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Transcript of Eric Bretschneider, Ph.D.

Date: July 18, 2025

Case: BOE Technology Group Co., LTD -v- Optronix Sciences LLC

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WORLDWIDE COURT REPORTING & LITIGATION TECHNOLOGY

Transcript of Eric Bretschneider, Ph.D.
Conducted on July 18, 2025

1 (1 to 4)

1 UNITED STATES PATENT AND TRADEMARK OFFICE 2 ----- 3 BEFORE THE PATENT TRIAL AND APPEAL BOARD 4 ----- 5 BOE Technology Group Co., LTD 6 Petitioner, 7 v. 8 Optronic Sciences LLC 9 Patent Owner, 10 ----- 11 Inter Partes Review No. IPR2024-01131 12 U.S. Patent No. 7,266,801 13 ----- 14 15 REMOTE VIDEOTAPED DEPOSITION OF 16 ERIC BRETSCHNEIDER, Ph.D. 17 Friday, July 18, 2025 18 19 20 Pages 1 - 248 21 Reported by: Susan S. Klinger, RMR-CRR, CSR 22 Job No. 590501	3 1 A P P E A R A N C E S: 2 3 Attorneys for Petitioner: 4 Zachary Loney, Esquire 5 DLA PIPER Austin (US) 6 303 Colorado Street 7 Suite 3000 8 Austin, Texas 78701 9 512.457.7234 10 11 12 Attorneys for the Patent Owner: 13 Jefferson Cummings, Esquire 14 RUSS AUGUST & KABAT 15 12424 Wilshire Boulevard 16 12th Floor 17 Los Angeles, California 90025 18 310.826.7474 19 20 21 Also Present: 22 William Pantoja, videographer
2 1 July 18, 2025 2 10:58 a.m. 3 4 5 6 Remote Videotaped Deposition of ERIC 7 BRETSCHNEIDER, Ph.D., held at the before Susan S. 8 Klinger, a Registered Merit Reporter and Certified 9 Realtime Reporter of the State of Texas. 10 11 12 13 14 15 16 17 18 19 20 21 22	4 1 I N D E X 2 3 WITNESS PAGE 4 ERIC BRETSCHNEIDER, Ph.D. 5 EXAMINATION BY MR. LONEY 6 6 7 8 E X H I B I T S 9 No. Description Page 10 Exhibit 1 Declaration of E. Bretschneider 10 11 Exhibit 2 U.S. Patent 6,406,636 16 12 Exhibit 3 U.S. Patent, 7,226,801 40 13 14 15 16 17 18 19 20 21 22

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5 1 PROCEEDINGS 2 VIDEOGRAPHER: Here begins Media Number 1 3 in the videotaped deposition of Dr. Eric 4 Bretschneider in the matter of BOE Technology 5 Group Co., Ltd. versus Optron Science, LLC in 6 the United Patent -- in the United States Patent 7 and Trademark Office before the Patent Trial and 8 Appeal Board, Case Number IPR2024-01131. 9 Today's date is July 18th, 2025. The time 10 on the video monitor is 10:58 a.m. Central Time. 11 All parties of the video -- all parties of this 12 video deposition are attending remotely. The 13 remote videographer today is William Pantoja 14 representing Planet Depos. 15 Would counsel both please voice-identify 16 themselves and state whom they represent? 17 MR. LONEY: This is Zachary Loney with DLA 18 Piper representing BOE Technology Group, 19 petitioner. 20 MR. CUMMINGS: This is Jefferson Cummings 21 with Russ, August & Kabat representing Optron 22 Science, patent owner.	7 1 A Yes. 2 Q Okay. So, Dr. Bretschneider, how many 3 times have you been deposed before? 4 A Three times this week alone. I stopped 5 counting at about 80, which was years ago. 6 Q Okay. So you're -- you're familiar with 7 the -- the rules and procedures for depositions? 8 A Yes. 9 Q Okay. And you understand that you're 10 under oath, and you have to tell the truth today? 11 A Yes. 12 Q And you're going to do that, right? 13 A Yes, that's my intent. 14 Q Okay. And you understand that you're 15 required to give full and accurate testimony? 16 A Yes. 17 Q Okay. Is there any reason today that you 18 cannot give full and accurate testimony? 19 A No. 20 Q Okay. And before we get too far into it, 21 do you have any printed materials or anything in 22 front of you that you'll -- you intend to use
6 1 VIDEOGRAPHER: The court reporter today is 2 Susan Klinger also representing Planet Depos as 3 well. 4 The witness will now be sworn. 5 ERIC BRETSCHNEIDER, Ph.D., 6 having been first duly sworn testified as follows: 7 EXAMINATION 8 BY MR. LONEY: 9 Q Good morning, Mr. Bretschneider. 10 A Good morning. 11 Q Am I pronouncing your name correctly? 12 A Yes. 13 Q Okay. Can you spell your name just for 14 the record? I -- I remember you mentioning 15 earlier that it had one T, I believe, instead of 16 two. 17 A Yes. B-r-e-t-s-c-h-n-e-i-d-e-r. 18 Q Perfect. And have you been deposed 19 before? 20 A Yes. 21 Q I just realized I called you Mr. You're a 22 doctor, correct?	8 1 today? 2 A I have a clean copy of my declaration 3 for -- 4 Q Okay. 5 A -- this IPR. 6 Q And do you have any of the additional 7 exhibits or prior art related to this IPR? 8 A Not as hard copy. 9 Q Okay. Do you have anything open on your 10 computer related to the deposition today other 11 than this video? 12 A There's antiviral software running in the 13 background. I also have a folder window open 14 because I'm expecting to download some documents, 15 so I want them in a nice, easy to find location 16 once they're downloaded. 17 Q Perfect. And I believe we have a download 18 system provided by the -- the court reporter, but 19 I'll also be dropping files into chat -- the chat 20 for you to download as we go through. Sound good? 21 A Yes. 22 Q All right. So to start with, how did you

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9 1 prepare for today's deposition? 2 A I met with counsel last week, and also 3 I've reviewed my declaration and some portions of 4 the prior art references. 5 Q Okay. Have you met with counsel since the 6 meeting that you -- you mentioned last week 7 regarding this deposition? 8 A On this topic, no. 9 Q Okay. How many times did you meet with 10 counsel to prepare for today's deposition? 11 A Last week was preparation for four 12 different depositions, so it was based over a 13 number of days, each -- we primarily focused on 14 each topic, but sometimes there was a little 15 overlap. So it's a difficult question to answer. 16 I will say nominally once, but it doesn't 17 mean there weren't a few comments on -- during 18 other IPRs preparations. 19 Q Understood. And if I make reference to US 20 Patent Number 7,226,801, are you familiar with 21 that patent? 22 A Yes.	11 1 the last page, could you let me know if that's 2 your signature on the last page of this document? 3 A That is my signature. 4 Q Okay. So you signed this -- you signed 5 the expert declaration before it was submitted, 6 right? 7 A Yes. 8 Q Do you know how long before it was 9 submitted that you signed it? 10 A I signed it on the date that's listed 11 there, May 7th. 12 Q And did you review it before you put your 13 signature on the document? 14 A Yes. 15 Q Are there any mistakes, typographical 16 errors that you're aware of in the document? 17 A There are some typographical errors. I 18 don't think I've written a declaration yet that 19 didn't have at least one or two. 20 Q Sitting here right now, are you aware of 21 any specific errors? 22 A My discussions on one of the prior art
10 1 Q And if I refer to that patent as the '801 2 patent, you'll understand what I'm -- what I'm 3 referring to? 4 A Yes. 5 Q Okay. And did you review the '801 patent 6 in preparation for today's deposition? 7 A I may have looked at a few portions of it, 8 but I don't recall reviewing it in its entirety. 9 MR. LONEY: Okay. So we can -- I will 10 drop Exhibit Number 1 titled Declaration of Eric 11 Bretschneider Ph.D., which has been previously 12 marked as Exhibit 2008 in the IPR. 13 (Exhibit 1 marked.) 14 Q Just so we're on the same page, 15 Dr. Bretschneider, if you can open that up and let 16 me know when you have it in front of you. 17 A Okay. 18 Q Is this a copy of the declaration that you 19 submitted in the current IPR proceeding? 20 A It appears to be on quick review. 21 Q Take your time, as much time as you need 22 to -- to confirm, but also if you could go down to	12 1 references, when I was reviewing, I realized 2 weren't as clear as they could have been. 3 Q And which -- which ones are those? 4 A The Vaganov reference. 5 Q Is there any clarifications you'd like to 6 make on the record regarding that reference? 7 A Yes. Formerly in my declaration, I talk 8 about Vaganov's isotropic etch for silicon, and I 9 say that it wouldn't work because the materials 10 don't attack -- the etchants wouldn't attack 11 organic materials. 12 What I didn't include as well is that the 13 other etchants, the anisotropic etchants, also 14 wouldn't work for organic materials because 15 they're just too aggressive. It's too difficult 16 to control. Most of them are the equivalent of 17 Drano. So if a chemical will etch inches of 18 material in minutes, then microns of material, 19 it's essentially impossible to control. 20 Q And does that also include the RIE etching 21 techniques that are described in Vaganov? 22 A RIE techniques are -- stands for reactive

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13 1 ion etch. It's a type of plasma etch. Those are 2 also rather aggressive. 3 Q And so just so I'm -- what do you mean by 4 aggressive? How is RIE etching aggressive? 5 A Instead of chemicals -- as I said, the RIE 6 stands for reactive ion. 7 Q Uh-huh. 8 A That's basically a plasma, so you're not 9 dealing with molecules anymore. It's ionized 10 molecules. So there's a lot of free electrons 11 around, which makes them much more reactive than 12 they normally would be. 13 Q And RIE is a suitable etching technique 14 for the technology in Vaganov, correct? 15 A I'd -- 16 MR. CUMMINGS: Objection, form. 17 A I would have to review the section of 18 Vaganov for that. 19 Q Do you have an opinion on whether Vaganov 20 teaches RIE etching to create angles in 21 substrates? 22 MR. CUMMINGS: Objection, form.	15 1 A TFT is thin film transistor, or some 2 people will say thin film technology. It's 3 specific that it's not single crystal silicon in 4 comparison to the glass or, in some cases, 5 flexible substrates used for TFT devices. 6 The crystal -- single crystal silicon is 7 much more expensive. It's also a much more 8 difficult material to handle. It's expensive. 9 It's fragile. It's only limited -- or available 10 in limited sizes. 11 Q Okay. 12 A If you want 300 millimeter round, that's 13 very easy. You might be able to get 200 14 millimeter round. Anything other than that is 15 probably a special order, which makes it even more 16 expensive. 17 Q Okay. Within the context of the Vaganov 18 reference, RIE etching is one technique that 19 Vaganov teaches for creating the microp profiling 20 within the Vaganov reference. 21 MR. CUMMINGS: Objection, form. 22 A I don't have the Vaganov reference open to
14 1 A At a high level, one of the issues is the 2 substrates Vaganov is concerned about. Vaganov is 3 specific to single crystal semiconductors. That's 4 not the same substrate as thin film technology. 5 The materials in thin film technology are 6 amorphous or polycrystalline. 7 So there's a significant issue. If I'm 8 doing something with single crystal silicon, it's 9 extraordinarily difficult to say, well, yes, go 10 ahead and do it with polycrystalline or amorphous 11 materials. It's a different class of materials. 12 Even if it's silicon, it's amorphous or 13 polycrystalline. So trying to apply the same 14 etches, you're not going to get a predictable 15 result unless your prediction is failure. 16 Q Just to clarify your answer, it sounded 17 like you said phone technology. Do you -- is 18 that what you -- 19 A Film. 20 Q Film. 21 A Film. 22 Q Okay.	16 1 review it, and I'm trying to do a search for RIE 2 to see if I specifically... 3 Q Sure. While you're doing that, let me 4 drop Exhibit Number 2, which is the Vaganov 5 reference that's previously been marked as Exhibit 6 1007 in the IPR proceeding. 7 (Exhibit 2 marked.) 8 A It still hasn't shown up in the chat. 9 Q I'm sorry. That is -- I'm dropping it in 10 two different places, so there, it should be 11 uploading now. 12 A There it is. Didn't want you to think -- 13 Q Let me know when you -- 14 A Didn't want you to think I was ignoring 15 you. 16 Q That's fine. I'm -- I'm looking at the 17 reference myself, so plenty to read. 18 A There are discussions in Vaganov about RIE 19 etching or trenches. 20 Q So within the context of Vaganov, RIE 21 etching is an appropriate etching technique for 22 that purpose?

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17 1 MR. CUMMINGS: Objection, form. 2 A That purpose is where I'm struggling 3 because what I'm seeing for Vaganov, the RIE etch 4 is only used for a portion of the process where 5 RIE etching is being used, so it's where trench. 6 And then there are subsequent etch processes and 7 isotropic etch processes that form shapes at the 8 bottom of the trench, if you will. 9 Q Okay. So you'd agree that Vaganov teaches 10 using RIE etching to create trenches in the 11 silicon structure? 12 A The specific example I'm talking about or 13 that I'm seeing is related to anisotropic etching 14 of a 110 crystalline orientation silicon wafer. 15 Q So I apologize for my ignorance, but would 16 you agree that Vaganov teaches using RIE etching 17 to create trenches in the silicon structures of 18 Vaganov? 19 A I'm trying to be specific because the 20 example's specific to a crystalline orientation, 21 and it's one of the issues because it does state 22 that it's -- the specific is -- is column 5	19 1 you're still thinking. 2 A No. Just -- just for trenches. 3 Q Okay. And you mentioned that Vaganov is 4 specific to -- I think you said single crystal 5 structures, monocrystal structures? Please 6 correct me. 7 A Usually we would say single crystal 8 substrates. 9 Q Okay. 10 A Monocrystal is technically correct, just 11 not often used. 12 Q And where in Vaganov do you see the 13 disclosures limiting the teachings to single 14 crystal structures? 15 MR. CUMMINGS: Objection, form. 16 A Even at the beginning, in Field of 17 Invention, column 1, line 6: This invention 18 relates to integrated circuits, microsensors, and 19 micromachining, and more particularly to the 20 bonding of silicon or other wafers. 21 The discussion is filled -- the 22 specification is filled with crystalline
18 1 starting at line 23. 2 Q Uh-huh. 3 A In the example shown in Figure 6, here the 4 upper wafer profile defines trenches with vertical 5 sidewalls, which can be achieved in different 6 ways, for example, by an isotropic etching of 110 7 crystalline orientation silicon surface or RIE 8 etching of any wafer orientation. 9 So you can do the RIE etching to create 10 the trenches. What I'm saying is the results 11 might depend on the orientation. It does say any 12 orientation, but, again, the issue is, you're 13 going through a single crystal material. And, 14 again, these trenches, it's an interim step. It's 15 not the final. 16 Q So for the process of creating the 17 trenches in the silicon structure of Vaganov, one 18 example of the method that could be used to do so 19 is RIE etching? 20 MR. CUMMINGS: Objection, form. 21 A For trenches. 22 Q I didn't want to cut you off if you -- if	20 1 orientations. And when you're bonding silicon, 2 the fields they're talking about for 3 micromachining, microsensors, integrated circuits, 4 those are created using single crystal substrates. 5 Q And so the -- the silicon and wafer 6 structures that are being described in the Vaganov 7 patent can only be created using single crystal 8 substrates? 9 MR. CUMMINGS: Objection, form. 10 A If you want the angled sidewalls, if you 11 want to follow the teachings, it's going to be 12 single crystal. The anisotropic etches 13 specifically rely on a differential etch rate on 14 different exposed crystal planes, and that's how 15 the structures are created, and that's why the 16 angles are, I will say, rather inordinately 17 precise. 18 Q But we did -- when we were talking about 19 the RIE etching, you agreed that it refers to 20 using RIE etching without any specific 21 orientation. 22 A It does. Again, there's other

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21 1 considerations that would be brought into that 2 that a person of ordinary skill in the art -- we 3 already talked about how RIE is a very aggressive 4 etch. To do etching, if you don't want to just 5 remove everything, which would be more of a 6 thinning or lapping, usually would be a completely 7 different process, you have to apply a mask. So 8 you expose a certain portion of the substrate that 9 you want to etch. 10 The issue is -- with RIE etching is it's 11 so aggressive, you can't use a soft mask. You 12 can't use a photoresist material, an organic 13 material. You need to define a hard mask, which 14 would be a silicon nitride or silicon oxide type 15 material, could be a metal in some cases, 16 something that's capable of withstanding the RIE 17 etch. 18 If I tried to simply put down an organic 19 mask, the mask would disappear incredibly fast, 20 and I'd be etching the entire surface. So it's 21 inherent in the process. This is not something 22 you would consider using for organic materials or	23 1 Q Anything else? 2 A I'll be more specific, single crystal 3 inorganic semiconductors. 4 Q Anything else? 5 A Those are the ones I'm confident in 6 saying. 7 Q So in your experience, RIE etching, that 8 technique is limited to inorganic single crystal 9 substrates? 10 MR. CUMMINGS: Objection, form. 11 A I'm -- I'm trying to be careful and 12 precise here. Substrate is your starting 13 material. It's the -- the wafer. In the case of 14 integrated circuits, that's the -- the original 15 plate disk of silicon, if you will. 16 In fabrication you can deposit additional 17 semiconductor layers on top of it, and this is -- 18 it's really the whole basis of LED structures 19 because usually your substrate isn't the same 20 as -- it's not the same material as the 21 semiconductor layers you grow on it. 22 For example, gallium nitride is grown on a
22 1 inorganic materials. You can use RIE etching. 2 Q Okay. My questions are just focused on 3 the Vaganov reference itself and what it teaches. 4 You understand that, right? 5 A Yes. And my answer was related to what it 6 teaches. 7 Q Okay. 8 A There's what's in the text. There's what 9 the text informs a person of ordinary skill in the 10 art as well. 11 Q And so the RIE etching of Vaganov, could 12 that be used with polycrystalline structures? 13 MR. CUMMINGS: Objection, form. 14 A It would depend on the material, and it 15 may or may not be predictable depending on the RIE 16 chemistry you're using and conditions. 17 Q Are -- are you aware of any materials that 18 could be -- well, are you aware of any materials 19 where RIE etching could be applied to where you 20 would get predictable results? 21 MR. CUMMINGS: Objection, form. 22 A Single crystal semiconductors.	24 1 substrate that's single crystal sapphire, and then 2 you grow single crystal gallium nitride on top of 3 that. So you use RIE to etch the gallium nitride. 4 Technically the gallium nitride is not a 5 substrate. It's a film on a substrate. 6 Q Okay. 7 A So RIE is -- again, for the semiconductor 8 industry, that's where it's applied, is the 9 semiconductor films. 10 Q Is RIE etching used in any other industry 11 besides the semiconductor industry that you're 12 aware of? 13 MR. CUMMINGS: Objection, form. 14 A It could be. The equipment I'm aware of 15 and familiar with is found in semiconductor 16 application facilities. 17 Q Have you ever used RIE etching in your 18 career? 19 A Yes. 20 Q And what did you use it for? 21 A Gallium nitride materials. 22 Q Anything else?

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25 1 A Aluminum nitride, indium nitride. 2 There -- it's -- again, I'm trying to be precise. 3 In the semiconductor industry people say gallium 4 nitride, and that means it could have some 5 aluminum and some indium or both. I've also used 6 it for phosphide, various indium gallium arsenide 7 phosphite compounds, aluminum gallium arsenide, 8 indium phosphide, zinc sulfide in some cases. 9 Q And would you consider all of those 10 examples to be applications within what you've 11 called the semiconductor industry? 12 MR. CUMMINGS: Objection, form. 13 A Yes. 14 Q Okay. And what do you mean when you say 15 semiconductor industry? 16 A Creation of devices based on inorganic 17 semiconductor materials. 18 Q Does it involve the use of organic 19 materials? 20 MR. CUMMINGS: Objection, form. 21 A In -- are you referring to does the -- or 22 are you asking does the semiconductor industry use	27 1 the -- the pattern is, some can -- some patterns 2 can be deposited as a pattern. Some patterns are 3 deposited as a blanket film, and then portions are 4 removed to leave what you want. That general 5 process for patterning is usually discussed as 6 photolithography, so you basically apply a film, 7 take a picture, develop the film. 8 The difference is that unlike old camera 9 film, you don't have a contiguous sheet anymore. 10 Once you develop a photoresist material, some of 11 it's gone. That's what developing means, is you 12 get rid of -- get rid of what you don't want. You 13 go to the next process step. Eventually any 14 residual film has to be removed, and you keep 15 going on. 16 Q And how long has photolithography been -- 17 been used in the semiconductor industry? 18 MR. CUMMINGS: Objection, form. 19 A Longer than I've been alive -- 20 Q Okay. 21 A -- we'll say. 22 Q But it's not a new process?
26 1 organic materials? 2 Q I'm -- I'm just trying to get an idea of 3 the scope of -- of the term "semiconductor 4 industry" and what -- what techniques and products 5 it would cover. 6 A Well, asking about using the materials is 7 processes, not products. So you -- you just -- 8 your clarification made things worse for me. 9 Q Well, I -- I'm curious about both the 10 products that are created by the semiconductor 11 industry as well as the techniques or processes 12 used to create those. 13 A The products can include organic materials 14 depending on what you're making. OLEDs are an 15 example. The O in OLED stands for organic, so 16 it's an organic light-emitting diode. 17 During processing you -- a large part of 18 the semiconductor industry, you have to form 19 structures. It's not just a blanket structure. 20 You have to create layers of films in a certain 21 sequence. They have to be patterned. 22 Depending on what the film is or what	28 1 A No, it's not. 2 Q And is -- photolithography, is that a -- a 3 process used with organic layers, to -- to create 4 patterns in organic layers? 5 A It could be used for that. 6 Q Is photolithography used in creating 7 patterns in inorganic materials? 8 A Most definitely. 9 Q Would photolithography be used in creating 10 patterns in the semiconductor wafers like those 11 described in Vaganov? 12 A Vaganov in many cases talks about masking, 13 and masking is referring to a photolithography 14 process because you're -- it's not a blanket mask. 15 If I put down a mask that covered everything, then 16 there's nothing to etch. So a mask implies that 17 it's a patterned feature. You're protecting some 18 portions. 19 Q So correct me if I'm wrong, but the 20 masking discussions within Vaganov are referring 21 to photolithography techniques? 22 A When it's talking about deposition of

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29 1 masking layers, I do see a reference to spraying 2 through a shadow mask. I will say that's a 3 boundary case. A shadow mask is -- it's like 4 cutting out a pattern in paper and then spraying 5 paint through it. So you -- you have a physical 6 structure with holes in it, and you're applying 7 material through the holes. 8 So how that mask would be made, depending 9 on what that material is, you may or may not call 10 that photolithography. It does use a mask. 11 That's why I said it's -- it's really a borderline 12 case. I would say it's an in-between, but just 13 since because they talk about a shadow mask. 14 Q Okay. And since we're on the topic of 15 Vaganov, can you explain what is isotropic 16 etching? 17 A It means the etch proceeds at the same 18 rate, nominally the same rate in all directions. 19 Q And is that a technique that's specific to 20 single crystal structures? 21 MR. CUMMINGS: Objection, form. 22 A It's most appropriately discussed for	31 1 you get round shapes. 2 Isotropic etching is not good for angles, 3 to be clear, and the clarification, I think, is 4 needed because if I apply an isotropic etch to a 5 flat surface, I should keep a flat surface. 6 That's not the case. 7 Q So are you aware of -- of any instances in 8 which isotropic etching is used with organic 9 layers? 10 MR. CUMMINGS: Objection, form. 11 A Developing photoresist masks. 12 Q So isotropic etching is used -- 13 A Oh, I'm -- 14 Q Sorry. 15 A Actually, I'm -- I'm sorry. I'm trying to 16 back up. I would say it could be, because the way 17 photoresist materials work is you have a 18 compositional change. So I will say it's possible 19 you might use an isotropic etch, but you don't 20 care isotropic versus anisotropic because you have 21 a layer of two different materials. One of them 22 etches. The other one doesn't.
30 1 single crystal structures. It can in some cases 2 apply to polycrystalline or amorphous. 3 Q Would isotropic etching be used with 4 organic layers? 5 MR. CUMMINGS: Objection, form. 6 A I'm -- I'm struggling here, because 7 there's -- when someone talks about an isotropic 8 etch in the industry, they're talking about an 9 idealized situation. 10 If you look at Figure 25 of Vaganov, in 11 the upper substrate and actually in the lower one, 12 you see round channels. I will say that's the 13 idealized. That's, you could say, how things 14 start. But the discussion for Vaganov is you 15 start with a trench, mask the sidewalls of the 16 trench, and then use an isotropic etch. 17 So isotropic etch, even from a flat 18 surface, there's boundary issues. So I turned 19 something that had a flat bottom into a round 20 structure. So there's how the term is used, and 21 then there's the reality of it. They say it 22 etches equally in all directions, but that is how	32 1 So that's -- that's about the best I could 2 say. It could be used, but I'm not aware because 3 of the way photoresist masks work. 4 Q Are you aware of any instances in which 5 anisotropic etching is used with organic layers? 6 MR. CUMMINGS: Objection, form. 7 A I'm trying to determine how anisotropic 8 etching could be done with organic materials. If 9 it was an organic crystal, I would say it's 10 possible. But the -- the science behind 11 anisotropic etching is a difference in etch rate 12 on different crystal planes. 13 So if I have a uniform piece of plastic, 14 if you will, an anisotropic etch through a 15 material that has isotropic properties, that's 16 where I struggle to see if it could be done. 17 Q Okay. I have a couple more questions 18 about Vaganov, but I want to go back to your 19 declaration. Is there anything else other than 20 the statements that you mentioned earlier about 21 Vaganov that you would like to -- to correct or 22 clarify from your declaration?

