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Transcript of Jason A. Janet, Ph.D.

Date: August 30, 2024
Case: Hesai Technology Co., Ltd. -v- Ouster, Inc. (PTAB)



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WORLDWIDE COURT REPORTING & LITIGATION TECHNOLOGY

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UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE PATENT TRIAL AND APPEAL BOARD

HESAI TECHNOLOGY CO., LTD.,
Petitioner,
v.
OUSTER, INC.,
Patent Owner.

Case IPR 2023-01421
U.S. Patent No. 11,175,405

DEPOSITION OF JASON A. JANÉT, PH.D.
Conducted Virtually
Friday, August 30, 2024
9:02 a.m. EDT

Job No.: 551156
Pages: 1 - 64
Reported by: Monique Vouthouris, CCR, RPR, CRR

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DEPOSITION OF JASON A. JANÉT, PH.D., pursuant to notice, conducted virtually via Zoom Videoconference, before Monique Vouthouris, Certified Court Reporter, Registered Professional Reporter, Certified Realtime Reporter, and Notary Public in and for the States of New Jersey and New York.

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A P P E A R A N C E S

ON BEHALF OF PETITIONER
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C O N T E N T S

EXAMINATION OF JASON A. JANÉT, PH.D. PAGE
By Mr. Hagiz 5

PREVIOUSLY MARKED EXHIBITS REFERRED TO:

Exhibit 1003 Declaration of James F. Shanley, Ph.D.
Exhibit 2010 Corrected Declaration of Jason A. Janét, Ph.D.
Exhibit 2014 Paper by Sergey Vinogradov.

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PROCEEDINGS

JASON ANDRE JANÉT, PH.D.,
being first duly sworn or affirmed by the Notary,
testifies as follows:

EXAMINATION

BY MR. HAGIZ:

Q Good morning, Dr. Janét. My name is Ron Hagiz. I am counsel for Hesai in this proceeding.
Have you been deposed before?

A Yes, I have.

Q And roughly how many times?

A I think it's close to 50. It might be -- might be more than 50.

Q Okay. So you know how it works. I'll just kind of briefly reiterate the procedure, just for the record.
So you understand I'll be asking you questions today and you'll provide answers to my questions?

A Yes, sir.

Q And your counsel may object from time to time. But unless you're instructed not to answer, you should still answer my question after the objection.
Do you understand?

A Yes, sir.

Q I'll try my best not to talk over you so that our court reporter can get a clear record. I'll just ask that you do the same and wait for me to finish my question before you begin your answer.
Is that okay?

A Absolutely.

Q Because we're doing things remotely via Zoom, I just want to double-check a few things.
Do you have any materials in front of you that you're referring to or plan to be referring to during the deposition?

A No. I just have my computer up and running and my email.

Q Okay. And do you have any kind of communications, whether it's email or chat or instant message, open with your counsel right now?

A No.

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Q And I'll just ask other than communications on the record -- sorry, other than communications in the Zoom itself while we are on the record, you don't kind of separately communicate with your counsel, or with anyone else, for that matter. Is that okay?

A Yes, sir.

Q Okay. Is there any reason why you can't provide complete and honest testimony today?

A No, sir.

Q One last thing, I'll try to take a break probably every hour or so. If you need a break earlier than that, let me know. I'll just ask if there's a question pending, that you answer the question before we take a break.
Is that okay?

A Yes, sir.

Q So let's get started.
I'm going to upload into the chat what has been marked -- here we go. So I've uploaded into the chat what was marked as Exhibit 2010, which is the corrected Janét declaration. Let me know when you've had a chance to download it and open it up.

A Sorry. I'm setting up a folder on my desktop for that.

Q Sure.

A Okay. I have that.

Q And this is the declaration that you submitted in this proceeding relating to the '405 patent?

A Yes, sir.

Q And are the -- are there any errors anywhere in your declaration that you feel you need to correct?

MR. LAUPPE: Object to form.

A I don't know the full extent. I'm aware of a couple of grammatical errors here and there. But nothing substantive that I can recall. We may discover something as we're talking today, and if a correction is needed, we'll certainly put that in the errata.

Q Sounds good.
I want to ask a little bit about some of your background and work experience. If you could

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turn to your -- your CV, which is on PDF page 103 of your declaration. Let me know when you're there.

A I'm there.

Q So let me just start with your undergraduate is in mechanical engineering. Is that right?

A Yes, sir.

Q Do you have a particular focus or specialization?

A It would have probably been on -- well, there was no particular concentration. I would say it was a good cross-section of mechanical engineering, everything from thermodynamics to vibrations, controls, electronics, to the extent of -- to a limited extent, to the extent of what would be in a Bachelor of Science mechanical engineering curriculum, I think just a couple of classes on electronics. And then, let's see, probably a fair amount on the sensors is where I would have put an emphasis during that time.

Q And what types of sensors were you -- did you put an emphasis with during your undergraduate

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curriculum?

MR. LAUPPE: Object to form.

A I would not consider this limiting as I describe it. But sensors included, you know, type of sensors that could be used for detecting strain and stress and vibrations, optical sensors that would be used for ranging and proximity sensing, tactile sensors, gate sensors.

I realized towards the end of my Bachelor of Science degree that I was -- I was discovering an interest in robotics and automation and -- and so it's -- I guess it's a -- this is just the way things go sometimes, you find out, you know, in the last maybe year and a half of your curriculum what you really are passionate about. And so that last year and a half, two years, that's where I threw myself into sensors and kinematics and stuff like that.

Q I understand that. That's how I ended up in law school, so.

When you say -- the different sensors that you mentioned that kind of was part of the focus of

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the curriculum, were the courses you took focusing on how to build or design those types of sensors, or how to use or apply those types of sensors?

MR. LAUPPE: Object to form.

A Well, initially it would be how to use them, and usually in the process of using them or applying them, you would find limitations.

