IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS
MARSHALL DIVISION

FRACTUS, S.A.	§	
	§	
Plaintiff,	§	
	§	
	§	
v.	§	**Civil Action No. 2:20-cv-00097-JRG**
	§	
TCL CORP.; TCL COMMUNICATION TECHNOLOGY HOLDINGS, LTD.; TCT MOBILE WORLDWIDE, LTD.; AND TCT MOBILE INTERNATIONAL, LTD.	§	**JURY TRIAL DEMANDED**
	§	
	§	
	§	
	§	
	§	
	§	
Defendants.		

FIRST AMENDED COMPLAINT FOR PATENT INFRINGEMENT

Plaintiff Fractus, S.A. ("Fractus" or "Plaintiff") hereby submits this First Amended Complaint for patent infringement against Defendants TCL Corporation (n/k/a TCL Technology Group Corporation), TCL Communication Technology Holdings, Limited, TCT Mobile Worldwide, Limited, and TCT Mobile International, Limited (collectively, "TCL" or "Defendants").

THE PARTIES

1. Fractus, S.A. is a foreign corporation duly organized and existing under the laws of Spain with its principal place of business in Barcelona, Spain.
2. Fractus is the owner by assignment of all right, title, and interest in U.S. Patent Nos. 7,394,432, 7,397,431, 8,941,541, 8,976,069, 9,054,421, 9,240,632, and 9,362,617 (the "Patents-in-Suit").
3. On information and belief, Defendant TCL Corp. is a corporation organized under the

laws of China with its principal place of business at No. 26, the Third Road, Zhongkai Avenue, Huizhou City, Guangdong, P.R. China 516006. TCL Corp. may be served pursuant to the provisions of the Hague Service Convention.

4. On information and belief, Defendant TCL Communication Technology Holdings, Ltd., is a corporation organized under the laws of China with its principal place of business at 15/F, TCL Tower, Gaoxin Nan Yi Road, Nanshan District, Shenzhen, People's Republic of China. TCL Communication Technology Holdings, Ltd., may be served pursuant to the provisions of the Hague Service Convention. TCL Communication Technology Holdings, Ltd., is one of four business units of its parent, TCL Corp.

5. On information and belief, Defendant TCT Mobile Worldwide, Ltd., is a corporation organized under the laws of Hong Kong with its principal place of business at 5/F HK Science Park Bldg., Shatin, NT, Hong Kong. TCT Mobile Worldwide, Ltd., may be served pursuant to the provisions of the Hague Convention. TCT Mobile Worldwide, Ltd., is a subsidiary of TCL Communication Technology Holdings, Ltd.

6. On information and belief, Defendant TCT Mobile International, Ltd., is a corporation organized and existing under the laws of Hong Kong, with its principal place of business located at 1910-12A Tower 3, China Hong Kong City, 33 Canton Road, Tsim Sha Tsui, 31802888 Hong Kong. TCT Mobile International, Ltd., may be served pursuant to the provisions of the Hague Convention. TCT Mobile International, Ltd., is a subsidiary of TCT Mobile Worldwide, Ltd.

7. On information and belief, the defendants identified in paragraphs 3-6 above are an interrelated group of companies which together compromise one of the leading manufacturers of cellular telephones in the world and a big seller of cellular telephones in

the United States.

JURISDICTION AND VENUE

8. This is an action for patent infringement arising under the patent laws of the United States, 35 U.S.C. §§ 1, et seq. This Court has jurisdiction over this action pursuant to 28 U.S.C. §§ 1331, 1338(a), and 1367.

9. This Court has personal jurisdiction over Defendants. Fractus is informed and believes, and on that basis alleges, that Defendants conduct business and have committed acts of patent infringement and/or have induced acts of patent infringement by others in this judicial district, the State of Texas, and elsewhere in the United States. Defendants have purposefully directed infringing activities at residents of the State of Texas, and this litigation results from those infringing activities. Defendants regularly sell (either directly or indirectly), their products within this district. For example, Defendants have placed and continue to place infringing products into the stream of commerce via an established distribution channel with the knowledge or understanding that such products are being and will continue to be sold in this Judicial District and the State of Texas. Defendants are subject to this Court's specific and/or general personal jurisdiction pursuant to due process and/or the Texas Long Arm Statute, due at least to their substantial and pervasive business in this State and judicial district, including at least part of their infringing activities alleged herein and deriving substantial revenue from goods sold to Texas residents.

10. Venue is proper for all Defendants in this federal district pursuant to 28 U.S.C. § 1400(b), 28 U.S.C. § 1391(c), and *Brunette Mach. Works, Ltd. v. Kockum Indus., Inc.*, 406 U.S. 706 (1972). There is no clearly more convenient venue.

FACTUAL ALLEGATIONS

Fractus Technology

11. Fractus is a company specializing in advanced antenna technologies based in Barcelona, Spain. Fractus was founded by two college friends, Ruben Bonet and Carles Puente. Dr. Puente, a Professor at the Universitat Politècnica de Catalunya, is the lead inventor on the Patents-in-Suit. Dr. Puente's early research work focused on fractal antennas and evolved over time into the widely applicable and flexible antenna designs that appear in and are covered by the Patents-in-Suit. While these designs have their origins in fractal antenna designs, they are not themselves fractal antennas. Instead, the antenna designs adhere to rules that allow the reuse of antenna regions during operation in multiple frequency bands while eliminating the requirement of a self-repeating shape as was required in fractal designs. By implementing the concepts disclosed in the Patents-in-Suit, the inventions permit antennas to operate at increased numbers of frequency bands while simultaneously reducing their size, allowing greater performance within smaller spaces.

12. Fractus has designed antennas for and/or has licensed the right to use its technology to much of the mobile antenna community, including HTC, Kyocera, LG, Palm, Pantech, RIM, Motorola, Samsung, Sharp, and UTStarcom. Since its incorporation Fractus has cumulatively sold more than 40 million antennas to customers. Among the numerous awards and honors the company has received for its innovative work, Fractus won the 2004 Frost & Sullivan Award for technological innovation, was named a 2005 Davos World Economic Forum Technology Pioneer and one of Red Herring's top innovative companies for 2006. Fractus inventors were finalist for the EPO European Inventor Award in 2014 and on April 2017 Fractus received the "European Inspiring Company Award" by the London Stock Exchange and the Elite Group. In October 2017, Fractus was selected

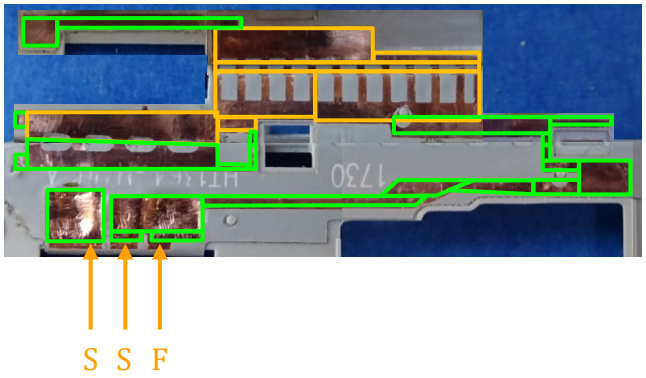
by the European Patent Office (EPO) as an example of IP strategist for small and medium-sized enterprises.

