FEDERAL TRADE COMMISSION

I N D E X (PUBLIC RECORD)

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Shirley	4133	4187		

EXHIBITS	FOR ID	IN EVID	WITHDRAWN
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UNITED STATES OF AMERICA

FEDERAL TRADE COMMISSION

In the Matter of:)

Rambus, Inc.) Docket No. 9302

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Wednesday, June 4, 2003

9:30 a.m.

TRIAL VOLUME 22

PART 1

PUBLIC RECORD

BEFORE THE HONORABLE STEPHEN J. McGUIRE

Chief Administrative Law Judge

Federal Trade Commission

600 Pennsylvania Avenue, N.W.

Washington, D.C.

Reported by: Susanne Bergling, RMR

For The Record, Inc.
Waldorf, Maryland
(301) 870-8025

APPEARANCES:

ON BEHALF OF THE FEDERAL TRADE COMMISSION:

M. SEAN ROYALL, Attorney
GEOFFREY OLIVER, Attorney
JOHN C. WEBER, Attorney
CARY ZUK, Attorney
Federal Trade Commission
601 New Jersey Avenue, N.W.
Washington, D.C. 20580-0000
(202) 326-3663

ON BEHALF OF THE RESPONDENT:

GREGORY P. STONE, Attorney
STEVEN M. PERRY, Attorney
PETER A. DETRE, Attorney
SEAN GATES, Attorney
ANDREA WEISS JEFFRIES, Attorney
Munger, Tolles & Olson LLP
355 South Grand Avenue, 35th Floor
Los Angeles, California 90071-1560
(213) 683-9255

APPEARANCES:

ON BEHALF OF THE RESPONDENT:

A. DOUGLAS MELAMED, Attorney
Wilmer, Cutler & Pickering
2445 M Street, N.W.
Washington, D.C. 20037-1420
(202) 663-6090

ON BEHALF OF THE WITNESS:

JARED BOBROW, Attorney
Weil, Gotshal & Manges, LLP
201 Redwood Shores Parkway
Redwood Shores, California 94065
(650) 802-3034

P R O C E E D I N G S

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JUDGE McGUIRE: This hearing is now in order.

Before we start this morning, any items that need to come to the Court's attention?

Mr. Royall?

MR. ROYALL: Good morning, Your Honor.

JUDGE McGUIRE: Good morning.

MR. ROYALL: As I'm sure you know, Rambus filed a motion late yesterday afternoon related to some demonstratives that were identified for today. We haven't had time to prepare a written response, but if Your Honor would allow, I'd like to respond orally.

JUDGE McGUIRE: Go ahead.

MR. ROYALL: First of all, the motion that they had filed is predicated on Federal Rule of Evidence 1006, and technically, of course, the Federal Rules of Evidence don't apply here, but assuming that the rule were to be applied here, it simply doesn't apply to the circumstances presented here.

The premise of the motion is that complaint counsel is offering summaries of voluminous documents in evidence and in a summary form, and that simply is not -- not what is intended through these demonstratives. They are offered as demonstratives

only, as pedagogical aids for the witness' testimony, and they are based on information, as we will establish by laying a foundation, based on the personal knowledge of this witness.

This is a witness who has been deposed by Rambus twice. The subject matters that are covered by these demonstratives are well within the scope of his responsibilities, as Rambus well knows having had that opportunity to depose him twice. They have made the point that the material is not in the record in this case, the underlying material. The fact of the matter is that material of the sort that the witness will testify about and that's summarized in the demonstratives is in the record, not necessarily for this time period, but it -- and I could cite Your Honor to Bates numbers of the types of things that have been produced.

So, the bottom line is that we're not offering these as evidence. They are demonstratives. We've complied with the 24-hour notice requirement as we've agreed to. There's no prejudice at all to Rambus. They have an opportunity to cross examine, and the sole purpose of the demonstratives is just to assist Your Honor and all of us in following testimony from a witness whose scope of responsibilities involves

various types of data and statistics that we think we will all benefit from some type of summary as he goes through these issues, again, after we lay a foundation that he has personal knowledge about the matters that we intend to probe through his testimony.

JUDGE McGUIRE: Okay, thank you, Mr. Royall.

Any response, Mr. Stone?

MR. STONE: Yes, Your Honor.

I think the issue can easily be separated from the demonstratives. The question is whether a witness can review voluminous documents and prepare any form of a chart, cheat sheet or other aid for himself, appear at trial, testify based on his review of the voluminous records, and not make those records available for review and inspection.

This witness, in his deposition, did not know the answers to the type of questions that are reflected on the chart. He said he could guess, he would have to look at documents to find out and so on. So, what is plain I think from the record that we have of his deposition and of these charts is that the witness has gone out, looked at documents, put together summaries of what he reviewed in those documents. No one would know, I can't imagine any witness would know, all of these numbers from the top of their head without having

gone to documents and pulled them together. That was certainly the state of affairs at his deposition.

So, I think we're entitled to have access to those underlying documents. Why? I think the reason is clear, because the underlying documents may or may not support what he says is in them, and it may be that the documents themselves allow us to put these numbers in context so that they produce a different conclusion or impression than the witness will try to convey. It may be that the witness has simply done his math wrong.

Ms. Zuk pointed out to us this morning two errors in the charts that were sent to us yesterday. So, obviously he is reviewing something to check his charts against to make sure they're right. We don't know and shouldn't be required to take his word for it that they're now correct. We should be entitled to look at the underlying documents that he looked at to see whether the information that he's prepared to present is, in fact, accurate.

So, separate from the demonstratives, our request is really for a chance to see whatever information he looked at to prepare his charts or to prepare his testimony.

JUDGE McGUIRE: Have you made that request to complaint counsel?

MR. STONE: That's the essence of our request or objection and that's the essence of our request that they're responding to. We didn't know this until we got his charts, which is why his charts brought it to a head. At his deposition, he didn't know this information.

JUDGE McGUIRE: I assume at this point in time that's not going to happen, Mr. Royall, where they have asked you to be able to have a chance to review the evidence that these charts are otherwise based upon?

MR. ROYALL: Well, first of all, it sounds like we're now responding to a different motion -- it sounds like they have withdrawn their challenge to the demonstratives, which was the nature of what they challenged in their written motion, and in terms of underlying documents, Rambus has had ample opportunity to request discovery from Micron, and as you know, they are in separate litigation with Micron --

JUDGE McGUIRE: Well, but as he just indicated, these charts are something that I assume until, you know, Tuesday he didn't -- he was not aware that they were going to be produced.

So, now, if I understand what you're saying, Mr. Stone, are you now asking for an opportunity to see that underlying evidence?

MR. STONE: Yes, Your Honor, and I didn't mean to -- I don't mean to withdraw our objection --

JUDGE McGUIRE: No, I understand.

MR. STONE: -- and that is the essence of our request.

JUDGE McGUIRE: Okay, my question is at this point in time, is the FTC inclined to give them an opportunity to see this underlying evidence? And if not, I am going to go ahead and rule on their objection.

MR. ROYALL: Well, first of all, it is not for the FTC to decide what information is produced by Micron. I think that the only issue here -- as I said earlier, and I want the record to be very clear on this, they do have information of the sort that is reflected in these demonstratives. The only question might be the time period for which they have that information. That's something that they can take up with Micron, and they could obtain that information for later time periods through Micron. It's not for us to speak to that issue.

But we -- I don't believe that there is any prejudice to Rambus from cross examining this witness based on what is in these demonstratives, which is within his personal knowledge, and he obviously can

speak to the types of documents that he sees in the ordinary course of business and his recollection and his knowledge of various statistics.

And at a minimum, Your Honor, we would ask that we be allowed to proceed subject to -- essentially as an offer of proof with the witness and for you to make a judgment as to whether there is any prejudice, in which case they could -- you could entertain a motion to strike the demonstratives, but the other thing is that we can't resolve the document issue today.

JUDGE McGUIRE: Right.

MR. ROYALL: But it could be resolved at a later time. They could have that information later and do with it what they would if there is any reason to believe there's any inconsistency between those documents and anything that comes up in today's testimony.

JUDGE McGUIRE: Do you want to respond to that, Mr. Stone?

MR. STONE: Yes. I think Mr. Royall concedes that the underlying documents are not in evidence. All he can say is we have documents of this type. It's not our burden to anticipate the evidence that complaint counsel may offer in a summary form and then to have known in advance that we should have insisted on

discovery of whatever documents that summary would be based on. So, we are at a disadvantage.

Now, whether we resolve the disadvantage by saying that all of the underlying documents will be produced to us later and Mr. Shirley will then be available for cross examination later, that's one solution. Another solution I think, since he corrected the charts sometime between yesterday when they were provided to us and this morning, I assume those documents are readily available to him. He could make them available to us today, and Mr. Shirley could -- his examination could simply be slipped for a day so that we have a chance to look at the documents tonight.

I think there are a lot of solutions that are available here to ensure that we have some opportunity to look at the documents.

