

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

APPLE, INC.,)
)
Plaintiff,)
)
VS.) Case No. 22-1377-MN-JLH
)
MASIMO CORPORATION and SOUND)
UNITED, LLC,)
)
)
Defendants.)
)

MASIMO CORPORATION and CERCACOR)
LABORATORIES, INC.,)
)
Counter-Claimants,)
)
VS.)
)
APPLE INC.,)
)
Counter-Defendant.)

*** [REDACTED] ***

VIDEOTAPED DEPOSITION OF MOHAMED DIAB
Wednesday, November 8, 2023
Irvine, California

REPORTED BY:
GRACE CHUNG, CSR No. 6246, RMR, CRR
FILE NO.: SY008222

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

APPLE, INC.,

Plaintiff,

VS.

MASIMO CORPORATION and SOUND
UNITED, LLC,

Defendants.

MASIMO CORPORATION and CERCACOR
LABORATORIES, INC.,

Counter-Claimants,

VS.

APPLE INC.,

Counter-Defendant.

Case No. 22-1377-MN-JLH

Videotaped Deposition of MOHAMED DIAB, taken
on behalf of Plaintiff, at 2040 Main Street, 14th Floor,
Irvine, California, beginning at 9:07 a.m. and ending at
6:02 p.m., on Wednesday, November 8, 2023, before GRACE
CHUNG, CSR No. 6246, RMR, CRR, CLR.

A P P E A R A N C E S

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ALSO PRESENT: Ryan LaFond, Videographer

1 I N D E X

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10 EXHIBITS

11 NO. DESCRIPTION PAGE

12 Exhibit 1 Deposition Transcript of Mohamed Diab 19
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13 Exhibit 2 United States Patent No. 7,791,155 23

14 Exhibit 3 Document entitled "Masimo Signal 49
Extraction Technology"16 Exhibit 4 Document entitled "Masimo Signal 55
Extraction Technology"

17 Exhibit 5 Radical Operator's Manual 57

18 Exhibit 6 Document entitled "LN00P & NR, SpO2 69
adhesive & reusable sensors"

19 Exhibit 7 United States Patent No. 8,190,223 70

21 Exhibit 8 United States Patent No. 8,626,255 104

22 Exhibit 9 U.S. Patent No. 10,984,911 116

23 Exhibit 10 Fee Transmittal for FY 2005 166

24 Exhibit 11 U.S. Patent No. 7,764,982 182

25 Exhibit 12 U.S. Patent No. 8,849,365 184



1	Exhibit 13	U.S. Patent No. 8,385,996	186
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6	Exhibit 18	Email chain, with top email from Valerie Begnoche, dated November 29, 2001	265
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11	Exhibit 21	U.S. Patent No. 6,584,336	280

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PREVIOUSLY MARKED EXHIBITS REFERENCED

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Irvine, California
Wednesday, November 8, 2023
9:07 a.m.

THE VIDEOGRAPHER: Good morning. We are now on the record. Today's date is November 8, 2023. The time on the record is 9:07 a.m. This is the video deposition of Mohamed Diab in the matter of Apple, Inc., versus Masimo, Corp., et al. This case is filed in the United States District Court for the District of Delaware. The case number is 22-1377-MN-JLH.

My name is Ryan LaFond. I'm the videographer. Our court reporter is Grace Chung. We represent TransPerfect.

Would counsel please identify yourself and state whom you represent.

MR. SHAW: David Shaw from Desmarais, LLP, on behalf of plaintiff and counterclaim-defendant, Apple, Inc.

MR. OLDHAM: Perry Oldham from Knobbe Martens representing Masimo, Cercacor, Sound United, and the witness.

THE VIDEOGRAPHER: Thank you. Would the court reporter please swear in the witness.

