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Transcript of Jeremy R. Cooperstock, Ph.D.

Date: August 22, 2024

Case: Peloton Interactive, Inc. -v- NEC Corporation (PTAB)

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Transcript of Jeremy R. Cooperstock, Ph.D.
Conducted on August 22, 2024

1 (1 to 4)

1 UNITED STATES PATENT AND TRADEMARK OFFICE 2 ----- 3 BEFORE THE PATENT TRIAL AND APPEAL BOARD 4 ----- 5 PELOTON INTERACTIVE, INC., 6 Petitioner, 7 vs. 8 NEC CORPORATION, 9 Patent Owner. 10 ----- 11 Case: IPR2023-01239 12 U.S. Patent No. 8,752,101 B2 13 14 15 DEPOSITION OF JEREMY COOPERSTOCK, Ph.D. 16 via videoconference 17 Thursday, August 22, 2024 18 11:05 a.m. EST 19 Job No.: 550572 20 Pages: 1 - 171 21 Stenographically Reported By: 22 Alison C. Webster, CSR-6266, RPR, RMR, CRR, RDR	3 1 A P P E A R A N C E S 2 3 ON BEHALF OF THE PETITIONER 4 ANUPAM SHARMA, ESQUIRE 5 Covington & Burling LLP 6 3000 El Camino Real 7 10th Floor 8 Palo Alto, California 94306 9 650.632.4709 10 asharma@cov.com 11 12 RAJESH PAUL, ESQUIRE 13 Covington & Burling LLP 14 850 Tenth Street, NW 15 Washington, D.C. 20001 16 202.662.5740 17 rpaul@cov.com 18 19 20 21 22
2 1 2 3 4 5 6 Deposition of JEREMY COOPERSTOCK, Ph.D., produced 7 as a witness at the instance of the Petitioner, and duly 8 sworn, was taken in the above-styled and numbered cause on 9 Thursday, August 22, 2024, from 11:05 a.m. to 6:09 p.m. 10 Eastern Time, before Alison C. Webster, RPR, CRR, RMR, RDR, 11 CSR-6266 (Michigan); License No. 14559 (California); License 12 No. 084.004953 (Illinois); License No. 23001848 13 (Washington); CSR-12432 (Texas), reported by stenographic 14 method, via videoconference, pursuant to the Federal Rules 15 of Civil Procedure and the provisions stated on the record 16 or attached hereto. 17 18 19 20 21 22	4 1 A P P E A R A N C E S C O N T I N U E D 2 3 ON BEHALF OF THE PATENT OWNER 4 LANCE J. GOODMAN, ESQUIRE 5 Baker Botts 6 401 South 1st Street 7 Suite 1300 8 Austin, Texas 78704 9 512.322.2629 10 lance.goodman@bakerbotts.com 11 12 13 14 15 16 ALSO PRESENT: 17 Jeremy Hatfield, Planet Depos tech 18 19 20 21 22

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2 (5 to 8)

5	7
1 T A B L E O F C O N T E N T S	1 Patent Owner.
2	2 STENOGRAPHER: Hearing no objections,
3 Witness Page	3 Mr. Cooperstock, would you please raise your right
4 JEREMY COOPERSTOCK, Ph.D.	4 hand.
5	5 Do you swear or affirm the testimony you
6 EXAMINATION	6 are about to give in this matter will be the truth,
7 BY MR. SHARMA: 7	7 the whole truth, and nothing but the truth?
8 EXAMINATION	8 MR. COOPERSTOCK: I do.
9 BY MR. GOODMAN: 166	9 STENOGRAPHER: Thank you.
10	10 You may proceed.
11 E X H I B I T I N D E X	11 MR. SHARMA: Good morning, Dr. Cooperstock.
12	12 THE WITNESS: Good morning, Mr. Sharma.
13 Exhibit Page	13 JEREMY COOPERSTOCK, Ph.D.,
14	14 was thereupon called as a witness herein, and after
15 (Exhibits attached to transcript.)	15 having first been duly sworn to testify to the truth,
16	16 the whole truth and nothing but the truth, was
17 PREVIOUSLY MARKED EXHIBIT 2012 9	17 examined and testified as follows:
18 PREVIOUSLY MARKED EXHIBIT 1001 10	18 EXAMINATION
19 PREVIOUSLY MARKED EXHIBIT 1004 11	19 BY MR. SHARMA:
20 PREVIOUSLY MARKED EXHIBIT 1016 11	20 Q. Dr. Cooperstock, have you been deposed in an IPR
21	21 proceeding before?
22	22 A. I have.
6	8
1 DEPOSITION OF JEREMY COOPERSTOCK, Ph.D.	1 Q. Roughly how many times?
2 Thursday, August 22, 2024	2 A. Approximately 20.
3	3 Q. And out of those 20, how many of them have been on
4 STENOGRAPHER: The attorneys participating	4 behalf of the patent owner?
5 in this deposition and the witness have verified that	5 A. I don't recall the split.
6 he is Jeremy Cooperstock, Ph.D. In lieu of an oath	6 Q. Do you have any estimates? Have they been all on
7 administered in person, the witness will visually	7 behalf of the patent owner?
8 affirm his testimony in this matter is under penalty	8 A. No, they have not.
9 of perjury.	9 Q. So you have testified both on behalf of patent owner
10 The parties and their counsel consent to	10 and also on behalf of Petitioners; is that correct?
11 this arrangement and waive any objections to this	11 A. That is correct.
12 manner of reporting or admissibility of the	12 Q. Is there any reason you cannot testify truthfully and
13 transcript.	13 accurately today?
14 Would counsel please state their appearance	14 A. No reason.
15 and any objections to proceeding in this manner,	15 Q. I do appreciate that you're willing to start at
16 starting with scheduling counsel.	16 11 a.m. Eastern Time and over the lunch hour, so we'll
17 MR. SHARMA: Anupam Sharma from Covington &	17 try to take a break every one hour, but if you want
18 Burling on behalf of Petitioner, Peloton Interactive,	18 to, whenever you want to have a lunch break or a
19 Inc. Also here with me is my colleague Raj Paul, also	19 longer break, just do let us know and we can take a
20 from Covington & Burling.	20 break at that time.
21 MR. GOODMAN: And this is Lance Goodman	21 A. Very good.
22 from Baker Botts on behalf of NEC Corporation, the	22 MR. SHARMA: We'll go ahead and mark some

9 1 exhibits over here. The first one is Exhibit 2012, 2 that's the Declaration of Dr. Cooperstock. 3 ENTERED INTO THE RECORD: 4 PREVIOUSLY MARKED EXHIBIT 2012 5 11:07 a.m. 6 BY MR. SHARMA: 7 Q. And, Dr. Cooperstock, do you have a copy of the 8 Declaration with you? 9 A. I do. 10 Q. Is it a clean copy with no marks? 11 A. It is. That is correct. All of the documents that I 12 have locally are clean copies. 13 Q. Okay. So if it's okay with you and Mr. Goodman, we 14 will just refer to the exhibits by the numbers as used 15 in the PTAB and you can refer to your copies with you, 16 if that's easier for you. 17 A. Very good. 18 Q. And if any of these exhibits you want us to share them 19 on the screen, be happy to share them on the screen. 20 Otherwise, you can refer to the paper copies. 21 A. Electronic copies. 22 Q. Yeah, we have electronic copies, but if you want to	11 1 A. Very good. 2 MR. SHARMA: And next exhibit would be 3 Exhibit 1004. That's a U.S. patent publication number 4 U.S. 2006/0143678 A1. That's the publication with 5 Dr. Chou as the inventor. 6 ENTERED INTO THE RECORD: 7 PREVIOUSLY MARKED EXHIBIT 1004 8 11:09 a.m. 9 BY MR. SHARMA: 10 Q. Is it okay, Dr. Cooperstock, if I refer to that as the 11 Chou reference or the Chou publication? 12 A. That is fine. 13 MR. SHARMA: And the next is Exhibit 1016, 14 that's the U.S. Patent Number U.S. 7,606,928. 15 ENTERED INTO THE RECORD: 16 PREVIOUSLY MARKED EXHIBIT 1016 17 11:09 a.m. 18 BY MR. SHARMA: 19 Q. And is it okay if I refer to it as the Wang patent? 20 A. That works as well. 21 MR. SHARMA: And I also want to mark Paper 22 Number 21, and that is NEC Corporation's Patent Owner
10 1 have -- yeah. 2 A. No, mine are electronic as well, just to be clear. 3 Q. Oh, I see. 4 A. If we're going -- so just in terms of logistics here, 5 I have one computer that I'm using for Zoom, a second 6 computer that has my documents on it. 7 Q. Okay, well, that's fine, then. My mistake. I thought 8 you had paper copies with you, but that's fine. If 9 you want to refer to your electronic version of the 10 copy to answer the questions, that's perfectly fine, 11 so... 12 A. Very good. 13 Q. Okay. I'd like to go ahead and mark some other 14 exhibits while we're at it. 15 MR. SHARMA: Next will be Exhibit 1001, and 16 that is U.S. 8,752,101. 17 ENTERED INTO THE RECORD: 18 PREVIOUSLY MARKED EXHIBIT 1001 19 11:08 a.m. 20 BY MR. SHARMA: 21 Q. And, Dr. Cooperstock, is it okay if I refer to that as 22 the '101 patent, shorthand?	12 1 Response, or POR. 2 [Exhibit not marked] 3 BY MR. SHARMA: 4 Q. And, Dr. Cooperstock, is it okay if I refer to that as 5 NEC's POR or NEC's Patent Owner Response? 6 A. That is fine. That's Paper 14, to be clear? I'm 7 just confirming. That's Paper Number 14; is that 8 correct? 9 Q. I think that NEC's POR is Paper Number 21. 10 A. Oh, I'm sorry, that's the POPR. Let me make sure 11 I've got the POR in front of me. 12 What was the exhibit number on that? 13 Q. The referring number we are referring to as Paper 14 Number 21. 15 A. Okay. So, it doesn't have an Exhibit 10-something? 16 Q. Not that I am aware of. 17 A. Okay. 18 Q. But if you want, we're happy to use that. 19 A. So it may be better if you put that through the Zoom 20 Chat so I have a copy here. I'm not finding where I 21 stored it. 22 PLANET DEPOS TECH: And, Counsel, I'm not

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13 1 seeing that I have a copy of that either. 2 MR. SHARMA: Okay. So we will email it to 3 you and we will -- before we refer to it. 4 BY MR. SHARMA: 5 Q. Okay. So let's start with the -- Dr. Cooperstock, 6 with your Declaration, this Exhibit 2012. Could you 7 tell us how the process of drafting the Declaration 8 happened? 9 A. Much like in other cases I've been involved, it's a 10 significant amount of back-and-forth with the 11 attorneys. I read the materials that have formed 12 part of the case, the patent, the asserted prior art, 13 Petition, the Petitioner's Petition, the Declaration 14 of Dr. Reader, in this instance, and other materials 15 that have been provided by counsel, and looked -- we 16 go back and forth in terms of drafts and comments on 17 drafts. 18 I provide input, I provide some text. The 19 attorneys prepare text. I comment on that. I 20 provide input, we discuss and iterate on numerous 21 rounds of back-and-forth until arriving ultimately at 22 the final version of the Declaration.	15 1 in the '101 case, that was, I believe, sometime after 2 my initial -- the initial time of my being retained, 3 and I don't recall exactly when those dates were. 4 Q. Do you recall roughly when did you start working on 5 your Declaration? 6 A. I would have to hazard a very approximate guess and 7 say it was probably sometime around half a year ago. 8 Q. So over six months ago? 9 A. Again, that's a very rough guess. 10 Q. Okay. Yeah, you submitted the Declaration on 11 May 31st. Do you recall how many weeks or months 12 before that? 13 A. I do not. As I said, my recollection of the exact 14 dates is not -- my recollection of dates is far from 15 exact. 16 Q. Do you recall whether you started working on the 17 Declaration after the IPR was instituted or before? 18 A. Yeah, I don't -- I don't recall. I may have been 19 told whether the institution decision was pending or 20 whether it had been instituted. 21 Again, there was -- my involvement in the 22 case goes back prior to -- or my -- I should say, my
14 1 Q. Dr. Cooperstock, is it correct that you did not submit 2 a Declaration along with NEC's POPR, that is Patent 3 Owner Preliminary Response? 4 A. Sorry, could you repeat the question? 5 Q. Yeah. Is it correct that you did not submit a 6 Declaration along with NEC's POPR? 7 A. In the '101 case, the present one, I only submitted 8 one Declaration, the present one to which you're 9 referring. 10 Q. Yeah, and just for clarification, I know you were the 11 expert in a different IPR, the '4,427 patent, but all 12 the questions I'll have today will refer only to the 13 '101 IPR. I will not make any references to the '427 14 IPR. 15 A. Understood. 16 Q. Thank you. And when were you retained by NEC to work 17 on the '101 IPR? And by "101 IPR," I mean the IPR 18 2023-01239. 19 A. Yeah, I don't recall the exact time frame. I know I 20 was retained initially by NEC in conjunction with the 21 litigation and the IPR matters, but in terms of when 22 the determination was made that I would be involved	16 1 engagement with NEC goes back prior to formal 2 involvement in the '101, so in terms of the temporal 3 order of institution decision relative to my 4 involvement in the Declaration, I -- it's somewhat 5 mixed up in terms of at what point that occurred. 6 Q. Dr. Cooperstock, let's go to paragraph 63 of your 7 Declaration, Exhibit 2012. 8 Are you there? 9 A. I am. 10 Q. So paragraph 63, which is on pages 22, 23, you cite an 11 equation from the '101 patent; is that correct? 12 A. That is from the '101 patent, that's correct. 13 Q. And the equation is shown on page 10 around line 54. 14 Let me strike that. 15 And the equation that is shown in 16 paragraph 63 of your Declaration is excerpted from 17 column 10, roughly line 54 of the '101 patent; is that 18 correct? 19 A. That is the location of the equation in the '101 20 patent. 21 Q. And on the previous page in your report, on page 22, 22 you mentioned that '101 provides Equation 5 as an

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17 1 exemplary equation; is that correct? 2 A. That is what my Declaration states, yes. 3 Q. So in other words, Equation 5 is just an example of 4 how the process disclosed in the '101 patent may be 5 executed; is that correct? 6 A. That is consistent with the wording from column 10 of 7 the '101 where it begins, "In this exemplary 8 embodiment," and proceeds to introduce the equation. 9 Q. And what is the purpose of Equation Number 5, shown in 10 '101 patent? Please feel free to refer to your 11 Declaration or to the '101 patent. 12 A. Yes, so, both my Declaration – well, I should say, 13 my Declaration uses the language or quotes the 14 language from the '101 patent, so reading from either 15 will give the same text. The Equation 5 is used to 16 determine a code rate $m+1$ by using the remaining 17 time that is calculated at t_s-t_n, and that equation – 18 I should say, the difference of t_s-t_n is the 19 difference between the time at the present moment – 20 or, I should say, it's actually the difference 21 from – of the reproduction start time and the time 22 at the present moment.	19 1 the upcoming frame. 2 Q. And in your expert report in footnote 1 of page 23, 3 you mention a typo, and you mention that in 4 Equation 5, when it refers to t_s, it really means T_s. 5 Do you see that? 6 A. I do see that footnote, yes. 7 Q. Maybe for the purposes for this deposition we'll 8 assume Equation Number 5 when it mentions t_s, the 9 equation should read T_s. Is that okay with you? 10 A. So there are a few minor clerical errors that don't 11 change in any way the substance of my opinions in the 12 Declaration, but on review, I realized that the '101 13 probably meant instead to introduce -- now, let me 14 just get the symbols correct here. Or the location 15 in which they're described. 16 Bear with me for just a moment. I'm trying 17 to find where, in the '101, the term was first 18 introduced. Or the symbol. 19 Q. How about column 8 line 2? 20 A. That is correct, reproduction start time, T_s, and the 21 lowercase in Equation 5... 22 So the introduction on column 8 is
18 1 It's reproduction start time minus time at 2 the present moment, and T_n, which denotes the 3 available reproduction time, received at the present 4 moment, and although not stated in paragraph 63 of my 5 Declaration, T_d is the deadline at which the frame 6 should be played out. 7 Q. And the equation refers to a variable called B_n, and 8 what is that variable? 9 A. So B_n, as described at line 45 of column 10, is the 10 communication speed used for frame "n". That's 11 during the period between the present moment and the 12 reproduction start time. 13 Q. In Equation 5 when you mention $m+1$, that's related to 14 as to the code rate; is that correct? 15 A. That is the code rate. 16 Q. And the $n+1$ implies that this code rate "r" will be 17 used to decode at the next step in time? 18 A. What it's referring to is the code rate that will be 19 used for frame $n+1$. So if the present – the present 20 time is dealing with frame "n," where B_n is the 21 communication speed used at the present moment, then 22 the r of $n+1$ is the code rate that will be used for	20 1 consistent with the equation and correct, but I 2 recall – and unfortunately I'm not finding it now – 3 where there was other language in the '101 that – oh, 4 no. Sorry. Capital is correct. Lowercase in 5 Equation 5, but the lowercase is t_s and – t_s-t_n, the 6 meaning time, which is... reproduction time... 7 Yeah, I'm not finding where the terminology 8 that was introduced was misleading or where something 9 other than Equation 5 warranted correction, but as I 10 read Equation 5, it seems fine, and the comment in the 11 footnote should – can be ignored. The use of 12 capitalization and lowercase is fine, but if I recall 13 correctly there was something else in the spec that 14 had – could have been improved in wording for 15 clarity. 16 Q. Just for the -- to make sure we're on the same page, 17 then, on Equation 5 when the '101 report refers to t_s 18 is referring to the reproduction start time; is that 19 correct? 20 A. That is correct, t_s is the reproduction start time 21 and t_n is the present moment. 22 Q. And just one, sort of, clerical issue, the claims of

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21 1 the '101 patent refer to available reproduction time 2 defined -- but never defines what that is. Is it okay 3 if I simply refer to that as "available time" in this 4 deposition? 5 A. Yes, I will understand "available time" to mean 6 available reproduction time. 7 Q. And same thing, we have remaining time in the patent, 8 claim describes remaining time. Is it okay if I refer 9 to "remaining time," you will understand that I'm 10 referring to remaining time as used in claim 1 and 11 other claims of the '101 patent? 12 A. That will simplify matters, yes. 13 Q. If at any time you need clarification as to my 14 question ambiguous, please, interrupt me. 15 A. Thank you. 16 Q. Just going back to Equation Number 5 in the '101 17 patent, how is the value of ts determined? 18 A. Sorry, the value of ts? 19 Q. Yes, the reproduction start time. 20 A. If you look at column 12 of the '101 patent, 21 beginning at row or line 19 -- this is in reference 22 to Figure 4 -- there's a discussion there that	23 1 Q. Okay. But based on your understanding, the 2 description that's given on column 12 line 19 onwards 3 is a consistent description of how Ts is described or 4 as asserted across all embodiments? 5 A. No. This is -- as noted in line 14, this is an 6 exemplary embodiment. 7 Q. Does the second embodiment calculate Ts in a different 8 matter? 9 A. I'm not sure what you are referring to with regard to 10 "the second embodiment." I'm just drawing from the 11 discussion around the exemplary embodiment that is 12 shown in Figure 4. 13 Q. Okay. Well, in column 18 of '101, it describes a 14 second exemplary embodiment. 15 A. Okay. 16 Q. And my question was, does the second embodiment, which 17 starts on column 18, describe a different way of 18 calculating Ts? 19 A. Yeah, I'm seeing in column 20 some discussion around 20 the reproduction start time setting. This is, as far 21 as I recall, something that I haven't opined on in my 22 Declaration, so if you want me to give, sort of,
22 1 describes "the server device 10 determines 2 reproduction start time" -- ah, so here we have, yes, 3 the Ts, and I think this is where we start to get 4 into this uppercase lowercase confusion introduced in 5 the use of the symbols in the '101. 6 But if we assume that they are referring, 7 indeed, to the same item, the reproduction start time, 8 this is based an a maximum value Tp max of the 9 calculated each-device reproduction preparation times 10 Tp. 11 And then the server device as the 12 determined reproduction start time to the session 13 information, et cetera, et cetera. So it's determined 14 as per the discussion in column 12 and as outlined in 15 Figure 4. 16 Q. And is that the only place the '101 patent describes 17 how to determine the reproduction start time? 18 A. I haven't gone through to look for whether there are 19 multiple instances. I just know that Figure 4 deals 20 with it, and it's described in this area at any rate. 21 If you'd like me to look further, I can certainly do 22 so.	24 1 comments on this, I would really need to take further 2 time to study it. But as I said, when I was 3 preparing my Declaration in terms of what my 4 understanding was of the setting, I was referring to 5 Figure 4. 6 Q. Understood. And you mentioned column 20, which -- did 7 you focus on a particular line number on column 20? 8 A. I'm seeing the paragraph beginning at line 17, that 9 mentions the reproduction start time setting means 10 for setting would be reproduction start time. 11 Q. Understood. Thank you. 12 Just going back to Equation 5 on column 10, 13 you mention tn is the present moment; is that correct? 14 A. tn is -- well, as it's actually clarified in line 34, 15 it's the time of reception of the available 16 reproduction time information this time, and 17 elaborated as time at the present moment. 18 Q. So the lowercase tn tells you or signifies when frame 19 "n" was received at the client; is that correct? 20 A. It's the time of reception of the available 21 reproduction time information as it's defined. 22 Q. Okay. Yeah. Sorry. Just to clarify, then, then the

