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UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA, SAN FRANCISCO DIVISION

WAYMO LLC,
Plaintiff,
vs.
UBER TECHNOLOGIES, INC.;
OTTOMOTTO LLC; OTTO TRUCKING
LLC,
Defendants.

CASE NO. 3:17-cv-00939

**DECLARATION OF PIERRE-YVES
DROZ**

**REDACTED VERSION OF DOCUMENT
SOUGHT TO BE SEALED**

1 I, Pierre-Yves Droz, hereby declare as follows.

2 1. I have been employed by Waymo LLC (“Waymo”), and before that, Google Inc.
3 (“Google”) since October 2011. My current title is Principal Hardware Engineer, and I have been
4 the technical lead on Waymo’s LiDAR project since its inception. I make this declaration in
5 support of Waymo’s Motion for a Preliminary Injunction and have personal knowledge of the
6 facts stated herein.

7 2. I received a Masters degree in engineering from the Ecole Polytechnique in Paris,
8 France in 2005, and a Masters degree in Electrical Engineering and Computer Science from the
9 University of California, Berkeley in 2005.

10 **A. My Early Development of LiDAR Systems**

11 3. In 2006, I co-founded a company, along with Anthony Levandowski and Andrew
12 Schultz, that was eventually called 510 Systems, LLC (“510 Systems”). I worked full time at 510
13 Systems, and my role included, among other things, principal responsibility for research and
14 development (analogous to the role a Chief Technology Officer would have at a larger company).
15 Mr. Levandowski was leading the company on a part-time basis, providing input on major
16 strategic decisions, with less involvement with day-to-day operations.

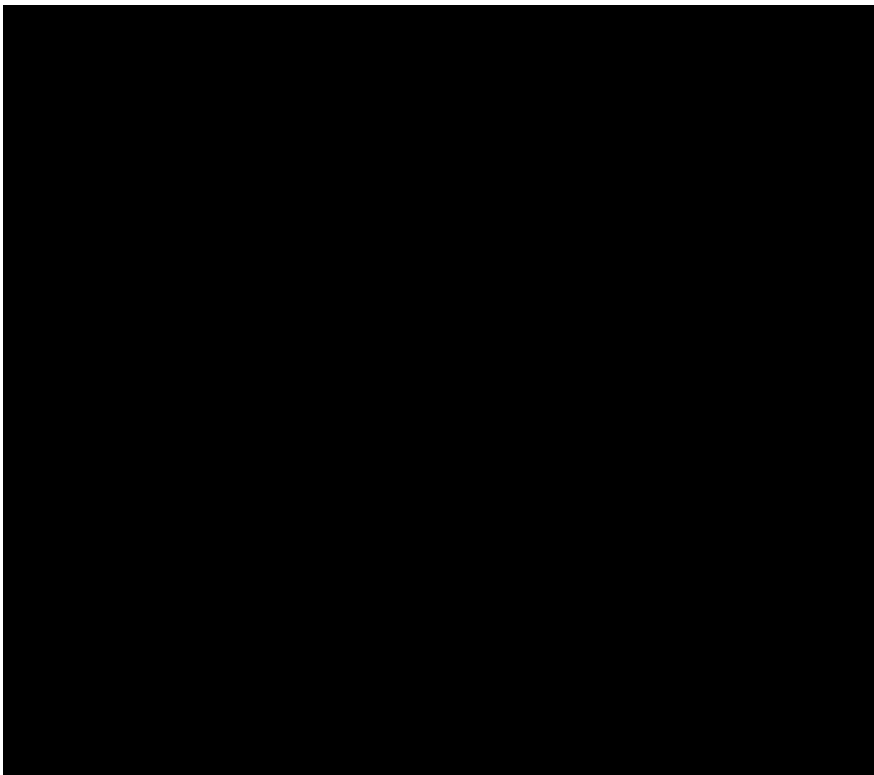
17 4. In 2009, [REDACTED] Project
18 Chauffeur, the internal name of Google’s self-driving car project. [REDACTED]

19 [REDACTED]
20 [REDACTED].

