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8 *Attorneys for Plaintiff ParkerVision, Inc.*

9 UNITED STATES DISTRICT COURT  
10 CENTRAL DISTRICT OF CALIFORNIA

11 PARKERVISION, INC., 12 Plaintiff, 13 v 14 TCL TECHNOLOGY GROUP CORP. 15 and TTE TECHNOLOGY, INC., 16 Defendants. 17	Case No.  <b>COMPLAINT FOR PATENT  INFRINGEMENT</b>  <b>JURY TRIAL DEMANDED</b>
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19 Plaintiff ParkerVision, Inc. (“ParkerVision”), by and through its undersigned  
20 counsel, files this Complaint against Defendants TCL Technology Group Corp.  
21 and TTE Technology, Inc. (collectively, “TCL”) for patent infringement of United  
22 States Patent Nos. 6,049,706; 6,266,518; 6,580,902; 7,110,444; 7,292,835;  
23 8,588,725; 8,660,513; 9,118,528; 9,246,736 and 9,444,673 (the “patents-in-suit”)  
24 (Exhibits 1-10) and alleges as follows:

25 **NATURE OF THE ACTION**

26 1. This is an action for patent infringement arising under the patent laws  
27 of the United States, 35 U.S.C. §§ 1 *et seq.*

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1 **PARTIES**

2 2. Plaintiff ParkerVision is a Florida corporation with its principal place  
3 of business at 9446 Philips Highway, Jacksonville, Florida 32256.

4 3. On information and belief, TCL Technology Group Corp. (f/k/a TCL  
5 Corporation) (“TCL Group”) is a foreign corporation duly organized under the  
6 laws of the People’s Republic of China with a principal place of business located at  
7 22/F, TCL Technology Bldg., No. 17, Huifeng 3rd Rd., Zhongkai Hi-Tech  
8 Development District, Huizhou, Guangdong, 516000 China. On information and  
9 belief, TCL Group is a parent of Defendant TTE Technology, Inc.

10 4. On information and belief, Defendant TTE Technology, Inc. (d/b/a  
11 TCL North America and TCL USA) (“TCL USA”) is a Delaware corporation with  
12 its principal place of business at 1860 Compton Avenue, Corona, California 92881.

13 5. On information and belief, Defendants act in concert to design,  
14 manufacture, sell, offer for sale, import, distribute, advertise, and/or otherwise  
15 promote the accused infringing products in the United States, the State of  
16 California, and this judicial district.

17 **JURISDICTION AND VENUE**

18 6. This Court has jurisdiction over the subject matter of this action  
19 pursuant to 28 U.S.C. §§ 1331 and 1338(a) because the action arises under the  
20 patent laws of the United States, 35 U.S.C. §§ 1 *et seq.*

21 7. TCL is subject to this Court’s personal jurisdiction in accordance  
22 with due process and/or the California Long-Arm Statute, California Code of Civil  
23 Procedure § 410.10.

24 8. This Court has personal jurisdiction over TCL because TCL has  
25 sufficient minimum contacts with this forum as a result of business conducted  
26 within the State of California and this judicial district. In particular, this Court has  
27 personal jurisdiction over TCL because, *inter alia*, TCL, on information and belief,  
28 has substantial, continuous, and systematic business contacts in this judicial

1 district, and derives substantial revenue from goods provided to individuals in this  
2 judicial district.

3 9. TCL has purposefully availed itself of the privileges of conducting  
4 business within this judicial district, has established sufficient minimum contacts  
5 with this judicial district such that it should reasonably and fairly anticipate being  
6 hauled into court in this judicial district, has purposefully directed activities at  
7 residents of this judicial district, and at least a portion of the patent infringement  
8 claims alleged in this Complaint arise out of or are related to one or more of the  
9 foregoing activities.

10 10. This Court has personal jurisdiction over TCL because TCL (directly  
11 and/or through its subsidiaries, affiliates, or intermediaries) has committed and  
12 continues to commit acts of infringement in this judicial district in violation of at  
13 least 35 U.S.C. § 271(a). In particular, on information and belief, TCL uses, sells,  
14 offers for sale, imports, advertises, and/or otherwise promotes infringing products  
15 in the United States, the State of California, and this judicial district.

16 11. Venue is proper in this judicial district under 28 U.S.C. §§ 1391(b) –  
17 (d) and/or 1400(b). TCL is registered to do business in the State of California,  
18 maintains a regular and established place of business within this judicial district,  
19 and has committed acts of infringement in this judicial district.

### 20 **BACKGROUND**

21 12. In 1989, Jeff Parker and David Sorrells started ParkerVision in  
22 Jacksonville, Florida. Through the mid-1990s, ParkerVision focused on developing  
23 commercial video cameras, e.g., for television broadcasts. The cameras used radio  
24 frequency (RF) technology to automatically track the camera's subject.

25 13. When developing consumer video cameras, however, ParkerVision,  
26 encountered a problem – the power and battery requirements for RF  
27 communications made a cost effective, consumer-sized product impractical. So,  
28 Mr. Sorrells and ParkerVision's engineering team began researching ways to solve

1 this problem.

2 14. At the time, a decade's-old RF technology called super-heterodyne  
3 dominated the consumer products industry. But this technology was not without its  
4 own problems – the circuitry was large and required significant power.

5 15. From 1995 through 1998, ParkerVision engineers developed an  
6 innovative method of RF direct conversion by a process of sampling a RF carrier  
7 signal and transferring energy to create a down-converted baseband signal.