And as an adjunct to my Bachelor of Science curriculum, I was also a machinist. I wouldn't put myself in the master machinist category, probably more in the journeyman level, but or at least a machinist, and so I was really unafraid to take things apart and build them.

But I also had some great mentors that had a similar dauntless approach to -- and they taught myself and others in these practical classes that we took, practical meaning that they were very lab intensive. We would set up everything from thermocouples to, you know, accelerometers to optics to, you know, when we could get our hands on them in those days, laser systems. And if we didn't find that it was working the way we needed it to, and

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sometimes these things were part of the lab, we would take them apart, understand the anatomy of them, and switch out parts, and in a couple of cases before I finished my undergrad, building from the ground up.

Q Let me ask a little more specifically. You mentioned optical sensors before. As part of your -- as part of the work that you just mentioned during your undergraduate curriculum, did you build or take apart any optical sensors?

MR. LAUPPE: Object to form.

THE WITNESS: Sorry, did I cut you off, Patrick?

MR. LAUPPE: All good. It registered on the realtime.

THE WITNESS: Okay.

A Yes. One of probably half a dozen examples was we used a laser to evaluate how different things at a distance would vibrate. And I'm picturing, among other things, we had this elaborate fluid control thermal control system on a wall, it was a very big practical lab, if you will,

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and we wanted to see how fluid that was passing through these passageways would cause vibration in the conduits.

And we had a couple of ways of evaluating that. One was with accelerometers. Another one was just simple acoustic sensors. And the third was with an optic sensor that we would set it up, and as it vibrated even in imperceptible ways, we could see the deflection as the light was either hitting a sensor that was directly on it, or when we did it remotely and tried to -- tried to get some distance between us and the -- and the system, we would also notice the flutter as the light pattern returned.

Q So how did that involve building or taking apart an optical sensor?

MR. LAUPPE: Object to form.

A Well, we had to put the right lensing in there to filter out the noisy elements and ambient light. Sometimes it took the shade on the window to just be partly open a sliver and it would affect the readings. So we wanted to tune right into the -- in that situation I think we were using a visible red

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laser, and so we had to get into some optical filters, started with cellophane, you know, the colored cellophane, but graduated to, you know, other types of glass-like or plastic-like filters. And, again, we were just looking for very minor deflections in what was being returned. But we wanted to amplify that so then we would also have optics that would do a visual amplification and then we could use a camera. In some cases it was pretty crude, we would literally stand there with a pen and we would look at the peak and valley and make a mark. But when we could use a video camera, and, you know, again, this was using kind of crude VHS type of recording mechanisms back then, we did it for that.

Q Let me move on to your master's degree. That said it's in integrated manufacturing systems engineering. What is that exactly?

A Well, the Integrated Manufacturing Systems Engineering Institute, or IMSEI, is a program at North Carolina State University that is multidisciplinary. I knew I was interested in

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robotics. I just wasn't sure what major discipline of robotics I wanted to focus on.

So when I had the option of going to grad school, I explored a couple of different places. And when I spoke with folks at NC State, obviously one option was mechanical engineering, the other was electrical engineering, I should say a third was computer science, and then a fourth was the integrated manufacturing systems.

And to me, IMSEI was a good middle ground, it gave me the option of working in a multidisciplinary field and in a multidisciplinary academic program to then decide where I really wanted to focus. And my concentration during that time was mobile robot motion planning, sensing, perception, and self-localization.

Q All right. Let me -- let me just go through each of those.

What is mobile robot motion planning?

A Mobile robot motion planning relates to mobile robots being able to plan their trajectories through space. I think at the time I mostly just

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focused on ground vehicles. So planning motion around obstacles both known and unknown, static and moving.

Q And when you said -- when you said sensing among the things that you focused on during your master's, what -- what kind of sensing?

MR. LAUPPE: Object to form.

A That's a very long list, because, as you can imagine again, robotics is inherently a multidisciplinary field. I can list a few sensors but they're not going to be exhaustive. But the sensors included the very early stage commercial LiDAR systems like from SICK, tactile sensors like whiskers and impact sensors, date sensors, acoustic sensors, ranging sensors like infrared, proximity sensors, computer vision.

I'm sure there are other things I'm leaving off, but that's a decent example set of the types of sensors I dealt with.

Q Were you building any of these sensors yourself, or were you kind of purchasing or acquiring off-the-shelf components?

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MR. LAUPPE: Object to form.
A The -- it really was a mixture of both. If we couldn't get -- if I couldn't get a sensor off the shelf, which, unfortunately, was more times the case than I had wanted, but you're talking about the early '90s, early to mid '90s, then I would endeavor to build it or to get the core components and do an assembly and build the support circuitry and the signal processing and -- signal processing on the back end and the front end, and then ingesting that information and putting that into some sort of actionable format. For example, the maps that would be created for motion planning, or the algorithms that would be used for motion planning, or the algorithms that would be used for self-localization, just to say figuring out where you are in the environment, oftentimes building a map.
Q You mentioned perception as one of the other focuses during your master's degree. What does that refer to?
MR. LAUPPE: Object to form.
A That really goes hand in hand with the

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sensing. Perception is -- it really is hand in hand with -- with sensing. Just I would say it's more fundamental, you're kind of at the transducer level oftentimes, but you will -- you know, perception is also from the perspective of the, in my situation, the mobile robots, can they perceive the environment and extract important information and fulfill some sort of mission on the basis of that information and preferably do it in realtime.
Q And the last one you had mentioned was self-localization. What is that?
MR. LAUPPE: Object to form.
A Self-localization is -- and, by the way, I'll put self-referencing in with that bucket. But self-referencing is -- is being able to use features of the environment to figure out where you are, and localization is essentially the same thing. I think some people would look at it as having a more precise I'm at this position and at this orientation, sometimes referred to as pose.
And self-localization is not a simple process, it continues to be a challenge, but it's

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very, very sensor intensive.
Q In any of the work or research that you did both in your undergraduate career and your master's career, did any of that involve designing or building LiDAR systems?
MR. LAUPPE: Object to form.
A Not in my undergrad. My master's and Ph.D. overlapped, so it's difficult for me to remember exactly the specific time frame when I started getting my hands dirty with building a LiDAR type of system.
One of the things that we noticed with the SICK LiDAR system was it was strictly a 2-D plane, the refresh rate or the scan cycle wasn't always very quick, had a very limited field of view, and it was highly susceptible to ambient light. And so put a couple of -- well, put a single motor with an encoder, had it controlled by I think an HC11 at the time and a grabbed -- fortunately, I didn't have to buy a brand new laser, for this, we had several already in the center. And it was a bit bulky, I would say it was very bulky.

