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. IPR2025-00928
Patent 8,456,365

PATENT OWNER'S PRELIMINARY RESPONSE

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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. 8,456,365 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.

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Application of Kamm, 452 F.2d 1052 (C.C.P.A. 1972).....28

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I. INTRODUCTION

Fractus, S.A. ("Patent Owner") requests that the Board decline to institute *inter partes* review ("IPR"), because the Petition's sole ground of rejection fails to render obvious claims 1-42 and 44-45 of U.S. Patent 8,456,365 ("the '365 Patent"). The Petition's key argument, replacing the wireless device antenna of the primary reference Tran with the antenna of the secondary reference Teng, is premised on the presence of elements in Tran that simply do not exist or are fundamental mischaracterizations of Tran's antenna. As discussed in detail below, Tran describes ***a single-band antenna*** with a novel dual-strip design that reduces space requirements by eliminating the antenna's need for a ground plane. Tran touts its antenna's superior performance and size reduction compared to antennas that include a ground plane, leaving no doubt that ***Tran's antenna does not involve a ground plane***. Teng, by contrast, is characterized as a multi-band antenna that includes and relies on a large ground plane.

Despite Tran's clear and unequivocal disclosure, the Petition seeks to create the fiction that the invalidity ground involves merely replacing one ground-plane-based multi-band antenna for another. Specifically, the Petition misrepresents Tran's antenna as a multi-band antenna, despite Tran's express disclosure that its antenna is a single-band antenna ***"not intended for use as a dual-band antenna."*** Likewise, instead of addressing the distinction between the absence of a ground plane in Tran's

antenna design and the necessary, large ground plane in Teng's antenna, the Petition simply asserts – contrary to Tran's unambiguous teaching – that Tran's antenna *does* rely on a ground plane. As a result, the Petition conjures within Tran's antenna the very structure Tran's antenna design seeks to avoid.

Because Teng's antenna requires both a radiating element and a ground plane, it is considerably larger than the single-band antenna in either of Tran's disclosed embodiments. Nevertheless, the Petition alleges the opposite – that Teng's antenna is smaller than Tran's – by ignoring the ground plane of Teng's antenna. Tran itself exposes the error in the Petition's comparison by including the ground plane required by other antennas in its own size comparisons. The Petition's inaccurate recasting of the nature of Tran's antenna underpins its rationales for replacing Tran's antenna with Teng's antenna. Those rationales, however, collapse when confronted with Tran's explicit teachings.

In other words, Petitioners, finding certain key aspects in Tran not helpful to their arguments, do not merely ignore them but actually seek to convince the Board that Tran discloses the opposite. When Tran is considered for what it actually discloses, a person of ordinary skill in the art ("POSITA") would not have found it obvious to replace Tran's antenna with Teng's antenna considering the fundamental incompatibilities of these two antennas.

In addition, the Petition also fails to explain how certain limitations in each of the independent claims are met by the proposed combination of Tran and Teng. The Petition fails to address, for example, how Tran's coaxial feed mechanism, which separately feeds two radiating elements with different signals at different locations, can be adapted to be a single feeding point that feeds two radiating arms at a feeding port at a common conductor between two radiating arms as claimed.

II. BACKGROUND

A. The '365 Patent

The '365 Patent is entitled "Multi-Band Monopole Antennas for Mobile Communications Devices," and issued on June 4, 2013. EX1001, 1. The '365 Patent issued from U.S. Patent Application No. 12/228,487, filed on August 13, 2008, which is a continuation of U.S. Patent Application No. 10/584,442 filed on July 18, 2006 (now U.S. Patent No. 7,423,592), which is a national stage application of international application No. PCT/EP2005/000880, filed on January 28, 2005, claiming benefit of U.S. Provisional Patent Application No. 60/540,450, filed January 30, 2004.

Patent Owner has taken the position in litigation that at least claims 1-2, 4-8, 12-13, 31-32, 35-37, and 41 are entitled to a priority date of December 5, 2003, based on the conception of the invention and no later than January 30, 2004, including through the filing of U.S. Provisional Application No. 60/540,450, EX1007, 2, 4.

The priority date of the challenged claims is not directly pertinent to any of the arguments Patent Owner is making in this Preliminary Response and, accordingly, is not addressed. Patent Owner, however, reserves the right to present arguments relating to the priority date of the challenged claims if an IPR is instituted.

As explained in the Background of the '365 Patent, when mounted inside a mobile communication device, prior art antennas suffered from problematic amounts of electromagnetic interference and provided limited bandwidth, making implementation of an internally mounted multi-band antenna difficult. EX1001, 34 (1:26-39). The multi-band antennas for use in a mobile communication device disclosed in the '365 Patent, overcomes such problems by implementing internal antenna elements with multiple branches or "radiating arms" having specific characteristics and arrangements. For example, at least one radiating arm of the disclosed antenna elements can include a shape that meets the requirements of a "space filling curve" and/or "grid dimension curve." EX1001, 35, 38-39 (3:1-23; 6:50-8:10). Such shapes enable a compact, internal radiating arm to have sufficient length to operate at lower-frequency bands. EX1001, 35 (3:43-51); EX2008 (Expert Declaration of Dr. Hossein Hashemi), ¶31.

The disclosed mobile communication device includes a printed circuit board (PCB) with a ground plane layer, a feeding point, and communication circuitry. The radiating arms of the multi-band antenna element are connected via a common

conductor that includes a feeding port that is coupled to the PCB's feeding point such that the antenna element operates in cooperation with the ground plane layer. EX1001, 20-23, 35-36 (Figs. 10, 12, 13, 14; 4:49-5:26; 5:49-6:50). In some embodiments, at least portions of the radiating arms are arranged on different planes. EX1001, 29-32, 37-38 (Figs. 20a-23; 8:13-9:49); EX2008, ¶32. These and other novel features of the disclosed multi-band antennas arranged inside the housing of a mobile communication device are reflected in the claims of the '365 Patent.

