of frequency bands. *Id.*, [0039]-[0040] (first feed point “provide[s] operation at 900 MHz, 1800 MHz, and 5 GHz”; third feed point “is also used for three operating frequency bands, which are 2.1 GHz, 5.2 GHz, and 5.8 GHz”).

It would have been obvious to a POSITA to substitute a multiband transceiver, as taught by Govind, for one or more of Wen’s transceivers, particularly those

transceivers connected to a feed point that is used for multiple frequency bands.

EX1003, ¶¶123-24.

For example, Govind discloses “a ***multi-band transceiver***” that operates at “a first frequency and a second frequency different from the first frequency.” EX1008, 2:8-13, 2:21-31. Govind’s multi-band transceiver may be connected to “a multi-band antenna ... for receiving signals in various frequency ranges.” *Id.*, 17:17-31.

For the reasons discussed above in Section X.B, a POSITA would have been motivated to apply Govind’s teachings regarding multi-band transceivers to Wen’s wireless device, and would have reasonably expected the combination to succeed.

7. **6[f]: “wherein said at least one antenna is one or more of an actively tuned antenna, and; is tuned by one or more passive elements which are selected or interconnected using electronic control”**

See Ground I, Limitation 1[d].

- D. **Claim 7: The wireless device of claim 6 said at least one antenna is used for transmitting, receiving, or transmitting and receiving simultaneously in said plurality of different bands.**

See Ground I, Claim 3.

- E. **Claim 8: The wireless device of claim 6 wherein said mobile device is selected from the group consisting of computers, telephones, portable computing or communication devices, games, wireless post it notes, wireless memory media, RFID tags, vehicles, clothing, personal data assistants and navigation assistants.**

See Ground I, Claim 5.

F. Claim 9: The wireless device of claim 6 wherein said passive elements are comprised of either or both lumped or distributed elements.

See Ground I, Claim 2.

G. Claim 10

1. 10[pre]: “A wireless device, comprising”

See Limitation 6[pre].

2. 10[a]: “at least one multiband antenna”

Wen discloses at least one antenna. See Limitation 6[a]. The antenna is a multiband antenna that operates in a plurality of frequency bands. See Limitation 6[e].

3. 10[b]: “at least one multiband transmitter, receiver or transceiver”

See Limitation 6[b]

4. 10[c]: “a tuner associated with said at least one multiband transmitter, receiver, or transceiver, said tuner matching said at least one multiband antenna to said at least one multiband transmitter, receiver or transceiver in a plurality of different bands simultaneously”

“a tuner associated with said at least one multiband transmitter, receiver, or transceiver”: See Limitation 6[c].

“said tuner matching said at least one multiband antenna to said at least one multiband transmitter, receiver or transceiver in a plurality of different bands simultaneously”: Wen in view of Ella and Govind renders this limitation

obvious. As discussed above, it would have been obvious to a POSITA to substitute multiband transceivers for Wen's transceivers in view of Govind. See Limitation 6[b]. It would further have been obvious to a POSITA to use a tuner to match the impedance of the antenna and an associated transceiver in view of Ella. See Limitation 6[c]. Further, Ella expressly discloses that its tuning apparatus matches the impedance of the transceiver to a multiband antenna in two bands (*i.e., a plurality of different bands*) *simultaneously*. EX1005, 7:30-37 (“[E]mbodiments of the present invention provide an advantage in that they are able to compensate for changes in the impedance of a dual band antenna element and optimize the antenna in both resonant frequency bands.”), 7:59-8:50 (discussing selection of parameters to optimize operation for two frequency bands). Accordingly, in the combined system, the tuners would match the multiband antenna to at least one transceiver in a plurality of different bands simultaneously. EX1003, ¶134.

H. Claim 11: “The mobile device of claim 10 wherein said at least one antenna is used for transmitting, receiving, or transmitting and receiving simultaneously in said plurality of different bands”

See Claim 7.

I. Claim 12: “The wireless device of claim 10 wherein said mobile device is selected from the group consisting of computers, telephones, portable computing or communication devices, games, wireless post it notes, wireless memory media, RFID tags, vehicles, clothing, personal data assistants and navigation assistants”

See Claim 8.

J. Claim 13

1. 13[pre]: “A wireless portable device, comprising”

To the extent the preamble is limiting, Wen discloses a ***wireless device***. See Limitation 6[pre]. Wen further discloses ***portable wireless devices***, including cellular telephones and handheld wireless communication devices. See Claim 8.

2. 13[a]: “one or more antennas radiating or receiving electromagnetic energy at particular frequency bands, at least one of said one or more antennas radiating or receiving electromagnetic energy at a plurality of particular frequency bands;

Wen discloses ***one or more antennas***. See Limitation 6[a]. Wen’s antenna sends and receives signals at a ***plurality of particular frequency bands***. See Limitation 6[e] (antenna is used by transceivers in a plurality of different bands); EX1004, [0039]-[0040] (antenna includes a first feed point that “provide[s] operation at 900 MHz, 1800 MHz, and 5 GHz” and a third feed point “used for three operating frequency bands, which are 2.1 GHz, 5.2 GHz, and 5.8 GHz”), [0048] (mobile device “may send and receive communication signals” via the antennas). A POSITA would have understood that antennas receive communication signals by ***receiving electromagnetic energy*** at particular frequency bands, and that antennas transmit communication signals ***by radiating electromagnetic energy*** at particular frequency bands. EX1003, ¶138.

3. 13[b]: “one or more components selected from the group consisting of receivers, transmitters and transceivers, said

one or more components connected to said at least one of said one or more antennas”

Wen discloses *one or more transceivers*. See Ground I, Limitation 1[b]. The transceivers are *connected to the one or more antennas*. See Ground I, Limitation 1[c].

4. 13[c]: “at least one of said one or more components transmits or receives electromagnetic energy simultaneously at two or more of said plurality of particular frequency bands, or two or more components transmit or receive electromagnetic energy simultaneously at two or more of said plurality of particular frequency bands”

Wen discloses one or more transceivers (*i.e.*, **components**). See Limitation 13[b]. A POSITA would have understood that transceivers send and receive signals by *transmitting and receiving electromagnetic energy*, respectively. EX1003, ¶140.

“two or more components transmit or receive electromagnetic energy simultaneously at two or more of said plurality of particular frequency bands”:

Wen discloses the second optional prong of this limitation because it discloses a plurality (*i.e.*, **two or more**) transceivers, each operating (*i.e.*, sending or receiving) in a different frequency bands. See Ground I, Limitation 1[b]. Accordingly, Wen’s transceivers collectively operate in a **plurality of frequency bands**. EX1003, ¶141. In addition, Wen discloses that multiple transceivers may use the common antenna

at different frequency bands “at the same time” (*i.e.*, ***simultaneously***). EX1004, [0031]; *see also* Ground I, Claim 3.

“at least one of said one or more components transmits or receives electromagnetic energy simultaneously at two or more of said plurality of particular frequency bands”: Wen renders obvious the first optional prong of this limitation. EX1003, ¶142. It would have been obvious to a POSITA to use a multiband transceiver in Wen’s system based on Govind. *See* Limitation 6[b]. A ***multiband*** transceiver transmits and receives in two or more frequency bands simultaneously. EX1003, ¶142; *see also* Limitation 6[b].

K. Claim 14: “The wireless portable device of claim 13 wherein said wireless portable device is selected from the group consisting of computers, telephones, personal data assistants, and navigation assistants”

See Claim 8.