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And then we set up a couple of photocells, I think we started with the cadmium sulfides and then we graduated to photodiodes, and I believe we had avalanche photodiodes around that time, if I'm not mistaken. Anyway, we tried several different photo sensors.
I think one of the biggest challenges that we had was the timing of it all. The HC11 wasn't a fast enough processor. So then we graduated to a -- well, let me just say the HC11 was not fast enough for doing time of flight for light.
We could -- we could do a couple of other things with it. We could -- not with the HC11 necessarily processing, but we could come up with a structured light approach where we would look at triangulation or how the projected signal would get distorted. We tried to slow, obviously, the light down a little bit with the optics, and but -- then we had to use a digital signal processor, which was very power intensive, and I can't remember -- it's right on the tip of my tongue -- the specific DSP suite that we used. And ultimately, I don't think

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we ever got to a point where we could do time of flight, but we did sort of a triangulation approach.

Q And you mentioned -- one of the problems that you mentioned with the SICK sensor that led to the work you described was that it had -- it was highly susceptible to ambient light. Was that a problem that you were able to solve in your design?

MR. LAUPPE: Object to form, scope.

A I don't know that we ever fully solved it. I think that we were able to make it less susceptible to ambient light. If we were indoors, the windows were shut, and when I say shut, I mean light tight, you know, nothing was getting in. The SICK was fine. And that was our baseline. And so, you know, and we got our stuff to be -- to be fine at that level, and then we would basically let open these covers that we put over the windows to just see how the performance degraded.

So I feel like at some -- and I wouldn't consider this production grade or product grade. But at a fundamental research level, it looked encouraging at the time.

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I think the thing to remember is that when you're in the robotics and automation space, because it's multidisciplinary, and because rarely do you find something commercial off-the-shelf that you can just plug and play and it worked seamlessly the way that you need it to, you get into a mode where you anticipate having to tear things down, modify them or build them from scratch.

And by the way, that's beyond the sensors, I've built many robotic limbs and actuators and mobile vehicles from scratch as well.

So the overarching point of that is to build a system that does a particular task, does a particular set of tasks. And in that endeavor, particularly related to the LiDAR system, we were preparing for a couple of competitions. One of them was the name is IJCAI, but I think it's I-J-C-A-I. And, gosh, I'm trying to remember a couple of the other organizations. But we needed to have the ability to figure out, for the robot to be able to figure out autonomously where it is in the environment, try and map that environment, going

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room to room doing certain tasks, and we were very hopeful that -- that the LiDAR systems could complement the suite of sensors.

At the end of the day, even though we had encouraging results, to my previous point, we just had to not use the LiDAR systems, whether it was our home-brewed system or the SICK, and -- and went instead to computer vision with a structured laser light grid projected onto the floor or, you know, kind of in front of the robot.

Q Got it. And the project you were just describing involving building a LiDAR system during your master's Ph.D., that would have been in the mid to late 1990s. Is that right?

MR. LAUPPE: Object to form.

THE WITNESS: Sorry, I didn't mean to talk over you, Patrick.

A Yes, that would have been in the '96 to '98 time frame, maybe '95 --

Q And do you recall -- sorry, go ahead.

A Maybe '95 to '98.

Q Do you recall roughly how much time you

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spent building that LiDAR device?

MR. LAUPPE: Object to form, scope.

A I couldn't tell you precisely how many man-hours were put into it.

I can tell you this. I didn't have a social life when I was doing my grad school. So I -- we had a machine shop and electronics assembly shop, the -- the electronics inventory. And I had a very large center with open space all in one area in a place called Daniels Hall at North Carolina State University, and I also had a cot and a refrigerator and a microwave. And you can ask people I went to school with and they'll tell you I was pretty much around the clock there.

Q Well, setting aside the specific man-hours, do you know if that LiDAR design or LiDAR building project, was that something you worked on over the span of weeks? Months? Years?

MR. LAUPPE: Object to form, scope.

A I would say it spanned at least a year. I don't know if it crossed the two-year threshold at that point.

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Q Other than that project, is there anything else during your education, whether it's bachelor's, master's or Ph.D., where you were building or designing a LiDAR system?
MR. LAUPPE: Object to form.
A That example is the one that stands out the most.
I was very motivated during that time and -- and dove into various technologies on an as-needed basis. And I'm not sure that I remember everything, but I would say that's the one that stands out the most.
Q And there's no other project specifically that comes to mind right now?
MR. LAUPPE: Object to form.
A Not at this point. That doesn't mean it didn't happen, but not at this point.
Q Let's shift to kind of your post -- post-Ph.D. work and professional work. And I think you discussed some of that in paragraphs 4 through 22, I think, in your declaration. Is that right?
MR. LAUPPE: Object to form.

