

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

THE BOEING COMPANY,
Petitioner,

v.

THE REGENTS OF THE UNIVERSITY OF CALIFORNIA,
Patent Owner.

IPR2024-00761
Patent 7,487,684 B2

Record of Oral Hearing
Held: July 14, 2025

Before JENNIFER S. BISK, JOHN A. HUDALLA, and
ALYSSA A. FINAMORE, *Administrative Patent Judges*.

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P R O C E E D I N G S

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JUDGE FINAMORE: Good morning. This is an oral argument in IPR2004-00761, the Boeing Company versus the Regents of the University of California. I am Judge Finamore, and I'm joined by Judges Hudalla and Bisk.

We issued a Hearing Order that will set forth the run of the show today. As the parties know, they each have 60 minutes per side. Petitioner, you will begin, and you may reserve some of your argument time for rebuttal. Patent Owner, you will go second, and you may reserve time for surrebuttal.

I do have a short list of housekeeping matters that I'd like to address before we begin today's oral argument. First, we understand that there's an outstanding opposed Motion to Exclude. We will consider the arguments today in light of that Motion to Exclude once it's decided. We also note there's an outstanding request for authorization to file a motion for sanctions. We will address that outstanding request after today's oral argument.

There is a public line for this oral argument in which members of the public may listen in. I want to bring this to your attention, although I don't believe there's a concern about confidential information being discussed today. There are no speaking objections. If you feel you need to make an objection to opposing counsel's argument, please do so during your argument time.

And finally, please announce your name at the beginning of each presentation and refer to slide numbers of your demonstratives to assure the

1 transcript is clear. With that, I'd like to turn it over to the party's
2 appearances. Petitioner, can you please approach the podium and announce
3 who will be appearing today on behalf of Petitioner?

4 MR. JAIRAM: Good morning, Your Honors. My name is Arvind
5 Jairam, and I am on behalf of Petitioner, Boeing. And I am joined by my
6 colleague, Casey Shomaker --

7 MS. SHOMAKER: Good morning.

8 MR. JAIRAM: -- as well as representative from our client, Boeing,
9 and a couple of our summer associates. Thank you.

10 JUDGE FINAMORE: Thank you, Mr. Jairam.

11 Patent Owner, will you please approach the podium and introduce
12 who's appearing on behalf of Patent Owner?

13 MR. RACHUBA: Good morning, Your Honors. My name is
14 Roman Rachuba, representing Patent Owner, the Regents of the University
15 of California. And joining me today is my partner, Raja Saliba.

16 JUDGE FINAMORE: Thank you. All right. Well, we are set to
17 begin. So Petitioner, please go ahead, approach the podium. If you could let
18 me know if you'd like to reserve time for rebuttal.

19 MS. SHOMAKER: Yes. I'd like to reserve 15 minutes.

20 JUDGE FINAMORE: All right. That gives you 45 minutes of
21 argument time. You may begin when you're ready.

22 MS. SHOMAKER: Thank you. Good morning, Your Honors.
23 My name is Casey Shomaker. May I proceed?

24 JUDGE FINAMORE: Yes.

25 MS. SHOMAKER: Turning to Slide 2. While the challenged
26 claims are unpatentable under each of Grounds 1 through 7, I'll be focusing

1 today on the grounds involving Wang-Dissertation, which are Grounds 1
2 through 3, and the Gupta-1992 prior art which are Grounds 3 through 6.

3 Turning to Slide 3, on Slide 3 we just have a little --

4 JUDGE BISK: Can I ask you quick question?

5 MS. SHOMAKER: Yes, ma'am.

6 JUDGE BISK: So the Wang-Dissertation, we have the issue with
7 the publication. How is Wang-2002 different than the Wang-Dissertation?
8 And could we just use that so that we don't have to worry about the issues
9 involved in the Wang-Dissertation?

10 MS. SHOMAKER: So Wang-2002, I'll say, is a starting point for
11 the Wang-Dissertation. So Wang-2002 discloses an experimental setup that
12 does not include the fused silica glass element. And Petitioner has argued
13 that Wang-2002, in view of Gupta-1992, discloses a glass element because
14 there's motivation to combine the Wang -- excuse me, the Gupta-1992 fused
15 quartz glass element with Wang-2002.

16 So yes, the Board should find that the claims are unpatentable
17 under Ground 7. It's just a little bit different than the disclosures in the
18 Wang-Dissertation.

19 JUDGE BISK: Thank you.

20 MS. SHOMAKER: Moving to Slide 3, just a little sign posting for
21 today. I'll start with a brief technology background, explain why
22 Wang-Dissertation is prior art under both 102(a) and (b), explain why
23 Wang-Dissertation does disclose the challenged claims and --

24 JUDGE FINAMORE: Excuse me, did you bring up the 102(a)
25 issue in your Petition?

26 MS. SHOMAKER: Yes, ma'am. Petitioner argued that

1 Wang-Dissertation was prior art under at least 102(b), that language was not
2 limiting. And in Patent Owner's Preliminary Response, it raised the issue
3 that it might be able to swear behind that reference, indicating that it
4 understood Wang-Dissertation was raised as a 102 reference.

5 And in Petitioner's Reply, we further expanded on the 102(a)
6 argument by explaining that Wang-Dissertation was indexed in the -- at least
7 the University of Illinois Urbana-Champaign Library prior to the provisional
8 application that led to the challenged patent.

9 JUDGE FINAMORE: Counsel, is there any express mention of
10 102(a) in the Petition?

11 MS. SHOMAKER: It is not expressly mentioned by its number,
12 so the words 102(a) are not listed.

13 JUDGE FINAMORE: Thank you.

14 JUDGE HUDALLA: I hate to belabor the point, but why is that
15 fair for us to consider this if you haven't developed the argument at all for
16 102(a) in the Petition?

17 MS. SHOMAKER: Well, Patent Owner's Preliminary Response
18 indicates that it was on notice of this argument, so they understood --

19 JUDGE HUDALLA: But you have the burden.

20 MS. SHOMAKER: That's true, we do have the burden. The prior
21 art was raised under at least 102(b). Patent Owner understood that that
22 meant it was also prior art -- raises prior art under 102(a) due to its public
23 disclosure prior to the filing of the provisional application. Patent Owner
24 understood that; they made a record of it. They had every opportunity to
25 respond to that and understood that after our response -- or our Petitioner's
26 Reply that that was a ground that we were advancing.

1 It seems between the Preliminary Response and Patent Owner's
2 Response, that they chose not to attempt to predate that reference. And so as
3 the record stands, the Wang-Dissertation is prior art under 102(a) due to its
4 indexing in the library.

5 JUDGE HUDALLA: So just to be clear, as long as you put 102 in
6 the Petition, you could come up with anything, 102(a), (b), (e), whatever you
7 want, as long as it's -- you just say 102 in the Petition? That's what I'm
8 hearing.

9 MS. SHOMAKER: That's our position here. And I think that
10 Petitioner's -- or Patent Owner's Response indicating that it understood that
11 that was our position in the Petition indicates that they were on notice of that
12 theory and that argument, and they had ample opportunity to respond.

13 JUDGE HUDALLA: Okay. I understand your position. I don't
14 know if I agree with it. But thank you.

15 MS. SHOMAKER: Understood. Finally, I'll move on to the
16 Gupta-1992 reference and explain how it discloses the challenged claims.
17 Moving to Slide 4, will begin our background section. And moving to
18 Slide 5, Slide 5 includes two screenshots from the '684 patent.

19 Now, the '684 patent is directed to systems and methods for
20 performing laser spallation. Laser spallation at a high level is a technique
21 used to separate a material, often a metal or a film, from a substrate. Laser
22 spallation existed long before the advent of the '684 patent. What the '684
23 patent allegedly teaches and allegedly differs from the prior art is it adds a
24 glass element, which you see highlighted here in red, between the substrate
25 and the test film.

26 If you can move to Slide 6, please. As shown on Slide 6, the

1 prosecution history tells us a little bit about the role of this glass element.
2 The glass element modifies an input stress wave, creating, for example, a
3 shock wave or a rarefaction shock that experiences a rapid decrease in
4 pressure. However, the addition of this glass element and its use wasn't new
5 or innovative.

6 We can move to Slide 7. As shown on Slide 7, Dr. Junlan Wang
7 proposed adding a fused silica glass element between a substrate and test
8 film in her 2002 dissertation for the same purpose, the generation of that
9 shock wave. If we can move to Slide 8, Dr. Gupta, the inventor of the patent
10 himself, had the idea to use a glass element long before filing his patent
11 application. In fact, he disclosed the use of a fused quartz glass element
12 long before filing for the '684 patent. In short, there's nothing new or novel
13 about the claims of the '684 patent.

14 Moving to Slide 9. So I talked a little bit about the contents of
15 Wang-Dissertation. But let's discuss how the Wang-Dissertation is prior art.

16 JUDGE FINAMORE: So Counsel, if I can interrupt you before we
17 get to the Wang-Dissertation, going back to the '684 patent, you alluded to
18 some of the prosecution history there. And in the briefing, the parties seem
19 to agree that there's no need for an express claim construction. However,
20 Patent Owner does provide what appears to be a construction of the
21 modified stress wave limitation.

22 And I'm going to read right from their Patent Response, that that
23 limitation means "changing the profile of the laser generated compressive
24 wave and propagating the wave profile as modified to the free surface of the
25 coating, which upon reflection from the free surface as a tension wave
26 generates a tensile stress at the coating/substrate interface." I just want to

1 confirm that Petitioner is fine adopting that, what appears to be express
2 claim construction.

3 MS. SHOMAKER: To us, that's consistent with the plain and
4 ordinary meaning. If you can briefly flip to Slide 23, Slide 23 just includes
5 exemplary claim 1. The plain language of element 1[d] includes in it a lot of
6 that language. And so we're in -- the requirement that the glass element
7 propagate and modify a stress wave to the film/substrate interface and
8 generate a tensile stress wave, that's just the plain language of the claim. So
9 we don't believe an express construction is required.

10 JUDGE BISK: So you agree with that construction of the Patent
11 Owner?

12 MS. SHOMAKER: Yes.

13 JUDGE BISK: Okay. Thank you.

14 MS. SHOMAKER: If we could go back to Slide 11, please.
15 Slide 11 just depicts a timeline of the relevant events for establishing that
16 Wang-Dissertation is prior art. Moving to Slide 12, I want to first focus on
17 the events of March 10th, 2003, which confirm that Wang-Dissertation is
18 prior art under 102(a), because Wang-Dissertation was published before the
19 earliest effective filing date of the '684 patent.