8 16. After creating prototype chips and conducting tests, ParkerVision  
9 soon realized that its technology led to improved RF receiver performance, lower  
10 power consumption, reduced size and integration benefits. In other words, RF  
11 receivers could be built smaller, cheaper and with greater improved performance.

12 17. ParkerVision's innovations did not stop there. ParkerVision went on  
13 to develop additional RF down-conversion technologies, RF up-conversion  
14 technologies and other related direct-conversion technologies. ParkerVision also  
15 developed complementary wireless communications technologies that involved  
16 interactions, processes, and controls between the baseband processor and the  
17 transceiver, which improved and enhanced the operation of transceivers that  
18 incorporate ParkerVision's down-converter and up-converter technologies. To  
19 date, ParkerVision has been granted over 200 patents related to its innovations  
20 including, the patents-in-suit.

21 18. ParkerVision's technology helped make today's wireless devices,  
22 such as televisions, a reality by enabling RF chips used in these devices to be  
23 smaller, cheaper, and more efficient, and with higher performance.

24 **TCL**

25 19. TLC Group is a Chinese multinational electronics company  
26 headquartered in Huizhou, Guangdong Province, China. On information and belief,  
27 TCL USA is the United States subsidiary of TCL Group.

28 20. On information and belief, since 2014, TCL USA (or those acting on

1 its behalf) has made, used, sold, offered for sale and/or imported televisions (“TCL  
2 Products”) in/into the United States. [https://www.tclusa.com/about-us/press-](https://www.tclusa.com/about-us/press-releases/tcl-celebrates-five-years)  
3 [releases/tcl-celebrates-five-years](https://www.tclusa.com/about-us/press-releases/tcl-celebrates-five-years); <https://www.tclusa.com/products>.

4 21. TCL Products can be purchased through retailers throughout the  
5 United States including, without limitation, Best Buy, Target, Walmart, Costco, BJ  
6 Wholesale, B&H and PC Richards & Sons.

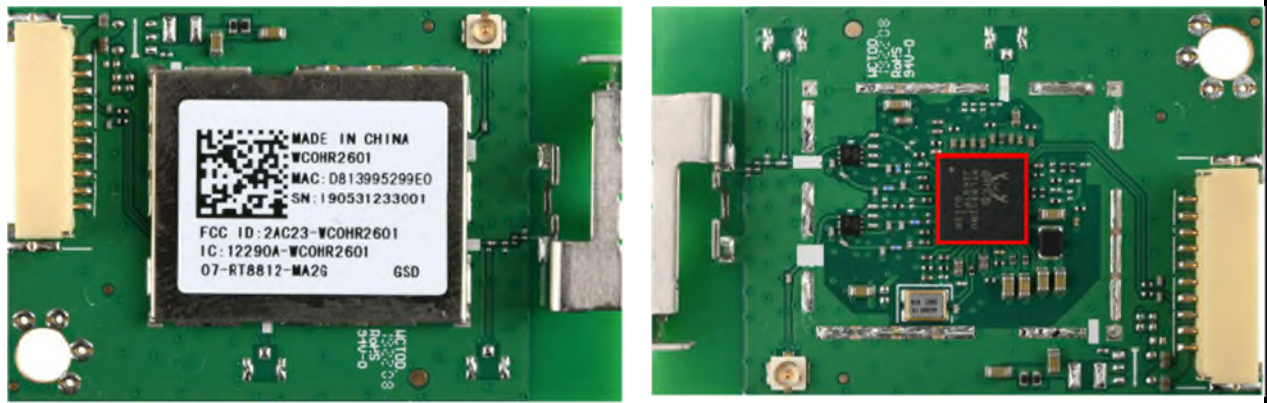
7 22. On information and belief, as of 2019, TCL was the second largest  
8 brand of smart televisions in the United States. [https://www.tclusa.com/about-](https://www.tclusa.com/about-us/press-releases/tcl-celebrates-five-years)  
9 [us/press-releases/tcl-celebrates-five-years](https://www.tclusa.com/about-us/press-releases/tcl-celebrates-five-years).

10 23. TCL Products include modules (e.g., WCOHR2601) containing Wi-Fi  
11 chips including, without limitation, Realtek RT8812BU (each a “TCL Chip”;  
12 collectively, the “TCL Chips”). TCL Chips provide wireless connectivity for TCL  
13 Products.

14 24. Below are images from a TCL television model no. 43S425 purchased  
15 from Best Buy.



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25. TCL Products include, without limitation, the televisions set forth below.

TV Model No.	FCC ID
65S427	W8U65S427
43S423	W8U43S423
55S426	W8U55S426
75Q825	W8U75Q825
65R625	W8U65R625

1	55S427	W8U55S427
2	55R625	W8U55R625
3	43S525	W8U43S525
4	65S525	W8U65S525
5	55S525	W8U55S525
6	55S423	W8U55S423
7	43S421	W8U43S421
8	50S525	W8U50S525
9	50S423	W8U50S423
10	65S423	W8U65S423
11	75S425	W8U75S425
12	75R615	W8U75R615
13	32S301	W8U32S301
14	55S421	W8U55S421
15	32S325	W8U32S325
16	49S325	W8U49S325
17	43S325	W8U43S325
18	40S325	W8U40S325
19	32S327	W8U32S327
20	32S425	W8U43S425
21	50S425	W8U50S425
22	49S425	W8U49S425
23	32S321	W8U32S321
24	65S425	W8U65S425
25	55S425	W8U55S425
26	49S403	W8U49S403
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1	65S401	W8U65S401
2	43S403	W8U43S403
3	55S401	W8U55S401
4	65S517	W8U65S517
5	55S517	W8U55S517
6	65R613	W8U65R613
7	55R613	W8U55R613
8	49S517	W8U49S517
9	43S517	W8U43S517
10	75C807	W8U75C807
11	49S303	W8U49S303
12	43S303	W8U43S303
13	40S303	W8U40S303
14	28S303	W8U28S303
15	32S303	W8U32S303
16	55C807	W8U55C807
17	65C807	W8U65C807
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**THE ASSERTED PATENTS**