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A You're referring to the section in my declaration Background and Qualifications. Is that correct?
Q That's right.
A Okay. I'm there.
Q So reading through this section, I see in paragraph 17 you refer to some work that you did with LiDAR systems when you were at Teledyne Technologies. Do you see that?
A Which paragraph did you say? 17?
Q 17.
A Yes.
Q And just before -- before we talk about that, is there anything else, any other kind of position work that you did post-Ph.D. where you were working with LiDAR systems specifically?
MR. LAUPPE: Object to form.
A Could you ask your question again? Are you -- did you refer to work or are you referring to academia?
Q So post -- post-academia, after your Ph.D., other than the work at Teledyne Technologies

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discussed in paragraph 17 of your declaration, is there any other work that you did in your employment or professional career involving LiDAR devices?
MR. LAUPPE: Object to form.
A Well, if you'll notice, I was an adjunct professor both at Duke University and at North Carolina State University for a couple of decades, and during the time that I served as an adjunct professor there, I taught various classes mostly in the engineering technology space, and for that matter, mostly in the controls, robotics and automation space, and LiDAR is a common sensor in the mobile robotics world. And, you know, it started to really kind of take off in the -- I want to say in the, I don't know, 2010-ish time frame, 2012-ish time frame.
But not everything is listed of the projects that I oversaw. But you may notice under Duke University and possibly at NC State University it's listed. But at both places the courses that I taught were project intensive, building, operating, utilizing in some way, shape or form robotics, and

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that included, I would say, a good portion of those were mobile robots and a good portion of those mobile robots had LiDAR systems on them of various types. Again, some were your bigger kind of off-the-shelf systems that came along I would say later in the 2010s time frame. Some of them were just early stage laser range finder bolted on something that scans and try to extract meaningful information from it.
But I would -- I would just say that given that you're simply asking me post my Ph.D., I just noticed that I taught both at Duke and at NC State University, and a lot of those projects involved LiDAR systems.
At Nekton I would probably -- I can't really recall anything specific with LiDAR systems while was at Nekton, which later became iRobot.
While at Vortex HC, which was a spinout from Avionic Instruments post-acquisition by TransDigm, we built a lot of mobile robotic systems. The hook, I guess, for our company was a wall climbing technology based on something referred to

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as vortex regenerative air movement or aqueous movement, it enabled robots to attract to surfaces so that they could climb walls, and if they're under water, you got even more attraction.

And so our wheeled systems when they were navigating were supposed to do a variety of things. We didn't get very far using lasers under water, I'm sure you can imagine, particularly in saltwater.

But I just remembered something about Nekton. But let me -- let me continue with Vortex. So, again, we tried to utilize a real simple lightweight laser range finders to enable the robots as they're maneuvering up the surfaces to know the best path to take. At that point, if they were operating in the air on a wall or a ceiling, it sounds cool, and it is, but it didn't take a whole lot for the attractor to get disrupted, take something, you know, a protrusion at about a centimeter if it crossed a wide -- if it crossed the width of the robot, and so it could traverse over that, but it sort of disrupted the vortex, and it wouldn't fall off the wall necessarily, but the

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ideal situation was to avoid those sort of things.

And so we had a really basic laser range finder which made it so that we didn't have to do image processing. So it minimized the burden on the processor, this vehicle -- I don't think I have one with me, but the vehicle is -- was only about maybe 10 inches wide and about 8 inches in length, and, you know, about 3 or 4 inches high. And so you can imagine it's battery-operated and size, weight and power per swap was a really big deal. So the laser range finder put in sometimes a static position, but sometimes in a sweeping position. We did have a pan and tilt unit on there. So that's where we used it.

Let me go back to Nekton, if I could. Let me see if I can find the specific project. So some of these things were classified and I don't know that I can talk about them at all. But let me just find -- okay. It is on here, I think.

The I guess second bullet down under Principal Investigator and Program Manager says "DARPA Distributed Micro-Robotics Swimming Arrays for Anti-Submarine Warfare," we -- we used a -- this

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was an applied research program, and we used a blue-green type of laser for tracking multiple vehicles that swam in a formation, and we tried to use that also so that they could triangulate off of each other and that they could communicate with each other. Highly directional, I'm sure you can imagine.

And but it was -- we were motivated to do it for a variety of reasons. One, we needed to stay quiet, and you're talking about an array formation that could change its shape to vary the aperture in a passive acoustic way to prevent what was referred to at the time as close encounters of the unexpected kind.

So the front end of a sub does a really bad job of scanning, just very difficult for it to scan where it's going. They can see things beside it really well. They used to have towed arrays like TB29s and what have you. But it couldn't really tell what was in front of it very well.

So the idea was that a larger unmanned underwater vehicle or uncrewed underwater vehicle

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would be deployed, in some cases two of them would be deployed, and these larger UUVs being able to go in and out of the submarine were actually validated, and I think in that situation the contractor for that was Northrop Grumman.

But inside those larger UUVs would be our smaller UUVs, and the UUVs would have to swim in a formation, and they had to swim in a pretty tight formation so that they could control the -- the, you know, the spectral range, again, varying the collective aperture, and you can do array beamforming, that sort of thing. But we were using a blue-green laser variant, I say a green laser variant because that penetrated the water really well.

Q Let me ask a little more simply, during your academic career at -- during your academic career at Duke and NC State, was there any work or research that you personally were involved in that included building or designing a LiDAR device or system?

MR. LAUPPE: Object to form.

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A I would have to take some time to generate a comprehensive list.

But among other things, we participated in the DARPA Grand and Urban Challenge, challenges plural I should say. And I believe the first one that we participated in the Grand Challenge we didn't really have a commercial off-the-shelf LiDAR option. But subsequent challenges, especially and including the Urban Challenge, we did. When we could buy them off-the-shelf we did, so it was more of an integration and an application and a post-signal processing effort, not necessarily working at the optics and emitter detector level.

But when we were looking at fielding both of the red team vehicles for the Grand Challenge, the first Grand Challenge, we fitted one with a radar system and we made efforts to fit the other with a LiDAR variant. And I'm trying to remember what was around at the time, I think it was called Regal. I could have the name wrong. And but -- but didn't get great results from that.