20 Moving to Slide 13, Dr. Hsieh Yee, Patent Owner -- or excuse me,
21 Petitioner's library expert, testified that the MARC record for
22 Wang-Dissertation confirms that an interested person could locate
23 Wang-Dissertation in the University of Illinois Urbana-Champaign Library
24 as of March 10th, 2003. So we see in the highlighted line on the right-hand
25 side that starts with 008, we have 3/3/10, which is March 10th, 2003. And
26 on line 40, you see it list the University of Illinois Urbana-Champaign

1 Library record.

2 If we can move to Slide 14, Dr. Hsieh Yee further testified that this
3 same library record was simultaneously made available to all subscribers of
4 the OCLC FirstSearch database, which is a library database that's shared
5 among subscribing institutions. Importantly, in this case, Dr. Hsieh Yee was
6 not cross-examined, and her testimony has not been disputed by any other
7 qualified witness.

8 JUDGE FINAMORE: But just to clarify, Counsel, this is the
9 102(a) prior art date.

10 MS. SHOMAKER: That's correct.

11 JUDGE FINAMORE: How do we know it was publicly available
12 based on the asserted 102(b) prior art date?

13 MS. SHOMAKER: So we can move on to Slide 15 and talk about
14 102(b). 102(b) -- or the Wang-Dissertation is prior under 102(b) because it
15 was available for sale or download more than one year prior to the effective
16 filing date of the '684 patent. Now, Patent Owner has argued that --

17 JUDGE BISK: Can I ask you a question? Because this seems to
18 be a big issue. In the modified declaration, it says for sale on print or
19 download or something. I don't have it in front of me. But it makes it sound
20 like it's either/or and not and. What if -- if it's only available for print, is
21 there enough -- I mean, I don't know that somebody could get it before the
22 critical date.

23 MS. SHOMAKER: Well, as Ms. Morris testified, once an order --
24 so back in 2003, it wasn't necessarily commonplace to digitize records as
25 soon as they came in. As Ms. Morris testified, as soon as an order was
26 made, that record was digitized and then it was provided to the purchaser.

1 So if an order came in and they were requesting Wang-Dissertation, it would
2 be digitized and provided to the interested party.

3 JUDGE BISK: And we -- do we know how long that takes?

4 MS. SHOMAKER: Our understanding, and supported by the
5 testimony of Dr. Hsieh Yee, is that it would be immediate.

6 JUDGE BISK: Okay. But it looks like from the evidence we have
7 that they could only search the abstract; is that correct?

8 MS. SHOMAKER: They could search the record. And so if you
9 can turn to Slide 16, the record contains the abstract and index record,
10 citation information, title, author, name, et cetera. The --

11 JUDGE BISK: Is it enough to make it publicly available?

12 MS. SHOMAKER: It is. And so if you can slide -- turn to
13 Slide 19, please, the Federal Circuit has instructed that the standard for
14 public availability is not whether the full text or the full electronic version
15 was available. If that was the case, then we wouldn't have had prior art
16 before computers. The relevant inquiry instead is whether an interested
17 party -- or whether the record is sufficiently indexed or categorized in a way
18 that allowed an interested party to locate and obtain it. And
19 Wang-Dissertation satisfies this test.

20 If we move to Slide 16 again, as previously mentioned, the record
21 of Wang-Dissertation, which includes its abstract and other identifying
22 information, was text searchable on the PQDT database. This means more
23 than one year prior to the filing of the provisional application. This means
24 that an interested individual could access the database and locate
25 Wang-Dissertation on that database.

26 JUDGE FINAMORE: So question about locating it on the

1 database, could a user locate the actual dissertation or just locate the record
2 online?

3 MS. SHOMAKER: The evidence indicates that it could -- first,
4 the user would need to locate the record and navigate to the record. If we
5 turn to Slide 17, after the record -- after locating the record, an interested
6 person could purchase the Wang-Dissertation either by paying or by -- if
7 they were an institutional subscriber accessing it through that subscription.

8 JUDGE FINAMORE: So the only way to access the full
9 dissertation is by purchase; is that correct?

10 MS. SHOMAKER: That's correct.

11 JUDGE FINAMORE: Do you have any case law that discusses
12 publication via purchase?

13 MS. SHOMAKER: I believe we cited an *Amazon* case in our
14 response that stated that navigating to the page where the printed publication
15 was available and then purchasing that printed publication did qualify as the
16 publication being available, publicly available. I don't have that cite in front
17 of me. I'm happy to get it on rebuttal.

18 JUDGE FINAMORE: Thank you.

19 JUDGE HUDALLA: But aren't we in a different situation?
20 Because you're talking about retrieving a paper from, I believe, microfiche,
21 right? Wasn't it on microfiche?

22 MS. SHOMAKER: That's correct.

23 JUDGE HUDALLA: That's going to take time. And you've got
24 one day. So I think that's what I'm hiccupping on. I mean, there's just no
25 case law that talks about that, is there?

26 MS. SHOMAKER: So actual access is not required under the law.

1 All that is required is that a person of ordinary skill could access.

2 JUDGE HUDALLA: But I'm not sure they could. If you ordered
3 on March 4th and you don't get it until March 8th, you're going to
4 microfiche. Somebody's got to go get that microfiche printed off and send it
5 to you. So we don't have any evidence that tells us about that in-between
6 time at all, do we?

7 MS. SHOMAKER: We do not. But what is required under the
8 law isn't actual access. It's that the person would have the opportunity to
9 access it. And under the facts here, we understand that ProQuest would
10 immediately digitize the record and provide it to the purchaser.

11 JUDGE HUDALLA: And it's just that -- I think it's like a
12 paragraph of testimony that you're hanging your hat on for that one?

13 MS. SHOMAKER: It's both Ms. Morris's testimony, and then it's
14 also supported by Dr. Hsieh Yee's testimony. And she cites a number of
15 policies from the ProQuest database as of that time, which clarify that the
16 purchase and the provision of the printed publication would be
17 instantaneous -- or immediately thereafter, not instantaneous.

18 JUDGE HUDALLA: Okay. Because, again, with instantaneous, it
19 would require almost, like, something downloadable. And you don't have
20 evidence of that, right?

21 MS. SHOMAKER: That's correct, so there's no evidence that it
22 was immediately available. So what we think now if you click to download
23 and it immediately pops up on your screen. But the orders were fulfilled as
24 soon as they were coming -- they came in.

25 JUDGE HUDALLA: Thank you.

26 MS. SHOMAKER: Moving on to Slide 18 --

1 JUDGE FINAMORE: Actually, Counsel, I'm sorry -- and I
2 apologize for beating a dead horse, but I just want to make sure we have all
3 the information in front of us.

4 MS. SHOMAKER: Of course.

5 JUDGE FINAMORE: So your declarant, Dr. Hsieh Yee, testified
6 that the full dissertation would be available online right away. Was this just
7 an error in her testimony or is there any basis for that?

8 MS. SHOMAKER: That's if the reference was already online -- or
9 already digitized. Here we know that the reference was not immediately -- it
10 wasn't already digitized, so it would be then digitized as soon as an order
11 came in and provided to the purchaser.

12 JUDGE FINAMORE: So that testimony is more of a
13 hypothetical?

14 MS. SHOMAKER: It's just consistent with the ProQuest policies.
15 The policy was if it's already digital, then they will immediately provide it.

16 JUDGE FINAMORE: Thank you.

17 MS. SHOMAKER: Moving to Slide 18, Ms. Morris further
18 testified that an interested purchaser could make a purchase of, for example,
19 Wang-Dissertation in any number of ways, including online or over the
20 phone. Moving to Slide 20, Wang-Dissertation, based on the evidence, is
21 prior art under 102(a) and (b). Moving to Slide 21 in addition to being prior
22 art, Wang-Dissertation also discloses the challenged claims, the --
23 remember, Wang-Dissertation is raised under Grounds 1 through 3.

24 Moving to Slide 22, Wang-Dissertation discloses a fused silica
25 glass element and explains that fused silica is an ideal substrate. Moving to
26 Slide 23, the parties only dispute whether the relevant prior art discloses

1 claim limitation 1[d]. That's the last claim element of claim 1. Patent
2 Owner argues that fused silica does not propagate and modify a stress wave.
3 That argument depends on the testimony of Dr. Gupta, who is biased by his
4 financial interest in the outcome of this IPR. Nevertheless, both Patent
5 Owner and Dr. Gupta are incorrect on the facts.

6 Moving to Slide 28, the Wang-Dissertation includes a chapter that
7 includes Dr. Wang's theoretical analysis. So these would be her hypothesis
8 and her predictions. These are supported by math and what was known in
9 the art. Chapter 3 of Wang-Dissertation is her experimental results, and both
10 confirm that fused silica causes a stress pulse to evolve into a shock wave
11 that travels to the test film interface.

12 JUDGE HUDALLA: On this point, the Patent Owner has brought
13 up a whole set of, I guess, Compression-Wave-1, Compression-Wave-2,
14 Tensile-Wave-1. Does that fit into this, what you have on the screen right
15 now, or is it something different? And do you disagree with the way that
16 they analyzed it?

17 MS. SHOMAKER: We disagree with their analysis. They are
18 correct that when a wave is generated, you know, Newton tells us you'll
19 have equal and opposite reactions. So there will be a stress wave generated
20 in opposite directions, one will travel to the test film interface and one will
21 travel backwards through the constraining layer.

22 As the math that's in Wang-Dissertation chapter 2 and as analyzed
23 by Dr. Wang, which is incorporated in Patent Owner's Response, confirms
24 that the reflection -- the reflected tensile wave that moves is opposite the
25 interface, it will not overtake the compressive wave that's moving forward.
26 Mathematically, it won't. There'll be a delay. So even though that tensile

1 wave is moving faster, it will not move faster than the compressive wave.
2 Because of the time that it took for that compressive wave to reflect and turn
3 around, it will not overtake the compressive wave.

4 This is further confirmed by -- so the figure we see on the left-hand
5 side of Slide 28 is measured at the test film interface. So this is what the test
6 film interface measures. This is what was received with -- what had
7 propagated and had reflected from the test film interface. And so what was
8 measured on the test film interface was a compressive wave. It was not the
9 tensile wave.

10 JUDGE HUDALLA: So using their terminology, which wave is
11 creating the stress or the -- whatever meets limitation 1[d]?

12 MS. SHOMAKER: Using their terminology, I believe it's
13 compressing -- compression -- Compressive-Wave-2. So it's the
14 compressive wave that is generated and propagates towards the test film
15 substrate interface. The reflected tensile wave, it's not going to overtake that
16 compressive wave. So it really plays no part in the data that we see here.

17 JUDGE HUDALLA: So since you agree with their claim
18 construction, I'm assuming that you're saying that it reflects off the test film
19 at the interface to the air and comes back and creates that stress or creates
20 the tension?

21 MS. SHOMAKER: Yes. That's exactly what we see on the left-
22 hand side of Slide 28. This is the measurement of the reflected stress that
23 has reflected -- that has resulted from Compressive-Wave-2.