21 5. In April 2010, 510 Systems started developing an in-house LiDAR solution, as
22 opposed to using purely third-party vendors, such as Velodyne. LiDAR stands for Light Detection
23 And Ranging, and uses the principles of radar but using laser beams instead of radio waves:
24 LiDAR shoots beams out into an environment, where objects reflect the beams back into the
25 LiDAR, such that the LiDAR can measure the time it took for the laser beams to come back and
26 figure out how far away an object is. I led our company’s efforts toward our in-house LiDAR
27 solution, and by December 2010 we had a prototype [REDACTED]

28 [REDACTED]:

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6. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

7. In early summer 2011, [REDACTED]

[REDACTED]

[REDACTED]. At the time, self-driving projects including Google's

used commercially available LiDAR systems from Velodyne. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

1 8. In July 2011, Google acquired 510 Systems, and I became a Google employee in
2 October of that year. My initial role was technical lead of the LiDAR team, and I have maintained
3 this role throughout my time at Google and now Waymo.¹ The LiDAR team has grown
4 consistently over the last five plus years, from 6 people when Google acquired 510 Systems to
5 approximately █ people today.

6 **B. Development of Waymo’s LiDAR Systems**

7 9. Designing and developing LiDAR systems is a difficult process. █
8 █
9 █
10 █
11 █
12 █
13 █, early on, we realized that
14 we would need different LiDAR designs for different ranges.

15 10. In particular, for long ranges, █
16 █
17 █
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23 █
24 █. After

25 _____
26 ¹ In this declaration, I use Google and Waymo interchangeably, understanding that the
27 Chauffeur self-driving car project at Google became its own separate company, Waymo, late last
28 year.

1 driving hundreds of thousands of miles with this LiDAR, however, we discovered new self-
2 driving car scenarios that could not be satisfied with it. For example, [REDACTED]
3 [REDACTED]
4 [REDACTED]. We thus iterated
5 more designs [REDACTED], eventually settling on a version with a 360 degree field of view, which
6 Waymo still uses on its self-driving fleet given the lack of viable alternatives for long-range
7 LiDAR.

8 11. [REDACTED], we also worked on
9 developing a mid-range LiDAR. Beginning in early summer 2011, [REDACTED]
10 [REDACTED]. After more than a year of hard work,
11 however, this design proved not to be viable for use in self-driving cars. [REDACTED]

12 [REDACTED]
13 [REDACTED]
14 [REDACTED]
15 [REDACTED]
16 [REDACTED]
17 [REDACTED]
18 [REDACTED]
19 [REDACTED]
20 **C. Waymo's Innovative Mid-Range LiDAR Design**

21 12. Beginning in December 2012, [REDACTED]
22 [REDACTED]
23 [REDACTED]
24 [REDACTED]. The [REDACTED] design was made
25 possible given all the know-how and technological capabilities my team had developed over
26 several years of working on LiDAR systems, [REDACTED]. In contrast to
27 commercially available LiDAR systems, such as the Velodyne system originally used by 510
28 Systems and previously Project Chauffeur, [REDACTED]

1 [REDACTED]
2 [REDACTED]
3 [REDACTED]
4 [REDACTED]
5 [REDACTED]
6 [REDACTED]

7 13. One of [REDACTED] innovations was a design that, in part, used a single lens—rather than
8 multiple sets of lenses—to both transmit and receive the collection of laser beams used to scan the
9 surrounding environment.

10 14. Traditionally, a LiDAR system used lens assemblies with multiple elements (such
11 as 3 lens elements—or a triplet lens—for transmit side and another triplet lens for the receive
12 side), but this approach was not practical in a LiDAR system meant for self-driving cars because
13 the size and cost of the system would be very large due to the complexity of manufacturing
14 numerous complex lens elements. Another option that Velodyne actually used was putting
15 multiple singlet lenses next to each other. However, this required using two separate lenses for
16 two separate sets of beams, thereby splitting the field of view of the LiDAR into two separate
17 fields of view, slightly getting around the problem of handling multiple beams but not
18 significantly decreasing the cost or size of the system. (Velodyne’s 64-beam LiDAR previously
19 used by Google costs over \$70,000, well above the cost of most cars.)

