UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

GEOTAB INC. AND GEOTAB USA, INC.
Petitioners,

v.

FRACTUS, S.A.,
Patent Owner.

Case No. IPR2025-00929
Patent 8,810,458

PATENT OWNER'S PRELIMINARY RESPONSE

TABLE OF CONTENTS

EXHIBIT LIST iv

TABLE OF AUTHORITIES v

I. Introduction 1

II. Background 2

A. Technical Background 2

B. The '458 Patent 5

C. The Cited Art 6

i. Wong 6

ii. Lee 9

iii. Gaucher 11

iv. Zhao 15

D. The Person of Ordinary Skill in the Art 15

III. Claim Construction 16

IV. Argument 16

A. Ground 1A – Claims 1-9, 12, and 13 over Wong in view of Lee 16

i. Claims 1-9, 12, and 13 Are Not Obvious from the Disclosures of Wong and Lee 17

ii. Petitioners are Unlikely to Succeed with Respect to Claim 8 and Its Dependents 29

B. Ground 1B – Claims 14-15 and 17-19 over Wong 34

C. Ground 2 – Claims 1-10, 12, and 13 over Gaucher 35

i. The Modification of Gaucher Proposed in Ground 2 Renders the Device Unsuitable for its Intended Purpose 36

ii. Petitioners are Unlikely to Succeed with Respect to Claim 8 and Its Dependents.....39

D. Ground 3 – Claims 14-18 over Zhao 42

E. The Petition Should be Denied for Failing to Meet the Requirements of 37 CFR § 42.104 47

V. Conclusion.....47

EXHIBIT LIST

Exhibit No.	Title
Ex. 2001	PACER Docket Reports from July 28, 2025 in *Fractus, S.A. v. Verizon Connect Inc. et al,* 2:24-cv-01009-JRG-RSP (E.D.Tex.) and Fractus, S.A. v. Geotab Inc. 2:24-cv-01008-JRG-RSP (E.D.Tex.)
Ex. 2002	Defendants' Preliminary Invalidity Contentions dated June 18, 2025 in 2:24-cv-01009-JRG-RSP (E.D.Tex.)
Ex. 2003	Invalidity Contentions for U.S. Patent No. 8,810,458 in 2:24-cv-01009-JRG-RSP (E.D.Tex.)
Ex. 2004	Amended Docket Control Order dated April 10, 2025 in 2:24-cv-01009-JRG-RSP (E.D.Tex.)
Ex. 2005	Complaint dated December 6, 2024 in 2:24-cv-01008-JRG-RSP (E.D.Tex.)
Ex. 2006	Docket Navigator Time to Trial Statistics for Judge Rodney Gilstrap (last accessed July 23, 2025)
Ex. 2007	Declaration of Mark J. DeBoy
Ex. 2008	Expert Declaration of Hossein Hashemi, Ph.D.
Ex. 2009	Steven E. Ellingson, Electromagnetics II (2025) (available at https://commons.libretexts.org/book/eng-19441 (last accessed August 28, 2025))

TABLE OF AUTHORITIES

Cases

Cambridge Mobile Telematics, Inc., v. Sfara, Inc., IPR2024-00952, Paper 12 (P.T.A.B. Dec. 13, 2024) 47

Chemours Co. FC, LLC v. Daikin Indus., Ltd., 4 F.4th 1370 (Fed. Cir. 2021).....33

Ex Parte Bjarne Harbo & Lucas Willemoes Hesselhof, No. APPEAL 2024-002314, 2025 WL 2159181 (P.T.A.B. July 25, 2025).....39

In re Gordon, 733 F.2d 900 (Fed. Cir. 1984) 38

Statutes

35 U.S.C. § 314 ..... 16, 48

Rules

37 C.F.R. § 42.104 47

I. INTRODUCTION

Fractus, S.A. ("Patent Owner") requests that the Board decline to institute *inter partes* review ("IPR") of U.S. Patent No. 8,810,458 (the "'458 Patent"), because the Petition's multiple invalidity grounds fail to render obvious any of the claims of the '458 Patent.

Ground 1A challenges claims 1-9, 12, and 13 over Wong (EX1005) in view of Lee (EX1011), alleging that it would have been obvious to replace Wong's GSM/DCS antenna with Lee's quadband antenna. But the combination of Wong and Lee is improper because there is no motivation to combine those references. The Petition disregards the conclusions of Wong regarding antenna isolation, as well as what a person of ordinary skill in the art ("POSITA") would have understood about the severe isolation problems introduced by Lee's design. The proposed substitution eliminates the optimal WLAN antenna placement identified by Wong, likely substantially degrades isolation between the antennas, as well as introduces substantial new coupling problems due to both the larger surface currents of Lee's lower frequency band and the closer proximity of Lee's higher frequency PCS band to WLAN frequencies. Further, Lee's additional resonance at 2.5 GHz falls almost exactly at the WLAN band, creating still more isolation problems with Wong's WLAN antenna.

Ground 1B challenges claims 14, 15, and 17-19 based on Wong alone. That ground should also be rejected. Here, Petitioners attempt to relocate Wong's WLAN antenna away from the optimal location determined by Wong, a non-obvious modification.

Ground 2 challenges claims 1-10, 12, and 13 based on Gaucher (EX1012). The Petition proposes replacing one of Gaucher's quadband antennas with a tri-band antenna from an incorporated reference, Gaucher848 (EX1013). Gaucher, however, is expressly directed to providing spatial and polarization diversity by using two antennas operating over the same frequency ranges. By substituting an antenna operating in completely different frequency bands, Petitioner's modification destroys this intended purpose and renders the device incapable of functioning as designed.

Finally, Ground 3 challenges claims 14-18 based on Zhao (EX1008). Zhao fails to provide a second antenna meeting the size requirements explicitly recited in claim 14.

II. BACKGROUND

A. Technical Background

When multiple antennas are implemented in the same device, especially when they share a common ground plane, electromagnetic coupling between the antennas may degrade system performance. EX2008, ¶35. Coupling occurs because antennas are inherently sensitive to both the desired signals they are designed to receive or

transmit, and to undesired signals from nearby radiators. *Id.* The shared ground plane, while necessary for some types of antennas (*e.g.,* slot antennas), also acts as a medium for surface currents that facilitate energy transfer between antennas. *Id.* These currents can cause mutual coupling, leading to interference, radiation pattern distortion, and reduced efficiency. *Id.* In certain applications, even modest levels of coupling can reduce antenna performance. *Id.* The necessity for isolation between such antennas, *i.e*., the flip side of coupling, is driven by the fact that each antenna is typically optimized for a specific frequency band, polarization, and radiation pattern. *Id.* Insufficient isolation can prevent the receiver from discerning the desired signal from overwhelming local interference, leading to dropped connections or corrupted data. *Id.*

Shared ground planes compound these challenges because they support surface currents that are not confined to the immediate feed point of the antennas. EX2008, ¶36. When a transmitter excites an antenna, part of the energy can travel across the ground plane surface and be consumed at undesired points. *Id.* A neighboring antenna connected to the same ground structure can inadvertently pick up part of this energy, not through free-space propagation alone but also via ground plane surface current. *Id.*

The attenuation rate of surface currents on a ground plane depends on its size relative to wavelength. At shorter wavelengths (higher frequencies), surface current

tends to be more localized around the feed region. EX2008, ¶37. At longer wavelengths (lower frequencies), surface currents can occupy a larger fraction of the ground plane area. *Id.*

If two antennas are configured to operate at the same or nearby frequencies, the coupling between the antennas will likely increase. EX2008, ¶38. Specifically, the transmitting antenna launches strong surface currents on the ground plane at its resonant frequency, and the receiving antenna is most sensitive to currents and fields at that same frequency or nearby frequencies. *Id.* As a result, even small amounts of ground-plane-mediated energy transfer can cause significant coupling and interference. *Id.*

Further, the electromagnetic behavior of the ground plane is very sensitive to, for example, changes in frequency, geometry, and loading from connected antennas. EX2008, ¶39. At certain frequencies, resonances in the ground structure can occur, enhancing coupling between antennas in complicated ways. *Id.* These resonances can shift or intensify depending on environmental conditions, mounting structures, or nearby conductive elements, making isolation prediction a very complicated problem. *Id.*

Ultimately, while a shared ground plane can offer antenna performance benefits, it inherently increases the likelihood of antenna-to-antenna coupling unless isolation measures are deliberately engineered. EX2008, ¶40. The challenge lies in

balancing the structural and integration benefits of a common ground plane with the necessity of keeping antenna systems functionally independent. *Id.*

B. The '458 Patent

The '458 Patent issued from U.S. Patent Application No. 13/718,348, filed December 18, 2012, which is a continuation of U.S. Patent Application No. 13/341,051, filed December 30, 2011 (now U.S. Patent No. 8,362,960), which is a continuation of U.S. Patent Application No. 11/988,888, filed September 30, 2008, which is a National Stage Entry of International PCT Application No. PCT/EP2006/007050, filed July 18, 2006 (now U.S. Patent No. 8,115,686). The '458 Patent's priority chain also includes priority from Provisional Application No. 60/702,205, filed July 25, 2005. EX2008, ¶32.

The '458 Patent relates to techniques for providing enhanced antenna isolation in wireless handheld or portable devices that are configured to operate using multiple antennas in conjunction with a shared ground plane. EX1001, claims 1, 8, and 14; EX2008, ¶33. Specifically:

> [T]he enhanced isolation between antennas attainable using the techniques and teachings of the present invention provide handset and handheld device manufacturers with more flexibility when designing the layout of the PCB [printed circuit board] of the devices and the placement of the antennas and neighboring electronics on the PCB of the devices, reducing the costs of integration of the antenna, simplifying

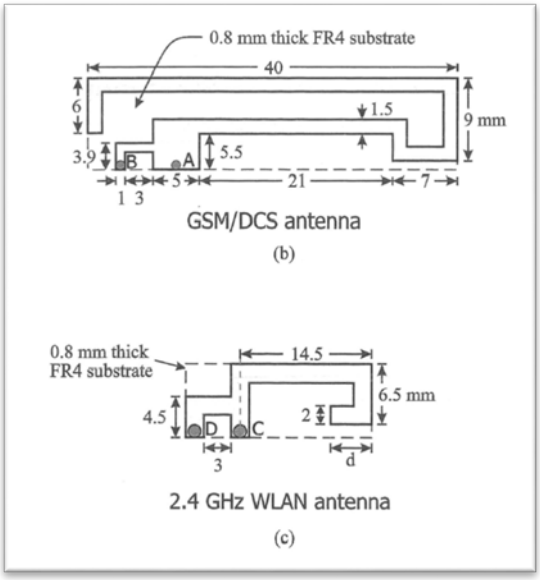
the new product development cycle, and accelerating the time to market of their new products.

EX1001, 24:21-29.