MOHAMED DIAB,

1 having been first duly sworn or affirmed,
2 was examined and testified as follows:

3

4 EXAMINATION

5 BY MR. SHAW:

6 Q. Good morning, Doctor. Can you please
7 state and spell your full name for the record.

8 A. Sure. I'm not a doctor, by the way.

9 Q. Oh, I apologize.

10 A. No need to apologize. That's okay.

11 Q. Let me reask.

12 A. People always mistaking me for a doctor.
13 That's okay.

14 Q. Can you please state and spell your full
15 name for the record.

16 A. Okay. Mohamed Kheir Diab.

17 Q. And where do you live, Mr. Diab?

18 A. In Laguna Niguel, California.

19 Q. And who is your current employer?

20 A. Masimo Corporation.

21 Q. And you have been employed by Masimo
22 Corporation since 1989; right?

23 A. That is correct.

24 Q. Okay. And you've been deposed a number of
25 times before; true?

1 Q. Were you trying to solve any particular
2 problems when you came up with the inventions that
3 are described in the '911 patent?

4 MR. OLDHAM: Objection. Vague.

5 A. Well, during this time, we were working on
6 the rainbow measurement and the rainbow devices.
7 And the goal at the time was to measure total
8 hemoglobin, total -- not total, carbon monoxide,
9 HbCO, and methemoglobin. So that was the overall
10 goal.

11 And under that, in order to come up with a
12 noninvasive measurement of those parameters, we had
13 to develop certain type of sensors, certain type of
14 boards that worked together, and algorithms, of
15 course.

16 BY MR. SHAW:

17 Q. So other than the goal to measure total
18 hemoglobin, carbon monoxide, HbCO, and HB MET, were
19 there any other problems that you were trying to
20 solve when you came up with the inventions that are
21 described in the '911 patent?

22 A. Of course. At the time, we were designing
23 a new device, a new product that did not exist
24 before. And along with that comes a lot of
25 problems.

1 So user interface as the '223 patent was
2 one of them. The sensor, how to measure in
3 real-time the actual wavelength in a sensor. How
4 to make a sensor that can avoid ambient light and
5 light piping. How to drive sensor with 16 LED
6 while making the cable not too hard, not too --
7 keeping the cable flexible.

8 So that also were some of the problems we
9 were trying to solve. There were just many things
10 that we had to solve in order to bring the device
11 to market.

12 So it wasn't only those because we have
13 envisioned other parameters for the rainbow to be
14 able to measure. So the first three were what I
15 mentioned, but there were other parameters we were
16 trying to solve. So we were tackling all of these
17 problems simultaneously.

18 Q. So sitting here today, are you aware of
19 any other problems besides what you've already
20 described that you were trying to solve with the
21 inventions in the '911 patent?

22 A. I just mentioned to you other problems.
23 For example, we wanted to measure bilirubin. We
24 wanted to measure more accurately the saturation.
25 We wanted to measure the oxygen, total oxygen.

1 We -- these are some of the things that comes to
2 mind. I don't remember all the details today.

3 But there were other things that we were
4 trying to measure, besides, I think, the user
5 interface, which was something we paid some
6 attention to as well, instead of just, you know,
7 copying whatever was there before.

8 Q. So prior to the '911 patent, devices
9 existed that could measure hemoglobin; right?

10 A. Noninvasively? In 2005, not to my
11 knowledge.

12 Q. Prior to the '911 patent, devices existed
13 that could measure carbon monoxide; right?

14 A. Invasively, yes, but not noninvasively.

15 Q. Prior to the '911 patent, devices existed
16 that could measure HbCO; right?

17 A. Those were all invasive devices. And I'm
18 talking about 2005, the origin of this patent, not
19 necessarily I'm talking about -- 2020, Masimo had
20 devices.

21 Q. Yes, 2005.

22 A. So I'm going back in -- so let's make sure
23 I'm clear. Prior to 2005, I was not aware, to the
24 best of my knowledge, there was device that would
25 noninvasively measure carbon monoxide poisoning in

1 the blood, total hemoglobin, or methemoglobin.

2 Q. So prior to 2005, devices existed that
3 could invasively measure total hemoglobin, carbon
4 monoxide, HbCO, and HB MET; right?

