

1 UNITED STATES PATENT AND TRADEMARK OFFICE

2 BEFORE THE PATENT TRIAL AND APPEAL BOARD

3
4 TESLA, INC.,

5 Petitioner,

6 v.

7 iQAR, INC.,

8 Patent Owner

9
10 IPR2024-00545
11 PATENT NO. 8,972,161 B2

12
13
14 STENOGRAPHIC DEPOSITION OF
15 NIKOLAOS PAPANIKOLOPOULOS, PH.D.

16 MINNEAPOLIS, MINNESOTA

17 THURSDAY, OCTOBER 31, 2024

18
19 (Reported Remotely)

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21
22
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LCR-991 (TN)

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October 31, 2024

11:01 a.m.

Stenographic deposition of

NIKOLAOS PAPANIKOLOPOULOS, PH.D.,

held in Minneapolis, Minnesota before

Tanya L. Verhoven-Page, Certified Court

Reporter (GA), Licensed Court Reporter

(TN) and Certified Shorthand Reporter (TX).

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EXHIBITS INDEX:		
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1 MINNEAPOLIS, MINESOTA; THURSDAY, OCTOBER 31, 2024

2 11:01 A.M.

3

4 Thereupon --

5 NIKOLAOS PAPANIKOLOPOULOS, PH.D.,
6 called as a witness, having been first duly sworn,
7 was examined and testified as follows:

8

9 EXAMINATION

10 BY MR. HERMAN:

11 Q Doctor, could you please state your full
12 name for the record.

13 A I'm Nikolaos Papanikolopoulos.

14 MR. HERMAN: And this is Patrick
15 Herman from Orrick, Herrington &
16 Sutcliffe here on behalf of patent owner.

17 And just for clarity the deposition
18 here today is in a proceeding captioned
19 Tesla, Inc. v. iQAR, Inc. in IPR
20 22400545.

21 Counsel for petitioner, would you
22 like to introduce yourself?

23 MR. JHURANI: Yes, good morning.
24 This is Karan Jhurani with Fish &
25 Richardson, appearing here on behalf of

1 petitioner Tesla.

2 BY MR. HERMAN:

3 Q Now, Doctor, have you been deposed
4 before?

5 A Yes.

6 Q Approximately how many times would you
7 say?

8 A Around eight times, depending if you
9 count an IDC deposition.

10 Q So despite that past experience, before
11 we begin, I'm going to go through a few basic ground
12 rules to make sure we're on the same page and to help
13 ensure that things go smoothly.

14 So the first is, as you saw, there's a
15 court reporter here. So it's important that you
16 respond verbally to my questions so that they can
17 record your testimony; is that okay?

18 A Yes.

19 Q It's also important that we try not to
20 talk over each other so that there's a clear record.
21 And I'll do my best to wait for you to finish before
22 asking another question, and I also ask that you wait
23 until I'm done with my question before answering.

24 Is that okay?

25 A Absolutely.

1 Q You're also entitled to a question you
2 understand. So if anything I ask is unclear, please
3 let me know, otherwise I'll assume we're on the same
4 page. Is that also okay?

5 A Yes.

6 Q And I ask that you not look at anything
7 during the deposition besides documents that I give
8 you. And if you do look at anything, for instance,
9 your own electronic copies of your declaration, I ask
10 that you tell me. Is that okay?

11 A Yes. So do you want me to use your copy
12 or the electronic copies? I mean --

13 Q So whichever is easier for you, but I'd
14 like you to let me know what you're doing when
15 answering questions. Is that okay?

16 A Yeah. Let's start with the assumption
17 I'm going to use the electronic copies, and I can put
18 them on the share screen that you can see that they
19 are marked and so on and so forth.

20 Q You don't have to put them on the share
21 screen. You representing that they're unmarked is
22 fine.

23 Next, I ask that you not have any side
24 conversations or use technology to chat or
25 communicate with anyone during the deposition. Is

1 that okay?

2 A Yes.

3 Q Now, is there anything that would prevent
4 or interfere with your testimony today?

5 A No.

6 (Papanikolopoulos Deposition
7 Exhibit No. 1003 was marked for
8 identification.)

9 BY MR. HERMAN:

10 Q Okay. So I'm going to start by putting
11 Exhibit 1003 in this IPR proceeding into the Chat.
12 And you have your own electronic version of 1003
13 that's clean, you can refer to that, or you can
14 download what I just put in the Chat.

15 A Yeah, I'm using my own electronic copy.

16 Q So what is Exhibit 1003?

17 A My declaration regarding the particular
18 IPR.

19 Q And this declaration relates to U.S.
20 Patent 8,972,161, correct?

21 A Yes.

22 Q Is it okay if I refer to that today as
23 the '161 patent?

24 A Yes.

25 Q Now, sitting here today, is there

1 anything in your declaration, Exhibit 1003, that you
2 believe to be inaccurate?

3 A No.

4 Q Okay. Could you turn down to Paragraph
5 57 of your declaration for me.

6 A Give me a minute.

7 Q And if it helps, I believe that is on
8 Page 34 of the exhibit PDF.

9 A Bear with me a second. Yes.

10 Q So this paragraph appears in a part of
11 your declaration explaining why, in your view, a
12 prior art reference to Neiss renders the '161
13 patent's claims obvious; is that right?

14 A Yeah, I'm referring in particular to 1A.

15 Q And this paragraph, as you noted, begins
16 a discussion of the limitation in Claim 1 of the '161
17 patent requiring, quote: Receiving a route at a
18 computer of said vehicle, end quote.

19 Is that correct?

20 A Yes.

21 Q Now, if you turn all the way down to
22 Paragraph 67 in this particular section of your
23 declaration --

24 A Yes.

25 Q -- you note here that: A POSITA would

1 have understood that the onboard computer which
2 implements Neiss' PCC block receives a route, e.g.
3 receives a prediction horizon, or receives a set of
4 prediction horizons that constitute a complete
5 origin-to-destination route.

6 Do you see that text in this paragraph?

7 A Yes.

8 Q And then in the rest of the paragraph you
9 go on to reference the inclusion of 3D digital road
10 map and other data in the prediction horizon, true?

11 A Yes.

12 Q So, in your view, Neiss' prediction
13 horizon that's filled with this map data is a route
14 that is received by Neiss' system, correct?

15 A Counsel, the description of the route and
16 the receiving of the route starts a little bit
17 earlier. So I'm starting the description at
18 Paragraph 60. So I want to make sure that we put
19 things into context.

20 Q Sure. So is there anything wrong about
21 what I just said, that, in your view, Neiss'
22 prediction horizon that's filled with this 3D map and
23 other data is, in your view, a route that is received
24 by Neiss' system?

25 MR. JHURANI: Objection to form.

1 THE WITNESS: Can you repeat the
2 question?

3 BY MR. HERMAN:

4 Q Sure. Is there anything wrong with my
5 statement; and I said, in your view, Neiss'
6 prediction horizon, when it's filled with the 3D map
7 data and the other data that you reference in
8 Paragraph 67, in your view, constitutes a route that
9 is received by Neiss' system?

10 MR. JHURANI: Objection to form.

11 THE WITNESS: Counsel, if I'm -- if
12 I'm allowed, I would like to go to
13 Paragraph 60, because basically I'm
14 stating the context under which the
15 paragraph that you mentioned should be
16 viewed. I want to be accurate to the
17 record.

18 So if you look at Paragraph 60, I'm
19 saying: Neiss' optimization algorithm
20 iteratively calculates vehicle control
21 parameters that optimize the vehicle
22 operating cost function from a
23 predetermined distance, referred to as a
24 Prediction Horizon, along the route ahead
25 of the vehicle.

1 And I have the references from the
2 Tesla -- from -- basically, the reference
3 I consider, Neiss.

4 A cruise control unit for a motor
5 vehicle, which minimizes vehicular
6 operating cost, based on an analysis of
7 vehicle operating parameters and route
8 information regarding a route section
9 ahead of the vehicle. 49, Abstract,
10 Claim 1.

11 Iteratively calculating and storing
12 in a memory, vehicular parameters that
13 minimize said vehicle operating cost
14 function for a predetermined distance
15 along set route of said vehicle.

16 And then I have Figure 10 annotated
17 where I'm saying the Prediction Horizon.
18 And below I'm indicating route, the whole
19 prediction horizon or a portion of the
20 route. And I'm indicating integration
21 step, frame length. This is from Neiss.
22 And I have four frames. And I'm
23 continuing just to put in context what is
24 being discussed in the particular
25 paragraph you mentioned, the prediction

1 horizon corresponds to a route.

2 And I want to put emphasis here:

3 Because it constitutes a path being
4 traveled by the vehicle. Additionally or
5 alternatively, Neiss discloses that the
6 vehicle traverses an overall route, for
7 example, one with a starting point and an
8 ending point or final destination where
9 the vehicle stops, and that its
10 optimization operations are performed
11 iteratively for proportions of the route,
12 which Neiss refers to as the Prediction
13 Horizon, ahead of the vehicle as the
14 vehicle continues to travel the route to
15 its final destination. As such -- and I
16 want to emphasize this -- a POSITA would
17 have understood that Neiss discloses a
18 vehicle traversing an overall route, with
19 optimizations performed on each
20 iteratively updated Prediction Horizon
21 ahead of the vehicle as it travels this
22 route.