TCL's Infringing Products

13. TCL makes, uses, sells, offers for sale and/or imports Infringing Products in the United States, including but not limited to, the following examples of infringing mobile devices: Alcatel 1S, Alcatel Dawn, Alcatel Pixi 3 (4.5"), Alcatel QuickFlip, Alcatel 1X, Alcatel Elevate, Alcatel Pixi 4 (4.5"), Alcatel Raven, Alcatel 1X Evolve, Alcatel Fierce 4, Alcatel Pixi 4 (5"), Alcatel Retro, Alcatel 3V (2019), Alcatel Fling, Alcatel Pixi 4 (6"), Alcatel REVVL, Alcatel 7, Alcatel Go Flip (CDMA), Alcatel Pixi Avion, Alcatel REVVL 2 Plus, Alcatel 871A, Alcatel Go Flip (GSM), Alcatel Pixi Bond, Alcatel SmartFlip, Alcatel A30 (GSM), Alcatel Go Flip 3, Alcatel Pixi Eclipse, Alcatel Sonic, Alcatel A30 Fierce, Alcatel Go Flip V, Alcatel Pixi Glitz, Alcatel SpeakEasy, Alcatel A30 Plus, Alcatel Go Play, Alcatel Pixi Pulsar, Alcatel Streak, Alcatel A205G, Alcatel Ideal, Alcatel Pixi Theatre, Alcatel Tetra, Alcatel A206G, Alcatel IdealXCITE, Alcatel Pixi Unite, Alcatel Tru, Alcatel A207BG, Alcatel IdealXTRA, Alcatel Pop 3 (5"), Alcatel Verso, Alcatel A392G The Big Easy Flip, Alcatel Idol 3 (5.5"), Alcatel Pop 4 Plus, Alcatel ZIP, Alcatel Allura, Alcatel Insight, Alcatel Pop Icon, Alcatel Avalon V, Alcatel Jitterbug Flip, Alcatel Pop Icon 2, Alcatel Cameox, Alcatel Jitterbug Smart 2, Alcatel Pop Mega, Alcatel Cinch, Alcatel Kora, Alcatel Pop Nova, Alcatel Cingular Flip 2, Alcatel MyFlip, Alcatel Pop Star, Alcatel Conquest, Alcatel Onyx, Alcatel Pop Star 2, TCL A1, TCL A1X, TCL LX, TCL LX1, and TCL LX2 (the "Infringing Products").

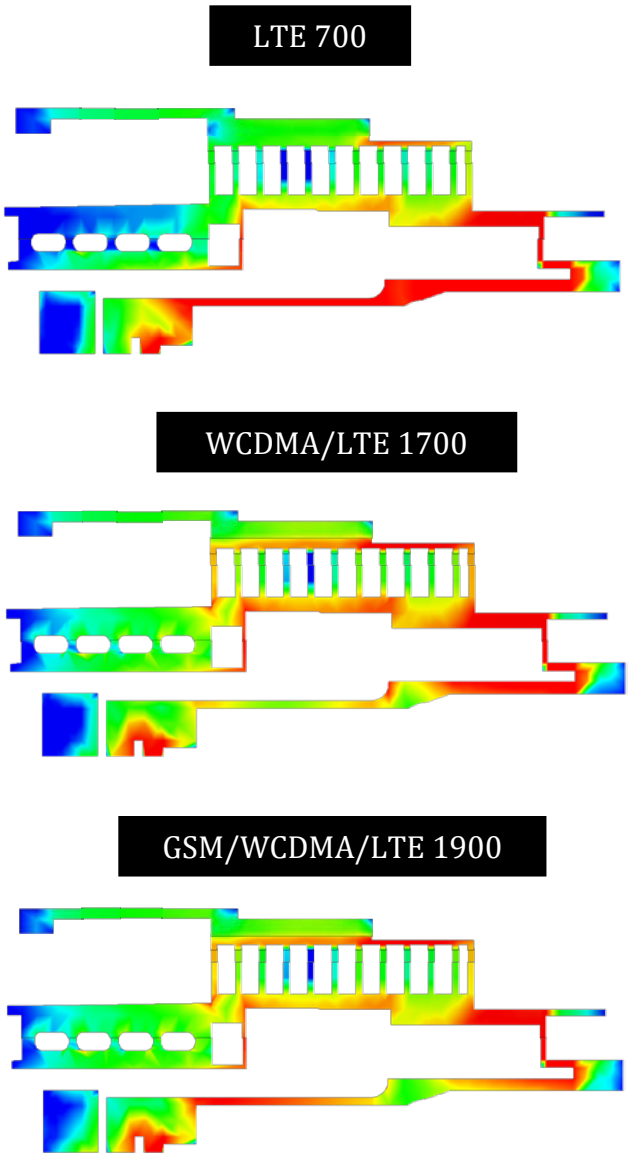
14. The above list is not exhaustive. Fractus's investigation of TCL's Infringing Products is ongoing, and the above list will expand as warranted to include additional Infringing Products with similarly designed antennas.

15. Each of the accused devices includes an internal, multiband antenna such as the one depicted below from the Alcatel REVVL.



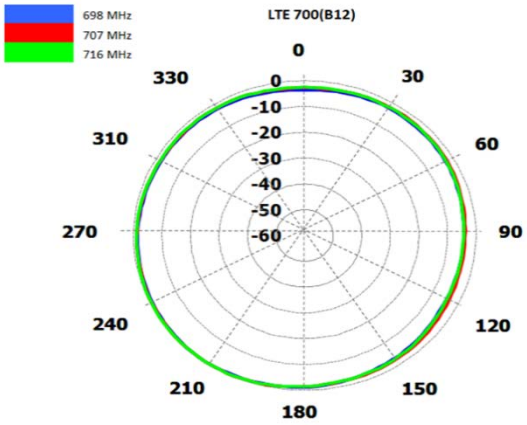
16. The antennas in the Infringing Products are not fractal, but are made up of multiple levels of detail. The overall shape of the antenna is one level of detail. The overall shape is made up of another level of detail consisting of smaller electromagnetically connected elements of different sizes. As can be seen in the image above, the majority of the individual elements remain identifiable because at least 50 percent of their perimeters remain free (depicted by the green overlaid lines). These electromagnetically connected elements form different paths or regions on which the currents associated with the multiple frequency bands flow while the antenna is operating. On information and belief, the associated currents flow in different regions of the antenna depending on the frequency band at which the antenna is operating, although there will always be some regions in common among the different frequency bands. Rather than having a separate antenna for each frequency band of operation, the antennas in the Infringing Products obtain multiband performance by reusing the same antenna regions across their multiple bands of operation. The simulation figures below show the active regions of the Alcatel REVVL antenna at three of its operational frequencies, 700 MHz, 1700 MHz, and 1900 MHz, with blue

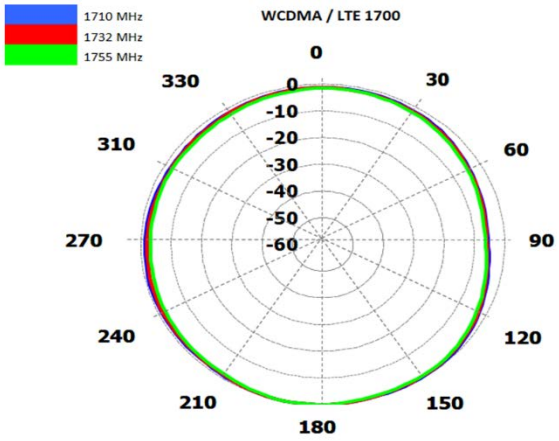
colors indicating inactive regions. As can be seen, all three frequencies reuse some of the same portions of the antenna during operation.

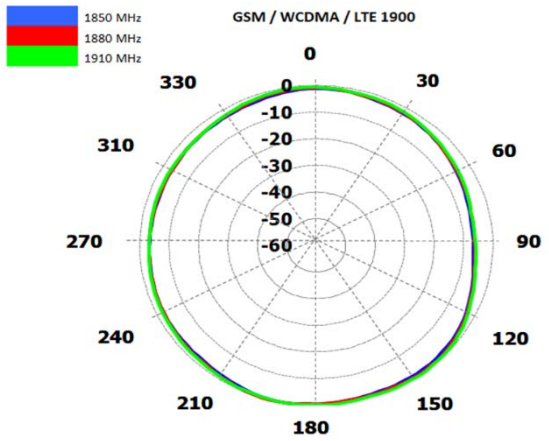


17. On information and belief, the radioelectric performance of the antennas is similar between the multiple frequency bands of operation. Cell phone antennas require omnidirectional radiation patterns to ensure proper operation regardless of the orientation of the cell phone in relation to the cell tower. Additionally, on information and belief, the impedance levels of the antennas must fall within certain ranges (typically measured using

a standing wave ratio (SWR) of 4.0 or less) to ensure sufficient transmitting power and adequate battery life for the cell phone. The measured radiation patterns for the Alcatel REVVL antenna at three of its operational frequency bands are shown below. As can be seen, they are substantially similar and omnidirectional.