5 A. Correct.

6 Q. And prior to 2005, devices existed that
7 could invasively measure bilirubin; right?

8 A. Correct.

9 Q. And prior to 2005, devices existed that
10 could noninvasively measure oxygen saturation;
11 right?

12 A. Correct.

13 Q. And prior to 2005, devices existed that
14 could noninvasively measure total oxygen; right?

15 MR. OLDHAM: Objection.

16 A. No.

17 MR. OLDHAM: Vague.

18 A. No.

19 BY MR. SHAW:

20 Q. Prior --

21 A. Not total oxygen.

22 Q. Prior to 2005, devices existed that could
23 invasively measure total oxygen; right?

24 MR. OLDHAM: Objection. Vague.

25 A. Yes. I think you can calculate that with

1 an invasive device.

2 BY MR. SHAW:

3 Q. Okay. Now, one of the other things you
4 mentioned that you were trying to solve was, quote,
5 the sensor, how to measure in real-time the actual
6 wavelength sensor -- strike that.

7 One of the things you mentioned that you
8 were trying to solve is, quote, "how to make a sensor
9 that can avoid ambient light and light piping."

10 How do the inventions described in the '911
11 patent avoid ambient light and light piping?

12 A. We have designed a -- the pad of the
13 device where the detector is located with a type of
14 a light block around it that prevented light piping
15 and minimized ambient light.

16 Q. And is that light block that prevented
17 light piping and minimized ambient light shown in
18 one of the figures of the '911 patent?

19 A. One embodiment of that is shown.

20 Q. Which figure shows -- sorry, strike that.

21 Which figure in the '911 patent shows an
22 embodiment of the light block that prevented light
23 piping and minimized the ambient light?

24 A. So if you start with Figure 29A. So this
25 is a figure of the pad that goes around the finger.

1 And you can see it has two flaps on the side, and
2 it also has this ridge, the number 2830.

3 Q. Uh-huh.

4 A. So the combination of those minimize the
5 light, ambient light going into the photodetector.
6 The photodetector would be sitting in that cavity.

7 Q. So Figure 29A shows a device in the '911
8 patent -- sorry, strike that.

9 Figure 29A in the '911 patent shows an
10 embodiment of the light block that minimizes the
11 ambient light going into the photodetector; right?

12 A. That's correct. And Figure 29B is the
13 other piece where the LEDs are located, and also
14 you see the other mating flaps. They are not
15 mating, but they go to the side of the other flap.
16 So this is another piece of it.

17 Q. So you're saying that Figure 29B in the
18 '911 patent also shows an embodiment of the light
19 block that minimizes ambient light going into the
20 photodetector?

21 A. Yes.

22 Q. Are there any figures -- well, strike
23 that.

24 Do Figures 29A and 29B of the '911 patent
25 also show an embodiment of the light block that

1 minimizes light piping?

2 A. No, not those.

3 Q. Okay.

4 A. The light piping actually, if you look at
5 Figure 29A, the 2830, that ridge, that actually is
6 a piece of minimizing light piping, that one.

7 Q. Uh-huh.

8 A. But the other piece -- you are talking
9 specifically about light piping?

10 Q. Uh-huh.

11 A. That would be in Figure -- one embodiment
12 would be in Figure 32A and 32B, and actually I
13 think all the way to E. It's just different
14 cross-section of that one.

15 Q. Okay.

16 A. And maybe even H. all the way to 32H, I
17 think.

18 Q. Okay. So just so I'm clear, Figures 32A
19 through 32H of the '911 patent show an embodiment
20 of the light block that minimizes light piping?

21 A. Correct.

22 Q. Okay. Now, another thing that you
23 mentioned is that --

24 A. Actually, I just want to add that the
25 design of this one also minimize ambient light, the

1 way the opening is designed.

2 Q. Uh-huh.

3 A. So they have a dual function.

4 Q. Okay. So another problem you mentioned
5 that you were trying to solve in the '911 patent
6 was how to drive a sensor with 16 LEDs while making
7 the cable not too hard, keeping the cable flexible?

8 A. Correct.

9 Q. Is there a figure in the '911 patent that
10 solved that problem?

11 A. Well, it's really the way we drive those,
12 because if you have, for example, the three LED,
13 then you would need three wires to drive it. And
14 those are no problem. You can make cable that are
15 not too hard with three wires.

16 But as you add more and more LEDs, then
17 you need more and more wires to -- I mean, enable
18 those or energize the LED. And the technique we
19 came up with here, one of the inventions, is really
20 this matrix drive.

