

UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE PATENT TRIAL AND APPEAL BOARD

CLEARCORRECT OPERATING, LLC,
Petitioner,

vs.

Case No. IPR2025-00817

ALIGN TECHNOLOGY INC.,
Patent Owner.

Patent 10,791,936 B2

DEPOSITION UPON ORAL EXAMINATION

VIA ZOOM OF

LINA KARAM, PH.D.

DATE: February 2, 2026

REPORTED BY: Holly J. Buckmaster, CSR

CSR No. 2859



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No exhibits were marked

SCOTTSDALE, ARIZONA; MONDAY, FEBRUARY 2, 2026

8:30 A.M.

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LINA KARAM, PH.D., being first duly sworn by a certified
shorthand reporter testified as follows:

E X A M I N A T I O N

BY ATTORNEY ARGENTI:

Q. (BY ATTORNEY ARGENTI) Good morning, Dr. Karam, could you
please state your full name for the record.

A. Lina Karam.

Q. And where are you located?

A. Scottsdale, Arizona.

Q. Is there anyone else in the room with you today?

A. No.

Q. It's my understanding that you have printed copies of
your declaration and the cited exhibits available to
you; is that correct?

A. Yes.

Q. Are those copies clean, without any notes?

A. Yes.

Q. Do you have any notes with you?

A. No.

1 Q. So if I ask you questions today, it will be my
2 understanding that you will be referring to those
3 printed copies that you have available to you. When we
4 talk about particular documents, if you don't have any
5 of those documents, let me know and I am sure we can
6 find a copy and put it in the chat, okay?

7 A. Okay.

8 Q. Have you ever been a witness in a deposition before
9 today?

10 A. Yes.

11 Q. About how many times?

12 A. More than ten times.

13 Q. And was that in the context of patent litigation?

14 A. Could you repeat the question.

15 Q. Were those previous depositions in the context of patent
16 litigation, were you serving as an expert witness?

17 A. Yes. Yes.

18 Q. When was the most recent?

19 A. I do not recall.

20 Q. Do you remember if it was in the past year?

21 A. Yeah, it was in the past year.

22 Q. And were any of those depositions for an IPR, an Inter
23 Partes Review, before the Patent Trial and Appeal Board?

24 A. Yes.

25 Q. Were some of the depositions for district court

1 litigation in federal court?

2 A. Yes.

3 Q. About how many were for IPRs?

4 A. Like I am not sure of the exact number.

5 Q. Well, I am going to run through the ground rules for the
6 deposition here, just so we are on the same page.

7 Do you understand that you are providing your
8 testimony under oath and you are expected to tell the
9 truth?

10 A. Yes.

11 Q. Is there any reason you cannot provide complete and
12 accurate testimony today?

13 A. No reason.

14 Q. Hopefully my questions will be clear. If you don't
15 understand any question, please let me know that it is
16 unclear. Under the guidelines for this proceeding, you
17 must ask me for any clarification and if you don't tell
18 me otherwise, I will assume that you understand the
19 question, okay?

20 A. Okay.

21 Q. Please provide verbal answers rather than nodding your
22 head for the benefit of the record.

23 And we can take a break any time that you
24 would like one as long as there is not a question
25 pending. If there is a question pending, you must

1 answer the question before we take a break, do you
2 understand?

3 A. Yes.

4 Q. Okay. I will try to take breaks every hour or so, but
5 if you would like to take one before I suggest it, go
6 ahead and just feel free to ask, okay?

7 A. Yeah, maybe I just want to ask because I have my cell
8 phone, I should put it on the ground and then I want to
9 like just turn off the ringer, so that is what I am
10 going to do, so like half a minute break.

11 Q. Okay.

12 A. Okay.

13 Q. Okay. Dr. Karam, you have committed a declaration in
14 IPR2025-00817, correct?

15 A. Yes.

16 Q. That declaration addresses US Patent Number 10,791,
17 '936, correct?

18 A. The '936 patent.

19 Q. There you go, I was going to suggest that we can use it
20 as a shorthand, so if I refer so the '936 patent today,
21 you will understand what I am talking about?

22 A. Yes.

23 Q. Could you take that declaration out, please, that is
24 Exhibit 1003.

25 A. Yes.

1 Q. On the last page of the declaration, page 146, is that
2 your signature?

3 A. Yes.

4 Q. Did you add that signature personally?

5 A. Yes.

6 Q. How did you add it?

7 A. I just wrote it, like jotted.

8 Q. Okay. So it is a handwritten signature and then the
9 document was scanned?

10 A. Like I signed it, handwritten, but, yeah, you know,
11 electronic tools too, yeah.

12 Q. Did you sign your declaration on April 10th, 2025?

13 A. Yes.

14 Q. Before I get started on more questions, is there
15 anything about your declaration that you would like to
16 modify or correct?

17 A. Like there are some typos, you know, some minor typos,
18 one of them, I don't know if we need to correct those,
19 they are understood from context.

20 Q. Okay. As we go through, if you across any typos that
21 you would like to point out, by all means, feel free to
22 do it.

23 As far as you're aware right now, do any of
24 those typos change the substance of your testimony?

25 A. No. I mean, but there is one correction, I guess, also

1 maybe that would change the substance, like one typo I
2 would say. It doesn't change the substance, it changes
3 the background, so basically we are talking about
4 background and referencing something, I don't know if it
5 would change anything, but the wrong word was put there
6 but it is understood from the previous paragraph that it
7 is the wrong word, does that make sense?

8 Q. Can you point out that paragraph?

9 A. One moment. Yeah, on paragraph 187.

10 Q. 187?

11 A. Yes. The last sentence.

12 Q. Okay.

13 A. Here like the last sentence is written, which would
14 displace optical element 42 relative to the device's
15 sensing element phase 97. This should be, the sentence
16 should be, which would displace focal plane 101, which
17 was like the focal plane, not optical element 42 with
18 respect to the sensing phase.

19 Q. You mentioned an issue with the background section, is
20 this the issue that you were thinking about?

21 A. Yeah, yeah. It is talking about the art, like the prior
22 art here, it is not the background section but it is
23 referring to the prior art, yeah, and this was -- should
24 be focal plane, as understood also from the previous
25 paragraph and this paragraph.

1 Q. Got it. Did you do anything to prepare for this
2 deposition?

3 A. Yes.

4 Q. What did you do?

5 A. I read through my declaration, through the prior art and
6 related art also, like I mentioned in my declaration,
7 and reviewed the '936 patent and select part of the
8 prosecution history. And also I had some prep session
9 with counsel.

10 THE COURT REPORTER: I just need a second.

11 (Discussion off the record.)

12 ATTORNEY ARGENTI: Back on the record.

13 Q. (BY ATTORNEY ARGENTI) Dr. Karam, when you mentioned that
14 you reviewed a select portion of the prosecution
15 history, which section or portion was that?

16 A. The portions that I referred to in my declaration at
17 this point.

18 Q. Okay. For instance, in paragraph 56, it looks to me
19 where you cite the prosecution history, is that -- and
20 you refer to the notice of allowance, as well as I guess
21 a few other pages, 10, 66, 79 of that exhibit, those are
22 the portions that you reviewed in preparing for the
23 deposition?

24 A. In paragraph 56, we have, yeah, pages there that are
25 mentioned, yeah, and noted. Yeah, these are the

1 portions.

2 Q. Okay. In preparing for your deposition, did you review
3 any documents that are not cited in your declaration?

4 A. No.

5 Q. So have you reviewed Align's preliminary response in
6 this IPR?

7 A. Oh, I reviewed those before, yeah.

8 Q. Have you reviewed the PTAB's institution decision in
9 this IPR?

10 A. Yes.

11 Q. Have you reviewed Align's request for director review of
12 the institution decision?

13 A. No.

14 Q. In preparing for your deposition, did you talk to
15 anyone?

16 A. Could you repeat the question.

17 Q. Did you talk to anyone to help prepare for this
18 deposition?

19 A. I had prep session with Finnegan counsel.

20 Q. Did you talk to anyone other than counsel at Finnegan?

21 A. No.

22 Q. When did those discussions take place?

23 A. Which discussions?

24 Q. The discussions with the Finnegan counsel to prepare for
25 this deposition?

1 A. Over the last few weeks.

2 Q. How many discussions were there?

3 A. Maybe around five or six.

4 Q. About how many hours would you say you spent talking to
5 Finnegan counsel to prepare for the deposition?

6 A. Maybe around twelve hours or something like that.

7 Q. Let's turn to page 1 of your declaration, please.

8 A. The cover page?

9 Q. The page marked page 1 at the bottom. It starts with
10 the heading "Introduction" at the top.

11 A. Yes.

12 Q. In paragraph 4 at the bottom of the page 1, you say that
13 your curriculum vitae records your education, experience
14 and publications in greater detail, do you see that?

15 A. Yes.

16 Q. Do you know whether your CV has been submitted in this
17 IPR?

18 A. Yes, my CV has not been submitted but --

19 Q. Do you have any degrees in dentistry?

20 A. No degrees in dentistry.

21 Q. Do you have any degrees in orthodontics?

22 A. No degrees in orthodontics.

23 Q. Looking at the description of your qualifications in
24 paragraphs 4 through 17 of your declaration, it sounds
25 like a fair amount of your research and work experience

1 has related to machine learning and autonomous vehicles,
2 is that accurate?

3 A. Could you repeat the question.

4 Q. Sure. In your description of your qualifications in
5 your declaration, it sounds like a fair amount of your
6 experience is in machine learning and autonomous
7 vehicles, is that accurate?

8 A. I would like to correct like how it is stated. So this
9 is also related to imaging. So the machine learning
10 autonomous vehicle is related to scanning and imaging.
11 And my background, as I state like extensively here --
12 and my CV, by the way, is available publicly on
13 LinkedIn, so it is available publicly, you could find it
14 and I update it constantly, fully.

15 But in my, I summarize my CV in the
16 declaration, you know, the main elements there and I
17 said if you want more details, one can refer to my CV,
18 which is publicly available, but I worked in medical
19 imaging, you know, and I have, you know, the publication
20 of medical imaging, worked even on reword systems that
21 were implemented based -- and technology transfer that
22 were used at the Barrow Neurological Institute that --
23 and also like other medical facility, so my work relate
24 to imaging, image processing, multi-dimensional signal
25 processing, all very relevant to medical imaging and

1 also to dental imaging.

2 Q. And it looks like that Barrow Neurological Institute is
3 described in paragraph 9 of your declaration; is that
4 right?

5 A. This is where it is referenced partly, yeah.

6 Q. And as you describe it in paragraph 9, that work for the
7 Barrow Neurological Institute related to image
8 processing technologies used for brain tumor biopsies;
9 is that right?

10 A. These are the publications -- no, one of them; not all
11 of them. You know, I have many other things there,
12 not --

13 Q. What else did that work relate to?

14 A. That work related to imaging different parts of the body
15 and calibration and -- and also, you know, medical
16 imaging in general. Yeah.

17 Q. And then in paragraph 10, it looks like you go on to
18 discuss other biomedical image work that you have done,
19 right?

20 A. Yes.

21 Q. And that work in paragraph 10 related to cancer
22 diagnostics and drug discovery; is that correct?

23 A. That is the application of the work. It is still
24 imaging.

25 Q. Do you have any experience with dental imaging?

1 A. Yes, I do.

2 Q. What experience is that?

3 A. I have like the things also we develop were integrated,
4 can be integrated in this imaging. And also as
5 experience, I served as expert in district court cases
6 for dental imaging cases and I was admitted as an expert
7 witness, did expert declarations and I was deposed as an
8 expert in dental medical imaging cases and then -- yeah.

9 Q. So I want to unpack that and take those different
10 categories one at a time.

11 When you said that the things you worked on
12 can be used for dental imaging, were you using them for
13 dental imaging in your research?

14 A. They are applicable to dental imaging and, you know,
15 things we do are like an imaging and only separate, no,
16 the '936 patent, to my recollection, also like I believe
17 some places they said this can be applied to any imaging
18 of objects, not only dental and oral, and these were
19 also happened upon, so the '936 patent says this also.

20 So imaging an object, these object can be
21 tooth, teeth, dentition, it can be objects, it can be
22 anything and this is like my area of expertise.

23 Q. So is that a no, then, that your specific research that
24 you personally were working on did not involve dental
25 imaging?

1 ATTORNEY ZHANG: Object to the form of the
2 question,

3 THE WITNESS: I don't recall. I did a lot of
4 research, whether we looked at images with teeth and
5 dentition, I don't recall that.

6 Q. (BY ATTORNEY ARGENTI) So you don't recall working on any
7 research projects that involved dental imaging or
8 orthodontic imaging; is that right?

9 A. I had discussions with people working on those, but
10 whether I had a funded research project in that area,
11 funded, sponsored, I didn't have sponsored research
12 projects on that.

13 Q. What kind of discussions?

14 A. Discussion about technologies and so forth and with
15 people working in that field and how imaging applies to
16 that and the technology. Because these are users, I
17 mean, a dentist or medical doctors are users, they don't
18 know the technology even. They use the equipment, okay,
19 but in these imaging are developed by researchers such
20 as signal processing people, multi-dimension signal work
21 on multi-dimension signal processing, 3D imaging
22 reconstruction, it is all based on imaging and signal
23 processing and multi-dimension processing.

24 And then these are incorporated in devices
25 that dentists choose. Not necessarily they understand

1 the technology, they are users of the technology, yeah.
2 But this technology is based on -- on work that we do in
3 our area of expertise and these get transferred into
4 these devices.

5 Q. Was the brain tumor biopsy imaging that you described in
6 paragraph 9 then applied to dental applications?

7 A. This -- the imaging, image reconstruction, yes, it is --
8 part of it can apply.

9 Q. It can apply. I am asking if it was applied?

10 A. There are a lot of devices using technologies we
11 develop, so it is proprietary, these devices and they
12 might have adopted things from there, like some
13 principles, so I cannot answer this question.

14 Q. So if I understand correctly, someone else may have
15 taken from the imaging -- imaging work that you
16 developed and then applied it in the dental or
17 orthodontic field but you yourself don't have experience
18 doing that; is that right?

19 ATTORNEY ZHANG: Objection; form.

20 THE WITNESS: The experience, I developed the
21 technology in other applied. And actually, in one of
22 the references that we rely on like Boerjes, clearly
23 they adopted techniques that we worked on and developed,
24 like getting the three-dimensional structure from camera
25 motion, we worked on depth estimation from structure

1 from motion heavily on 3D construction, 3D imaging from
2 camera motion and so worked on 3D camera imaging and all
3 of these patents, like the prior art, heavily rely on 3D
4 construction and the technique we have.

5 And we have patent also on 3D construction in
6 addition to publications, so this is indeed within my
7 area of expertise.

8 Q. But the only experience you have with dental imaging or
9 orthodontic imaging directly is serving as an expert
10 witness in patent litigation; is that right?

11 A. What do you mean by directly?

12 Q. Your personal work experience in the fields of dental
13 imaging or orthodontic imaging is limited to patent
14 litigation expert work, correct?

15 A. I disagree, I respectfully disagree. All the imaging we
16 do is applicable to dental imaging, you know, as
17 application, all of the imaging. And indeed, my work
18 applies to dental imaging extensively.

19 Q. But you have no personal work experience with dental
20 imaging applications or orthodontic imaging
21 applications, right?

22 A. My experience and my work experience, all of it like
23 that I am citing -- not all, like I am saying a major
24 amount of it, let's put it this way, a major amount
25 applies to dental imaging.

1 It is like you mentioned autonomous vehicle.
2 Didn't you mention autonomous vehicle as one? I didn't
3 develop the autonomous vehicle, I developed the imaging.
4 That technology transfer is applicable, so it is the
5 same. Cameras, I didn't develop cameras, our technology
6 incorporated through the technology transfer.

7 Q. So you keep mentioning --

8 A. It is through productization. So technology, we develop
9 with our patent on get into these devices. I am not the
10 productization person, so I respectfully disagree with
11 your statement.

12 Q. So you keep mentioning that it is applicable to other
13 fields, do you personally have experience applying your
14 imaging research to the fields of dental imaging or
15 orthodontic imaging?

16 A. The imaging makes use of 3D imaging and software that,
17 yes, we have experience on. It is the same software,
18 you know, you get that, you use the software we develop
19 for these. So in that regard, yes, because these are
20 based on computers, processors, using software running
21 3D imagery reconstruction after acquiring the image
22 through cameras, that is exactly what we have worked on,
23 we developed the software on. That software can just
24 readily be just there.

25 So it is the software we worked on and we

1 developed and we improved and that is used in the dental
2 and medical imaging, it is based on that software, that
3 is all. That is imaging teeth instead of imaging
4 objects, other objects, it is the same technology. And
5 this is stated in the '936 patent also.

6 So indeed we worked on that technology, which
7 you just put on imaging teeth, you can use to get
8 imaging teeth but it is the same 3D reconstruction
9 software that is being doing that and this is indeed I
10 worked on that extensively on -- in this area.

11 Q. Is it your testimony that you personally have experience
12 applying the software you developed to dental imaging or
13 orthodontic imaging applications?

14 ATTORNEY ZHANG: Objection; form.

15 THE WITNESS: The dentist takes the images but
16 this is based on software that we worked on also and
17 developed. This could, you know, 3D imaging, meaning
18 like this software there is based on technologies we
19 worked on extensively.

20 Q. (BY ATTORNEY ARGENTI) Is it the same software or is it
21 just based on technologies that you worked on?

22 A. Could you repeat the question.

23 Q. In your previous answer you said the dentist takes the
24 images but this is based on software that we worked on
25 also and developed. This could, you know, be 3D

1 imaging, meaning this software there is based on
2 technologies that we worked on extensively, so to
3 clarify your previous answer, my question is, are you
4 saying it is the same software or that it is based on
5 imaging technologies that you worked on?

6 ATTORNEY ZHANG: Objection; form.

7 THE WITNESS: I cannot answer this question
8 because whether they put the same software there, they
9 used our software or modified it or whatever, I don't --
10 these, when they productize this, I don't know what
11 software they use in these devices in terms of whether
12 they modified it or used the same. Like the software we
13 developed can do -- can perform several functionalities.

14 Q. (BY ATTORNEY ARGENTI) So to the extent that your
15 research work was applied in the field of dental or
16 orthodontic imaging, you don't know what changes might
17 have been made to your work, do I have that right?

18 ATTORNEY ZHANG: Objection; form.

19 THE WITNESS: I don't know what changes have
20 been made there, you know, in the software.

21 Q. (BY ATTORNEY ARGENTI) Let's turn to page 19 of your
22 declaration, please. Starting at paragraph 28, you
23 discuss your understanding of the level of ordinary
24 skill in the art for the '936 patent, right?

25 A. So I discuss that the level of ordinary skill in the

1 art.

2 Q. And in the first full sentence at the top of page 20,
3 you say, "It is my opinion that such a person of
4 ordinary skill in the art, as related to the '936
5 patent, would have been a person having at least a
6 bachelor's degree in electrical engineering, computer
7 engineering, or a closely related field such as computer
8 science, and two years of work experience in 3D imaging
9 of physical structures, including the generation of 3D
10 models of physical structures and image processing,"
11 right?

12 A. That is what is stated.

13 Q. In your opinion, the relevant person of ordinary skill
14 in the art need not have any dental or orthodontic
15 experience; is that right?

16 A. Could you specify what you mean, what kind of experience
17 more specifically?

18 Q. Any experience in the fields of dentistry or
19 orthodontics?

20 A. If it is imaging, I do have that experience, okay, if it
21 is related to the imaging, okay, and 3D models and to
22 claim the limitation of the '936 patent's claim, I do
23 have that experience and that is what the level of the
24 POSITA is.

25 Q. I think we are talking about two different things, your

1 level of experience versus the definition of the POSITA.

2 My question is, this definition of the POSITA
3 that you have in your declaration doesn't require
4 anything about dentistry or orthodontic experience,
5 correct?

6 A. I disagree. I respectfully disagree because all of the
7 questions should be really rephrased. The way I
8 understand it, I understand dentistry and orthodontic to
9 include imaging.

10 Q. Let me ask it this way: Does your understanding of the
11 appropriate level of ordinary skill in the art for the
12 '936 patent require dentistry or orthodontic experience?

13 A. Could you more qualify that, like what do you mean
14 orthodontic experience? Being a dentist, taking
15 imaging, you know, using that, what do you mean by that?

16 Q. We could take those one at a time.

17 Does your definition of the POSA skill
18 level -- do you understand what I mean when I say POSA,
19 personal of ordinary skill in the art?

20 A. Yes, POSITA.

21 Q. We can use the term POSITA as well, it is a helpful
22 shorthand, so I will start over.

23 Does your understanding of the appropriate
24 POSITA definition in this IPR require a degree in
25 dentistry?

1 A. No.

2 Q. Does it require a degree in orthodontics?

3 A. No.

4 Q. Does it require experience with capturing dental images?

5 A. Like could you also qualify that, what does it mean
6 experience with capturing dental images?

7 Q. Images of dental structures, teeth, the intraoral
8 cavity.

9 A. Yes, it does require capturing, meaning the cameras that
10 are capturing the sensing, how these are captured, the
11 technology behind that, so the technology rather than
12 using.

13 A dentist wouldn't understand the claim
14 limitations of the '936, so if somebody was like -- is
15 not a POSITA then, because as it relates to the '936
16 claim limitations, which is more about the technology
17 that is used rather than just a user using the
18 technology blindly as a black box.

19 So as a black box, using it doesn't require
20 that, but knowledge of the technology for capturing and
21 capturing how, yes.

22 Q. So I think I see the distinction you are making and I
23 want to clarify it a little bit. You keep circling back
24 to the imaging technology, which is different than the
25 application that I am talking about, right?

1 If you have a camera that can capture a
2 physical object in three dimensions, which is the type
3 of technology that you have experience working on,
4 correct?

5 A. I respectfully disagree. It depends on the application.
6 We take the application into account when we develop the
7 technology because you can optimize for applications.
8 So applications is relevant and people -- one has to --
9 some application, some technology can be applied to
10 different applications but still you need to know that
11 application and whether it is applicable or you need to
12 modify something more.

13 Imaging 3D objects, whether teeth or other
14 objects, you know, that technology, the claim limitation
15 of the '936 patent apply to that.

16 Q. Can you explain to me how in your research work you took
17 dental imaging applications into account in your work?

18 A. We know our technology applied to the dental imaging,
19 you know, because these are objects and 3D
20 reconstruction from cameras, this is applicable to
21 dental imaging.

22 Now, the interpretation of these images, later
23 dentist finding issues, problems, you know, and what's
24 the right treatment, these conclusions, that is the
25 dentist, but the 3D reconstruction that is presented are

1 the tools that are presented to the dentist, everything
2 related to imaging, rendering the visualization, the
3 user -- you know, what you have to manipulate and things
4 of the 3D object, but the treatment, that is the
5 doctor's job, the dentist job, they use -- we provide
6 the technology that they use for the doctor to make the
7 treatment and the conclusion.

8 Q. So when your definition of the POSITA says two years of
9 work experience in 3D imaging of physical structures, it
10 doesn't require that those physical structures be dental
11 structures, does it?

12 A. It like -- the 3D imaging, not necessarily. It could be
13 but it is applicable to dentist structure. So
14 definitely the physical structure could be dental
15 structure because other structure could be used also and
16 it is the same technology though, as also stated in my
17 recollection in the '936 patent.

18 Q. It doesn't require that the physical structures be
19 structures in the human body, does it?

20 A. It could be in a human body.

21 Q. But it doesn't require it, right?

22 A. This is applicable to physical structure, whether human
23 body or outside the human body. Yeah, it is not limited
24 only to human body, but it encompasses the human body
25 and extends further to external also structures.

1 Q. It could be 3D imaging of a physical structures
2 elsewhere in the galaxy, right?

3 ATTORNEY ZHANG: Objection; form.

4 THE WITNESS: I don't have -- I don't
5 understand the question.

6 Q. (BY ATTORNEY ARGENTI) You have done imaging research
7 that was of interest to NASA, correct?

8 A. Yes.

9 Q. That is described, for example, in paragraph 14 of your
10 declaration, right?

11 A. Yes, so that paragraph starts, "I directed the
12 development of scalable visual compression
13 technologies."

14 Q. Right. And maybe it did, maybe it didn't, I am not
15 sure, did that work involve capturing 3D images of
16 physical structures?

17 A. Not the NASA work, no.

18 Q. But NASA does do that, right? Does NASA capture 3D
19 images of physical structures, for example, on the moon?

20 A. If you provide documentation -- I didn't opine on this
21 in my declaration and I cannot answer this question. If
22 you provide documentation, what I can read and see how
23 they are capturing, I can answer that question.

24 Q. In your declaration, the POSITA level of ordinary skill
25 is broad enough to encompass capturing that type of

1 physical structure 3D image, right?

2 A. Could you remind me which paragraph that was.

3 Q. That was in paragraph 29 of your declaration at the top
4 of page 20.

5 A. Could you please repeat the question.

6 Q. Is your definition of the POSITA level of skill broad
7 enough to encompass two years of work experience in 3D
8 imaging of physical structures on the moon?

9 ATTORNEY ZHANG: Objection; form.

10 THE WITNESS: So I cannot answer the moon. I
11 don't have experience with space and moon and things, so
12 I don't really cannot opine on that.

13 Q. (BY ATTORNEY ARGENTI) And your definition of the POSITA
14 skill level is broad enough to encompass two years of
15 work experience in 3D imaging of physical structures in
16 the brain, right?

17 A. Could you repeat the question and more clarify what the
18 question is.

19 Q. So I am looking specifically at the portion of your
20 POSITA definition that says "two years of work
21 experience in 3D imaging of physical structures," do you
22 see that in your declaration?

23 A. Yes.

24 Q. Would this definition be satisfied if the physical
25 structures were in the brain?

1 A. It depends on the technology used.

2 Q. How so?

3 A. It depends on the -- I don't understand the question in
4 here. Could you more give an example of context. That
5 is why I can't answer just like broadly like that.

6 Q. Dr. Karam, this is your definition of the POSITA skill
7 level.

8 A. Yeah.

9 Q. It seems you don't understand your definition of the
10 POSITA skill level.

11 A. I do understand. I don't understand your question.

12 Q. So would two years of work experience in 3D imaging of
13 brain structures satisfy the work experience
14 requirement?