23 BY MR. HERMAN:

24 Q All right. So you just read a lot of
25 your declaration, correct?

1 A Yeah, because basically in 62, I'm
2 saying, moreover, and as explained below, Neiss, this
3 is a receiving route. For example, it is receiving
4 either immediate prediction horizon ahead of the
5 vehicle or the route represented by starting position
6 and an ending position or final destination at a
7 computer of said vehicle, onboard computer in this
8 vehicle.

9 Q So what I'm having trouble with is your
10 Figure 10 in your declaration is an empty prediction
11 horizon. There is no data in it. When does it
12 become a route? Is it a route when there's data in
13 it or is it a route when it is empty and there's no
14 data in it at all?

15 MR. JHURANI: Objection to form.

16 THE WITNESS: Can you repeat the
17 question? I'm not sure I understand.

18 BY MR. HERMAN:

19 Q Figure 10 in your declaration, it's just
20 a series of empty blocks. There's nothing there,
21 right? There's no position data, there's no angle
22 data, there's no optimal velocities. It's just a
23 container. There's nothing there.

24 Is an empty container standing by itself
25 a route?

1 A This is a conception diagram showing
2 basically the route and the frames and their
3 segments.

4 If you see further -- let me show -- in
5 my declaration, I indicate -- bear with me. So do
6 you want to go to Page 47, just before Paragraph 81.

7 Q Oh, okay. I'm there. Go ahead.

8 A So if you see here the Figure 12A, I'm
9 showing, for example, how this disclosure, basically,
10 by Neiss, that would have the frames, we have the
11 whole route, which is the prediction horizon, and
12 then I have rows like angles associated with the
13 grade of the road, grade use, velocity, throttle, et
14 cetera.

15 Q Okay. So in this paragraph, you have an
16 annotated version of Figure 12A from Neiss; is that
17 right?

18 A Correct.

19 Q And you've labeled in Figure 12A the
20 entirety of what's shown, so Frame Zero, Frame 1,
21 Frame 2 and Frame 3, as the route or a portion of a
22 route; is that correct?

23 A Yes. It is a diagram that I'm using, but
24 accurate, I'm trying to -- the description is
25 actually -- starts earlier in paragraphs -- let me

1 see.

2 Paragraph 68 and after, until basically
3 the paragraph which is immediately before, where I'm
4 trying to describe why basically the Limitation 1A is
5 disclosed by Neiss.

6 Q Now, in the figure that you've annotated
7 here, Figure 12A, there are some angle and radius
8 data points that are included; is that correct?

9 A Yes.

10 Q And they're shown in Frame Zero, but
11 there's kind of a series of dots at the end of the
12 list of angle and radius measurements. Do you see
13 that?

14 A Yes.

15 Q Is that meant to represent that there are
16 angle and radius measurements in the other frames, as
17 well?

18 A Yeah. I believe Neiss -- may I have
19 access to Neiss -- say something that, for that --
20 that -- if I have wide content, there are several
21 initial values. But can you share up Neiss or I
22 could bring up Neiss.

23 Q Sure, we'll get to that in a minute once
24 we're done talking about this, but I'll provide you
25 with a copy right now.

1 A So if you could bear with me, I'm just
2 trying to find --

3 Q So if it helps to kind of speed our
4 discussion along, why don't we look at Paragraph 177
5 of Neiss, which appears to be discussing Figure 12A.

6 A Yeah, there is also something -- some
7 text when this thing is set up. So let me -- just
8 bear with me.

9 So if you go to my declaration, just
10 before Paragraph 84, do you see the Figures 13B
11 through D annotated from Neiss?

12 Q Yes. I see that.

13 A And if you see, I'm explaining in the
14 paragraph before how the values -- what basically all
15 those values are and how I indicate an example of
16 using four frames, how this horizon works.

17 Q Okay.

18 A Do you see, for example, Figure 12C in
19 Frame 2, I have all these values. And in Neiss, he's
20 indicated that the absence -- it's just that this is
21 for illustration purposes, that indicates -- it tries
22 to show the iteration and how the variations in the
23 target speed, along with the angles and the radius
24 are represented in Frame Zero, 1, 2 and 3.

25 And it should be noted here that this is

1 just for illustration purposes, we have these four
2 frames representation and, in fact, Neiss talks about
3 having 400 frames.

4 Q So the first of those figures that you
5 just referenced appears in Paragraph 83; is that
6 right?

7 A Yes, at the end of 83.

8 Q So the paragraph -- the figure that
9 you've annotated at the end of Paragraph 83, you've
10 labeled in green the ends of Frame Zero, Frame 1, and
11 Frame 2 as segments destinations; is that right?

12 A Yes.

13 Q And you've labeled all the frames as a
14 route, correct?

15 A If you look at Figure 12C, I have these
16 blue indication of the route, at the bottom, the
17 annotation.

18 Q And in this figure there appears to be
19 angle, radius, velocity and other data in Frame Zero,
20 1 and 2; is that correct?

21 A Yes.

22 Q Now, if you could turn to Paragraph 177
23 of Neiss?

24 A Paragraph 177.

25 Q Which is on Page 20 of the PDF of Neiss.

1 A Bear with me. Yes, I'm there.

2 Q So this paragraph begins a discussion of
3 what Neiss calls the sequence of the optimization
4 algorithm; is that right?

5 A Yes.

6 Q And here, Neiss explains that Figures 12A
7 through C show an initialization stage in which the
8 whole prediction horizon, except for the last frame,
9 is calculated. Do you see that?

10 A Yes.

11 Q Now, in Neiss, data is stored in a ring
12 buffer, correct?

13 MR. JHURANI: Objection to form.

14 THE WITNESS: The demonstration,
15 you want to -- do you want it to narrow
16 down? Do I cite the ring buffer
17 somewhere in my declaration or do I refer
18 to the ring buffer?

19 BY MR. HERMAN:

20 Q The very next paragraph of Neiss says:
21 The initialization of the ring buffer, Figures 12A
22 through C, must be completed before the vehicle
23 reaches the start point on the road where the PCC
24 system is triggered.

25 That's what Neiss says, correct?

1 A Yeah, many disclosures of how this
2 prediction horizon may be implemented.

3 Q But the actual example starting in
4 Paragraph 177 about how the prediction horizon is
5 initialized refers to initialization of the ring
6 buffer, true?

7 A So if you go -- the discussion of the
8 ring buffer, I think it started in Paragraph 162:
9 For an area around the current vehicle position
10 (Prediction History -- Prediction Horizon), the
11 optimal velocity, throttle pedal positions, and
12 controller gain series are stored in the look-up
13 table, (which is contained in a ring buffer memory,
14 as discussed hereinafter). The resolution of this
15 look-up table is thereby the Integration Step Size h .
16 (The optimal velocity is considered to be constant
17 for small distances h). The output --

18 And it continues. So this is for
19 demonstration purposes, the disclosure that starts
20 162, I believe. Maybe it's introduced earlier.

21 Q So for demonstration purposes, Neiss is
22 discussing the storage of optimal velocity, throttle
23 pedal position and controller gain values in a ring
24 buffer, correct?

25 A Give me one minute just to -- I'm going

1 through my declaration again.

2 If you can go to Paragraph 47: Notably,
3 although Figures 12A-C and 13A-D show a prediction
4 horizon spanning only four frames, to make the basic
5 operation of the ring buffer clear, Neiss explains
6 that the realistic values for the prediction horizon
7 would be 4000 -- and it's not corrected here, because
8 I think I mentioned 400 -- assuming Integration Step
9 Size of 1 meter and 200 for the number of frames.
10 Thus, nearly 200 optimization integration steps are
11 performed with regard to the values in one frame
12 before they are actually read out.

13 Q So there you're saying that the ring
14 buffer could store more frames. You are not,
15 however, opining here and you have not opined
16 anywhere in this declaration that the prediction
17 horizon can be stored in anything other than a ring
18 buffer, true?

19 MR. JHURANI: Objection to form.

20 THE WITNESS: Can you repeat the
21 question?

22 BY MR. HERMAN:

23 Q Yes. You have not opined anywhere in
24 your declaration that the prediction horizon would be
25 stored in something other than a ring buffer,

1 correct?

2 MR. JHURANI: Objection to form.

3 MR. HERMAN: If you have, feel free
4 to point it out.

5 THE WITNESS: In my -- I was asked
6 to consider -- to look basically at the
7 disclosure of Neiss. And I look at the
8 Neiss spec and I found the ring buffer
9 as a -- basically as a sufficient
10 disclosure for 1A and the subsequent
11 claim elements.

12 BY MR. HERMAN:

13 Q So in your declaration you have taken
14 into account the fact that Neiss stores its
15 prediction horizon in a ring buffer, true.

16 MR. JHURANI: Objection to form.

17 THE WITNESS: Just for the
18 demonstration purposes I'm trying to
19 highlight Elements 1A, how are disclosed
20 by Neiss, 1B, 1C, 1D, et cetera.

21 BY MR. HERMAN:

22 Q And you have not opined anywhere in your
23 declaration that Neiss would store its prediction
24 horizon in anything other than a ring buffer,
25 correct?

1 A Let me check. It's been a while since I
2 drafted -- since I drafted the report.

3 If you look at -- consider also,
4 generally, Storage Memory. If you go to Paragraph 54
5 of my declaration: Moreover, Neiss describes
6 controlling the vehicle according to the vehicle
7 parameters determined by the optimization of the
8 vehicle operating cost function. Specifically, the
9 calculated optimized vehicle control parameters are
10 stored in memory and subsequently used by a
11 controller to control the vehicle in accordance with
12 these vehicle control parameters.

