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 1            SUPERIOR COURT OF THE STATE OF CALIFORNIA

 2                     COUNTY OF SANTA CLARA

 3

 4

 5     SZ HUA HUANG, Individually and as )
       successor in interest to WEI LUN  )
 6     HUANG, deceased; TRINITY HUANG, a  )
       minor; TRISTAN HUANG, a minor;     )
 7     HSI KENG HUANG; and CHING FEN      )
       HUANG,                             )
 8                                        )
            Plaintiffs,                   )
 9                                        )
        vs.                               )
10                                        )Case No.
       TESLA INC. dba TESLA MOTORS,       )19CV346663
11     INC., THE STATE OF CALIFORNIA,     )
       and DOES 1 through 100,            )
12                                        )
            Defendants.                   )
13     _____)

14

15           REMOTE VIDEOTAPED DEPOSITION OF

16                   ASHOK ELLUSWAMY

17               Thursday, June 30, 2022

18

19

20     STENOGRAPHICALLY REPORTED BY:
       RHONDA HALL-BREUWET, RDR, CRR
21     CA CSR NO. 14411
       TX CSR NO. 11956
22     NV CCR NO. 990
       TN LCR NO. 675
23     LA CCR NO. 2017004
       WA CCR NO. 21000131
24     GA CCR NO. 5087-2801-9674-7264
       FL FPR NO. 693
25     JOB NO. 288717
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4   June 30, 2022

5   10:08 a.m.

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7

8   Videotaped Deposition of ASHOK ELLUSWAMY,

9   held remotely before Rhonda Hall-Breuwet, Registered

10   Diplomate Reporter, Certified Realtime Reporter,

11   Certified Shorthand Reporter (CA and TX), Licensed

12   Court Reporter (TN), Certified Court Reporter (GA,

13   LA, NV, and WA), Florida Professional Reporter, and

14   Notary Public of the State of Florida.

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25   (Continued)
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13   GREG McCULLOUGH

14   RYAN McCARTHY

15   LINDSEY ADAMS-HESS

16

17 VIDEOGRAPHER:

18   ELIJAH OCHOA

19

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NUMBER                                        MARKED

Exhibit 152  Blog Post Titled                    23

             "Upgrading Autopilot:

             Seeing the World in

             Radar," dated 9/11/16
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1   (Exhibit Number 179, First Amended Notice of

2   Taking Videotaped Deposition of Ashok Elluswamy

3   and Request for Production of Documents, was

4   premarked for identification.)

5   THE VIDEOGRAPHER: We are on the record. My

6   name is Elijah Ochoa, and I am contracted by Steno.

7   I'm not financially interested in this action, nor

8   am I a relative or an employee of any of the

9   attorneys or any of the parties.

10   Today is June 30th, 2022, and the time is

11   10:08 a.m. Pacific Time. This video deposition is

12   taken remotely via MS Teams. The name of the case

13   is Huang, et al., versus Tesla Inc., et al., filed

14   in the Superior Court of the State of California for

15   the County of Santa Clara, Case Number 19CV346663.

16   This is the video-recorded deposition of

17   Ashok Elluswamy, Volume 1. The attorney taking this

18   deposition is Andrew McDevitt.

19   Would the attorneys please introduce

20   themselves and state who you represent.

21   MR. McDEVITT: Andrew McDevitt for

22   plaintiff.

23   MR. BRANIGAN: Tom Branigan from the Bowman

24   and Brooke law firm for Tesla Inc.

25   MS. MILLER: Lauren Miller for Tesla Inc.

1   MS. LOVE: This is Rosemary Love for the

2   Department of Transportation.

3   THE VIDEOGRAPHER: We are ready to proceed.

4   The court reporter today is Rhonda Breuwet with

5   Steno.

6   Will the reporter please swear in the

7   witness.

8   CERTIFIED STENOGRAPHER: Raise your right

9   hand, please.

10   Do you solemnly swear the testimony you are

11   about to give will be the truth, the whole truth,

12   and nothing but the truth?

13   THE WITNESS: Yes.

14   MR. McDEVITT: And before we begin, I wanted

15   to note that Greg McCullough, who's a consultant for

16   plaintiffs, is also in the Teams meeting.

17   And then, Tom, if there's anybody else here

18   from Tesla, can you just announce that, please.

19   MR. BRANIGAN: Yeah. Ryan McCarthy and

20   Lindsay Adams-Hess are hooked into the deposition

21   remotely.

22   ASHOK ELLUSWAMY

23   acknowledged having been duly sworn to tell the

24   truth and testified upon his oath as follows:

25   ///

1	DIRECT EXAMINATION
2	BY MR. McDEVITT:
3	Q. Good morning.
4	A. Good morning.
5	Q. Please state your full name for the record.
6	A. My full name is Ashok Kumar Elluswamy.
7	Q. Mr. Elluswamy, have you ever had your
8	deposition taken before?
9	A. Yes.
10	Q. How many times?
11	A. Twice.
12	Q. And did both of those depositions occur in
13	connection with lawsuits against Tesla?
14	A. Yes.
15	Q. Tell me your -- go ahead.
16	A. I'm not sure if it's against or -- it
17	involved Tesla.
18	Q. Okay. Tell me your understanding of the
19	underlying facts for each of those two cases.
20	A. The first case was in relation to IP
21	conflict issue. The second one was related to a
22	crash in Florida.
23	Q. Was the -- the second deposition, the one in
24	Florida, was that in the Banner case?
25	A. Yes.

1   Q.   And then the first case you mentioned, was

2   that a lawsuit that Tesla brought against a former

3   employee who allegedly took trade secret

4   information?

5   A.   Yes.

6   Q.   What is your current job position with

7   Tesla?

8   A.   I'm a director of software.

9   Q.   Director of Autopilot software?

10   A.   Yes.

11   Q.   How long have you been the director of

12   Autopilot software?

13   A.   I believe since mid-2019.

14   Q.   And I'm going to pause for a moment and go

15   over a few more rules related to the deposition. I

16   presume you've already heard these things, but I

17   just want to make sure that we all have the same

18   understanding. Okay?

19   So the first -- you gave me a good intro

20   there -- is your responses need to be verbal. So

21   although I understood when you nodded your head,

22   that doesn't come across on the transcript. So

23   please make an effort throughout today to respond

24   verbally. If you forget to do so, I will prompt

25   you. I'm not trying to be rude. It's just so that

1 we have a clear and accurate record.

2   Okay?

3   A.   Understood.

4   Q.   I don't want you to guess. I don't want you

5 to speculate. I obviously don't want you to make

6 things up in response to my questions.

7   Do you understand that?

8   A.   Yes.

9   Q.   Do you understand that the instruction I

10 just gave you about not guessing and not

11 speculating, that applies for the entire deposition?

12   A.   Yes.

13   Q.   Okay. And do you feel like you will be able

14 to remember that throughout today's deposition, that

15 you don't need to be reminded not to guess or

16 speculate; correct?

17   A.   Yes.

18   Q.   If you don't understand one of my questions,

19 please let me know, and I will either have the court

20 reporter read it back if I think the question is

21 clear, or I will reword the question.

22   I'm going to do my best to ask you questions

23 that, from my perspective, are understandable and

24 answerable, but I don't know if you -- you know, for

25 some reason you might not understand the way I word

1 a question; so I'm going to rely on you to let me

2 know. Okay?

3   A. Yes.

4   Q. You understand that you are under oath

5 today?

6   A. Yes.

7   Q. Okay. And you appreciate that the oath that

8 you took today carries with it the penalty of

9 perjury?

10   A. Yes.

11   Q. This may or may not be obvious to you, but

12 today's deposition is being videotaped -- or video

13 recorded. Okay?

14   A. Yes.

15   Q. And just so you have a full appreciation of

16 the significance of that, the deposition being video

17 recorded means that if this case goes to trial,

18 portions of the questions that I ask you and your

19 answers could be shown to the jurors in court on a

20 large screen with speakers.

21   Okay?

22   A. Yes.

23   Q. If you need a break for any particular

24 reason, let us know. We'll generally try to take a

25 break every hour. Okay?

1   A.   Understood.

2   MR. BRANIGAN: Andrew, can I interject?

3   Since you mentioned breaks, Mr. Elluswamy told me

4   before we get started that he will need to take a

5   short break around 11:30ish for a business point. I

6   don't think it'll take very long, but I wanted to

7   make you aware of that.

8   MR. McDEVITT: Thanks. That's fine. Okay.

9   BY MR. McDEVITT:

10   Q.   Okay. If you answer my questions during the

11   deposition today, I'm going to believe that you

12   heard the question, you understood the question, and

13   you're providing a truthful response.

14   Fair enough?

15   A.   That's fair.

16   Q.   All right. When did you first start working

17   for Tesla?

18   A.   Since Jan. 2014.

19   Q.   And you have a somewhat unique story about

20   how you got hired; right?

21   MR. BRANIGAN: Objection. Form. Vague.

22   Go ahead, if you can answer, if you

23   understand it.

24   THE WITNESS: I understand it. I'm not sure

25   if it's unique. I have some story, yeah.

1   (Stenographer requests clarification.)

2   THE WITNESS: I understand it. I'm not sure

3   if it's unique, but I have -- I'm not sure I'd call

4   it a story. It is something, yeah.

5   BY MR. McDEVITT:

6   Q. Okay. Can you describe for us the

7   circumstances that led to you getting hired to --

8   hired by Tesla, starting with the tweet you saw by

9   Elon?

10   A. Yeah. In 2013, Elon had tweeted publicly

11 that he's hiring for the Autopilot team. So I

12 applied in response to that, and that's how the

13 interview process started.

14   Q. And is it your understanding you were the

15 first person to be hired in response to the

16 particular tweet that Elon -- that Elon issued in

17 2013?

18   A. I believe from the outside, that is true. I

19 think there were internal engineers who already had

20 been working on Autopilot even before I started.

21   Q. Describe for us what the tweet stated.

22   A. I don't precisely recall.

23   Q. What was your understanding of what Elon

24 Musk was communicating by his tweet, the one that

25 you responded to?

1   A.   My understanding was that Tesla was starting

2   an Autopilot team, and it was an open call for

3   engineers to apply.

4   Q.   And when you started with Tesla, what was

5   your job title?

6   A.   I believe it was software engineer.

7   Q.   Let me back up for a moment. Can you tell

8   us your -- your educational background, and just

9   tell us what your bachelor's was in and what your

10   master's was in and where you obtained those

11   two degrees.

12   A.   My bachelor's was in electronics and

13   communication. I got it from college of Engineering

14   Guindy in India, and then I did my master's in

15   robotic system development. That was from Carnegie

16   Mellon University in Pittsburgh.

17   Q.   What year did you complete your studies at

18   Carnegie Mellon?

19   A.   December 2013.

20   Q.   And you worked for WABCO Vehicle Control

21   Systems for a period of time; correct?

22   A.   Yes.

23   Q.   When did you work for WABCO?

24   A.   I believe it was from 2010 until 2012.

25   Q.   On your LinkedIn page, it states that at

 1   WABCO you worked in the vehicle dynamics and control

 2   group.

 3   Is that accurate?

 4   A.   That's correct.

 5   Q.   And you worked on brake actuation modules to

 6   establish real-time performance guarantees of

 7   actuators?

 8   A.   Yes.

 9   Q.   What does that mean?

10   A.   The brake actuators have software in them to

11   actuate, for example, ABS systems, which kick in

12   when the brakes are at the limits of the traction,

13   so sort of like pulse the brakes to get more

14   traction and things like those. There's a bunch of

15   software regarding such systems, and I worked on

16   making sure that the algorithms there and the

17   compute are scheduled in a manner that fit inside

18   the time budget.

19   For any real-time system, it needs to

20   produce its outputs within a certain amount of time.

21   (Stenographer requests clarification.)

22   THE WITNESS: I can repeat.

23   For any real-time system, the software has

24   to produce the outputs within a certain amount of

25   time in order to be effective. I worked on the

1 software that schedules that and also reports any

2 failures to meet the deadline. There's a long list

3 of things, but that's roughly the idea.

4 BY MR. McDEVITT:

5   Q. While you were at WABCO, did you have any

6 involvement in design, development, or testing of

7 automatic emergency braking systems?

8   A. No.

9   Q. After WABCO, you spent some amount of time

10 for -- working for Volkswagen's Electronic Research

11 Lab; correct?

12   A. Yes.

13   Q. And can you describe for us what you did

14 while working at Volkswagen Electronic Research Lab.

15   A. I was working on their autonomous driving

16 research platform. And, specifically, there is a

17 module called "localization" which helps the car

18 understand where it is with respect to a prebuilt

19 map. I was working on that localization system.

20   Q. Did the localization system utilize GPS?

21   A. It does use GPS, I believe, but I was not

22 involved in that part of the system.

23   Q. What part of the system did you work on?

24   A. I was trying to use camera features such as

25 lane lines and such to help with localization.

```
 1      Q.  And in simple or ordinary language, can you
 2  please describe for us what "localization" means.
 3      A.  Back then, one of the strategies to do
 4  autonomous driving was to build a map up front with
 5  precise locations of obstacles.  And then when the
 6  car needs to drive the road, it localizes itself in
 7  the map so that used precise location of the car and
 8  its heading in a prebuilt map.  And now that you
 9  have a map and you know the location of the car on
10  the map, you can then also know the location of the
11  obstacles with respect to the car, and that helps
12  the car navigate around the scene while avoiding
13  obstacles.
14      ███████████████████████████████████████
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24      Q.  Give me one moment.
25          Okay.  I'm going to show you what was
```

 1 previously marked as Exhibit 152.

 2   Hold on.

 3   MR. BRANIGAN: It's either not working, or

 4 it's a picture of all of us.

 5   MR. McDEVITT: No, I'm -- it was giving --

 6 only giving me the option to, like, show the screen

 7 that we were already looking at. So I was trying to

 8 change that.

 9   MR. BRANIGAN: There we go.

10   MR. McDEVITT: Okay. Are you able to see

11 Exhibit 152?

12   MR. BRANIGAN: It's very, very small.

13   MR. McDEVITT: Is that any better?

14   THE WITNESS: That's better, but I can only

15 see parts of it.

16 BY MR. McDEVITT:

17   Q. Okay. Do you see this exhibit says

18 "Upgrading Autopilot: Seeing the World in Radar"?

19   A. I can read that here.

20   Q. Okay. Do you see it's dated September 11th,

21 2016?

22   A. I see that.

23   Q. Are you familiar with this blog post?

24   A. I don't recall this blog post.

25   Q. Okay. I'm going to show you -- on the

```
 1   second page, the last sentence refers to a geocoded

 2   whitelist.

 3          Do you see that?

 4          MR. BRANIGAN:  Can you see it okay?

 5          THE WITNESS:  Yes, I can see it.

 6          MR. BRANIGAN:  All right.

 7   BY MR. McDEVITT:

 8   ███████████████████████████████████████████████

     ███████████████████████████████████████████████

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12     Q.   Okay.  And let me just pause for a moment.

13          So for Autopilot, through today, there is

14   Hardware 1, Hardware 2, Hardware 2.5, and

15   Hardware 3.0 in terms of production vehicles;

16   correct?

17     A.   That is correct.

18     Q.   And Hardware 1, that Autopilot system used

19   components by Mobileye; correct?

20     A.   Yes.

21     Q.   And did Hardware 2 -- as far as you

22   understand it, was that the first version that -- of

23   Autopilot that utilized Tesla's in-house design?

24     A.   Yes.

25     Q.   And what's your understanding of the
```

1 difference between Hardware 2.0 and Hardware 2.5?

2   A. I believe the hardware had one more GPU in

3 it. And then secondly, the camera modules had some

4 differences in the Bayer pattern.

5   Q. I'm sorry. The last two words you said, the

6 what pattern?

7   A. Cameras have a thing called "Bayer pattern."

8 That's how they register color and brightness.

9 There were some differences. I believe the

10 Hardware 2 cameras had a red, clear, clear, clear

11 pixel arrangement, but the Hardware 2.5 had a red,

12 clear, clear, green arrangement.

13   Q. Okay. Now shifting to Hardware 2.0, with

14 hardware 2.0, did Autopilot at any point in time

15 utilize the strategy of having map data and

16 localizing the vehicle as part of the scheme for

17 Autopilot to work?

18   A. Will you please repeat the question?

19   Q. Yes.

20   So you mentioned your work at Volkswagen

21 having to do with localizing a vehicle within a

22 predefined map; correct?

23   A. Is your question did I work on localization

24 with respect to a map at Volkswagen?

25   Q. For now, yes, that's the question.

1   A.   Yes.

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1   Q.   And you understand "hw-2" to refer to

2   Hardware 2?

3   A.   Yes.

4   Q.   And tell us what Autosteer is.

5   A.   Autosteer is part of the Autopilot feature

6   set where, when turned on, the car would stay within

7   the lanes.

8   Q.   What is the difference between Autosteer and

9   the feature called "ALC," or automatic lane change?

10   A.   I think there is --

11   MR. BRANIGAN: Let me just object to the

12 overly broad nature of the question.

13   But go ahead.

14   THE WITNESS: Yeah, my understanding is

15 Autosteer is referring to the auto's functionality,

16 and automatic lane change is part of it.   Auto --

17 when turned on, Autosteer tries to keep the car

18 inside the lane, and automatic lane change triggers

19 when the driver puts on their blinkers to request a

20 lane change, and then the car attempts to complete

21 the lane change.

22 BY MR. McDEVITT:

23   Q.   Okay.   And there's -- in addition to

24 automatic lane change, there is a functionality

25 called "uncommanded lane change"; correct?

1   A.   Yes, that's correct.

2   Q.   Or also referred to as "ULC"? True?

3   A.   Yes, that's correct.

4   Q.   Describe the difference between automatic

5   lane change and uncommanded lane change.

6   A.   The automatic lane change, the driver

7   presses the blinker stalk to request a lane change

8   to the left or the right. And then once requested,

9   the system would then -- when it thinks it's

10 appropriate, plans the lane change maneuver and

11 executes it.

12   In the ULC case, the system can trigger such

13 lane changes based on some conditions and then can

14 automatically execute that lane change as well. It

15 does require -- I believe the software does require

16 the driver to be hands-on or sometimes confirm such

17 requests.

18   Q.   Okay. And with respect to the uncommanded

19 lane change, depending on what market you're in or

20 depending on what time period we are referring to,

21 the vehicle may or may not require the driver to

22 acknowledge and confirm the lane change that the

23 vehicle is about to perform; correct?

24   A.   The question was too long. I am not able to

25 follow. Could you please repeat?

1   Q.   Okay. So for the uncommanded lane change,

2   initially when that was introduced, before the Tesla

3   would change lanes, the driver had to acknowledge or

4   confirm that the driver was okay each time the Tesla

5   was going to prompt its own lane change; right?

6   A.   Yes.

7   Q.   Then there has been a period of time where

8   the uncommanded lane change feature will

9   automatically function, meaning that it will

10   initiate a blinker activity and move the vehicle

11   over without any input from the driver. True?

12   A.   In the Navigate on Autopilot feature set, it

13   still requires hands-on. So the -- they don't need

14   to confirm, but they need to have their hands on the

15   steering wheel. At least that's my understanding.

16   I'm not sure what the current cointegration is.

17   Q.   Now, going back to Exhibit 183 -- well,

18   actually, let me ask you a few more questions about

19   Autosteer.

20   In the -- in certain versions of the Tesla

21   manual, it describes Autosteer the following way:

22   Autosteer intelligently keeps a Tesla in its driving

23   lane when cruising at a set speed.

24   Is that an accurate description of

25   Autosteer?

1   A.   Yeah, I think so.

2   Q.   Another description of Autosteer indicates

3   that Autosteer detects lane markings and the

4   presence of vehicle objects to steer a Tesla.

5   Is that an accurate description of

6   Autosteer?

7   A.   One could say so.

8   Q.   Okay. In terms of Autopilot, the most basic

9   Autopilot is a combination of Traffic-Aware Cruise

10 Control and Autosteer; correct?

11   A.   I think so.

12   Q.   And Traffic-Aware Cruise Control will

13 automatically accelerate or brake in response to

14 traffic moving in front of the Tesla?

15   A.   Yes.

16   Q.   And then Autosteer -- you described

17 Autosteer will keep the Tesla -- or the objective of

18 Autosteer is to keep the Tesla within the lane that

19 the Tesla was in at the time that the driver

20 activated Autosteer; correct?