C. The Cited Art

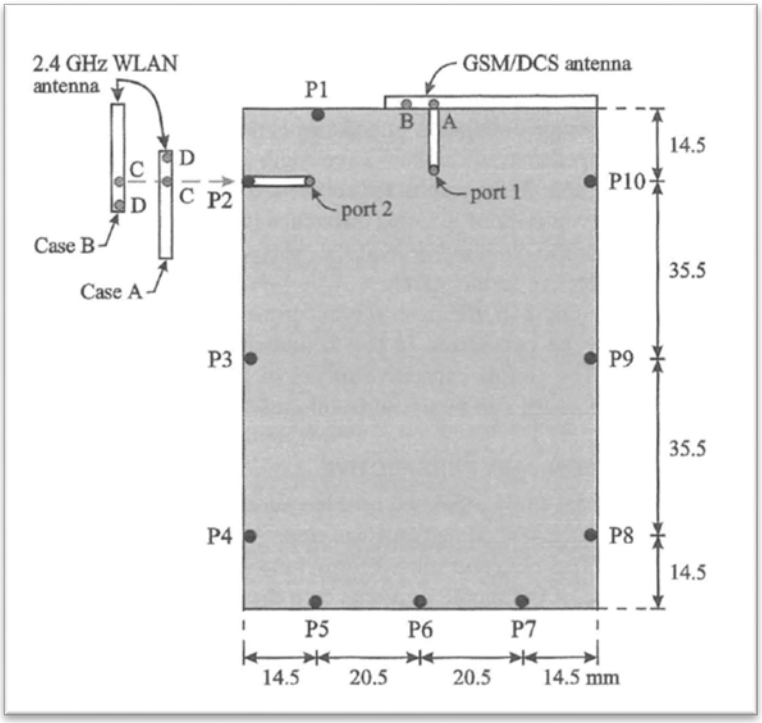
i. Wong

Wong[1] (EX1005) describes "a study on two promising internal antennas" for use in a personal digital assistant (PDA) phone for cellular and wireless local area network (WLAN) operation. EX1005, 347; EX2008, ¶47. The specific antennas studied in Wong are illustrated in FIGs. 1(b) and 1(c) of the reference.



[1] K-L Wong, J-H Chou, S-W Su, and C-M Su. "Isolation between GSM/DCS and WLAN Antennas in a PDA Phone," *Microwave and Optical Technology Letters*, volume 45, no. 4, 2005, pp. 347-352.

For purposes of the study, the GSM/DCS antenna of FIG. 1(b) is positioned at the top of a ground plane, while the WLAN antenna of FIG. 1(c) is measured at 10 different positions around the ground plane, positions P1 through P10, illustrated in FIG. 2. The WLAN antenna was also tested at different orientations relative to its feed point (point C) and its short or ground point (point D). *See* EX2008, ¶48. The study showed that not all of locations P1-P10 were acceptable (EX1005, 349), that the location of the WLAN antenna affected its operating frequency (EX1005, 349), and that the isolation between the two antennas is strongly related to the excited surface current distributions in the system ground plane (EX1005, 351). *See* EX2008, ¶48.



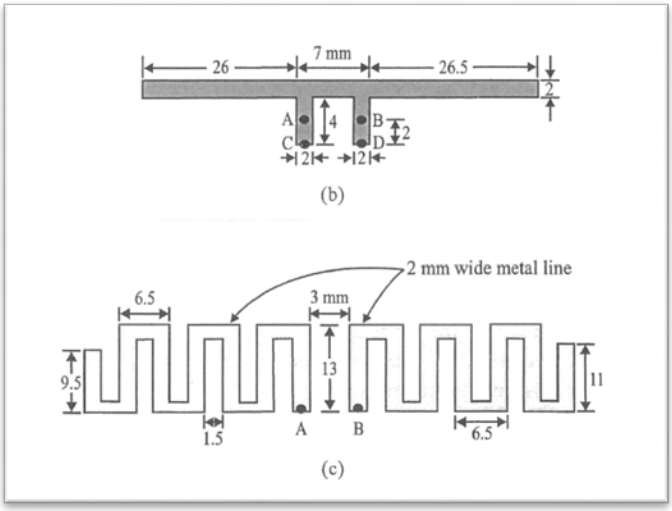
As illustrated in Table 1 from Wong, location P10 generally exhibited the worst isolation between the two antennas, with location P4 being the optimized location. EX1004, 349; EX2008, ¶49. The results of the measurements here are, however, not predictable. For example, location P7 generally exhibited worse isolation than locations P2 and P3 even though location P7 is substantially further from the GSM/PCS antenna. EX2008, ¶49. Depending on the relative positioning of its feed and ground (*i.e.*, depending on case "A" or "B") location P5 can exhibit better or worse isolation than location P2, even though P5 is essentially the same distance from the GSM/DCS antenna as location P4, the "optimized" location. *Id.*

The observed isolation was also difficult to foresee with regard to whether the antennas extend orthogonally or parallel to each other. EX2008, ¶50. For example, when the WLAN antenna was arranged at location P8, orthogonal to the GSM/DCS antenna, it exhibited worse isolation than when arranged at location P7 with a parallel orientation. *Id.* Wong further discloses that the isolation/coupling between the antennas is strongly influenced by the surface currents resulting in the ground plane from antennas. *Id.*

To the extent that any conclusions may be drawn from Wong, it is that location P10 is "not acceptable for practical applications." EX1005, 349; EX2008, ¶52.

ii. Lee

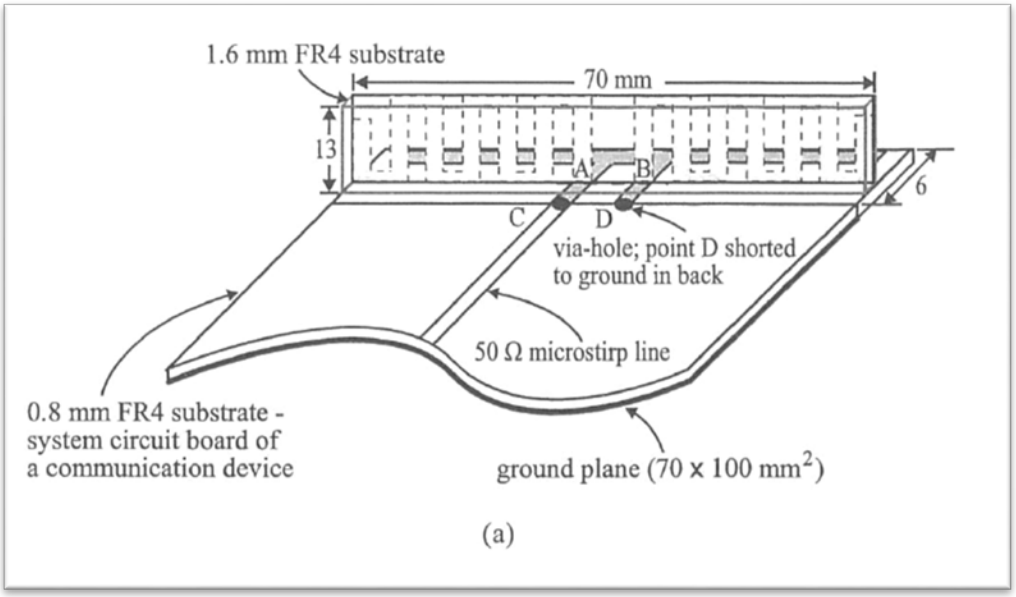
Lee[2] (EX1011), which shares an author in common with Wong, discloses what is described as a "quadband antenna," but which is actually two independent, orthogonally arranged dual-band monopole antennas. EX1011, 359; EX2008, ¶53. These two independent antennas are illustrated in FIGs. 1(b) and 1(c) of Lee.



The combination of the two independent monopole antennas provides operation in the APMS (824-894 MHz), GSM (890-960 MHz), DCS (1710-1880 MHz), and PCS (1850-1990 MHz) frequency bands. EX1011, 359. While the Lee antenna has a ground plane which is similar in size to that of Wong, the antenna is

[2] G-Y Lee and K-L Wong. "Quad-Band Internal Monopole Mobile-Phone Antenna," *Microwave and Optical Technology Letters*, volume 40, no. 5, 2004, pp. 359-361.

substantially larger than the Wong antenna, extending across the entire top of the ground plane, as illustrated in FIG. 1(a) in the reference.



As noted above, the Lee antenna operates at two of the same frequencies as the Wong GSM/DCS antenna and adds the APMS band and the PCS band. The APMS band, which has a lower frequency of 824-894 MHz, will result in longer surface currents due to the inverse relationship between frequency and wavelength of electromagnetic radiation. EX2008, ¶55. The PCS band, with a higher frequency of 1850-1990 MHz, comes substantially closer to the frequencies at which Wong's WLAN antenna operates (2400-2482 MHz) than the GSM (890-960 MHz) and DCS (1710-1880 MHz) frequencies of the Wong antenna. *Id.*

Further, Lee illustrates that its antenna includes a resonant frequency very close to 2500 MHz, which is indicated by the highlighting added to Lee's FIG. 2

below and identified by the substantial return loss around 2500 MHz. EX2008, ¶56. This resonant frequency of around 2500 MHz is substantially the same frequency as the resonant frequency of Wong's WLAN antenna. EX1005, 347; EX2008, ¶56.

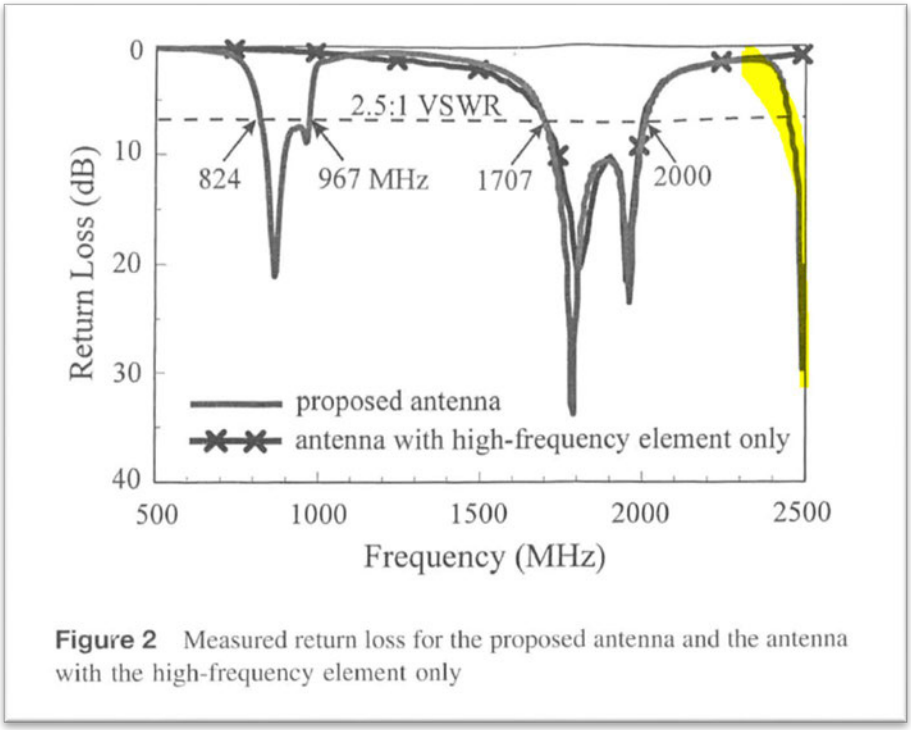


Figure 2 Measured return loss for the proposed antenna and the antenna with the high-frequency element only

iii. Gaucher

Gaucher[3] (EX1012) is directed to a quadband antenna for use in portable devices constructed from "f-shaped" and "l-shaped" pieces. EX1012, Abstract. The antenna is constructed from a plurality of radiating elements as shown in FIGs. 5A and 5B.

