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Transcript of Michael A. Hickner, Ph.D.

Date: January 9, 2026

Case: Shenzhen Tuozhu Technology Co., Ltd. -v- Stratasy, Inc. (PTAB)

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1 UNITED STATES PATENT AND TRADEMARK OFFICE

2 _____
3 BEFORE THE PATENT TRIAL AND APPEAL BOARD

4 _____
5 SHENZHEN TUOZHU TECHNOLOGY CO., LTD.,

6 Petitioner,

7 v.

8 STRATASYS, INC.,

9 Patent Owner.

10 _____
11 Case IPR2025-00438

12 U.S. Patent No. 10,569,466

13 _____
14
15 Deposition of MICHAEL A. HICKNER, PH.D.

16 Conducted Virtually

17 Friday, January 9, 2026

18 9:58 a.m. CST

19 Job No.: 614558

20 Pages: 1 - 146

21 Stenographically reported by: Judith E. Bellinger,

22 RPR, CRR, CSR-TX CCR-WA, CCR-NM

1 Deposition of MICHAEL A. HICKNER, PH.D.,
2 conducted virtually.

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11 Pursuant to notice, before Judith E.
12 Bellinger, Registered Professional Reporter,
13 Certified Realtime Reporter, and Notary Public in
14 and for the State of Maryland.

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A P P E A R A N C E S

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1 A P P E A R A N C E S C O N T I N U E D

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3 O N B E H A L F O F T H E P A T E N T O W N E R :

4 C H R I S T I A N T A T U M , E S Q U I R E

5 M C D E R M O T T W I L L & S C H U L T E L L P

6 5 0 0 N o r t h C a p i t o l S t r e e t , N W

7 W a s h i n g t o n , D C 2 0 0 1

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C O N T E N T S

| EXAMINATION OF MICHAEL A. HICKNER, PH.D. | PAGE |
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| By Mr. Tatum | 6 |
| By Mr. Bisenius | 142 |

PREVIOUSLY MARKED EXHIBITS

(Retained by counsel)

Previously Marked:

| | |
|---|-----|
| Exhibit 1001 United States Patent Number 10,569,466 B2 | 11 |
| Exhibit 1003 Declaration of Dr. Michael Hickner | 9 |
| Exhibit 1004 United States Patent Application Publication Number 2006/0091199 A1 | 36 |
| Exhibit 1009 United States Patent Application Publication 2006/0127153 A1 | 122 |
| Exhibit 1010 United States Patent Application Publication Number 2011/0299110 A1 | 82 |
| Exhibit 1018 KISSlicer Quick-Start Guide | 107 |

1 MICHAEL A. HICKNER, PH.D.,
2 being first duly sworn, was examined
3 and testified as follows:

4 EXAMINATION BY COUNSEL FOR THE PATENT OWNER
5 BY MR. TATUM:

6 Q Please state your name for the record.

7 A Michael A. Hickner.

8 Q And, Dr. Hickner, because we're
9 conducting a remote deposition today, we're not in
10 the same room, I'm going to ask you a few
11 questions about your environment, okay?

12 A Okay.

13 Q Do you have any materials, whether
14 written or electronic, with you today?

15 A No, I just have the Zoom window pulled
16 up on my computer.

17 Q And do you intend to open any materials
18 during today's deposition, other than what I'm
19 going to show you?

20 A No, I do not. The Zoom chat sharing of
21 exhibits has been working, so that's fine with me.

22 Q And other than the Zoom chat that we're

1 using right now, do you have access to any other
2 chat or messaging applications?

3 A No. Those are all closed on my
4 computer.

5 Q Do you have access to any email
6 applications at the moment?

7 A Those are closed as well.

8 Q And is there anyone else in the room
9 with you today, Dr. Hickner?

10 A No, there is not.

11 Q Will you let us know if anyone enters
12 the room during the course of this deposition?

13 A I will. I have a do-not-disturb sign
14 on my door, but if there's an interruption, I'll
15 let everyone know.

16 Q And have you been deposed before?

17 A Yes, I have.

18 Q And, approximately, how many times have
19 you been deposed?

20 A Approximately, 20 times previously.

21 Q Just as a reminder, I will ask you
22 questions today, and you're under oath to answer.

1 And your counsel may object, but you'll still have
2 to answer my question.

3 Do you understand that?

4 A I understood the instructions.

5 Q And if you need a break at any point,
6 please, just let us know, we can take a break, but
7 I will ask that you answer my pending question
8 before we take that break; is that okay?

9 A That sounds good to me.

10 Q And is there any reason that you cannot
11 testify truthfully and to the best of your ability
12 today?

13 A There's no reason. I can testify
14 truthfully and to the best of my ability today.

15 Q And, Dr. Hickner, you're here today
16 because you offered a declaration in support of
17 the petition for inter partes review in IPR
18 2025-00438, right?

19 A That's correct, yes. I think that's
20 the '466 patent.

21 Q And in that inter partes review, the
22 petitioner is Shenzhen Tuozhu Technology Company

1 Limited, right?

2 A That's correct.

3 Q I'm uploading an exhibit into the chat.
4 Please let me know when you see that in
5 front of you.

6 (Exhibit 1003 previously marked for
7 identification and retained by counsel.)

8 A All right. Exhibit 1003 is up on my
9 computer.

10 Q And Exhibit 1003 is a copy of your
11 declaration in this IPR, right?

12 A That's correct.

13 Q Did you draft this declaration?

14 A Yes, I did.

15 Q Was there anyone else involved in the
16 drafting of this declaration, other than you?

17 A I collaborated with counsel on drafting
18 this declaration.

19 Q That's counsel at Fish & Richardson?

20 A That's correct.

21 Q Besides yourself and counsel at Fish &
22 Richardson, did anyone else contribute to the work

1 or analysis for your opinions in this declaration?

2 A No.

3 Q Now, you see on page 1 of Exhibit 1003,
4 there's a page number at the bottom, right?

5 A That's right. PDF page 1 in the
6 software also has a numeral 1, right at the
7 bottom.

8 Q If I refer to page numbers in
9 Exhibit 1003 today, you'll understand that I'm
10 referring to the page number on the bottom of the
11 page there, right?

12 A That sounds good to me.

13 Q Approximately, how much were you paid
14 for putting together this declaration?

15 A I spent about 15 to 18 hours on this
16 declaration, and I'm paid an hourly rate, so, 450
17 dollars an hour times 15 or 18.

18 Q Did that 15 hours, I believe you said,
19 did that include the time spent reviewing the
20 references discussed in this declaration?

21 A The references were billed -- or the
22 reference review or document review was billed

1 separately. And so, that was probably an
2 additional eight to ten hours, I would say.

3 Q And in your declaration, you express
4 opinions regarding United States
5 Patent Number 10,569,466, right?

6 A That's correct.

7 Q I put into the chat what is labeled as
8 Exhibit 1001.

9 Please let me know when you have it
10 pulled up.

11 (Exhibit 1001 previously marked for
12 identification and retained by counsel.)

13 A I have Exhibit 1001 pulled up, and
14 that's the '466 patent.

15 Q You'll understand that if I refer to
16 the '466 patent today that I'm talking about the
17 patent shown in Exhibit Number 1001, right?

18 A I understand that, yes.

19 Q And do you understand the concept of a
20 person of skill in the art?

21 A So in my declaration on -- or, sorry,
22 in paragraph 19, I outline what a person of

1 ordinary skill in the art is and their
2 qualifications.

3 Q Do you understand that the prior art
4 has to be viewed from the perspective of a person
5 of ordinary skill in the art?

6 A I understand that, and I wrote my
7 declaration from that perspective of a person of
8 ordinary skill in the art.

9 Q If, today, I refer to a POSITA, you'll
10 understand that I'm referring to a person of
11 ordinary skill in the art, right?

12 A That's correct. I'm comfortable with
13 using the term "POSITA."

14 Q And in your declaration, you express
15 opinions regarding claims 1 through 5, 7 through
16 13, and 16 through 20 of the '466 patent, right?

17 A That's correct.

18 Q I'd like to direct your attention, down
19 in Exhibit 1001, to column 23. And specifically,
20 where it starts with claim 1.

21 Please let me know when you're there.

22 A Yes, I'm there, column 33, starting

1 claim 1.

2 Q Do you see, in line 35, the limitation
3 that begins "receiving a request from a client
4 over a network to fabricate an object"?

5 A Yes. That looks like -- well, there's
6 more in that limitation, but I see the start of
7 that phrase on line 35.

8 Q What would a POSITA understand the term
9 "client" to mean in the context of this claim?

10 A So, in the context of this claim,
11 specifically, receiving a request from a client
12 over a network, a POSITA would understand that
13 there's -- receiving a request from some other,
14 let's say, computer machine, like a print server
15 or a controller, or some other thing doing the
16 request, for example. And so, that receiving
17 request from a client is, basically, there's a
18 client requesting, over a computer network, to
19 fabricate an object on the three-dimensional
20 printer.

21 So the client is the thing making the
22 request over the network.

1 Q Is the client separate from the
2 three-dimensional printer?

3 A So, in this specific limitation, what's
4 recited is receiving a request from a client over
5 a network to fabricate an object on the
6 three-dimensional printer.

7 So in my analysis, say, based on
8 Menchik, in paragraph 137 of my declaration, the
9 POSITA would have understood that the printing
10 apparatus receives the printing file, printing
11 parameters, other things from Menchik, from a
12 controller or computing device, which is a client
13 over the network.

14 And so, this limitation is talking
15 about the request from the client over a network.
16 And it doesn't -- and the request, of course, is
17 fabricate an object on the three-dimensional
18 printer. This specific limitation doesn't really
19 talk about physical proximity separate or
20 together, but there is this over the network --
21 or, sorry, over a network term, which a POSITA
22 could understand how this client is networked to

1 the three-dimensional printer.

2 Q The '466 patent describes both a client
3 and a controller, right?

4 A Yes, throughout the '466 patent, the
5 terms "client" and "controller" is used. And so,
6 they talked -- the '466 patent discusses both of
7 those terms.

8 Q Does client mean the same thing as
9 controller, in the context of the '466 patent?

10 A So in column 4, in the '466 patent,
11 starting line 13, the patent states, the '466
12 patent states "Similarly, various functions
13 described herein may be allocated between an
14 onboard processor for the printer and a separate
15 computer. All such computing devices and
16 environments are intended to fall within the term
17 controller or processor, as used herein, unless a
18 different meaning is explicitly provided or
19 otherwise clear from the context."

20 And so, the '466 talks about this term
21 controller. And when it comes to client, the '466
22 patent also talks about client devices received

1 from one or more of the client devices.

2 So it talks about both terms,
3 "controllers" and "client devices," in the '466
4 patent.

5 Q Does the term "client" mean the same
6 thing as the term "controller" in the context of
7 the '466 patent?

8 A So, in one of the sections in my
9 declaration, paragraph 130, where I analyze this
10 limitation, I say "Based on Menchik's explicit
11 teachings, the 'computing platform' providing the
12 printing file is an example of the controller
13 external to the print apparatus. In accordance
14 with the scope of this limitation advanced by the
15 Patent Owner in the litigation, a POSITA would
16 have understood that the printing file provided by
17 the controller of the computing device," which is
18 the client, "to the printing apparatus
19 (three-dimensional printer) is a request to
20 fabricate an object on the printing apparatus
21 (three-dimensional printer)."

22 Q And just to be clear, I'm not asking

1 about some of your analysis of the prior art,
2 we'll get to that in a moment. My question is
3 just about what a POSITA would understand the
4 terms in the '466 patent to mean.

5 And so, with that in mind, my question
6 is, in the context of the '466 patent, would a
7 POSITA understand that the terms "client" and
8 "controller" mean the same thing, or is there some
9 difference between them?

10 A So the '466 patent gives various
11 examples of controller and client throughout the
12 text. I didn't analyze, in the -- just in the
13 context of '466, whether or not controller and
14 client can be equated in some way or not. Just
15 looking at the '466, the text talks about
16 controllers and clients. But I would have to
17 analyze further whether those terms can be
18 interchangeable or not, in the context of '466.

19 In my initial analysis, I didn't
20 consider whether those terms can be equated or
21 not, just looking at the '466.

22 Q Are you able to perform that analysis

1 as you sit here today?

2 A So I've looked at these terms in the
3 '466 patent, and the '466 patent does describe
4 examples of those terms, both controller and
5 client, but I don't have a complete analysis just
6 confined to the '466.

7 Of course, I talk about clients and
8 controllers in the context of other references in
9 the prior art, but if we just wanted to confine
10 the analysis to the '466, I would have to consider
11 that further.

12 Q Understood. Turning your attention
13 back to that limitation we were discussing, and
14 that is at column 23, line 35.

15 Let me know when you have that in front
16 of you.

17 A Yes, I'm there.

18 Q And you see it says "Receiving a
19 request from a client over a network to fabricate
20 an object."

21 What would a POSITA understand the term
22 "request" to mean, in the context of this claim?

1 A So, the total limitation -- or the
2 complete text of the limitation is "Receiving a
3 request from a client over a network to fabricate
4 an object on the three-dimensional printer. The
5 three-dimensional printer coupled to a supply of a
6 build material, including a tag that stores at
7 least one property of the build material."

8 So a POSITA would understand that
9 receiving a request means just what it says here.
10 So receiving a request from a client, say, a thin
11 client or other sort of computing device, over a
12 computer network to fabricate an object on the
13 three-dimensional printer.

14 So that's pretty plain language. A
15 POSITA would understand, in the context of this
16 patent, that receiving a request is some sort of
17 network communication to fabricate an object from
18 the client to the printer.

19 Q Would any transmission of data
20 constitute a request or is a request something
21 more specific?

22 A So a request is not any transmission of

1 data. A request is more specific than, let's say,
2 as you said, any transmission of data, a request
3 is something more specific than any transmission
4 of data across the network.

5 Q Okay. So what constitutes a request,
6 then?

7 A So the '466 patent doesn't define the
8 term "request" in the specification of the patent,
9 but, say, for instance, in paragraph 53 of my
10 declaration, where I'm discussing one of the
11 references, I say that a POSITA would have
12 understood that in the context of this reference,
13 Loughran, the transmission of a fabrication job,
14 from the client to SFF system, or the 3D printer,
15 is a request to fabricate the object defined by
16 the fabrication job.

17 So that's one example of a request.

18 Q My question, again, is centered on the
19 '466 patent and what a POSITA would understand in
20 reading that patent.

21 And so, you mentioned that a request is
22 something more specific than any transmission of

1 data. So my question is, what would a POSITA
2 understand a request to mean, in the context of
3 the '466 patent.