**United States Patent No. 6,049,706**

26. On April 11, 2000, the United States Patent and Trademark Office duly and legally issued United States Patent No. 6,049,706 (“the ’706 patent”) entitled “Integrated Frequency Translation and Selectivity” to inventor Robert W. Cook et al. A true and correct copy of the ’706 patent is attached as Exhibit 1.

27. The ’706 patent is presumed valid under 35 U.S.C. § 282.

28. ParkerVision owns all rights, title, and interest in the ’706 patent.

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**United States Patent No. 6,266,518**

29. On July 24, 2001, the United States Patent and Trademark Office duly and legally issued United States Patent No. 6,266,518 (“the ’518 patent”) entitled “Method and System for Down-Converting Electromagnetic Signals by Sampling and Integrating Over Apertures” to inventor David F. Sorrells et al. A true and correct copy of the ’518 patent is attached as Exhibit 2.

30. The ’518 patent is presumed valid under 35 U.S.C. § 282.

31. ParkerVision owns all rights, title, and interest in the ’518 patent.

**United States Patent No. 6,580,902**

32. On June 17, 2003, the United States Patent and Trademark Office duly and legally issued United States Patent No. 6,580,902 (“the ’902 patent”) entitled “Frequency Translation Using Optimized Switch Structures” to inventor David F. Sorrells et al. A true and correct copy of the ’902 patent is attached as Exhibit 3.

33. The ’902 patent is presumed valid under 35 U.S.C. § 282.

34. ParkerVision owns all rights, title, and interest in the ’902 patent.

**United States Patent No. 7,110,444**

35. On September 19, 2006, the United States Patent and Trademark Office duly and legally issued United States Patent No. 7,110,444 (“the ’444 patent”) entitled “Wireless Local Area Network (WLAN) Using Universal Frequency Translation Technology Including Multi-Phase Embodiments and Circuit Implementations” to inventor David F. Sorrells et al. A true and correct copy of the ’444 patent is attached as Exhibit 4.

36. The ’444 patent is presumed valid under 35 U.S.C. § 282.

37. ParkerVision owns all rights, title, and interest in the ’444 patent.

**United States Patent No. 7,292,835**

38. On November 6, 2007, the United States Patent and Trademark Office duly and legally issued United States Patent No. 7,292,835 (“the ’835 patent”)

1 entitled “Wireless and Wired Cable Modem Applications of Universal Frequency  
2 Translation Technology” to inventor David F. Sorrells et al. A true and correct  
3 copy of the ’835 patent is attached as Exhibit 5.

4 39. The ’835 patent is presumed valid under 35 U.S.C. § 282.

5 40. ParkerVision owns all rights, title, and interest in the ’835 patent.

6 **United States Patent No. 8,588,725**

7 41. On November 19, 2013, the United States Patent and Trademark  
8 Office duly and legally issued United States Patent No. 8,588,725 (“the ’725  
9 patent”) entitled “Apparatus, System, and Method For Down Converting and Up-  
10 Converting Electromagnetic Signals” to inventor David F. Sorrells et al. A true and  
11 correct copy of the ’725 patent is attached as Exhibit 6.

12 42. The ’725 patent is presumed valid under 35 U.S.C. § 282.

13 43. ParkerVision owns all rights, title, and interest in the ’725 patent.

14 **United States Patent No. 8,660,513**

15 44. On February 25, 2014, the United States Patent and Trademark Office  
16 duly and legally issued United States Patent No. 8,660,513 (“the ’513 patent”)  
17 entitled “Method and System for Down-Converting an Electromagnetic Signal, and  
18 Transforms for Same, and Aperture Relationships” to inventor David F. Sorrells et  
19 al. A true and correct copy of the ’513 patent is attached as Exhibit 7.

20 45. The ’513 patent is presumed valid under 35 U.S.C. § 282.

21 46. ParkerVision owns all rights, title, and interest in the ’513 patent.

22 **United States Patent No. 9,118,528**

23 47. On August 25, 2015, the United States Patent and Trademark Office  
24 duly and legally issued United States Patent No. 9,118,528 (“the ’528 patent”)  
25 entitled “Method and System for Down-Converting an Electromagnetic Signal, and  
26 Transforms for Same, and Aperture Relationships” to inventor David F. Sorrells et  
27 al. A true and correct copy of the ’528 patent is attached as Exhibit 8.

28 48. The ’528 patent is presumed valid under 35 U.S.C. § 282.

1 49. ParkerVision owns all rights, title, and interest in the '528 patent.

2 **United States Patent No. 9,246,736**

3 50. On January 26, 2016, the United States Patent and Trademark Office  
4 duly and legally issued United States Patent No. 9,246,736 (“the '736 patent”)  
5 entitled “Method and System for Down-Converting an Electromagnetic Signal” to  
6 inventor David F. Sorrells et al. A true and correct copy of the '736 patent is  
7 attached as Exhibit 9.