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33 1 A No. 2 Q Okay. If you could turn to paragraphs 55 3 and 56 of your declaration, and let me know once 4 you're there. 5 A Okay. 6 Q Okay. Do you see where you state that: A 7 POSITA would also note that Vaganov emphasizes 8 minimization of the area used for bonding? 9 A Yes. 10 Q Does Vaganov also teach increasing the 11 surface area or contact area within the minimized 12 bonding area? 13 MR. CUMMINGS: Objection, form. 14 A The answer is, column 3, starting at line 15 29: A common principle here is the use of the 16 third dimension--the thickness of the wafer--to 17 decrease bonding surface area in the plane defined 18 by the surface of the wafer, but increase total 19 bonding surface area and therefore increase 20 mechanical strength and hermeticity of the bond. 21 Q And in layman's terms, what does that 22 mean?	35 1 with using some materials for bonding. 2 Q So in your experience, have you ever 3 increased bonding strength by increasing the 4 surface area that came into contact with the 5 bonding agent? 6 MR. CUMMINGS: Objection, form. 7 A Usually the approach has been just find a 8 better bonding agent. 9 Q And so you -- you haven't ever tried to 10 increase bonding strength by increasing the 11 surface for contact area? 12 MR. CUMMINGS: Objection, form. 13 A The issue is that if you want to increase 14 the contact area for the bonding agent, now you've 15 got to add additional process steps, verification 16 steps. Every step in manufacturing has a cost and 17 a yield associated with it. 18 If I'm going to add two or three steps 19 just to increase the area for bonding versus I 20 found a better glue, changing the bonding agent, 21 that could be as easy as a one for one. I replace 22 one step with another, as opposed to let me insert
34 1 MR. CUMMINGS: Objection, form. 2 A Increasing the total surface area used for 3 bonding. 4 Q And the language "common principle," do 5 you agree that it's a common principle -- that's 6 what's described in Vaganov is a common principle? 7 MR. CUMMINGS: Objection, form. 8 A What's described in that passage is 9 commonality of the embodiments of Vaganov. 10 Q So would the principle of increasing 11 bonding strength -- or, sorry, let me rephrase 12 that. 13 Would -- the principle of increasing 14 mechanical strength and hermeticity by increasing 15 the total bonding surface area, would that be a 16 principle that would be applied outside of the 17 teachings of Vaganov? 18 MR. CUMMINGS: Objection, form. 19 A I don't believe I offered an opinion on 20 that, because one of the other easy things to do 21 is just to make sure you have a better glue, if 22 you will. There are discussions about some issues	36 1 two or three, maybe more, steps, and it still 2 might not work. 3 Q Okay. But in your experience, have you 4 ever used the principle of increasing the surface 5 area of contact to increase the bonding strength 6 between two layers? 7 MR. CUMMINGS: Objection, form. 8 A I have not. 9 Q And in your experience, are you aware of 10 anyone else in the industry that has attempted to 11 increase bonding strength by increasing the 12 surface area of contact between two layers? 13 MR. CUMMINGS: Objection, form. 14 A The prior art references talk about it. 15 They talk about maximizing the bonding area. 16 Q And when we say bonding area, are -- are 17 we referring to the surface area within the 18 bonding area, or are you referring to something 19 else? 20 MR. CUMMINGS: Objection, form. 21 A In the industry people would say the 22 wetted area.

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37 1 Q I -- I just want to be clear because I 2 understand -- and let me know if you agree with 3 this, but you could increase the bonding area both 4 by simply making it larger. That would create 5 more surface area. You could also create -- 6 create more surface area by doing microprofiling 7 or other similar techniques. 8 A My answers have been about texturing the 9 surface, if you will -- 10 Q Uh-huh. 11 A -- because, yes, increasing the lateral 12 area, I've done that, but I did not think that was 13 the question you were asking. 14 Q You -- you are right on point. That was 15 not the question I was asking, so I appreciate 16 that -- that clarification. 17 So going back, you'd agree that -- the 18 prior art references you mentioned, that they do 19 describe increasing the surface area for contact 20 of the bonding agent? 21 MR. CUMMINGS: Objection, form. 22 A I believe I state that many of them teach	39 1 enough, points to several problems of using an 2 adhesive with an organic bonding layer. So Zhang 3 teaches use the adhesive with an inorganic 4 material. 5 And like I said, there's also the 6 difference in fields. Zhang's specific to TFT 7 materials, and, again, Vaganov is not a -- in the 8 field of TFT devices. 9 Q So my -- my question was a little more 10 high level than that. 11 In your opinion, does Zhang and Vaganov 12 both describe increased -- increasing bonding 13 strength by increasing the surface area that comes 14 into contact with the bonding agent? 15 MR. CUMMINGS: Objection, form. 16 A Where I'm struggling a bit is a 17 significant portion of Vaganov is actually 18 directed to mechanically locking components 19 together. Literally, once the adhesive hardens, 20 it can't be pulled out. And that has no parallel 21 with Zhang. So that -- that's where there's a 22 little bit of difficulty and, again, the
38 1 you want to maximize the area for bonding. 2 Q And please take your time, but if you have 3 a specific example of that, let me know. 4 A Paragraph 78, referring -- or discussing 5 the Zhang reference, I quote from Zhang: The main 6 purpose of this embodiment is to increase the 7 contact area of the frame adhesive, allowing more 8 adhesive to penetrate into the grooves/openings, 9 thereby enhancing the bonding strength between the 10 TFT substrate and the CF substrate. 11 There's a -- I'll stop there. 12 Q And that -- the purpose that you just 13 mentioned from Zhang, does that align with the 14 teachings of Vaganov we were discussing at column 15 3, lines 29 through 34? 16 MR. CUMMINGS: Objection, form. 17 Q Or, sorry, 29 through 36. 18 A The complication is that Vaganov is 19 talking about bonding inorganic materials. Zhang 20 teaches actually that you don't want to use 21 organic materials with the adhesive. Zhang has 22 comments about it's inadequate. It's not strong	40 1 processes. 2 Q Understanding that the two references may 3 have different scope of teaching, do both the 4 Vaganov and the Zhang reference teach increasing 5 bonding strength by increasing the surface area 6 that comes into contact with the bonding agent? 7 MR. CUMMINGS: Objection, form. 8 A Vaganov does teach the passage I cited 9 before, increase total bonding surface area, and 10 therefore, increase mechanical strength and 11 hermeticity of the bond. And -- and the quote 12 from Zhang in paragraph 78 teaches the similar 13 approach. 14 MR. LONEY: So I am adding to chat Exhibit 15 Number 3, which is the '801 patent, which has 16 previously been marked as Exhibit 1001 in this 17 proceeding. 18 (Exhibit 3 marked.) 19 Q Let me know once you have that open, 20 Dr. Bretschneider. 21 A Okay. Not wanting to open. Okay. There 22 we go.

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41 1 Q Okay. So first question, is this the '801 2 patent that you are opining about in your 3 declaration? 4 A Yes. 5 Q And what is the purpose of the invention 6 of the '801 patent? What problem was it trying to 7 solve? 8 MR. CUMMINGS: Objection, form. 9 A I would say that's in the Summary section, 10 column 1, starting at line 47: The present 11 invention reduces reliability and integrity 12 problems encountered in conventional methods. 13 Peeling of sealant, uneven cell gaps, and 14 formation of voids in sealant regions during 15 assembly are all reduced. 16 Q And what conventional methods is the 17 patent talking about in that -- that -- that 18 paragraph? 19 MR. CUMMINGS: Objection, form. 20 A Applying sealants. 21 Q Anything specific about applying sealants 22 that was conventional that needed to be improved	43 1 bubbles, voids. If you have a bubble or void, 2 then -- and that's in your sealant, in your 3 adhesive, obviously it's weaker. If the bubble is 4 on a surface, now you've actually reduced the area 5 for bonding. 6 Q So a POSITA at the time of the '801 patent 7 would have understood that having bubbles and 8 voids in the sealant region was a bad thing? 9 MR. CUMMINGS: Objection, form. 10 A Yes. 11 Q And a POSITA at the time of the '801 12 patent would have understood that having an angle 13 greater than 60 degrees would increase the 14 possibility of bubbles and voids in the sealant 15 region? 16 MR. CUMMINGS: Objection, form. 17 A If they read the patent, yes, they would 18 have that understanding. 19 Q Well, my question is a little different. 20 Without reading the patent, is that 21 something that would be known to a POSITA at the 22 time?
42 1 upon? 2 MR. CUMMINGS: Objection, form. 3 A That's what we discussed previously. 4 Peeling of the sealant, uneven cell gaps, 5 formation of voids, bubbles, if you will, in 6 sealant regions during assembly are all reduced. 7 So those are the problems the patent is 8 addressing. 9 Q Okay. How does the '801 purport to solve 10 or improve upon those -- those issues? 11 MR. CUMMINGS: Objection, form. 12 A Column 2, line 37: Voids or bubbles 150 13 can be formed during application of the sealant 14 146 occur due to angle theta between the sidewall 15 of the saw tooth openings 134 and the surface of 16 silicon nitride layer 142 exceeding 60 degrees. 17 Q I'm sorry. Is that -- is that the method 18 that the '801 patent -- 19 A No. That -- 20 Q -- is -- 21 A No. It's -- it's what they're stating, 22 that at -- if the angle is too steep, you get	44 1 MR. CUMMINGS: Objection, form. 2 A What would be known is that you can have 3 voids or bubbles in the sealant or adhesive. 4 Q And would a POSITA at the time of the '801 5 patent have understood that having a higher degree 6 angle of sidewall would increase the chance of 7 those voids and bubbles? 8 MR. CUMMINGS: Objection, form. 9 A Again, if they read the patent, they 10 would. Outside of the patent, I haven't seen 11 anything that suggested or taught that. 12 Q In your experience, would that have been 13 something that would have been known by POSITAs in 14 the field? 15 MR. CUMMINGS: Objection, form. 16 A No. In my experience, a POSITA in the 17 field would have known that it could be a problem. 18 Usually the way people try to address voids or 19 bubbles is literally degassing the sealant. 20 Q So I -- let me ask it a different way. 21 The '801 patent, does it purport to have 22 discovered this problem that having an angle

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45 1 greater than 60 degrees would increase the 2 likelihood of voids and bubbles? 3 MR. CUMMINGS: Objection, form. 4 A I think the summary passage read 5 previously makes it pretty clear. They're saying 6 they found a method to reduce the formation of 7 voids and bubbles, and then they outline the 8 conditions where this is when it gets worse. 9 Where I'm struggling, when you say purport 10 to have discovered, your question sounds more like 11 here's a peer-reviewed research article that says 12 this was discovered. Patents aren't journal 13 articles. 14 Q Sure. I think you're right about that. 15 Definitely not peer-reviewed in the -- in 16 the normal sense of the term, are they? 17 A No. 18 Q What I'm trying to understand is, in your 19 opinion, would a POSITA, without reading the '801 20 patent, have understood that the steeper the 21 incline of the sidewall, the more likely bubbles 22 and voids are to form in the sealant region?	47 1 it could have openings in one or more of the 2 layers to increase the surface area of contact? 3 MR. CUMMINGS: Objection, form. 4 A I'm going to say they'd understand that it 5 could be patterned. 6 Q Okay. And is it also your opinion that a 7 POSITA understanding that the layers could be 8 patterned would also not have considered changing 9 the patterning to try to decrease the likelihood 10 of voids or bubbles? 11 MR. CUMMINGS: Objection, form. 12 A Where I'm struggling is all the prior art 13 references and everything Dr. Neikirk looked at, 14 none of them mentioned voids or bubbles. So 15 you're asking, would a person of ordinary skill in 16 the art consider something that's not in the large 17 number of references Dr. Neikirk cited? 18 Honestly, voids and bubbles, like I said, 19 were treated as a material issue. Sealant A might 20 be a little better for bubbles than sealant B. 21 Maybe it's weaker. Maybe it's stronger. Can you 22 change the conditions you apply it? What's the
46 1 MR. CUMMINGS: Objection, form. 2 A I don't think so. 3 Q And why not? 4 A Again, if you have voids and bubbles, the 5 standard thing people in the industry would do, 6 they would look at the properties of the adhesive. 7 They would say, did you degas the adhesive? 8 There's something wrong with your application 9 conditions. 10 They didn't think about changing the 11 device structure. All of the prior art references 12 relied upon by Dr. Neikirk are all pretty clear. 13 Increase the area. If you want to maximize the 14 area, you're going to a very steep angle. 15 Q And we talked earlier about how at least 16 the Zhang and Vaganov references discuss 17 increasing the surface area of contact by creating 18 openings or profilings in one or more of the 19 layers, right? 20 A Yes. 21 Q And so a POSITA at the time would have 22 understood that when creating the sealant region,	48 1 temperature? What's the environment? 2 Those are the standard procedures that a 3 person of ordinary skill in the art would go 4 through. 5 Q But an ordinary person of skill in the art 6 would not have considered changing the profiling 7 to try to reduce those -- those issues? 8 MR. CUMMINGS: Objection, form. 9 A They have no reason to change the 10 profiling, and I believe I offer multiple opinions 11 and rationales why, if the direction is to 12 increase the area for adhesion, you're going to 13 maximize the angles. The processes used for 14 those -- the angle is what it is. Measuring the 15 sidewall angle of a via is actually a very 16 difficult thing to do, so it's typically not done. 17 Q What do you mean, it's typically not done? 18 A In manufacturing, particularly for 19 semiconductors, everything is about high yield. 20 Semiconductor processes can run anywhere from a 21 dozen to several hundred process steps. A small 22 yield hit at each process step could be

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49 1 significant in the long run. 2 So you want to track precisely what's 3 going on at each step, and you have control 4 charts. What are the critical parameters to make 5 sure I'm doing things right? 6 For via formation, sidewall angles — it's 7 not a control chart, because you can't measure it 8 for a via. And as I state in my declaration, the 9 concern is really did it go down to the right 10 layer, and what's the area at the bottom? 11 Q Just so I understand, in your experience, 12 most manufacture processes don't bother with 13 trying to determine a precise angle to the via 14 openings? 15 MR. CUMMINGS: Objection, form. 16 A I'm saying it's incredibly difficult to 17 determine the angle for a via opening, so it's not 18 tracked, and it's not a consideration. You try to 19 make it steep-sided, but the number is what it is. 20 If you take a step back and think about 21 how you measure it, to measure it means I have to 22 take advice and do a cross-section. Doing that	51 1 area at the bottom to make a reliable electrical 2 contact, you're done. 3 Q Okay. Are there -- you -- you mentioned 4 FIB, I believe. But are there -- are there 5 specific etching techniques that a POSITA would 6 understand would create a specific angle without 7 measuring it after the angle has been created? 8 MR. CUMMINGS: Objection, form. 9 A That goes to Vaganov. If you're using 10 single crystal materials, you can get etches that 11 the angle will be very, very precise because it's 12 determined by the fundamental properties of the 13 crystal. 14 Q And what about the '801 patent, does it 15 teach any specific etching processes that would 16 create a specific angle? 17 MR. CUMMINGS: Objection, form. 18 A The difference is it's stating that this 19 is important, and it's giving preferable ranges. 20 And the angles that are described would not be 21 consistent with a via, which means there's 22 different processes that could be used to
50 1 cross-section, well, I'm going to destroy the 2 device. 3 This isn't something I'm going to do just 4 as devices pass through. I've got to sacrifice 5 some number of devices. I've got to form a very 6 precise cross-section. Then I prepare the sample, 7 put it in SEM, and make a measurement. 8 The alternative would be, if you didn't 9 want to destroy the entire device, you would use a 10 process called FIB, focused ion beam. It's a 11 milling process. You use heavy atoms to basically 12 sandblast away material, and you could dig a 13 trench that you could look in a SEM and see the 14 sidewall angles. 15 But FIB is not a fast process. That's an 16 eight to ten-hour delay. No one's going to hold 17 up their manufacturing line for that period of 18 time to get feedback. 19 So, again, for a via, it's -- I will say 20 you could measure the angles if you're doing 21 research, but in the process, the angle is what is 22 it. You don't really care. If you have enough	52 1 determine and control those angles. 2 Q And in the context of the '801 patent, 3 when it's referring to an angle, that angle should 4 be determined and intended before its creation, 5 right? 6 MR. CUMMINGS: Objection, form. 7 A Just as an example, because it's sticking 8 out in claim 9, the final element: An organic 9 material pattern layer having a saw tooth opening 10 formed on the predetermined material layer to 11 expose the surface of the predetermined material 12 layer underneath, wherein the surface of the 13 predetermined material layer and the sidewall of 14 the organic material pattern form a predetermined 15 angle. 16 So if it's predetermined, someone 17 specified it before the process. 18 Q Okay. So for -- for a predetermined 19 angle, that angle would be specified and known 20 before the process began? 21 MR. CUMMINGS: Objection, form. 22 A If it wasn't specified and known before,

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53 1 then it wouldn't be predetermined. 2 Q And if you don't have any intended 3 specific angle, but an angle is created through 4 byproduct of the process, that wouldn't be a 5 predetermined angle? 6 MR. CUMMINGS: Objection, form. 7 A The beginning of your question answered 8 that. 9 Q So -- 10 A If -- if you don't have an intended angle, 11 it can't be predetermined. 12 Q All right. Does a predetermined angle 13 need to be repeatable through the manufacturing 14 process? 15 MR. CUMMINGS: Objection, form. 16 A It's a very strange question because 17 the -- the obvious answer is yes, because if the 18 answer is no, then it's not predetermined. If I 19 only have to do it once, I'll -- and then it 20 changes, that's not a manufacturing process. If I 21 only have to measure it once, and I don't care 22 after that, that's not predetermined.	55 1 entire range the predetermined angle, or would 2 it -- does it refer to a specific angle within 3 that range? 4 MR. CUMMINGS: Objection, form. 5 A I don't think I offered an opinion on 6 that. My declaration was largely responsive to 7 Dr. Neikirk, and I don't think he offered an 8 opinion on that. 9 Q If you could look at paragraph 60 of your 10 declaration, actually, it's on page 26. About 11 four rows down from the top, you have a sentence 12 that reads: Further, a POSITA would be aware that 13 Kim does not teach a fixed or predetermined angle 14 and rather teaches a wide range of acceptable 15 angles. 16 Do you see that? 17 A Yes. 18 Q So what I'm trying to understand is 19 whether the predetermined angle can be -- needs to 20 be a specific angle within a range or can be 21 multiple angles as long as they're within that 22 range.
54 1 It -- it's -- it's very contrary to 2 quality control. So I'm -- I'm sorry if I have 3 some strange expressions. I've had a lot of 4 training in quality control -- 5 Q I -- 6 A -- systems. 7 Q I am happy to be -- be corrected and 8 taught as we go through this. So you are 9 perfectly fine. 10 A I don't think you want that. I was 11 trained as a quality -- quality control engineer, 12 so I was two months from being a certified quality 13 engineer, so... 14 Q Maybe -- maybe it's good we only have one 15 day, then. 16 Sticking with predetermined angle, I had 17 another question. The patent, the '801 patent, in 18 the dependent claims -- well, in the specification 19 and dependent claims provides ranges for the 20 predetermined angle, correct? 21 A Yes. 22 Q When the patent provides a range, is that	56 1 MR. CUMMINGS: Objection, form. 2 A Just to further address Kim, later on in 3 the paragraph, I state: Moreover, Kim doesn't 4 even teach planar sidewalls and instead teaches 5 that a curved or gradual profile is desired. 6 That by itself is really problematic 7 because when you're talking about an angle of a 8 curve, pick your measurement point, and you can 9 get something. 10 Q Okay. 11 A So I'm just -- just to be clear there, you 12 know, you're -- you're talking about a reference 13 that says, okay, 30 to 60 degrees. Again, I did 14 not -- do not recall providing an opinion on the 15 tolerance of the predetermined angle, again, 16 because Dr. Neikirk didn't either. 17 Q Let me ask it a different way. 18 You do state that Kim's description of an 19 angle between 30 to 60 degrees does not teach a 20 fixed or predetermined angle, right? 21 MR. CUMMINGS: Objection, form. 22 A Reading this section as an overview of

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57 1 Kim, Kim's purpose for the openings is to allow 2 creation -- smooth creation of layers formed on 3 top of the organic layer. Specifically, Kim was 4 worried about short-circuits, breaks in 5 conductors. So Kim doesn't need to be precise 6 and, honestly, doesn't care as long as you're in 7 that range. 8 Q So, again, it -- it's your opinion that a 9 POSITA would understand Kim to not teach a fixed 10 or predetermined angle when it describes an angle 11 between 30 and 60 degrees? 12 MR. CUMMINGS: Objection, form. 13 A I'd also say a person of ordinary skill in 14 the art would understand that Kim has -- is not 15 related to sealing adhesives. It's maintaining 16 electrical continuity. And that process, as long 17 as you're in that range, Kim is saying make it 18 curved, and here's the inclination angle at -- at 19 this -- ideally at this end of the curve, and 20 you'll be okay. 21 Q So a POSITA would understand Kim's 22 teaching of an angle between 30 and 60 degrees to	59 1 MR. CUMMINGS: Objection, form. 2 A Kim, again, is pretty clear. Defining the 3 sidewall of the organic insulating layer, defining 4 the contact holes, bearing an inclination degree 5 of about 30 to 60 degrees, and the pixel 6 electrodes formed on the organic insulating layer 7 being electrically connected to the drain 8 electrodes. 9 So the pixel electrode connection to the 10 drain electrode connection is the key concern. 11 Again, that's what Kim was discussing, and, 12 again -- 13 Q So -- 14 A -- Kim has nothing to do with adhesion. 15 Q What I'm trying to understand is the 16 tolerances for the predetermined angle. If the 17 angle is between a range of stated angles -- of 18 stated predetermined -- a predetermined range, 19 does that constitute a predetermined angle? 20 MR. CUMMINGS: Objection, form. 21 A I've answered as best I could with the Kim 22 reference. Like I said, again, the Kim reference
58 1 not be a fixed or predetermined angle? 2 MR. CUMMINGS: Objection, form. 3 A Again, going from memory, because I don't 4 have Kim in front of me, Kim doesn't require a 5 predetermined angle as long as it's somewhere in 6 that range. 7 Q So would a POSITA not understand -- 8 understand Kim to teach that you could use the 9 same angle over and over again as long as that 10 angle is within that range? 11 MR. CUMMINGS: Objection, form. 12 A A POSITA would understand that there's no 13 reason to be concerned about the angle. It 14 wouldn't be a control chart. It wouldn't be 15 something that's tracked. Kim's discussion on 16 electrical continuity, that would be a much better 17 example of what would be tracked and what would be 18 the concern. That it made contact, does the 19 contact have the proper characteristics? Yes. 20 Q And the angle of Kim being between 30 and 21 60 degrees, that's not a predetermined angle if it 22 falls somewhere in that range?	60 1 is problematic because when you have a curve, the 2 accuracy of your measurements changes your 3 measured angle. These are all reasons why Kim -- 4 it's, like, no, I don't -- nothing is 5 predetermined. 6 Q So Kim doesn't care -- the disclosures of 7 Kim do not care whether the angle is repeated 8 between implementations? 9 A Kim cares about the pixel electrodes being 10 electrically connected to the drain electrodes. 11 As long as that's met, that's the goal. 12 Q But Kim also teaches having an angle 13 between 30 and 60 degrees to meet that goal, 14 right? 15 MR. CUMMINGS: Objection, form. 16 A I have to say again Kim teaches a curve 17 with a portion of the curve having an angle. This 18 is -- like I said, it's -- it -- it's actually a 19 very difficult technical point because if I have a 20 curve profile, you and I can measure the same 21 curve, the identical curve, and come up with 22 different answers depending on how we do the

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61 1 measurements, which supports that's not really 2 what Kim concerns about. They give you some rough 3 guidelines. 4 What is the angle is from iteration of the 5 process to iteration of the process, you don't 6 care about that because what you care about is the 7 electrical continuity. 8 Q I still have a few more questions about 9 the range. But talking about the curved 10 sidewalls, could the claims of the '801 patent be 11 satisfied by a curved sidewall? 12 MR. CUMMINGS: Objection, form. 13 A I don't think I offered an opinion on 14 that. 15 Q Does the '801 patent -- well, does the 16 '801 patent teach any specific manner for 17 measuring the predetermined angle? 18 MR. CUMMINGS: Objection, form. 19 A Given the ranges of angles, I would say 20 it's not necessary. Those could be measured by a 21 few different techniques. 22 Q What are those techniques?	63 1 opinion on tolerance, which I don't recall 2 providing in my declaration. And I don't recall 3 Dr. Neikirk providing one as well or offering one. 4 Q Sure. Do you have -- so if -- if you have 5 a variance in the angle by -- by 2 degrees either 6 way, would that be considered a predetermined 7 angle? 8 MR. CUMMINGS: Objection, form. 9 A Again, I haven't offered an opinion on 10 tolerance or repeatability, and neither has 11 Dr. Neikirk. My declaration is largely responsive 12 to his. 13 Q And if you have a variance of the angle of 14 5 degrees either way, would that -- could that be 15 considered a predetermined angle? 16 MR. CUMMINGS: Objection, form. 17 A The best I can say is that a predetermined 18 angle is determined before the process. 19 Q And so if you have a variance of 15 20 degrees either way of an angle, would that be 21 considered a predetermined angle? 22 MR. CUMMINGS: Objection, form.
62 1 A One of them -- and it's usually referred 2 to as Dektak. That's the equipment manufacturer. 3 It's surface profilometry. You drag a needle 4 across a surface, and you measure the height 5 difference of the surface. 6 There's also AFM or any of the derivatives 7 of it, atomic force microscopy. It's similar to 8 profilometry except just much more precise. 9 Q And if I could have you look back at the 10 '801 patent, specifically column 3, lines 16 11 through 21, let me know once you're there. 12 A Okay. 13 Q So in this section, the '801 patent is 14 describing that the predetermined angle can be an 15 angle within various ranges, correct? 16 A Yes. 17 Q So my question is, is the predetermined 18 angle a predetermined angle as long as it falls 19 somewhere within the range, or does it need to be 20 a repeatable angle within the range? 21 MR. CUMMINGS: Objection, form. 22 A Your question necessarily includes an	64 1 A What I can find in the declaration in 2 paragraph 102 discussing the Kim 935 reference: 3 Kim 9 -- similarly, Dr. Neikirk opines that Kim 4 935 teaches openings with specific angles. And a 5 citation there. Kim 935 disclose an LCD device 6 comprising substrates opposing substrates (10 and 7 30) and an interlayer/passivation layer formed 8 from a photoresist resin and including openings 9 that expose the underlying layers such as a 10 transparent electrode. The sidewalls of the 11 openings form an angle within a range of about 20 12 to 110 degrees. 13 Kim 935 describes angle reflectors, but 14 does not even mention sealing, so there's some of 15 the issues, but that is an enormous range of 16 variation. It can be within a 90-degree range. 17 I'm going to say that's not predetermined. 18 Then in the discussion of another 19 reference, Tanaka, in the following paragraph, 20 paragraph 102, the summary: Tanaka's requirement 21 means that any etch process that does not produce 22 an undercut would suffice and that the acceptable