L. Claim 15: “The wireless portable device of claim 13 further comprising one or more tuners which match electromagnetic energy at a particular frequency band to only one of said one or more components”

Wen in view of Ella renders this limitation obvious. As discussed above, it would have been obvious to a POSITA to use a tuner to match the impedance of the antenna and an associated transceiver in view of Ella. *See* Limitation 6[c]. Ella discloses that its tuning apparatus (***tuners***) match the resonant frequencies of the antenna (*i.e.*, ***match electromagnetic energy at a particular frequency band***) to the

associated transceiver (*only one of said one or more components*). EX1005, (“[E]mbodiments of the present invention ... are able to compensate for changes in the impedance of a dual band antenna element and optimize the antenna in *both resonant frequency bands*.”); EX1003, ¶144.

XI. GROUND IV: WEN IN VIEW OF ELLA, GOVIND, AND VLAHOS RENDERS CLAIM 16 OBVIOUS

Wen, Ella, and Govind collectively disclose and render obvious a wireless device comprising a multiband antenna, multiband transceivers, and tuners, as described in Ground III. EX1003, ¶145. Vlahos further discloses filters and similar elements to provide RF isolation for different components.

A. Vlahos (EX1013)

U.S. Pat. No. 5,926,751 (“Vlahos”) was filed on February 19, 1997 and issued on July 20, 1999. It is prior art under at least pre-AIA 35 U.S.C. § 102(b).

Vlahos discloses a “method and apparatus” that “enables a communication device ... to operate in multiple bands.” EX1013, Abstract. The device includes a “transceiver” comprising a “transmitter” that “transmits through an antenna” and a “receiver” for “[i]nformation received by the communication device’s antenna.” *Id.*, 2:25-31, Fig. 1. The receiver includes “separate path[s] ... for each band,” each comprising a “preselector filter,” a “preamplifier” that “provide[s] isolation ... from transmitter energy and other spurious frequencies,” and a “combination filter.” *Id.*,

2:51-3:2. An “LC trap circuit” is also used to “filter the input RF signals (for each band).” *Id.*, 3:29-33.

B. Motivation to Combine

A POSITA would have been motivated to add a tuner and controller, as taught by Ella, and multiband transceivers, as taught by Govind, to Wen’s wireless device, and would have reasonably expected the combination to succeed. *See* Section X.B.

A POSITA would have further been motivated to include filters and other RF isolation components, as taught by Vlahos, in Wen’s wireless device, and would have reasonably expected the combination to succeed. EX1003, ¶149.

First, the need for RF isolation in multi-band wireless communication systems would have been well understood by a POSITA. EX1003, ¶150. RF isolation and filtering for transmitters and receivers in wireless devices long predates the ’763 patent, as evidenced at least by its disclosure in Vlahos over a decade earlier. Indeed, the ’763 patent acknowledges that the “key to proper operation” of a transceiver is to “provide sufficient RF isolation,” and notes that “RF filtering and overload protection” is already available in “commercially available wireless transceivers in various popular bands.” EX1001, 5:30-37. Accordingly adding RF isolation and filtering to Wen represents the use of a known technique with predictable results. EX1003, ¶150.

Second, Vlahos provides an express motivation to combine. EX1003, ¶151.

Vlahos discloses that its filters and other isolation circuitry “provide isolation ... from transmitter energy and other spurious frequencies.” EX1013, 2:59-65. A POSITA would have understood that absent such filtering and isolation, the transmitter energy and other spurious frequencies may interfere with proper operation of a receiver. EX1003, ¶151. In addition, a POSITA would have understood that filtering and isolation circuitry is particularly important in a multiband system, where different components within the system are configured to receive or transmit signals at different frequencies, which increase the risk of interference. *Id.*

In addition, Like Wen, Ella, Govind, and the ‘763 patent, Vlahos is analogous art because it is directed to RF components for wireless devices that operate in multiple frequency bands. EX1013, Abstract (“A method and apparatus enables a communication device ... to operate in multiple bands.”).

Finally, a POSITA would have reasonably expected the combination to succeed. EX1003, ¶153. As noted above, RF isolation techniques were standard, well known, and commercially available prior to the ‘763 patent. EX1001, 5:30-37. A POSITA would have been capable of adding filters and isolation circuitry to Wen’s transceivers using routine engineering to achieve predictable results. EX1003, ¶153.

C. Claim 16: “The wireless portable device of claim 13 further comprising isolation means for isolating said one or more components from more than one particular frequency band of said plurality of frequency bands”

As discussed above, this is a means-plus-function limitation with the function “isolating said one or more components from more than one particular frequency band of said plurality of frequency bands” and corresponding structure “circuitry that provides overload protection, shielding, and/or filters out unwanted bands.”

It would have been obvious to a POSITA in view of Vlahos to use isolation circuitry to filter unwanted bands for each transceiver in Wen’s system (as modified by Ella and Govind).

Vlahos discloses several types of circuitry for filtering out unwanted frequency bands. EX1003, ¶156. For example, Vlahos disclose that its receiver includes “separate path[s] ... for each band.” 2:51-54. Each path includes a “preselector filter” that only passes RF signals in a specific frequency band. *Id.*, 2:54-60. Each path also includes a “preamplifier” with an “enable line” that “controls a transistor to provide isolation ... from transmitter energy and other spurious frequencies.” *Id.*, 2:60-65. Each path also includes a “combination filter” that further filters the received signal before it is output to a mixer. *Id.*, 2:65-3:6. In addition, Vlahos discloses an “LC trap circuit” in the mixer that further “filter[s] the input RF signals (for each band).” *Id.*, 3:29-33; *see also* EX1001, 5:42-47 (describing the use of an “RF Trap” to provide isolation).

For the reasons discussed above in Section XI.B, a POSITA would have been motivated to apply Vlahos’s teachings regarding filtering and isolation to Wen’s wireless device, and would have reasonably expected the combination to succeed.

**XII. GROUND V: RUBINSHTEYN IN VIEW OF WEN RENDERS
CLAIMS 1-3 AND 5 OBVIOUS**

Rubinshteyn discloses a wireless device comprising an antenna and a multiband transceiver that operate in multiple frequency bands. To the extent PO argues that Rubinshteyn does not disclose a plurality of transmitters, receivers, or transceivers, Wen discloses connecting a plurality of transceivers to a multiband antenna. A POSITA would have been motivated to apply Wen’s teachings regarding multiple transceivers to Rubinshteyn’s wireless device, as detailed below. EX1003, ¶158.

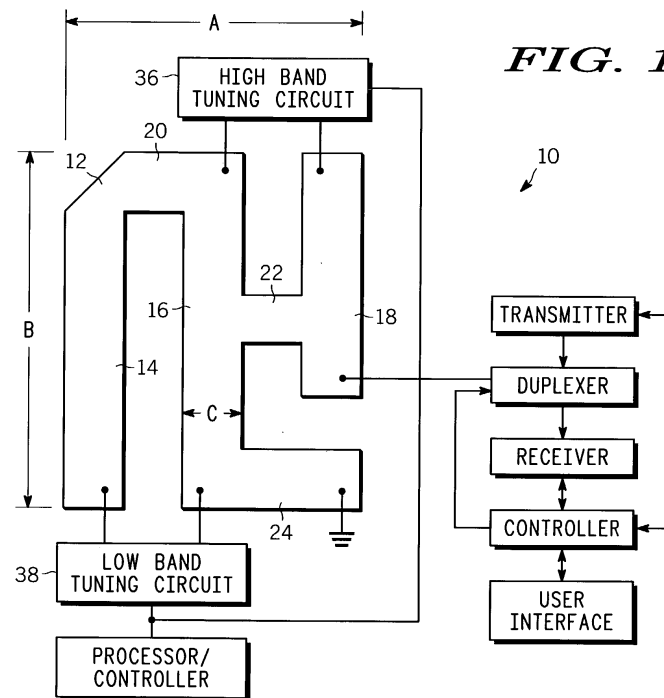
A. Rubinshteyn (EX1006)

U.S. Pat. Pub. No. 2004/0125027 (“Rubinshteyn”) was filed on December 27, 2002, and was published July 1, 2004. It is prior art under at least pre-AIA 35 U.S.C. § 102(b).