So once again, you know, blew the dust off

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of the getting some laser. You can imagine we had some in-house expertise that helped us on the optics. At the end of the day, we didn't feel like we could put that on the vehicle to operate in the desert, and so it just wasn't fielded.

Q You referred to "we" just now. Who does that include?

MR. LAUPPE: Object to form, scope.

A "We" would be myself and the students, and then our partners in that situation, which would have been Carnegie Mellon, and I want to say there might have been another partner. We deployed two Hummers or Humvee vehicles.

Q I guess let me be a little more specific. As part of the DARPA Grand -- the DARPA Grand Challenge that you were discussing, were you personally involved in building or designing any LiDAR devices or systems?

MR. LAUPPE: Object to form.

THE WITNESS: Sorry, Patrick.

MR. LAUPPE: That's fine.

A I got involved hands-on when our -- the

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options that we were aware of didn't work. And so, again, you know, being a machinist and having the equipment there and having, you know, a budget, which oftentimes came out of my pocket, but that's where I got more hands-on with the intended replacement option.

I will say that's not the only sensor that we evaluated and in some cases built or modified significantly that didn't get deployed in the ultimate competition. Just kind of how that works, you funnel down.

Q Any other projects in your academic career where you were personally involved with building or designing a LiDAR system?

MR. LAUPPE: Object to form.

A I wouldn't say no. You know, I could certainly think more on other examples. I've been pretty blessed with opportunities and passion and skills to tackle these things, so they start to stack up after a while, and some become easier to remember than others.

Q How much time across your academic and

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professional career, how much time would you say you spent building or designing LiDAR systems?

MR. LAUPPE: Object to form.

A I couldn't tell you the specific amount of time. And I don't know that we got to all of the other postgraduate work either that involved LiDAR systems, including at Teledyne. But I would say if you add it all up, I wouldn't be surprised if it's in the -- I wouldn't be surprised if it's in the thousands of hours.

It's just one of those sensors that a lot of times we try to design around and you realize that you -- you just can't, the computer vision, best of intentions, and we've had so many great successes over the years, myself and various teams, teammates with computer vision.

But at the end of the day, the LiDAR system is a low-powered, robust ranging system for building point clouds that is very difficult to operate without. So I would be surprised if it's less than a couple thousand hours, man-hours.

Q And are there any projects, whether in

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your academic or professional career, where you were involved in designing or building a production grade or commercial grade LiDAR system?

MR. LAUPPE: Object to form.

A I guess that depends on your definition of production grade and commercial grade. Every LiDAR system I've had my hands on has been embedded in a -- in some other system. So it hasn't really been sold as a stand-alone ranging point cloud-generating type of system. It's been more of an essential building block to a larger system that was deployed.

And so, yes, there were, you know, the VMRP was a deployed system that had the range, the laser ranging capability on it with the pan tilt, the micro UUVs have been deployed.

And, you know, I would have to think hard about a couple of other systems, but -- oh, well, when I was at DeltaFive, we had -- and the company still exists. I just left as CEO in 2018, I believe. But the major intent of that company was to have automated systems to enhance the hospitality space, not from an entertainment perspective, but

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from a back-end operations and maintenance perspective. At the end of the day trying to make sure that guests would have a good experience but not -- but be kind of oblivious as to how.

And so DeltaFive, the five elements -- and I'm probably going to forget one, but there are two different types of cleanliness, there's inventory and there's positioning, and I'm blanking on the fifth one. But, anyway, there were five major things.

So we had robots that would enter rooms, and sometimes referred to as cobots, would work alongside the housekeeping staff or sometimes alone and monitor for cleanliness and all these other things, is the lamp working, is the picture hung on the wall properly, is everything made, are there enough towels. And we used LiDAR systems on that vehicle and we had to do a home brew with those because at that point there was a cost threshold above which it just didn't make economic sense to purchase the robot or deploy that robot. And so we -- we took -- fortunately, the laser range finders

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had gotten better and so did slip rings and a few other things that enabled the full rotation, and on that robot we had -- we had LiDAR systems.

Q And were you -- did you design and build that LiDAR system at the optics and emitter detector level?

MR. LAUPPE: Object to form.

A I -- first of all, I wouldn't be able to claim personal credit for everything. But in that situation it's, unfortunately, a repeated and classic example of hoping that something commercial off-the-shelf would do the trick, hoping that computer vision would do the trick.

And computer vision went a very long way in the types of environments these robots operated in. You know, it's indoor, it's structured, it's repetitive in a lot of ways. You could tell what room you're in just by looking at the door.

But, once again, the LiDAR systems just didn't do the trick. And so in that situation, we -- gosh, we bought so many different ones and took them apart and reassembled and played with the

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optics and played with integrating SPADs. But, you know, among others we looked at, at the inexpensive range, we looked at one from a company I think called Neato, but that was a single line type of sensor. Now, it had a good refresh rate, I want to say it was somewhere in 4, 5 hertz, but I could be wrong. It might have been closer to 2 hertz. And, you know, generally pretty good ratings.

But we needed to be able to speed up the refresh or the suite, and so we used the basic actuation and then tried to put our own optics, and started with APDs and then dabbled a little bit in SPADs. And then we tried to change it from a single line to a three line suite. And so in that regard, yes, I was very hands-on at that.

MR. HAGIZ: All right. Why don't we take our first break.

(Recess 10:00 a.m. - 10:13 a.m.)