24 JUDGE HUDALLA: Okay.

25 MS. SHOMAKER: The Wang-Dissertation also describes that the
26 generation of a shock in fused silica was well known and was disclosed back

1 in the '70s in this Barker and Hollenbach paper. Therefore, it wasn't
2 surprising that Dr. Wang chose to use a fused silica substrate in her
3 experiments and observed what we would say kind of the expected
4 properties of the material. Moving on to Slide 29, on Slide 29 we see a
5 figure from the Petition that maps each claim element to the disclosures in
6 Wang-Dissertation, which confirms that Wang-Dissertation does disclose
7 the entirety of claim 1.

8 Moving now to Slide 30, claim 13 largely mirrors claim 1, but it
9 has this additional limitation at 13[d], which is separating the coating from
10 the substrate as a result of the stress wave-generated tensile force. Moving
11 to Slide 31, Wang-Dissertation clearly discloses this limitation. It discloses
12 the failing of the film substrate interface, which is this separation. And it's
13 called failing. So that would be a separation in that interface caused by the
14 compressive wave.

15 JUDGE HUDALLA: Could you address Patent Owner's
16 arguments that Dr. Wang's later paper undermines the theory that's in this
17 dissertation?

18 MS. SHOMAKER: So yes, the Wang-2009 paper is in fact
19 completely consistent with what is in the dissertation. So Wang-2009 is just
20 an expansion of the tests that Dr. Wang ran in her dissertation. Wang-2009
21 also discloses the generation of the stress wave in the fused silica versus the
22 silica glass where there is no modification of the stress wave.

23 So the disclosures of Wang-Dissertation and Wang-2009 are
24 completely consistent. What Patent Owner argues is because they disagree
25 with those disclosures and they disagree that those disclosures satisfy the
26 claims, that there's been some sort of, I guess, misconduct on our part.

1 JUDGE HUDALLA: Well, how do we take that into account, say,
2 the 2009 article shows by experimental results that your dissertation stresses
3 aren't really there? And I think that's what Patent Owner is arguing. So let's
4 say we disagree with you on that. How would we take that into account, or
5 should we take that into account when looking at the dissertation?

6 MS. SHOMAKER: I don't think it should be taken into account
7 because we're not just relying on the experimental evidence in
8 Wang-Dissertation. We're also relying on the disclosures from
9 Wang-Dissertation itself. As the APJs know, there's no requirement of
10 reduction to practice here. What Wang -- the Wang-Dissertation,
11 particularly in chapter 2, discloses is that they're based on just the
12 knowledge of a person of ordinary skill in the art, including the mass and the
13 accepted characteristics of fused silica, a shock should be generated.

14 Whether or not that a shock was generated in 2009, which we
15 argue that there was shock generation -- and that's very clearly shown if you
16 compare the Figure 3, which is I believe the wave profile in silica glass, as
17 opposed to Figure 5 from Wang-2009 which is the wave profile in fused
18 silica, that there is a shock generation in the wave profile of fused silica
19 where there's not shock generation in the silica glass.

20 JUDGE FINAMORE: Counsel, speaking of the
21 Wang-Dissertation, you had said that the -- although the tensile wave moves
22 faster, it doesn't overtake the compressive wave. But at the bottom of
23 page 65 of the dissertation or Exhibit 1005, it expressly states that the tensile
24 wave propagates faster and eventually overtakes the compressive wave. Is
25 there a different context for this disclosure, or how does that not contradict
26 what you just said?

1 MS. SHOMAKER: I do believe so. So the compressive wave will
2 reach the film interface. Eventually, the tensile will catch up. It will catch
3 up. But the readings that -- if you can go back to Slide 28, please, the
4 readings that Dr. -- the evidence that Dr. Wang measured on the interface
5 were resulted from the compressive wave, which tells us that the
6 compressive wave reached that interface first.

7 JUDGE FINAMORE: So wait, how do we know that this is the
8 compressive wave causing this shock?

9 MS. SHOMAKER: Because this is what Dr. Wang hypothesized
10 happened. So she said that the compressive wave would devolve or would
11 turn into a decompressive shock and would reach the film interface, and it
12 would cause the separation of the film and the substrate.

13 Moving to Slide 37, Gupta-1992 also discloses the challenged
14 claims. So moving to Slide 38 --

15 JUDGE FINAMORE: Counsel, just a real quick question on
16 Gupta-1992. It seems like both parties agree that, essentially, Gupta-1992
17 and the Wang-Dissertation kind of go hand in hand. They either both
18 disclose it for the same reasons, or they both do not disclose it for the same
19 reasons. Is that fair to say?

20 MS. SHOMAKER: That's correct, yeah.

21 JUDGE FINAMORE: Thank you.

22 MS. SHOMAKER: So Gupta-1992 discloses a fused quartz glass
23 element as opposed to Wang-Dissertation's fused silica glass element. And
24 again, the substantive dispute is whether the fused silica -- or fused quartz
25 propagates and modifies the stress wave. It's the same dispute, as we saw
26 with Wang-Dissertation.

1 JUDGE HUDALLA: On that point, do -- you obviously have a
2 broader idea of what the glass element can be than Patent Owner does; is
3 that right?

4 MS. SHOMAKER: Our required -- our understanding of the glass
5 element is consistent with the claims. It's just a glass element, which I don't
6 think anybody disputes that fused silica and fused quartz are glass that
7 propagates and modifies a stress wave to the test film interface. I think the
8 disagreement, I think, in there too is whether there's been a shock wave
9 generation and whether that shock propagates. Our position is that both
10 fused silica and fused quartz propagate and modify stress wave to the test
11 film interface.

12 Moving to Slide 40, again, I think APJ Finamore, you just hit the
13 nail on the head, fused quartz is equivalent to fused silica. For the purposes
14 of the claims here, that's not in dispute. Even Dr. Gupta admitted that
15 they're identical materials as far as wave propagation is concerned.

16 Moving to Slide 45, this means that the shock wave described and
17 depicted in Wang-Dissertation will also occur in fused silica, which is
18 disclosed in Gupta-1992 and shown here in red. I'll note that Patent Owner
19 does not dispute that Gupta-1992 discloses the additional limitations of the
20 dependent claims or those in claim 13.

21 We can go to Slide 32. I'll briefly walk through those dependent
22 claims. So claims 7 and 18 just require that the glass element is bonded to
23 the second side of the substrate. As we see here, Wang-Dissertation
24 discloses that fused silica should be in between the substrate and the test
25 film.

26 Moving to Slide 33, claims 8 and 19 require that the glass element

1 be made of Pyrex, soda lime, quartz, or borosilicate. Here, both fused silica
2 and fused quartz include quartz, they're both silicon -- they're both quartz
3 structures -- elements. Moving to Slide 34, claim 10 requires that the
4 substrate be made of silicon. Both fused quartz and fused glass have the
5 chemical composition, silicon dioxide, SiO_2 . So they include -- disclose
6 silicon.

7 Moving to Slide 35, both references disclose claims 11 and 21
8 because they disclose a constraining element, which we see as the confining
9 layer here, the waterglass, disposed adjacent to the glass element. Moving to
10 Slide 36, the references disclose claims 12 and 22 as well.

11 And unless Your Honors have any further questions, I'll reserve the
12 rest of my time for rebuttal.

13 JUDGE FINAMORE: I did have just one more follow-up question
14 on the fused quartz, fused silica. Does Dr. Wang agree that there's some
15 attenuation of the compressive wave, or is her -- and is her position that it's
16 just not enough to prevent it from reaching the coating/substrate interface?

17 MS. SHOMAKER: That's exactly her position. So there will be
18 attenuation in anything, that's just -- we know that to be the case. Dr. Wang
19 has opined and Petitioner has adopted the position that a person of ordinary
20 skill in the art would know how to manage this attenuation.

21 So there's a number of variables that can be adjusted to these
22 experimental setups, including the laser strength and the widths of the
23 substrate in the glass elements. And so a person of ordinary skill in the art
24 would know how to tailor those different, I would say, parameters in order to
25 minimize the amount of attenuation into -- that would result in a
26 compressive wave that does indeed reach that test film interface.

1 JUDGE FINAMORE: Okay. And I appreciate -- this is going to
2 be a bit of an academic question. But if we all seem to agree that these
3 materials, the fused silica and the fused quartz, have some type of
4 attenuation, then why is it considered the ideal substrate for this type of
5 testing?

6 MS. SHOMAKER: I believe it's due to the amorphous nature of
7 the substrate and the negative elasticity, which means that -- if I get this
8 correct and bear with me. Because of the negative elasticity, it means that
9 the material will have ideal conditions under an ideal amount of pressure.
10 So it's not linear. And so you can basically get the shock wave generation of
11 the amount of energy necessary to separate the test film without ruining the
12 substrate.

13 So you don't want to just drive all of this force into the substrate in
14 hopes that it would attenuate at the level needed. Instead, you need this
15 nonlinear shock wave to where you don't damage the substrate so that the
16 wave connection -- or the compressive shock can actually reach the test film
17 interface.

18 JUDGE FINAMORE: All right. We'll stop you there. It looks
19 like you have about 14 and a half minutes remaining.

20 MR. RACHUBA: Good morning, Your Honors.

21 JUDGE FINAMORE: Patent Owner, would you like to reserve
22 time for surrebuttal?

23 MR. RACHUBA: Yes. I'd like to reserve 10 minutes. Also, a
24 brief housekeeping matter. Patent Owner's Counsel sent an email
25 approximately 10:00 last night to the Trial and Appeal Board asking
26 permission to use the corrected version of our demonstratives. I'm unsure

1 we have authorization to use that. If not, we would use our filed
2 demonstratives. Just for clarity, we prefer to use the newer version.

3 JUDGE FINAMORE: We did receive the corrected version, and
4 you may use it.

5 MR. RACHUBA: Thank you, Your Honor.

6 JUDGE FINAMORE: You may begin when you ready.

7 MR. RACHUBA: Thank you, Your Honors. Good morning, my
8 name is Roman Rachuba, with my partner Raja Saliba. Today we have an
9 exceptional and rare case where the later-discovered work of Petitioner's
10 declarant, Dr. Wang, who authored the primary reference, affirms that the
11 primary reference disclosure even if considered -- because it is not prior art,
12 as I will discuss -- fails to disclose a glass element that is configured to
13 propagate and modify a compressive stress wave to the interface such that
14 the compressive stress wave rebounds off the free surface and returns and
15 applies a tensile stress at the interface.

16 Rarely do we have actual evidence of performance of prophesized
17 contemplated future work. Here we do, and it confirms what the
18 Wang-Dissertation fails to anticipate. At best, the future work in Wang is an
19 invitation to experiment. In Wang-2009, it confirms that that
20 experimentation does not work. That is, it took Wang seven years to
21 perform the future work described in her dissertation.

22 When we had actual evidence of that work in Wang-2009, we
23 know that fused silica does not modify compressive wave and does not
24 result in a shock. And that compressive wave does not propagate, the
25 modified compressive wave, or shock all the way through the substrate to
26 the interface, such that it returns as a tensile force.