15 A. Physical structure, including brain structure, outside
16 structure and others.

17 Q. That is a yes?

18 A. So -- so basically like how could you quantity --
19 qualify how does it relate to the '936 patent base --
20 like your question, like could you qualify 3D imaging of
21 physical structure? Imaging of the brain is 3D imaging,
22 if like imaging of the brain, especially if you do 3D.

23 Q. So in your view, a person with a bachelors degree in
24 computer engineering and two years of work experience in
25 3D imaging of physical structures, where the physical

1 structures are the brain, including the generation of 3D
2 models of the brain and image processing, that would be
3 a POSITA from the per -- that you define in paragraph
4 29; is that right?

5 A. You could have a brain as a physical structure. I mean,
6 you could have the brain that you -- actually brain that
7 you are imaging as a structure, you know, and it could
8 be like in the -- like in the prior art, it could be a
9 cast of the brain, it could be a brain, actual brain,
10 whether from animals or human and yes, it does encompass
11 that.

12 Q. Does the autonomous vehicle work that you describe in
13 your qualification section involve capturing 3D imaging
14 of physical structures?

15 A. Yes, it does.

16 Q. And if a person had a bachelors degree in computer
17 engineering and two years of work experience in 3D
18 imaging in the context of autonomous vehicles, that
19 would also satisfy your POSITA definition, correct?

20 A. It would satisfy.

21 Q. So you would agree, then, that the POSITA doesn't need
22 any biomedical imaging experience, right?

23 ATTORNEY ZHANG: Objection; form.

24 THE WITNESS: A POSITA would need the
25 experience just to know that the same technologies are

1 being used there.

2 Q. (BY ATTORNEY ARGENTI) What experience were you just
3 referring to?

4 A. Experience in terms of knowledge of when they -- like if
5 they were working on a case, they would see the prior
6 art or before they worked in that field to know the
7 imaging, to know basically that these imaging can be
8 used, same technologies, but either like having the
9 experience is just like also understanding the prior
10 art, like looking at -- and they would see it, so maybe
11 the question is not clear, experience in what, so the
12 word experience that you are using.

13 Q. Working with --

14 A. Is it working with a dentist?

15 Q. No.

16 A. Is it technology research? What is experience there?

17 Q. Working with biomedical imaging applications. Not
18 something that could be applied to the field of
19 biomedical imaging, actually working with biomedical
20 imaging applications, it is not a requirement of your
21 POSITA definition, correct?

22 A. I would say it is not necessary because the same
23 technology is being used, it is not necessary. It is
24 preferable though.

25 Q. Did you consult with a dentist or orthodontist when

1 preparing your opinions in your declaration?

2 A. No.

3 Q. Did you consult -- strike that.

4 Let's turn to page 23 of your declaration.

5 A. Yes.

6 Q. Do you see the heading that says, " three-dimensional
7 (3D) virtual models of the intraoral cavity were known
8 and conventional in dentistry"?

9 A. Yes, I see it.

10 Q. What is the basis for your understanding of what was
11 conventional in dentistry prior to the priority date for
12 the '936 patent?

13 A. Could you repeat the question, what is?

14 Q. What's the basis for your understanding of what was
15 conventional in dentistry prior to the priority date for
16 the '936 patent?

17 A. As a POSITA and in that technology and looking at the
18 prior art in imaging application to dentistry field.

19 Q. When you say a POSITA in that technology, what
20 technology are you referring to?

21 A. The 3D imaging, 3D medical imaging, biomedical, also
22 working in the biomedical and also imaging of 3D
23 physical structure, yeah.

24 Q. But we just agreed a few pages ago that your POSITA
25 definition doesn't require any experience working with

1 biomedical imaging applications?

2 A. It does --

3 ATTORNEY ZHANG: Objection; form.

4 THE WITNESS: Excuse me. Can you repeat the
5 question.

6 Q. (BY ATTORNEY ARGENTI) You just testified that when you
7 are saying a POSITA in that technology, you are
8 referring to 3D imaging, 3D medical imaging, biomedical,
9 also working in the biomedical and imaging of 3D
10 structures, but we just went through a lot of questions
11 looking at the POSITA definition to get to the point
12 where you agreed that biomedical imaging application
13 experience is not a requirement of the POSITA?

14 A. It is not necessary, I said, because the same technology
15 is being used. But when reading and they see the same
16 technology, these prior arts that are being used in
17 dentistry and conventional, so that, basically from the
18 prior art, that technology is disclosed being applied
19 and conventional in dentistry, that technology that is
20 related to the claim limitation of the '936 patent, it
21 is clearly the prior art discloses being used in
22 dentistry and a POSITA would understand that the
23 technology disclosed in the '936 patent and the claim
24 limitations, that this is the important part and that is
25 being used in dentistry as disclosed by the state of the

1 art and the prior art.

2 Q. So do I have it right that your understanding of what
3 was conventional in dentistry prior to the '936 patent
4 is based on your review of the prior art cited in your
5 declaration?

6 A. Based on the review of the prior art and background art.

7 Q. And it is not based on any personal knowledge that you
8 have as to what was conventional in dentistry prior to
9 the '936 patent, right?

10 A. Personal knowledge is not relevant in this case. What's
11 relevant is evidence, prior art, state of the art, that
12 is published with the publication date that is prior --
13 before the priority date of the '936 patent.

14 And I did have personal knowledge myself
15 because I worked in also that biomedical and also 3D
16 discussions and I had personal knowledge this is being
17 used, but that is out of the I guess your question of a
18 POSITA.

19 Q. You had personal knowledge of what three-dimensional
20 modeling techniques were conventional in dentistry prior
21 to the '936 patent priority date, is that what you just
22 said?

23 ATTORNEY ZHANG: Objection; form.

24 THE WITNESS: Yeah, personal knowledge,
25 because I worked -- I work in that field. And also

1 through discussions with the people working in that
2 field, I had personal knowledge, yes.

3 That said, also as a POSITA and having
4 personal knowledge, I know that it is not necessary for
5 a POSITA to have that, you know. The 3D imaging
6 technology, knowing the technology and from the prior
7 art, a POSITA would see that technology applied in
8 dentistry way before the earliest date of the '936
9 patent and this -- and to make this statement that it
10 was conventional based on the prior art and the evidence
11 and the background art, personal knowledge is not
12 relevant as evidence.

13 Q. Let's turn to page 57 of your declaration, please.

14 Starting at the bottom of 57 and carrying on
15 to 58, you have a table of the prior art grounds that
16 you propose, right?

17 A. Yes.

18 Q. For some claims, you apply the Boerjes reference on its
19 own or in combination with Geng, right?

20 A. Yes.

21 Q. That is grounds one and two respectively, correct?

22 A. Yes.

23 Q. And then in grounds three and four, you add a Babayoff
24 reference, right?

25 A. Yes.

1 Q. What does Babayoff add to the combination of prior art
2 in those grounds?

3 A. Okay, I can't -- like if you want I could -- you have to
4 give me some moment, I don't want to answer out of
5 memory, but one thing I know it does, among others, is
6 the more specificity or details about the imaging device
7 and optics and the confocal device, yeah.

8 Q. Apologies, I didn't mean to cut you off, did you have
9 more to say?

10 A. Yeah, I said the confocal device.

11 Q. Let's turn to your discussion of grounds three and four,
12 I think that starts at page 121 of your declaration.

13 A. I am there.

14 Q. Looking at your discussion of dependent claim two,
15 starting at page 122, you rely on Babayoff for a number
16 of the intraoral scanner components that are recited in
17 that claim, right?

18 A. Yeah, I need to be given some time to read this, the
19 dependent claim two. I didn't memorize all of the
20 claims.

21 Q. Okay.

22 A. So what was the question again? I read dependent claim
23 two, what was the question?

24 Q. So for claim two, you rely on Babayoff for a number of
25 the intraoral scanner components that are recited in

1 that claim, right?

2 A. Yes.

3 Q. And if we turn to paragraph 188 of your declaration, on
4 page 130, starting here, you discuss the reasons that
5 you think a person of ordinary skill in the art would
6 have turned to Babayoff regarding those scanner
7 components, right?

8 A. So if you could just repeat the question? A person in
9 the ordinary skill of the art would have found it
10 obvious to use Babayoff's intraoral scanner of Boerjes
11 combined, yeah, that section is about a POSITA would
12 have found it obvious.

13 Q. Okay. And at the bottom of this page, in paragraph 190,
14 in the last sentence, you say that, "A person of
15 ordinary skill in the art would have understood that
16 Babayoff's scanner provides advantageous features to
17 improve the system of Boerjes or Boerjes as modified by
18 Geng," do you see that?

19 A. Yes.

20 Q. And those advantageous features are described in the
21 next few paragraphs, right?

22 A. I have to just like have time just to look at the next
23 paragraphs to answer your question. Okay. So what is
24 the question? I just looked at these paragraphs.

25 Q. So the -- my question is, the advantageous features that

1 you mention at the end of paragraph 190, those are
2 described in the following paragraphs of your
3 declaration, right?

4 A. Yeah. So these are some of the advantageous features,
5 yes.

6 Q. Looking at the first sentence of paragraph 191, you say
7 that Boerjes -- sorry, strike that.

8 Looking at the first sentence of paragraph
9 191, you say that "Babayoff's color scan data or 3D
10 color model would improve the dental restoration
11 procedure of Boerjes or Boerjes as modified by Geng,"
12 right?

13 A. Yes.

14 Q. And you go on in that paragraph to say that color scan
15 data or a 3D color model would allow more accurate color
16 and shade matching for a prosthesis relative to a visual
17 comparison, right?

18 A. Yes.

19 Q. In paragraphs 193 and 194, you say that color scan data
20 would improve identification -- actually, let me correct
21 that. Apologies again.

22 In paragraphs 192 and 193, you say that color
23 scan data would improve identification of the margin
24 line in Boerjes, right?

25 A. So that is paragraph 193?

1 Q. 192 and 193, I think in both of those you discuss the
2 margin line.

3 A. Yes.

4 Q. So in this section --

5 A. 192, there is a discussion of margin line, yes.

6 Q. In this section of your declaration, you identify two
7 benefits of turning to Babayoff, correct?

8 A. Two benefits related to imaging and extraction of
9 features to classify features in the image, including
10 margin lines, including the color and shading, all of
11 which are imaging technologies in -- yeah.

12 Q. The first benefit is improved color matching for a
13 prosthesis relative to a visual comparison, right?

14 A. Yes. And this is done virtually, through image, through
15 image processing, imaging and then you could do it like
16 physically, but all of that is done virtually, yeah,
17 through digital models.

18 Q. And the second benefit is using color to improve margin
19 line identification, right?

20 A. Also done through image processing and imaging, yes.

21 Q. So both of those benefits that you discuss are based on
22 improving Boerjes or Boerjes plus Geng by adding color
23 scanning; is that right?

24 A. In these paragraphs, 191 and 192, yeah.

25 ATTORNEY ARGENTI: We have been going a little

1 over an hour now, why don't we take a short break.

2 THE WITNESS: What does it mean, short, like
3 how many minutes?

4 ATTORNEY ARGENTI: As long you would like. We
5 could do ten minutes or less or more. How does ten
6 minutes sound?

7 THE WITNESS: Ten is good. Okay.

8 ATTORNEY ARGENTI: So then we will come
9 back -- why don't we come back at a quarter to the hour.

10 THE WITNESS: Okay.

11 (A break was taken.)

12 Q. (BY ATTORNEY ARGENTI) Dr. Karam, could you take out the
13 '936 patent, please, that is Exhibit 1001.

14 A. One moment. Yeah, I have it, I have Exhibit 1001.

15 Q. Did you read this patent in its entirety when preparing
16 your declaration?

17 A. Yes, I read the '936 patent in its entirety.

18 Q. Did you also read it in its entirety when preparing for
19 this deposition?

20 A. Yes, I read it through.

21 Q. Let's turn to column 1, please, and the section entitled
22 "Background of the Invention." This section begins by
23 saying, "Precise three-dimensional virtual
24 representations of the oral cavity can be useful to the
25 dental practitioner," correct?

1 A. Yes.

2 Q. Then if we go down to the last paragraph in column one,
3 in the first sentence it says, "It is often the case
4 that when scanning the intraoral cavity" --

5 A. Excuse me. What lines?

6 Q. The last paragraph in column 1, the one that begins,
7 "However, it is often the case."

8 A. Okay.

9 Q. That first sentence reads, "It is often the case that
10 when scanning the intraoral cavity to obtain 3D data of
11 the preparation and finish line on which the virtual
12 model is based, part of the finish line and possibly
13 also the shoulder and other parts of the preparation may
14 be obscured by soft tissues such as the gum that no
15 longer being supported by the dental surfaces that have
16 been removed, deformed, cover at least part of the
17 finish line on the prepared dental site," do you see
18 that?

19 A. Yes.

20 Q. What is the finish line in that context?

21 A. The finish line is the -- the transition between or the
22 line between the prepared and unprepared surface of the
23 tooth.

24 Q. And what does it mean for a surface to be prepared?

25 A. Surface to be prepared is the dentist prepares the

1 surface of the tooth by reducing the tooth so that you
2 could have a prosthesis attached.

3 Q. What is the shoulder in that -- in that paragraph?

4 A. Okay. For the finish line, also you have a shoulder,
5 which is -- it depends on the finish line form, because
6 there are many finish line forms that rely on others, so
7 some of them they have shoulders because you have
8 different forms of finish line.

9 Shoulder, it is like -- I don't know how to --
10 like you have a line and then you have a flat, a little
11 bit of a shoulder and then you have the other part of
12 the tooth that has been prepared, so it is like the
13 form, so it is the transition is like a step function
14 with some small shoulder, but this is one type of finish
15 line.

16 Q. If we look at the last paragraph of the background
17 section of the '936 patent, so this starts at line 12 of
18 column two, let me know when you are there.

19 A. Okay. I am there.

20 Q. And it starts that, "Similarly, there are other
21 situations in which a virtual model of the physical
22 item, obtained from scanning the physical item, is
23 partially obscured or incomplete," do you see that?

24 A. Yes.

25 Q. And then it says, "Or in which part of the physical item

1 needs to be subsequently modified after obtaining the
2 virtual model," do you see that?

3 A. Yes.

4 Q. It goes on to say that, "Such situations would
5 conventionally require a rescanning of the entire
6 physical item, which may involve additional time,
7 inconvenience and patient discomfort," right?

8 A. That is what is written here.

9 Q. You have no reason to dispute that, do you?

10 A. I do. I don't know what "convention" means here because
11 the prior art indeed discloses that you don't have to do
12 the entire and --

13 Q. Which prior art are you talking about specifically?

14 A. Prior art and also background art.

15 Q. Which references?

16 A. The references I have in my declaration, for example,
17 that is some of the references.

18 Q. Can you be more specific?

19 A. For what? Like -- I discuss this in detail in my
20 declaration, you know, including Boerjes combined with
21 Geng.

22 Q. Anything else?

23 A. And we have also state -- background art also that I
24 reference, I can't from memory now, but I reference
25 background art. Rohaly, I guess, is one of them and

1 other also background art.

2 Q. What was that last reference that you just mentioned?

3 A. Rohaly, I guess one of them. I have a lot of background
4 art also referenced. This is one of them. Let me see.

5 Q. You do have a lot of background art referenced, Dr.

6 Karam. I am asking specifically about when the '936
7 patent says, "In situations in which part of the
8 physical item needs to be subsequently modified after
9 obtaining the virtual model that would conventionally
10 require a rescanning of the entire physical item which
11 may involve significant additional time, inconvenience
12 and patient discomfort," it sounds like you dispute that
13 and the basis for your disputing that is Boerjes and
14 Geng and something else?

15 A. As a POSITA, having knowledge of all of the prior art
16 before the thing, yes, I dispute that, but I don't know
17 what conventional here is, what they are relying on,
18 conventional using the devices they used or what, but in
19 terms of patent limitations and, you know, having a
20 problem like that so that you show that you are solving
21 a problem, the prior art as a POSITA discloses that you
22 don't have to scan the entire thing.

23 I mean, I don't know what conventionally means
24 here, like what they refer to, but in context to all of
25 the equipment, but in terms of claim limitation and

1 patent law and having that problem, the prior art -- as
2 a POSITA, the prior art before -- and background art
3 before the priority date discloses that you don't have
4 to take an entire scan.

5 Q. So you do dispute the '936 patent statement that
6 "modification of a patient's intraoral cavity after
7 creating a 3D model of it conventionally required a
8 rescanning of the entire cavity"?

9 A. Yes. Based -- as a POSITA, based on the knowledge that
10 statement is, based on prior art, that is not required.

11 Q. The POSITA has no understanding of conventional dental
12 treatment approaches, correct?

13 A. This is for patent.

14 ATTORNEY ZHANG: Objection; form.

15 THE WITNESS: Yeah. So yeah, could you please
16 repeat the question.

17 Q. (BY ATTORNEY ARGENTI) The POSITA has no understanding of
18 conventional dental treatment approaches, right?

19 A. The POSITA has understanding of the technology imaging
20 used indeed and based on the prior art and evidence and
21 published prior art patents, you know, state of the art
22 related to dental, the POSITA indeed has knowledge of
23 the technology, that is imaging technology.

24 The dentist wouldn't know, you know, like
25 basically would know just how to use it and why they

1 need to rescan maybe because it doesn't support, but the
2 POSITA would know the technology available for dentistry
3 in terms of the prior art and the state of the art
4 indeed.

5 Q. In the context of dental treatment, the POSITA would not
6 know what was conventional in dental treatment, right?

7 ATTORNEY ZHANG: Object to form.

8 THE WITNESS: Dental treatment is different
9 than imaging and rescanning. Scanning an entire
10 facility, like entire intraoral cavity, this is imaging.
11 Then after imaging and providing all of that, the
12 dentist can do treatment, but to reconstruct images, you
13 don't require to scan based on the prior art.

14 Q. (BY ATTORNEY ARGENTI) But when the '936 patent talks
15 about one approach leading to significant patient
16 discomfort, that sounds like dental treatment, right?

17 A. Can you tell me what lines you are referring to?

18 Q. Yeah. Sure, that last paragraph in the background
19 section where it concludes, "Where the physical item is
20 part of the body of a patient, such as, for example, the
21 intraoral cavity, this may also involve significant
22 patient discomfort"?

23 A. So what was the question?

24 ATTORNEY ARGENTI: Could we read the question
25 back, please.

(Question read.)

THE WITNESS: Can you be more specific? Where is the dental treatment here in taking imaging and having to rescan again and that is why the patient, the way this is like stated, the patient has significant discomfort because of having to scan again and they have to open their mouth to have the image being taken and that is why they are having discomfort within this context, that is what this is saying.

Q. (BY ATTORNEY ARGENTI) Right.

A. So if you have to rescan, you are having signif -- because you are waiting and you have to open your mouth again and so it is not like a faster is better in imaging and the patient wants to just leave.

Q. Right. And if there is a patient there and the patient is undergoing discomfort, that is during the course of dental treatment, right?

A. It is not written here. This is a scanning. The treatment, what treatment are you talking about? Maybe it is scanning to check the tooth, it not doing any treatment so far. It could be treatment, it could be just imaging to check the -- whether there is any -- anything, any cavity, any problem.

It could be like checking the preparation, just like to check the quality that everything is fine,

1 so yeah, you have to clarify the question here, like it
2 is not --

3 Q. Would it make more sense if I said this was during the
4 course of dental care?

5 A. Okay. Yeah, I mean this is the course of dental care
6 that imaging the mouth of a patient, for sure. The
7 discomfort here is understood as the discomfort because
8 the imaging rescanning and you have to wait more time
9 and have your mouth open there, it is not like --
10 necessarily it is because of the rescanning and having
11 to wait and yeah, and also redoing things.

12 So I don't see anything else discussed there
13 to imply discomfort from -- and if one has pain,
14 definitely to have to wait until the thing gets done,
15 but it could be discomfort from several things. The
16 '936 patent does not specifically disclose the
17 discomfort is coming from what.

18 Q. And when you said earlier you don't understand what
19 conventionally means there, in what way do you not
20 understand that?

21 A. What I said, I don't understand what the '936 patent is
22 saying conventional because I do not disagree with the
23 statement that the prior art as a POSITA and as it
24 relates to patent law, the claim limitation, I do not
25 agree that this was -- this was disclosed in the prior

1 art, so I do not agree this was the case that you have
2 to take the whole entire scan.

3 As disclosed in the prior art and the
4 background art, the case was it was known, well-known
5 you could take just a partial scan and register it to
6 the previous scan, you don't have to rescan everything.

7 Q. When you say that you could take a partial scan and you
8 don't have to rescan, that doesn't necessarily go to
9 what was conventional at the time, does it?

10 A. To my understanding in patent law, when you are trying
11 to pose a problem that exists, this means the technology
12 is not available and that is why you can get issued a
13 patent, so this invention has to show there is a problem
14 that hasn't been solved so far and as a POSITA, I am
15 saying, you know, the prior art did indeed solve this
16 problem and disclosed that you don't have to take an
17 entire scan.

18 So as pertain to patent law and issuing a
19 patent, that problem did not exist at the time of the
20 '936. It was well explicitly disclosed -- or well
21 disclosed and state, you know, in background art, the
22 prior art, this problem did not exist and that is why
23 this patent shouldn't have been issued then. That is
24 why I am here.

25 So it is making a problem out of a problem

1 that doesn't exist to issue an invention, so talking
2 about patent law here. Whether a dentist want to use a
3 known technology and not make use of new technology that
4 was an invention or the -- so that is another thing, we
5 are talking about patent law here and having a problem
6 that doesn't exist in terms of an invention patent
7 issued and state of the art.

8 Q. Do you have any understanding as to why dentists at the
9 time might have used what the '936 calls the
10 conventional approach as opposed to what you are
11 pointing to as available technology?

12 A. I did not opine on this in my declaration, I opined on
13 the prior art, the state of the art and the -- that this
14 was well-known before that you can take a partial scan,
15 this is the technology. I mean, if the dentist has the
16 technology, that is like it depends on what item they
17 have, so I didn't opine on that in my declaration.

18 Q. Let's take out the Boerjes reference now, please, which
19 is Exhibit 1004.

20 A. Okay, I have Boerjes.

21 Q. Did you review this reference when forming your
22 opinions?

23 A. Yes, I reviewed this reference when forming my opinion.

24 Q. It is pretty long. Did you read the entire thing?

25 A. Yeah, that is what I recall, I read the entire thing. I

1 scanned through some things if, you know, when reading
2 the paragraph, you know, and I read like the entire
3 thing, the substantial things there, yeah.

4 Q. Boerjes describes the scanning system for capturing
5 digital dental models, correct?

6 A. Could you point me to where you are --

7 Q. For example, in the abstract.

8 A. So the abstract, yeah, disclosed the system and methods
9 employ a scanning system for capturing highly detailed
10 digital dental models, yeah.

11 Q. In your declaration, you discuss Figure 4 of Boerjes,
12 right?

13 A. Yes.

14 Q. And that figure of Boerjes depicts a quality control
15 procedure for use in its digital dental system, correct?

16 A. Yes.

17 Q. If we look at Figure 4, do you see elements 406, 408 and
18 410?

19 A. So I am looking on my declaration, is it sufficient?

20 Q. Sure.

21 A. Or should I flip to the figure in Boerjes?

22 Q. I will be referring to Boerjes.

23 A. Okay.

24 Q. And then maybe some other paragraphs of Boerjes, so if
25 it is helpful to refer to your declaration, we can do

1 that, too, we can go back and forth.

2 A. Yeah, because the figure is at the end of the -- of that
3 application but the application, so I have to look at
4 the end and flip it, so that is why I am asking, but I
5 will flip.

6 Q. Sure, if you want to look at a copy of Figure 4 in your
7 declaration.

8 A. Anyhow, I am there now. I have it, yeah. Both.

9 Q. Okay. So again, do you see elements 406, 408 and 410 in
10 Boerjes Figure 4?

11 A. Yes.

12 Q. What are those elements?

13 A. These are described in detail in Boerjes. If you want,
14 we can go through that. These are part of the quality
15 control, they include -- the quality control can be
16 manual quality control, it can be automated quality
17 control, it can be remote and also, although it is not
18 depicted in Figure 4, it could be semi-automated, part
19 automated, part manual, but one moment.

20 Okay, so I am at a relevant paragraph in case
21 you have more questions about Boerjes and Boerjes, but
22 anyhow, related to Figure 4.

23 Q. Okay. So the discussion of Figure 4 in Boerjes begins
24 at paragraph 184, right?

25 A. Yeah.

1 Q. At paragraph 188, Boerjes says that "Once a digital
2 model is obtained in step 404, the process may proceed
3 to one or more quality control steps as depicted in
4 steps 406 through 410," right?

5 A. Yes.

6 Q. Starting at paragraph 189, Boerjes then discusses the
7 automated quality control, which is step 406, right?

8 A. This may include automated quality control, it starts
9 there, yeah.

10 Q. The automated quality control discussion continues
11 through paragraph 191 and then, as you already
12 mentioned, moves on to a discussion of semi-automated
13 quality control in paragraph 192, right?

14 A. Like the 189 says "this may include automated quality
15 control," but then 190 starts "in one aspect, quality
16 may include," so it is not necessarily the automated in
17 190.

18 So -- so what -- like the question was, as I
19 understood it, maybe correct me if I am wrong, whether
20 automated control covers paragraph 189 to 191 in Boerjes
21 but I say that I respectfully disagree with that because
22 189 talks about automated quality control, 190 is one
23 aspect but it is written feedback, it can be in also
24 manual or semi-automated written feedback, not
25 necessarily in the automated, it is not saying this

1 applies only to automated in 190.

2 And also 191, it is different. It is one
3 aspect that can apply to automated, semi-automated or
4 other. And Boerjes does say later that these can be all
5 run exclusive together, can be done all together.

6 Q. So do I have it right in your view paragraph 189 is
7 talking about the automated quality control specifically
8 and then paragraphs 190 and 191 relate more broadly to
9 all three types of quality control?