8 51. The '736 patent is presumed valid under 35 U.S.C. § 282.

9 52. ParkerVision owns all rights, title, and interest in the '736 patent.

10 **United States Patent No. 9,444,673**

11 53. On September 13, 2016, the United States Patent and Trademark  
12 Office duly and legally issued United States Patent No. 9,444,673 (“the '673  
13 patent”) entitled “Methods and Systems for Down-Converting a Signal Using a  
14 Complementary Transistor Structure” to inventor David F. Sorrells et al. A true  
15 and correct copy of the '673 patent is attached as Exhibit 10.

16 54. The '673 patent is presumed valid under 35 U.S.C. § 282.

17 55. ParkerVision owns all rights, title, and interest in the '673 patent.

18 **CLAIMS FOR RELIEF**

19 **COUNT I - Infringement of United States Patent No. 6,049,706**

20 56. The allegations set forth above are re-alleged and incorporated by  
21 reference as if they were set forth fully here.

22 57. TCL directly infringes (literally and/or under the doctrine of  
23 equivalents) the '706 patent by making, using, selling, offering for sale, and/or  
24 importing in/into the United States products covered by at least claim 1 of the '706  
25 patent.

26 58. TCL products that infringe one or more claims of the '706 patent  
27 include, but are not limited to, the TCL Products and any other TCL audio/visual  
28 device that is capable of filtering and down-converting a higher-frequency signal to

1 a lower-frequency signal as claimed in the '706 patent.

2 59. Each TCL Chip is/includes an apparatus for filtering and down-  
3 converting (e.g., a higher frequency RF signal to a lower frequency signal). Each  
4 TCL Chip includes a frequency translator, comprising a down-convert and delay  
5 module to under-sample an input signal (e.g., high frequency RF signal) to produce  
6 an input sample of a down-converted image of said input signal, and to delay said  
7 input sample. Each TCL Chip also includes a filter, comprising at least a portion of  
8 said down-convert and delay module, at least one delay module to delay instances  
9 of an output signal, and an adder (e.g., operational amplifier with parallel resistor-  
10 capacitor feedback) to combine at least said delayed input sample with at least one  
11 of said delayed instances of said output signal to generate an instance of said  
12 output signal.

13 60. The down-convert and delay module under-samples (e.g., at a sample  
14 rate below the Nyquist rate) said input signal according to a control signal (e.g.,  
15 local oscillator (LO) signal), wherein a frequency of said control signal is equal to  
16 a frequency of said input signal plus or minus a frequency of said down-converted  
17 image, divided by  $n$ , where  $n$  represents a harmonic or sub-harmonic of said input  
18 signal.

19 61. ParkerVision has been damaged by the direct infringement of TCL  
20 and is suffering and will continue to suffer irreparable harm and damages as a  
21 result of this infringement.

22 **COUNT II – Infringement of United States Patent No. 6,266,518**

23 62. The allegations set forth above are re-alleged and incorporated by  
24 reference as if they were set forth fully here.

25 63. TCL directly infringes (literally and/or under the doctrine of  
26 equivalents) the '518 patent by making, using, selling, offering for sale, and/or  
27 importing in/into the United States products covered by at least claim 67 of the  
28 '518 patent.

1           64. TCL products that infringe one or more claims of the '518 patent  
2 include, but are not limited to, the TCL Products and any other TCL audio/visual  
3 device that is capable of down-converting a higher-frequency signal to a lower-  
4 frequency signal as claimed in the '518 patent.

5           65. Each TCL Chip is/includes an apparatus for down-converting a carrier  
6 signal (e.g., high frequency RF signal) to a lower frequency signal (e.g., baseband  
7 signal). Each TCL Chip has a universal frequency down-converter (UFD),  
8 including a switch (e.g., transistor), an integrator (e.g., operational amplifier with  
9 parallel resistor-capacitor feedback) coupled to said switch, a pulse generator (e.g.,  
10 LO) coupled to said switch; and a reactive structure (e.g., active filter) coupled to  
11 said UFD.

12           66. The pulse generator (e.g., LO) outputs pulses (e.g., LO signal) to said  
13 switch at an aliasing rate that is determined according to a frequency of the carrier  
14 signal  $\pm$  a frequency of the lower frequency signal) divided by N.

15           67. The pulses have apertures (e.g., 25% duty cycle) and cause said  
16 switch to close and sample said carrier signal (e.g., high frequency RF signal).  
17 Energy is transferred from said carrier signal and integrated using said integrator  
18 (e.g., operational amplifier with parallel resistor-capacitor feedback) during  
19 apertures of said pulses, and said lower frequency signal (e.g., baseband signal) is  
20 generated from the transferred energy.

21           68. The energy is transferred to a load (e.g., resistor) during an off-time  
22 (e.g., when the switch is open).

23           69. ParkerVision has been damaged by the direct infringement of TCL,  
24 and is suffering and will continue to suffer irreparable harm and damages as a  
25 result of this infringement.

26           **COUNT III – Infringement of United States Patent No. 6,580,902**

27           70. The allegations set forth above are re-alleged and incorporated by  
28 reference as if they were set forth fully here.

1           71. TCL directly infringes (literally and/or under the doctrine of  
2 equivalents) the '902 patent by making, using, selling, offering for sale, and/or  
3 importing in/into the United States products covered by at least claim 1 of the '902  
4 patent.