JUDGE McGUIRE: Okay, then Mr. Royall, what is your -- there's a couple of options on the table here. Why don't you choose one of them.

MR. ROYALL: Well, again, I'm limited in speaking. I can't speak for Micron on producing documents. I don't believe and I believe Your Honor would see if we're allowed to go forward with his testimony --

JUDGE McGUIRE: That's not the point --

MR. ROYALL: -- and examination, there is no prejudice --

JUDGE McGUIRE: That's not the point of your being allowed to go forward. It's a matter of basic rules of evidence, and if we are not going to exercise one of the options that has been put forward to give the other side an opportunity to see this underlying evidence, either today or at some point, you know, tonight and then give the other side a chance to either recall this witness, then I'm going to uphold the opposition as I did, if you remember, in the order I issued on Tuesday regarding the testimony of I think Dr. Oh and certain inquiries made under charts that he had not prepared. So, that is -- I want to follow that same standard that I employed in that earlier order.

MR. ROYALL: Can I say a couple of things? First of all, that's a very different issue. As I understand it, in the Dr. Oh matter, as you just said, this is a situation in which there were charts that he did not prepare. We would lay a foundation, if allowed to, that the demonstratives that are at issue here -- and again, they are not summaries of evidence subject to Rule 1006 as Mr. Stone alluded to. They are demonstratives. They are simply pedagogical aids that were prepared by the witness, and we would establish

that foundation so it's distinct from the Dr. Oh issue, and these are matters that are within his personal knowledge. It's simply a pedagogical aid to allow him to explain his --

JUDGE McGUIRE: Did he assist in the charts' preparation?

MR. ROYALL: Yes, Your Honor. He will testify to that. They were prepared under his direction.

JUDGE McGUIRE: So, that's one -- we have two issues here, as I see it. One regarding whether or not he has personal knowledge as to the -- this chart and how it was prepared. They're saying that he does. So, that may resolve that issue. But the other issue is one of evidence as well regarding whether respondent has had an opportunity to see the underlying evidence upon which these charts were based.

Now, complaint counsel is saying that these are not inherently I guess summaries. I'm going to find that they are summaries. So, on that holding now, I'm going to give you a chance to try to iron this out together. If you can't, then they are not coming in.

MR. ROYALL: What I can say in response to what Mr. Stone said earlier is that we would certainly not oppose any request of discovery by Rambus for underlying documentation relating to these

demonstratives, nor would we ourselves oppose having Mr. Shirley called back to answer whatever limited questions there may be relating to that documentation when it's produced, but we see no reason why we shouldn't be able to go forward today with use of these demonstratives.

They would be able to then request the underlying documents in a timely way, and then if they deem it necessary, request to have Mr. Shirley back, and we won't -- we would not oppose that.

JUDGE McGUIRE: Mr. Stone, actually, that's not an option that you proposed. Is that agreeable to you at this point?

MR. STONE: No, because Micron has been particularly difficult in discovery issues, and I think it's complaint counsel's obligation, if they call the witness, to make sure that the witness complies with the orders and rules of evidence and the orders of the Court, and so I don't think it's fair to tell us we should serve a request on Micron, and they then have 30 days to respond to it.

JUDGE McGUIRE: Right, the issue isn't to give the respondent an opportunity to request these documents. They need to be provided these documents. So, that's where this is going to have to head.

MR. ROYALL: One last thing, Your Honor. I just consulted with Micron's counsel, and there's a possibility, if we could -- if I could confer with Mr. Stone briefly, that we might be able to resolve this more expeditiously.

JUDGE McGUIRE: Go ahead. Let's go off the record, and you all can take as much time as you need.

(A brief recess was taken.)

JUDGE McGUIRE: Okay, let's go back on the record.

The parties have had a chance to confer. Any points you want to make?

MR. ROYALL: Thank you, Your Honor.

The new information is that Micron's counsel learned of this, as we did, late yesterday afternoon, and they have taken the step of quickly pulling together the underlying documents and have agreed that they will produce them immediately subject to the in camera designations, which is I know another issue that needs to be discussed this morning.

JUDGE McGUIRE: Right.

MR. ROYALL: What I have raised with Mr. Stone is would there be any objection to us proceeding with the direct, allowing Rambus to review it, and then making judgments whether it needs any additional time

to prepare for cross? I'll let Mr. Stone comment.

JUDGE McGUIRE: Mr. Stone?

MR. STONE: I understand they will provide the documents this morning. If we can review them over the lunch hour and complete the cross today, we will. If we need to ask for the evening to review the documents, we'll make that request of you and of complaint counsel.

JUDGE McGUIRE: All right, very good. All right, good.

MR. STONE: If that's acceptable, thank you.

JUDGE McGUIRE: Are there any other items that we need to take up this morning?

MR. ROYALL: I believe that the other issue relates to the same demonstratives and the motion for in camera treatment by Micron, so perhaps Micron's counsel should address that.

JUDGE McGUIRE: Yes.

MR. BOBROW: Good morning, Your Honor, Jared Bobrow from Micron Technology.

I believe yesterday we filed a motion for in camera treatment.

JUDGE McGUIRE: Good morning, yes.

MR. BOBROW: We believe that treatment is appropriate given the nature of the information which

relates to production costs, planning, product mix and the like, and so we requested the in camera treatment to protect confidentiality.

JUDGE McGUIRE: Right.

Mr. Stone?

MR. STONE: Just briefly, Your Honor. Some of the information, the financial -- the specific financial information, I don't object to it being afforded in camera treatment, although I think since Rambus is not a competitor in the manufacturing business, there's no reason to exclude Rambus employees from that testimony, although it may be appropriate to exclude the presence of employees of competitors.

JUDGE McGUIRE: So, this ties into the other --

MR. STONE: It does --

JUDGE McGUIRE: -- pleading regarding the proposed protective order?

MR. STONE: Yes. And the only other comment is I think some of the information is simply not entitled to in camera protection. The fact that in 1995 a particular process was being used to configure the manufacturing process is in the 10-K. It's not confidential. It's a public --

JUDGE McGUIRE: The problem is I haven't had a chance really to go over that motion. Now, I have

looked at the other pleading regarding the -- asking the Court to file a protective order, and to the extent that these two issues tie in, I'm not quite prepared to determine what should receive in camera treatment at this point.

Now, is that going to cause a problem for today?

MR. BOBROW: Well, perhaps, Your Honor, then a provisional ruling could be made until such time as Your Honor has a chance to consider the issues.

JUDGE McGUIRE: All right, very good. Then we will grant it that status for 20 days, I believe, under the FTC Rules. We'll grant it provisional in camera status for 20 days, and at that time, only those individuals that were authorized access under the August 2002 protective order will be allowed access to that information.

MR. STONE: And I would -- just in that regard, Your Honor, I have no objection to giving provisional status to it. The only issue is whether Micron objects to any of the Rambus employees being able to assist us in reviewing the information, since we didn't get the information until yesterday, we do -- so they can assist us on this. They are not a competitor. So, their ability to make any competitive use I think of

this is zero.

JUDGE McGUIRE: Do you want to respond to that?

MR. BOBROW: Yes, Your Honor. The issue there is this is very, very sensitive information that describes at some level of detail Micron's manufacturing processes and production costs, which are closely guarded. Rambus and its officers and directors and others have regular contact with our competitors in this business, regular contacts to discuss issues about manufacturing costs and the like. This kind of information could be very detrimental if it was released to the public.

JUDGE McGUIRE: Okay, as I say, I'm going to uphold my prior ruling and grant all this information provisional in camera treatment under the terms of the August 2002 protective order.

MR. STONE: Thank you, Your Honor.

MR. BOBROW: Thank you, Your Honor.

JUDGE McGUIRE: Okay, anything else we need to take up?

MR. ROYALL: I don't believe so, Your Honor, thank you.

JUDGE McGUIRE: Okay, then at this point, complaint counsel may call its next witness.

MS. ZUK: Complaint counsel would now like to

call Brian Shirley to the stand.

JUDGE McGUIRE: Mr. Shirley, are you in the courtroom? There he is. Okay, Mr. Shirley, would you please approach the Bench and be sworn by the court reporter.

Whereupon--

BRIAN M. SHIRLEY

a witness, called for examination, having been first duly sworn, was examined and testified as follows:

JUDGE McGUIRE: Mr. Shirley, if you will have a seat right there.

DIRECT EXAMINATION

BY MS. ZUK:

Q. Good morning, Mr. Shirley.

A. Good morning.

Q. Will you please state your full name for the record?

A. Brian Michael Shirley.

Q. And where do you work, Mr. Shirley?

A. I work for Micron Technology in Boise, Idaho.

Q. What's your job today at Micron?

A. Excuse me.

My job is a design operations manager for the computing and consumer group for Micron Technology.

Q. And could you briefly describe what the role of

the consumer and computing group is at Micron?

