

Deposition Transcript

Case Number: 2:24-cv-01073-JRG

Date: May 13, 2025

In the matter of:

RADIAN MEMORY SYSTEMS LLC, v SAMSUNG ELECTRONICS CO., LTD., et al.

Mark Jones

**CERTIFIED
COPY**

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DEFENDANTS.

NO. : 2:24-cv-01073-JRG

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<div>1</div> <div>2</div> <div>3</div> <div>4</div> <div>5</div> <div>6</div> <div>7</div> <div>8</div> <div>9</div> <div>10</div> <div>11</div> <div>12</div> <div>13</div> <div>14</div> <div>15</div> <div>16</div> <div>17</div> <div>18</div> <div>19</div> <div>20</div> <div>21</div> <div>22</div> <div>23</div> <div>24</div> <div>25</div>	<div>Page 3</div> <div>INDEX</div> <div>PAGE</div> <div>MARK JONES</div> <div>DIRECT EXAMINATION BY MR. YANG:..... 5</div> <div>EXHIBITS</div> <div>NO. DESCRIPTION PAGE</div> <div>Exhibit 1 U.S. Patent No. 11544183 and U.S. Patent No. 11347656..... 35</div> <div>Exhibit 2 U.S. Patent No. 11347656..... 35</div> <div>Exhibit 3 The Declaration of Dr. Mark T. Jones in support of plaintiff's motion for preliminary injunction... 41</div> <div>(Exhibits not received at time of production.)</div>
<div>1</div> <div>2</div> <div>3</div> <div>4</div> <div>5</div> <div>6</div> <div>7</div> <div>8</div> <div>9</div> <div>10</div> <div>11</div> <div>12</div> <div>13</div> <div>14</div> <div>15</div> <div>16</div> <div>17</div> <div>18</div> <div>19</div> <div>20</div> <div>21</div> <div>22</div> <div>23</div> <div>24</div> <div>25</div>	<div>Page 4</div> <div>P R O C E E D I N G S.</div> <div>VIDEOGRAPHER: Good morning.</div> <div>We are on the record at 9:18 a.m., Central Time on May 13th, 2025 to begin the deposition of Dr. Mark Jones. In the Matter of Civil Action 2:24-CV-1073.</div> <div>This case has been retained in the District Court for the Eastern -- Eastern District of Texas Marshall Division. The Case Number is 2:24-CV-01073-JRG.</div> <div>The deposition is being taken place at Caldwell Cassady & Curry downtown Dallas. The legal videographer is with Tim Bishop here on behalf of Steno. My name is Giovanni Borgeat, and the court reporter is Kelly Bryant also on behalf of Steno.</div> <div>Would Counsel please identify yourselves and state whom you represent?</div> <div>MR. YANG: Lance Yang of Quinn Emanuel representing Defendants Samsung.</div> <div>MR. CURRY: This is Austin Curry at Caldwell Cassady & Curry representing Radian. With me today is Hamad Hamad also at my firm.</div> <div>THE COURT: Thank you, Counsel.</div> <div>Will -- will the court reporter please swear in the witness?</div> <div>MARK JONES,</div>
<div>1</div> <div>2</div> <div>3</div> <div>4</div> <div>5</div> <div>6</div> <div>7</div> <div>8</div> <div>9</div> <div>10</div> <div>11</div> <div>12</div> <div>13</div> <div>14</div> <div>15</div> <div>16</div> <div>17</div> <div>18</div> <div>19</div> <div>20</div> <div>21</div> <div>22</div> <div>23</div> <div>24</div> <div>25</div>	<div>Page 5</div> <div>having been first duly sworn, testified as follows:</div> <div>DIRECT EXAMINATION</div> <div>BY MR. YANG:</div> <div>Q. Good morning, Dr. Jones.</div> <div>A. Good morning, sir.</div> <div>Q. I understand you provided some opinions regarding infringement in this case; is that correct?</div> <div>A. That's correct.</div> <div>Q. Have you provided -- or were you asked to provide any opinions regarding the invalidity in this case?</div> <div>A. No.</div> <div>Q. Okay. So you have no opinions one way or the other regarding the validity of the patents; is that correct?</div> <div>A. I haven't formed any opinions other than, obviously, they're presumed valid.</div> <div>Q. Have you consulted -- have you been an expert witness for litigation before?</div> <div>A. Yes.</div> <div>Q. And how many times have you testified?</div> <div>A. I would guess including depositions certainly more than 50 times.</div> <div>Q. Now, you understand that for a patent to be infringed it has to be valid, correct?</div>

<p>Page 6</p> <p>1 MR. CURRY: Objection, form.</p> <p>2 A. I -- I don't know whether or not that's true.</p> <p>3 I think it -- but it seems irrelevant if it is infringed</p> <p>4 but it is invalid.</p> <p>5 Q. (BY MR. YANG) Fair enough.</p> <p>6 One of the defenses to patent infringement</p> <p>7 is that the patent is invalid, correct?</p> <p>8 A. My -- generally I believe that's the case.</p> <p>9 Q. Okay. Now, you've been retained by the</p> <p>10 Plaintiff Radian in this case, correct?</p> <p>11 A. Yes.</p> <p>12 Q. Have you heard of Radian before?</p> <p>13 A. I'm not sure. Nothing comes to mind, but I</p> <p>14 see a lot of companies and I couldn't tell you for</p> <p>15 certain one way or the other.</p> <p>16 Q. But sitting here today, you have no specific</p> <p>17 memory of Radian prior to this litigation; is that</p> <p>18 correct?</p> <p>19 A. That's correct.</p> <p>20 Q. Had you seen the patents that you're opining</p> <p>21 on in this case prior to this engagement?</p> <p>22 A. I don't believe so, no.</p> <p>23 Q. Are you familiar with -- strike that.</p> <p>24 Had you ever heard of any of the named</p> <p>25 inventors on the two patents you opine on prior to this</p>	<p>Page 7</p> <p>1 litigation?</p> <p>2 A. I don't have a specific recollection of having</p> <p>3 heard of them. I -- I may have seen the names but</p> <p>4 nothing stands out.</p> <p>5 Q. Are you familiar with the term cooperative</p> <p>6 flash memory?</p> <p>7 A. Generally, yes.</p> <p>8 Q. How did you first become aware of that</p> <p>9 concept?</p> <p>10 A. That, I couldn't tell you. I -- I -- I don't</p> <p>11 recall specifically when I learned about it.</p> <p>12 Q. Are you familiar with the term cooperative</p> <p>13 flash management?</p> <p>14 A. I would put it in the same general category as</p> <p>15 what you mentioned before. I've generally seen</p> <p>16 discussions of it, yes.</p> <p>17 Q. Prior to this litigation, had you come across</p> <p>18 the concepts cooperative flash management or cooperative</p> <p>19 flash memory?</p> <p>20 A. That, I couldn't tell you.</p> <p>21 Q. So no specific memories of hearing about</p> <p>22 either of those two terms prior to this litigation; is</p> <p>23 that correct?</p> <p>24 A. That's correct.</p> <p>25 Q. If I refer to those as CFM during this</p>
<p>Page 8</p> <p>1 deposition, will you understand that?</p> <p>2 A. Yes.</p> <p>3 Q. What is your experience working with flash</p> <p>4 memory?</p> <p>5 A. I have taught in courses the use of flash</p> <p>6 memory in computer architecture, computer organization.</p> <p>7 I have developed embedded systems that use flash memory.</p> <p>8 I have done chip designs that make use of flash memory.</p> <p>9 That is -- well, that's generally what comes to mind.</p> <p>10 Q. Have you ever designed a -- strike that.</p> <p>11 Have you ever designed flash memory?</p> <p>12 A. Not a new version of flash memory. I've</p> <p>13 designed a processor architecture that incorporates</p> <p>14 flash memory within the processor itself, but not at the</p> <p>15 level of designing, for example, a new type of flash</p> <p>16 memory.</p> <p>17 Q. In the processor that you designed, did you</p> <p>18 design the flash memory that that processor used?</p> <p>19 A. We used existing -- called primitive, I guess,</p> <p>20 of flash memory that we built the organization for, but</p> <p>21 the -- we used existing flash memory primitives.</p> <p>22 Q. What do you mean by a primitive?</p> <p>23 A. An -- an existing design that we could</p> <p>24 incorporate into our processor architecture, just as one</p> <p>25 would -- as an example, one might take an existing</p>	<p>Page 9</p> <p>1 primitive for an add or a multiplier and incorporate it</p> <p>2 into the architecture.</p> <p>3 Q. What company designed that primitive that you</p> <p>4 had previously used?</p> <p>5 A. I don't recall. It was -- I -- I believe it</p> <p>6 was part of the (inaudible) design package that we were</p> <p>7 using. That's the -- the best of my recollection</p> <p>8 though. I -- I'm not certain that's the case.</p> <p>9 Q. When did you -- when did this -- when did you</p> <p>10 develop this processor?</p> <p>11 A. In the -- sometime around 2010, maybe but I'm</p> <p>12 not sure of the precise year.</p> <p>13 Q. Was this for a particular company or was this</p> <p>14 for academic purposes?</p> <p>15 A. This was a project within the university in</p> <p>16 an -- as part of the National Science Foundation grant.</p> <p>17 Q. Now, what do you mean when you testified that</p> <p>18 you developed -- or we -- your team developed the</p> <p>19 organization for that flash memory?</p> <p>20 A. How it was accessed and how it was</p> <p>21 distributed, the device.</p> <p>22 Q. And were you the one responsible for designing</p> <p>23 the organization for that flash memory device?</p> <p>24 A. Primarily, though -- of course, students</p> <p>25 were -- graduate students were working on the project</p>

<p style="text-align: right;">Page 10</p> <p>1 and they certainly had input -- input into the design 2 and -- it -- it was a team. I was leading that team, 3 but the graduate students had input as well. 4 Q. Did the flash memory and that processor from 5 around 2010 use any particular standards? 6 A. I don't believe so, but I also -- it's almost 7 15 years ago so if -- if it did, I don't recall them. 8 Q. Did the flash memory that you used back in 9 2010 -- well, let me ask -- strike that. 10 What was the level of control that the 11 host played in reading and writing to that flash memory? 12 A. There really wasn't a host. This was part of 13 the processor itself. So everything -- but it -- well, 14 also, it wasn't a traditional processor, so there -- in 15 this system there -- there wouldn't have been some 16 concept of a host really. 17 Q. Would there have been a flash memory 18 controller? 19 A. No. 20 Q. So this was just a sort of pure storage 21 location. 22 Is that a fair way to say it? 23 A. I mean, I'm not sure the difference between 24 that and any other flash sale, but it was an integral 25 part of the processor design, as opposed to something</p>	<p style="text-align: right;">Page 11</p> <p>1 where it is an external storage, perhaps, accessed as a 2 peripheral. This was not that. 3 Q. So did this memory have a flash translation 4 layer? 5 A. No. It was on a much smaller scale on the 6 units that were -- that were distributed around the 7 device. So it -- it -- it was not -- I guess in the way 8 to look at it, it was -- each portion was fulfilling a 9 specific role within -- and a dedicated role within the 10 processor. 11 Q. Does that mean that write commands were issued 12 directly to physical addresses in the memory as opposed 13 to logical addresses? 14 A. They weren't really addresses in the sense 15 that you are thinking of. 16 Q. What information was used to write to the 17 memory then, if it's not addresses? 18 A. Direct control items. These were part -- or 19 storing dedicated context. 20 Also storing -- my recollection storing 21 data pipeline information. It -- it -- it wasn't 22 storage in the sense of the processor writes to an 23 address. There really wasn't a processor in that sense 24 that read or wrote to addresses. 25 Q. Any other experience you have with designing</p>
<p style="text-align: right;">Page 12</p> <p>1 flash memory? 2 A. No. 3 Q. Okay. Any other experience -- let me ask it a 4 better way. So do you have any experience designing 5 flash memory that used addresses to read and write or 6 flash translation layers? 7 A. No. 8 Q. Do you have any experience designing flash 9 memory that used addresses to erase? 10 A. No. 11 MR. YANG: Just -- sorry for the record, 12 read or write should be read or write. Sorry. I can't 13 help it, even though I know you will clean it up later. 14 Q. (BY MR. YANG) When did you first become aware 15 of NVMe? 16 A. Sometime in the 2010s, but I -- I don't recall 17 specifically when. Or at least that's the first I 18 can -- general recollection, but I don't -- I don't 19 recall like, oh, here's the day I learned about it. 20 Q. Do you remember the circumstances under which 21 you learned about NVMe? 22 A. No. I mean I would expect in -- or most 23 likely in connection with classes that I've taught, but 24 I -- I just don't recall the specifics. 25 Q. Have you taught NVMe to students before in</p>	<p style="text-align: right;">Page 13</p> <p>1 courses? 2 A. I believe I've described it in an architecture 3 class in the context of describing design issues 4 involving flash memory and how flash memory was 5 affecting overall computer architecture designs. 6 MR. YANG: Just so -- it's NVMe. Sorry. 7 I mumble sometimes so that may not be clear. 8 Q. (BY MR. YANG) Okay. When did you become 9 aware of zone name space or ZNS? 10 A. That, I'm not sure. 11 Q. Were you aware of ZNS prior to this case? 12 A. The first recollection I think that I have is 13 in connection with this case, but I -- I certainly 14 couldn't rule out seeing it before that. 15 Q. Have you designed flash memory that uses NVMe? 16 A. No. 17 Q. Have you designed flash memory that uses ZNS? 18 A. No. 19 Q. Have you designed any memory where there was a 20 host and a memory controller? 21 A. I've designed a system that implemented a 22 processor with a -- well, processor implemented memory 23 controller for an external DRAM as well as an external 24 SRAM. 25 Q. Right. I think my question was a little more</p>