5           72. TCL products that infringe one or more claims of the '902 patent  
6 include, but are not limited to, the TCL Products and any other TCL audio/visual  
7 device that is capable of down-converting a higher-frequency signal to a lower-  
8 frequency signal as claimed in the '902 patent.

9           73. Each TCL Chip is/includes a circuit for down-converting an  
10 electromagnetic signal (e.g., high frequency RF signal) to a lower frequency signal.  
11 Each TCL Chip includes an energy transfer module having a switch module (e.g.,  
12 module with one or more transistors) and an energy storage module (e.g., module  
13 with one or more capacitors). The energy transfer module of the TCL Chip  
14 samples the electromagnetic signal at an energy transfer rate (e.g., LO rate with a  
15 25% duty cycle), according to an energy transfer signal (e.g., LO signal), to obtain  
16 sampled energy. The sampled energy is stored by said energy storage module (e.g.,  
17 module with one or more capacitors). A down-converted signal (e.g., baseband  
18 signal) is generated from the sampled energy.

19           74. The energy transfer module of each TCL Chip has transistors coupled  
20 together. The transistors have a common first port, a common second port, and a  
21 common control port. The electromagnetic signal is accepted at the common first  
22 port and the sampled energy is present at the common second port.

23           75. The common control port accepts the energy transfer signal, which  
24 has a control frequency that is substantially equal to said energy transfer rate.

25           76. Each of the transistors of the TCL Chip has a drain, a source, and a  
26 gate. The common first port couples together drains of the transistors, the common  
27 second port couples together sources of the transistors, and the common control  
28 port couples together gates of the transistors.

1           77. ParkerVision has been damaged by the direct infringement of TCL  
2 and is suffering and will continue to suffer irreparable harm and damages as a  
3 result of this infringement.

4           **COUNT IV - Infringement of United States Patent No. 7,110,444**

5           78. The allegations set forth above are re-alleged and incorporated by  
6 reference as if they were set forth fully here.

7           79. TCL directly infringes (literally and/or under the doctrine of  
8 equivalents) the '444 patent by making, using, selling, offering for sale, and/or  
9 importing in/into the United States products covered by at least claim 2 of the '444  
10 patent.

11           80. TCL products that infringe one or more claims of the '444 patent  
12 include, but are not limited to, the TCL Products and any other TCL audio/visual  
13 device that is capable of down-converting a higher-frequency signal to a lower-  
14 frequency signal as claimed in the '444 patent.

15           81. Each TCL Chip is/includes a wireless modem apparatus (e.g., a  
16 modulation/demodulation device providing bi-directional, over-the-air data  
17 transmission) having a receiver for frequency down-converting an input signal  
18 (e.g., high frequency RF signal). The receiver for frequency down-converting an  
19 input signal includes a first frequency down-conversion module to down-convert  
20 the input signal, wherein said first frequency down-conversion module down-  
21 converts said input signal according to a first control signal (e.g., LO signal) and  
22 outputs a first down-converted signal (e.g., baseband signal); a second frequency  
23 down-conversion module to down-convert said input signal, wherein said second  
24 frequency down-conversion module down-converts said input signal according to a  
25 second control signal (e.g., LO signal) and outputs a second down-converted signal  
26 (e.g., baseband signal); and a subtractor module (e.g., module with differential  
27 amplifier) that subtracts said second down-converted signal from said first down-  
28 converted signal and outputs a down-converted signal.

1           82. The first frequency down-conversion module under-samples (e.g., at a  
2 sample rate below the Nyquist rate) the input signal according to the first control  
3 signal, and the second frequency down-conversion module under-samples samples  
4 (e.g., at a sample rate below the Nyquist rate) the input signal according to said  
5 second control signal.

6           83. ParkerVision has been damaged by the direct infringement of TCL,  
7 and is suffering and will continue to suffer irreparable harm and damages as a  
8 result of this infringement.

9           **COUNT V - Infringement of United States Patent No. 7,292,835**

10          84. The allegations set forth above are re-alleged and incorporated by  
11 reference as if they were set forth fully here.

12          85. TCL directly infringes the '835 patent by making, using, selling,  
13 offering for sale, and/or importing in/into the United States products covered by at  
14 least claims 1 and 17 of the '835 patent.

15          86. TCL products that infringe one or more claims of the '835 patent  
16 include, but are not limited to, the TCL Products and any other TCL audio/visual  
17 device that is capable of down-converting a higher-frequency signal to a lower-  
18 frequency signal as claimed in the '835 patent.

19          87. TCL Products enable users to watch live TV and on demand  
20 programming from their cable service providers over a wireless network.

21 <https://support.tclusa.com/televisions-setup-configurations/258975-how-to->  
22 [connect-your-tcl-roku-tv-to-the-internet](https://support.tclusa.com/televisions-setup-configurations/258975-how-to-); <https://www.tclusa.com/top-tv-apps>. TCL  
23 Chips are configured to function/capable of functioning as wireless cable modems.  
24 For example, TCL Chips provide a wireless connection to cable services.

25          88. Each TCL Chip is/includes a cable modem (e.g., wireless modem for  
26 communicating with a cable television network) for down-converting an  
27 electromagnetic signal (e.g., a high frequency RF signal), having complex  
28 modulations (e.g., QAM)), to a lower frequency signal. The electromagnetic signal



1 is transmitted by a wireless method to the cable modem.