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25 1 tn and t tells you when the available time was conveyed 2 to the client device or to the server device. 3 A. When the available time was received at the client 4 device. 5 Q. And going on to the denominator -- oh, let me stay 6 here for a minute. 7 And you mentioned the enumerator, which is 8 ts minus tn, both lowercase Ts denote the available 9 time; is that correct? 10 A. ts-tn is considered to be a remaining time. 11 Q. Right. My mistake. I was looking at the wrong place 12 in my notes. Okay. We'll please start again. 13 In Equation 5, ts minus tn, both lowercase, 14 denote remaining time; is that correct? 15 A. That is correct. 16 Q. And why does Equation 5 subtract tn from ts? 17 A. As opposed to going the other way around? 18 Q. As opposed to relying only on ts. 19 A. Well, you want to calculate the ratios of the 20 remaining time and the -- let's see how to explain 21 this... 22 Q. Let me rephrase my question, maybe it will help to	27 1 tn, the present time, has to be subtracted from ts, 2 which is a time in the future. 3 Q. Understood. I did have the order wrong, but you're 4 right. We'll go with your answer. 5 Now, going to the denominator, we have Td 6 and an uppercase T, that you mention is a target 7 available reproduction time; is that correct? 8 A. Yes, so Td is the target available reproduction time. 9 Q. And how does '101 patent decide what is the target 10 reproduction time? 11 A. The target available reproduction time? 12 Q. Yes. 13 A. So, again, citing a exemplary embodiment that is 14 described in column 7 of the '101 patent, at line 44 15 there is a preset target available reproduction time, 16 and going -- skipping down a few lines down to, I 17 believe, line 47, the target available reproduction 18 time Td is a target value of an available 19 reproduction time. The target available reproduction 20 time may be set for each terminal device, so it's 21 something that is determined somewhat ad hoc for each 22 terminal device that is going to be receiving the
26 1 answer the question. 2 Can you calculate the remaining time by 3 just looking only at ts? 4 A. You cannot calculate remaining time only by looking 5 at ts because you need to calculate a delta. You 6 need to calculate the difference between the 7 reproduction start time, the time at which playout of 8 content will begin and the present moment to have a 9 duration in time as opposed to an absolute wall clock 10 time. And it's that delta, that difference between 11 two times, that constitutes the enumerator, and that 12 is divided by, also, a duration in time. 13 The denominator, in order to obtain a ratio 14 that informs the choice of the appropriate coding 15 rate. 16 Q. So in other words, then ts is like a timestamp and you 17 cannot figure out the remaining time by just looking 18 at ts, and you have to subtract it from tn to figure 19 out the remaining time; is that correct? 20 A. I think you have the order backwards. You have to 21 subtract tn -- unless you said that correctly, I lost 22 track of the order in which you portrayed it. But	28 1 data transmission. 2 Q. Moving onto the last Equation 5, there's Tn, that you 3 refer to as the -- denotes the available reproduction 4 time, receipt of time Tn; is that correct? 5 A. The available reproduction time capital Tn. 6 Q. Okay. And how does the '101 patent ascertain what the 7 value of Tn is? 8 A. As I've described in numerous locations throughout my 9 Declaration, that if I refer you to the initial 10 discussion of this point, at the top of page 7, in 11 paragraph 23, the available reproduction time is a 12 time available for reproducing the content based on 13 the content data stored at the reception device. 14 So the '101 patent looks at and quantifies 15 the content data that is stored in the buffer of the 16 reception device to -- as part of its basing of the 17 calculation for the available reproduction time. 18 Q. And, sorry, Dr. Cooperstock, you had mentioned 19 column7, what line number? 20 A. No, in my Declaration on page 7. 21 Q. Oh? 22 A. Paragraph 23, top of page 7.

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29 1 Q. I see that. My question was, can you refer to me 2 somewhere in the patent which describes how to 3 calculate the available time that's Tn? 4 A. Yeah, I think this -- the discussion or the -- yeah, 5 the discussion from my Declaration that I just cited 6 to you, it can be based easily from column 7, or 7 arises easily from column 7. If you look at lines 51 8 and following, "The available reproduction time is a 9 time that a terminal device can reproduce content 10 based on content data stored in the storage device," 11 and then "(a buffer part 33 described later) of the 12 terminal of device." 13 Q. So the text you just quoted from, column 7 line 50 to 14 55 of '101 patent, that says that the available time 15 is based on the content data stored in the device. 16 That largely mimics the claim language of Claim 1; is 17 that correct? 18 A. That is correct. It's consistent with the claim 19 language of limitation 1[c]. 20 Q. Does the '101 patent provide any other details on how 21 to calculate the available time beyond what's 22 described in column 7 line 51 to 55?	31 1 we have times as in reproduction start time that are 2 expressed in something other than seconds. It could 3 be hours, minutes, seconds, or it may be minutes, 4 seconds, and milliseconds. It's not specified I 5 don't think. 6 Q. But in Figures 14 and 15 where it's talking about 7 time, they're still using the units of time, albeit 8 hours or minutes or milliseconds; is that fair? 9 A. The numbers given throughout the specification and in 10 these figures when referring to time are in some 11 quantum of time, as you say, whether it's hours, 12 minutes, or seconds. 13 Q. And then in column 7 of '101 patent, at line 253, it 14 mentions that content data stored in the storage 15 device. And is content data measured in units of bits 16 or bytes? 17 A. So I just did a quick search here through the '101 18 because this is not something that I've given -- 19 offered any opinions of in my Declaration, but from a 20 brief perusal here, I'm not seeing any explicit 21 teaching as to how the '101 patent is considering the 22 measure of contents in the buffer.
30 1 A. I have not considered that in preparation for my 2 Declaration, so if you're asking me to sort of find 3 any other discussion within the '101, I would have to 4 really go through, take the time to search for any 5 instances where it's discussed. 6 Q. But sitting here right now, the one you can point to 7 is on column 7 lines 51 to 55; is that correct? 8 A. That, I believe, is the first instance I find in the 9 specification that provides those -- that information 10 that appears equally in limitation 1[c]. 11 Q. Okay. And as used in column 7 of the '101 patent, and 12 on the claims, the term "available time" would be 13 something that's described in seconds; is that 14 correct? 15 A. Throughout the specification there are several 16 references to times being expressed in seconds. 17 That's the SI unit standard for representing periods 18 of time, but I don't believe it's indicated that it 19 has to be specified in seconds as opposed to some 20 other unit as milliseconds or minutes or hours. And, 21 in fact, we do have in, I believe, figure -- which 22 was the -- yeah, so in Figure 14 and 15, for example,	32 1 From a POSITA's perspective, buffer 2 contents of media are typically measured in terms of 3 the byte content, how many bytes of memory they 4 consume, but there will be a mapping from those bytes 5 based on the coding rate that the -- is used to 6 represent the media and the time that those buffer 7 contents would take to play out at a regular playout 8 rate. 9 Q. If you look at Claim 1 of the '101 patent, it mentions 10 that -- and I'm looking at column 24 line 55 or so, 11 that Claim 1 requires that time available for 12 reproducing the content based on the content data 13 stored in the storage device. 14 So my questions do go towards a claim 15 element, and I'm presuming you opined upon this claim 16 limitation in your report; is that correct? 17 A. You'll have to repeat the -- pretty much the entirety 18 of the question as I was just getting to the line 19 when you were in the middle of talking. 20 Q. Okay. My apologies. But are you at column 24 line 55 21 of '101 patent? 22 A. I am.

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33 1 Q. And the limitation which talks about available time 2 does mention that available time is "based on the 3 content data that is stored in the storage device;" is 4 that correct? 5 A. That's how the claim language reads, "a time 6 available for reproducing the content based on the 7 content data stored in the storage device of the 8 reception device." 9 Q. And in your report, you have addressed this claim 10 limitation of Claim 1 of '101 patent; is that correct? 11 A. Yes, I have. 12 Q. Going back to column 7 -- if you read that column 7 13 line 50 to 55 show one way of calculating available 14 time. I would appreciate it if you can point to me 15 other places in '101 where the patent teaches how to 16 calculate available time. 17 A. So the first instance of the '101 patent explaining 18 the available reproduction time is at the bottom of 19 column 1 and the top of column 2, and I believe every 20 instance that I'm going to find is probably going to 21 repeat either identical or very similar language, but 22 I'll go through them with you.	35 1 content data stored in the storage device of the 2 reception device." 3 Also column 3 line 55, "available 4 reproduction time, which is a time available for 5 reproducing the content based on the content data 6 stored in the storage device." 7 And then we come to column 4 line 7, 8 "available reproduction time which is a time available 9 for reproducing the content based on the content data 10 stored in the storage device of the reception device." 11 We then have -- I believe this was the 12 excerpt that I read initially to you from column 7 -- 13 apologies if this is a repetition -- from line 51, 14 "available reproduction time is a time that a terminal 15 device can reproduce content based on content data 16 stored in the storage device (a buffer part 33 17 described later) of the terminal device." 18 Column 9 line 61, "available reproduction 19 time, which is a time that the content reproduction" 20 execution "part" -- there's a typo there -- "33c can 21 reproduce the content based on the content data stored 22 by the buffer part 33b, every time an acquisition
34 1 So the first, as I said, bottom of column 2 1, "available reproduction time, which is a time that 3 it is possible to reproduce content based on content 4 data stored in the storage device of the reception 5 device." 6 And the next instance is in column 2 7 line 43, "available reproduction time, which is a time 8 available for reproducing the content based on the 9 content data stored in the storage device of the 10 reception device." 11 And then at the top of column 3, "available 12 reproduction time, which is a time available for 13 reproducing the content based on the content data 14 stored in the storage device of the reception device." 15 And the same column 3, at line 22, 16 "available reproduction time, which is a time 17 available for reproducing the content based on the 18 content data stored in the storage device at the 19 reception device." 20 Same column, column 3, at line 38, 21 "available reproduction time, which is a time 22 available for reproducing the content based on the	36 1 period," that is, "(a change period), set in advance 2 elapses." 3 Column 19 line 15, "available reproduction 4 time, which is the time available for reproducing the 5 content based on the content data stored in the 6 storage device of the reception device." 7 Column 21 line 29, "available reproduction 8 time which is a time available for reproducing the 9 content based on the content data stored in the 10 storage device of the reception device." 11 Column 21 -- oh, sorry, I've already done 12 that one. 13 Column 22 line 48, "available reproduction 14 time which is a time available for reproducing the 15 content based on the content data stored in the 16 storage device of the reception device." 17 And same column line 65, "available 18 reproduction time, which is a time available for 19 reproducing the content based on the content data 20 stored in the storage device." 21 Column 23 line 37, "available reproduction 22 time, which is a time available for reproducing the

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37 1 content based on the content data stored in the 2 storage device of the reception device." 3 And then we're into the claims. 4 Q. Thank you. So, Dr. Cooperstock, so you read through 5 about, you know, a dozen or so places -- and I may be 6 off, maybe 14 or so, at least 11 -- 12 to 14 places 7 where the patent '101 refers to available time, and 8 each of those instances, the specification largely 9 mirrors the claim language, saying that available time 10 is based on the "content data stored in the storage 11 device." Is that correct? 12 A. Pretty much all of the, yeah, instances, except for, 13 perhaps, one of them, I recall, it used explicitly 14 the language of based on the "content data stored in 15 the storage device." 16 Q. And without going through all those 14 places, do you 17 know which place the specification did not rely on the 18 language "based on"? 19 A. It may be faster if you go back to the ones I read 20 out because I wasn't noting them down myself. 21 Otherwise, I will have to start all over at the 22 beginning.	39 1 determination available reproduction time did not 2 follow the standard pattern of "based on the 3 contents" -- let me find the standard language. 4 I'm going to have to find the standard one. 5 Yes, the standard language that seems to 6 come up in almost all of the instances was, "a time 7 available for reproducing the content based on the 8 content data stored in the storage device;" and two 9 instances, I believe, used slightly different 10 language. One of them was in column 7 line 50 -- 11 beginning at line 51, "a time that a terminal device 12 can reproduce content based on content data stored in 13 the storage device (a buffer part [33] described 14 later) of the terminal device." 15 And the second instance was column 9 16 line 61, "available reproduction time, which is a time 17 that the content reproduction" execution -- with a 18 typo -- "part 33" -- sorry, let me read that again. 19 "Available reproduction time, which is a 20 time that the content reproduction" execution -- and 21 "execution" has a typo in it -- "part 33c can 22 reproduce the content based on the content data stored
38 1 Q. Oh, okay. We will defer that question for now. 2 So as -- 3 THE WITNESS: Sorry, Mr. Sharma, we've been 4 going for a little more than an hour. Should -- is 5 this a good time to take, perhaps, a five- to 6 ten-minute break? 7 MR. SHARMA: Yes, that's fine. How about a 8 ten-minute break? It's about 9:11, we come back at 9 9:20. 10 THE WITNESS: Sure, that would be fine. 11 MR. SHARMA: We will see you then. 12 THE WITNESS: Okay. 13 (Off the record at 12:11 p.m.) 14 (Back on the record at 12:21 p.m.) 15 MR. SHARMA: Welcome back, Dr. Cooperstock. 16 BY MR. SHARMA: 17 Q. I understand that during the break you had a chance to 18 go back and check where the available time is used in 19 the specification. You would like to make a 20 clarification; is that correct? 21 A. Yes. Just, I think, we had identified two locations 22 where the wording of the description of the	40 1 by the buffer part 33b, every time an acquisition 2 period (a change period) set in advance elapses." 3 I believe those are the two instances where 4 the wording is somewhat different. 5 Q. But in the two instances that you pointed to, 6 Dr. Cooperstock, just now, column 7 line 51, and 7 column 9 line 61, the specification does state that 8 the available reproduction time is based on the 9 content that is stored in the buffer or in the storage 10 device; is that correct? 11 A. That is correct. 12 Q. In all the places that you discussed just now where 13 they use available time is "based on the content data 14 stored in the storage device" or in the buffer in the 15 '101 patent, does the patent describe anywhere how to 16 derive the available time based on the data stored in 17 the storage device? 18 A. I don't recall any explicit statement as to the 19 straightforward formula that would be used. I would 20 have to go back and double-check to be certain. 21 Again, this is not something that I've 22 discussed in my Declaration, but my understanding, as

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41 1 thinking through the eyes or the lens of a POSITA, 2 would be that one would take the content -- the 3 contents of the buffer and -- in bytes, and divide 4 that by the bit rate or the coding rate, the bits per 5 second, to determine the available reproduction time 6 for the contents in that buffer. 7 Q. Feel free to take a look at the specification if you 8 need to, but sitting here, do you know whether the 9 '101 patent mentions or provides that level of detail 10 that you can take the bits and multiply or divide them 11 by the coding rate to arrive at the available time? 12 A. I will take the time to look through the 13 specification now and see if that's described 14 somewhere. 15 Yeah, so column 7, while not explicitly 16 articulating the full equation that one would use, 17 provides the details that make it abundantly clear as 18 to how to proceed. 19 So from the top line 1, "The content data 20 storage part 44 of the server device 10 stores 21 (accumulates) a plurality of content data in advance. 22 Each of the content data is data representing one of	43 1 time;" is that correct? 2 A. Yes, "available time" as we've seen in the dozen or 3 so instances that I read out mentions based on the 4 contents of the buffer, and then the practitioner 5 implementing the patent will read the description of 6 the buffer contents or the data storage that's 7 described in column 7 to understand the relationship. 8 Q. Okay. And that will be within the comprehension of a 9 POSITA as of 2009 when the patent was -- claims 10 priority to? 11 A. Well before. This is very elementary storage that 12 didn't -- would even predate networking as it's 13 simply a matter of data encoding and the 14 representation in terms of what the code rate 15 determines for the time period at which that data 16 would be played out. 17 Q. And likewise, you mentioned "code rate" in column 7, 18 starting at line 7, and read how -- or what the code 19 rate represents. Do you see that? 20 A. At line 7 I see "a code rate varying with the 21 content." And then in line 8, "The code rate 22 represents," yes.
42 1 a plurality of contents" e.g. -- sorry, "(e.g., 2 information representing video and/or audio)." 3 And then here, "The content data storage 4 part 44 stores, as the content data representing the 5 respective contents, a plurality of content data in 6 each of which the content is coded with a code rate 7 varying with the content. The code rate represents 8 the data amount (the data size, e.g., the number of 9 bytes) of content data for reproducing content at 10 constant speed (reproducing content at 1x speed) for 11 a unit time (e.g., 1 second)." 12 So that's pretty much giving the basis 13 that you have buffer contents of a certain byte size, 14 you have a code rate that represents the data size 15 and the number of bytes that will be played out in a 16 certain time at constant speed, and one can then 17 infer the appropriate calculation, which, again, is 18 the buffer contents or size of the buffer contents in 19 bytes divided by the coding rate in bytes per second 20 or bits per second if one wants to multiply by 8. 21 Q. So the part you read from top of column 7 from line 1 22 to line 11 or so does not mention the term "available	44 1 Q. Okay. So in column 7, from line 8 through line 11 2 onwards, the patent defines what a code rate is. 3 A. Well, it -- just to be clear, I know "defines" has a 4 very specific meaning in patentees. So it describes. 5 It says, "The code rate represents the data amount," 6 et cetera. 7 Q. Okay. So in column 7 line 8 to line 11, '101 patent 8 tells you what code rate represents; is that correct? 9 A. That is correct. 10 Q. And that representation was known to a person of skill 11 in the art before the patent was filed. 12 A. That is correct. 13 Q. And does the patent '101 -- oh, sorry. Start again. 14 Does the '101 patent describe anywhere how 15 to acquire the amount of data or the value of the 16 amount of data that is stored in the storage buffer in 17 order to calculate available time? 18 A. So once again you're asking me questions that I don't 19 think I've offered any opinions of; you know, whether 20 these sorts of basic functions of inspecting a 21 buffer, from my Declaration, so I'll need to take 22 some time to go through the '101 to answer your