<p style="text-align: right;">Page 14</p> <p>1 specific than that.</p> <p>2 Have you designed any flash memory where</p> <p>3 there was a host and a memory controller?</p> <p>4 A. I have not done that, no.</p> <p>5 Q. Prior to this litigation, were you familiar</p> <p>6 with the concept of a host sharing some of the</p> <p>7 controller responsibilities with the flash memory</p> <p>8 controller?</p> <p>9 A. Yes.</p> <p>10 Q. And when did you first hear of this concept?</p> <p>11 A. That, I couldn't tell you. I -- I don't</p> <p>12 recall.</p> <p>13 Q. How did you become aware of that concept?</p> <p>14 A. My recollection is that certain operating</p> <p>15 systems could give feedback to the flash memory device,</p> <p>16 for example, SSD to provide either hints or requests to</p> <p>17 perform operations.</p> <p>18 Q. Which operating systems were these?</p> <p>19 A. I believe that Windows had the capability to</p> <p>20 provide that type of feedback. I don't recall whether</p> <p>21 they were requests or hints, but Windows was an example.</p> <p>22 Q. Which version of Windows first included this</p> <p>23 functionality that you're aware of?</p> <p>24 A. No idea.</p> <p>25 Q. Would this have been sometime in the 2000s?</p>	<p style="text-align: right;">Page 15</p> <p>1 2000 to 2010 time period?</p> <p>2 A. I don't -- I don't recall specifically.</p> <p>3 Q. What hints or feedback or requests were you</p> <p>4 thinking about here?</p> <p>5 A. It may have been in connection with the -- a</p> <p>6 hint as to whether something was still in use or not.</p> <p>7 Q. What do you mean by that?</p> <p>8 A. Whether data that had been stored was still in</p> <p>9 use by the operating system.</p> <p>10 Q. And so the Windows operating system would</p> <p>11 provide this information or would the memory controller</p> <p>12 provide this information?</p> <p>13 A. My recollection is that Windows was providing</p> <p>14 it, but it -- I -- you know, I just don't recall the</p> <p>15 details. If I could recall the details I could give you</p> <p>16 a better answer, but I don't recall the details of it.</p> <p>17 Q. Other than the Windows operating system, prior</p> <p>18 to this litigation, are you aware of any other instances</p> <p>19 where the host shared some of the control functionality</p> <p>20 with the flash memory controller?</p> <p>21 A. My recollection is that embedded systems that</p> <p>22 I've used the -- the processor in that system had direct</p> <p>23 control over the flash memory. And it would be a memory</p> <p>24 controller but not at the level of having a flash</p> <p>25 translation layer. In that kind of system there's not</p>
<p style="text-align: right;">Page 16</p> <p>1 necessarily division between host and say an external</p> <p>2 device, but within that kind of system, an embed system</p> <p>3 like that, the processor has direct control.</p> <p>4 Q. Are you referring back to the -- the processor</p> <p>5 that -- that included the flash memory that we were</p> <p>6 discussing earlier or is this something else?</p> <p>7 A. This would be something else where I -- I have</p> <p>8 I would say an embedded processing board that contains</p> <p>9 flash memory and there is a memory controller for that</p> <p>10 flash memory. But it's the -- the processor is making</p> <p>11 direct access to the flash memory and addressing it</p> <p>12 directly, but they're -- they're part of say the same</p> <p>13 board.</p> <p>14 Q. When did you work on this particular device?</p> <p>15 A. I've worked on a series of devices like that</p> <p>16 dating back to, I think the 2000 timeframe going forward</p> <p>17 to late 2010s at least.</p> <p>18 Q. So in these systems that had -- where the</p> <p>19 processor had direct access to the memory, in that case,</p> <p>20 would the processor be the one that initiated write and</p> <p>21 erase commands?</p> <p>22 A. Yes. There really wasn't anything else to do</p> <p>23 that in the system, though I -- I would say that it is</p> <p>24 possible to do some of that externally as well.</p> <p>25 Sometimes you can use an external program</p>	<p style="text-align: right;">Page 17</p> <p>1 or device to program the embedded system, and by program</p> <p>2 I mean, load something into memory or debug it.</p> <p>3 Q. And did your -- strike that.</p> <p>4 So did your -- the systems you worked on</p> <p>5 have the ability for external programs or devices to --</p> <p>6 to load something or -- into the memory or debug it?</p> <p>7 A. I -- I -- it wasn't the external programs to</p> <p>8 do it. It would be the external program or a physical</p> <p>9 device that could connect to it that was also often a</p> <p>10 debugger and that would allow you to, for example, step</p> <p>11 through processor instructions.</p> <p>12 And in some cases, it would allow you to</p> <p>13 load a program into memory. I don't recall whether it</p> <p>14 was also allowed you to do it with flash memory, but</p> <p>15 that could -- I have worked on a bunch of such devices,</p> <p>16 so I certainly couldn't rule that out.</p> <p>17 Q. So in the instances that you worked on prior</p> <p>18 to 2010 where there was a processor that had direct</p> <p>19 access to the memory, did those systems include wear</p> <p>20 leveling?</p> <p>21 A. To the best of my recollection, no, they did</p> <p>22 not.</p> <p>23 Q. Did they include error correction coding?</p> <p>24 A. I don't know.</p> <p>25 Q. Did they include defect detection in the</p>

<p style="text-align: right;">Page 18</p> <p>1 memory?</p> <p>2 A. Not that I can recall, no. I -- I can't say</p> <p>3 they didn't, but I don't recall it.</p> <p>4 Q. What did the flash memory controller do in</p> <p>5 that system?</p> <p>6 A. Well, there are a bunch of such systems. My</p> <p>7 general recollection is that it was responsible for</p> <p>8 the -- taking the requests over the bus and translating</p> <p>9 those into specific signals for the flash memory chip or</p> <p>10 chips.</p> <p>11 Q. By signals, do you mean electrical signals?</p> <p>12 A. Well, everything in there is electrical</p> <p>13 signals.</p> <p>14 Q. Fair enough. What do you mean by signals</p> <p>15 then?</p> <p>16 A. There are -- on a -- in a typical device that</p> <p>17 I would be working with the processor would send out</p> <p>18 requests on a bus that could -- in a format that was the</p> <p>19 same for all the other units connected to that bus. And</p> <p>20 then in the case of a memory controller that memory</p> <p>21 controller would be responsible for interpreting that</p> <p>22 bus signal, for example, determining that it was</p> <p>23 destined for it and translating that into the specific</p> <p>24 lines and timing that are used to communicate with the</p> <p>25 particular memory device.</p>	<p style="text-align: right;">Page 19</p> <p>1 Q. I see. So on -- in these systems you could</p> <p>2 have multiple flash memory devices connected to the same</p> <p>3 bus; is that correct?</p> <p>4 A. Conceptually probably. I don't recall ever</p> <p>5 having that. I mean, the device -- the boards were</p> <p>6 either purpose built by us or built by someone that --</p> <p>7 they weren't boards where you could just plug another</p> <p>8 flash memory -- you weren't plugging flash memory</p> <p>9 devices in, they were part of the board.</p> <p>10 Q. What other devices were connected to the bus?</p> <p>11 A. You could have -- generally, I recall there</p> <p>12 were -- would have been RAM memory. There could be a</p> <p>13 network adapter. There could be a serial communication</p> <p>14 port. There -- it really depended on the board and the</p> <p>15 processor. And some of these things were part of the</p> <p>16 processor chip at times. Some of them weren't, but even</p> <p>17 -- oftentimes, even on the processor chip, they would be</p> <p>18 on the same -- on the bus that could also communicate,</p> <p>19 externally.</p> <p>20 Q. Approximately, when were you retained for this</p> <p>21 case?</p> <p>22 A. Oh, I believe it was in July of 2023, and</p> <p>23 it -- I wasn't retained for this case but retained by</p> <p>24 Radian in 2023.</p> <p>25 Q. What were you asked to do when you were first</p>
<p style="text-align: right;">Page 20</p> <p>1 retained in 2023?</p> <p>2 MR. CURRY: I'm going to instruct the</p> <p>3 witness not to reveal any work product. And -- and,</p> <p>4 Counsel, the way you've stated your question, actually,</p> <p>5 I think, just calls for work product outright. So I'll</p> <p>6 let the witness give a general answer, as long as by</p> <p>7 doing so, there's an agreement on the record that his</p> <p>8 answer does not constitute a waiver.</p> <p>9 MR. YANG: Agree. Fair enough.</p> <p>10 MR. CURRY: And so you can -- you can</p> <p>11 give a high-level description of what you were asked to</p> <p>12 do.</p> <p>13 A. Like, at -- at a high level, I was asked to</p> <p>14 answer questions after studying various Radian patents.</p> <p>15 Q. (BY MR. YANG) When did you start -- when did</p> <p>16 you start working on the Declaration you submitted in</p> <p>17 this case?</p> <p>18 A. Early this year.</p> <p>19 Q. Prior to that, had you analyzed Samsung</p> <p>20 products with respect to the patents in this case?</p> <p>21 A. I would need to look back to check. I -- I</p> <p>22 believe I may have, but I -- I don't recall</p> <p>23 specifically.</p> <p>24 Q. And prior to this litigation, had you ever</p> <p>25 analyzed Samsung's flash memory device products?</p>	<p style="text-align: right;">Page 21</p> <p>1 A. I had evaluated them for purchasing certain</p> <p>2 drives for my own use, but I don't recall doing so in</p> <p>3 another context.</p> <p>4 Q. Have you used a Samsung flash memory device</p> <p>5 before?</p> <p>6 A. Yes.</p> <p>7 Q. In what -- in what context?</p> <p>8 A. I have used them for storage on my personal</p> <p>9 convenience system.</p> <p>10 Well, that's what comes to mind.</p> <p>11 Q. Anything else?</p> <p>12 A. Not that I can think of.</p> <p>13 Q. Had you ever developed a system that used a</p> <p>14 flash memory that was compliant with NVMe?</p> <p>15 A. When you say "developed a system," what do you</p> <p>16 mean?</p> <p>17 Q. Designed any system in any way that used</p> <p>18 memory that was compliant with NVMe?</p> <p>19 A. Other than selecting drives for my personal</p> <p>20 convenience system, no.</p> <p>21 Q. And so the drives that you used for your</p> <p>22 personal computing system, those were compliant with</p> <p>23 NVMe; is that correct?</p> <p>24 A. My recollection is that at least one of them</p> <p>25 is. I would need to go back and check, but that's my</p>

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1 **recollection.**
2 Q. Did you ever design any systems that used
3 flash memory that was compliant -- compliant with ZNS?
4 **A. No.**
5 Q. Have you ever designed any systems that used
6 flash memory where the host and the controller shared
7 control functions?
8 **A. No.**
9 Q. Now, in preparing your Declaration that you
10 submitted in this case, what materials did you consider?
11 **A. Well, the materials that I relied upon in**
12 **forming my opinion are cited in my Declaration. That's**
13 **how I would put it.**
14 Q. Were there any documents that you considered
15 in forming your opinions that were not cited in your
16 Declaration?
17 **A. There were certainly documents that I saw that**
18 **I haven't relied upon that I didn't cite. I did a**
19 **independent search of the -- what I could find on public**
20 **information, and certainly, came across many things**
21 **doing that, but the things that I relied upon, are**
22 **cited.**
23 Q. What kind of materials did you consider that
24 were not relied upon in your Declaration -- sorry. Let
25 me say that again.