Rubinshteyn teaches a wireless communication device having a planar, tunable antenna with a low band element and a high band element designed to “resonate[] at two different center frequencies simultaneously, which permits simultaneous operation of the device at two different frequencies,” allowing “*reception or transmission of RF signals...at two different frequencies*

simultaneously.” EX1006, [0016]. The low band element and high band element are each connected to, respectively, a low band tuning circuit and high band tuning circuit on the antenna that “electronically alter the frequencies at which the elements...resonate” by selectively coupling a capacitive reactance or “a combination of a capacitive reactance and an inductive reactance” between predetermined points on the antenna. *Id.*, [0028]. A processor or controller is connected to both the high and low band tuning circuits to “independently control [both] circuits to tune the antenna ... to multiple pairs of high band and low band frequencies.” *Id.*

Rubinshteyn Figure 1 illustrates one embodiment of such tunable planar antenna with connected elements such as tuning circuits and controller:



B. Motivation to Combine

A POSITA would have been motivated to include a plurality of transmitters, receivers, or transceivers, as taught by Wen, in Rubinshteyn's wireless device, and would have reasonably expected the combination to succeed. EX1003, ¶162.

First, both single-band and multiband transceivers were well known in the art and were commercially available prior to August 2008. EX1003, ¶163; *see also* EX1009, 1:11-15 (“A vast majority of the transceivers are built for being used in in only one band, the more the bands the more transceivers. Relatively recent, multi-band transceivers and accordingly multi-band receivers and multi-band transmitters have been considered.”). The '763 patent similarly acknowledges that both single-band and multi-band transceivers were known in the prior art. EX1001, 4:60-5:2 (describing prior art devices using “different band transceivers”), 6:54-57 (“[I]t is possible to purchase multi-band transceiver chips for popular wireless standards where different antenna ports are provided for various RF output bands.”). Accordingly, using a plurality of transceivers with Rubinshteyn's multiband antenna would have been a simple substitution of known elements with predictable results. EX1003, ¶163.

Second, a POSITA would have understood that single-band transmitters, receivers, or transceivers, and multi-band transmitters, receivers, and transceivers,

are the two known alternatives available to a system designer in a multiband wireless system. EX1003, ¶164. Accordingly, it would have been obvious to a POSITA to try from among these two finite number of well-known and predictable solutions. *Id.* Further, a POSITA would have understood that selecting between multiband transceivers or a plurality of single-band transceivers in a multiband wireless device may depend on design constraints. *Id.* For example, Govind discloses that multiband transceivers may present “difficulties in power consumption, compatibility, interference, and integration.” EX1008, 1:48-50. Govind discloses a multi-band transceiver that “may satisfy one or more of these issues,” *Id.*, 2:1-4, but design constraints may nevertheless limit a particular device to use a plurality of single-band transceivers. EX1003, ¶164.

In addition, Rubinshteyn, Wen, and the ’763 patent are all analogous art because they are directed to the same technological subject matter, namely, radio frequency (RF) components, and in particular, multiband antennas and associated components, in wireless devices. EX1001, Abstract (describing “wireless devices” that “use a single physical structure (e.g., an antenna) for transmission and reception of many different bands”); EX1004, Abstract (describing a “mobile wireless communications device” with “a common antenna” and “a plurality of wireless radio frequency (RF) transceivers ... coupled to ... the common antenna” with “respective

different operating frequency”); EX1006, [0016] (describing a “tunable antenna” in a “wireless communication device” that “can operate at multiple frequencies”).

Finally, a POSITA would have reasonably expected the combination to succeed. EX1003, ¶¶165-66. Adding multiple transceivers into Rubinshteyn’s wireless device represents a simple substitution of Rubinshteyn’s individual multiband receiver and transmitter for a plurality of transmitters, receivers, or transceivers. *Id.* A POSITA would have been capable of implementing this change using routine engineering to achieve predictable results. *Id.* In addition, because Rubinshteyn’s antenna is already configured to operate using multiple frequency bands, it would have been trivial for a POSITA to use a plurality of transceivers instead of a single multiband transceiver in connection with the multiband antenna. *Id.*

C. Claim 1

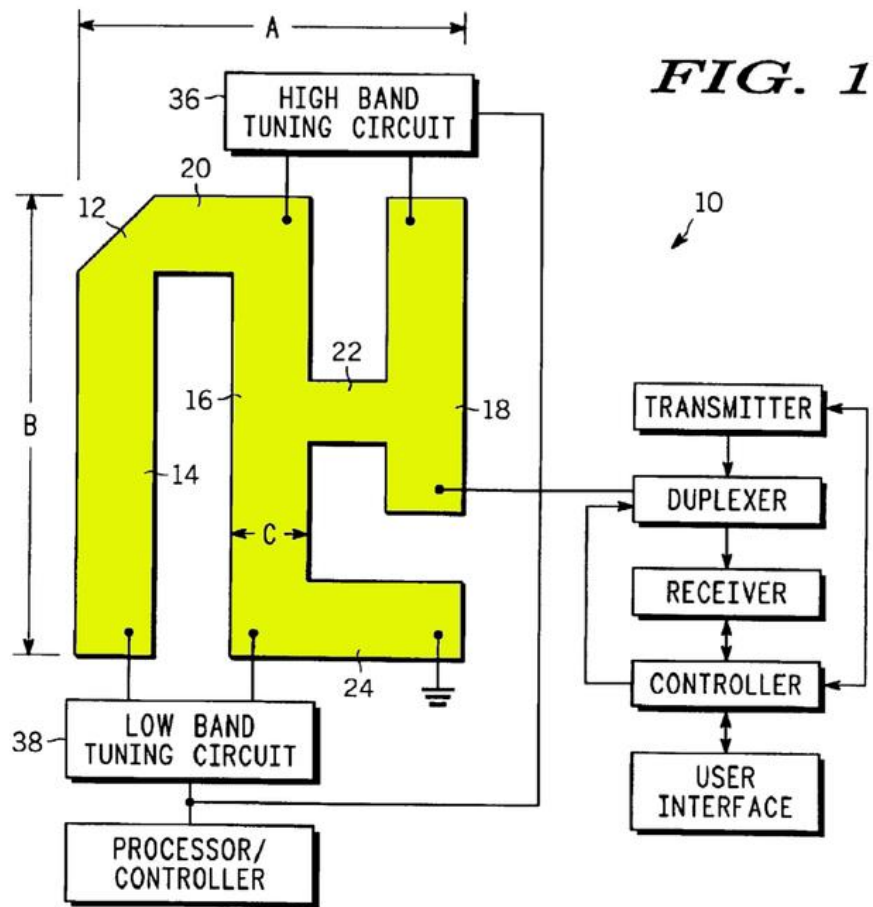
1. 1[pre]

To the extent the preamble is limiting, Rubinshteyn discloses a wireless device. EX1003, ¶¶167-68. For example, Rubinshteyn discloses that its “invention” relates to “**wireless communication devices**,” and specifically, “tunable, multiple-frequency planar antennas **for wireless communication devices**.” EX1006, [0001].

2. 1[a]

Rubinshteyn discloses one or more antennas. EX1003, ¶¶169-70. For example, Rubinshteyn discloses various configurations of “a multi-band antenna.”