4 A So "request" is used a number of times
5 as a term in the '466 patent. And so, in, let's
6 say, column 16, line 41, the '466 patent states
7 "As a non-limiting example, a remote client device
8 may request an object to be printed on the network
9 connected three-dimensional printer. The
10 three-dimensional printer may have one or more
11 supplies containing build material connected to
12 one or more couplings. The client device may
13 request the three-dimensional printer to transmit
14 the data tag for one or more of the connected
15 supplies for the determination of operational
16 parameters for at least one of the connected
17 supplies."

18 So here, "request" is used, and by
19 example, a POSITA would understand what this
20 means, in terms of the limitation that we're
21 discussing, receiving a request from a client.

22 So reading through the '466 patent, a

1 POSITA could understand this limitation, receiving
2 a request from a client over a computer network to
3 fabricate an object on the three-dimensional
4 printer.

5 Q You just read an example in which the
6 remote client device may request an object to be
7 printed on the network; is that right?

8 A That's correct. That was in column 16,
9 starting line 41.

10 Q How would that request be made?

11 A So in this computer networked
12 environment, a POSITA would understand the network
13 communications between, say, a client and a 3D
14 printer. And so, if we go down a little bit
15 further in column 16, line 46, I also said "The
16 client device may request the three-dimensional
17 printer to transmit the data tag."

18 So in two instances of requests, in
19 this column 16, lines 41 to, let's say, 48,
20 there's two instances of a request, it's the
21 request of an object to be printed over the
22 network, and then the client device may request

1 the three-dimensional printer to transmit the data
2 tag.

3 And so, in the second passage I read,
4 line 46, in column 16, to 48, the format of this
5 request is the client device may request the
6 three-dimensional printer to transmit the data
7 tag.

8 And so, in that instance of request,
9 it's a request over the network, and then
10 expecting a response, as implied by this language.

11 And so, in the first passage, starting
12 line 41, a remote client device may request an
13 object to be printed. And so, that is
14 transmission of the request to print something,
15 whereas, in the second instance, in this paragraph
16 that I've been discussing, that's a request for
17 transmission of data back.

18 And so, in a networked environment,
19 between printers and controllers and computers,
20 these requests come over the network, as described
21 by this limitation.

22 Q So the request to go over the network

1 and then wherever they would arrive, they,
2 essentially, ask the component there to do
3 something; is that roughly right?

4 A I mean, in this limitation, so in 1B,
5 it says "Receiving a request from a client over a
6 network to fabricate an object on the
7 three-dimensional printer."

8 So, clearly, the client, based on this
9 language, the client is sending the request over a
10 computer network to fabricate an object on the
11 three-dimensional printer.

12 And then if we go back to my -- excuse
13 me -- my example on column 16, again, lines 46 to
14 48, the client device may request the
15 three-dimensional printer to transmit the data tag
16 for one or more of the connected supplies.

17 And so, in that instance of a request,
18 it's not requesting printing of an object, it's
19 requesting data back from the printer.

20 Q In that last example, you mentioned a
21 data tag. What would a POSITA understand the term
22 "tag" to mean, in the context of the '466 patent?

1 A So in column 14 of the '466, starting
2 lines 36, the specification says "The data tag 304
3 may be any device or combination of devices
4 suitable for storing data relating to the build
5 material 312. This tag [sic], for example,
6 include a radio frequency identification tag, such
7 as an active or passive RFID tag, an optically
8 identifiable tag, such as a barcode, quick read,"
9 or QR code, "or the like, a magnetically
10 identifiable tag, such as a magnetic swipe strip,
11 or any other tag that can be automatically
12 detected and correlated by the controller to
13 identify information for the build material in the
14 supply."

15 So the '466 gives a few different
16 examples of this data tag.

17 Q Other than using data tags, could
18 information about a build material in a system be
19 transmitted over a network?

20 A Just in general?

21 Q Just in general.

22 A So just in general, say, in my own work

1 on 3D printing, we use a personal computer or an
2 external computer to slice a model. And within
3 that slicer program, as we call it, there's
4 information about the build material in that
5 slicer program. And that's transmitted over the
6 network to the printer.

7 And so, that system, that we use in my
8 lab, doesn't have a data tag. So it's entirely
9 possible to transmit material -- or, sorry,
10 transmit a data about a build material over a
11 network in the absence of that tag.

12 Q I would like to direct your attention
13 down a few lines, this will be column 23, and then
14 starting at line 44, the limitation that begins
15 "receiving one or more operational parameters from
16 the client."

17 Do you see that?

18 A Yes. It says "Receiving one or more
19 operational parameters from the client selected
20 for use in controlling operation of the
21 three-dimensional printer."

22 So, yes, I see that limitation. I'm

1 there.

2 Q What would a POSITA understand the term
3 "operational parameter" to mean, in the context of
4 the '466 patent?

5 A So if we look at column 15, line 17 of
6 the '466 patent, the specification says "For
7 example, the operational parameter may be at least
8 one of an extruder temperature, a feed rate, a
9 build platform temperature, a build volume,
10 temperature, an infill requirement, a rafting
11 requirement, a support structure requirement, a
12 cooling requirement, or other operational
13 parameter" that might be usefully -- "that might
14 usefully be determined by the controller from the
15 data stored in the data tag."

16 So this talks about, this passage talks
17 about operational parameters and what they are in
18 the context of the '466 patent.

19 Q Would it be fair to describe the
20 operational parameter as printer control
21 parameters?

22 A So, I didn't contemplate the term

1 "printer control parameters," but in my analysis
2 of operational parameters, which is the term in
3 the '466 patent, I discuss some examples saying,
4 in paragraph 172, as I'm contemplating the Menchik
5 reference, talking about optimum building
6 parameters for building or supports, and the
7 controller uses the data to determine printing
8 parameters, operation parameters, building
9 parameters, material parameters, and supply
10 parameters. Collectively, those are operational
11 parameters, including the amount of material of
12 each type and color presently available in each
13 cartridge.

14 So I didn't talk about the term
15 "printing control parameters," and I don't think
16 that is a term in the '466 patent.

17 Q Can you point me to any discussion in
18 the '466 patent that would lead a POSITA to
19 understand that the amount of material is an
20 operational parameter?

21 A So in column 15, the paragraph starting
22 line 11, but I'll just start reading from line 17,

1 which is the key part "The '466 states, for
2 example, the operational parameter may be at least
3 one of an extruder temperature, a feed rate, a
4 build platform temperature, a build volume
5 temperature, an infill requirement, a rafting
6 requirement, a support structure requirement, a
7 cooling requirement, or other operational
8 parameter that might be usefully determined by the
9 controller from the data stored by the data tag."

10 And so, this describes
11 characteristics -- well, the sentence above says
12 "described herein to determine at least one
13 operational parameter for the three-dimensional
14 printer based on at least one characteristic of
15 the build material."

16 So that would connect the operational
17 parameter, as we've been discussing, to
18 characteristics of the build material for
19 fabrication of the object, as cited in column 15,
20 starting line 14.

21 Q Is it your opinion that characteristics
22 of the build material, themselves, are operational

1 parameters?

2 A So it says right in the '466, column
3 15, starting, again, line 14 "described herein to
4 determine at least one operational parameter for
5 the three-dimensional printer based on at least
6 one characteristic of the build material."

7 Q Is it your opinion that characteristics
8 of the build materials, themselves, are
9 operational parameters?

10 A So the '466 patent states, column 15,
11 starting line 46, "As should be appreciated, the
12 controller may use any combination of data from
13 the data tag and a local or remote data store to
14 determine the operational parameters."

15 And so, in this discussion, as it says,
16 the controller uses any combination of data from a
17 data tag or a local remote to determine
18 operational parameters.

19 And so, the '466, in a lot of the
20 examples, cites determination of operational
21 parameters.

22 And I would have to consider this

1 connection between operational parameters, such as
2 build platform temperature, feed rate, cooling
3 parameters, build chamber heating parameters, and
4 so forth, I'd have to think about -- you know, of
5 course those parameters are derived from the build
6 material type.

7 But I'd have to think about that,
8 whether the build material type is an operational
9 parameter. I think a POSITA understands that a
10 build material type is just a name of a polymer,
11 like PLA, ABS, something like that.

12 And that name of the build material
13 type, that name is not an operational parameter
14 because it's just a name. We could -- the POSITA
15 could call it whatever they wanted. But within
16 that name, there are these characteristics of the
17 build material, where the controller can calculate
18 operational parameters from that name.

19 Q As you sit here today, do you have an
20 opinion on whether characteristics of the build
21 material are, themselves, operational parameters?

22 A So characteristics of the build

1 material is a property of the material, melting
2 temperature, something like that. You know,
3 viscosity. And so, those -- a POSITA would
4 understand those as characteristics of the build
5 material.

6 An operational parameter, as the '466
7 says, can be determined from the characteristics
8 of the build material. But I would have to think
9 of an instance, or I'd have to do some more
10 analysis where, like, a physical property or a
11 characteristic of that build material, that are
12 readily identifiable by what type of material it
13 is, whether that can be used exactly as an
14 operational parameter or, for instance, we have
15 lots of rules of thumb for, say, thermal plastic
16 printing, where the characteristics of the
17 material might be melting temperature at
18 180 degrees Celsius. And our rule of thumb is
19 that the operational parameter needs to be
20 30 degrees Celsius higher than the melting
21 temperature.

22 And so, I'd have to think about an

1 example where the characteristic of the build
2 material, for example, a physical property of the
3 build material, can be used as an operational
4 parameter.

5 I'd have to contemplate that a little
6 bit more.

7 Q I would like to direct your attention,
8 now, to column 24, and go down to claim 19 there.

9 Please let me know when you're there.

10 A Column 24, yeah. "A method comprising
11 providing a three-dimensional printer," that
12 starts claim 19.

13 Q Oh, apologies. I'll actually direct to
14 claim 17. So that starts on line 47.

15 A 17, "the method of claim 1 further
16 comprising," that's where we're at?

17 Q Correct.

18 A Yes, I'm there.

19 Q Can you see this claim 17 requires
20 further comprising performing a diagnostic test to
21 determine whether the one or more operational
22 parameters is suitable for the three-dimensional

1 printer?

2 Do you see that?

3 A Yes, I do.

4 Q What would a POSITA understand the term
5 "diagnostic test" to mean, in the context of the
6 '466 patent?

7 A So just looking at the '466, in column
8 15, line 53, the specification states "In another
9 aspect, the determination of operational
10 parameters may include preliminary diagnostic
11 tests, such as whether the diameter of the build
12 material, size of a build material pellet, build
13 material fluid viscosity, or the like is
14 appropriate for the three-dimensional printer.
15 Additional diagnostic test may be performed, such
16 as whether the correct build material is provided
17 on the supply, whether the correct color or color
18 lot build material is on the supply, or any other
19 appropriate preliminary diagnostic build material
20 test used to determine as a threshold matter,
21 whether a desired fabrication could be performed
22 with the supply 302."

1 So the specification gives a couple of
2 examples here about this diagnostic test, as
3 referred to in claim 17.

4 Q The color of a build material is not an
5 operational parameter; is that fair?

6 A So the color of a build material is,
7 certainly, a characteristic of the build material,
8 and we just discussed the correspondence between
9 characteristic of build material, which is readily
10 identifiable by its physical properties, and
11 operational parameter. I mean, if we just wanted
12 to talk about a plain-words example, there is no
13 operational parameter, say, red, for a
14 three-dimensional printer, that I know of, and red
15 would be a color or a characteristic of the build
16 material.

17 So that's one example that I think a
18 POSITA could understand, that unless the color of
19 a build material is connected to some other
20 physical property, like melting point or
21 viscosity, a POSITA could understand that the
22 color of the build material really doesn't matter

1 if you're going to print that material. There's a
2 lot of other physical properties of a build
3 material that are much more important for
4 determining these operational parameters.

5 Q Some of the opinions you provided in
6 your declaration were based on a reference named
7 Loughran; is that right?

8 A Yes, I know which reference you're
9 referring to. And if Loughran is the correct
10 pronunciation, I certainly know that reference.

11 Q I've put into the chat what is labeled
12 as Exhibit Number 1004.

13 (Exhibit 1004 previously marked for
14 identification and retained by counsel.)

15 Q Please let me know when you have it
16 pulled up.

17 A I have 1004 up, and that's Loughran.

18 Q You'll understand today that if I refer
19 to Loughran, that I'm talking about the reference
20 shown in Exhibit Number 1004; is that fair?

21 A That's fair. I get that.

22 Q Can you explain where, in Loughran, the

1 printer reads data from a tag on a build material
2 supply and then provides that tag data to a client
3 over a network?

4 A So, as I say in paragraph 30 of my
5 declaration, a couple sentences down, Loughran
6 discloses that after the SFF system reads the
7 material identifier tag, and that's in
8 Exhibit 4 -- excuse me, Exhibit 1004, paragraphs
9 21 and 33, the SFF system sends the material
10 identifier for the material to the client, as
11 indicated by the letter C -- C 122, shown in
12 Figure 1, and the client system may receive the
13 unique material identifier of the material from
14 the second SFF system, and that's in Exhibit 4,
15 28, and 38. And the remote client system 102 then
16 parses the information regarding the materials for
17 using it in the SFF fabrication job generation.
18 That's in paragraph 43.

19 And so, this is discussed in the
20 specification of -- or, sorry, in the text of
21 Loughran. It's in various places, as I've cited
22 in my declaration, but I think paragraph 47 of

1 Loughran discuss -- discusses this as well. The
2 communication mechanism 506 receives the unique
3 material identifier from the material container
4 110, containing the material, and that is
5 presented to the second SFF system.

6 So there's discussion in Loughran about
7 this idea of receiving a material and transmitting
8 it to another part of the system.

9 Q What is an SFF system?

10 A So SFF is -- well, it's an acronym for
11 solid free-form fabrication. It's a term of art
12 that, really, is synonymous with 3D printing or
13 additive manufacturing. So SFF is sort of a term
14 of art acronym. And if you say SFF, people -- a
15 POSITA, in general, would know that you're talking
16 about 3D printing.

17 Q So is an SFF a 3D printer? Is that
18 fair to say?

19 A I mean, you know, it depends how
20 expansive you want to say, you know, is it just
21 the hardware of the 3D printer or is an SFF
22 system, say, a computer or print server, plus the

1 3D printers, or network group of 3D printers. I
2 think an SFF system sort of implies that I could
3 be more than just a 3D printer sitting on a desk.

4 So a POSITA, you know, depending on the
5 context, a POSITA would understand if you're
6 talking about, say, a print bureau or a print
7 warehouse, or a manufacturing site, the SFF system
8 might be network 3D printers, plus clients, plus
9 lots of different things. Whereas, if you're
10 talking to an undergraduate and you talk about the
11 SFF system and point to a 3D printer on the desk,
12 a POSITA would understand sort of what the
13 discussion is about.

14 MR. BIENIUS: Counsel, we've been
15 going for a bit over an hour. Now might be a good
16 time for a break.

17 MR. TATUM: Sure. We can take a break
18 now.

19 MR. BIENIUS: Reconvene at 20 past?

20 MR. TATUM: That works.

21 THE WITNESS: That works for me. Thank
22 you.

1 (Recess taken from 11:11 a.m. to
2 11:19 a.m.)