21   A.   That's what it tries to do.

22   Q.   Okay. And now getting back to Exhibit 183,

23 the ticket says:

24   "Autosteer pulls towards almost every exit."

25   Do you see that?

1   A.   Yes.

2   Q.   And do you see under the "Watchers" field,

3   you are listed as one of the watchers?

4   A.   Yes.

5   Q.   Okay. And that means that when the

6   ticket -- the Jira ticket was created, you would be

7   one of the people to receive an email indicating

8   that the ticket had been created; correct?

9   A.   I think so.

10   Q.   That also means that whenever a person would

11   add a comment, you would receive an email with the

12   text of the content -- the comment; correct?

13   A.   I think it's possible. I do not have -- I

14   do not know what setting I have for the

15   notifications for the ticket.

16   Q.   Okay. Fair enough.

17   With respect to Autosteer, the -- let me

18   back up.

19   So we talked about the uncommanded lane

20   change feature, and with the uncommanded lane

21   change, am I correct that one of the functionalities

22   includes the Tesla leaving the lane that it is in to

23   go off to take an exit?

24   A.   Yeah, if the navigation route suggests that

25   some exit must be taken, I believe it tries to take

1 that exit off the highway.

2   (Stenographer requests clarification.)

3   THE WITNESS: Tries to take that exit off

4 the highway.

5 BY MR. McDEVITT:

6   Q. Before Navigate on Autopilot was released to

7 the public, there were no occasions where Autosteer

8 was designed to leave the freeway by taking an exit;

9 correct?

10   A. Before Navigate on Autopilot, there was no

11 intent to follow some kind of navigation route. So

12 it might not intentionally choose some exit to

13 follow the route.

14   Q. Okay. But if we're just -- let's just focus

15 on Autosteer. If you're -- if we're talking about

16 Autosteer, if there's no automatic lane change

17 initiated and there's no uncommanded lane change

18 initiated, Autosteer is intended to remain in a

19 single lane of travel; correct?

20   A. Autosteer generally attempts to stay in the

21 lane.

22   Q. Okay. And from the Autopilot software

23 development side, to the extent the team learned of

24 instances where Autosteer did not stay within the

25 lane, the team would create tickets to flag that

 1   activity; correct?

 2   A. Generally, yes.

 3   Q. And one of the reasons that the Autopilot

 4   software team would create a ticket to flag

 5   scenarios where Autosteer would leave the original

 6   travel lane was because it was a potential safety

 7   issue; correct?

 8   MR. BRANIGAN: Objection to the form.

 9   THE WITNESS: I don't think so.

10   MR. BRANIGAN: Incomplete hypothetical.

11   BY MR. McDEVITT:

12   Q. So is it your understanding that the

13   Autopilot software team never created tickets to

14   flag instances where Autosteer left the lane out of

15   concern for safety?

16   MR. BRANIGAN: Objection. Overly broad.

17   Lack of foundation.

18   THE WITNESS: I cannot comment on whether it

19   was created for safety or not.

20   BY MR. McDEVITT:

21   Q. Okay. During your time working at Tesla,

22   have you recognized that if Autosteer controls the

23   steering of the Tesla in a way that takes the Tesla

24   out of the lane it's in, that creates a potential

25   safety issue?

1   MR. BRANIGAN: Objection. Form. Incomplete

2   hypothetical.

3   THE WITNESS: It depends on the situation.

4   That is normal answer for this question.

5   BY MR. McDEVITT:

6   Q. Well, you recognize that there are

7   situations where if Autosteer controls the steering

8   of the Tesla out of the lane the vehicle's in, that

9   can result in a crash. True?

10   MR. BRANIGAN: Same objection. Vague.

11 Incomplete hypothetical.

12   THE WITNESS: Again, it depends on the

13 situation.

14 BY MR. McDEVITT:

15   Q. Okay. And I understand it depends on the

16 situation, but you -- during your time with Tesla,

17 you've recognized that there are instances where if

18 Autosteer controls the steering of the Tesla out of

19 the lane it's in, that can cause a crash; right?

20   A. The --

21   MR. BRANIGAN: Same objections.

22   THE WITNESS: My understanding is that if

23 the driver was paying attention and watching the

24 road, I do not believe there is any safety concern.

25   ///

 1   BY MR. McDEVITT:

 2   Q. And has that been your mentality the entire

 3   time that you've worked at Tesla?

 4   A. Yes.

 5   Q. That you have not felt there's a need for a

 6   safety concern upon learning that Autosteer

 7   controlled a Tesla vehicle out of the lane it was in

 8   because you've always assumed that the driver will

 9   always be able to take over; correct?

10   MR. BRANIGAN: Objection. Form. Incomplete

11   hypothetical. Also misstates the witness's prior

12   testimony.

13   THE WITNESS: The system is designed to stay

14   within the limits of steering and braking. Any

15   attention-paying human should be able to override

16   the system with ease and then drive the car safely.

17   BY MR. McDEVITT:

18   Q. Is there anybody on the Autopilot team that

19   is a human factors engineer?

20   A. I do not know.

21   Q. During your time with Tesla, have you ever

22   received any training on the topic of

23   perception-reaction time?

24   A. I do not recall.

25   Q. Do you have any familiarity with the concept

 1   of perception-reaction time?

 2   A.   I would have to guess what those words mean.

 3   Q.   Well, when you've worked at Autopilot -- or

 4   worked at Tesla on Autopilot, have you had in mind

 5   the notion that humans have some sort of lag time in

 6   processing visual information?

 7   A.   I am not the person who is studying human --

 8   whatever time you alluded to. I am a software

 9   engineer on the team.

10   Q.   Okay. Well, my question to you, though, has

11   any -- have you ever been a part of any discussions

12   at Tesla where there has been an acknowledgment that

13   humans have a lag time in processing visual

14   information?

15   MR. BRANIGAN: Objection. Overly broad.

16   THE WITNESS: I do not recall either way.

17   BY MR. McDEVITT:

18   Q.   With respect to Autopilot and Autosteer, has

19   Tesla ever had a documented set of functional

20   specifications for Autosteer?

21   A.   I do not know what that means.

22   Q.   Have you ever heard of the phrasing

23   "behavioral competencies"?

24   A.   Not to my recollection.

25   Q.   During your time with Tesla, have you ever

1 reviewed a document that's called "Automated Driving

2 Systems, a Vision for Safety"?

3   A. I do not recall.

4   Q. Let me just show you it on the screen so

5 that you can take a look at the cover and see if

6 that refreshes your recollection.

7   Okay. Do you see what's displayed as

8 Exhibit -- it's Exhibit 111 from the deposition of

9 Chris Payne on September 29th, 2021. Do you see the

10 cover page there?

11   A. Yes.

12   Q. Have you ever seen that document?

13   A. I don't think so.

14   Q. Have you ever been at a meeting at Tesla

15 where this document was reviewed?

16   A. I don't recall.

17   Q. Have you ever heard any of your colleagues

18 at Tesla refer to this document, Exhibit 111?

19   A. I do not recall.

20   Q. Were you aware that the -- or strike that.

21   Do you know what NHTSA is?

22   A. Yes.

23   Q. Were you aware that the NHTSA generated

24 guidance for the automotive industry on design best

25 practices for the testing and safe deployment of

 1   automated driving technologies?

 2   MR. BRANIGAN: Objection. Form. Also to

 3   the extent it misstates the intention of NHTSA.

 4   THE WITNESS: I do not recall reading this

 5   document.

 6   BY MR. McDEVITT:

 7   Q. Okay. And I'll address the objection. So

 8   I'm going to -- I'm going to PDF page 4 which is

 9   internal document page ii.

10   Do you see the paragraph that starts with

11   "In this document"? I've just highlighted it.

12   MR. BRANIGAN: It would be helpful if you

13   could enlarge it.

14   MR. McDEVITT: Sure.

15   MR. BRANIGAN: It's very small. Please.

16   That's better.

17   THE WITNESS: I see what you have

18   highlighted here.

19   BY MR. McDEVITT:

20   Q. Okay. Do you see that it says:

21   "In this document, NHTSA offers a

22   nonregulatory approach to automated vehicle

23   technology safety"?

24   Do you see that language?

25   A. Yes.

1   Q.   And then the next sentence says:

2   "Section 1: Voluntary Guidance for

3   Automated Driving Systems (Volunteer Guidance)

4   supports the automotive industry and other key

5   stakeholders as they consider and design best

6   practices for the testing and safe deployment of

7   Automated Driving Systems"?

8   Do you see that?

9   A.   I see that.

10   Q.   Have you ever heard anybody at Tesla ever

11   refer to this document?

12   A.   I don't recall.

13   Q.   Okay. Now I'm going to PDF page 7, document

14   page number 1. I'm going to direct you to the

15   second paragraph. The second sentence refers to

16   this -- this voluntary guidance document. It says:

17   "It updates the Federal Automated Vehicles

18   Policy released in September 2016 and serves as

19   NHTSA's current operating guidance for ADSs."

20   Do you see that?

21   A.   I see that wording.

22   Q.   During your time at Tesla, have you ever

23   been aware that the NHTSA has issued operating

24   guidance for automated driving systems?

25   MR. BRANIGAN: Let me just object to the

1 form of the question because I think it

2 mischaracterizes the scope of the document.

3   But go ahead.

4   THE WITNESS: I do not recall either way.

5 BY MR. McDEVITT:

6   Q. On the -- there's a text -- or there's a box

7 within this particular page that has the heading of

8 "NHTSA's Mission."

9   Do you see that?

10   A. Yes.

11   Q. It says:

12   "Save lives, prevent injuries, and reduce

13 economic costs due to road traffic crashes, through

14 education, research, safety standards, and

15 enforcement activity."

16   Prior to me reading that to you, were you

17 aware that that was NHTSA's mission?

18   A. I don't think so.

19   Q. Have you ever become familiar with 12

20 priority safety design elements where -- that were

21 generated by the NHTSA for automated driving

22 systems?

23   A. I do not recall.

24   Q. What is an operational design domain?

25   A. I do not know.

1   Q.   During your time at Tesla, have you ever

2   heard anybody within the Tesla Autopilot software

3   team refer to an operational design domain?

4   A.   I've heard those words before, but I do not

5   recall much more than that.

6   Q.   During your time with Tesla, have you ever

7   seen a document that sets forth an operational

8   design domain for Autosteer?

9   A.   I do not recall.

10   Q.   As you sit here today, do you know of any

11   document that sets forth an operational design

12   domain for Autosteer?

13   A.   I do not know.

14   Q.   During your time with Tesla, have you ever

15   seen a document that sets forth an operational

16   design domain for Autopilot?

17   A.   I do not know.

18   Q.   As you sit here today, do you know of any

19   document that describes an operational design domain

20   for Autopilot?

21   A.   I do not know.

22   Q.   And I'm going to -- let me go back to that

23   document, and I'm going to ask some follow-up

24   questions just to see if perhaps the wording is

25   different.

1   So I'm going to page -- PDF page 12, and it

2   says -- there's a -- heading "2," says "Operational

3   Design Domain," and I'm going to direct your

4   attention to the -- oops, excuse me -- the sentence

5   that starts with "The ODD."

6   Do you see that?

7   A. Yes.

8   Q. I've highlighted it. Okay. And I'm going

9   to just read it into the record:

10   "The ODD is the definition of where (such as

11   what roadway types and speeds) and when (under what

12   conditions such as day/night, weather limits, etc.)

13   an ADS is designed to operate."

14   So let me just have you focus on that

15   sentence. Okay?

16   A. Yes.

17   Q. Are you aware of any document within Tesla

18   that describes the -- or where and when Autosteer is

19   designed to operate?

20   A. I do not know whether the document exists or

21   not.

22   Q. Have you ever learned that the Tesla

23   Autopilot software team made a decision about where

24   and when Autosteer is designed to operate?

25   MR. BRANIGAN: Objection. Form. Overly

1   broad.

2   THE WITNESS: I do not know.

3   BY MR. McDEVITT:

4   Q. Okay. Now I'm going to direct you to the

5   right-hand column of the document. The top sentence

6   starts with:

7   "The ODD would include the following

8   information at a minimum to define each ADS's

9   capabilities limits/boundaries."

10   Do you see that?

11   A. I see the --

12   Q. Okay.

13   A. -- that reference.

14   Q. And the first bullet point is "Roadway types

15 on which the ADS is intended to operate safely."

16   Do you see that?

17   A. Yes.

18   Q. Has Tesla defined the roadway types where

19 Autosteer is intended to operate safely?

20   A. Will you please repeat the question?

21   Q. Yes.

22   Has Tesla identified roadway types on which

23 Autosteer is intended to operate safely?

24   A. What do you mean by "identify"?

25   Q. Like, in other words, has Tesla said, "Well,

1   Autosteer is intended to operate safely on freeways

2   or highways separated by a median barrier but is" --

3   "you know, rural streets within, you know,

4   neighborhoods are outside the operational design

5   domain"? Anything like that?

6   A.   There are some activation conditions for

7   Autopilot, such as presence of lane lines, or there

8   are a few more conditions. I don't recall all the

9   conditions. So Autopilot's only available in such

10 conditions.

11   Q.   Are there roadway types on which Autosteer

12 is intended to operate safely?

13   MR. BRANIGAN: Sorry, Andrew. Can you

14 repeat that question one more time?

15   MR. McDEVITT: Yes.

16 BY MR. McDEVITT:

17   Q.   Are there roadway types on which Autosteer

18 is intended to operate safely?

19   A.   I'm thinking about it, but I can't -- I

20 don't know for sure if there are any such

21 restrictions or not in the software.

22   Q.   As you understand it as the director of

23 Autopilot software, is Autosteer intended to operate

24 safely on freeways?

25   MR. BRANIGAN: Objection to form with

1   respect to the timing. Do you mean at the time of

2   the subject crash or anytime?

3   MR. McDEVITT: I'm going to ask both.

4   BY MR. McDEVITT:

5   Q. Let me just start with: As you understand

6   it as the director of Autopilot software, has

7   Autosteer ever been intended to operate safely on

8   freeways?

9   A. Autopilot and specifically Autosteer is

10 generally designed to keep the car within the lane,

11 and it is -- the production version of the Autopilot

12 software has some conditions for enabling it. And

13 then once enabled, it does its best to stay within

14 those lanes.

15   Q. Okay. But my question is a little bit

16 different. Is Autosteer -- or has Autosteer ever

17 been intended to operate safely on freeways?

18   A. If used appropriately, it should operate

19 safely everywhere.

20   Q. Okay. Is there a speed range for Autosteer?

21   A. I believe there's a max speed.

22   Q. Is that -- the max speed currently 90 smile

23 an hour?

24   A. On some software configurations it's

25 90 miles per hour. On some others, it's 85 miles

 1   per hour. But throughout the Autopilot development

 2   period, there have been different top speed limits.

 3   Q. Okay. The -- I'm going to -- are there any

 4   constraints that Tesla has identified and documented

 5   for the operation of Autosteer?

 6   MR. BRANIGAN: Objection. Overly broad.

 7   Vague.

 8   THE WITNESS: At what time point?

 9   BY MR. McDEVITT:

10   Q. Well, let's focus on the first six months of

11   2018. Were there constraints that Tesla internally

12   identified for the operation of Autosteer?

13   A. As I mentioned earlier, the system would

14   only present itself upon some conditions. So you

15   could call that as constraints to the system.

16   Q. During the year 2018, was Autosteer intended

17   to operate safely on freeways?

18   A. Yes.

19   Q. Now I'm going to go back to the document.

20   So the paragraph -- the second paragraph on this

21   particular page says:

22   "An ADS should be able to operate safely

23   within the ODD for which it is designed."

24   Do you see that?

25   A. Yes.

1   Q.   And at Tesla, was that the policy

2   internally, that the Autopilot features should be

3   able to operate safely within the design domain for

4   which they were designed?

5   A.   From the beginning, the philosophy for

6   Autopilot has been it is a safe system for anyone

7   who is using the system appropriately.

8   Q.   Okay. Well, do you agree that there -- with

9   respect to Autopilot, when an Autosteer is

10   activated, the Tesla is in control of the

11   acceleration, braking, and steering of the Tesla;

12   correct?

13   A.   When activated, Autopilot can control those

14   three axis but within limits.

15   Q.   Did you say those three axis, a-x-i-s?

16   A.   Yes.

17   Q.   Okay.

18   A.   What I mean was the steering, braking, and

19   acceleration.

20   Q.   And within, Tesla Autosteer is identified as

21   what's called an "active feature"; correct?

22   A.   Yes.

23   Q.   And an active feature means that it takes

24   over control of the vehicle. True?

25   A.   "Active" means it can control the car, as

```
1    opposed to "passive," where the car has no control.
2         Q.  Okay.  At Tesla, when the -- when referring
3    to an active feature, that's a feature that take --
4    those are features that take control over the
5    vehicle; correct?
6         A.  I'm not sure what you mean by "take
7    control."  It can change steering action or the
8    braking or acceleration.
9         Q.  Let me just -- I'm going to refer you to --
10   oops, wrong one.  Let me show you Exhibit 71 in this
11   case to -- this was marked as Exhibit 71 to the
12   deposition of Mr. Shroff, and then it was also 71 to
13   the deposition of Mr. Payne.
14   ███████████████████████████████████████
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1　[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

18　　　Q.　So it's 11:30.　So I don't know how much

19　time of a -- or how long of a break do you need?

20　　　A.　Maybe like five or ten minutes.

21　　　　MR. BRANIGAN:　Why don't we take ten

22　minutes.

23　　　　MR. McDEVITT:　Okay.

24　　　　THE VIDEOGRAPHER:　We are off the record.

25　The time is 11:29 a.m. Pacific Time.

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 1              (Break taken from 11:29 a.m. to 11:42 a.m.)
 2              THE VIDEOGRAPHER:  We are back on the
 3    record.  The time is 11:42 a.m. Pacific Time.
 4    BY MR. McDEVITT:
 5         Q.  Mr. Elluswamy, have you heard Elon Musk
 6    refer to the prime directive for Autopilot?
 7         A.  Yes.
 8         Q.  Tell us your understanding of what the prime
 9    directive is.
10         A.  The prime directive is to not collide.
11         Q.  Okay.  So the prime directive for Autopilot
12    is for -- well, strike that.
13              So we discussed when Autopilot is activated
14    it can control both steering and -- well, strike
15    that.
16              When Autopilot's activated, it can control
17    steering, braking, and acceleration; correct?
18         A.  Yes.
19         Q.  The prime directive for Autopilot is for
20    Autopilot to not accelerate or steer in a manner
21    that results in the Tesla colliding with either an
22    object or a person; correct?
23         A.  That is the objective.
24         Q.  When did you first hear Elon Musk identify
25    that as the prime directive?
```

1   A.   I don't recall when.

2   Q.   Is it your recollection that Elon Musk

3   developed that prime directive for Autopilot after

4   the fatal crash involving Joshua Brown?

5   A.   That is not my understanding.

6   Q.   Okay. Is it your recollection or belief

7   that Elon Musk always had the prime directive for

8   Autopilot to be not to collide with people or

9   objects, even before the fatal crash involving

10   Joshua Brown?

11   A.   Yeah, that's roughly my understanding. From

12   the beginning, it's always been: Try not to crash.

13   Q.   Have you also heard Elon Musk refer to the

14   prime directive as, quote, do not smash?

15   A.   Yeah. There's a few ways to phrase that,

16   yes.

17   Q.   What are the other ways that you've heard

18   Elon Musk refer to the prime directive besides "do

19   not collide," "do not smash"?

20   A.   "Do not crash."

21   Q.   Okay. And you've understood that when

22   Elon Musk said that, what he meant was that he

23   didn't want the Autopilot system to steer the Tesla

24   onto a path that would result in it colliding with a

25   person, vehicle, or object. True?

1   A.   I believe the intent was to build a system

2   that would, you know, try its best to avoid all

3   collisions.

4   Q.   Okay. But when Elon Musk said that, the

5   prime directive, he didn't say, "Try your best to

6   make the vehicle not collide."

7   He said, "The prime directive is for the

8   vehicle to not collide with people, objects, or

9   vehicles when Autopilot has control of the Tesla."

10 True?

11   A.   Elon said prime directive was do not crash.

12   Q.   And, again, you understood that when

13 Elon Musk said the prime directive for Autopilot was

14 do not crash, he meant that he doesn't want auto --

15 the Autopilot system to steer the Tesla onto a path

16 that would result in it colliding with a person,

17 vehicle, or object. True?

18   A.   That's what one would infer, I guess. It's

19 English. That's what he said: Autopilot should not

20 crash.