20 15. A key insight we had at Waymo was that using one lens for both transmit and
21 receiving is simpler and allows for a smaller and less expensive LiDAR unit. Using one lens
22 better ensures that focal lengths are equal for both sending laser beams out (transmit side) and for
23 receiving reflected light back (receive side) so that the transmit and receive arrays can match
24 perfectly. If the two arrays don’t match, they would not line up and you would only be able to
25 align a few channels, making all others channels useless for detection. Waymo first pioneered a
26 single-lens design [REDACTED]. While using a multiple-element lens in a LiDAR makes the focal plane
27 flat like a pancake rather than curved like a bowl, complicating the optical layout, we developed
28

1 many innovations to deal with the curved focal plane that allowed us to get the small-size and low-
2 cost benefits of a single-lens system.

3 16. I was one of the primary people who conceived and developed the single-lens
4 design concept. This design greatly simplified the manufacturing process by eliminating the need
5 to painstakingly align pairs of transmit and receive elements, with even a slight miscalibration
6 would significantly affect the accuracy of the system. Waymo was awarded a patent on its design
7 in 2014: United States Patent No. 8,836,922 (“the ‘922 patent”), entitled “Devices and Methods
8 for a Rotating LiDAR Platform with a Shared Transmit/Receive Path.” I am a named inventor on
9 this patent. My colleagues at the time, Anthony Levandowski, Gaetan Pennecot, and Daniel
10 Gruver were among the other named co-inventors. I understand that all now are employed by
11 Otto/Uber.

12 **D. Perfecting [REDACTED] for Use in Self-Driving Cars**

13 17. With the goal of making this new design accurate and robust enough to use on self-
14 driving cars, Waymo’s LiDAR Team continued to invest resources into developing its LiDAR
15 systems over several months. [REDACTED]

16 [REDACTED] Again, compared to off-the-shelf solutions, the [REDACTED]
17 design [REDACTED] was groundbreaking. It dramatically reduced the cost and size of the
18 LiDAR system while increasing resolution and performance for self-driving vehicles. To get to
19 this point, it had taken us nearly two years from when we first set out to build a mid-range LiDAR
20 accurate and robust enough to provide the data required for a car to drive itself and thus to replace
21 the Velodyne LiDARs we used at the time.

22 18. Development [REDACTED] required solving innumerable issues. For example, [REDACTED]
23 [REDACTED]
24 [REDACTED]
25 [REDACTED]
26 [REDACTED]
27 [REDACTED]
28 [REDACTED]

1 [REDACTED]. Issues like these are something a LiDAR designer not
2 previously familiar with Waymo's designs could not foresee in advance.

3 19. Through our many months of design and development, we finally had a successful
4 and cost-effective mid-range LiDAR for self-driving cars. We finally switched from off-the-shelf
5 Velodyne LiDAR systems to our in-house [REDACTED] LiDAR [REDACTED]
6 [REDACTED], almost three years after we first set out to do so [REDACTED] and
7 approximately a year after we first came up with the single-lens concept [REDACTED].

8 **E. Waymo's Current-Generation Mid-Range LiDAR**

9 20. Waymo's current-generation mid-range LiDAR, [REDACTED]
10 [REDACTED]
11 [REDACTED] are specifically
12 designed—based on Waymo's years of testing, simulation, experimentation, and optimization for
13 different test scenarios—for use in self-driving cars. [REDACTED]

14 [REDACTED]
15 [REDACTED]
16 [REDACTED] Yet implementing these designs was not easy. As one example of the difficulty
17 of implementing [REDACTED]
18 [REDACTED]
19 [REDACTED].