13 The vehicle -- so, in other words, I'm
14 saying that a POSITA will have understood that many
15 bands of memory could have been used, and Neiss
16 discloses exactly that to a POSITA.

17 And then I continue and say, from Neiss:
18 The vehicle is then controlled by reading -- and this
19 is underlined -- the optimized vehicle control
20 parameters from the memory, corresponding to the
21 current position of the vehicle.

22 Q So your opinion sitting here today is
23 that one of ordinary skill in the art would throw out
24 Neiss' ring buffer and implement it in an entirely
25 different way, true?

1 MR. JHURANI: Objection to form and
2 scope.

3 BY MR. HERMAN:

4 Q And that's what you just said, right?

5 You said that it's not your opinion that
6 Neiss is limited to a ring buffer; that one of
7 ordinary skill in the art would understand that it
8 could be implemented in any way. And you're saying
9 that because you used the word "memory" in Paragraph
10 54 without anything else, true?

11 MR. JHURANI: Objection to form,
12 and compound.

13 THE WITNESS: Let me go to
14 Paragraph 15. Just give me one minute.

15 In Paragraph 15 of Neiss, and I
16 think this is -- it's a very important
17 paragraph with respect to my analysis and
18 the disclosures: In the predictive
19 cruise control system according to the
20 invention, a vehicle operating cost
21 function is defined, based on a
22 plurality of environmental parameters,
23 vehicle parameters, vehicle operating
24 parameters and route parameters. As the
25 vehicle travels over a particular route

1 for which the route parameter such as
2 road gradient and curvature, are stored
3 in a road map, sensors aboard the vehicle
4 detect environmental and vehicle
5 operating parameters, including at least
6 vehicle speed and position relative to
7 the road map. As the vehicle proceeds,
8 an onboard computer iteratively
9 calculates and stores in a memory --
10 these are the words of Neiss -- vehicle
11 control parameters that optimize the
12 vehicle operating cost function for a
13 predetermined distance, referred to as a
14 Prediction Horizon, along the route ahead
15 of the vehicle.

16 So, and then it continues and says:
17 The optimal vehicle control parameters
18 for the Prediction Horizon are then
19 stored in a memory and continuously
20 updated and replaced by new data as the
21 vehicle and as the prediction horizon
22 moves along.

23 In other words, the prediction
24 horizon is not static, it changes.

25 Thereby adjusting optimal control

1 parameters to reflect actual vehicle
2 historical operating experience during
3 the journey. The vehicle is then
4 controlled by reading the optimized
5 vehicle control parameters from the
6 memory, corresponding to the car position
7 of the vehicle.

8 These are the words of Neiss.

9 BY MR. HERMAN:

10 Q So those --

11 A The disclosures of Neiss.

12 Q So those words that you just read back
13 just used the word "memory," correct?

14 A Yes.

15 Q They don't describe what type of memory
16 Neiss is using, true?

17 A A POSITA will have known what memory at
18 that time would have been.

19 Q So where in your declaration do you
20 explain in words the types of different memories
21 besides a ring buffer one of ordinary skill in the
22 art would have known at that time? Where are those
23 examples articulated in your declaration?

24 A As I say, I was asked to look at the
25 claim terms and basically see where Neiss discloses

1 each one of the claims or the claim limits, and
2 that's exactly what I did.

3 Q So sitting here today, you cannot point
4 me to any portions of your declaration that identify
5 types of memory contemplated by Neiss besides a ring
6 buffer, true?

7 A Since -- since my declaration is almost
8 100 pages, let me make sure that I check to make sure
9 that I give you a complete -- comprehensive answer.

10 Let me ask for clarification. Are you
11 still referring to Neiss? You're not referring --

12 Q Yeah. Just the Neiss.

13 A For example, if you go to Paragraph 58,
14 of my declaration, I'm saying: Neiss teaches a
15 computer of said vehicle. Specifically, Neiss
16 discloses an onboard computer that includes memory
17 and a data processor.

18 And I have references. So, in other
19 words, I assume any onboard computer that includes
20 some type of memory is part of my declaration.

21 Q So in that paragraph you just used the
22 word "memory," correct? You don't provide any
23 specific examples of memory that would be different
24 from a ring buffer, correct?

25 MR. JHURANI: Objection. Form.

1 THE WITNESS: Let me look through
2 my declaration, if you can bear with me.

3 I think, since -- Neiss is very
4 clear. For example, if you look at
5 Figure 4 in his disclosure about a
6 computer that includes memory. I didn't
7 feel the need to elaborate more.

8 If you look at Figure 3 -- Figure
9 4, excuse me, you can see the Element 3,
10 which is labeled Predictive Cruise
11 Control module, where the algorithm
12 parameters/map are fed in, along with GPS
13 information from Unit 4, along with the
14 velocity. And this unit is computing
15 unit, is computer. Along with the memory
16 produces the V desired, the desired
17 throttle, and the controller gain in
18 order to inform the controller.

19 And Neiss explicitly discloses that
20 these elements are stored in the memory
21 associated with the computer that is
22 implementing.

23 BY MR. HERMAN:

24 Q And in Neiss' example, that memory is in
25 the form of a ring buffer, true?

1 MR. JHURANI: Objection to form.

2 THE WITNESS: Again, the ring
3 buffer was mentioned as an example
4 associated with the four frames example.

5 I don't see the disclosure of Neiss
6 regarding the memory is very clear.

7 BY MR. HERMAN:

8 Q But you can't point me to any portion of
9 your declaration that discusses the implementation of
10 Neiss with anything other than a ring buffer,
11 correct?

12 A Counsel, I disagree, because as I
13 mentioned earlier in Paragraph -- let me see --
14 Paragraph -- Paragraph 58 of my declaration, I
15 explicitly say: Neiss teaches a computer of said
16 vehicle. Specifically, Neiss discloses an onboard
17 computer that includes memory and a data processor.

18 And I'm giving the abstract: An onboard
19 computer iteratively calculates and stores in a
20 memory vehicle control parameters that optimize the
21 vehicle operating cost function for a predetermined
22 prediction horizon along the route ahead of the
23 vehicle.

24 A radio -- Paragraph 15, and I'm also
25 citing 34, 37 paragraphs through 41, 44, which is

1 describing the predictive cruise control PCC block,
2 as computing the optimal vehicle control parameters
3 such as desired speed, throttle and control gain.

4 The Figures 4 and 15 show and are
5 describing the PCC block implemented in the vehicle.
6 The Claim 15 from Neiss, which describes a data
7 processor to calculate optimal vehicle control
8 parameters and memory for storing road map and a
9 look-up table including the calculated optimal
10 vehicle control parameters.

11 And Neiss continues -- I don't want to --
12 if you want me, I can continue reading this from my
13 declaration, but I think I explore all the different
14 configurations where memory plays a role and not only
15 which system it belongs to, but also which parameters
16 are stored and are moved out in order to inform the
17 controller.

18 Q So this paragraph, it simply states that
19 Neiss includes a memory, period, it does not say what
20 form or data structure that memory stores, correct?

21 A I don't think I need this in my analysis.
22 I was asked to look at the claim language. And I
23 think there is significant disclosure in Neiss, more
24 than enough disclosure in Neiss, including an example
25 with the four frames, that is very illustrative of

1 all how all these different components come together.

2 Q Now will you agree with me that in Neiss'
3 example that's shown in Figure 12A through 12C, Neiss
4 specifically says that that example -- in the context
5 of that example, it stores the data in a ring buffer?

6 A Can you point me, please, where -- where
7 are you referring it?

8 Q Sure. Paragraph 178 says: The
9 initialization of the ring buffer, Figures 12A
10 through C, must be completed before the vehicle
11 reaches the start point on the road where the PCC
12 system is triggered.

13 So Neiss is saying in that paragraph that
14 Figures 12A through C are depicting, in Neiss' own
15 words, initialization of the ring buffer, correct?

16 A Let me go to -- I think I mentioned to
17 you that the ring buffer is mentioned earlier, if I'm
18 right. So I think it's important to go to the first
19 declaration and put it in context.

20 So I believe this is 162, which comes
21 after 161, from Neiss, where it says: Implementation
22 of the Cost Minimizing Algorithm. For an area around
23 the current vehicle positioned, Prediction Horizon,
24 the optimal velocity, throttle pedal positions and
25 controller gain series are stored in the look-up

1 table, which is contained in a ring buffer memory as
2 discussed hereinafter.

3 And we should view this in context that
4 Neiss earlier mentions that this is just an example
5 and you can have as many -- if you look, for example,
6 at Paragraph 192, it says: In the examples of
7 Figures 12 and 13, the parameters prediction horizon,
8 a number of frames are chosen very small in order to
9 make the basic operation of the ring buffer clear.
10 Realistic values for the prediction horizon would be
11 4000 assuming integration step size of 1 meter, and
12 200 for the number of frames.

13 So the objective of Neiss is basically to
14 make the basic operation of the big ring buffer
15 clear.

16 Q All right. So starting at Paragraph 161,
17 Neiss is discussing an example implementation of the
18 cost minimizing algorithm, correct?

19 A Yes.

20 Q And in that example, ring -- Neiss says
21 that the look-up table is stored in a ring buffer
22 memory, correct?

23 A In the context of illustrating the basic
24 operation that takes place.

25 Q And in the context of illustrating that

1 basic operation, Neiss discusses storage of the
2 look-up table in a ring buffer, correct?

3 A Ring buffer memory.

4 Q And then going down to Paragraph 178,
5 still within this example, Neiss talks about how it
6 initializes that ring buffer memory, true?