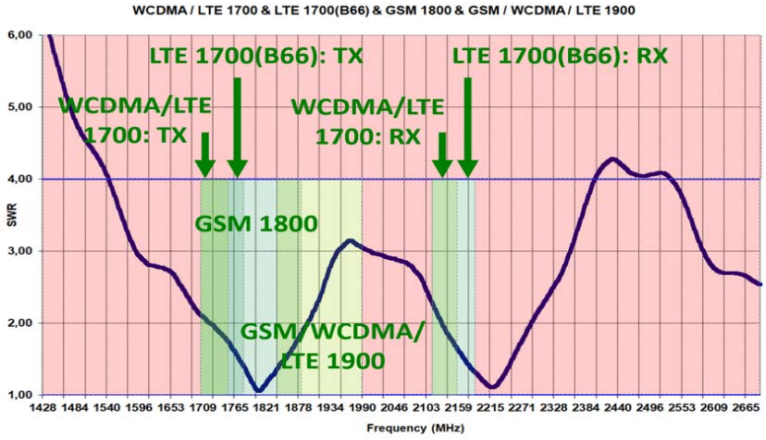


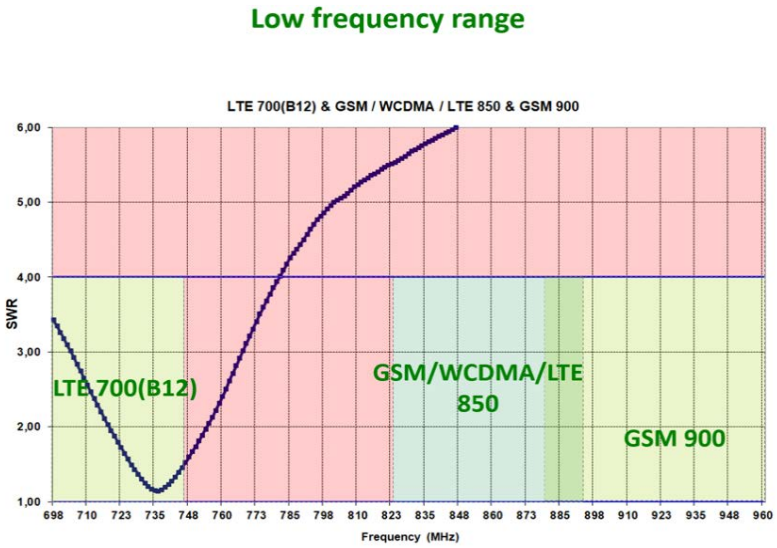




The measured SWR for the Alcatel REVVL antenna is also shown below and is substantially similar across the operational frequency bands.

High frequency range





Notice & Willfulness

18. Fractus first noticed TCL via two letters in November of 2015. The letters informed TCL that Fractus believed that TCL was infringing its patents. The letters provided a complete list of Fractus's patent portfolio, and specifically identified certain TCL products and Fractus patents that those products were infringing as examples, including several of the Patents-in-Suit. One letter was sent on November 3, 2015, to Mr. Qiulin Luo, the Director, IP Center, TCL Corp., and the other letter was sent on November 20, 2015, to Mr. Stephen Chiang, VP and General Counsel, TCL Corp.

19. More specifically, the letters identified particular claims for particular patents and then identified particular TCL phones that Fractus asserted infringed on those claims. The letters also noted that similar TCL phones also likely infringed Fractus's patents. They further described how Fractus's patents covered antenna technology for wireless devices, stated that the technology was ubiquitously employed by cell phone manufacturers like TCL, and provided a list of other companies to whom Fractus had licensed its antenna patents. Furthermore, Fractus requested a meeting with TCL to discuss a patent licensing agreement.

20. Fractus called several TCL employees over a period of months regarding these letters, but all of them refused to help and none were willing to provide any kind of contact information. Fractus spoke with Mr. Luo, the addressee of the first letter, but he refused to even admit whether he had received Fractus's initial letter. Other employees were similarly unwilling to provide even basic information. For example, TCL would not disclose which of its managing people had received the letters, even though lower level employees admitted to receipt of the letters. Nor would any of the secretarial, intellectual property, or legal contacts at TCL that Fractus spoke with provided Fractus any additional points of contact or information to enable Fractus to enter into substantive discussions with TCL.

21. Fractus followed up on these initial letters in February 2016 by sending a letter to Mr. Aiping Guo, CEO, TCL Communication Technology Holding Ltd., again proposing to discuss TCL's infringing activities and opportunities for TCL to license Fractus's technology. Fractus sent yet another letter to Mr. Guo in April 2018, informing TCL of its continuous infringement and again identifying examples of TCL phones that infringed the Patents-in-Suit. Though Fractus received delivery confirmation that TCL had received these letters, TCL made no attempt to contact Fractus to discuss infringement or licensing.

22. After being informed of its infringing activities, upon information and belief TCL did not make any attempt to design around the patents or procure non-infringing alternatives. Upon information and belief TCL did not obtain any opinion of counsel that it was not infringing Fractus's patents. If TCL did obtain such an opinion, it was never shared with Fractus. Upon information and belief, prior to this lawsuit TCL never disputed the validity of the Patents-in-Suit; in particular, TCL never communicated any allegedly

invalidating prior art to Fractus nor did it attempt to bring any post-grant action at the United States Patent and Trademark Office.

23. Instead of duly obtaining authorization or a license to practice the Patents-in-Suit, TCL continued making, using, selling, offering for sale, and importing into the United States products that infringed the Patents-in-Suit.

24. TCL's conduct has demonstrated a continuing pattern of bad-faith actions to continue infringing the Patents-in-Suit despite being on notice that it was infringing TCL's patents by either reviewing Fractus's letters regarding infringement, concluding TCL needed a license, and yet proceeding to sell infringing products regardless of that determination or by failing to make a good faith effort to evaluate the Patents-in-Suit or even discuss the matter with Fractus and thus willfully blinding itself to the need to obtain a license to practice the Patents-in-Suit.

INFRINGEMENT OF U.S. PATENT NO. 7,394,432

25. On July 1, 2008, United States Patent No. 7,394,432 (the "'432 patent") was duly and legally issued for an invention entitled "Multilevel Antenna." The claims of the '432 patent were amended during an *ex parte* reexamination that was initiated by Samsung, and a Reexamination Certificate was issued for the claims in their current form on April 7, 2015. A true and correct copy of the '432 Patent and the reexamination certificate are attached as Exhibit 1.

26. The '432 Patent is valid, enforceable, and was duly issued in full compliance with Title 35 of the United States Code.

27. TCL has directly infringed and continues to infringe at least claim 6 of the '432 patent by its manufacture, use, sale, importation, and/or offer for sale of Infringing Products, including but not limited to certain mobile phones with internal antennas such as those

described above in paragraphs 13-17.

28. As detailed below, the Infringing Products meet every element of Claim 6 of the '432 Patent literally or under the doctrine of equivalents.[1] Further, the identified components and functionality are representative of the components and functionality present in all Infringing Products.

29. The first element of Claim 1 of the '432 Patent, from which Claim 6 depends, recites a "multi-band antenna comprising a conductive radiating element including at least one multilevel structure, said at least one multilevel structure comprising a plurality of electromagnetically coupled geometric elements." One such Infringing Product, the Alcatel REVVL, has a multi-band internal antenna comprising a conductive radiating element that includes a multilevel structure comprising a plurality of coupled geometric elements.

30. The next element of Claim 1 of the '432 Patent recites that "said plurality of geometric elements includes at least three portions, a first portion being associated with a first selected frequency band, a second portion being associated with a second selected frequency band, and a third portion being associated with a third selected frequency band." The Alcatel REVVL has first, second, and third portions included within the plurality of geometric elements. The first portion is associated with the GSM/WCDMA/LTE 1900 band, the second portion is associated with the LTE 700(B12) band, and the third portion is associated with WCDMA/LTE 1700 band.

31. The next element of Claim 1 of the '432 Patent recites that "said second and third portions are located substantially within the first portion." In the Alcatel REVVL, the second and

[1] This description is illustrative and is not intended to be an exhaustive or limiting explanation of every manner in which each Infringing Product infringes the '432 Patent.

third portions are substantially located within the first portion.