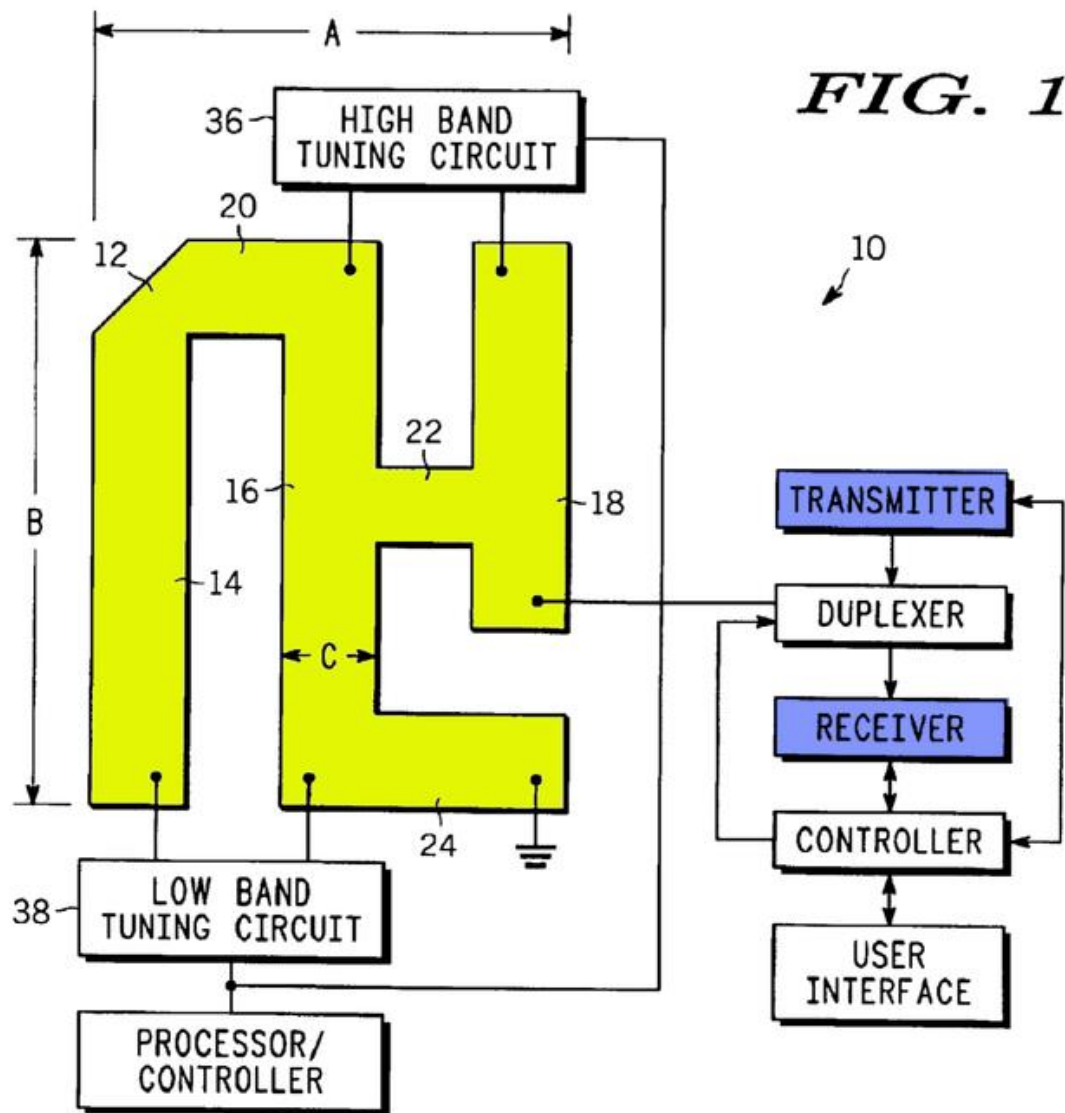
EX1006, [0002], [0041], Fig. 1. The multiband antenna, in one embodiment, is “designed such that it resonates at two different center frequencies simultaneously, which permits simultaneous operation of the device at two different frequencies.” EX1006, [0016]. In particular, Rubinshteyn’s antenna includes at least a “high band element” and a “low band element” that “is simultaneously resonant at a lower frequency than the high band element.” *Id.*, [0022]. As a result, “the antenna 12 is resonant at two different center frequencies, which allows operation in two bands simultaneously.” *Id.* The antenna (annotated in yellow) is shown in Figure 1, reproduced and annotated below.



3. 1[b]

Rubinshteyn discloses at least one multiband transmitter and receiver. EX1003, ¶171. For example, Rubinshteyn discloses that the high band and low band elements in the antenna “share a common RF input port ... which is connected to a duplexer.” EX1006, [0022]. The duplexer in turn connects the high band and low band elements to “*a transmitter and a receiver.*” A POSITA would have understood that Rubinshteyn’s transmitter and receiver operate in at least the high frequency band and the low frequency band (corresponding to the high band and low band

antenna elements), and thus are ***multiband***. EX1003, ¶172. For example, Rubinshteyn discloses that its multiband system “allows a user ... to use multiple services with the same antenna.” EX1006, [0016]. A POSITA would have understood that this requires the device to be capable of transmitting ***and*** receiving at the frequency bands of the supported services. EX1003, ¶172. Rubinshteyn also expressly discloses that “reception ***or*** transmission of RF signals may be performed at ***two different frequencies simultaneously***,” further confirming that the transmitter and receiver are multiband. EX1006, [0016]. Rubinshteyn’s transmitter and receiver (annotated in blue) are shown in Figure 1, reproduced and annotated below.

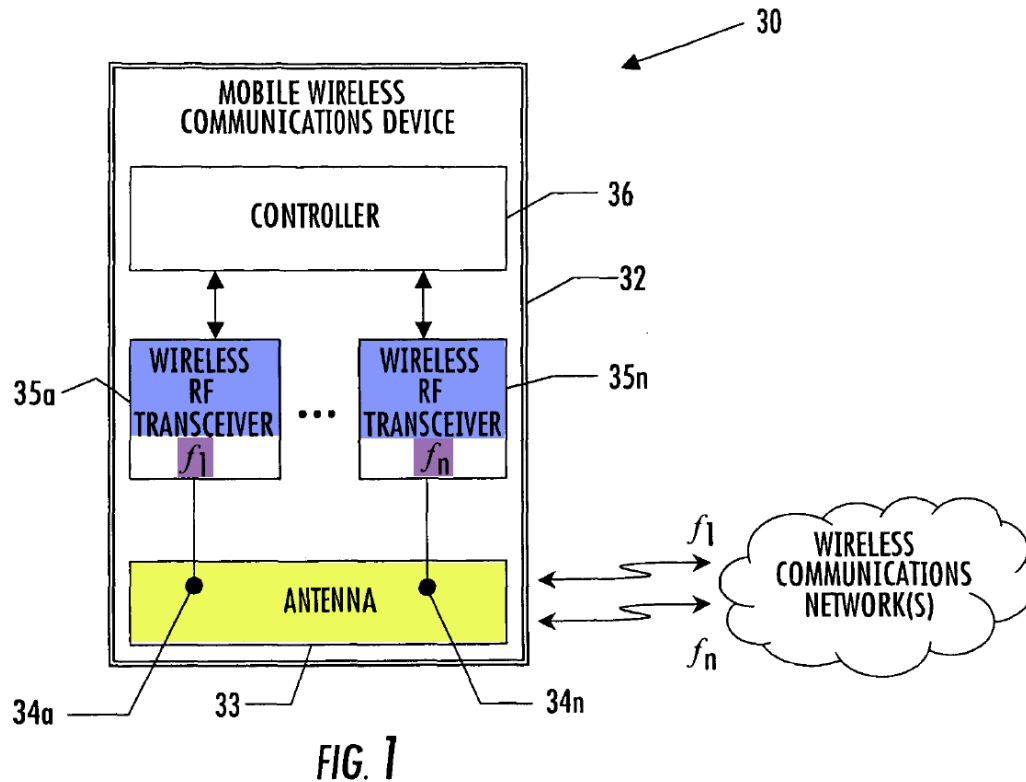


Rubinshteyn also discloses a **plurality** of receivers, transmitters, or transceivers because it discloses one transmitter and one receiver, *i.e.*, two components from the recited set of components. EX1003, ¶174.