7 A Let me read the -- yes, for a particular
8 example.

9 Q All right. And also in this example, in
10 Paragraph 179 Neiss states that: First, the ring
11 buffer memory is filled with angle and radius values
12 from Cell Zero up to the last cell of the
13 next-to-last frame.

14 Do you see that?

15 A Yes.

16 Q Now, those angle and radius values that
17 are referenced there, they are coming from the 3D
18 digital road map that Neiss stores; is that right?

19 A Bear with me just -- yeah, according
20 to -- if you look at the disclosure of Neiss, this
21 is -- this is one of the possibilities.

22 Q And those values reflect the angle and
23 the radius, essentially, of the road ahead of the
24 vehicle, correct?

25 A There are many ways. You may get the

1 whole map of things ahead of you, behind you, and
2 then the PCC unit, the predictive cruise control, can
3 decide.

4 Q But this particular paragraph is talking
5 about initialization of the ring buffer, and it says
6 in Paragraph 178 that that: Must be completed before
7 the vehicle reaches the start point on the road where
8 the PCC system is triggered.

9 Do you see that?

10 A Yeah, let me go there. Just one moment.
11 Can you please -- repeat, please, the question.

12 Q So Neiss is saying in Paragraph 178 that
13 it's performing an initialization of the ring buffer
14 before the vehicle reaches the start point on the
15 road where the PCC system is triggered, correct?

16 A Yeah, among other disclosures of Neiss in
17 this case, it says ahead, because this is how he
18 views in this particular instance the prediction
19 horizon implementation.

20 I think we need to view this in
21 conjunction with Paragraph 15 of Neiss, where it says
22 that we get these prediction horizons either in one
23 step, and it's the whole route; or as the vehicle
24 moves, we have one prediction horizon, the next one,
25 the next one, the next one, until we reach basically

1 the destination. I think paragraph 15 is pretty
2 important.

3 Q So right now we're talking about
4 Paragraph 178. And in 178, Neiss is discussing the
5 initialization of the ring buffer, correct?

6 A Yeah. But what I'm saying is actually --
7 Paragraph 15 gives the overall -- the overarching
8 framework, and 117, it shows a particular
9 implementation with the four frames and the ring
10 buffer.

11 Q So right now I'm trying to ask you about
12 how Neiss initializes -- specifically initializes in
13 its example that ring buffer. And that is discussed
14 in Paragraph 177, 178 and 179, true?

15 A For the particular example, yes.

16 Q And in those paragraphs, Neiss explains
17 in 179 that: First, the ring buffer memory is filled
18 with angle and radius values from Cell Zero up to the
19 last cell of the next-to-last frame.

20 Right?

21 A For this particular example, yes.

22 Q All right. So in this particular
23 example, Neiss will first fill up Cell Zero, correct?

24 A It uses the full range. It says I'm
25 going until the ring buffer memory is filled with

1 angle and radius values from Cell Zero up to the last
2 cell of the next-to-last frame.

3 So discloses that the whole thing, it may
4 have just one step that fills the whole buffer with
5 these values. It doesn't necessarily say, I'm just
6 doing only Cell Zero.

7 Q In fact, it does say that, right? It
8 shows that in its figures, true?

9 MR. JHURANI: Objection to form.

10 BY MR. HERMAN:

11 Q In fact, it says: From Cell Zero up to
12 the last cell of the next-to-last frame.

13 That's the words that Neiss uses,
14 correct?

15 A Yeah, I have several answers for this.

16 First of all, there are many ways a
17 POSITA will have looked at this and say, how can I do
18 this. And one thing is you just dump the whole row
19 values in one shot.

20 The other thing is also -- I'm trying to
21 find, there is text in Neiss which says, for
22 demonstration purposes, illustrate -- some of these
23 values are omitted or are periods which are used.

24 Let me --

25 So if you look at 177, it says: The

1 sequence of the optimization algorithm will now be
2 explained by reference to the example.

3 So it doesn't say -- it doesn't -- this
4 is just one example, ring buffer of Figure 11.

5 Figures 12A-C show in the initialization
6 stages in which the whole prediction horizon, except
7 for the last frame, is calculated, while Figure
8 13A-C -- so -- and this continues. And says, for
9 example, that this is a simplified -- I'm going to
10 Paragraph 175, this is a simplified version for
11 illustration only.

12 Q So based on your interpretation of Neiss,
13 Neiss' system could instantaneously pull 4,000 angle
14 and radius measurements out of the air at the same
15 time and fill up every single cell of a 4,000 long
16 prediction horizon at the same time? That's how you
17 read Neiss?

18 MR. JHURANI: Objection to form.

19 Scope.

20 THE WITNESS: Just -- I'm telling
21 you what Neiss discloses, the spec in
22 Neiss discloses. I think a POSITA would
23 have read all these. I mean, it very
24 explicitly says this is a simplified --
25 Paragraph 170: This is a simplified

1 version for illustration only. The
2 parameter Number of Frames determines the
3 rate at which the optimal trajectory is
4 updated.

5 So, in other words, a lot of the
6 stuff out of disclosures with respect to
7 this particular component of Neiss, which
8 tries to illustrate the logic and what
9 it's basically using the road map to
10 accomplish its goals, as stated
11 throughout the Neiss reference.

12 BY MR. HERMAN:

13 Q So you think that Neiss should be
14 interpreted in a way that is consistent with the
15 goals that are expressed throughout the Neiss
16 reference, true? That's what you just said?

17 A I think that Neiss -- let me go to my
18 declaration.

19 Q I'm asking about your testimony.
20 You just said one second ago that Neiss
21 should be interpreted with its goals. Is that your
22 testimony, that Neiss should be interpreted
23 consistent with its goals; yes or no?

24 A As stated in the disclosures.

25 Q And can we ignore some of those goals and

1 focus only on others when interpreting Neiss?

2 MR. JHURANI: Objection to form.

3 THE WITNESS: This is not what I
4 said.

5 BY MR. HERMAN:

6 Q So you think it would be an error to
7 ignore some of Neiss' goals and focus only on others
8 when interpreting Neiss, true?

9 MR. JHURANI: Objection to form.

10 THE WITNESS: Counsel, I was asked
11 to look at the patent, the claims in
12 patent '161, and where Neiss makes
13 disclosures. There are certain parts of
14 Neiss which basically make disclosures,
15 very clear disclosures, about the
16 elements in the claims that I mention.

17 So, as I mentioned in Paragraph 58
18 of my declaration, Neiss teaches a
19 computer of said vehicle. If we go to
20 Paragraph 60, I'm saying Neiss
21 discloses -- and paragraphs after. So
22 discloses basically rating a route by a
23 computer and so on and so forth.

24 So my goal was not basically -- my
25 goal was actually to read Neiss and make

1 sure that Neiss -- understand Neiss and
2 try to see how Neiss discloses the
3 elements of the claims that I was asked
4 to consider.

5 MR. JHURANI: Counsel, let me just
6 jump in really quick. We've been going
7 for over an hour. Can we take a break --
8 a ten-minute break and then continue in
9 this of questioning?

10 MR. HERMAN: Yeah, that's fine.

11 Doctor, is that fine with you, a
12 ten-minute break?

13 THE WITNESS: Yes.

14 MR. HERMAN: I don't want to stop
15 you in the middle of your question,
16 though. So if you had more you to say
17 before we take our break, you should
18 continue and then we can stop.

19 THE WITNESS: No, that's fine. I
20 mean, I think I have mentioned --

21 MR. HERMAN: You're okay? You're
22 ready for a break?

23 THE WITNESS: Yeah, I can take a
24 break.

25 MR. HERMAN: All right. So why

1 don't we take a ten-minute break and
2 start back up about 22 after.

3 Does that make sense for everybody?

4 (Brief pause.)

5 BY MR. HERMAN:

6 Q Okay, Doctor. Could you turn to Figure 6
7 of Neiss for me.

8 A Give me one minute. Yes.

9 Q So this is a block diagram of Neiss' PCC,
10 or its predictive cruise control; is that right?

11 A Yes.

12 Q And per the figure, the PCC includes a
13 look-up table, which I think is labeled with Item
14 Number 26; is that right?

15 A Yeah, it -- yeah, it seems 26 or 25.

16 Q But it also includes the words "look-up
17 table," correct?

18 A Yeah, yeah.

19 Q And that look-up table stores the
20 velocity, the throttle pedal, controller gain and the
21 other parameters for the predictive horizon, correct?

22 A Let me go to the record just one minute.

23 Yes, the Look-up Table 26, based on
24 Paragraph 47 from Neiss, is a memory where desired
25 velocity, throttle pedal and controller gain values

1 are stored for an area.

2 Q And Figure 6 shows input going into that
3 look-up table from what's labeled as Position
4 Estimator 25. Do you see that?

5 A Just one minute. Which figure are you
6 referring to?

7 Q Figure 6?

8 A Figure 6. The desire -- so you mean
9 about the boldfaced Auto?

10 Q Well, there's an arrow going from
11 Position Estimator 25 to Look-up Table 26.

12 A Yes.

13 Q And if you could turn to Paragraph 47 for
14 me.

15 A Of Neiss, right?

16 Q Of Neiss, yes. That paragraph says that
17 Look-up Table 26 is: A memory where desired
18 velocity, throttle pedal and controller gain values
19 are stored for an area, the Prediction Horizon,
20 around the current vehicle position.

21 Do you see that?

22 A Yes.

23 Q Then it goes on to say: The outputs of
24 the PCC block are determined by reading out the
25 values belonging to the vehicle position supplied by

1 the Position Estimator.