21 Q. I think it's --

22 A. We call it matrix because it -- okay,
23 Figure 17 would be one example of that.

24 Q. Can you turn to Figure 8.

25 A. Okay.

1 Q. Is Figure 8 one example of the matrix
2 drive for driving up to 16 LEDs?

3 A. So this is a logical diagram, logical
4 electrical diagram that shows you the connection to
5 the LED, and we called it a matrix connection.

6 Q. Okay.

7 A. So the advantage right here is that you
8 can drive a total of 16 LED with eight wires
9 instead of 16 wires.

10 Q. Uh-huh.

11 A. So we cut that by half.

12 Q. Right. And so the problem that's solved
13 by the embodiment shown in Figure 8 of the '911
14 patent is how to drive 16 LEDs with fewer than 16
15 wires; right?

16 A. In this case, eight.

17 Q. Right. Do the inventions described in the
18 '911 patent have any advantages over prior systems?

19 MR. OLDHAM: Objection. Vague.

20 A. What do you mean, the invention? There
21 are many inventions. Could you be more specific?

22 BY MR. SHAW:

23 Q. Do any of the inventions described in the
24 '911 patent provide advantages over products that
25 existed before March 1st, 2005?

1 MR. OLDHAM: Vague.

2 A. Well, I don't know all the other products,
3 so I cannot do a comparison. I can tell you what
4 each one of them did for sure. And -- but the --
5 for example, the ability to measure in real-time
6 the wavelengths, that -- that's definitely
7 something was very important.

8 The ability to minimize light piping
9 turned out to be extremely important. These are --
10 the ability to, you know, have a cable that is
11 flexible is very important as well. And the
12 ability to use -- to control the intensity using
13 what we call it, I think, sunglasses or the
14 equivalent of sunglasses over the LED was very
15 important.

16 They are just -- I don't remember all the
17 pieces, but these are some of the aspect of the
18 '911 patent that were very important and
19 advantageous, of course.

20 BY MR. SHAW:

21 Q. At the time when you came up with the
22 inventions that are described in the '911 patent,
23 so in the 2003 to 2005 rough time frame, did you
24 think that those inventions were important?

25 A. Of course.

1 Do you know whether any invention in the
2 '911 patent is used in the Masimo W1 watch?

3 A. I do not know. I was not part of the W1
4 watch design.

5 Q. Do you know whether any invention
6 described in the '911 patent is used in the Masimo
7 Freedom watch?

8 A. I do not know.

9 Q. So your co-inventors on the '911 patent
10 are Robert Smith, David Dalke, Ammar Al-Ali,
11 Mohamed Diab is you, and then Marcelo Lamego. Do
12 you see that?

13 A. Yes.

14 Q. What were Robert Smith's contributions to
15 the inventions described in the '911 patent?

16 A. Robert and Dave would be responsible more
17 for the hardware part of things. They were also
18 involved in the debugging of a lot of problems we
19 had as we were building the sensor.

20 Ammar was really the guy who came up with
21 the idea of the matrix design, as well as other idea
22 to the sensor design itself. Remember, the sensor
23 has to conform to the digit and to certain shape, and
24 even if you look at the pieces that we discussed
25 today, for example, the light block, it has curves in

1 it, and it conforms to the finger. So Ammar was
2 involved in that as well.

3 I and Marcelo worked on really the
4 wavelengths' characterization and wavelengths'
5 prediction, and I worked on the light piping design.

6 Q. Okay. So it's okay, but I need you to
7 focus on the question, because the question was
8 only about Robert Smith.

9 A. Oh. I'm sorry.

10 Q. No, it's okay. We just want to make sure
11 we have a clean record with clean questions and
12 answers.

13 A. Yes.

14 Q. So what were Robert Smith's contributions
15 to the inventions in the '911 patent?

16 A. It would be the electrical design of the
17 driver circuitry and the electrical design of the
18 array that you see in Figure 8, for example.

19 Q. Okay. What were David Dalke's
20 contributions to the inventions described in the
21 '911 patent?

22 A. Same. Same, but in addition, when we had
23 problems identifying extraneous wavelengths'
24 emission during the development, both Bob Smith --
25 Robert Smith and David Dalke were also involved in

1 that.