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45 1 question adequately. 2 Q. That's fine. Please take a look. And just for the 3 record, I mean, the claims do require that how -- 4 available time is based on content data stored in the 5 storage device, so I assume that how the Claim 1 reads 6 or how the Claim 1 is supported in this spec would be 7 part of the Declaration you offered in this IPR. 8 A. Yes, the -- just to be clear, yes, the interpretation 9 of the claims would be part of what I've opined on. 10 But what you're asking me in terms of your present 11 question is something that is a, sort of, basic 12 innate knowledge of a POSITA in terms of how one 13 determines the size of contents and the buffer. 14 Right? 15 One, for example, in, sort of, Computer 16 Science 101, you may have a link list or a queue and 17 you maintain a variable that stores how many bytes or 18 how many elements have been added to that data 19 structure, and as you add data you increment the 20 variable; as you remove data, you detriment the 21 variable. 22 Whether the '101 patent describes that,	47 1 data that is stored at (or near) the time of 2 determining the code rate to obtain," and so on. And 3 then you cite to two locations from the '101 patent. 4 So I was trying to figure out the basis of 5 your opinion that you mention that whether the 6 patent -- how does the patent describe it examines or 7 finds out the value of content data that is stored in 8 the buffer as you described in paragraph 57 of your 9 report. 10 A. So with respect to the cited sections of the '101 11 patent in paragraph 57 in my Declaration, I am indeed 12 relying on a POSITA's common sense knowledge and 13 basic understanding of how buffers are -- the 14 contents of the buffer are stored in a variable in 15 terms of the number of bytes or size of the buffer 16 elements. 17 Q. So just to understand correctly, so when you look at 18 the cites you provided in paragraph 57, they do not 19 explicitly mention that how the size of the data 20 stored in the storage device is obtained; is that 21 correct? 22 A. What they recite, the key language, that is what the
46 1 sort of, common knowledge explicitly, I haven't 2 considered that in preparation of my Declaration and 3 I'd have to go through fairly exhaustively to answer 4 your question as to whether that, sort of, basic point 5 of buffer management or maintaining the variable that 6 denotes the size of contents in the buffer is recited, 7 but I'm happy to do so. I'll take the time to look at 8 that now. 9 Q. Understood. Yeah. And if you can find out, as 10 described in '101, please point out. And if you 11 believe it does not describe but would be obvious -- a 12 POSITA would know, then you can respond in that manner 13 too. I just want to understand your position. 14 A. Sure. Yeah. So in order to be able to respond 15 either way I'd really have to take the time to look 16 through the patent. 17 Q. Dr. Cooperstock, maybe I can speed things up, and if 18 you go to your report and go to paragraph 57. 19 A. Yes. 20 Q. And towards the end of paragraph 57, you state, I 21 quote, over here, "a POSITA would understand to mean 22 that the system looks to (i.e., examines) the content	48 1 POSITA would interpret as such, is from the beginning 2 of the -- particularly, the first citation from 3 column 9 line 60, or beginning at line 62, "a time 4 that the content reproduction execution part 33c can 5 reproduce the content based on the content data 6 stored by the buffer part." 7 So based on the content data stored by the 8 buffer part, would require a -- an access to a 9 variable that denotes the number of bytes or the 10 number of elements that have a fixed byte size to them 11 to determine how much information, how much data, is 12 stored in the buffer. And mapping that, as we 13 discussed before, by dividing by the code rate, would 14 give one the available reproduction time. 15 Q. Okay. Even though a lot of the steps that you 16 mentioned are not explicitly mentioned in column 9, is 17 it your position that a POSITA in 2009 or earlier 18 would be able to infer those steps based on the 19 discussion or the phrase over here based on the 20 content data here as used in column 9 line 63; is that 21 correct? 22 A. Based on any reference to contents in a buffer, a

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49 1 POSITA would understand how one determines the amount 2 of data. And with respect to the POSITA's knowledge 3 of coding, would understand how to map that quantum 4 of data in bytes to a unit -- to a corresponding 5 measure of time and available reproduction time in 6 seconds or some other unit of time. 7 Q. And, again, as you mentioned earlier, that this 8 discussion in column 7 line 1 to 10 -- and then you 9 pointed to discussion on bottom of column 9 -- neither 10 of those explicitly recite a formula that can work 11 that variable that represents the data into available 12 time; is that correct? 13 A. So I didn't catch the second section you were 14 referring to, but from column 7 lines 1 to 10, that 15 excerpt of the -- or that portion of the patent does 16 not explicitly recite the equation. It's providing 17 the piece that makes it clear to a POSITA how one 18 goes about determining the number of seconds or the 19 amount of time that would be represented by the data. 20 Q. Okay. And I'll refer you to bottom of column 9, the 21 text you were referring to starting around line 63 to 22 65.	51 1 A. I see that. 2 Q. Yeah, so I was saying, you are implying over there 3 that in the claims of the '101 patent, available time 4 has to be "examined, acquired, or determined." 5 A. Based on the claims of the '101 patent, "an available 6 reproduction time" has to be "examined, acquired, or 7 determined" in order to have available the knowledge 8 of available reproduction time or available time. 9 Q. And it's your opinion that same is true for remaining 10 time too, in the claims of '101 patent it has to be 11 examined, acquired, or determined; is that correct? 12 A. I'm sorry, can you point me to where in my 13 Declaration I opine that the remaining time must be 14 determined, acquired, or examined? I just want to 15 have the context for that. 16 Q. If you look at paragraph 60 of your report on page 20 17 and look at it now, you're talking about remaining 18 time in the paragraph. 19 A. I'm talking about available reproduction time in that 20 paragraph. 21 Q. You're right. Okay. So maybe it's your opinion that 22 remaining time does not need to be examined, acquired,
50 1 A. Yes. Likewise, this is not explicitly teaching the 2 basic equation, this is common knowledge of a POSITA 3 as to how to infer from the -- that is the content 4 based on the content data stored by the buffer part, 5 what that represents in terms of bytes and what that 6 represents in terms of time. 7 Q. Going back to your paragraph 57 in your Declaration, 8 you mentioned that the available time has to be 9 "examined, acquired, or determined." Is that correct? 10 A. If you're referring to the last few lines where I 11 write, "a POSITA would understand to mean that the 12 system looks to (i.e., examines) the content data 13 that is stored at (or near) the time of determining 14 the code rate to obtain, determine, and/or acquire 15 the available time," that is correct. 16 Q. And I was referring to top of 57 and I was 17 paraphrasing what you said before. You mention over 18 there, in top of 57, "that if an available 19 reproduction time is not examined, acquired, or 20 determined, then no determination could be made based 21 on the available time." 22 Do you see that?	52 1 or determined beforehand? 2 A. So, again, I'm asking if you can point me to where in 3 my Declaration I've offered opinions on that. I 4 would like to consider that in the context of what 5 I've described. 6 Q. Yeah. Sitting here right now I cannot point to 7 anything, so therefore I wanted to clarify whether you 8 are giving that opinion or not. 9 A. So, again, if I -- if you can point me to where in my 10 Declaration I've given that opinion or something 11 related to it I'm happy to reflect on that and what 12 I -- what I had expressed. But off the top of my 13 head, I'm sort of starting to consider it. That's an 14 interesting question, does the remaining time, 15 similar to the available time, have to be determined, 16 acquired, or examined... I would need to think about 17 that for a little bit. 18 Q. Okay. So just to be clear, sitting here right now, 19 you agree that in paragraph 57 you opine that 20 available time should be "examined, acquired, or 21 determined" as per the claims of the '101 patent; is 22 that correct?

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53 1 A. As I've expressed in paragraph 57, "available 2 reproduction time" has to be "examined, acquired, or 3 determined." 4 Q. And sitting here right now, you don't recall anywhere 5 in your report that you have given the similar opinion 6 for remaining time; i.e., that is, remaining time must 7 be examined, acquired, and/or determined as part of 8 the claims of the '101 patent; is that correct? 9 A. I would want to take the time to go through my 10 Declaration fully before answering that question, so, 11 again, you can help me by pointing me to something 12 where I've expressed an opinion on that. Otherwise, 13 I'll have to search and go through it. 14 Q. But sitting here right now -- you may check later, but 15 right now, you don't recall any place that jumps to 16 your mind where you have given that opinion on 17 remaining time? 18 A. Again, I don't like to answer questions without 19 carefully considering what I've expressed, and quite 20 a few items in the Declaration, so give me a moment 21 to go through. 22 Q. Okay.	55 1 A. Yeah, as I expressed in paragraph 60, yeah, this is 2 referring to "the available reproduction time that" 3 must first be "determined, acquired, or 'examined'." 4 Q. Let's go back to paragraph 57. On the top you mention 5 three words over here, "examined, acquired, and 6 determined." What's the difference between these 7 three? 8 A. Well, I give those examples with "et cetera," so 9 these are variants of mechanism by which a value can 10 be obtained. So it can be "determined," and 11 determination may involve a calculation of some sort. 12 "Acquiring" may be information that is 13 given, that is supplied or is stored already in a 14 variable or has been calculated elsewhere and then is 15 provided to the element that is making use of it. 16 And "examining" would be a lookup 17 consultation of a value or a variable that is stored 18 or that is delivered. Those are some examples by 19 which the reproduction time in a tangible form would 20 be obtained by the system. 21 Q. And then you cite to two places in the '101 patent, 22 after that, quote, lines 90 -- sorry, column 9 line 60
54 1 A. So what I -- what I see I've opined on in the 2 Declaration with respect to remaining time in 3 paragraph 59 is that the remaining time, or a 4 remaining time before reproduction start time set as 5 time at which the reception device starts 6 reproduction of the content from a present moment, is 7 something that must be used in order to determine the 8 code rate. 9 So I have opined that the code rate 10 determination must make use of that variable, but in 11 that paragraph I have not offered an opinion as to 12 whether the remaining time itself is or must be 13 determined or acquired or calculated. 14 And I would have to, again, go through the 15 Declaration carefully in full and consider that 16 question if it's not explicitly written in my 17 Declaration. 18 Q. Okay. And staying in the paragraph I pointed you to, 19 paragraph 60, even though it's under the heading of 20 Remaining Time, your opinion of paragraph 60 is about 21 availability of reproduction time and not about 22 remaining time; is that correct?	56 1 to column 10 line 18, and column 10 line 65 to 2 column 11 line 3. Do you see that? 3 A. Yes, those are the citations we went through 4 previously. 5 Q. Okay. And these are the citations that you believe 6 support your belief that "available time" must be 7 "examined, acquired, or determined" before it is used; 8 is that correct? 9 A. The reason why I believe that those passages support 10 what I've written there is, much like all of the 11 other descriptions of available reproduction time 12 that we went through before the break, the 13 specifications and the claims themselves note that 14 the available reproduction time is something that is 15 based on the content data stored by the buffer or 16 stored in the storage device of the receiving device. 17 Q. In paragraph 60 you also mention that available time 18 must be "first determined, acquired, or 'examined' 19 using the content data." In paragraph 60, you put 20 "examined" in a double quotes. Is there a particular 21 significance for that? 22 A. "Examined" does not appear to be quoted from the '101

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57 1 itself, so I believe -- and this is sort of trying to 2 reflect back several months what my, sort of, 3 thinking was at the time of preparing the 4 Declaration -- that this is sort of a loose, not very 5 scientific terminology for discussing how one obtains 6 a particular value. So "examined" is sort of, like, 7 loosely described as encompassing the mechanism by 8 which one obtains that information. 9 Q. Would you agree the word "examined" does not appear in 10 the '101 at all? 11 A. The closest I could find just now searching was 12 "examiner." 13 Q. Now, you -- in paragraph 58, you mention Claim 3 to 14 support your argument that available time must be 15 examined, acquired, or determined; is that correct? 16 MR. GOODMAN: Objection to form. 17 A. So I'm not seeing, in paragraph 58, mention of the 18 acquired or calculated or examined language. 19 BY MR. SHARMA: 20 Q. Okay. 21 A. That appears -- in the previous paragraph I see 22 "examines." So as sort of further elaborating on the	59 1 reception device, and as I've opined throughout my 2 Declaration, a POSITA would infer from that that the 3 value, that measure of the time available for 4 reproducing the content based on the content data, 5 would require some form of determination or 6 acquisition of the -- or examination, as per the 7 description I provided, of looking to the content data 8 because it is based on the content data that is in the 9 buffer. 10 Q. Yeah, in paragraph 57, the top second line, you 11 mention "examined, acquired, and determined." But 12 towards the end you mentioned "obtain, determine, 13 and/or acquire." Are you treating "examined," 14 "acquired," "determined," and "obtain" as more or less 15 conveying the same idea that you have to acquire the 16 value? Is that correct? 17 A. I'm sorry, I spoke over you for a brief moment 18 accidentally in the middle of your question, but if I 19 understand your question correctly, as I noted 20 earlier, I give these different verbs as examples, I 21 preface them in parentheses with an e.g. and I end 22 with et cetera, so I'm allowing for different verbs
58 1 "examined" in quotes, I see here I've offered a, sort 2 of, description of what I mean by that is the system 3 looks to or examines. And that may be why "examined" 4 appears in quotations in a subsequent paragraph. 5 Q. Of the three terms you mentioned, "examined," 6 "acquired," or "determined," they don't appear 7 specifically in Claim 1 of the '101 patent; is that 8 correct? 9 A. No. And, sorry, the words that I see here in 10 paragraph 57 are "obtain, determine, and/or acquire." 11 I don't recall -- so and then earlier, "determining, 12 acquiring, examining, et cetera," so I'm using 13 examples of terms or examples of verbs that relate to 14 the manner in which the information, in this case the 15 available reproduction time, is obtained in a usable 16 form by the system. 17 And in terms of the language of Claim 1, 18 Claim 1, if I recall correctly, simply states the -- 19 that these values are based on. So in limitation 20 1[c], Available Reproduction Time, which is the time 21 available for reproducing the content based on the 22 content data stored in the storage device of the	60 1 to describe the action of obtaining the value of the 2 available reproduction time that must exist in a 3 tangible form usable by the system. 4 Q. And it's your opinion as in paragraph 57, that to -- 5 the remaining time -- sorry. Let me start again. 6 As you mention in paragraph 57 for 7 available time, because the spec or the claims say is 8 "based on available time," a POSITA would understand 9 the claim requires the system to obtain, determine, 10 acquire, or examine a value; is that correct? 11 A. I'm sorry, some of your question got a little bit 12 muffled there. 13 Q. Okay. 14 A. What I can tell you is that because of the language 15 of Claim 1 that states that the available 16 reproduction time, which is a time available for 17 reproducing the content based on the content data 18 stored in the storage device of a reception device, a 19 POSITA reading that would understand that one must 20 consult, one must have an explicit measure which can 21 be acquired or calculated or examined or determined 22 of the contents of the storage device that is the

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61 1 content that is stored in the storage device in order 2 to obtain this time value which is a calculated 3 numerical quantity, the time available for 4 reproducing the content. 5 Q. You mentioned Claim 2 in your paragraph 58 of your 6 report. Right? 7 A. I do refer to Claim 2. 8 Q. Okay. Claim 2 depends on Claim 1. Correct? 9 A. Claim 2 is a dependent claim on Claim 1. 10 Q. As the claims are drafted and interpreted, Claim 1 11 would be broader than Claim 2. Right? 12 A. That is my understanding. 13 Q. And in -- 14 THE WITNESS: Sorry, Mr. Sharma, I realize 15 we haven't been going for a full hour, but just in 16 terms of balancing the time before and after our, sort 17 of, median break, would this be a good time to take 18 just a five-minute pause just to kind of stretch a 19 little bit and then resume until 2:00 Eastern? 20 MR. SHARMA: Yep, that's perfectly fine. 21 So it's about 10:15 my time, so we can meet at -- it's 22 10:14, so we can come back at 20 past the hour?	63 1 Q. Is that correct? Do you agree with that? 2 A. That is my layperson's from a patent legal 3 perspective understanding, yes. 4 Q. And Claim 3 also uses the word "acquire," and Claim 3 5 mentions specifically, "unit is configured to acquire 6 a communication speed." Do you see that? 7 A. I do. 8 Q. So both in Claims 2 and 3, the inventor, Mr. Onishi, 9 O-n-i-s-h-i, used the word "determine" and "acquire." 10 Do you see that? 11 A. I do. 12 Q. So if the inventor wanted to use the word "determine" 13 or "acquire," they knew how to do that because they 14 use it explicitly in Claim 2 and Claim 3; is that 15 correct? 16 A. I'm not sure if I follow your question. You're 17 saying that the inventor had knowledge of the words 18 "determine and acquire" and had the choice of which 19 word to employ? 20 Q. Yes. And as shown in Claims 2 and 3, they chose to 21 employ the terms "determine" and "acquire" because 22 those are the appropriate terms to use in Claims 2 and
62 1 THE WITNESS: Yes, that would be great. 2 MR. SHARMA: Thank you. 3 THE WITNESS: Thank you. 4 (Off the record at 1:14 p.m.) 5 (Back on the record at 1:21 p.m.) 6 BY MR. SHARMA: 7 Q. Okay, Dr. Cooperstock, welcome back. 8 A. Thank you. 9 Q. Yeah, just before we broke, we were talking about 10 Claim 1 and Claim 2 of the '101 patent. And if you 11 look at Claim 2, it uses the word "determine." Do you 12 see that? 13 A. I do. 14 Q. And the same thing -- let's go to Claim 3. Claim 3 15 depends on Claim 1; is that correct? 16 A. Claim 3 depends on Claim 2 which depends on Claim 1. 17 Q. Yeah. Yeah. Okay. I meant to say Claim 3 depends 18 indirectly from Claim 2, but I agree with you, Claim 3 19 depends on 2 which depends on 1. So, again, the way 20 the patent claims are interpreted, 3 would be narrower 21 than 2, which is then narrower than Claim 1. 22 A. Okay.	64 1 3. Would you agree with that? 2 A. Okay, so I went back to the specification to consider 3 the choice of language that was used in the claim, 4 and I see in column 10, line 24, beginning at 5 line 24, "the code rate determining part 47 6 calculates (acquires) a communication speed Bn during 7 a period," et cetera, et cetera. 8 So what I see from that is that the patent 9 writer, whether Mr. Onishi or a patent writer who was 10 working on his behalf, chose to use the term 11 "acquire" in Claim 3, with respect to acquiring a 12 communication speed as representing a calculation, so 13 that would be the intent in terms of the use of that 14 word. 15 Q. And you were reading from column 10, line 24 and 25; 16 is that correct? 17 A. That is where I was reading, yes. 18 Q. Yeah. And in column 10, line 24, it states that what 19 the inventor's describing is an exemplary embodiment; 20 is that correct? 21 A. That is correct. 22 Q. But you believe that even though the exemplary

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65 1 embodiment, it uses the word calculates (acquires), it 2 gives -- explains the motivation why the inventor 3 chose to use the word "acquire" in Claim 3; is that 4 correct? 5 MR. GOODMAN: Objection to form. 6 A. Yeah, I don't know if it explains the motivation, but 7 it rather gives an indication as to what the intended 8 meaning of "acquires" is in that context. 9 BY MR. SHARMA: 10 Q. Let's go to column 13 and look at line -- starting at 11 line 20 on column 13. 12 Are you there? 13 A. I am. 14 Q. Yeah, so in this portion of the specification the '101 15 patent is talking about Figure 6, and it talks about 16 step S306. And in line 23, it says that "and proceeds 17 to step S306 to acquire an available reproduction 18 time." 19 Do you see that? 20 A. I see that. 21 Q. Okay. So in this instance over here the inventor is 22 describing or using the word "acquire" in the context	67 1 A. I couldn't put myself in the head of the inventor or 2 the head of the patent writer at the time. I do see 3 that the word that is used is different, but I also 4 understand, reading the claim and reading the 5 specification from the perspective of a POSITA, that 6 "based on" would require some form of explicit 7 determination of the value, whether that be acquired 8 or calculated or examined, et cetera. 9 Q. Now I was going back by your example from column -- 10 for Claim 3. You had referred me to column 10, and 11 you mentioned that a "code rate determining [unit] 12 calculates [and] (acquires) a communication speed," 13 and that might lend credence or explain why the 14 inventor used the word "acquire" in Claim 3. I was 15 just trying to draw a parallel between Claim 3 and 16 Claim 1. 17 MR. GOODMAN: Objection to form. 18 BY MR. SHARMA: 19 Q. So you believe the inventor -- column 10 line 25 20 explains why the inventor used the word "acquire" in 21 Claim 3, but column 13 lines 23 to 24, you would 22 explain why the inventor did not use the word
66 1 of available reproduction time. Do you have that? 2 A. That is what is stated there, yes. 3 Q. Nevertheless, in column [sic] 1, when the inventor 4 mentioned "available reproduction time," he chose not 5 to use the word "acquire" but used the word "based 6 on." Is that correct? 7 A. Sorry, which line in column 1? 8 Q. I'm talking about column 13 -- 9 A. Oh, I heard you say column 1. So which line in 10 column 13? 11 Q. Sorry, sorry. When I mentioned column 1, I meant 12 Claim 1. 13 A. Claim 1, okay. Yes. 14 Yes, so the claim language is based on 15 available reproduction time, and the cited portion of 16 the specification in column 13, it says, at "step 17 306, to acquire an available reproduction time." 18 Q. So even though, in column 13, the inventor uses the 19 word "acquire" in the context of available 20 reproduction time, the inventor chose not to use that 21 word in Claim 1 when referring to available 22 reproduction time; is that correct?	68 1 "acquire" in Claim 1? 2 A. Again, I can't speak from the head or the mindset of 3 the inventor or the patent writer in terms of the 4 choice of a particular word, I can only give you my 5 opinion in terms of how a POSITA would understand and 6 interpret that language. 7 Q. Now, same question on Claim 2, also, the inventor knew 8 how to use the word "determine" when evaluating a 9 value in Claim 2; is that correct? 10 A. As you note in Claim 2, the language says, 11 "configured to determine a value becoming smaller as 12 the available reproduction time," et cetera. 13 Q. So the inventor knew how to use the term "determine" 14 in Claim 2 and chose to use it; is that correct? 15 A. Again, I can't speak to the intent or the mindset of 16 the inventor or the patent writer. I can speak to my 17 understanding of the term and how a POSITA would 18 understand those terms. 19 Q. And it's your opinion right now that -- if you look at 20 Claim 1, and look at the term "based on" an available 21 time, a POSITA would understand that the claim 22 requires you to obtain, determine, examine, acquire