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65 1 angle theta between the side surface and the 2 substrate is in the range of 90 to 180 degrees. 3 So they don't undercut. That's not a 4 predetermined angle. 5 Q So if you have a variance of 15 degrees 6 either way like the 360-degree range we discussed 7 in -- about regarding Kim in paragraph 26 of your 8 declaration, would that be considered a 9 predetermined angle? 10 MR. CUMMINGS: Objection, form. 11 A Again, you're asking for an opinion on 12 tolerance, and I've provided the opinions in my 13 report, and what you're asking, I haven't 14 considered, I haven't formed an opinion on yet. 15 Q But you do have an opinion on whether 16 Kim's disclosure of an angle between 30 and 60 17 degrees is or is not a predetermined angle? 18 MR. CUMMINGS: Objection, form. 19 A The -- more the issue is that Kim doesn't 20 care as long as it's in that range. Again, I have 21 to reiterate Kim's not even talking about 22 adhesion, about sealing. What Kim is teaching is	67 1 angle before you started the process, it doesn't 2 matter -- it doesn't matter where the angle falls 3 except that it falls on the -- the point that was 4 chosen or intended. That's what determines 5 whether it's predetermined or not? 6 MR. CUMMINGS: Objection, form. 7 A If it's predetermined, it's going to be 8 tracked. It's going to be measured. There's 9 going to be a control chart with upper spec 10 limits, lower spec limits, upper warning limits, 11 lower warning limits, and the engineers in charge 12 of the process will be looking at the CPK and PPK 13 numbers for the process. 14 Q And if the process flow doesn't care about 15 what the angle is, it just is what it is, then 16 that's not a predetermined angle? 17 MR. CUMMINGS: Objection, form. 18 A Then there wouldn't be a control chart. 19 Q And the angle wouldn't be predetermined? 20 MR. CUMMINGS: Objection, form. 21 A It wouldn't even be measured. 22 Q Going back to column 3, lines 15 through
66 1 maintaining electrical continuity. 2 Q So is it your opinion that Kim -- Kim's 3 discussion of a 30 to 60-degree range would not 4 include a 45-degree angle with a 15-degree 5 variance in either direction? 6 MR. CUMMINGS: Objection, form. 7 A Again, I haven't formed an opinion on 8 that, but I will reiterate that Kim -- there is no 9 indication that Kim cares about it being 10 predetermined. Try to do this. If you do it, 11 maybe it's okay, maybe it's not. But Kim, again, 12 is concerned about preventing electrical open 13 circuits. 14 Q So if I understand you correctly, it's not 15 about whether the angle falls within the range 16 disclosed, it's whether it falls at the intended 17 degree within that angle -- or within that range 18 that's disclosed; is that right? 19 MR. CUMMINGS: Objection, form. 20 A The best I can answer is, did you 21 determine the angle before the process? 22 Q Again, if -- so if you determined the	68 1 21, with the ranges of the predetermined angle, 2 let me know when you're there. 3 A Okay. 4 Q Does the '801 patent describe selecting or 5 intending any specific angle within any of these 6 ranges? 7 MR. CUMMINGS: Objection, form. 8 A A person of ordinary skill in the art 9 would optimize based on the properties of the 10 sealant or adhesive and the process being used. 11 Q And what do you mean by that? How would 12 a -- a POSITA optimize? What would they consider? 13 MR. CUMMINGS: Objection, form. 14 A What the range is saying in that passage 15 for the '801 patent is here's the places to look 16 for optimization, and there would be a variety of 17 tests, reliability tests, that would be done 18 before the process went into manufacturing to 19 determine the predetermined angle. 20 Q What if we look at claim 2 at the top of 21 column 4 next to it, do you see where it talks 22 about the predetermined angle is less than 60

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69 1 degrees? 2 A Yes. 3 Q Would any angle suffice as a predetermined 4 angle if it's less than 60 degrees? 5 MR. CUMMINGS: Objection, form. 6 A I don't think I've offered an opinion on 7 that. 8 Q So sticking with claim 2, if during 9 manufacturing no controls are put in place to 10 control the angle, but the resulting angle is then 11 measured and is found to be less than 60 degrees 12 would that be a predetermined angle? 13 MR. CUMMINGS: Objection, form. 14 A What you're saying, if they're not 15 measuring, if it wasn't planned, then I would say 16 by definition, it can't be predetermined. 17 Q Okay. And I know we've been going for -- 18 for about an hour and a half, so I'm happy to 19 continue. If -- if you need a break, just let me 20 know. We're on a little bit different time zones, 21 I believe. 22 A Based on your background, we're close.	71 1 Q Okay. If you could go to column 2 2 starting around line 9, a series of questions I'd 3 like to -- to get your input on. Let me know once 4 you're there. 5 A Okay. 6 Q Do you see in the first and second line 7 where it says: Thin film transistor-liquid 8 crystal display (TFT-LCD)? 9 A Yes. 10 Q Did TFT-LCDs exist before the '801 patent? 11 A The '801 patent is not claiming to have 12 invented TFT-LCDs. 13 Q And so did TFT-LCDs exist before the '801 14 patent? 15 A Yes. 16 Q Let's skip down to line 26. Do you see 17 where it refers to a TFT array substrate 132? 18 A Yes. 19 Q And did the '801 patent -- does it purport 20 to have invented TFT array substrates? 21 MR. CUMMINGS: Objection, form. 22 A By definition, if TFT-LCDs existed before
70 1 Q You are, yeah. 2 A I'm -- I'm Mountain Time. I'm not a good 3 person to ask about for breaks. 4 Q Okay. Well, then unless I hear otherwise, 5 I'll just -- I'll just keep plowing through. 6 Let's go back to the '801 patent. Can you 7 describe -- or how does the '801 patent purport to 8 solve the -- the issues that we were discussing 9 earlier? 10 A I think the clearest description, column 3 11 at line 27: With predetermined angle alpha, air 12 exhausts easily via the tapered profile of the saw 13 tooth opening 234 during application of sealant, 14 avoiding formation of voids or bubbles in the 15 sealant. 16 Q Okay. So what was new or novel about the 17 invention of the '801 patent? 18 MR. CUMMINGS: Objection, form. 19 A I think the patent itself makes that 20 clear. It's using the angled sidewalls to prevent 21 or minimize the formation of bubbles or voids in 22 sealant.	72 1 the '801 patent, TFT substrates would have existed 2 before. 3 Q Okay. And below that, it refers to a 4 predetermined material layer such as silicon 5 nitride. Do you see that? 6 A Yes. 7 Q Was silicon nitride known and used in 8 TFT-LCDs before the '801 patent? 9 MR. CUMMINGS: Objection, form. 10 A Silicon nitride has a long history in the 11 semiconductor industry that includes the time 12 before the '801 patent. 13 Q So the use of silicon nitride layers 14 within a TFT-LCD was not -- not new to the '801? 15 MR. CUMMINGS: Objection, form. 16 A I'm trying to be precise because I don't 17 remember Dr. Neikirk addressing that. I don't 18 think I expressed an opinion on that, but I will 19 say I believe silicon nitride was used previously. 20 Q Do you know if it was used as a 21 passivation layer -- 22 MR. CUMMINGS: Objection, form.

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73 1 Q -- in TFT-LCD displays? 2 MR. CUMMINGS: Objection, form. 3 A I don't think I offered an opinion on 4 that. I don't recall in this matter that that was 5 raised as an issue. 6 Q Have -- have you ever used a silicon 7 nitride layer as a passivation layer? 8 MR. CUMMINGS: Objection, form. 9 A Yes. 10 Q In what context? 11 MR. CUMMINGS: Objection, form. 12 A I'm limited on what exactly I can say on 13 this, but I believe I can say for a light-emitting 14 device. 15 Q Have you ever used silicon nitride -- a 16 silicon nitride layer as a passivation layer in 17 the creation of a TFT-LCD? 18 MR. CUMMINGS: Objection, form. 19 A A significant portion of the work I do as 20 a consultant is under non-disclosure agreements, 21 so my previous answer is the best I can answer. 22 Q And then next moving down to line 31 of	75 1 material layer 144? 2 A Yes. 3 Q What is that referring to, the etching? 4 MR. CUMMINGS: Objection, form. 5 A Etching means you're removing material. 6 Q Is that same process as photolithography, 7 or is it different? 8 A It depends. 9 Q Could the etching described in lines 34 10 through 36 be the same process as the 11 photolithography described above it? 12 MR. CUMMINGS: Objection, form. 13 A I'm trying to be precise with 14 photolithography. When you're removing material, 15 the term a person of ordinary skill in the art 16 would use is developing. If you're not in the 17 semiconductor industry, you could say developing 18 is etching. 19 But for a person of ordinary skill in the 20 art, etching is a different type of process. 21 It -- it's a -- you're asking a question that's in 22 a gray area that, depending on the exact
74 1 column 2, do you see where it refers to organic 2 material layer 144? 3 A Yes. 4 Q Would a POSITA have understood that 5 TFT-LCDs included organic material layers before 6 the '801 patent? 7 A The entire section column 2, line 31 to 8 33, is absolutely consistent with standard 9 photolithography. Photolithography involves 10 putting down an organic material later -- layer 11 and patterning it by lithography. 12 Q All right. So organic material layers 13 were known prior to the '801 patent? 14 A Yes. 15 Q And using photolithography to pattern 16 organic material layers was also known prior to 17 the '801 patent? 18 A Again, that's photolithography. 19 Photolithography and organic material layers go 20 hand-in-hand. 21 Q What if we go down to lines 34 through 36, 22 do you see where it refers to etching the organic	76 1 perspective, could have different answers is why 2 I'm struggling. 3 Q And would a POSITA have been aware of the 4 order of layers described in column 2 as existing 5 at the -- in TFT-LCDs at the time of the '801 6 patent? 7 MR. CUMMINGS: Objection, form. 8 A Towards the top of column 2, starting at 9 column 9? 10 Q Let me ask a slightly different question. 11 Would a POSITA have been aware of using a 12 TFT substrate with a silicon nitride passivation 13 layer formed on top and then an organic material 14 layer formed on top of the silicon nitride 15 layer -- that combination of layers, would that 16 have been known to a POSITA prior to the -- in 17 TFT-LCDs prior to the '801 patent? 18 MR. CUMMINGS: Objection, form. 19 A What you described was putting silicon 20 nitride passivation on the substrate. I'm -- I'm 21 struggling there, because that implies that the 22 substrate is active and needs to be passivated,

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77 1 which means it's not a bad substrate, so someone 2 would use it. 3 Q So let me ask you, looking at lines 28 and 4 29, do you see where it says: A predetermined 5 material layer such as silicon nitride layer 142 6 is formed on the TFT array substrate 132, serving 7 as a passivation layer? 8 A Yes. 9 Q So is that something -- is that -- is that 10 a process or implementation that would have been 11 known to a POSITA at the time of the '801 patent? 12 MR. CUMMINGS: Objection, form. 13 A I'll just clarify one point. There's a 14 difference when you see TFT substrate versus TFT 15 array substrate. There -- there are subtle 16 changes there, so, again, just trying to stay 17 accurate. 18 A person of ordinary skill in the art 19 before the '801 patent would know about a variety 20 of passivation materials that could be used in 21 that application. 22 Q And would a person of ordinary skill in	79 1 predetermined material layer with -- that would 2 comprise both -- one or more of the passivation 3 layer materials listed and one or more of the 4 metal electrode layer materials listed in column 5 2, lines 46 through 55? 6 MR. CUMMINGS: Objection, form. 7 A Could you repeat the question? 8 Q Do you see in column 2, lines 46 through 9 55, where it -- it states that the -- a 10 predetermined material layer such as silicon 11 nitride layer, and then also explains that? 12 Alternatively, the passivation layer can comprise 13 silicon oxynitride, silicon oxide, organic 14 dielectric layer, or a combination thereof? 15 Do you see that language? 16 A Yes. 17 Q And do you see the following sentence 18 where it says: The predetermined material layer 19 may further comprise -- I'm going to read these 20 out for the reporter, but Mo, Ti, Al, Ta, metal 21 oxide, metal nitride, or a combination thereof 22 serving as a metal electrode layer?
78 1 the art have also been aware of the order of 2 layers described in the '801 patent? 3 MR. CUMMINGS: Objection, form. 4 A A person of ordinary skill in the art 5 would be aware of a variety of different 6 structures, layer sequences that would include 7 what's described in the patent. 8 Q And I think you -- you touched on this, 9 but would a POSITA have been aware of the 10 passivation layer materials listed or identified 11 in the '801 patent specifically including those at 12 column 2, lines 46 through 55? 13 MR. CUMMINGS: Objection, form. 14 A Passivation layers are most commonly 15 silicon oxide, silicon nitride, or silicon 16 oxynitride. They're inorganic materials, and 17 using an organic dielectric layer. The best I 18 could say would be, it depends on what you're 19 trying to define as passivation or what you're 20 trying to passivate. 21 Q Would a POSITA have been aware -- or would 22 a POSITA have known the potential to create a	80 1 A Yes. 2 Q Would a POSITA at the time of the '801 3 patent have understood how to create the 4 predetermined material layer described in this 5 paragraph? 6 MR. CUMMINGS: Objection, form. 7 A There's different processes depending on 8 what the predetermined material layer is. For 9 example, the silicon nitride or silicon oxynitride 10 or silicon oxide would be deposited -- it could be 11 a -- a sputter process. It could be a physical 12 vapor deposition. 13 The materials for the electrode layer, 14 molybdenum, titanium, aluminum, tantalum, metal 15 oxide, metal nitride, or a combination thereof 16 would most likely be deposited using different 17 processes, evaporation, possibly evaporation 18 followed by rapid thermal anneal to convert a 19 metal to a metal oxide. You might sputter a metal 20 nitride layer. 21 So there's -- I just have to say there's 22 not one approach that works for everything, but

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81 1 they would -- a person of ordinary skill in the 2 art would be aware of methods to deposit those 3 materials. 4 VIDEOGRAPHER: Excuse me, counsel. We've 5 been about two hours. Would it be possible to go 6 off record for just a brief moment to switch 7 files? 8 MR. LONEY: Absolutely. 9 VIDEOGRAPHER: Sounds good. 10 We are now going off record. The time is 11 12:54 p.m. 12 (Recess, 12:54 to 1:04 p.m.) 13 VIDEOGRAPHER: We are now back on record. 14 The time is 1:04 p.m. 15 Q Welcome back, Dr. Bretschneider. 16 A Thank you. 17 Q Sticking with the '801 patent, could 18 you -- does the '801 patent describe how to create 19 the predetermined angles disclosed in the 20 specification? 21 A Yes. 22 Q And could you explain how the '801 patent	83 1 mask is somewhat like a gray scale. So you change 2 the crosslinking in the organic material as a 3 result of the exposure to UV light, and by 4 changing the amount of crosslinking after 5 subsequent development, you end up with profiled 6 structures. 7 Q And the photolithography process you just 8 described, including the half-tone mask, was that 9 something that was known at the time of the '801 10 patent to a POSITA? 11 MR. CUMMINGS: Objection, form. 12 A I'll say the use of half-tone masks was 13 known before. 14 Q And specifically, was the use of half-tone 15 masks with photolithography known as a method of 16 patterning an organic material prior to the '801 17 patent? 18 MR. CUMMINGS: Objection, form. 19 A I'm struggling a little bit. What I can 20 say is prior to the '801 patent, I used half-tone 21 masks with a material. I will say depending on 22 your viewpoint, it was organic or may have been
82 1 describes doing that? 2 A Column 2 at line 56: An organic material 3 layer 244 is formed on silicon nitride layer 242. 4 The organic material layer 244 is patterned by 5 lithography, exposed to UV light 250 through a 6 half-tone mask 248 with a predetermined pattern 7 thereon. The predetermined pattern can comprise 8 various openings of different size, providing 9 various local transmittances. Accordingly, the 10 organic material layer 244 is tapered after 11 subsequent development and etching. 12 Q Okay. So breaking that down, the 13 photolithography step, would that create angled 14 openings? 15 MR. CUMMINGS: Objection, form. 16 A The process described can create angled -- 17 Q How would it do that? 18 A -- curves. 19 Q Sorry. How would it do that? 20 A The specific description is use of a 21 half-tone mask with a predetermined pattern, so 22 trying to think of an analogy here. A half-tone	84 1 inorganic. It was a form of spin-on glass. It 2 was primarily a glass material, but it was liquid. 3 And the process was used to form optical lenses in 4 a thin film format. 5 Q All right. But would a POSITA at the time 6 of the '801 patent have known how to use a 7 half-tone mask in photolithography to create an 8 angled pattern in -- in an organic material layer? 9 MR. CUMMINGS: Objection, form. 10 A It's a strange question because your 11 question answers itself. The purpose of using 12 half-tone masks is to provide a gradient in the 13 developed photoresist material as it's 14 traditionally used. So you're asking if a process 15 that produces a gradient was known to be able to 16 produce a gradient in thickness? 17 Q Yes. I'm -- I'm asking if the process of 18 using a half-tone mask in photolithography to 19 create a gradient was known at the time of the 20 '801 patent. 21 A Again, that's the purpose of the half-tone 22 mask, so the question answers itself.

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85 1 Q It was known before the '801 patent? 2 MR. CUMMINGS: Objection, form. 3 A As I stated, I used half-tone masks to 4 form optical structures, lenses, in a thin film 5 format. I will say those geometries were 6 exceptionally precise. 7 Q And when you used the half-tone masks, 8 were you creating specific angles? Were you using 9 them to create specific angles? 10 A I was using them to create specific 3D 11 shapes. There were a variety of different shapes. 12 Like I said, it was literally making a lens array 13 that was a few microns thick. 14 Q And correct me if I'm -- I'm wrong. 15 Creating three-dimensional shapes would be more 16 difficult than creating a simple angle? 17 MR. CUMMINGS: Objection, form. 18 A Most lenses are not straight lines, so 19 I -- yes, it's more complicated. 20 Q If you had wanted to, do you think you 21 could have used half-tone masks in 22 photolithography to create a gradient or angled	87 1 light. That light initiates changes in the 2 organic material. Depending on whether it's 3 positive or negative, either it crosslinks and 4 becomes more resistant to solvents or etching or 5 it breaks them apart, and so those two 6 differences. But after the exposure to the light, 7 I have changed the properties of portions of the 8 film. 9 Once I have done that, then I can develop 10 it, which means removing the more soluble 11 material. I went back -- since this patent was 12 assigned to a Taiwanese company, I'm going to say 13 the subsequent development and etching is standard 14 photolithography. You develop the pattern, which 15 means removing portions of the material. 16 Q Okay. And so just to be clear, in your 17 opinion, reading the '801 patent, the use of 18 photolithography methods is sufficient to create 19 the predetermined angles disclosed in the patent? 20 MR. CUMMINGS: Objection, form. 21 A I will say that will allow you to 22 create -- the language is specific, a
86 1 opening in an organic material layer before the 2 '801 patent? 3 MR. CUMMINGS: Objection, form. 4 A I haven't considered that, and, again, the 5 best I can do is to go back to my direct 6 experience. I was forming precise optical 7 structures. 8 Q Going back to the '801 patent, after the 9 photolithography step that we mentioned, do you 10 see at lines 61 through 63 it refers to the 11 organic material layer is tapered after subsequent 12 development and etching? 13 A Yes. 14 Q What does that mean? 15 A The process being described, they're 16 talking -- they refer to it as lithography. It's 17 a lithographic process, which means -- I'm going 18 to assume we're just starting on something flat to 19 make it easy. I apply a coating of material. I 20 make sure it's uniform over everything, so I have 21 this uniform film of material. 22 I expose this uniform film to a pattern of	88 1 predetermined pattern. It's a -- a clear teaching 2 that you can precisely change and modify the 3 material. 4 Q And if we go to the next page at the top 5 of column 3, can you explain what a gray-tone or 6 slit-pattern mask is? 7 A A traditional photolithography mask is 8 digital in a sense. Either it blocks light or it 9 lets light through. 10 A gray-tone, slit-pattern, or half-tone 11 mask means I've added a gray scale. It -- I can 12 let -- I can let all the light through. I can let 13 some of the light through. I can block all of the 14 light. That's the gray-tone. 15 A slit-pattern is relying more on the 16 fraction effects to produce the same end result 17 that the intensity of light projected on to the 18 film will not be the same everywhere, and I have 19 to say within tolerances. 20 Once -- and I'm going to assume the light 21 crosslinks because that's the easier thought for 22 me. The light makes the organic more resistant.

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89 1 There's a limit to how far it goes. It's not keep 2 shining the light on or increase the intensity, 3 and it gets more and more resistant. 4 There's an end stage to the process. So 5 it's doing that -- you know, above a certain 6 threshold intensity of light, dose of light, it's 7 not going to change. But it's precisely 8 controlling from that threshold. I've done the 9 maximum change down to I've done no change. 10 Those masks are different ways to do that. 11 You're varying the intensity in a very precise way 12 of the light projected during the photolithography 13 process. 14 Q All right. And the -- the gray-tone and 15 slit-pattern masks, were those known to a POSITA 16 for use with photolithography before the '801 17 patent? 18 MR. CUMMINGS: Objection, form. 19 A I'll say I don't recall offering an 20 opinion on that, but they were known. 21 Q And then the following sentence refers to: 22 No etching is performed when using specific	91 1 Q So sitting here today, looking at the '801 2 patent, you're not sure what it means when it says 3 that in certain -- when it says no etching is 4 performed in this scenario? 5 MR. CUMMINGS: Objection, form. 6 A I'm stating I haven't formed an opinion 7 because low-k dielectrics are -- have different 8 uses, and I would say it would depend on if the 9 organic material layer, the low-k dielectric 10 material, has an additional function. 11 Q So my question is, do you understand what 12 the '801 patent means when it says no etching is 13 performed in the scenario at column 3, lines 2 14 through 4? 15 MR. CUMMINGS: Objection, form. 16 A And I'm stating I haven't formed an 17 opinion on that. 18 Q Okay. 19 A Dr. Neikirk didn't raise it, so I didn't 20 consider it. 21 Q Let's go back to your declaration, and 22 specifically let's start at paragraph 28. Let me
90 1 photosensitive organic materials. 2 Do you see that? 3 A It states: Preferably no etching is 4 performed when using photosensitive low-k organic 5 materials in the organic material layer. 6 Q Do you know what that's referring to? 7 A What would be more formally called low-k 8 dielectrics, so -- 9 Q And. 10 A -- materials with a low dielectric 11 constant. 12 Q And so if no etching is performed -- I'm 13 just trying to get a sense of which steps of the 14 photolithography process are and are not 15 performed. 16 MR. CUMMINGS: Objection, form. 17 Q So what does it -- what does it mean when 18 it says no etching is performed? 19 MR. CUMMINGS: Objection, form. 20 A I don't recall Dr. Neikirk expressing an 21 opinion on that, and I don't think I've formed an 22 opinion at this point, either.	92 1 know when you're there. 2 A Okay. 3 Q Would you agree that the '801 patent 4 discusses issues and purported solutions to those 5 issues that relate to TFT-LCD devices? 6 A That's what's stated in this section of 7 the patent I quote. 8 Q And not -- not a big deal, but the -- the 9 last word on the first line of paragraph 28 that 10 should be LCD, correct, last acronym? 11 A Where's that? 12 Q First line of paragraph 28. 13 A Okay. Yes. 14 Q All right. 15 A I was reading other parts. I didn't -- 16 didn't get to that first one, one of those 17 typographical errors. 18 Q Perfect. So then moving down to paragraph 19 30, in the first sentence, you state that: The 20 '801 patent goes on to describe a new approach 21 that remediates these issues using a combination 22 of layers, forming a saw tooth opening pattern in

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93 1 an organic material layer, and using a 2 predetermined angle. 3 Do you see that? 4 A Yes. 5 Q Which one of those three listed portions 6 of the solution was new and did not exist prior to 7 the '801 patent? 8 MR. CUMMINGS: Objection, form. 9 A I don't think I offered an express opinion 10 on that. I did respond to Dr. Neikirk's various 11 theories of obviousness. 12 Q Okay. 13 A And -- 14 Q Go ahead. 15 A The -- the best I can say is he didn't 16 address all claim elements of the ones that he 17 opined on. That's where my response is. My 18 opinions are stated as a response to his. 19 Q Okay. So sticking with the first sentence 20 of paragraph 30, did the '801 patent -- does it 21 describe using a new combination of layers in the 22 TFT-LCD?	95 1 substrates used by Vaganov. So it was in a sense 2 predetermined -- similar to Ford with the Model T, 3 you can have any color you want as long as it's 4 black. According to Vaganov, you can have any 5 angle you want as long as it's these precise 6 angles. 7 Q So does the '801 patent describe a new way 8 of using predetermined angles in TFT-LCDs? 9 MR. CUMMINGS: Objection, form. 10 A The best I can say, the '801 patent 11 invention reduces reliability and integrity 12 problems encountered in conventional methods. 13 Peeling of substrate, uneven cell gaps, and 14 formation of voids in the sealant regions during 15 assembly are all reduced. 16 Q And so was -- the '801's patent's 17 description and use of a predetermined angle, is 18 that something new that did not exist prior to the 19 '801 patent? 20 MR. CUMMINGS: Objection, form. 21 A The best I can state, the '801 patent's 22 approach to reducing voids and improving the
94 1 MR. CUMMINGS: Objection, form. 2 A I don't think I offered an opinion on 3 that, nor have I formed an opinion at this point. 4 Q And the '801 patent's disclosure -- 5 disclosures regarding forming a saw tooth pattern 6 in an organic material layer, was that something 7 new that the '801 patent introduced? 8 MR. CUMMINGS: Objection, form. 9 A Again, I'm not sure I offered an opinion 10 or formed an opinion on that yet. 11 Q And does -- the '801 patent's use of a 12 predetermined angle, is that something that didn't 13 exist prior to -- the use of a predetermined angle 14 didn't exist prior to the '801 patent? 15 MR. CUMMINGS: Objection, form. 16 A I believe my opinions are fairly clear 17 that none of the prior art references relied upon 18 by Dr. Neikirk taught a predetermined angle that 19 was relevant. 20 Vaganov, I have to say, was the exception 21 because the predetermined angles were based on 22 fundamental properties of the single crystal	96 1 reliability and integrity of devices was a new 2 approach. 3 Q So in your opinion, before the '801 4 patent, a POSITA would not have known to approach 5 the problem of reducing voids and air bubbles by 6 using a predetermined angle? 7 MR. CUMMINGS: Objection, form. 8 A In my experience, prior to the '801 9 patent, what a person of ordinary skill in the art 10 would focus on is the actual process of dispensing 11 the adhesive material. I had mentioned degassing. 12 Do you change the environment, the curing 13 conditions? Do you find another glue, or do you 14 find a better way to use the same glue? 15 Degassing is as simple as it sounds. I 16 put a pot of adhesive in a chamber, pump out the 17 air, and wait for the bubbles to stop forming. 18 Then I apply it, now I've got a bubble-free 19 material because the supposition would have been 20 these bubbles are inherent to the adhesive 21 material, which is why they would look at changing 22 adhesive materials.