2 Do you see that?

3 A Yes.

4 Q So why is Neiss using the position
5 estimator to determine values in the look-up table
6 rather than just automatically reading them out and
7 using them to control the vehicle?

8 MR. JHURANI: Objection to form.

9 THE WITNESS: If we go to Neiss, it
10 says: The position estimator is a module
11 which may be present in the vehicle
12 navigation system -- and again, this is a
13 relevant reference, because both Neiss
14 and '161 deal with vehicle navigation
15 systems -- determines the current
16 position of the vehicle on the road by
17 integrating the vehicle velocity and
18 taking into account the common GPS
19 messages.

20 So the GPS messages are part of --
21 if you go to Figure 4, Neiss, do you see
22 how the GPS messages are informing Unit
23 Element 4 with the auto -- it says: GPS
24 is informing the predictive cruise
25 control unit.

1 BY MR. HERMAN:

2 Q So my question is why is Neiss using GPS
3 to inform the predictive cruise control unit as
4 opposed to just simply reading out and automatically
5 applying the values that are stored in its look-up
6 table in all circumstances?

7 A What is disclosed in Paragraph 4 is
8 actually -- it says, the last sentence of Paragraph 4
9 of Neiss: In such a system, the current vehicle
10 position may be determined, for example, by means of
11 a global positioning system, and information about
12 the upcoming terrain can be taken from a
13 three-dimensional digital road map for the purpose of
14 controlling vehicle operation.

15 One of the many options described -- at
16 the bottom is described basically in Neiss.

17 Q So my question is why Neiss is not just
18 automatically applying the control values stored in
19 the look-up table? Why is it inputting and searching
20 that table using GPS positions? Do you have an
21 understanding as to why that's the case?

22 A The disclosure is that -- if you go to
23 Paragraph 15 -- so if you go to Paragraph 15 of
24 Neiss: As the vehicle travels over a particular
25 route for which route parameters, such as road

1 gradient and curvature, are stored in a road map,
2 sensors aboard the vehicle detect environmental and
3 vehicle operating parameters, including at least
4 vehicle speed and position relative to the road map.
5 As the vehicle proceeds, an onboard computer
6 iteratively calculates and stores in a memory vehicle
7 control parameters that optimize the vehicle
8 operating cost function for a predetermined distance
9 along the route ahead of the vehicle.

10 So, in other words, this information --
11 so there is -- there are many parameters,
12 environmental and vehicle parameters that Neiss
13 describes as potentially influence the decision.

14 In this particular aspect, it says that:
15 The optimal vehicle control parameters -- and
16 continuing from the same paragraph -- for the
17 Prediction Horizon are then stored in a memory and
18 continuously updated and replaced by new data as the
19 vehicle, and hence the prediction horizon, moves
20 along, thereby adjusting the optimal control
21 parameters to reflect actual vehicle historical
22 operating experience during the journey.

23 So one of the reasons why you want to
24 do -- one of the reasons why you see this at all is
25 actually that you want to have continuous adjusting

1 the optimal control parameters to reflect actual
2 vehicle historical operating experience during the
3 journey.

4 Q So the last sentence in that paragraph
5 you read says: The vehicle is then controlled by
6 reading the optimized vehicle control parameters from
7 the memory corresponding to the current position of
8 the vehicle.

9 So my question is this. Why does Neiss
10 care what the current position of the vehicle is?
11 Why does it not just automatically spit out the
12 optimized vehicle control parameters from the memory
13 in all cases?

14 MR. JHURANI: Objection. Form.
15 Compound.

16 THE WITNESS: Can you repeat the
17 question, please.

18 BY MR. HERMAN:

19 Q So Neiss stores optimized control
20 parameters in its memory, true?

21 A Yeah.

22 Q Will it use those optimized control
23 parameters as the vehicle travels in all cases?

24 MR. JHURANI: Objection to form.

25 THE WITNESS: I think Neiss is very

1 clear about why it does that. I don't
2 know -- I think I -- the paragraphs --
3 the sentences in 15 just explained this.
4 I don't know -- do you want me to read
5 them again or --

6 BY MR. HERMAN:

7 Q So sitting here today, you don't have
8 anything to add besides the words that appear in
9 Paragraph 15, true?

10 A I think I have analyzed in my report the
11 Paragraph 15, but let me -- let's make sure that --
12 If you go to Paragraph 32 of my
13 declaration, I'm saying: Neiss' cruise control unit
14 aims to minimize vehicle operating costs by
15 optimizing a vehicle operating cost function, that is
16 defined based on environmental parameters, vehicle
17 parameters, vehicle operating parameters, and route
18 parameters.

19 And I am citing 15 and 1: As the vehicle
20 proceeds along its route, an onboard computer
21 iteratively calculates and stores in a memory vehicle
22 control parameters that optimize the vehicle
23 operating cost function for a predetermined distance
24 along the route ahead of the vehicle. The vehicle is
25 then controlled by reading the optimized vehicle

1 control parameters from the memory, corresponding to
2 the current position of the vehicle.

3 And again, this is 15 -- 15 Paragraph:
4 Neiss describes an optimization problem with a cost
5 function that depends on multiple subfunctions,
6 including fuel consumption.

7 Q Now, will Neiss control the vehicle using
8 the optimized vehicle control parameters stored in
9 its memory if those parameters do not correspond to
10 the current position of the vehicle?

11 A Can you repeat the question, because I'm
12 not sure I -- just to be clear for the record, can
13 you repeat the question?

14 Q So will Neiss' system control the vehicle
15 using the optimized vehicle control parameters stored
16 in its memory if those optimized vehicle control
17 parameters do not correspond to the current position
18 of the vehicle?

19 MR. JHURANI: Objection to form.

20 THE WITNESS: I think if we go to
21 Figure -- if we go to figure from Neiss,
22 Figure -- just one minute. Figure 4.
23 And also the way -- the example with the
24 four frames in Figures 12 and 13. It's
25 just a -- this is an alternative process.

1 As these values are coming in, this
2 is what the controller is going to pick
3 up and use. And it's going to do this in
4 a way that these energy-efficient
5 velocities are going to be determined by
6 the process disclosed in Neiss.

7 BY MR. HERMAN:

8 Q So previously you pointed me to Paragraph
9 192 of Neiss during your testimony earlier today,
10 correct?

11 A And remind me -- or let me go to
12 Paragraph 192. Yes.

13 Q So in this paragraph, Neiss says:
14 Realistic values for the Prediction Horizon would be
15 4000 assuming an Integration Step Size of 1 meter.

16 Do you see that?

17 A Yeah.

18 Q That's talking about a prediction horizon
19 that covers 4-kilometers of roadway ahead of the
20 vehicle, true?

21 A Yes.

22 Q Now, over the course of 4-kilometers, a
23 vehicle could, of course, change its route many, many
24 times, correct?

25 MR. JHURANI: Objection to form.

1 THE WITNESS: What do you mean --

2 I'm not sure I understand in the context
3 of Neiss and the '161 how you use the
4 term "changes route."

5 BY MR. HERMAN:

6 Q So if a vehicle is traveling along a
7 highway, they could exit the highway over the course
8 of 4 kilometers, correct?

9 A Uh-huh.

10 Q But if it's traveling on a local roadway,
11 it could turn onto a different roadway over the
12 course of 4 kilometers, correct?

13 A It's a possibility, but I'm not sure
14 how -- yeah, I mean, I can tell you quite of a few
15 things.

16 Q If the prediction horizon in Neiss
17 represents 4 kilometers along a highway and the
18 vehicle exits in the middle of that 4-kilometer
19 stretch, it would never reach the end of the
20 prediction horizon, true?

21 MR. JHURANI: Objection to form and
22 scope.

23 THE WITNESS: As I mentioned, the
24 prediction horizon can by itself the
25 route, as I have shown in the annotated

1 Figure 10, or it can be a portion of the
2 route.

3 Let me tell you where in my -- so I
4 think if you look -- let me go -- for
5 example, if you go just before Paragraph
6 76 of my declaration, I have an example
7 of what Neiss discloses with respect to
8 the prediction horizon. And I'm saying
9 that the prediction horizon could be the
10 route or a portion of the route.

11 BY MR. HERMAN:

12 Q So if the prediction horizon is simply
13 the highway ahead of the vehicle for 4 kilometers and
14 the vehicle exits, then the vehicle would never reach
15 the end of that 4-kilometer stretch of highway,
16 correct?

17 MR. JHURANI: Objection to form and
18 scope.

19 THE WITNESS: I'm just -- I'm going
20 to just go back to this description that
21 I give. And, in fact, let me go -- there
22 are many options provided in '161. Do
23 you have a copy, or can I access my copy
24 of '161 or do you want to --
25

1 BY MR. HERMAN:

2 Q So I'm asking about Neiss right now.

3 Neiss. Neiss, the reference.

4 A Yeah, but I want to show that route --

5 Q So, in your opinion, you believe you can
6 interpret what Neiss discloses to one of ordinary
7 skill in the art based on what the '161 patent
8 discloses? Is that how you analyze Neiss in this
9 particular proceeding?

10 MR. JHURANI: Objection to form.

11 BY MR. HERMAN:

12 Q So you took the examples in the '161
13 patent and used them to inform your understanding of
14 Neiss, correct?

15 MR. JHURANI: Objection to form.

16 Mischaracterizes testimony.

17 THE WITNESS: Let me state what I
18 did, what I was asked to do.

19 I was asked to look at the claims
20 in '161 and I was asked to look at Neiss
21 and at its disclosures. And I believe
22 that Neiss discloses the particular
23 claims, as I mention in any declaration.