1 In each of Boeing's grounds -- so in Ground 1, the
2 Wang-Dissertation, they're relying on a single type of glass, fused quartz or
3 fused silica. Boeing does not take the position that would have been obvious
4 to modify -- or that would have been obvious to study different types of
5 glasses for substitute for the specific glass disclosed in each of those
6 references. So we must rely in the glass as used. The glass as used in each
7 of those references fails to have the physical properties necessary under
8 claims 1 and 13, propagation, modification, and application of the tensile
9 stress.

10 JUDGE FINAMORE: Counsel, just to kind of tie what you're
11 saying -- what I think you're saying, to the language of the claims. Patent
12 Owner originally argued two limitations, the glass element itself and then
13 the function associated with the glass element, I believe, in Petitioner's,
14 limitation 1[d]. Are you still arguing limitation 1[c], that the fused silica and
15 the fused quartz fails to disclose the glass element? Or really, is your
16 argument now focused just on limitation 1[d], which is the function
17 associated with the glass element?

18 MR. RACHUBA: Well, it depends on which portion of reference
19 is applied. And I want to correct one misconception. Patent Owner does not
20 believe it's a functional limitation. We believe it is a structural limitation of
21 physical properties of the glass that is necessary for that, similar to like an
22 eyeglass lens that has a special magnification quality. So this glass element
23 as claimed it has specific physical qualities that allow propagation and
24 modification.

25 Now, as far as the presence of the glass element, the experiments
26 and theory discussed in the Wang-Dissertation do not have the additional

1 glass element. The future work describes a scenario with an additional glass
2 element. But her Wang-2009 paper confirms that that glass element, when
3 added to the experimental setup described in the Wang-Dissertation, does
4 not have the physical properties and characteristics that allow for
5 propagation and modification.

6 Raja, if you could please turn to -- Counsel, could please turn to
7 Slide 2 -- or Your Honors, please turn to Slide 2. Briefly, I'd like to discuss
8 the background and technology of the '684 patent, and then I'll get into --
9 there seems to be the pressing issue here of whether the Wang-Dissertation
10 qualifies as prior art. Following, I'll address Grounds 1, 4, 7 primarily here.
11 If Your Honors have questions about other grounds, I'd be happy to address
12 those as well.

13 And Your Honors, if could you please just turn to Slide 8. The
14 Wang-Dissertation is not prior art under Section 102(a) or Section 102(b).
15 Next slide please. The '684 patent has a filing date of March 5th, 2004,
16 undisputed; and a critical date of March 5th, 2003. Petitioner relies on these
17 dates.

18 Next slide please. There is no evidence that the Wang-Dissertation
19 was publicly available as of the critical date under Section 102(b) or the
20 filing date under 102(a). In the Petition, Petitioner relied exclusively on
21 Section 102(b). As conceded here today, there is zero mention of
22 Section 102(a). The Board recognized that the Petition relied solely
23 on 102(b).

24 If you could pull up, please, Paper 8, go to Slide 7 -- or page 7. So
25 not only was Section 102(b) the only ground that was raised in the Petition.
26 As I just mentioned, the Board recognized that, and they instituted grounds

1 on 102(b) for the Wang-Dissertation. Page 7. As you can see the charts
2 here, these are the grounds the Board recognized that Petitioner was
3 attempting to institute. Row 1 here, we have the Wang reference. And as
4 we can see, the prior art basis is solely under 102(b).

5 The next -- back to the presentation, Slide 11, please. For prior art
6 to qualify under Section 102(b) or 102(a), it must be publicly available.
7 That is, it needs to be locatable and examinable or accessible. So Petitioner
8 is right in that they do not need to establish evidence that a person of
9 ordinary skill need to have actually examined it or located or viewed it, but
10 they needed to have that ability. Here, we don't have that. Mere
11 catalogization or placing something -- placing a record somewhere isn't
12 enough. That record needs to be -- it needs to permit a person of ordinary
13 skill to access that document.

14 JUDGE HUDALLA: Well, if you order the document on that
15 same day, March 4th, is that -- isn't that access?

16 MR. RACHUBA: There is -- well, first of all, a sale is not a basis
17 of prior art in an IPR, as Your Honors well know. There is zero evidence in
18 the record that a person of ordinary skill could have purchased that
19 document and got it the same day. So that's a great point. Actually, let's
20 consider that hypothetical. As Petitioner concedes, the Wang-Dissertation
21 was not accessible online as of that day, as of the critical date under
22 Section 102(b).

23 Raj, could you please turn to Slide 19? So as of the date, the
24 record of the Wang-Dissertation was available on ProQuest, this would be
25 March 4th, 2003. It was stored in microfilm. It was not stored in an online
26 database, as Petitioner's declarant Ms. Wang -- or Ms. Morris confirmed in

1 her revised declaration. So here, in this hypothetical, a person of ordinary
2 skill in the art would have had to locate the Wang-Dissertation through
3 ProQuest by either its title, a different abstract than what is actually included
4 in the document itself. They would have had to purchase it.

5 Following that purchase, ProQuest would have had to scan it,
6 digitize it, upload it, and either print it and mail it or somehow provide an
7 electronic copy to an individual, which in early 2003 where a lot of
8 electronic transactions were not nearly as sophisticated as they are now.
9 And all this would have had to happen not even within 24 hours. This
10 would have had to happen within working hours of a single business day.
11 And there is just zero evidence to support that theoretical and incredible
12 possibility.

13 JUDGE HUDALLA: So I mean, we are in a very unusual
14 situation. I'm not aware of any case law that talks about that. I assume you
15 aren't either, right? That interplay between I found a record and I got to get
16 it, you know, in the next 12 hours or something like that, you're not aware of
17 any sort of case law about that?

18 MR. RACHUBA: No, I'm not, Your Honor. And in addition to
19 not even having case law on that point, the facts just don't support it.
20 Because what we have here, we have what is at best -- if you take Ms.
21 Morris's revised testimony at face value -- you have a record of a reference
22 available online.

23 Petitioner doesn't rely on that record as basis for prior art. They
24 don't rely on the abstract of that record as a basis for prior art. They're
25 relying on the actual physical document, which it's undisputed at this point
26 that that actual document -- physical, electronic, whatever -- was not

1 available as of that date.

2 JUDGE FINAMORE: And Counsel, speaking of case law, so I
3 believe Petitioner cites the *VidStream* case, which I think Counsel referred to
4 earlier today as the *Amazon* case. What is Patent Owner's response to why
5 that case doesn't apply?

6 MR. RACHUBA: First of all, there's no evidence in the record
7 that ProQuest had the online technological capabilities that Amazon had to
8 allow a same-day shipment or same-day provisioning online. All we know
9 is that the Wang-Dissertation was stored on microfilm.

10 So even under that best hypothetical case or best hypothetical set
11 of facts I just mentioned, during the business hours of a working day,
12 someone would have had to attain that microfilm from ProQuest, digitize it,
13 upload it, and either provide an online sale or print and mail a copy same
14 day. And there is just -- even if we consider the *Amazon* case, there is no
15 record of that capability of ProQuest.

16 Ms. Morris did not testify that. She did not have personal
17 knowledge of the workings of ProQuest as of the critical date or filing date.
18 And Petitioner's other declarant, Dr. Yee, does not have personal knowledge
19 of ProQuest capabilities and systems as of the critical or filing date.

20 JUDGE FINAMORE: So the only distinguishing factor is
21 capability?

22 MR. RACHUBA: Only distinguishing factor I can think of right
23 now, if -- I'm not -- I don't have the case right in front of me. On rebuttal, I
24 can provide more details on that.

25 JUDGE FINAMORE: Thank you.

26 MR. RACHUBA: And just as the reference is not prior art under

1 102(b), it's also not prior art under 102(a). And before we get to the
2 substance of that, I want to be clear here that Section 102(a) argument was
3 not raised in Petition and raised for the first time in Petitioner's Reply and
4 should not be considered.

5 Now, please turn to Slide 24. Actually, please open Paper 1 and
6 turn to page 5. So as Your Honors can see, 102(a) does not appear anywhere
7 in the Petition, page 5 of the PDF. In fact, in their table of authorities, the
8 only reference is 102(a) is 102(b) -- or sorry, their only reference on
9 Section 102 is reference to 102(b).

10 JUDGE BISK: So I'm confused. We understand the argument that
11 they didn't put it in their Petition. Did you also have an argument that on the
12 merits it wouldn't be a 102(a) reference anyway?

13 MR. RACHUBA: That's correct, Your Honor.

14 JUDGE BISK: Can you go into that? Thank you.

15 MR. RACHUBA: Absolutely. Could you please pull up
16 Exhibit 1057, turn to page 14? This is the Petitioner's response. So
17 Petitioner relies on the testimony of Dr. Yee, who is opining on WorldCat
18 MARC records, which is a -- page 14 -- which is a bibliography database of
19 the records of scholarly works.

20 Here, however, it is important to understand what Yee did not
21 testify on. Dr. Yee presents no firsthand knowledge of what the records
22 actually represent. She did not testify that she accessed the records. She did
23 not testify that a person of ordinary skill ever accessed these records as of
24 the critical date or -- sorry, the 102(a) date. She did not even testify that a
25 person of ordinary skill could have accessed the full record as of the 102(a)
26 date.

1 Rather, what she did testify -- if you turn to our presentation,
2 Slide 14 -- what she did testify -- oh, I'm sorry, Exhibit 1041, my mistake.
3 What she did testify is that the Wang-Dissertation was discoverable as of the
4 date alleged. And she testified that it is presently available at the University
5 of Illinois. So the discoverable citation is on page 3, paragraph 6. Let's see
6 here.

7 JUDGE BISK: How does discoverable compare to the case law,
8 which is examinable or accessible? You're saying it's different?

9 MR. RACHUBA: Yes. Discoverable is not accessible.

10 JUDGE BISK: Okay.

11 MR. RACHUBA: It's similar to problems we have under 102(b).
12 Just because you can discover a record -- because, again, all this
13 discoverability goes back to the record of a reference. It doesn't go to the
14 substance or the substance of the actual reference itself. So Yee is testifying
15 in her declaration, paragraphs 6 to 7, that it was discoverable as the date
16 alleged but no evidence that it was, as you would recognize, accessible or
17 that a person could -- a person of ordinary skill could examine it.

18 And likewise, her testimony in paragraph 9 -- go to the bottom of
19 paragraph 9, next page -- it reads here, "The physical copy of the dissertation
20 is available." That's present tense. She did not testify that it was available
21 as of the critical date. There is no testimony from Dr. Yee that supports the
22 idea that the Wang-Dissertation was publicly accessible as of the 102(a)
23 date, even if you take her testimony at face value. Which given Petitioner's
24 admission that she was testifying on the hypothetical capabilities of
25 accessing the Wang-Dissertation in the ProQuest database for
26 Section 102(b), it perhaps shouldn't be given full weight.

1 JUDGE FINAMORE: So Patent Owner -- and I apologize for
2 putting words in your mouth. But just to understand your argument, it's your
3 position that the record was discoverable but there's no evidence that the
4 complete dissertation was discoverable as of the 102(a); is that correct?