[3] U.S. Patent App. Pub. No. 2006/0082503 to Gaucher et al.

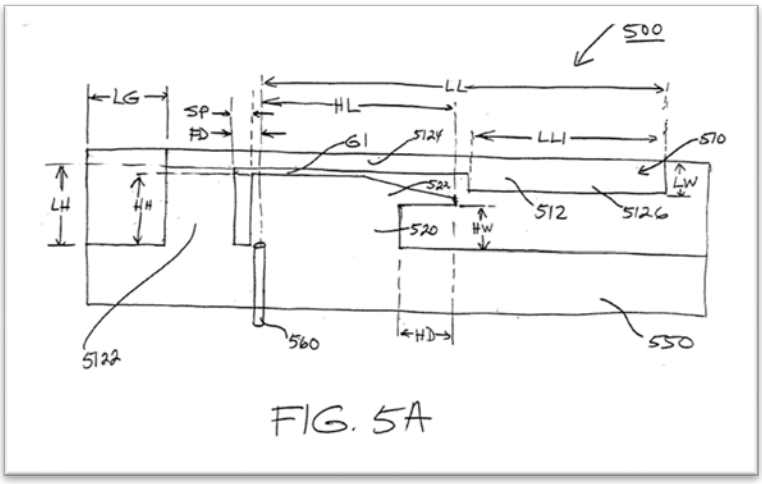


FIG. 5A

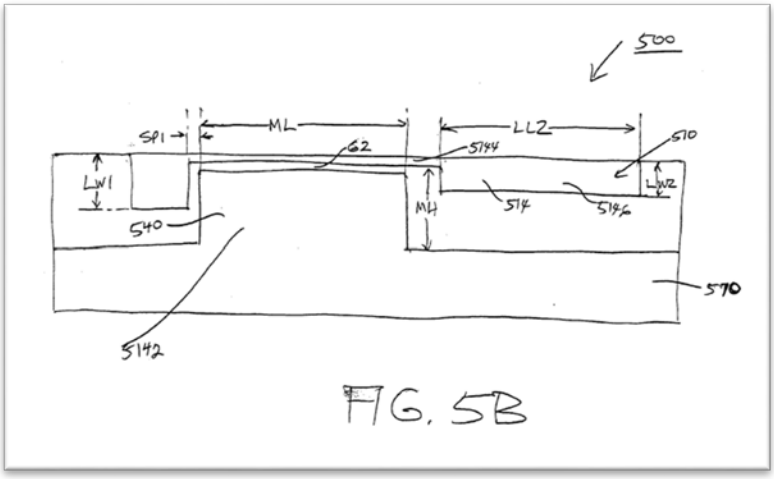


FIG. 5B

As further explained in the reference, multiple copies of the antenna may be incorporated into a portable device, such as a laptop, which are illustrated as antennas 310 and 320 in FIG. 3 of the reference.

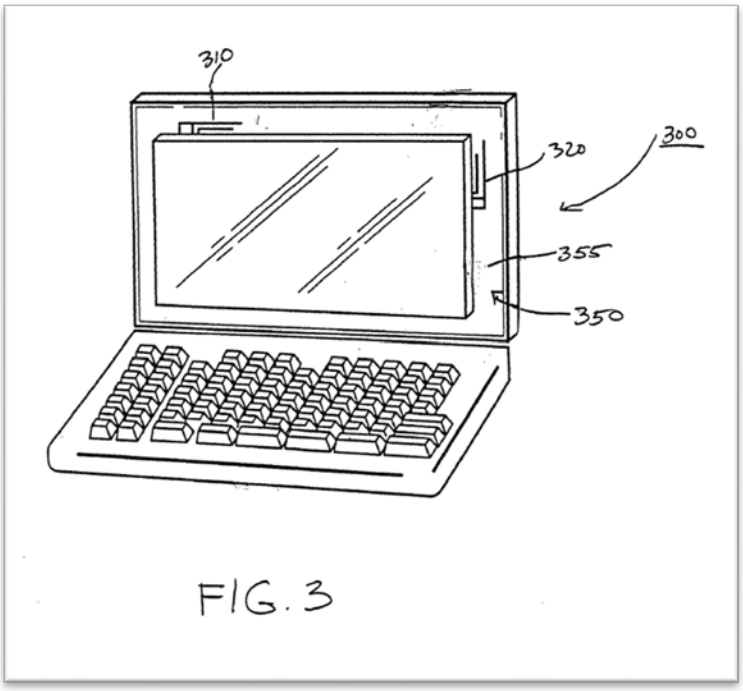


FIG. 3

The background section of Gaucher explains that the purpose of providing multiple copies of the antenna arranged at different locations is to reduce the blockage caused by the laptop display in some directions, or to provide spatial diversity to the portable device. EX1012, ¶[0004]; EX2008, ¶59. The multiple antennas may also be provided with orthogonal orientations to provide polarization diversity. EX1012, ¶[0004]; EX2008, ¶59.

Antenna spatial diversity and polarization diversity are two different but complementary techniques for improving wireless system performance by reducing the effects of fading, interference, and multipath. EX2008, ¶41 Spatial diversity involves using two or more antennas that operate at the same frequencies placed at different physical locations so that the signals they receive (or transmit) experience

different propagation paths. *Id.* Polarization diversity uses antennas with different polarization orientations to reduce signal degradation caused by polarization mismatch or rotation during propagation. *Id.*

Gaucher incorporates by reference a number of earlier disclosures, including Gaucher848[4] (EX1013) and Asano[5] (EX1024). Gaucher848 and Asano are notable in that they confirm that the purpose of the multiple antennas in Gaucher is to provide spatial and/or polarization diversity. EX1013, ¶[0004]; EX1024 at ¶¶ [0008]; [0100], [0126], [0130]; EX2008, ¶60. Gaucher848 further explains that if one of the antennas is moved to a different location, the other antenna should also be moved to maintain the desired spatial diversity:

> FIG. 6(a) illustrates two tri-band antennas (61, 62) mounted to a metallic support frame (63) of the laptop display unit having a plastic cover (66), wherein the plane of each tri-band antenna (61, 62) is substantially parallel to the plane of the display frame (63). FIG. 6(b) illustrates two tri-band antennas (64, 65) mounted to the display frame (63) wherein the plane of each tri-band antenna (64, 65) is substantially perpendicular to the plane of the display frame (63). **In FIGS. 6(a) and 6(b), the tri-band antennas (62) and (65) can be positioned on the left side of the display frame (63)(as opposed to the right side of the**

[4] U.S. Patent App. Pub. No. 2004/0113848 to Gaucher et al.

[5] U.S. Patent App. Pub. No. 2002/0021250 to Asano et al.

> **frame as shown) and the tri-band antennas (61) and (64) can be located on the right side of the upper portion of the frame (63) (as opposed to the left side of the upper portion of the frame as shown).**

EX1013, ¶[0049] (emphasis added); *see* EX2008, ¶60.

iv. Zhao

Zhao[6] (EX1008) discloses wireless ultra-wideband ("UWB") communication systems comprising a quarter-wavelength slot UWB antenna integrated on a PCB and used for mobile terminals. EX1008, ¶[0006]. Relevant to the current proceedings is an embodiment in Zhao in which a "dual-band PIFA antenna 40" along with the "quarter-wavelength slot UWB antenna 50" are arranged on the PCB of the handset. EX1008, ¶[0035]. Zhao includes a return loss plot for this antenna in FIG. 7B, which allows the POSITA to evaluate the operating characteristics of the PIFA antenna 40 and the UWB antenna 50 in this embodiment. EX2008, ¶62.

D. The Person of Ordinary Skill in the Art

For purposes of this Preliminary Response only, Patent Owner assumes the POSITA definition asserted in the Petition. Petition, 7. Patent Owner, however, reserves the right to present its own definition in the event an IPR is instituted.

[6] U.S. Patent App. Pub. No. 2009/0002248 to Zhao et al.

III. CLAIM CONSTRUCTION

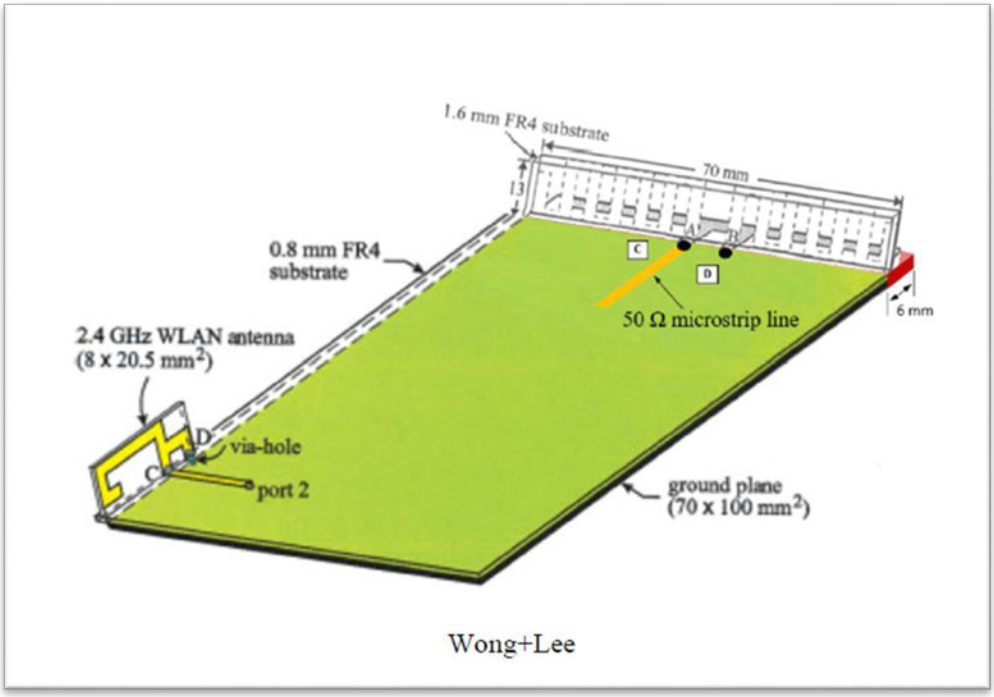
Patent Owner respectfully submits that, for purposes of this preliminary stage, the claim terms should be given their ordinary meaning as understood by the POSITA in light of the Specification. Patent Owner reserves the right to provide constructions for claim terms in the event trial is instituted in this proceeding.