24 Now, it's very interesting that
25 Neiss -- that '161 says -- I don't know

1 if you can give me access or I can access
2 the copy I have. It's very interesting
3 that it uses the term "a route
4 typically." But I need to have the
5 particular reference to tell you.

6 BY MR. HERMAN:

7 Q So right now I'm asking you about Neiss,
8 the Neiss reference. So if you can turn to Paragraph
9 163 for me, and I'd like you to focus on Neiss and
10 what Neiss teaches to one of ordinary skill in the
11 art. And in Paragraph --

12 A Okay. Which paragraph do you want me
13 to --

14 Q 163.

15 A Yes, I read it.

16 Q In Paragraph 163 Neiss says: The look-up
17 table values are calculated on-line, in realtime, as
18 the vehicle proceeds along the traveled routes.

19 Do you see that?

20 A Yes.

21 Q Now, by "on-line," Neiss is not referring
22 to on the internet, right? It's referring to
23 performing calculations as the vehicle is moving from
24 one place to another, correct?

25 A Yeah, if you consider the time of -- of

1 the disclosure, which I believe is 2004, yes.

2 Q And if you look at Paragraph 165, it says
3 that: An on-line determination gives the opportunity
4 to change the route while driving.

5 Do you see that?

6 A Yes.

7 Q So what Neiss is saying is that it
8 produced calculations for one course of travel and
9 then produces new calculations if the vehicle takes
10 another different route, correct?

11 A It gives the opportunity. I mean, a
12 POSITA can read this that it may have the option.

13 Q So Neiss' system is designed to allow for
14 that, to perform calculations for one course of
15 travel and then perform new calculations on-line if
16 the vehicle takes another different course of travel,
17 correct?

18 A It's one of the many possibilities
19 disclosed in this.

20 Q And if you look at Paragraph 167, which
21 is two paragraphs down --

22 A Uh-huh.

23 Q -- Neiss explains that: When the vehicle
24 velocity drifts significantly from the velocity
25 stored in the look-up table for the current position,

1 as might be caused, for example, by a slower vehicle
2 driving ahead, the velocity values for the following
3 positions in the look-up table then can no longer be
4 considered to be optimal.

5 Do you see that?

6 A Yes.

7 Q So what Neiss is saying here is that it
8 may perform a whole bunch of calculations and store
9 them in this look-up table, but then have to throw
10 them away because the vehicle changes speed for some
11 unexpected reason, correct?

12 MR. JHURANI: Objection to form.
13 Mischaracterizes the document.

14 THE WITNESS: It doesn't say that
15 need to be thrown away. They can no
16 longer be considered to be optimal, and a
17 POSITA will have looked at them and, not
18 being optimal -- a disclosure of not
19 being optimal is something that, for
20 example -- let me -- let me go to my
21 declaration because I have a whole
22 analysis about this, if you don't mind.

23 If you can go to Paragraph 120 of
24 my declaration, on Page 72, around the
25 middle, I'm saying: Another object of

1 the invention is to provide a vehicle --
2 this is from Neiss, direct quote -- a
3 vehicle control system which exhibits a
4 high degree of flexibility, and is able
5 to adapt the velocity control to changing
6 driving conditions which result from the
7 intervention of exterior constraints on
8 driving behavior as the vehicle transits
9 a particular route.

10 And I'm referencing 65 until 67.

11 And then it continues, describing that:

12 Realtime calculation gives the
13 opportunity to change the route while
14 driving and allows for taking the current
15 velocity into account.

16 And then at 169: A new
17 optimization calculation only occurs once
18 the vehicle has covered a specified
19 distance or when the set speed has
20 changed.

21 So, again, the 160 -- the statement
22 in 167 should be viewed in conjunction
23 with what Neiss discloses as an on-line,
24 energy efficient or the best energy
25 efficient calculation optimization in

1 order for the vehicle to have the
2 velocities that minimize the energy
3 metric.

4 And it says -- and I'm concluding
5 here, I'm saying: A POSITA would have
6 recognized that continuing the
7 calculation until a final destination is
8 reached extends this flexibility
9 throughout the vehicle's entire trip, and
10 would have been motivated to pursue this
11 implementation to obtain this
12 flexibility, which would then help to
13 ensure that optimized parameters for the
14 current situation can be calculate --
15 recalculated or calculated at any
16 suitable point during the trip.

17 BY MR. HERMAN:

18 Q So two circumstances in which Neiss
19 discusses the need to engage in that sort of
20 recalculation are, number one, when there's a route
21 change or, number two, when a slow driver is
22 encountered, correct?

23 A In this particular part, yes.

24 Q So in those circumstances, Neiss could
25 recalculate the value stored for its prediction

1 horizon, correct?

2 A The calculations are happening
3 continuously. Now, it just explains how, if we have
4 a situation like the one that you discuss, how the
5 system may perform.

6 Q So calculations are being performed for
7 some amount of roadway ahead of the vehicle, true?

8 A Calculations are always taking place.
9 And if you look back at Figure 13 in this small --
10 let me -- if you look at Paragraph 84, just before
11 that it shows in this demonstration of the four
12 frames how these optimization activations are
13 happening. So this is an ongoing process.

14 Q Now, when Neiss says that the route may
15 change or a slow driver may be encountered, what it's
16 saying is that it may reach a point in the data
17 stored for its prediction horizons where the
18 vehicle's position or the vehicle speed does not
19 match what it previously stored, correct?

20 A What it says -- but I think it's -- it's
21 different. It says: The velocity values for the
22 following positions in the look-up table then can no
23 longer be considered to be optimal. In this case, an
24 on-line version of the algorithm can adapt these
25 values by taking the current velocity into account.

1 So he discloses an alternative process
2 that, if a POSITA will have liked, could have
3 followed in order to address the possibility of
4 non-optimality. And I think if you go --

5 Q And so --

6 A Sorry. If you go back to Paragraph 169
7 from Neiss, it says: It is therefore important to
8 implement the optimization algorithm in a manner
9 which permits on-line adaptation of the look-up
10 table. While the optimization calculation could be
11 performed for every computational cycle given enough
12 computing power, this approach was not used in the
13 current implementation. Rather, a new optimization
14 calculation only occurs once the vehicle has covered
15 a specified distance, which is referred to hereafter
16 as a frame, or when the set speed is changed.

17 So the conjunction -- the combination of
18 167 of 169 enumerates several different options for a
19 POSITA.

20 Q And one of the things that's expressed
21 here is that it's important to implement the
22 optimization algorithm in a manner which permits
23 on-line adaptation of the look-up table; that's what
24 Neiss says, correct?

25 A Yeah, it says -- again, it repeats this

1 in 168: An on-line version has the advantage of
2 being able to adapt the optimal trajectories to
3 variable vehicle parameters such as vehicle mass,
4 which has --

5 So he considers many, many parameters
6 that may affect, and proposes different solutions
7 based on the different scenarios that the system may
8 encounter, a vehicle may encounter as it goes with
9 this route prediction horizon.

10 Q And the examples in Paragraphs 163
11 through about 169 that Neiss identifies are changes
12 to the routes, the vehicle velocity, drifting
13 significantly from what -- the velocity stored in the
14 look-up table and variable vehicle parameters such as
15 vehicle mass, those are the examples he provides,
16 correct?

17 A Yeah, and also he provides when the
18 vehicle drifts -- for example, if you see in my
19 Paragraph 140, I'm saying: Neiss describes that when
20 vehicle velocity drifts significantly from the
21 velocity stored in the look-up table for the current
22 position, as might be caused by a slower vehicle
23 driving ahead, the velocity values for the following
24 positions in the look-up table then can no longer be
25 considered to be optimal, and the optimization

1 algorithm is re-executed taking the current velocity
2 into account.

3 For instance, a POSITA will have
4 recognized that this re-optimization may be triggered
5 when the current speed drifts outside of the speed
6 band, such that the vehicle is no longer operating in
7 its optimal range. Furthermore, a POSITA would have
8 found it obvious, as discussed below, that when this
9 new optimization is performed, the set speed, target
10 speed, see 1C, my analysis in 1C above, for the
11 optimization is determined based on the vehicle's
12 current speed.

13 And: Moreover, a POSITA will have
14 understood that the vehicles current speed, which
15 informs the setting of the target speed, is achieved
16 by the driver's interaction with the gas pedal,
17 pressing the gas pedal to accelerate or easing
18 pressure on the gas pedal to decelerate. Thus, the
19 target speed is set in response to driver interaction
20 with the gas pedal in controlling the vehicle's
21 current speed, for example, in response to a position
22 of the gas pedal.

23 So this is one of the many scenarios that
24 Neiss is disclosing.

25 Q And so it's disclosed a scenario where

1 its calculations and its optimizations are meant to
2 adapt to a variety of different circumstances that
3 could change as the vehicle moves along, correct?

4 A Yes, I think -- I think that's -- there
5 is a plethora of disclosures, according to the
6 different scenarios that may happen.

7 Don't forget that we're talking about the
8 predictive cruise control. Let me go -- just one
9 moment. Bear with me. I want to go to Paragraph
10 30 -- 31. Just below the description of the
11 invention: The basic idea of Predictive Cruise
12 Control is to replace or supplement the set speed of
13 a conventional cruise control with a speed band.

