



Planet Depos®
We Make It *Happen™*

Transcript of P. Morgan Pattison, Ph.D.

Date: July 30, 2024

Case: Mianyang BOE Optoelectronics Tech. Co., et al -v- Samsung Display Co.
(PTAB)

Planet Depos

Phone: 888.433.3767

Email: transcripts@planetdepos.com

www.planetdepos.com

1 UNITED STATES PATENT AND TRADEMARK OFFICE
2 BEFORE THE PATENT TRIAL AND APPEAL BOARD
3 - - - - - x
4 MIANYANG BOE OPTOELECTRONICS :
5 TECHNOLOGY CO., LTD.; WUHAN : Case Nos.
6 CHINA STAR OPTOELECTRONICS : IPR2023-00987
7 SEMICONDUCTOR DISPLAY : IPR2023-00988
8 TECHNOLOGY CO., LTD; TIANMA : IPR2023-01075
9 MICROELECTRONICS CO., LTD.; :
10 and VISIONIX TECHNOLOGY, :
11 INC., : U.S. Patent Nos.
12 Petitioners, : 9,818,803
13 v. : 10,854,683
14 SAMSUNG DISPLAY CO., LTD. : 11,594,578
15 Patent Owner. :
16 - - - - - X
17 Deposition of P. MORGAN PATTISON, Ph.D.,
18 Conducted Virtually
19 Tuesday, July 30, 2024, 10:02 a.m. EDT
20 Job No.: 547213
21 Pages 1 - 86
22 Reported by: Debra A. Whitehead

1 Deposition of P. MORGAN PATTISON, Ph.D.,
2 conducted virtually.

3

4

5 Pursuant to notice, before Debra Ann Whitehead,
6 E-Notary Public in and for the State of Maryland.

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

1 A P P E A R A N C E S

2 ON BEHALF OF PETITIONERS:

3 K. PATRICK HERMAN, ESQUIRE

4 ORRICK, HERRINGTON & SUTCLIFFE LLP

5 51 West 52nd Street

6 New York, New York 10019-6142

7 (212) 506-5000

8

9 ON BEHALF OF PATENT OWNER:

10 JEFFREY LERNER, ESQUIRE

11 KEE YOUNG LEE, ESQUIRE

12 COVINGTON & BURLING LLP

13 One CityCenter

14 850 10th Street, NW

15 Washington, DC 20001-4956

16 (202) 662-6000

17

18

19 ALSO PRESENT:

20 DORU HALIP, A/V Technician

21

22

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22

C O N T E N T S

EXAMINATION OF P. MORGAN PATTISON, Ph.D.	PAGE
By Mr. Lerner	6
By Mr. Herman	75
By Mr. Lerner	78

EXHIBITS MARKED IN TODAY'S SESSION

(Attached to the Transcript)

SDC DEPOSITION EXHIBIT	PAGE
Exhibit 2083 Pattison ITC Testimony	16
Exhibit 2084 Electric Circuits, Fifth Edition	32
Exhibit 2085 Excerpt from Wiley Electrical and Electronics Engineering Dictionary	34

EXHIBITS MARKED IN PRIOR SESSIONS

(Not Attached)

SDC DEPOSITION EXHIBIT	PAGE
Exhibit 2009 Declaration of Dr. Kymissis in IPR 9,818,803	11
Exhibit 2011 Arnold Reference, U.S. Patent 6,747,618	19

1	EXHIBITS MARKED IN PRIOR SESSIONS - CONTINUED		
2	PETITIONER DEPOSITION EXHIBIT		PAGE
3	Exhibit 1004	U.S. Patent No. 6,897,855	28
4	Exhibit 1005	U.S. Patent No. 7,091,986	57
5	Exhibit 1017	Reply Declaration of P. Morgan	8
6		Pattison in IPR 9,818,803	
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			

1

P R O C E E D I N G S

2

P. MORGAN PATTISON, Ph.D.,

3

having been duly sworn, testified as follows:

4

EXAMINATION BY COUNSEL FOR PATENT OWNER

5

BY MR. LERNER:

6

Q Good morning, Dr. Pattison.

7

A Good morning.

8

Q Where are you located today?

9

A Johnson City, Tennessee.

10

Q Is there anyone there with you?

11

A No.

12

Q Do you have any documents with you?

13

A No.

14

Q All right. So we're taking this

15

deposition remotely. I would ask that you not

16

communicate with anyone during the deposition

17

outside of the discussion we're having on the

18

record.

19

Is that okay?

20

A Yes.

21

Q I know you've been deposed before, but

22

just to cover the ground rules, if you could

1 please answer audibly so the court reporter can
2 take down your answers, that would be helpful.

3 Is that okay?

4 A Okay.

5 Q I'll try to ask clear questions. If you
6 don't understand a question, please ask me to
7 clarify; otherwise, I'll assume you've understood
8 it.

9 Is that okay?

10 A Okay.

11 Q Is there any reason you can't provide
12 true and accurate testimony today?

13 A No.

14 Q What did you do to prepare for your
15 deposition today?

16 A I reviewed my reply declarations and the
17 primary references that are in those declarations.

18 Q Did you review any materials besides your
19 declarations and the materials cited in them?

20 A No.

21 Q Did you meet with anyone or speak with
22 anyone to prepare?

1 A No; just with counsel.

2 Q Who did you speak with?

3 A Mr. Herman.

4 Q Anyone else?

5 A No.

6 Q How long did you speak with him?

7 A I don't know, a few hours, less; maybe an
8 hour.

9 Q And when was that?

10 A Yesterday.

11 Q You submitted reply declarations in IPR
12 proceedings on the '803 patent, the '578 patent,
13 and the '683 patent. Correct?

14 A That's correct.

15 MR. LERNER: Can we pull up your reply
16 declaration in the '803 patent IPR proceeding.

17 (Petitioner Exhibit 1017, previously
18 marked, not attached.)

19 Q Dr. Pattison, do you recognize your reply
20 declaration filed in the IPR proceeding on the
21 '803 patent?

22 A I do.

1 MR. LERNER: If we could go to the last
2 page of that exhibit, please.

3 Q Is that your electronic signature?

4 A Yes.

5 Q And there is a line for Date and Location
6 that are blank.

7 Do you see that?

8 A I do.

9 Q Why are those blank?

10 A I'm not sure. They are filled out in my
11 versions.

12 Q What do you mean they're filled out in
13 your versions?

14 A In my copies of those documents
15 they're -- they're populated.

16 Q When was it dated?

17 A I'd have to pull up my version on my
18 computer.

19 Q Well, why don't we work with the ones we
20 have which were the ones that were submitted to
21 the Board in this proceeding.

22 In preparing your reply declaration, did

1 you speak with anyone besides counsel for BOE?

2 A No.

3 Q Have you had any discussions about the
4 matters in this proceeding with anyone at BOE?

5 A No.

6 Q Have you had discussions with anyone from
7 TCL China Star Optoelectronics?

8 A No.

9 Q Have you had discussions with anyone from
10 Tianma Microelectronics?

11 A No.

12 Q Have you had discussion with anyone from
13 Visionox Technology?

14 A No.

15 Q You understand that BOE makes AMOLED
16 displays that employ a diamond crystal structure.

17 Correct?

18 MR. HERMAN: Object to form. Also
19 outside the scope of direct.

20 A I wouldn't say that.

21 MR. LERNER: If we could pull up
22 Dr. Kymissis's declaration in the '803 patent IPR

1 proceeding, which is Tab 7, please.

2 (SDC Exhibit 2009, previously marked, not
3 attached.)

4 MR. LERNER: If we could go to Paragraph
5 341, please.

6 Q Dr. Pattison, you reviewed Dr. Kymissis's
7 declarations in the '803 patent IPR proceeding.

8 Correct?

9 A In relation to my reply declaration.

10 Q And you discussed copying in your reply
11 declaration. Correct?

12 A Yeah, just to a limited extent, that's
13 true.

14 Q And if we see Paragraph 341 is under a
15 section of Dr. Kymissis's declaration that's
16 discussing copying. Correct?

17 A Okay.

18 Q Now, in Paragraph 341 Dr. Kymissis
19 provides a side-by-side image of an illuminated
20 pixel structure from the Samsung display AMOLED in
21 the Galaxy S22 Ultra product and a Mianyang BOE
22 AMOLED product from the iPhone 12 product.

1 Do you see that?

2 MR. HERMAN: Objection. Form.

3 A I do.

4 Q And the structure of the Mianyang BOE
5 AMOLED is what's referred to as a diamond pixel
6 structure. Correct?

7 MR. HERMAN: Objection. Form.

8 A Well, Number 1, I don't refer to it as a
9 diamond pixel structure. It's just a quad pixel
10 structure as shown, you know, what I described in
11 my -- in my declarations. They look similar, but
12 I haven't really looked closely at the specifics
13 of these.

14 Q Did you discuss this pixel structure with
15 anyone at BOE?

16 MR. HERMAN: Objection. Form.

17 A No.

18 MR. HERMAN: Outside the scope of direct.

19 Q Have you discussed with BOE how it
20 arrived at the pixel structure of the AMOLED
21 that's Exhibit 2041?

22 MR. HERMAN: Objection. Form.

1 A No.

2 MR. HERMAN: Also outside the scope of
3 direct.

4 A No, I did not speak to anyone at BOE.

5 Q Did you undertake any investigation into
6 how BOE arrived at this pixel arrangement
7 structure that's set forth in Exhibit 2041?

8 MR. HERMAN: Objection. Form. Also
9 outside the scope of direct.

10 A No.

11 Q If we could scroll down to Paragraph 346.
12 This is still of Dr. Kymissis's declaration in the
13 '803 patent.

14 Do you see there are illuminated images
15 of pixel arrangement structures for a number of
16 companies, Group Vertical, Phone LCD Parts,
17 Sourcely plus, for example, that are Exhibits 2044
18 to 2046?

19 A Yes, I see those.

20 Q Do you have an understanding of who
21 manufactured those pixel arrangement structures?

22 MR. HERMAN: Objection. Form. Also

1 outside the scope of direct.

2 A Yeah, I didn't -- I think it's like it
3 shows here, Group Vertical, Phone LCD Parts, and
4 Sourcing Plus.

5 Q So it's your understanding those are the
6 manufacturers of the displays?

7 MR. HERMAN: Objection. Form.

8 A It's my understanding that Professor
9 Kymissis is saying that those are the
10 manufacturers of those displays.

11 Q And have you investigated whether
12 Mianyang BOE manufactured any of these displays?

13 MR. HERMAN: Objection. Form. Also
14 outside the scope of direct.

15 A No.

16 Q Did you investigate whether TLC China
17 Star Optoelectronics manufactured any of the
18 displays with these pixel arrangement structures?

19 MR. HERMAN: Same objection.

20 A No.

21 Q Did you make any investigation into
22 whether Tianma Microelectronics manufactured any

1 of these delays with these pixel arrangement
2 structures?

3 MR. HERMAN: Same objections.

4 A No.

5 Q Did you investigate whether Visionox
6 Technology manufactured the displays with these
7 pixel arrangement structures?

8 MR. HERMAN: Same objections.

9 A No.

10 Q In your reply declarations you offer
11 opinions about Matthies, Yamada, Phan, and Arnold
12 references. Correct?

13 A That's correct.

14 Q And you also recently testified about
15 those same references in a trial in the
16 International Trade Commission. Correct?

17 A Correct.

18 Q You testified about them under oath in
19 your ITC trial testimony. Correct?

20 A Correct.

21 Q And you provided truthful, accurate, and
22 complete testimony in the ITC about these

1 references. Correct?

2 A Correct.

3 MR. LERNER: If we could have Exhibit
4 2083, please.

5 (SDC Deposition Exhibit 2083 marked for
6 identification and is attached to the transcript.)

7 Q Dr. Pattison, Exhibit 2083 is a public
8 version of your trial testimony from the ITC
9 proceeding.

10 MR. HERMAN: Counsel, before we continue,
11 is this already an exhibit that patent owner has
12 filed in connection with this IPR proceeding?

13 MR. LERNER: You'll see on this cover
14 that it was dated July 8, 2024, which is after the
15 patent owner response. So this is not something
16 that has yet been made an exhibit. It is being
17 made an exhibit today.

18 MR. HERMAN: So have you gotten Board
19 permission to interject this exhibit into the
20 proceeding?

21 MR. LERNER: Counsel, we're going to
22 proceed with this deposition. Do you have any

1 objection to this exhibit?

2 MR. HERMAN: Yes. It's contrary to the
3 Board's rules. You're not permitted to file it
4 without advanced Board permission. And if you
5 file it I'm going to move to strike it. And if I
6 have to move to strike it I'm going to move for my
7 costs for doing so because you did not follow the
8 procedure that the Board's rules required.

9 You've had plenty of time to approach the
10 Board and seek permission to interject this
11 particular exhibit into the proceeding in the way
12 the rules required, and as far as I'm aware you
13 have not done so.

14 MR. LERNER: Well, this --

15 MR. HERMAN: You have presented it at a
16 deposition, it's not a way to end run around the
17 board's rules. So I object to its inclusion. And
18 if you file it or if you even attempt to attach it
19 to the transcript, I'm going to move to strike it,
20 and I will likely move for my costs in doing so.

21 MR. LERNER: So we have your position. I
22 disagree. This is cross-examination of the

1 witness on references that he testifies about both
2 in the ITC and in these proceedings. This is
3 evidence that wasn't available at the time of
4 prior proceedings. And this is appropriate
5 subject matter for this proceeding and for
6 deposition. And we have your position and we'll
7 take it under advisement. But let's proceed.

8 Q Dr. Pattison, Exhibit 2083 is a public
9 version of your trial testimony from the ITC
10 hearing that took place on July 8 and July 9.

11 Correct?

12 A I don't know. This is the first time I'm
13 seeing it.

14 Q Okay.

15 A If you say it is. Okay.

16 Q Why don't we give you control, and you
17 can scroll through it.

18 MR. HERMAN: Counsel, if you happen to
19 have a PDF copy of it, it would be helpful if you
20 put it in the chat so I can also take a look at
21 it.

22 MR. LERNER: Sure. We can send it to

1 you.

2 MR. HERMAN: Thank you.

3 A Okay. Yeah, this looks like --

4 Q Just so we have a clear record, Exhibit
5 2083 is a public version of your trial testimony
6 from the ITC taken July 8th and 9th, 2024.

7 Correct?

8 A Yeah, I haven't had the opportunity to
9 review the whole thing, but that's what it looks
10 like it is.

11 Q And you recall testifying under oath in
12 the ITC proceeding about the Matthies, Yamada,
13 Phan, and Arnold references. Correct?

14 A Yes.

15 Q So I would like to start with one of the
16 references you discuss in your reply declaration
17 and you testified about in the ITC trial, the
18 Arnold reference.

19 MR. LERNER: If we could have the Arnold
20 reference, please. We're going to upload that
21 now.

22 (SDC Exhibit 2011, previously marked, not

1 attached.)

2 Q Dr. Pattison, do you recognize the Arnold
3 reference, U.S. Patent 6,747,618, that you've
4 offered testimony about?

5 A Yes.

6 MR. LERNER: And if we could turn to
7 Column 2 of Arnold, Lines 35 to 38.

8 Q Arnold criticizes Yamada said that
9 Yamada, quote, "fails to disclose other important
10 characteristics of OLED materials that will affect
11 device lifetime, such as the differences in the
12 inherent luminance stability over time of
13 different materials."

14 Correct?

15 MR. HERMAN: Objection. Form.

16 A I see that he says that.

17 Q And Arnold goes on to say in the next
18 sentence, "Yamada does not consider important
19 optical characteristics of the target display
20 design, each of which will influence the overall
21 lifetime of OLED materials."

22 Correct?

1 A Yeah, he says that.

2 Q And Yamada -- sorry. Arnold is
3 criticizing Yamada for failing to discuss what
4 Arnold considers to be important characteristics
5 that affect device lifetime. Correct?

6 MR. HERMAN: Objection. Form.

7 A Yeah, he is criticizing Yamada. I think
8 it's -- it's unfair and unfounded. But he does,
9 he does do that.

10 Q And you reference Figure 5 of Arnold in
11 your reply declaration. Correct?

12 A Can we see it?

13 MR. LERNER: Turn to Figure 5 of Arnold.

14 A I don't recall the explicit reference in
15 my -- in my declaration, in my reply declaration.
16 Maybe we could get over there.

17 MR. LERNER: Okay. Let's pull up your
18 '803 patent reply declaration.

19 A I recall referencing Arnold, I just
20 don't -- I need to refreshes myself on that that's
21 fine.

22 MR. LERNER: If you could pull up Tab 1,

1 please, and Paragraph 13.

2 Q Do you see in the last three sentences
3 you refer to Arnold providing examples of a pixel
4 arrangement, Figure 5 is one such example?

5 A Yeah. Thank you. This is -- this is
6 describing how the square pixel arrangement could
7 be used for active or passive matrix drive
8 schemes, and Arnold says that, yeah.

9 Q My question was just --

10 A I remember it now. Thank you.

11 Q Thank you. If you could just stick to my
12 questions that would be helpful and make this go
13 faster.

14 A Yeah, it just was the context was a
15 little different, but yeah.

16 MR. LERNER: Okay. So if we could go
17 back to the Arnold reference, Figure 5.

18 Q This is a quad-pixel structure with two
19 blue subpixels, one red and one green subpixel.

20 Correct?

21 A That's correct.

22 Q And the subpixels are each equally sized.

1 Correct?

2 A Correct.

3 Q So in Arnold the red subpixel, the blue
4 subpixel, and the green subpixel are each the same
5 size and there's two blue subpixels. Correct?