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69 1 the available time; is that correct? 2 A. So I have a fairly lengthy section in my Declaration 3 that gets into this question in-depth. I've already 4 alluded to a portion of it, but if you read from 5 paragraph 61 through paragraph 64 of my Declaration, 6 I give numerous details as to why the term "based on" 7 requires that the value is used as an input. 8 And in paragraph 63, I note that the '101 9 patent provides that exemplary equation we looked at 10 at some length, Equation 5, that may be used to 11 determine a code rate $NR_{[ph]}$ of $n+1$, et cetera. I 12 go on to note below equation -- my reproduction of 13 Equation 5 that the '101 patent explains that this is 14 an example of what is meant by the term, in 15 quotations, "based on." 16 The patent goes on to say -- to state, 17 "that is to say, the content transmitting part 45 18 changes the code rate of the content data to be 19 transmitted to the terminal device having transmitted 20 the available reproduction time information, to the 21 code rate determined based on the available 22 reproduction time information."	71 1 the cites you have to column 10 in paragraph 63, do 2 any of them mention or specify that the claims of '101 3 patent are limited to Equation Number 5? 4 A. As we discussed earlier, this section is all as an -- 5 under the exemplary embodiment, so it provides 6 Equation 5 as an example. 7 Q. Let's look at paragraph 64 of your report that you 8 mentioned just now. And in the paragraph you mention 9 that the "Patent makes clear that the term" quote, 10 unquote, "based on" is used to signify a direct use 11 of the values..." 12 Do you see that? 13 A. I do. 14 Q. Okay. How do you come to the conclusion that "based 15 on" signifies a direct use of the values? 16 A. That's as per my discussion in the previous 17 paragraphs in this section under heading -- yeah, I 18 have to find the high-level heading, but it's under 19 most -- the lowest level title is number 1, "The '101 20 patent Confirms That 'Based on,' in quotation marks, 21 "Means that a Value of the" -- of, quote, "the 22 available reproduction time," closed quote, and,
70 1 That's the quotation from part of the 2 excerpt we were looking at, so this is what, as I note 3 in paragraph 64, makes it clear from the '101 patent 4 that this term, when we see "based on," signifies a 5 direct use of the values, and as such has to be an 6 explicit calculation or determination or a value that 7 is acquired, in other words, calculated. 8 Q. And as you discussed earlier, you -- yeah, we 9 discussed the equations earlier. And the two portions 10 you cite over here are paragraph 63, you point to 11 column 10 line 54 for Equation 5. Do you see that? 12 A. Well, I cite to numerous sections of column 10. I 13 cite above my reproduction of the equation from lines 14 33 to 59, and then, below, I also cite to 65 to -- 15 sorry, 10:65 to 11:3. 16 Q. Yes. So if you look at the quotes in column 10 that 17 are mentioned in paragraph 63, do any of them limit 18 the claims of the '101 patent to the Equation 5? 19 A. I'm sorry, can you repeat the question? You're 20 asking whether any of the excerpted portions limit? 21 Q. Yes, I'm asking that. Let me ask the question again. 22 Look at paragraph 63 of your report, and on	72 1 quote, "remaining time," closed quote, "are used in 2 the determination," so those paragraphs 61 through 63 3 provide the basis for my conclusion that the patent 4 makes clear that the term "based on" is, as you read 5 out, used to signify a direct use of the values 6 representing the available reproduction time and the 7 remaining time. 8 Q. Did you consult a dictionary definition of "based on"? 9 A. I did not. 10 Q. And just to confirm, that there's nothing in your 11 report in Section 2, titled Understanding of the Law 12 that gives you any guidance as to what the scope of 13 "based on" is; is that correct? 14 A. If I'm searching correctly, the first occurrence of 15 "based on" in my report occurs in the section that 16 we're just reading from previously from the beginning 17 of paragraph 61. 18 Oh, sorry, I take that back. My apologies. 19 Just a moment. I see that it appears, in fact, as 20 early as paragraph 23. 21 But then we come to discussion of the 22 points under section Roman Numeral V.

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73 1 Q. Okay. Just to confirm that you looked at your report, 2 and in Section 2, which is titled Understanding of the 3 Law, you did not -- you do not discuss or mention 4 scope of "based on" in that section; is that fair? 5 A. I do use the term "based on" several times in that 6 section, but not for describing my interpretation of 7 the term as used in the patent. 8 Q. Right. And in Section 2 when you refer to "based on," 9 you are not referring to the claim term "based on" as 10 used in the claims of the '101 patent. Correct? 11 A. I'm not using the words "based on" in the context of 12 the '101 patent in Section 2 of the report. 13 Q. In coming up with your opinions that are described in 14 this report, you relied on the description of "based 15 on" as mentioned in paragraph 64; is that correct? 16 MR. GOODMAN: Objection to form 17 A. As we discussed previously, the entirety of the 18 section beginning with the heading, The '101 patent 19 Confirms That "Based On" Means That a Value of "the 20 available reproduction time" and "remaining time" are 21 used in the Determination, provides the rationale for 22 my conclusion, and I highlight, as sort of a key	75 1 that "based on" signifies the "direct use of values," 2 is an opinion that you relied upon in forming your 3 conclusions in this patent? 4 A. The understanding that I have provided in this 5 section of my report that relates to the meaning and 6 the interpretation of the term "based on" is 7 something that informs my opinions in other parts of 8 the report as well. 9 Q. And one of those things is that "based on" signifies a 10 direct use of values; is that correct? 11 A. It is correct that my opinion is that, as the '101 12 patent uses the term "based on," it means a direct 13 use or signifies a direct use of the values that are 14 associated with the elements in the claim 15 limitations, for example, the available reproduction 16 time, that says this is based on the contents of the 17 buffer or the contents of the storage device, the 18 receiving device. 19 Q. And in paragraph 61 through 64 -- sorry, paragraphs 61 20 through 63 inform your conclusions in paragraph 64; is 21 that correct? 22 A. They are the -- parts of the reasoning that I provide
74 1 point in there, that following Equation 5, or the -- 2 after the detailed discussion of Equation 5, the 3 patent goes on to say, that is -- to state, I should 4 say, "that is to say, the content transmitting 5 part 45 changes the code rate of the content data to 6 be transmitted to the terminal device having 7 transmitted the available reproduction time 8 information to the code rate determined based on the 9 available reproduction time information." 10 So this provides the basis for my 11 understanding and how a POSITA would understand "based 12 on" as requiring some form of determination of the 13 actual value. 14 BY MR. SHARMA: 15 Q. Thank you, but my question was slightly different, 16 Dr. Cooperstock. Let me ask again. So in 17 paragraph 64, you mention, "In other words, the '101 18 patent makes clear that the term," quote, "based on," 19 closed quote, "is used to signify direct use of 20 values," and then you go on. 21 What I was asking was in -- that your 22 conclusion that you say, in other words in summary,	76 1 for my conclusion in paragraph 64. 2 Q. Let's go to Figure 3 of '101 patent. 3 Are you there? 4 A. I am. 5 Q. I'm assuming that you read patent '101 in forming your 6 opinions in your report; is that correct? 7 A. I did read the patent in forming my opinions, yes. 8 Q. So in Figure 3, let's go to block S107 on the left 9 side. Do you see that? 10 A. Yes. 11 Q. Is it correct that block S107 mentions or implies the 12 terminal device 20a transmits available time to server 13 device 10? 14 A. That is what is taking place in that portion of the 15 figure. 16 Q. Likewise, block S108 implies that terminal device 20b 17 is transmitting available time to server device 10; is 18 that correct? 19 A. That is also correct. 20 Q. And in block S109, server device 10 changes the code 21 rate. 22 A. That is correct.

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77 1 Q. And all this is happening before either terminal 2 device 20a or 20b starts reproducing the content as 3 shown in S110a and S110b; is that correct? 4 A. That appears to be correct. 5 Q. Even though it's not shown over here, is it fair to 6 state that the process of transmitting data from the 7 server device to terminals and the process of 8 obtaining or transmitting available time to the server 9 will happen several times? 10 A. Sorry, can you repeat the question? 11 Q. Okay. If you look at the bottom half of Figure 3, it 12 says, "Start transmission of [content] data" in S106. 13 Do you see that? 14 A. I do. 15 Q. Okay. And then we just discussed just now, S107, S108 16 say that the devices will send the transmit -- or send 17 the available time to the server. 18 A. Correct. 19 Q. Do you see that? Okay. 20 Now, these steps S106, S107, S108, S109, 21 may happen several times; is that correct? 22 A. So I'm -- unfortunately I'm going to take some time	79 1 Q. Okay. That's helpful. Thank you very much. 2 A. Now, I just note if -- this may be a good time to 3 break for lunch, or if you have something that you 4 want to wrap up this section, I don't mind going a 5 few more minutes. 6 Q. Yeah, if you can go a few more minutes, we'll wrap up 7 this section. 8 A. Sure. 9 Q. And then have a lunch break pretty quick. 10 A. Yeah, very good. 11 Q. So going back to Figure 3 in S106, the server will 12 start transmission of content data; is that correct? 13 A. That's what S106 refers to. 14 Q. And some time would lapse, and at that time terminal 15 device 28 will transmit the available time back to the 16 server; is that correct? 17 A. That is correct. 18 Q. And, again, then some time would lapse before the 19 server device will change the code rate in S109. 20 A. That is correct. 21 Q. However, between S106 -- let me strike that. 22 However, between steps S107 and step S109,
78 1 here because this is not an item that I've opined on 2 whatsoever in my Declaration in terms of the 3 specifics of the repetitions. 4 I was trying to find in the specification 5 some text that may be helpful there to answer your 6 question. I do see in -- but having traced through 7 in detail, at least in column 14, on lines 7 through 8 9, we have at the -- and it's jumping between 9 descriptions in multiple figures, not just Figure 3, 10 but going into different phases of the process, we 11 see that after this stage where the code rate is 12 being determined, the server device 10 returns to 13 step S401 to repeatedly execute the process described 14 above. 15 Now, if you want me to trace back and sort 16 of delineate where that process described above 17 begins, I would need to take a fair bit more time, but 18 I wanted to at least point you to a section in the 19 spec that explains that yes, indeed, there is a cycle 20 of repeatedly obtaining the available reproduction 21 time from the terminal devices and the server 22 thereafter changing the code rate.	80 1 the server device will continue to send data to the 2 terminal device 20a; is that correct? 3 A. Unless you can point me to some section of my 4 Declaration that comes even remotely close to 5 describing this element, I'm having to go into 6 speculation territory here as it's not something that 7 I've been able to locate an explicit description 8 within the specification of the '101 patent. 9 I only have available the example that 10 is -- or the illustration of the flowchart in -- not 11 the flowchart, sorry, the timing diagram shown in 12 Figure 3, so I'm having to venture out in speculation 13 and not be able to give you a well-informed opinion 14 as to what's taking place there. 15 Q. In Figure 3, when terminal device 20 transmits 16 available time in block S107 it represents the status 17 of the client device at that time; is that correct? 18 A. That would be correct. 19 Q. And at some time later when the server device is 20 changing the code rate in block S109, it is relying 21 upon the data that was sent to it from the terminal 22 device 20a in block S107; is that correct?

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81 1 A. Well, the changing the code rate in block S109 will 2 be changing the code rate for each of the terminal 3 devices that have transmitted and available 4 reproduction time. It would not be limited 5 exclusively to terminal device 20a. 6 Q. So in S109 what changes the code rate for devices 20 7 and 20b in Figure 3, the server will rely upon the 8 data that was communicated to it based on the blocks 9 S107, S108; is that correct? 10 A. So the closest I can come to answering that question 11 is to refer to a different figure that is described 12 in column 18 of the specification that has a similar 13 transmission from the terminal device of the 14 available reproduction time information, including an 15 available reproduction time to the server device 16 10 – sorry, this is from lines 11 forward, in column 17 18, so I'll repeat. 18 From line 11, "the terminal device 20c 19 transmits available reproduction time information, 20 including an available reproduction time to the 21 server device 10 every time a transmission period 22 elapses."	83 1 mentioning -- you're referring to column 18 while 2 referring to Figure 13 embodiment; is that correct? 3 A. That's correct. That's -- as I said, in terms of 4 discussing what is available in the specification 5 with regard to the periodicity of changing code rate, 6 this is the one instance I was able to find searching 7 just now. 8 As I stated, the details as to the 9 frequency of changing code rate or the -- whether the 10 transmission continues while -- prior to, I should 11 say, receipt by the server of a new available 12 reproduction time from the client or whether there is 13 sort of a constrained handshake between them, I 14 haven't investigated that or considered that. That's 15 sort of beyond the scope of the analysis I conducted. 16 MR. SHARMA: Okay, we can go off the 17 record. We can take a break for lunch. 18 THE WITNESS: Okay. 19 (Off the record at 2:07 p.m.) 20 (Back on the record at 2:42 p.m.) 21 BY MR. SHARMA: 22 Q. Welcome back, Dr. Cooperstock.
82 1 And that's shown in step S504 of Figure 13. 2 So in terms of the periodicity of this 3 transmission of available reproduction time and 4 changing of code rate, it seems to be -- at least in 5 the embodiment that it's described in column 18, it's 6 happening every time a transmission period elapses. 7 And in terms of the specifics of what that 8 transmission period entails, you would have to refer 9 me to an area in the Declaration where I've gotten 10 into that terminology. I don't believe I've gotten 11 into those specifics. 12 Q. Yeah, Figure 3 in S109 talks about changing code rate, 13 right, and the claims require changing code rate, 14 understand, understand, when you reviewed the claims 15 and the specification whether you considered the 16 disclosures in the patent for the claim term. So even 17 though you may not explicitly mention Figure 3, but 18 you have opined on the issue how the '101 patent 19 teaches changing code rate. 20 MR. GOODMAN: Objection to the form. 21 BY MR. SHARMA: 22 Q. Lastly, does Figure 13 -- you mention -- you're	84 1 A. Thank you, Mr. Sharma. 2 Q. Let's continue with your Declaration, Exhibit 2012. 3 And let's go to page 28. 4 In pages 26, starting with paragraph 69 5 onto paragraph 74, is it correct you provide a 6 high-level overview of the Chou reference? 7 A. That is correct. 8 Q. And just for clarity, when I say "Chou reference," or 9 "Chou reference" -- I don't know what's the right way 10 to say it -- I am referring to Exhibit 1004 that we 11 marked earlier today. Do you understand? 12 A. Yes. I believe the correct pronunciation is actually 13 more approximating a Chou, but I don't expect any of 14 us on the call here to be able to get that to the 15 satisfaction of a native Chinese speaker. 16 Q. Let's go to page 28 of your report where you have 17 Figure 4 from the Chou reference. 18 I'm presuming you have reviewed portions of 19 the Chou reference that describes Figure 4; is that 20 correct? 21 A. I have. 22 Q. So in Figure 4, what does g(n) -- or maybe not

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85 1 correct. Let me start again. In Figure 4, what does 2 g(n) depict? 3 A. So Chou describes that or defines the terminology for 4 g(n) in paragraph 66 as being the gap "at frame n 5 between the buffer tube upper bound and the coding 6 schedule." 7 Q. And does it describe -- let me just make one thing for 8 administrative. So in Figure 4 and onwards there are 9 a few times that are g(n) and also b(n). For 10 simplicity, if I say "b of (n)" or "g of (n)," would 11 you understand that I'm referring to items shown in 12 Figure 4? 13 A. I would. 14 Q. Does paragraph 60 on page 7 also disclose what g(n) 15 is? 16 A. I'm afraid I am not seeing a definition either 17 explicit or implicit in paragraph 60 for g(n). 18 Paragraph 60 describes the overall height of the tube 19 as being height of B which is shown at the bottom 20 left of Figure 4, but that is not the same as the 21 b(n). 22 Q. Let's take it in two steps, then. Let's go to	87 1 A. Okay, so I've situated myself now. Can you -- sorry 2 to ask you to repeat your question one more time so 3 that I know what I'm asked to opine on. 4 Q. Okay. In paragraph 66 when Chou refers to "the buffer 5 tube upper bound," is he referring to Schedule C? 6 A. I believe so. 7 Q. Likewise, when Chou refers to "coding schedule" in 8 paragraph 66, is he referring to Schedule D? 9 A. Schedule D, as described in Chou, appears in 10 paragraph 60 as being the schedule at which frames 11 are removed from the decoder buffer and instantly 12 decoded for presentation. The coding schedule, as 13 described later in that paragraph, can be either the 14 staircases of -- in Figure 3 of plot A or D. 15 Q. But if you look at Figure 4 of Chou, the pattern in 16 the middle can be Schedule A or Schedule D; is that 17 correct? 18 A. That is as described in paragraph 60. 19 Q. And Figure 4, if you see the straight line with the 20 slope to the left of the staircase pattern, is that 21 Schedule C? 22 A. I don't believe this is discussed in my Declaration
86 1 paragraph 66 that you mentioned just now. And you 2 mention that "gap g(n) at frame n is between the upper 3 tube upper bound and the coding schedule." Do you 4 agree with that? 5 A. That is what is stated by Chou in paragraph 66. 6 Q. And if you look at Figure 4, does Schedule C -- and 7 also you have to consider Figure 3 also, does 8 Schedule C refer to the buffer tube upper bound? 9 I can direct you to your report, if that 10 would help. 11 A. No, I was just trying to open a second copy of Chou 12 so I could refer to the figure and the text at the 13 same time. Just give me a moment. 14 Okay, now I have Figure 3 open. Okay. So 15 can you repeat your question, please? 16 Q. Yeah, maybe let's go to page 28 of your report, and 17 it's on page -- paragraph 71 that carries over to 18 paragraph [sic] 28. You mention that "Schedule C is 19 an 'upper bound' to Schedule D." Do you see that? 20 A. Yes, I do. 21 Q. In paragraph 66 when Chou mentions "buffer tube upper 22 bound," is he referring to Schedule C?	88 1 so I'm, again, trying to go through this on the fly 2 here, and I'm -- just from my limited understanding 3 from what I'm reading now, and considering this 4 question, it appears to me that that may depend on 5 whether the staircase that's shown in Figure 4 is 6 assumed to be A or D. 7 Again, I would have to go through this in 8 further detail to give you an answer with confidence, 9 but as I'm standing here I do my best to answer your 10 question on the basis of something that I'm just 11 considering at present. I believe it's going to 12 depend on the interpretation of the staircase itself. 13 Q. In the interest of time, if you don't have an opinion 14 or you have not offered something I've asked, please 15 state so, because I don't have enough time on the 16 record for you to formulate new opinions and so on. 17 So let me ask you this, then. Assuming, in 18 Figure 4, the staircase pattern is Schedule D, do you 19 have an opinion as to what is Schedule C in Figure 4? 20 In the interest of time, Dr. Cooperstock, 21 if you don't have an opinion, say so, or you can point 22 me to a paragraph.