5 MR. RACHUBA: That's correct. Our primary position is that
6 102(a) should not even be considered.

7 JUDGE FINAMORE: Right.

8 MR. RACHUBA: But if it's considered, at best we have evidence
9 of discoverable record.

10 JUDGE FINAMORE: Thank you.

11 MR. RACHUBA: And again, on the appropriateness of
12 considering the 102(a) grounds -- Raj, could you please turn to Slide 25 of
13 our demonstratives? So Petitioner alleged that Patent Owner was on notice
14 based on the broad -- at least 102(b) language in the Petition. But Patent
15 Owner was on no notice because no date was provided for Patent Owner to
16 possibly even antedate their reference.

17 In the Preliminary Response, which is not part of the record in this
18 proceeding -- because there's two separate rounds, as Your Honors know.
19 We have the pre-institution phase, and then we have the post-institution
20 phase which starts at the institution decision.

21 But even if we were to consider the arguments made in the
22 Preliminary Response, what Patent Owner said was if a 102(a) argument
23 were raised, Patent Owner could antedate it. But since no date was provided
24 in the Petition, there was no opportunity for Patent Owner to seek out and
25 affirmatively swear behind any hypothetical date.

26 JUDGE BISK: So do you agree with -- there's a conversation

1 earlier with your colleague on the other side that basically this -- the
2 technical problem with the Wang-Dissertation is the same technical problem
3 with the Gupta. So I'm not sure why we're spending so much time on the
4 Wang-Dissertation, I guess. Because we have to decide a technical question,
5 right? And if it's the same for all of the references, does it matter if
6 Wang-Dissertation gets kicked out?

7 MR. RACHUBA: It does matter, Your Honor. Well, first of all,
8 the Gupta-1992 reference was incorporated and of record in Gupta's prior
9 '402 patent, which is of record in the '684 patent. So it was subsequently
10 considered. The details of the Gupta-1992 were considered in the '402
11 patent, and those details were considered during prosecution of the '684
12 patent. And we believe that the material therein was overcome during
13 prosecution and considered.

14 The Wang-Dissertation is an extensive piece of prior art, over
15 120 -- I think 140 pages. The Gupta-1992 is a much shorter disclosure. But
16 in some sense, fused silica and fuse quartz in that context are similar. And it
17 is our position that neither disclosed modifying a compressive wave,
18 propagating it all the way to the interface, such that it reflects off the free
19 surface, returns as a tensile wave and loads the interface in tension. And that
20 I think we can get into probably the merits and -- in details of the actual
21 case.

22 Raj, could you please turn to Slides 3 and 4. So briefly, I'd like to
23 talk about the technology of the '684 patent. The '684 patent is directed
24 towards disclosures that provide for tensile strength and measurement of an
25 interface between two different materials. And this is key in a variety of
26 industries such as aerospace to develop reliable components, you know,

1 sufficient -- protection for painted bodies to various materials. It's widely
2 used in various industries.

3 And it is undisputed that Dr. Gupta was the first to use propagated
4 stress waves to measure tensile stress at an interface between two different
5 materials, as he opined on -- in his unchallenged declaration. Now, his
6 initial work, Dr. Gupta's initial work, was resulted in the '402 patent.

7 JUDGE BISK: I'm sorry, what do you mean by unchallenged
8 declaration?

9 MR. RACHUBA: That portion of the declaration was
10 unchallenged.

11 JUDGE BISK: Okay.

12 MR. RACHUBA: Certain portions of Dr. Gupta's opinions have
13 been challenged by Petitioner. That portion of his declaration was not
14 challenged.

15 JUDGE BISK: Okay.

16 MR. RACHUBA: Sorry, I misspoke. This initial work resulted in
17 the '402 patent to Dr. Gupta, which was considered by the examiner during
18 prosecution. Now, the '684 patent, however, greatly improved upon the
19 work in the '402 patent because it described how to propagate a modified
20 compressive wave to the interface to measure bonds between the substrate
21 and the film, that is by spallation.

22 Okay. Petitioner, I believe, briefly describes Figure 4, but I will go
23 through the elements again just for clarity here. Figure 4 of the '684 patent
24 on the left, it is an example schematic of disclosures therein. Starting with
25 element 114, we have a laser pulse that is applied to the constraining layer or
26 confining layer of 102. And again, I'm going from left to right in the axial

1 direction. So adjacent to 102 we have 104, which is the laser absorption
2 layer, 106 which is the substrate -- 106 is a glass element. I'm sorry. 108 is
3 a substrate, 110 is the thin film, and 112 is the free surface thereof.

4 Now, I'll explain the mechanisms of operation in '684 because this
5 is a fairly complicated technological process. Initially, when the laser is
6 fired, 114, it generates a laser impact in the laser absorption layer 104. Here,
7 a single compression wave is generated that propagates through the glass
8 element 106, through the -- it propagates to the glass element 106. In the
9 glass element 106, the single compression wave is modified such that it has
10 a sharp --

11 JUDGE BISK: This is the stress wave function?

12 MR. RACHUBA: Correct, Your Honor. This is the compressive
13 stress wave, according to the undisputed claim construction that we have in
14 this case. Now, the glass element modifies this compression stress wave,
15 such that it has a sharp stress drop. In some cases, this is referred to as
16 rarefaction shock. It's a sharp stress drop at its tail. It's a modified post-peak
17 decay. So you have the peak of the wave, and it sharply drops off on its far
18 end.

19 This modified stress wave propagates all the way through the glass
20 element to the -- to -- all the way through the glass element to the interface,
21 which is between 108 and 110, through the interface, through the test film,
22 the thin test film, 110, and it rebounds off the free surface, 112, as a
23 returning tensile wave. Now, since the highest portion of stress in the
24 modified compression wave is at its peak, as the wave passes through the
25 interface and begins to rebound off the free surface, there is destructive
26 interference as that compressive wave is continuing to pass through.

1 Okay. When the peak of the compressive wave passes through the
2 interface, there is no longer destructive interference. Remember, we have
3 that sharp drop off. Then we see that return tensile wave with a sharp spike
4 and stress up. Because there's no longer any destructive interference and
5 you have that sharp drop-off through the modified compression layer. That
6 sharp drop-off results in a tension spike and spallation of the thin film at the
7 interface.

8 Now, the mechanics in the Wang-Dissertation, Gupta-1992, they
9 operate very differently.

10 JUDGE BISK: Can you just take what you said and map this to
11 the (INDISCERNIBLE)?

12 MR. RACHUBA: Sure.

13 JUDGE BISK: You say a lot of words and I understand what
14 you're saying, but I don't know how exactly they map to -- it's a pretty short
15 claim language there overall of of what you just said.

16 MR. RACHUBA: Okay. I will do my best to do it with the claim
17 language itself. And maybe I can show a figure from the patent, that might
18 be helpful as well. So I'm referring to the last paragraph in claim 1 here.

19 We have the glass element being configured to propagate and
20 modify. So this means that it is -- as the compressive stress wave passes
21 through the glass element, the glass element modifies that compressive stress
22 wave. And by modification, I'm referring to a sharp stress cut-off on its tail
23 end. So if you look at Figure 6 here, you'll notice on the right side of the
24 figure --

25 JUDGE BISK: But what in the claim it requires that sharp -- with
26 the cut-off?

1 MR. RACHUBA: So I guess we can consider it -- looking at the
2 Specification, interpreting the claim 1 language. But I was using the sharp
3 cut-off for illustrative purposes. So I guess here, the claim doesn't require a
4 sharp drop-off. I was doing it for illustrative purposes.

5 So the glass element is configured to modify. So change the wave
6 profile structure. And that changed profile structure is propagated to the
7 coating/substrate interface. So this means that the changed wave, in its
8 changed form, goes all the way through the glass element to the substrate.

9 And then we have the language to generate a tensile stress between
10 the substrate and the coating. How this tensile stress is generated is that
11 after that modified wave passes through the substrate -- or through the glass
12 element, through the interface, it goes through the thin film, and it rebounds
13 off the free surface of that film in the opposite direction as a tensile wave.
14 And that tensile wave, that reflected tensile wave off the free surface of a
15 thin film, results in a tensile stress between the substrate and the coating at
16 the interface.

17 JUDGE BISK: Okay. But not all of that is claimed. So the
18 rebounding, I mean, if there -- theoretically, if there was another way to
19 create a tensile stress between the substrate and the coating, this claim would
20 cover it.

21 MR. RACHUBA: I guess, theoretically, that is a possibility. But
22 the physics and evidence that we have in this proceeding, there has been no
23 other possible way to generate a tensile stress of the coating.

24 JUDGE BISK: Okay.

25 MR. RACHUBA: At least from that modified compression wave.
26 Raja, could you please turn to --

1 JUDGE BISK: I'm sorry. And by modified compressive wave,
2 you mean the modified stress wave?

3 MR. RACHUBA: Yes.

4 JUDGE BISK: That's what the claim calls it?

5 MR. RACHUBA: Yes.

6 JUDGE BISK: Okay.

7 MR. RACHUBA: Yes. But we do have the undisputed claim
8 construction on the Slide 27. So Petitioner agrees with this claim
9 construction, which we understand is in accordance with the plain and
10 ordinary meaning that the wave here refers to the compressive wave.

11 JUDGE BISK: Okay.

12 MR. RACHUBA: Raj, could you please go to Slide 32? So the
13 mechanism of operation in the Wang-Dissertation in Gupta-1992 is very
14 different than mechanism of operation in the '684 patent. So in the
15 Wang-Dissertation -- and this is in the experimental setup. Because this is a
16 diagram according to experimental setups in Wang-Dissertation, this is in
17 chapter 3, although her future work operates in the same way.

18 But here, we have the confining layer abutting directly against the
19 absorption layer, which abuts directly against the substrate. Here there's no
20 separate fused silica glass element because this is the experimental setup in
21 the experimentations performed in chapter 3. But the mechanism of
22 operation also operate the same way in the future work.

23 In the Wang-Dissertation, after the laser is absorbed by the
24 absorbing layer, two compressive waves of equal magnitude are generated.
25 One continues to travel towards the substrate and the test film, the other
26 travels backwards toward the confining layer. The Compressive-Wave-2 --

1 JUDGE BISK: But wasn't these -- both these waves would be
2 generated in the situation of the patent also, though, right?

3 MR. RACHUBA: No. Actually --

4 JUDGE BISK: Why not?

5 MR. RACHUBA: Because the specific -- well, this -- I want to be
6 clear here because I have it -- I don't want to mix up my words, and this is a
7 complicated issue. So it is actually undisputed by Petitioner in the '684
8 patent that two waves are not generated. You only have the one
9 compressive wave.