21   Q.   Okay. And as the director of Autopilot

22 software, have you become aware of Tesla maintaining

23 data regarding instances in which a Tesla crashed

24 while Autopilot was activated?

25   A.   Will you please repeat the question?

1   Q. Yes.

2   You're aware, I presume, that Tesla has

3   maintained data tracking instances in which a Tesla

4   vehicle was involved in a crash while Autopilot is

5   activated. True?

6   A. Yes.

7   Q. And is it your understanding that there are

8   several hundred instances in which a Tesla vehicle

9   has been involved in a crash while Autopilot is

10 activated?

11   MR. BRANIGAN: Objection. Form. Vague.

12   THE WITNESS: Your question is -- don't have

13 years of time ranges, and I'm not aware of the exact

14 count right now.

15 BY MR. McDEVITT:

16   Q. Okay. But regardless of you being aware of

17 the precise number, you do understand that there

18 have been several hundred instances in which a Tesla

19 vehicle has been involved in a crash while Autopilot

20 is activated. True?

21   MR. BRANIGAN: Same objection.

22   THE WITNESS: Again, I do not recall the

23 number, whether it was several hundreds or tens. I

24 know there have been crashes. I just do not know

25 the range of the numbers.

```
1    BY MR. McDEVITT:

2        Q.   Okay.  Did you -- did you learn within the

3    last month of the NHTSA publishing information about

4    the number of crashes that were reported by Tesla in

5    which Autopilot was activated?

6        A.   I recall the document came out.

7        Q.   Okay.  And am I correct you understood that

8    the NHTSA published information indicating 270-plus

9    reported crashes of Tesla vehicles in which

10   Autopilot was activated at the time?  True?

11       A.   If that's what -- if that's the number on

12   the document, then that -- you know, that's the

13   number.  And I think the document also presents all

14   data where Autopilot was active within 30 seconds

15   prior to crash.  So Autopilot may or may not have

16   been active at the time of the crash.

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7   (Stenographer requests clarification.)

8   BY MR. McDEVITT:

9   Q. Within the Autopilot software team, does the

10   team believe that whenever there is no hands-on

11   detection signal, that means the driver's not paying

12   attention?

13   MR. BRANIGAN: Objection. Form. Incomplete

14   hypothetical.

15   THE WITNESS: The hands-on system checks in

16   with the driver based on some frequency as to

17   whether the driver is available or not, and,

18   further, it requests some kind of hands on the

19   wheel.

20   BY MR. McDEVITT:

21   Q. So for Tesla vehicles, in terms of driver

22   monitoring, the way that is performed within Tesla

23   is by a steering wheel torque signal; correct?

24   A. Yeah. For many of the configurations, yeah,

25   that's how it's done.

1   Q. And there have been instances or time
2 periods where the Autopilot engineers have discussed
3 or considered using the in-car camera as a way to
4 monitor whether the driver is attentive; correct?
5   A. Yes.
6   Q. Within the Autopilot software engineering
7 team, there is recognition that the steering wheel
8 torque method of evaluating a driver's attention is
9 flawed. True?
10   MR. BRANIGAN: Objection. Form. Overly
11 broad. Vague.
12   THE WITNESS: I do not think so.
13 BY MR. McDEVITT:
14   Q. Okay. So your belief is that the Autopilot
15 software engineering team has not identified any
16 flaws in using the steering wheel torque method to
17 evaluate a driver's attention?
18   MR. BRANIGAN: Same objections.
19   THE WITNESS: Will you please you repeat the
20 question?
21 BY MR. McDEVITT:
22   Q. Yes.
23   Is it your belief that the Autopilot
24 software engineering team has not identified any
25 flaws in using the steering wheel torque method to

1 evaluate a driver's attention?

2   MR. BRANIGAN: Same objection.

3   THE WITNESS: My belief is that the hands-on

4 system is a sufficient system to do nominal checks

5 that the driver is present.

6 BY MR. McDEVITT:

7   Q. Okay. My question was slightly different.

8 My question was: Is it your belief that the

9 Autopilot software engineering team has not

10 identified any flaws in using the steering wheel

11 torque method to evaluate a driver's attention?

12   MR. BRANIGAN: Same objection. Overly

13 broad. Vague.

14   THE WITNESS: I'm not aware of any flaws

15 that indicate.

16 BY MR. McDEVITT:

17   Q. Isn't it true that there's been points in

18 time where engineers at Tesla have said the torque

19 method really doesn't work very well?

20   A. I'm not aware of the statements.

21   Q. And with respect to the torque method of

22 evaluating driver attention, am I correct that the

23 engineers recognize that the absence of a torque

24 signal doesn't even mean that the driver doesn't

25 have his or her hands on the wheel?

1   MR. BRANIGAN: Objection. Form. Overly

2   broad. Lack of foundation.

3   THE WITNESS: The test of whether the torque

4   is present or not is precisely what it is. The

5   system requests some amount of torque be placed on

6   the wheel. And if that was not present when

7   requested or after a while, then that's -- for some

8   reason the torque was not present, and if you don't

9   request it for some time, then, you know, we would

10 not measure that. But it's a trade-off between how

11 annoying the automatic system because if you always

12 request the torque, then it may be too much and too

13 tedious. But if you request too little, then you

14 are checking in on the driver less frequently.

15   So we try to strike this balance between not

16 to be extremely annoying and nagging as opposed to

17 being extremely lenient, so that we try to strike

18 that balance in general.

19 BY MR. McDEVITT:

20   Q. And there's -- there was at least one point

21 in time when Tesla changed the frequency with which

22 it had auto -- or had the vehicle check for torque

23 based on Elon Musk receiving a tweet from a

24 customer; correct?

25   A. I don't --

1   MR. BRANIGAN: Objection. Lack of

2   foundation. If you know.

3   THE WITNESS: I'm not aware of the tweet.

4   BY MR. McDEVITT:

5   Q. Okay. You don't have any recollection of a

6   customer tweeting that they were annoyed with how

7   many or how often they were asked to input torque on

8   the wheel and Elon Musk responding that he would

9   make a change to that?

10   MR. BRANIGAN: Objection. Form. Lack of

11   foundation. Also object to the extent it

12   mischaracterizes the statements of the people

13   referred to.

14   THE WITNESS: I do not recall such incident.

15   BY MR. McDEVITT:

16   Q. Has Elon Musk ever provided direction to the

17   Autopilot team regarding how often the system should

18   check for a torque signal?

19   A. He has provided some direction, yes.

20   (Stenographer requests clarification.)

21   BY MR. McDEVITT:

22   Q. Okay. Tell us about the instances in which

23   he has provided direction to the team on that.

24   A. I only vaguely recall the discussions. I do

25   not precisely know the numbers nor the times when

1 those are happening. I recall that there were some

2 discussions, and he had some inputs on this.

3   Q. Okay. And when you say "some inputs on

4 this," you mean Elon Musk has provided some

5 direction on how often the Autopilot system should

6 be checking for the presence of torque on the

7 steering wheel?

8   A. To my understanding, yes. And it's also not

9 just how often, also when, because sometimes it can

10 be contextual on to when to present this.

11   Q. Okay. And one example of that would be when

12 the system is about to initiate an uncommanded lane

13 change, Autopilot in that period of time will

14 want -- will perform a check to see if there's a

15 torque on the wheel; correct?

16   A. Yeah. Exactly.

17   Q. With respect to the steering wheel torque as

18 the hands-on detection, the presence of a torque on

19 the wheel doesn't actually mean necessarily that the

20 driver has his or her hands on the wheel; right?

21   A. So any such system that is known to what we

22 would call as position recall, that's, like, a

23 scientific term where you -- if your question is, is

24 it possible to fool the system, yes, it's possible

25 to fool the system.

1   Q. Okay. And, for example, if you put a banana

2   at the corner of the steering wheel, that could

3   supply enough torque on the wheel for the Autopilot

4   system to believe a driver had his or her hands on

5   the wheel; right?

6   MR. BRANIGAN: Objection. Vague. Lack of

7   foundation.

8   THE WITNESS: We have to perform the test,

9   but it's -- like I said, if your question is, is it

10 possible to fool the system, yes, it's possible to

11 fool the system.

12 BY MR. McDEVITT:

13   Q. Okay. And because of that, that means that

14 when a torque is detected, that doesn't necessarily

15 mean the driver has his or her hands on the wheel;

16 correct?

17   MR. BRANIGAN: Objection. Form. Incomplete

18 hypothetical.

19   THE WITNESS: It is possible to fool the

20 system. So, yes, you can do something to trick the

21 system into thinking that you're paying attention

22 when you're not paying attention.

23 BY MR. McDEVITT:

24   Q. Okay. And with respect to the inverse of

25 that, the absence of a steering wheel torque signal

1 does not mean that the driver does not have his or

2 her hands on the wheel; correct?

3   MR. BRANIGAN: Same objection. Vague.

4 Incomplete hypothetical.

5   Go ahead.

6   THE WITNESS: I don't think the opposite is

7 true because we request for some hands-on, and the

8 user is not acknowledging it for a while. It does

9 not mean that they are somewhat placing their hands

10 on the wheel.

11 BY MR. McDEVITT:

12   Q. And I'm distinguishing between responding to

13 a prompt to have your hands on the wheel and just

14 the torque signal for now. So let me ask a new

15 question.

16   The -- the existence of a signal -- steering

17 wheel torque signal, the fact that there is a signal

18 there, that doesn't mean that the driver has his or

19 her hands on the wheel -- or strike that. Let me

20 start over.

21   When there is no torque signal on the

22 steering wheel, the absence of that torque signal

23 doesn't mean that the driver doesn't have his or her

24 hands off the wheel. True?

25   MR. BRANIGAN: Objection. Form. Vague.

 1   Incomplete hypothetical.

 2   THE WITNESS: Will you please repeat the

 3   question?

 4   BY MR. McDEVITT:

 5   Q. Yeah. The absence of a torque signal on the

 6   steering wheel does not necessarily mean that the

 7   driver doesn't have his or her hands on the wheel.

 8   True?

 9   MR. BRANIGAN: Same objections.

10   THE WITNESS: I mean, the pedantic

11   definition would be that this absence of torque, it

12   just means that there is no torque. So one could

13   infer that as -- you know, that is the actual

14   information to the objective of it. And why there

15   was lack of torque is -- if that's your question,

16   I'm not able to -- you know, there's any reason why

17   there could be a lack of torque, including one of

18   the reasons being that the hands -- they're not

19   applying torque. So the hands could be on but not

20   applying torque or, you know, they -- their hands

21   would be off and not applying torque.

22   BY MR. McDEVITT:

23   Q. Okay. And, actually, just following up on

24   your comment, the absence of torque -- you're

25   accurate. That just means that there's no torque

1 being applied; correct?

2   A. Yes.

3   Q. Okay. So you could actually have your hand

4 on the steering wheel and be gripping as hard as you

5 possibly could grip, but if you aren't applying

6 torque, the Autopilot would infer that there's no

7 hand on the wheel; correct?

8   A. My understanding is that the prompt is to

9 apply torque on the wheel. And when the Autopilot

10 requests for the -- the driver present, it is the

11 torque that it requests. So the driver must

12 acknowledge with torque.

13   Q. Okay. But just to be clear, the way that

14 Autopilot evaluates whether a driver has his or her

15 hands on the wheel is by looking to see is there a

16 torque being applied; correct?

17   A. It asks for the user to apply some torque

18 and checks if the user applies the torque.

19   Q. Okay. And has that always been true?

20   A. To my understanding, yes, but I could be

21 wrong.

22   Q. Okay. And you agree, though, that the

23 absence of a torque signal doesn't actually mean

24 that the driver has his or her hands off the wheel;

25 correct?

1   MR. BRANIGAN: Objection. Form. Vague.

2   Incomplete hypothetical.

3   Go ahead, sir.

4   THE WITNESS: The system requests a torque,

5   and if it does not see the torque, then that is the

6   answer. It request a torque -- it requested a

7   torque, and there was no torque. So, you know,

8   that's -- that is the inference of the subject and

9   nature of it.

10 BY MR. McDEVITT:

11   Q. Okay. So let me break that down. Let's say

12 that in between the instances in which the Autopilot

13 system requests a torque -- let's say that's

14 three -- there's a three-minute time period there.

15   In that three-minute time period, if the

16 system doesn't detect a torque on the wheel, that

17 doesn't mean that the driver doesn't have his or her

18 hands on the wheel; correct?

19   A. It is possible, yes.

20   Q. And the reason that is possible is because

21 there are a number of different ways you could have

22 your hand on the steering wheel but also not be

23 applying enough torque to trigger the signal on the

24 sensor; correct?

25   A. Yes.

1   Q.   Is there currently an Autopilot safety team?

2   A.   What do you mean by "safety team"?

3   Q.   A team within Autopilot that has the

4   designation as the safety team or is responsible for

5   safety.

6   A.   Everyone on the team is working on improving

7   the safety of the car.

8   Q.   Okay. And what I'm -- I guess what I'm

9   wondering is, so my understanding is within the

10 Autopilot software team, there are subteams for

11 Vision or subteams for Controls. What I'm

12 wondering, is there a subteam that is specifically

13 focused on safety?

14   A.   I believe safety is improved by improving

15 the components like you mentioned like Vision and

16 Control. Safety comes from improving those things.

17 And in that sense, yes, all these teams are safety

18 teams.

19   Q.   And I understand that, and I'm not -- I'm

20 not challenging that notion. What I'm wondering is,

21 is there a team that has a title of or designation,

22 this is the safety team?

23   A.   There is a team called "active safety." But

24 other than that, I'm not aware of other teams that

25 are just titled as safety teams.

1   Q.   Okay.   And is -- the active safety team, are

2   they involved in automatic braking,

3   forward-collision warning, lane departure, those

4   things? Or is that something else?

5   A.   My understanding is that that -- the active

6   safety team really provides the regulations and

7   tests the systems for this, but all the development

8   is done by the other team, technician and planning

9   and control, etc.

10   Q.   Who are the people that you know of that are

11   on the active safety team?

12   A.   I believe Suraj was one person.

13   Q.   Do you mind giving us --

14   A.   I don't recall --

15   Q.   Sorry. Do you mind giving a spelling for

16   the court reporter?

17   A.   Yes. It's -- first name is Suraj,

18   S-u-r-a-j.

19   Q.   The last name?

20   A.   It's Nagaraj. I do not know the spelling.

21   It starts with an N.

22   Q.   Since you've become the -- or since you've

23   acquired the title director for Autopilot safety, do

24   you report to Elon Musk?

25   MR. BRANIGAN: Objection. Did you say since

 1   he acquired the title of Autopilot safety?

 2   MR. McDEVITT: Director. I'm sorry. You're

 3   right. I totally misspoke. So let me ask a new

 4   question.

 5   MR. BRANIGAN: Maybe he gave you a

 6   promotion.

 7   MR. McDEVITT: I did. You're promoted.

 8   BY MR. McDEVITT:

 9   Q. Okay. So since becoming director of

10   Autopilot software, have you reported to Elon Musk?

11   A. Yes.

12   Q. And who besides yourself on the Autopilot

13   software team reports directly to Elon Musk?

14   A. Milan Kovac and Andrej Exhibit 115A.

15   Q. Have you ever presented at a Tesla AI Day?

16   A. Yes.

17   Q. How many times?

18   A. There has only been one AI Day. So it's

19   just that one instance.

20   Q. Have you presented at any other -- well,

21   strike that.

22   So there's AI Day. My understanding is

23   there's, like, a Battery Day.

24   Is that true?

25   A. I believe there was a Battery Day.

1   Q.   Are there any other regular annual Tesla

2   days where there's a presentation to the public?

3   A.   I'm not sure if it's regular. We had a

4   Exhibit 115A back in 2019.

5   Q.   Okay. Did you present at the Autonomy Day?

6   A.   I did not.

7   Q.   Okay. You worked at Tesla during the year

8   2016; correct?

9   A.   Yes.

10   Q.   And in terms of the -- do you have an

11 office, a physical office, that you would go to?

12   A.   Yes.

13   Q.   Where was that located?

14   A.   3500 Deer Creek Road, Palo Alto.

15   Q.   So I'm going to pause here and show you what

16 was previously marked as Exhibit 113 during the

17 deposition of Mr. Payne. Give me a second to just

18 pull it up.

19   Hold on. Let me -- I've got to change the

20 setting here.

21   Are you able to see what I'm showing on the

22 screen right now?

23   A.   Yes, I see it.

24   Q.   And you see that I paused at one second into

25 Exhibit 113, there's text displayed that says "The

1 person in the driver's seat is only there for legal

2 reasons. He is not doing anything. The car is

3 driving itself."

4   Do you see that?

5   A. Yes, I see that.

6   Q. And from this -- just seeing this alone, do

7 you know what video this is?

8   A. I think this was the Autonomy Day video.

9   Q. Let me hit play. I'll see if --

10   (Video playing.)

11 BY MR. McDEVITT:

12   Q. Let me pause there. I know it was a just a

13 few moments, but do you recognize the person that is

14 in the driver's seat of the vehicle?

15   A. Yes.

16   Q. Who is that?

17   A. I believe that was David Nister.

18   (Stenographer requests clarification.)

19 BY MR. McDEVITT:

20   Q. Does Mr. Nister work at Tesla anymore?

21   A. He does not.

22   Q. Okay. I presume now, by seeing this much of

23 the video, you know the video that -- you recognize

24 this video; right?

25   A. Yes.

1   Q.   And were you involved in any way in the

2   creation of this video?

3   A.   Yes.

4   Q.   And what was your role?

5   A.   I was an engineer on the team that helped

6   with this demo video.

7   Q.   Is it true that for this demo video the

8   route or a part of the route that was traveled by

9   the vehicle in the video was 3-D mapped beforehand?

10   A.   Yes.

11   Q.   Was that done using LIDAR?

12   A.   No.

13   Q.   How was it 3-D mapped before?

14   A.   Using the cameras and other sensors too.

15   Q.   And am I correct that in connection with the

16 effort to create this video, the Tesla that was used

17 in the video actually crashed?

18   A.   Yes.

19   Q.   Where did it crash?

20   A.   Into a fence inside our parking lot.

21   Q.   Is that the -- is the -- the crash shown in

22 any of the videos that were put on Tesla's website?

23   A.   I'm not aware of.

24   Q.   Okay. And as far as you know, when Tesla

25 released this video, they didn't put any disclaimer

1 in the video indicating that the vehicle actually

2 crashed during the process of creating the video;

3 right?

4   A.   I do not believe it crashed in this specific

5 video, but during the development, it crashed

6 before.

7   Q.   Okay. And let me just hit play here for a

8 second.

9   (Video playing.)

10 BY MR. McDEVITT:

11   Q.   You agree that at this moment the driver is

12 not holding on to the steering wheel; correct?

13   A.   I can't see the bottom of the video because

14 of the Teams thing. I can try to move it, but . . .

15   Yeah, if you say that person is not holding

16 the wheel, then I believe you, yeah.

17   (Video playing.)

18 BY MR. McDEVITT:

19   Q.   Was the -- or was Elon Musk involved in the

20 creation of this video in any way?

21   A.   In some ways.

22   Q.   And describe how he was involved.

23   A.   He asked for a demonstration of the system's

24 capabilities.

25   Q.   And did he specifically ask for the team to

1   generate a video that showed the Tesla driving by

2   itself?

3   A.   I do not recall the exact ask from him.

4   Q.   Did Elon Musk know that the team had to 3-D

5   map the route that the vehicle took before it drove?

6   A.   I do not know if he knew or not.

7   Q.   Did the Autopilot team give Elon Musk the

8   impression that the Tesla was able to navigate the

9   route without 3-D mapping that was done beforehand?

10   A.   I do not recall the specifics of what was

11 communicated to him.

12   Q.   Okay. Do you recall any communications

13 amongst the engineers that there was a decision to

14 conceal information from Elon Musk about how the

15 demonstration was created?

16   MR. BRANIGAN: Objection. Form.

17 Foundation. Also object to the extent it

18 mischaracterizes or misstates statements by others.

19   THE WITNESS: I am not aware of any such

20 plans to conceal information.

21 BY MR. McDEVITT:

22   Q.   Okay. So as far as you knew, nobody on the

23 Autopilot team was part of a conspiracy to trick

24 Elon Musk into thinking that the Tesla in the video

25 that's marked as Exhibit 113 was able to perform the

 1 drive without having 3-D mapping of the route in

 2 advance; right?

 3   MR. BRANIGAN: Objection. Form.

 4 Foundation.

 5   THE WITNESS: Will you please repeat the

 6 question?

 7 BY MR. McDEVITT:

 8   Q. Yes.

 9   So as far as you know, nobody on the

10 Autopilot team developed a conspiracy to trick

11 Elon Musk into thinking the video that's marked as

12 Exhibit 113 was generated without the help of

13 advanced 3-D mapping; right?

14   MR. BRANIGAN: Objection. Form.

15 Foundation.

16   THE WITNESS: I'm not aware of any

17 conspiracy to hide this.

18 BY MR. McDEVITT:

19   Q. Okay. Do you have any reason to think that

20 Elon Musk did not know that the route traveled by

21 the vehicle in Exhibit 113 was 3-D mapped ahead of

22 time?

23   MR. BRANIGAN: Objection. Form. Calls for

24 speculation.

25   THE WITNESS: I do not know what he thought.

1   BY MR. McDEVITT:

2   Q.   Okay.   No, but I mean, do you have a reason

3   to think -- either from conversations where he

4   commented or any interactions that you had, do you

5   have any reason to think that Elon Musk was unaware

6   that the route the vehicle in Exhibit 113 traveled

7   was 3-D mapped?

8   MR. BRANIGAN: Same objections.   Form.

9   Calls for speculation.

10   THE WITNESS: I'm not able to -- I do not

11 recall what he knew or asked.

12 BY MR. McDEVITT:

13   Q.   Okay.   And what I mean by that is, you know,

14 at some point after this video was generated, did

15 Elon say, "Well, hey, the video shows that the car's

16 able to navigate from this location to the office

17 without any issue.   Why" -- "why isn't full

18 self-driving feature complete at this point?"

19   MR. BRANIGAN: Same objections.

20   THE WITNESS: I'm not sure what -- I mean,

21 because 2016, so it's been six years since this

22 video; so I don't recall what unfolded afterwards.

23 BY MR. McDEVITT:

24   Q.   How many different attempts did it take in

25 order to create Exhibit 113?

1   A.   I do not know.

2   Q.   It didn't -- you weren't -- the team was not

3   able to generate the video in a single take; right?