B. Petitioners' Art

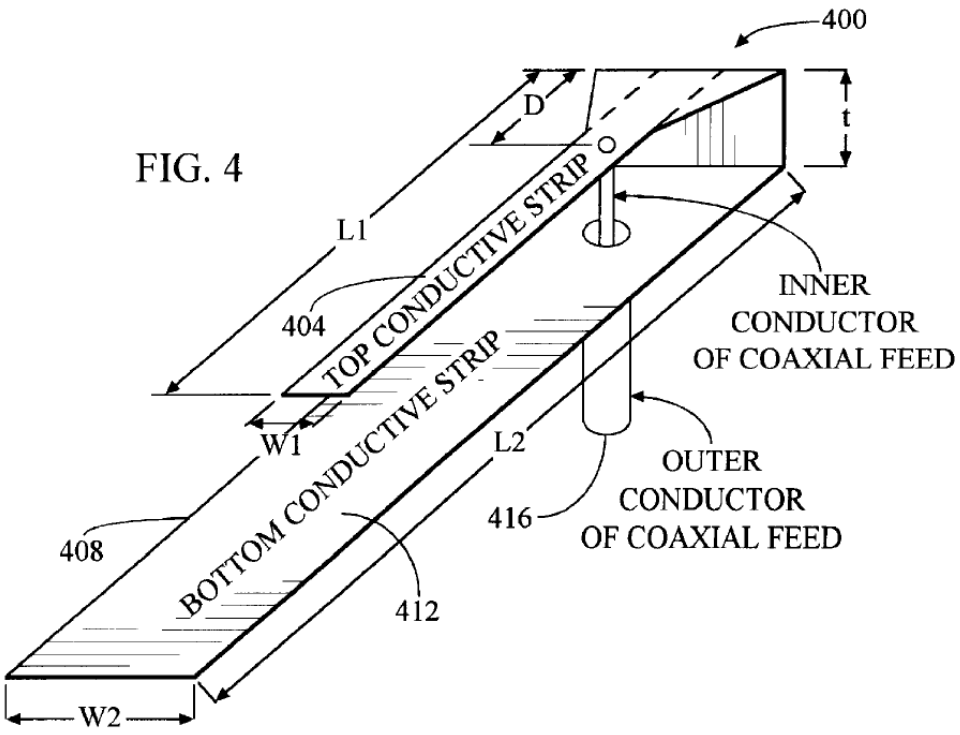
i. Tran

U.S. Patent No. 6,184,833 to Tran, entitled "Dual Strip Antenna" ("Tran") issued on February 6, 2001. Tran is generally directed to a dual strip antenna that provides a broader bandwidth with a reduced antenna size. As depicted in Figure 4, an example dual strip antenna 400 includes a top (first) conductive strip 404 arranged above and parallel to a larger bottom (second) conductive strip 408. The two strips are electrically connected to each other at one end and separated by a dielectric material 412. EX1005, 1, 3, 18-19, 21 (Abstract; Fig. 4; 2:65-3:7; 2:35-37; 7:63-8:9); EX2008, ¶34.

Tran's antenna employs a distinctive principle of operation, functioning as an "open-ended parallel plate waveguide" having "asymmetrical conductor terminations." EX1005, 20-23 (5:39-41; 8:59-65; 9:3-7; 11:54-59). Both the first and

second conductive strips in Tran's antenna are active radiators. EX1005, 21-23 (8:66-9:9; 11:63-12:3). An inner, positive conductor of a coaxial feed is electrically connected to the top strip 404 at a distance from the connected end, and an outer, negative conductor of the coaxial feed is electrically connected to the bottom strip 408, also at a distance from the connected end. EX1005, 19, 21, 23, 24 (3:8-13; 7:67; 8:37-43; 12:39-42; 13:12-14). That is, the two radiating strips of Tran's antenna are separately fed by two different conductors at two different points and with two different signals at different potentials, and neither radiating strip is fed at the commonly connected end. EX2008, ¶35.

FIG. 4



Tran explains that the overall sizes of then-existing antenna designs, such as whip antennas and microstrip antennas, were problematic for wireless communication devices.

> It may also require a minimum device housing dimension when retracted that is larger than desired. While the antenna can be configured with additional telescoping sections to reduce size when retracted, it would generally be perceived as less aesthetic, more flimsy or unstable, or less operational by consumers.

EX1005, 18 (2:2-7)

> Another area in which further improvement is desired is the size of a microstrip antenna. For example, a reduction in the size of a microstrip antenna would make a wireless communication device in which it is used more compact and aesthetic.

EX1005, 20 (5:17-21)

An important objective of Tran's antenna design is to achieve "antenna compactness" EX1005, 1 (Abstract). Tran repeats this point throughout the disclosure:

> One area in which a reduction in size is still desired is communication device antennas. This is due to the fact that the size of the antenna can play an important role in decreasing the size of the device. In addition, the antenna

> size and shape impacts device aesthetics and manufacturing costs.

EX1005, 18 (1:31-36)

> One such area in which a further improvement is desired is a reduction in overall size.

EX1005, 18 (2:49-50)

Another important design goal of Tran is to increase the bandwidth of the antenna without increasing its size. EX1005 1, 18-23 (Abstract; 1:9-13; 1:47-58; 2:56-59; 4:11-18; 5:9-16; 5:42-45; 8:56-65; 9:14-16; 11:46-57; 12:4-19; 12:57-62).

a. Tran discloses only a single-band antenna

Tran's disclosure relates exclusively to the design of a single-band antenna. EX2008, ¶39. Tran's two radiator strips have center frequencies that are offset from each other, one to each side of a center frequency of a single operating band. The bandwidths of the two radiators are combined to achieve a single, wider bandwidth over one operating frequency band.

> In order to enhance the radiator or antenna bandwidth, the dimensions of each strip, in a preferred embodiment, are chosen to establish different center frequencies which are related to each other in a preselected manner. For example, say that f_O is the desired center frequency of the antenna. The length of the shorter strip can be chosen such that its center frequency resides at or around $f_O+\Delta f$, and the length of the longer strip such that its center frequency is at or

> around f_O-Δf. This provides the antenna with a wide bandwidth on the order of from $3\Delta f/f_O$ to $4\Delta f/f_O$.

EX1005, 23 (12:4-15)

While Tran's two radiator strips have offset center frequencies, Tran's antenna is not a multi-band antenna with each strip acting as an independent antenna radiator. EX2008, ¶40. In fact, Tran's disclosure could not be clearer in explaining that the described dual strip antenna is not a dual-band or multi-band antenna. After describing the technique of achieving a broader single-band bandwidth from the two offset center frequencies of the two radiator strips, Tran is quick to clarify:

> ***In other words, this is not intended for use as a dual-band antenna with each strip acting as an independent radiator***.