10 ATTORNEY ZHANG: Objection; form.

11 THE WITNESS: This is like Boerjes does not
12 say this applies only to quality control, it is one
13 aspect of the written feedback, which could be when a
14 user is annotating, they can see the annotation every
15 time being displayed. It can apply to manual quality
16 control, a POSITA would understand that.

17 Also, in 191, quality control may include an
18 evaluation of suitability of the surface preparation,
19 using one or more techniques is written there, so it is
20 not necessarily the automated quality control there, it
21 could apply to, you know, it is one aspect, which
22 doesn't exclude automated or non-automated.

23 Q. In that last answer, Dr. Karam, you said -- you started
24 off by saying Boerjes does not say this applies only to
25 quality control. Did you mean --

1 A. Automated.

2 Q. To automated quality control?

3 A. To automated, yes.

4 Excuse me, I believe maybe sometimes because I
5 am looking like this, because the files are not, as you
6 know, I am looking at the screen and the like mics are
7 here on the computer, but the files are on my side, so
8 maybe sometimes I guess the reporter wouldn't -- I
9 believe I said automated, but it wasn't heard, you see,
10 so it is good, thank you for asking. But because of the
11 big binder here, I am -- you know, I will see what I can
12 do because I have to be looking and talking like on the
13 side and talking to the screen.

14 Q. If we look at paragraph 191, in the first sentence where
15 it says "Quality control may include an evaluation of
16 suitability of a surface preparation," what is a surface
17 preparation in this context?

18 A. Let me read, please, the paragraph then, one moment.

19 So the question was, what is a surface
20 preparation?

21 Q. Yes.

22 A. Surface preparation, already like I guess I answered
23 that question in here, it is similar meaning, I mean,
24 you prepare the surface of the tooth to accept like a
25 prosthesis to be attached to it or a restoration, so the

1 tooth surface is being reduced and carved in a certain
2 way to be able for a prosthesis to be fitted on the
3 tooth, for example, or -- yeah.

4 Q. Then, we go down to paragraph 193, Boerjes describes its
5 manual quality control process, correct?

6 A. Yeah, I mean, Boerjes says like quality control may
7 include like -- the manual quality control, it starts
8 like that this paragraph.

9 Q. And that corresponds to step 408 in Figure 4, right?

10 A. Yes.

11 Q. And it goes on to say in paragraph 193 that in the
12 manual quality control process, the dentist may visually
13 inspect the scan to identify, for example, holes or
14 incomplete areas of the scan, right?

15 A. That is an e.g., for example, that is one example given,
16 holes or areas of incomplete scan needed for an intended
17 dental procedure.

18 Q. And if we go on to the next paragraph, paragraph 194,
19 Boerjes then talks about remote quality control, right?

20 A. Yes.

21 Q. And the remote quality control is step 410 of Figure 4,
22 right?

23 A. Yes.

24 Q. For remote quality control, Boerjes says that "after
25 completing a scan, a dental office may transmit a

1 digital model to a dental laboratory or fabrication
2 facility for analysis," right?

3 A. For evaluation of adequacy of the scan. For evaluation
4 of adequacy of the scan, yeah.

5 Q. And the laboratory can provide feedback to the dentist
6 in real time so that the patient doesn't need to come
7 back later for additional scanning or surface
8 preparation, correct?

9 A. Could you please tell me which lines because we are
10 talking about that paragraph.

11 Q. This is the next sentence, the second sentence of that
12 paragraph.

13 A. Okay. One moment. And you mentioned there was like
14 real-time feedback in your question?

15 Q. Yeah.

16 A. And this is what like we are saying, remember like the
17 other paragraph in 190 says one aspect is real-time
18 feedback, so here we can see applicable here, you know,
19 so it is not.

20 Q. And then paragraph 194 goes on to provide some examples
21 of what could be analyzed remotely, correct?

22 A. Paragraph 1 -- which paragraph, please?

23 Q. The same paragraph we have been looking at, paragraph
24 194.

25 A. Could you please give those lines, just for --

1 Q. So we looked at the first two sentences and then after
2 that, starting in the third sentence and going on,
3 paragraph 194 provides examples of what could be
4 analyzed remotely, correct?

5 A. Just give me a moment to read that. So there are
6 example of how dental apparatus can provide feedback and
7 the feedback on the prepared surface, feedback -- and
8 other feedback also, like color and shade is one of them
9 also and marking of a margin by the dentist also can
10 provide feedback. And other, depending on their
11 standards, including accuracy, the surface quality and
12 so forth and may request additional or new scan data
13 consistent with its own specifications and it goes on
14 also, yeah.

15 Q. And that is all feedback that is provided based on the
16 remote analysis of the digital model, correct?

17 A. Yes. These are examples of all of this, yes.

18 Q. In the sentence in paragraph 194 that starts at line 15,
19 you see where it says, "The dental laboratory may also
20 apply separate standards for data quality, parentheses,
21 density, accuracy, surface continuity, feature detail,
22 et cetera, closed parentheses, and may request
23 additional or new scan data consistent with its own
24 specifications"?

25 A. Yeah, I see that sentence.

1 Q. What is your understanding of the difference between
2 "additional scan data" and "new scan data" in that
3 sentence?

4 A. Well, let me just read the sentence then if you are
5 asking about it. I mean, later, one has to understand
6 also the -- as a whole when reading, because here, it
7 says dentist and it stops but to be consistent with
8 Boerjes, as a whole, you know, this can be qualified
9 based on different examples.

10 So like -- so if you have this question like
11 specifically about that, because there are different
12 also examples like later that are given, so my
13 understanding, both of these are supplementing like, you
14 know, it is like new scan data or additional scan data
15 when you want to scan that, it is a different model than
16 the current model that evaluate, so you send a model to
17 be evaluated and then when you want to give either
18 additional or new scan data, that is the second part
19 with model that you are sending to be incorporated in
20 the other one, okay.

21 So it depends on the dental, what they are
22 asking and typically, based on Boerjes, with the marking
23 of the regions and specific areas, that there are
24 example on that like may inspect and prepare surface,
25 may inspect also regions and if you hear Boerjes in a

1 whole, they usually inspect regions, mark regions and
2 these regions are marked.

3 So especially this is remote and you are doing
4 a real-time feedback, the patient is waiting and that is
5 the whole thing in Boerjes, because you want to have the
6 patient single visit, so when you mark a region that is
7 in the model or require an additional preparation, you
8 are getting a new scan data for that region or
9 additional scan data for that region.

10 In both cases, this region is a new model
11 for -- this scan, whether additional scan or new scan is
12 a modeled, second model for that region and that is
13 sent -- okay, for -- sent and then this gets
14 incorporated in order to see things as a whole, this
15 could -- can get incorporated in the original model,
16 too, because to design what they want to design or, you
17 know, typically that is what happens.

18 And that is how Boerjes discloses. Especially
19 offer in Figure 4, like you said, in the declaration,
20 that says how it can be understood. I mean, because
21 that is Figure 4 is where the quality control. We
22 should understand things in context, not without
23 context. The context is Figure 4 and in Figure 4, you
24 can see at 404 obtain model, so that is obtain, that is
25 model one.

1 Based on manual quality control or automated
2 or the remote control, some regions are marked or
3 commence essentially by origins in that model, that some
4 things are not satisfactory. And you have to keep in
5 mind here, immediate feedback and the lead time and here
6 in that same thing, as you said, you mentioned this to a
7 dentist, while a dentist patient is still in the dental
8 office or still in a dentist chair at the dental office,
9 so thus avoiding a need to schedule repeat visit for
10 additional scanning, so it is very important that it is
11 very fast, you know, feedback.

12 Because you mentioned that, too, when you
13 asked me the question, that, you know, that the dentist
14 and it is the chair, single visit, immediate feedback is
15 important, so if a region is marked here and you want
16 feedback on that, a new scan data or additional data is
17 provided for that region, that is an error or that is
18 not adequate, to be sent back.

19 And that is actually consistent with Figure 4
20 fully, you know, based on my quality control remote
21 automated and as disclosed in several places in Boerjes
22 uses a marking regions. Why mark regions? Because you
23 want to correct these regions.

24 So supplement scan, you can see the supplement
25 in 414, supplement to additional data for that region,

1 supplement scan, so you are supplementing, doing a
2 second supplement model for that region, additional data
3 or new scan data, that is being sent back and this is
4 being incorporated in the first model to form a new
5 updated model and a quality control is done again until
6 a satisfactory model, combined model is obtained.

7 And this is -- because the context is Figure 4
8 here. And also, context is what is said on lines in
9 that paragraph, on lines with the immediate feedback --
10 so Boerjes, lines 6 to 9 important, this is the context
11 of real-time feedback and also, as a whole in Boerjes in
12 several places, you want to correct these regions, you
13 want to do it as fast as possible.

14 And also you are supplementing the scan, 414.
15 It is not saying acquire a whole new scan, it is
16 supplement, supplement meaning get something to
17 supplement the model, not redo the whole model and why
18 mark regions then, you could just like say redo all of
19 the model. You don't have to also waste time marking
20 regions then if you want to scan the whole thing, you
21 just look and say redo the model or sometimes you mark
22 to okay prepare that, but you can say redo the model and
23 send feedback, redo that preparation.

24 So that is to give -- so this is what that
25 means, just looking at the whole here and Figure 4 and

1 putting things in context.

2 Q. Well, thank you for that. I am going to go back to what
3 my question was, which is, is there a distinction
4 between additional scan data or new scan data there?

5 A. So one moment. So I am trying to go back to that line
6 to find it. Here, Boerjes, does not -- the important is
7 you are doing new scan data, whether it is additional or
8 new. In that sentence, Boerjes does not explicitly
9 disclose what additional is, like explicitly versus new.
10 That said, because in that sentence we have density,
11 surface continuity, feature detail and Boerjes does
12 disclose doing different resolutions of the scans.

13 So in some cases where the scanning like is
14 being done fast, you might not have as sufficient
15 resolution for a part or you could decide to do core
16 scanning and then they mark parts and say give me more
17 details about that part because that is the important
18 part we want to see or we see something, so additional
19 scanning, you scan that part again to get more -- more
20 scanning and more resolution.

21 And you scan higher resolution by providing
22 this additional data, additional -- that can get added
23 and things that are missing, it can have holes because
24 you did fast over, so that additional data or it can
25 have editor's fault because of blurred headers, so for

1 these you need additional scanning data for this.

2 Or new scan. So -- both of them are scanning
3 again. Okay, both of them are new scan used to
4 supplement for different objectives, increasing the
5 resolution versus not increasing the resolution, but new
6 scan data to just correct because there is -- this was
7 missing completely or it needed to be changed, something
8 needed to be changed, so a prepared surface is not
9 adequate, you need to redo it.

10 In this case is a new scan data because it was
11 changed, the prepared surface, you need to send new scan
12 data. In situations where you didn't have, you know, to
13 actually change a lot of surface or you had some errors
14 because of that surface or you had some obstruction
15 providing sometimes additional without doing further
16 changes to the surface necessary but getting the
17 scanning, that is the additional, you could do this
18 additional data of that same section.

19 New scan data, you did some changes, like
20 significant changes and then you need to scan again, so
21 that is how additional versus new scan.

22 Q. So is the distinction in your understanding that Boerjes
23 refers to additional scan data when it is taking further
24 scanning of an area that has not been physically changed
25 and it refers to new scanning when it is taking scanning

1 of an area that has been physically changed?

2 ATTORNEY ZHANG: Objection; form.

3 THE WITNESS: That is one interpretation.

4 This is one interp -- like Boerjes does not explicitly,
5 but people, it depends how they write. I could say
6 additional scan to be meant, but here, if we want to
7 give them separate meaning, a POSITA, based on what was
8 qualified before would understand that.

9 Now, yeah, that is one interpretation, yeah,
10 one understanding if we want to distinguish between
11 additional and new scan data.

12 Q. I just want to be clear, is that your interpretation of
13 what Boerjes is saying?

14 A. Well, a POSITA would understand from the text if there
15 was -- like from the context, you know, if you want to
16 distinguish those. The distinction is the additional
17 scan, you just additionally scanning something to -- to
18 add to it okay, you know -- you might have some
19 obstruction, for example. By scanning at a different
20 angle, that obstruction can be removed, so you would
21 have it changed because the obstruction is removed but
22 by the scanning, you are sending additional data versus
23 physical change and maybe you need to do a new scan.

24 If you do a physical change, you need to do a
25 new scan for that region. But until it is at the region

1 that is marked that scan is being done, for that region
2 and the model.

3 Q. You said if you want to distinguish those, my question
4 to you is, is it your understanding that they should be
5 distinguished?

6 ATTORNEY ZHANG: Objection; form.

7 THE WITNESS: Since we are using two terms
8 here, additional and new scan data, here the word --
9 because like -- if you want just for the English
10 language out of context, sometimes you use the word to
11 mean, oh, this means this, you see, so it depends on the
12 context.

13 Sometimes you could say, you know, or meaning
14 like you are qualifying the previous word, I mean, in
15 English, okay, if you take things out of context. This
16 is or -- it is a distinguish two separate word from the
17 context here, additional scan, you know, the new scan is
18 done when you do the physical -- it change on the
19 surface that requires scanning, that region from scratch
20 but it is still a region.

21 Additional, you could scan -- you could keep
22 some points of that region, okay, in the original model
23 and add to it. Still you might -- you might basically
24 have to change a small portion of that region and you
25 scan some additional one, you know, so instead like you

1 keep some parts in the model for that region that you
2 are scanning so you send the additional.

3 It depends on the size of the region you are
4 scanning and it depends on what you are doing, whether
5 you did a small change and you are scanning a bigger
6 region around that change. This can qualify also as
7 additional, meaning you don't really need to send that
8 whole region around but -- so -- so there are different
9 ways to kind of -- like new scan is like you are
10 scanning that region from scratch but it is still the
11 region, one portion of the model that was marked.

12 Additional, you are just adding, the scan, you
13 keep points for that region, some of the parts, so you
14 might remove a portion of that region but keep parts and
15 whatever you scan gets added to the points you are
16 keeping for that region, so the original model still has
17 some point or some parts of that region that you are
18 scanning or that are marked and you are sending
19 additional, so this is the interpretation as a POSITA
20 for that.

21 Q. So it sounds like, in your view, the POSITA would
22 understand that in the context of Boerjes, when it
23 refers to additional or new scanning, that there is a
24 distinction between additional and new scanning; is that
25 correct?

1 A. I mean, Boerjes did not explicitly specify that, but,
2 you know, both of them are supplement scanning, whether
3 additional, you are keeping part of it or new scan, you
4 know, like you are doing it from scratch, you know, for
5 that region.

6 Q. So it is your view that both additional scanning and new
7 scanning in the context of Boerjes are types of
8 supplemental scanning?

9 A. Yes.

10 Q. But there are distinctions between them, if I understand
11 your testimony, in your --

12 A. You know, here you asked me if you want to distinguish
13 them, you can give me another part where these appear
14 and we can look at that, we shouldn't really take things
15 out of context, but as a POSITA, I mean, an additional
16 scan, you know, could be also -- you know, could be also
17 take one more time the scan as a new scan also, I mean,
18 it could be interpret this way.

19 If we want to take the broader stance of the
20 additional here, it could include that you kept some
21 part and added to them or it could be also additional
22 that you are taking another scan and a new scan of that,
23 so all in this case qualifies also as an addition, but
24 in the broader sense, it includes both in that case.
25 Yeah.

1 Q. So it would include taking an entirely new scan?

2 A. If we are saying take an additional scan, meaning take a
3 second scan, that is the additional scan, you know, an
4 additional is like take another scan meaning. In that
5 sense, it could include broadly, if we take the broad
6 meaning, it could include new scan but also it can
7 include not fully new but partially new of the region,
8 like you kept some points, so to include both.

9 Now, when you say new scan, this, you
10 understand, taking a new scan of the region as a whole.
11 Additional can encompass both broadly. Additional
12 refers, given like the context, because here it is to --
13 basically to scanning again, scanning a second time and
14 additional, yeah.

15 Q. So then a new scan would be used to create a new model,
16 whereas an additional scan could be used to either
17 create a new model or supplement an earlier model, do I
18 have that right?

19 A. I --

20 ATTORNEY ZHANG: Objection; form.

21 THE WITNESS: Not really. I have to clarify
22 here. Both of them create a new model because when you
23 are scanning, already they have the other model, so you
24 are scanning the marked region. Both of them are
25 creating a new model, one new model can is like scanning

1 the entire region that are marked or the new model can
2 be scanning part of the region that are marked, you
3 know, while you are relying on the other part being like
4 the other part.

5 So you remove part of the region only and you
6 scan, oh, there are holes in the region or there are
7 some errors in the region but some other parts are not
8 erroneous as much so you keep them and you scan part of
9 the region, you can do that. But both of them you are
10 scanning a new model because you are scanning, whatever
11 you are scanning, this additional scan or new scan is a
12 new model, okay, it is the model.

13 Now, you create a model from the scan, that is
14 the new model, that is the second model, whether it is
15 the additional scan or the new scan data. And you send
16 that model back for that region and that gets
17 incorporated in the original model because you are
18 correcting marked regions in the model and you are
19 scanning, you are doing additional scan or the new scan
20 for these regions.

21 Q. So you seem to be making a distinction between creating
22 a new model that is used to supplement the original
23 model versus just creating a new model that is not used
24 to supplement the original model?

25 A. No, I am not making a distinction, both are used to

1 supplement, but you are asking me what additional in a
2 broader sense can mean here and I am saying, for
3 example, you need higher density, okay, or you have some
4 errors that affected the density, so for a region that
5 is marked, you can create a model by doing portions of
6 that region, keeping some points and removing some
7 points but you still have some points kept for that
8 region. In the other models, you are not rescanning all
9 of that region that is marked, you are scanning an
10 additional part from it to add -- to add like portions
11 for the density, you see more, but you have some points
12 that are still there, it could be that additional scan,
13 but when you scan, you are generating a model. Every
14 time you scan, that is a scan, how it is working, it
15 creates a 3D model, okay?

16 So the 3D model is creating whatever you scan.
17 Whether you do additional scan, it is creating a second
18 model, or whether you do a new scan for that region, you
19 are creating a model, so that is the supplement and the
20 new model both, you know, that you are sending.

21 One you are sending, you are sending that is
22 the model just replace that region all of it with it,
23 you know, by registering it so that it fills that
24 region. One of them you sent, these are portions of
25 that region, you know, replace those portions but keep

1 other portions, so that is an additional, that is the
2 one aspect of additional you know.

3 Q. Right. So Dr. Karam, let me see if I understand your
4 position correctly. In Boerjes, you have a digital
5 model of the intraoral -- of a region in the mouth,
6 correct?

7 ATTORNEY ZHANG: Objection; form.

8 Q. (BY ATTORNEY ARGENTI) A digital dental model, right?

9 A. When you scan, you form the -- after you scan.

10 Q. So you have a digital dental model and then in the
11 quality control process, a region of that digital dental
12 model can be identified that is of concern for one
13 reason or another?

14 A. Uh-huh.

15 Q. And it sounds like your understanding of the distinction
16 between additional scan data and new scan data is that
17 if only some of the data inside that region is then
18 updated, that would be additional scan data and if all
19 of the data inside that region is updated, that would be
20 new scan data, do I have that right?

21 A. This can be interpreted that way. Again, Boerjes does
22 not explicitly, you know, say what, but based on the
23 context and as read as a whole, you know, new scan --
24 like additional can include also, again, the additional
25 can include the new scan but can include, that is what I

1 said, can include the other one, it is a broader, you
2 know.

3 But if you are taking -- one moment also, if
4 we go to that sentence, because I want to -- may request
5 additional or new scan data, yeah, within this sentence,
6 in this context where we are talking about dentist
7 accuracy, surface continuity, et cetera, within that
8 sentence, qualified by that, for example, surface
9 continuity in that region, maybe the surface isn't
10 treated very well, so additional is like for these
11 portions in that region, give me these additional,
12 versus a new scan data because, you know, you need
13 feature detail is not there and you need to improve the
14 detail or you need to improve preparation, redo that
15 surface region, so you do a new scan data.

16 Now, additional can include new, too, because
17 an additional scan can be new but can also encompass the
18 other one like you mentioned where you are having
19 portions of these regions being scanned instead of that
20 whole -- to supplement versus new -- to supplement that
21 region and the model versus new scan data of that
22 region, like the region can be scanned as a whole to
23 supplement also the model.

24 Q. And this understanding of what it means by additional
25 scan data and new scan data, it sounds like you agree

1 that is not actually spelled out anywhere in Boerjes?

2 A. It is not. But from the context when you say the entity
3 surface continuity, it is not. I mean, in this case,
4 you know, whether new scan data or additional scan data,
5 both of them are supplemented. And actually, this
6 refers, as you also mentioned, and as I mentioned myself
7 in my declaration, all of this paragraph refers also to
8 Figure 4, because it is saying as in step 410, 410 is
9 Figure 4, the step in Figure 4.

10 And you can see in Figure 4, 414 is supplement
11 scan, 414, so whatever you send is a supplement scan to
12 the other model. You are sending a scan, which is now
13 when you scan became a supplement 3D model, which is
14 second model, that you are sending to supplement the
15 previous model, so that you can modify or merge them
16 together, it is a supplement scan in all cases and that
17 is exactly in this Figure 4 and all of these are
18 described.

19 So in Figure 4 it makes it more clear because
20 supplement scan, whether new scan data, additional scan,
21 whatever you want to call it, it doesn't change the fact
22 that it is a supplement scan. The supplement scan has
23 its own 3D model because every time you scan, so
24 supplement doesn't necessarily mean the whole thing,
25 redo the model, you are supplementing with a scan by

1 scanning these regions that are or the region that needs
2 to be improved or prepared more, whatever the scan is,
3 additional, new, it doesn't matter, it is a supplement
4 scan, with its own supplement 3D model, which is another
5 model, that you sent to merge and obtain together
6 combined the -- you know, to get an updated model that
7 you check again.

8 And that is clearly also depicted in Figure 4
9 and also in the descriptions in Boerjes of these tools
10 and user given feedback and marking regions and regions
11 that require additional preparation or regions that
12 require additional correction, additional accuracy and
13 so forth.

14 Q. And this idea that whether it is an additional scan or a
15 new scan, that that scan is used to create a second 3D
16 model that is then used to supplement the original 3D
17 model, you say that is clearly depicted in Figure 4,
18 what aspect of Figure 4 depicts that?

19 A. 414, supplement scan. That is the supplement scan, that
20 is scanning again these areas that are -- it is called
21 supplement scan, 414. Supplement meaning it is a scan
22 that is used to supplement another something else as a
23 supplement.

24 ATTORNEY ARGENTI: Okay. It has been over an
25 hour, why don't we take another break.

1 THE WITNESS: Okay. So ten minutes or more?

2 ATTORNEY ARGENTI: Ten minutes. Let's go five
3 past the hour, just to round it out a little bit. We
4 will go to -- is it 11:53 your time, Dr. Karam?

5 THE WITNESS: Yes.

6 ATTORNEY ARGENTI: So we can either come back
7 at 12:05 and then continue going or are you going to
8 want to take a lunch break at some point?

9 THE WITNESS: It is up to you. I will leave
10 it up to you because I am fine without lunch. If anyone
11 likes a lunch break, we can take it but I am fine
12 without taking lunch break now.

13 ATTORNEY ARGENTI: If you are fine for now at
14 least, why don't we go for another hour and we can
15 revisit it.

16 THE WITNESS: Okay. That is fine.

17 (A break was taken.)

18 ATTORNEY ARGENTI: Welcome back, Dr. Karam,
19 are you ready to go?

20 THE WITNESS: Yeah, thank you.

21 Q. (BY ATTORNEY ARGENTI) Let's stick with the Boerjes
22 reference for now and I want to move on to paragraph
23 195.

24 A. Okay.

25 Q. So at the beginning of paragraph 195, it says that

1 "Regardless of the type of quality control that is used,
2 there are a number of evaluations that can be
3 performed," right?

4 A. Yeah.

5 Q. And starting at I believe line 28, the second line of
6 that paragraph, Boerjes says that "one example is
7 examining whether a prepared tooth has adequate space
8 for cement to bond a restoration to the prepared tooth
9 surface," do you see that?

10 A. Yeah, one moment. Yes.

11 Q. Do you understand that example as falling in the
12 category of analyzing suitability of a surface
13 preparation that we saw in paragraph 191?

14 A. I understand this to include surface preparation.

15 Q. And moving on in paragraph 195, at line 31, "Another
16 example evaluation is inspecting the scan for gross
17 errors or omissions such as holes, gaps, distortions,
18 twists and the like," do you see that?

19 A. I see that.

20 Q. And that is similar to the description of looking for
21 holes or areas of incomplete scan in paragraph 193,
22 right?

23 A. 193? Which line?

24 Q. Two lines up from the bottom of page 55.

25 A. That is e.g., by the way, as an example, 193 gives these

1 as an example, for example.

2 Q. Right. And then there are additional examples in
3 paragraph 195, correct?

4 A. Yes.

5 Q. So it seems like Boerjes has two categories of issues
6 that quality control can look for. One of them is
7 evaluating whether the surface preparation is adequate
8 and the other one is evaluating whether the scan data
9 itself is adequate, would you agree?

10 ATTORNEY ZHANG: Objection; form.

11 THE WITNESS: These are among the categories I
12 would say. They are not really the only two categories.

13 Q. (BY ATTORNEY ARGENTI) What the other categories that
14 Boerjes describes?

15 A. I am not going to be comprehensive but I will give an
16 example. For example, you could have a surface
17 preparation but you can have obstruction or distortions
18 due to soft tissue or due -- like obstructing part or
19 like saliva or other debris may be around, so this would
20 be distortions also as a category, one category to like
21 among others, I am not going to be comprehensive but
22 giving an example of why it is not only surface
23 preparation versus scanning. Also, it could be
24 distortions because of these debris and other tissues.

25 Q. And so the distortions, is that the distortions in

1 paragraph 195, where it gives that as an example of
2 accuracy of a scan?

3 A. This can include distortions, any distortions that could
4 distort. It could be distortion of the scan itself or
5 distortions due to actual physical things that are being
6 imaged.