10 And this is because, as Dr. Gupta opined in unchallenged
11 testimony, looking at paragraph 55 of his report, "Laser fluence is used that
12 results in instantly vaporizing the laser absorption layer, creating a physical
13 gap between the constraining layer and the substrate, preventing the
14 transmission of the wave into the substrate." So if you go back to Slide 4 --

15 JUDGE HUDALLA: You said that was 55 of Dr. Gupta?

16 MR. RACHUBA: Yes.

17 JUDGE HUDALLA: Okay.

18 MR. RACHUBA: So the laser absorption layer, 104, is blown off
19 after the laser impacts it. So it only allows propagation in one actual
20 direction towards the interface. There is no return back towards the opposite
21 direction.

22 JUDGE BISK: That's in a '684 patent?

23 MR. RACHUBA: Correct.

24 JUDGE BISK: But that's nowhere in the claim, is it?

25 MR. RACHUBA: That is not in the claim.

26 JUDGE BISK: Okay.

1 MR. RACHUBA: I'm just explaining the physics and mechanism
2 of operation that allows the -- specifically, the structural features of the
3 claim.

4 JUDGE BISK: But if 104 wasn't totally obliterated, you would get
5 the two compressive --

6 MR. RACHUBA: I don't want to speculate, Your Honor.

7 JUDGE BISK: Okay.

8 MR. RACHUBA: And there is no evidence in the record to
9 suggest a disclosure like that.

10 JUDGE BISK: Okay.

11 MR. RACHUBA: Certainly, Petitioner did not prevent -- or
12 present any arguments in that regard.

13 We can turn to Slide 32, next slide, please. So in fact, in the
14 Wang-Dissertation, after the Compression-Wave-2 reflects off the confining
15 layer, it returns back as Tension-Wave-1.

16 JUDGE BISK: So in this one, absorbing layer isn't obliterated?

17 MR. RACHUBA: Correct.

18 JUDGE BISK: Okay.

19 MR. RACHUBA: Well, there is one experiment, which I'll discuss
20 in a moment, where it is blown off. And you'll actually see -- and that one is
21 very clear because you don't have the influence of the tension wave. You
22 can see the sole compression wave, and you can see that it's not modified.
23 So I will address that question in a moment, Your Honor.

24 JUDGE BISK: Okay.

25 MR. RACHUBA: Right. So in the Wang-Dissertation, you have
26 the reflected tensile wave that chases after the Compression-Wave-1. And

1 this Tension-Wave-1 eventually catches up to and overtakes the
2 Compression-Wave-1. And it's this tension wave that results in the tension
3 spike, as shown in 3.15(c), as Dr. Gupta --

4 JUDGE BISK: So you don't agree with your Counsel on the other
5 side that said that it doesn't catch up with it?

6 MR. RACHUBA: Correct, Your Honor. And actually, Raj, if you
7 could go to Slide 35, please. Not only do we disagree, Dr. Wang disagrees
8 as well. And the Wang-Dissertation disagrees as well also. So here on the
9 right side of the slide, we have a direct quote from the Wang-Dissertation.
10 And it reads, "Because tension-wave-1 is 'tensile, it propagates faster than
11 the peak compressive stress and faster than the low stress tail of the main
12 pulse. It actually overtakes the [compressive-wave-1]."

13 And with respect to Figure 3.15, which is calculated stress in the
14 substrate, not the interface. So Petitioner's contention that the tensile wave
15 would not reach the interface until a later point in time is incorrect. Because
16 we can already see it in the interface itself, even before -- or sorry, in the
17 substrate itself even before the interface that the tension wave overtakes it.

18 So Dr. Wang here testifies that the tension wave arrives at the
19 same moment that the alleged -- which Petitioner is alleging is causing the
20 attenuation stress, tension from the compressive wave. So even Petitioner's
21 own declarant agrees that the tension wave catches up and overtakes.

22 JUDGE FINAMORE: Counsel, what is your response to Dr.
23 Wang's testimony about the timing? In Petitioner's Reply, there's a
24 mathematical formula presented on page 17, which I believe is from
25 paragraph 5 of Dr. Wang's supplemental declaration. Whereas not having
26 done the math myself, but from what I see in the Petitioner Reply, it looks

1 like the tensile wave does not arrive at the interface before the compressive
2 wave.

3 MR. RACHUBA: Next slide, please. It is directly contradictory to
4 her deposition testimony that the tensile wave overtakes it. And it's directly
5 contradictory to the express disclosure of the Wang-Dissertation, which
6 states that the tensile wave does overtake it.

7 JUDGE FINAMORE: So the math is incorrect?

8 MR. RACHUBA: I don't know if the math is incorrect or if she's
9 using a different mathematical theory that's not appropriate. But that
10 mathematical theory is in direct contradiction to her own testimony on
11 deposition, directly contradictory to express disclosures in the
12 Wang-Dissertation, which states right here that "being tensile, it propagates
13 faster than the peak compressive stress and is faster than low stress tail at the
14 main pulse. Eventually, it overtakes the compressive main pulse."

15 JUDGE FINAMORE: And just to elaborate on that, the tensile
16 wave propagates faster due to the material properties of glass; is that
17 correct?

18 MR. RACHUBA: Due to the specific material properties of the
19 fused silica as tested in the Wang-Dissertation, which we contend is not a
20 glass element as claimed.

21 JUDGE FINAMORE: Thank you.

22 JUDGE HUDALLA: Can I ask you a question about that
23 particular aspect, Counsel? Obviously, you have this interplay between the
24 glass element limitation and the wherein limitation, at the end of the claim,
25 claim 1 I'm talking about.

26 MR. RACHUBA: Yes, sir.

1 JUDGE HUDALLA: There seems to be an enumerated list in the
2 '684 patent. Is it your contention that what the glass elements have be within
3 that enumerated list or is it -- I mean, where's the boundary, I guess, is what
4 I'm asking?

5 MR. RACHUBA: Well, my understanding is that enumerated list
6 is open-ended, so it gives specific examples of glass elements that do have
7 the intrinsic physical structural properties of the glass element as claimed.
8 But there are -- it at least opened the possibility for other glass elements.

9 Whether other glass elements meet that limitation is not within the
10 scope of this proceeding. There's been no expert testimony. The facts
11 haven't been explored. So I think it's just out of the scope of this proceeding.
12 And I don't want to speculate to what that is. But I will say that the list is
13 open-ended.

14 JUDGE HUDALLA: Okay.

15 JUDGE BISK: I'm sorry. I'm still a little confused about whether
16 you are contesting the glass element, limitation [c], or just the portion of
17 glass element that is modified by limitation [d].

18 MR. RACHUBA: We think they go hand in hand. Because the
19 wherein clause adds additional features and limitations to the glass element.
20 So if the glass element isn't capable of meeting those structural and physical
21 characteristics in that last wherein clause, it necessarily doesn't meet the
22 earlier glass element because it wouldn't be a glass element as shown and
23 described.

24 JUDGE BISK: Okay.

25 MR. RACHUBA: Raj, if you could please pull up Slide 38. So
26 the only portion in the Wang-Dissertation that actually describes an

1 additional -- what Petitioner contends is a glass element, is Dr. Wang's
2 future work, where Dr. Wang contends that you would insert an additional
3 fused silica element in the experimental arrangement.

4 Now, Dr. Wang has opined that Wang-2009, which was not
5 disclosed with the Petition but only found later on by Dr. Gupta whilst
6 preparing for his deposition, prevents -- presents experimental results of the
7 future work described in her dissertation. Now, in the -- go to Slide 43,
8 please, 43 and 44. In Wang-2009, two sets of experiments were run. The
9 first, exemplified by Figure 3 on the left, is using a -- where no additional
10 fused silica layer was inserted. So in other words, this is the same
11 experimental setup that was described in chapter 3 of Wang-Dissertation.

12 Dr. Wang refers to this -- again, that's in line with the experiment
13 performed in her dissertation as a non-modified stress wave during
14 deposition. On the right is a -- what Dr. Wang initially opined on as a
15 modified version of stress waves, shown from Figure 5, where an additional
16 fused silica layer was inserted. Neither of these -- neither of the waves --
17 none of the waves shown in either Figure 3 or Figure 5 are modified, as I'll
18 explain.

19 Slide 45 please. So in her second declaration, Dr. Wang opined
20 that the stress in figure -- stress wave in Figure 5 was modified because it
21 has a shorter unloading portion of approximately 10 nanoseconds, compared
22 to a longer unloading portion of approximately 10 to 15 nanoseconds in
23 Figure 3, the admittedly unmodified wave. Now, despite claiming
24 modification, Dr. Wang stopped short of claiming there was the shock,
25 which was the basis of Petitioner's whole argument in the Petition and the
26 substance of most of Dr. Wang's arguments in her initial declaration.

1 In fact -- Slide 46, please -- Dr. Wang confirms there's no shock in
2 Figure 3. Next slide, please. And Dr. Wang confirms there's no shock in
3 Figure 5. With respect to the modification to Slide 48 -- with respect to the
4 modification based on a longer unloading time of 15 nanoseconds in
5 Figure 3 -- first, I want to note a typo in this slide and a typographical error
6 in Patent Owner's Sur-reply. The questionnaire reads, "Can you show me
7 how you calculated the 15 nanoseconds," Figure 5 should be in Figure 3.

8 And in looking at the transcript of the deposition testimony on
9 page 61 right there -- or sorry, it's actually on page 60, line 16, it confirms
10 that we're talking about Figure 3. It's just Patent Owner made a
11 typographical error here. But ignoring that typographical error, Dr. Wang
12 on cross confirmed that the unloading times of the waves in Figure 3 are not
13 15 nanoseconds, but that each of the waves is actually 10 nanoseconds. So
14 she recanted the only basis in her declaration for claiming there was
15 modification in Figure 5 versus Figure 3.

16 JUDGE FINAMORE: Counsel, just to make sure I'm following, in
17 Wang, we have the two waves, right? We have Compression-Wave-1,
18 Compression-Wave-2, which becomes Tension-Wave-1. What wave are we
19 looking at here in these figures?

20 MR. RACHUBA: This is also two waves. In all of Wang's work
21 there are two waves. So this is why you have -- well, I believe there are two
22 waves. Let me grab that. I don't have the record in front of me right now,
23 and I don't want to speculate. So I will try to find an answer for you on that
24 on rebuttal.

25 JUDGE FINAMORE: That's fair. And as a follow-up question, if
26 we're not sure what we were looking at here, do we at least know where this

1 is measured? In particular, is this taken at the coating/substrate interface?

2 MR. RACHUBA: I believe this is taken in the substrate.

3 JUDGE FINAMORE: In the substrate? Thanks.

4 MR. RACHUBA: So, again, regardless if there are two waves
5 here shown, there's no shock. There's no modification. So if there's one
6 wave, it's very clear, compressive wave is not modified. There's no shock.
7 If there are two waves, then there's no evidence for any modification or
8 shock. Petitioner has a burden to persuade the Board that there is a
9 modification. It's either clearly not present or no evidence is for it.