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89 1 A. Yeah, again, I don't believe I've offered opinions on 2 this in my Declaration so I will refrain, then, from 3 attempting to answer your question on this one. 4 Q. Okay. Likewise, coming back to Figure 4 of Chou, 5 assuming the staircase pattern is Schedule D, do you 6 have an opinion as to what is Schedule B in Figure 4? 7 A. Okay. So I'll answer the same way. I haven't 8 considered these questions in my Declaration, so I 9 would have to form an opinion on the fly here. 10 Q. Okay. And on page 27 of your report, you excerpt 11 Figures 2 and Figures 3 from Chou patent. Do you see 12 that? 13 A. Sorry, which paragraph? 14 Q. Page 27. 15 A. Page 27, I have -- yes, I've included copies of 16 Figures 2 and 3. 17 Q. Yeah, and just for clarity, when I was talking about 18 Schedules A, B, C, and D, I was referring to schedules 19 shown in Figure 3 of your report on page 27. 20 A. Understood. 21 Q. Just coming back to Figure 4 on page 28 of your 22 report, and onto --	91 1 interpretation as to whether the staircase is A or D. 2 In either case, we have the bounds that 3 form the tube constituting Schedules B and C, and we 4 know that C is the upper bound and B is the lower 5 bound. 6 Q. So in Figure 4, the straight line all the way to the 7 right would correspond to Schedule B? 8 A. The lower bound is -- let me make sure. Schedule B 9 is the lower bound. That's correct. 10 Q. And likewise, Schedule C would be upper bound. And 11 would that be the leftmost line, straight line, in 12 Figure 4? 13 A. The leftmost straight line is Schedule B. 14 Q. Okay. So just to make sure, the record says, the 15 leftmost straight line is Schedule B. Is that what 16 you meant to say? Or did you mean to say Schedule C? 17 A. Schedule C is the upper bound. 18 Q. Uh-huh. 19 A. And Schedule B is the lower bound. And accordingly, 20 as we see in Figure 3, because we're mapping the same 21 axes, the bits, in media time, Schedule C is to the 22 right of Schedule B, so that is the -- the rightmost
90 1 A. Sorry, just a moment. As you were asking previously 2 as to Figure 4, right, what I was considering the 3 line -- the straight line to the left of the 4 staircase in Figure 4? 5 Q. Yes. I was asking both about the straight lines in 6 Figure 4 and the staircase pattern in the middle. 7 A. Okay. So I apologize, I had forgotten that I did, in 8 fact, explain this in the Declaration. The straight 9 lines are -- that are shown for both buffer 10 schedules B and C, so Schedules B and C -- this is 11 in -- at the bottom of paragraph 61 -- sorry, 12 paragraph 71 in my Declaration, "Schedules B and C 13 are disclosed to be the 'buffer tube'" that is said 14 to bound both buffer schedules, which is shown in 15 Figure 4," and the buffer schedules which we note can 16 be -- may have used the term "buffer schedule" as 17 opposed to "coding schedule." 18 Yes. Because we have the -- both the 19 encoder buffer and the decoder buffer, so either the 20 schedule for the encoder buffer or the decoder 21 buffer, regardless, Schedules B and C, constitute the 22 tube. So it does not, in fact, require	92 1 straight line is Schedule C, and the leftmost 2 straight line in Figure 4 is Schedule B. 3 Q. Just to make sure, I recall I thought you testified 4 something differently earlier. So just to make sure 5 the record is clear, Figure 3 shows Schedules A, B, C, 6 and D, and Figure 3 is then mapped into Figure 4. 7 Would you agree with that? 8 A. Well, I wouldn't say that they're mapping Figure 3 9 into Figure 4, rather they are taking a choice of 10 either A or D from Figure 3 and they are then 11 illustrating further details in Figure 4 by 12 illustrating the -- I've got to get the terminology 13 straight here -- the buffer tube that bounds the 14 staircase. 15 Q. And in Figure 4, you testified just now that the 16 staircase pattern can be either Schedule A or 17 Schedule D of Figure 3; is that correct? 18 Dr. Cooperstock, I'm just repeating what 19 you said a few minutes ago. 20 A. Yes, I'm trying to reconcile the descriptions from 21 Chou with respect to Figure 3 and 4 as to what is -- 22 what constitutes the two lines that -- to limit the

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93 1 staircase because there's an obvious difference 2 between the representation in B -- I'm sorry, in 3 Figure 3, in which, as per Chou's description in 4 paragraph 60, Schedule B is a lower bound to 5 Schedule A, Schedule C is an upper bound to 6 Schedule D. 7 Clearly, neither of those schedules or, I 8 should say, the two schedules, B and C, do not 9 encompass or surround either of the staircases which 10 are the coding schedules for either the receiver or 11 the transmitter or the encoder or decoder. 12 So the mapping to Figure 4 which I have not 13 described in my Declaration, although I do refer to 14 the buffer tube in terms of bounding them, I'm trying 15 to on the fly answer that question, and I'm afraid all 16 I've done in my Declaration in this regard is to 17 describe the buffer tube itself that bounds both 18 buffer schedules. 19 And as such, what I was saying earlier as 20 to the relationship between the straight lines in 21 Figure 4 and Schedules B and C in Figure 3, I'm not 22 confident that I've actually answered that correctly.	95 1 Figure 4. 2 Q. So you don't have an opinion as to whether Schedules B 3 and C are shown in Figure 4; is that correct? 4 A. No, that's not what I've stated. I've stated that in 5 my report, in paragraph 71, I state, "since the 6 system in Chou utilizes both an encoder buffer and a 7 decoder buffer, Schedules B and C are disclosed to be 8 the 'buffer tube' that is said to bound both buffer 9 schedules, which is shown in Figure 4." 10 Q. Okay. Let me just ask you, what is Schedule B in 11 Figure 4? 12 A. So it's the lower bound. So where does that place 13 it? Lower bound to Schedule A, and C is the upper 14 bound to Schedule D. So it's the lower bound, which 15 means it's the earliest, so the earliest in time, 16 which would mean that for a particular coded 17 transmission it would be the lower one, in which case 18 B, which is opposite to what is shown in Figure 3 -- 19 let me take a moment to review Chou. 20 Q. If you don't have an opinion, haven't expressed this 21 in report, I think we don't have the luxury for you to 22 figure it out. So you can either state you don't have
94 1 Q. I understand that, and obviously given the limited 2 time we can't go and analyze everything so I'm trying 3 to limit myself to the questions you have in the 4 report. 5 Let me ask you again, then, you don't have 6 an opinion in your report that what are Schedules A 7 and D in Figure 4; is that correct? 8 A. Sorry, what Schedules A and D are in Figure 4? 9 Q. Yes. 10 A. So I did not provide in my report a statement to that 11 effect, but as per paragraph 60 of Chou, it appears 12 that the coding schedule, shown as the staircase, 13 could be either A or D. 14 Q. And do you have an opinion in your report as to what 15 is the line on the left of the staircase schedule? 16 A. Yes, so I've stated in my report that those lines are 17 the buffer tube Schedules B and C shown in Figure 4. 18 However, as I've stated, as I'm trying to go through 19 this in detail with regard to the mapping to 20 Figure 3, I'm having to reconcile the fact that the 21 Schedules B and C do not encompass either of the 22 coding Schedules A and D in Figure 3, as is shown in	96 1 an opinion or you can point us to the report where you 2 have done that. 3 A. Right. In the report I've simply disclosed it as the 4 buffer tube, but I haven't mapped them to the 5 corresponding which line is which. And I would be 6 more comfortable if I could reconcile that at 7 present, but I -- as you've noted, I have not 8 indicated in my report which line maps to which 9 portion of the buffer tube. 10 Q. Just for the record, in your report where you discuss 11 Figure 4 of Chou, you have not opined on what are 12 Schedules B and C in Figure 4. 13 A. No, I -- that's not what I said. I did opine in 14 saying that Schedule B is a lower bound, and 15 Schedule C is an upper bound to, respectively, 16 Schedules A and D. 17 Q. But in Figure 4, as shown in your report on page 28, 18 you have not identified what is Schedule B and C in 19 Figure 4 is. 20 A. I did not label the -- or refer to each line 21 individually with a label. That is correct. 22 Q. And in your report you did not explain what g(n) is.

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97 1 A. Well, I certainly discussed the gap that Chou 2 calculates. I don't recall if I used the g(n) 3 terminology. At least I'm not finding it in a search 4 now. But I've discussed at some length Chou's 5 measure of the gap. 6 Q. And the gap you're referring to is g(n) as shown in 7 Figure 4? 8 A. Well, the gap is dependent on how the Petitioner has 9 interpreted the terminology from Chou. As I explain 10 in paragraph 68, the Petition talks about the gap 11 between the arrival schedule and the playback 12 deadline as well as the gap between the arrival time 13 and the playback deadline. 14 In Chou, we have g(n) defined as discussed 15 earlier, the gap between the buffer tube upper bound 16 and the coding schedule. 17 Q. So the gap that is shown in Figure 4 of Chou is 18 different than the gap you opined upon in paragraph 68 19 of your report; is that correct? 20 A. What I've described in my report in paragraph 68 is 21 the position advanced by Peloton in terms of its 22 discussion of the gap.	99 1 A. I'm sorry, I'm not seeing that in paragraph 60. 2 Q. If you go to the bottom of paragraph 60 of Chou 3 reference. 4 A. Yes, the last few lines I'm seeing is, "It can be 5 seen that capital D=Fd/R is the startup delay between 6 the time that the first bid arrives at the receiver 7 and the first stream is decoded." 8 Q. All right. Look at paragraph 60. 9 A. I am. 6-0. 10 Q. Look at the third sentence -- third line from the 11 bottom which begins with, "Indeed." 12 A. No, I'm not seeing that. 13 This is Exhibit 1004. Correct? 14 Q. Let's make sure we're on the right exhibit. 1004, 15 yes. 16 A. Yes. So paragraph 60, [0060], on page 8 -- 17 Q. No, I think it's page 7. 18 A. Page 7 -- okay. So, sorry, that's not the end of the 19 paragraph, though. Paragraph 60 ends on page 8. 20 Q. I was talking about the end on page 7. 21 A. Okay. I was reading the end of the paragraph. Okay. 22 Okay. Now I'm with you.
98 1 Q. Let's go to paragraph 60, very last line. And I'll 2 read it from the third line from the bottom on page 7 3 in paragraph 60 of Chou. 4 He states there, "Indeed, the gap between 5 Schedules A and B represents, at any point in time, 6 the size of bits in the encoder buffer." 7 Do you see that? 8 A. You were referring me to my Declaration, so I wasn't 9 sure... are you reading, say, from Chou rather than 10 my Declaration? 11 Q. Yeah, I apologize. 12 A. Okay. 13 Q. I'm talking about paragraph 60 of Chou. 14 A. Okay, so let me go back to Chou then. 15 And you're saying the last few lines? 16 Q. The last few lines of paragraph 60 of Chou reference. 17 A. Yes. 18 Q. In the last three lines in paragraph 60 of Chou 19 reference he states, "Indeed, the gap between 20 Schedules A and B represents, at any point in time, 21 the size and bits of the encoder buffer." 22 Do you see that?	100 1 Q. Okay. Sorry about that. Let's start again now. 2 Page 7, paragraph 60, on the bottom of that 3 page it says, "Indeed, the 'gap' between Schedules A 4 and B." Do you see that sentence? 5 A. I do. 6 Q. Would you agree that in those last three sentences 7 Chou is saying that, "the 'gap' between Schedule A and 8 B represents, at any point in time, the size in bits 9 in the encoder buffer?" 10 MR. GOODMAN: Object to form. 11 A. What this paragraph reads in the section you've 12 excerpted is, "Indeed, the gap between Schedules A 13 and B represents, at any point in time, the size in 14 bits of the encoder buffer, while the gap between 15 Schedules C and D likewise represents the size of the 16 decoder buffer." 17 BY MR. SHARMA: 18 Q. And would you agree, then, the gap between Schedules C 19 and D represents, at any point in time, size and bits 20 of the decoder buffer? 21 A. That appears to be consistent with the excerpt we 22 just read.

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101 1 Q. Okay. And just referring to the gap that is mentioned 2 in the last line of page 7, in paragraph 70 [sic], is 3 the gap mentioned in last line of page [sic] 70 in the 4 context of Schedule C and D, the same "gap g(n)" that 5 is mentioned in paragraph 66? 6 A. Okay, you have to slow that down. There's a lot of 7 pages and paragraphs and so forth. So – 8 Q. Okay. 9 A. – you're referring to my Declaration now when you're 10 talking about – 11 Q. No, I'm still talking to you about the Chou reference. 12 And I want to ask you, do you see -- let me break it 13 down in two questions, then. 14 Do you see a gap that is mentioned on 15 page 7, and the gap is between Schedule C and D? Do 16 you see that? 17 A. I see the gap between Schedule C and D. 18 Q. Okay. And now if you come to paragraph 66 there's the 19 "gap g(n)" that is mentioned in the Chou reference. 20 Do you see that? 21 A. I do. 22 Q. Do you have an opinion as to the relationship between	103 1 A. That's -- as described here, that is the decoder 2 buffer fullness. 3 Q. Have you expressed an opinion on what a decoder buffer 4 fullness is in your report? 5 A. I have not provided an explicit definition. I mean, 6 this is sort of, again, a simple term that a POSITA 7 understands and doesn't need to be described. 8 What I discuss with respect to the fullness 9 of the buffer is that this is something that Chou 10 explicitly teaches against trying to control. 11 Q. And have you considered Equation 10 from Chou 12 reference in forming your opinions? 13 A. If you could refer me to an area in my Declaration 14 where I'm pointing to Figure [sic] 10 of Chou, I 15 would be happy to discuss. 16 I don't recall referencing this equation. 17 I do note that Chou is describing here how that 18 fullness can be expressed, but, again, I repeat that 19 Chou teaches against trying to control that variable. 20 Q. Yeah, you mentioned "Figure 10," but I'm referring to 21 Equation 10, so... 22 A. Yes, sorry. If I said "figure," I meant "equation."
102 1 "gap g(n)" mentioned in paragraph 66 and "the gap" 2 that is mentioned in the last line of paragraph 60 on 3 page 7? 4 Again, if you have not expressed an opinion 5 on the relationship, please state so. 6 A. Well, it appears that they are related. I have not 7 commented specifically on the relationship between 8 them in my Declaration, but I -- it's referring to 9 the same figure, it's referring to the same bounds on 10 the tube and the coding schedule. 11 Q. So then "gap g(n)" in paragraph 66 represents size and 12 bits at any instant of time in the decoder buffer; is 13 that correct? 14 A. I'm not sure if it's explicitly related only to the 15 decoder buffer. It does say that, "Note that the 16 decoder buffer fullness," and then $F_d(n) = B - F_e(n)$ can 17 also be expressed..." I'm reading that at present to 18 assume that this may, like the previous discussion in 19 paragraph 60, be considering both possibilities of 20 the encoder or the decoder, but this is not something 21 I've opined on explicitly. 22 Q. Okay. What's your understanding of $F_d(n)$?	104 1 Q. At least in your report, I did not find any reference 2 to Equation 10. I want to confirm that you agree that 3 you have not offered any opinion on Equation 10. 4 A. I don't recall including that equation in my report. 5 Q. Okay. Let's move on to the next page of Chou 6 reference. That's page 9. Here are Equations 11 7 through 17 on the left-hand side. And have you 8 expressed an opinion on the Equations 11 through 17 in 9 your report? 10 A. I believe I refer to at least one of those, but I'll 11 need a moment to locate it. But if you would like to 12 save time and point me to the paragraph in my 13 Declaration, I'd be happy to turn there. 14 Q. Give me one minute. 15 A. Actually, I found one. There's -- in paragraph 118 I 16 make reference to Equation 18, and then in 17 parentheses I note "(or any of the equations)." So 18 as I -- I'll just cite or quote from paragraph 118, 19 "As described above, Chou discloses its primary goal 20 as approximating the," quote, "upper bound," 21 unquote, "for frame," quote, "n," unquote, "to the, 22 quote, "target schedule," unquote, "and does not

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105 1 consider the," quote, "'remaining time,'" unquote, 2 "because there is no value in Equation 18 (or any of 3 the equations) that suggest taking into account 4 (i.e., basing the code rate determination on) a," 5 quote, "remaining time,'" unquote. 6 Q. Okay. So referring to paragraph 118 of your report, 7 and you're mentioning "Equation (18) (or any of the 8 equations)." So does that include Equations 10 9 through 17? 10 A. It does. 11 Q. Okay. So just let me then ask you some questions on 12 these equations here. In paragraph -- on page 9, it 13 makes reference to b(n). What does value b(n) denote? 14 A. This is b(n) in Equation 14? 15 Q. Yes, Equation 14. Also used in Equation 11, 12, 13, 16 is b(n), that's correct. 17 A. But the definition for it, the -- where b(n) appears 18 on the left-hand side is from Equation 14. Okay. 19 Yeah, so this is part of the leaky bucket 20 formulation, and as described in paragraph 61 of Chou, 21 that is the number of bits that the encoder dumps into 22 the leaky bucket at time Tau(n).	107 1 Q. So as you sit here now, you have no opinion as to the 2 relationship between gap, in paragraph 60, is with 3 respect to g(n) in paragraph 66? 4 A. I have not offered an opinion in my Declaration as to 5 the relationship between the discussion of gap in 6 paragraph 60 and that of paragraph 66. What I have 7 offered an opinion on is the terminology that was 8 proposed by Petitioner in the Petition with respect 9 to the gap. 10 THE WITNESS: Mr. Sharma, would this be 11 about a one-hour time to take another break? 12 MR. SHARMA: Okay, let's take a break. We 13 started at 40 minutes after the hour. Let's take a 14 ten-minute break and come back. 15 THE WITNESS: Sure. 16 (Off the record at 3:41 p.m.) 17 (Back on the record at 3:50 p.m.) 18 BY MR. SHARMA: 19 Q. Dr. Cooperstock, we were talking about equations on 20 page 9 of the Chou reference. Continuing with those 21 equations, if you look at Equation 14 on page 9 of 22 Chou, have you expressed an opinion as to what g(n-1)
106 1 Q. And at the time Tau(n), the number of bits that are 2 present in the decoder are denied by g(n); is that 3 correct? 4 A. Well, g(n), as we discussed previously, represents 5 the gap, which is the separation between the buffer 6 tube upper bound and the coding schedule. 7 Q. And then when we're discussing g(n) we also discuss 8 paragraph 60, and you agreed that "gap g(n)" depicts 9 number of bits at any point of time in the decoder 10 buffer; is that correct? 11 MR. GOODMAN: Objection to form 12 A. What I've read from in paragraph 60 from the bottom 13 of page 7, is that, "the gap between Schedules A and 14 B represents, at any point in time, the size and bits 15 of the encoder buffer, while the gap between 16 Schedules C and D likewise represents the size of the 17 decoder buffer." 18 I don't see that as tied to the symbol 19 g(n). Again, this is sort of mapping over, as we were 20 discussing earlier, the terminology and the notation 21 from paragraph 66. 22 BY MR. SHARMA:	108 1 is? 2 MR. GOODMAN: Objection to scope. 3 A. As I've noted previously, I've described the gap that 4 Petitioner has advanced theories of in the Petition. 5 I have not gotten into the details of the equations 6 in this portion of Chou other than to note that Chou 7 does not explicitly calculate the available time or, 8 that is, use the buffer duration in its calculations. 9 BY MR. SHARMA: 10 Q. Just going back to your paragraph 118 of your expert 11 report, I think you mentioned that when you have 12 looked at Equation 18, and other equations, you have 13 not considered those equations other than to observe 14 where the -- take remaining time into account; is that 15 a correct statement? 16 A. What I've stated in my paragraph is that none of 17 these paragraphs consider the remaining time. There 18 is no value in those equations that take that into 19 account or base the code rate determination on 20 remaining time. 21 Q. And as you discussed earlier that in your report the 22 only question you've mentioned is in Equation 18, you