3 BY MR. TATUM:

4 Q Dr. Hickner, in your previous answer,
5 you said that a POSITA would understand that if
6 you're talking about, say, a print bureau or a
7 print warehouse, or manufacturing site, the SFF
8 might be a network 3D, plus a lot of different
9 things, like clients and controllers.

10 Did I get that right?

11 A I think we were talking about an SFF
12 system. So, yeah, so that's right. So a system,
13 SFF system could be a collection of 3D printers or
14 again, as I said, if you're talking to an
15 undergraduate in a lab, the SFF system might just
16 be the 3D printer sitting right in front of them.
17 So I think when you call it an SFF system, it
18 depends on the context that a POSITA would
19 understand what you're talking about.

20 Q And in that context that you just
21 described, what would a POSITA understand to be
22 the client versus the controller?

1 A So in the Exhibit 1004, Loughran talks
2 about client devices in the context of what a
3 client is. And then, if we look at something like
4 Figure 1, where we have a second SFF system 102,
5 first SFF system 104, the controller -- either of
6 these could be clients, if there's requested info
7 or something like that.

8 But in these second SFF system or first
9 SFF system, there could be a controller that
10 controls that system. And so, the 1004 reference,
11 where Loughran doesn't really describe a
12 controller separate from the SFF system, it really
13 just discusses the client devices and the like
14 with information, or with other client devices of
15 users, things like that, in the Loughran patent.

16 Q Loughran teaches that the second SFF
17 system can be automatically and dynamically
18 adjusted using information retrieved from a
19 material information server, right?

20 A Yes, I believe that's referred to in
21 paragraph 24 of Loughran. It talks about this
22 automatically and dynamically adjusted aspect of

1 Loughran.

2 Q And this is describing the printer in
3 Loughran automatically and dynamically adjusting
4 its own operational parameters; is that right?

5 A Yeah, I think in paragraph 24 of the
6 reference, it states "The type and format of the
7 information retrieved by the second SFF system,
8 from the material information server, regarding
9 the material, can vary. For instance, the
10 information received by the second SFF system,
11 regarding the material, may include information in
12 a machine-readable format that is not readily
13 understood by users and by which the second SFF
14 system is automatically and dynamically adjusted
15 for utilization with the material. Such
16 information may include parameters of the
17 material, including, but not limited to, melting
18 temperature, storage temperature, minimum feature
19 size, horizontal and vertical shrinkage rates,
20 material lifetime interlayer delay time, and
21 amount of UV light required per layer, among other
22 parameters."

1 Q Are any of those parameters you just
2 listed operational parameters, as a POSITA would
3 understand the term in the '466 patent?

4 A So in paragraph 24, we were talking
5 about the material information server, and in
6 paragraph 25, Loughran, sort of halfway down the
7 paragraph, says "Thus, the information retrieved
8 from the material information server, which was
9 discussed in paragraph 24, regarding the material,
10 may be both information on which basis the second
11 SFF system dynamically adjusts its own parameters
12 for fabricating physical objects from the
13 material, as well as information intended for user
14 education. These parameters may include the
15 operating temperature that the second SFF system
16 needs to achieve to melt the material, the
17 temperature that the second SFF system needs to
18 maintain to store the material, the length of time
19 to wait after one layer of the material has been
20 fabricated before processing the next layer, and
21 so on."

22 And so, this passage, in paragraph 25,

1 refers to both material parameters and operating
2 parameters of where it says "these parameters may
3 include the operating temperature."

4 Operating temperature is, certainly, an
5 operating parameter.

6 Q And which items listed here would be
7 material parameters, as opposed to operating
8 parameters?

9 A So operating -- so just in regards to
10 this reference, and I'm looking at this passage in
11 paragraph 25, operating temperature is definitely
12 an operating parameter. As it says near the
13 bottom of paragraph 25, the temperature that the
14 second SFF system needs to maintain to store the
15 material, that's like a storage requirement, but
16 that's an operating parameter of the SFF system
17 for storage.

18 And then, this length of time to wait
19 after one layer of the material has been
20 fabricated for processing the next layer. So this
21 wait time can be related to an operating
22 parameter, where the printer or the SFF system

1 needs to pause, or something like that.

2 And so, these examples, at the bottom
3 of 25, a POSITA would understand that in the
4 context of operating parameters, these are
5 temperatures and lengths of time that dictate how
6 the SFF system operates.

7 Q And these are all parameters that are
8 dynamically adjusted by the SFF system itself,
9 right?

10 A So in paragraph 45 of the Loughran
11 reference, it says, near the bottom of that
12 column, paragraph 45, it says "The SFF mechanism
13 can fabricate the physical object from the
14 material since the parameters of the second SFF
15 system are dynamically adjustable based on the
16 information regarding the material retrieved from
17 the material information server." And so, these
18 parameters are particularly the parameters of the
19 SFF mechanism.

20 So this reference, just looking at it
21 on its own, talks about these dynamically
22 adjustable parameters.

1 Q Does Loughran ever discuss a client
2 transmitting to the printer a set of these
3 parameters we've been discussing that are selected
4 for use in controlling printer operation?

5 A So in paragraph 3 of the Loughran
6 reference, it talks about client devices and
7 updating SFF systems. And it says "Updating both
8 the SFF systems of SFF fabricators, as well as
9 client devices of users, can be a laborious
10 process. Typically, the SFF systems and sometimes
11 the client devices are hard coded with the
12 information of the material such that the
13 introduction of information regarding new
14 materials into the systems and the devices is
15 difficult to accomplish."

16 And so, this sentence is talking about
17 client devices holding material information?

18 Q Does Loughran ever discuss a client
19 transmitting to the printer a set of parameters
20 that are selected for use in controlling printer
21 operation?

22 A So in paragraph 12, just looking at

1 Loughran, it says halfway down the paragraph, or a
2 little bit more than halfway, "In some embodiments
3 of the invention, the first SFF system may be
4 considered a client to the second SFF system, in
5 that the first SFF system provides SFF jobs to the
6 second SFF system, and the second SFF system
7 fabricates these jobs."

8 So it talks about this client and
9 fabrication of jobs in Loughran.

10 Q Does Loughran ever discuss a client
11 transmitting, to the printer, a set of parameters
12 that are selected for use in controlling printer
13 operation?

14 A So in paragraph 43, Loughran states the
15 first SFF system may -- the first SFF system
16 further may verify the authenticity of the
17 information that has been retrieved in the same
18 manner as has been described in relation to the
19 second SFF system, verifying the authentication of
20 the information it receives, the first SFF system
21 stores the new material identifiers in the second
22 list, since they are now known to the first SFF

1 system, and stores the information regarding the
2 materials of these identifiers that has been
3 retrieved.

4 The first SFF system then parses the
5 information regarding the materials for using it
6 in SFF fabrication job generation. Periodically,
7 the first SFF system, like the second SFF system,
8 may update the stored information regarding the
9 material of each material identifier in the first
10 list and/or the second list so that the
11 information remains current.

12 So this paragraph 43 talks about this
13 issue of material information and updating the
14 information on materials in these SFF systems.

15 Q Does Loughran ever discuss a client
16 transmitting to the printer a set of parameters
17 that are selected for use in controlling printer
18 operation?

19 A So as I state in paragraph 63 of my
20 declaration, Loughran discloses that the client
21 system creates the CAD instructions for
22 fabricating the object, in part, based on

1 information about the material, including
2 operational parameters selected for use in
3 controlling the operation of the three-dimensional
4 printer or the SFF system when fabricating the
5 object using the material.

6 And so, a POSITA would have recognized
7 that based on this information from Loughran, it
8 would be useful to have specific tailoring. As I
9 say, a POSITA would have recognized that such
10 specific tailoring of the fabrication job to the
11 specific material provides, or at least renders
12 obvious, operational parameters for use in
13 controlling operation of the three-dimensional
14 printer when fabricating the object with the build
15 material.

16 Loughran also discloses that the
17 materials from which SFF systems of SFF
18 fabricators can fabricate physical objects can
19 have different type of information. For example,
20 melting temperature, storage temperature,
21 et cetera.

22 And so, a POSITA would have found it

1 obvious that to tailor these jobs, operational
2 parameters for use in controlling operation of the
3 three-dimensional printer would have been
4 advantageous.

5 Q Can you, please, point me to the
6 disclosure in Loughran where a client transmits to
7 the printer a set of parameters that are selected
8 for use in controlling printer operation?

9 A So as I discussed in my previous
10 answers, Loughran talks about transmission of
11 material properties and updating material
12 properties; that was in my previous answer.

13 And in my analysis of Loughran, like
14 I've described in paragraph 63, it would have been
15 obvious, based on -- obvious to a POSITA, that
16 specific tailoring of these jobs would have
17 required operational parameters for controlling
18 operation of the three-dimensional printer.

19 So in Loughran's discussion of these
20 material parameters, the next step would have been
21 obvious to a POSITA because the material
22 parameters are connected to the operating

1 parameters. The material parameters that you're
2 going to use in a printer are connected to the
3 operating parameters of the printer.

4 Q Does Loughran, at any point, say that
5 operational parameters are embedded in the
6 fabrication job itself?

7 A So this is described in paragraph 43 of
8 Loughran and, also, in my analysis, in paragraph
9 63, near the bottom. I say in my declaration,
10 paragraph 63, Loughran's client system parses the
11 information regarding the materials for using it
12 in SFF fabrication job generation, a cite to
13 paragraph 43. And I go on to say, "That is,
14 Loughran's client system develops parameters for
15 melting temperature, melting time, storage
16 temperature, feature sizes and other aspects of
17 the fabrication job based on the specific build
18 material or materials being used in the
19 fabrication process."

20 Q What is your support in Loughran for
21 the final sentence that you just said?

22 A So in paragraph 37 of Loughran, it

1 states "The second SFF system parses the retrieved
2 information regarding the material to, for
3 instance, extract parameters regarding the
4 material and dynamically adjust its own parameters
5 based on parameters extracted. For example, if
6 the information retrieved in Extensible Markup
7 Language format, the second SFF system parses the
8 XML-formatted information to extract the
9 parameters regarding the material," so that's
10 talking about the material, "contained therein.
11 These parameters regarding the material are
12 employed by the second SFF system to adjust its
13 own parameters so that the physical objects can be
14 properly fabricated from the material as can be
15 appreciated by those of ordinary skill in the
16 art."

17 So this material -- this paragraph, 37,
18 connects the material parameters to the adjustment
19 of the second SFF system, adjusts its own
20 parameters so that the physical objects can be
21 properly fabricated from the material.

22 So this is a connection between

1 material and these -- adjusting the parameters of
2 the second SFF system.

3 Q The adjustments to the parameters of
4 the second SFF system described in this paragraph
5 are not contained in the fabrication job, right?

6 A So in paragraph 55 of Loughran, it says
7 "The CAD software generates SFF fabrication job
8 for fabrication from a specific material based on
9 the information regarding that material, which has
10 been received. The CAD software then sends the
11 SFF fabrication job to the second SFF system over
12 the network via the communication mechanism of the
13 first SFF system."

14 So this connects specific material to a
15 fabrication job.

16 Q The final sentence of paragraph 37,
17 that you pointed us to, reads "The adjustment is
18 dynamic in that it can occur while the second SFF
19 system 104 is running without having to reboot the
20 second SFF system 104 and can also occur without
21 user intervention and involvement."

22 Do you see that?

1 A Yes, I do.

2 Q You would agree that if the adjustment
3 is dynamic and can occur while the system is
4 running, the information for that adjustment is
5 not contained in the fabrication job that is sent
6 to start the print, right?

7 A Oh, I see what you're saying. So once
8 the job is sent, the second SFF system just does
9 its own thing in dynamically adjusting without any
10 other jobs being sent or anything like that.

11 Q In the dynamic adjustment that the
12 second SFF system is doing, it's not based on
13 information received in the fabrication job,
14 right?

15 A So the adjustment -- this dynamic
16 adjustment has to start somewhere. And so, that
17 starting point is in the fabrication job. I mean,
18 you know, there needs to be a job sent. You know,
19 this sentence does say without user intervention,
20 okay, so this is just the system working by
21 itself. But the adjustment, at least in terms of
22 thinking about dynamically adjusting parameters or

1 tuning parameters, a POSITA knows that you have to
2 start from somewhere, and then adjust from there.
3 And in Loughran, the adjustment is performed based
4 on where the system starts from, which is
5 specified in the job.

6 Q If the operational parameters were
7 included in the fabrication job, why would any
8 dynamic adjustments need to be made during the
9 course of the job?

10 A So Loughran says, in paragraph 48, "The
11 SFF mechanism is then able to dynamically adjust
12 its parameters based on this information so that
13 the physical objects can be fabricated from the
14 material."

15 And so, this dynamic adjustment, as
16 described by Loughran, talks about -- well, I
17 mean, this is in paragraph 24 -- is automatically
18 and dynamically adjusted for utilization with the
19 material.

20 So this is the -- speaks to utilization
21 of the material in the SFF system, where this
22 dynamic adjustment is occurring.

1 Q And that dynamic adjustment is
2 happening based on information received from the
3 material information server, right?

4 A I mean, in one example, in paragraph
5 35, Loughran says the information regarding the
6 material is then downloaded from the material
7 information server, so that's certainly described
8 in Loughran.

9 Q You'd agree that information obtained
10 from a material information server and a
11 fabrication job are different things, right?

12 A I mean, I think in plain language, just
13 as you said, a POSITA would understand, you know,
14 material information from a server is just
15 material information that can be displayed, and
16 then a fabrication job is what we've been talking
17 about, in terms of a client requesting a 3D
18 printer to print something that would be more akin
19 to a fabrication job. So I think that they can be
20 different things.

21 Q And you've identified some instances in
22 Loughran where it describes dynamically adjusting

1 the printer parameters based on information
2 received from a material information server,
3 right?

4 A So most of the passages in Loughran
5 talk about this material information server
6 holding the parameters. I'd have to look more
7 closely, if there's anywhere else regarding the
8 material information (indiscernible), but in lots
9 of examples, it does talk about dynamically
10 adjusting its own parameters based on parameters
11 extracted from the material information server.

12 Q And as you sit here today, are you
13 aware of any passages of Loughran that instead
14 describe determining the operational parameters,
15 packaging them as part of the fabrication job, and
16 then sending that to the printer?

17 A So in paragraph 43 in Loughran, halfway
18 down, it does state, "The first SFF system then
19 parses the information regarding the materials for
20 using it in SFF fabrication job generation."

21 So this sentence talks about using
22 information of the materials for SFF fabrication

1 job generation.