A. Sure, the computing and consumer group is essentially responsible for what we consider DRAM design at Micron Technology.

Q. And what are your work responsibilities today at Micron?

A. As design operations manager for the computing and consumer group, I'm responsible for oversight of the DRAM design group, looking at things like staffing, prioritization, technical direction, cost analysis for DRAM projects.

Q. Are there several different kinds of engineers that work in your group?

A. Yes, there are.

Q. What are the different kinds of engineers that work in your group?

A. The different kinds of engineers who report to me include design engineers, a group of engineers or technical professions that we call layout designers, and finally, a group of engineers that we call computer-aided design engineers.

Q. How many design engineers work in your group?

A. Currently, in my group, we have around 100 design engineers.

Q. And about how many layout designers work in

your group?

A. We currently have about 100 layout designers.

Q. And how about the number of CAD engineers in your group?

A. There are currently about 30 CAD engineers in the group.

Q. And all of those engineers or designers report to you?

A. They do.

Q. How long have you been the DRAM design operations manager at Micron?

A. I've been the DRAM design operations manager since about 19 -- early 1997.

Q. Did you hold a position before early 1997 at Micron?

A. I did.

Q. And what was that position?

A. Prior to becoming design operations manager, I was a DRAM designer from about 19 -- early 1994 time frame.

Q. And what did you do as a DRAM designer in the early 1994 time frame?

A. At that time I was lead designer on several designs. These were older, smaller density designs than we're making now.

Q. And what products were you doing design work for in that time frame?

A. I was lead designer for several different four-megabit products, referred to as EDO or extended data out products.

Q. And before you worked as a design engineer at Micron, and you said you started doing that in early 1994, were you obtaining a degree?

A. I did.

Q. And where did you obtain your degree?

A. I obtained my degree from Stanford University in 1992.

Q. And what degree did you obtain from Stanford in 1992?

A. It was a Bachelor of Science in electrical engineering.

Q. In your job today as DRAM design operations manager, who do you report to?

A. My boss is a gentleman by the name of Bob Donnelly.

Q. And what is Mr. Donnelly's position at Micron?

A. Mr. Donnelly heads up the computing and consumer group. He's vice president of the organization.

Q. And besides your group, the DRAM design group,

are there other divisions of the consumer and computing group at Micron?

A. There are.

Q. And what are those divisions?

A. There are two other divisions that report to Bob Donnelly. The first is referred to as the marketing group, and the second is referred to as the product engineering group.

Q. And who is the head of the marketing group?

A. The head of the marketing group is a gentleman referred to as Terry Lee.

Q. And in your work as head of the design group, do you have occasion to work with the marketing group?

A. Very often.

Q. And what's the nature of the work that you do with the marketing group at Micron?

A. We're involved with obtaining the specifications for new design projects that marketing develops, because it's my group's responsibility to actually implement those designs based on the specifications that the marketing group develops.

Q. And you used the term "specifications." Can you explain what that term means?

A. Specification is simply a collection of functional and operational guidelines that describe to

us how the part should look to a customer.

Q. Okay. And can you briefly explain what you mean by "functional and operational guidelines"?

A. Sure. These are guidelines on what a particular microchip should do under certain circumstances if it's given certain commands or if it's given certain parameters.

Q. And do you have an understanding of how the marketing group develops these specifications that are given to your group later on?

A. I have a broad level of understanding.

Q. And what is that understanding?

A. The marketing group develops these specifications based on several inputs, the foremost of which is an organizational body referred to as JEDEC, spelled J-E-D-E-C. They also receive inputs from several of our customers from which -- or to which we will sell these parts when they're in production.

Q. Okay. Now, you just referred to customer inputs. Can you explain what you mean by customer inputs that the marketing group uses to develop its specifications?

A. Sure. It's common that a few of our very important customers, the large computer makers such as IBM or Sun, would add additional parameters that they

may care about for a particular design project.

Q. Now, you just mentioned that they add additional parameters.

A. Correct.

Q. Can you explain what you mean by your use of the word adding?

A. They may take a JEDEC specification and add additional parameters such as a particular speed or a particular current that they would like a particular design of ours to adhere to.

Q. Are you familiar with Intel's PC-100 specification?

A. I am.

Q. And how did you become familiar with that specification?

A. Really in my role as design operations manager, I became familiar with the Intel PC-100 specification.

Q. Is this an example of a customer input, as you just described?

A. It is.

Q. And how -- can you articulate how it is an example of one of the customer inputs you described earlier?

A. Sure. The Intel PC-100 specification added what I would call as a low level of detail about

additional speed grades and additional current requirements that they saw as important to their use of our memory products.

Q. Now, after you get a specification from the marketing group, what interaction do you continue to have, if any, with that group?

A. Well, it may be on occasion some interaction back and forth on what I would call a low level of detail with a specification. For instance, for us to take an estimate of how much power we think one of our chips may take and have that become part of the specification. So, there's a little bit of back and forth.

Q. Okay. Now, next I'd like to have you walk us through the different steps in the design process, but before we go into each step, I'd like to have you list and identify each step for us, and as you do that, I'll write the steps down on the easel.

A. Great.

MS. ZUK: Can everybody see the easel?

JUDGE McGUIRE: Do you want to turn it just a little more toward me if you wouldn't mind?

MS. ZUK: Like this?

JUDGE McGUIRE: That's good.

BY MS. ZUK:

Q. Okay. What are the different -- could you please identify the different steps in the design process?

A. Sure. The first step is what we recall or what we call the design phase.

Q. Okay. And after the design phase?

A. After the design phase, in some senses in parallel with the design phase is something that we call the layout phase. There's a little bit of a time lag between the design phase and the layout phase.

Q. Okay. And if you could continue down the list of steps.

A. There's another step that we call the simulation phase that really starts to happen as the design phase is coming to an end.

Q. And after the simulation phase?

A. Lastly, there's a -- there's a process that we call the final verification phase.

Q. Okay, after the simulation phase?

A. That's correct.

Q. And are there any additional steps?

A. At that point, we hit a milestone that in design we call tapeout.

Q. And after tapeout?

A. After tapeout, preceded by some number of

weeks, we receive initial silicon on that design product, one wafer that comes out of the fabrication plant of that particular product.

Q. And how would you refer to that step in the design process?

A. I'd -- it's really a milestone, and I would just call it initial silicon.

Q. And after the initial silicon phase?

A. That's followed by a phase that we call the validation phase.

Q. And after the validation phase?

A. That's followed by something that we call the -- the internal qualification phase.

Q. And how about after the internal qualification phase?

A. That's followed by what we think of as the start of production. So, really what I would call just the production phase.

Q. Okay. Well, thank you for identifying all those steps. Now we're going to go one by one.

A. Um-hum.

Q. Starting with the first step, which is the design phase, can you explain what work is involved in the design phase?

A. I can. This is the phase where the design

engineers on a product do what we refer to as the actual circuit design, putting down the transistors that will implement the specification that's come over from marketing.

Q. And you just used the term "transistors." Can you briefly give us a sense of what are transistors?

A. Sure. Transistors are kind of the building blocks of these microchips, the individual gates, of which there may be millions on a given microchip.

Q. And you just used another word that is somewhat unfamiliar to me, "gates." Can you give us a sense of what are gates?

A. Gates are just -- it's almost another term for the transistor. It's a term that we use to think of particular operations inside of the memory chip.

Q. Okay. Now, what happens during the layout phase?

A. In the layout phase, the layout designers will take these schematics, these circuit designs that the design engineers have created, and they're responsible for actually literally drawing rectangles and polygons that truly represent what that circuitry will look like when it's on the wafer.

Q. Okay. And after the -- I'm assuming layout designers are the ones -- are the people in your group

that are responsible for the layout phase. Is that --

A. That's correct.

Q. -- accurate?

Now, after the layout designers have laid out these rectangles and other shapes on the silicon --

A. Um-hum.

Q. -- what happens during the simulation phase?

A. In the simulation phase, the design engineers are taking the schematics, the circuits that they've created, and they're actually simulating these on very powerful computers that we use to tell us if the memory chip will hopefully do what it's supposed to do when it's in silicon.

Q. And are you familiar with the software that the engineers who are responsible for the simulation phase use?

A. I am.

Q. And what is that software?

A. Well, there's several names for it. A very common industry term would be SPICE, for instance, which is actually an acronym. There are other terms for that type of simulation software.

Q. Okay. And after the simulation phase, you listed the final verification phase. Can you tell us what is involved in the final verification phase?

A. That phase is when -- when the layout is complete, when all these shapes have been put together, there's an additional step where we go and make sure that all of these rectangles that have been drawn out truly represent the schematics that the design engineers created.

Q. And after you've completed that process in the final verification phase, you said you reach a point called tapeout. Can you explain what the term "tapeout" means?

A. Um-hum. Tapeout is a -- it's an industry term that means -- when we're finished with this design, these -- the individual rectangles, these shapes that will show what the final memory chip will look like need to be put onto a set of glass plates that we refer to as masks, and the tapeout phase is simply the process of taking this data and putting it onto these plates that we'll use in the actual fabrication process.