7 Q. So that would be in one of those two categories that we
8 talked about, right?

9 A. It is not only surface preparation, it is like debris.
10 So the surface preparation might be adequate, I am
11 saying, but it might be obstructed due to -- by some
12 other things.

13 Q. In which case that would fall into the problem of
14 adequacy of scan data, right?

15 A. Or basically you need them to do some physical change
16 there and cleaning up these portions and scan it. So it
17 still can be done physically, that is what I am saying,
18 rather than just scanning.

19 So if you keep scanning, you might not
20 improve, even if you change your scanning, you need to
21 do some physical change to that area in that case by
22 clicking on that area more, then scan, so you would have
23 physical change.

24 So maybe, I don't know, if maybe it could be
25 physical change, no, like you had -- and then you had to

1 rescan because it wasn't adequate, the -- whatever you
2 were scanning was not adequate, so you need to do some
3 physical change to the added scan or it could be the
4 physical change -- physical structure you are scanning
5 is adequate but the scanning had problems.

6 Is this what you are trying to ask?

7 Q. I think so. It sounds like you are adding a third
8 category which would be a category where a physical
9 change is necessary to correct an issue with the
10 adequacy of the scan data?

11 A. Yeah, but this is maybe if we want to -- if we want to
12 take two categories, it will be physical structure is
13 inadequate, physical include any physical thing around
14 it, you know, this is the physical and this can be done
15 by correcting the -- doing a physical change and
16 scanning.

17 This includes the physical, as examples,
18 surface, you know, a surface of a tooth or like debris
19 around the tooth while the surface, the prepared surface
20 is fine but still the debris is part of that physical
21 structure being imaged, so the change could be cleaning
22 those, so the category about the physical structure,
23 whatever being imaged, versus the scanning issue, maybe
24 scanning too fast by the dentist.

25 Because as Boerjes discloses, the scan is done

1 incrementally, you are scanning as you are doing and
2 these portions are being adjusted and added, so because
3 of the nature of the intraoral scanner and you are
4 scanning the mouth of a patient, so you need to move and
5 you are incrementally scanning and adding portions
6 anyhow to the model, so you might move fast and by
7 moving fast, you might blur a portion or you might skip
8 a portion, you know, like and you need to go back and do
9 it, so that portion is not imaged right because of the
10 scanning speed, because you are collecting portions
11 incrementally, you know, and stitching them, you are
12 registering them together. Yeah.

13 Q. Can you show me where Boerjes describes a situation
14 where you need to make a physical change other than
15 updating the surface preparation, such as for example
16 you mentioned removing saliva or debris?

17 A. Like I don't remember -- as you said, Boerjes is too
18 big, I don't remember and recall like all of the
19 examples or where they are, you know? So maybe if you
20 can point me somewhere, I can go there and tell you, but
21 for me to recall from memory all of these paragraphs and
22 where things and all of the examples, you know, and
23 where they are stated, I am not able to do that from
24 memory.

25 Q. Unfortunately I am not able to direct you to it either

1 because I am not sure it is there. Is it possible that
2 you are confusing the disclosure in Boerjes with the
3 '936 patent?

4 A. No. We have also a state of the art thing where they
5 said blood and saliva, so these are distortions, so a
6 POSITA would know such distortions occur.

7 For example, Babayoff reference and the state
8 of the background art, also they talk about these
9 distortions very clearly, so a POSITA would understand
10 based on even if like saliva and blood is not disclosed
11 or there is debris in Babayoff, I am not saying he
12 doesn't but even though, because I don't recall the
13 whole thing.

14 Q. Boerjes, correct?

15 A. Boerjes, yes. Boerjes, yes. Even if he doesn't -- like
16 I am certain that the background art does disclose that.
17 And we have it in the declaration also stated and
18 referred, these are distortions that occur.

19 So a POSITA in reading that, in context
20 knowing the prior art, would understand these
21 distortions can occur, including having like external
22 thing there, you know, debris, lots of saliva and other
23 external thing obscuring.

24 Q. Do any of those references that you cite refer to those
25 scenarios as distortions?

1 A. Yeah, obscured, that is distortions. When you obscure
2 something, this is a distorted -- a distortion, yes. A
3 POSITA would understand that, that these are distorting
4 your data because these are outliers producing
5 distortion to the data, making it less accurate of what
6 you want to image.

7 Q. So you are equating obscuring and distorting?

8 ATTORNEY ZHANG: Objection.

9 THE WITNESS: I am not equating. That is one
10 example of distortion. Yes.

11 Q. (BY ATTORNEY ARGENTI) And again, it is an example that
12 you are unable to point me to in Boerjes, right?

13 A. For example, nose obscurance, a nose can be an obscurant
14 to image quality and image processing and imaging,
15 quality depends on many thing. Even if, for example,
16 you could have a snow being in your nose, although it is
17 not in the real world but it is snow because you didn't
18 want snow in your image and you wanted to take the face
19 of the person, it depends on the application, because
20 you want to have authentication of the person, so that
21 is noise, that is distortion, so based on my field and
22 video image quality, which I work in, too, this is
23 distortion. A POSITA would understand that is
24 distortion. It is noise.

25 Q. Let's turn now to paragraph 199 in Boerjes. Let me know

1 when you are there.

2 A. I am there.

3 Q. In this paragraph, Boerjes explains that after the
4 quality control steps, there is a determination as to
5 whether the scan or surface preparation data is
6 necessary, right?

7 A. Are satisfactory, you mean.

8 Q. And so again we see two categories of potential
9 problems, right, a problem with the scan data or a
10 problem with the surface preparation, correct?

11 A. One moment. Could you point me to what, like where you
12 are saying we see like -- is it like on line, let me ask
13 you, 7, like this may include 6 and 7, this may include,
14 for example, new scanning to replace apparently
15 erroneously scan data, is this what you are --

16 Q. No, we will get to that, I am looking at the first
17 sentence of paragraph 199.

18 A. Here it is mentioning a scan and/or surface preparations
19 are satisfactory.

20 Q. So my question is, in that sentence, it is talking about
21 looking at whether two particular things are
22 satisfactory, the scan and/or the surface preparation,
23 right?

24 A. Yeah.

25 ATTORNEY ZHANG: Objection to the form.

1 THE WITNESS: To answer your question, I think
2 it is not like only -- because the scan include the scan
3 of the surface preparation, so the scan when it is not
4 satisfactory -- if the surface preparation is not
5 satisfactory, the scan of that surface preparation is
6 not satisfactory.

7 Because you are looking at a scan, I mean, we
8 have to view things in context, we cannot out of context
9 take things. This is referring to Figure 4 still. So
10 you are looking at the model of a scan, you cannot look
11 at a scan, so all of it is a scan. Whether the surface
12 preparation, it is a scan of the surface preparation
13 presented as a 3D model, so we have to kind of have it
14 be in context.

15 Again, this is like a scan or and/or; the scan
16 encompass both. It is like addition and/or additionally
17 encompass both. A scan encompass both here. It
18 encompass error in the scan data or inadequacy of the
19 physical structure being scanned such as a surface
20 preparation here, but it is a scan also because we are
21 looking at -- we have to take the context into account,
22 you know.

23 So it is a scan of the surface preparation
24 doing it in the 3D model and so that scan here before
25 that encompassed both, the surface preparation or scan,

1 so and/or is like part of it embodied, yeah.

2 Q. So would you agree that Boerjes describes situations
3 where the scan data is adequate and satisfactory
4 because, for example, there are no gaps or distortions
5 and yet the surface preparation is not satisfactory
6 because additional surface preparation work needs to be
7 done?

8 A. Then the scan would be not satisfactory. The scan -- if
9 the surface preparation, the 3D model of that surface
10 preparation, which is a scan, obtained through a scan of
11 the surface preparation, it is not sats -- the surface
12 preparation in that scan is not satisfactory, that scan
13 would not be satisfactory, so it is still the scan not
14 being satisfactory because the surface preparation in
15 that scan.

16 Q. I don't want to get hung up on the satisfactory term
17 then. Maybe we will use the term that Boerjes uses in
18 195 paragraph: accuracy. Would you agree that Boerjes
19 describes situations where the scan is accurate because
20 it, for example, has no gaps or distortions and yet the
21 surface preparation is not satisfactory?

22 ATTORNEY ZHANG: Objection; form.

23 THE WITNESS: I would say -- I would phrase
24 your question differently. I don't want because what
25 you are asking is not for me accurate, what you are

1 asking me, this dentist, so I wouldn't really agree with
2 this sentence.

3 What I would say, there are situations
4 described in Boerjes where the surface preparation is
5 adequate and the scan is not satisfactory due to holes,
6 but not the way you put it. I mean, that's --

7 Q. (BY ATTORNEY ARGENTI) What is wrong with the way I put
8 it?

9 A. The wrong, you said the scan is not satisfactory.

10 Q. I didn't say that.

11 A. You said the scan is satisfactory.

12 Q. I did not say that.

13 A. Okay. Could you repeat.

14 ATTORNEY ZHANG: Objection to form.

15 Q. (BY ATTORNEY ARGENTI) Would you agree that there are
16 situations in Boerjes where the scan is accurate because
17 for example it has no gaps or distortions and yet the
18 surface preparation is not satisfactory?

19 A. So could you qualify what "accurate" means here?
20 Accurate in what respect? Accurate, it should be in
21 respect to something.

22 Q. Accurate in the context of paragraph 195 of Boerjes that
23 we have already discussed and that I just referred you
24 to.

25 A. Okay, so let me look at it. Okay, I would like to point

1 your attention to paragraph 195, to lines 31 to 33,
2 okay? This is what you are referring to also, I
3 believe. And I will read it and I will read it slowly
4 for the court reporter here.

5 "As another example, a dentist may visually
6 confirm accuracy of a scan by inspection for gross
7 errors or omissions, such as holes, gaps, distortions
8 twists and the like." And again, I would like to point
9 your attention to distortions. So as an example, we are
10 trying to do a surface preparation that is adequate,
11 okay, that is satisfactory, that adequate but I have
12 debris around it and covering, so it is not going to be
13 an accurate representation of my surface.

14 So the scan itself is fine because it is
15 slowly -- the scan speed is fine, not the scan itself
16 but the scan speed, the resolution is fine, but the
17 issue is still a physical structure obstructing my
18 surface preparation and not represented to get accurate
19 in the 3D model because of occlusion and these
20 obstructions are going to cause holes in the
21 representation of my surface preparation, of the object
22 of interest.

23 I am interested in a prepared surface, surface
24 of a tooth. If we have obstruction, these will be
25 distortions and they will create hole in the

1 representation of that region of interest, which is the
2 prepared surface. In that case, that is why the scan
3 would not be satisfactory because the physical structure
4 that is being scanned is not represented accurately in
5 the scan and has holes in the representation of that
6 surface due to obstruction and occlusions distorting its
7 representation.

8 So it is a distortion of the representation of
9 my prepared surface that is of interest to me, so that
10 is why, you know, that is basically my answer to your
11 question and this is why I don't agree with the
12 statement or the question how it was phrased, so that is
13 a full answer to your question.

14 Q. Does Boerjes explain that those distortions are present
15 in every scan it captures?

16 A. What do you mean by present in every scan it captures?

17 Q. I don't understand why you are -- I am asking whether
18 Boerjes has situations where the scan is accurate but it
19 still needs an updated surface preparation and you keep
20 circling back to situations where the scan isn't
21 accurate, Dr. Karam.

22 A. No, so --

23 ATTORNEY ZHANG: Objection to form.

24 THE WITNESS: Sorry.

25 As an example, I will give you an example, I

1 cannot agree with the statement that you are -- you are
2 like the way you are phrasing it because I am showed you
3 where the surface preparation is adequate, the scan,
4 there is no problem with the speed and resolution and
5 this is what you qualifying you are referring to. The
6 things that you are not qualifying, what is in the scan.

7 What I can say, there are situations where the
8 surface preparation is adequate, where maybe there are
9 no obstruction, okay? Yes, no distortions due to the
10 debris and the scan quality, because of speed of
11 scanning, so one should quantify things, because of
12 speed of scanning, it misrepresenting some region, it is
13 skipping some parts, creating holes, there is a
14 situation like that, so I can give you that is, so I am
15 saying, yes, there are situation like that.

16 Q. That is not the situation I am asking you about, Dr.
17 Karam.

18 A. Okay. So give me an example of your situation you are
19 asking about, not saying scan is accurate about without
20 qualification because I showed you accuracy can relate
21 to occlusion and distortion by physical structure.

22 Those --

23 Q. There are other situations where the surface preparation
24 needs to be updated and it does not impact the accuracy
25 of the scan, correct?

1 A. So if we take the accuracy of the scan to be the
2 resolution of the scan, the number of fonts, the surface
3 continuity, the resolution of the scan, everything being
4 covered like so it is slow enough to capture everything
5 and high resolution, in that case -- and, you know, the
6 surface preparation, you know, so the scan would be
7 adequate in that case, you know, in terms of imaging the
8 physical structure.

9 So the objective here would be I want the
10 actual -- a good representation, a representation of my
11 current physical structure, whatever it is, whatever it
12 is, if this is the case that you are asking about, all I
13 care about is the resolution of what I am imaging, I
14 don't care about the representation of the surface being
15 prepared because this might not be accurate, it might be
16 distorted, I care about whatever I have, I am imaging it
17 and I have the right speed, the right resolution, the
18 scan can be adequate in this case if that is the
19 objective.

20 You have to state your objective when you talk
21 about accuracy, when you talk about quality, that is an
22 objective that is used to measure under this context
23 accuracy. Because accuracy can be measured in different
24 ways, quality can be measured, all of these should be
25 qualified with a metric of objective.

1 It cannot be -- so if you are asking me a
2 question about accuracy, it should be with a metric,
3 with an objective that you phrase, otherwise I can't
4 answer the question broadly. I tried to answer to the
5 best of my abilities by giving you examples, by
6 quantifying myself and qualifying what accuracy is, so
7 maybe following that, if you present me with the
8 objective goals, what is the accuracy, et cetera, I
9 could answer.

10 Q. Why do you keep saying the scan may be distorted when I
11 am asking you about scenarios where the scan isn't
12 distorted?

13 A. What is a scan? Give me the situation, describe a
14 context, describe what you are imaging and what accuracy
15 you care about, what distortions you care about, give me
16 a situation and ask a question.

17 Q. In the context of Boerjes.

18 A. In the context of Boerjes.

19 Q. Where you are taking digital --

20 A. Where he talks about --

21 Q. -- dental scans.

22 A. I gave you my understanding but you are asking me about
23 something else.

24 Q. So again, let's look at paragraph 195, Dr. Karam.

25 A. Okay.

1 Q. And paragraph 195 is talking about evaluating digital
2 dental scans, right?

3 A. About quality control, evaluating of the --

4 Q. Right.

5 A. Yeah.

6 Q. And it says that you can confirm the accuracy of a scan
7 by inspection for gross errors or omissions, such as
8 holes, gaps, distortions, twists and the like, right?

9 A. That is what is written in here, yeah.

10 Q. So this is saying you could have a scan that has no
11 gross errors or omissions, such as holes, gaps,
12 distortions, twists or the like, right?

13 A. You could have a scan that doesn't have gross -- errors
14 or omissions based on what you quantify as errors, based
15 on what you want. If you expect very high resolution
16 and your scanner is not giving you that, so based on
17 your application and your metrics and objectives, you
18 could have a scan, so you have to quantify the
19 objectives, but under some objectives, yes, you could
20 have a scan that qualify to have no gross errors or
21 omissions.

22 Q. And that scan could be confirmed as accurate, as Boerjes
23 explicitly says, right?

24 A. Based on your accuracy of objectives, that scan, if it
25 doesn't have, based on this objective, gross errors and

1 omissions, it can be confirmed, yeah.

2 Q. And yet that confirmed accurate scan could still involve
3 a need for an updated surface preparation, correct?

4 ATTORNEY ZHANG: Objection; form.

5 THE WITNESS: No. I mean, it depends on your
6 gross errors, the gross errors.

7 Q. (BY ATTORNEY ARGENTI) There are no gross errors. We
8 just confirmed that it is accurate, Dr. Karam.

9 A. It depends whether your surface preparation is in error,
10 it constitutes an error. If I am marking that, that
11 needs to be admitted as an error. That is an error in
12 the surface preparation, so I won't agree with that.

13 Q. Is that an accuracy error in the scan?

14 A. It is -- it is an accuracy, yes, I just gave you
15 answered that. It is an accuracy in the representation
16 of, you know, in the representation of the surface
17 preparation, it is not accurate, the surface
18 preparation, so the 3D model is not accurate as it is,
19 so it is inaccuracy, it is a gross errors found in the
20 scan that render that surface preparation inaccurate or
21 its representation inaccurate and has errors, needs to
22 be corrected for the specific application of fitting a
23 given restoration, a specific restoration.

24 So the representation is not accurate for the
25 objective. The objective, I want to fit a given

1 restoration, prosthesis that has a particular shape, so
2 when scanning that the accuracy of the representation,
3 given the objective of the 3D model, it has gross errors
4 because it doesn't fit because the scan is representing
5 the representation of that.

6 So it depends on the objectives again. That
7 is why we can't take accuracy out of context. If you
8 tell me accuracy means only forget the surface
9 preparation, it is not included, yes, but it is included
10 here, so accuracy of the scan is accuracy of the
11 representation of the scanned surface, the 3D model,
12 according to Figure 4.

13 Also that the 3D model coming from the scan,
14 how accurate it is with respect to an objective. That
15 is why accuracy should not be taken by itself without an
16 objective. If the objective is to get adequate surface
17 preparation and that is why I am scanning, then the
18 gross errors in the preparation, because I didn't do
19 them right, affect -- this is inaccurate, so that scan
20 would be not satisfactory and would not be accurate
21 because it is not representing, it has gross errors in
22 the surface preparation and the 3D model resulting from
23 that is erroneous because it is not able to fit my
24 objective of fitting that restoration and these needs to
25 be corrected, these errors.

1 Q. So it is your understanding of that sentence in
2 paragraph 195, when it refers to confirming accuracy of
3 a scan, it is not talking about accuracy of capturing
4 the current conditions inside the mouth?

5 A. It is not --

6 ATTORNEY ZHANG: Object to form.

7 THE WITNESS: Can you repeat your question,
8 not talking about what? I couldn't hear that.

9 Q. (BY ATTORNEY ARGENTI) When Boerjes talks about
10 confirming accuracy of a scan in paragraph 195, your
11 interpretation of that is that it is not referring to
12 accurately capturing the conditions inside the mouth?

13 ATTORNEY ZHANG: Objection; form.

14 THE WITNESS: It is -- it embodies both.
15 Accuracy is based on objective. One objective is
16 accurately capturing the actual physical structure as it
17 is, that is one objective and that affect the accuracy
18 for that objective.

19 Another objective is a scanning to get a 3D
20 model of the scanned surface and to see if it is
21 accurately representing the objective of fitting my
22 restoration or whether there are gross errors there.
23 And that is another accuracy base, another objective.

24 And we could have -- these are non-exclusive,
25 we can have both, accuracy, we can have that, accuracy

1 without accuracy, I want both to capture as a test, as
2 an accuracy and I want both also to capture gross errors
3 in the modeling of that, that is also an accuracy of a
4 scan.

5 Q. (BY ATTORNEY ARGENTI) But Boerjes talks about the
6 treatment objective in the previous example, the
7 previous sentence, right?

8 ATTORNEY ZHANG: Objection; form.

9 THE WITNESS: He is giving an example but he
10 is not saying this is accuracy. Like I told you --

11 Q. (BY ATTORNEY ARGENTI) I know he is not saying it's
12 accuracy. That is my point.

13 A. He is not saying this doesn't include that, he is saying
14 as another example and he is giving more what accuracy
15 is.

16 Q. When Boerjes talks about assessing whether the treatment
17 objective will be reached, he doesn't mention anything
18 about accuracy in that sentence, right?

19 A. It is like these are not mutually exclusive here.
20 Accuracy over representation, it is not -- it is
21 accuracy also, like you define how good it fits and your
22 objective, that is what accuracy is with a POSITA. Here
23 he is giving other examples, he is giving such as
24 distortions, okay, or the like, the like can include the
25 surface preparation, too. He is giving examples. I

1 mean, he is not -- he is not covering all examples,
2 these are just examples he is giving, okay, and this is
3 how he write it.

4 First, specifically he said that would receive
5 a restoration, maybe evaluated a tooth, that would
6 receive a restoration, may be evaluated to determine
7 whether that is adequate space, so he is talking about
8 the space. He could have talked about something else.
9 So he has given a specific example.

10 As another example he is talking about other
11 things, holes, and including like other examples. This
12 doesn't mean that it doesn't include surface
13 preparation.

14 Q. So when we look at that first example, "For example, a
15 prepared tooth in an arch that will receive a
16 restoration will be evaluated to determine whether there
17 is adequate space for cement to bond the restoration to
18 the prepared tooth surface," your understanding is that
19 that is an example of confirming accuracy of a scan, do
20 I have that right?

21 ATTORNEY ZHANG: Objection; form.

22 THE WITNESS: The objective. The objective
23 that the restoration, it was my objective that the
24 restoration needed to have adequate space and the space
25 is not there, then the accuracy of that restoration, as

1 shown by the scan and this representation, is not
2 accurate, yes. And I need to redo it to make it more
3 accurate, that is my objective.

4 Q. (BY ATTORNEY ARGENTI) My question was a little
5 different.

6 A. The specification and the later application or give an
7 example, it doesn't exclude other examples. That is one
8 example.

9 Q. So my question was a little different. To confirm, your
10 understanding of Boerjes is that that first example in
11 paragraph 195 is an example of confirming accuracy of a
12 scan, do I have that right?

13 ATTORNEY ZHANG: Objection; form.

14 THE WITNESS: Receipt of the 3D model to fit
15 my objective, that is what you have, it is not like
16 without qualification. So that is what you are doing,
17 you are seeing the 3D representation of the scan,
18 whether it is accurate to fit my objective of having
19 enough space for cement to be there or to fit a
20 restoration. If it doesn't have that, this 3D
21 representation is not -- doesn't fit the accuracy
22 requirement that I need to fit my restoration, that is
23 what I am saying.

24 Q. (BY ATTORNEY ARGENTI) And you could have a scenario
25 where all the parameters in the second example are

1 satisfied, the explicit parameters for confirming
2 accuracy, no omissions, such as holes, gaps,
3 distortions, twists and the like?

4 A. And the like. The like includes many other situations.
5 So unless you can be specific and give me this
6 situation, is this accurate, I cannot answer this
7 broadly. There is "and the like," okay? And that "and
8 the like" can include many things.

9 Q. All right. Let's go back to paragraph 199, please. In
10 the second sentence of paragraph 199, Boerjes says that
11 "If the data is not satisfactory at step 414 in Figure
12 4, the digital model may be supplemented or replaced
13 with new scan data," right?

14 A. This is what is stated here.

15 Q. What is your understanding of the difference, if any, in
16 that sentence between supplementing the digital model
17 and replacing it with new scan data?

18 A. It is when I talked about before also additional that
19 encompasses new scan data and here it is very consistent
20 with that answer. You can see to step 414, let's go to
21 step 414 and Figure 4, it is written supplement scan, do
22 you see that?

23 So supplemented can include replace with new
24 data and can include additional data. And here, the
25 region you mark is supplemented, so supplements scan in

1 figure 414 is a supplement scan for the very first model
2 that was obtained, you are checking if satisfactory and
3 step 414, you check to see if it is satisfactory by
4 marking regions and you mark regions that are not
5 satisfactory, if any, and for these, you supplement, you
6 do a supplement scan.

7 Supplement scan can be new scan for that
8 region, so that would replace the new scan data or can
9 be a supplemental scan for that region. This means the
10 region is like additional, like we talked before, where
11 you keep some portion and replace some in that region
12 but in both cases, this is a supplement scan for the
13 model, for the model that you had and you are checking.

14 This is, both cases, whatever you do for that
15 region you marked, whether you acquire additional data
16 by supplementing it or you replace it with new scan
17 data, that new model you get, new second model you get
18 for that region is a supplement scan as shown in 414,
19 and this refers to 414, for the model you were checking
20 and marking these region.

21 Because these region are being scanned and
22 these scans form a second scan that is a supplement scan
23 to the original model, you combine it to create an
24 updated model, so yeah, this is consistent with my --
25 with the previous things we discussed and with Figure 4,

1 Figure 4. 414 is the step.

2 Q. (BY ATTORNEY ARGENTI) Maybe I didn't follow it. Can you
3 explain again what is the distinction between scanning
4 and replacing in that sentence -- supplementing and
5 replacing in that sentence?

6 A. I am saying we refer to step 414, no? Isn't that right
7 and this is talking about Figure 4?

8 Q. Right.

9 A. Let's go to step 414, what does that step say on Figure
10 4? It says supplement scan, isn't that right? You have
11 Figure 4 in front of you also.

12 Q. Okay.

13 A. Okay, so 414 is supplement scan, that is it, it is a
14 supplement scan for the model for which I am checking
15 the quality. I highlight some regions that are
16 erroneous or need surface preparation and I do a
17 supplement scan to these regions.

18 For these region, you could be have additional
19 data that is supplemental in nature that is adding for
20 these region that are erroneous. You are supplementing
21 some part of these regions, you know, where you are
22 doing a partial scan of these region and keeping some
23 point or you can scan newly the region, that region that
24 you want to rescan, but both of them as shown in 414, we
25 have to take them in context, are supplement scan for

1 the model, the original model for which you are checking
2 the quality.

3 Q. Okay. So is it your understanding then that when we
4 look at paragraph 199 and it says that you proceed to
5 step 414 where the digital model may be supplemented or
6 replaced with new scan data, you are interpreting both
7 supplemented and replaced in that sentence to be
8 supplementing because element 414 in Figure 4 says
9 supplement scan?

10 ATTORNEY ZHANG: Objection; form.

11 THE WITNESS: I am -- no, I have to
12 distinguish. Yes, it is supplement scan for the
13 original -- you see the model -- obtain the model in
14 step 414, do you see the digital model?

15 Q. Okay.

16 A. So then you are doing manual quality control on a model,
17 similar or automated or what have you, you are checking,
18 you mark, you find some erroneous region or some surface
19 that requires further preparation, you mark that, then
20 you do a supplement scan for that region.