BY MR. HAGIZ:

Q So, Doctor, I want to turn to your opinions on the Hall, Borowski, Spector combination, and that starts in page 63 of your declaration,

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paragraph 123. Just let me know when you're there.
A Okay.
Q And I want to focus on the Hall, Spector part of the combination and make sure I understand your opinions there.
So your understanding is that in the Hall and Spector combinations specifically, Spector's arrayed micro-optics and aperture array would be incorporated into Hall's system. Is that right?
MR. LAUPPE: Object to form and scope.
Q And for reference, I'm looking at paragraph 124 of your declaration.
MR. LAUPPE: Same objections.
A So what was your question again?
Q I want to make sure I understand your understanding of the proposed combination of Hall and Spector is that Spector's arrayed micro-optics and aperture array would be incorporated into Hall's system. Is that right?
MR. LAUPPE: And again, object to form and scope.
A It's my understanding that Dr. Shanley

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states that it would have been obvious to incorporate the SPADs, or single photon avalanche detectors, from Borowski into Hall's spinning LiDAR system, and to incorporate Spector's arrayed micro-optics at the -- well, into Hall, and an aperture array from Spector and Hall's light detection module.
And I wonder if it's possible to bring up, just to kind of ground through this, I believe this is Dr. Shanley's report, Exhibit 1003.
Q Let me just upload that to the chat. So that's -- okay. I've uploaded and you should now have accessible Exhibit 1003, which is Dr. Shanley's declaration.
Let me know if you need me to repeat the question. It seemed like you were still working on your answer.
A So just quoting from Dr. Shanley's declaration, starting at paragraph 190 he writes that Borowski's -- or Borowski's SPAD arrays address a problem identified in Hall, specifically, that they rely on laser pulse intensity, and there's a

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motivation essentially for better power management and high levels of imaging resolution and range.
Dr. Shanley goes on to say that "Borowski teaches that its SPAD arrays can provide detection at lower light intensities because SPADs 'provide significant carrier amplification.'"
And Dr. Shanley concludes in this paragraph that a person of ordinary skill would have been motivated to incorporate the SPAD arrays into Hall's LiDAR sensor for the benefits of SPADs, and more specifically, that they address a problem identified by Hall.
The next paragraph refers to -- or the next paragraph in Dr. Shanley's declaration goes on to say that a person of ordinary skill would have been motivated to combine Hall and Spector to incorporate the arrayed micro-optic at Hall's light emission module, and an aperture array at Hall's light detection module.
So to your question, I believe I am simply quoting in that paragraph Dr. Shanley's declaration.
Q Well, what you say in your declaration in

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paragraph 124 is that "Dr. Shanley asserts that it would have been obvious to incorporate the SPADs disclosed by Borowski into Hall's spinning LiDAR system, and to incorporate Spector's arrayed micro-optics at the light emission module of Hall and an aperture array from Spector at Hall's light detection module."
Did I read that correctly?
A You read that correctly, yes, sir.
Q And in paragraph 191 of -- of Dr. Shanley's declaration, he does not use the phrase "Spector's arrayed micro-optics" or "an aperture array from Spector," right?
MR. LAUPPE: Object to form.
A Well, in paragraph 191 he does mention Spector's arrayed micro-optic and aperture layer. And then goes to say that the implementation of which displays and spacial separation used by Hall, and at the same time reduce cross-talk.
Q I just want to be clear because I heard you say that you were quoting Dr. Shanley, and I just wanted to be sure we're on the same page.

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The language that you use in paragraph 124 of your declaration, that's not a direct quote from paragraph 191 of Dr. Shanley's declaration, right?
MR. LAUPPE: Object to form.
A It's a citation to paragraphs 190, 191, and I agree, it's not a verbatim quote. It's intended to summarize.
Q Okay. And again, I just want to make sure that I understand how you're reading Dr. Shanley's declaration. Your understanding is that Dr. Shanley is proposing taking the specific arrayed micro-optic and aperture array from Spector and inserting them into Hall's light emission module and light detection module respectively. Is that right?
MR. LAUPPE: Object to form and scope.
A I -- I'm not sure how else to describe this other than how it's written, and, you know, my interpretation of what Dr. Shanley had written.
I understand that -- that there were aspects, I believe, of Spector that were presumed to not be included. However, I think, at a minimum, the receiving optoelectronics from Spector was

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envisioned or proffered by Dr. Shanley as being placed on Hall. Otherwise the gimbal, if I understand correctly, was presumed I believe by the PTAB as to not being used, and I'm not entirely sure that -- that Dr. Shanley was pushing for the gimbal itself.
Q I just want to make sure I understand. With respect to the receiving electronics, or more specifically, the aperture array, your understanding is that Dr. Shanley is proposing taking the specific aperture array in Spector and inserting that into Hall's light detection module. Is that right?
MR. LAUPPE: Object to form, scope, and asked and answered.
A Yeah, I'm just not sure how else to state what's in that paragraph. I'm hesitant to go off the rails or try to redescribe it.
Again, there's some ambiguity as to what exactly is being advocated, or at least the extent to which it's being advocated by Dr. Shanley. But, you know, I kind of feel that the paragraph speaks for itself.

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Q Okay. In paragraph 1 -- let me turn next -- let's turn next to paragraph 145 in your declaration. Let me know when you're there.
A You said 135?
Q 145.
A Oh, 145. I'm sorry. Yeah. Okay. I'm there.
Q And in paragraph 145 you're referring to an article by someone named Sergey Vinogradov.
A You say that name more fluidly than I do. Yes.
Q I could be butchering it, but I'm trying my best. So let me just have it available while we're talking about it. Let me upload this to the chat, this was Exhibit 2014, and let me know when you have that available.
A Okay.
Q The Vinogradov article, I'm just going to refer to it as Exhibit 2014 so I don't have to keep saying that name. Exhibit 2014, is that a document that you were familiar with or had come across before your work on this proceeding?

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MR. LAUPPE: Object to form and scope.
A I actually had seen, whether it was this specific one or something else from him in the -- during the time when I was at DeltaFive, because, as I mentioned, we were trying to integrate SPADs, and just having a devil of a time with the circuitry to support the quenching and just the sequencing basically that each one of those sensor arrays needed. And so this was -- this and/or something very similar to this I had seen somewhere in the 2017-ish, 2018-ish time frame.
Q And do you know who Sergey Vinogradov is?
MR. LAUPPE: Object to form and scope.
A Well, I mean, as it says here, he -- well, my understanding is that he's with the -- I'm probably not going to say this very fluidly either -- the Lebedev Physical Institute, Russian Academy of Sciences, and I don't remember much else about his credentials. But in below the title there are footnotes associated with his name and the other co-authors, including -- no, I'm sorry, it was just him, yeah.