EX1005, 23 (12:20-22) (emphasis added)

To further reenforce that the antenna design is that of a single-band antenna, Tran provides two detailed embodiments of single-band antennas. The dual strip antenna of Tran's first embodiment operates at the single cellular band from 824-894 MHz. EX1005, 23 (12:23-62); EX2008, ¶42. Tran's Table I lists the lengths and widths of the first strip 404 (3.0 in. x 0.2 in.) and the second strip 408 (4.9 in. x 0.4 in.) and the thickness of the dielectric 412 between the strips (0.3 in.). Considering the size of the antenna of Tran's first embodiment volumetrically, the minimum-sized rectangular box into which the antenna fits is:

4.9 in. x 0.4 in. x 0.3 in. = 124.5 mm x 10.2 mm x 7.6 mm = 9,651.2 mm^3

As shown in Tran's Fig. 10, the frequency response of the dual strip antenna of the first embodiment covers only the single band from 824-894 MHz.

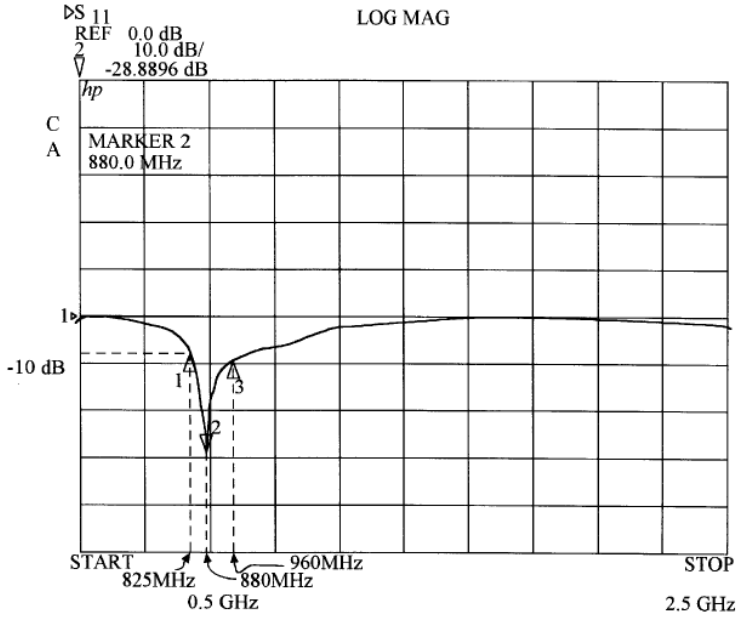


FIG. 10

The dual strip antenna of Tran's second embodiment operates at the single cellular PCS band from 1.85-1.99 GHz. EX1005, 23, 24 (12:63-13:14), EX2008, ¶44. Tran's Table II lists the dimensions of the first strip 404 (1.34 in. x 0.2 in.), the second strip 408 (2.21 in. x 0.2 in.), and the thickness of the dielectric 412 (0.08 in.) for the dual strip antenna of the second embodiment. Considering the size of the antenna of Tran's second embodiment volumetrically, the minimum-sized rectangular box into which the antenna fits is:

2.21 in. x 0.2 in. x 0.08 in. = 56.1 mm x 5.1 mm x 2.0 mm = 572.2 mm^3

As shown Tran's Fig. 11, the frequency response of the dual strip antenna of the second embodiment covers only the single PCS band from 1.85-1.99 GHz. Neither of Tran's embodiments suggests operation at two frequency bands, and the design of Tran's antenna is not capable of supporting transmission or reception of signals at two frequency bands. EX2008, ¶¶41-44.

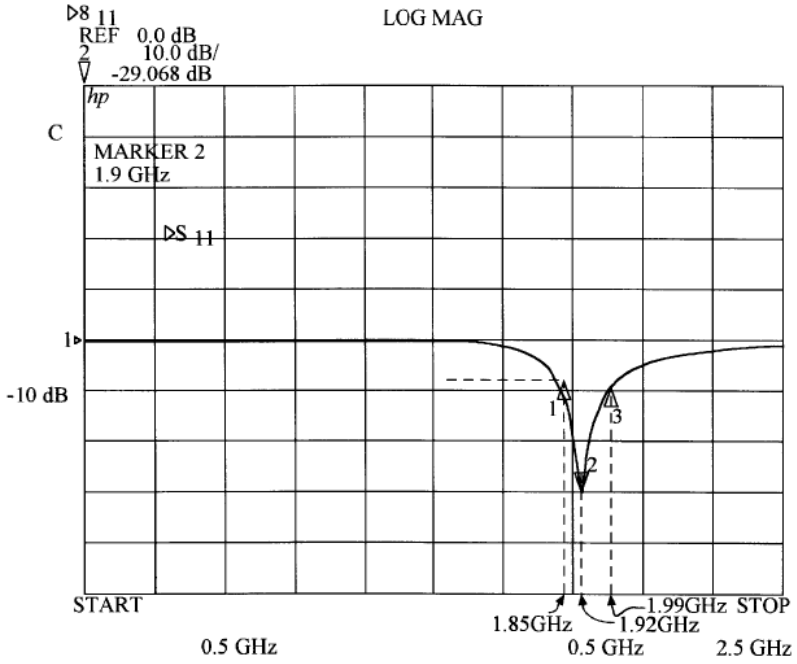


FIG. 11

b. Tran's antenna does not involve or rely on a ground plane

To provide context for why the disclosed single-band dual strip antenna is smaller than comparable then-known antennas, Tran explains that certain types of antennas require both a radiating element and a ground plane. The ground plane of such antennas is much larger than their radiating element, thereby contributing significantly to the overall size of the antenna.

> FIG. 2 shows a conventional microstrip patch antenna 200. **Antenna 200 includes a microstrip element 204, a dielectric substrate 208, a ground plane 212 and a feed point 216.** Microstrip element 204 (also commonly referred to as a radiator patch) and ground plane 212 are each made from a layer of conductive material, Such as a plate of copper.

EX 1005, 20 (6:55-6:60) (emphasis added).

> A second microstrip antenna commonly used is the quarter wavelength microstrip antenna. **The ground plane of the quarter wavelength microstrip antenna generally has a much larger area than the area of the microstrip element.** The length of the microstrip element is approximately a quarter wavelength at the frequency of interest in the substrate material. **The length of the ground plane is approximately one-half wavelength at the frequency of interest in the substrate material**.

EX1005, 21 (7:38-46) (emphases added).

Tran contrasts the size requirements of its dual strip antenna with antennas requiring both a radiating element and a ground plane, noting that the dual strip antenna design reduces the overall length and area required because its largest component – the second, lower radiator strip – is much shorter than the length of a ground plane required for a conventional antenna. Tran further states that the area of

the second radiator strip is "much smaller" than the area of the ground plane required for a conventional microstrip antenna.