Page 24

1 **A. I think there was a back and forth on that to**
2 **arrive at that list.**
3 Q. Between you and the attorneys, who identified
4 the Accused Products that you cite in your Declaration?
5 **A. I believe that was a back-and-forth process.**
6 Q. So you can't say, in other words?
7 **A. Well, the final list included was my decision.**
8 **The -- but I don't believe that that particular list was**
9 **just given to me by the attorneys either.**
10 Q. Let me phrase it a better way. I understand
11 now.
12 Who -- between you and the attorneys, who
13 was the first to identify the Accused Products listed in
14 your -- in your Declaration?
15 **A. That, I don't recall. In -- in -- that one, I**
16 **couldn't tell you.**
17 Q. Were there any products, Samsung products,
18 that you analyzed, that you found not to infringe the
19 two patents in your Declaration?
20 MR. CURRY: I'm going to instruct the
21 witness not to answer based on work product.
22 MR. YANG: Counsel, could you explain
23 that one because I'm -- all I'm asking is whether he's
24 aware of Samsung products that do not infringe with the
25 two patents in his Declaration.

Page 23

1 What kind of materials did you consider
2 that were not cited in your Declaration?
3 **A. Anything that I would have seen in these**
4 **searches were things that I determined weren't relevant**
5 **to what I was opining upon.**
6 **But those could include research papers,**
7 **portions of Samsung's website, lots of materials. I**
8 **just didn't -- you know, things that I found that had**
9 **information that I found relevant to what I was opining**
10 **on.**
11 Q. Well, we're talking about Internet searches
12 here; is that correct?
13 **A. That's correct.**
14 Q. I see. So you performed your own searching of
15 materials in forming your opinions in your Declaration;
16 is that correct?
17 **A. Yes, I also -- the attorneys on the case also**
18 **had materials they drew my attention to as well.**
19 Q. The materials cited in your Declaration, were
20 those found by you? Or were those provided by the
21 attorneys?
22 **A. I believe it was a combination.**
23 Q. For the Samsung products identified in your
24 Declaration, was that list of products provided by
25 Radian, or was that something that you had determined?

Page 25

1 MR. CURRY: Yes, that's work product, and
2 I'm instructing the witness not to answer.
3 MR. YANG: How is that work product?
4 MR. CURRY: Because it's not been
5 disclosed to you what work we've done along those lines,
6 and therefore, it's not waived.
7 MR. YANG: Yeah, so whether or not he's
8 aware of not infringing Samsung products, isn't work
9 product.
10 Why are you claiming that it is?
11 MR. CURRY: You asked: "Were there any
12 products, Samsung products, that you analyzed that you
13 found not to infringe the two patents in your
14 Declaration?"
15 To the extent that we've done that work
16 and have not disclosed it to you, that's work product
17 that's not been waived.
18 MR. YANG: Let me ask it a different way
19 then.
20 Q. (BY MR. YANG) Are you aware of any Samsung
21 flash memory devices that do not infringe the
22 two patents in your Declaration?
23 MR. CURRY: To the extent your answer
24 involves any undisclosed work product, I caution the
25 witness not to reveal any such undisclosed work product.

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1 Otherwise, you can answer, if there's anything left in
2 your answer to give.
3 **A. I'm not sure I -- is -- is there anyway to**
4 **take a break and get an understanding of what the**
5 **direction means because, I -- I guess, I'm not -- I**
6 **don't want reveal work product, but I also don't quite**
7 **follow.**
8 MR. YANG: Yes. I'm happy to take a
9 break, if that -- if that helps. Let's go off the
10 record.
11 **THE WITNESS: Okay.**
12 VIDEOGRAPHER: Going off the record.
13 The time is 10:08 Central Time.
14 (Break)
15 VIDEOGRAPHER: We are back on the record.
16 The time is 10:17 a.m. Central Time.
17 Q. (BY MR. YANG) Are you aware of any Samsung
18 flash products that do not infringe the two patents in
19 your Declaration?
20 MR. CURRY: The same instruction and
21 caution.
22 **A. Yes. For example, Samsung has made SSDs that**
23 **are just based on a conventional FTL. Those don't**
24 **require analysis really to figure out whether they**
25 **infringe or not, they don't.**

Page 28

1 Q. Okay. So the Accused Products do use a
2 conventional FTL then?
3 **A. As far as I know, they have the ability to be**
4 **used without ZNS, and my understanding is based on that,**
5 **that they can -- that they have a conventional FTL that**
6 **could be used when not used with the ZNS protocol.**
7 Q. I see. So if the Accused Products do not have
8 the ZNS functionality and they just use a conventional
9 FTL, then that wouldn't infringe, correct?
10 **A. I'm sorry. Can you ask that one more time.**
11 Q. Sure. If the Accused Products didn't have ZNS
12 capability and they used a conventional FTL, then that
13 would not infringe the two patents in the Declaration,
14 correct.
15 **A. I haven't done that analysis, but if all they**
16 **used -- all they had was conventional FTL, then they**
17 **would infringe.**
18 Q. What do you mean by the accused products have
19 capability to be used without ZNS?
20 **A. My understanding is that they can be used as**
21 **a -- well, they can be interfaced to without using ZNS.**
22 Q. If the Accused Products are -- don't have ZNS
23 functionality, then they would not infringe the two
24 patents that you identified in your Declaration,
25 correct?

Page 27

1 **Samsung also makes flash memory chips**
2 **that, on their own, don't infringe and don't require**
3 **analysis to determine that.**
4 Q. (BY MR. YANG) When did you first become aware
5 of Samsung's flash devices that use a conventional FTL?
6 **A. I -- I don't know. It's -- it's been a --**
7 **like, certainly, been a while, but I -- I don't know**
8 **when I first learned of it.**
9 Q. What do you mean by conventional FTL?
10 **A. A flash -- devices that employ a controller**
11 **that uses a FTL in a way that's consistent with what**
12 **I've seen in the -- done in industry for a -- a long**
13 **period of time. That's not to say that one can't have**
14 **innovations in FTL, but it's an FTL, as generally**
15 **understood.**
16 Q. What is the difference between a conventional
17 FTL and the FTLs in the Accused Products that you list
18 in your Declaration?
19 **A. The Accused Products have the capability to**
20 **use the ZNS protocol.**
21 Q. So are you -- you saying that a ZNS -- strike
22 that.
23 Are you saying a product that is compliant
24 with ZNS, does not use a conventional FTL?
25 **A. No.**

Page 29

1 **A. I couldn't tell they -- they wouldn't**
2 **infringe. I can tell you my analysis is based on ZNS.**
3 **I haven't done any other analysis.**
4 Q. Just so I understand correctly, when you say
5 that the accused devices can be interfaced with --
6 without using ZNS, are you saying that the ZNS can be
7 bypassed?
8 **A. I don't have enough information to know**
9 **exactly how that works.**
10 **What I do know is that it's -- or the**
11 **documentation I've seen has indicated that it is**
12 **something that is an additional feature, and I don't**
13 **know whether that means that's something that is**
14 **configured by Samsung or can be configured -- or**
15 **something that can be configured on the fly, I -- I**
16 **couldn't tell you that.**
17 Q. I see. So if a accused device is sold without
18 the ZNS feature added to it, you haven't done an
19 analysis of whether or not such a product would
20 infringe, correct?
21 MR. CURRY: I'm going to instruct on --
22 on work product, not to answer this question.
23 MR. YANG: Okay. I disagree with both of
24 the objections so far. We may have to take this up at a
25 later time, but let me see if I can rephrase the

<p>Page 30</p> <p>1 question a little bit here. I'll take out the analysis 2 part of the question. 3 Q. (BY MR. YANG) If an accused device is sold 4 without the ZNS feature, then that would not infringe, 5 correct? 6 A. I think it would depend on whether it's being 7 sold with -- it would depend on how it can be 8 configured. In -- in other words, if -- if it's 9 something that it's being sold and the end user's being 10 provided with the ability to configure for ZNS, then 11 that would be one. That's probably more of a legal 12 question than it is a question for me, but if it's being 13 sold and cannot be used for ZNS at all, I don't have an 14 opinion that it infringes. 15 Q. If an accused product is sold without the 16 ability for the customer to implement ZNS, then you 17 would agree that it does not infringe, correct, the two 18 patents in your Declaration? 19 A. I would agree that I haven't done -- I mean, 20 my analysis doesn't apply to those -- to such a product. 21 Q. And based on the evidence that you have see in 22 the case, you're unaware of what -- strike that. Let me 23 start over again. 24 You are unaware of whether or not ZNS 25 is -- let me start over again.</p>	<p>Page 31</p> <p>1 You're not aware of whether ZNS is -- let 2 me say it a different way. 3 You testified that there was documentation 4 that you saw that indicated ZNS was an additional 5 feature; is that correct? 6 A. Yes, that's correct. 7 Q. You're not aware of how that additional 8 feature is enabled or added to the Accused Products, 9 correct? 10 A. My understanding is it relates to firmware, 11 but I'm not -- I don't have an understanding of the -- 12 the timing of or whether that's in all the firmware 13 whether it's -- that is not something I could see in the 14 documentation. 15 Q. What is firmware? 16 A. Firmware is software that's loaded typically 17 as part of an embedded -- or run by an embedded 18 processor. 19 In this case it's for the memory 20 controller on the device. 21 Q. So is this firmware provided by Samsung or the 22 customer? 23 A. Based on what I've read, I believe it was 24 provided by Samsung but I don't know -- the 25 documentation doesn't say who installs it or when it's</p>
<p>Page 32</p> <p>1 installed. There will be firmware on that device. I 2 just don't know the timing of -- or selection of 3 those -- of those features, if that's something that can 4 be done by the customer downloading new firmware or this 5 is something Samsung has to do. 6 I -- that wasn't something I could see in 7 the documentation. 8 Q. So without this firmware -- just so I 9 understand what we're talking about here. 10 Is it fair to refer to this as ZNS 11 firmware, just for the sake of this deposition? 12 A. I don't know it is. There it -- it -- I guess 13 we could -- one way to say it might be the firmware with 14 ZNS capability because are there are -- there's always 15 going to be firmware out there. 16 Q. Fair enough. Okay. 17 So without the firmware with ZNS 18 capability, could the Accused Products infringe the two 19 patents in your Declaration? 20 A. I -- I don't have an analysis that they do. I 21 -- I don't know -- beyond that I don't know the answer 22 to your question because I haven't analyzed anything 23 else. 24 Q. So your infringement analysis assumes that the 25 firmware that implements ZNS is installed on the Accused</p>	<p>Page 33</p> <p>1 Products, correct? 2 A. Yes, or sold with it, but it's -- it's -- the 3 analysis is for a device that has that firmware. 4 Q. Did you analyze any products -- any Samsung 5 Accused Products that actually have that firmware 6 installed? 7 A. I did not have the actual products, so I 8 analyzed the documentation that I have. 9 Q. Ah. Let me take a step back and ask you this. 10 So did you analyze any Samsung products 11 themselves in forming your opinions in your Declaration? 12 MR. CURRY: Objection, form. 13 A. I analyzed documentation for the -- that I -- 14 what was publicly available, but I don't have -- I did 15 not, for example, have the physical products to examine 16 or the -- or to use. 17 Q. (BY MR. YANG) So you didn't do any testing of 18 Samsung Accused Products in forming your opinions; is 19 that correct? 20 A. That's correct. 21 Q. Did you analyze how Samsung's products -- 22 well, let me take a step back. 23 I understand that in your Declaration you 24 provided opinions based on the ZNS specification itself, 25 correct?</p>

Page 34

1 A. Yes.

2 Q. Have you analyzed how Samsung's Accused

3 Products actually implement the ZNS standard?

4 A. Not -- I could not do that without -- for

5 example, the source code for Samsung's devices. So I --

6 I've not analyzed their implementation.

7 Q. Is it your opinion that to implement the ZNS

8 standard, you necessarily have to infringe the two

9 patents in your Declaration?

10 A. I don't know. I don't know of a way not to --

11 nothing comes to mind, but I haven't tried to figure

12 that out either.

13 Q. Okay. So there could be ways to implement the

14 ZNS standard that do not infringe either of the two

15 patents in your Declaration; is that correct?