14 So once you have -- instead of having a
15 set speed, have a variety of speeds.

16 Forward-looking terrain information is
17 used to determine, as a function -- this is again
18 Paragraph 31 -- as a function of position, a desired
19 speed inside the speed band, as shown in Figure 1 for
20 example, in order to maximize fuel savings. In the
21 ideal case, the vehicle that is equipped with
22 Predictive Cruise Control slows down as it moves
23 uphill until it reaches a minimum speed on top of the
24 hill, and regains speed on the downhill part, thus
25 completely converting the potential energy into the

1 kinetic energy.

2 And it lists some other benefits. And it
3 continues to Paragraph 34.

4 Q Okay. So that paragraph that you just
5 read to me is expressing the point that traveling at
6 a lower speed up a hill and then a higher speed down
7 a hill is better for efficiency purposes, correct?

8 A Just to use Neiss disclosure, it says:
9 This strategy prevents unnecessary braking or delays
10 braking until it is unavoidable.

11 And it goes in 32 and introduces: The
12 road curvature information can be also used to reduce
13 vehicle speed in curves in order to avoid high
14 lateral acceleration which can lead to vehicle
15 rollover.

16 Q So you just read a different paragraph,
17 but I'd like your view, sitting here today, whether
18 you agree with what's in Paragraph 31.

19 Is it more efficient to drive slower up a
20 hill and faster down the hill?

21 A A POSITA actually will recognize that
22 speeding when you are downhill is not the most energy
23 efficient way.

24 Q Though there are differences in the speed
25 going up a hill and down a hill that would be

1 efficient; is that correct?

2 A There are many combinations.

3 Q So traveling up a hill and down a hill at
4 exactly the same speed is not necessarily the most
5 efficient speed to travel; will you agree with that?

6 MR. JHURANI: Objection to form.

7 THE WITNESS: The ascent potential
8 on a set of parameters -- for example,
9 think of the following scenario. If you
10 are in a urban environment versus a rural
11 environment, you want to consider the
12 safety as well. So we need to be -- we
13 need to view the context in which --

14 BY MR. HERMAN:

15 Q So I think the opinion that you're
16 expressing is that determining the most efficient
17 speed to drive up and down a hill is very
18 complicated. That appears to be what you're saying,
19 correct, and very situational dependent, true?

20 A I think Neiss expresses and discloses the
21 best in view of the '161 claims, that it has a number
22 of parameters that tries to optimize in order to
23 provide all these input parameters to the vehicle
24 controller that will minimize energy. And this is my
25 analysis is all about.

1 I mean, I will need some time to analyze
2 all possible scenarios, which may be broader than the
3 '161.

4 Q So let's go back to your declaration,
5 Exhibit 1003.

6 A Please tell me where you want me to go.

7 Q Let's go all the way down to Paragraph
8 176, which is on Page 97.

9 A Just give me one minute. Yes.

10 Q So this begins the portion of your
11 declaration discussing another combination of prior
12 art, a combination that involves a reference to
13 Schramm and a reference to Clapper; is that right?

14 A Yes.

15 Q And in Paragraph 177, you note that: In
16 Schramm's route optimization process, an operator
17 initially specifies an origin and a destination.

18 Do you see that?

19 A Yes.

20 Q Then you go on to note in that paragraph:
21 Additionally, a desired speed is determined, e.g., by
22 an operator specifying a desired average speed at
23 which the operator intends to drive the vehicle to
24 the destination point or by determining the current
25 speed of the vehicle.

1 Do you see that in this paragraph?

2 A Yes.

3 Q And then you conclude the paragraph by
4 noting that: Based on the origin, destination, and
5 desired speed, a minimum-energy route is determined
6 by following the process illustrated in Schramm's
7 Figure 3.

8 Is that right?

9 A Which I've annotated, yes.

10 Q So, generally, Schramm teaches a system
11 for determining the minimum energy route for the
12 vehicle to travel, correct?

13 A Yes, it identifies an energy optimal
14 route based on the knowledge -- yes, this is just
15 before 177 Paragraph of my declaration, what I'm
16 saying, as in here, identification of an
17 energy-optimal route.

18 Q So among other inputs, Schramm's system
19 is receiving the vehicle's origin, the intended
20 destination and the desired speed, correct? Those
21 are inputs that are supplied to its system?

22 A Are we talking about Schramm specifically
23 or Schramm and Clapper in combination?

24 Q The Schramm, standing by itself. And
25 Schramm, its system receives origin, destination and

1 the desired speed as inputs for its calculation,
2 correct?

3 A Yes, but my main analysis, it was a
4 combined Schramm, Clapper analysis.

5 Q Sure. But before we get there, I'd like
6 to talk about what Schramm discloses.

7 And Schramm discloses performing an
8 optimization calculation using origin, destination
9 and speed as inputs, correct?

10 A Yeah, but it has also -- for example, if
11 you look at the Block 57 -- 58, the yellow one in
12 Figure 3 of Schramm, it uses also the average --
13 determines the average elevation change.

14 Q So that's another input, right? It gets
15 origin, destination, speed and elevation change
16 inputs, correct?

17 A Yes, and the inputs from the database.
18 Because if you see, it retrieves the route from the
19 database. So it starts from Element 56 in Figure 3
20 of Schramm. Then it moves to 58. Then it moves to
21 60, access energy consumption models to determine
22 energy consumption of segment, which then updates the
23 purple Box 62.

24 And we have two loops, an interior loop
25 that has to do with the segments. And an external

1 loop that has basically to do with, do we have more
2 routes to examine and so on and so forth. And as an
3 output, we have the Module 72, which returns the
4 route with the lowest cost.

5 Q So that's the output of Schramm's system,
6 the route at the lowest cost, correct?

7 A Yes.

8 Q Okay. Now, if we turn down to 193.

9 A Paragraph 193?

10 Q Yes, of your declaration. Or actually
11 192.

12 A Let me ask you, is it okay if I get -- if
13 I upload Schramm on my -- if I bring it up, the PDF
14 file?

15 Q The Schramm reference, Exhibit 1009?

16 A Yeah, I don't have it -- I don't have
17 it -- I don't have it in the Chat. So --

18 Q I'll stick it in the Chat for you.

19 MR. JHURANI: Counsel, since we're
20 going to be talking about Clapper, too,
21 could we put that in the Chat, as well?

22 MR. HERMAN: Sure. Just for the
23 record, Schramm is Exhibit 1009. Clapper
24 is Exhibit 1005.

25 (Papanikolopoulos Deposition

1 Exhibits Nos. 1005 and 1009 were marked
2 for identification.)

3 MR. JHURANI: And we're coming up
4 on an hour. I don't think we're there
5 yet, but we're coming up on an hour. So
6 whenever is a good stopping point for a
7 break.

8 MR. HERMAN: Sure. Just give me
9 ten more minutes.

10 THE WITNESS: Yeah, give me one
11 minute to make sure that now, since I
12 have -- just one minute -- yeah, please
13 tell me.

14 BY MR. HERMAN:

15 Q So Paragraph 192 of your declaration
16 starts the discussion of the Clapper reference; is
17 that right?

18 A Yes.

19 Q And if you look at Paragraph 193, here
20 you explain that Clapper includes a user database
21 with speeds used at a given location in the past; is
22 that right?

23 A Counsel, can you pinpoint me? Paragraph
24 193 you said?

25 Q Yeah.

1 A Just below Figure 1 from Clapper?

2 Q That's right.

3 A Yes.

4 Q And in the first sentence, you reference
5 Clapper having a user database, and you say that that
6 user database: Specifies speeds used at a given
7 location in the past.

8 Do you see that?

9 A Yes.

10 Q And then at the very end of that
11 paragraph, there's a sentence that begins: If no
12 match for the vehicle's location is found in the
13 user's own database...

14 Do you see that?

15 A Give me a minute. Yeah, there is one
16 part that says some adjustments that can happen and
17 also something about speed limits.

18 Q So, yeah, I think the final sentence is
19 the speed limit.

20 A Yeah. So I'm there, If no match.

21 Q Then a speed limit is stored in -- so the
22 speed limit or the speed for the vehicle's current
23 location is set to the stored speed limit value;
24 that's what you say?

25 A Yes, this is what I said, that it has a

1 couple of options.

2 Q So Clapper is teaching a system that can
3 output a stored speed value which is a speed that the
4 user employed at a given point, correct?

5 A I think it's more than that. Because if
6 you look at my Paragraph 194, I'm saying: Clapper's
7 system also provides functionality for adjusting the
8 speed based on environmental conditions.

9 And I'm referring on Clapper, Column 2,
10 Row 8 to 11.

11 For instance, a website hosting the
12 database mapping speeds to location speed provide
13 information about current driving conditions may be
14 used to moderate the user's previous history. As an
15 example, if it is storing, the stored speeds may be
16 reduced.

17 And this is in Column 2, 10 to 11 row of
18 Clapper.

19 And then continues and describes and
20 describes what we can see in the Figure 4, adapting
21 the display. But summarized with the rest, Clapper
22 discloses an automatic cruise control that discloses
23 a range of speeds, of energy-efficient speeds.

24 Q So the speeds that are stored in Clapper
25 are the user's prior speed; that's what's stored in

1 its database, correct, or speed limits?

2 A Plus whatever I read -- I just read.

3 Because he says that, depending on how the database,
4 the locations may provide information about current
5 driving conditions.

6 Q And so if it's snowing and the user's
7 stored speed is 100 miles an hour, but it may output
8 25 miles an hour, correct?