Q. Okay. And what is done at that point when you've taped out a design? What happens next?

A. The next phase, once those -- once those masks are created, which is a very time-consuming, capital-intensive process, the masks are returned back to Micron, okay, the actual creation of the masks

happens at an outside company, and those masks are sent back to us, and the fabrication plant will then take those masks and through this fabrication process produce a set of wafers for us to take a look at the true silicon.

Q. Okay. Now, before we get into that phase, which I think you referred to as the initial silicon phase --

A. Um-hum.

Q. -- I'd like to get a sense of that timing that you just referred to.

A. Okay.

Q. In your experience, how long does it typically take to move a project at Micron from the start of design to tapeout?

A. Well, it really depends on the scope of the project, but this can be anywhere from say three months all the way up to 18 months on a very complicated new design.

Q. Okay. And you said that you were waiting to receive something from the vendors that you send the tapeout to.

A. Um-hum.

Q. What are you -- what again did you -- what term did you use to explain what you were waiting for?

A. Well, the vendors create these masks, these plates that we use in the production process.

Q. Are you familiar with the term "mask set"?

A. I am.

Q. And can you explain what a mask set refers to as opposed to a mask, say?

A. A mask set is just a term that refers to all the different masks that would be necessary to build one wafer of that memory product. There may be anywhere from 17 to 26 individual layers responsible for building that -- a memory chip.

Q. Now, after you get the mask set, the first mask set from these vendors that make mask sets, what happens during the initial silicon phase?

A. Well, the initial silicon phase, that's -- I think of that more as just a milestone when after those masks come back to Micron, it takes several weeks to create these first wafers using these masks, and the initial silicon milestone just refers to the first time that we actually have a finished wafer that's completed the production process.

Q. And about how much time does it take to get that initial wafer from the first mask set that you receive?

A. Well, the process of fabricating the masks from

the start of tapeout can be usually about three weeks long, and the process of creating that first wafer could be typically on the order of another three to four weeks. We -- we really try to speed up that first wafer, because it's really our first look at that product in silicon.

Q. And after you've produced the first wafer from that initial mask set, what happens during your validation phase?

A. This is the phase where we take a few of those wafers and we go through a variety of tests to find out if generally our design did what it was supposed to do. We look for problems. We look for how speedy that microchip is, how much power it draws, really trying to see if we were on the mark.

Q. And what happens during the internal qualification phase?

A. Once we're comfortable that the memory chip performs the way it was meant to and implemented any fixes that -- for problems that we may have found, then we go into this internal qualification phase, which could take something on the order of two to three months, and what's involved there is really trying to put the part through a much more rigorous set of tests that make sure that not only is it -- does it perform

according to specifications, but also that it's a reliable memory chip, that it will last for the amount of time that it needs to in someone's computer.

Q. Okay. And now, you mentioned a particular period of time for -- that it takes typically to get through the internal qualification phase.

A. Um-hum.

Q. And I want to get sort of a summary sense of the time. You earlier testified that to get from -- typically to get from -- the time it takes to get from design to tapeout is anywhere from six to 18 months.

A. Correct.

Q. Now, typically, based on your experience at Micron, how long does it take to get from the -- through the initial silicon phase and finish with the internal qualification phase?

A. From -- from the point of tapeout to what we would deem a product ready for production could take anywhere from four to nine months depending on the problems we've found in the design, problems that we've found in the production process. It really depends.

Q. And can you briefly describe what happens after the internal qualification phase typically?

A. Well, at this point, several things happen, one of which is that we have parts that we feel are very

representative of what the high-volume production material will look like. So, at that point we send out what we call customer samples to several of our customers to make sure that they're happy with the product. This is after sending out what we would call engineering samples, which are very early, rough material that may have problems with it that we do during the validation phase.

But then the other thing in the internal qualification phase is starting to order more of these mask sets to get ready for what we call high-volume production.

Q. And in your experience, about how long does it take to get ready for high-volume production?

A. Well, it really depends. The -- in high-volume production, it depends on the readiness of that production process, it depends on the tooling of that production process and a variety of other factors.

Q. Do you feel comfortable giving a range of time that it might take Micron to ramp or go into high-volume production with a certain part?

A. Well, this phase from the point that we start high-volume production to the point that we're comfortable starting, you know, several tens of thousands of wafers a week, which would be a

representative high-volume product, could be, you know, generally another six to nine months. This is a very, very critical piece of the flow for risk management reasons.

It's -- in some senses, it's very easy to run one wafer and see how it does. When you're running several thousands of wafers, there's variability issues and new problems that show up, and for risk management reasons, it's a very, very critical part of the flow.

Q. Now, you just referred to risk management issues.

A. Um-hum.

Q. Can you explain what you mean? What are some of the risk management issues that Micron faces when moving a part into volume production?

A. Well, all the time we're taking a look at the cost-effectiveness, the yields, the reliability of the product that's coming out of the production process, and if we start to see problems with that, there's always a question about how good the -- what we call the WIP, the work in progress, back somewhere in the line, if it's going to have the same problems.

So, because this is such a time-consuming process, one of our chief concerns at any given time is just making sure that if we have any hint of a problem,

we can very quickly jump on it.

Q. And how does Micron -- in your experience, how does Micron make sure that if you encounter -- if it encounters any problems, it will be ready to deal with them?

A. Well, there's several groups in the production operations called -- one of which is called yield analysis, another of which is called quality assurance. These are groups that are constantly looking at the final product and making sure that nothing has shifted in the production process, making sure that there's no hidden problems or reliability aspects that we haven't uncovered.

Q. Okay. Are you familiar with the costs associated with that process?

A. Well, I'm familiar with the costs of what happens when something goes wrong, unfortunately.

Q. Well, we'll get -- we'll get to that I think a little bit later.

Just focusing on the production process, what you know about that, are you familiar with a term "wafer starts"?

A. I am.

Q. What does the term "wafer start" mean?

A. Wafer starts just refers to the rate at which

we're starting new wafers in the production process for any given product type. We usually think in terms of wafers per week that we're starting.

Q. And what is the state of the silicon at the wafer start phase of production?

A. Well, at that point, the wafers are essentially blank. They're just what are referred to as blank wafer slugs. There has not been any work really done on those wafers yet.

Q. And in your experience, how long does it take to move a wafer from that blank slug state through the production line and resulting in a finished chip?

A. From the point of wafer start to the point of wafers completed in the fab, we typically think in terms of somewhere between 45 to 55 days.

Q. Okay. And in your experience, about how many mask sets are required to enable full volume production of a leading part at Micron?

A. Well, typically we buy that first mask set for those first wafers, and we think in terms that that first mask set is usually good for about 500 wafers a week. As soon as we take a product beyond the point of 500 wafer starts a week, we buy our second mask set, and that mask set might be good for another -- somewhere between, you know, 800 to 1600 wafer starts

per week.

We buy the second set much earlier for these risk management reasons just in case, you know, somebody in the fabrication plant accidentally drops one of those reticles, for instance, we can't let that shut down the production line.

Q. Okay. And can you estimate for us about how many mask sets you would -- Micron would need to acquire to put a leading part into full volume production?

A. Sure. A high-volume product at Micron, you know, generally we would think in terms of roughly a thousand wafer starts a week per reticle set. The capability of Micron over the last several years has been roughly 50,000 wafer starts a week, and at any given time, we've got several more than just 50 wafer or 50 mask sets for a variety of other reasons, but some of these high-volume products may take anywhere from, you know, 25 to 45 reticle sets to run in production.

Q. Do all designs go into volume production?

A. No.

Q. Can you explain why that's true?

A. Well, there's a variety of reasons, the chief of which is that once we're done with the design,

Micron is always looking at customer demand to really be the determining factor for how much production a particular product will see.

Q. Okay. Now, you've just taken us through the different steps in the design process.

A. Um-hum.

Q. And now I want to get a sense of the different kinds of design work that your group does.

A. Right.

Q. And first of all, are there different kinds of design work that --

A. There are.

Q. -- your group does?

Now, I'd like to go through those different kinds of design with you step by step as we did with the steps in the design process, but can you first identify for me the different kinds of design work that your group does?

A. Well, we typically subdivide our kinds of design projects based on project scope, and so the three top-level distinctions we use would be a new design, and then a derivative design, and then finally what's referred to as a revision design.

Q. Okay. Now, let's take the first of those categories of design that you mentioned, new design.

A. Um-hum.

Q. Can you explain what you mean by new design work?

A. Sure. New design work is a design project that is usually not able to use a lot of circuitry that might have been developed from other microchip products, and so we think of these as very big, very long projects, really because it's time-consuming to create all of this new circuitry and all of this new layout.