21 In the step 414, you need -- you do supplement
22 scan for the model, I mean, I have to take that back.
23 You do a supplement scan for model 414, meaning you do a
24 scan, a new scan that's a supplement scan for the region
25 you are marking and this is going to be used as a

1 supplement scan for the original when you update the
2 model and you obtain it again, this is a supplement. It
3 doesn't require that you do the whole model again
4 original but the supplement for these area is that
5 require attention.

6 That said here, for that region that require
7 attention, that region may be the scanning can be done
8 by replacing it with new scan data, that region, or it
9 can be supplemented itself, also like we discussed in
10 the other paragraph about additional can be supplemented
11 itself by replacing portions in that region, but again,
12 as I discussed for additional, supplemented encompasses
13 the new scan data. It encompasses all, both situation
14 in this case meaning like supplemented in this case,
15 like there are two things. I take that back.

16 There are two things. Just to clarify. There
17 is the supplement scan for the model as a whole, the
18 model I received, I marked region, so when I scanned
19 these region, this supplemental scan, these correspond
20 to supplement scan for the whole model, but now when I'm
21 scanning the region, I could acquire new scan data and
22 this is consistent with the additional or new scan data
23 also interpretation or I could supplement these regions.

24 So just, you know, keep some of the parts and
25 scan some other part as supplementation and send those.

1 But even the supplemented sent for that region is a
2 supplement scan for the whole model and the new data
3 scan for that region, for these regions, one or more
4 regions is a supplemental scan for the original model I
5 started with.

6 Q. So in paragraph 199, when it says the digital model may
7 be supplemented, you are reading that to mean the same
8 thing as the additional scan data that is referred to in
9 paragraph 194?

10 A. For the regions --

11 ATTORNEY ZHANG: Objection; form.

12 THE WITNESS: -- also.

13 What I am saying is for the regions, the
14 additional there includes supplementation, the
15 additional is more broad. Additional can be the
16 supplementation and the new scan data for that region.

17 And this is -- we don't have to take things
18 out of context, this is basically paragraph reading
19 Boerjes as a whole as a POSITA, looking at Figure 4,
20 with the 414 supplement scan, this is what that -- this
21 is how the meaning, a POSITA would understand the
22 meaning, not taking things out of context, one sentence
23 here, without taking the whole context into account and
24 the whole embodiment and Figure 4 and what you know all
25 of the paragraphs about Figure 4.

1 Q. (BY ATTORNEY ARGENTI) So you are reading paragraph 199
2 to talk about if the quality control indicates that the
3 scan and/or surface preparation is not satisfactory,
4 then you are reading it as saying that the -- there is
5 going to be an unsatisfactory region and if you
6 supplement the data in that region, you are updating
7 just a part of the data in that region.

8 Whereas if you replace the data in that
9 region, you are updating the entirety of the data in
10 that region, that is consistent with what we talked
11 about earlier, for the distinction of additional or new
12 scan data, right?

13 A. Yeah. Like this is -- this is like as a POSITA, yeah,
14 and based on the paragraphs related to Figure 4 and this
15 embodiment.

16 Q. So still looking at paragraph 199, the first part of the
17 next sentence says, "This may include, for example, new
18 scanning to replace apparently erroneous or inadequate
19 scan data," do you see that?

20 A. Yeah.

21 Q. And that doesn't say anything about surface preparation,
22 right?

23 A. But it could apply to surface preparation. Like I will
24 tell you what is the difference between erroneous or
25 inadequate. There are two words here if you want to

1 just look at everything. But inadequate scan data,
2 inadequate because you have obstructions due to debris
3 and on the surface preparation and you need to clean the
4 surface preparation now, so you still need to do
5 physical change because the scan data is inadequate
6 because of these obstruction and doesn't give you the
7 objective, the objective I'm applying, because I have to
8 quantify, is I want to have a clear view of my surface
9 preparation and that is the accurate or adequate scan
10 data.

11 If I only see this adequate because I see
12 obstructions, that would be inadequate scan data. I
13 would have to go and clean up this surface, then rescan.

14 Q. What erroneous scan data?

15 A. I mean, again, erroneous can include like example in
16 195, can include holes, caps, distortions also. It
17 depends on your accuracy and what you consider as
18 erroneous or inadequate and -- yeah.

19 Q. So the sentence in paragraph 199 goes on in the second
20 half of the sentence to refer to a new scan of the
21 dental subject matter following e.g. additional surface
22 preparation consistent with errors identified during
23 quality control, do you see that?

24 A. I see that.

25 Q. That example is referring to an issue with the surface

1 preparation rather than an issue with the scan data,
2 right?

3 ATTORNEY ZHANG: Objection; form.

4 THE WITNESS: That is giving more detailed
5 examples. It is not mutually exclusive. Let me, for
6 example, to illustrate. You see apparently erroneous or
7 inadequate scan data that we just read, no? You think
8 erroneous is adequate scan data? It is also inadequate.
9 So it is just giving more examples but they are not
10 mutually exclusive. Erroneous scan data is not adequate
11 scan data. But you could say erroneous or inadequate.
12 Or a new scan is just giving more details of things and
13 more examples. It doesn't mean that this doesn't apply
14 or they are mutually exclusive and if he gives another
15 example, this means the previous example doesn't apply
16 to it.

17 And just one more thing. In the sentence you
18 mentioned, lines 8, 9, e.g., additional surface
19 preparation consistent with errors identified, referring
20 to the errors identified, so the erroneous scan data
21 informed the practitioner to do additional that is
22 consistent with these errors and inadequate scan data or
23 erroneous, so you see the errors here, which is
24 erroneous data.

25 So scan data is data obtained through scan.

1 The data can contain errors and that is why the surface
2 preparation should be consistent with the errors
3 identified in that scan data because the errors are only
4 identified from the scan data, not through anything
5 here. From the scan data that is represented in the 3D
6 model, you see errors, whether errors relates to
7 omissions or to surface preparation as here clearly it
8 was stated by Boerjes.

9 Again, I am going to read that, "additional
10 surface preparation consistent with errors identified
11 during quality control," so consistent with scan data
12 that shows errors.

13 Q. So it is your interpretation of this portion of Boerjes
14 that when it refers to new scanning to replace
15 apparently erroneous or inadequate scan data, that is
16 also referring to surface preparation. And then when it
17 goes on to refer to "a new scan of the dental subject
18 matter following, e.g., additional surface preparation
19 consistent with errors identified during quality
20 control," that is also referring to scan data?

21 A. The second one for sure, it is referring -- excuse me,
22 like the second one referring to surface preparation
23 explicitly here, the inadequate scan data can include
24 surface preparation and distortion, obstructions and
25 others, yes, because it is inadequate representation.

1 Again, inadequate and errors, what is an error
2 at the end of the day? You have to determine how you
3 are measuring your errors. It is based on objectives.
4 Once you set an objective, anything that deviates from
5 it significantly would be erroneous, unacceptable,
6 inadequate.

7 Q. Was that your whole answer, Dr. Karam?

8 A. For now.

9 Q. Paragraph 199 of Boerjes does not describe updating a
10 portion of the digital model of a patient's teeth after
11 a physical change in the patient's intraoral cavity,
12 does it?

13 ATTORNEY ZHANG: Objection; form.

14 THE WITNESS: I disagree with that. I
15 respectfully disagree because it is referring to Figure
16 4 of this and the steps 406, 410, 414 and it does teach
17 this.

18 Q. (BY ATTORNEY ARGENTI) And you relied on that teaching in
19 your obviousness analysis; is that right?

20 A. I relied --

21 ATTORNEY ZHANG: Objection; form.

22 THE WITNESS: -- on what teaching?

23 Q. (BY ATTORNEY ARGENTI) Your understanding that Boerjes
24 discloses updating a portion of the digital model of the
25 patient's teeth after a physical change in the patient's

1 intraoral cavity?

2 A. As a POSITA, Boerjes is clear and a POSITA would
3 understand that Boerjes teaches this claimed limitation
4 and yeah, based on also our discussion now and what we
5 just discussed inadequate can include obstruction, you
6 need to remove it, to correct it, you know, the
7 supplement scan in 414, supplement doesn't -- clearly a
8 POSITA would understand supplement doesn't mean acquire
9 the whole thing. The immediate feedback and also
10 marking the regions by user, you mark regions for this
11 to be corrected.

12 And I think -- and plus Boerjes also clearly,
13 you know, teaches that the scan is formed in an
14 incremental fashion, you don't just take one view of the
15 whole mark. Because of the intraoral scanner, you have
16 to clearly incrementally. So imagine you are taking
17 incrementally, like you went from the lower arc,
18 basically from left -- from one extreme to the other
19 taking a scan and you find on the other extreme that you
20 have an error or you require a surface preparation and
21 you are doing it incrementally, meaning these are
22 assembled in portions.

23 Once you discover something needs attention
24 and it is very far from things that are -- they don't
25 have to do anything and you spent all of this time

1 acquiring that whole arc, are you going to acquire
2 everything -- Boerjes teach incremental scanning, so you
3 are incrementally stitching a scan there. A POSITA
4 would understand in marking the regions and the
5 supplement scan, all consistent with Boerjes' teaching
6 and how scans are acquired that are incremental, so that
7 is a component that you just incrementally added, you
8 see it requires that you just rescan that component
9 because that is how scans are formed. It doesn't make
10 sense for a POSITA like to -- a POSITA would understand
11 that was consistent with Boerjes' teaching and the prior
12 art.

13 So you are not going to rescan things that are
14 incrementally anyhow assembled, you know. Until that
15 and you have them and you just assembled that portion
16 incrementally, you found an error and they just require
17 that portion, you know, so you remove that portion from
18 your existing model or suppose you acquire that portion
19 and some subsequent portion and you realize there is an
20 error, it is just required from that portion, you remove
21 that portion of the model area acquired. You are not
22 going to require the whole thing. This is consistent
23 with the understanding of a POSITA and consistent with
24 Boerjes' teachings, all across.

25 Q. Dr. Karam, in your obviousness analysis, you rely on

1 Boerjes as disclosing updating a portion of a digital
2 model of the patient's teeth after a physical change in
3 the patient's intraoral cavity; is that right?

4 ATTORNEY ZHANG: Objection; form.

5 THE WITNESS: Could you point me specifically
6 to where in my declaration I am opining on that and then
7 I can answer the question.

8 Q. (BY ATTORNEY ARGENTI) Sure. Why don't we look at
9 paragraph 109 of your declaration.

10 A. Okay, I am there.

11 Q. And the bottom six or seven lines of that page 81.

12 A. One moment, please.

13 Q. Starting with where it says, "A person of ordinary skill
14 in the art would have understood that Boerjes"?

15 A. One moment, paragraph 109 on page 80?

16 Q. Sorry, I think I mentioned 109 and then I was looking at
17 110.

18 A. Okay.

19 Q. We can look at 109, I think it is in both paragraphs.

20 A. Okay. So you are asking about 109 and 110 again?

21 Q. Yes. If we start with 109.

22 A. Yeah. So just to orient myself, like in here, I just
23 need a couple of minutes just to look at this paragraph
24 to orient myself to the context --

25 Q. Okay.

1 A. -- so that I can answer your question better.

2 Okay. Thank you for the time.

3 Q. So now that you have had -- you have had a chance to
4 review paragraphs 109 and 110; is that right?

5 A. Yes.

6 Q. Now that you have had a chance to review them, I will
7 ask again: In your obviousness analysis, you rely on
8 Boerjes as disclosing updating a portion of a digital
9 model of the patient's teeth after a physical change in
10 the patient's intraoral cavity; is that right?

11 A. Yeah, disclosing or at least in some parts, yeah,
12 teaching that.

13 Q. Okay. And you also rely on Boerjes as disclosing that,
14 even when combining it with Geng, correct?

15 ATTORNEY ZHANG: Objection; form.

16 THE WITNESS: When combining with, like when
17 we are saying as a POSITA, I understand that Boerjes
18 teaches this or at least, you know, and if the people
19 disagrees, then Boerjes in view of Geng teaches that,
20 with Geng explicitly giving more details and disclosing
21 the function more explicit details, this is my answer to
22 your question.

23 ATTORNEY ARGENTI: Okay. Why don't we take
24 another break. It has been over an hour at this point
25 and I mentioned we would circle back to the idea of

1 lunch, would you like to take a longer break at this
2 break?

3 THE WITNESS: Okay, we could take a longer
4 break, that is fine. How long?

5 ATTORNEY ARGENTI: Would 30 minutes be enough?
6 We could circle back at a quarter to the hour.

7 THE WITNESS: Yeah, thank you.

8 ATTORNEY ARGENTI: Let's do that if that
9 sounds good to everybody. Okay.

10 (A lunch break was taken.)

11 Q. (BY ATTORNEY ARGENTI) Welcome back, Dr. Karam, we are
12 still going to be going through your declaration, so you
13 will want to have that in front of you and in
14 particular, let's turn to paragraph 111 on page 83,
15 please.

16 At the beginning of paragraph 111 you say, "I
17 was asked to opine on whether Boerjes renders obvious
18 limitation 1[h] under the district court's construction
19 of limitation 1[h]," and then you go on to include that
20 construction, do you see that?

21 A. Yes.

22 Q. So starting at this paragraph and continuing in the next
23 few paragraphs, you are analyzing limitation 1[h] under
24 the district court's claim construction, correct?

25 A. Yes.

1 Q. We look at paragraph 112, it is your opinion that a
2 POSITA would have understood that the well-known image
3 registration and stitching techniques disclosed in
4 Boerjes would be used to replace at least a portion of
5 the user-identified portion of the model with the new
6 scan data, right?

7 A. Yes.

8 Q. And going on to paragraph 113, you provide your
9 explanation of the reasons that a POSITA would have done
10 that, correct?

11 A. I believe in the same paragraph, with the same paragraph
12 112, we also like just Boerjes disclose, et cetera,
13 registering and combining 3D data and 3D model referring
14 to the paragraphs where Boerjes discloses registration
15 and combining 3D data. That registration are indeed
16 mentioned in Boerjes explicitly as part of Boerjes'
17 invention.

18 And Boerjes also discloses that new 3D data
19 can be fitted or stitched to existing 3D data and so
20 forth and a person, a POSITA would have found it obvious
21 to use conventional and known methods such as
22 registering and stitching as disclosed in Boerjes and
23 other -- Boerjes discloses those to perform Boerjes'
24 replacement of the user-identified portion of the model,
25 so I don't know, the question was what?

1 Q. So I think, as I read it, it looks like in paragraph 112
2 you are talking about registering and stitching and then
3 in paragraph 113 you go on to address the portion of the
4 construction that talks about removing the
5 user-identified portion of the model, am I reading that
6 right?

7 A. Oh, okay. So you are talking about not the registration
8 here. The quote -- one moment, let me go back to the --
9 okay. So yeah, I mean, there is the court construction
10 about replace, which is register and that is after
11 removing also, yeah, so we are talking -- because we
12 didn't specify which one, so that is why I got -- I
13 didn't clearly understand your question.

14 Q. I apologize it was unclear. Why don't we jump to
15 paragraph 114, which is in your discussion of the
16 removing requirement and in paragraph 114, you say that
17 a POSITA would have understood that removing the
18 questionable or erroneous data in the user identified
19 portion from the model would reduce the risk of improper
20 or failed registration of the new scan data to the
21 model, do you see that?

22 A. Yes.

23 Q. And when you refer to erroneous data there, is that the
24 erroneous data that is referred to in Boerjes paragraph
25 199?

1 ATTORNEY ZHANG: Objection; form.

2 THE WITNESS: Erroneous data is the data how I
3 describe it, it depends on your objective. It can be
4 erroneous data that doesn't represent your
5 representation. This is like the surface preparation
6 that you see quality control errors, so that is
7 erroneous data. It is not replacing of your objective
8 to achieve the representation of the surface you want,
9 so this is still like consistent with my previous answer
10 of what erroneous data is. This is data that you don't
11 want there, that is unnecessary, that is extraneous or
12 erroneous that you don't -- that is erroneous in terms
13 of your objective.

14 Q. So you are using the term erroneous more broadly than
15 the erroneous data that Boerjes specifically refers to,
16 do I understand that right?

17 ATTORNEY ZHANG: Objection to form.

18 THE WITNESS: Yeah, I disagree with that
19 because I discussed it before the break with you what
20 erroneous, even what Boerjes, a POSITA would understand
21 erroneous and errors and in paragraph 199, I
22 specifically also pointed out that even the -- if we go
23 to paragraph 199, lines 8 to 10, Boerjes specifically
24 discloses additional surface preparation consistent with
25 errors identified, so you see, even the surface

1 preparation, consistent with the erroneous data,
2 erroneous here, the error, because it is not
3 representative of the surface that you are scanning, it
4 is obscured by something or it is not prepared -- it is
5 not the objective also for restoration, so it is
6 erroneous, it is not prepared well, so this is how it
7 is.

8 So data, unwanted data, undesired data and
9 erroneous data, for example. Here we give an example,
10 something that you don't want for your objective, so it
11 is rendering the presentation, the scan, the 3D model
12 not meeting your criteria and your standards, so these
13 data are erroneous, not accurate, based on the standards
14 you want for the objective you want.

15 Q. Why don't we look at paragraph 196 of Boerjes. Okay?

16 A. I am waiting as you like, but I am there.

17 Q. You are at 196. Great.

18 A. Yeah.

19 Q. So at line 19 of 196, do you see where paragraph --
20 where that paragraph refers to questionable or erroneous
21 areas of a preparation?

22 A. Yes.

23 Q. Is that the questionable or erroneous data that you are
24 referring to in paragraph 114 of your declaration?

25 A. It is part of it. I mean, erroneous data, as I said,

1 includes this and others, but it is one part of
2 erroneous data, one example.

3 Q. Okay. And then you would also point to the discussion
4 of erroneous data or errors -- errors identified during
5 quality control in paragraph 199; is that right?

6 A. Yeah, this is another example. And again, these are
7 examples given here by Boerjes, they are not like --
8 they are examples, so they are not restrictive examples
9 but they are examples to make it more clear.

10 Q. Are there other examples of questionable or erroneous
11 data that you are referring to in paragraph 114?

12 A. It could be the erroneous data due to the holes, gaps,
13 distortions, any erroneous data or like -- any undesired
14 add in that is not desired for your objective would be
15 what qualified the error of that objective.

16 Q. Why don't we take out Geng, which is Exhibit 1005,
17 please.

18 A. Yeah, I am there at Geng.

19 Q. In your declaration, and I apologize if we need to jump
20 back and forth between Geng and your declaration, but in
21 your declaration, you cite the editor tool and the
22 merger tool that Geng describes, correct?

23 A. I remember citing that but could you point me in the
24 paragraph we are talking about because I --

25 Q. Sure. I think one example is at paragraph 64 of your

1 declaration.

2 A. Yeah, so I am saying in paragraph 64, for example, "the
3 user can use an editor tool to manipulate or edit the 3D
4 image model, such as by modifying and/or eliminating
5 undesirable areas on the original 3D image."

6 Q. And then in the next sentence you refer to Geng's merger
7 tool, right?

8 A. Yes. So in the next sentence, "The user can also use a
9 merger tool that integrates multiple 3D images into a
10 single 3D image via registration using common points
11 between the images."

12 Q. Those editor tools and merger tools are depicted in
13 Geng's Figure 3, correct?

14 A. Let me look at Geng Figure 3. Yes.

15 Q. So there is editor tool (312) and merger tool (320),
16 correct?

17 A. Correct. Let me see. Yeah, but there is a typo in Geng
18 someplace where the numbers are messed up like in the
19 specification.

20 Q. I think I know what you are talking about and we will
21 get to it. Yeah, is it the reference to condenser
22 (320)?

23 A. Yeah. But later they correct it further later.

24 Q. Yeah. Yeah. So before we get to the more detailed
25 discussion of the editor and the merger tools, I just

1 want to make sure which are on the -- we have the same
2 understanding of Figure 3. Figure 3 is a depiction of
3 the image processing module that is element (204) of the
4 software architecture framework in Figure 2, correct?
5 And if it helps, you might take a look at column 2,
6 lines 45 through 49 of Geng.

7 A. Column 2, line, could you please repeat that.

8 Q. Lines 45 through 49, where it talks about the various
9 figures.

10 A. Yeah. Okay. Yes.

11 Q. So Figure 2 shows the overall software architecture of
12 Geng's system and Figure 3 is the more detailed
13 description of figure 2's image processing module tool
14 4, would you agree?

15 A. Like depicting the -- illustrating the image processing
16 module but we need to keep in mind these are examples,
17 not limiting, for a patent, as you know.

18 Q. Dr. Karam, I am not sure how it is for the reporter but
19 I am having a little trouble hearing you when you are
20 faced away from your computer.

21 A. Okay. Okay. I am sorry.

22 Yeah, so the question was whether like Figure
23 3 represented an example of the image processing module
24 tool 4, you know, yeah, it is an example of a modules
25 that included as part the image processing describing

1 these image processing module.

2 Q. Now, let's turn to column 6 of Geng, starting at line
3 54.

4 A. Line 6.

5 Q. Column 6, line 54.

6 A. Okay. Yeah.

7 Q. Do you see where it says, "The image processing module
8 ((204)) is configured to perform 3D image editing
9 functions and enable operators to modify 3D image data
10 interactively and conveniently"?

11 A. Yes.

12 Q. Based on your review of Geng, is that an accurate
13 characterization of the image processing module?

14 A. It is like some characterization. It is not the
15 exhaustive. It is like -- it is one characterization of
16 the image processing module, yes.

17 Q. And if we go down in that column, the next paragraph
18 begins, "Figure 3 is a block diagram illustrating
19 sub-modules that provide functionalities of the image
20 processing module ((204)) of Figure 2, according to one
21 embodiment," do you see that?

22 A. Yes.

23 Q. And one of those sub-modules is the editor tool, element
24 (312) in Figure 3, correct?

25 A. I would have to check the number. One moment, I have to

1 go back to the Figure 3. It is the editor tool, but the
2 number, I have to make sure it is the right one. (312),
3 yes.

4 Q. I wasn't sure if you were still reviewing to confirm?

5 A. No, no, I am sorry.

6 Q. So yeah, just to clarify, one of the sub-modules in
7 Figure 3 is the editor tool element (312), right?

8 A. Yes.

9 Q. Okay. And another one of the sub-modules in the image
10 processing module is the merger tool, correct?

11 A. Yeah. And it is not listed like there like on this by
12 mistake, I guess, but it is listed later. And it is in
13 the Figure 3.

14 Q. Understood. The figure where it says merger (320), that
15 is consistent with the description that starts in the
16 last paragraph of column 7, right?

17 A. Yeah. On line 57.

18 Q. And I think I agree with you that that reference to
19 condenser (320) in the second line of column 7 seems to
20 be a typo, right?

21 A. Yeah.

22 Q. Okay. The editor tool (312) and the merger tool (320)
23 are each distinct sub-modules in the image processor
24 module, correct?

25 A. I am not sure what -- could you like qualify what you

1 mean on distinct sub-modules. You know, I mean, they
2 are kind of put as functionalities but they can be
3 combined together. I mean it is like it allows this and
4 that but the way you implement those is like can be
5 implemented concurrently or like in sequence or in
6 sequence or so forth but yeah, they can be -- at least
7 they are distinct, one way to see it, but it allows
8 other things, it is not restrictive.

9 Q. Geng describes them as different sub-modules, right?

10 A. Okay.

11 Q. So let's look at the description of the merger tool that
12 starts at the bottom of column 7?

13 A. Okay.

14 Q. Down at line 57. Starting at line 57, the first
15 sentence of that paragraph reads, "The merger tool (320)
16 provides tools that enable operators to integrate
17 multiple uncalibrated 3D images into a single 3D digital
18 impression," do you see that?

19 A. Yes.

20 Q. And then it refers to element 116 of Figure 1, correct?

21 A. Let me see that element 116. Okay.

22 Q. What is your understanding of the distinction that Geng
23 makes between 3D images and a 3D digital impression?

24 A. Could you like it does -- Geng, can you point to me
25 where Geng is mentioning the 3D digital impression?

1 Q. It is in the first sentence of the bottom paragraph in
2 column 7 that we just read.

3 A. Here it said -- oh, into a single 3D digital impression.
4 Sometimes it is the way you write really. I mean, here,
5 digital impression is saying the dentition, basically,
6 it is an impression of some physical structure, but the
7 3D images also are also images, also, you know, of
8 physical structure and the 3D images are also a model.

9 When you take an image, even the camera is
10 model, so it depends to what extent you want to. 3D
11 images, you're acquiring the 3D surfaces, the 3D
12 whatever, so 3D images, when you're acquiring them, you
13 are getting 3D models, you could be getting 3D models
14 from those because the cameras -- we have to go to the
15 cameras that -- can we go to the camera again, we have
16 to look at that.

17 Q. Okay.

18 A. That talks about the sensor so that we can have some
19 embodiment what Geng is looking at.

20 If you can put me there, I am also looking at
21 that, Number 4. If you know where Geng is talking about
22 camera, I don't recall from memory here or like the
23 sensing device? One moment. Yeah. Okay.

24 So it is written, at least like I found
25 something here on column 3, line 52, okay? Line 51

1 starting, like so column 3, starting at line 51, "As
2 shown in Figure 1, a camera (104) can be used to acquire
3 image data representative of a patient's dentition." So
4 it is also representative of a patient dentition.

5 And still the digital impression is based on
6 image data, so we could call it image because it is
7 image data and you are representing that the impression
8 is a digital model, a 3D digital model but coming from
9 image data, so it is image data also.

10 But the difference is there in the other one,
11 it is talking about uncalibrated 3D image versus the 3D
12 impression. So uncalibrated 3D images is part of them,
13 meaning multiple uncollaborated 3D image, so meaning as
14 a whole set, these are uncalibrated. You could have --
15 typically what was done, you could have one in a
16 reference frame and the other, you know, uncalibrated
17 meaning also you don't know the position of the camera.

18 Because you could have register in different
19 way. You could register by suppose you have fixed
20 cameras or you move the position of your camera or you
21 fix it, you can use the transformation based on the
22 position of your camera and you calibrate camera to get
23 its focal lens, et cetera, et cetera, so you know the
24 camera parameters as a whole, you can get them through
25 calibration. So the image you acquire, you can use that

1 information to calibrate and to determine the
2 transformation to register the images.