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97 1 Q And for clarification, the explanation you 2 just provided, is that specific to your own 3 experience, or is that your opinion on what a 4 POSITA at the time of the '801 patent would have 5 understood? 6 MR. CUMMINGS: Objection, form. 7 A I will say both. 8 Q Earlier you mentioned that via holes would 9 have steep or -- or near perpendicular sidewalls; 10 is that right? 11 A I believe I stated they're essentially 12 just a steep-sided hole. 13 Q And when you say steep-sided hole, is that 14 near vertical, vertical? Is there -- is there a 15 tolerance to that "steep" term? 16 MR. CUMMINGS: Objection, form. 17 A In paragraph 38 I state: A POSITA would 18 understand penetration holes and vias to be steep 19 penetrating features in a thin film device. 20 Q Okay. 21 A Vias are commonly used to provide 22 electrically conductive paths between	99 1 be as close to vertical as possible? 2 MR. CUMMINGS: Objection, form. 3 A What I state in paragraph 39: Primary use 4 of the via is to provide an electrical path. A 5 POSITA understood it's desirable for the sidewalls 6 of a via to be as close to vertical as possible in 7 order to minimize area requirements. 8 Q And so I'm -- I'm asking if you agree with 9 your statement in the middle of that sentence that 10 a POSITA understood it is desirable for the 11 sidewalls of a via to be as close to vertical as 12 possible. 13 MR. CUMMINGS: Objection, form. 14 A The statement is what it is. That's my 15 opinion. 16 Q Okay. Just confirming that that -- that 17 remains your opinion. 18 A Okay. That's why I was confused. It's -- 19 it's my opinion, yes. 20 Q Okay. And so a POSITA, when creating a 21 via, would understand and intend to have sidewalls 22 that are as near vertical as possible?
98 1 metallization layers in multiple -- multilayer 2 structures, and a critical parameter for a via is 3 the diameter at the bottom of the via. If the 4 diameter is too small, it can lead to current 5 crowding or overheating issues due to high 6 electrical resistance. 7 So, again, the point is, try to get close 8 to vertical is what I say in the following 9 paragraph. But, again, via sidewall angles, it's 10 not something that's measured, nor is it even easy 11 to measure. It's not what's tracked. The via is 12 wide enough. It -- there's either enough area at 13 the bottom for the electrical contact or there 14 isn't. 15 And the depth is usually controlled just 16 by using an etch stop layer. So the bottom of the 17 via is something that isn't etched. That's what a 18 etch stop is. So once it gets to that layer, 19 things just stop. 20 Q And so you would agree that a POSITA at 21 the time of the '801 patent would have understood 22 it to be desirable for the sidewalls of a via to	100 1 MR. CUMMINGS: Objection, form. 2 A They look at area at the bottom, and 3 that's it. Like I said, the process is -- the 4 sidewall angle is just -- it's not a 5 consideration. Dig a hole, stop at this depth is 6 an analogy. 7 Q So I'm just trying to understand. So is 8 it -- is it inherent in the process that as you're 9 digging the hole, the sidewalls will just be 10 vertical? 11 MR. CUMMINGS: Objection, form. 12 A It's not that they'll be vertical. 13 They'll be steep. Absent an anisotropic etch like 14 Vaganov, where you're relying on differences in 15 crystal planes, etch rates on different crystal 16 planes, you're going to have something other than 17 vertical. 18 And it's more -- again, when you design a 19 via, the angle of the sidewalls isn't the 20 consideration. And you're asking, okay, someone 21 to design a via, do you consider -- is the 22 sidewall important, they would literally say, why

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101 1 do I care about that angle? I can't even measure 2 it. 3 So that -- that's a part of the 4 complication. It -- it's -- 5 Q Well -- 6 A -- at best, incredibly difficult to 7 measure. Why am I going to care about it? If I 8 care about it, I want to be able to measure it and 9 verify it, so... 10 Q But we did -- we did agree that a POSITA 11 understands it's desirable to have sidewalls as 12 close to vertical as possible? 13 MR. CUMMINGS: Objection, form. 14 A That's what I state -- what I state in 15 paragraph 39 is the best I can say. 16 Q So -- so if I'm understanding your 17 opinion, a POSITA would understand it's desirable 18 to have vertical sidewalls, but wouldn't take any 19 intentional action to create near vertical 20 sidewalls? 21 MR. CUMMINGS: Objection, form. 22 A A POSITA understands it's desirable for	103 1 Q And in your opinion, the intent to make 2 the via as close to vertical as possible, that's 3 not the same as a predetermined angle of 90 4 degrees? 5 MR. CUMMINGS: Objection, form. 6 A Again, depending on the materials, I don't 7 know that an angle of 90 degrees is possible. 8 Again, you try to make it steep. That's it. 9 There's no predetermined. Is it deep enough? Is 10 there enough area at the bottom to make electrical 11 contact? That's it. 12 Q In -- in a perfect world a POSITA would 13 want a 90-degree angle on the sidewall of a via? 14 MR. CUMMINGS: Objection, form. 15 A Where I'm struggling is, in a perfect 16 world a POSITA would be able to measure the angle 17 of the sidewall of a via, but we don't live in 18 that world. 19 And, again, if I have no way to measure 20 it, talking about the term "predetermining" it is 21 literally a waste of time, because if you can't 22 measure it, how do you know if it's predetermined?
102 1 the sidewalls to be close to vertical, but other 2 than that, they don't care. There's no 3 predetermined angle. Again, just trying to 4 measure that angle would be, at best, incredibly 5 difficult. So you -- you -- you don't design a 6 predetermined feature if you can't verify it. 7 Q Would a POSITA avoid methods and processes 8 that create shallower angles? 9 MR. CUMMINGS: Objection, form. 10 A For a via? 11 Q For a via. 12 A The following -- the second sentence in 13 paragraph 39: Wide, shallow vias provide no 14 operational or design benefit and would, in fact, 15 impose design constraints due to increased area 16 requirements. 17 So, for example, if I wanted a via, 18 assuming I could make it at 45-degree angle 19 sidewalls, it's going to take up a lot more area, 20 and that's actually a detriment. So I'm just 21 going to try to make it as close to vertical as -- 22 as possible.	104 1 What's the argument? Did you hit the goal? Yes 2 or no. I don't know. I didn't measure it. I -- 3 I can't measure it, not in a regular process, no. 4 Let me shut down the line for a half a day or so, 5 and I'll tell you. It's just not going to be 6 done. It's, again, simply not a design 7 consideration. 8 Q So going back to my -- my -- my question, 9 if a POSITA could decide to create a 90-degree 10 angle on the sidewall of a via, that is the angle 11 that they would decide -- that they would choose? 12 MR. CUMMINGS: Objection, form. 13 A I'm struggling because your question is 14 equivalent to saying if you can do the impossible, 15 would you choose to do the impossible? Again, 16 it's a via. You try to make it steep, and that's 17 it. 18 Q And does -- the predetermined angle, does 19 it have tolerances that would allow an 88-degree 20 side angle to still be considered the 21 predetermined angle if they were shooting for 90? 22 MR. CUMMINGS: Objection, form.

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105 1 A There's the quality engineer perspective 2 to answer that question. There's also -- again, 3 you're talking about something that isn't measured 4 and for all practical intents can't be measured. 5 So setting a -- setting a tolerance for 6 something that you don't and can't measure, it's 7 arguing how many angels can dance on the head of a 8 pin. We -- we can talk about it all day, but it 9 doesn't change the reality of the situation. 10 Q But it -- it is important to the '801 11 patent language especially -- can you explain 12 whether the predetermined angle needs to be 13 measured after it's created to be a predetermined 14 angle? 15 MR. CUMMINGS: Objection, form. 16 A I will say at a high level, it needs to be 17 capable of being measured. 18 Q And your position is that the via holes, 19 particularly the ones that we see described here 20 in the declaration, those are not capable of being 21 measured, the sidewall angles? 22 A I know 14 process engineers, senior	107 1 Q So I -- I'm -- I'm not asking about the 2 practicality of manufacturing. I'm asking about 3 the -- the scope of the patent and how this works. 4 Let me go back to the via holes, and 5 I'll -- I'll take it step-by-step. 6 If a POSITA intended to have a 90-degree 7 angle in the sidewall of their via before creating 8 the via, would that be enough to have a 9 predetermined angle? 10 MR. CUMMINGS: Objection, form. 11 A Again, absent the anisotropic etches of 12 Vaganov, I don't think even determining that angle 13 is adequate. Even with the substrates of Vaganov 14 there's always a tolerance on the orientation, 15 crystal graphic orientation, of the substrate. 16 For example, a typical might be 100 plus or minus 17 a quarter degree, or it might be 110, 2 degrees 18 off towards the nearest 100 plane. So even then, 19 the angles aren't going to be precisely 90 20 degrees. 21 Q So I'll ask my question again. 22 If a POSITA intended to have a 90-degree
106 1 process engineers, at Intel have all told me the 2 same thing, that, no, we don't measure it. We 3 can't measure it. They stopped short of saying 4 it's a stupid question because I've known them for 5 a few years. 6 Q And you mentioned earlier that one of the 7 methods was taking cross-sections and looking at 8 the cross-section to determine the angle; is that 9 right? 10 A If you want to measure the sidewall angle 11 of a via, it's the only way I could consider doing 12 it. 13 Q Okay. So -- 14 A We don't have other ways to do it. 15 Q So it is possible to measured the sidewall 16 angle of a via like those described in the -- the 17 prior art in your declaration? 18 MR. CUMMINGS: Objection, form. 19 A I would say it's a hypothetical that a 20 researcher could do, but in manufacturing 21 processes, it's just not done. It's too 22 impractical.	108 1 angle when they created the via hole, would that 2 be enough to have a predetermined angle? 3 MR. CUMMINGS: Objection, form. 4 A I'm struggling with a POSITA deciding to 5 have a via hole at 90 degrees. If they want a 6 precise 90-degree angle, I don't think that can be 7 done. So that's the issue with answering the 8 second half of your question. Again, if I want to 9 do the impossible, is that enough to say I've 10 predetermined? 11 Q So -- so my question is a little 12 different. 13 We agreed that a POSITA would understand 14 it's desirable to have as close to vertical as 15 possible. My question is, if a POSITA goes into 16 the manufacturing process intending to create the 17 sidewall angle of the via as close to 90 degrees 18 as possible, would that be enough for a 19 predetermined angle? 20 MR. CUMMINGS: Objection, form. 21 A Again, it's -- a POSITA wouldn't come to 22 that conclusion, I want to be as close to 90

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109 1 degrees as possible. That's just not a design 2 consideration for the vias. 3 Q Well, but we agreed that it is desire -- 4 the POSITA would understand it's desirable to have 5 as near vertical as possible? 6 A They want a steep size, but, again, I 7 can't make it predetermined if I can't measure it. 8 I can say what I'm trying to do. We've gone 9 through what are the design considerations for a 10 via. What layers am I going through? What's my 11 etch stop? If I don't have a good etch stop, 12 what's the control on my process for going through 13 a depth so that I know that I stop at the right 14 place? How long does it take? 15 And, really, that's it. So it's coming 16 back to asking me to consider -- a POSITA to 17 consider a requirement for a via that they 18 wouldn't consider. 19 Q Okay. I'll -- I'll try to lay out a 20 couple different options to -- to explain where 21 I'm going. 22 We agreed that a POSITA would find it	111 1 would understand it is desirable for the sidewalls 2 of the via to be as close as to vertical as 3 possible in order to -- 4 Q But it's your opinion -- 5 A -- minimize -- 6 Q Sorry. 7 A -- area requirements. 8 Q But it's also your opinion that a POSITA, 9 when creating a via hole wouldn't care how close 10 to vertical the sidewall angle is because that's 11 not something that they measure or can measure? 12 MR. CUMMINGS: Objection, form. 13 A The discussion of sidewall angles in 14 conjunction with vias is the issue. There are 15 no -- you're supposed to make it steep, but that's 16 it. 17 Even Dr. Neikirk, during his deposition, 18 he offered the analogy of creation of a via to 19 pushing a thumbtack through several coatings on a 20 wall. The hole made by that thumbtack is 21 equivalent to the via. So you're just worried 22 about punching through layers.
110 1 desirable to have a near vertical sidewall angle. 2 And so if a POSITA intends to create a near 3 vertical sidewall angle, but it's never measured, 4 tested, is that enough for the predetermined angle 5 of the '801 patent, or does the angle need to be 6 measured for a POSITA to know whether the 7 predetermined angle was actually created? 8 MR. CUMMINGS: Objection, form. 9 A Again, it's -- a predetermined sidewall 10 angle for a via is the problem. Like I said, it's 11 just not what's considered for designing vias or 12 implementing them in a -- a process. So if I 13 can't specify a process to make it 90 degrees, if 14 I can't measure it, why -- then a discussion on is 15 it predetermined isn't appropriate. 16 Q So let's -- let's -- let's go back. 17 Is it desirable -- would a POSITA 18 understand it's desirable to have a near vertical 19 sidewall angle in a via? 20 A That's -- 21 MR. CUMMINGS: Objection. 22 A -- what I state in paragraph 39. A POSITA	112 1 Q So what I'm trying to figure out is, is a 2 near vertical sidewall desirable or not? Does a 3 POSITA care how close to vertical the sidewall is? 4 A Again, I believe I've stated my opinion 5 clearly in paragraph 39. They understand it's 6 desirable for them to be as close to vertical as 7 possible, and the reason is to minimize area 8 requirements. 9 Q So understanding that a POSITA -- with 10 that understanding that a POSITA would find it 11 desirable to have near vertical sidewalls, is it 12 also your opinion that a POSITA cannot intend to 13 create near vertical sidewalls? 14 MR. CUMMINGS: Objection, form. 15 A I'm struggling because the process is 16 going to give what it gives. If I look and I see 17 a via, I know what the intents of the via are. 18 What I'm understanding your question to 19 be, if the designer intended something completely 20 different that's not evident in any analysis, does 21 that count as predetermined? 22 Maybe the designer intended for the

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113 1 sidewalls of the via to be blue. Well, I can't 2 measure that. I don't know if they're blue or 3 not. I have no idea why they would care about the 4 color. That's an equivalent thing. It's -- 5 again, the sidewall angle is not the design 6 consideration for a via. 7 Q That's -- that's not true based on your 8 next sentence, right, where you say that shallow 9 vias impose design constraints? So that they 10 would -- a POSITA looking at and creating a via 11 would care about the angle of the via sidewall at 12 least to that extent? 13 MR. CUMMINGS: Objection, form. 14 A They want to minimize the area 15 requirements, and that discussion gets into the 16 fact that Dr. Neikirk points to multiple prior art 17 references that all say it's desirable to 18 maximize, to increase the contact area -- not the 19 two-dimensional projection area, to maximize the 20 contact area. 21 So the total surface area -- if I want to 22 maximize the total surface area, I'm going to make	115 1 use that for organic material. I can't control 2 it. It -- it's just too aggressive. 3 So a person of ordinary skill in the art 4 is going to choose from a limited set of process 5 etches or etch processes that are known. They're 6 not going to go develop a brand-new one. 7 Q And when choosing the process -- the 8 etching process used to create the via, would a 9 POSITA consider whether that etching process would 10 create a wider or shallower -- a wider opening and 11 thereby a shallower sidewall angle? 12 MR. CUMMINGS: Objection, form. 13 A Via etch processes that a person of 14 ordinary skill in the art would choose from are 15 going to be suitable for the material, which means 16 it would already produce a steep sidewall angle. 17 Again, a person of ordinary skill in the art is 18 not going to go out and look and develop a 19 brand-new etch. That seems to be the implication. 20 They're literally going to the recipe book 21 and say, oh, here's my material. Here's the etch 22 processes. These all work. This one's
114 1 the sidewalls as steep as possible, which is 2 completely different from a shallow angle for a 3 sidewall. So beyond some range, do I want the 4 sidewall angles to be 10 degrees different from 5 the horizontal plane? You wouldn't call it a via. 6 A via is supposed to be a steep-sided hole. 7 Q Can a POSITA choose different methods or 8 processes for creating a via? 9 MR. CUMMINGS: Objection, form. 10 A The process would be dependent on the 11 material being etched. 12 Q But if the material being etched is 13 constant, there's only -- sorry, I'm trying to 14 understand. Is there a single methodology that's 15 applied for each material, or is it possible to 16 use different methodologies with the same 17 material? 18 MR. CUMMINGS: Objection, form. 19 A My answer was more thinking if it's an 20 organic film, am I -- am I going to use a KOH, a 21 potassium hydroxide etch, that goes back to Drano. 22 That is literally what Drano is. I'm not going to	116 1 cheaper. We're already doing it in our facility. 2 So I choose this one. That's the type of process 3 for a person of ordinary skill in the art. 4 Q And just to run that back, a person of 5 skill in the art would look and choose the 6 appropriate methodology for their -- their needs 7 to create the via hole? 8 MR. CUMMINGS: Objection, form. 9 A They're going to look at processes that 10 have already been verified to produce suitable 11 vias in the material. 12 Q So they would use known processes to 13 create the vias? 14 A Again, a person of ordinary skill in the 15 art is not going to develop a new process. 16 Q So a POSITA would use a known process to 17 create the via holes? 18 A Yes. 19 Q And a POSITA would know how those 20 processes -- a POSITA would understand the 21 different constraints and benefits of those 22 processes?

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117 1 MR. CUMMINGS: Objection, form. 2 A Again, a POSITA is going to look at what's 3 most easily implemented. Are the chemicals, are 4 the materials already being used? They don't 5 want -- there's economic aspects, I guess I should 6 say. 7 Do I need a brand-new process? Do I -- 8 this one works, but we don't use it anywhere else. 9 So now I need additional area on the production 10 floor just for one -- this one process. What's 11 the cost? What's the yield? 12 There might be safety concerns depending 13 on where the facility is located. Some materials 14 are easier to use in some locations than others. 15 For quite a period of time, it was 16 notorious that environmental regulations in the US 17 made some processes extremely difficult to do. If 18 you went to other countries, safety concerns 19 might -- I'll just say they were significantly 20 relaxed. 21 Q Would a POSITA, when choosing an etching 22 process, consider the variance or tolerances	119 1 economics. If you've done process design and 2 modeling, there's a lot of things that -- if 3 you're -- if you're looking at economics, all of 4 that is automatically considered. 5 Q Would a POSITA consider -- well, let me 6 ask this a different way. 7 The known processes that you've mentioned 8 that a POSITA would choose from, is there any 9 variance in the -- the product that each process 10 would produce? 11 MR. CUMMINGS: Objection, form. 12 A I'm not sure what you mean by variance. 13 Q Are there processes that are more coarse 14 or crude and other processes that are more fine 15 and more -- more precise? 16 MR. CUMMINGS: Objection, form. 17 A I would say that the processes would all 18 be equivalent in performance. Otherwise, people 19 wouldn't be considering to use them. 20 Q So the only differences that go into the 21 calculation of which one to use would be the 22 economic factors that you mentioned?
118 1 inherent to each of the processes, to the 2 different processes? 3 MR. CUMMINGS: Objection, form. 4 A Again, a POSITA is going to look to a 5 known process that's already been verified to be 6 suitable for etching a via. You're -- it's like 7 an approved -- it's like an approved vendors list. 8 I have three people I can buy from, and I don't 9 care about their specifications or capabilities. 10 They've been approved. I have processes that I 11 know work. I'm going to choose a process that 12 works. 13 Q So you did -- you did agree that a POSITA 14 would consider economical -- economic factors when 15 picking one of the known processes, right? 16 A It would be one of the considerations. 17 Q And a POSITA would also consider 18 manufacturing and logistical constraints such as 19 adding new -- new elements to the line when 20 picking a process, right? 21 MR. CUMMINGS: Objection, form. 22 A I could say that all goes back to the	120 1 MR. CUMMINGS: Objection, form. 2 A At the end of the day, it comes down to 3 economics one way or another. Do I need 4 additional personnel, technicians, engineers? Are 5 there -- does the process bring in additional 6 safety concerns? Does it affect yield, which 7 yield is a huge factor for economics. But those 8 are the -- that's why I say at the end of the day, 9 it's economics, but it's everything that affects 10 the economics. 11 Does the process take longer? That means 12 it takes more time. That means my dynamic and 13 static line speeds are longer, which means I don't 14 produce as much product per day. 15 Are there extra safety concerns? There's 16 a cost. I have to pay attention to those safety 17 concerns. Does it require me to add a different 18 process area, new equipment that is only used for 19 that step? That is an economic concern. 20 So at -- at the high level, that's -- 21 that's the end of the day. Can I make good 22 product economically? And that's the decisions

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121 1 that are going to be made. I know these processes 2 work. Which one works best with the rest of the 3 product design? 4 Q So when -- understanding that a POSITA 5 would know that it's desirable to have a sidewall 6 angle as near vertical as possible, would that 7 also mean that the different processes that a 8 POSITA would choose from for making that via hole 9 would all fall within the acceptable tolerance? 10 MR. CUMMINGS: Objection, form. 11 A A POSITA would choose an acceptable 12 process is the best way to answer. If -- if it 13 doesn't perform acceptable results, why would a 14 POSITA consider it? And, again, sidewall angles 15 just -- it's not a design parameter, a 16 specification for a via. 17 Q They would need -- a POSITA would need to 18 know that the process they're using does not 19 create sidewall angles that are too shallow such 20 that they take up too much space, right? 21 MR. CUMMINGS: Objection, form. 22 A Again, a POSITA is going to choose a	123 1 design benefit and would, in fact, impose design 2 constraints due to increased area requirement. 3 It's not going to be a via anymore. Even, 4 again, Dr. Neikirk basically said push a tack into 5 the wall. A tack has a sharp metal part that 6 pushes in. It's -- he's not saying, well, let me 7 take a -- a bowling ball and push it into the 8 wall, so I have a really wide, shallow depression. 9 That's not a via. 10 Q Where in your declaration do you state 11 that a wide, shallow via is no longer a via? 12 MR. CUMMINGS: Objection, form. 13 A Again, it's inherent in paragraph 39: A 14 POSITA would understand it is desirable for the 15 sidewalls of a via to be as close to vertical as 16 possible. 17 So if a via is supposed to have sidewalls 18 that are as close to vertical as possible, a wide, 19 shallow depression isn't a via because those 20 shallow angles are not as close to vertical as 21 possible. 22 Q So what I'm trying to understand is why --
122 1 process that's adequate for forming vias. That's 2 the best I can state. You're asking things -- 3 well, what if it's too wide? Well, that wouldn't 4 be an acceptable process. This makes a good via. 5 That's what they're going to look at. 6 Q But we -- we did agree that shallow vias 7 impose design constraints for a POSITA, right? 8 That's in paragraph 39 in your declaration? 9 A Yes. More specifically, if it was 10 shallow, it wouldn't be a via. 11 Q And, I'm sorry, where -- where is that in 12 your declaration? 13 A We talked about that before. A via is 14 supposed to be a steep-sided hole. If it's a 15 shallow hole, it's not a via. You can look at any 16 number of SEM cross-sections for a via. They're a 17 very steep-sided hole. If it's wide and shallow, 18 it's not going to be called a via. 19 Q Okay. Again, where is that in your 20 declaration? Where do you state that? 21 A It's -- trying to help you understand. 22 Wide, shallow vias provide no operational or	124 1 I -- I see your opinion that a wide, shallow via 2 is undesirable. What I don't see in your 3 declaration, what I haven't seen you point out, is 4 where you explain or state that a wide, shallow 5 via is not a via, rather than just an undesirable 6 via. 7 MR. CUMMINGS: Objection, form. 8 A That's the understanding of a person of 9 ordinary skill in the art. Again, Dr. Neikirk 10 offered the analogy of the thumbtack through 11 paint. Okay. I'm taking a sharp metal object, 12 and I'm pushing it through and creating a very 13 steep-sided hole. He didn't say, I'm taking 14 anything and putting in a wide, shallow dent. So 15 it's consistent. 16 Q So to confirm, you can't point to anyplace 17 in your declaration where you state that a wide, 18 shallow via is no longer a via? 19 MR. CUMMINGS: Objection, form. 20 A Not that specific opinion, but, again, 21 it's inherent in everything. It's the 22 understanding of a person of ordinary skill in the