10 Now, Wang's recanted testimony during her deposition is expressly
11 in line with the disclosures of Wang-2009 itself. Next slide, please.

12 Wang-2009, when referring to the waveforms shown at Figure 5, expressly
13 describes it as the waveforms having the same shape as the Wang admittedly
14 unmodified waves shown at Figure 3. And it also describes an unloading
15 ramp of about 10 nanoseconds. Again, the same as shown in Figure 3.

16 So in summary, the future work of Dr. Wang fails to disclose at
17 least the last wherein clause of claim 1, and then similarly recited in
18 claim 13, because the glass element -- in this case, fused silica -- does not
19 modify, let alone propagate a compressive stress wave to the interface. And
20 there's no modified compression wave that generates a tensile stress at the
21 coating/substrate interface.

22 Now the other disclosures in the Wang-Dissertation do not
23 provide -- do not show any anticipation either. Raj, if you'll please pull up
24 Slide 56. This is Figure 3.15 from the Wang-Dissertation that's been
25 discussed at length in this proceeding, and it depicts a calculated net
26 theoretical stress at some point in the substrate. And per Dr. Wang's

1 testimony, this theoretical point is both infinitely far from the energy
2 absorption layer and also infinitely far from the substrate interface with the
3 test film.

4 Here, the calculated tension from Points A on the bottom to C is
5 caused by the unmodified Tension-Wave-1. It is not, as Dr. Wang initially
6 alleged in her first declaration, the decompression shock through a modified
7 compression wave. The calculated stress here depicts the net stress from
8 both the unmodified compression wave and the unmodified tension wave.
9 Since it's a continuous stress profile, it's evident that the Tension-Wave-1
10 arrives at Point A and loads the substrate up in tension -- up to Point C.
11 Merely because Point B, the net zero stress, falls in that line does not
12 provide any evidence that the Compression-Wave-1 is modified.

13 Slide 50, please. In fact, Dr. Wang has testified that there's no
14 evidence to show that that tension spike is from the reflected tension wave
15 from the interface on the other side or the reflected Tension-Wave-1 that's
16 coming in from the confining layer side, that's chasing Tension-Wave-1; she
17 admitted in her deposition.

18 Now, Raj, can please turn to Slide 58? Now, I mentioned earlier
19 that there was one figure in the Wang-Dissertation where there were not two
20 waves shown, this is Figure 3.19. Here, the -- similar to the mechanics in
21 the '684 patent, that late energy absorption layer was blown off here so it
22 prevented the transmission of that reflected chasing tension wave. So what
23 we see here is the pure compression wave. And as Dr. Gupta testified in
24 un rebutted and unchallenged testimony, this compression wave is not
25 modified. There's no shock shown.

26 Slide 62, please. As Your Honors recognized earlier during

1 Petitioner's presentation, there's a significant element of attenuation at play
2 here. So even if there were to be any hypothetical modification of that
3 Compressive-Wave-1 in the fused silica using the Wang-Dissertation
4 experiments, Dr. Gupta has testified that that wave would revert back to its
5 unmodified form by the time it reaches the interface.

6 This is because laser-generated stress waves in fused silica -- even
7 if they were to develop a shock profile or modification profile -- lose 50 to
8 90 percent of their amplitudes through the substrate. And as that -- as those
9 amplitudes decrease, the fused silicate would no longer be subject to
10 volumetric compression, which could potentially enable any hypothetical
11 shock or modification.

12 As further evidence of this, next slide, please. This is Table 3.4 of
13 Dr. Wang's dissertation. And what this table is showing here is calculated
14 stresses for the different portions in the substrates of varying thicknesses.
15 And as we can see, as the substrate thickness increases, the stress is reduced.
16 So this provides further evidence of that attenuation.

17 JUDGE HUDALLA: Doesn't Petitioner put in some rebuttal -- or I
18 should say reply declaration testimony saying, hey, we can just ramp up the
19 power of the laser and overcome this?

20 MR. RACHUBA: Petitioner does put it in evidence, a declaration,
21 correct. But what Petitioner doesn't do is they don't rebut Dr. Gupta's
22 testimony, which says that merely modifying the amplitude of the stress
23 wave is not a obvious or an easy feat. It is a very complicated matter that
24 involves complicated physical workings and understandings of the specific
25 physical properties of that glass element. Dr. Gupta's testimony in that
26 regard is unrebutted.

1 JUDGE HUDALLA: I guess this all comes to a head for me in the
2 idea of, you know, kind of the hypothetical of how do I -- how would I ever
3 infringe this claim. It seems like, you know, we could go round and round
4 in circles about, okay, do I have the right glass element? Do I have the right
5 amount of reflection? Is the right wave reflecting at the right time?

6 I mean, you're trying to ascribe a lot of behaviors to this claim.
7 And I just don't understand what the metes and bounds of this claim, you
8 know, really is. That's what I'm really struggling with here. You know, this
9 seems to be rebutting some of your arguments. But you come back and say,
10 well, it's not good enough. Could you address that?

11 MR. RACHUBA: I guess the strongest problem we have right
12 now is that it's Petitioner's burden to show invalidity by prior art reference
13 under Section 102 or 103, to the extent there are infringement questions or
14 enablement questions regarding the scope of the claims, that's not an issue in
15 this proceeding. That issue has not been fully explored. So I don't want to
16 speculate on what -- on how we might answer or address those questions.

17 JUDGE HUDALLA: Okay. Well, I get it. I mean, I said
18 infringement, but I'm really --

19 MR. RACHUBA: Yeah.

20 JUDGE HUDALLA: -- talking about claim construction.

21 MR. RACHUBA: Right. And I guess bringing it back to the
22 claim construction, Patent Owner proposed a claim construction, Petitioner
23 didn't disagree with it. And I think under that construction, if you go to
24 Slide 26, the alleged prior art just doesn't meet those claims. So here, what
25 we -- we're essentially requiring three things under this claim construction,
26 which is changing the profile of laser-generated compressive wave,

1 propagating the wave as modified to the free surface of the coating, which
2 upon reflection as the tension wave generates tensile stress at the
3 coating/substrate interface.

4 So here, we basically have three things. We modify the
5 compressive wave, we propagate that modified compressive wave to the
6 interface, and after passing through the interface, we reflect back as a
7 tension wave and load that interface with tension. The prior art does not
8 meet those elements.

9 JUDGE FINAMORE: Counsel, what about to the extent Petitioner
10 is relying on this, the teaching from the 1970s -- I believe it was Barker and
11 Hollenbach -- that fused silica was known to create a shock?

12 MR. RACHUBA: So two things on the Barker and Hollenbach
13 paper. One, Petitioner is not relying on it as a prior art reference in any of
14 the grounds, so its disclosure isn't particularly relevant. But the extent
15 Barker and Hollenbach is considered, it's a very different mechanical and
16 experimental setup. So Barker and Hollenbach, there's no laser shocks.
17 What you have is a tungsten carbide tube and another tungsten carbide tube.
18 And one hits the other and generates the stress wave into the tube.

19 And what's referred to as a rarefaction shock in that reference, it's
20 referring to the reflected wave in the hammer of the other tungsten tube
21 bouncing off the free end and returning back into this end. And that
22 destructive interference from that reflected wave is the same as we see in the
23 Wang-Dissertation. It's that destructive interference that shows the step
24 down. But Petitioner has not made a prior art argument based on the Barker
25 and Hollenbach paper. So the full mechanics of that had not been fleshed
26 out.

1 I'll yield the remaining amount of time.

2 JUDGE FINAMORE: Thank you. You finished right on the nose
3 at 50 minutes.

4 Petitioner, whenever you're ready. According to my count, you
5 have 29 and a half minutes.

6 MS. SHOMAKER: Thank you, Your Honors. I don't plan to use
7 them all. I'll try to be brief. I want to first address Patent Owner's argument
8 regarding the 102(a) grounds, the creation of the MARC record. Patent
9 Owner suggests that the creation of the MARC record in the University of
10 Illinois Urbana-Champaign Library does not establish that the
11 Wang-Dissertation was actually available in that library.

12 As Dr. Hsieh Yee testified in her declaration, a MARC record is
13 created when the library receives the printed publication. So the live -- the
14 printed publication of Wang-Dissertation would have been in the library
15 itself when it created that MARC record.

16 I also want to raise that Patent Owner did not argue in the papers
17 and I'm not aware of any evidence in the record, that demonstrates that
18 Gupta-1992 was actually considered during prosecution of either the '402
19 patent or the '684 patent. You know, it is possible that it is referenced in the
20 specifications of those patents or was perhaps identified during prosecution.
21 But we're not aware that the Patent Office actually analyzed that reference
22 when determining -- when evaluating the claims. And Patent Owner has not
23 advanced that argument prior in this proceeding.

24 I do want to discuss Figure 3.15, which if you'll recall is the figure
25 of the shock generation. And Patent Owner argues that in Figure 3.15, the --

26 JUDGE BISK: Was this in the Wang-Dissertation?

1 MS. SHOMAKER: Yes. Sorry. Do you mind scrolling up little
2 bit to Figure 3.15 so we can orient everyone? Right there. So it's 3.15(c) in
3 the bottom left-hand corner. As Dr. Wang explains in her dissertation and
4 was actually discussed during her deposition, Figure 3.15(c) does actually
5 depict where the tensile wave overtakes the Compressive-Wave-2. And
6 that's where the pressure goes from negative to positive stress. So that's, I
7 would say, about 29 nanoseconds.

8 And if you could scroll back down, please, to the highlighted
9 portion on -- I believe it's page 66, the Wang-Dissertation acknowledges
10 this. And she explains that the shock is followed by a regime in which the
11 velocity has changed sign indicating that the tensile pulse has overtaken the
12 compressive pulse.

13 However, remember these readings were taken from the free edge
14 of the test film, meaning that the compressive pulse had already reached the
15 test film and was beginning to reflect back through and, in fact, in part had
16 reflected back by the time that the tensile pulse got there. The patent claims
17 do not specify that there's a minimum amount of the compressive pulse that
18 must be realized at the free interface. And so the claims are satisfied simply
19 by that compressive pulse reaching the free interface.

20 JUDGE FINAMORE: So Counsel, just a clarification for me.
21 That's talking about a change in the sign of velocity. But Figure 3.15(c) is a
22 measure of pressure versus time. So where would I see velocity on this
23 chart?

24 MS. SHOMAKER: Do you mind scrolling back up? Really, Dr.
25 Wang testified in her deposition that when that -- when we enter the positive
26 substrate stress, that's when that -- the same timing as when that tensile pulse

1 was reflecting through.

2 JUDGE FINAMORE: Okay. So we'll just call it the Y axis?

3 MS. SHOMAKER: The Y axis, yes.

4 JUDGE FINAMORE: Okay. Thank you.

5 MS. SHOMAKER: So when you flip from the negative numbers
6 to the positive of the substrate stress, that's where the tensile pulse comes in.
7 So the compressive pulse has already reached the free surface and reflected
8 back. And then yes, before that entire compressive wave has come through
9 there, the tensile wave does catch up.