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Q So other than what's referenced in Exhibit 2014 itself, do you have any understanding of Sergey Vinogradov's background or experience with LiDAR systems?
MR. LAUPPE: Object to form and scope.
A Did you say 2014?
Q Exhibit 2014 is the exhibit number. Other than what's described or included in Exhibit 2014, you don't have any -- any other knowledge or understanding of Sergey Vinogradov's background or experience with LiDAR systems?
MR. LAUPPE: And same objections.
A I know that I've seen the name. I've not met him in person. But I would say that if you had asked me this in the 2018 time frame, I probably would have a better memory of his credentials. But -- but, anyway, you know, beyond that, I -- it would take me a little time, I think, to recall the specifics of my familiarity with him.
Q Sitting here today, you can't recall anything about him beyond what was indicated in Exhibit 2014 itself?

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MR. LAUPPE: Object to form and scope.
A I would have to go back and look at some notes from that time frame to be sure.
Q My question is sitting here today, you can't recall anything specific about him beyond what's indicated in Exhibit 2014. Is that fair?
MR. LAUPPE: Same objections and asked and answered.
A The only thing that I can recall is that I gave credence to his research and reporting at the time, and that I would have to go back and take a look at my notes to have more details.
Q And in -- in paragraphs 145 and 146 of your declaration, you quote from some passages in the Vinogradov paper Exhibit 2014 on pages 3 and 4. Do you see that?
A Yes.
Q And specifically -- let me start that over.
The portions of Exhibit 2014 that you quote in paragraphs 145 and 146, those include citations to several other papers that are indicated

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in the bracketed numbers 20 to 21, 22, 23 and 24. Do you see that?
A Yes, sir, I pulled those over, yes.
Q And if you turn to the last page of Exhibit 2014, that includes the authors and titles of those papers numbers 20 to 24. Do you see that?
A Yes. The references?
Q That's right.
A Yes.
Q And so my question is did you read or review those five references numbered 20 to 24 in Exhibit 2014 in preparing your declaration?
MR. LAUPPE: Object to form and scope.
A The reference from Zappa from SPIE, I don't recall the extent to which and how deep I went into that reference. From Frach looks familiar, because around that time and prior to that time I was also doing work for -- well, we were delivering products to GE Nuclear Hitachi -- GE Hitachi Nuclear, Framatome and Areva, and so those are the most familiar ones as I look at those.
You know, if you were to ask me to recite

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for you the specifics of those documents, I would have to go back and do some homework, but -- and then the others may or may not have drilled down that deep. But, you know, again, I gave credence to the author that the research was done in a proper manner.
Q I'm not sure I understood your answer. Let me -- let me see if I can clarify.
You mentioned some of these papers look familiar. Let me take them one by one.
Did you review the Zappa paper reference number 20 in Exhibit 2014, did you review that when you were preparing your declaration in this proceeding?
MR. LAUPPE: Object to form and scope.
A As I was writing this -- well, let me just I guess kind of say at the outset, I'm not really sure as it relates to fill factor and integration of SPADs that Dr. Shanley put forth anything specific to fill factor. So the, you know, the depth of research into teaching references, or references that give a perspective of a person of ordinary

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skill at or around that time, particularly one that had credibility, you know, probably dictated what might have been a perceived need to drill down.

But that being said, again, those references look familiar to me. During the composition of my declaration, I may or may not have glanced at them. But -- but I believe historically I did at least to the extent to make sure that they squared with the authors' positions.

Q I didn't hear a clear answer there.

Do you not recall whether you reviewed the Zappa reference, reference number 20 in Exhibit 2014, specifically for the purposes of preparing your declaration Exhibit 2010?

MR. LAUPPE: Object to form and scope.

A I try to be a good steward of listing the materials that I utilized, and I'll defer to that. Whether I went back and looked at it during the composition, I don't exactly recall. But, again, looks familiar from at least prior review.

Q When you say you try to be a good steward of listing the materials that you utilized, do you

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mean if you relied on particular materials, you would have identified it in your declaration?

A I do make that effort. That doesn't mean it's --

MR. LAUPPE: Just object to form and scope.

You can proceed. I'm sorry to interrupt you.

THE WITNESS: No. I apologize.

A I do make that effort. It doesn't mean that things are always included to the nth degree. In this situation it's a reference that's included in a reference. And so if it's not listed, it doesn't mean I didn't necessarily glance at it, or didn't necessarily remember it to any particular extent.

But I -- as I'm here today, I can't recall the extent to which I went back and looked at the citations in the Vinogradov reference while composing this declaration.

Q All right. Let me -- let me ask more specifically, do you have any specific recollection

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of reviewing the Zappa reference, which is reference number 20 to Exhibit 2014, when you were preparing your declaration in this action?

MR. LAUPPE: Object to form, scope, and asked and answered.

A I would not rule it out. Recognize Zappa and the other one that I mentioned, exactly when I last looked at them is not really coming to mind right now. Again, it's a reference within a reference, and it's included, and, you know, I'll just kind of restate here, I just don't recall, and I'm happy to look at it if he did, where Dr. Shanley put forth anything related to fill factor modification.

Q My question was just you do not specifically recall reviewing the Zappa reference when you were preparing your declaration in this action. Is that right?

MR. LAUPPE: Object to form, scope, and asked and answered.