6 A Yeah.

7 MR. HERMAN: Object to form.

8 A That's what he's showing here.

9 Q And if we go to Arnold's Example 3,
10 Arnold carries out an analysis of using Yamada's
11 approach. Correct?

12 A I mean, this is Figure 2 -- Figure 3?

13 Q No. It's Example 3. It's in the bottom
14 of Column 15 of Arnold.

15 Do you see Example 3, parentheses,
16 Comparative?

17 A No. Can you make it bigger? Okay. Now
18 I see it.

19 Q Do you see that example begins, "In this
20 example, the method of Yamada in U.S. Patent
21 Number 6,366,025 is used to determine the relative
22 red, green, and blue areas"?

1 A Okay.

2 Q And if we go to Column 16, Lines 15 to
3 21, Arnold concludes that using the method of
4 Yamada to determine relative areas of red, green,
5 and blue, the red light-emitting area would be
6 largest. Correct?

7 MR. HERMAN: Objection. Form.

8 A I don't -- I don't agree with this
9 analysis. That's what he's saying, but I don't
10 think that's what -- I don't think he's
11 representing what Yamada is actually getting at.
12 Because Yamada actually shows the blue pixel as
13 the biggest.

14 So I do take issue with this analysis
15 with Arnold, but he does basically corroborate the
16 idea that you can resize pixels based on their
17 emission efficiency and lifetime, and not --

18 Q Dr. Pattison --

19 A It would be a routine design choice.

20 Q Dr. Pattison, again, if you could please
21 stick to my questions, this will go a lot faster.

22 My question is simply, Arnold concludes

1 that using the method of Yamada to determine
2 relative areas of red, green, and blue, the red
3 light-emitting area would be the largest.

4 Correct?

5 MR. HERMAN: Objection. Form.

6 A In this example that he provides.

7 Q In this example that he provides it's
8 correct that red would be the largest, blue would
9 be the intermediate, and green would be the
10 smallest. Correct?

11 MR. HERMAN: Objection. Form.

12 A In this example that's his conclusion.

13 Q You haven't carried out any analysis of
14 your own of specific materials to calculate the
15 relative ratios of red to green to blue. Correct?

16 MR. HERMAN: Objection. Form.

17 A In my experience working on OLED
18 materials for almost 20 years, it's well-known
19 that blue OLED materials are much less efficient
20 than red and green. They sometime can have less
21 than 20 percent of the efficiency of red and green
22 devices. And that then becomes a lifetime issue.

1 So just based on that very general,
2 well-known understanding, you would -- you would
3 always work to be making blue relatively larger
4 than red and green pixels. I mean, that's
5 basic --

6 Q You didn't carry out any calculations on
7 actual materials, did you?

8 A I just told you a calculation that
9 they're 20 percent -- blue OLEDs have about 20
10 percent of the efficiency as red and green. So
11 that's a calculation. And the easiest way to --
12 you know, and that -- that affects the lifetime.
13 And the easiest way to adjust for that would be to
14 make the blue subpixel larger to reduce the
15 current density. So that's a basic calculation.

16 Now, certainly OLED materials have
17 changed over the years, so the specific ratio of
18 how you -- how you -- how big you make the
19 specific pixels relative to one -- to each other
20 is going to change. And that's just a routine
21 design choice that any -- any engineer would know
22 to be able to do.

1 So -- so I do -- I do know that that's
2 true. And I didn't have to, you know, pencil that
3 out because I just told you that equation.

4 MR. LERNER: I move to strike as
5 nonresponsive.

6 MR. HERMAN: Objection. Form. Also,
7 that's not relief that's available during a
8 deposition. The relief is not to answer the
9 question -- or ask the question in the first
10 place, not to move to strike the answer.

11 MR. LERNER: Counsel, you can take your
12 position. That was nonresponsive to my question
13 and should not be part of the record. But we'll
14 proceed.

15 Q So, Dr. Pattison, am I correct that you
16 disagree with Arnold's assessment of Yamada's
17 teachings?

18 MR. HERMAN: You can answer that yes or
19 no.

20 A There's multiple assessments in here. So
21 in that specific example, is that what you're
22 getting at, Example 3?

1 Q Do you disagree with Example 3 of Arnold?

2 A I disagree with the assumptions --

3 Q Yes or no?

4 A -- that led to his analysis. So yes, I
5 disagree.

6 MR. LERNER: If we could turn to the
7 Matthies reference, which is Tab 4.

8 (Petitioner Exhibit 1004, previously
9 marked, not attached.)

10 MR. LERNER: If we could pull up Column
11 7, please.

12 Q Dr. Pattison, do you recognize Matthies
13 U.S. Patent 6,897,855 is the Matthies reference
14 that you've offered testimony about?

15 A Yes.

16 Q Okay. And actually, if we could go back
17 to your reply declaration in the '803 patent
18 proceeding and pull up Paragraph 9.

19 A/V TECHNICIAN: Tab 1?

20 MR. LERNER: Yes, please.

21 Q You write, According to Matthies it's,
22 quote/unquote, display can be either, quote,

1 active or passive, close quotes, parentheses

2 Matthies 7, Lines 15 to 19. Correct?

3 A Yes.

4 Q Now, let's look at Column 7, Lines 15 to
5 19 of Matthies.

6 In Matthies, Column 7, Lines 15 to 19,
7 Matthies says, quote: One exemplary tile
8 structure consists of a multi-layer ceramic
9 circuit board, 132, that serves as a sub substrate
10 upon which, colon, the display material is mounted
11 on the viewer side while the electronics 134,
12 parentheses active and passive, close parentheses,
13 for drive or other functions are mounted mostly on
14 the back side.

15 Correct?

16 A Yes.

17 Q So Matthies is referring to the
18 electronics 134 parenthetically active and
19 passive. Correct?

20 A Yeah.

21 Q Matthies does not say active or passive
22 in that sentence. Correct?

1 MR. HERMAN: Objection. Form.

2 A Yeah, if you're going to use active
3 devices, then it would be an active matrix
4 drives --

5 Q That wasn't my question, sir. Matthies
6 does not say, quote/unquote, active or passive in
7 that sentence. Correct?

8 A Yeah. Just for context, an active matrix
9 drives --

10 Q It has no context. Let's go back to your
11 declaration.

12 MR. HERMAN: Counsel, Counsel, stop
13 interrupting the witness.

14 MR. LERNER: The witness is not answering
15 the questions.

16 MR. HERMAN: It does not matter. You
17 need to allow him to provide his answer. And when
18 he is done answering then you can ask your next
19 question. If you don't think he answered your
20 question, ask another one. But you may not
21 interrupt his testimony. Allow the witness to
22 testify.

1 MR. LERNER: Sorry to interrupt. The
2 witness is not answering the question. They are
3 simple questions. This is not a platform for the
4 witness to just talk. I have questions to have
5 him answer. And I'd like those questions
6 answered.

7 MR. HERMAN: Well, then allow him to
8 supply an answer. You don't get to stop his
9 testimony in the middle of his testimony. You
10 just don't.

11 Q Dr. Pattison --

12 MR. LERNER: Are you done, Counsel.

13 MR. HERMAN: Yes.

14 MR. LERNER: Thank you.

15 Q Dr. Pattison, let's go back to your
16 declaration.

17 In Paragraph 9 of your declaration you
18 have a quotation, active or passive.

19 Do you see that?

20 A I do.

21 MR. HERMAN: Objection to form.

22 Q My simple question is, the words "active"

1 or "passive" that you have quoted here do not
2 appear in Matthies Column 7, Lines 15 to 19.

3 Isn't that correct, yes or no?

4 A Yes.

5 Q Now, you understand what active
6 electronics are. Correct?

7 A Yes.

8 MR. LERNER: And if we could pull up --
9 strike that.

10 Q "Active electronics" and "passive
11 electronics" are terms that are widely used in
12 electrical engineering. Correct?

13 A Yes.

14 MR. LERNER: If we could pull up Exhibit
15 2084, please.

16 (SDC Exhibit 2084 marked for
17 identification and is attached to the transcript.)

18 MR. HERMAN: Counsel, I also object to
19 inclusion of this in the record because I don't
20 believe you have gotten Board permission to
21 interject this exhibit. And the Board's rules are
22 quite clear. In surreply the only exhibit you're

1 permitted to use is Dr. Pattison's testimony.
2 Anything else besides that that you need Board
3 permission in advance.

4 Q Dr. Pattison, if we could please turn --
5 strike that.

6 This is a book Electric Circuits, Fifth
7 Edition, by Nilsson and Riedel.

8 Do you see that?

9 A I do.

10 MR. LERNER: If we could turn to Page 30
11 of the book. And that should be PDF Page 6. If
12 we could enlarge the top of Page 30.

13 Q Do you see a definition, "An active
14 element is one which models a device capable of
15 generating electric energy"?

16 A I do.

17 MR. HERMAN: Object to form. And also
18 outside the scope.

19 Q And that's -- that's consistent with the
20 standard definition of an active element in
21 electrical engineering. Correct?

22 MR. HERMAN: Objection. Form. Also

1 outside the scope of direct.

2 A Yeah, it would be like a transistor or a
3 memory element.

4 Q And the book defines passive elements as
5 modeling physical devices which cannot generate
6 electric energy. Correct?

7 MR. HERMAN: Same objections.

8 A I see that.

9 Q That's a standard definition of passive
10 elements in electrical engineering?

11 A Yeah.

12 Q And resistors, inductors, and capacitors
13 are examples of passive circuit elements.

14 Correct?

15 A Correct.

16 MR. HERMAN: Object to form. Also
17 outside the scope of direct.

18 MR. LERNER: If we could have Exhibit
19 2085, please.

20 (SDC Deposition Exhibit 2085 marked for
21 identification and is attached to the transcript.)

22 MR. HERMAN: The same objection.

1 Counsel, this is entirely inappropriate. If you
2 wanted to submit these exhibits, the appropriate
3 time to do so was with your response. Like, just
4 out of curiosity, how many of these exhibits do
5 you have? Because this is not the last one, we're
6 going to have to stop this deposition and I'm
7 going to call the Board and ask for a protective
8 order. Because this is literally an abuse of the
9 board's process.

10 Like, please explain to me why you
11 believe introducing new exhibits at a reply
12 deposition is within the scope of the rules.
13 What's your position on that? How have you
14 followed the Board's rules? Like, where is the
15 Board's rules say that you can introduce whatever
16 new exhibits you want at a reply deposition? What
17 rule are you relying on?

18 MR. LERNER: Counsel, this is directly
19 responsive to the reply declaration.

20 MR. HERMAN: It does not matter. The
21 Board's rules say no new exhibits without Board
22 permission in advance. Have you sought Board

1 permission in advance?

2 MR. LERNER: This has not been made an
3 exhibit in the proceeding. This is responsive to
4 the witness's testimony.

5 MR. HERMAN: You just assigned an exhibit
6 number. You said it is Exhibit 2085. So you're
7 presumably going to file it with your surreply.

8 MR. LERNER: We will decide whether to
9 file it or not. This is appropriate
10 cross-examination of the witness on his reply
11 declaration.

12 MR. HERMAN: My position is it is not.

13 MR. LERNER: May I finish, Counsel?

14 MR. HERMAN: It's inappropriate. Like,
15 you can't introduce new exhibits. You can refer
16 to exhibits that are currently of record. That's
17 it, period.

18 MR. LERNER: Okay. You have your
19 objection. This is the last one.

20 MR. HERMAN: Can I --

21 Q Dr. Pattison, this is a Wiley Electrical
22 and Electronics Engineering Dictionary. I just

1 have some very basic questions for you.

2 We were discussing active electronics.

3 If we could turn to Page 4 where the dictionary

4 defines active component as an electronic

5 component such as a transistor that can operate on

6 an applied electrical signal, as in amplifying,

7 rectifying, or switching.

8 Do you see that?

9 MR. HERMAN: Objection. Form. Also

10 outside the scope of direct.

11 A I don't see it yet.

12 Okay. I see that.

13 Q That's a standard definition of active

14 component in electrical engineering. Correct?

15 MR. HERMAN: Same objections.

16 A Yeah.

17 Q And active circuit is defined as a

18 circuit which incorporates one or -- one or active

19 components or devices such as transistors or

20 operational amplifiers. Correct?

21 MR. HERMAN: Same objection.

22 A Correct. There would also be passive

1 components in such a circuit as well.

2 Q And if we go to the definition of passive
3 components, the Wiley dictionary defines passive
4 component as an electronic component such as a
5 capacitor or resistor that cannot operate on an
6 applied electrical signal, as an amplifying,
7 rectifying, or switching, nor as a source of
8 energy. Correct?

9 MR. HERMAN: Same objections.

10 A Correct.

11 Q And that's again a standard definition of
12 passive component in electrical engineering?

13 MR. HERMAN: Same objections.

14 A Yes.

15 Q And a passive circuit is defined as a
16 circuit which does not incorporate any active
17 components or devices, such a circuit consists
18 exclusively of passive components and devices.

19 Correct?

20 A Is that one of these definitions?

21 Q Do you see above, passive circuit
22 defined?

1 A Okay. Yeah. It's kind of small for me.

2 Q We can enlarge it.

3 A I see that. I see that definition now.

4 Q And that's a standard definition of
5 passive circuit in electrical engineering.

6 Correct?

7 MR. HERMAN: Object to form. Also
8 outside the scope of direct.

9 A I think so. That's in this -- in this
10 dictionary.

11 Q So if we go back to Matthies, Matthies
12 discusses electronics 134 being active and
13 passive. Correct?

14 A Yes.

15 Q And you would agree that a circuit cannot
16 be both active and passive. Correct?

17 A Well, the electronics in a circuit can be
18 active and passive. That's what I just said
19 earlier. A circuit with active components would
20 be an active circuit and it would have both active
21 and passive components in it.

22 Q Right. And a passive circuit cannot have

1 active components. Correct?

2 MR. HERMAN: Objection. Form.

3 A According to that, that dictionary. But
4 yeah, I think that would generally be true.

5 Q So a circuit cannot be both active and
6 passive. The elements in the circuit can be, but
7 the circuit itself is either active or it's
8 passive. Correct?

9 A Yeah, I'm not -- I mean, a circuit has
10 power, and the power is an active element in
11 there. So it does kind of come down to the
12 context of the circuit. Like for display driving,
13 in that context there is power provided, so there
14 is an active element that even if the rest of the
15 components are passive. So that's not -- that's
16 not kind of hard and fast, I guess. It's more of
17 a passive matrix has mostly passive elements in
18 the context of displays, and active matrix has the
19 transistors and capacitors to hold the -- hold the
20 charge.

21 Q Matthies has circuits like an integrated
22 circuit and a compensation circuit. Correct?

1 A I'd have to review that. They talked
2 about memory, also having memory for the
3 subpixels. There's various embodiments he brings
4 up.

5 Q Now, an active matrix is not a single
6 circuit. Correct?

7 A Well, it has single circuits going to the
8 subpixels. It has -- yeah. So it's a matrix of
9 single circuits that drive the subpixels.

10 Q Right. An active matrix is not itself a
11 single circuit. Correct?

12 MR. HERMAN: Objection. Form.

13 A It's comprised of single circuits.

14 Q Right. It's comprised of multiple
15 circuits. Correct?

16 A Yeah. So is passive matrix.

17 Q And so the active matrix itself is not a
18 single circuit. Right?

19 A Like I said, it's comprised in single
20 circuits, so it's a -- it's a general description
21 of a drive scheme.

22 Q Active matrix OLEDs require a pixel

1 circuit for each and every pixel. Correct?

2 MR. HERMAN: Objection. Form.

3 A Yeah. Yeah, that would be my
4 understanding.

5 Q And Matthies does not discuss a pixel
6 circuit for any single pixel. Correct?

7 MR. HERMAN: Objection. Form.

8 A I think he talks about using memory for
9 compensation to drive -- as part of the drive
10 scheme or just memory elements to drive the
11 pixels, the individual subpixels. So I do think
12 he touches on that.

13 Q A pixel in an active matrix OLED requires
14 transistors and a capacitor. Correct?

15 A Memory -- they act as a memory element,
16 the transistors and the capacitors. So I think
17 you could have a memory element that also is
18 classified as an active matrix display as well.

19 Q Do you agree that a pixel circuit in an
20 active matrix OLED requires transistors and a
21 capacitor?

22 A I'd say there's other ways to do it with

1 other active elements, like a memory or integrated
2 circuit or something like that.

3 Q And what -- strike that.

4 Do you agree that there's no mention of a
5 transistor in Matthies?

6 A I don't recall.

7 Q Do you agree there's no mention of a
8 capacitor in Matthies?

9 A Yeah, he doesn't -- well, I'll say this:
10 He mentions active electronic components, which
11 would include transistors. He mentions passive
12 electronic components, which includes capacitors.

13 Q Matthies does not disclose having
14 multiple memory chips per tile. Correct?

15 MR. HERMAN: Objection to form.

16 A I don't recall exactly. I think it's one
17 memory chip that addresses multiple pixels, or
18 subpixels, in the tile.