IV. ARGUMENT

The Office may institute IPR of the claims of the '458 Patent only if the Petition "shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition." 35 U.S.C. § 314. The Petition has not met this threshold.

A. Ground 1A – Claims 1-9, 12, and 13 over Wong in view of Lee

The Petition alleges that claims 1-9, 12, and 13 would have been obvious to the POSITA at the time of invention based on the combined teachings of Wong and Lee. More specifically, the Petition proposes a combination of Wong and Lee in which the POSITA replaces Wong's GSM/DCS antenna with Lee's quadband antenna, as illustrated in the figure below reproduced from the Petition. Petition, 12.

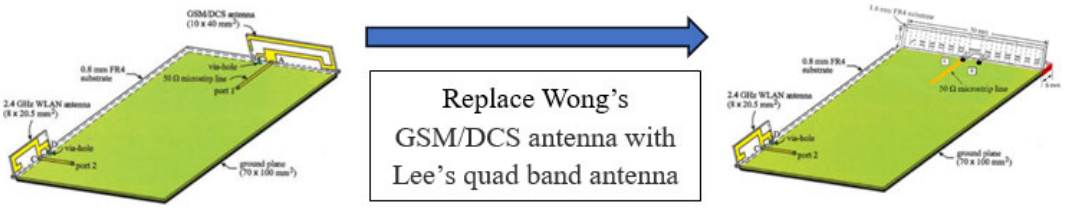


Wong+Lee

The Petition alleges that the POSITA would have had a reasonable expectation of success for this modification (Petition, 15), but that allegation must be rejected because it ignores the actual conclusion of the references and Wong in particular. The Petition asserts an expectation of success by ignoring every conclusion reached in Wong regarding antenna isolation/coupling and ignores what the POSITA would understand about how implementing the Lee antenna in conjunction with Wong's WLAN antenna would likely present isolation challenges considered insurmountable at the time. EX2008, ¶65.

i. Claims 1-9, 12, and 13 Are Not Obvious from the Disclosures of Wong and Lee

As indicated above, alleged invalidity Ground 1A proposes replacing Wong's GSM/DCS antenna with Lee's quadband antenna.



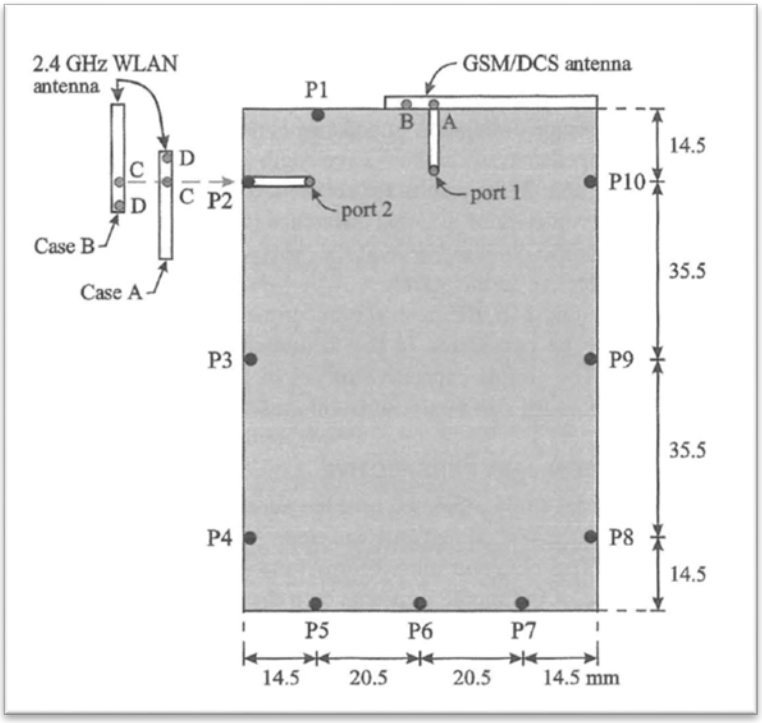
This replacement takes a dual band antenna that extends across half of the top side of the disclosed ground plane and replaces it with a quadband antenna that extends across the entire top side of the ground plane. There are numerous reasons why the POSITA would not have made such a modification to Wong. Further, the POSITA would have readily understood that such a modification would have been unlikely to succeed due to the antenna isolation challenges such a modification would have introduced.[7]

The Proposed Modification Would Eliminate the Optimal Location for the WLAN Antenna as Determined in Wong

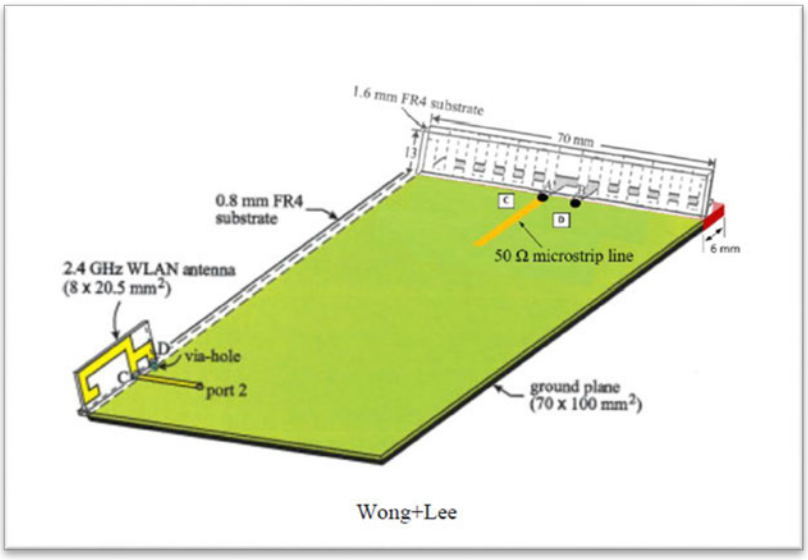
Wong concludes "that the isolation obtained at location P4 for case A orientation is optimal among all the locations and orientations of the WLAN

[7] The discussion herein focuses on the isolation/coupling issues that would have been introduced by the Petition's modification to Wong. The POSITA would also understand that the proposed modification would also introduce substantial issues with respect to the device's electromagnetic characteristics, its impedance, and its reflection coefficient.

antennas studied here." EX1005, 350. As illustrated in FIG. 2 from Wong, location P4 is diagonally opposite or "catty corner" from the GSM/DCS antenna.



The proposed combination of Wong and Lee set forth in the Petition eliminates the possibility of arranging the WLAN antenna diagonally opposite the Lee quadband antenna. EX2008, ¶67. As illustrated below, the Lee antenna extends across the entire top of the ground plane so that there can no longer be a location for the WLAN antenna that is diagonally opposite the quadband antenna. The proposed construction turns location P4 into another P8 – a location on the opposite end but on a same side as a lateral edge of the other quadband antenna. *Id*.



Assuming no other negative effects on isolation due to this modification (a poor assumption as explained in detail below), the modification converts the optimal location P4 into a mirror of location P8. EX2008, ¶68. Location P8, however, exhibits substantially degraded antenna isolation performance. *Id.* As illustrated in Table 1 from Wong, location P8 exhibits some of the worst antenna isolation out of all the locations studied in Wong, substantially worse isolation performance than the "optimal" location P4. *Id.* Put differently, the modification proposed in the Petition takes the location with the ***best*** isolation performance, location P4, and transforms it into a location with some of the ***worst*** isolation performance, location P8. *Id.*

TABLE 1 Measured Maximum Isolation (S_{21}) Within the GSM, DCS, and WLAN Bands, Respectively, at Different Locations (P1 to P10) of the WLAN Antenna Shown in Fig. 2

Location	Case	Max. S_{21} [dB] in GSM band	Max. S_{21} [dB] in DCS band	Max. S_{21} [dB] in WLAN band
P1	A	−27.4	−18.8	−27.3
	B	−24.3	−14.2	−22.2
P2	A	−28.6	−20.9	−26.1
	B	−27.6	−24.9	−27.0
P3	A	−29.5	−21.9	−31.8
	B	−28.0	−23.2	−33.4
P4	A	−33.6	−27.9	−33.0
	B	−26.5	−26.8	−35.6
P5	A	−34.2	−21.6	−32.8
	B	−26.8	−29.7	−34.6
P6	A	−29.6	−21.8	−32.1
	B	−28.1	−25.6	−34.1
P7	A	−26.9	−19.7	−22.5
	B	−28.8	−19.0	−24.9
P8	A	−28.3	−14.8	−22.4
	B	−35.6	−19.8	−25.5
P9	A	−26.3	−15.8	−21.6
	B	−30.0	−13.9	−20.0
P10	A	−14.9	−5.9	−4.6
	B	−23.7	−4.2	−16.1

The Proposed Modification to Wong Would Introduce Substantial Additional Isolation Problems from Larger Surface Currents

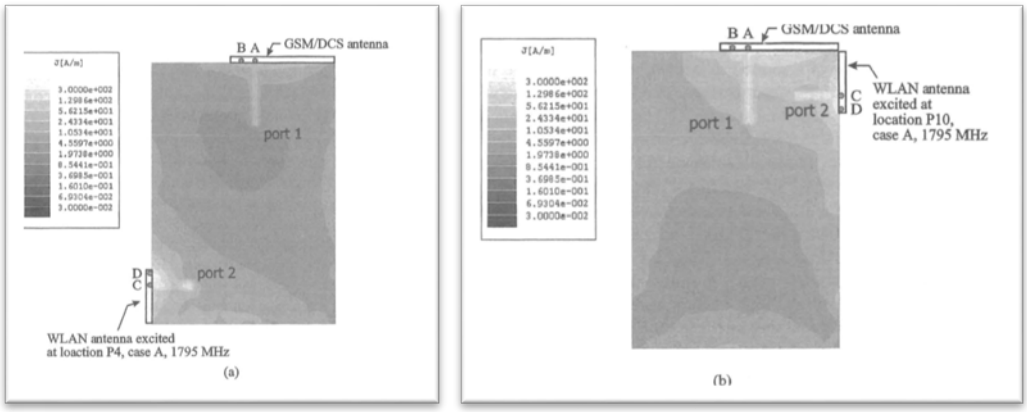
As discussed above, Lee's quadband antenna operates at two frequency bands that Wong does not operate at, the APMS band which has a lower frequency, 824-894 MHz, than those supported by Wong's GSM/DCS antenna, and the PCS band which has a higher frequency, 1850-1990 MHz, than those supported by Wong's GSM/DCS antenna. The Petition alleges that these additional frequencies would motivate the POSITA to make the proposed modification. Petition, 13. The opposite is, in fact, the case. EX2008, ¶70.