2 Q. Okay. And what were Ammar Al-Ali's
3 contributions to the inventions described in the
4 '911 patent?

5 A. So Ammar is the guy who came up with the
6 idea of a matrix drive for this. And I believe he
7 also worked on the general design of the pad of the
8 sensor as well.

9 Q. So when you say that Mr. Al-Ali came up
10 with the idea of a matrix drive, can you describe
11 for me what you mean by "matrix drive"?

12 A. Okay. It is -- a logical diagram of a
13 matrix drive is probably in Figure 8, whereby you
14 arrange the drivers that were -- into an anode and
15 a cathode.

16 So, for example, when you want to drive an
17 LED, the LED has something called an anode where the
18 current enters and a cathode where the current exist.

19 And the arrangement here is to make it look
20 like a rows and columns, and you can energize any row
21 or any column at will, or you can energize two
22 columns and one row, so you can turn on two LEDs at
23 the same time or more.

24 This is at least the basic idea behind a
25 matrix drive. And since you can access any LED by

1 just turning one row and one column, then you have
2 the ability or the flexibility to drive all of these
3 LEDs with less number of wires, just because of the
4 matrix configuration.

5 Q. So Mr. Al-Ali came up with the idea of
6 arranging the LED drivers into a matrix of rows and
7 columns; is that what you're saying?

8 A. Yes.

9 Q. Okay. And what was Marcelo Lamago's
10 contribution to the inventions of the '911 patent?

11 A. So we -- Marcelo and I worked on the
12 wavelengths type of prediction, and it has to do
13 with how the thermal mass and the heating and the
14 thermistor that is part of this work.

15 Q. So can you turn back to Figures 32A
16 through 32H that we talked about before.

17 A. Okay.

18 Q. Which of your co-inventors came up with
19 the idea for the structure that's shown in Figures
20 32A through 32H?

21 A. That one, I do not remember. I just don't
22 remember.

23 Q. Okay. So in Figure 32B, do you see the
24 structure that's labeled 3210?

25 A. Yes.

1 successful. Very successful.

2 BY MR. SHAW:

3 Q. Are you aware of any evidence that the
4 success of the rainbow sensors was due to their use
5 of the '911 patent inventions?

6 MR. OLDHAM: Same objections.

7 A. I can tell you for sure that without the
8 '911 inventions, we will not have a rainbow device
9 that measure HbCO or it can measure HbMet or it can
10 measure total hemoglobin. That's for sure.

11 The part that has to do with the
12 wavelengths' interpolation was absolutely critical
13 for that. So without the invention in the '911,
14 these product would not even make it to the market.
15 As a matter of fact, even till today, nearly 20 years
16 later, there is not.

17 BY MR. SHAW:

18 Q. So are you aware of any evidence -- so,
19 for example, any documents, any feedback from
20 customers, anything like that -- that says that the
21 success of the rainbow sensors was due to their use
22 of the '911 patent inventions?

23 A. I know for sure because I developed it,
24 and I knew what would happen with the data
25 collection that we have done with or without the

1 invention.

2 As a matter of fact, the solution -- for
3 example, we -- the first time we collected the data
4 and we did not have the wavelength interpolation,
5 the error was 6 percent, which is one standard
6 deviation.

7 (Reporter interruption for clarification.)

8 A. And that is unusual.

9 So with the -- with the invention of the
10 wavelengths' interpolation, we dropped that error by
11 half, and that made it a device that could be used
12 out there. So that's just one aspect of these
13 invention, one embodiment of the invention that made
14 it possible. It would not have been possible; it's
15 that simple. So I know that for a fact because I was
16 part -- I am the guy who worked on the development.

17 So there would be no device for people out
18 there or clinician to evaluate without this one
19 particular piece.

20 BY MR. SHAW:

21 Q. And --

22 A. Let me finish.

23 Q. Yeah, I thought you were finished. I
24 apologize.

25 A. Okay. So the other one would have been,

1 for example, the light piping. The light piping
2 and the light block that we have used was quite
3 critical because even the designs that we have
4 right there did not work before for the Adt and the
5 LNOP sensor. We had to go beyond that. That was
6 another piece, and that made the -- directly
7 impacted the accuracy.