19 MR. LERNER: If we could pull up Figure 6
20 of Matthies, please.

21 Q Dr. Pattison, is Figure 6 the structure
22 you're referring to where there is a circuit 134

1 prime that fans out to the various rows and
2 columns of the tile?

3 A I'd have to refresh myself on this. We
4 could read through it. I just recall the memory,
5 he has a memory element driving -- driving the
6 subpixels. So I'd have to reread those sections.

7 MR. LERNER: If we could turn to Column 8
8 of Matthies. Pull up Line 20, please.

9 Q Beginning at Line 20 Matthies states, "
10 The electronics which form the image processing
11 and pixel driving circuitry are mounted on the
12 layers. Electronics are used in the broadest
13 sense to include both active and passive, and both
14 discrete devices mounted on the layers and devices
15 formed in place by processes such as those now
16 used to make active matrix circuits for displays
17 on various high-temperature substrates."

18 Correct?

19 A Yeah, I see that.

20 Q If we start with the first sentence, what
21 electronics is Matthies referring to as the image
22 processing circuitry?

1 A I guess that would be whatever integrated
2 circuits are used to generate the image.

3 Q And then Matthies in the next sentence
4 says electronics are used in the broadest sense to
5 include both active and passive. Correct?

6 A Yes.

7 Q So that's active circuits and passive
8 circuits and circuit elements?

9 MR. HERMAN: Objection. Form.

10 A Yeah, and there's image processing. He
11 talks about image processing and driving
12 circuitry, so not just the processing.

13 Q And the driving circuitry is the column
14 driver and the row driver. Correct?

15 MR. HERMAN: Objection. Form.

16 A He said it's in the broadest sense. I
17 don't -- does he say the column driver and row
18 driver? He kind of says it's just in the broadest
19 sense.

20 Q Well, he says electronics are used in the
21 broadest sense. Correct?

22 MR. HERMAN: Objection. Form.

1 A Yeah, he says to make active matrix
2 circuits for displays.

3 Q That's not what he says. He says,
4 "Electronics are used in the broadest sense, to
5 include both active and passive."

6 Correct? Isn't that a direct quote?

7 A Yes.

8 Q Okay. And then Matthies goes on to refer
9 to discrete devices that are mounted on the
10 layers. Correct?

11 A Yeah, let me just read the whole thing.
12 And both discrete devices mounted on layers and
13 devices formed in place -- in place by processes
14 such as those values to make active matrix
15 circuits for display on high-temperature
16 substrates, yeah.

17 Q So those discrete devices mounted on the
18 layers are preformed electronic components that
19 are mounted on the tile. Correct?

20 MR. HERMAN: Objection. Form.

21 A I don't see the word "preformed."

22 Q Well, what do you understand "discrete

1 devices mounted on the layers" to mean?

2 A Discrete devices. Components mounted on
3 the -- on the layers.

4 Q And then Matthies says that's one option,
5 and the other is devices formed in place by
6 processes such as those now used to make active
7 matrix circuits for displays on various
8 high-temperature substrates. Correct?

9 A Yes.

10 Q And there are processes like chemical
11 vapor deposition and etching that are used to form
12 electronic components on a tile or other substrate
13 that are also used to make active matrix circuits.
14 Correct?

15 A Yeah, there's a whole field of making
16 transistors and passive components that are
17 integrated into electronics, that's -- that's --
18 it's kind of like he's talking about making an
19 integrated circuit on these tiles.

20 MR. LERNER: If we could turn to Column
21 10, Lines 21 to 23.

22 Q Here Matthies discusses adjusting the

1 level of current applied to each pixel to match
2 the amount of light emitted by the pixel to the
3 amounts of light emitted by every other pixel in
4 the display device. Correct?

5 A Correct.

6 Q So Matthies is describing a structure in
7 which the current applied to different pixels may
8 differ to match the amounts of light emitted by
9 other pixels. Correct?

10 MR. HERMAN: Objection. Form.

11 A In this embodiment he is saying that. He
12 is also talking about pulse width modulation to
13 adjust the light level there.

14 Q And on that point, in Column 10, Lines 31
15 to 33, Matthies says, "The exemplary embodiment of
16 the invention employs a passive addressing
17 technique with a block in which only one row of
18 pixels is illuminated at any time."

19 Correct?

20 A Correct, in that embodiment, yes.

21 Q And one approach for that passive
22 addressing technique is the pulse width modulation

1 that you mentioned. Correct?

2 A Yes.

3 Q And so in pulse width modulation,
4 different subpixels may be activated for longer
5 times than other subpixels to generate relatively
6 more light. Correct?

7 MR. HERMAN: Objection. Form.

8 A Yep. Yes.

9 Q And so in Matthies' display, different
10 subpixels will be driven for different amounts of
11 time or with different amounts of current than one
12 another. Correct?

13 MR. HERMAN: Objection. Form.

14 A In -- in this embodiment, yeah.

15 Q Matthies doesn't disclose an embodiment
16 in which each pixel is driven at the same current
17 for the same amount of time. Correct?

18 MR. HERMAN: Objection. Form.

19 A I just have to think about that. I'm not
20 sure if he does. He -- you know, a display would
21 need to have some sort of control over the
22 brightness of the subpixels. But that would be,

1 you know, obvious in the combination of Matthies
2 with Yamada.

3 Q To get a full color display with
4 different full colored subpixels, you would either
5 need to adjust the amount of current to the
6 subpixels or in a pulse width modulation adjust
7 the amount of time that different subpixels were
8 activated. Correct?

9 MR. HERMAN: Objection. Form.

10 A Yes.

11 Q And so either the amount of current going
12 to different subpixels will differ or the length
13 of time they're exposed to current will differ.

14 Correct?

15 MR. HERMAN: Same objection.

16 A Yeah. But you'd want to balance them so
17 you get a white point that's, you know, when
18 they're all on, they have the targeted luminance
19 that you're looking for and white point that
20 you're looking for.

21 Q And Matthies discusses circuitry to
22 measure and adjust the brightness of different

1 pixels to achieve uniform brightness and the
2 desired color point. Correct?

3 A Yes. And I think he also brings that up
4 to manage depreciation or differential
5 depreciation of the -- of the subpixels.

6 Q Matthies discloses both monochromatic and
7 color displays. Correct?

8 A I believe he does, yes.

9 MR. LERNER: And if we go to Column 16 of
10 Matthies, Lines 16 -- Lines 36 to 40.

11 Q Matthies says, "The displays described
12 above have been, in general, monochrome displays."

13 Do you see that?

14 A Line 36 to 40?

15 Q Yeah. Start with Line 36 to -- oh.
16 Maybe it's Line 37 to 38.

17 A Okay. Yeah.

18 Q Do you see a paragraph that begins, "The
19 displays described above"?

20 A I do.

21 Q And in Column 16, Lines 37 to 38,
22 Matthies says, "The displays described above have

1 been, in general, monochrome displays."

2 Correct?

3 A Yes, that's what he says.

4 Q A monochrome display does not have
5 different colored subpixels. Correct?

6 A No. It had same color pixels or
7 subpixels.

8 Q Right. So all the pixels or subpixels in
9 a monochrome display will be the same color.

10 Right?

11 A Yes.

12 Q And Matthies goes on to say, "Color
13 pixels may be implemented as shown in Figures 8A
14 and 8B."

15 Correct?

16 A Yes.

17 Q And Figures 8A and 8B are passive matrix
18 OLED structures. Correct?

19 MR. HERMAN: Objection. Form.

20 A Not necessarily.

21 Q As described and depicted in Figures 8A
22 and 8B, those structures are passive matrix OLEDs.

1 Correct?

2 MR. HERMAN: Objection. Form.

3 A I think he says something about that
4 somewhere. I don't recall where he actually
5 describes that. But I think they could be used
6 for active or passive matrix drive. There's
7 nothing fundamental about that arrangement that
8 limits the drive scheme to active or passive
9 matrix. And that's, you know, in the other parts
10 of my reply declaration, that's what I talked
11 about.

12 Q If a row of pixels is activated together,
13 that would be a passive matrix display. Correct?

14 A Not -- no.

15 MR. HERMAN: Object to form.

16 A That doesn't -- I don't agree with that
17 description at all.

18 MR. LERNER: If we could turn to Column
19 24 of Matthes.

20 Q In your reply declaration you discuss a
21 variable P that's used in Matthes. Correct?

22 A Yes.

1 Q And if we go to Column 24, Lines 9 to 11,
2 Matthies says, "A display tile has an array of
3 pixels equally spaced a distance known as P, the
4 pixel pitch."

5 Correct?

6 A I see that.

7 Q So the value P that Matthies is
8 discussing is a distance of equally spaced pixels.

9 Correct?

10 A Yeah, in an embodiment with equally sized
11 pixels he shows that they're equally spaced.

12 I think he also mentioned that there
13 could be irregular spacing applied in this --
14 somewhere in the patent, I forget where.

15 But, yeah, in this embodiment he talks
16 about when the pixels -- subpixels are the same
17 size they have equal spacing.

18 Q He defines the variable P as a distance
19 between equally spaced pixels. Correct?

20 A Yeah. And I think in this embodiment the
21 pixels are the same size.

22 Q And Matthies also has a variable D sub P.

1 Correct?

2 A I see that, yes.

3 Q And Matthies, Column 24, Lines 6 to 7,
4 says, The emissive regions 1910 at the bottom of
5 the glass substrate 320 have a width $D_{sub P}$.

6 Do you see that?

7 A Can you -- can you show -- it's still a
8 little small for me. Can you tell me exactly
9 where that is again?

10 MR. LERNER: Yeah. Can we enlarge Column
11 24, Lines 6 to 7.

12 Q Do you see it says, Matthies says, The
13 emissive regions 1910 at the bottom of the glass
14 substrate 320 have a width $D_{sub P}$?

15 A Yes, I see that.

16 Q So Matthies is defining its emissive
17 regions by a single width $D_{sub P}$. Correct?

18 A Yes.

19 Q And if we go to Figure 19 which this is
20 discussing, Matthies includes in Figure 19 the
21 labels for P and $D_{sub P}$.

22 Do you see that?

1 A Yeah, I see that.

2 Q And the distance P goes from the outer
3 edge of one subpixel to the outer edge of the
4 adjacent subpixel. Correct?

5 A I see that, yes.

6 Q And the D sub P is the emissive region of
7 the subpixel. Correct?

8 MR. HERMAN: Object to form.

9 A Yes.

10 Q And Matthies explains that to avoid
11 blocking light, both the value D sub P that
12 represents the pixel width and the value P equals
13 spacing between pixels must be taken into account.
14 Correct?

15 MR. HERMAN: Objection. Form.

16 A Yeah, in this embodiment, in this
17 context, this situation.

18 Q Okay.

19 MR. LERNER: Let's go off the record.

20 (A recess was taken.)

21 MR. LERNER: I just wanted to say for the
22 record Exhibit 2084 and Exhibit 2085, the Nilsson,

1 Riedel electronics circuits textbook excerpt and
2 the excerpt from the Wiley Electrical and
3 Electronics Engineering Dictionary are available
4 through the chat.

5 And Exhibit 2083, the ITC testimony of
6 Dr. Pattison, is also available through the chat,
7 as it was earlier.

8 BY MR. LERNER:

9 Q Dr. Pattison, you have offered testimony
10 about the Phan reference. Correct?

11 A Correct.

12 MR. LERNER: If we could have the Phan
13 reference, which is Tab 5, please.

14 (Petitioner Exhibit 1005, previously
15 marked, not attached.)

16 Q Dr. Pattison, do you recognize U.S.
17 Patent Number 7,091,986 as the Phan reference that
18 you offered testimony about?

19 A Yes.

20 Q And you have offered testimony about this
21 reference in these IPR proceedings as well as in
22 the parallel ITC proceeding. Correct?

1 A Correct.

2 Q If you could turn to Figure 3, please.

3 More precisely, Figures 3A through 3E.

4 Do you see those?

5 A I do.

6 Q Is it your understanding of Phan that
7 Phan is disclosing each of these arrangements of
8 three pixels as being suitable for its -- for its
9 embodiments?

10 MR. HERMAN: Objection. Form. Also
11 outside the scope of direct.

12 A Yeah, I didn't cover this in my reply
13 declaration. But I'd have to see -- I'd have to
14 see the description of these. But I believe they
15 are offered as embodiments, in addition the -- the
16 quad pixel is an embodiment also.

17 Q If you turn in Phan to Column 4.

18 Figures 3A through 3E are discussed at
19 the bottom, beginning at Line 66, through Column
20 5, Line 8.

21 Why don't you just take a moment to
22 review that. And we can give you control of this

1 so you can control at your leisure.

2 A It's a little touchy. Where was -- where
3 are you at?

4 Q Starting at the bottom of Column 4 and
5 carrying over to the first full paragraph at the
6 top of Column 5. It's a description of Figures 3A
7 to 3E.

8 A Okay, I see that.

9 Q Phan discloses the pixel arrangements of
10 Figures 3A to 3E as suitable for its disclosures.

11 Correct?

12 A Yes, I see that.

13 Q And in Column 5, Lines 4 to 5, Phan says,
14 The spacial arrangement of the different color
15 dots 13, 14, 15 is not critical.

16 Do you see that?

17 A I do.

18 Q And so if we go to Figures 3D and 3E,
19 those arrangements of red, green, and blue pixels
20 in a triple dot arrangement would be suitable for
21 Phan's dynamic pixels, according to Phan.

22 Correct?

1 MR. HERMAN: Objection to form.

2 A Yes.

3 MR. HERMAN: Outside the scope of direct.

4 Q And if we turn to Figure 10 of Phan.

5 Figures 10A and 10B show an arrangement of four

6 dots in a rectangular structure. Correct?

7 A Sorry, it jumped around on me.

8 So the pixel -- yeah, it shows basically

9 a quad-pixel array with rectangular subpixels.

10 Eleven -- 11 shows that, too. 11A and 11B shows

11 something similar but a square.

12 Q And in a matter of terminology, Phan

13 refers to the light-emitting elements as dots.

14 Correct?

15 A Yes, he does.

16 Q And in Figures 10A and 10B there are four

17 dots arranged together in a rectangular pattern.

18 Correct?

19 A Correct.

20 Q And that structure could be tiled in

21 Figure 12 of Phan. Correct?

22 A Yeah, as long as you maintain consistent

1 spacing between the tiles such that the subpixel
2 spacing or the dot spacing is consistent
3 horizontally and vertically.

4 Q In Figures 10A and 10B the horizontal
5 distance between centers of dots is different than
6 the vertical distance between the centers of dots.

7 Correct?

8 MR. HERMAN: Objection. Form.

9 A So the horizontal -- yes.

10 Q And Phan discloses that a quad-pixel
11 grouping may be in a rectangle. Correct?

12 A Well, that's what he's showing here in
13 10B.

14 Q So you're going to have -- strike that.

15 In Figure 12, Phan shows physical pixels
16 with a square box. Correct?

17 MR. HERMAN: Objection. Form.

18 A Yes.

19 Q And there's nothing in the description of
20 Figure 12 in Phan that discusses the relative
21 spacing of the pixels in the display that's being
22 depicted. Correct?

1 MR. HERMAN: Objection. Form.

2 A I would say that -- let me -- I mean,
3 it's -- I'd say it's inherent in the approach,
4 that you need to have consistent spacing of both
5 the pixels -- or the dots within the pixel, but
6 also in the dynamic or virtual pixels that are
7 being generated to increase resolution, the
8 spacing needs to be consistent. I thought there
9 was a figure that reflected that.

10 But I guess the best figure would be
11 maybe 12A, where -- well, let's see. I thought
12 there was another figure.

13 But I think there's a figure in my reply
14 declaration that shows that you need to have the
15 circles among the dots being consistent both for
16 the pixels and the dynamic or virtual pixels that
17 are being generated.

18 Q Now, in Figure 12, that is 12 and then
19 12A through 12D, Phan is not showing the structure
20 of the dots themselves. Correct?

21 A That's correct.

22 Q And that's true in Figures 7, 8, 9 of

1 Phan as well. Correct?

2 A Let me scroll up there. Yeah, Figure 9
3 shows -- just by the way, shows kind of the
4 consistent circles. Right? But seven -- there it
5 is, yeah. So seven, eight -- yeah, I see seven.
6 What was the question again?

7 Q Figures 7, 8, and 9 of Phan don't show
8 the structure of the dots themselves that would be
9 in the display structure. Correct?

10 A That's correct.

11 Q And Figure 2A and 2B of Phan also doesn't
12 show the structure of the dots in the display
13 structure. Correct?

14 MR. HERMAN: Objection. Form.

15 A No. But I'll -- back to your earlier --
16 well, discussion about Figure 3. These are all
17 quad-pixel arrays or quad dot arrays in Figure 2
18 and 7. So it's not -- not referring to these
19 stripes or other dot arrangements.

20 Q And if you look at Figures 4A, 4B, and 5,
21 those are structures with triple pixel or triple
22 dot structures. Correct?

1 A Yes. Yeah.

2 Q And so Figures 4A, 4B, and 5 show that
3 according to Phan, the dynamic pixel approach that
4 Phan is disclosing can be implemented using a
5 triple pixel structure. Correct?

6 A Yeah. But the dynamic pixel is only made
7 in one dimension. Right?

8 MR. LERNER: If we could turn to Column 2
9 of Phan. If we could go to Lines 57 to 59.
10 Actually, let's start at 54. Just take the whole
11 paragraph in its full context.