32. The next element of Claim 1 of the ’432 Patent recites that “said first, second and third portions define empty spaces in an overall structure of the conductive radiating element.” In the Alcatel REVVL, the empty spaces are defined by the first, second and third portions in the overall structure of the conducting radiating element.

33. The next element of Claim 1 of the ’432 Patent recites that “to provide a circuitous current path within the first portion, within the second portion and within the third portion.” In the Alcatel REVVL, a circuitous current path is provided within GSM/WCDMA/LTE 1900, within LTE 700(B12), and within WCDMA/LTE 1700 defined by empty spaces.

34. The next element of Claim 1 of the ’432 Patent recites that “and the current within said first portion providing said first selected frequency band with radio electric behavior substantially similar to the radio electric behavior of said second and third selected frequency bands, the current within the second portion providing said second selected frequency band with radio electric behavior substantially similar to the radio electric behavior of said first and third selected frequency bands, and the current within the third portion providing said third selected frequency band with radio electric behavior substantially similar to the radio electric behavior of said first and second selected frequency bands.” In the Alcatel REVVL, the first, second and third portions have substantially similar radio electric behavior. The measured VSWR of the Alcatel REVVL is 4 or less for much of the at least first, second and third portions. The radiation patterns in the at least first, second and third portions are substantially similar and substantially omnidirectional.

35. Claim 6 of the ’432 Patent, which depends from Claim 1, recites that “the multi-band

antenna as set forth in claim 1, wherein said antenna is included in a portable communications device." The Alcatel REVVL is a cellular phone, which is a portable communications device.

36. The next element of Claim 6 of the '432 Patent recites that "[wherein]: the first portion is a first level of structural detail comprising the overall structure and having a first geometry configured to operate at the first selected frequency band." In the Alcatel REVVL, the first portion has a first level of structural detail comprising the overall structure of the conductive radiating element, and has a first geometry configured to operate at GSM/WCDMA/LTE 1900. The first level of structural detail is the same as the overall structure of the conductive radiating element at the frequency bands of interest.

37. The next element of Claim 6 of the '432 Patent recites that "the second portion is a second level of structural detail within the first level of structural detail, the second portion being smaller than the first portion and having a second geometry configured to operate at the second selected frequency band." In the Alcatel REVVL, the second portion has a second level of structural detail, and has a second geometry configured to operate at LTE 700(B12). In the Alcatel REVVL, the second portion is smaller than and within the first portion.

38. The next element of Claim 6 of the '432 Patent recites that "and the perimeter of the multilevel structure has a different number of sides than each of the geometric elements that compose the multilevel structure." In the Alcatel REVVL, the perimeter of the radiating multilevel structure has a different number of sides than the geometric elements that compose it.

39. Defendants have knowledge of the '432 Patent and have also indirectly infringed at least

claim 6 of the ’432 Patent by active inducement under 35 U.S.C. § 271(b). Defendants have induced, caused, urged, encouraged, aided and abetted their direct and indirect customers to make, use, sell, offer for sale and/or import Infringing Products. Defendants have done so by acts including but not limited to selling Infringing Products to their customers; marketing Infringing Products; and providing instructions, technical support, and direct links to vendor websites (available via https://us.alcatelmobile.com/ and https://nasupport.alcatelmobile.com/hc/en-us/categories/115000433268-Phones, for instance) for the use of Infringing Products. Such conduct by Defendants was intended to and actually resulted in direct infringement, including the making, using, selling, offering for sale, and/or importation of Infringing Products in the United States.

40. The acts of infringement by Defendants have caused damage to Fractus, and Fractus is entitled to recover from Defendants the damages sustained by Fractus as a result of Defendants’ wrongful acts in an amount subject to proof at trial. The infringement of Fractus’s exclusive rights under the ’432 Patent by Defendants has damaged and will continue to damage Fractus, causing irreparable harm, for which there is no adequate remedy at law, unless enjoined by this Court.

INFRINGEMENT OF U.S. PATENT NO. 7,397,431

41. On July 8, 2008, United States Patent No. 7,397,431 (the “’431 patent”) was duly and legally issued for an invention entitled “Multilevel Antennae.” The claims of the ’431 patent were amended during an *ex parte* reexamination that was initiated by Samsung, and a Reexamination Certificate was issued for the claims in their current form on March 31, 2015. A true and correct copy of the ’431 Patent and the reexamination certificate are attached as Exhibit 2.

42. The ’431 Patent is valid, enforceable, and was duly issued in full compliance with Title 35

of the United States Code.

43. TCL has directly infringed and continues to infringe at least claim 14 of the '431 patent by its manufacture, use, sale, importation, and/or offer for sale of Infringing Products, including but not limited to certain mobile phones with internal antennas such as those described above in paragraphs 13-17.

44. As detailed below, the Infringing Products meet every element of Claim 14 of the '431 Patent literally or under the doctrine of equivalents.[2] Further, the identified components and functionality are representative of the components and functionality present in all Infringing Products.

45. The first element of Claim 1 of the '431 Patent, from which Claim 14 depends, recites "a multi-band antenna comprising a conductive radiating element including at least one multilevel structure, said at least one multilevel structure comprising a plurality of electromagnetically coupled geometric elements." The Alcatel REVVL has a multi-band internal antenna comprising a conductive radiating element that includes a multilevel structure comprising a plurality of coupled geometric elements.

46. The next element of Claim 1 of the '431 Patent recites "said plurality of geometric elements including at least two portions, a first portion being associated with a first selected frequency band and a second portion being associated with a second selected frequency band." The Alcatel REVVL has a first and a second portions included within the plurality of geometric elements. The first portion is associated with GSM/WCDMA/LTE 1900, and the second portion is associated with LTE 700(B12).

47. The next element of Claim 1 of the '431 Patent recites "said second portion being located

[2] This description is illustrative and is not intended to be an exhaustive or limiting explanation of every manner in which each Infringing Product infringes the '431 Patent.

substantially within the first portion." In the Alcatel REVVL, the second portion is substantially located within the first portion.

48. The next element of Claim 1 of the '431 Patent recites "said first and second portions defining empty spaces in an overall structure of the conductive radiating element to provide a circuitous current path within the first portion and within the second portion." In the Alcatel REVVL, the empty spaces are defined by the first and second portions in the overall structure of the conducting radiating element to provide a circuitous current path within GSM/WCDMA/LTE 1900, and within LTE 700(B12).

49. The next element of Claim 1 of the '431 Patent recites "and the current within said first portion providing said first selected frequency band with radio electric behavior substantially similar to the radio electric behavior of said second selected frequency band and the current within the second portion providing said second selected frequency band with radio electric behavior substantially similar to the radio electric behavior of said first selected frequency band." In the Alcatel REVVL the first and second portions have substantially similar radio electric behavior. The measured VSWR is 4 or less for much of the at least first and second portions. The radiation patterns in the at least first and second portions are substantially similar and substantially omnidirectional.

50. Claim 12 of the '431 Patent, from which Claim 14 depends, recites "the multi-band antenna set forth in claim 1, wherein said antenna is included in a portable communications device." The Alcatel REVVL is a cellular phone, which is a portable communications device.

51. Claim 13 of the '431 Patent, from which Claim 14 depends, recites "the multi-band antenna set forth in claim 12, wherein said portable communication device is a handset."

The Alcatel REVVL is a cellular phone, which is a handset.

52. Claim 14 of the ’431 Patent recites “the multi-band antenna set forth in claim 13, wherein said antenna operates at multiple frequency bands, and wherein at least one of said frequency bands is operating within the 800 MHz-3600 MHz frequency range.” The Alcatel REVVL operates at multiple frequency bands, as shown in the table below, and at least one is within the 800 MHz – 3600 MHz frequency range.