9 A Yes, as an example.

10 Q Sure. So either the user's stored speed,
11 a speed that takes into account the weather
12 conditions or the speed limit, correct, that's what's
13 being output by Clapper?

14 A Among the different combinations. Go
15 ahead.

16 Q And in your view, that's what Schramm's
17 system would then be using as an input to its system,
18 the speeds that are output from Clapper's system,
19 correct?

20 A I will go further on that, because this
21 database, if we go -- let's go to Figure 4 of
22 Clapper. Do you see Paragraph 96? I have different
23 colors in the different blocks of Figure 4 of
24 Clapper.

25 Do you see the GPS signal? Option -- let

1 me -- let me -- let me try to explain, for example, a
2 little bit more. I would say it discloses more
3 stuff. Give me one minute.

4 So, for example, if you go to Clapper,
5 Row 3 -- sorry -- Column 3, Row 48: Additional
6 information may be provided about whether the
7 locating apparatus, such as the GPS receiver, has
8 acquired a good signal as indicated by 66. When the
9 signal is not adequate, the user may be advised that
10 the previous speed display at 62 may not be correct
11 and a previous speed will not be displayed. The user
12 is thereby warned, for example by a flashing light or
13 an audible signal, that no GPS information is
14 currently being acquired. So the system will then
15 operate as a conventional cruise control until good
16 position information is acquired.

17 So the system disclosed by Clapper also
18 uses the position information, and there is a
19 disclosure, a detailed disclosure, if this
20 information temporarily is not available or reliable,
21 how the system will operate.

22 Q The speeds that are being output, the
23 only speeds that are being output are those that are
24 stored in previous Speed Box 55 or Database Speed 50,
25 correct?

1 A These are two of the speeds, but it tells
2 you that -- for example, we mentioned the scenario
3 with the snow. It may tell you, for example, look,
4 you may want to reduce by a factor of 50 percent your
5 speed if there is snow. And also it can tell you
6 something about the position as disclosed here.

7 Q So it's using position to look up speeds
8 in its stored databases, correct?

9 A It uses position in order to augment the
10 information that it has about the overall status of
11 the vehicle as it traverses the particular route.

12 Q It's using the position information to
13 query its stored speed databases, correct?

14 A Yeah, but you want -- I read, it very
15 specifically says if the GPS signal is not strong,
16 then it issues a warning either by a flashing light
17 or an audible signal that no GPS information is
18 currently being acquired. So the system will then
19 operate as a conventional cruise control until good
20 position information is acquired.

21 Q So all that's saying is that if the
22 vehicle can't figure out where it is, it's unable to
23 query its databases and thus will not apply its
24 database stored speeds, true, and will warn the user
25 accordingly?

1 A The speed uses --

2 MR. JHURANI: Objection.

3 THE WITNESS: Sorry.

4 BY MR. HERMAN:

5 Q So it may not change its speed because it
6 doesn't know where it's position currently is. It
7 will continue using whatever speed it was previously
8 using like a traditional cruise control, correct?

9 A It's one option. The user is warned, and
10 I think the user can decide if it's going to override
11 the system or whatever. I think Clapper is reached
12 in a variety of solutions for a POSITA of how to
13 operate the vehicle in the aforementioned conditions.
14 I mean, all this, I would say are edge cases.

15 Q Was that it or did you have a further
16 answer?

17 A No, I tried to say, if you look, Clapper
18 is quite detailed in its disclosure, because it even
19 discloses possible options that a POSITA about edge
20 cases, cases which may not happen very often.

21 MR. HERMAN: I think with that, I
22 don't have any further questions. So
23 thank you, Doctor.

24 THE WITNESS: Thank you.

25 MR. HERMAN: If your question has

1 counsel, he's free to ask them.

2 MR. JHURANI: Can we take a --
3 maybe like a five, seven-minute break,
4 and we can come back with -- to see if we
5 have more redirect.

6 MR. HERMAN: Yeah, sure. Take your
7 time.

8 (Brief pause.)

9 MR. JHURANI: We don't have any
10 redirect.

11 MR. HERMAN: Thank you for your
12 time today, Doctor.

13 THE WITNESS: Thank you.

14

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16 (Thereupon, the deposition was
17 concluded at approximately 1:41 p.m.)

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NIKOLAOS PAPANIKOLOPOULOS, PH.D.

Subscribed and sworn to before me
this_____ day of_____, 2024.

CERTIFICATE OF SHORTHAND REPORTER - NOTARY PUBLIC

I, Tanya L. Verhoven-Page, Reporter and Notary Public within and for the State of Georgia do hereby certify:

That Nikolaos Papanikolopoulos, Ph.D., the witness whose deposition is hereinbefore set forth, was duly sworn by me before the commencement of such deposition and that such deposition was taken before me and is a true record of the testimony given by such witness.

I further certify that the adverse party, Petitioner, was represented by counsel at the deposition.

I further certify that the deposition of NIKOLAOS PAPANIKOLOPOULOS, PH.D. occurred via Zoom conference (Minneapolis, Minnesota), on Thursday, October 31, 2024, commencing at 11:01 a.m. to 1:41 p.m.

1 I further certify that I am not related to any
2 of the parties to this action by blood or marriage, I
3 am not employed by or an attorney to any of the
4 parties to this action, and that I am in no way
5 interested, financially or otherwise, in the outcome
6 of this matter.

7 IN WITNESS WHEREOF, I have hereunto set my hand
8 this 4th day of November, 2024.

9 My commission expires:

10 April 31, 2025

11
12 NOTARY PUBLIC IN AND FOR THE
13 STATE OF GEORGIA

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20 _____
21 Tanya L. Verhoven-Page,
22 Certified Court Reporter,
23 B-1790.
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ERRATA SHEET FOR THE TRANSCRIPT OF:

Case Name:

Tesla v. iQAR

Dep. Date:

October 31, 2024

Deponent:

Nikolaos Papanikolopoulos, Ph.D.

CORRECTIONS

Pg.	Ln.	Now Reads	Should Read	Reason
_____	_____	_____	_____	_____
Pg.	Ln.	Now Reads	Should Read	Reason
_____	_____	_____	_____	_____
Pg.	Ln.	Now Reads	Should Read	Reason
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Pg.	Ln.	Now Reads	Should Read	Reason
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Pg.	Ln.	Now Reads	Should Read	Reason
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Pg.	Ln.	Now Reads	Should Read	Reason
_____	_____	_____	_____	_____

Signature of Deponent

SUBSCRIBED AND SWORN BEFORE ME

This the_____ day of_____, 2024.

(Notary Public)

My Commission Expires:_____

1 1 10:16 13:10 16:20 18:24 19:10,20 22:9 33:11 48:19 50:15 63:19 71:1 10 13:16 15:10,19 52:1 72:17 100 28:8 73:7 1003 9:7,11,12,16 10:1 66:5 1005 69:24 70:1 1009 69:15,23 70:1 11 38:4 72:10,17 117 36:8 11:01 6:2 12 33:7 49:24 120 56:23 12A 16:8,16,19 17:7 18:5 20:6,21 32:3,9,14 12A-C 22:3 38:5 12C 18:18 19:15 32:3 13 33:7 49:24 59:9 13A-C 38:8 13A-D 22:3 13B 18:10 140 61:19 15 25:14,15 30:24 31:4,6 35:21 36:1,7 45:23 48:3,9,11,19 49:3 160 57:21 161 9:23 10:12,16 32:21 33:16 40:12 44:14 51:3 52:22,24 53:7,12,20,25 65:21 66:3 162 21:8,20 32:20 163 54:9,14,16 61:10 165 55:2 167 55:20 57:22 60:18 168 61:1 169 57:16 60:6,18 61:11 170 38:25 175 38:10 176 66:8 177 18:4 19:22,24 21:4 36:14 37:25 66:15 67:15	178 32:8 34:4 35:6,12 36:4,14 179 34:10 36:14,17 192 33:6 50:9,12 69:11 70:15 193 69:8,9 70:19,24 194 72:6 1:41 77:17 1A 10:14 17:4 23:10,19 1B 23:20 1C 23:20 62:10 1D 23:20 2 2 16:21 18:19,24 19:11,20 72:9,17 20 19:25 200 22:9,10 33:12 2004 55:1 2024 6:1 22 42:2 22400545 6:20 25 42:15 43:4,11 73:8 26 42:14,15,23 43:11,17 3 3 16:21 18:24 29:8,9 67:7 68:12,19 74:5 30 63:10 31 6:1 63:10,18 64:18 32 48:12 64:11 34 10:8 30:25 64:3 37 30:25 3D 11:9,22 12:6 34:17 4 4 29:5,9,13 31:4 44:21,23 45:7,8 49:22 51:8,12,17 52:13 72:20 73:21, 23 4,000 38:13,15 4-kilometer 51:18 52:15 4-kilometers 50:19,22	400 19:3 22:8 4000 22:7 33:11 50:15 41 30:25 44 30:25 47 16:6 22:2 42:24 43:13 48 74:5 49 13:9 5 50 74:24 75:4 54 24:4 25:10 55 74:24 56 68:19 57 10:5 68:11 58 28:13 30:14 40:17 68:11,20 6 6 42:6 43:2,7,8 60 11:18 12:13,18 40:20 68:21 62 15:1 68:23 74:10 65 57:10 66 74:8 67 10:22 12:8 57:10 68 17:2 7 72 56:24 69:3 76 52:6 8 8 72:10 8,972,161 9:20 81 16:6 83 19:5,7,9 84 18:10 59:10 9 96 73:22
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