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125 1 art. If -- if I say this should have sidewall 2 angles that are as close to vertical as possible, 3 and you show me something that has very shallow 4 angles, I would say you're not showing me what I 5 asked for, a clarification that I think is rather 6 straightforward. 7 Q And so how does a -- how would a POSITA 8 determine whether the sidewall angles are too 9 shallow to be considered a via anymore? 10 MR. CUMMINGS: Objection, form. 11 A Again, a POSITA is not going to look at 12 the sidewall angles. They're going to choose a 13 process that's suitable for creating vias in the 14 materials they want the via in. 15 You -- you keep asking about sidewall 16 angles, but that's not a part of specifying a via. 17 Is it deep enough? Do I have enough area at the 18 bottom to make electrical contact? That's it. 19 The angle is not a part of it. So you keep asking 20 about, well, are they going to look at the 21 specification that they wouldn't even care about? 22 It's not a specification for a via.	127 1 So that's what a POSITA is looking at for 2 a via. If you were to make a wide, shallow via, 3 you would have these problems. And what I didn't 4 explicitly state is a POSITA wouldn't consider it 5 a via anymore. 6 Q And at what point -- what -- what angle, 7 what range of angles would a POSITA not consider 8 the opening to be a via anymore? 9 MR. CUMMINGS: Objection, form. 10 A The issue keeps coming back to you are 11 asking or implying the POSITA is going to measure 12 the angles of a via. Again, a POSITA is not 13 designing and developing a new process. They're 14 selecting a process that is suitable for creating 15 vias. 16 Q So I'm not -- I'm not talking about 17 measuring them. I'm -- I'm talking about what you 18 said regarding a POSITA understanding whether an 19 opening is too shallow and wide to be considered a 20 via any -- any longer. And my question is how -- 21 what is the criteria for a POSITA to understand 22 that? Where do they draw the line?
126 1 Q Perhaps I'm not understanding. Is -- is 2 it your position that a wide, shallow via is not a 3 via anymore because it's too shallow to reach the 4 depths that it needs to reach? 5 MR. CUMMINGS: Objection, form. 6 A I'll try to be more precise. An opening 7 with shallow angle sidewalls wouldn't be 8 considered a via. What I state specifically, and 9 I'll try to clear this up a little bit: Wide, 10 shallow vias provide no operational or design 11 benefit and, in fact, would impose design 12 constraints due to increased area requirements. 13 As such, the diameter of via is -- is determined 14 primarily by the ability of metals deposition 15 process to fill the via. 16 So I need a certain area. I need to be 17 able to get the metal in to fill the via. But 18 what I'm trying to say is -- the previous 19 sentence, I state: A POSITA would understand it 20 is desirable for the sidewalls of the via to be as 21 close to vertical as possible in order to minimize 22 the area requirements.	128 1 MR. CUMMINGS: Objection, form. 2 A And that's the question. The POSITA 3 doesn't make the decision. A POSITA looks at 4 these processes are good for making a via. That's 5 it. If it was wide and shallow sidewalls, it 6 wouldn't be a process for making a via. 7 So, again, you're asking -- where the 8 disconnect is, a POSITA is going to look at 9 processes that have been determined suitable for 10 forming a via. So what you're saying is, a POSITA 11 is going to ignore that, go into the lab, do 12 everything on their own, and then try to determine 13 the sidewall angles that, at best, are going to be 14 incredibly difficult to measure, if not impossible 15 to measure, and then determine if it's a suitable 16 via. That's not how a POSITA operates. 17 They know the processes. Processes have 18 been determined suitable for use to create a via, 19 and that is what they do. So your question is a 20 complete disconnect from how a POSITA would 21 proceed. 22 Q Well, let me just ask you about what you

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1 just said. You said the POSITAs know the 2 processes, and the processes have been determined 3 suitable for use to create a via. But we also 4 talked about how holes can be too wide and shallow 5 and no longer considered a via. 6 So what -- what is it? What information 7 does the POSITA know that allows them to make the 8 determination that the process is suitable to 9 create a via with a sidewall that is appropriately 10 vertical? 11 MR. CUMMINGS: Objection, form. 12 A Again, the process has already been 13 determined. What you are again implying is that 14 the POSITA is going to do development, and that 15 development ability is significantly outside the 16 definition of a POSITA I offered and Dr. Neikirk's 17 definition of a POSITA, which I adopted for the 18 purposes of this IPR. 19 So that's the problem. You're asking -- a 20 POSITA is going to do something they're not 21 trained or qualified to do and make a decision. 22 If they're doing that, they're not a POSITA.	131 1 approved. I'm using it. I'm not questioning the 2 judgment of other people. I'm using something 3 that has already been determined to be suitable 4 for use for vias. I am not, as a POSITA, 5 attempting to determine if something is suitable 6 for vias. 7 That's the disconnect. Your question is, 8 the POSITA is going to determine if something is 9 suitable. The reality is, the POSITA is going to 10 use something that has been determined to be 11 suitable. They are not going to make the 12 determination themselves. They would not -- 13 Q So -- 14 A -- be a POSITA. They would be above the 15 skill level and expertise of a POSITA. 16 Q And I think you -- you may have -- have 17 led us to the right question. You said that the 18 processes have already been determined to be 19 suitable. 20 So, again, if -- what is it that would 21 lead a POSITA to understand that the process has 22 already been determined suitable for the use?
130 1 Q I think we're -- we're talking past each 2 other. I'm specifically talking about what you 3 said where a POSITA would know certain things 4 about the process that would let a POSITA know or 5 make the determination that the process is 6 suitable for vias. 7 And my question is, what is that 8 information? How does -- how does a POSITA know 9 that the process is suitable, other than other 10 people have used it before? 11 A You -- 12 MR. CUMMINGS: Objection. 13 A -- pretty much just hit the nail on the 14 head. They're not make the decisions. Other 15 people have determined these are suitable 16 processes. Again, what your previous questions 17 have implied, I'm going to go through -- look 18 through every possible etch process and determine 19 what's suitable for a via. 20 That's not what a POSITA would do, and 21 that's not the process. Oh, they said this is 22 suitable for a via. Fine, I'm using it. It's	132 1 And -- and if -- if it's as simple as that's what 2 everybody has done for years, I -- I -- I would 3 like to hear that. I just want to know if there's 4 any, like, actual other information. 5 A They -- 6 MR. CUMMINGS: Objection, form. 7 A They are going to look at known, published 8 processes that are suitable. Again, they're not 9 going to do an exhaustive search. It is literally 10 going to be, I need a via in this material, and, 11 oh, here's what people have used before. 12 Q Great. So -- 13 A Everyone -- other people have said this is 14 suitable. I'm going to agree with them. 15 Q So I -- I think that's my confusion. If 16 the POSITA is not deciding whether the process is 17 suitable because it's already been determined 18 suitable, who is making that determination? 19 MR. CUMMINGS: Objection, form. 20 A I didn't offer an opinion on that. And I 21 want to reiterate at this point in paragraph 109, 22 I state: I understand that Dr. Neikirk has opined

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133 1 that a POSITA would have had a bachelor's degree 2 in electrical or mechanical engineering or a 3 comparable field of study plus approximately two 4 to three years of professional experience with the 5 electronic and optoelectronic device design or 6 other relevant industry experience. Additional 7 graduate education could substitute for 8 professional experience, and significant 9 experience in the field could substitute for 10 formal education. 11 If we start at the beginning, a bachelor's 12 degree with two or three years is not going to 13 qualify someone to do the research and make the 14 determinations. They are going to ask. They 15 going to look, what a suitable via etch process, 16 and that's what they are going to do. 17 The questions you are asking are above the 18 skill level and expertise of a POSITA, which 19 neither I nor Dr. Neikirk have opined on. 20 So if you want me to spend time and review 21 the patent and the prior art references to 22 determine what that would be, I can do that. It	135 1 have at a bar after hours. 2 Q So, again, just -- just to -- so I 3 understand this, a POSITA, when looking to create 4 a via hole, would look to known processes that 5 have already been determined suitable for creating 6 that via hole? 7 MR. CUMMINGS: Objection, form. 8 A A POSITA would look to known processes 9 suitable for creating the via. 10 Q Okay. And a POSITA would also -- a 11 POSITA, by selecting a process, would intend to 12 create a -- well, strike that. 13 A POSITA choosing a process would not care 14 about the sidewall angles that would result from 15 that process; is that right? 16 MR. CUMMINGS: Objection, form. 17 A The best statement is a POSITA would care 18 that the process is suitable for producing vias. 19 Q A POSITA would care that it has previously 20 been determined suitable, but not necessarily the 21 specific output of the process concerning the 22 sidewall angle?
134 1 would have been much easier if Dr. Neikirk had 2 provided an opinion that I could respond to, but 3 he didn't. 4 So, again, you are asking questions that 5 the simplest answer is, the determination would be 6 made by a person who is above ordinary skill in 7 the art. 8 Q Where would a person of ordinary skill in 9 the art look to -- let's see. Where would they 10 look or who are they going to ask to understand 11 what a suitable via etch process would be? 12 MR. CUMMINGS: Objection, form. 13 A In a typical corporate environment, there 14 would be a list of known processes to use. 15 Q Would those known processes include 16 tolerances or variances? 17 MR. CUMMINGS: Objection, form. 18 A I'll reiterate for a via there's no 19 practical way to measure the sidewall angle. So 20 talking about tolerances or specifications for 21 something that you can't measure is irrelevant. 22 It's the type of discussion that workers would	136 1 A Again, sidewall angle is not a 2 specification or consideration, and that's where 3 the difficulty in answering is coming from. You 4 keep asking, would a POSITA be concerned about a 5 specification that doesn't exist and, for all 6 practical purposes, can't be measured? 7 So if I'm going to put a specification 8 requirement on something that I don't measure and 9 can't measure, it's a -- at best, a pointless 10 specification. It's -- the -- the sidewall angle 11 is not a relevant consideration for a via process. 12 Q So I understand the last part. Just to be 13 clear, we -- we did agree that there is at least 14 one way to measure the sidewall angle of a via, 15 and that's by doing a cross-section, right? 16 A You could do an SEM cross-section. 17 Q So it is possible to measure the sidewall 18 angle of a via after it's been created? 19 A It's possible to do that, but a person of 20 ordinary skill in the art would definitely not 21 propose that, nor would they consider doing that 22 because, at a minimum, I measure one via.

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137 1 If you want to talk about specifications, 2 you have to have an adequate sample to know what 3 you're actually doing. If you want to do standard 4 deviation, you should have at least 30 5 measurements. 6 And there would also need to be a Gage R&R 7 study considered as well. Gage R&R stands for 8 reproducibility and repeatability, which looks at 9 the variance between different operators, 10 different personnel performing the process, and 11 the process being performed at different times on 12 the same equipment or between different pieces of 13 the same model of equipment. 14 Q All right. Let's go back to your 15 declaration. I think you just pointed us to 16 paragraph 110 regarding the level of skill in the 17 art. Let me know once you're there. 18 A I was at paragraph 109 with Dr. Neikirk's. 19 110 is my definition. 20 Q And under your definition, a POSITA, 21 around the time of the '801 patent, would have at 22 least a bachelor's degree in a field of either	139 1 Q Okay. And what -- what professional 2 experience do you have related to the design and 3 manufacture of the relevant aspect of flat -- flat 4 panel displays? 5 A I work with a large number of companies. 6 A part of my graduate experience, my graduate 7 work, was, I will say, focused primarily on 8 compound semiconductors, although there was 9 work -- I did actually develop -- my dissertation 10 was on using crystalline silicon to create a 11 visible light emitting LED. 12 But as a graduate student, I was a 13 participant in the Phosphor Technology Center of 14 Excellence, which was a consortium between 15 industry and academia and some national research 16 labs developing phosphor technology for different 17 varieties of flat panel displays, including field 18 emission displays, plasma displays, 19 electroluminescent displays. I feel like I'm 20 missing something somewhere, at least those. 21 Then working in industry, among other 22 things, I cited work with Kopin for full color
138 1 engineering or physics and at least two or three 2 years related to the design and manufacture of the 3 relevant aspect of flat panel displays; is that 4 right? 5 A Yes. I -- I will say the definitions are 6 similar, except that I feel Dr. Neikirk's 7 electronic and optoelectronic device design is too 8 broad. Literally, light bulb optoelectronic 9 devices. They're electronic and optoelectronic. 10 So if I spent three years making light bulbs, to 11 pretend that that person should know anything 12 about a flat panel display would be questionable. 13 Q Okay. 14 A So similar educational backgrounds, I'm 15 going to say equivalent. I just narrowed the 16 professional experience field. 17 Q Okay. So do you have a bachelor's degree 18 in engineering or physics as of the '801 patent? 19 A Bachelor's degree and a Ph.D. 20 Q And what -- what engineering field do you 21 have a -- a bachelor's degree in? 22 A Chemical engineering.	140 1 microdisplays, which were used for electric 2 viewfinders and Kodak digital cameras, which was 3 around the 2001 timeframe. So when Kodak first 4 went from, instead of a single lens reflex camera 5 looking at the image literally through the lens to 6 the eyepiece, it was all done electronically. The 7 eyepiece was not an optical pathway. It was just 8 a microdisplay. 9 I did a significant amount of work with 10 the Society for Information Display on various 11 aspects of different display technologies. I -- 12 the first three years that Society for Information 13 Display hosted a conference titled LEDs and 14 Displays, I was the keynote speaker. After that, 15 I politely told them find someone else. I don't 16 want it to be my conference. This is just 17 something for the industry. 18 Q And maybe I missed it, but can you -- can 19 you identify which of those experiences you're 20 pointing to as relevant experience -- or 21 experience with the manufacture of the relevant 22 aspects of flat panel displays?

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141 1 A The Phosphor Technology Center of 2 Excellence, the -- as I said, was a consortium 3 between industry, national labs, and research 4 universities. So in particular, there was a 5 significant -- significant amount of work with a 6 company called Planar. 7 I worked -- there was a -- a company that 8 was doing electroluminescent backlights. Planar 9 was some of that, but there was another one, 10 because I remember they got product into the -- I 11 think it was Casio. It was the G4, the Indiglo 12 watches for backlights. 13 Also worked with Phillips on the plasma 14 displays. Kopin, I think, speaks for itself. 15 Again, a number of other companies I've worked 16 for, but those are some of the specific examples 17 that's in my declaration. 18 Q Yeah. Speaking of that, can you point me 19 to the paragraphs in your declaration you're 20 referring to for these experiences? 21 A Paragraphs 20 and 23. 22 Q I see. In 23 you state that your graduate	143 1 sealing, in terms of forming the device. Where's 2 the dry circuitry? Is it active matrix? Is it 3 passive? 4 Q And so -- so your work at the Phosphor 5 Technology Center of Excellence, did that involve 6 the manufacturing processes of creating the layers 7 and adding the sealant to the displays? 8 A That was portions of it. That was work in 9 conjunction with Planar Systems. 10 Q So what was your -- what was your 11 involvement in the portions of your work at 12 Phosphor that involved the sealing and creation of 13 the layers in the -- in the displays? 14 A Reliability testing and I guess you could 15 say troubleshooting. Failure mode analysis would 16 be the more formal. So we produced a product. 17 Let's test it. Let's put it through its paces. 18 Here's some displays that are to be tested 19 under normal conditions. Here's high temperature, 20 high humidity. Here's low temperature. Here's 21 thermal cycling. Here's different environments. 22 Does anything happen? What fails? Why does it
142 1 work back in 1997 focused on development of 2 optoelectronics devices? 3 A Yes. 4 Q But your -- your proposed construction 5 argued that experience with optoelectronic devices 6 alone was -- was insufficient or too broad; is 7 that right? 8 A Yes. And I have to point out, thin film 9 electroluminescent displays, that's what TFELD 10 stands for. Those are display devices. And if 11 you notice the comments on the PTCOE, the Phosphor 12 Technology Center of Excellence, the work there, 13 again, it was development of display technology. 14 So the very first plasma TVs, that was a spinout 15 of the PTCOE. 16 Q And how does your work on novel -- the -- 17 the visible LEDs and sulfide based TFELD 18 structures, how does that relate to the subject 19 matter of the '801 patent? 20 MR. CUMMINGS: Objection, form. 21 A There are similar issues with any of the 22 flat panel display technologies in terms of	144 1 fail? 2 Inevitably under those operating 3 conditions, particularly with respect to 4 temperature cycling and high temperature, high 5 humidity operation, those performance envelopes 6 are related to the ability of moisture and oxygen, 7 sometimes other environmental contaminants, to 8 penetrate into the device and react with the 9 materials inside. 10 Q Okay. And so your -- your experience with 11 the display aspects with phosphor, that involved 12 products or devices that were already 13 manufactured; is that fair? 14 MR. CUMMINGS: Objection. 15 A This was at the development. It was 16 trying to get products ready for, let's say, large 17 scale manufacturing. It's the setup. Things 18 don't go simply from the lab into manufacturing. 19 There's always a lot of reliability effort that 20 needs to go into any consumer electronics device. 21 Q And does -- your experience at Phosphor, 22 did it include designing the different layers that

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1 go into creating the display? 2 A I'm trying to be more accurate. If you're 3 doing FMEA, failure mode and effects analysis, 4 there's two aspects to that. There's DFMEA, which 5 is the design failure mode and effects analysis. 6 Is there something inherent in the design that's 7 causing the failure modes? 8 And then you have PFMEA, process failure 9 mode effects and analysis, which is the design's 10 fine. Something is wrong with the process. It's 11 not acting the way it should. It's variance in 12 the process. Those two go hand-in-hand. 13 And when you're doing FMEA efforts, it 14 kind of sweeps over everything because you have to 15 determine this failure mode, is it from the 16 process? In which case we change the process. 17 Was it from the design? In which case we need to 18 go back even earlier and analyze, we need to 19 change layers. We need to change the -- the 20 literal design specifications as opposed to the 21 processes, how to implement the design. 22 Q All right. Let me take a step back. I	145 1 Q And so your work with LCD products at 2 Phosphor, what components in those products did 3 your work involve? 4 A Again, it's the backlight and integration. 5 If you're doing failure mode effects and analysis, 6 that's pretty much everything. I mean, that's the 7 charter for an FMEA team. 8 It's not, oh, only pay attention to this 9 part. You have to go back and challenge 10 everything. You have to dig. The -- sometimes 11 what seems to be the obvious failure isn't the 12 actual cause. You keep working. You keep digging 13 until you find the root cause. It's not enough to 14 cure the symptom or fix the symptom, treat the 15 symptom. You want to cure the disease. 16 Q So let's go back to paragraph 110. You 17 describe professional experience related to design 18 and manufacture of the relevant aspects of flat 19 panel displays. And my question is, what do you 20 remember by relevant aspect of flat panel 21 displays? 22 MR. CUMMINGS: Objection, form.
146 1 forgot to ask this question. Did -- your work at 2 Phosphor, did it involve working with LCD panel 3 displays? 4 A That was inevitable for some of the 5 backlight applications. It depends on the form of 6 the backlight. In some cases the backlights were 7 matrix displays. In other cases -- when I 8 mentioned the Indiglo watches, just because that's 9 the one that, at least in the '90s, everyone 10 remembered. You -- the goal was just to 11 perform -- or perform -- just to produce a uniform 12 lighted background. And then you had an LCD on 13 top. 14 Part of the work with the thin film 15 electroluminescent devices, there were two 16 aspects. One is developing the material so it 17 that it could be a direct red green blue emitter 18 capable. So similar to color TVs, I'm just 19 creating the light I want. Then there's also, can 20 I just create a white light and use an LCD filter, 21 if you will, on top? I've created all colors. 22 I'll let the LCD sort things out.	147 1 A In terms of the '801 patent -- I'll go to 2 something clearly outside. The color and plastic 3 material of the bezel, okay, it's related to a -- 4 a display. That, I will say, most likely has no 5 effect on the operation or reliability of the 6 device. 7 Q Okay. But what about the relevant aspects 8 of the flat panel displays? 9 A I was trying to get to that if you'd give 10 me -- needed another second there. 11 The relevant aspects would be the issues 12 that are being addressed. Have you dealt with the 13 environmental sealing, the failure modes, and 14 effects analysis of, okay, it cracked. 15 Environmental contaminants are getting in. It's 16 not sealed. 17 Q Anything else that would be a relevant 18 aspect of flat panel displays? 19 A I would say in the background of the '801 20 patent, column 1, starting at line 11: TFT-LCD 21 devices can suffer from degradation related to 22 ambient environmental conditions such as moisture,
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149 1 which may lead to performance loss, operational 2 instability, or color/emission accuracy, and 3 shortened operational life. Specifically, water 4 can cause crystallization and formation of organic 5 solids, electrochemical reactions at the 6 electrode-organic layer interface, corrosion of 7 metals, and migration of ionic species. 8 That's pretty much outlining what the 9 problems are, what -- what are the relevant issues 10 that the '801 patent is trying to address. 11 It then goes on to state: To minimize 12 such degradation, a TFT-LCD device must be 13 properly encapsulated to prevent moisture 14 migration. Typical encapsulation methods utilize 15 a color filter substrate covering organic polymer 16 areas with an adhesive sealant. It then goes on 17 to talk about some of the issues there. 18 But that's the critical aspects that the 19 patent is really addressing, is, there are these 20 problems with environmental contamination, if you 21 will, intrusion of environmental contaminants. It 22 points out moisture is a particular concern, and	151 1 find the root cause. It's not just to solve the 2 problem. It's to determine the root cause so that 3 appropriate corrective actions or modifications 4 can be made to prevent the occurrence. 5 Q And during your work doing reliability 6 testing and failure mode testing, were you -- were 7 you part of the design team that handled the 8 design aspects for environmental sealing? 9 A I was a part of the team that performed 10 the DFMEA. 11 Q So did you make the decision -- 12 A There's -- 13 Q -- on how to seal the devices? 14 MR. CUMMINGS: Objection, form. 15 A FMEA processes are almost never done by a 16 single individual. There's a team that does it. 17 There's a significant benefit from having multiple 18 people on the team, because the purpose is to 19 figure out all the possible design issues. And 20 you go through, and it's literally questioning 21 everything. Is this the appropriate material? 22 Q Is --
150 1 sealing and protecting the device. 2 Q Okay. And then going back to your 3 experience at Phosphor, what experiences do you 4 have designing the relevant aspects of flat panel 5 displays that you just described? 6 A When you do the design failure mode and 7 effects analysis, that's directly relevant to the 8 design. There was similar work with Kopin. The 9 challenge at Kopin was, honestly, the size of the 10 displays. Instead of something that was measured 11 in inches, possibly feet, Kopin's microdisplays 12 were best measured in millimeters. 13 So there's a challenge, if you will. If 14 you want to take a step back and say, the -- all 15 other things being equal, diffusion scales 16 inversely with distance. If I have a wider 17 barrier and something diffuses through it, it 18 takes longer than when it's a small, thin barrier. 19 So it's just different aspects. But if 20 you've done DFMEA, that is necessarily relevant to 21 the design. You go back to the design. And, 22 again, the purpose of DFMEA and even PFMEA is to	152 1 A Once -- 2 Q Sorry. Go ahead. 3 A Once -- once you have gone through the 4 design, then usually the same group -- again, once 5 you have the process or even before the process is 6 developed, you start looking at it and saying, 7 what can go wrong with the process? 8 It could be something as simple, oh, well, 9 we bake this in an oven. Well, the question is, 10 what's the temperature? What's the humidity? 11 What's the time duration? You bake it in an oven. 12 Does it matter if 120C or 130C? Does it matter if 13 it's 20 minutes or 30 minutes? 14 That's the process part. The design would 15 be, use this material and thermal cure. 16 Q And were you involved in making the 17 decisions, the design decisions you just referred 18 to, as they related to the sealing aspects of 19 those products? 20 MR. CUMMINGS: Objection, form. 21 A It was a critical part of -- I had the 22 most expertise with the emitter materials, in

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153 1 particular. And I was also told I have a strong 2 aptitude for failure mode analysis. Literally, 3 the -- the reason I got into chemical engineering 4 was because chemical engineering, all other things 5 aside, teaches general problem-solving skills. 6 That's the goal of the field, is to solve 7 problems. 8 You have to know enough about a broad 9 variety of topics, but how do you solve problems. 10 If you like solving problems and puzzles, chemical 11 engineering can actually be fun. If you don't, it 12 can be considered an extremely challenging 13 discipline. There's a high attrition rate, I will 14 say, in academic programs on the order of 75 15 percent. 16 Q Yeah. I -- I can understand that. 17 A And -- and that's not from -- that's not 18 from failing classes. Let me be particular on 19 that -- clear on that. It's not that students 20 fail. They don't find it enjoyable, I guess is 21 the best way to put it. They switch to another 22 discipline.	155 1 If you look where I list my academic 2 background, I received my bachelor's in 1989 and 3 my Ph.D. in 1997. The majority of that time was 4 my working as a graduate student and basically 5 completing two dissertations. That's also a part 6 of what led me being -- to being incorporated on 7 the FMEA teams for Planar. 8 Q And so your -- your graduate experience 9 that you just mentioned, was that -- did you -- 10 did you maintain the LED technology as the center 11 of your thesis? 12 MR. CUMMINGS: Objection, form. 13 A Interim project was doing sulfide based 14 T-F-E-L-E-D -- T-F-E-L-D devices. Those are thin 15 film electroluminescent displays. That's what led 16 to my being a part of the Phosphor Technology 17 Center of Excellence. They were working on LED 18 technology as well, but the primary purpose was 19 looking at the use of phosphors. 20 In electroluminescent displays the term 21 "phosphor" has a little bit different meaning from 22 other industries.
154 1 Q So -- and remind me, your work at 2 Phosphor, that was while you were a graduate 3 student? 4 A Yes. 5 Q Okay. And so under -- under your own 6 opinion regarding the -- the knowledge of a 7 POSITA, Phosphor -- your work at Phosphor alone is 8 not enough to -- to satisfy the two to three years 9 of professional experience that you listed? 10 MR. CUMMINGS: Objection, form. 11 A I would say it does. My graduate career 12 was unusual. The original topic of dissertation 13 was zinc selenide based blue LEDs. I started that 14 work in 1989. The issue was, before I had 15 significant results, a company in Japan called 16 Nachia commercialized a -- what was considered 17 then a high brightness blue LED based on gallium 18 nitride technology. 19 And the funding literally disappeared 20 overnight for that work. There weren't funds to 21 complete my work on Zinc selenide, so I started 22 over from scratch.	156 1 In general, a phosphor is considered to be 2 a material that absorbs light of one wavelength 3 and emits light of a different wavelength, 4 typically a longer wavelength, although the 5 opposite can happen. 6 In electroluminescent displays, the 7 phosphors are solid state materials that -- they 8 emit light when a voltage is applied to them. 9 They are not LEDs. They would be more accurately 10 described as either light-emitting resistors or 11 light-emitting capacitors. It would depend on the 12 construction and the material. 13 But they rely on impact ionization and 14 relaxation of electrons excited in an activator 15 atom in the host. When it decays back down from 16 the excited state, it emits light as opposed to 17 electron-hole recombination, which is what happens 18 in LEDs and OLEDs. 19 Q And -- 20 A My apologies if that was technical, but 21 it's... 22 Q Well, I have a few questions that will

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157 1 likely show my -- my ignorance. But LEDs and 2 OLEDs, that's a different technology than LCD flat 3 panel displays, right? 4 A I would say it depends. 5 Q And what does it depend on? 6 A The aspect of the technology. If you look 7 at flat panel displays, the first emissive LCD 8 displays used backlights. The most common 9 backlights initially were what was known as CCFL, 10 cold cathode fluorescent backlights. 11 CCFL is basically a fluorescent tube light 12 with the cross-sectional area of a swizzle stick. 13 So it's a thin -- very thin glass straw that is a 14 fluorescent light. So you have a bunch of these 15 in the back. It emits white light. The LCD is 16 the color filter that converts that into images. 17 There was work with displays based on LED 18 backlights, which took a significant amount of 19 time because the LEDs were not as energy efficient 20 as CCFL. They were much more expensive, but they 21 did have the benefit of being solid state, and 22 that if you can imagine a 2-millimeter glass straw	159 1 enough that you could easily read them in 2 sunlight. 3 There's a company in Minnesota called 4 Daktronics. They were the first company to do 5 large area LED-based displays. So in the mid to 6 late 1990s if you saw a LED display at a sports 7 arena, the safe bet would be that Daktronics 8 produced it. So it was using LEDs in a display 9 application. 10 Q And how does -- LED and OLED technology, 11 how does it relate to the environmental sealing 12 aspects of LCD flat panel displays? 13 A It still gets to an issue. If you test 14 the LCD display by itself outside of the device, 15 I'm just switching the LCD, putting it through its 16 paces, you are not going to get the same results 17 as, here's the backlight. Let me test it. Let me 18 run it now. 19 For LCD display this is a particular issue 20 because LCDs function based on polarization of 21 light. While they look very efficient, the 22 qualification statement for a high efficiency LCD
158 1 that's a foot long, it's a fairly fragile piece of 2 equipment. 3 An LED I can literally hit with a hammer, 4 and it will still work, and not gently with a 5 hammer. I've actually done that as demonstrations 6 for people to say it still works, might not be as 7 bright, but you still get light. 8 OLED, it's a similar thing. Originally 9 OLEDs were being looked at as a single-source 10 backlight, if you will, something that produced 11 white light, that could be used behind an LCD. 12 Later on they got better at things. And now OLED 13 displays have separate red green blue emission, or 14 at least some of them do. 15 But it's really the display aspect of the 16 technology. If you look at just LEDs, the field 17 includes more than use and displays. But if 18 you've dealt with displays, even some of the first 19 high intensity emissive displays, there were 20 displays for fighter cockpits, specifically for 21 the F-16 and F-18, that were based on LEDs, direct 22 emission of LEDs, and the intensity was high	160 1 display means that the optical efficiency, the 2 amount of light emitted versus the amount of light 3 originally created, is on the order of 10 percent. 4 I have seen LCD displays that only transmit a 5 maximum of 5 percent of the light. 6 So if you look at a 300-nit display -- 7 it's a typical specification for brightness for a 8 display. Now it tends to be a higher. It is 9 really a 3,000-nit display which would be pushing 10 sunlight conditions. Sunlight -- indirect 11 sunlight is about 10,000 lux, which is about 3,000 12 nit. 13 So if you look at sunlight reflecting off 14 concrete or off grass, that's about how bright, 15 how much light energy is being created behind an 16 LCD in an emissive display because that light is 17 absorbed, it's heat. So you are heating it. 18 There's also the issue, what's been a 19 longstanding pain for the industry, organic 20 molecules don't tend to like blue light. The 21 photon energy for blue light is very high. It's 22 high enough to catalyze reactions.