System	Uplink (MHz) (used to send information from mobile station to base station)	Uplink Center Freq. (MHz)	Downlink (MHz) (used to send information from base station to mobile station)	Downlink Center Freq. (MHz)
LTE-700 (B12)	698 – 716	707	728 – 746	737
GSM/WCDMA/LTE-850 (B5)	824 – 849	836	869 – 894	881
GSM-900 (B8)	880 – 915	897	925 – 960	942
WCDMA/LTE-1700 (B4)	1710 – 1755	1732	2110 – 2155	2132
LTE-1700 (B66)	1710 – 1780	1745	2110 – 2200	2155
GSM-1800 (B3)	1710 – 1785	1747	1805 – 1880	1842
GSM/WCDMA/LTE-1900 (B2)	1850 – 1910	1880	1930 – 1990	1960

53. The next element of Claim 14 of the ’431 Patent recites “[wherein:] the first portion is a first level of structural detail comprising the overall structure and having a first geometry configured to operate at the first selected frequency band.” In the Alcatel REVVL, the first portion has a first level of structural detail comprising the overall structure of the conductive radiating element, and has a first geometry configured to operate at GSM/WCDMA/LTE 1900. The first level of structural detail is the same as the overall structure of the conductive radiating element at the frequency bands of interest.

54. The next element of Claim 14 of the ’431 Patent recites “the second portion is a second level of structural detail within the first level of structural detail, the second portion being smaller than the first portion and having a second geometry configured to operate at the second selected frequency band.” In the Alcatel REVVL, the second portion has a second level of structural detail, and has a second geometry configured to operate at LTE

700(B12). In the Alcatel REVVL, the second portion is smaller than and within the first portion.

55. The next element of Claim 14 of the ’431 Patent recites “the perimeter of the multilevel structure has a different number of sides than each of the geometric elements that compose the multilevel structure.” In the Alcatel REVVL, the perimeter of the radiating multilevel structure has a different number of sides than the geometric elements that compose it.

56. Defendants have knowledge of the ’431 Patent and indirectly infringe at least claim 14 of the ’431 Patent by active inducement under 35 U.S.C. § 271(b). Defendants have induced, caused, urged, encouraged, aided and abetted their direct and indirect customers to make, use, sell, offer for sale and/or import Infringing Products. Defendants have done so by acts including but not limited to selling Infringing Products to their customers; marketing Infringing Products; and providing instructions, technical support, and direct links to vendor websites (available via https://us.alcatelmobile.com/ and https://nasupport.alcatelmobile.com/hc/en-us/categories/115000433268-Phones, for instance) for the use of Infringing Products. Such conduct by Defendants was intended to and actually resulted in direct infringement, including the making, using, selling, offering for sale, and/or importation of Infringing Products in the United States.

57. The acts of infringement by Defendants have caused damage to Fractus, and Fractus is entitled to recover from Defendants the damages sustained by Fractus as a result of Defendants’ wrongful acts in an amount subject to proof at trial. The infringement of Fractus’s exclusive rights under the ’431 Patent by Defendants has damaged and will continue to damage Fractus, causing irreparable harm, for which there is no adequate remedy at law, unless enjoined by this Court.

INFRINGEMENT OF U.S. PATENT NO. 8,941,541

58. On January 27, 2015, United States Patent No. 8,941,541 (the "'541 patent") was duly and legally issued for an invention entitled "Multilevel Antennae." A true and correct copy of the '541 Patent is attached as Exhibit 3.

59. The '541 Patent is valid, enforceable, and was duly issued in full compliance with Title 35 of the United States Code.

60. TCL has directly infringed and continues to infringe at least claim 17 of the '541 patent by its manufacture, use, sale, importation, and/or offer for sale of Infringing Products, including but not limited to certain mobile phones with internal antennas such as those described above in paragraphs 13-17.

61. As detailed below, the Infringing Products meet every element of Claim 17 of the '541 Patent literally or under the doctrine of equivalents.[3] Further, the identified components and functionality are representative of the components and functionality present in all Infringing Products.

62. The first element of Claim 17 of the '541 Patent recites "a multi-band antenna comprising a ground plane, and a conductive radiating element electrically coupled to the ground plane." The Alcatel REVVL has a multi-band internal antenna with a conductive radiating element electrically coupled to the ground plane.

63. The next element of Claim 17 of the '541 Patent recites "including at least one multilevel structure, said at least one multilevel structure comprising a plurality of electromagnetically coupled geometric elements." The multi-band antenna of the Alcatel REVVL includes a multilevel structure comprising a plurality of coupled geometric

[3] This description is illustrative and is not intended to be an exhaustive or limiting explanation of every manner in which each Infringing Product infringes the '431 Patent.

elements.

64. The next element of Claim 17 of the ’541 Patent recites “wherein a perimeter of the multilevel structure has more than five sides.” The perimeter of the radiating multilevel structure of the Alcatel REVVL has more than five sides.

65. The next element of Claim 17 of the ’541 Patent recites “said plurality of geometric elements including at least three portions, a first portion being associated with a first selected frequency band, a second portion being associated with a second selected frequency band, and a third portion being associated with a third selected frequency band.” The Alcatel REVVL has a first, second, and third portions included within the plurality of geometric elements. The first portion is associated with GSM/WCDMA/LTE 1900, the second portion is associated with LTE 700(B12), and the third portion is associated with WCDMA/LTE 1700.

66. The next element of Claim 17 of the ’541 Patent recites “at least substantial parts of said second and third portions being part of the first portion.” In the Alcatel REVVL, substantial parts of the second portion and the third portion are part of the first portion.

67. The next element of Claim 17 of the ’541 Patent recites “said first, second and third portions defining empty spaces in an overall structure of the conductive radiating element.” In the Alcatel REVVL, the empty spaces are defined by the first, second and third portions in the overall structure of the conducting radiating element.

68. The next element of Claim 17 of the ’541 Patent recites “to provide respective circuitous current paths within the first portion, within the second portion and within the third portion, a plurality of the circuitous current paths overlapping within a plurality of the geometric elements.” In the Alcatel REVVL, circuitous current paths are provided within

GSM/WCDMA/LTE 1900, within LTE 700(B12), and within WCDMA/LTE 1700 defined by the empty spaces. The plurality of geometric elements overlaps the plurality of circuitous current paths.

69. The next element of Claim 17 of the '541 Patent recites that "and the current within said first portion providing said first selected frequency band with radio electric behavior substantially similar to the radio electric behavior of said second and third selected frequency bands, the current within the second portion providing said second selected frequency band with radio electric behavior substantially similar to the radio electric behavior of said first and third selected frequency bands, and the current within the third portion providing said third selected frequency band with radio electric behavior substantially similar to the radio electric behavior of said first and second selected frequency bands." In the Alcatel REVVL, the first, second and third portions have substantially similar radio electric behavior. The measured VSWR is 4 or less for much of the at least first, second and third portions. The radiation patterns in the at least first, second and third portions are substantially similar and substantially omnidirectional.

70. The next element of Claim 17 of the '541 Patent recites "wherein the multiband antenna is an internal antenna concealed within a portable communications device." In the Alcatel REVVL, the multi-band internal antenna is concealed within a cellular phone, which is a portable communications device.

71. Defendants have knowledge of the '541 Patent and indirectly infringe at least claim 17 of the '541 Patent by active inducement under 35 U.S.C. § 271(b). Defendants have induced, caused, urged, encouraged, aided and abetted their direct and indirect customers to make, use, sell, offer for sale and/or import Infringing Products. Defendants have done so by acts

including but not limited to selling Infringing Products to their customers; marketing Infringing Products; and providing instructions, technical support, and direct links to vendor websites (available via https://us.alcatelmobile.com/ and https://nasupport.alcatelmobile.com/hc/en-us/categories/115000433268-Phones, for instance) for the use of Infringing Products. Such conduct by Defendants was intended to and actually resulted in direct infringement, including the making, using, selling, offering for sale, and/or importation of Infringing Products in the United States.

72. The acts of infringement by Defendants have caused damage to Fractus, and Fractus is entitled to recover from Defendants the damages sustained by Fractus as a result of Defendants' wrongful acts in an amount subject to proof at trial. The infringement of Fractus's exclusive rights under the '541 Patent by Defendants has damaged and will continue to damage Fractus, causing irreparable harm, for which there is no adequate remedy at law, unless enjoined by this Court.

INFRINGEMENT OF U.S. PATENT NO. 8,976,069

73. On March 10, 2015, United States Patent No. 8,976,069 (the "'069 patent") was duly and legally issued for an invention entitled "Multilevel Antennae." A true and correct copy of the '069 Patent is attached as Exhibit 4.