To the extent PO argues this limitation requires a plurality of receivers, a plurality of transmitters, or a plurality of transceivers, it would have been obvious to

a POSITA to use a plurality of transceivers, rather than a single multiband transmitter and receiver, as taught by Wen. EX1003, ¶175.

Wen discloses “a **plurality** of wireless radio frequency (RF) **transceivers** carried by the housing and coupled to respective ones of the signal feed points of [a] common antenna.” EX1004, [0027]. “Each wireless RF transceiver preferably has a **respective different operating frequency** associated therewith.” *Id.*, [0031]; *see also id.*, [0039] (example with antenna “tuned to provide operation at 900 MHz, 1800 MHz, and 5 GHz via a selective connection of appropriate wireless RF transceivers”). Thus, each transceiver **operates in at least one frequency band**, and the plurality of transceivers **operate in multiple frequency bands** (at least one per transceiver) (*i.e.*, **operate in one or more frequency bands**). EX1003, ¶175. Wen’s transceivers are illustrated in Figure 1, annotated below, where the plurality of transceivers are elements 35a-35n (annotated in blue) and their corresponding frequencies of operation are f_1 - f_n (annotated in purple):



EX1004, Fig. 1.

For the reasons discussed above in Section XII.B, a POSITA would have been motivated to apply Wen's teachings regarding a plurality of transceivers to Rubinshteyn's wireless device, and would have reasonably expected the combination to succeed.

4. 1[c]

As described above, Rubinshteyn discloses a transmitter and a receiver (*i.e.*, a **plurality of transmitters, receivers, or transceivers**) that operate in at least a high band and a low band (*i.e.*, a **plurality of different bands**). See Limitation 1[b]. Further, Rubinshteyn discloses **at least one antenna** (*e.g.*, antenna 12, annotated in

yellow above) that “resonates at two different center frequencies simultaneously, which permits simultaneous operation of the device at two different frequencies [*i.e.*, **a plurality of different bands**].” EX1006, [0016]; *see also* Limitation 1[a]. Rubinshteyn’s antenna **is used by** the receiver and transmitter in the plurality of different bands because “[t]he low band element 26 and the high band element 28 share a common RF input point, which ... is connected to a duplexer,” and subsequently “connected to [the] transmitter and a receiver.” EX1006, [0022]; *see also* EX1003, ¶177.

To the extent PO argues this limitation requires a plurality of receivers, a plurality of transmitters, or a plurality of transceivers, it would have been obvious to a POSITA to use a plurality of transceivers with a multiband antenna, rather than a single multiband transmitter and receiver, as taught by Wen. EX1003, ¶178.

Wen discloses a **plurality of transceivers** that operate in **a plurality of different bands**. *See* Limitation 1[b]; *see also* EX1004, [0029] (example with “different operating frequencies ... within a range of about 900 MHz to 6 GHz”). Further, Wen discloses that the plurality of transceivers connect to (*i.e.*, **use**) a single multiband **antenna** (*e.g.*, antenna 33) in a plurality of different bands (*e.g.*, transceivers 35a-35n operating in bands f_1 to f_n). EX1004, [0031], Fig. 1. Wen also expressly discloses that “[t]he antenna 33 ... is **shared** by a **plurality of wireless radio frequency (RF) transceivers 35a-35n** (*e.g.*, cellular and/or wireless LAN

transceivers)” and that “[e]ach wireless RF transceiver preferably has a respective ***different operating frequency associated therewith.***” EX1004, [0031]; *see also id.*, [0039] (example where the antenna “provide[s] operation at 900 MHz, 1800 MHz, and 5 GHz via a selective connection of appropriate wireless RF transceivers 35”). Accordingly, the shared antenna is used in a ***plurality of different bands***, *i.e.*, at least one for band for each of the plurality of transceivers. EX1003, ¶178.

For the reasons discussed above in Section XII.B, a POSITA would have been motivated to apply Wen’s teachings regarding a plurality of transceivers to Rubinshteyn’s wireless device (including Rubinshteyn’s multiband antenna), and would have reasonably expected the combination to succeed.

5. 1[d]

Rubinshteyn discloses at least prong (b) of Limitation 1[d] because Rubinshteyn’s antenna is tuned by one or more passive elements which are selected or interconnected using electronic control. EX1003, ¶180. Specifically, as detailed below, Rubinshteyn’s antenna is tuned by using electronic control to select one or more passive elements in the form of capacitors and/or inductors. Rubinshteyn’s capacitors and inductors are passive elements because they have fixed electrical characteristics. *Id.*; *see also* EX1006, [0035] (describing the relative capacitance of each capacitor and how to choose the capacitance).

For example, as illustrated in Figure 4, reproduced and annotated below, Rubinshteyn discloses a “high band tuning circuit” that includes “three capacitors 62, 64, 68” (annotated in green) and “PIN diode[s] 54, 56, 58.” EX1006, [0030], Fig. 4. “[E]ach of the capacitors 62, 64, 68 may [also] be connected in parallel or in series with an inductor.” *Id.*, [0031]. Each capacitor “effectively alters the electrical length of the high band element, in this case, thus changing the center frequency at which the high band element is resonant [*i.e.*, **tuning** the high band element of the antenna].”

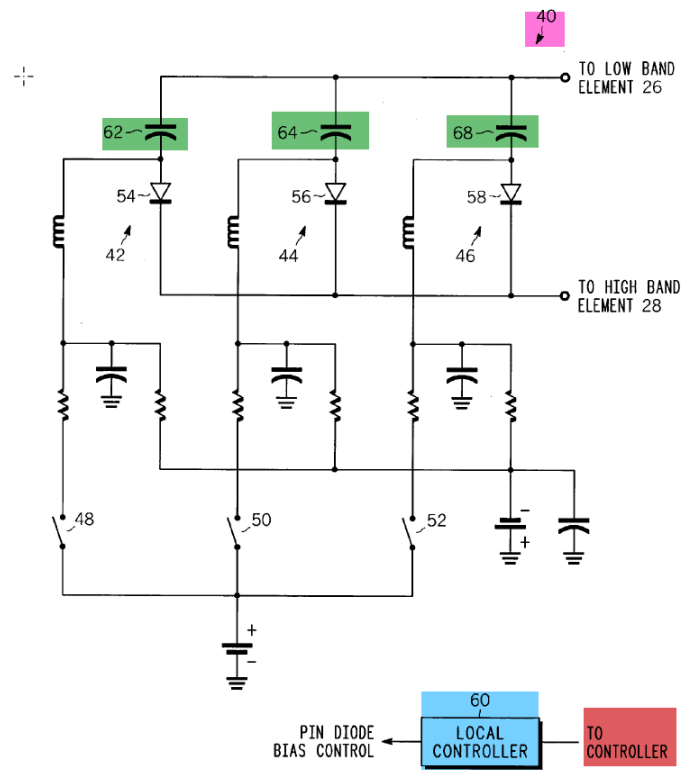


FIG. 4

The PIN diodes are controlled by switches 48, 50, and 52, so that when “one of the switches ... is closed, the corresponding PIN diode ... couples the

corresponding capacitor ... between the predetermined points of the antenna.” *Id.*

The switches are thus used to ***select*** the capacitors and/or inductors (*i.e.*, the ***passive elements***). EX1003, ¶182. By activating different switches, different combinations of passive elements can be selected, such that “eight different resonant center frequencies of the high band element can be provided.” EX1006, [0035], Fig. 5. In other words, the high band element can be ***tuned*** to different frequency bands by selecting different combinations of passive elements. EX1003, ¶182. A similar approach can be used to tune the low band element. EX1006, [0036].