12 Q Phan says, "The above object is achieved
13 by a variable generation of pixels from existing
14 dots, said pixels forming a dynamically generated
15 logical unit by grouping adjacent dots so that
16 adjacent pixels are physically superimposed."

17 Correct?

18 A I see that.

19 Q And in your view is that the core
20 teaching of Phan?

21 MR. HERMAN: Objection. Form.

22 A Yeah, I mean, the -- Phan shows, first of

1 all, a quad-pixel, or a quad-subpixel array, and
2 then how that can be used with adjacent pixels,
3 quad or stripes or whatever, to -- addressed in
4 such a way to address a portion of the dots
5 within -- within the pixel to make -- I think he
6 calls it a virtual or a dynamic pixel out of --
7 out of portions of two explicit pixels.

8 Q And then in Column 2, Lines 57 to 59,
9 Phan goes on to say, "In the process said
10 generation of the dynamic pixels takes place at a
11 rate high enough not to be perceivable by the
12 human eye."

13 Do you see that?

14 A I see that.

15 Q What rate is that -- that Phan is
16 referring to that would be not perceivable by the
17 human eye?

18 A It's the rate that the pixels change. It
19 would be, like, 75 hertz, something like that.

20 Q Do you have an understanding of what rate
21 of generation would need to be achieved to be high
22 enough not to be perceivable at the human eye

1 according to Phan?

2 MR. HERMAN: Objection. Form.

3 A I don't know if he's explicit, but
4 generally anything above 75 hertz is not -- not
5 explicitly perceivable. Although there could be
6 some physiological effects, migraines and stuff,
7 even if we're not noticing the flicker or
8 perceiving it consciously. So it's usually, like,
9 75 hertz is a --

10 MR. LERNER: If we turn to Figures 10 and
11 11 of Phan.

12 Q These are examples of structures where a
13 pixel is made up of four dots. Correct?

14 A Yes.

15 Q And then if you go to Figure 1A through
16 1C, those are additional structures where four
17 dots compose a single pixel. Right?

18 A Yes.

19 Q And Phan indicates in Figure 1A through
20 1C that you could have two blue subpixels in the
21 four-dot structure, you could have two red, or two
22 green. Correct?

1 A Yeah, that would be a routine design
2 choice.

3 Q Phan doesn't disclose the absolute sizes
4 of any of the dots. Correct?

5 MR. HERMAN: Objection. Form.

6 A No. Phan discloses that the size can be
7 adjusted in basically a routine way.

8 Q Phan doesn't disclose the spacing between
9 dots or between pixels in absolute terms.

10 Correct?

11 A No. Let me think. No, it doesn't
12 provide engineering diagrams or explicit spacing.

13 Q And Phan doesn't disclose the relative
14 spacing between dots or between pixels. Correct?

15 A That's correct.

16 Q Phan -- well, strike that.

17 Does Phan disclose what the use would be
18 for the displays; for example, would they be for
19 televisions, jumbotrons, or something else?

20 A Let me -- let me review. No. He's -- he
21 does mention TV, television, but I don't think
22 it's a -- it's general. I don't think it's

1 limited to television.

2 Q Is there any disclosure in Phan of how
3 far the viewer would be from the display?

4 MR. HERMAN: Objection. Form.

5 A No. That would depend on the -- the type
6 of display it is. Because I don't -- I think it
7 would be kind of inherent as to what kind of
8 display people are pursuing.

9 Q And do you agree that Phan's drawings are
10 conceptual and not engineering drawings or design
11 drawings of actual displays?

12 A Yes.

13 MR. LERNER: Can we turn back to Figure 3
14 and Figure 4.

15 Q Phan's RGB dynamic pixels that is using
16 the structures like those in 3A through 3E don't
17 have reduced visual blending of the dots.

18 Correct?

19 MR. HERMAN: Objection. Form.

20 A I'm not sure what you mean by "reduced
21 visual blending."

22 Q Phan doesn't disclose any issue with the

1 light output and the perception of the light
2 output of those triple-dot structures in its
3 dynamic pixel approach. Correct?

4 MR. HERMAN: Objection. Form.

5 A I don't recall.

6 Q Why don't you take a look.

7 A So visual blending, is that -- is that
8 what I'm looking for?

9 Q Any disclosure in Phan of an issue or
10 problem with the perception of light from the
11 triple-dot structures using its dynamic pixel
12 approach.

13 A Yeah, I think he just says it's not
14 perceivable by the human eye.

15 Q So there's no apparent difference in the
16 light using the different triple-pixel structures
17 in the dynamic pixel approach of Phan. Right?

18 MR. HERMAN: Objection. Form.

19 A I think he's -- he's -- let me go back to
20 that section. But he's saying that with the
21 dynamic pixel process to make virtual or
22 intermediate pixels, that's not perceivable for a

1 given pixel, pixel arrangement.

2 Q And that's true for the quad-dot
3 structures as well. Correct?

4 A That's what he says, or that would be the
5 inference.

6 MR. LERNER: Could return to Figure 9 of
7 Phan.

8 Q I think you might have mentioned this
9 earlier. Figure 9 shows a number of circles
10 superimposed on -- well, on the figure. Correct?

11 A Yes.

12 Q And each of those circles is intended to
13 represent a dynamic or virtual pixel?

14 A Yes.

15 Q And Phan doesn't draw those circles with
16 great precision, if you look at 9.1, Figures 9.1
17 through 9.8. Right?

18 MR. HERMAN: Objection. Form.

19 A Yeah, no. This is just to show a person
20 of skill in the art how you would -- how you would
21 address the dynamic pixels, you know, based on the
22 arrangement of the quad, the actual quad pixels.

1 Q And in circling four dots, that's Phan's
2 way of indicating that you would have four dots in
3 each of the dynamic or virtual pixels?

4 A Yeah, I think, you know, it's -- his
5 dynamic pixels in both the triple- or quad-pixel
6 arrangements maintain the same number of dots.

7 Q So you wouldn't want to draw a circle
8 that covered five dots or six dots consistent with
9 Phan's disclosures. Right?

10 A Well, if the -- if somebody got it in
11 their head to make a five- or six-dot pixel and
12 repeat that, then you might -- you might want to
13 do that. The six dot could be something similar
14 to the three-dot approach. I don't know.
15 Five-dot might be tough. But you would -- you
16 would make the virtual pixel basically equivalent
17 virtually to the underlying actual pixel.

18 Q For a four-dot pixel, you wouldn't want
19 to draw a circle that covered more than four dots
20 to show the dynamic or virtual pixels, according
21 to Phan. Correct?

22 A Yeah, for Phan's objective of this whole

1 virtual pixel concept, you would -- I think you
2 would maintain -- you would maintain -- or he
3 shows maintaining the underlying pixel kind of
4 quantity, let's say.

5 Q Have you seen a device that implements
6 the dynamic or virtual pixel algorithm of Phan?

7 A No, I don't -- I don't think I have. I
8 might not have noticed, if I did.

9 Q In a display that has a structure like in
10 Figure 10B of Phan, where it has four dots that
11 are arranged in a rectangular pixel, would the
12 differences in pixel size be visible to the
13 viewer?

14 MR. HERMAN: Objection. Form.

15 A I mean, this is a conceptual drawing, but
16 I'd say the objective would be no. You know, one
17 of the reasons to resize it like this would be to
18 have similar brightness of the dots so it wouldn't
19 be, you know -- the objective, the design
20 objective, and there's multiple design objectives
21 in any display, but it would be to not -- not have
22 that be visible.

1 Q So in Figure 10B, for instance, do you
2 think that the left column of red and green pixels
3 would have a similar brightness to the right
4 column of green and blue pixels, or dots?

5 MR. HERMAN: Objection. Form.

6 A I don't -- I think they would be close,
7 but you're not really aiming exactly for
8 brightness as you are for chromaticity. But I
9 would say it like this: If you repeated that in a
10 horizontal way, you know, the brightness of the --
11 you know, the rectangular quad-pixel there, would
12 be this -- you know, should be the same, would
13 make sense to be the same as if you were just
14 taking the second column green and blue pixel, and
15 then the left column red and green pixel -- or
16 dots of the -- of the adjacent pixel, and were
17 combining those four, then you would expect that
18 the total pixel brightness to be the same in those
19 situations.

20 And the virtual -- yeah, just saying it
21 like this: The virtual pixel, the dynamic pixel,
22 should have -- would have the same brightness as

1 the actual pixel.

2 Q Is it your understanding that Phan's
3 dynamic-pixel approach could be implemented with a
4 five-dot or six-dot structure for pixels?

5 MR. HERMAN: Objection. Form. Also
6 outside the scope of direct.

7 A Yeah, I think a six dot could be
8 implemented basically in the same way as the three
9 dot.

10 Q And there wouldn't be issues with
11 differences in the light output being visible?

12 MR. HERMAN: Objection. Form. Also
13 outside the scope of direct.

14 A I think it would be -- whatever the
15 issues are, they would be the same as what he's
16 shown with the -- it would be equivalent to the
17 three-pixel example he shows.

18 MR. LERNER: Let's go off the record.

19 (A recess was taken.)

20 MR. LERNER: I have no further questions.

21 EXAMINATION BY COUNSEL FOR PETITIONERS

22 BY MR. HERMAN:

1 Q Dr. Pattison, I just have a few followup
2 questions for you before we're done for today.

3 The first is, you were asked a series of
4 questions about what counsel called standard
5 definitions of the terms, quote, active
6 components, end quote; quote, passive components,
7 end quote; quote, active circuit, end quote; and,
8 quote, passive circuit, end quote.

9 Do you remember that?

10 A I do.

11 Q I'm going to give you a copy of Exhibit
12 1004 to Matthies. I don't believe you have it.
13 So I'm going to put it in the chat.

14 This is from the 987 proceeding. And let
15 me know when you've got that.

16 A Okay.

17 Q And if you could turn to Column 7 quickly
18 for me.

19 A I am just downloading it here.

20 Okay, I'm there.

21 Q There's a passage that starts at Column
22 7, Line 18, that refers to electronics 134 active

1 and passive for drive for other functions.

2 Do you see that?

3 A I do.

4 Q Do you remember discussing that with
5 counsel earlier today?

6 A Yes.

7 Q Now, the term "active components,"
8 "passive component," "active circuit" or "passive
9 circuit" do not appear in that particular passage.
10 Correct?

11 A That's true.

12 Q Now, if you could look in Column 8,
13 starting at about Line 20, there is a sentence
14 that reads, "The electronics which form the image
15 processing and pixel driving circuitry are mounted
16 on the layers. Electronics are used in the
17 broadest sense to include both active and
18 passive."

19 Do you see that?

20 A Yes.

21 Q Do you remember discussing that passage
22 with counsel earlier today as well?

1 A Yes.

2 Q And again, that passage that I just read
3 doesn't use the terms "active component," "passive
4 component," "active circuit," or "passive
5 circuit." Correct?

6 A That's correct.

7 Q Now, is it your opinion that one of the
8 things a person having ordinary skill in the art
9 would consider Matthies to be contemplating in the
10 passages we just discussed in Column 7 to Column 8
11 and the other passages you referenced in your
12 declaration is a display that employs active
13 matrix addressing?

14 MR. LERNER: Objection to form.

15 A Yes.

16 Q So --

17 A Yes.

18 Q -- when Matthies uses the terms, quote,
19 active, end quote, and, quote, passive, end quote,
20 a person having ordinary skill in the art would
21 understand Matthies to be referring to more than
22 just individual components and circuits. Correct?

1 MR. LERNER: Objection to form.

2 A Correct.

3 MR. HERMAN: That's all I have. Thank
4 you, Doctor.

5 MR. LERNER: All right. If we could pull
6 up Exhibit 2085, please, the Wiley Electrical and
7 Electronics Dictionary. If we could go to Page 3
8 of the exhibit. And the definition of the term
9 "active." Can we enlarge that. It's on the
10 right-hand column, fourth from the bottom.

11 EXAMINATION BY COUNSEL FOR PATENT OWNER
12 BY MR. LERNER:

13 Q Dr. Pattison, do you see a definition of
14 "active" in the Wiley dictionary?

15 A I do.

16 Q And the fifth definition is, "A component
17 or device which operates on an applied electrical
18 signal as in amplifying, rectifying, or
19 switching"?

20 MR. HERMAN: Objection. Form.

21 A I see that.

22 Q And that's consistent with the dictionary

1 definition of active component. Correct?

2 MR. HERMAN: Objection. Form.

3 A I think you showed that before, and I
4 recall that it was consistent.

5 MR. LERNER: And if we turn to the
6 dictionary definition of passive, which is on Page
7 5 of the PDF in Exhibit 2085.

8 Q Do you see the definition of passive is,
9 1, "A component or device which does not operate
10 on an applied electrical signal, as in amplifying,
11 rectifying, or switching, nor is the source of
12 energy. Resistors, transformers, and capacitors
13 are examples."

14 Do you see that?

15 MR. HERMAN: Objection. Form.

16 A I don't see it. It may be getting cut
17 off on my screen. Is it on the left there?

18 MR. LERNER: If we could enlarge the
19 left-hand column. It's about midway down. The
20 term "passive."

21 Q Let me know when you're there.

22 A Yeah, you see that.

1 Q Okay. And the dictionary definition of
2 passive in the Wiley Electrical and Electronics
3 Engineering Dictionary is, 1, "A component or
4 device which does not operate on an applied
5 electrical signal, as in amplifying, rectifying,
6 or switching, nor is a source of energy.
7 Resistors, capacitors, and transformers are
8 examples."

9 Do you see that?

10 A Yes, I see it.

11 Q And that's consistent with the definition
12 of passive component. Correct?

13 MR. HERMAN: Objection. Form.

14 A Yes, I think so.

15 Q But your counsel asked you about the term
16 "active matrix addressing."

17 Do you recall that?

18 A I do.

19 Q If we turn back to the Matthies
20 reference, which we can pull up as Tab 4 that we
21 discussed before, and we can give you control,
22 isn't it correct that Matthies contains just one

1 reference to active matrix in the entire
2 disclosure?

3 MR. HERMAN: Objection. Form.

4 A Let me -- let me go to that section if I
5 have control.

6 Q Let me ask you a different question, but
7 please go there.

8 A Okay.

9 Q Matthies doesn't use the term "active
10 matrix addressing." Correct?

11 A I don't think so. That's kind of a --
12 yeah. I don't think so.

13 Q And the reference to processes such as
14 those now used to make active matrix circuits for
15 displays on various high-temperature substrates in
16 Column 8 your counsel mentioned to you, that's the
17 only reference in Matthies to active matrix
18 circuits. Correct?

19 MR. HERMAN: Objection. Form.

20 A Yeah, I mean, a person of skill in the
21 art would read this and know that they could apply
22 an active matrix drive scheme. And I go --

1 Q Okay. But just to be clear --

2 A And I go through that in my reply
3 declaration. We didn't talk about the other parts
4 of that. But it's corroborated by numerous other
5 references.

6 So a person of skill in the art would
7 certainly know that this arrangement, this pixel
8 arrangement, could be driven actively or
9 passively. And furthermore, I mean, that's not
10 even a requirement in the diamond pixel patents.
11 They're agnostic to drive schemes. So a person of
12 skill in the art would look back and, you know,
13 consider this reference no problem.

14 Q I just want to make sure I get a clear
15 answer to my question.

16 The reference to processes such as those
17 now used to make active matrix circuits for
18 displays in various high-temperature substrates in
19 Column 8 is the only reference in the Matthies
20 patent to active matrix circuits. Correct?

21 MR. HERMAN: Objection. Form.

22 A The active matrix, yeah, yeah. In that

1 limited context. But when he says that it's using
2 the active electronics for drive of the display,
3 that would -- that would inherently be an active
4 matrix situation.

5 Q Okay.

6 MR. LERNER: Thank you. I have nothing
7 further.

8 MR. HERMAN: I don't have anything else.

9 So thank you very much for your time,
10 Dr. Pattison and everybody else today.

11 (Off the record at 12:19 p.m. EDT.)
12
13
14
15
16
17
18
19
20
21
22

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22

ACKNOWLEDGMENT OF DEPONENT

I, P. MORGAN PATTISON, Ph.D., do hereby
acknowledge that I have read and examined the
foregoing testimony, and the same is a true,
correct and complete transcription of the
testimony given by me, and any corrections appear
on the attached Errata sheet signed by me.

(DATE)

(SIGNATURE)

1 C E R T I F I C A T E

2 I, Debra Ann Whitehead, E-Notary Public in and for
3 the Commonwealth of Virginia, do hereby certify:

4
5 That P. MORGAN PATTISON, Ph.D., the
6 witness whose deposition is hereinbefore set forth,
7 was duly sworn by me before the commencement of such
8 deposition and that such deposition was taken
9 virtually and is a true record of the testimony
10 given by such witness.

11
12 I further certify that the adverse
13 parties, MIANYANG BOE OPTOELECTRONICS TECHNOLOGY
14 CO., LTD.; WUHAN CHINA STAR OPTOELECTRONICS
15 SEMICONDUCTOR DISPLAY TECHNOLOGY CO., LTD; TIANMA
16 MICROELECTRONICS CO., LTD.; and VISIONIX TECHNOLOGY,
17 were represented by counsel at the deposition.

18
19 I further certify that the deposition of
20 P. MORGAN PATTISON, Ph.D., occurred virtually, on
21 Tuesday, July 30, 2024, from 10:02 a.m. to 12:19
22 p.m. EDT.