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109 1 have not mentioned any of the equation from Chou in 2 your expert report; is that correct? 3 A. That is not correct. I refer to -- in paragraph 118, 4 I refer to Equation 18 "(or any of the equations)." 5 That would be any of the equations, period, in Chou 6 that do not -- or, I should say, none of the 7 equations suggests taking into account remaining 8 time. 9 Q. Okay, let's go to page 31 of your report in 10 paragraph 75. So in paragraph 75 of your report you 11 mentioned that the Board concluded that Chou's target 12 buffer duration teaches a delivery time; is that 13 correct? 14 A. To be exact in the quotation, I stated that, "The 15 Board stated that 'Petitioner' has established that 16 Chou's target buffer duration...teaches the argued 17 'available reproduction time.'" 18 Q. And you cited to page 41 of the Institution Decision; 19 is that correct? 20 A. That is correct. 21 Q. But in coming up with your opinion, did you consider 22 the remainder of the Institution Decision?	111 1 from? 2 Q. Okay, let me find that. Look at paragraph 87 of your 3 report. 4 A. Paragraph 87 or page -- 5 Q. Paragraph 87. 6 A. Yes. I don't see anything in paragraph 87 that 7 discusses what Petitioner alleged. I have here the 8 discussion -- oh, sorry, the very beginning. "The 9 Petition alleges that the 'gap between the arrival 10 schedule and the playback deadline' corresponds to 11 the claimed 'available reproduction time.'" 12 Okay. Sorry. That is, yes, the allegation 13 from the Petition. 14 Q. And later on you mention that "is different from 15 Chou's 'gap' between 'target schedule' and the 16 'playback deadline,'" which is then identified in the 17 Institution Decision as the available time. 18 A. That is correct. 19 Q. And maybe I'm putting two and two together, but my 20 conclusion was that you are saying or you have 21 concluded that Peloton is not arguing that the target 22 schedule meets the available time limitation; is that
110 1 A. With respect to this opinion here, I focused on the 2 Board's conclusion or the Board's statement that, 3 "Petitioner has established that Chou's target 4 buffer duration...teaches the argued 'available 5 reproduction time.'" I was dealing in this paragraph 6 with that specific finding of the Board. 7 Q. But did you read the Institution Decision cover to 8 cover, or did you read only -- strike that. 9 In preparing this expert report, did you 10 read the entire Institution Decision? 11 A. I believe I read almost all of it. There were 12 portions perhaps at the beginning or the very end 13 that I did not go through in detail, but I did read 14 most, if not all, of the decision. 15 Q. To the extent the decision discussed available 16 reproduction time, did you read all the relevant 17 portions of the opinion? 18 A. I believe so. 19 Q. And also you have noted that Peloton did not argue 20 that target buffer duration meets the available 21 reproduction time limitation; is that correct? 22 A. Sorry, could you point me to where you're reading	112 1 correct? 2 A. What I'm stating in this paragraph is that there is a 3 difference between what Chou is teaching with respect 4 to the gap and what the Petition alleges to be the 5 gap. And what the Institution Decision found to be 6 the available reproduction time is different as well 7 from Chou's gap between -- sorry, the -- what the 8 Institution Decision referred to as the available 9 reproduction time is Chou's gap between the target 10 schedule and the playback deadline. 11 And I note that that is, in fact, the 12 target buffer duration. 13 Q. And you believe that the Petition did not allege that 14 the target buffer duration is the available time; is 15 that correct? 16 A. What I've described, for example, in paragraph 89, is 17 that the gap that Petitioner describes, which is in 18 Figure 5 of Chou between the arrival schedule and the 19 playback deadline, is something that cannot be 20 calculated because it's dealing with a future event. 21 And I've also noted that with respect to 22 Petitioner's position, the gap that is in Chou

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113 1 between the arrival schedule and the playback 2 deadline, while illustrated in those figures, is not 3 something that is ever determined. 4 Q. Let's go to page 41 of your report, Dr. Cooperstock. 5 And you mentioned -- just strike that. 6 On page 41 of your report you provide an 7 annotated Figure 5. Do you see that? 8 A. I do. 9 Q. Okay. In the Figure 5 box in the blue on the 10 left-hand side. Do you see that? 11 A. I do. 12 Q. And then you specify a gap over there. What is the 13 gap shown in blue in your annotated Figure 5? 14 A. As I've explained in the box that you referred to, 15 that is the "'gap' between the 'playback deadline' 16 (td(n-2))," and which is the uppermost line in the 17 graph, and the "'arrival schedule,'" which is the 18 staircase, at the arrival (ta(n-2)). 19 Q. Is the gap that you've identified in blue in Figure 5 20 any relationship to the gap mentioned in paragraph 66 21 of Chou? 22 MR. GOODMAN: Objection. Scope.	115 1 A. In paragraph 93 of my Declaration, the paragraph of 2 Chou to which I refer is paragraph 81. And this is 3 with reference to the time or the earliest time -- or 4 "the earliest frame," I should say, "at which the 5 controller can determine the coding bit rate." 6 And I also refer to Figure 5 of Chou. 7 BY MR. SHARMA: 8 Q. Now, if you look at -- back to Figure 5 on page 41, 9 the blue box that denotes the "gap" between" the 10 "playback deadline" and" the "arrival schedule," 11 now this is at a time -- let me strike that. 12 The blue box talks about a "gap" between 13 'playback deadline' and 'arrival schedule.'" Are you 14 referring to frame n-2 when you are describing the gap 15 in the blue box? 16 A. This is indeed with respect to frame n-2. 17 Q. And does the gap that is shown in blue include frame 18 n-2? 19 A. If you mean do we have a label of "n-2" explicitly on 20 the graph, no. But as you can see from the -- if you 21 take the horizontal access where we have media time, 22 then the one point in the axis that has a labeled
114 1 BY MR. SHARMA: 2 Q. Dr. Cooperstock, if you have not opined on this one, 3 please feel free to state so. 4 MR. GOODMAN: I object to scope again. 5 A. What I've described is as per paragraph 93, which is 6 saying, in the hypothetical, that, "Even if a 'gap 7 between a frame's arrival time and its playback 8 deadline' was calculated...it is still not the 9 claimed 'available reproduction time.'" 10 I haven't, in this paragraph, made 11 reference to specific paragraphs in Chou. What I've 12 done is related the "gap between a frame's arrival 13 time and its playback deadline" to the requirements 14 of the claims of the '101 patent, which teach using 15 the -- or relying upon or basing the calculations on 16 the available reproduction time. 17 BY MR. SHARMA: 18 Q. When looking at paragraph 93 of your report, you do 19 not reference "gap g(n)" from paragraph 66 of Chou 20 report [sic]; is that correct? Or the Chou reference. 21 Sorry. 22 MR. GOODMAN: I'll object to scope again.	116 1 value to it, which is Taud(n), if we move to the left 2 two jumps in the staircase or two stairs in the 3 staircase, we come to media time of (Taud(n-2)), and 4 as such we are referring to, here, the correspondence 5 between media time and client time for frame n-2. 6 As such, the span denoted by the blue curly 7 bracket that is pointed to by the blue box encompasses 8 the gap between the arrival time and the playback 9 deadline or the arrival schedule and the playback 10 deadline, I should say, for frame n-2. 11 Q. That is the basis of your statement that you make on 12 page 42 on the next page when you state, "the client 13 device would not stop playing after frame 'n-2' 14 finished playing at time 'td(n-1),'" is that correct? 15 A. That is an independent statement that is not tied 16 explicitly to anything in Figure 5. It's simply a 17 property of media payout. That is, a player device, 18 in this case the client, will complete its playback 19 or payout of a frame that is designated as frame n-2 20 as of the time at which the playback deadline for the 21 successive frame n-1 occurs. 22 Q. If you just look at the sentence over here, it says,

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117 1 "For example, the 'gap' in frame 'n-2,' in blue would 2 yield a result of $td(n-2) - ta(n-2)$." Do you see that? 3 A. I do. 4 Q. That refers to the gap as shown in blue in Figure 5 on 5 the previous page. Right? 6 A. That is what that is referring to, yes. 7 Q. But you -- after that, you say that, "but the client 8 device would not stop playing until frame 'n-2' 9 finished playing at 'time $td(n-1)$.'" 10 A. That is correct. 11 Q. In making the second half of the statement, aren't you 12 assuming that frame n-2 constitutes the gap you 13 mentioned on page 42? 14 A. What I've assumed, or what I've represented in my 15 annotated version of Figure 5, is the gap between the 16 arrival schedule of n-2 and the playback deadline of 17 frame n-2. 18 And to go further, what I'm stating in the 19 second half of the sentence you read, is that the gap 20 itself does not indicate when the client device stops 21 playing. It doesn't stop playing until frame n-2 22 finishes playing, which occurs at time deadline	119 1 between a frame's playback deadline and its actual 2 arrival time, I give some discussion about that. 3 And we also have my reasoning with respect 4 to "the 'gap' between the arrival schedule" -- this is 5 in paragraph 87 -- "and the playback deadline." So 6 there are two theories that seem to be advanced by 7 Petitioner and I'm discussing both of them and noting 8 that, in any case, this is different from the gap that 9 is taught by Chou, which is between the target 10 schedule and the playback deadline. 11 BY MR. SHARMA: 12 Q. My question was only about paragraph 93. Just to 13 clarify, that at least in paragraph 93, the "gap" 14 you're mentioning on page 42 is not related to "gap 15 $g(n)$" in paragraph 66 of Chou. 16 A. As I've described already, I'm trying to address the 17 multiple potential interpretations of gap that have 18 been advanced by Petitioner as well as relating that 19 to the gap that is ascribed in Chou. I have not 20 explicitly articulated in paragraph 93 which 21 interpretation maps to what. 22 What I'm saying is that, "Even if a gap
118 1 $td(n-1)$. 2 Q. So what you're implying over here is, if I'm -- or 3 maybe the way Figure 5 would work, is the frame n-2 4 would start playing at time $td(n-2)$, but will keep 5 playing until $td(n-1)$. Correct? 6 A. I wasn't looking at Figure 5 while you were reading 7 that, but what you described sounds consistent with 8 what I've stated in the sentence that the playback 9 deadline for frame n-2 indicates when frame n-2 10 begins playing, not when it finishes playing. 11 Q. And just to clarify one more time, in paragraph 93, 12 that goes on from page 40 to 42, you refer to "gap" on 13 page 42, but this gap is not gap $g(n)$ that is 14 mentioned in paragraph 66 of Chou. 15 MR. GOODMAN: Objection to scope. 16 A. I haven't made any statement to one effect or another 17 there. I'm describing the gap that represents the 18 gap described by Chou, which is as per my discussion 19 beginning -- let's see -- well, there are several 20 theories for the gap as advanced by the Petition, but 21 if we go back to, for example, paragraph 90, if we 22 assume that the gap that Petition refers to is	120 1 between a frame's arrival time and its playback 2 deadline' was calculated," it's not the "available 3 reproduction time." That's the point of this 4 paragraph. 5 Q. Let's go to the figure you have shown on page 43 of 6 your report. I'll ask a few questions on this figure. 7 Figure 5 that is shown below is from the 8 Chou reference; is that correct? 9 A. The portion of the figure that is the Figure 5 framed 10 portion at the bottom is from Chou, yes. 11 Q. And the box above, which shows Frame n-3 in red, that 12 entire box is something you created in your report; is 13 that correct? 14 A. That was created for my report, yes. 15 Q. I just want to understand here on the top, when you 16 say it's frame n-3, and there's a timeline with 0 17 from t from left to right, are you depicting that 18 frame n-3 is present in the decoder buffer? 19 A. This is -- indeed, as per the annotation in the 20 rectangular frame below the red frame n-3, this is 21 "based on the content data stored at arrival of frame 22 n-3." So it is at the -- in the storage device of

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121 1 the receiving client. 2 Q. So in this case, the frame n-3 arrived at time 0, and 3 it will play for 5 seconds when it comes -- the time 4 comes; is that correct? 5 A. On its playback deadline, assuming that it is not 6 being skipped or fast-forwarded or played at a slower 7 rate by user interaction, it would play for 8 5 seconds. 9 Q. Well, if you come to the part in blue below, how did 10 you arrive that the playback deadline could be 11 5 seconds or 2 seconds or 7 seconds? Just trying to 12 figure out the basis of the numbers that are shown 13 below. 14 A. Right. So that playback deadline is somewhat 15 arbitrary decision whether it's from the server side 16 or the receiver side as to when playback of media is 17 to begin. So one cannot assume a priority what that 18 playback deadline will be, it is something that is 19 going to be specified on a per session and per sender 20 and receiver basis. 21 Q. This deadline which you mentioned that could be 22 2 seconds or 7 seconds, this is just exemplary number	123 1 A. That is correct. 2 Q. And in media time, that would correspond to time 3 (Taud(n-3)); is that correct? 4 A. That is the playback deadline for that frame in media 5 time. 6 Q. And at that time, frame n-3 would have been placed in 7 the decoder buffer of the client; is that correct? 8 A. So I would have to go back to Chou to verify that 9 it's the time at which it is placed in the decoder 10 cover as opposed to the time at which data starts to 11 come out of the decoder buffer, but if we are willing 12 to assume that that's a very small difference, then 13 it's largely the same item that we're talking about. 14 Q. And just to confirm, then, putting aside those minor 15 differences in Figure 5 or in annotated Figure 5 shown 16 on page 43 of your report, you're assuming a time 17 (Taud(n-3)) frame n-3 would have been placed in the 18 decoder buffer. 19 A. That's what we were -- if we're stipulating that it 20 might be -- have -- it might have been placed in the 21 decoder buffer a very short time before and contents 22 are now coming up because that is the playback
122 1 that you provided in this report; is that correct? 2 A. That is correct. 3 Q. And same thing, frame n-3 being 5 seconds long is 4 again an assumption you made in creating this figure; 5 is that correct? 6 A. Not an assumption, it's just an example to -- for the 7 purpose of illustration. 8 Q. And you're assuming at this time this would be -- 9 since document frame n-3 would be document time 10 Tau(n-3), frame n-3 has been placed in the decoder 11 buffer; is that correct? 12 A. I'm not clear on where you're referring to the 13 Tau(n-3)? Where does that appear? 14 Q. I am just going by the scheme you described in the 15 previous page, Figure 5 on the bottom shows Taud(n). 16 And I think if you move -- keep moving to the left, 17 you will get to (Taud(n-3)). 18 A. That's correct. It is not labeled as such in the 19 figure. 20 Q. Okay. Thank you for clarifying then. When the blue 21 arrow is shown in Figure 5 on page 43, you're 22 referring to frame n-3. Correct?	124 1 deadline. Again, I would have to go back and consult 2 Chou for exactly the specification that Chou requires 3 for td or Taud. 4 Let's jump to page 54 of your report. 5 Looking at paragraph 111 of your report. 6 And in the first sentence of paragraph [sic] 54, you 7 state that, "The Petition alleges that Chou's 8 disclosure of 'target buffer duration' corresponds to 9 the claimed 'remaining time.'" 10 Do you see that? 11 A. I see it in paragraph 111 on page 54, not 12 paragraph 54. 13 Q. Sorry about that. Yeah. Thanks for the correction. 14 On page 54 of -- in paragraph 111 of your 15 report, you cite to Petition pages number 35 and 36; 16 is that correct? 17 A. Yes, it is. 18 Q. And later on you cite to page 38, and then you cite, 19 again, to page 35 and 36 of the Petition on page 55; 20 is that correct? 21 A. It is. 22 Q. Okay. And what -- paragraph 118 -- sorry -- strike

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125 1 that. 2 What paragraph 111 on page 54 of your 3 report is stating that Peloton has alleged that the 4 target buffer duration in Chou meets the remaining 5 time limitation of Claim 1 of the '101 patent; is that 6 correct? 7 A. I haven't explicitly stated here of Claim 1, but you 8 paraphrased essentially what the purpose of this 9 paragraph is in my Declaration. 10 Q. Yeah. And when it says, in paragraph 111 "claimed 11 remaining time," I assume that you're referring to 12 "remaining time" mentioned in Claim 1 of the '101 13 patent and other independent claims, yeah? 14 A. That is correct. 15 Q. And on paragraph 112, you also mentioned that, 16 "Petitioner alleges that the target buffer duration," 17 and you say -- towards the end says that the target 18 buffer duration is the claimed remaining time, and 19 then you quote Petition at page 37; is that correct? 20 A. What I've stated in this paragraph is that I'm 21 characterizing Petitioner's allegation that the 22 target buffer duration or the gap between the time at	127 1 A. Since the beginning of paragraph 111 in my 2 Declaration refers to Chou's disclosure of "target 3 buffer duration," then, indeed that would be 4 referring to Chou's Figure 6 or at the -- the 5 indication of target buffer duration as illustrated 6 in Figure 6. 7 Q. I just wanted to clarify -- I'm asking -- I wanted to 8 clarify that there's no other target buffer duration 9 other than in Figure 6 that you're referring to in 10 paragraphs 111 and 112, so that was it. 11 And I just want to confirm that is correct 12 that you indeed are referring to Figure 6 when talking 13 about target buffer duration in these two paragraphs; 14 is that correct? 15 A. The gap -- I'm just going to refer to paragraph 112. 16 "The 'gap between the time at which Chou's system is 17 determining the coding bit rate for a given 18 frame...and the playback deadline for that frame.'" 19 And let me go back to Figure 6 of Chou, the 20 target schedule and the playback deadline... 21 When Chou's system is determining the new 22 coding bit rate, it examines a desired target arrival
126 1 which Chou's system is determining the coding bit 2 rate for a given frame and the playback deadline for 3 that frame is the claimed remaining time before 4 reproduction start time. 5 Q. And just for clarification, when you mention "target 6 buffer duration" in paragraph 111 and 112, you are 7 referring to the target buffer duration shown in 8 Figure 6 of Chou Patent? 9 A. Sorry, which paragraph of my Declaration? You're 10 on -- well ahead, but I see just -- to go back, 11 because I don't refer to Figure 6 explicitly in those 12 paragraphs from which we're reading, but I do see 13 much earlier on that I -- I cite in paragraph 76, at 14 the top of page 32, to Chou's "target buffer 15 duration," and I note that in Figure 5 -- Figures 5 16 and 6. And, indeed, the target buffer duration is 17 explicitly indicated in Figure 6 in Chou. 18 Q. Yeah. Yeah, I just want to clarify that when you 19 mention "target buffer duration" in double quotes in 20 paragraph 111 and paragraph 112 of your report, you 21 are referring to the target buffer duration shown in 22 Figure 6 of the Chou patent; is that correct?	128 1 time based on the target schedule for that frame as 2 per the Petition page 38, and it is assuming, without 3 support, that Chou's approximation of the upper bound 4 to the target schedule is based on a remaining time. 5 The gap between the time, a determining of 6 the coding bit rate... So where do we have... the 7 target schedule, which also appears in Figure 5. And 8 let me go back to my annotated version of Figure 5. 9 Oh, but that's not the target, so we're in 10 a different section now. "Target buffer duration"... 11 yeah, so that's -- I mean, that's all I can -- I refer 12 to here is Chou's target buffer duration, and that is 13 shown in Chou in Figure 6, so I do not have anything 14 here to indicate that I'm suggesting otherwise. 15 Q. Okay. And Figure 6, the target buffer duration is 16 shown as the -- 17 A. I'm sorry, my apologies, I meant Figure 6. Yes. The 18 target buffer duration was illustrated in Figure 6. 19 My apologies for the interruption. 20 Q. Okay, yeah, you had mentioned Figure 5. I just wanted 21 to clarify that. So just for the record, Figure 6 of 22 Chou Patent, target buffer duration is shown as the