2 Q Is there any disclosure in Loughran
3 that after parsing information regarding
4 materials, operational parameters are then
5 determined and included in a fabrication job that
6 is, then, sent to another printer?

7 A So in paragraph 63, in my declaration,
8 in the analysis of Loughran, I say that, halfway
9 down the paragraph, "Loughran also discloses that;
10 'the materials from which SFF systems of SFF
11 fabricators can fabricate physical objects can
12 have different types of information, for example,
13 melting temperature, storage temperature, minimum
14 feature size, horizontal and vertical shrinkage
15 rates, material lifetime, inter-layer delay time,
16 and amount of ultraviolet light required per
17 layer, among other types of information, can vary
18 from material to material.'" "

19 So that's in paragraph 2 of Loughran.
20 And then, as we're discussing in paragraph 43, I
21 go on to say in my analysis, "Loughran's client
22 system parses the information regarding the

1 materials for using it in SFF fabrication job
2 generation."

3 So that's the connection between the
4 materials and how they're used, or the melting
5 temperature, UV light required per layer, and the
6 fabrication job generation.

7 Q Some of the opinions you provided in
8 the declaration were based on a reference named
9 Dubois; is that right?

10 A That's correct, yes.

11 Q I've put into the chat what is labeled
12 as Exhibit Number 1005.

13 Please let me know when you have it
14 pulled up.

15 A I have Exhibit 1005 pulled up, and that
16 is the patent by Dubois.

17 Q You understand that if I refer to
18 Dubois today that I'm talking about the reference
19 shown in Exhibit 1005?

20 A Yes, I understand that.

21 Q Can you identify the passages in Dubois
22 describing where the optimum values of printing

1 parameters are stored and/or determined?

2 A So in one instance of Dubois's
3 discussing this is paragraphs 81 and 82. It says,
4 starting in paragraph 81 at the bottom, "These
5 ranges are determined in such a way that whatever
6 the value of printing parameters select therein,
7 the static properties desired for the object are
8 satisfied under predetermined deposition
9 conditions."

10 And then it goes on to say, in
11 paragraph 82, "These ranges of parameters can
12 originate from earlier investigations, can be
13 stored in a database, and can be loaded during or
14 prior to the slicing stage."

15 So that's talking about the parameters
16 and storage in Dubois.

17 Q And where does this database sit in
18 relation to the printer in Dubois?

19 A So in paragraph 148 of Dubois, it
20 states "A computation unit, 198, adapted in
21 particular to cut up 3D representation of the
22 component to be produced into characteristics

1 objects has, as its input, said 3D representation.
2 The product specification of the component
3 parameterized in the form of digital data and is
4 connected to a database 199. The database 199
5 contains all of the results."

6 So if we go look up at the figure for
7 198 and 199, which is Figure 6, it talks about the
8 relation of the computational unit and the
9 database. It really doesn't describe any sort of
10 physical arrangement between the computation unit
11 and the database, but it shows them sort of
12 schematically, in that figure.

13 Q Does Dubois describe a remote CAD
14 client selecting and sending printer control
15 parameters to a printer over a network?

16 A So Dubois, as I say in my overview
17 paragraph on -- sorry, in my declaration, in
18 paragraph 32, Dubois describes a method and a
19 device for producing three-dimensional
20 multi-material components by inkjet printing of
21 successive layers. So Dubois doesn't really talk
22 about clients and networks, and things like that,

1 it's more concerned with this sort of production
2 of a component by this 3D representation.

3 Q How would a POSITA have to change the
4 system of Loughran to implement the teachings of
5 Dubois that you point to?

6 A So as I say in paragraph 45 of my
7 declaration, based on my knowledge and experience
8 in the field, and my review of Loughran and
9 Dubois, by the relatively late time frame leading
10 up to 2012, it is clear that a POSITA would have
11 been motivated to implement Loughran's SFF system,
12 based on the suggestions of Dubois to include
13 additional functionality of sending the
14 fabrication job from the CAD client, using CAD
15 information that includes printing parameters
16 concerning the state of characteristics of the
17 materials for purposes of achieving several known
18 benefits that all articulate in further detail
19 below.

20 "Such an implementation of Loughran's
21 system, based on the teachings of Dubois, would
22 have enabled to resulting system to complete each

1 fabrication job based on CAD information with the
2 optimal set of material parameters. A POSITA
3 would have also been motivated to make this
4 predictable combination to provide a 3D printing
5 method in which the 3D printer would readily
6 identify and correct printing errors," such as I
7 detail below.

8 And so, then I go into the reasons that
9 a POSITA would make this combination, and none of
10 those reasons include modifying Loughran's
11 functionality. It's really incorporating Dubois'
12 teaching into Loughran.

13 Q How would a POSITA incorporate Dubois'
14 teaching into Loughran without modifying any of
15 Loughran's functionality?

16 A So in paragraph 46, I continue "As I
17 discussed above, Loughran's client computer sends
18 fabrication job through the network to the SFF
19 printer. These fabrication jobs include CAD
20 information, and the POSITA would have" been
21 beneficially -- "and a POSITA would have
22 beneficially applied Dubois's suggestions to the

1 system of Loughran such that the CAD information
2 additionally includes operational parameters, as
3 suggested by Dubois. As such, in the resulting
4 system, the SFF printer receives information that
5 is specific to an individual fabrication job, such
6 that the fabrication job is conducted using
7 'optimum values of printing parameters, such as a
8 function of the nature of materials, the
9 characteristics of the printer, and deposition
10 conditions.'"

11 And that refers to paragraph 148 in
12 Dubois.

13 I go on to say "It is apparent from
14 Dubois's teachings that 'the quality of the object
15 to be produced depends on all the related
16 parameters which are representative of the nature
17 of the materials used, the properties of the
18 printer, and the computer-aided design.'"

19 And so, this is where it's beneficial
20 to combine Dubois' teachings into the system of
21 Loughran.

22 Q In the combination you proposed, how

1 would Loughran's remote CAD client retain the
2 characteristics and deposition condition inputs
3 that Dubois uses to determine optimum values?

4 A Can you ask that question again,
5 please?

6 Q Sure. In the combination you proposed
7 of Loughran and Dubois, how would Loughran
8 obtain -- strike that.

9 In the combination of Loughran and
10 Dubois, how would Loughran's remote CAD client
11 obtain the printer characteristics and deposition
12 condition inputs that Dubois uses to determine
13 optimum values?

14 A So in Loughran's system, if you look --
15 or in Loughran's reference, if you look at
16 Figure 1, the components of the system are all
17 networked together. And so, given the network
18 nature of Loughran in this SFF system, a POSITA
19 would have understood how these different
20 components communicate with one another.

21 And so, I think through the network,
22 this information could be passed, for instance,

1 the -- just as you said, information concerning
2 operating parameters from Dubois could have been
3 passed through the network to be obtained by one
4 of the components of the SFF system from Loughran.

5 Q Dubois relies on printer
6 characteristics and deposition condition inputs to
7 determine its optimum values, right?

8 A So, for instance, in paragraph 28 of
9 Dubois -- sorry, I lost my place. In paragraph 28
10 of Dubois, it says "Establishing a spatial and
11 temporal sequencing law for the print path for
12 said print layers and for said discrete spatial
13 trajectories as a function of the objects, their
14 relative three-dimensional arrangement, and the
15 characteristics of the printer in order to
16 optimize the process of depositing each print
17 layer."

18 So that connects characteristics of the
19 printer to these optimal parameters.

20 Q If you want to scroll down to
21 paragraph 148 and then read the final sentence
22 there, and let me know when you've done so.

1 A Yes, I've read the final sentence in
2 paragraph 148.

3 Q In paragraph 148 of Dubois, describes
4 that the choice of optimum values of printing
5 parameters are a function of the nature of the
6 materials, the characteristics of the printer, and
7 the deposition conditions, right?

8 A Yes, I see that. That's the last
9 sentence in paragraph 148.

10 Q And your proposed combination of
11 Loughran and Dubois would import these optimum
12 values into the combined system, right?

13 A So, as I said in paragraph 45 of my
14 declaration, a POSITA would have been motivated to
15 implement Loughran's SFF system based on the
16 suggestions of Dubois to include additional
17 functionality of sending the fabrication job from
18 the CAD client, using CAD information that
19 includes parameters concerning the state or
20 characteristics of the materials for purposes of
21 achieving several known benefits, which I state
22 below.

1 Q In the following paragraph you state,
2 "As such, in the resulting system, the SFF printer
3 104 receives information that is specific to an
4 individual fabrication job such that the
5 fabrication job is conducted using optimum values
6 of printing parameters," and then it goes on, and
7 you're quoting Dubois there, correct?

8 A That's correct. That's paragraph 48 in
9 Dubois.

10 Q And as we just discussed, those optimum
11 values of printing parameters are determined as a
12 function of the nature of the materials, the
13 characteristics of the printer, and the deposition
14 conditions, right?

15 A Yes. That's what Dubois says.

16 Q So then my question is, in the
17 combination you propose, how would Loughran's
18 remote CAD client obtain the printer
19 characteristics and deposition condition inputs
20 that Dubois uses to determine the optimum values?

21 A So as I responded previously, in
22 Figure 1 of Loughran, the SFF -- the second SFF

1 system, first SFF system, those are all networked
2 together. And so, information can be passed
3 between those units of Loughran through the
4 network, including the information that Dubois
5 indicates in paragraph 148.

6 Q Can you describe that information flow
7 in your proposed combination?

8 A Oh, like a physical example? So taking
9 Figure 1 from Loughran and then modifying it in a
10 way to sort of pictorially show the combination?

11 Is that what you're asking for?

12 Q What I'm trying to understand is how
13 your proposed combination, that puts Loughran and
14 Dubois together, would work, essentially.

15 And so, whatever data flow needs to
16 happen between printer and (indiscernible) CAD
17 client, that's what I'm asking about.

18 What is the data flow in your proposed
19 combination?

20 A So I didn't propose -- in my analysis,
21 I didn't propose a specific data flow or a
22 specific arrangement of components between

1 Loughran and Dubois. But I did analyze, in
2 paragraph 48, I say "Loughran and Dubois are
3 directed towards highly similar subject matter,
4 three-dimensional printing, and then in light of
5 these similarities, a POSITA would have possessed
6 ample skill to successfully implement the
7 combination as I've described it above."

8 So I didn't -- I didn't propose a
9 physical arrangement or a data flow, or anything
10 like that. But because Loughran and Dubois are
11 talking about very similar subject matter, it
12 would be apparent to a POSITA to implement this
13 combination. And such an implementation of
14 Loughran's SFF jobs and SFF system, based on
15 Dubois's suggested techniques, would have been
16 merely the application of known techniques to a
17 known system, ready for improvement to yield
18 predictable results.

19 Based on my knowledge and experience in
20 this field and my review of Loughran and Dubois,
21 I'm confident a POSITA would have recognized that
22 this modification would have yielded predictable

1 results and required only routine adjustments to
2 the software to provide the additional
3 functionality disclosed by Dubois, and as such, a
4 POSITA would have had a reasonable expectation of
5 success in making such modifications.

6 So I didn't propose a schematic. I
7 didn't propose an example. But my analysis of
8 Loughran and Dubois and the combination and
9 expectation of success is detailed in paragraph 48
10 of my declaration.

11 Q So you contend that the combination of
12 Loughran and Dubois would yield predictable
13 results. But as you sit here today, you're not
14 able to describe what that predictable result
15 would be?

16 MR. BISENIUS: Sorry. Objection.
17 Form.

18 A So, as I say in paragraph 47 of my
19 analysis, as such, a POSITA would have recognized
20 that implementing Loughran's system, based on the
21 suggestions of Dubois to include the additional
22 printing parameters disclosed by Dubois, based on

1 the identified material used in the fabrication
2 job, in Loughran's SFF fabrication job
3 information, would have provided for optimal use
4 of the various functions of the printer based on
5 the nature of the materials in the printer.

6 As such, a POSITA would have recognized
7 the benefits of including printing parameters
8 concerning the state or characteristics of the
9 material, along with the CAD information in
10 Loughran's fabrication jobs to improve the system.

11 So it's clear that the Loughran system
12 would have been improved by modification with
13 Dubois' suggested techniques. I didn't provide a
14 network analysis or an information flow example,
15 or anything like that, but because these
16 references are talking about a very similar
17 subject matter, as I say in my declaration in
18 paragraph 48, a POSITA would have recognized that
19 this modification would have yielded predictable
20 results and required only routine adjustments to
21 the software to provide the additional
22 functionality disclosed by Dubois. And as such, a

1 POSITA would have a reasonable expectation of
2 success in making such modifications.

3 So because we're in a networked
4 environment of Loughran, it's within a POSITA's
5 understanding to rearrange the components of that
6 network or dictate the information flow based on
7 what Loughran shows in Figure 1.

8 Q So it's your testimony that a POSITA
9 would just inherently understand how to rearrange
10 any components or any information flow, as long as
11 it's within a networked environment?

12 A So we've been talking about Loughran,
13 how would that modification of Loughran occur?

14 So Figure 1 in Loughran shows this
15 networked environment. We've also been talking
16 about 3D printers and clients, and it's routine
17 for a POSITA to be able to modify software. I
18 mean, that was performed often in the early 2010s,
19 and, as I say, by the late time frame of 2012,
20 which I used in my analysis, that printer software
21 and how printers were connected to computers, and
22 how print servers were connected to printers, I

1 mean, that was all known by a POSITA at this time.

2 And so, modification of Loughran's
3 Figure 1, in order to include the teachings of
4 Dubois, a POSITA would have understood how to do
5 that because the networking of printers and
6 computers, like I said, was a well-known -- a
7 well-known activity at this time, in 3D printing.

8 Q Why wouldn't a POSITA simply
9 incorporate Dubois' optimum values on Loughran's
10 printer, just like Loughran dynamically adjusts
11 its operational -- or its parameters based on the
12 material information from the material
13 identification server?

14 A Oh, so you're proposing to take these
15 optimum values from Dubois and just put them into
16 the information server in Loughran, rather than in
17 a networked environment?

18 Or I don't necessarily understand
19 exactly what you want to do.

20 Q That's okay. We can come back to that.
21 What specific deficiency in Loughran
22 does Dubois allegedly solve, given that Loughran

1 already teaches obtaining material information and
2 dynamically adjusting the printer?

3 A So as I say in my analysis in paragraph
4 47, "As expressly discussed by Dubois, it is
5 important to control the nature of the materials
6 in the printer in order to provide materials
7 having the property required for printing and to
8 use the various functions of the printer
9 optimally." That's discussed in Dubois. "As
10 such, a POSITA would have recognized that
11 implementing Loughran's system based on the
12 suggestions of Dubois to include the additional
13 printing parameters disclosed by Dubois, based on
14 the identified material used for the fabrication
15 job in Loughran's SFF fabrication job information,
16 would have provided for optimal use of the various
17 functions of the printer based on the nature of
18 the materials in the printer. As such, a POSITA
19 would have recognized the benefits of using
20 printing parameters concerning the state or
21 characteristics of the materials along with the
22 CAD information in Loughran's fabrication jobs to

1 improve the system." A POSITA would have also --
2 would also have recognized that including the
3 functionality for correcting printing errors,
4 which we haven't talked about, describe by Dubois
5 in the system of Loughran, would have resulted in
6 optimal outcomes by allowing the resulting system
7 to correct for such identified errors.