> In dual strip antenna 400, the length of first strip 404 is approximately 20 percent less than the length of the radiator patch of a quarter wavelength microstrip antenna operating at the same frequency. **The length of second strip 408 is approximately 40 percent less than the length of the ground plane of a quarter wavelength microstrip antenna operating at the same frequency. Thus, the present invention allows a significant reduction in the overall length of the antenna, thereby making it more desirable for use in personal communication devices**.
>
> **Generally, the ground plane of a conventional microstrip antenna is required to be much larger than the radiator patch. Typically, it is at least one-half of the wavelength in dimension in order to work properly. In dual strip antenna 400, the area of second strip 408 is much smaller than the area of the ground plane of a conventional microstrip antenna, thereby significantly reducing the overall size of the antenna**.

EX1005, 21 (8:20-36) (emphases added).

This "significantly reducing the overall size of the antenna" would not be so if Tran's antenna also required a ground plane. Contrasting the size of its second

radiating strip to the size of a ground plane is meaningful only if Tran's antenna does not include a ground plane. EX2008, ¶¶45-47. The second radiating element is the largest component of Tran's antenna, unlike antennas that include a ground plane. In fact, Tran explicitly highlights this distinction.

> **Unlike a conventional microstrip patch antenna having a radiator patch and a ground plane**, **in the dual strip antenna, both the first and second strips act as active radiators.** During operation of the dual strip antenna, surface currents are induced in the first strip as well as in the second strip. … In other words, the length and the width of the first and second strips are carefully sized so that both the first and second strips perform as active radiators.

EX1005, 21-22 (8:66-9:9). (emphasis added)

These passages establish that Tran's disclosure considers the appropriate size comparison between antennas as requiring inclusion of both an antenna's radiating element ***and*** its ground plane, where a ground plane is part of the antenna structure. Tran uses this methodology when comparing the size of its dual strip antenna – which does not include or require a ground plane – with antennas that do include a ground plane. EX2008, ¶48.

While Tran's disclosure once mentions "a ground layer or ground plane," Tran neither suggests that this ground structure is part of its antenna nor that it is used by

its antenna. Figs. 14A and 14B of Tran show the overall layout of the antenna system within a mobile phone, including a printed circuit board (PCB). The only mention of any ground plane within the cellular phone is a single sentence stating that "either layer 1414 or 1418 [of the PCB] could form a ground layer or ground plane for board 1402, as would be known in the art." EX1005, 24 (13:55-57). Curiously, layers 1414 and 1418 are not actually shown in Figs. 14A or 14B or any other figures of Tran. Tran does not suggest that the ground plane mentioned in this passage is part of the dual strip antenna or that the antenna uses or relies on the ground plane. Rather, the PCB's ground layer or ground plane is described merely as being "for board 1402." *Id.* at 13:56. The notion that the board's ground plane is part of the dual strip antenna is directly contradicted by the overwhelming evidence in Tran's disclosure to the contrary. EX2008, ¶49.

ii. Teng

Teng, P.L. & Wong, K.L., "Planar monopole folded into a compact structure for very-low-profile multiband mobile-phone antenna." *Microwave and Optical Technology Letters,* vol. 33, no. 1, 2002 ("Teng") discloses a planar monopole antenna having three meandering branch strips designed to operate as quarter-wavelength radiators at three respective, different frequencies: 900 MHz, 1800 MHz, and 1900 MHz. EX1006, 4 (p. 22). The antenna is formed on one side of a substrate and then folded into a three-dimensional box-like shape. EX1006, 5 (p.

23). Teng's antenna also includes a ground plane that is substantially larger than the three-branch radiating element. EX1006, 23; EX2008, ¶50. All three branches of Teng's radiating element are fed at a common point via a single microstrip line conductor. EX1006, 6 (p. 24).

Only one of Teng's branches is designed to radiate at frequencies that overlap with one of the single bands covered by Tran's single-band antennas, *i.e.*, at 1900 MHz. Teng's antenna does not have a radiator that corresponds to the frequency band covered by the first embodiment of Tran's single-band dual strip antenna (824-894 MHz). Because lower frequencies require longer radiator lengths, to provide operation at frequencies within the operating band of Tran's first embodiment, Teng's antenna would have required modification to include a longer branch radiator. It has not been established that such a modification to Teng's antenna would have been feasible within the space constraints of Teng's antenna or whether such a modified antenna would have suitable operating characteristics. EX2008, ¶51.

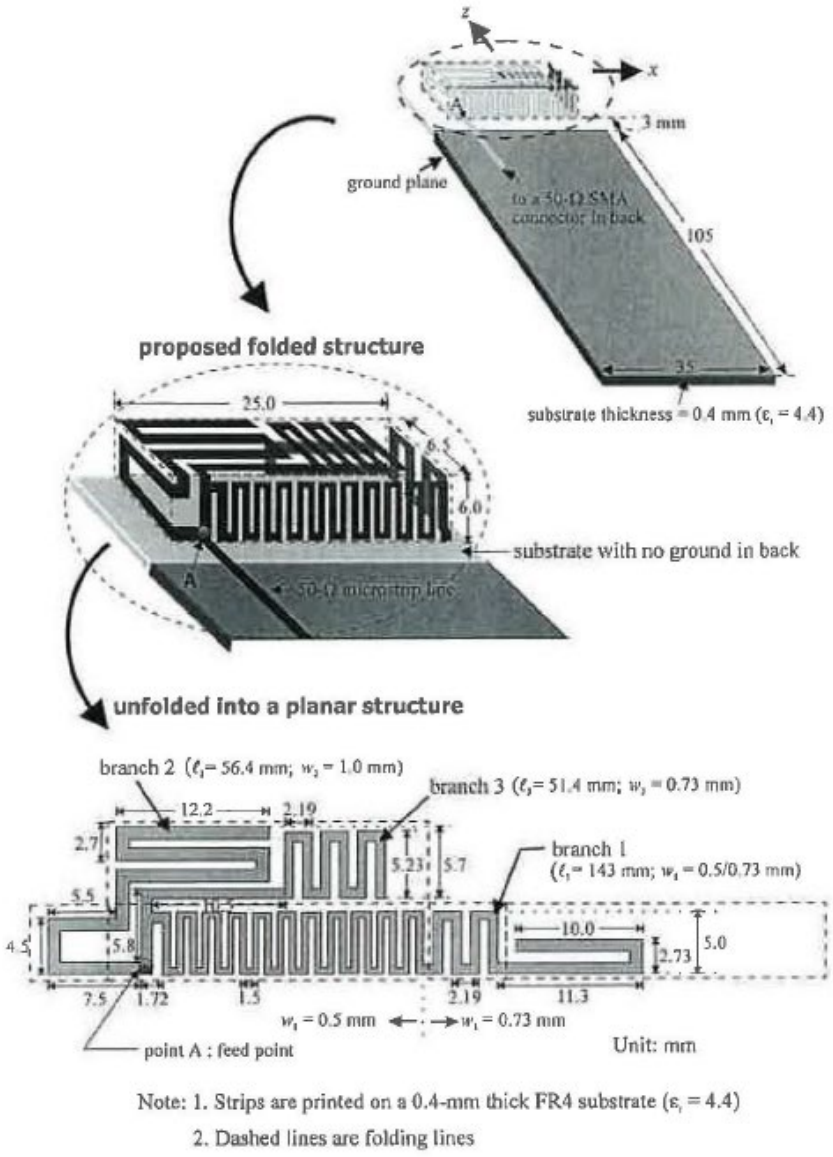


Figure 1 Proposed planar monopole folded into a compact structure for multiband mobile phone antennas