Wong explains that "the isolation between the two antennas is strongly related to the excited surface current distributions in the system ground plane." EX1005, 351; EX2008, ¶71. As illustrated in FIGs. 6-8 from Wong, the proximity of surface

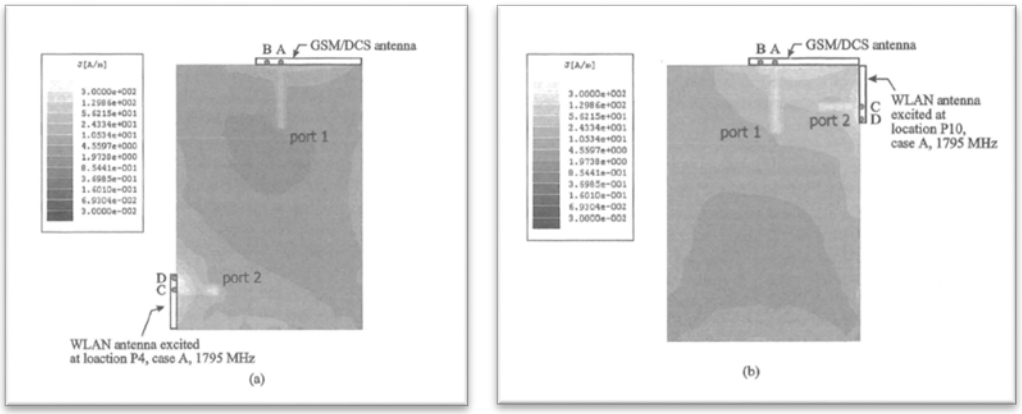
currents generated by one antenna in closer proximity to the other antenna results in decreased isolation/increased coupling between the antennas:

> [I]t is clearly seen that **the excited surface currents near the GSM/DCS antenna are much stronger in Figure 6(b) than in Figure 6(a). This behavior may explain the reason for the poor isolation obtained in the GSM band** for location P10 with case A shown in Figure 4. …

EX1005, 351 (emphasis added).

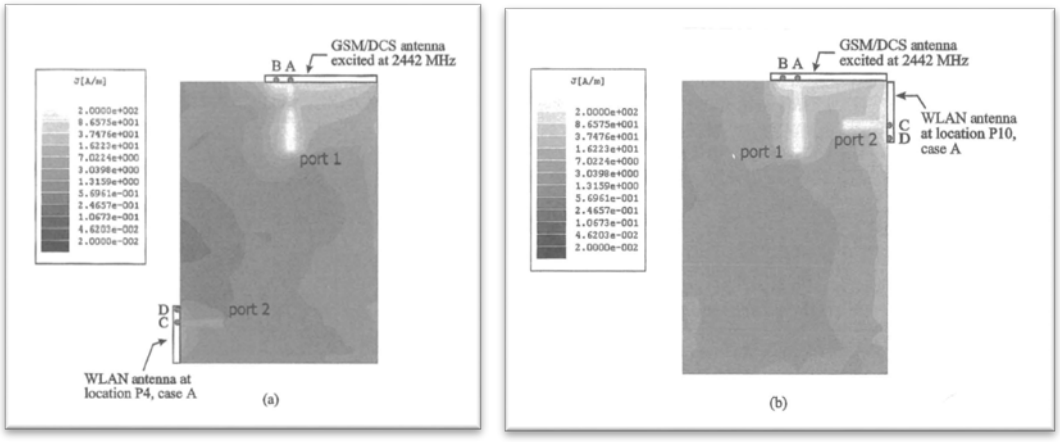


> Similarly, by comparing Figure 7(a) (location P4 with case A, the same as the study in Fig. 3) to Figure 7(b) (location P10 for case A, the same as the study in Fig. 4), **much stronger excited surface currents near the GSM/DCS antennas in Figure 7(b) are seen. This behavior may also explain the reason for the poor isolation obtained in the DCS band for location P10 with case A shown in Figure 4.**
>
> EX1005, 351 (emphasis added).



[T]he obtained results shown in Figure 8 also indicate that **much stronger surface currents are excited near the WLAN antenna in Figure 8(b) than in Figure 8(a). This may also lead to the poor isolation obtained in the 2.4-GHz WLAN band** for location P10 with case A shown in Figure 4.

EX1005, 351 (emphasis added).



In other words, Wong explicitly teaches that strong surface currents resulting from one antenna which are excited near the other antenna result in poor isolation/increased coupling between the two antennas. EX2008, ¶72. The Petition,

however, proposes a modification that would increase the proximity between the WLAN antenna and the surface currents induced by the other antenna.

First, as discussed above, using the Lee antenna which extends across the entire top of the ground plane will decrease the distance between the WLAN antenna and the surface currents induced by the other antenna. EX2008, ¶73. Second, the Lee antenna adds a low frequency band – the APMS band which operates at 824-894 MHz. The surface currents associated with this lower frequency band will be larger than the surface currents associated with the GSM and DCS frequency bands used by the Wong antenna. *Id.* As understood by the POSITA, the size of the surface currents is related to the wavelength associated with the frequency at which the antenna is operating. *Id.* The lower frequencies of the APMS frequency band will result in larger/longer surface currents in the ground plane, resulting in decreased isolation/increased coupling between the antennas. *Id.*

Given the POSITA would understand that the size of the Lee antenna and the low frequency APMS band at which it operates would substantially decrease isolation/increase coupling, the POSITA would not have had an expectation of successfully implementing the combination of the teachings of Wong and Lee as proposed in the Petition. EX2008, ¶75.

The Proposed Modification to Wong Would Introduce Substantial Additional Isolation Problems due to the Higher Operating Frequency of the Lee Antenna

As discussed above, Lee's quadband antenna would be expected to decrease isolation/increase coupling due to its operation at the APMS frequency band. The POSITA would also understand that Lee's quadband antenna would be expected to decrease isolation/increase coupling due to its operation at the higher 1850-1990 MHz PCS frequency band. EX2008, ¶76.

As understood by the POSITA, if two antennas are configured to operate at the same or nearby frequencies, the coupling between the antennas will likely increase. EX2008, ¶77. Specifically, the transmitting antenna launches strong surface currents on the ground plane at its resonant frequency, and the receiving antenna is most sensitive to currents and fields at that same or nearby frequencies. *Id.* As a result, even small amounts of ground-plane-mediated energy transfer can cause significant coupling and interference. *Id.*

The upper bound of the PCS frequency band at which the Lee antenna operates is substantially closer to the operating frequency of the WLAN antenna than the upper bound of the Wong antenna's DCS frequency band. EX2008, ¶78. The proximity of Lee's higher frequency PCS range to that of Wong's WLAN antenna would be understood by the POSITA as decreasing isolation/increasing coupling between the two antennas. *Id.*

For example, even before replacing Wong's GSM/DCS antenna with Lee's quadband antenna, the higher frequency DCS band in Wong resulted in decreased isolation/increased coupling. As illustrated in Table 1 from Wong, the isolation at the DCS band is almost always substantially worse than the isolation at the GSM band. For example, the isolation at location P8 is substantially worse for the DCS band (-14.8 dB and -19.8 dB) than the GSM band (-28.3 dB and -35.6 dB). Accordingly, the POSITA would have understood that the even higher frequency of Lee's PCS band would result in even greater coupling/decreased isolation between the Lee antenna and the Wong WLAN antenna. EX2008, ¶78.

The resulting decreased isolation/increased coupling from the Lee antenna PCS operating frequency range would indicate to the POSITA that there was no likelihood of success by modifying the Wong antenna as proposed by the Petition. *Id.*

The Proposed Modification to Wong Would Introduce Substantial Additional Isolation Problems due to Additional Resonant Frequencies of the Lee Antenna

As discussed above, if two antennas are configured to operate at the same or nearby frequencies, the coupling between the antennas will likely increase. EX2008, ¶¶76-78. The Lee antenna has a resonant frequency that corresponds almost exactly to the operating frequency of the Wong WLAN antenna. EX2008, ¶80. Accordingly,

the POSITA would expect the modification proposed in the Petition to exhibit substantially decreased isolation/increased coupling between the antennas. *Id*.

Reproduced below is the return loss plot for the Lee quadband antenna. As illustrated, there is substantially low return loss at the frequencies associated with the APMS (824-894 MHz), GSM (890-960 MHz), DCS (1710-1880 MHz), and PCS (1850-1990 MHz) frequency bands. The POSITA would have understood from this graph that the Lee antenna radiates within these frequency bands – the low return loss is a result of the antenna radiating this energy instead of it being reflected back. EX2008, ¶81. As indicated by the highlighted portion below, the Lee antenna also exhibits substantial low return loss at 2500 MHz, and the POSITA would understand that this is a resonant frequency of the Lee antenna. *Id.*

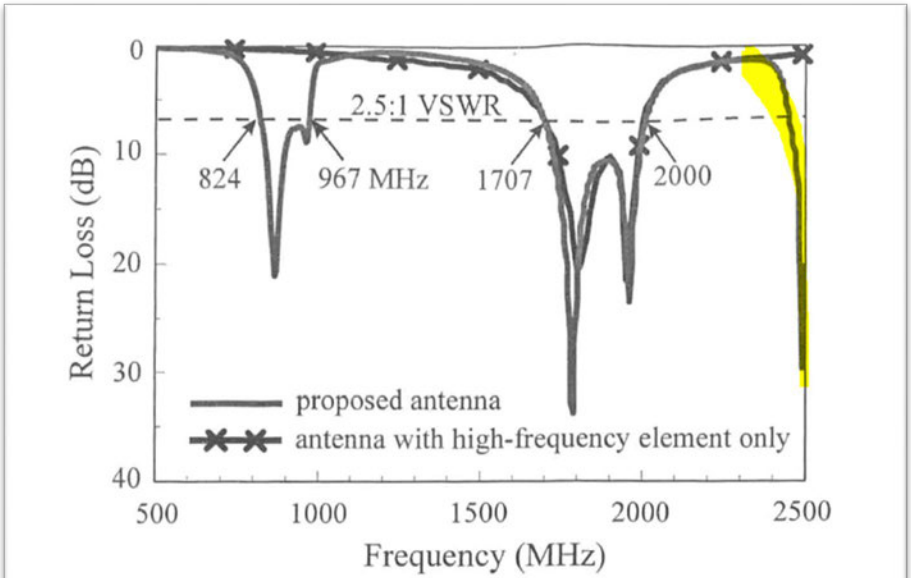


Figure 2 Measured return loss for the proposed antenna and the antenna with the high-frequency element only

The POSITA would further understand that this resonant, radiating frequency that corresponds almost exactly to the operating frequency of the WLAN antenna would result in decreased isolation/increased coupling between the Lee antenna and the Wong WLAN antenna. EX2008, ¶82.