74. The '069 Patent is valid, enforceable, and was duly issued in full compliance with Title 35 of the United States Code.

75. TCL has directly infringed and continues to infringe at least claim 32 of the '069 patent by its manufacture, use, sale, importation, and/or offer for sale of Infringing Products, including but not limited to certain mobile phones with internal antennas such as those described above in paragraphs 13-17.

76. As detailed below, the Infringing Products meet every element of Claim 32 of the '069

Patent literally or under the doctrine of equivalents[4]. Further, the identified components and functionality are representative of the components and functionality present in all Infringing Products.

77. The first element of Claim 32 of the '069 Patent recites "an apparatus comprising an internal antenna element having a multi-band behavior, the antenna element being concealed within a portable communication device and configured to operate in at least three frequency bands." The Alcatel REVVL has a multi-band internal antenna concealed within a cellular phone, which is a portable communications device, and operates at GSM 850/900/1800/1900, WCDMA 850/1700/1900 and LTE 700(B12)/850/1700/1700(B66)/1900.

78. The next element of Claim 32 of the '069 Patent recites "the antenna element comprising a plurality of geometric elements arranged to provide at least three winding current paths that circumvent empty spaces in the antenna element, the at least three winding current paths respectively corresponding to the at least three frequency bands to provide the antenna element with the multi-band behavior." In the Alcatel REVVL, the antenna element comprises a plurality of geometric elements providing at least three winding current paths for LTE 700(B12), WCDMA/LTE 1700 and GSM/WCDMA/LTE 1900 that circumvent the empty spaces.

79. The next element of Claim 32 of the '069 Patent recites "wherein portions of the at least three winding current paths extend along a plurality of common geometric elements." The Alcatel REVVL has portions of the at least three winding current paths that extend along a plurality of common geometric elements.

[4] This description is illustrative and is not intended to be an exhaustive or limiting explanation of every manner in which each Infringing Product infringes the '069 Patent.

80. The next element of Claim 32 of the ’069 Patent recites “and a ground plane, the antenna element being electrically coupled to the ground plane.” In the Alcatel REVVL, the antenna element is electrically coupled to the ground plane.

81. The next element of Claim 32 of the ’069 Patent recites “wherein the geometric elements are arranged such that the antenna element does not comprise substantially non-overlapping portions that serve as respective single band antennas.” In the Alcatel REVVL, the antenna element does not comprise substantially non-overlapping portions that serve as respective single band antennas. The majority of the geometric elements contribute to the operation in the at least three frequency bands.

82. Defendants have knowledge of the ’069 Patent and indirectly infringe at least claim 32 of the ’069 Patent by active inducement under 35 U.S.C. § 271(b). Defendants have induced, caused, urged, encouraged, aided and abetted their direct and indirect customers to make, use, sell, offer for sale and/or import Infringing Products. Defendants have done so by acts including but not limited to selling Infringing Products to their customers; marketing Infringing Products; and providing instructions, technical support, and direct links to vendor websites (available via https://us.alcatelmobile.com/ and https://nasupport.alcatelmobile.com/hc/en-us/categories/115000433268-Phones, for instance) for the use of Infringing Products. Such conduct by Defendants was intended to and actually resulted in direct infringement, including the making, using, selling, offering for sale, and/or importation of Infringing Products in the United States.

83. The acts of infringement by Defendants have caused damage to Fractus, and Fractus is entitled to recover from Defendants the damages sustained by Fractus as a result of Defendants’ wrongful acts in an amount subject to proof at trial. The infringement of

Fractus's exclusive rights under the '069 Patent by Defendants has damaged and will continue to damage Fractus, causing irreparable harm, for which there is no adequate remedy at law, unless enjoined by this Court.

INFRINGEMENT OF U.S. PATENT NO. 9,054,421

84. On June 9, 2015, United States Patent No. 9,054,421 (the "'421 patent") was duly and legally issued for an invention entitled "Multilevel Antennae." A true and correct copy of the '421 Patent is attached as Exhibit 5.

85. The '421 Patent is valid, enforceable, and was duly issued in full compliance with Title 35 of the United States Code.

86. TCL has directly infringed and continues to infringe at least claim 1 of the '421 patent by its manufacture, use, sale, importation, and/or offer for sale of Infringing Products, including but not limited to certain mobile phones with internal antennas such as those described above in paragraphs 13-17.

87. As detailed below, the Infringing Products meet every element of Claim 1 of the '421 Patent literally or under the doctrine of equivalents[5]. Further, the identified components and functionality are representative of the components and functionality present in all Infringing Products.

88. The first element of Claim 1 of the '421 Patent recites "an apparatus comprising an antenna element having a multi-band behavior and configured to operate in at least first and second non-overlapping frequency bands." The Alcatel REVVL has a multi-band internal antenna that operates at GSM 850/900/1800/1900, WCDMA 850/1700/1900 and LTE 700(B12)/850/1700/1700(B66)/1900, where at least 2 of those frequency bands are

[5] This description is illustrative and is not intended to be an exhaustive or limiting explanation of every manner in which each Infringing Product infringes the '421 Patent.

non-overlapping frequency bands.

89. The next element of Claim 1 of the ’421 Patent recites “and comprising a plurality of geometric elements arranged to define empty spaces in the antenna element to provide at least first and second winding current paths through the antenna element, the at least first and second winding current paths circumventing the empty spaces and respectively corresponding to the at least first and second non-overlapping frequency bands to provide the antenna element with the multi-band behavior.” In the Alcatel REVVL, the antenna element comprises a plurality of geometric elements providing at least a first and a second winding current paths for the non-overlapping bands LTE 700(B12) and GSM/WCDMA/LTE 1900 that circumvent the empty spaces.

90. The next element of Claim 1 of the ’421 Patent recites “and a ground plane, the antenna element being electrically coupled to the ground plane.” In the Alcatel REVVL, the antenna element is electrically coupled to the ground plane.

91. The next element of Claim 1 of the ’421 Patent recites “wherein the antenna element provides a substantially similar impedance level and radiation pattern in the at least first and second non-overlapping frequency bands.” In the Alcatel REVVL, the at least first and second non-overlapping frequency bands have substantially similar impedance level and radiation patterns.. The measured VSWR is 4 or less for much of the at least first and second non-overlapping frequency bands. In the Alcatel REVVL, the radiation patterns in the at least first and second non-overlapping frequency bands are substantially similar and substantially omnidirectional.

92. The next element of Claim 1 of the ’421 Patent recites “wherein the geometric elements are arranged such that the antenna element does not comprise a group of single band

antennas that respectively operate in the at least first and second non-overlapping frequency bands." In the Alcatel REVVL, the antenna element does not comprise substantially non-overlapping portions that serves as respective single band antennas. The majority of the geometric elements provide operation in the at least two non-overlapping frequency bands.

93. The next element of Claim 1 of the '421 Patent recites "wherein the antenna element is not a fractal type antenna element." In the Alcatel REVVL, the antenna element is not fractal, that is, it is not an antenna with a self-similar shape generated in an iterative manner on different scaling levels.

94. Defendants have knowledge of the '421 Patent and indirectly infringe at least claim 1 of the '421 Patent by active inducement under 35 U.S.C. § 271(b). Defendants have induced, caused, urged, encouraged, aided and abetted their direct and indirect customers to make, use, sell, offer for sale and/or import Infringing Products. Defendants have done so by acts including but not limited to selling Infringing Products to their customers; marketing Infringing Products; and providing instructions, technical support, and direct links to vendor websites (available via https://us.alcatelmobile.com/ and https://nasupport.alcatelmobile.com/hc/en-us/categories/115000433268-Phones, for instance) for the use of Infringing Products. Such conduct by Defendants was intended to and actually resulted in direct infringement, including the making, using, selling, offering for sale, and/or importation of Infringing Products in the United States.

95. The acts of infringement by Defendants have caused damage to Fractus, and Fractus is entitled to recover from Defendants the damages sustained by Fractus as a result of Defendants' wrongful acts in an amount subject to proof at trial. The infringement of Fractus's exclusive rights under the '421 Patent by Defendants has damaged and will continue to damage Fractus, causing irreparable harm, for which there is no adequate remedy at law, unless enjoined by this Court.