4   A.   Yeah, we went through a development process

5   where we were trying to get a good demonstration.

6   Q.   Okay. So my statement was accurate, that

7   the video that's marked as Exhibit 113 was not

8   generated in a single take. True?

9   A.   If you define "single take" as a single

10 consistent video, then it is a single take in the

11 sense that it is not stitched together, but it

12 required some iteration get to a point where when

13 the entire drive would be zero intervention.

14   Q.   I'm sorry. I may just have misunderstood

15 your answer. So I apologize.

16   A.   Usually a single take --

17   Q.   Were you asking me a question, or were

18 you -- I couldn't tell if you answered the question.

19 I apologize.

20   A.   Usually a single take means that the video

21 is continuous and it's not stitched together. My

22 understanding is that this video is continuous, and

23 it's not stitched together. In that sense, it is

24 single take, but it was not the first iteration. It

25 required a few iterations to get this.

1   Q.   And isn't it true that during the various

2   attempts to generate the video, there were instances

3   in which the person sitting in the seat had to

4   intervene?

5   A.   Yes.

6   Q.   And were there also instances where the

7   vehicle itself just disengaged as a part of

8   fail-safe?

9   A.   I do not recall the specifics.

10   Q.   Okay. But you do know that, during the

11   effort to create Exhibit 113, there were attempts to

12   create the video where the driver actually had to

13   take control of the steering wheel. True?

14   A.   Yes.

15   Q.   Okay. So now I'm going to show you

16   Exhibit 113 again.

17   (Video playing.)

18   BY MR. McDEVITT:

19   Q.   Let me pause that. I'm pausing it at 38

20   seconds into Exhibit 113.

21   What was the starting point for the video?

22   Was it a particular individual's house, or where was

23   it?

24   A.   Somewhere in Menlo Park. I don't recall

25   whose house it was.

1   Q.   Okay.   Does Exhibit 13 [sic] accurately

2   reflect the capabilities of Autopilot as of

3   November 2016?

4   MR. BRANIGAN: Objection.   Form.   Vague.

5   THE WITNESS: I believe the intent of the

6   video was to showcase the potential of the system.

7   BY MR. McDEVITT:

8   Q.   Okay.   So given that it is showcasing the

9   potential of the system, it -- Exhibit 113 should

10 not be interpreted as accurately portraying the

11 performance capabilities of Autopilot that -- at the

12 time; right?

13   MR. BRANIGAN: Objection.   Form.

14 Mischaracterizes the witness's testimony.

15   THE WITNESS: Like I mentioned earlier, the

16 objective of the video was to demonstrate the

17 potential of what was capable of the system.   That

18 was the intent.

19   (Stenographer requests clarification.)

20 BY MR. McDEVITT:

21   Q.   Okay.   So my question is a little bit

22 different.   My question is actually:

23   Does Exhibit 113 accurately portray the

24 performance capabilities of the version of Autopilot

25 that was released to the public at the time?

1   MR. BRANIGAN: Same objections.

2   THE WITNESS: The intent of the video was --

3   the intent of the video was not to accurately

4   portray what was available for customers in 2016.

5   It was to portray what was possible to build the

6   system.

7   BY MR. McDEVITT:

8   Q. Okay. So I just -- I just want to be clear.

9   You agree that Exhibit 113 does not accurately

10   portray the performance capabilities of the version

11   of Autopilot that was released to the public at the

12   time. True?

13   MR. BRANIGAN: Objection. Form.

14   Mischaracterizes the witness's prior testimony.

15   Repetitive. Asked and answered.

16   Go ahead, sir.

17   THE WITNESS: The intent of the video was to

18   portray its capabilities, and that's what it tries

19   to do. So in that sense, yes, it was not trying to

20   portray what was -- what was the then state of

21   Autopilot.

22   BY MR. McDEVITT:

23   Q. Okay. And the reason I'm asking the

24   follow-up question is you're inserting the qualifier

25   intent of the video and what the -- what you're

 1   trying to do, and my question is a little bit

 2   different.

 3   So my question is:

 4   Does Exhibit 13 [sic] accurately portray the

 5   performance capabilities of the version of Autopilot

 6   that was released to the public at the time?

 7   A. It does not.

 8   (Video playing.)

 9   BY MR. McDEVITT:

10   Q. All right. Okay. So now I'm pausing it at

11   52 seconds into Exhibit 113. There's a little bit

12   better light in this frame. You can see that the

13   driver is not holding the steering wheel; correct?

14   A. Yeah.

15   Q. Did you ever ride along in the Tesla vehicle

16   for any of the efforts to create the video footage?

17   A. Yes.

18   Q. And were you in the vehicle at the time this

19   particular video was captured?

20   A. I don't recall.

21   Q. When you did the ride-alongs, did you sit in

22   the back seat?

23   A. Yes.

24   Q. Okay. So when -- earlier when you told us

25   there were attempts where the driver had to

1   intervene, you actually observed that there were

2   attempts where the driver actually had to take over

3   the steering wheel; right?

4   A. Yes.

5   Q. Did you ever sit in the steering wheel

6   during an attempt to create this video?

7   MR. BRANIGAN: You mean the driver's seat?

8   MR. McDEVITT: No. I meant within the air

9   bag. Yes. Sorry. I messed up.

10 BY MR. McDEVITT:

11   Q. Did you ever sit in the driver's seat during

12 an attempt to create the video that is marked as

13 Exhibit 113?

14   A. I do not recall whether I was driving or

15 not.

16   Q. Okay. Who else besides yourself and the

17 individual you already identified participated in

18 the effort to create the video?

19   A. Mostly all of our team were involved in

20 this.

21   Q. Okay. And with respect to how the Autopilot

22 in the video was operating when the video was

23 created, how did that differ from the then-released

24 version of Autopilot, how it operated?

25   A. The demo was specific to some predetermined

1   route; whereas, Autopilot tries to understand the

2   scene around it and drive the car.

3   Q.   Okay. The -- one of the fundamental

4   concepts of Autopilot is for the vehicle to be able

5   to navigate a situation based on Vision inputs

6   alone; right?

7   MR. BRANIGAN: Objection. Form.

8   THE WITNESS: Generally the design intent is

9   to use camera information to drive the car, yes.

10 BY MR. McDEVITT:

11   Q.   Okay. But for the -- what we see in

12 Exhibit 113, in addition to having the camera

13 information, the Autopilot system had a 3-D mapped

14 route that it could use to navigate. True?

15   MR. BRANIGAN: Objection. Asked and

16 answered. Form.

17   Go ahead.

18   THE WITNESS: In this video, it was using

19 additional premapped information to drive, yes.

20   MR. BRANIGAN: Andrew, are we getting to a

21 point where we can take a short break?

22   MR. McDEVITT: Yeah. I'm just going to try

23 to get through the end of this video. I mean, we

24 came back on at 11:40; so we haven't been going an

25 hour. But, yeah, I -- we can take a break after

1   this.

2   MR. BRANIGAN: Okay.

3   (Video playing.)

4   BY MR. McDEVITT:

5   Q. Okay. So now going back to this video,

6   this -- do you agree the video just showed the Tesla

7   vehicle recognizing a red light at the stoplight --

8   or at a traffic light and stopping for the traffic

9   light without any driver input; right?

10   A. That's what the video shows.

11   Q. And the released version of Autopilot as of

12 November 2016 did not have that capability. True?

13   A. In 2016, there was no traffic-light-handling

14 capability.

15   Q. Okay. And we just saw from the last few

16 seconds -- I just paused it, one minute and eight

17 second -- the Tesla in the video recognizes that the

18 traffic light has changed from red to green and

19 accelerates without any driver input; correct?

20   MR. BRANIGAN: Objection. Form.

21   THE WITNESS: I mean, the video shows that

22 the car goes on green.

23 BY MR. McDEVITT:

24   Q. And the video shows that the driver -- there

25 was no driver input. In other words, the Autopilot

 1 is doing that; correct?

 2   MR. BRANIGAN: Same objection. Form.

 3 Foundation.

 4   THE WITNESS: The video shows that there is

 5 no driver input.

 6 BY MR. McDEVITT:

 7   Q. Okay. And the production version of

 8 Autopilot as of November 2016 did not have the

 9 capability to accelerate in response to a traffic

10 light changing from red to green. True?

11   A. Yes, it did not.

12   Q. Okay.

13   MR. BRANIGAN: Hey, Andrew, I've got to take

14 a break for a minute. My phone's ringing.

15   MR. McDEVITT: Okay. Well, I mean, I'd like

16 to get through this exhibit here.

17   MR. BRANIGAN: Yeah, I understand. Could we

18 just take two minutes here so I can get rid of this?

19   MR. McDEVITT: Okay. I mean, we can just go

20 off the record for a second, if you want to do that.

21   MR. BRANIGAN: Yeah. Hang on.

22   THE VIDEOGRAPHER: We are off the record.

23 The time is 12:36 p.m. Pacific Time.

24   (Break taken from 12:36 p.m. to 12:41 p.m.)

25   THE VIDEOGRAPHER: We are back on the

 1   record. The time is 12:41 p.m. Pacific Time.

 2   BY MR. McDEVITT:

 3   Q. Okay. I'm going to jump back a second here

 4   in Exhibit 113. I'm going to play from 1:04, and

 5   then I'm going to pause. So hitting play now.

 6   (Video playing.)

 7   BY MR. McDEVITT:

 8   Q. Okay. So from 1:04 to 1:05 in the video,

 9   the -- we see that the traffic light changes to

10   green, and then the view that is presented on the

11   video shifts to the left forward vehicle camera;

12   correct?

13   MR. BRANIGAN: Let me just object to the

14   form of the question. The witness has already told

15   you that this is a video that doesn't --

16   MR. McDEVITT: Tom, can you not make a

17   speaking objection? You can -- just make an

18   objection.

19   MR. BRANIGAN: I am, if you would let me

20   finish.

21   MR. McDEVITT: Well, I don't want you to

22   coach the witness by saying what he is and hasn't

23   done. Just --

24   MR. BRANIGAN: The witness --

25   MR. McDEVITT: -- make it a legal objection.

1   MR. BRANIGAN: We can ask the witness to

2   leave the room. The witness doesn't need to be

3   coached by me. He's already told you that this

4   video doesn't depict what was actually on the road,

5   and so we object to the form of the questioning

6   about this video.

7   MR. McDEVITT: Okay.

8   (Video playing.)

9   BY MR. McDEVITT:

10   Q. All right. So from 1:04 to 1:05, in the

11   video we see the light change from red to green, and

12   then the view of the video changes.

13   Do you see that?

14   A. The left video camera, yes.

15   Q. Okay. Now, did the Autopilot actually

16   accelerate for the green light in this video, or did

17   the driver do the acceleration?

18   MR. BRANIGAN: Same objections. Objection

19   to form. The question's misleading and

20   argumentative, given what the witness has already

21   told you about this video.

22   THE WITNESS: The video shows that the

23   driver -- I can't actually see the bottom of the

24   video because of the Teams bar. But if you say that

25   the driver was not pressing the accelerator, then

1 the system must have accelerated.

2 BY MR. McDEVITT:

3   Q. Okay. And actually what we see is when the

4 light turns green, the view of the video changes

5 when the vehicle accelerates.

6   And so what I'm asking you is, during these

7 trial runs, did the Autopilot actually react to red

8 and green lights, or did the person sitting in the

9 driver's seat do the acceleration and braking?

10   MR. BRANIGAN: Objection. Form. Lack of

11 foundation.

12   THE WITNESS: I do not recall to what extent

13 the traffic controls were integral into the system.

14 BY MR. McDEVITT:

15   Q. In the video, was any of the acceleration or

16 braking done by the person in the driver's seat?

17   MR. BRANIGAN: Same objection. Form. Lack

18 of foundation.

19   THE WITNESS: I do not recall.

20 BY MR. McDEVITT:

21   Q. Okay. Is it your recollection that in

22 November 2016 the team had already developed the

23 neural network such that it was capable of

24 responding to red and green lights?

25   A. I do not recall what neural networks was

 1 running the car in 2016.

 2   Q. Okay. And separate from that question, do

 3 you believe that in November 2016 any version,

 4 development or otherwise, of Autopilot had been

 5 developed to the point that it had the capability to

 6 detect red and green traffic lights?

 7   MR. BRANIGAN: Objection. Lack of

 8 foundation.

 9   THE WITNESS: My vague recollection is there

10 were some neural networks that detected traffic

11 lights and signs.

12 BY MR. McDEVITT:

13   Q. Okay. So I'm scrubbing forward in this

14 video to 1:39.

15   (Video playing.)

16 BY MR. McDEVITT:

17   Q. From 1:39 to 1:52 of the video that's marked

18 as Exhibit 113, that shows Autopilot taking a

19 freeway exit and steering the vehicle up to a stop

20 sign and coming to a stop for the stop sign. True?

21   MR. BRANIGAN: Objection. Form.

22 Misleading. Argumentative, based on the witness's

23 prior testimony about the video.

24   THE WITNESS: That is what this video shows.

25   ///

1   BY MR. McDEVITT:

2   Q.   Okay. And the -- as of November 2016, the

3   publicly released versions of Autopilot were not

4   capable of bringing the vehicle -- the Tesla vehicle

5   to a stop in response to a stop sign. True?

6   A.   I do not think so.

7   Q.   And from one -- up through 1:59 in the

8   video, we see the Tesla accelerating from a stop,

9   going across lanes of traffic to make a left turn,

10   and get into a travel lane. True?

11   A.   That's what the video shows.

12   Q.   And the production release version of

13   Autopilot at the time in November 2016 did not have

14   that capability. True?

15   A.   True.

16   (Video playing.)

17   BY MR. McDEVITT:

18   Q.   I'm pausing at two minutes and 17 seconds

19   into Exhibit 113. Do you recognize the location

20   shown in this frame?

21   A.   Yes.

22   Q.   What is this?

23   A.   This is the entrance to 3500 Deer Creek

24   Road.

25   Q.   And within this particular frame at two

1 minutes 17 seconds into Exhibit 113, can we see the

2 wall or whatever it was that the Tesla vehicle

3 crashed into during one of the efforts to create

4 this video?

5   MR. BRANIGAN: Objection. Form.

6   THE WITNESS: Yes.

7 BY MR. McDEVITT:

8   Q. Where is it?

9   A. It's near the main road, that fence.

10   Q. Okay. So did the vehicle actually go up

11 onto the curb and hit the fence?

12   A. It was turning around the bend in the

13 parking lot, and it -- I think it -- yeah, at the

14 time, it was sideswiping the fence.

15   Q. Okay. So in one of the attempts to create

16 this video, am I correct that the Tesla vehicle

17 drove up over a curb, through the bushes, and hit a

18 fence?

19   A. I'm not so sure about the curb or the bush.

20 I do know about the fence.

21   Q. Okay. So the Tesla vehicle, in an effort to

22 create this video, did drive into bushes and hit a

23 fence?

24   MR. BRANIGAN: Objection. Form.

25 Repetitive. Asked and answered.

1   THE WITNESS: Like I mentioned earlier, I do

2   not recall the curb or the bushes. I recall that it

3   hit the fence on the side.

4   BY MR. McDEVITT:

5   Q. Okay. And actually, I apologize. There's a

6   chain-link fence that extends from the red curb line

7   that's, in this portion of the video, about 5 or

8   6 feet in front of the Tesla; correct?

9   A. If you're asking me what is shown in the

10 video, then, I mean, that's what's shown in the

11 video.

12   Q. Yeah, and I'm just trying to identify the

13 fence so that I can -- so that we're referring to

14 the same thing. I didn't know if you were referring

15 to what I'm motioning over now, which is like a

16 wood --

17   A. Yeah, it's not that one. It's the one

18 inside the parking lot.

19   Q. Okay. So there's a chain-link fence; right?

20   A. Yeah.

21   Q. And in this frame, two minutes 17 into

22 Exhibit 113, there -- it appears that in one section

23 of the chain-link fence, you can see, like, a red

24 rectangular sign affixed to the fence; is that true?

25   A. Yes.

1   Q.   I'm going to scroll forward here -- scrub

2   forward.

3   (Video playing.)

4   BY MR. McDEVITT:

5   Q.   At two minutes 32 seconds into Exhibit 113,

6   the video shows the driver getting out of the Tesla;

7   right?

8   A.   Yes.

9   Q.   And then at two minutes 35 seconds into

10 Exhibit 113, there's no person sitting in the

11 driver's seat of the Tesla vehicle as it begins to

12 move forward?

13   A.   Yes.

14   Q.   Okay. And at two minutes 30 -- or 41

15 seconds into the video, there's an aerial overhead

16 of the blue Model X that is -- has its controls

17 being operated by Autopilot; correct?

18   MR. BRANIGAN: Same objection. Form.

19 Misleading. Argumentative, based on the witness's

20 prior statement about the video.

21   THE WITNESS: To my recollection, there is

22 no driver in the car when the car is driving around

23 this parking lot.

24 BY MR. McDEVITT:

25   Q.   Okay. And is it during this -- this

1 maneuver that we see here -- I'm pausing at 2:41.

2   Was it during the attempt to video this

3 maneuver that the Tesla vehicle crashed into a

4 fence?

5   A. I think so.

6   Q. Okay. So nobody was actually in the car at

7 the time; right? Or in the driver's seat, rather.

8   A. Yeah. I don't think there was anyone in the

9 driver's seat.

10   Q. Who was in the -- was anybody in the vehicle

11 when it crashed?

12   A. It's possible someone -- someone was in the

13 back. I don't recall whether someone was or not.

14   Q. Did the Autopilot team bring it to Elon

15 Musk's attention that there was a crash during an

16 effort to create the video that's marked as

17 Exhibit 113?

18   MR. BRANIGAN: Objection. Form. Lack of

19 foundation.

20   THE WITNESS: I don't recall.

21 BY MR. McDEVITT:

22   Q. Okay. The vehicle that crashed had to be

23 repaired; right?

24   MR. BRANIGAN: Objection. Lack of

25 foundation.

1   THE WITNESS: Possible.

2   BY MR. McDEVITT:

3   Q. Was the vehicle that crashed the same blue

4   Model X that we see in Exhibit 113?

5   A. I don't recall.

6   (Video playing.)

7   BY MR. McDEVITT:

8   Q. Okay. Then now at two minutes 43 seconds,

9   this part of the video shows the blue Model X

10 navigating through the parking lot with nobody in

11 the driver's seat; right?

12   A. Yeah.

13   Q. Is there any -- has there ever been any

14 released version of Autopilot that allowed the Tesla

15 to drive without somebody in the driver's seat?

16   A. There are some features, like Summon, that

17 allow for the car to be moved without someone inside

18 the driver's seat.

19   Q. Okay. But Smart Summon and Summon, both of

20 those features require the person that's using the

21 app to be within a certain distance of the vehicle;

22 correct?

23   A. I believe so.

24   Q. Neither of those features would allow a

25 person to go into a building and ignore the vehicle

1 as the vehicle parked itself; correct?

2   A. The design is to have the driver close to

3 the car.

4   Q. Okay. So to the extent Exhibit 113 shows

5 the driver going into a building and ignoring the

6 vehicle while the vehicle parked itself, there has

7 never been a released version of Autopilot that

8 allowed that; right?

9   MR. BRANIGAN: Objection. Form.

10 Foundation.

11   THE WITNESS: As we mentioned earlier, the

12 Summon feature is the only one where the driver may

13 not be inside the vehicle, and that requires the

14 driver to be somewhat close to the car. The exact

15 specifics, I don't recall how close or far.

16   (Video playing.)

17 BY MR. McDEVITT:

18   Q. Okay. And I'm now pausing at two minutes 44

19 seconds into the video. On the -- toward the

20 left-hand side of the video, we can see a chain-link

21 fence. Is that the fence that the Tesla crashed

22 into?

23   MR. BRANIGAN: Objection. Form.

24   THE WITNESS: I think so.

25   ///

1   MR. McDEVITT: All right. So why don't we

2   take a break here for -- for lunch. How long do you

3   guys want to take?

4   MS. MILLER: 30 minutes.

5   MR. BRANIGAN: 30 minutes okay?

6   THE WITNESS: Yeah, 30 minutes okay.

7   MS. MILLER: 45 to --

8   MR. BRANIGAN: Why don't we say 40 minutes.

9   I don't even know if our lunch is here.

10   MS. MILLER: It is.

11   MR. BRANIGAN: Okay. Why don't we -- why

12   don't we say 40 minutes, Andrew.

13   MR. McDEVITT: Oh, Tom, are you there?

14   MR. BRANIGAN: Yeah.

15   MR. McDEVITT: Your background is so

16   realistic. I thought you were somewhere else.

17   MR. BRANIGAN: That's actually a picture of

18   my office in Detroit.

19   MR. McDEVITT: Okay. So --

20   THE VIDEOGRAPHER: Off the record?

21   MR. McDEVITT: -- why don't we come back --

22   why don't we shoot for -- want to shoot for 1:30?

23   MR. BRANIGAN: Yeah, 1:30, 1:35ish.

24   MR. McDEVITT: Okay. All right. See you.

25   THE VIDEOGRAPHER: We are off the record.

1 The time is 12:56 p.m. Pacific Time.

2   (Luncheon recess from 12:56 p.m. to

3   1:41 p.m.)

4   THE VIDEOGRAPHER: We are back on the

5 record. The time is 1:41 p.m. Pacific Time.

6 BY MR. McDEVITT:

7   Q. Okay. Mr. Elluswamy, I just have a few more

8 questions about the video that we were going through

9 that was marked as Exhibit 113. After that -- the

10 video was created, am I correct that the video was

11 reviewed with Elon Musk?

12   MR. BRANIGAN: Objection. Lack of

13 foundation.

14   THE WITNESS: I don't recall.

15 BY MR. McDEVITT:

16   Q. Who's -- who made the decision to publish

17 the video that was marked as Exhibit 113 on Tesla's

18 website?

19   MR. BRANIGAN: Same objection. Lack of

20 foundation.

21   THE WITNESS: I do not know.

22 BY MR. McDEVITT:

23   Q. Do you believe that the Autopilot software

24 team decided to publish that video on the website

25 without Elon Musk's approval?

1   MR. BRANIGAN: Same objection. Lack of

2   foundation. Calls for speculation.

3   THE WITNESS: I do not know.

4   BY MR. McDEVITT:

5   Q. Okay. Am I correct that, from your

6   experience working at Tesla, that video,

7   Exhibit 113, would not have been published on

8   Tesla's website without Elon Musk's approval? True?

9   MR. BRANIGAN: Same objection. Lack of

10 foundation. Calls for speculation.

11   THE WITNESS: I would not be able to

12 comment.

13 BY MR. McDEVITT:

14   Q. You indicated that Elon Musk was one -- was

15 -- had asked for the video to be created; right?

16   A. That is my understanding.

17   Q. Okay. So am I correct that your

18 understanding is that Elon Musk reviewed the end

19 product that the team generated?

20   MR. BRANIGAN: Objection. Form. Lack of

21 foundation. Calls for speculation.

22   THE WITNESS: Like I mentioned earlier, I do

23 not know if he reviewed or not -- if he did not

24 review.

25   ///

1   BY MR. McDEVITT:

2   Q.   I'm sorry?

3   A.   As mentioned earlier, I do not know if he

4   reviewed or he did not review.

5   Q.   Okay. And that video, Exhibit 113,

6   that's -- remains on Tesla's website today; correct?

7   A.   I'd have to check.

8   MR. BRANIGAN: Objection. Lack of

9   foundation.

10   (Exhibit Number 180, Screenshot of Web Page

11   for Self-Driving Video, was marked for

12   identification.)

13 BY MR. McDEVITT:

14   Q.   Let me show you Exhibit 180. Okay. Do you

15 see Exhibit 180?

16   A.   Yeah.

17   Q.   Do you see it's dated Novem- -- there's a --

18 it says "Videos," and then under "Tesla Self-Driving

19 Demonstration," it says "November 18, 2016."

20   Do you see that?

21   A.   Yes.

22   Q.   And then in the bottom left, we see