Rubinshteyn further discloses that a “controller can be connected to the high and low band tuning circuits ... to independently control the high and low band tuning circuits to tune the antenna 12 to multiple pairs of high band and low band frequencies.” EX1006, [0028]. For example, a “local controller” can “independently control[] the switches 48, 50, 52” to “[c]hang[e] the center resonant frequency of one of the band elements” (*i.e.*, using ***electronic control***). *Id.*, [0034], [0036]; *see also id.*, [0036] (“[A] single local controller 60 can control the capacitance stages of both the high band tuning circuit and the low band tuning circuit.”).

D. Claim 2

Rubinshteyn discloses both lumped passive elements. EX1003, ¶¶184-85. For example, as discussed above, Rubinshteyn discloses tuning the antenna by using

a controller to select passive elements in the form of capacitors and/or inductors. See Limitation [1d]. A POSITA would have understood that Rubinshteyn's capacitors and inductors are ***lumped elements*** because they are modeled as discrete points of capacitance or inductance, without regard to the physical dimensions of the capacitors or inductors themselves. EX1003, ¶185; see also EX1012, 3-4 (defining “distributed” and “lumped” elements).

E. Claim 3

Rubinshteyn discloses that its antenna “resonates at ***two different center frequencies simultaneously***.” EX1006, [0016]; see also *id.*, [0022] (“[T]he antenna 12 is resonant at two different center frequencies, which allows ***operation in two bands simultaneously***.”). The antenna is “connected to a transmitter and a receiver,” and can therefore both ***transmit and receive*** simultaneously in the two operating frequency bands. *Id.*, [0022]; see also *id.*, cl. 20 (“receiving or transmitting signals at two different frequencies with a single antenna simultaneously”); EX1003, ¶186; Limitation 1[a].

F. Claim 5

Rubinshteyn discloses “[w]ireless communication devices” that “may be used in a variety of different applications, including ***cellular telephone***” devices and “land-mobile” devices (*i.e.*, two-way radios, or ***portable communication devices***). EX1006, [0002]; see also EX1003, ¶187.

**XIII. GROUND VI: RUBINSHTEYN IN VIEW OF WEN AND ELLA
RENDERS CLAIMS 4 AND 17 OBVIOUS**

Rubinshteyn discloses a wireless device comprising an antenna and a multiband transceiver that operate in multiple frequency bands. To the extent PO argues that Rubinshteyn does not disclose a plurality of transmitters, receivers, or transceivers, Wen discloses connecting a plurality of transceivers to a multiband antenna. Ella further discloses tuners for impedance matching in a wireless device such as Rubinshteyn's. A POSITA would have been motivated to apply Wen's teachings regarding multiple transceivers and Ella's teachings regarding tuners to Rubinshteyn's wireless device, as detailed below. EX1003, ¶188.

A. Motivation to Combine

A POSITA would have been motivated to include a plurality of transmitters, receivers, or transceivers, as taught by Wen, in Rubinshteyn's wireless device, and would have reasonably expected the combination to succeed. *See* Section XII.B.

A POSITA would have further been motivated to add a tuner and controller, as taught by Ella, to Rubinshteyn's wireless device, and would have reasonably expected the combination to succeed. EX1003, ¶190.

First, tuners were well known in the art and were commercially available prior to August 2008. EX1003, ¶191. For example, Ben-Bassat, filed in June 2007, discloses that "antenna tuning circuits are in *widespread use today*" and used to "allow[] [an antenna] to operate over a wide range of frequencies" and adjust the

impedance of the antenna to “minimize[] the SWR [standing wave ratio] and maximize[] power transfer through the antenna system.” EX1010, 1:51-2:9. Indeed, a POSITA would have known that tuners are frequently used in RF systems to match the impedance at the antenna to the impedance of a transmitter, receiver, or transmitter in order to achieve well-known benefits, such as improving power transfer, minimizing distortion, and preventing overheating. EX1003, ¶191. Accordingly, adding tuners associated with Rubinshteyn’s transmitter and receiver would have entailed nothing more than the use of a known technique to improve similar devices (*i.e.*, Rubinshteyn’s wireless device and associated transmitter and receiver) in the same way. *Id.*

Second, Ella provides express motivations to combine. EX1003, ¶192. Ella identifies two advantages associated with its tuning apparatus and associated controller. EX1005, 1:51-2:9. First, Ella teaches that its invention “provide[s] an advantage” because it “provide[s] adaptive tuning of an antenna element.” *Id.*, 7:21-23. Specifically, Ella “detect[s] changes in impedance of an antenna element and then reactively compensate for the changes in impedance.” *Id.*, 7:23-25. This “result[s] in the device operating more efficiently (since the electrical energy supplied to the antenna element will be maximized) and effectively (the signal strength of the antenna element may be improved).” *Id.*, 7:25-29. Second, Ella teaches that its invention provides an additional advantage because it is “able to

compensate for changes in the impedance of a **dual band** antenna element and optimize the antenna in **both resonant frequency bands.**” *Id.*, 7:30-33. A POSITA would have thus been particularly motivated to use a tuner and controller as taught by Ella with Rubinshteyn’s multiband antenna in order to optimize performance in the plurality of frequency bands used by the antenna. EX1003, ¶192.

In addition, Rubinshteyn, Ella, and the ’763 patent are all analogous art because they are directed to the same technological subject matter, namely radio frequency (RF) components for wireless devices. EX1001, Abstract (describing “wireless devices” that “use a single physical structure (e.g., an antenna) for transmission and reception of many different bands”); EX1006, Abstract (describing a “mobile wireless communications device” with “electronically tunable planar antenna” connected to “tuning circuits [that] electronically change the resonant center frequency of the corresponding element”); EX1005, 1:10-13 (“invention” relates to “a portable radio telephone”), 4:15-29 (describing the tuning “apparatus” in the context of a “mobile cellular phone” with an “antenna arrangement”).

Finally, a POSITA would have reasonably expected the combination to succeed. EX1003, ¶194. As noted above, tuners were well known and commercially available prior to the ’763 patent. *Id.*; EX1010, 1:51-2:9. A POSITA would have been capable of adding a tuner and controller as taught by Ella to the receive path of

Rubinshteyn’s transceivers using routine engineering to achieve predictable results.

EX1003, ¶194.

B. Claim 4

1. 4[a]

Rubinshteyn discloses tuning the operating frequencies of the antenna. For example, Rubinshteyn discloses “tuning circuits [that] can change one or both of the two center frequencies at which the antenna resonates.” EX1006, [0016]; *see also* Ground V, Limitation 1[d].

It would have been obvious to a POSITA in view of Ella to add a tuner between Rubinshteyn’s antenna and Rubinshteyn’s transmitter and receiver. EX1003, ¶196. Alternatively, in the combined Rubinshteyn-Wen system, it would have been obvious to a POSITA in view of Ella to add a tuner between each of the plurality of transceivers and Rubinshteyn’s antenna. *Id.*

Ella discloses a tuner associated with a transceiver. *See* Ground II, Limitation 4[a].

A POSITA would have been motivated to apply Ella’s teachings regarding tuners to Rubinshteyn’s transmitter and receiver, or to the Rubinshteyn-Wen plurality of transceivers, and would have reasonably expected the combination to succeed. *See* Section XIII.A.

2. 4[b]

Rubinshteyn discloses a **controller** that “independently control[s] the high and low band tuning circuits to tune the antenna 12 to multiple pairs of high band and low band frequencies.” EX1006, [0028]; *see also* Ground V, Limitation 1[d]; EX1003, ¶198.

It would have been obvious to a POSITA in view of Ella to use Rubinshteyn’s controller to digitally control tuners (as disclosed by Ella, *see* Limitation 4[a]), or to add a separate controller to control each such tuner. EX1003, ¶199.