INFRINGEMENT OF U.S. PATENT NO. 9,240,632

96. On January 19, 2016, United States Patent No. 9,240,632 (the "'632 patent") was duly and legally issued for an invention entitled "Multilevel Antennae." A true and correct copy of the '632 Patent is attached as Exhibit 6.

97. The '632 Patent is valid, enforceable, and was duly issued in full compliance with Title 35 of the United States Code.

98. TCL has directly infringed and continues to infringe at least claim 17 of the '632 patent by its manufacture, use, sale, importation, and/or offer for sale of Infringing Products, including but not limited to certain mobile phones with internal antennas such as those described above in paragraphs 13-17.

99. As detailed below, the Infringing Products meet every element of Claim 17 of the '632 Patent literally or under the doctrine of equivalents[6]. Further, the identified components and functionality are representative of the components and functionality present in all Infringing Products.

100. The first element of Claim 17 of the '632 Patent recites "a multi-band antenna including at least one structure for the multi-band antenna useable at least three ranges of

[6] This description is illustrative and is not intended to be an exhaustive or limiting explanation of every manner in which each Infringing Product infringes the '632 Patent.

frequencies, each of the at least three ranges of frequencies extending between two limiting frequencies, the at least one structure being included in a portable communication device." The Alcatel REVVL has a multi-band internal antenna. At least one structure in the Alcatel REVVL is usable at GSM 850/900/1800/1900, WCDMA 850/1700/1900 and LTE 700(B12)/850/1700/1700(B66)/1900. The structure is included in a cellular phone, which is a portable communications device. Each range of frequency extends between two limiting frequencies, as shown below.

System	Uplink (MHz) (used to send information from mobile station to base station)	Uplink Center Freq. (MHz)	Downlink (MHz) (used to send information from base station to mobile station)	Downlink Center Freq. (MHz)
LTE-700 (B12)	698 – 716	707	728 – 746	737
GSM/WCDMA/LTE-850 (B5)	824 – 849	836	869 – 894	881
GSM-900 (B8)	880 – 915	897	925 – 960	942
WCDMA/LTE-1700 (B4)	1710 – 1755	1732	2110 – 2155	2132
LTE-1700 (B66)	1710 – 1780	1745	2110 – 2200	2155
GSM-1800 (B3)	1710 – 1785	1747	1805 – 1880	1842
GSM/WCDMA/LTE-1900 (B2)	1850 – 1910	1880	1930 – 1990	1960

101. The next element of Claim 1 of the '632 Patent recites "including at least two levels of detail, wherein one level of detail makes up another level of detail, the at least one structure including at least one antenna region comprising a set of closed figures bounded by the same number of sides, the sides comprising one or more of straight lines, portions of circles and portions of ellipses." The Alcatel REVVL has a structure that includes at least two levels of detail: one level of detail constitutes the entire antenna, and the other level of detail formed by closed figures. In the Alcatel REVVL, the structure comprises 29 quadrilaterals.

102. The next element of Claim 1 of the '632 Patent recites "the at least one structure including at least three portions, a first portion having a first geometry configured to operate at a range of frequencies of the three ranges of frequencies, a second portion

located substantially within the first portion and having a second geometry configured to operate at a range of frequencies of the three ranges of frequencies, and a third portion located substantially within the first portion and having a third geometry configured to operate at a range of frequencies of the three ranges of frequencies." The Alcatel REVVL has first, second and third portions that are included within the structure. The first portion has a first geometry that operates at GSM/WCDMA/LTE 1900, the second portion has a second geometry that operates at LTE 700(B12), and the third portion has a third geometry that operates at WCDMA/LTE 1700. The second and third portions are located substantially within the first portion.

103. The next element of Claim 1 of the '632 Patent recites "the second and third portions substantially overlap with the first portion." In the Alcatel REVVL, there is overlap between second and third portions with the first portion.

104. The next element of Claim 1 of the '632 Patent recites "wherein each of the closed figures in the antenna region is directly or proximately linked to at least one other of the closed figures such that electromagnetic power is exchanged between the closed figures in the antenna region either directly through at least one point of contact or through a small separation providing coupling, wherein for at least 75% of the closed figures, the region or area of contact between the closed figures is less than 50% of their perimeter or area, wherein not all of the closed figures have the same size." In the Alcatel REVVL, one closed figure is coupled to at least one other, and 22/29 (76%) of the closed figures have more than 50% of perimeter free of contact. Further, not all of the closed figures have the same size.

105. The next element of Claim 1 of the '632 Patent recites "and the perimeter of the at

least one structure has a different number of sides than the closed figures that compose the antenna region, wherein each of a plurality of the closed figures of the antenna region is generally identifiable as a closed figure defined by a free perimeter thereof and a projection of ones of the longest exposed perimeters thereof to define the least number of closed figures within the region necessary to form the generally distinguishable closed figures where the closed figures perimeters are interconnected." In the Alcatel REVVL, the perimeter of the structure has a different number of sides than the closed figures that compose it. Closed figures are generally identifiable, and are defined by a free perimeter and a projection of ones of longest exposed perimeters to define the least number of closed figures.

106. The next element of Claim 1 of the '632 Patent recites "and wherein the multiband antenna is configured to operate at the at least three ranges of frequencies and wherein at least one of the at least three ranges of frequencies is within the 800 MHz-3600 MHz frequency range." The multiband internal antenna of the Alcatel REVVL operates at least at the three ranges of frequencies and at least one is within the 800 MHz – 3600 MHz frequency range, as shown below.

System	Uplink (MHz) (used to send information from mobile station to base station)	Uplink Center Freq. (MHz)	Downlink (MHz) (used to send information from base station to mobile station)	Downlink Center Freq. (MHz)
LTE-700 (B12)	698 – 716	707	728 – 746	737
GSM/WCDMA/LTE-850 (B5)	824 – 849	836	869 – 894	881
GSM-900 (B8)	880 – 915	897	925 – 960	942
WCDMA/LTE-1700 (B4)	1710 – 1755	1732	2110 – 2155	2132
LTE-1700 (B66)	1710 – 1780	1745	2110 – 2200	2155
GSM-1800 (B3)	1710 – 1785	1747	1805 – 1880	1842
GSM/WCDMA/LTE-1900 (B2)	1850 – 1910	1880	1930 – 1990	1960

107. Defendants have knowledge of the '632 Patent and indirectly infringe at least

claim 17 of the ’632 Patent by active inducement under 35 U.S.C. § 271(b). Defendants have induced, caused, urged, encouraged, aided and abetted their direct and indirect customers to make, use, sell, offer for sale and/or import Infringing Products. Defendants have done so by acts including but not limited to selling Infringing Products to their customers; marketing Infringing Products; and providing instructions, technical support, and direct links to vendor websites (available via https://us.alcatelmobile.com/ and https://nasupport.alcatelmobile.com/hc/en-us/categories/115000433268-Phones, for instance) for the use of Infringing Products. Such conduct by Defendants was intended to and actually resulted in direct infringement, including the making, using, selling, offering for sale, and/or importation of Infringing Products in the United States.

108. The acts of infringement by Defendants have caused damage to Fractus, and Fractus is entitled to recover from Defendants the damages sustained by Fractus as a result of Defendants’ wrongful acts in an amount subject to proof at trial. The infringement of Fractus’s exclusive rights under the ’632 Patent by Defendants has damaged and will continue to damage Fractus, causing irreparable harm, for which there is no adequate remedy at law, unless enjoined by this Court.

INFRINGEMENT OF U.S. PATENT NO. 9,362,617

109. On June 7, 2016, United States Patent No. 9,362,617 (the “’617 patent”) was duly and legally issued for an invention entitled “Multilevel Antennae.” A true and correct copy of the ’617 Patent is attached as Exhibit 7.

110. The ’617 Patent is valid, enforceable, and was duly issued in full compliance with Title 35 of the United States Code.

111. TCL has directly infringed and continues to infringe at least claim 17 of the ’617 patent by its manufacture, use, sale, importation, and/or offer for sale of Infringing

Products, including but not limited to certain mobile phones with internal antennas such as those described above in paragraphs 13-17.