8 And so, Loughran can still do its job
9 of dynamically adjusting while Dubois -- Dubois'
10 teaching is providing these optimum parameters
11 and, also, this additional functionality of
12 errors, as we talked about.

13 Q So in your proposed combination of
14 Loughran and Dubois, that system is still
15 dynamically adjusting its parameters for
16 operation, based on information received from a
17 material identification server?

18 A I mean, I think that Loughran's
19 automatically and dynamically adjusting still
20 could be incorporated in this. All that Dubois is
21 doing is providing these optimal parameters and
22 additional parameters not described by Loughran.

1 But that doesn't prevent Loughran's system from
2 still dynamically adjusting based on -- based on
3 Loughran's disclosure.

4 Q In your proposed combination, what
5 happens where one of the optimum parameters from
6 Dubois is the same as one of the parameters that
7 Loughran is dynamically adjusting, based on
8 information received from the material
9 identification server?

10 A I mean, I'd have to think about how
11 exactly Dubois -- if we're just talking about the
12 material information server from Loughran, like I
13 said, I'd have to think about the exact
14 arrangement or information flow, but, of course,
15 some printing parameters, like, say, you know,
16 extrusion temperature, or something like that, I
17 think that those parameters, that are both
18 discussed by Dubois and Loughran, yeah, I don't
19 think there's a conflict between those systems
20 discussing similar parameters.

21 And this would come out in the
22 implementation, where the network arrangement and

1 information flow would have to be worked out by a
2 POSITA in order to make this combination. I don't
3 think there's any conflict there.

4 Q But as you sit here today, you've not
5 considered or worked out the implementation of
6 this network arrangement and information flow to
7 ensure that there would not be a conflict there?

8 A Yeah, as I said in my declaration, in
9 paragraph 48, Loughran and Dubois are directed
10 towards highly similar subject matter. And so, a
11 POSITA is familiar with this networked
12 environment. A POSITA would have the skill to
13 modify software or to implement Loughran based on
14 Dubois' suggested techniques.

15 And so, that was a very common activity
16 in the late aughts or early 2010. I mean, we, in
17 my own work, networked printers all the time and
18 modify software, and did things that were similar
19 in sort of the implementation to what I described
20 in my analysis of the combination of Loughran and
21 Dubois. So that would be well within a POSITA's
22 understanding of how to do that.

1 Q As you sit here today, you've not
2 considered or worked out the implementation of
3 this network arrangement and information flow to
4 ensure that there would not be a conflict in the
5 combination of Loughran and Dubois, right?

6 A What I did was, I analyzed the --
7 Loughran and Dubois, and I analyzed the
8 expectation of success that a POSITA would have.
9 But I didn't propose, in my declaration, I didn't
10 propose a new network arrangement or I didn't
11 propose an information flow.

12 I could perform that analysis, if
13 asked, based on a POSITA's knowledge at the time.
14 But I did not perform that detailed analysis in my
15 declaration.

16 MR. BIENIUS: Counsel, we've been
17 going about an hour and a half since the last
18 break. Would now be an okay time to take a break?

19 MR. TATUM: Yeah. We can take a break
20 now.

21 MR. BIENIUS: Should we reconvene on
22 the hour?

1 MR. TATUM: That works fine.

2 THE WITNESS: That works for me.

3 (Recess taken from 12:48 p.m. to
4 12:59 p.m.)

5 BY MR. TATUM:

6 Q Dr. Hickner, how did you determine
7 whether a reference was analogous art to the '466
8 patent.

9 A So, when I was looking for prior art,
10 of course, I considered the priority date of the
11 '466 patent, and as I understand, the term
12 analogous art really refers to prior art in the
13 same field, say, solid free-form fabrication, as
14 we talked about, or 3D printing or additive
15 manufacturing or, in some cases, a lot of
16 information from, say, machining or 2D printing
17 has also been used in 3D printing or additive
18 manufacturing.

19 So in order to determine analogous art
20 or prior art in the references in the same field,
21 I relied on my experience with additive
22 manufacturing and the development of additive

1 manufacturing, in terms of what information
2 sources are drawn upon that have helped to build
3 up the additive manufacturing ecosystem.

4 Q You said when you were looking for
5 prior art? Did you identify the references
6 asserted in this IPR or did somebody else?

7 A So I collaborated with counsel on the
8 declaration for this IPR, and I found some
9 references, counsel suggested some references.

10 But I evaluated all the references, in
11 terms of prior art for this IPR.

12 Q Which references did you find?

13 A I didn't denote which references I
14 found. I'd have to look back at my notes. I
15 don't recall the specific ones I found versus ones
16 that were suggested to me. I don't have that
17 information with me right now.

18 But as I said, I identified some
19 references, counsel identified some. But
20 evaluated all of the prior art references and
21 analyzed them in my declaration.

22 Q Some of the opinions you provided in

1 your declaration were based on a reference named
2 Jazayeri, right?

3 A That's correct, yes.

4 Q I've put in the chat what is labeled as
5 Exhibit Number 1010.

6 Please let me know when you have that
7 pulled up.

8 (Exhibit 1010 previously marked for
9 identification and retained by counsel.)

10 A Yes, I have Exhibit 1010, Jazayeri,
11 pulled up on my computer.

12 Q And you understand that if I refer to
13 Jazayeri today that I'm talking about the
14 reference shown in Exhibit Number 1010, right?

15 A I understand that, yes.

16 Q Now, in your declaration you represent
17 Ground 1B, which includes Jazayeri, as an
18 alternative to Ground 1A, to the extent Loughran's
19 fabrication job is not, itself, a request; is that
20 right?

21 A So in paragraph 93 of my declaration, I
22 discuss this Ground 1B, which talks about the

1 combination of Loughran, Dubois, and Jazayeri.
2 And so, my prior analysis of Ground 1A holds, and
3 I incorporate the teachings of Jazayeri,
4 specifically in regards to the claims as I
5 discussed in Ground 1B.

6 Q Other than claim element 1b, your
7 analysis for Ground 1B is identical to Ground 1A;
8 is that right?

9 A So, as I say in paragraph 93 of my
10 declaration, "As such, I incorporate my prior
11 analysis of Ground 1A into Ground 1B." And "The
12 predictable implementation of Jazayeri's
13 suggestion does not disturb the aspects of
14 Loughran and Dubois mapped to the other claim
15 elements," outside of 1b.

16 Q So other than claim element 1b your
17 element to Ground 1B are identical to Ground 1A,
18 right?

19 A Yes, that's what paragraph 93 says.

20 Q I would like to direct your attention
21 down to paragraph 94. And you'll see the second
22 sentence there says "To the extent that Loughran's

1 SFF fabrication job is not considered a request to
2 fabricate an object on the three-dimensional
3 printer, a POSITA would have found it obvious and
4 beneficial" for the system -- for the SFF system
5 104 to receive a request prior to receiving the
6 SFF fabrication job, based on the additional
7 suggestions of Jazayeri.

8 Do you see that?

9 A Yes, I do.

10 Q Is it your opinion that Loughran's
11 fabrication job already constitutes a request to
12 fabricate an object on the three-dimensional
13 printer?

14 A So in my analysis of claim 1b, in
15 paragraph 53, I say that "Loughran also discloses
16 that the client sends a request to fabricate an
17 object on the three-dimensional printer to the
18 first SFF system." For example, Loughran's SFF
19 system three-dimensional printer may also be
20 referred to as an SFF server system that receives
21 SFF fabrication jobs from client, such as client
22 system 102, and fabricates SFF jobs received from

1 the client system 102.

2 So a POSITA would have understood that,
3 in this context, the transmission of a fabrication
4 job from the client system to SFF system is a
5 request to fabricate the object defined by the
6 fabrication job.

7 Q If that's the case, then why does
8 Ground 1B need Jazayeri at all?

9 A So my analysis on this, with Jazayeri,
10 is described in paragraphs 94 and 95 of my
11 declaration. And in 94, I say, "As I discussed
12 above in Ground 1A, element 1b, Loughran's SFF
13 system may also be referred to as an SFF server
14 that receives SFF fabrication jobs from clients,
15 such as the client system 102 and fabricates SFF
16 jobs received from the client system," and that's
17 described in Loughran.

18 And so, I added this extra ground, or I
19 added the Jazayeri modification, as described in
20 paragraph 94, to the extent that Loughran's SFF
21 fabrication job is not considered a request to
22 fabricate an object on the three-dimensional

1 printer, which is Loughran's SFF system 104. A
2 POSITA would have found it obvious and beneficial
3 for the SFF system to receive a request prior to
4 receiving the SFF fabrication job, based on the
5 additional suggestions of Jazayeri.

6 And I go on in my analysis, in
7 paragraph 95, to say "For example, Jazayeri
8 describes a print server, including an application
9 manager that receives 'a print request over a
10 network from an application executing on a
11 device,' which includes 'virtually any computing
12 device from which a user may wish to execute a
13 print job, such as a laptop or desktop computer, a
14 netbook, tablet computer, smartphone, or any
15 device which may store, have access to data which
16 the user may desire to print.'"

17 So this modification, as I go on to say
18 in paragraph 96, multiple reasons would have
19 prompted a POSITA to apply the teachings of
20 Jazayeri to the system of Loughran, as modified
21 Dubois, such that the resulting system includes
22 the functionality of the Jazayeri print server as

1 a part of Loughran's system.

2 Q Jazayeri describes document printing
3 print characteristics, like paper size,
4 orientation, and number of copies, right?

5 A I think some of those characteristics
6 are described in paragraph 36. I focused on the
7 print server part of Jazayeri, but Jazayeri
8 alludes to those characteristics that you just
9 stated, yes.

10 Q And you cite Jazayeri's paragraph 36 in
11 paragraph 95 of your report, right?

12 A So in paragraph 95 of my report, I
13 start, "For example, Jazayeri describes a print
14 server, including an application manager that
15 receives 'a print request over a network from an
16 application executing on a device,' which includes
17 'virtually any computing device from which a user
18 may wish to execute a job, such as a laptop or
19 desktop computer, a netbook, a tablet computer, a
20 smartphone, a camera, or any device which may
21 store or have access to data which the user may
22 desire to print' and executes an application

1 'which provides the user with a rendering of data
2 which the user may wish to print.'"

3 And so, that's in Jazayeri, the
4 abstract, paragraphs 8 through 10, 19 through 21,
5 and 36 as well, the citation that we're talking
6 about.

7 Q Can you, please, point me to the
8 paragraph, or paragraphs, in Jazayeri that teach
9 that a three-dimensional printer, as opposed to a
10 print server, receives a request?

11 A So in Jazayeri, I focused on the print
12 server and print request functionality of
13 Jazayeri. For instance, in paragraph 66 it states
14 "In the example of Figure 2, a print request may
15 be received at a server over a network and from an
16 application executing on a device. For example,
17 as described above, the application manager may
18 receive a print request from a user of the
19 application, executing on the device or of the
20 application executing on the application server or
21 of the application of the device. The print
22 request may be received over the network using an

1 API that is common to the application."

2 So I really focused on the print server
3 and request of Jazayeri in my modification.

4 Q As you sit here today, can you identify
5 any place in Jazayeri where it talks about
6 receiving a request from a client over a network
7 to fabricate an object on a three-dimensional
8 printer?

9 A So as we discussed before, in 3D
10 printing, there's been lots of information used
11 from related fields, like printing, like
12 machining, which uses G code, things that really
13 inform the development of 3D prints. And so, in
14 my description of Jazayeri, and how I used this
15 reference, in paragraph 35, I said "Jazayeri
16 generally 'relates to printing.'" In Figure 1,
17 Jazayeri shows a print server which provides
18 printing capabilities over a network to a device
19 which includes virtually any computing device from
20 which a user may wish to execute a print job.

21 And so, I used the print server and
22 printing-related functionality of Jazayeri to

1 modify the 3D printer or the SFF system of
2 Loughran with Dubois' modification as well.

3 Q I understand, Dr. Hickner, that you've
4 taken some of these references and done things
5 with them or have your interpretations of them.

6 My question is much more narrow, and it
7 is, as you sit here today, can you identify any
8 place in the Jazayeri document where it talks
9 about receiving a request from a client over a
10 network to fabricate an object on a
11 three-dimensional printer?

12 A So in the abstract of Jazayeri, it
13 states "A print server may include an application
14 manager configured to receive a print request over
15 a network from an application executing on a
16 device and configured to provide, over the
17 network, a print dialogue to user of the
18 application. The print dialogue configured to
19 provide for a selection of at least one printer
20 associated with the user account of the user and
21 thereafter receive a selected printer from the
22 selection."

1 So Jazayeri uses printer because it
2 relates, in general, to printing.

3 Q You'd agree that Jazayeri explicitly
4 talks about 2D printing in some places, right?

5 A In some places of Jazayeri, say, in
6 paragraph 36, it talks about color versus black
7 and white, paper size, orientation, number of
8 copies. And so, there -- those are
9 characteristics of, let's say, 2D printing. But
10 as I said before, in the development of 3D
11 printing technology, there's been lots of drawing
12 from machining, printing. In fact, we use -- in
13 my lab, we use a DLP chip, which is a type of 2D
14 print chip in order to stack three-dimensional
15 layers. And so, Jazayeri is focused on printers
16 in general, but does provide some examples of
17 things that are important to 2D printing, if you
18 want to put it that way.

19 Q Is there any place in Jazayeri where it
20 mentions three-dimensional printing?

21 A There's only mention of printing in
22 Jazayeri. It doesn't explicitly say

1 three-dimensional printing.

2 Q What is the '466 patent's field of
3 endeavor?

4 A So in my declaration, in paragraph 26,
5 I say "The '466 patent describes 'methods and
6 systems for the automatic detection and acquiring
7 of three-dimensional printer build material
8 characteristics.'" So the field of endeavor is
9 really discussing printer build material
10 characteristics and 3D printers.

11 Q Jazayeri is not directed to 3D printing
12 or build material characteristics, right?

13 A Jazayeri's directed towards printing
14 and print servers and print jobs, and that is
15 analogous to how we understand networked 3D
16 printers. I mean, Jazayeri is -- does say a print
17 server request over the network. So it talks
18 about printing in general.

19 Q What is the problem addressed by the
20 '466 patent?

21 A So in the abstract of the '466 patent,
22 the patent, the abstract says "A supply of build

1 materials, such as the spool or cartridge, is
2 instrumented with the data tag that includes
3 information about the build material. A
4 three-dimensional printer can read the information
5 from the tag and determine how to use the build
6 material during the fabrication of a
7 three-dimensional object."