2 89. Each TCL Chip has (a) an oscillator (e.g., LO) to generate an in-phase  
3 oscillating signal (e.g., in-phase LO signal), (b) a phase shifter (e.g., a flip-flop) to  
4 receive the in-phase oscillating signal and to create a quadrature-phase oscillating  
5 signal (e.g., quadrature-phase LO signal), (c) a first frequency down-conversion  
6 module (e.g., a first module that includes at least one switch and at least one  
7 capacitor) to receive the electromagnetic signal and the in-phase oscillating signal  
8 and (d) a second frequency down-conversion module (e.g., a second module that  
9 includes at least one switch and at least one capacitor) to receive the  
10 electromagnetic signal and the quadrature-phase oscillating signal.

11 90. The first frequency down-conversion module includes a first  
12 frequency translation module (e.g., a module having one or more switches) and a  
13 first storage module (e.g., a module having one or more capacitors). The first  
14 frequency translation module samples the electromagnetic signal at a rate (e.g., LO  
15 with a 25% duty cycle) that is a function of the in-phase oscillating signal, thereby  
16 creating a first sampled signal.

17 91. The second frequency down-conversion module includes a second  
18 frequency translation module (e.g., a module having one or more switches) and a  
19 second storage module (e.g., a module having one or more capacitors). The second  
20 frequency translation module samples the electromagnetic signal at a rate (e.g., LO  
21 rate with a 25% duty cycle) that is a function of the quadrature-phase oscillating  
22 signal, thereby creating a second sampled signal.

23 92. ParkerVision has been damaged by the direct infringement of TCL,  
24 and is suffering and will continue to suffer irreparable harm and damages as a  
25 result of this infringement.

26 **COUNT VI - Infringement of United States Patent No. 8,588,725**

27 93. The allegations set forth above are re-alleged and incorporated by  
28 reference as if they were set forth fully here.

1           94. TCL directly infringes (literally and/or under the doctrine of  
2 equivalents) the '725 patent by making, using, selling, offering for sale, and/or  
3 importing in/into the United States products covered by at least claim 1 of the '725  
4 patent.

5           95. TCL products that infringe one or more claims of the '725 patent  
6 include, but are not limited to, the TCL Products and any other TCL audio/visual  
7 device that is capable of down-converting a higher-frequency signal to a lower-  
8 frequency signal as claimed in the '725 patent.

9           96. Each TCL Chip is/includes an apparatus for down-converting an  
10 electromagnetic signal (e.g., high frequency RF signal) to a lower frequency signal.  
11 Each TCL Chip has an aliasing module comprising a switching device (e.g.,  
12 transistor) and a storage module (e.g., one or more capacitors). The aliasing  
13 module receives as an input an RF information signal and provides as an output a  
14 down-converted signal. The switching device of the aliasing module receives as an  
15 input a control signal (e.g., LO signal) that controls a charging and discharging  
16 cycle of the storage module by controlling the switching device so that a portion of  
17 energy is transferred from the RF information signal to the storage module during a  
18 charging part of the cycle and a portion of the transferred energy is discharged  
19 during a discharging part of the cycle.

20           97. The control signal operates at an aliasing rate (e.g., LO rate with a  
21 25% duty cycle) selected so that energy of the RF information signal is sampled  
22 and applied to the storage module at a frequency that is equal to or less than twice  
23 the frequency of the RF information signal. The storage module generates the  
24 down-converted signal from the alternate charging and discharging applied to the  
25 storage module using the control signal.

26           98. ParkerVision has been damaged by the direct infringement of TCL,  
27 and is suffering and will continue to suffer irreparable harm and damages as a  
28 result of this infringement.

1           **COUNT VII - Infringement of United States Patent No. 8,660,513**

2           99. The allegations set forth above are re-alleged and incorporated by  
3 reference as if they were set forth fully here.

4           100. TCL directly infringes (literally and/or under the doctrine of  
5 equivalents) the '513 patent by making, using, selling, offering for sale, and/or  
6 importing in/into the United States products covered by at least claim 19 of the  
7 '513 patent.

8           101. TCL products that infringe one or more claims of the '513 patent  
9 include, but are not limited to, the TCL Products and any other TCL audio/visual  
10 device that is capable of down-converting a higher-frequency signal to a lower-  
11 frequency signal as claimed in the '513 patent.

12           102. Each TCL Chip is/includes a system for frequency down-converting a  
13 modulated carrier signal (e.g., a high frequency RF signal) to a lower frequency  
14 signal. Each TCL Chip has (a) a first switch (e.g., transistor), (b) a first control  
15 signal (e.g., LO signal) which comprises a sampling aperture (e.g., 25% duty  
16 cycle) with a specified frequency, and (c) a first energy storage element (e.g., one  
17 or more capacitors) that down-converts the modulated carrier signal according to  
18 the first control signal and outputs a down-converted in-phase signal portion of the  
19 modulated carrier signal.

20           103. Each TCL Chip has (a) a second switch (e.g., transistor), (b) a second  
21 control signal (e.g., LO signal) which comprises a sampling aperture (e.g., 25%  
22 duty cycle) with a specified frequency, and (c) a second energy storage element  
23 (e.g., one or more capacitors) that down-converts the modulated carrier signal  
24 according to the second control signal and outputs a down-converted inverted in-  
25 phase signal portion of the modulated carrier signal.

26           104. Each TCL Chip has a first differential amplifier circuit that combines  
27 the down-converted in-phase signal portion with the inverted in-phase signal  
28 portion and outputs a first channel down-converted differential in-phase signal.