Q. Okay. Are you familiar with the term "transparent design work"?

A. I am.

Q. What is your understanding of the term "transparent design work"?

A. Well, that's a term that we use in the design group to think of whether a new design project will essentially be transparent to the user, meaning that the -- it's going to perform to a specification that already exists.

Q. Okay. When you're doing new design work, how often does that -- is that work transparent to the user?

A. For what we would think of as a new design project, it may be roughly 50 percent of the time that

we think of a project as being transparent, that it's -- it adheres to the existing specification as opposed to a new specification.

Q. How many engineers do you normally assign to a new design project?

A. Well, it would really depend according to the project scope, but these are generally our heavier-staffed projects and could be anywhere from five to 10 or even 12 design engineers.

Q. And how about layout engineers, how many layout -- or layout designers, I'm sorry, that's the term you used earlier.

A. Um-hum.

Q. How many layout designers would you assign normally to a new design project?

A. We typically think of design to layout staffing as just being a one-to-one ratio. So, if there's five designers on a project, typically there's about five, maybe a couple more, layout designers.

Q. Generally speaking, do you know how many new design projects at Micron typically -- are typical in a given year?

A. Well, it varies quite a bit by year, but a rough average would be something on the order of roughly a third of our total design projects as being

new designs.

Q. And in terms of number of projects, what -- can you estimate for us what that 30 percent of total design projects might result in?

A. Sure. Depending on the year, that one-third may be anywhere from, you know, two projects up to -- up to five projects for any given time.

Q. Now, the second category of design that you mentioned was derivative design work.

A. Correct.

Q. Are there different kinds of derivative design work?

A. There are.

Q. And can you identify for me what those different kinds of derivative design work are?

A. Um-hum. This is a very broad category. Derivative designs we think of as a design project that can use a lot of circuitry, a lot of layout from a project that might already exist, and so there are -- there are several different categories of derivative design work.

Q. And what are those different categories?

A. Well, one of the biggest categories at Micron is a category that we call a design shrink.

Q. Okay. And are there other categories of

derivative design work that you can think of?

A. There are.

Q. And can you -- we can go through them one by one, but can you just identify what those categories are?

A. Well, the broad categories would be what we would think of as a configuration change. Another category may be something that we think of as a cut-down, as well as a flip-out.

Q. Now, you just mentioned that much of the derivative design work uses a lot of circuitry from existing design work. What does that indicate about whether the -- whether derivative design work is typically transparent or not?

A. More often than not, what we think of as derivative projects will be transparent designs. They're adhering to a specification that we have already used for another microchip design, and so it will be transparent to the user.

Q. Now, let's take the first example of derivative design work that you mentioned, which was a shrink. Can you briefly explain what's a shrink?

A. Sure. A design shrink is a project where we take an existing design, for instance, a 64-megabit design, and we move it to another production process,

and we do that because these newer production processes may allow us to manufacture that design more cheaply.

Q. Now, you used the term "newer production process." Can you explain what you mean by "newer production process"?

A. Um-hum. This is -- refers to something that is happening in the fabrication plant. Roughly every 15 months or so, we're trying to bring in new production equipment, new production gear that allows us to make these chips smaller. So, a 16-megabit chip we might be able to reduce its total size by 35 percent, for instance.

Q. Do you have an understanding of why Micron tries to move existing designs to newer production processes?

A. Well, it's really a cost -- a cost reason. If we're able to move a certain design to a newer production process, we're able to output more product from our given production plans.

Q. And can you give us a sense based on your experience at Micron what kind of a cost savings is generated by moving products to a newer process?

A. Well, the -- I guess an easy figure of merit to use is that every time we're able to move a design to a newer process, if we have the tooling for that new

process and if there's no snags in that new production process -- and there always are -- but we're generally able to output something like 50 percent more product from a given wafer.

Q. Okay. Generally speaking, when Micron plans to transition to a newer process, does shrink design work occur for all of the parts being produced?

A. No.

Q. Can you explain why shrink work doesn't occur for all of the parts being produced at Micron?

A. Well, there are several reasons. One of them is that several designs we decide that the additional -- the additional product out the door, the additional cost/benefits is not worth the extra cost of this new -- this new project, which is very expensive.

Another reason may be unfortunately just a fixed number of design teams available to go and do the shrinks. And another reason may be that the -- when we bring a new production process to Micron, that's a very expensive process, the act of buying this new tooling for the production plant, and so there's several times when we're simply limited on our capacity for that new production process.

Q. Now, you mentioned earlier that -- as far as I understood it, and correct me if I'm wrong -- that

Micron has the ability to -- or gets newer production processes every 15 months. Did I get that right?

A. That's generally about correct, yeah.

Q. Does that mean that it has an understanding 15 months in advance of when new process technology is going to be available?

A. At least.

Q. And can you give me a sense how much time in advance of that Micron needs in order to get its design ready for those -- get its design work -- or have its shrink design work done by the time new process technology is available?

A. Sure. Well, my job as design manager is to make sure that designs for shrink reasons are never the limiter. If Micron invests the money to bring in this new production process, which is incredibly capitally intensive, then typically we want to make sure that the designs are in silicon, proven out, qualified and ready to go by the time that that process is ready for high-volume production. So, ideally, we would like to be -- you know, to have the chip through this entire process, internally qualified and ready for production, you know, before that process technology is ready to ramp in the fabs. If it's not, then we've bought a lot of tools that are just sitting around depreciating and

not generating the kind of cost improvement revenue that we want.

Q. And can you estimate in terms of number of months or whatever you feel comfortable how much time before a new process technology is available Micron needs to be underway with its shrink design work?

A. We would like to be internally qualified, you know, three to four months before a production process is ready to go. If you go back through the entire time phase, that would imply that tapeout has happened at least a year, a year and a half before that production process is ready to -- ready to ramp. And you can take back the start of the design phase from there.

Q. Do you know how many separate fabrication plants Micron has across the world?

A. Currently we're running roughly six production plants in operation right now.

Q. To your knowledge, when Micron transitions from one process technology to another, does it transition all of those plants at the same time to the new process technology?

A. No, we don't.

Q. Can you explain to the Court why Micron doesn't transition all of its fabrication plants at the same time to a new process technology?

A. Well, the largest reason is probably just the cash to do so. There might be other reasons such as, you know, risk management reasons of that new process technology.

Q. Now, earlier you explained that you typically assign anywhere from five to ten design engineers for new design work and an equivalent number of layout designers. Can you give us the same kind of information about how many design engineers and layout designers you typically assign to a shrink project?

A. Again, it varies, but typically it's going to be a smaller number. It might be somewhere between three to six or eight if it's a very, very involved derivative, for instance, but that's the ballpark.

Q. And before we even moved into the categories of design, you estimated that it normally takes Micron to move from the start of design and get to tapeout anywhere from six to 18 months.

A. Correct, for a new design.

Q. Can you explain where shrink design work would fall in that time range that you gave us?

A. There's some variance, but I think, you know, a ballpark range would be something on the order of three to nine months, depending on how involved that project is.

Q. And that would be from the start of the shrink design to tapeout?

A. That's correct.

Q. And I don't think I actually asked the same question for new design work. Can you give us a sense of how long it would take typically at Micron to get from the start of design to tapeout for a new design project?

A. This is -- you know, generally these are longer projects. I think, you know, a nine to 18-month kind of figure for a new design project may be about right.

Q. Okay. Now, earlier you mentioned a second kind of derivative design work, and you used the term "configuration."

A. Um-hum.

Q. Can you explain what you mean by configuration design work?

A. Sure. This is a subset of the derivative category. It may be simply taking an existing design that has something that we call outputs, it might have 16 outputs, for instance, and a configuration change may be making that product now have 32 outputs, possibly to make it better for, you know, graphics memory or different applications.

Q. And how many engineers do you typically assign

to do configuration work?

A. This would roughly be on the order of three to six designers, depending on the scope.

Q. And in your experience, how long does configuration design work typically take?

A. I think you're talking on the order of four to seven months, depending on the scope of the project.

Q. And a third category of derivative design work that you mentioned was flip-out --

A. Um-hum.

Q. -- design. Can you explain what you mean by flip-out design?

A. If it's possible, we try to take an existing design that may be for a 64-meg product, for instance, and in its simplest form, take all of that layout work and just flip it and put two of them together, move a few of the rectangles, and hopefully have something that's basically a 128-meg memory chip design. Unfortunately, it's never quite that simple, but that's the essence of it.

Q. And how many engineers do you typically assign to a flip-out project?

A. This might be on the order of three to six designers.

Q. And how long does a flip-out project typically

take?

A. It could be anywhere from four to eight months.

Q. Now, you also mentioned a cut-down design work. Is that the same thing as flip-out or is that different?

A. Well, in essence it's the same, only that we're trying to get a design of smaller density from our existing design. So, we may take a 256-megabit design and try to take all of that layout data and cut off the 64 million of those memory cells and try to make a -- or I'm sorry, 128 million of those memory cells and make a 128-megabit DRAM design from that existing design.