The resulting decreased isolation/increased coupling from this additional resonant frequency in the Lee antenna would indicate to the POSITA that there was no likelihood of success by modifying the Wong antenna as proposed by the Petition. EX2008, ¶83. In fact, the '458 Specification explicitly teaches that these types of resonances should be avoided in order to ensure proper isolation between the antennas of the disclosed techniques:

> Another aspect of the invention relates to techniques to enhance the isolation between the mobile antenna and the wireless connectivity antenna. Some of these techniques comprise the steps of shaping the geometry of the mobile antenna to eliminate higher order resonant modes or spurious modes that may fall within an operating band of the wireless connectivity antenna (or vice-versa), giving rise to strong coupling of the mobile antenna with the wireless connectivity antenna.

EX1001, 18:54-62.

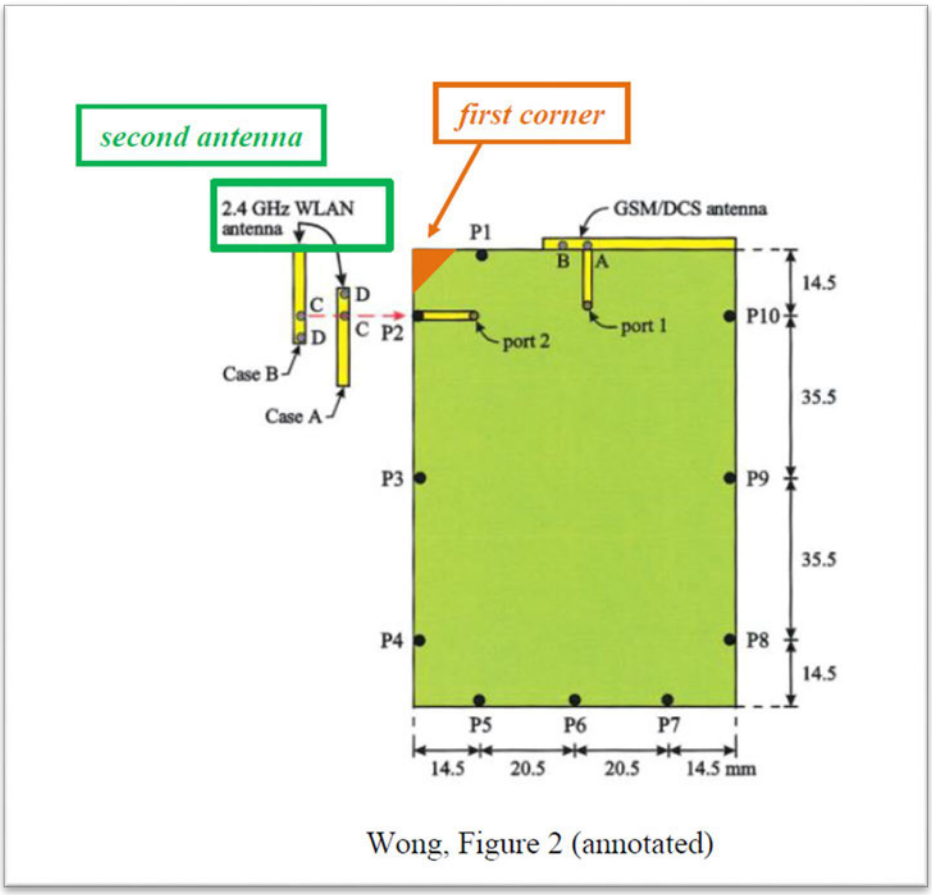
Conclusions

Based on the reasons set forth above, the POSITA simply would not have modified the Wong device to use the quadband antenna from Lee. EX2008, ¶84. The POSITA would have understood that the modification to Wong proposed in the Petition would decrease isolation/increase coupling between the antennas due to the four different mechanisms described above. *Id.* Accordingly, the proposed modification would have been non-obvious at the time of invention and would have been understood as being unlikely to succeed by the POSITA. *Id.* Therefore, Patent Owner respectfully submits that there is no reasonable likelihood that Petitioners would prevail with respect to any claim under Ground 1A.

ii. Petitioners are Unlikely to Succeed with Respect to Claim 8 and Its Dependents

While all the arguments presented in section IV.A.i, *supra,* apply with equal force to claims 1-9, 12, and 13, claim 8 and its dependents further distinguish over

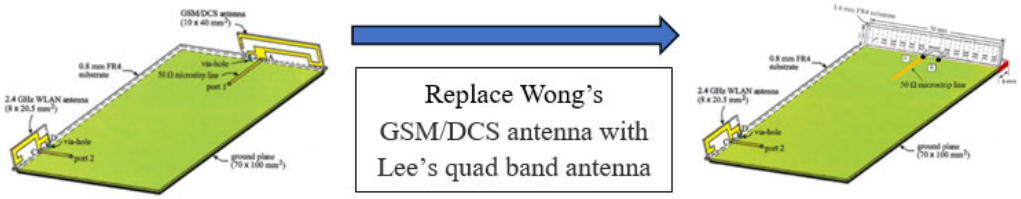
Ground 1A from the Petition. Claim 8 recites that the "second antenna," which Ground 1A alleges corresponds to Wong's WLAN antenna, "is arranged substantially close to a first corner of the portable device." The recited "first corner" is a corner of the portable device that Petitioners assert corresponds to a top corner of the Wong ground plane, as illustrated in Petitioner's annotated figure from page 50 of the Petition, reproduced below.

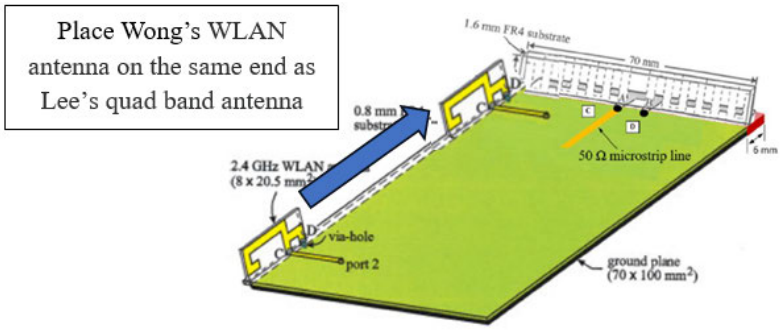


Wong, Figure 2 (annotated)

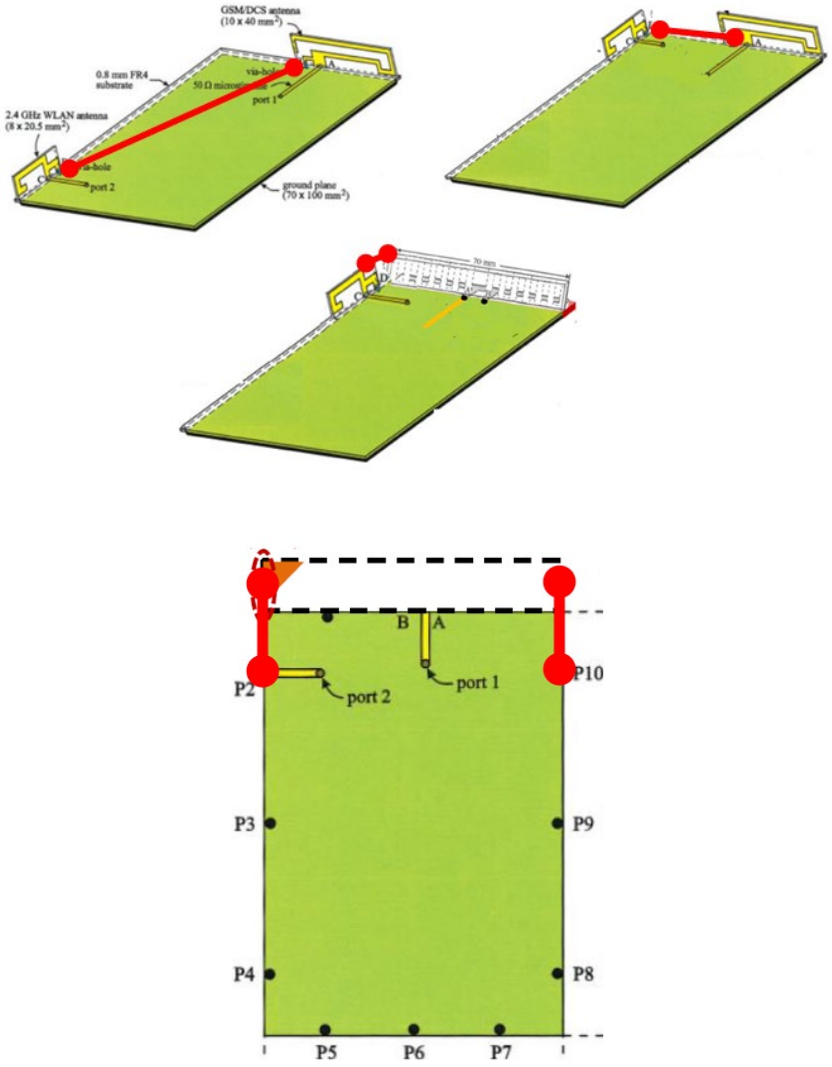
Accordingly, in purporting to show the invalidity of claim 8, Petitioners propose first replacing Wong's GSM/DCS antenna with Lee's quadband antenna and then positioning the WLAN antenna at location P2. The substantial problems with

this modification to Wong should be readily apparent based on the discussion in section IV.A.i, *supra.*





As discussed above, by replacing Wong's GSM/DCS antenna with Lee's quadband antenna, Petitioner's modification to Wong makes location P2 equivalent to location P10 – because Lee's quadband antenna extends across the entire top of the ground plane, the relative distance between the WLAN antenna and the quadband antenna at location P2 is the same as the relative position between the WLAN antenna and the quadband antenna at location P10. EX2008, ¶87. As illustrated below, when the WLAN antenna from Wong is positioned at location P2, as proposed in the Petition, its distance and orientation relative to the Lee antenna is the same as if it were positioned at location P10. *Id.*



Wong is, however, explicitly clear that the level of antenna isolation at location P10 is "**not acceptable for practical applications**." EX1005, 349 (emphasis added). By proposing to modify Wong so that location P2 is made equivalent to location P10, and then arranging the WLAN antenna at location P2, the Petition turns Wong's primary teaching on its head. EX2008, ¶89. The point of Wong is to determine which of locations P1-P10 is suitable, and Wong explicitly

states that location P10 is "**not acceptable for practical applications**." EX1005, 349 (emphasis added). Petitioners inexplicably allege that a location equivalent to location P10 would be acceptable because it was tested in Wong, while ignoring that Wong determined that location P10 was **unacceptable**.

Put differently, the modification to Wong proposed in Ground 1A as directed to claim 8 is contrary to the specific teaching in Wong that such a positioning of the WLAN antenna is "not acceptable for practical applications." It is not simply that the POSITA would not expect to succeed in making the proposed modification (EX2008, ¶89), Wong explicitly teaches that the proposed modification would not succeed. Thus, such a proposed modification is non-obvious. *See Chemours Co. FC, LLC v. Daikin Indus., Ltd.*, 4 F.4th 1370, 1376 (Fed. Cir. 2021) (prior art reference teaches away when it explicitly discourages a skilled artisan from modifying a prior art reference in the manner necessary to reach the claimed invention.). The POSITA would not have been motivated to make the modification proposed in Ground 1A with respect to claim 8 and would not have had any expectation of success to implement the modification – Wong teaches the proposed modification is "**not acceptable for practical applications**."