16 A. There -- I -- I can't really -- since I

17 haven't done the analysis I couldn't say there aren't.

18 MR. YANG: Let's mark some exhibits for

19 the record. All right. Guys, the copy folks only

20 printed out one of copy of each of my exhibits instead

21 of the four that I asked for, but it's just the patents

22 in the case so hopefully that doesn't throw you guys off

23 too much.

24 MR. CURRY: Do you want to reschedule the

25 deposition for another time?

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1 Let me know when you get there.

2 A. I'm there.

3 Q. Okay. And are you familiar with the patents

4 disclosure regarding delegated copy and data relocation?

5 A. I've read it but it's been a while since I

6 have read it.

7 Q. I'm going to ask you some questions about the

8 first paragraph here. Do you want to take a chance to

9 read it first?

10 A. Yes.

11 Q. Okay.

12 A. Do you want me to read all the way down the

13 entire -- like it's a long paragraph so if there's some

14 place you want me to stop.

15 Q. Well, I'm going to ask you questions for the

16 second half of that paragraph and so if you --

17 (Pause in Proceedings)

18 THE WITNESS: All right. I'm done

19 reading that.

20 Q. (BY MR. YANG) Okay. Now, in flash memory in

21 order to write to a memory location, that location has

22 to be erased first, correct?

23 A. At -- at a high level, that's correct.

24 Q. In other words, in flash memory there's no

25 overwrite command, correct?

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1 MR. YANG: No, no. We don't need to do

2 that. That would be -- that would be a significant

3 waste of all our time.

4 All right. So let's mark as Exhibit 1 to

5 the deposition, U.S. Patent No. 11544183.

6 Let's mark as Exhibit 2, U.S. Patent No.

7 11347656.

8 And Dr. Jones, just fair warning here, the

9 staple doesn't seem to have gone through all the way on

10 this Exhibit 2.

11 THE WITNESS: Okay.

12 MR. YANG: Try to keep these together, and

13 these are Exhibit's Q and R respectively to your

14 deposition.

15 (Defendant's Exhibit No. 1-2 marked.)

16 Q. (BY MR. YANG) Dr. Jones, do you recognize

17 Exhibit 1 and 2?

18 A. I do.

19 Q. Did you analyze all the disclosures in these

20 two patents before forming your opinions?

21 A. I did.

22 Q. Now in Exhibit 1, which is the '183 Patent, I

23 would like to direct you to the section beginning at

24 Line 4 of Column 24 and it's the section titled,

25 Delegated Copy/Data Relocation.

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1 A. That's correct.

2 Q. Now, I would like to turn your attention to

3 the sentence starting on Line 32 of Column 24, the one

4 that begins as an optional.

5 Do you see that?

6 A. I do.

7 Q. Okay. Now, this sentence describes an option

8 where memory locations are released but not yet erased,

9 correct?

10 A. That's correct.

11 Q. Okay. And it states specifically here that

12 these memory units cannot be written to until the entire

13 erased unit associated with those pages is first erased,

14 correct?

15 A. That's correct.

16 Q. Okay. So in flash memory where you have

17 page -- pages that are released but not yet erased, the

18 page cannot be written to, correct?

19 A. In the sense that released is being used here,

20 yes.

21 Q. In the next sentence it discusses another

22 optional command feature where there could be an

23 automatic erase operation under certain conditions,

24 correct?

25 A. Or an automatic check and then the EU is

<p style="text-align: right;">Page 38</p> <p>1 erased.</p> <p>2 Q. Fair enough. And that check is if the release</p> <p>3 releases the entire erased unit, correct?</p> <p>4 A. Yeah -- I think the i.e. there is the right</p> <p>5 way to -- that it's a release of the last page. In</p> <p>6 other words, there are no more -- there are no pages</p> <p>7 that have -- validated them or data that is being relied</p> <p>8 upon.</p> <p>9 Q. Okay. So there are instances where the</p> <p>10 release of pages can result in an erase operation and</p> <p>11 there's also the scenario where the release of a page</p> <p>12 does not result in an erase operation, correct?</p> <p>13 A. Correct.</p> <p>14 Q. So if I could turn you to line -- sorry,</p> <p>15 column 26, Line 19, there's a sentence that begins NA --</p> <p>16 NVMe compatible environment.</p> <p>17 Do you see that?</p> <p>18 A. I do.</p> <p>19 Q. Okay. And this states in a NVM- -- NVMe</p> <p>20 compatible embodiment an explicit erase command can be</p> <p>21 implemented using a vendor-specific extension of the</p> <p>22 D allocate administrative command.</p> <p>23 Do you see that?</p> <p>24 A. I do.</p> <p>25 Q. Are you familiar with the D allocate</p>	<p style="text-align: right;">Page 39</p> <p>1 administrative command in NVMe?</p> <p>2 A. I have seen it but I don't recall the -- its</p> <p>3 parameters and the details of it.</p> <p>4 Q. Do you recall what it's for?</p> <p>5 A. Not separately from what's being described</p> <p>6 here. I don't know.</p> <p>7 Q. What's being described here? Sorry. Let me</p> <p>8 ask a better question.</p> <p>9 What is the functionality of the D</p> <p>10 allocate command that's being described here?</p> <p>11 A. That it can be used to implement a -- an</p> <p>12 explicit erase command with a vendor specific extension</p> <p>13 of that command.</p> <p>14 Q. What is vendor specific extension mean?</p> <p>15 A. That would -- I can tell you generally what it</p> <p>16 means. I don't know with respect to the D allocate</p> <p>17 command, but generally vendor specific extensions are</p> <p>18 ways that a particular device vendor can provide</p> <p>19 specific -- or extend the commands in a way that allows</p> <p>20 them to perform or get additional information, perform</p> <p>21 additional commands, or make those available as part of</p> <p>22 the -- in a way that other vendors don't have.</p> <p>23 In other words, if you -- if you send such</p> <p>24 a command to a different vendor, you don't know what's</p> <p>25 going to happen. It's -- it's designed for that</p>
<p style="text-align: right;">Page 40</p> <p>1 particular vendor.</p> <p>2 Q. I see. So is it correct to say that a vendor</p> <p>3 specific extension is functionality that the vendor adds</p> <p>4 to existing functionality in a standard?</p> <p>5 A. It -- it can be. It's -- it's -- I would say</p> <p>6 it's more about allowing you to provide a mechanism to</p> <p>7 communicate with that vendor's device that is not</p> <p>8 standardized so they could -- it doesn't mean they're</p> <p>9 doing -- necessarily doing something additional. It</p> <p>10 just means that you have either access to some</p> <p>11 information or you can set a command.</p> <p>12 That's different to -- you can't just send</p> <p>13 anything you want, but the implication here is that I</p> <p>14 could extend that command in a vendor-specific way.</p> <p>15 Q. Okay. So I just want to make sure I</p> <p>16 understand what you're saying here.</p> <p>17 So in this sentence, it says: "In a NVMe</p> <p>18 compatible embodiment an explicit erase command can be</p> <p>19 implemented, using a vendor-specific extension of the</p> <p>20 D allocate administrator command."</p> <p>21 So is this saying that a vendor can add an</p> <p>22 explicit erase command as an extension to the D allocate</p> <p>23 command that exists in NVMe?</p> <p>24 A. Without looking at the -- the ways that I can</p> <p>25 do a vendor-specific extension in the standard, I -- I</p>	<p style="text-align: right;">Page 41</p> <p>1 couldn't tell you. I don't know that it's saying</p> <p>2 that -- I'm not sure whether it's saying that they're</p> <p>3 going to provide additional information in the command</p> <p>4 or the command is going to do something different, and</p> <p>5 you just have to know it.</p> <p>6 It's -- there's not enough detail here,</p> <p>7 and I would have to look back at the standard to see it.</p> <p>8 Q. So you don't know whether the NVMe standard,</p> <p>9 prior to the '18 Patent being filed, already included a</p> <p>10 D allocate command that included the erase</p> <p>11 functionality; is that correct?</p> <p>12 A. That's correct.</p> <p>13 Q. And it's possible, based on what you're seeing</p> <p>14 here, that the NVMe standard already included a</p> <p>15 D allocate command that included an erase command,</p> <p>16 correct?</p> <p>17 A. It's not what I necessarily read it to be</p> <p>18 saying, but I can't rule it out without going back and</p> <p>19 reading that in detail.</p> <p>20 (Defendant's Exhibit No. 3 marked)</p> <p>21 MR. YANG: I would like to mark as</p> <p>22 Exhibit 3, the Declaration of Dr. Mark T. Jones in</p> <p>23 support of Plaintiff's Motion for Preliminary</p> <p>24 Injunction. And sorry, I only got one copy.</p> <p>25 (Defendant's Exhibit No. 3 marked.)</p>

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1 Q. (BY MR. YANG) Dr. Jones, do you recognize
2 Exhibit 3?

3 A. Yes, this is the Declaration that I forwarded.

4 Q. Now, if you could turn to -- well, before I
5 get to that, are you aware of any corrections that you
6 need to make to this Declaration?

7 A. No, I'm not.

8 Q. Okay. So as far as you're aware, sitting here
9 today, all the information and opinions you provided in
10 this Declaration is accurate, correct?

11 A. That's correct.

12 Q. Okay. Now, if you could turn to page 5 of
13 your Declaration.

14 A. (Witness complies.)

15 Q. You excerpted a portion of the 183
16 specification.

17 Do you see that?

18 A. I do.

19 Q. Okay. And at the top of this page, there's
20 reference to PE asymmetry.

21 Do you see that?

22 A. I'm sorry. Which --

23 Q. Sorry. Page 5 of your Declaration.

24 A. I'm there, yeah. Oh, sorry. I -- I see what
25 you mean, yes.

Page 44

1 of your Declaration. And at the top of the page, you
2 have the abstract of the '183 Patent we produced there.

3 Do you see that?

4 A. I do.

5 Q. Okay. Now, this specif- -- the abstract
6 refers to the host -- it says: "The host can
7 specifically then command each of the consolidation and
8 erase using direct addressing."

9 Do you see that, toward the middle of the
10 abstract?

11 A. I do.

12 Q. Then it says: "By redefining host controller
13 responsibilities in this manner, much of the overhead
14 association with the FTL functions can be substantially
15 removed from the memory controller with the host
16 directly specifying physical addresses."

17 Do you see that?

18 A. I do.

19 Q. Okay. And so what this is describing is one
20 of the benefits of the invention, being that the host
21 can directly specify the physical address as opposed to
22 using FTL, correct?

23 A. It's describing one of the benefits at least
24 an embodiment. I don't know that it's saying that it's
25 removing all of the flash trans layer -- trans --

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1 Q. What is PE asymmetry?

2 A. That there's a difference in the behaviors for
3 erase and program. In other words, as an example,
4 programming is typically done at the level of pages.
5 And erase is done in erasures (phonetic), which are much
6 larger blocks than pages, or typically, much large
7 blocks.

8 Q. And is programming here, referred to write
9 commands?

10 A. Yes.

11 Q. Okay. Now, it says here -- it references an
12 attempt to write data to an already programmed location
13 without an intervening erase option.

14 Why is it that in flash memory, you have
15 to have an intervening erase operation before you can
16 write data to a particular location?

17 MR. CURRY: Object to form.

18 A. That's a requirement of the -- driven by the
19 physics of the devices.

20 Q. (BY MR. YANG) And what is it about the
21 physicals of the devices that prevent writing to a
22 location without first erasing the information in that
23 location?

24 A. That, I don't recall.

25 Q. And I'd like to turn your attention to page 9

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1 translation layer functions, but certainly, removing
2 much of it.

3 Q. Yes. And I didn't mean to suggest that you
4 remove all of the flash translation layer.

5 My understanding, and just let me know if
6 I'm correct here, the abstract indicates that one of the
7 benefits of the '183 Patent is that the host can
8 directly specify physical addresses, which removes a lot
9 of the overhead you have, from a traditional memory
10 controller; is that correct?

11 A. Yes.

12 Q. Okay. Do you see that benefit being realized
13 in Claim 1 of the '183 Patent, which you have on the
14 previous page of your Declaration?

15 MR. CURRY: Object to form.

16 A. I see the benefit of removing some of the
17 overhead that would be associated with typical FTL
18 functions of being the benefit, but I don't see the
19 Claim 1 requiring the direct addressing using physical
20 addresses by the host.

21 Q. (BY MR. YANG) Right. So in the abstract, it
22 says: "Much of the overhead associated with FTL
23 functions can substantially remove from the memory
24 controller with the host directly specifying physical
25 addresses."