a. Teng's antenna requires a ground plane

As a monopole antenna, Teng's antenna requires both a radiating element and a ground plane, and the positioning of the radiating element relative to the ground

plane is critical to the operating characteristics of the antenna. EX1006, 6 (p. 24) EX2008, ¶52.

> Notice that the top portion has no ground plane in back, and the proposed antenna should be placed at a minimum distance of 3 mm away from the other portion with a ground plane in back (see the figure), which has dimensions of 35 x 105 mm^2.

EX1006, 6 (p. 24)

Teng's three-branch radiating element has a height of 6.5 mm, a width of 6 mm, and a length of 25 mm. EX1006 4, (p. 22). As seen in Teng's Figure 1, like the ground-plane-dependent antennas Tran compares to its single-band dual strip antenna, the ground plane of Teng's antenna is considerably larger than its three-branch radiating element, making the ground plane the dominant component for the space requirements of Teng's antenna. EX2008, ¶¶53, 60.

b. Teng's antenna is substantially larger than any of Tran's single-band antennas

Because Tran's antenna does not use a ground plane, Tran compares the size of its antenna with prior art antenna systems, inclusive of both the radiating element and the required ground plane. That is, Tran teaches that the relevant comparison of the size of its antenna to the size of an antenna that includes a ground plane is to consider the size of both components (radiator and ground plane). Tran's significant

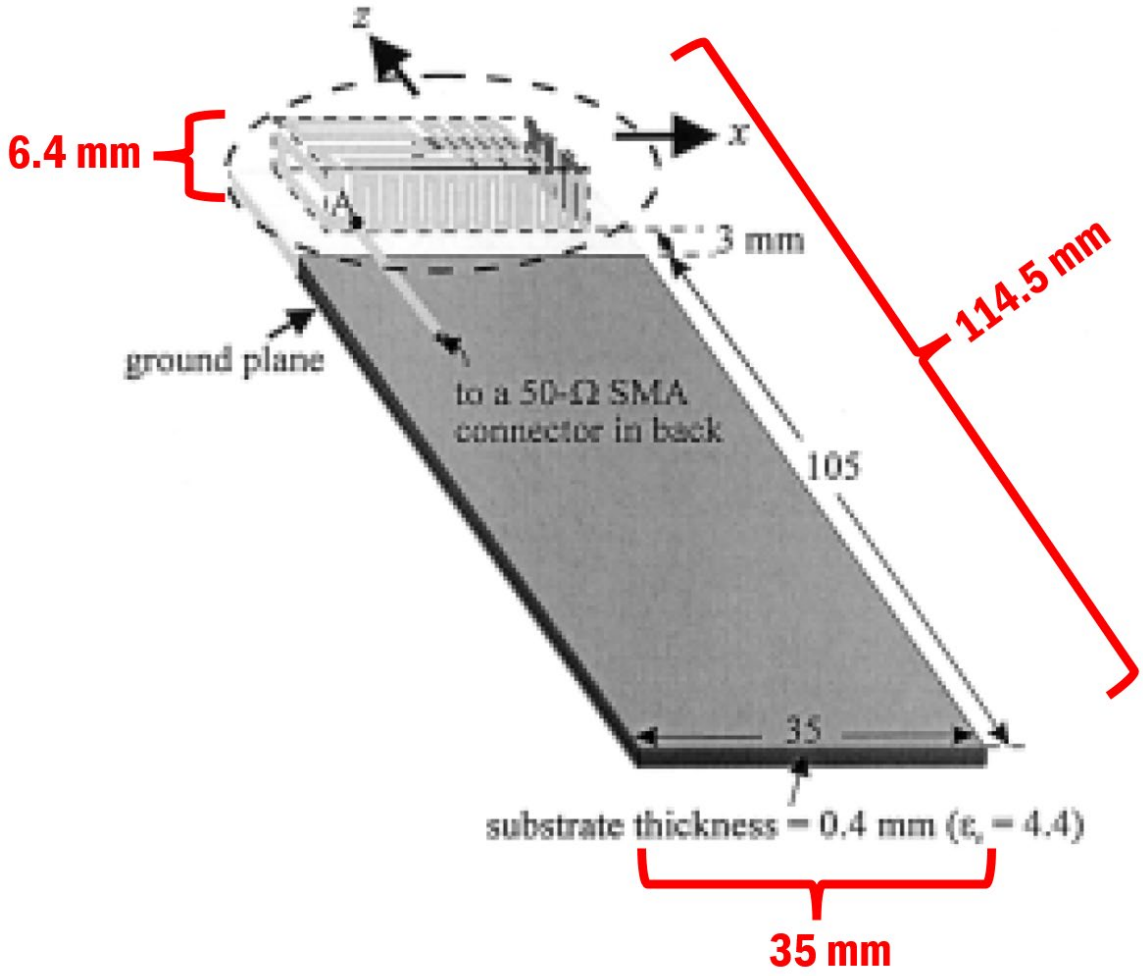
size reduction is due largely to the elimination of the ground plane in Tran's antenna design. EX1005, 21 (8:20-36); EX2008, ¶¶45-47.

Owing, in part, to its need for a ground plane, the overall size of Teng's antenna is substantially larger than every antenna disclosed in Tran. EX2008, ¶64.

As explained in Section II.B.i.a, *supra*, the single-band antenna described in Tran's first embodiment, operating at 824-894 MHz, has a volume of 9,651.2 mm^3, and the single-band antenna described in Tran's second embodiment, operating at 1.85-1.99 GHz, has a volume of 572.2 mm^3.

The comparable size of Teng's antenna requires determining the volume of the smallest rectangular box that encloses both components of Teng's antenna, *i.e.*, both the three-branch radiating element and the ground plane.[1] EX2008, ¶61.