8 And then in the background of the
9 patent, after the figures, it says, "In general,
10 three-dimensional printers use build material of
11 various type and configuration to print
12 three-dimensional objects. In order to properly
13 process the build material through the
14 three-dimensional printer, a printer extruder for
15 the fabrication of an object, the
16 three-dimensional printer controller may need at
17 least a basic set of characteristics of the build
18 material to determine operation. There remains a
19 need for methods and systems for the automatic
20 detection and acquiring of three-dimensional
21 printer build material characteristics."

22 And then it goes on to state the

1 summary in the claim.

2 So that describes the problem that the
3 '466 patent is addressing.

4 Q Can you describe how Jazayeri's print
5 server paradigm would be integrated into
6 Loughran's SFF job submission architecture?

7 A So as I state in paragraph 96 of my
8 declaration, "Multiple reasons would have prompted
9 a POSITA to apply the teachings of Jazayeri to the
10 system of Loughran (as modified by Dubois) such
11 that the resulting system includes the
12 functionality of Jazayeri print server as part of
13 Loughran's SFF system. This would have included
14 implementing Loughran's system to include the
15 functionality of an application manager for
16 receiving a print request over the network from a
17 client device, providing the client with the print
18 dialogue or other user interface for the user to
19 select an available printer, and then receiving a
20 print job designate the selected printer from the
21 client device to achieve several known benefits,"
22 as I talk about below. "The resulting system

1 would have enabled Loughran's SFF system to
2 receive a print request over the network from a
3 client device and respond by providing the client
4 with a dialogue to select any available printer.
5 A POSITA would have been motivated to combine
6 Loughran's and Jazayeri's teachings to provide
7 this functionality for multiple reasons," as I
8 state further in my analysis.

9 Q Can you describe, practically and
10 functionally, how the combined system of Loughran
11 and Dubois would change when you implement the
12 teachings of Jazayeri?

13 A So Loughran, let's take Figure 1 for
14 instance, Loughran already talks about material
15 information server, Loughran discusses CAD server.

16 So integrating the suggestion of
17 Jazayeri for a print server, while I didn't
18 formulate a new block diagram, or anything like
19 that, as we talked about before, based on Figure 1
20 of Loughran, because of this networked
21 environment, it's well within a POSITA's knowledge
22 to implement things like print servers, as

1 suggested by Jazayeri.

2 And, again, I didn't work out the block
3 diagram. I didn't propose a network architecture
4 or network flow, but a POSITA would have been
5 motivated to implement this print server for
6 Jazayeri, based on my analysis of this
7 combination.

8 Q You pointed to Figure 1 of Loughran.
9 When you add in the print server from Jazayeri, do
10 you remove any components? Do you add the print
11 server and connect it somewhere else in this
12 diagram?

13 I'm trying to understand how a POSITA
14 would actually implement the combination that
15 you're suggesting.

16 A So I didn't work out, again, the
17 details of how I would modify, say, Figure 1, for
18 instance, of Loughran to put in this print server.

19 But as I discussed in paragraph 97 of
20 my analysis in the declaration, applying
21 Jazayeri's suggestion to Loughran would provide an
22 ability for, virtually, any application running on

1 any device within the network to communicate with
2 the cloud print service to, thereby, print to any
3 printer, which is also in communication with the
4 cloud print service. Consequently, users may
5 benefit from increased printing option and
6 abilities. As such, the predictable application
7 of Jazayeri's teachings to the Loughran-Dubois
8 system would have resulted in a system that
9 allowed the user of the client system to select
10 from the various different types of
11 three-dimensional printers, based on the
12 requirements of a given fabrication job.

13 Additionally, a POSITA would have
14 recognized that such a selection of an appropriate
15 three-dimensional system for a given fabrication
16 job could have beneficially been performed
17 automatically by the client system.

18 So because of this networked
19 environment of Loughran, a POSITA would have
20 understood how to integrate the teachings of
21 Jazayeri into a schematic of Loughran's system,
22 for example, Figure 1.

1 Q Do you cite any record evidence to
2 support your conclusion that a POSITA would have
3 understood how to integrate the teachings of
4 Jazayeri into a schematic Loughran system, for
5 example, Figure 1?

6 A So based on my knowledge of a POSITA's
7 skills, and the information available to a POSITA
8 on networked environment -- networked environment
9 of 3D printers, which were common at this time, my
10 analysis indicates that a POSITA would have had
11 ample skill to successfully incorporate Jazayeri's
12 suggested teachings into Loughran's networked
13 environment of 3D printers and, thus, would have
14 reasonably expected success achieving the
15 combination.

16 Like I said, we networked 3D printers
17 all the time, starting in 2010 and onward, when I
18 started working with 3D printers in my lab. So
19 that was a common occurrence in 3D printing before
20 2012.

21 Q Other than your own experiences, you do
22 not cite any record evidence to support your

1 conclusion that a POSITA would have understood how
2 to integrate the teachings of Jazayeri into
3 schematic for Loughran's system, for example,
4 Figure 1, right?

5 A So are you talking about, like, a
6 network analysis textbook, or, like, a schematic
7 of how different printers and print servers and
8 clients are configured in a network?

9 Are you talking about a reference to
10 something like that?

11 Q Just any sort of evidence in the record
12 that would support your conclusion, other than
13 your own experiences and opinions as to what a
14 POSITA would know at that time.

15 A So as I said in my declaration, in
16 paragraph 19, "In rendering the opinions set forth
17 in this declaration, I was asked to consider the
18 patent claims and the prior art through the eyes
19 of a person of ordinary skill in the art as of the
20 effective filing date of the '466 patent." So
21 this is the POSITA that we've been talking about.

22 And I concluded October 29th, 2012, as

1 the effective filing date. So that's in my
2 declaration.

3 And so, I go on to say that a POSITA
4 relating -- in paragraph 20, a POSITA relating to
5 the technology of the '466 patent would have had
6 at least, one, a bachelor's degree in mechanical
7 engineering, computer engineering, material
8 science, or related field, and, two, at least
9 two years of research or industry experience in 3D
10 printer or materials used for 3D printer.

11 And so, based on a POSITA's
12 qualifications, as discussed in paragraph 20,
13 engineers and people working with 3D printers, as
14 I talk about in the detailed qualifications, they
15 all have knowledge of the network environment of
16 3D printers, print servers, how to accomplish this
17 sort of networked environment.

18 I think that's all included in the
19 understanding of a POSITA.

20 Q I would like to direct your attention
21 back to the '466 patent and, specifically, column
22 23, line 64 through 67. That's claim 5.

1 A Okay. I'm there at claim 5.

2 Q Okay. And you see that claim 5
3 requires receiving a selection of one of the first
4 build material and the second build material from
5 the client for use in fabricating the object using
6 the three-dimensional printer?

7 A Yes, I see what claim 5 says.

8 Q And you understand that claim 5 depends
9 on claim 4, which, itself, depends on claim 3?

10 A That's how I understand this to be
11 constructed, claim 5 says "the method of claim 4,"
12 claim 4 says "the method of claim 3," and so, that
13 builds on one another, as you just described.

14 Q So you understand that claim 5 requires
15 that there's two different build material
16 supplies, each with a tag, that the printer
17 provides tag data from both supplies to the
18 client, and that the printer ultimately receives a
19 selection from the client of one of those two
20 build materials, right?

21 A I mean, claim 4 says "The method of
22 claim 3 further comprising providing data from the

1 first tag and the second tag to the client over
2 the network."

3 So that's talking about the tag and the
4 client.

5 "The data including at least one
6 property of the first build material and second
7 build material."

8 So that covers tag and properties of
9 the build material.

10 And then claim 5 says "The method of
11 claim 4, further comprising receiving a selection
12 of one of the first build material and the second
13 build material from the client for use in
14 fabricating the object using the three-dimensional
15 printer."

16 So that -- claim 4 sort of provides the
17 discussion of the tag and the properties. And
18 then claim 5 talks about selection of one of the
19 first build material and second build material for
20 the client for use in fabricating the object using
21 the three-dimensional printer. That's what the
22 claims say.

1 Q What passages in Loughran or Dubois do
2 you rely on to satisfy claim 5?

3 I'll withdraw that question. Let me
4 ask it in a better way.

5 Dr. Hickner, if you'd turn to your
6 expert report at paragraph 78, and let me know
7 when you're there.

8 A Okay. So I'm at paragraph 78 of my
9 report, and that's under the section where I
10 discuss claim 5.

11 Q And do you see here, in this first
12 sentence, you say "A POSITA would have understood
13 that a slice specifies a selection of build
14 material for use in printing the layer of the
15 multi-material component"?

16 A Yes, I see what I've written there in
17 paragraph 78.

18 Q What reference do you rely on to reach
19 that conclusion?

20 A Uh, my PDF viewer just crashed. Let me
21 get back to Dubois. Apologies.

22 Q Of course.

1 A So in Dubois, in paragraph 61, and in
2 paragraph 77 of my declaration, I say, "In Dubois,
3 'cutting up the 3D of the component to be produced
4 involves cutting up the 3D representation of the
5 component to be produced by ink-jet printing into
6 characteristic objects defined by a set of
7 geometric properties and physico-chemical
8 properties taken in combination.'"

9 So this passage in Dubois really speaks
10 to this sentence in paragraph 78, that based on
11 Dubois, a POSITA would have understood that a
12 slice-specified selection of a build material for
13 use in printing the layer of the multi-material
14 component.

15 So the layer is geometric, as talked
16 about in Dubois, and then the build material is
17 these physicochemical properties of Dubois.

18 And so, a POSITA would understand that
19 sort of nomenclature of Dubois. And then I bring
20 in this reference from Napadensky, which discloses
21 that division of the virtual object is done in
22 order to enable a signing of different modeling

1 materials or modeling material combination or
2 structures to different regions.

3 And so, this is what Dubois is talking
4 about, in terms of these different objects, as
5 both the geometry and the material properties.

6 Q Napadensky is not part of the asserted
7 Ground 1A or Ground 1B combination, right?

8 A No Napadensky is not part of the -- of
9 the combination, but I used Napadensky to
10 interpret what Dubois is talking about, in terms
11 of these sets of geometric and physicochemical
12 properties, as used in the language of Dubois.

13 Q Dubois doesn't talk about receiving
14 data from tags, though, right?

15 A So Dubois doesn't address tags. It
16 talks about, say, in paragraph 40, Dubois says
17 "The present invention also relate to a device for
18 storing a material for device for production by
19 ink-jet type printing." It talks about this
20 database that we discussed before. But there's no
21 mention of something like a tag or an RFID in
22 Dubois.

1 Q For Grounds 1C, 1D, 3G, and 3H, you add
2 KISSlicer to the combinations for claim 5, right?

3 A No, I'm just looking through to verify
4 what you said. But, yes, I do use KISSlicer in
5 some of my grounds. That's correct.

6 Q KISSlicer is a user guide, right?

7 A So the reference that I cited, in
8 regards to KISSlicer, is the user guide PDF. But
9 KISSlicer, itself, is a piece of software that we
10 would refer to as a slicer, in sort of term of art
11 of 3D printing. So KISSlicer is a piece of
12 software, but of course the user guide is my
13 reference because that explains how the software
14 works.

15 Q And for purposes of this IPR, are you
16 relying so just the user guide or also
17 functionality otherwise in the software of
18 KISSlicer?

19 A So I relied on the user guide because
20 that's the cited reference in my declaration. And
21 the way that I understand KISSlicer, we've used --
22 or I've used lots of different slicers in my 3D

1 printing research. And so, KISSlicer has all of
2 the functionality that I would have expected a
3 slicer, at this time, to have. I mean, there were
4 a number of different slicing softwares, like,
5 Slic3r with a 3, S-L-I-C-3-R, there was SFACT,
6 there was Netfabb, but the user guide is what I
7 used as my reference, and that really informed me,
8 in terms of the functionality of the KISSlicer
9 software itself being -- sort of having the
10 functionality that slicing programs at the time
11 had.

12 Q KISSlicer doesn't mention receiving
13 information about build materials from data tags,
14 right?

15 A Can you send me the KISSlicer
16 reference? I don't have it in front of me. I
17 only have our exhibits up. But I'm happy to look
18 at that reference, if you want to pass it over.

19 Q Sure thing. I've just added what has
20 been marked as Exhibit 1018 into the chat, if you
21 want to pull that up.

22 (Exhibit 1018 previously marked for

1 identification and retained by counsel.)

2 A Okay. So I have Exhibit 1018,

3 KISSlicer Quick-Start Guide, in front of me.

4 Q And in the quick-start guide, KISSlicer

5 doesn't talk about data tags or anything like

6 that. KISSlicer does talk about selection of

7 materials. So in the KISSlicer settings dialogue,

8 say, on the bottom of page 3, where the user guide

9 is talking about how the software works, under the

10 materials selection, there's different materials

11 that are available in the KISSlicer software.

12 And if you look at the bottom of that

13 page, it specifically says "select your material

14 from one of the default options, and for the

15 moment, keep the default settings."

16 Do you see that?

17 A Yes. I see that sentence in the user

18 guide.

19 Q And this is describing that KISSlicer's

20 material selection, that you pointed out there, as

21 default settings for different materials, right?

22 A Yes. That seems to be what it

1 indicates. Where it says, you know, select your
2 material from one of the default options, and
3 that's shown in this drop down box, in the figure
4 above. So I think that -- well, that is how
5 KISSlicer, at least, incorporates a number of
6 default materials.

7 Q And KISSlicer doesn't say anything
8 about being able to automatically receive
9 information from a data tag about a material and
10 have that update in the software, right?

11 A So KISSlicer talks about these default
12 materials, and it also says, at the bottom of
13 page 3, "In case you already have a working
14 temperature profile for your material, update it
15 accordingly."

16 That update, where you can adjust the
17 parameters, it doesn't say whether that update is
18 automatic. As we said, it doesn't talk about the
19 tag. But it does talk about the ability to update
20 a working temperature, which would be part of the
21 printer settings that you'd need to print that
22 material. So KISSlicer does have the ability to

1 change the default parameters.

2 Q And KISSlicer shows that a user would
3 do that by adjusting some of these boxes we see on
4 the screen in Figure 3, right here, right?

5 A I mean, it does say -- the quick-start
6 guide says "In case you already have a working
7 temperature profile for your material, update it
8 accordingly."

9 It doesn't say whether that's a plug it
10 in the boxes or calculate something. But I think
11 in lots of these slicer programs, there were
12 automatic calculations. But there were also boxes
13 like this. I mean, I don't have the software in
14 front of me, where you could change things like
15 the temperature profile on a user basis. I mean,
16 KISSlicer sort of just says update it accordingly.
17 It doesn't talking about, necessarily, the
18 mechanics of how that's done.