<p style="text-align: right;">Page 46</p> <p>1 You don't see this requirement or the</p> <p>2 associated benefit of carrying Claim 1 of '813 Patent,</p> <p>3 correct?</p> <p>4 MR. CURRY: Object to form.</p> <p>5 A. And I see some parts being described here in</p> <p>6 these two sentences as being described in Claim 1, but I</p> <p>7 would agree that Claim 1 does not specify direct</p> <p>8 addressing.</p> <p>9 Q. (BY MR. YANG) For any benefit associated with</p> <p>10 direct addressing, correct?</p> <p>11 MR. CURRY: Object to form.</p> <p>12 MR. YANG: That's a --</p> <p>13 THE WITNESS: Right.</p> <p>14 MR. YANG: Four not form. I'm sorry.</p> <p>15 A. I would agree with respect to the directs --</p> <p>16 directly specifying physical addresses. That's not</p> <p>17 something that's in Claim 1.</p> <p>18 Q. (BY MR. YANG) All right. So in your</p> <p>19 interpretation of Claim 1 -- Claim 1, when it refers to</p> <p>20 addresses there, that can include both logical and</p> <p>21 physical addresses, correct?</p> <p>22 A. Yes.</p> <p>23 Q. Now, in the second-to-the-last limitation,</p> <p>24 where it refers to detecting a defect in one of the</p> <p>25 erase blocks, do you see that?</p>	<p style="text-align: right;">Page 47</p> <p>1 A. I do.</p> <p>2 Q. Is that defect limited to physical addresses?</p> <p>3 A. I -- I'm not sure what you mean.</p> <p>4 Q. Let me ask it a different way.</p> <p>5 When you have a -- what is a defect in an</p> <p>6 erase block?</p> <p>7 A. The erase block has an air condition that</p> <p>8 indicates that it is defective, which typically means</p> <p>9 that you no longer want to use it or you've classified</p> <p>10 it as not usable.</p> <p>11 Q. Okay. And this limitation requires -- well,</p> <p>12 let me take a step back.</p> <p>13 It states: "Logic to in connection with</p> <p>14 the erasure, detect a defect in one of the erase</p> <p>15 blocks."</p> <p>16 Do you see that?</p> <p>17 A. I do.</p> <p>18 Q. So the detection of a defect -- strike that.</p> <p>19 Let me start over again.</p> <p>20 So Claim 1 of the '183 Patent requires</p> <p>21 that the detection of a defect is in connection with the</p> <p>22 erasure in the previous limitation, correct?</p> <p>23 A. I -- I would put it a little differently.</p> <p>24 It -- it -- it's saying it -- it's not requiring that</p> <p>25 all defects have to be detected that way, but it's</p>
<p style="text-align: right;">Page 48</p> <p>1 requiring that the claimed logic here has to detect a</p> <p>2 defect in one of the erased blocks, and to do so in</p> <p>3 connection with the erasure, which the erasure</p> <p>4 references the previous limitation.</p> <p>5 Q. Okay. I just want to make sure we're clear on</p> <p>6 how you're reading the claims here. So previous</p> <p>7 limitation requires logic to receive and erasure request</p> <p>8 from the host, correct?</p> <p>9 A. Yes.</p> <p>10 Q. And then Claim 1 also requires that</p> <p>11 responsibly control erasure of each unerased erase block</p> <p>12 in the group respective to the one specific -- one of</p> <p>13 the subdivisions, correct?</p> <p>14 A. Yes.</p> <p>15 Q. Okay. So that limitation requires logic to</p> <p>16 receive an erasure request from the host and then</p> <p>17 perform an erasure, correct?</p> <p>18 A. Yes.</p> <p>19 Q. Okay. The next limitation in Claim 1,</p> <p>20 requires logic to in connection with the erasure, detect</p> <p>21 a defect in one of the erase blocks.</p> <p>22 Do you see that?</p> <p>23 A. Yes.</p> <p>24 Q. The erasure refers back to the erase from the</p> <p>25 previous limitation, correct?</p>	<p style="text-align: right;">Page 49</p> <p>1 A. Correct.</p> <p>2 Q. Okay. So Claim 1 requires that there has to</p> <p>3 be logic to detect a defect in one of the erase blocks</p> <p>4 in connection with the erase from the previous</p> <p>5 limitation, correct?</p> <p>6 A. Correct.</p> <p>7 Q. Okay. I'd like you to turn to Paragraph 73 of</p> <p>8 your Declaration, which is on page 46 -- oh, sorry --</p> <p>9 Paragraph 75, which is on page 47.</p> <p>10 Now, this section identifies your analysis</p> <p>11 for the erasure limitation in Claim 1, correct?</p> <p>12 A. Yes.</p> <p>13 Q. And specifically, you're referring to the zone</p> <p>14 reset operation as the claimed erase command, correct?</p> <p>15 A. Correct.</p> <p>16 Q. What is a zone reset operation?</p> <p>17 A. It's a command from the host to the controller</p> <p>18 indicating that the entire -- that the zone can be -- or</p> <p>19 should be reset such that the zone is now in an empty</p> <p>20 state or will be transitioned to an empty state as a</p> <p>21 result of this.</p> <p>22 Q. What do you mean by transitioned to an empty</p> <p>23 space?</p> <p>24 A. I'm sorry, I must have said it wrong. Be</p> <p>25 transitioned to an empty state.</p>

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1 Q. Sorry. What do you mean by transitioned to an
2 empty state?

3 A. That in ZNS the zones are -- represent -- are
4 -- are in various states and those are governed by -- or
5 the transitions, changes from one state to another,
6 occur based on a state machine, and so one of the state
7 transitions happens when issuing a reset zone command to
8 a zone.

9 Q. In ZNS as part of this state transition to an
10 empty state, is there any erase command?

11 A. There will be an erase for the erase units
12 that are not -- that have data that has been written to
13 them since the last erase.

14 Q. Sorry, I'm not following, but I'm sure that's
15 probably my issue. Let me ask it a different way.
16 When there is a reset command that's
17 issued to a certain set of erase units, are those erase
18 units erased? Sorry. Let me start -- maybe there's a
19 better way to say this.

20 A. Okay.

21 Q. A reset command is when you transition certain
22 memories locations to being empty, correct?

23 A. It's when you -- the reset zone command
24 instructs the controller that that zone should be trans-
25 -- transitioned to the empty state. And that means

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1 A. Yeah. They must be erased. It does not
2 require -- it does not indicate the timing of when they
3 will be erased.

4 Q. But they must be erased if they're later going
5 to be written to again, correct?

6 A. Certainly. I -- I mean, if they're never
7 going to use them again, then they wouldn't have to
8 erase them, but there's no way for the controller to
9 know they're never going to be used again.

10 Q. But it's possible then that the controller
11 does not erase them until later on they're being
12 rewritten to again, correct?

13 A. That's possible, yes.

14 Q. And that later write command is a separate
15 command from the reset operation command, correct?

16 A. It is, though it's still responsive to the
17 previous command because it couldn't be erased unless it
18 had been indicated in this reset command that it was
19 ready to be erased.

20 Q. Now, if you turn to the next Limitation which
21 is Claim Limitation 1G, and this begins on page 50 of
22 your Declaration. You refer to Bad Block Management and
23 Error Correcting Code, correct?

24 A. You're talking about in the cited evidence?

25 Q. Yes, in the cited evidence.

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1 that -- that includes the right pointer for that being
2 set back to the beginning of the zone and that will
3 require that the -- in the blocks that -- we call them
4 erase units to be precise. The -- the erase units that
5 have been written to since the last erase of that erase
6 unit, those can be and will eventually be erased.

7 Q. Okay. So that's what I'm trying to understand
8 here that last part.

9 A. Uh-huh.

10 Q. When you use the reset command to release
11 memory locations, at which point does that -- there then
12 become an erase of those memory locations?

13 A. They are -- the standard doesn't specify the
14 timing, only that they will -- but the semantics
15 indicate that they will be erased because they have been
16 marked as -- the -- they -- the data is -- or that erase
17 unit is ready for erase because there is no more valid
18 data in it. The standard doesn't dictate when after
19 that but the timing of when that erase happens.

20 Q. Okay. So the reset request of ZNS indicates
21 when -- indicates that the released memory locations are
22 ready for erase, correct?

23 A. It -- it does, yes.

24 Q. And it doesn't specify if and when the
25 released memory units are actually erased, correct?

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1 A. Yes, I am.

2 Q. Let me ask it a different way then.
3 The claim limitation requires detecting a
4 defect in one of the erase blocks. What are the defects
5 that you're pointing to ZNS?

6 A. This wouldn't be a defect in the ZNS.

7 Q. Let me phrase it a better way then?

8 A. Sure.

9 Q. What are the defects that you're pointing to
10 in the Accused Products for Limitation 1G?

11 A. It would be defects that are connected to that
12 erase operation. So it would be something that's either
13 a return by the erase operation or any validation of
14 that erase operation valid -- or in connection with that
15 erase operation, any validation.

16 So in that -- for example, in what I'm
17 highlighting or underlining on page 51 for bad block --
18 for that section Bad Block Management Error Correcting
19 Code, it would be the bad blocks that are made during
20 erase operations.

21 Q. What do you mean made during erase operations?

22 A. That the memory controller on the SSD detects
23 during -- or in connection with that erase operation and
24 indicates that that's now classified as a bad block
25 based on detection of various error conditions during --

<p style="text-align: right;">Page 54</p> <p>1 or in connection to that erase operation.</p> <p>2 Q. I see. So just to make sure I understand,</p> <p>3 according to your analysis, the Accused Products will</p> <p>4 detect defects in connection with erase commands,</p> <p>5 correct?</p> <p>6 A. Yes.</p> <p>7 Q. And in response to those erase commands --</p> <p>8 sorry. In response to detecting those defects, that's</p> <p>9 when you take certain actions that you're citing here in</p> <p>10 Bad Block Management and Error Correcting Code, correct?</p> <p>11 A. Yes.</p> <p>12 Q. And the next section you have highlighted here</p> <p>13 says, "Why is OP important?"</p> <p>14 What is -- what is OP?</p> <p>15 A. Overprovisioning.</p> <p>16 Q. And what is -- why did you cite this</p> <p>17 overprovisioning section here?</p> <p>18 A. For the mention of Bad Block Management in the</p> <p>19 second line.</p> <p>20 Q. I see. So that's -- that's why you're citing</p> <p>21 to this particular passage?</p> <p>22 A. Yes.</p> <p>23 Q. And is that the same for the next passage as</p> <p>24 well --</p> <p>25 A. Yes.</p>	<p style="text-align: right;">Page 55</p> <p>1 Q. -- from the Microsoft Denali presentation?</p> <p>2 A. That's correct. At the bottom of page 51 the</p> <p>3 part I've underlined is mapping out bad blocks.</p> <p>4 Q. What does mapping out bad blocks refer to?</p> <p>5 A. It refers to the controller's ability to</p> <p>6 substitute another -- erasing it for a bad erase unit,</p> <p>7 but what's called a bad block.</p> <p>8 It is often the case that word block is</p> <p>9 used for erase units and that's what's being referenced</p> <p>10 there.</p> <p>11 MR. CURRY: Counsel, do you mind if we</p> <p>12 take a break?</p> <p>13 MR. YANG: Yeah, sure. We have been</p> <p>14 going about an hour.</p> <p>15 MR. CURRY: Yeah.</p> <p>16 MR. YANG: Let's go off the record.</p> <p>17 VIDEOGRAPHER: We're going off the</p> <p>18 record. The time is 11:26 Central Time.</p> <p>19 (Break taken)</p> <p>20 VIDEOGRAPHER: We are back on the record.</p> <p>21 The time is now 11:43 a.m. Central Time.</p> <p>22 MR. CURRY: Before we proceed with the</p> <p>23 questioning, I wanted to mention for the record that the</p> <p>24 parties have agreed separately that the time used today</p> <p>25 is going to be counting against the overall limits for</p>
<p style="text-align: right;">Page 56</p> <p>1 deposition that are provided in the court's discovery</p> <p>2 order.</p> <p>3 MR. YANG: I'm not aware of that, but</p> <p>4 that -- if that's the case, I certainly have no reason</p> <p>5 to disagree with that.</p> <p>6 Q. (BY MR. YANG) I'd like to move on to your</p> <p>7 opinions regarding the '646 Patent. If you could turn</p> <p>8 to --</p> <p>9 A. Or just put the 656 --</p> <p>10 Q. Sorry.</p> <p>11 A. Yeah.</p> <p>12 Q. 656.</p> <p>13 A. Yeah.</p> <p>14 Q. What did I say?</p> <p>15 A. 646. It's close.</p> <p>16 Q. It's close. Thank you for the correction.</p> <p>17 Now, if you could turn to paragraph 96 of</p> <p>18 your Declaration, which is page 63, and this is Exhibit</p> <p>19 3. What does the claim limitation mean when it states</p> <p>20 where in the circuitry is used -- is to use a division</p> <p>21 operation to identify a logical erase unit within the</p> <p>22 address seg -- segment?</p> <p>23 A. I just viewed that as plain and ordinary</p> <p>24 meaning.</p> <p>25 Q. What is a division operation?</p>	<p style="text-align: right;">Page 57</p> <p>1 A. An operation that divides.</p> <p>2 Q. In the context of flash memory, what is a</p> <p>3 division operation?</p> <p>4 A. It's -- examples could be performing a</p> <p>5 integer -- integer division, it could be division</p> <p>6 including modular arithmetic, it could be dividing</p> <p>7 address -- address into portions. Those are examples.</p> <p>8 Q. I see. So conceptually how is a -- or how can</p> <p>9 a division operation be used to identify a logical erase</p> <p>10 unit?</p> <p>11 A. An example would be to take a -- an offset of</p> <p>12 an address into the zone and divide that by the number</p> <p>13 of erase units in the zone with an integer division and</p> <p>14 that would identify a logical erase unit within the</p> <p>15 zone.</p> <p>16 Q. I see. Let me take a step back then.</p> <p>17 So identifying a logical erase unit within</p> <p>18 an address segment, address segments contain multiple</p> <p>19 logical erases; is that correct?</p> <p>20 A. Yes. Or let me make sure -- let me just go</p> <p>21 back to the beginning.</p> <p>22 Q. Take your time.</p> <p>23 A. The claim doesn't specify that the address</p> <p>24 segment has multiple logical erase units, but that is</p> <p>25 how I understand the claim based on the identify</p>