Q. And how many designers would you typically assign to a flip -- or a cut-down project?

A. This could be on the order from three to five designers.

Q. And about how long does it typically take to do a cut-down project?

A. This usually just might be on the order of three to five months in general.

Q. Okay. And again, that time period, just to make the record clear, is the time period involving the start of design work to tapeout?

A. That's correct.

Q. The third category of design that you mentioned was revision design.

A. Correct.

Q. Can you explain what revision design work entails?

A. Um-hum. We think of a revision design as taking an existing design project and keeping most of the circuitry, most of the layout intact and just changing something on it, be it something required by the process or some kind of a circuit change, something that requires new transistors, a new set of masks, basically a new design project, but just making a smaller number of changes.

Q. Okay. Under what circumstances does Micron do revision design work?

A. Well, there's not many of these projects. Unfortunately, if we're doing a -- what we call a revision tapeout, it's usually the case that we've found something fundamentally wrong in a -- in one of our design projects that made it to silicon, some kind of a problem that we have to fix with a new set of masks. So, it doesn't happen often.

Q. Can you remember an example of when Micron had to do revision design work?

A. Sure, a relatively recent example would be

Micron's first 256-meg DDR product. We taped this out in mid-year 2000. We got it in silicon. We thought it looked pretty good. About four or five months down the road, more of this testing through this validation process and this internal qualification process uncovered the fact that there were some -- there were some flaws in the circuitry, certain things that weren't working the way they were supposed to, and consequently, we started out a new revision design called the T96B to go fix those.

Q. Okay. Now, in the process of fixing those problems that you uncovered in that project, did you have to do transparent design work or did you have to do something besides transparent design work?

A. Well, that's what we would have called transparent design work, because both of those projects still conformed to our existing specification, our list of guidelines on what that part should do from a customer's perspective.

Q. Okay. And about how long did this revision design work on the 256-meg DDR part take?

A. From the start of design to tapeout, it was roughly a four-month project.

Q. And were there costs associated with that four-month project on the 256-meg DDR revision?

A. Yes, very much so.

Q. And can you identify what categories -- what kinds of costs were associated with that revision work?

A. Well, I guess you could break it down into three primary sets of costs; what we considered as out-of-pocket costs, a second category that we think of in terms of inventory and WIP, work in progress, on the older design that is essentially worthless, and then the third category is what we would think of as opportunity costs.

Q. Okay. Now, I'd like to take you through each of those costs that were associated with that revision work. What did you mean when you used the term "out-of-pocket costs" in relation to the revision work that was done on the 256-meg DDR?

A. Well, these are just -- these are hard costs that -- out-of-pocket money that Micron needs to spend on this -- on this unplanned design project, this new project that is really just fixing problems from the older project.

Q. And what are examples of some of the money that had been spent on that project by Micron?

A. Um-hum. Well, one of the out-of-pocket expenses was just the cost for this new mask set. In that particular case, this was a project on what we

call a 0.15-micron production process --

MR. BOBROW: I'm sorry, Your Honor, Jared Bobrow from Micron Technology.

JUDGE McGUIRE: Sir, I'm going to ask you again to come to the podium so I'll know on the record who you are. So, just state your name again.

MR. BOBROW: Jared Bobrow from Micron Technology. I'm sorry for interrupting. It sounded like the witness was about to go into some information that might be confidential to Micron in terms of the process series and what the cost of that mask set might be to Micron, so I just wanted to caution the witness on that or ask for provisional in camera treatment.

JUDGE McGUIRE: Let me ask counsel, do you intend to go into this area to any extent at all? If so, I am just going to declare it in camera testimony.

MS. ZUK: Your Honor, we may get into some actual numbers, certainly in a little bit we will, so it may be --

JUDGE McGUIRE: When you say -- what, are you going to do that now or at some point during the examination? If you're going to do it now, then we are just going to declare in camera treatment.

MS. ZUK: I would -- I think on the side of caution, it would be a good thing to do that.

JUDGE McGUIRE: All right, why don't we do this. It's time to take a break anyway. Why don't we take a ten-minute break. I'm going to ask the audience, we've gone through this before, but due to a prior order issued by this Court, the testimony that we're going to take up next is confidential, and the public will not be able to be in court during this inquiry. So, when we come back, I'm going to ask only those individuals that have access to in camera treated evidence to come back in the courtroom.

Do we have some idea as to how long that may take so we can advise the audience, you know, about how much time this might take? And then also, as we did the other day, we may want to discuss whether respondent at that time wants to go into its cross to expedite this in camera type treatment.

MS. ZUK: I would think that -- I mean, the rest of the presentation will involve the demonstratives that you ruled on earlier today, so it may be -- it may cause the entire examination -- the remaining examination to involve --

JUDGE McGUIRE: Okay, then let's take our break. The audience then will be apprised, we will open the door, we will do something at the end of this, and my apology, but that's the way it has to be in this

case.

So, let's take a ten-minute break. Hearing in recess.

(A brief recess was taken.)

JUDGE McGUIRE: This hearing is in order and is now in in camera session.

(The in camera testimony continued in Volume 22, Part 2, Pages 4204 through 4253, then resumed as follows.)

MR. STONE: In that regard, Your Honor, could I just clarify based on Micron's counsel's statement that the last question and answer about needing additional test equipment is one we can discuss with our client not subject to the in camera order?

JUDGE McGUIRE: Mr. Bobrow, do you want to be heard?

MR. BOBROW: Yes, I have no objection to that.

JUDGE McGUIRE: Okay, so noted.

MR. STONE: Thank you, Your Honor. I appreciate that courtesy.

THE REPORTER: Can we go off the record?

(Discussion off the record.)

JUDGE McGUIRE: On the record.

MS. ZUK: Would it be possible to read that question back?

(The record was read as follows:)

"QUESTION: And earlier, in describing the inventory that you had established for the design that you had to revise on the 256-meg part, you mentioned -- I'm sorry, let me start that over again."

JUDGE McGUIRE: Off the record.

(Discussion off the record.)

JUDGE McGUIRE: Okay, where are we?

MS. ZUK: I believe we are at the inventory cost issue, so I will try to rephrase.

BY MS. ZUK:

Q. Earlier you -- when you described the revision work on the 256-meg DDR part that you had -- that Micron had to do, you mentioned that one of the costs associated with that were inventory costs.

A. Correct.

Q. How would the inventory costs associated with that revision work compare to the inventory costs associated with work -- redesign work that would need to occur on SDRAM and DDR parts as a result of litigation with Rambus?

MS. JEFFRIES: I'm going to again object on the same opinion testimony and speculative grounds, and in this particular question, we are getting into the compound question of some significance because of the

different alternatives that have been proposed. They are widely varying possibilities with respect to inventory, at a minimum.

JUDGE McGUIRE: Well, I'll let you be heard on this, Ms. Zuk. How is this not opinion testimony?

MS. ZUK: It's based on his understanding of what revision work has entailed for Micron and what --

JUDGE McGUIRE: All right, I do think that it's a compound question, so on that basis, I'll uphold the objection. So, you need to state the question with more specificity.

MS. ZUK: Okay.

MS. JEFFRIES: Thank you, Your Honor.

BY MS. ZUK:

Q. Let's take the redesign work that would need to occur on SDRAM parts separately from the redesign work that would need to occur on DDR SDRAM parts.

A. Okay.

Q. Focusing on the redesign work that would need to occur on SDRAM parts, how would the inventory costs associated with that redesign work compare to the inventory costs associated with the revision work that was done on the 256-meg SDRAM part?

MS. JEFFRIES: Your Honor, again, I have to object. That hasn't quite corrected the problem.

There are at least six alternatives that are proposed, for example, to change out the programmable CAS latency feature. There are additionally six or so proposed alternatives for the programmable burst length feature. Each of those could have potentially different impacts on the inventory, and so without breaking it down, we're getting a compound question that doesn't -- again, calling for opinion, calling for speculation, and now giving us an inaccurate response, frankly, with respect to its combination.

JUDGE McGUIRE: All right, sustained.

MS. JEFFRIES: Thank you.

MS. ZUK: Perhaps we can ask these preliminary questions and it might resolve some of these issues or concerns.

JUDGE McGUIRE: Please.

BY MS. ZUK:

Q. Are you familiar that there are different alternatives to -- that could be used to avoid each feature that is at issue in the Rambus case?

A. Generally, I'm familiar with the fact that there are some proposed alternatives if infringement were found.

Q. Do you have an understanding about whether or not the different costs associated with implementing

those alternatives would differ depending on the alternative selected?

MS. JEFFRIES: Object to that on lack of foundation. The witness has not shown that he understands in any detail what any of these alternatives would entail, and so being aware at a general level doesn't provide him with the basis to respond to the inventory question.

JUDGE McGUIRE: I'll -- that's overruled. He can answer it to the extent that he has personal knowledge of that area. Overruled.