1           105. Each TCL Chip has (a) a third switch (e.g., transistor), (b) a third  
2 control signal (e.g., LO signal) which comprises a sampling aperture (e.g., 25%  
3 duty cycle) with a specified frequency, and (c) a third energy storage element (e.g.,  
4 one or more capacitors) that down-converts the modulated carrier signal according  
5 to the third control signal and outputs a down-converted quadrature-phase signal  
6 portion of the modulated carrier signal.

7           106. Each TCL Chip has (a) a fourth switch (e.g., transistor), (b) a fourth  
8 aperture signal (e.g., LO signal), and (c) a fourth energy storage element (e.g., one  
9 or more capacitors) that down-converts the modulated carrier signal according to  
10 the fourth control signal and outputs a down-converted inverted quadrature-phase  
11 signal portion of the modulated carrier signal.

12           107. Each TCL Chip has a second differential amplifier circuit that  
13 combines the down-converted quadrature-phase signal portion with the inverted  
14 quadrature-phase signal portion and outputs a second channel down-converted  
15 differential quadrature-phase signal.

16           108. ParkerVision has been damaged by the direct infringement of TCL,  
17 and is suffering and will continue to suffer irreparable harm and damages as a  
18 result of this infringement.

19           **COUNT VIII – Infringement of United States Patent No. 9,118,528**

20           109. The allegations set forth above are re-alleged and incorporated by  
21 reference as if they were set forth fully here.

22           110. TCL directly infringes (literally and/or under the doctrine of  
23 equivalents) the '528 patent by making, using, selling, offering for sale, and/or  
24 importing in/into the United States products covered by at least claim 1 of the '528  
25 patent.

26           111. TCL products that infringe one or more claims of the '528 patent  
27 include, but are not limited to, the TCL Products and any other TCL audio/visual  
28 device that is capable of down-converting a higher-frequency signal to a lower-

1 frequency signal as claimed in the '528 patent.

2 112. Each TCL Chip is/includes a system for frequency down-converting a  
3 modulated carrier signal (e.g., high frequency RF signal) to a baseband signal.  
4 Each TCL Chip includes a first switch (e.g., transistor) coupled to a first control  
5 signal (e.g., LO signal) which comprises a sampling aperture (e.g., 25% duty  
6 cycle) with a specified frequency, wherein the first switch is on and a portion of  
7 energy that is distinguishable from noise is transferred from the modulated carrier  
8 signal (e.g., high frequency RF signal) as an output of said first switch during the  
9 sampling aperture of the first control signal.

10 113. Each TCL Chip includes a first energy storage element (e.g., one or  
11 more capacitors) that stores the transferred energy from the modulated carrier  
12 signal and outputs a down-converted in-phase baseband signal portion of said  
13 modulated carrier signal.

14 114. Each TCL Chip includes a second switch (e.g., transistor) coupled to a  
15 second control signal (e.g., LO signal) which comprises a sampling aperture (e.g.,  
16 25% duty cycle) with a specified frequency, wherein the second switch is on and a  
17 portion of energy that is distinguishable from noise is transferred from the  
18 modulated carrier signal (e.g., high frequency RF signal) as an output of said  
19 second switch during the sampling aperture of the second control signal.

20 115. Each TCL Chip includes a second energy storage element (e.g., one or  
21 more capacitors) that stores the transferred energy from the modulated carrier  
22 signal and outputs a down-converted inverted in-phase baseband signal portion of  
23 said modulated carrier signal.

24 116. The portions of transferred energy from each of the first and second  
25 switch are integrated over time to accumulate said portions of transferred energy  
26 from which said down-converted in-phase baseband signal portion and said down-  
27 converted inverted in-phase baseband signal portion are derived.

28 117. Each TCL Chip includes a first differential amplifier circuit that

1 combines said down-converted in-phase baseband signal portion with said down-  
2 converted inverted in-phase baseband signal portion and outputs a first channel  
3 down-converted differential in-phase baseband signal.

4 118. ParkerVision has been damaged by the direct infringement of TCL,  
5 and is suffering and will continue to suffer irreparable harm and damages as a  
6 result of this infringement.

7 **COUNT IX - Infringement of United States Patent No. 9,246,736**

8 119. The allegations set forth above are re-alleged and incorporated by  
9 reference as if they were set forth fully here.

10 120. TCL directly infringes (literally and/or under the doctrine of  
11 equivalents) the '736 patent by making, using, selling, offering for sale, and/or  
12 importing in/into the United States products covered by at least claim 1 of the '736  
13 patent.

14 121. TCL products that infringe one or more claims of the '736 patent  
15 include, but are not limited to, the TCL Products and any other TCL audio/visual  
16 device that is capable of down-converting a higher-frequency signal to a lower-  
17 frequency signal as claimed in the '736 patent.

18 122. Each TCL Chip is/includes a system for frequency down-converting a  
19 modulated carrier signal (e.g., high frequency RF signal) to a demodulated  
20 baseband signal. Each TCL Chip has a first switch (e.g., transistor) coupled to a  
21 first control signal (e.g., LO signal) which comprises a first sampling aperture  
22 (e.g., 25% duty cycle) with a specified frequency, wherein the first switch is on  
23 during the first sampling aperture and wherein the first switch is off outside the  
24 first sampling aperture.

25 123. Each TCL Chip has a first energy storage element (e.g., one or more  
26 capacitors), coupled to said first switch, that outputs a down-converted in-phase  
27 baseband signal portion of the modulated carrier signal.