23 "Tesla Motors ©2016"?

24   A.   Yes.

25   Q.   Okay. And then if we go to the next page,

1 you see it says "Tesla 2022"?

2   A. Yeah.

3   Q. Okay. So at no point, as far as you are

4 aware, has the video been removed from Tesla's

5 website; correct?

6   MR. BRANIGAN: Objection. Form. Lack of

7 foundation. Asked and answered.

8   THE WITNESS: Yeah, I believe

9 (indiscernible) --

10   (Stenographer requests clarification.)

11   THE WITNESS: I see the same dates that

12 Mr. McDevitt pointed out, and I have not checked the

13 website rigorously to know whether it was -- it's

14 always been there or not.

15 BY MR. McDEVITT:

16   Q. Okay. You recognize the -- the format of

17 the first page of Exhibit 180 to be the format

18 layout of Tesla's website; right?

19   A. Roughly.

20   Q. All right. And then for page 2 of

21 Exhibit 180, you recognize this to be the format and

22 layout of Tesla's website?

23   A. I believe so.

24   Q. Okay. And there's a section of the Tesla

25 website that has videos. There's a button where you

1 can look at videos. True?

2   A. If you say so. I haven't, you know, tried

3 myself, but I can believe you.

4   Q. Okay. I'm going to show you now -- before I

5 do that, you have a LinkedIn page; correct?

6   A. Yes.

7   Q. And you've added information to your

8 LinkedIn profile at various different times?

9   A. Yes.

10   (Exhibit Number 178, LinkedIn Profile of

11   Ashok Elluswamy, was marked for identification.)

12 BY MR. McDEVITT:

13   Q. Let me show you -- okay. Do you see this is

14 actually -- this is Exhibit 178. Do you recognize

15 this to be the content of your LinkedIn page?

16   A. Yeah.

17   Q. And on your LinkedIn page, it says you

18 started as a software engineer for Tesla in

19 January 2014.

20   Is that accurate?

21   A. Yes.

22   Q. And it indicates you were a software

23 engineer from January 2014 through June 2016; is

24 that true?

25   A. Yes.

1   Q.   And during that time you worked on things

2   such as velocity planning and control, automatic

3   lane change, etc., for the first generation

4   Autopilot; is that true?

5   A.   Yes.

6   Q.   When you say "first generation Autopilot,"

7   can you -- are you referring to -- what are you

8   referring to when you say "first generation

9   Autopilot"?

10   A.   The Hardware 1 system.

11   Q.   Okay. So you spent some time working on the

12   Autopilot that was associated with the Mobileye

13   hardware. True?

14   A.   Yes.

15   Q.   Okay. Then you also worked on the second

16   generation of Autopilot; correct?

17   A.   Yes.

18   Q.   And on your LinkedIn, you say: "Worked on

19   various systems needed to ship Tesla's in-house

20   computer vision system, that was developed from

21   scratch, for second generation Autopilot."

22   Is that accurate?

23   A.   Yes.

24   Q.   What is -- when there's references within

25   the Tesla documents to having feature parody between

1 the second generation Autopilot and the Hardware 1,

2 what does that mean?

3   A. Means that the new system needs to have the

4 same level of functionality or similar level of

5 functionality as the previous system that we have

6 shipped.

7   Q. Initially, the second generation of

8 Autopilot, the in-house developed one, had some

9 regressions as compared to the Mobileye version of

10 Autopilot. True?

11   A. Yes.

12   MR. BRANIGAN: Objection. Form.

13 BY MR. McDEVITT:

14   Q. And that was something that Elon Musk

15 announced, that there was going to be a period of

16 time where the in-house Tesla-developed version of

17 Autopilot with the Tesla hardware was not going to

18 perform as well as the Mobileye version; correct?

19   MR. BRANIGAN: Objection to the extent it

20 mischaracterizes the statement of another witness,

21 but go ahead.

22   THE WITNESS: I don't recall the precise

23 wording of what he said.

24 BY MR. McDEVITT:

25   Q. Well, internally within the Tesla Autopilot

 1 software development team, there was an awareness

 2 that moving to the Tesla in-house system with

 3 Tesla-developed hardware initially was going to be a

 4 step backwards as compared to the Mobileye system;

 5 correct?

 6   MR. BRANIGAN: Objection. Form.

 7 Foundation. Calls for speculation.

 8   THE WITNESS: I wouldn't say it was a step

 9 backwards in some soft -- in the software quality

10 step. It's lack of functionality for some amount of

11 time when we ship -- shipped it.

12 BY MR. McDEVITT:

13   Q. Okay. Your LinkedIn also indicates that you

14 became a senior staff software engineer in

15 September 2017.

16   Is that accurate?

17   A. I think I might have skipped a couple steps

18 in between. There was, like, one more level, but I

19 didn't bother to put it in here.

20   Q. Okay. Nevertheless, is it accurate to say

21 that you became a senior staff software engineer in

22 September 2017?

23   A. That's what I'm trying to say. I am not

24 sure if the dates are correct. It might be later.

25   Q. Okay. Understood.

1   The description indicates:

2   "Worked on geometric scene understanding to

3   significantly improve the performance of Autopilot

4   using fleet learning techniques?"

5   Is that an accurate description?

6   A. Yes.

7   Q. What is -- and what does that mean?

8   A. It means that I worked on -- it literally

9   means what it says there.

10   Q. Okay. When you're referring to the fleet,

11   you mean the -- the production versions of

12   Autopilot -- or Tesla vehicles with Autopilot that

13   are owned or operated by customers; right?

14   A. The fleet refers to customer vehicles.

15   Q. Okay. And am I correct that customer

16   vehicles have been a source of feedback for the

17   Autopilot software development team?

18   A. Yes.

19   Q. The customer vehicles have provided a method

20   for Tesla to identify bugs in the Autopilot

21   software. True?

22   MR. BRANIGAN: Objection. Form. Vague.

23   THE WITNESS: We generally study the fleet

24   for data from the fleet, things like harsh braking,

25   harsh steering. We do check those, and that helps

 1 us guide the priorities of what to include next.

 2 BY MR. McDEVITT:

 3   Q. The statement that I just said, though, that

 4 the Tesla customer fleet is one source for Tesla to

 5 identify bugs in Autopilot software, that is a true

 6 statement; correct?

 7   MR. BRANIGAN: Objection. Form. Vague.

 8   THE WITNESS: It's possible that we can find

 9 bugs from the fleet.

10 BY MR. McDEVITT:

11   Q. Well, beyond being possible, you know as a

12 matter of fact that bugs have been developed from

13 information discovered within the Autopilot -- or

14 the Tesla customer fleet; right?

15   MR. BRANIGAN: Same objection. Form.

16 Vague.

17   THE WITNESS: Typically, it's -- you know,

18 it's improvement track, especially bugs that are

19 not -- they are some known -- it's only a bug in a

20 sense that it's some known level of performance that

21 we ship, and every release aims to improve the

22 performance, and we can get feedback from the fleet

23 as to does the improvement -- or if the fleet didn't

24 match our expectation of the performance.

25   ///

1 BY MR. McDEVITT:

2   Q. Well, okay. In addition to utilizing

3 information from the customer fleet to improve the

4 software, the customer fleet also is one source of

5 information for Tesla to identify bugs in the

6 Autopilot software; correct?

7   MR. BRANIGAN: Same objection. Form.

8 Vague.

9   THE WITNESS: It's possible to find bugs,

10 and people -- customers can report bugs to us by,

11 you know, taking screenshots or pressing a clip

12 recording button to report bugs.

13   Whether they're actually bugs or not, you

14 know, the engineers have to triage issue and see,

15 you know, is it actually a bug or is it some --

16 any -- yeah. Or is it general improvement. And

17 majority of the time, it's just some general

18 improvement that needs to happen in what people call

19 as bugs.

20 BY MR. McDEVITT:

21   Q. Autopilot software engineers, including

22 yourself, are amongst the people that test

23 Autopilot. True?

24   A. They can also test their own software, but

25 there's dedicated QA organizations inside Autopilot

1 that test a system, in addition to a lot of

2 automated tests in terms of unit test, open-loop

3 replay test, integration test, closed-loop

4 simulation tests --

5   (Stenographer requests clarification.)

6   THE WITNESS: In addition to the engineers

7 testing themselves, we have a dedicated QA

8 organization that tests the system. Separate from

9 the QA organization, we have a lot of tests defined

10 in software. In the bottom there's a unit test

11 which tests a specific module, and there are

12 indication tests that test a combination of modules.

13 And there are open-loop replay tests that test the

14 system end to end by replaying sensor data that were

15 previously captured to measure the performance.

16   There are also closed-loop simulation tests

17 where we run simulations of real-world scenarios

18 recreated in our simulator world and see how some

19 reacts to that. We have QA track tests where the QA

20 operators take the car to track tests and set up

21 scenarios and test using those. And then there are

22 general driving on real-road situations from the QA

23 org again, and those engineers -- the QA engineers

24 flag issues in addition to developers driving their

25 own software.

1   And then we can do shadow modes at different

2   levels to identify the performance where the system

3   is running in the background and sending telemetry

4   information on how it's performing. And once we are

5   gaining confidence and there's like 8, 9 levels of

6   testing, then we ship the software to customers.

7   And even that is done slow -- gradually. We

8   will ship it to employee customers and be like in

9   the few hundreds and then get telemetry back from

10   them and see if the software is performing as

11   designed. And then even -- only after all of those

12   things are all passed, only then we expand to

13   general customer base.

14   BY MR. McDEVITT:

15   Q. Are you saying that all of the actions that

16   you just described are performed before every single

17   public release version of Autopilot is pushed to the

18   fleet?

19   A. Or any middle release, yes. A couple steps.

20   For example, the -- yeah, shadow mode might not be

21   needed if there's, like, a minor point release that

22   doesn't change anything functionally. Sometimes

23   there can be cosmetic releases. Those ones don't

24   require such extensive variation. But for any

25   important release, we go through the full steps

1 before releasing to customers.

2   Q. Has that always been true, that every time

3 any version of -- released version of Autopilot has

4 been shipped to the public, all the steps that you

5 identified have been completed?

6   A. The tests have been measuring over a large

7 amount time, but generally it has been true. The

8 size of the test sets obviously grow over time. As

9 we get more exposure, more clips, the size of the

10 test sets grow. But it has generally been the same

11 process, just the magnitude to which each step

12 grows -- yeah, it grew over time. It's -- because

13 you can't unveil one, have, you know, 100,000

14 curated clips of difficult situations to test

15 against. You start with, like, a thousand, a few

16 thousand, and slowly when you find more and more

17 test cases, you add them to the test scenarios. And

18 once you document sufficiently, now you have a

19 really big set of test cases to test against. So

20 it's an ever-growing set of test cases.

21   Q. Okay. And real quick, in your prior

22 response -- I just want to make sure the court

23 reporter gets it -- you were saying QA team, not QR

24 team; right?

25   A. QA. Quality assurance.

1   Q.   Okay.   The customer fleet has been one

2   source of the data that's used in the unit test for

3   the Vision.   True?

4   A.   We can use data from the customer fleet to

5   create a test.

6   Q.   And, in fact, Tesla has used data from the

7   customer fleet either when a customer intervened or

8   when the system triggered a "takeover immediately"

9   command to add to its unit test database.   True?

10   A.   Yes.

11   Q.   Getting back to my prior question, the

12   Autopilot software engineers are amongst the people

13   that test the development versions of the Autopilot

14   software; correct?

15   A.   Yes.

16   Q.   Elon Musk is also one of the people that has

17   historically tested the development versions of

18   Autopilot.   True?

19   A.   Yes.

20   Q.   The customers and the customer fleet are

21   also amongst the group that is testing Autopilot;

22   correct?

23   MR. BRANIGAN: Objection.   Form.

24   THE WITNESS: I don't recall them as testing

25   Autopilot.   They are consumers of the software, and

1 we can use data from them to help us improve the

2 system.

3 BY MR. McDEVITT:

4   Q. Can you identify for us -- well, strike

5 that.

6   Before a release candidate is -- for -- an

7 Autopilot release candidate is shipped, the

8 Autopilot engineers maintain a list of known issues

9 and bugs; correct?

10   A. Yeah, before any release, we can identify

11 the list of the issues. And if they are issues that

12 are still acceptable, then we can, yes, have these

13 sorts of issues and then still ship them.

14   Q. Elon Musk, at least during the year 2017 and

15 2018, was provided with a list of outstanding or

16 known issues prior to a release candidate being

17 shipped; right?

18   MR. BRANIGAN: Object to the form.

19 Foundation.

20   THE WITNESS: I'm not --

21   MR. BRANIGAN: Calls for speculation.

22   THE WITNESS: I'm not aware of whether he

23 was shown or not shown in 2017-2018.

24 BY MR. McDEVITT:

25   Q. Okay. There have been periods of time where

1 you know that Elon Musk has been presented with a

2 list of outstanding or known issues associated with

3 Autopilot before a release candidate was shipped to

4 customers; correct?

5   A. In 2020, for example, we are shown the top

6 issues. It's obviously not an exhaustive list of

7 issues, but we are shown some of the top issues

8 before release.

9   Q. And part of the reason for that is because

10 Elon is one of the ultimate decision-makers as to

11 whether a release candidate will be shipped to the

12 customer with the known issues that still remain;

13 correct?

14   MR. BRANIGAN: Objection. Form.

15 Argumentative.

16   THE WITNESS: Sometimes it is to just

17 explain why or, like, to help and time the release

18 as opposed to make a decision on whether to ship

19 with the issue or not, and it's really more for

20 communication as opposed to any other specification.

21 BY MR. McDEVITT:

22   Q. Okay. Well, in addition to sometimes it

23 being for -- you know, for information or for

24 awareness, there have been periods of time where the

25 known outstanding unresolved issues have been sent

1 to Elon Musk that are associated with a release

2 candidate so that he can provide input as to whether

3 it's okay to still ship the version of Autopilot to

4 customers; correct?

5   A.   Typically the process is we show him some of

6 the top issues, and we have recommendations for

7 whether we need more time or if these are acceptable

8 things to be present in the software that is

9 released. We try to ensure that the essentials of

10 safety of the software are always present. We --

11 and we would not release something that is, in a

12 sense, unsafe.

13   And there are -- there can be other cosmetic

14 issues, other issues that are not blocking the

15 release and can be a net safety improvement. And

16 when we believe it's a net safety improvement in the

17 previous release we then take steps to release the

18 software.

19   (Stenographer requests clarification.)

20   THE WITNESS: The general philosophy for any

21 release is to check -- is to test if the net safety

22 of the system is better than the previous release.

23 And when we, internally using our metrics in our

24 tests, believe that the new software is safer in

25 total compared to the previous one, we then release

 1 the software.

 2 BY MR. McDEVITT:

 3   Q. There are issues or -- there can be issues

 4 that are characterized or qualified as release

 5 blockers; right?

 6   A. It's possible, yes.

 7   Q. Explain to us what a release blocker is,

 8 just generally.

 9   A. Release blocker is an issue that must be

10 solved before the release.

11   Q. When you talk about the Autopilot being

12 safer, that does not necessarily mean it is

13 completely free of known bugs. True?

14   MR. BRANIGAN: Objection. Form. Calls for

15 speculation. Lack of foundation.

16   THE WITNESS: Like I mentioned earlier, any

17 software version can improve some aspects of the

18 software, readdress other aspects of the software.

19 We evaluate the net -- the total system performance

20 and then compare that against the previous release.

21 And if the total system performance is better than

22 the previous release, then we are obligated to

23 release it because it's net safer.

24   And some of these release-blocking issues

25 are in the sense that they're -- they make the net

1 lower than the previous release, and that's why they

2 are release blocking. Once these issues are

3 resolved or mitigated in some manner, then the net

4 safety improves, and then we release it.

5 BY MR. McDEVITT:

6   Q. How does the Autopilot safety team evaluate

7 the net safety of a particular release candidate of

8 Autopilot?

9   A. I think I mentioned earlier in the

10 deposition today that there is no such team as a

11 safety team.

12   Q. I'm sorry. I didn't mean to say that. I

13 meant to say --

14   MR. BRANIGAN: Objection to form.

15 BY MR. McDEVITT:

16   Q. Okay. I misspoke. I apologize.

17   How does the Autopilot software team

18 evaluate the net safety of a particular release

19 candidate of Autopilot?

20   A. It's using the test framework that I had

21 explained earlier. There's many tests. There's the

22 open-loop test, simulations, unit test, integration

23 test, QA tests, real-world miles from the QA

24 organization, to whether they inform the overall

25 safety of the product.

1   Q.   One of the ways that the Autopilot software

2   team evaluates the safety of a particular release is

3   by its performance on particular predefined routes

4   or drives; correct?

5   A.   Yes.

6   Q.   And in connection with those predefined

7   routes or drives, there are criteria that the

8   Autopilot software team utilizes to evaluate the

9   performance of Autopilot; correct?

10   A.   Yes.

11   Q.   One example that has been included is

12   Autopilot performance at gores.   True?

13   A.   As part of the Navigator and Autopilot

14   feature set in the end of 2018 or something, we

15   started doing lane changes to follow the route. And

16   as part of that exercise, we expanded the test

17   criteria to include gores.

18   Q.   Okay. So at the beginning of the year 2018

19   through March of 2018, the test criteria you're

20   referring to did not evaluate whether there was,

21   quote/unquote, a gore entry by Autopilot on a

22   particular drive; right?

23   MR. BRANIGAN: Objection. Form.

24   Mischaracterizes the witness's testimony.

25   THE WITNESS: I do not recall when the code

1   metrics were introduced, but I do know they were

2   introduced in the context of the Navigator and

3   Autopilot feature set, which should perform lane

4   changes on the highway and also a time to exit the

5   highway. And all of the cases that it would need to

6   do is lane change from one lane from the right side

7   on the rightmost exit lane, for example, and if that

8   happens too late, then it can intrude into the gore.

9   As part of that feature development, we introduced

10   these metrics to study the lane changes that are

11   happening prior to that or why they're intruding

12   into the gore. But I do not recall the precise

13   timing of when it was introduced.

14   BY MR. McDEVITT:

15   Q. With respect to the test metric relating to

16   gore entry, gore entry in the test metric is

17   considered to be a negative behavior; correct?

18   MR. BRANIGAN: Objection. Form. Incomplete

19   hypothetical.

20   THE WITNESS: The test-passing condition was

21   that the vehicle must not enter the gore region.

22   BY MR. McDEVITT:

23   Q. Explain for us why the Autopilot software

24   team did not want Teslas to enter gore areas.

25   A. If generally possible, it's better to do the

1 lane changes earlier than later. And gore is like

2 the last moment that you can do the lane change. So

3 it's kind of testing how early does the system

4 perform the lane changes.

5   Q. Okay. Do you agree one reason that the

6 Autopilot software team did not want Teslas to enter

7 gore areas is because they recognized that could

8 lead to a crash?

9   A. I do not know what was the intention when

10 they designed these metrics, but my understanding,

11 main reason was to study the behavior of lane

12 changes as they pertain to when they happen when

13 trying to exit the highway.

14   Q. Has it ever been your understanding that

15 Tesla does not want Tesla vehicles to enter gore

16 areas because Tesla recognizes that the -- if Tesla

17 Autopilot steers a vehicle into a gore area, that

18 could lead to a crash?

19   MR. BRANIGAN: Objection. Form. Incomplete

20 hypothetical. Calls for speculation.

21   THE WITNESS: I do not know if I can answer

22 for Tesla on the whole.

23 BY MR. McDEVITT:

24   Q. How about for you? Has it ever been your

25 understanding that one reason you don't want a Tesla

1 vehicle to enter a gore area is because you

2 recognize that if Autopilot steers a vehicle into a

3 gore area, that could lead to a crash?

4   MR. BRANIGAN: Same objection. Incomplete

5 hypothetical. Calls for speculation.

6   THE WITNESS: My general belief is that if

7 there's no reason to enter the gore, then there is

8 no reason to enter the gore. The car must just stay

9 on the regular lanes. But if there is some reason

10 to enter the gore, then the car can enter the gore

11 region.

12 BY MR. McDEVITT:

13   Q. Okay. To be clear, am I correct you do not

14 appreciate that a Tesla steering the vehicle into a

15 gore area is a potential safety issue? Is that

16 true?

17   MR. BRANIGAN: Same objection. Incomplete

18 hypothetical.

19   THE WITNESS: Well, it depends on the

20 situation. If the situation demands that, say,

21 entering a gore is better, then that is better

22 objective. I am not able to comment on the general

23 motion of entering gores or not.

24 BY MR. McDEVITT:

25   Q. Okay. Well, you recognize that if Autosteer

1 steers a vehicle into a gore area, that could lead

2 to a crash; right?

3   MR. BRANIGAN: Objection. Form. Incomplete

4 hypothetical. Calls for speculation.

5   THE WITNESS: In a vehicle, anything is

6 possible. So I'm not sure what I'm supposed to

7 answer this question.

8 BY MR. McDEVITT:

9   Q. Okay. What I'm asking, for the benefit of

10 the jurors, is whether you as director for Autopilot

11 software have an appreciation that if Autosteer

12 steers a Tesla into a gore area, that could lead to

13 a crash?

14   MR. BRANIGAN: Same objection. Asked and

15 answered. Incomplete hypothetical. Calls for

16 speculation. And it's overly broad and vague.

17   THE WITNESS: Like I mentioned earlier, the

18 safety of the gore region depends on the situation.

19 Some situations might require that the vehicle be in

20 the gore to avoid some other collision. In that

21 case, gore would be preferable to something else. I

22 am not able to make a general statement about gore

23 regions.

24 BY MR. McDEVITT:

25   Q. Okay. Well, you indicated sometimes it