THE WITNESS: I think my -- my understanding is looking at the first step of the process, which is simply getting the allegedly infringing circuitry off the design, and in that sense, the inventory costs that would be incurred do, in fact, compare to the revision that we talked about.

In that case, there was essentially no inventory and trivial amount of work in progress because we hadn't started ramping that product yet. For either mid-year 2000 or end of year 2002, obviously these SDRAM and DDR products were in high-volume production.

MS. ZUK: Your Honor, can I have a minute to talk with co-counsel?

JUDGE McGUIRE: Sure.

(Counsel conferring.)

MS. ZUK: All right, I'm ready.

JUDGE McGUIRE: All right, go ahead.

BY MS. ZUK:

Q. Let's move on to the last topic.

A. Okay.

Q. Have you ever been involved in any other patent litigation for Micron besides the Rambus litigation?

A. I have.

Q. And what was that litigation besides the Rambus litigation that you were involved with?

A. I was involved with litigation with Mosel-Vitelic involving patent disputes about three years ago.

Q. And what was your involvement in the Mosel-Vitelic litigation?

A. I was helping out Micron counsel on a broad variety of technical matters.

Q. Were you deposed in that case?

A. I was.

Q. How long were you involved in that litigation?

A. To the best of my memory, my involvement in that litigation occurred over about a six to eight-month period.

Q. Are you familiar with Micron's '376 patent?
A. I am.
Q. Why are you familiar with Micron's '376 patent?
A. I am -- the inventor of that patent reports to me. I had several discussions with him on this patent at the time that he was filing it.
Q. Do you know whether Micron's '376 patent was at issue in the Mosel-Vitelic case?
A. I do.
Q. And was it at issue?
A. It was.
Q. What Mosel parts did Micron assert the '376 patent against?
A. We asserted this against Mosel-Vitelic's synchronous DRAM part.
Q. Were burst EDO parts at issue in the Mosel-Vitelic case?
A. No, they were not.
Q. Do you have an understanding of why burst EDO parts were not at issue in the Mosel-Vitelic case?
A. To my knowledge, Mosel-Vitelic did not make burst EDO parts.
Q. Do you have an understanding of what the '376 patent relates to based on your familiarity with that patent?

A. I do.

Q. How did you develop that understanding?

A. Really through the discussions with the inventor of that patent, as well as the fact that we used the invention on several of our designs.

Q. Can you explain what you understand the '376 patent to relate to based on your familiarity with the patent?

A. The '376 patent discloses an invention that helps the speed of the DRAM array operate faster.

Q. Does the '376 patent, to the best of your familiarity with it, describe any circuits -- circuitry?

A. It does.

Q. What kind of circuitry, to the best of your understanding, does it describe?

A. The '376 patent describes circuitry located down in the guts of the memory array that helps that memory array to write faster.

Q. Now, you just referred to or you used the term "guts of the memory array."

A. Um-hum.

Q. What does that indicate about the level of circuitry that this patent relates to?

JUDGE McGUIRE: All right, let me interject

here. Where are we headed with the '376 patent?

MS. ZUK: This was an issue that was raised in the -- with another Micron witness, and we're just broadening the record on this issue.

JUDGE McGUIRE: Yeah, but why are you broadening the record is my point?

MS. ZUK: Because it goes to --

MR. ROYALL: I --

MS. ZUK: Go ahead --

MR. ROYALL: I'm sorry --

MS. ZUK: I'll let co-counsel respond.

MR. ROYALL: I can answer that, Your Honor. I believe that this --

JUDGE McGUIRE: Is this patent, the patent we're discussing now, an issue in this case?

MR. ROYALL: It's only an issue I believe because Rambus has made it an issue with a prior Micron witness, and that prior Micron witness, unlike this witness, was not involved in the litigation that involved the patent, so that I think Ms. Zuk has only a few questions to clarify based on what was raised earlier by the witness.

JUDGE McGUIRE: Okay, I'll hear the inquiry then. Proceed.

BY MS. ZUK:

Q. Does the local write-enable circuit that you believe is described in the '376 patent relate to an interface of a part?

A. No, not at all.

Q. By that, do you mean that Micron's specification would not specify a local write-enable circuit?

MS. JEFFRIES: Object to that as leading, Your Honor.

JUDGE McGUIRE: Sustained.

BY MS. ZUK:

Q. Do you have an understanding of whether or not Micron's specification describes a local write-enable circuit?

A. I do have an understanding of whether or not our specifications mention that, and they do not.

Q. Do you have an understanding of why Micron's specification does not describe a local write-enable circuit?

MS. JEFFRIES: Object, Your Honor, lacks foundation.

JUDGE McGUIRE: That's the same question, so also sustained.

BY MS. ZUK:

Q. Are you familiar with a burst EDO

specification?

A. I am.

Q. What burst EDO specifications are you familiar with?

A. I'm familiar with Micron's internal burst EDO specification.

Q. How did you become familiar with Micron's burst EDO specification?

A. Really by being in the design group at the time and having familiarity with the design work that was occurring on burst EDO.

Q. Do you have an understanding of the level of detail that the burst EDO specification goes into?

A. I do.

Q. What is your understanding?

A. Well, my understanding of the level of the burst EDO specification is that it's roughly the same as the rest of our specifications, which is solely a description of how the part -- the memory chip will operate and look to a customer.

Q. Does a burst -- does Micron's burst EDO specification go into the level of detail that would include a local write-enable circuit?

A. It does not, no.

Q. Do you have an understanding of why it does

not?

MS. JEFFRIES: Object to that as lacking foundation.

JUDGE McGUIRE: No, I think she's laid the foundation now. Overruled.

THE WITNESS: Well, the local write-enable circuit that's disclosed in the '376 invention is something that's really an implementation detail in the memory array. It's something that would be completely transparent to the user, and so there's really nothing that could be said about it in the specification.

BY MS. ZUK:

Q. Are you familiar with Micron's SDRAM specifications?

A. I am.

Q. And are you familiar with Micron's DDR SDRAM specifications?

A. I am.

Q. How did you become familiar with those specifications?

A. Really in my work as DRAM design manager for products -- the SDR and DDR products.

Q. Do any of Micron's SDRAM specifications today describe a local write-enable circuit?

A. No.

Q. Do you have an understanding of why Micron's SDRAM specifications do not describe a local write-enable circuit?

A. Really for the same reasons. A local write-enable circuit is something down in the guts of the memory array that just does not pertain at all to the interface of a particular design. There's nothing to say about it in the specification.

Q. Do any of Micron's DDR SDRAM specifications get down to the level of a local write-enable circuit?

A. They do not, no.

Q. And why -- why don't they?

A. Really for the same reasons. It's just a -- this is not an invention that has anything to do with the interface, something that the customer would see.

Q. Do you have any firsthand experience with JEDEC?

A. No, I do not.

Q. Did you ever attend any JEDEC meetings?

A. No.

Q. Did you ever review any presentations that were made during JEDEC meetings?

A. Over time, I've had occasion to review certain JEDEC presentations.

Q. Are you familiar with JEDEC's specifications?

A. I am.

Q. How did you become familiar with JEDEC's specifications?

A. Really in my interactions with the -- with the marketing group, in my design capabilities, I have had cause to review JEDEC specifications.

Q. Do any of JEDEC's specifications to the best of your knowledge require a local write-enable circuit?

A. They do not, no.

MS. ZUK: Thank you, Your Honor, I have no further questions.

JUDGE McGUIRE: Okay, very good.

How much time does counsel want for lunch today?

MS. JEFFRIES: I think if we break until 2:00, that should be fine.

JUDGE McGUIRE: All right, that will be fine, very good. We will take a break until 2:00 for lunch. Off the record.

(Whereupon, at 12:50 p.m., a lunch recess was taken.)

AFTERNOON SESSION

(2:00 p.m.)

JUDGE McGUIRE: This hearing is now in order.

At this time we will hear the cross examination by respondent.

MS. JEFFRIES: Thank you, Your Honor.

CROSS EXAMINATION

BY MS. JEFFRIES:

Q. Good afternoon, Mr. Shirley.

A. Good afternoon.

Q. I'd like to start off this afternoon by talking to you about the design process you spoke with Ms. Zuk about on direct examination.

A. Yes.

Q. And you had indicated that the design process begins when you receive a spec or your group receives a spec from marketing?

A. That's correct.

Q. Marketing, is that the same group that has previously been referred to as applications engineering?

A. Applications engineering is a -- I think something we think of as a subgroup of marketing, certainly one of the pieces of marketing.

Q. All right. So, Terry Lee you mentioned was the

head of marketing. Is that right?

A. Terry Lee is the head of marketing for the computing and consumer group today.

Q. And Brett Williams, is he also part of the general marketing group?

A. I believe so.

Q. And Terry Walther, he's also part of that applications/marketing segment at Micron?

A. I'm -- as of today, I'm not quite sure where Terry Walther is located.

Q. He has been in that group previously?

A. To the best of my knowledge, yes.

Q. And you indicated that you regularly interact with the folks in the marketing or applications engineering with respect to the specifications that you receive from them. Is that right?