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1 language.
2 Q. Right. You wouldn't need -- need a division
3 operation if the address segment only has one logical
4 erase unit, correct?
5 A. That's the understanding that -- that I've
6 applied. I -- I mean, if there's another way to look at
7 it -- the view I've taken and my understanding would be
8 in accordance with what you just said.
9 Q. Now, there are ways to identify logical erase
10 units within an address segment other than using a
11 division operation, correct?
12 A. I really haven't considered whether there is
13 another way. I -- I would -- nothing comes to mind, but
14 I certainly haven't set out to rule it out.
15 Q. Sure. For example, if you had a lookup table
16 that identified logical erase units then you wouldn't
17 need a division operation, correct?
18 A. In all likelihood you still would. How would
19 you look up table function? What's the -- what's the --
20 what am I looking up?
21 Q. So each logical address unit is identified in
22 the lookup table by an index, right, so you can just
23 lookup logical erase units based on LBAs -- or logical
24 block addresses in the table?
25 A. How do you use the logical block address to

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1 Q. Why would you need to compute your index if it
2 was just assigned?
3 A. How do I know if -- let's -- let's say
4 we're -- in your example we were looking for a -- a
5 logical block address, how do I map a logical block
6 address to an index into that lookup table?
7 Q. Let's say I wanted to get to the second
8 logical block address, I would just say I want to go to
9 the second entry in the lookup table.
10 A. How many entries are there in the lookup
11 table.
12 Q. Let's say there are four.
13 A. There are many more block addresses than there
14 are erase units.
15 So what are the entries in my table?
16 Q. Oh, I see. Okay. So then what if the lookup
17 table was -- identified the starting logical block
18 address for every logical erase unit inside the address
19 segment? So instead of an index number, it actually
20 included the starting logical block address?
21 A. And how do I find my -- I scan through the
22 entire lookup table.
23 Q. Yeah. It's not -- I'm not saying it's the
24 ideal way to do it, but would that be a way to do it
25 without a division operation?

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1 look it up?
2 Q. Well, maybe I'll say it a different way.
3 So let's say you have a table that
4 identifies all of the logical erase units, okay?
5 A. All the logical erase units in that segment or
6 just everywhere?
7 Q. Let's say in that segment.
8 A. Okay.
9 Q. Let's start with that.
10 A. Okay.
11 Q. In that case, you wouldn't need a division
12 operation to identify those logical erase units because
13 they're already identified in the lookup table itself,
14 correct?
15 A. I think the -- but how do I look it up? What
16 am I looking up based on? The reason I'm asking that is
17 that would typically involve a division operation to be
18 able to look it up.
19 Q. Oh, I see. What if it was indexed by an index
20 number? So, for example, one would correspond to a
21 particular logical erase unit, two would correspond to
22 another logical erase unit, et cetera, et cetera?
23 A. Right. But how do I get that -- how do I
24 compute my index to determine which one it is that I'm
25 looking up?

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1 A. In my -- just to be clear, by scanning, would
2 be comparing the desired logical block address to the
3 starting logical block address for an EU and the
4 starting logical block addressed for the next EU?
5 Q. That's right.
6 A. Then yeah, I don't think that would require a
7 division operation.
8 Q. Okay. Now in your opinion, in paragraph 97 of
9 your Declaration, you state: "Samsung's accused
10 instrumentalities likely have zones with multiple
11 equally-sized erase units. And a division operation is
12 likely used to identify a particular erase unit within a
13 zone."
14 Do you see that?
15 A. I do.
16 Q. Why did you use the term "likely"?
17 A. I used that because that's -- I'm basing this
18 on my understanding of how -- well, take it in two
19 parts.
20 The first part, based on the examination
21 of information available to me about the typical sizes
22 of erase units and typical sizes of zones, makes it
23 likely that there are multiple erase units per zone, and
24 that they're equally sized. But that I don't have -- I
25 say "likely" because I don't have a -- a data sheet or

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1 other information for the Accused Products that
2 indicates that this is, in fact, true.
3 Q. What -- I'm sorry. Go ahead.
4 A. Should I do the second part or do you want to
5 just take --
6 Q. No, you go ahead.
7 A. For the second part of this, I based the
8 likelihood -- likelihood -- or it's likely that they use
9 a division operation to identify an erase unit within
10 the zone, based on my experience of efficient ways to
11 identify a -- a -- parts -- portions of memory, doing
12 basically operations on addresses and portions of
13 address and efficient ways to do that in both hardware
14 and -- and firmware and --
15 But I don't have access to something that
16 tells me specifically how Samsung's products are
17 implementing this. So I can say it's likely based on
18 its experience and efficiency, but I cannot -- I don't
19 have evidence to say this is certainly how it's done.
20 Q. Okay. Now the first part of that, why does it
21 matter that the zones are equally sized -- have equally
22 sized erase units?
23 A. For the -- if they didn't -- if they were --
24 well, if there's not some pattern, for example, equally
25 sized, I don't know of -- or nothing comes to mind for

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1 Q. Are those -- are you referring to the Accused
2 Products?
3 A. No. I -- what I'm saying is -- and that's why
4 I was saying "likely," like, if -- if I had seen -- if
5 the data sheets or information that I had was that I
6 could -- would tell me about the Accused Products, I
7 would just know the answer and wouldn't say "likely."
8 What I'm basing this on is other data
9 sheets, other descriptions, experience with flash
10 memory, indicates that the erase units are equally
11 sized.
12 Q. And just to be clear, in order -- as far as
13 you're aware, in order to use a division operation to
14 identify a logical erase unit, you need the logical
15 erase units to be of the same size, correct?
16 A. No, I -- I wouldn't say it that way. What I'm
17 saying is my -- my analysis for this being likely, is
18 based on them being equally sized. I'm not saying that
19 if they are not equally sized, that one couldn't use a
20 division operation, if that makes sense.
21 Q. Correct. But you can't think of a way to use
22 a division operation, sitting here today, where the
23 erase units are different sizes, correct?
24 A. I'm sure I could, but there would be some
25 assumptions there, but if they are unequally sized -- it

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1 how that identification would be done using a division
2 operation.
3 I'm not saying it couldn't, but what I
4 have in mind for efficient operations, using addresses
5 and portions of addresses, for example, would -- is
6 typically done with equally sized chunks of memory and
7 mapping to those.
8 Q. But you don't know one way or the other,
9 whether or not Samsung uses equally sized erase units,
10 correct?
11 A. I would say the -- I'm not aware of unequally
12 sized erase units. If the -- what -- what I don't know
13 and the standard doesn't require is -- with certainty,
14 is whether the zones have more than one erase unit.
15 The information that I've seen, makes that
16 likely, but I don't have evidence to show that in
17 Samsung's Accused Products, they certainly used multiple
18 erase units per zone.
19 Q. I see. So it's your opinion that the ZNS
20 standard requires equally sized erase units; is that
21 correct?
22 A. I don't know that the ZNS standard cares about
23 the size of erase units. It's more that the flash
24 memory chips, that I have examined, detail data sheets
25 for have equally sized erase units.

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1 would really depend on how they're unequally sized, as
2 to whether I would say you could, but I don't know how I
3 would map this. I -- I -- without more information, I
4 couldn't tell you it was likely, for example.
5 Q. Now on the second sentence, it says: "A
6 division operation is likely used to -- let me start
7 over again.
8 It's -- the third sentence of paragraph 97
9 states: "A division operation is likely used to
10 identify a particular erase unit within a zone."
11 Do you see that?
12 A. I do.
13 Q. But as we discussed earlier, it's possible
14 that the Accused Products could use a lookup table, for
15 example, that doesn't require a division operation,
16 correct?
17 A. I would phrase that as uses a lookup table and
18 uses comparison operations to find the -- to identify
19 the logical erase unit. But a lookup table doesn't --
20 I -- I don't want -- I don't -- want to be clear, that a
21 lookup table doesn't mean you don't use a division
22 operation.
23 The particular example that we discussed,
24 that -- that we got down to the comparisons, that didn't
25 use a division operation. The lookup tables generally

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1 would.

2 Q. Just to be clear, by comparison operations, do

3 you mean having a table with log -- starting logical

4 block address for each of the logical erase units, and

5 then just trying to figure out using that table, where

6 the logical erase unit was?

7 A. Let me say it real -- like, I'll -- I'll say

8 it real precisely so it's clear. So it's not as much

9 about the table as it is how I'm looking it up.

10 So in the lookup, in the example we

11 described, one could -- to decide which entry was a

12 match for an LBA, I would compare the incoming LBA to

13 the starting LBA of a block and the starting LB of the

14 next block, and I -- it's actually a comparison

15 operation on the computer.

16 Like, is it greater than equal to and less

17 than. If so, it's in that one. Then they go to the

18 next. Do the same thing until I find one where it's

19 both greater than equal to and less than the next one.

20 Does that make sense?

21 Q. It does?

22 A. Okay.

23 Q. And that doesn't use a division operation,

24 correct?

25 A. Correct.

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1 less efficient, in my view, but certainly, possible,

2 which is why I say it's likely based on my experience

3 and knowledge of these operations.

4 Q. What makes the division operation more

5 efficient?

6 A. For example -- well, it -- one example would

7 be if I am able to subdivide the address and select bits

8 that directly allow me to represent which logical erase

9 unit it is. That's a very efficient operation.

10 I can do that with a -- a bitmask and a

11 shift. Or in hardware, I can just do it by selecting

12 those bits. That would be one example.

13 Q. That's an example where you're trying to

14 identify -- or let me start over again.

15 In that example, you've already identify a

16 particular defect within a logical erase unit, correct?

17 A. No. There, I'm just trying to find which

18 multiple erase unit I am -- out of a group of logical

19 erase units why it was being addressed.

20 Q. Oh, okay. So then -- I'm probably missing

21 something then. So why is it more efficient? Wouldn't

22 a lookup table also be efficient in the sense that you

23 can identify exactly which logical erase unit you want

24 to go to, just based on the L -- the starting LBA for

25 that erase unit?

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1 Q. Okay. Now you don't know one way or the other

2 whether or not Samsung's products used that type of

3 comparison lookup table as opposed to a division

4 operation, correct?

5 A. I think that's less likely than a division

6 operation, but I can't tell you one way or the other

7 whether they did.

8 Q. Well, let's be clear, because I want to make

9 sure I understand your testimony --

10 A. Okay.

11 Q. -- and what it means for something to be

12 likely in your mind.