112. As detailed below, the Infringing Products meet every element of Claim 17 of the '617 Patent literally or under the doctrine of equivalents[7]. Further, the identified components and functionality are representative of the components and functionality present in all Infringing Products.

113. The first element of Claim 17 of the '617 Patent recites "a multi-band antenna including at least one structure for the multi-band antenna useable at at least three ranges of frequencies, each of the at least three ranges of frequencies extending between two limiting frequencies, the at least one structure being included in a wireless communication device in a monopole configuration." The Alcatel REVVL has a multi-band internal antenna with at least one structure that is usable at GSM 850/900/1800/1900, WCDMA 850/1700/1900 and LTE 700(B12)/850/1700/1700(B66)/1900. Each range of frequency extends between two limiting frequencies, as shown below.

System	Uplink (MHz) (used to send information from mobile station to base station)	Uplink Center Freq. (MHz)	Downlink (MHz) (used to send information from base station to mobile station)	Downlink Center Freq. (MHz)
LTE-700 (B12)	698 – 716	707	728 – 746	737
GSM/WCDMA/LTE-850 (B5)	824 – 849	836	869 – 894	881
GSM-900 (B8)	880 – 915	897	925 – 960	942
WCDMA/LTE-1700 (B4)	1710 – 1755	1732	2110 – 2155	2132
LTE-1700 (B66)	1710 – 1780	1745	2110 – 2200	2155
GSM-1800 (B3)	1710 – 1785	1747	1805 – 1880	1842
GSM/WCDMA/LTE-1900 (B2)	1850 – 1910	1880	1930 – 1990	1960

The structure of the Alcatel REVVL is included in a cellular phone, which is a wireless communication device.

[7] This description is illustrative and is not intended to be an exhaustive or limiting explanation of every manner in which each Infringing Product infringes the '617 Patent.

The antenna of Alcatel REVVL is in a monopole configuration, as it contains a radiating element and a ground plane, wherein a practical application, the ground plane is not infinite, and the antenna would produce a radiation pattern approximating that of an electric dipole in the half-space above the ground plane if the ground plane were infinite.

114. The next element of Claim 1 of the ’617 Patent recites “the at least one structure including at least three portions, a first portion having a first geometry configured to operate at a range of frequencies of the three ranges of frequencies, a second portion located substantially within the first portion and having a second geometry configured to operate at a range of frequencies of the three ranges of frequencies and a third portion located substantially within the first portion and having a third geometry configured to operate at a range of frequencies of the three ranges of frequencies.” The Alcatel REVVL has first, second and third portions that are included within the structure. The first portion has a first geometry that operates at GSM/WCDMA/LTE 1900, the second portion has a second geometry that operates at LTE 700(B12), and the third portion has a third geometry that operates at WCDMA/LTE 1700. The second and the third portions are located substantially within the first portion.

115. The next element of Claim 1 of the ’617 Patent recites that “the second and third portions substantially overlap with the first portion.” In the Alcatel REVVL, there is overlap between the second and third portions with the first portion.

116. The next element of Claim 1 of the ’617 Patent recites “the at least one structure includes a generally identifiable non-convex geometric element, wherein said non-convex geometric element comprises a plurality of convex geometric elements defining the first portion.” In the Alcatel REVVL, the antenna element includes a concave, *i.e.*, non-convex

geometric element. The non-convex element comprises a plurality of convex geometric elements and defines the first portion.

117. The next element of Claim 1 of the ’617 Patent recites “wherein said non-convex geometric element shapes the electric currents on the first portion.” In the Alcatel REVVL, the non-convex element shapes the electric currents on the GSM/WCDMA/LTE 1900.

118. The next element of Claim 1 of the ’617 Patent recites “while at least a subset of said plurality of convex geometric elements shapes the electric currents on the second portion.” In the Alcatel REVVL, at least a subset of the convex geometric elements shapes the electric currents on the LTE 700(B12).

119. The next element of Claim 1 of the ’617 Patent recites “wherein not all of the convex geometric elements have the same size and the perimeter of the at least one structure has a different number of sides than the convex geometric elements that compose the at least one structure.” In the Alcatel REVVL, not all of the convex geometric elements have the same size and the perimeter of the structure has a different number of sides than the convex geometric elements that compose it.

120. The next element of Claim 1 of the ’617 Patent recites “wherein the multiband antenna provides a substantially similar combined amount of resistance and reactance measured at an input/output connector and radiation pattern in the at least three ranges of frequencies.” In the Alcatel REVVL, the at least three ranges of frequencies have substantially similar combined amount of resistance and reactance and radiation pattern. The measured VSWR is 4 or less for much of the at least three ranges of frequencies. The radiation patterns in the at least three ranges of frequencies are substantially similar and

substantially omnidirectional.

121. The next element of Claim 1 of the ’617 Patent recites “wherein the multiband antenna is configured to operate at the at least three ranges of frequencies and wherein at least one of the at least three ranges of frequencies is within the 800 MHz-3600 MHz frequency range.” The multi-band internal antenna of the Alcatel REVVL operates at least at the three ranges of frequencies and at least one is within the 800 MHz – 3600 MHz frequency range, as shown below.

System	Uplink (MHz) (used to send information from mobile station to base station)	Uplink Center Freq. (MHz)	Downlink (MHz) (used to send information from base station to mobile station)	Downlink Center Freq. (MHz)
LTE-700 (B12)	698 – 716	707	728 – 746	737
GSM/WCDMA/LTE-850 (B5)	824 – 849	836	869 – 894	881
GSM-900 (B8)	880 – 915	897	925 – 960	942
WCDMA/LTE-1700 (B4)	1710 – 1755	1732	2110 – 2155	2132
LTE-1700 (B66)	1710 – 1780	1745	2110 – 2200	2155
GSM-1800 (B3)	1710 – 1785	1747	1805 – 1880	1842
GSM/WCDMA/LTE-1900 (B2)	1850 – 1910	1880	1930 – 1990	1960

122. Defendants have knowledge of the ’617 Patent and indirectly infringe at least claim 17 of the ’617 Patent by active inducement under 35 U.S.C. § 271(b). Defendants have induced, caused, urged, encouraged, aided and abetted their direct and indirect customers to make, use, sell, offer for sale and/or import Infringing Products. Defendants have done so by acts including but not limited to selling Infringing Products to their customers; marketing Infringing Products; and providing instructions, technical support, and direct links to vendor websites (available via https://us.alcatelmobile.com/ and https://nasupport.alcatelmobile.com/hc/en-us/categories/115000433268-Phones, for instance) for the use of Infringing Products. Such conduct by Defendants was intended to and actually resulted in direct infringement, including the making, using, selling, offering for sale, and/or importation of Infringing Products in the United States.

123. The acts of infringement by Defendants have caused damage to Fractus, and Fractus is entitled to recover from Defendants the damages sustained by Fractus as a result of Defendants' wrongful acts in an amount subject to proof at trial. The infringement of Fractus's exclusive rights under the '617 Patent by Defendants has damaged and will continue to damage Fractus, causing irreparable harm, for which there is no adequate remedy at law, unless enjoined by this Court.

PRAYER FOR RELIEF

WHEREFORE, Fractus prays for judgment against TCL as follows:

124. A judgment in favor of Fractus that Defendants have infringed and are infringing, either literally and/or under the doctrine of equivalents, the Patents-in-Suit;

125. An award of damages to Fractus arising out of Defendants' infringement of the Patents-in-Suit, and enhanced damages pursuant to 35 U.S.C. § 284, together with prejudgment and post-judgment interest, in an amount according to proof;

126. An award of attorneys' fees pursuant to 35 U.S.C. § 285 or as otherwise permitted by law; and

127. Granting Fractus its costs and further relief as the Court may deem just and proper.

DEMAND FOR JURY TRIAL

128. Pursuant to Federal Rule of Civil Procedure 38(b), Fractus hereby demands a trial by jury on all issues triable by jury.

Dated: June 23, 2021

Respectfully submitted,

By: */s/ Max L. Tribble*

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CERTIFICATE OF SERVICE

I hereby certify that counsel of record who are deemed to have consented to electronic service are being served this 23rd day of June 2021, with a copy of this document via electronic mail.

By: */s/ Adam Tisdall*
Adam Tisdall