A. It depends on the specification, but there is interaction that occurs, yes.

Q. And I think you mentioned one instance would be when you're dealing with a power issue, for example, and you need to interact with them back and forth about that?

A. That's correct, yeah.

Q. All right, let's go to the nine steps that you identified with Ms. Zuk, if we could.

A. Okay.

Q. All right. And these are the nine steps of the process for developing a DRAM. Is that right?

A. That is correct, yes.

Q. All right. And each of these nine steps would be required for each DRAM product that Micron creates. Is that correct?

A. That is correct, if we took that particular product all the way to tapeout, for instance.

Q. So, then, there are some products that you don't take all the way to tapeout, that you might work on some design for, might even do some layout, but you would not get all the way to tapeout?

A. That is correct.

Q. And what percentage of products -- excuse me, of projects that start with the design phase would you say do not make it all the way to tapeout?

A. Boy, that's a tough one to answer. There's certainly a number of projects for which we have started a database and three days of design work, for instance, knowing that that's a product that would never tape out. We kind of use that -- that design phase, that database as kind of a scratchpad, if you will.

Q. And do you have a rough number in mind, say for

example, with respect to SDRAM products that Micron started to design that did not reach tapeout? Do you have an estimate of that number?

A. Boy, I don't think I do.

Q. And what about for DDR SDRAM products, any estimate?

A. Not without some further research, no.

Q. Okay. And I noticed actually going through some of the documents that your counsel provided to us that there seem to be a set of designs that, as you say, did not reach tapeout, and I'd just like to confirm with you by going through those documents, if I could --

A. Sure, okay.

Q. -- if that's the case.

I don't know if there is going to be an in camera assertion at this point.

MR. BOBROW: Jared Bobrow from Micron Technologies. I believe that those documents that were provided at the request of Rambus' counsel were designated in that fashion of restricted confidential.

JUDGE McGUIRE: Okay, so we are going to have to go back into in camera session?

MS. JEFFRIES: I believe so.

JUDGE McGUIRE: Okay, let me advise again to

the audience that due to a prior court order in this case, the testimony that is about to be offered is considered confidential and is closed to the public. So, at this time, everyone that has not been cleared to have access to this testimony will have to vacate the courtroom.

(The in camera testimony continued in Volume 22, Part 2, Pages 4254 through 4288, then resumed as follows.)

JUDGE McGUIRE: Okay, let's go back on the record. At this time, this proceeding is in the -- will return to the public session, and you may proceed, if you would, Ms. Jeffries, in your cross examination.

MS. JEFFRIES: Thank you. Thank you, Your Honor.

BY MS. JEFFRIES:

Q. Mr. Shirley, you testified on direct examination earlier today that you began your design work on DDR SDRAM in -- sometime in 1997. Is that right?

A. That's correct.

Q. If I could please call up RX-0920.

May I approach, Your Honor?

JUDGE McGUIRE: Yes.

MS. JEFFRIES: Would you like a hard copy as

well?

JUDGE McGUIRE: No, not if it's -- if it's on the screen, no.

BY MS. JEFFRIES:

Q. Mr. Shirley, I'd like you to take a look at what's just been handed to you, it's been marked RX-0920. If you look at the second page of the document, you'll see there's a statement where it says --

MS. ZUK: Objection, Your Honor. I am going to have to object on grounds of this questioning lacks foundation. It's not clear to me that Mr. Shirley has ever seen this document.

JUDGE McGUIRE: Response?

MS. JEFFRIES: He may not have seen the document, Your Honor. I was just going to ask him about the contents and whether they had been relayed to him.

MS. ZUK: Your Honor, I believe you've previously ruled that a witness cannot testify to a document before it has been established that the witness has seen the document.

JUDGE McGUIRE: Well, why don't we ask him if it's been received, and then -- as of the current time, you haven't laid the foundation. So, I'll give you the

opportunity, and then I'll entertain the objection. I mean, that objection is upheld. Now, if you want to go ahead and try to lay a proper foundation, I'll give you that opportunity.

BY MS. JEFFRIES:

Q. Mr. Shirley, have you ever seen before what's been marked as RX-0920?

A. To my knowledge, no.

Q. Were you ever told in April of 1997 by either Terry Lee, Kevin Ryan, Gary Welch or Jeff Mailloux that Rambus feels DDR for any memory is under their patent coverage?

A. To the best of my memory, no.

Q. Were you told at any time by any of these individuals, again, Jeff Mailloux, Terry Lee, Kevin Ryan, Terry Walther, Jon Biggs or anyone else at Micron that Rambus feels DDR for any memory is under their patent coverage?

A. It's certainly possible, but nothing outside of the context of this litigation comes to mind.

Q. And when you say "this litigation," are you meaning the litigation between Micron and Rambus?

A. That's correct.

MS. JEFFRIES: May I approach, Your Honor?

JUDGE McGUIRE: Yes.

BY MS. JEFFRIES:

Q. If we could have RX-0976?

Mr. Shirley, you've just been handed what's been marked RX-0976. That appears to be an email that was sent from Jeff Mailloux to you and some other folks at Micron.

Do you see that?

A. I do.

Q. And do you have any reason to doubt that you received this document in August of 1997, the date depicted?

A. I don't.

Q. And if you take a look at the -- this is an email that appears to be forwarding a press release about a company called AMCC. Is that right?

A. Correct.

Q. Okay. If you look at the top portion of the email, it states, "Did not know if you had seen this, might be worth looking at what PLL or DLL stuff these guys have? Get some chips and look at them? Etc."

Do you see that?

A. I do.

Q. Then Mr. Mailloux continues to say, "Just a note, although they probably work with Rambus to develop these clock chips," and that's referring to the

clock chips that are discussed in that press release below, right?

A. Um-hum.

Q. He's continuing --

A. To be fair, I'd have to reread through the entire press release.

JUDGE McGUIRE: All right, take your time.

THE WITNESS: Okay. (Document review.) I think I've got a good enough of an overview to go on.

BY MS. JEFFRIES:

Q. All right, thank you. Now that you've reviewed the document, do these clock chips -- does that phrase refer to the clock chips being discussed in the press release that's being forwarded in this email?

A. I would assume so.

Q. And Mr. Mailloux goes on to say, "Of course, that does not necessarily mean that Rambus does not have IP that relates to the AMCC stuff."

Do you see that?

A. I do.

Q. And subsequent to receiving this email in August of 1997, did you do anything to investigate whether, in fact, Rambus had IP that could relate to the AMCC stuff or PLLs or DLLs?

MS. ZUK: Objection, potentially

mischaracterizes the document. The document refers to AMCC stuff, not PLLs.

JUDGE McGUIRE: Sustained.

BY MS. JEFFRIES:

Q. Did you do any investigation subsequently to receiving this email as to whether Rambus had any IP that relates to the AMCC stuff?

A. To the best of my knowledge, no.

Q. And you earlier stated that you began design work on DDR2 sometime in late 1999. Is that right?

A. That is correct.

Q. And I believe you said you had a product that taped out -- a DDR2 product that taped out in January 2002. Is that right?

A. That is correct.

MS. JEFFRIES: Thank you, Your Honor, I have nothing further.

JUDGE McGUIRE: All right, thank you, Ms. Jeffries.

Ms. Zuk, any further questions on redirect?

MS. ZUK: I will have probably a few questions. Can I have maybe two minutes to --

JUDGE McGUIRE: Sure. All right, off the record.

(A brief recess was taken.)

JUDGE McGUIRE: On the record.

Ms. Zuk?

MS. ZUK: I have no further questions.

JUDGE McGUIRE: Thank you very much. Sir, you're excused from this proceeding.

THE WITNESS: Thank you.

JUDGE McGUIRE: Thank you very much for your testimony.

How does complaint counsel intend to proceed this afternoon? I assume you don't have anyone else in mind that you can call this afternoon?

MR. ROYALL: No, Your Honor, I don't believe we do. I think we have noticed another -- notified respondent's counsel of another witness who will be prepared to testify in the morning.

JUDGE McGUIRE: Okay, then if not, this hearing will be adjourned until we convene at 9:30 a.m. on Thursday.

(Whereupon, at 3:15 p.m., the hearing was adjourned.)

C E R T I F I C A T I O N O F R E P O R T E R

DOCKET NUMBER: 9302

CASE TITLE: RAMBUS, INC.

DATE: JUNE 4, 2003

I HEREBY CERTIFY that the transcript contained herein is a full and accurate transcript of the notes taken by me at the hearing on the above cause before the FEDERAL TRADE COMMISSION to the best of my knowledge and belief.

DATED: 6/5/03

SUSANNE BERGLING, RMR

C E R T I F I C A T I O N O F P R O O F R E A D E R

I HEREBY CERTIFY that I proofread the transcript for accuracy in spelling, hyphenation, punctuation and format.

DIANE QUADE