3 Another approach is, no, you don't know
4 anything about the camera and you don't have to get
5 calibration parameter because you need to recalibrate,
6 things change, it is structured from motion. From the
7 camera, we acquire. From what you acquire, the data,
8 you could then implicitly we call it auto calibration,
9 meaning you don't calibrate based on the known
10 parameters of the camera, you don't have to do
11 calibration of the camera, so it is a term to how you
12 register.

13 We can do structure from motion, by finding
14 point of interest, registering those, so if it is one of
15 these images -- so a reference frame. So here it is
16 just saying uncalibrated 3D images but still these are
17 modeling at least a region, one of them is modeling a
18 region. Another one, they are not all calibrated to the
19 same thing because you don't know the camera parameters,
20 but each one is representing a 3D model of -- if it is a
21 dental application of a dental intraoral cavity, it says
22 you can look at it to say, oh, it is a part of an
23 impression still.

24 But if you want to guide the whole -- it
25 depends on the whole, big impression that you want to

1 manufacture, okay, you want to register those together,
2 it depends like on what you are trying -- but usually
3 you want to have a larger area so that you could see in
4 some applications where the tooth is with respect to its
5 neighbor, maybe you have several missing teeth, so it
6 depends on the application and then you have to
7 register, typically scanning a very small portion, so
8 you have to register these.

9 And even if you have a model and that you look
10 and we have the editor tool talking about removing
11 erroneous data in Geng, so once you remove erroneous
12 data, you are scanning now again and this is another 3D
13 uncalibrated image or 3D model, uncalibrated meaning the
14 way you register it, you don't need the camera
15 calibration but you register to the existing model of
16 what you acquired for your intraoral cavity to form a
17 new digital impression together, that is how it is here.

18 So it is use of words, not enough to repeat
19 things, plus focusing on how to reconstruct a digital
20 impression of something of -- so of a bigger region of
21 interest, while scanning one or more images of some
22 regions, whether this is due to correcting an error in
23 the vision, changing that vision and rescanning one or
24 more image of that region, you know, maybe you are
25 correcting two teeth out of like a few, so you are

1 rescanning, you have to scan several images here and
2 connect them together and then, you know, and register
3 them to the model, you could do it by connecting them
4 together first and then scanning or connecting one, you
5 know, correcting the errors concurrently or in sequence.

6 Q. When we were talking about Boerjes earlier, we looked at
7 Boerjes and Boerjes talks about capturing scan data and
8 you said, I believe, that then that scan data is used to
9 create a model; is that right?

10 A. No, can we point out to where in my declaration I am
11 saying that? Maybe we can go to this. I didn't say
12 this, I don't believe.

13 I said scan data is like you capture by
14 scanning but you capture image data, I mean, Boerjes
15 talk about cameras and even he talks about getting the
16 3D through camera motion, like consistent with this
17 uncalibrated, so camera motion you can get the 3D and
18 that, this is also disclosed in Boerjes, so the data,
19 the scan data is scanned image data. It is your
20 imaging, that is what you are doing, by passing through
21 the intraoral, so that is the scanner, it is just
22 Boerjes discloses cameras and, you know, optical
23 scanning through cameras as in Geng.

24 Q. Right. And I think what you testified earlier today is
25 that when we were talking about the additional or new

1 scan data in Boerjes, you said that that additional or
2 new scan data would be used to create a second model, do
3 you remember that?

4 A. Anytime you are doing 3D -- when you capture the images
5 and you form the 3D image, that is your model, the 3D
6 reconstruction model, yes, that you are storing. Every
7 time. It could be like even like two image sets like in
8 a stereoscopic camera or scanner which has multiple
9 aperture, even that area is getting a 3D sub model, I
10 call it. You can call it model, second model, but it is
11 like a second model, yes. You could integrate it in a
12 bigger model to form a combined model.

13 It is like, for example, if we go to Geng,
14 Figure 2, you have image processing model. It has all
15 of these sub models, which are models themselves. But
16 what I am saying is still, even a scan of a small region
17 is a model. You want to call it sub model but it is a
18 model, a second model, whatever you want to call it,
19 that gets integrated into another model to correct it,
20 but still it is consistent image data from which you
21 kind -- the 3D, you are reconstructing the 3D imaging
22 and okay, this is the model. It is a model. Even the
23 imaging we take are a model.

24 Q. Looking at the 3D image in Geng that -- is there ever a
25 point where that 3D image is not itself a model?

1 A. You have -- imaging, by itself, by the camera, even
2 regular camera, for example, if you look at the screen
3 now, I am a model here. The camera is changing a little
4 bit, this is the model presentation of me. It depends
5 on what you are -- so the important thing is the 3D
6 model, okay, so you are getting -- what model you are
7 getting.

8 You are getting a 3D model but everything is
9 through imaging. There is the raw data, which gives you
10 maybe two sets of two dimensions images. It depends on
11 your scanner, too. But one scanner will give you two
12 pairs of images. From these, you process them, you
13 triangulate to get the 3D, that is the called focal
14 imaging, that gets you images at several depth and from
15 that, you can take a derivative to get the great
16 intensity and get the 3D.

17 But yeah, everything is a model at the end of
18 the day. Even we are models here on the screen.
19 Because you are filtering a lot of the wave lengths, you
20 are trying to estimate the resolution, what the sensors
21 can capture in terms of spectrum intensity, so
22 everything is modeling the world and trying to get it as
23 accurate as possible for the application.

24 You want a 3D model? You can do it in
25 different ways -- stereoscopic, multi-aperture,

1 confocal -- where you get these images and process them
2 to get the 3D coordinates and render them as continuous
3 surfaces, but yeah, I mean, it is different models at
4 different stages or same stage, yeah, so yeah. Yes,
5 different models.

6 Q. So the system in Geng, the camera captures raw data and
7 then that raw data is processed into a 3D image which is
8 a model, do I understand that right?

9 A. Yeah. Yeah, the 3D images, typically, when you capture
10 it, you capture basically 2D image sets that are
11 processed to get the depth, that's right. You can have
12 a ranging camera that capture 2D and have ranging to get
13 the depth image but even in that case you have to merge
14 them together if you want to get the 3D images, okay?

15 So it is a different representation. Confocal
16 also captures sequential images and then try to process
17 to get, so that is the model, also, the 3D model, these
18 images, the 3D image data.

19 Q. And then the scan data in Boerjes, is that the raw data
20 that is captured by the camera or is that after
21 processing to turn it into a model?

22 A. Could you point me to a specific part --

23 ATTORNEY ZHANG: Objection; form.

24 THE WITNESS: -- so that we can just look at
25 that. Scan data is scan data, you know, it can be a

1 different stages, it is still -- but we need to go to
2 the context of what's mentioned and try in that case, in
3 this embodiment in that, so could you point me --

4 Q. Sure, I will ask you, can you point me to anything in
5 Boerjes that would clarify whether its scan data is the
6 raw data captured by a camera or post-processing model?

7 ATTORNEY ZHANG: Objection; form.

8 THE WITNESS: I can point you to an example
9 but the scan data includes the raw data, like in one
10 stage and the process data also, the 3D is very
11 explicitly this close in Boerjes.

12 Q. (BY ATTORNEY ARGENTI) Can you show me where that is?

13 A. I will have to look to see.

14 Q. Let's take a look at paragraph 74.

15 A. Of what?

16 Q. Of Boerjes.

17 A. Okay.

18 Q. So in this paragraph, it starts with, "The
19 three-dimensional data acquisition system adapted for
20 intraoral acquisition of dental data from one or more
21 intraoral structures, as disclosed herein, may include a
22 first operating mode for capturing scan data and
23 rendering a low quality three-dimensional image from the
24 scan data in real time," so to me, that sounds like the
25 scan data is the raw data that is captured and then you

1 can render a low quality three-dimensional image from
2 the scan data but it is not the scan data itself that is
3 the three-dimensional image model, do you have the same
4 understanding?

5 ATTORNEY ZHANG: Objection to form.

6 THE WITNESS: No, I disagree because capturing
7 scan data at the end of the day you want to capture, for
8 example, three-dimensional presentation. How you
9 capture them first? You get the raw data, then you
10 process them, then -- this is still consistent with
11 capturing the data through scanning. You are capturing
12 information through scanning.

13 How you capture? You could -- you can be
14 processing to capture that data. And after you will
15 present your 3D model, so you have some capturing in it,
16 so you capture the scan data by capturing raw
17 processing, getting that, so that is the data. Then you
18 render that data, the 3D model. But there is still scan
19 data, it is still data done from scanning and that has
20 several stages to get to that data. And you can get
21 that data at several stages.

22 But when we say rendering a low quality
23 three-dimensional from the scan data, here he is talking
24 about rendering low quality versus high quality. The
25 rendering is always the three-dimensional rendering, the

1 3D scan data being granted. You can have the raw scan
2 data, it is a scan data still. You can have the process
3 scan data, at a certain stage maybe, maybe you want to
4 do other processing and then you could have the 3D scan
5 data, you are processing to get the 3D now, you can
6 process to match color with the 3D also, that is another
7 processing, but also here it is the qualifying here is
8 low quality versus high quality.

9 So you are rendering the low quality 3D scan
10 from the scan data versus high quality. Because in
11 here, every time and in the second operating note for
12 generating a high quality image from the scan data after
13 this, so you could have, you scan but the reconstruction
14 of 3D data, if you want to do it very fast, you could do
15 course and render that or you could reconstruct but all
16 of it is still scan data at different stage, data
17 obtained by scanning, requiring scanning captured and
18 whatever process extracted is still scanned based data.

19 Q. So when we were looking at Geng, I understood you to be
20 making a distinction between the raw data that is
21 captured and then the 3D images that are then generated
22 from that raw data; is that right?

23 A. But what I am saying, still images are captured, okay?
24 So I said raw data that is captured, but you can -- the
25 captured data doesn't have to be -- it could be captured

1 processed data, too, so you are capturing data and still
2 capturing it and processing it, but still it is captured
3 data but processed, too.

4 And actually, in cameras, everything is like
5 processed because --

6 Q. And does -- sorry.

7 A. You know, it is going to be processed anyhow, so you
8 have that processing.

9 Q. But I am talking about the processing that you
10 referenced that would specifically be the generation of
11 the 3D image.

12 A. Okay. But here also the scan data here, capturing scan
13 data and when you see it entering low dimension 3D image
14 from the scan data every time, the scan data refers also
15 to the 3D scan data. It has that information. You can
16 extract it from it.

17 If it didn't have that information, you can't
18 extract it from it. So you could have two images being
19 the scan data still process but let's say -- but it has
20 that information, you just have to process it to
21 represent it.

22 Q. Is the three-dimensional image that is referred to in
23 paragraph 74 of Boerjes different than the 3D image that
24 is referred to at the bottom of column 7 in Geng?

25 A. The 3D image in Geng is consistent with Boerjes

1 three-dimensional representation models and that is the
2 3D model. The 3D image, a POSITA will understand is the
3 3D model.

4 Q. And they are generated from captured data, right?

5 A. Generated from captured raw data -- whatever you want to
6 call raw, you are capturing with the camera, your camera
7 data is capturing and you can generate that information
8 or your camera within it can generate it or you can send
9 the camera data via computer to also generate the 3D,
10 again, you have 3D cameras that would give you in
11 different forms this information. It depends what you
12 want to generate to render, okay?

13 Q. And in paragraph 74 of Boerjes, it says that the scan
14 data is captured and then the three-dimensional image is
15 generated from the scan data, right?

16 A. The rendering.

17 Q. No, keep reading.

18 A. And rendering a low quality from the scan data, you are
19 rendering from that scan data --

20 Q. Keep reading, please.

21 A. For generating a high quality three-dimensional -- after
22 exiting the first operating model. And I explained to
23 you how. I told you, you could be scanning but you
24 could really be getting further entering just some
25 points to get the course of rendering that whole thing,

1 you could be generating, further rendering higher
2 quality by processing all of these points for the
3 rendering because rendering requires representing
4 through surfaces to get continuous services, rendering
5 can take time, so course rendering is faster than high
6 detail and you can focus on high detail if you want, it
7 depends on rendering capability.

8 You can have GPUs fast rendering or you
9 have -- so you could have more high performance
10 equipment with GPUs to render fast or if you have a
11 less, it depends on the pressing device, you want to
12 consume less power, you have less costly system,
13 rendering of the high quality, you want to save on time
14 and cost, you could first be rendering course by not
15 rendering all of the points in your scan data.

16 You can generate a high dimension by entering
17 all of the points, so by increasing the portions, the
18 portions and the parts that are being rendered more, so
19 you could render some portions by, for example, having
20 less polygons being rendered, like more costly, for
21 example, you have enmeshed with points but you could
22 have less polygons and points in the mesh versus you
23 want more, so you add more points from the scan data to
24 get a more accurate match for that rendering. You
25 generating these further rendering. It is a

three-dimensional model also for rendering.

Q. Is it your testimony that you interpret paragraph 74 of Boerjes to describe capturing scan data and processing it into a 3D model before rendering a low quality three-dimensional image and before generating a high quality three-dimensional image?

ATTORNEY ZHANG: Objection; form.

THE WITNESS: I am not really saying this because it can be done concurrently. You could do it before or you could do it concurrently as needed where you can on the fly basically get them in the form you want for the rendering and only those that you need or you could have generated these 3D models and then rendered what you need for faster rendering basically by picking more sparse like the portions that you want to render, so it could be done either way. All is embodied here.

Q. (BY ATTORNEY ARGENTI) Is there a difference between generating and rendering in that paragraph?

A. We are talking about here, you know -- let me read that paragraph since you are asking me about that paragraph in particular.

Okay, so go back to your question, if we look at that paragraph like on line -- so paragraph 74, line 7, okay? So include a first operating mode for

1 capturing scan data and rendering a low quality
2 three-dimensional image from the scan data every time.
3 Did this mention generating? Do you see generating
4 being mentioned in this sentence? We don't see
5 generating. Rendering. How can you render without
6 generating? So I think these are examples given, not
7 like, oh, saying this word rather than that word, a
8 POSITA would understand this is generated to be
9 rendered.

10 And similarly later for generating a high
11 quality three-dimensional, I mean, because the low
12 quality is being generated, too, or you could have
13 generated a high quality and rendered that, I mean, it
14 is within the first sentence on line 7 and 8, rendering
15 a low quality, it doesn't say generating.

16 Generating can be you generate the low quality
17 and then render it or you could have generated a higher
18 quality and rendered the higher quality, you could have
19 both, but there is a second model also where you
20 generate a high quality three-dimensional data after
21 exiting the first operating mode.

22 The high quality three-dimensional image data
23 may have greater special resolution than the low quality
24 three-dimensional image. So in here it is saying after
25 you exit the first mode, the second mode, you are

1 generating a higher quality data. So this doesn't
2 really exclude that.

3 In the first mode, you might have had a middle
4 quality, higher than the low quality from which you
5 render a low quality. It could. All this is saying in
6 the second operating mode, you generate a higher quality
7 data than the low quality data. So you could have -- so
8 basically things are not excluded here and the first
9 operating mode, it doesn't say generating, it says
10 rendering, so you could have generated something a
11 little bit higher than that low quality and rendered it
12 low quality or you could have generated the low quality
13 and rendered.

14 In the second mode you are generating, you say
15 I want to generate high quality data at greater special
16 resolution, like you want -- because once you typically
17 determine what regions you want as higher resolution or
18 basically you see, oh, this is satisfactory, maybe I
19 want to generate a higher special resolution or I can't
20 see something, I want more higher special resolution,
21 you could exit the mode and go into a second mode where
22 you generate that higher special resolution further.

23 And while you are generating it, it is
24 entered. Basically, based on Boerjes, you have to
25 display for people to give quality control or at least

1 you have to render the data, whether you take this high
2 special resolution and then you generate a middle
3 quality rendered, okay, that is fine or maybe with some
4 areas rendered at higher quality, maybe some areas might
5 be less important rendered at lower quality or middle
6 quality, it is feasible to do that, too.

7 Q. So I think you said that in between capturing scan data
8 and rendering a low quality three-dimensional image,
9 there would be a generating step, did I hear that right?

10 A. In between capturing scan data, what your question is,
11 in between capturing scan data? Like in context,
12 capturing raw scan data. You are capturing scan data.
13 When you are capturing a 3D model, this is scan data,
14 you are capturing with your camera the raw data you want
15 to see or the camera may be also giving you the 3D, so
16 this is capturing, too so we have to qualify, capturing
17 raw data versus capturing 3D image data.

18 Still we are capturing, everything is a model
19 again, so you have to be specific what the model is. Is
20 it as close to the raw data as the raw data modeling,
21 which means, you know, we just -- I mean, also you have
22 to qualify what the raw is, you know, maybe the raw data
23 is whatever the camera can give you but maybe the camera
24 has processing in it that gives you the 3D model, too.

25 Q. And when Boerjes --

1 A. At the end of the day, what is raw data, you have to
2 define that.

3 Q. Well, there is no raw data that is mentioned in Boerjes,
4 right, in paragraph 74? I think that was your term that
5 you introduced, so you can define however you would like
6 to define it, it is your term.

7 I will ask you about Boerjes, though, Dr.
8 Karam, when Boerjes says in paragraph 74, "A first
9 operating mode for capturing scan data," are you unable
10 to tell whether capturing scan data means capturing the
11 raw data or capturing three-dimensional data?

12 A. The scan data, capturing scan data includes capturing
13 the scan data 3D model, this is included here. It is
14 embodied capturing the data.

15 I mean, and to give you an example of raw, for
16 example, raw data can be uncompressed data, for example,
17 some camera compress the data. Sometimes, as people in
18 the art, raw data is taken to say, okay, high fidelity,
19 like more precision, high precision versus low
20 precision, so raw data also is a relative term of what
21 the camera capability is and what's needed in here, so
22 high fidelity to the data.

23 So captures scan data, you are capturing data,
24 scanned-base data which can be the 3D model because it
25 is captured by imaging, you are capturing that data,

1 that information is there and you can get that 3D model,
2 okay? The camera can process that and get you this.

3 If the capture is at the level of the camera,
4 then whatever captures scan data is there. It includes
5 the 3D information but maybe you want to process it in
6 different form that is more user friendly for rendering,
7 that is all, so you transform your data into forms, but
8 all of it is captured scan data represented in different
9 forms.

10 Q. Right. And you can't tell reading Boerjes whether that
11 processing has been applied that you just described,
12 right?

13 ATTORNEY ZHANG: Objection; form.

14 THE WITNESS: I don't agree with that. I put
15 on my declaration using Boerjes as a whole, the scan
16 data includes the processing and the 3D model and there
17 are, as I mentioned, you know, a scan data, it is
18 disclosed in Boerjes as the scan data represent 3D
19 images and 3D models and I put this in my declaration
20 and gave citations and so forth in there.

21 Q. (BY ATTORNEY ARGENTI) Let's go back to Geng and that
22 same paragraph at the bottom of column 7, so looking at,
23 again, at the first sentence where it is describing the
24 merger tool (320), in Geng, it is 3D images are used to
25 generate the 3D digital impression, right?

1 A. Geng says here, "The merger (320) provides tools that
2 enable operators to integrate multiple uncalibrated 3D
3 images into a single 3D digital impression."

4 Q. And let's go up to the discussion of the editor tool
5 that is at line 38 of that same column of Geng and the
6 second sentence in that paragraph says that "The editor
7 (312) allows operators to modify and/or eliminate any
8 undesirable areas on the original 3D image obtained from
9 the camera, remove abnormal data points and clean up the
10 acquired image data to reduce the sizes of image data
11 files," right?

12 A. That is what is stated there, yes.

13 Q. That sentence is talking about editing the 3D image as
14 opposed to the digital impression, correct?

15 A. The 3D image, when it is imaging patient and the
16 intraoral cavity, would be a digital impression, okay.
17 It doesn't have to say because we know that digital
18 impression is a 3D model of the -- when intraoral cavity
19 is imaged.

20 So whenever you are using a camera to image,
21 if you use the camera to image a building, that is not a
22 digital impression of the teeth, you know, dental teeth,
23 it is a digital impression of the building but all of
24 them are a digital impression.

25 Q. I'm sorry, I thought we just agreed when we were looking

1 at the merger tool discussion that Geng says that
2 multiple uncalibrated 3D images are merged into a single
3 3D digital impression?

4 A. It is single. Here they are saying single. It is using
5 a different word. He could have said, you know, the
6 multiple uncalibrated 3D image impressions are being
7 merged into a single 3D digital impression. The 3D
8 images are impressions, they are 3D impressions. They
9 are uncalibrated, though, meaning that the registration
10 is done without calibration of the camera, that doesn't
11 happen of the camera parameters, so you could do it
12 through correspondence than between these impressions, I
13 am going to use the synonym, 3D images are 3D digital
14 impressions.

15 Q. Does Geng use the term 3D digital impressions
16 synonomously with 3D image?

17 A. A 3D image is a 3D digital impression. Did he define
18 otherwise, that it is not an image? If you show me
19 that, a POSITA would understand a 3D digital impression
20 that is obtained through camera and imaging is a 3D
21 image. A POSITA. Does Geng, based on -- does Geng
22 define that an impression is not an image? Can you
23 point me out to this, please?

24 Q. This is your deposition, Dr. Karam.

25 A. I am telling you.

1 Q. Is it your understanding that Geng uses the terms 3D
2 image and 3D digital impression synonomously?

3 A. 3D image is a 3D digital impression, you know, and I
4 cannot from memory really -- but 3D image, unless Geng
5 cites otherwise, and to my recollection, he did not
6 state otherwise, a 3D image of an object is a 3D digital
7 impression of that object. That is what a POSITA would
8 know.

9 Q. So you are interpreting the paragraph starting at line
10 38 of column 7 of Geng, everywhere that it says "3D
11 image," you are interpreting that to mean 3D images
12 and/or 3D digital impressions; is that right?

13 ATTORNEY ZHANG: Objection; form.

14 THE WITNESS: Excuse me, and/or what? Could
15 you please -- I am not.

16 Q. (BY ATTORNEY ARGENTI) In your view, would it change
17 anything about the meaning of that paragraph if
18 everywhere it says 3D image, it was replaced with 3D
19 digital impression?

20 A. In that paragraph, in that context, you know, so this
21 would be 3D digital impression of portions of the region
22 being imaged. So you are taking like portions being
23 imaged here and, you know, like it could be a whole also
24 thing that already because it is combined together, you
25 could have something combined together already and you

1 could have portions, uncalibrated 3D image of other one
2 or more portions, you know, and this would be 3D digital
3 impression of these portions that now you are putting
4 together, you know, and combining with the already
5 acquired digital -- you know, 3D image, forming a 3D
6 impression of a bigger region.

7 But these are impressions, 3D impression of
8 these parts that you're acquiring, yes. One of them is
9 bigger because you already combined together several 3D
10 impressions to form a single impression that is bigger,
11 now you find an error, you mark it with the editing
12 tool, you erase parts that are undesired, then you take
13 a 3D image or 3D digital impression of that portion and
14 combine it because you can -- you combine it into that.

15 Now you combine it. You have to align it to
16 combine in there, okay? So it is still an impression.
17 Now, with that said, if you want something to
18 manufacture as a whole for the whole thing, you have to
19 combine them into one single digital impression and send
20 it. But if you want just that -- so basically all of
21 them are digital impression. Are they usable for your
22 problem, like maybe -- you need to -- probably you want
23 to, if you want to do like a crown or a bridge, you need
24 to combine to view the neighboring to match the
25 neighboring color and that is why you need to combine to

1 create a more meaningful digital impression that would
2 help you in your manufacturing so that you can have
3 the -- fit the prosthesis in the right way, matching its
4 color to the neighboring teeth, having the right spacing
5 between the teeth, having the right also spacing between
6 the upper and lower jaw, so you need a bigger impression
7 to inform you about all of that things.

8 But yes, these are all 3D digital impressions,
9 the 3D images.

10 Q. What part of Geng were you just referring to there?

11 A. I am talking -- we are talking about the merger tool
12 here.

13 Q. It sounded like you might have been talking about the
14 editor tool?

15 A. No, I am talking about the merger tool there. But also
16 the editor tool. I was looking at the merger tool here.

17 But anyhow, yes, so basically the 3D image
18 there also, also here, is a 3D impression. A impression
19 is a model, 3D model of what you are imaging, that is
20 what it is.

21 Q. So in the bottom paragraph of column 7, Geng refers to
22 the 3D digital impression as an integrated collection of
23 3D images, right?

24 A. So can you -- where please?

25 Q. First sentence.

1 A. Which column?

2 Q. Are you kidding?

3 A. No, sorry, I am not getting -- I didn't hear what column
4 please. Maybe there is some -- I don't know, maybe the
5 volume, I should put it higher. I couldn't really hear
6 what the column number is.

7 Q. We are still looking at column 7, Dr. Karam.

8 A. I heard three, that is why, I heard column 3, so you had
9 meant line three or --

10 Q. No. The bottom paragraph, referring to the merger tool,
11 that you just said you were talking about in your
12 previous answer.

13 A. Yes.

14 Q. The first sentence there says that its 3D digital
15 impression is an integration of multiple uncalibrated 3D
16 images, right?

17 A. I do not agree with you. This is mischaracterizing what
18 this sentence is. This is saying it is combining into a
19 single 3D, into a single, not double. It is not saying
20 the 3D image is an integration, that is not correct. It
21 is saying these are getting integrated into a single
22 digital impression, these multiple 3D impressions are
23 getting integrated into a single one, so I respectfully
24 disagree.

25 Q. But it doesn't say integrating multiple digital

1 impressions into a single digital impression, does it?

2 A. It doesn't matter. I could call it an image and I could
3 call it visually captured by camera, still an image. So
4 here, the fact that this is a 3D digital impression
5 captured by camera, the 3D images are indeed 3D digital
6 impression, these are integrated into another 3D digital
7 impression, but the 3D images themselves are 3D digital
8 impressions because they are -- they are imaging a
9 object, you know, 3D object here and given a 3D model
10 from it, so 3D image, it is indeed a 3D digital
11 impression.

