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UNITED STATES INTERNATIONAL TRADE COMMISSION

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IN THE MATTER OF	:
	: Investigation
CERTAIN MLC FLASH MEMORY	: No. 337-TA-683
DEVICES AND PRODUCTS	:
CONTAINING SAME	:
-----	X

OPEN SESSION

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1 BEFORE THE
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10 Hearing Room A

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13 United States
14 International Trade Commission

15 500 E Street, S.W.

16 Washington, D.C.

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19 Tuesday, April 27, 2010

20 9:00 A.M.

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23 The parties met, pursuant to the notice of the

24 Judge, at 9 a.m.

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1 P R O C E E D I N G S

2 (8:54 a.m.)

3 JUDGE ESSEX: Please be seated. All
4 right, let's come to order. We are here In the
5 Matter of Certain MLC Flash Memory Devices and
6 Products Containing Same, Case Number
7 337-TA-683.

8 Complainants, do you have anything to
9 take up before we start the tutorial?

10 MR. WHITE: No, Your Honor, just other
11 than the general introductions of who we have
12 here today.

13 JUDGE ESSEX: Before you do your
14 general introductions, I want to make sure your
15 microphone is turned on so the court reporter
16 can hear clearly, that will apply to everybody.
17 Go ahead.

18 MR. WHITE: I'm sorry, Your Honor, no,
19 the Complainant only has the introductions and
20 the presentations we prepared for the Court's
21 benefit this morning.

22 JUDGE ESSEX: Go ahead and introduce
23 your team, then.

24 MR. WHITE: Your Honor, to my left is
25 Dr. Thomas Rhyne, he is BTG's retained expert to

1 DR. RHYNE: I have two boards that
2 don't, and I will clarify when we go into CBI.

3 JUDGE ESSEX: We're not in CBI yet?

4 DR. RHYNE: Not yet.

5 What I would like to do is compare the
6 language of claim 12 to this last figure and
7 show you kind of how these two ideas relate,
8 okay?

9 Okay, a multi-level memory apparatus,
10 comprising an electrically alterable
11 non-volatile memory cell, having more than two
12 predetermined memory states. In figure 8, this
13 is the cell, with the circuitry around it. In
14 terms of the predetermined memory states, those
15 are the regions of voltage, threshold voltage
16 that have been determined to represent 1-1, 0-1,
17 1-0 or 0-0, and they're a range of threshold
18 voltages.

19 You basically have to look at what is
20 called here the read reference. What is the
21 voltage that's the highest threshold voltage
22 that you're willing to accept as a 1-1 in
23 comparison to the lowest threshold voltage that
24 you're willing to accept as a 0-1, and then you
25 move up, what's the highest voltage you'll

1 accept as a 0-1 in comparison to the lowest
2 voltage that could be a 1-0.

3 So the first thing somebody does is
4 take this range of threshold voltages and break
5 it up, in this case, into four regions. The
6 lowest region kind of doesn't have a bottom, but
7 it's got a top. The highest region really
8 doesn't have a top, but it's got a bottom, but
9 the two in the middle have to have a clearly
10 identified top and bottom, so that you know
11 where one stops and the next one starts.

12 Then it says a selecting device which
13 selects one of a plurality of reference signals
14 in accordance with information indicating a
15 memory state. Let me stop there. The circuit
16 shows that I'm going to store two bits, and you
17 can see this arrow and that little slash means
18 that this is really not one wire, it's really
19 two wires. And depending on whether that is a
20 0-0, a 0-1, et cetera, all the way to 1-1,
21 information is going to come into this verify
22 reference select, and it's going to pick as a
23 switch one of the four externally supplied
24 reference voltages that come into it.

25 And at any given time, when you

1 program it, only one of those voltages is the
2 voltage you're working at, okay? And what that
3 reference voltage is is within this
4 predetermined memory state, which is a range of
5 threshold voltages. The patent says you find a
6 verify reference that is between these two, it
7 doesn't give you a specific place to put it.
8 And it also says that the sequence of reference
9 voltages have to increase as you go to higher
10 and higher threshold voltages for each of the
11 higher defined memory states.

12 But, for example, here, using figure
13 9, the reference voltage number 2 would be the
14 lowest voltage that you would accept as a
15 threshold voltage for a cell that is being
16 programmed from 1-1 up to 0-1. So the way you
17 program is you start with a cell that's a 1-1,
18 you program it, you hit it with a voltage that
19 puts some electrons on the floating gate, and we
20 showed that little -- somebody called it the
21 pancake D-RAM, the little thing that moves
22 along. You'll move that cell to the right.

23 Then you'll check, have you gotten the
24 threshold voltage up to where it's greater than
25 or equal to V_{ref2} . The answer is no. You hit

1 it again. You check against Vref2. No, I hit
2 it again, I hit it again until finally that cell
3 and hopefully all the others that are like it
4 will be moved past this threshold, this minimum
5 threshold that you're going to allow for a
6 programmed cell that's a 0-1. Similarly, if you
7 were going all the way up here, you would just
8 have to have more programming or bigger
9 programming shots, and then you would move it on
10 up here.

11 The claim goes on to say, with
12 information indicating a memory state to which
13 said memory cell is to be programmed, each
14 reference signal corresponding to a different
15 memory state of said memory cell. So having
16 decided in the first part what the predetermined
17 memory states are, what the claim says is that
18 you pick a reference signal voltage, which would
19 be the minimum threshold voltage allowed for a
20 cell in that state, and that that threshold
21 voltage, this reference voltage that you're
22 going to verify with would correspond to the
23 state.

24 So you know where the state is. It
25 would be, for example, Your Honor, this range.

1 You pick a reference verify voltage somewhere in
2 that range, and then you push all the cells past
3 that reference voltage, and that voltage has to
4 correspond to whether or not you're programming
5 a 0-1 or a 1-0 or a 1-1, and that correspondence
6 is verified by this verify reference selection
7 switch. There has been a program voltage
8 switch, there hasn't been much discussion of
9 that in this case. It's block number 220 that
10 supplies the programming information.

11 And then the claim concludes by
12 calling for a verifying device which detects a
13 parameter indicating the state of the memory
14 cell, and that basically says, figure out a way
15 to find out what the reference voltage is. You
16 can do it by applying a voltage and, there is
17 two or three ways to do it. And it says -- and
18 that parameter verifies whether said memory cell
19 is programmed to the state indicated by the
20 information, what was the input telling you to
21 do, based on the detected parameter and the
22 selected reference signal.

23 So, again, you will be using one
24 reference signal to program a given cell. If
25 you were trying to get to the purple 1-0