19 Q You can put KISSlicer away.

20 MR. BISENIUS: Counsel, if we're
21 switching references, now might be a good time for
22 a break.

1 MR. TATUM: Yep. I think that's a good
2 idea.

3 THE WITNESS: I just want to add that
4 I'm on East Coast time, and it's 3:00.

5 So I would be looking for a little bit
6 longer break, whether it's this one or the next
7 one, but any time. I just need, like, 30 minutes
8 to grab a quick sandwich or something. So whether
9 that's now or in an hour, I'm fine with whatever.

10 MR. TATUM: Of course. Why don't we
11 take a 30-minute break now so you can do that, if
12 that works for everybody, and then you can come
13 back after.

14 MR. BISENIUS: Sure.

15 THE WITNESS: Great. I appreciate
16 that.

17 MR. TATUM: Yeah.

18 (Recess taken from 2:00 p.m. to
19 2:30 p.m.)

20 BY MR. TATUM:

21 Q Dr. Hickner, some of the opinions you
22 provided in your declaration were based on a

1 reference named Devos, right.

2 A That's correct, yes.

3 Q I've put into the chat what is labeled
4 as Exhibit 1008. Please let me know when you have
5 it pulled up.

6 A Yeah, so I have 1008 pulled up, and
7 that's Devos, the patent by Devos.

8 Q I would like to take you to
9 paragraph 32 of Devos.

10 Let me know when you have that in front
11 of you.

12 A Okay. I've got paragraph 32 in front
13 of me.

14 Q And do you see the final sentence of
15 paragraph 32 that reads "The system can also use
16 the data encoded in or on the memory mechanism 146
17 to determine certain operating parameters, such
18 as, for example, print speed, drop volume per
19 voxel, color maps, dry time needed after build
20 completion, shrink or expansion size, adjustment
21 factors, powder settling coefficients, e.g., to
22 determine whether powder supports need to be

1 included and, if so, how much, minimum allowable
2 layer thickness, et cetera"?

3 A Yes, I see that last sentence that you
4 just read.

5 Q What is a powder settling coefficient?

6 A So a powder settling coefficient, this
7 is the only place in Devos where it discusses this
8 powder settling coefficient. And that's a term of
9 art in additive manufacturing when powders are
10 involved.

11 And so, these powders settle. And
12 powder settling coefficients are used in additive
13 manufacturing to understand how powders settle.
14 And you can formulate a powder settling
15 coefficient using different mathematical
16 expressions. But whenever you're using powders in
17 additives these powder settling coefficients can
18 be computed.

19 Q And powder settling coefficients
20 describe how the powder settle; is that right?

21 A Yes, so in general, in additive
22 manufacturing, let's say, for example, you're

1 interested in layer-by-layer, powder-based
2 process, in that case, the powder settling
3 coefficient would describe the settling of powders
4 when they're spread in the bed. So, for example,
5 if you're going to do powder additive and you set
6 the layer height in the machine to 300 microns,
7 and then what powder is laid down in the additive
8 layer-by-layer process, even though you set the
9 machine to 300 microns, based on the
10 characteristics of the powder, which is
11 incorporated in a powder settling coefficient, you
12 might not get a 300-micron layer thick of powder.

13 And so, you can compute the
14 coefficient, which is a characteristic of the
15 build material that describes how the powder
16 settles compared to the set layer height.

17 So it's a property of whatever powder
18 you're interested in, and you can formulate that
19 coefficient using a couple different strategies.

20 Q And do you know what values or units
21 powder settling coefficients would have?

22 A So, in one formulation of a powder

1 settling coefficient, you have, let's say if
2 you're using height, or units of length, you have
3 length divided by length, which gives you a
4 unit-less powder settling coefficient. And so,
5 usually, these coefficients, whether it's a powder
6 settling coefficient, or some other compaction
7 coefficient, if you will, it's usually height
8 divided by height, which has the engineering units
9 of length divided by length. So the coefficient
10 is formally unit-less when you compute it.

11 Q Does Devos ever disclose generating a
12 printer setting or requirement that configures the
13 printer to fabricate support structures as part of
14 the build?

15 A So, in the sentence that we're
16 discussing in paragraph 32, it says "To determine
17 certain operating parameters, such as, for
18 example, print speed, drop volume per voxel, color
19 maps, dry time needed after build completion,
20 shrink or expansion size, adjustment factors,
21 powder settling coefficient, e.g., to determine
22 whether powder supports need to be included and,

1 if so, how much support minimum allowable layer
2 thickness, et cetera."

3 So it's talking about the connection
4 between operating parameters and this powder
5 settling coefficient and support requirement, and
6 how much support.

7 Q You said that the powder settling
8 coefficient is a function of the powder used; is
9 that right?

10 A So the powder settling coefficient, it
11 can depend on the type of powder. It can also
12 depend on, say, the spreading speed or the
13 characteristics of the printer.

14 In this case, Devos is saying, the
15 system can also use the data encoded in or on the
16 memory mechanism to determine certain operating
17 parameters. And so, it's really, in this list of
18 properties, where powder settling coefficient is,
19 that is referring to data encoded in are on the
20 memory mechanism.

21 And so, this powder settling
22 coefficient, it really has to be determined

1 experimentally. And so, as I said, the type of
2 powder, powders settle differently depending on
3 how fast they're spread. It could be a function
4 of other characteristics of the machine. And so,
5 the powder settling coefficient really includes a
6 mixture of different things. One of which is the
7 type of powder that you're using.

8 Q Would a POSITA understand a powder
9 settling coefficient to be an operational
10 parameter, as described in the '466 patent?

11 A So as I say in paragraph 113 of my
12 declaration, "Based on Devos's disclosure of
13 determining operating parameters, including powder
14 settling coefficient to determine whether and how
15 much powder supports are needed, a POSITA would
16 have found it obvious and straightforward to
17 implement Devos's system to determine an operating
18 parameter specifying whether and how much powder
19 supports are needed. Indeed, based on the
20 expressed disclosure of Devos, that a powder
21 settling coefficient is used to 'determine whether
22 powder supports need to be included and, if so,

1 how much support,' would have indicated to a
2 POSITA that the system would need to generate a
3 parameter indicating 'how much support' material
4 to be used in fabricating the object. A POSITA
5 would have recognized that this parameter provides
6 the claim support structure requirement."

7 Q Yes or no, would a POSITA understand a
8 powder settling coefficient to be an operational
9 parameter, as described in the '466 patent?

10 A So in the '466 patent, in column 15,
11 starting line 17, it -- the '466 patent states
12 "For example, the operational parameter may be at
13 least one of an extruder temperature, a feed rate,
14 a build platform temperature, a build volume
15 temperature, an infill requirement, a rafting
16 requirement, a support structure requirement, a
17 cooling requirement, or other operational
18 parameter that might" be -- "that might usefully
19 be determined by the controller from the data
20 stored in the data tag."

21 So that connects operational parameter
22 to support structure requirement and discusses

1 other operational parameters that might be useful
2 in this build process.

3 Q Yes or no, would a POSITA understand a
4 powder settling coefficient to be an operational
5 parameter, as described in the '466 patent?

6 A So looking at the '466 patent, it
7 discusses powder, say, in column 18, line 56, it
8 says "Build material may be any size or
9 combination of sizes, ranging from a fine powder
10 to relatively large sphere."

11 So '466 does not talk about powder
12 settling coefficients, but it does talk about
13 these parameters and powder. So a POSITA that's
14 using powder would have an understanding of powder
15 settling coefficients.

16 Q And I'd ask you to just listen to my
17 question and answer it as asked. Yes or no, would
18 a POSITA understand a powder settling coefficient
19 to be an operational parameter, as described in
20 the '466 patent?

21 MR. BIENIUS: Objection. Asked and
22 answered.

1 A Oh, you want a simple yes-or-no answer
2 to that question?

3 Q Are you able to provide a yes-or-no
4 answer to that question?

5 A I provided my response. I mean, we're
6 talking about, you know, complicated details of
7 additive manufacturing and powders. And so, I
8 provided a response to that. It's not a simple
9 yes-or-no answer.

10 Q So just to be clear, as you sit here
11 today, you are not able to answer, yes or no,
12 whether a POSITA would understand a powder
13 settling coefficient to be an operational
14 parameter?

15 A I've provided my response, and I could
16 perform further -- if you wanted me to boil it all
17 down to a yes or no, I could do that analysis, but
18 I haven't done it. I've given you my response to
19 this question.

20 Q Are you able to perform that analysis
21 right now and boil it down to a yes or no?

22 A So I've given my response and analysis

1 at this time.

2 Q Can you identify, in Devos, where Devos
3 provides technical details for how a POSITA could
4 implement a support structure requirement based on
5 a powder settling coefficient?

6 A So Devos discusses this issue of powder
7 settling coefficient, for example, to determine
8 whether powder supports need to be included, and
9 if so, how much support. There's no technical
10 detail in Devos as to how that's done. But at
11 this time, or the time of the '446, 2012 and
12 earlier, there was a lot of technology and
13 know-how around using powders, supports being
14 required, how to fabricate supports, how to
15 determine if you need supports. And so, Devos
16 doesn't discuss those technical details in
17 particular. But just like a POSITA understands
18 powder settling coefficients and how to formulate
19 those coefficients, and different ways to
20 mathematically determine those coefficients, a
21 POSITA would understand this issue of determine
22 whether powder supports need to be included, and

1 if so, how much support. But there's no technical
2 detail or equations, or anything like that, in
3 Devos that discusses the details.

4 Q Some of the opinions you provided in
5 your declaration were based on a reference named
6 Menchik; is that right?

7 A That's correct. Menchik or Menchik,
8 that's correct.

9 Q I've put in the chat what has been
10 labeled as Exhibit 1009. Please let me know when
11 you have that pulled up.

12 (Exhibit 1009 previously marked for
13 identification and retained by counsel.)

14 A I have it pulled up Exhibit 1009. This
15 is the patent by Menchik.

16 Q Can you point me to any paragraph where
17 Menchik discloses a client, distinct from the
18 printer, that receives tag data from the printer
19 over a network?

20 A So, as I discuss in paragraph 128 of my
21 declaration, Menchik's controller 105 may include,
22 for example, a processor 110, a memory unit 115,

1 software code 120, and a communications unit 125,
2 and that's described in paragraph 21 of Menchik.

3 Menchik describes an embodiment where a
4 separate unit, such as a personal computer or
5 workstation, may provide some control or data
6 storage capability. Communication unit 12 may,
7 for example, enable transfer of data and
8 instructions between controller 105 and printing
9 apparatus 140, and/or between controller 105 and
10 one or more cartridge apparatuses 180 or cartridge
11 arrays 190. And that's still from paragraph 21 in
12 Menchik.

13 I go on to say, "Specifically,
14 controller 105 may be located outside of printing
15 apparatus 100. Controller 105 may be located
16 outside of printing system 100 and may communicate
17 with printing system, for example, over a wire
18 and/or using wireless communications." That's
19 discussed in paragraph 24 of Menchik.

20 "Controller 105 may be included within,
21 or may include, a computing device, such as a
22 personal computer or a desktop computer, a mobile

1 computer, a laptop computer, a server computer, or
2 workstation (and thus part or all of the
3 functionality of controller 105 may be external to
4 the 3D printer system). Thus, based on Menchik's
5 teachings here, the controller 105 can operate as
6 a computing device that communicates with the
7 printing apparatus over a network."

8 Q You mentioned a controller 105.
9 Menchik also references a separate computing
10 platform that can provide a printing file.

11 In your view, is the controller 105 and
12 the computing platform the same thing, as
13 described in Menchik, or are they something
14 different?

15 A So in paragraph 26 in Menchik, this
16 issue is described, paragraph 26 says "Controller
17 105 may be implemented using any suitable
18 combination of hardware and/or software. In some
19 embodiments, controller 105 may include, for
20 example, a processor, a memory and software or
21 operating instructions. Processor 110 may also
22 include conventional devices such as a central

1 processing unit, microprocessor, a computer on a
2 chip, a microcontroller, et cetera. Memory 115"
3 maybe -- "may include conventional devices such as
4 random access memory, read-only memory, or other
5 storage devices and may include mass storage, such
6 as A CD-ROM or hard disk. Controller 105 may be
7 included within or may include a computing device
8 such as the personal computer, a desktop computer,
9 a mobile computer, a laptop computer, a server
10 computer, or workstation and, thus, part or all of
11 the functionality of controller 105 may be
12 external to the 3D printer system 100. Controller
13 105 may be of other configurations and may include
14 other suitable components."

15 Q Do you see the preceding paragraph
16 number 25?

17 A Yes, I do. I'm at 20 -- paragraph 25
18 of Menchik.

19 Q And do you see that one says "In some
20 embodiments, a printing file or other collection
21 of print data may be prepared and/or provided and
22 are programmed, for example, by computing platform

1 connecting to 3D printing system 100"?

2 A Yes, I see that.

3 Q And my question to you is, in your
4 analysis, are you equating computing platform, in
5 this sentence, with controller 105 in the
6 following paragraph or are they different?

7 A So in paragraphs 25 and 26, if you look
8 at both of those, paragraph 25 starts "In some
9 embodiments, a printing file or other collection
10 of print data may be prepared and/or provided in
11 our program, for example, by a computing platform
12 connected to a 3D printing system 100."

13 So if we go look at the figure, which
14 is Figure 1, there's a 3D printing system 100
15 that's specified with an arrow, that's just
16 talking about the entire system. And in paragraph
17 25, where it says "A printing file or other
18 collection of print data prepared or provided in a
19 program by computing platform," that computing
20 platform is not labeled with a number like 3D
21 print system in 100.

22 And then if we look at paragraph 26, it

1 says "Controller 105 may be implemented using any
2 suitable combination of hardware and/or software."

3 So 105, the controller, is noted, in
4 Figure 1, as its own box. And then paragraph 26
5 goes on to say that "Controller 105 may be of
6 other configurations and may include other
7 suitable components." It can be -- you know,
8 "controller 105 may be included within or may
9 include a computing device such as a personal
10 computer, a desktop computer," et cetera. So 25
11 and 26 talk about this other computing platform.
12 25 leaves it open.

13 I mean, it doesn't identify a box, in
14 this case, by a computing platform connected to
15 the 3D printer system, which it talks about. But
16 controller is certainly identified. And so, I
17 think these are just providing some examples, or
18 as this patent says, in some embodiments, it's
19 providing a couple different examples as to how
20 this would work.

21 Q How is the computing platform in 25
22 different from the controller described in

1 paragraph 26?

2 A So as I say in paragraph 130 of my
3 declaration, based on Menchik's explicit
4 teachings, the computing platform providing the
5 printing file is an example of the controller 105
6 external to the printing apparatus 140. In
7 accordance with the scope of this limitation,
8 advanced by the patent owner in the litigation, a
9 POSITA would have understood that the printing
10 file provided by the controller of the computing
11 device, which is the client, to the printing
12 apparatus, three-dimensional printer, is a request
13 to fabricate an object on the printing apparatus
14 or three-dimensional printer.