A With respect, my answer will be the same. I can't rule it out. I look at a lot of things when

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I put together declarations. If it's a significant reference, or if it's a stand-alone reference, which is to say not included in another citation, then I make the effort to be a good steward and list it. If it's included by reference, then, again, I can't rule it out that I reviewed that at least in part or as a refresher, if only to refresh my memory that that's the same reference I looked at in the late 2010s time frame. That's really as far as I would go. I can't rule it out. I can't say definitively.

Q And so that's my question, you don't have a specific recollection that you did review the Zappa reference in Exhibit 2014? I'm not asking if you can rule it out or not. I'm asking do you have a specific recollection that you reviewed that reference in preparing your declaration in this action?

MR. LAUPPE: And again, object to form, scope, asked and answered.

A It's entirely possible that I looked at it if only briefly to refresh my memory of that particular reference --

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(Simultaneous speaking.)
Q I'm not asking -- Doctor, I need an answer to my question. I'm not asking if it's possible.
I'm asking do you have a specific recollection of reviewing the Zappa reference when you prepared your declaration?
MR. LAUPPE: Again, object to form, scope, asked and answered. Also, I would just -- if you could keep from interrupting the witness, please, Ron.
MR. HAGIZ: I need -- I need an answer to my question, so I'm going to make sure that I get it.
BY MR. HAGIZ:
Q Doctor, do you have a specific recollection of reviewing the reference -- the Zappa reference when you were preparing your declaration?
MR. LAUPPE: Same objections. And also, I mean, if you want an answer, you need to stop interrupting the witness.
MR. HAGIZ: We don't need the colloquy on the record.

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Q Doctor, can you answer my question?
A With respect, Counsel, I would say it the exact same way. I can't rule out the possibility. I do recall looking at that reference somewhat recently, whether that was while working on the IPR or just refreshing my memory on other matters, I can't say exactly. But it's fairly recent that I looked at it, and I would have to go back and see if I have some notes specific to that.
Q What is fairly recent? Is that in the past year?
MR. LAUPPE: Object to form.
A Well, I would say definitely within the past year. But which specific month, I would have to go back and look at my notes.
Q But with respect to the Durini reference, reference 21 in Exhibit 2014, did you have a specific recollection of reviewing that in preparing your declaration in this proceeding?
MR. LAUPPE: Object to form and scope.
A That one is less clear to me. Again, I'm sorry, but I can't rule it out. I look at a lot of things sometimes ever so briefly just to make sure that it's what I thought it was to ground truth it. That one is -- is I can only say less clear than the Zappa reference.

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Q Okay. But my question is not about ruling out. You don't have an affirmative recollection that you reviewed the Durini reference when you prepared your declaration. Is that right?
MR. LAUPPE: Object to form and scope.
A I would not go that far. I would have to go back and look at my notes.
Q Okay. So you can tell me sitting here right now that you reviewed the Durini reference when you were preparing your declaration. Is that your testimony today?
MR. LAUPPE: Object to form and scope.
A I would have to go back and look at my notes.
Q So you don't recall?
MR. LAUPPE: Object to form and scope.
A Is this a memory test or, you know, would I be able to go back and look at my notes?

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Q I'm asking if you recall whether you reviewed the Durini reference when you were preparing your declaration. That's my question. Can you answer that question?
MR. LAUPPE: Same objections.
A Yeah, I would have to go back and look at my notes.
Q Do you have an affirmative recollection of reviewing the Zou reference, reference 22 cited in the Vinogradov paper Exhibit 2014, when you were preparing your declaration in this proceeding?
MR. LAUPPE: Object to form and scope.
A That fits into the Zappa category, that seems more fresh to me. I have a -- you know, a similarly -- a similar recollection of looking at it to ground truth. But as with all of these, I would have to go back and look at my notes.
Q Do you have an affirmative recollection of reviewing the first Frach reference, reference number 23 cited in the Vinogradov article Exhibit 2014, when you were preparing your declaration in this proceeding?

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MR. LAUPPE: Object to form and scope.
A That I would put in the same category as the Durini reference, I believe. But again, I would have to go back and look at my records.
Q And same question, do you have an affirmative recollection of reviewing the second Frach reference, reference number 24 cited in the Vinogradov article Exhibit 2014, when you were preparing your declaration for this proceeding?
MR. LAUPPE: Object to form and scope.
A That fits into the category of the Durini one, where it's less clear to me. But with respect, I would probably have to go back and look at my records to see the last time I took a look at those.
MR. HAGIZ: Okay. I think I'm almost done. Why don't we take a five-minute break, let me just collect my notes and see if we can wrap this up.
MR. LAUPPE: Thanks, Ron.
(Recess 10:49 a.m. - 10:52 a.m.)
MR. HAGIZ: Thanks for your time today, Dr. Janét. That's all the questions I have for you.

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MR. LAUPPE: And no questions from me at this point.
(Time noted: 10:52 a.m.)

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CERTIFICATE OF CERTIFIED SHORTHAND REPORTER
NOTARY PUBLIC

I, MONIQUE VOUTHOURIS, Certified Court Reporter and Notary Public within and for the State of New Jersey, do hereby certify:
That JASON A. JANÉT, PH.D., the witness whose remote deposition is hereinbefore set forth, was duly sworn by me before the commencement of such deposition, and that such deposition was taken before me and is a true record of the testimony given by such witness.
I further certify that the adverse party, OUSTER, INC., was represented by counsel at the deposition.
I further certify that the remote deposition of JASON A. JANÉT, PH.D. occurred on Friday, August 30, 2024, commencing at 9:02 a.m. to 10:52 a.m.
I further certify that I am not related to any of the parties to this action by blood or marriage, I am not employed by or an attorney to any of the parties to this action, and that I am in no way

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interested, financially or otherwise, in the outcome of this matter.
IN WITNESS WHEREOF, I have hereunto set my hand this 4th day of September 2024.

Monique Vouthouris
Monique Vouthouris, CCR, RPR, CRR
Notary Public of the State of New Jersey
My commission expires: April 8, 2029

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