Accordingly, there is no reasonable likelihood that Petitioners would prevail with respect to claim 8 and its dependents under Ground 1A.

B. Ground 1B – Claims 14-15 and 17-19 over Wong

Ground 1B purports to show that claims 14, 15, and 17-19 would have been obvious at the time of invention from the teachings of Wong alone. This ground fails for many of the same reasons discussed above with regard to Ground 1A.

Claim 14 recites a rectangle having first, second, and third sides which inscribes the ground plane of the claimed wireless or portable handheld device, where a length of the second side is longer than a length of the first side and a length of the third side. A "first antenna" extends parallel to the first side and a "second antenna" is proximate to and extends parallel to the third side. Ground 1B alleges that Wong's GSM/DCS antenna corresponds to the recited "first antenna" and alleges that Wong's WLAN antenna corresponds to the recited "second antenna." In order to meet the claim limitations, the Petition moves the WLAN antenna from location P4 to location P5. Petition, 59 ("Wong meets [14.i] because the WLAN antenna, when positioned at location P5 of Figure 2, '*extends in a direction substantially parallel to'* the ground plane rectangle's third side.").

Wong, however, teaches away from this position and location. Specifically, Wong teaches placing the WLAN antenna at location P4. EX1005, 350 ("By comparing the obtained results, it can be concluded that the isolation obtained at location P4 for case A orientation is optimal among all the locations and orientations of the WLAN antennas studied here."). Ground 1B, however, suggests deviating

from the explicit teachings of Wong and positioning the WLAN antenna not at location P4, but at location P5 instead.

Further, even though location P4 is closer to the Wong's GSM/DCS antenna, P4 is still a more optimal location than P5. This indicates to the POSITA that the orthogonal orientation of P4 is more optimal than the parallel orientation that is required in locations P5, P6, and P7. Therefore, placing the WLAN antenna at location P5 with a parallel orientation is not an arrangement that the POSITA would have used. EX2008, ¶91.

Accordingly, Patent Owner submits that Petitioner's modifications proposed in Ground 1B are non-obvious and, therefore, there is no reasonable likelihood that Petitioners would prevail with respect to claim 14 and its dependents under Ground 1B.

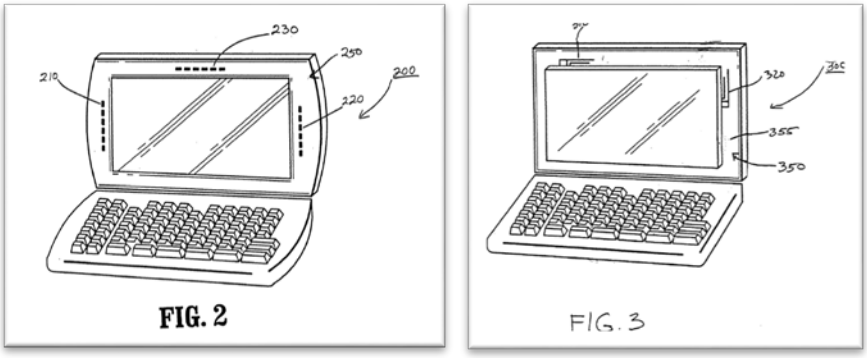
C. Ground 2 – Claims 1-10, 12, and 13 over Gaucher

The Petition alleges that claims 1-10, 12, and 13 would have been obvious to the POSITA at the time of invention based on the teachings of Gaucher combined with references incorporated therein by reference, such as Gaucher848. More specifically, the Petition proposes replacing one of Gaucher's quadband antennas with a tri-band antenna from Gaucher848. Petition, 69-70. Such a modification to Gaucher is contrary to Gaucher's intended purposes of providing multiple copies of

its quadband antenna. Therefore, the modification proposed in Ground 2 would have been non-obvious at the time of invention of the '458 Patent.

i. The Modification of Gaucher Proposed in Ground 2 Renders the Device Unsuitable for its Intended Purpose

As discussed in section II.C.iii, *supra,* Gaucher is directed to a specific quadband antenna constructed from "f-shaped" and "l-shaped" pieces. EX1012, Abstract. These quadband antennas (antennas 310 and 320 in FIG. 3 from Gaucher, reproduced below) may be arranged on the long and short sides of the display of a portable device.



As explained in the background section of Gaucher, as well as in Gaucher848 and Asano (both incorporated by reference in Gaucher), the purpose of providing these multiple antennas is to provide spatial diversity, polarization diversity, or both:

> In one exemplary embodiment, two embedded antennas 210, 220 may be placed on the left and right edges of the laptop display 250, respectively, whereby **the use of the two antennas 210 and 220 may reduce the blockage caused by the laptop display 250 in some**

> **directions that occurs in one antenna designs, and provide space diversity to the wireless communication system. Alternatively, one of the antennas 210 or 220 may be disposed on one side of the laptop display 250 while a second antenna 230 is disposed in an upper portion of the laptop display 250, [t]hereby providing antenna polarization diversity, depending on the antenna design used**.

EX1012, ¶[0004] (emphasis added); *see also* EX1013, ¶[0004]; EX1024 at ¶¶ [0008]; [0100], [0126], [0130]; EX2008, ¶94.

As understood by the POSITA, the spatial and polarization diversity techniques of Gaucher (as well as Gaucher848 and Asano) depend on both antennas 310 and 320 (in FIG. 3) or antennas 210, 220, and 230 (in FIG. 2) operating over the same frequency ranges. EX2008, ¶¶41, 94.

Ground 2 in the Petition, however, proposes replacing one of the antennas 310, 320 from Gaucher with a different antenna from Gaucher848. Specifically, Ground 2 proposes modifying Gaucher so that antenna 320 is a quadband antenna as taught in Gaucher (Petition, 76), but antenna 310 is replaced with a tri-band antenna from Gaucher848 (Petition, 79 ("Gaucher's antenna 310 implemented as Gaucher848's tri-band wireless antenna is '*a second antenna*' included in Gaucher's laptop 300.")).

This modification to Gaucher explicitly runs contrary to the teaching in Gaucher that the purpose of antennas 310 and 320 is to provide spatial or polarization

diversity. EX2008, ¶96. By replacing antenna 310 with a different antenna that operates at a completely different frequency, the modification to the Gaucher device proposed in the invalidity grounds renders the Gaucher construction unsuitable for its intended purpose of providing spatial or polarization diversity. *Id.*

Specifically, Gaucher's quadband antenna operates at the 824-894 MHz frequency band, the 880-960 MHz frequency band, the 1710-1880 MHz frequency band, and the 1850-1990 MHz frequency band. EX1012, ¶[0030]. The triband antenna from Gaucher848 operates at the 2.4-2.5 GHz frequency band, the 5.15-5.35 GHz frequency band, and the 5.47-5.825 GHz frequency band. EX1013, ¶[0041]. With zero overlap between the frequency bands supported by the quadband antenna in Gaucher and the triband antenna in Gaucher848, the combination of antennas proposed in the Petition is incapable of providing spatial or polarization diversity – two multiband antennas that operate at completely different bands from each other provide no spatial or polarization diversity at all. EX2008, ¶97. Accordingly, the proposed combination of Gaucher and Gaucher848 renders the proposed device not just unsatisfactory but incapable of operating according to Gaucher's intended purpose. *Id.* Therefore, the proposed modification would not have been obvious to the POSITA at the time of invention of the '458 Patent. *See In re Gordon*, 733 F.2d 900, 902 (Fed. Cir. 1984) (finding that a modification that renders the invention inoperable for its intended purpose is not obvious because it teaches away from the

invention); *see also Ex Parte Bjarne Harbo & Lucas Willemoes Hesselhof,* No. APPEAL 2024-002314, 2025 WL 2159181, at *3 (P.T.A.B. July 25, 2025).

Accordingly, Patent Owner respectfully submits that there is no reasonable likelihood that Petitioners would prevail with respect to any claim under Ground 2.

ii. Petitioners are Unlikely to Succeed with Respect to Claim 8 and Its Dependents

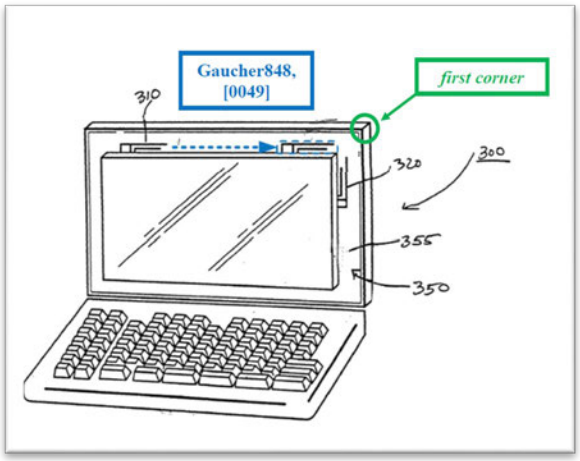
While all the arguments presented in section IV.C.i, *supra,* apply with equal force to claims 1-10, 12, and 13, claim 8 and its dependents further distinguish over Ground 2 from the Petition. Claim 8 recites that the "second antenna" is "arranged substantially close to a first corner of the portable device." The Petition, however, completely mischaracterizes the teachings of Gaucher848 in an attempt to invalidate claim 8. EX2008, ¶99.

Specifically, the Petition alleges that it would have been obvious to the POSITA to:

> rearrang[e] antenna 310 (second antenna) in Gaucher's Figure 3 from the upper-left portion to the upper-right portion of support frame 355, **as Gaucher848 specifically teaches as an option for its tri-band antenna**.

Petition, 93 (emphasis added).