15 So in my analysis of Menchik's
16 teachings, I say the computing platform is an
17 example of the controller. I don't think all the
18 different examples in Menchik are alliterated, but
19 in these paragraph 25 and 26, I state that this is
20 an example of the -- or the computing platform
21 providing the printing file is an example of the
22 controller.

1 Q You mentioned, "in accordance with the
2 scope of this limitation advanced by Patent Owner
3 in the litigation."

4 What is the scope of this limitation
5 advanced by Patent Owner in the litigation?

6 A So that comes from the preliminary
7 Patent Owner response, which I don't have in front
8 of me. And so, I'd have to go review that
9 document in order to give you a definitive answer
10 on scope.

11 Q You understand, Dr. Hickner, that you
12 submitted this declaration prior to the
13 Patent Owner's preliminary response in this
14 matter, right?

15 A Yes. I understand that.

16 Q So how could this be referring to
17 Patent Owner's preliminary response, if you
18 submitted this before that was ever filed?

19 A I believe I misspoke. I mean, I had
20 the patent, I had the '466 patent in front of me
21 when I prepared this declaration. So the
22 limitations discussed in the patent are what I'm

1 referring to.

2 Q But doesn't this sentence say "in
3 accordance with the scope of this limitation
4 advanced by Patent Owner in the litigation"?

5 What litigation is this referring to?

6 A So when I prepared this declaration, it
7 was for the IPR of U.S. Patent Number, you know,
8 10,569,466, and so the '466 patent. So this
9 sentence, the litigation is referring to this IPR.

10 Q And at the point that you are served
11 this declaration, had Patent Owner ever taken a
12 position in this IPR on the scope of this
13 limitation?

14 A So of course I had the '466 patent and
15 its claims and the limitations to those claims,
16 and that's how I performed my analysis.

17 I'm not sure I understand the question,
18 in terms of what you're asking, because I had the
19 patent, and I evaluated the claims and
20 limitations. That's what I did in my declaration.

21 Q I'm just simply trying to understand
22 why you included this extra language here, that's

1 not included for most limitations, where you
2 specifically call out the scope of the term as
3 advanced in the litigation?

4 And if you don't know the answer to
5 that, that's okay. I'm just trying to understand
6 the reasoning behind your report.

7 A I don't have a specific answer to that
8 question. I would have to consider that question
9 further.

10 Q What operational parameters, received
11 from the client and selected for use in
12 controlling operations of the printer during
13 fabrication, does Menchik disclose?

14 A Sorry. Can you ask that question
15 again?

16 Q What operational parameters, received
17 from the client and selected for use in
18 controlling the operations of the printer during
19 fabrication, does Menchik disclose?

20 A So are you referring to limitation 1f
21 or specific language from the '466 patent? I
22 apologize, the question is long, so I just want to

1 get the right response for you.

2 But if you'd refer me to specific
3 language as written, I can give you a response.

4 Q Sure. In relation to limitation 1f,
5 which requires receiving, from the client,
6 operational parameters, in your discussion and
7 analysis of Menchik, what do you contend are the
8 operational parameters that meet that claim?

9 A Ah, okay. I understand now.

10 So in paragraph 35 of Menchik, one
11 example of this discusses various data storage,
12 and it says "Memory chip may, for example, store
13 and/or record information relating to the material
14 stored within the cartridge, for example, the type
15 of building material in the cartridge bag, the
16 material's color, manufacturing date, optimal
17 operation parameters, e.g., recommended jetting
18 temperature, optimum building parameter, e.g., for
19 billing or support, and material parameters, for
20 example, viscosity and/or surface tension at the
21 recommended temperature."

22 So in this example of where it

1 discusses operation parameters in paragraph 35, it
2 refers to an example of a recommended jetting
3 temperature.

4 Q Are there any other operational
5 parameters disclosed in Menchik?

6 A So, as I say in my declaration, this is
7 in paragraph 136 of Menchik [sic], but this is
8 described in paragraph 48 of the reference,
9 itself, "'The printer controller may also compute
10 the expected order and quantity of uptake and
11 deposition of each type of material into the
12 printing apparatus, for the printing or
13 construction of a given object.' This provides
14 yet another example of selecting the claimed one
15 or more operational parameters."

16 Then I go on, in Figure 6 or partial
17 cutout of Figure 6, on the top of page 116, "In
18 another example, Menchik describes that the
19 printer control may compute, based on the
20 materials required for printing a given object,
21 supply parameters for the material in each
22 cartridge."

1 Q You provide opinions regarding claim 17
2 under Grounds 1E, 1F, 3E, and 3F, right?

3 A I'm just looking to verify all those
4 grounds, but, yes, I provided opinions on claim
5 17.

6 Q What is the diagnostic test you rely on
7 in Menchik for satisfying claim 17?

8 A So, as I say in my declaration, in
9 paragraph 174, a POSITA would have also understood
10 that calculating whether a cartridge contains
11 enough material to complete the print jobs
12 specified in the printing file is a diagnostic
13 test to determine whether or not the operating
14 manager, the amount of material required, is
15 suitable for the printing apparatus to complete
16 the job.

17 And if you look at paragraph 47 of --
18 excuse me, 46 in Exhibit 1009, it says "According
19 to some embodiments of the present invention, a
20 method is provided to monitor and calculate the
21 amount of building material required for printing
22 a particular object or series of objects."

1 And so, this calculation, as I say in
2 my declaration, is a diagnostic test to determine
3 whether the operational parameter, the amount of
4 material required, is suitable for the printing
5 apparatus to complete the job.

6 Q In your opinion, does the printer also
7 include the building material storage?

8 A Are you talking about in Menchik,
9 specifically?

10 Q Let's start with Menchik.

11 Is it your opinion that the building
12 material supplies there are part of the 3D
13 printer, as opposed to a separate component?

14 A So if we look at Figure 1 of Menchik,
15 it has this label of the controller and the 3D
16 printer, et cetera. And, also, this cartridge
17 array. So this cartridge array is where the
18 materials are, and then, they go through the flow
19 diagram, through the valve matrix, and then,
20 eventually, arrive at the printing head.

21 So in this type of printing, you know,
22 it doesn't really say whether the cartridge array

1 is a box inside the printer. I've seen examples
2 where the material supply for the printer is sort
3 of its own box, if you will, that's connected by
4 hoses, to the box that houses the printing head.
5 I think that there can be a number of different
6 configurations or ways to think about Figure 1.
7 And there are examples of printers out there
8 where, say, the raw materials are stored, like,
9 right underneath the printing tray.

10 So I think there can be a number of
11 different configurations for where the materials
12 sit in relation to the printing function.

13 Q When the material supply, you said sort
14 of its own box that's connected to the box that
15 houses the print head, do you still consider that
16 material supply to be part of the printer?

17 A So if we just look at Menchik in
18 Figure 1, starting paragraph 20, Menchik says,
19 "Figure 1 is a block diagram of a 3D printer
20 system 100 according to an exemplary embodiment of
21 the present invention. A 3D printer system 100
22 may include, for example, a controller 105,

1 printing apparatus 140, and one or more
2 three-dimensional modeling material supply
3 sources, such as cartridge apparatuses 180 or
4 cartridge arrays 190. In a typical configuration,
5 a set of cartridge apparatuses outside of the
6 cartridge arrays is not used with a separate
7 cartridge array, but such a configuration is
8 within the scope of the invention."

9 So I think that Menchik is describing
10 one example of this configuration where the
11 cartridge array 190 is holding the materials. And
12 then the printer 140 is -- it's a different box in
13 Figure 1.

14 Now, when this is built as a machine,
15 I've seen the material supply, let's say, 190,
16 which is the cartridge array, the materials, be a
17 different box connected by hoses, or some other
18 method, to the printing box 140. I've seen the
19 cartridge array sitting underneath the printing
20 box 140.

21 I think that Menchik is just giving an
22 example of how these different components can be

1 configured. But in my own 3D printing work, I've
2 seen the configurations done differently,
3 depending on the exact materials and the cartridge
4 array, and what the printer looks like, et cetera.
5 It can be done multiple ways.

6 Q Does Menchik provide any error message
7 in response to the diagnostic test that you had
8 identified?

9 A So in paragraph 53 of Menchik, it says
10 "According to some embodiments at block 635, if
11 controller 105 determines that the amount and/or
12 type of material in one or more cartridges 250
13 requires replacement, controller 105 may, for
14 example, transmit an alert message to one or more
15 system operators."

16 And so, this alert message, and we
17 talked before about determining the amount or type
18 of material as a diagnostic test, transmitting an
19 alert message is an error message or a message
20 saying that the amount or type of material in one
21 of the cartridges requires replacements.

22 So that's stated in paragraph 53 of

1 Menchik.

2 Q Is the type of material an operational
3 parameter?

4 A So we were discussing previously what
5 characteristics of materials may or may not be
6 operational parameters. A type of material is
7 really a name, like PLA or ABS, or liquid or
8 solid, you know, so it's not necessarily an
9 engineering variable, the way we've named types of
10 materials.

11 Now, properties of the material, those
12 are what matter for the operational parameters.
13 But type of material is sort of the general -- a
14 general term, just noting, you know, is the type
15 PLA? Is the type ABS? And that, in and of
16 itself, doesn't give the detailed information that
17 one would need for operational parameters such as
18 temperatures, or something like that. There needs
19 to be a further -- well, the material name or type
20 of material doesn't give all of the
21 characteristics of the material needed.

22 Q And that would be the same for the

1 amount of the material as well?

2 A So in terms of amount of material, that
3 cuts much more to the operational parameter
4 because the system knows how much material is
5 going to be needed for a given build. So I think,
6 you know, type of material, a lot of materials are
7 just named generically. But amount of material
8 really gets to the fact of how large the build
9 volume is going to be.

10 Q So would a POSITA understand that the
11 amount of material on the spool, for instance, or
12 in the material supply, is an operational
13 parameter of the printer?

14 A So as I say in paragraph 174 in my
15 declaration, "Based my knowledge and experience in
16 the field and my view of Menchik and Dahlin,"
17 another reference, "a POSITA would have understood
18 that the amount of modeling material, support
19 liquid, or combination of modeling and support
20 materials required for printing are given
21 three-dimensional object." So this is amount of
22 modeling material, which could be the amount of

1 filament on the spool, as cited in Menchik
2 paragraph 48, "is an operational parameter used in
3 controlling operation of the three-dimensional
4 printer when fabricating an object with the
5 material."

6 Q So is it your opinion that the amount
7 of modeling or support material needed to do the
8 job is an operational parameter, or is it your
9 opinion that the amount of material on the spool,
10 or in supply is an operating parameter?

11 A So in paragraph 48, Menchik says "At
12 block 615 the printer controller may compute, for
13 example, the amount of modeling material, support
14 liquid, or combination of modeling and support
15 materials required for printing a given
16 three-dimensional object."

17 That paragraph 48 in Menchik is what I
18 cited in paragraph 174 of my declaration that says
19 "Based on my knowledge in the field and my review
20 of Menchik and Dahlin, a POSITA would have
21 understood that the amount of modeling material,
22 support liquid, or combination of modeling and

1 support material required for printing a given
2 three-dimensional object is an operational
3 parameter used in controlling operation of the
4 three-dimensional printer when fabricating the
5 object with a material."

6 MR. TATUM: All right. I can pass the
7 witness.

8 THE WITNESS: Sorry, Rick, you're
9 muted.

10 MR. BIENIUS: Thank you. I just have
11 a few questions, Dr. Hickner.

12 EXAMINATION BY COUNSEL FOR THE PETITIONER
13 BY MR. BIENIUS:

14 Q In addition to this IPR proceeding
15 involving the '466 patent, you've provided written
16 opinions for a few other proceedings between these
17 two parties, Stratasys and Bambu; is that correct?

18 A That's correct, yes.

19 Q Some of those other proceedings are IPR
20 proceedings; is that correct, involving other
21 patents?

22 A That's correct, yes.

1 Q Have you also provided written opinions
2 regarding the District Court litigation between
3 these two parties?

4 A Yes, I have.

5 Q When you refer to "the litigation" in
6 your declaration, in this proceeding, are you
7 referring to that District Court litigation?

8 A So this -- this declaration was
9 prepared for the IPR. And so, that's the -- this
10 IPR declaration is the substance of my opinion for
11 the IPR.

12 I guess I would have to --

13 Q I can direct you to an example.

14 In paragraph 53 of your declaration, if
15 you could turn to that, I want to talk about the
16 portion that's on page 45.

17 A Okay. I'm on paragraph 53, but I'm
18 scrolled down to page 45.

19 Q In the last sentence here you state,
20 "In accordance with the scope of this limitation
21 advanced by Patent Owner in the litigation,
22 Loughran's SFF fabrication job corresponds to a

1 request to fabricate an object on the
2 three-dimensional printer."

3 Do you see that sentence?

4 A Yes, I do.

5 Q And so, my question was, when you refer
6 to "the litigation" here, are you referring to the
7 District Court litigation between the parties?

8 A So when I was working on these IPRs,
9 there was also -- or on this IPR declaration,
10 there was also a discussion of a District Court
11 litigation. And so, that's the term I used here.

12 I really -- I don't have a better
13 answer for that, but I was certainly aware of the
14 District Court litigation as I was preparing this
15 IPR declaration.

16 MR. BIENIUS: No more questions. I'll
17 pass the witness.

18 MR. TATUM: No further questions.

19 MR. BIENIUS: All right. Thanks for
20 getting us out on time on a Friday.

21 MR. TATUM: I did my best.

22 THE STENOGRAPHER: I just need the

1 orders on the record.

2 MR. BIENIUS: I don't need anything on
3 my side.

4 THE STENOGRAPHER: And, Mr. Tatum, I
5 think you have a standing order.

6 MR. TATUM: Perfect. Thank you.

7 (Off the record at 3:44 p.m.)
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CERTIFICATE OF REPORTER - NOTARY PUBLIC

I, Judith E. Bellinger, Certified Stenographer and Notary Public within and for the State of Maryland do hereby certify:

That MICHAEL A. HICKNER, PH.D., the witness whose deposition is hereinbefore set forth, as duly sworn by me before the commencement of such deposition and that such deposition was taken before me and is a true record of the testimony given by such witness.

I further certify that the adverse party, Shenzhen Tuozhu Technology Co., Ltd., was represented by counsel at the deposition.

I further certify that the deposition of MICHAEL A. HICKNER, PH.D., occurred remotely on Friday, January 9, 2026, commencing at 9:58 a.m. CST to 3:44 p.m CST.

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

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my notarial seal this 12th day of January, 2026.
My Commission Expires: November 3, 2028

Judith E. Bellinger

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