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161 1 So making an organic material, which LCDs 2 are by default organic materials, the actual 3 liquid crystal materials, are organic materials 4 making sure that they are at least resistant to 5 blue light is a big challenge. 6 So again, if I -- if I test it, the LCD 7 part by itself, as opposed to with the backlight, 8 I'm going to get different results. And those 9 backlights impose a lot of challenges, and that's 10 where there's the need for FMEA efforts, because 11 now you have to sort out, well, this was fine 12 without everything. Is it the blue light from the 13 LEDs? Is it the heat that the LEDs created 14 directly? Is it the heat from the optical losses 15 inherent in the system? 16 So you keep stepping through, and, again, 17 you -- you have to find the root cause -- you 18 don't want to cure the -- you don't want to treat 19 the symptom. You want to cure the disease. 20 Q So I'm -- I'm not sure I -- I may have 21 missed it, but how does -- LED and OLED 22 technology, how does it relate to the design and	163 1 scales on its wings are actually microoptical 2 devices, rather amazing technology in and of 3 itself. And Morpho was -- that was their 4 inspiration. They were using similar effects that 5 you could turn on and off. 6 Q Interesting. So was -- OLED and LED 7 technology, was it included in the design and 8 manufacture of the sealing, the environmental 9 sealing aspects of LCD flat panel displays? 10 A Again, it has to be considered because if 11 you test the LCD part without the light source, 12 you're doing part of the job. 13 VIDEOGRAPHER: Excuse me, counsel. We're 14 nearing the two-hour mark on this file as well. 15 Would we be able to go off record just to switch 16 files again? 17 MR. LONEY: That works. 18 VIDEOGRAPHER: Thank you. One moment. We 19 are going off record. The time is 3:00 p.m. 20 (Recess, 3:00 to 3:12 p.m.) 21 VIDEOGRAPHER: We are now back on record. 22 The time is 3:12 p.m.
162 1 manufacturing aspects relevant to the flat panel 2 displays described by the '801 patent? 3 A Sorry for the long answer. The short 4 answer, though, is LCDs by themselves don't make a 5 good display. You can't see them. They only -- 6 they're light valves. So you have, at best, a low 7 contrast display if you're trying to rely on 8 reflected light. 9 LCDs in displays almost universally have 10 some type of backlight. Those backlights are 11 commonly OLED or LED-based. So, again, if you are 12 making the full device, those are going to be 13 involved. 14 Q So LCD devices may include OLED or LED 15 components? 16 A The finished device. Again, virtually all 17 of our displays are emissive displays. The only 18 company that had any success with non-emissive 19 displays was called Morpho. There's a -- the name 20 was from a rather famous blue butterfly. 21 The blue is not a physical color. It's a 22 structural color. So the butterfly's -- the	164 1 Q Welcome back, Dr. Bretschneider. 2 A Thank you. 3 Q If I'm understanding your -- your 4 testimony correctly, the LED and OLED technology 5 that you worked with during your graduate studies 6 relate to the environmental sealing aspects of LCD 7 flat panel displays at least because they are 8 involved with the ability to test and identify the 9 reliability of the sealant? 10 A It's more if you're going to test and 11 verify the reliability of the sealant or a sealant 12 system method, you have to do the testing on the 13 complete product. 14 I will share there was one particular -- 15 it was a strange issue, I'll say. There was a 16 failure. It happened after product had been 17 released. We identified a contaminant that was 18 nowhere in the materials. We literally couldn't 19 figure out where it was coming from. 20 It was a -- coming from a glue and 21 adhesive that was used in the cabinet that the 22 display was in, that it turned out some of the

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165 1 materials had out-gassed at a very high diffusion 2 coefficient through the barrier material we had 3 put in. 4 It was more peculiar in that the exact 5 failure mode only occurred if you turned the 6 device on and off, and the reliability testing was 7 based on turning it on and leaving it on. 8 We didn't have the conditions that -- this 9 was only -- if you leave it on, it's kind of like 10 an incandescent light bulb. If you turn it on and 11 never turn it off, it will literally last forever. 12 There's a light bulb, I think it's in California, 13 that's literally been burning over 100 years. If 14 you use it like most normal people, turning it on 15 and off, you -- it will last about 1,000 hours. 16 So this was an example. It was just a 17 very peculiar one because, again, we couldn't -- 18 once we knew what was causing it, we couldn't 19 figure out where it came from at first and even 20 not being able to replicate the failures in the 21 field because we were only doing static, turn it 22 on and leave it on.	167 1 dissertation the following year and received my 2 degree in '97. 3 So I was working at Emcore Corporation. 4 The work with Uniroyal Optoelectronics was an 5 outcome of that. It was a joint venture between 6 Emcore and Uniroyal Technology Corporation. So 7 living in New Jersey versus having lived in the 8 southeast most of my life, a chance to go back 9 home, if you will, and design and build a 10 semiconductor facility seemed too good an 11 opportunity to pass up. 12 So I just wanted to clarify I wasn't only 13 a graduate student. There was the work with 14 Phosphor Technology Center of Excellence. There 15 was also this work at Emcore prior to Uniroyal 16 Optoelectronics, but then the work at Uniroyal 17 Optoelectronics brought me right back to displays. 18 Q So with that distinction, and looking at 19 paragraph 110 of your declaration, it's still your 20 opinion that the additional graduate education 21 after your bachelor's degree could reduce, but not 22 eliminate, the time requirement you listed for
166 1 Q All right. And I -- I want to go back to 2 paragraph 10 where you have your -- your 3 explanation of the level of a POSITA. Do you 4 recall earlier, when I asked you whether your 5 graduate studies -- or your years of graduate 6 study and work at Phosphor, would that -- whether 7 that would meet the professional experience 8 criteria, in your -- in your opinion? 9 A I will -- I will say it could, but there 10 was also work I did with displays after I received 11 my degree. One particular note, there's -- when I 12 was looking at my background, Uniroyal 13 Optoelectronics was not my first employment. I 14 actually started work with a company called Emcore 15 prior to receiving my degree. 16 There was an issue with characterization 17 equipment, and I could sit around waiting for the 18 equipment to be fixed, drawing the stipend of a 19 graduate student, or I could get a job. I decided 20 to get a job. So October '96, you could say I 21 left the University of Florida, although I was 22 still enrolled as a student. I defended my	168 1 professional experience? 2 A The graduate education alone could reduce, 3 but it wouldn't eliminate it. It's the difference 4 between knowing the theory of something and then 5 how was it actually done. And one of the issues, 6 for example, to -- as a graduate student, as a 7 Ph.D. candidate, if your project is making an LED, 8 a brand-new LED structure, you only need to make 9 one. That doesn't mean you know everything about 10 it. If you used an off-the-shelf package and 11 dropped a chip into it, then you know nothing 12 about package design. 13 If you had to design a package for it 14 because of peculiar nature of the chip, that would 15 give you some experience. But, again, just 16 because you did something once doesn't mean you 17 really understand it. 18 There's an issue for quality engineers 19 kind of a joke, a meme, that you don't ask a Ph.D. 20 if something is possible because if they did it 21 once, they will say yes. You also, more 22 importantly, don't ask them if it's reproducible

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169 1 because if they say yes, that means they did it 2 twice. 3 In both cases it doesn't matter how many 4 attempts. If it took me 100 times to get it once, 5 yes, it's possible. If it took me 1,000 times to 6 do it twice, it's repeatable. So there is the 7 accidental success versus, no, this was 8 intentional. I know what I'm doing. 9 Q Got it. So I'd like -- I'd like to focus 10 on the professional experience that you have in 11 your background that you believe meets the 12 criteria you listed. And I think you identify 13 paragraphs 20 and 23 as identifying professional 14 experience relative -- relevant to the manufacture 15 and design of LCD flat panel displays; is that 16 right? 17 A Yes. 18 Q All right. Is there anywhere else in your 19 background where you -- you identify experience 20 that's relevant to the manufacture and design of 21 LED -- LCD flat panel displays? 22 A Paragraph 18, where I talk about my	171 1 referred to as a glass cockpit, instead of analog 2 instruments, all digital instruments with a 3 programmable display. 4 Q Very cool. I wish that was the subject of 5 our talk today. 6 Let's -- before we get into the Toyoda, 7 let's -- let's look at the Uniroyal 8 Optoelectronics paragraph you have at paragraph 20 9 in your declaration. Let me know when you're 10 there. 11 A Okay. 12 Q So during your time -- this time that you 13 identify at Uniroyal Optoelectronics, what 14 experience did you have with the design and 15 manufacture of the environmental sealing aspects 16 of LCD flat panel displays? 17 A The example -- the work with Kopin was a 18 specific design. Microvision was another company. 19 Also you see my horrible list of titles there. 20 Director of university relations and government 21 contracts was more than just research with 22 universities and contracts. It was also private
170 1 experience at Toyoda Gosei North America, I was 2 always amused -- I was hired as a sales manager 3 because that was the opening they had. In 4 reality, my job, my task was technical support for 5 the western hemisphere, which, for a Japanese 6 company, literally means everything outside of 7 Japan. 8 So that was -- meant I was designing LED 9 package, LED products. I also specifically note 10 working the applications for LED-based backlights 11 for LCD displays, some of the customers there, 3M, 12 Global Lighting Technologies, who produces 13 backlights for very large format TVs, Apple, Dell, 14 Hewlett-Packard, Microvision, Samsung, Phillips. 15 Garmin, that was another one. That was a neat 16 one. 17 There's a lot more companies that I didn't 18 list that I did. Those are just ones that most 19 people would be familiar with. There was a 20 discussion yesterday about Odyssey, a Company that 21 manufactured aviation instrument modules. So the 22 effort there was for what was called a -- or	172 1 research contracts with organizations. And that, 2 I will say, included a number of different 3 companies. 4 The Kodak digital cameras, for people who 5 remember when they came out, that's probably the 6 most memorable just because the LED technology was 7 just somewhat new. At least in that form factor 8 it was very new. They were displays about the 9 size of your fingernail on your little finger. 10 That -- that's a very challenging -- as opposed to 11 a 12 or 4-inch diagonal display, that's a huge 12 challenge. 13 Q So can you give some -- some examples of 14 the type of work you did that would relate to the 15 manufacture and design of the environmental 16 sealing aspects of the LCD flat panel displays? 17 A Again, once everything is incorporated, 18 you have to interact. It's not a handoff. It's 19 not a simple as, here's the backlight, here's the 20 display, put them together. There's a lot of talk 21 back and forth. To a large extent, depending on 22 the backlight technology, it can be a completely

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173 1 different level of technology and semiconductor 2 work. It can be as simple -- and I'm -- I am 3 really dumbing this down, as, here's some LEDs and 4 a sheet of plastic. 5 There's a lot more details behind that, 6 but it's -- it could be using LED packages, 7 existing packages, and then putting everything 8 together or designing the entire backlight. It 9 depends on the format of the backlight. 10 Does it use a waveguide structure, 11 basically a flat piece of plastic? Is it a matrix 12 array of LEDs? There's two different 13 requirements. There's reason to go for either 14 one. But that makes it a lot more challenging, 15 brings in more issues. 16 And then it has to be integrated with the 17 design, and you look at the tradeoffs. Is 18 there -- are there common components that can be 19 used that serve a purpose for the LCD portion as 20 well as for the backlight portion? 21 The back of my business cards, when I had 22 them, had a saying that engineering is a science,	175 1 Q For the sealant region? 2 A Again, I was trying to be more precise. 3 If you work on reliability aspects, the sealant 4 region would clearly fall under reliability 5 aspects. 6 Q So your -- your interaction with the 7 design and manufacture of the sealant region 8 relates to your involvement with the reliability 9 responsibilities that you had? 10 A I'm trying to be careful because I'm not 11 going to say I was the only one doing it. I don't 12 want to -- there were other people who worked very 13 hard on the team, so I want to make sure that I am 14 acknowledging that I had colleagues who I worked 15 with. This was not a sole source, Eric, take care 16 of it, and let us know when you're done. 17 And that was -- the charter of the group 18 was reliability aspects, so it's not just the 19 environmental sealing. There are other aspects 20 that goes back to that failure mode and effects 21 analysis. 22 Q In your work, were you responsible for
174 1 but good engineering is an art. Then I tell 2 people that I'm an aspiring artist. 3 But it's -- in my mind, good engineering 4 is where you can have a design that a component 5 does more than one thing, so it's not just about a 6 backlight. It's not just an LCD. It's an LCD 7 that has features that help the backlight work 8 better or might even be a part of the backlight. 9 Q So during your -- your time in the 10 employment you list in paragraph 20, did you have 11 any involvement in selecting or designing the 12 layers that went into the sealant region of LCD 13 displays? 14 A I can state that I worked on reliability 15 aspects. 16 Q Okay. But -- 17 A And that would be a part of reliability. 18 Q So were you responsible for selecting or 19 designing the layers that went into the sealant 20 region of LCD -- LCD displays? 21 MR. CUMMINGS: Objection, form. 22 A I was a part of the design team.	176 1 selecting or designing the layers that went into 2 the sealant region of the LCD displays? 3 A Again, I'm trying to be specific. The 4 entirety of sealing was a part of the charter of 5 the group. 6 Q What do you mean by that, that the 7 entirety of sealing was part of the charter of the 8 group? 9 A The issue, our charter was to study the 10 reliability and improve or have recommendations 11 for improvement for reliability. So, again, it's 12 a failure mode and effects analysis for 13 reliability. Sealing is a significant aspect. 14 One of the prior art references, and I 15 forget which one right now, also talks about 16 adding an additional material inside the sealed 17 area to absorb or collect contaminants. I believe 18 it was moisture and oxygen, what would be known as 19 a getter material. So you can put something in 20 the sealed environment that will capture -- 21 collect and capture moisture or oxygen that was 22 residual from the assembly process or, in some

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177 1 cases, that, well, some of it managed to get 2 through the barrier, but we've got something that 3 will pick it up, kind of like a garbage collector. 4 It's in one point, one location, but because the 5 diffusion, hopefully it gets to the getter before 6 it causes problems elsewhere. 7 Q And in the work you list in paragraph 20, 8 were you responsible for decision-making regarding 9 the manufacture or manufacturing process of the 10 environmental sealing -- environmental sealing 11 aspects of LCD flat -- flat panel displays? 12 MR. CUMMINGS: Objection, form. 13 A It's an awkward question because the 14 results of the failure mode and effects analysis, 15 you have -- you generate a list of recommended 16 process changes, modifications. You detail, 17 here's the failure modes and effects that were 18 identified. Here's remediation efforts. 19 The final decision would usually be an 20 engineering manager. It would be someone, I'll 21 say, at a higher level. They make the decision 22 what to implement. They may come back and say, go	179 1 the right place, and all the waste goes away. 2 That's kind of the high level, but you're -- it's 3 a way to form chemical -- or to have chemical 4 reactions occur at a surface, so it's very, very 5 common for depositing films. 6 Q And your work with MOCVD hardware 7 modification, did that involve the manufacture or 8 design of the sealant area in LCD flat panel 9 displays? 10 A MOCVD hardware modification relates to the 11 equipment used for the chemical vapor deposition. 12 In most cases, it's what's known as the reaction 13 chamber or the reactor chamber. That's where all 14 the magic happens. 15 At a high level, it's an oven that you 16 pump gases into and pull things out of, but if you 17 do everything right, just like baking a cake, you 18 get something pretty nice and sweet at the end. 19 So that's the best I can say there, is in 20 some cases, modifications to the hardware I was 21 able to identify. The challenge is most 22 individuals, because of the complexity of the
178 1 talk to the engineers and do A, B, and E on your 2 list. Don't worry about C and D. 3 That's not a decision that was in the 4 group's authority. We made the recommendations, 5 and someone above us had the authority to 6 implement our recommendations. 7 Q So in paragraph 20, middle of the 8 paragraph, what do you mean when you say MOCVD 9 hardware modification? 10 A MOCVD stands for metal-organic chemical 11 vapor deposition. It's a type of deposition 12 process. It's very commonly used for compound 13 semiconductor materials. It's also used for 14 different types of materials. 15 It's a subset of chemical vapor 16 deposition. So the idea is that you have 17 chemicals in the gas phase or vapor phase. They 18 diffuse down onto a surface, move around on the 19 surface, react on the surface, form a new 20 compound. Reactants leave. 21 So it's -- it's kind of come down to the 22 surface, look around, hopefully react and stick in	180 1 systems, will try to find the proper combination 2 of variables. If I make -- if I turn this knob 3 this way, I get this result. 4 It's actually a very complicated process. 5 You could have 14 to 20 free variables, so if 6 you're trying to optimize, find a target in even 7 10-dimensional space, and it's a small target, 8 it's very difficult. 9 If you change the hardware, you can make 10 the target larger. I guess that would be the 11 difference that -- for most people, they tried to 12 hit a small target. I wanted to go back and 13 change the hardware so that it was a bigger 14 target. 15 Q I -- I guess I've been making a -- an 16 assumption, so let me -- let me clarify. 17 Your work that you list in paragraph 20, 18 did that involve work with LCD flat panel 19 displays? 20 A Again, the specific example is Kopin. 21 Q Is there any other example of work with 22 flat panel -- or LCD flat panel displays in

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1 paragraph 20. 2 A That's the explicit. Again, even though 3 it's been a number of years, there were 4 confidential -- confidentiality issues with some 5 of the research contracts. 6 Q And for the Kopin displays, did that 7 involve -- did your work also involve the design 8 or manufacture of the sealant region? 9 A Again, I will reiterate. Formally, I was 10 part of the failure mode and effects analysis 11 team, and we were focused on reliability, and 12 anything dealing with the sealant region falls 13 squarely under reliability. 14 Q Do you draw a distinction between, say, a 15 design team and a quality assurance team? 16 MR. CUMMINGS: Objection, form. 17 A In a manufacturing organization, there are 18 design groups. There is also a quality 19 department. People may be assigned exclusively to 20 one department or the other. It's not uncommon 21 for people to have a portion of their time devoted 22 to quality assurance.	181 1 MR. CUMMINGS: Objection, form. 2 A Again, design failure mode and effects 3 analysis. 4 Q And is that one group, or is that two or 5 three separate groups? 6 A At a high level, it was failure mode and 7 effects analysis. That is the easiest one because 8 there's a difference in timing between the design 9 failure mode and effects analysis and the process 10 failure mode and effects analysis. 11 But it's not uncommon for individuals to 12 work with both of those groups. Either you're 13 good at troubleshooting and solving prosecutors, 14 or you aren't, is kind of the short summary. 15 Q And you also mentioned being part of a 16 design group, is that right, or is that part of 17 what you -- the other groups? 18 A For backlight I had, I'll say, primary 19 design. It was, here's the design going forward. 20 But then I had to go into the -- the FMEA and 21 justify everything. It's a -- it -- it's why some 22 people don't like it. It's basically a bunch of
182 1 It depends on the capabilities and 2 training of the individuals. Someone may be a 3 good -- very good process engineer or good with 4 statistics, good with -- good understanding of 5 quality systems. So they might be a member of an 6 internal quality audit team. 7 Part of a quality system is you get what 8 are called CARs, corrective action request. When 9 something goes wrong, a CAR is issued. They 10 figure out what went wrong and fix it. That's not 11 always assigned to the person in charge of the 12 process. Again, it depends on the capability. 13 So the CAR is issued. It goes to a 14 manager. A manager assigns someone to take 15 responsibility and ensure that it is closed, which 16 means that the corrective actions have been 17 identified and implemented. It can be a process 18 that takes an hour or two, or it can take two 19 months. 20 Q And regarding your work listed in 21 paragraph 20, what group or groups were you a part 22 of?	183 1 people with similar qualifications questioning 2 everything you did, every decision you made. 3 That type of questioning is difficult for 4 some people to stomach. I will say I've noted a 5 lot of people get offended, and they don't 6 understand. It's not that I'm saying you're an 7 idiot. I'm just making sure we've documented 8 everything properly. Tell me your justifications, 9 your reason, and we move on. If you fight me, no, 10 it's just going to take longer. 11 Just observations, that's the way it goes. 12 It's why not everyone does quality control. 13 Q So you had primary design responsibility 14 for the black -- backlight portion of the products 15 even though it had to go to FMEA afterwards? 16 A Typically there's FMEA after a design is 17 completed no matter what. 18 Q Did you have any responsibility for the 19 design of the sealant area in the LCD panels? 20 MR. CUMMINGS: Objection, form. 21 A Again, that's a part of the failure mode 22 and effects analysis. You go in and you start 184

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185 1 asking the questions. In some cases, you can make 2 comments. It depends on the response. 3 If someone can justify the design or 4 process decisions, if they've considered 5 everything, then there's no need to go any 6 further. If there are gaps, if there's no good 7 reasoning, then there's a lot more work to do. 8 I will say, as an analogy, one thing I've 9 done throughout my career, if -- ask someone why 10 they do something, the worst answer is, we've 11 always done it that way. If they say, we've 12 always done it that way because, and then they 13 tell me why, that's a good answer. Then they know 14 why they do it, not just someone else said it was 15 fine. 16 Well, no, we've done it -- always done it 17 this way. This is an accepted process that -- 18 it's standard, so we use it. Those are acceptable 19 answers. But if someone says oh, I just chose 20 this material. Why? I don't know, that's not a 21 good answer. That's not a good designer. 22 Q And during your employment listed in	187 1 effects analysis group has that decision. 2 That's -- I'm not going to say there are 3 companies that don't do that. I am going to say 4 it's very dangerous, and it's contrary to standard 5 quality systems. 6 Q So my understanding, based on what -- what 7 you've told us, is that the FMEA group will 8 receive a product or suggestions that the FMEA 9 group will then test and ask questions about; is 10 that right? 11 MR. CUMMINGS: Objection, form. 12 A The FMEA group will review and question 13 aspects of a design. They will also review and 14 question aspects of a process. 15 Q Okay. So FMEA doesn't create the process 16 or design that they're reviewing? 17 A It's possible an individual responsible 18 for a design or process could participate with 19 FMEA efforts. At some point, they -- someone has 20 to be present because the questions are going to 21 be asked, why was this done? 22 Okay. You say this. Okay. If it's, for
186 1 paragraph 20, did you have any design 2 responsibilities for the layers that made up the 3 LCD flat -- flat panel displays? 4 MR. CUMMINGS: Objection, form. 5 A Again, that was related to my work for 6 failure mode and effects analysis. If we 7 identified a failure mode that related to the 8 design of those layers and the processes for those 9 layers, then, yes. 10 Q And would you implement the design changes 11 that you suggested? 12 MR. CUMMINGS: Objection form. 13 A Again, as I answered previously, there's a 14 recommendation list for modifications. The 15 approval necessarily can't be by the team that 16 created the recommendations and suggestions. 17 That's a conflict of interest. 18 So it went to a higher level of production 19 or just management in general, and the decision 20 was made, again, do these. We'll leave these for 21 now, but what's going to be implemented -- it's 22 conflict of interest if the failure mode and	188 1 example, a material, okay, you say this thickness 2 of material. What if the material is too thick? 3 What if it's too thin? What if it's not cured 4 properly? What if something happens -- that -- 5 that's the design part. Is it too thick, is it 6 too thin, would be an example. That's the design. 7 The process is, if it was a thermal cure, 8 did you cure it at too high of temperature, too 9 low a temperature, too long a time, too short a 10 time? What if you didn't do a cleaning step 11 before? Are there contaminants that could be 12 residual from before that affect the process of 13 that layer, that material curing, for example? 14 So that's -- when you do FMEA, you go 15 through -- the common tool is called a fishbone 16 diagram that basically you work along every step 17 in the process. Every step is another branch off 18 of the spine, if you will. So it -- it looks like 19 a fish skeleton somewhat. And it depends on -- on 20 the process and everything, or design, but that's 21 how it's done. 22 So it's literally going through