[1] The methodology of evaluating the size of an antenna by the smallest rectangular box into which the antenna fits is consistent with the approach taken in the Petition, but the Petition erred in failing to include the entirety of Teng's antenna, in the manner taught by Tran.



The overall length of Teng's antenna includes: 1) the length of the ground plane (105 mm); 2) the length of the side of Teng's radiating element in the length direction (6.5 mm); and 3) the space between the radiating element and the ground plane (3.0 mm). Thus, the length dimension of Teng's antenna is:

105 mm + 6.5 mm + 3 mm = 114.5 mm

EX2008, ¶62.

The height of Teng's antenna is determined from the sum of the height of the radiating element, which is 6 mm, and the thickness of the ground plane, which is 0.4 mm (the bottom of the radiating element is substantially coplanar with the top of the ground plane layer), totaling 6.4 mm. The width of Teng's antenna is determined from the width of the ground plane (the widest component), which is 35 mm. The overall volume of Teng's antenna is then:

114.5 mm x 35 mm x 6.4 mm = 25,648 mm^3

EX2008, ¶63.

Comparing the size of Teng's antenna to those disclosed by Tran, Teng's antenna is over two and half times larger than the single-band antenna of Tran's first embodiment and a whopping 45 times larger than the single-band antenna of Tran's second embodiment. EX2008, ¶64.

Even using the Petition's incorrect methodology, which ignores the required ground plane in Teng's antenna, Teng's radiating element alone is still larger than the single-band antenna of Tran's second embodiment. The volume of Teng's radiating element is 25 mm x 6.5 mm x 6 mm = 975 mm^3, which is larger than the volume of the antenna of Tran's second embodiment (572.2 mm^3). EX2008, ¶64.

Teng's antenna cannot operate at the frequency band covered by the single-band antenna of Tran's first embodiment (824-894 MHz) and would need to be modified to include a larger radiating branch to reach such low frequencies. Aside

from whether such a modification is even feasible, the size of Teng's resulting radiating element is unknown making a comparison between Teng's radiating element and the antenna of Tran's first embodiment even more meaningless. EX2008, ¶65.

III. CLAIM CONSTRUCTION

Claims in this IPR are construed "using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. 282(b), including construing the claim in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art." 37 C.F.R. § 42.100. Patent Owner does not necessarily agree with Petitioners' claim construction as presented in the Petition (Petition, 7-13) or in any other proceeding, but any differences are not directly pertinent to any of the arguments Patent Owner is making in this Preliminary Response and, accordingly, are not addressed. Patent Owner, however, reserves the right to challenge Petitioners' claim construction and to provide different and additional constructions if an IPR is instituted.

IV. 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, 6. Patent Owner, however, reserves the right to present its own definition in the event an IPR is instituted.

V. ARGUMENT

A. The Petition Fails to Show a Reasonable Likelihood of Invalidating Any Claim of the '365 Patent Because Tran in View of Teng Does Not Render Obvious Claims 1-42 and 44-45

The Board may institute IPR of the claims of the '365 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. The Petition presents one invalidity ground: obviousness of claims 1-42 and 44-45 over Tran in view of Teng. Because a POSITA neither would have been motivated to combine Tran with Teng nor had reasonable expectation of success and because, even if such a combination was appropriate, all elements of the claims would not be found in the combination, inter partes review should not be instituted based upon the Petition.

1. Tran discloses only a *single-band antenna*, not a multi-band antenna as alleged in the Petition

The argument in the Petition for why a POSITA would have been motivated to replace Tran's antenna with Teng's antenna is based substantially upon the contention that Tran's antenna is a multiband antenna. *See* Petition, 14 ("Tran's

antennas are dual-band antennas")[2]; *id* at 17 ("Tran's desire for 'small' multiband antennas (Tran, 1:24-37)");[3] *id* at 18 ("Tran's antenna operated on GSM850 and PCS1900 bands. Tran, FIG 10, 12:23-27, 12:56-57");[4] *id.* at 19 ("Tran discloses mounting its multi-band antenna").

As discussed in detail in Section II.B.i.a, *supra,* however, Tran's antenna ***is not a multiband antenna, but rather a single band antenna***. Indeed, to remove any doubt Tran explicitly states its antenna is ***"not intended for use as a dual-band antenna."*** EX1005, 23 (12:20-22). Not a single passage in Tran's disclosure teaches or suggest anything but an antenna and a phone designed to operate at a single frequency band. Thus, not surprisingly, none of the portions of Tran cited in the Petition to support the assertion it is a multi-band antenna actually do so. *See* footnotes 1-4. Accordingly, a fundamental argument in the Petition for combining

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[2] As discussed in detail in Section II.B.i.a, the portions of Tran's specification cited in the Petition do not disclose a single antenna operating at two bands, but rather two separate embodiments of single-band antennas, one operating on GSM850 (FIG. 10) and another operating on PCS1900 (FIG. 11).

[3] This portion of Tran's specification cited in the Petition says nothing about "multi-band antennas."

[4] *See* note 2.

Tran with Teng collapses in the face of this mischaracterization of Tran's antenna. Indeed, viewing the obviousness analysis based upon a correct reading of Tran yields an entirely different result as it would not have been a simple substitution to replace Tran's single band antenna with a multi-band antenna such as Teng's. Indeed, doing so would change the fundamental principle of operation of Tran's device, which is not designed for multi-band operation. EX2008, ¶¶40-44, 55.

Because Tran's dual-strip antenna is designed to operate at a single frequency band, all of the components and communication circuitry on Tran's printed circuit board that enable operation of Tran's wireless phone would necessarily also be designed to handle communication signals transmitted and received in a single frequency band. This communication circuitry would not be capable of transmitting or receiving signals in more than one frequency band or of discriminating between or switching operation between different frequency bands, as would be necessary in a mobile device supporting two or more frequency bands. In effect, the Petition is proposing to convert Tran's single-band communication device into a multi-band communication device by merely swapping a single-band antenna for a multi-band antenna without addressing how the single-band architecture of Tran's electronics could be adapted to support multiple bands. Notably, the Petition relies exclusively on Tran for the "communication circuitry" recited in the claims but fails to address how the single-band architecture of Tran's electronics could be adapted to support

multiple bands. Petition at 17 ("POSA's considering the teachings of Tran and Teng together had reason to implement a multi-band cellular telephone having …the telephone's **communication circuity inside the device's housing of the type disclosed by Tran**, but using **Teng's compact low profile multiband-antenna design**")(emphasis added). This failure to address how Tran's system could be adapted to support multiple bands stems directly from the Petition's "multi-band" mischaracterization of Tran's single-band antenna. EX2008, ¶56.