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129 1 gap between playback deadline and the target schedule; 2 is that correct? 3 A. That is correct. 4 Q. And the subsequent paragraphs that you discuss on 113 5 to 118 are based on the assumptions stated in 111 and 6 112 of your report? 7 A. Well, I would suggest that paragraphs 111 and 112 are 8 providing the background for the discussion that 9 follows in paragraphs 112 and onward. 10 Q. And in paragraphs 113 onwards to 118, you dispute that 11 the target buffer duration in Figure 6 of Chou is not 12 the claimed remaining time of the '101 patent. Is 13 that a fair statement? 14 A. I dispute that it is a remaining time. I stated that 15 it is not a remaining time. 16 Q. Okay. 17 A. So just to avoid the double negatives. 18 Q. Okay. Let's go to page 59 of your report. 19 Now, on page 59 of your report there's a 20 table that you have provided. Do you see that? 21 A. I do. And I just -- since we're on that table at 22 present, I'd just like to point out a clerical error	131 1 in my Declaration is that frames -- the arrival times 2 for n-1 through n+1 cannot be known a priority. 3 Q. Right. Because frames n-1 and n+1 have not arrived -- 4 A. Correct. 5 Q. -- so won't know what will happen in the future; is 6 that correct? 7 A. That is correct. 8 Q. And the second column refers to the Playback Deadline 9 in Media Time; is that correct? 10 A. Yes, it is. 11 Q. And it shows that the playback time for frames 12 starting n-3 would be zero, 30 seconds, 60 seconds, 13 and so on; is that correct? 14 A. It is. 15 Q. And you are assuming that each frame would play -- 16 would play for about for 30 seconds; is that correct? 17 A. For exactly 30 seconds. 18 Q. And then on the third column you show the Playback 19 Deadline, which is the same as the one on the column 20 left except this is in Client Time. 21 A. That is correct. 22 Q. And then on the last two columns you have arrival time
130 1 there. The bottommost box or rectangle which says in 2 the second line, "e.g., frame n-2 will play for 30 3 seconds in addition to the 15 seconds left of 4 playback for n-2," that final n-2 should, in fact, be 5 n-3. 6 Q. That was the only question I was going to ask, so 7 thank you. 8 And this is a table that you created as 9 part of your report; is that correct? 10 A. This table was created as part of my report, yes. 11 Q. As I understand the table over here on the top left 12 corner, you have Frame No. Do you see that? 13 A. I do. 14 Q. And the left column shows frames N-3, N-2, and so on, 15 arriving in sequence at the client. 16 A. That is correct. 17 Q. And the second column is labeled Playback Deadline 18 (Media Time). Do you see that? 19 A. Actually, just on the previous question, because it's 20 maybe a subtle but an important point, it really only 21 shows n-3 and n-2 arriving in sequence. 22 One of the key points that I try to make	132 1 for the frames n-3 and n-2 in media time and in client 2 time. 3 A. That is also correct. 4 Q. And as you said earlier, the frames n-1 and later are 5 not arrived yet, so you don't know their arrival time; 6 is that correct? 7 A. It is. 8 Q. Now, looking at the first row, and just considering 9 the media time, frame n-3 will arrive at minus 10 5 seconds and play at time zero seconds; is that 11 correct? 12 A. In media time, yes. 13 Q. Unless -- for simplicity, let's assume we are all 14 talking media time when we are referencing this table. 15 Is that okay? 16 A. Fair enough. 17 Q. Likewise, frame n-2 will arrive at time 15 seconds and 18 will play at 30 seconds. 19 A. Correct. 20 Q. Now, you are relying on the disclosure of Chou at 21 paragraph 81 to mention that -- or to highlight that 22 when you are calculating or when you have data for

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133 1 frame n-2, you can calculate the frame rate or coding 2 rate for frame "n," is that correct? 3 A. I have to go and verify that that is the correct 4 paragraph, but that is indeed the teaching of Chou. 5 Q. Please go ahead and check. 6 A. That is correct, paragraph 81. Yes, 0081. 7 Q. So in this case, if frame "n" will play at time 8 90 seconds, and when frame n-2 arrives -- let me 9 strike that again. 10 What you state in that table on page 59 of 11 your report is, when frame n-2 arrives it's at time 12 15 seconds, and at that time, 15 seconds worth of 13 frame n-3 has played; is that correct? 14 A. That is correct because the playback deadline in 15 media time for frame n-3 is zero seconds. 16 Q. So at time 15 seconds when frame n-2 arrives you'll 17 have 15 seconds worth of frame n-3 in the buffer; is 18 that correct? 19 A. Not necessarily "in the buffer" because it may have 20 already left the buffer and be in the decoder or 21 elsewhere in the audio or video player component. 22 Q. Well, let's assume, for the purposes of next few	135 1 of the three rectangles at the bottom of the figure 2 above paragraph 118 where I explicitly note that the 3 remaining time for frame "n" is 75 seconds because we 4 have the 90 seconds of the playback deadline for 5 frame "n" and we have to subtract the 15 seconds in 6 media time. And as such, the -- sorry, the 7 15 seconds in media time is, of course, the 8 portion -- just a minute here. 9 This is when -- if you go back here, we 10 point to n-2. So when frame n-2 arrives and we are 11 calculating the code rate for frame "n", according to 12 Chou is the earliest time we can do so, the current 13 time, which is the arrival time of n-2 is 15 seconds 14 in media time as per the 30 seconds of -- sorry. 15 So 15 seconds indicated there in red on the 16 second row, and thus the remaining time must account 17 for the 15 seconds -- sorry, I'm -- I apologize, I'm 18 mixing -- I'm mixing up the discussion in the bottom 19 row which is related to the 15 seconds left of 20 playback for n-2. This is what I wanted to point to. 21 So the available reproduction time that 22 we're calculating on the arrival of frame n-2 has to
134 1 questions, that when frame n-2 arrives you have still 2 15 seconds of n-3 left in the buffer. Would you mind 3 doing that? 4 A. I'm not comfortable stipulating that it's "in the 5 buffer." I think that's clouding the reality as to 6 the way in which media players typically operate, in 7 that the dequeuing of a frame for decoding and 8 playback would typically remove that frame in toto 9 from the buffer even though it may have remaining 10 time that has yet to play out. 11 Q. Let me just ask you to make an assumption for these 12 questions. Are you willing to make that assumption? 13 I'm not asking you to stipulate it. 14 A. The problem is that it -- stipulating or assuming 15 that a frame that is currently playing is still in 16 the buffer, it changes the nature of my understanding 17 of -- and my analysis. 18 Q. Okay. 19 A. So just to be clear about this, in my discussion of 20 the consideration for the time remaining, we have to 21 consider both the contents of the buffer and we have 22 to consider the time as discussed here in the middle	136 1 consider not only the time in the buffer, but also the 2 remaining time that exists for the playback of the 3 currently playing frame. 4 Q. So, Dr. Cooperstock, let me pause because I think it's 5 getting confusing now. So maybe let's take one thing 6 at a time. Maybe let's discuss remaining time first, 7 and then we can discuss available time? 8 A. Sure. 9 Q. Okay. I can follow what you're saying. Otherwise, 10 I'm not able to follow as the transcript is going by. 11 So just to make sure, in the box that is 12 marked "Remaining Time," you take 90 seconds as the 13 playback time for frame "n," and then you subtract 14 15 seconds from there, and that, you say, is the 15 remaining time that's 75 seconds. 16 A. The remaining time for frame "n," when we are 17 calculating the code rate for frame "n," is 18 75 seconds because the media time of frame "n" is 19 90 seconds, and the arrival time of n-2, which is 20 when we are doing this calculation, is 15 seconds. 21 So we're already 15 seconds into media time, which 22 leaves us 75 seconds of remaining time.

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137 1 Q. And the term "playback deadline" is a -- as you 2 characterize it in a previous page, is a timestamp. 3 A. The only time I recall referring to timestamps is in 4 conjunction with the Wang reference, not with Chou. 5 Q. Okay, so let me ask you again, then. In paragraph 117 6 you mention that, "the 'playback deadline' is," I 7 quote, "just a clock value where given in a time 8 domain such as media time or client time." Do you see 9 that? 10 A. I'm not yet at the location where you're reading 11 from. "The 'playback deadline' is just a clock value 12 in a time domain," yes, "such as media time or client 13 time." 14 Q. And then after that you mention, "leaving a POSITA 15 clueless as to what domain the value is with reference 16 to." What do you mean by "domain" when you -- as used 17 in paragraph 117 of your report? 18 A. That is when you are specifying a reference to a 19 present moment -- sorry, without reference to a 20 present moment. If you simply describe the playback 21 deadline then we don't know what that playback 22 deadline is relative to, so it's necessary to have an	139 1 to assume that those contents are still in the 2 buffer, I said, well, we have to be careful here 3 because what my point is, is that we cannot rely 4 solely on the contents in the buffer, we have to also 5 factor whatever remaining time there is on the 6 playback of the currently playing frame. 7 Q. Yeah. So at time 15 seconds in media time, you 8 testified just now that you would not know how much of 9 frame n-3 is in the buffer; is that correct? 10 A. Well, as I stated, I don't want to assume that frame 11 n-3 is in the buffer if it's currently being played. 12 It may have been dequeued from the buffer. 13 Q. It's possible that the frame n-3 has been removed from 14 the buffer, there is 15 seconds left, but none of 15 frame n-3 is in the buffer; is that correct? 16 A. That is possible. 17 Q. In this case, the available reproduction time of 18 45 seconds is not based on what's in the buffer; is 19 that correct? 20 A. That is incorrect because it is based on what is in 21 the buffer in addition to the remaining time of the 22 currently playing frame.
138 1 anchor that establishes what the delta is, to now, 2 and to do that you have to know what "now" is in 3 whatever domain you're operating in, whether it be 4 client time or media time. 5 Q. Moving onto the next block, Available Reproduction 6 Time on figure -- on page 59. Here, you mention the 7 available time is 45 seconds. 8 A. That's correct. 9 Q. And it says, "frame n-2 will play for 30 seconds." Do 10 you see that? 11 A. I do. 12 Q. And then you also mention, "in addition to 15 seconds 13 left of the playback for n-3," with the correction you 14 made. Do you see that? 15 A. Thank you. Yes. 16 Q. Does 15 seconds denote how much playback time there's 17 left for frame n-3? 18 A. That is correct, and that's because the arrival of 19 frame n-2 occurs at time 15 seconds in media time, 20 and given that the duration of frame n-3 is 30 21 seconds, that means there's 15 seconds left. 22 And this is why earlier when you asked me	140 1 Q. Make sure this is right. 2 And the available reproduction time has two 3 components, one is the 30 seconds of frame n-2, that's 4 in the buffer, and 15 seconds of frame n-3 that may or 5 may not be in the buffer; is that correct? 6 A. That would be a much better way of stating it. 7 Q. I got it right on the second try. Okay. 8 MR. SHARMA: Do you want to take a -- I've 9 been going for an hour, and you've been honest and 10 keeping us straight, so do you want to take a 11 ten-minute break now? 12 THE WITNESS: Very good. 13 (Off the record at 4:51 p.m.) 14 (Back on the record at 5:01 p.m.) 15 BY MR. SHARMA: 16 Q. Dr. Cooperstock, we can go back to your Declaration, 17 and I want to go to the section titled what you have 18 considered, on page 7. So in paragraph 66 -- sorry, 19 on paragraph 27 of your report you list all the 20 materials that you have considered in forming this 21 opinion; is that correct? 22 A. It is.

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141 1 Q. And then as you mentioned, the '101 patent, its file 2 history, the Petition and the exhibits, the 3 Declaration of Dr. Reader, as well as the prior art 4 references cited; is that correct? 5 A. Yes. I realize now that this really should have 6 included mention of the Institution Decision as well. 7 Q. Okay. So in addition to what I just mentioned, you 8 have Institution Decision and you also mentioned the 9 POPR exhibits thereto and Declaration of 10 Dr. Schonfeld. Is that a correct listing? 11 A. That's correct. 12 Q. And that is a complete list of documents including the 13 Institution Decision that you have considered in 14 forming your opinions? 15 A. That is to the best of my recollection, correct. 16 Q. And to the extent if you don't remember something, it 17 will be cited in the report that you submitted; is 18 that correct? 19 A. I don't quite understand your question. 20 Q. Oh, I'm saying, to the extent you haven't mentioned 21 anything else in paragraph 27, you have mentioned 22 those documents or references elsewhere in your	143 1 adjusting the coding bit rate of the streaming media 2 [data] to control the client buffer duration." 3 Do you see that? 4 A. I do. 5 Q. So in this excerpt over here, paragraph 19, Chou is 6 stating that his technique will adjust the coding rate 7 to control the client buffer duration; is that 8 correct? 9 MR. GOODMAN: Objection to form. 10 A. What Chou is describing in the summary is that the 11 coding bit rate control that is the subject of the 12 present invention "involves dynamically adjusting the 13 coding bit rate of the streaming media data to 14 control the client buffer duration." 15 BY MR. SHARMA: 16 Q. So the goal over here, as expressed by Chou in 17 paragraph 19, in the part we just read, is to control 18 the client buffer duration. 19 MR. GOODMAN: Objection. Form. 20 A. I don't know if that is the goal. It is an outcome 21 of the actions that the dynamic control strategy 22 adopted by Chou accomplishes.
142 1 report. 2 A. That would make sense, yes. 3 Q. Just want to mention, you made one correction on 4 page 59, and I will check with you, are there any 5 other corrections or typographical errors you would 6 like to fix? 7 A. So there were a few minor typographical errors, but 8 they're not anything that substantively change the 9 nature of the opinions there. If you'd like to go 10 through and make minor typographical corrections I 11 don't mind, but I don't know if it's necessary. 12 Q. I leave it up to you, if you want to correct them. If 13 you don't believe they are important, we don't have to 14 go through them. 15 A. I don't think they're important. 16 Q. I'll ask you a few questions on the Chou reference. 17 Let's go to paragraph 19 of the reference. 18 Are you there? 19 A. I am now. 20 Q. If you look at paragraph 19 of the Chou reference, in 21 the third line of paragraph 19, it says, "In general, 22 this coding bit rate control involves dynamically	144 1 BY MR. SHARMA: 2 Q. And Chou refers to the "client buffer duration" in 3 paragraph 67. Do you -- would you mind going to 4 paragraph 67? 5 If you see in the last line on page 8, 6 moving onto page 9, in paragraph 67, Chou states that, 7 "the gap between a frame's arrival time and its 8 playback deadline is the client buffer duration at the 9 time of the frame arrival." 10 Do you see that? 11 A. I see that. 12 Q. Is the "client buffer duration" mentioned in 13 paragraph 19 the same as the "client buffer duration" 14 mentioned in paragraph 67 of Chou? 15 A. I don't have any reason to assume that it's 16 otherwise, but I don't see anything explicit that 17 says this is the same client buffer duration that 18 Chou was talking about earlier. 19 Q. Sticking with paragraph 19, would a person of ordinary 20 skill reading paragraph 19 understand that, to 21 conclude the client buffer duration, Chou has to know 22 what the size of the client buffer duration is?

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145 1 A. I think you're mischaracterizing or misunderstanding 2 what Chou is doing with respect to the client buffer 3 duration. As Chou teaches, the objective is to – 4 and let me quote directly from paragraph 118 of my 5 Declaration – Chou's primary goal – 6 Q. Hold on a second. Let me get to paragraph 118. 7 A. Yeah, uh-huh. Chou's primary goal, when we talked 8 about goal or you asked me about goal earlier, and I 9 think Chou maybe even explicitly states goal, maybe 10 not explicitly states it, but makes it clear that the 11 goal of the invention is "approximating the 'upper 12 bound' for frame 'n' to the 'target schedule.'" 13 That's what Chou is doing. 14 And as a result of that, it affects the 15 contents in the buffer. But what's important to note 16 is that Chou does not calculate at any point or seek 17 to set the value or determine the value of the 18 contents in the storage or the client buffer. 19 Q. Is it your opinion, Dr. Cooperstock, that Chou can 20 accomplish its goal of controlling the client buffer 21 duration without ever examining the size of the client 22 buffer duration?	147 1 duration. 2 Do you see that? 3 A. I see, "this coding bit rate control involves 4 dynamically adjusting the coding bit rate of the 5 streaming media data to control the client buffer 6 duration." 7 Q. And it's your opinion that the bit rate control can 8 adjust the coding rate and control the client buffer 9 duration without examining the size of the client 10 buffer duration? 11 A. Yes. 12 Q. So at one instant of time when it's trying to control 13 the client buffer duration sometime in the future, the 14 coding bit rate control does not need to know what the 15 client buffer duration is at the time or where it was 16 in the past. 17 A. Sorry, repeat the question. 18 Q. Okay. So when the coding bit rate control is trying 19 to figure out what the coding rate ought to be to 20 achieve a particular client buffer duration, it does 21 not need to know what the current value of the buffer 22 duration is or what the value was in the past.
146 1 A. So, once again, I don't believe that Chou's goal is 2 to control the size of the client buffer. Chou's 3 goal is to approximate the "upper bound" for a 4 particular frame to the "target schedule," and as a 5 byproduct of that it affects the size of the target 6 buffer. Or, so sorry, the size of the client buffer. 7 Q. And again, it's your opinion, then, even if -- well, 8 let me ask you, in paragraph 118, you mention "its 9 primary goal." Did Chou use the word "primary goal" 10 in explaining? 11 A. In paragraph 71 of Chou, it states, "Although 12 controlling the upper bound to the target schedule is 13 our primary goal, it is also desirable to minimize 14 quality variations due to large or frequent changes 15 to the coding bit rate." 16 So the answer to your question is, yes, 17 Chou does use the words explicitly "primary goal." 18 Q. And you're right, in paragraph 19, Chou does not 19 use -- mention the word "goal." 20 So let's go back to paragraph 19 again. It 21 means the coding bit rate control algorithm involves 22 changing the coding rate to control the client buffer	148 1 A. No, that's not correct. If you have – if you're 2 trying to achieve a particular target buffer 3 duration, it is important to know the current or near 4 past buffer content size. 5 Q. Now, same thing, question -- question in paragraph 19, 6 it says that the coding bit control is trying "to 7 control the client buffer duration," and you believe 8 it can do so without knowing the current or the past 9 value of the client buffer duration? 10 A. You can control or Chou can control the client buffer 11 duration without knowing the value. It can increase 12 the bit rate to – increase the coding bit rate, I 13 should say, so that you have – assuming the network 14 is delivering the contents effectively, such – so 15 that the client buffer increases in size, and you can 16 decrease the coding bit rate so that the client 17 buffer decreases. That's possible to do without 18 measuring at any point or obtaining the current size 19 of the buffer. 20 Q. And you stated earlier, however, if you are trying to 21 achieve a certain buffer size, in that case you need 22 to know the current or the present or past value of