12 Q. Can I use the term integrated 3D digital impression to
13 refer to that digital impression in the first sentence
14 of that bottom paragraph of column 7, would you
15 understand what I am referring to?

16 A. The combined digital impression, the digital impression
17 that is produced by combining 3D images if you can,
18 yeah.

19 Q. So we will refer to that as a combined 3D digital
20 impression; is that fair?

21 A. Yeah.

22 Q. So looking back up at the editor tool, in that second
23 sentence that we looked at, starting at line 40 where it
24 says, "The editor (312) allows operators to modify
25 and/or eliminate any undesirable areas on the original

1 3D image obtained from the camera," that is not the
2 combined 3D digital impression that is referred to down
3 in the merger tool discussion, right?

4 A. So I have to go -- I don't want to read this out of
5 context. I want to see what is the original 3D. It can
6 be a combined because it is -- the term original
7 qualifies, based on the reading of Geng, and based on
8 the fact that you are scanning and stitching
9 incrementally, the undesired area, you are not going to
10 see the undesired area until you combine. Because the
11 way the scanning was done, a POSITA would know it is
12 incremental scanning.

13 You can't see, just small portion, you can't
14 see if it is undesirable or not, you have to get a
15 bigger scan. So indeed this original 3D obtained from
16 the camera, because it is a 3D image, all of them is
17 obtained from the camera but it is combined, too, to
18 eliminate and see that a problems and basically you want
19 to remove basically -- so if we look at the paragraph,
20 let's look at it.

21 The editor can include general purpose 3D
22 model editing software that allows operator to modify 3D
23 data interactively, and you have to look before how the
24 3D models were acquired. So it is a 3D model already
25 that we are looking at, the editor is dealing with a 3D

1 model, okay? The editor allows operator to modify
2 and/or eliminate any undesirable areas on the original
3 3D image obtained from the camera, meaning on the
4 initial, original here is the initial model, that it is
5 obtained from the camera.

6 How it is obtained? It is obtained by
7 scanning and integrating this together to form that 3D
8 image, you see, so it is still a POSITA would
9 understanding this is an integrated 3D impression but
10 that is the initial one obtained with the camera and now
11 the operator are looking at eliminating undesirable
12 areas, you can't see just from a single spot.

13 Q. I am going to stop you there. You said it is an
14 integrated digital impression. I am asking you if it is
15 the combined 3D digital impression that is referred to
16 in the first sentence of the merger tool discussion?

17 A. I don't understand the question really. This original
18 3D image is a combined, could be as well a combined 3D
19 impression based on how the scanning is done and you can
20 use it and clean up. It could -- it is like it
21 encompasses a 3D digital impression that is combined
22 from smaller 3D images or impressions, that is the first
23 question I guess you have, so I answered that.

24 Now, the second question, is it the same? I
25 don't understand. Because the merger tool, the merger

1 tool, this is the user, you know, after editing and
2 removing say replace and more saying combined things, so
3 this is like you take that original, you remove things
4 from it and now you have you took -- you know, you scan
5 areas and you combine it with the -- that image with,
6 for example, with eliminated portion to create a single
7 3D digital impression, that is one example I am giving
8 you. It could then -- this is how it applies to the
9 previous one.

10 Okay, I want to point your attention to make
11 it clear what I am talking about, too, column 7, lines
12 48 to 51, can you see that?

13 Q. Yes?

14 A. "The editor (312) can also provide various filtering
15 functions," okay, "that can be applied to" but what I am
16 saying, the important thing is 50 and 51, that "can be
17 applied to entire 3D data set or to selected local
18 areas," you see, it could be selecting areas to process
19 and these local areas or entire -- so this entire 3D is
20 the accumulation, you know, it is like by combining
21 several impressions, you do the 3D data sets
22 corresponding to 3D images are 3D models and a form of
23 the 3D digital impression, it is in different forms, you
24 see.

25 Q. Anything else?

1 A. No, I am waiting for your question.

2 ATTORNEY ARGENTI: Okay, we have been going
3 for over an hour now, so it is probably time for another
4 break. Should we take ten minutes or I guess nine,
5 should we come back at ten past the hour?

6 THE WITNESS: Okay.

7 (A break was taken.)

8 ATTORNEY ARGENTI: Back on the record.

9 Q. (BY ATTORNEY ARGENTI) Dr. Karam, we are going to
10 continue looking at the merger tool discussion at the
11 bottom of column 7 of Geng, okay, and we already saw
12 that in the first sentence it says that the merger tool
13 enables operators to integrate multiple uncalibrated 3D
14 images into a single 3D digital impression, and you
15 touched on this earlier but I just want to make sure
16 that we have your complete answer, what does Geng mean
17 when he says that the 3D images are uncalibrated?

18 A. If you want to have my complete answer or like my
19 answer, I am not sure any answer could be, but as much
20 as I could to answer your question, part of the merger
21 tool, if you look at the last line here on column 7,
22 starting at 7, line 67 going to 8-3 and this is part of
23 the merger tool description.

24 "Alternatively, image registration techniques
25 known to those skilled in the art can be used to merge

1 the acquired images together to form the 3D digital
2 impression," okay, so we could -- we see that. No? So
3 basically that merger tool provides also the
4 registration techniques known to those skilled in the
5 art can be used to merge acquired images, okay?

6 So going back to 7, line 57, again within that
7 context, too, "The merger provides tools that enable
8 operators to integrate," so this is one -- like one
9 characteristic of the merger tool enabling operator to
10 even register uncalibrated 3D images, which is harder
11 than calibrated, so it doesn't mean that calibrated
12 can't be registered, calibrated are easy to register,
13 but still --

14 Q. What is the difference between calibrated and
15 uncalibrated in this context?

16 A. The way uncalibrated -- calibrated, basically when you
17 know you have camera calibration parameters, if you know
18 the position of your camera exactly, Y, Y, Z
19 orientation, how it is, the position and if you know the
20 parameters of the camera, the focal lines, et cetera,
21 but these need to be calibrated and these change, okay,
22 but if you know them and you calibrate your camera, it
23 is easier to register images but still the merger tool
24 would allow you to do that based on the alternative
25 images registered with that.

1 What it is saying here, it is giving an
2 example that provides tools that enable. It doesn't
3 mean that it doesn't enable anything else, the other --
4 because later, the merger tool, it provide tools that
5 can enable operator to integrate multiple -- this is one
6 example what the merger tool can do, you see.

7 Because -- and this is disclosed in Geng, also
8 says, alternatively, part of this merger tool is to use
9 the registration techniques, tools that perform known
10 registered techniques that are known in the art, any
11 registration technique that is known in the art can be
12 used as part of this merger tool, so we have to separate
13 these things.

14 So here is one example of what the merger tool
15 can enable you, so it enables you to integrate these
16 uncalibrated 3D images, meaning you know, without having
17 camera calibration formation pre-calibrated, so you
18 could do that using this merger tool.

19 And it said so in manual mode requires
20 operator to specify corresponding point, so one way to
21 do it, which is one mode, which is manual, specify
22 corresponding points among the 3D. And using these
23 points, you could now derive transformations, how to
24 transform and align the images. Once you know the
25 points that correspond to each other, you can compute if

1 something is rotated, if something is -- yeah, so
2 basically rotated, translated, et cetera, and you can
3 align them because these are common points and you put
4 them in the same reference frame.

5 So you could see -- shall -- then auto mode
6 provides intelligent capability that can find these
7 points and extract features to find common points that
8 share the same feature and then align them by using --
9 by finding the transformation. This wouldn't require
10 camera calibration parameters, so that is how this
11 uncalibrated being mentioned, one way to understand
12 that.

13 Q. So you touched on my follow-up question here, this
14 paragraph of Geng says that the merging can be
15 accomplished manually or automatically or using other
16 known image registration techniques, correct?

17 A. Yes.

18 Q. But as we see in that last sentence that you pointed me
19 to, regardless of whether other image registration
20 techniques are used, the merger tool is still merging
21 multiple acquired 3D images together to form a 3D
22 digital impression, correct?

23 A. Okay. It can be used to merge the acquired images
24 together to form the 3D digital impression, these
25 acquired images, some of them can be existing acquired

1 images from before that are already merged but it is an
2 acquired image by the camera images that have been
3 readjusted and aligned together. Still these are
4 acquired images, okay?

5 And you could use those and another acquired
6 image to also register to update the -- to get another
7 new digital impression, digital impression Number 3. So
8 you had the digital impression Number 1, which is the
9 original 3D image like what we mentioned, that is the
10 original 3D impression, that was formed also by merging
11 things together. And then upon like seeing some errors
12 in that, you can eliminate undesired areas and you can
13 now use the merger tool of Geng to take these one or
14 more regions that were removed, you could take one or
15 more acquired images corresponding to these regions and
16 then combine these acquired images, the one or more
17 image with the original image and still these are
18 multiple uncalibrated 3D images together to form a new
19 digital impression updated.

20 Q. This paragraph doesn't say anything about updating an
21 existing 3D digital impression with a new 3D image, does
22 it?

23 A. It is basically because you have to understand as a
24 whole as Geng. You know, Geng, in reference to this,
25 you are taking and removing undesired areas and you are

1 modifying objects also certain in the adjuster tool.
2 And the way you can modify also later, after you merger,
3 you can merge things to replace -- merge images, so
4 could you be merging anything.

5 This merger tool, you can take multiple
6 images, whether existing, but we still have images in
7 existing digital impression, by the way, so yes, there
8 is an existing and there are other digital impression
9 that are acquired. One of them was acquired before the
10 others because of the scanning nature, the intraoral
11 scanner.

12 So you acquired multiple images by scanning,
13 you had some already incrementally, the art,
14 consistently and Boerjes and Geng, the scanning is
15 understood to be acquiring if you wanted to see the
16 areas, so you merge together also you -- and this is a
17 process, you have a digital impression that was merged
18 together, but that is an acquired, that is an image, 3D
19 image. Now you acquire more images, you could merge it
20 into that.

21 So this is not telling you you cannot do that,
22 this can be applied to any images, existing or currently
23 being scanned. And it has to have existing because,
24 again, you are not in parallel acquiring all of these
25 images, you are also acquiring images at different times

1 by scanning, by eliminating and rescanning tool or by
2 scanning and you could -- you are merging.

3 So actually, a POSITA would understand that
4 you have existing images that you are merging with other
5 images. An existing single impression, even that you
6 are -- which is an image, the original image from the
7 camera that was what the editor mentioned, you know,
8 that is being also you have merging more images into it
9 to get a single impression, also the final impression
10 that you want to manufacture.

11 And that is why we have a reference to 116
12 here, by the way. A reference to 116 is referencing
13 that one impression that you want to send to the
14 manufacturing, as an example, and that is why you want a
15 single impression, final impression at the end of the
16 day to send for it manufacturing. It doesn't mean the
17 others are not impressions.

18 Q. So just to be clear, you can't point me to any actual
19 disclosure in Geng of updating a 3D digital impression
20 with a new 3D image, can you?

21 ATTORNEY ZHANG: Objection; form.

22 THE WITNESS: Excuse me?

23 ATTORNEY ZHANG: Objection; form.

24 THE WITNESS: From memory, I put the things
25 that I opine on this in my declaration and I pointed to

1 things in my declaration. I can look to see in my
2 declaration, but I have to look there, I didn't memorize
3 things.

4 And a POSITA, a POSITA, as you know, is
5 knowledgeable of based on reading the thing as a whole
6 and based on knowledge of the prior art and background
7 art would understand also things as -- a POSITA would
8 have understood that Geng is indeed modifying an
9 existing structure by merging a new structure --
10 impression to it, an existing digital impression, I have
11 to correct that. So an existing digital impression or
12 existing 3D model by merging another model, it is the
13 way the scanning is done, it is the way things are
14 described in Geng and revealed and I discussed this in
15 detail in my declaration. I opined on it.

16 So if you want to point me somewhere in my
17 declaration you said this, what do you mean, I will be
18 happy to answer, but from memory, I cannot --

19 Q. (BY ATTORNEY ARGENTI) I am at loss, Dr. Karam, I don't
20 know where you opine on that in your declaration and
21 saying Geng discloses that.

22 A. I opined how a POSITA, that Boerjes and Geng rendered
23 this obvious, okay.

24 Q. So, for example, that starts at page 87 of your
25 declaration, right?

1 A. One moment.

2 Q. We already discussed that you think Boerjes does
3 disclose updating an existing 3D model with new scan
4 data after a physical change, right?

5 A. I just need -- I am just seeing another page in my
6 declaration of background I gave on Geng before going to
7 87. One moment.

8 Q. Okay.

9 A. If you give me a couple of minutes.

10 Q. Which paragraph is that that you are reviewing?

11 A. Paragraph 64 and 65, 66.

12 Okay. So the question was? So I am on that
13 paragraph 87 you mentioned in my declaration, so I am
14 there.

15 Q. Okay.

16 A. Yeah.

17 Q. Or let's go back to what you were looking at, your
18 initial description of Geng on pages 52 to 54 and I am
19 looking at the bottom of page 53, in it paragraph 64
20 where it starts, "For example, the user can use an
21 editor tool," do you see that? And then I am reading
22 through the end of the paragraph.

23 A. Yeah.

24 Q. It looks like you are not applying Geng's terminology
25 where Geng talks about integrating multiple uncalibrated

1 3D images into a single 3D digital impression, right?

2 ATTORNEY ZHANG: Objection; form.

3 THE WITNESS: Where are you, "The user can
4 also use a merger tool"? That is -- that sentence, you
5 are referring to?

6 Q. (BY ATTORNEY ARGENTI) Yeah.

7 A. Yeah, cannot integrate multiple 3D images into a single
8 3D image.

9 Q. That is not what Geng says, is it?

10 A. Yes, it is what he says. I mentioned to you at the end
11 of the paragraph, "Alternatively, you could use any
12 registration technique that is" --

13 Q. Keep reading, though. Keep reading.

14 A. One moment. Geng said, "The merger, even at the
15 beginning, provides tools that enable operators to
16 integrate multiple 3D images uncalibrated here," but it
17 could be -- uncalibrated is harder, meaning in the wild,
18 you can take any multiple 3D images and integrate them.

19 Q. And what are they integrated into?

20 A. I put -- into a single -- I told you the 3D digital
21 impression is a 3D model. I could have put here 3D
22 image model, these are imaging model, these are images,
23 points, anything multi-dimensional is an image.
24 Anything 3D is multi-dimensional imaging.

25 Q. So you would agree then that you are not using the same

1 terminology as Geng, right?

2 A. For me the 3D digital impression is a 3D image. I
3 didn't use the exact word here, I am referring to that,
4 but that is -- this is consistent with what Geng is
5 saying, the 3D digital impression, which is also
6 obtained through images and since it is obtained from
7 also images, that is a 3D image. It is a single 3D
8 image.

9 How can you combine 3D image into what, into
10 speech, into sound, you combine them into another 3D
11 image, no? That is what a POSITA would understand.

12 Q. So if we look back at the merger tool discussion in Geng
13 at the bottle of column 7, going on to column 8, that
14 paragraph describing Geng's merger tool doesn't mention
15 dental treatment, right?

16 A. Geng's doesn't mention -- the question, you are asking
17 whether Geng mentioned dental treatment?

18 Q. Right.

19 A. The whole invention, let's go back to the beginning,
20 because we have to --

21 Q. No, no, I am asking about that paragraph actually. I
22 know it is talking about obtaining a dental digital
23 impression in the context of dental treatment, I am
24 asking about the merger tool discussion doesn't mention
25 dental treatment, right?

1 A. You have to read it within the context. This is about
2 like dental imaging but also can apply to other things,
3 again, these imaging techniques, but within the Geng's
4 disclosure, a POSITA would understand this should apply
5 also to dental imaging in addition to other things, it
6 shouldn't not imply since this is the field of the
7 invention.

8 Q. Nothing in the paragraph describing Geng's merger tool
9 that begins at column 7, line 57 talks about updating a
10 3D digital impression as a result of a change in a
11 patient's oral cavity, right?

12 A. This is taking in any situation, whether you want to
13 update or not, you could merge things for updating
14 because at the end of the day you are eliminating the
15 undesired area and then you could use that merger tool.
16 But, independently of that, in my declaration I had a
17 planning of Boerjes in view of Geng, I didn't have a
18 ground with Geng at all, no?

19 So Boerjes in view of Geng, because a POSITA
20 would have -- it is understood that these are well-known
21 technique that is manual, because Boerjes discloses
22 manual QC because of the editor tool and a POSITA -- and
23 provides some discussion on those. A POSITA would have
24 looked for more details. Geng gives more details and
25 gives more explicit details about how these tools are

1 used as part of a user interface and how it can, also in
2 line with Boerjes, how it can improve the cost and the
3 time, et cetera, so a POSITA would look into Geng tools
4 and these are well-known technique to integrate, so
5 replacing a well-known editing with another editing,
6 disclosed editing and including Geng disclosed
7 well-known registration tool to achieve similar results.

8 So this would have been also a design choice,
9 a suitable option very well known that is used in the
10 manual QC editing functions of Boerjes to achieve this
11 result.

12 Q. So when we are talking about updating a digital
13 impression or a digital model as a result of a change in
14 the patient's oral cavity, you are relying on Boerjes
15 for that specifically, not Geng, right?

16 A. At least I am relying on Boerjes in view of Geng, yeah,
17 Boerjes discloses that based on Figure 4 and the
18 discussion we did, yes, Boerjes does teach this.

19 Geng more explicitly, you know, also more
20 explicitly discusses tools and user interface, including
21 the removing undesired specific tools to remove
22 undesired areas explicitly and ability to merge
23 different images, so you take imaging of these areas and
24 you can merge them, so you could use tools Geng within
25 Boerjes, that is what I opine on as an obviousness

1 ground in my petition. I didn't rely on Geng alone on
2 that, no.

3 Q. You did not rely on Geng for teaching updating a model
4 of the patient's teeth after a physical change in the
5 patient's intraoral cavity, right?

6 A. Not to my recollection.

7 ATTORNEY ZHANG: Objection; form.

8 THE WITNESS: But that I relied on Geng, you
9 know, it is Boerjes in view of Geng. And we can go, let
10 me go to that element because I have it here, so I don't
11 want to do it from memory, so one moment.

12 This is element 1[h], that is what element you
13 are asking about, 1[h], replacing --

14 Q. (BY ATTORNEY ARGENTI) Right.

15 A. Yeah. One moment. Just to make -- so for 1[h], we know
16 Boerjes discloses replacing -- and by the way, replacing
17 include removing in it, the meaning of replace is like
18 removing data and replacing them, so a POSITA would
19 understand that replace include remove.

20 But also, you know, Geng talks about replacing
21 by registration also and aligning, which is -- and this
22 is in align with the court construction, so in that --
23 so here, also -- and Boerjes discusses registration as
24 stitching and a POSITA would understand also that
25 Boerjes replaces also by registration.

1 But Geng is more explicitly given tools,
2 merging tools, editing tools for removal explicitly
3 disclose removal tools, that you have to remove in this
4 certain area and this can be integrated in Boerjes'
5 system, you know, as suitable options to use tools of
6 Geng like the editing tool to remove the undesirable
7 area before replacing.

8 Although replacing include removing, also, to
9 replace in Boerjes and ground one, also we talked about
10 that, but in ground two, explicitly Geng mentioned the
11 removal tool removing undesirable area and also Geng
12 teaches replacement via registration also through the
13 merger tool that can be incorporated also as part of the
14 manual editing and quality control or automated quality
15 control. But the manual, after you remove areas, you
16 could do also the merger tool, integrate Geng as a
17 suitable option in line with and achieve the goals,
18 objectives of Boerjes of having some feedback.

19 So in here, so -- so Boerjes, combined with
20 Geng's merger function, renders the limitation, this
21 opines, and I indicate in my declaration, under the
22 district court construction, but also when you register
23 and replace by decision, this is also replace.

24 So but if you want to have this Geng
25 specifically also talk that you can use non-registration

1 methods to do replacement and to do combinations, so the
2 replace of Boerjes can be done, a POSITA would
3 understand that can be done, the replacement through
4 Geng's merger tool.

5 Also through Geng editing and removing also
6 explicitly and also by merging to replace through
7 registration, because if you wanted to replace a
8 specific portion, you need to align the data to get a
9 good replacement and a POSITA would understand that.

10 Also Geng's explicitly also says this and also
11 we have background art, in addition to the prior art
12 that we also -- that I referred to in my declaration
13 also showing why you should remove so that you minimize
14 the errors in registration applications of images, so
15 these are well-known technique in image processing when
16 you want to remove a part of an image and replace it
17 with another one, the defective part, you are not going
18 to remove the whole image and replace it again.

19 Especially in some parts you want them and
20 they are consistent, you just -- it is very common and
21 well-known in imaging and image processing that if a
22 part is defective, you remove that part and you replace
23 it with data for registration by aligning and stitching,
24 blending or stitching. You know, by aligning, you have
25 to align registration is aligning, meaning finding the

1 right position and aligning it in the right rotation so
2 that it can -- it can be composed and merged and in a
3 meaningful way.

4 So this is in the declaration in here, so that
5 is how I would opine on it. I am not really relying on
6 Geng alone on that.

7 Q. Okay. So that was a very long answer that had almost
8 nothing to do with my question, Dr. Karam, except for I
9 think maybe at the end. So I understand that you are
10 proposing to apply what you think are the replacement --
11 removal and replacement tools from Geng and apply that
12 in combination with Boerjes, I get that, I am more
13 interested in what you are not relying on Geng for.

14 So I will ask again, do you agree with me that
15 Geng does not describe updating a model of the patient's
16 teeth after a physical change in the patient's intraoral
17 cavity?

18 ATTORNEY ZHANG: Objection; asked and
19 answered.

20 THE WITNESS: Yeah, and I do not from memory,
21 so Geng is -- is updating by removing the areas that are
22 undesirable, so removing the error and the undesirable
23 is updating the model and this is through the editing
24 tool. And if you want to give me -- I mean --

25 Q. (BY ATTORNEY ARGENTI) You just reviewed your ground two

1 element 1[h] discussion.

2 A. Yes.

3 Q. Are you relying on Geng for that aspect of the claims or
4 are you relying on Boerjes?

5 A. Updating, you mean? On updating?

6 Q. Updating a model of the patient's teeth after a physical
7 change in the patient's intraoral cavity.

8 Do you understand your declaration testimony,
9 Dr. Karam?

10 A. I understand it, but I didn't memorize it, so I have to
11 look to be careful to answer basically when I hear the
12 question as much as I can, but you have to give me a few
13 moments to review what I relied on in Geng.

14 Q. Okay. You can review it again.

15 A. Thank you.

16 Okay. So I want to point your attention to
17 the background section at the beginning, and we are
18 referring and interpreting Geng within the whole context
19 of reading and referring to how a POSITA, so if you go
20 to column one and if we start basically, let's start on
21 line 32, I guess, to give some context and this is the
22 background describing the problem that is being solved
23 by Geng.

24 So we start here at the first visit,
25 diagnostic work is performed, so this is -- before, like

1 this is in the first paragraph saying traditionally that
2 is what is being done and it requires that any error or
3 problem, redoing the surface, redoing the casting, the
4 molding, if there is a physical model instead of 3D
5 model, that is the background being done here, it says
6 here.

7 So in this paragraph again, line 32, At the
8 first visit diagnostic work is performed to determine,
9 with the patient's approval, it shows a matter for
10 treatment and in the context of a replacement
11 prosthesis, being a crown, for example, the diagnostic
12 work often includes taking diagnostic impressions, e.g.,
13 a wax mold, this is the physical impression, by the way,
14 that is being replaced by the 3D impression by Geng, 3D
15 digital impression instead of physical.

16 So we continue. So the diagnostic work often
17 includes taking diagnostic impressions of the patient's
18 teeth for a diagnostic study of the patient's dentition.

19 Next, the patient tooth structure is modified
20 in preparation to fit a crown. So we have a
21 modification now. For example, the tooth that is to
22 receive the crown is reduced in size, so such that the
23 crown will fit on the tooth within the patient's
24 dentition, so we have an update clearly saying we have
25 to update, we take an image before the preparation is

1 done and now the preparation.

2 Q. Dr. Karam, I need to cut you off, my question was about
3 what you are relying on in your declaration.

4 A. I am relying on Geng as a whole. So when I am
5 discussing something, it is in context of what Geng is
6 trying to solve.

7 Q. Got it. So can you point to me in that 1[h] discussion
8 in your declaration, what is the starting point for what
9 you are relying on in Geng and then we can maybe explain
10 how other parts of Geng illustrate the context.

11 A. Okay. I am relying on that Geng, that it is consistent
12 with Boerjes in dealing with the same problem of trying
13 to reduce having to take over and over physical
14 impressions and the 3D digital model can be added, that
15 is the problem being solved here, it is very clear in
16 the background.

17 Q. Can you point that to me in your declaration?

18 A. I put into my declaration, for example, on paragraph 97,
19 I just went there, let me see if something before -- I
20 think, paragraph 97, for example, in my declaration and
21 given the context of Geng, that is trying to fit a
22 prosthesis and prepare tooth and take an image before
23 the tooth.

24 Q. Sorry, which?

25 A. 97.

1 Q. And what part of 97 are you referring to?

2 A. Let's start like the first sentence, Geng discloses
3 receiving user input defining a surface portion of the
4 model to be removed and removing that surface portion
5 from the displayed model. So this is already a model
6 has been taken and this is in the context of background
7 to prosthesis, so you have some -- something that needs
8 to be removed so that to -- to image the surface
9 preparation, I am here referring to 2:21-31 as part of
10 the background, as part of the summary of the invention
11 after the background.