Ella discloses a controller that controls tuning of the tuners. *See* Ground II, Limitation 4[b].

A POSITA would have been motivated to apply Ella’s teachings regarding tuners to Rubinshteyn’s transmitter and receiver, or to the Rubinshteyn-Wen plurality of transceivers, and would have reasonably expected the combination to succeed. *See* Section XIII.A.

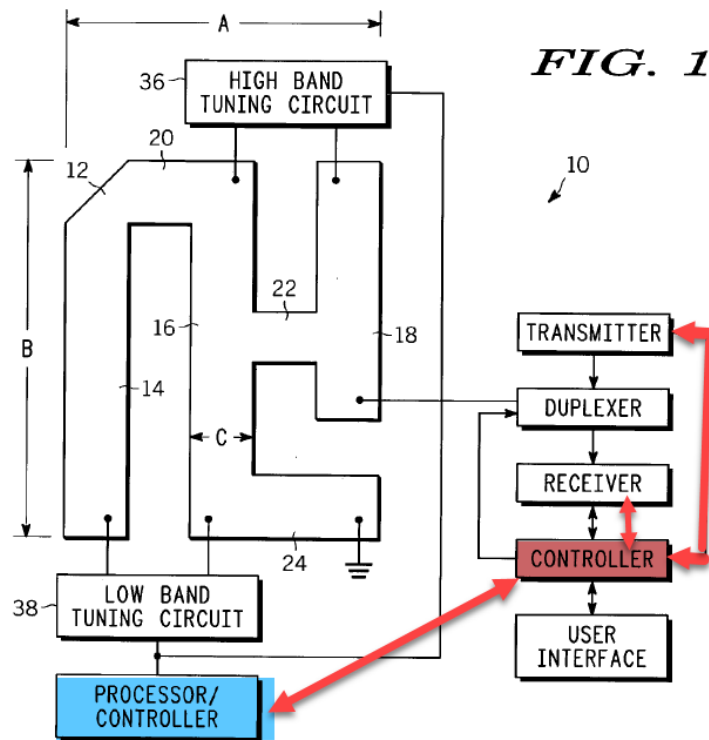
C. Claim 17

1. 17[pre]

“A wireless device component”: Rubinshteyn discloses a wireless device. *See* Ground V, Limitation 1[pre]. The wireless device includes components such as antennas and transceivers. *See* Ground V, Limitations 1[a], 1[b]; EX1003, ¶201.

“comprising a tuner or a set of tuners or controller or other circuitry configurable to be coupled to at least one antenna and a plurality of

transmitters, receivers, or transceivers”: Rubinshteyn discloses or renders obvious a *controller coupled to an antenna and a plurality of transmitters, receivers, or transceivers*. EX1003, ¶202. For example, as illustrated in Figure 1, reproduced and annotated below, Rubinshteyn discloses a main controller (annotated in red) *coupled to* a receiver and transmitter (i.e., a *plurality of transmitters, receivers, or transceivers*), and coupled to the antenna via a local controller (annotated in blue). EX1006, Fig. 1, [0022], [0028]; *see also id.*, [0034] (disclosing the main controller controlling the local controller to control the switches in the tuning circuits).



To the extent PO argues this limitation requires a plurality of receivers, a plurality of transmitters, or a plurality of transceivers, it would have been obvious to a POSITA to use a plurality of transceivers, rather than a single multiband transmitter and receiver, as taught by Wen. *See* Ground V, Limitation 1[b].

Alternatively, Rubinshteyn (or Rubinshteyn and Wen) in view of Ella render obvious a tuner coupled to at least one antenna and a plurality of receivers or transceivers. *See* Limitation 4[a].

“at least one antenna and a plurality of transmitters, receivers, or transceivers that operate at one or more frequency bands”: Rubinshteyn discloses at *least one antenna*. *See* Ground V, Limitation 1[a]. Rubinshteyn discloses, or Rubinshteyn and Wen render obvious, *a plurality of transmitters, receivers, or transceivers*. *See* Ground V, Limitation 1[b]. The antenna operates at *multiple frequency bands*, and the plurality of transmitters, receivers, or transceivers operate in one or more frequency bands. *See* Ground V, Limitation 1[c].

“wherein said at least one antenna is used by said plurality of transmitters, receivers or transceivers in a plurality of different bands”: *See* Ground V, Limitation 1[c].

2. 17[a]

See Ground V, Limitation 1[d].

**XIV. GROUND VII: RUBINSHTEYN IN VIEW OF ELLA RENDERS
CLAIMS 6-15 OBVIOUS**

Rubinshteyn discloses a wireless device comprising an antenna and a multiband transceiver that operate in multiple frequency bands. Ella discloses tuners for impedance matching in a wireless device such as Rubinshteyn's. A POSITA would have been motivated to apply Ella's teachings regarding tuners to Rubinshteyn's wireless device, as detailed below. EX1003, ¶208.

A. Motivation to Combine

A POSITA would have been motivated to add a tuner and controller, as taught by Ella, to Rubinshteyn's wireless device, and would have reasonably expected the combination to succeed. *See* Section XIII.A.

B. Claim 6

1. 6[pre]

See Ground V, Limitation 1[pre].

2. 6[a]

See Ground V, Limitation 1[a].

3. 6[b]

Rubinshteyn discloses at least one multiband transmitter and receiver. *See* Ground V, Limitation 1[b].

4. 6[c]

See Ground VI, Limitation 4[a].

5. 6[d]

See Ground VI, Limitation 4[b].

6. 6[e]

Rubinshteyn discloses that its multiband **antenna** is **used by** the multiband **transmitter** and the multiband **receiver** in at least a high band and a low band (*i.e.*, a **plurality of different bands**. this limitation. See Ground V, Limitation 1[c].

7. 6[f]

See Ground V, Limitation 1[d].

C. Claim 7

See Ground V, Claim 3.

D. Claim 8

See Ground V, Claim 5.

E. Claim 9

See Ground V, Claim 2.

F. Claim 10

1. 10[pre]

See Limitation 6[pre].

2. 10[a]

Rubinshteyn discloses at least one antenna. See Limitation 6[a]. The antenna is a multiband antenna that operates in a plurality of frequency bands. See Limitation 6[e].

3. 10[b]

See Limitation 6[e].

4. 10[c]

“a tuner associated with said at least one multiband transmitter, receiver, or transceiver”: See Limitation 6[c].

“said tuner matching said at least one multiband antenna to said at least one multiband transmitter, receiver or transceiver in a plurality of different bands simultaneously”: Rubinshteyn in view of Ella renders this limitation obvious. Rubinshteyn discloses a multiband antenna and a multiband transmitter and receiver. See Limitation 6[b]. It would have been obvious to a POSITA to use a tuner to match the impedance of the antenna and an associated receiver or transmitter in view of Ella. See Limitation 6[c]. Further, Ella expressly discloses that its tuning apparatus matches the impedance of a transceiver to a multiband antenna in two bands (*i.e., a plurality of different bands*) *simultaneously*. EX1005, 7:30-37 (“[E]mbodiments of the present invention provide an advantage in that they are able to compensate for changes in the impedance of a dual band antenna element and optimize the antenna in both resonant frequency bands.”), 7:59-8:50 (discussing selection of parameters to optimize operation for two frequency bands). Accordingly, in the combined system, the tuners would thus match the multiband

antenna to at Rubinshteyn's transmitter and receiver in a plurality of different bands simultaneously. EX1003, ¶225.

G. Claim 11

See Claim 7.

H. Claim 12

See Claim 8.

I. Claim 13

1. 13[pre]

To the extent the preamble is limiting, Rubinshteyn discloses a **wireless device**. See Limitation 6[pre]. Rubinshteyn further discloses **portable wireless devices**, including cellular telephones and “land-mobile” devices (*i.e.*, two-way radios). See Claim 8.