28 124. Each TCL Chip has a second switch (e.g., transistor) coupled to a

1 second control signal (e.g., LO signal) which comprises a second sampling  
2 aperture (25% duty cycle) with a specified frequency, wherein the second switch is  
3 on during the second sampling aperture and wherein the first switch is off outside  
4 the second sampling aperture.

5 125. Each TCL Chip has a second energy storage element (e.g., one or  
6 more capacitors), coupled to the second switch, that outputs a down-converted  
7 inverted in-phase baseband signal portion of the modulated carrier signal.

8 126. The first and second control signals each control a charging and  
9 discharging cycle of their respective energy storage element so that for each switch  
10 a portion of energy from the modulated carrier signal is transferred to the  
11 respective energy storage element when the respective switch is on during the  
12 charging cycle, and a portion of previously transferred energy is discharged during  
13 the discharging cycle for each respective switch when the respective switch is off.

14 127. For each respective energy storage element, the energy discharged  
15 during any given discharge cycle is not completely discharged, with the remaining  
16 undischarged energy from the given discharge cycle becoming an initial condition  
17 for a next charging cycle that begins immediately following the given discharge  
18 cycle.

19 128. The down-converted in-phase baseband signal portion is derived from  
20 energy accumulated at the first energy storage element during both the charging  
21 and the discharging cycles for the first energy storage element. The down-  
22 converted inverted in-phase baseband signal portion is derived from energy  
23 accumulated at the second energy storage element during both the charging and the  
24 discharging cycles for the second energy storage element.

25 129. Each TCL Chip has a first differential amplifier circuit that combines  
26 the down-converted in-phase baseband signal portion with the down-converted  
27 inverted in-phase baseband signal portion and outputs a first channel down-  
28 converted differential in-phase baseband signal.

1           130. ParkerVision has been damaged by the direct infringement of TCL,  
2 and is suffering and will continue to suffer irreparable harm and damages as a  
3 result of this infringement.

4           **COUNT X - Infringement of United States Patent No. 9,444,673**

5           131. The allegations set forth above are re-alleged and incorporated by  
6 reference as if they were set forth fully here.

7           132. TCL directly infringes (literally and/or under the doctrine of  
8 equivalents) the '673 patent by making, using, selling, offering for sale, and/or  
9 importing in/into the United States products covered by at least claim 1 of the '673  
10 patent.

11           133. TCL products that infringe one or more claims of the '673 patent  
12 include, but are not limited to, the TCL Products and any other TCL audio/visual  
13 device that is capable of down-converting a higher-frequency signal to a lower-  
14 frequency signal as claimed in the '673 patent.

15           134. Each TCL Chip is/includes an apparatus for down-converting an input  
16 modulated carrier signal (e.g., high frequency RF signal) to a demodulated  
17 baseband signal, wherein the modulated carrier signal has an amplitude variation, a  
18 phase variation, a frequency variation, or a combination thereof.

19           135. Each TCL Chip has a frequency down-conversion module that has a  
20 switch (e.g., transistor), a capacitor coupled to said switch, and a pulse generator  
21 (e.g., LO) coupled to the switch. The pulse generator outputs pulses to the switch  
22 at a rate (e.g., LO rate with a 25% duty cycle) that is a function of a frequency of  
23 the modulated carrier signal and a frequency of the demodulated baseband signal  
24 determined according to: (the frequency of the modulated carrier signal +/- a  
25 frequency of the demodulated baseband signal) divided by N, where N is any  
26 integer including 1.

27           136. The pulses have apertures and the pulses cause the switch to open  
28 outside of the apertures and cause the switch to close and sample the modulated



1 carrier signal during the apertures by transferring energy from the modulated  
2 carrier signal and accumulating the transferred energy in the capacitor each time  
3 the switch is closed.

4 137. Some of the previously accumulated energy is discharged from the  
5 capacitor into load circuitry (e.g., a resistor and/or differential amplifier) each time  
6 said switch is open. The demodulated baseband signal is generated from (a) the  
7 accumulating of the energy transferred to the capacitor each time the switch is  
8 closed and (b) the discharging of the some of the previously accumulated energy  
9 into the load circuitry each time the switch is opened.

10 138. ParkerVision has been damaged by the direct infringement of TCL,  
11 and is suffering and will continue to suffer irreparable harm and damages as a  
12 result of this infringement.

13 **JURY DEMANDED**

14 Pursuant to Rule 38(b) of the Federal Rules of Civil Procedure, ParkerVision  
15 hereby requests a trial by jury on all issues so triable.

16 **PRAYER FOR RELIEF**

17 WHEREFORE, ParkerVision respectfully requests that the Court enter  
18 judgment in its favor and against TCL as follows:

- 19 a. finding that TCL directly infringes one or more claims of each of the  
20 patents-in-suit;
- 21 b. awarding ParkerVision damages under 35 U.S.C. § 284, or otherwise  
22 permitted by law, including supplemental damages for any continued  
23 post-verdict infringement;
- 24 c. awarding ParkerVision pre-judgment and post-judgment interest on  
25 the damages award and costs;
- 26 d. awarding cost of this action (including all disbursements) and attorney  
27 fees pursuant to 35 U.S.C. § 285, or as otherwise permitted by the  
28 law; and

1 e. awarding such other costs and further relief that the Court determines  
2 to be just and equitable.

3 Dated: May 14, 2020 GOLDBERG SEGALLA LLP

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By: /s/ Peter J. Woo

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