13 If you don't know how Samsung performs the

14 logical erase block lookup or determination, how can you

15 say whether or not one option's more likely than the

16 other?

17 A. I can say it based on my understanding of the

18 operations and efficient ways to do them to -- for

19 example, in a group of memory blocks, to use an address

20 to map to one of those memory blocks is -- efficient

21 ways to do that involve a division operation, either

22 subdividing the address or using energy division. All

23 the ways that I know are based on that, that are

24 efficient.

25 Now we've discussed a way that would be

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1 A. I'll give you and -- let's take the -- this is

2 a different example, but example I was going to, and

3 it's more efficient than that, because I don't even have

4 to have my lookup table. And I have my selection and

5 number by pulling out that portion of the address.

6 The case you're talking about, though, a

7 lookup table, the -- a typically more efficient way to

8 do that is to directly compute the index based on a

9 portion of the address.

10 So I don't have to scan through each -- in

11 the example, on average, it will take me the number of

12 erase units divided by two. I have to compare against

13 that many different ones, right?

14 Whereas, I can compute the index, if

15 they're equally sized erase units, into that lookup

16 table, by doing one operation and going directly to that

17 entry. Or in -- in fact, the -- I don't need the lookup

18 table at all if I want the logical erase unit because I

19 just -- I can just compute the index, which is entry,

20 but if I wanted to do it that way, I could.

21 Q. Okay. So at -- I think I understand, but let

22 me just make sure I understand the -- the way you're

23 suggesting to do it by just computing the index.

24 In that instance, every logical erase unit

25 inside an address segment, has a particular index; is

<p style="text-align: right;">Page 70</p> <p>1 that correct?</p> <p>2 A. Yes.</p> <p>3 Q. Okay. And to get -- to identify a particular</p> <p>4 logical erase unit, you can just identify the index for</p> <p>5 that logical erase unit, correct?</p> <p>6 A. Yes.</p> <p>7 Q. For example, if a logical erase unit had an</p> <p>8 index of four, to get to that logical erase unit you</p> <p>9 could just identify the index of four, correct?</p> <p>10 A. Yes.</p> <p>11 Q. Okay. Now, does such a system necessarily</p> <p>12 require a division operation?</p> <p>13 A. The efficient ways to do it that I know of</p> <p>14 to -- I'm not saying you couldn't come up with one that</p> <p>15 would get me directly there, but I -- I don't have an</p> <p>16 example of one that would get you the index that</p> <p>17 wouldn't require a division operation.</p> <p>18 Q. Well, can't you just start off with a system</p> <p>19 that has -- where you know you have ten logical erase</p> <p>20 units within an address segment and then each one of</p> <p>21 them is just sequentially assigned numbers one through</p> <p>22 ten?</p> <p>23 A. How do you -- how would you identify that</p> <p>24 with, for example, a logical block address?</p> <p>25 Q. Let's say you don't have to identify it with a</p>	<p style="text-align: right;">Page 71</p> <p>1 logical block address, you're just trying to identify it</p> <p>2 with a logical erase unit based on a number, an index</p> <p>3 number?</p> <p>4 A. What -- what is the source of the index</p> <p>5 number?</p> <p>6 Q. The system has index numbers one through ten.</p> <p>7 A. Right. But I'm -- I'm typically trying to map</p> <p>8 something to that index number.</p> <p>9 Q. Let's say you're trying to -- let's say you're</p> <p>10 mapping that index number to physical block locations or</p> <p>11 physical block addresses.</p> <p>12 A. It's kind of the other -- well, that I</p> <p>13 understand, but if I want to identify the logical erase</p> <p>14 unit from a logical block address or a portion of it or</p> <p>15 an offset into a zone, I don't know the index without</p> <p>16 doing some kind of operation. Right. What's coming in</p> <p>17 is not the same as the index.</p> <p>18 Q. Yes. We're not operating in a world where you</p> <p>19 need to offset to get to the logical block address,</p> <p>20 right, we're not trying to do that. We're in a system</p> <p>21 where all you need -- you already have the lookup table</p> <p>22 that has all the logical erase units indexed by number</p> <p>23 and those numbers correspond to physical address</p> <p>24 locations.</p> <p>25 A. Well, I understand that, but I don't</p>
<p style="text-align: right;">Page 72</p> <p>1 understand -- at some point I need to know that -- I'm</p> <p>2 going to need to know for a logical block address or</p> <p>3 some related address which index I need to use.</p> <p>4 Q. Yes, I -- maybe we're talking past each other.</p> <p>5 I guess I'm confused.</p> <p>6 So you're saying you get -- the claim</p> <p>7 requires, right, the use of a division operation to</p> <p>8 identify a logical erase unit within the address</p> <p>9 segment, correct?</p> <p>10 A. Correct.</p> <p>11 Q. The point is that you want to identify a</p> <p>12 logical erase unit within the address segment. Right?</p> <p>13 A. Yes.</p> <p>14 Q. Now if you don't use a division operation,</p> <p>15 you're not practicing this -- practicing this</p> <p>16 limitation, correct?</p> <p>17 A. Correct.</p> <p>18 Q. Okay. Now to identify a logical erase unit</p> <p>19 within an address segment, you could have a lookup</p> <p>20 table, for example, that has an index of numbers that</p> <p>21 identify each of the logical erase units within an</p> <p>22 address segment.</p> <p>23 Do you follow my scenario there?</p> <p>24 A. I do.</p> <p>25 Q. And that scenario, the table -- the lookup</p>	<p style="text-align: right;">Page 73</p> <p>1 table identifies a logical erase unit within the address</p> <p>2 segment and that table isn't a division operation,</p> <p>3 correct?</p> <p>4 A. I would agree if that were the only way that</p> <p>5 table were used, then that wouldn't be -- a portion of</p> <p>6 the controller that meets its limitation, but I don't</p> <p>7 agree that that covers the scenarios where I need to</p> <p>8 identify a logical erase unit.</p> <p>9 Q. Okay. What are the scenarios you're thinking</p> <p>10 about in your infringement opinions where you need to</p> <p>11 identify a logical erase unit?</p> <p>12 A. When I -- there are operations where I am</p> <p>13 using addresses -- most of the information -- or most of</p> <p>14 the requests are going to involve logical block</p> <p>15 addresses that ultimately need to be mapped to physical</p> <p>16 addresses but also to portions of the other blocks of</p> <p>17 memory device.</p> <p>18 When an address comes in, in your</p> <p>19 scenario, I don't know which one of the erases units</p> <p>20 it's associated with in there.</p> <p>21 In other words, you have -- I agree you</p> <p>22 can have them indexed like that -- in fact, I don't even</p> <p>23 need to make a table to do that. But let's say I have a</p> <p>24 table that translates logical to physical addresses, I</p> <p>25 don't need to -- I need to know where those addresses</p>

<p style="text-align: right;">Page 74</p> <p>1 fall and that lookup table doesn't -- doesn't tell me 2 how to do that if -- doesn't tell me which index to look 3 up. I need a way to get to that index. 4 And a typical way to get to that index 5 would be to say, take the offset of that logical block 6 address into the zone and divide it by the size of an 7 erase unit via energy division that would give me a -- 8 that index directly. In other words, by dividing it by 9 the size of your erase unit I'll fall into -- that will 10 give me an integer value from -- in your example of -- 11 go from 0 to 9, and that would trail me which one of the 12 logical erase units it is. 13 It would -- in that table, then it would 14 also tell me which physical erase unit it was mapped to, 15 but I needed to do something to get into that to get 16 that index. 17 Q. So you're assuming in that scenario that each 18 address segment has its own index, or each logical erase 19 units has its own index? In other words, what if 20 there's just one combined index and you don't need to 21 use a division operation to get to a particular index? 22 A. When you say it's one -- like what do you 23 mean? 24 Q. Let me take a step back. 25 When you said index, do you mean like the</p>	<p style="text-align: right;">Page 75</p> <p>1 particular row in a table? 2 A. (Moving head up and down.) 3 Q. I see. I understand that. 4 A. Yeah. 5 Q. Okay. So then -- okay. 6 Now, Claim 1F requires that you identify 7 an ad -- addressed storage location within the address 8 segment from the third address portion. 9 Do you see that? 10 A. I do. 11 Q. Okay. Now in the example you just gave, when 12 you're referring to looking up the index, is this what 13 you're referring to? 14 A. It can be. It's not necessarily -- it doesn't 15 have to be for the erase unit and it wouldn't have to be 16 via lookup table, but it's -- it would be included in 17 one of the -- that kind of operation would be one way to 18 do this 1F limitation. 19 Q. Okay. I just want to make sure that we're 20 clear here with our terminology in the claim 21 limitations. 22 Claim 1 identifies an address storage 23 location within the address segment, correct? 24 A. Yes. 25 Q. Claim 1G requires identifying a logical erase</p>
<p style="text-align: right;">Page 76</p> <p>1 unit within the address segment, correct? 2 A. Yes. 3 Q. Those are two separate identifications, 4 correct? 5 A. I don't know that they have to -- that they 6 can't be met by the same circuitry. That would probably 7 be more of a legal question, but I don't see why they 8 couldn't be met by the same -- same operation. 9 Q. Well, at least in the analysis you provide in 10 your Declaration, you're pointing to two separate things 11 for claim limitations 1F and 1G, correct, two separate 12 steps? 13 A. I don't know that I'm requiring them to be 14 separate operations, but they can be. 15 Q. Well, let me just be clear here. I want to 16 make sure that we understand your opinions here. 17 For your infringement analysis, are you 18 mapping the identification in Claim 1F and the 19 identification in Claim 1G the same identification 20 operation in the Accused Products? 21 A. When in 1F it is identifying a location that 22 is a logical erase unit, then yes. When in 1F it's 23 locating logical block or page, then no. 24 Q. Okay. So are you saying you have three 25 different infringement reads for claim indication 1F?</p>	<p style="text-align: right;">Page 77</p> <p>1 A. Yes. 2 Q. Okay. So the address portion would be a 3 logical block page or an erase unit -- sorry. Did I say 4 that right? No. Sorry. Let me say it again. 5 The identifying address storage location, 6 that storage location you're saying is satisfied by a 7 logical block, a page, or an erase unit, correct? 8 A. Correct. 9 Q. Okay. And for limitation 1G, which requires 10 identifying a logical erase unit, you're saying that 11 those -- that you pointed the same thing for 1G and 1F, 12 where in 1F you have identified the logical block? 13 A. I'm sorry, can you ask that one more time? 14 Q. Sure. Let me say it a better way. That was 15 clumsy. 16 In 1G, the logical erase unit you're 17 pointing to there, what are you pointing to as the 18 identification of the logical erase unit? 19 A. What I'm pointing to is taking a address or a 20 portion of an address and identifying which logical 21 erase unit that address is being -- is corresponding to. 22 Q. What functionality in the Accused Products are 23 you pointing to? Are you saying that that's what the 24 Accused Products do? 25 A. Well, first, I'm saying it's -- in 97 I'm</p>