20 21. [REDACTED]
21 [REDACTED]
22 [REDACTED]
23 [REDACTED]
24 [REDACTED]
25 [REDACTED]
26 [REDACTED]
27 [REDACTED]
28 [REDACTED]

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13 [REDACTED]
14 [REDACTED]
15 [REDACTED]
16 [REDACTED]
17 [REDACTED]
18 [REDACTED]
19 [REDACTED]
20 [REDACTED]
21 [REDACTED]
22 [REDACTED]

F. Waymo’s Current-Generation Short-Range LiDAR

23
24 23. In 2013, we noticed a problem with [REDACTED]
25 [REDACTED]. To solve this problem, we designed and developed a very simple
26 short-range LiDAR system [REDACTED].
27 Waymo’s fleet now uses four [REDACTED] LiDAR units on each car to cover the main mid-range LiDAR
28 unit’s blind spots very close to the car.

1 **G. Confidential Files Downloaded by Mr. Levandowski**

2 24. I understand that Mr. Levandowski may have downloaded 14,000 design files
3 contained in the SVN repository containing circuit design schematic files for all of Waymo's
4 projects. Over 4,000 of these files are related to Waymo's LiDAR designs, including each and
5 every design discussed above. For example, files found at the following file path:

6 [REDACTED]
7 provide the detailed specifications, including positioning and alignment of all elements on [REDACTED]
8 [REDACTED]. Similarly, [REDACTED] contain the detailed
9 specifications, including positioning and alignment of all elements on [REDACTED].
10 But the SVN repository downloaded by Mr. Levandowski contains all highly confidential and
11 proprietary circuit specification and design files for *every* product developed at Waymo, including
12 [REDACTED]
13 [REDACTED].

14 25. I also understand that Mr. Levandowski may have downloaded additional files
15 from Waymo servers from November 2015 to January 2016, shortly before his departure,
16 including "Chauffeur TL weekly updates - Q4 2015 [REDACTED]
17 [REDACTED]," which I am familiar with from my work. They are attached as Exhibits
18 A-I to this declaration. Each of these documents reflects confidential, proprietary information on
19 how Waymo designs and implements its LiDAR systems.

20 26. For example, the "TL weekly updates" document is a collection of information
21 from technical leads from the entire self-driving team, detailing what they are doing each week,
22 the problems they are running into and eventually, the solutions they come up with. This type of
23 information would be highly beneficial information for a competitor looking to implement a self-
24 driving car. As one example, [REDACTED]

25 [REDACTED]
26 [REDACTED]
27 [REDACTED]
28 [REDACTED]

1 [REDACTED]
2 [REDACTED]
3 [REDACTED]
4 [REDACTED]
5 [REDACTED]
6 [REDACTED]
7 [REDACTED]

8 [REDACTED] Having this knowledge would allow a competitor to save time, money,
9 and effort that would otherwise have been spent addressing the various risks encountered during
10 LiDAR design and development.

11 27. Mr. Levandowski personally told me in January 2016 he was interested in
12 implementing long-range LiDAR at his new company and was thus interested in the [REDACTED] design,
13 which is not available in any commercially available LiDAR system that I know of. I distinctly
14 remember taking a walk around our Mountain View office one-on-one with Mr. Levandowski on
15 or around January 5, 2016. During this walk, he told me specifically that he wanted his new
16 company to have a long-range LiDAR, which is very useful for self-driving truck applications he
17 was interested in. He also told me that he planned to “replicate” this Waymo technology at his
18 new company.

19 28. This conversation did not surprise me. Mr. Levandowski had previously told me,
20 in or around the summer of 2015, that he had talked with Brian McClendon, an Uber executive
21 involved with their self-driving car project. We were having dinner at a restaurant near the office,
22 and he told me that it would be nice to create a new self-driving car startup and that Uber would be
23 interested in buying the team responsible for the LiDAR we were developing at Google.

24 29. Later in January 2016, a colleague told me that Mr. Levandowski had been seen at
25 Uber’s headquarters in mid January. I asked Mr. Levandowski about this, and he admitted he had
26 met with Uber, and the reason he was there was that he was looking for investors for his new
27 company.