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

7

8 IN WITNESS WHEREOF, I have hereunto set my
9 hand this 31st day of July, 2024.

10

11 My commission expires:

12 October 31, 2027

13

14

Debra A. Whitfield



15

16

E-NOTARY PUBLIC IN AND FOR THE

17

COMMONWEALTH OF VIRGINIA

18

19

20

21

22

A			
able	activated	actually	agnostic
26:22	49:4, 50:8,	24:11, 24:12,	82:11
about	53:12	28:16, 53:4,	agree
10:3, 15:11,	active	64:10	24:8, 39:15,
15:14, 15:18,	22:7, 29:1,	addition	42:19, 43:4,
15:22, 18:1,	29:12, 29:18,	58:15	43:7, 53:16,
19:12, 19:17,	29:21, 30:2,	additional	68:9
20:4, 26:9,	30:3, 30:6,	66:16	aiming
28:14, 41:2,	30:8, 31:18,	address	73:7
42:8, 45:11,	31:22, 32:5,	65:4, 70:21	algorithm
47:18, 48:12,	32:10, 33:13,	addressed	72:6
49:19, 53:3,	33:20, 37:2,	65:3	all
53:7, 53:11,	37:4, 37:13,	addresses	6:14, 50:18,
54:16, 57:10,	37:17, 37:18,	43:17	52:8, 53:17,
57:18, 57:20,	38:16, 39:12,	addressing	63:16, 65:1,
63:16, 75:4,	39:16, 39:18,	48:16, 48:22,	78:3, 78:5
76:13, 79:19,	39:19, 39:20,	77:13, 80:16,	allow
80:15, 82:3	40:1, 40:5,	81:10	30:17, 30:21,
above	40:7, 40:10,	adjacent	31:7
38:21, 51:12,	40:14, 40:18,	56:4, 64:15,	almost
51:19, 51:22,	41:5, 41:10,	64:16, 65:2,	25:18
64:12, 66:4	41:17, 41:22,	73:16	already
absolute	42:13, 42:18,	adjust	16:11
67:3, 67:9	42:20, 43:1,	26:13, 48:13,	also
abuse	43:10, 44:13,	50:5, 50:6,	3:19, 10:18,
35:8	44:16, 45:5,	50:22	13:2, 13:8,
according	45:7, 46:1,	adjusted	13:22, 14:13,
28:21, 40:3,	46:5, 46:14,	67:7	15:14, 18:20,
59:21, 64:3,	47:6, 47:13,	adjusting	27:6, 32:18,
66:1, 71:20	53:6, 53:8,	47:22	33:17, 33:22,
account	75:5, 75:7,	advance	34:16, 37:9,
56:13	75:22, 76:7,	33:3, 35:22,	37:22, 39:7,
accurate	76:8, 76:17,	36:1	41:2, 42:17,
7:12, 15:21	77:3, 77:4,	advanced	47:13, 48:12,
achieve	77:12, 77:19,	17:4	51:3, 54:12,
51:1	78:9, 78:14,	adverse	54:22, 57:6,
achieved	79:1, 80:16,	85:12	58:10, 58:16,
64:12, 65:21	81:1, 81:9,	advisement	62:6, 63:11,
acknowledge	81:14, 81:17,	18:7	74:5, 74:12
84:3	81:22, 82:17,	affect	although
acknowledgment	82:20, 82:22,	20:10, 21:5	66:5
84:1	83:2, 83:3	affects	always
act	actively	26:12	26:3
42:15	82:8	after	amoled
action	actual	16:14	10:15, 11:20,
86:2, 86:4	26:7, 68:11,	again	11:22, 12:5,
	70:22, 71:17,	24:20, 38:11,	12:20
	74:1	55:9, 63:6, 77:2	among
			62:15

amount 48:2, 49:17, 50:5, 50:7, 50:11 amounts 48:3, 48:8, 49:10, 49:11 amplifiers 37:20 amplifying 37:6, 38:6, 78:18, 79:10, 80:5 analysis 23:10, 24:9, 24:14, 25:13, 28:4 ann 2:5, 85:2 another 30:20, 49:12, 62:12 answer 7:1, 27:8, 27:10, 27:18, 30:17, 31:5, 31:8, 82:15 answered 30:19, 31:6 answering 30:14, 30:18, 31:2 answers 7:2 any 6:12, 7:11, 7:18, 10:3, 13:5, 14:12, 14:17, 14:21, 14:22, 16:22, 25:13, 26:6, 26:21, 38:16, 42:6, 48:18, 67:4, 68:2, 68:22, 69:9, 72:21, 84:6, 86:2, 86:3 anyone 6:10, 6:16,	7:21, 7:22, 8:4, 10:1, 10:4, 10:6, 10:9, 10:12, 12:15, 13:4 anything 33:2, 66:4, 83:8 apparent 69:15 appeal 1:2 appear 32:2, 76:9, 84:6 applied 37:6, 38:6, 48:1, 48:7, 54:13, 78:17, 79:10, 80:4 apply 81:21 approach 17:9, 23:11, 48:21, 62:3, 64:3, 69:3, 69:12, 69:17, 71:14, 74:3 appropriate 18:4, 35:2, 36:9 area 24:5, 25:3 areas 23:22, 24:4, 25:2 arnold 4:21, 15:11, 19:13, 19:18, 19:19, 20:2, 20:7, 20:8, 20:17, 21:2, 21:4, 21:10, 21:13, 21:19, 22:3, 22:8, 22:17, 23:3, 23:10, 23:14, 24:3, 24:15,	24:22, 28:1 arnold's 23:9, 27:16 around 17:16, 60:7 arranged 60:17, 72:11 arrangement 13:6, 13:15, 13:21, 14:18, 15:1, 15:7, 22:4, 22:6, 53:7, 59:14, 59:20, 60:5, 70:1, 70:22, 82:7, 82:8 arrangements 58:7, 59:9, 59:19, 63:19, 71:6 array 54:2, 60:9, 65:1 arrays 63:17 arrived 12:20, 13:6 art 70:20, 77:8, 77:20, 81:21, 82:6, 82:12 asked 75:3, 80:15 assessment 27:16 assessments 27:20 assigned 36:5 assume 7:7 assumptions 28:2 attach 17:18 attached 4:8, 4:17, 8:18, 11:3,	16:6, 20:1, 28:9, 32:17, 34:21, 57:15, 84:7 attempt 17:18 attorney 86:3 audibly 7:1 available 18:3, 27:7, 57:3, 57:6 avoid 56:10 aware 17:12 B back 22:17, 28:16, 29:14, 30:10, 31:15, 39:11, 63:15, 68:13, 69:19, 80:19, 82:12 balance 50:16 based 24:16, 26:1, 70:21 basic 26:5, 26:15, 37:1 basically 24:15, 60:8, 67:7, 71:16, 74:8 because 17:7, 24:12, 27:3, 32:19, 35:5, 35:8, 68:6 becomes 25:22 been 6:3, 6:21, 16:16, 36:2, 51:12, 52:1
---	--	---	--

before 1:2, 2:5, 6:21, 16:10, 75:2, 79:3, 80:21, 85:7 beginning 44:9, 58:19 begins 23:19, 51:18 behalf 3:2, 3:9 being 16:16, 39:12, 58:8, 61:21, 62:7, 62:15, 62:17, 74:11 believe 32:20, 35:11, 51:8, 58:14, 75:12 besides 7:18, 10:1, 33:2 best 62:10 between 54:19, 56:13, 61:1, 61:5, 61:6, 67:8, 67:9, 67:14 big 26:18 bigger 23:17 biggest 24:13 blank 9:6, 9:9 blending 68:17, 68:21, 69:7 block 48:17 blocking 56:11 blood 86:2 blue 22:19, 23:3,	23:5, 23:22, 24:5, 24:12, 25:2, 25:8, 25:15, 25:19, 26:3, 26:9, 26:14, 59:19, 66:20, 73:4, 73:14 board 1:2, 9:21, 16:18, 17:4, 17:10, 29:9, 32:20, 33:2, 35:7, 35:21, 35:22 board's 17:3, 17:8, 17:17, 32:21, 35:9, 35:14, 35:15, 35:21 boe 1:4, 10:1, 10:4, 10:15, 11:21, 12:4, 12:15, 12:19, 13:4, 13:6, 14:12, 85:13 book 33:6, 33:11, 34:4 both 18:1, 39:16, 39:20, 40:5, 44:13, 45:5, 46:5, 46:12, 51:6, 56:11, 62:4, 62:15, 71:5, 76:17 bottom 23:13, 55:4, 55:13, 58:19, 59:4, 78:10 box 61:16 brightness 49:22, 50:22, 51:1, 72:18, 73:3, 73:8,	73:10, 73:18, 73:22 brings 41:3, 51:3 broadest 44:12, 45:4, 45:16, 45:18, 45:21, 46:4, 76:17 curling 3:12 C calculate 25:14 calculation 26:8, 26:11, 26:15 calculations 26:6 call 35:7 called 75:4 calls 65:6 can't 7:11, 36:15 cannot 34:5, 38:5, 39:15, 39:22, 40:5 capable 33:14 capacitor 38:5, 42:14, 42:21, 43:8 capacitors 34:12, 40:19, 42:16, 43:12, 79:12, 80:7 carried 25:13 carries 23:10 carry 26:6 carrying 59:5	case 1:5 centers 61:5, 61:6 ceramic 29:8 certainly 26:16, 82:7 certify 85:3, 85:12, 85:19, 86:1 change 26:20, 65:18 changed 26:17 characteristics 20:10, 20:19, 21:4 charge 40:20 chat 18:20, 57:4, 57:6, 75:13 chemical 47:10 china 1:6, 10:7, 14:16, 85:14 chip 43:17 chips 43:14 choice 24:19, 26:21, 67:2 chromaticity 73:8 circle 71:7, 71:19 circles 62:15, 63:4, 70:9, 70:12, 70:15 circling 71:1 circuit 29:9, 34:13, 37:17, 37:18,
---	--	--	--

38:1, 38:15, 38:16, 38:17, 38:21, 39:5, 39:15, 39:17, 39:19, 39:20, 39:22, 40:5, 40:6, 40:7, 40:9, 40:12, 40:22, 41:6, 41:11, 41:18, 42:1, 42:6, 42:19, 43:2, 43:22, 45:8, 47:19, 75:7, 75:8, 76:8, 76:9, 77:4, 77:5 circuitry 44:11, 44:22, 45:12, 45:13, 50:21, 76:15 circuits 4:11, 33:6, 40:21, 41:7, 41:9, 41:13, 41:15, 41:20, 44:16, 45:2, 45:7, 45:8, 46:2, 46:15, 47:7, 47:13, 57:1, 77:22, 81:14, 81:18, 82:17, 82:20 cited 7:19 city 6:9 citycenter 3:13 clarify 7:7 classified 42:18 clear 7:5, 19:4, 32:22, 82:1, 82:14 close 29:1, 29:12,	73:6 closely 12:12 colon 29:10 color 50:3, 51:2, 51:7, 52:6, 52:9, 52:12, 59:14 colored 50:4, 52:5 column 20:7, 23:14, 24:2, 28:10, 29:4, 29:6, 32:2, 44:7, 45:13, 45:17, 47:20, 48:14, 51:9, 51:21, 53:18, 54:1, 55:3, 55:10, 58:17, 58:19, 59:4, 59:6, 59:13, 64:8, 65:8, 73:2, 73:4, 73:14, 73:15, 75:17, 75:21, 76:12, 77:10, 78:10, 79:19, 81:16, 82:19 columns 44:2 combination 50:1 combining 73:17 come 40:11 commencement 85:7 commission 15:16, 86:11 commonwealth 85:3, 86:17 communicate 6:16	companies 13:16 comparative 23:16 compensation 40:22, 42:9 complete 15:22, 84:5 component 37:4, 37:5, 37:14, 38:4, 38:12, 76:8, 77:3, 77:4, 78:16, 79:1, 79:9, 80:3, 80:12 components 37:19, 38:1, 38:3, 38:17, 38:18, 39:19, 39:21, 40:1, 40:15, 43:10, 43:12, 46:18, 47:2, 47:12, 47:16, 75:6, 76:7, 77:22 compose 66:17 comprised 41:13, 41:14, 41:19 computer 9:18 concept 72:1 conceptual 68:10, 72:15 concludes 24:3, 24:22 conclusion 25:12 conducted 1:18, 2:2 connection 16:12 consciously 66:8 consider 20:18, 77:9,	82:13 considers 21:4 consistent 33:19, 60:22, 61:2, 62:4, 62:8, 62:15, 63:4, 71:8, 78:22, 79:4, 80:11 consists 29:8, 38:17 contains 80:22 contemplating 77:9 context 22:14, 30:8, 30:10, 40:12, 40:13, 40:18, 56:17, 64:11, 83:1 continue 16:10 continued 5:1 contrary 17:2 control 18:16, 49:21, 58:22, 59:1, 80:21, 81:5 copies 9:14 copy 18:19, 75:11 copying 11:10, 11:16 core 64:19 corrections 84:6 corroborate 24:15 corroborated 82:4 costs 17:7, 17:20
---	---	---	--

could 6:22, 9:1, 10:21, 11:4, 13:11, 16:3, 19:19, 20:6, 21:16, 21:22, 22:6, 22:11, 22:16, 24:20, 28:6, 28:10, 28:16, 32:8, 32:14, 33:4, 33:10, 33:12, 34:18, 37:3, 42:17, 43:19, 44:4, 44:7, 47:20, 53:5, 53:18, 54:13, 57:12, 58:2, 60:20, 64:8, 64:9, 66:5, 66:20, 66:21, 70:6, 71:13, 74:3, 74:7, 75:17, 76:12, 78:5, 78:7, 79:18, 81:21, 82:8 counsel 6:4, 8:1, 10:1, 16:10, 16:21, 18:18, 27:11, 30:12, 31:12, 32:18, 35:1, 35:18, 36:13, 74:21, 75:4, 76:5, 76:22, 78:11, 80:15, 81:16, 85:17 court 7:1 cover 6:22, 16:13, 58:12 covered 71:8, 71:19 covington 3:12 critical 59:15	criticizes 20:8 criticizing 21:3, 21:7 cross-examination 17:22, 36:10 crystal 10:16 curiosity 35:4 current 26:15, 48:1, 48:7, 49:11, 49:16, 50:5, 50:11, 50:13 currently 36:16 cut 79:16 D date 9:5, 84:10 dated 9:16, 16:14 day 86:9 dc 3:15 debra 1:22, 2:5, 85:2 decide 36:8 declaration 4:19, 5:5, 8:16, 8:20, 9:22, 10:22, 11:9, 11:11, 11:15, 13:12, 19:16, 21:11, 21:15, 21:18, 28:17, 30:11, 31:16, 31:17, 35:19, 36:11, 53:10, 53:20, 58:13, 62:14, 77:12, 82:3 declarations 7:16, 7:17,	7:19, 8:11, 11:7, 12:11, 15:10 defined 37:17, 38:15, 38:22 defines 34:4, 37:4, 38:3, 54:18 defining 55:16 definition 33:13, 33:20, 34:9, 37:13, 38:2, 38:11, 39:3, 39:4, 78:8, 78:13, 78:16, 79:1, 79:6, 79:8, 80:1, 80:11 definitions 38:20, 75:5 delays 15:1 density 26:15 depend 68:5 depicted 52:21, 61:22 deponent 84:1 deposed 6:21 deposition 1:17, 2:1, 4:9, 4:18, 5:2, 6:15, 6:16, 7:15, 16:5, 16:22, 17:16, 18:6, 27:8, 34:20, 35:6, 35:12, 35:16, 47:11, 85:6, 85:8, 85:17, 85:19 depreciation 51:4, 51:5 described 12:10, 51:11,	51:19, 51:22, 52:21 describes 53:5 describing 22:6, 48:6 description 41:20, 53:17, 58:14, 59:6, 61:19 design 20:20, 24:19, 26:21, 67:1, 68:10, 72:19, 72:20 desired 51:2 determine 23:21, 24:4, 25:1 device 20:11, 21:5, 33:14, 48:4, 72:5, 78:17, 79:9, 80:4 devices 25:22, 30:3, 34:5, 37:19, 38:17, 38:18, 44:14, 46:9, 46:12, 46:13, 46:17, 47:1, 47:2, 47:5 diagrams 67:12 diamond 10:16, 12:5, 12:9, 82:10 dictionary 4:14, 36:22, 37:3, 38:3, 39:10, 40:3, 57:3, 78:7, 78:14, 78:22, 79:6, 80:1, 80:3 differ 48:8, 50:12, 50:13
--	---	---	---