```
 1   might be safer to enter the gore.  You also

 2   appreciate that there are other times when the

 3   Autosteer steering the Tesla into the gore could

 4   lead to a crash or an unsafe scenario.  True?

 5        A.  It would only lead to a crash if the driver

 6   was also not run into and not paying attention to

 7   the road.

 8        Q.  All right.  Well, let me show you

 9   Exhibit 194 [sic] and see if that is of any benefit

10   to you.

11            MR. BRANIGAN:  194?

12            MR. McDEVITT:  No, no.  94.

13            MR. BRANIGAN:  94.  Thank you.

14   BY MR. McDEVITT:

15        Q.  All right.  Do you see the video window

16   displayed?

17        A.  Yes.

18        Q.  All right.  I'm going to -- it's at four

19   seconds.  I'm going to push play on Exhibit 94.

20   Okay?

21            (Video playing.)

22   BY MR. McDEVITT:

23   ████████████████████████████████████████████████
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██

███████████████

6   BY MR. McDEVITT:

7   Q.   Has -- have you, during your time with

8   Tesla, been present for any discussions or

9   evaluations regarding the amount of time that is

10 necessary for a driver to recognize that Autosteer

11 is not performing appropriately and to take over,

12 how much time is needed?

13   A.   I do not recall being in such discussions.

14   Q.   Okay. So do you know -- you indicated you

15 don't -- you don't have any familiarity with the

16 concept of perception-reaction time?

17   MR. BRANIGAN: Objection. Form.

18 Mischaracterizes the witness's earlier testimony.

19   THE WITNESS: I mentioned that I was -- I do

20 not recall being involved in such discussions.

21 BY MR. McDEVITT:

22   Q.   What is the range of perception-reaction

23 time for the general public?

24   MR. BRANIGAN: Objection. Form. Incomplete

25 hypothetical.

```
1              THE WITNESS:  I do not know.
2    BY MR. McDEVITT:
3         Q.  Do you know what the perception-reaction
4    time -- do you know if the perception-reaction time
5    is longer for an older driver versus a younger
6    driver?
7              MR. BRANIGAN:  Same objection.  Incomplete
8    hypothetical.
9              THE WITNESS:  I do not know.
10   BY MR. McDEVITT:
11        Q.  In Exhibit 94 -- or Exhibit 94, do you know
12   if a driver with an average perception-reaction time
13   would actually have time to intervene and avoid the
14   collision?
15             MR. BRANIGAN:  Objection.  Form.
16             THE WITNESS:  I do not know.
17   BY MR. McDEVITT:
18        Q.  Are you familiar with the concept of minimal
19   risk condition?
20        A.  No.
21        Q.  Have you ever heard in the context of
22   automated driving systems the notion that when a
23   automated driving system is outside of its
24   operational design domain that it should transition
25   to a minimal risk condition?
```

1   A.   I'm not aware.

2   Q.   Have you, during your time with Tesla, ever

3   been a part of meetings or discussions that address

4   the topic of transitioning to a minimal risk

5   condition?

6   A.   Not to my recollection.

7   Q.   Is it your understanding that the portion of

8   the road that, in Exhibit 94, the vehicle crashed

9   into, that's considered a dangerous area to drive

10   in?

11   MR. BRANIGAN: Objection. Form. Call --

12   calls for speculation. We don't even know where the

13   road is.

14   THE WITNESS: Will you please repeat the

15   question?

16   BY MR. McDEVITT:

17   Q.   Has it been your understanding, during your

18   time with Tesla, that Tesla considers the area

19   within a gore, a gore area, to be a dangerous area

20   to drive in?

21   MR. BRANIGAN: Objection. Form. Incomplete

22   hypothetical.

23   THE WITNESS: I cannot speak for Tesla's

24   consideration.

25   ///

```
 1   BY MR. McDEVITT:

 2        Q.  Well, have you ever been provided documents

 3   that were generated by Tesla indicating that the

 4   area within a gore is a dangerous area for the

 5   vehicle to drive in?

 6        A.  Not to my recollection.

 7   ██████████████████████████████████████████████████
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████　BY MR. McDEVITT:

19　　　Q.　And can you tell us all the reasons that you

20　understand for there to be a reason for the car to

21　enter the gore?

22　　　A.　Humans enter the gore for many different

23　reasons, like to avoid a crash.　Say someone in

24　front of you brakes hard and they can swerve into

25　the gore region or pull onto the gore region in case

1 there is some other accident happening. I can come

2 up with more reasons if you're interested, but,

3 yeah, there are some reasons why that region can be

4 used to, you know, drive.

5   Q. Okay. In normal, ordinary driving

6 circumstances where there's no hazard in the lane or

7 there's no -- nothing blocking the travel lane for

8 the Tesla, can -- in those circumstances, can you

9 identify for us reasons why Autosteer should enter a

10 gore area?

11   MR. BRANIGAN: Objection. Form. Incomplete

12 hypothetical.

13   THE WITNESS: The design is for Autopilot to

14 not enter this region until it's -- unless it senses

15 it for some reason.

16 BY MR. McDEVITT:

17   Q. Okay. You worked or spent some time working

18 on Autopilot Vision; correct?

19   A. Yes.

20   Q. Did you spend some time working with

21 Mr. Karpathy on that?

22   A. Yes.

23   Q. Did you, during your time with Tesla, have

24 any interaction with the Samasource data labelers?

25   (Stenographer requests clarification.)

1   MR. McDEVITT: S-a-m-a-s-o-u-r-c-e.

2   THE WITNESS: I had minimal interaction with

3   them.

4   MR. BRANIGAN: I'm sorry.   Did you say

5   minimal?

6   THE WITNESS: Minimal.

7   MR. BRANIGAN: Thank you.

8   BY MR. McDEVITT:

9   Q.   The Autopilot Vision system has -- well,

10   strike that.

11   Are you familiar with the phrase "object and

12   event detection and response"?

13   A.   No.

14   Q.   The Autopilot Vision system over time has

15   been trained to detect objects; correct?

16   A.   What do you mean by "objects"?

17   Q.   What?

18   A.   What do you mean by "objects"?

19   Q.   Let me show you.   So I'm going to go back to

20   Exhibit 71.

21   All right.   Are you able to see page 58625

22   of Exhibit 71?

23   A.   Yes.

24   ██████████████████████████████████

██████████████████████████████████

11   BY MR. McDEVITT:

12   Q.   Have you ever heard Elon Musk state that

13   Autopilot should be able to detect and brake for any

14   object in the Tesla's path even if it's a UFO?

15   A.   Yes.

16   Q.   In 2018 did Autopilot have the capability to

17   detect and brake for any object in a Tesla's path

18   even if it was a UFO?

19   MR. BRANIGAN: Objection. Form. Incomplete

20   hypothetical. Calls for speculation.

21   THE WITNESS: I can't comment whether it

22   would react well for a UFO or not. We haven't do

23   the test. It was primarily designed for nominal

24   objects in the scene, like vehicles, motor bikes,

25   trucks, buses, pedestrians, some construction

```
 1   vehicles.  So whether some object falls into this

 2   ontology or not, it's hard to exactly determine.

 3   BY MR. McDEVITT:

 4        Q.  All right.  Well, let's go back to

 5   Exhibit 115A.
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 6   ██

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22   BY MR. McDEVITT:

23        Q.  What do you mean, there are some other ways

24   to determine a gore region?

25        A.  When you approach this region, you can see
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1 that there's a gore region starting, and then you

2 can mark the start of that region as the start of a

3 gore region.

4   Q. The gore point?

5   A. Yeah. It's like all -- you can't see it in

6 this image, but on the approach to this where the

7 lanes kind of diverge away, the starting point of

8 that is the starting point of the gore region.

9   Q. Okay. So in 2018, Autopilot was supposed to

10 be able to identify the start of a gore region?

11   A. I think in late 2018, as part of the

12 Navigate on Autopilot feature, that's when we added

13 this gore -- start of gore region, I think in

14 context to lane changes to exit the highway.

15   Q. Okay. Well, what about for, let's say,

16 April 2018 and earlier?

17   A. I do not precisely recall when the gore --

18 start of the gore region was introduced.

19   Q. What is your understanding of why Tesla

20 added the capability -- or included the capability

21 of Autopilot to detect a gore point?

22   A. Like I mentioned earlier, we wanted to make

23 sure that the lane changes were happening early on

24 for the Navigate on Autopilot feature. And as part

25 of that, the gore point detection would help the

1 planner make the decision as to whether it must do

2 the lane change or if it should avoid doing the lane

3 change if it's too late.

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12   Q.   Yeah. It might help if I just show you an

13 exhibit; so I'm going to display Exhibit 111, and

14 I'm going to the internally marked page 7.

15   So do you see that there's one highlighted

16 sentence in the second paragraph under bullet -- or

17 under heading "3"?

18   A.   I see the highlighted section.

19   Q.   Okay. The sentence preceding that says:

20   "Entities are encouraged to have a

21 documented process for assessment, testing, and

22 validation of their ADS's OEDR capabilities," and

23 the first sentence of this document -- or first

24 sentence of this page defines "OEDR" as "object and

25 event detection and response."

1   So my question is, does Autopilot -- or does

2   Tesla have a documented process for assessment,

3   testing, and validation of Autopilot's object

4   detection capabilities?

5   MR. BRANIGAN: Counsel, just for reference,

6   is this from the same exhibit that you used before

7   lunch from NHTSA, the NHTSA document?

8   MR. McDEVITT: Yeah.

9   THE WITNESS: I'm not aware of OEDR. But

10   that said, we do have ontology for the objects that

11   we recognize, and we have documentation for it. We

12   have tests for it. And, yeah, that is present.

13   BY MR. McDEVITT:

14   Q. Okay. So the documentation for the objects

15   that it does recognize is the documentation, is that

16   the ontology documents?

17   A. Yeah, that's one of the documents.

18   Q. What are the other documents?

19   A. There are, like, test reports that measure

20   position recall. And I'm not sure what time frame

21   you're referring to based on that, like, the amount

22   of documents that are available --

23   (Stenographer requests clarification.)

24   THE WITNESS: Yeah, I'm not sure what time

25   frame you're referring to. As the team has

 1 progressed, we have had more and more documentation

 2 of the different things that the system detects, and

 3 we have metrics around those things.

 4 BY MR. McDEVITT:

 5   Q. Okay. So for the Autopilot, the Vision

 6 system, am I correct that Tesla maintains a

 7 collection of what are called "unit tests"?

 8   A. Yeah.

 9   Q. And then there's a subset of images that are

10 referred to as "VIP unit tests"?

11   A. Yes.

12   Q. And for each -- or for a particular

13 iteration of the Vision component of the software,

14 are you saying that when a test is run to see how

15 well the particular iteration of the Vision software

16 recognizes defined things within the unit test,

17 there's a test report created?

18   A. When we evaluate the Vision system, we run

19 tests against BAP sets, and there we can get metrics

20 around position and recall of detecting these

21 various things.

22   Q. What's the software tool that's used to run

23 that test?

24   A. The software is usually run in Python; so

25 there's, like, Python scripts that run and produces

 1   metrics and can be visualized in some web tools that

 2   Tesla has created.

 3   (Stenographer requests clarification.)

 4   THE WITNESS: Some of the web tools that

 5   Tesla has created.

 6   BY MR. McDEVITT:

 7   Q. All right. So going back to Exhibit 111, in

 8   let's say -- let's go with January of 2018. Did the

 9   version of Autopilot that was the public released

10   version at that time, was it expected to be able to

11   detect and to respond to objects in its path that

12   could affect its safe operation of the vehicle?

13   A. Will you please repeat?

14   MR. BRANIGAN: Objection. Let me just

15   object to the form of the question. It's an

16   incomplete hypothetical.

17   But go ahead.

18   THE WITNESS: Will you please repeat the

19   question?

20   BY MR. McDEVITT:

21   Q. Yeah.

22   With the version of Autopilot that was the

23   public release version in January of 2018, was that

24   version of Autopilot expected to be able to detect

25   and to respond to objects in its path that could

 1 affect the safe operation of the Tesla?

 2   MR. BRANIGAN: Same objection. Incomplete

 3 hypothetical.

 4   THE WITNESS: It's still hard to follow the

 5 question. If you could break it down, that's

 6 probably easier.

 7 BY MR. McDEVITT:

 8   Q. Okay. Sure.

 9   So I'm focusing on the January 2018 time

10 frame. At that point in time, there was a public

11 release version of Autopilot; correct?

12   A. Yes.

13   Q. For the public release version of Autopilot

14 as of January 2018, was that version of Autopilot

15 expected to be able to detect and to respond to

16 objects in the Tesla's path when Autopilot was

17 enabled, to the extent those objects could affect

18 the safe operation of the Tesla?

19   MR. BRANIGAN: Same objection. Incomplete

20 hypothetical.

21   THE WITNESS: The software at the time had

22 some ontology of objects that it responds to, and

23 for those ones, the design intent was to respond to

24 those objects.

25   ///

 1 BY MR. McDEVITT:

 2   Q. At that point in time, were crash cushions

 3 that existed on the road, either within a gore area

 4 or elsewhere, within the ontology of objects?

 5   A. I do not think so.

 6   Q. This -- I asked you earlier about behavioral

 7 competency, and I'm -- do you see under the "Normal

 8 Driving" heading there -- there's a heading "Normal

 9 Driving." Do you see that?

10   A. I see that heading.

11   Q. Okay. There's a sentence that begins with

12 "Behavioral competency."