28

1 **H. Waymo’s LiDAR Trade Secrets Are Protected**

2 30. Waymo takes robust measures to protect its LiDAR trade secrets. As a condition of
3 employment, I understand Waymo requires all employees—including members of the LiDAR
4 team who have left Waymo to work for Defendants—to enter into written agreements to maintain
5 the confidentiality of proprietary and trade secret information, and not to misuse such information.
6 In addition, Waymo enforces an employee code of conduct that explains employees’ strict
7 obligations to maintain the secrecy of confidential information.

8 31. For example, employees are required to complete annual information security
9 training. I understand that Waymo tracks whether I have completed the training (and re-training)
10 on an annual basis.

11 32. Waymo also employs network security measures and access policies that restrict
12 the access and dissemination of certain confidential and proprietary trade secret information to
13 only teams that are working on projects related to that information. For example, Google
14 employees working on projects with no relation to Waymo or self-driving cars could not (and
15 cannot) access Waymo’s confidential and proprietary schematics (e.g., the “SVN” repository).
16 They are distributed on a “need to know” basis.

17 33. Networks hosting confidential and proprietary information include numerous
18 safeguards, such as encryption, passwords and dual-authentication.

19 34. Waymo also takes reasonable measures to mark confidential and proprietary
20 information, such as documents and other materials, with visible legends designating them as such
21 when sharing them outside of Waymo (subject to NDAs).

22 35. Waymo employs reasonable efforts to secure physical facilities by restricting
23 access and employing locks, cameras, guards, and other security measures.

24 36. In my experience, Waymo also requires consultants, vendors, and manufacturers to
25 sign confidentiality agreements that require that they undertake reasonable efforts to maintain, and
26 not to disclose, any confidential or trade secret information.

27 37. Though sharing technical information with vendors is sometimes necessary,
28 Waymo closely guards and never discloses our LiDAR systems’ overall specifications (such as ■■■)

1 [REDACTED]
2 [REDACTED]), or our desired target specifications to satisfy different self-
3 driving test scenarios, to any vendors, even under an NDA.

4 **I. Potential Harm to Waymo**

5 38. Google and now Waymo has spent an enormous amount of time developing its
6 self-driving car technology, including its custom-built LiDAR systems. In my team alone (now a
7 team of approximately [REDACTED] people), we've spent 5-7 years working on our LiDAR designs to get to
8 our current-generation design, [REDACTED]. This has included Google and Waymo spending several
9 millions as well as thousands of hours of time. I personally have the last six years working almost
10 entirely on custom LiDAR solutions for self-driving cars.

11 39. Our current design, [REDACTED], reflects these years and millions of dollars of research
12 and development that no one else in the industry has access too. Waymo is unique in the industry
13 in its long history researching and pioneering LIDAR designs for self-driving cars. This is one
14 reason that I believe Waymo is the industry leader in self-driving cars.

15 40. For example, and as discussed above, our development time (while still ongoing in
16 some respects) took the team about six months to develop the [REDACTED] design even with the [REDACTED]
17 design already done (and three years after we first started working on our original mid-range
18 LiDAR, [REDACTED]). Also as discussed above, [REDACTED] provides a number of benefits not present in the
19 [REDACTED] design or disclosed in our patents, including being less expensive for better resolution, a
20 smaller design, more robust—all important criteria for self-driving cars.


21 41. In my opinion, the self-driving car market is a nascent market in which the cost and
22 energy required to deploy at large scale in a new region are significant. The growth, profitability,
23 and even survival of individual companies will likely be determined by what happens in the next
24 few years. If another company, such as Otto/Uber, were to use Waymo's intellectual property, I
25 believe that would greatly harm Waymo during this embryonic market formation process by
26 providing direct competitors with essentially a multi-year "head start" in their development of
27 self-driving car technology.

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I declare under penalty of perjury that the foregoing is true and correct. Executed in
Mountain View, California, on March 9, 2017.

DATED: March 9, 2017



Pierre-Yves Droz