8 Another piece was, for example, we have
9 used the array driver for that one. And I know for a
10 fact that nurses out there always complained about
11 our competitors, and I heard that through our
12 clinical group, that their cable are too thick and
13 they are unwieldy and inflexible.

14 So we knew that we have to come up with
15 something, especially when you have so many wires, to
16 make it flexible. So this is the use type that will
17 make it successful.

18 So the -- from a person who did the
19 development, I know for a fact, without the invention
20 of the '911, there will not be a Rad-57. There would
21 not be a device that can measure HbCO noninvasively
22 or total --

23 (Reporter interruption for clarification.)

24 A. There will not be a device that will
25 measure HbCO noninvasively or total hemoglobin

1 noninvasively or methemoglobin noninvasively.

2 BY MR. SHAW:

3 Q. So the question was about evidence. So I
4 understand that that's your personal belief.

5 A. No, no, no.

6 Q. I'm asking, is there -- do you have, for
7 example, a document that shows customer feedback
8 that says "We like this product because of the
9 inventions of the '911 patent"? Are you aware of
10 anything like that?

11 A. First of all, I don't think there will be
12 a doctor out there or a nurse who is well versed in
13 the art to understand that the '911 is related to
14 the wavelengths' interpolation. I think that's
15 kind of ridiculous.

16 But they would go and evaluate the device
17 and see if it helps them or not. So the evidence I
18 have, I have, of course, document that shows what
19 was the error before and after. Of course I have
20 that document. And if you like, I will be more
21 than happy to provide that.

22 So this is my evidence, that what -- the
23 '911 patent made the difference? Yes, I do have
24 that evidence. If you would like, I will provide
25 that document.

1 algorithm. It's about the sensor. So that top
2 level, I can answer.

3 You were asking far more detailed question,
4 and you asked a lot of the questions about the
5 claims, which I really don't know. So it's not like
6 I am not comfortable answering you; I'm comfortable
7 answering him. It's the type of the questions I can
8 answer, and the others I cannot.

9 MR. SHAW: All right. Again, subject to
10 any re-re-redirect, I have nothing further.

11 MR. OLDHAM: No further questions.

12 THE VIDEOGRAPHER: This concludes today's
13 deposition. The time off the record is 6:02 p.m.

14 (Proceedings adjourned at 6:02 p.m.)
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DECLARATION UNDER PENALTY OF PERJURY

I, MOHAMED DIAB, do hereby certify under penalty of perjury that I have read the foregoing transcript of my deposition taken on November 8, 2023; that I have made such corrections as appear noted on the Deposition Errata Page, attached hereto, signed by me; that my testimony as contained herein, as corrected, is true and correct.

Dated this _____ day of _____, 2023, at _____, California.

MOHAMED DIAB

ERRATA SHEET FOR THE TRANSCRIPT OF:

Case Name: Apple v. Masimo
Dep. Date: November 8, 2023
Deponent: MOHAMED DIAB

Page No. _____ Line No. _____

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change: _____

1 STATE OF CALIFORNIA)
 2 COUNTY OF LOS ANGELES) SS
 3)

4 I hereby certify that the witness in the
 5 foregoing deposition was by me duly sworn to
 6 testify to the truth, the whole truth and nothing
 7 but the truth, in the within-entitled cause; that
 8 said deposition was taken at the time and place
 9 herein named; and that the deposition is a true
 10 record of the witness's testimony as reported by
 11 me, a duly certified shorthand reporter and a
 12 disinterested person, and was thereafter
 13 transcribed into typewriting by computer.

14 I further certify that I am not
 15 interested in the outcome of the said action, nor
 16 connected with nor related to any of the parties in
 17 said action, nor to their respective counsel.

18 IN WITNESS WHEREOF, I have hereunto set
 19 my hand.

20 Reading and Signing was:

21 ___ requested ___ waived _x_ not requested
 22
 23

24 _____
 Grace Chung, CSR. NO. 6246, RMR, CRR
 25