<p style="text-align: right;">Page 78</p> <p>1 saying it's likely that they do that, and they do that</p> <p>2 with respect to addresses -- logical block addresses or</p> <p>3 portions of addresses.</p> <p>4 Q. What is the -- so looking back at 1F then,</p> <p>5 what are you mapping as the third address portion?</p> <p>6 A. The logical block address and/or the zone</p> <p>7 offset.</p> <p>8 Q. Okay. And then the address storage location</p> <p>9 is the logical block, the page and/or erase unit,</p> <p>10 correct?</p> <p>11 A. Yes.</p> <p>12 Q. Okay. Now if you turn to 1G, for your</p> <p>13 infringement allegations, are you pointing to any of</p> <p>14 those things as the identification of a logical erase</p> <p>15 unit within the address segment?</p> <p>16 A. When you say any of those things, which ones</p> <p>17 are you --</p> <p>18 Q. The address storage location or the third</p> <p>19 address portion.</p> <p>20 A. The logical erase unit is one of the things</p> <p>21 that I identified in paragraph 95. The address being</p> <p>22 operated on could be a logical block address or an</p> <p>23 offset into the zone based on the logical block address,</p> <p>24 but it's going to be something based on a logical block</p> <p>25 address.</p>	<p style="text-align: right;">Page 79</p> <p>1 Q. Okay. So which one of the address storage</p> <p>2 locations in 1F are you pointing to also for 1G?</p> <p>3 A. It would be for the logical erase unit in 1F.</p> <p>4 MR. CURRY: Counsel, it's about 12:30.</p> <p>5 Our food is here if you wanted to break for lunch.</p> <p>6 MR. YANG: Yeah, that works. That's</p> <p>7 fine.</p> <p>8 VIDEOGRAPHER: Okay. Going off the</p> <p>9 record.</p> <p>10 The time is 12:32 p.m., Central Time.</p> <p>11 (Lunch taken)</p> <p>12 VIDEOGRAPHER: We are back on the record.</p> <p>13 The time is 1:21 p.m.</p> <p>14 Q. (BY MR. YANG) Welcome back.</p> <p>15 A. Thank you.</p> <p>16 Q. Hoped you enjoyed your lunch.</p> <p>17 A. Yes.</p> <p>18 Q. All right. So if you turn to paragraph 98 of</p> <p>19 your Declaration, which is Exhibit 3 -- let me know when</p> <p>20 you're there.</p> <p>21 A. I'm there.</p> <p>22 Q. All right. In that first sentence in</p> <p>23 paragraph 98, you mentioned a logical erase unit to</p> <p>24 physical erase unit map.</p> <p>25 Do you see that?</p>
<p style="text-align: right;">Page 80</p> <p>1 A. I do, yes.</p> <p>2 Q. What's the difference between a logical erase</p> <p>3 unit and a physical erase unit?</p> <p>4 A. The logical erase unit is something that's at</p> <p>5 the level of the organization of a -- a zone where you</p> <p>6 see -- an example in the figure above as you see there</p> <p>7 are flash blocks. Each one of those is an erase unit</p> <p>8 and there's a mapping of logical block address or a</p> <p>9 portion of the logical block address to those flash</p> <p>10 blocks. The physical block -- and I said that's a</p> <p>11 logical representation, an organization of the flash</p> <p>12 blocks.</p> <p>13 Q. Sorry. Just to -- if I can interrupt.</p> <p>14 So the -- in the figure above paragraph</p> <p>15 98, the flash block is a logical representation of the</p> <p>16 erase unit; is that correct?</p> <p>17 A. In -- in how it -- at least at the level of</p> <p>18 mapping a logical block address to that ordering of</p> <p>19 flash blocks. In other words, there are -- but the --</p> <p>20 each -- in that logical representation, each one of</p> <p>21 those corresponds to a physical erase block, for which</p> <p>22 there's a mapping, but there's not a requirement that</p> <p>23 the -- blocks that are, for example, in a particular</p> <p>24 zone, are co-loaded -- colocated next to one another in</p> <p>25 a physical way.</p>	<p style="text-align: right;">Page 81</p> <p>1 Q. Okay. So let me make sure I understand.</p> <p>2 Erase units are sort of the -- the units of which you</p> <p>3 have to -- the small -- the smallest unit over which you</p> <p>4 can perform a erase function; is that correct?</p> <p>5 A. Sorry. Can you say it one more time, yeah,</p> <p>6 sorry.</p> <p>7 Q. And you can feel free to correct me or use</p> <p>8 different language.</p> <p>9 A. Okay.</p> <p>10 Q. An erase unit is the smallest unit over which</p> <p>11 an erase command can happen, correct?</p> <p>12 A. That's correct.</p> <p>13 Q. Okay. A logical erase unit is an erase unit</p> <p>14 that is defined by its biological addresses, correct?</p> <p>15 A. Or is mapped to logical addresses or a logical</p> <p>16 organization, as opposed to a -- a physical -- a purely</p> <p>17 physical organization.</p> <p>18 Q. Okay. So an erased unit -- so a physical</p> <p>19 erased unit is one that is mapped to physical addresses?</p> <p>20 A. At -- at some level it -- it -- it -- yes.</p> <p>21 It -- I have a -- it has a physical location, which a</p> <p>22 combination of -- it -- it may not be just a single</p> <p>23 address that I use to go to a physical location, but it</p> <p>24 may involve, for example, selecting a -- particular</p> <p>25 chips and a -- particular chip and a particular -- and</p>

<p>Page 82</p> <p>1 then putting an address to that particular chip. 2 So there is -- those chips, like, 3 sometimes are viewed as part of the address. Sometimes 4 they're not. But I've got a very -- it is a particular 5 physical location for that, for a physical erase block. 6 Q. Okay. I'm just trying to make sure I 7 understand the difference between a logical erase unit 8 and one that is a physical erase unit. In both 9 instances, the erase unit indicates the smallest member 10 unit to which an erase can be applied, correct? 11 A. Correct. 12 Q. Okay. One is referred to as logical because 13 why? 14 A. It -- it's -- I guess maybe another way to -- 15 or a way to conceptualize it is, in these zones that you 16 see here on the figure, that representation, if one of 17 the physical erase units were to have a defect, that 18 wouldn't mean that that zone can't be used anymore. 19 Instead, the -- there would be mapped a 20 replacement for that logical -- the logical 21 representation doesn't have to -- it does correspond to 22 a physical erase unit, but it does not have correspond 23 same one always, so I can replace it. 24 But when I'm -- when I went and I 25 address -- if I issue an address and it goes to, say,</p>	<p>Page 83</p> <p>1 the third erase unit in Zone 1, even when I replace 2 that, say, the currently mapped physical erase unit with 3 the new one, the address would still go to the third 4 logical one. 5 Q. I understand. Okay. Well, let -- let me make 6 sure I understand before I claim I did. 7 In the figure here, what's being shown are 8 flash blocks. For each of these flash blocks is a 9 logical erase unit; is that correct? 10 A. That's how I'm -- I mean, that's how I am 11 explain -- I'm using -- explaining it using this figure. 12 I don't know if the -- I would have to look at the rest 13 of the presentation, but that's how I'm explaining it 14 with the figure, yes. 15 Q. Okay. Let me phrase that better then. 16 So in the figure on page 64, if we 17 consider each of these flash blocks to be logical erase 18 units, then each of these logical erase units can be 19 mapped to a particular physical erase unit, correct? 20 A. Yes. 21 Q. Okay. And that physical erase unit to logical 22 erase unit mapping can change, depending on whether or 23 not there are defects, for example, in a particular 24 physical erase unit? 25 A. Yes, I -- I would usually say the logical to</p>
<p>Page 84</p> <p>1 physical, but I -- I guess, you could also have a 2 physical to logical. 3 Q. Sure. I wasn't trying to -- 4 A. Yeah, yeah. 5 Q. Okay. So then Claim 1G requires that there 6 was circuitry to identify a logical erase unit within 7 the address segment, correct? 8 A. Yes. 9 Q. And that's different from saying, wherein, 10 there's circuitry to identify a physical erase unit 11 within the address segment, correct? 12 A. Yes. 13 Q. Okay. Now if you turn back to paragraph 98, 14 what evidence are you citing that shows that Samsung's 15 Accused Products maintain a logical erase unit to 16 physical erase unit mapping? 17 A. So I'm pointing to the -- in Exhibit G, I'm 18 pointing to the Bad Block Management discussion and that 19 the blocks are replaced with other blocks. 20 In -- I'm also looking in Exhibit O at 21 the -- actually on page 65, the mapping out of Bad 22 Block's parenthetical under the first bullet point. 23 Q. Now, are you certain that the Bad Block 24 Management in the error correction in -- identified in 25 Exhibits G and O identify -- or include a logical erase</p>	<p>Page 85</p> <p>1 unit, physical erase unit mapping? 2 A. In combination with the use of ZNS, yes. 3 Q. Okay. And the division operation that you're 4 pointing to, are you confident, based on your 5 analysis -- or let me ask it a different way. 6 Is it your opinion that the Bad Block 7 Management in Exhibits G and O use a division operation? 8 A. That is not why I'm pointing to those. 9 Q. Oh. Why are you pointing to those? 10 A. For the use of Bad Block Management and 11 mapping associated with that, but what I'm pointing to 12 is -- is how ZNS works in combination with the 13 requirement to do Bad Block Management. 14 Q. All right. Maybe I'm misunderstanding you. 15 The claim limitation requires that there 16 be division operation to identify a logical erase unit 17 within the address segment, correct? 18 A. Yes. 19 Q. Okay. So you're pointing to bad -- Bad Block 20 Management as part of the identification of a logical 21 erase unit within the address segment, correct? 22 A. Yeah. I -- I'm -- I might be more precise 23 about it, if that's okay. What I'm pointing to is the 24 -- let me back up for a second. 25 If you look at the figure at the top of</p>

<p style="text-align: right;">Page 86</p> <p>1 page 64, you know, we discussed earlier, if we view 2 those as logical blocks, we know that they -- there's a 3 need to map from that position of that EU, that logical 4 erase unit, because I will -- at a minimum, I'm going to 5 need to occasionally map out or replace one of those 6 physical -- replace the physical block that corresponds 7 to one of those blocks.</p> <p>8 So that's what's telling me there are 9 logical erase units, that this is not a purely physical 10 mapping, for example. And so these are telling -- this 11 is evidence of the need to do the -- a mapping for Bad 12 Block Management. It's not necessarily saying that it's 13 a logical physical mapping.</p> <p>14 Though, generally, I think that's what's 15 in Exhibit G. I would have to look back at Exhibit O, 16 but it's that it's more that these are telling me, I'm 17 going to have remapping. I need to remap failed 18 physical units, and it's what's telling me that the 19 erase units in ZNS are logical units.</p> <p>20 Q. Okay. So just to be clear, this isn't telling 21 you that there would be a division operation associated 22 with the Bad Block features discussed here in G and O, 23 correct?</p> <p>24 A. Correct.</p> <p>25 Q. Okay. And the division operation, in your</p>	<p style="text-align: right;">Page 87</p> <p>1 opinion, is likely used, but it's not certain, correct?</p> <p>2 A. Correct.</p> <p>3 Q. Okay.</p> <p>4 MR. YANG: All right. I have no more 5 questions for the witness.</p> <p>6 MR. CURRY: None here.</p> <p>7 MR. YANG: All right. I think that does 8 it, Dr. Jones. Thank you for your time.</p> <p>9 THE WITNESS: Okay.</p> <p>10 VIDEOGRAPHER: This the concludes the 11 deposition of Dr. Mark Jones In the Matter of Radian 12 Memory Systems, LLC, v. Samsung Electronics et, al. 13 We are now off the record. 14 The time is 1:37 p.m., Central Time. 15 (End of proceedings)</p> <p>16 17 18 19 20 21 22 23 24 25</p>
<p style="text-align: right;">Page 88</p> <p>1 IN THE UNITED STATES DISTRICT COURT 2 FOR THE EASTERN DISTRICT OF TEXAS 3 MARSHALL DIVISION 4 RADIAN MEMORY SYSTEMS,) 5 LLC,) 6 PLAINTIFF,) 7) CIVIL ACTION 8 VS.) 9) NO.: 2:24-cv-01073-JRG 10 SAMSUNG ELECTRONICS CO.,) 11 LTD., SAMSUNG ELECTRONICS) 12 AMERICA, INC.,) 13 DEFENDANTS.) 14 15 16 17 18 19 20 21 22 23 24 25</p> <p>12 REPORTER'S CERTIFICATION 13 DEPOSITION OF MARK JONES 14 MAY 13, 2025</p> <p>15 ----- 16 I, Kelly Bryant, Certified Shorthand Reporter in 17 and for the State of Texas, hereby certify to the 18 following: 19 That the foregoing deposition of MARK JONES, the 20 witness, hereinbefore named was, at the time named, 21 taken by me in stenograph on MAY 13, 2025 having been 22 first duly cautioned and sworn to tell the truth, the 23 whole truth, and nothing but the truth, and the same 24 were thereafter reduced to typewriting by me or under my 25 direction.</p>	<p style="text-align: right;">Page 89</p> <p>1 I further certify that pursuant to FRCP Rule 2 30(f)(1) that the signature of the deponent: 3 4 _____ was requested by the deponent or a party 5 before the completion of the deposition and is to be 6 returned within 30 days from date of receipt of the 7 transcript. If returned, the attached Changes and 8 Signature Page contains any changes and the reasons 9 Therefor; 10 11 ___XXX___ was not requested by the deponent or a 12 party before the completion of the deposition. 13 14 I further certify that I am neither counsel for, 15 related to, nor employed by any of the parties in the 16 action in which this proceeding was taken, and further 17 that I am not financially or otherwise interested in the 18 outcome of the action.</p> <p>19 GIVEN UNDER my hand and of office on May 14, 2025. 20 <i>Kelly Bryant</i> 21 KELLY BRYANT 22 Texas CSR No. 5772 23 Expiration Date: 07/31/25 24 25</p>

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