This proposed "rearrangement" is illustrated in the annotated FIG. 3 from Gaucher provided on page 94 of the Petition and reproduced below:



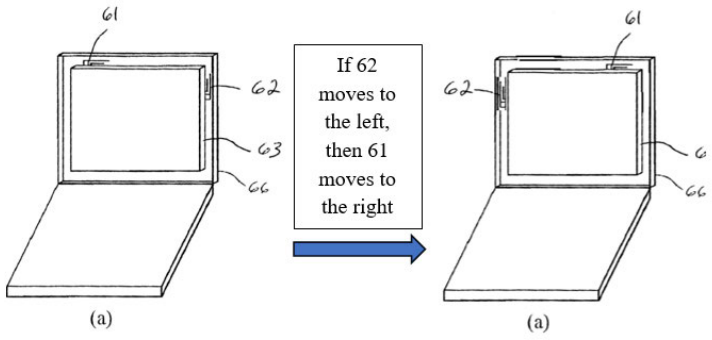
The Petition cites paragraph [0049] of Gaucher848 as describing the above-illustrated rearrangement. Petition, 93. In doing so, however, the Petition selectively quotes from Gaucher848, leaving the impression that the reference teaches that antennas 310 and 320 can be independently repositioned. Petition, 93. This passage from Gaucher848 does not propose rearranging only one of the antennas, as the Petition's selective quotation suggests. Instead, Gaucher848 actually teaches that if antenna 310 were moved to the right side of the display as proposed above, then antenna 320 would move to the left hand side of the display:

> FIG. 6(a) illustrates two tri-band antennas (61, 62) mounted to a metallic support frame (63) of the laptop display unit having a plastic cover (66), wherein the plane of each tri-band antenna (61, 62) is substantially parallel to the plane of the display frame (63). FIG. 6(b) illustrates two tri-band antennas (64, 65) mounted to the display frame (63) wherein the plane of each tri-band antenna (64, 65) is substantially perpendicular to the plane of the display frame (63). **In FIGS. 6(a) and**

> **6(b), the tri-band antennas (62) and (65) can be positioned on the left side of the display frame (63) (as opposed to the right side of the frame as shown) and the tri-band antennas (61) and (64) can be located on the right side of the upper portion of the frame (63) (as opposed to the left side of the upper portion of the frame as shown).**

EX1013, ¶[0049] (emphasis added).

As illustrated above, Gaucher848 explains that if antenna 62 were repositioned on the left side of the display frame, then antenna 61 would be repositioned to the right side of the upper frame 63, as illustrated in the annotated figure below. EX2008, ¶¶102-103. This is, of course, not surprising because one of the intended purposes of the Gaucher848 antenna system is to provide spatial diversity between the antennas (EX1013, ¶[0004]), which would be destroyed if only one of the antennas was repositioned. EX2008, ¶¶102-103.



Accordingly, moving only one of the antennas as proposed in the Petition would ***not*** have been obvious to the POSITA. EX2008, ¶104. When provided in its

full context, and accurately characterized, it is clear that Gaucher848 teaches that if one antenna is moved, then the other antenna should also be relocated to preserve the spatial diversity techniques of Gaucher, Gaucher848, and Asano. *Id.* If both antennas were repositioned as taught in Gaucher848, the antenna arrangement would fail to meet the requirements of claim 8, as the device would not include a "first antenna … arranged substantially close to the first side of the portable device" and a "second antenna … arranged substantially close to a first corner of the portable device." *Id.* Accordingly, there is no reasonable likelihood that Petitioners would prevail with respect to claim 8 and its dependents under Ground 2.

D. Ground 3 – Claims 14-18 over Zhao

The Petition alleges that claims 14-18 would have been obvious to the POSITA at the time of invention of the '458 Patent based on Zhao. The Petition is incorrect as its position ignores the explicit disclosures in Zhao.

Claim 14 recites that "a sum of a length and a width of the second rectangular area is smaller than a quarter of an operating wavelength of the second antenna." This recitation would not have been obvious to the POSITA at the time of invention based on the teachings of Zhao. Zhao discloses that "The length of second side 10 of slot 8 [of its half wavelength antennas] is about one half-wavelength of the lower resonant frequency" and that its "quarter-wavelength slot UWB antennas can be designed by using half of the slot [of its half wavelength antennas]." EX1008, ¶¶

[0040], [0042]. The half wavelength antenna slot is 28 mm, which would make the length of the quarter wavelength slot antenna wavelength 14 mm.[8] EX2008, ¶106. Accordingly, the POSITA would understand from Zhao that ¼ of its resonant wavelength is "about" 14 mm. *Id.*

The Petition purports to show that the "sum of a length and a width of the second rectangular area" in Zhao is 16.75 mm. Petition, 111. As 16.75 mm is **not** less than 14 mm, the POSITA would understand from Zhao that Zhao's antenna 50 is not constructed such that "a sum of a length and a width of the second rectangular area is smaller than a quarter of an operating wavelength of the second antenna." EX2008, ¶106.

The POSITA would also have understood from Zhao that the permittivity of the FR-4 material used in the Zhao printed circuit board ("PCB") should be taken into account when determining the operating wavelength of the Zhao antenna. EX2008, ¶107. The POSITA would understand that is the reason Zhao provides a

[8] It is noted for completeness that Zhao discloses that its ¼ wavelength slot antennas have slot widths of 11.8 mm, 12 mm, and 12.75 mm. EX1008 at ¶ [0042]. Zhao explains that the values, which are less than 14 mm, are "due at least in part to the stronger capacitive effects which occur at the open sides 28 of the quarter-wavelength slot UWB antennas 26." *Id* at ¶ [0043].

value for the permittivity of its PCB dielectric. EX2008, ¶107; EX1008, ¶[0038] ("The dielectric material used for the PCB is FR4 with τ_r=4.4 …").

To calculate the wavelength of electromagnetic radiation through a dielectric material, the following formula may be used:

$$\lambda = \frac{\lambda_0}{\sqrt{\tau_r}} = \frac{c}{f\sqrt{\tau_r}};$$

where λ_0 is the free-space operating wavelength, τ_r refers to the permittivity of the dielectric material (sometimes referred to as ε_r), c is the speed of light and *f* is the frequency of the radiation. *see* also EX2008, ¶41; EX2009, 169. When radiation passes through both air and a dielectric, an effective permittivity is used which is a combination of the permittivity for the air and the dielectric, and can be estimated in some instances as follows, as the permittivity of air is essentially 1:

$$\tau_{eff} = \frac{\tau_r+1}{2}.$$

EX2008, ¶41.

Using 3.0 x 10^{11} as the speed of light in millimeters, the resonant frequency wavelengths in millimeters for the Zhao antenna may be calculated using the following formula:

$$\lambda = \frac{\lambda_0}{\sqrt{\frac{\tau_r + 1}{2}}}$$

$$= \frac{c}{f\sqrt{\frac{\tau_r + 1}{2}}}$$

$$= \frac{3.0 \times 10^{11}}{f\sqrt{\frac{4.4 + 1}{2}}}$$

$$= \frac{3.0 \times 10^{11}}{f\sqrt{\frac{4.4 + 1}{2}}}$$

$$\lambda = \frac{3.0 \times 10^{11}}{f \times 1.64}$$

EX2008, ¶¶108-109.

Using the frequency values from Zhao of 3.1 GHz and 4.9 GHz (EX1008, ¶[0025]) results in the following values for the operating wavelengths in Zhao:

$$\lambda_{3.1} = \frac{3.0\times10^{11}}{3.1\times10^{9}\times1.64} = 59.1 \text{ mm}$$

$$\lambda_{4.9} = \frac{3.0\times10^{11}}{4.9\times10^{9}\times1.64} = 37.2 \text{ mm}$$

EX2008, ¶110.

These values are then divided by 4 to get the ¼ wavelength values:

$$\frac{\lambda_{3.1}}{4} = \frac{59.1}{4} = 14.8\, mm$$

$$\frac{\lambda_{4.9}}{4} = \frac{37.2}{4} = 9.3\, mm$$

EX2008, ¶111.

One quarter of the lower frequency wavelength calculated in this matter, 14.8 mm, corresponds closely to the 14 mm value that the POSITA would understand from the Zhao disclosure. EX2008, ¶112; *see* EX1008, ¶¶ [0040], [0042].

The Petition, however, ignores the explicit teachings in Zhao and incorrectly determines that the POSITA would have understood from Zhao that 1/4 of the operating wavelength at 3.1 GHz is 24.25 mm. Petition, 112. This 24.25 mm value, unlike the value of 14.8 mm calculated using the permittivity of Zhao's substrate, is nowhere close to the 14 mm value that the POSITA would have understood from the disclosures in Zhao. EX2008, ¶113; *see* EX1008, ¶¶ [0040], [0042]. Accordingly, the Petition is incorrect that "a sum of a length and a width of the second rectangular area is smaller than a quarter of an operating wavelength of the second antenna" would have been obvious to the POSITA at the time of invention from the teachings of Zhao. EX2008, ¶114. Therefore, the Petition has not shown that it is likely to succeed in showing the invalidity of claim 14 and its dependents over Zhao.

In view of the above, Patent Owner submits that there is no reasonable likelihood that Petitioners would prevail with respect to claim 14 and its dependents under Ground 3.

E. The Petition Should be Denied for Failing to Meet the Requirements of 37 CFR § 42.104

37 C.F.R. § 42.104(b)(3) requires that the Petition "must identify … How the challenged claim is to be construed." The Petition provides no explanation for how any term in the challenged claims is to be construed. Instead, the Petition simply alleges that "Because the Petition's prior art discloses each claim element under any plausible construction, no outer-boundary constructions are necessary." This is problematic because it is unclear how the Petition is construing the terms for invalidity purposes. For example, the Petition implies that the claim term "operating wavelength" is synonymous with "free space operating wavelength." Petition, 112. The Petition, however, never explains if this is, in fact, the correct construction of the term, or just a posited "outer-boundary" of a plausible construction, not a correct construction as required. Failing to meet the requirements of 37 C.F.R. § 42.104(b)(3) is sufficient justification to deny the Petition. *See Cambridge Mobile Telematics, Inc., v. Sfara, Inc.,* IPR2024-00952, Paper 12 (P.T.A.B. Dec. 13, 2024). Accordingly, Patent Owner submits the Petition is deficient and should be denied for this independent reason.

V. CONCLUSION

In light of the foregoing, there is no "reasonable likelihood that Petitioners would prevail with respect to at least one of the claims challenged in the Petition,"

and *inter partes* review should not be instituted based upon this proposed invalidity ground. Accordingly, pursuant to 35 U.S.C. § 314, Patent Owner respectfully requests that the Board refuse to institute *inter partes* review for the reasons stated herein.

Dated: August 28, 2025

Respectfully submitted,
/Mark J. DeBoy/
Mark J. DeBoy (Reg. 66,983)
Attorney for Patent Owner
Fractus S.A.

CERTIFICATE OF SERVICE

The undersigned certifies that pursuant to 37 C.F.R. § 42.6(e), a copy of the foregoing **PATENT OWNER'S PRELIMINARY RESPONSE** and accompanying **EXHIBITS** were served via email (as previously consented to by counsel) on August 28, 2025 to lead and backup counsel of record for Petitioners as follows:

AWichman-PTAB@WolfGreenfield.com
MRader-PTAB@WolfGreenfield.com
MMoresco-PTAB@WolfGreenfield.com
MParsons-PTAB@WolfGreenfield.com

Dated: August 28, 2025

/Mark J. DeBoy/

Mark J. DeBoy (Reg. No. 66,983)
Attorney for Patent Owner
Fractus S.A.

CERTIFICATE OF COMPLIANCE

Pursuant to 37 C.F.R. § 42.24(d), the undersigned hereby certifies that this brief complies with the type-volume limitation of 37 C.F.R. § 42.24 because this brief contains 8569 total words.

Dated: August 28, 2025

By: /Mark J. DeBoy/
Mark J. DeBoy (Reg. No. 66,983)
Attorney for Patent Owner
Fractus S.A.