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149 1 the buffer; is that correct? 2 MR. GOODMAN: Objection to scope. 3 BY MR. SHARMA: 4 Q. Let me withdraw the question in the interest of time. 5 A. Well, I just wanted to refer to what I've described 6 in paragraph 81 of my Declaration, which is beginning 7 on line 4, that "Chou describes the 'target buffer 8 duration' depicted in Fig. 6 as 'the desired client 9 buffer duration.'" 10 And that means it is not tied to any data 11 already stored in the storage device of the reception 12 device. It specifies a desired amount of content 13 data to be stored at some future time, but not a 14 value based on the content data already stored in the 15 storage device. 16 So that's the specifics of Chou. 17 Q. And then coming back to paragraph 118 of your report, 18 you mention Chou's 'primary goal as approximating the 19 'upper bound' for frame 'n' to the 'target schedule.'" 20 Do you see that? 21 A. Let me jump back to the paragraph. 22 "Primary goal as approximating the 'upper	151 1 buffer. 2 Q. And you believe -- you opine that you can achieve that 3 without considering the buffer size or the file buffer 4 size. So, in other words, what you're saying is that 5 the client buffer duration would not have any impact 6 in adjusting the coding rate in the algorithm that 7 Chou uses; is that correct? 8 A. Yeah, as I've described in paragraph 118, the -- what 9 Chou is describing is modifying the upper bound or 10 approximating the upper bound to try to target -- to 11 try to match that target schedule or to 12 asymptotically approach it. 13 And since that upper bound does not 14 control actual arrival of frames, which is something 15 that Chou warns explicitly against trying to do, and 16 is not tied to the playback time, you have no 17 connection to contents currently in the buffer. 18 They're unrelated -- sorry, they're related in the 19 sense that previous arrival times and frames will 20 impact what is in the buffer, but it doesn't 21 constitute part of the equation or part of the 22 control strategy.
150 1 bound' from frame 'n' to the 'target schedule,'" yes. 2 Q. And it's your opinion that Chou can achieve that goal 3 of approximating the upper bound to the target 4 schedule without knowing the buffer size when it's 5 trying to figure out the coding rate for the frame. 6 A. Yeah, this is -- the schedule, or the target 7 schedule, is independent of what is in or what will 8 be in the buffer. It is purely a question of the 9 arrival of the frames that are coming in to 10 approximate or to try to match towards that "target 11 schedule." 12 Q. Okay. And according to you, Chou can achieve that and 13 make sure that the upper bound matches the target 14 schedule without considering how much data is present 15 in the buffer when it's time to make the coding 16 decision; is that correct? 17 A. Well, it's fairly explicit in that none of the 18 equations that Chou is using for basing the code rate 19 determination actually consider a remaining time, and 20 a remaining time would relate to the contents that 21 are already in the buffer as the remaining time is 22 based on the contents that are currently in the	152 1 Q. Well, that would mean only -- that would include 2 the -- I just want to make sure I get this right. I'm 3 looking at the transcript. You say, the potential 4 arrival times "will impact." And I want to make sure 5 that when you're talking about just arrival time, 6 you're talking about the size of the buffer in the 7 past would influence the buffer size in the future. 8 MR. GOODMAN: Objection to form. 9 A. The buffer size in the past, while it will be a 10 factor in the buffer size in the future, is 11 independent of what Chou is controlling and what 12 Chou's objective is. Chou's objective -- as we 13 stated, the primary goal is approximating the upper 14 bound for the -- to the target schedule, so that 15 affects the arrival rate of frames and indirectly 16 will affect the buffer, but it's not based on the 17 buffer, it's not considering the buffer. 18 BY MR. SHARMA: 19 Q. Okay. Indirectly affect the buffer in the sense when 20 bits arrive, the buffer size will go up. Is that what 21 you're trying to say? 22 A. As bits arrive, the buffer increases. As frames are

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153 1 dequeued for playback or decoded, the buffer size 2 decreases. That's how the buffer grows and shrinks. 3 Q. Okay. And your opinion expressed in 118 that Chou can 4 achieve his primary goal independent of what the 5 buffer size is at certain time or in the near past; is 6 that correct? 7 A. Yeah, I keep coming back to, as I review the summary, 8 as to the issues with Petitioner's position, in the 9 end, it all comes down to paragraph 118, which is, 10 what is Chou actually teaching? What is Chou's 11 objective? And it has nothing to do with the actual 12 buffer size or buffer contents. It's controlling the 13 upper bound for frame "n" relative to the target 14 schedule. 15 Q. Let's go to paragraph 81, I think that you mentioned 16 in your report. And I'm talking paragraph 81 of Chou. 17 A. Ah, okay. 18 Q. Sorry. Yeah, I guess both in the reference and in the 19 report. 20 Are you there? 21 A. Yes. 22 Q. Okay. In paragraph 81, it mentions "a feedback loop."	155 1 A. What I've done with respect to citation to paragraph 2 81 is to note that the earliest time at -- or the 3 earliest frame in which the controller can determine 4 the decoding bit rate for frame "n" -- sorry, for -- 5 at time "n," I should say, or the time of arrival of 6 frame "n," is for that of frame n+2. That's the 7 portion of paragraph 81 that I've referred to in my 8 Declaration. 9 So in the paragraph -- that is the portion 10 of paragraph 81 of Chou that I've referred to in my 11 Declaration. 12 Q. Let me ask you a few questions about paragraph 81, and 13 if -- and so -- just to make sure, that you considered 14 only the second half of the paragraph in forming your 15 opinions? 16 A. That is the only portion of the paragraph to which 17 I'm referring in my Declaration. 18 Q. But did you consider other part of paragraph 81 that 19 you did not refer to in your Declaration? 20 A. No. I also considered from the third line at least, 21 "Note, however, that by the time frame n arrives 22 completely at the client, frame n+1 has already
154 1 Do you see that? 2 A. I see that. 3 Q. This feedback loop refers to the data or some 4 information going back from the client to the server; 5 is that correct? 6 MR. GOODMAN: Objection to scope. I'm just 7 going to lodge an objection to scope on this entire 8 line. 9 A. Okay. So as I'm reading this, which is not something 10 that I've opined on in my Declaration, what I see 11 here is that a feedback loop involves the client 12 sending a message to the server. 13 BY MR. SHARMA: 14 Q. Yeah, make a stopover here, just make sure. 15 In response to your statement that you 16 haven't opined upon on it, have you expressed any 17 opinions in paragraph 81 in your report? And I'm 18 talking about paragraph 81 of the Chou reference. 19 A. I cite to it in paragraph 73 of my Declaration, and 20 it looks like also in paragraph 93. 21 Q. So you have discussed paragraph 81 in your report, 22 then. Right?	156 1 started streaming from the server," et cetera. I 2 just didn't give opinions specifically on the 3 feedback loop. 4 Q. Understood. So you considered part of paragraph 81 5 that begins with "Note, however" until the end, but 6 did not consider or did not express opinions on the 7 first sentence of paragraph 81; is that correct? 8 A. I did not express opinions about the feedback loop, 9 but I understand that there's communication from the 10 server to the client in terms of sending media, and I 11 understand that there's feedback or communications 12 from the client back to the server so that the server 13 can adjust the coding rate, but that's not something 14 that I've discussed in terms of the mechanism by 15 which that takes place. 16 Q. Similarly, you did not express any opinions on how 17 information is conveyed to the client or from the 18 client as described in paragraph 69 of Chou. 19 MR. GOODMAN: Objection to scope. 20 BY MR. SHARMA: 21 Q. Dr. Cooperstock, if you did not express an opinion, 22 feel free to state so. My question is simply asking

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157 1 you whether you expressed an opinion or not. 2 A. I did. I've cited to paragraph 69 of Chou in two 3 instances, one in paragraph 72 of my Declaration and 4 a second in paragraph 97. 5 Q. 72 and 97. Give me one second. 6 And did you consider all of paragraph 69 of 7 Chou or only consider only portions of those? 8 A. Well, I considered the entirety of that paragraph. 9 I'm referring to specific elements of it within my 10 Declaration, but I read and considered the entirety 11 of the paragraph. 12 And I should also note with regard to the 13 previous paragraph we were looking at, I read it and 14 considered it, I just didn't express opinions on it. 15 But that is the first line regarding the feedback 16 loop mechanism. 17 Q. Understood. And I can only go by what you expressed 18 in your report, not by what you considered and 19 discarded, because experts consider many things and 20 not everything makes it into the report. 21 Just going back to the Chou reference, how 22 does the mechanism described in paragraph 69 differ	159 1 A. That is correct. 2 Q. With respect to the grounds based in Chou reference in 3 Peloton's Petition you dispute only that limitation 4 1[d] is not rendered obvious or disclosed by Chou; is 5 that correct? 6 A. You'll have to repeat the beginning of your question, 7 I didn't quite catch what you were saying. 8 Q. Okay. Yeah, I'm talking about how the Petition has 9 different grounds, some based on Chou, some based on 10 Wang, and I'm just asking you right now on the grounds 11 based on Chou reference, and I want to confirm that in 12 your report you dispute that limitation 1[d] is not 13 rendered obvious by Chou; is that correct? 14 A. To the contrary. I dispute that it is rendered 15 obvious. I deny. I do not believe that it is 16 rendered obvious by Chou. 17 Q. Right. Yeah. Well, that's what I say you dispute 18 that limitation 1[d] is rendered obvious by Chou. 19 A. That is a correct statement characterizing my 20 opinion. 21 Q. And as far as the Chou reference is considered, you do 22 not dispute that other limitations of Claim 1 are
158 1 from the mechanism described in the portion of 2 paragraph 81 that you expressed an opinion on? 3 MR. GOODMAN: Objection to scope. 4 BY MR. SHARMA: 5 Q. Dr. Cooperstock, if you have not considered the 6 comparison between the two or expressed an opinion on 7 the differences or similarities between the two, feel 8 free to state so. 9 A. Well, what I've, I believe, noted at some point, 10 these fall under different options in terms of the 11 approach that Chou takes. The discussion in 12 paragraph 69 falls under the rate control model 13 whereas the discussion for paragraph, was it, 81? 14 Q. Yes. 15 A. Yes, for 81, is under the optimal control solution 16 target schedule design. So these are different 17 options that Chou puts forward, and I've commented on 18 both of those in my Declaration. 19 Q. And for paragraph 69, you mention the two places you 20 discuss paragraph 69 of Chou was paragraph 72 of your 21 report and paragraph 97 of your report; is that 22 correct?	160 1 disclosed by Chou. 2 A. I have not expressed opinions on the other 3 limitations of Claim 1. 4 Q. And then on Ground Number 3, Peloton asserted that 5 Nobuyoshi can be combined with Chou. Do you recall 6 reading Ground 3? 7 A. I do. 8 Q. And you did not express any other opinion regarding 9 the Chou and Nobuyoshi combination besides what you 10 mentioned in context of Chou; is that correct? 11 A. As I've stated in paragraph 151, the claims to which 12 the Petition is referring for the -- with respect to 13 the combination of Chou and Nobuyoshi, these claims 14 each depend from either Claim 1 or 11, and as I've 15 indicated, that they are not obvious in view of Chou. 16 I have not offered further details in the Chou aspect 17 in noting that Nobuyoshi does not remedy those 18 deficiencies. 19 Q. Let's go back to '101 patent for a few minutes, and 20 that's Exhibit 1001. Just before we broke for lunch, 21 we were discussing Figure 3 from the '101 patent. Do 22 you recall that?

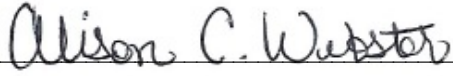
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161 1 A. I do. 2 Q. And you also pointed to Figure 13 from '101 patent 3 just before lunch. Do you recall that? 4 A. I do. 5 Q. Although you have summarized paragraph '101 -- 6 although you have given a brief summary of '101 patent 7 in your report -- let me see -- and that summary is 8 on -- starting on page 16, you have not discussed 9 Figure 3 in that summary; is that correct? 10 MR. GOODMAN: Objection to scope. 11 A. I don't recall explicit reference to Figure 3 12 certainly in the summary of the '101 patent in my 13 Declaration. 14 BY MR. SHARMA: 15 Q. And likewise, you did not discuss Figure 13 also in 16 the summary; is that correct? 17 MR. GOODMAN: Objection to scope. 18 A. I don't see references to Figure 3 or Figure 13 in 19 the summary of the '101 patent in paragraphs 51 20 through 54 of my Declaration. 21 BY MR. SHARMA: 22 Q. In the same paragraphs in your Declaration have you	163 1 mentions of "repeatedly execute" that you'll find on 2 columns 13 and 14 of the '101 patent that are related 3 to different aspects of the process, and if you would 4 like me to give you a fulsome answer I would need to 5 take some time to make sure that I am relating the 6 appropriate steps of the algorithm that relate to the 7 changing of the code rate. 8 But as we see in the description here, 9 there is a repeatedly execution on these processes. 10 BY MR. SHARMA: 11 Q. Okay. So do you have an opinion whether the code rate 12 is changed after the devices have started producing 13 content as shown in Figure 3? 14 MR. GOODMAN: Objection to scope. 15 A. So, again, without going through in detail because I 16 know you're rushing through the questions that you 17 have remaining, as I note on paragraph -- I'm sorry, 18 in column 14, the paragraph beginning at line 27 with 19 the -- "Then, the server device 10 specifies '16 20 Mbps' as a code rate," et cetera, et cetera, if you 21 get down to the bottom of that paragraph, "After 22 that, the server device 10 returns a step S401 to
162 1 discussed Figure 6 or Figure 10 of the '101 patent? 2 MR. GOODMAN: Objection to scope. 3 A. I don't believe I refer to those figures in my 4 summary. 5 BY MR. SHARMA: 6 Q. And going to Figure 3 of the '101 patent -- are you 7 there? 8 A. I am. 9 Q. Yeah. Earlier we discussed in Figure 3, terminal 10 devices 20a and 20b started reproducing content in 11 blocks S110a and S110b. Do you see that? 12 A. Yes, I see that. 13 Q. Okay. Do you know whether, in the '101 patent, the 14 code rate is ever changed after devices 20a and 20b 15 started reproducing content? 16 MR. GOODMAN: Objection to scope. 17 BY MR. SHARMA: 18 Q. Dr. Cooperstock, in the interest of time, I'm just 19 looking for a yes/no answer. Either you know it or 20 you don't know it. 21 A. Yes, I know it. What I'm trying to do is find you 22 the appropriate portion because there are several	164 1 repeatedly execute the process described above." 2 So while this is not referencing the same 3 figure to which you're pointing me, it is describing 4 changing of the code rate, and we see that this 5 process is repeatedly executed. As such, it would 6 make sense that the code rate is changed multiple 7 times through the transition. 8 BY MR. SHARMA: 9 Q. Yeah. I agree with you that the code rate is changed 10 multiple times through the transmission, but does the 11 code rate change after the client device has started 12 to play content? 13 MR. GOODMAN: Objection to scope. 14 A. So I don't see, without the opportunity to go through 15 and align the different algorithms that are 16 discussed, where I can walk you through the step -- 17 the determination that the process repeating or 18 executing repeatedly is encompassing the steps of 19 S109 and S110 and occurring repeatedly, but I don't 20 see anything that teaches against that, and it would 21 certainly seem to deprive the practitioner from the 22 benefits of the changing code rate structure or the

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165 1 functionality of the patent if it were not possible 2 to do so after the start of reproduction of content. 3 One would lose many of the benefits of 4 being able to obtain the best quality media playback 5 as permitted by the network at the time. 6 MR. SHARMA: Okay. I think let's take a 7 break so that way -- I'm going to switch topics, so if 8 that's okay with you, we can take a 15-minute break 9 now? 10 THE WITNESS: I'd prefer if we can take a 11 five-minute break just so I keep to schedule of an 12 upcoming meeting that I have later on. I don't want 13 to collide with that, which was one of the reasons 14 that I was a bit adverse to starting late. So if 15 you're all right keeping it to a shorter break, I 16 would much prefer that. 17 MR. SHARMA: I'm hoping this will be the 18 last session after this one, we don't take any more 19 breaks. So maybe how about we take ten minutes and 20 then we come back, and this will be the last one, and 21 we will finish it up after that. 22 THE WITNESS: Okay.	167 1 Q. If you could go to paragraph 19. 2 A. I am there. 3 Q. In paragraph 19, do you see the statement, "In 4 general, this coding bit rate control involves 5 dynamically adjusting the coding bit rate of the 6 streaming media data to control the client buffer 7 duration"? 8 A. The second sentence of the paragraph. 9 Q. Yes. And now at the bottom of the paragraph, do you 10 see the sentence that starts, "It is noted that in the 11 present system and process, it is not the actual 12 fullness of the client buffer that is controlled, but 13 an upper bound on the time of arrival of bits into the 14 client buffer, to a target level"? 15 A. Yes, I see that. 16 Q. How do you reconcile those two statements? 17 A. So I understand now, having looked at the end of the 18 paragraph, that indeed consistent with the positions 19 I expressed in my Declaration, the purpose or the 20 approach that Chou takes for controlling a bit rate 21 of streaming media is not by dynamically adjusting 22 the coding bit rate to control client buffer duration
166 1 MR. SHARMA: Thank you. 2 (Off the record at 5:48 p.m.) 3 (Back on the record at 5:56 p.m.) 4 MR. SHARMA: Mr. Cooperstock, thank you for 5 your time. We don't have any questions. 6 THE WITNESS: Okay. Thank you. 7 MR. GOODMAN: We may have some redirect 8 questions. We would just like to take a quick break, 9 if that's okay. Maybe ten minutes. Plan on being 10 back here at 6 past the hour. 11 MR. SHARMA: Sounds good. 12 (Off the record at 5:56 p.m.) 13 (Back on the record at 6:04 p.m.) 14 MR. GOODMAN: All right. Good afternoon, 15 Dr. Cooperstock. 16 EXAMINATION 17 BY MR. GOODMAN: 18 Q. Do you recall in your questioning being asked about 19 the question -- oh, first, let me direct your 20 attention to what's been marked as Exhibit 1004 or the 21 Chou reference. 22 A. Yes.	168 1 as is generally done, but rather taking the approach 2 that is described in the penultimate sentence which 3 is to say, rather than controlling the actual 4 fullness of the client buffer, it is instead the 5 upper bound on the time of arrival of bits into the 6 client buffer, as I noted several times during the 7 deposition. 8 Q. If Chou is not controlling the actual fullness of the 9 client buffer to a target level, does it need to know 10 the past actual fullness of the client buffer? 11 A. No, it does not. It's operating independent of the 12 contents of the client buffer. 13 Q. I would also like to talk -- do you remember being 14 questioned about a variable in Chou called a g(n)? 15 A. Yes, I do. 16 Q. Do you recall that being -- that variable ever being 17 listed in the Petition? 18 A. I recall searching for it -- in the Petition or in 19 the Declaration? 20 Q. In the Petition or in Mr. Reader's Declaration. 21 A. Let me check. It's not in the Petition. 22 Q. Is Figure 4 in the Petition? Figure 4 of Chou, for a

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169 1 clear record. 2 A. Figure 5 of Chou is in the Petition, but not 3 Figure 4. 4 Q. Does the Petition, with respect to Claim Element [1d], 5 discuss a feedback loop at all? 6 A. I only see "feedback" being described in the context 7 of Limitation [1e] in paragraph 159. Chou further 8 describes changing or switching the code rate with 9 reference to Figure 10 that, quote, "Upon receiving 10 the feedback from the client, the server selects a 11 stream with coding bit rate as high as possible." 12 Q. So, I'm sorry, you said that was with respect to Claim 13 Element [1e]? 14 A. 1 "e" as in echo. 15 MR. GOODMAN: Thank you, I have no further 16 questions. 17 MR. SHARMA: No questions for Peloton 18 either. So thank you very much. 19 THE WITNESS: Thank you. 20 (Proceedings concluded at 6:09 p.m.) 21 22	171 1 in no way interested, financially or otherwise, in 2 the outcome of this matter. 3 4 IN WITNESS WHEREOF, I have hereunto set my 5 hand this 26th day of August, 2024. 6 7 8 9  10 11 ALISON C. WEBSTER, CSR-6266, RPR, RMR, CRR, RDR 12 Notary Public, Oakland County, Michigan 13 My commission expires: May 1, 2029 14 15 16 17 18 19 20 21 22
170 1 CERTIFICATE OF SHORTHAND REPORTER - NOTARY PUBLIC 2 3 I, ALISON WEBSTER, Certified Reporter 4 and Notary Public within and for the State of 5 of Michigan do hereby certify: 6 That JEREMY R. COOPERSTOCK, PH.D., the 7 witness whose deposition is hereinbefore set 8 forth, was duly sworn by me before the 9 commencement of such deposition and that such 10 deposition was taken before me and is a true 11 record of the testimony given by such witness. 12 I further certify that the adverse party, 13 NEC Corporation, was represented by counsel at the 14 deposition. 15 I further certify that the deposition of 16 JEREMY R. COOPERSTOCK, PH.D., occurred 17 virtually on Thursday, August 22, 2024, commencing 18 at 11:05 a.m. PDT. 19 I further certify that I am not related to 20 any of the parties to this action by blood or 21 marriage, I am not employed by or an attorney to 22 any of the parties to this action, and that I am	

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