12 So the present specification describes systems
13 and methods for interactive three-dimensional dental
14 imaging. More specifically, the present methods and
15 systems provide for interactive computer-aided design
16 (CAD), interactive CAD, interactive is interpretive, you
17 are trying to prepare a dental applications according to
18 one of many possible compartments, an interactive dental
19 purity design system includes a GOI for displaying at
20 east one three-dimensional image for viewing by an
21 operator in access interface for receiving input from
22 the operator and prosthesis designed module providing
23 the design tools --

24 Q. What are you reading from right now? I am sorry, Dr.
25 Karam.

1 A. So this is comment 2, lines 21-31, but this is the
2 summary to solve the problem, exact problem.

3 Q. Got it.

4 A. That you have to -- that you do -- you take an
5 impression, you do a preparation, which was described in
6 Geng just before that paragraph, and then you have to
7 redo it again. Instead, you have that interactive
8 design and we said this is the same field of endeavor of
9 Boerjes and given it is consistent with Boerjes
10 interpretive design, Geng provides the tools to do that
11 and relying now on these tools being integrated in
12 Boerjes.

13 But it is solving the same problem of you are
14 updating the physical structure in a patient as
15 described clearly in the background and -- and also
16 bringing the issue of physical model that needs to be
17 retaken and done and repetitive treatment, you have to
18 redo them and given example of preparing the tooth
19 taking actually an impression before preparation, doing
20 a preparation, taking another impression and this is
21 costly, et cetera, and the solution is the summary here
22 having this interactive process, including ability to
23 remove, including ability to merge, I mean, a POSITA
24 within that context would understand that Geng is
25 disclosing a solution to the problem of updating, of

1 providing -- updating a 3D model after physical change
2 has happened because that is the problem that Geng is
3 dealing with and offering a solution.

4 That said, we are not relying on Geng alone,
5 it is Boerjes in view of Geng renders that in the
6 declaration. But Geng does indeed deal with update
7 of -- a POSITA would understand that Geng deals and
8 teaches updating the 3D model after changing the
9 physical structure inside an intraoral cavity because
10 that is the problem he is addressing, as given by the
11 background and what this invention is trying to achieve.

12 Q. Can you point me to anywhere in Geng that it actually
13 talks about updating an existing digital impression
14 after a physical change in the patient's intraoral
15 cavity?

16 ATTORNEY ZHANG: Objection; form.

17 THE WITNESS: I cannot from memory do that,
18 okay?

19 Q. (BY ATTORNEY ARGENTI) Are you aware of anywhere that you
20 cite in your declaration where you identify a part of
21 Geng that he talks about updating an existing digital
22 impression after a physical change in the patient's
23 intraoral cavity?

24 ATTORNEY ZHANG: Objection; asked and
25 answered.

1 THE WITNESS: I could look -- the thing is
2 that I have parts, if you are asking me a specific
3 question, what my declaration, I am citing specifically,
4 starting in other part 4:54 to 65, I can go there and,
5 you know, if you want basically I could -- I will check
6 those to see if any one is -- does -- the background and
7 context of Geng, a POSITA would understand that from
8 clear background and the context of Geng and the
9 invention the problem is trying to solve, whether it is
10 in Geng and I reference that, from memory I can tell you
11 that I have to look at the references that I am
12 providing, so if you give me another five minutes to
13 see, that I go to these references and see if any one --
14 also I can point you to something being repeated there
15 about that background problem and --

16 Q. Okay.

17 A. So like I looked at some sections in here and I would
18 like to point your attention to maybe the ones -- this
19 is what I cite in my declaration that I am opining,
20 first bottom of 6, 6:41, one moment, let me look. Okay.

21 So, for example, if we go to 6:21-41, okay?
22 When you are there --

23 Q. This is column 6, starting at line 21 of Geng, right?

24 A. I am sorry, column 6, starting at line, yeah, 26 to 41.
25 26.

1 Q. Okay.

2 A. So in here, if we kind of like -- so if we go to the
3 bottom, because it talks about teeth imaging and so
4 forth, but if we go to line 34 from that -- better to
5 skip the first, it is fine. "The user interface
6 model" -- maybe I should come closer to the speaker
7 here.

8 "The user" -- so this is 6 I am reading,
9 starting line 33, "The user interface module is
10 configured to interact with any of the access devices
11 listed above to receive and process operator input. 3D
12 image editing functions are also incorporated into the
13 user interface module to provide both diagnostic tool
14 and a communication tool for communicating information
15 to dentists, patients and lab technicians. This allows
16 dentists to visually demonstrate diagnoses and
17 prescription orders to patients and lab technicians."

18 But in here you see the communication to
19 dentists, the patient and lab technician, so you have
20 communicated to the lab technician, the lab technician
21 give you a quality control based on what was described
22 before and then we go to like the beginning of the
23 conclusion, so we go to --

24 Q. Hold on. Before -- are you moving to another part of
25 Geng?

1 A. Yeah, because everything is like in context, you have to
2 understand. There is -- Geng, the purpose is to have
3 single patient visit, single, and have this prosthesis
4 treatment and like design done in a single patient visit
5 and is interactive and things are being communicated to
6 lab technicians, who can provide feedback by, you know,
7 through the editing tools also to erase on this desired
8 area and then you have to remove these undesired area or
9 say it needs to be like in the background, this needs to
10 be adjusted, so then it is adjusted and then
11 communicated again, it is interactive and it is
12 interpreted as described in the background, so POSITA --

13 Q. So -- just to be clear.

14 A. Sure.

15 Q. You are citing column 6, line 26 through 41 of Geng as
16 disclosure of updating an existing digital impression
17 after a physical change in the patient's intraoral
18 cavity, do I understand that correctly?

19 A. I am giving you -- the disclosure I told you, the
20 background to put in context, this and the background,
21 given the POSITA's knowledge of whole Geng and given
22 also the purpose of Geng very well explicitly that a
23 single patient visit and the prosthesis required fitting
24 and checking and working the tools as disclosed in Geng
25 and fitting again, this design is interactive to provide

1 communication to lab technicians, to provide feedback,
2 delete undesired area, merge things to provide a single
3 patient visit.

4 For that and to adjust the prosthesis. You
5 have to adjust it, then you have to take another picture
6 and check it and this is in the background saying
7 physical model is difficult, that is why we are
8 providing this interactive interface to solve that
9 problem, so a POSITA would understand that by reading
10 Geng, that it is solving that problem and it addresses
11 the problem of designing a prosthesis system in an
12 interactive way, in a single visit and being able to
13 communicate in that single visit with lab technicians,
14 with dentists, to adjust it and to get the needed result
15 and to have a final prosthesis designed and without the
16 patient leaving their chair.

17 And this is consistent with Boerjes, but this
18 is basically -- but there are also other sections that
19 also -- 3:48, also 42 in that paragraph, maybe going
20 down, I am just like going to read a section from this,
21 okay. Oh, yeah, so basically starting at line 56, so
22 this is column 3, line 56, "The computer (112) includes
23 predefined logic (e.g. software) competent to form a
24 three-dimensional digital impression of all or part of
25 the patient's dentition from the acquired image data,"

1 okay? So we can take all or we can take part and merge
2 it, so you can see three-dimensional impression of all
3 or part of the patient's from the acquired image data.

4 "3D dental computer-aided design software
5 provides functionality for manipulating the 3D digital
6 impression." "Further, the CAD software provides
7 functionality that enables an operator to design and
8 simulate," so -- "a 3D model of a dental prosthesis
9 based on the 3D digital impression."

10 And when you design and when you want to
11 design also and you want to simulate and then you have
12 to do the preparation, you know, for the tooth and you
13 have to image again because based on the -- on the other
14 disclosure in Geng, "As shown in Figure 1, the 3D model
15 can be sent to CAM," which can manufacture after this is
16 done, after you simulate thing, you have to get them
17 also into the patient tooth and you have to communicate
18 to the lab technicians and to the dentists and get
19 feedback and adjust, because that is the whole problem
20 we are dealing with.

21 If we are not going to adjust the patient
22 tooth, then you could do it off-line. The patient can
23 go and you could design virtually your prosthesis
24 without adjusting any more, why the patient should be
25 there waiting and then you can send the prosthesis to be

1 manufactured.

2 The patient is there because you're adjusting
3 and preparing their mouth as like in they disclose in
4 the background section the problem, Geng, that is the
5 problem, the patients are there, you take a first
6 impression of the mouth, then you prepare the mouth and
7 you take another one now and then maybe there is others
8 and you have to fit it again and it is a long process
9 with the physical one because you have to wait.

10 Now it is a digital one, it is just if I take
11 one digital and now I play with it virtually, why do I
12 need the patient to wait there in the chair in a single
13 visit? So the POSITA would understand like preparation
14 are being done as the problem that is being solved on
15 the patient, their oral cavity is being changed and
16 updated and scans are being taken and being merged, so
17 you delete undesirable area, you prepare the surfaces
18 and -- and this is consistent with Boerjes.

19 Boerjes is teaching that and this is the
20 problem also that Geng is solving. What we are relying
21 on is Boerjes taking the tools of Geng, also in Boerjes,
22 and incorporating them in the interface of Boerjes now,
23 but Geng does indeed address this problem and a POSITA
24 would understand that this is the problem, that updates
25 are being done on the patient intraoral cavity while

1 waiting on that chair, while the prosthesis is being
2 designed and simulated and then more preparations
3 getting done.

4 Q. Aside from Geng column 3, line 48 through column 4, line
5 2 and column 6, lines 26 through 41, are there any other
6 portions of Geng that you would identify as disclosing
7 updating an existing digital impression after a physical
8 change in the patient's intraoral cavity?

9 A. Sorry.

10 ATTORNEY ZHANG: Objection; form.

11 THE WITNESS: So the one I rely on in my
12 declaration, maybe there are others, but I rely also on
13 15:41 through 56 that explicitly says, it reminds us of
14 the problem, that in a single patient visit and you are
15 doing all of that with your chairside dental equipment,
16 without the patient leaving the office, so 15:41 through
17 57 and these are the things.

18 I am just noting whatever I am referring in my
19 declaration and these by themselves, they do -- a POSITA
20 would understand that the patient -- if you are just
21 going to not take another image, why have the patient
22 waiting, and this is the background problem is being
23 described in Geng -- I am not referring to the
24 background section, I am referring to the invention, but
25 understanding Geng is understanding the problem being

1 solved, so a POSITA would understand that these tools
2 are being enabled.

3 This and -- this is being done also because
4 this is the prosthesis design and simulation and
5 manufacturing and Geng, he did say it requires surface
6 preparation, taking first an impression, then doing a
7 surface, then doing another impression and he was
8 solving it, instead of physical, he is doing digital and
9 getting these tools, so we have to keep that context in
10 our minds.

11 Q. (BY ATTORNEY ARGENTI) Any other disclosure in Geng that
12 you would point me to as disclosing, updating an
13 existing digital impression after a physical change in
14 the patient's intraoral cavity?

15 A. I am just -- I can not answer this Geng in my
16 declaration for Geng, I am telling you those. This is
17 basically I am giving you -- but in Geng there might be
18 disclosure; I am just basically pointing to what I cited
19 in Geng myself.

20 Q. And since you mentioned your declaration, can you point
21 me to where in your declaration you specifically offer
22 the opinion that Geng discloses updating an existing
23 digital impression after a physical change in the
24 patient's intraoral cavity?

25 A. In 1[h] we are relying on Geng, we incorporate Geng

1 editing functions within Boerjes, so it is the system of
2 Boerjes, okay? With the editing function, you know,
3 substituted with Geng's editing function, so
4 substituting a well-known technique with another, to
5 achieve the same goal.

6 And that editing technique, so Boerjes does
7 disclose this and Geng discloses the removal, so 1[e],
8 1[f], also -- so for the replacing that, we have a
9 removal, tools to remove and also registration and
10 merging, replacing by merging, using the tools of Geng.
11 This is what we are relying on.

12 But Geng is within the same field of endeavor
13 and is addressing a similar problem, but in my
14 declaration, this is what I am relying on and opining
15 on.

16 Q. So when you mention ground H, ground 2 -- sorry, element
17 1[h] and ground 2 involves Geng, right, so you are
18 talking about paragraphs 118 through 123 of your
19 declaration, do I have that right?

20 A. But we have to go to also 1[e], [f] because 1[h] has
21 elements of [e] and [f] also, because after the surface
22 is removed, so you have the removal thing, so Geng is
23 relied on 1[e], 1[f], basically explicitly to teaching
24 the removal.

25 Q. And that is paragraphs 97 to 105 of your declaration,

1 right?

2 A. Yes, 97.

3 Q. So where in paragraphs 97 to 105 or paragraphs 118
4 through 123 do you offer the opinion that Geng discloses
5 updating an existing digital impression after a physical
6 change in the patient's intraoral cavity?

7 A. Okay. So for the purpose of my declaration, so if we go
8 to paragraph 100, okay? There, basically at the end of
9 the paragraph, you could see that in Geng, lines -- and
10 we -- I am citing here column 7:40 to 44 saying, "The
11 editor allows operator to modify and eliminate any
12 undesirable areas of the original 3D image," okay?

13 And we are relying on that because it is any
14 undesirable removing, so we relying on this when
15 integrating Boerjes' replacement process to use Geng's
16 editing function to remove the undesirable portion from
17 the model based on Geng being the same feed and trying
18 to solve the same problem as Boerjes, but Boerjes is
19 relying on the system of Boerjes and the replacement
20 process, that is clearly disclosed in Boerjes, we are
21 relying on Geng's editing function to implement the
22 removal process to remove the explicitly because
23 explicitly Geng's describe an interface that can enhance
24 the process, that can reduce costs and eliminate
25 unnecessary time, waste for dentists and patients and

1 within the goal of Boerjes.

2 So Boerjes talks about replacement but Geng
3 gives more details about tools that are offered to make
4 an enhanced way to replace, remove undesirable area,
5 merging, so it would be, a POSITA, it is well-known
6 within the POSITA to use these tools in Geng and to look
7 for ways to make replacement of Boerjes efficient and
8 use Geng's tool that are described in Geng that is
9 within the same endeavor to implement Boerjes's
10 replacement process through removal using its editor
11 tool of Geng for removing and the merging tool of Geng
12 to -- for replacing or registering and replacing the
13 removed portion.

14 So it is a combination here of obviousness
15 ground, not relying on Geng by -- by itself for that.

16 Q. So you were not relying on Geng on its own as disclosing
17 updating an existing digital impression after a physical
18 change in the patient's intraoral cavity; is that
19 correct?

20 A. I am relying on Geng for updating after, in combination
21 with Boerjes. Boerjes in view of Geng teaches that, so
22 I am relying on Geng to teach exactly that but Boerjes
23 in view of Geng. That is what the declaration is about.
24 But Geng is enabling the updating after removal through
25 its editing tool. The removal tool for removal and the

1 updating is enabled by Geng by implementing the
2 replacement of Boerjes.

3 Boerjes -- Boerjes does in Figure 4 talk about
4 supplement scan, talking about actually taking
5 preparation after a physical change, more explicitly
6 Boerjes talks about acquiring scans and physically after
7 taking -- a physical change, the Boerjes replacement,
8 though, Geng does enable an update after -- and does
9 enable removing the portion within Geng system and does
10 enable updating that portion.

11 Q. In that answer you just gave, you said I am not relying
12 on Geng to teach exactly that, did you mean that you are
13 not relying on Geng to teach updating an existing
14 digital impression after a physical change in the
15 patient's intraoral cavity?

16 A. You are saying it too fast.

17 ATTORNEY ZHANG: Objection; form.

18 THE WITNESS: I am -- I am saying Geng's tools
19 are being used to update, we are relying on Geng's tools
20 to use. Geng's tools can be used to update by removing,
21 so after the user select a portion and mark a portion to
22 be removed, okay? And Boerjes rely on Boerjes also in
23 highlighting the regions and the surface preparation, so
24 after a user mark a region to be removed, Geng's tools
25 are used for removing the highlighted region and Geng

1 teaches using the editor also to remove undesired region
2 and Boerjes does state that this can be marked by user
3 and it is a part of quality control and Geng does say
4 this is interface for user to also manually remove --

5 Q. Set Boerjes aside, I am not asking you about Boerjes, or
6 the combination, I need to know your opinion on whether
7 Geng discloses updating an existing digital impression
8 after a physical change in the patient's intraoral
9 cavity?

10 ATTORNEY ZHANG: Objection; asked and
11 answered.

12 THE WITNESS: I am trying to get your question
13 here because so you are asking whether Geng, we can use
14 Geng, whether we are relying on Geng for updating an
15 existing structure after removal of -- yes, we are
16 relying.

17 Q. (BY ATTORNEY ARGENTI) No, that not what I am asking, Dr.
18 Karam. Please listen to my question, which I have asked
19 many many times.

20 Are you relying on Geng as disclosing updating
21 an existing digital impression after a physical change
22 in the patient's intraoral cavity?

23 ATTORNEY ZHANG: Objection; asked and
24 answered.

25 THE WITNESS: Geng does that, but we are

1 relying on a combination, Boerjes with Geng.

2 Q. (BY ATTORNEY ARGENTI) Where in your declaration, aside
3 from paragraph 100, do you think you identified your
4 opinion that Geng does that?

5 A. I told you, the other paragraph, you know, within
6 context, paragraph 97 citing 6:26, the section
7 paragraph, the column 6, lines 26-41 and also -- and
8 also the 15 -- okay. Paragraph 99, starting at 15,
9 41-57 saying the patient needs to do a single visit to
10 do all of their prosthesis and get an understanding of
11 the problem. Geng, yeah, Geng is -- so we are relying
12 on Geng that is solving this problem, too.

13 At the same time, Boerjes --

14 Q. No, stop, I am not asking about Boerjes, I am asking you
15 identify where in your declaration you make the
16 assertion that Geng discloses updating an existing
17 digital impression after a physical change in the
18 patient's intraoral cavity.

19 So far you have identified paragraphs 97, 99
20 and 100, are there any other paragraphs you would
21 identify?

22 ATTORNEY ZHANG: Objection; form, asked and
23 answered.

24 THE WITNESS: I tried to answer it like
25 different way. In our case, Boerjes discloses updating

1 an existing structure after a physical change and we
2 were opining and showing that in the declaration and we
3 were relying on Geng's tool in performing the update,
4 okay.

5 Q. (BY ATTORNEY ARGENTI) But Geng itself does not disclose
6 making an update after a physical change in the
7 intraoral cavity, right?

8 A. I disagree with that. I respectfully disagree with
9 that. I showed you that a POSITA would understand that
10 Geng teaches and discloses that.

11 Q. And where in your declaration do you discuss that?

12 A. In my declaration, I rely on Geng for the implementation
13 of the replacement tool of Boerjes and I say within -- I
14 don't discuss this at length, I say these are within the
15 same endeavor and the field and prosthesis design, but I
16 don't discuss -- I don't really refer to the background
17 and discuss that, I discuss Boerjes tools.

18 But saying that Boerjes does not teach that,
19 Boerjes does teach this.

20 Q. I am not asking about Boerjes. We have already talked
21 about Boerjes.

22 A. Geng. Geng. Geng. Geng.

23 Q. I am asking you, where in your declaration do you talk
24 about Geng making updates after a physical change in the
25 patient's intraoral cavity?

1 ATTORNEY ZHANG: Objection; asked and
2 answered.

3 THE WITNESS: Yeah, I tried to answer your
4 question basically and I told you. In my declaration,
5 Geng is -- Geng is making update after physical change.

6 Q. (BY ATTORNEY ARGENTI) Where do you identify that? Show
7 me.

8 A. I am relying on Boerjes to -- you know, to more
9 exclusively --

10 Q. You are now answering a different question than what I
11 just asked.

12 Where do you say that in your declaration?

13 A. In my declaration, I am relying -- that is what I can
14 tell you, I am relying on Boerjes for the Boerjes
15 replacement part which occurs after a physical structure
16 is -- after an update is done to the physical structure
17 in the intraoral cavity and after that is done,
18 basically there is a replacement.

19 The replacement process, Geng's editor tool
20 are being used because it is the same problem and the
21 same field of endeavor. That said, we have Figure 4 on
22 page 74, so the ground is based on Boerjes disclosing
23 the after the physical structure modification.

24 This doesn't mean Geng does not but in my
25 declaration, Geng does teach that, too, but in my

1 declaration, I relied on Boerjes disclosure of a scan
2 being taken after a change in the physical structure is
3 happened or is made and the update is done using Geng's
4 tool.

5 Q. Okay. So I have asked you quite a few times where your
6 declaration talks about Geng making an update to an
7 existing physical digital impression after a physical
8 change in the intraoral cavity, you explained your
9 opinion that Geng discloses that but you haven't pointed
10 to anywhere in your declaration that you talk about
11 that.

12 This is your last chance, would you like to
13 identify anywhere in your declaration where you actually
14 talk about that?

15 A. I believe --

16 ATTORNEY ZHANG: Objection; asked and
17 answered.

18 THE WITNESS: Yeah, I believe I answered the
19 question. I would like to put context to my answer so
20 that it doesn't get taken out of context, I believe I
21 answered clearly your question.

22 In my declaration, I rely on Boerjes for
23 the -- after the physical change happened, taking a scan
24 and I rely on Geng's on the replacement for the
25 implementing the replacement of Boerjes. That is in my

1 declaration.

2 ATTORNEY ARGENTI: Okay. Why don't we take a
3 short break, five minutes should be enough, unless you
4 would like a longer break?

5 THE WITNESS: No, five minutes is fine. Do
6 you know how long we are going? So maybe counsel should
7 be asking that question.

8 ATTORNEY ARGENTI: We should be close to being
9 done, so let's take a short break and let me confirm
10 that.

11 ATTORNEY ZHANG: Thank you.

12 Holly, once we are off of the record, we would
13 like to confirm the time because the time you mentioned
14 is different from the calculation we had.

15 (A break was taken.)

16 ATTORNEY ARGENTI: Back on the record.

17 Q. (BY ATTORNEY ARGENTI) Dr. Karam, at any point today
18 since the deposition started have you had discussions
19 with ClearCorrect's counsel, whether verbal or written?

20 A. No.

21 Q. Okay.

22 ATTORNEY ARGENTI: Barring any follow-up after
23 redirect, that is all of my questions.

24 THE WITNESS: Okay. Thank you.

25 ATTORNEY ZHANG: No redirect from us.

1 ATTORNEY ARGENTI: All right. Thank you.

2
3 (The deposition concluded
4 at 3:42 p.m.)
5 (Signature was reserved.)
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C E R T I F I C A T E

STATE OF WASHINGTON)

COUNTY OF KING)ss:

I, the undersigned Washington Certified Court Reporter, pursuant to RCW 5.28.010 authorized to administer oaths and affirmations in and for the State of Washington, do hereby certify:

That the annexed and foregoing deposition transcript of the witness named herein was taken Stenographically before me and reduced to a typed format under my direction; that the transcript is a full, true and complete transcript of the proceedings, including all questions, objections, motions and exceptions of counsel, made and taken at the time of the foregoing proceedings, to the best of my abilities;

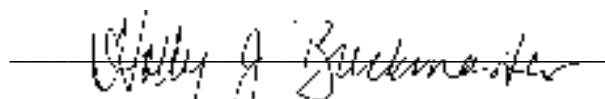
That I am not a relative, employee, attorney or counsel of any party to this action or relative or employee of any such attorney or counsel, and that I am not financially interested in the said action or the outcome thereof;

That the witness, before examination, was by me duly sworn, and the transcript was made available to the witness for reading and signing upon completion of transcription, unless indicated herein the waiving of signature;

I further certify that I am sealing the deposition in an envelope with the title of the above cause and the name of the witness visible, and I am delivering the same to the appropriate authority;

I further advise you that as a matter of firm policy, the Stenographic notes of this transcript will be destroyed three years from the date appearing on this Certificate unless notice is received otherwise from any party or counsel hereto on or before said date;

IN WITNESS WHEREOF, I have hereunto set my hand on this 5th day of February, 2026, at Mountlake Terrace, Washington.


Holly J. Buckmaster, CCR # 2859.

DEPOSITION ERRATA SHEET

Our Assignment No. J14202827
Case Caption: ClearCorrect v. Align

DECLARATION UNDER PENALTY OF PERJURY

I declare under penalty of perjury that I have read the entire transcript of my Deposition taken in the captioned matter or the same has been read to me, and the same is true and accurate, save and except for changes and/or corrections, if any, as indicated by me on the DEPOSITION ERRATA SHEET hereof, with the understanding that I offer these changes as if still under oath.

Signed on the _____ day of _____, 2026.

LINA KARAM, Ph.D.

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LINA KARAM, Ph.D.

1 Date: February 5, 2026

2 To: XIRUI ZHANG
3 Attorney at Law
4 FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER, LLP
5 Two Seaport Lane
6 Boston, Massachusetts 02210
7 xirui.zhang@finnegan.com

8 Case: ClearCorrect v. Align

9 Cause No.: IPR2025-00817

10 Deposition of: LINA KARAM, Ph.D.

11 Date Taken: February 2, 2026

12 The above transcript must be read and the Correction Sheet
13 signed within 30 days of this notice or before the trial
14 date. If the Correction Sheet is not signed within that
15 time period, signature will be deemed waived for all
16 purposes.

17 Please contact the witness and arrange a convenient time and
18 place for reading and signing.
19 After the Correction Sheet is signed, please mail the signed
20 original Correction Sheet to:

21 MATTHEW A. ARGENTI
22 Attorney at Law
23 WILSON SONSINI GOODRICH & ROSATI
24 650 Page Mill Road
25 Palo Alto, California 94304
margenti@wsgr.com

26 FAX OR MAIL ADDITIONAL COPIES TO:

27 Esquire Deposition Services
28 101 Marietta Street, Suite 2700
29 Atlanta, Georgia 30303
30 Fax No.: 404-588-3812

31 Reporter: Holly J. Buckmaster, CSR
32 License No.: 2859

1 Date: February 5, 2026

2
3 To: MATTHEW A. ARGENTI
Attorney at Law
4 WILSON SONSINI GOODRICH & ROSATI
650 Page Mill Road
5 Palo Alto, California 94304
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7
8 Case: ClearCorrect v. Align
Cause No.: IPR2025-00817
9

10
11 YOU ARE HEREBY NOTIFIED that the following original
transcript has been sealed and served upon you for filing:
12

13 Deposition of: LINA KARAM, Ph.D.

14 Taken: February 2, 2026

15 Signature: Waived _____

16 Reserved _XX_

17
18 Within 30 days or before the trial date,
the witness should forward to you the
19 original signed correction sheet, which can
be filed separately at the time of trial.
20 Do not open the sealed transcript.

21
22
23
24
25 cc: XIRUI ZHANG