2. 13[a]

Rubinshteyn discloses **one or more antennas** that operates at particular frequency bands (*e.g.*, a high band and a low band). See Limitation 6[a]. Rubinshteyn's antenna sends and receives signals at a **plurality of particular frequency bands**. See Limitation 6[e] (antenna is used by a multiband transmitter and a multiband receiver in a plurality of different bands). A POSITA would have understood that antennas receive communication signals by **receiving electromagnetic energy** at particular frequency bands, and that antennas transmit

communication signals *by radiating electromagnetic energy* at particular frequency bands. EX1003, ¶229.

3. 13[b]

Rubinshteyn discloses a transmitter and a receiver. See Limitation 6[b]. The transmitter and receiver are *connected to the one or more antennas*. See Limitation 6[e].

4. 13[c]

Rubinshteyn discloses a transmitter and receiver (*i.e.*, *components*). See Limitation 13[b]. A POSITA would have understood that transmitters send signals *by transmitting electromagnetic energy*, and receivers receive signals *by receiving electromagnetic energy*, respectively. EX1003, ¶231.

“at least one of said one or more components transmits or receives electromagnetic energy simultaneously at two or more of said plurality of particular frequency bands”: Rubinshteyn discloses the first optional prong of this limitation because it discloses a multiband transmitter and a multiband receiver, which can transmit and receive (respectively) simultaneously in at least two frequency bands (*i.e.*, a high band and a low band). See Limitation 6[b].

“two or more components transmit or receive electromagnetic energy simultaneously at two or more of said plurality of particular frequency bands”: Rubinshteyn also discloses the second optional prong of this limitation because it

discloses two components (a transmitter and a receiver), each operating in at least two different frequency bands (*e.g.*, a high band and a low band). See Limitation 6[b]. Accordingly, Rubinshteyn's transmitter and receiver together operate in a ***plurality of frequency bands***. EX1003, ¶233. In addition, Rubinshteyn discloses that transmitter and receiver may use the antenna at different frequency bands simultaneously via the duplexer. EX1006, [0022]; EX1003, ¶233.

J. Claim 14

See Claim 8.

K. Claim 15

Rubinshteyn in view of Ella renders this limitation obvious. As discussed above, it would have been obvious to a POSITA to use a tuner to match the impedance of the antenna and an associated receiver in view of Ella. See Limitation 6[c]. Ella discloses that its tuning apparatus (***tuners***) match the resonant frequencies of the antenna (*i.e.*, ***match electromagnetic energy at a particular frequency band***) to the associated transceiver (***only one of said one or more components***). EX1005, (“[E]mbodiments of the present invention ... are able to compensate for changes in the impedance of a dual band antenna element and optimize the antenna in ***both resonant frequency bands***.”); EX1003, ¶235.

**XV. GROUND VIII: RUBINSHTEYN IN VIEW OF ELLA AND VLAHOS
RENDERS CLAIM 16 OBVIOUS**

Rubinshteyn and Ella collectively disclose and render obvious a wireless device comprising a multiband antenna, multiband transceivers, and tuners, as described in Ground VII. EX1003, ¶236. Vlahos further discloses filters and similar elements to provide RF isolation for different components.

A. Motivation to Combine

A POSITA would have been motivated to add a tuner and controller, as taught by Ella, to Rubinshteyn’s wireless device, and would have reasonably expected the combination to succeed. *See* Section XIV.A.

A POSITA would have further been motivated to include filters and other RF isolation components, as taught by Vlahos, in Rubinshteyn’s wireless device, and would have reasonably expected the combination to succeed. EX1003, ¶238.

First, the need for RF isolation in multi-band wireless communication systems would have been well understood by a POSITA. EX1003, ¶239; EX1001, 5:30-37; *see also* Section XI.B. Adding RF isolation and filtering to Rubinshteyn represents the use of a known technique with predictable results. EX1003, ¶239.

Second, Vlahos provides an express motivation to combine. EX1003, ¶240. Vlahos discloses using filters and other isolation circuitry to “provide isolation ... from transmitter energy and other spurious frequencies,” EX1013, 2:59-65, which

would otherwise interfere with a receiver, particularly in a multiband system.

EX1003, ¶240; *see also* Section XI.B.

In addition, Like Rubinshteyn, Ella, and the ‘763 patent, Vlahos is analogous art because it is directed to RF components for wireless devices that operate in multiple frequency bands. EX1013, Abstract (“A method and apparatus enables a communication device ... to operate in multiple bands.”).

Finally, a POSITA would have reasonably expected the combination to succeed. EX1003, ¶242. As noted above, RF isolation techniques were standard, well known, and commercially available prior to the ‘763 patent. EX1001, 5:30-37. A POSITA would have been capable of adding filters and isolation circuitry to Rubinshteyn’s transmitter and/or receiver using routine engineering to achieve predictable results. EX1003, ¶242.

B. Claim 16

As discussed above, this is a means-plus-function limitation with the function “isolating said one or more components from more than one particular frequency band of said plurality of frequency bands” and corresponding structure “circuitry that provides overload protection, shielding, and/or filters out unwanted bands.”

It would have been obvious to a POSITA in view of Vlahos to use isolation circuitry to filter unwanted bands at least for Rubinshteyn’s receiver.

Vlahos discloses several types of circuitry for filtering out unwanted frequency bands. *See* Ground IV, Claim 16.

For the reasons discussed above in Section XV.A, a POSITA would have been motivated to apply Vlahos's teachings regarding filtering and isolation to Rubinshteyn's wireless device, and would have reasonably expected the combination to succeed.

XVI. MANDATORY NOTICES AND FEES

A. Real Party-In-Interest

The real party-in-interest for Petitioner is Samsung.

B. Related Matters

Patent Owner filed a patent infringement lawsuit against Petitioners asserting the '763 patent in related district court litigation captioned *Massively Broadband LLC v. Samsung Electronics Co., Ltd. et al*, 2:25-cv-00608-JRG (E.D. Tex.). Petitioners are submitting additional petitions for *inter partes* review of patents within the same family as the '763 patent, namely U.S. Patent No. 11,876,548; 8,593,358; and 11,063,625, the proceedings for which are associated with IPR Case Nos. 2025-#####, 2025-#####, 2025-01564.

C. Counsel and Service Information

Petitioner provides the following counsel and service information. Petitioner consents to electronic service the email addresses listed in the table below and at:

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Pursuant to 37 C.F.R. § 42.10(b), a Power of Attorney accompanies this

Petition.

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D. Payment of Fees

The undersigned authorizes the Office to charge the fee required for this Petition for *Inter Partes* Review to Deposit Account No. 50-5708. Any additional fees that might be due are also authorized.

XVII. CONCLUSION

For these reasons, Petitioner requests *inter partes* review of the '763 patent.

Date: September 25, 2025

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CERTIFICATION UNDER 37 C.F.R. § 42.24

Under the provisions of 37 C.F.R. § 42.24, the undersigned hereby certifies that the word count for the foregoing Petition for *inter partes* review (excluding the table of contents, table of authorities, mandatory notices, certificate of service or word count, and appendix of exhibits or claim listing) totals 13,887 words, which is within the word limit allowed under 37 C.F.R. § 42.24(a)(1)(i).

Date: September 25, 2025

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CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. §§ 42.6(e), 42.105(a), the undersigned hereby certifies service on the PO of a copy of this Petition and its respective exhibits at the official correspondence address for the attorneys of record for the '763 patent as shown in USPTO PAIR via FedEx:

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Courtesy copies were also sent via FedEx and electronic mail to Patent

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Petition for *Inter Partes* Review
U.S. Patent No. 8,350,763

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