difference 69:15 differences 20:11, 72:12, 74:11 different 20:13, 22:15, 48:7, 49:4, 49:9, 49:10, 49:11, 50:4, 50:7, 50:12, 50:22, 52:5, 59:14, 61:5, 69:16, 81:6 differential 51:4 dimension 64:7 direct 10:19, 12:18, 13:3, 13:9, 14:1, 14:14, 34:1, 34:17, 37:10, 39:8, 46:6, 58:11, 60:3, 74:6, 74:13 directly 35:18 disagree 17:22, 27:16, 28:1, 28:2, 28:5 disclose 20:9, 43:13, 49:15, 67:3, 67:8, 67:13, 67:17, 68:22 discloses 51:6, 59:9, 61:10, 67:6 disclosing 58:7, 64:4 disclosure 68:2, 69:9, 81:2 disclosures 59:10, 71:9 discrete 44:14, 46:9,	46:12, 46:17, 46:22, 47:2 discuss 12:14, 19:16, 21:3, 42:5, 53:20 discussed 11:10, 12:19, 58:18, 77:10, 80:21 discusses 39:12, 47:22, 50:21, 61:20 discussing 11:16, 37:2, 54:8, 55:20, 76:4, 76:21 discussion 6:17, 10:12, 63:16 discussions 10:3, 10:6, 10:9 display 1:7, 1:14, 11:20, 20:19, 28:22, 29:10, 40:12, 42:18, 46:15, 48:4, 49:9, 49:20, 50:3, 52:4, 52:9, 53:13, 54:2, 61:21, 63:9, 63:12, 68:3, 68:6, 68:8, 72:9, 72:21, 77:12, 83:2, 85:15 displays 10:16, 14:6, 14:10, 14:12, 14:18, 15:6, 40:18, 44:16, 46:2, 47:7, 51:7, 51:11, 51:12, 51:19, 51:22, 52:1, 67:18, 68:11,	81:15, 82:18 distance 54:3, 54:8, 54:18, 56:2, 61:5, 61:6 doctor 78:4 documents 6:12, 9:14 doing 17:7, 17:20 done 17:13, 30:18, 31:12, 75:2 doru 3:20 dot 59:20, 61:2, 63:17, 63:19, 63:22, 71:13, 74:7, 74:9 dots 59:15, 60:6, 60:13, 60:17, 61:5, 61:6, 62:5, 62:15, 62:20, 63:8, 63:12, 64:14, 64:15, 65:4, 66:13, 66:17, 67:4, 67:9, 67:14, 68:17, 71:1, 71:2, 71:6, 71:8, 71:19, 72:10, 72:18, 73:4, 73:16 down 7:2, 13:11, 40:11, 79:19 downloading 75:19 dr 4:19, 6:6, 8:19, 10:22, 11:6, 11:15, 11:18, 13:12, 16:7, 18:8,	20:2, 24:18, 24:20, 27:15, 28:12, 31:11, 31:15, 33:1, 33:4, 36:21, 43:21, 57:6, 57:9, 57:16, 75:1, 78:13, 83:10 draw 70:15, 71:7, 71:19 drawing 72:15 drawings 68:9, 68:10, 68:11 drive 22:7, 29:13, 41:9, 41:21, 42:9, 42:10, 53:6, 53:8, 76:1, 81:22, 82:11, 83:2 driven 49:10, 49:16, 82:8 driver 45:14, 45:17, 45:18 drives 30:4, 30:9 driving 40:12, 44:5, 44:11, 45:11, 45:13, 76:15 duly 6:3, 85:7 during 6:16, 27:7 dynamic 59:21, 62:6, 62:16, 64:3, 64:6, 65:6, 65:10, 68:15, 69:3, 69:11, 69:17, 69:21, 70:13, 70:21,
---	--	---	--

71:3, 71:5, 71:20, 72:6, 73:21 dynamic-pixel 74:3 dynamically 64:14	33:21, 34:10, 36:21, 37:6, 37:14, 38:6, 38:12, 39:5, 57:2, 78:6, 78:17, 79:10, 80:2, 80:5 electronic 9:3, 37:4, 38:4, 43:10, 43:12, 46:18, 47:12 electronics 4:13, 29:11, 29:18, 32:6, 32:10, 32:11, 36:22, 37:2, 39:12, 39:17, 44:10, 44:12, 44:21, 45:4, 45:20, 46:4, 47:17, 57:1, 57:3, 75:22, 76:14, 76:16, 78:7, 80:2, 83:2 element 33:14, 33:20, 34:3, 40:10, 40:14, 42:15, 42:17, 44:5 elements 34:4, 34:10, 34:13, 40:6, 40:17, 42:10, 43:1, 45:8, 60:13 eleven 60:10 else 8:4, 33:2, 67:19, 83:8, 83:10 embodiment 48:11, 48:15, 48:20, 49:14, 49:15, 54:10, 54:15, 54:20, 56:16, 58:16	embodiments 41:3, 58:9, 58:15 emission 24:17 emissive 55:4, 55:13, 55:16, 56:6 emitted 48:2, 48:3, 48:8 employ 10:16 employed 86:3 employs 48:16, 77:12 end 17:16, 75:6, 75:7, 75:8, 77:19 energy 33:15, 34:6, 38:8, 79:12, 80:6 engineer 26:21 engineering 4:13, 32:12, 33:21, 34:10, 36:22, 37:14, 38:12, 39:5, 57:3, 67:12, 68:10, 80:3 enlarge 33:12, 39:2, 55:10, 78:9, 79:18 enough 65:11, 65:22 entire 81:1 entirely 35:1 equal 54:17 equally 22:22, 54:3,	54:8, 54:10, 54:11, 54:19 equals 56:12 equation 27:3 equivalent 71:16, 74:16 errata 84:7 esquire 3:3, 3:10, 3:11 etching 47:11 even 17:18, 40:14, 66:7, 82:10 every 42:1, 48:3 everybody 83:10 evidence 18:3 exactly 43:16, 55:8, 73:7 examination 4:2, 6:4, 74:21, 78:11 examined 84:3 example 13:17, 22:4, 23:9, 23:13, 23:15, 23:19, 23:20, 25:6, 25:7, 25:12, 27:21, 27:22, 28:1, 67:18, 74:17 examples 22:3, 34:13, 66:12, 79:13, 80:8 excerpt 4:12, 57:1, 57:2 exclusively 38:18
---	--	---	---

exemplary 29:7, 48:15 exhibit 4:9, 4:10, 4:11, 4:12, 4:18, 4:19, 4:21, 5:2, 5:3, 5:4, 5:5, 8:17, 9:2, 11:2, 12:21, 13:7, 16:3, 16:5, 16:7, 16:11, 16:16, 16:17, 16:19, 17:1, 17:11, 18:8, 19:4, 19:22, 28:8, 32:14, 32:16, 32:21, 32:22, 34:18, 34:20, 36:3, 36:5, 36:6, 56:22, 57:5, 57:14, 75:11, 78:6, 78:8, 79:7 exhibits 4:7, 4:16, 5:1, 13:17, 35:2, 35:4, 35:11, 35:16, 35:21, 36:15, 36:16 existing 64:13 expect 73:17 experience 25:17 expires 86:11 explain 35:10 explains 56:10 explicit 21:14, 65:7, 66:3, 67:12 explicitly 66:5 exposed 50:13	extent 11:12 eye 65:12, 65:17, 65:22, 69:14 F failing 21:3 fails 20:9 fans 44:1 far 17:12, 68:3 fast 40:16 faster 22:13, 24:21 few 8:7, 75:1 field 47:15 fifth 4:11, 33:6, 78:16 figure 21:10, 21:13, 22:4, 22:17, 23:12, 43:19, 43:21, 55:19, 55:20, 58:2, 60:4, 60:21, 61:15, 61:20, 62:9, 62:10, 62:12, 62:13, 62:18, 63:2, 63:11, 63:16, 63:17, 66:15, 66:19, 68:13, 68:14, 70:6, 70:9, 70:10, 72:10, 73:1 figures 52:13, 52:17, 52:21, 58:3, 58:18, 59:6, 59:10, 59:18, 60:5, 60:16, 61:4, 62:22, 63:7, 63:20, 64:2, 66:10, 70:16 file 17:3, 17:5, 17:18, 36:7, 36:9 filed 8:20, 16:12 filled 9:10, 9:12 financially 86:5 fine 21:21 finish 36:13 first 18:12, 27:9, 44:20, 59:5, 64:22, 75:3 five 71:8, 71:11 five-dot 71:15, 74:4 flicker 66:7 follow 17:7 followed 35:14 follows 6:3 followup 75:1 foregoing 84:4 forget 54:14 form 10:18, 12:2, 12:7, 12:16, 12:22, 13:8, 13:22, 14:7, 14:13, 20:15, 21:6, 23:7, 24:7, 25:5, 25:11, 25:16, 27:6, 30:1, 31:21, 33:17, 33:22, 34:16, 37:9, 39:7, 40:2, 41:12, 42:2, 42:7, 43:15, 44:10, 45:9, 45:15, 45:22, 46:20, 47:11, 48:10, 49:7, 49:13, 49:18, 50:9, 52:19, 53:2, 53:15, 56:8, 56:15, 58:10, 60:1, 61:8, 61:17, 62:1, 63:14, 64:21, 66:2, 67:5, 68:4, 68:19, 69:4, 69:18, 70:18, 72:14, 73:5, 74:5, 74:12, 76:14, 77:14, 78:1, 78:20, 79:2, 79:15, 80:13, 81:3, 81:19, 82:21 formed 44:15, 46:13, 47:5 forming 64:14 forth 13:7, 85:6 four 60:5, 60:16, 66:13, 66:16, 71:1, 71:2, 71:19, 72:10, 73:17 four-dot 66:21, 71:18 fourth 78:10
--	--

full 50:3, 50:4, 59:5, 64:11 functions 29:13, 76:1 fundamental 53:7 further 74:20, 83:7, 85:12, 85:19, 86:1 furthermore 82:9	23:9, 24:2, 24:21, 28:16, 30:10, 31:15, 38:2, 39:11, 51:9, 54:1, 55:19, 56:19, 59:18, 64:9, 66:15, 69:19, 74:18, 78:7, 81:4, 81:7, 81:22, 82:2 goes 20:17, 46:8, 52:12, 56:2, 65:9 going 16:21, 17:5, 17:6, 17:19, 19:20, 26:20, 30:2, 35:6, 35:7, 36:7, 41:7, 50:11, 61:14, 75:11, 75:13 good 6:6, 6:7 gotten 16:18, 32:20 great 70:16 green 22:19, 23:4, 23:22, 24:4, 25:2, 25:9, 25:15, 25:20, 25:21, 26:4, 26:10, 59:19, 66:22, 73:2, 73:4, 73:14, 73:15 ground 6:22 group 13:16, 14:3 grouping 61:11, 64:15 guess 40:16, 45:1,	62:10 H halip 3:20 hand 86:9 happen 18:18 hard 40:16 head 71:11 hearing 18:10 helpful 7:2, 18:19, 22:12 here 14:3, 23:8, 27:20, 32:1, 47:22, 61:12, 75:19 hereby 84:2, 85:3 hereinbefore 85:6 hereunto 86:8 herrington 3:4 hertz 65:19, 66:4, 66:9 high 65:11, 65:21 high-temperature 44:17, 46:15, 47:8, 81:15, 82:18 hold 40:19 horizontal 61:4, 61:9, 73:10 horizontally 61:3 hour 8:8	hours 8:7 human 65:12, 65:17, 65:22, 69:14 I idea 24:16 identification 16:6, 32:17, 34:21 illuminated 11:19, 13:14, 48:18 image 11:19, 44:10, 44:21, 45:2, 45:10, 45:11, 76:14 images 13:14 implemented 52:13, 64:4, 74:3, 74:8 implements 72:5 important 20:9, 20:18, 21:4 inappropriate 35:1, 36:14 inc 1:11 include 43:11, 44:13, 45:5, 46:5, 76:17 includes 43:12, 55:20 inclusion 17:17, 32:19 incorporate 38:16 incorporates 37:18 increase 62:7
---	--	--	---

indicates 66:19	investigation 13:5, 14:21	40:16, 45:18, 47:18, 63:3, 68:7, 72:3, 81:11	left 73:2, 73:15, 79:17
indicating 71:2	iphone 11:22		left-hand 79:19
individual 42:11, 77:22	ipr 1:6, 1:7, 1:8, 4:20, 5:6, 8:11, 8:16, 8:20, 10:22, 11:7, 16:12, 57:21	know 6:21, 8:7, 12:10, 18:12, 26:12, 26:21, 27:1, 27:2, 49:20, 50:1, 50:17, 53:9, 66:3, 70:21, 71:4, 71:14, 72:16, 72:19, 73:10, 73:11, 73:12, 75:15, 79:21, 81:21, 82:7, 82:12	leisure 59:1
inductors 34:12	irregular 54:13		length 50:12
inference 70:5	issue 24:14, 25:22, 68:22, 69:9	known 54:3	lerner 3:10, 4:3, 4:5, 6:5, 8:15, 9:1, 10:21, 11:4, 16:3, 16:13, 16:21, 17:14, 17:21, 18:22, 19:19, 20:6, 21:13, 21:17, 21:22, 22:16, 27:4, 27:11, 28:6, 28:10, 28:20, 30:14, 31:1, 31:12, 31:14, 32:8, 32:14, 33:10, 34:18, 35:18, 36:2, 36:8, 36:13, 36:18, 43:19, 44:7, 47:20, 51:9, 53:18, 55:10, 56:19, 56:21, 57:8, 57:12, 64:8, 66:10, 68:13, 70:6, 74:18, 74:20, 77:14, 78:1, 78:5, 78:12, 79:5, 79:18, 83:6
influence 20:20	issues 74:10, 74:15	kymissis 4:19, 11:18, 14:9	less 8:7, 25:19, 25:20
inherent 20:12, 62:3, 68:7	itc 4:10, 15:19, 15:22, 16:8, 18:2, 18:9, 19:6, 19:12, 19:17, 57:5, 57:22	kymissis's 10:22, 11:6, 11:15, 13:12	let's 18:7, 21:17, 29:4, 30:10, 31:15, 56:19, 62:11, 64:10,
inherently 83:3	itself 40:7, 41:10, 41:17		
instance 73:1		L	
integrated 40:21, 43:1, 45:1, 47:17, 47:19	J	labels 55:21	
intended 70:12	jeffrey 3:10	larger 26:3, 26:14	
interested 86:5	job 1:20	largest 24:6, 25:3, 25:8	
interject 16:19, 17:10, 32:21	johnson 6:9	last 9:1, 22:2, 35:5, 36:19	
intermediate 25:9, 69:22	july 1:19, 16:14, 18:10, 19:6, 85:21, 86:9	layers 44:12, 44:14, 46:10, 46:12, 46:18, 47:1, 47:3, 76:16	
international 15:16	jumbotrons 67:19	lcd 13:16, 14:3	
interrupt 30:21, 31:1	jumped 60:7	led 28:4	
interrupting 30:13		lee 3:11	
introduce 35:15, 36:15	K		
introducing 35:11	kee 3:11		
invention 48:16	kind 39:1, 40:11,		
investigate 14:16, 15:5			
investigated 14:11			

72:4, 74:18 level 48:1, 48:13 lifetime 20:11, 20:21, 21:5, 24:17, 25:22, 26:12 light 48:2, 48:3, 48:8, 48:13, 49:6, 56:11, 69:1, 69:10, 69:16, 74:11 light-emitting 24:5, 25:3, 60:13 likely 17:20 limited 11:12, 68:1, 83:1 limits 53:8 line 9:5, 44:8, 44:9, 51:14, 51:15, 51:16, 58:19, 58:20, 75:22, 76:13 lines 20:7, 24:2, 29:2, 29:4, 29:6, 32:2, 47:21, 48:14, 51:10, 51:21, 54:1, 55:3, 55:11, 59:13, 64:9, 65:8 literally 35:8 little 22:15, 55:8, 59:2 llp 3:4, 3:12 located 6:8 location 9:5	logical 64:15 long 8:6, 60:22 longer 49:4 look 12:11, 18:20, 29:4, 63:20, 69:6, 70:16, 76:12, 82:12 looked 12:12 looking 50:19, 50:20, 69:8 looks 19:3, 19:9 lot 24:21 luminance 20:12, 50:18 M made 16:16, 16:17, 36:2, 64:6, 66:13 maintain 60:22, 71:6, 72:2 maintaining 72:3 make 14:21, 22:12, 23:17, 26:14, 26:18, 44:16, 46:1, 46:14, 47:6, 47:13, 65:5, 69:21, 71:11, 71:16, 73:13, 81:14, 82:14, 82:17 makes 10:15 making 26:3, 47:15, 47:18	manage 51:4 manufactured 13:21, 14:12, 14:17, 14:22, 15:6 manufacturers 14:6, 14:10 many 35:4 marked 4:7, 4:16, 5:1, 8:18, 11:2, 16:5, 19:22, 28:9, 32:16, 34:20, 57:15 marriage 86:3 maryland 2:6 match 48:1, 48:8 material 29:10 materials 7:18, 7:19, 20:10, 20:13, 20:21, 25:14, 25:18, 25:19, 26:7, 26:16 matrix 22:7, 30:3, 30:8, 40:17, 40:18, 41:5, 41:8, 41:10, 41:16, 41:17, 41:22, 42:13, 42:18, 42:20, 44:16, 46:1, 46:14, 47:7, 47:13, 52:17, 52:22, 53:6, 53:9, 53:13, 77:13, 80:16, 81:1, 81:10, 81:14, 81:17, 81:22, 82:17, 82:20, 82:22,	83:4 matter 18:5, 30:16, 35:20, 60:12, 86:6 matters 10:4 matthies 15:11, 19:12, 28:7, 28:12, 28:13, 28:21, 29:2, 29:5, 29:6, 29:7, 29:17, 29:21, 30:5, 32:2, 39:11, 40:21, 42:5, 43:5, 43:8, 43:13, 43:20, 44:8, 44:9, 44:21, 45:3, 46:8, 47:4, 47:22, 48:6, 48:15, 49:9, 49:15, 50:1, 50:21, 51:6, 51:10, 51:11, 51:22, 52:12, 53:19, 53:21, 54:2, 54:7, 54:22, 55:3, 55:12, 55:16, 55:20, 56:10, 75:12, 77:9, 77:18, 77:21, 80:19, 80:22, 81:9, 81:17, 82:19 maybe 8:7, 21:16, 51:16, 62:11 mean 9:12, 23:12, 26:4, 40:9, 47:1, 62:2, 64:22, 68:20, 72:15, 81:20, 82:9 measure 50:22
--	--	---	--