13   Do you see that?

14   A. I see the sentence.

15   Q. Okay. It says:

16   "Behavioral competency refers to the ability

17 of an ADS to operate in the traffic conditions that

18 it will regularly encounter, including keeping the

19 vehicle in a lane, obeying traffic laws, following

20 reasonable road etiquette, and responding to other

21 vehicles or hazards."

22   So having now read that, the behavioral

23 competency explanation, does that refresh your

24 memory as to whether you've ever heard that?

25   A. No. I've never -- I don't think I've heard

1   that.

2   Q.   Under the -- on this same page of the

3   document, "Crash Avoidance Capability — Hazards,"

4   there's text that says:

5   "Entities are encouraged to have a

6   documented process for assessment, testing, and

7   validation of their crash avoidance capabilities and

8   design choices."

9   As of March 2018, did Tesla have a

10 documented process for assessment, testing, and

11 validation of its crash avoidance capabilities and

12 design choices?

13   MR. BRANIGAN: Do you mean for the version

14 of Autopilot that was in your client's vehicle?

15   MR. McDEVITT: No. This was -- this is more

16 about a process. This is not about a particular

17 iteration of the software.

18   MR. BRANIGAN: Yeah, I understand, but the

19 reason I'm asking you is because you've been

20 referring to a document that, by its -- by its own

21 terms, relates to a Level 3 to Level 5 system. So

22 that's why I'm asking you why or whether your

23 question relates to the version of Autopilot in your

24 client's vehicle or some future version that might

25 be related to this document that doesn't relate to

 1   your client's version.

 2   MR. McDEVITT: Okay. Well, that's an

 3   interesting argument, but I disagree that the

 4   Autopilot system as Tesla released it would have fit

 5   within a clear Level 2. The way that they released

 6   it to the public without having any restraints on

 7   the opposite -- operational design domain I think

 8   blurs the line as to whether it's Level 2 or

 9   Level 3. So I don't agree with you.

10   MR. BRANIGAN: I know you don't, but I'm

11   telling you that the document that you're showing

12   the witness speaks for itself. And when you read it

13   earlier today, you stopped short of reading to him

14   that it applies to a Level 3 to Level 5 system. So

15   that's why I asked you to clarify your question,

16   because you keep asking him questions about a

17   document that, by its own terms, doesn't relate to

18   our product.

19   MR. McDEVITT: Oh, okay. So if it's a

20   Level 2, then you shouldn't have any documented

21   processes and you shouldn't do any of these things?

22   I disagree.

23   MR. BRANIGAN: No. No, I -- we're just

24   arguing with each other. I object to the form of

25   the question --

1   MR. McDEVITT: Okay.

2   MR. BRANIGAN: -- for the reasons I said.

3   MR. McDEVITT: All right. Well, in any

4   event, he had -- okay. Well, yeah. I just don't

5   think we are on the same page on that. So let me go

6   back to my question.

7   BY MR. McDEVITT:

8   Q. Did Tesla have a documented process for

9   assessment, testing, and validation of its crash

10 avoidance capabilities and its design choices

11 related to those capabilities?

12   MR. BRANIGAN: Same objection. Overly

13 broad. Vague.

14   THE WITNESS: 2018, I believe we had a

15 process where we would test the system, and then

16 there are validation documents and there are design

17 documents.

18 BY MR. McDEVITT:

19   Q. Where -- as you understand it, where are

20 those documents kept? Are those in Confluence? Are

21 those in some database? Where were they?

22   A. Some of it was on Jira. Some of it was on

23 Confluence.

24   Q. Can you tell us your role with respect to

25 automatic emergency braking in Autopilot?

1   A.   In what time frame?

2   Q.   Well, let me just start in general. What --

3   what is -- what has been the extent of your

4   involvement in automatic emergency braking?

5   A.   Over the time, I have been involved in

6   different aspects of it.

7   Q.   Okay. Let's focus on the time period from

8   March 2018 and earlier. What was the nature of your

9   involvement in automatic emergency braking during

10   that period of time?

11   A.   I was working on improving the Vision system

12   to have higher position and recall in the emergency

13   braking situation.

14   Q.   Were you involved in field testing or

15   actually real-world tests of automatic emergency

16   braking for Tesla prior to March of 2018?

17   A.   To some extent, yes.

18   Q.   Where are the locations where that was

19   performed?

20   A.   Some of it was performed at the Moffett

21   Airfield. Some of it was performed in Alameda, I

22   believe, but there could have been more. That's --

23   that's what I remember.

24   Q.   Was any of it done in Arizona?

25   A.   It's possible.

1   Q.   When -- for the tests that you were involved

2   in for the automatic emergency braking, was the

3   typical practice to videotape the tests?

4   A.   We would record internal data -- data clips

5   that have information.

6   Q.   Do you mean you'd use the cameras that were

7   incorporated into the vehicle, or do you mean you'd

8   mount a camera or something else?

9   A.   No. The Autopilot cameras, I think the

10 internal -- the vehicle cameras would be used to

11 record some data. Probably not every test is

12 recorded, but some tests are recorded that are of

13 interest.

14   Q.   Okay. And then after the facts -- after the

15 fact, was there a capability to review the clips

16 with the Augmented Vision overlaid so that you could

17 evaluate when the system detected an object or the

18 accuracy of the system in predicting the distance to

19 the object and evaluating when the system decided to

20 either present a warning or apply the brakes?

21   A.   Yeah. We'd use Augmented Vision combined

22 with other signals to determine those things.

23   Q.   And what -- amongst the different tools that

24 Tesla developed in-house, which tool would be used

25 to do that?

1   A.   I don't recall the name of the tools in

2   2018.   Most recently, we used our internal web tools

3   to do that.

4   Q.   Okay.   Was TIDE one of the tools or Apviz?

5   What were the tool names?

6   A.   Yeah, Apviz is one of the -- recently, the

7   last few years, we have been using Apviz.   I do not

8   recall when it became the main tool.   Before that,

9   there was Tclips.

10   Q.   And for the court reporter, Apviz is

11   A-p-v-i-z; correct?

12   A.   That's correct.

13   MR. BRANIGAN: Hey, Andrew, are we getting

14   to a point where we can take a break?   We've been

15   going for about an hour and 20 --

16   MR. McDEVITT: Sure.

17   MR. BRANIGAN: -- 25.

18   MR. McDEVITT: Yeah, let's take a break.

19   Yeah.

20   MR. BRANIGAN: Okay.

21   THE VIDEOGRAPHER: We are off the record.

22   The time is 3:05 p.m. Pacific Time.

23   (Break taken from 3:05 p.m. to 3:28 p.m.)

24   THE VIDEOGRAPHER: We are back on the

25   record.   The time is 3:28 p.m. Pacific Time.

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 1   BY MR. McDEVITT:

 2        Q.  So I have a few follow-up questions on the

 3   video that was marked as Exhibit 113.  I'm going to

 4   show you Exhibit 192 -- which I realize I've skipped

 5   a bunch of numbers, but I'm going to go to 192 and

 6   come back.

 7             (Exhibit Number 192, Email from Jason Kong

 8        to Ashok Elluswamy, dated 10/17/16,

 9        Bates-stamped TESLA-00105249 - 105250, was

10        marked for identification.)

11   BY MR. McDEVITT:

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 6      Q.   When you were working at Tesla in 2018, I

 7  presume you learned of the March collision involving

 8  a Model X on Highway 101; is that true?

 9      A.   Is it this case?

10      Q.   Yes.

11      A.   Okay.  Yeah, I heard of it.

12      Q.   How did you learn about it?

13      A.   From the news.

14      Q.   And at any point within the week of the

15  collision did you go to the area where the collision

16  occurred specifically to follow up on the collision?

17      A.   I did not specifically go to follow up on

18  the collision.

19      Q.   Okay.  Did you, as just part of your

20  commute, pass that area?

21      A.   Yes.

22      Q.   Do you -- as a matter of your normal habit,

23  when you commute to -- commuted to work past that

24  location, did you utilize Autopilot?