Because the Petition mischaracterizes the nature of Tran's antenna it makes no effort to address these issues and provide the required explanation as to "*how* or *why* the references would be combined to produce the claimed invention" when Tran is viewed correctly as only disclosing a single-band antenna. *Trivascular, Inc. v. Samuels*, 812 F.3d 1056, 1066 (Fed. Cir. 2016), (*quoting, Kinetic Concepts, Inc. v. Smith & Nephew, Inc.,* 688 F.3d 1342, 1368 (Fed. Cir. 2012) (emphases added) (internal quotation marks omitted)). Accordingly, it would not have been obvious to combine Teng's multi-band antenna with Tran, which was expressly designed to utilize a single-band antenna. *See KSR Int'l Co. v. Teleflex Inc.,* 550 U.S. 398, 421 (2007) (noting that if an ordinarily skilled artisan would not believe that a particular combination would have a reasonable expectation of "anticipated success," the combination may not be obvious). Further, assuming *arguendo* that the POSITA would consider combining Tran and Teng, the combination would

require substantial modification to Tran's communication circuitry for it to operate with a multiband antenna. The Petition fails to identify these modifications, much less explain how they would be implemented to reach the claimed invention, and is therefore, deficient. *See Trivascular*, 812 F.3d at 1066. (Party asserting obviousness must explain "*how* or *why* the references would be combined to produce the claimed invention").

2. Tran's antenna avoids using a ground plane, so replacing Tran's antenna to require a ground plane would not have been obvious

The Petition's argument for why a POSITA would have been motivated to replace Tran's antenna with Teng's antenna is also substantially based upon the contention that Tran's antenna uses a ground plane. *See* Petition, 17 (noting that Tran has a ground plane); *id.* at 23 ("Tran, 13:43-57 (PCB comprises 'dielectric material layer 1412 disposed next to ***metallic conductor layer*** 1414 disposed next to dielectric material layer 1416 supporting or disposed next to ***metallic conductor layer 1418***' wherein 'either layer 1414 or 1418 ***could form a ground layer or ground plane*** for board 1402, as would be known in the art.'") (emphasis original).

As discussed in detail in Section II.B.i.b, *supra,* however, the Petition once again mischaracterizes the reference as Tran's antenna not only ***does not use a ground plane, but expressly relies on the benefits of not having a ground plane***. EX1005, 21 (8:20-36). As Tran specifically explains there is a size benefit of not

using a ground plane in contrasting the ground-plane-less two-strip design with antennas that require a ground plane. EX2008, ¶57. The Petition simply ignores these portions of Tran and instead relies on the single mention of a ground plane in Tran which does not support its position, but rather indicates the ground plane is not for the antenna but ***"for board 1402."*** EX1005, 24 (13:55-57) (emphasis added). *See Application of Kamm,* 452 F.2d 1052, 1057 (C.C.P.A. 1972) (*quoting In re Wesslau*, 353 F.2d 238, 241 (C.C.P.A. 1965)) ("It is impermissible within the framework of section 103 to pick and choose from any one reference only so much of it as will support a given position, to the exclusion of other parts necessary to the full appreciation of what such reference fairly suggests to one of ordinary skill in the art.")

Indeed, viewing the obviousness analysis based upon a correct reading of Tran yields an entirely different result as it would not have been a simple substitution to replace Tran's single band two-strip antenna, which does not require a ground plane, with a multi-band antenna such as Teng's three-branch radiating element, which does. Simply put, doing so would require the introduction of a ground plane into an antenna design in which a ground plane was neither needed nor, indeed, desired. EX2008, ¶58.

Tran's own disclosure explains why introducing a ground plane in the antenna design is undesirable and this would be non-obvious – it greatly increases the overall

size of the antenna. EX 1005, 20 (6:55-6:60). Tran considers the appropriate size comparison between antennas as requiring inclusion of both an antenna's radiating element ***and*** its ground plane, where a ground plane is part of the antenna structure. Tran uses this methodology when comparing the size of its dual strip antenna – which does not include or require a ground plane – with antennas that do include a ground plane. Specifically, Tran compares the size of its dual strip antenna with antennas requiring both a radiating element and a ground plane, explaining that the dual strip antenna design reduces the overall length and area compared to the length and area required by the ground plane of a conventional antenna. EX1005, 21 (8:20-36). The "significantly reducing the overall size of the antenna" would not be so if Tran's antenna also required a ground plane. Tran's contrasting of the size of its second radiating strip to the size of a conventional ground plane is meaningful only if Tran's antenna does not include a ground plane. The second radiating element is the largest component of Tran's antenna, unlike antennas that include a ground plane. EX2008, ¶59. Indeed, as addressed in the next section, Teng's antenna, which requires a ground plane, is substantially larger than any of the example antenna's disclosed by Tran.

Because the Petition incorrectly states that Tran's antenna utilizes a ground plane it makes no effort to address these issues and provide the required explanation as to "*how* or *why* the references would be combined to produce the claimed

invention" when Tran is viewed correctly as only disclosing a single band antenna that does not utilize a ground plane. *Trivascular*, 812 F.3d at 1066. Accordingly, it would not have been obvious to combine Teng's three-branch multi-band antenna, which requires a ground plane with Tran, which was expressly designed to utilize a two-strip single-band antenna that requires no ground plane. *See KSR* 550 U.S. at 421 (2007) (noting if an ordinarily skilled artisan would not believe that a particular combination would have a reasonable expectation of "anticipated success," the combination may not be obvious).

3. Teng's antenna is substantially larger than Tran's antenna, not smaller as alleged in the Petition

The Petition further substantially relies on the assertion that "Teng's compact antenna (6.5 x 6 x 25 mm^3, Teng 25) is substantially smaller than Tran's internal antenna (4.9 x .0.4 x 0.3 $inches^3 \cong$ 124 x 10 x 8 mm^3 , Tran, 12;23-41)." Petition, 17; "Teng's antenna is 'compact,' smaller than Tran's, and intended for use in a "practical mobile headset.'" *Id.* at 20, citing Teng 24. As discussed in detail in Section II.B.ii.b, *supra*, this is also incorrect. Indeed, the overall size Teng's antenna is actually substantially larger than the overall size of Tran's antenna due, in part, to Teng's antenna's need for a ground plane, which Tran's antenna does not need. Section II.B.i.b; EX2008, ¶¶60, 64.