meet 7:21	52:4, 52:9	new 3:6, 35:11, 35:16, 35:21, 36:15	24:7, 25:5, 25:11, 25:16, 27:6, 30:1, 31:21, 33:22, 34:22, 36:19, 37:9, 37:21, 40:2, 41:12, 42:2, 42:7, 43:15, 45:9, 45:15, 45:22, 46:20, 48:10, 49:7, 49:13, 49:18, 50:9, 50:15, 52:19, 53:2, 56:15, 58:10, 60:1, 61:8, 61:17, 62:1, 63:14, 64:21, 66:2, 67:5, 68:4, 68:19, 69:4, 69:18, 70:18, 72:14, 73:5, 74:5, 74:12, 77:14, 78:1, 78:20, 79:2, 79:15, 80:13, 81:3, 81:19, 82:21
memory 34:3, 41:2, 42:8, 42:10, 42:15, 42:17, 43:1, 43:14, 43:17, 44:4, 44:5	more 40:16, 49:6, 58:3, 71:19, 77:21	next 20:17, 30:18, 45:3	objections 15:3, 15:8, 34:7, 37:15, 38:9, 38:13
mention 43:4, 43:7, 67:21	morgan 1:17, 2:1, 4:2, 5:5, 6:2, 84:2, 85:5, 85:20	nilsson 33:7, 56:22	objective 71:22, 72:16, 72:19, 72:20
mentioned 49:1, 54:12, 70:8, 81:16	morning 6:6, 6:7	nonresponsive 27:5, 27:12	objectives 72:20
mentions 43:10, 43:11	mostly 29:13, 40:17	nos 1:5, 1:11	obvious 50:1
method 23:20, 24:3, 25:1	mounted 29:10, 29:13, 44:11, 44:14, 46:9, 46:12, 46:17, 46:19, 47:1, 47:2, 76:15	nothing 53:7, 61:19, 83:6	occurred 85:20
mianyang 1:4, 11:21, 12:4, 14:12, 85:13	move 17:5, 17:6, 17:19, 17:20, 27:4, 27:10	notice 2:5	october 86:12
microelectronics 1:9, 10:10, 14:22, 85:16	much 25:19, 83:9	noticed 72:8	offer 15:10
middle 31:9	multi-layer 29:8	noticing 66:7	offered 20:4, 28:14,
midway 79:19	multiple 27:20, 41:14, 43:14, 43:17, 72:20	number 12:8, 13:15, 23:21, 36:6, 57:17, 70:9, 71:6	
might 70:8, 71:12, 71:15, 72:8	must 56:13	numerous 82:4	
migraines 66:6	myself 21:20, 44:3	nw 3:14	
modeling 34:5	N	o	
models 33:14	nd 3:5	oath 15:18, 19:11	
modulation 48:12, 48:22, 49:3, 50:6	necessarily 52:20	object 10:18, 17:17, 23:7, 32:18, 33:17, 34:16, 39:7, 53:15, 56:8, 64:12	
moment 58:21	need 21:20, 30:17, 33:2, 49:21, 50:5, 62:4, 62:14, 65:21	objection 12:2, 12:7, 12:16, 12:22, 13:8, 13:22, 14:7, 14:13, 14:19, 17:1, 20:15, 21:6,	
monochromatic 51:6	needs 62:8		
monochrome 51:12, 52:1,			

57:9, 57:18, 57:20, 58:15 office 1:1 oh 51:15 okay 6:19, 7:3, 7:4, 7:9, 7:10, 11:17, 18:14, 18:15, 19:3, 21:17, 22:16, 23:17, 24:1, 28:16, 36:18, 37:12, 39:1, 46:8, 51:17, 56:18, 59:8, 75:16, 75:20, 80:1, 81:8, 82:1, 83:5 oled 20:10, 20:21, 25:17, 25:19, 26:16, 42:13, 42:20, 52:18 oleds 26:9, 41:22, 52:22 one 3:13, 19:15, 22:4, 22:19, 26:19, 29:7, 30:20, 33:14, 35:5, 36:19, 37:18, 38:20, 43:16, 47:4, 48:17, 48:21, 49:11, 56:3, 64:7, 72:16, 77:7, 80:22 ones 9:19, 9:20 only 32:22, 48:17, 64:6, 81:17, 82:19 operate 37:5, 38:5,	79:9, 80:4 operates 78:17 operational 37:20 opinion 77:7 opinions 15:11 opportunity 19:8 optical 20:19 option 47:4 optoelectronics 1:4, 1:6, 10:7, 14:17, 85:13, 85:14 order 35:8 ordinary 77:8, 77:20 orrick 3:4 other 20:9, 26:19, 29:13, 42:22, 43:1, 47:5, 47:12, 48:3, 48:9, 49:5, 53:9, 63:19, 76:1, 77:11, 82:3, 82:4 otherwise 7:7, 86:5 out 9:10, 9:12, 23:10, 25:13, 26:6, 27:3, 35:4, 44:1, 65:6, 65:7 outcome 86:6 outer 56:2, 56:3 output 69:1, 69:2,	74:11 outside 6:17, 10:19, 12:18, 13:2, 13:9, 14:1, 14:14, 33:18, 34:1, 34:17, 37:10, 39:8, 58:11, 60:3, 74:6, 74:13 over 20:12, 21:16, 26:17, 49:21, 59:5 overall 20:20 own 25:14 owner 1:15, 3:9, 6:4, 16:11, 16:15, 78:11 P page 4:2, 4:9, 4:18, 5:2, 9:2, 33:10, 33:11, 33:12, 37:3, 78:7, 79:6 pages 1:21 paragraph 11:4, 11:14, 11:18, 13:11, 22:1, 28:18, 31:17, 51:18, 59:5, 64:11 parallel 57:22 parentheses 23:15, 29:1, 29:12 parenthetically 29:18 part 27:13, 42:9 particular 17:11, 76:9	parties 85:13, 86:2, 86:4 parts 13:16, 14:3, 53:9, 82:3 passage 75:21, 76:9, 76:21, 77:2 passages 77:10, 77:11 passive 22:7, 29:1, 29:12, 29:19, 29:21, 30:6, 31:18, 32:1, 32:10, 34:4, 34:9, 34:13, 37:22, 38:2, 38:3, 38:12, 38:15, 38:18, 38:21, 39:5, 39:13, 39:16, 39:18, 39:21, 39:22, 40:6, 40:8, 40:15, 40:17, 41:16, 43:11, 44:13, 45:5, 45:7, 46:5, 47:16, 48:16, 48:21, 52:17, 52:22, 53:6, 53:8, 53:13, 75:6, 75:8, 76:1, 76:8, 76:18, 77:3, 77:4, 77:19, 79:6, 79:8, 79:20, 80:2, 80:12 passively 82:9 patent 1:1, 1:2, 1:11, 1:15, 3:9, 4:21, 5:3, 5:4, 6:4, 8:12, 8:13, 8:16, 8:21,
---	--	--	--

10:22, 11:7, 13:13, 16:11, 16:15, 20:3, 21:18, 23:20, 28:13, 28:17, 54:14, 57:17, 78:11, 82:20 patents 82:10 patrick 3:3 pattern 60:17 pattison 1:17, 2:1, 4:2, 4:10, 5:6, 6:2, 6:6, 8:19, 11:6, 16:7, 18:8, 20:2, 24:18, 24:20, 27:15, 28:12, 31:11, 31:15, 33:4, 36:21, 43:21, 57:6, 57:9, 57:16, 75:1, 78:13, 83:10, 84:2, 85:5, 85:20 pattison's 33:1 pdf 18:19, 33:11, 79:7 pencil 27:2 people 68:8 perceivable 65:11, 65:16, 65:22, 66:5, 69:14, 69:22 perceiving 66:8 percent 25:21, 26:9, 26:10 perception 69:1, 69:10	period 36:17 permission 16:19, 17:4, 17:10, 32:20, 33:3, 35:22, 36:1 permitted 17:3, 33:1 person 70:19, 77:8, 77:20, 81:20, 82:6, 82:11 petitioner 5:2, 8:17, 28:8, 57:14 petitioners 1:12, 3:2, 74:21 ph 1:17, 2:1, 4:2, 6:2, 84:2, 85:5, 85:20 phan 15:11, 19:13, 57:10, 57:12, 57:17, 58:6, 58:7, 58:17, 59:9, 59:13, 59:21, 60:4, 60:12, 60:21, 61:10, 61:15, 61:20, 62:19, 63:1, 63:7, 63:11, 64:3, 64:4, 64:9, 64:12, 64:20, 64:22, 65:9, 65:15, 66:1, 66:11, 66:19, 67:3, 67:6, 67:8, 67:13, 67:16, 67:17, 68:2, 68:22, 69:9, 69:17, 70:7, 70:15, 71:21, 72:6, 72:10	phan's 59:21, 68:9, 68:15, 71:1, 71:9, 71:22, 74:2 phone 13:16, 14:3 physical 34:5, 61:15 physically 64:16 physiological 66:6 pitch 54:4 pixel 11:20, 12:5, 12:9, 12:14, 12:20, 13:6, 13:15, 13:21, 14:18, 15:1, 15:7, 22:3, 22:6, 24:12, 41:22, 42:1, 42:5, 42:6, 42:13, 42:19, 44:11, 48:1, 48:2, 48:3, 49:16, 54:4, 56:12, 58:16, 59:9, 60:8, 62:5, 63:21, 64:3, 64:5, 64:6, 65:5, 65:6, 66:13, 66:17, 69:3, 69:11, 69:17, 69:21, 70:1, 70:13, 71:11, 71:16, 71:17, 71:18, 72:1, 72:3, 72:6, 72:11, 72:12, 73:14, 73:15, 73:16, 73:18, 73:21, 74:1, 76:15, 82:7, 82:10	pixels 24:16, 26:4, 26:19, 42:11, 43:17, 48:7, 48:9, 48:18, 51:1, 52:6, 52:8, 52:13, 53:12, 54:3, 54:8, 54:11, 54:16, 54:19, 54:21, 56:13, 58:8, 59:19, 59:21, 61:15, 61:21, 62:5, 62:6, 62:16, 64:13, 64:14, 64:16, 65:2, 65:7, 65:10, 65:18, 67:9, 67:14, 68:15, 69:22, 70:21, 70:22, 71:3, 71:5, 71:20, 73:2, 73:4, 74:4 place 18:10, 27:10, 44:15, 46:13, 47:5, 65:10 platform 31:3 please 7:1, 7:6, 9:2, 11:1, 11:5, 16:4, 19:20, 22:1, 24:20, 28:11, 28:20, 32:15, 33:4, 34:19, 35:10, 43:20, 44:8, 57:13, 58:2, 78:6, 81:7 plenty 17:9 plus 13:17, 14:4 point 48:14, 50:17, 50:19, 51:2
---	--	---	--

populated 9:15	11:1, 11:7, 16:9, 16:12, 16:20, 17:11, 18:5, 19:12, 28:18, 36:3, 57:22, 75:14	pulse 48:12, 48:22, 49:3, 50:6	29:7, 30:6, 46:6, 75:5, 75:6, 75:7, 75:8, 77:18, 77:19
portion 65:4		pursuant 2:5	
portions 65:7		pursuing 68:8	quoted 32:1
position 17:21, 18:6, 27:12, 35:13, 36:12	proceedings 8:12, 18:2, 18:4, 57:21	put 18:20, 75:13	quotes 29:1
power 40:10, 40:13	process 35:9, 65:9, 69:21	Q	R
precisely 58:3	processes 44:15, 46:13, 47:6, 47:10, 81:13, 82:16	quad 12:9, 58:16, 63:17, 65:3, 70:22	rate 65:11, 65:15, 65:18, 65:20
precision 70:16	processing 44:10, 44:22, 45:10, 45:11, 45:12, 76:15	quad-dot 70:2	ratio 26:17
preformed 46:18, 46:21	product 11:21, 11:22	quad-pixel 22:18, 60:9, 61:10, 63:17, 65:1, 71:5, 73:11	ratios 25:15
prepare 7:14, 7:22	professor 14:8	quad-subpixel 65:1	read 44:4, 46:11, 77:2, 81:21, 84:3
preparing 9:22	protective 35:7	quantity 72:4	reads 76:14
present 3:19	provide 7:11, 30:17, 67:12	question 7:6, 22:9, 24:22, 27:9, 27:12, 30:5, 30:19, 30:20, 31:2, 31:22, 63:6, 81:6, 82:15	really 12:12, 73:7
presented 17:15	provided 15:21, 40:13	questions 7:5, 22:12, 24:21, 30:15, 31:3, 31:4, 31:5, 37:1, 74:20, 75:2, 75:4	reason 7:11
presumably 36:7	provides 11:19, 25:6, 25:7	quickly 75:17	reasons 72:17
previously 8:17, 11:2, 19:22, 28:8, 57:14	pull 8:15, 9:17, 10:21, 21:17, 21:22, 28:10, 28:18, 32:8, 32:14, 43:19, 44:8, 78:5, 80:20	quite 32:22	recall 19:11, 21:14, 21:19, 43:6, 43:16, 44:4, 53:4, 69:5, 79:4, 80:17
primary 7:17		quotation 31:18	recently 15:14
prime 44:1		quote 20:9, 28:22,	recess 56:20, 74:19
prior 4:16, 5:1, 18:4			recognize 8:19, 20:2, 28:12, 57:16
problem 69:10, 82:13			record 6:18, 19:4, 27:13, 32:19, 36:16, 56:19, 56:22, 74:18,
procedure 17:8			
proceed 16:22, 18:7, 27:14			
proceeding 8:16, 8:20, 9:21, 10:4,			

83:11, 85:9 rectangle 61:11 rectangular 60:6, 60:9, 60:17, 72:11, 73:11 rectifying 37:7, 38:7, 78:18, 79:11, 80:5 red 22:19, 23:3, 23:22, 24:4, 24:5, 25:2, 25:8, 25:15, 25:20, 25:21, 26:4, 26:10, 59:19, 66:21, 73:2, 73:15 reduce 26:14 reduced 68:17, 68:20 refer 12:8, 22:3, 36:15, 46:8 reference 4:21, 19:18, 19:20, 20:3, 21:10, 21:14, 22:17, 28:7, 28:13, 57:10, 57:13, 57:17, 57:21, 80:20, 81:1, 81:13, 81:17, 82:13, 82:16, 82:19 referenced 77:11 references 7:17, 15:12, 15:15, 16:1, 18:1, 19:13, 19:16, 82:5 referencing 21:19 referred 12:5	referring 29:17, 43:22, 44:21, 63:18, 65:16, 77:21 refers 60:13, 75:22 reflected 62:9 refresh 44:3 refreshes 21:20 region 56:6 regions 55:4, 55:13, 55:17 related 86:1 relation 11:9 relative 23:21, 24:4, 25:2, 25:15, 26:19, 61:20, 67:13 relatively 26:3, 49:5 relief 27:7, 27:8 relying 35:17 remember 22:10, 75:9, 76:4, 76:21 remotely 6:15 repeat 71:12 repeated 73:9 reply 5:5, 7:16, 8:11, 8:15, 8:19, 9:22, 11:9, 11:10, 15:10, 19:16, 21:11, 21:15,	21:18, 28:17, 35:11, 35:16, 35:19, 36:10, 53:10, 53:20, 58:12, 62:13, 82:2 reported 1:22 reporter 7:1 represent 70:13 represented 85:17 representing 24:11 represents 56:12 require 41:22 required 17:8, 17:12 requirement 82:10 requires 42:13, 42:20 reread 44:6 resistor 38:5 resistors 34:12, 79:12, 80:7 resize 24:16, 72:17 resolution 62:7 response 16:15, 35:3 responsive 35:19, 36:3 rest 40:14 return 70:6 review 7:18, 19:9, 41:1, 58:22,	67:20 reviewed 7:16, 11:6 rgb 68:15 riedel 33:7, 57:1 right 6:14, 39:22, 41:10, 41:14, 41:18, 52:8, 52:10, 63:4, 64:7, 66:17, 69:17, 70:17, 71:9, 73:3, 78:5 right-hand 78:10 routine 24:19, 26:20, 67:1, 67:7 row 45:14, 45:17, 48:17, 53:12 rows 44:1 rule 35:17 rules 6:22, 17:3, 17:8, 17:12, 17:17, 32:21, 35:12, 35:14, 35:15, 35:21 run 17:16 S said 20:8, 36:6, 39:18, 41:19, 45:16, 64:14, 65:9 same 14:19, 15:3, 15:8, 15:15, 23:4, 34:7, 34:22, 37:15, 37:21, 38:9,
---	---	---	---