10 And that's consistent with the calculations that are identified -- that
11 are -- exhibit number -- page 17 of Patent Owner's -- or Petitioner's Reply.
12 Dr. Wang calculated that there would be about a three-nanosecond delay in
13 the tensile pulse overtaking that compressive pulse. And that's exactly what
14 we see here in this figure. There's about three nanoseconds where you have
15 only compressive strain before the tensile strain comes in.

16 And I'll briefly touch on Figure 3.19, which I know that Patent
17 Owner has alleged. Figure 3.19, for an example, is the -- or to reorient us, is
18 the figure where Patent Owner alleges the constraining layer was blown off.
19 What Dr. Wang was measuring in Figure 3.19 was she was varying the
20 width of the waterglass constraining layer. So she was -- this is the layer
21 that the laser first hits before it extends into the metal layer that expands to
22 generate the actual shock.

23 And so Dr. Wang acknowledges in her dissertation that that --
24 because the -- if the constraining layer is too thick or too thin, you won't get
25 a shock. She also discusses that a person of ordinary skill in the art would
26 know how to vary the constraining layer to get a shock. And so that's what's

1 depicted in Figure 3.19. There wasn't -- the presence of no shock wasn't a
2 result of the fact that fused silica does not generate a compressive wave. It
3 was the fact that the waterglass was not of an appropriate thickness to get to
4 a compressive wave.

5 And to briefly address the Barker and Hollenbach reference, so
6 yes, Patent Owner is correct that this is not an independent ground or a
7 reference that we rely on to establish that the claims are unpatentable. But
8 this is a pretty well-known piece of work that both Dr. Wang and Dr. Gupta
9 have cited in their respective publications that does demonstrate that the -- a
10 physical property of fused silica is the ability to generate a shock wave.

11 And unless there are any further questions?

12 JUDGE HUDALLA: I guess I would ask one more question.
13 You've agreed today that Patent Owner's construction about the reflective
14 wave having -- creating the tension. Is that -- do we have that information in
15 the Petition? I mean, that's -- it seems like you're -- you said, well, we put
16 some waves into this test piece and it creates some tension, but we don't
17 necessarily have, hey, it's got to be the reflected wave that creates the
18 tension. Do you have that piece in the Petition?

19 MS. SHOMAKER: Well, that's exactly what's shown in
20 Figure 3.15. So Figure 3.15, again, is the measurement from the free film
21 surface. So this is after the wave has gone all the way through the test film,
22 it's reflected back. And so that's what you see from -- I think it's about 26
23 nanoseconds to -- I would say it's like 29 nanoseconds. So when the
24 substrate just goes positive, that is the tension that results on the free film
25 interface that's been reflected back.

26 JUDGE HUDALLA: That's the Segment BC, I think, in one of the

1 diagrams?

2 MS. SHOMAKER: So that was actually Segment AB.

3 JUDGE HUDALLA: AB. Okay.

4 MS. SHOMAKER: So AB is results from the compressive force.

5 JUDGE HUDALLA: Okay.

6 MS. SHOMAKER: And then BC, which is I guess the positive
7 stress, is what results from the tensile wave that has overtaken that
8 compressive force.

9 JUDGE HUDALLA: Okay.

10 MS. SHOMAKER: If there's nothing further, I'll take my seat.

11 JUDGE FINAMORE: Thank you.

12 MS. SHOMAKER: Thank you.

13 JUDGE FINAMORE: So Patent Owner, before you begin, I just
14 want to deal with a technical issue we're having on our end. May I ask that
15 Counsel please unplug and replug the HDMI cable? Yes, please. Thank
16 you. We can see it fine here in the hearing room, but apparently there's
17 some issue with the signal on the public line. So if you can just give me one
18 moment to confirm.

19 MR. RACHUBA: I just did it.

20 JUDGE FINAMORE: Thank you.

21 MR. RACHUBA: It worked?

22 JUDGE FINAMORE: It looks like it did. Thank you.

23 Patent Owner, according to my count, you have 10 minutes. You
24 may begin when you're ready.

25 MR. RACHUBA: Thank you, Your Honor. Raj, Slides 66 and 67,
26 please. I just want to at least briefly address two additional pieces of alleged

1 prior art, the Gupta-1992 reference and the Wang-2002 reference.

2 JUDGE FINAMORE: Counsel, before we get into Gupta-1992,
3 I'm going to ask you the same question I asked Petitioner. Do essentially
4 Gupta-1992 and the Wang-Dissertation rise and fall together, meaning they
5 either don't disclose the claimed invention for the same reason, or they do
6 disclose it for the same reason?

7 MR. RACHUBA: The Gupta-1992 reference is cumulative of the
8 future work portion of the Wang-Dissertation. So to the extent -- we can see
9 that the '92 reference rises and falls with the future work in the
10 Wang-Dissertation.

11 JUDGE FINAMORE: Which I believe is what Petitioner is
12 relying on for that last element of claim 1.

13 MR. RACHUBA: Yes. I think they're relying on that last -- the
14 future work in -- when viewed in view of the experiments in chapter 3,
15 which we believe is evidence that there is no modification.

16 JUDGE FINAMORE: Understood. Thank you.

17 MR. RACHUBA: Thank you, Your Honor. Next slide, please.
18 Okay. So here, Dr. Wang confirms that Gupta-1992 is essentially the same
19 idea. They call it -- it's the same idea. She calls it the same idea as the
20 future work in the Wang-Dissertation. Next slide, please. Dr. Gupta has
21 testified that there was no shock, as Petitioner alleged, in the Gupta-1992
22 paper. Next slide, please. Dr. Wang confirms that there's no shock shown in
23 the Gupta-1992 paper, as alleged by Petitioner.

24 Next slide, please. In fact, Gupta-1992 of the waveform shown at
25 Gupta-1992 aligns closely with Figure 3.19, which I've inverted here on the
26 right side of the figure. Here, as mentioned, the Figure 3.19 shows only a

1 compressive waveform, an unmodified compressive waveform. Likewise,
2 with Gupta-1992, there is no tension wave present. It's only dealing with the
3 compressive wave.

4 And as shown, these waveforms neither show a modification,
5 neither show a shock. And this is because fused quartz and fused silica are
6 similar materials. They're both amorphous solids. And neither are described
7 as being one of the glass elements as used in the '684 patent. Quartz without
8 the term fused on the other hand is. Quartz is a pure crystalline form.

9 And that helps distinguish that material based on the intrinsic
10 properties thereof that refer back to the specifically claimed properties in the
11 last wherein clause in claim 1, claim 13. Go to slide 72, please. This slide
12 confirms that the Wang '92 -- or Wang-2002 reference is -- it contains a
13 smaller subset of the disclosures in the Wang-Dissertation and does not
14 provide any additional disclosures.

15 When I refer back to Figure 3.15 that Petitioner referred to -- Raja,
16 if you could please pull up Slide 56. Now, Petitioner was saying that this is
17 a measured stress at the interface. This is not true. And this is not what Dr.
18 Wang testified on. In her deposition on page 72, lines 12 to 19, she explains
19 that this is a backwardly calculated stress from the measured interferometer
20 signals on the free surface of the thin film.

21 So we have the thin film on the free surface. We have thin film,
22 and we have a free surface thereof. And we have a interferometer that is
23 measuring the changes in velocity of the free surface. And that measured
24 change in velocity based on the interferometer signal is backwardly
25 calculated from formulas described in Dr. Wang's dissertation. But this is
26 substrate stress, as shown clearly on the Y axis here. This is not stress at the

1 interface.

2 So as Petitioner acknowledged, we do see the tension wave arrive
3 here. And this is in the interface before -- or sorry, this is in the substrate
4 before the interface. So we already have the tension wave overtaking and
5 coming past the compressive wave before we even get there. Now --

6 JUDGE FINAMORE: So Counsel, just to make sure I'm tracking.
7 This is prior to reflection from the free surface of the coating, correct?

8 MR. RACHUBA: That is correct.

9 JUDGE FINAMORE: Thank you.

10 MR. RACHUBA: And if we would go to -- Raja, could you please
11 pull up Exhibit 2009, go to page 50? So actually, in specific reference to
12 this Figure 3.15, Dr. Wang has testified that the tension wave arrives before
13 the compressive wave gets to the interface.

14 And while my partner is pulling that up, I'd like to -- we talked
15 briefly about the equation that Dr. Wang relied on in her second dissertation.
16 This is directly addressed on page 18 of Patent Owner's Sur-reply. Page 50.
17 So to the extent Dr. Wang attempts to define a specific time delay of the
18 tension wave, Dr. Wang has confirmed in her dissertation itself that it's not
19 an easy calculation.

20 The delay -- this is quoting from page 65 of her dissertation. It
21 reads, "The delay varies from test to test as the surface properties of the
22 constraining layer are not well controlled." If those properties are not well
23 controlled, there's no basis for her to calculate a specific time delay with
24 reference to 3.15. Regardless, it's directly contradictory with her testimony
25 starting on page 50, beginning line 3. So question asked, "Dr. Wang, you
26 had just testified that the tensile wave overtakes the compressive wave at

1 roughly 28 or 29 seconds."

2 Down here, they repeat the question. Their answer begins on
3 line 21. "So in this case, it's almost simultaneously. So the tension wave
4 follows, due to the fast shock for time. So the two almost immediately
5 follow." So she's not testifying that the compression wave definitively will
6 arrive before. And she confirms, through her dissertation, through her
7 deposition testimony, that the tension wave will arrive.

8 Now, there's notice -- go back to, I think, 3.15, please. I'm sorry,
9 Slide 56. The important way to consider this waveform here isn't A to B or
10 B to C. It's A to C or from O to C. It's a continuous, measured -- or
11 continuous calculated stress. There's no definitive break between where the
12 tension wave arrives or where the compression wave ends and the tension
13 wave arrives. It's a continuous wave -- a continuous measured stress, and it's
14 clear that the tension wave is resulting in that tensile stress.

15 Dr. Wang agrees with Dr. Gupta's explanations of the physics and
16 the understanding of the elements in claims 1 and 13. Let's not lose sight
17 that Dr. Wang has recognized Dr. Gupta as a key player in industry, and Dr.
18 Wang too is a leading scientist in this industry. And both agree that in the
19 Wang-Dissertation, there are two waves. Both agree that in the
20 Wang-Dissertation, in Wang-2009, the tensile wave overtakes the
21 compressive wave.

22 And both agree that there's no evidence in the Wang-Dissertation
23 experiments to show that the tensile wave is -- or that the compressed wave
24 is the cause of the tensile stress. They both agree there's no evidence of that.
25 With that, Your Honor, I rest my case.

26 JUDGE FINAMORE: That concludes today's oral argument. We

- 1 thank the parties both for their presentations. We are now off the record.
- 2 (Whereupon, the above-entitled matter went off the record at 10:44
- 3 a.m.)

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