As further detailed in Section II.B.ii.b, *supra,* when the size is calculated correctly, Teng's antenna is over two and half times larger than the single-band antenna of Tran's first embodiment and a 45 times larger than the single-band antenna of Tran's second embodiment. EX2008, ¶¶61-64. In fact, even using the Petition's incorrect methodology, which ignores the required ground plane in Teng's antenna, Teng's radiating element alone is still larger than the single-band antenna of Tran's second embodiment. Specifically, the volume of Teng's radiating element is 25 mm x 6.5 mm x 6 mm = 975 mm^3, which is larger than the volume of the antenna of Tran's second embodiment (572.2 mm^3). EX2008, ¶64.

Moreover, Teng's antenna cannot operate at the frequency band covered by the single-band antenna of Tran's first embodiment (824-894 MHz) and would need to be modified to include a larger radiating branch to reach such low frequencies. It is unclear whether such a modification is even feasible given the size of Teng's resulting radiating element is unknown and the Petition makes no effort to even address this issue. This makes any comparison between Teng's radiating element and the antenna of Tran's first embodiment even more meaningless. EX2008, ¶65. *See Trivascular*, 812 F.3d at 1066. (noting that the party asserting obviousness must explain "*how* or *why* the references would be combined to produce the claimed invention").

Because Teng's antenna is not smaller than Tran's antenna, yet another rationale offered in the Petition for combining Tran and Teng falls by the wayside. *See Kamm,* 452 F.2d at1057 ("It is impermissible within the framework of section 103 to pick and choose from any one reference only so much of it as will support a given position, to the exclusion of other parts necessary to the full appreciation of what such reference fairly suggests to one of ordinary skill in the art.")

4. The feeding mechanisms of Tran and Teng are fundamentally different and incompatible and thus substituting one for the other could not have been an obvious "design choice."

As set forth in detail in Sections II.B.i and II.B.ii, *supra*, the feeding mechanisms of Tran and Teng are fundamentally different. Specifically, in Tran the two radiating strips of the antenna are ***separately fed*** by two different conductors at two different points and with two different signals at different potentials, and neither radiating strip is fed at the commonly connected end. EX1005, 19, 21, 23, 24 (3:8-13; 7:67; 8:37-43; 12:39-42; 13:12-14); EX2008, ¶¶35, 66. In contrast, all three branches of Teng's radiating element are ***fed at a common point*** via a single microstrip line conductor. EX1006, 6 (p. 24); EX2008, ¶¶50, 66.

Once again, despite the fact that the Petition proposes a complete substitution of the Teng antenna for the Tran antenna, no effort whatsoever is made to explain how one could be substituted for the other. Rather, the Petition merely offers the

conclusory assertion that "it would have been a design choice whether to connect the PCB's feeding point to the antenna via a coaxial wire as in Tran or via a solder or other bond between the antenna and the feeding point as discussed in Teng, and POSAs had reason to choose Teng's approach to avoid a bulkier coaxial wire." Petition, 31. *See Polaris Industries, Inc. v. Arctic Cat, Inc.,* 882 F.3d 1056, 1069, n.4 (Fed. Cir. 2018) ("Merely stating that a particular placement of an element is a design choice does not make it obvious"); (*quoting, Cutsforth, Inc. v. MotivePower, Inc., 636* Fed.Appx. 575, 578 (Fed. Cir. 2016)).

Indeed, contrary to assertions in the Petition, these are not common, interchangeable options. To replace Tran's coaxial cable – which includes two conductors that separately feed two radiating elements with two different signals at two different feed points – with Teng's single microstrip line conductor – which feeds all three branches of Teng's radiating element at a common point – at a minimum, it would be necessary to substantially modify Tran's communication circuitry to accommodate this completely different feeding mechanism to support Teng's swapped-in antenna with a fundamentally different principle of operation. The need to make such wholesale changes to Tran's communication circuitry and feeding mechanism do not amount to a simple "design choice" between two well-known alternatives. The Petition, notably, relies exclusively on Tran for the claimed communication circuitry (Petition, 27-28), but then relies on exclusively on Teng for

the claimed feeding port on a common conductor (Petition, 39-40), but makes no effort to reconcile the fundamental incompatibility between these two systems or address the substantial changes that would be required within Tran's communication circuitry. EX2008, ¶67.

5. There is no expectation of success for the proposed combination.

Given these fundamental differences between the antennas in Tran and Teng – single-band v. multi-band, ground plane v. no ground plane, antenna size differences, different feeding mechanisms – the Petition fails to meet its burden of establishing that a POSITA would have been motivated to make such a combination, let alone have predicable results doing so. *See KSR* 550 U.S. at 421 (noting that if an ordinarily skilled artisan would not believe that a particular combination would have a reasonable expectation of "anticipated success," the combination may not be obvious).

B. Certain limitations in each of the independent claims are not met by the proposed combination of Tran and Teng

For some of the same reasons, a POSITA would not combine Tran and Teng, the Petition also fails to demonstrate that a combination of Tran and Teng would include certain limitations of the independent claims.

Claim 1

Claim 1[H] recites "the antenna element operates in cooperation with the ground plane layer." The Petition relies on the false narrative that Tran's antenna relies on a ground plane. Petition, 23, 31, 34-35. As discussed in detail above, however, Tran does not have a ground plane that operates in cooperation with a ground plane layer. While Tran's disclosure once mentions "a ground layer or ground plane," Tran does not suggest that this ground structure is part of its antenna or is used by its antenna. EX2008, ¶¶45-49. Rather, the PCB's ground layer or ground plane is described merely as being "for board 1402." Indeed, the notion that the board's ground plane is part of the dual strip antenna is directly contradicted by the overwhelming evidence in Tran's disclosure to the contrary. EX 1005, 20-22 (6:55-6:60; 7:38-46; 8:20-36; 8:66-9:9).

Claim 1[F] recies "the communication circuitry is coupled to the feeding point and to the ground plane layer." The Petition contends that either Tran's or Teng's feeding point suffices to meet this limitation and deciding which one to use is merely a "design choice." Petition, 31. As discussed in Section V.A.4, *supra,* this is simply not the case as the two feeding mechanisms are fundamentally different and are not capable of simple substitution.

Claim 15

Claim 15[H] recites "the antenna element is coupled to the feeding point and operates in cooperation with the ground plane layer." The Petition fails to show this limitation for the same reason it fails to show limitation 1[H].

Claim 31

Claim 31[F] recites "the communication circuitry is coupled to the feeding point and to the ground plane layer." The Petition fails to show this limitation for the same reason it fails to show limitation 1[H].

VI. CONCLUSION

In light of the foregoing, there is no "reasonable likelihood that Petitioner 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,
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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:

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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 7919 total words.

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