38:13, 49:16, 49:17, 50:15, 52:6, 52:9, 54:16, 54:21, 71:6, 73:12, 73:13, 73:18, 73:22, 74:8, 74:15, 84:4 samsung 1:14, 11:20 say 10:20, 18:15, 20:17, 29:21, 30:6, 35:15, 35:21, 42:22, 43:9, 45:17, 52:12, 56:21, 62:2, 62:3, 65:9, 72:4, 72:16, 73:9 saying 14:9, 24:9, 48:11, 69:20, 73:20 says 20:16, 21:1, 22:8, 29:7, 45:4, 45:18, 45:20, 46:1, 46:3, 47:4, 48:15, 51:11, 51:22, 52:3, 53:3, 54:2, 55:4, 55:12, 59:13, 64:12, 69:13, 70:4, 83:1 scheme 41:21, 42:10, 53:8, 81:22 schemes 22:8, 82:11 scope 10:19, 12:18, 13:2, 13:9, 14:1, 14:14, 33:18, 34:1, 34:17, 35:12,	37:10, 39:8, 58:11, 60:3, 74:6, 74:13 screen 79:17 scroll 13:11, 18:17, 63:2 sd 4:9, 4:18, 11:2, 16:5, 19:22, 32:16, 34:20 second 73:14 section 11:15, 69:20, 81:4 sections 44:6 see 9:7, 11:14, 12:1, 13:14, 13:19, 16:13, 20:16, 21:12, 22:2, 23:15, 23:18, 23:19, 31:19, 33:8, 33:13, 34:8, 37:8, 37:11, 37:12, 38:21, 39:3, 44:19, 46:21, 51:13, 51:18, 54:6, 55:2, 55:6, 55:12, 55:15, 55:22, 56:1, 56:5, 58:4, 58:13, 58:14, 59:8, 59:12, 59:16, 62:11, 63:5, 64:18, 65:13, 65:14, 76:2, 76:19, 78:13, 78:21, 79:8, 79:14, 79:16, 79:22, 80:9, 80:10	seeing 18:13 seek 17:10 seen 72:5 semiconductor 1:7, 85:15 send 18:22 sense 44:13, 45:4, 45:16, 45:19, 45:21, 46:4, 73:13, 76:17 sentence 20:18, 29:22, 30:7, 44:20, 45:3, 76:13 sentences 22:2 series 75:3 serves 29:9 session 4:7 sessions 4:16, 5:1 set 13:7, 85:6, 86:8 seven 63:4, 63:5 sheet 84:7 should 27:13, 33:11, 73:12, 73:22 show 55:7, 60:5, 63:7, 63:12, 64:2, 70:19, 71:20 showed 79:3 showing 23:8, 61:12,	62:19 shown 12:10, 52:13, 74:16 shows 14:3, 24:12, 54:11, 60:8, 60:10, 61:15, 62:14, 63:3, 64:22, 70:9, 72:3, 74:17 side 29:11, 29:14 side-by-side 11:19 signal 37:6, 38:6, 78:18, 79:10, 80:5 signature 9:3, 84:10 signature-5tmlq 86:13 signed 84:7 similar 12:11, 60:11, 71:13, 72:18, 73:3 simple 31:3, 31:22 simply 24:22 single 41:5, 41:7, 41:9, 41:11, 41:13, 41:18, 41:19, 42:6, 55:17, 66:17 sir 30:5 situation 56:17, 83:4 situations 73:19 six 71:8, 71:13, 74:7
---	--	---	---

six-dot 71:11, 74:4 size 23:5, 54:17, 54:21, 67:6, 72:12 sized 22:22, 54:10 sizes 67:3 skill 70:20, 77:8, 77:20, 81:20, 82:6, 82:12 small 39:1, 55:8 smallest 25:10 some 37:1, 49:21, 66:6 somebody 71:10 something 16:15, 43:2, 53:3, 60:11, 65:19, 67:19, 71:13 sometime 25:20 somewhere 53:4, 54:14 sorry 21:2, 31:1, 60:7 sort 49:21 sought 35:22 source 38:7, 79:11, 80:6 sourcely 13:17, 14:4 spaced 54:3, 54:8, 54:11, 54:19 spacial 59:14	spacing 54:13, 54:17, 56:13, 61:1, 61:2, 61:21, 62:4, 62:8, 67:8, 67:12, 67:14 speak 7:21, 8:2, 8:6, 10:1, 13:4 specific 25:14, 26:17, 26:19, 27:21 specifics 12:12 square 22:6, 60:11, 61:16 st 86:9 stability 20:12 standard 33:20, 34:9, 37:13, 38:11, 39:4, 75:4 star 1:6, 10:7, 14:17, 85:14 start 19:15, 44:20, 51:15, 64:10 starting 59:4, 76:13 starts 75:21 state 2:6 states 1:1, 44:9 stick 22:11, 24:21 still 13:12, 55:7 stop 30:12, 31:8, 35:6 street 3:5, 3:14	strike 17:5, 17:6, 17:19, 27:4, 27:10, 32:9, 33:5, 43:3, 61:14, 67:16 stripes 63:19, 65:3 structure 10:16, 11:20, 12:4, 12:6, 12:9, 12:10, 12:14, 12:20, 13:7, 22:18, 29:8, 43:21, 48:6, 60:6, 60:20, 62:19, 63:8, 63:9, 63:12, 63:13, 64:5, 66:21, 72:9, 74:4 structures 13:15, 13:21, 14:18, 15:2, 15:7, 52:18, 52:22, 63:21, 63:22, 66:12, 66:16, 68:16, 69:2, 69:11, 69:16, 70:3 stuff 66:6 sub 29:9, 54:22, 55:5, 55:14, 55:17, 55:21, 56:6, 56:11 subject 18:5 submit 35:2 submitted 8:11, 9:20 subpixel 22:19, 23:3, 23:4, 26:14, 56:3, 56:4, 56:7, 61:1	subpixels 22:19, 22:22, 23:5, 41:3, 41:8, 41:9, 42:11, 43:18, 44:6, 49:4, 49:5, 49:10, 49:22, 50:4, 50:6, 50:7, 50:12, 51:5, 52:5, 52:7, 52:8, 54:16, 60:9, 66:20 substrate 29:9, 47:12, 55:5, 55:14 substrates 44:17, 46:16, 47:8, 81:15, 82:18 suitable 58:8, 59:10, 59:20 superimposed 64:16, 70:10 supply 31:8 sure 9:10, 18:22, 49:20, 68:20, 82:14 surreply 32:22, 36:7 sutcliffe 3:4 switching 37:7, 38:7, 78:19, 79:11, 80:6 sworn 6:3, 85:7 T tab 11:1, 21:22, 28:7, 28:19, 57:13, 80:20 take 7:2, 18:7,
--	--	--	--

18:20, 24:14, 27:11, 58:21, 64:10, 69:6 taken 19:6, 56:13, 56:20, 74:19, 85:8 takes 65:10 taking 6:14, 73:14 talk 31:4, 82:3 talked 41:1, 53:10 talking 47:18, 48:12 talks 42:8, 45:11, 54:15 target 20:19 targeted 50:18 tcl 10:7 teaching 64:20 teachings 27:17 technician 3:20, 28:19 technique 48:17, 48:22 technology 1:5, 1:8, 1:10, 10:13, 15:6, 85:13, 85:15, 85:16 television 67:21, 68:1 televisions 67:19 tell 55:8 tennessee 6:9 term 76:7, 78:8,	79:20, 80:15, 81:9 terminology 60:12 terms 32:11, 67:9, 75:5, 77:3, 77:18 testified 6:3, 15:14, 15:18, 19:17 testifies 18:1 testify 30:22 testifying 19:11 testimony 4:10, 7:12, 15:19, 15:22, 16:8, 18:9, 19:5, 20:4, 28:14, 30:21, 31:9, 33:1, 36:4, 57:5, 57:9, 57:18, 57:20, 84:4, 84:6, 85:9 textbook 57:1 th 3:14 thank 19:2, 22:5, 22:10, 22:11, 31:14, 78:3, 83:6, 83:9 themselves 62:20, 63:8 thing 19:9, 46:11 things 77:8 think 14:2, 21:7, 24:10, 30:19, 39:9, 40:4, 42:8, 42:11,	42:16, 43:16, 49:19, 51:3, 53:3, 53:5, 54:12, 54:20, 62:13, 65:5, 67:11, 67:21, 67:22, 68:6, 69:13, 69:19, 70:8, 71:4, 72:1, 72:7, 73:2, 73:6, 74:7, 74:14, 79:3, 80:14, 81:11, 81:12 thought 62:8, 62:11 three 22:2, 58:8, 74:8 three-dot 71:14 three-pixel 74:17 through 18:17, 44:4, 57:4, 57:6, 58:3, 58:18, 58:19, 62:19, 66:15, 66:19, 68:16, 70:17, 82:2 tianma 1:8, 10:10, 14:22, 85:15 tile 29:7, 43:14, 43:18, 44:2, 46:19, 47:12, 54:2 tiled 60:20 tiles 47:19, 61:1 time 17:9, 18:3, 18:12, 20:12, 35:3, 48:18, 49:11, 49:17,	50:7, 50:13, 83:9 times 49:5 tlc 14:16 today 6:8, 7:12, 7:15, 16:17, 75:2, 76:5, 76:22, 83:10 today's 4:7 together 53:12, 60:17 told 26:8, 27:3 took 18:10 top 33:12, 59:6 total 73:18 touches 42:12 touchy 59:2 tough 71:15 trade 15:16 trademark 1:1 transcript 4:8, 16:6, 17:19, 32:17, 34:21 transcription 84:5 transformers 79:12, 80:7 transistor 34:2, 37:5, 43:5 transistors 37:19, 40:19, 42:14, 42:16, 42:20, 43:11,
---	--	--	--

47:16 trial 1:2, 15:15, 15:19, 16:8, 18:9, 19:5, 19:17 triple 59:20, 63:21, 64:5, 71:5 triple-dot 69:2, 69:11 triple-pixel 69:16 true 7:12, 11:13, 27:2, 40:4, 62:22, 70:2, 76:11, 84:4, 85:9 truthful 15:21 try 7:5 tuesday 1:19, 85:21 turn 20:6, 21:13, 28:6, 33:4, 33:10, 37:3, 44:7, 47:20, 53:18, 58:2, 58:17, 60:4, 64:8, 66:10, 68:13, 75:17, 79:5, 80:19 tv 67:21 two 22:18, 23:5, 65:7, 66:20, 66:21 type 68:5	18:7, 19:11 underlying 71:17, 72:3 understand 7:6, 10:15, 32:5, 46:22, 77:21 understanding 13:20, 14:5, 14:8, 26:2, 42:4, 58:6, 65:20, 74:2 understood 7:7 undertake 13:5 unfair 21:8 unfounded 21:8 uniform 51:1 unit 64:15 united 1:1 unquote 28:22, 30:6 upload 19:20 use 30:2, 33:1, 67:17, 77:3, 81:9 uses 77:18 using 23:10, 24:3, 25:1, 42:8, 64:4, 68:15, 69:11, 69:16, 83:1 usually 66:8	56:12 values 46:14 vapor 47:11 variable 53:21, 54:18, 54:22, 64:13 various 41:3, 44:1, 44:17, 47:7, 81:15, 82:18 version 9:17, 16:8, 18:9, 19:5 versions 9:11, 9:13 vertical 13:16, 14:3, 61:6 vertically 61:3 view 64:19 viewer 29:11, 68:3, 72:13 virginia 85:3, 86:17 virtual 62:6, 62:16, 65:6, 69:21, 70:13, 71:3, 71:16, 71:20, 72:1, 72:6, 73:20, 73:21 virtually 1:18, 2:2, 71:17, 85:9, 85:20 visible 72:12, 72:22, 74:11 visionix 1:10, 85:16 visionox 10:13, 15:5 visual 68:17, 68:21,	69:7 W want 35:16, 50:16, 71:7, 71:12, 71:18, 82:14 wanted 35:2, 56:21 washington 3:15 way 17:11, 17:16, 26:11, 26:13, 63:3, 65:4, 67:7, 71:2, 73:10, 74:8, 86:5 ways 42:22 we'll 18:6, 27:13 we're 6:14, 6:17, 16:21, 19:20, 35:5, 66:7, 75:2 well-known 25:18, 26:2 west 3:5 whatever 35:15, 45:1, 65:3, 74:14 whereof 86:8 whether 14:11, 14:16, 14:22, 15:5, 36:8 white 50:17, 50:19 whitehead 1:22, 2:5, 85:2 whole 19:9, 46:11, 47:15, 64:10, 71:22 widely 32:11
U ultra 11:21 under 11:14, 15:18,	V value 54:7, 56:11,		

width 48:12, 48:22, 49:3, 50:6, 55:5, 55:14, 55:17, 56:12 wiley 4:12, 36:21, 38:3, 57:2, 78:6, 78:14, 80:2 within 35:12, 62:5, 65:5 without 17:4, 35:21 witness 18:1, 30:13, 30:14, 30:21, 31:2, 31:4, 36:10, 85:6, 85:10, 86:8 witness's 36:4 word 46:21 words 31:22 work 9:19, 26:3 working 25:17 wouldn't 10:20, 71:7, 71:18, 72:18, 74:10 write 28:21 wuhan 1:5, 85:14 Y yamada 15:11, 19:12, 20:8, 20:9, 20:18, 21:2, 21:3, 21:7, 23:20, 24:4, 24:11, 24:12,	25:1, 50:2 yamada's 23:10, 27:16 yeah 11:12, 14:2, 19:3, 19:8, 21:1, 21:7, 22:5, 22:8, 22:14, 22:15, 23:6, 29:20, 30:2, 30:8, 34:2, 34:11, 37:16, 39:1, 40:4, 40:9, 41:8, 41:16, 42:3, 43:9, 44:19, 45:10, 46:1, 46:11, 46:16, 47:15, 49:14, 50:16, 51:15, 51:17, 54:10, 54:15, 54:20, 55:10, 56:1, 56:16, 58:12, 60:8, 60:22, 63:2, 63:5, 64:1, 64:6, 64:22, 67:1, 69:13, 70:19, 71:4, 71:22, 73:20, 74:7, 79:22, 81:12, 81:20, 82:22 years 25:18, 26:17 yep 49:8 yesterday 8:10 york 3:6 young 3:11 0 00987 1:6	00988 1:7 01075 1:8 02 1:19, 85:21 1 10 1:19, 3:14, 47:21, 48:14, 60:4, 60:5, 60:16, 61:4, 61:13, 66:10, 72:10, 73:1, 85:21 10,854,683 1:13 10019 3:6 1004 5:3, 28:8, 75:12 1005 5:4, 57:14 1017 5:5, 8:17 11 4:19, 54:1, 60:10, 66:11 11,594,578 1:14 12 11:22, 60:21, 61:15, 61:20, 62:11, 62:18, 62:19, 83:11, 85:21 13 22:1, 59:15 132 29:9 134 29:11, 29:18, 39:12, 43:22, 75:22 14 59:15	15 23:14, 24:2, 29:2, 29:4, 29:6, 32:2, 59:15 16 4:10, 24:2, 51:9, 51:10, 51:21 18 75:22 19 4:21, 29:2, 29:5, 29:6, 32:2, 55:19, 55:20, 83:11, 85:21 1910 55:4, 55:13 1a 66:15, 66:19 1c 66:16, 66:20 2 20 25:18, 25:21, 26:9, 44:8, 44:9, 76:13 20001 3:15 2009 4:19, 11:2 2011 4:21, 19:22 202 3:16 2023 1:6, 1:7, 1:8 2024 1:19, 16:14, 19:6, 85:21, 86:9 2027 86:12 2041 12:21, 13:7 2044 13:17
--	--	---	--

2046 13:18 2083 4:10, 16:4, 16:5, 16:7, 18:8, 19:5, 57:5 2084 4:11, 32:15, 32:16, 56:22 2085 4:12, 34:19, 34:20, 36:6, 56:22, 78:6, 79:7 21 24:3, 47:21 212 3:7 22 11:21 23 47:21 24 53:19, 54:1, 55:3, 55:11 28 5:3 2a 63:11 2b 63:11 3 30 1:19, 33:10, 33:12, 85:21 31 48:14, 86:9, 86:12 32 4:11 320 55:5, 55:14 33 48:15 34 4:12 341 11:5, 11:14,	11:18 346 13:11 35 20:7 36 51:10, 51:14, 51:15 37 51:16, 51:21 38 20:7, 51:16, 51:21 3a 58:3, 58:18, 59:6, 59:10, 68:16 3d 59:18 3e 58:3, 58:18, 59:7, 59:10, 59:18, 68:16 4 40 51:10, 51:14 4956 3:15 4a 63:20, 64:2 4b 63:20, 64:2 5 5000 3:7 506 3:7 51 3:5 52 3:5 54 64:10 547213 1:20 57 5:4, 64:9, 65:8	578 8:12 59 64:9, 65:8 6 6,366,025 23:21 6,747,618 4:22, 20:3 6,897,855 5:3, 28:13 6000 3:16 6142 3:6 66 58:19 662 3:16 683 8:13 7 7,091,986 5:4, 57:17 75 4:4, 65:19, 66:4, 66:9 78 4:5 8 803 8:12, 8:16, 8:21, 10:22, 11:7, 13:13, 21:18, 28:17 850 3:14 86 1:21 8a 52:13, 52:17, 52:21 8b 52:14, 52:17, 52:22	8th 19:6 9 9,818,803 1:12, 4:20, 5:6 9.1 70:16 9.8 70:17 987 75:14 9th 19:6
--	--	---	--