25      A.   Yeah.
```

1   Q. And did you ever have an occasion where the

2 Tesla vehicle that you were in with Autopilot

3 engaged, pulled, or veered toward the gore area

4 where the crash occurred?

5   A. Not to my recollection.

6   Q. Did you -- following the crash involving

7 Walter, did you attempt to drive by that location

8 with Autopilot activated, in the same lane that he

9 was in to see if the Autopilot would pull toward the

10 gore?

11   A. I don't recall trying to do that.

12   Q. All right. I just want to make sure I'm

13 understanding you accurately. Did you actually do

14 it or -- whether or not you were doing it

15 intentionally for that reason?

16   A. I don't recall actually doing it.

17   Q. Okay. Did you ever learn that there had

18 been a -- another Tesla customer that wanted to see

19 if his vehicle would do the same thing -- and by

20 that, I mean veer into the gore area -- and that the

21 other Tesla customer did experience the same

22 phenomenon?

23   A. I don't recall this anecdote.

24   Q. Okay. Were you asked, following the fatal

25 crash involving Mr. Huang, to review data that Tesla

1   had relating to previous vehicle trips by Teslas

2   with Autopilot engaged through that area?

3   A.   I don't think I was asked.

4   Q.   Were you -- was it your understanding that

5   somebody within the team was asked?

6   A.   I do not recall.

7   Q.   Okay. Did you -- were you present for any

8   meetings or occasions where the crash involved --

9   the fatal crash involving Mr. Huang was discussed or

10 referenced?

11   A.   I don't recall being in any formal meetings.

12   Q.   Okay. And setting aside formal meetings,

13 did you -- did you participate in any conversations

14 or discussions that related in any way to the crash

15 involving Mr. Huang?

16   A.   I mean, there were casual discussions

17 amongst engineers. I think I was involved in those

18 discussions.

19   Q.   Okay. And did -- at any point did you hear

20 that the Vision system had erroneously labeled one

21 of the stripes of the gore area as a lane boundary?

22   MR. BRANIGAN: Objection. Form.

23   THE WITNESS: I don't recall what we

24 discussed.

25   ///

1   BY MR. McDEVITT:

2   Q.   Okay.   At any point did you hear that

3   Autosteer directed the Tesla to steer into the gore

4   area prior to the crash?

5   A.   I don't precisely recall what we discussed.

6   Q.   Okay.   Well, did anybody within the

7   Autopilot software team, as best you can recall, try

8   to figure out how it was that the Model X with

9   Autopilot engaged ended up in the gore area?

10   A.   I do not know who investigated that.

11   Q.   Did you ever learn that somebody had made an

12 effort to determine why the Model X was in the gore

13 area when it had Autopilot engaged?

14   A.   My rough understanding of the overall

15 situation was we did not get telemetry from the

16 actual car that was involved.   And then Tesla sent

17 QA operators to reproduce the issue, and they were

18 unable to do so.

19   Q.   Did -- who were the QA operators that were

20 sent out?

21   A.   I do not know.

22   Q.   Do you know if the QA operators had the same

23 development version of Autopilot that was in

24 Mr. Huang's vehicle?

25   A.   I do not know.

1   Q. Did you learn that the version of Autopilot

2 that Mr. Huang had on his vehicle was the

3 development version?

4   A. Will you please repeat the question?

5   Q. Yeah. Did you learn at some point that the

6 version of Autopilot Mr. Huang had on his vehicle

7 was the development version?

8   A. What do you mean by "development version"?

9   Q. The version was an internal development

10 version as opposed to a authorized release

11 candidate.

12   MR. BRANIGAN: Objection. Form. Vague.

13   Go ahead.

14   THE WITNESS: I don't recall, nor do I --

15 yeah, I don't -- I don't think that Mr. Huang's

16 vehicle had a development version, at least to what

17 I can recall.

18 BY MR. McDEVITT:

19   Q. Okay. Am I correct that development

20 versions of the Autopilot, the hash will have the

21 suffix "dev" at the end?

22   A. I do not know.

23   Q. Is that -- has it been your experience that

24 the development versions of Autopilot will have the

25 suffix of "dev"?

1   A.   Nowadays, I don't see that suffix. I don't

2   know which version you're referring to.

3   Q.   Was there ever a period of time when

4   development versions of Autopilot had a suffix of

5   "dev"?

6   A.   If you're referring to the hash, it does not

7   have it because it's like a (indiscernible) --

8   (Stenographer requests clarification.)

9   THE WITNESS: It's a hexadecimal code. It

10   cannot have the letter V, for example. And

11   typically they are not -- the hash is like a

12   function that's computed based on the code and

13   everything else. It cannot be -- you cannot add a

14   name to it. I'm not sure if you're referring to

15   some of the tags or some build artifacts, but the

16   hash does not -- it's not possible to have this

17   forever.

18   Q.   Okay. I'm sorry. Then the -- I guess the

19   firmware designation -- or no. That's not it. Hold

20   on. Oh, sorry.

21   So for the different iterations of the

22   Autopilot, is there something referred to as a

23   package directory or a package path?

24   A.   Yeah, the build is a package, but I'm not

25   the person who worked on build systems. So,

1 honestly, I do not know much about this.

2   Q. Okay. If the -- so do you know whether --

3 was it your understanding that if the build or the

4 package had the word "develop" in it that that

5 referred to a development version?

6   A. I mean, it makes sense, but I don't know if

7 it was called that.

8   Q. Okay. Fair enough.

9   And when did you first, in connection with

10 this case, speak with any attorneys?

11   A. Couple weeks back.

12   Q. Okay. So let me -- I'm going to just

13 exclude the time period starting from when you first

14 talked to an attorney. So keep that out of here.

15   Prior to when you first spoke with an

16 attorney in this case, what did you learn about what

17 had occurred in Walter Huang's crash?

18   MR. BRANIGAN: Let me just -- let me just

19 interject that to the extent that you learned

20 anything before speaking with your counsel related

21 to this deposition from lawyers at Tesla, I'm

22 instructing you not to answer that question that

23 would include that information.

24   Do you understand what I'm saying?

25   THE WITNESS: Yeah.

1   MR. BRANIGAN: Okay.

2   THE WITNESS: What is the question again?

3 BY MR. McDEVITT:

4   Q. Yes. Prior to when you first spoke with

5 attorneys about this case, what did you learn about

6 what had occurred in Walter Huang's crash?

7   MR. BRANIGAN: Same objection.

8   THE WITNESS: My general understanding is

9 that the Tesla somehow entered the gore region and

10 crashed into the crash barrier.

11 BY MR. McDEVITT:

12   Q. And did you learn of anybody trying to

13 figure out why it was or how it was that the Tesla

14 entered the gore region?

15   A. I don't recall. I don't recall, no.

16   Q. Okay. Am I correct that as of March 2018,

17 Autosteer, by design, was not supposed to steer

18 Tesla vehicles into gore areas.

19   Is that true?

20   A. The intent of the design was to stay in the

21 lane.

22   Q. Okay. So what I said was accurate, that as

23 of March 2018, Autosteer, by design, was not

24 supposed to steer Tesla vehicles into gore areas;

25 correct?

1   A.   Yes.

2   Q.   And am I correct that in March of 2018, the

3   Traffic-Aware Cruise Control, by design, was not

4   supposed to accelerate Tesla vehicles into fixed

5   objects?

6   A.   Will you please repeat the question?

7   Q.   Yes. As of March 2018, the Traffic-Aware

8   Cruise Control feature, by design, was not supposed

9   to accelerate Tesla vehicles into fixed objects.

10 True?

11   A.   The design of the Traffic-Aware Cruise

12 Control is to follow vehicles and, like, reduce

13 speed if the vehicles in front of us are braking;

14 and then when they are leaving, it will, you know,

15 accelerate back up. It has -- I do not know if it

16 has any control for other objects.

17   Q.   Okay. As of March 2018, was the Forward

18 Collision Warning supposed to trigger in response to

19 a fixed object in the path of the Tesla?

20   MR. BRANIGAN: Objection. Form. Incomplete

21 hypothetical.

22   THE WITNESS: What is a fixed object?

23 BY MR. McDEVITT:

24   Q.   Well, does it depend on what the fixed

25 object is?

1   A.   Yes.

2   MR. BRANIGAN: Same objections.

3 BY MR. McDEVITT:

4   Q.   Okay. So as of March 2018, the Forward

5 Collision Warning in Teslas was supposed to trigger

6 in response to some fixed objects in the path of the

7 Tesla but not all of them?

8   MR. BRANIGAN: Objection. Form. Incomplete

9 hypothetical.

10   THE WITNESS: The Forward Collision Warning

11 and the emergency braking are primarily -- are

12 initial designed for vehicle-like objects, so

13 sedans, SUVs, trucks, buses, bicyclists, you know,

14 so on.

15   And then I also think at some point we added

16 general drivable space, base collision warnings.

17 And any such system that depends on computer Vision

18 has some sort of precision and recall.

19   So it would not, you know, get every

20 possible object. There's some things that it

21 doesn't get, and it's a statistical metric on, like,

22 what fraction of things it gets or not.

23   But, yeah, it's -- we can always relate on

24 the whole but not, you know, on -- it would depend

25 on the situation or the type of object and data set

 1 and things like those.

 2 BY MR. McDEVITT:

 3   Q. Okay. So would it be accurate to say that

 4 as of March 2018, a Tesla should almost always hit

 5 the brakes if an object is in its path, regardless

 6 of visibility conditions?

 7   MR. BRANIGAN: Objection. Form. Incomplete

 8 hypothetical. Vague. Calls for speculation.

 9   THE WITNESS: I do not know if it would hit

10 the brakes or -- yeah, I do not know what the

11 software configuration was at that point in time.

12 BY MR. McDEVITT:

13   Q. Okay. Let me show you what was previously

14 marked as Exhibit 152. This is blog post dated

15 September 11, 2016. It says, "Upgrading Autopilot:

16 Seeing the World in Radar."

17   Do you see that --

18   A. I see this document.

19   Q. -- title?

20   Okay. And this indicates:

21   "After careful consideration, we now believe

22 it" -- referring to radar -- "can be used as a

23 primary control sensor without requiring the camera

24 to confirm visual image recognition."

25   Do you recall a point in time when that was

1 the belief of the Autopilot team?

2   A.   Will you please repeat the question?

3   Q.   Yeah. Do you recall, as of September 2016,

4 Tesla, within the Autopilot team, the belief was

5 that radar could be used as a primary control sensor

6 without requiring the camera to confirm visual image

7 recognition?

8   A.   My understanding is that we worked on

9 radar-only braking. But like the other systems, it

10 also had its own, you know, precision and recall

11 metrics. So it would not get every obstacle, but,

12 you know, it would trade off true braking. Some --

13 in some cases, there are actual obstacles and we

14 integrate. In other cases, the system thinks

15 there's an obstacle, but, in reality, there is no

16 obstacle. And the system would brake, and that's

17 known as "false braking."

18   Typically, it's a very careful and delicate

19 balance to set the threshold in a manner that you

20 want some of the true braking; but if you go too

21 much to that extreme, then you're going to have a

22 lot of false braking, which you don't want -- do not

23 want either.

24   These systems, you know, when you tune them,

25 you have set the balance in such a manner that, you

1 know, it's not too bad in either way. If you only

2 have to miss for false braking, then you might miss

3 out on some of the true braking. And if you do too

4 much of the true braking, then you could miss out on

5 some -- or, like, you could have a lot of false

6 braking.

7   And that's why any of the systems have this

8 precision recall balance, and then they set a

9 threshold based on oral considerations of the

10 system.

11   Q. Okay. As of September 2016, did the

12 Autopilot team conclude that by using radar as a

13 primary control sensor, quote, the -- Tesla, quote,

14 car should almost always hit the brakes correctly

15 even if a UFO were to land on the freeway in

16 zero-visibility conditions?

17   A. That's what it says here.

18   Q. Okay. And is that accurate?

19   MR. BRANIGAN: Objection. Form. Incomplete

20 hypothetical.

21   THE WITNESS: Again, like I mentioned

22 earlier, there is the precision recall to this

23 argument. Like, it's -- you have to measure, okay,

24 how many instances of this UFO was the system able

25 to avoid? And I would probably guess that not

1   100 percent, but also it was from zero percent. So

2   somewhere in between.

3   BY MR. McDEVITT:

4   Q. Okay. I guess my question is, as of

5   September 2016, by utilizing the sensors and -- that

6   existed on the vehicles at the time and the software

7   in its state at that time, was it true to say that a

8   Tesla should almost always hit the brakes correctly

9   even if a UFO were to land on the freeway in

10 zero-visibility conditions?

11   MR. BRANIGAN: Same objections.

12   Go ahead, sir.

13   THE WITNESS: I did not work on the system.

14 So I cannot answer this question.

15 BY MR. McDEVITT:

16   Q. Okay. Well, in your experience, is the

17 description I just read consistent with your

18 observations of its performance capabilities?

19   A. Like I mentioned earlier, the system has the

20 precision recall. So it will not get every UFO, but

21 it also, you know, doesn't fail at every one of

22 them. It's somewhere in between.

23   Q. Okay. And would -- in terms of that scale

24 of in between, is it accurate to say that it would

25 be closer to almost always correctly braking versus

 1 | not?

 2 | A. I do not know.

 3 | MR. BRANIGAN: Objection. Form.

 4 | BY MR. McDEVITT:

 5 | Q. All right. I'm going to now show you

 6 | Exhibit 184.

 7 | (Exhibit Number 184, Video, was marked for

 8 | identification.)

 9 | MR. McDEVITT: All right. I'm going to hit

10 | play.

11 | (Video playing.)

12 | BY MR. McDEVITT:

13 | Q. Okay. Did you hear -- did you recognize

14 | Elon Musk in that clip?

15 | A. Yes.

16 | Q. And you heard him describe the prime

17 | directive for Autopilot?

18 | A. Yeah.

19 | Q. And that's -- what he said there is the

20 | prime directive for Autopilot is "do not crash";

21 | correct?

22 | A. Yeah.

23 | Q. And that's consistent with what you've heard

24 | Elon Musk say during your time at Tesla?

25 | A. Yeah.

1   Q. And then did you hear his reference to a UFO

2   landing on the road and not crashing?

3   MR. BRANIGAN: Objection. Form. It

4   mischaracterizes the totality of what Mr. Musk

5   actually said on the tape. So the question is

6   misleading.

7   THE WITNESS: I heard the videotape.

8   BY MR. McDEVITT:

9   Q. Okay. And, actually, independent of that

10 video clip, you've actually heard Elon Musk use the

11 UFO -- use a UFO example of a scenario that

12 Autopilot should be able to encounter and react to

13 without crashing; correct?

14   A. Yes.

15   Q. I'm going to now show you --

16   MR. McDEVITT: Just for the record,

17 Exhibit 181 is a New York Times article.

18 Exhibit 179 is the deposition notice.

19 BY MR. McDEVITT:

20   Q. Let me just ask you this: Did you -- prior

21 to your deposition today, did you make an effort to

22 search for and locate documents that matched the

23 description in the deposition notice?

24   A. No.

25   Q. I'm going to now show you Exhibit --

1   MR. BRANIGAN: Counsel, for the record, the

2   deposition notice was served on Tesla's counsel. So

3   Tesla's counsel responded to the deposition notice.

4   I think you know that.

5   MR. McDEVITT: And my question was whether

6   he made an effort to search for documents. It has

7   nothing to do with -- both those -- there's nothing

8   inconsistent about those two things.

9   MR. BRANIGAN: That's true, but to the

10   extent that you're trying to create the implication

11   it was his obligation to do so, that wouldn't be

12   right either.

13   MR. McDEVITT: Well, no, my intention is

14   to -- just to create a record that the witness

15   didn't search for any document, and that was because

16   he was -- well, because of the position that has

17   been articulated and communicated to us.

18   MR. BRANIGAN: Well, that's not right

19   either. It's because we didn't ask him to search

20   for any documents. It wasn't incumbent upon him.

21   He's not here as a corporate representative. You

22   served a notice not on him; you served it on the

23   company. And we responded on behalf of the company,

24   and you know our position.

25   So all I'm saying is, to the extent that

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1   you're trying to create the implication that he was

2   under some obligation to do so through that

3   question, that's an unfair and misleading question.

4            MR. McDEVITT:  No.  Actually, what you just

5   said is a mischaracterization of California law.

6   Actually, as the witness, the service of the

7   deposition on the employer of the witness is

8   equivalent to serving him with a subpoena.  So he

9   actually was required to look for documents.  It was

10  not the company.

11           And, actually, that's the reverse of the

12  position I always hear in these depositions, that,

13  "Oh, this is a deposition notice to a person, not

14  the corporate entity; so the documents weren't

15  searched for."

16           I mean regardless, I don't think we need to

17  belabor this.  I only had one question about it.

18  BY MR. McDEVITT:

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11   Q.   Okay.   And even if you can't give us the

12   specific names, can you just generally describe,

13   would those be the documents that contained the

14   results from various different unit test for vision?

15   A.   Yeah, would be one source, but also be, you

16   know, some video replays how maybe the car drives

17   even.

18   Q.   Okay.   At any point in time when you've been

19   employed by Tesla, has Tesla had a document that's

20   identified as a functional safety plan?

21   A.   I'm not aware of such a document.

22   Q.   All right.   There's -- I have a few more

23   documents that I'm going to try to go through as

24   quickly as I can, but do you -- do we want to take a

25   five-minute break, or do you want to just charge on?

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 1            MR. BRANIGAN:  If you're going to be five,
 2   ten minutes -- well, first of all, I defer to the
 3   witness.  If he wants to take a break now, we'll
 4   take a break now.
 5            THE WITNESS:  If we can likely go for the
 6   finish, that's better than taking a break.
 7            MR. BRANIGAN:  Well, I agree with that, but
 8   our understanding of what going through the finish
 9   is may not match Mr. McDevitt's.
10            So that's why I'm saying, if you're talking
11   about finishing up in about five to ten minutes,
12   then I think the witness and everybody else here can
13   say, yeah, let's do it.  If you think you're going
14   to be another 30 to 45 or another 60, then we'll
15   take you up on the offer to have a break.
16            MR. McDEVITT:  I can tell you for sure it's
17   not going to be 30, 45.  I'm running out of gas for
18   sure.
19            I'm just going to try to -- I mean, I just
20   have -- why don't we just take five minutes, and
21   then I'll just -- that'll give me a chance to
22   organize my thoughts, and I'll be more efficient.
23   And I'll go as fast as I can here.
24            MR. BRANIGAN:  Okay.
25            THE WITNESS:  Okay.
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1   MR. BRANIGAN: All right. We'll take five.

2   MR. McDEVITT: All right.

3   THE VIDEOGRAPHER: We are off the record.

4   The time is 4:34 p.m. Pacific Time.

5   (Break taken from 4:34 p.m. to 4:43 p.m.)

6   THE VIDEOGRAPHER: We are back on the

7   record. The time is 4:43 p.m. Pacific Time.

8   BY MR. McDEVITT:

9   Q. Has Tesla used LIDAR as part of the

10   development of Autopilot?

11   A. What do you mean by "development"?

12   Q. For instance, has Tesla used LIDAR

13   technology to generate ground-truth information

14   that's then used to train the neural networks?

15   A. Yes.

16   Q. Can you tell us all the different ways that

17   you're familiar with that Tesla has used LIDAR in

18   the development of Autopilot.

19   A. We use 3-D sensors -- LIDAR's one of them --

20   to help provide ground-truth data for training the

21   neural networks. We also used it, it for evaluation

22   where we can measure the overall system performance

23   compared to LIDAR, for example.

24   Q. How come Tesla doesn't use cameras to get

25   the ground-truth information?

1   A.   Tesla uses cameras to get ground-truth

2   information.

3   Q.   Okay.   I'm going to show you Exhibit 194.

4   And before -- actually, before I do that, am

5   I correct that during your time at Tesla you have

6   been aware of Elon Musk's representations in the

7   public regarding when Tesla full self-driving will

8   be feature complete?

9   MR. BRANIGAN: Objection.   Form.   Relevance.

10   THE WITNESS: Will you please repeat the

11   question?

12   BY MR. McDEVITT:

13   Q.   During your time at Tesla, have you been

14   aware of Elon Musk's tweets or public statements

15   about when Tesla will have a feature-complete

16   version of full self-driving?

17   MR. BRANIGAN: Same objections.

18   THE WITNESS: I'm aware that he has tweet4ed

19   about that topic.

20   BY MR. McDEVITT:

21   Q.   Okay.   Am I correct that over the years

22   you've been with Tesla, Elon Musk has pressured the

23   Autopilot software development team to get the

24   software out to the public as fast as possible?

25   MR. BRANIGAN: Objection.   Form.

1   THE WITNESS: I would not agree with the

2   precise wording of the statement.

3   BY MR. McDEVITT:

4   Q. Okay. Can you tell -- if you have to

5   rephrase it in a way that is more accurate to you,

6   can you do that, please.

7   A. What I've heard from him is that it matters

8   how early or how late we get autonomy done.

9   Obviously earlier is better because there are

10 crashes happening in the real world, and Autopilot

11 has the potential to save them. So it's important

12 to do it earlier than later.

13   Q. Okay. Have you, during your time at Tesla,

14 heard of Autopilot software engineers feel like they

15 need to convince Elon Musk to devote resources

16 towards features that just make Autopilot safer as

17 opposed to more convenient?

18   MR. BRANIGAN: Objection. Form.

19 Foundation.

20   THE WITNESS: For a practical Autopilot

21 system, you want us to balance safety and comfort.

22 So if you're talking about trading off, you know,

23 the position recall for true braking versus false

24 braking, we do communicate our choices to Elon, but

25 we do make a lot of revisions on our own based on,

1 you know, engineering reviews.

2 BY MR. McDEVITT:

3   Q. And during the time you've been with Tesla,

4 there have been Autopilot software team meetings

5 where Elon Musk has called in from his Tesla while

6 using Autopilot to provide his feedback on how the

7 Autopilot is functioning; correct?

8   A. Yes.

9   Q. And can you tell us how many times that has

10 occurred or how often?

11   A. I can't count. I can't give you a specific

12 count.

13   Q. Is that something that has been a pretty

14 regular occurrence, for Elon Musk to call in to a

15 meeting and to provide feedback to the team based on

16 his evaluation of the particular build of Autopilot?

17   MR. BRANIGAN: Objection. Form. Vague.

18   THE WITNESS: Yeah, I think you had a couple

19 of questions in your statement.

20 BY MR. McDEVITT:

21   Q. Okay. Well, let me -- let me back up.

22   As a starting point, during the time you've

23 been with Tesla, there have been numerous occasions

24 where the engineering team has pushed a development

25 version of Autopilot to a vehicle that Elon Musk

1 drives; correct?

2   A. Yes.

3   Q. And there have been numerous occasions where

4 Elon Musk has called in to a team meeting while

5 drive -- while in a Tesla with that particular

6 development version of Autopilot in use for the

7 purpose of providing feedback to the team on how

8 it's functioning; correct?

9   A. I wouldn't say it's numerous times.

10   Q. Okay. Well, do you agree it's more than

11 three?

12   A. Sure. It's, yeah, somewhere around there.

13   Q. Okay. And there have been at least some

14 occasions where Elon Musk has -- the feedback that

15 he's provided to the Autopilot software team is

16 along the lines of something like, "This build is

17 shit"; correct?

18   A. Yeah.

19   Q. There's also been occasions where Elon Musk

20 has provided the feedback to the Autopilot software

21 team that "This build sucks"?

22   A. Yes.

23   Q. And am I correct that Elon Musk was the

24 person -- or he decided that the feature Navigate on

25 Autopilot shouldn't be called "Drive on Navigation";

 1   instead, it should be called "Navigate on

 2   Autopilot"?

 3   A.   I do not know.

 4   Q.   There -- during your time with Tesla, it has

 5   been normal or usual for Elon Musk to make decisions

 6   about the Autopilot software; correct?

 7   MR. BRANIGAN: Objection. Form. Vague.

 8   THE WITNESS: He's the CEO of the company.

 9   He can make whatever decisions he wants about the

10   company.

11   BY MR. McDEVITT:

12   Q.   Okay. And that would include with respect

13   to Autopilot?

14   A.   Yeah.

15   Q.   Let me show you Exhibit 194.

16   (Exhibit Number 194, Document Titled "Peer

17   Review of Behavioral Competencies for AVs,

18   University of California PATH Program," dated

19   February 2016, Bates-stamped TESLA-00182382 -

20   182429, was marked for identification.)

21   BY MR. McDEVITT:

22   Q.   This document's called "Peer Review of

23   Behavioral Competencies for AVs, University of

24   California PATH Program," from February 2016.

25   Are you familiar with this document?

1   A.   No.

2   Q.   And I appreciate that you are not familiar,

3   but there's -- there's some descriptions in here

4   that I just want to see if you've heard in a

5   different context or, without knowing the source,

6   you became aware of during your time at Tesla.

7   MR. BRANIGAN: What's the exhibit number

8   again, please?

9   MR. McDEVITT: 194.

10   MR. BRANIGAN: Thank you.

11   BY MR. McDEVITT:

12   Q.   And this is Bates TESLA-182382.

13   I'm showing you Bates 182402 -- or strike

14   that.

15   I'm going to go to 182403. On this page,

16   you see there's a table that has a column labeled

17   "Behavioral Competency"?

18   A.   Sure.

19   Q.   And then it says "Behavioral Competency,

20   Detect and respond to system engagement and

21   disengagement restrictions"?

22   A.   I see that.

23   Q.   The -- in the second column, "Description of

24   Behavioral Competency," I'm going to direct your

25   attention to the second bullet.

1   You see that?

2   MR. BRANIGAN: Can -- is it possible to make

3   it larger?

4   MR. McDEVITT: Yeah. Absolutely.

5   BY MR. McDEVITT:

6   Q. All right. Are you able to see the sentence

7   that begins with "Detects"?

8   A. I see some sentence there, yes.

9   Q. Okay. So it says:

10   "Detects any restricted condition under

11   which the vehicle is not intended to operate and:

12   If autonomous mode is not already engaged, prohibits

13   the operator from engaging autonomous mode." Let me

14   pause there.

15   Does Autopilot -- or has Autopilot had a

16   function that detects whether there's a restricted

17   condition under which Autopilot's not intended to

18   operate and prohibit the operator from engaging

19   Autopilot in that instance?

20   MR. BRANIGAN: Objection. Form.

21   Foundation. Incomplete hypothetical.

22   THE WITNESS: Like I mentioned earlier in

23   the deposition, Autopilot, the production version of

24   it, has some conditions to enable just presence of

25   lane lines and a few other conditions. So one can

 1   interpret that as conditions that, you know, enable

 2   -- enabling the system.

 3   BY MR. McDEVITT:

 4   Q.   Okay.   Then the second part of it is:

 5   "Detects any restricted condition under

 6   which the vehicle is not intended to operate and:

 7   If autonomous mode is already engaged, responds to

 8   disengagement condition by either transferring

 9   control to the operator, switching to a reduced

10   performance operating mode to ensure safety, or

11   coming to complete stop."

12   Do you see that language there?

13   A.   Yes.

14   Q.   And as of March 2018, did Autopilot have

15   that functionality?

16   MR. BRANIGAN: Objection.   Form.

17   Foundation.

18   THE WITNESS: Autopilot had something

19   similar.   It's called "take over immediately."   The

20   system triggers that under certain circumstances.

21   BY MR. McDEVITT:

22   Q.   With respect to the take-over-immediately

23   feature, as it relates to the Tesla being within a

24   gore area with Autopilot engaged, take over

25   immediately did not apply to that situation until

1   after March of 2018; correct?

    2   A.   I do not know.

    3   Q.   Okay. Let me show you -- I'm going to go

    4   through just a series of Jira tickets, and that's --

    5   I don't have any other questions after that.

    6   (Exhibit Number 188, Jira Ticket SW-133126,

    7   Bates-stamped TESLA-00062119 - 00062120, was

    8   marked for identification.)

    9   BY MR. McDEVITT:

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14   Q. Okay. I don't have any other questions for

15 you. I don't know if anybody from Caltrans --

16 actually, I apologize. There is one -- I just

17 wanted to ask you if you've seen this article.

18   (Exhibit Number 181, New York Times Article

19   Titled "Inside Tesla a Elon Musk Pushed an

20   Unflinching Vision for Self-Driving Cars," was

21   marked for identification.)

22 BY MR. McDEVITT:

23   Q. I'm going to show you Exhibit 181. This is

24 a New York Times article titled "Inside Tesla as

25 Elon Musk Pushed an Unflinching Vision for

```
1  Self-Driving Cars."
2         Did you -- did you ever read this particular
3  article?
4      A.  I don't recall reading this article.
5      Q.  Okay.  And you had told us -- I'm just going
6  to show you some -- this is -- well, I guess I'll
7  just make it an exhibit.  This is an Excel sheet
8  Bates-stamped HUANG-163, and that'll become
9  Exhibit 195.
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         MR. McDEVITT: All right. Okay. So I don't

have any other questions. Like I said, I don't know

if anybody from Caltrans has questions.

         MS. LOVE: This is Rosemary. I have no

questions.

         MR. BRANIGAN: Mr. Elluswamy, we have no

questions for you. So the deposition is over. A

copy of the transcript will be provided for you,

once it's available, for you to review and sign.

         THE WITNESS: Understood.

         MR. BRANIGAN: All right.

         THE WITNESS: Thank you.

         MR. BRANIGAN: Thank you.

         THE VIDEOGRAPHER: Before we go off the

record, do you want to get your order on the record?

         CERTIFIED STENOGRAPHER: Yes. Mr. Branigan

or Ms. Love, do you need copies of the transcript?

         MR. BRANIGAN: Yes.

         MS. LOVE: Yes. This is --

         MR. BRANIGAN: I think we --

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 1            MS. MILLER:  Yes, and video.

 2            MR. BRANIGAN:  Yes, and video, please.

 3            MS. LOVE:  Same.

 4            THE VIDEOGRAPHER:  Video for both?

 5            MS. LOVE:  Yes, please.

 6            THE VIDEOGRAPHER:  All right.  Is that

 7   synced with the transcript?

 8            MS. MILLER:  Yes.

 9            MS. LOVE:  Yes.

10            MR. BRANIGAN:  Yes, please.

11            THE VIDEOGRAPHER:  Mr. McDevitt, you have a

12   standing order; correct?

13            MR. McDEVITT:  I don't think we do yet; so

14   we'll take a synced transcript as well.

15            THE VIDEOGRAPHER:  Okay.  Anything else

16   before we go off?  Got everything?

17            All right.  Then we are --

18            MR. McDEVITT:  That's it.

19            THE VIDEOGRAPHER:  -- off the record.  The

20   time is 5:20 p.m. Pacific Time.

21            (Concluded at 5:20 p.m.)

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6   _____

7   ASHOK ELLUSWAMY

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10   Subscribed and sworn to before me

11   this 15th day of July, 2022.

12

13   _____

14   (Notary Public)

15

16   My Commission expires:_____

17

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1   C E R T I F I C A T E

2   STATE OF CALIFORNIA:

3

4   I, RHONDA HALL-BREUWET, RDR, CRR, CSR, LCR,

5   CCR, FPR, NCRA Realtime Systems Administrator,

6   shorthand reporter, do hereby certify:

7   That the witness whose deposition is

8   hereinbefore set forth was duly sworn, and that such

9   deposition is a true record of the testimony given

10   by such witness.

11   I further certify that I am not related to

12   any of the parties to this action by blood or

13   marriage, and that I am in no way interested in the

14   outcome of this matter.

15   IN WITNESS WHEREOF, I have hereunto set my

16   hand this 15th day of July, 2022.

17

18

19

20   _____

21   RHONDA HALL-BREUWET, RDR, CRR, CSR, LCR, CCR, FPR,

22   NCRA Realtime Systems Administrator

23   Shorthand Reporter

24

25

 1 ERRATA SHEET FOR THE TRANSCRIPT OF:

 2 Case Name: SZ HUA HUANG, et al., v. TESLA INC. dba
    TESLA MOTORS, INC., THE STATE OF CALIFORNIA, and
 3 DOES 1 through 100
    Dep. Date: June 30, 2022
 4 Deponent: ASHOK ELLUSWAMY

 5   CORRECTIONS:

 6   Pg.   Ln.   Now Reads   Should Read Reason

 7   ___   ___   _____   _____   _____

 8   ___   ___   _____   _____   _____

 9   ___   ___   _____   _____   _____

10   ___   ___   _____   _____   _____

11   ___   ___   _____   _____   _____

12   ___   ___   _____   _____   _____

13   ___   ___   _____   _____   _____

14   ___   ___   _____   _____   _____

15   ___   ___   _____   _____   _____

16   ___   ___   _____   _____   _____

17   ___   ___   _____   _____   _____

18

19   _____

20   Signature of Deponent

21 SUBSCRIBED AND SWORN BEFORE ME

22 THIS _____ DAY OF _____, 2022

23

24 _____

25 (Notary Public) MY COMMISSION EXPIRES: _____