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189 1 everything, and like I said, it can be considered 2 tedious, but it's a necessary part, and it's 3 expected for quality control systems. 4 Q Okay. So the input to the FMEA is 5 processes or designs for the FMEA to evaluate. 6 The output from the FMEA is suggestions or 7 resolutions to issues identified in those 8 processes or designs? 9 A I would say recommendations and concerns. 10 It could be corrective actions. If it's a 11 safety-related thing, that's probably the one – 12 one exception to requiring management. Safety is 13 safety. Anything in industry, if something is in 14 an unsafe condition, that's something anyone in 15 the organization should have the authority to stop 16 and make sure is addressed. 17 Q Okay. Let's move up to paragraph 18, 18 which you identified earlier. In the employment 19 you've listed in paragraph 18, can you tell me if 20 it includes any experience with the design or 21 manufacture of the sealant areas in flat panel 22 LCDs?	191 1 LCDs? 2 A Yes. 3 Q And how so? 4 A Again, just working through the 5 reliability efforts, the overall global design. I 6 believe I mentioned yesterday, for Apple, the most 7 notable product that people remember, the first 8 generation iPad. It was a peculiar situation 9 because I knew it was a 9.9-inch diagonal display. 10 I did not know what the end product was. 11 18 months before it was announced, I will 12 say they were testing and evaluating, and we were 13 shipping product, but it wasn't until it was 14 announced that literally we knew, oh, it was the 15 iPad. Apple is a very secretive company. Dell, 16 Hewlett-Packard, Sony, they're, I will say, more 17 open. 18 Q And did you have any decision-making 19 responsibilities regarding the design of the 20 sealant region in flat panel LCDs during your time 21 at Toyoda? 22 A I will say again, the final decision was a
190 1 A What's explicitly listed, the work with 2 Apple, Dell, Hewlett-Packard, Sony was involved, 3 the packet instrumentation cockpit, and I believe 4 the company was called Odyssey, those definitely. 5 Q Were those related to the sealant area, 6 your work on those -- with those clients? 7 A Again, it was similar. I'll say I started 8 with the list of recommendations. Based on my 9 prior experience I said, you know, literally 10 here's what works. I'm expecting to see something 11 like this. In some cases, it was, that's already 12 the design we're using. In some cases it's, no, 13 we're doing something different, so, again, it 14 turned into an FMEA process. 15 But once they realized that despite my 16 business card saying sales manager, that I 17 actually knew the technology, I'll just say I was 18 treated differently in some cases. I was 19 introduced, no, this is your technical support. 20 If you need any help, call Eric. 21 Q And did your responsibilities include the 22 design of the -- the sealant areas for flat panel	192 1 level above where I was interacting. 2 Q Did you have any decision-making 3 responsibilities regarding the manufacture of the 4 sealant region in the flat panel displays? 5 A Again, the final decision would be made at 6 a level above where I was working. It's a part of 7 a manufacturing process. Even an individual 8 process engineer, you can't just make a change. 9 Any of these companies, any of these efforts, 10 there's a quality system involved. 11 You can change a process. You can change 12 a design, but there's a methodology that has to be 13 followed. You don't just make it and don't tell 14 anyone. You don't make it and tell people after 15 the fact. You propose it. It's reviewed. 16 There's a -- it's a process change request, and 17 once that's evaluated, then you can make the 18 change. 19 So even at the level of an engineer 20 directly responsible for something, they don't 21 technically have the authority to just make it. 22 They can propose the change, but the actual

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193 1 decision authority has to sit at a level above, 2 and a part of that is traceability and 3 responsibility. If you're making a product and 4 you don't know what product is, that is a very 5 scary thing for a company. 6 If you make the product, if something was 7 changed somewhere along the line, and you know 8 exactly who did it and when and the justification, 9 that's fine. If a change was made that results in 10 failure of product or an unsafe condition for the 11 end customer, and you don't have any traceability, 12 that's a lawsuit, I mean, just to be real blunt. 13 That can force a company into bankruptcy and to go 14 out of business. 15 So, again, just a standard part of quality 16 systems, a person responsible for the process does 17 not have the authority to approve a change. 18 Q And looking at paragraph 18, the 19 experiences you listed range from 2004 to 2008, 20 correct? 21 A Yes. 22 Q What date are you using for your analysis	195 1 this time period prior to two thousand -- December 2 2005? 3 A Sony was one. Garmin was another one, the 4 company I mentioned before called Microvision, 5 Odyssey. 6 Q And did -- your work with those clients 7 prior to December 2005, did it include work on the 8 design and manufacture of the sealant areas of 9 flat panel LCDs? 10 A Again, I'll say my work with them was 11 specific for the backlights and FMEA efforts for 12 the backlights as well as the integrated displays. 13 Q Okay. If you could, move down to 14 paragraph -- I think it begins at paragraph 44 or 15 45 of your declaration. You begin a discussion 16 regarding the surface area. 17 A Yes. 18 Q And so in paragraph 51, after the -- the 19 graphs, you state that: Decreasing the angle of a 20 via sidewall reduces overall contact area. 21 Do you see that? 22 A Yes.
194 1 of the '801 patent? I believe you have a date 2 listed at paragraph 107 if that's helpful. 3 A Yes. I had just gotten there. 107, I 4 state: My analysis of the challenged claims 5 should be viewed from the perspective of a person 6 of ordinary skill in the art (POSITA) as the 7 earliest claim priority date, which I have been 8 informed is December 28th, 2005. 9 Q All right. Going back to paragraph 18, 10 can you tell me which of the experiences you've 11 listed here occurred prior to December 2005? 12 A Dell, Hewlett-Packard, I mentioned Sony. 13 I know there were other companies. I remember 14 traveling an awful lot related to backlight work. 15 I can tell you I flew a hundred -- over 160,000 16 miles in one year. That -- that wasn't frequent 17 flyer miles. That was actual miles in the air. 18 And those were domestic. 19 Q I don't see Sony listed in paragraph 18. 20 A No. I had mentioned them previously. 21 Q But -- but you are saying now today that 22 Sony was one of the clients you worked with during	196 1 Q I guess an initial question is, when you 2 say overall contact area, what are you referring 3 to? 4 A What we said -- talked about previously, 5 the wetted area, not the plan view, not the 6 projection, but the total area available for 7 contact. 8 Q And that would include the area of the 9 sidewalls of the via? 10 A It necessarily includes the sidewalls, but 11 to answer your question, yes. 12 Q And is the -- I'm -- I'm trying to figure 13 out why or how reducing -- decreasing the angle 14 reduces contact area when an angled wall -- 15 sidewall would necessarily create more contact 16 area than a vertical sidewall. 17 MR. CUMMINGS: Objection, form. 18 A The discussion in this section is related 19 to Dr. Neikirk's opinion that the motivation is 20 increasing contact area. So if I simply want to 21 increase contact area, increase the wetted area, 22 I'm going to make the sidewall angles as steep as

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197 1 possible. 2 Q And is it -- 3 A That -- 4 Q Sorry. 5 A That -- well, that's the stated 6 motivation, is increasing the contact area. If I 7 want to increase the contact area, I'm not going 8 to use the shallow angle. That's contrary to my 9 stated motivation. If I want to increase the 10 contact area, I'm going to make the sidewall angle 11 as steep as possible. 12 Q So I'm -- I'm looking at the graphs that 13 you have at paragraph 47. And you'll agree that 14 the top of those mesas, you -- you have them at 15 one unit, correct? 16 A Yes. 17 Q But the bottom of the mesas on the right 18 are more than one unit? 19 A No. The bottom is one unit as well. 20 Q Okay. Maybe -- maybe it's my -- my 21 screen. 22 A Paragraph 45 I state: To illustrate,	199 1 segments versus the horizontal distance. 2 Q Does your math still hold true if the top 3 of the mesa and the bottom of the valley are not 4 maintained at one unit? 5 A The figures above paragraph 49 show where 6 the top is maintained at one unit, and the bottom 7 goes to a point contact. And then the figures 8 below paragraph 49 show where the top of the 9 mesa -- the mesa is basically a point, and the 10 bottom goes to a point contact as well. 11 Q So I'm specifically looking at the -- the 12 images under paragraph 46. Does -- does your math 13 still hold true if the mesas in the right graph 14 are allowed to have a mesa top less than one and a 15 valley less than one? Would it be possible for 16 the rightmost graph to have more contact area than 17 the left? 18 MR. CUMMINGS: Objection, form. 19 A I haven't considered that, but I would say 20 it's not a fair comparison because -- 21 Q Why not? 22 A -- the purpose is to illustrate the effect
198 1 consider a one-dimensional analog of a series of 2 vias. The mesa (flat, unetched region of the 3 film) and the valley (bottom of the etched via) 4 have a constant length of one unit. 5 Q So -- 6 A If it -- if it -- if it doesn't look 7 uniform, I'm going to blame Excel. 8 Q And it -- we agree, looking across the two 9 graphs, the vertical is at one unit high and the 10 horizontal axis goes out to 10 units -- sorry, the 11 top of the mesas are at one unit high? 12 A Yes. 13 Q So if we look at the area, that's the same 14 for both graphs. That's -- that's 10 square 15 units? 16 A 10 -- 17 MR. CUMMINGS: Objection, form. 18 A If you look at height versus distance, 19 then you can consider it that way because the 20 understanding is that these would be more linear 21 features. But what I was looking at is the length 22 ratio, so it's what's the total length of the line	200 1 of sidewall angle. So the only difference between 2 those two graphs is the sidewall angle. If you 3 say, I'm going to change the side angle, and I'm 4 going to change something else between the graphs, 5 then you haven't really shown the trend. You've 6 confounded effects, would be the technical term. 7 Q So looking at -- at the math that you have 8 here, if a POSITA was -- sought to maximize the 9 surface area for contact, they would use openings 10 that have sidewalls as close to 90 degrees as 11 possible within the given area? 12 MR. CUMMINGS: Objection, form. 13 A They'd want the sidewall angles to be as 14 steep as possible. 15 Q And by steep, that would be 90 degrees? 16 MR. CUMMINGS: Objection, form. 17 A I'll just say steep as possible because 18 there's an issue saying you can actually reach 90 19 degrees. 20 Q Well, regardless of what is -- is 21 possible, someone could want to have a -- a 22 sidewall angle of 90 degrees, correct?

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201 1 MR. CUMMINGS: Objection, form. 2 A What you're saying, is what a person of 3 ordinary skill in the art wants something that's 4 impossible. I suppose you could want whatever you 5 want, but if it's impossible, you're not being a 6 very good engineer. 7 Q But even knowing that it's not -- that 8 perfection is not possible, an engineer or POSITA 9 could desire to get as close as possible? 10 MR. CUMMINGS: Objection, form. 11 A Looking -- we discussed that previously, 12 so I'm trying to go back to... 13 Q Well, maybe I could direct you to your -- 14 your statements in paragraph 51. Do you still 15 agree that a desire to increase surface area would 16 strongly motivate a POSITA to not adjust or 17 otherwise attempt to predetermine the angle of the 18 sidewall? 19 A And that's consistent because 20 Dr. Neikirk's opinions are that a POSITA 21 attempting to increase or maximize the surface 22 area would use a shallower angle for the sidewall,	203 1 talks about an LCD panel, there's necessarily a 2 display area. So if I talk about a display, does 3 that imply a display area? Yes. 4 Q Let me ask you this. If a reference talks 5 about creating an opening in an organic layer with 6 a specific angle, but does not reference sealing 7 or sealant, does that lack of -- of reference to 8 sealant, does that mean it is not relevant to the 9 '801 patent? 10 MR. CUMMINGS: Objection, form. 11 A I will state that some of Dr. Neikirk's 12 opinions on combination and motivation are based 13 on ignoring the teachings of the patents and what 14 they're trying to do. We discussed the Kim 15 reference before where Kim is talking about 16 creating openings for metallization to prevent an 17 open circuit. 18 If a person of ordinary skill in the art 19 is trying to address sealing issues, I strongly 20 believe they would not come across a reference 21 that's dealing with preventing open circuits in 22 metallization structures.
202 1 which is simply wrong. 2 So if the motivation is to increase the 3 contact area, the wetted area, then I'm just going 4 to use my via process, and what that angle gives 5 is what it gives. If I try to decrease that 6 angle, then I'm going against the stated 7 motivation of increasing contact area. 8 Q Now, in your opinions regarding the prior 9 art, does the prior art need to describe sealant 10 or sealing regions to be relevant to the '801 11 patent? 12 MR. CUMMINGS: Objection, form. 13 A I'm trying to answer. I'm not sure if I 14 offered a clear opinion on that, but what I can 15 say is, Dr. Neikirk did rely on prior art 16 references that did not discuss sealant in the 17 etched features he was talking about. 18 Q And if a prior art reference discusses the 19 display area of an LCD panel, is that relevant to 20 the '801 patent? 21 MR. CUMMINGS: Objection, form. 22 A I'm struggling because if a reference	204 1 Q Do you disagree that Kim discusses 2 creating a -- an opening or tapered edge of an 3 organic layer? 4 MR. CUMMINGS: Objection, form. 5 A I believe my stated opinion is that a 6 person of ordinary skill in the art would not come 7 across the Kim reference and that Dr. Baker's 8 motivation to combine has issues. 9 As I state in -- starting in paragraph 10 178: As discussed above in Section IV.C, Kim's 11 teachings of inclined sidewalls is restricted to 12 contact holes and a -- and a desire to ensure 13 adequate electrical contact is made to the layer 14 at the bottom of a via. 15 These vias would be a central region of 16 the display, and a POSITA would not be motivated 17 to use them in place of Kwak's vias as they serve 18 distinctly different functions. Put another way, 19 Kim is not concerned with sealing and focuses on 20 forming better electrical contacts. 21 Paragraph 179: More importantly, as 22 discussed above, Kwak emphasizes increasing

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205 1 contact area to improve sealant performance by 2 changing the depth of a via. Kim's teaching of 3 inclined sidewalls in via structures directly 4 opposes this goal of Kwak's. Kim's contact via 5 would reduce the area whereas Kwak teaches to 6 increase the area, as mathematically demonstrated 7 above. 8 In paragraph 180: In my opinion, a POSITA 9 would have understood that the goals of Kwak and 10 Kim are contradictory and could not be combined 11 without the use of hindsight. 12 So, again, if I'm a person of ordinary 13 skill in the art trying to deal with sealing 14 problems, I would not have come across the Kim 15 reference. And even if the Kim reference and Kwak 16 reference were put in front of a person of 17 ordinary skill in the art, they would understand 18 that they have contradictory goals. One wants to 19 increase area. The other wants to decrease area. 20 And they can't be combined unless you are relying 21 on hindsight. 22 Q Are you relying on your experience with	207 1 person of ordinary skill in the art and also the 2 teachings, the content of the specification of the 3 '801 patent. 4 Q All right. And the knowledge and 5 experience of a person of skill in the art that 6 you applied for not understanding what the '801 7 patent discloses, that includes your knowledge and 8 experience working with the LEDs and backlights in 9 LCD flat panel displays? 10 MR. CUMMINGS: Objection, form. 11 A I believe by definition, that is my 12 experience and knowledge as a person of ordinary 13 skill in the art. 14 Q So someone of ordinary -- a person of 15 ordinary skill in the art would have at least the 16 same knowledge that you had based -- that you 17 could have gathered based on your experience with 18 LEDs and backlights? 19 MR. CUMMINGS: Objection, form. 20 A I wouldn't say they would have at least as 21 much. I worked with a large number of companies 22 and organizations, which probably gave me more
206 1 LEDs and backlights within LCD flat panel displays 2 to inform your opinion of what a POSITA would 3 understand in regards to the '801 patent? 4 MR. CUMMINGS: Objection, form. 5 A Again, as we've discussed previously, in 6 Section III, paragraphs 28 to 33, I talk about my 7 opinions on the '801 patent. 8 We've also discussed that, in my opinion, 9 the -- at the time of the priority date of the 10 '801 patent, a person trying to address the 11 problem of voids and bubbles, in particular, would 12 have looked at changing process conditions for 13 depositing the -- or applying the adhesive 14 material or the composition of the adhesive 15 material. 16 Q Are you relying on your experience that 17 you stated earlier regarding LEDs and backlights 18 within LCD flat panel displays to inform your 19 opinion on what a POSITA would understand the '801 20 to disclose? 21 MR. CUMMINGS: Objection, form. 22 A It's my knowledge and experience as a	208 1 experience than the requirements for a person of 2 ordinary skill in the art. But my opinions remain 3 based on the level of ordinary skill in the art 4 that I stated in my declaration. 5 Q And just to be clear, does -- your 6 experience with LEDs and backlights, does it 7 inform your understanding of the teachings of the 8 '801 patent? 9 MR. CUMMINGS: Objection, form. 10 A It's a part of the considerations in 11 reviewing and forming opinions on the '801 patent. 12 Q So would a POSITA look to the same type of 13 information when considering the teachings of the 14 '801 patent? 15 MR. CUMMINGS: Objection, form. 16 A I'm not sure I understand the question. 17 Q That's because it was a bad question. 18 Would a POSITA look to teachings regarding 19 LEDs or backlights when considering the 20 applications and the teachings of the '801 patent? 21 MR. CUMMINGS: Objection, form. 22 A I think more specifically, they would look

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209 1 at teachings related to sealing of the devices. 2 Q What about if a POSITA was looking to 3 identify existing methodologies to create openings 4 in an inorganic layer, could they also look at LED 5 and backlight-related technology for that purpose? 6 MR. CUMMINGS: Objection, form. 7 A Excuse me. That's a difficult question to 8 answer because a POSITA looking to address issues 9 with the reliability and sealing, that would be 10 the main scope of their search. They're going to 11 be looking at sealing and reliability issues. 12 They're not going to do a search just, oh, 13 I want to create openings. That's backwards. 14 That would be hindsight. I'm going to work for 15 openings and films to the teachings of the '801 16 patent. You also, at best, get an enormous number 17 of irrelevant references and information. 18 Q So I guess my -- my question is a little 19 different. 20 I'm asking if a POSITA would look to 21 techniques -- similar techniques that are used in 22 slightly different areas of technology.	211 1 that's one of the problems with the combinations. 2 Q Let me ask you, if a piece of prior art 3 describes creating an opening in an organic layer, 4 would that be relevant to considerations of 5 obviousness related to the '801 patent? 6 MR. CUMMINGS: Objection, form. 7 A That can't be answered because, again, if 8 I'm making the opening for electrical contacts or 9 electrical continuity, why would I come across 10 that when I'm looking at a sealing issue as 11 described in the '801 patent? 12 So -- so you've gone from the broad, let 13 me look for everything dealing with this even 14 though I only care about this very specific 15 aspect. It's not how a person of ordinary skill 16 in the art would look for information. It's not 17 how they would come across prior art. It's a 18 hindsight approach. 19 Q So if someone -- 20 A I know what I'm looking -- 21 Q Oh. 22 A I know what I'm looking for to invalidate
210 1 MR. CUMMINGS: Objection, form. 2 A Respectfully, they're not similar because 3 the issue is the areas of technology. We were 4 talking about -- I think it was the Kim reference, 5 which is making openings for electrical contact 6 and preventing open circuits versus I'm making an 7 opening for better sealing. Those are very 8 different tasks and performance metrics. It -- 9 it's very different layers and aspects of 10 technology. 11 Q So is it your -- 12 A But the one -- the one -- really, other 13 than both being a part of flat panels, don't have 14 anything to do with each other. In one case I'm 15 forming a -- a barrier to environmental 16 contaminants, and the other I'm making sure my 17 wires are all connected, to put it in layman's 18 terms. 19 How do you get from a wiring issue to 20 sealing the whole display? How do you get from 21 sealing the whole display to -- you've got a break 22 in your wire? They're different efforts, and	212 1 the claims. So let me do everything I can to find 2 something that -- I'll make up an argument for 3 motivation. But that's working backwards from the 4 claims. It's not working from the teachings of 5 the patent or even the references. 6 Q So is it your position that a POSITA would 7 not look to an existing piece of art, and then to 8 improve a specific piece or component of that 9 reference, look to other references that are in 10 related fields? 11 MR. CUMMINGS: Objection, form. 12 A Your questions have been about looking at 13 unrelated fields. I'm trying to seal and protect 14 a display. I'm trying to make sure I have 15 electrical continuity. Those are different 16 fields. Those are different efforts. 17 Q So LEDs have nothing to do with the 18 sealant areas within LCD devices? 19 MR. CUMMINGS: Objection, form. 20 A It's a vague question because LEDs can 21 impact the reliability of the seal area, as we've 22 discussed previously.

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213 1 Q Would a POSITA look to methods used to 2 create openings in organic layers related to LCDs 3 or LEDs for doing -- using the same techniques or 4 procedures to create an opening in an organic 5 layer in a sealant region of an LCD? 6 MR. CUMMINGS: Objection, form. 7 A Again, that approach smacks of hindsight, 8 and the -- the issue is the layers used for 9 forming an LED or an OLED and forming openings in 10 those layers, there's no guarantee there's going 11 to be a match-up with what's used in the sealing 12 area for the LCD display. 13 So, again, you're assuming you know what 14 you're looking for. You're working backwards from 15 the claim limitations, not, I have a sealing 16 problem, so let me look at how people have solved 17 sealing problems. 18 Q So let's -- let's talk about what a POSITA 19 would have known before the '801 patent. The 20 POSITA would have understood the same order and -- 21 order and type of layers that it described in the 22 '801 patent, right?	215 1 to form a seal on different layers. 2 Q Okay. And a POSITA would have been 3 familiar with using photolithography processes to 4 create an opening in an organic layer? 5 MR. CUMMINGS: Objection, form. 6 A Apologies, but your question answers 7 itself because photolithography is a process that 8 creates patterns or openings in an organic layer. 9 Q I just learned that today. So my question 10 is, would a POSITA at the time of the '801 patent 11 have known that information already? 12 A If they're familiar with photolithography, 13 which they would have been. As I said, 14 photolithography, by definition, is forming 15 patterns or openings in an organic layer. You 16 wouldn't have the computers we have today without 17 the process. 18 Q And would a POSITA have understood how to 19 create an angled opening in the organic layer 20 using photolithography at the time of the '801 21 patent? 22 MR. CUMMINGS: Objection, form.
214 1 MR. CUMMINGS: Objection, form. 2 A A POSITA would have been familiar with 3 general structures for sealing. 4 Q And a POSITA would have been familiar with 5 having an organic layer on top of a predetermined 6 material layer which is on top of a TFT substrate? 7 MR. CUMMINGS: Objection, form. 8 Q TFT array substrate. 9 A Again, the best I can say is a person of 10 ordinary skill in the art would be familiar with 11 common layer structures. 12 Q And would a POSITA be familiar with adding 13 a layer of sealant on top of the organic layer as 14 described in the '801 patent? 15 MR. CUMMINGS: Objection, form. 16 A Could you repeat the question, please? 17 Q Would a POSITA have been familiar with 18 adding a sealant on top of the organic layer as 19 described in the '801 patent? 20 MR. CUMMINGS: Objection, form. 21 A The best answer I can give is a POSITA 22 would be familiar with using a sealant or adhesive	216 1 A Ignoring the '801 patent, they may or may 2 not. It would depend on their individual 3 particular experience. They may not have been 4 aware of the existence of half-tone, gray-tone, or 5 slip-pattern masks. 6 Q We -- we're talking about a POSITA, right, 7 a hypothetical person? 8 A Yes. 9 Q So with that hypothetical POSITA, would it 10 have had knowledge of the half-tone masks, 11 gray-tone masks that you described that could be 12 used for creating angled openings in organic 13 layers? 14 MR. CUMMINGS: Objection, form. 15 A That's what I answered. They may not. It 16 would not be a requirement. 17 Q So you -- 18 A It would -- it would -- it would depend on 19 their individual background and experience. It's 20 possible someone could qualify as a POSITA and not 21 know of the existence of those types of masks. 22 Reading the '801 patent, they could go -- they

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217 1 would then be aware of them and find information. 2 That's the -- the issue. Some -- some might know, 3 some might not. But I can't state that it's an 4 absolute that they would know. 5 Q So just to be clear, your position is that 6 a POSITA, as it relates to the '801 patent, 7 wouldn't need to know the methods that the '801 -- 8 about the methods that the '801 patent teaches for 9 creating angled openings? 10 MR. CUMMINGS: Objection, form. 11 A Your previous questions are, would a 12 POSITA know about half-tone, gray-tone, or 13 slit-pattern masks? And that's where I stated 14 they may or may not. I can't give a definitive 15 answer one way or the other. 16 If the individual were a photolithography 17 engineer, I would expect them to know that, but a 18 photolithography engineer does not necessarily 19 qualify as a person of ordinary skill in the art. 20 Q So I guess I'm a little confused. It -- 21 it sounds like you're saying that a POSITA could 22 be a person of ordinary skill, but not actually	219 1 A I have trouble because the length of the 2 patent itself is inadequate to teach the full 3 scope of what's involved with photolithography. 4 There's an enormous amount of information that has 5 to be accumulated. It goes with the education and 6 the practical work experience. 7 If I hand someone a two-page document and 8 expect them to be expert in photolithography, I 9 would say I'm going to be sadly disappointed. 10 Again, the patent teaches methods that, once 11 aware, a person of ordinary skill in the art could 12 understand the methods. They could even say, I 13 want to do this using this method. I want to use 14 a half-tone mask. I want to use a gray-scale 15 mask -- mask. 16 That's the issue. The patent teaches it. 17 Whether they were aware of the existence of 18 half-tone and gray-scale masks before isn't 19 relevant. 20 Q So is it your opinion that it's possible 21 for a POSITA to -- looking at the '801 patent, to 22 understand that they desire to use a gray-tone
218 1 understand certain teachings of the '801 patent 2 unless they did further research and educated 3 themselves. 4 MR. CUMMINGS: Objection, form. 5 A What I -- you asked a question, would a 6 POSITA know something, a particular aspect of 7 technology? And there's not a binary answer. 8 It's not a yes or no. They might -- a POSITA 9 reading, if you tell them, oh, yeah, there's 10 half-tone and gray-scale masks, there's a strong 11 chance especially if you say gray scale, that they 12 would have a very good idea of what that entailed. 13 But they would have the knowledge and 14 experience to do some quick research and say, 15 okay, now I know what they're talking about. Now 16 I know what it is useful for. 17 Q So for that set of POSITAs, the ones that 18 don't have the knowledge of half-tone or 19 gray-scale masks, the patent alone wouldn't be 20 sufficient to teach them how to actually implement 21 the invention of the '801 patent? 22 MR. CUMMINGS: Objection, form.	220 1 mask, but do not know how to use it without 2 further education? 3 MR. CUMMINGS: Objection, form. 4 A It's my opinion a POSITA reading the '801 5 patent would be aware of the existence of 6 gray-scale or half-tone or slit-pattern masks and 7 then could use that knowledge to as a basis for 8 design. 9 Q All right. Could you go to paragraph 123 10 of your declaration? I just want to confirm a few 11 things with you once you're there. 12 A Okay. 13 Q Is it still your understanding that use of 14 a known technique to improve similar devices such 15 as methods or products in the same way is 16 something to be considered when looking at whether 17 a patent -- whether a reference renders aspects of 18 a patent obvious? 19 A I actually -- I state at the beginning of 20 120: I understand that an obviousness 21 determination included the consideration of the 22 following factors: (1) the scope and content of

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221 1 the prior art, (2) the differences between the 2 prior art and the claims at issue, (3) the level 3 of ordinary skill in the art, and (4) any 4 secondary indicia of non-obviousness (e.g., 5 secondary considerations such as commercial 6 success in the marketplace of the claimed 7 invention), to the extent that they exist. 8 And then I state: I understand that the 9 following are examples of approaches and 10 rationales that may be considered. 11 Q Okay. 12 A And this was in a section titled 13 Applicable Legal Standards, so I have to reiterate 14 I'm not an attorney. I don't have legal training 15 or background. So counsel provided this for me, 16 and I reviewed it and -- 17 Q Of course. 18 A -- applied it to the best of my ability. 19 Q And so is it still your understanding that 20 the use of a known technique to improve similar 21 devices such as methods or products in the same 22 way is an example of a rationale to be considered	223 1 finite number of identified and predictable 2 solutions with a reasonable expectation of 3 success, is a factor to be considered when 4 performing an obviousness analysis? 5 A Paragraph 125 states: Applying a 6 technique or approach that would have been obvious 7 to try (choosing from a finite number of 8 identified, predictable solutions, with a 9 reasonable expectation of success). 10 Q And did you consider that rationale when 11 writing your declaration? 12 A Yes, I did. 13 Q And then paragraph 126, is it still your 14 understanding that: Known work in one field of 15 endeavor may prompt variations of it for use in 16 either the same field or a different one based on 17 design incentives or other market forces if the 18 variations would have been predictable to a person 19 having ordinary skill in the -- the art. 20 A That's what's stated in paragraph 126. 21 Q And did you apply that rationale when 22 forming your opinions that you've written down in
222 1 in an obviousness analysis? 2 A It's an example of an approach or 3 rationale that may be considered. 4 Q And did you consider that when writing 5 your declaration? 6 A Yes, I did. 7 Q Okay. And is it still your opinion or 8 still your understanding that applying a known 9 technique to a known device ready for improvement 10 to yield predictable results is another example of 11 a rationale to be considered in an obviousness 12 analysis? 13 A What is stated in paragraph 124: Applying 14 a known technique to a known device (method or a 15 product) ready for improvement to yield 16 predictable results. 17 Q And did you -- did you consider that 18 rationale when writing your declaration? 19 A Yes, I did. 20 Q Is it still your understanding that 21 applying a technique or approach that would have 22 been obvious to try, such as choosing from a	224 1 your declaration? 2 A Yes. 3 Q Looking at the top of paragraph 128, can 4 you explain what that first sentence -- your 5 understanding of the first sentence you have 6 there? 7 A It states: I understand that the burden 8 is on the petitioner to explain how an invention 9 is obvious if one of ordinary skill in the art, 10 facing a wide range of needs created by 11 developments in the field, would have seen an 12 obvious benefit to the solutions tried by the 13 applicant. 14 Q And so that -- that's what the words say, 15 but what is your understanding of that sentence? 16 MR. CUMMINGS: Objection, form. 17 A To answer that, I'd need to reiterate 18 what's in the previous paragraph, paragraph 127. 19 Some teaching, suggestion, or motivation 20 in the prior art that would have led one of 21 ordinary skill to modify the prior art reference 22 or to combine prior art reference or to combine

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225 1 prior art references -- reference teaching to 2 arrive at the claimed invention. I am further 3 informed that when a prior art reference teaches 4 away from the claimed invention, that is a factor 5 in determining obviousness. 6 So that's a part of looking at it. If it 7 is obvious to a person of ordinary skill in the 8 art, and some of the specific issues that I 9 address with Dr. Neikirk's combinations and 10 motivations are that he tries to combine two prior 11 art references that literally teach away from each 12 other. They teach opposite things. 13 A person of ordinary skill in the art 14 would not find a way to combine opposite things. 15 You can't do that. The specific examples, he 16 points to prior art references that say increase 17 the surface area for contact, and then he combines 18 them with one that would decrease the surface area 19 for the adhesive contact. 20 How do you do that? One says increase. 21 One says decrease. Do you split the middle and 22 say I don't make any changes? That's the problem.	227 1 understanding is that the Patent and Trademark 2 Office has determined that the invention is not 3 obvious. It's novel. It's new. 4 Q Okay. 5 A That decision has been made, and, 6 therefore, the burden is on the petitioner to 7 explain that it isn't, because the Patent Office 8 went through a lengthy process and determined that 9 it wasn't obvious. 10 Q Okay. So -- so your understanding in the 11 first sentence of paragraph 128 is premised on the 12 understanding that it is describing an 13 already-issued patent? 14 MR. CUMMINGS: Objection, form. 15 A The language is pretty clear in paragraph 16 128, the first sentence: I understand that the 17 burden is on the petitioner to explain how an 18 invention is obvious. 19 If it's an invention, that, to me, is 20 describing an issued patent. If a patent hasn't 21 been issued, if the '801 patent had never been 22 issued, I would say there would be no grounds,
226 1 And then paragraph 128, the sentence I 2 read is my understanding, it's -- the burden is on 3 the petitioner to explain how it's obvious, how 4 you would come about doing -- go about doing this. 5 And I will state I think trying to combine 6 two references, two prior art references that 7 teach opposite things is far from obvious. Trying 8 to combine two references that teach similar 9 things would be a different story, but if there's 10 not motivation, if there's not an expectation of 11 success -- again, if I'm trying to do two opposite 12 things, how can I expect to succeed? By 13 definition, one of them has to fail. 14 Q I think we're getting off track of the 15 language in the first sentence of 128. I'm just 16 trying to figure out what it means, why -- why is 17 it your understanding that the burden is on 18 petitioner to show obviousness based on the 19 recognition of a benefit of a solution, regardless 20 of whether that solution is novel. 21 MR. CUMMINGS: Objection, form. 22 A If a patent has been granted, then my	228 1 there would be no basis for any activities in 2 district court or before the Patent Trial and 3 Appeal Board. 4 Q All right. Then going to the -- the 5 second part of paragraph 128, do you still have 6 the same understanding -- well, do you still 7 understand that when there's a design need or a 8 market pressure to solve a problem, and there are 9 a finite number of identified predictable 10 solutions, it may be obvious to a person of 11 ordinary skill to try those known objections? 12 A That's what it states. 13 Q Yeah. And is it still your opinion or 14 your understanding that if a technique has been 15 used to improve one device, and a person of 16 ordinary skill in the art would recognize that it 17 would improve a similar device in the same way, 18 then using that technique would have been obvious? 19 A Yes. And, again, our previous discussions 20 have been about a reference that deals with 21 electrical continuity and a reference that deals 22 with sealing, which that's not similar. Those are

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229 1 completely different considerations. 2 Q So I think that partially answers my next 3 question. But did you apply these two 4 understandings when forming your opinions and 5 writing your declaration? 6 A Yes. 7 Q I also had a question in paragraph 132, 8 the sentence -- the second sentence in the 9 paragraph that reads: My understanding is the 10 inventor's own path never leads to a conclusion of 11 obviousness. 12 I'm just curious what your understanding 13 of that sentence is. 14 MR. CUMMINGS: Objection, form. 15 A If the inventor explains how they arrived 16 at something, if they explain everything that led 17 to the solution, that led to the patent, you can't 18 use their insights, their inventiveness to say it 19 was obvious. 20 I've been told in the past that if a 21 patent is only obvious after it's been explained, 22 then that actually is a very good patent because	231 1 period of time. So my explaining the patent can't 2 be used to say the patent is obvious. 3 Q Just to reiterate, your understanding is 4 that if the inventor explains how they arrived at 5 something, if they explain everything that led to 6 their solution, that led to the patent, then the 7 petitioner can't use their insights to develop 8 their invention to say that the invention is 9 obvious. Is that a -- is that correct, that's 10 your understanding? 11 MR. CUMMINGS: Objection, form. 12 A My understanding is in paragraph 132. I 13 understand that it is impermissible to use 14 hindsight to arrive at the claimed invention. My 15 understanding is that the inventor's own path 16 never leads to a conclusion of obviousness. 17 Those two sentences say, working backwards 18 from the patent to arrive at a conclusion of 19 obviousness, that's hindsight. That's not what's 20 allowed. If you work backwards, you're not 21 following what a person of ordinary skill in the 22 art would do.
230 1 absent the actual explanations of the patents, no 2 one thought of it before. 3 So if I say, oh, if you do A, B, C, D, and 4 E, you get a result, and here's the rationale for 5 going through all of it, if that's my inventive 6 steps to develop that process, you can't say, 7 well, I understand it now that you've explained 8 it, so it is obvious. 9 The genesis of the word "patent" comes 10 from the patent meaning to make obvious. And 11 that's a part of my understanding of the 12 negotiation, the deal, if you will, for patents. 13 The purpose of the limited exclusive 14 rights to a technology is based on disclosing the 15 full content, how to practice the patent. In 16 return, the assignee gets a period of exclusive 17 rights to the technology, after which the patent 18 expires, and that monopoly, if you will, goes 19 away. So other people can build on the knowledge. 20 So that's the tradeoffs. I'm going to 21 tell you everything about the patent, how to do 22 it. You can't do it without my permission for a	232 1 The inventor has already shared their own 2 path with the Patent Office, and the Patent Office 3 determined that it was a new, novel invention and 4 granted a patent. 5 So it's basically saying if the -- if the 6 patent is issued, you can't use the patent to say 7 that it's obvious. 8 Q And did you apply the understanding that 9 an inventor's own path never leads to a conclusion 10 of obviousness when forming your opinions and 11 writing your declaration? 12 MR. CUMMINGS: Objection, form. 13 A As stated there, yes. I will also point 14 out, this is somewhat related in paragraph 129. I 15 further understand that the petitioner cannot rely 16 on conclusory payments, but must instead provide a 17 reasonable explanation supported by evidence. 18 Q I have one more -- 19 A Merely -- merely saying a person of 20 ordinary skill in the art would do this and it 21 would work isn't enough. There's got to be a -- a 22 reasoned explanation.

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233 1 Q I have one more question on paragraph 32, 2 that second sentence. 3 If the inventor's own path is to take one 4 thing and combine it with another thing that would 5 be obvious to solve a very well-known problem, and 6 that everybody is doing it, but the inventor got 7 the patent, why would that not be obvious? 8 MR. CUMMINGS: Objection, form. 9 A Forgive me, but it sounds -- it sounds 10 like you're asking if the Patent Office utterly 11 failed, and I -- I -- I'm struggling because 12 you're saying someone applies for a patent on 13 something that everyone is doing and is obvious, 14 but they get a patent anyways. 15 Q Well, there are patents that are 16 invalidated for being obvious, right? 17 MR. CUMMINGS: Objection, form. 18 A It's my understanding that some patents 19 have been invalidated for obviousness. 20 Q So it's possible that even though an 21 invention is obvious, there's still a patent 22 issued?	235 1 of the previous sentence. 2 I understand that a prima facie case of 3 obviousness may be rebutted by showing that the 4 art, in any material respect, teaches away from 5 the claimed invention. 6 Then it goes on: I understand that a 7 known or obvious composition does not become 8 patentable simply because it has been described as 9 somewhat inferior to some other product for the 10 same use. 11 And, again, this is in a section on legal 12 standards, so I did my best to apply that 13 understanding. 14 Q Are you aware that the '801 patent is also 15 at issue in district court litigation between 16 petitioner and patent owner? 17 A I am aware, yes. 18 Q Are you aware that in that district court 19 litigation, the petitioner and the patent owner 20 have agreed to a construction for the "layer" term 21 within the '801 patent? 22 MR. CUMMINGS: Objection, form.
234 1 MR. CUMMINGS: Objection, form. 2 A It's -- I'm -- I'm trying to figure out 3 how that ties into the second sentence in 4 paragraph 132. 5 Q I'll ask one last question or -- or just 6 explanation. But my question is, how -- how it 7 is -- why does it matter what the inventor's path 8 is if ultimately the invention was obvious anyway? 9 MR. CUMMINGS: Objection, form. 10 A This is in a section on legal standards, 11 and it sounds like you're asking for a legal 12 opinion, which I'm neither qualified nor prepared 13 to give. 14 Q It's more of a thought exercise, but, 15 yeah, I appreciate that. 16 How about paragraph 142, is it still your 17 understanding that a known or obvious composition 18 does not become patentable simply because it's 19 been described as somewhat inferior to some other 20 product for the same use? 21 MR. CUMMINGS: Objection, form. 22 A That has to be considered in the context	236 1 A My preparations for today were specific to 2 my declaration for the IPR that is the subject 3 matter of today. And I don't believe in the IPR 4 declaration I have any opinions or statements on 5 district court matters. So I haven't reviewed 6 that situation in preparation for today, so I'm, 7 at best, uncomfortable answering. 8 Q So it's fair to say, sitting here today, 9 you have no opinions regarding this current 10 proceeding under the agreed-upon construction that 11 was offered or that was -- that was agreed upon in 12 the district court? 13 MR. CUMMINGS: Objection, form. 14 A I'm here today to discuss my declaration 15 and the opinions in my declaration. I -- 16 Q Your -- go ahead. 17 A I'm not prepared to discuss issues or 18 matters or status of district court litigation. 19 Q And the matters discussed in your 20 declaration do not include an agreed-upon 21 construction for the "layer" term between patentor 22 and petitioner?

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237 1 MR. CUMMINGS: Objection, form. 2 A I don't believe that Dr. Neikirk 3 referenced or opined on district court matters, 4 and, again, I'm here today to talk about this 5 declaration and my opinions in this declaration. 6 I'm, again, not prepared to discuss aspects of the 7 district court litigation. 8 Q Do you have an opinion regarding whether 9 the references identified in the petition render 10 in the '801 patent obvious under petitioner's 11 proposed construction for the "layer" term? 12 MR. CUMMINGS: Objection, form. 13 A Again, not related to district court, but 14 in paragraph 150, I state: Additionally, another 15 of petitioner's experts in related IPR2024-01133 16 testified generally (i.e., not specific to the 17 '801 patent) that his understanding of layer 18 supports the construction I applied in this 19 declaration. 20 Q And your understanding in your declaration 21 is that petitioner and patent owner are in 22 disagreement over the meaning of the term "layer,"	239 1 opinion about -- under any construction other than 2 the one that you'd advanced in your declaration? 3 MR. CUMMINGS: Objection, form. 4 A Paragraph 162, I state: Dr. Neikirk again 5 demonstrates a reliance on hindsight, as despite 6 his acknowledgment that Kwak fails to teach a 7 predetermined material layer, he clearly opines 8 that any arbitrary combination of layers will 9 suffice -- suffice. In my opinion, a POSITA would 10 not have done this. 11 The specific issue is where Dr. Neikirk 12 offers the opinion: Kwak's layer 160 alone or a 13 combination of 160, 140, and 120 or a combination 14 of 160 and 140 are the claimed predetermined 15 layer. 16 I state at the end of paragraph 160: 17 Thus, a combination of 160 and 140 and 120 would 18 not be a layer because they are films formed at 19 different manufacturing steps. 20 So Dr. Neikirk is basically saying, I can 21 point at anything, and it's the layer. If it's 1, 22 2, 3, it doesn't matter. It's all irrelevant, as
238 1 right? 2 MR. CUMMINGS: Objection, form. 3 A In this IPR, I state my understanding of 4 the definition of the term "layer." I don't see 5 that Dr. Neikirk offered a construction for the 6 term. I do not have his declaration in front of 7 me to verify that, but I don't see that I 8 responded to a formal definition he provided or 9 opined on. 10 Q So sitting here today, you have no 11 knowledge of a competing proposed construction for 12 the term "layer"? 13 MR. CUMMINGS: Objection, form. 14 A I have a few opinions expressed in my 15 declaration where it appears that Dr. Neikirk 16 relied on a definition that one -- a layer could 17 be multiple layers. Specifically, I'm looking at 18 paragraph 170 right now. But I believe there are 19 other places where it's apparent that Dr. Neikirk 20 was implicitly using that definition. 21 Q When -- in your analysis of the Kwak 22 patent, did you consider -- did you offer an	240 1 opposed to clearly identifying a predetermined 2 material layer. 3 Q And are -- your opinions regarding Kwak 4 disclosing a predetermined material layer, are 5 they based on your proposed construction for the 6 term "layer"? 7 MR. CUMMINGS: Objection, form. 8 A They're based on my opinions in paragraphs 9 144 to 152. 10 Q I believe we're talking about different -- 11 I'm looking at Kwak, which begins down at 12 paragraph 160. 13 A Yes. And you had asked about my proposed 14 definition for layer. 15 Q Yeah, I understand -- 16 A And -- and -- and that's where that is. 17 Again, Dr. Neikirk did not provide a formal 18 construction. It's evident he believes the 19 prematerial -- predetermined material layer can be 20 almost anything he points to, whatever he needs to 21 invalidate the claims. There's an implication it 22 can be one or more layers. And, again, my

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241 1 declaration is responsive to Dr. Neikirk. 2 Q And so in your declaration, did you offer 3 an opinion of whether Kwak renders -- anticipates 4 or renders obvious the '801 patent if Dr. Neikirk 5 is correct about any of his -- his analysis of the 6 layers? 7 A Again, the issue is that he didn't 8 formally express or offer a construction. I'm 9 having to rely on what he has implied through his 10 combinations and opinions on obviousness. 11 Again, it literally seems that he's of the 12 opinion that, as long as I point to something as 13 the predetermined layer, if I work back from the 14 claims, the claims need a predetermined layer, I'm 15 going to pick a layer and call it the 16 predetermined layer, and, therefore I'm done. 17 So I don't have a formal construction to 18 even attempt to consider, only what's inferred. 19 Q But let me ask you, you didn't offer an 20 opinion in the alternative should Dr. Neikirk be 21 found to be correct regarding any of the 22 combinations of layers he identifies?	243 1 reference with the -- with the understanding that 2 Dr. Neikirk was correct about any of the 3 combinations of layers he identified in his 4 declaration? 5 MR. CUMMINGS: Objection, form. 6 A I'm -- I'm just struggling because you say 7 if he's right about any of the combinations. So 8 he states it could be 160 alone. It could be a 9 combination of 161, 140, and 120, which means it 10 could be 160 and 140. It could be 140 and 120. 11 It could be 160 and 120 or 160, 140, and 120. 12 That, honestly, feels like keep guessing 13 until you get it right. In particular, saying a 14 combination of 160, 140, and 120, the implication 15 is the predetermined layer can be 160 and 120, 16 combination of 160 and 120, despite the fact that 17 140 is between them. And I struggle on that, and 18 there should be a simple -- 19 Q Let me -- 20 A -- application. It's -- I -- I'm sorry, 21 but Dr. Neikirk is offering every opinion he can 22 in an effort to invalidate. There's not a clear
242 1 MR. CUMMINGS: Objection, form. 2 A Again, Dr. Neikirk -- the issue is that he 3 didn't provide a construction. There's an 4 inferred construction. If he had offered an 5 opinion on a construction, then it would have been 6 reasonable for me to discuss if his expressed 7 construction were considered. 8 But because it's implied -- as I said, he 9 points at a few combinations and say, any of these 10 will suffice, because it invalidates the claims. 11 That's where I have the issue. 12 I will say I really feel like you're -- 13 you have something you want to ask about the 14 district court matter, and that's not referenced 15 in my declaration. And I didn't prepare for that, 16 and I'm not prepared to discuss any of the issues 17 in district court. I'm here to talk about this 18 declaration on the '801 patent. 19 Q Perfectly understand. I'm happy to not 20 talk about the district court anymore. What I am 21 curious about, what I -- what I'd like to know is 22 if you offered any opinions regarding the Kwak	244 1 rationale. I explained my rationale for what I 2 believe a person of ordinary skill in the art 3 would understand a layer to be. And Dr. Neikirk 4 failed to formally do that. He just offered every 5 possible combination in hope that one of them 6 would work. 7 Q Let me ask you a different question. 8 VIDEOGRAPHER: Counsel -- 9 Q Did you offer any opinion -- 10 MR. LONEY: Oh, sorry. Go ahead, yeah. 11 VIDEOGRAPHER: Yeah. We're nearing the 12 two-hour mark, and I just need to change files 13 very quickly. 14 MR. LONEY: Yeah. I don't have much more, 15 but that's fine, if we could just do that and get 16 back on if that's all right with everybody else. 17 VIDEOGRAPHER: The time is 5:10. We are 18 off the record. 19 (Recess, 5:10 to 5:10 p.m.) 20 VIDEOGRAPHER: We are now back on record. 21 The time is 5:10 p.m. 22 Q Welcome back, Dr. Bretschneider.

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245 1 A Seems like it's been forever. 2 Q Yeah. So let me ask you this question. 3 If you are wrong about the correct construction of 4 the term "layer" that you offer in your 5 declaration, does your declaration have any 6 opinion regarding the Kwak reference that does not 7 rely on that -- that argument or the -- the layer 8 construction that you offer? 9 MR. CUMMINGS: Objection, form. 10 A Paragraph 163 is under the heading Kwak 11 Fails to Disclose a Predetermined Angle. 12 Q I'll -- I'll cut you off there. Let's -- 13 let's stick to the -- the predetermined layer 14 discussion of Kwak. 15 Do you have any opinions regarding the -- 16 whether Kwak discloses a predetermined layer that 17 do not rely on your proposed construction for the 18 "layer" term? 19 MR. CUMMINGS: Objection, form. 20 A Paragraph 161: Further, claim element 9c, 21 9c recites: An organic material pattern layer 22 formed on the predetermined material layer to	247 1 construction or reply to it. 2 If it had been formally expressed, then I 3 would have formed an opinion to formally rebut it, 4 but because it was an implied opinion, I worked 5 with what I was given. 6 Q And it's -- it's fair to say that it's 7 your understanding that Dr. Neikirk's opinions do 8 not align with your proposed construction for the 9 "layer" term? 10 A In particular, since he includes a 11 combination of two layers that don't make contact 12 with each other, I would say yes. 13 Q And then -- let's see. Sorry. 14 MR. LONEY: I think that's all the 15 questions I have. 16 MR. CUMMINGS: I have no questions, 17 either. 18 VIDEOGRAPHER: This marks the end of the 19 deposition of Eric Bretschneider. The time on the 20 video monitor is 5:15 p.m. 21 (Deposition adjourned at 5:15 p.m.) 22
246 1 expose the surface of the predetermined material 2 layer underneath. 3 Sorry, then after that, it goes to my 4 proposed construction. 5 But I do note: All the figures relied on 6 in Kwak show that protection layer 180 is not 7 formed on buffer layer 120. Likewise, protection 8 layer 180 is formed on interlayer 160, but 9 interlayer 160 is not formed on the substrate. 10 So there are issues with formed on the 11 substrate. 12 Q So understanding that you may have another 13 reason for thinking -- for understanding that Kwak 14 does not disclose the predetermined layer, in 15 paragraphs 160 through 162, do you have any 16 opinions regarding whether Kwak discloses the 17 predetermined material layer that don't rely, at 18 least in part, on your construction of layer? 19 A I will say at issue is the fact that 20 Dr. Neikirk did not opine on a formal construction 21 for the term "layer." So I -- I don't have -- I 22 did not have a reason to consider his implied	248 1 CERTIFICATE OF SHORTHAND REPORTER 2 I, Susan S. Klinger, Certified Reporter and Notary Public within and for the State of Texas 3 do hereby certify: That ERIC BRETSCHEIDER, PH.D., the witness 4 whose deposition is hereinbefore set forth, was duly sworn by me before the commencement of such 5 deposition and that such deposition was taken before me and is a true record of the testimony 6 given by such witness. I further certify that the adverse party, 7 BOE TECHNOLOGY GROUP CO., LTD, was represented by counsel at the deposition. 8 I further certify that the deposition of ERIC BRETSCHEIDER, PH.D., occurred virtually 9 on Friday July 18, 2025, commencing at 10:58 a.m. to 5:15 p.m. 10 I further certify that I am not related to any of the parties to this action by blood or 11 marriage, I am not employed by or an attorney to any of the parties to this action, and that 12 I am in no way interested, financially or otherwise, in the outcome of this matter. 13 IN WITNESS WHEREOF, I have herunto set my hand on the 28th of July, 2025. 14 15  16 17 Susan S. Klinger, RMR-CRR, CSR 18 Texas CSR 6531, Exp: 10/23/25 19 California CSR 14487, Exp: 11/30/25 20 21 22

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